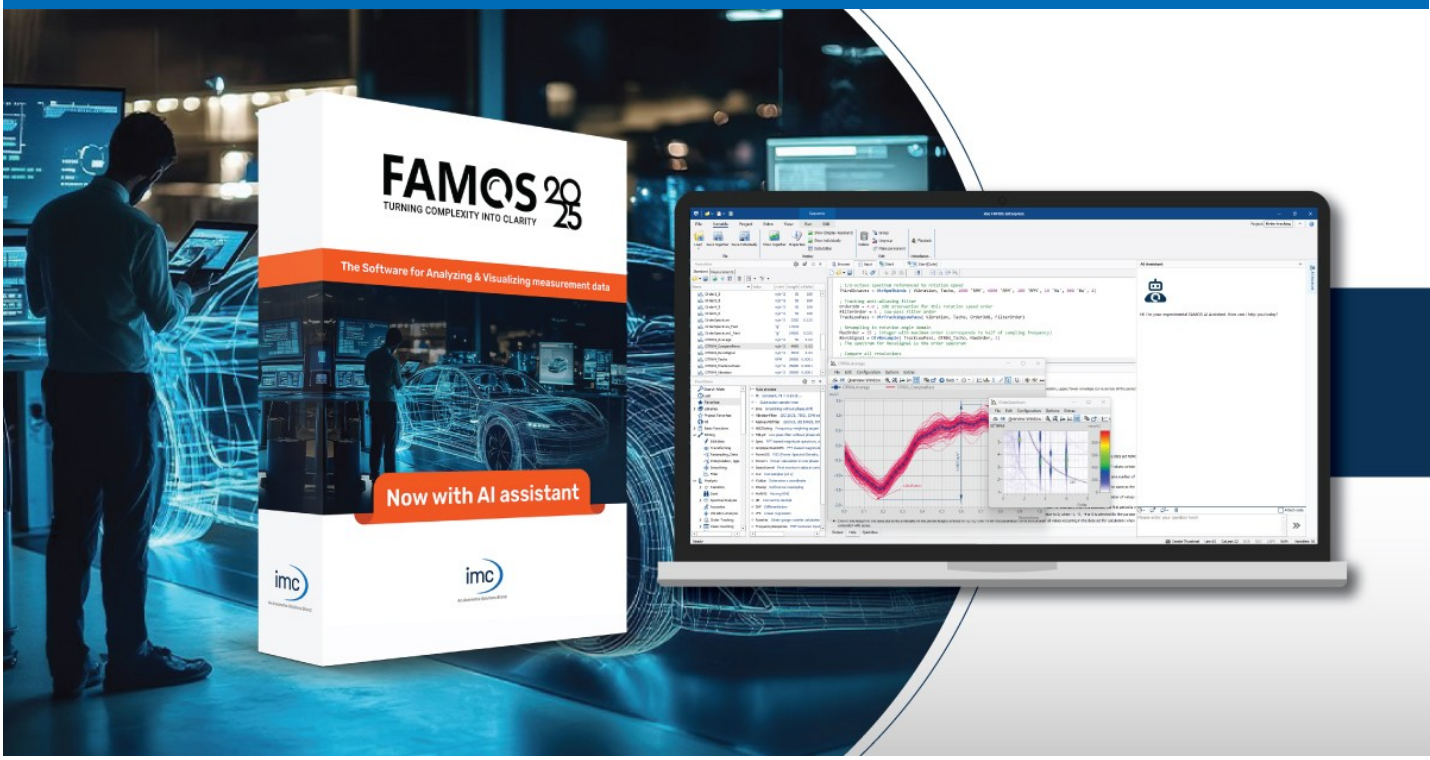
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imc FAMOS 2025

Users Manual

Doc. Rev.: 1 - 2025-05-16



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Disclaimer of liability

The contents of this documentation have been carefully checked for consistency with the hardware and software systems described. Nevertheless, it is impossible to completely rule out inconsistencies, so that we decline to offer any guarantee of total conformity.

We reserve the right to make technical modifications of the systems.

Copyright

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The software described in this document may only be used in accordance with the provisions of the "imc Software License Agreement".

Open Source Software Licenses

Some components of imc products use software which is licensed under the GNU General Public License (GPL). Details are available in the About dialog.

If you wish to receive a copy of the GPL sources used, please contact our tech support.

Notes regarding this document

This document is an excerpt from the imc FAMOS online Help. The manual for imc FAMOS is available both as an chm and in PDF format. Click on the symbol to open the help.

The program "*imc Help and Documentation*" (in the Start menu or via the menu ribbon "*Help*" > "*Additional Documents*") provides you with access to the PDF-file and other documents.

What is the best way to read the imc FAMOS documents?

If you have already worked with an older imc FAMOS version, we recommend taking a look at the topic "*Update-Info*" (What's new...). Here you can get a quick overview of changes and innovations implemented in the current version.

Getting Started

Before installing the software, start by reading the document "*Getting Started*". This contains important tips for achieving problem-free installation, as well as for operation.

All information presented in the document "*Getting Started*" is also presented in the imc FAMOS manual.

Manual - complete documentation

The manual serves as reference material. However, it is still recommended that you observe the entire instructions in order to be able to use certain functions which are more interesting than obvious.

ReadMe

This presents info on changes and extensions in imc FAMOS which were implemented after this manual went to print.

Tutorials

Following successful installation, we recommend working through the chapter "*Tutorial* 145" in order to get quickly acquainted with the workings of imc FAMOS. It familiarizes you with the imc FAMOS operating philosophy and basic operations in a convenient manner.

Training programs for introduction to the systems, and advanced workshops

We recommend that before you begin working with imc FAMOS you participate in an extensive training session. Such training will enable you to get started working efficiently much faster. Additionally, you will obtain valuable tips and information on how to use the software more effectively. More information is available on our homepage under "*Service & Training*" > "*imc ACADEMY*".

Special notes

Warning

Warnings contain information that must be observed to protect the user from harm or to prevent damage to property.

Note

Notes denote useful additional information on a particular topic.

Reference

A reference in this document is a reference in the text to another text passage.

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1 General introduction

1.1 Before you start

Dear user.

1. The software you have obtained, as well as the associated manual are directed toward competent and instructed users. If you notice any discrepancies, we request that you contact our tech support 9.
2. Updates during software development can cause portions of the manual to become outdated. If you notice any discrepancies, we request that you contact our tech support.
3. Please contact our tech support if you find descriptions in the manual which you believe could be misunderstood and thereby lead to personal injury.
4. Read the enclosed license agreement 11. By using the software, you agree to the terms and conditions of the license agreement.

Note Notes on the descriptions and the screenshots

- The help may also contain parts **shared imc software components**. These parts may differ from the rest of the help in terms of style and structure. All help files are equipped with a full text search functionality and have an index.
- The screen shots appearing in this documentation were created with a **variety of Windows versions** and their appearance may thus differ from that of your installed program.

1.2 Tech support

If you have problems or questions, please contact our tech support:

Phone: (Germany): **+49 30 467090-26**

E-Mail: hotline@imc-tm.de

Internet: https://www.imc-tm.com/service-training/

Tip for ensuring quick processing of your questions:

If you contact us **you would help us**, if you know the **serial number of your devices** and the **version info of the software**. This documentation should also be on hand.

- The device's serial number appears on the nameplate.
- The program version designation is available in the About-Dialog.

Product Improvement and change requests

Please help us to improve our documentation and products:

- Have you found any errors in the software, or would you suggest any changes?
- Would any change to the mechanical structure improve the operation of the device?
- Are there any terms or explanations in the manual or the technical data which are confusing?
- What amendments or enhancements would you suggest?

Our tech support 9 will be happy to receive your feedback.

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1.3 Service and maintenance

Our service team is at your disposal for service and maintenance inquiries:

Phone: (Germany): **+49 30 629396-333** (Mon.-Fri.: 9.00 - 12.00 and 13.00 - 17.00)

E-Mail: imc-service@axiometrixsolutions.com

Internet: https://www.imc-tm.com/service

Service and maintenance activities include, for example calibration and adjustment, service check, repairs.

1.4 Legal notices

Quality Management



imc Test & Measurement GmbH holds DIN EN ISO 9001 certification since May 1995 and DIN EN ISO 14001 certification since November 2023. You can download the CE Certification, current certificates and information about the imc quality system on our website: https://www.imc-tm.com/quality-assurance/ and in the download area of imc FAMOS.

imc Warranty

Subject to the general terms and conditions of imc Test & Measurement GmbH.

Liability restrictions

All specifications and notes in this document are subject to applicable standards and regulations, and reflect the state of the art well as accumulated years of knowledge and experience. The contents of this document have been carefully checked for consistency with the hardware and the software systems described. Nevertheless, it is impossible to completely rule out inconsistencies, so that we decline to offer any guarantee of total conformity. We reserve the right to make technical modifications of the systems.

The manufacturer declines any liability for damage arising from:

- failure to comply with the provided documentation,
- inappropriate use of the equipment.

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1.5 imc Software License Agreement

imc Test & Measurement GmbH
Voltastr. 5
13355 Berlin, Germany
Trade register: Berlin-Charlottenburg HRB 28778
Managing directors: Michael John Flaherty, Frank Mayer

imc Test & Measurement GmbH
Terms and Conditions
Governing the Use of imc Test & Measurement GmbH Software
As of: January 18th, 2024

§ 1 Objects of the Agreement

(1) In addition to the "General Terms and Conditions Governing imc Test & Measurement GmbH Deliveries and Services to Customers", these terms and conditions apply to all contracts concluded with imc Test & Measurement GmbH (hereinafter referred to as "imc") which involve the transfer of rights of use to any software developed by imc (standard software, software created or adjusted specifically for the Customer, which is recorded on the machine-decodable data carriers such as data files, databases and database material, updates, upgrades, releases, etc., including corresponding documentation, information and materials, hereinafter referred to as "Software").

(2) The Software is provided to the Customer as an executable object program on machine-decodable data carriers specified in the "Objects of the Agreement". The Software's product documentation is also supplied to the Customer either in print or on a machine-decodable data carrier. Unless otherwise expressly agreed in writing, the Customer is not issued the source code of the Software.

§ 2 Rights of Use, Scope

With regard to any transfer of rights of use to Software created by imc, the following provisions apply:

(1) Basic provisions

a) The Customer is granted a non-exclusive and – subject to the terms and conditions governing the use of Software by third parties, resale and leasing – non-transferrable right of use to the Software for its own purposes. "Use" signifies running the programs and editing the data records.

b) Until each due fee is paid in full, the Customer is entitled to use the Software solely on a revocable basis. If the Customer is in default with regard to the payment of fees, imc is entitled to revoke the use of the respective services for the duration of the default. The Customer is granted the permanent right to use copyright protected services, in particular the Software, only upon full payment of the agreed fee.

c) The Customer agrees to undertake appropriate precautionary measures to prevent unauthorized access by third parties to the Software. The original data carriers and the data carries used to make copies as per the agreement, as well as the documentation, are to be stored in a secure location. Employees are to be notified that the production of copies beyond the scope of the agreement is not permitted.

d) If the right of use is revoked or expires due to another reason, the Customer is obligated to return to imc the Software, the copies made by the Customer and the documentation. Provided that a physical return of the Software and the copies is not possible due to technical reasons, the Customer is obligated to delete such and confirm deletion to imc in writing.

(2) Reproduction

a) The Customer is entitled to make copies of the Software only if copies are necessary to use the Software in accordance with the contract. The following are considered cases in which reproduction is necessary: installation of the Software from the original data carrier onto the hard disk drive of the hardware used, as well as loading the Software into the computer memory.

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c) The Customer is not allowed to make any reproductions other than those expressly permitted under the provisions of this agreement.

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a) The Software may be used for the purposes stipulated in this contract, in particular for the Customer's business operations. Access to the Software may also be provided to parties which rely on using the Software as instructed by the Customer. In particular, the Customer is entitled to operate the Software or allow the Software to be operated on data processing devices, which are located on the premises of and are directly owned by a third party company (outsourcing). The prohibition against multiple use remains unaffected.

b) The Customer may permanently sell or give the Software to third parties provided that the Customer is granted permanent use of the Software. In the context of its period of use, the Customer may temporarily transfer the Software to third parties for a fee or free of charge. The prohibition against multiple use remains unaffected. The Customer is expressly notified that transfer to third parties is not permitted and use by third parties is technically not possible if an individual license must be acquired or an individual activation is required for third party usage, such as in the case of runtime licenses.

c) With regard to the valid use of Software by a third party, the Customer is obliged to ensure that the third party acknowledges the provisions of this agreement governing the rights of use as binding for such third party. The Customer may not transfer Software and documentation to third parties if there are grounds to suspect that the third party may infringe upon the provisions of this agreement governing the rights of use, in particular with regard to the unauthorized production of copies.

d) Subject to the provisions stipulated in § 4 Paragraphs 1 and 2 or a deviating express agreement in writing, the Customer may not use the Software while the Software is being used by a third party (prohibition against multiple use); in the event that the Software is transferred to the third party, the customer is obliged to surrender to imc all Software copies including, if applicable, all existing backup copies, or to destroy copies not surrendered.

(4) Decompilation

The reverse translation of the provided program code into other code forms (decompilation), disassembling and other forms of reverse engineering of the various production phases of the Software is not permitted. If interface information is required to achieve the interoperability of a separately created computer program, such may be requested from imc, or a third party to be named by imc, for a minor fee. Section 69 e of the German Copyright Act ("UrhG") remains unaffected by this provision.

(5) Changes by imc

If imc conducts adjustments, changes or enhances the Software on behalf and on account of the Customer, the Customer thus acquires the corresponding rights of use to the changes or enhancements of the Software to which he is entitled according to the stipulations of this agreement.

(6) Exceptional Usage Requests by the Customer

If the Customer requests to use the Software according to terms which deviate from the requirements stipulated in Paragraphs 2 through 5, this exceptional use of the Software must be agreed in writing by imc. In such an instance, the Customer agrees to provide imc with information about the desired scope of use, the pertinent field of application, etc. If imc subsequently grants a license covering the Customer's special intended use, the parties agree that a new license fee is owed by the Customer, which is independent of payments made by the Customer for the previously existing license.

§ 3 Copyright, Protection of the Software

(1) The intellectual property, in particular the copyright as well as all industrial property rights and trade secrets, are retained by imc and are not transferred to the Customer. The Customer's ownership of the machine-decodable data carries and data processing units remains unaffected.

(2) Copyright notices, serial numbers as well as designations and reservations of rights which serve as program identification or a protective right may not be removed or changed. The Customer is obliged to transfer the existing protective right notices to all copies. In particular, backup copies of the Software must be expressly designated as such.

§ 4 License Types, Multiple Use

(1) In the case of a Single-User License, the Software may be activated and run on only one data processing unit. "Activation" refers to the process of transferring the license to the data processing unit.

If the technical specifications for the Software permit a second activation, then the Customer may additionally activate the Software on a second data processing unit. However, the Software may only run on one data processing unit at any one time, not on both simultaneously.

(2) With a Network License, the Software may be run on as many data processing units as the amount of licenses obtained. In this case a central data processing unit acts as the license server for which the activation process is performed.

If the technical specifications for the Software permit a second activation, then the Customer may additionally activate and run the Software on as many data processing units as the amount of licenses obtained. However, these additional data processing units must be used by the same users who operate the Software via the license server.

(3) Subject to the provisions in Paragraphs 1 and 2 or a deviating express agreement in writing regarding network use, multiple use of the Software is not permitted.

(4) If the data processing unit is changed, the Customer is obliged to delete the Software from the hard disk drive of the previously used hardware.

§ 5 Software-Subscription

If the Software used is a software-subscription, the following additional restrictions apply:

(1) The right of use is valid for a limited time period. The start and end of the time period are specified. After the end of the time period, the right of use is expired.

(2) If the Customer wishes to continue using the Software after elapse of the specified time period, the subscription must be renewed.

§ 6 Trial Version

If the Software used is a free trial version, then the following additional limitations apply:

(1) The trial version only entitles the user to test the Software. In particular, commercially productive utilization is not permitted.

(2) The rights of use granted expire after the elapse of a period stated in the product description.

§ 7 License Key

(1) Upon delivery of the Software the Customer receives a License Key. Using this License Key, the Customer is able to activate the Software purchased. By means of this License Key the Customer can also view his license status and order updates and upgrades.

(2) The License Key is to be protected against access by third parties in order to prevent misuse. If, however, a third party gains unlawful access to the Key, the Customer is obliged to notify imc immediately via telephone, as well as in writing, so that the previous License Key may be suspended and a new one issued.

§ 8 Conclusion

(1) The law of the Federal Republic of Germany shall apply under exclusion of private international law. The provisions of the UN Convention on Contracts for the International Sale of Goods (CISG) do not apply.

(2) The place of performance for all obligations arising from this agreement is imc's registered seat. Insofar as the Customer is a merchant as defined by the German Commercial Code (HGB), a legal entity under public law, or a special asset under public law, the exclusive place of jurisdiction for all disputes directly or indirectly arising from the contractual relationship is agreed as imc's registered seat. The same applies to persons who have no general place of jurisdiction in Germany, as well as to persons who have moved their place of residence or usual whereabouts abroad since conclusion of the contract, or whose place of residence or usual whereabouts is unknown at the time the action is filed. In addition, imc is entitled to file suit at the statutory venue.

(3) Oral side-agreements are not valid. Deviating or supplementary conditions as well as modifications of this contract, including this written requirement clause, are only valid if agreed in writing and expressly marked as a modification or supplement.

(4) If certain provisions of this contract are inoperative or unfeasible, this does not prejudice other provisions of the contract. The contracting parties agree to contractually substitute an operable provision which approximates the commercial intention of the contract as closely as possible for any inoperable one.

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2 Foreword

imc FAMOS (**F**ast **A**nalysis and **M**onitoring **o**f **S**ignals) is a software program for analysis and evaluation of measurement results. With an extensive range of functions conceived especially for the needs of measurement and control applications, imc FAMOS eliminates much of your routine work in a comfortable fashion.

With imc FAMOS , you can process large data sets quickly and efficiently and create computational procedures using standard mathematical notation. No specialized programming expertise is required! Furthermore, imc FAMOS offers powerful means for displaying your data in charts or tables and for printing these in individually designed reports.

imc FAMOS processes measured data produced by imc devices (e.g. imc CRONOS, imc C-SERIES). The scope of functions also includes a large number of import- and export filters for common file formats (e.g. the standard formats of different manufacturers of measurement devices).

The task of importing data into an analysis program which are not expressed in a directly supported file format is often the first and most difficult problem involved with analyzing measured data. Toward this end, imc FAMOS offers support in a variety of ways: for simple ASCII formats, for example, a flexible and easily configured Assistant is provided. For more complex formats, the imc File Assistant can be used, by which means the user can personally create import filter, even without possessing any programming skills.

imc FAMOS is principally conceived for use in offline evaluation of data and cannot be used to control measurement instruments

imc FAMOS can be expanded with add-on modules and function libraries. Expansions are available which, for example, make it possible to design digital filters or to classify measurement data. Furthermore you can add your own self-written function libraries to imc FAMOS.

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3 Setting up - Software

3.1 System requirements

Supported operating systems
Windows 10*/11* (64 bit)
Windows 2016/2019/2022 Server (64 bit)

*released in conformance with the version of Windows 10 / Windows 11 applicable at build date of imc software

For the purpose of assigning imc FAMOS network licenses by means of the License Manager, support of Windows 2003 Server continues.

Minimum requirements for the PC
Processor with 1 GHz
2 GB RAM
1 GB free hard disk drive (NTFS format)

Languages:

German, English for programming. GUI also supports Japanese , French, Chinese, Korean partially.

Microsoft ® Excel:

In order to be able to import or export files in Microsoft ® Excel format (*.xls,*.xlsx), Excel must be installed on the same computer. The following versions are supported:

- Excel 2010, 2013, 2016, 2019, 2021 (except "*Starter Edition*"), Microsoft 365*

*released in conformance with the version of Microsoft 365 applicable at build date of imc software

Other operating system components

The following components are installed with the imc FAMOS setup if they are not already present:

Component	Version	Folder in "OSUpdate" directory
Microsoft .NET Framework	4.8.3761.0	ndp48-x86-x64-allos-deu.exe
	4.8.4115.0	ndp48-x86-x64-allos-enu.exe
Microsoft VC 2022	14.31.31103	VC2022

3.2 Installation

Windows must be correctly installed and all system requirements must be assured before installing imc FAMOS .

To install imc FAMOS , start the program "S*etup_ImcFamos_X64.exe*" from the root directory of the installation CD.

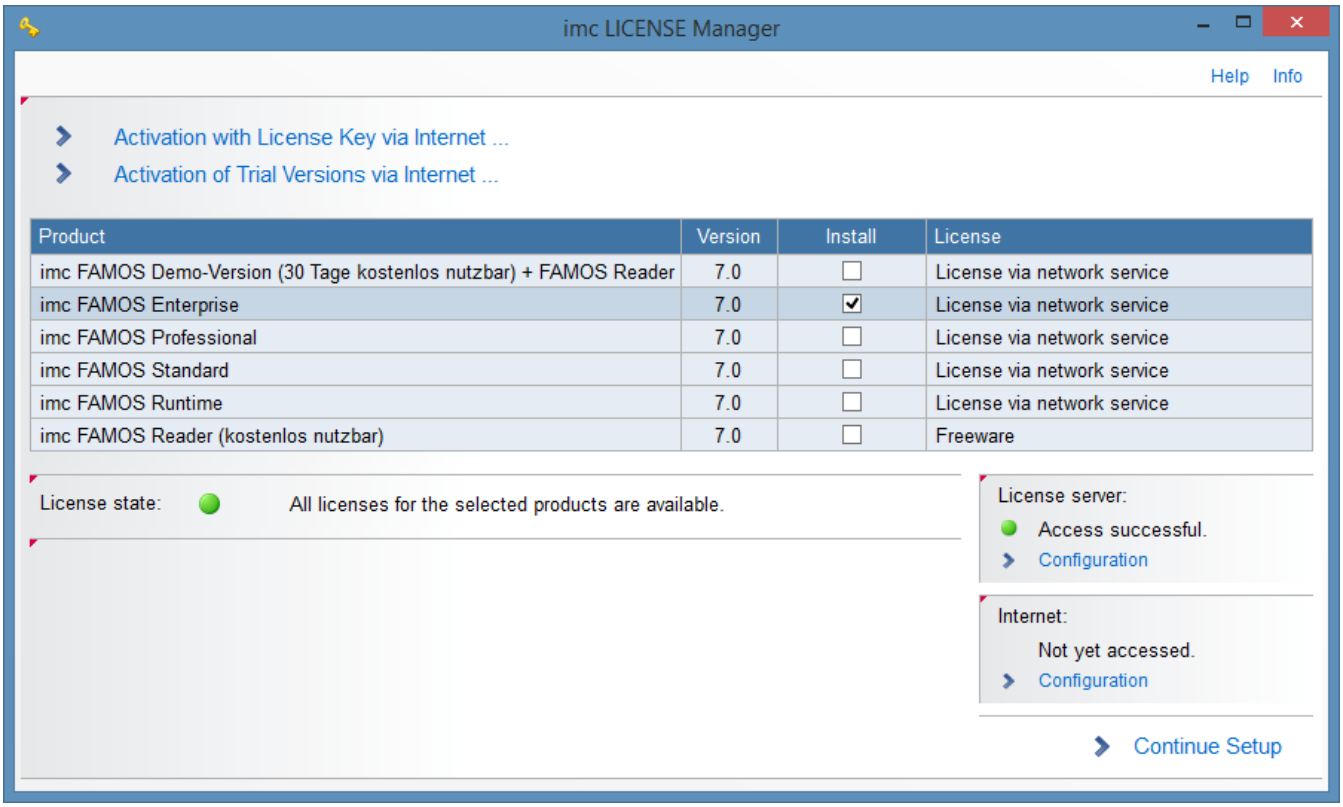
Alternatively you can select the "*Software*" icon and subsequently the command "*Install*".

Administrator rights required

For the purposes of installation and uninstallation, a user account with **administrator privileges for the PC is required**.

If you are logged on to the PC **without administrator rights**, **log yourself out** and log back on with an administration-level user account. If you don't possess the appropriate account type, you will need the support of your system administrator or IT department.

Select the edition of imc FAMOS to install:



The licensing procedure must precede the installation. Select the edition you have acquired.

Start the licensing procedure by selecting the link "***Activation with License Key via Internet...***"

The ***Reader***-version does not require licensing. To test the ***Enterprise*** version for 30 days, license it using the link "***Activation of Demo Versions via Internet...***"

For details on licensing, see here 24.

Follow the Assistant's instructions and select your preferred language for the online help files and example files like projects, sequences and dialogs.

In the subsequent dialog, the license agreement appears. Once you have accepted its provisions, select the installation folder to which to copy all the files.

The installation folder must be on the PC's local hard drive. imc FAMOS cannot be installed on a network drive.

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This base directory will be structured with various subdirectories where, for example, sample files are deposited. The subdirectory \BIN, for instance, contains all executable files and program libraries; the subdirectory "*SEQ*" sample sequences (macros); the subdirectory "*DAT*" has measurement data files containing information in various data formats.

At installation, you must also supply a name for the program group; the installation program will then supplement the Windows Start menu with a corresponding entry. If, for instance, you specify "*imc*" as your group name, you will be able to call the program from the submenu "*Start/ Programs/ imc*".

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3.2.1 Silent-Setup

Installation of imc FAMOS can be included as a part of another program setup and thus can be performed without any user input ("silent-setup").

3.2.1.1 FAMOS Silent-Setup Settings

Installation is performed by means of Inno and uses its (start) parameters such as `/verysilent`,... A comprehensive overview is available from Inno Setup itself.

Up-to-date instructions on the Silent-Setup are provided in the *ReadMe.txt* file folder "*SilentSetup*" on the installation CD, or in the zipped download version.

1. Copy the file *FamosSetup.ini* from the folder *SilentSetup* to "*Setup_imcFamos.exe*" or respectively to "*Setup_imcFamos_x64.exe*".
2. Configure the settings by editing FamosSetup.ini.
3. Start the installation:
   `Setup_imcfamos.exe /verysilent /loadinf=FamosSetup.ini`

imc FAMOS requires the following software packages (see also *SilentSetup**ReadMe.txt*)

- Microsoft .NET-Runtime 4.8 (Full)
- Microsoft VC Runtime 2022 (Version 14.31.31103.0 or newer)

These should be called prior to the silent-installation and are located in the folder "*OSUpdate*". The are called by a command line as a silent-installation:

```
    vcredist_x64_2022.exe /q
.Net-Runtime
    ndp48-x86-x64-allos-enu.exe /q
.Net-Runtime, AddOn German Windows UI (only if required)
    ndp48-x86-x64-allos-deu.exe /q
```

3.2.1.1.1 FAMOSSetup.ini: Predefined paths

- `{group}`
  The path to the Start Menu folder, as selected by the user on Setup's Select Start Menu Folder wizard page. This folder is created under the All Users profile unless the user installing the application does not have administrative privileges, in which case it is created in the user's profile.
- `{localappdata}`
  The path to the local (nonroaming) Application Data folder.
- `{sendto}`
  The path to the current user's Send To folder. (There is no common Send To folder.)
- `{userappdata} & {commonappdata}`
  The path to the Application Data folder.
- `{usercf}`
  The path to the current user's Common Files directory. Only Windows 8 and later supports {usercf}; if used on previous Windows versions, it will translate to the same directory as {localappdata}\Programs\Common.
- `{userdesktop} & {commondesktop} *`
  The path to the desktop folder.
- `{userdocs} & {commondocs}`
  The path to the My Documents folder.

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- `{userfavorites} & {commonfavorites} *`
  The path to the Favorites folder.
- `{userpf}`
  The path to the current user's Program Files directory. Only Windows 8 and later supports {userpf}; if used on previous Windows versions, it will translate to the same directory as {localappdata}\Programs.
- `{userprograms} & {commonprograms} *`
  The path to the Programs folder on the Start Menu.
- `{userstartmenu} & {commonstartmenu} *`
  The path to the top level of the Start Menu.
- `{userstartup} & {commonstartup} *`
  The path to the Startup folder on the Start Menu.
- `{usertemplates} & {commontemplates} *`
  The path to the Templates folder.

3.2.1.1.2 imcGlobal.ini: Additional settings

File format V2 or V3

The setting for the file format (V2 or V3) used by imc FAMOS (7.4 and newer) after the installation can not be specified by means of the SilentSetup-file. As of FAMOS 2023, V3 will be used as the standard. In order to ensure that the identical format is uniformly used throughout an entire company or department, this can be accomplished by means of the imcGlobal.ini file. This file must be configured one single time:

```
[Main]
Language=0x0000
[Famos]
PreferFileFormatV2=0
```

Alternatively, and maybe for future additional settings, this could be configured by someone who has an installed instance of imc FAMOS which already has the settings desired (by means of *imc FAMOS > Extra > Options*). The setting for the file format is then saved in the file *"%PROGRAMDATA%\imc\common\settings\imcGlobal.ini"*.

In a normal silent-setup, this file is not affected. Customized company installers would need to provide the configured *"imcGlobal.ini"* file accordingly.

3.2.1.1.3 License Manager Setup

Reference imc License Manager

Observe the License Manager's 54 notes on the Silent Setup .

3.2.1.2 Error messages

3.2.1.2.1 userdocs

Error message: Failed to expand shell folder constant "userdocs"

Cause: Installation of R (not the imc R-Kit) under system account. The problem is known to the R Foundation, but has not been remedied to date.

Solution:

- If R is desired
  - "Normal" installation

    - *No adaptation necessary*
  - Installation with system account, not subject to a user login.
    - *Install R. If necessary, skip Silent Setup; reference contact: 'The R Foundation' or 'R Core Team', or the associated open source community.*
    - *install imc FAMOS. Silent Setup is possible without any problem.*
- If R is not required
  - Customized installation
    - *In the Setup.ini-file, the following command line must appear without any semicolon:*
    - *Components=program,samples,manual,help,soundkit,odsbrowser*

3.2.1.3 Hardlock (HL) Dongle-Treiber Silent Installation

The entry

```
USEDONGLE=0
```

in the ini-file completely suppresses installation of the driver.

Subsequently, the driver needs to be installed muss separately (switch /S for silent):

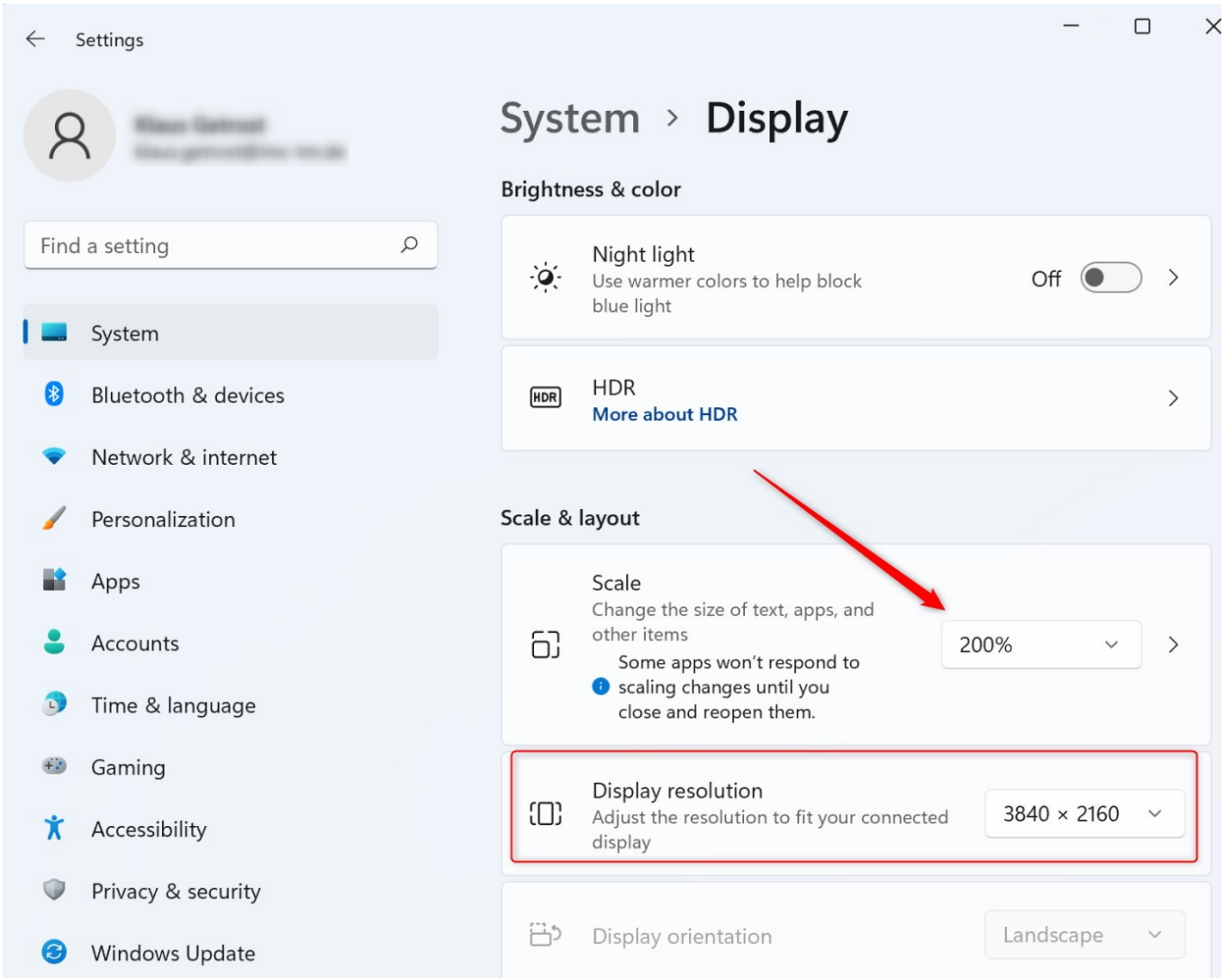
```
hldrv32.exe /S
```

3.3 Custom presets

Custom settings can be imported using the supplemental program "*imc FAMOS Configuration Im- & Export*". This program enables, for example, the distribution of company-specific sequences, Panels, projects and presets.

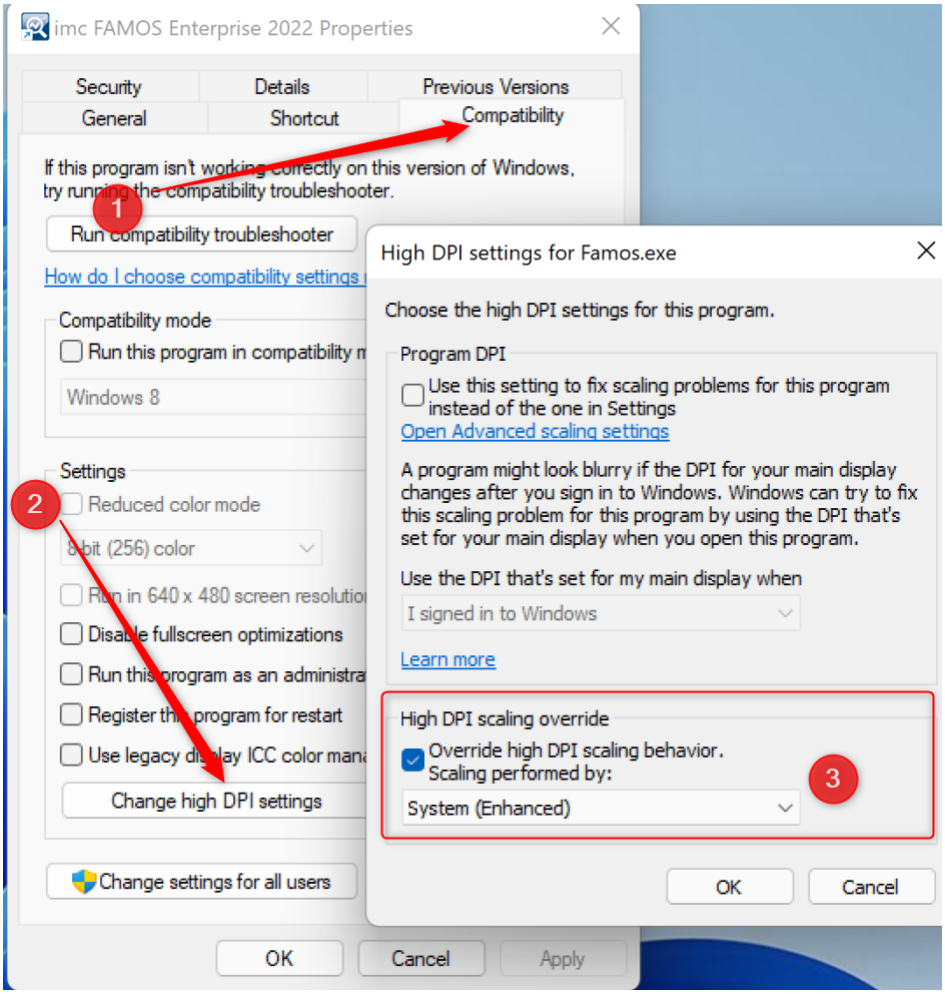
With **monitors having high resolution** (e.g. 4k UltraHD), certain combinations of settings can cause the scaling to fail to affect all of the FAMOS dialogs. For instance, this can happen to various monitors when operating FAMOS via Remote Desktop.

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Scaling of the display

To remedy this, change the properties of the FAMOS-Shortcut on the desktop. Right-click the mouse to open the properties for the Shortcut:



Override HDPI scaling

3.4 Start

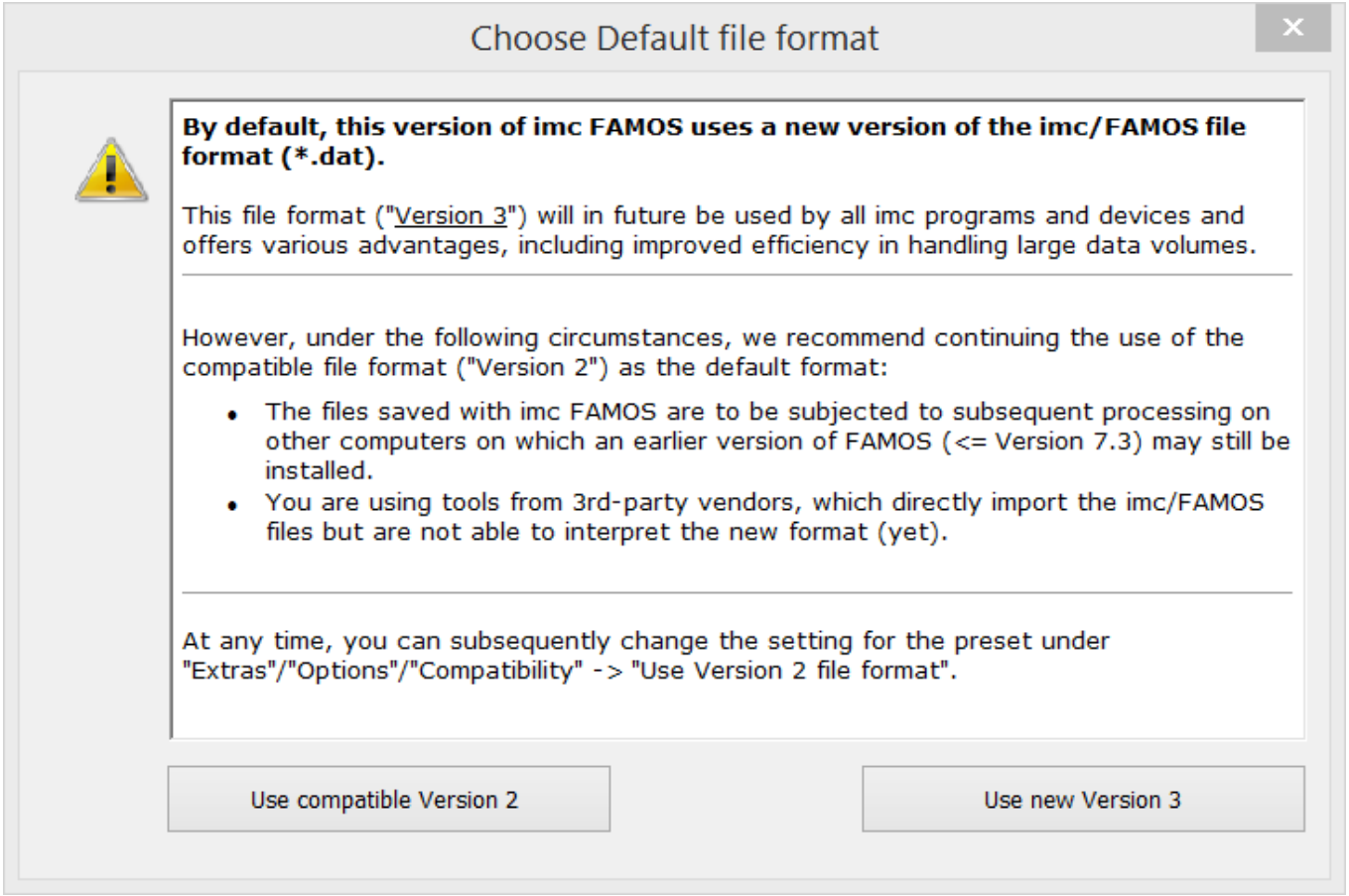
Start imc FAMOS either via the corresponding entry in the Windows Start menu, or by clicking on the shortcut on the Windows-Desktop which was created during the installation, or directly by calling the file "*famos.exe*" from the Windows Explorer.

Licensing

The software license is administered by a License Manager. A detailed description is located in the next section 24. Earlier versions had been copyright-protected by a hardlock (blue dongle). As of imc FAMOS 6.1 this will no longer be required. If you wish to exchange an old imc FAMOS hardlock for the License Manager, please contact our tech support 9.

New data format

With imc FAMOS 7.4, the new file format imc3 is supported. This format has been designed in particular to allow the more rapid generation of data display when the data volumes become very large. Upon successful installation, you are presented one single time with a special decision aid dialog, which asks whether you wish to use the new format:



By means of FAMOS' Options dialog 231, it is possible to change the setting at any time. User Interface 71.

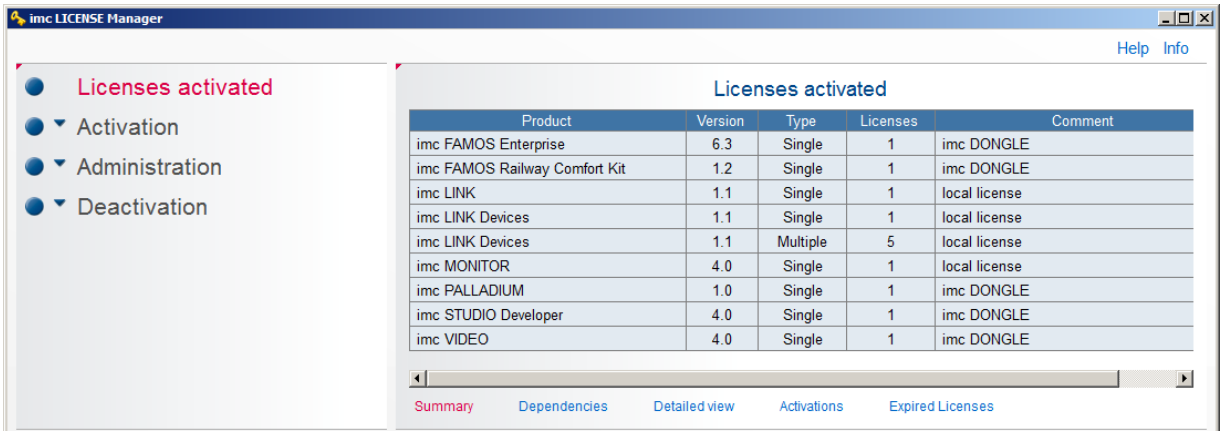
We now recommend working through the Tutorial 145 chapter.

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3.5 imc LICENSE Manager

3.5.1 Overview

The *imc LICENSE Manager* enables you to activate and display imc software products requiring a license.



imc LICENSE Manager

When you acquire an imc software product you receive an activation key.

After installing the software, the licensing process is performed using the *LICENSE Manager.*

The program can be activated

- **locally**, for the **PC** and can be run exclusively on this PC.
- on the ***imc DONGLE.*** In this case the software can be run on any PC where
  a) the software has been installed and
  b) the *imc DONGLE* 25 is connected.

3.5.1.1 Installation

Manual installation of the imc LICENSE Manager must be performed for the following cases:

- **When using network licenses**
  When setting up a **network server**, the installation of the "IMC-LI" service must also be performed via *imcLM_SetupServer.exe*. After installation, the "IMC-LI" service is started automatically.
- **If no activated imc software is available on a PC**
  This is necessary if the software to be licensed (e.g. imc FAMOS) is installed on a PC which itself has no access to the Internet.

The *imcLM_Setup* installation file is located in the "*LicenseManager*" or "*Products*" > " *imc LICENSE Manager*" folder of the installation medium.

When installing the software products imc FAMOS, imc STUDIO etc., the imc LICENSE Manager is also installed. No manual installation is necessary for this.

For correct functioning the Internet settings 39 are to be considered.

3.5.1.2 License types

There are two ways to license imc software: as a **single-user license** or as a **network license**.

Both the **single-user licenses** and **network licenses** of certain products (e.g. imc FAMOS and imc STUDIO) include a **second activation**. When in doubt, refer to the technical data on the product you own.

Single-user licenses can also be used with the **imc DONGLE**, in which case the second activation is omitted.

Network licenses require a **License server** and can not be used with the **imc DONGLE**.

What is a single-user license?

A single-user license provides permission to run the licensed imc software product on **one** PC, to which the software is then confined.

A single-user license comes with a second activation, for example, for use on a mobile computer.

When the computer is replaced, the single-user license must be deactivated using the License Manager. Subsequently, it is available for use on a different PC.

What is a software subscription?

A software subscription is a single-user license valid for a limited period of time.

What is a network license?

Network licenses are not confined to one PC and are assigned to computers running imc software by a local license server.

The license server has a pool of licenses. All computers having access to this server are assigned a license dynamically and return it when no longer using it. Thus, for example, 30 computers may have access to a license server having only 15 network licenses, which means that only 15 computers can run imc software in parallel.

The network licenses are activated on the license server and must be deactivated again when the license server is replaced.

Each network license also comes with a second activation for use by a user on a second computer such as a laptop.

What is a second activation?

A second activation is a license for one user to run imc software on a second computer such as a laptop. It is important to note that the software may **never** be run on both computers **simultaneously**.

The second activation behaves like a single-user license and is permanently confined to one computer.

When uninstalling the imc software or replacing a computer, the second activation needs to be deactivated by means of the License Manager. Subsequently, it is available again for use on a different computer.

Second activations are always linked with either a single-user or a network license.

Note

If you experience problems activating or deactivating licenses, please contact our tech support 9.

3.5.1.3 imc DONGLE

If multiple computers are running the imc products, you can transfer the licenses to an **imc DONGLE**. The **imc DONGLE** then activates the operating computer.

Toward this end, the License Manager supports a mixture of licenses; such which are linked to a specific computer, such which may be available via a network server, and such which are read by the **imc DONGLE**.

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License types

With an **imc DONGLE**, only first licenses and their updatescan be activated.

Network licenses and second activations are not possible with an **imc DONGLE**.

Important constraint: If a license is activated on an **imc DONGLE**, then no second activation is available any longer for this license.

Software version

The **imc DONGLE** is supported as of license manager version 1.3.

The **imc DONGLE*nano*** is supported as of license manager version 3.0.

Structure

The imc DONGLEs consist of a USB-HID device, which is the protected dongle part.

imc DONGLE	imc DONGLEnano
Order No. 1010111	Order No. 1010180
	
also consist of a USB-Flash: free memory	no USB-Flash / no free memory

Plugging/unplugging an imc DONGLE

In order to use the licenses on an **imc DONGLE**, the **imc DONGLE** must be connected at the start of the program to be licensed. If the **imc DONGLE** is unplugged during the program's runtime, a message appears to prompt the user to plug in. If the user does not comply, the License Manager closes the program after 1 min. It is also possible to save the program and close it manually, if the **imc DONGLE** is no longer available.

If the only licenses on the **imc DONGLE** are ones which are not needed, then it can be unplugged even while using an imc program requiring licensing.

Transfer of a license from the imc DONGLE to PC or vise-versa

An activated license can be deactivated 49 at any time. Following deactivation, the license is available for another PC or **imc DONGLE** and can be re-transferred. Since any activation 33 and deactivation 49 is always registered on the imc Server, either direct 33 or indirect 38 connection to the Internet is required.

Use of the imc DONGLE in virtual machines

When the **imc DONGLE** is used with a virtual machine, both USB device parts (USB-HID,USB-Flash) must be adjusted to the VM (Connect (Disconnect from host)).

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Note

For the use of licenses with the **imc DONGLE**, writing authorization on the USB-port is **not** necessary; Demo-licenses are exempted from this requirement. For this reason, it is recommended to activate Demo licenses directly on the PC.

Warning

- **Never format** the **imc DONGLE**! Formatting imc DONGLE also deletes the folder containing the license information!
- **Never encrypt** the **imc DONGLE**! Encryption prevents reading out the license information!

3.5.1.3.1 FAQ imc DONGLE

FAQ

How much does it cost to exchange the dongle?

Exchange is available as a purchase; in this case, a new **imc DONGLE** is ordered.

With which software can the imc DONGLE be used?

The versions of the products imc FAMOS, imc STUDIO , imc LINK etc. do not matter. What is decisive is having Version 3.0 or higher of the License Manager. This comes standard beginning with imc FAMOS 7.1. Additionally, the License Manager can be downloaded from the imc site: https://www.imc-tm.com

As of which License Manager version is the imc DONGLE supported?

Version 3.0

Will the old imc DONGLE still be recognized by a new License Manager of version 3.0 or higher?

Yes

Is it possible to activated demo licenses on the imc DONGLE?

No

How do I find out if the imc DONGLE is still recognized?

1. Open the License Manager
2. Select activation via Internet
3. The **imc DONGLE** should appear on page 3 (7):

Note: The old **imc DONGLE** appears as a drive, but the **imc DONGLE*nano*** does not.

Can the imc DONGLEnano still be used as a storage medium?

In contrast to the old **imc DONGLE**, the **imc DONGLE*nano*** has no free memory, i.e. it can not be used as an additional storage medium.

Is it possible to accidentally delete/format the imc DONGLEnano or is it protected against this?

The **imc DONGLE*nano*** is no longer displayed as a drive and thus can also not accidentally be formatted, nor its content deleted.

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3.5.1.4 Definition of terms

Term	Definition
Activation	"Activation" denotes the procedure for obtaining a license to use a software product. Computer-specific data (the fingerprint) are combined with certain data for the product to obtain the license. Following installation of a program, it must first be activated before it can be run.
Activation file	The "activation file" is a transport file for computer-specific data and activated licenses with whose help it is possible to activate computers not having Internet access.
Full version	In contrast to updates and upgrades, the version of the software which can be run without the installation or activation of any further components.
imc DONGLE 25	USB-dongle, on which a product license can be activated.This then replaces the computer-bound licensing.
License	A "license" is the entitlement to use a software product on a computer.
License Key	By purchasing an imc software product, you acquire a *"License Key"*, which is assigned to you as the customer. A imc products requiring a license which you purchase are assigned to this *"License Key"*. The License Key must be carefully kept and may not be made available to third parties. *The "License Key"* thus does not pertain to a single product but to you as a registered user. Additional activations of the program on this computer are thus made possible by means of this License Key. Toward this end, ensure that the same License Key is used. In particular, when making repeat orders, be able to state the License Key.
License file	The "License file" contains all licenses activated for the local computer.
Network license 52	Network licenses are licenses which are not attached to a single PC. Within the network, a server is set up which has a certain number of available licenses. All computers having access to this server obtain a license by dynamic assignment. Under certain conditions (see the corresponding product documentation), when you purchase a network license for N users, you obtain additional N single-user licenses as second activation.
Product	A "product" is a software package appearing in the price list, e.g. imc FAMOS Professional.
Product bundle	The "product bundle" contains multiple products, e.g. imc FAMOS Professional and the Spectral Kit.
Software subscription 37	A software-subscription is a single-user license which is valid for a limited period of time.
Second activation 35	Under certain conditions, a program can be activated on a second computer. However, special note must be made that the program may never be used on both computers simultaneously. A second activation is possible if a single-user license (not a network license) was purchased and the corresponding product documentation indicates the possibility of a second activation. The "second activation" enables an additional activation if one activation has already been performed on a different computer. It is provided for purposes of use by he same user on a mobile PC or a home computer. The second activation is also attached to the particular computer. Second activation can be omitted if the license is activated on the imc DONGLE. Please note that the second activation does not constitute a second activation, but instead enables the same license, for practical purposes, to be used sometimes on one computer and sometimes on another, without the inconvenient need for repeatedly transferring the license from one computer to the other.

Term	Definition
Single-user (license) 34	A license which entitles a program to be used on one computer. Upon activation, the license is transferred to a computer. This means that the license is attached to this computer. Under certain conditions, it is possible to perform a second license activation; see below.
Trial version 54	A trial version is a full version having an expiration date, attached to a single computer, and possibly subject to other limitations.
Update	The enhancement of a program to a higher and newer version. For instance, an update from imc FAMOS 2021 to 2022.
Upgrade	The enhancement of a program or a related program to a more powerful version

3.5.2 User Interface

3.5.2.1 Licenses activated

A license is activated locally for either a PC or for the *imc DONGLE*. A local license is bound to a certain PC and cannot be transferred to a different PC. The process of activating a license involves transferring data which uniquely identify the PC. The PC's data are then permanently associated with the activated license for one product.

If the license was linked to the *imc DONGLE*, it can be used independently of any particular PC. In order to be able to run the software on any PC, the software must be installed and the *imc DONGLE* possessing the appropriate license must be connected.

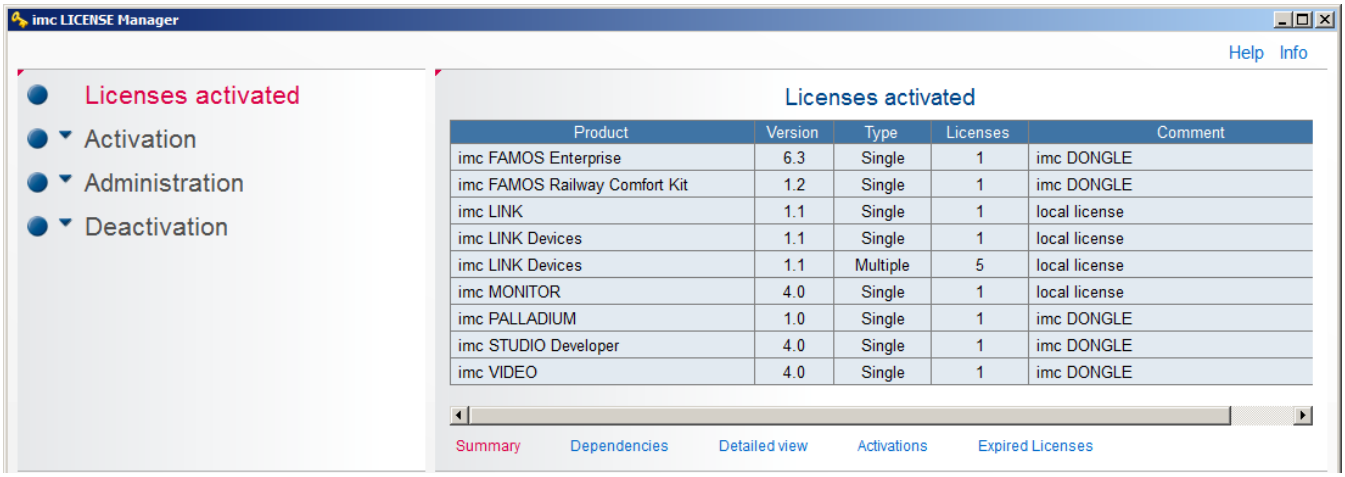
The table in the branch *Licenses activated* lists all software products which have been activated on this PC and/or on the connected *imc DONGLE* . If you wish to see all of a Licence Key's **possible** software products, use the menu item *Administration > License overview* 44.

There are various views which can be selected for the table:

Summary:

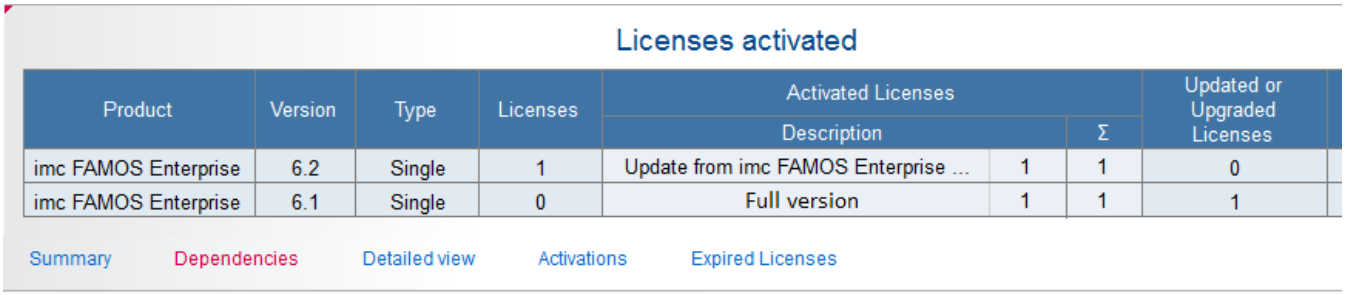
In the view "Summary", the relevant information for the installed products is listed.

The comment indicates whether the was obtained via the imc DONGLE connected, or via a network service or from the PC's hard drive.



Dependencies:

"Dependencies" indicates whether the version of the software product is a full version or was licensed by means of updates.



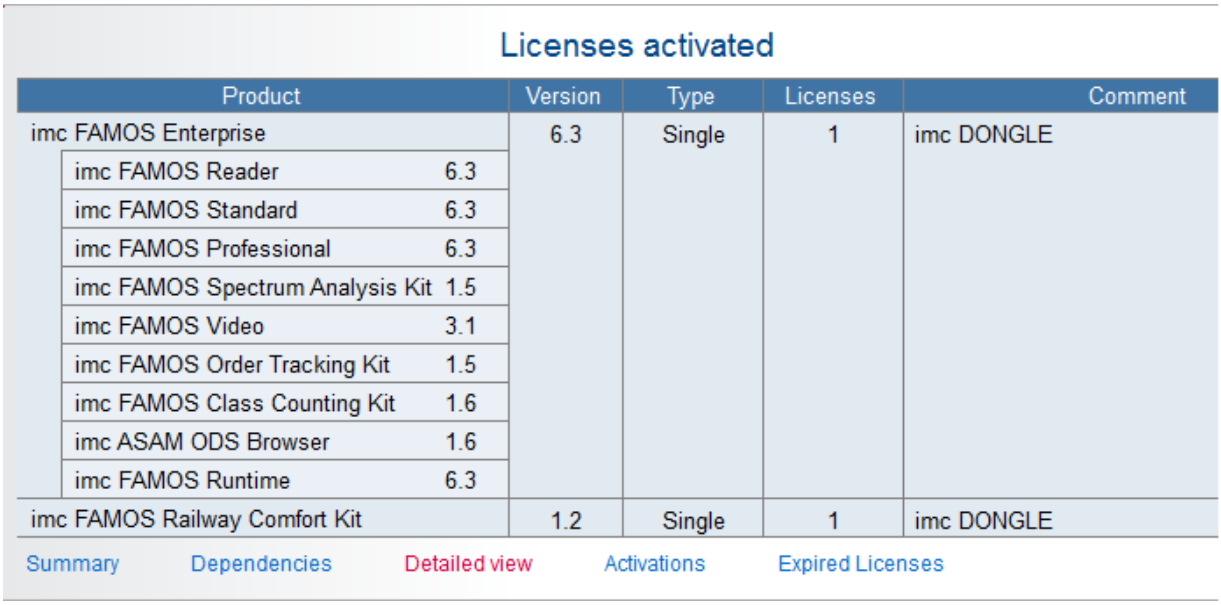
Licenses activated

Product	Version	Type	Licenses	Activated Licenses			Updated or Upgraded Licenses
				Description		Σ	
imc FAMOS Enterprise	6.2	Single	1	Update from imc FAMOS Enterprise ...	1	1	0
imc FAMOS Enterprise	6.1	Single	0	Full version	1	1	1

Summary Dependencies Detailed view Activations Expired Licenses

Detailed view:

"Detailed view" lists all components which are automatically licensed along with the software product.



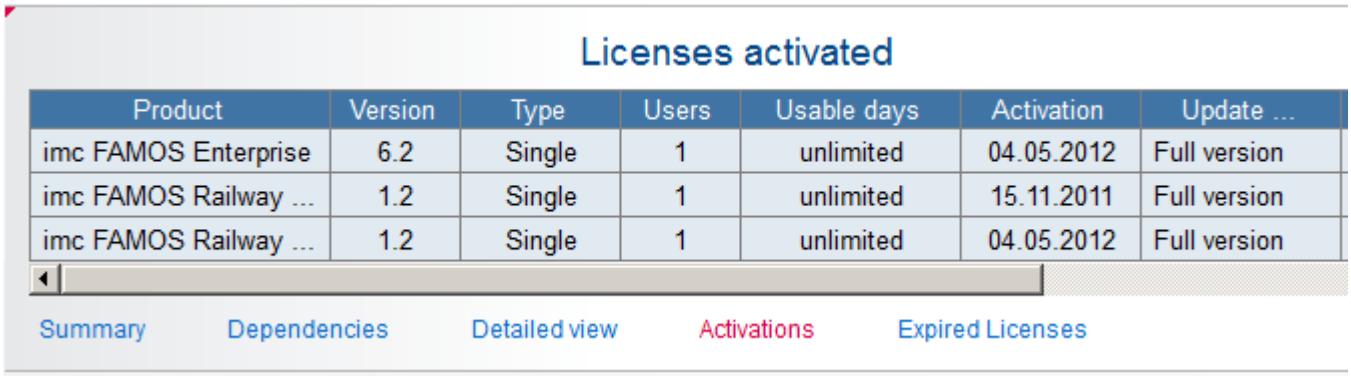
Licenses activated

Product		Version	Type	Licenses	Comment
imc FAMOS Enterprise		6.3	Single	1	imc DONGLE
imc FAMOS Reader	6.3				
imc FAMOS Standard	6.3				
imc FAMOS Professional	6.3				
imc FAMOS Spectrum Analysis Kit	1.5				
imc FAMOS Video	3.1				
imc FAMOS Order Tracking Kit	1.5				
imc FAMOS Class Counting Kit	1.6				
imc ASAM ODS Browser	1.6				
imc FAMOS Runtime	6.3				
imc FAMOS Railway Comfort Kit		1.2	Single	1	imc DONGLE

Summary Dependencies Detailed view Activations Expired Licenses

Activations:

"Activations" shows the points in time at which licenses are activated as a demo, full version, software-subscription or update.



Licenses activated

Product	Version	Type	Users	Usable days	Activation	Update ...
imc FAMOS Enterprise	6.2	Single	1	unlimited	04.05.2012	Full version
imc FAMOS Railway ...	1.2	Single	1	unlimited	15.11.2011	Full version
imc FAMOS Railway ...	1.2	Single	1	unlimited	04.05.2012	Full version

Summary Dependencies Detailed view Activations Expired Licenses

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Expired Licences:

Here, demo versions and software-subscriptions whose term has expired are listed.

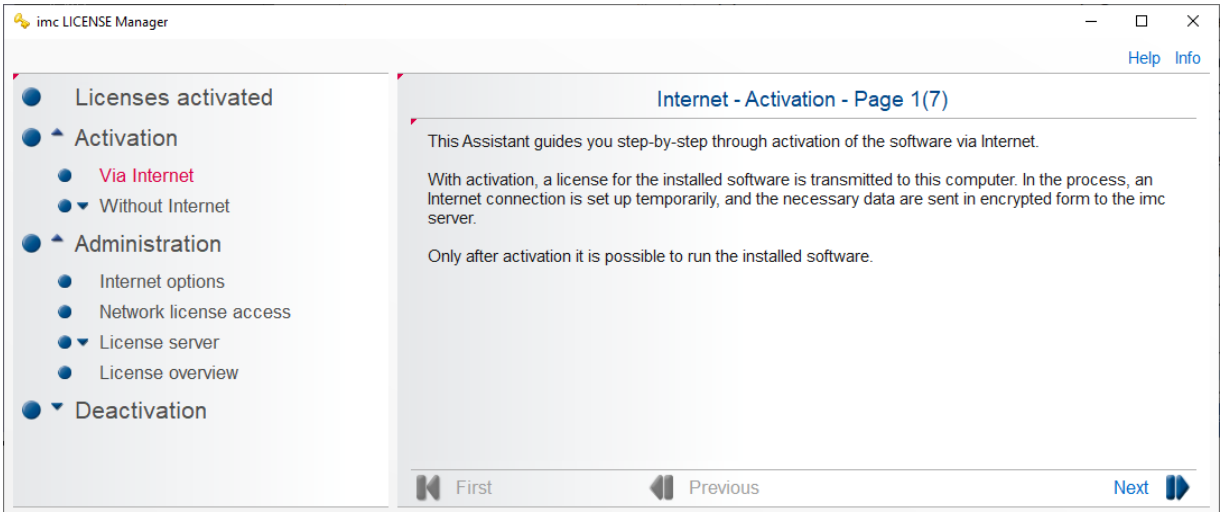
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3.5.2.2 Activation

In order to activate your product directly, Internet access is necessary. If the computer for which the software is intended does not have Internet access, it is possible to activate the license via a different computer. On this topic, see Activation without Internet 38.

3.5.2.2.1 Via Internet

The inputs needed for activating a license for a product are to be entered in the sequence of pages belonging to the Activation Assistant. If and entries are missing, it is not possible to proceed to the next page. The controls "Start", "Back" and "Next" allow switching between the Assistant's pages.



Page	Description
1(7)	This page contains general explanations about activation.
2(7)	**Contact data:** Here, enter your name, company and e-mail address. The contact data "Name", "Company" and "e-mail" are necessary for a "second activation" for certain products and should be filled in accurately.
3(7)	**Enter the License Key:** Here, enter you License Key 29. If the activation of multiple products is desired, enter the "License Key". The License Key is obtained along with the delivered program. If you wish to test the software in trial mode or free programs like the imc FAMOS Reader, select the option "Trial versions and free software". For this purpose, a License Key is required. By selecting "Second Activation", it is possible to next perform an additional activation on a different computer. Please not the conditions under which this is actually possible.
4(7)	**Connection with the Internet:** This page visualizes the Internet communication with the web service for requesting activation of products. If any connection errors occur, corresponding error messages are displayed. If communication was successful, the next page opens automatically.

Page	Description
5(7)	**Display of available products:** On this page, a tabular list of all products which can be activated is presented. Using the selection control in each line, it is possible to select the product desired in each row. The button "Show all products" shows the product list of product bundles and other products which can be activated but are not installed on the local computer. Products for which there is already a license on the local computer (see Licenses 30), no longer appear in the list. Neither do products which belong to product bundles on the local computer, and older versions of which the newer ones are already licensed. If there are trial licenses on the local computer, then any products purchased can be activated. If purchased products are activated, any trial versions of the product are no longer listed.
6(7)	**Connection to the Internet:** This page displays the Internet communication with the web service for activation. If connection errors occur, there will be error messages. In this step of activation, the activated licenses are transferred to the local computer.
7(7)	The last page provides information about the conclusion of the activation and any additional information about the status of particular products.

Note Notes for the administrator

As of version 4.0, Internet access to the domain "LM.imc-tm.de" (82.144.33.125) via HTTPS (port 443) is necessary. The support of TLS 1.2 is required.

3.5.2.2.1.1 Single Location (License)

Activation via Internet

With direct Internet access, proceed as follows:

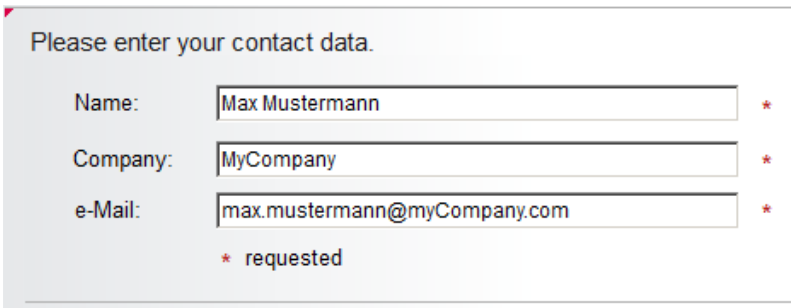
Step 1:

After installing the program, open the *imc LICENSE Manager* and click on *Activation > Via Internet* and go to contact data via *Next*.

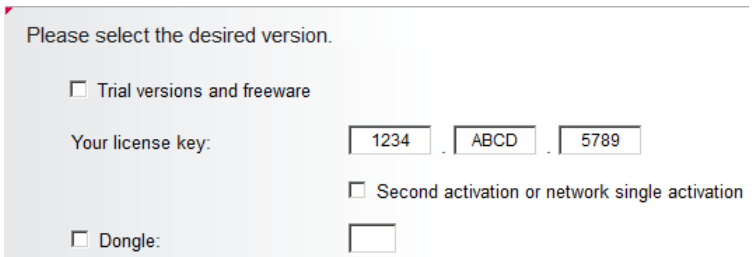
Step 2:

Here, enter your contact data. Keep a record of these with the License Key, since these data absolutely must match for any subsequent activation.

Proceed with *Next* on page 3.



Step 3:



For activation, these are the available selections:

1. Enabling Trial Version: Select *Trial Version and freeware* if you have not yet purchased the software and you wish to test the software without a License Key.
2. Freeware: Enable Trial *versions and freeware*.
3. Entering the License Key: If you have purchased the program, enter the License Key here.
   - Activate the single-user license
   - Activate a network license on the computer which is to serve as the license server.
   - Second activation of a single-user license is only possible if the single user license has already been activated once and the conditions or the second activation are met.

Attention: The contact data for the single user license and the second activation must be identical.

Step 4:

By clicking on "Next", the system accesses the Internet to research whether there is already an available license for your version (page 4). Subsequently, page 5 appears with the list of the available products.

Licenses activated

Product	Version	Type	Licenses	Period of validity	Comment
imc API Developer	7.3	Single	1	unlimited	local license
imc Inline FAMOS	5.2	Single	1	unlimited	local license
imc STUDIO Developer	5.2	Single	1	unlimited	local license

Example: activated licenses

Products do not appear if

- the license is already activated on the computer.
- the license is already activated on a different computer.
- if no product had been purchased which has the License Key entered.
- if they are already a part of a product bundle which is activated on the computer.

Trial versions do not appear if a full version has already been activated.

Updates and upgrades do not appear if the corresponding full versions have already been activated.

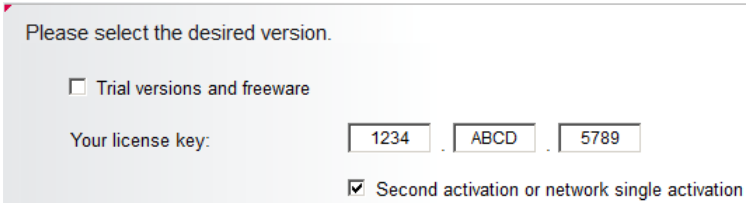
If your product does not appear, please contact our tech support 9.

Step 5:

A click on Next activates the license via Internet. Subsequently, the successful activation is indicated on page 7.

Second activation

If a single-user license has already been transferred to a computer, under certain conditions it may be transferred to a second computer. This second activation is performed in the same way as the first one, except that in step 5 the option *Second activation* must be selected.



Entries for the second activation

Note

- The contact data and the License Key must match those for the first activation.
- The "second license" can not be installed on a computer on which there is already a single user license.
- The contact data sent pertain to the "second computer"
- Please note the conditions which apply to the second activation 29.
- A second isn't available if the first activation is saved on the *imc DONGLE*.

3.5.2.2.1.2 Software subscription

Activation

To activate a software subscription, proceed in the same way as for a Single Location (License) 34.

The overview of available products will then contain the following entries, as an example:

Internet - Activation - Page 5(7)

Please select the desired products using the corresponding checkbox in the "Selection" column.

Available products	Version	Selection	Type	Users	Period of validity	Update ...	Comment	
imc STUDIO Developer	*	☐	Single	1	7/31/2021	Rental	installed	
imc FAMOS Enterprise	*	☐	Single	1	7/31/2021	Rental	installed	

Software-subscriptions

After the activation, the software-subscriptions appear in the overview as seen below:

Licenses activated

Product	Version	Type	Licenses	Period of validity	Comment
imc FAMOS Enterprise	*	Single	1	7/31/2021	local license
imc STUDIO Developer	*	Single	1	7/31/2021	local license

activated software-subscription

You can also activate rented licenses on an imc DONGLE.

Period of Validity

The number of (validity) days remaining is indicated in the License Manager under *Activated Licenses*:

Licenses activated

Product	Version	Type	Licenses	Period of validity	
imc FAMOS Enterprise	*	Single	1	1 day	local license
imc STUDIO Developer	*	Single	1	1 day	local license

Period of Validity

License expiration

Before a software-subscription elapses, a message is posted upon starting the software affected.

This message appears 31 days, 10 days, 3 days, 2 days and 1 day before validity expiration.

Product Licensing Message

No.	Product	Version	Message
1	imc STUDIO Developer	5.2	The period of use expires in 3 days!

Info-Window: Validity elapse indication

Expired licenses appear in *Activated Licenses under Expired Licences* 32

3.5.2.2.2 Without Internet

The functions in this group pertain to activating a license on a computer which does **not have Internet access**.

Therefore an activate file is exported from the computer **without** internet (PC_o). This file is transferred to a computer **with** internet (PC_i). On this PC_i the activation file is used for activation. Afterward this file is transferred back to the PC without internet.

Step 1: Export activation file



After the installation of the imc Software on the PC **without** Internet access, open the imc LICENSE Manager and select *Activation > Without Internet > Export activation file*.

Follow the instructions. The computer-specific data are displayed.

At the end of the instructions, save these information to an arbitrary location by clicking on *Save activation file*. The file extension is **.imclicinfo*.
The computer without Internet access exports its specific date and the already saved activated licenses in an activation file.

Step 2: Copy the activation file to the computer with Internet access (PC_i)

Note: Since the *imc LICENSE Manager* will alter the contents of the activation file, it must be ensured that the file is not write-protected. For that reason, it is also not possible to import the file directly from a CD. In this case, the file must be copied to a re-writable data carrier.

Step 3: Activate with activation file



Open the imc LICENSE Manager on the PC with Internet access and choose *Activation > Without Internet > Activate with activation file*.

Select the copied file by clicking on *Open activation file*. The computer information are displayed.

The computer with Internet access opens this activation file.
Now follow the instructions of the Assistant using *Next*, in the same way as for Activation with Internet. 34

Next, the license file selected above is found updated in the same folder. The *imc LICENSE Manager* had previously saved the original file with the file extension **.bak*.

Step 4: Copy the activation file back to the computer without Internet

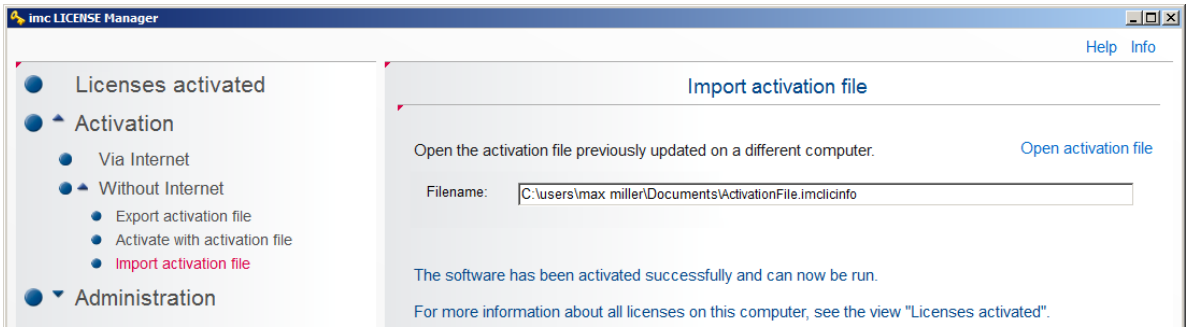
Step 5: Import activation file (PC_o)

Select *Activation > Without Internet > Import activation file*.

Open the newly created activation file. The activated licenses are applied to the computer without the Internet access.

Only the licenses which match the computer's data are applied. Import to a 3rd computer is not possible.

After importing, the software is activated and the following dialog is displayed:

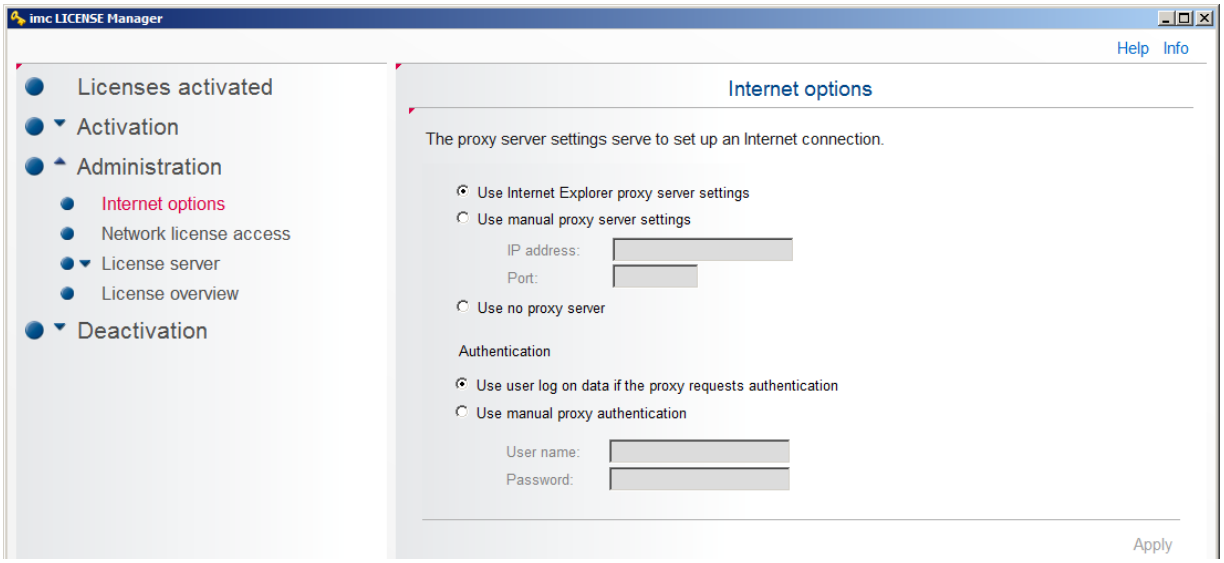


Note

The validity of the activation file expires after three days. After that time, the procedure must be repeated.

3.5.2.3 Administration

3.5.2.3.1 Internet options



Internet options

If the Internet access is via a **Proxy server**, individual settings are necesary unless the Internet Explorer's settings are used.

Port: Normally it is sufficient to use the Internet Explorer's settings. Typically, either Port 80 or 8080 is used. If a different port setting is necessary, contact your system administrator.

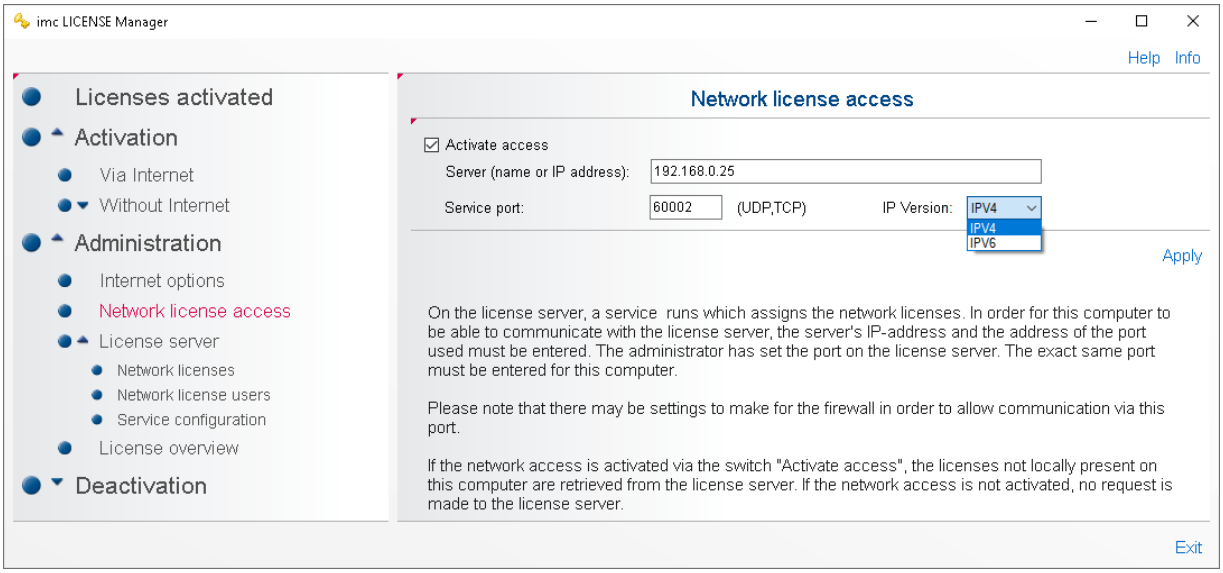
Protocol: The use of TCP/IPv4 is required for correction functioning.

TCP/IPv6 is also supported from imc LICENSE Manager version 4.5.

3.5.2.3.2 Access to network licenses

When a network license is used, the imc software queries a **network server** for the license.

For this purpose, its IP address and its Service Port are required. Ask your administrator for these specifications.



Access to network licenses

Note Network license access

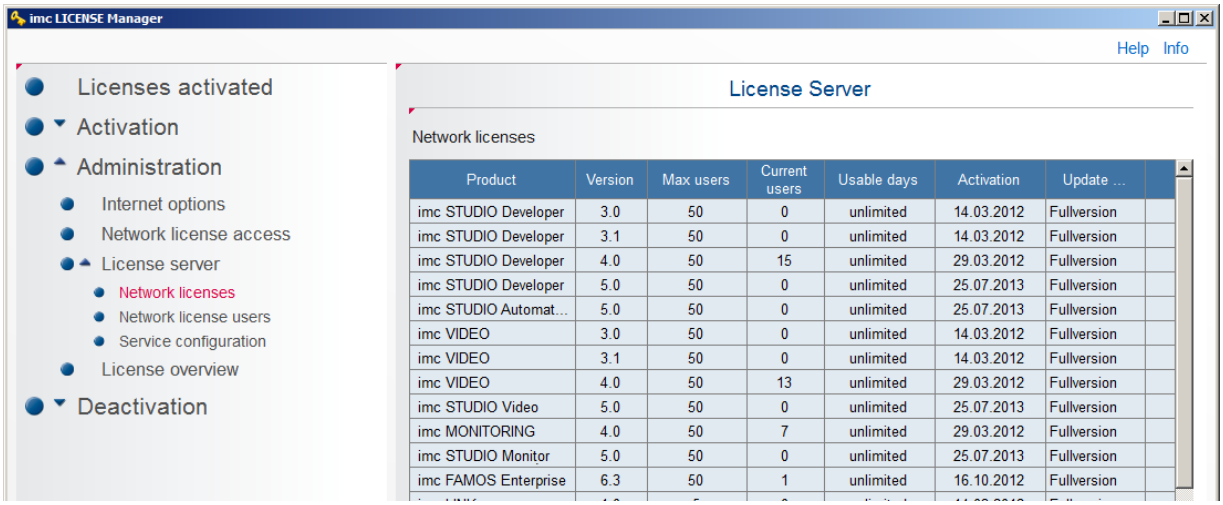
The network server itself must also activate access to network licenses.

3.5.2.3.3 License server

3.5.2.3.3.1 Network licenses

In the menu *Administration > License Server > Network licenses* all available network licenses are listed.

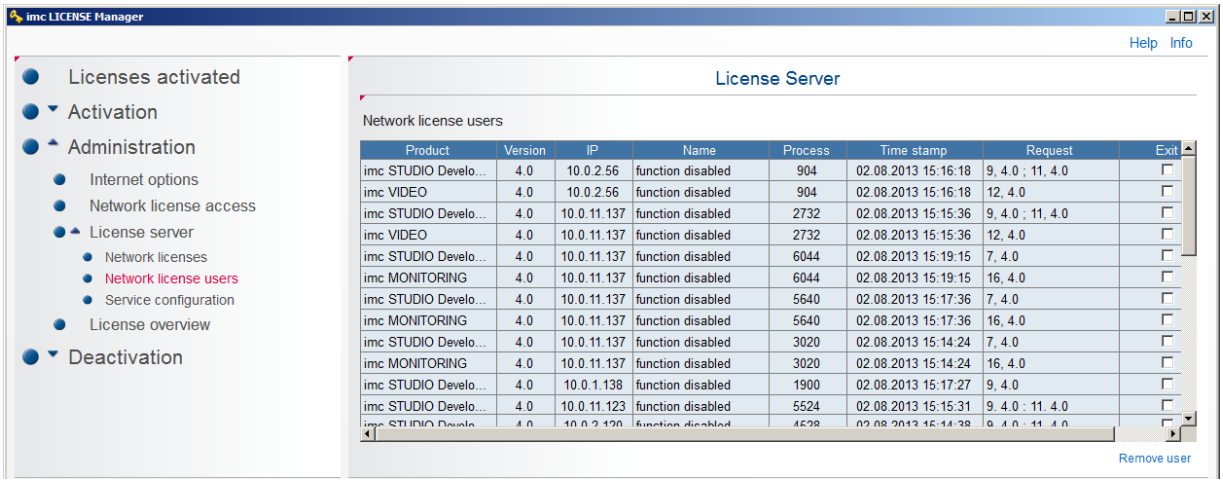
To obtain a list of all software products activated on the PC, use the branch *Licenses activated* 30.



3.5.2.3.3.2 Network licenses users

The "*Network licenses users*" and "*Service Configuration*" are only visible if the "*imc License Server (imcLM_SetupServer.exe)* 24" is installed.

All currently allotted licenses are displayed.



Display of currently used licenses

If a license was unable to be correctly registered due to a PC crash, it remains intact on the server for one more hour. The *imc LICENSE Manager* indicates this by an entry in red letters. The administrator can enable the license with *"Remove user"*.

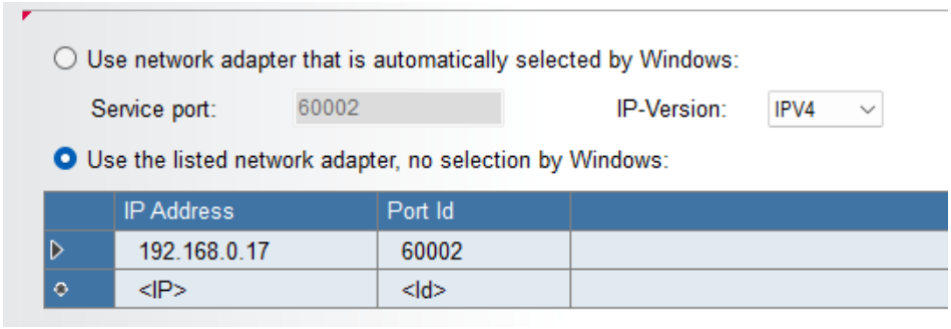
3.5.2.3.3.3 Service configuration

Note

- This view is only visible on the computer on which the **License Server-service** has been run.
- In order to edit these settings, the License Manager must be started with **Administrator** privileges, and the corresponding **License Server service** must be installed.

Use network adapter

For the administration of the license server, it is necessary to enter the service port.



License Server

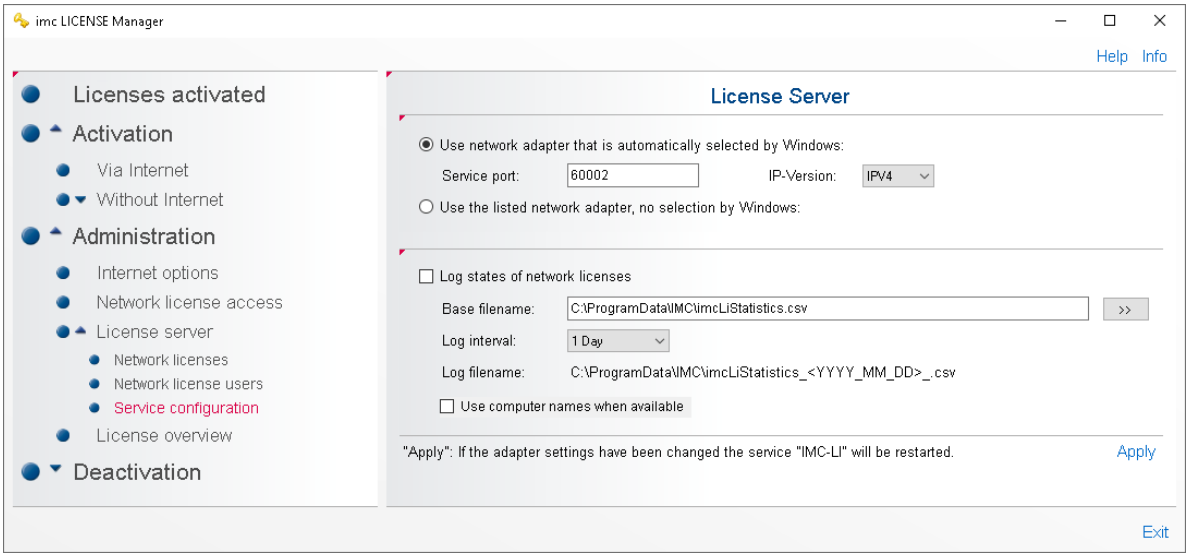
Logging

It is possible to log the allocation status of the network licenses.

Configuration via the License Manager

In order to activate the logging of network license status, start the License Manager with Administrator privileges.

The configuration can be made under the view "*Administration*" > "*License server*" > "*Service configuration*".



Service Configuration - Logging

The time interval for usage of a log file can be set to one day or one month. The service generates a unique log file name from the date and the specified base filename.

For simplification purposes, the starting day "01" is used for monthly logging.

When newly creating a log file, the denial counter is reset for each network license.

Interval	Filename
Day	<filename>_YYYY_MM_DD.<extension>
Month	<filename>_YYYY_MM_**01**.<extension>

Example: "imcLiStatistics_2016_04_13.csv"

Warning

The License Server-service can not access paths or files in the **User-folder** (My Documents).

Log entry structure

Designation	Separator	Content	Meaning
<Timestamp>	<,|TAB>	04/22/16 11:15:29	Date (MM/DD/YY) and time
<Productname>	<,|TAB>	imc Produkt	Name of an imc product
<Productversion>	<,|TAB>	V7.0	Version of an imc product
<Type>	<,|TAB>	INIT, STOP, START, PASS, FREE, FAIL	Type of event logged
<IP>	<,|TAB>	10.0.3.95 -	IP address of the PC upon START, STOP, INIT
<PC Count>	<,|TAB>	50	Extent of network license
<current PCs>	<,|TAB>	10	Current license count
<Denials>	<,|TAB>	0	Number of denied activations.

The separator is determined by the filename's extension. If the extension is csv, then commas are used as separators, otherwise the Tabulator character.

With text files, the Tabulator is the specified separator in EXCEL.

The denial counter is reset for each new log file.

Example (*.csv)

```
04/22/16  11:15:29,imc FAMOS Enterprise,V7.0,INIT,-,1,0,0
04/22/16 11:15:29,imc FAMOS Enterprise,V7.1,INIT,-,1,0,0
04/22/16 11:25:38,imc FAMOS Enterprise,V7.0,PASS,10.0.3.95,1,1,0
04/22/16 11:25:41,imc FAMOS Enterprise,V7.0,FREE,10.0.3.95,1,0,0
04/22/16 11:28:28,STOP
04/22/16 11:28:34,imc FAMOS Enterprise,V7.0,START,-,1,0,0
04/22/16 11:28:34,imc FAMOS Enterprise,V7.1,START,-,1,0,0
```

Event types

Event	Description
INIT	When generating a new log file, the current allocation status of network licenses is listed.
STOP	Logging was stopped via the configuration interface.
START	Logging was started either via the configuration interface or the service. The current allocation status of network licenses is listed.
PASS	A PC logged on and received a clearance for use.
FREE	A PC has logged out and surrendered the allocation.
FAIL	A PC was denied clearance for use. The denial counter was incremented upward.

Configuration file

The configuration of the logging can also be made by means of the configurations file "imcLiM.config" in the node <Statistics> in the section <LicenceServer>. The service "IMC-LI" must subsequently be restarted.

```
<LicenceServer>
  <Service Port="60007" ServerIP="" />
  <Adapters Use="0">
    <Adapter IP="10.0.3.95" Port="60003" />
  </Adapters>
  <Statistics Use="1">
    <File Name="C:\ProgramData\IMC\imcLiStatistics.csv" Interval="DAY" />
  </Statistics>
</LicenceServer>
```

Behavior at runtime

The logging behavior at runtime accounts for the need to temporarily open the log file (for viewing) by another process which prevents writing of an entry (e.g. EXCEL"). For this reason, the entries are saved temporarily in an internal list. The actual writing is initiated asynchronously by a clock counter. This causes a delay of an event's appearance in the log file.

If a network license is activated/deactivated while the license server service "IMC-LI" is running, then all internal administration structures are reset. In the log, the new status is recorded as a "Start" following a "Stop".

The license server service internally encoded for the asynchronous clock counter is 10s and the buffer size is 500 entries.

Runtime errors

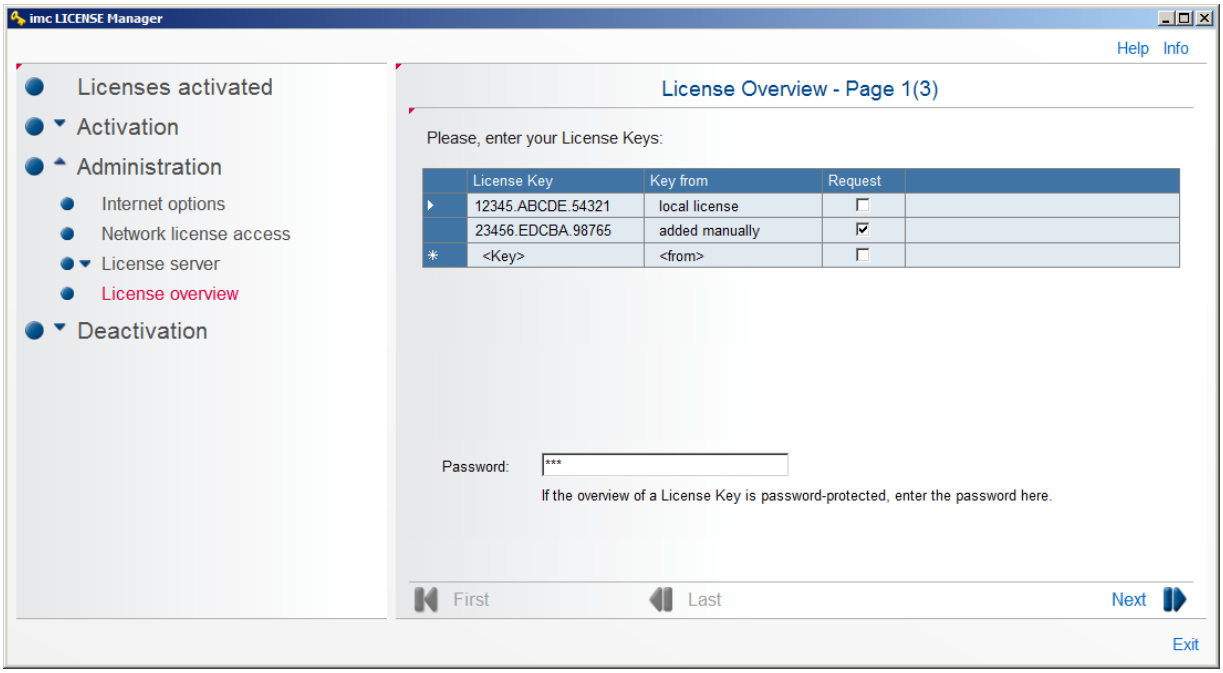
If any errors (exceptions) occur during logging or upon initializing the log, they are entered in the Windows Application Log as the event type "Error". Only the first occurrence of each particular error is entered in the event log.

Any incorrect logging should not lead to closing of the service, in order to ensure that clearance for use can be issued in any case.

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3.5.2.3.4 License overview

The License Overview enables the listing of **all** software products which can be activated for a License Key. Along with the Licence Keys used locally, you can add additional ones manually. If you only wish to see the software products activated on this PC, use the table under *Licenses activated* 30.



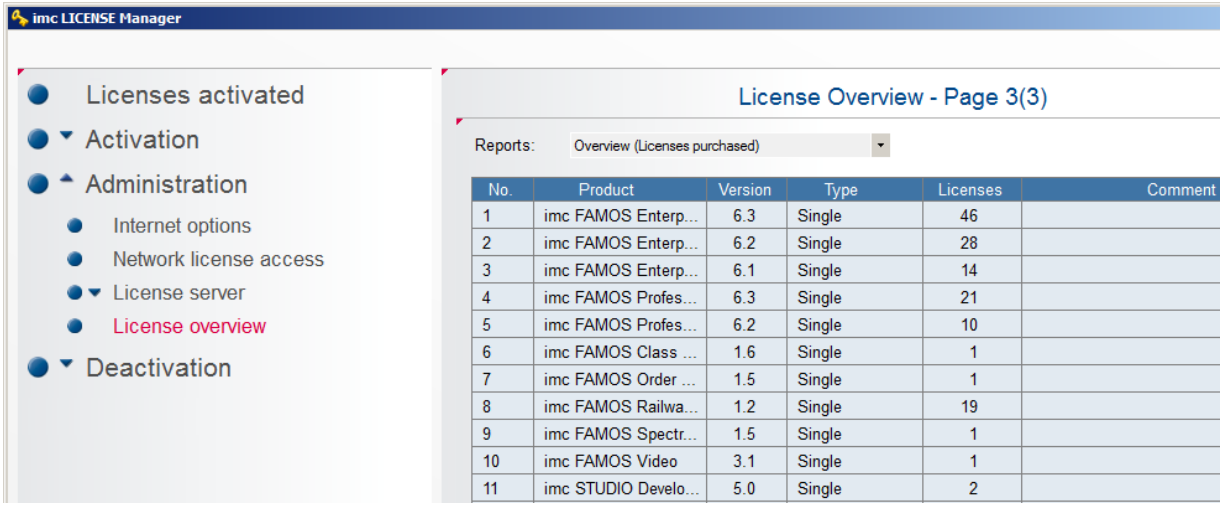
List of all local and manually entered License Keys

Password protection

A license can be password-protected, in which case the software products only appear once the correct password has been entered. The password is supplied in consultation with our tech support 9. It is not possible to make any entries or changes by means of the License Manager.

Display of all software products of a license

Place a checkmark under Request for each license whose software products you wish to have listed. The click on *Next*. Your computer will then set up a connection via Internet to the License Server and lists all software products.



Software products of the requested License Keys

This dialog initially lists all licenses entered for this PC. You can then enter additional License Keys in the view.

Add and remove additional licenses

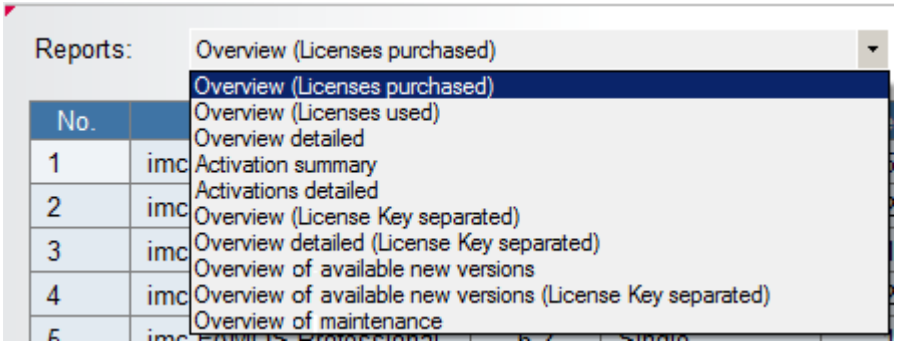
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Click on the last row under License Key and enter an additional key. Set the checkmark under *Request* and click on *Next.*

To remove an entry, select the line by clicking the triangle on the left. Then enter *Delete key* with a right mouse click.

3.5.2.3.4.1 Reports

The License Overview information is organized in different reports which present simplified summaries of the information.



List of all local and manual entered License Keys

Overview (Licenses purchased)

Product

Licensed imc software

Version

Product version

Type

Single-user or Second Activation

Licenses

The column *Licenses* contains the total number of licensable installations of this version on different PCs. It shows how many full versions are activated and how many updates have been performed for the products purchased.

If updates contribute to the total number, the number of remaining licenses for the predecessor versions is reduced by the number of updates. The predecessor version remains usable, since licenses for higher versions include the predecessor versions.

Comment

The comment provides information on interdependence between licenses (Update and Full License). The user does not enter the comment.

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Overview (Licenses used)

Product

Licensed imc software

Version

Product version

Type

Single-user or Second Activation

Licenses

The column *Licenses* contains the total number of licensable installations of this version on different PCs. It shows how many full versions are activated and how many updates have been performed for the products purchased.

If updates contribute to the total number, the number of remaining licenses for the predecessor versions is reduced by the number of updates. The predecessor version remains usable, since licenses for higher versions include the predecessor versions.

Free full versions

This column states how many installations of the product version on new PCs can be licensed. The free full version can consist of a full license of the corresponding version, or be composed of successive activations of a predecessor version with subsequent activation of an update license.

Free updates

This column states how many update to this product version are still remaining. In contrast to "Free Full Versions", this "Free Update" can only be activated on PCs having an existing license for the predecessor version.

Comment

The comment provides information on interdependence between licenses (Update and Full License). The user does not enter the comment.

Overview detailed

Like Overview with two additional columns.

Activations

This column states how many activations there are of this version and indicates the current usage of this product version.

Updates available

This column indicates the number of usages of this version which can be raised to a higher version by updates.

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Activation summary

The report "*Activation summary*" lists how many licenses and how many update licenses were purchased. In the column "Purchased" of this report, the sum of products contained for the specified "License Key" is indicated. These correspond to the information on the delivery note.

Update...
: Number of update licenses purchased.

Acquired
: Sum of products included for the specified License Key = *Activations + Free*.

Activations
: Number of products activated

Free
: Number of activations still available

Activation detailed

This report shows the activations of individual users.

User, PC, e-mail, Company to be entered by the user upon activation

Usable days
: Duration of still available use in days

Users
: Number of users in network licenses

UID
: Unique license ID number

License Key
: Associated License Key

Overview (License Key separated)

Like Overview, but sorted by License Key

Overview detailed (License Key separated)

Like *Overview detailed*, but sorted by License Key

Overview of available new versions

Product

Licensed imc software

Version

Product version

Type

Single-user or Second Activation

Licenses

The column *Licenses* contains the total number of licensable installations of this version on different PCs. It shows how many full versions are activated and how many updates have been performed for the products purchased.

If updates contribute to the total number, the number of remaining licenses for the predecessor versions is reduced by the number of updates. The predecessor version remains usable, since licenses for higher versions include the predecessor versions.

Available new version

Version to which an existing installation can be updated.

Required licenses

Number of licenses required to be purchased in order to be able to perform an update on all computers with the "*Available new version*".

Overview available new versions (License Key separated)

Same as *Overview of available new versions*, with corresponding License Key specified.

Overview of maintenance

Product

Licensed imc software

Last maintenance servicing

Last date an update was provided.

Maintenance until

End of period during which updates are provided.

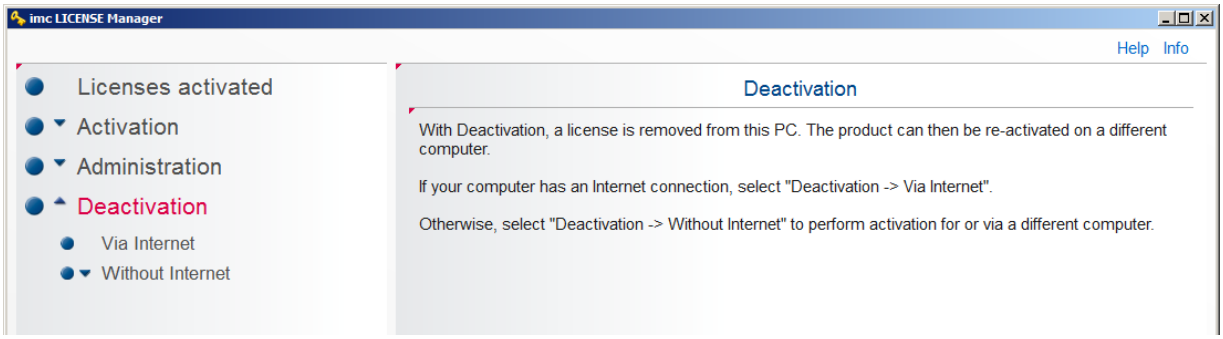
License Key

License Key associated with the maintenance contract.

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3.5.2.4 Deactivation

If you wish to transfer a product's license to a different computer, the activated license must first be restituted. As with activation 33, this can be accomplished directly via Internet 49 or via a different computer having an Internet connection.

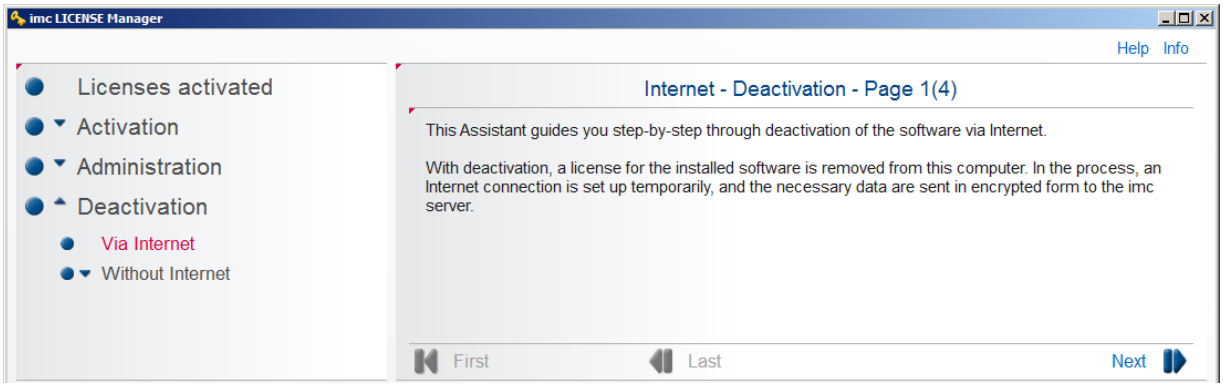


Deactivating a license for an installed program

The deactivation is recorded on imc's licensing server, where the license is not deleted but recorded as "not active". You can activate a license and deactivate it again as often as you wish.

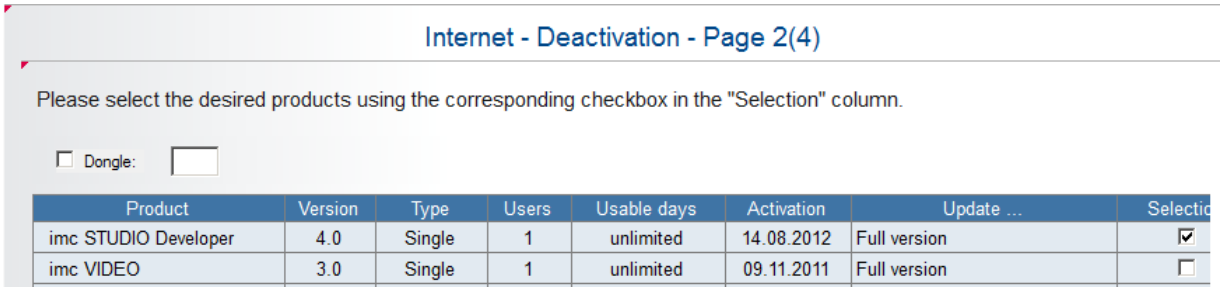
3.5.2.4.1 Via Internet

Select the item *Deactivation > Via Internet* and follow the Assistant's instructions.



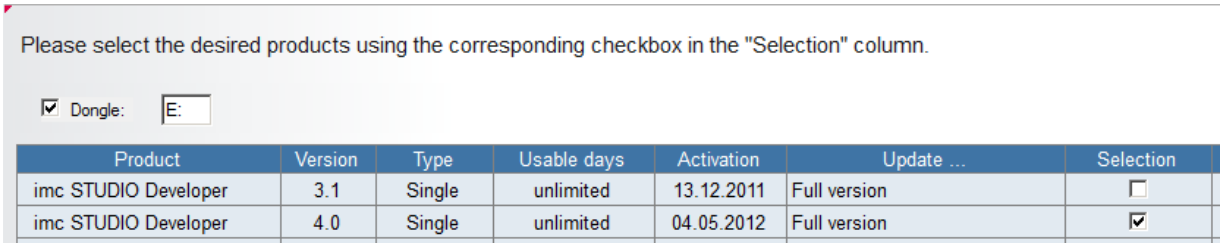
Deactivation Via Internet

Click on *Next*. A list of all activated products appears. Under *Selection*, select the product which you wish to deactivate.



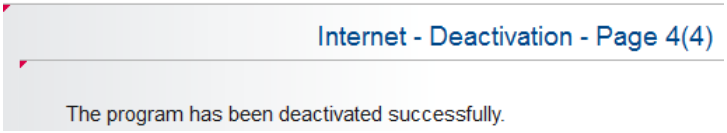
Deactivation: Select the product

When the *imc DONGLE* is connected, an option box *Dongle* appears, with an indication of the drive designation. When this option is selected, the dongle's licenses are listed an can be deactivated:



Deactivation of a dongle-license

Click again on Next. The causes an Internet connection to the imc server to be set up. Subsequently there is a confirmation that the software has been successfully deactivated.

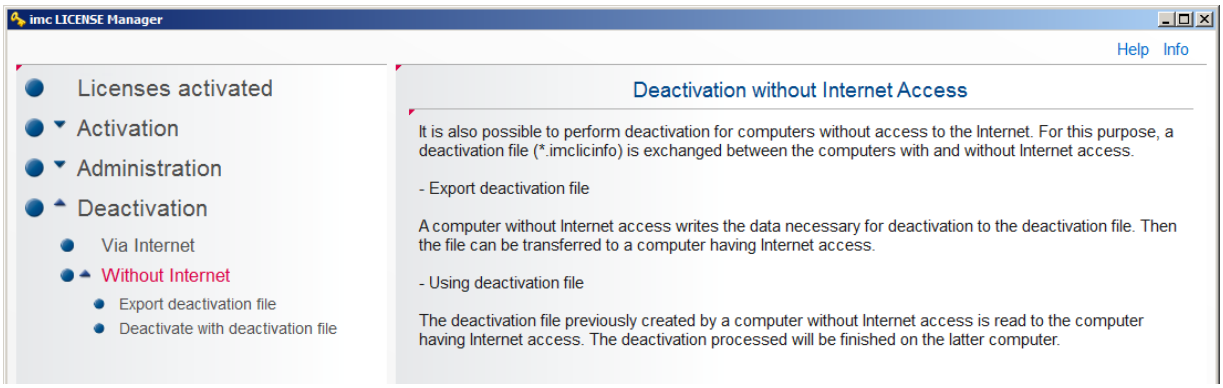


Deactivation: Software has been deactivated successfully

It is now possible to activate the software from a different PC.

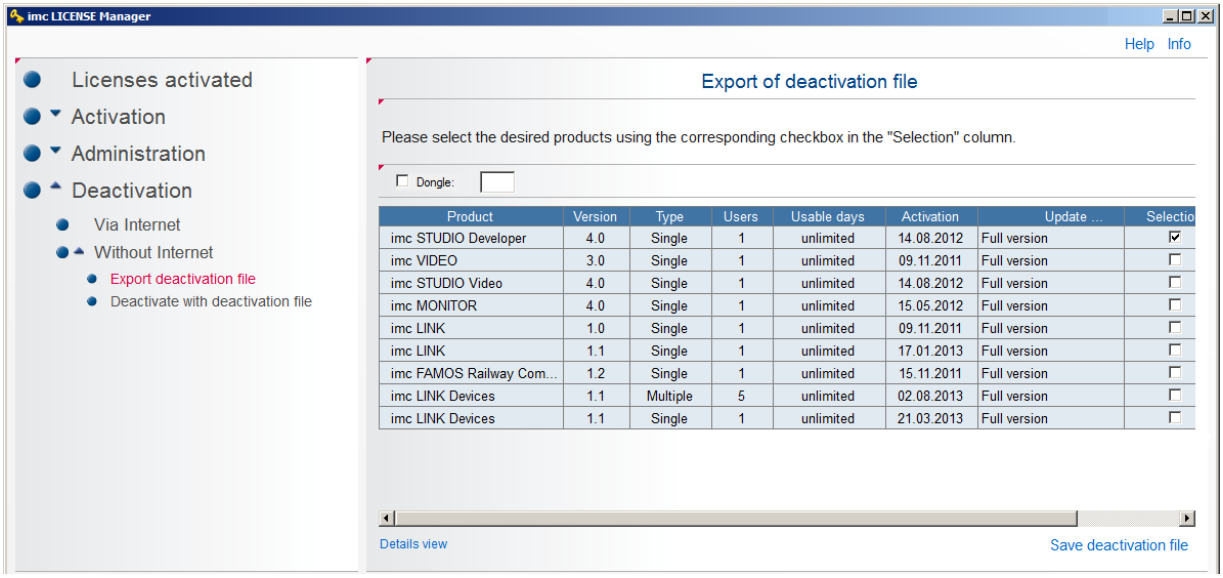
3.5.2.4.2 Without Internet

Deactivation without Internet connection is performed similarly to activation 38. Initially, a deactivation file is created on the computer having the activated software, and saved in a data carrier (Export deactivation file). This file is opened by a computer having Internet access and sent to the imc license server.



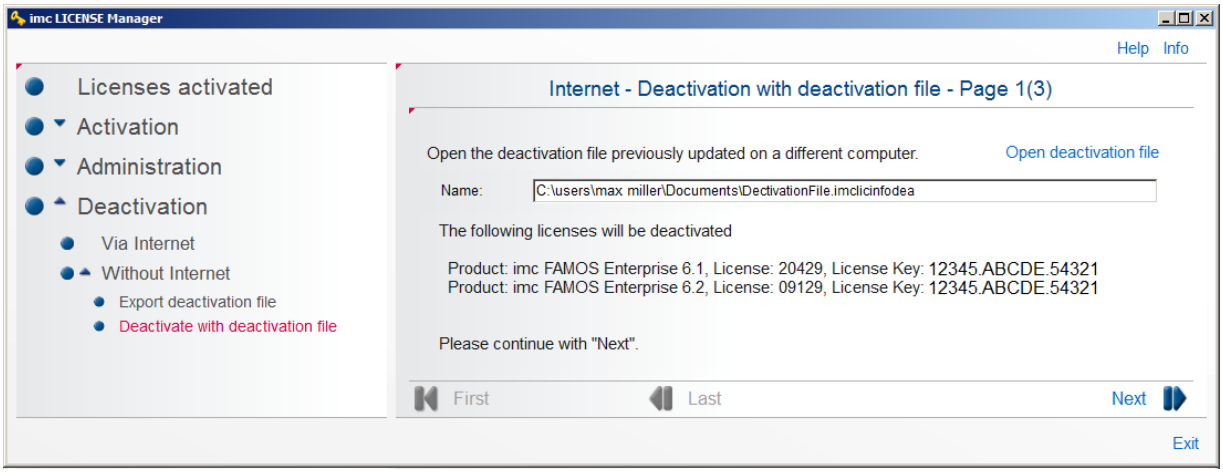
Deactivation without Internet access

To perform deactivation without Internet access, select the item Export *deactivation file*. Select the program desired and enter a storage location for the file. From this moment, activation on that computer is already canceled.



Deactivation: Exporting the deactivation file

Load the deactivation file to the computer without the Internet connection. By clicking on the button *Next*, you are sending information to imc's license server. Subsequently, the software license is available for activation again.



Deactivation: Sending the deactivation file

3.5.3 Network license

3.5.3.1 Instructions for administrators

First install the imc LICENSE Manager if no other imc products are already present.

Activation of the network licenses is performed as for a single-user license, see Installation of the single user license 34. Additionally, the administrator must set up the server's IP address and the port number.

- The Service Port can be set using the *imc LICENSE Manager*. After changing the port number, it is necessary to restart the server in order to have the settings applied.
- Changing the IP address by means of the *imc LICENSE Manager* is not possible.

Note

- When additional network licenses are purchased, they are activated just like other licenses. For this purpose, the same contact data and License Key are to be used.
- The prerequisite is the **additional** service ***imc License Service "IMC-LI"*** installed by *imcLM_SetupServer.exe*.
- In order for the **client & administrator** to be able to access the Licence server, it may be necessary for the port set to be **enabled** on the License server (admin rights are required).
  For example, with Port 60002, Windows-10-Firewall: Find under Control Panel > System and Security > Windows Defender Firewall > Advanced settings; where a "New rule" is to be set under "Inbound Rules":
  UDP + TCP of specific local port 60002
  On the client, it would be possible to define an "Outbound rule", but the Firewall normally does not put limitations on the outbound ports.
- **Windows Powershell** can also be used to enable the ports as follows:

```
New-NetFirewallRule -Name imc_LM_Network_Server_TCP -DisplayName 'imc LICENSE Manager
Network Server TCP' -Enabled True -Direction Inbound -Protocol TCP -Action Allow -
LocalPort 60002

New-NetFirewallRule -Name imc_LM_Network_Server_UDP -DisplayName 'imc LICENSE Manager
Network Server UDP' -Enabled True -Direction Inbound -Protocol UDP -Action Allow -
LocalPort 60002
```

3.5.3.2 User & administrator instructions

Step 1:

In order to obtain a network license on a computer, the server's IP address and its port must be known. Users get this information from their administrator.

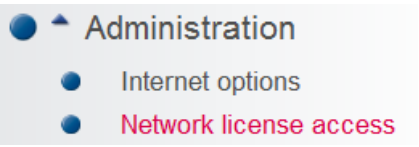
Install your imc product.

Step 2:

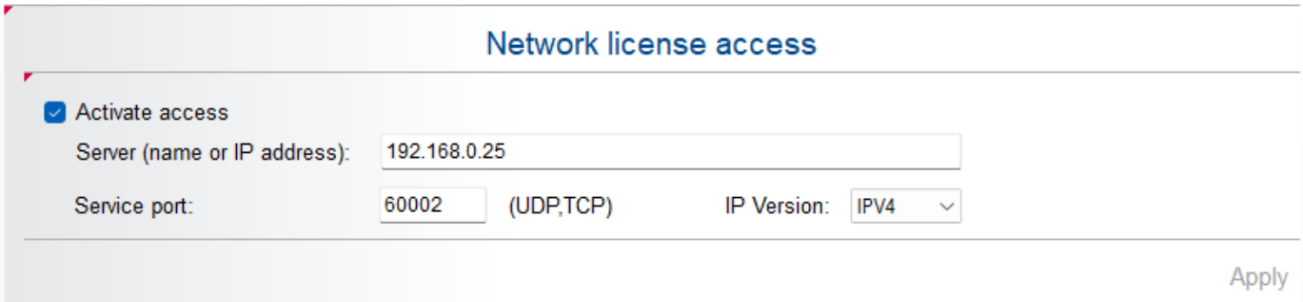
Start the *imc LICENSE Manager*

Step 3:

Select *Administration > Network license access*



The following dialog appears:



Activate access *Server IP address* *Service Port*

Internet access must be configured for the PC, in other words, the HTTP protocol (Port 80) must be enabled. If a proxy server is used, the corresponding port must be specified (it depends on the network, so inquire with the administrator).

If a proxy server is used, the LM adopts the default gateway from the Internet options. However, the proxy server can also be set in the License Manager 39. The corresponding settings are made by the respective purchaser's network admin.

Note Checklist in case of error

1. Are the ports and protocols mentioned above enabled?
2. Is the License Manager blocked by the Firewall?
3. Is the Internet access limited to permitted Internet addresses?

Step 4:

Select *Activate access.*

Step 5:

Enter the server IP address and Service Port number which you obtained from the Administrator. With *Save configuration*, the settings are applied.

Note

- The number of licenses still available can be seen under the menu item Administration/ License server/ Network licenses 40.
- If more network licenses are requested than are available, the user is notified by a message.
- If the server fails, the programs continue running for a reserve time of **four** hours. An error message provides notification of the server's failure.
  - Within the **first two hours** of the reserve time, the program tries to resume contact with the server. Every 30 minutes, the user receives a message. If the server is back on the network within the first 2 hours, the licenses are automatically retrieved.
  - The program runs for **another two** hours without searching for the server. If the server is back on the network in this time, the software must be restarted in order to re-initialize the licensing.
  - If the server is not back on the network when the reserve time elapses, the program ends automatically.
- Which PCs were issued licenses is noted under Administration/ License server/ Licenses used 40
- In order to prevent any deactivation of the program due to server failure, the computers can be equipped with the corresponding single-user license.

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3.5.3.3 Silent Setup

The following provides an explanation of how to enter the access data for the license server on the Client's PC in conjunction with automated installation of the License Manager.

The License Manager uses an XML-file: **imcLiM.config**, which contains the settings for the access to the license service. This file is normally generated when entering the data "Administration" - "Access to network licenses" 40. The file has the following structure:

```
<?xml version="1.0" encoding="utf-8"?>
<Config>
   <LicenceManager>
      <NetLiSvcAccess IP="11.222.33.44" Port="60002" Enable="1" />
      <WebProxy Use="0" Address="" Port="" Auth="0" />
   </LicenceManager>
   <LicenceServer>
      <Service Port="60002" />
   </LicenceServer>
</Config>
```

For the Client, the pertinent section is `<LicenceManager> … </ LicenceManager>`. The section `<LicenceServer> … </ LicenceServer>` pertains to the service of the Server.

The entry sets the IP address, the port and enables access.

```
<NetLiSvcAccess IP="11.222.33.44" Port="60002" Enable="1" />
```

Copy these data to the Client-PC along with the automated installation. Thus, the access data are set on the Client-PC and the user is able to start the licensed products directly.

Target folder for the imcLiM.config file:	
Win8, 8.1, Win10, Win11:	`"C:\ProgramData\imc\LI\"`

3.5.4 Trial version license

- The trial version has the rights of the full version but with certain limitations.
- Trial version licenses come with time limits for use.
- The validity period depends on the particular software product.
- Please observe the license agreement, in particular also §7, which represents additional limitations of the trial version.
- Depending on the product, additional limitations may apply to the trial version; please refer to the corresponding product documentation.
- A trial version license can only be activated on a computer once per software product. After the validity expires, a single-user or network license is needed in order to continue using the program.
- The conversion of a trial version license is only possible by activating a single-user 34 or network license 52.

Note

If the validity of the Demo license expires while the software is running, it reacts like in the case of expiration of a network license. See notes under Network license\What does the user need to do? 52. The procedure does not start until the next morning at 9 AM, so that there should be sufficient time to remedy the problem.

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3.6 imc FAMOS Editions

imc FAMOS is now available in different editions administered by the License Manager.

The functions belonging to the smaller editions are also incorporated in the larger editions.

Note

The manual lists the function scope of imc FAMOS Professional. In the "smaller" editions then, not all of the features presented here are present.

Using Start parameters it is possible to force the use of a particular edition:

imc FAMOS Reader

Start parameter /VR

The Reader version consists of the Variables list and the File Browser and does not require licensing.

This enables

- data import
- display in the curve window
- documentation of measured data

imc FAMOS Standard

Start parameter /VS

The scope of the imc FAMOS Reader is augmented with the following functions:

- Analysis
  - editing and analysis of measured data
  - saving / export of events
  - mathematics + statistics function library
- Sequences (macros)
- Excel-Kit

imc FAMOS Professional

Start parameter /VP

The scope of imc FAMOS Standard is augmented with the following functions:

- Project Management (organization of all files needed for a task (measured data, reports, sequences) in one project, including Pack&Go for easy transfer
- Dialog-Editor (creating dialogs to be added to sequences by the user)
- Video-Kit
- Calculation of measurement uncertainty
- Spectrum Analysis Kit
- R-Kit
- PowerPoint-Kit
- Python-Kit

imc FAMOS Enterprise

Start parameter /VE

The scope of the imc FAMOS Professional is augmented with the following functions:

- Class-counting package
- Order Tracking Analysis Kit
- ASAM-ODS-Browser

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imc FAMOS Runtime

Start parameter /VU (only in conjunction with an additional parameter /P, /S or /B; see Start with parameters 57, otherwise an error message appears.

The runtime enables a sequence, dialog or panel without editing capabilities to be called. Once the sequence has run or the dialog or panel has been closed, the runtime concludes.

Further, the runtime enables use as a COM-server, e.g. for imc Studio. However, some COM commands are prohibited, e.g. "*Famos.Visible = true*".

Main Runtime features:

- Independent edition to be selected upon installation.
- No "manual" operation, only for running previously created applications.
- imc FAMOS operating interface not visible. All that is visible are dialogs and Panel.
- All kits provided with the Enterprise-Edition are available.
- Each call of the runtime is started as an independent program (instance).

Constraints on the Panel: Display/operation only of previously created panels. No Design-mode, no New, no Save.

Licensing: The system first checks against Runtime-license. In case of failure, the system checks against the Enterprise Edition. By this means, even developers who do not possess an explicit Runtime license can test routines as Runtimes.

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3.7 Start with Parameters

3.7.1 Overview

It is possible to set parameters which initiate certain processes upon starting imc FAMOS , or which influence the general functioning of the application.

The following options are defined:

/B 62	Load panel
/C 59	Set registry key for configuration file
/D 59	Open and display measurement data file
/E 62	Execute imc FAMOS operation
/F 59	Establish file format for /L and /D
/L 59	Open measurement data file
/N 63	Starting a new instance of imc FAMOS
/P 62	Load and start imc FAMOS project
/S 61	Run imc FAMOS sequence, panel or dialog
/X 61	In conjunction with /S or /P: Close imc FAMOS after running
/VR 55	Starts imc FAMOS as imc FAMOS Reader
/VS 55	Starts imc FAMOS as imc FAMOS Standard
/VP 55	Starts imc FAMOS as imc FAMOS Professional
/VE 55	Starts imc FAMOS as imc FAMOS Enterprise
/VU 56	Starts imc FAMOS as a runtime in conjunction with /P (project); /S (sequence or dialog) or /B (Panel).

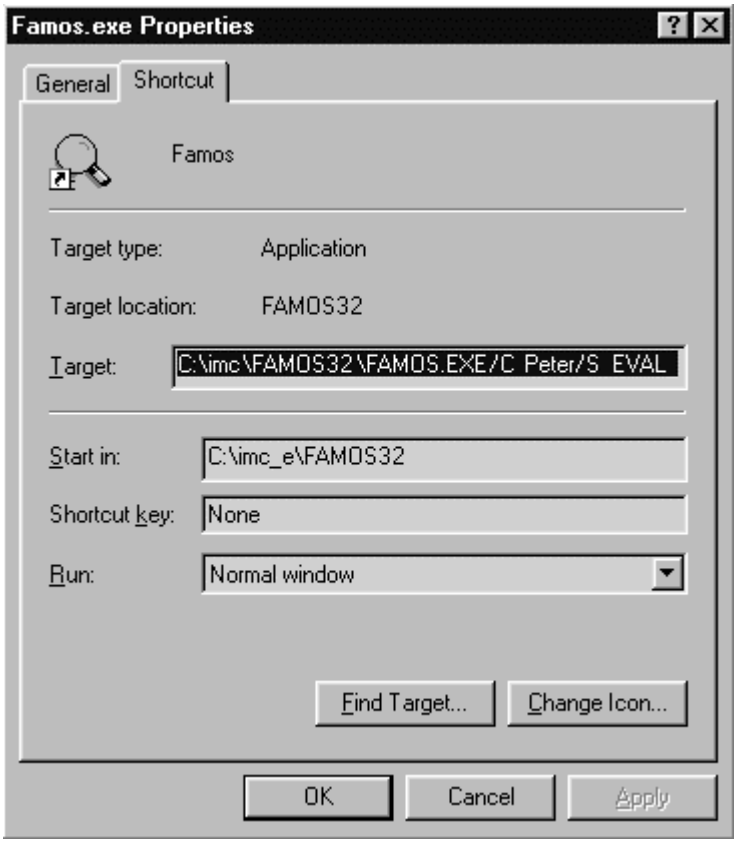
You can select the above options either when calling imc FAMOS by typing command text (Windows input prompt or "*Start/ Run*"), or, more easily, by creating a program shortcut.

To make a new imc FAMOS shortcut having starting parameters, first create a shortcut to the file "*famos.exe*". For information on creating program shortcuts, please refer to your documentation for Windows. Once the shortcut exists, a right-click on its icon calls its context menu, in which you must select the item "*Properties*". In the dialog which then appears, enter the desired parameter in the entry box "*Target*" which is on the index card "*Shortcut*".

Observe the following rules on command line syntax:

- Between the option appendage and the parameter text (e.g., file name), there must be at least one space.
- If the parameter text contains spaces, it must be written inside quotation marks.
- If the parameter text itself contains quotation marks, they must be preceded by a '****' character.

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Windows dialog Properties/ Shortcut

The settings shown above instruct imc FAMOS to look for the configuration settings with the key "*Peter*". The sequence "*Eval*" is to be run when imc FAMOS is started.

Note

If imc FAMOS has already been started, the open imc FAMOS window is made active and the command line is implemented (except in the case of /C).

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3.7.2 Registry-Key for Configurations Data

Syntax

/C keyname

Explanation

The configuration settings for imc FAMOS are saved to the Windows system registry when the application is closed. At the next start, the registry is referred to and the settings indicated there are implemented.

The settings are saved separately for each user. Therefore, if you wish to work with many different configurations, you can simply log in to Windows under different names.

Another possibility would be to specify an additional key under which configuration data are to be deposited in the registry.

As the default, all configuration data are stored under the keys

```
HKEY_CURRENT_USER
   Software
      imc Measurement and Control
         Default
```

With the command line option switch "/C", followed by a name, you can replace the valid subkey "*Default*" with a subkey having the name you entered. In this way, it's possible to create multiple shortcuts which each call imc FAMOS with a different starting configuration.

Example

```
C:\Program Files\imc\Famos\Bin\famos.exe /C PetersConfigurations
```

3.7.3 Opening a measurement value file

Syntax

/L FileName

/D FileName

/F FileFormat

Explanation

These option appendages cause measurement data files to be opened. The switch ***/L*** opens the file, while ***/D*** opens the file and displays its contents in a curve window.

As the default, imc FAMOS file format is used at a session's start. The switch ***/F*** lets you specify a different format:

/F BIN	Binary format
/F ASC	ASCII-format
/F NIC	Nicolet WFT-format
/F DIG	Digiskop-format
/F FormatName	User-defined import filter

If you enter a file name as the parameter text without supplying a complete path, the default directory stated under imc FAMOS is used. If the file name contains spaces, it must be written inside quotation marks.

With the standard formats, the valid file format options, such as options for reading binary and ASCII files, remain as they are set for imc FAMOS .

With user-defined format, the syntax for the /F-parameters is identical with the corresponding entry for the function *FileOpenFAS*:

If importing is accomplished by means of an import filter created using the File Assistant, the import filter's name (*.fas) is specified as the /F-parameter:

```
/F ImportFilter.fas
```

On the other hand, if importing is accomplished by means of an expansion library, The format is specified as follows:

```
/F "#DLLName|FilterName|Parameter"
```

All specifications needed for this are available from the expansion library's maker; while <FilterName> and <Parameter> can often be omitted. Further information on the topic is provided with the description of the function *FileOpenFAS*.

If a derivative import filter is to be used, the format is specified as follows:

```
/F "$FormatName"
```

"*FormatName*" represents the name assigned by the user, as it is displayed in the imc FAMOS dialog "*Options"/"Import filter*", for example.

Example

```
"C:\Program Files\imc\Famos\Bin\famos.exe" /D  slope.dat
"C:\Program Files\imc\Famos\Bin\famos.exe" /L  C:\Users\Public\Documents\imc\imc
FAMOS\ascii\tab.asc /F ASC
"C:\Program Files\imc\Famos\Bin\famos.exe" /L  c:\lecroy\c1.001 /F lecroy.fas
"C:\Program Files\imc\Famos\Bin\famos.exe" /D "C:\Users\Public\Documents\imc\imc
FAMOS\dat\File 12.5.96.dat"
"C:\Program Files\imc\Famos\Bin\famos.exe" /D "c:\1.mat" /F
"#MatLabImportExport.DLL"
```

3.7.4 Running a Sequence/ Dialog

Syntax

```
/S SequenceFile Parameter1 Parameter2 .. [/X]
```

Specifying parameters is optional.

```
/S DialogDatei [/X]
```

Explanation

This option switch instructs imc FAMOS to open and execute the specified sequence- or dialog file file upon starting. As of version 7.4, this switch can also be used to execute a panel as a dialog. If the sequence needs to know certain parameters to run, these must be entered after the file name.

Unless a full directory path is entered, imc FAMOS looks for the file in the default sequence directory.

With dialog files, it's absolutely necessary to supply the filename extension (.dlg); correspondingly a panel file with the extension *.panel.

If you enter parameters, or if the filename contains spaces, the entire call must be written inside quotation marks. If the text of the call itself contains quotation marks, these must be preceded by the '\' character.

You can also enter the switch /X. By this means, imc FAMOS is closed as soon as the dialog or sequence has been run. The parameter is ignored if imc FAMOS was already open before.

Example

Sequence path contains spaces -> add "\":

```
"C:\Program Files\imc\Famos\Bin\famos.exe" /S  C:\Users\Public\Documents\imc\imc
FAMOS\seq\evaluate.seq
```

Sequence in the standard directory. Close sequence again afterwards -> add /X:

```
"C:\Program Files\imc\Famos\Bin\famos.exe" /S "evaluate slope.dat" /X
```

Sequence in the default directory. Add text parameter with space -> \" in front of " :

```
"C:\Program Files\imc\Famos\Bin\famos.exe" /S "evaluate2 \"Joe Doe\""
```

Starting a dialog in a new instance:

```
"C:\Program Files\imc\Famos\Bin\famos.exe" /N /S "c:\My Dialogs\Dialog1.dlg" /X
"C:\Program Files\imc\Famos\Bin\Famos.exe" /S "C:\Users\Public\Documents\imc\imc
FAMOS\imc FAMOS\Projects\Crash Test\VideoPanel1.panel" /X
```

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3.7.5 Executing Operations

Syntax

```
/E OperationsText
```

Explanation

It is also possible to pass a command to imc FAMOS , which it must execute when it starts, as a parameter. As the parameter text, you can enter any command which can be entered in the imc FAMOS Input Box.

imc FAMOS remains open after the execution of the line. This means that several /E calls can be executed one after the other, the results of which are processed further. In general, it makes more sense to package such statements in a sequence file and use the /S switch. Most purposes can be achieved more conveniently by writing the commands involved in a sequence file and then using the option appendage " /S".

If the operations' text contains spaces, the text must be written inside quotation marks; and if the text itself contains quotation marks, they must be preceded by a '\' character.

Example

```
"C:\Program Files\imc\Famos\Bin\famos.exe" /C Conf1 /E "SEQU eval.seq"
"C:\Program Files\imc\Famos\Bin\famos.exe" /E  erg=Ramp (0,1,100)
"C:\Program Files\imc\Famos\Bin\famos.exe" /E "Name =\"Herbert\""
```

Calling a sequence function 381

```
"C:\Program Files\imc\Famos\Bin\Famos.exe" /E "signal= !CreateSignal.Constant(0.2,
100, 3.14)"
```

3.7.6 Running a project

Syntax

```
/P ProjectFolder [/X]
```

Explanation

With this switch, imc FAMOS is instructed to load and run the specified project upon starting.

You can also enter the switch /X. By this means, imc FAMOS is closed as soon as the dialog or sequence has been run. The parameter is ignored if imc FAMOS was already open before.

Example:

```
"C:\Program Files\imc\Famos\Bin\famos.exe" /P "c:\projects\evaluation" /X
```

3.7.7 Loading and starting a panel

Syntax

```
/B PanelFileName
```

Explanation

With this switch, imc FAMOS is instructed to load the specified panel file.

If the filename contains spaces, the entire call must be written inside quotation marks. If the text of the call itself contains quotation marks, these must be preceded by the '\' character.

Example

```
"C:\Program Files\imc\Famos\Bin\famos.exe" /B "C:\Users\Public\Documents\imc\imc
FAMOS\Seq\Evaluation.panel"
```

Start with Runtime in new instance:

```
"C:\Program Files\imc\Famos\Bin\Famos.exe" /VU /N /B "C:
\Users\Public\Documents\imc\imc FAMOS\imc FAMOS\Projects\Crash
Test\VideoPanel1.panel" /X
```

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3.7.8 Ignore installed kits

Syntax

```
/I "Kitname1.dll,Kitname2.dll"
```

Explanation

In rare cases, it can be desirable to ignore installed kits and plugins upon starting imc FAMOS . In the Options 337, such disabled kits by a red stop sign icon.

Example 1: imc FAMOS without Class-counting and Spectrum kits

```
"C:\Program Files\imc\Famos\Bin\famos.exe" /I "im7clsc1.dll,im7spct1.dll"
```

For the standard kits it is also possible to use the following abbreviations instead of the DLL names:

Kit	Abbreviation	DLL
Class-counting Kit	**CLS**	im7clsc1.dll
Spectrum Analysis Kit	**SPC**	Im7spct1.dll
Order-tracking Kit	**OTR**	im7otrk1.dll
Video-Kit and -Plugin	**VPL**	ImcVpl02.dll
ASAM-ODS-Kit and -Plugin	**ODS**	ImcOds02.dll
R-Kit	**RKT**	imcRKit.dll
Railwaykit	**RWY**	im7Railway.dll
Databasekit	**no abbreviation**	imc.database.kit.dll

Example 2: Starts imc FAMOS as the Enterprise-Edition, but ignores the loading of all standard kits and plugins.

```
"C:\Program Files\imc\Famos\Bin\famos.exe" /VE /I "CLS,SPC,OTR,VPL,ODS"
```

Example 3: Start imc FAMOS as the Enterprise-Edition without databasekit:

```
"C:\Program Files\imc\Famos\Bin\Famos.exe" /VE /I "imc.database.kit.dll"
```

3.7.9 Starting a new instance of imc FAMOS

Syntax

```
/N
```

Explanation

By means of this parameter, it is possible to start multiple independent instances of imc FAMOS on a single PC. Calls from outside, such as *Curve segment to imc FAMOS* coming from a curve window, are then transferred to the last instance started. For global settings such as colors, font size, etc., those applicable in the last instance started prevail.

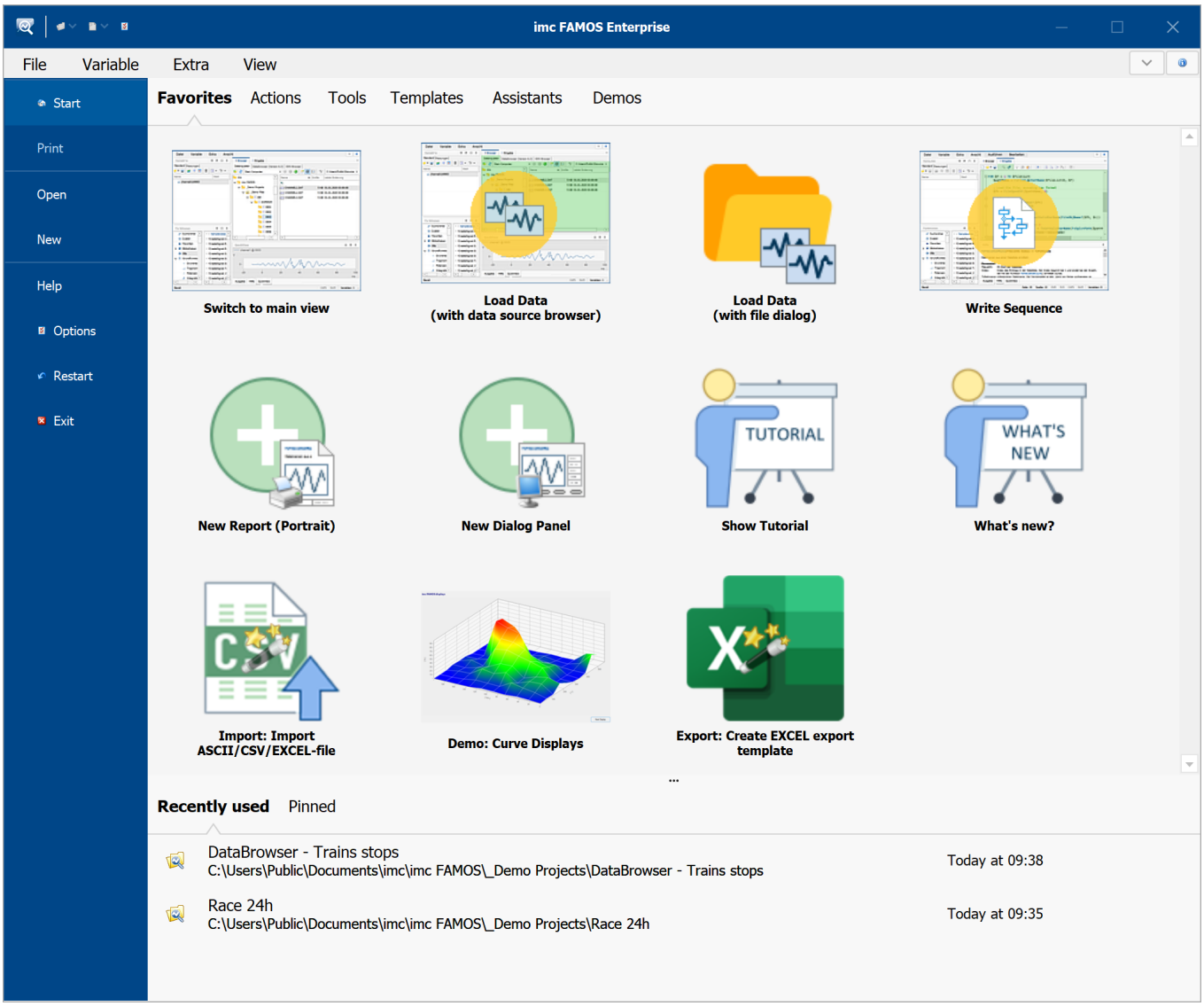
Example:

```
"C:\Program Files\imc\Famos\Bin\Famos.exe" /VE /N
```

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4 User-Interface

4.1 The Start Screen

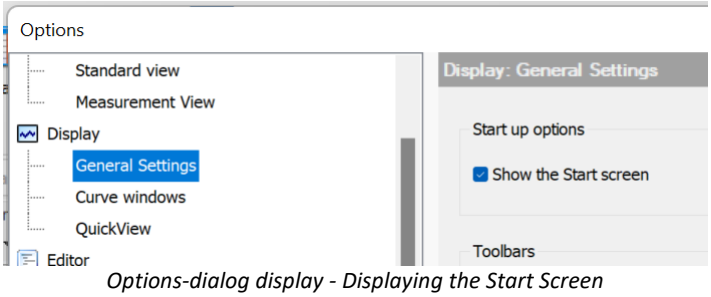


Start Screen

The Start screen is the introductory portal to imc FAMOS. It is subdivided into the areas Favorites, Tools, Templates, Assistants and Demos.

In the lower region, the files on which work had most recently been done are listed: projects, panels, sequences etc.

Activating/deactivating the Start Screen



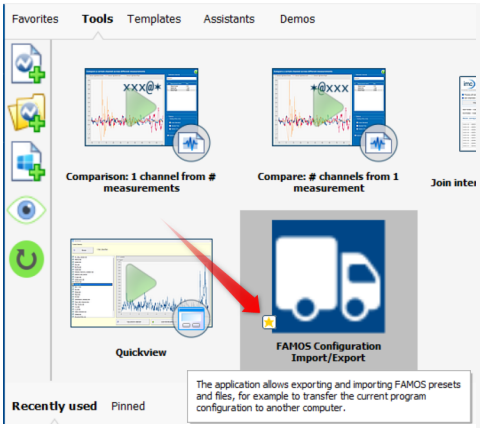
Options-dialog display - Displaying the Start Screen

Under *Extra\Options*, in the branch *Display\General Settings*, it is possible to specify whether FAMOS starts with the Start Screen or with its classic user interface.

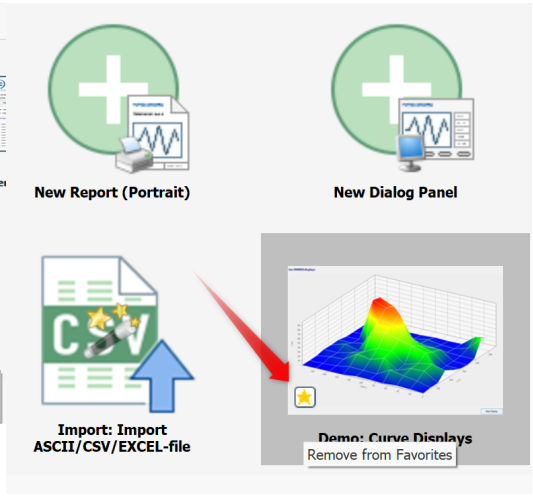
Favorites

On this page, the elements from the other areas, which have been designated as Favorites, are listed.

These are added by clicking on the Favorites star. Conversely, an element can be removed from the Favorites list by clicking on the Favorites star:

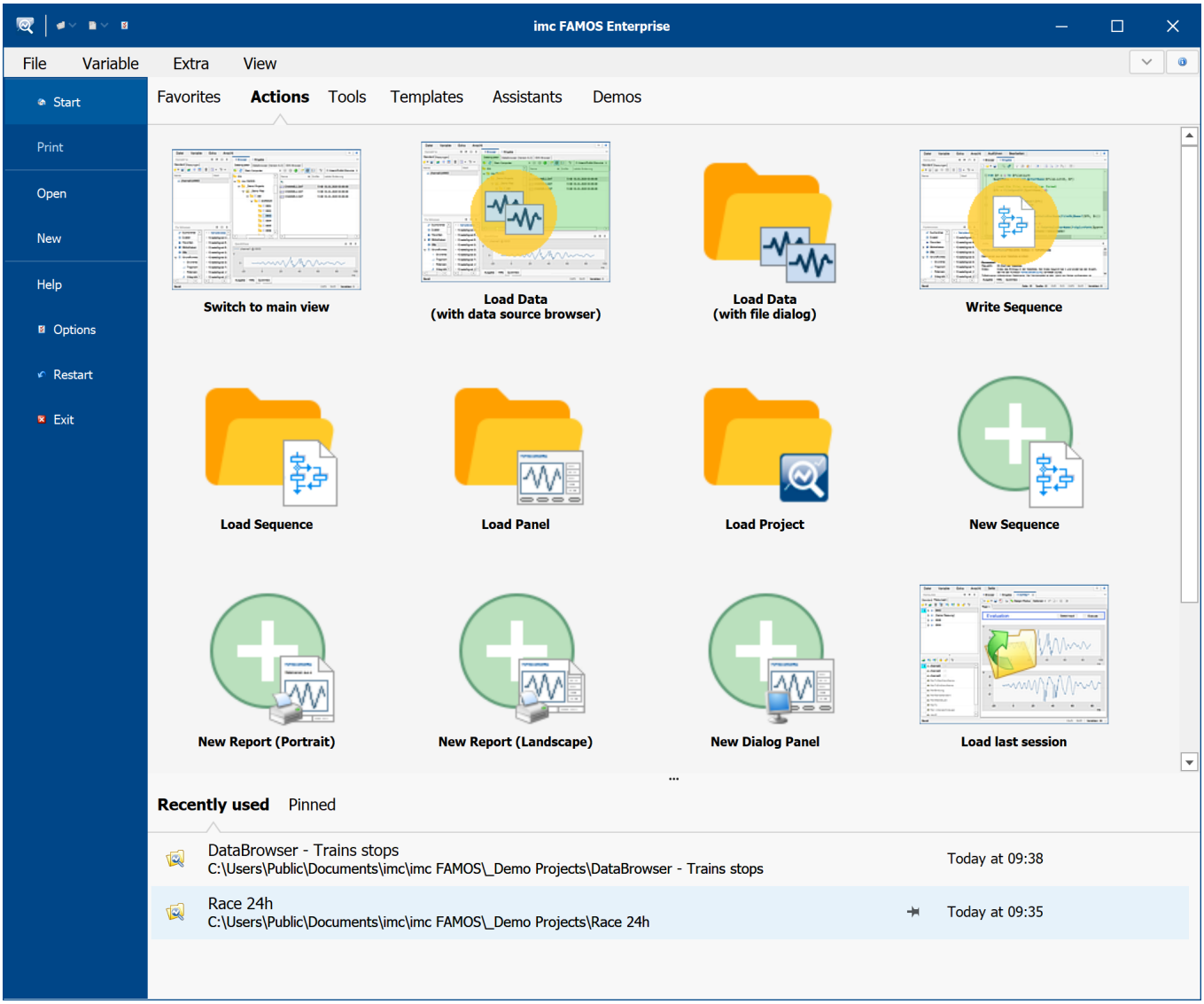


Tools page: Adding a Favorite



Favorites page: Removing a Favorite

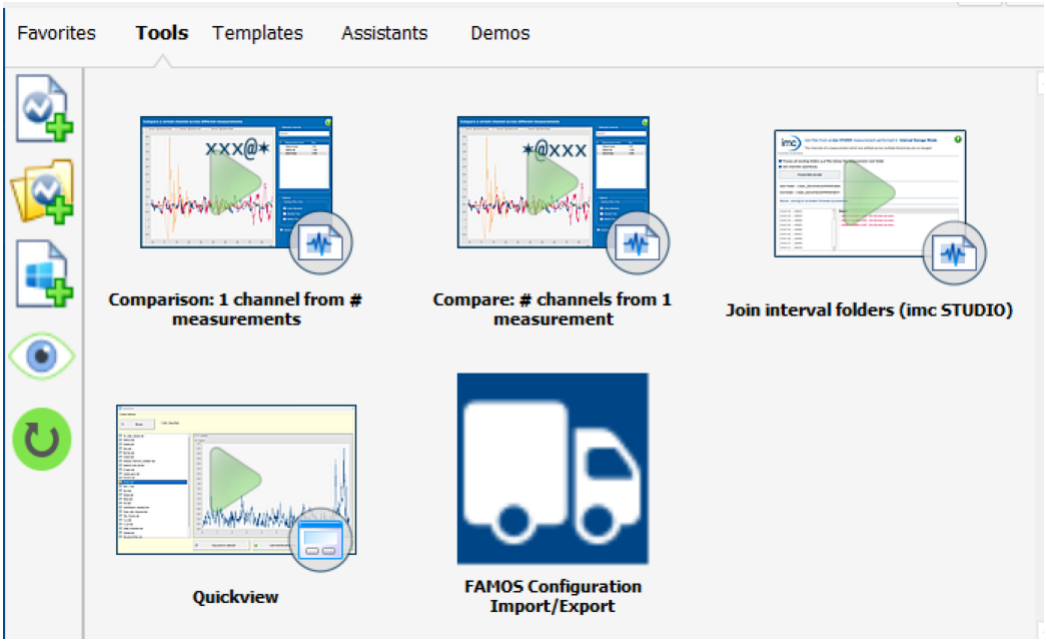
Aktionen



Start Screen: Actions

On the **Actions** page, all important entries from the *Open* and *New* menus can be executed via shortcuts.

Tools



Start Screen: Tools

Panels, dialogs or projects which are used as helpful tools can be made available on the Tools page. It is also possible to add links to executable programs such as the FAMOS configuration program, as shown above.

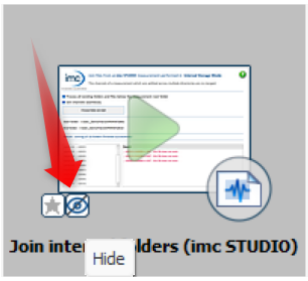
Adding tools

 Tools consisting of a file: Panel, Dialog, Sequence, or packed projects

 Project folder

 Miscellaneous executable programs

Hiding/displaying tools

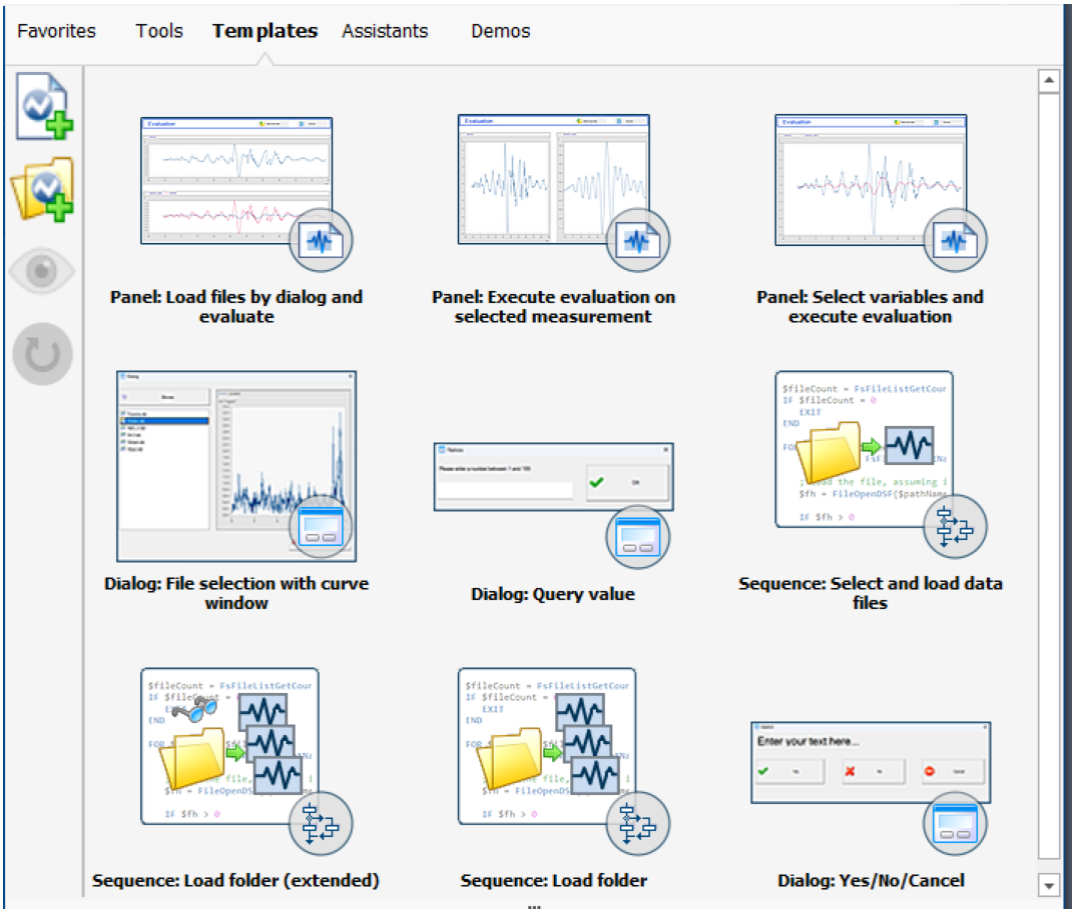
It is possible to temporarily hide tools. To do this, click on the crossed-through eye-icon, located next to the Favorites star. When you click on the plain eye-icon, the hidden tools are displayed once again.

Hiding tools

 Restore Defaults: Any added tools are removed and any hidden default tools are made visible again.

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Templates



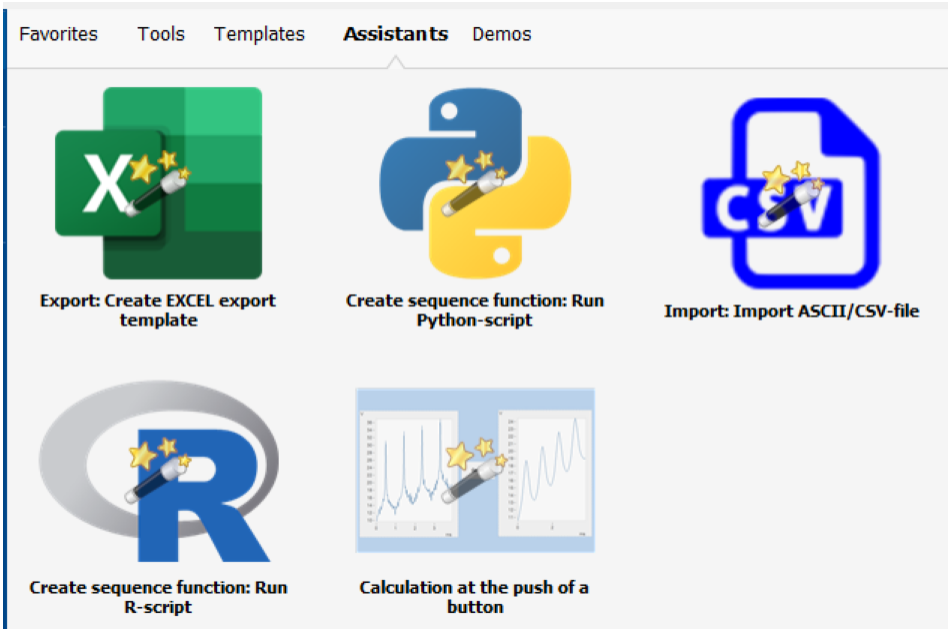
Start Screen: Templates

For the purpose of developing new sequences, panels or projects, it is possible to use templates. In contrast to the tools, the templates are executable only after some modifications to the application environment have been made.

Hiding templates

See Tools 67

Assistants



Start Screen: Assistants

This page presents a list of direct links to the FAMOS Assistants. These Assistants are created by imc and can not be added by the user.

EXCEL Export Template 246 — This Assistant creates an EXCEL export template which can be used for exporting data sets in the XLSX-format. The export template's settings determine the format of the EXCEL-table created.

Phyton-Script 341 — This Assistant creates a sequence function by means of which a Python-script can be parameterized and executed.

ASCII/CSV Import 186 — This Assistant provides support in importing data from a column-oriented ASCII- or CSV-file.

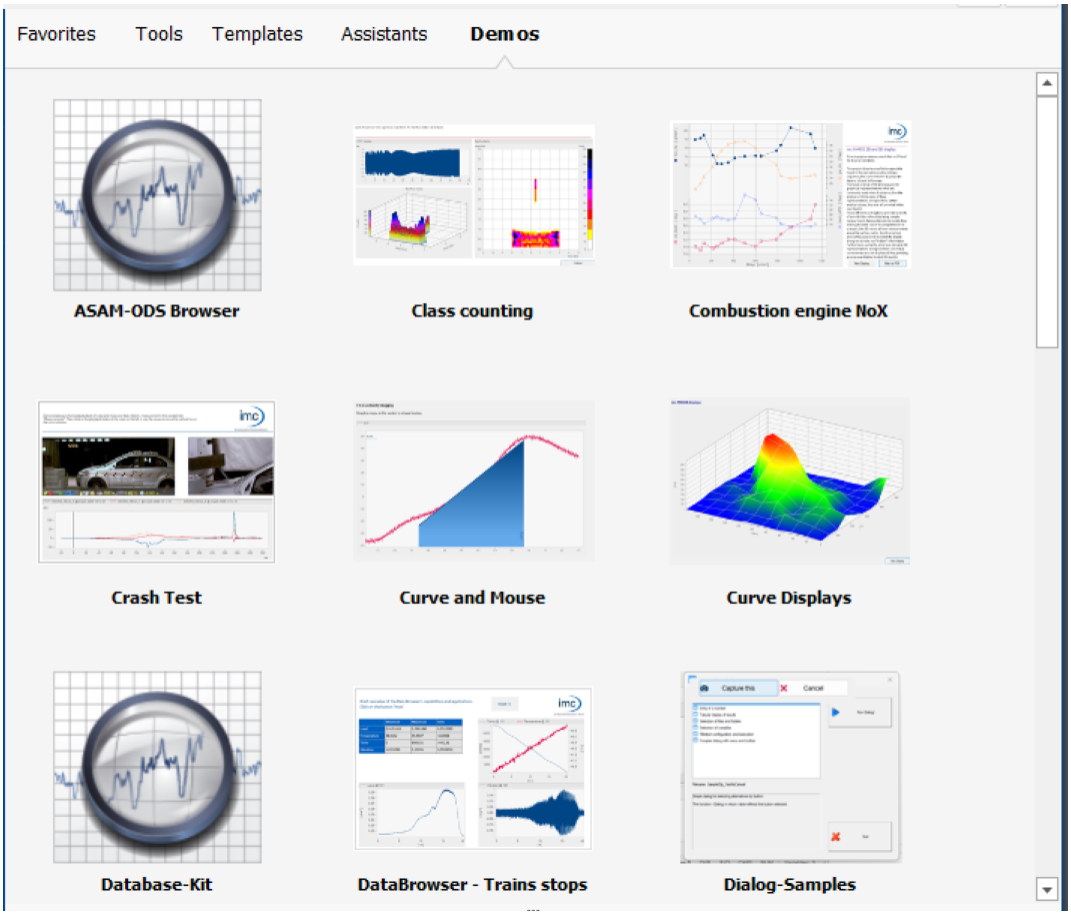
R-Script 340 — This Assistant creates a sequence function by means of which an R-script can be parameterized and executed.

Calculation at the push of a button — This Assistant creates a framework for a simple evaluation routine. In a Panel, selected data are displayed in a curve window and subjected to a configurable calculation at the push of a button. The results are also displayed.

Note imc FAMOS Edition

Assistants that use functions that are not supported by the imc FAMOS Edition 55 are displayed in gray (locked).

Demos



Start Screen: Demos

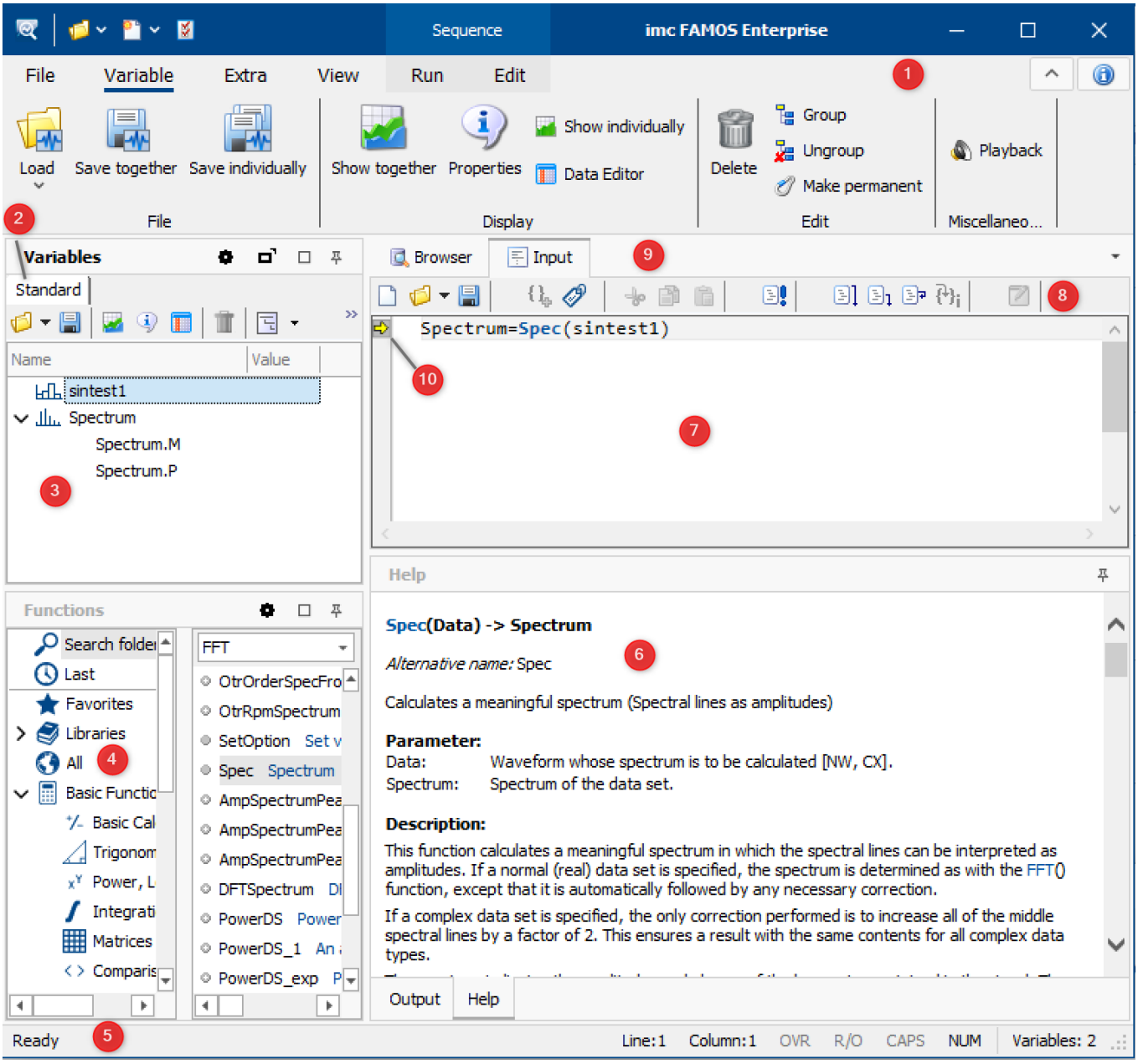
imc FAMOS comes with a collection of sample projects. These can be opened directly from the Start Screen's Demos-page.

Alternatively, they can be called via the Project-Explorer 418. Clicking on the button *Examples Folder* causes them to be listed in the Explorer.

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4.2 Introduction

imc FAMOS ' Applications window always appears upon starting up as it was when exited at the last session. If you wish to restore the default arrangement, click in the **Multi-function bar [1]** *"View" on "Back to default"* 130. Then the main window will appear as follows:



FAMOS: Applications window

At left below the Multi-function bar is the **variables field**. This lists the data which are currently loaded as in either **Standard** or **Measurements [2]** mode. In *Standard* mode, the are are listed as in the imc FAMOS ' predecessor versions **[3]**. In the mode *Measurements*, the data are displayed in measurement folders and channels. For working with Panel pages, this is the preferable setting.

Below the variables list is the **Functions list [4]**, displaying the available functions and commands. These are organized according to various topic groups. A search function finds a list of all functions whose name or application is associated with the search term.

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Beside the functions list you have the **Output box [6]**. Here, output for the user's attention, such as help texts, warnings and calculation results, is displayed.

Above this is the **Editor box [7]**. Formulas are entered here in standard mathematical notation and calculation is started by pressing the button labeled **Execute [10].** In the same box, it is also possible to program and execute sequences (macros). Due to the large number of commands which apply to the editor box, it has its own **toolbar [8]**.

At the upper right is the **Plug-in box [9]**. This is where expansion modules having their own user interfaces are displayed. The **File Browser plug-in** is always present for fast access to the measurement files. By default, this box is minimized, meaning that only its icon is visible.

Status messages, number of loaded variables and short explanatory notes about the menu options appear in the **status line [5]** under the output box.

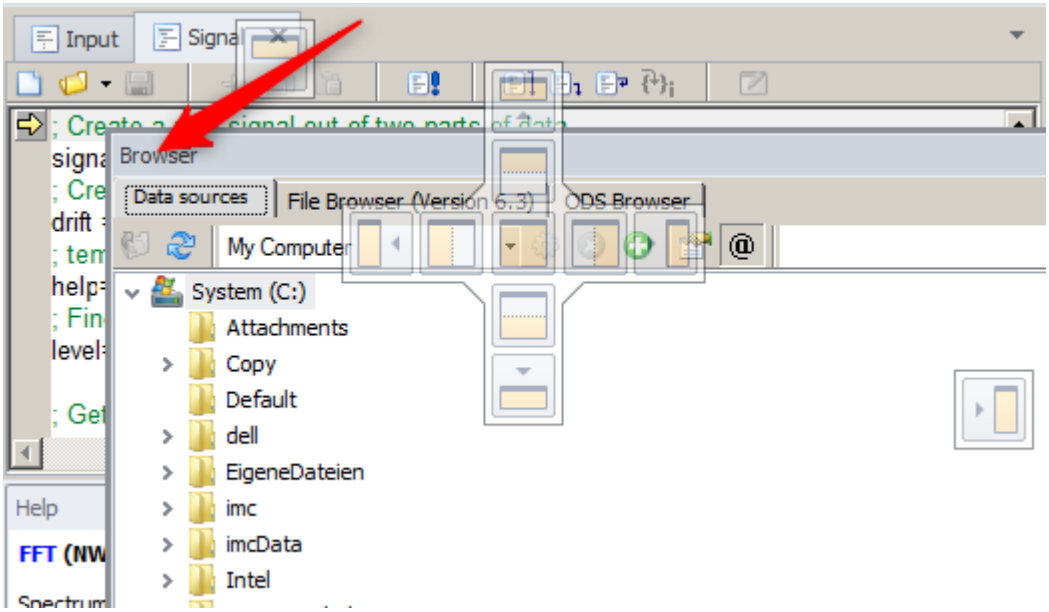
Reference

Section 'Customizing the user interface 144

4.2.1 Docking/Undocking

All components of imc FAMOS can be uncoupled as independent parts of the program.

By means of drag&drop, move a component to a free area. The following symbol for docking/undocking appears.



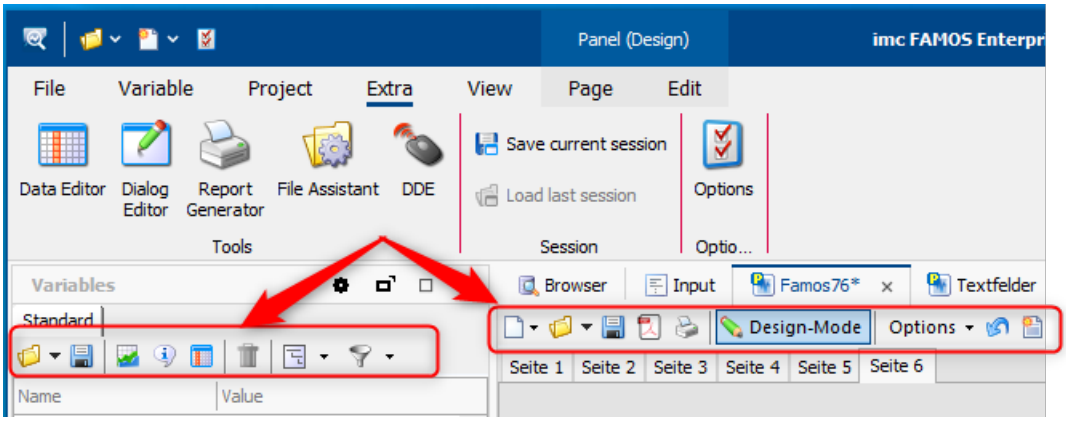
Conversely, the docking/undocking symbol appears as soon as an undocked component is moved. Thus you can also dock a component at another position and completely adapt the appearance of imc FAMOS to your working methods.

The associated multi-function bars are displayed when a component is undocked. In this way you can, for example, start a printout from a free-floating component.

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4.2.2 Toolbars

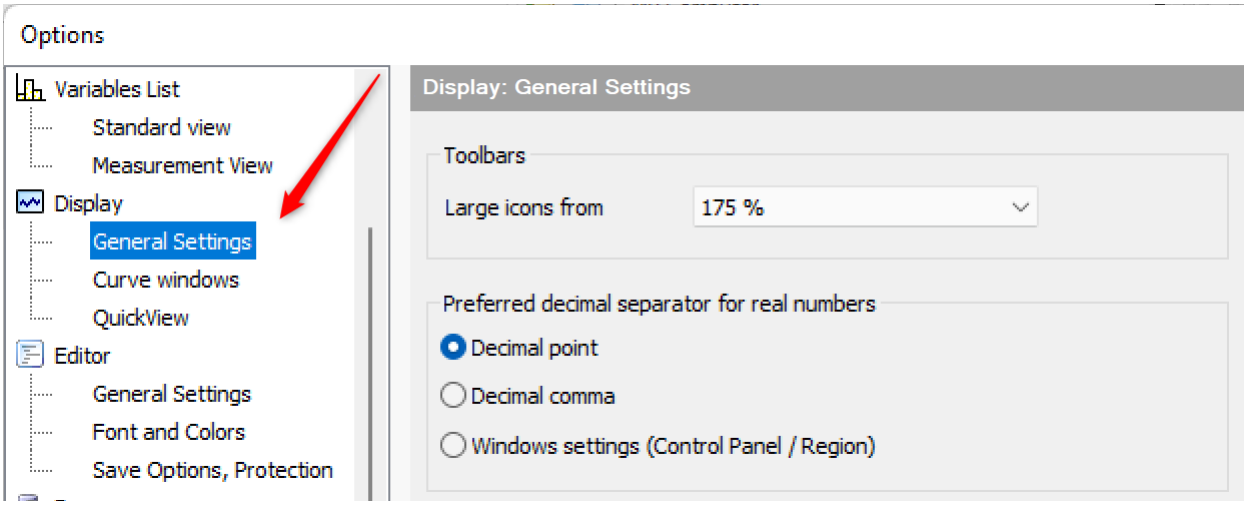
Commonly used (context-) menu commands can be accessed in the toolbars.



Toolbars at default size

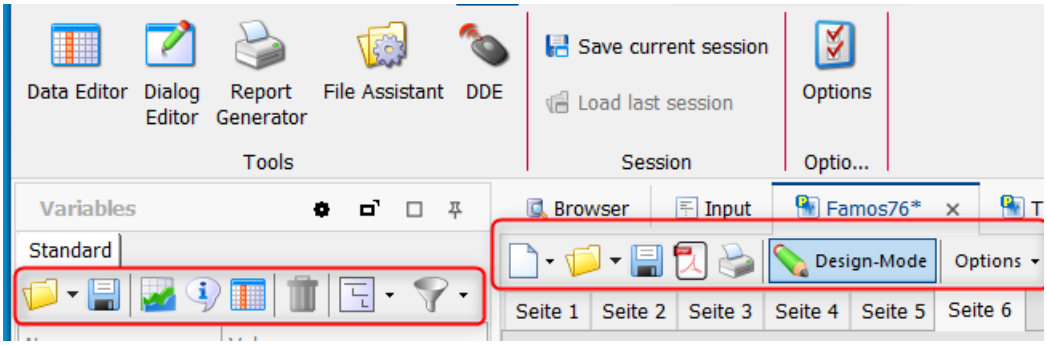
Modifying the toolbars

When using high-resolution monitors, the toolbar buttons can sometimes appear too small. In such a case, it is possible to make modifications in the dialog called by the item "*Display / General Settings*" in the *Extra / Options* menu.



Setting the monitor screen magnification factor, beyond which the large toolbar are to be used.

On screens having a high DPI resolution, the toolbars are now easier to operate:

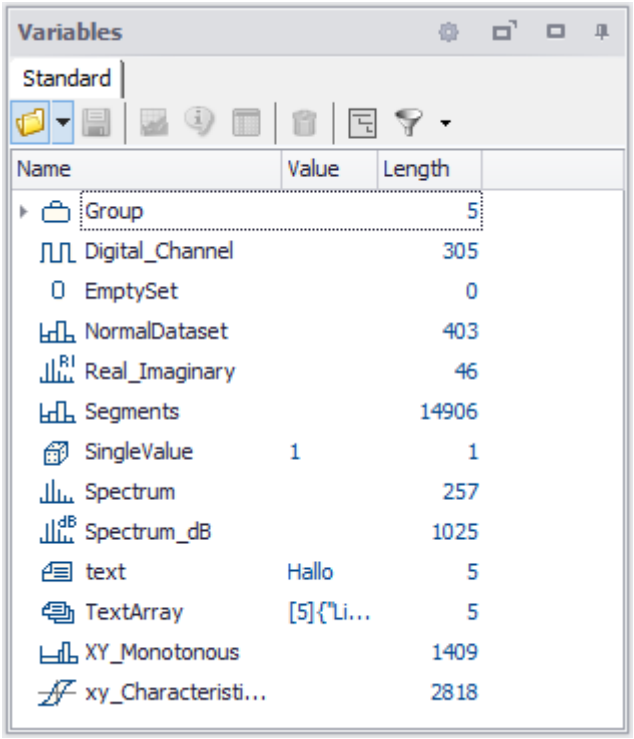


Toolbars with large buttons

4.3 Variables List

4.3.1 Overview

All variables currently being used in imc FAMOS are shown in this list. The names of the variables (and for single values, their actual values) are displayed next to a symbol representing the variable type.



For more information on imc FAMOS variables, for instance a description of the individual data types, refer to the Chapter "Variables 262".

The Variables list represents the centerpiece of imc FAMOS ' operating design. Most of the basic imc FAMOS functions either change the contents of the Variables list (e.g., loading of measurement files or execution of math functions) or they take effect upon the current selection in the Variables list (e.g. the display of channels in the curve window or saving of data sets).

The tab "*Measurements*" displays the data sorted according to the associated measurement 209.

4.3.2 Operation

Selection

Many menu items, especially in the "*Variables*" menu, take effect on the variables currently **selected** in the list. To select a variable, simply click on its entry with the mouse. If the variables list currently has the input focus, entering a letter selects the next variable in the list starting with that letter.

Multi-selection

To select a group of entries which are not adjacent to each other in the list, click on each desired entry while holding down the CTRL-button. To select a group of adjacent entries, there are the following options:

- Select the first item in the group of desired entries and next select the last item while holding down the SHIFT-key
- Use the arrow keys while holding down the SHIFT-key
- Click on an entry not selected and then brush the mouse cursor over the region containing the desired entries while holding down the mouse button

Copying a name to the Editor box

When you **double-click** on a variable, its name is copied to the Editor box. This can save you some work in writing out formulas.

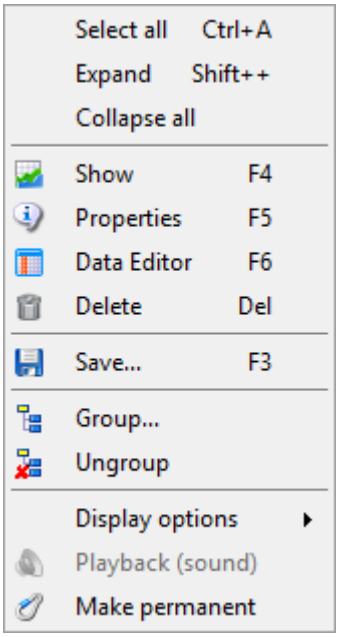
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Drag&drop

When you click on a selected entry and move the mouse away while holding down its button, the **drag&drop-mode** (denoted by a change of the mouse pointer's appearance) is activated. In this mode, you can drag whatever variables are currently selected to different locations. While you are doing so, the mouse pointer's appearance is constantly updated to reflect whether a certain action can be performed by the variables at the mouse's momentary position. You can drop the variables at the following positions by releasing the mouse button:

- in the **Editor box**; this inserts the variable into the formula line at the mouse position.
- on a **function name** in the **function box**; this opens a Formula Assistant dialog pertaining to the selected function and when applicable, designates the variable as the first parameter of the function.
- in a **curve window**: this causes the curves for the dropped variables -if applicable- to be displayed along with any curves already present; see section "Displaying variables 288".
- in the **Data Editor**: the variable(s) are displayed in the selected column(s) in the Data Editor.
- in the **Report Generator**: the variables are transferred into the current document. Either a new curve-, textual or tabular item is created or an existing report-item is updated to reflect the new variable's content.
- over the Functions Assistant. A parameter box is filled.

Context menu



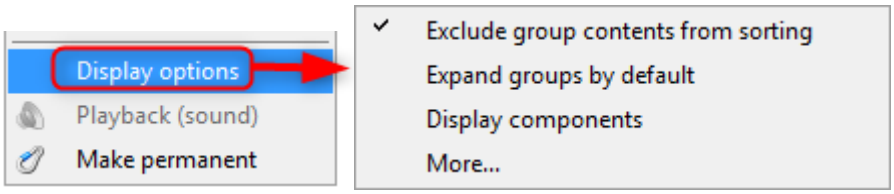
When you click on the **right mouse button** over the Variables list, a context menu appears. Here you will find commands that affect the current selection in the variable list and correspond to the functions in the menu bar 124, such as *Show*, *Properties*, etc.

Create a data group 277 with the *Group* command or expand the variables with the *Ungroup* 206 command.

When using a tree diagram, the variables can be expanded and collapsed. If only the selected variables are to be expanded and collapsed, use the *CTRL* shortcuts 109 with *right* or "+" of the numeric keypad to expand or *left* or "-" to collapse. If you use *SHIFT* instead of *CTRL*, you can expand to the lowest level.

Exclude group contents from sorting excludes group contents from the sorting.

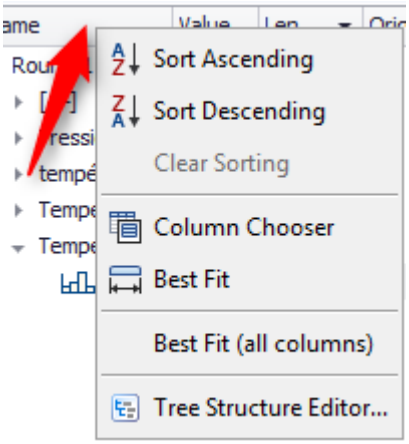
When the option "***Expand groups by default***" is set, the data objects contained in data groups are also displayed in the list. By **clicking on the [▾] symbol**, you can also expand or collapse data groups individually.



The option "***Display components***" means that for 2-component data types (complex and XY-data), the individual components are additionally displayed.

"More..." opens in the Options dialog and shows the branch *"Variables List: Standard view* 78*"*.

Context menu of column headers



Context menu of the column headers

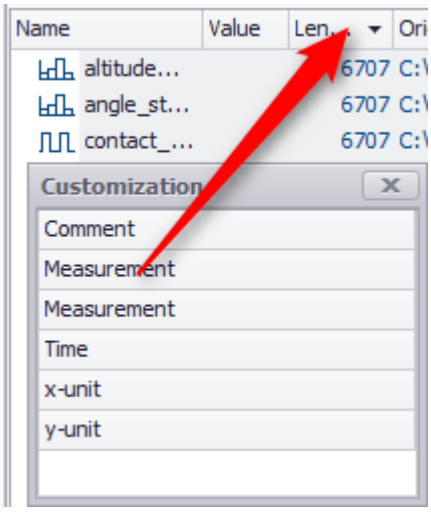
Right-clicking in the **headers** of the Variables list opens the context menu shown at left.

Sort A-/Descending: Sorting is performed according to the column on which the user clicks.

Best Fit: The width of the column on which the user clicks is adjusted to fit the longest entry.

Best Fit (all columns): The widths of all columns is adjusted to their respective longest entries.

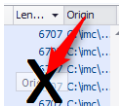
Tree Structure Editor...: The display of the variables can be organized hierarchically according to their properties. These can be defined by the user as described under Options 79.



Column Chooser

Column Chooser opens a window with all available properties which are not displayed in the Variables list.

You can **add a property** by simply dragging it from the selection box to the desired position in the column headers.

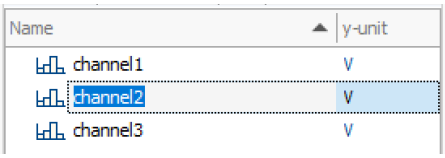


A column is deleted by dragging the column header downward.

Properties of the variables

All of the variables' properties can be displayed as a column in the Variables list; see the info on the context menu of the column headers in the last section.

Inplace-Editor

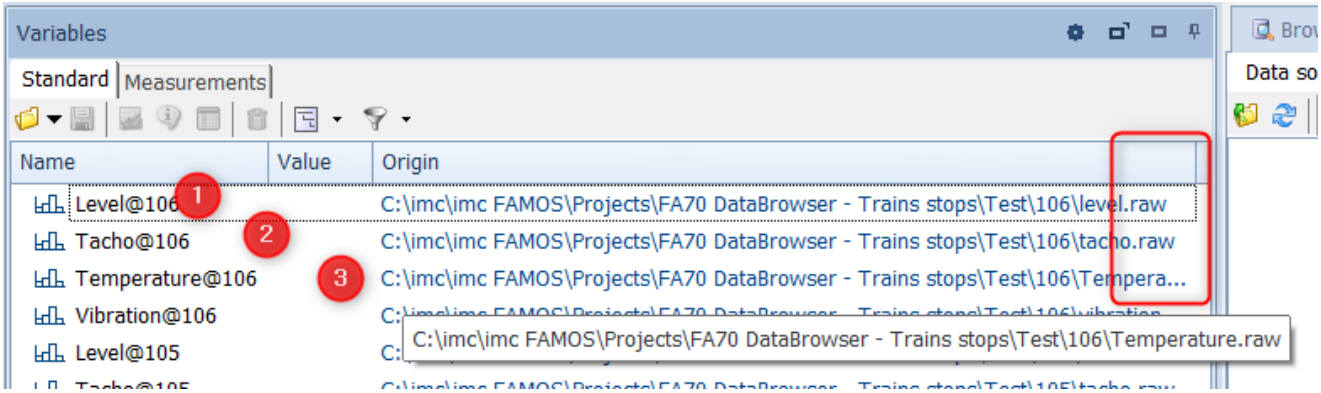


Some properties can be changed directly in an **Inplace-Editor**: *Variable names*, *x-Delta, x- Offset, x-* and *y-Unit*, as well as the *Trigger time*. In the Options 79, it is possible to select the **action**, which activates the *Inplace-Editor*.

Remarks: When "Extended Tree View 78" is activated, it is not possible to change the *variable name*.

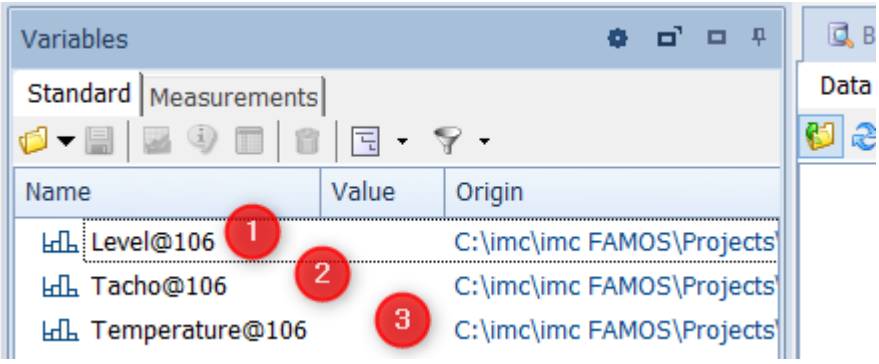
Tooltip in the standard list

If the information for a variable in a column does not fit into the column width, a tooltip with the content appears.



Only the third entry does not fit in the column "Origin" and displays the tooltip

Note that the width of the variable list can be narrower than the column. The column width can be sufficient, but not completely visible due to the width of the variable list. In this case, no tooltip appears.



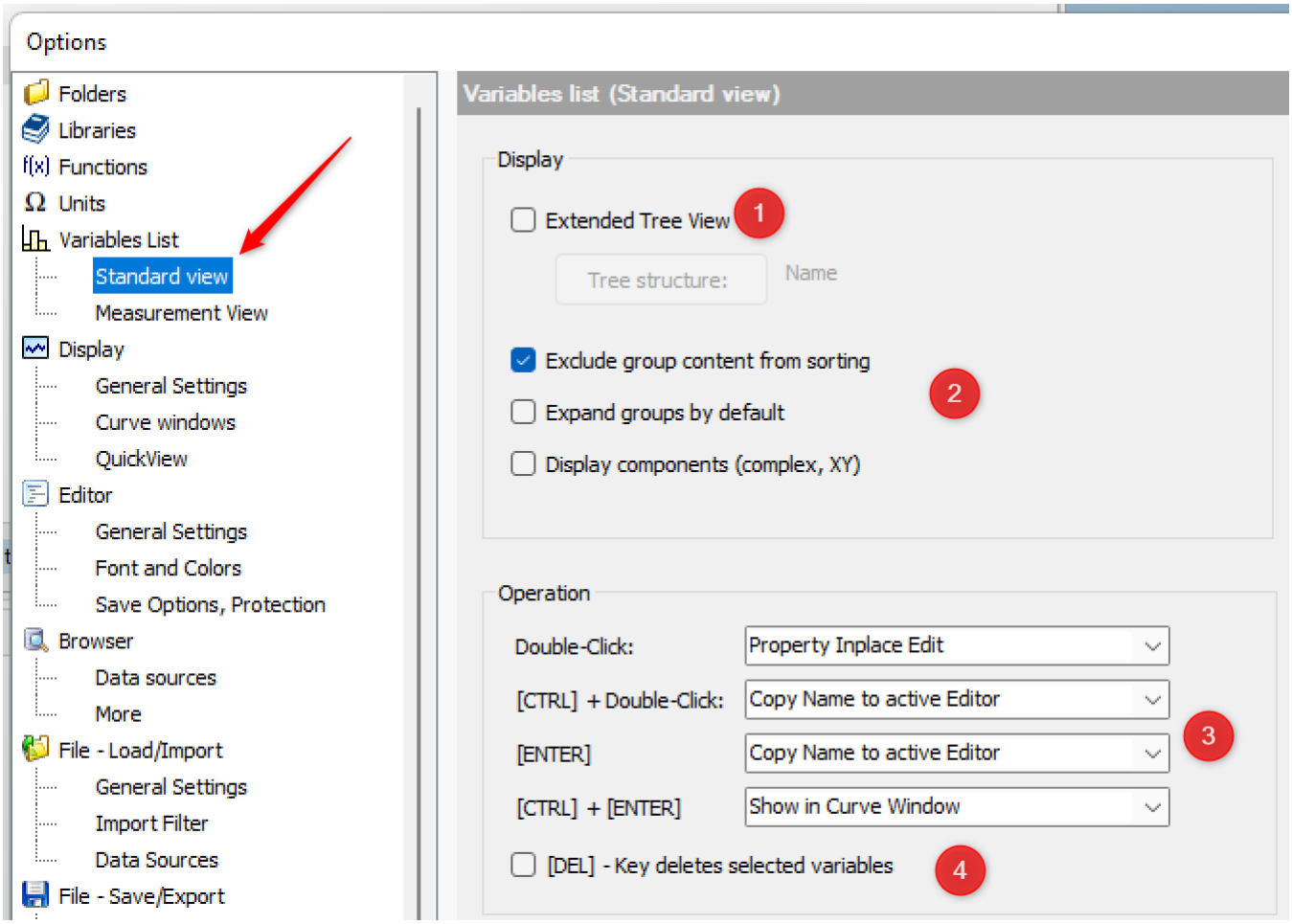
The first entry is not completely visible due to the width of the Variables list.
However the tooltip is not displayed because the column "Origin" is wider than the text.

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4.3.3 Options: Standard view

The imc FAMOS Options menu (under "*Extra/ Options*") has a "*Variable list*" dialog containing settings for the display and operation of the variables list. Some of these controls are also available in the context menu.

Standard view



Dialog : Options/ Variables list

Extended Tree View

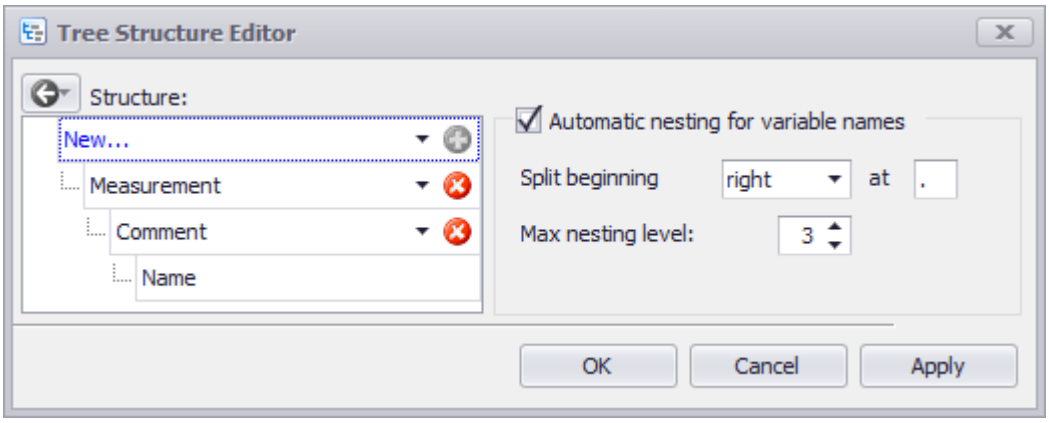
The display mode of the standard list can be alternated between List mode and tree diagram.

Wen there are very many variables, the simple list display is at the boundary of its capabilities in terms of operability. In such cases, a structured tree diagram is often more advantageous.

Note: When "*Extended Tree View*" is activated, it is not possible to change the variable's name 77.

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Tree Structure Editor

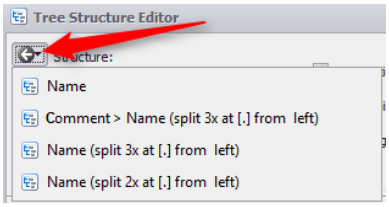


This dialog can also be opened directly via the context menu of the column header in the Variables list 76.

Variables can be listed in a tree diagram either according to their properties or their names. The description appears further below under:

- Tree diagram structured according to standard and user-defined properties 80
- Tree diagram structured according to variable names 81

The structures most recently created are available as a history:



The user-defined tree diagram structure is saved with the layout and is available again the next time imc FAMOS is started.

Exclude group content from sorting

The sorting of the variables contained in the groups can be ignored. These and the two subsequent options can be directly set in the context menu; see description there 76.

Operation

The following **events**

- *Double-Click*
- *CRTL+Double-Click*
- *ENTER*
- *CRTL+Enter*

can be configured for the following **actions**:

- *Property Inplace Editor:* Enables direct editing of *variables' names* and, when added as a column, of *x-Delta, x- Offset, x-* and *y-Unit* as well as of the *Trigger time*.
- *Copy name to active editor*, corresponds to double-clicking in previous versions
- *Show in Curve Window*

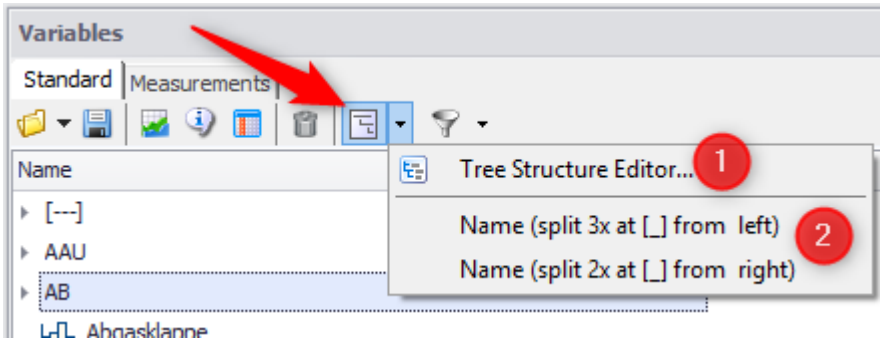
[DEL]-key deletes selected variables

If this option is activated, the DEL-key on the keyboard can be used directly to delete variables from the list (the same function as the menu item "*Variable/ Delete*") as long as the Variable list has the input focus.

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4.3.3.1 Tree structure active/passive

The variables can be listed hierarchically in a tree structure on the basis of their variable properties 80 or their names 81.



Activate tree structure

Activation is carried out with the tree structure switch: .

The small triangle next to it opens a list with access to the tree structure editor (1) and the most recently loaded settings (2).

4.3.3.2 Tree structure structured according to properties

You can create a tree diagram which is based on the properties of the variables. **By default**, imc FAMOS offers the following properties to select:

- ***Measurement***: parent folder
- ***Origin***: Path + filename. This property is useful for multi-files.
- ***Comment***: Comment on the channel; see also the chapter Dialog: Properties/characteristic values (data set) 296.

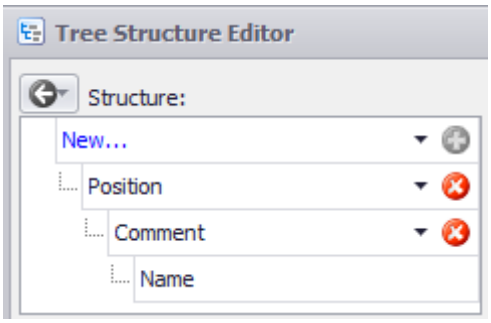
Additionally, **user-defined properties** can be used for structuring purposes. User-defined properties are automatically made available in the Tree Structure Editor.

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Example: A property "*Position*" has been defined, which is specified as "*Front*" or "*Rear*". In the comment, the test protocol was recorded as "*Test A*" or "*Test B*". These were assigned to the default property "Measurement".

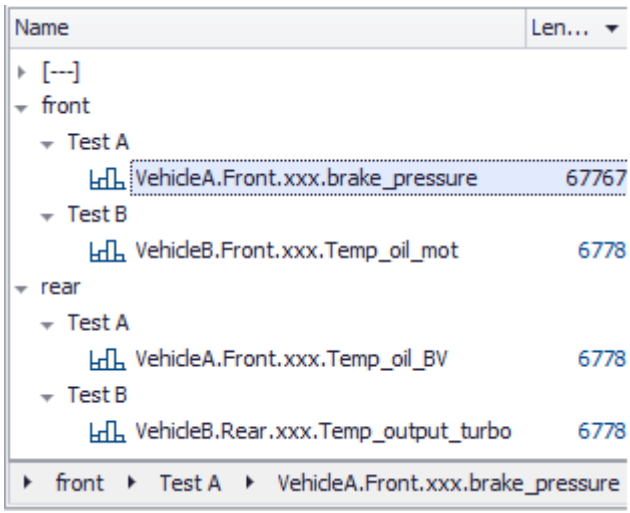
The data can now be listed in the following way:

Definition



Tree Structure Editor

Result



Variables list

Variables for which the properties don't exist are sorted under [---].

Selected entries can be expanded and collapsed with the shortcuts *CTRL + Right* or *Left*. 109

4.3.3.3 Tree structure structured according to variable names

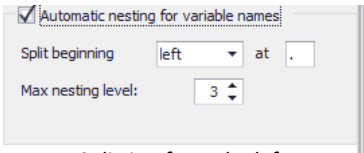
If the variables are structured according to their name, this can also be used to create a tree structure. This is set by means of a separator character and the *maximum nesting level*. The *"**Max nesting level***" specifies how many elements separated are used as structure. "***Split beginning***" to the "***right***" or "***left***" sets the direction.

Example 1: The variable "**a_b_c_d**" is structured with "**_**" and a *maximum nesting level* of **3**:

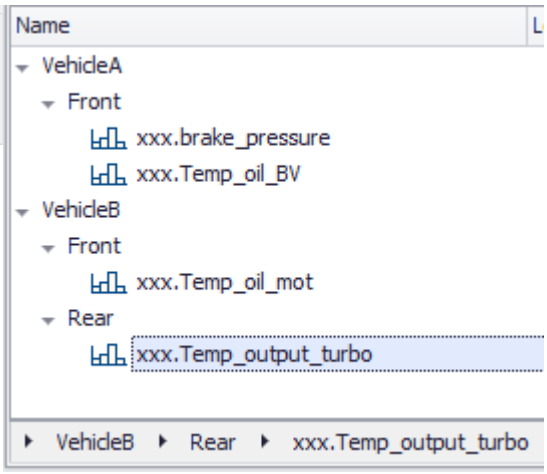
"*Split beginning right left*" -> branch "**a**" - subbranch "**b**" - variable "**c_d**".
"*Split beginning from right*" -> branch "**a_b**" - subbranch "*c*" - variable "**d**".

Example: The variables are designated according to the pattern "***Object.Position.xxx.Name***". The **period** character is the separator. A maximum of **3** levels are to be generated. The dialog in FAMOS and the resulting variable list could look like this:

Definition **Result**

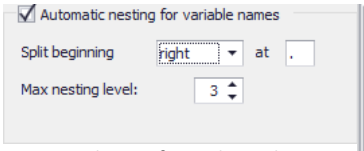


Splitting from the left

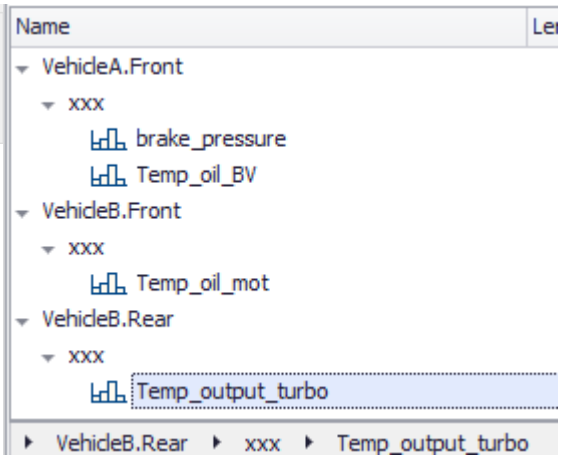


Variables list

Definition **Result**



Splitting from the right



Variables list

More rules:

- Separators at the beginning or end of a variable name are ignored.
  Example 1 with separator "_": "***_Var1***" remains "***_Var1***""
  Example 2 with separator "_": "***Var2_ab1_***" -> branch "***Var2***" with element "***ab1_***".

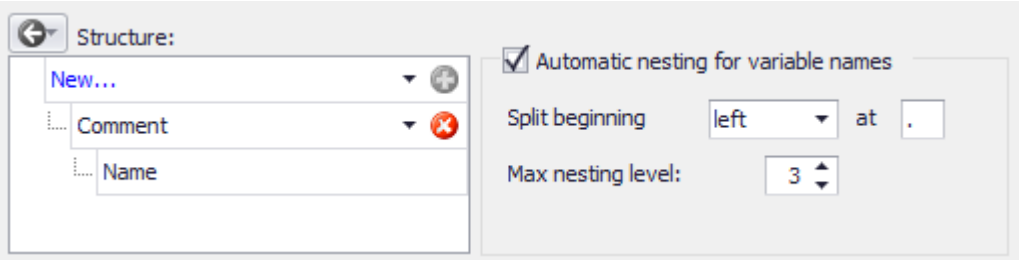
If there are several consecutive separators, only the first one for "*Split beginning left*" or the last one for "*Split beginning right*" is taken into account.
Example:"***Motor__Pressure***" with separator "_" is set to
Branch "***Motor***" with element "***_Pressure*** " at "*Split beginning left* ".
Branch "***Motor_***" with element "***Pressure***" at "*Split beginning right*".

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4.3.3.4 Combined tree structure

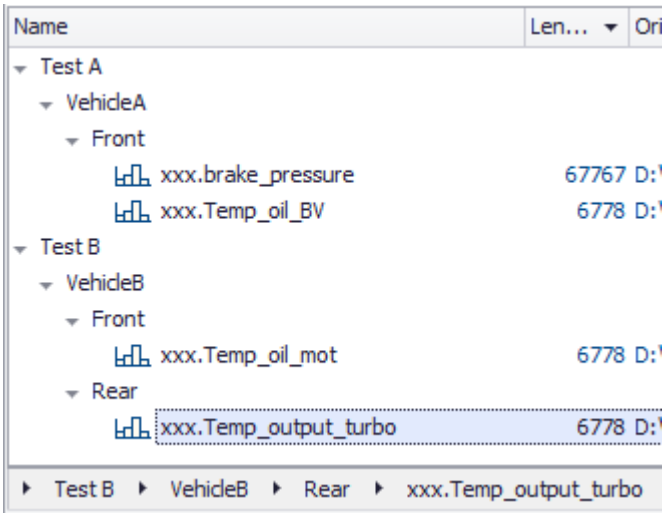
Properties and **variable names** can be combined. The rule is: The higher-level structure is derived from the properties, the subordinate structure from the variable's name.
In this example, the *Comment* is additionally used as a main group.

Definition



Splitting from the left

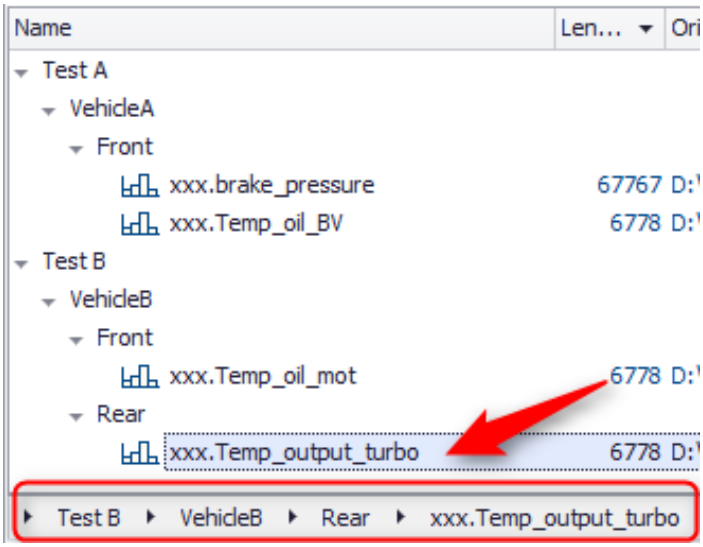
Result



Variables list

4.3.3.5 Bread crumb Navigator

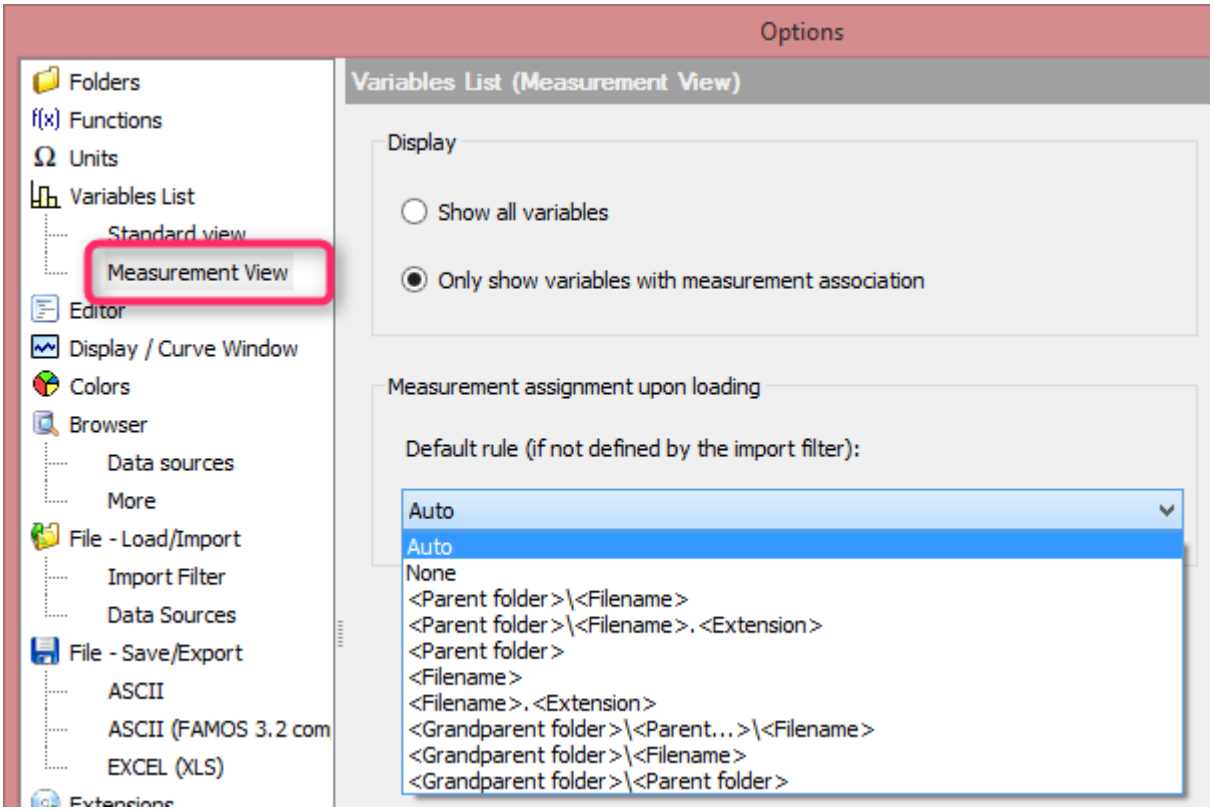
Below the standard list, the properties of the selected variables are displayed in one line.



Variables list

4.3.4 Options: Measurement view

Measurement-View



Dialog : Options Variables list "Measurement-View"

Display

In the Measurement-view, you can filter the display according to variables with a measurement association.

Measurement assignment upon loading

This setting determines how the channels/measurement are/is named. By default, the folder designation is used as the measurement name ("*Parent folder*", e.g. "2014-05-20-14-20-09"). If the data are joined up into a multi-file, select "*Filename*".

For data which were generated using imc STUDIO, for example, in separate trigger folders, select *<Grandparent folder>\<Parent folder>\<Filename>.*

If the data are loaded by means of an import filter 177 which handles the measurement assignment, the import filter's rule applies.

4.3.5 Filters

To provide a clearer overview, the Variables list can be filtered. The available choices are a simple filter with wildcards and an extended filter.

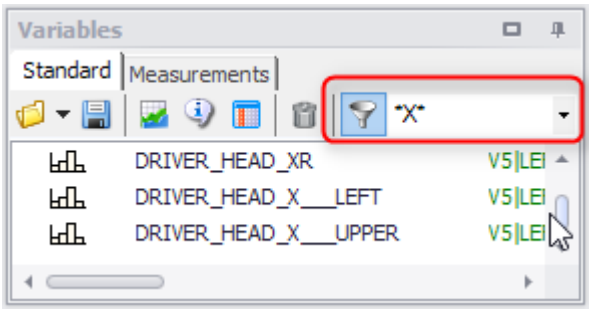
 The filter settings can be activated/deactivated by clicking on the funnel icon.

Filter settings once created are saved along with the layout and are available for used once the program is restarted.

Note

The total count of loaded variables is stated in the Status bar, regardless of any filter in operation.

4.3.5.1 Simple filter



variables with filtered view

The simple filtering method makes use of the variable's name. For the purpose, only portions of the variable for which the system is to search must be entered, if the remaining letters are substituted by wildcard characters "`*`".

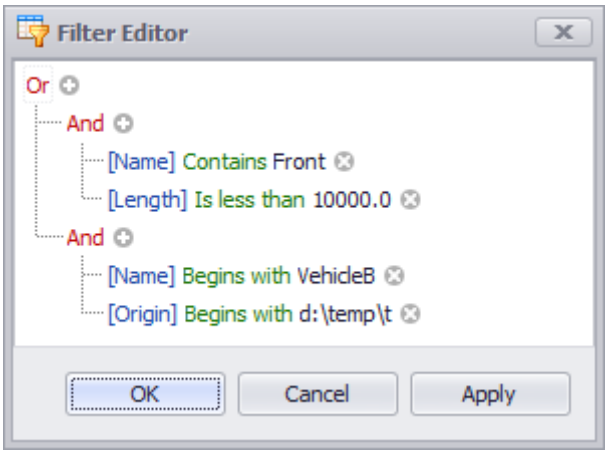
Variables can also be hidden by prefixing them with a "`!`".

Examples:

A "`*`" stands for an arbitrary number of any letters.	"`a*`"	Displays all variables beginning with "`a`".
A "`?`" stands for exactly one arbitrary letter.	"`?`"	Displays all variables having just one letter.
	"`Temp?`"	Displays all variables "`Temp`" followed by one additional character.
By prefixing a "`!`", the meaning of the filter pattern is inverted.	"`!a*`"	Displays all variables which DO NOT begin with the letter "`a`".

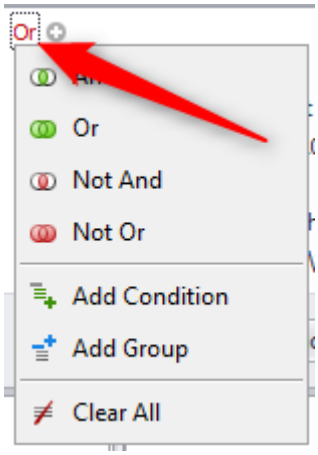
4.3.5.2 Extended filter

With the extended filter, it is possible to make logic combinations of multiple attributes.



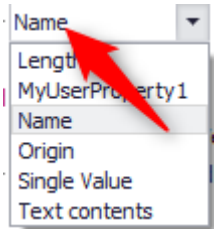
Variables list with filtered view

Select the logic operation...



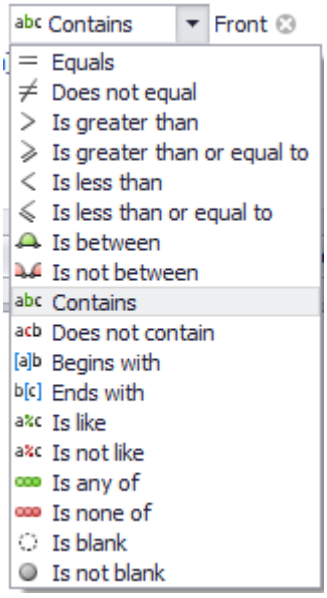
logic operator

...and the property ...



Property

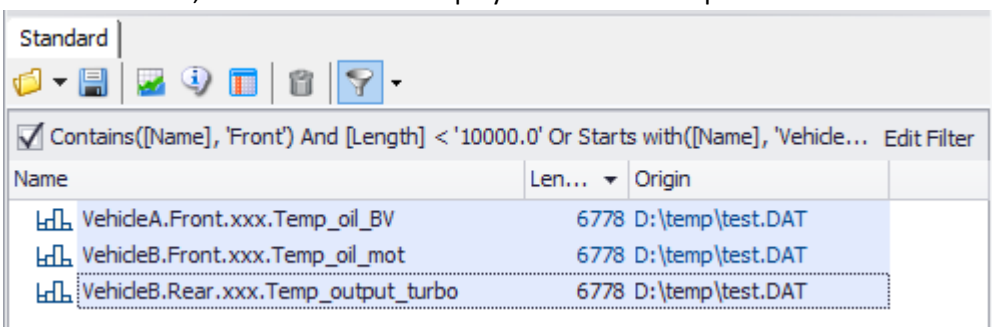
... with its condition:



Condition

Alongside the default properties, it is also possible to filter according to the user-defined properties.

In the Variables list, the active filter is displayed to the extent possible:



Condition

Note Wildcards in the extended filter

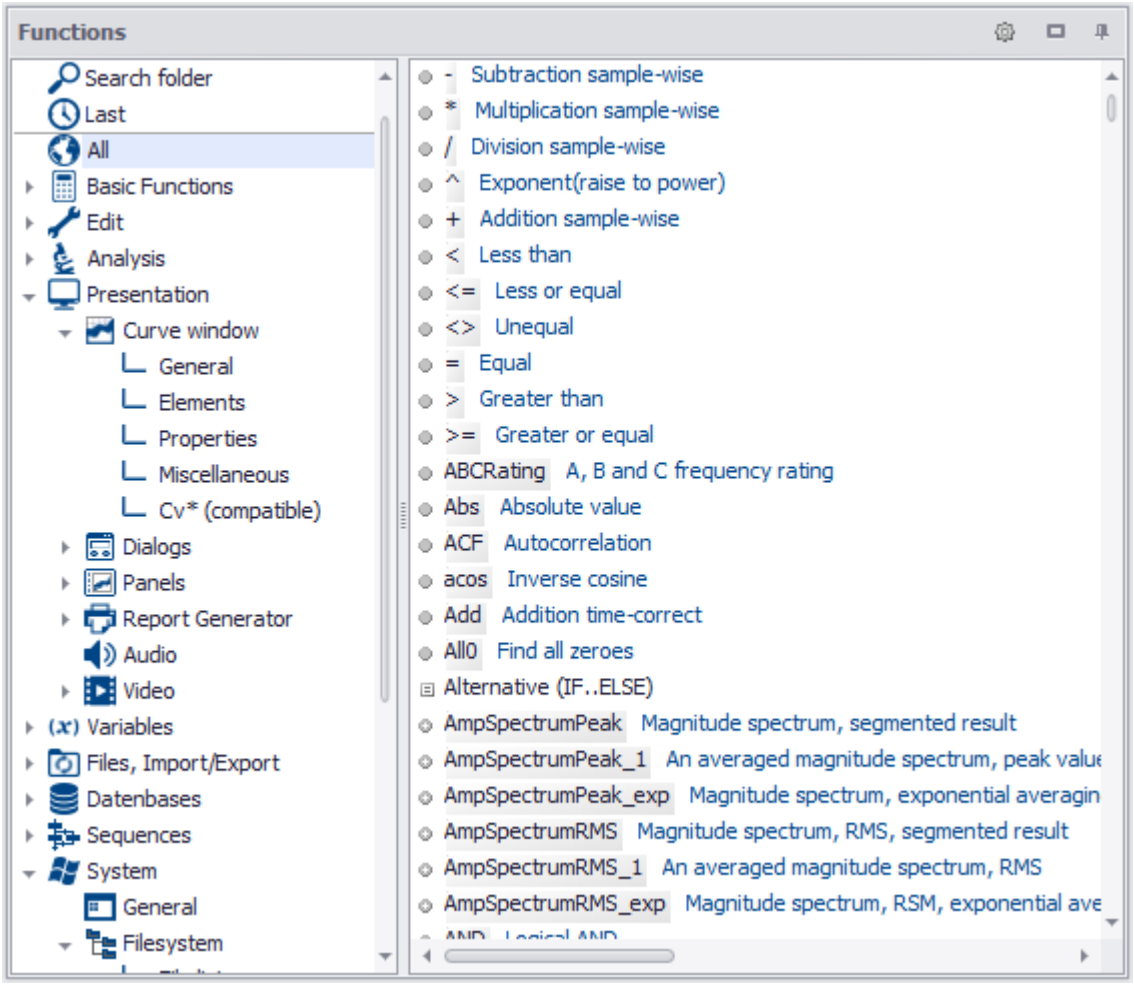
SQL queries are generated with the "`Is Like`" or "`Is Not Like`" query. The usual wildcards for SQL queries, "`%`" for any number of characters (instead of "`*`") and the underscore "`_`" for any letter (instead of "`?`"), apply here.

Since the underscore is often used in variable names as a substitute for a space, this leads to an unintentional use of a wildcard. To filter for the underscore, it must be masked, which is done in SQL with square brackets `[_]`, e.g.: "`Name Is Like signal[_]%`".

4.4 The Functions List

4.4.1 Overview

The Functions list presents all available functions and commands. These are arranged in one or more topical groups.



Search folder

Clicking on the Search entry opens a text entry dialog. Not only such functions are listed whose name matches the search term but also any functions topically related to it.

Last

List of the most recently used functions.

Favorites

The Favorites list can be compiled by the user himself. Here, functions and formulas used often can be placed here for ease of access. The Favorites can be organized in hierarchical groups as desired.

Reference

Section 'Administering Favorites 140'

All

Listing of all functions in alphabetical order.

Basic Functions

General calculation functions, comparable to the functions on a scientific pocket calculator. The basic functions are subdivided among:

- *Basic Calculations* (+, -, /,...)
- *Trigonometry* (sin, cos, atan, ...)
- *Power, Logarithms* (ln, lg, exp, dB, ...)
- *Integration, Differentiation* (also moving integral and sum)
- *Matrices*
- *Comparisons* (<, >, =, ...)
- *Operations* (AND, OR, BitAnd,...)
- Misc.

Edit

Functions for editing and modifying data sets

- *Edit Data* (getting and setting values, copying regions, appending)
- *Transform* (band-limiting, scaling, mirroring, sorting, ...)
- *Resampling*, *Data reduction* (normal data set from XY-data, ...)
- *Interpolation, Approximation* (linear regression, polynomial envelope curve, Perio, ...)
- *Smoothing* (Smo(), Hysteresis, Median, ...)
- *Filter* (classical filter, ABC weighting,...)

Analysis

Functions for analytical evaluation of data sets

- *Statistics* (mean value, maximum, histogram, Perio,...)
- *Seek* (SearchLevel, position of a value, relative maxima, ...)
- *Spectral Analysis* (FFT, transfer function, 1/3-octaves,...)
- *Acoustics* (ABC weighting, loudness, 1/3-octave-spectrum,...)
- *Vibration Analysis* (KBT-signal rating, vibration filter, ...)
- *Order Tracking* (order spectrum and other functions from the Order Tracking Analysis kit)
- *Class Counting* (Rainflow Filter and other functions from the class-Counting kit)
- *Power* (power calculation for 1-3 phases with all characteristic variables)
- *Intervals* (automatic interval identification)

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Presentation

Functions for displaying the data sets in dialogs, curve windows and reports

- *Curve window* (Kit-functions for remote control of the curve window)
- *Dialogs* (Kit-functions for remote control of dialogs, as well as BoxMessage, BoxText?,...)
- *Panels* (Kit-functions for remote control of the Panels)
- *Report Generator* (Kit-functions for remote control of the Report Generator)
- *Audio* (Kit-functions for playback of audio files as well as import/export functions)
- *Video* (Kit-functions for remote control of the Video Player and video widgets)

Variables

Reading and setting of variables' properties, querying the Variables list

- *List* (querying the Variables list, getting/editing the variable name, ...)
- *Data Types* (functions for text-, binary-, normal data, segments and event-based data)
- *Properties* (reading/editing variables' properties,...)
- *Measurements, Data selector* (querying the Measurements list and setting the selection,...)
- *Constants* (PI, e, ...)

Files, Import/Export

Loading and saving of variables and import/export in 3rd-party formats

- *Standard* (Load/Save File, folder preset for loading/saving)
- *Extended* (multi-channel file loading/saving)
- *ASCII* (loading of simple ASCII file, line-by-line reading/writing of ASCII file)
- *Excel* (basic functions for opening an Excel-file, reading/writing in an opened Excel-file)
- *Excel (Extended)* (Kit-functions for remote control of an Excel-file)
- *Misc.* (special file functions)

Data bases

Functions for linkage with databases

- *ASAM-ODS-Kit*

Sequences

Functions for creating sequences

- *General* (calling, Pause, Cancel, Options,...)
- *Loops* (FOR, While, ...)
- *Conditions* (If, Switch,...)
- *Boilerplates* (reading multi-channel files, loops,...)

System

Functions for interaction with the programming environment

- *General* (System information and starting of Windows programs)
- *File system* (finding, creating, opening, saving files/folders, etc.)
- *DDE* (Dynamic Data Exchange with other programs on the computer)
- *Internet* (querying Internet pages)

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Kits

This group contains all functions provided by imc extension libraries (so-called "Kits"). When the kits meet applicable conditions, imc FAMOS automatically recognizes them and lists them in this branch. If no kit is registered, the Kits branch is hidden.

Reference

Chapter 'Functions', section 'imc-Kit Interface 335'

DLL-Functions

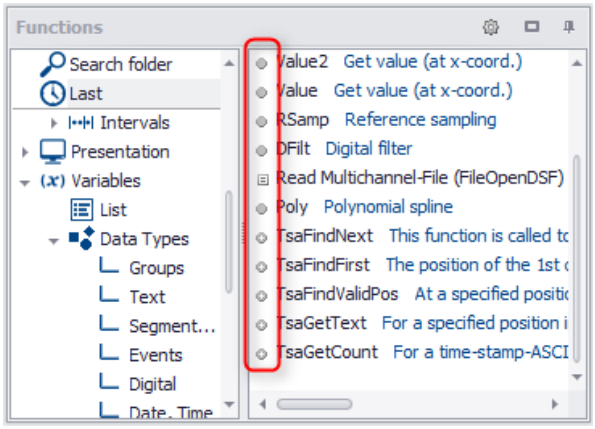
Along with imc-Kits, general WINDOWS-libraries (so-called DLLs) can be integrated into imc FAMOS . The DLL-functions registered in imc FAMOS ("Extra/ Options/ Extensions | Register DLL functions") are then listed in this branch. If no DLL-function is registered this branch is not displayed.

Reference

Chapter 'Functions', section 'Standard DLL Interface 342'

Symbols in front of the functions

In the right-hand column in front of the list of functions, there is an additional symbol before each entry denoting its respective purpose:

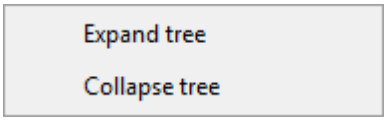


- Command
- Constant
- Favorite
- Executable favorite
- Function
- Function-Kit
- Project
- Executable project
- Boilerplate

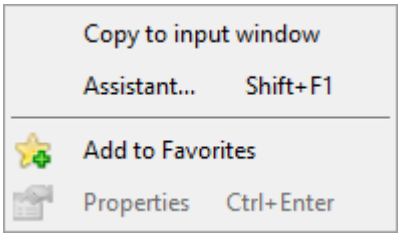
4.4.2 Operation

Context menu

Right-clicking the mouse once over the functions list calls the context menu. This contains commands and options affecting the functions list.



Right-clicking on the tree diagram at left allows you to expand/collapse the tree.



Right-clicking on the function opens the menu shown here.

What commands are available depends on which main group is currently selected. For instance, in the Favorites-list there are additional commands for creating and changing entries.

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Configuring the display

To expand or collapse a group in tree display, click on the arrow-symbol in front of the group name or double-click on the group name.

The menu item "*Expand tree*" in the context menu expands all groups; whereas "*Collapse tree*" closes all groups.

Copying a function name to the Editor window

Double-clicking on a function entry copies the function name along with argument brackets into the active Editor window.

You can use the command "*Copy to input window*" as an alternative. If the function list currently has the input focus, just pressing the <ENTER> key has the same effect..

You can also use **drag&drop** to take an entry from the function list to the desired position in the editor (or: input) box. Here, too, a parameter mask is copied to the editor box, if appropriate.

Function Assistant

To open the **Function Assistant**, use the combination of keys ***<SHIFT> + <F1>*** or the context menu.

Reference

Chapter Functions, section 'Function Assistant 333'

Quickhelp text

When the selection in the Functions list is changed, or when the user clicks on a function in the Editor, a help text about the function is displayed in the output box, if available.

When the Editor-option "*Show automatically*" 100 is deactivated, the Quickhelp text for the current selection can be accessed using either the keyboard combination *ALT+F1* or the command "*Functions-Help*" in the context menu.

Note Notes on the Favorites list

The menu item 'Add to favorites' adopts the current selection in the Favorites list. If the Favorites list itself is active, the context menu contains additional items for creating, deleting and editing favorites. How to administer the favorites is described in detail in the chapter "*Administering Favorites* 140".

Transferring entries from the Favorites to the editor box, as well as calling the help texts and the Assistant (if available) are accomplished in the manner already described.

As a special feature, operation of the Favorites list supports the combination of keys CTRL + ENTER (or CTRL + double-click) as the call for the Favorites-Properties dialog, and the ability to edit the order and grouping of the favorites through the use of drag&drop.

4.4.3 Options

Clicking on the Options symbol makes the following items available:

Favorites-view

Switches off all branches except Favorites.

Hide obsolete functions

For purposes of compatibility with already existing sequences, certain legacy functions which have been replaced by more powerful successors still remain available. When developing new sequences, it is possible to keep these obsolete functions hidden.

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External DLL-functions

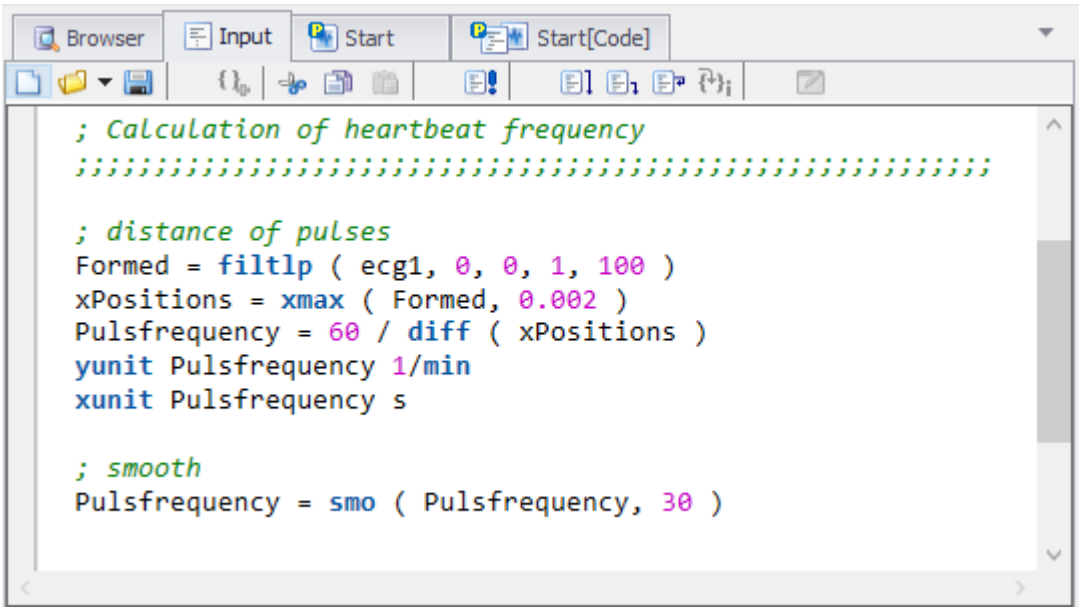
Accesses the Options dialog 342, by means of which DLL functions are registered.

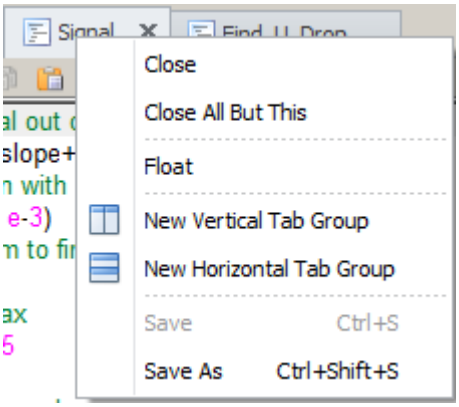
4.5 Editor Box

4.5.1 Overview

The Editor box is for entering and executing **formulas** and also for administering, entering, testing and executing complete **sequences**. Sequences are macros consisting of a sequence of individual commands an/or formulas. When working with Panels or dialogs, the Editor is used for programming the associated event sequences.

In this section, we will concentrate on the basic operation of the editor for entering text and executing individual formulas.


Browser
Input
Start
Start[Code]
; Calculation of heartbeat frequency
;;;



Right-clicking the mouse on the title bar opens a **context menu** primarily containing commands for administering (Load/ Save/ Close) and executing sequences.



Below the title bar is the **toolbar**. This contains often-used commands affecting the editor box. To learn the function of a certain symbol, move the mouse cursor over the symbol and wait a short time to see a small window containing a short description (called a "*tool-tip*") appear. All of the commands offered here can also be accessed from the imc FAMOS main menu, in the submenu "*Sequence*" or they can be called via one of the two context menus.

Below the toolbar is the actual **input box**. Right-clicking the mouse over the input box opens a context menu 96 containing commands mainly concerning text editing.

4.5.2 Editing text

The editor box supports the usual Windows shortcut keys 111 and editing commands, such as the use of the Clipboard (Copy/ Past) and multi-step Undo/ Redo.

Additionally, the editor has special functions intended to make entering formulas and sequences easier. These include, for instance, configurable **color-coded syntax** 102, **parameter-tips** 98, automatic formatting 96 according to the process structure, automatic indenting of new lines as well as **bookmarks** 373 and **breakpoints** 372 for use in testing sequences.

Words can be highlighted by double-clicking; rows by a triple-click 111.

It is possible to select whole lines by dragging the mouse on them. To select a rectangle region 112, drag the mouse while holding down the ALT-key.

In order to avoid the length of lines of code being limited by the word processing end-of-line, it is possible to achieve a folding of code lines in the Editor 358 by means of SHIFT+ENTER.

Function and variable names can also be directly adopted from the corresponding list (by double-clicking on the corresponding list entry or by using drag&drop).

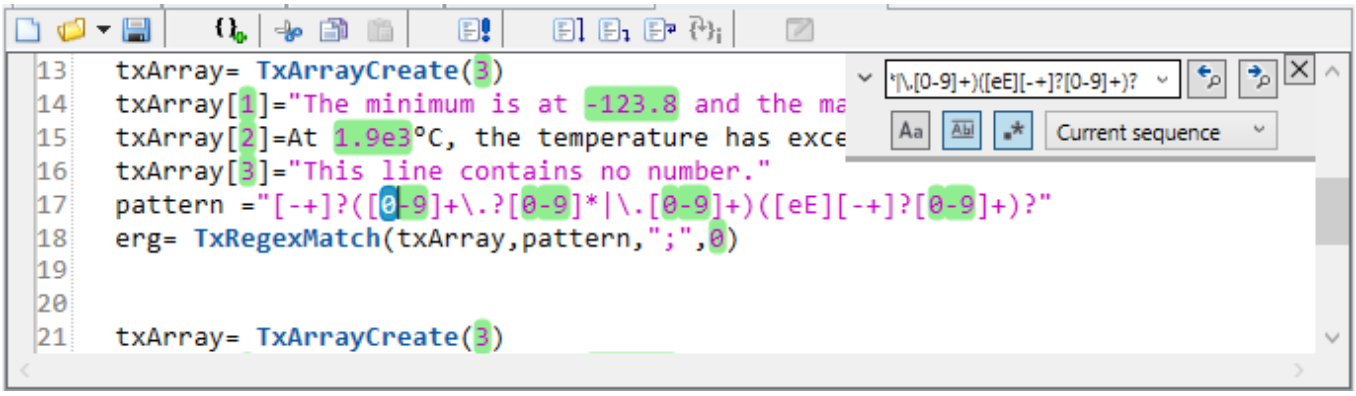
Commands: Functions for editing the contents of the Editor box are available in the multi-function bar "*Edit* 136".

Commands for editing text are presented in the next chapter.

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4.5.3 Find and Replace

The Find/Replace dialog is opened by the keyboard combination Ctrl+F or respectively Ctrl+H 109 :



All locations found are highlighted.

By means of the keyboard combination 111 ***Ctrl+W***, you can proceed to the next location found.

You select the previous location found using ***Ctrl+Shift+W***.

Simple Find and Replace

A simple text search can be performed for the currently open sequence or for a selected region within it. When working with Panels or dialogs, the search can be applied to all event sequences belonging to it.

Additional options:

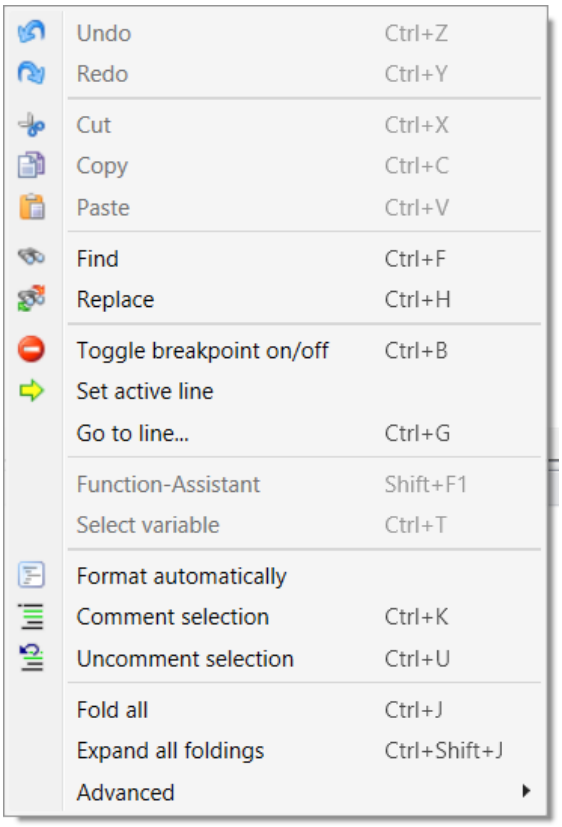
- **Case sensitive spelling** is applied.
- **Whole word:** The search text is only found if it is present in the text as a complete word. In the example above, only the string "txArray", but not "txArr" would be found.
- **Regular expressions**: This powerful function enables an exhaustive search as described in detail along with the function TxRegExMatch.

History

The search terms most recently used remain in the input box even after the program is restarted and can be selected by means of the small arrow at right.

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4.5.4 Context menu (Editor box)



Right-clicking over the Editor box opens a **context menu** mainly containing commands for text editing.

In the Editor box, you can enter formulas and instructions completely "by hand" or, as described earlier, "piece them together" from the Variables- and Functions lists, or by means of drag&drop.

Breakpoint on/off [CTRL +B]

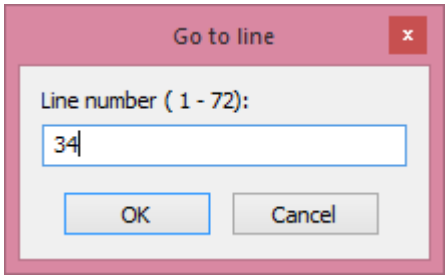
Sets breakpoints by means of the context menu or the keyboard combination CTRL+B. See also here 372.

Set Active Line: See here 98

Go to line...

Skip to a specified line. To show the line number, activate it in the Options 101.

You can also call it from the ribbon menu 137.



Functions Assistant... [SHIFT+F1]

Click on a (blue) function in the Editor and open the Functions Assistant 333.

Select variable [CTRL +T]

When the cursor is located on a variable's name, then this command makes that variable visible in the standard Variables list and selects it.

This command is useful when testing sequences if you wish to investigate the current content of variable used (e.g. display in the curve window or the Properties dialog). With the keyboard combination *CRTL+T, F4,* you can quickly generate a curve window for displaying the variables.

Notes

- If the *Measurement View* 209 is active at the time the command is called, the *Standard-list* is initially activated.
- If the variable is not visible due to an active display filter, the filter is switched off.
- The current variable is displayed in the Quickview-Window 105.

Format automatically

Performs automated formatting of the sequence displayed, i.e. the indents on the individual lines are determined automatically on the basis of the sequence's logical structure. See also here 137.

Comment out/Uncomment Block

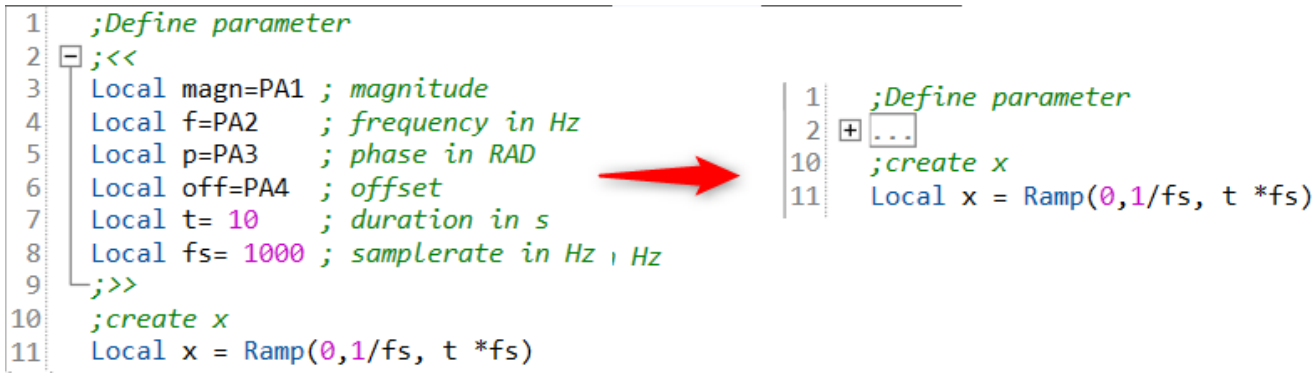
Commenting 378 out **[Ctrl + K]** or uncommenting **[CTRl + U]** of multiple lines by adding ";". Also via menu 137. Note also the possibility of folding comments in the following section.

Alternatively, consecutive lines can be commented out with **(* ... *)**. Please note the following:

- Beginning (* and end *) of the block comment are only recognized at the beginning of the line; only blanks are allowed before that, and at the end also after (!). In contrast to imc Online FAMOS, no parts within a line can be commented out here.
- If the end marker is missing, the end of the file is assumed to be the end of the comment.
- Nested block comments are not supported.

Expand/collapse code folding

If code folding is activated under Options 101, the code can be completely displayed/hidden. Code blocks are recognized by keywords for flow control (e.g. WHILE, FOR, IF, END). Furthermore, comment lines beginning with";<< " or ";>> " are also recognized as the beginning or end of a possible convolution.



Advanced >

Opens a submenu with additional commands.

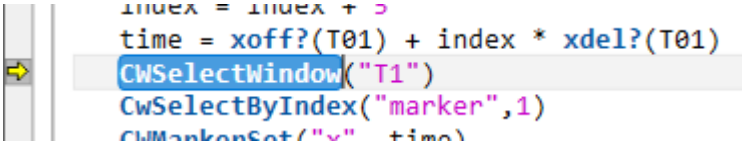
Delete all breakpoints: Also possible via menu 134.

Set bookmark: These functions can also be accessed via the Edit menu 137. Working with bookmarks is described here 373.

4.5.5 Active line, executing formulas

Every command or formula must be placed on **one** separate line; spaces are allowed.

Only one line is defined as "*active*". The "*active line*" is the command line to be carried out next. This line is denoted by colored shading, as well as by an arrow button appearing at its left. Clicking on this button causes the command line it points to to be carried out; thus for further reference we will call this button the "*Execute*"-button.



To **set the active line**, the following methods are available:

- Double-clicking on the desired line
- Editor context menu - "*Set active line*"
- Menu "*Run*" -"*Set active line*"
- Set cursor on desired line and press *ALT + ENTER*

To **execute the active line**, the following methods are available:

- Click on the "*Execute*"-button
- Title bar context menu - "*Run line*"
- Menu "*Run*"/toolbar - "*Single step*" or F9: the command line is executed and the next line is activated

Setting and executing in one step: The keyboard combination *CTRL+ENTER* makes the row with the cursor the active row and runs it immediately.

When sequences are run and in single-step mode, the position of the active line is changed automatically.

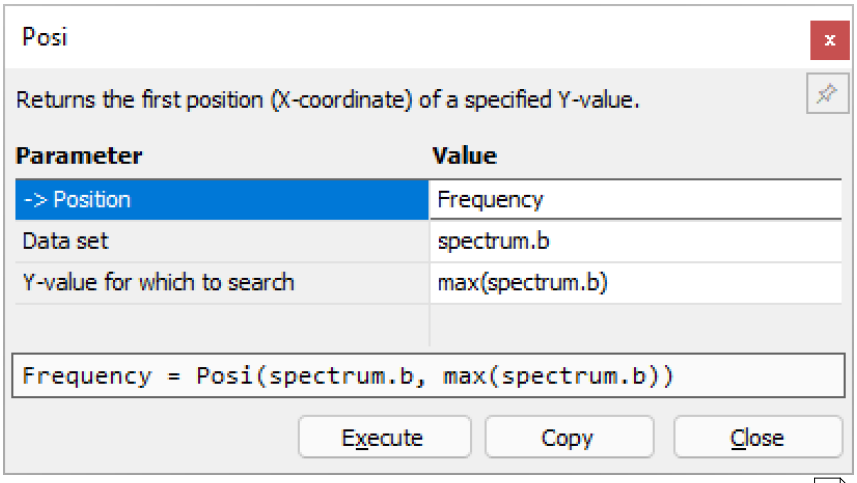
4.5.6 Help and Assistant

Functions description in the Help box

When you click on a function's name, a "Quickhelp" text about that function appears in the Help box. Alternatively, you may deactivate the option "*Display automatically*" 100 in the Editor settings. In consequence, the help text about the current selection is displayed in response to either the keyboard combination ***ALT+F1*** or the command "***Function-Help***" in the context menu.
See also the chapter "Output Box" 104

Function-Assistant SHIFT+F1

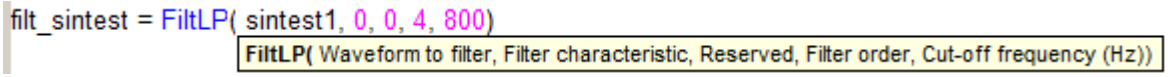
On the other hand, if you use the combination of keys ***SHIFT + F1***, the **Function-Assistant** is called. A dialog appears which is helpful for setting the function's parameters. Once they are given, the parameters are immediately adopted in the dialog's corresponding input boxes.



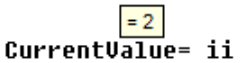
The help and Assistant are also both available via the context menu 93.

Parameter-Tip and Data-Tip

When typing in the parameters for a function or while moving the cursor over a function call in the command text, a small window appears providing brief information on the parameters expected (a so-called **parameter-tip**). The parameter at the cursor's position is written in boldface.



If you move the mouse in the Sequence Editor over the name of a variable, then the variable's current value/content is displayed in a little window above the name.

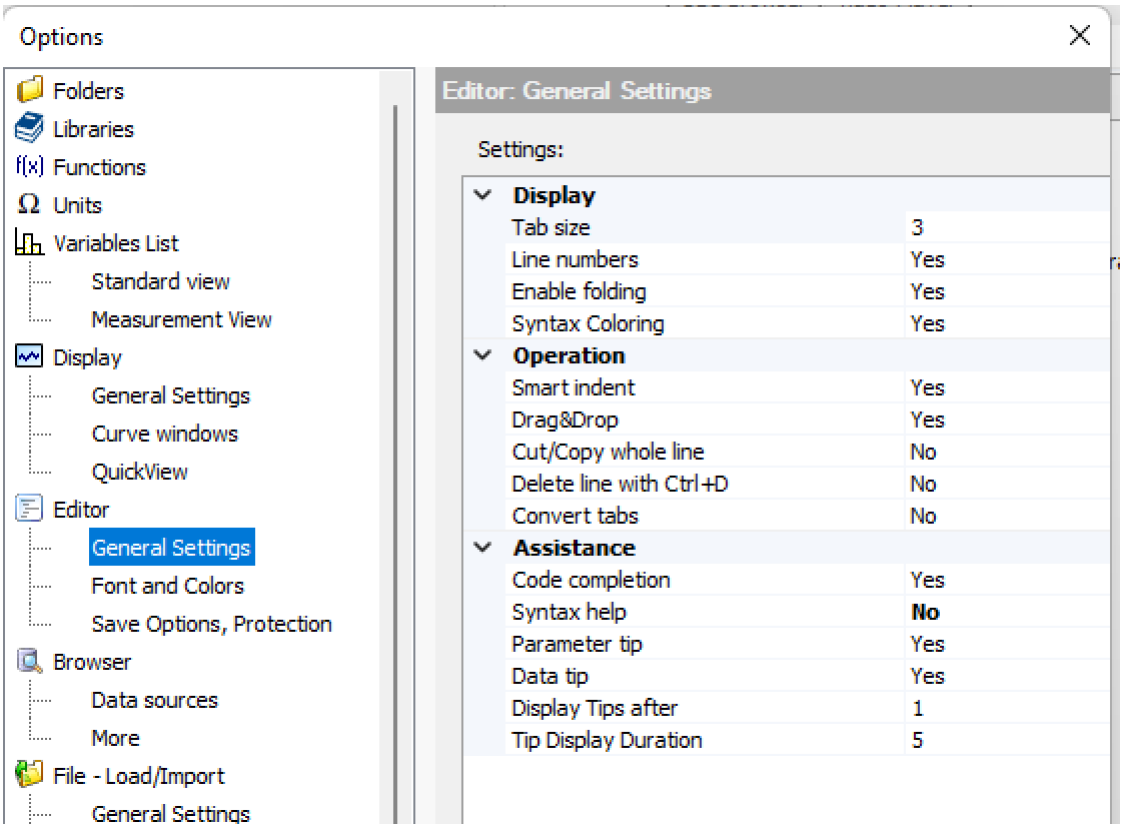


The *Parameter/Data-Tip* and its display delay and duration can be set in the Options 102.

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4.5.7 Options: Editor

The menu item "***Extra / Options / Editor***" calls a dialog offering a variety of pre-settings for the editor box:

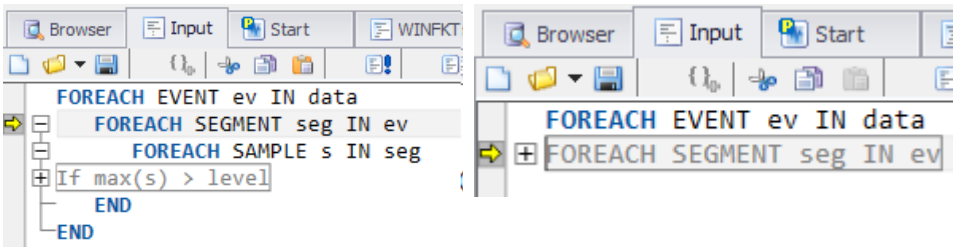


Dialog: Options / Editor - General Settings

4.5.7.1 General settings

General settings: Display

- **Tabulator width:** Sets the tabulator width for text readout. The specification in the input box pertains to the average width of a character in the selected font.
- **Line numbers:** The line numbers are shown in front of the lines. This only applies to sequences - the input editor does not show any line numbers. Skip to the desired line via the context menu by using the command "*Go to line...* 96".
- **Allow code-folding**: Enables code for conditions and loops to be displayed/hidden.



Note

In addition to the flow control keywords (e.g. WHILE, FOR, IF, END) used for recognizing foldable code-blocks, any comment lines beginning with ";<<" or ";>>" 97 " are also recognized as potential folding start/end locations.

- **Syntax Coloring:** The colors set under Font and Colors 102 are used or displayed in black.

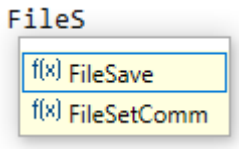
General settings: Operation

- **Indent automatically:** If this option is activated, the indentation of the previous line is used when a new line is created (in other words, after pressing the ENTER key).
  After entering a block-opening command such as *IF, WHILE* etc., the next line is automatically indented by 1 tab stop. After entering *END*, the current indentation may be reduced by 1 tab stop.
- **Drag&drop:** If this is activated, a selected text can be moved by means of drag&drop 112. Otherwise, a text region is highlighted.
- **Copying whole lines:** Sets whether the commands "Copy (Ctrl+c)" and Cut (Ctrl+x)" apply to the entire line containing the cursor, when there is no selection.
- **Deleting a line with Ctrl+D**: Enables deletion of a line containing the cursor by means of the keyboard combination Ctrl+D
- **Tabulator conversion:** Instead of a tab, spaces are inserted.

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General settings: Assistance

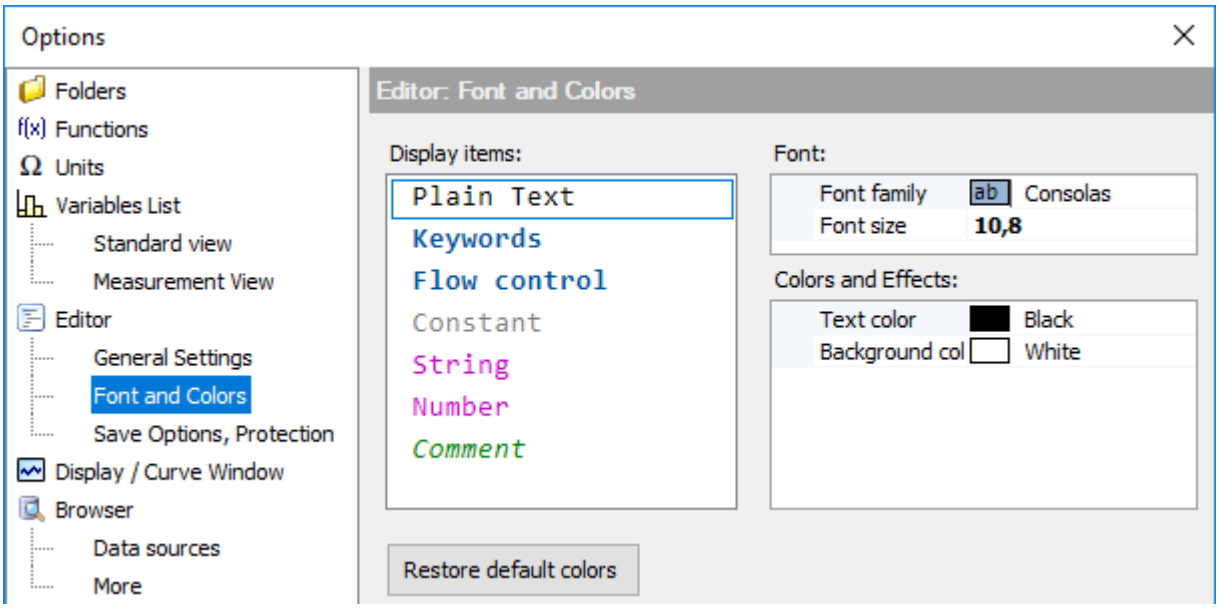
- **Auto-Completion:** When *"Show suggestions list automatically"* is activated, during entry a list of possible functions for selection is shown.



- **Syntax-Help:** When the cursor moves to over a function's name, the associated Quickhelp text 104 is displayed. The previous behavior up to version 6.3Rev8 (CTRL+F1) can still be obtained using the keyboard combination ALT+F1, if the setting "*Display automatically*" is previously deactivated.
- **Parameter-tip, Data-tip:** This option activates display of the *Parameter-tip* for functions and *Data-tip* for variables, as described in the previous section 99.
- **Display Tips after:** Sets the delay time until the Parameter/Data-tip appears.
- **Tip display duration:** Sets the display duration, expressed in seconds.

4.5.7.2 Font and colors

Font and Colors



Dialog: Optionen / Editor - Schriftart und Farben

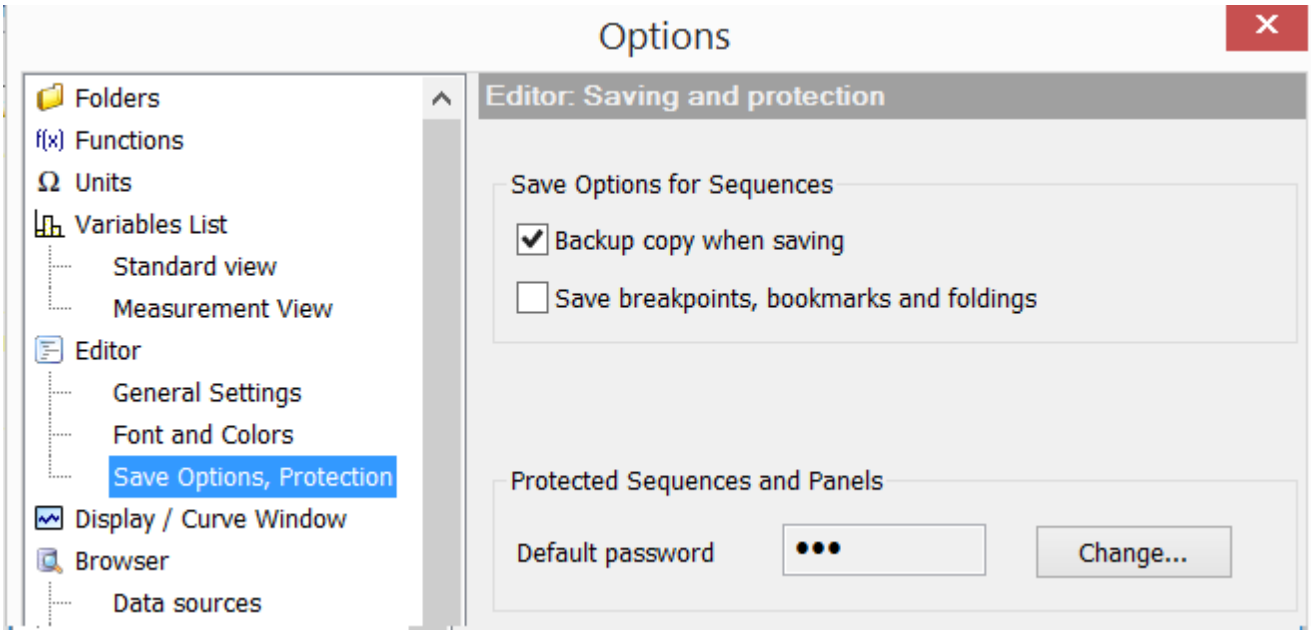
By default, syntax elements such as function names, strings, comments etc. are color-coded. This is intended as an aid for understanding the structure of the text. If you deactivate the option "***Syntax Coloring*** 101", the color coding is completely disabled.

Generally, selecting a proportional font is not recommended, since the different widths of individual characters makes it difficult to achieve a uniform indent. Instead, select a font with a fixed character width, such as "Fixedsys" or "Courier".

The button "***Restore to default colors***" restores the default settings. Otherwise it is possible to set any desired color for each separate syntax element type.

By rolling the mouse wheel while holding down the CTRL key 111, you can **change the font size**.

4.5.7.3 Saving, sequence protection



Dialog: Options / Editor - Saving, Protection

Backup copy when saving

If this option is active, then whenever a sequence or panel is saved under an already existing name, a backup copy is created and has the extension ".seq.bak" or ".panel.bak".

Save breakpoints and bookmarks

If this option is active, the positions of any breakpoints and bookmarks in a sequence are saved along with the sequence and are available again the next time the sequence is loaded to the system.

Protected sequences, panels

Sequences and panels can be password-protected. The program code of protected sequences is unreadable except for the commentary at the sequence's beginning 364. For more information on password protection of Panels, go here 514.

4.6 Output Box

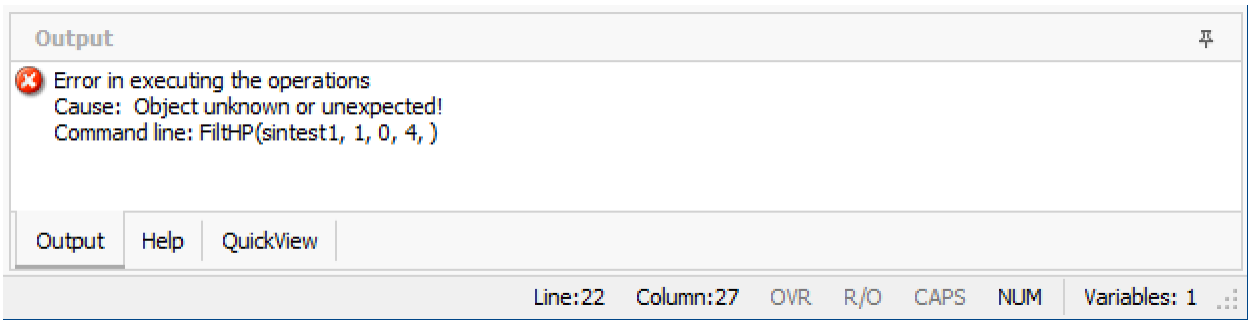
The ***Output box*** displays **messages**, **help texts** or a **curve window** pertaining to the variables selected.

The outputs are arranged on **three tabs**. Each of these can be dragged away using **Drag&Drop** to become a free-floating window. To do this, the tab must be grabbed by its **tab caption**. Alternatively, the entire output box along with all three tabs can be undocked by the top caption.

Conversely, the free window can be re-integrated as described in the chapter *Docking/Undocking* 72.

Output

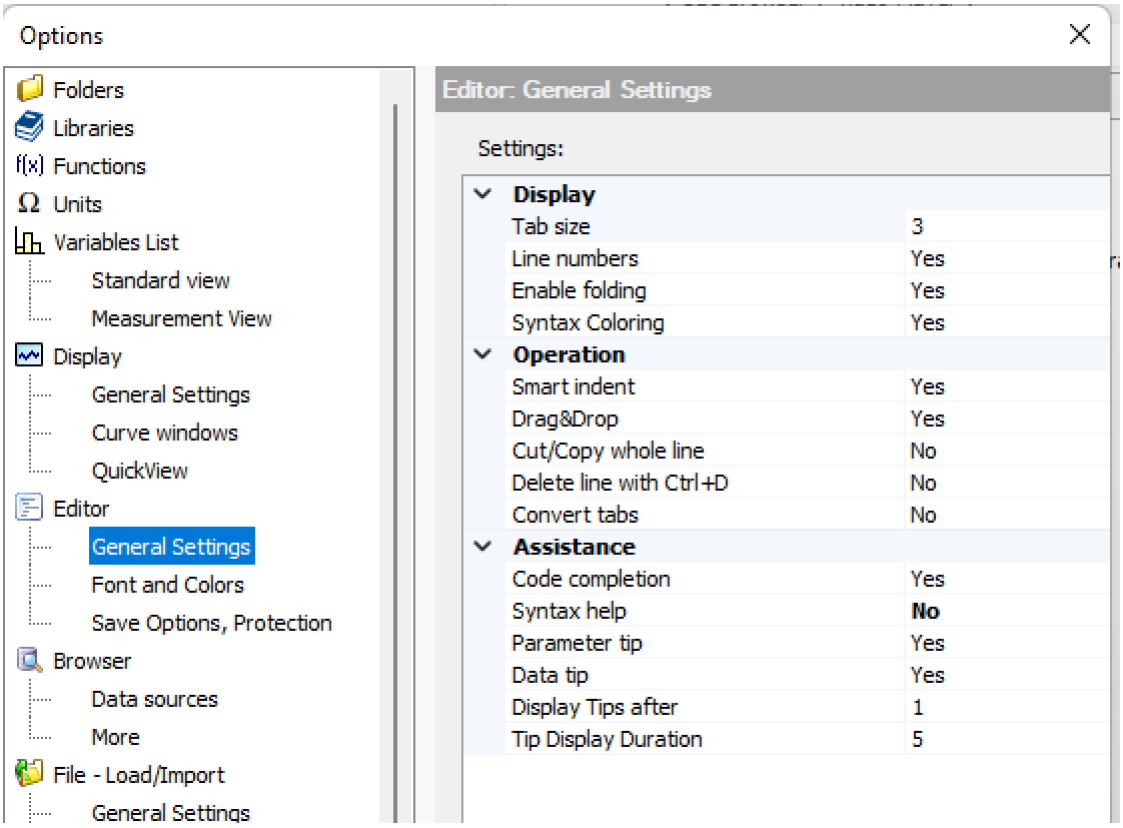
When the functions are tun, **error messages**, **warnings** and even sometimes **results** are generated, which are then displayed in this box.



Output box with error message

Help

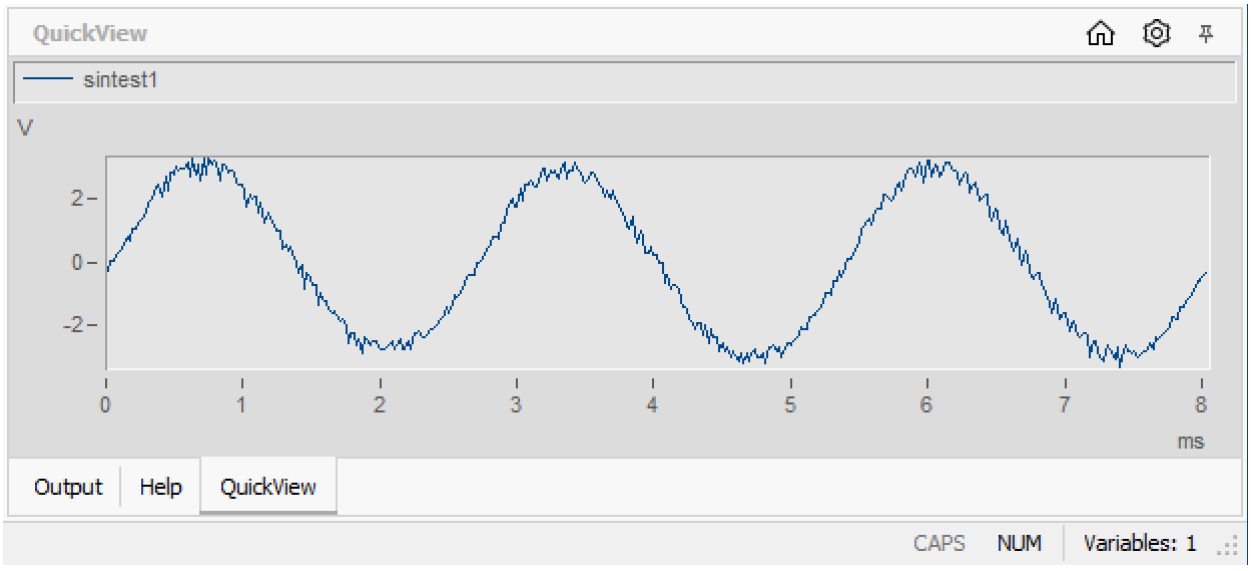
A function's Quickhelp text appears when you click on the function in the Functions list or in the Editor box. Alternatively the *"Syntax-Help"* 102 can be deactivated in the Options under *Editor > General Settings > Assistance > Syntax-help* 100. Then the Quickhelp about the current selection can be displayed using either the key combination ***ALT+F1*** or the command "***Functions-Help***" in the context menu.



Output box with function help

QuickView

The QuickView-window displays the data sets currently selected in the Variables list.



Output box with an embedded QuickView-window

In the options at *Display > QuickView*, the **maximum number of displayed variables** can be specified. Furthermore, there is the possibility to **ignore single values**.

Reference

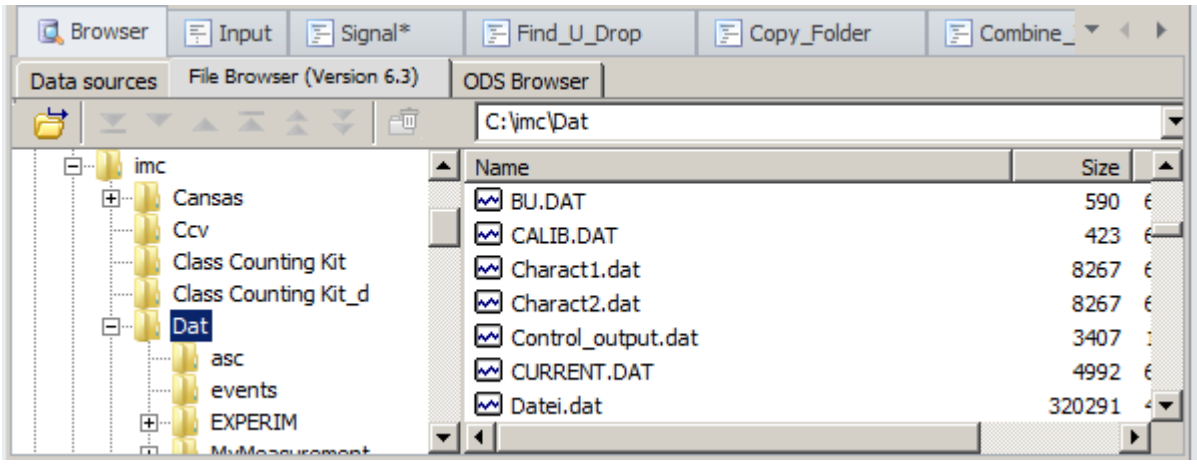
More information on QuickView is presented in the chapter Variables > Displaying variables 291.

4.7 The Browser box

The Browser box displays the separate user interfaces of expansion modules which come with their own user interface. What is always available is the ***Data Source*** 200 ***"My Computer"***, which enables quick access to the files of measured data.

Other available Plug-ins include e.g. the ***File Browser (Version 6.3)*** 218, the ***ODS-Browser Plug-in*** (access to ASAM-ODS data sources) and the ***Video Player Plug-in*** (playback of video files with synchronized coupling to the curve windows).

A tab ***Panels*** 432 will also appear among in this row of tabs, as soon as any have been created or loaded.



Plug-in box with file browser

If more plug-ins are installed, corresponding index card tabs appear in the tab bar above the box.

Switching between plug-ins is accomplished by clicking on the corresponding tab. If the box is too narrow to display all tabs present, arrow buttons appear at the right edge of the tab bar. Clicking on these buttons allows you to access tabs which are not currently in view.

The combination of keys ***"CTRL" + "TAB"*** proceeds to the next available plug-in; the combination of keys ***"SHIFT"+ "CTRL"+ "TAB"*** proceeds to the last one.

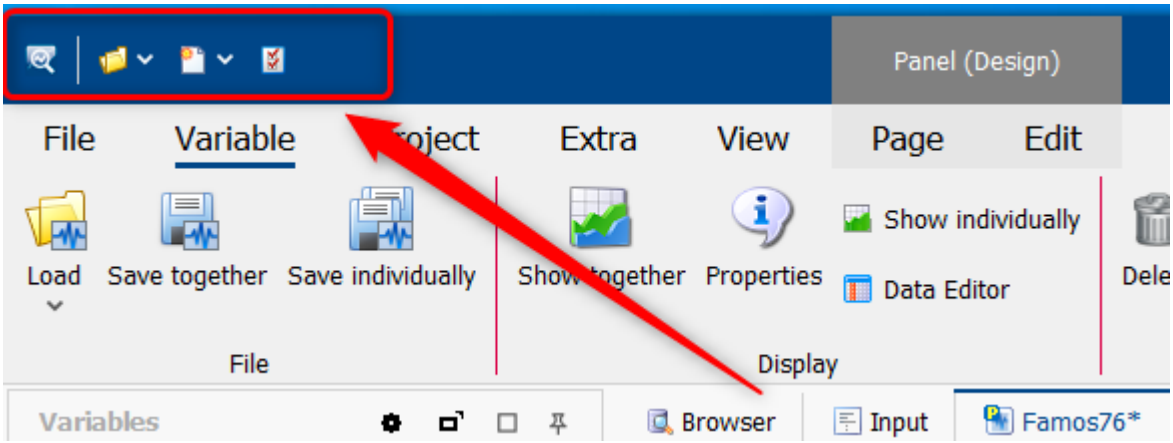
Below the tab bar, the user interface for the respective plug-in is displayed.

Reference

Thus use of the File Browser is described in detail in the chapter ***Data Sources (My Computer)*** 430, ***File Browser (Version 6.3)*** 218 and other ***Data Sources*** 200.

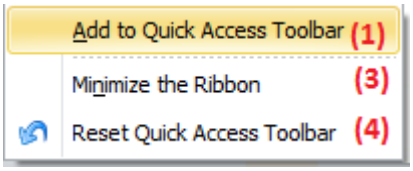
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4.8 The Quick Access toolbar



The Quick Access toolbar is always present regardless of whatever tool windows are active.

Right-clicking the mouse over a menu function opens the following context menu:

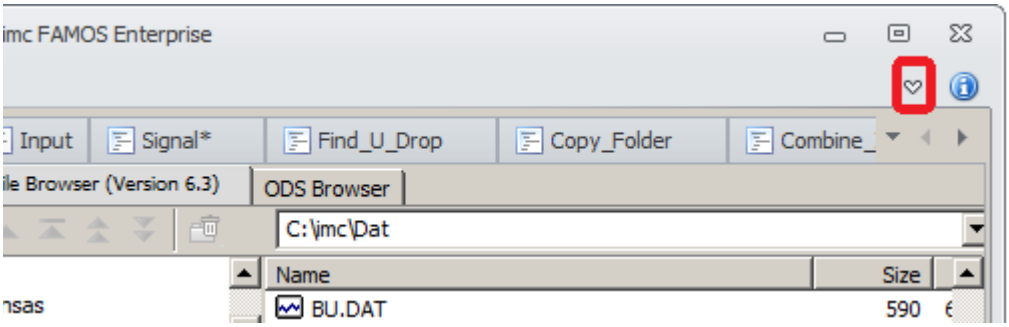


Add functions (1)

All menu functions can be added to the Quick Access toolbar via the right mouse button.

Minimize Multi-function bar (3)

The Multi-function bar is minimized and can be opened up using the arrow on the right side.



Reset Quick Access bar (4)

The Quick Access bar is reset to its basic functions. All functions previously added by means of the right mouse button are deleted.

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4.9 Mouse-clicks and keyboard shortcuts

4.9.1 imc FAMOS main window (Variables list, Functions list, ..)

as of imc FAMOS 7.0	Description	until imc FAMOS 6.3
CTRL + TAB	Document-Selector	-
SHIFT + TAB	Activates the next/previous component box (except in the Editor box)	SHIFT + TAB
CTRL + PageUp/PageDown	Changes the active page in the Variables list, Function list, Browser window and Panel	CTRL + Tab
F2	Switches between Browser window and the last Sequence/Panel-window used	-
SHIFT+F2	Load measurement value file dialog	F2
F3	Save selected variables together	SHIFT+F3
SHIFT + F3	Save selected variables individually	F3
F4	Show selected variables together	SHIFT+F4
SHIFT + F4	Show selected variables individually	F4
F5	Selected variables' properties	F5
F6	Selected variables in the Data Editor	F10
SHIFT + F6	Call Data Editor *(remains empty!)*	-
(ALT+F1)	The function's help 104 is displayed if the cursor is above a function name. The old behaviour (CTRL+F1) is now enabled with the key combination ALT+F1, if under "Extra\Options\Editor 100" -> "*Syntax Help*" "*Show automatically*" is deactivated.	CTRL+F1
F7	Run sequence	F7
CTRL + F7	Run sequence (Debug)	CTRL + F7
SHIFT + F7	Resume sequence	SHIFT + F7
F8	Call Project-Explorer	-
F9	Single sequence step	F9
SHIFT + F9	Single sequence step (in sub-sequence)	SHIFT + F9
F10	Activates/deactivates access key infos. (ALT has same function)	-
F11	Load curve configuration	F11
CTRL + O	Load sequence/panel/document	CTRL + O
CTRL + S	Save sequence/panel	CTRL + S
CTRL + N	New sequence/panel/document	CTRL + N
CTRL + SHIFT + S	Save sequence/panel as...	-
CTRL + D	Shift to panel Design-mode	CTRL + D
CTRL + A	Panel: Select all widgets of the page	-
-	Toggles the active window between the normal and maximized state	CTRL+ F9
CTRL + "+" or right	Expand for variable list with tree structure	-
CTRL + "-" or left	Collapse for variable list with tree structure	-

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as of imc FAMOS 7.0	Description	until imc FAMOS 6.3
SHIFT+ "+"	Deep expand for variable list with tree structure	-
SHIFT+ "-"	Deep collapse for variable list with tree structure	-

4.9.2 Variables list

Action	Description
Drag&drop from the Variables list	Taking an entry from the Variables list- • to an input box: the variable name is entered. • to a function button: the Formula Assistant is started. • to a column header in the Data-Editor: variable are entered starting from this column. • to a curve window: displays the selected variable. • to the Report Generator: creates a new report object or updates an existing object.
Drag&drop to the Variables list	From the curve window of other imc-applications to the Variables list: the variable is created in imc FAMOS .
Double-clicking on a variable name	This copies the variable name to the active input box.
[DEL] -key	Deletes the selected variable (if enabled under "Options / Variables list").
Multi-selection with the mouse	Click on an entry not previously selected, hold the mouse button down and brush over the desired region with the mouse cursor. Or: click on desired entries individually while holding down the [CTRL]-key.
Right-clicking the mouse	Context menu

Reference

Chapter: "Variable List" 74

4.9.3 Function box

Action	Description
Drag&drop within the Favorites list	Rearrangement of the favorites
Drag&drop on a function entry	Starting from a curve window, Data-Editor or Variables list: call to the Formula-Assistant
Click on a function	Show function help
Double-clicking on a function or ENTER-key or Drag&drop to the Editor box	Function name with parameter mask is entered (or executed immediately in the case of a favorite entry).
Right-click of the mouse	Context menu
SHIFT-key + double-click on function or SHIFT+ ENTER-keys or SHIFT-key + F1	Call to the Formula Assistant
CTRL-key + double-click or CTRL-key + ENTER-key or CTRL-key + F1	Only in the Favorites dialog for defining a favorite

4.9.4 Editor box

Navigation shortcuts

Shortcut	Description
LEFT/RIGHT	Move cursor by one character in the respective direction
CTRL+LEFT/RIGHT	Move cursor by one word left/right
UP/DOWN	Move cursor by one character/line in the respective direction
CTRL+UP/DOWN	Scroll content by 1 line in the respective direction
POS1	Move cursor to line beginning
CTRL+POS1	Move cursor to text beginning
END	Move cursor to line end
CTRL+END	Move cursor to the text end
PAGE UP/DOWN	Move cursor up/down by one page
CTRL+G	Go to line

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Shortcuts Selection

Shortcut	Description
SHIFT+ LEFT/RIGHT	Extend selection by one character in the respective direction
SHIFT+ CTRL+ LEFT/RIGHT	Extend selection by one word in the respective direction
SHIFT+ POS1	Select all up to line beginning
SHIFT+ CTRL+ Pos1	Select all up to line beginning
SHIFT+ END	Select all up to line end
SHIFT+ CTRL + END	Select all up to text end
SHIFT+ PAGE UP/DOWN	Extend selection by one page upward/downward
Double-click, left button	Select current word = CTRL + click on a word
Triple-click, left button	Select whole line
CTRL+A	Select all
Drag mouse over lines with left button held down	Selects the lines touched.

Shortcuts *Rectangular* selection

Shortcut	Description
Drag open rectangle with mouse (left button) + ALT	Selects a **rectangular** region.
ALT+SHIFT+LEFT/RIGHT	Extends rectangular selection by one character
ALT+SHIFT+UP/DOWN	Extends rectangular selection by one line
ALT+SHIFT+POS1	Extends rectangular selection up to line beginning
ALT+SHIFT+END	Extends rectangular selection up to line end
Drag&drop for a selected region	Moves the region if the option drag&drop 101 is activated.

Shortcuts Edit

Shortcut	Description
DEL	Delete selection
BACK	Delete characters to the left of the cursor
CTRL+DEL	Delete up to word end
CTRL+BACK	Delete up to word beginning
CTRL+D	Deletes line containing cursor if the option is activated 101.
CTRL+C, CTRL+INS	Copy selection to clipboard.
CTRL+X, SHIFT+DEL	Excise selection to the Clipboard.
CTRL+V, SHIFT+INS	Paste Clipboard contents.
CTRL+Z	Undo last change.
CTRL+Y	Redo last change.
TAB	Increase indent
SHIFT+TAB	Reduce indent
CTRL+K	Comment out block
CTRL+U	Uncomment block
INS	Toggles between the modes Insert<>Overwrite

Shortcuts Active line

Shortcut	Description
Left-click of the mouse on the "Execute"-Button, ALT+ENTER-key	The line becomes the active line.
Left-click to position indicator	Runs active command line.
CTRL+ENTER	The line with the cursor becomes the active line and is run immediately.

Shortcuts Breakpoints

Shortcut	Description
CTRL+B; CTRL+left mouse button in indicator-bar	Breakpoint on/off.
CTRL+SHIFT+B	Delete all breakpoints

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Shortcuts Find and Replace

Shortcut	Description
CTRL+F	Find
CTRL+H	Find and replace
CTRL+W:	Skip to next found location in a text search 95.
CTRL+SHIFT+W	Go to previous search result
CTRL+R	Replace next found text
CTRL+SHIFT+R	Replace all found texts

Shortcuts Bookmarks

Shortcut	Description
CTRL+SHIFT+F2	Delete all bookmarks
CTRL+Number	Set bookmark
ALT+Number	Go to bookmark
CTRL+F2	Go to next bookmark
ALT+F2	Go to previous bookmark

Shortcuts and operation general

Shortcut	Description
SHIFT+F1	If the cursor is positioned on a function name, the Formula Assistant 333 is called.
ALT+F1	Show help for function below the cursor. (If the Syntax Help is deactivated in the Options 102.)
CTRL+T	Select variable below the cursor in the Variables list
CTRL+J	Show all folded code if *Folding* is activated in Options 101.
CTRL+SHIFT+J	Hide folded code if *Folding* is activated in Options 101.
CTRL+SPACE	Show list autocorrect suggestions
CTRL+SHIFT+SPACE	Show functions parameter tip
Data-Tip	When you hold the mouse over a variable in the Editor window 101, its contents are displayed above the name.
Parameter-Tip	Shows the function parameters 99 while the mouse is held over the function.
Drag&drop to the Editor box	Inserts variable name (from Variables list) and function name (Functions box).
Click on function name	Displays the Quickhelp on the function in the Help window. If *Extras\Options\Editor* *Syntax-Help* 101 "Show automatically" is deactivated, then use ALT+F1.
Mouse wheel: Turn + CTRL	Font size larger/smaller
Right-click of the mouse over the input region	Context menu 96 with editing commands

4.9.5 Data sources/File Browser (6.3)

Action	Description
Double-clicking on a file's entry in the file list	Switches to the "Selected for loading "- file status.
Double-clicking on a folder's entry in the folder list	Expands / collapses the subfolders.
Right-click of the mouse	Context menu

4.9.6 Data Editor

Action	Description
Double-click in the column header	Dialog for selecting the variables to be displayed
Drag&drop to the column header	From the variables list or the curve window: displays the variable from this column on.
Drag&drop from the column header	To the curve window: displays the variable To a function button: calls the Formula Assistant. To the Report Generator: creates a new report-object or update of an existing object with the line's contents.
Drag&drop from the spreadsheet to the Report Generator	Triggered by clicking the mouse on the selection while holding down the CTRL-key. Creates a new report-object or updates an existing object with the contents of the selection.
Right-clicking mouse	Context menu. The contents depend on the mouse's position (table header or body).

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4.9.7 Curve window

Action	Description
Double-click on axes	Opens dialog for axis scaling.
Drag&drop to the curve window	Variables from the Variables list in the imc FAMOS main window, from the column header in the Data Editor or from another curve window: display of the variable, depending on the cursor's position when the mouse button is released.
Drag&drop from the curve window	To another curve window: The curve is displayed in this window also. To the same curve window: the curve's position (relative to the coordinate system and axis) is changed. To the Variables list in the imc FAMOS main window: if the variable doesn't exist in imc FAMOS , it is created there. To the column header in the Data-Editor: If the variable already exists in imc FAMOS , it is displayed in the selected column. To the Report Generator: creates a new report-object or updates an existing object with the window's contents
Moving the measurement cursor	With the measurement value window open, the measurement cursors can be moved while the right or left mouse button, respectively, is held down.
Positioning the measurement cursor	With the measurement value window open, a measurement cursor can be set at the position of the mouse cursor by clicking on the mouse while holding down the SHIFT-key.
Right-click of mouse over curve window	Calls context menu, offering, inter alia, "*More channels in curve window*"
Right-click of mouse over color-setting dialog	Calls context menu, offering, inter alia "*Save color settings to file / load from file*"
Right-click of mouse over axis scaling dialog	Context menu for setting order of magnitude (ten's exponent) for axis scaling.
Vertical line in scrolling link	The line can be grabbed with the mouse and moved within the window.

4.9.8 Report Generator

Action	Description
Double-clicking on an object	Calls the dialog for changing an object. In the case of curve objects, the ALT-key must be pressed at the same time.
Drag&drop to the Report Generator	Starting from the imc FAMOS Variables list, from the Data-Editor or from the curve window: creates a new Report-object or updates an existing object.
Right-clicking the mouse	Context menu. The contents depend on the mouse position.

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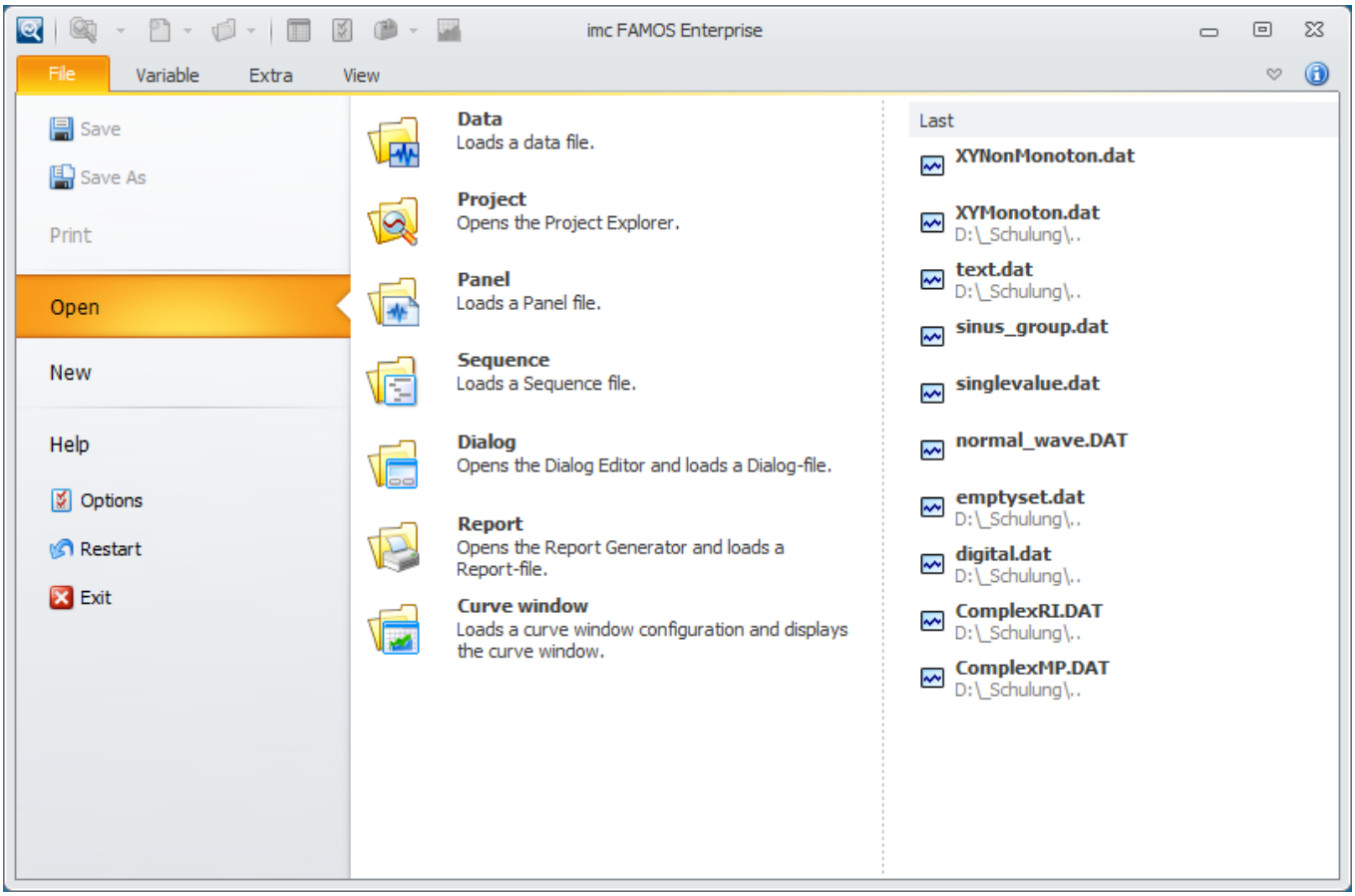
4.9.9 Interaction with the Windows Explorer

Action	Description
Displaying sequence-file(s) (*.seq) with Notepad	• by selecting the desired file(s) + menu item "Open" in the Explorer context menu
Running sequence-file(s) (*.seq)	• by selecting the desired file(s) + menu item "Run" in the Explorer context menu
Printing out sequence-file(s) (*.seq)	• by selecting the desired file(s) + menu item "Print" in the Explorer context menu
Printing out Report-Generator file(s) (*.drb)	• by selecting the desired file(s) + menu item "Print" in the Explorer context menu
Loading and display of imc measure-ment data file(s) (*.dat, *.raw)	• by double-clicking on a file with the specified extension • by selecting the desired file(s) + menu item "Open" in the Explorer context menu
Loading measurement data file(s) (*.*)	• by moving files to the imc FAMOS Variables list by means of drag&drop. The files are loaded to imc FAMOS in the currently set file format.
Opening a Panel file(*.panel)	• by double-clicking on a file with the specified extension.
Opening a Project file (*.FamosPrj)	• by double-clicking on a file with the extension *.FamosPrj or *.FamosPrjX.
Opening Report-Generator file(s) (*.drb)	• by double-clicking on a file with the specified extension • by selecting the desired file(s) + menu item "Open" in the Explorer context menu. • by moving files to the Report Generator window by means of drag&drop
Opening sequence-file(s) (*.seq)	• by moving files to the Editor box by means of drag&drop
Activation of the Preview window	• Displays the selected data set as a curve window with a description of the properties 292

4.10 Menu "File"

The following is a short description of the imc FAMOS main menu commands. Most of the menu items are described in detail in pertinent chapters of this manual.

The menu "*File*" contains general functions for opening and saving data projects, Panels etc.



4.10.1 Save/Save as

The two menu items "*Save*" and "*Save As...*" apply to the active element.

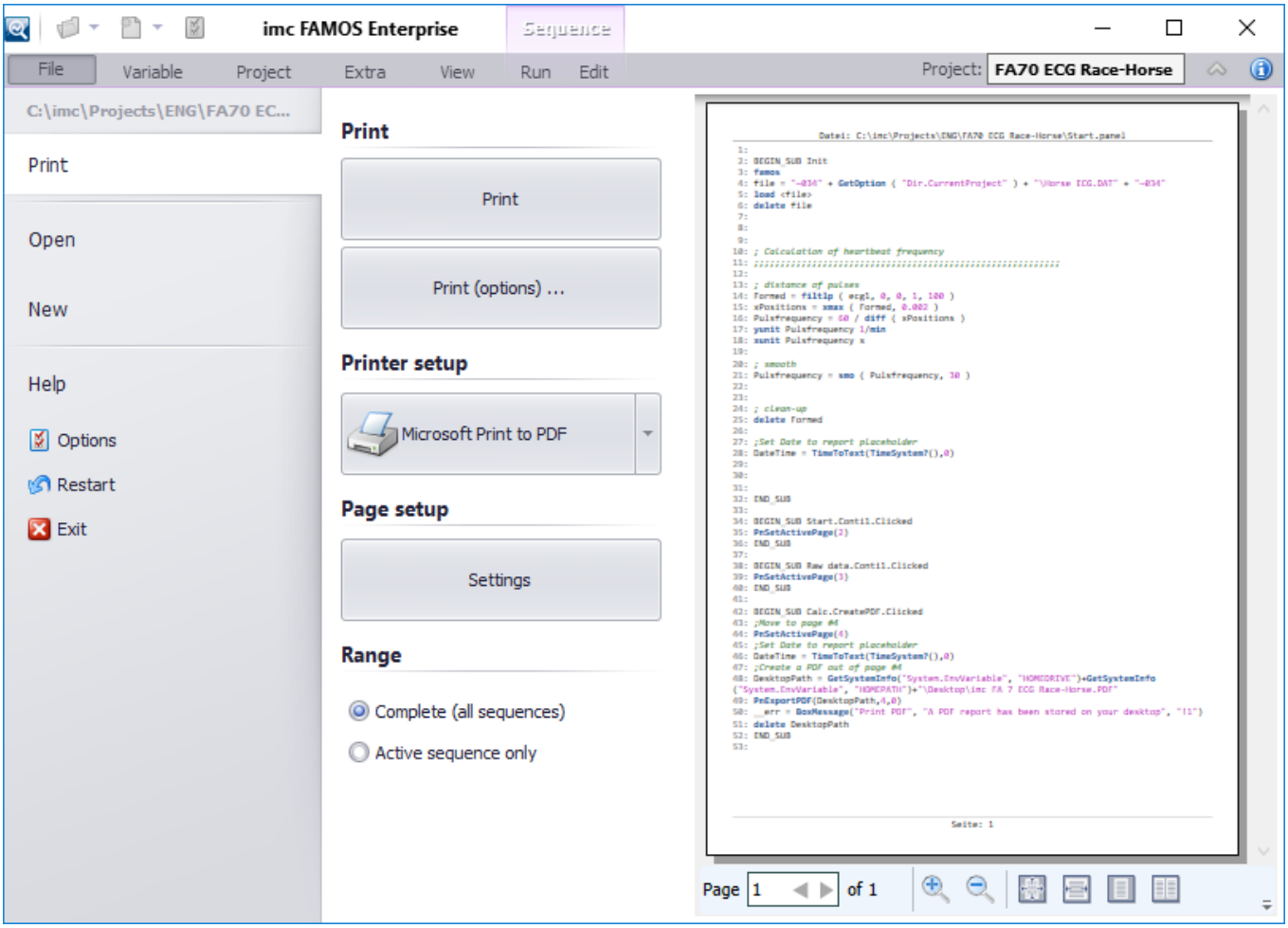
If a Panel is active in the Editor, the dialog for saving the panel is opened. The respective dialogs for saving sequences, dialogs and reports are also opened correspondingly.

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4.10.2 Printing

The buttons shown below only appear when there is an object such as a sequence or a Panel to print.

You have the option of printing out either the Editor window contents (generally the source code text for a sequence) or a Panel. With *Range*, select whether you want to print only the currently active sequence or all open (event) sequences.



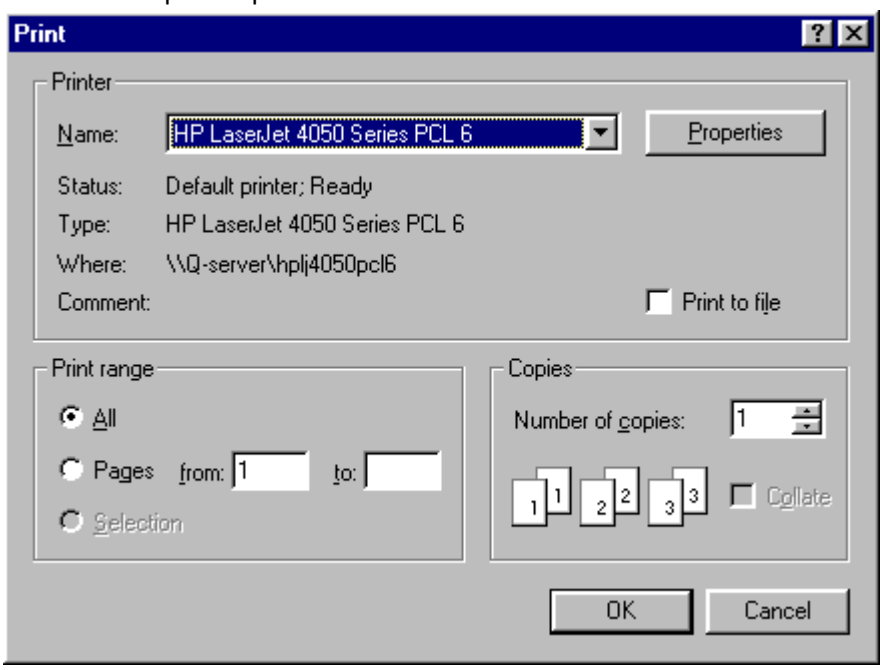
On the right side, a preview is displayed, indicating how the finished printout would look with the current settings applied. The printout's appearance is mainly influenced by the paper format, the font which is set, and the settings for the margins, orientation, as well as the header and footer.

Here you can view the individual pages of the printout one by one and check the formatting. If you are satisfied with the results, you can start the printout directly by means of the ***Print*** button.

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4.10.2.1 Print (options)

With ***Print (Options)***, you can make such selections as the printer to use, the range of pages to print out, and the number of copies to print.



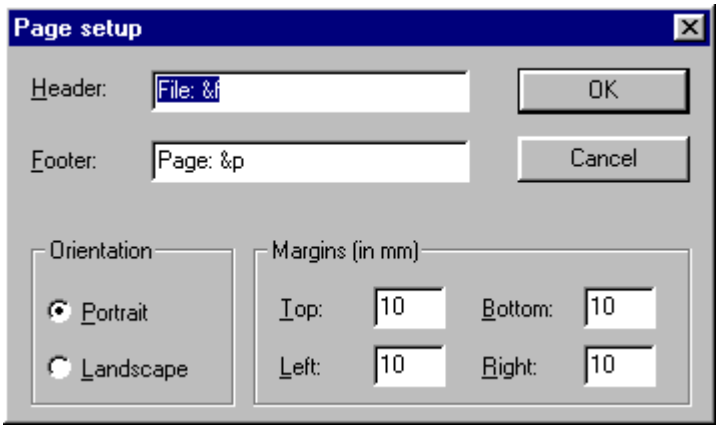
Dialog: Page setup

The button "***Properties***" accesses an additional dialog where more options for the printer can be set. This dialog is provided by the printer manufacturer and its appearance and functionality thus depends on the particular printer used.

By pressing the button "***OK***", the dialog is closed and printout begins.

4.10.2.2 Page setup

Under ***Page setup /Settings***, you can set page parameters for the printout of sequences. You can specify that a header and footer should be made, as well as specify the orientation and margins.



Dialog: Page setup

Header / Footer

Enter the desired text for the header and footer. The header and footer are each separated from the actual text body by a horizontal line. Both header and footer are left-justified.

Along with permanent text, placeholders can also be set, which are filled during printout. The following placeholders are defined:

&f	Sequence filename (complete path)
&p	Current page number
&t	Current system time
&d	Current system date
&tf	File modified time
&df	File modified date

Orientation

Select either landscape or portrait format.

Margins

Enter here the desired margin size; the given margins are kept free when the file is printed out.

The effect of the controls in this dialog can be checked before printout using the menu item "*Print preview*".

4.10.3 Open

Data



One or several data sets are loaded from files and the data sets contained in the files are indicated in the Variable List.

Reference

'Chapter 'File Management', 'Loading Files 174'

Project



Opens the Project Explorer

Reference

Chapter 'The Project Explorer 418'

Panel



Opens the selection dialog for loading available Panels.

Reference

Chapter 'Panels 432'

Sequence



Opens a dialog for selecting files, loads the selected sequence- or dialog file and displays it in the editor box.

Reference

Chapter 'Sequences 358'

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Dialog



Opens a dialog for selecting files, loads the selected dialog file and displays it in the Dialog Editor.

Reference

Chapter 'File Management', 'User-defined dialogs 547'

Report



Opens a dialog for selecting files, loads the selected report template and displays it in the Report Generator.

Reference

Chapter manual 'Report Generator'.

Curve windows



Opens a dialog for selecting files, loads the selected curve window configuration and displays the curve window. If the curve window uses existing variables, these are displayed immediately.

Reference

Chapter 'Curve window'

4.10.4 New

Create Project



Opens the Project Explorer

Reference

Chapter 'The Project Explorer 418'

New Sequence



A new tab for a sequence is created in the Editor.

Reference

Chapter 'Sequences 358'

New Dialog



Starts the Dialog-Editor.

Reference

Chapter 'File Management', 'User-defined dialogs 547'

New Panel



Creates a new Panel. Use the standard templates on the right side if you wish to create, for example, a report page or a dialog with a particular partitioning.

Reference

Chapter 'Panels 432'

New Report



Starts the Report Generator.

Reference

Chapter manual 'Report Generator'.

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4.10.5 Help

Support

Help topics



Select this menu item or press function key F1 to call up the integrated on-line help. An overview of the available help topics is displayed.

Find...



The integrated On-line help is called up and starts with a dialog in which a search topic can be entered.

First Steps



Information on getting started and notes on new features.

Contact us



Starts your E-Mail client for sending an inquiry to our tech support 9.

Visit our Homepage



Opens the imc website. Here you will find current information on imc FAMOS and all other imc products.

Tools

Check for updates



Opens the Updates page of the imc LICENSE Manager. Here, you can search directly for current versions and install them.

Info

On the right side of the page, you can obtain information on the program version currently in use, and on the licensing of imc FAMOS .

4.10.6 Restart

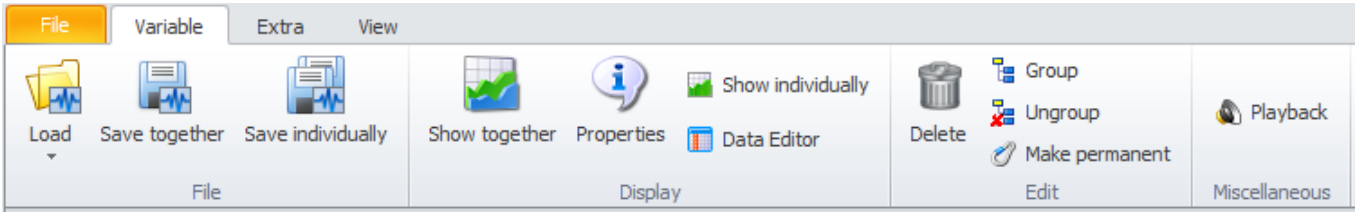
The variable list is emptied, i.e. all variables are deleted.. All open sequences are closed. Directories for loading and storing files are reset to the Default set-up. This function is equivalent to ending and then subsequently restarting imc FAMOS .

4.10.7 End

This closes imc FAMOS . Alternatively, the system menu or the combination of keys ALT + F4 may be used to close imc FAMOS . If changed variables or sequences have not yet been saved, a cautionary message will appear.

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4.11 Menu "Variable"



This menu contains a variety of possibilities for editing variables. Some of these commands are also available via the context menu of the Variables list.

File

Load

Submenu containing a list of the files most recently loaded. Selection of an entry causes the corresponding file to be loaded again.

Reference

Chapter 'File Management', 'Loading Files 174'

Save together

Variables selected in the Variable List are stored together in one file.

Reference

Chapter 'File Management', 'Saving Files 229'

Save individually

Variables selected in the Variable List are each saved in a file.

Reference

Chapter 'File Management', 'Saving Files 229'

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Display

Show together



Variables selected in the variables list are graphically displayed in one curve window.

Reference

Chapter 'Variables', section 'Showing Variables 288'

Properties



A dialog box appears as a stack of several file cards, on which information about variables selected in the variables list is displayed.

Reference

Chapter 'Variables', section 'Showing and Changing Characteristics 295'

Show individually



Variables selected in the variables list are each graphically displayed in a curve window.

Data Editor



Calls the imc FAMOS Data Editor for tabular display and processing of channels and data sets.

Reference

Chapter 'Data Editor 583'

Edit

Delete

Variables selected in the variable list are deleted. If the associated option is set in the dialog "Options" / "Variables list", it is also possible to use the DELETE-key.

Group

Variables selected in the variable list are assembled into one data group.

Reference

Chapter 'Variables', section 'Group/ Ungroup Variables (Data Groups) 308'

Ungroup

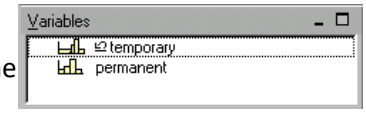
Data groups selected in the variable list are dissolved and the channels formerly contained in the groups reappear in the list as independent variables. When a single channel not its corresponding group is selected, only this channel is released from the group, the group itself remains intact.

Reference

Chapter 'Variables', section 'Group/ Ungroup Variables (Data Groups) 308'

Make permanent

When working with the built-in File Browser, it is possible to create variables possessing the property "*temporary*". These are denoted in the Variables list by a special symbol.



Such variables are automatically deleted in some circumstances, for example when the current folder in the File Browser changes.

This menu item is disabled if none of the selected variables is temporary.

Reference

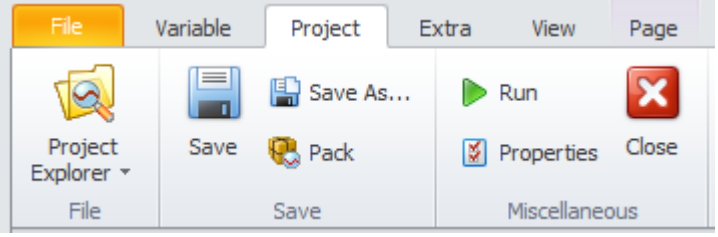
Chapter 'Variables', Chapter 'File Browser 218'.

Miscellaneous

Playback

The variables selected in the Variable list are outputted as sound by the computer's audio system.

4.12 Menu "Project"



This Multi-function bar is only displayed once a project has been loaded. Here, a variety of functions for creating and managing imc FAMOS projects are available to you.

Reference

Chapter 'Project management 417'

File

Project-Explorer

Starts the Project-Explorer 418. The Project-Explorer is the headquarters for the management of imc FAMOS projects. Here, you can created, open, run and delete projects.

Clicking on the triangle below the symbol lists the last ten projects.

Save

Save/ Save as...

Saves all setting for the current project under the current or a new name, respectively.

Pack...

Pack And Go: The project is saved in a way which is transportable. All project files are grouped together to a singe file called "*ProjectName..FamosPrjX*". This file can be transported to a different computer and saved there as a project.

Project archives have this peculiarity: The project is unpacked in a temporary folder which is automatically deleted when imc FAMOS is closed. This is advantageous if the project is of a "*ReadOnly*" nature to the user. If the user wishes to save and change a packed project permanently, it must be saved to the target computer using "*Save As..*".

Miscellaneous

Run

Starts the execution of the project open at the moment.

Properties

In the dialog which appears, you can specify which additional settings belong to the current project.

Reference

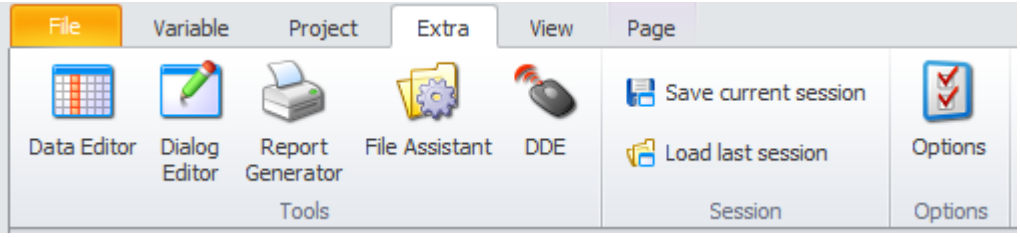
Chapter Project: 'Project-Properties 424'.

Close

The project open at the moment is closed.

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4.13 Menu "Extra"



This menu contains commands for creating special work space, for starting imc FAMOS extensions and for calling the imc FAMOS Options dialog.

Tools

Data Editor

Calls the imc FAMOS Data Editor for tabular display and processing of channels and data sets.

Reference

Chapter 'Data Editor' 583

Dialog-Editor

Calls the imc FAMOS Dialog-Editor for creating and editing user-defined dialogs.

Reference

Chapter 'User-Defined Dialogs 545'.

Report Generator

The imc Report Generator is called using this menu item. This allows you to prepare results for printing by creating tailor-made documents out of texts and graphics.

Reference

Documentation for Report Generator

File Assistant

This calls the imc File Assistant. Because measurement data are stored in various formats, reading a special file format into an analysis program is often the Number One Problem in evaluating the data. The imc File Assistant allows you to design your own file formats. Using the format design file which it then creates, imc FAMOS can read your data with as much ease as data in a standard format.

Reference

Manual 'imc Shared Components', Chapter 'File Assistant'.

DDE

A dialog appears to control other applications from imc FAMOS via DDE (Dynamic Data Exchange). Commands may be sent to other applications and data may be transferred, as well.

Reference

Chapter 'DDE-Interface' 608'.

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Session

Save current session

Saves the current state of the active imc FAMOS session. This includes, for example, the contents of the Variables list, the curve windows and sequences open, the layout of the various imc FAMOS windows and the input box's contents.

Load last session

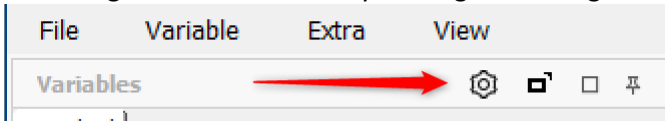
Counterpart of the command "*Save current session*". The last session saved is restored.

Options

Options

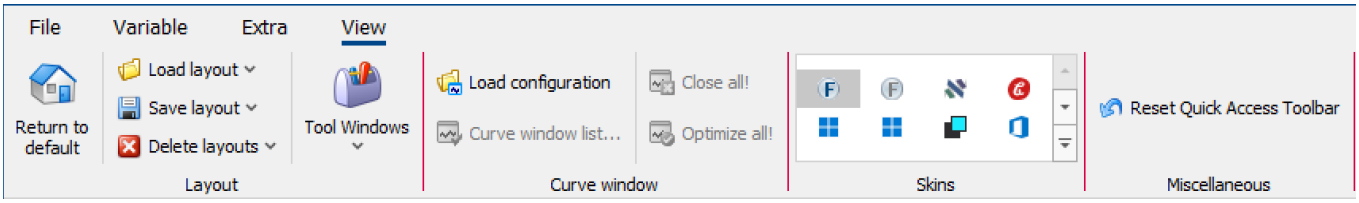
Calls the imc FAMOS Options dialog. This dialog compiles all imc FAMOS presettings, organized in categories.

The dialog can also be called by clicking on the cogwheel icon:



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4.14 Menu "View"



This menu contains commands affecting the appearance of imc FAMOS.

The imc FAMOS user interface can be adapted to your working methods. The "*Views*" or "*Layouts*" you create can be saved and later restored.

Reference

Chapter 'Customizing the User Interface 144'

Layout

Return to default

Restores the default layout.

Standard

The Plugin window is minimized; all other boxes are visible.

Variables list | File Browser

- Except for the Variables list and the Plugin box, all other boxes are minimized. In the Plugin box, the file Browser is activated. This arrangement corresponds to the "*File window mode*" of previous imc FAMOS versions.
- Extra columns are deleted. Only the columns "*Value*" and "*Name*" are retained.
- The filter is switched off.
- The tree view is switched off.

Without Plugin box

The Plugin box is hidden; all other boxes are visible.

(User-defined)

A maximum of three user-defined layouts, which had previously been saved using the menu item "*Save layout*".

Load layout

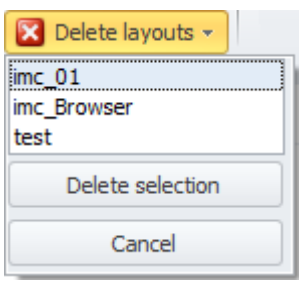
Loads a previously saved layout.

Save layout

Saves the current user interface.

Delete layouts

Enables you to remove a layout.

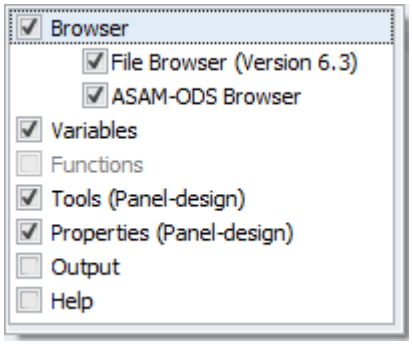


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Tool window



All tool windows in a selection box can be either shown or hidden.



Curve window

Load configuration



Here you can load a curve configuration which you had earlier saved by means of the curve window menu item "*Save As...*". The curve window is created according to the settings saved. The data sets displayed at the time the curve window is saved are simply recorded by name in the configuration, but not their plot in the graph or the associated data. If a data set with that name exists at the time the configuration is loaded, it is automatically displayed immediately. if such a variable is only created later, e.g. as the result of a formula or by loading a file, this is then also automatically display in this curve window.

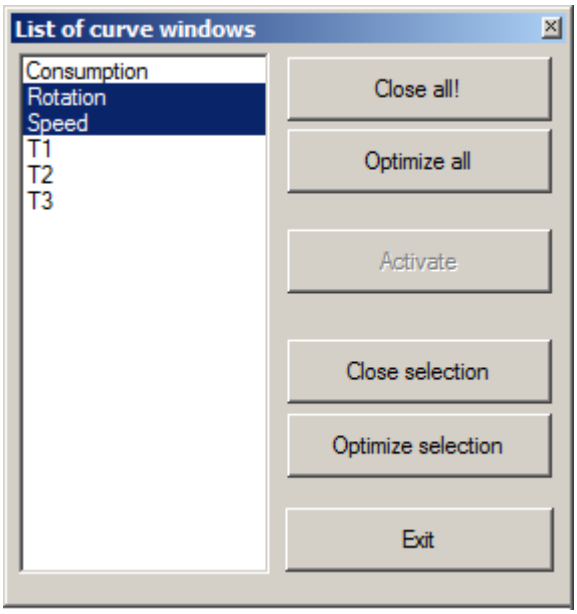
Reference

User's manual 'Curve Window'

Curve window list



Opens a list of all curve windows present. Selection of such a menu item activates the respective curve window and places it in the foreground.



Close all!



All curve windows which are currently open or created by imc FAMOS are closed.

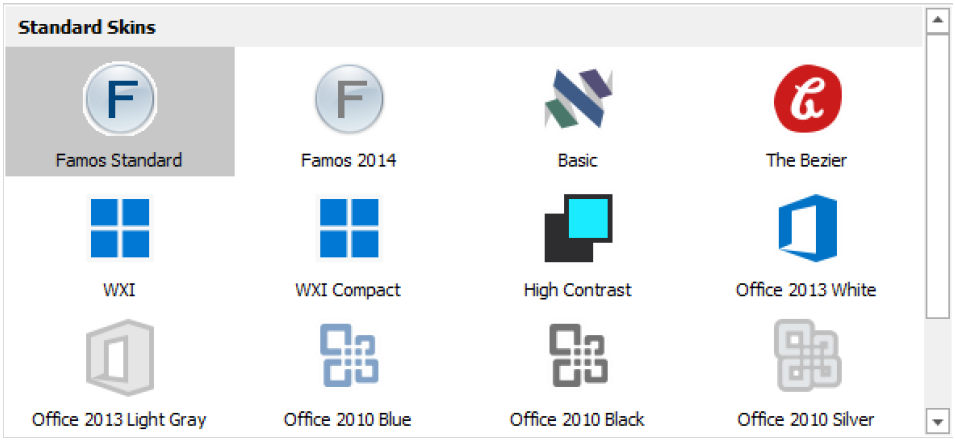
Optimize all!

Upon loading a curve configuration or due to subsequent deletion of data sets, it is possible for there to be curve windows which are "missing" any data set. This means that the curve window would display a data set which is not currently available in imc FAMOS . The curve window remembers the name of these data sets in order to be able to display them automatically as soon as they are generated.

With this menu item, all entries not currently in use are deleted from the curve windows. Any empty axes and coordinate systems in the curve window are deleted, or any empty curve windows closed.

Skins

Displays the imc FAMOS user interface with various colors.



Miscellaneous

Reset Quick Access Toolbar

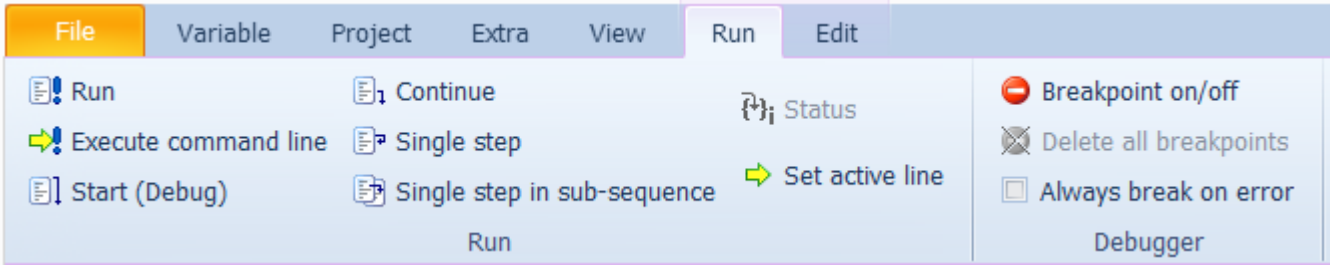
The Quick Access bar is reset to its basic functions. All functions added by means of the right mouse button are removed.

Reference

Chapter 'The Quick Access Toolbar' 108

4.15 Menu "Run" (Sequence)

The multi-function bar "*Run*" is displayed when the editor is selected (input, sequences, Panel Code).



This menu offers commands for the administration, editing and execution of sequences. All the commands are explained in detail either in this chapter in the section "*Editor box*", or in the chapter "*Sequences*".

Sequences can also be components of user-defined dialogs (*'event-sequences'*). Some of the commands then don't refer to the sequence currently displayed, but to the entire dialog. See the chapter '*User-Defined Dialogs* 545' for details on editing event sequences.

All these commands are also available from one of the two editor box context menus (right-click over the title bar or over the input area), and some are also available in the editor box toolbar.

Run

Run

The sequence or dialog currently in the editor box is run completely.

Execute command line

The current command line in the current sequence is run.

Reference

Chapter 'Active line 98'.

Start (Debug)

The current sequence or dialog currently in the editor box is run completely; any breakpoints set are observed.

Continue

Execution of the sequence is continued from the current position (active command line). Any breakpoints set are observed.

Single step

The active command line of the active sequence is executed and then the next line becomes active.

Single step in sub-sequence

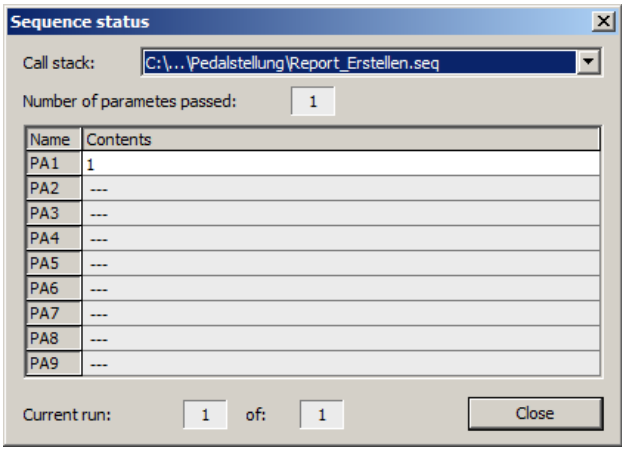
The active line of the active sequence is executed, then the next line becomes active. If the current command is the call to a sub-sequence (SEQUENCE-command), the sub-sequence is loaded, displayed, and its first line activated.

If the current command is a dialog call (DIALOG-function), the dialog is started and interrupted before the first line of the first event sequence is carried out.

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Status

If the current position of a sequence run's progress is in a sub-sequence, various information is displayed here, e.g. about the parameters passed, and if applicable, the number of the sequence run, if the sequence was called with wildcard parameters.



Set active line

Sets the line in which the cursor is flashing active

Reference

Chapter 'Active line 98'.

Debugger

Breakpoints On/Off

Sets a breakpoint in the line of code where the cursor is flashing.

Reference

Chapter Sequences 'Breakpoints 372'

Delete all breakpoints

Deletes all breakpoints in the current sequence.

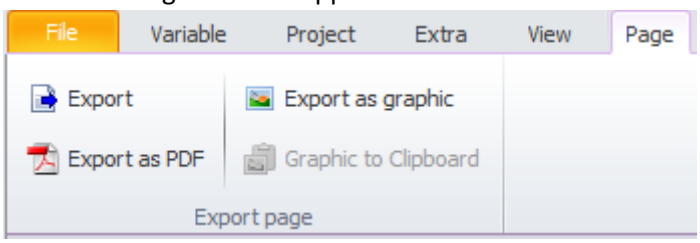
Always break on error

Regardless on OnError(), debugger breaks always on error.

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4.16 Menu "Page"

The following functions appear whenever a Panel is currently selected.



Export page

Export

Export of the selected *Panel*-page. The file also is assigned the extension "*.panel".

Export as PDF

A loaded Panel page is exported in PDF-format. For this purpose, imc FAMOS ships with the PDF driver. Note the possible export method in the options dialog 580.

Export as graphic

Saves the Panel page in various graphics formats (PNG, BMP, JPG, EMF 580)

Graphic to Clipboard

Copies the Panel to the Clipboard as a screenshot. To this end, the Design mode must be deactivated.

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4.17 Menu "Edit" (Sequence)

What functions appear in the multi-function bar "*Edit*" depends on whether the Editor or a Panel page was selected. The following functions appear when the Editor is selected (input, sequences, Panel Code).



Here you find commands for editing the text in the Editor.

Reference

Chapter 'The Editor window 93'

General

Copy

Makes a copy of the highlighted text in the editor box in the Clipboard.

Paste

Inserts Clipboard contents at cursor position in the editor box.

Cut

Removes highlighted text in editor box to Clipboard.

Undo

Reverses the effect of the last action in the editor box.

Redo

Restores the state prevalent before previous "*Undo*" command.

Find

Find

Conducts a search for particular text in the current input box.

Replace

Conducts a search for particular text in the current input box and replaces all instances of the specified text found.

Find again

Repeats the last text search.

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Format

Automatic formatting

Performs automatic formatting of the sequence displayed, meaning that the indentations of the lines are set automatically. The indentation depends on the logic of the sequence's procedural structure.

Comment out block (CTRL+K)

The lines currently selected are commented out, meaning that a semicolon is set before each line to denote it as a comment.

Uncomment block (CTRL+U)

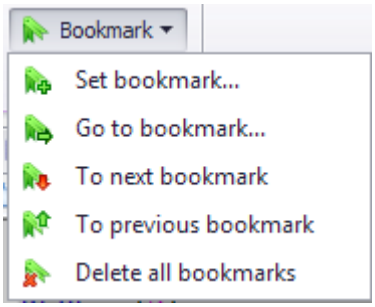
The comment status of the lines currently selected is canceled, meaning that the semicolon before each of the lines is removed.

Miscellaneous

Dialog-Editor

Performs automatic formatting of the sequence displayed, i.e. the indents of the individual lines are determined on the basis of the sequence's logic structure.

Bookmark



Set bookmark...: Sets a bookmark in the command line in which the cursor is currently positioned.

Goto bookmark: Finds a particular bookmark in the current sequence.

To next bookmark: Goes to next bookmark; the search begins in the line in which the cursor is currently positioned.

To previous bookmark: Goes to previous bookmark; the search begins in the line in which the cursor is currently positioned.

Delete all bookmarks: All bookmarks are deleted from the current sequence.

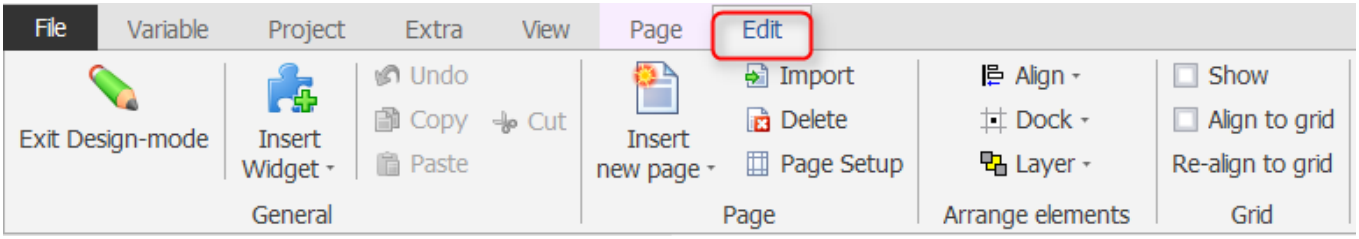
Go to line

Go to line, analogous to the context menu function 96.

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4.18 Menu "Edit" (Panel)

What functions the multi-function bar "*Edit*" contains depends on whether the Editor or a Panel page was selected. The following functions appear when the Panel is selected in Design-mode.



Reference

Chapter 'Panel 432

General

Exit Design-mode

Exits the Design mode and runs the Panel.

Insert Widget >

Adds widgets, see here 455 and ff.

Undo, Copy, Paste, Cut

Functions for cutting, copying, and pasting widgets in the Panel

Page

Insert new page >

Adds a new page to the selected Panel. See also here 434.

Import

Imports a Panel page which had previously been exported. See also here 437.

Delete

Deletes the current Panel page

Page Setup

Settings for the printout.

Arrange widgets

Align > (Align Top, Align Left...)

Aligns all selected widgets. While holding down the CTRL-key, select all the widgets in succession which you wish to align.

Align with cursor buttons

In Design mode, the cursor buttons can now be used to move the widgets.

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Select all widgets

Using CRTL+A 109, it is possible to select all widgets on the page.

Dock > (Free, Left, Right...)

These functions are only available for tiled dialogs. Widgets can be permanently docked in a section.

Layer > (To foreground, To background)

Widgets which overlap can be placed in the foreground or the background. By this means, you can, for example, place a frame in the background if it is located above a button which it is thus making inaccessible.

Grid

The grid's dimensions are set, in mm, in the Properties of the page (context menu for the page, unless a widget is selected -> Properties -> Grid).

Show

Displays the grid as dots.

Align to grid

When creating or moving a widget, it is snapped to the grid.

Re-align to grid

Subsequent alignment to of all widgets

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4.19 Administering Favorites

4.19.1 Overview

The functions and commands available are indicated in the function list on the index cards "*Standard*", "*Kit*" and "*DLL*". The user has the additional option to compile a list of favorites under the index card "*Favorites*". Here, it is possible to store functions, formulas and sequence calls and projects which are used frequently, so that they can be accessed quickly. It is possible to store both complete, ready-to-go formulas and formula masks in which only the currently applicable parameter needs to be entered.

The Favorites list can be organized in any hierarchical structure desired.

A "*Favorites*" entry has the following distinguishing properties:

- **The title**. The favorite is listed by this name.
- **The type.** This can be either a formula or instruction, or a project. If it's a formula or instruction, the actual **instructions text** must be specified. This can be, for instance, a function call with a partly or totally completed parameter list, a complete formula, or an instruction. If it's a project, the project's folder path must be specified.
- **The "*Execute*" property.** This determines what is supposed to happen when a favorite is selected. "*Instruction*" type: If this option is not activated, the instructions text is simply copied to the editor box (just like selection of a built-in function from the "*Standard*" function list). This is sensible in cases, for example, where the instructions text contains a function call which still needs to be completed with current parameter specifications. However, if this option is activated, the instructions are executed immediately. This naturally makes sense if the favorite is a complete formula or instruction. The option can be sensibly applied, for instance, to start a sequence by means of the SEQUENCE-command.
- **"*Project*" type:** If this property is set, the project is run immediately upon being opened.
- **The short description**. This is displayed in the Favorites list to the right of the title.
- **The help text**. If applicable, this is displayed in the imc FAMOS output box.

4.19.2 Creating a new favorite

To store an entry for a new favorite, there are the following possibilities:

1. If a function from one of the other groups is to serve as the basis for the favorite, select the desired function and then select the context menu item "*Add to favorites*". Then, once you switch to the Favorites, you see a copy of the selected entry at the end of the Favorites list. Using the context menu item "*Properties*", it is then possible to edit the entry.
2. To use an existing favorite as the basis for a new one, use the command "*Duplicate entry*" from the Favorites list's context menu. The new entry appears at the end of the Favorites list and the dialog for editing the properties is called.
3. To define a totally new favorite, select the command "*New entry*" from the Favorites list's context menu. The dialog for defining a favorite then appears.

4.19.3 Setting / changing properties of favorites

If you select either of the items "*New entry...*" or "*Properties...*" from the Favorites list's context menu, the dialog for defining a favorite appears:

Designation

Enter here the title for your favorite. It appears in the Favorites list under this name.

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Kind:

Statement, Boilerplate, Project, see further below 142.

Execute!

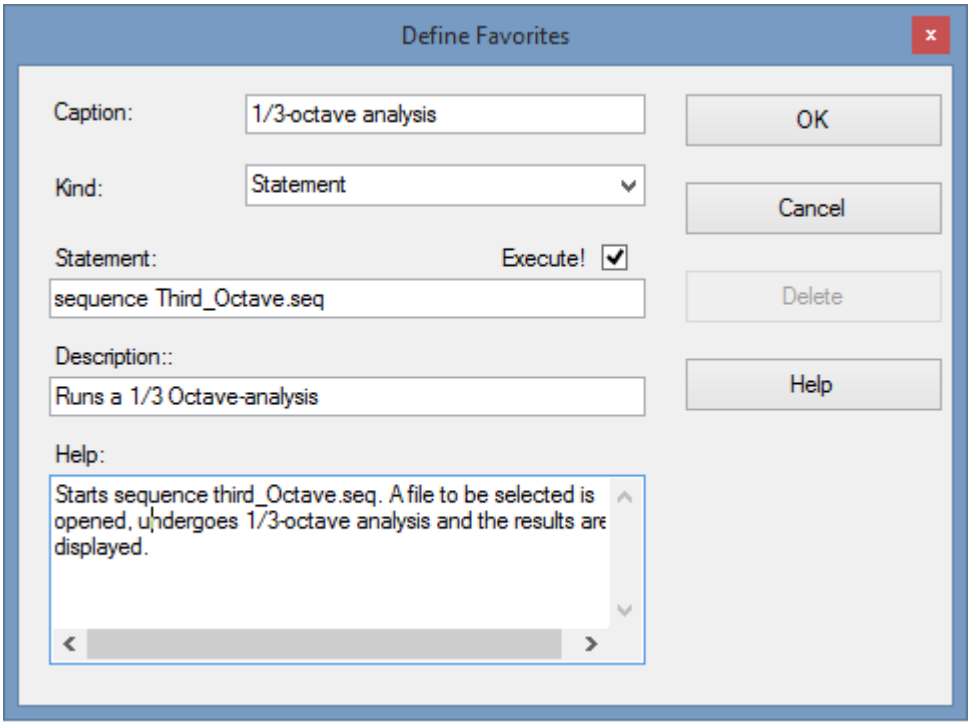
For a *Statement* or *Project*, this option can be used to specify that the associated instruction is to be executed, e.g. by double-clicking.

Note Execute!

This is a special case for calls of functions or sequence functions 384 created by the command "*Add to favorites* 90" in the corresponding context menu: Here, the "*Execute!*" option has the effect that the parameter assistant

is called for the corresponding function.

Statement



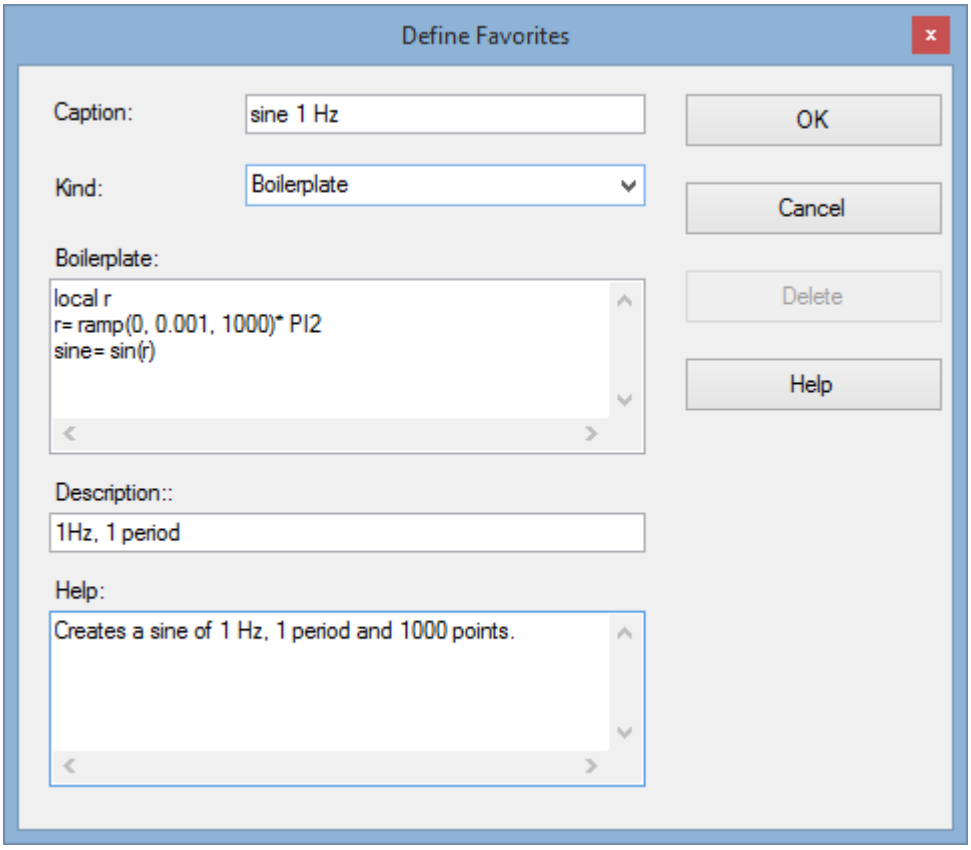
Dialog: Define favorite instruction

Activate this option if the favorite is meant to be a formula or instruction. In this text box, you can specify the text to be linked with this favorite. The cursor position is also noted. When the favorite is later selected and the assigned text is copied into the active editor box, the cursor it positioned at this location, for instance, where an updated parameter value is to be entered into the prepared formula line.

In the context menu of this input box, you will find the command "***Insert current operation line***". This command copies the active line in the imc FAMOS editor box to this box.

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Boilerplate



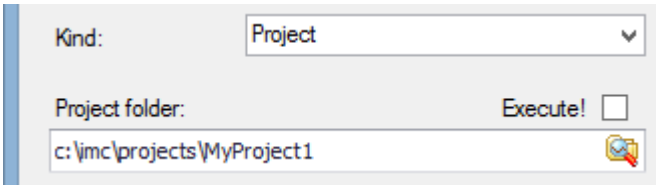
Dialog: Define favorite boilerplate

In addition to the boilerplates provided, which are found under "*Sequences\boilerplates*", you can define additional ones here. You can copy parts from the Editor and insert them into the box *Boilerplate*.

In the context menu of this input box, you will find the command "***Insert current operation line***". This command copies the active line in the imc FAMOS editor box to this box. The current help text can be inserted by right-clicking the mouse over the box *Help*.

Project

Activate this option if the favorite is a project which is to be loaded/run. In the input box, enter the project folder.



You can also use the button at the right of the input box in order to select the project from a folder selection dialog.

Help

Here you can determine a help text for the favorite. It will be displayed in the imc FAMOS output window.

In the context menu of this input box, you will find the command "***Insert current help text***". This command copies the current contents of the imc FAMOS output box to this box.

Delete

The favorites entry is completely deleted.

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4.19.4 Organizing favorites

The Favorites list can be organized in any hierarchical structure desired.

Creating a group

To create a new group, select the command "*New favorites group*" from the context menu. A new group entry is created at the end of the list and an attached input box is opened in which you can enter the name for the group, and confirm the entry by pressing the ENTER-key.

Changing the group name

Select the desired group and in the context menu select the command "*Rename*". An attached input box appears, in which you can edit the name.

Order / Grouping in Favorites list

The order and grouping of the Favorites list can be changed by means of the drag&drop technique.

Click on an entry with the mouse and drag it while holding down the mouse button to the new position desired. While the cursor is moving, it takes on the appearance either of a horizontal line or of a frame around a group entry.

The horizontal line means that the entry being dragged could be deposited at exactly the current position.

The frame means that the entry being dragged would be deposited in the framed group when the mouse button is released.

Deleting and entry

To delete an entry, select it from the list and then select the command "*Delete favorites group*" or "*Delete favorite*" from the context menu.

4.19.5 Transferring favorites to other computers

References

- To administer the favorites, use the program "imc FAMOS Configuration Im- & Export".

4.20 Customizing the User Interface

4.20.1 Overview

As of Version 7, the layout of the individual parts of the main imc FAMOS window (Variables list, Functions list, Editor box, Browser etc.) can be altered by the user as desired. It is also possible to completely undock 72 individual widgets, for instance, in order to better use a PC with multiple monitors. Additionally, the size and visibility of the individual boxes can be altered as desired. In this way, you can adapt the user interface to a variety of different tasks.

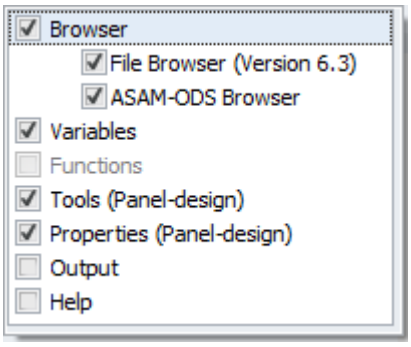
For example, if you use the File Browser to get a quick overview of your stores of recorded data, then the general operating controls for entering and running operations may not be necessary; you may want to hide the Functions list, Editor box and Output box in order to use the available space optimally. On the other hand, if you wish to enter and test sequences, you may not need the plugin window with the File Browser.

Along with some permanently defined layout arrangements, you can also save your own personal "*Layouts* 130", in order to be able to restore them later at need. All functions which affect the layout are available in the multi-function bar "*View* 130"

4.20.2 Hiding boxes

Any boxes which aren't needed can also be completely hidden. To do this, select the symbol "*Tool Window* 131" under "*View*".


A dialog appears in which the visibility of the individual boxes can be turned on/off.



Not all combinations are possible; at least one window must be open on each of the sides of the main window.

5 Tutorial

5.1 Introduction

This chapter has been provided to acquaint you with some of the main features in imc FAMOS . After working through this chapter, you should be familiar with the basic functions. When performing more complex tasks, please refer to the relevant chapters for more detailed information.

The tutorial will demonstrate how to load a data set from a file and how to perform analysis using formulas. You will also display channels in graphs and create an automatic sequence. Efficient use of the File Browser for quick loading of files and for comparing data files is demonstrated.

Many of the commands used below can be called in several ways - via the imc FAMOS main menu, or via the respective context menu (right-click of the mouse), via the corresponding icon in the toolbar or by a combination of certain keys. In order to familiarize you with all of these options, they are each used in turn in the discussion below, or at least mentioned as alternatives.

If you encounter unfamiliar terms in the discussion below, refer to the chapters 'User-Interface', 'Appendix' and the help for MS-Windows.

Note

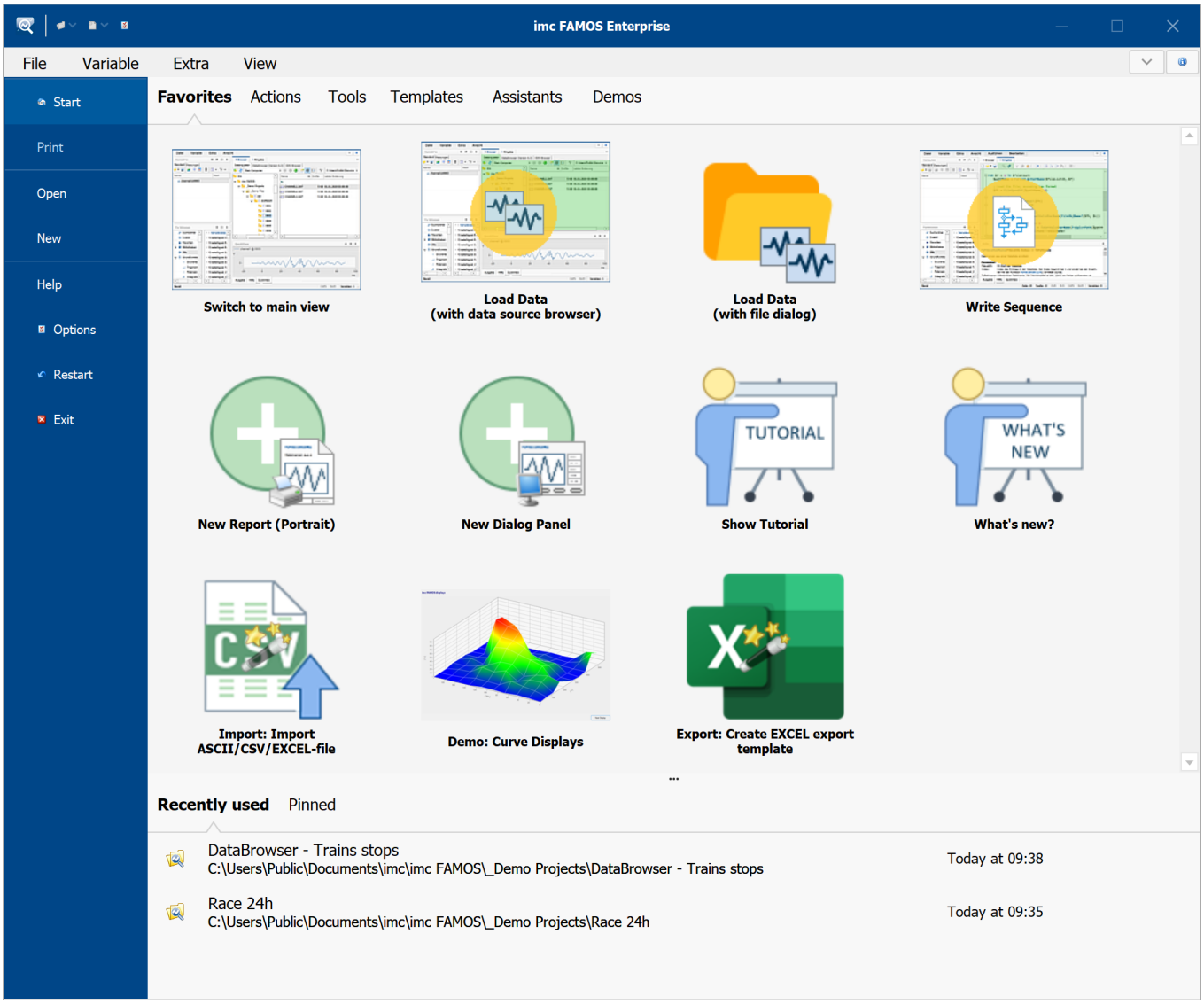
In order to be able to follow the tutorial on the PC, at least the imc FAMOS Standard Edition is required.

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5.2 Starting FAMOS

After successfully installing, start imc FAMOS either by accessing the shortcut installed in the Windows Start Menu or desktop.

The Start screen appears:

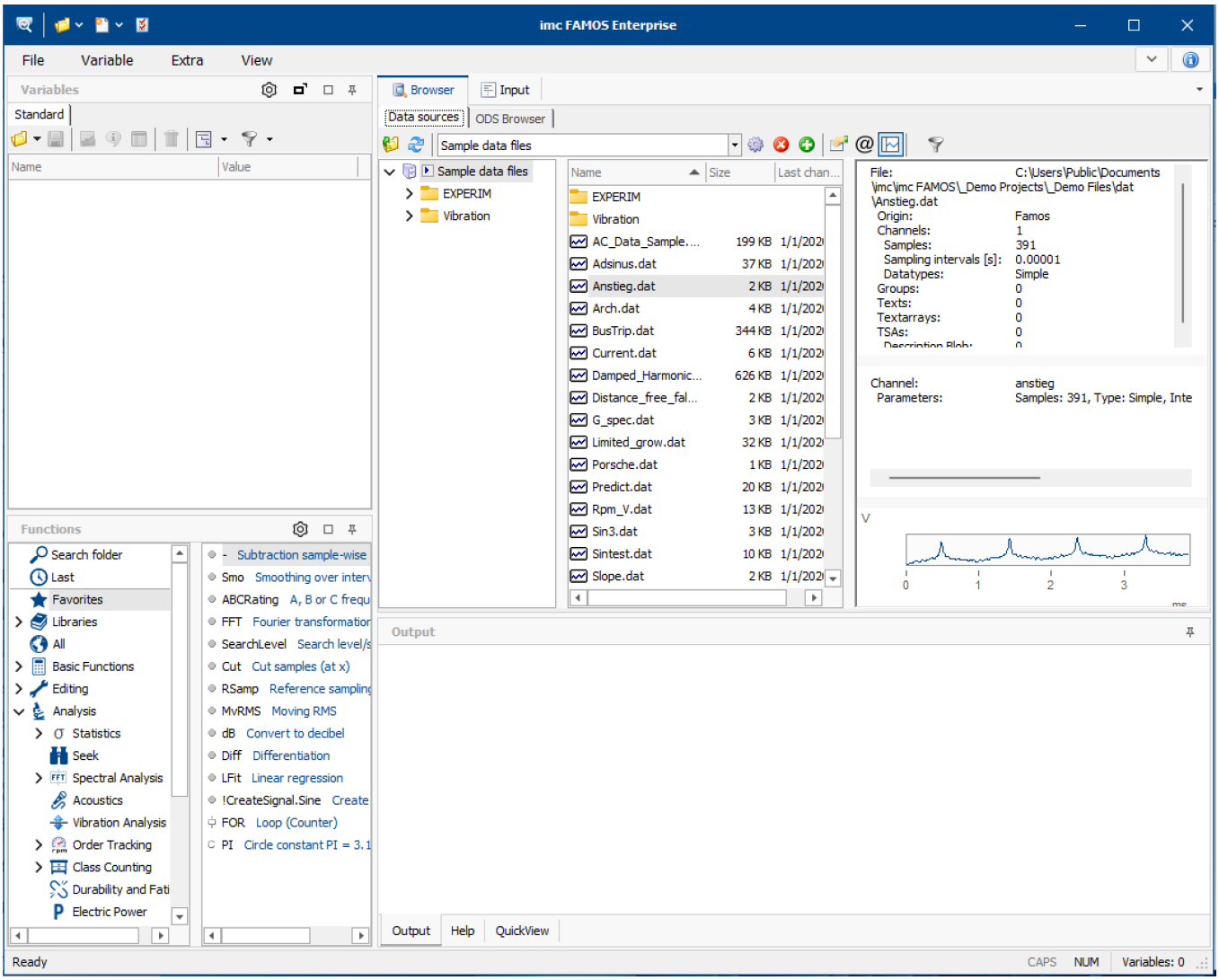


imc FAMOS start screen

The start screen is the entry portal to imc FAMOS. Assistants and templates can be opened from here. A detailed description can be found in the chapter The start screen 64.

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By clicking on *File*, FAMOS switches to the classic view:



FAMOS: Main window in standard set-up

If the main window appears differently from the illustration here, select menu *"View" / "Return to Default"* in order to restore the default configuration.

The workspace below the menu bar and tool bar is divided into 5 boxes:

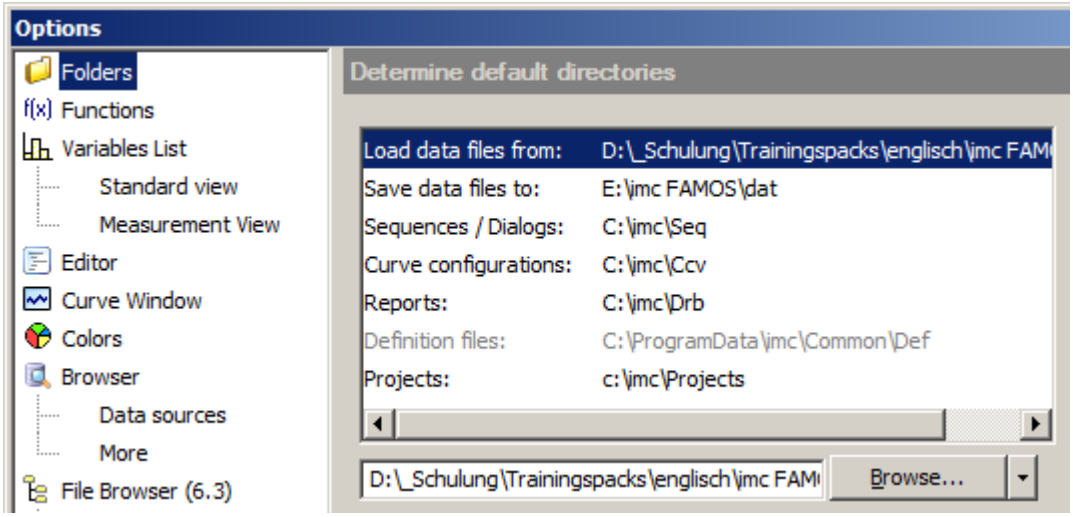
- **Variable list**, displaying all channels and variables currently being processed.
- **Function list**, displaying all available functions and commands.
- **Plug-in window**, in which the separate user interfaces of extension modules are displayed. The File Browser plug-in is permanently available for fast access to measurement files. By default, this window is minimized, meaning that only its title bar is visible.
- **Editor window**, for entering and executing individual operations and sequences (macros)
- **Output window**, displaying help texts, error messages and warnings

The basic arrangement of these boxes is fixed (e.g., the variables list is always at the upper left), but the size and visibility of the boxes can be altered. For instance, it's possible to grab the border between 2 boxes with the mouse and move it, or use the corresponding buttons to minimize or maximize a box

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5.3 Directories

Select the item "*Options*" in the "*Extra*" menu. The dialog which then appears presents all the presettings influencing imc FAMOS ' behavior. These are organized in various sections which can be selected from the list at left. Select from here the entry "*Folders*". A dialog box appears, in which you can set the default folders.



Dialog "Determine default directories"

The selected directory may be changed either in the input box or by calling a dialog with "*Browse*", which searches existing directories or can create a new directory.

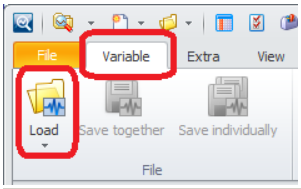
If you have completed installation of imc FAMOS and have selected the folder "*C:\Users\Public\Documents\imc\imc FAMOS*" for sample files, the subfolders should appear as follows:

```
"Load data files from:"  C:\Users\Public\Documents\imc\imc FAMOS\DAT
"Save data files:"       C:\Users\Public\Documents\imc\imc FAMOS\DAT
"Sequences:"             C:\Users\Public\Documents\imc\imc FAMOS\SEQ
"Curve configurations:"  C:\Users\Public\Documents\imc\imc FAMOS\CCV
"Reports:"               C:\Users\Public\Documents\imc\imc FAMOS\DRB
"Definition files:"  C:\ProgramData\imc\Common\def   (depends on system, read only)
"Projects:"              C:\Users\Public\Documents\imc\imc FAMOS\Projects
```

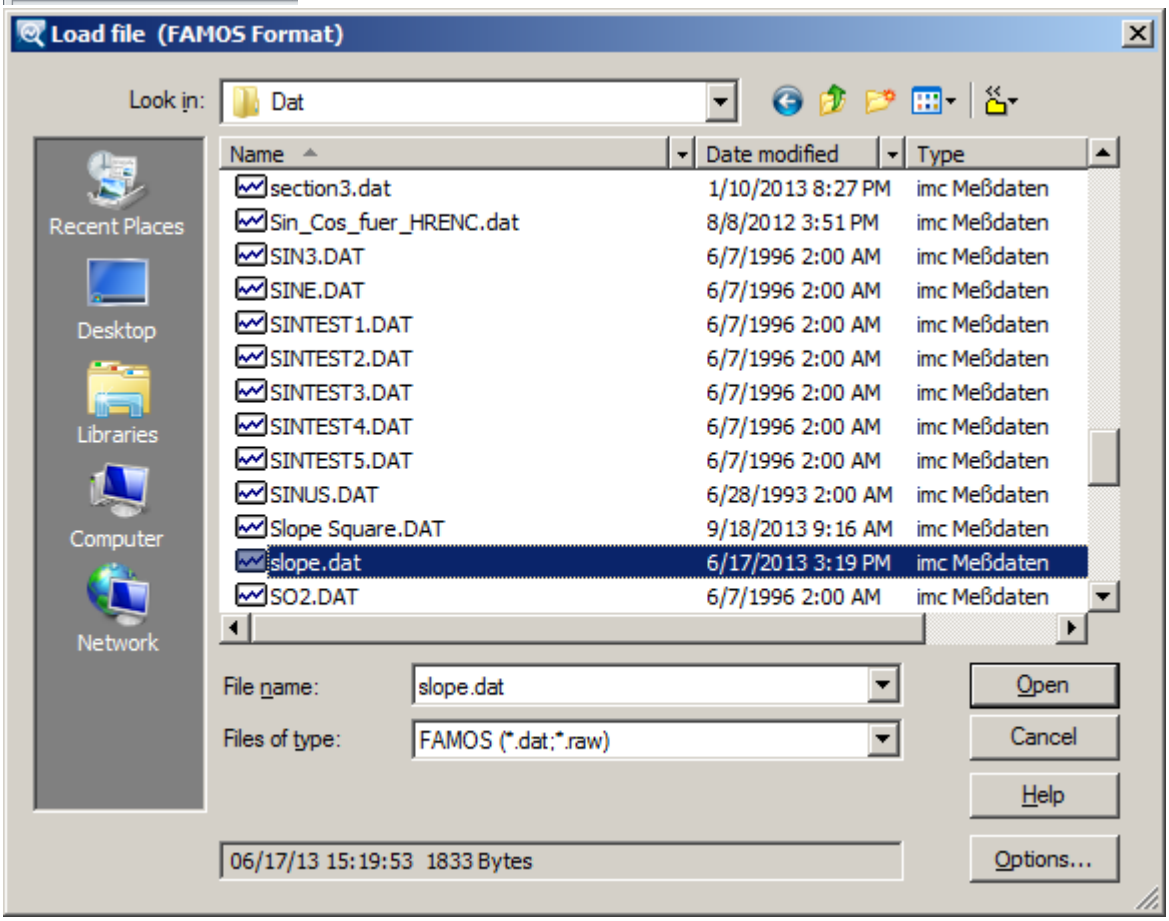
If unwanted directories are entered, simply change the appropriate entries. Confirm changes with <*OK*>, otherwise <*Cancel*>.

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5.4 Loading Files



In the multi-function bar "*Variable*", select the menu item "*Load*". A dialog appears for loading a file. Set the file format "*imc FAMOS* " below left in the format list. All data set examples are listed in the directory box. Double-click on "*slope.dat*" or select the entry and then press <*OK*> to load the file.



Dialog "Load FAMOS file"

The dialog box is closed and the file opened. The variable `slope` appears in the list.

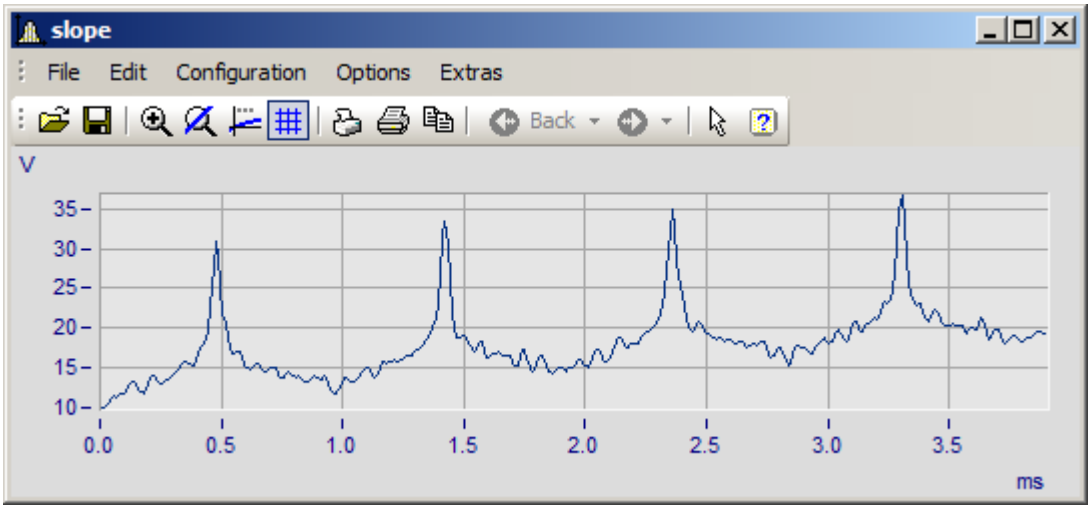
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5.5 Showing Variables

Select the entry `slope` in the variable list by clicking on it once.



Press function key F4 or select item "*Show together*" in menu "*Variable*". A curve window displaying the channel appears, with the variable's name as the title.



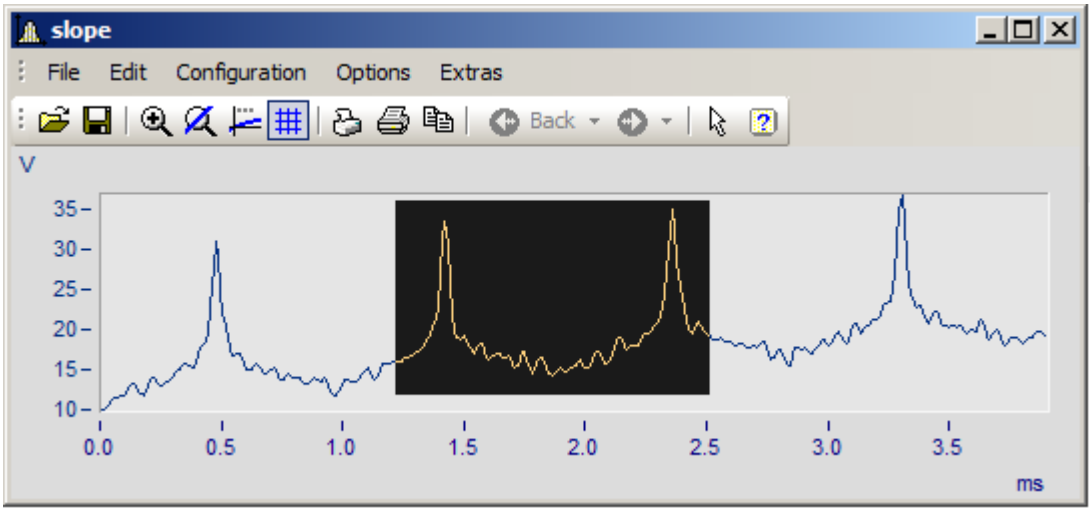
Curve window with variable "slope"

Move and enlarge the curve window somewhat and shift it away from the lower right corner of the screen.

5.6 Zoom

Select "*Zoom*" in the menu "*Edit*". The mouse cursor takes the shape of a vertical arrow.

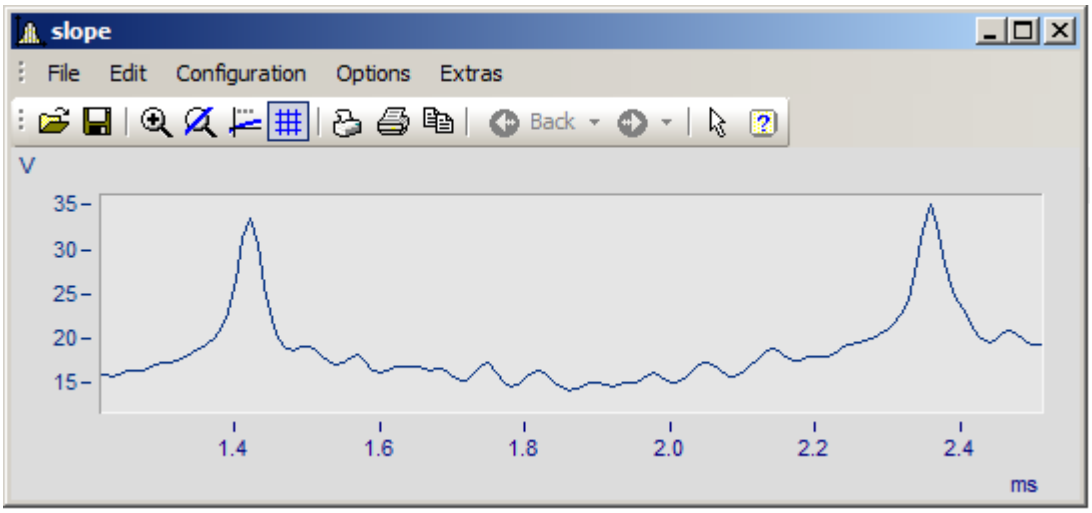
Stretch a selection rectangle around the desired region while holding down the left mouse button. The region is displayed with its colors inverted.



Curve window with zoomed section

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Select a range and release the mouse. The selected range is enlarged.



Curve window with zoomed waveform

To enlarge the curve section even more, simply repeat the process. Use the "*Back*" function if you wish to reverse the effects of the last actions.

Reference

'Curve Window' documentation, section 'Zoom'

5.7 Unzooming

Select item "*Unzoom*" in the curve window menu "*Edit*". The whole waveform can be seen again.

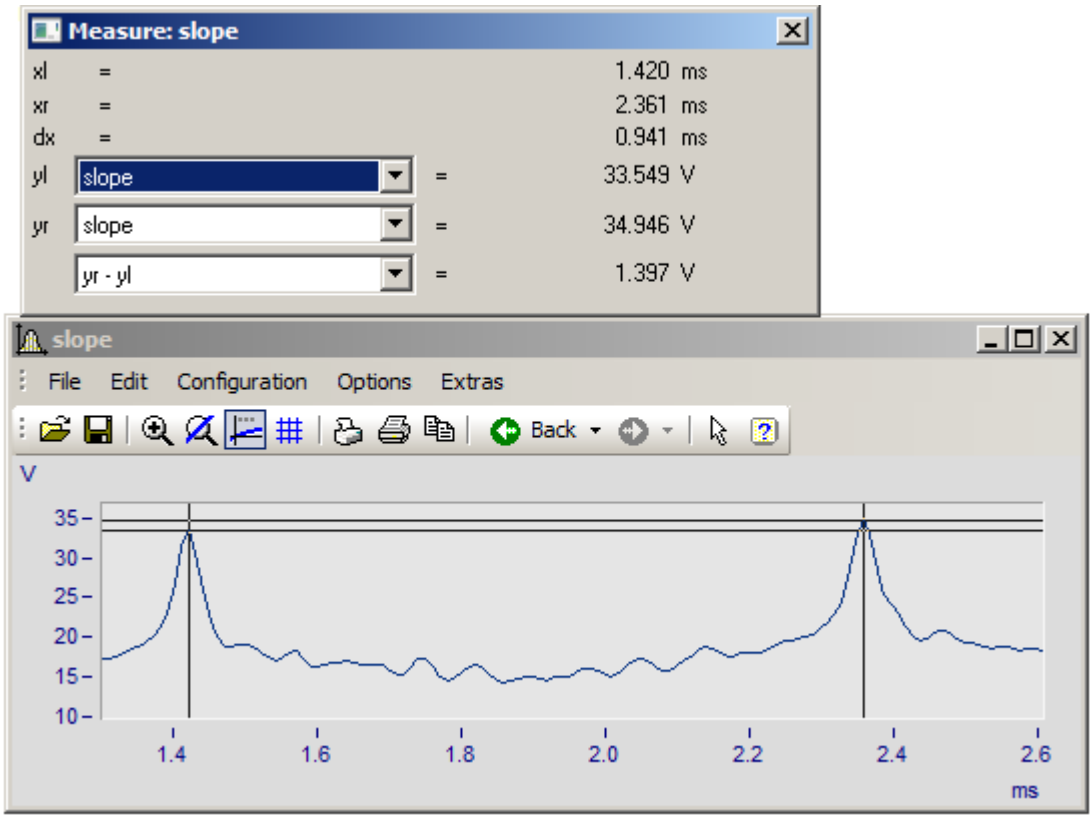
© 2025 imc Test & Measurement GmbH

5.8 Measure

To open the "*Measure*" window, select "*Measure*".

Two measurement cursors (crosshairs) appear in the curve window. The curves' values at the position of the measurement cursors are displayed in the measurement value window.

The x-value of the left crosshair is indicated by "xl = ..." and likewise with the right crosshair ("xr = ..."). The difference between the two x-values is indicated by "dx = ..." (dx = xr - xl). In the same way, "yl" and "yr" display the y-values of the two crosshairs. To move a crosshair, simply press the right or left mouse button and drag the it to the desired position. The crosshair follows the path of the waveform.



Curve window with measurement cursors (crosshairs)

The horizontal line tracks the curve's y-value.

As soon as you release the mouse button, the measurement results are displayed in the "*Measure*" window. By pressing moving the mouse while holding down both mouse buttons simultaneously, you can obtain measurements applicable to a constant dx. To quit the "*Measure*" mode, simply close the "*Measure*" window.

Reference

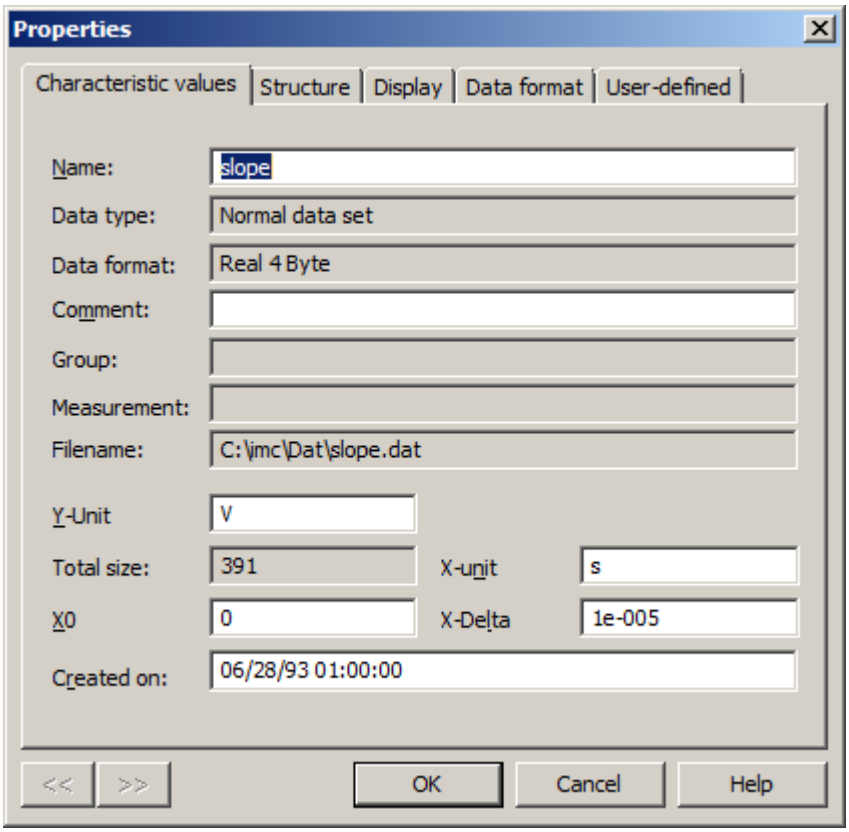
Curve Window' documentation, section 'Measure'

5.9 Properties

If the entry "*SLOPE*" in the Variables list is not displayed in inverted colors, select it by clicking on it.

In the menu "*Variable*" select the item "*Properties*" (alternatively, push the function key F5 or click on the corresponding symbol in the toolbar).

A dialog box of information on the data set "*SLOPE*" appears, containing its length (number of data points), sampling interval, units and comments.

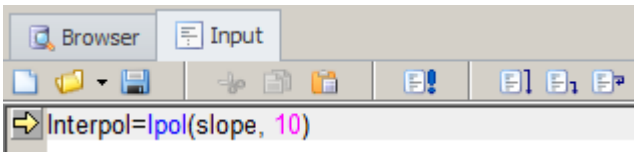


Dialog: Properties

Properties which cannot be edited are displayed in the background color (usually gray). To exit this dialog, select <*Cancel*>.

5.10 Interpolation

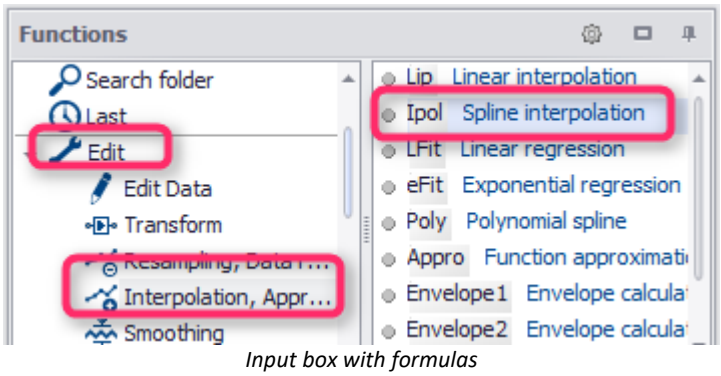
If you have zoomed extensively in the curve window, you must have noticed that the plot of the data set "*SLOPE*" is jagged. The channel consists of a finite amount of points. The graphical display in the curve window simply connects the data set's points by straight lines. If you wish to smooth the curve, you can generate a new data set on the basis of "*SLOPE*" by means of interpolation. To do this, enter the following formula in a new line in the Editor box:



This creates a variable `Interpol`. This new variable has a point density ten times greater than the data set `slope`.

"*IPOL*" is the name of the imc FAMOS function which performs such interpolation. This function has two parameters, the data set to be interpolated (here: "*Slope*") as well as the interpolations factor (here: 10). The result of this calculation is then assigned to the newly created variable "*INTERPOL*".

Enter the formula by proceeding as follows: first, type
`"INTERPOL ="`



Input box with formulas

Next, in the Functions box at left, select the branch *Edit\Interpolation.*

Alternatively, select Search folder and enter the word *Interpolation*.

Select the function *Ipol*.

Double-clicking on the entry IPOL copies the function name along with its corresponding parameter mask to the current position in the editor window.

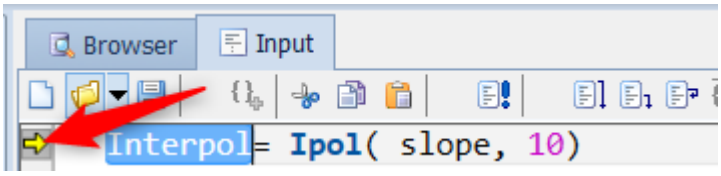
```
INTERPOL = IPol(,)
```

Next, double-click in the Variables list on the entry "*SLOPE*" (to the right of the symbol). The variable's name is copied to the Editor box:

```
INTERPOL = IPol(SLOPE,)
```

Click once with the mouse between the comma and the right parenthesis and type in 10. The formula is now complete.

Now, we can test the formula. The line just entered must be denoted as the active formula. To do this, double-click on this line, which then is shaded light gray, and to the left of the line a little arrow button then appears.



Execute command line with button

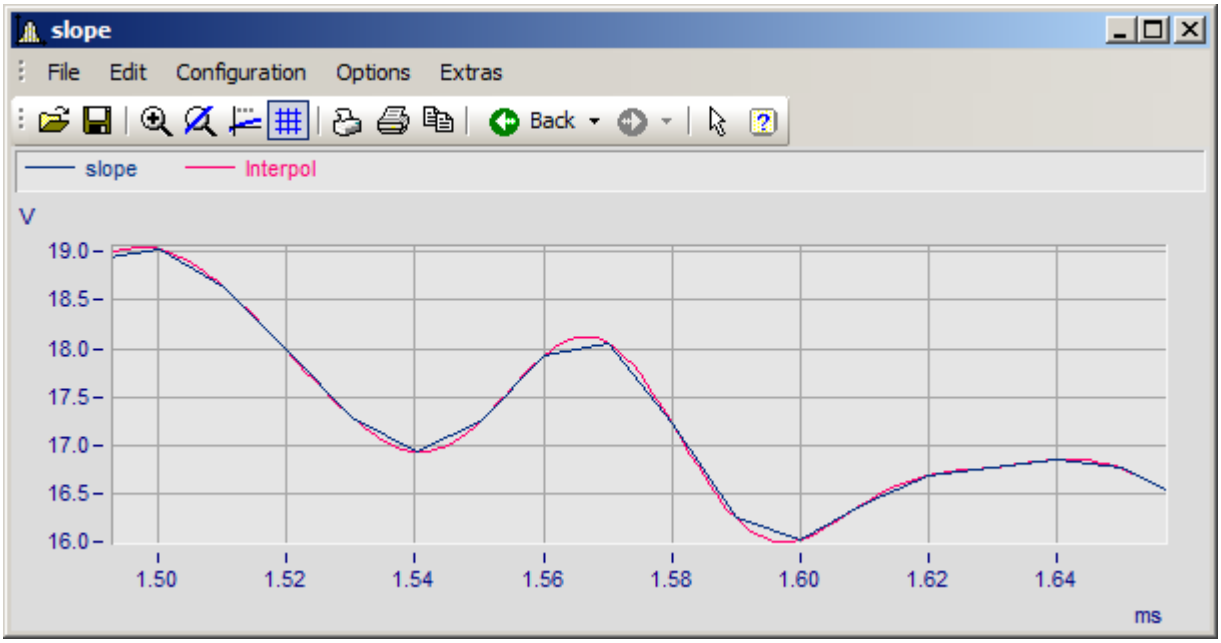
Thus, the currently active line is denoted in an unmistakable way, and by clicking on the button, the formula in this row is carried out.

Click on the button circled to execute the formula. If the formula was entered incorrectly, an error message appears. Correct the formula before attempting to execute it again.

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Alternatively, you can use the combination of keys "*CTRL*" + "*ENTER*" to activate and execute the line with the input cursor.

Once the formula has been successfully calculated, the entry `Interpol` appears already selected in the variables list. Use function key F4 or the appropriate button in the tool list to view data set `Interpol`.



Curve window with variable 'INTERPOL'

Close the curve window and activate the window `slope`. Select "*Unzoom*" to view the entire curve.

Remarks

- Function and variable names can also be entered in the editor window using drag&drop. Refer to *chapter 'User Interface', sections 'Variables List' and 'Function List'* 87.
- As an alternative to the methods of manually entering formulas named, the parameterizing Assistant can be used. To access this, select the function "*IPOL*" in the functions list and use the combination of keys "*SHIFT*" + "*F1*", or select the corresponding menu item in the function list's context menu.
- If you select a function in the functions list or click on a function name in the input box, then a short description ("Quickhelp text) of the function appears in the output box.

Reference

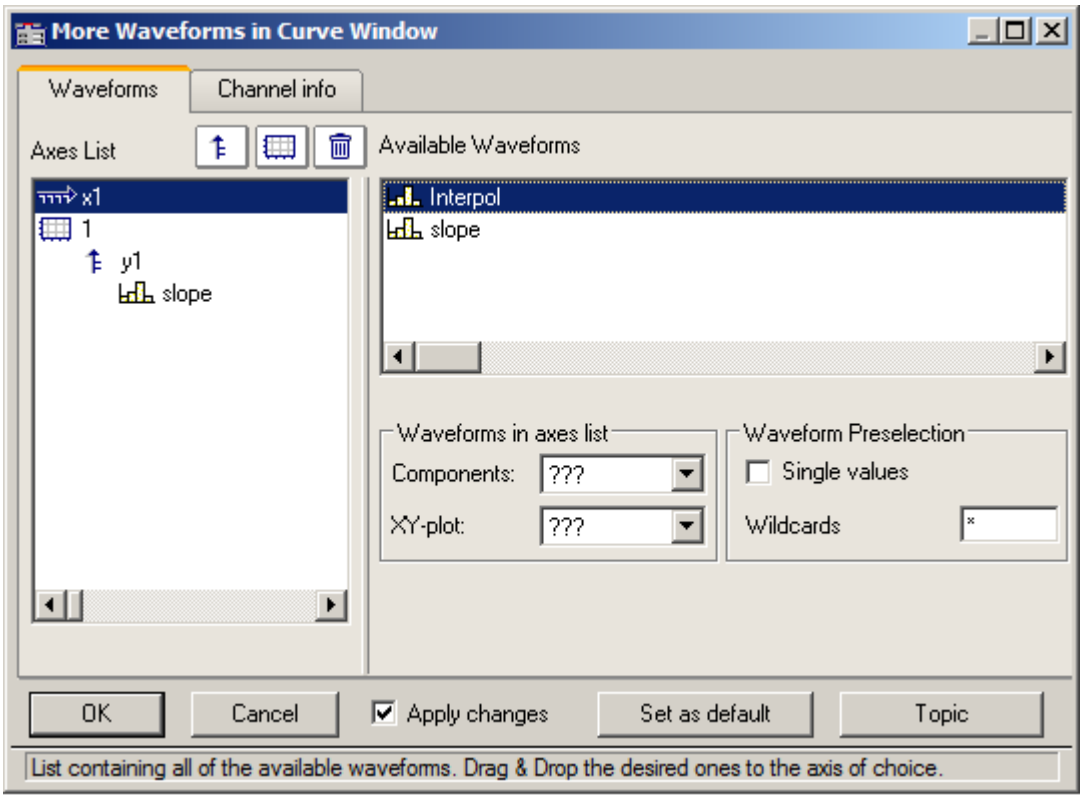
Chapter *'Functions'*, Section '*Function Assistant* 333'.

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5.11 Two channels in Curve Window

For better comparison of two curves, display both in the same curve window.

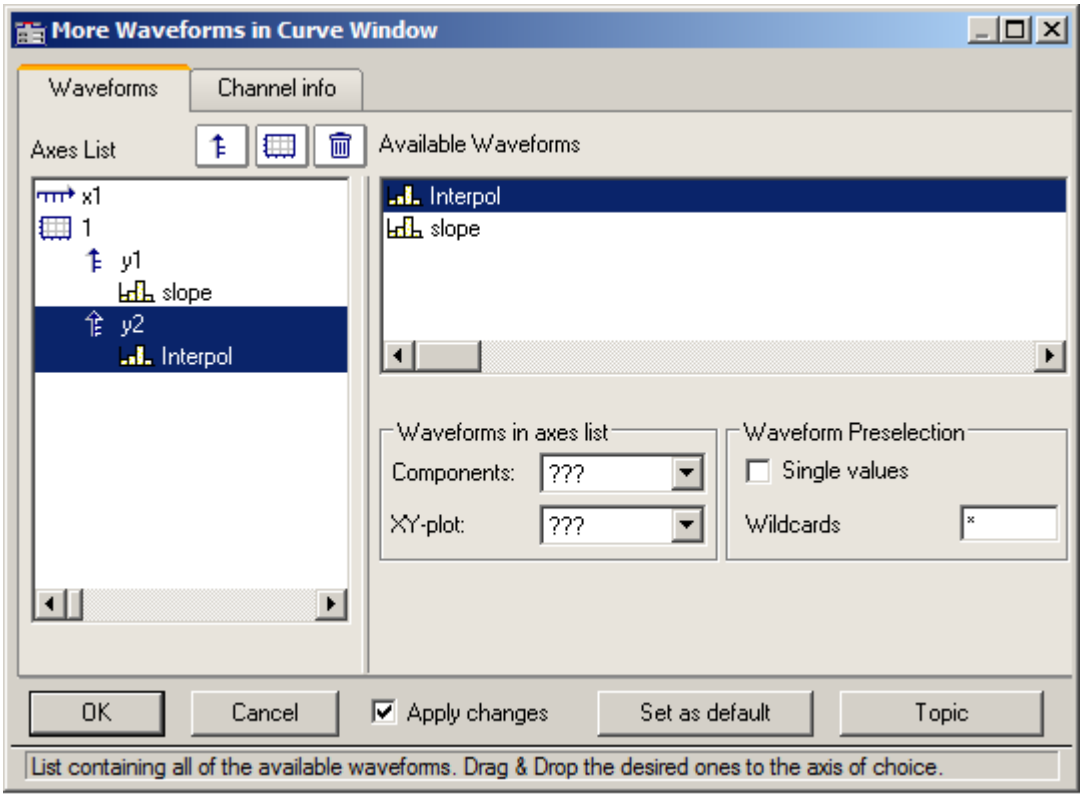
To do this, right-click in the curve window. In the context menu which then appears, select the item "*More Channels*...". In the following dialog, you can select additional variables and configure their appearance in the same curve window.



FAMOS: Dialog "More channels in curve window"

All data sets available for selection are listed in the list at right. The channels already displayed are indicated in the list at left.

Click on the data set *interpol* in the right list and drag the mouse while keeping its button pressed to the left list below the variable *slope*. Next, enter *interpol* in the left box as the second curve. Click the leftmost of the three screen buttons and click onto the *interpol* entry, in order to cause this waveform to be displayed in the curve window, sharing the x-axis of slope, but featuring its own y-axis.



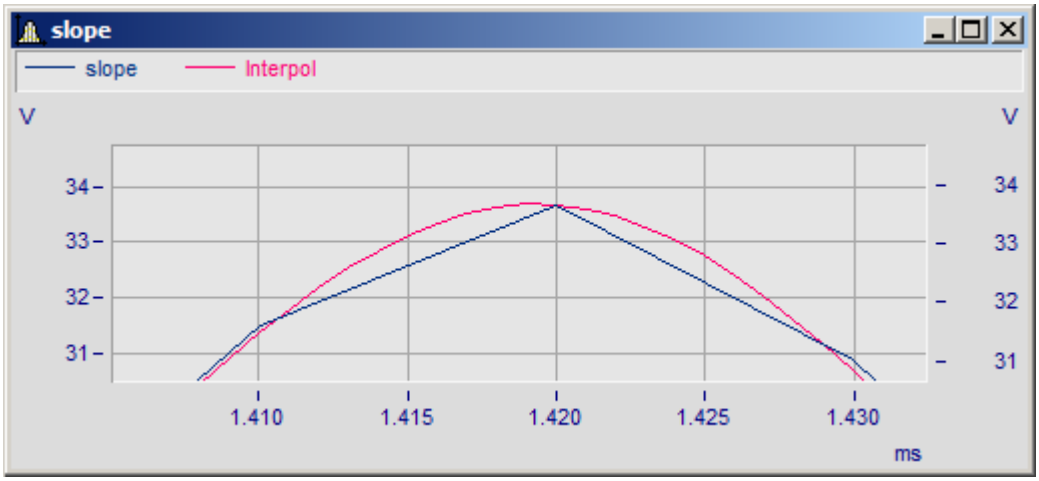
Curve window with two curves

Click on the screen button <*OK*>. The dialog is closed and the curve window redrawn, with two y-axes for two curves.

Note

The same result could be achieved by employing drag&drop on the data set's entry in the variables list; depositing the entry in the middle of the curve window.

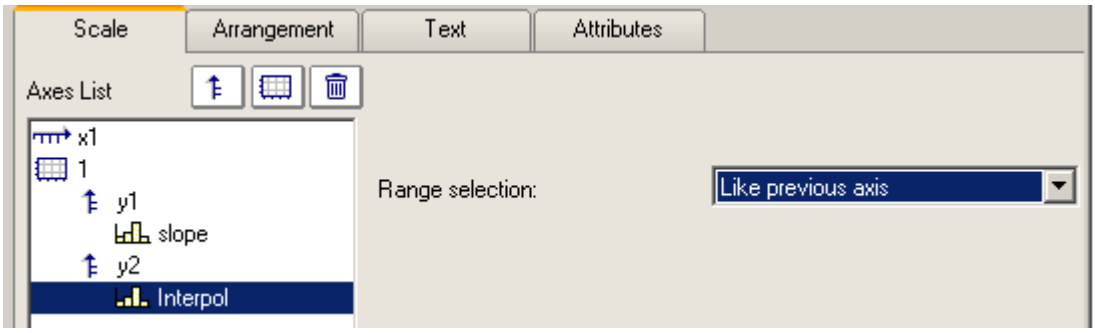
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Curve window with two curves (separate axes)

In order to compare two curves, it is useful to set the same value range for both curves. Double-click between labels of the right (2nd) y-axis or select the menu item "*Axes*"in the curve window menu "*Y*".

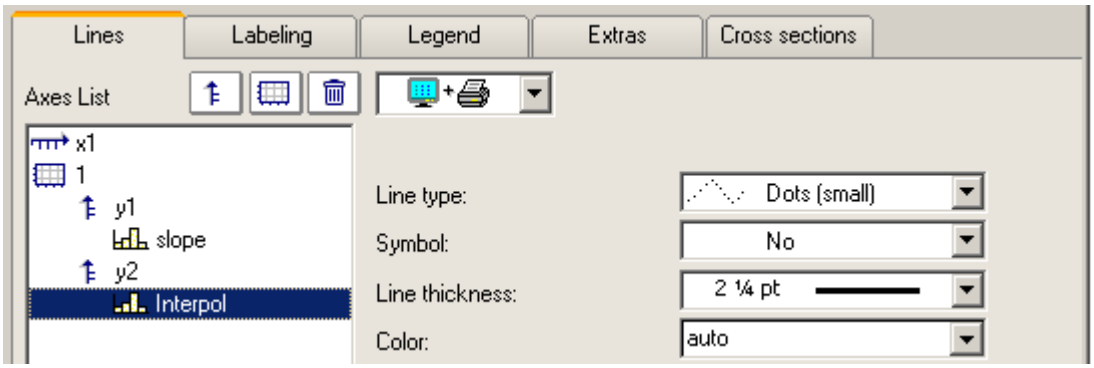
A dialog box for scaling the axis appears.



FAMOS: Dialog for scaling y-axes

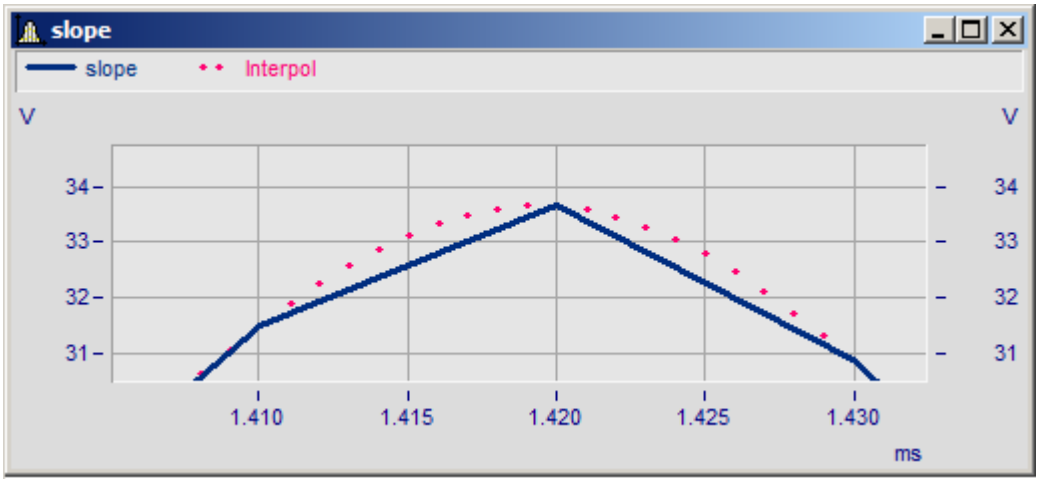
Select "*Range selection/ Like previous axis*" (base axis is the left y-axis).

We also wish to change the line style with which the curve "*INTERPOL*" is drawn. To do this, push the button "*Topic*" and from the menu which appears, select the item "*Lines*...".



Select from the axes list at left the data set "INTERPOL". Then select under "*Line type*" the item "*Dots*".

Select <*OK*> to close the dialog box. The curve window is redrawn. The right y-axis is deleted; the left y-axis applies to both curves, and is scaled according to the setup in the dialog box for selecting the range. The second curve (data set `INTERPOL`) is represented by a dotted line.



Curve window with two curves (common axis)

Note

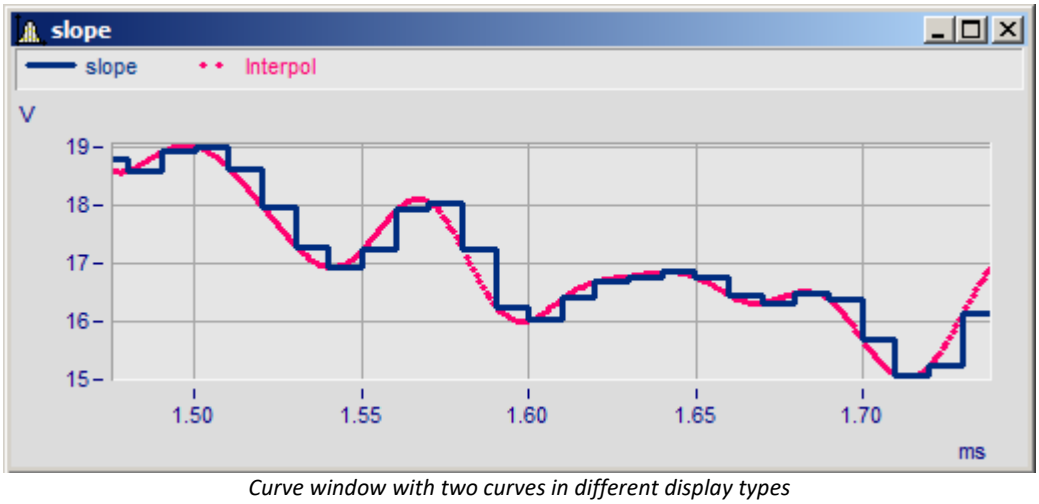
The same result can also be achieved using the previously discussed dialog "*More channels in curve window*", by selecting the y-axis in the axes list and clicking on the Delete icon.

Zoom into close range to see the dots clearly.

To make the two separate waveforms yet more distinct, display the data set `slope` (1st curve) in a stair-step display.

To do this, select the menu item "*Configuration/Lines*". From the axes list which appears at the left of the dialog, select the item "*SLOPE*".

Select "*Steps*" in the menu "*Line type*" selection list and then select <*OK*>. Zoom in the new curve display. Here, the function "*IPol*" was used to interpolate the data set `slope` through cubic splines.



Curve window with two curves in different display types

5.12 Changing a Formula

Change the formula to get a lower interpolation factor.
INTERPOL = IPol(SLOPE, 3)
There are two ways to do this:

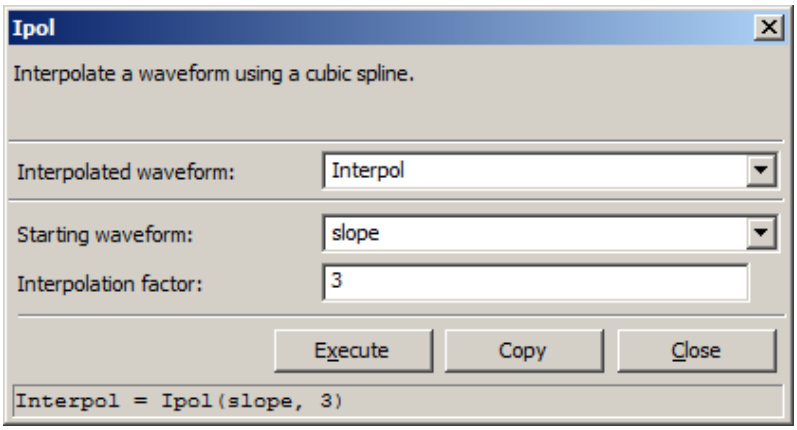
Changing the formula in the Editor

Use either of the keys BACKSPACE or DELETE to delete characters and change the parameter.

To apply the change, press the key combination Ctrl + ENTER. Alternatively, activate the line by double-clicking and then click on the "*Execute*"-button. The curves displayed are updated.

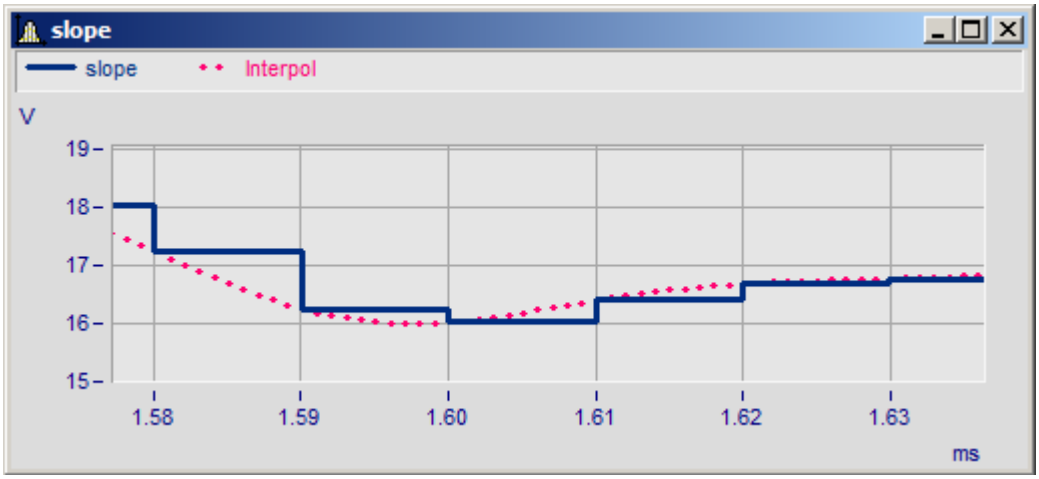
Calling the Formula Assistant from the Editor

Click on the function so that the cursor is on the blue letter. Press SHIFT + F1.



Open Formula Assistant with SHIFT + F1

The Formula Assistant for the IPol() function appears with the parameters entered. The function is selected in the Editor. Change the parameter in the Assistant and click on "*Execute*". In the curve window, you can observe the change directly. if you are satisfied with the result, you can overwrite the line by clicking on "*Copy*" in the Editor.



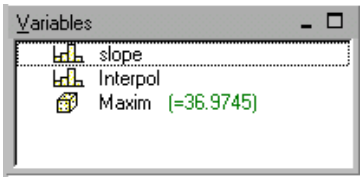
Curve window with two curves in different display types

5.13 Single Values

Calculate the maximum of the data set `slope`. Enter the following formula in the Editor box on a new line:
`Maxim = Max(SLOPE)`

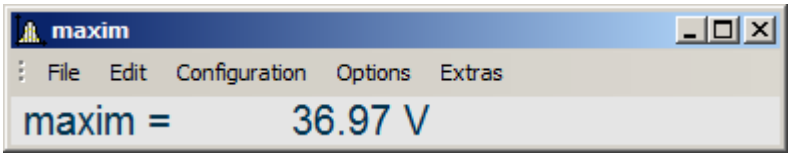
The function "*Max*" is found e.g. in the branch *Analysis**Statistics* of the Functions tree diagram.

After the formula has been executed by pressing "*CTRL + RETURN*", a further entry appears in the variable list:



The dice symbol shows that the value is a single value, occupying no extent of time, in contrast to the data sets `slope` and `interpol`. If the value of the variable "*Maxim*" is not displayed, activate the option "*Single value: show content*" in the dialog "*Extra/ Options/ Variables list...*".

The value can also be displayed in a single value window by pressing F4.



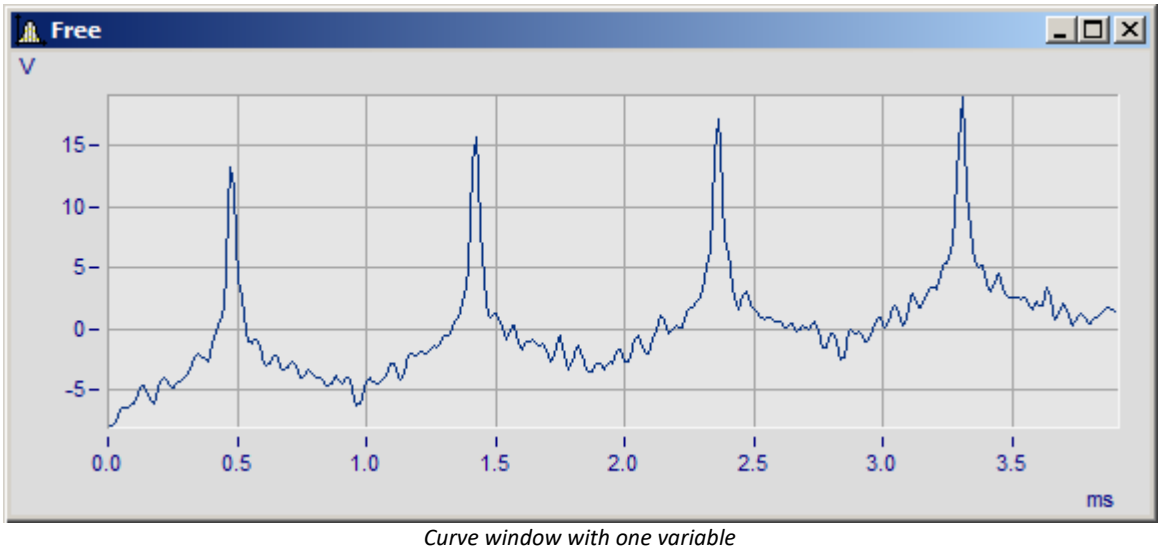
Single value window

5.14 Calculations

A new data set is to be generated by reducing the data set `slope` by its mean value:
`FREE = SLOPE - Mean(SLOPE)`

The function "*Mean*" (e.g. in the branch *Analysis**Statistics**Standard* of the Functions tree diagram) calculates the arithmetic mean of the specified channel. This mean value is subtracted from the data set `slope`.

Execute this formula and display the data set "*FREE*" by clicking on the curve symbol in the tool bar.



Curve window with one variable

You will notice that the waveform "*FREE*" has the same shape as the data set `slope`, but all its values have been decreased by the mean value of `slope`.

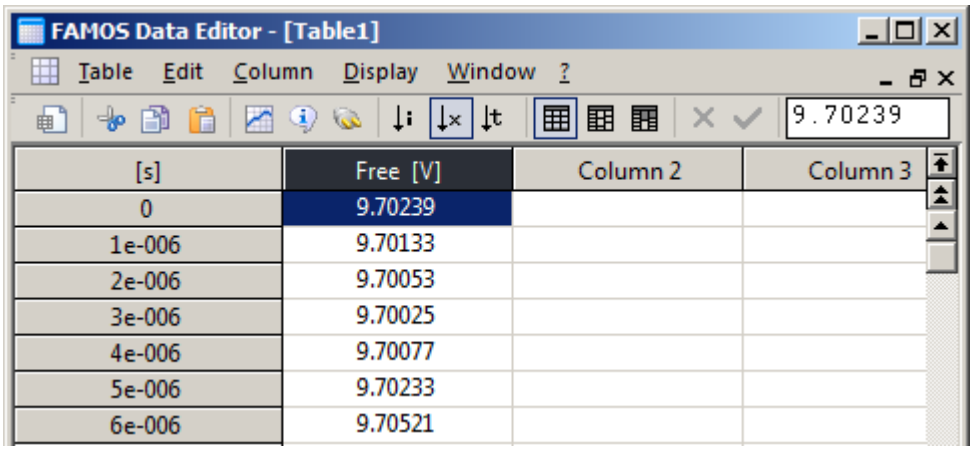
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5.15 Data Editor



Select "*FREE*" in the variable list, which you have previously generated in the chapter Calculations 161. Then select the icon "*Data Editor*" in the Variables toolbar.

A new window appears. A table listing the individual numerical values of the data set "*FREE*" is found in the left column.



Data Editor

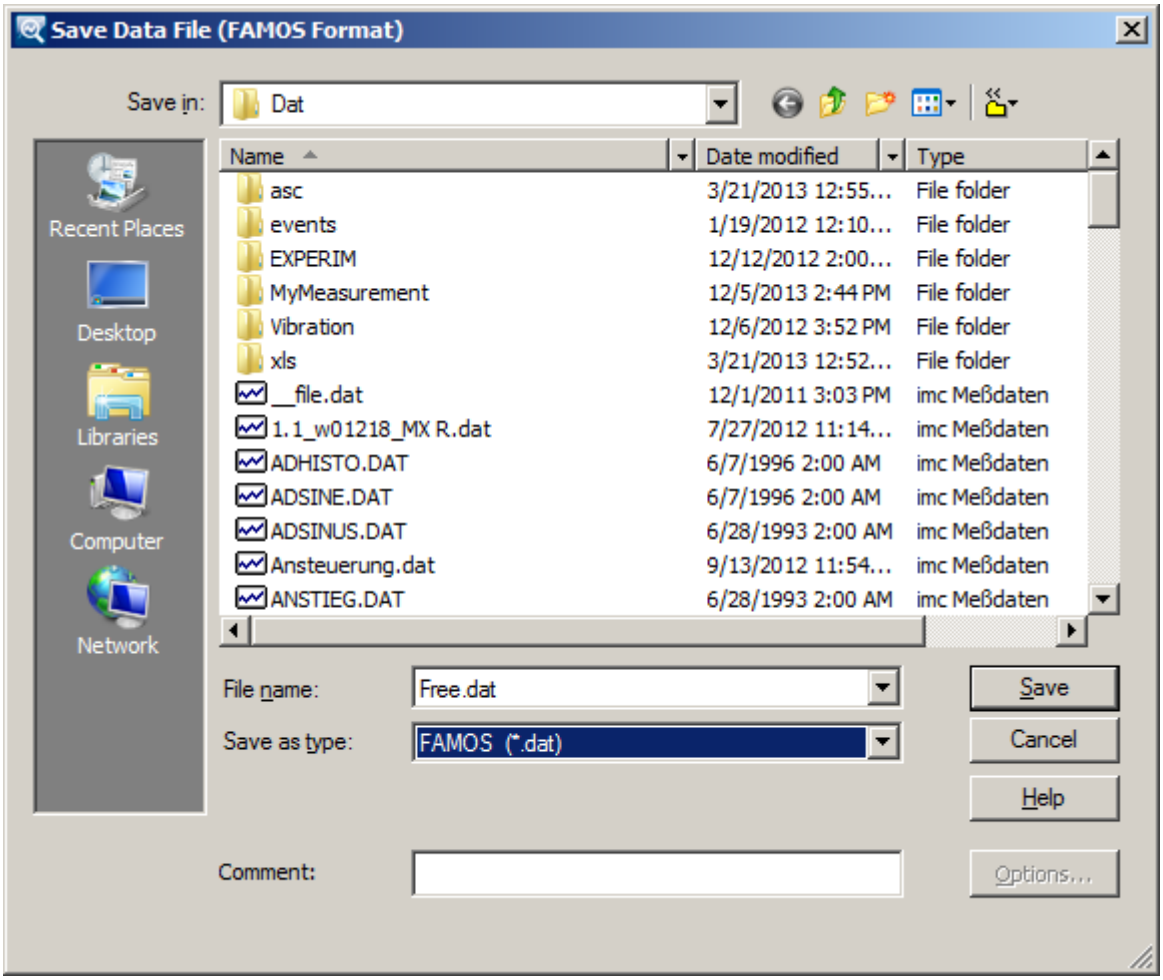
Use the scroll bar on the right side to view further numerical values. Close the window.

Reference

Chapter 'Data Editor 583'.

5.16 Saving results

Select "*FREE*" in the variable list and "*Save Individually*..." in the menu "*Variable*". A dialog box appears for entering a file name under which the variable should be stored. Set the file format to "*imc FAMOS* ". The file "*FREE.DAT*" is created by selecting <*Save*>. This data set may be reloaded later.



Dialog "Save File"

Reference

Chapter 'File Management 173'.

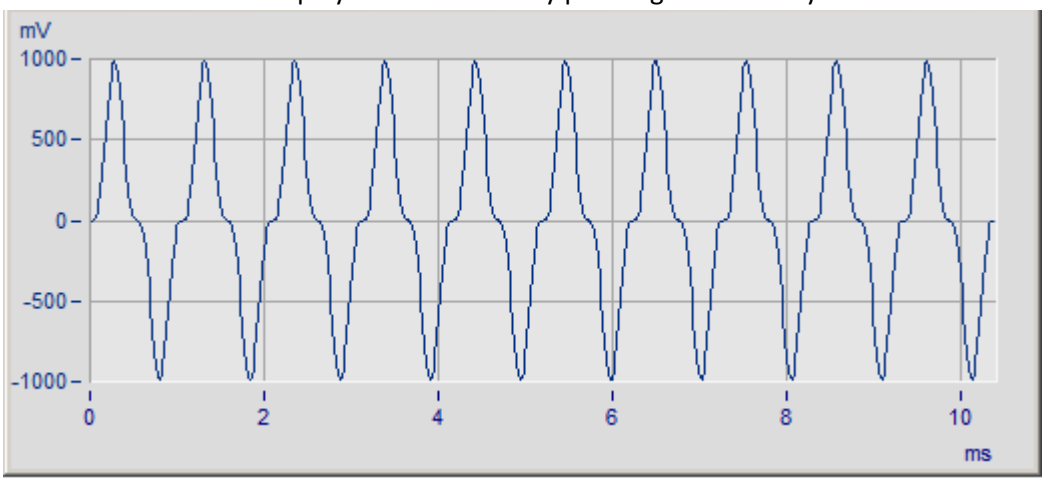
5.17 Deleting variables

The variables "*FREE*", "Maxim" and `interpol` are no longer needed and should be deleted from the Variables list. First select these variables in the Variables list, then select "*Delete*" in the menu "*Variable*". The only entry remaining is the variable `slope`.

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5.18 Spectrum

Load file "*SIN3.DAT*". Display the waveform by pressing function key F4.



Curve window displaying variable "sin3"

The data set contains several periods of a sine-shaped signal, which has a strong third harmonic (second harmonic oscillation). The distortion of the signal around its zero passages is typical for such a curve.

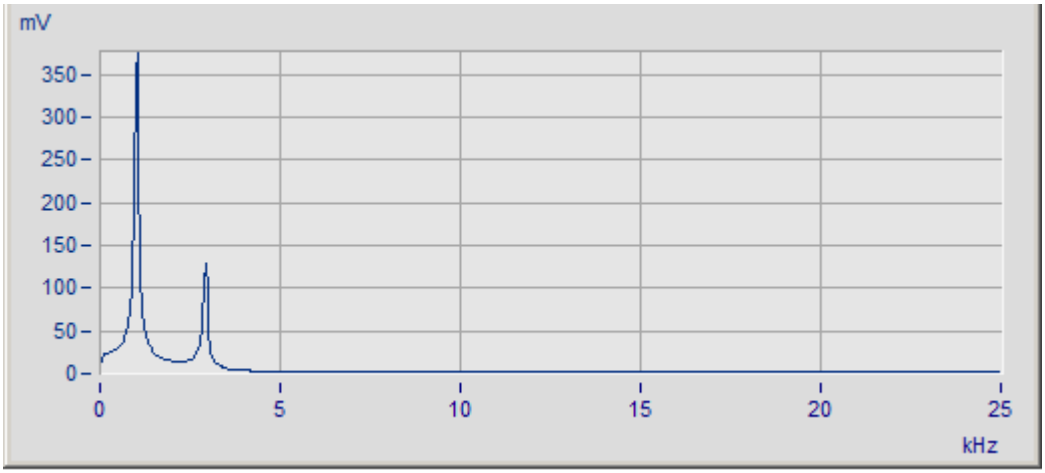
Enter the following formula to calculate the spectrum of the variable "*SIN3*":

```
SPECTRUM = Spec(SIN3)
```

The function "*Spec*" is found e.g. int he branch *Analysis\Spectral Analysis\General*. Double-click on this line in the functions list, as well as on the variable "*SIN3*" in the variable list. Complete the formula using the keyboard.

Execute the formula. "*SPECTRUM (MP)"* appears in the variables list. A complex variable was generated in Magnitude / Phase (MP) representation.

Press function key F4 to display the spectrum magnitude in the curve window.



Curve window displaying magnitude of spectrum

The magnitude of the spectrum exhibits a strong fundamental wave and a somewhat smaller second harmonic oscillation.

Note that the fundamental wave has a somewhat smaller amplitude than the signal "*SIN3*". The amplitudes of the oscillations correspond to those which would be exhibited by a selective voltmeter.

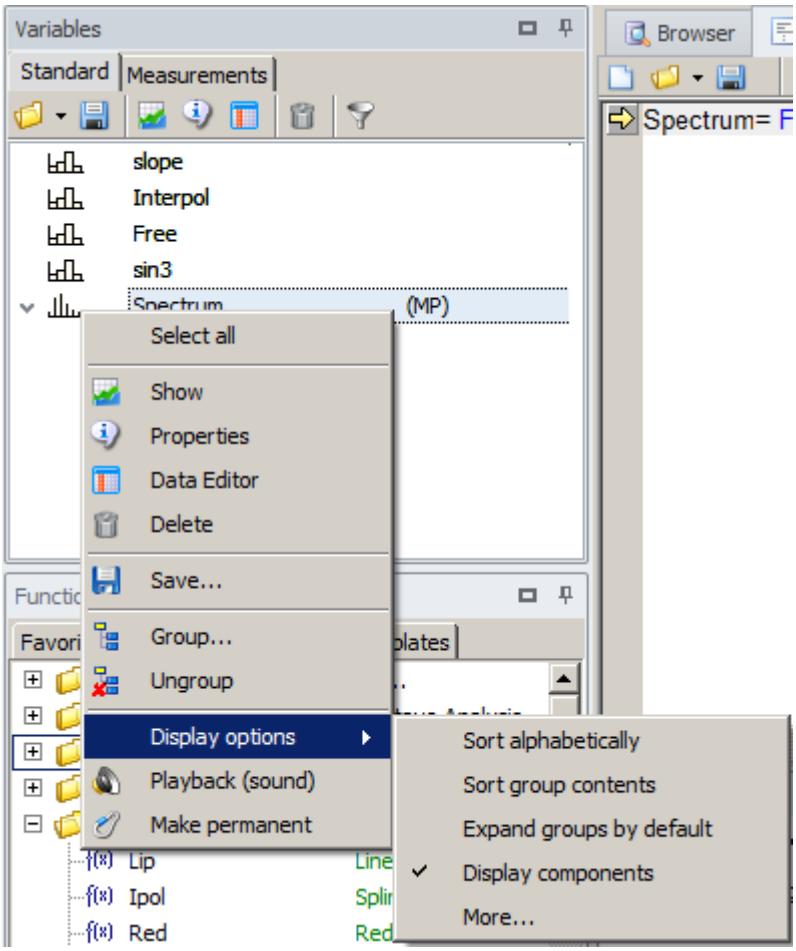
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Note

The Spec function is based on Fast-Fourier-Transformation, which is the function FFT() in the same group. These calculations normally require additional parameters such as windows and window widths. As a quick way to enter the parameters, they are entered globally under Options 331.There, you will set up the data window and decide whether to interpolate the data set to obtain a number of points which is the nearest power of 2, or to fill the data set with zeroes. In the example, the window was set to "*Square*" and "*Fill with zeroes*" was deactivated.

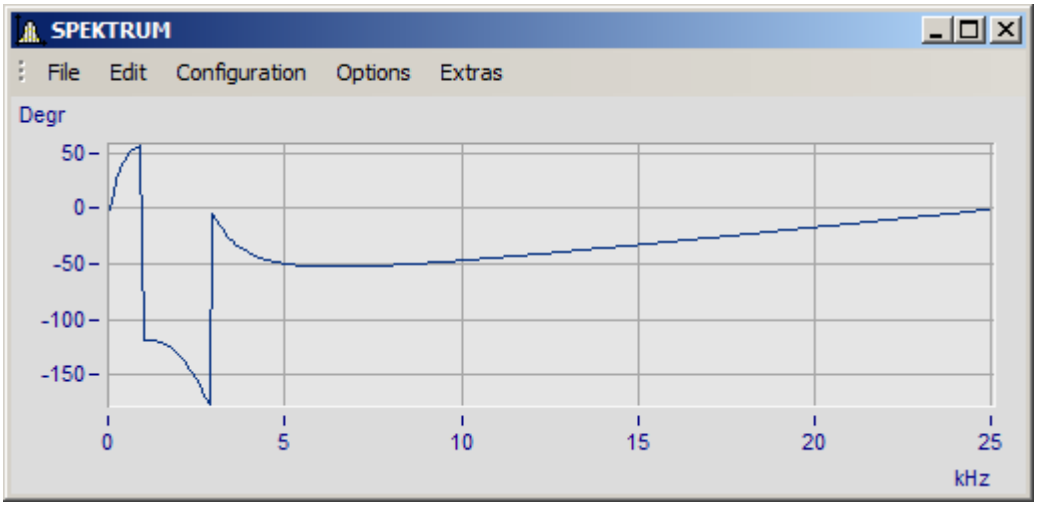
5.19 Complex data sets

If "*Spectrum.M*" and "*Spectrum.P*" are not indicated in the Variables list, move the mouse pointer into the variable box and right-click the mouse. Click on "*Show Components*" in the context menu.



This menu item is checkmarked if and when it is active. Additional entries now appear in the Variables list: "*SPECTRUM.M"* and *"SPECTRUM.P*". These are the magnitude and phase components, respectively, of the complex data set.

Select the entry "*SPECTRUM.**P***" in the Variables list by clicking once. Press function key F4 to display the phase of the spectrum in a curve window.

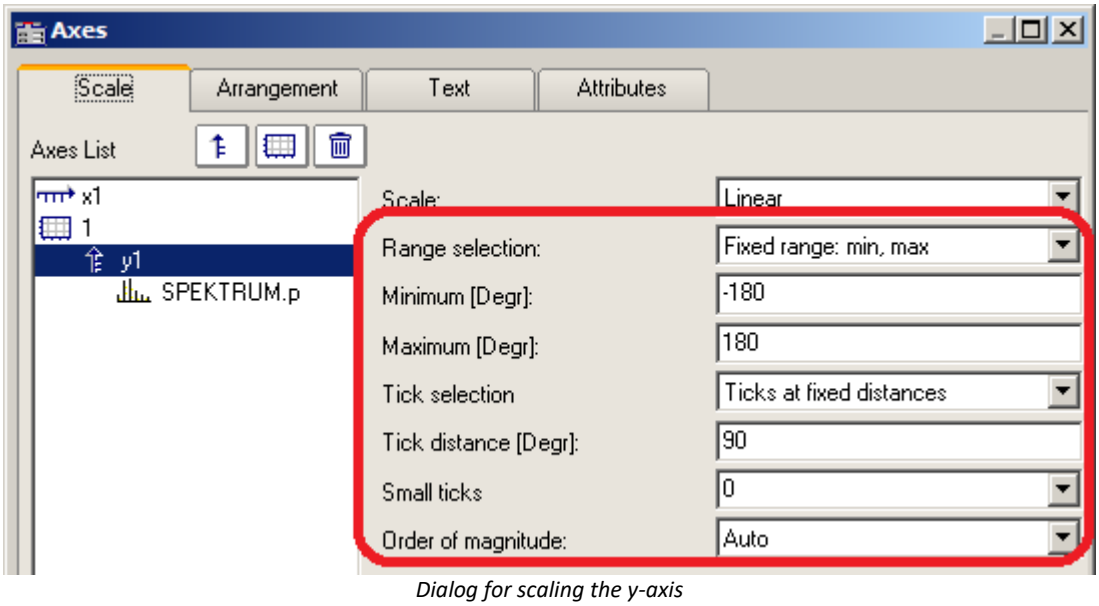


Curve window with phase of spectrum, unscaled

The phase spectrum should be displayed from -180° to +180°.

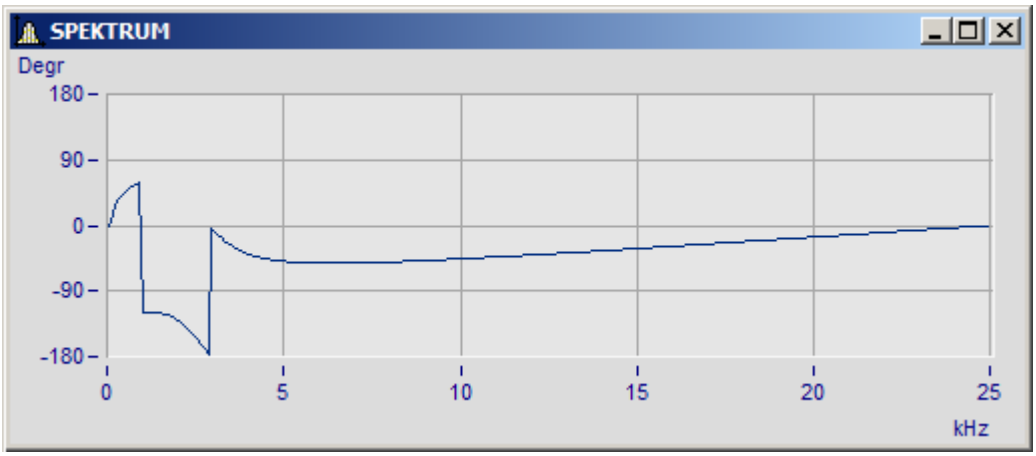
Double-click in the space between the y-axis labeling in the curve window *SPECTRUM.P*. A dialog appears for scaling the y-axis.

Under "*Range selection*", select "*Fixed Range: min, max*" from the menu "*Range*", and enter in the corresponding text boxes *Minimum = -180 degrees, Maximum = 180 degrees* and *Tick selection = "Ticks at fixed distances"* "*Tick distance"* = 90.



Dialog for scaling the y-axis

Click on <*OK*> to close the dialog.



Curve window with phase of spectrum, scaled

imc FAMOS now attempts to display the specified range from -180° to +180° with appropriate axis labels.

5.20 Creating sequences

A sequence (also called a macro) is a series of operations which imc FAMOS executes automatically in the specified order. Frequently used series of operations can be automated by creating sequences.

Suppose, for example, the "*frequency*" of signal "*SIN3*" is to be found. Here we will define the "*frequency*" as the maximum oscillation occurring in the spectrum of the signal.

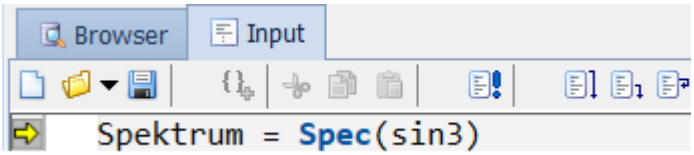
First open a new, empty sequence. Right-click the mouse over the Editor box's title bar and select the item "*New*" in the context menu which then appears. Alternatively, you can use the combination of keys "CTRL"+"N" or the corresponding icon at the upper left of the Editor box's toolbar.

A new tab then appears in the Editor box's title bar, "*Unnamed0*". This is then active and the sequence it pertains to (which is empty at the moment) is displayed. Any other sequences, whether newly created or already opened, would be displayed in the same way; to move between sequences, simply click on the tab in the title bar which is associated with the sequence desired.

First, activate the standard Editor box (the tab all the way to the left) and select the previously entered formula

```
SPECTRUM = Spec(SIN3)
```

using the mouse. Via the context menu or by means of "*CTRL"+"C"*, copy the formula text to the Windows Clipboard. Switch back to the new sequence and enter the formula text into the sequence as the first line by way of the context menu or "*CTRL"+"V"*.



Sequence Editor (with command)

Now enter the following formula in the next line:

```
Freq = Pos( spectrum.m, Max (spectrum.m))
```

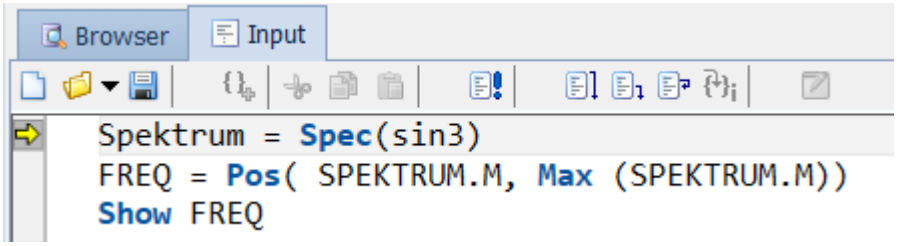
The x-position of the spectrum's maximum magnitude is determined. Execute this formula once as a test by double-clicking in the command line and then clicking on the arrow key (appearing at the left of the command currently in readiness), or alternatively, *CTRL + ENTER*. Correct any errors if an error message appears.

Now enter the line

```
SHOW freq
```

in the text window. This command displays the variable "*FREQ*" in the curve window.

You have created a sequence consisting of three commands.



Sequence Editor

5.21 Executing sequences

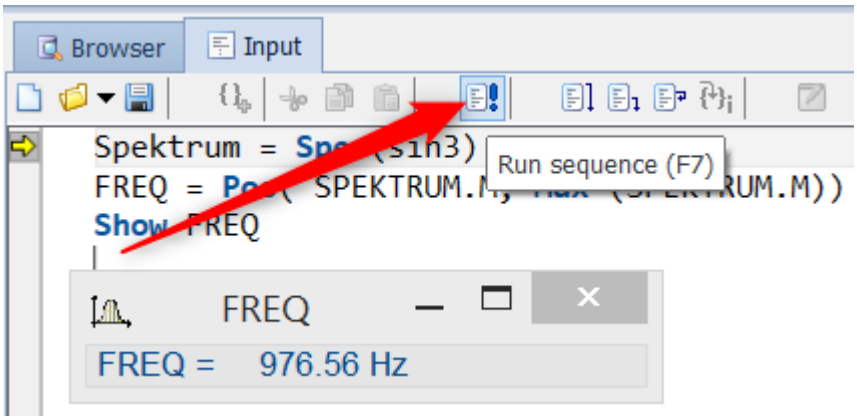
First delete the variables created in the sequence.

Select entries "*SPECTRUM...MP*" and (if present) "*FREQ*" and then select "*Delete*" in the menu "*Variable*".

Now select from the context menu (accessed by right-clicking the mouse over the Editor box's title bar) the menu item "*Execute*". Here, too, you have the alternative to use the keyboard ("F7") or the corresponding icon in the editor box's toolbar.

The sequence is now carried out, starting from the first line.

At the end of the sequence, a single value window is displayed indicating the calculated frequency.



Single value

5.22 Changing sequences

The procedure introduced for determining the frequency works only for signals with a relatively small offset. Therefore, the signal's mean value shall be removed.

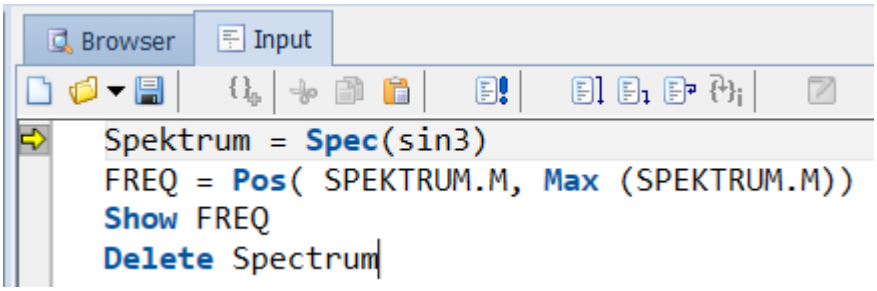
Change the first line in the Sequence Editor as follows:

```
SPECTRUM = Spec( SIN3 - Mean(SIN3))
```

The calculated data set "*SPECTRUM*" should automatically be deleted because it is used as an intermediate result in the sequence. Enter the following line at the end of the Editor box:

```
Delete spectrum
```

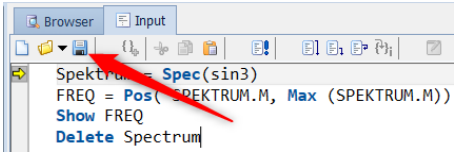
Restart the sequence.



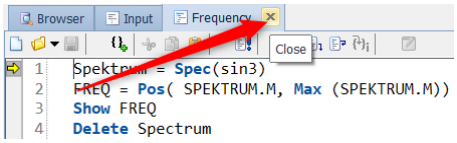
Sequence-editor

5.23 Saving sequences

Select the menu item *"File" / "Save"* 118 or right-click the mouse on "*Input*" and then "*Save As...*". Save the sequence under the name "*Frequency.SEQ*".



Alternatively, you can save the sequence by clicking on the diskette icon in the Editor.



Close the sequence you just made by clicking on "X", or select the context menu item "*Close*".

You can now run the saved sequence directly. To do this, enter the command:

```
SEQUENCE Frequency.SEQ
```

The file "*Frequency.SEQ*" is opened in the background and the sequence it contains is executed.

5.24 Creating documention with Panels

After analysis of the measured data, documenting the results is usually the next step. This means not only saving the file, but also the creation of various documents (either digital or hard copy) for the saving and presentation of the results.

Create a report page for documentation of results.

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Procedure

Load the data set **slope** and use the following command lines to obtains its statistics values:

```
FAMOS
LOAD slope
Maximum = Max(slope)     ; Group: Analysis > Statistics > Generic
Minimum = Min(slope)
MeanValue = Mean(slope)
```

- Create a Report page as a Panel. Go to the menu item *File-> New-> New Panel-> Report (Portrait*).
- In the tool window at the bottom left, select *Standard>Label* and then in the Report page drag open a frame for it (holding down the left mouse button).
- Next, leave the tool window and go to the Properties window. In the text box under the item Text, enter a title for your report. Under Font, you can alter the font and font size.
- Go to the page *Edit* under *General* and use "*Insert Widget*" *> Standard > Image* to add a placeholder for an image to the report. In the Properties window under *Image*, select a picture or logo on your hard drive and have it displayed.
- In the Standard variables list, highlight the channel "slope", drag it to an empty area in your report and release the left mouse button there. Select Standard for a standard curve window.
- Select the results Maximum, Minimum and MeanValue in the Variables list and drag them together to below the curve window of the channel "slope". After releasing the left mouse button, select the option "*Numerical*".
- To see the complete page, right-click at the bottom right in the Zoom box on the rectangle.

Save this page as part of the Panel using *File -> Save* and assign it the filename **FirstPanel.panel**.

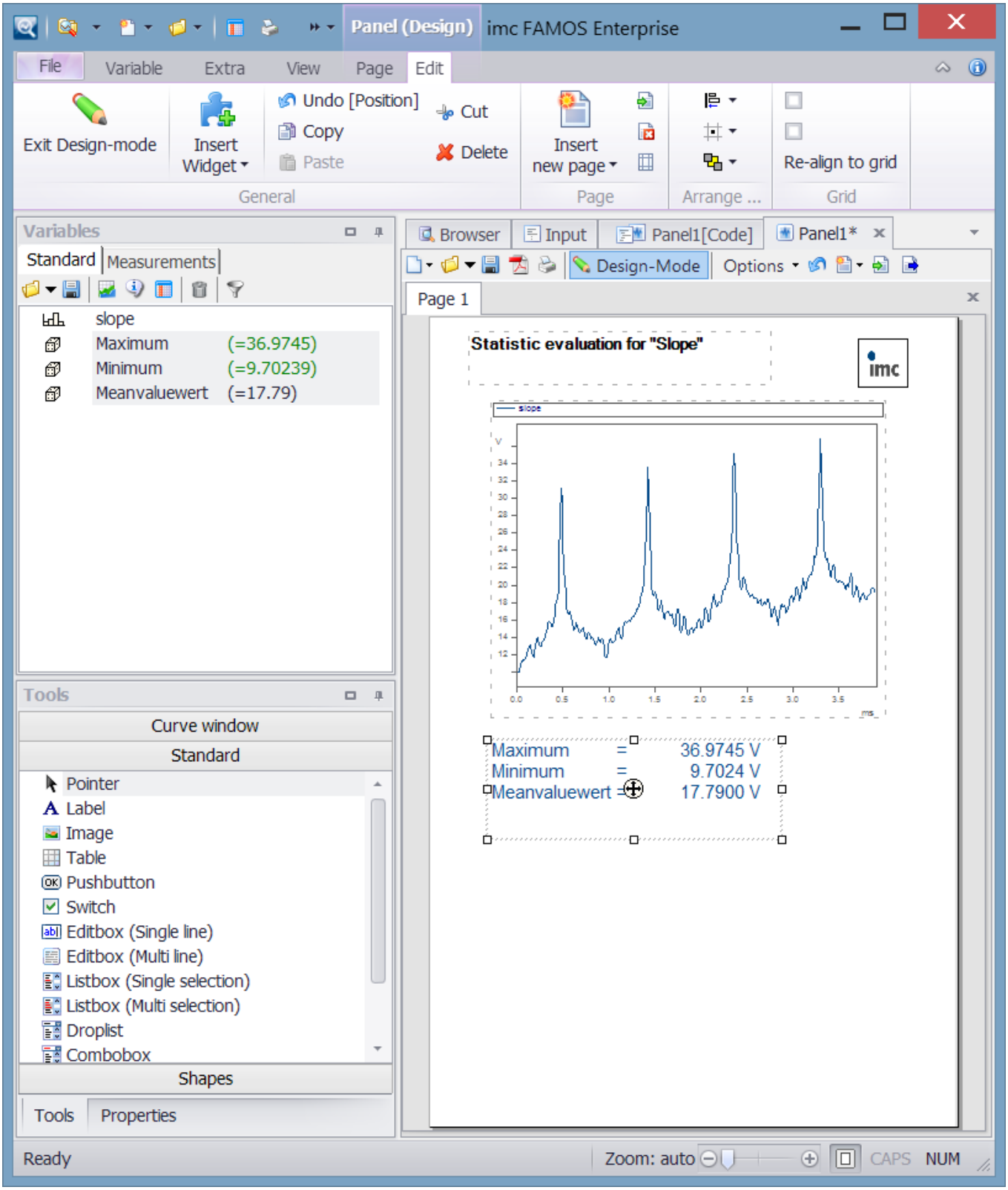
Export the report as a PDF using *File -> Export as PDF* under the name **PDFReport.pdf**.

Result

You have created as report which was also exported as a DIN-A4 page PDF.

Within a Panel, you can also create multi-page reports and of course export all of them in PDF.

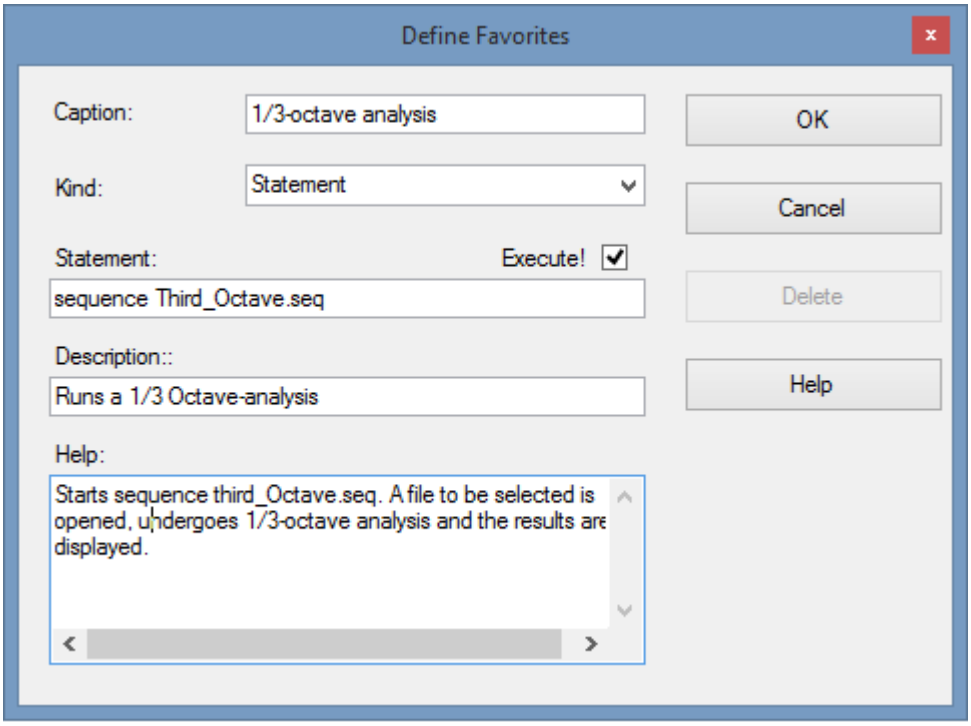
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Panel (Design)
imc FAMOS Enterprise
File
Variable
Extra
View
Page
Edit
Exit Design-mode
Insert Widget
Undo [Position]
Copy
Paste
Cut
Delete
Insert new page
Re-align to grid
General
Page
Arrange ...
Grid
Variables
Standard
Measurements
slope
Maximum (=36.9745)
Minimum (=9.70239)
Meanvaluewert (=17.79)
Tools
Curve window
Standard
Pointer
Label
Image
Table
Pushbutton
Switch
Editbox (Single line)
Editbox (Multi line)
Listbox (Single selection)
Listbox (Multi selection)
Droplist
Combobox
Shapes
Tools
Properties
Browser
Input
Panel1[Code]
Panel1*
Design-Mode
Options
Page 1
Statistic evaluation for "Slope"
imc
slope
Maximum = 36.9745 V
Minimum = 9.7024 V
Meanvaluewert = 17.7900 V
Ready
Zoom: auto
CAPS
NUM

5.25 Favorites

Formulas or sequences used frequently can be entered into a list of favorites, in order to save on time spent typing.

Open the context menu by right-clicking the mouse over the list and select the menu item "*New Entry*". In the dialog which then appears, enter a short, descriptive name under "*Caption*", e.g. "*1/3-octave analysis*". The actual text is entered in the *Statement* box. You can, for example, enter the formula manually, or use "Copy" and "Paste" to get it from the editor box, or even easier, use the formula input box's context menu to transfer in the currently active line in the editor box. Now you can also enter a short description and a help text.



Dialog for definition of "Favorites"

The option *"Execute!*" ensures that the entry will be executed upon double-clicking on it.

The new entry is now shown in the Favorites list; double-clicking on it is enough to have the sequence "*Third_Octave.SEQ*" carried out.

Reference

Chapter 'User Interface', Section 'Administering Favorites 140

6 File Management

6.1 Introduction

In this chapter you will learn how to read in data files of various formats to imc FAMOS and how to save your results in a file.

In order to load a file in imc FAMOS , the format in which values are saved in the file must be found. The format depends on the origin of the file, e.g. the program or measuring device where the file was originally created.

Load/Import

The system also includes a large number of import- and export filters for common file formats (e.g. the standard formats of different manufacturers of measurement devices). An overview is presented here: Import- /Export filters.

Once a file is successfully loaded, data sets contained in the file are declared as variables in imc FAMOS and entered in the Variables list.

Selection among viewable formats is performed in the dialog "*Manage import filters* 177".

ASCII files can easily be imported using the ASCII Import Assistant 186. The settings can then be saved as import formats.

Finally, the File Assistant is available to you, by means of which you can create your own import filters for complex file formats in binary, hexadecimal or ASCII format. A description is provided in a separate user manual "*Shared Components*" in the chapter "*File Assistant*".

Save/Export

For the data storage formats, along with that of imc FAMOS , other formats from different manufacturers (MATLAB, Google Earth(KML), MDF etc.) are available. Export is accomplished by selecting the file format in the Save dialog 229.

Additionally, imc FAMOS offers an easy-to-use Assistant for defining one's own ASCII 234- or Excel 247 files.

DLL-extension

Another possibility is to use function libraries, which can be integrated via the imc-Kit 335 or the general DLL-interface 342.

Default folders and navigation

The default folders for loading and saving can be set using the dialog *"Extra"/ "Options"/ "Folders..."* 259.

For convenient browsing through data, especially data saved in the typical experiment folder structure with multiple subfolders of measured data, the 'File Browser (Version 6.3) 218' is very suitable.

The File Browser (measurement) 430 goes a step further and links a file browser with user-created Panels for the purpose of performing evaluations and composing reports.

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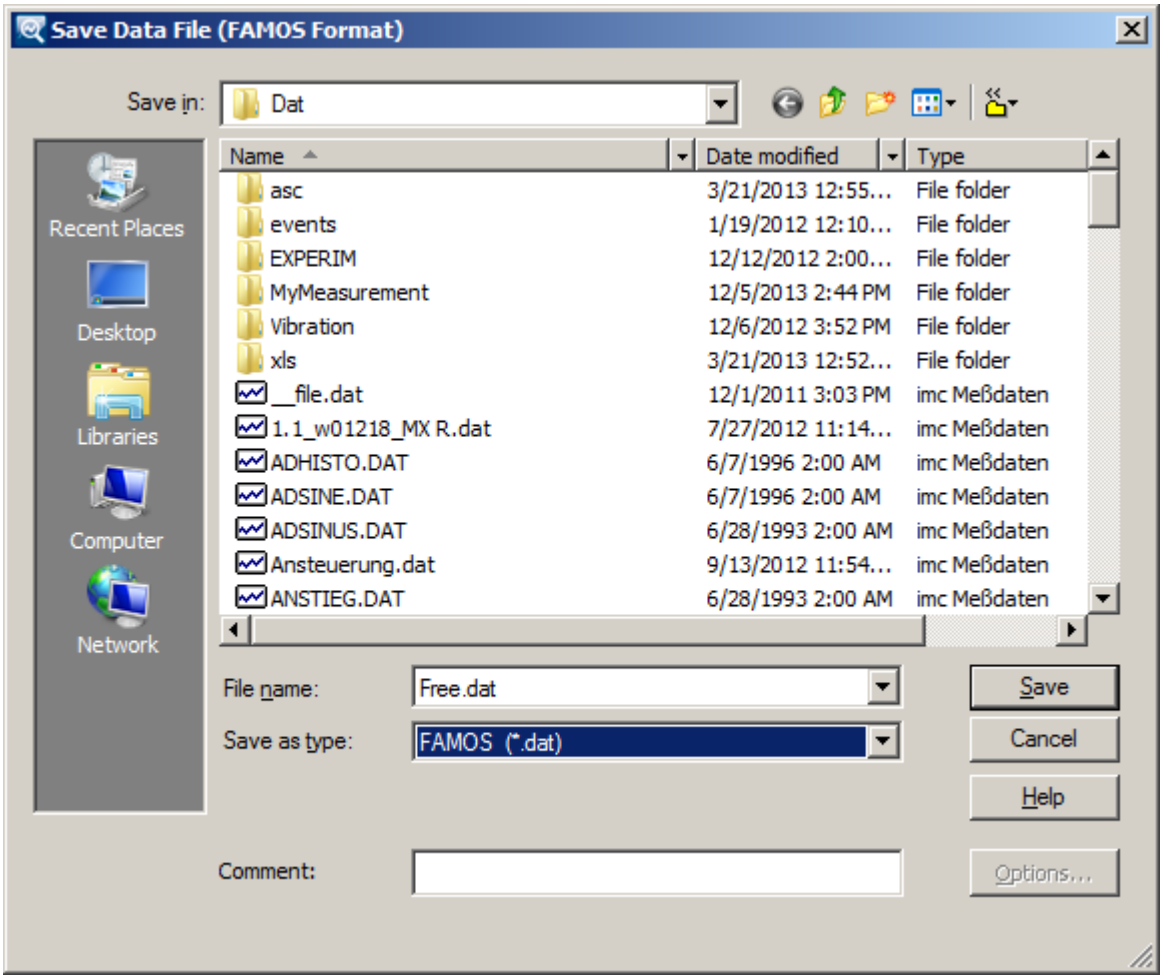
6.2 Loading Files

Call the dialog for selection of files to be loaded with "*File/ Load /Data*..." or by means of the Variables-menu item "*Load*".

In the dialog under "*File"/ "Load*", you can select files which you wish to load. You can also select multiple files at the same time. Specify which format you desire. Once the selection has been made, these files are loaded in the format set and are entered as variables in the Variable list.

The dialog's appearance and operation style largely matches that of standard Windows file selection dialogs.

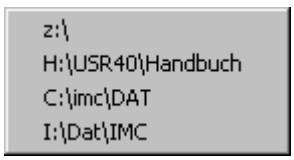
When the dialog is started, the directory last used appears as the default selection. The first time the dialog is called, the standard directory defined in "*Options/ Folders*" is used.



Dialog: File load

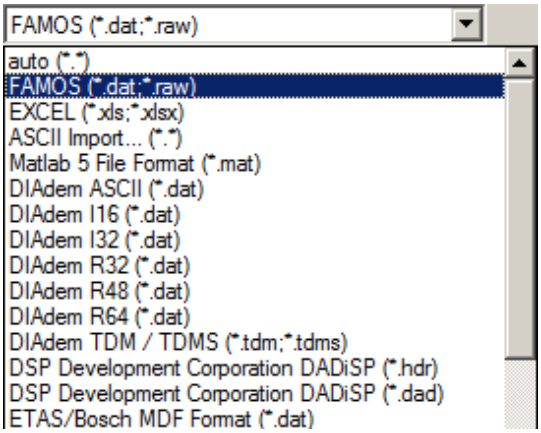


The toolbar at the upper right includes an additional button.



Clicking on this button with the mouse opens the menu listing the folders last used. Selecting one of the menu entries takes you to the corresponding folder.

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At the bottom of the dialog is the list of available file formats. The format currently selected is also displayed in the dialog's title bar. Which entries appear in the list is specified in the dialog "*Managing Import Filters* 177".

The format setting **"*auto*"** means that imc FAMOS tries to determine the appropriate format on the basis of the filename extension or other file characteristics. If it is not possible to determine the format unambiguously, the user is presented with an additional dialog in which to select from among the possible options.

Options

If the currently selected file format is configurable, a dialog containing useful setup options for the format can be called up with the button "*Options*". These option dialogs will be described along with the corresponding file formats.

Status bar

A status bar is found in the lower margin of the dialog. A comment about the currently selected file, if one exists, is displayed in the status bar. If no commentary is present, the date and time of the file's creation is shown.

Selecting several files

Several files to be loaded may be selected at the same time. If the files appear consecutively in the list, the following is possible:

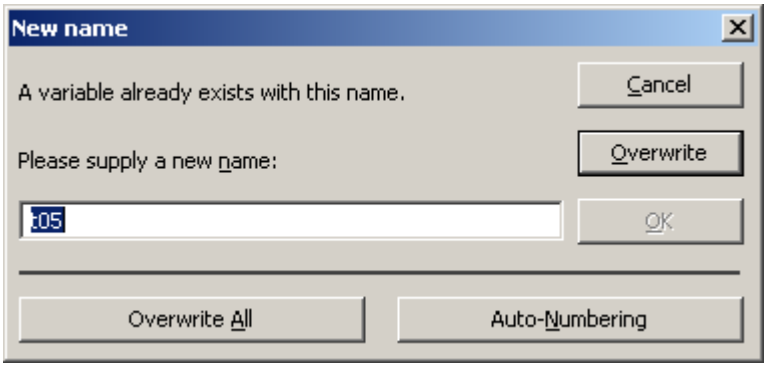
- Click with the mouse beside the first file name you want to select and then drag the cursor, with the mouse button still pressed, to beside the last file name.
- First move the marker with the direction keys to the desired file. Then select all other desired files while holding down the <*Shift*> key.

To select files not listed consecutively, click on the desired entry while holding down the <*Ctrl*> key.

Click on <*Open*> to end the dialog and load the selected files. Variable names are taken from the file, if present, or the file name.

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If the variable name may not be used in imc FAMOS or already exists, a dialog appears for changing the variable name:



Dialog: New name

A new variable name can be entered in the text box and confirmed with <*OK*>. If the variable name already exists, select <*Overwrite*> to replace the existing variable. The screen button <*Overwrite All*> will cause overwriting to occur in all subsequent instances of duplicate names, for files which are due to be loaded because of multi-selection, as well as for the current file.

The "*Auto-Numbering*" button causes all subsequent variables having duplicate names to have a "_" character plus a serial number appended.

Press <*Cancel*> if the file should not be loaded.

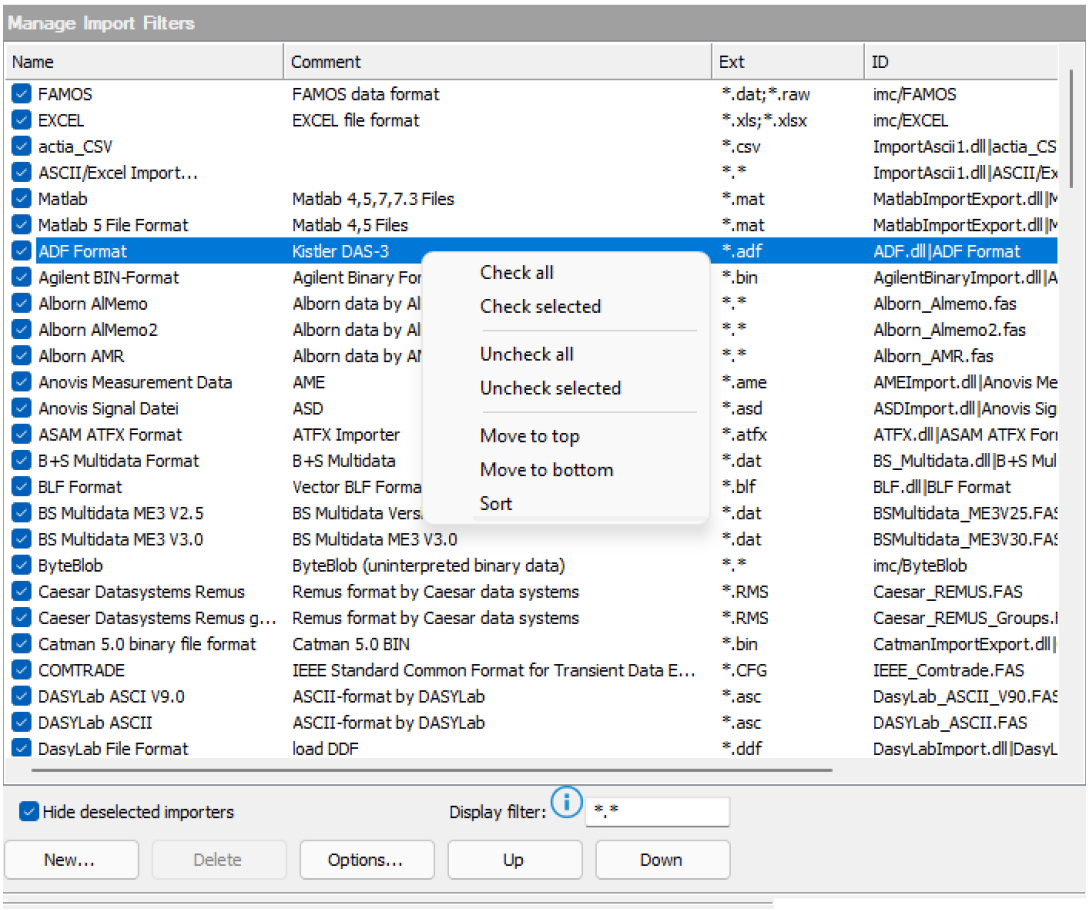
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6.2.1 Manage import filters

This dialog provides an overview of all import filters currently available on the computer. Here, you can control the visibility and order of the filters in the associated selection lists (e.g. in the dialog "*Load File*", or in the Data Source Browser), set filter options and define new, derivative import filters.

The priority of import filters set here is also applied to finding the the right import filter for the files selected when the format is set as "*automatic*".

The dialog is called by means of the menu item *"Extra"/"Options", on the page "File-Load/Import"* 128.



The list contains all import formats supported by imc FAMOS . These comprise:

- the import formats permanently integrated into imc FAMOS (imc FAMOS , EXCEL...),
- import filters created with the File Assistant (menu item "*Extra"/"File Assistant*", file extension *.fas). E.g. (LeCroy, Diadem..,),
- import filters made available through special extension libraries (*.dll) (Matlab, ATFX...),
- derivative import filters (see below)

Installation already comes with a large amount of import filters. An overview is provided here: Import- /Export Filters.

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List columns

Name: Name of the import filter under which it appears in the corresponding format selection lists (e.g. in the "*Load File*"-dialog).

Comment: Comment created by the import filter's creator.

***Ext.*:** File extension applicable to this filter.

ID: Format-identifier. May be necessary for setting function parameters for file handling.

The selection lists only display filters whose checkbox in front of the entry is checked. You can also select multiple entries at the same time and change their status all at the same time by clicking on their control boxes. You can also use the commands "*De-select All"* or *"Select All*" in the context menu.

The order of filters in the selection lists matches the order in this dialog. To change the order (for example, in order to move more frequently used filters to the front of the list), use the "*Up"/"Down*" buttons or the corresponding context menu items.

Note: The imc FAMOS file format can not be de-selected and is always at the top position.

A crossed-out entry indicates that the associated filter is not available on the computer (any longer) and cannot be used. This can happen if for instance the user deletes or renames import filters (*.fas). Such invalid entries can be permanently deleted from the list by means of the "*Delete*" button.

Display filter

Hide deselected importers

De-selected (crossed-out) import filters are hidden.

Display filter

Only such import filters are displayed whose names, comments or assigned file extensions contain the text entered here.

Buttons

New

This button starts a dialog 179 used to define a "*derivative import filter*".

The definition of a derivative import filter consists of stating the real import filter on which it is based, general options common to all derived import filters, and any private options specific to the respective import format.

Derived import filters are denoted in the list by **blue font**.

Delete

Deletion of the currently selected entries. Only invalid (crossed-out) or derivative import filters (blue) can be deleted.

Options

Call of the Options dialog for the currently selected filter.

When selecting a format which had been created using the ASCII/Excel Import Assistant 186 (*.ascimp), the Assistant opens with a default file. In this case, the preview is not indicative of the actual appearance since the colored shading is not possible with the default file. However, the settings can be changed. When you exit by clicking on OK, the changes are saved to the *.ascimp file.

Up / Down

The currently selected filter is moved up or down by one position in the list.

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Context menu

Check/Uncheck all/selected

For quick activation/deactivation of the import filter to be used.

Move to top/bottom

Moves the current filter selection to the respective end of the list.

Sort

Alphabetic sorting according to the name column.

6.2.1.1 Creating derivative import filters

This dialog is used to define a derivative import filter.

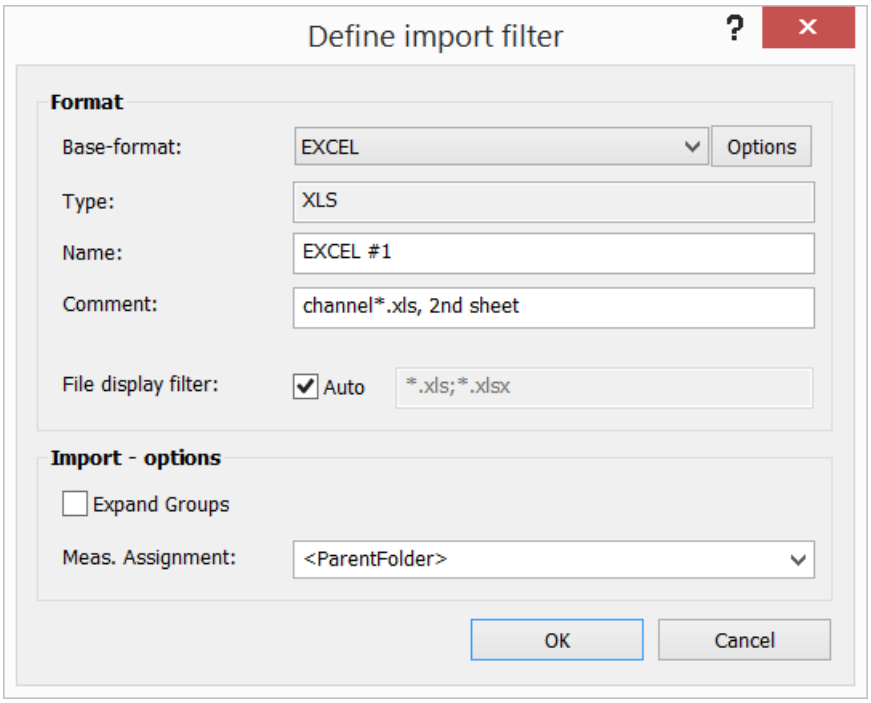
Import filters can be configured both by means of global, format-independent options (e.g. assigning association with a measurement for the imported data) and also sometimes by means of specific options particular to the respective filter's format. A derivative import filter combines a real import filter together with the desired options under a new name. Thus, you can create your own import filters which share the principal properties of their basis import filter but whose import results are now adapted to their respective purpose.

Application example:

Supposing you have 2 different EXCEL formats to import in alternation. The first file variant has the name pattern "*channel*.xls*", and the payload data are located on the first sheet. In the 2nd variant, (arbitrary filename *.xls), the payload data are in the 2nd sheet. Normally, you would need to go to the EXCEL Options dialog each time you manually load in another format, in order to set options accordingly. Instead, define two import filters derived from the EXCEL format, in which the corresponding option "*Page #*" is configured differently. The two filters created in this way then also appear in the Format-selection list and you can easily switch between the two formats. For added convenience, you can limit the file list display for the first filter to the desired mask "*channel*.xls*".

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To call the dialog, click on the button "*New*" in the dialog Manage Import Filters 177.



Base-format: In this list, select the import filter to be used as the basis.

Option: This item is only enabled if the basis import filter selected comes with its own option. In that case, the button calls a format-specific dialog. The options set here are permanently associated with the derivative import filter.

Name: User-defined designation of the import filter in the corresponding format selection lists

Comment: Comment on the import filter, displayed, for example, in the title bar of the "*Load File*"-dialog

File display filter: Determines the display filter to be used for files. If the checkbox "*auto*" is checkmarked, the filter is generated on the basis of the filename extension set for the Basis import filter. Otherwise, you can freely specify name-mask in the input box, where the wildcard characters "*" and "?" are interpreted in the customary way.

`"*.dat"`	all files having the extension "*dat*"
`"s*.dat"`	all files whose name begins with "*s*" and has the extension "*dat*"
`"s??.dat"`	all files whose name consists of "*s*" and 2 additional characters and have the extension "*dat*"
`"*.raw;*.dat"`	You can also specify multiple name-masks, separated by a semicolon

Expand groups: If activated, any groups generated by the import filter are always split up into their constituent channels.

Quick Load: Only for imc FAMOS /imc format. Activates "fast loading" (see imc FAMOS -Format 183 options).

Measurement assignment: Determines whether the variables loaded are automatically assigned to a measurement, and how the measurement's name is formed. This option is mainly of interest when loading data in the Data Source Browser. For more information on the use of measurements in this way, see the chapter Variables with measurement association 266.

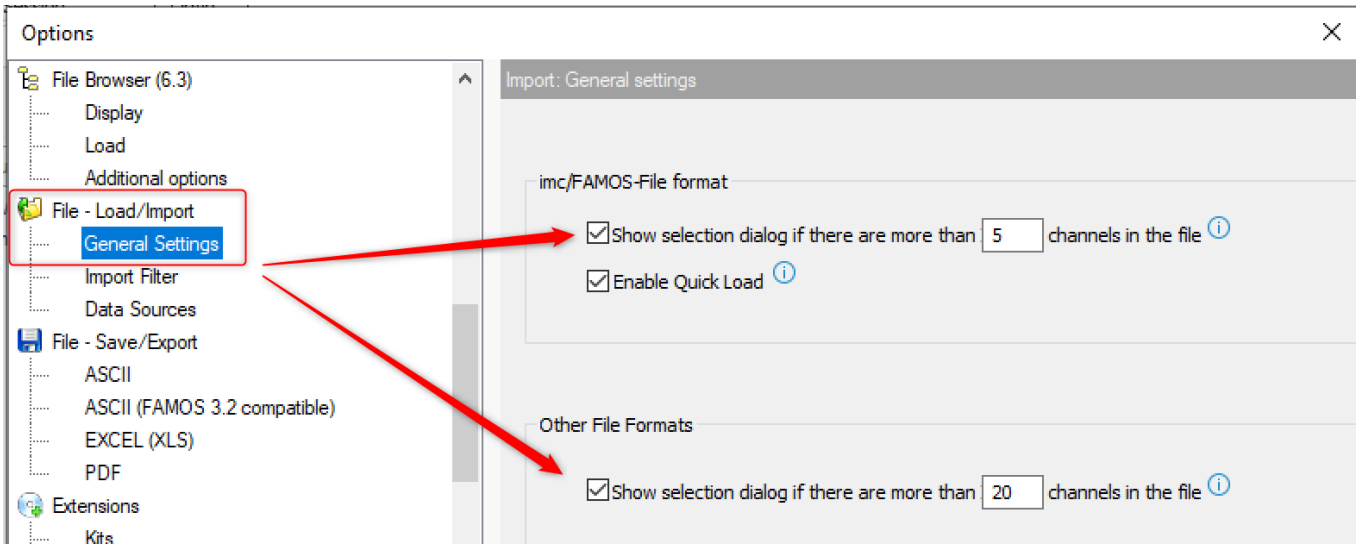
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6.2.1.2 Channel selection dialog

When loading files having **many channels**, it is possible to use a **channel selection dialog** in order to load targeted individual channels.

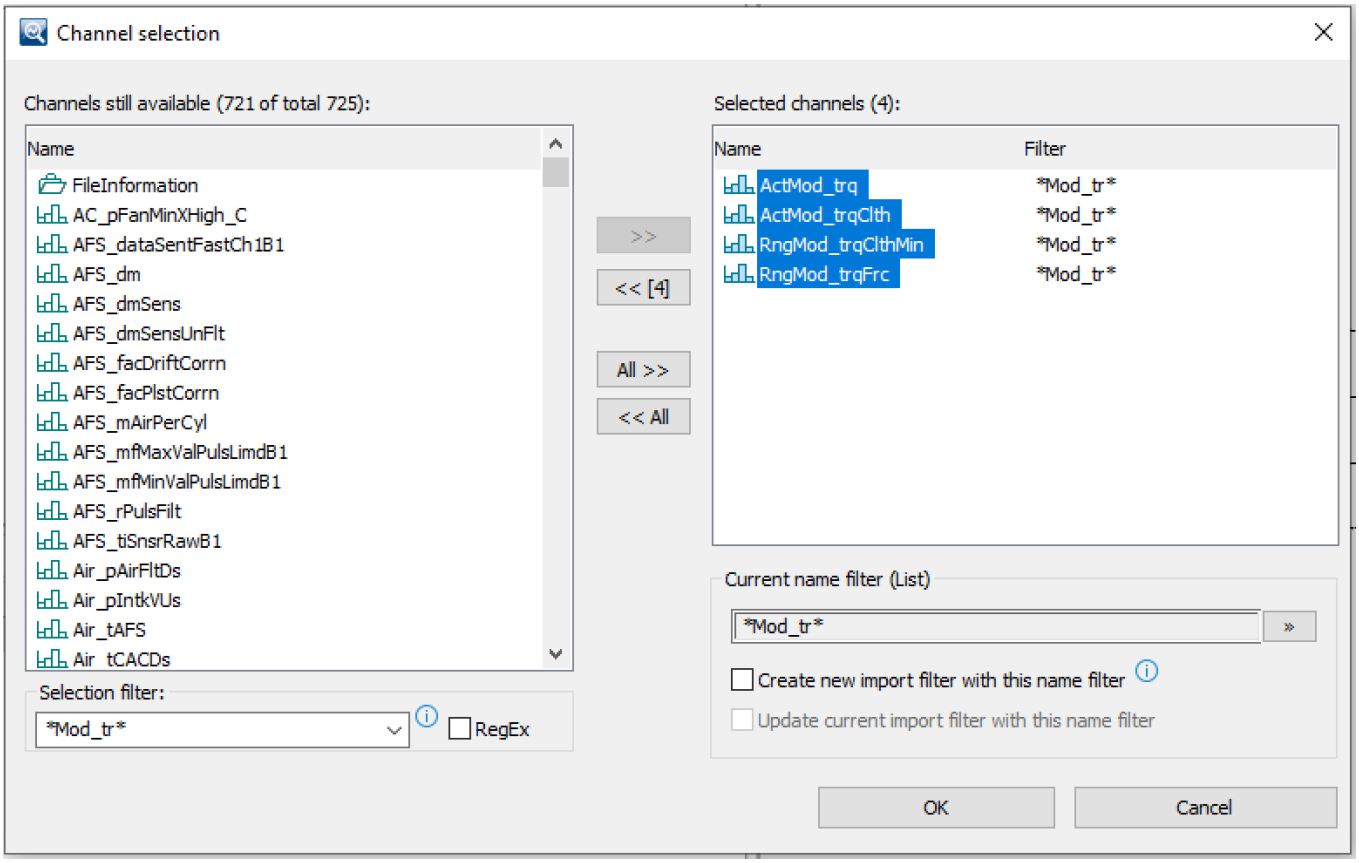
In the Options, this selection dialog can be activated both for the **imc file format** and for **other formats**.

Activation is accomplished in the Options under "*Load/Import File* > *General Settings*" by check-marking "*Show selection dialog if there are more than n channels in the file*".



Activating the Channel Selection Assistant

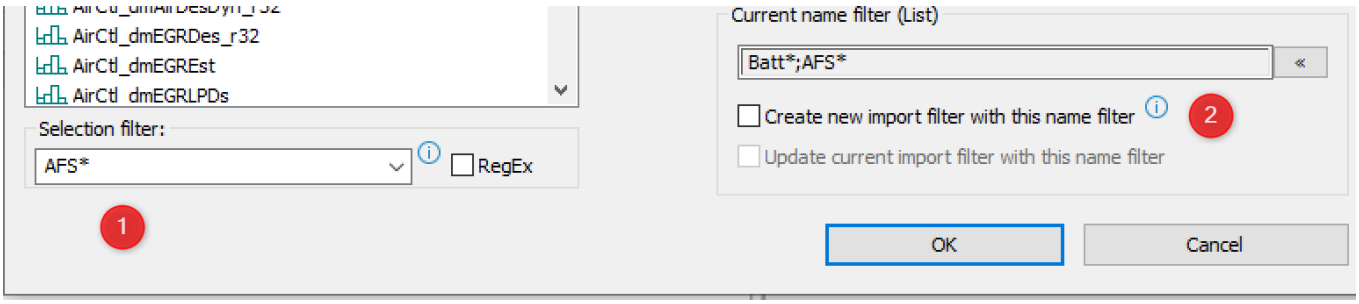
When the option is activated, the selection dialog opens automatically if the file contains **more data objects than specified** above.



Channel Selection Assistant

Further, the list of channels indicated can be limited by means of a **selection filter**. ❶ Several selection filters can be created for a file. These are displayed in an additional filter list by pressing the ">>" key.

If "*Create new import filter with this name filter*" is activated, then after import, the dialog for setting a **derivative import filter** 179 appears. ❷



Selection filter and automated generation of a derivative import filter

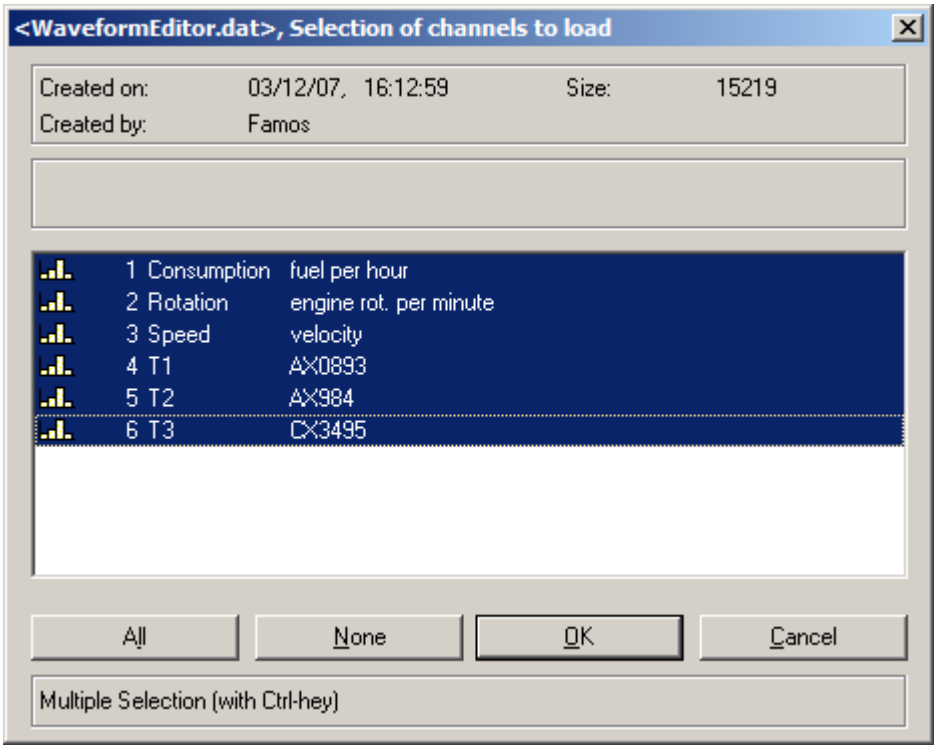
6.2.2 imc FAMOS-Format

The imc FAMOS data format is suitable for all data types supported by imc FAMOS . The format contains data and all information about data, such as physical units, sampling times, data type, comment, etc. Data themselves are filed in compact binary form. Texts may also be saved. This allows several variables with different types to be saved together in one file. A file comment may be added to the file.

This format is used by all other imc applications and devices as the default format. A detailed description of the imc FAMOS file format is found in the Curve Window documentation.

The file comment is displayed in the status bar when selected individually, if it is present in the file. The date and time of the file's creation are displayed if a commentary is not present.

If the file contains multiple variables, by default a selection dialog automatically opens. You can change this behavior if desired in the options for imc FAMOS Format 184.



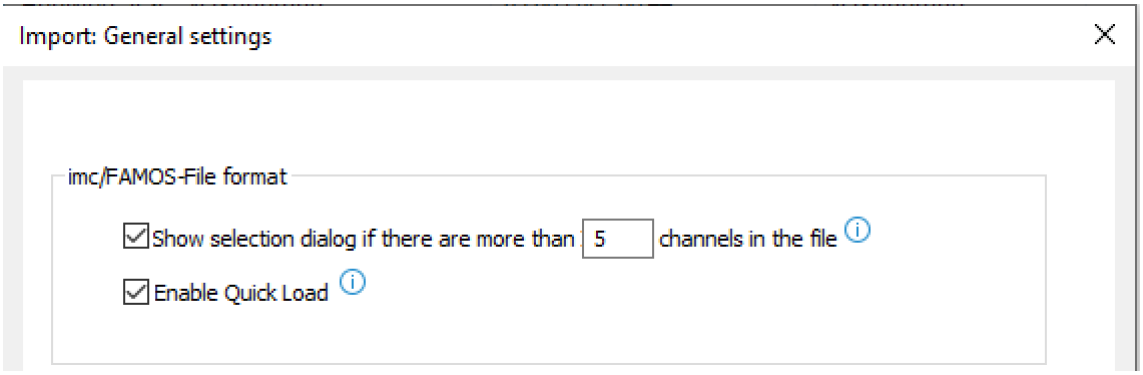
Dialog "FAMOS-File load: Selection of channels to load"

The dialog header displays information on the file such as the time, file size in Bytes, and any comment on the file.

In the list below that, all data sets which the file contains are listed. A row in the list consists of a type symbol, the file set's name and any comment on the data set which may exist.

You can also select the exact data sets from the list with which you actually wish to work in imc FAMOS . When closing the dialog by means of the <OK> button, the data sets currently selected at this time are loaded. When closing using <Cancel>, this file is completely skipped.

Use the button <*Options*> to call up a dialog with setups for loading the imc FAMOS format:



Dialog: FAMOS-File load / Options

imc FAMOS-file format

This group of options controls the behavior when loading imc FAMOS files with several data objects present.

Displaying the selection dialog when there are more than n channels in the file

A selection dialog is displayed if the specified count of data objects has been exceeded.

Quick load activated

By default, a copy of data contained in the imc FAMOS Data Manager is created when a file is loaded. Copying large amounts of data requires a noticeable amount of time. By selecting this option, copying is not executed and the variable is managed internally with a reference to this file.

This has the following effects:

- Loading the variable takes little time and is available almost immediately in the imc FAMOS variable list.
- Read access to this variable takes longer, if the variable would also have been created in the PC's main memory. The difference is minimal in short data sets. On the other hand, with longer ones it's more likely that the variable would have had to be relocated to a temporary file, anyhow.
- In the first write access to the variable, copying the data must be done now because the original file may not be changed under any circumstances. In this case, no time is saved.
- The file may not be changed by other programs, for example by renaming in the File Manager.

The selected options are accepted with <*OK*>. They also remain when the dialog "*Load file*" is closed by selecting <*Cancel*>.

Reference

Chapter 'Sequence Commands (Reference)', commands *FAMOS , LOAD ,FileLoad*

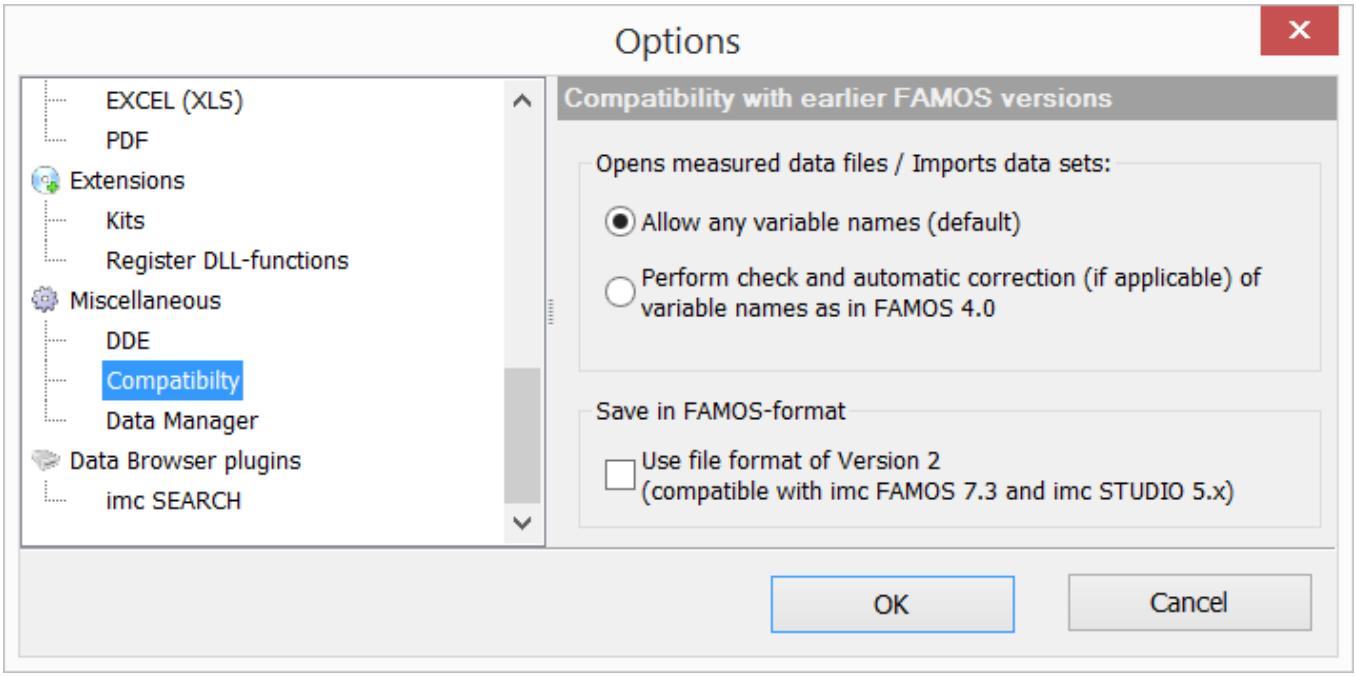
Manual imc FAMOS Functions Reference', Functions *FileOpenDSF, FileObjRead, FileClose*

Chapter 'Variables', section 'Data types'

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6.2.3 Compatibility with earlier FAMOS-versions

To reach the following dialog, browse to *Extra\Options -> Miscellaneous*:



Opens measured data files/ Imports data sets:

In the default settings, even variable names which do not conform to the specifications of imc FAMOS are permitted, e.g. having special characters, beginning with a number, spaces. Such variable names 264 must be bracketed with curly brackets "{VarName}".

If the imc FAMOS specifications for nomenclature must be observed, it is possible for the system to force this to happen using the other choice "Perform check...".

Saving in imc FAMOS-format

Use this option if compatibility with older FAMOS versions is required. Otherwise, imc FAMOS file format Version 3 is used.

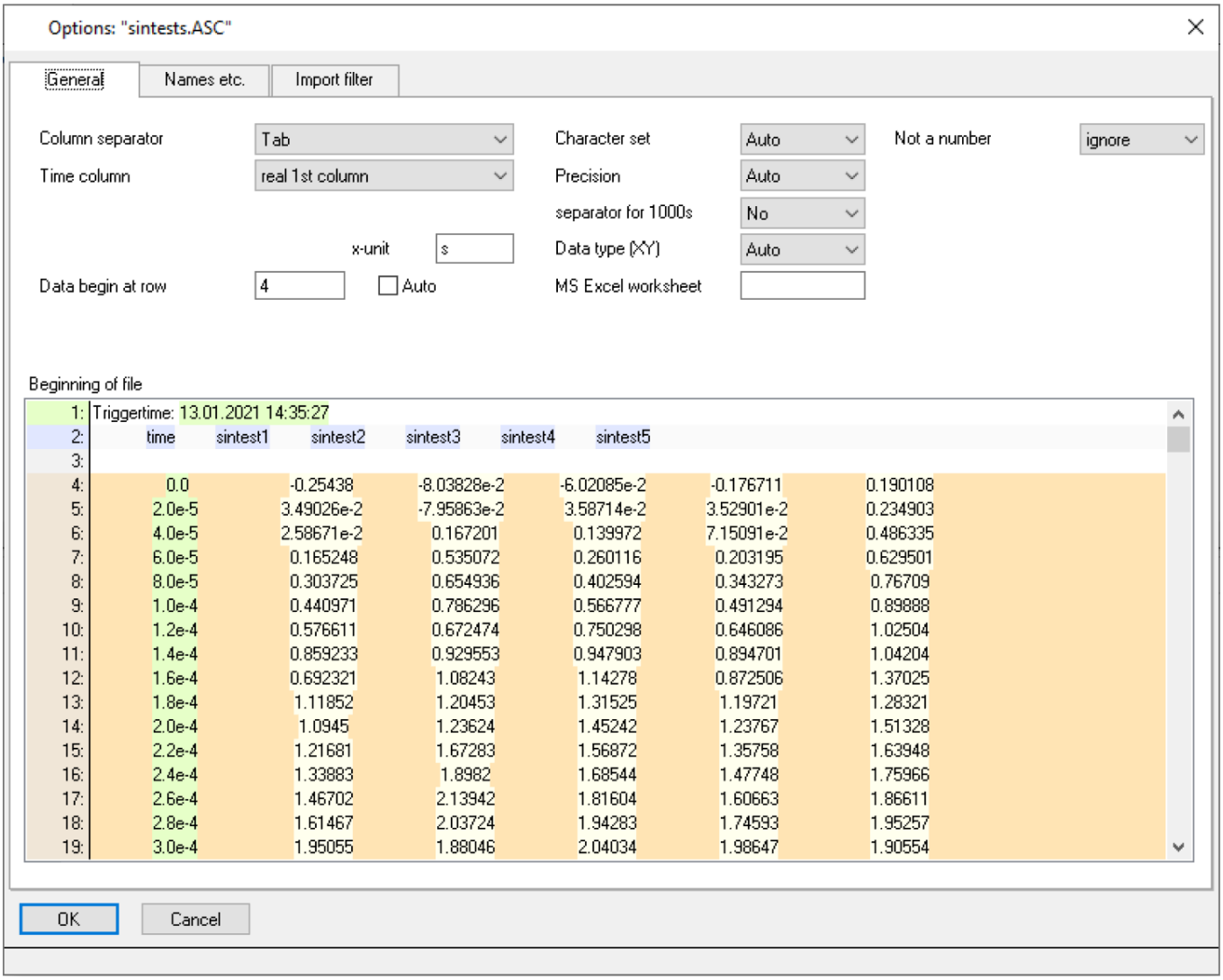
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6.2.4 ASCII/EXCEL Import (Assistant)

The ASCII/EXCEL Import Assistant is a convenient way for importing ASCII or EXCEL data.

Set as the file type *ASCII/EXCEL Import...(*.*)* and select the desired file. The ASCII/EXCEL Import Assistant opens and displays the beginning of the file.

By means of the settings on the tabs "*General*" and "*Names etc.*" you can specify in what format the data are expressed and where to find the information.

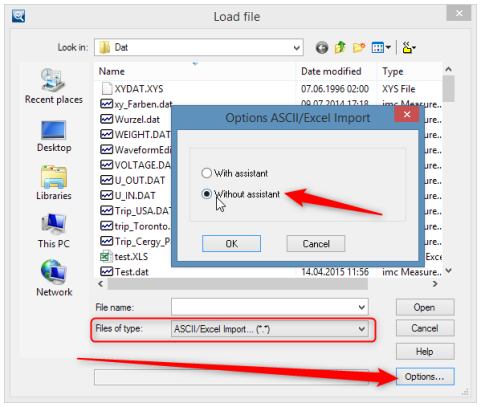


Entries for file setup

All information located is presented with colored shading.

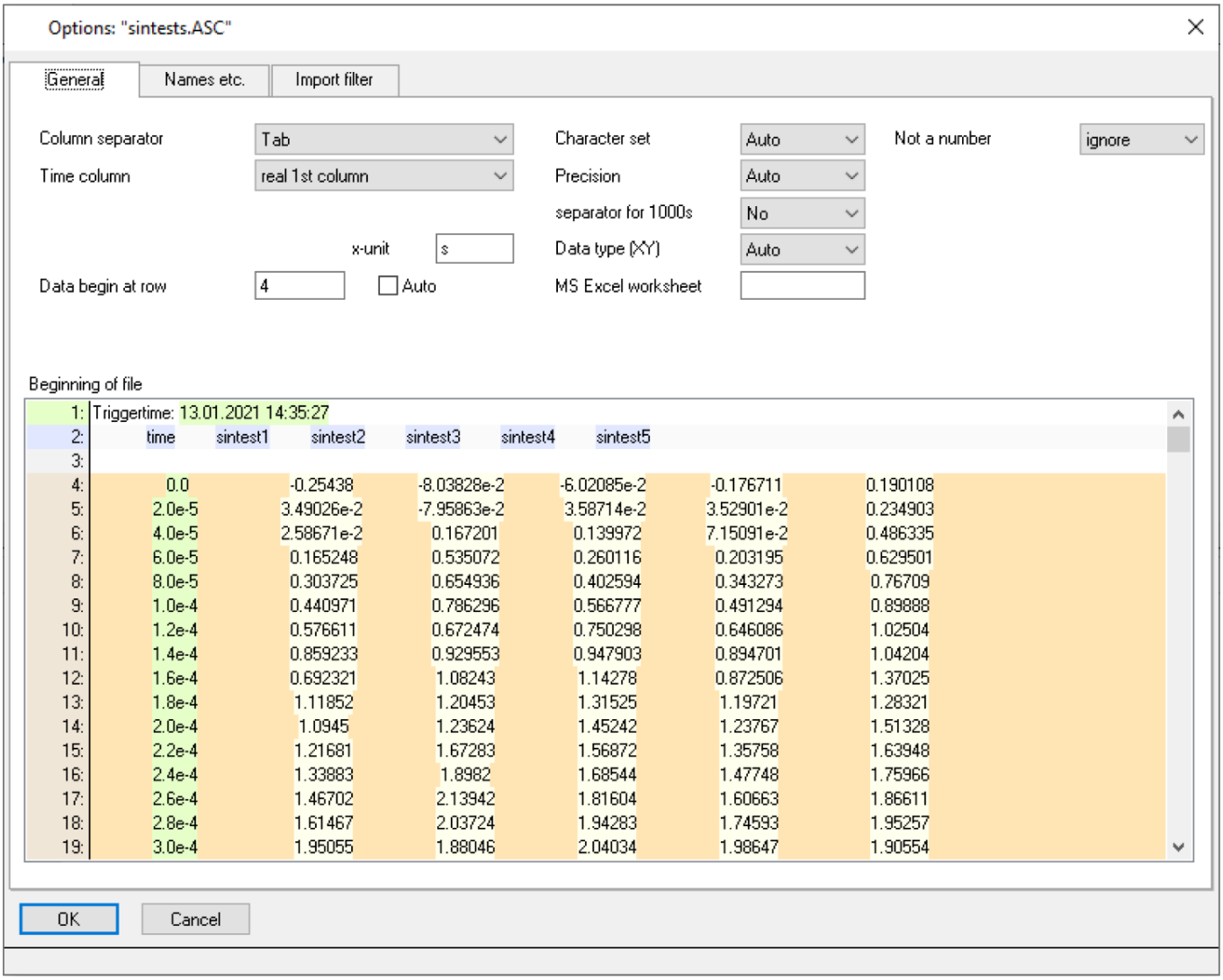
Note

ASCII/Excel import assistant



The following dialogs of the assistant appear when the file type "*ASCII/Excel Import...(*.*)*" is selected in conjunction with the option "*With Assistant*".

6.2.4.1 Tab: General



Entries for file setup

Column separator: As the separator between ASCII files with multiple data sets, the available choices are: *tab, space, comma* and *semicolon*.

Character set:

- *Automatic*: ; also 16 bit unicode with BOM; "UTF8" with BOM
- *DOS*
- *UTF8* (with or without BOM)

Time column:

- 1st, 2nd or 3rd column real, i.e. relative in seconds
- Date and/or time
- 1st or 2nd column in EXCEL time format
- 1st or 2nd column in UNIX time format
- Columns alternate (x, y, x, y,...)
- 1st ,2nd or 3rd column in seconds

- Time stamp freely defined

Sets the format for a time stamp with date and time is specified. Placeholders and separators in pointy brackets, other characters outside of the pointy brackets.
Examples of column separators are:
<DD.MM.YYYY*hh:mm:ss> met by e.g. 31.12.2021; 23:58:45.121
<c>Date:<YY*MM*DDc*hh:mm:ss> met by e.g. 07;Date:19/12730; 23:30:50;
<*YYY/MM/DD> met by e.g. date: "2021/30/12"
YY, YYYY: year with 2 or 4 digits
D, DD: day with 1 or 2 digits
M, MM: month with 1 or 2 digits
h, hh: hours with 1 or 2 digits
m, mm: minutes with 1 or 2 digits
s, ss: seconds with 1 or 2 digits
s.ss, ss.ssss or similar: seconds with decimal places
SSS or **SSS.S** or similar: milliseconds with decimal places; only after integer seconds
*: Skip all characters up to the next digit. But not including the next digit itself.
t: 1 tabulator (ASCII 09H) read over
c: to next column; skip all characters up to and including the next column separator.
AM or **A.M**.: For AM/PM
Characters which are specified outside pointy brackets must appear exactly the same way in the file.

Precision:

- ***Auto***: Depending on the numerical values, either 4-Byte or 8-Byte Real format are used for y-values.
- ***high***: always 8-Byte

Note: Precision only affects the y-values. For x-tracks, 8-Byte is always used.

separator for 1000s: The available choices are *No* (no separator), *Point* and *comma.*

If the number 1000.0 is indicated in the file as 1,000.0, the corresponding separator character for 1000's is thus specified. This character is then expected between every three digits left of the decimal point in fixed point notation.

Sampling interval: Appears only when *Time column= none.*

The interval between samples (x-Delta) of the data; for equidistant data, when there is no time column in the measured data.

x-unit:

Here it is possible to specify the unit along the x-axis if there is no time column in the measured data. Otherwise, "s" is assumed.

Data type (XY):

- ***Auto***: For files without a time track, an equidistant channel is generated using the specified sampling interval. When there is a time track present and (approximately) equal time intervals, an equidistant channel is also generated; else XY-data.
- ***Always XY***: XY-data are generated no matter what the time intervals are in an existing time track.

Data begin at row: Automatic or line

MS Excel worksheet: Selection of the worksheet in case of Excel files having multiple tables

Specified as number or name of the worksheet. If the specified designation is not distinct (the worksheet is designated by a number), it is possible to prefix a space character to the number, since Excel does not allow spaces in names. Numbers begin with 1 for the first worksheet.

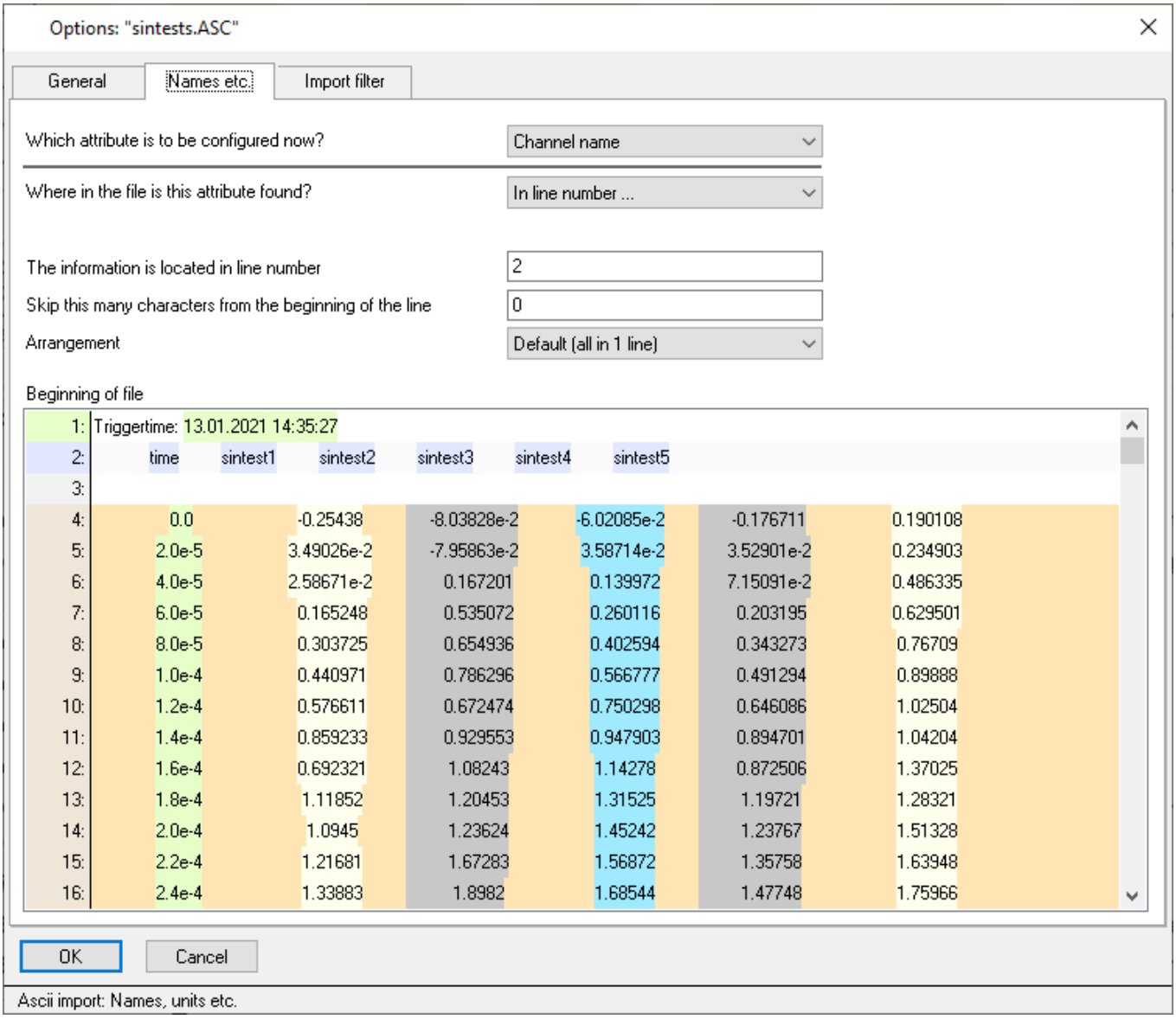
If no Excel-file (*.xls, *.xslx) is selected, the entry is ignored.

Not a number:

- ***auto***: If the file contains NaN (Not a number) items, FAMOS will interpret them as "NaN" (= 1E35).
- ***ignorieren***: NaN is handled like an empty cells

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6.2.4.2 Tab: Names



Definition of name and unit

Attribute: The content of the input boxes depends on the attribute selected here.

Attribute: Channel name and **y-unit**

Position of the attribute:

- ***Fixed text, not from file***: A fixed name is specified in the input box. Multiple data sets are distinguished using an extension index.
- **Position:** In case of channel name and y-unit, it is possible to specify the position in the file by **double-clicking** in the preview.
- Alternatively, the position can be specified by:
  - **line number** with specification of bytes skipped
  - **Number of lines behind specified text** and skipped bytes as of beginning of line
  - **Number of lines before data** with specification of skipped bytes as of beginning of line
  - **Arrangement**: *Default (all in 1 line)* or stacked vertically)
- ***Use filename****:* If only one data set is loaded, it is possible to use the filename. If there are multiple data sets, an index number is appended to the filename.
- ***list separated by****:* In this input box, all names of data sets are entered in succession:
  Example, Channel name: "*Speed;Temp1;RPM*". If there are fewer names than data sets, the default name "Channel_"+ Index is used.
  Example, unit: "*km/h;°C;min^-1*". If there are fewer units than data sets, the unit for this remains empty.

Attribute: Group

All of the file's data sets can be assigned to a variable group

- ***no group***: No group is created.
- ***Fixed text, not from file***: The group name is entered in the input box underneath.
- ***Use filename***: The filename (name without path or file extension) is used as the group name.

Attribute: *1 time stamp in the header*

If one start time is used for all of the data sets, it can be determined from the header or it is specified by the user.

For **specifying the position**, comparable choices are offered as for the channel name and y-unit 192.

Otherwise, the time stamp can be specified using the input box by selecting ***Fixed text, not from file***.

If the individual rows of measured data already include a complete time stamp, then specify *no time stamp* here.

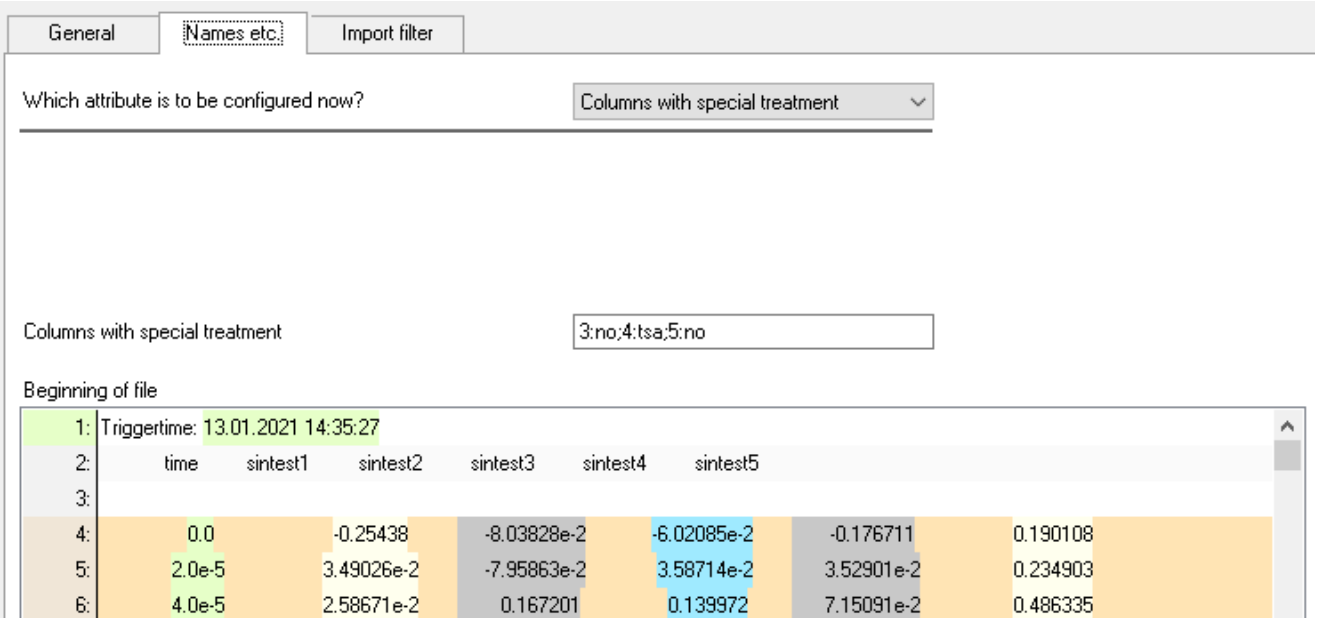
In an exceptional case, the header may contain an incomplete time stamp, for instance only a date and a time with the measured values. Inthat case, the two are combined.

- ***Time stamp format***: In order for the time stamp to be interpreted correctly, the format must be specified.

Example: Time stamp in the file:	"13.01.2021 14:35:27"	->	Format:<DD.MM.YYYY hh:mm.ss>
	"14:35:27 2020-11-31"	->	Format: <hh:mm.ss YYYY-MM-DD>

  Additional formatting options are presented in the online help when you move the mouse over the Formatting box.

Attribute: *Columns with special treatment*



Hiding Columns 3 and 5. Loading Column 4 as TimeStampAscii

List of columns which are to be given special treatment.

A sequence of characters according to the pattern *iii:xxx* where *iii* is the column number, the character ***;*** is used to separate individual columns in increasing numerical succession. iii= 1 for the first column.

Optionally, the list can begin with **:xxx* as the default value for all columns not listed explicitly.

xxx may take the following values:

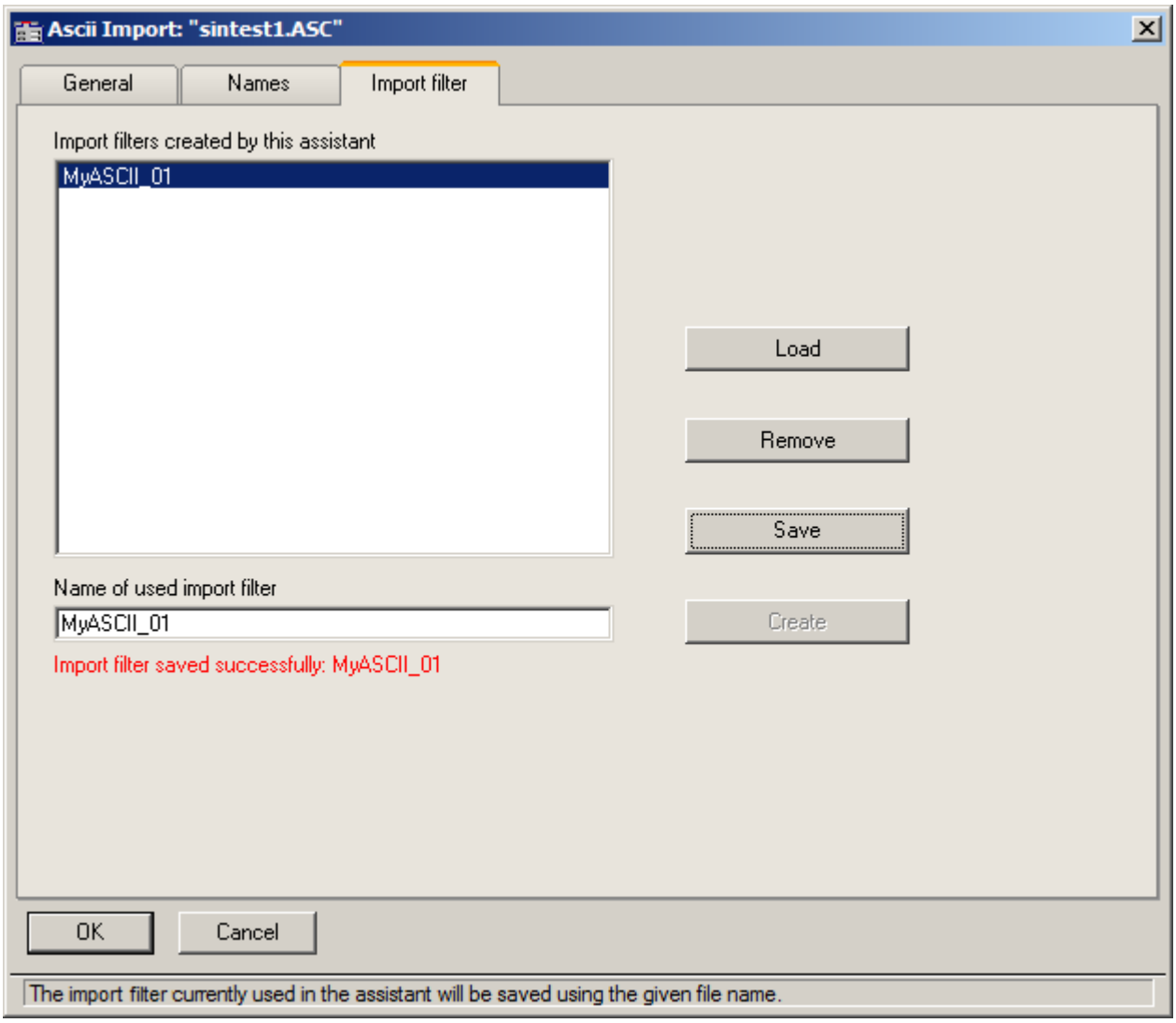
- *no*: the column is to be ignored
- *num*: This column contains a number. This is the normal case for a measured value
- *tsa*: This column contains a text and is intended to produce a channel in Time Stamp ASCII format
- **:num* does not need to be specified explicitly since it is assumed by default.
- Time stamp columns are not listed here and are not subject to the associated treatment!

Examples:

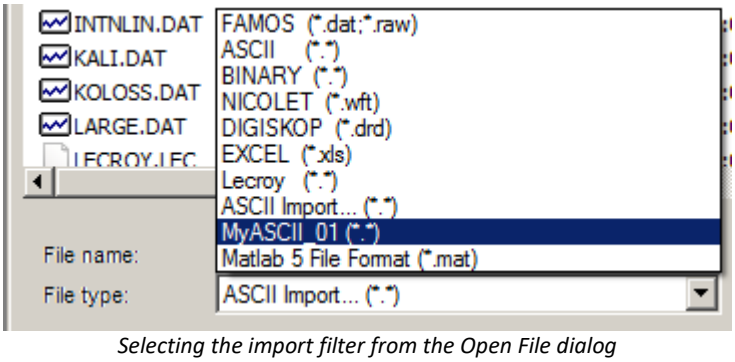
6:no;7:no	All columns are interpreted as numerical values, but Columns 6 and 7 are not read in.
*:no; 5:num	Only Column 5 is read; none of the others are
5:tsa	Column 5 contains texts and is read in in Time Stamp ASCII. All other columns contain numerical values.

6.2.4.3 Tab: Import filter

The settings can be saved and are then available in the Open File dialog.



Saving the settings as an import filter



Selecting the import filter from the Open File dialog

Import filters defined with the help of the Assistant can also be used in sequences with the function *FileOpenFAS()*.

Storage location of the filters created

The import filters are saved globally on the computer. The path is normally "*C:\ProgramData\imc\Common\Def*". This is also stated under Extra / Options in the branch Folders - Definitions files 259. Note that the filter file must be copied separately when running a project on a different computer.

Data format

Depending on the precision of ASCII/EXCEL-values provided, the ASCII/EXCEL import-filter generates either 4-byte or 8-byte data.

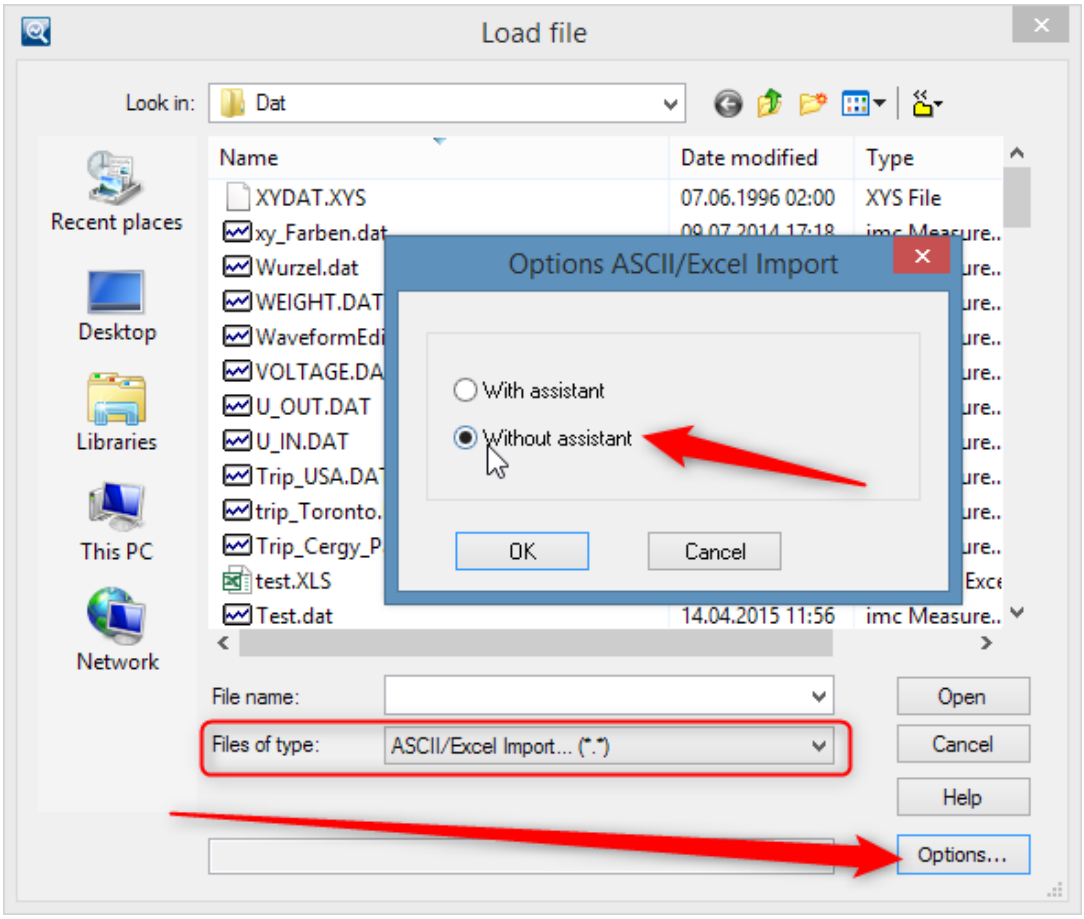
In the processing of the time track (scaling column), the system checks whether the time stamps are equidistant. If the time values are at a fixed interval, the result is a "Normal data set", meaning a data set with a trigger time and xDelta without any separate time track. If there is a cumulative discrepancy of more than 1/100 of the sampling rate detected, the time is recorded as the X-component of an XY-data set. In consequence, small scale inaccuracies are ignored. However, gaps in the time track always cause an XY-data set to be generated.

Note

If the file has as its extension either "*.XLS" or "*.XLSX", imc FAMOS always uses MS EXCEL to open it. For this reason, do not attach an EXCEL extension to a CSV or an ASCII file.

6.2.4.4 Loading options

For the selection "*ASCII/Excel Import (*.*)*", the button *Options* opens the dialog below:



Performing ASCII/Excel Import with its default settings without utilizing the assistant.

1. **With assistant:**
   - *Files of type*: "*ASCII/Excel Import...(*.*)*": The assistant opens with the selected file. The last settings are used.
   - If the *file type* selected is an import filter which had been created using the ASCII/Excel Import Filter, the Options button opens the assistant with the filter's settings. However, if a file with the associated data type is not selected, the print preview would not show the correct color shading. Nevertheless, you are able to edit settings and save them upon exiting the dialog. This behavior matches that in the Import Filter dialog 178.
2. **Without assistant:** An ASCII- or Excel file can be loaded directly with the default settings. In that case, the assistant is not displayed.

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6.2.4.5 Calling ASCII/EXCEL import template in a sequence

Import templates created with the ASCII/EXCEL Import assistant can be loaded automatically with *FileLoad*(). The call is also possible with the older and more general function *FileOpenFAS*().

Example1:

To load an ASCII file a template "*MyASCIIFormat*" was created. The call in the sequence is then:

```
ret = fileload("C:\Users\Public\Documents\imc\imc FAMOS\Dat\Beispiel_ASCII_Import.txt", "#ImportAscii1.dll|MeinASCIIFormat", 0)
```

Example2:

If there is no template yet, the default settings of the assistant can be used. With the addition "|*HideAssi=1*" the assistant is executed invisibly.

```
ret = fileload("C:\Users\Public\Documents\imc\imc FAMOS\Dat\Beispiel_ASCII_Import.txt", "#ImportAscii1.dll|ASCII/Excel Import...|HideAssi=1", 0)
```

Example3:

Using a (personally created) *.ascimp file in a particular folder.

```
ppara = "|file=" + "D:\temp\MyFormat1.AscImp"
filename= "D:\temp\sintests.ASC"
retcode=fileload(filename, "#ImportAscii1.dll|ASCII/Excel Import..."+ppara,0)
```

Example4:

Using a *.ascimp file from the Def folder (MyFormat1.ascimp exists there):

```
ppara = "|file=" + "MyFormat1.AscImp"
filename= "D:\temp\sintests.ASC"
retcode=fileload(filename, "#ImportAscii1.dll|ASCII/Excel Import..."+ppara,0)
```

Example5:

Specification of individual parameters. A detailed list of all parameters is presented in the subsequent table 198.

The parameters are passed as a list with "|" separating the individual columns:

```
para="sp=1|ti=2|la=1|N2=1|N4=2|Y2=1|Y4=3"
```

If | appears within a text, then | is duplicated!

```
retcode =Fileload("C:\UserData\Famos\Dat\Beispiel_ASCII_Import.txt", "#ImportAscii1.dll|ASCII/Excel Import...|"+para,0)
```

It is absolutely necessary to begin with "|sp=" as well as the specification of "la=".

Note FileLoad -> FileOpenFAS

In imc Famos 2021, it may be necessary to use FileOpenFAS if the parameter text has > 255 characters.

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6.2.4.5.1 Format *.ascimp (Sequenzbefehle)

Abbreviation	Meaning	Values
sp	ColumnSeparator	1=[TAB]; 2=[SPACE]; 3=comma; 4=semicolon; 5=vertical stroke
ti	TimeColumn	1=no; 2="seconds 1st column"; 3="seconds 2nd column"; 4="seconds 3rd column" 5="Date Time"; 6="Time Date"; 7="date"; 8="time"; 9="Excel 1st column" 10="Excel 2nd column"; 11="UNIX timestamp 1st col"; 12="UNIX timestamp 2nd col" 13="alternating x-y"; 14="real 1st column"; 15="real 2nd column" 16="real 3rd column"; 17 = User defined timestamp
ch	CharSet	0="auto"; also 16 bit unicode with BOM; "UTF8" with BOM 1="DOS"; 2= "UTF8" with or without BOM
pr	Precision	0=auto; 1=high
td	seperator for 1000s	0 no; 1 point; 2 comma
cl	TimeFormat	necessary for TimeColumn = [5, 6, 8]; 1="hour min sec"; 2="min sec"; 3="hour min"
da	DateFormat	necessary for DateColumn = [5, 6, 7] 1="day month year"; 2="month day year"; 3="year month day"; 4="month day" ; 5="day month"; 6="year month"; 7="month year"
dx	DeltaX	sample time when no time column is given
xu	x-unit	unit of the x scale; If not date/time. Otherwise s is used.
ld	DataStartRow	Number of the first row with data points Starting at 0 for the first line of the file.
la	DataStartAuto	0="use DataStartLine"; 1="find data start row automatically"
N2	ChannelNameCreate	0="fix text"; 1="in row number..."; 2="N rows after text" 3="N rows in front of data"; 4="use filename"; 5 semicolon-separated name list
N1	ChannelNameCharsSkip	number of characters to skip in the row
N3	ChannelNameString	if ChannelNameCreate=0: channelname (prefix, followed by the channel index) if ChannelNameCreate=2: string to find if ChannelNameCreate=5: semicolon-separated name list
N4	ChannelNameLine	if ChannelNameCreate=1: row number with the channel names if ChannelNameCreate=2: numbers of rows to skip if ChannelNameCreate=3: numbers of rows in front of data
c3	ChannelNameArrange	0="default, all in one row"; 1="one below the other"
Y2	YUnitCreate	0="fix text"; 1="in row number"; 2="N rows after text"; 3="N rows in front of data" 5 semicolon-separated unit list
Y1	YUnitCharSkip	; number of characters to skip in the row
Y3	YUnitString	if YUnitCreate=0: fixed unit; if YUnitCreate=2: string to find if YUnitCreate=5: semicolon-separated unit list
Y4	YUnitLine	if YUnitCreate=1: row number with the units if YUnitCreate=2: numbers of rows to skip if YUnitCreate=3: numbers of rows in front of data
c2	YUnitArrange	0="default, all in one row"; 1="one below the other"

Abbreviation	Meaning	Values
ex	extension	default extension of data files. (usually txt for text files)
ga	GroupCreate	0 no group; 1 fixed text; 2 filename
gx	GroupName	fixed text if GroupCreate=1
xy	DatatypeXY	0 auto, 1 always xy
xs	xlsSheet	Sheet name or number (>=1). Only if Excel file
T2	TimestampCreate	Timestamp in Header. 0: not used. 1="in row number..."; 2="N rows after text" 3="N rows in front of data";4="fixed text"
T1	TimeStampCharSkip	number of characters to skip in the row
T3	TimestampString	if TimestampCreate =4: fixed timestamp if TimestampCreate =2: string to find
T4	TimestampLine	if TimestampCreate =1: row number with the timestamp if TimestampCreate =2: numbers of rows to skip if TimestampCreate =3: numbers of rows in front of data
T5	TimestampFormat	Format specification of the timestamp, if a timestamp is used with TimestampCreate.
ts	TimeColumnFormat	Format specification of the timestamp of the data rows, if TimeColumn=17
co	ColumnList	Columns with special treatment, e.g. "5:no;6:tsa"

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6.3 Data sources

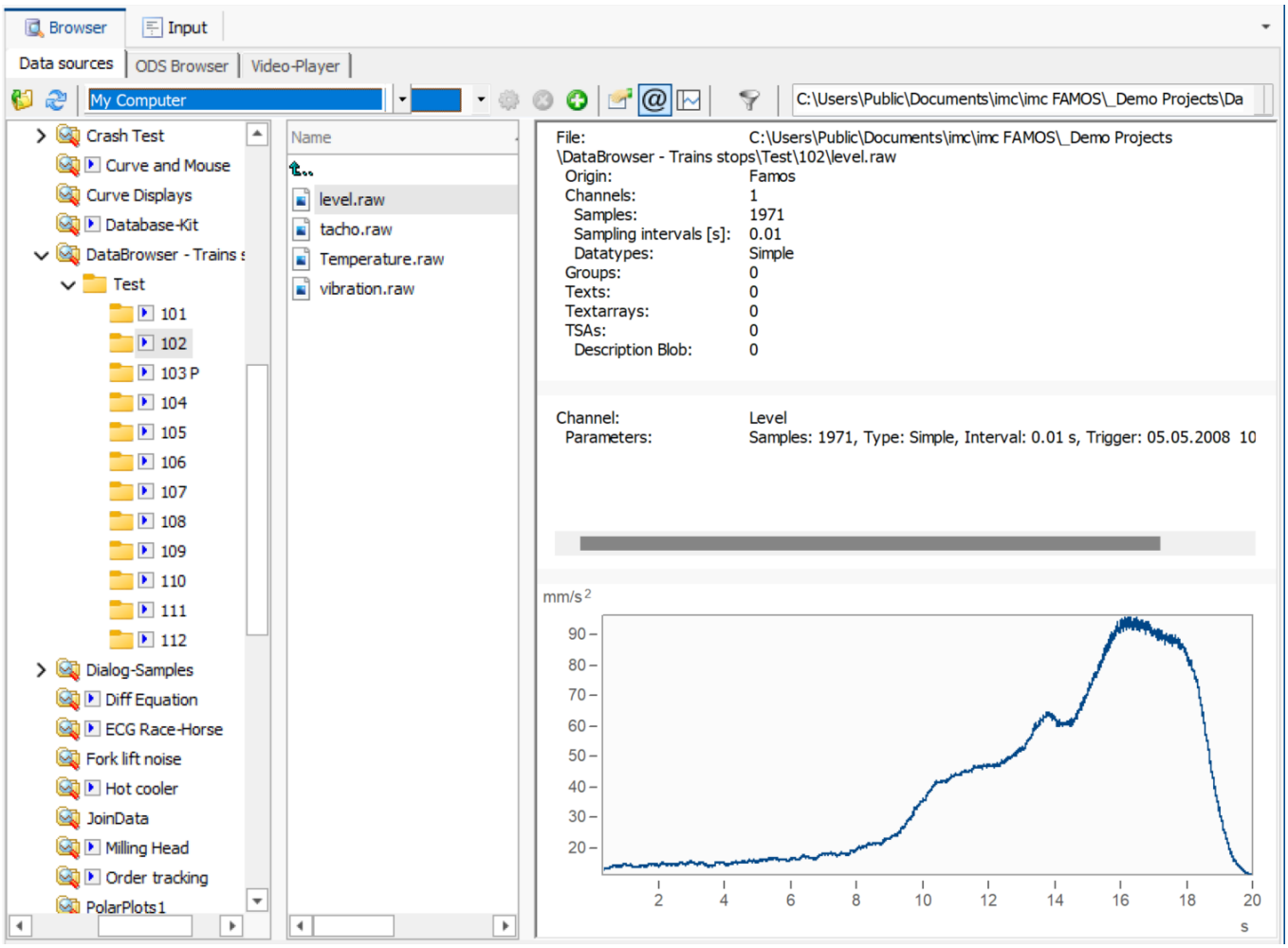
The concept of "**data sources**" enables quick and easy access to various stores of measured data in the filing system. A data source is mainly characterized by its **location in the filing system** and the **file type** (thus also the type of import filter to be used).

The use of data sources is of particular advantage when measured data originating from a variety of different measurement devices must be handled. Mixed data storage directories (meaning folders containing measured data in different formats) are also supported, since multiple import filters can be allocated to a single data source. You can also load the contents of such folders "all at one go" without having to change the format. Once definition of data sources has been completed, you can switch between data sources in the associated Browser-views 201 at a single click of the mouse, which brings you immediately to the "correct" location in the filing system with appropriately selected import filters.

Following installation of imc FAMOS , one data source named "Sample Data" is already set up, which refers to the folder selected for sample data upon performing the installation.
To list and manage data sources, use the dialog *"Administer Data Sources"* 204 (menu item "*Extra*"/"*Options*", page "*Data Sources*").

6.3.1 Data Source Browser

Data sources can be accessed via the tab *"Browser"*:



Data sources in browser-TAB

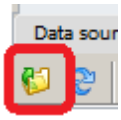
Toolbar

Along with a selection list in which it is possible to move among various data sources, the following commands are available:

	Load	Loads the files currently selected
	Update	Repeats import of the folder and file structure
	Edit	Edits the properties of the data source
	Delete	Deletes the current data source
	New	Creates a new data source
	Properties	Opens the properties dialog of the Data Source 202
@	Measurement association 266	Variables are associated with a measurement. Thus the variables are listed in the variables measurement list 74.
	Display filter	Optional display filter of data types

The buttons *"New"* and *"Edit"* start the dialog Define Data Source 202.

Loading files



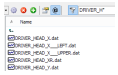
A single file can be loaded by double clicking on it or by pressing the ENTER key while it is highlighted. you can also select multiple files and use the associated toolbar icon. A preview of the first selected file is displayed on the right-hand side.

Loading whole folders



To load a whole folder, select the one desired and click on the arrow symbols next to the folders, or on the Load-icon in the toolbar.

Filtern der Datenliste



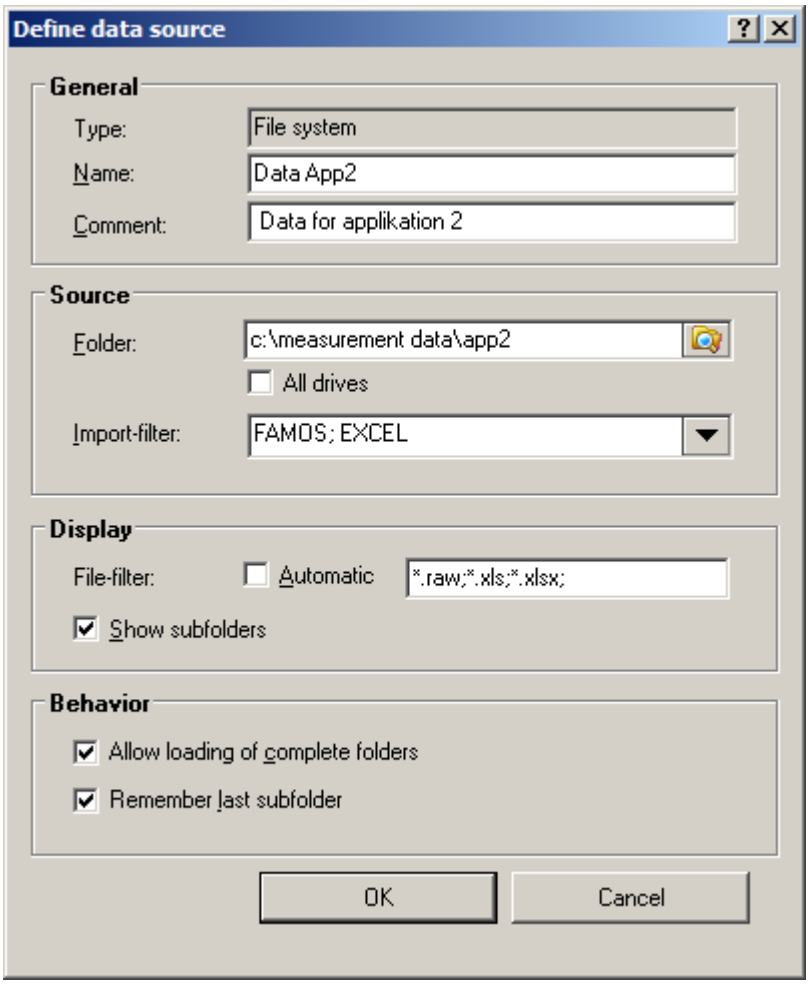
**Display filter like the filter for the variable list 85. By clicking on the filter symbol, a new input box "*Filter*" opens which allows a new filter for the variables displayed to be entered by name.

This is an extra filter to the "*file*" filter of the datasource definition.

6.3.2 Define Data Source dialog

This dialog lets you create a new data source or change the properties of an existing data source.

To call the dialog, select the menu item "*Extra*"/"*Options*", and subsequently the page "*Data Sources*", or click on either of the buttons "*New*" or "*Options*" or on the corresponding buttons in the toolbar Data Source Browser 201.



General

Typ:

File system: Any path.

imc STUDIO Measurement data storage: Location of data, that has been recorded by imc STUDIO 217.

Name

Here, enter the name for the data source. This will be displayed in the Data Source Browser's selection list, for example.

Comment

The comment appears in the Data Source Browser's status bar, for example.

Source

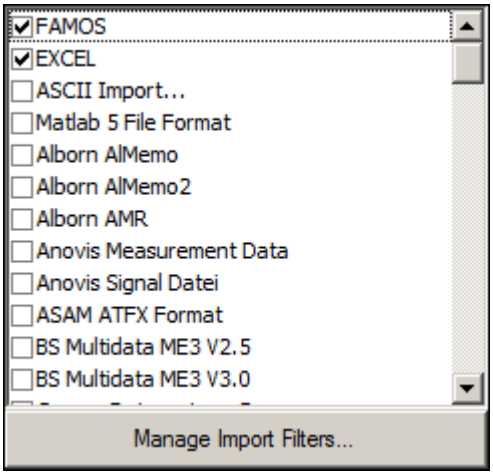
Folder

Root directory for data storage

All drives

When this is selected, the Data Source Browser allows navigation through all drives.

Import-Filter



Here you enter the import filter needed for loading the files selected. By clicking on the arrow symbol on the right edge, you open a selection list offering all available import filters in which you can select the necessary filter.

The button "*Manage Import Filters*" below the list offers quick access to the corresponding dialog 177, in case you wish to change any filter settings or create new derivative filters.

Display

File-filter

This determines which files are displayed in the Browser and may need to be opened. For "*automatic*", the mask is determined according to which import filters are assigned, otherwise you can specify any desired filters in their usual spelling, separated by semicolons.

Show subfolders

When this is selected, the Browser also displays any subfolders of the root directory selected above.

Behavior

Allow loading of complete folders

When this is selected, an additional symbol appears in the Browser to the left of the folder names. Clicking on this symbol loads all files in the folder.

Remember last subfolder

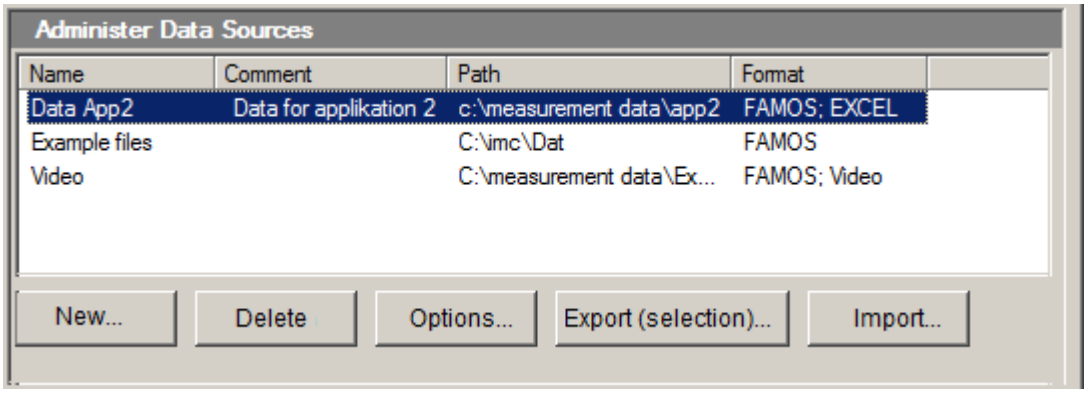
When this option is selected, after selection of a data source, the same folder is selected again, from which a file was last loaded.

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6.3.3 Manage Data Sources dialog

This dialog offers an overview of all data sources already defined. Here, you can create new data sources, or delete or change existing ones.

Call the dialog by selecting the menu item "*Extra*"/"*Options*" in the branch *"File - Load/Import" -"Data Sources".*



The table contains a list of all data sources already defined.

New

Creates a new data source.

Delete

Deletes the data source selected.

Options...

For changing the properties of the currently selected data source.

Export (selection)...

Exports the definitions for the selected data sources to a file. If you wish to export the entire list, first select the item "*Select all*" in the table's context menu (called by right-clicking the mouse).

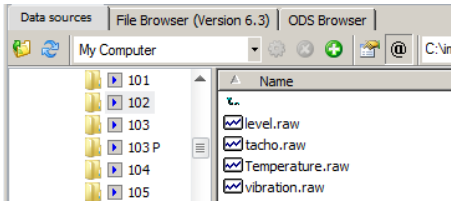
Import...

Imports a file with data source definitions, which had previously been saved using the command "*Export*".

6.3.4 Data source (My Computer)

One particular pre-installed data source is "*My Computer*". Frequently when capturing measured data, the same quantity is measured repeatedly in successive trials. **Examples:**

- A number of test objects are tested in succession on a test rig under identical conditions.
- With type tests, different measurements are performed on the same test object under differing test conditions.



Such measurements quickly accumulate large volumes of data, which must subsequently be saved, compared, presented and in some cases documented and printed out.

The **Data Source (My Computer)** is the tool for quick and easy visualization of measured data.

Interplay with Panel pages

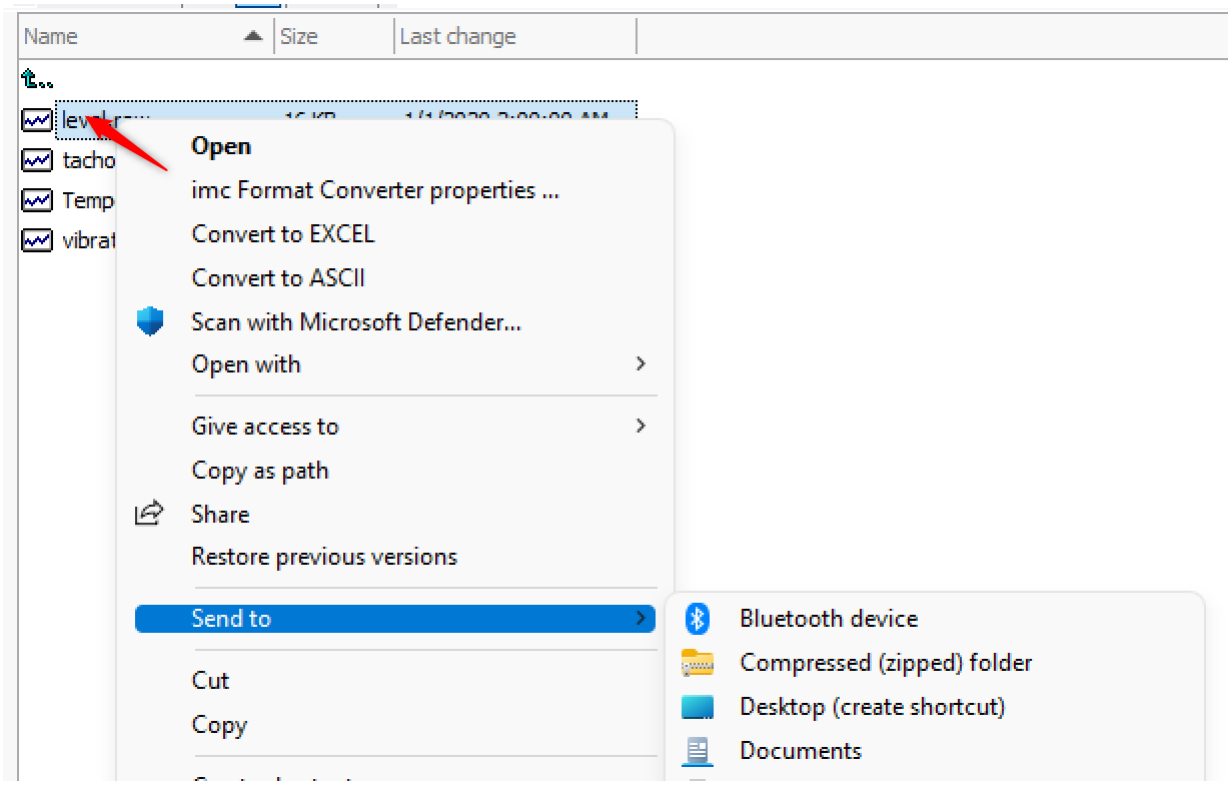
The curve window functions are supplemented with flexible assignment of measurement channels. One's own created Panels 430 immediately display the current selection in the File Browser (Measurements). These combine the properties of dialogs (active widgets, linkage to variables - see User-defined dialogs 545) and reports (optimized for printout - see Report-Generator).

You can find an example here 527.

Context menu

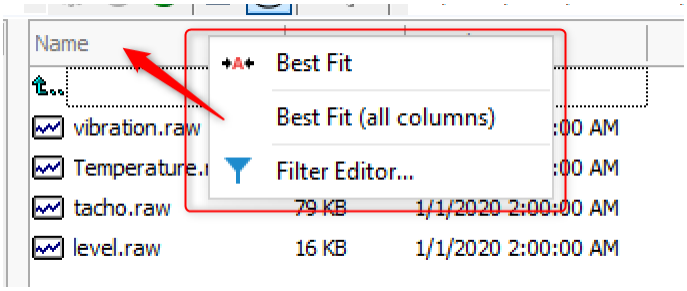
File list

Right-clicking the mouse opens the context menu, as familiar from the Windows-Explorer:

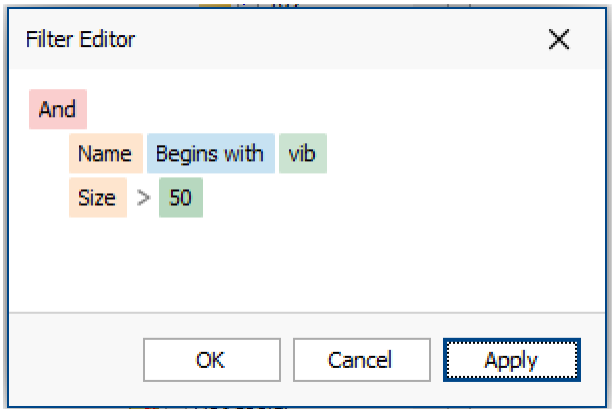


Column header

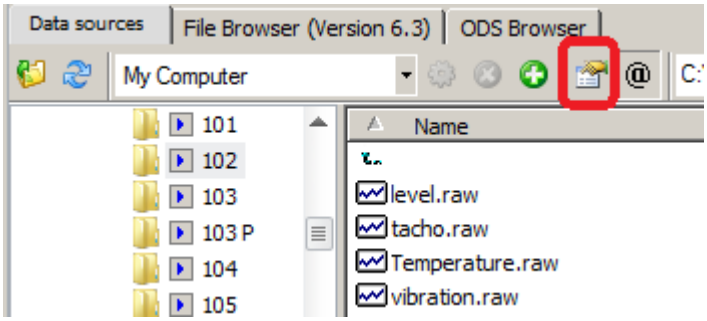
Using the context menu belonging to the column headers, you can modify the **column width**:



Also, the selection of files can be additionally limited by means of a **filter**:

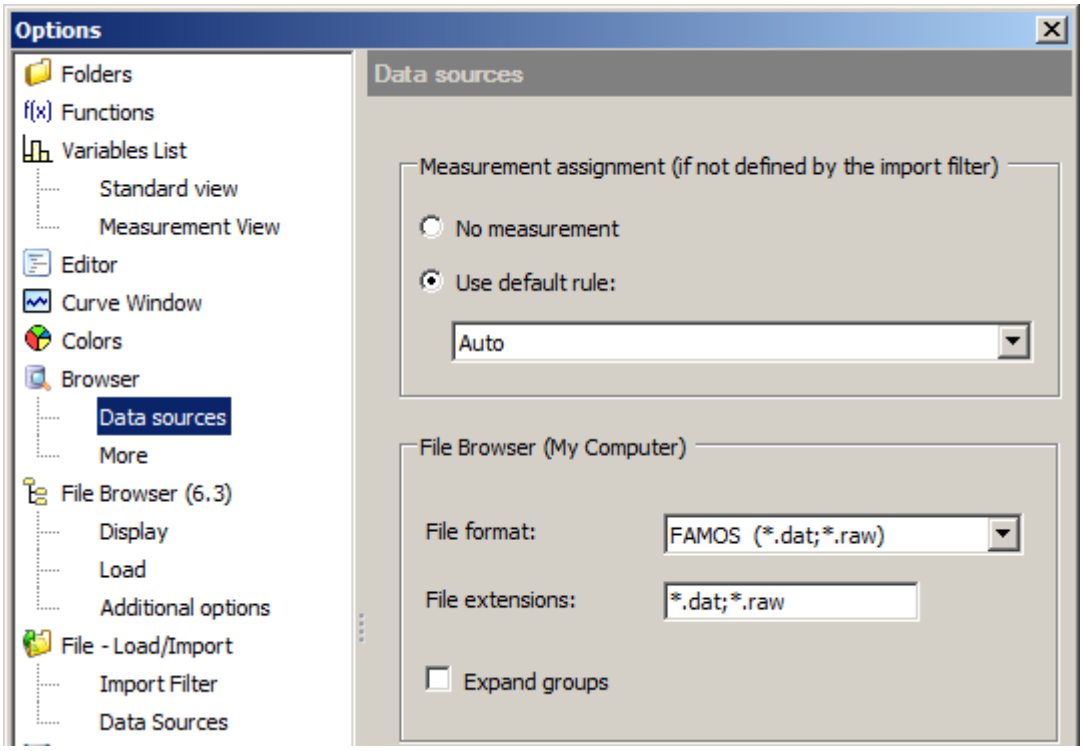


6.3.4.1 "My Computer" Options



In the toolbar for the File list, you will find the button for the Options.

When you click on this button, the Options dialog appears in the branch *File Browser (Measurement Mode).*



File format (My Computer)

Here you set the file format for loading processes (with the associated name extension(s). The Files list only shows such files which possess name extensions set here. The list of possible file formats depends on what import/export-filters are installed.

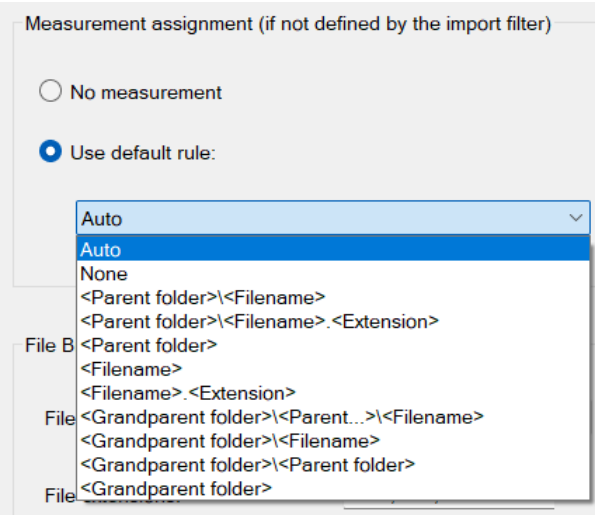
The other options are only applicable if the import filter is not a derivative one. For these, the settings which the user made for the format are applicable instead.

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Expanding groups

Upon loading, the tree diagram expands to display data sets or texts contained in data groups.

Assignment to measurement



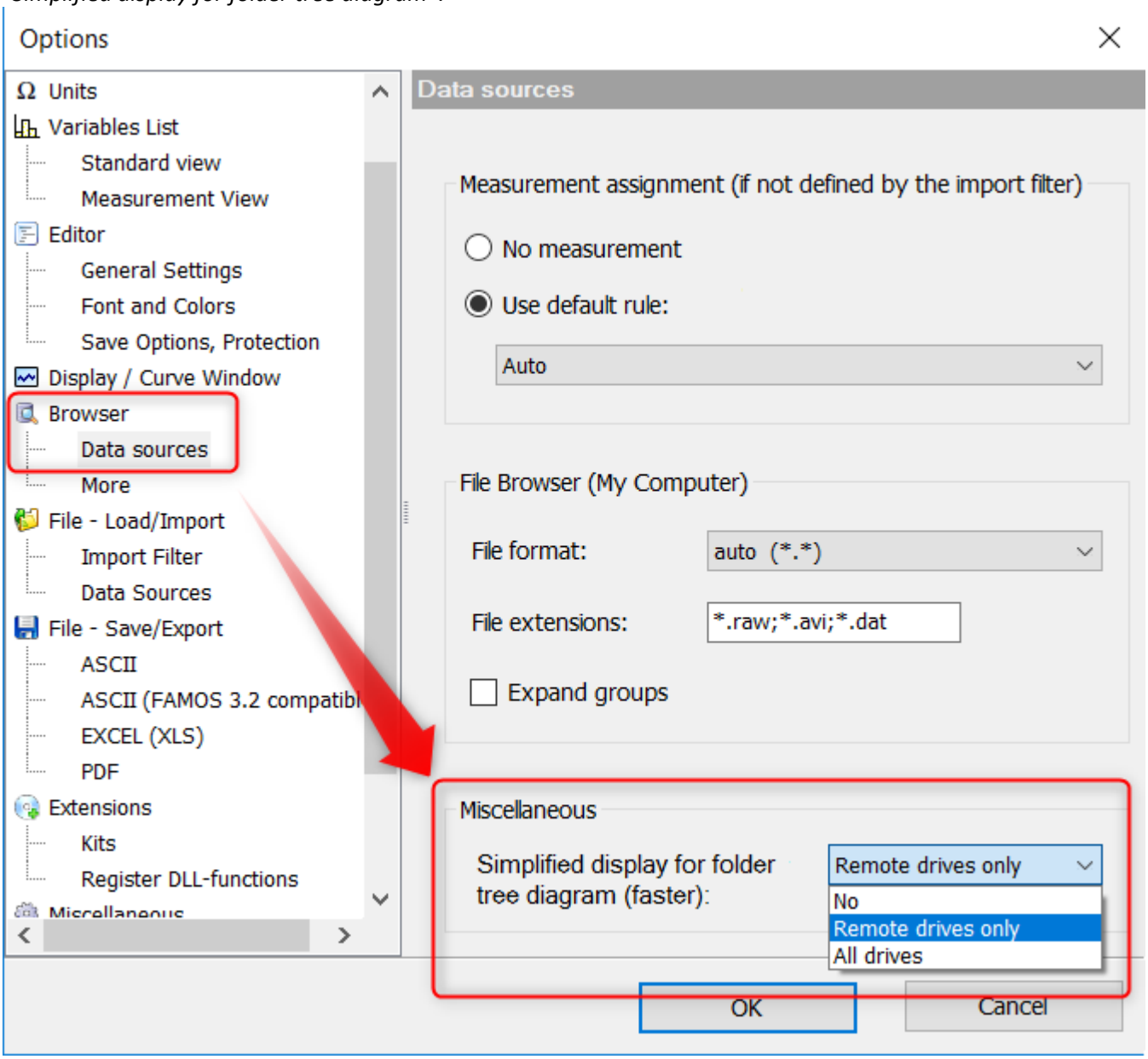
Options for measurement name

Here you select how the measurements' names are generated from the data selection. The appearance of the measurements in the Variables list 209 is in accordance with these settings.

For more information see Variable list > Measurement view 84.

6.3.5 Accelerated construction of the folder tree diagram

Setting up of the folder tree diagram can take a very longtime, particularly when network drives and folder structures with very many subfolders are involved. This process can be sped up by means of the option "*Simplified display for folder tree diagram*".



"Options"/"Browser"/"Data sources"

No: No speedup; behavior as usual

Remote drives only: Local drives can be used as previously. For network drives, the limitations stated below apply.

All drives: The limitations stated below apply for all folders.

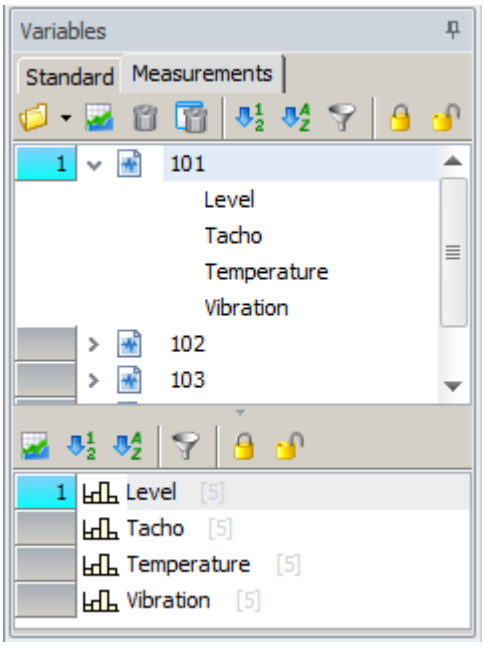
The following limitations apply to this option, however:

- The "Load" – button at folders containing measured data is not shown.
- All folders are initially displayed as "expandable", even if they do not have any subfolders.
- All folders are displayed with the default folder symbol and the original name in the file system instead of with the (localized) display names (e.g. "Program files" vs. "Programs").

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6.3.6 Measurements and Channels lists

On the Measurements page, the data are listed by their measurement folders.



The variables are selected via the **data selector**, which consists of a *measurement list* and a *channel list* with the associated variables.

The **Measurements list** contains the names of all measurements available. When loading files, a name is automatically generated for the measurement, to which the associated channels are assigned. The measurement's name may be formed, for example, from the file name or the name of the folder to which it belongs; see File list options 206.

The names of the channels opened are adopted in the Channels list.

The **Channels list** contains the names of all files currently loaded. The user can make the selection for the data selector here. The method for choosing and numbering the channels is the same as for the Measurements list. If multiple channels have the same name, the amount of duplicates is indicated after the name (in square brackets).

Double-clicking copies the name to the active script window (analogously to the behavior of the Standard Variables list). Depending on the list and list element, the following names are transferred:

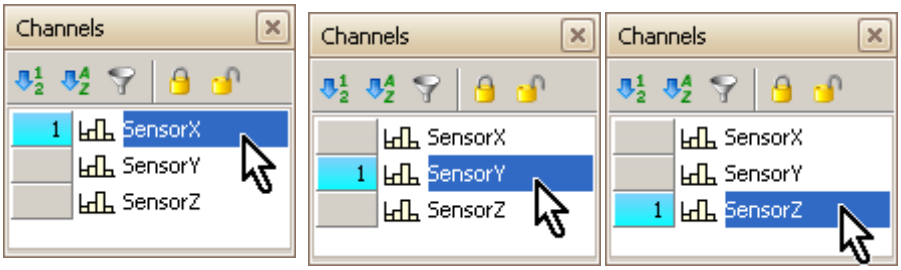
Channel list: =>	Channel name
Measurement list/Meas. node: =>	Measurement name
Measurement list/Channel entry: =>	ChannelName@MeasurementName

6.3.6.1 Numbering and locking

Numbering for the data selection

The main task of both lists is to set the numbering (reference) of the measurements and channels. If the name of a channel or measurement is selected, the associated number in the Measurements list or Channels list is displayed in the numbering column at left (gray background).

Normally the numbering follows the current state of highlighting in the respected list, which the user can change by means of the mouse or arrow buttons.



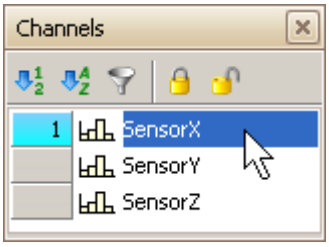
The picture shows that the numbering in the list follows whichever entry's name is selected in the list.

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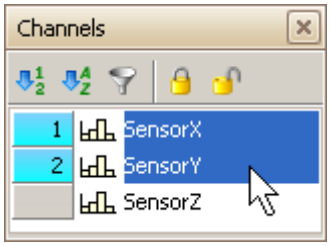
Select multiple entries

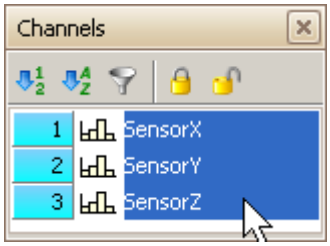
If you wish to select and number multiple entries, you must use the keyboard. See the table "Key combinations for making selections 214" for details.

Example



Click on the entry "*SensorX*", which is thus assigned the number 1.

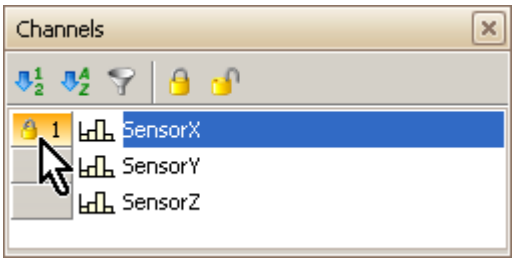




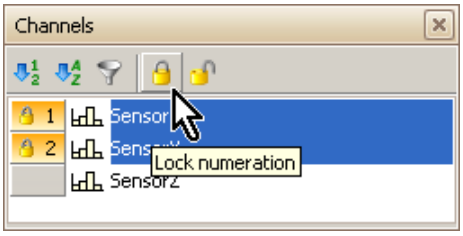
Keep the "*Ctrl*" key pressed and click on the names "*SensorY*" and "*SensorZ*" in succession. This assigns the numbers 2 and 3 to these channels, respectively.

Locking the numbering

The numbering can be locked. This preserves the current numbering order, even if the highlighting in the list is subsequently changed. Locked entries are distinguished by an extra padlock symbol next to the number.



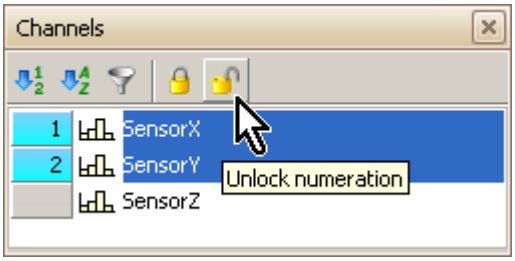
Locking a single entry by clicking in the numbering column



Locking of ALL selected entries with the padlock symbol

Unlocking numbering

To activate/deactivate the lock on an entry, left-click the mouse on the numbering column. Alternatively, use the corresponding toolbar button, which will take effect on **all** currently highlighted entries:



Unlocking all selected entries

6.3.6.2 Example of numbering/locking

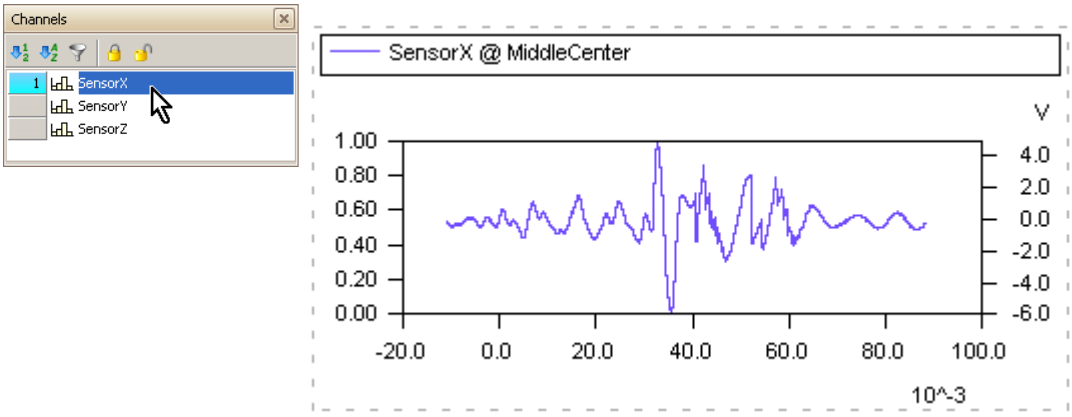
Example

Scenario:
A curve window was configured to display the 1st and 2nd channels of the 1st selected measurement:

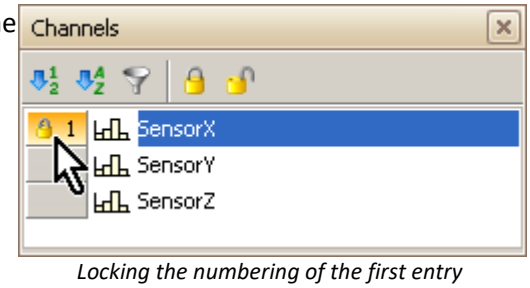
```
Channel #1 @ Measurement #1
Channel #2 @ Measurement #1
```

The current measurement "**MiddleCenter**" contains the channels "**Sensor_X**", "**Sensor_Y**" and "**Sensor_Z**". In the curve window, the procedure is for the first channel (the reference channel) to be successively compared with each of the other channels.

1) Click on the entry "Sensor_X", which is thus assigned the number 1. The curve window then shows this channel.

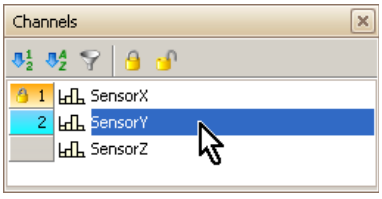


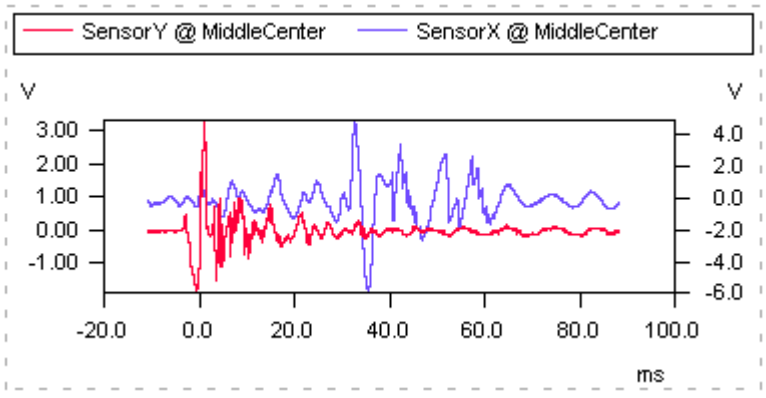
1) Click in the same line in the numbering column at left. The padlock symbol appears, indicating that the entry is locked.



Locking the numbering of the first entry

1) Click on the first channel to be compared ("*Sensor_Y*"). Since the number 1 has already been assigned and locked, it is assigned the next free number (2), and is displayed in the curve window along with the reference channel.



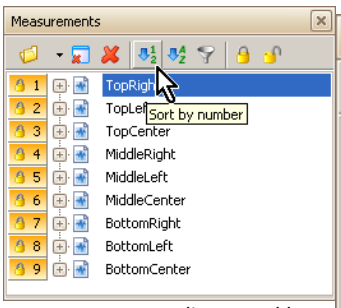


4) Highlight (by mouse click or using arrow keys) the other channels to be compared in succession. The display in the curve window changes accordingly, while the reference channel stays the same.

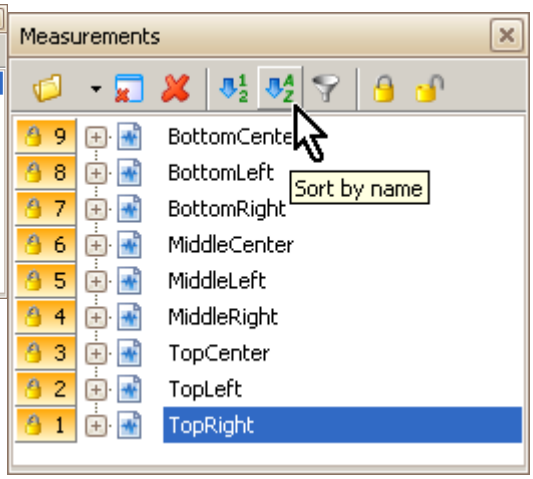
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6.3.6.3 Sorting

In order to keep an overview of multiple entries, the lists can be sorted (either by number or name) as well as filtered.



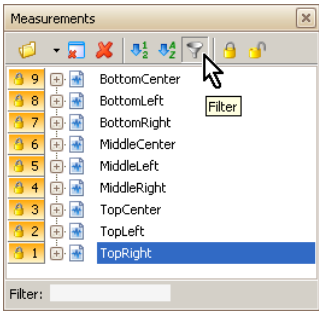
Measurements list sorted by number



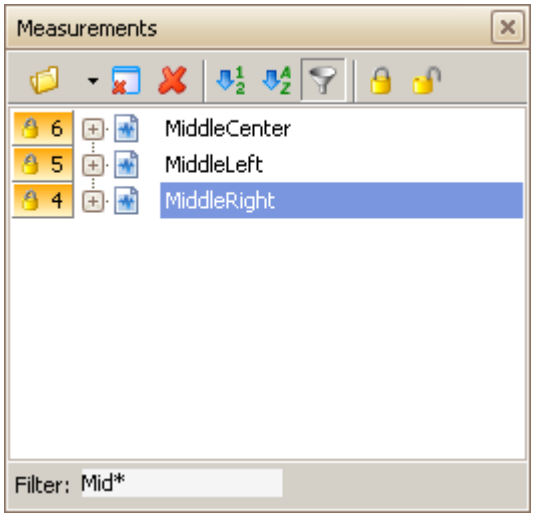
Measurements list sorted by name

6.3.6.4 Filtering

With an **activated filter**, there is an extra input box at the bottom edge of the list, in which you can set the filter conditions for the names to be displayed. Then the only measurements/channels displayed are those adhering to the corresponding name pattern.



Measurement list unfiltered



Measurement list filtered
(measurement names beginning with "Mid")

You can use the **Joker characters** '*' (to stand for an unknown amount of characters) and '?' (standing for exactly one character). No distinction is made between uppercase and lowercase spelling.

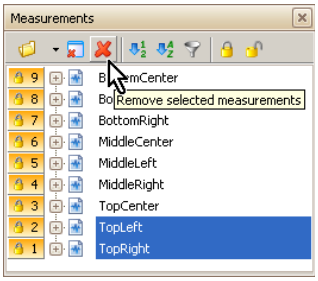
Example

The (unfiltered) channel list contains the entries "v_01", "v_02", "v_01", "v_100", "u_02"

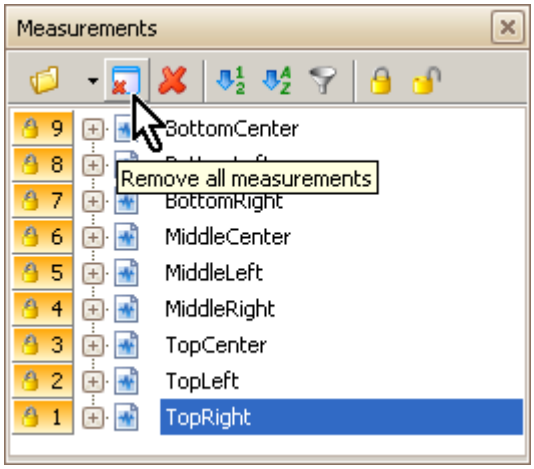
Filter	Display
*	all
V*	v_01, v_02, v_100
V_??	v_01, v_02
*02	v_02, u_02

6.3.6.5 Removing measurements

To remove measurements from the list, use the corresponding toolbar buttons ("*Remove selected measurements*" or "*Remove all measurements*"). Channels belonging to the respective measurements will also be removed.



Remove highlighted measurements (here: "TopRight" and "TopLeft")



Remove all measurements (all nine measurements)

6.3.6.6 Renaming measurements

Right-click the mouse over a measurement's name. A context menu including the item "*Rename measurement*" appears.

Only the name in the Measurements list is changed, but not the data folder. The corresponding function is called *RenameMeasurement()*.

6.3.6.7 Key combinations for making selections

The following table presents key combinations by means of which you can select elements of the Channels or Measurements lists.

Action	Effect
Clicking on an entry +CTRL key	Changes an entry's selection status without affecting the selection status of other entries. Can be used, for instance, to expand the selection.
Clicking on an entry + SHIFT key	Selects all entries between the one on which you click and the last one on which you previously clicked. Any previous selection is discarded.
SHIFT+UP/SHIFT+DOWN repeatedly	This selects a contiguous group of entries. Any previous selection is discarded when you start making this selection.
Clicking on an entry + CTRL + SHIFT	Selects the contiguous group of entries between the currently clicked entry and the previously selected entries.
CTRL+SHIFT+UP or CTRL+SHIFT+DOWN key	Selects contiguous groups of entries. Preserves the previous selection ("*Add*")

6.3.6.8 Drag&drop from the Measurements and Channels lists

The easiest way to select channels and measurements for display on the panel is to use the drag&drop technique. Click the left mouse button over the object which you wish to drag and hold the mouse button down. Next, move the mouse to the position in the page where you wish to deposit it, and release the mouse button.

An important advantage offered by the Data Browser is the flexible assignment of messages and channels to the data displayed in the curve window or in other panel widgets.

The drag&drop method simplifies two common cases in operating the program:

- fixed channel name, changing measurement name ("test series").
- the channel name and the measurement name change.

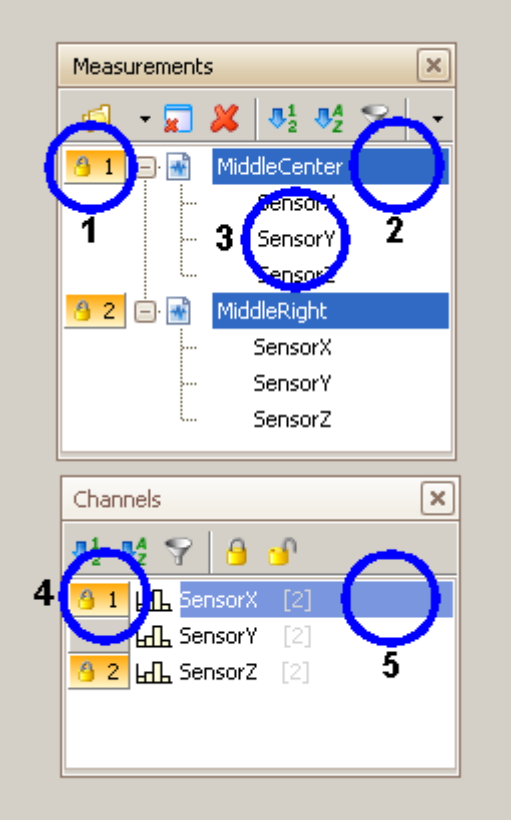
The first case is accomplished by applying drag&drop from positions 1, 2 215 or position 5 216.

The second case is accomplished by applying drag&drop from position 4 216 (assignment by numbers only).

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Positions

There are five positions from which it is possible to apply the drag&drop action to objects, as shown in the image below:



The five positions for the startof the Drag&Drop action

1: The measurement list's numbering column

2: The measurement list's name column

3: The channel name in in the measurement list

4: The numbering column in the channel list

5: The channel name in the channel list

Which channels and measurements are used depends on the selection and numbering in the lists. How the measurements and channels are formed depends on the position from which the drag&drop action is begun.

Step by step instructions

Before applying the drag&drop procedure, select or respectively number the desired channels and measurements.

Next, select the appropriate position at which to drag the selection onto the page. The selection for the position determines which data are displayed in the curve window or other panel widgets.

Position 1 or Position 2

Each measurement **selected** (denoted by a colored background) in the measurement list is combined with the channels in the channel list which are **numbered** (if the measurement includes any). The associated name is formed from the name in the channel list (e.g. "*SensorX*") and the measurement's number (e.g. "*Measurement #1*").

If you start at position 1 (or position 2) in the image above, the resulting names will be as follows:

```
SensorZ @ Measurement #1
SensorZ @ Measurement #2
SensorX @ Measurement #1
SensorX @ Measurement #2
```

Note that the selection of the names from the channel list only depends on the numbering and not on the current selection.

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Position 2 SHIFT + drag&drop

At this position, additionally pressing the <SHIFT>-key causes the objects to be named differently. Specifically, the names are formed from fixed measurement names (e.g. "*MiddleCenter*") and fixed channel names (e.g. "*SensorX*").

In the image above, if you use <SHIFT> + drag&drop from position 2 to the page, the following names will be formed:

```
SensorX @ MiddleCenter
SensorZ @ MiddleCenter
SensorX @ MiddleRight
SensorZ @ MiddleRight
```

Position 3

The channel name and the measurement name are adopted unchanged. Neither the selection or numbering in the channel list play any role. If you click in the image above on "*SensorY*" in the measurement list (position "3"), then this entry is selected. Then if you drag it to the panel, the following name will be formed:

```
SensorY @ MiddleCenter
```

By means of key combinations 214, it is also possible to select and drag multiple channels. It is also possible to combine channels from multiple measurements (select by means of <Ctrl>+click).

Position 4

Here, all channels selected in the channel list are combined with whichever measurements from the Measurements list are numbered. The name is formed exclusively from the measurements numbers and channel numbers. If you start at position 4 in the image above, the following names will result:

```
Channel #1 @ Measurement #1
Channel #1 @ Measurement #2
```

If you previously additionally select "*SensorZ*" in the Channels list using Ctrl+click, and then start at position 4 or at SensorZ's numbering, the following names will result:

```
Channel #1 @ Measurement #1
Channel #2 @ Measurement #1
Channel #1 @ Measurement #2
Channel #2 @ Measurement #2
```

Position 5

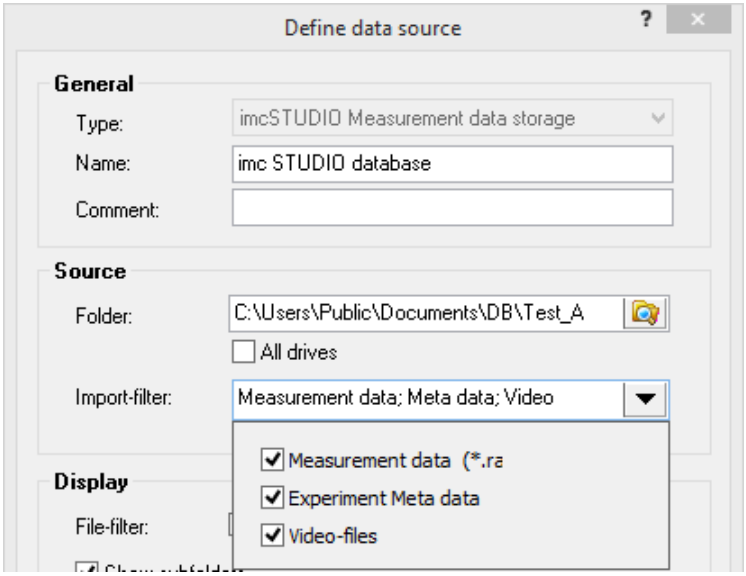
Here, all channels selected in the channel list are combined with whichever measurements from the Measurements list are numbered. The name is formed from the fixed channel name (e.g. "*SensorX*") and the measurement number. If you start at position 5 in the image above, the following names will result:

```
SensorX @ Measurement #1
SensorX @ Measurement #2
```

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6.3.7 imc STUDIO Measurement data storage

Optimized for data recorded with imc STUDIO.

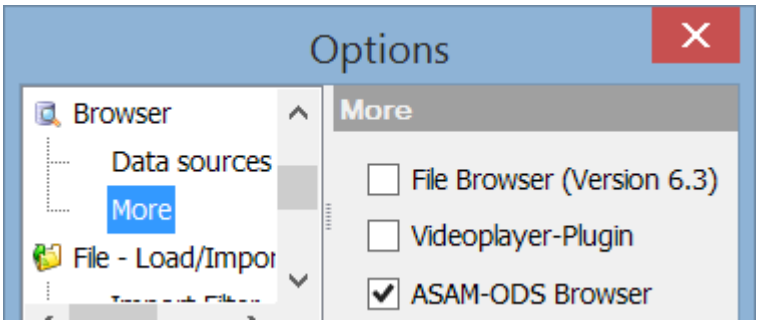


Along with actual measurement readings (*.raw), any metadata and videos in the measurement folder are automatically loaded also.

"Multi-trigger videos" (the individual "event"-videos are saved in the subfolders with the names "*.avi") are supported.

Furthermore, any subfolders containing data not relevant to analysis ("Meta", "Config") are automatically hidden.

6.4 More browsers



Additional browsers are available under "*Extra\Options*" in the branch "*Browsers*" under "*More*".

Here you will find the browser used up until imc FAMOS Version 6.3 218, the *Video Player-plugin*, which is better integrated into the Panel by means of a widget, and the *ASAM-ODS-Browser*.

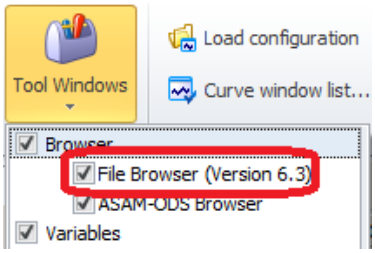
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6.4.1 File Browser (Version 6.3)

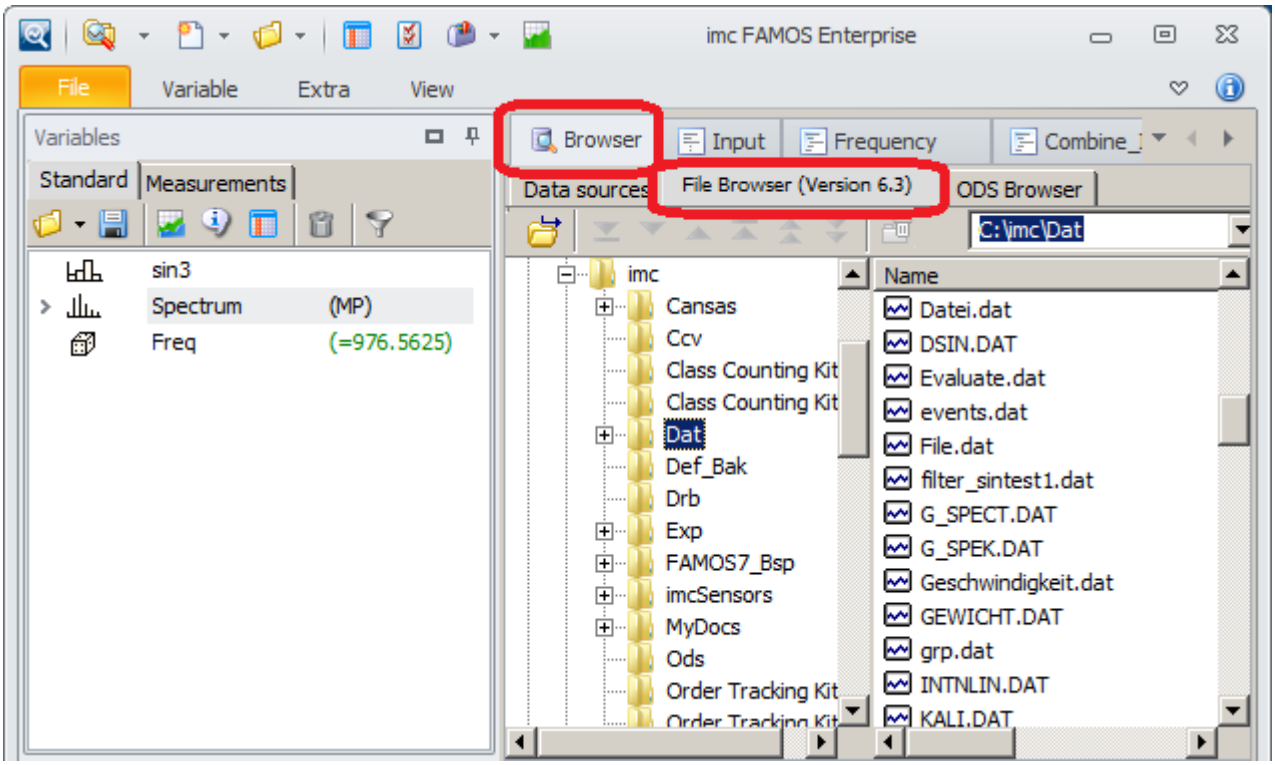
Note

As of Version 7.0, the File Browser familiar from previous versions is hidden by default.

Activate it via the multi-function bar View - Tool Window - File Browser (Version 6.3) 131 or at Options\Browser\More 217.



The File Browser (Version 6.3) provides quick and easy access to your files of measured data. It offers capabilities which save time compared to using the "*File / Load*"-dialog 174. The File Browser is included in all editions of imc FAMOS .



The File Browser is particularly useful in situations where multiple measurement value files, all having the same name, are located in different, consecutive directories. Many modern measurement systems generate such a directory structure, especially for consecutive measurements adhering to a fixed configuration.

The main components of the File Browser are a directory tree and a file list which indicates the files located in the currently selected directory. The border between the two lists can be shifted, using the mouse.

At the top there is a toolbar offering commands affecting the current selection in the folder or file list, as well as a combo box which for displaying/changing the current folder.

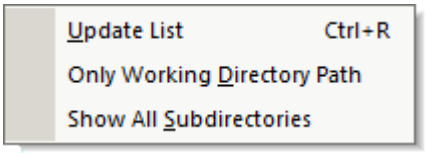
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6.4.1.1 The Folder List

At the File Browser's first call, it displays only that path in the directory tree which leads to the default folder which is set for loading files (adjustable via menu item "*Extra / Options / Folders*").

Double-clicking on a directory's entry toggles between "On" and "Off" for a listing of that folder's subdirectories. Instead of double-clicking, you can select (mark) the desired directory and then press <Enter>..

Context menu (tree display)



Right-clicking the mouse on the directory tree calls a **context menu**, which offers the following operations.

Update List

Re-reads the directory structure. This is only necessary when the automatic updating 221 has been deactivated.

Only Working Directory Path

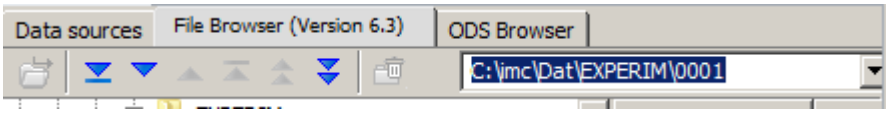
Causes the path to the set default directory for loading files to be shown. This is what the list does when imc FAMOS is first started..

Show All Subdirectories

Starting from the current folder all subfolders are displayed.

Directory n the tool bar

The currently selected folder is entered in the toolbar. This text box can be deactivated in the Options: In the File list's context menu, select the command *"Display Options..."* 220, or select the menu item "*Extra" / Options"/ "File Browser (Version 6.3)| Display* 221": *"Show current directory in toolbar"*.



To change to another folder, you can enter a different path in this box and confirm using ENTER. A history of recently used folders is opened when you click on the triangle at right.

Using the arrow buttons

When Selection-mode 223 is active, it is possible to navigate through the subfolders using the arrow buttons. The double-arrows cause you to jump automatically from one folder to the next after a delay time 227. How to use these arrow buttons to compare data from different folders is described in greater detail in the section 'Behavior when changing folders' 225.

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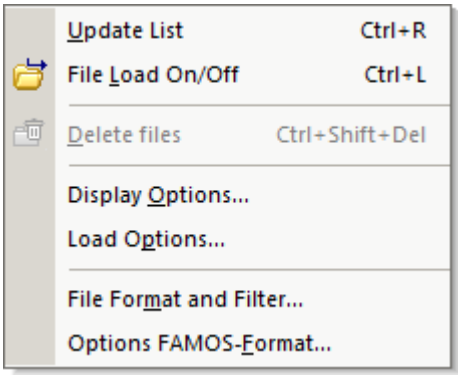
6.4.1.2 The File List

The file list indicates the files belonging to the currently selected folder.

Loading files

when you **double-click** on a file's entry, the associated file is loaded according to the format set for it. **One or more files** can be loaded using the ENTER-key, once having been selected. Instead of the ENTER-key, you can click on the icon in the toolbar or use the corresponding context menu item. For details, see the chapter 'Loading files (with the File Browser)' 223.

Context menu (File list)



By right-clicking the mouse over the File list, you open a **context menu** offering the following operations.

Update List

Re-reads the directory structure. This is only necessary of automatic updating 221 had been deactivated.

Delete files

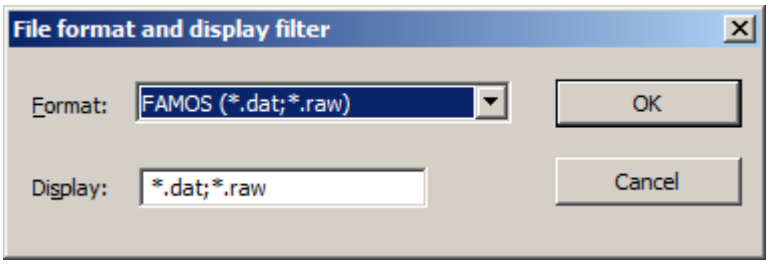
With the appropriate presettings, the currently selected files can also be deleted; see the chapter 'Deleting files (with the File Browser) 226'.

Display/Load Options...

Opens the corresponding dialog for making presettings. It can also be called via the main menu "*Extra / Options / File Browser*".

File Format and Filter...

For selecting the file format and display filter; see the next section.



Along with the file format, you can specify a display filter. For instance, you can have only such files displayed in the list which contain interesting measurement data, while hiding other files (such as configuration files, etc.).

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Options FAMOS-Format...

If applicable, calls the respective configuration dialog for the file format set.

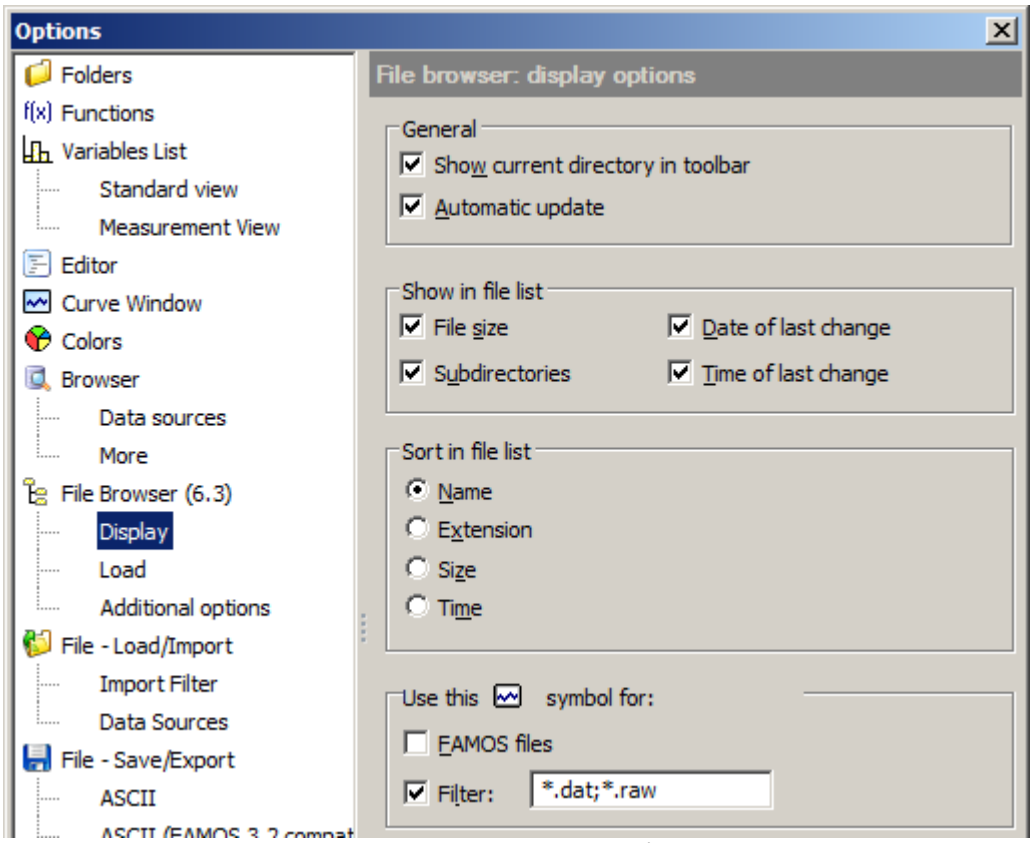
In the filter, you can use the wildcard characters '*' and '?' in the customary way; multiple filters are to be separated by semicolons.

Examples



6.4.1.3 Display Options

Various File List presettings are available in the dialog "*Options ? File Browser (Version 6.3)| Display*". This dialog is called via the File List context menu 220 or from the main menu"*Extra" / "Options", "File Browser (Version 6.3) | Display* 129", auf.



Dialog: Options File Browser (6.3) / Display

Show current folder in toolbar

The File Browser's toolbar indicates the current folder in a combobox.

Automatic update

If this option is active (default setting), the file and folder lists are automatically updated if the directory structure changes (e.g. due to the creation, renaming or deletion of files or folders). This process can require lots of time and impede working with imc FAMOS , in particular if network drives are involved. In this case it is recommended to switch this option off and update the lists manually 220, if necessary.

Show in File List

Displays additional info on files or folders.

If the option **Subfolders** is selected, along with the files also the subfolders are shown in the File List. Whatever sorting mode is active, these will always appear before the files.

Sorting in File list

The sorting of the entries in the file list proceeds in the manner indicated by the option chosen here. Sorting by size places the largest files at the head of the list. Sorting by time or date places the newest files a the head of the list. Alternatively, you can change the sorting order by clicking on the corresponding column header in the file list.

Use this symbol for files

Files of measured data are denoted by the icon.

imc FAMOS -Format

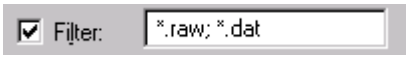
If this option is activated, all files in the imc FAMOS file format are denoted by this symbol. This does not cause entire files to be checked but only the first bytes of a file. All imc applications which save measurement data to files (e.g. imc STUDIO) use this format.

If you are not particularly concerned with files in this format it is advisable to deactivate this option, as it slows down the processing of the File Window.

Filter

This option causes the entries of all files which correspond to the specified name template to be accompanied by a special symbol. The template may incorporate the characters "*" and "?" as wildcards, to be employed in the usual manner ("*" = any number of any characters"?"). Multiple filters may be specified; they must then be separated by semicolons.

Examples





Note that it is also possible to filter via the context menu of the display 220.

6.4.1.4 Loading files

6.4.1.4.1 Overview

The File Browser provides an easy way to accomplish the steps

select file -> load file -> display data sets

In contrast to simply using the Load-dialog 124, the File Browser can be used to best effect if a group of measurement value files, destined for the above mentioned processing, are saved under the same name and in different, consecutively placed directories. Many modern measurement systems generate just such a directory structure, especially involving consecutive measurements adhering to a fixed configuration.

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6.4.1.4.2 Specifying and configuring a file format

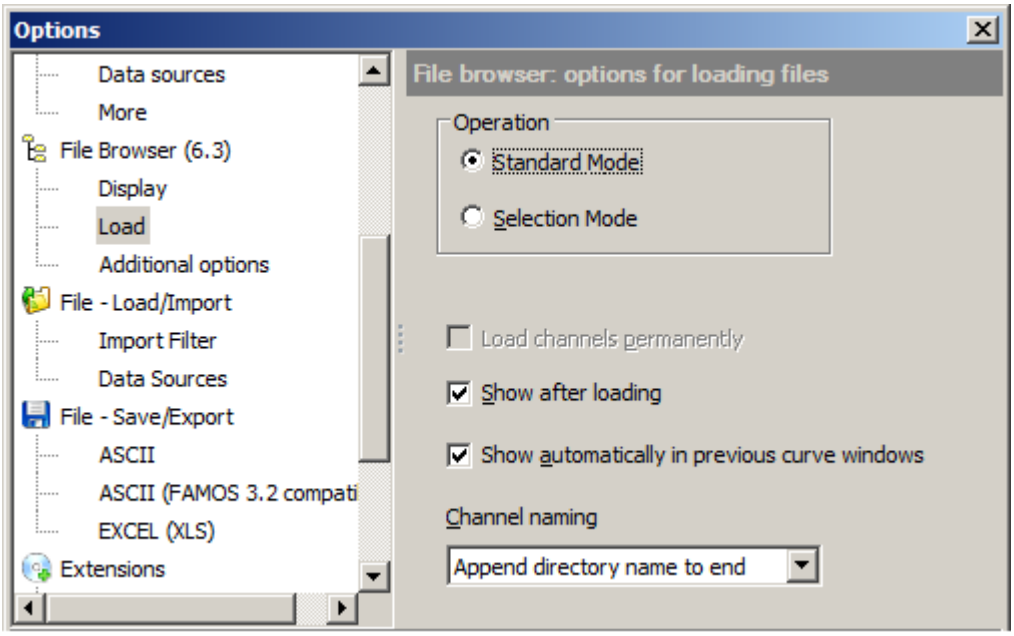
You can select the file format via the context menu command "*File format and -filter*". The format selection list in this dialog depends on the selection made under Manage import filters 177. Along with the standard, included internal file formats, any formats previously defined by the user with the help of the ASCII-Import Assistant 186 or the File Assistant.

If the file format selected can be configured, you can create a derivative import filter 179, so that its special settings can be applied here.

6.4.1.4.3 Options for loading with the File Browser

The File Browser offers special settings affecting imc FAMOS 's behavior upon loading the files. Among other things, you can determine whether the display of the waveform should occur immediately and also how the naming of the loaded data sets should be done.

You make these settings in the dialog *"Options"* in the branch *"File Browser (Version 6.3)/ Load"*. This dialog is accessed either via the main menu (*"Extra / Options"/ "File Browser (Version 6.3)"* 129) or more quickly via the file List's context menu, with the command *"Load Options..."* 220".



Dialog: Options File Browser (6.3) / Load

The data set loading process is controlled by the settings in this dialog as follows::

Operation/ Standard Mode

In Standard Mode, the system behaves like an "*File / Open*" dialog. The files selected are opened without renaming. The arrow keys for automated navigation are not available. The option "*Load channels permanently* 224" is ignored. The loading is always permanent in this case.

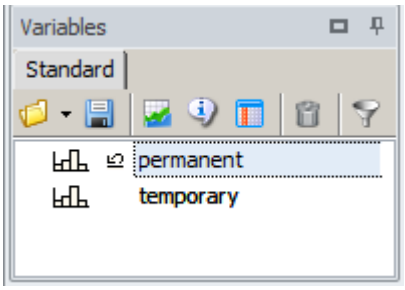
Operation / Selection Mode

When opening a file, it is at the same time highlighted with a yellow symbol 225 as "loaded". When one navigates to a different measurement folder, imc FAMOS looks for files with the same name and then automatically opens them. In conjunction with "*channel naming* 224" this enables quick comparison of files from different folders which have the same name.

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Loading channels temporarily / permanently

Temporary refers to files which are automatically deleted (from imc FAMOS) when the current directory in the directory list is changed. They also are deleted as soon as their file entry is no longer the current entry in the File List.



This allows you to gain a quick overview of measurement data files stored in various directories without the files accumulating in the imc FAMOS variables' list, which might necessitate deleting them manually later on. A special symbol "⍁" distinguishes temporary files in the Variables list.

Permanent channels, by contrast, remain accessible in a imc FAMOS session until they are removed from the variables list via menu item "Delete". This is the appropriate setting in cases where you wish to compare channels belonging to different folders.

Temporarily loaded channels can be subsequently declared permanent (menu item "*Variable/ Permanent*").

Show after loading

If this option is active, and the loaded data set isn't already being displayed, a new curve window is opened and displays the data set.

Regardless of these settings, the display is updated in any existing curve windows where this data set is already displayed. This can occur, for example, when overwriting data sets.

Show automatically in previous curve windows

With this option active, after loading is completed all curve windows are checked for a channel bearing the same *original* name as the data set just loaded. If a curve window displaying such a waveform is present, the newly loaded data set is displayed together with the old occupant waveform in that curve window. This option is only sensible if the active option for "*Channel naming*" is either "*Append directory name to end*" or "*Precede with directory name*".

Example

Suppose that in the beginning, a data set "Channel1" belonging to folder "F1" is loaded. Its name is now "F1_Channel1". Next, a data set from the folder "F2", also called "Channel1", is loaded; its name is now "F2_Channel1". With the above option set, a search begins for a channel named "*_Channel1" (* = any name). "F1_Channel1" is promptly found and so "F2_Channel1" is drawn in the curve window with it.

Channel naming

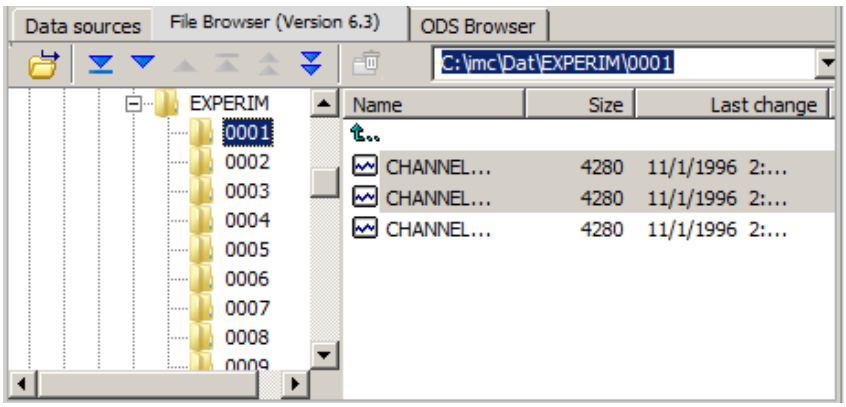
The loaded data sets are designated by default by their variable's name in the file. With this option, the current folder name can be prefixed/appended to this name. When loading a multi-channel file, the filename can be used instead.

This option is sensible for cases where you intend to compare multiple channels all bearing the same file name. Since imc FAMOS requires channels' names to be unambiguous, The last channel loaded would otherwise write over the previously present channel with the same name.

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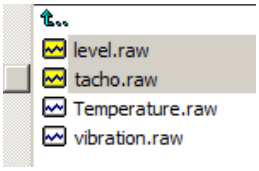
6.4.1.4.4 Selecting/deselecting files for loading

Select the desired files with the mouse.



The <Enter> key, the corresponding button in the toolbar or the appropriate item in the context menu all cause the current selection to be loaded. If only a single file is involved, it is sufficient to double-click on its entry in the list.

imc FAMOS will attempt to load the files in accordance with the currently set format. If an error occurs and the file cannot be loaded, an error message will appear in the status bar in the main window. Otherwise, the data sets contained in the files become accessible in imc FAMOS , and are indicated in the Variables list.



A loaded file is distinguishable in the file list by a symbol with a yellow background.

Names of files which feature the "loaded" symbol are recorded internally. On the occasion of a change of folder, the names of files in the new folder are compared with the recorded names. If the new folder contains files with names identical to those already loaded, they are automatically reloaded.

De-selecting files

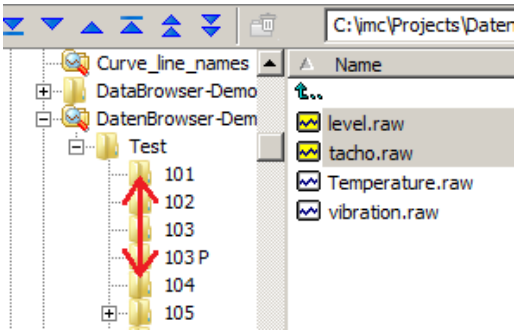
Files highlighted as loaded can be de-selected by the same technique. In that case the symbol appears with a white background.

When de-selecting a file, the data sets having the attribute "temporary" which belong to this file are deleted from the Variables list.

Note

This function is only available in Selection Mode 223. In Standard Mode, the files are loaded in the "normal" way by means of double-clicking, or the ENTER-key, or by menu.

6.4.1.4.5 Behavior when changing folders



When you move through the folders list to a folder on the same level, any files highlighted as "loaded" are re-loaded. This means that all files in this folder are compared with the already filenames of open files and then a new loading procedure is automatically performed if any names match.

If, for example, you wish to view a collection of channels stored under the filename "Channel1.DAT" in several folders, it is sufficient to load just one of the files and then change the folder.

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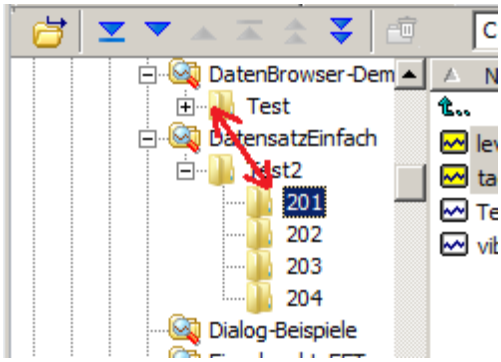
This means you can simply go from folder to folder in the Folders list, and if a file of that name exists in any of the folders, it is automatically loaded.

For such applications the arrow files in the toolbar come in very handy.

 These provide a convenient method of switching between folders on the same level.

Automatic scrolling through folders is performed in response to clicking on either of the double-arrows. Using the dialog "*File Browser (6.3)"/ "Additional options* 227", you can set how long to pause between each change of folder.

You can also set when to identify a folder as the "last" one in a certain direction. This automatic scrolling stops when the last folder in this level has been reached or when the button in the toolbar has been clicked again.



When you go to the parent level folder in the Folders list, any data sets which were created having the property "temporary" are deleted from the Variables list.

6.4.1.5 Deleting files

You can also delete files via the File Browser. This function deletes the selected files and folders from the data from the data storage medium.

Warning

Be very certain that you no longer need the files deleted.

Please give consideration to the fact that deleting a folders automatically entails deletion of all its subfolders and files they contain.

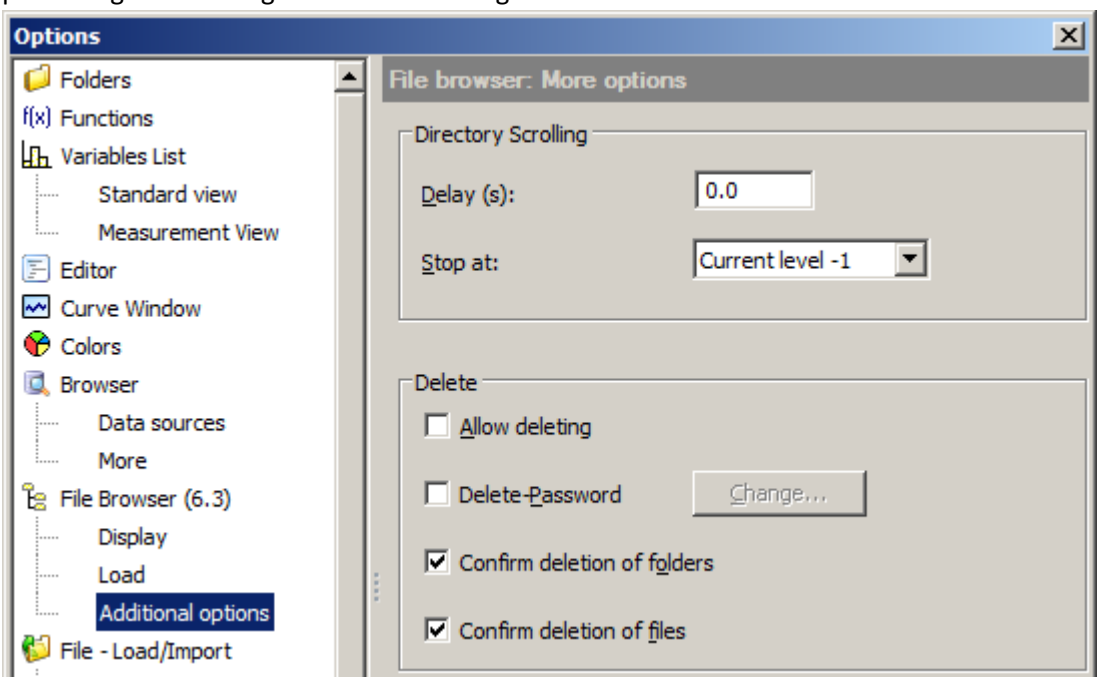
To delete selected files you can use the pertinent button in the toolbar or the corresponding item in the context menu (accessed by right-clicking in the File list).

These only respond if the deletion operation is permitted at all by the program. This option is selected in the dialog *"File Browser Options (Version 6.3)" / "Additional Options"* 228 and be default is "*off*". Other settings affecting deletion can also be performed in this dialog. For instance, an optional deletion-password can be established, or prompts for confirmation of the deletion command can be ordered.

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6.4.1.6 More Options

The menu item *"Extra" / "Options" / "File Browser (Version 6.3) | More Options"* opens a dialog for making presettings concerning automatic scrolling and deletion of files.



Dialog: Options File Browser (6.3) / Additional options

Directory Scrolling

These options affect the behavior of the "File Window" when you use the arrow buttons to "explore" in the directory tree.

Delay

Determines the time (in seconds) between changes of the directory during automatic scrolling in the direction selected.

Stop at

The arrow buttons allow you to jump to the next directory on the same level in the direction indicated. This setting specifies when the last directory in the relevant direction is to be considered as already reached.

Current level -1

The end of the scrolling process is reached when the next folder in the direction indicated is at least one place higher in the hierarchy than the current folder.

In the example below, only the subfolders "Shot1" and "Shot2" would be accessible via the arrow buttons if this were the valid setting.

Current level -2

The end of the scrolling process is reached when the next folder in the direction indicated is at least two places higher in the hierarchy than the current folder.

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In the example below, the subfolders "Shot1" to "Shot6" would all be accessible via the arrow buttons if this were the valid setting.

```
|----Labtests
| |--------Exp1
| | |-----Shot1 <<< current folder
| | |-----Shot2
| |--------Exp2
| | |----Shot3
| | |----Shot4
| |--------Exp3
| |----Shot5
| |----Shot6
|----Tmp
```

Delete

The following options configure direct deleting using the File Browser.

Allow deleting

Deletion is only possible if this option is activated. Otherwise, the corresponding menu item and button in the toolbar are not operable.

In this way, data are protected from accidental loss due to incorrect operation of the user interface.

Delete Password

For additional security against deletion of files by accident or by unauthorized operators, a password can be established which is inquired before deletion of files is performed. If this option is set to "active", an additional dialog appears in which to enter the password (consisting of at least 4, and at most 8 characters). Deactivation of this option can also only be performed after correct response to the password prompt.

Change

Here you can replace a previously established password.

Confirm

This option causes a confirmation prompt to appear, which must be replied to in the affirmative, before deletion is actually executed.

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6.5 Saving files

"Saving Files" is available with imc FAMOS edition *Reader*, *Professional* and *Enterprise*.

First select the variables to be saved in the variable list in the main window. Then select "*File/ Save Individually*" or "*File/ Save Together*".

imc FAMOS variables can be saved in imc FAMOS file format, and with some restrictions, in ASCII format. If Microsoft ® Excel is installed on the same computer, files in Excel-XLS format can also be created. For saving in ASCII- and XLS-format, the user can define so-called export templates by operating a dialog. These templates set, for instance, file and column headers, numerical formats and the presence of scaling columns. Format templates once defined are then available under the selected name for the format selection.

From imc FAMOS 5.0 on, additional file formats are available as optional import extension libraries which can be seamlessly integrated into the imc FAMOS user's interface. This includes the MATLAB-export, for example, which comes standard with imc FAMOS .

For an overview about all installed export filters see here: Import-/export filters.

Other file formats, such as an enhanced ASCII or a configurable BINARY format can be generated by imc function libraries, which are used via the Kit interface in imc FAMOS .

6.5.1 Save individually



The selected variables are saved in succession, each in one file. Select the menu item "*File/ Save Individually*". A dialog is called up for each variable selected to enter the file name and select the format.

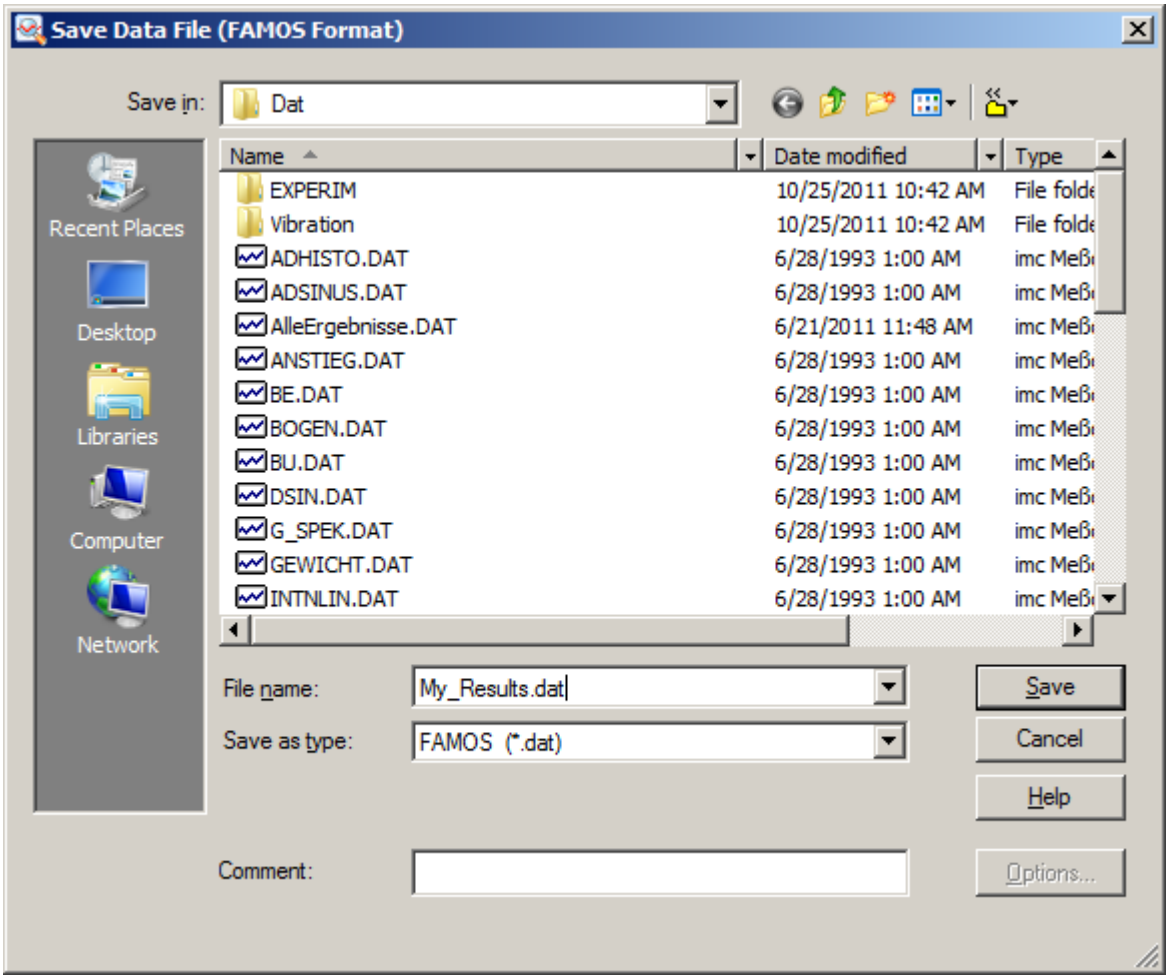
6.5.2 Save together



Saves the selected variables together in one file. For this purpose, select the menu item "*Variables"/"Save together*".

In this dialog, enter the file name under which the selected variables should be saved.

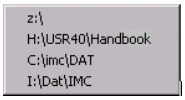
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Dialog: Save file

The folder opened upon starting is the last folder used for saving. At the beginning, the folder belonging to the default imc FAMOS setting is used. This default setting can be edited in the dialog "*Options*"/"*Folders*" and remains intact after the program is closed.

The toolbar at the upper right contains an additional button: 



Clicking on this button with the mouse opens a small menu offering the most recently used folders. Selecting items from this menu is a fast way to moving to another folder.

Format

In the format selection list, select the desired file format. Along with "*imc FAMOS* ", you can also find any ASCII- and XLS export templates you defined personally. In "*Save individually*" mode, the format "ASCII (3.2 compatible)" is also available.

If no filename extension is specified, a default extension is automatically appended. This is ".DAT" for imc FAMOS -format, ".ASC" for ASCII-(3.2) format and for personally defined ASCII- and XLS export templates the extension defined by the user.

A warning message is generated if the selected file already exists. You may either overwrite the existing file or cancel the "Save" command.

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Reference

Chapter 'Sequences', commands SAVE, imc FAMOS , ASCSAVE, ASCOPTION

Manual *'imc FAMOS :* imc FAMOS Functions Reference': *FileOpenDSF, FileObjWrite, FileOpenASCII, FileLineWrite*

Manual *imc Shared Components*, description of the imc FAMOS file format

6.5.3 imc FAMOS-Format

The imc FAMOS format is the default format for saving variables. All data types and formats can be saved in this format. All additional information, such as name, unit, comment, etc. is saved along with the variables. Any number of variables may be saved together in one file. Data sets of any type and text can be combined.

If you don't specify a filename extension, "*.DAT*" is appended automatically.

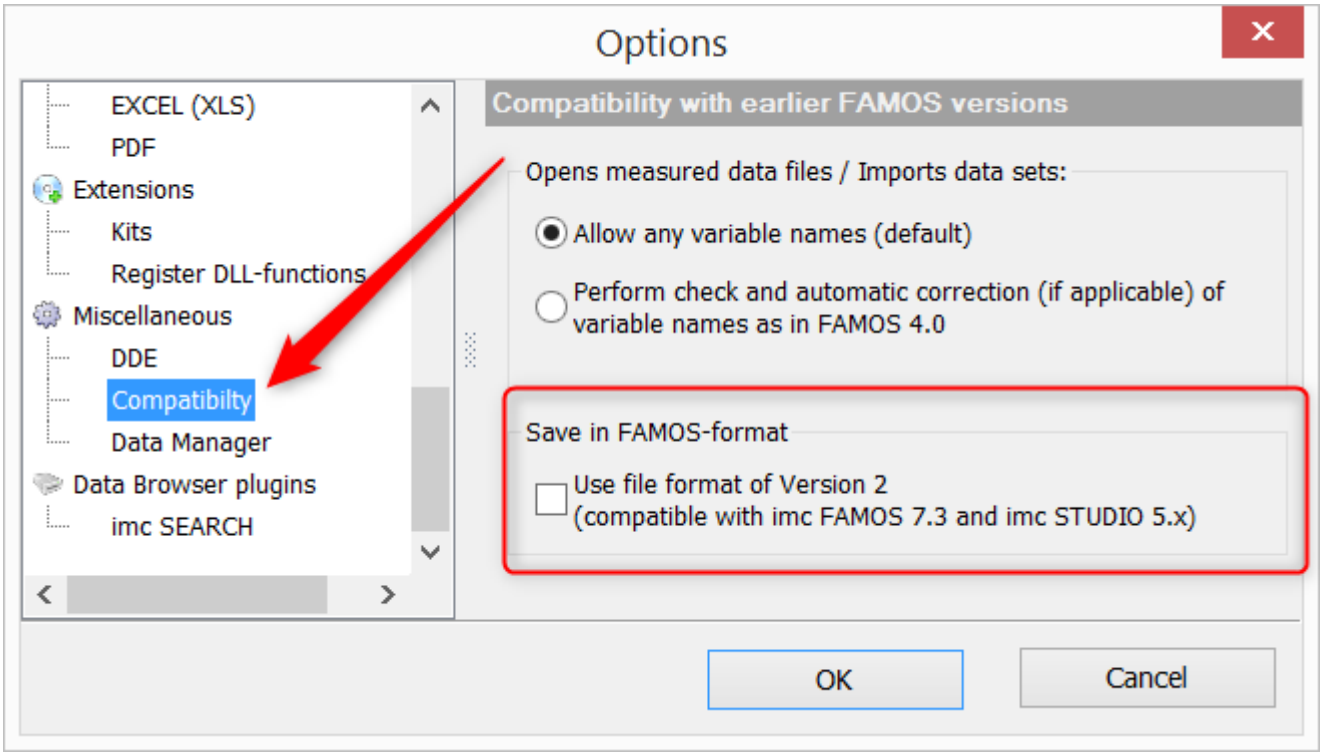
The file may also contain a comment. It is displayed in the file selection dialog when loading and helps make finding files easier.

Enter the commentary in the edit box at the lower margin of the dialog "*Save file*".

A detailed description of the imc FAMOS format is found in the Help under "*imc Data format*".

File format

As of imc version FAMOS 7.4, Version 3 of the file format is available. In the Options dialog (menu item: "Extras\Options") under Miscellaneous\Compatibility, it is possible to specify whether or not to continue using Version 2 of the file format. It may be sensible to do this if data are to be transferred between users who have not yet updated to imc FAMOS 7.4 or higher.



Reference

Chapter 'Sequences', commands SAVE, imc FAMOS , ASCSAVE, ASCOPTION

Manual *'imc FAMOS :* imc FAMOS Functions Reference: FileOpenDSF, FileObjWrite, FileOpenASCII, FileLineWrite

Manual *imc Shared Components*, description of the imc FAMOS file format

6.5.3.1 imc FAMOS ZIP

Some types of imc device channel data can be saved in a compressed condition. For this purpose, the format must be set to imc FAMOS ZIP in the device operating software's Storage dialog.

The compression is managed by the CS2 key in the header of the saved file.

This format is supported as of imc FAMOS Version 7.2Rev 4.

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6.5.4 ASCII-Format (export template)

6.5.4.1 Overview

Variables can also be saved in a configurable ASCII-format and thus made accessible to other programs for further processing. It is also possible, for example, to save multiple channels together in a multi-column file, to record extra infos in a file header or in column title, as well as to define numerical formats and column separators.

Such a format definition is called an ASCII export template. A template is defined by the user with the help of a dialog, and saved under a permanent name. Under this name, the format can later be selected in the format selection list in the dialog under "File - Save". Thus, it is easy to define the formats you need and access them later as required..

All settings for an export template are recorded in the form of a text file in the imc FAMOS definitions folder. This file bears the name of the export template, plus the filename extension ".aet".

To save a file in ASCII-format, select the command "*File/ Save individually*" or "*File/ Save together*". In the file selection dialog which then appears, select from the format list an existing ASCII export template (denoted by the prefix "[ASC]"). The "*Options*" button accesses a dialog in which settings can be changed, if necessary, and then you can enter a filename and hit the button "*Save*" to finish.

You can also define and use a completely new ASCII export template. Toward this end, select the entry "*Define new export template*..." in the format list, then "*Options*" and in the dialog which then appears select the entry "*ASCII Export Template*". After completed definition of the template, it appears in the format list under the designated name and can immediately be used for saving.

When saving structured data types (groups, **segmented** data sets, data sets with **events**, 2-component data sets), the individual parts (group channels, events, segments, components) are branched out in the display, appearing in respective rows.

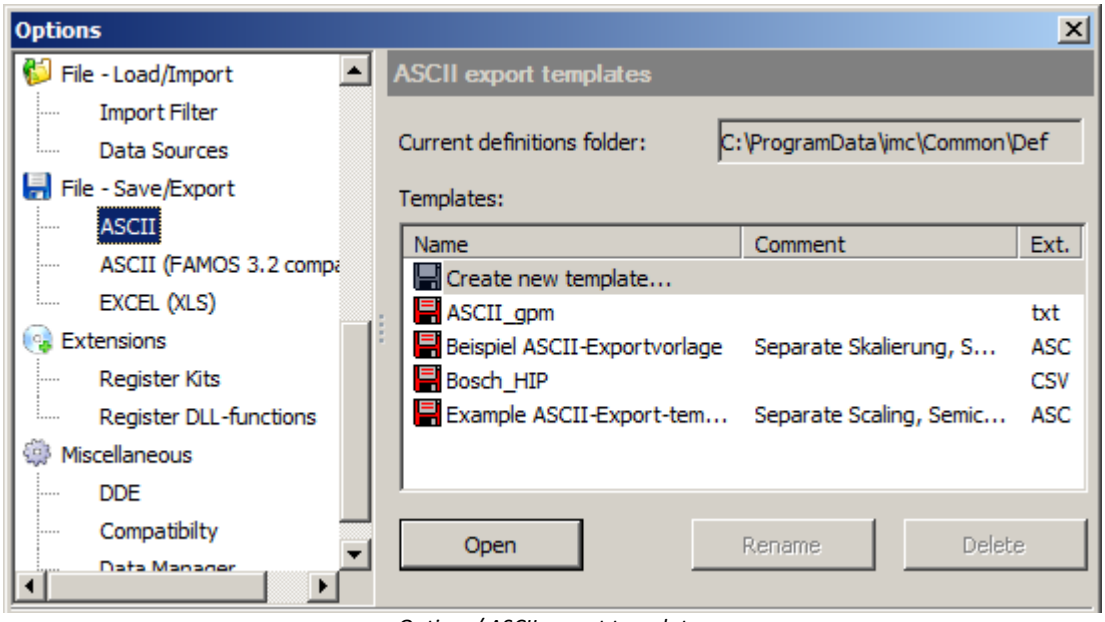
The definitions dialog for export templates can also be called via the imc FAMOS options dialog, *"Extra"/ "Options* 129", page "*Save File - ASCII* 234".

An export template once defined can also be used in sequences. The corresponding function is called *FileOpenASCII2(..)*.

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6.5.4.2 Managing ASCII export templates

From the Options menu (opened via "*Extra"/ "Options* 129") in the main menu), access the dialog "File - Save/ Export: ASCII". The following dialog for managing export templates opens.



Options/ ASCII export templates

Templates

In addition to the entry "*Create new template...*", this list contains all export templates previously defined by the user which are located in the default definitions folder. Along with the name (under which the template also appears in the format selection list) you will find the user-defined comment and the specified default file extension for the format concerned.

To define a new template, double-click on the entry "*Create new template...*". Then the template definition dialog starts with its default settings.

Proceed in the same way to edit an existing template. You can also create a new template based on an old one by first opening the old one and then entering a new name for it.

Note

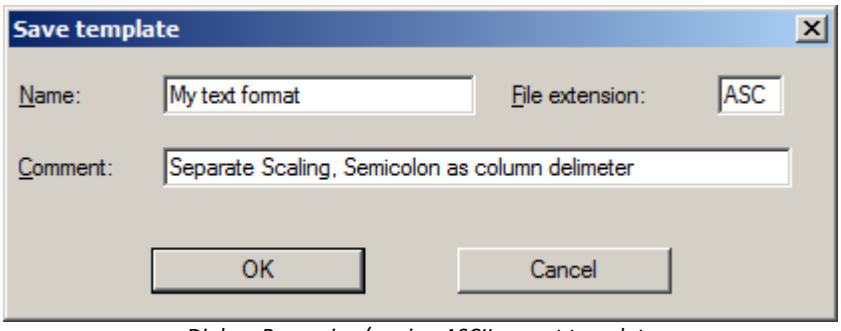
As an alternative, you can call the export template definition dialog from the "*Save file*" dialog. To do this, first select an existing ASCII export template (denoted by the prefix [ASC]) or the entry "Define new export template, and then hit the "*Options*" button.

Open

Starts the Definitions dialog 236 for the template currently selected in the selection list; just as for double-clicking on a list entry.

Rename

Calls a dialog in which you can edit the name, comment and file extension for the selected export template.



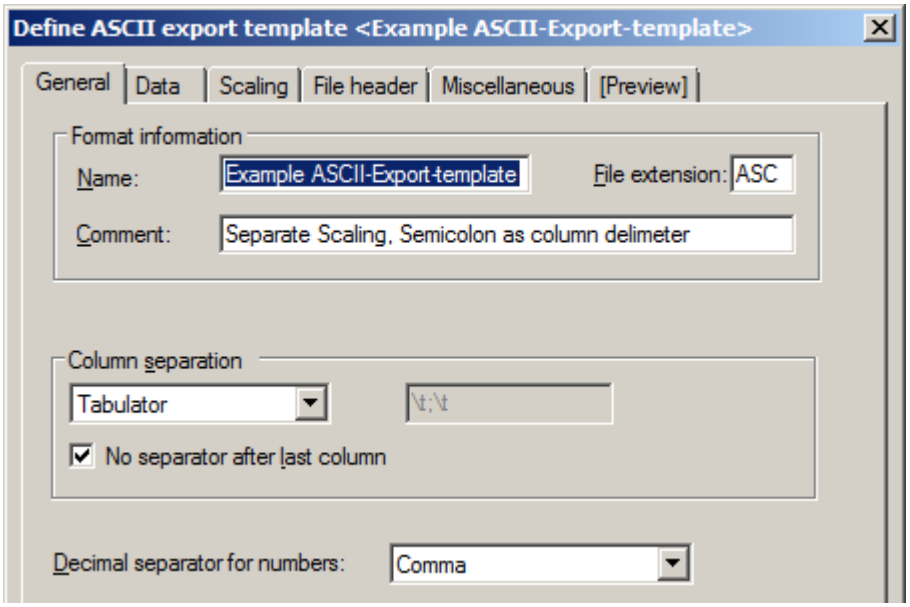
Dialog: Renaming/ saving ASCII-export template

Delete

Deletes the selected export template.

6.5.4.3 Defining ASCII export templates

The template definition dialog offers controls for all settings necessary for complete definition of an ASCII export template. Because of the large amount of available options, the dialog is divided into different index cards.



Dialog: ASCII-Exportvorlage definieren

The division of the dialog also reflects the basic structure of an ASCII-file

```
FAMOS ASCII export                                                  (1)
Company: J. Doe Corp.
Prepared by: J. Blow
Comment: Analysis

  Date: 04/19/02 (2a)  |  Name: Test1 (3a)  |  Name: Test2;  |  Name: Test2
                       |  Unit: [V];        |  Unit: [km/h];|  Unit: [km/h]
  11:01:07;            |          0.0100;   |      142.0400;|
  11:01:07;            |          0.0123;   |              ;|       12.5000
  11:01:07;            |          0.1000;   |      167.5000;|       15.3000
  11:01:07;            |          0.1200;   |              ;|        9.2000
  11:01:07;            |          0.4214;   |      189.2000;|        7.1100
  11:01:08;            |          0.9200;   |              ;|        5.1200
  11:01:08;            |          1.2300;   |      195.2300;|        1.2200
  11:01:08;            |          3.0000;   |              ;|        0.0002
  11:01:08;            |          6.1230;   |      205.1000;|        0.0000
  11:01:08;            |         15.2000;   |              ;|       -6.2000
  11:01:09;            |                ;   |              ;|      -15.2000
```

(2b) (3b)

Example of an ASCII-file with 2 data sets

In general, it consists of a file header [1], which can contain a permanent text and/or general information. Next, the data set readings follow in adjacent columns [2], [3]. Each column, in turn, can have its own column header [2a], [3a], which can feature indications of the column contents, such as channel name, sampling rate, comments or similar things. Below the column header, the actual numerical values appear [2b], [3b]. The individual columns are separated by a defined separator; in this example, by a semicolon.

There is also a distinction between scaling columns [2] and readings columns [3]. A scaling column returns the scaling (e.g. the time axis) for all readings columns to its right. In the case of multi-column files, one scaling column at left can be valid for all subsequent readings columns, or each data set can come with its own scaling column, as illustrated in the example.

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This basic structure determines what specifications are necessary for describing such a format.

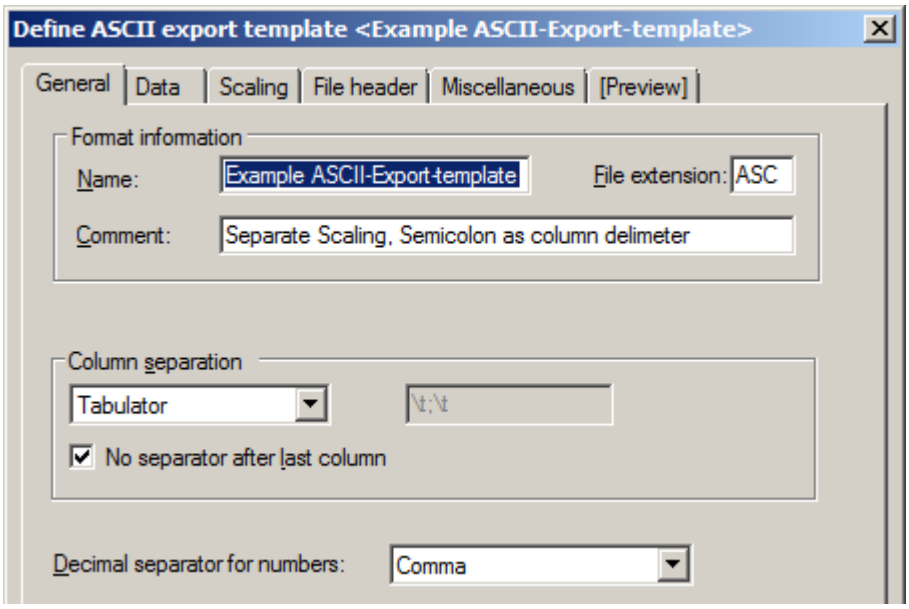
- The page "***General***" covers global settings such as column separators and the decimal character to use with numbers, along with export template specifications.
- The page "***Data***" describes the structure of a readings column, including column header, column width and numerical format.
- Analogously, the page "***Scaling***" controls the arrangement and format of the scaling column(s).
- The page "***File header***" defines the introductory text at the beginning of a file.
- Under "***Miscellaneous***", further options mainly affecting only special data types can be found.
- "***Preview***" enables you to see in advance how the format as currently defined is applied to sample data sets.

Once you have made all settings necessary, you can save the export template definitions to a file by hitting the "***Save***" button.

This file is stored in the default definitions folder. It bears the export template's name, plus the extension "***.aet***". If the "Save file"-dialog is opened, the definitions folder is searched and all export templates found are added to the format selection list.

The button "***Close***" exits the dialog. If you have made changes previously, a prompt appears asking you to confirm that the template changes are to be saved.

Define ASCII export template / General



Dialog: ASCII-Exportvorlage definieren

This page offers global settings such as column separators and the decimal character to use with numbers, along with export template specifications.

Format-Information

General specifications describing the export template can be made here.

Name

Name by which the template is identified. The format then appears under this name in the format selection list in the dialog "*Save file*", as well as in the format list in the options dialog under "*Options/ File - Save/ Export/ ASCII*". In addition, the template itself is saved under this name, supplemented by the extension "*aet*", in imc FAMOS ' default definitions folder.

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File extension

Default file extension to be used when saving files with this export template. It is appended to the filename, unless another extension is explicitly specified upon saving.

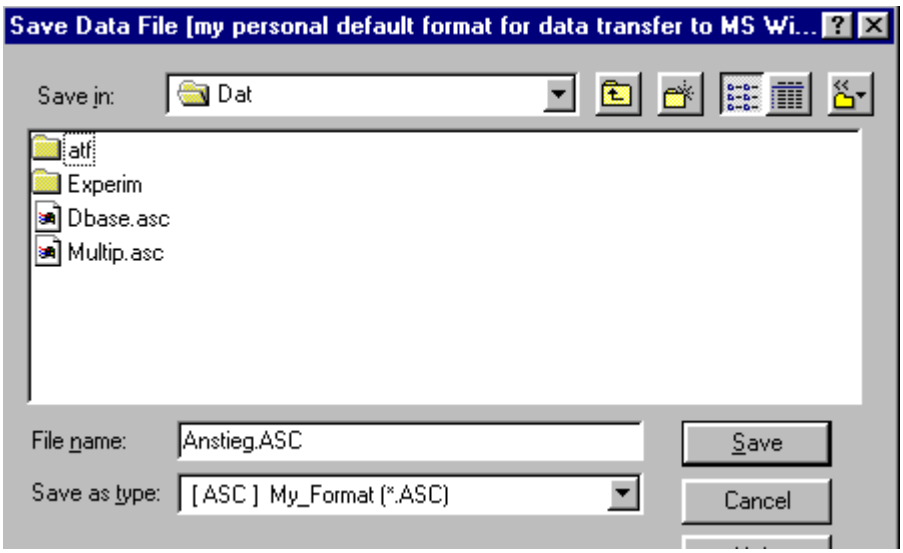
Comment

Here you can enter brief commentary describing the format. This comment is then displayed in the title bar of the "Save file" dialog, for example, whenever the corresponding format is selected in the format selection list.

Example of format information:

As per the illustration above, the export template itself is stored under the filename "*My Format.aet*" in the imc FAMOS definitions folder. If you wish to use this export template on another computer, you need only copy this file to the corresponding definitions folder.

When this format is selected, the "*Save file*" dialog appears as follows:



Dialog: Save file with ASCII-format selected

The text in the format selection list consists of a permanent prefix [ASC] denoting an ASCII export template, the selected name and the specified filename extension. The latter is also used as the display filter for the file list.

Column separation

This group of options determines how individual columns are to be separated from each other. In the list box, you can first select a fixed separator character (Tab, semicolon, Space or comma), or "*string*".

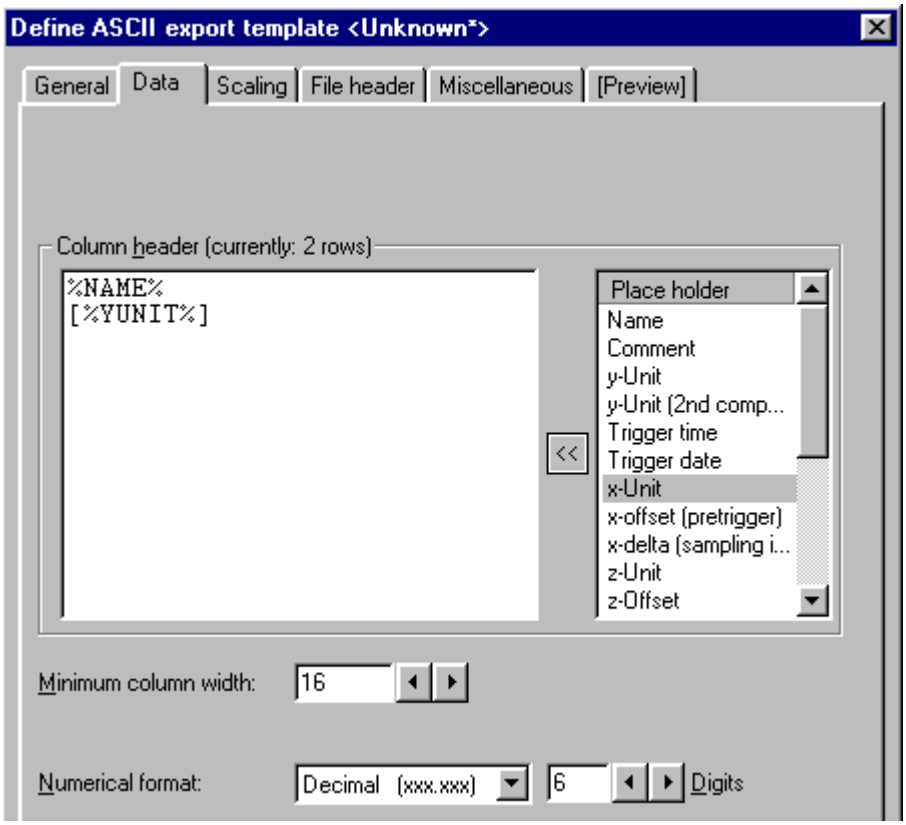
If "*String*" is selected, you can enter a string in the adjacent input box. A tabulator can be entered as the special character '\t'. The string "*\t;\t*", for instance, sets the separator between two columns to be the combination <Tabulator>, semicolon, <Tabulator>.

If the option **"*No separator after last column*"** is selected, the last column remains open, meaning that it is not completed by the selected separator.

Decimal separator for numbers

Set here whether the decimal marker in numbers is a point (e.g. "*3.142*" or a comma ("*3,142*"). With the option "*Automatic*" active, the valid setting in the Windows Control Panel, under "*Regional Settings/ Number*" is used.

6.5.4.4 Define ASCII-export template / Data



Dialog: Define ASCII-export template / data

This dialog on this page affects the format of the data readings columns.

Column header

In this input box, you can set the title appearing above each individual column of readings. This can be a combination of fixed text and placeholders. Such placeholders represent specific characteristic values belonging to the data set written in the respective column, and are filled with the current texts (e.g. name, comment, units) or numerical values (e.g sampling interval, length) upon saving. A placeholder can be recognized as a fixed designation surrounded by percent signs.

%NAME%, for instance, means the name, %YUNIT% the y-unit of the data set recorded. In the selection list at right, all placeholders defined are listed. Double-clicking on the desired entry (or selecting the entry and hitting the [<<]-button) copies the placeholder to the current cursor position in the input box.

You can also use the input box's context menu (called by right-clicking in the input box) to insert a placeholder. This also offers a list of available placeholders.

If you wish to insert a placeholder for a user-defined property, use the syntax **%#***name***%**, where *name* stands for the name specified (see dialog *Properties/User-defined*) 304, for example "%#imc01%" or "%#MyProperty %". In an export template a maximum of 75 user-defined properties can be used.

If no column header is needed, simply leave the input box empty (or completely delete its contents).

Minimum column width

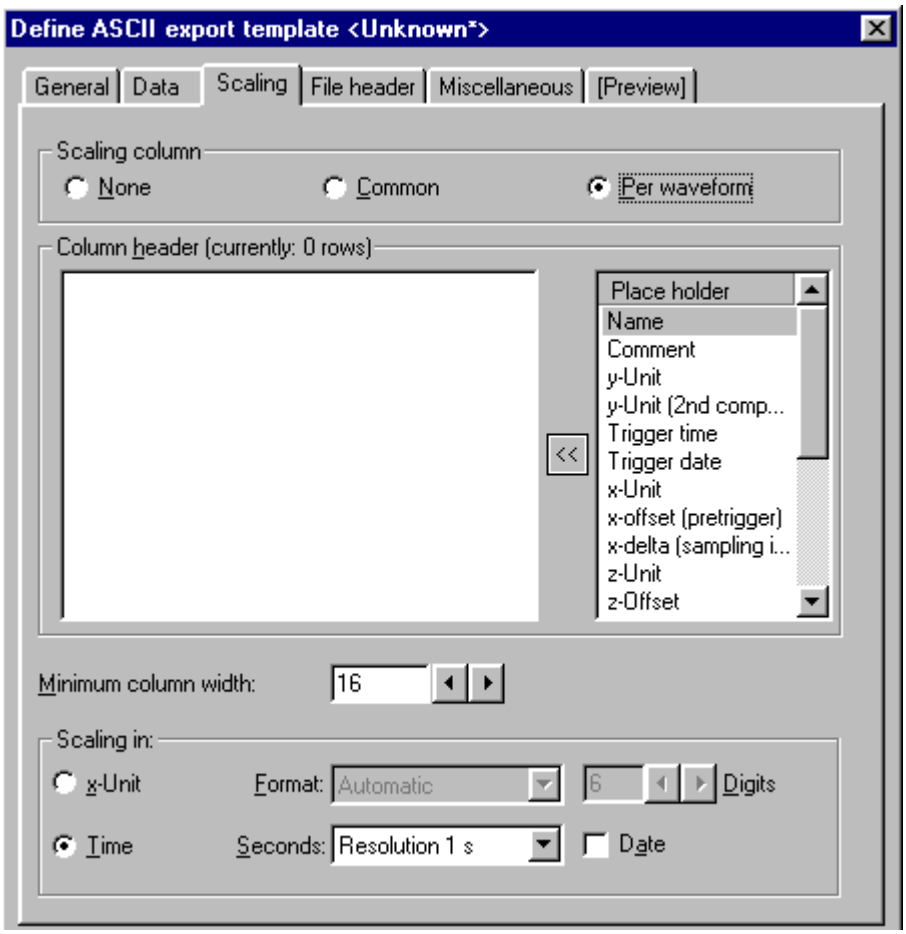
Determines the minimum width a data column can have. If the actual contents are narrower than the specified width, the left side is filled with empty spaces and the contents are right-justified. However, if the actual contents are wider, they are still displayed entirely, and the column is widened for the purpose.

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Numerical format

Here, you specify the numerical format and resolution of numerical output. You can choose among exponential notation (e.g. "*1.23E3*"), decimal notation ("*123.4*") and "*Automatic*". Automatic means, in this case, that the shortest possible notation is selected for the given numerical value. The "Digits" box is for entering the number of decimal places to be displayed.

6.5.4.5 Define ASCII-export template / Scaling



Dialog: Define ASCII export template / Scaling

On this page, you can find controls for positioning and formatting scaling columns.

Scaling column

In general, the scaling column states the x-position corresponding to a y-value (amplitude) in the data set; a frequent example is a time-axis. This is analogous to the portioning of the (horizontal) x-axis used in graphical data display. How the scaling column is created depends on the data type, according to the scheme below:

Normal (equidistantly sampled) data set	Generated from sampling interval / pretrigger / trigger time (or x-delta/x-offset)
XY-data set	the X-component of the data set is used
Complex data sets	The frequency (for magnitude / phase representation) or the independent parameter for real- / imaginary-part representation

[None]

No explicit scaling column is stored. This can be sensible if the information either isn't relevant or can be derived from other data in the file (e.g. if the sampling rate is specified in the column header of the data column). If this option is selected, all further input controls in this dialog are disabled.

[Common]

A common scaling column (at left) is created for all data sets stored. In consequence, it is possible that gaps can appear in the matrix of data columns if a certain data set has no value assigned to a particular x-position (in other words, there is no interpolation; the corresponding cell simply stays empty).

Thus, this display style is sensible only if all the data sets stored have the same scaling (because, for instance, they all are derived from the same measurement with a common time base) or at least all cover approximately the same x-range.

[Per waveform]

Each data set receives its own scaling column, which appears at the left of its respective data column.

Column header

In this input box, you define a title which appears above each individual scaling column. To do so, you can combine fixed text with placeholders. Such placeholders denote specific values belonging to the data set and are filled upon data saving with the current strings (e.g. name, comment, units) or numerical values (e.g. sampling interval, length). A placeholder can be recognized as a permanent name bracketed from both sides by the "percent" character.

%NAME%, for example, denotes the name, and %YUNIT% the y-unit of the particular data set. In the list box at right, all placeholders already defined are listed. Double-clicking on the entry of the desired placeholder (or selecting the entry and hitting the button [<<]) copies the placeholder to the current input position in the input box.

You can also use the context menu (right mouse click) of the input box to insert a placeholder. This also presents a list of all available placeholders. If no column header is needed, just leave the input box empty (or delete all the contents).

If you wish to insert a placeholder for a user-defined property, use the syntax **%#***name***%**, where *name* stands for the name specified (see dialog Properties/User-defined) 304, for example "*%#imc01%*" or "*%#MyProperty%*". In an export template a maximum of 75 user-defined properties can be used.

Minimum column width

Specifies the minimum width of the scaling column. If the current content is narrower than the specified width, the left side is filled with empty spaces and the content thus right-justified. If, however, the current content is wider, it is displayed in full and the column is widened accordingly.

Scaling in: x-Unit

The scaling corresponds to the data set's x-unit.

Here, you can set the numerical value and the resolution of the numerical values. You have a choice between exponential notation (e.g. "*1.23E3*"), decimal notation ("*123.4*") and "*Automatic*". Automatic means in this case that the shortest possible notation is used, which depends on what the particular numerical value is. In the 'Digits' box, you specify the number of decimal places to display.

Scaling in: Time

The scaling output is expressed as absolute time and date. This option, of course, only makes sense if data sets recorded over time and having "s" (seconds) as the x-unit are actually involved.

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Seconds

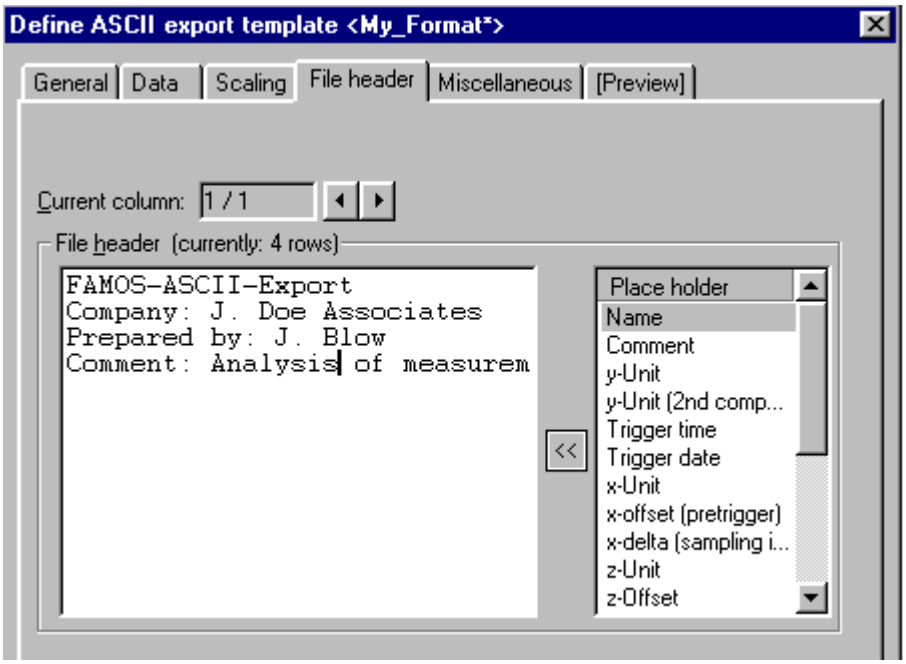
Here you specify the resolution for the time display. "*None*" means display of the time of day in terms of "*Hours:Minutes*", for instance "*23:11*". For the setting "*1 s*", the seconds are also indicated ("*23:11:59*"), "*100ms*" also indicates tenths of seconds 1/10 ("*23:11:59,4*"), etc. The separator in front of the fractions of seconds (comma or point) depends on the current Windows system setting for "Decimal symbol".

Date

If this is selected, the date (in abbreviated form, e.g. "*11.12.01*") is output together with the time of day.

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6.5.4.6 Define ASCII export template / File header



Dialog: Define ASCII-export template / File header

Here you can configure a file header to be entered at the beginning of the file to be saved.

File header

Enter in this input box the text you wish to have at the beginning of the file. To do so, you can combine fixed text with placeholders. Such placeholders denote specific values belonging to the data set and are filled upon data saving with the current strings (e.g. name, comment, units) or numerical values (e.g. sampling interval, length). In the case of placeholders referenced to data-sets, the first data set's characteristic values are used in the file, if multiple data sets are stored.

A placeholder can be recognized as a permanent name bracketed from both sides by the "percent" character.

%NAME%, for example, denotes the name, and %YUNIT% the y-unit of the particular data set. In the list box at right, all placeholders already defined are listed. Double-clicking on the entry of the desired placeholder (or selecting the entry and hitting the button [<<]) copies the placeholder to the current input position in the input box.

You can also use the context menu (right mouse click) of the input box to insert a placeholder. This also presents a list of all available placeholders.

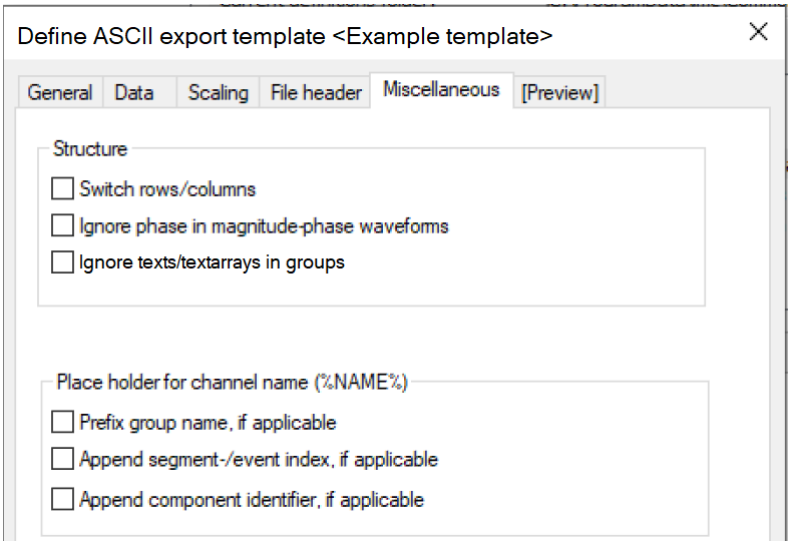
If you wish to insert a placeholder for a user-defined property, use the syntax **%#*name*%**, where *name* stands for the name specified (see dialog: Properties/User-defined) 304, for example "*%#imc01%*" or "*%#MyProperty %*". In an export template a maximum of 75 user-defined properties can be used.

If no file header is needed, just leave the input box empty (or delete all the contents).

You can also divide the file header into multiple columns. To do this, use the arrow buttons associated with the "*Current column*" control, in order to add a column or to switch to another column. Empty columns are "optimized" away upon saving and therefore do not need to be explicitly deleted.

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6.5.4.7 Define ASCII-export template / Miscellaneous



Dialog: Define ASCII-export template / Miscellaneous

This page offers additional options concerning special data types.

Switch rows / columns

The rows of the data matrix are switched with its columns, including the column header, which means that what once was the first row becomes the first column. This option makes most sense in the case of segmented data sets (matrices), for instance. If the option is deactivated, then for a segmented data set, each segment is written to its own column, but if this option is activated, the values belonging to a single segment are written side by side in a row.

Ignore phase in magnitude-phase waveforms

If this option is selected, then only the magnitude component of complex data sets in magnitude/phase representation is saved.

Ignoring texts/text arrays in groups

This option when activated matches the behavior of older FAMOS versions and texts are not exported. When it is inactive, texts and text arrays are now also exported as a column. If the export template was created in an older version of FAMOS, in which this option did not yet exist, the default setting is "active".

Placeholder for channel name

These options affect how the placeholder for the channel name %NAME% is interpreted in file or column headers.

Prefix group name (if applicable)

In data sets belonging to groups, the group name is placed before the channel name (and is separated from it by a colon).

Append segment-/event index (if applicable)

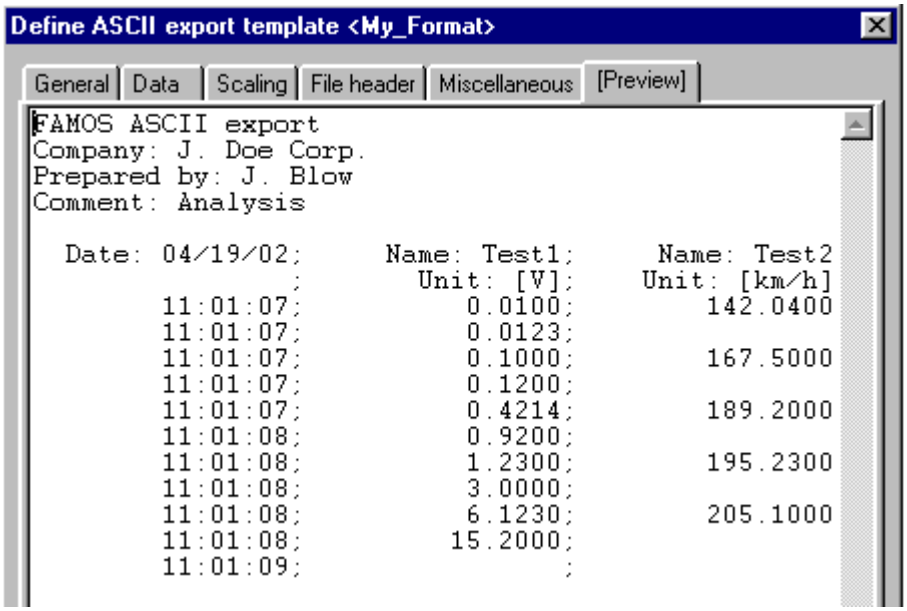
In the case of segmented or event-based data sets, each column contains one event or segment. If this option is active, the index of the current segment/event is appended (in square brackets). The setting is ignored if the placeholder is positioned in the file header or in the header for a common scaling column.

Append component identifier (if applicable)

Bn the case of complex or XY-data sets, one component per column is stored. If this option is active, the standard component tag in imc FAMOS is appended, e.g. "***.M***" for a complex data set's magnitude or "***.X***" for the X-component of an data set. The setting is ignored if the placeholder is positioned in the file header or in the header for a common scaling column.

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6.5.4.8 Define ASCII-export template / Preview



ASCII export template definition dialog / Preview

The effect of the currently valid settings is demonstrated by applying them in a preview based on already provided sample data sets.

Thus, this provides help in predicting the results of the settings you make.

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6.5.5 Excel (XLS)-Format

6.5.5.1 Overview

Note

This functionality can only be used if a version of the spreadsheet program Microsoft ® EXCEL is installed which is supported (see "System requirements 15").

XLS-format is the default file format for the widely circulated spreadsheet program Microsoft ® Excel. If Excel is installed parallel to imc FAMOS , XLS-files can be exported by imc FAMOS directly. For this purpose, Excel is remotely controlled by a mechanism called "OLE-Automation". Excel is started in the background, advised to receive the data from imc FAMOS and to store the file and is finally closed again.

Constrains

- Excel can only administer a limited number of data sets of limited length. The maximum number of rows (=maximum length of a data set) **is limited to 65536 values** (Excel 95: 16384 values). The **maximum number of columns is 256** (= number of data sets which can be transferred).
- Only one table per XLS-file can be exported.
- Only data sets (not text variables) can be exported.
- Note also that there are different versions of the XLS-format. Excel 95, for instance, cannot read XLS-files saved in Excel 2000 format.

When saving structured data types (groups, event-based and segmented data sets, 2-component data sets), the individual parts (channels of the group, events, segments, components) are extracted and written out each in its own column.

Data export in XLS-format comes with many configuration options. Naturally, it is possible to save multiple data sets together in a table with multiple columns. A table header, column titles and scaling column(s) all can also be defined.

Such a format definition is called an XLS export template. A template is defined by the user with the help of a dialog, and saved under a permanent name. Under this name, the format can later be selected in the format selection list in the dialog under "File - Save/Export". Thus, it is easy to define the formats you need and access them later as required.

All settings for an export template are recorded in the form of a text file in the imc FAMOS definitions folder. This file bears the name of the export template, plus the filename extension "*.aet*".

Technically, there is no difference between an XLS export template and an ASCII export template. Only the number of settings available is different, since some specifications needed for ASCII-export are not necessary for Excel-export.

To save a file in XLS-format, select the command "*File/ Save individually*" or "*File/ Save together*". In the file selection dialog which then appears, select from the format list an existing XLS export template (denoted by the prefix "*[XLS]*"). The "*Options*" button accesses a dialog in which settings can be changed, if necessary, and then you can enter a filename and hit the button "*Save*" to finish.

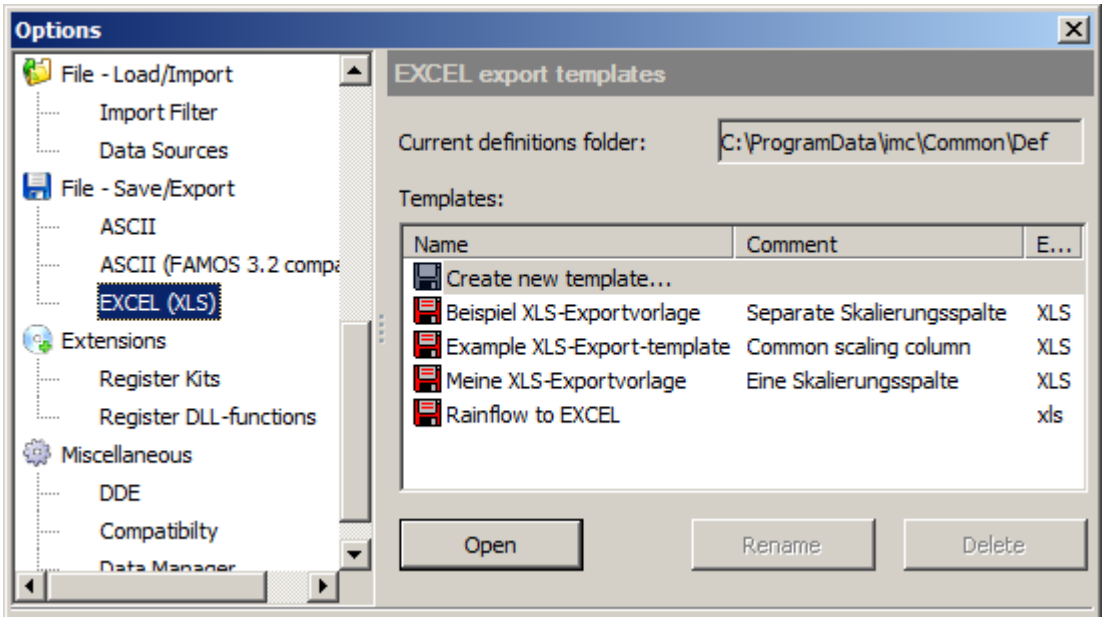
You can also define and use a completely new XLS export template. Toward this end, select the entry "*Define new export template...*" in the format list, then "*Options*" and in the dialog which then appears select the entry "*XLS Export Template*". After completed definition of the template, it appears in the format list under the designated name and can immediately be used for saving.

The definitions dialog for export templates can also be called via the imc FAMOS options menu, (accessed via "*Extra/ Options*" in the main menu) under "*File - Save/ Export: EXCEL*".

An export template once defined can also be used in sequences. The corresponding function is called FileOpenXLS2(..).

6.5.5.2 Managing EXCEL export templates

In the Options dialog (menu item "*Extra*"/ "*Options*"), go to the page "*File - Save: EXCEL (XLS)*". The dialog below for managing export templates appears.



Options/ EXCEL export templates

Templates

In addition to the entry "*Create new template...*", this list contains all export templates previously defined by the user which are located in the default definitions folder. Along with the name (under which the template also appears in the format selection list) you will find the user-defined comment and the specified default file extension for the format concerned.

To define a new template, double-click on the entry "*Create new template...*". Then the template definition dialog starts with its default settings.

Proceed in the same way to edit an existing template. You can also create a new template based on an old one by first opening the old one and then entering a new name for it.

Note:

As an alternative, you can call the export template definition dialog from the "*Save file*" dialog. To do this, first select an existing XLS export template (denoted by the prefix [XLS]) or the entry "*Define new export template*", and then hit the "*Options*" button.

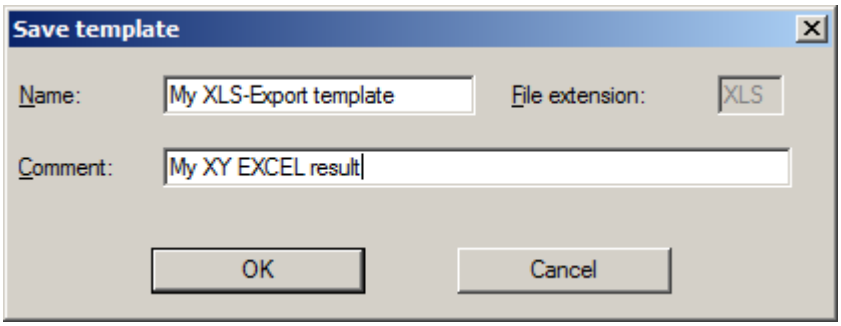
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Open

Starts the definition dialog for the template currently selected in the selection list; just as for double-clicking on a list entry.

Rename

Calls a dialog in which you can edit the name, comment and file extension for the selected export template.



Dialog: Save EXCEL export template

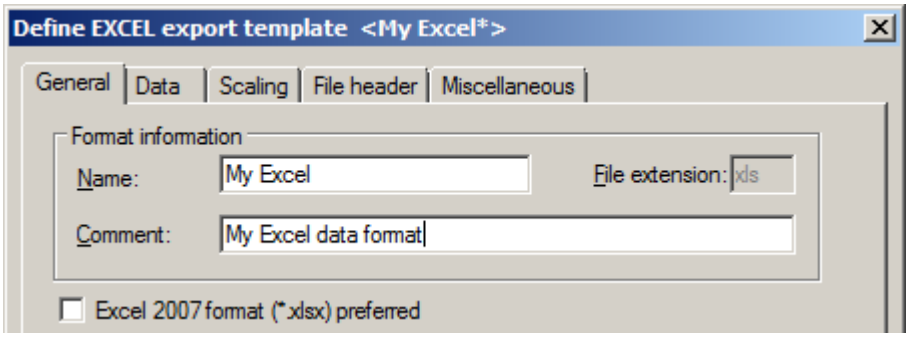
Delete

Deletes the selected export template.

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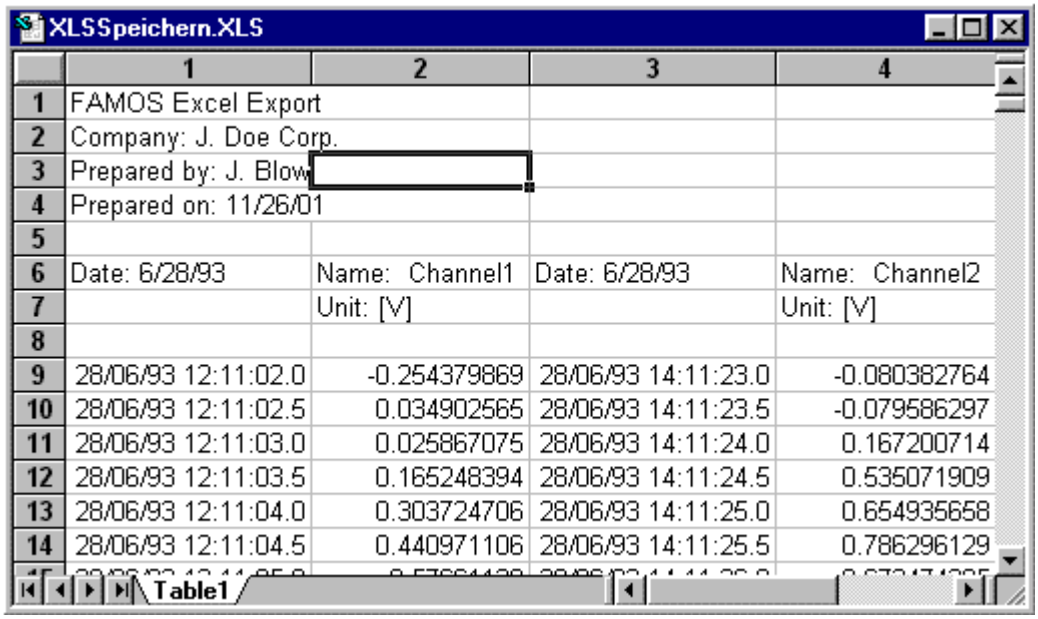
6.5.5.3 Defining EXCEL export templates

The template definition dialog offers controls for all settings necessary for complete definition of an EXCEL export template. Because of the large amount of available options, the dialog is divided into different pages.



Dialog: Define EXCEL export template

The division of the dialog also reflects the basic structure of an `XLS-file:



Example of an EXCEL-file with 2 data sets

In general, it consists of a file header [Cells A1 to A5], which can contain a permanent text and/or general information. Next, the data set readings follow in adjacent columns. Each column, in turn, can have its own column header [Cells 6 to 8], which can feature indications of the column contents, such as channel name, sampling rate, comments or similar things. Below the column header, the actual numerical values appear [starting at Row 9].

There is also a distinction between scaling columns [Columns A and C] and readings columns [Columns B and D]. A scaling column returns the scaling (e.g. the time axis) for all readings columns to its right. In the case of multi-column files, one scaling column at left can be valid for all subsequent readings columns, or each data set can come with its own scaling column.

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This basic structure determines what specifications are necessary for describing such a format.

- The page "***General***" covers general export template properties.
- The page "***Data***" describes the structure of a readings column, including column header.
- Analogously, the page "***Scaling***" controls the arrangement and format of the scaling column(s).
- The page "***File header***" defines the introductory text at the beginning of the table.
- Under "***Miscellaneous***", further options mainly affecting only special data types can be found.

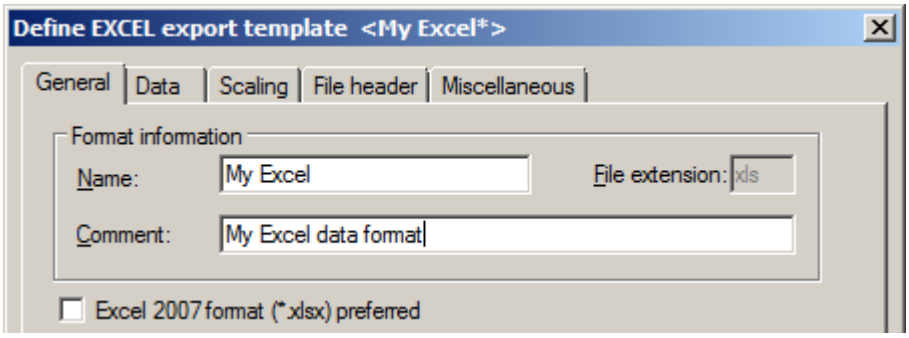
Once you have made all settings necessary, you can save the export template definitions to a file by hitting the "***Save***" button.

This file is stored in the default definitions folder. It bears the export template's name, plus the extension "***.aet***". If the "Save file"-dialog is opened, the definitions folder is searched and all export templates found are added to the format selection list.

The button "***Close***" exits the dialog. If you have made changes previously, a prompt appears asking you to confirm that the template changes are to be saved.

Define EXCEL export template / General

This page contains controls for general descriptive settings for the export template.



Dialog: Define Excel export template/ General

Name

Name by which the template is identified. The format then appears under this name in the format selection list in the dialog "*Save file*", as well as in the format list in the options dialog under "*Options/ File - Save/ Export/ EXCEL*". In addition, the template itself is saved under this name, supplemented by the extension "*aet*", in imc FAMOS ' default definitions folder.

File extension

Default file extension to be used when saving files with this export template. It is appended to the filename, unless another extension is explicitly specified upon saving. Set permanently to "*XLS*".

Comment

Here you can enter brief commentary describing the format. This comment is then displayed in the title bar of the "*Save file*" dialog, for example, whenever the corresponding format is selected in the format selection list.

Excel 2007 format preferred

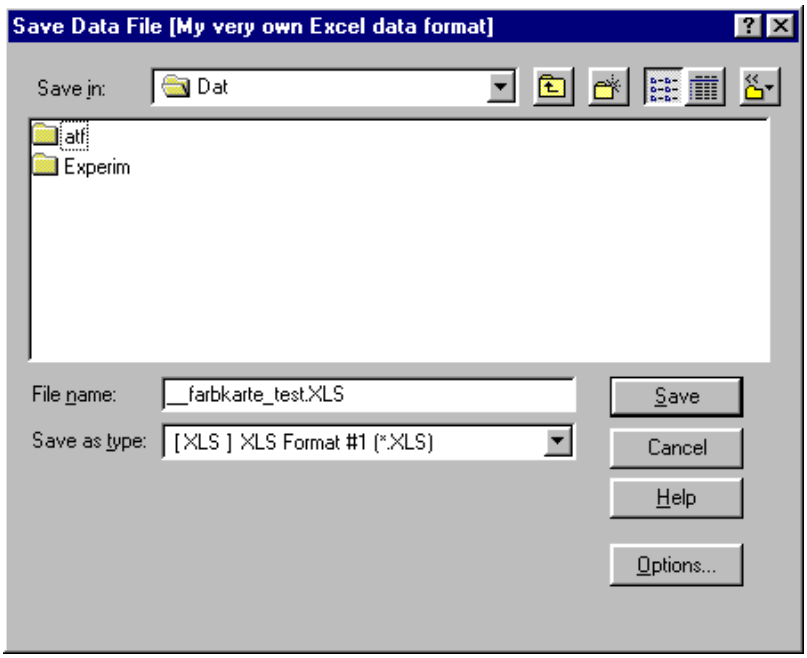
If this option is selected and Excel 2007 or higher is installed, then by default the format "*XLSX*", newly introduced with Excel 2007, is used in stead of the "XLS" formats from earlier Excel versions.

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Example of format information:

As per the illustration above, the export template itself is stored under the filename "*XLS Format #1.aet*" in the imc FAMOS definitions folder. If you wish to use this export template on another computer, you need only copy this file to the corresponding definitions folder.

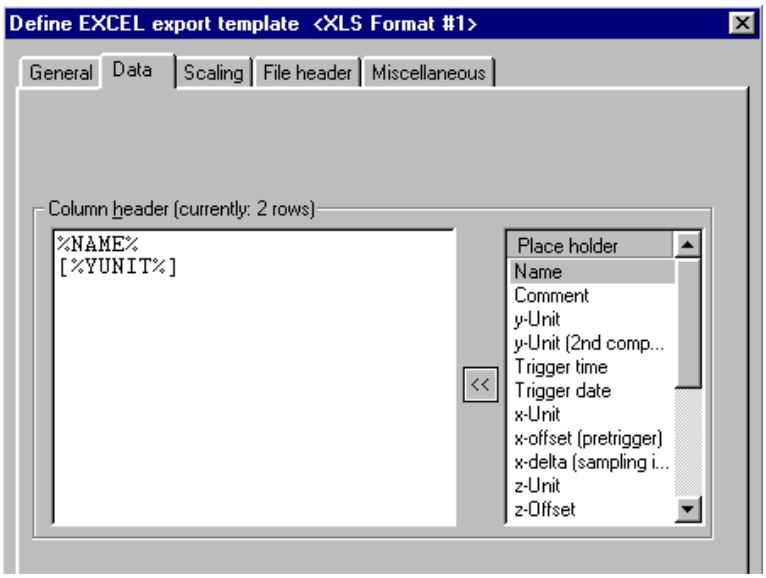
When this format is selected, the "*Save file*"-dialog appears as follows:



Dialog: Save file (with Excel-format selected)

The text in the format selection list consists of a permanent prefix [XLS] denoting an EXCEL export template, the selected name and the specified filename extension ("*.xls*"). The latter is also used as the display filter for the file list.

6.5.5.4 Define EXCEL export template / Data



Dialog: Define Excel export template / Data

This page contains controls affecting the format of a data column.

Column header

In this input box, you can set the title appearing above each individual column of readings. This can be a combination of fixed text and placeholders. Such placeholders represent specific characteristic values belonging to the data set written in the respective column, and are filled with the current texts (e.g. name, comment, units) or numerical values (e.g. sampling interval, length) upon saving. A placeholder can be recognized as a fixed designation surrounded by percent signs.

%NAME%, for instance, means the name, %YUNIT% the y-unit of the data set recorded. In the selection list at right, all placeholders defined are listed. Double-clicking on the desired entry (or selecting the entry and hitting the [<<]-button) copies the placeholder to the current cursor position in the input box.

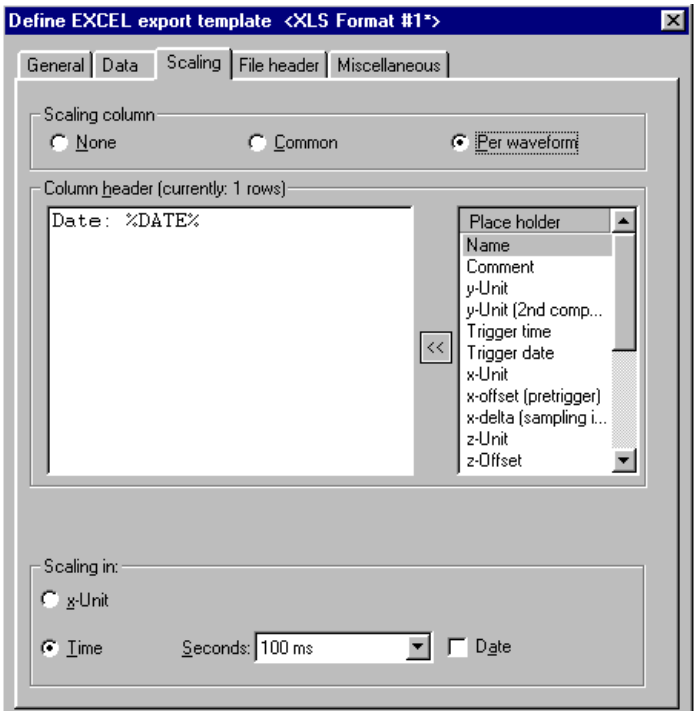
You can also use the input box's context menu (called by right-clicking in the input box) to insert a placeholder. This also offers a list of available placeholders.

If you wish to insert a placeholder for a user-defined property, use the syntax **%#*name*%**, where *name* stands for the name specified (see dialog Properties/User-defined) 304, for example "*%#imc01%*" or "*%#MyProperty%*". In an export template a maximum of 75 user-defined properties can be used.

If no column header is needed, simply leave the input box empty (or completely delete its contents).

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6.5.5.5 Define EXCEL export template / Scaling



Dialog: Define Excel export template / Scaling

This page contains controls affecting the positioning and formatting of scaling columns.

Scaling column

Here, you can set whether the file comes with any scaling column. In general, the scaling column states the x-position corresponding to a y-value (amplitude) in the data set; a frequent example is a time-axis. This is analogous to the portioning of the (horizontal) x-axis used in graphical data display. How the scaling column is created depends on the data type, according to the scheme below.

Normal (equidistantly sampled) data set	Generated from sampling interval / pretrigger / trigger time (or x-delta/x-offset)
XY-data set	The X-component of the data set is used.
Complex data sets	The frequency (for magnitude/phase representation) or the independent parameter (for real-/imaginary part representation)

[None]

No explicit scaling column is stored. This can be sensible if the information either isn't relevant or can be derived from other data in the file (e.g. if the sampling rate is specified in the column header of the data column). If this option is selected, all further input controls in this dialog are disabled.

[Common]

A common scaling column (at left) is created for all data sets stored. In consequence, it is possible that gaps can appear in the matrix of data columns if a certain data set has no value assigned to a particular x-position (in other words, there is no interpolation; the corresponding cell simply stays empty).

Thus, this display style is sensible only if all the data sets stored have the same scaling (because, for instance, they all are derived from the same measurement with a common time base) or at least all cover approximately the same x-range.

[Per waveform]

Each data set has its own scaling column, which appears at the left of its respective data column.

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Column header

In this input box, you define a title which appears above each individual scaling column. To do so, you can combine fixed text with placeholders. Such placeholders denote specific values belonging to the data set and are filled upon data saving with the current strings (e.g. name, comment, units) or numerical values (e.g. sampling interval, length). A placeholder can be recognized as a permanent name bracketed from both sides by the "percent" character.

%NAME%, for example, denotes the name, and %YUNIT% the y-unit of the particular data set. In the list box at right, all placeholders already defined are listed. Double-clicking on the entry of the desired placeholder (or selecting the entry and hitting the button [<<]) copies the placeholder to the current input position in the input box.

You can also use the context menu (right mouse click) of the input box to insert a placeholder. This also presents a list of all available placeholders.

If you wish to insert a placeholder for a user-defined property, use the syntax **%#***name***%**, where *name* stands for the name specified (see dialog Properties/User-defined) 304, for example "*%#imc01%*" or "*%#MyProperty%*". In an export template a maximum of 75 user-defined properties can be used.

If no column header is needed, just leave the input box empty (or delete all the contents)

Scaling in: x-Unit

The scaling corresponds to the data set's x-unit.

Scaling in: Time

The scaling output is expressed as absolute time and date. This option, of course, only makes sense if data sets recorded over time and having "s" (seconds) as the x-unit are actually involved.

The time values are converted to EXCEL time format and transferred. Then the EXCEL-column's numerical format us set as time (see EXCEL menu item "*Format/ Format cells/ Numbers*").

Be aware that time statements in EXCEL only have a resolution of approx. 10ms. If your time axis has a finer resolution, the precision will be reduced upon saving.

Seconds

Here you specify the resolution for the time display. "*None*" means display of the time of day in terms of "*Hours:Minutes*", for instance "*23:11*". For the setting "*1 s*", the seconds are also indicated ("*23:11:59*"), "*100ms*" also indicates tenths of seconds 1/10 ("*23:11:59,4*"), etc.

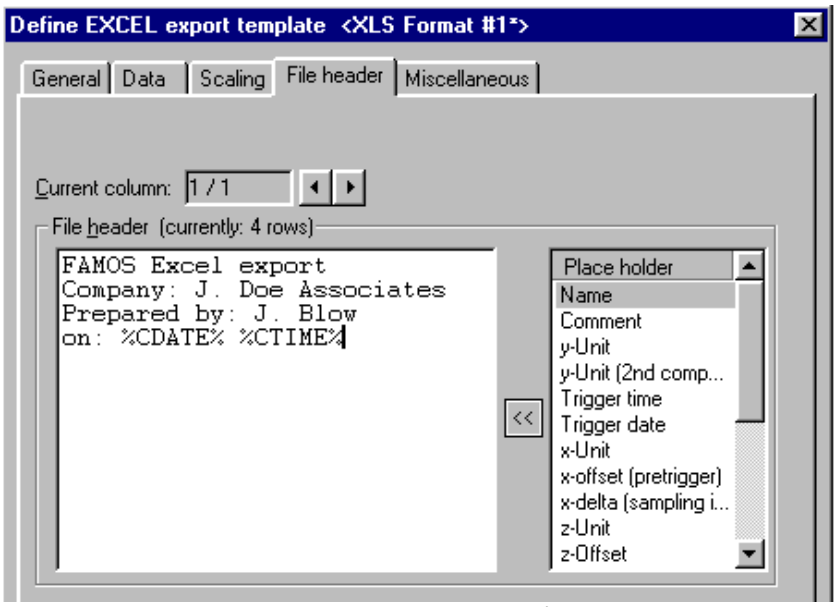
Date

If this is selected, the date (in abbreviated form, e.g. "*11.12.01*") is output together with the time of day.

The two specifications Seconds and Date, then, only determine the numerical format displayed initially. The display in EXCEL can be edited later (menu item "*Format/ Cell*").

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6.5.5.6 Define EXCEL export template / File header



Dialog: Define Excel export template / File header

Here you define a file header to be entered at the top of the table.

File header

Enter in this input box the text you wish to have at the beginning of the file. To do so, you can combine fixed text with placeholders. Such placeholders denote specific values belonging to the data set and are filled upon data saving with the current strings (e.g. name, comment, units) or numerical values (e.g. sampling interval, length). In the case of placeholders referenced to data-sets, the first data set's characteristic values are used in the file, if multiple data sets are stored.

A placeholder can be recognized as a permanent name bracketed from both sides by the "percent" character.

%NAME%, for example, denotes the name, and %YUNIT% the y-unit of the particular data set. In the list box at right, all placeholders already defined are listed. Double-clicking on the entry of the desired placeholder (or selecting the entry and hitting the button [<<]) copies the placeholder to the current input position in the input box.

You can also use the context menu (right mouse click) of the input box to insert a placeholder. This also presents a list of all available placeholders.

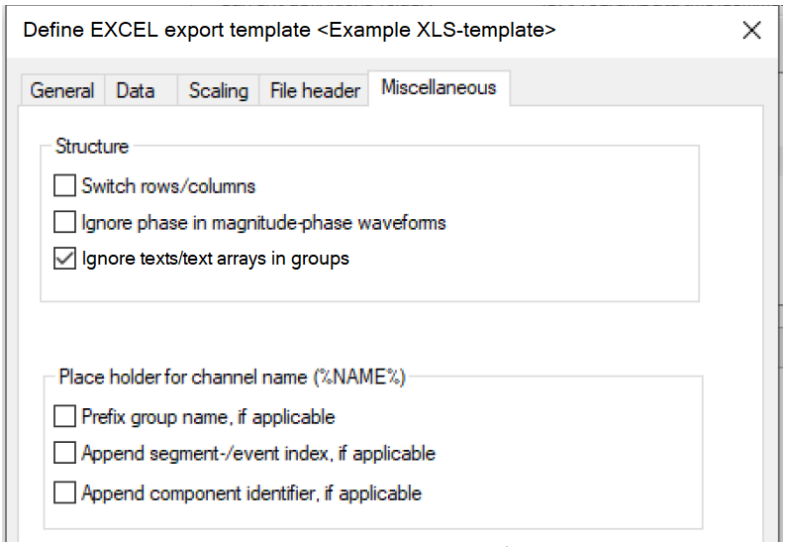
If you wish to insert a placeholder for a user-defined property, use the syntax **%#***name***%**, where *name* stands for the name specified (see dialog: Properties/User-defined) 304, for example "*%#imc01%*" or "*%#MyProperty %*". In an export template a maximum of 75 user-defined properties can be used.

If no file header is needed, just leave the input box empty (or delete all the contents).

You can also divide the file header into multiple columns. To do this, use the arrow buttons associated with the "*Current column*" control, in order to add a column or to switch to another column. Empty columns are "optimized" away upon saving and therefore do not need to be explicitly deleted.

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6.5.5.7 Define EXCEL export template / Miscellaneous



Dialog: Define Excel export template / Miscellaneous

This page offers options manly affecting only special data types.

Switch rows / columns

The rows of the data matrix are switched with its columns, including the column header, which means that what once was the first row becomes the first column. This option makes most sense in the case of segmented data sets (matrices), for instance. If the option is deactivated, then for a segmented data set, each segment is written to its own column, but if this option is activated, the values belonging to a single segment are written side by side in a row.

Ignore phase in magnitude-phase waveforms

If this option is selected, then only the magnitude component of complex data sets in magnitude/phase representation is saved.

Ignoring texts/text arrays in groups

This option when activated matches the behavior of older FAMOS versions, and texts are not exported. When it is inactive, texts and text arrays are now also exported as a column. If the export template was created in an older version of FAMOS, in which this option did not yet exist, the default setting is "active".

Placeholder for channel name

These options affect how the placeholder for the channel name %NAME% is interpreted in file or column headers.

Prefix group name (if applicable)

In data sets belonging to groups, the group name is placed before the channel name (and is separated from it by a colon).

Append segment-/event index (if applicable)

In the case of segmented or event-based data sets, each column contains one event or segment. If this option is active, the index of the current segment/event is appended (in square brackets). The setting is ignored if the placeholder is positioned in the file header or in the header for a common scaling column.

Append component identifier (if applicable)

Bn the case of complex or XY-data sets, one component per column is stored. If this option is active, the standard component tag in imc FAMOS is appended, e.g. "***.M***" for a complex data set's magnitude or "***.X***" for the X-component of an data set. The setting is ignored if the placeholder is positioned in the file header or in the header for a common scaling column.

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6.5.6 Compatibility

6.5.6.1 ASCII-Format (3.2 compatible)

This format has only been retained for the sake of compatibility to older versions of FAMOS. The possibilities for configuring it are limited and it can only be used in "Save individually" mode. It is generally preferable to use ASCII-export templates 236 instead.

Data sets can also be saved in ASCII format. This file may then read by other programs as an ASCII file. A simple ASCII data format is used, which saved individual values in lines without special separating characters.

To save data in this format, select the format "ASCII (3.2 compatible) from the format list in the "Save file" dialog. This selection is only available if the dialog is called via the "Save individually" menu item.

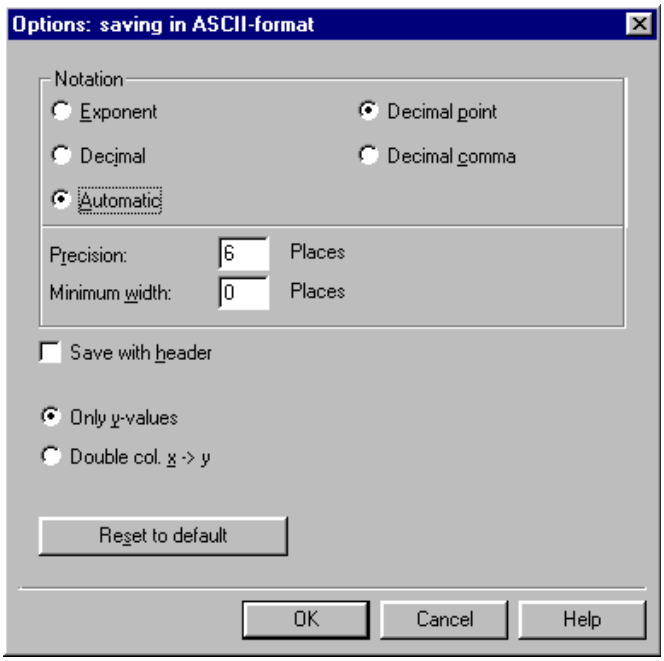
Use this format only if you want to save data for processing with other programs. Do not use this format if you want to reload the file in imc FAMOS at a later time.

Please note that this format has a very limited use. Only one data set per file may be filed; additional information, such as commentary are not filed. Storing texts is not possible.

To generate complex ASCII formats, refer to the section on *"ASCII-export templates 236"*.

If no file name extension is specified, "***.ASC***" is automatically used.

To save texts to ASCII-files (for example for protocol-files), you can use the functions for creating rows of ASCII-files ("***FileLineWrite***").



Dialog: Options: saving in ASCII- format

A dialog is called using the button <Options> in which the format for the file to be created can be specified in more detail.

Define the ASCII file format to be created in more detailed in this dialog.

Notation

The format of saved numerical values is defined using the option selected in this group. The user may specify that values are always displayed in **exponential notation**, always in **decimal notation** or **mixed**. Mixed means that the shortest display is selected for each individual value. The user may also choose to save values with the standard **decimal point** or a **decimal comma**.

Precision

The entry in the text box indicates the number of significant places to be output in 'Mixed' representation. Otherwise, it corresponds to the number of significant places to be output after the decimal point. The value range allowed is 0..7.

Minimum width

Specify here the minimum number of places to be output. The range allowed is 0..99. If the actual width of the number to be output is smaller than the value specified, spaces fill up the number from the left. This can be used to justify the decimal points of all values saved in a column, which significantly increases legibility.

Save with header

If this option box is selected, a defined block with various information about the saved channel entered at the beginning of the file. Otherwise, only individual values are saved.

This block is structured as follows (the fixed keywords are underlined) :

```
IMC imc FAMOS
Name:          DSIN
Time:          10.08.89  17:26:20
Length:        1101
Unit X-Axis:   4e-006 s
1st x-Value:   0 s
Unit Y-Axis:    V
Data:
0.0000
0.2991
...
```

The data set is this example has the name DSIN and was generated on 8-10-89. The name is the variable name, it may differ from the file name. The data set consists of 1101 values, recorded at a rate of 4 µs, beginning with the specified trigger time. The y-axis has the unit volts, indicating that the curve represents voltage with respect to time. The individual values begin in the line after the key word Data:

Only y-values / Double column x-> y

Specify using these option buttons whether only the y-values should be saved in a vertical column or whether each y-value is saved preceded by its corresponding x-value (separated by a tab).

Default

This button creates settings which execute storing in ASCII format analog to previous imc FAMOS versions (<= Version 1.5), without this option dialog.

Reference

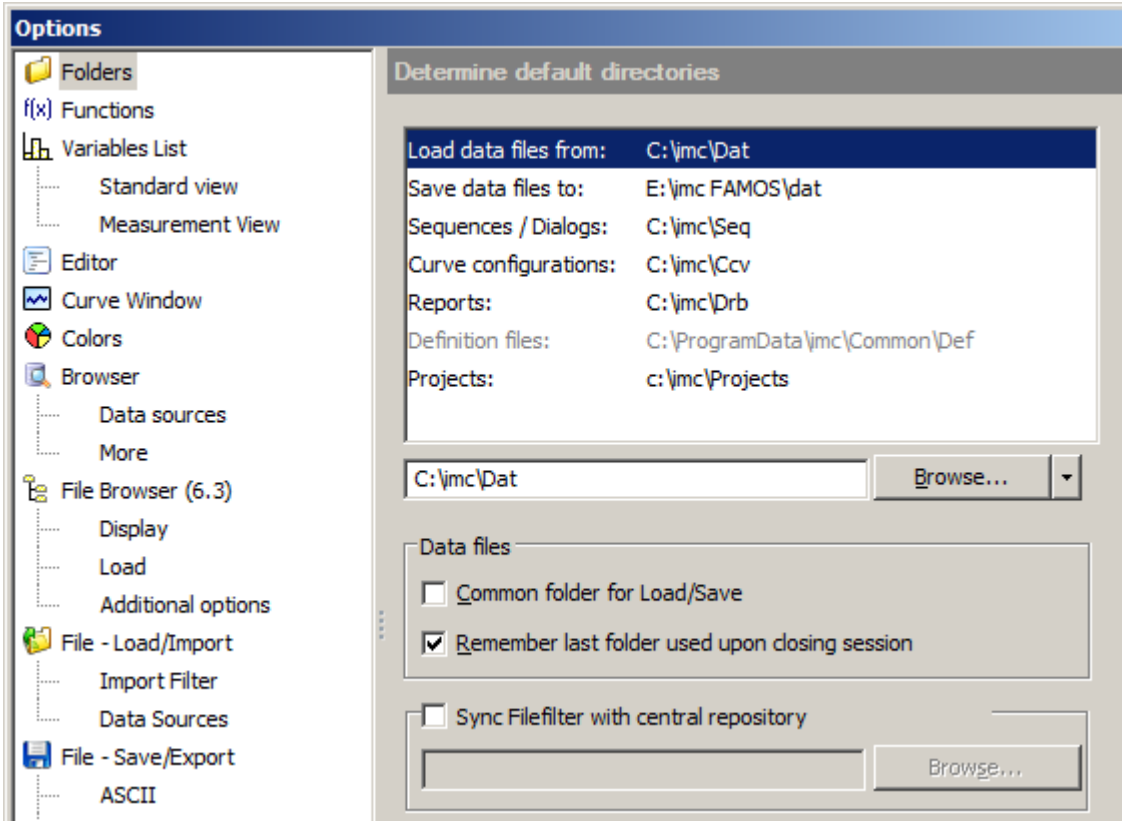
Chapter 'Sequences', commands ASCSAVE, ASCOPTION

Manual: imc FAMOS Functions Reference: FileOpenASCII, FileOpenASCII2, FileLineWrite

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6.6 Default folders

You can set here which folders imc FAMOS searches for files by default. To open the dialog, select the menu item "*Extra"/ "Options* 129", page "*Folders*".



Dialog: Default folders

Note

As soon as you have created or opened a project 417, instead of the default folders, the project's folder is used.

The folders

Select the directory you want to change in the list. You may either change the directory in the input box directly or use <Search> to call a dialog to search already existing directories or creating a new one. The arrow button next to the <Search>-button opens a selection menu with the most recently used folders (only for "*Load files"/ "Save files"/ "Sequences"*).

Load data files from

When starting imc FAMOS , the directory specified here is used as the source directory for loading data files in any format. It is used as the initial directory for the dialog "*Load file*". The Load file commands and functions (LOAD, WFTLOAD, FASLOAD, FileOpenDSF, etc.) use this directory if no complete path name is specified. The setup is no longer used if you have loaded a file for the first time from another directory or if the directory has been converted with the LDIR command or the SetOption()-function. See also *Common folder for Load/Save* below

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Save data files to

When starting imc FAMOS , the directory specified here is used as the target directory for saving data files in any format. It is used as the initial directory for the dialog "*Save file*". The Save file commands and functions (SAVE, ASCSAVE, FileOpenDSF) use this directory if no complete path name is specified. The setup is no longer used if you have saved a file for the first time in another directory or if the directory has been changed with the SDIR command or the SetOption()-function. See also *Common folder for Load/Save* below.

Curve configuration:

Saved curve configurations ("**.ccv*") are searched for in this directory. Menu item "*Extra/ Load Curve Configuration*" and kit-functions for remote-controlling the curve window start searches in this directory.

Sequences / Dialogs:

When starting imc FAMOS , the directory specified here is the default directory for loading and storing sequence- and dialog files. It is used as initial directory for the dialogs "*Load file*" / "*Save file*" in the sequence window. The command for executing the sequence (SEQUENCE), as well as the function DIALOG, for starting a dialog, uses this directory if no complete path name has been specified. The setup is no longer valid if you have used a sequence for the first time from another directory or if the directory has been converted with the MDIR command or the SetOption() function.

Folder for Reports

Print layout files for the imc Report Generator are searched for in this directory. The functions in the Report Generator kits use this directory.

Definition files

Declaration files for external DLL functions are searched for in this directory. In addition, this is the base directory for format definition files created by the imc File Assistant. It is used by the function 'FileOpenFAS' as well as the command 'FASLOAD'. This folder is also used to store user-defined Export Templates (ASCII or XLS).

As of imc FAMOS 6.2, this folder is the permanent setting (subfolder "imc\common\def" of the default system folder for program data used in common) and can not be changed by the user.

Projects:

The folder set here serves as the base folder for new projects to create. It is used, for example, upon starting the Project Explorer.

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Data files

- ***Common folder for Load/Save*:** The entries "Import measured data from" and "Save measured data to" are joined in a measured data folder.
- ***Remember last used folder on exit*:** Saves the last open folder when exiting the program.
- ***Synchronize file filter with central repository***

  When this option is active (or after the data storage folder has been changed), the locally available file filters with the folder specified (which are typically located on a network server) are synchronized. This process then repeats automatically at each start of imc FAMOS .

  This especially applies to import filters which had been created using the File Assistant (*.fas), ASCII- and EXCEL-export templates (*.aet), as well as to configurations created with the ASCII-Import Assistant (*.ascimp), which are also copied to the local imc FAMOS definitions folder.

  Import and export filters which are part of special extension libraries (*.dll) are also synchronized. Any of these are copied to the subfolder "*/imc/Shared/Extensions*" in the default program folder "*c:\Program Files*". However, for this purpose, certain writing rights for this system folder which a standard user account may not include are needed.

  Any already existing files are only overwritten if the main version is newer. The determining criterion is the file version (with *.dll, if it exists), or the file's last modified date (*.fas, *.aet, *.ascimp).

Reference

Chapter 'Functions', section General DLL-interface 342

Manual: imc FAMOS Functions Reference, functions *FileOpenDSF, FileOpenFAS, SetOption*

Chapter 'Sequences', commands *LAYOUT, SDIR. MDIR, LDIR*

Manual: imc Report Generator; manual: imc File Assistant

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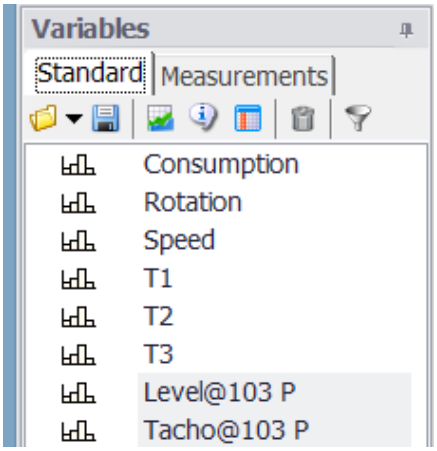
7 Variables

7.1 Introduction

imc FAMOS uses a concept of data which is tailored to the needs of measurement and control technology, allowing various data types to be processed and analyzed. All channels, values and texts which can be processed in imc FAMOS are alike designated as variables.

The main window displays a list of all existing variables. In addition to the variable's name, the type symbol and - where appropriate- the values of variables are also displayed. As each variable is generated, it is entered into the list, which is initially empty in a imc FAMOS session.

Standard or Measurements



The Variables list has two pages, *Standard* and *Measurements*. Data sets which are added by the command *Load File* are located on the *Standard* page.The page *Measurements* is provided for the purpose of working the Panel when multiple channels are loaded which have identical names but originate from different measurements.

A comprehensive assortment of functions for processing the variables is provided, ranging from basic mathematical operations to complex calculus and including special tools for the manipulation of variables, specifically designed for the needs of measurement and control technology.

imc FAMOS includes a formula interpreter which allows you to construct complex mathematical expressions from the available standard functions. Using the formula interpreter, new data may be calculated or existing data can be modified.

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A typical variable in imc FAMOS would pass through this sequence of stages:

1. Variable assignment, accomplished by
   - loading from file
   - importing from other applications
   - creation using Data Editor 583
   - designation as the result of a formula
2. Processing variables, e.g.
   - changing data, e.g. as the result of a mathematical operation
   - changing characteristic values, e.g. via dialog
   - use as parameter for functions and commands
   - visualization as a curve or in tables
3. Storage of results by
   - documentation with Report Generator
   - saving in a file
   - transfer to another application
   - Deletion of variables

Variables are identified by their names, in which terms they can be entered as parameters into formulas. A variable's name may have up to 255 characters.

Each variable consists of the actual (measurement) data and of its assigned properties (also referred to as characteristic values). For instance, the information about the measurement of a voltage over time consists of the actual voltage values (data) as well as name, sampling interval, trigger instant etc. (properties). In addition to these permanently assigned properties, the user can personally define additional properties for each variable (see dialog Properties/User-defined 304).

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7.2 Variable names

Variables are identified by their names, whereby no distinction is drawn between upper- and lower case letters. A variable's name can be specified either automatically (loading from file) or by the user (by declaring a variable).

The name, like any variable characteristic, can be changed by the user at will at any time.

To get a valid variable name use function `TxGetValidVarName(text)`.

Use the dialog (menu item "*Variable/ Properties*") or the command (RENAME) to rename a variable.

A legal variable name **may**

- have a maximum of 255 characters,
- not match another variable's name,
- not contain a character of ASCII-code < 32 (e.g. Tab, Line Break),
- not contain the characters "}", "<" or ">"

Note that names are not case-sensitive; this means that there is no difference between names written with upper- and lower-case letters.

A variable's name **should**

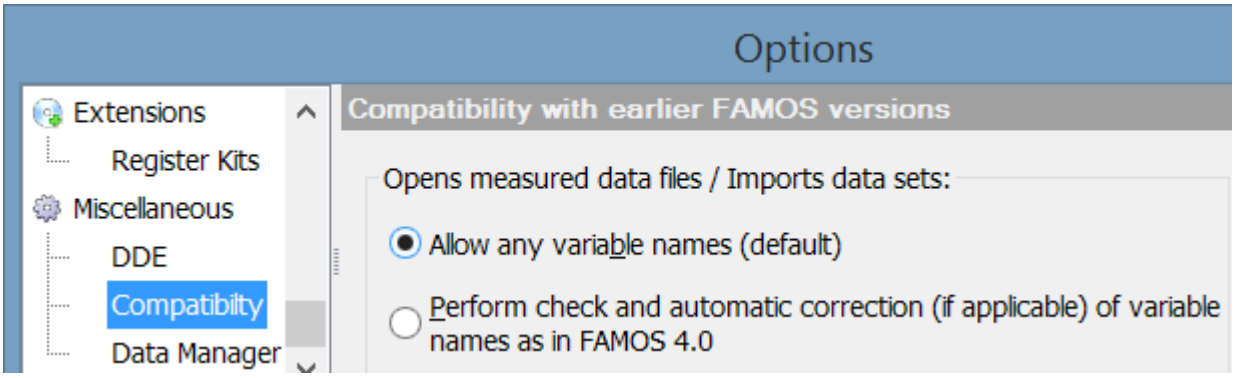
- not begin with a digit
- not contain mathematical operators. referring to the characters
  + - ( ) * / ^ = { [ ] |
- not have any spaces, semicolons, "@", quotation marks,":" , "?", "." or commas,
- not be the same as a sequence (macro) command
- not be the same as the name of a constant.

The latter constraints are necessary for the imc FAMOS formula interpreter to be able to distinguish among variable names, numbers and operators. But if you absolutely must use names which don't adhere to these rules, it's possible to place the names in formulas by writing them within **curved brackets**.

Example

```
LOAD 123_Measurement.asc
 My Result  = sin ( 123_Measurement ) ; WRONG!
{My Result} = sin ({123_Measurement}) ; OK!
```

Please note the possible settings in*"Extras\Options" -> "Miscellaneous\Compatibility"*



Variable names can be extended in formulas by an index or by component labels in order to address certain elements of a variable. The section "*Indexing variables*" of this chapter describes the syntax used in that operation.

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Attention

The use of special characters in names, such as question marks, exclamation points etc. is to be generally avoided.

Question marks, for example, are permitted in variable names, but can have undesired consequences in some cases. The adaptation of a variable name as a file name, which is common practice, faces the complication that question marks can not be used in file names. Furthermore, when calling a macros-sequence with parameters, you may want to extend the file name using question marks as wildcards (DOS-usage).

Some commands also allow a question mark to be used as the wildcard character.

Names of functions as variable names are not prohibited, but for reasons of clarity not to be recommended.

Note

Due to the language independence of imc FAMOS 6.1, the following names are no longer permitted for variables: *sMittel, sMean, sEff, sRMS, sStreu, sStDev, InGrad, InDegr, LEER, EMPTY*. In order to continue to be able to use existing sequences without transcribing the names, the intended language must be set under Options/Functions/Language 331.

Reference

Chapter 'Sequences', command *RENAME*
Section 'Showing and editing properties 295' in this chapter
Section 'Indexing variables 283' in this chapter
Indirect use of variables 328

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7.3 Variables associated with a measurement

Variables can be associated with a measurement.

The concept of a variable being associated with a particular measurement previously was mainly applicable to the File Browser (Measurements) 441. There, when a file of measured values us opened, a measurement name is automatically assigned to each variable in order to distinguish between variables having the same name but originating from different data sources.

In order to be able to differentiate between such variables and to be able to use sequences, the syntax *[VariableName]@[MeasurementName]* is used.

Example:

```
MaxYesterday = Max( Channel1@MeasuredYesterday)
MaxToday     = Max( Channel1@MeasuredToday)
```

Assignment

The **assignment** of a measurement is performed directly when a new variable is created by an assignment command line

```
NewVariable@MeasurementName =  …
```

If a default measurement was defined by means of SelUseMeasurement(), the following notation is sufficient:

```
NewVariable@ = ….
```

The newly created variable is then assigned to the current default measurement.

Alternatively assignment of a measurement can be performed by a function using the command SetMeasurementName().

To construct such combined names, use the function SelBuildVarName():

```
TxName = SelBuildVarName("MeasuredYesterday", "Channel1", 0)
MaxYesterday = Max( <TxName> )
```

or for groups:

```
TxName = SelBuildVarName("MeasuredYesterday", "MeasPoint:Channel1", 0)
MaxYesterday = Max( <TxName> )
```

Measurement association with variable groups

With **variable groups**, the measurement association is a property of the entire **group** and applies to all channels contained in the group. Accordingly, the syntax is:

[GroupName]@[MeasurementName]:[ChannelName]

thus for a group named "MeasPoint001" and the constituent channel "Channel1" it follows, for example:

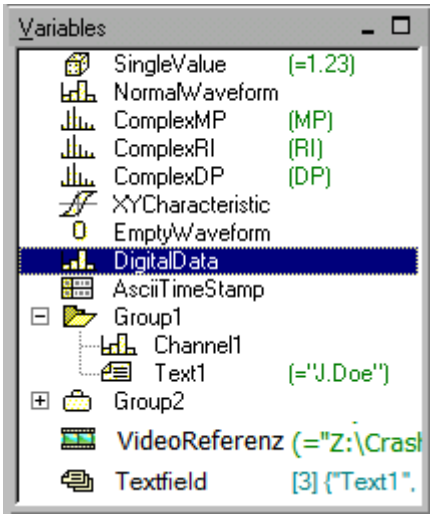
```
MaxYesterday = Max( MeasPoint001@MeasuredYesterday:Channel1)
MaxToday     = Max( MeasPoint001@MeasuredToday:Channel1)
```

When expanding a local group, the expanded channels become global and the implicit measurement name (the identifier of the sequence) is not copied.

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7.4 Data types

The main characteristic of a variable is its data type. It determines the form of the display in the curve window, the admissibility of the variable as a parameter for mathematical functions, as well as the amount and type of properties associated with the variable.



This illustration depicts a list of variables representing all existing types, accompanied by their respective symbols. The types are described in detail in the following chapters.

imc FAMOS supports variables with the following data types, i.e., these can be created, processed and stored:

1. Normal data sets
   - equidistantly sampled series of readings,
   - one-dimensional vectors
2. Single values
3. XY-data sets
   - data-reduced time-based data sets
   - two-dimensional vectors
   - X-axis can be monotonic (measurements over time) or non-monotonic (e.g. hysteresis curves)
4. Complex data sets
   - magnitude/phase,
   - real/imaginary-part representation
5. Text variables
6. TimeStamp-ASCII data sets
7. Data groups

Take as an example the case of a curve measuring voltage over time, sampled equidistantly and ready for processing. The voltage curve is a normal channel. If its mean value is determined, the result is a single value; if its spectrum is determined, the result is a complex data set. These results may be processed further; the mean value, say, subtracted from the voltage or the spectrum divided by another to get a transfer function.

Determining the relative maxima of the voltage curve gives value pairs (time/ voltage) which amount to an xy-data set. To save this data set with a function, the file name -as text- is supplied as a parameter. To manage all these variables jointly, it is possible to collect them into a data group under a new name.

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Not every data type is supported by every mathematical function. For example, the spectrum of an xy-data set cannot be calculated.

Data sets may have a length of anything between 0 (empty data set) and over 250,000,000 data (= 1,000,000,000 bytes). In practice, the maximum length is limited by the small size of data storage units.

7.4.1 Normal Channels

A normal channel (equidistant) is a one-dimensional field (vector) of real numbers with units, names etc. A sequence of sampled values of a measured quantity with a fixed sampling rate represents a normal channel.

Suppose that the current values 12 A, 14 A, 16 A, and 18 A were measured at the times 6 s, 7 s, 8 s, and 9 s. Displayed as a value table, the data take the following form:

Time in s	Current in A
6	12
7	14
8	16
9	18

In graphic representation, the current would be entered along the y-direction, and the time in the x-direction; according to imc FAMOS ' efficient storage method, outlined as follows: The numerical values 12, 14, 16, and 18 for the current are stored. The unit for the y-coordinate, "A", is stored only once for all data. It is not necessary, now, to store all numerical values to define the x-coordinate, because most channels are sampled equidistantly, making the time difference between adjacent samplings constant; in this case, 1s. What is stored, then, is the x-offset, which is the x-value of the first sampling (in this case 6s), and the sampling time (delta-x), being the interval between two sampling values; and of course the unit of the x-coordinate. Finally, the channel has a name by which it can be addressed and applied. This data set has a length of 4, meaning that it contains four sampling values.

The defining attribute, then, of a normal channel is the presumed equal distance (generally an equidistantly spaced x-coordinate) between 2 adjacent data set values. This is the case with equidistantly sampled measurements and also with data sets, where the association value <-> time (or y-value <-> x-value) is either not present or not of interest .

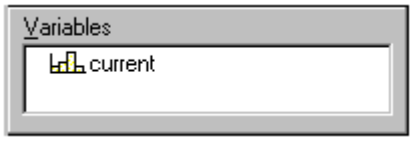
The actual data in a normal channel are stored as a one-dimensional vector. The most important characteristic values are the x-value of the data set's first element of data, and the x-distance between two consecutive values. In a time based channel, this would be the trigger time and sampling rate, which in conjunction with each other determine the corresponding time for each measurement value.

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You can generate a normal channel as per the following pattern:

```
NormalWave = Ramp(0, 1, 100)
```

Display of a normal channel in the Variables list:



Furthermore, data sets can be created via initialization lists:

```
; with default values:
Data = [1, 2, 3, 2, 1]
; with constants:
Data = [1 , PI2, 3, 4, 5]
; with any expressions:
Data = [1 'V', 2+7, 3, 4, 5]
Sawtooth = [Ramp(0,1,100), Ramp(0,1,100)]

; variables can also be used. As an alternative to the binding function:
FilledWithZeros = [Data, 0, 0, 0]
; with indexed values:
Value_1_3_5 = [Data[1], Data[3], Data[5]]

; Initialization lists can also be placed inside expressions:
Half_wave = sin( [0, PI/4, PI/2, 3*PI/4, PI] )
BeforeYesterday=-7
Yesterday=2
Today=-15
Mean3Days = Mean( [BeforeYesterday, Yesterday, Today] )
```

Note Initialization lists

The maximum number of complex initializers (e.g. sin(x), PI/4 etc.) is 15.

A special case of a normal channel is an empty data set, meaning a data set with a length of 0. It contains no data but has characteristics. This type of data set is denoted in the variable list with a special symbol.

```
EmptyDataset1 = All0( Ramp(1,1,2 ))
EmptyDataset2 = empty
```

Symbol for an empty data set in the Variables list:



7.4.2 Single Values

A single value is a single real number associated with a name and possibly a unit, such as 'Minimum = 3.2 A', or 'Number = 45'.

A single value can be interpreted as a special case of a normal channel; one having the length 1.

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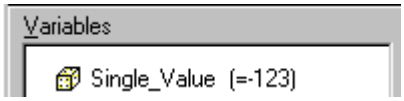
Numerical values can be specified as whole or real numbers. The symbols "E" or "e" are used to express powers-of-ten, and are read as "ten to the power of ..". Decimal places smaller than unity are to be placed after a decimal point not a comma, though the latter is customary in some cultures. The following expressions therefore represent the same number:

```
Number = 187
Number = 0.187E+3
Number = .187e3
Number = 187.00
```

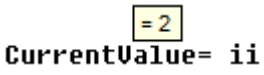
Integers without sign can be specified in hexadecimal format, for which the prefix 0x is used.

```
Number = 0x0  ;(=0)
Number = 0x1   ;(=1)
Number = 0xA   ;(=10)
Number = 0xFF   ;(=255)
Number = 0xFFFFFFFF  ;(=4 294 967 295)
```

Display of single values in the Variables list and Editor:



Display of the numerical value can be optionally suppressed using the dialog "*Extra"/ Options"/ "Variables list*".



Holding the mouse over a variable in the Editor window causes its content to be displayed above the name.

Single values are often generated as the result of a function (e.g. in the calculation of a mean value) or supplied to a function as a parameter (e.g. filter cut-off frequency).

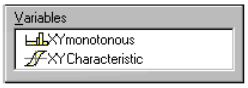
7.4.3 XY-Data Sets

XY-data sets arise where two values must be stored for each data point, namely, the (amplitude) value and additionally the time- or x-value. imc FAMOS manages this information as two sets of values' components; one set containing all y-values and the other containing the x-values; both sets having, of course, the same length.

There is a distinction between

- XY-data sets with a **monotonic** X-track. This is inherent in all measured quantities recorded over time, as when generated with data-reducing procedures.
- XY-data sets with a **non-monotonic** X-track. Here, multiple y-values can be assigned to one x-value. This applies to hysteresis curves, for example.

Below you see the registration of xy-data sets in the variable list:



The channel components can also be indicated. Select the corresponding item in the context menu (click the right mouse button above the variable list) or in the dialog "*Extra/ Options/ Variables list*".

Generate an XY-data set using the following formula, for example:

```
XYData = XYof( Ramp(0,1,100), Ramp(0,1,100))
```

Refer to the individual components in formulas using the suffixes .x and .y . For example, to double the amplitude of a reduced time-data set, simply write:

```
XYData.Y = XYData.Y * 2
```

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7.4.4 Complex Data Sets

Complex data sets result primarily from Fourier transformations or more generally from the calculation of a channel's spectrum.

```
ComplMP =  Spec( Ramp ( 0,1,128 ))
```

As with xy-data sets, the data are managed in two sets of values' components. An additional parameter, over which both components are plotted, is also present and to be noted.

For example, the FFT of a voltage channel generates a magnitude (unit: V) and a phase (unit: degrees), both over the frequency (unit: hertz).

Complex data sets can be represented in three styles:

- **Magnitude / Phase** (abbreviated MP in the Variables list)

  Phase may be stated in either degrees or radians. You can address the individual components via the suffixes .M and .P.

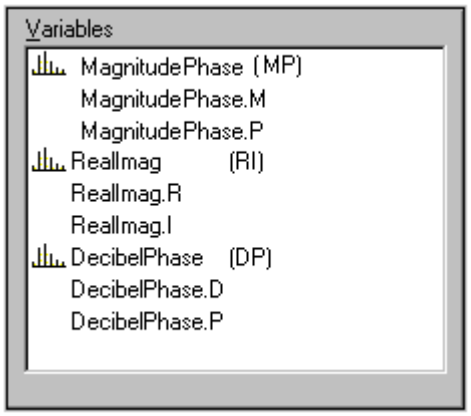
- **Decibel / Phase** (DP in the Variables list)

  This is the same as the representation in terms of magnitude and phase, however the magnitude is expressed in dB, which amounts to the magnitude's logarithm times twenty. Transfer functions and frequency responses are usually expressed logarithmically (in dB). Here, the magnitude is recorded in decibels, by convention. The phase can be expressed in degrees or radians. You can address the individual components via the suffixes .D and .P.

- **Real- /Imaginary part** (RI in the Variables list)

  Individual components can be addressed via the suffixes .R and .I.

Here, the registration of complex data sets in the variable list is shown.:



In the Variables list shown, the individual components are also registered. Registration of the components in the variable list is optional and can be suppressed using either the context menu (click above the variable list with the right mouse button) or menu item "*Extra/ Options/ Variables list*"

One can easily convert variables between the different representation styles by using mathematical functions.

```
magnitude_phase  = FFT( Ramp( 0,1,128))
magnitude        = magnitude_phase.B
decibel_phase    = DB( magnitude_phase )
Phase            = decibel_phase.P
real_imag        = CART( magnitude_phase)
RealPart         = real_imag.R
```

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Please make note of the following, when calculating with complex data sets:

- The particular representational style employed for a complex data set, whether RI, MP or DB, isn't important for a computation. Thus, one complex data set given in MP, say, can be divided by another one given in RI.
- A peculiarity of complex data sets is the fact that both components always have the same x-axis scaling.
- The y-axis units must relate to each other in a manner appropriate to the particular representational style employed. When using "RI", you need identical units in both y-axes; for styles involving phase, one of the y-axes must have a phase unit.
- Phase can take the units "°" or "Degrees", by both of which are meant degrees on the scale between 0 and 360. However, the phase can also be stated without any unit or with the designation "Rad", which indicates an expression in radians, with a range between 0 and 2 * Pi. Since the phase of a complex data set is of crucial importance, care must be taken not to interpret it incorrectly when performing a calculation. If the phase has an invalid unit, the interpretation is indefinite.

7.4.5 Texts

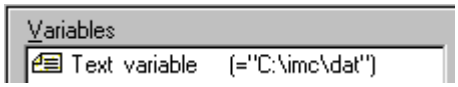
7.4.5.1 Text variables

An example of their use would be for forming and storing file- and variable names. Certain functions require texts as parameters, for instance functions which define data set units or comments.

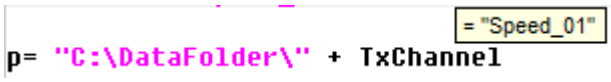
Text constants must be enclosed in quotation marks and may not exceed 255 characters in length per line. However, text variables can be appended to each other as often as desired and can thus reach a permissible length of up to 2^31-1 characters.

```
TXpath    = "C:\Users\Public\Documents\imc\imc FAMOS\dat"
Comment   = "Created on 6/13/93, E. Muster"
TXEmpty   = ""
```

Display in the **Variables list**:



with tip in the **Editor**:



To include special characters in text constants, use the "tilde" character (~) followed by three digits representing the ASCII-code of the special character desired, e.g.

"~009"	Tabulator
"~013"	Carriage return
"~010"	Line Feed
"~034"	Quotation marks ("). Alternatively, the quotation mark is entered with """Text""".

Example

A text constant including both CarriageReturn and LineFeed. This combination is used by many text editing programs to begin a new line:

```
TxCRLF = "FileName: ~013~010"
```

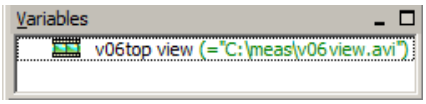
Text containing quotation marks:

```
TxCommand = "LOAD ~034c:\test.dat~034"
```

oder

```
TxKommando = "LADEN ""c:\test.dat"""
```

A special case among text variables is the type "Text / Video-Reference".



Variables of this type normally are generated by loading video files with the import filter "Video", the variables' content is the video file's complete pathname.

Such variables are used in conjunction with the Video Player control in the Panel. By linking such variables with the Player, the video automatically shows up in the path entered as the variable's value.

This data type is distinguished by the user-defined property "imc07" (format), which here has the value 7 (Video).

7.4.5.2 Text Array

A text array denotes a collection of individual texts which are saved under a joint name and which can be addressed jointly by an index.

You can create a Text Array having the desired initial amount of elements using the function *TxArrayCreate()*.

Alternatively, a text box can be **initialized** directly, for instance by this code:

```
MyTextArray= ["Text1", "Text2", "Text3", ..., "Testx"]

MainUser = ["Smith", "Meyer", "Miller" ]
AllUsers = [MainUser, "Baker" ]
```

Also expressions are possible:

```
BaseName = "channel"
AllChanNames = [BaseName + "_1", BaseName + "_2", BaseName + "_3"]
```

For setting and getting the particular texts, use the index notation with square brackets, e.g.

```
FourTexts     = TxArrayCreate(4)
FourTexts[2] = "Text for the second element"
SecondText    = FourTexts[2]
```

Example to initialize a text array:

```
local dim=1000
TxArray= TxArrayCreate(dim)
For i=1 to dim
   TxArray[i]= "DefaultText"
End
```

You can subsequently change the number of elements in a text array using the function *TxArraySetSize()*.

When a text is assigned, if the specified index is 1 higher than the momentary size, the size is automatically adapted internally. This has convenient uses, for instance if the text array is to be filled step-by-step in a loop and the ultimate size is not yet known.

```
TxArray = TxArrayCreate(0) ; Initial size is 0
Index = 1
WHILE ...
    ...
    TxArray[Index] = AnyText  ; TxArray grows automatically
    Index = Index+1
END
```

If or when the final size is known, however, it is more efficient to specify it explicitly using TxArrayCreate() or by means of TxArraySetSize().

For enumerating a text array's elements, the FOREACH ELEMENT-loop is well suited. In the example below, a text array having the name [Log] is loaded from a file and entered into a list in the currently open panel.

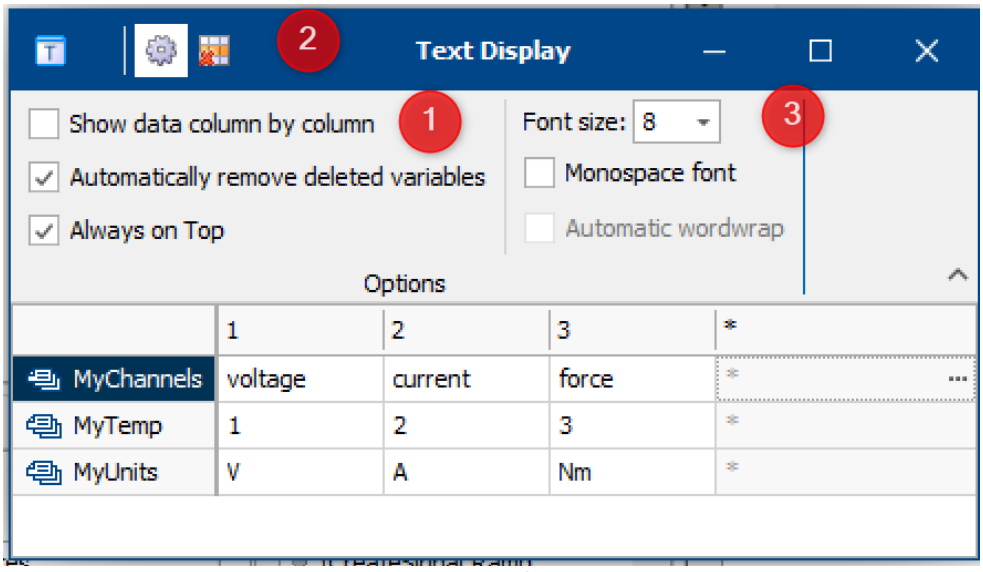
```
FileLoad("c:\logfiles\Log.dat", "", 0)
FOREACH ELEMENT LogEntry in Log
  PnInsertItem( "list", 0, LogEntry, 0)
END
```

This data type is available to imc FAMOS Version 6.3. Please note that files containing text arrays can not be read by older versions of imc FAMOS .

7.4.5.3 Text Display

Text variables and text arrays are displayed in a table editor. Several text variables and text arrays can be selected in the Variables list.

Press **F4** or the symbol for the curve window to open the display:

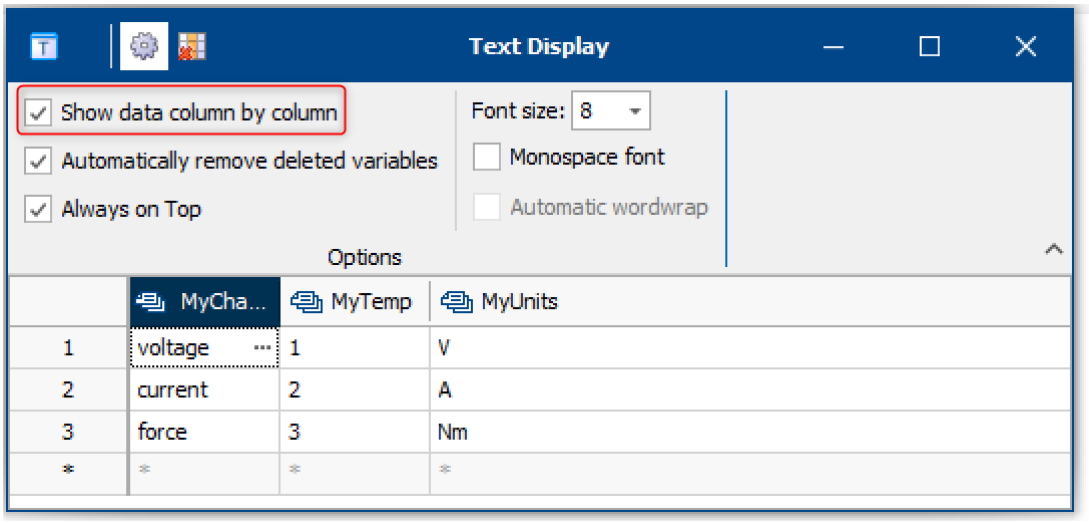


Text Display

The upper "***Options***" area can be collapsed.

Drag & Drop additional variables from the Variables list into the open text display.

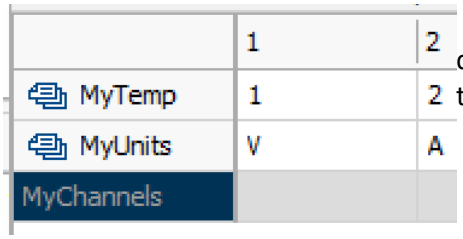
❶ **Display:** The display can be arranged in columns or rows:



Row display

❷ 

Remove: Text variables can be removed from the text display.



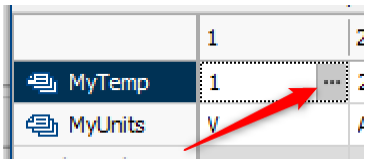
If "*Automatically remove deleted variables*" is active, a variable deleted in the Variables list is automatically removed from the text display. Otherwise, a placeholder remains in the table.

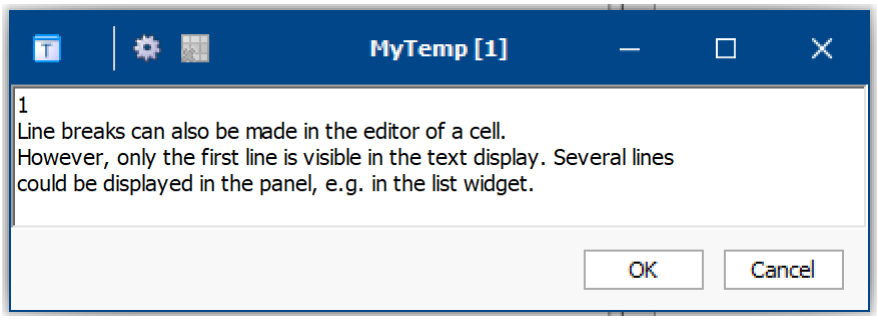
Placeholder for a removed variable if "Remove automatically" is deactivated.

❸ **Font:** Selection of *font size* and type: *non-proportional or proportional font*

Edit:

- *Inplace-Editor:* The text can be edited with a double click.
- *Editor*: Clicking on the three dots in the cell for a text opens the Editor:





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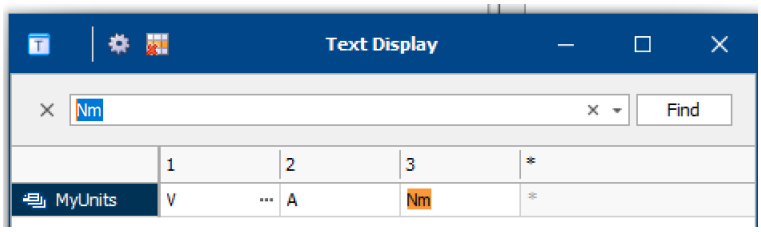
Context menu

Depending on the selected area, the following options are available via the context menu:

Toolbar: *Close toolbar* - Hide options

Variable name:

- *Best Fit* - this or all columns
- *Best fit (all columns)*
- *Remove Selected Variable from Grid* - deletes a variable from the grid in accordance with the respective display style. The variable is not deleted as a result, and remains in the Variables list.
- *Close toolbar*
- *Find:*



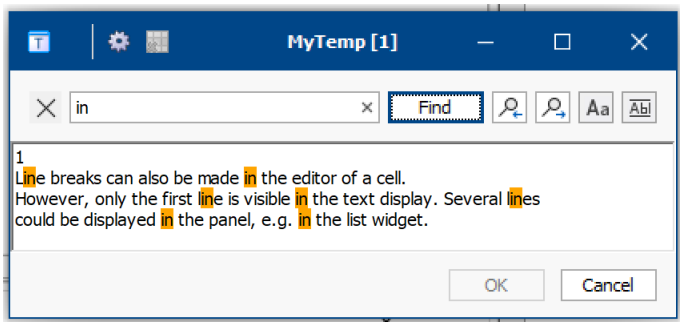
Shows all rows that contain the search term

Cell of a text array:

*Delete Text Field***:** targeted deletion of a text array

Context menu in cell editor :

Find:

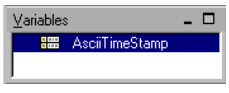


Finding text in a cell's Editor mode

7.4.6 TimeStamp-ASCII

his is a rare and very special data format which imc measurement devices can generate. Such data sets contain a list of texts (or generally, blocks of ASCII-code), each of which comes with its own time stamp. In practice, this data type is generated when protocol or alarm lists are created.

Display in the Variables list:



Many typical functions and commands cannot be applied to variables of this type. Such data sets can basically only be processed by the functions of the so-called TimeStampASCII-Kit, which is included in the standard imc FAMOS package, but is not registered by default.

Display of this data in the imc FAMOS Data-Editor is also not possible, but instead, tabular representation can be used in the curve window.

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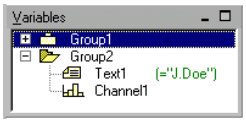
7.4.7 Data Groups

Data groups themselves do not contain data in the usual sense, rather, they amount to a list of data sets or texts assembled into a group with a collective name.

This is useful for grouping data sets with related content, e.g., data stemming from different channels in the same measurement sequence. An entire group can be stored in unison, or it can be directly transferred in unison to mathematical functions. In the latter case, the function acts on each element of the group in succession.

A group can consist of channels or texts, but not of other groups.

Display of data groups in the Variables list:



You can choose whether to display the component channels in a group. You can switch the display mode by left-clicking the mouse on the [+] or [-]symbol which appears next to the group icon, or via the context menu (accessed by right-clicking the mouse over the variables list; command "Show channels") or via the dialog called via "*Extra"/ Options"/ "Variable list*".

To address a particular channel in a group, place a colon after the group name and then specify the channel, which is identified either by its name or by its index within the group. The index must be set in brackets. The index "1" refers to the first element of the group.

```
MeanK2 = Mean( MeasNo123:Channel002)
MeanK2 = Mean( MeasNo123:[2])
```

The channel index refers to the momentary position of a particular channel within the group and isn't a channel's permanent property Thus, it is subject to rearrangements in the group order.

```
Channel2      = MeasNo123:[2]
Delete      MeasNo123:Channel001
AlsoChannel2  = MeasNo123:[1]
```

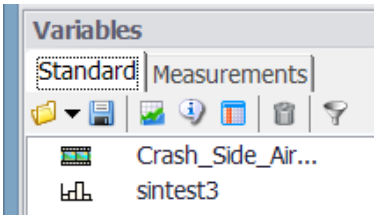
In the above example, deleting the first channel has altered the index order of the remaining channels; "Channel2" and "AlsoChannel2" are thus equivalent variables.

Channels and texts can be added to and removed from groups as desired.

Reference

Chapter 'Functions', section 'Data groups as function parameters 327' and variables associated with a measurement. 266

7.4.8 Video-file



Video files can be linked with data sets and be displayed in the Panel or Video Player. imc FAMOS loads the file only as a text-reference and displays it with a Video-symbol in the Variables list; see also here 272.

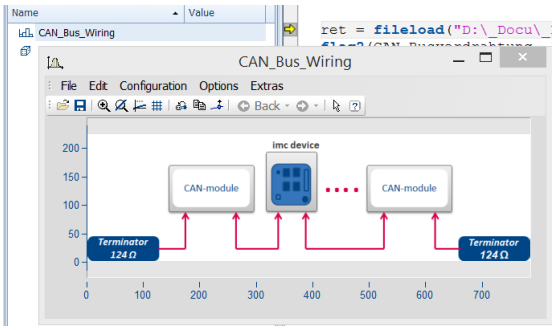
When you display the Video-variable using the Show function, a pre-defined Panel is opened, which loads the film and plays it.

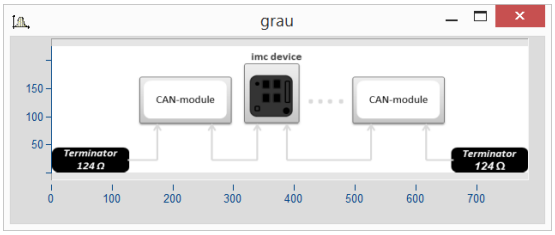
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7.4.9 RGB image as a variable

A variable as an image is **not** an independent data type but a special case of a **segmented normal data set** 280 and a **color flag** 287**,** which interprets each data value as a color value. By means of this flag, the curve window recognizes that the variable is to be displayed as an image. Furthermore, any functions which work with RGB-values also interpret the data as color values.

The data permitted are **unscaled unsigned 4-Byte Integer values (RGB)** and **1-Byte unsigned** (**gray scale**). For 4-Byte RGB, only 24 bits (one Byte each for the colors red, green, blue) are used.





For instance, the colors flag is set automatically when an image file is loaded with the **FileLoad**() command and the format specification "*Picture Format*".

The curve window then displays the data set as an image. The color-flag can be set using SetFlag() and queried using Flag?().

For more information on the use of RGB images, see the Curve Window user's manual.

Unscaled data expressed as 1-Byte unsigned integer are interpreted as **gray scale**. When setting the the data format, it is important to define the value range as 0 = black to 255 = white.

Example:

```
Red= Bitand(CAN_Bus_wiring, 0xFF,32)
gray= Red
SetDatFormat( gray, 5, 0,255)
```

The function **RGB**() can also be applied to data sets.
Most functions do not treat R, G, and B separately, but only the RGB-value. For this reason, not many mathematics functions can be applied. The functions which feature special handling of RGB values will have an indication of this in their descriptions.

```
; Example of extracting RGB-components
Red= Bitand(CAN_Bus_wiring, 0xFF,32)
Green= Bitand(CAN_Bus_wiring, 0xFF00,32)
Blue= Bitand(CAN_Bus_wiring, 0xFF0000,32)
; as colors
colorvaluemax=  2^32-1
SetDataFormat(Red, 7, 0, colorvaluemax)
SetDataFormat(Green, 7, 0, colorvaluemax)
SetDataFormat(Blue, 7, 0, colorvaluemax)
setflag( Red, 1, 1)
setflag( Green, 1, 1)
setflag( Blue, 1, 1)
show Red
show Green
show Blue

; as gray scale
; shifting to an unsigned Byte integer
Red_RGB= Red
Green_RGB= BitShift(Green, -8, 32)
Blue_RGB= BitShift(Blue, -16, 32)
SetDataFormat(Red_RGB, 5, 0, 255)
SetDataFormat(Green_RGB, 5, 0, 255)
SetDataFormat(Blue_RGB, 5, 0, 255)
setflag( Red_RGB, 1, 1)
setflag( Green_RGB, 1, 1)
setflag( Blue_RGB, 1, 1)
show Red_RGB
show Green_RGB
show Blue_RGB

; reconstruction
Rebirth= RGB( Red_RGB, Green_RGB, Blue_RGB)
```

7.5 Structured data sets

Normally, a data set consists of a collection of values which are associated by a particular measurement series.

Example: the moment a predetermined triggering condition is met, measurements are taken at a certain port for a prearranged period of time, and the measurement values are recorded as a channel designated by a particular name. imc FAMOS ' data management capabilities, however, support more elaborate structuring of data sets, in accommodation to the practical demands of measurement and control technology.

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7.5.1 Segments

A data set may be segmented, with each segment having the same length and the entire data set's length being a whole number multiple of the segment length. Data management operations can be performed on an individual segment as well as on the complete data set. In conjunction with the Colors-flag, a segmented data set can be displayed by the curve window as an image 278.

Example

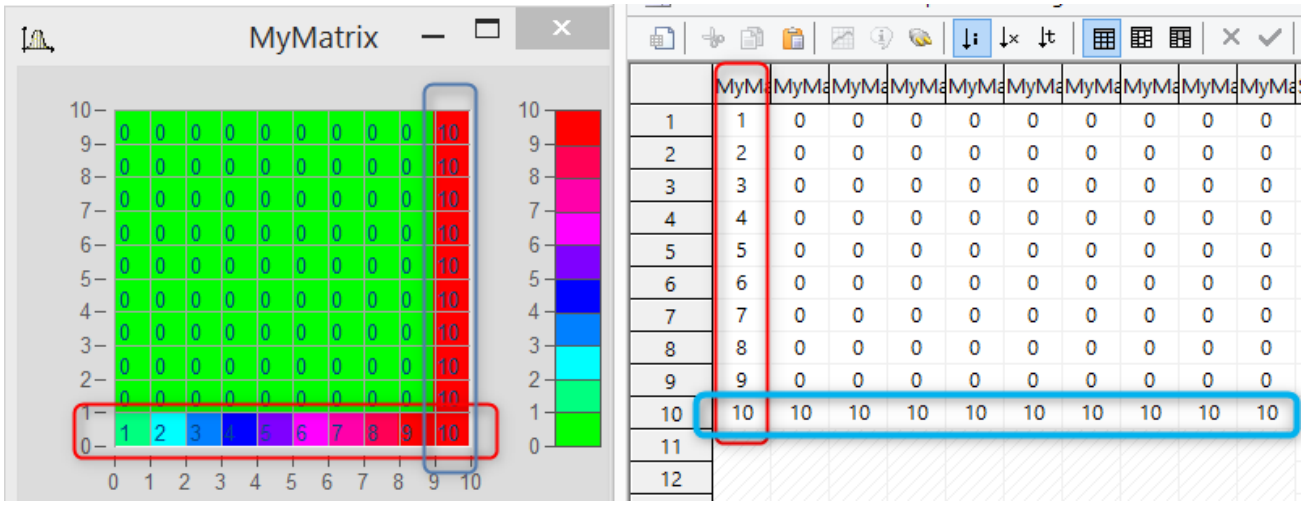
A measurement device calculates a 1024-point FFT each time a defined triggering condition is met on a channel, and appends the newly-calculated data to an existing data set. If ten measurements were executed, the data set contains a total of 10240 values, organized in 10 segments with a length of 1024 values apiece.

The following data types can be structured as segments:

- Normal channels
- complex data sets
- XY-data sets

Note Matrices

The segmented data sets also include **matrices**, for the calculation of which imc FAMOS includes a dedicated functions group among the basic functions. Matrices can be displayed both in the Data Editor and in the curve window, e.g as a color map or as an RGB image. Be aware that the curve window sorts segments as rows, while the Data Editor sorts them as columns. The matrix functions use the Data Editor sorting arrangement. The images below illustrate the difference. The function MatrixSumLines() uses the designation used in the function:



Matrice as colormap and in data editor

Column_sum	Row_sum
55	1
10	2
10	3
10	4
10	5
10	6
10	7
10	8
10	9
10	100

Example: MatrixSumLines()

7.5.2 Events

A data set can also be structured as several events, which, unlike segments, can take different lengths. Thus, an additional list containing the beginning and length of each event must be managed along with the data set. Various data set characteristics, such as trigger time and sampling rate, are also managed in the capacity of characteristics of particular events.



Example

A measurement device executes a measurement series each time a predefined trigger condition is met, and online data reduction is employed. The amount of values actually stored in each measurement series varies. All the measurement series are appended to one data set. The measuring rate may be changed from one measurement series to the next. In order to later evaluate the accumulated data in a sensible manner, each measurement series (=event) must be stored along with its trigger time, sampling rate and number of values.

Of course it would be possible to create separate variables instead of storing several events to one data set. However, when handling large numbers of measurement series, there are cases where organization of data as several events (belonging to fewer channels) provides greater efficiency and a helpful overview to the management process.

An individual segment or event can be accessed by its index, as explained in the next chapter.

The following data types can be structured as events:

- Normal channels, Single values
- complex data sets
- XY-data sets
- TimeStamp-ASCII

Reference

Chapter 'Functions', section 'Displaying and editing properties 295' in this chapter

7.6 Indexing variables

To refer parts of a data sets to a formula, you can use a component-specific suffix (.B, :X etc.), or access a particular element in the data set using its index. Indexes are stated in brackets after the variable name. Multiple indexes are separated by commas. The index of a data set's first element is always "1".

The most common use of this procedure is to access a specific value (a sample) of an **unstructured data set**. This may occur on either side of an assignment; on the right, in order to, say, define a function parameter; or on the left for setting a particular value. An index may be stated as a constant or as a single-value variable.

```
Data           = Ramp( 1,1,100 )
ValueAt50      = Data[ 50 ]
Index          = 49
Data[ Index ]  = ValueAt50
```

As a result, the values at positions 49 and 50 of the data set are the same.

It is also possible to calculate with indices:

```
Data[1] = Data[leng?( Data)]
```

Now the first and last values of the data set are the same.

Texts can also be indexed:

```
Folder   = "C:\Users\Public\Documents\imc\imc FAMOS\dat"
OldDrive = Folder[1]
Folder[1]= "d"
```

The content of the variable 'Folder' is now "*d:\imc\dat*"; the variable 'OldDrive' has the content "*c*".

With **two-component data-types**, you must first state the index of the desired sample and then the component suffix:

```
kplx  = FFT( Ramp( 0,1,128 ))
kplx1 = kplx[2]
; kplx1 : complex data set of length 1
Mag1 = kplx[2].B
; Mag1 : single value (magnitude)
```

Invalid indexes cause an error message to appear:

```
Values100 = Ramp( 0,1,100 )
Wrong     = Values100[101]
index     = 0
i[index]  = 3
```

Indexes may also be used to specify a **channel in a data group**. The bracket should be preceded by a colon in this case:

```
NewGroup:Channel1 = Ramp( 0,1,100)
NewGroup:SinOfK1  = sin(NewGroup:[1])
SinOf1            = NewGroup:[2]
Delete              NewGroup:[1]
AlsoSinOf1        = NewGroup:[1]
```

Please note that by deleting a preceding channel, the index for channel `NewGroup:SinOfK1` has changed.

Indexes, separated by a comma, can be combined:

```
ValueNo10 = NewGroup:SinOfK1[10]
ValueNo10 = NewGroup:[1,10]
```

In both cases above, the 10th value of the 1st channel is assigned to "ValueNo10".

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With **structured data sets** (involving events or segments), each structural level must be indexed individually.

Example

Segmented data set with segment length 10

```
Segment3       = SegmDataSet[3]
OneValue       = SegmDataSet[3, 10]
Group:Channel1= SegmDataSet
OneValue       = Group:[1,3,10]
```

In the first line the entire 3rd segment is assigned; thus, "Segment3" has a length of 10. In the second and fourth lines, the last value of the third segment of the data set, a single value, is assigned..

7.6.1 [*] Indexing

With the indexer [*] the complete data content of a variable can be overwritten, while the other properties like user-defined properties 304 remain unchanged.

```
var = Ramp(0,1,100)
SetComm(var, "My comment")
; …
var = Ramp(0,2,200)    ; New definition, comment is reinitialized
```

The variable 'var' is completely redefined and overwritten. The previously assigned properties are lost.

With indexing the properties are preserved:

```
var[1] = 11            ; Partial overwriting of content
```

A part of the contents of the variable (here: the 1st value) is overwritten. All other properties are retained.

```
var[*] = Ramp(0,2,200); Only data is reassigned, comment is retained.
var[*] = 1; The data record becomes single value 1, the comment is retained.
```

The entire (data) content of the variable is overwritten. Properties that are independent of the new data are retained.

The following properties are retained:

- Comment
- User-defined properties
- File name/origin
- Display color and display Y-scaling

All other characteristic values (units, trigger time, sampling time or x-delta, pretrigger or x-offset, z-scaling, segment length) are overwritten together with the actual data values.

Prerequisites

- The [*] indexer is only allowed on the left side of an assignment.
- The assignment must not change the data type (data record, text, data group).

Indexing data groups

The [*] indexer can also be applied to group variables:

```
Data_group[*] = New content
```

The contents of all variables contained in the data group are overwritten. To do this, the right side of the assignment must have the **same structure** as the target variable. This means that the **number** and **data types** of the channels must be identical for target and source.

For data groups, the [*] indexer can also be combined with a channel index:

```
; The content of the first channel of the data group is overwritten.
Data_group[1, *] = New content
```

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7.7 Data formats

Data (numbers) can be stored in various formats.

There is a fundamental distinction between real and integer formats. Real numbers are stored in a mantissa/ exponent representation. Any number -between a fixed range and subject to a maximum level of precision- can be expressed. The range and precision are determined by the digits available for the representation of the mantissa and exponent.

Real numerical formats		
4 Byte Real	float	7 decimal places are significant
8 Byte Real	Double	15 decimal places are significant

An integer format, by contrast, can only express discrete values located within a range whose limits are dictated by the width of the bit string; every possible combination of bits signifies one particular value.

For example, a 1-byte integer format without sign can express 256 discrete values from 0 (no bits set) to 255 (all 8 bits set).

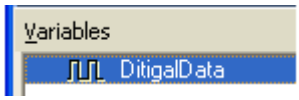
To represent a physical quantity using integer format in a sensible manner, it is necessary to provide information on how to convert from discrete numbers to physical values; this is done by specifying the range the physical values can take.

Example

A voltage measurement in the range between 5 and 10 V is recorded and stored in 1-byte integer format. A numerical value of 0 corresponds to 5 V and a numerical value of 255 corresponds to 10 V. Larger or smaller physical values are out of bounds and can't be represented. The maximum resolution for voltage values is 5 V/255 = 0.02 V.

Digital data are a special case which can only take values of either 0 or 1, and come without scaling information. They are indicated in the variable list by their own symbol.

Representation of digital data in the variable list:



Integer number formats enjoy widespread use in measurement and control technology because they can be directly generated by ADC's. Thus they can be stored and computationally manipulated in a straightforward manner.

imc FAMOS doesn't require you to be constantly alert to the particular data format used in a variable. The mathematical functions provided will work, regardless of the parameter's data format. The intra-system calculations are always performed using real numbers and the results of most functions are stored in that format, to ensure suitable precision.

Nevertheless, the user can convert a data set between the different data formats at will. Converting from a real-number format to an integer format, for example, may be sensible in some cases (subject to the resolution required) where conservation of space in storage or in the data storage unit is aimed for. Naturally, this only applies if the integer format's resolution is sufficient for the particular application.

Integer data formats	
1 Byte signed/unsigned	2^8-1 quantization levels
2 Byte signed/unsigned	2^{16}-1 quantization levels
4 Byte signed/unsigned	2^{32}-1 quantization levels
8 Byte signed/unsigned	2^{64}-1 quantization levels
Digital	Values 0 and 1

Remark: For calculations, integer data are generally converted to real numbers, which can cause a decrease of precision.

Colors-flag

As of imc FAMOS 7.5, there is a new flag which interprets the data as color values. This is only evaluated for unsigned 4-Byte Integer (RGB) or unsigned 1-Byte Integer for gray scale.

The curve window goes into "Image-mode 278" when the flag is set and the data set is segmented. Mathematics functions or functions for video analysis may need to evaluate this flag in order to achieve a useful result (e.g. interpolation functions). This also applies when, for instance, one line of the whole data set is extracted and passed to a function.

imc3 data format

As of imc FAMOS 7.4 the data format imc3 is supported. With this format, an envelope curve is additionally stored for large amounts of data, so that the display in the curve window and its operation remains fluid. This feature can be deactivated under Extra\Options\Miscelleneous\Compatibility 231.

Reference

Section 'Displaying and editing properties 295' in this chapter

Chapter 'Functions', 'Dialog: Options/ Functions 331'

Manual imc FAMOS Functions Reference', Function *'SetDatFormat'*

7.8 Displaying variables

This section describes how to display data sets in a curve window. Please refer to the Curve Window documentation for information about operating a Curve window. If you wish to display channels in a numerical format, refer to the chapter 'Data Editor 583' of this manual.

Single values and texts can be displayed in the variable list after the variable name. This requires the pertinent check boxes in the dialog "*Extra/Options/Variables list*" to be activated.

The File Browser offers a practical option to load and display data sets in a single step. For details, see the chapter 'File Browser 218' of this manual.

7.8.1 Show variables individually

Select one or several variables from the list. Then select "*Show*" in the "*Variable*" menu or click on the corresponding button in the tool bar. The button <F4> may also be used as an alternative.

Each variable selected is displayed. If the variable is a single value, the numerical value with unit is displayed in a single-value-window; if the variable is a channel, the curve is displayed in the curve window.

If the variable is a text, a small window containing the text is displayed. Each subsequently selected text variable is displayed in the same window, so that only one text variable can be viewed at any one time.

If a variable already displayed is selected, its window emerges into the foreground.

Reference

All other settings can be accessed directly from the curve window menu bar. Please refer to the Curve Window documentation for detailed information about operating the curve windows.

Variables themselves possess characteristics, which determine their representation in the curve windows. For example, a set color and scaling can be assigned to the variable. Refer to the section 'Showing and editing properties 295' in this chapter.

The display of variables in tabular form is described in the chapter 'Data Editor 583'.

Chapter 'Sequences', command *SHOW*

7.8.2 Show variables together

Select several variables from the list and then "Show together" from the variable menu. Alternatively, you can use the key combination SHIFT + <F4>.

The currently selected channels are then displayed **together in one curve window**.

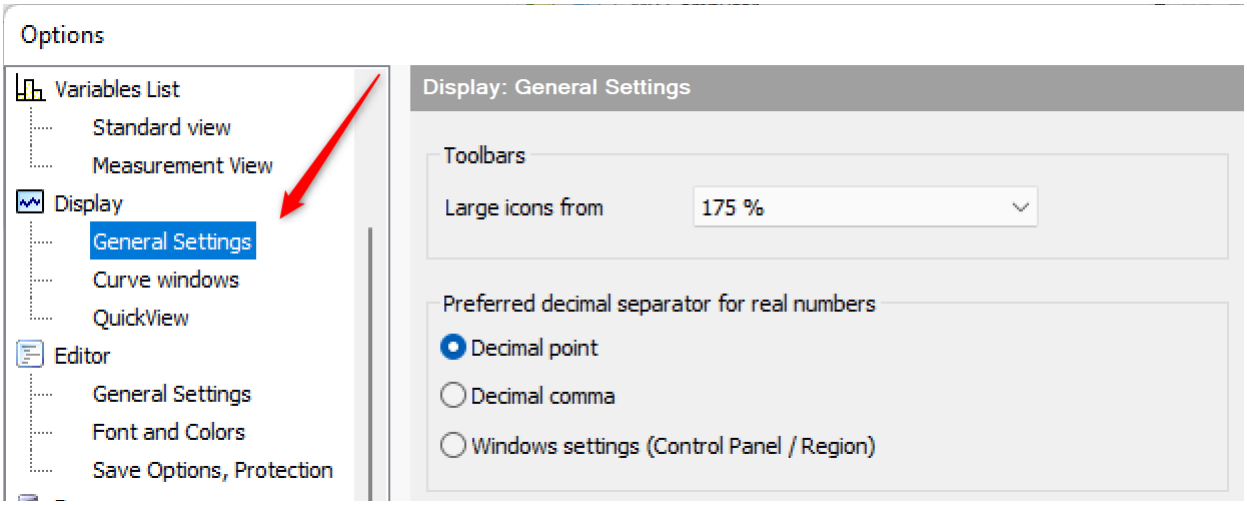
Otherwise there are no differences from the menu item "*Show variable*" treated above.

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7.8.3 Display options

Some important options for displaying the data sets are available in the menu under *"Extra"/ "Options"/ "Display"*

Display: General Settings



Options dialog: Display / General Settings

Reference: Modifications of the toolbars are described in the chapter Introduction 73.

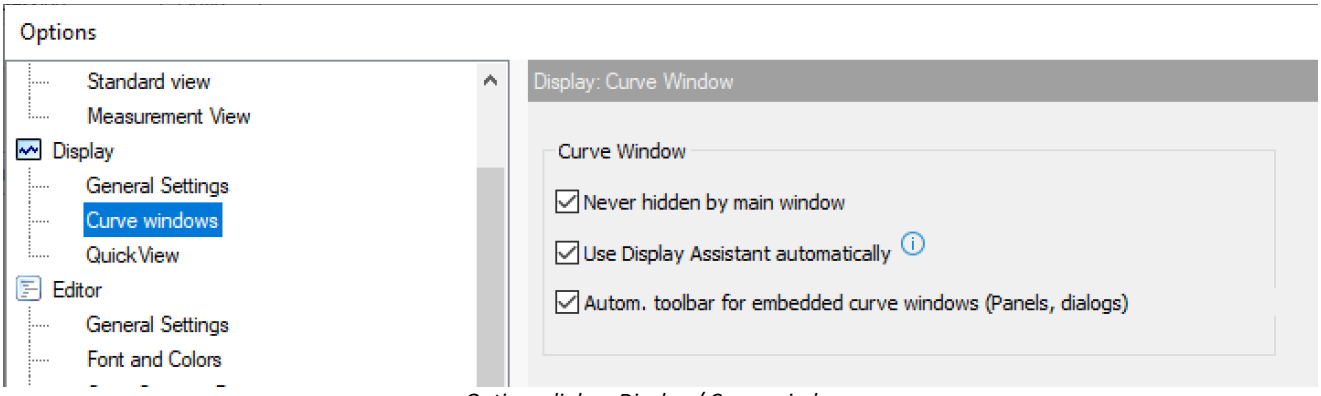
Comma or period: ***Preferred decimal separator for real numbers***

Display of curve windows, in Panel- and dialog elements and in the Report Generator.

Remarks

- In sequence code, a period is always used.
- When **changing the setting using the Windows Control Panel**, the changes are only applied after restarting the computer.
- Changes to the option will not take effect everywhere immediately, but only after the next update of the respective display element.

Display: Curve Windows



Options dialog: Display / Curve windows

Never hidden by main window

If this option is selected, the curve windows are always in front of the imc FAMOS main window. Otherwise, when activating the main window, curve windows in the same region of the screen may be partly or entirely obscured.

A list of all curve windows currently open is available in the menu accessed via the menu item "*View / Curve window list...*". By selecting the desired window in this menu, it is possible to move quickly among the windows.

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Use Display Assistant automatically

Opens the curve window's Display Assistant automatically when **multiple** variables or data sets having **special properties** such as order spectra or matrices are displayed.

The Assistant is opened when

Option: active

- Menu command: "*Variable > Display > Show together*"
- Keyboard combination [F4]
- "*Show*" button in the toolbar of the Variables list (... *Measurements-/Channels list*)
- Context menu command "*Show*" in the Variables list
- **Drag&Drop** from the Variables list to the **Panel** in Design mode

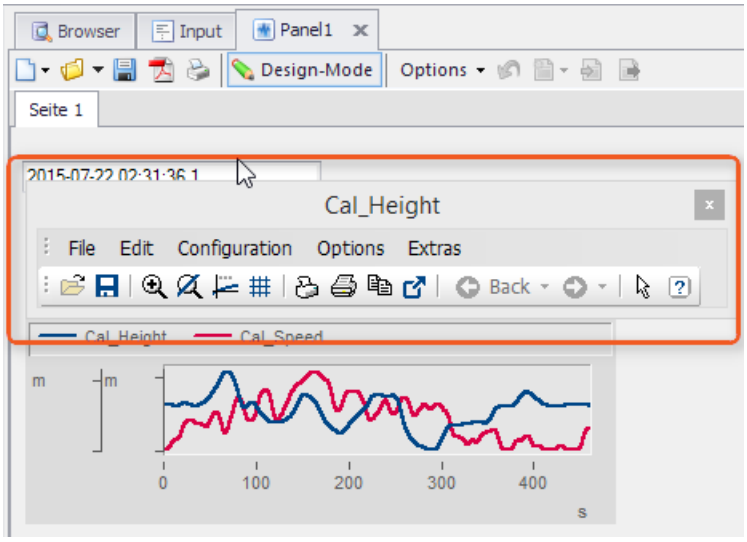
Option: passive

- Menu command: "*Variable > Display > Show together* ***(Display-Assistant)***"
- Keyboard combination *CTRL+SHIFT+F4*
- *CTRL*-key plus click on the "*Show*" button
- *CTRL*-key plus selection of the context menu item "*Show*" in the Variables list

The Display Assistant is described in detail in the user's manual.

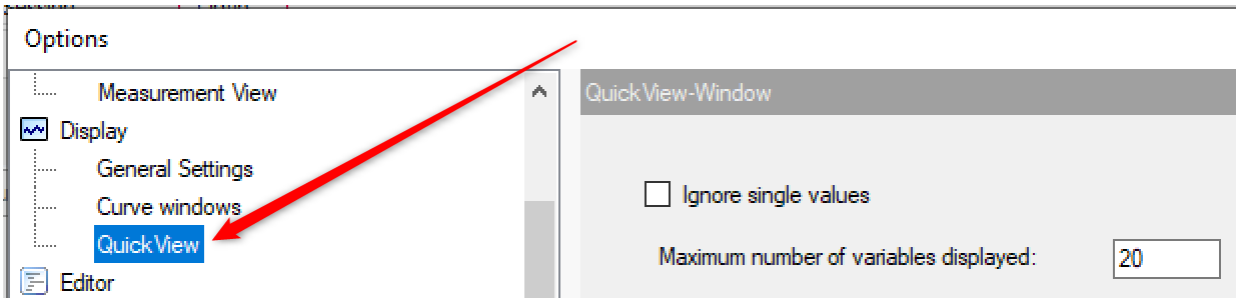
Autom. toolbar for embedded curve windows (Panels, dialogs)

If this option is activated, clicking in an embedded curve window opens the menu and toolbar.



The toolbar is displayed by means of the embedded curve window

Anzeige: QuickView



Options dialog: Display / Quick View

The QuickView 291 window normally shows single values as a line, these can be hidden with *Ignore single values*.

Furthermore, the *Maximum number of variables displayed* is specified here.

7.8.4 Loading a curve configuration

You can save the current condition of a curve window using the menu item "*Save As*.." in a so-called curve configuration file. This curve configuration contains the curve window's current settings as well as the names of all data sets displayed in it.

You can restored the saved configuration using the menu item "Extra/ Load curve configuration". This generates a curve window featuring the previously stored configuration. The configuration file contains the name of the channel which was present when the configuration was stored, but not the curve itself or the appertaining data. If a channel (data set) with that name still exists, it will automatically be accessed and displayed when the configuration is summoned. If none any longer exists but is due to be generated (e.g. as the result of a computation or by loading a file), it, then, will automatically be displayed in the curve window.

A curve configuration can also be retrieved directly from an open curve window by selecting menu item "Load".

7.8.5 The QuickView-window

The QuickView-window is another way of displaying data sets in the curve window.

The *QuickView-window* is embedded in the Output box 105. In this curve window, all data sets selected are automatically displayed in the Variables list. Any change of the selection is immediately reflected in the QuickView-window. When no data set is selected at the moment, the QuickView-window remains empty.

The QuickView-Window offers a convenient and rapid overview of open data sets.

Example TextTemplate

A measurement consisting of several channels is loaded into imc FAMOS . You want to do a quick review of the curve shapes in order to seek out curves fulfilling specific criteria.

Open the QuickView window via the menu item "Extra/ QuickView Window". Then select the first channel in the variable list. Now use the direction keys to scan through the list of variables. The currently selected channel is always displayed in the window.

Remarks

- To obtain an overview of large amounts of files stored in different folders, you can also use the File Browser. Loading and displaying channels and, if necessary, switching into the next folder can all be accomplished in one step.

Reference TextTemplate

The description of the Output box 104.

7.8.6 Showing variables in an existing curve window

If you wish to display additional data sets in a curve window which is already open, then from within this curve window you may stipulate new variables for it to display. This procedure is described in detail in the Curve Window documentation.

Another possibility is the method of "**drag&drop**" between the variable list and the curve window, using the mouse. Proceed as follows::

1. Select the desired variable in the variable list.
2. Left-click the mouse on the selected entry in the variables list and keep the mouse button pressed down.
3. While still holding the left mouse button, move the mouse across the desired curve window; this is known as **dragging**. The mouse pointer is constantly updated, to reflect whether or not the variable may be dropped onto the present position.
4. Release the mouse button with the pointer over the desired curve window. This is known as **dropping**. Depending on where exactly the drop is performed, the variables' display is arranged in one of the following ways:
5. Above / below a coordinate system: a new coordinate system is generated and the variables are displayed in it.
6. Inside an existing coordinate system: the variables are displayed with a new axis within this coordinate system.
7. On one axis: the variables are displayed in the coordinate system with reference to this axis.

7.8.7 Preview in Windows Explorer

FAMOS files can be displayed using the Microsoft Windows Explorer's Preview function.

For more information, see the chpter Curve Window in the User's Manual.

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7.9 Creating variables

Variables can be created by means of a simple assignment:

```
X= 1 ; creates the variable with the value 1


; constants, denoted by gray font, can be embedded by means of
; the function group Variables > Constants, e.g.
x= EMPTY ; creates an empty variable
y= PI    ; creates a variable y with the value 3.14...


tx= "Hallo"                 ; creates a variable text with the content "Hallo"
FourTexts = TxArrayCreate(4); creates a text box for four texts
```

Creating variables with initialization lists

In order to initialize (short) data sets and text arrays with values, it is possible to specify a list of initial values, placed in square brackets. The single values must be separated by commas. Initialization lists can be specified in formulas wherever a data-set or text array variable is also allowed.

The **number** of the values depends on the type:

- **Directly specified numeric** or **text constants** can have any number of elements.
- Complex and **indirect initial values** such as **variables**, named constants, or **arithmetic expressions** are limited to 15 elements.

7.9.1 Data set initialization lists

The individual initialization elements are joined to form a single new simple data set.

As the initialization input, it is possible to use a **single value** or even a **normal data set**, which is an equidistant data set without any events or segments. In the simplest case, these can be directly entered decimal numbers or whole numbers expressed in Hexadecimal format:

```
Coefficients = [1, 0.2 , -1.4e-5, 2]
Performance specs = [Data1, Data2]
```

Along with decimal numbers, whole numbers expressed in Hexadecimal format are also allowed:

```
Mask = [0x00, 0x0F , 0xFF]
```

However, even variables or arbitrary formula expressions are allowed:

```
ExtendedWithZeroes = [Data, 0,0,0]
Sawtooth = [Ramp(0,1,100), Ramp(0,1,100)]
Value_1_3_5 = [Data[1], Data[3], Data[5]]
ZeroOneZero = sin( [0, PI/2, PI] )
```

If all the initial values are of the same data format, it is also used for the result. Otherwise the data are converted to 8 Byte Real (Double).

The new data set "inherits" any units and additional parameters (such as Pretrigger/x-Offset, Sampling interval/x-Delta) from the first initialization input having a length >= 2. If this doesn't apply to any initialization input, the 1st initialization input is used as the reference.

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7.9.2 Initialization of segmented data sets (matrices)

Initialization lists can also be nested, where each "inner" list represents one segment.

All inner lists must then have the same length to match the segment length of the result.

Example:

Creating a segmented data set with 3 segments of length 2.

```
Matrix_3x2 = [[1,2], [3,4], [5,6]]
```

Creating a segmented data set having 2 segments of length 100.

```
Matrix_2x100 = [[Ramp(0,1,100)], [Ramp(0,1,100)]]
```

7.9.3 Initialization of text arrays

The initialization inputs are joined to form a new text array. As the initialization input, it is possible to use a text or text array.

Example:

```
MainUsers = ["Smith", "Meyer", "Miller" ]
AllUsers = [MainUsers, "Baker" ]

BaseName = "channel"
AllChanNames = [BaseName + "_1", BaseName + "_2", BaseName + "_3"]
```

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7.10 Showing and changing properties

Every variable is associated with supplementary information in addition to the actual data values, for example, there are the characteristics variable name, data type, number format, commentary, trigger and sample time, etc. The characteristics applicable to a specific variable depend on the variable's type.

In addition to such permanently set properties, the user can also set any arbitrary user-defined property for each variable.

Characteristics can be queried and changed in imc FAMOS using a dialog of commands and functions. This chapter explains how to show and change the characteristics of a variable using a dialog.

7.10.1 The "Properties"- dialog

Select variables from the variable list and then select "Properties.." in the "Variable" menu. Or alternatively, click on the corresponding button in the tool bar in the main window or use the <F5> button.

A dialog appears as a stack of several index cards (pages). The particular make-up of the "characteristics" page depends on the data type of the current variable. The other index cards are only accessible if the variable in question is of the "data set" type. Activate a different index card by clicking on its marker tab or by simultaneously pressing the ALT button and the underlined letter in the title of the marker tab.

If you have selected several variables in the list, use the screen-buttons ">>" and "<<" to pass from one variable to the next, thereby updating the dialog to reflect the properties of the current variable.

The "Cancel" screen-button terminates the dialog, and changes made in the current page are disregarded. The screen-button "OK", by contrast, closes the dialog while adopting changes which have been made to its settings.

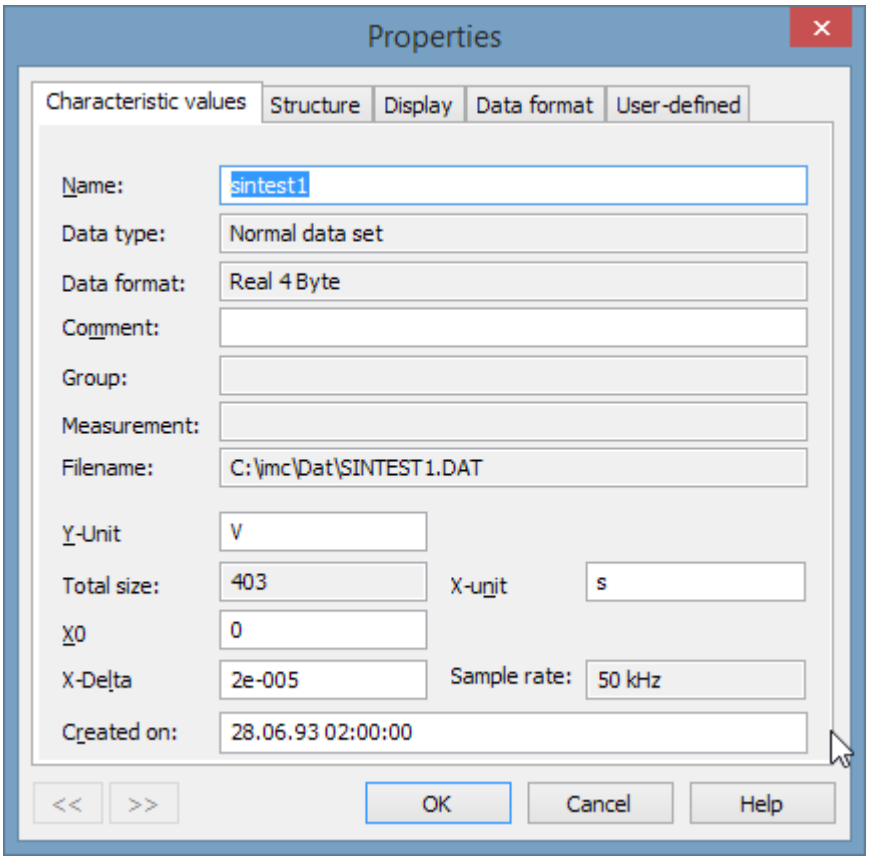
Note

When switching to another index card by activating another card or clicking the screen-buttons ">>" and "<<", the changes made in the page are accepted. If you wish to discard the changes, click on "Cancel" before switching pages.

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7.10.2 Dialog: Properties/Characteristic values (data set)

The dialog "Properties" (for a data set) appears as follows:



Dialog: Properties for a waveform

Name

The variable's name can be changed here. The name can have 255 characters at most. Refer to the section "*Variable names*" in this chapter for rules governing valid variable names.

Data type

The data type of the current data set is stated here. This box can not be edited.

Data format

The number format in which the data are filed is stated here. If the data set has two components, the data format for each component is stated individually. This box also can not be edited. If you wish to change the data format you must click on the marker tab for the index card "*Data Format*". An overview of available data formats can be found in the section "*Data formats*" of this chapter.

Comment

Here you may enter a comment, which may contain a maximum of 255 characters.

Group

If the data set in question is assigned to a group, the data group's name is indicated here, otherwise the box remains empty. This box can not be edited.

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Measurement

If the data set is assigned to a measurement, the measurement's name appears here, or else the box is empty. The box's content can not be edited.

Filename

If the data set was loaded from a file, the file's name will be indicated here, otherwise this box remains empty. The box cannot be edited.

Units (X-unit, Y-unit, Phase unit..)

Here you may redefine the data set's units. Refer to the section "Units" of this chapter for information on naming the units. The inscription which appears with the "units"- box depends on the particular data type the data set belongs to.

Total size

In this non-editable box the total length of the data set is stated.

X0

You can set the x-offset (i.e. the x-coordinate of the first value) to a new value in this box. Or, for two-component data sets, define the offset of the parameter.

X-Delta, Sample rate

The sampling time or the increment of the data set's x-axis can be redefined here. The data set's numerical values and units do not change. The sampling time is the difference between the x-coordinates of two adjacent points. The sampling time should take a value which is not smaller than the offset by too many powers-of-ten, otherwise the x-axis will not have adequate resolution.

Created

Redefine the trigger time for the variable using this function. The time is entered and displayed in the format set in the Windows-"Control Panel". The entries of the time and the date should be kept separate by at least one space. Enter the year as a two-digit number in order to save space; the valid range is between 1980 and 2042, thus between 80..99 and 00..42.

Fractions of seconds must be separated by a comma or a period. The maximal resolution for the trigger time is 10µs.

Example

```
11.11.95  00:00:00.5
```

The trigger time has been set to 500ms past midnight.

Cancel

If you opened this dialog only to obtain information and/or you wish to discard any changes you made, exit the dialog without saving the changes by clicking here.

OK

Click on this button when exiting to confirm and implement changes. You will be alerted if invalid entries have been made and the dialog cannot be exited until they are corrected.

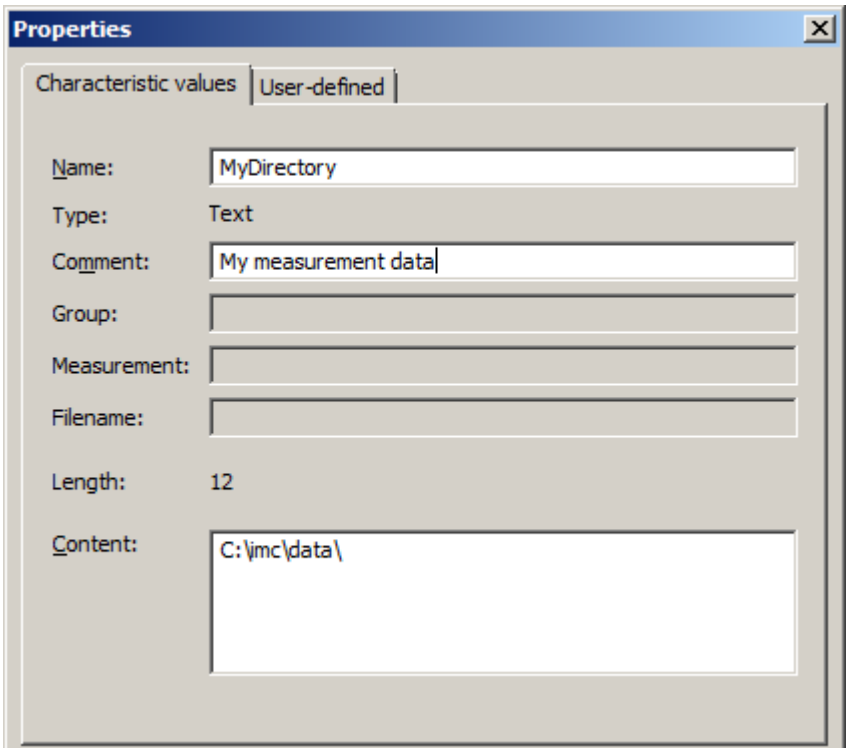
>>, <<

If you have selected several variables before opening the dialog, you can flip through the dialogs for the respective variables -one at a time, forwards or backwards in the list- using these buttons. Changes made to a dialog are accepted when exiting it by this method.

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7.10.3 Dialog: Properties/Characteristic values (Text)

The dialog "*Properties*" (Text) has the following appearance:



Dialog: Properties of a text variable

Name

The variable's name can be changed here. It may have a maximum of 255 characters Refer to the section "Variable names" in this chapter for rules governing valid variable names.

Comment

Enter a comment about the variable here. It may have a maximum of 255 characters.

Group

If the text is assigned to a group, the name of the data group is indicated. Otherwise, the box, which is non-editable, remains empty.

Measurement

If the data set is assigned to a measurement, the measurement's name appears here, or else the box is empty. The box's content can not be edited.

Filename

If the data set was loaded from a file, the file's name will be indicated here, otherwise this box remains empty. The box cannot be edited.

Length

The number of characters in the text is stated in this box. It can not be edited.

Content

The content of text variables can be changed in this box. The text may have a maximum of 255 characters.

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Cancel

If you opened this dialog only to obtain information and/or you wish to discard any changes you made, exit the dialog without saving the changes by clicking here

OK

Click on this button when exiting the dialog to confirm and implement changes. You will be alerted if invalid entries have been made and the dialog cannot be exited until they have been corrected.

>>, <<

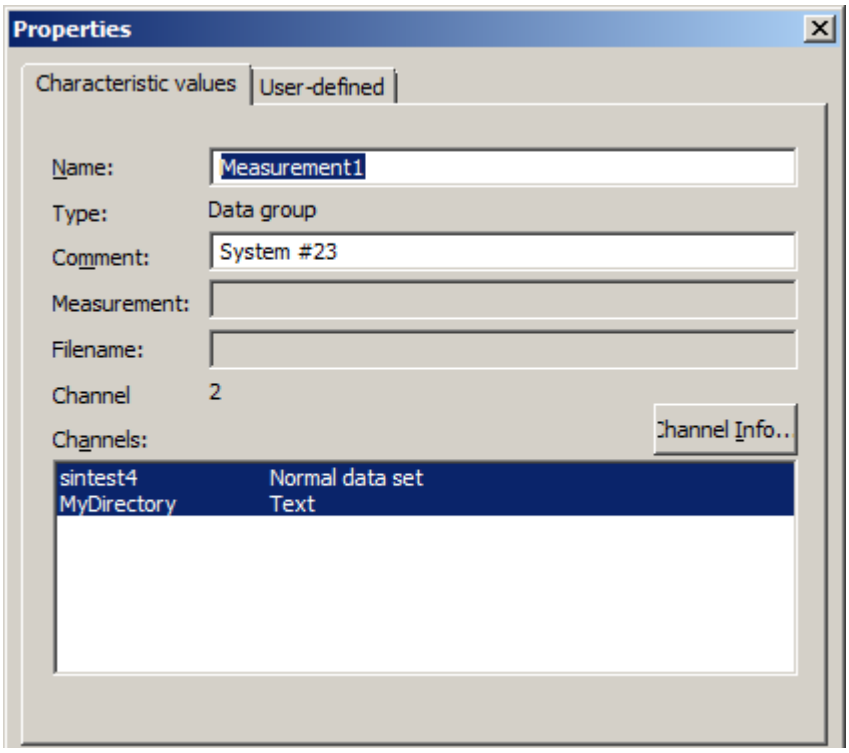
If you have selected several variables before entering the dialog, you can flip through the dialogs for the respective variables -one at a time, forwards or backwards in the list- using these buttons. Changes made to a dialog are accepted when exiting it by this method.

7.10.4 Dialog: Properties/Characteristic values (Text Array)

Like the analogous dialog for (Text), but with additional controls for selecting the current elements (to one for which the content is being displayed).

7.10.5 Dialog: Properties/Characteristic values (Group)

The dialog "Properties" (Group) has the following appearance:



Dialog: Properties of a data group

Name

The variable's name can be changed here. It may have a maximum of 255 characters Refer to the section "Variable names" in this chapter for rules governing valid variable names.

Comment

Enter a comment about the variable here. It may have a maximum of 255 characters.

Measurement

If the data set is assigned to a measurement, the measurement's name appears here, or else the box is empty. The box's content can not be edited.

Filename

If the data set was loaded from a file, the file's name will be indicated here, otherwise this box remains empty. The box cannot be edited.

Channel count

The number of variables assigned to this group is displayed in this box. The box can not be edited.

Channels

All channels assigned to this group are listed here. Their names and respective data types are stated. By double-clicking on one of the entries you open the "*Properties*" dialog for the corresponding channel. You can also select several entries and then click on the button <Channel Info>.

Cancel

If you opened this dialog only to obtain information and/or you wish to discard any changes you made, exit the dialog without saving the changes by clicking here.

OK

Click on this button when exiting the dialog to confirm and implement changes. You will be alerted if invalid entries have been made and the dialog cannot be exited until they have been corrected.

>>, <<

If you have selected several variables before entering the dialog, you can flip through the dialogs for the respective variables -one at a time, forwards or backwards in the list- using these buttons. Changes made to a dialog are accepted when exiting it by this method.

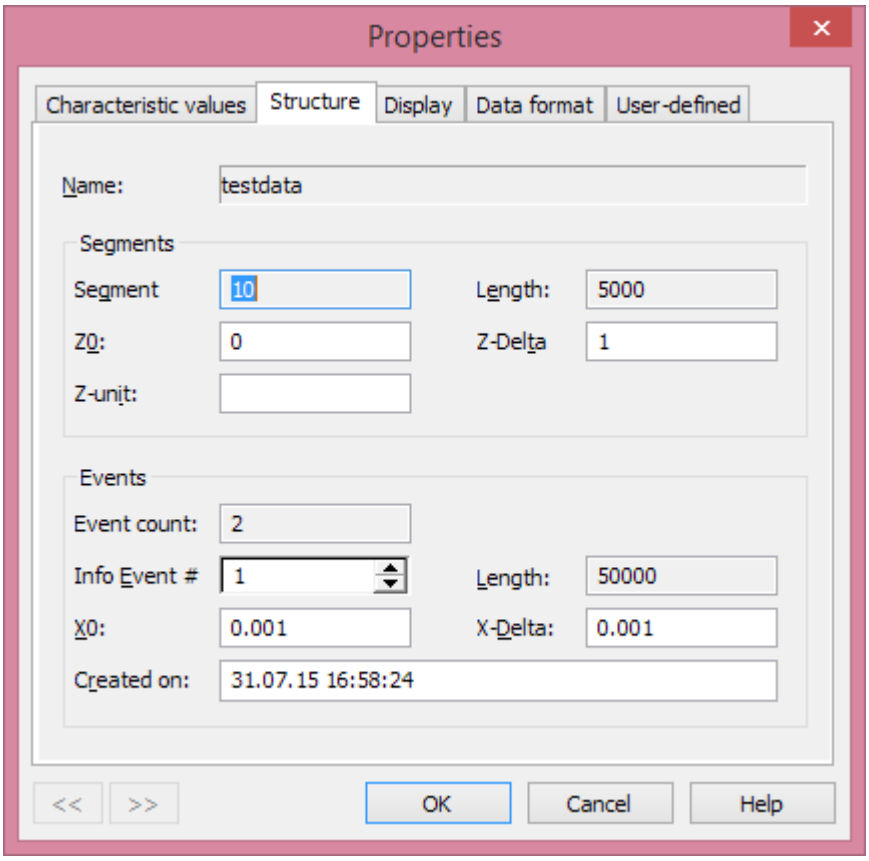
Channel Info

Opens the "Properties" dialog of selections made in the channel list.

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7.10.6 Dialog: Properties/Structure

This dialog card is available only for channels. Any structuring of the data set in question, in, say, events or segments, is indicated here. This index card normally does not apply to unstructured data sets, for which most widgets' boxes are grey.



Dialog: Variable properties structure

Segments

If the data sets in question are segmented, this is where an indication of the number and length of the segments will be located. The entries for z0, z-Delta and z-units are used for configuring the z-axis, which is a feature of certain of the curve window's representation styles (waterfall diagrams, color maps), if the corresponding option in the curve window ("*Options/ 3D*") is active.

The entries "z0" and "z-units" can also be used for manipulating the z-axis in the display of unsegmented data sets, in order to obtain appropriate scaling for a waterfall diagram or color map representation, or where multiple channels are displayed together in a single curve window for purposes of comparison.

Segment and *-length* can not be changed here. These properties can be edited with function *SetSegLang()*.

Events

This group of controls is only accessible in the case of event-structured data sets (where there are multiple trigger events within the channel). The characteristics x-Offset (Pretrigger), x-Delta (sampling time) and trigger time no longer pertain to the data set as a whole, but can be specific to each event. The characteristics can be viewed and changed for the event corresponding to the entry in the input box "Info Event #".

Datasets with events can be modified with imc FAMOS functions group 19.

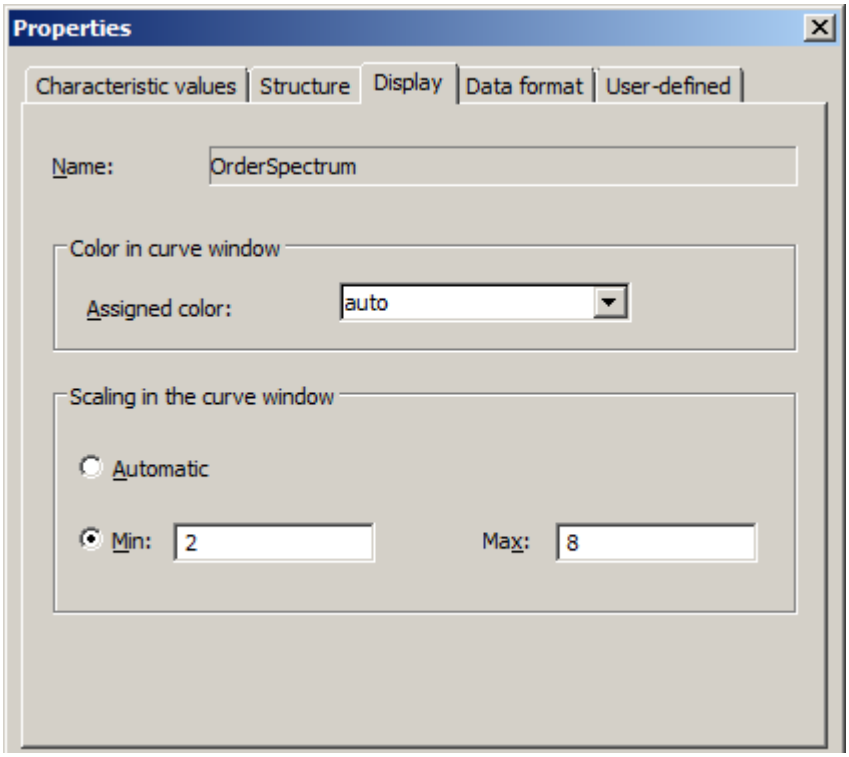
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Note

Characteristics which are identical for all events are indicated on the page "*Characteristic values*", otherwise the entry in the pertinent box will be "*???*". To set a characteristic of all the events to a common value, it is therefore enough to replace the corresponding "*???*" entry with the desired value.

7.10.7 Dialog: Properties/Display

This dialog card is available only for data sets. Here you can assign properties which affect the representation of the variable.



Dialog: Properties display

Color in curve window

By default, the colors in which a waveform is represented is determined by the current settings in the Curve Window. The entry "auto" then appears in the combination box. It is possible, however, to assign a set color to a waveform. In that case the channel is always displayed in that color in every Curve Window. To accomplish this, open the combination box and select the color from the list.

Scaling in curve window

The default setting, indicated by the entry "*auto*", determines the scaling of the y-axis from the value range of the channel. You can also arbitrarily set the scaling. To do this, set the minimum and maximum of the desired range using the corresponding text boxes. This setting will only be employed when the option "*automatic*" is selected for scaling the axis in the Curve Window. In other words, a set scaling of the axis in the curve window overrides the variable's characteristic.

Reference

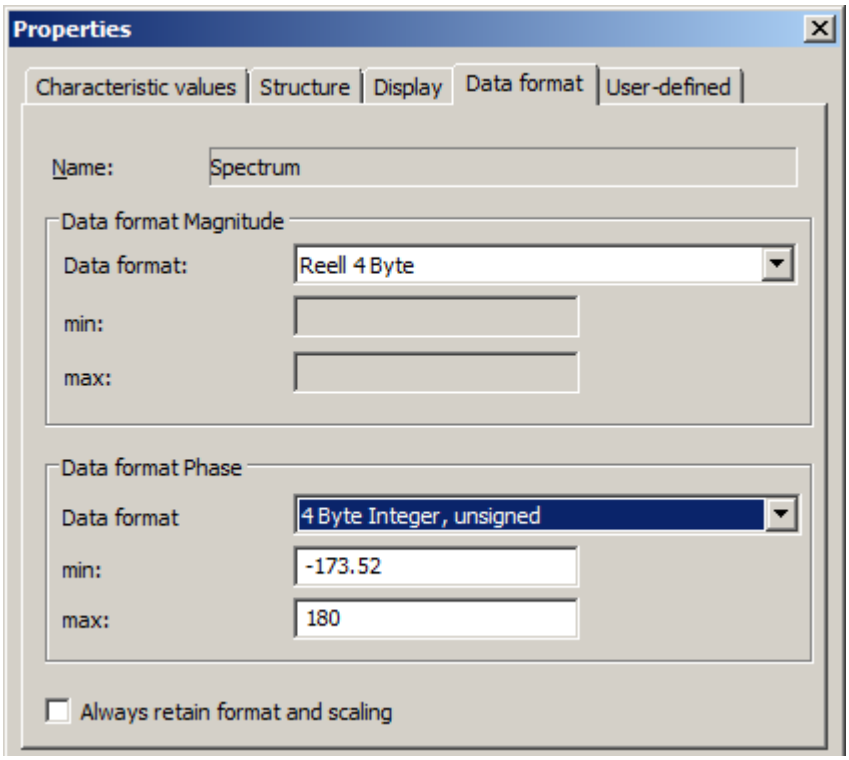
Documentation on the Curve Window/Options

imc FAMOS Functions Reference, functions SetDisplayY, DisplayY?, SetColor, Color?

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7.10.8 Dialog: Properties/Data format

This dialog card is available only for data sets. It shows the data format in which the values of a data set are stored. The following example shows the page as it would appear for a complex data set; in a one-component data set only one group of dialog boxes would appear.



Dialog: Properties data format

Data format

In this list box the current data format for the particular component. To change the data format, simply choose the desired format from the list.

min/max

If an integer data format is selected, the scaling of data in the physical value range is indicated here. The current settings are displayed if the data set is already in the integer format. If you have just chosen integer format from the list box, whereas the data set was previously in real format, then sensible values for the conversion are offered as suggestions. Towards that end, the minimum and maximum of the data set are determined. In a subsequent conversion to integer format the full range would be retained at the maximum possible resolution. With large data sets, determining the extreme values can be very time-consuming.

Always retain format and scaling

If this option is activated, the data format can not be changed by an assignment command. If, for example, one value of an integer format data set is set to a real number, the data format of the entire data set would usually be reset to real, in order to avoid any loss of data. This behavior can be suppressed switching on this check box.

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Cancel

If you opened this dialog only to obtain information and/or you wish to discard any changes you made, exit the dialog without saving the changes by clicking here.

OK

If you wish to confirm the changes you made and really wish to change the data format, click on this button. The conversion will then be carried out for the components changed. For very long data sets, this can take a long time. Subsequently, the dialog closes.

Reference

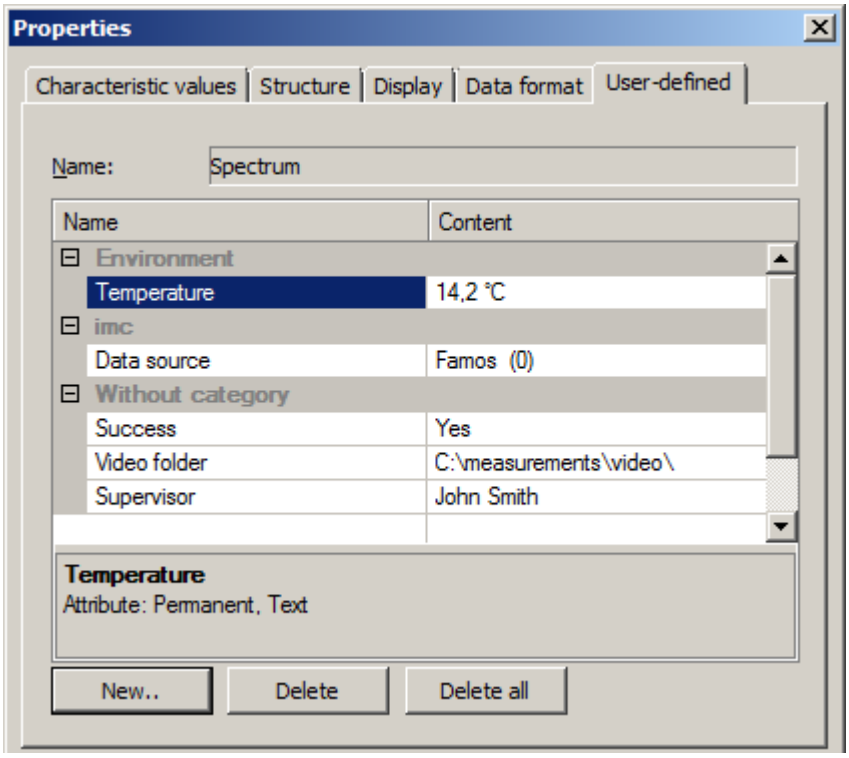
Section Data formats 286 in this chapter

imc FAMOS Functions Reference, functions: SetDatFormat, DatFormat?

7.10.9 Dialog: Properties/User-defined

In this dialog page, you can defined additional properties for, and view or edit the variable. As an addition to the already existing default properties such as units and sampling interval, such user-defined properties can be assigned to variables and defined as desired.

A user-defined variable is characterized by its name, its data type, and any additional attributes as well as its current content.



The table lists all user-defined properties which already exist. The left side shows the name, while the right side shows the property's current content. To change a property's content, click on the associated box on the right side. Depending on the property's data type, you can either freely enter the new content or select it from a list.

The pre-defined properties are a special case. Such properties' name always takes the form "imc?", with ? representing a number of at least two digits. Such properties come with a distinctive title which appears in the stead of the internal name.

Example of a pre-defined property

Name	imc12
Title	Class-counting unit
Meaning	Determines how a classification procedure's result's units are interpreted.
Possible values	"Classes" or "Physical unit"

In the box under the table, additional information for the currently selected property is displayed. These include the data type and attribute specified when the property is created, as well as the internal name for pre-defined properties.

Data types

Text	arbitrary text
Integer	integer
Real	Real number in customary fixed-point or floating-point notation
Boolean	0 or 1 (also interpretable as Yes/No)
List (*)	Selection from a list with fixed values
Time (*)	Interpretable as date/time

Attributes

Permanent Temporary	Specifies whether the property is to be included (permanent) or omitted (temporary) when saving the variable (in imc/imc FAMOS file format). Permanent properties are available again following loading of the file.
Write-protected (*)	The property can not be deleted and the content can not be changed by the user.

(*) Only for pre-defined properties

New

Opens a dialog 306 by means of which a new property is created.

Delete / Delete All

With these buttons you can delete either the currently selected properties or all of the properties. Properties having the attribute "write-protected" can not be deleted.

Reference:

imc FAMOS Functions Reference, functions for editing user-defined properties, e.g. UserPropSet

Note Retaining user-defined properties

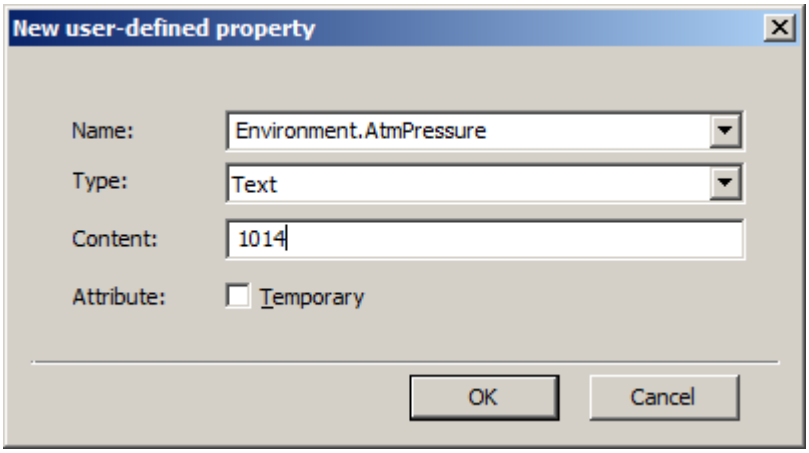
User-defined properties of variables are normally not inherited. Also a recursive assignment, e.g. `Var1= Join(Var1, Max(Var2))` deletes the user-defined properties of Var1.

To rewrite the content only and not the properties, use indexing of variables 285:

Example: `Var1[*]= Join(Var1, Max(Var2))`

7.10.9.1 New user-defined property

By clicking on the button "New" in the dialog *Properties/User-defined* 304 this dialog is called, which is for letting you create a new user-defined property.



Name

Here, enter the desired name for the property.

It is also possible to use the pop-down list to select among already existing names of pre-defined properties. These properties, whose names begin with 'imc', are reserved for internal purposes. It is not possible to create new properties having these names, and when defining them, only their content but not their data type or attributes can be changed. Internal properties can additionally be supplied with the attribute 'write-protected'.

The following constraints apply to the names of new properties:

- The name may not begin with "imc".
- The first character may not be a period.
- Neither the first or lat character may be a space
- The following characters are illegal: <>{}[]()&%$§|
- Special characters with ASCII-code < 32 (e.g. Tabulator) are illegal

Names of user-defined properties are not case-sensitive.

If a property's name includes a period, then the part before the period is interpreted as a **category** designation. In this way, properties with similar significance can be grouped together to categories. The category appears in the display of the properties in the dialog 'Variable'/Properties' for the purpose of achieving a hierarchical listing of properties.

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Type

Determines the property's data type.

Text	arbitrary text
Integer	integer
Real	Real number in customary fixed-point or floating-point notation
Boolean	0 or 1 (also interpretable as Yes/No)
List	selection from a list of fixed values
Time	interpretable as date/time

The data types "List" and "Time" are only possible for the properties already pre-defined by imc.

Content

Depending on the variable type, you can either freely enter the content, or select it from a list.

Temporary

By default, the properties assigned to the variable are saved along with it (in imc/Famos file format), which means they are permanent and thus applicable whenever the file is loaded again. By contrast, if you put a check in this box, the property will be ignored with the variable saved.

Reference

imc FAMOS Functions Reference, functions for editing user-defined properties, e.g. UserPropSet

7.11 Deleting variables

Select one or several variables in the variable list and then "*Delete*" in the "*Variable*" menu. Alternatively, click on the corresponding button in the tool bar. The variables are then removed from the variable list and thus unavailable to imc FAMOS .

In accordance with the corresponding setting in the dialog "*Options" / "Variables list*", the "*Del*"-key can also be used to accomplish the purpose.

You can also delete all variables in one step by selecting "*Restart*" in the "*File*" menu.

If you mark a data group in the variable list for deletion, it will be completely purged including all data sets and texts.

Reference

Manual "imc FAMOS Functions Reference", command *Delete*

7.12 Group/Ungroup variables (data groups)

As described in the section "*Data types*", channels and texts can be assembled into groups with a collective name.

To accomplish this with existing variables, first select some in the variable list. Then select menu item "*Variables/ Group*".

A dialog appears in which to enter the group name:



Group name

You can now enter a new name in the text box. If other groups already exist, they may be selected in the combination box. The selected variables are then added to the existing group.

In section "*Variable names*" the rules governing assignment of names are outlined and those apply to this procedure. Initial digits and spaces, in particular, are prohibited.

OK

If you have provided a valid name for a group, the current selection of variables is consolidated to a group with that name (if groups were selected, they are disregarded).

Cancel

The grouping of variables is not carried out.

To undo the aggregation of variables into a group, select menu item "*Variables/ Ungroup*". If a group is then selected in the variable list, all its channels are made autonomous, and the group is canceled. If you select only a particular channel but not the group as a whole, that channel alone is released from the group and the group persists.

Specific channels must be indicated in the variable list in order to be selected. If a desired one is not, click on the [+] -symbol to the left of the group symbol. The context menu may also be used to switch channel registration on or off (right-click the mouse above the variable list).

Reference

Section 'Data Types 267' in this chapter.

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7.13 Local variables, permanent and temporary variables

Local variables

Variables can be defined as "local" within a sequence. Such variables are only valid while the sequence is running; once the sequence execution is completed, such variables are deleted automatically. For this purpose, the new keyword "LOCAL" has been introduced.

The ***declaration*** is made directly when making the assignment:

```
LOCAL temp = Ramp(0, 1, 100)
```

or by forward declaration:

```
LOCAL temp
temp = Ramp(0, 1, 100)
```

In the forward declaration, wildcards (*, ?) can also be used:

```
LOCAL ?    ; all variables having exactly one character
LOCAL #*   ; all variables beginning with '#'
```

Naming

The name of local variables is formed according to *[Name]@![SequenceName]*.

Example

```
; Sequence "Evaluation.seq"
LOCAL LocalVariable = 1
; Full name:  LocalVariable@!Evaluation
```

With sub-sequences, the name of the sub-sequence is additionally appended:

Example

```
; Sequence "Evaluation.seq", sub-sequence "Part1"
LOCAL LocalVariable = 1
; Full name:  LocalVariable@!Evaluation.Part1
```

With event sequences for dialogs or Panels, the "locality" refers to the event sequence to be declared and not to the overall sequence. In the formation of the name, the name of the dialog/panel, and if appropriate, of the triggering event is additionally reflected.

Examples

```
; Panel "MyPanel", Init-Sequence
LOCAL LocalVariable = 1
; Full name: LocalVariable@!MyPanel.Init

; Panel "MyPanel", event "clicked" of the button "Button1"
LOCAL LocalVariable = 1
; Full name: LocalVariable@!MyPanel.Button1.Clicked
```

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Duplicate names with permanent variables

When local variables are generated, any existing permanent variable of the same name is ignored:

```
X = 1
LOCAL X
X = 2 ; => 2 variables, x and x!SequenceName
```

The local variable has priority:

```
X = 1
LOCAL X
X = 2  ; => 2 variables, x and x!SequenceName
Y = X  ;Y has the value 2 (like the local variable)
```

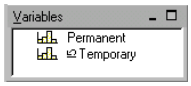
Constraints for local variables

- In the input editor, the LOCAL-command is ignored. The variable is created only once the content of the input editor is saved.
- Local variables are not listed for VarGetInit?(), VarGetName(), VarExist?().
- Local variables can not be linked with panel- or dialog elements.
- Local variables are not visible for DDE-requests.
- Local variables are not displayed in the Measurement view 84.
- Local variables are not saved along with projects or the "current session".
- When passing local variables as parameters for subsequences, the full name must always be specified.

Permanent or temporary

A variable's life normally extends until it is intentionally deleted by the user; such variables are known as "**permanent**". Variables which come about as the results of formulas or by being imported via the "Load file" dialog are always of the permanent kind.

By contrast, variables can also be "**temporary**", and such variables are eventually deleted automatically. To date, temporary variables can only be created when working with the built-in File Browser. The variables are automatically deleted when the current folder in the File browser is switched.



Temporary variables are denoted in the variables list by a special symbol.

A variable created as a "***temporary***" or "***local***" variable can later be transformed into a permanent one. To do this, use the command "*Make Permanent* 126" in the "*Variable*"-menu.

7.14 Playback of variables

The imc Sound Kit is delivered together with imc FAMOS . If the Sound Kit is registered in imc FAMOS , the additional menu item "*Variables/ Play*" is available.

When using this option, the selected variables are converted internally to 16-bit monowave files and played back, provided that an appropriate output device (sound card) is connected.

Reference

Online Help for 'Sound-Kit'.

Chapter 'Functions', section 'imc-Kit-Interface 335'

7.15 Constants and pre-defined variables

Numerical and textual constants can be entered into formulas directly:

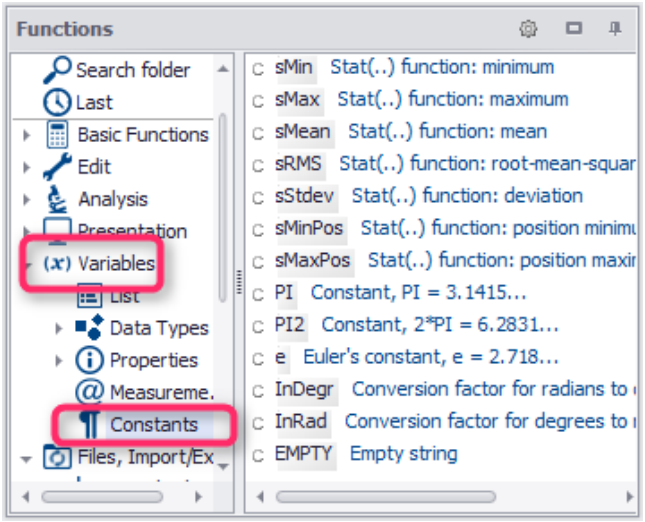
```
Data        = Data + 12
Directory   = "c:\" + "imc\dat"
Mean        = 123.22 'V'
ASCIIcode   = 0x64
```

imc FAMOS has several predefined constants at its disposal. These constants can be used as single values. No new value can be assigned to them, however, and they are not registered in the variable list.

To use predefined constants in formulas without typing them in manually, select the group "*Variables> Constants*" in the function list and then click on the appropriate function entry. The constant's name is written to the current position in the editor box. Alternatively, you can place the constant's name at the desired position using the drag&drop technique with the mouse.

Furthermore, there are a number of predefined variables available. The statistics function "*Stat(...)*" promptly calculates all of them. Afterwards you can insert these variables into formulas. When the statistics function is executed again, the predefined variables are recalculated and obsolete values are overwritten with new ones. Care should therefore be taken to use any desired predetermined variables before calling the statistics function once to often.

The predefined variables are not indicated in the variable list. They may not be changed individually in a formula and thus may not appear on the left side of an assigning operator in a formula.



Constants and predefined variables in the function list

Predefined constants and variables	
sRMS	rms value of data set (root mean square)
e	Euler number e
InDegr	constant for converting radians to degrees
InRad	constant for converting degrees to radians
PI	circle constant PI
2*PI	2 * circle constant PI
sMax	maximum value of data set
sMaxPos	X-coordinate of the maximum of a data set
sMin	minimum value of data set
sMinPos	X-coordinate of the minimum of a data set
sMean	arithmetic mean of a data set
Stdev	standard deviation of a data set

Reference

imc FAMOS Function Reference: function 'Stat'

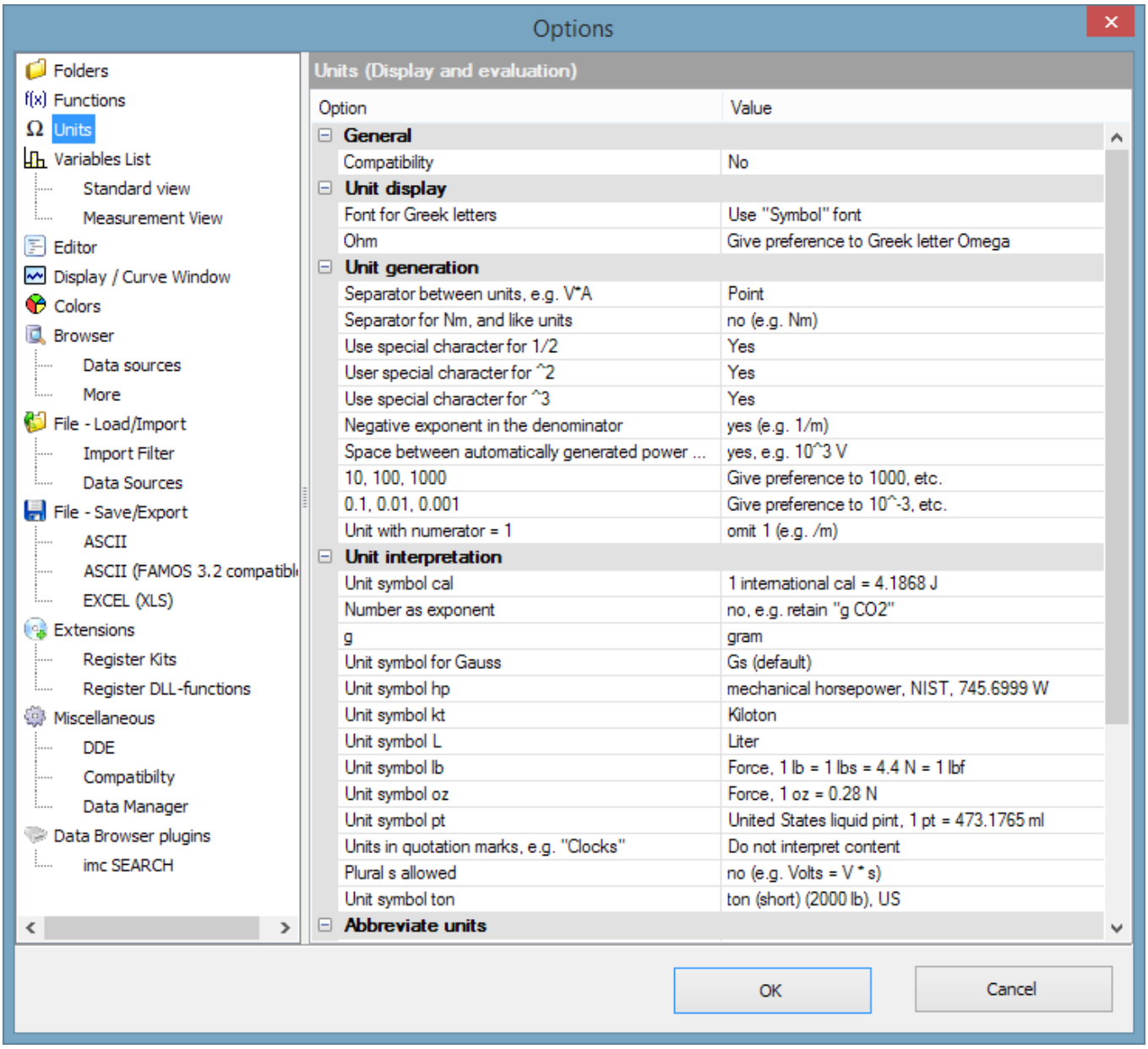
7.16 Units

Every channel may have one or more units. Each unit can, if desired, be reset using appropriate functions or commands. You can also use the "*Properties*" dialog to accomplish this.

Units are processed, calculated and adapted when mathematical functions are executed, provided that the units you supply are registered SI-units.

When math functions are carried out, the units are also handled, calculated and converted. The condition for this is that the units be specified as SI-units 316. As of imc FAMOS 7.1, common non-SI-units and special characters such as "Ω²" are also recognized and converted.

In the menu *Extra\Options\Units*, you are able to modify the imc FAMOS default settings.



Options dialog for units

General	
Compatibility	*No*: The subsequent settings are activated. Order of magnitude units such as m for milli and k for kilo are converted in the units, see also here 316. *Yes: Like imc FAMOS 7.0 and predecessors*

Display of units, e.g. in the curve window	
font for Greek letters	*Use "Symbol" font* *Greek characters in selected font*
Ohm	*Always display "Ohm" as string* *Give preference to Greek letter Omega Ω*

Generating of units, e.g. in a mathematical calculation	
*Separator between units, e.g. V*A*	Point: V · A *: V*A *Separator*: V A
Separator for Nm and alike units	*Yes (e.g. N*m)* *No (e.g. Nm)*
Use special character for 1/2	*Yes*: e.g. Hz½ *No, always write as Hz^1/2*
Use special character for ^2	*Yes*: ² *No, always write as ^2*
Use special character for ^3	*Yes*: ³ *No, always write as ^3*
Negative exponent in the denominator	*Yes (e.g. 1/m)* *No (e.g. m^-1)*
Space between automatically generated power of 10 and unit	*Yes (e.g. 10^3 V)* *No (e.g. 10^3V)*
Applies u instead of μ (prefix 10-6)	Use *"u"* instead of *"μ"*. Important for Asian operating systems.
10,100,1000	Give preference to 1000 etc. Give preference to 10^3 etc.
0.1, 0.01, 0.001	Give preference to 0.001 etc. Give preference to 10^-3 etc.
Unit with numerator = 1	conventional (e.g. 1/min) omit 1 (e.g. /min)

Unit interpretation	
Unit symbol cal	*1 international cal = 4.1868 J* *1 thermochemical cal = 4.184 J*
Number as exponent	*No*, e.g. "t=Sqrt(4's^2')" -> "t=2s" *Interpret in clear arrangements,* e.g. "t=Sqrt (4's^2')" -> "t=2s^2^{½}"
g	*Gram* *Standard gravity 9.81 m/s²*
Unit symbol for Gauss	*Gs (default)* *G*
Unit symbol hp	*mechanical horsepower, NIST, 745.6999 W* *metric horsepower, 735.49875 W = 1 PS* *electric horsepower, 746 W* *hydraulic horsepower, 745.69988145 W*
Unit symbol kt	*Kiloton* *Knot*
Unit symbol L	*Liter* *Lambert*
Unit symbol lb	*Force, 1 lb = 1 lbs= 4.4 N = 1 lbf* *Mass, 1lb = 1 lbs= 0.45 kg = 1 lbm*
Unit symbol oz	*Force, 1 oz = 0.28 N* *Mass, 1 oz = 0.0.28 kg*
Unit symbol pt	*United States liquid pint, 1 pt = 473.1765 ml* *Imperial pint. UK, 1 pt = 568.268.26125 ml* *United States dry pint, 1 pt = 550.6104713575 ml* *printer point, 1pt = 0.35146 mm*
Units in quotation marks, e.g. "Clocks"	*Do not interpret content* *Attempt interpretation of content, e.g. "N" als N*
Plural s allowed	*No (e.g. Volts = V *s)* *Yes (e.g. Volts = V)*
Unit symbol ton	*ton (short) (2000 lb), US* *ton (long) (2240 lb), UK*

Abbreviate units	
Convert to C (Coulomb)	*No* (default), e.g. Charge= I*t= "1 A*s" *Yes*, e.g. Charge= I*t= "1 C"
Convert to F (Farad)	*No* (default), e.g. Capacity = I*t/U= "1 A*s/V" = "1 s/Ω" *Yes*, e.g. Capacity = I*t/U= "1 F"
Convert to H (Henry)	*No* (default), e.g. Inductivity= U*t/I= "1 V*s/A"= "1Ω/s" *Yes*, e.g. Inductivity= I*t= "1 H"
Convert to J (Joule)	*No* (default), e.g. Energy= P*t= "1 W*s" oder F*s= "1 N*m" *Yes*, e.g. Energy = P*t= "1 J"
Convert to Pa (Pascal)	*Yes* (default), e.g. Pressure = F/A= "1 Pa" *No*, e.g. Pressure= F/A="1 N/m²"
Convert to S (Siemens)	*Yes* (default), e.g. Conductivity= I/U= "1 S" *No*, e.g. Conductivity= I/U= "1 A/V" = "1 /Ω"
Convert to T (Tesla)	*No* (default), e.g. Magn_flux_density= U*t/A= "1 V*s/m²" *Yes*, e.g. Magn_flux_density= U*t/A= "1 T"
Convert to Wb (Weber)	*No* (default), e.g. Magn_flux= U*t= "1 V*s" *Yes*, e.g. Magn_flux= U*t= "1 Wb"

Computation of units

When mathematical operations are performed, the units are also handled, calculated and converted. As of imc FAMOS 7.1, common non-SI-unit prefixes and special characters such as m for milli, ² etc. are recognized and converted. This behavior can be deactivated by selecting "yes" under Compatibility 314.

Fundamental SI-units are:

A	Ampere	electric current
cd	Candela	light intensity
K	Kelvin	temperature
kg	Kilogram	mass
m	Meter	length
s	Second	time

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Derivative SI-units are:

Unit	Name	Physical Quantity	Conversion
°C	Celsius	temperature	1 °C = 1 K for temperature differentials
C	Coulomb	electrical charge	1 C = 1 As
F	Farad	electrical capacitance	1 F = 1 As/V
H	Henry	inductivity	1 H = 1 Vs/A
Hz	Hertz	frequency	1 Hz = 1 1/s
J	Joule	energy	1 J = 1 Nm = 1 Ws
lm	Lumen	light flux	
lx	Lux	illuminance	1 lx = 1 lm/m^2
mol	Mol	particle count	
N	Newton	force	1 N = 1 kgm/s^2
Ohm	Ohm	electrical resistance	1 Ohm = 1 V/A
Pa	Pascal	pressure	1 Pa = 1 N/m^2
S	Siemens	electrical conductivity	1 S = 1 A/V
T	Tesla	magnetic flux density	1 T = 1 Vs/m^2
V	Volt	electrical voltage	
W	Watt	electrical power	1 W = 1 VA
Wb	Weber	magnetic flux	1 Wb = 1 Vs

Additional units and pseudo-units, which are recognized but disregarded in calculations:

dB	decibels	no unit; logarithmic scaling
Degr	degrees	angle, range 0 ... 360
empty		no unit
%	percent	no unit
Rad	radians	angle, range 0 ... 2*Pi

When defining units, you may use the units in any arbitrary combination.

To add exponents to a unit, use the exponentiation character "^x" (where x is the exponent) followed by the exponent. A reciprocal exponent (i.e. root) can be created using "^1/x" (where x is the root).

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Example

kgm/s^2 = kgm/s² (Newton, unit of force)
m^2 = m²(square meter, unit of area)
m^3 = m³(cubic meter, unit of volume)
m/s (meters per second, unit of velocity)
m/s^2= m/s² (meters per seconds squared, unit of acceleration)
ms^-2 = m/s^2
s^(1/2t)= $s^{1/2t}$; for complex exponents use brackets.
1/ms (interpreted as 1/(ms))
1/s (1 over seconds, unit of frequency)
VA (Volt Amperes, unit of electrical power)

Prohibited units can be assigned to , as long as no computations are performed on such data sets. Otherwise, the units will be incorrectly interpreted and consequently misapplied.

Powers of ten

If a data set's order of magnitude is such that a prefix in front of the unit is required, you can affix the corresponding prefix to the unit (10-3 = m, 10-6= M, etc.). imc FAMOS calculates the prefixes correctly if you selected "no" under Compatibility 314.

In graphic representation of channels, prefixes such as milli and kilo are popular, as they help avoid graphically representing powers-of-ten.

The following prefixes are used:

p	10-12	pico
n	10-9	nano
µ	10-6	micro
m	10-3	milli
k	10+3	kilo
M	10+6	Mega
G	10+9	Giga

Not all units can be combined with all prefixes, as illustrated in the following example:

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Remarks

- Milli-seconds (ms) exist, but not kilo-seconds; rather "E+3s".
- A coordinate axis with a value range of 0.001s to 0.020s is labeled with the numerical values from 1...20 and the unit "ms".
- Units are aggregated through multiplication and can cancel each other out through division. Thus the multiplication of a data set with values of a current with a data set consisting of voltages, including the corresponding units "A" and "V", yields a product-data set with units of power, "W".
- Squaring a data set consisting of distances and taking the unit "m" yields a data set of areas and the unit "m^2".
- Division of a data set of voltages by a single value taking the unit "A" for a current yields a data set labeled with the unit "Ohm", representing resistances..

Units of numbers

When entering formulas, write units immediately after the numerical values. Thus, it is not necessary to first create a single value and then assign a unit to it by calling a function. Units must be enclosed in single quotation marks and positioned directly after the entry for the value.

Example

```
x = y * 3.5 'V'
MeanV = GInt (Data, 2E-3 's') / 2E-3 's'
```

where "Data" is a equidistant channel.

User-defined units

If you wish to prevent units from being computed with each other, enclose the units in double quotation marks. The units will then be interpreted as user-defined and disregarded by the imc FAMOS -algorithm which calculates with units.

```
Power1 =  220'V' * 1.01'A'
Power2 =  220'"V"' * 1.01'A'
;--- or also ---
YUNIT U1 V
YUNIT U2 "V"
Power1 =  U1 * 1.01'A'
Power2 =  U2 * 1.01'A'
```

Power1 is assigned the unit 'W', Power2 the unit 'VA'.

Reference

Section 'Showing and changing properties 295' in this chapter

Note

See also hint to Special characters in sequences 360.

7.17 Memory management / Data Manager options

imc FAMOS ' memory requirements during run-time mainly consist of the storage space needed for administering variables (data sets).

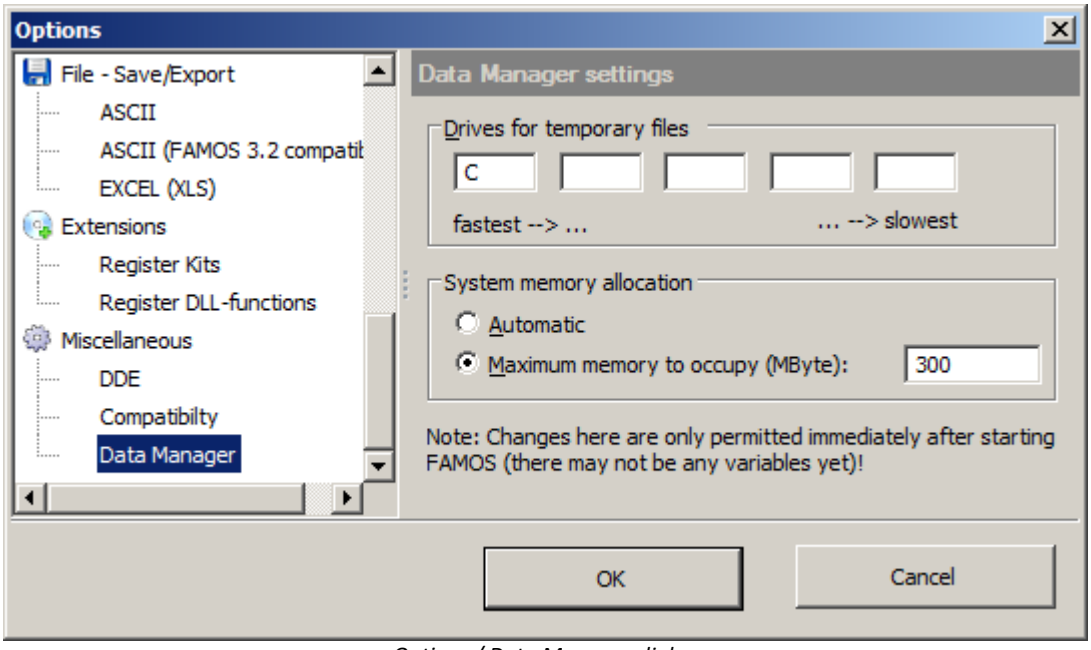
For this purpose, imc FAMOS first uses the working memory (RAM, virtual working memory) made available by the system. If this isn't sufficient, the data sets are transferred to the hard drive as temporary files.

The memory necessary for storing a data set can be estimated roughly on the basis of the data set's length and data format; e.g., 10 channels having 1000000 readings each and 2 Bytes per reading take about 20 Megabytes of memory. f

Also, storage of a single data set cannot be distributed onto multiple drives; the whole data set must fit on one of the ones available.

By default, the "C" drive is used for storage of temporary files. This setting can be changed, and you can even make a list of drives, as well as exert influence the memory requirements .

The corresponding settings dialog is fund under "*Extra/ Options/ Miscellaneous/ Data Manager*".



Options / Data Manager dialog

Note that changes made in this dialog only take effect at the start of a imc FAMOS session; no variables may have been created beforehand.

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Drives for temporary files

You can specify up to 5 drives on which imc FAMOS can keep files for data sets and intermediate results.

imc FAMOS accesses these temporary files when making graphics displays of and when performing calculations with data sets. To guarantee fast running of imc FAMOS , it makes sense to specify a high-speed drive on which the data sets are to be kept.

Therefore, enter your fastest drive at the top of the list, and after that the other hard drives and virtual drives available to your system. Only hard drives should be specified; drives on removable media (e.g. USB sticks, memory cards) are not suitable for temporary files.

If there is not enough space for a data set on a drive, imc FAMOS tries to save it on the next drive in the list. If none of the specified drives nor the working memory has enough space available, imc FAMOS returns corresponding error messages.

The temporary files are always stored in folder "***\tmp***" of the respective drive. Exception: If it is the same drive in which the Windows default folder for temporary files is located (set as the environmental variable "TEMP"), then that folder is used.

At least one drive has to be specified.

Entry in the System Registry

Alternatively, a different path can be specified in the System Registry (see regedit.exe). If a valid folder is specified there, **it will be used first** (instead of the "*tmp*" folder of the first drive). Only if no more sufficient space is available there, the remaining drives will be used.

The entry in the Registry must be made before imc software is started.

Warning

Incorrect use of the Registry Editor may cause serious problems that may require you to reinstall the operating system. Check carefully that you have opened the correct Registry path.

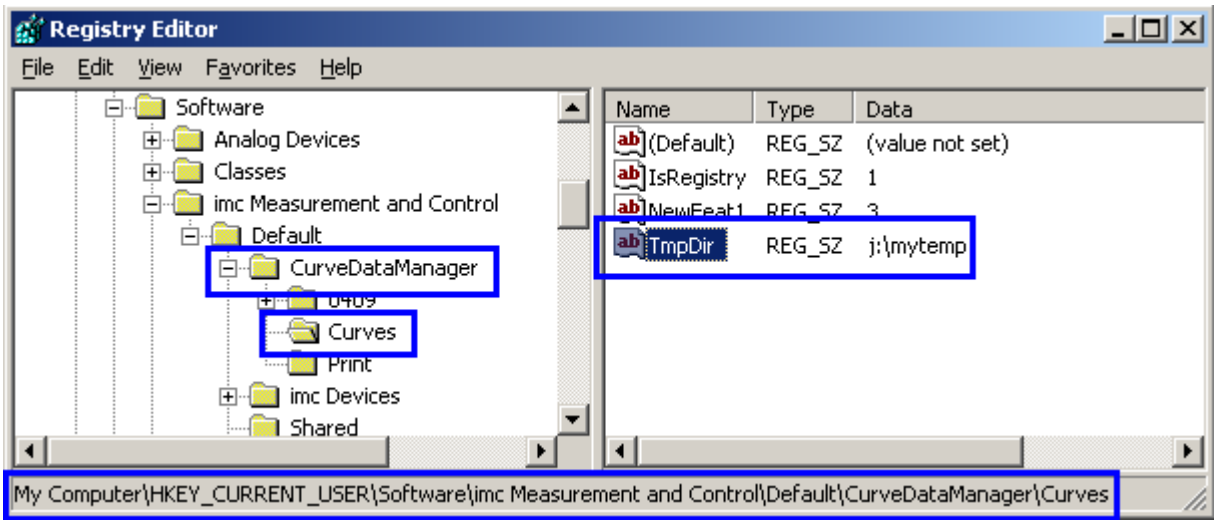
How to proceed

Start the Registry-Editor. For that click on the Windows "*Start*"-Button, select "*Run*" and enter "*regedit*", confirm with "*OK*". Now open the Registry.Key:

HKEY_CURRENT_USER\Software\imc Measurement and Control\Default\CurveDataManager\Curves

Create a new "String" named "*TmpDir*" (right click on the key entry "*Curves*"). Change the value to the desired path, e.g. "*j:\mytemp*" (double-click on "*TmpDir*"). Make sure that the specified path is present. Here too: you must not use drives on removable media.

Example



Registry entry for temporary files

Automatic

imc FAMOS always first requests the memory it needs from the operating system. Only if this is no longer able to provide any free space (RAM or virtual working memory), temporary files are used to hold the data.

Maximum memory to occupy:

imc FAMOS limits the memory demanded of the operating system to the specified maximum. If more memory is needed, data are sourced out to temporary files, even if the system has sufficient space available. This option can, under certain circumstances, improve system performance in cases where equally memory-intensive applications are running alongside imc FAMOS . Setting a limit ensures that other applications not having their own memory management, and thus dependent on the operating system's working memory, get a share of the system memory.

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8 Functions

8.1 Introduction

Functions are included in the editions imc FAMOS Standard, Professional and Enterprise.

imc FAMOS provides the user with multitude of functions for processing and analyzing data. These include simple mathematical functions such as square roots and trigonometry, as well as complex analysis functions such as integration, differentiation or calculation of spectra, and even statistical functions such as histograms or calculation of standard deviation.

A variety of manipulation functions specially designed for measurement technology are included, such as joining of channels, resampling, creation of curve portions, smoothing, determination of function values, changing length of data sets and waveform approximation.

The integrated formula interpreter allows the user to construct complex mathematical formulas from the basic functions available. New data sets can be calculated or existing data sets may be changed using formulas. Formulas can be entered and executed in the Input box in the imc FAMOS main window. Sequences (macros) can also be created. Sequences consist of a series of formulas, which are automatically executed in succession.

Several possibilities exist for enhancing imc FAMOS to meet the demands of your special applications. In addition to supplemental library programs and optional software upgrades available from ***imc***, you can integrate your own user-defined function libraries.

The imc-Kit Interface

imc offers special function libraries, also known as "Kits", whose functions are also available when operating imc FAMOS , thus allowing the program to be enhanced for special applications. These kits provide functions such as classification of data or loading and storing special data formats.

The Plug-in interface

Alongside the Kits, which are generally function libraries not having their own user interface, there are also so-called plug-ins for special applications. These come with a dialog-based user interface which fits right into the imc FAMOS main window. The File Browser plug-in is already provided, and further, future plug-ins include, for example, a video player plug-in synchronized monitoring of video and measurement data, and an ASAM-ODS-Browser.

Standard DLL Interface

Functions from Windows-DLLs (DLL = Dynamic Link Library, standard format for function libraries under Windows) can be used in imc FAMOS . The user can use all the functions provided by MS-Windows itself as a programming interface. The user can also include his own DLLs, which must not have the defined imc-Kit interface.

Reference: Section 'The general DLL interface 342' in this chapter

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8.2 Formulas

Formulas must be defined in order to execute mathematical functions. Formulas are entered in the editor box or in the sequence window. A typical formula consists of a target variable name, an assignment operator and a mathematical expression. For example:

Example: `Number = 10 * 2`

"Number" is the name of a variable to be created, "=" is the assignment operator, and "*10 * 2*" is the mathematical expression. In this formula, the mathematical expression is first evaluated, resulting in the value 20. This value is then assigned to the variable "*Number*". A new single value variable "*Number*" has been created.

A comment may follow a formula. Comments start with a semicolon.

```
Data = Ramp( 0,1,100 ) ;this is a comment!
;and this as well!
```

Overwriting of variables already existing

The name of a variable already existing may be selected as the target variable. The existing variable name is either partly or totally **overwritten**.

Create a new text variable:

```
var = "C:\Users\Public\Documents\imc\imc FAMOS\dat"
```

The text variable is overwritten:

```
var = Ramp( 0,1,100 )
```

A new **data group** is created in which the first channel is defined:

```
NewGroup:Channel1 = var
```

A new channel is added to an existing data group:

```
NewGroup:Channel2 = var+2
```

A new assignment overwrites the already existing channel in a data group:

```
NewGroup:Channel1 = 123
```

Reference

Chapter 'Variables', section 'Variable names 264'

Chapter 'Variables', section 'Data types: Data groups 277'

imc FAMOS works as line interpreter

The Editor box may only contain one formula per line. If you have entered a formula, you can have the function carried out by activating the line it is on (e.g. by double-clicking on it) and then clicking on the "*Execute*" button which appears to the left of the currently activated line. Next, you can enter the next formula on the next line of the editor box (or you can overwrite the current line if you no longer need it).

Parentheses

Any number of **parentheses** may be used in a mathematical expression. Each parenthesis must have a closing partner. For example:

```
Number = 2 * (3 + Min(Data) - 1) + (-(-1))
```

"*Data*" designates a equidistant data set whose minimum value is calculated. The minimum value is increased by 3 and decreased by 1. The result is then multiplied by 2. The expression (-(-1)) simplifies to +1 . If the minimum function yields a value of 1, the variable "*Number*" is assigned the value 7.

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Precedence rule

The **precedence rule for arithmetical operators** in FAMOS **deviates** from that of the "pure doctrine" of algebra.

Classical theory: *Exponent operator > multiplication/division > addition/subtraction (incl. sign)*

```
-2^2 = -4
```

imc FAMOS: *Sign > Exponent operator > multiplication/division > addition/subtraction*

```
-2^2 = 4
```

The interpretation of the sign, used by FAMOS, as a "unary" operator with higher precedence than the exponent is also used by EXCEL and VBScript, for example.

Upper and lower case, spaces

The program is **not case-sensitive** for function and variable names. Please note that in physical units, upper and lower case letters can have a decisive effect! The following formulas are equivalent:

```
Spectrum = dB (fft (Data))
SPECTRUM = DB (FFT (DATA))
```

In this example, "Data" is a equidistant data set whose spectrum is calculated in decibels. A legible combination of capital and small letters is recommended. Lines written in capital letters only are often more difficult to read.

Spaces may be used in formulas between all names and characters to improve legibility. The following formulas are equivalent:

```
Spectrum = dB (fft (Data))
Spectrum = dB (    fft ( Data )    )
```

Numerical input

Numerical values may be specified as integers or real numbers. The characters "E" or "e" are used to express **powers of ten**, read as "ten to the power of". Numerical values may also be specified in **hexadecimal**, use the prefix "0x". A decimal point is used to introduce places after the decimal, commas are not allowed. The following formulas are equivalent:

```
Number = Number + 163
Number = Number + 0.163E+3
Number = Number + .163e3
Number = Number + 163.00
Number = Number + 0xA3
```

In each of these cases, the number is increased by 163.

Data types and parameters

All data types may be **combined** in formulas, as long as the expression makes sense. For instance, adding complex data sets is allowed, but the spectrum of a XY-data set cannot be defined. Note the declaration of individual mathematical functions for details about which data types can be used with each function.

Note — Integer-Parameter (ganze Zahlen)

Many functions expect **parameters** as integers, e.g. the order in a filter function or the window function in the FFT(). If decimal numbers are specified here, FAMOS rounds up or down mathematically correct.

```
sintest_HP= FiltHP( sintest5, 1.3, 0, 5.6, 120)
```

In **two-component data types**, component labels are used to access the individual components.

```
FFTres = FFT( Ramp( 0,1,128)
   MagnitudeSquare = Sqr( FFTres.B)
```

Data sets and texts can be indexed in order to access individual elements of a variable. Indexes are set in brackets, several indexes (when allowed by the data type) are separated by commas. The index of the first element is 1.

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Exactly one index may be specified for unstructured data sets and texts. The index allows access to a single sample or a single character.

```
Data = Ramp( 0,1,100 )
Data[100]    = 111
Index         = 1
Data[ Index] = Data[ 100]
```

The first and last value in the data set now contain the value 111.

Indexes may also be calculated. The following formulas are equivalent:

```
Data[Index] = Data[100]
Data[Index] = Data[leng?( Data)]
```

In **text variables**, use the **index** to access an individual character.

```
Dir     = "C:\Users\Public\Documents\imc\imc FAMOS\dat"
Drive = Dir[1]
Dir[1]  = "d"
```

The variable '*Drive*' contains "*c*", the variable '*Dir*' contains "*d:\imc\dat*".

Two-component variables can also be **indexed**.

The first value of a complex data set's magnitude is queried:

```
FFTres  = FFT( Data )
Magnitude1 = FFTres[1].B
```

Here the result is a complex data set with a length of 1, which is exactly the first value pair magnitude/phase in the data set.

```
MagnitudePhase1 = FFTres[1]
```

Variables can be partly changed by indexing an index which already exists. This also applies to the use of component labels.

Only the variable's second data value is changed, all other values remain unchanged:

```
var    = Ramp( 0,1,100)
var[2] = 234
```

The variable is completely overwritten:

```
var    = FFT( Ramp( 0,1,128))
```

The magnitude of a complex data set is doubled, the phase set completely to zero:

```
FFTres    = FFT( Ramp( 0,1,128))
FFTres.B  = FFTres.B * 2
FFTres.P  = Ramp( 0,1,128) * 0
```

Indexing new variables is not allowed:

```
Delete var
var[1]   = 1   ; Error !!!
Delete FFTres
FFTres.P = Ramp( 0,1,100 )  ; Error !!!
```

Invalid indexes also result in an error message.

```
NotThere    = Data[ leng?( Data) +1 ]
AlsoError = Data[0]
```

Reference

Chapter 'Variables', section 'Indexing variables 283'

Procedures

Some functions do not yield a **function value**. They are also labeled as procedures. They change the parameter itself or evaluate predefined variables.

```
SetUnit( Data, "Seconds", 0 )
Stat(3 * cos (Data))
```

An assignment operator may not be used in procedures since the function does not return a value which can be assigned. Thus, there is no target variable.

Calculation of units

When executing a mathematical function, any **SI units** are automatically converted or canceled against each other, as appropriate to the calculation.

Reference

Chapter 'Variables', section 'Units 313'

Special characters

If a variable's name contains special characters (such as spaces, semicolon, quotation marks, '+', '-', ':' etc.) or starts with a numeral, these characters must appear in curved brackets:

```
MY RESULT  = FFT( 123_Measurement ) ; Error !!!
{MY RESULT}= FFT({123_Measurement}) ; OK
```

8.3 Data groups as function parameters

Channels in data groups can also be used as function parameters or result variables. The channel name is separated from the group name by a colon.

```
NewGroup:Data    = Ramp( 0,1,100 )
NewGroup:SinData = sin( NewGroup:Channel1 )
```

Addressing by index is also allowed; a colon should precede the address.

```
NewGroup:Channel1 = Ramp( 0,1,100 )
K1 = NewGroup:[1]
K1 = NewGroup:Channel1
```

The last two formulas each provide the first channel in the group.

```
Value23 = NewGroup:[1,23]
Value23 = NewGroup:Channel1[23]
```

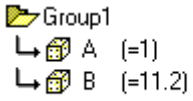
The last two formulas each provide the 23rd value of the first channel in the group variable 'NewGroup'.

Examples

If a data group is directly transferred as function parameter, this function is executed in succession for all included channels. Individual results are sorted into a group. The program attempts to pass the names of the channels to the result. If several data groups are calculated together, the program uses the channel names of the data group found first.

Example

```
Group1:A = 1
Group1:B = 11.2
```

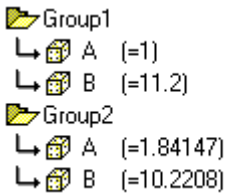


A group consisting of two channels is created.

A new group is derived from the first group and the channel names are adopted. The sine is calculated for each curve in the group and then added to the particular channel.

Example

```
Group2 = Group1+ sin( Group1 )
```

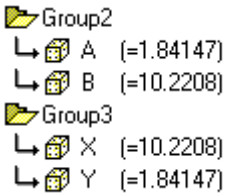


Group2 is derived from Group1.

A further group is created containing the channels from group 2 in the reverse order. The names of the channels are explicitly specified.

Example

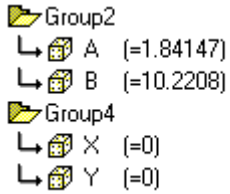
```
Delete Group1
Group3:X = Group2:B
Group3:Y = Group2:[1]
```



When adding two groups, channels with the same index are added. The Floor function is applied to both channels. A constant is subtracted from each channel.

Example

```
Group4 = Floor( Group3 + Group2 )
Delete  Group3
Group4 = Group4 - 12
```



8.4 Indirect use of variables

Text variables can be used in formulas is a special way. A text variable in pointed parentheses **< TextVar >** is replaced by its contents by the formula interpreter before calculation.

Example

Data = "Slope"

Spectrum = DB(FFT (< Data >))

The Formula Interpreter first searches for the text variable 'Wave' in the variable list and replaces the text of the formula in the partial expression "Wave" with the textual content of the variables. Then the formula is calculated, here:

Spectrum = DB(FFT (Slope))

The use of text variables in this way is useful only in sequences to specify variable or file names indirectly.

Reference

Refer to the chapter 'Sequences', section'Use of text variables 403' for more information and examples about using text variables.

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8.5 Error and warning messages

When you execute a formula, the program **checks the syntax**. It is checking for...

- invalid names given to variables,
- invalid names given to functions,
- mathematical signs in the incorrect position,
- incorrectly positioned parentheses,
- an incorrect number of parameters for a function,
- use of invalid characters,
- Maximum values 702 are exceeded, e.g. text constants more than 255 characters or more than 510 characters per sequence line,
- incorrect placement of assignment operator.

If there is an error in syntax, an appropriate error message is generated and the location of the error is marked in the formula. Once the error has been corrected, try again to execute the formula.

Before a formula is executed, the program checks the content for semantic errors. Warnings or error messages could be generated. If an error message is generated, the formula cannot be executed until the error is corrected. A formula can be executed if a warning message appears Warnings are intended as valuable and important tips that something may be wrong and that the formula should be checked. Of course, warnings may also be ignored and even be suppressed using the "*Options / Functions*" dialog.

Warnings appear in the output box in the imc FAMOS main window. **Error messages** additionally appear in a message box and must be acknowledged.

Error messages include:

- invalid data type as function parameter
- invalid combination of data types in function parameters
- data set is not complex
- data set is too short
- invalid parameter value
- data set too long for FFT

Warnings include:

- data sets specified for a function are scaled differently
- function parameter has incorrect unit
- the length of a data set is automatically shortened
- a numerical value cannot be sorted into histogram
- data sets must be shortened or lengthened, since the length in set in the target or a function expects a parameter with a definite length

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Semantic errors may also occur during actual calculation, which occur from the intermediate results of unknown numerical values, scaling, etc.

Errors causing cancellation include:

- memory is insufficient for a temporary data set (e.g. intermediate result in a formula)
- RAM has insufficient space

Errors which cause a warning to be posted but after which the formula is still executed include:

- division by zero
- magnitude of numerical values is too great
- value range of a function is exceeded

If the valid value range has been exceeded, the results of calculation are generally set to zero.

The **number range** is limited to -10^{35} ... -10^{-35}, 0, 10^{-35} ... 10^{35}.

8.6 Data format of results

imc FAMOS can manage data in various formats. The result format of mathematical functions depends on he actual function and the data format of the parameter.

Some functions provide their results independent of the type of parameter.

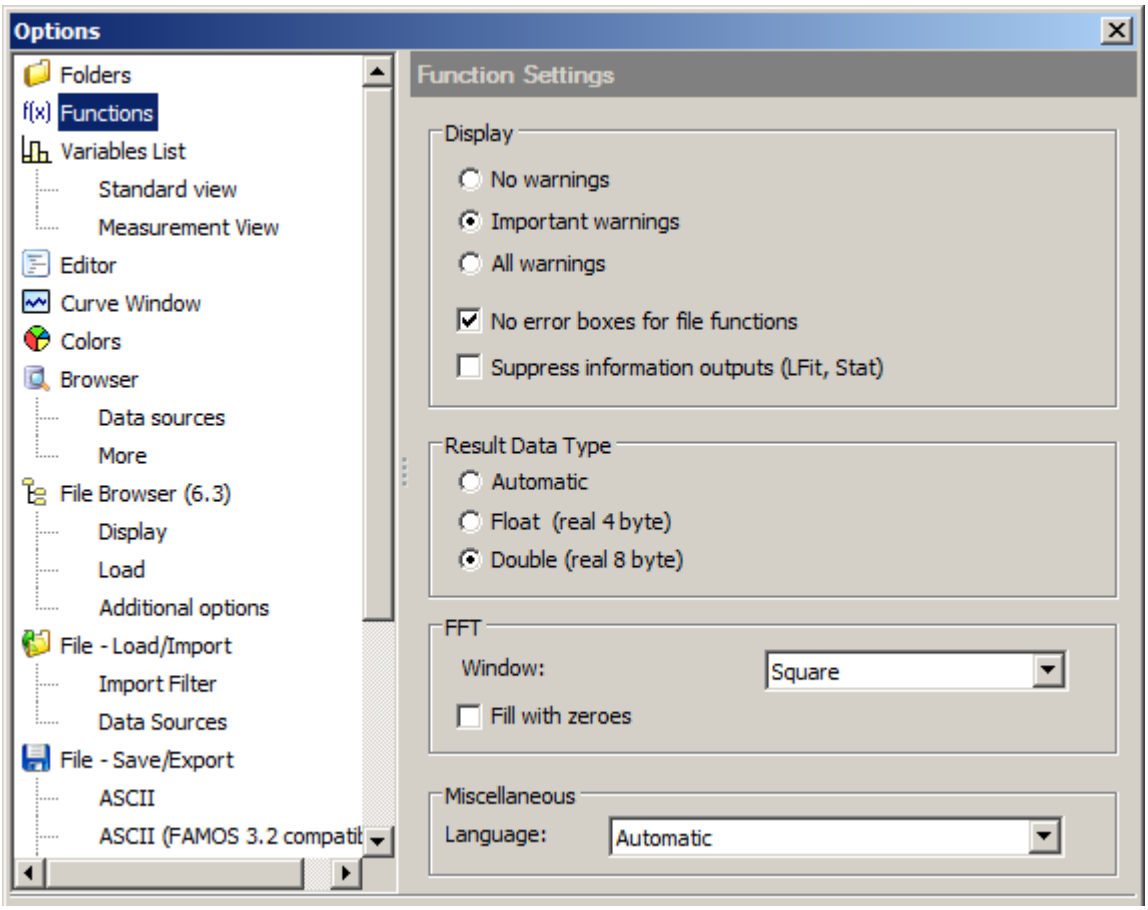
Other functions observe the data format of the parameter, for example the *Mirror* function for mirroring the values of a data set.

Otherwise the setups specified in "*Extra"/ "Options"/ "Functions* 331" are observed. The dialog is explained in the next section.

8.7 Dialog: Options/Functions

Use this dialog to set options which are generally valid for all functions. This concerns generation of warnings, selection of the data format for results and the setups for executing Fourier transformation.

The dialog is called via the menu item "*Extra"/ "Options"/ "Functions* 129".



Dialog: Options/ Functions

Reference

imc FAMOS Functions Reference: All options in this dialog can also be selected within a sequence by means of the function '*SetOption(...)*'.

Display

When executing functions, any **warnings** generated are shown in the output box in the imc FAMOS main window. If the options "*No warnings*" or "*Important warnings*" are activated, no warnings or only the important warnings appear.

No error boxes for file functions

If an error occurs when executing a imc FAMOS function, a box containing the error message is usually displayed and the return value/result is not generated. Any running sequence is canceled. When this option is selected, a return value is generated when using the file functions (Function Group "*Files, Import/Export*"), which displays the error and the value can then be evaluated. The error box does not appear and the functions are "quiet". This option is useful in sequences where the program must react automatically to the various reasons for the errors. For example, a missing file must not necessarily be interpreted as an error, the program could simply change to another directory and search for the file there.

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Suppress information outputs (Regr, Stat)

Some functions return multiple results. Display of these in the output box can be deactivated using this option.

Result Data Type

Nearly all functions return their results in a real number data format, either 4-Byte format (float) or in an 8-Byte format (double). If the option "***Automatic***" is selected here, then depending on the parameters' data types, the system selects the result data type which is able to express the result without data loss. For instance, if two "*float*" data sets are added, the result will also be of the type "*float*". By contrast, when one "*float*" and one "*double*" data set are added, the result type "*double*" is chosen.

On the other hand if either "**float**" or "**double**" is selected, the result will always be generated in that format unless the function itself makes a different data format obligatory. ***Exceptions:*** Calculated single values and time values are categorically generated in "**double**" format.

The precision of the "float" format, with 7 significant digits, is adequate for most practical applications.

In a sequence, the data type can be set by means of the function **SetOption**("Func.ResultFormat").

Note

Depending on the respective function and the data format of the input parameters, the result's actual data format actually generated may deviate from the rule. Certain functions always return Double data for reasons of precision (e.g. functions which determine times or X-positions), or are assigned the data type of the input parameter.

FFT

These setups affect the mathematical functions *FFT* and *Spec*. Specify the window function to be used in the selection list. The base-2-algorithm used requires that the length of the data set to be transformed is a power of two. If the option "*Fill with zeros*" is selected, the data set is filled with zeros to the next power of two before transformation. Otherwise the data set is truncated to the next smallest power of two.

Miscellaneous: Language

German (default) + English: The Formula Interpreter accepts both German and English function names. The Functions list displays the German names.

English (default) + German: See above, except the Functions list displays the English names.

Automatic: The default language for functions is English. The language of the functions description depends on the corresponding setting for Windows; thus in a German-language system, the setting Automatic means **English(default) + German.**

English only: Compatible with imc FAMOS 6.0, the Formula interpreter only recognizes the English language. This is only useful for solving compatibility issues.

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8.8 Functions-Assistant

The Functions Assistant offers the user support in creating the necessary formulas and in parameterizing the accompanying functions. The Function Assistant provides a parameterization dialog, which is specially adapted to each function. This dialog contains a short description and an Edit box or list box for each parameter, in which the current parameter value may be entered or selected. Once all the parameters have been entered, the function can either be executed directly or copied to the editor box.

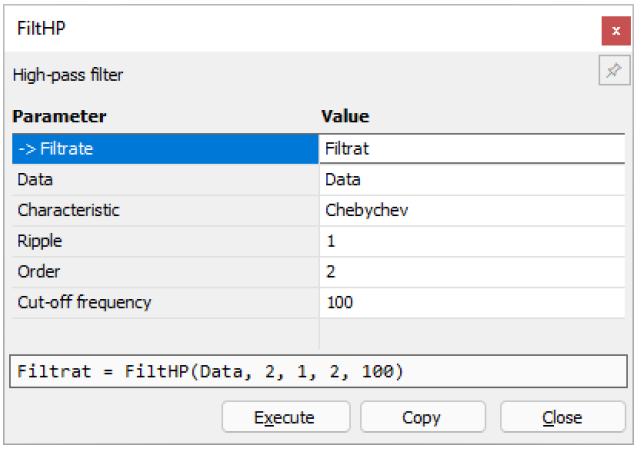
Such an assistant is available for each internal function and command ("Standard" index card in function list) and for most external kit functions.

This option is especially useful for functions with several parameters and for functions whose execution is controlled by option parameters. While the option is specified by a number in the formula, the option can be selected from a text list in the Function Assistant.

Calling the Functions Assistant:

- Highlight the desired function in the imc FAMOS main window's **Functions list** and type "***SHIFT+F1***" or click on the entry "***Assistant***" in the **context menu**.
- If the writing cursor in the **Editor box** is over a function name, the Assistant dialog also can be called by typing the combination of keys "***SHIFT+F1***" or by clicking on the "***Functions Assistant***" entry in the **context menu**. If parameters are already entered in the function formula in the Editor box, these parameter values will appear in the corresponding boxes in the Assistant dialog as defaults.
- It is also possible to **drag&drop** a variable (from the variables list, from a curve window or from the Data Editor) onto a function entry in the function list. This also calls the parameterizing dialog. The variable name appears in the dialog as the first parameter, if possible. In consequence, the **first parameter** of the function is filled, all subsequent parameters are assigned the values of the last call.

A typical parameterizing dialog looks like the following:



Example Functions Assistant dialog: Parametrization of 'FiltHP'

The **name** of the current function is displayed in the title bar, under the name a brief **comment**.

For the **result**, a name is suggested.

Next come some **input boxes** and **list boxes** for the return value and the function's parameters.

In the list for specifying variables, all available imc FAMOS variables are offered.

A **help text** on the selected parameter appears in the lower region.

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In **parameters where a set number of options is possible**, select the desired option from the **list**. Parameters which can take an arbitrary number, or a text, are entered in an input box. Instead of a static number or text, the name of a **variable** can also be entered via input or **drag&drop**.

The Assistant provides support in making entries by means of intelligent **autocompletion** functionality.

Parameters which represent a **filename** can be entered using a selection dialog. Here, direct **Drag&Drop from the Windows-Explorer** is supported.

The current formula is displayed in the **status bar**, as it would be generated from the setups in the dialog. The last examples shows how the parameter code (2) corresponding to *"Chebychev characteristics"* has been entered in the formula.

If the dialog was called from an input box using the key combination *<Shift>+<F1>*, any parameters possibly specified are used and entered in the dialog. In parameter code 0, the corresponding entry "*Chebychev*" was selected in the list. In addition to the short help messages for functions, an overview about the functions of a formula line (e.g. from an unknown sequence) can be made.

If no parameters can be identified in the formula line when the dialog is called, the dialog starts with the entries last used.

Execute

The formula is calculated immediately. The button is only enabled once all parameters have been provided.

Copy

The formula is inserted in the Editor box at the current cursor position or instead of whatever is highlighted there.

Close

Closes the dialog. You can even continue to work normally while imc FAMOS is open. The next time the Assistant is called, instead of a new dialog opening, the existing one is updated to reflect the desired function.



Note

The parameter boxes can also be filled by using Drag&Drop from a Variables list entry or on whatever is highlighted in the Sequence Editor.

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8.9 The imc-Kit Interface

8.9.1 Introduction

imc offers several "***Kits***", which provide additional functions for processing data sets. These kits have a standard interface and can be used by various **imc** applications. They offer functions for classification of data, loading and storing special data formats or replaying data sets via the Windows audio output.

These kits are special DLLs (Dynamic Link Libraries), which are accessed while an application is being used. They are equipped with a defined interface for parameter specification. The functions they provide are referred to as **external Kit functions**, as opposed to the internal functions available in imc FAMOS itself.

The included kits are already sorted in the respective branch of the Functions tree diagram 87. Customized or project-specific kits appear in the Functions tree diagram in the branch "Kits".

8.9.2 Installed Kits

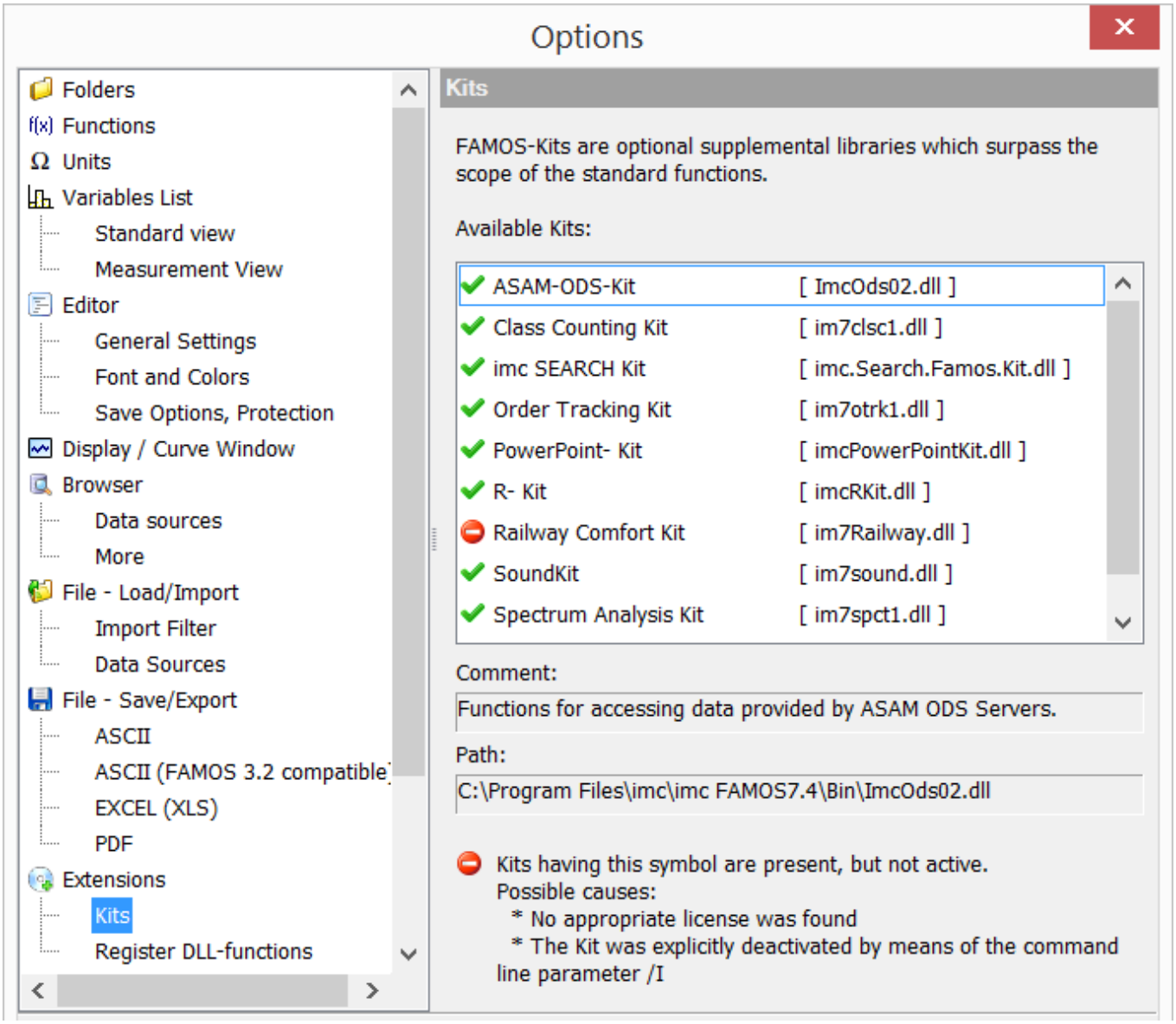
The kit DLLs are linked dynamically during the progress of the program. These functions can be used exactly like the functions available in imc FAMOS .

Kits can come as part of a imc FAMOS package or in the form of a separate installation program. The respective installation program copies the necessary files to the imc FAMOS program folder and.

If you install the kits manually, please note that the kit DLLs must be located in the imc FAMOS program directory, which contains the file "*famos.exe*".

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A list of the kits recognized by imc FAMOS is presented in the dialog reached via menu Item "*Extra"/ "Options*" under the tab *"Extensions -> Kits"*. Clicking on the Option symbol in the Functions list, and there selecting "*Register Kits...*" also leads to this dialog:



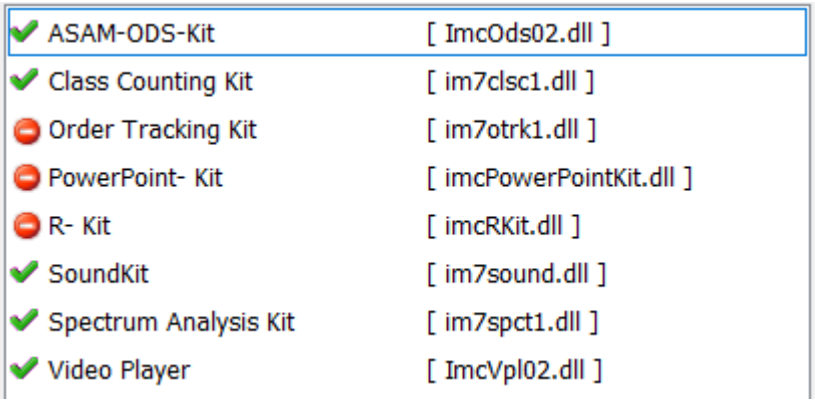
"Register Kits" dialog

The list indicates all Kits which are available and located in the imc **FAMOS program directory** or under "*Program Files**imc**Shared*".

Registering kits

Kits do **not** need to be deliberately registered (any more). imc FAMOS automatically registers them if the associated DLL meets the applicable conditions.

If certain kits have been disabled with the \command line parameter \I 63, or the kit is not part of the purchased edition 55, they will be marked with a red icon.



8.9.3 Calling external Kit functions

After the kits have been registered in "*Register imc-Kits...*", the functions they include can be selected from the function list.

The kits included in imc's product package are sorted according to their topic in the Functions tree diagram.

Functions belonging to customized kits appear in the branch *Kits*.

8.9.4 Kits in imc FAMOS Standard

8.9.4.1 Curve Kit

The **Curve Kit** contains various functions for the display and production of curve windows. For instance, you can specify the position and scaling for the window, add curve to a window, load configurations and much more.

A normal installation procedure should result in this kit being installed automatically; otherwise, the menu item *"Extra"/ "Options" / "Extensions - Register Kits* 335" will establish access. Subsequently, the group "***Curves***" is available in the "*Presentation*" Functions list.

The **Curve Kit** is a component of the DLL "*IM7CUDAM.DLL*", which is always included in the folder "*Program files**imc**Shared*" ("*c:**Program Files*" being the Windows default program folder). It is a standard feature of many **imc**-applications and therefore not a kit in the usual sense, but it also contains external functions.

Reference

The Curve Kit documentation describes the kit-functions in greater detail.

8.9.4.2 Panels Kit

The **Panels Kit** enables remote control of the panels by means of sequences and dialogs.

The **Panels Kit** is contained in the library "*imc.Famos.DataBrowser.Bridge.DLL*", which is in the imc FAMOS program folder following proper installation.

8.9.4.3 File Kit

The **File Kit** is also included in the imc FAMOS package and is automatically registered upon installation of imc FAMOS . The function group "*Files, Import/Export*" offers a number of file management functions, for example, for listing all the files in a folder, and for copying, moving or deleting files.

8.9.4.4 Dialog Kit

The **Dialog Kit** is also included with the standard imc FAMOS package and is registered by default. The functions group "*Presentation>Dialogs*" contains functions which can be used in the event sequences of user-defined dialogs.

Reference

The use of dialogs is described in the chapter 'User-defined dialogs' 545.

A detailed description of the included Kit functions is presented in the online help Dialog-Kit.

8.9.4.5 EXCEL-Kit

The **EXCEL-Kit** enables remote controlling of Microsoft EXCEL by means of sequences, Panels and dialogs.

The **EXCEL Kit** is contained in the library "*imcXLKit.DLL*", which is in the imc FAMOS program folder following proper installation.

8.9.4.6 Report Generator Kit

The **Report Generator Kit** contains a multitude of functions for the remote control of the Report Generator. For example, it might assist you in loading a report form, updating already present curve objects or tables with new data, or automating the printout of completed reports by means of a (macro) sequence. The remote control functions are significantly more efficient than the commands in the "*FORMULA*" group provided by imc FAMOS .

The **Report Generator Kit** is located in the DLL "*IM7DRKIT.DLL*", which will be placed in the folder "*Program Files**imc**Shared*" by regular installation of the Report Generator.

A normal installation procedure should result in this kit being installed automatically; otherwise, the menu item "*Register Kits*" will establish access. Subsequently, the Functions group "*Report Generator*" is available in the "*Presentation*" Functions list.

Reference

Exact descriptions of the kit's functions are to be found in the instructions for the Report Generator.

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8.9.4.7 Sound Kit

The **Sound Kit** ("IM7-SOUND.DLL") is included in imc FAMOS and can also be accessed using the kit interface. The sound kit has functions for converting data sets into the Windows WAVE format and playing them back via sound board. The selected variables are converted internally in a 16-bit mono-wave file and are played back if an appropriate device is present.

Note

You can listen to a variable by means of the menu function *"Variable" -> "Playback"* 126. There is also a toolbar in the curve window for listening to data.

Reference

A description of all the functions is available both in the online help for the Sound-Kit and in the User's Manual *"imc Software - Shared Components" -"Curve Window"\"Menu -Extras"\"Sound".*

8.9.4.8 Format Kit

Along with special functions for certain data formats, the **Format Kit** provides you with the functions "***MSave***" and "***BSave***", which let you save files in multi-column ASCII-files or a configurable binary format, respectively.

The **Format Kit** is located in the "IM8FORM.DLL" library, which regular installation will place in the imc FAMOS - Program directory.

You can make this kit accessible by means of the "*Register Kits*" dialog. Thereafter, the functions will appear under*"Files, Import/Export > Misc.*".

8.9.5 Kits in FAMOS Professional

8.9.5.1 Spectrum Analysis Kit

Spectrum analysis with moving and overlapping windowing, as well as additional FFT-based analysis procedures, such as amplitude spectra, power density spectrum, Cepstrum, coherence, cross power density, transfer function.

8.9.5.2 Video kit

Integration of a video player. The curve window can be linked with the film.

8.9.5.3 Determining the measurement uncertainty

With FAMOS, for almost every algorithm written as a FAMOS sequence, the effects of measurement uncertainty 616 can be analyzed and the measurement uncertainty of results can be calculated.

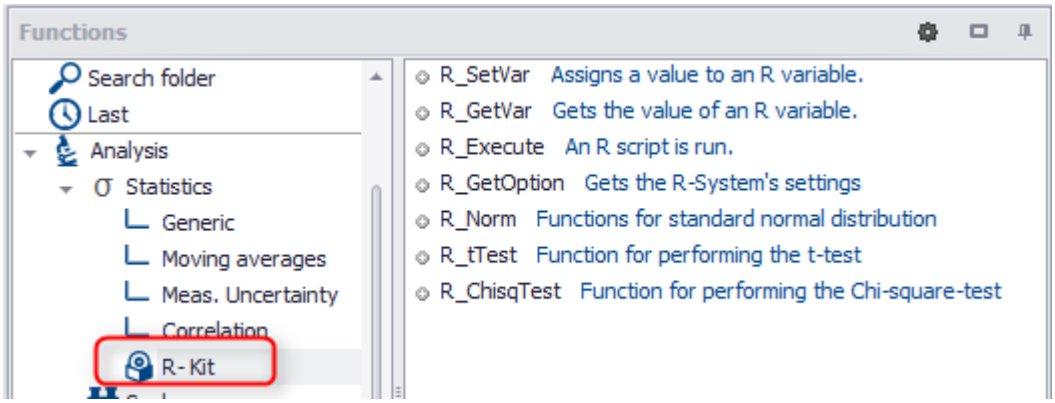
Reference Measurement uncertainty

Chapter measurement uncertainty 616.

8.9.5.4 R-Kit

The **R-Kit** enables incorporation of the open source software "R" for **statistical** analysis. This Kit provides a bridge to an existing installation of R on the computer. For this reason, it is possible to run any R-functions and -scripts from within imc FAMOS. Furthermore, it provides special functions for t-tests and chi²-tests.

The call from imc FAMOS comes with a few functions:



The kit is part of imc **FAMOS Edition Professional** or higher.

Note

- The "R" console must be installed separately. It is not part of the FAMOS setup.
- If the "R"-console is not installed, the R-Kit functions of imc FAMOS will generate error messages.
- The R-Kit functions work even if the "R"console is installed in a different path.

8.9.5.5 PowerPoint-Kit

The **PowerPoint-Kit** enables remote controlling of PowerPoint presentations by means of sequences, Panels and dialogs.

The **PowerPoit-Kit** is contained in the library "*imcPowerPointKit.DLL*", which is in the imc FAMOS program folder following proper installation.

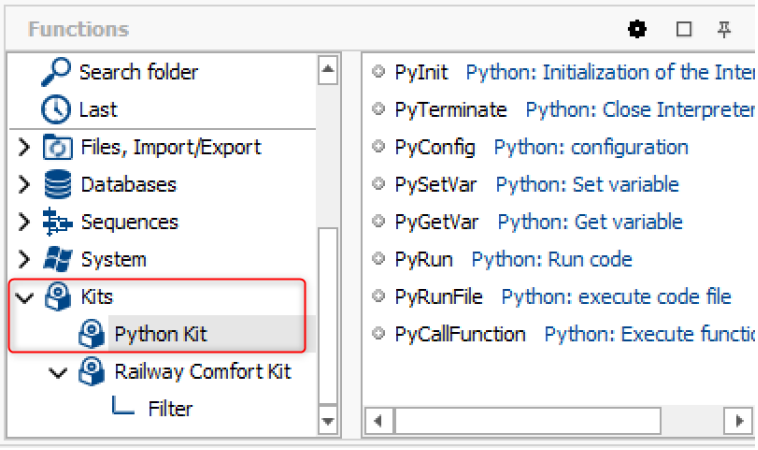
The kit is part of imc **FAMOS Edition Professional** or higher.

Note

The PowerPoint kit functions require an appropriate template with "placeholders". Creating such a template with a kit is not practical and is not supported.

8.9.5.6 Python

The Python-Kit supplies functions which provide a bridge to the **Python** programming language.



The kit is part of **imc FAMOS Edition Professional** or higher.

The Python-Kit supplies functions which provide a bridge to the **Python** programming language.

imc FAMOS generates an embedded instance of the **Python** runtime environment, which provides an interpreter for the **Python** programming language.

Python is an all-purpose object-oriented programming language which enjoys widespread prevalence especially in education and science/technology due to its accessibility for beginners, its platform independence, expandability and its free availability (Open Source). A large number of libraries are available, e.g. for numerical calculations, visualization of data, image analysis and all the way to machine learning. Familiar expansion libraries for the field of science and technology include **NumPy**, **SciPy** and **TensorFlow**.

There are functions for reading and writing **Python**-variables, as well as for executing **Python**-functions and code lines, or even whole **Python** programs.

System requirements:

Software	Compatible version	Installation	Notes
Python 64-bit	3.13, 3.12, 3.11, 3.10, 3.9, 3.8	required	Support is provided exclusively for the Python reference implementation from the "*Python Software Foundation*" (CPython) in one of the versions listed below; these can be downloaded and installed from https://www.python.org/.
NumPy 64-bit	2.1, 2.0, 1.23, 1.20, 1.19	optional	The Python bridge provides special support for data types defined in the expansion library "NumPy" (https://numpy.org).

Official **Python** website: https://www.python.org/

8.9.6 Kits in FAMOS Enterprise

8.9.6.1 Class-Counting Kit

Class-counting methods as per DIN 45667 (e.g. Level cross method, range method) and Rainflow-method.

8.9.6.2 Order Tracking Kit

Vibration analysis for rotating machinery.

8.10 The general DLL interface

8.10.1 Introduction

An excellent characteristic of MS-Windows is its ability to use program libraries, known as DLLs. DLL is the abbreviation for "Dynamic Link Library". These libraries provide functions which can be called by other applications.

MS-Windows itself consists mainly of DLLs, whose functions are called by the MS-Windows programs. These functions are described in the Microsoft SDK (Software Development Kit).

imc FAMOS is equipped with a standard DLL interface, which allows the functions to be accessed from any Windows-DLLs.

8.10.2 Registering DLLs in imc FAMOS

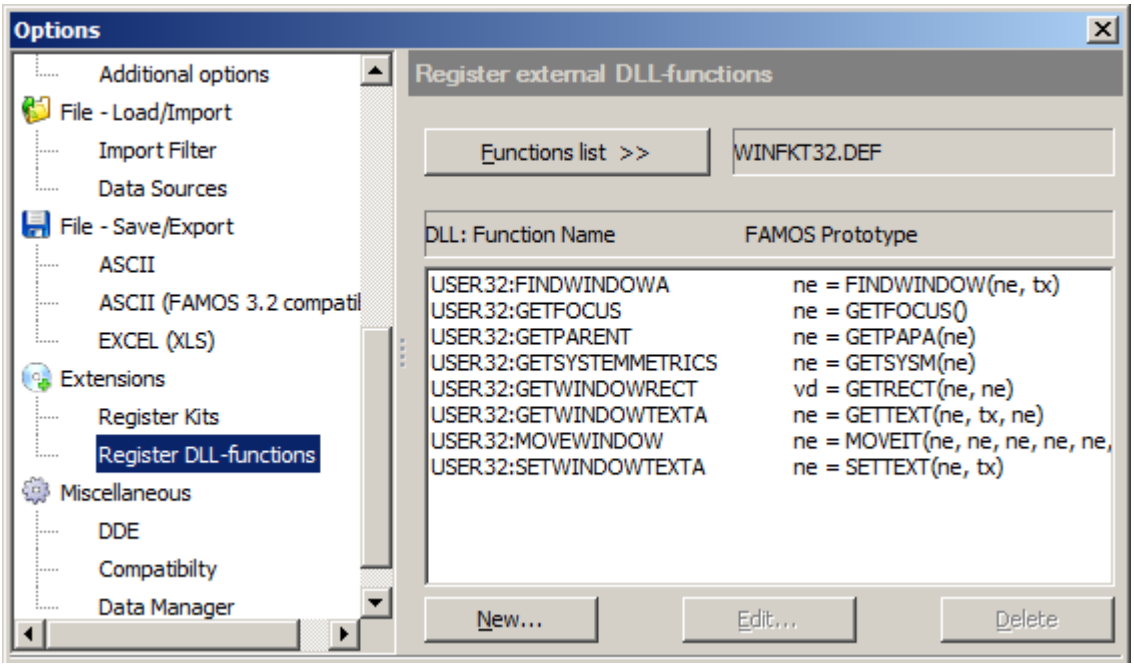
If functions from DLLs are to be called in imc FAMOS , they must be registered in imc FAMOS . The following information must be available for each function:

- DLL filename
- function name in the DLL
- function name in imc FAMOS
- number of parameters
- data type of parameters and return values.

In addition to the DLL and function name, other information about the function is necessary. This information is needed to give the function parameter the form expected by the function. imc FAMOS must also know in which form the results will be returned by the function, in order to provide enough memory and to correctly interpret the returned value.

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Select menu item "*Extra/ Options/ Extension: Register DLL functions*" to register a DLL function in imc FAMOS .



Dialog: External DLL functions/ Overview

When the dialog is started for the first time, the list of registered functions is empty. As soon as external DLL functions are registered in imc FAMOS , they are displayed in the list. All functions shown in the list can be used in imc FAMOS . Entries in the list have the following form:

```
DLLName:FctName EType=imc FAMOS Name( Par1Typ, ..ParNType)
```

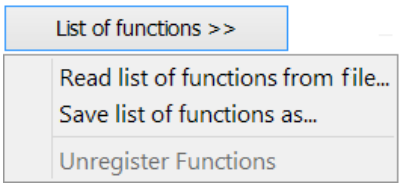
DLLName:	Name of DLL where the function is located
FctName:	Name under which the function is exported from the DLL
imc FAMOS Name:	Name under which the function can be used in imc FAMOS
Etype: **Par1Type..ParNType:**	Type abbreviation for event and parameter type in imc FAMOS . Meaning: **vd**: VOID, no return value, procedure **tx**: Character string, text **ne**: Data set or single value

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List of Functions>>

All declarations of external functions are stored in a declaration file. These declarations can be re-read the next time imc FAMOS is started.

Different declaration files can be generated with various function declarations, which can then be used in imc FAMOS . This allows you to adapt imc FAMOS quickly to various tasks. The following menu appears after selecting the Function list button:



Read list of function from file...

Functions currently registered in imc FAMOS are removed and a new function list is read from a file and entered in the list. Use the Windows-standard dialog for file selection to select the desired file. The directory set under "*Definition files*" in the "*Options / Folders*" dialog is used as default directory. The standard name extension for declaration files is "*.def*".

Save list of functions as...

Functions currently registered in imc FAMOS are stored in one file. Use the Windows standard dialog "*Save File*" to select the directory and file name. The directory set under "*Definition files*" in the "*Options/ Directories*" dialog is used as the default directory. Declaration files stored this way can be re-registered later in imc FAMOS using menu option "*Read list of functions as..*".

Unregister functions

All functions currently registered are removed using this option. The list is then empty.

The name of the file being used is shown in the box next to the button "*List of functions>>*". If no functions are registered or the currently defined list is not yet stored, "*No DLL functions*" appears.

OK

Selecting this option ends the dialog. If the current list has not yet been stored, a message appears. In closing the dialog, all specified DLLs are linked dynamically and the functions are listed in the function list on the "*DLL*" page. The functions may now be used in imc FAMOS . If a DLL cannot be located, the corresponding error message appears.

Delete

This removes any functions highlighted in the list.

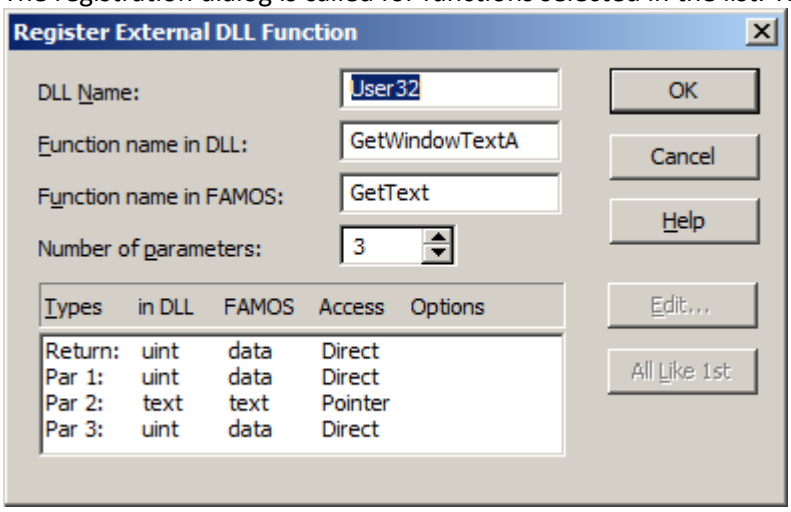
New

The definitions dialog for a DLL function appears. A new definition can be made.

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Edit

The registration dialog is called for functions selected in the list. The existing declaration can be changed.



DLL Name

Enter here the name of the DLL without filename extension.

The DLL must be in one of the following folders:

- current folder
- Windows folder
- Windows\System folder
- folder specified by means of the environmental variable "PATH"

Function name in the DLL

Enter here the name under which the DLL function is available to other applications.

If you wish to write and integrate your own DLL's, note that this name may differ from the original name in the source text, depending on the programming language used, the way the functions are declared in the DLL, and the compiler and linker used.

C-compilers generally prefix the function name with an underline and sometimes attach an indication of the total size of the parameters.

Example

The function is exported under the name "*_dummy@1*":

```
_stdcall int dummy ( BYTE par1 )
```

The function is exported under the name "*_dummy*":

```
_cdecl int dummy ( BYTE par1 )
```

C++ compilers append even more characters to the name, which contain information on the amount and types of parameters, as well as about the type of the return value.

To use such functions in imc FAMOS , you must either enter the entire name or instruct the compiler/linker to generate simple (so-called "undecorated") names.

Example

By stating the original name in the C-linker's module definitions file, it's possible to arrange for the DLL to export the functions under their original names (in other words, without the preceding underline).

Additionally, you can instruct a C++ compiler to refrain from "decorating" names by inserting the element "C" in the function declaration.

```
external "C"
{
   float _stdcall Fkt1( LPSTR lpsz );
   float _cdecl Fkt2( LPSTR lpsz );
}
```

Function name in FAMOS

The function is called in imc FAMOS by this name. The user may freely specify the name, usually the DLL function name. Note that the name should be unique. It may not be the same as that of internal functions, or begin with numbers. imc FAMOS does not differentiate between upper and lower-case letters. The name may have a maximum of 20 characters.

Number of parameters

Specify here the number of parameters that the function expects. Entries for each parameter are pre-initialized in the parameter list with standard values according to the information specified.

The maximum number of parameters is limited to 15.

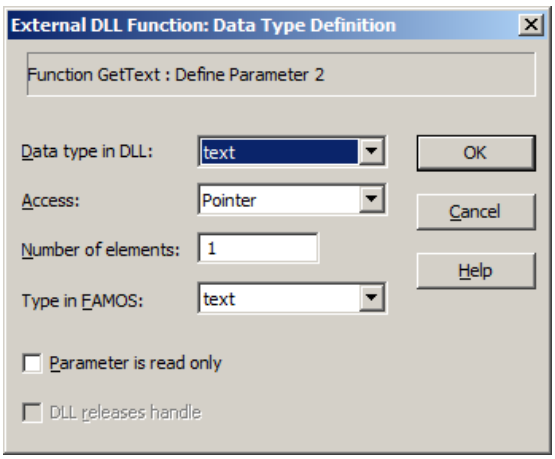
Types

Definitions for the return value and parameters are found in this list. To change definitions, select the corresponding entries and press "*Edit*" or double-click on the desired entry.

All like 1st

The settings for the first highlighted entry are copied to all subsequent entries.

Edit



Dialog: External DLL functions /data types

The dialog for defining parameters is called for the selected parameters; change individual settings in this dialog.

A parameter or return value of a DLL function is declared in this dialog. Specify the function name and the edited parameter in the text box in the upper corner of the dialog.

Data type in the DLL:

Specify here which data type the DLL function requires for this parameter. Specification of data types follows the type designations used in the programming language "C".

short	2 Byte signed integer	-32768..32768
ushort	2 Byte unsigned integer	0..65535
Int, long	4 Byte unsigned integer	-2.14e92..2.14e9
uint, ulong	4 Byte unsigned integer	0...4.19e9
longlong	8 Byte signed integer	-2^63...2^63
ulonglong	8 Byte unsigned integer	0...2^64-1
intptr	Signed integer; size like "longlong" (8Byte)	
uintptr	Unsigned integer; size like "longlong" (8Byte)	
char	1 Byte signed integer	-128..127
uchar	1 Byte unsigned integer	0..255
float	4 Byte real (floating point as per IEEE)	
double	8 Byte real (floating point as per IEEE)	
text	A DLL function is transferred to a FAR-pointer. The data type in imc FAMOS must also be text. Specify 1 for the number of elements.	

dsf	Additional information about a data set is necessary in imc FAMOS . To exchange simple data sets with a DLL, the structure DLL_WAVE was defined, which contains the measurement values and additional information. If you are already familiar with dynamic data exchange, this structure will be familiar to you. It is called **DDE_WAVE**. The structure is declared in the file DLL_WAVE.h, which is located on the imc FAMOS -installation medium in the folder Samples/DLLIFC32. Always transfer as a pointer or handle.
void	Only in result: no return value

Access

Provides information about transferring of the parameter or the return value. Parameters and return values can be transferred directly (one value) to the stack or as pointer or handle (one or several values, also >64KByte). Handles are here numbers which identify a memory block. Windows contains functions for accessing memory via the handles.

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Direct	Parameter transferred to stack , 1 value
Pointer	Parameter specifies address of data object in the global memory. A pointer is transferred to one or several values of the specified type.
Handle	Parameter is the identifier of a global memory object. A handle is transferred to one or several values of a specified type. A pointer can be created for the transferred memory using the Windows function "Global Lock". The DLL function must then release the memory block by using the function "GlobalUnlock".

Number of elements

The number of elements in direct access is always 1, otherwise the number of elements to be transferred from the particular data type. A '*' means that the length of the transferred curve defines the place. For example, if the DLL function expects double-values and a data set with 20 values is transferred, a buffer with 20 values * 8bytes = 160 bytes is transferred.

Type in imc FAMOS

This option specifies which data type should be generated or transferred in imc FAMOS .

Data	A data set or single value is transferred
Text	A text is transferred. Data type in the DLL must also be a text.
Void	Only in result: no return value

Parameter is Read-Only:

(Selectable only for pointer or handle access) The parameter is only changed by the function.

DLL releases handle

(Only in handle access) The DLL releases the global memory object. Otherwise the memory is released after returning the function in imc FAMOS .

Remarks

Each registered DLL function occupies memory and slows execution of the program. Register only those functions actually needed for your application.

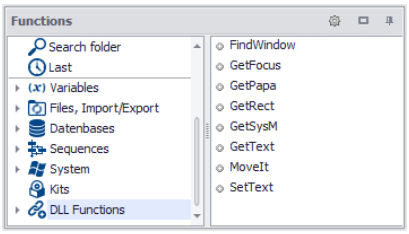
When installing imc FAMOS you can determine whether to include examples for programming your own DLL's in the installation. If you choose to do so, the examples are located in "DLLIFC32". Installing the examples can be accomplished at a later occasion, also.

On the imc FAMOS -installation medium, in the folder SAMPLES/DLLIFC32 there is an example of the programming and use of a user-made DLL.

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8.10.3 Calling external DLL functions

Once the DLL functions have been registered with "*Options/ Extensions: Register DLL-functions*", they can be selected from the function list @ "*DLL Functions*".



Double-clicking on a function's entry copies it into the editor box along with its parameter mask.

However, it is not possible to compose a description of the function in the output box.

If no DLL functions have been registered, the associated branch is not visible.

Example

The Windows system DLL "user32.dll" has a variety of functions available to other applications, which are described in the Microsoft- SDK (Source Development Kit). They make up a part of the Windows-API (Application Programmer's Interface). The functions GetActiveWindow() and GetWindowTextA() are parts of the application, which determine a reference to the active window or its title.

They are declared under Windows 95 as follows:

```
HWND _stdcall GetActiveWindow()
int _stdcall GetWindowTextA( HWND  FensterBezug,
char* Titel, int PlatzfürTitel)
```

HWND is an integer data type containing an access number to a window. In 32-bit applications it is 4 byte wide and in 64-bit applications 8 bytes.

Proceed as follows to use these functions:

1. Register the function GetActiveWindow()

Call the overview dialog of registered functions (menu option "*Extra/ Options/ Extensions: Register DLL-functions*") and then select the "*New*" button. This calls the declaration dialog for a function.

The following information is given in the declaration dialog:

DLL-Name: USER32
Function name: GetActiveWindow
Number of parameters: 0
Call: C

Double-click on "*Return..*" and the dialog for definition of the return value appears. Select the following setups:

Data type in DLL: intptr
Transfer: direct
Number: 1
imc FAMOS data type: data

Exit the last two dialogs with "*OK*". You are now in the overview dialog again and the function just defined is added to the list.

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2. Register the function GetWindowTextA(..)

Select the button "New" again. In the declaration dialog, the following setups are active:

DLL-Name: USER32
DLL function name: GetWindowTextA
Name in imc FAMOS : GetWindowText
Parameters: 3
Call: C

Now select all entries in the list and then the "*Edit*" button. In the parametrization dialog, set up as follows:

Return value: int, direct, 1, data
1st parameter: intptr, direct, 1, data
2nd parameter: text, Pointer,1, txt
3rd parameter: int, direct, 1, data

Exit the last two dialogs with "*OK*". You are now in the overview dialog again.

3. Saving the declarations

The settings just made should be stored in one file. Select the button "*Function list*" and the option "*Save as...*" in the open menu. Exit the dialog by selecting "*End*".

4. Call

Both functions are available via menu "*External*" in the submenu "*USER32*" and can now be called in imc FAMOS :

```
Text=""
GetWindowText(GetActiveWindow(),Text,255 )
```

The title text of that window active during function processing is determined. In this case, it is an (invisible) window with the title text "*imc FAMOS* ". Thus, after execution the variable "*Text*" has the content "*imc FAMOS* ".

Reference

- Microsoft SDK (Software Development Kit) documentation.
- After installing imc FAMOS , the Declarations-file "winfkt.def" can be found in the subdirectory "*DEF*", which also contains further declarations of Windows-internal functions.

- On the imc FAMOS -installation medium, in the subfolder SAMPLES/DLLIFC32, there is an example of programming one's own extention DLL.

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8.10.4 Tips for users of previous FAMOS versions

If you are transitioning from a 32-bit to a 64-bit system, or if you have even been working with a 16-bit version of imc FAMOS (<= Version 3.1) and thus have already used the general DLL-interface, please note the following:

Use of "home made" DLLs

DLLs must be provided in the appropriate architecture (32-bit/64-bit). In addition to some adaptations of the source text, this requires at least one re-compilation with the appropriate compiler/linker.

When porting a 16-bit DLL, note that under some circumstances the function's call convention changes (generally from PASCAL to C). For example, with the Microsoft-C compiler, the keywords "PASCAL" or "_pascal" can still be used. However, internally, these are translated internally to "_stdcall" and thus to conformity with C calling conventions. The declaration of the function in imc FAMOS must thus be adapted.

Regardless of the keyword specified, exported functions in 64-bit DLLs always conform to "Microsoft x64 calling convention".

Under certain circumstances, even the name under which the function is exported from the DLL can change; see the topic "Function name in the DLL", in the section '*Registering DLLs in imc FAMOS '* 335.

Use of Windows system libraries

Transitioning from imc FAMOS <= 3.1:

The Windows system libraries' names are distinguished from their 16 bit counterparts by a '32' appended to their names (e.g.: "kernel32.dll", "user32.dll", "gdi32.dll").

The calling convention from "PASCAL" to "C" has also changed.

When an old definitions file is loaded, these conversions are performed automatically and the user is informed by means of a message box.

Also not that the names of many system functions which require text as parameters have been altered to end with a appended "A".

For instance, the function "*GetWindowText*" is now exported under the name "*GetWindowTextA*". Therefore, the declaration in imc FAMOS for such instances must also be changed accordingly.

Transitioning to a 64-bit version:

The names of the system-DLLs are generally identical, e.g. "*user32.dll*". The version corresponding to the architecture of the calling program is automatically loaded.

Many system functions use an integer data type as the parameter, whose width is either 4 or 8 bytes, depending on the architecture. One example is the data type HANDLE or its specialization HWND (window-handle). When registering in imc FAMOS , these parameters should be specified as "*intptr*", in consequence of which the same function declaration can be used with both the 32-bit and the 64-bit versions of imc FAMOS .

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9 Functions Reference

You find details about the functions in the separate manual imc FAMOS Functions Reference.

9.1 Functions: German/English

All functions are listed below that differ in their English and German user settings.

German	English
ABCBewertung	ABCRating
Abfragen	Request
Ablage	Clipboard
AKF	ACF
Alle0	All0
Anweisen	Control
AnzeigeY?	DisplayY?
Applikation	Application
ASCSichern	ASCSave
Band	Clip
Bene	Ren
Benenne	Rename
BinÄr	Binary
Binde	Join
BoxAusgabe	BoxOutput
BoxNachricht	BoxMessage
BoxWert?	BoxValue?
BSichern	BSave
DateiName?	FileName?
DatFormat?	DataFormat?
DDEFrage	DDEInq
DDESende	DDESend
DDESetze	DDESet
DDETrenn	DDESepar
DlgDateiName	DlgFileName
DrDrucke	PrPrint
DrFenst	PrWin
DrKonfig	PrConfig
DrMove	PrMove
DrRdClip	PrRdClip
DrSetzen	PrSet
DrSicher	PrSave
DrTitleI	PrTitleI
DrTitleN	PrTitleN
DSPLaden	DSPLoad
Eff	RMS
Einheit?	Unit?
Ende	End

English	German
ABCRating	ABCBewertung
ACF	AKF
All0	Alle0
Application	Applikation
ASCSave	ASCSichern
Binary	BinÄr
BoxMessage	BoxNachricht
BoxOutput	BoxAusgabe
BoxValue?	BoxWert?
BSave	BSichern
CCF	KKF
chartosv	zeichent
Chrct	Kenn
Clip	Band
Clipboard	Ablage
ClsLvlCr	KlsDurch
ClsMaxSt	KlsMaxSp
ClsPeak1	KlsSpit1
ClsPeak2	KlsSpit2
ClsPeak3	KlsSpit3
ClsPkSmp	KlsSpsti
ClsRange	KlsSpann
ClsRFlow	KlsRflow
ClsRMean	KlsSMitt
ClsRngPr	KlsSPaar
ClsSampl	KlsStich
ClsSmSmp	KlsStsti
ClsTAtLv	KlsVweil
Cmp1	Kmp1
Cmp2	Kmp2
CmpX	KmpX
CmpY	KmpY
Color?	Farbe?
Com	Komm
Comm?	Komm?
Comment	Kommentar
Compl	Kompl
Control	Anweisen

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German	English
Entfernen	Delete
eRegr	eFit
EvnZahl?	EventNum?
ExitSequenz	ExitSequence
Farbe?	Color?
FASLaden	FasLoad
FiltTP	FiltLP
Formular	Layout
Ganz	Floor
GInt	MInt
Gla3	Smo3
Gla5	Smo5
Glatt	Smo
GrBinde	GrJoin
Gren	Cut
GrenIndex	CutIndex
GrKanalAdd	GrChanAppend
GrKanalEntf	GrChanDel
GrKanalFinde	GrChanFind
GrKanalName?	GrChanName?
GrKanalZahl?	GrChanNum?
GrNeu	GrNew
InGrad	InDegr
Ipli	Lip
Kart	Rect
Kenn	Chrct
KKF	CCF
KlsDurch	ClsLvlCr
KlsMaxSp	ClsMaxSt
KlsRflow	ClsRFlow
KlsSMitt	ClsRMean
KlsSPaar	ClsRngPr
KlsSpann	ClsRange
KlsSpit1	ClsPeak1
KlsSpit2	ClsPeak2
KlsSpit3	ClsPeak3
KlsSpsti	ClsPkSmp
KlsStich	ClsSampl
KlsStsti	ClsSmSmp
KlsVweil	ClsTAtLv
Kmp1	Cmp1
Kmp2	Cmp2
KmpX	CmpX
KmpY	CmpY
Komm	Com

English	German
Curve	Kurve
CurveSetup	KurveLaden
Cut	Gren
CutIndex	GrenIndex
CvAttrib	KvAttrib
CvAppendMarker	KvMarkerAnhängen
CvAskTitle	KvTitelAbfrage
CvConfig	KvKonfig
CvCursor	KvCursor
CvLoadGlobalSetting	KvGlobaleEinstellungLaden
CvPosi	KvPosi
CvRefDB	KvRefdb
CvReplaceChannel	KvKanalErsetzen
CvSave	KvSicher
CvSetCursor	KvCursorSetzen
CvTitle	KvTitel
CvUpdate	KvUpdate
CvVar	KvVar
CvWin	KvFenst
CvXAxis	KvXAchse
CvYAxis	KvYAchse
DDEinq	DDEFrage
DDESend	DDESende
DDESepar	DDETrenn
DDESet	DDESetze
Delete	Entfernen
DisplayY?	AnzeigeY?
DlgFileName	DlgDateiName
DSPLoad	DSPLaden
eFit	eRegr
else	sonst
Empty	Leer
end	ende
EventNum?	EvnZahl?
ExitSequence	ExitSequenz
FasLoad	FASLaden
FileName?	DateiName?
FiltLP	FiltTP
Floor	Ganz
GrChanAppend	GrKanalAdd
GrChanDel	GrKanalEntf
GrChanFind	GrKanalFinde
GrChanName?	GrKanalName?
GrChanNum?	GrKanalZahl?
GrJoin	GrBinde

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German	English
Komm?	Comm?
Kommentar	Comment
Kompl	Compl
Kurve	Curve
KurveLaden	CurveSetup
KvAttrib	CvAttrib
KvCursor	CvCursor
KvCursorSetzen	CvSetCursor
KvFenst	CvWin
KvGlobaleEinstellungLaden	CvLoadGlobalSetting
KvKanalErsetzen	CvReplaceChannel
KvKonfig	CvConfig
KvMarkerAnhängen	CvAppendMarker
KvPosi	CvPosi
KvRefDB	CvRefDB
KvSicher	CvSave
KvTitel	CvTitle
KvTitelAbfrage	CvAskTitle
KvUpdate	CvUpdate
KvVar	CvVar
KvXAchse	CvXAxis
KvYAchse	CvYAxis
Laden	Load
Lang	Leng
Lang?	Leng?
Lang?	Leng?
Leer	Empty
lg	log
Mitte	Mean
MrKanal?	MrChan?
MrLaden	MrLoad
MSichern	MSave
Oben	Top
Posi	Pos
PosiEx	PosEx
PosiEx2	PosEx2
PTastEx	RSampEx
PTast0	RSamp0
PTast	RSamp
Pulse	Peaks
Quad	sqr
Rampe	Ramp
Regr	LFit
Rez	Recip
sEff	sRMS

English	German
GrNew	GrNeu
if	wenn
InDegr	InGrad
Join	Binde
Layout	Formular
Leng	Lang
Leng?	Lang?
Leng?	Lang?
LFit	Regr
Lip	Ipli
Load	Laden
log	lg
Mean	Mitte
MInt	GInt
Mirror	Spieg
MrChan?	MrKanal?
MrLoad	MrLaden
MSave	MSichern
OctA	TerzA
OctI	TerzI
Peaks	Pulse
Pos	Posi
PosEx	PosiEx
PosEx2	PosiEx2
PrConfig	DrKonfig
PrMove	DrMove
PrPrint	DrDrucke
PrRdClip	DrRdClip
PrSave	DrSicher
PrSet	DrSetzen
PrTitleI	DrTitleI
PrTitleN	DrTitleN
PrWin	DrFenst
Ramp	Rampe
Recip	Rez
Rect	Kart
Red	Tast
Red2	Tast2
Rename	Benenne
Repl	Stück
ReplIndex	StückIndex
Request	Abfragen
RMS	Eff
RSamp	PTast
RSamp0	PTast0

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German	English
SegLang?	SegLen?
Sequenz	Sequence
SetAnzeigeY	SetDisplayY
SetDatFormat	SetDataFormat
SetEinheit	SetUnit
SetFarbe	SetColor
SetKomm	SetComm
SetSegLang	SetSegLen
Setze	Set
SetzeIndex	SetIndex
SetZeit	SetTime
Sichern	Save
Skali	Scale
sMittel	sMean
solange	while
sonst	else
Spek	Spec
Spieg	Mirror
sStreu	sStDev
StGren	SlClip
Streu	StDev
Stück	Repl
StückIndex	ReplIndex
SuchePegel	SearchLevel
Summe	Sum
Tast	Red
Tast2	Red2
TErsetze	TReplace
TerzA	OctA
TerzI	OctI
TKonv	TConv
TLang	TLeng
TTeil	TPart
TVerg	TComp
TxWo	TxWhere
TZeichen	SvToChar
TzuEw	TToSv
wenn	if
Wert	Value
Wert2	Value2
WertIndex	ValueIndex
WFTLaden	WFTLoad
Wurz	sqrt
xEinheit	xUnit
xMaxi	xMax

English	German
RSampEx	PTastEx
Save	Sichern
Scale	Skali
SearchLevel	SuchePegel
SegLen?	SegLang?
Sequence	Sequenz
Set	Setze
SetColor	SetFarbe
SetComm	SetKomm
SetDataFormat	SetDatFormat
SetDisplayY	SetAnzeigeY
SetIndex	SetzeIndex
SetSegLen	SetSegLang
SetTime	SetZeit
SetUnit	SetEinheit
Show	Zeigen
SlClip	StGren
sMean	sMittel
Smo	Glatt
Smo3	Gla3
Smo5	Gla5
Spec	Spek
sqr	Quad
sqrt	Wurz
sRMS	sEff
sStDev	sStreu
StDev	Streu
Sum	Summe
svtochar	tzeichen
tcompare	tverg
TConv	TKonv
Time?	Zeit?
TimeAdd	ZeitAdd
TimeCopy	ZeitKopie
TimeDiff	ZeitDiff
TimeJoin	ZeitBinde
TimeSet	ZeitSetzen
TimeSplit	ZeitTeil
TimeSystem?	ZeitSystem?
TimeToText	ZeitInText
TLeng	TLang
Top	Oben
TPart	TTeil
TReplace	TErsetze
TToSv	TzuEw

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German	English
XYvon	XYof
yEinheit	yUnit
ZeichenT	CharToSV
Zeigen	Show
Zeit?	Time?
ZeitAdd	TimeAdd
ZeitBinde	TimeJoin
ZeitDiff	TimeDiff
ZeitInText	TimeToText
ZeitKopie	TimeCopy
ZeitSetzen	TimeSet
ZeitSystem?	TimeSystem?
ZeitTeil	TimeSplit

English	German
TxWhere	TxWo
Unit?	Einheit?
Value	Wert
Value2	Wert2
ValueIndex	WertIndex
WFTLoad	WFTLaden
while	solange
xMax	xMaxi
xUnit	xEinheit
xunit	xeinheit
XYof	XYvon
yUnit	yEinheit
yunit	yeinheit

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10 Sequences

10.1 Introduction

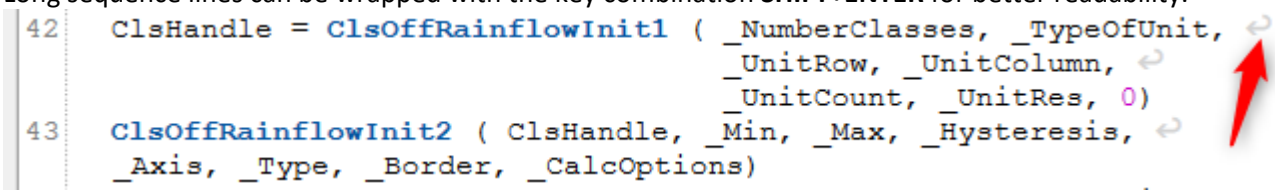
Sequences come with the editions imc FAMOS Standard, Professional and Enterprise.

A sequence, also called a macro, contains a series of formulas or commands which are executed in a definite order. Commands for sequencing control are available, e.g. loops and conditional branching can be realized in a sequence.

imc FAMOS has a series of commands especially for use in sequences. They control execution of the program, reproduce the function of menu options or influence predefined setups, which are usually set up using dialogs.

Sequences are created and processed line-by-line. The editor box in the imc FAMOS main window provides the necessary development environment to create, test, execute and save your sequences. It unites the functionality of a text editor with the ability to execute sequences either completely or step-by-step.

Long sequence lines can be wrapped with the key combination **SHIFT+ENTER** for better readability.



The symbol for line break by SHIFT+ENTER

Sequences can be parameterized, meaning that the sequence text can be composed containing placeholders which are replaced with updated parameter values upon being called. Special functions also allow the user to query numbers and texts while the sequence is being processed.

Sequences can also be nested, meaning that one sequence can appear as a subroutine within another sequence.

Sequences can be assigned to the "Favorites" list. This allows quick access to the sequences and can also store a help text for the function and the necessary parameters.

Sequences and dialogs can be saved in a **password-protected file format**. This lets you prevent other persons from editing, reading or copying the sequences.

Example

```
FAMOS
LOAD     Slope
SHOW     Slope
Root   = SQRT (Slope)
Save     Root
```

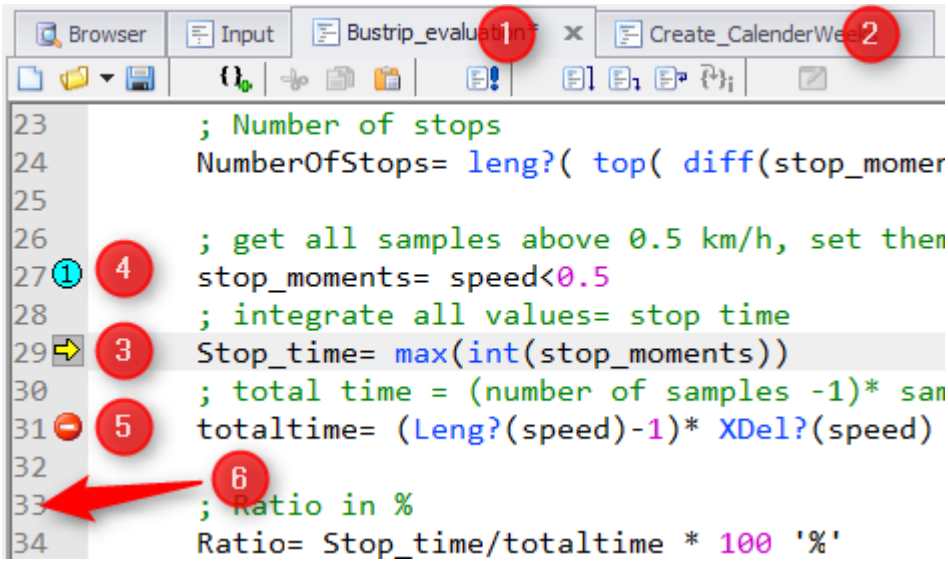
This sequence consists of 5 lines. The following tasks are performed during execution of this sequence:

- The imc FAMOS file format is set up.
- The file "*SLOPE.DAT*" is loaded and the variable "*Slope*" created.
- The variable created is displayed as a curve.
- A formula is calculated and generates the new data set "*Root*".
- The new variable "*Root*" is saved.

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10.2 Sequences and the Editor box

The Editor box is the workspace in which sequences can be created, tested, executed and managed.



The figure shows a sequence named "*Bustrip_evaluation*" **[1]**, whose contents are currently being displayed. Another sequence **[2]**, "*Create_Ca...*", is also open and could be displayed by clicking on its index rider. To the left of the actual sequence text, some special symbols or buttons are visible, namely the "**Execute**"-button **[3],** the identifiers for a **bookmark [4]** and a **breakpoint [5]** and the **line numbers[6]**, which you can activate in the options 101.

In the text input box, you can enter commands in the usual manner, and the usual editing functions like copy, paste and cut are all provided. Note that each command must be on its own line, empty lines are also permitted.

The commands for editing and running sequences can be called via

- the imc FAMOS main menu, submenu "*Sequences*",
- context Menu #1 (accessed by right-clicking the mouse on the title bar of the editor box, also referred to as the "*title bar context menu*"), which mainly contains commands for administering (Load, Save) and for running sequences,
- context Menu #2 (accessed by right-clicking the mouse on the text input area, also referred to as the "*text box context menu*"), which mainly contains commands for editing sequence text,
- the toolbar below the editor box title bar.

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Reference

Basic operation of the editor box is already explained in the chapter 'User Interface / Editor box' 93.

Also refer to that chapter to learn of important editing options going beyond the usual text editor functionality; these mainly include:

- using the "*Execute*"-button to display the active line and to execute it (double-click or ALT+ENTER to set the active line, click on "*Execute*" or CTRL+ ENTER to run a line),
- switching of the sequence displayed using the mouse (click on rider) or keyboard ([SHIFT] + CTRL +TAB),
- transferring of the names of variables and functions from the Variables and Functions list (by double-clicking in the list or using drag&drop),
- context-sensitive calling of Qickhelp text (click on function) and Assistant for functions (SHIFT+F1), parameter-tips, data-tips
- automatic indent formatting which reflects the sequence hierarchy structure,
- bookmarks for quick location of sequence lines,
- insertion of predefined boilerplate text for algorithm structures
- finding and replacing of text.

Various presettings concerning sequence display, editing and execution can be made in the dialogs "*Extra / Options / Editor*" and "*Extra / Options / colors*".

Sequences can also be integral components of user-defined dialogs (so-called 'event-sequences'). When editing and testing event sequences, certain peculiarities must be observed, which are described in the section 'User-defined dialogs' 545.

Note Attention when using special characters

imc FAMOS sequences are not saved in Unicode, but in the current character set. When one saves a sequence file under a German Windows OS, which contains the character "Ä" among others, then when the file is loaded under Chinese Windows, this character is replaced with a Chinese character. In Chinese FAMOS,a font is selected for the Sequence Editor which uses the Chinese character set.

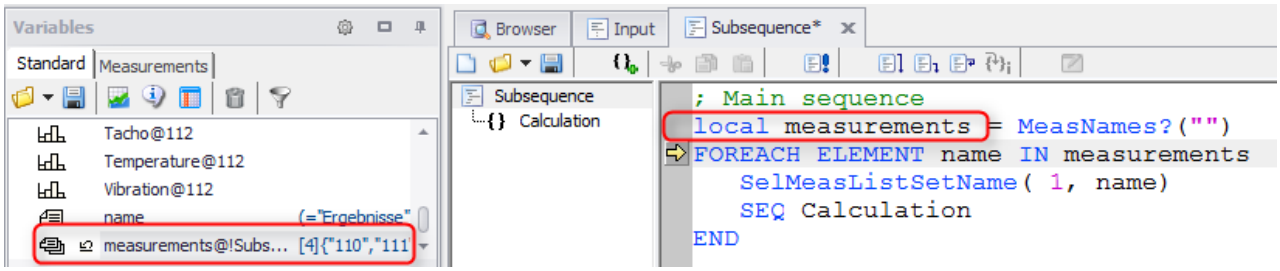
This also applies to units. Thus, a testsequence must also be created with special characters with the appropriate font for the respective language.

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10.2.1 Local variables

Temporary variables that are only needed during execution of the sequence can be created with the addition "local". After execution of the sequence, they are automatically deleted. During execution they appear in the variable list with the syntax: VarNameq@SeqName

Example



Reference

Detailed description of "Local Variables 309".

10.3 Managing sequences

The commands described below for creating, loading, and saving sequences can be found in the editor box title bar context menu, in the main menu "*Sequence*" and partly in the Editor box toolbar.

10.3.1 Creating a new sequence

A new sequence, as yet empty can be made using the menu command "*New*" in the title bar context menu or by using the corresponding button in the toolbar.

The sequence is given the default name ("*Unnamed*" + running number) and is displayed in the editor box.

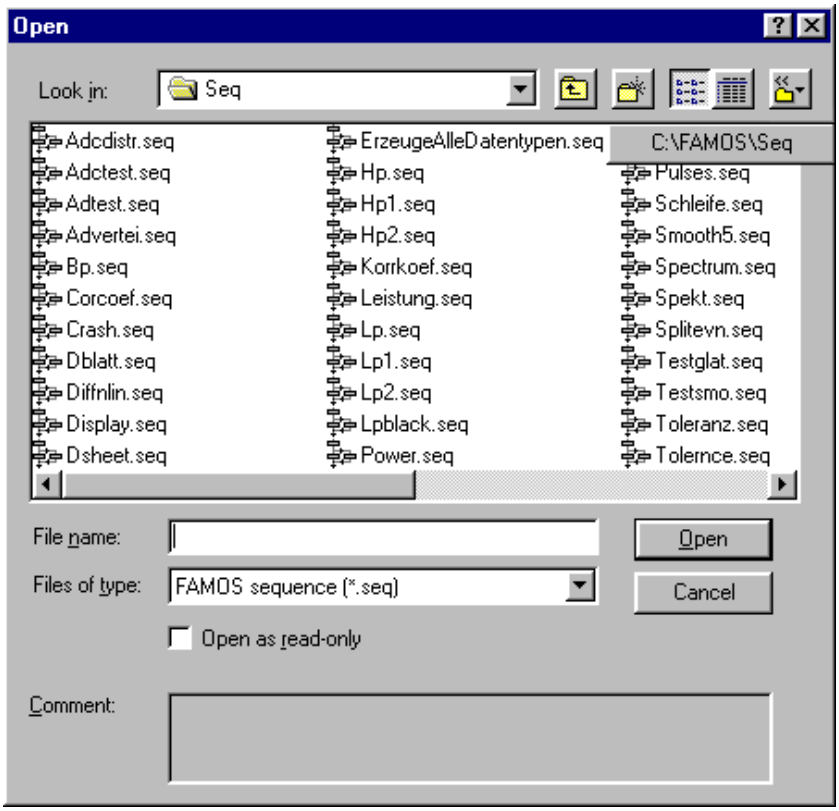
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10.3.2 Loading a sequence



To load an existing sequence, use the command "Load" in the context menu or the corresponding button in the toolbar.

A dialog appears from which the desired sequence file can be selected.



Dialog: Load sequence file

This dialog for selecting a file has a few special features. The dialog starts up displaying the sequence directory used. When imc FAMOS is started this is initialized according to the setting in the dialog "*Extra / Options / Folders*".

The toolbar at the upper right has an additional button:

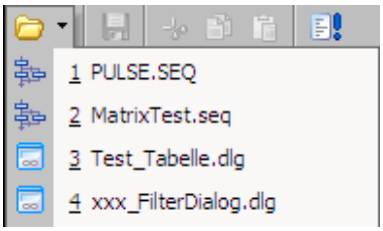


Clicking here with the mouse causes a small menu offering the last sequence directories used to appear. Selecting a menu entry is a quick way of switching directories.

The comment box in the lower portion of the dialog shows whatever commentary exists for the currently highlighted sequence. Such commentary can be entered upon saving a sequence.

When the dialog is closed by pressing <OK>, the selected sequence is loaded and displayed in the editor box.

If you click in the toolbar on the arrow next to the Load-icon, a small menu offering the sequence files last used appears.



Here you can select a file for loading directly.

The same menu can also be accessed in the main menu "*Sequence / Last sequences >*".

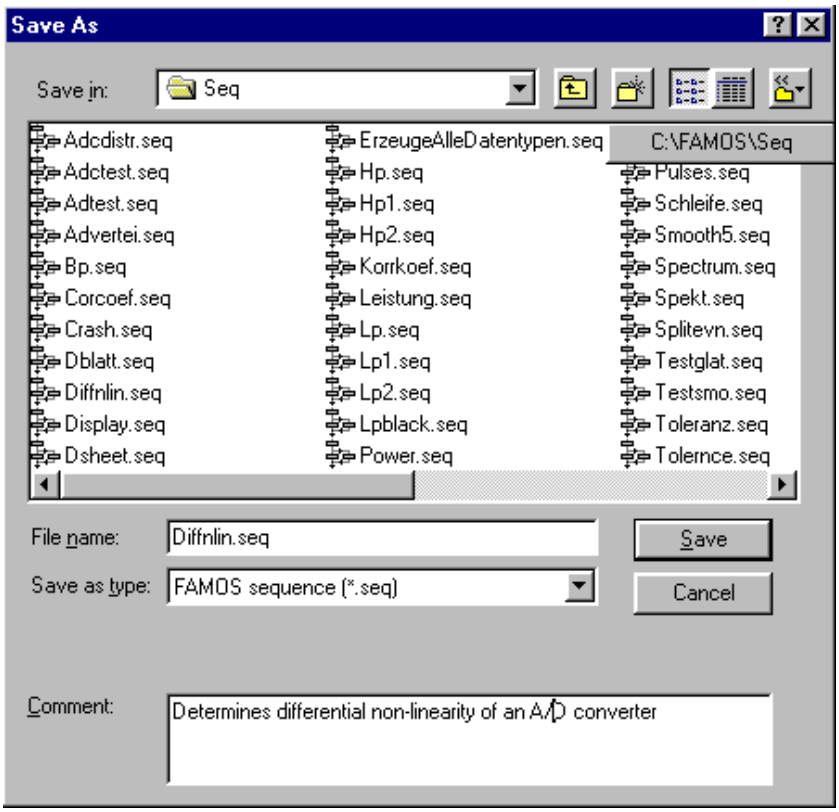
Note

Instead of a sequence-file, you can also open a dialog file (extension: *.dlg). Then in the editor box, the event sequences belonging to the dialog are indicated. At the same time, the file is opened in the Dialog-Editor so that it's possible to edit the dialog's graphical presentation. For details, see the chapter 'User-defined dialogs 545'.

10.3.3 Saving a sequence

To save the active sequence in the editor box to a file, use the menu item "*Save*" or the corresponding icon in the toolbar.

If you wish to change the name or location of the sequence or comment, use the menu item "*Save as...*".



Dialog: Save sequence file

The dialog starts up with the current sequence folder. After imc FAMOS starts, this is initialized according to the setting in the dialog "*Extra / Options / Folders*".

Just like the file dialog or loading sequences, this dialog also comes with an extra icon in the toolbar and a comment box.

Clicking on this icon opens a **menu offering the last sequence folders used.** Selecting a menu entry is a quick way of switching folders.

In the **comment box**, any comment on the sequence desired can be entered. Typical comments would be a short description of the sequence along with the parameters needed to call it.

In the dialog "*Extra / Options / Editor*", you will find the presetting "***Save breakpoints and bookmarks***". If this option is activated, the positions of any breakpoints and bookmarks is saved along with the file and restored upon the next load command.

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Write-/Read-protection

You can also save sequences with read-/ write-protection. To do this, select in the dialog the file type.

imc FAMOS -Sequence (protected) (*.seq)

For details, see the segment "*Write- and read-protection for sequences and dialogs* 364" in this chapter.

Remarks

The file comment, plus specifications regarding bookmarks and breakpoints are savedd in the file in a permanent header in the form of lines of comments. **Older versions of imc FAMOS prior to Version 4.0** display this header. The lines of comment will not affect execution of the sequence, but their appearance may cause confusion due to their being hidden. Therefore, if you intend to use your sequences also in older versions of imc FAMOS , you should leave the commentar box empty and also deactivate the option "*Save breakpoints and bookmarks*".

Note

Instead of a sequence-file, you can also save a dialog file (extension: *.dlg). The complete dialog is always saved, including the event sequences belonging to it, and its appearance as defined in the Dialog-Editor.

10.3.3.1 Write- and read-protection for sequences and dialogs

When transferring sequences or dialogs to other imc FAMOS users, it is often desirable to protect them against unintentional editing, or even to prevent the display of the sequence codes generally. For that purpose sequences and dialogs can be saved in a password-protected file format. Such files provide only limited access unless a password is entered. Nevertheless, the code can be run without any restrictions (using a SEQUENCE-command or respectively, a Dialog()-function), so that the files can either be integrated into the user's own analysis routines, or run at the push of a button as a defined favorite. As always, such sequences and dialogs can also be opened via the imc FAMOS input box and then started via "*Sequence"/"Run*"

Protection types

Two types are distinguished:

Write-protection:

Both data types can be opened and displayed using the imc FAMOS input box, but are protected against editing. All debug options in the input box such as running of single steps and breakpoints are also allowed.

Typically used for distributing sequences within a company, while preventing the sequences from accidently being altered by the user.

Read-protection:

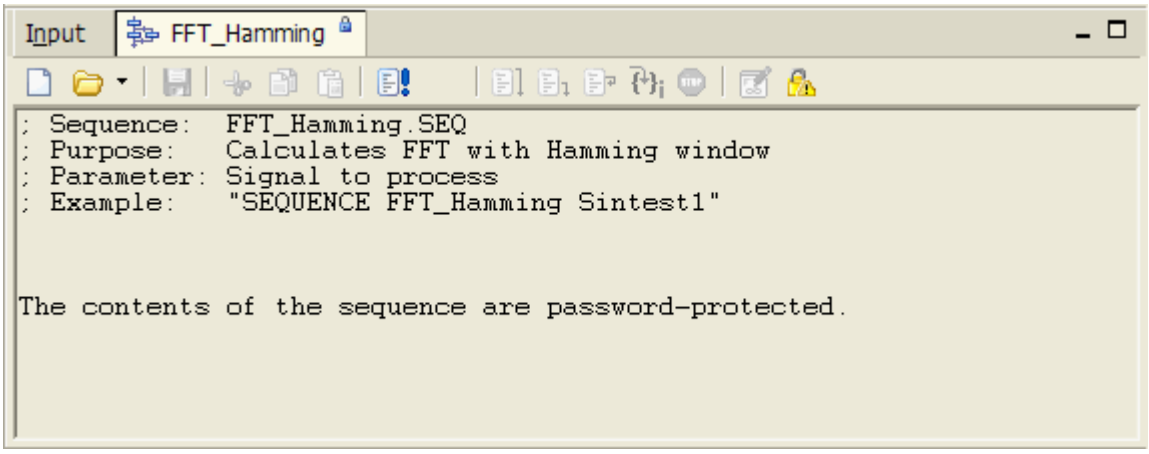
Both file types can be opened and run in the imc FAMOS input box, but the source code of the sequence(s) is not displayed. The imc FAMOS input box only posts a message prompting the user to enter a password for enabling the display.

Typically used for passing sequences to external users without revealing the exact code and algorithms used.

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Introductory comment

Special feature: If a sequence begins with a comment (each line is headed by a semicolon), then this introduction is always displayed, independent of the Write-/Read-Protection. The sequence's author thus has a possibility to inform the user about the purpose and use of the sequence and about any parameters required.



Introductory comment always shown

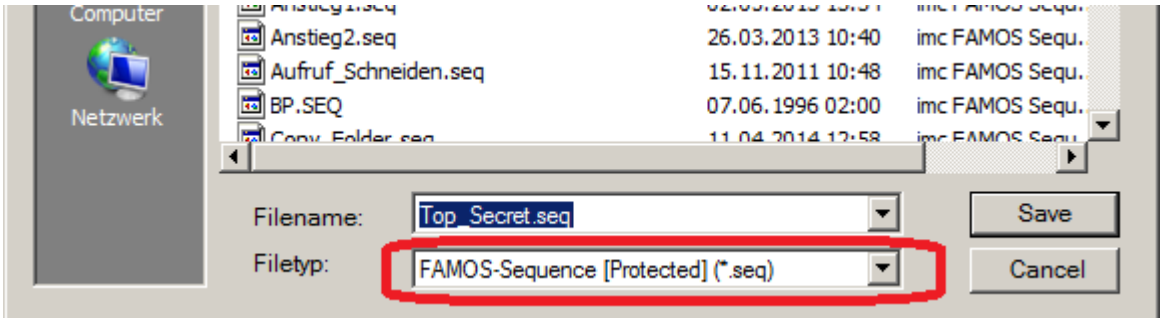
Default password:

In the dialog "*Extra"/Options*" - "*Editor*", a default password can be specified. If a file is to be saved with password protection, the user must enter a password to obtain access, and the password specidied here is the default password.

When a password-protected file is opened, the file password is automatically compared with the default password recorded here. If the two passwords match, the file is automatically enabled.

Saving protected files:

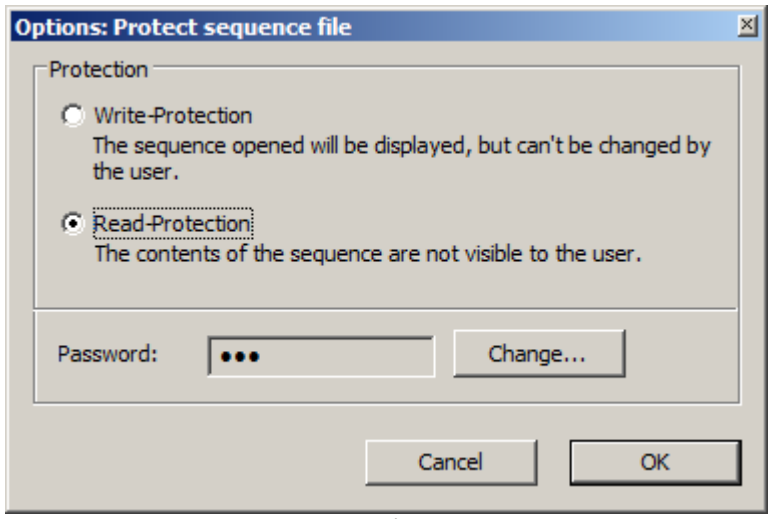
To save a sequence or dialog with password protection, click to select the option "***imc FAMOS -sequence [protected]***" or "***imc FAMOS dialog file [protected]***" in the respective file selection dialog under File type.



After clicking on the button "Save", the following dialog appears:

Write-protection / Read-protection:

Determines the type of access protection.



Dialog for write-/read-protection

Password:

Sets the password. The default password recorded in "*Extra"/"Options*"- "*Editor*" is initially suggested. By clicking on the "*Change*" button, it is possible to enter a different password.

Be sure to remember the password entered here - without it, you will no longer have access to your own files!

Note

When **passing protected files to others**, be aware that the recipient must be using the **imc FAMOS version 5.0 Revision 7** or higher. Older imc FAMOS versions are not able to read this file format.

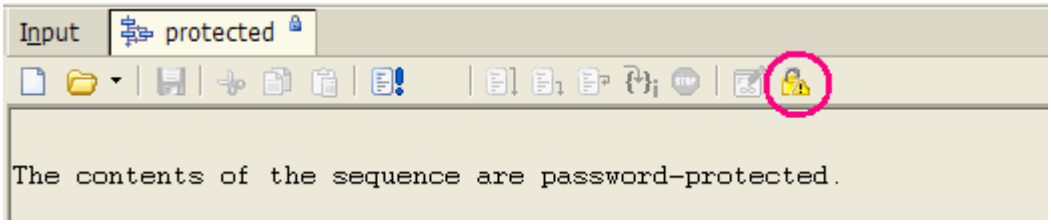
Also, note that when passing on sequences with read-protection, any introductory comment is still visible. As the author of the sequence, it can be used to inform the user about the sequence's purpose and use and about any parameters required.

Opening protected files

imc FAMOS input box

When a password-protected file is opened with the imc FAMOS input box, the file password is automatically compared with the default password specified under "*Extra"/"Options"- "Editor*". If the two passwords match, the file is automatically enabled.

Otherwise, the file is initially opened with limited access rights. In the input box's toolbar, an new additional symbol ("Padlock") appears.



Symbol for write-/read-protection

To unlock the file, click on this button. You are next prompted to enter the password. Once it has been entered correctly, the write-protection is canceled/ the sequence contents are displayed.

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imc FAMOS Dialog Editor

When a protected dialog file is opened with the imc FAMOS Dialog Editor, the password entered is at first compared with the default password which was set under "*Extra"/"Options*"- "*Editor*". If the two passwords match, the file is automatically enabled and the user obtains complete access rights.

Otherwise, opening of the file is only continued once the correct password has been entered.

10.3.4 Closing sequences

You can close any sequence no longer needed by accessing the menu item "*Close*" in the main menu "*Sequence*" or in the title bar context menu.

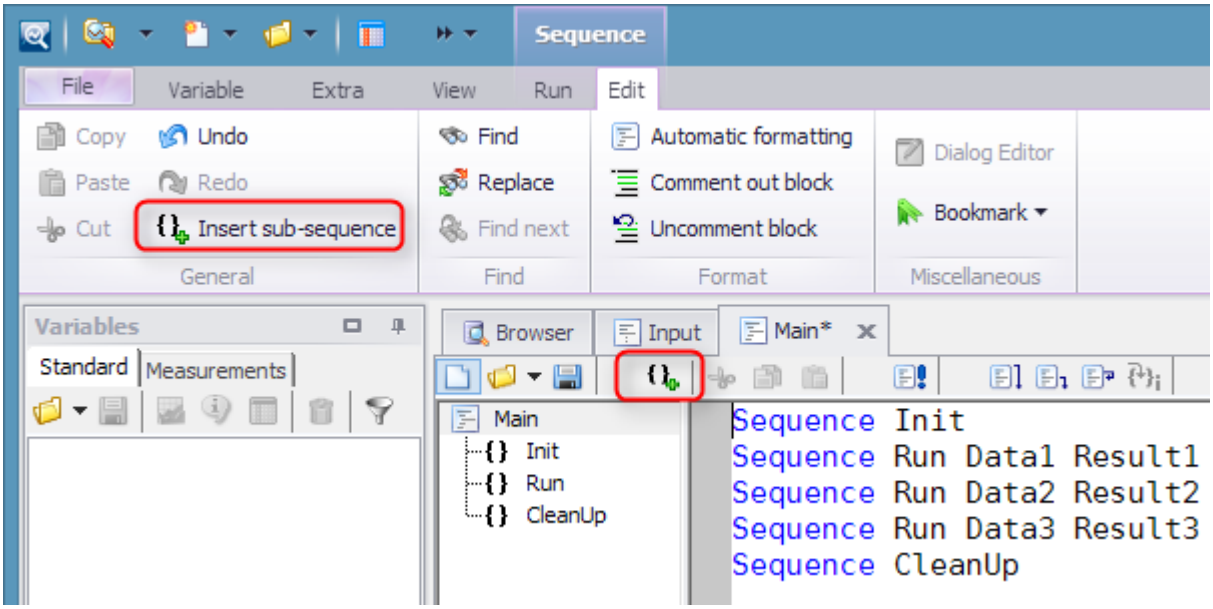
If the current state of the sequence is not yet saved, you must first respond to a confirmation prompt before you can exit.

Note

When a dialog's event sequence is concerned, the complete dialog is closed. If the dialog is also being edited in the Dialog-Editor, it is close there, as well.

10.4 Sub-Sequence

As of FAMOS 7.1, sub-sequences can be directly embedded in the calling sequence and no longer need to be saved as separate sequence files.



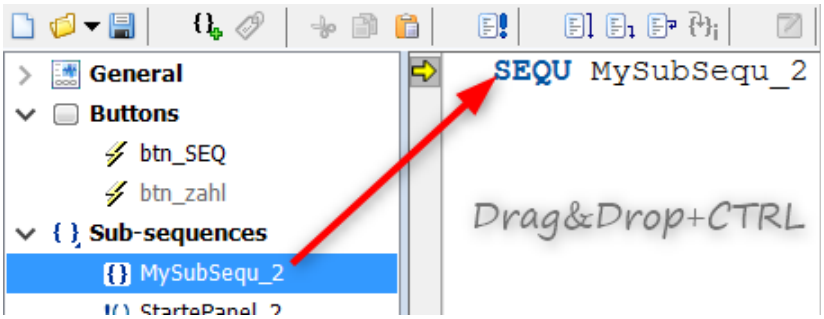
New icon in the Sequence toolbar and in the menu "Edit/General"

Rules for the naming of sub-sequences:

- Maximum of 64 characters
- Only letters, digits or underline. No spaces or other special characters.
- First character may not be a digit.
- Must not be the same as the title of another sub-sequence.

Dialogs, panels and sequences with existing sub-sequences

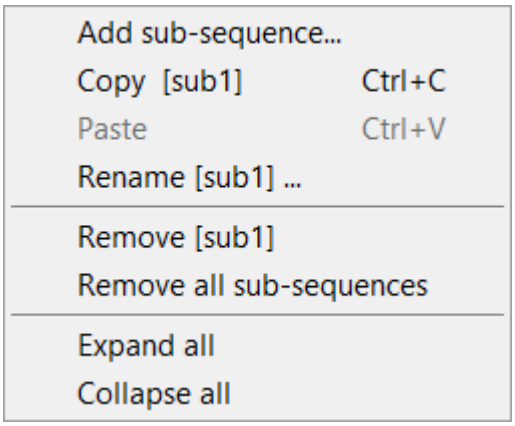
Drag&drop: As a convenient aid in making entries, it is possible to drag the name of a sub-sequence into the an event's code while holding down the CTRL-key. imc FAMOS will then create an entry *SEQU <Name of sub-sequence>*. With sequence functions, the call mask is also inserted.



Note

- For imc FAMOS versions older than Version 7.1, the following applies:
  - **Dialogs** and **Panels** containing sub-sequences can **not** be loaded with older FAMOS versions.
  - Sequences having sub-sequences can be loaded but not run. The sub-sequences are then embedded in the text using BEGIN_SUB and END_SUB so that they can be saved as independent sequences.
- **Find/Replace** is performed across all sequences of a group (dialog/panel/sub-sequences). In the Find- and Replace dialogs, additional options become accessible.
- **Print**: Panel-/dialog sequences are printed out as a compound document. If the currently displayed sequence is part of a sequence group, an appropriate option becomes accessible under File/Print.

10.4.1 Context menu in the Sequence tree diagram



The context menu of the sequence tree contains entries for ***removing*** all or the selected sub-sequence. You can create a new subsequence on the basis of an existing one with the commands "***Copy []***" and "***Paste***" or an empty sequence with "***Add sub-subsequence...***".

With "***Rename []...***" you can change the name of a subsequence afterwards.

Expand/Collapse all controls the folding of the sequence tree diagram.

10.5 Testing and running sequences

The following sections describe how to test and run sequences in the editor box. Certain particular features apply to event sequences in dialogs; see the chapter "***User-defined dialogs***" for details.

Sequences saved with read-protection are not displayed after loading and therefore cannot be tested step-by-step.

Note

As a practical way to use sequences, they are generally not loaded explicitly into the editor box, but called directly using the SEQUENCE-command. This call can, for instance, be entered in the editor's default input box and then executed. It is more convenient (and especially sensible in connection with parameter-less sequences) to place such a sequence call among the "Favorites" in the Functions list. Then you simply start your sequence with a double-click.

The same goes for user-defined dialogs, as far as applicable. These are called by means of the function *Dialog*.

The following commands and aids for testing and running sequences in the editor box are available.

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10.5.1 Run [F7]

The current sequence is run completely, starting with the first line; any breakpoints set are ignored.

If any errors occur during the processing of the sequence, the run is interrupted and the position pointer indicates the text line with the error.

If an event sequence is concerned, the associated dialog is started over from the beginning.

10.5.2 Run line

The active line is run. Instead of selecting the menu item, you can simply click on the "*Run*"-button next to the active line.

10.5.3 Start (Debug) [Ctrl]+[F7]

The current sequence is run completely, beginning with the first line. Breakpoints are observed, which means that running of sequence comes to a stop when a line having a breakpoint.

If no breakpoint is set, the same thing happens as in the case of "*Run*".

If an event sequence is concerned, the associated dialog is started over from the beginning.

10.5.4 Resume [Shift]+[F7]

Processing of the current sequence continues from the active line.

This command is used to resume execution of a sequence after a breakpoint was observed or the correction of a defective command line was performed. Running of the sequence halts again at the next breakpoint or error located, otherwise processing of the sequence continues till the end.

If no breakpoint is set, the same thing happens as in the case of "*Run*".

If an event sequence is concerned, the associated dialog is started over from the beginning.

10.5.5 Single step [F9]

The active line of the current sequence is run and then the next line is made active.

This lets you test a sequence step-by-step and evaluate the results of each individual line. However, if the active line contains a call to a subsequence or dialog, the entire subsequence or dialog is processed.

10.5.6 Single step in subsequence

This is basically the same as for "*Single step*", except when it comes to calling a subsequence (SEQUENCE-command) or a dialog (function: *Dialog*) in the active line.

In the former case, the subsequence is automatically loaded, displayed and the first line is activated. In the latter case, the dialog is opened and execution stops at the event sequence's first line.

Then you can continue to work through the subsequence step-by-step.

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10.5.7 Behavior in case of error

If an error is encountered during processing of a sequence, processing is halted. If the error occurs within a subsequence, it is automatically loaded and displayed in the editor box. The line with the error is activated and an error message is displayed which prompts the user to acknowledge it before disappearing. In addition, a detailed description of the error appears in the imc FAMOS output window.

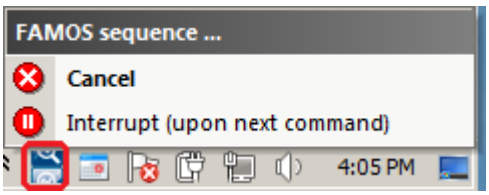
If possible, the line with the error can be corrected immediately and processing of the sequence can be resumed by using the command "*Resume* 370" (or even "*Single step* 370"). After correction has been performed, the altered sequence or dialog should be saved.

Reference

Notes on possible error messages can be found in the chapter 'Functions', section 'Error and warning messages 329'.

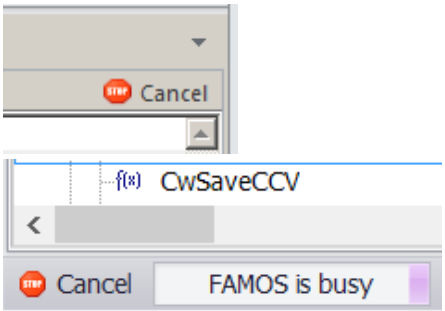
10.5.8 Cancelling/interrupting sequence runs

While a sequence or dialog is being processed, imc FAMOS cannot be operated; the sequence or dialog must first be completed or aborted



A running sequence is indicated in the Windows' taskbar's notification area by an extra symbol. Right-clicking the mouse calls a context menu which offers a command for interrupting the current run.

- "*Cancel*" completely ends the sequence or dialog running.
- "*Interrupt (upon next command)*" interrupts the run before the next sequence line is processed. Under some circumstances, the sequence involved is loaded to the Editor box. In this way, the results of the previous sequence processing can be viewed, for example, and the processing can be resumed by means of the command "*Resume* 370" or "*Single step* 370"



Further, a cancel-icon appears at the top right of the Editor and at the button left of the main window.

Please note that the sequence can only be interrupted between two command lines, not within a function in progress. If a time-consuming operation is currently running, for example a long FFT, it must first be completed before the sequence can be stopped.

Sequences can also interrupt themselves by means of "*breakpoints*", which are described in the next section.

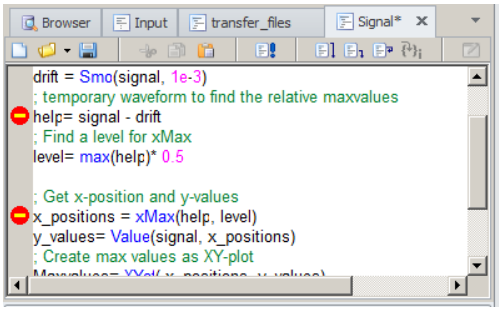
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10.5.9 Breakpoints

Breakpoints are a useful aid in testing long sequences.

If a sequence run is initiated by the commands "*Start (Debug)* 370" or "*Resume* 370", processing is interrupted in any command line containing a breakpoint. The user thus gets the chance to look at the results of sequence processing up until then and can resume processing using *Resume* 370" or "*Single step* 370", as appropriate.

The position of a breakpoint is denoted by a red stop-symbol at the left of the corresponding row:



Sequence with two breakpoints

To place or remove a breakpoint, position the cursor in the desired command line and select the menu item "*Toggle breakpoint on/off* 96 " in the text box context menu, or use the combination of keys "*CTRL*"+"*B*".

To remove all breakpoints in the current sequence, use the menu item "*Advanced / Delete all breakpoints* 136" in text box context menu.

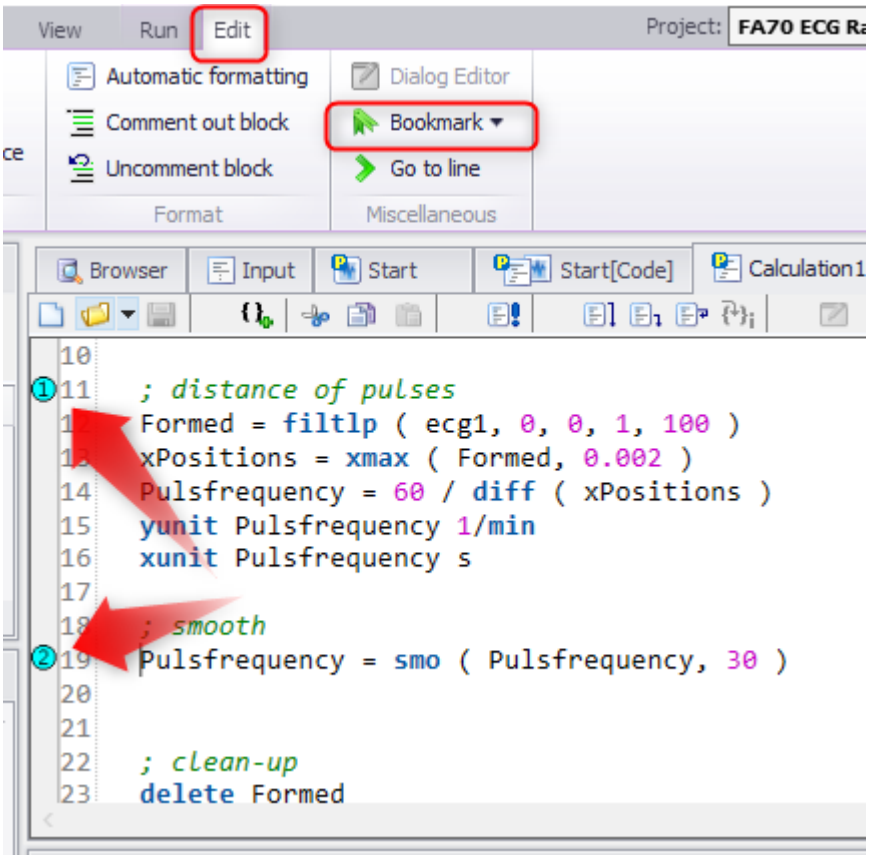
You can move a breakpoint to another line using drag&drop.

Note

When saving a sequence, the breakpoint positions can optionally be saved, too. See the dialog under "*Extra / Options / Editor*"; the option "*Save breakpoints and bookmarks*".

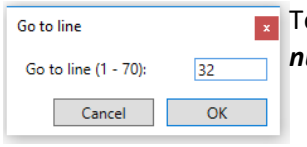
10.5.10 Bookmarks

When entering and testing long sequences, it's sometimes useful to be able to highlight certain command lines, so that it's possible to jump back to them at will. Such a highlight is called a bookmark, and the necessary commands are available in the "*Advanced*" submenu in the editor box context menu or the menu "*Edit* 136". Up to 10 bookmarks can be defined, and numbered (0..9) for identification purposes. A bookmark is indicated by a corresponding symbol to the left of a command line:



Editor box with 2 bookmarks set

To set a bookmark, position the cursor at the desired line use the combination of keys ***CTRL + number*** (number = 0...9). To delete the bookmark, press the CTRL key together with the desired bookmark's number again.



To jump to a particular bookmark, use the combination of keys ***ALT + (bookmark ID number)*** or open the "*Go to line*" dialog from the edit menu 136.

To find the next bookmark, use the combination of keys ***CTRL + F2*** (to go forwards) or ***SHIFT + F2*** (backwards).

The combination of keys ***CTRL+SHIFT+F2*** deletes all defined bookmarks.

All of these commands are also accessible via the context menu.

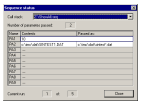
Optionally, the bookmark positions can be saved along with the actual sequence and thus be restored upon re-opening of the sequence; see the topic "Saving, sequence protection 103" for details.

A bookmark can be moved to another line using drag&drop.

10.5.11 Sequence-Status

If the sequence is interrupted during execution, for instance, due to an error or breakpoint or because the sequence is being run in single step mode anyway, a dialog can be called via the menu item "Sequence-Status" in the title bar context menu, which provides various information on the status of sequence execution.

This dialog is mainly useful if processing of a sequence was stopped within a subsequence.



Dialog: equence-statu

In that case, you obtain information here about which sequence or dialog called the subsequence and which parameters were passed. This is especially good to know if the sequence was called using wildcard parameters, which implies that the sequence was called repeatedly. In this case you obtain, for instance, the number of the current sequence run and the parameter value transferred in this run.

Call stack:

Shows the name of the current sequence and the order in which this sequence was called by higher-level sequences.

Number of parameters passed

Number of parameters to be passed upon calling.

Contents / Passed as

ADisplay of parameters actually passed. In the case of parameters with wildcards, the original, unexpanded parameter is additionally displayed.

Current run:

Display of the current run and the total number of runs which are to be processed by means of expanding a wildcard parameter.

Reference

See the section 'Processing folders' 378 in this chapter for more info on using wildcards.

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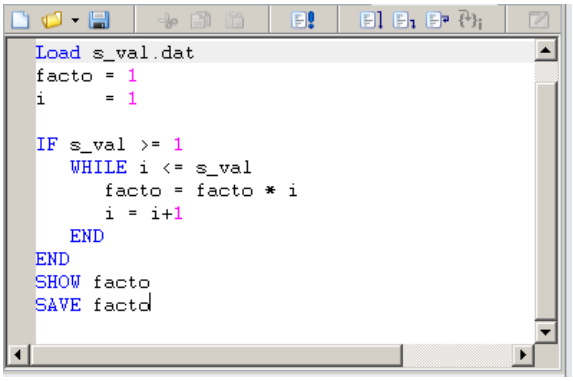
10.6 Sequence commands

imc FAMOS has several sequence-commands available especially designed for use in sequences. These commands control the program run, reproduce functions from menu options or influence preferences, usually set in the dialogs. The commands are divided into the function group "*Sequences*".

As with functions, Short-help is also available for commands. Commands can also be parametrized using the Function Assistant.

Example

A short sequence is shown, in which a single value named "*s_val*" is loaded, its factorial calculated, displayed and saved under the name "*facto*".



Editor box with sample sequence

The elements written in uppercase letters are sequence-commands. Sequence-commands have slightly different syntax than other functions. The parameters are usually separated from the command by a space rather than by a comma, and are not enclosed in parentheses. Commands can't be used in assignments, since they don't have return values.

All commands can be abbreviated, but the first four letters are necessary for correct identification. Lower case and upper case letters are treated the same, so commands may be written in either or both. The following commands have the same meaning:

```
SHOW      VAR
SHOW      vAR
show      var
show      Var
```

All "sequence commands" are listed alphabetically and by group in the next chapter.

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10.7 Sequences with parameters

10.7.1 Concept

Sequences can be written with set variable names:

```
Load slope
Show slope
```

This sequence is suitable only for loading and displaying the variable Slope. If another variable should be used in the sequence, the variable name must be changed accordingly:

```
Load sintest1
Show sintest1
```

It is more suitable to use general variable names in the sequence, which are then replaced by the current name each time the sequence is called. These names are specified as parameters when calling the sequence. There are ***20*** general names available:

```
PA1, PA2,..., PA20
```

These parameters are designated as formal sequence parameters.

The observed sequence is rewritten using a formal parameter to

```
Load PA1
Show PA1
```

The count of parameters passed can be requested in the sequence by using the function *ParametersPassed*`()`.

10.7.2 Call

Sequences with formal parameters cannot be called with menu option "*Start*" in the Sequence Editor "*Run*" menu.

Use the command "*SEQUENCE*" to call such a sequence. The sequence must be stored, for example under the name *SHOW*. The sequence name is specified first, then the current parameters, which replace the formal parameters in execution of the sequence.

After storing the sequence, enter the line

```
SEQUENCE Show Slope
```

in the editor box and then execute this line. The program then searches for the sequence file in the current sequence directory. A complete path name can also be specified:

```
Sequence  C:\Users\Public\Documents\imc\imc FAMOS\seq\SHOW.SEQ  Slope
```

The sequence *SHOW* is executed, and the format parameter *PA1* is replaced by Slope at each occurrence. Slope is the first current parameter transferred to the sequence. It appears as if the sequence

```
Load  Slope
Show  Slope
```

is executed. The following call is also possible:

```
Sequence  Show  Arc
```

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10.7.3 Multiple parameters

An example of a sequence with several parameters is a sequence which multiplies two variables. This sequence should be stored under the name *MULTI*:

```
PA3 = PA1 * PA2
```

Note that it is necessary for you to surround the parameters *PA1, PA2, PA3* with spaces, so that they are replaced when called.

For example, consider the following function call:

```
Sequence  MULTI  Slope  Slope  Square
```

When the sequence is called, *PA1* is replaced by the first parameter specified, here Slope; in the same manner, *PA2* is replaced by the second parameter specified. Finally, *PA3* is replaced by Square, so that the following operation is executed:

```
Square = Slope * Slope
```

When sequences are called with the command "*SEQUENCE*", the number of parameters transferred is not checked. If the sequence *MULTI* is called with only two parameters, the third is not replaced by a current parameter and remains in execution as *PA3*. In calling

```
Sequence  MULTI  Slope  Slope
```

the operation

```
PA3   = Slope * Slope
```

is executed. The variable PA3 is created and entered in the variable list under this name.

You can find the **count** of parameters using the function **VarGetInit(4)**.

```
ParCount = VarGetInit( 4)
SWITCH ParCount
   CASE 2
      ; ok, PA1 and PA2 have been specified
   CASE 1
      ; PA2 is missing, so apply default value
      PA2 = 2
   DEFAULT
      BoxMessage("Error", "Error upon calling", "!1")
      EXITSEQUENCE
END
```

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10.7.4 Comments

In creating sequences with parameters, the parameters should always be sufficiently documented.

Single-line

Use a semicolon to introduce a comment:

```
Comm Sequence MULTI
Comm Multiplication of 2 factors
;***  PA1 : 1st factor
;***  PA2 : 2nd factor
;***  PA3 :    product
PA3 = PA1 * PA2  ; multiplication
```

In older sequences, you may still find the command "*COMMENT*" (abbreviated COMM).

```
Comm Sequence MULTI
Comm Multiplication of 2 factors
```

Commenting out a multi-line block

Multiple lines can be encompassed within the characters (* .... *) and commented out.

The context menu in the editor also contains the commands Ctrl+K and Ctrl+U 97, which serve the purposes of commenting out/including selected lines of code. A semicolon precedes comments in such cases.

Remarks

Sequences may also contain **blank lines** to improve their structure. Comments may be inserted in the same line to the **right next** to the assignment, in which case the comment must begin with a semicolon.

Information about necessary parameters can also be stored as sequence commentary, which can be composed upon saving the sequence.

10.7.5 Application to whole folders

Often the user would like to use one sequence for a series of files. The operators "*" and "?" are available for this purpose. They are used to designate names which may contain (to a certain extent) any letters or characters.

For example, the following files are present in the default folder for loading files:

```
SLOPE.DAT
SINTEST1.DAT...SINTEST5.DAT
```

In the following sequence EVALUATE, a file should be loaded. The maximum of the data set should be determined and added to a list of the existing maxima:

```
Load    PA1
List  = Join( List, Max(  PA1  ))
```

The following sequences may be called in succession:

```
Sequence  EVALUATE  SINTEST1
Sequence  EVALUATE  SINTEST2
...
```

This procedure is possible, but rather complicated.

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The following is more suitable:

```
Sequence EVALUATE *
( or: Sequence EVALUATE *.dat )
```

The operator "*" is used to call the sequence EVALUATE for each data set stored in the set directory. The sequence is called six times. The operator "*" may also be used at the end of a series of letters. This allows the sequence to be used for all files which begin with a specified series of letters.

The call

```
Sequence EVALUATE SIN*
( or: Sequence EVALUATE SIN*.DAT)
```

calls the sequence for all files beginning with SIN. The operator "*" is used as in DOS and is defined and interpreted just as in DOS.

It is useful to use the operator "*" only in parameters loaded from a file at the beginning of a sequence using the command "*Load*".

Reference

- Please refer to the sections 'Use of text variables 403' and 'Dialogs during execution of sequences 409'
- The operators '*' and '?' can also be applied directly with the *LOAD*-command, to load a series of files by means of one command.
- The functions contained in the group *Files, Import/Export > extended* are also available for loading files and are more efficient than the LOAD command.
- For processing directory structures, it is often better to use the '*File-Kit*' functions, since these offer better control of the sequence process.

10.7.6 Multiple runs of the same sequence

If a sequence should be called several times to process files, it is recommended to store calculated results from the data set of the current file with consecutive numbering. The following sequence, named HISTOGR, which determines and stores the histogram of a data set:

```
Load      PA1
PA2    =  Histo( PA1, 0, 0)
Save      PA2
Delete    PA2
```

The histograms of all variables SINTEST1, SINTEST2,... should be filed as HIST1, HIST2,... The operator "#" is added to the name HIST. The desired result is achieved using the following call:

```
Sequence HISTOGR S* HIST#
```

The sequence is now called for each file contained in the set directory with a name corresponding to the specified S*. The first time the sequence is called, the file first in alphabetical order, here SINTEST1, is transferred as the first parameter; HIST1 is transferred as second parameter.

The following call is created:

```
Sequence HISTOGR SINTEST1 HIST1
Sequence HISTOGR SINTEST2 HIST2
...
```

If the sequence is called more than nine times, the operator "#" can be used several times:

```
Sequence  HISTOGR  S*   HIST###
```

Here, the following calls are generated:

```
Sequence  HISTOGR  SINTEST1  HIST001
Sequence  HISTOGR  SINTEST2  HIST002
...
```

Note

Sequences can be nested up to 10 times. Sequences called may also contain parameters.

The operators "*" or "?" should only be used in no more than one parameter. If the operator is used in different forms in different parameters at the same time, the sequence is called as often as the minimum number of appropriate file names.

When loading files in imc FAMOS format, the name extension "*.DAT*" is used; in other data formats, the name extension must always be explicitly specified. However, a different extension can be specified in imc FAMOS - format.

Reference

- Also see the sections 'Use of text variables 403' and 'Dialogs during execution of sequences 409'.

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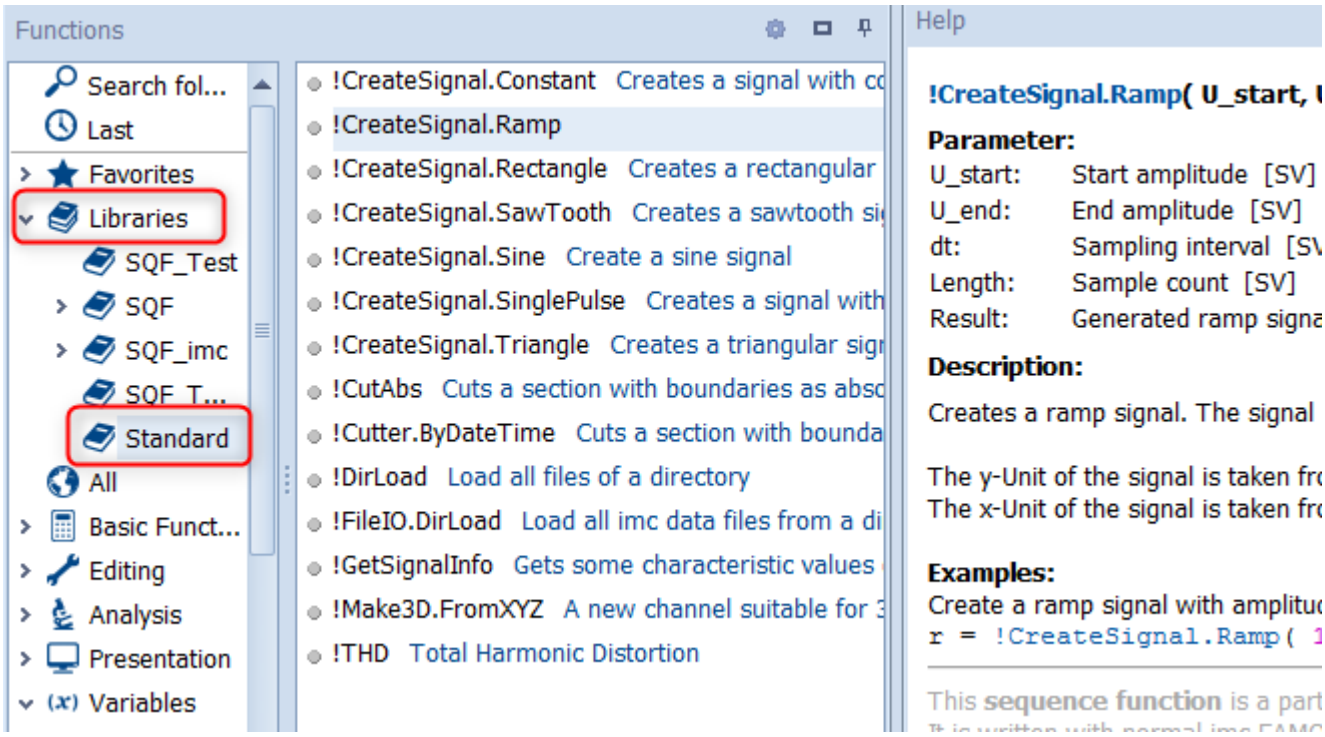
10.8 Sequence function and -libraries

10.8.1 Overview

Sequence functions are an advanced kind of classic imc FAMOS sequences which is supported as of Version 7.5.

In contrast to the "classic" sequences, sequence functions can be used like normal library functions. In addition to the actual program code they come with a **functions declaration** 386, in which the count, *type, direction (in, in/out)* and *Description of parameters, Type* and *Description of the (optional) return value* and a *Help text* are defined.

imc FAMOS provides some useful sequence functions. These can be found under *Standard* in the function folder *Libraries:*



Sequence functions are saved in a new file format and and are distinguished by the **file extension "*.sqf*"**.) The ".seq"-file format for classic sequences is not compatible with it. Older versions of FAMOSare not able to interpret SQF sequences.

Like classic sequences, sequence functions can also be password protected 364.

Note Note for the programmer

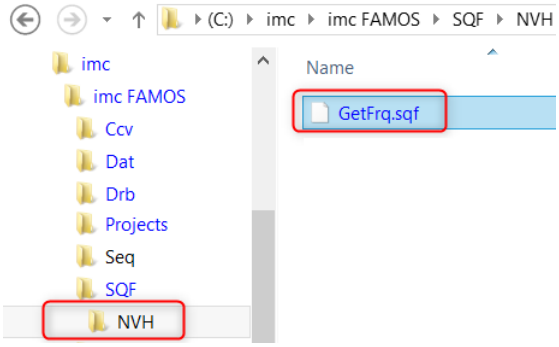
It is recommended to use English function and command names. This ensures that the function works on other systems, regardless of the language setting there.

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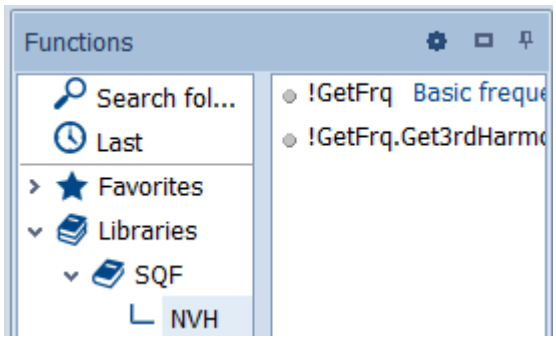
10.8.2 Structure of sequence functions and associated files

- Sequence functions can be organized in **functions libraries** (subfolders). Of course, these can contain multiple individual sequence function files (*.sqf).
- A sequence function can contain multiple sub-sequences. These are each declared 386 separately and then appear in the functions library as an indented sub-listing.

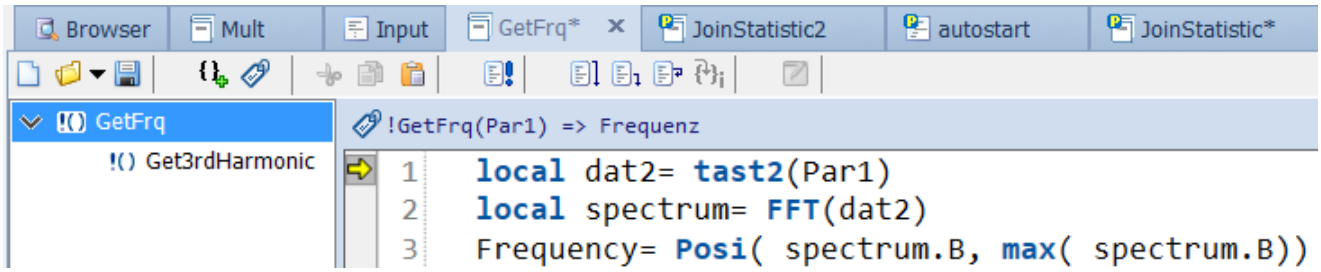
Example: The sequence *GetFrq.sqf* has a main sequence which finds a data set's frequency, and a sub-sequence which finds its third harmonic:



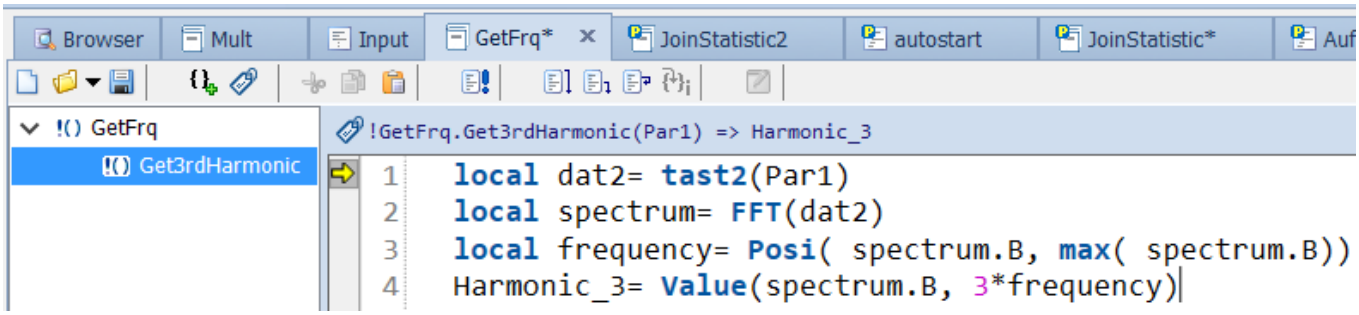
Sequence function in the folder NVH



Resulting tree diagram of functions

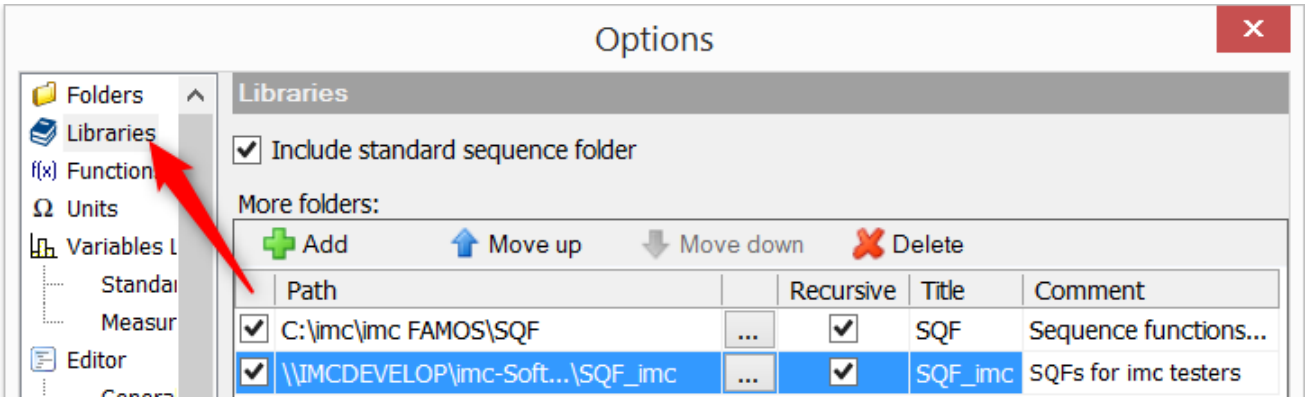


Main sequence GetFrq()

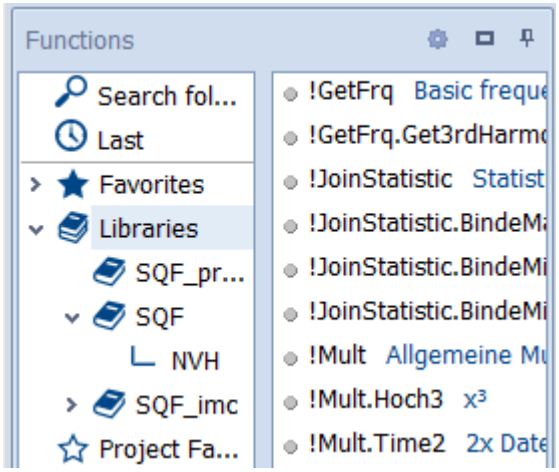


Sub-sequence Get3rdHarmonic()

It is possible to specify **multiple folders** as library folders. Network folders are also allowed, which enables functionalities to easily be shared throughout a work team, for example. The **filepaths** are added in the **Options** (menu item: *Extra\Options*).

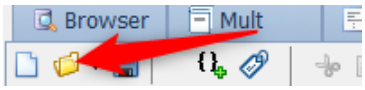


All **functions libraries** which are saved in pre-defined folders (or in the current project) are automatically loaded by FAMOS. The sequence functions they contain are available in the FAMOS Functions list in the subfolder "***Libraries***". The sub-folder is displayed as a branch.

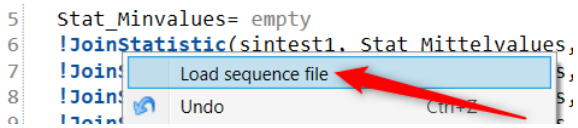


10.8.3 Editing a sequence function

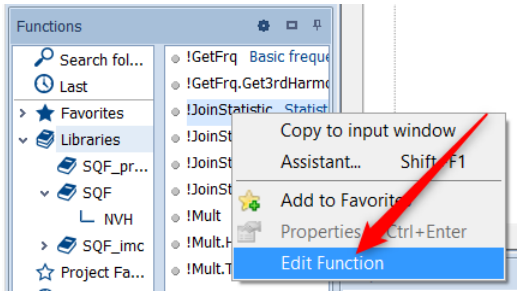
By using the Load command, a sequence function can be loaded into the Editor in the same way as a normal sequence.



When the cursor in the Editor is located on the name of a sequence function, the context menu contains an additional menu item "*Load sequence file*". By means of this command, the associated file is loaded to the Editor.



The Functions list provides an equivalent menu item in the context menu when a sequence function's name is selected.



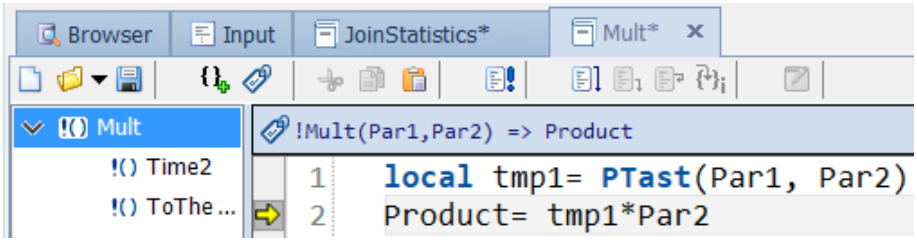
10.8.4 Calling a sequence function

There is no significant practical difference between the use of a built-in FAMOS-function and a user-written sequence function. All familiar input assistance such as syntax completion, parameter tips and the Functions-Assistant are available.

A sequence functions complete name consists of an **exclamation point**, the **library name** (which corresponds to the filename, without extension) and any sub-sequence, separated by a period.

Example:

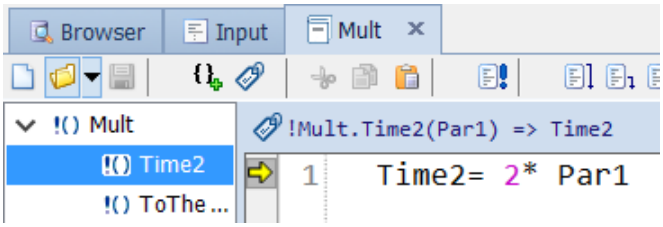
A sequence library's **main function** is called via the **library name**:



Structure of the sequence file: Main sequence Mult()

```
Eight = !Mult(4,2)
```

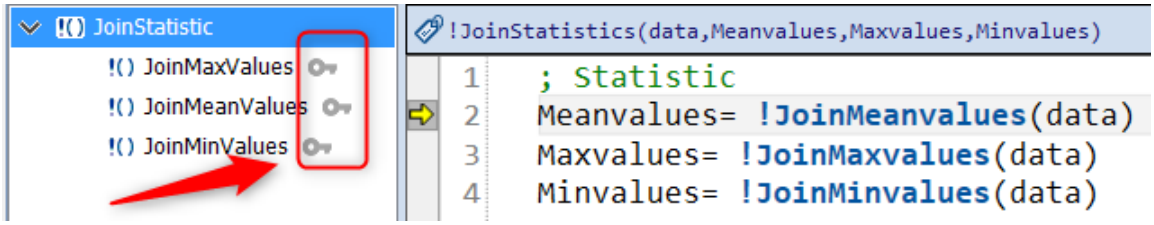
Calling the **sub-sequence** is accomplished using the *sequence filename* + "." + *name of the sub-sequence*:



Structure of the sequence file: Sub-sequence: Time2()

```
Eight = !Mult.Time2(4)
```

Sequence functions can be declared 387 as ***"private"*** 387. Such functions can only be called by other sequence functions belonging to the same file and are not visible from "outside". In the Editor's Sequence list, they are indicated by a **key symbol**. The call omits the library name:



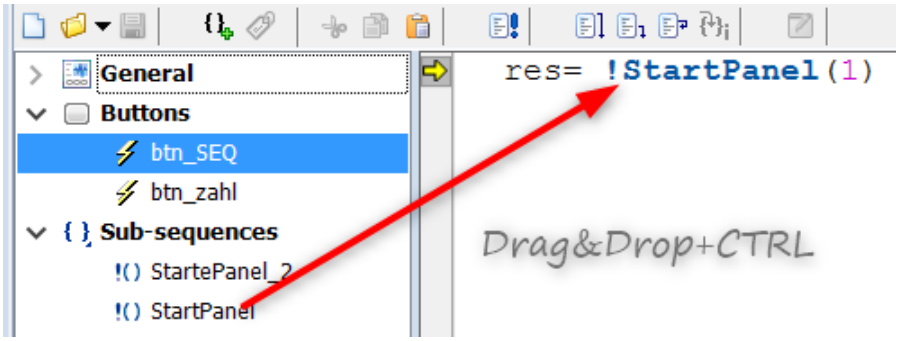
Private call of sub-sequences

Note

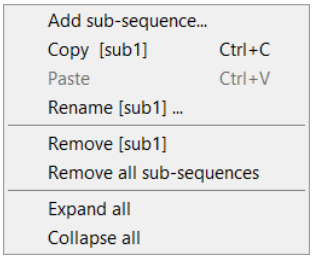
- A library file (*.sqf) can only contain sequence functions; a mix including classic sequences is not possible here. If a classic sequence's file (*.SEQ) is to be supplemented with a sequence function, it must be converted to SQF-format. This means the existing sequences need to be declared, and usually some modification of the code is also necessary. A corresponding user notification, including an option to cancel, is posted before the conversion process begins.
- **User-defined dialogs** and **panels** can contain sequence functions as well as classic sub-sequences. However, these are always "**private**" and can only be applied within the associated program code (meaning: within event sequences).
- Within a sequence function, it is **not permitted** to **call a classic sequence** using the SEQUENCE-command. Recursive calling of sequence functions is also not allowed.

Dialogs, panels and sequences with existing sub-sequence functions

Drag&drop: As a convenient aid in making entries, it is possible to drag the name of a sub-sequence function into the an event's code while holding down the CTRL-key. imc FAMOS will then create the call mask.



10.8.5 Context menu in the Sequence tree diagram



In the Sequence tree diagram's **context menu**, there are menu items to ***Remove*** *all*, or just the selected sub-sequence function. You can duplicate a sub-sequence along with its content using "***Copy"*** and save it with edited code under a new name, if desired.

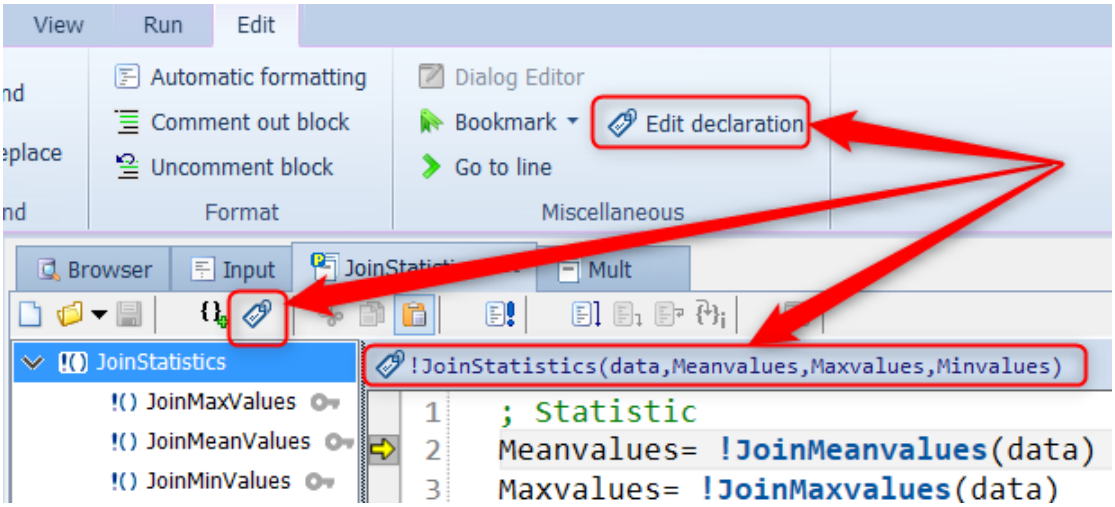
Using "***Rename"***, you can change a sub-sequences function's name at a later time.

10.8.6 Declaration

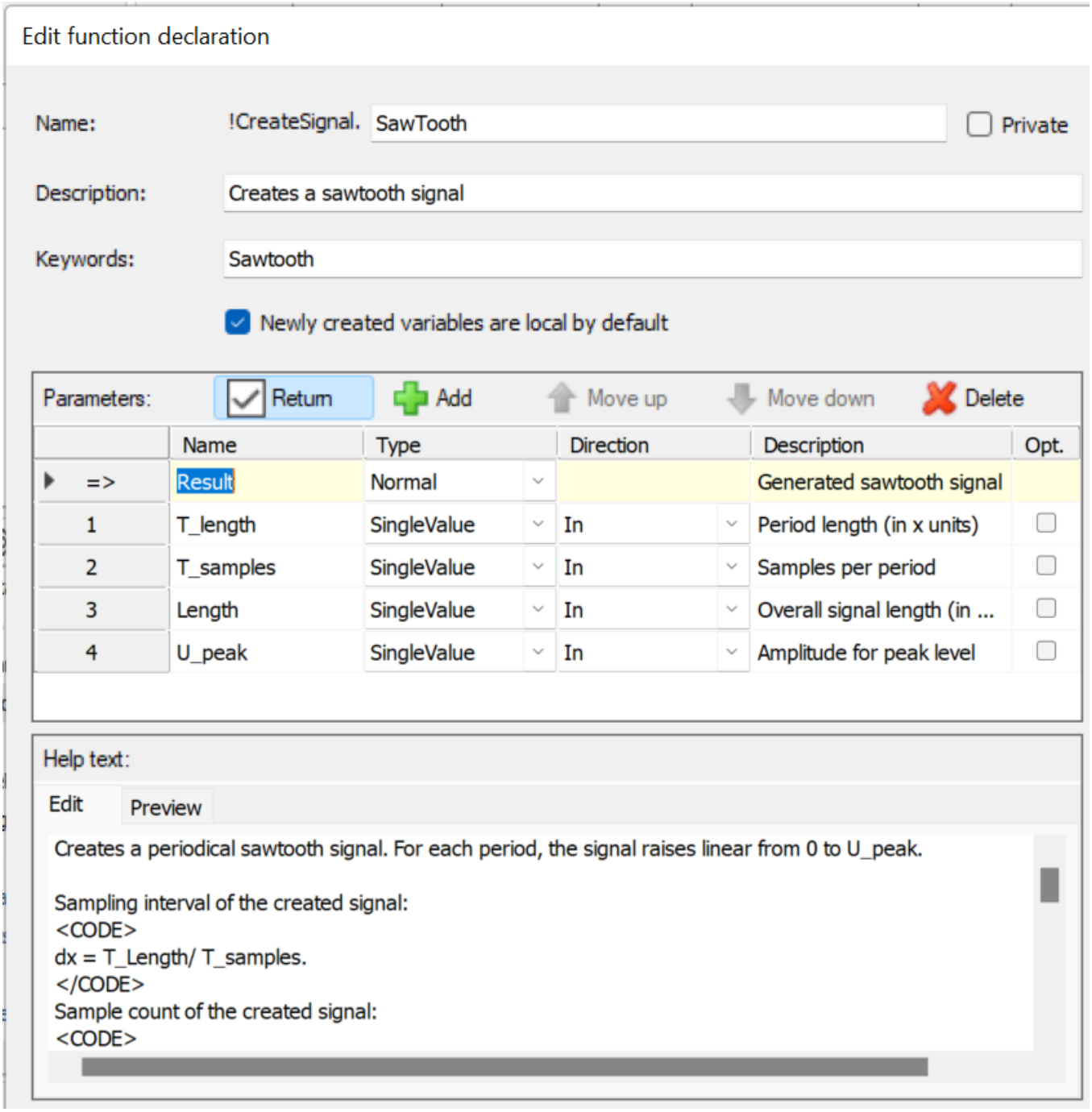
When a new sequence file is created, it is originally initialized as a classic sequence file (*.seq). Once the user makes a functions declaration, the format is then implicitly changed to that of a sequence library (*.sqf).

If the type has still not been determined implicitly (e.g. in case of sequences or Panels/dialogs which have not yet been saved), then when a new sub-sequence is created, the Declarations dialog opens automatically and the user is asked to choose the type.

The Declarations dialog is called by means of the **menu item** *Edit -> Edit declaration*, or via the corresponding **button** in the Editor window's toolbar, or by clicking on the **declarations bar** above the text window.



Calling the declaration



Name: The function's name. The name may be a maximum of 64 characters long, may not contain special characters such as parentheses, periods or math operation symbols, and may not begin with a digit. it must be unique within the file, and may not match the name of any internal FAMOS math function, sequence command, or pre-defined constants. It is not case-sensitive. **Only latin letters a..Z and '_' as well as '$' may be used, thus also no ä,ü,á, etc. and no DBCS characters!**

Private: When this is selected, the function may only be called within the same file. Otherwise, it is globally available. Sequence functions in user-defined dialogs and Panels are always private.

Description: Brief notes on the function's purpose. This will be displayed in the Functions list alongside the name.

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Newly created variables are local by default: Auxiliary variables are deleted at the end, so the **Local** command is not necessary. If auxiliary variables created in the SQF should remain, this option must be deactivated. The **Local** command can then be used further.

Keywords: Optional keywords (separated by semicolon), which can be used as search terms in the Functions list's *Search folder*.

Parameter: This is where the required parameters 389 and the (optional) return value are set. FAMOS looks for the placeholders used under *Name* in the functions sequence. The parameters PA1…PA20 used in the classic sequence are not used here!

Return: When this is selected, the function returns a result value which the user must request. The first line in the list then defines this result. It is necessary to ensure that a variable of this name is actually generated within the sequence code.

Add: Adds a new parameter. A maximum of 15 parameters is permitted.

Move up/down: Changes the order of parameter by moving the currently selected line up/down.

Delete: Deletes the selected parameter.

Duplicate: The list's context menu contains the additional command "*Duplicate parameter*". This is helpful when a function is to be assigned multiple parameters of the same kind.

Help text: Each sequence function has a help text which is generated automatically from previous entries. It would also be possible to enter an additional, more detailed description here, to be appended to the automated part. For formatting purposes, it is possible to use customary HTML-notation, e.g.

```
<B>bold font</B>
<I>italic font</I>
<U>underlined font</U>
```

More complex HTML-elements such as tables (<TABLE>, <TR>, <TD>) are also possible. By clicking on the tab "*Preview*", it is possible to assess the completed and formatted text as it would appear in the help window.

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10.8.6.1 Parameters

For each parameter, the following properties need to be defined:

Name *Name* of the parameter according to which it is used in the sequence function's code. Permitted characters include letters, digits (but not at first position) and the special characters '_' and '$'. The maximum permitted length is 64 characters.

Type The parameter's data type. When a sequence function is called, the parameter passed is checked against the data type specified here. For In/Out-parameters and the return value, the type verification is (also) performed at the end of the sequence function.

When the types do not match, an error message is posted and the execution is canceled.

When the specified type is [***XY***], then normal data sets and single values will also be accepted. When the specified type is [***Normal***] (= equidistantly sampled data set), then single values are also accepted.
For [***DontCare***], there is no verification of the type. In any other case, the type must match exactly.

Direction The distinction is between [***In***] and [***In/Out***]-parameters and [***REFERENCE***].

[***In***] and [***In/Out***]-parameters

With both kinds, when the sequence function is called, the parameter currently passed is copied to a local variable having the name specified.
With [***in/Out***] parameters, the current value of the local variable is additionally copied back to the call parameter. In consequence, the function may possibly change the value of the call parameter. For this reason, when using [***In/Out***]-parameters, only existing variables, in their "complete" form, must be passed; no arithmetical expressions or variables indexed in pointy brackets are permitted.

Passing parameters by means of reference

The local parameter name is interpreted as a reference to the variable passed, thus practically used as an alias name. The Formula Interpreter then uses the local alias name.

CAUTION: In this process, no real variable is created having the local parameter name, because otherwise there would be 2 variables in the Variables list referring to the same data object, and this is not supported.

If during debugging, you wish to know whether a genuine variable is being referred to by the alias name, it is possible to use either the function *Name?*() or the "*Call-Status*"-dialog.

When programming, the following constraints apply to reference parameters. Reference parameters:

- may not be overwritten, e.g. on the left side of assignments. However, a partial assignment is allowed, e.g. `Par1[1] = 2`.
- may not be deleted (DELETE)
- may not be renamed (RENAME)
- may not be used as a loop variable in FOR or FOREACH.

Description Brief description of the parameter, to be displayed in the function help material.

Opt. Optional parameter: A parameter can be optional, i.e. the parameter does not need to be available upon calling the sequence function. The count of parameters actually passed can be requested using the function *ParametersPassed*() and processed accordingly in the sequence.

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10.8.7 Debugging

When testing sequence functions during the development process, which means that they are not called "from outside", there are special circumstances to be aware of. Any newly created sequence functions must first be adopted into the Functions library before they can be run. To do this, the associated library file must first be saved to one of the pre-set library folders.

When executing a sequence function directly, the transferred parameters are not defined. For this reason, the user must parametrize the function. For this purpose, the Functions-Assistant dialog starts automatically. Once the desired configuration has been achieved, quit the dialog by clicking "*Execute*" and the sequence function routine starts to run.

Remarks:

- The sequence function is executed by "*Run sequence [F7]", "Run sequence (Debug) [STRG+F7]"* oder auch "*Resume [SHIFT+F7]"* und *"Single step [F9]"*, once the first code line has been activated. Running the routine by clicking on the yellow button does not work here, and only causes the appearance of a notification that the variable (in this case the parameter) is not defined.
- The Functions-Assistant dialog does not start if the function has neither parameters nor a return value.

If the execution of the routine is interrupted (after a single step, or due to a breakpoint, or an error), the sequence function freezes at the respective location and FAMOS goes into "*Execution interrupted*"-mode, which is recognizable in the associated buttons of the Editor window's toolbar, and in the main window's status bar. The user is now able to either completely halt the routine using these buttons, or to use "*Resume*" or "*Single step*" (if applicable, after fixing a bug) to continue.

10.8.8 Library folders

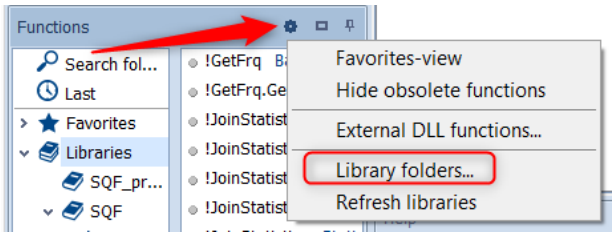
When a project is loaded, all SQF-files in the project folder are automatically loaded to the Functions library and placed in a subgroup having the project's name.

The user must nevertheless provide an instruction for FAMOS, in which folders to search for functions libraries (*.sqf).

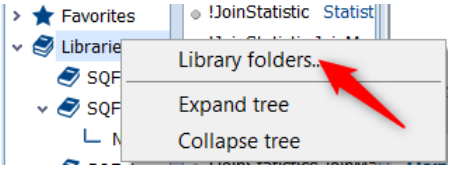
There are two ways to call the associated settings dialog:

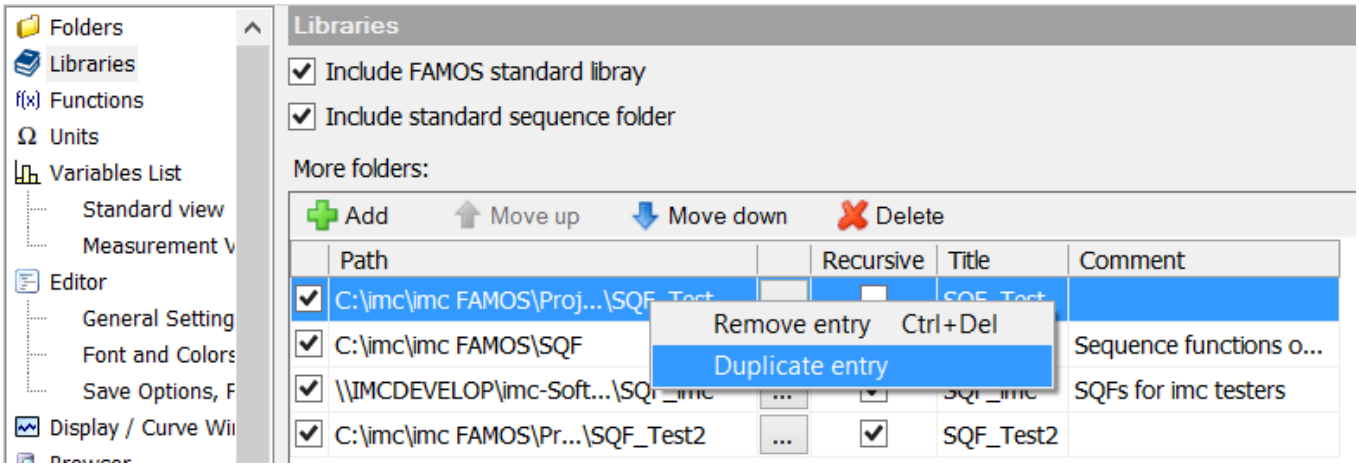
Menu "*Extra*"/"*Options*"/"*Libraries*"

"Options"-symbol



Right-clicking on the "Library folders"-item





"Include FAMOS Standard library": The provided functions from the standard library can be hidden here.

***"Include standard sequence folder"*:** When this is activated, all SQF-files present in the default sequence folder (*"Extra"/"Options"/"Folders"* => *"Sequences / Dialogs"*) are loaded and listed in the Functions list under "*Libraries*"->"*Standard*".

More folders:

Here you can specify additional folders to use.

***Add*:** Adds a new (folder-) entry to the list.

***Move up/down*:** Moves the currently selected entry of the list upward/downward.

***Delete*:** Deletes the selected entry; also available via context menu.

Duplicate entry: The list's context menu contains the additional command "*Duplicate entry*". This command is very helpful when defining multiple similar folders.

The order of entries in the list is significant if sequence libraries having the **same filename** appear in different folders. The file which is **used is from the folder higher up in the list**. All other files having the same name are ignored.

The selection proceeds according to the following rules of **priority**:

Highest priority: Project folder means load immediately

Next: **More Folders list** from top to bottom

Lowest priority: Default sequence folder if activated above

For each folder, the following settings must be defined:

Active: The checkbox in the first column determines whether the current folder is to be used currently.

Path: Complete pathname to the desired folder. Network drives are allowed. The pathname can either be entered directly or by using the button to the right of the name in conjunction with a folder selection dialog.

Recursive: When this is active, the system also searches through all sub-folders for sequence library files.

Title: Title of the sub-group in which all sequence functions found in this directory are sorted in the function list.

Comment: Optional brief description. At this time, it is displayed only in this dialog.

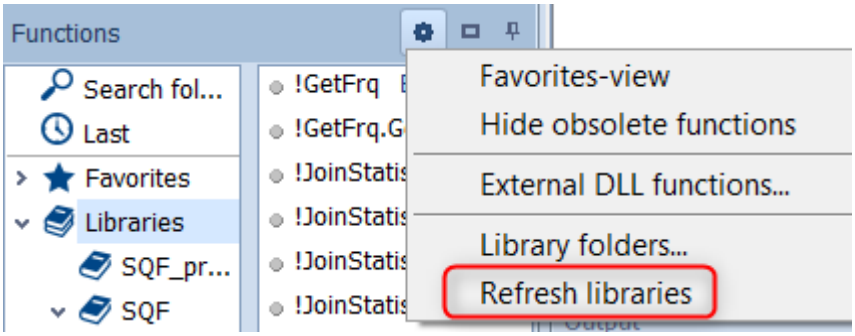
Note Priorities of library folders

- If several sequence functions have the **same name**, the sequence function whose directory is listed above is used.
- The *standard sequence folder* always has the second lowest priority and the *FAMOS standard library* the lowest. This ensures that functions written/changed by the user himself, which have the same name as functions of the standard library, are always found with priority.

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10.8.8.1 Updating the library

The menu item "*Refresh libraries*" in the Functions list's Options menu (symbolized by a cogwheel in the title bar) causes all library files in the folders specified to be re-imported. This may become necessary if files are copied into this folder during running operation of the program. When changes are made within FAMOS (creating, renaming of sequence functions, changes to the library folder), refreshing is performed automatically.



10.8.9 Comparison of classic sequences with sequence functions

	"Classic" sequence	Sequence function
File format	*.seq	*.sqf
Syntax of program code	identical	
Called via Functions list	No (only indirectly, via Favorites)	Yes
Calling	By means of "*SEQUENCE*"-command; parameters separated by spaces, e.g. `SEQUENCE Add2numbers 1 2`	Directly by means of its name, with preceding "!"; parameters appear in (..), separated by commas, e.g. `Result = !Add2numbers(1,2)`
Parameter-transfer	Only constants or variables possible; math expressions only with extreme limitations	Any desired arithmetical expressions possible, e.g. `Result = !Add2numbers(1,sin(PI))`
Parameter-names in the sequence code	Fixed names PA1.. PA20	Definable by the user in the column *Name*
Explicit results	None	Definable by user
Parameter processing	Before a line of code is executed, the fixed name "*PA?*" is replaced with the parameter passed by a pre-processor.	Transferred as a value. When the function is called, the parameters specified are copied to local variables having matching names. For In/Out parameters and the result, the value of the local variable is copied back at the end of the function.
Editor support	none	Syntax completion, parameter-tip, online help, Parameterization Assistant
Password protection 364	Yes	Yes
Miscellaneous		No classic sequences can be called in the code (the SEQUENCE command is not permitted)
Compatibility	All FAMOS versions	as of FAMOS 7.5

10.8.10 Multithreading

As of Version 2022, **imc FAMOS Professional** supports execution of sequence functions in a separate thread. Windows automatically distributes the threads to the processor cores present. By comparison to older FAMOS versions which have generally used only one processor core, the processing time can be substantially reduced.

The new construct BEGIN_PARALLEL / END_PARALLEL defines a parallel-block within a sequence, in which all , in sequence functions called are each executed in a separate processing thread and thus practically in parallel with each other.

In imc FAMOS, there are always at least two active threads. The **Main-Thread** takes care of the program's graphical user interface display and the processing of user inputs. By default, all sequence instructions are processed in FAMOS in a **standard-execution-thread**, which is also always active and, depending on circumstances, may be waiting for user inputs. Sequence functions in a PARALLEL_BLOCK are thus not executed in the **standard-execution-thread**, but rather in a separate temporary execution thread which is concluded once the sequence functions has been processed.

Example: 3 data sets are evaluated using a sequence function, which returns an individual statistic as its result. Subsequently, the mean value of the results is calculated.

```
BEGIN_PARALLEL
   t1 = !CalculateStatistic(data1)
   t2 = !CalculateStatistic(data2)
   t3 = !CalculateStatistic(data3)
End
t = (t1+t2+t3)/3
```

All sequence functions between BEGIN_PARALLEL and END_PARALLEL are performed asynchronously in a separate thread. When END_PARALLEL is used, the system waits until all sequence functions have been performed. Only then, running of the sequence resumes.

Application Tips

- Only truly time demanding calculations and analyses should be run in parallel. When the execution time is short, the losses due to resource demands from extra administration are often greater than the time gains from parallel execution.
- Please ensure that you only use parallel execution for tasks which are truly mutually independent. The order in which the partial tasks are executed is random, so the results of one parallel sequence function (not only explicit results variables, but also newly created files) may thus not be required as the input parameters or as implicit prerequisites for other parallel sequence functions. Approach the question this way: If executed sequentially, would it be possible to arbitrarily change the order of the calls in the PARALLEL-block? If not, then parallel execution is not possible.
- Sequence functions called in PARALLEL-blocks should only use local variables to the extent possible, since global variables could be changed if they are ever accessed in any unrelated operation. Example: the same sequence function is called two times in a parallel-block, with different parameters. In the sequence, a non-local loop variable i is used in a FOR-loop. Both threads access this variable in parallel and change its value. Thus, how often the loop is run in each oft sequence is actually random.

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Scope of presettings and initial values

- Some functions set presets or initial values which are used in subsequent function calls. These settings can apply either globally or locally to a specific thread.
- What "global" means here is that there is one single global memory allotted, which is available for and used by all execution threads. Examples include functions such as SetOption(), SelMeasListSetName(), FFTOPTION and all functions for remote control of Panels and Reports.
- Thread-local means that the internal memory allotted is managed separately for each execution thread, therefore it may need to be re-initialized in every parallel sequence function call. Examples include Stat(), FileOpenDSF(), SelUseMeasurement(), OctI(), CwSelectWindow(), OtrTachoMode() and the functions for remote control of Excel and Powerpoint. The specific behavior is described along with the online help for the respective functions.

Constraints:

- Within a PARALLEL-block, only direct calls of sequence functions (SQF) and comments are permitted. All other code lines cause a syntax error.
- PARALLEL-blocks can **not be nested**. So for instance, if a sequence function is called within a BEGIN_PARALLEL-block, any BEGIN_PARALLEL-instructions within the sequence function are ignored.
- Within one PARALLEL-block, **up to 64 threads** can be started. However, it does not make sense to create any more threads than there are virtual cores.
- Some functions can not be used within BEGIN_PARALLEL-blocks. Examples include the functions belonging to the Database-Kit, or to the ASAM-ODS-Kit. Other functions, by contrast, can in fact be called at any desired position in the routine, however they are moved internally to FAMOS' Main-Thread and executed there; this apples for instance to the functions belonging to the R- and the Pythons-Kit. Such constraints are indicated along in the online help for the respective functions.
- PARALLEL blocks are **not permitted** within **Timer Event sequences** (panels).
- PARALLEL-blocks are **ignored** during **execution in Debug-mode** (e.g. "Single Step", "Execute (Observe Breakpoints)".
- Upon **Suspend/Resume** of execution (e.g. because an error occurred), the system waits until all active parallel executions have concluded.

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Locking of access to variables

The quasi-simultaneous execution of lines of code is possible with PARALLEL blocks. When a line of code is executed in a parallel sequence function, the variables used (e.g. function parameters) are exclusively reserved internally for the time of execution of a partial function in this line. If another sequence line is to be executed in parallel, in which variables that have already been reserved are to be used, processing is delayed until all the required variables are available again. This prevents a variable used from being unexpectedly changed from elsewhere during processing. The variables are normally released after the sequence line has been completely processed.

There is an exception when calling sequence functions. Since when jumping into the sequence function in general. If a local copy of the parameters is created, the reserved parameters can already be released when processing the function begins. This also makes it possible for sequence functions that work on the same variable(s) to actually be executed in parallel within a BEGIN_PARALLEL block. But beware: if a data group is transferred as a parameter and the data type of the corresponding sequence function parameter is not defined as a data group, a loop is executed internally over all channels of the group. The parameter can then only be released when entering the last loop pass.

When duplicating a parameter for the local copy, however, there is the special feature that the original and the copy initially refer to the same internal memory area for the actual data. This optimization, which is common in FAMOS (which is also used with a simple assignment "a = b"), of course, saves storage space and time when duplicating, especially with large data sets, but can be disadvantageous with parallel calls and lead to unwanted delays! I f parallel executions want to access the data of the local copies of the same parameter at the same time, an appropriate lock must take effect because of the shared internal memory area. So if a parameter is used in a longer-running function, parallel accesses to the same parameter's data in other sequence functions must wait until the current function has finished its work.

So if the execution time of a PARALLEL block, in which the same data set is used repeatedly as a parameter for the called sequence functions, does not meet your expectations, you should try passing a temporary copy with its own (unshared) memory area instead of the original parameter. The easiest way to force a true copy with its own memory space is to add a 0. This procedure is demonstrated in Example 3 399.

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10.8.10.1 Tips on BEGIN_PARALLEL/END_PARALLEL

- For the purpose of parallel threads, FAMOS must create and work within an administration structure. Furthermore, generating and administering threads (e.g. allocating of the available processor-cores) is a demanding task for the operating system. For this reason, it is only sensible to use parallel threads in the case of very time demanding calculations and analyses! With very short run times the losses for overhead are often greater than the theoretically possible time savings from parallel threads.
- Select a reasonable number of parallel threads. Although the maximum count is 64, a practical guideline value is the count of virtual processor cores in the system.
- Only apply paralleling to tasks which are actually mutually independent. The order in which the tasks are performed is random. The results of one parallel sequence function (not just explicit event variables, but also any newly created file, for instance) may under no circumstances be used as the input parameters for a different parallel sequence function. Here is a helpful indicator: Would it be possible to randomly change the order of calls in the PARALLEL-block if they were executed in succession? If the answer is no, then parallel execution is not possible.
- As far as possible, avoid any accessing of global variables in the parallel sequence function calls, since global variables can be unexpectedly changed by extraneous accessing events.
- As a general rule: It is more efficient to have a few PARALLEL-calls of larger tasks than to have many PARALLEL-blocks each handling small tasks. One example of this are loops having large iteration counts. Here it is usually better to completely replace the outer loop with Parallel-calls which each iterate one part of the loop, instead of parallelizing them in the "large" loop:

Sequential execution (1)

```
FOR i = 1 TO count
   !Calculate_with_I(i)
END
```

Bad parallelism (2)

```
FOR i=1 TO count STEP 2
 BEGIN_PARALLEL
   !Calculate_with_I(i)
   !Calculate_with_I(i+1)
  END_PARALLEL
END
```

Better parallelism (3)

```
c = floor(count/2)
BEGIN_PARALLEL
  !Calculate_with_I_FromTo(1,c)
  !Calculate_with_I_FromTo(c+1,count)
END_PARALLEL


_____________________
the outer sequence function
Calculate_with_I_FromTo(start, stop)
has practically the same code as (1):

FOR i = von TO bis
   !Calculate_with_I(i)
END
```

Supposing a call of the function `Calculate_with_I` lasts 10s and there are 100 loop runs. In that case, solution (1) takes ca. 1000 s. So why is (2) worse than (3)?

For (2), 50 runs of the loop of 10s apiece are performed, thus taking ca. 500s. For (3), 2 sequence functions are run in parallel, which each take 500s. The theoretical net call duration is thus the same.

However: For (2), a total of 50 threads, while for (3) only 2 threads were created. The internal demands for administration are thus substantially less, for which reason (3) will be faster in practice.

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10.8.10.2 Usage examples

Example 1:

3 data sets are subjected to an analysis which returns a single statistic as its result. Subsequently the mean value of the results is calculated.

```
BEGIN_PARALLEL
   t1 = !CalculateStatistic(data1)
   t2 = !CalculateStatistic(data2)
   t3 = !CalculateStatistic(data3)
END_PARALLEL
t = (t1+t2+t3)/3
```

Example 2:

A text array contains a large number of file names. The associated files are to be loaded and evaluated.

```
allFiles = FsGetFileNames("c:\data", "*.raw", 0, 1, 0)
FOREAC ELEMENT file in allFiles
   !WorkWithFile(file) ; loads a file and performs the evaluation
END
```

We intend to make this call faster by means of parallel execution:

```
allFiles = FsGetFileNames("c:\data", "*.raw", 0, 1, 0)
count = TxArrayGetSize(allFiles)
chunksize = floor(count/4)
BEGIN_PARALLEL
   !WorkWithFiles(TxArrayPart(allFiles, 1, chunksize))
   !WorkWithFiles(TxArrayPart(allFiles, 1+ chunksize, chunksize))
   !WorkWithFiles(TxArrayPart(allFiles, 1+ chunksize*2, chunksize))
   !WorkWithFiles(TxArrayPart(allFiles, 1+ chunksize*3, count-3*chunksize))
END_PARALLEL
```

The sequence function *!WorkWithFiles* is then defined as follows:

```
; Declaration:
! WorkWithFiles(Par1 [Data type: TextArray])
FOREACH ELEMENT file in  Par1
   !WorkWithFile(file)
END
```

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Example 3:

A data set is to be subjected to the same evaluation multiple times in succession with different parameters each time. The actual evaluation routine is encapsulated in a sequence function.

In the example, a high-pass filter is calculated on the same data set with different cut-off frequencies.

```
testdata= …
f = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 500, 1000, 5000, 10000]* 1e-3
FOR i = 1 TO lang?(f)
   Name = "Filt_"+ TForm(i, "")
   <Name> = !DoSpecialHighPass(testdata, f[i])
END
```

We intend to make this routine faster by means of parallel execution:

```
testdata= …
f = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 500, 1000, 5000, 10000]* 1e-3
count = leng?(f)
chunksize = Floor(count/4)
BEGIN_PARALLEL
   !DoSpecialHighPass_Chunk( testdata+0, f+0, 1, chunksize)
   !DoSpecialHighPass_Chunk( testdata+0, f+0, 1+ chunksize, chunksize)
   !DoSpecialHighPass_Chunk( testdata+0, f+0, 1+2*chunksize, chunksize)
   !DoSpecialHighPass_Chunk( testdata+0, f+0, 1+3*chunksize, count-3*chunksize)
END_PARALLEL
```

The sequence function *!DoSpecialHighPass_Chunk* is then defined as follows:

```
; Declaration:
; !DoSpecialHighPass_Chunk(data [Data type: Normal], f, index, count  [Single
values])
;          (Option "Newly created variables are local by default" is switched off)
LOCAL i
FOR i = index TO index+count-1
   LOCAL Name = "Filt_"+ TForm(i, "")
   <Name> = FiltHP(data, f)
END
```

Passing **"testdata+0"** instead of **"testdata"** to the sequence function ensures that each call is executed with a complete, self-contained **copy of "testdata"**. The same applies to the **"f"** parameter. The ***FiltHP()*** calls in the sequence function are thus completely decoupled and can be executed in parallel. Without this trick, all "**data**" and "**f**" instances in the sequence functions would internally share the same data memory and the ***FiltHP()*** calls would have to be executed practically one after the other. The only parameters to be taken into account are those that are passed directly to functions that can potentially take a long time and therefore have to be blocked for a longer period of time. The variable "**chunksize**" in the example (local name "**count**") is only latched very briefly when reading, so the **"+0" trick** is not necessary here. See also the above explanation under."Locking of variable accesses 396".

Example 4:

For a group consisting of many channels, the FFT of each channel is to be calculated.

```
GrFFTs = FFT(GrInput, 0, 0)
```

We will make this calculation faster by means of parallel execution:

```
count = GrChanNum?(GrInput)
chunksize = floor(count/4)
BEGIN_PARALLEL
   GrFFT1 = !MyFFT(GrPart(GrInput, 1, chunksize))
   GrFFT2 = !MyFFT(GrPart(GrInput, 1+ chunksize, chunksize))
   GrFFT3 = !MyFFT(GrPart(GrInput, 1+ chunksize*2, chunksize))
   GrFFT4 = !MyFFT(GrPart(GrInput, 1+ chunksize*3, count-3*chunksize))
END_PARALLEL
GrFFTs = GrConcat(GrFFT1, GrFFT2, GrFFT3, GrFFT4)
```

The sequence function !MyFFT is then defined as follows:

```
; Declaration:
; !MyFFT(Par [Data type: Normal]) => Result [Data type: Complex]
Result = FFT(Par, 0, 0)
```

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10.8.10.3 Presets and "function memories"

All runs of sequences and individual sequence portions are processed in a main working thread, which is active in parallel to the GUI-thread, meaning to the FAMOS user interface, and which waits for tasks to perform.

However, sequence functions within a BEGIN_PARALLEL-blockare each performed in a separate thread.

10.8.10.3.1 Local vs. global scope

The following commands/functions have **global** application, i.e. in all execution threads:

- FFTOPTION,
- FAMOS, ASCII, BINARY,
- MDIR, SDIR, LDIR
- DDESepar()
- SetOption()
- SetBoxPos()
- DbSetActivePanel() and all other commands for remote control of panels.
- SelMeasListSetName() and all other functions for controlling the Data-Selector.
  The corresponding lists "*MeasurementName/ChannelName* <-> symbolic number" are global.
  But: SelUseMeasurement() applies only locally.
- SpeakConfig()

Multiple usage in sequence functions having different settings but performed in parallel is not a good idea. The last call of these commands determines what settings apply.

The following commands/functions/constants apply **locally**, i.e. both the **standard-execution-thread** as well as **each sequence function run in parallel** has its own memory:

- OctI()
- Stat() -> sMin, sMax etc.
- SelUseMeasurement() (!!)
- LogSetup()
- Curve-Kit: CwSelectMode() etc.
- Order Tracking: OtrTachoMode() etc.
- Spectrum Kit: PowerParameter() etc.
- DeqInit() etc.
- HTTPOption()
- GetLastError() – however upon the end of a parallel thread, the error is passed to the calling thread (important for OnError-handling).
- FileOpen*(), VFOpen() – the file-ID returned only applies within the current execution-thread. Files are automatically closed at the end of a thread.
- FileResetAll() – only the files opened in the current execution-thread are closed.

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10.8.10.3.2 Special features of kits and multi-threading

- **Curve-Kit**: All selections and setting apply locally to a thread.
- **Panel-Kit, Report-Kit, Video-Kit**: Active Document, Active Page, Active VideoWidget etc. are global. Parallel processing of documents can thus not be performed in a sensible way.
- **Database-Kit**: Calling within BEGIN_PARALLEL is not allowed.
- **Python-Kit, R-Kit**: All calls are internally routed to the GUI-thread. The respective back-ends do not support multithreading.
- **Excel-Kit, Powerpoint-Kit**: Each thread has its own remote control object. Calls within BEGIN_PARALLEL are thus allowed. So theoretically, different documents could be processed simultaneously in parallel threads. But it is questionable whether this is actually faster since multithreading is not allowed on the back-end side.
- **File-Kit**: File list-IDs (FsFileListNew() etc.) are globally applicable. FsGetLastError() is local to a single thread.
- **ODS-Browser**: Currently, calls within BEGIN_PARALLEL are not allowed.

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10.9 Use of text variables

Text variables can be used in sequences to specify command parameters indirectly. They are often used as an alternative to the operators "*", "?" and "#", and can increase the clarity and flexibility of sequences.

Possible uses include:

- consecutive numbering of created variables in loops
- use of names of formal parameters (variable or file name) for naming variable and file names created in the sequence
- analysis of transferred parameters (e.g. file names) and the resulting conditional execution of commands
- increased clarity and maintainability of sequences.

Text constants are written in quotation marks and may be assigned:

```
Path = "C:\Users\Public\Documents\imc\imc FAMOS\dat"
```

Several functions are available for processing text variables.

Use the operator <...> to access the content of text variables.

The content of a text variable in brackets **<** text variable **>** is replaced in the command line by the formula interpreter and then the created command line is processed. Using this operator, it is possible to specify command and function parameters indirectly.

```
DatName= "C:\Users\Public\Documents\imc\imc FAMOS\dat\slope"
LOAD    <DatName>
```

The formula interpreter checks whether a text variable with the name `DatName` exists. If the text variable is found, the construct `<DatName>` is replaced by the content of the variable; if it is not found, an error message is generated. In the example above, the following command is executed:

```
LOAD  "C:\Users\Public\Documents\imc\imc FAMOS\dat\slope"
```

If a formal parameter is written in quotation marks, the current parameter is interpreted as a text constant during execution of the sequence.

If a sequence containing the lines

```
z = "PA1"
y = "PA2"
```

is called with the first parameter as **`slope`** and the second parameter the numerical value 3, the lines are then read as

```
z = "slope"
y = "3"
```

after replacing PA1 and PA2. Two text variables, z and y, are created which contain the texts "slope" and "3".

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Example 1

The following sequence integrates the data set, transferred as parameter, and stores the result under a new name. The name of the data set created is formed from the first four letters of the name of the transferred data set, followed by the label "*_int*".

```
; Name of the sequence : Integr
; Parameter PA1     : filename
LOAD   PA1
Name    = TPart( "PA1",1,4) + "_int"
<Name>  = Int( PA1 )
SAVE <Name>
```

When the sequence is called, the file `slope.dat` is loaded. In line four, first the parameter PA1 is replaced and interpreted as a text constant, due to the quotation marks. The line is then read as

```
Name = TPart("slope",1,4) + "_int"
```

Without the quotation marks, PA1 would generate an error message, because the function `TPart(,,)` requires a text variable as the first parameter and the variable slope is a 'equidistant data set'.

The text variable Name now has the content "*slop_int*". In the next line, **<Name>** is replaced by the content of the text variable Name. The line now reads:

```
slop_int = Int(slope)
```

The variable `slop_int` is created and then saved in the next line. Calling the sequence with the parameter tst1 creates the variable `tst1_int`, which represents the integral of the data set `tst1`.

Text variables can also be used to increase the clarity and maintainability of sequences.

For example, if you change directories several times in one sequence, it is possible to assign the directories at the beginning of the sequence. The same is true for recurring options. If the options or path names change, the sequence must only be changed in one place.

Example 2

```
LoadPath1 = "c:\work\run1"
LoadPath2 = "d:\usr\reference\data"
BinForm1 = "2 2 0 0 0 Bits 0 -1 1"
BinForm2 = "4 20 0 100 Data"
...
LDIR  <LoadPath1>
BINARY <BinForm1>
LOAD vers01.dat
...
LDIR  <LoadPath2>
BINARY <BinForm2>
LOAD referenz.dat
...
LDIR  <LoadPath1>
BINARY <BinForm1>
LOAD vers01.dat
...
```

Using this method, text variables can be assigned complete commands in order to save typing:

```
ChDir1 = "LDIR c:\work\run1"
...
<ChDir1>
```

Note **Attention**

Please note that the command interpreter must find and replace the text variable before the line is executed, which increases the execution time of the sequence.

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Example 3

The histograms of all variables SINTEST... should be stored as HIST001, HIST002,... . This task was solved in the section 'Repeated execution of a sequence' using the operators "*" and "#". If the names of the data sets have the form SINTESTx (x is a number), use the following sequence:

```
index      = 1
WHILE index <=5
   ;*** Create file name SINTESTx
   TxNumber  = TForm( index, "f10" )
   DatName = "SINTEST" + TxNumber
   ;***Load file to the variable temp
   LOAD     <DatName> temp
   temp =    HISTO( temp, 0, 0)
   ;***Create filenamen HIST00x
   TxNumber  = TForm( index+1000, "f10" )
   TxNumber = TPart( TxNumber, 2, 3 )
   DatName = "HIST" + TxZahl
   ;*** Save
   SAVE temp <DatName>
   index = index +1
END
```

If you try to load a nonexistent file, the sequence is canceled.

Example 4

A directory contains only files in the form *xxx.dat (xxx : three-digit number), which were created by a 4-channel measurement device and stored with incrementing numbers (experiment 1 created files *001..*004, experiment 2 *005..*008 etc.). The x-offset of all files belonging to the fourth channel should be changed:

```
; Name of sequence : OffsetK4
; Parameter PA1 : file mask
; Parameter PA2 : New x-Offset
LOAD PA1
TxNumber = TPart( "PA1",TLeng(PA1)-2, 3)
isChan4  = 1- mod(TtoSV(TXNumber,"f"),4)
IF isChan4
   XOffset PA1  PA2
END
SAVE PA1
```

The command

```
SEQUENCE OffsetK4 test*.dat 0.1
```

changes the x-offset of the data sets test004.dat, test008.dat ... to 0.1.

10.10 Text and addressing options

General text options

"" Normal Text

```
MyText= "MyChannel"
```

<> Variable from text:

```
; Angle brackets converts text into variable.
<MyText>= Data

; Variable name by  text variable and addon:
<MyText>_Max = Max( <MyText>)

; also for groups 407:
<MyGroupName>:<MyChannelName> = 123
```

{} Variable with "forbidden" characters 264:

```
{12XY Channel @86%} = Data/100*86
; Combined with text variable:
Text= "Channel %1\2"
{<text>}= empty

; also for groups 407:
{<MyGroupName>}:{<MyChannelName>} = 456
```

Text array 273

```
FourTexts = TxArrayCreate(4)
FourTexts[2] = "Text for the second element"
SecondText = FourTexts[2]

; Dynamic extended text array
TxArray = TxArrayCreate(0) ; Initial size is 0
Index = 1
WHILE Index <= 5
   ; TxArray grows automatical
   TxArray[Index] = "Line "+ TForm( Index, "F00")
   Index = Index+1
END
```

General addressing options

: Group 277

```
MyGroup:sintest1= sintest1
MyGroup:sintest2= sintest2
MyGroup:sintest3= sintest3
```

@ Measurement 266

```
; Variable@Measurement
Data= RPM@{2022-09-15 11-25-35}


; Edit multiple variables from all measurements:
   ...
   m$= measurements[i]           ; current measurement
   data= <MyChannelName>@{<m$>} ; variable of measurement
   ...
   ; Example: values above 80%:
   Threshold@{<m$>}= max(data)*0.8 ; 80% threshold of the max
   result= SearchLevel(data, 2, Threshold@{<m$>}, 0, 0, 0, 0,
0)
; When using SelUseMeasurement(index) in the panel also e.g.:
   SelUseMeasurement(1)
   temp_min@ = min( {temp 1} )
```

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For samples:

X= Sintest1[3] -> 3rd sample of sintest1

For segments:

```
SecondSegment = SegmentedDataset[2]  ; 2. segment
```

For events:

```
ThirdEvent = TriggeredChannel[3]  ; 3. event
```

For groups:

```
SecondChannel= MyGroup:[2] ; copies variable 2 from group
```

For matrices or segmented waveforms:

```
MyMatrix[x,y]= z
```

Example:

```
;Create Matrix
dim= 10
MyMatrix= Ramp(0, 1, dim*dim) * 0
setseglen( MyMatrix, dim)

; Set Value
x= 2
y= 3
z= 5
MyMatrix[x,y]= z

; Read Value
My_Z_Value= MyMatrix[x,y]
```

. Components 271

```
Magnitudes= Channel.y
Time_values= Channel.x
Magnitudes= Spectrum.M
Phase= Spectrum.P
```

10.11 Dialogs during execution of sequences

For the purpose of communication with the user while the sequence is running, the following functions and commands are available:

PAUSE	Displays messages and provides the ability to cancel the sequence
BoxOutput	Output of messages
BoxMessage	Output of interactive messages
BoxText?	Retrieves box text
BoxValue?	Retrieves box value
DlgFileName	Selects a filename
FsDlgSelectFiles *FsDlgSelectDirectory*	Selects filenames or directories. Both functions are included in the File-Kit .

Reference

The functions are described in detail in the manual imc FAMOS Functions Reference and in the online help. The description of the command "*PAUSE*" is presented in the section "*Sequence commands*".
Here, its use is illustrated with an example.

Example

The following sequence asks for a file name and then loads the specified file. The loaded data set is interpolated and the result displayed. The user queries the interpolation factor and the name of the result variable. The length of the resulting data set is displayed. The user can either cancel or load the next file.

```
while 1
 TxFile=DlgFileName("C:\Users\Public\Documents\imc\imc FAMOS\dat", "dat", "", 0 )
 if TLeng( TxFile ) > 0
  Load <TxFile> var
  factor= BoxValue?("Interpolation factor ?",2, 0)
  TxName= BoxText?( "Result name ?","Interpol", 0)
  <TxName>= IPol( var, factor )
  Show  <TxName>
  TxMessage = "Length of "+ TxName + ":"
  BoxOutput( TxMessage, leng?(<TxName>), "", 0 )
 end
 Pause Load next file?
end
```

Reference

The input and output boxes generated by the functions named have a fixed appearance which the user cannot influence. For this reason, they are best used for simple, standard applications. However, imc FAMOS offers the user the extra option of personally designing input and output boxes. Refer to the chapter 'User-defined dialogs' 545 for details.

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11 AI-Assistant

11.1 Introduction

The FAMOS AI assistant supports you in programming sequences and helps with general questions about the operation of FAMOS. As with other AI assistance systems, communication takes the form of a written dialog ("chat"). You formulate your question in text form, receive the answer in text form and, if necessary, can refine the assistant's answers step by step and tailor them to your problem by asking further questions.

The AI assistant is available in the **Professional and Enterprise editions** and requires an Internet connection. The required services and applications are made available within Microsoft's Azure cloud platform.

The FAMOS client sends the requests to an imc web service, which forms the public interface to the required Azure infrastructure. This infrastructure includes other components that are controlled by the imc web service, such as databases and the actual AI language model. The imc web service prepares the request, sends it to the AI service (Azure OpenAI), receives the response from the AI and then sends it back to the FAMOS client.

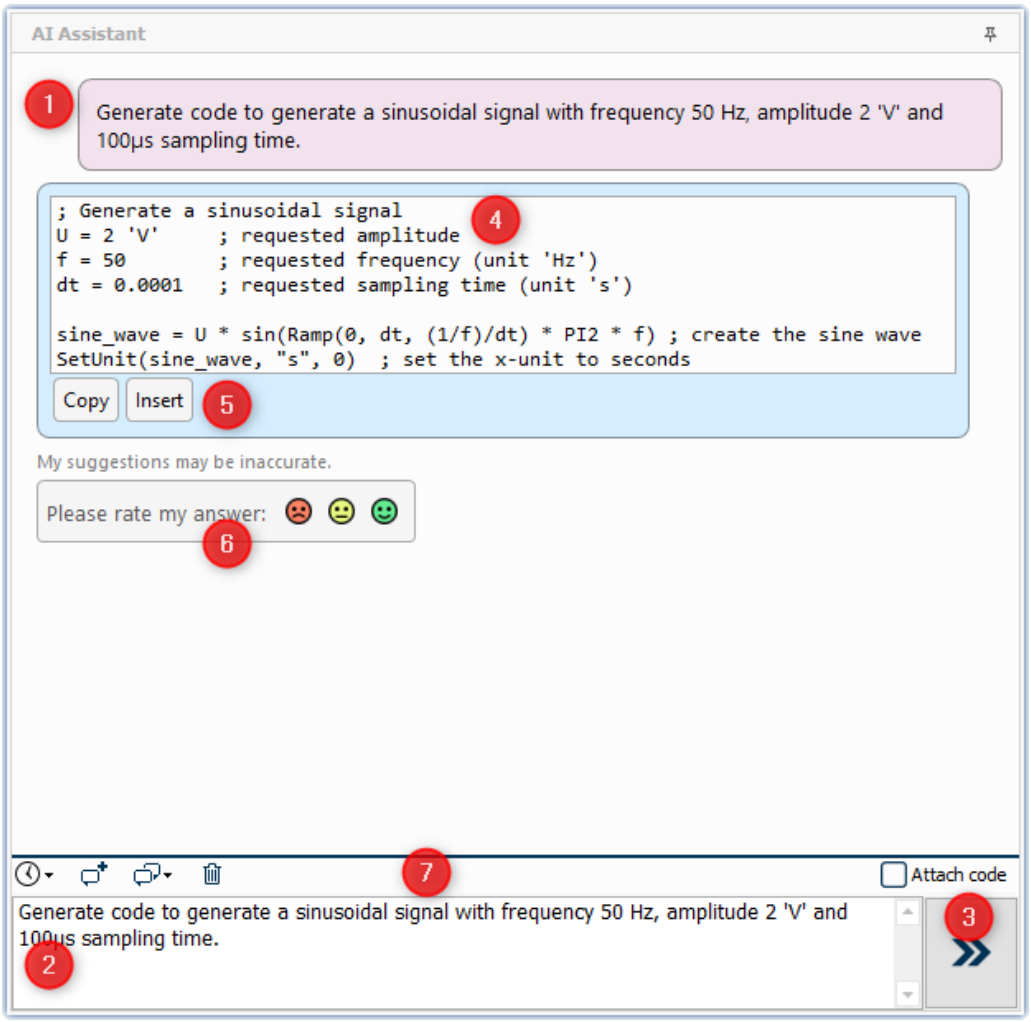
Before using the AI for the first time, you must confirm the "**Terms of Use / Privacy Policy**" of the FAMOS AI Assistant. Among other things, this also tells you how and where your data is processed and stored.

The AI assistant has the status "**experimental**" in version 2025 and is in constant and progressive further development. imc reserves the right to temporarily switch off the service for maintenance purposes and therefore does not guarantee 100% availability.

11.2 The AI chat window

The tool window for the AI Assistant can be found in the standard FAMOS layout on the right-hand side of the main FAMOS window as an automatically "rolling out" window. Click on the "AI Assistant" tab to display the window. Clicking outside the window then causes the window to roll up again. By clicking on the pin button in the title bar, the window can be kept permanently visible. As with all other FAMOS tool windows, you can adjust the position as required by dragging the title bar.

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The AI tool window contains the display of the current call history ❶ in the upper area. Below this is the input window ❷, in which you can formulate your requests. To the right of the input window, you will find the "Send" button ❸, which you can use to send the current request in the input window to the assistant.

The Assistant's response may contain sections that contain direct sequence code (highlighted in gray ❹). Right-click in these sections to open a context menu with the usual text processing commands such as "Copy"/"Paste"/"Delete".

Below the code sections you will find the "Copy" and "Insert" buttons ❺. "Copy" copies the entire code to the Windows clipboard, from where it can be inserted into other programs or FAMOS itself using "Paste". With "Paste", the code is inserted into the active sequence editor window (if an area is selected there, the selection is replaced, otherwise it is inserted at the cursor position).

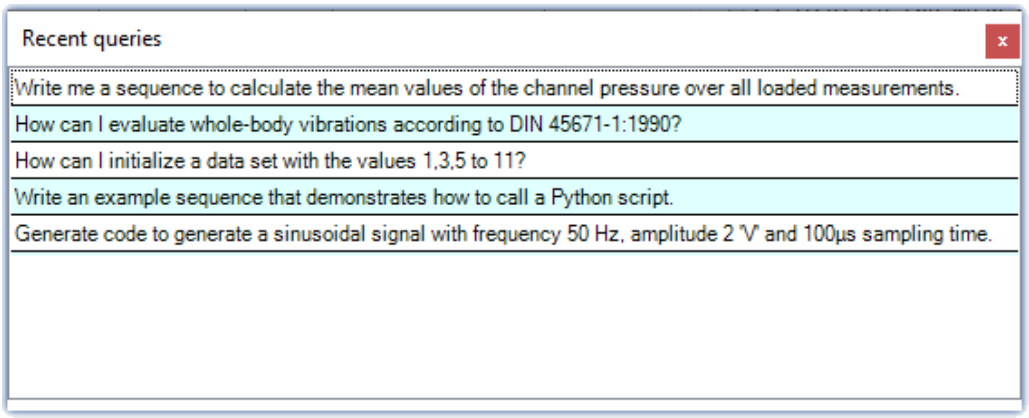
Below the answer of the Assistant you will find a control element ❻ with which you can rate the quality of the answer. After clicking on the corresponding smiley, a dialog opens in which you can optionally specify your rating in more detail (see section Rating dialog 416). The display of the rating element can be suppressed via the AI default settings (see section Default settings 415).

Right-click on the display window to open a context menu with the command "Save content". This command allows you to save the current content of the window in an HTML file.

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The toolbar ❼ above the input window provides access to the following commands:

Recent queries: You will find the list of the most recently sent requests here.

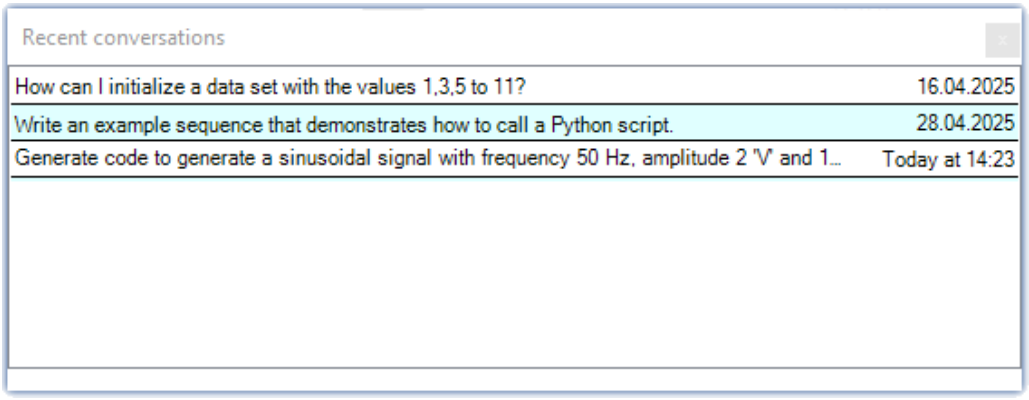


By clicking on an entry, the question is copied into the input window.

Start new conversation: Click here to start a new conversation. The conversation display of the previous history is deleted and the assistant's temporary memory is reset. This procedure is recommended if you want to ask a question about a new topic that has nothing to do with the previous discussion.

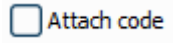
This ensures clarity and prevents contexts from being mixed up. Otherwise, the assistant will continue to take the previous discussion into account when answering the question, which can impair the quality of the answers.

Recent conversations: You can find the list of recent conversations here.



By clicking on an entry, the conversation history saved by the assistant on the server is restored and you can continue the discussion by asking further questions. As conversations are only saved by the assistant for a limited time, it may happen that the desired conversation is no longer available. In this case, a corresponding error message is displayed.

Delete current conversation: The current conversation is deleted and also completely removed from the AI assistant's memory.



Attach code:

If this option is activated, the current content or the current selection of the active sequence editor window is appended to the request. This is useful if your request relates to the current sequence, e.g. if extensions, improvements or explanations of the existing code are required. If an area is selected in the editor, only the selected section is transferred, otherwise the entire content of the window is transferred. However, the amount of data is limited to a reasonable size for the assistant; for very large files, only a corresponding section of the file is sent, whereby the current position of the cursor is approximately in the middle of the sent text.

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11.3 Practical tips for use

The FAMOS AI assistant mainly supports you in programming sequences and also helps with general questions about the operation of FAMOS. If you ask questions that leave this context ("What is the weather like in New York?"), the assistant will generally politely point out that it cannot answer this question.

Examples Examples of typical code generation queries:

- How can I initialize a data set with the values 1,3,5 to 11?
- Calculate the amplitude spectrum of the variable "Signal" (Hanning window, mixed radix mode) and assign the result to the variable "SpecOfSignal". Determine the frequency of the largest spectral line.
- Write me a sequence to calculate the mean values of the channel pressure over all loaded measurements.
- Generate code to generate a sinusoidal signal with frequency 50 Hz, amplitude 2 'V' and 100µs sampling time.
- Cómo cargar todos los archivos de una carpeta dada ("c:\tmp") y subcarpeta ("data") y calcular la FFT de ellos. (Note: the assistant understands many languages!)
- Write a sequence that generates a free-floating curve window for the "amp" channel as a bubble plot. The "amp" channel provides the actual data. The "color" and "size" channels determine the color and size of the bubbles. The X-axis is scaled from 1 to 100.
- Write an example sequence that demonstrates how to call a Python script.
- Load all files from a given directory and summarize the contained channels in a data group.
- How can I evaluate whole-body vibrations according to DIN 45671-1:1990?
- Give me an example of a counting loop in FAMOS that counts from 1 to 100 with an increment of 10!
- Find all local maxima in a data set whose amplitude is greater than 3! Smooth the data set a little before searching!

Examples Examples of typical requests for general FAMOS operation:

- Which command line parameter can I use to load a panel file?
- I have a CSV file here. How can I import it manually via the menu?
- How do I insert a line break into a text constant in FAMOS?
- Where can I specify the line width for the printout in the curve window menu?
- What are the differences between a sequence function and a classic sequence?
- Can I import and export MDF4 files?
- I would like to define an MDF4 import filter with my own settings. How do I proceed?
- Where can I set whether a decimal point or comma is used to display numbers?
- Explain the Monte Carlo method to me!
- What predefined constants are there in FAMOS?
- Panel creation: When should I use the report mode and when should I use the dialog mode?
- How can I specify a variable whose name is contained in the text variable TxVarName as a function parameter?

The answers of an AI model are not deterministic in principle. If you ask the same question twice, you may receive completely different answers of varying quality. If an answer does not solve your problem or is even fundamentally wrong, it may be worth asking the same question again with a different choice of words.

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AI assistants are by their very nature not error-free. They can completely misunderstand your question, answer only partially correctly or helpfully, provide outdated information or even suggest complete nonsense ("hallucinate"). The urgent recommendation is therefore to always check the generated content critically and check it for plausibility.

You have the opportunity to improve inadequate answers in conversation with the assistant by pointing out errors in the assistant's current answer or by further clarifying your original question.

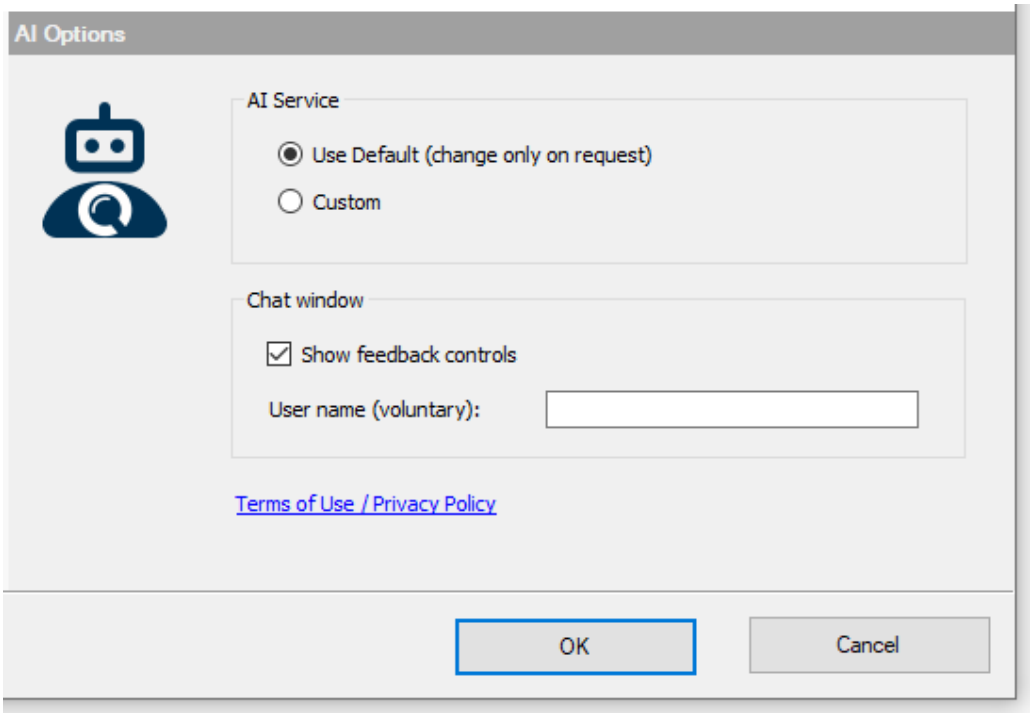
The FAMOS AI Assistant is constantly being developed and improved. This is done by optimizing the documents that are made available to the assistant and from which it obtains the information to answer the queries. So if you are dissatisfied with the quality of the answer for a particular problem domain, try again a few weeks later - it is quite possible that the assistant has learned more about this topic in the meantime and can provide significantly better answers.

You can also actively contribute to improving the assistant yourself by using the built-in rating function. The feedback generated in this way provides the development team with valuable information about any remaining weaknesses.

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11.4 Default settings

Under "Extra"/"Options"/"AI Assistant" you will find various default settings for the AI Assistant:



AI service:

You can specify the variant of the AI assistant to be used here. Please only change this setting on the explicit recommendation of imc support!

Chat window:

Show rating elements: If activated, a control element is displayed below each AI response, which you can use to rate the response quality. Your optional feedback helps us to continuously improve and develop the assistant.

User name: This (voluntary and freely selectable) information is transmitted to the server with requests and feedback. Even if the chosen name does not allow any direct conclusions to be drawn about the identity of the user, imc can obtain better information about the usage behavior of the user and gain valuable information for the further development of the assistant.

However, it may also be in the user's own interest to be identified if, for example, technical problems occur when using the assistant that are reported to imc's technical support ("I have been unable to connect to the assistant for 2 days. My user name is "Itsonlyme_123" (or Bernd.Mustermann@mail.de)". The user name then helps with the assignment of the process and with troubleshooting.

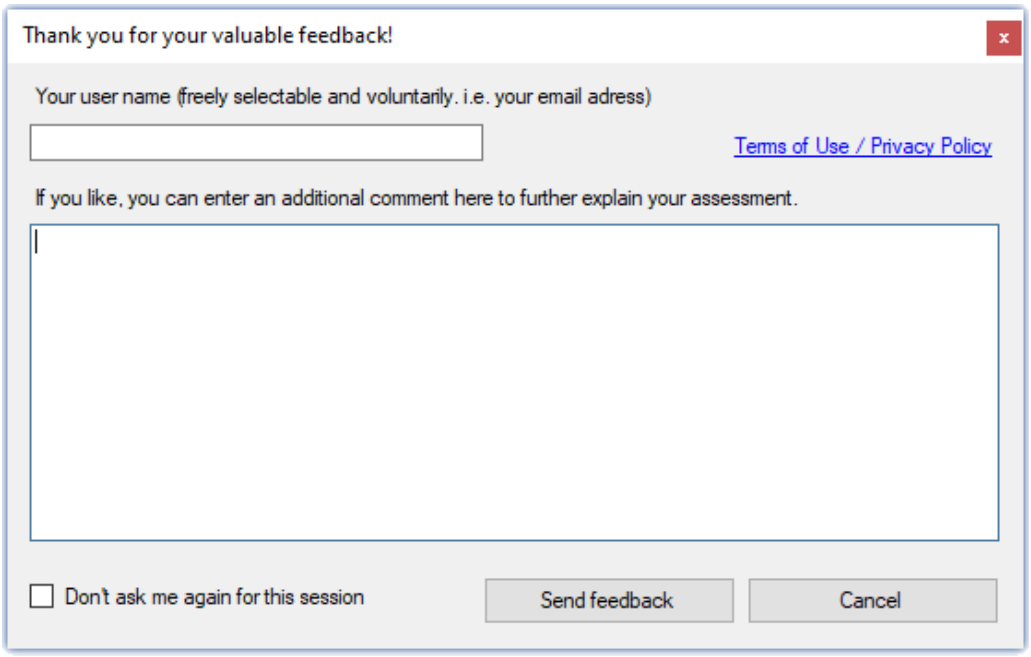
Terms of use / Privacy policy

Display of the terms of use and privacy policy for the FAMOS AI Assistant. These must be confirmed by the user before using the assistant for the first time.

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11.5 Rating dialog

A control element is displayed below each AI response, which you can use to rate the quality of the response. Your optional feedback helps imc to continuously improve and develop the assistant. After clicking on the corresponding smiley, a dialog opens in which you can optionally specify your rating in more detail:



User name: The user name (optional and freely selectable) is included in the rating sent. It helps us to assign your ratings.

Comment (optional): You can enter an additional comment here to clarify your assessment (for example, in the case of a poor assessment, additional details such as "Topic missed" / "Code not executable" / "Incorrect parameter suggestion for function XYZ"...).

Don't ask me again for this session: If activated, then clicking on a rating smiley will no longer display this dialog in the current session.

The rating sent will then only consist of the good/medium/bad rating without any further comment.

Terms of use / Privacy policy

Display of the terms of use and privacy policy for the FAMOS AI Assistant. Before using for the first time.

The display of the rating element can be suppressed via the AI default settings (see Options 415 section)

12 Project Management

12.1 Concept

Project Management comes with the editions imc FAMOS Professional and imc FAMOS Enterprise.

Small analysis and presentation tasks can often be accomplished with the help of a single imc FAMOS sequence.

However, for more complex tasks, that usually is not enough. The necessary algorithms are often distributed among a number of sequences and dialogs which may, for instance, be called consecutively from a "main sequence". Additionally there may be predefined curve configurations providing curve windows with a particular appearance, as well as templates for the Report Generator, which are later filled in with updated measurement results and curve plots. Thus, accomplishing a task may require an entire collection of files which must be jointly administered, edited and transferred.

The collection of files and settings necessary for solving a particular assignment is referred to as a **imc FAMOS project.** All files and settings belonging to a project are saved to a joint folder, the so-called **project folder**. This makes it very easy to administer (for instance, create a backup copy of) and transfer the project (for instance, to run it on a different PC) - it's sufficient to create a copy of the folder.

A project can also be "**executable**". For this purpose, the folder must contain a sequence with the name "**Autostart.seq**" or a dialog named "**Autostart.dlg**". Then the project can be run by starting this sequence or dialog, respectively.

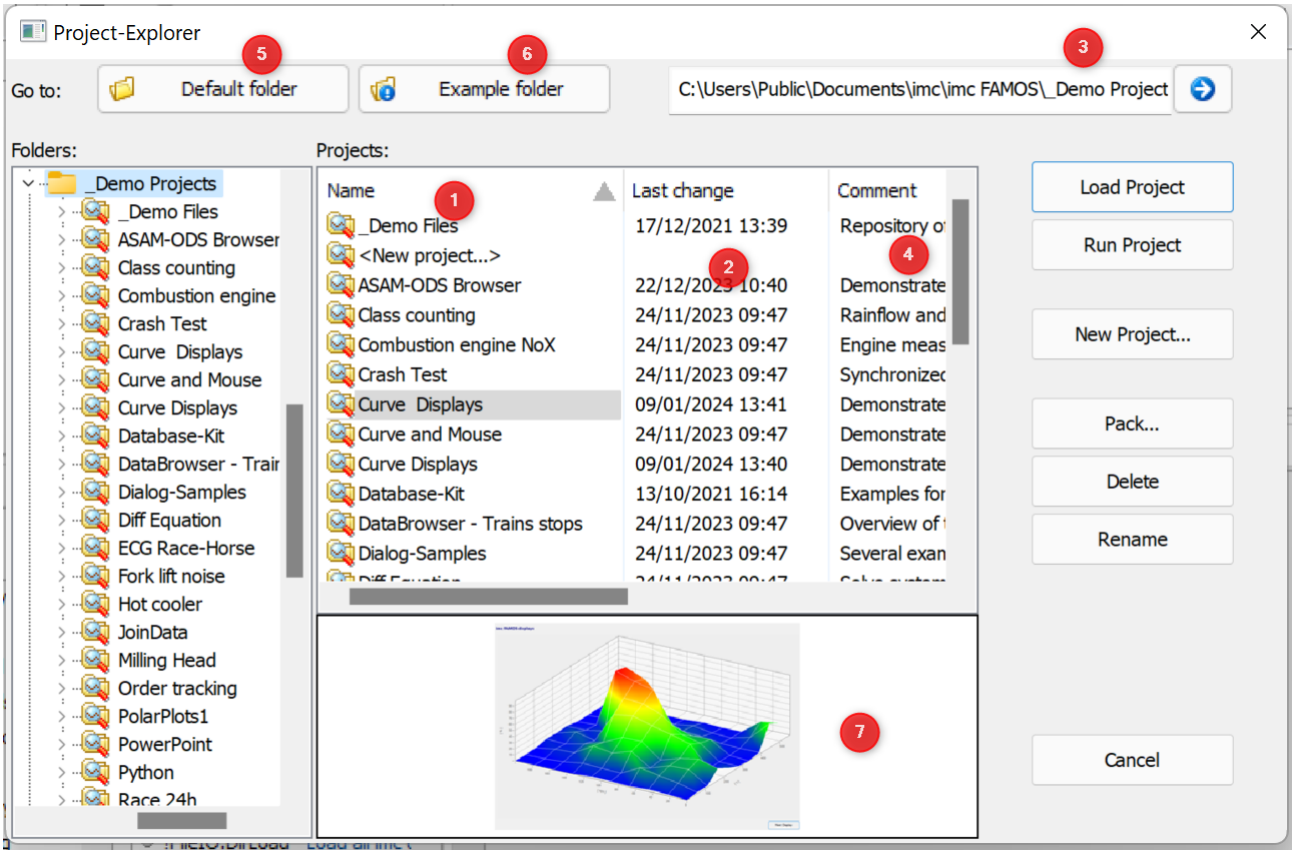
A special case of a general imc FAMOS project is the "***current session***". This enables you to save the project's current state (for instance, the contents of the variables list, the curve windows and sequences open) before exiting imc FAMOS , so that the next session can follow as seamlessly as possible on the last.

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12.2 The Project Explorer

The Project Explorer is the control center for administering imc FAMOS projects. From here, you can create, open, run and delete projects.

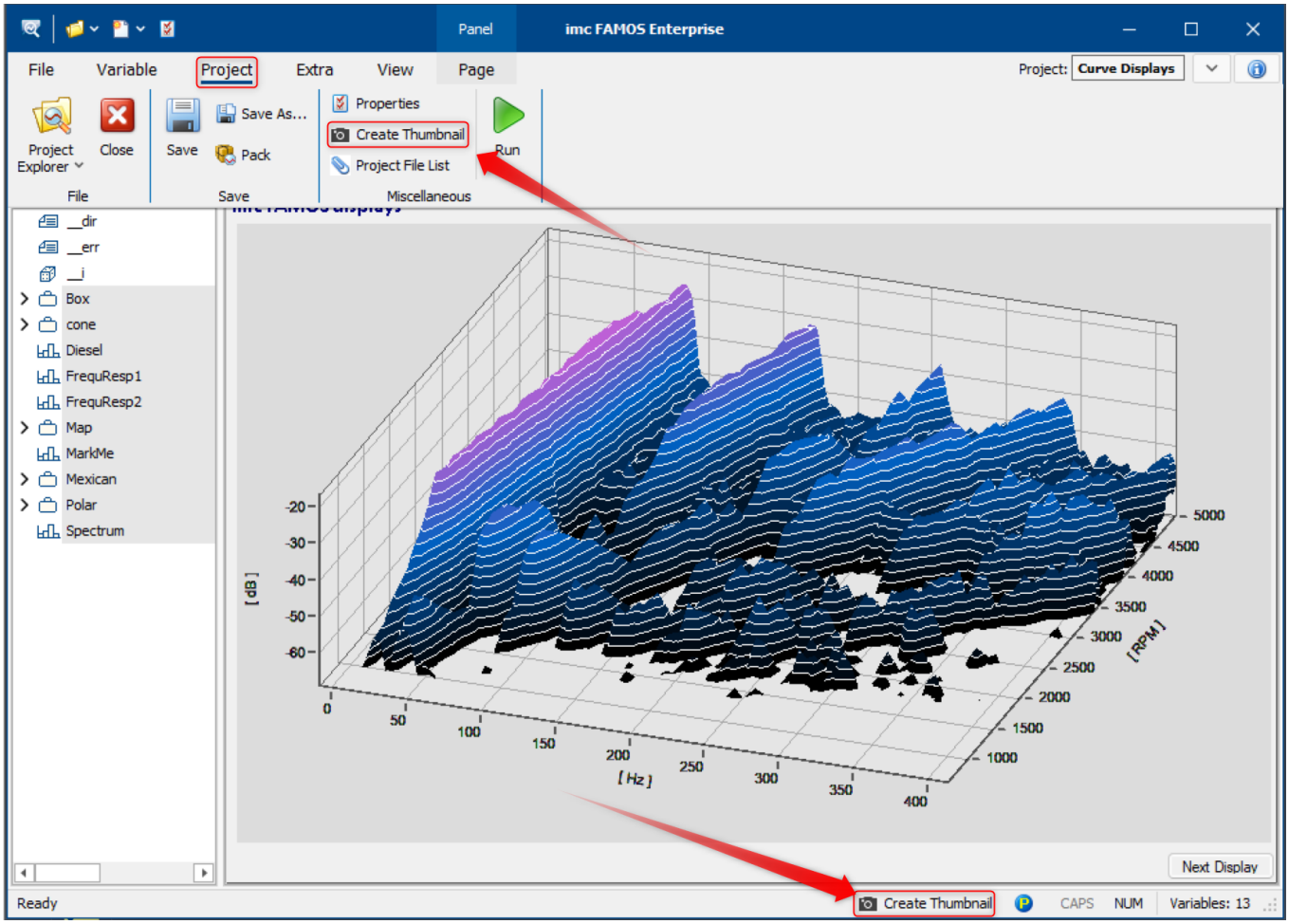
To call the Project Explorer, select the menu item"*File: Open>Project* 121". If any project is already open, it is also possible to make the call via the Project menu 127.



The tree diagram on the dialog's left side is a representation of your system's directory structure. Navigation within the tree diagram is similar to the operation of the Windows Explorer. When the Project Explorer is started, the imc FAMOS default folder 259 for projects becomes the active selection. This can be changed under "*Extra: Options: Folders* 129". Use the buttons *Default folder* ❺ and *Examples folder* ❻ to quickly find the desired selection.

The right side of the dialog (*Projects*) presents the project subfolders contained in the folder selected with *name, date* and *comment*. imc FAMOS project folders are marked with a special symbol. Click on the list headings to sort the list either by "*Name*" ❶ or "*Last change*" ❷. If the absolute path to the project is known, it can be entered into the input field ❸. The column "*Comment*" ❹ helps with the selection and is entered as a project property 424.

A thumbnail ❼ helps to select the project. This can be created and updated by the user:



Create Thumbnail

12.3 Creating a new project

To create a new project, first start the Project Explorer (menu item "Project: Project-Explorer").

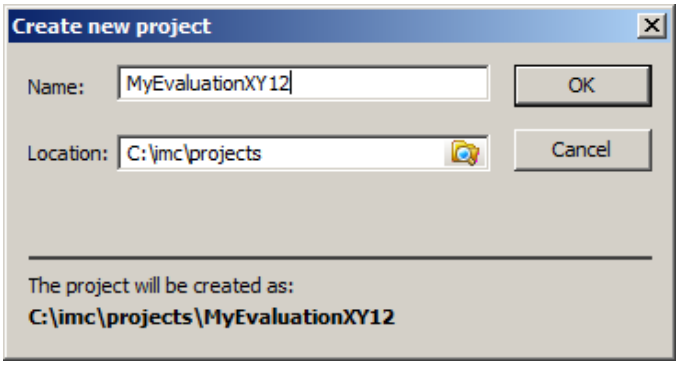
Begin by selecting in the tree diagram the folder in which you wish the project subfolder to be created.

If creating a new project is permitted in the currently selected folder, a new entry "<***New Project***>" appears in the project list.

Note

If this entry is missing, it means that no new project can be created in that folder. This can be the case, for example, if the parent folder is itself a project folder (projects cannot be nested).

Double-clicking on the entry <New project...> or pressing the button with that caption calls an additional dialog, by which you can set the project's name.



Under <***Name***>, enter the desired name for the project. This name is identical to the name of the project folder to be created. The same rules apply for the name's syntax as for a folder name, so that characters like "< ? > : \ /" aren't permitted. Also, no other folder of the same name may already exist.

Under *<Location>,* you can edit the location in which the project is saved. Once a valid name and location are entered, the resulting complete directory path is indicated at the bottom of the dialog.

The new project is then created once you click on the *<OK>* button.

This means in particular that:

- the project folder is created.
- the file "***Default.FamosPrj***" is created in the project folder. This so-called project file contains the settings valid for this project.
- the files "***Desktop.ini***" and "***FamosProject.ico***" are created. These ensure that the Windows Explorer display the imc FAMOS project icon for the folder.
- the file "***Autostart.seq***" is created. This "start sequence" for the project is called when the project is run. The sequence is originally initialized to output a default message and must be adapted according to your needs.
- Once the folder and files have been successfully created, the new project is loaded.

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12.4 Loading and running a project

To open an already existing project, select the desired project in the Project Explorer's project list and click on the button <Load Project>.

When a project is opened, the following actions are carried out.

- The opened project's name appears in pointed brackets in the imc FAMOS main window's title bar.
- The settings saved for the project are applied. These can include:
- Variables
- Curve windows
- Input box contents
- Sequences/ dialogs which are open in the Editor box
- Project favorites. These are displayed with the title as an additional sub-group in the "*Favorites*"-window.
- The default folders for sequences/ dialogs, curve configurations (*.ccv) and reports (*.drb) are reset as the project folder.

If you click the button <*Run Project*> in the Project Explorer, the project is opened as previously described. Next, a check is made of whether the project folder contains a sequence with the name "*autostart.seq*" or a dialog "*autostart.dlg*". If yes, the sequence or dialog, respectively, is run.

To open or run a project recently active, you can also use the historie entries of the menu item "*Project Explorer*".

To run a project already loaded, the following options also exist:

- **Menu item** "*Project: Run*": Runs the currently open project.
- **Project favorites:** Under the project favorites, you will find the automatically generated entry "Project <...> start".
- **Favorites:** You can also place entries in the Favorites list, in order to be able to start projects directly. To this end, the option "*Project*" must be activated in the favorite's properties, and the complete project path must be specified.

To open and run a project in a single step, the following possibilities are provided:

- **imc FAMOS command line parameter "/P project-path"** 62

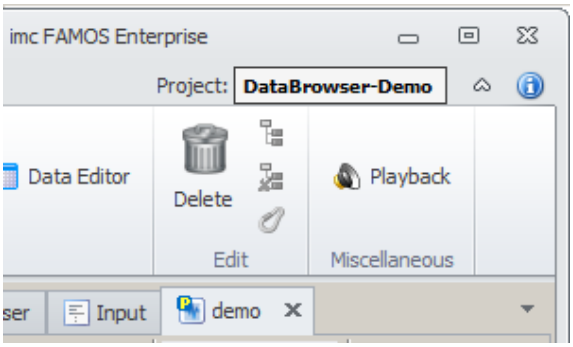
  Example:

```
famos.exe /P "C:\Users\Public\Documents\imc\imc FAMOS\prj\MyProject"
```

  Starts imc FAMOS and runs the project specified. Additionally, the switch "/X" can be combined with "/P". By this means, imc FAMOS is closed again after the project is run. This enables you, for instance, to create shortcuts for commonly needed projects.

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12.5 Special characteristics of an active project



The project's name is displayed in the imc FAMOS title bar in pointed brackets. A project folder's main significance is as a repository of all files (meaning sequences, dialogs, reports, curve window configurations) which affect the project. This is supported by special features and the operation technique of imc FAMOS , as described below.

12.5.1 Opening project-related files by command

For an active project, the response of the following commands or functions for opening project-related files is different:

- *CwLoadCCV* and the former function *CvConfig()*
- *CwLoadSettings* and the former function *CvLoadGlobalSetting()*
- *DbLoadPanel*
- *Dialog()*
- *PnSave*
- *PnExportPDF*
- *PnExportGraphics*
- *RgDocOpen()*
- *SEQUENCE*

Unless the complete path for the file to be opened (1st parameter) is supplied, the system searches for the file in the following folders in order:

- In the current working folder (determined by the sequence or dialog under which work takes place)
- **In the current project folder**
- In the pre-defined default folder for the respective file type (set via "*Extra: Options: Folders*" and functions or commands such as SDIR, SetOption, RgSetDir).

When working within a project, it's best not to supply the functions mentioned above with the complete filenames; otherwise, your projects may not be ready to run if they are copied to a different location.

If a sequence requires the current project path, use the function GetOption():

```
MyProjectPath = GetOption("Dir.CurrentProject")
```

12.5.2 Saving project-related files by command

For an active project, the response of the following commands or functions for saving project-relevant files is different:

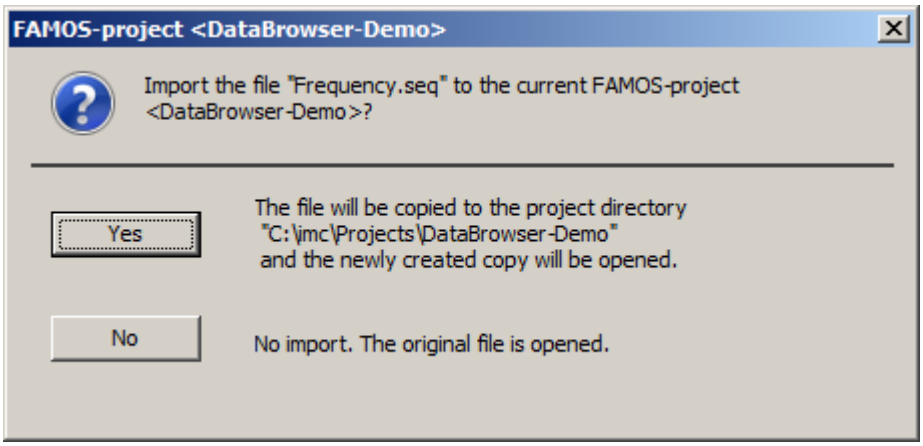
- RgDocSave()
- RgDocExport()
- CvSave()

Unless a complete path is specified for the file to be saved (1st parameter), the project folder is used.

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12.5.3 Manually loading project-related files

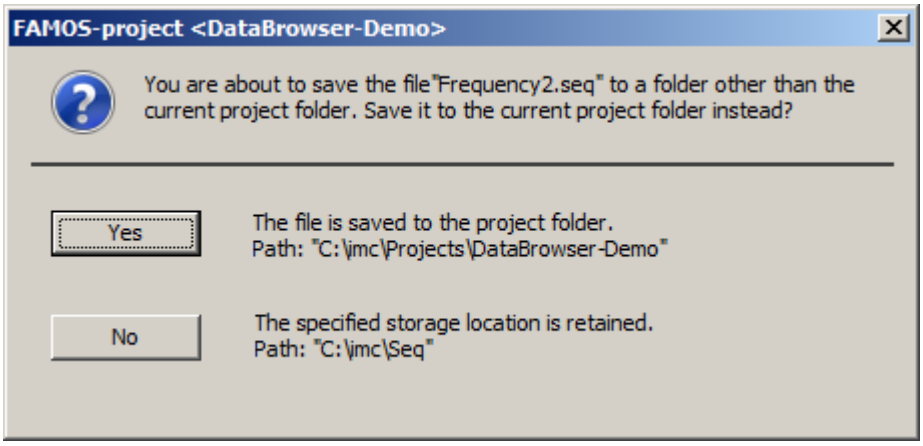
If you manually open a sequence, dialog, curve configuration or report which doesn't belong to the current project folder, you are prompted to confirm whether to add the file to the current project (i.e. import it to the project).



- If you select "*No*", the selected file is loaded unchanged.
- On the other hand, if you select "*Yes*", the selected file is copied to the project folder and the newly created copy is loaded. You can thus easily import already existing files to a project.

12.5.4 Manual saving of project-related files

If when manually saving a sequence, dialog, curve configuration or report, the path you specify doesn't match the project folder, you are prompted to determine whether it should be saved in the project folder instead.

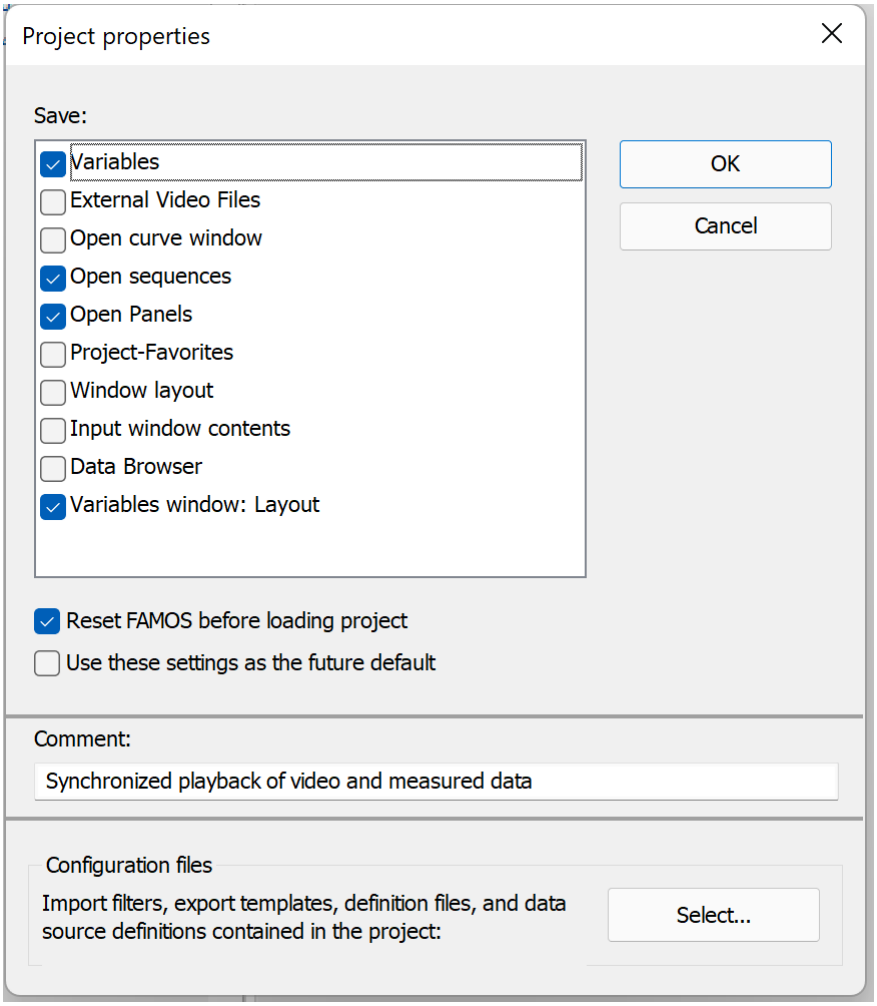


- If you choose "*No*", the file is saved under the path originally selected.
- Conversely, if you choose "*Yes*", the file is saved to the project folder instead.

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12.6 Project properties

In the project properties, you determine what additional settings the current project is to have. By selecting the menu item "*Project: Properties*" you open the following dialog:



Variables:

Saves the complete contents of the variables list. All variables are saved together in a file in the project folder. When you open the project, this file is automatically reopened.

External video files:

When this option is checked, video files are referenced only. Otherwise, the video files are saved with the project.

Open curve windows:

The configurations of all open curve windows are saved. When you open the project, the curve windows are displayed once again in the same position.

Open sequences:

The path names of the sequences currently open in the Editor window are saved. When the project is opened, the system attempts to re-load the sequences and to display them.

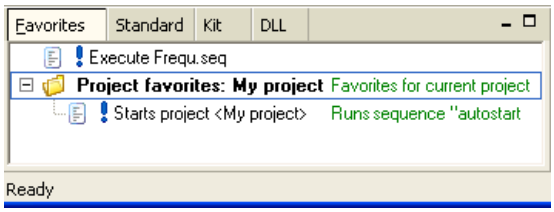
Open Panels:

The paths to the Panel-pages which are open are saved; not the panels themselves.

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Project Favorites:

The project has its own group of favorites with the name "*Project favorites: <Project name>*". Favorites created within this group by the user are automatically saved along with it and adopted in the Favorites list when the project is opened.



Window layout:

The position and configuration of the imc FAMOS main window, and, if they're open, of the Data Editor, Dialog Editor and the Report Generator, are saved.

Input window contents:

The complete contents of the editor input window are saved.

Data Browser:

With this option the state of the Data-Browser is saved.

Variables window: Layout:

All settings for the Standard Variables list (e.g. column configuration, tree structure, filters, sorting) are saved.

Option "***Reset imc FAMOS before loading project***":

With this option, the same command as in "*File -> Restart* 118" will be performed before loading the project. The Variables list is emptied, i.e. all variables are deleted.. All open sequences are closed.

Option "***Use these settings as the future default***":

When this option is selected, the data saving settings displayed will be offered in the future.

Comment:

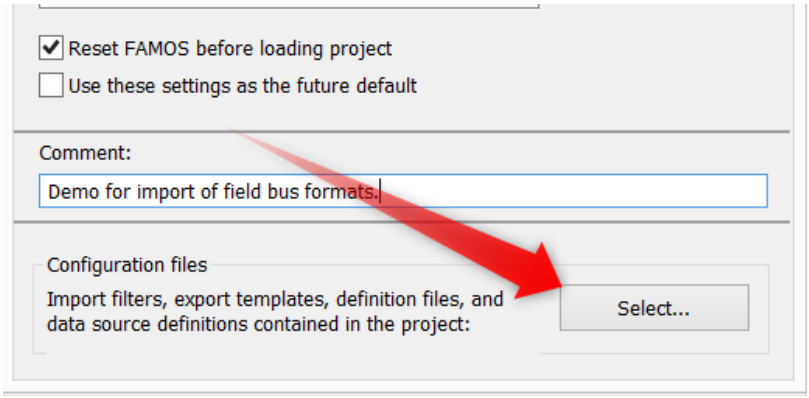
A description of the project that is helpful for selection in the Project Explorer 418.

12.6.1 Advanced project properties and configurations

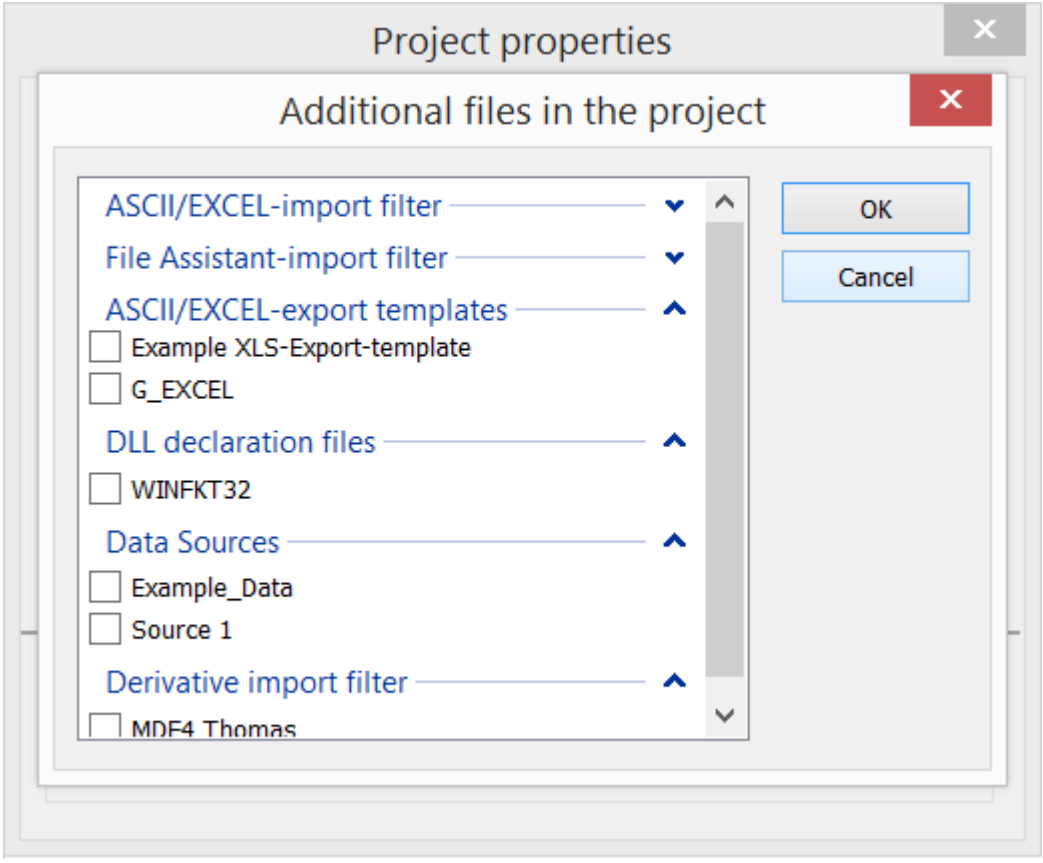
Additional elements needed for the project can be specified in the project properties:

1. ASCII/EXCEL-import-configurations (*.ascimp) created with the ASCII/EXCEL-Import Assistant
2. ASCII/EXCEL-export templates (*.aet)
3. File Assistant-import filters (*.fas)
4. DLL-declarations files for the external DLL-interface (*.def)
5. Definitions for data sources
6. Definitions derivative import filters

Any configurations to be incorporated into the project must be explicitly selected. To do this, select the dialog item "*Project*"/"*Properties*" "*Select*" under *Configuration files*:



After "*Select*", an additional dialog appears, in which the desired configurations can be selected:



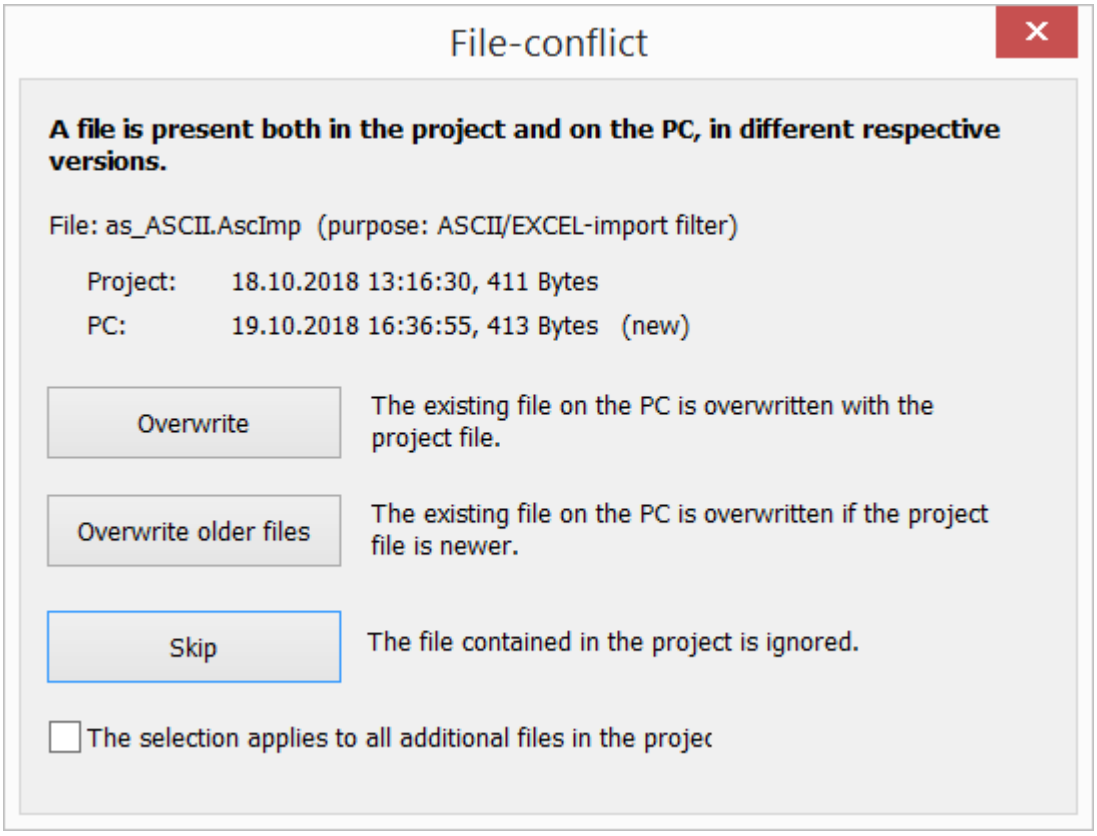
Saving the project

The project folder contains an additional subfolder named "*includes*". When the project is saved, the files selected here (1) through (4) are copied from the folder "*%PROGRAMDATA%\imc\Common\def*" to this folder.

The selected data sources and derivative import filters are exported to a file "*Importmanager.Config*" in the same folder.

Loading a project

The folder "*includes*" is scanned and the *.ascimp, *.aet, *.def and *.fas-files it contains are copied to the folder *"%PROGRAMDATA%\imc\Common\def*". In consequence, they can be used by FAMOS. If the files are already present and differ in terms of their time stamp or size, the user is presented with a dialog for resolving the conflict.



The file "*Importmanager.config*" is imported of it is present and the data sources and derivative import filters it contains are additionally available in FAMOS.

The names of the import filters and data sources imported in this way are assigned the suffix " [P]". This makes duplicate names unlikely to occur. If duplicate names still occur, the definition in the project is ignored. An associated warning is displayed.

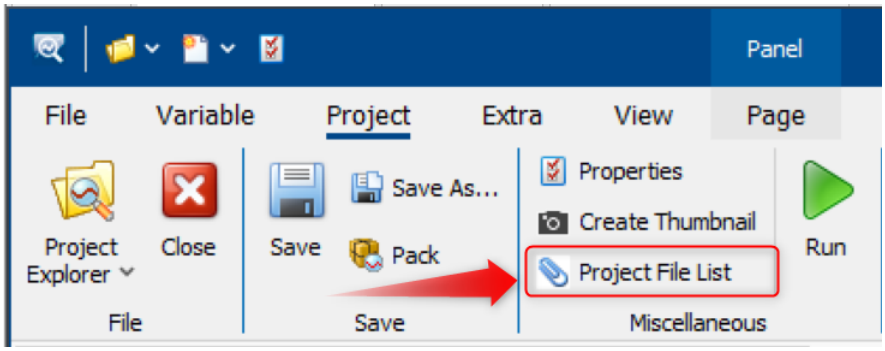
Closing the project

Any data sources/import filters defined in the project are deleted again upon closing. All other files remain intact.

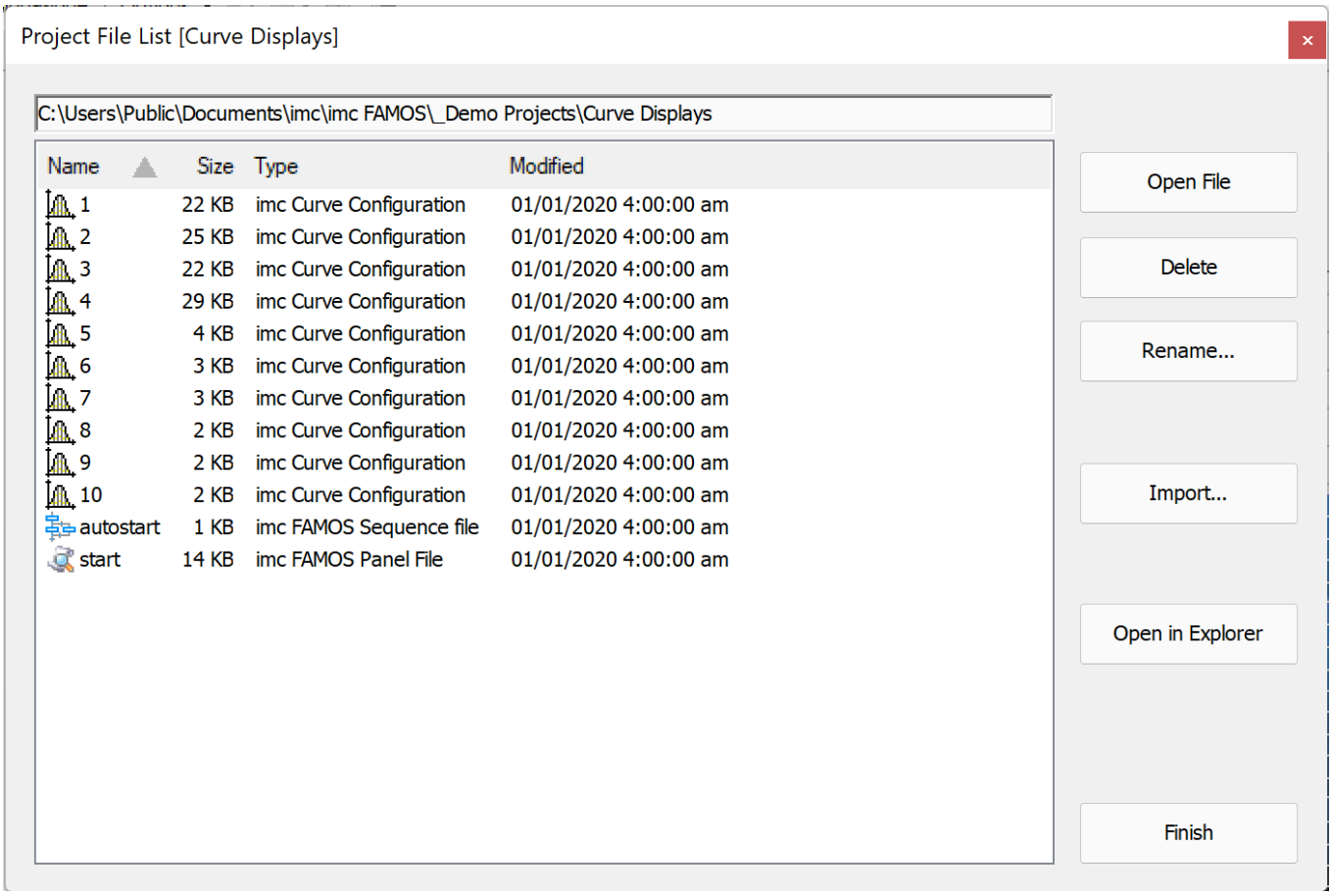
Remarks: The settings in the "*Select*"-dialog are not additionally recorded in the project file. Everything present in the "*includes*"-folder is imported. For this reason, it is possible to copy files directly into the folder.

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12.6.2 Project files



The ribbon menu item *"Project -> Project File List"* opens a dialogue that lists all files used in the project.



This dialogue behaves like Microsoft Explorer. This means that files can be opened, deleted, renamed and imported. There is no undo function.

12.7 Save, Close, Delete

To **save** the current project, use the menu item "Project: Save". The files and settings belonging to the project are saved in the project folder according to the project components set in the project properties.

Also note this option for packing a project 127.

To **close** the active project, use the menu item "Project: Close". If appropriate, a confirmation prompt may appear to ask you whether to save relevant changes to the project. Sequences, dialogs and panels belonging to sequences are also closed.

To **delete** a project no longer needed, you can use the button <Delete project> in the Project Explorer. The entire project folder along with all subfolders is deleted. Alternatively, you can simply delete the folder by way of the Windows Explorer or any other file manager.

12.8 Current/last session

The so-called **"*Current session*"** represents a special case of general FAMOS projects. Using the menu item "*Extra"/"Save current session* 128", you can save the current state of the FAMOS session. This includes, for instance, the content and sorting order of the Variables list, the curve windows and sequences which are open, the order of the various FAMOS working windows, and the content of the input window.

Later, you can use the associated menu command "*Load last session* 129" to restore the session, for example in order to resume work as seamlessly as possible on the next working day.

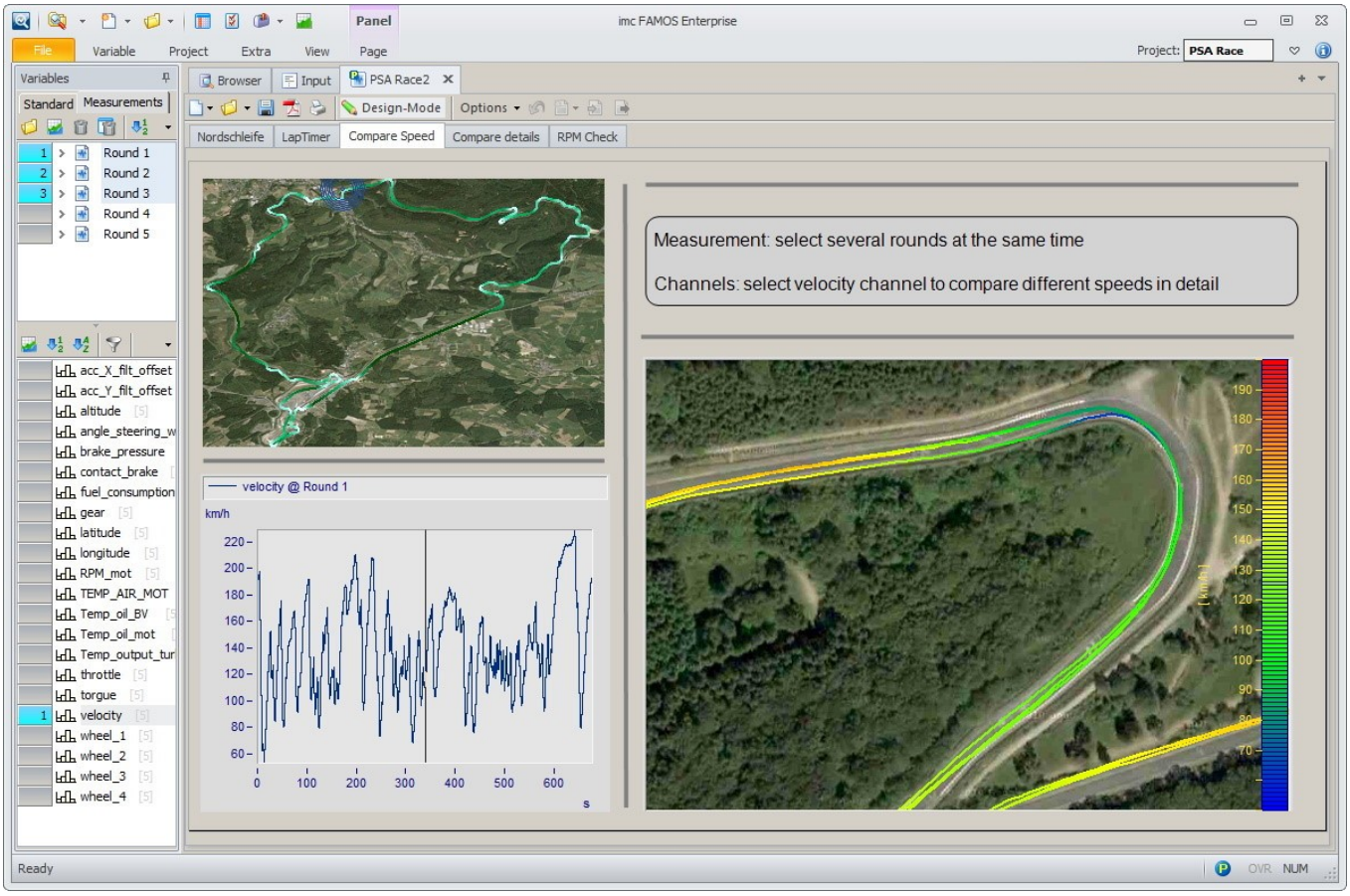
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13 Panels

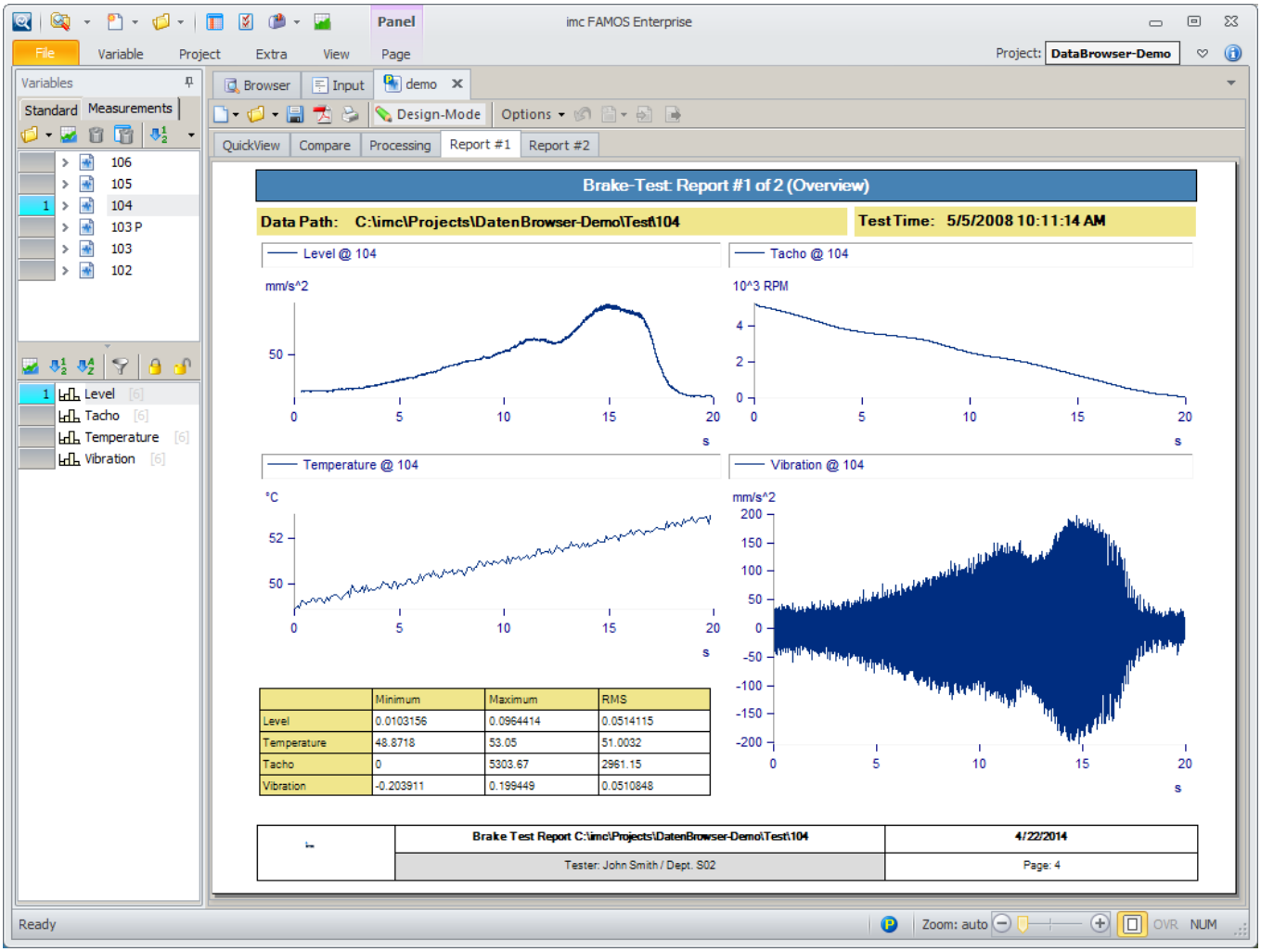
For display and documentation of measured data, so-called panels are used. A panel contains one or more pages. You can arrange a variety of **widgets** on a page. Typical widgets include curve windows, tables and labels. It is also possible to position interactive widgets such as buttons and input boxes for text in the forms. Such interactive widgets can either start sequences or be linked directly with imc FAMOS variables (Data Binding 499).

Channels belonging to measurements are especially suited to Panels, since their display can be controlled via the Measurements and Channels lists 209.

Panels thus combine the properties of dialogs (active widgets, variable linkage - see User-defined Dialogs (Dialog-Editor) 545) and reports (optimized for printout - see Report-Generator).



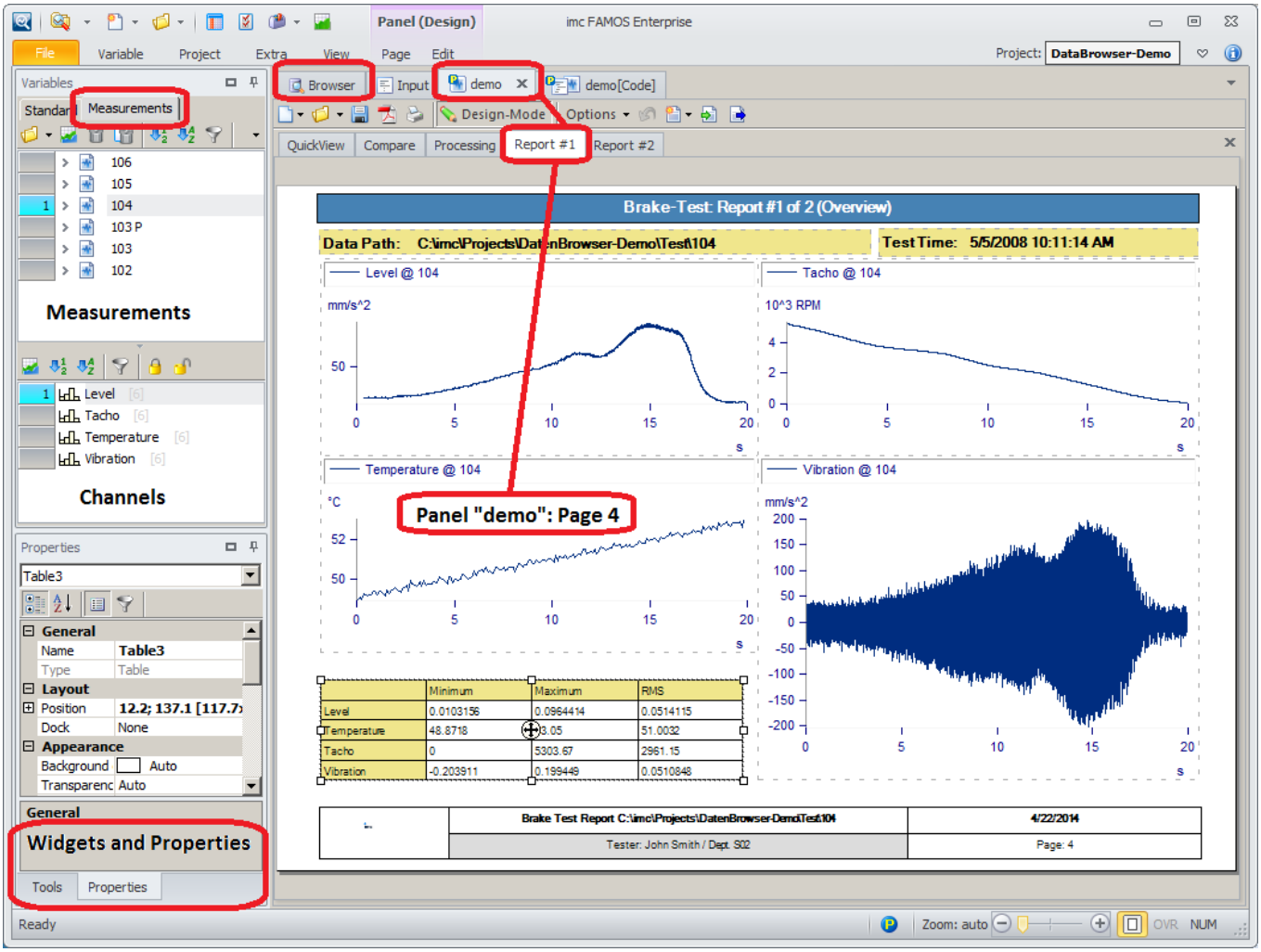
Panel for data evaluation



Panel as a report

13.1 Basic concepts and terms

The picture below shows a default view with a Panel page in Design Mode. Most of the objects can be freely positioned, so that the view could appear entirely different. To obtain this default view, use the menu command *"View" -> "Layout" -> "Return to default"* 130.



Elements of main window (default layout)

Panel

The main level contains the tab for the Panels. Multiple Panels can be loaded at the same time.

Each Panel can contain one or more pages.

Page

In the center you see the page. A page can be created either as a **Report** or **Dialog**.

- **Reports** are optimized for printout. They have a fixed size according to the printer settings and use the curve window's color settings for printouts.
- **Dialogs** use the screen colors for the curve window color settings.

Browser

To load more data, go to the Browser and select *Data sources: My Computer* 430. In the folders list, select the desired files of measured data.

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Measurements list

in the Measurements list 209, you can select one or more measurements. In the example shown, the names of the measurements are derived from the names of the folders.

The measurements and channels loaded are numbered.

Channel list

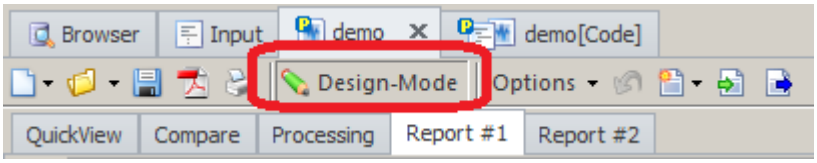
The Channels list is only seen if the Design Mode is inactive. It shows the channels belonging to the measurement selected.

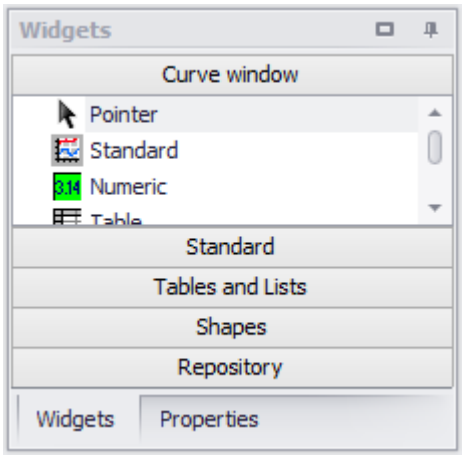
Widgets and **Properties**

The Widgets 455 and their properties are shown only in Design Mode.

Design Mode / Run Mode

To create or edit panels, you switch the Data-Browser to **Design Mode**.





In this mode, there are additional tools available:

- Toolbar for selecting the Panel widgets
- Editors with which to determine the panel widget properties

In Design Mode, the widgets can be moved to the current page by means of drag&drop.

Panels designed in this way (file extension: *.iform) can later be loaded during the **run** and either automatically or manually "filled" with the current measured data. You can use the input boxes and buttons, and print out the presentation of data, as well as save them in a variety of formats such as Adobe Acrobat PDF, PNG, BMP 580.

Data selection

The files of measured data must first be opened. To do this, use the Browser 204 with which you can load either individual measurement files or even whole folders at the push of a button. After loading the files, you will see the Measurements and Channels lists 209. Additionally, the Variables list automatically opens the page "*Measurements*".

Next, select the channels to be edited from among the many opened data.

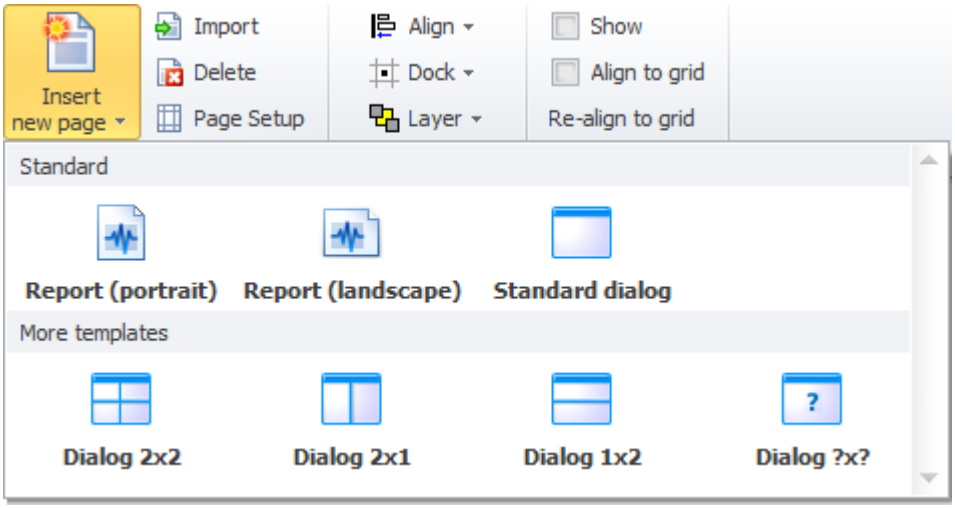
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13.1.1 The Panel page

A Panel may contain multiple pages. Each page can be set up as either a dialog or as a report page. Which kind is decided when the new page is added.

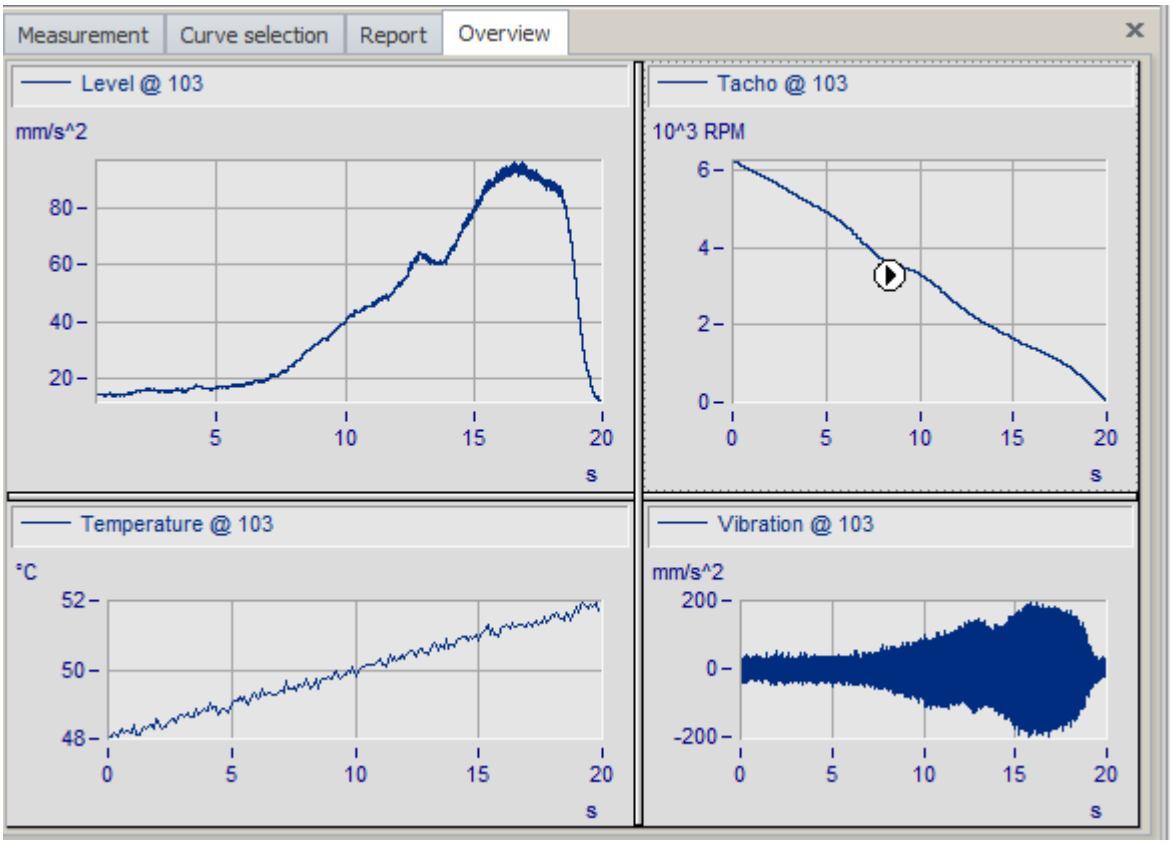
New Page

By means of either the context menu in the Panel area 138 or the menu item Edit /*Insert new page* 138, a variety of templates are available.

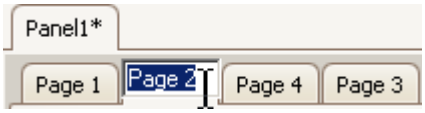


The choice **Report** uses the applicable printer settings to generate a page in either portrait or landscape format. The size can not be changed.

For a **dialog**, multiple variants are available. Tiled dialogs are especially suited for curve windows. By default, the widgets fill up a box and adjust their size dynamically.

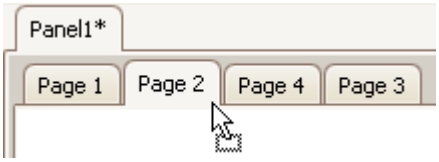


Renaming pages



Double-click on the tab bearing the page's name (e.g. "Page 2"). Then you can directly edit the name right there.

Changing the order



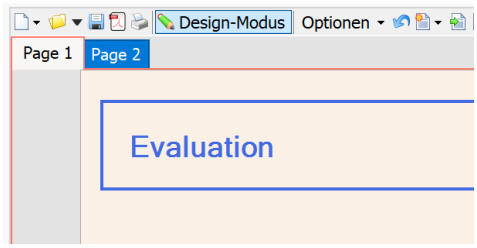
Using drag&drop on the tabs, you can alter the ordering of the pages.

Zoom



The size of Panel pages generated as Report pages can be adapted. But dialogs' sizes can not be changed.

Color



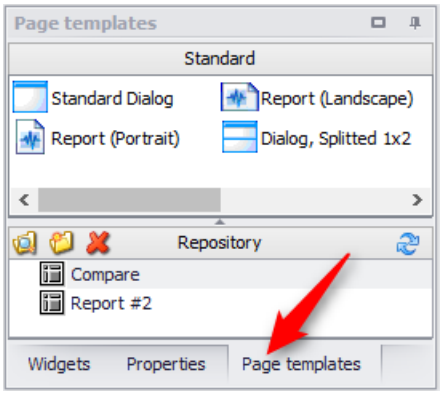
The color of the page background and the page button can be set individually via the properties of the page.

Hide page

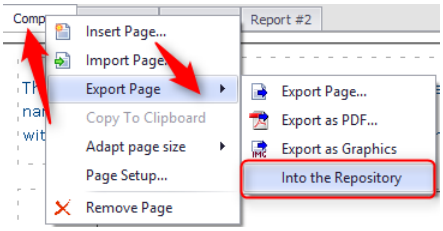
Individual pages can be hidden or blocked at runtime.

PnShowPage()

13.1.1.1 Page-templates and repository



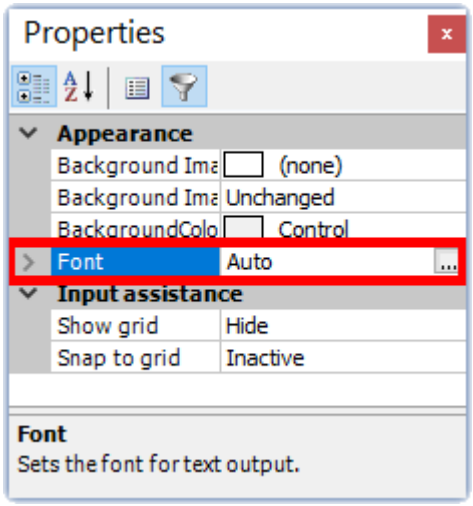
In Design mode, there is a tab for *Page templates*. Along with standard templates for dialogs and reports, you can also re-use panel pages which you had created yourself and which had been copied to the repository.



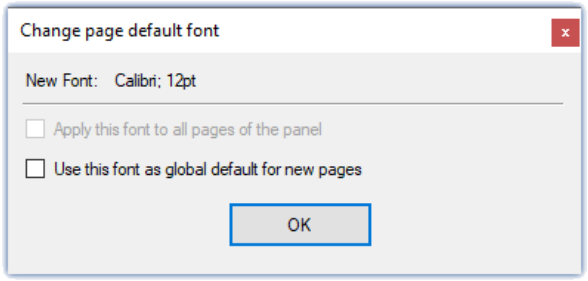
Pages are copied to the repository via the page context menu 439.

13.1.1.2 Fonts

For panel pages in design mode, a default font can also be defined in the properties of a page. This font is used for all widgets whose font setting is defined as "Auto".



The following dialog will appear:



"Apply this font to all pages of the panel" - Select this option if the new font should also be applied to all other pages of the panel (only selectable if the panel actually has several pages).

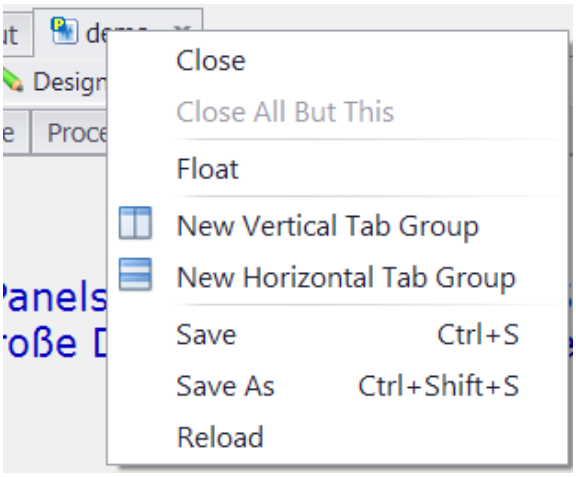
"Make this font the global default..." - Select this option if the new font is to be used as the default for new panel pages created in the future.

Click **[OK]** to close the dialog and implement the selected options.

The default font for new panel pages can also be specified via the general FAMOS options dialog ("Extras"/"Options" => "Panel design"). [**Reset**] in this dialog changes the setting back to "[**Automatic**]" and thus back to the behavior of FAMOS versions before V2025. A system-dependent standard font is then used; for Windows systems with English language settings, for example, this is "MS Sans Serif 8pt".

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13.1.2 Context menu (Panel)



Right-clicking on the Panel's designation opens the **context menu**

Close

Closes the Panel page

Close All But This

Closes all other Panel pages

Float

Undocks the Panels as an independent window.

New Vertical Tab Group

Displays the Panel in a separate tab group. In this way, the source code and the Panel can be displayed together.

New Horizontal Tab Group

Panel and source code can be displayed side-by-side.

Save/Save As

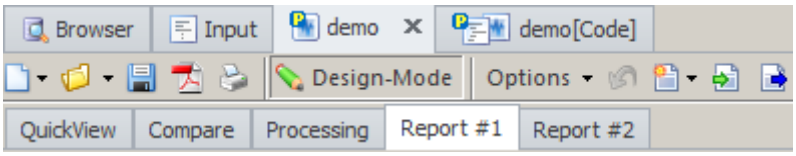
Saves the Panel.

Reload

Close and deletes the Panel page.

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13.1.3 Toolbar (Panel)



New Panel

Inserts a new Panel. A variety of templates for dialogs and reports 434 are available.

Load Panel

Opens the selection dialog for loading existing Panels.

Save Panel

Saves the Panel displayed.

Export Panel as PDF

Export in PDF format. Optionally, the page can be appended to an existing PDF. Note the possible export method in the options dialog 580.

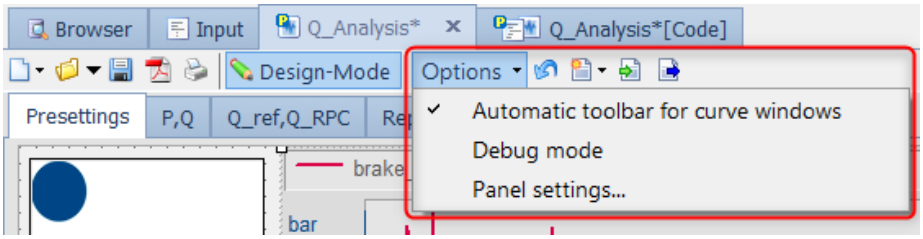
Print Panel

prints out the Panel. See also here 119.

Design-Mode On/Off

Switches between Design and Run modes.

Options



Automatic menu bar for curve windows.

When active, the curve window menu is shown as soon as the curve window receives the focus.

Debug Mode

Activate Debug mode for panel-sequences. 445

Panel Settings

Behavior of the panels during runtime 443

Insert Panel-page

Inserts a new page into the active Panel. Here, too, the available templates 434 are shown.

Import Panel-page

Imports one or more Panel pages.

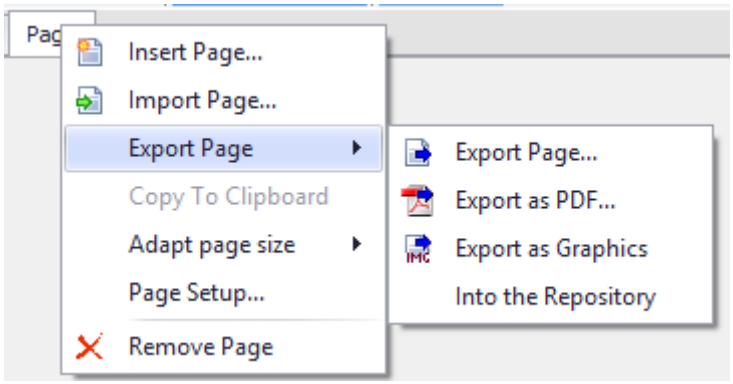
Export Panel-page

Export of the selected Panel-*page*. The file is also assigned the extension "*.panel".

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13.1.4 Context menu: "Page"

Right-clicking on a Panel's page designation opens the **context menu.**



Insert Page...

Adds a new page to the active Panel. The available templates 434 are offered.

Import Page...

Imports one or more Panel pages.

Export Page >

Exports the selected **Panel-*page***. This file also has the extension "*.*panel*".

A Panel page is exported in **PDF-format**. Note the possible export method in the options dialog 580.

Exports the Panel page in various **graphics formats** (PNG, BMP, JPG 580)

Into the Repository: Creates a copy in the page repository 435

Copy to the Clipboard

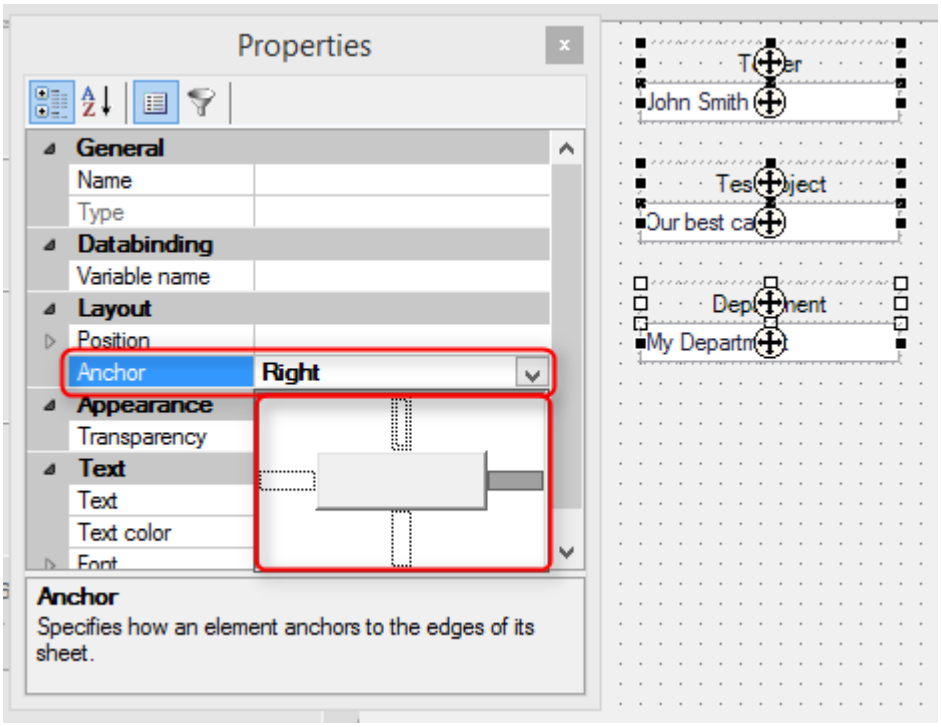
Copies the Panel as a screenshot to the Clipboard. To this end, the Design Mode must be active.

Adapt Panel page

Adapt Panel page to window size (keep aspect ratio): The size of the Panel page is adjusted to fill the available space in the Panel, with or without preserving the aspect ratio. You can also modify these settings in the Panel settings under Options 443.

Adapt Widget to the size of the Panel page: A widget's position can be linked to a Panel page's size. For this purpose, the widgets have the "***Anchor***" property:

Example:



All input boxes and captions are anchored to the upper right side. When the windows are rescaled, the distances to the top and right remain unchanged.

Page Setup...

Using this function either one or all report pages can be assigned either Portrait or Landscape orientation. As with the printer settings, the paper size and the margins are determined here.

Delete page

Deletes the Panel page.

13.1.5 Assigning the channels to measurements

When opening files of measured data, the associated channels are automatically assigned to a "Measurement". The measurement's name can be derived from, for example, the name of the file of measured values (for multi-channel files), from the name of the folder to which the files belong; see *File list options* 206. The term "Measurement" is not necessarily the actual result of a physical measurement, but groups related measured data (channels) together.

The measurement's name is a component of the resulting variable name in imc FAMOS , so that even identically named channels belonging to different measurements are uniquely designated. Such a combined variable name in imc FAMOS has the following syntax:

```
ChannelName @ MeasurementName
```

e.g.

```
Temperature_01@Experiment0001
Temperature_01@Experiment0002
```

or

```
SensorX@MiddleCenter
SensorX@BottomCenter
```

An example for assigning the channels can be found in the chapter on *Tutorial: Creating a Panel*, *Dragging a channel to the page* 517.

Also observe the notes in the section *Variables associated with a measurement* 266.

Curve windows and other widgets for measured data can be configured so that instead of concrete channel names, references to the current selection in these lists can be entered.

E.g. in the curve window, instead of the specific variable name

```
Temperature_01 @ Experiment002
```

a generic reference in the form

```
Channel #1 @ Measurement #2
```

(read: 1st selected channel belonging to the 2nd selected measurement)

or also

```
"Temp_01" @ Measurement #2
```

(read: Channel "Temp_01" from the 2nd selected measurement)

can be entered.

What specific channels is displayed in the curve window is determined by the current state of data selection, meaning the selection in the respective lists. This, you can design Panels which can switch out the data they display, without needing to alter the Panels or the widgets they contain.

Details on numbering are presented in the chapter Numbering and locking 209.

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13.1.6 Starting a Panel as a dialog

Just like user-defined dialogs 545, Panels can be run as **modal dialogs** by using the command Dialog(). The Panel is then displayed in a free-floating window, and while this is happening, the rest of the FAMOS user interface is disabled. A Panel running in this mode is also referred to as a ***Panel-dialog***. This is not to be mistaken for an embedded Panel-page in Dialog-mode.

For Panels which are planned for use as dialogs, you should select the associated option under "*Options/Settings* 443". This makes an additional event sequence "*Close*" 556 available. This is called in a manner analogous to user-defined dialogs 545, whenever the user tries to close the dialog in one of these ways:

- using the system menu
- Close-button in the title bar, or
- keyboard combination: Alt+F4

The event sequence "*Close*" is preset for a call to *DbPanelClose*(). Here it would be possible, for example, to show an extra prompt for the user to confirm whether to really close the dialog, the response to which would determine whether to actually call the function *DbPanelClose*().

In general, an active Panel-dialog can only be closed by explicitly calling the function DbPanelClose(). Panel dialogs with a missing or empty "*Close*"-event sequence are an exception. The standard techniques for closing windows, listed above, then work in the familiar way. This is intended to prevent faulty programming from causing Panel-dialogs to be displayed which can no longer be closed.

If this function is called within a Panel-dialog's event sequence, it changes how the option parameter for the function DbPanelClose (0 for closing the active Panel, 1 for all Panels) is interpreted. The current Panel-dialog is always closed and the parameter passed is used as the dialog()-command's return value. The function behaves in a way which is analogous to the function DlgCloseDialog() as applied to user-defined dialogs.

The Panel's previously parameter-less "*Initialization*"-event sequence 447 is assigned a parameter of the type Text. In Panels which are loaded in the "normal" way, it is empty, and for Panel-dialogs it is assigned the content of the Dialog()-function's 2nd parameter. In this regard, it behaves in a way which is analogous to the corresponding event sequence in conjunction with user-defined dialogs.

When a Panel consists of only one page, the page tab is hidden when the Panel is displayed as a dialog.

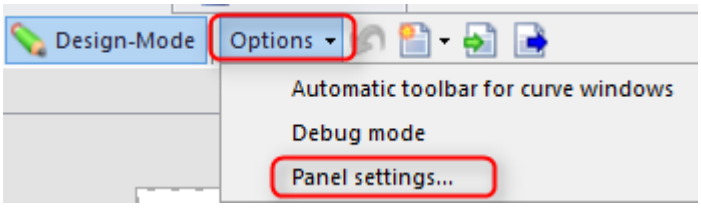
The behavior regarding debugging (observing breakpoints, indication of error location in case of sequence errors) matches that of user-defined dialogs.

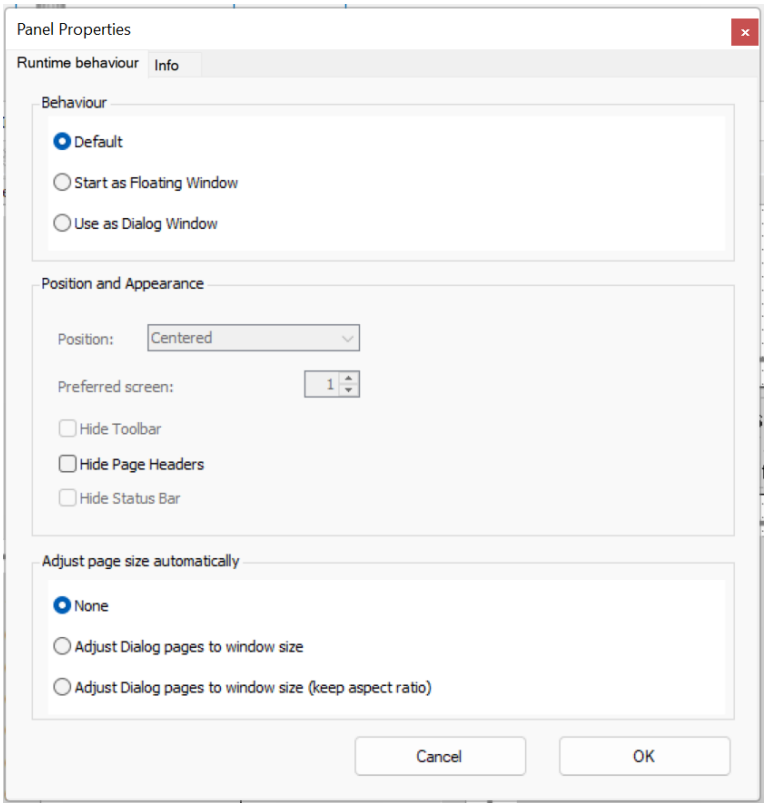
To start a panel as a dialog as a shortcut, use the **/S** start parameter.

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13.1.7 Panel Settings

When "*Design-Mode*" is activated, it is possible to open the "*Panel Settings*..." via the Options menu:





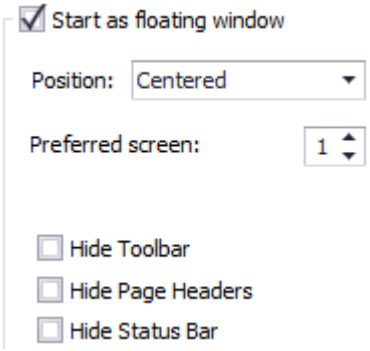
Behavior

***Default*:** The Panel is embedded in FAMOS.

***Start as Floating Window*:** The panel can be positioned as a floating window, like a dialog. In this mode, it is additionally possible to operate settings under "*Position and Appearance* 443". Some window elements 444 can be hidden in this mode.

Use as Dialog Window: In this setting, the Panel is treated as a dialog and is given an additional event sequence "*Close*". Its behavior then matches that of a User-defined dialog 545. The settings options under "*Position and Appearance* 443" are then changed for the dialog display 444.

Position and Appearance bei **Behaviour** "***Start as Floating Window***" and "***Use as Dialog Window***":



Position: *Centered, Top left..., Maximized*. For "*Free defined*", the position is stated in pixels.

Preferred screen: Regardless of the number of monitors currently connected, you can select a number 1-4. If the specified monitor is not present, then the panel appears on Monitor 1.

Hide Page Headers: Multiple pages of a panel can be opened via the page names. These can also be hidden, for example in order to guide user interaction through a specific sequence by means of buttons on the pages.

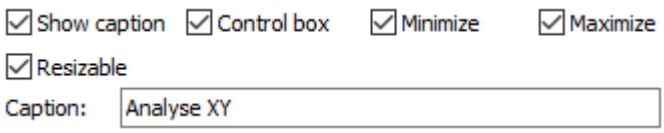
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Behaviour: "Start as floating window"

Hide Toolbar, Status Bar: Hides the respective bar.

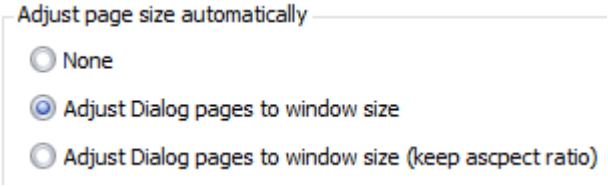
Hide Page Headers: Hides the tab containing the page designation.

Behaviour: "Use as Dialog Window"



The panel as a dialog can be supplemented with the usual Windows controls for dialogs. The window title can be different from the panel name.

***Adjust page size automatically*:** When monitors or beamers are used, which have a deviating resolution, the panel is optimized for the new resolution. It is possible to control the behavior in a targeted way in conjunction with the widget's anchor settings 440.



Adjust Dialog pages to window size: The new available space is used, regardless of any deviating aspect ratio. In consequence, the system may encounter contradictory anchor settings, so that the results fail to meet expectations.

Adjust-...(keep aspect ratio): The ratio of height to width is retained. This will usually enable the arrangement to be retained also.

Note

- This behavior affects **only pages created as a dialog,** not as a report. It is possible to modify report pages by means of additional Zoom-functions. However, the arrangement of the widgets always remains fixed on Report pages.
- The settings apply globally for **all** of the project's dialog pages.

13.2 Programming

13.2.1 Principles

Along with the panel's appearance, the sequence code associated with the panel must also be defined.

When a panel is run, events occur in consequence of which an associated sequence is also run. Examples of events include starting the panel (initialization), or pushing a button.

A Panel is run whenever it is loaded or when the Design mode is deactivated. However, only upon the first start, i.e. upon loading, the event initialization is run.

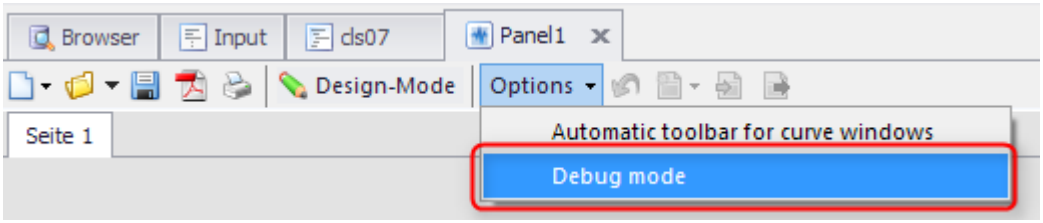
The procedure is very similar to that of a dialog. The description of a dialog's procedure can be applied to a Panel and is found here 556.

Within a Panel it is possible to create sub-sequences 368 and sequence functions 381 which are saved along with the Panel-file.

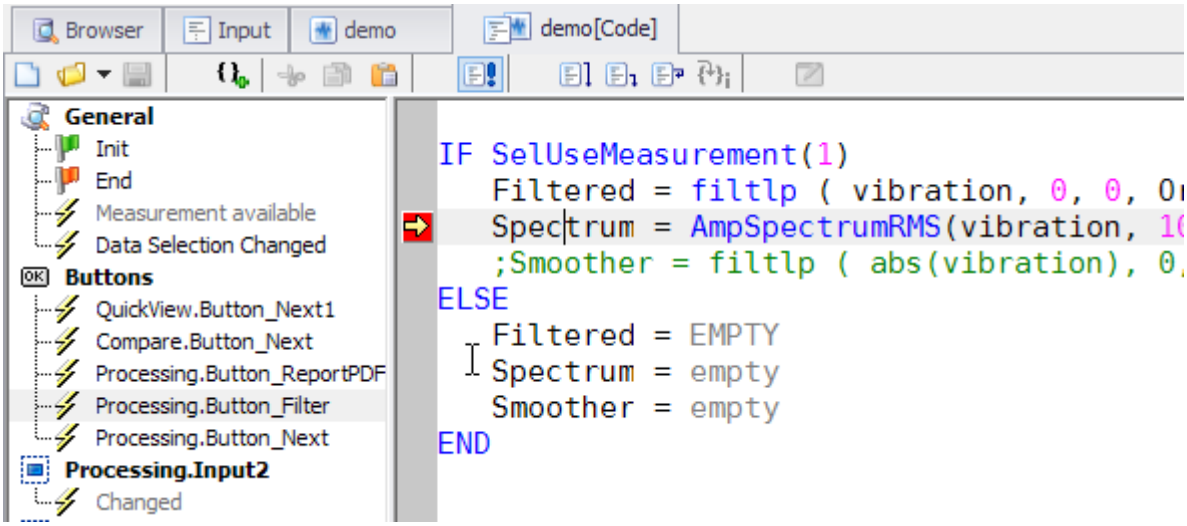
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13.2.1.1 Debug mode in panel-sequences

In the menu "*Options*" it is possible to activate the "*Debug-Mode*" for running Panel-even sequences.



This is an aid for developing, and in debugging when creating complex panels. As with "normal" sequences, breakpoints can be defined, in which the execution is interrupted. The sequence is displayed in the Editor and can be resumed from the current command line onward, step-by-step. The same applies when the sequence execution encounters a (syntax-) error.

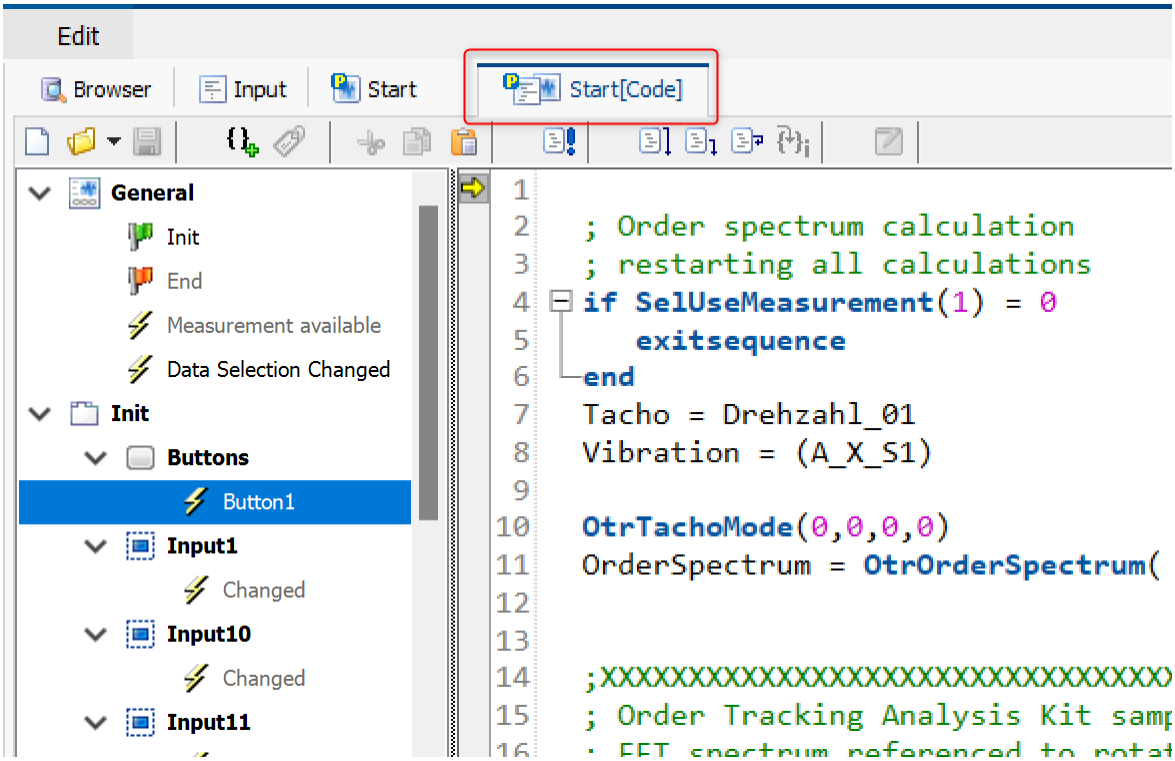


Note

Breakpoints are only observed if "*Save breakpoints and bookmarks*" is activated in the menu under "*Extra/Options/Editor*"!

13.2.2 Editing event-sequences

Event sequences can only be edited in Design Mode. Only in that case, there will be a tab of the same name, suffixed with "(Code)".



The event-sequences have the same syntax as "normal" imc FAMOS -sequences and are also created and tested using the sequence editor in the imc FAMOS main window. For information on the principles of operating the Sequence Editor, refer to the chapter 'Sequences 358'.

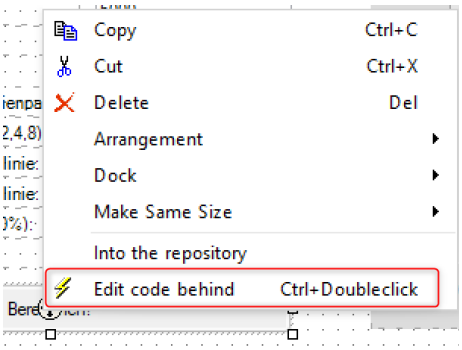
In addition to the familiar Sequence Editor, the workspace on the left side is supplemented with a tree diagram of events. Depending on the event selected, the associated sequence is shown.

For a better overview, the event list is organized into various groups which are described below.

Events to which no sequence code was yet assigned are displayed in a gray typeface.

The output box in the imc FAMOS main window shows a short help text about the currently selected event.

Finding an event sequence

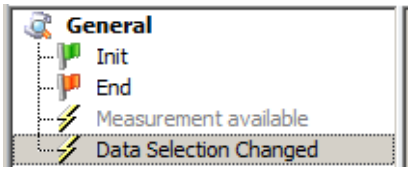


By holding down the **CTRL-key** and **double-clicking** on the widget, you can jump directly to the associated event sequence.

Alternatively, the **context menu** can be used. The "**lightning bolt**" also opens the code at the appropriate position.

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13.2.2.1 General



Events which are triggered by selection of the measurements, as well as upon starting/exiting the Panel.

13.2.2.1.1 Init(ialization)

The event is triggered once creation of the panel is completed. However, the panel is not yet visible.

Here, variables are created and initialized.

Note

The initialization is only carried out upon first loading. When exiting Design Mode, it is not performed. For changes of the initialization to take effect, run the code as a sequence.

Example:

The panel contains 2 text input elements used for entering filter cutoff frequencies, which are linked with the variables "Freq_Min" and "Freq_Max". When the button "Filter!" is pressed, the first selected channel with the first selected measurement is to be filtered accordingly. When the panel is closed any variables not needed are deleted.

```
General
    Initialization
      ;Initialization of the variables and their associated input box
      Freq_Min = 100
      Freq_Max = 1000

    End
      DELETE Freq_*
      DELETE Filtered
      END

Buttons
    Btn_Filter
      TxVarName = SelBuildVarName(1, 1, 0)
      IF TxVarName <> ""
         Filtered = FiltBP(<TxVarName>, 0, 0, 2, Freq_Min, Freq_Max)
      END
```

13.2.2.1.2 End

The event is triggered when the Panel is closed.

For instance, you can delete variables which are no longer needed.

Remarks: The event is not triggered if the Panel is in the Design Mode.

Example: See the section Init(ialization) 447

13.2.2.1.3 Measurement available

The event is triggered once a new measurement has been created or if new channels have been added to an already existing measurement. It's also triggered after loading the panel for each already loaded measurement.

Parameter	Definition
PA1:	Measurement name [TX]
PA2:	0: Panel open, measurement was newly generated. 1: Panel open, new channels added to an existing measurement. 2: Triggered after loading the Panel for each existing measurement.

Remarks: The event is not triggered if the panel is in the Design Mode. If the option "*Only show variables with measurement association*" is not activated, this event is triggered with PA1 as empty string and PA2 = 2. This also applies to variables created in initialization.

Example:

Once a new measurement has been created, the system checks whether it contains a channel named "speed". If so, that channel's maximum is determined and displayed in a separate curve window.

```
General
  Measurement available
    TxVarName = SelBuildVarName(PA1, "speed", 0)
    IF TxVarName <> ""
       MaxSpeed = max( <TxVarName> )
       SHOW MaxSpeed
    END
```

13.2.2.1.4 Data selection changed

This event is triggered when the selection in the Measurements or Channels list in the *File Browser (Measurements)* has been changed.

Parameter	Definition
PA1:	1: Selection in channel list has been changed 2: Selection in measurement list has been changed 3: Selection in both lists has been changed

Remarks: The event is not triggered if the panel is in the Design mode.

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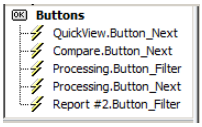
Example:

Once the data selection in the *File Browser (Measurements)* has been changed by the user, the system checks whether the selected measurement #1 contains the channels "Voltage" and "Current". If so, the power is computed and displayed in a separate curve window.

General

```
Data selection changed
  IF PA1 > 1
     TxUName = SelBuildVarName(1, "Voltage", 0)
     TxIName = SelBuildVarName(1, "Current", 0)
     ; Option 0: empty text, if variable does not exist!
     IF (TxUName <> "") AND (TxIName <> "")
        Power = <TxUName> * <TxIName>
        Show Power
     END
  END
```

13.2.2.2 Button

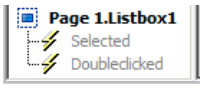


The event is triggered when the associated button is pressed by the user.

Example: See chapter Initialization 447

Parameter	Definition
PA1:	Name of the button

13.2.2.3 Lists



These events are available for the widgets listbox (single selection and multiple selection) and droplist.

13.2.2.3.1 Selected

One of the panel widget's (list-) entries was selected by the user.

Applies to: Listbox, Droplist

Parameter	Definition
PA1:	Name of the Panel widget
PA2:	For lists with single-selection: index if the sub-element which is now selected (list entry). 0 if no element is selected. For lists with multi-selection, always 0.

Example 1

At the push of a button, the selected entries in a (multi-selection) list field are to be evaluated. The button should only be enabled if at least 1 entry is selected. For that purpose, the number of selected entries in the event 'Selected' is checked:

```
Listbox1
    Selected
      Count = PnGetSelectedItemCount(PA1)
      PnEnable("Button1", Count > 0)
```

Example 2

A (single-selection) list box contains a list of filenames. In a separate label widget, the size and creation date belonging to the currently selected filename are displayed.

```
Listbox2
    Selected
      FileName$ = PnGetItemText( PA1, PA2)
      Time = FsGetFileTime(FileName$)
      Size = FsGetFileSize(FileName$)
      TxFileInfo = TForm(Size,"") + " Bytes " + ZeitInText(Time, 0)
      PnSetText("Status", TxFileInfo)
```

13.2.2.3.2 Double-clicked

A panel widget was double-clicked by the user.

Applies to: List box

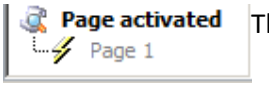
Parameter	Definition
PA1:	Name of the widget
PA2:	Index of the clicked sub-element (list entry).

Example 1

From a list containing names of measurement value files in the imc FAMOS format, an entry is selected by double-clicking on it, and the corresponding file is opened.

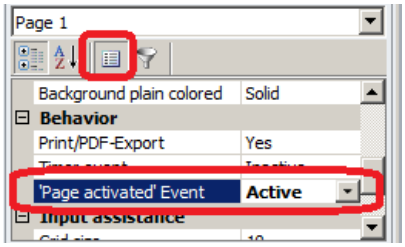
```
Listbox1
    Double-clicked
      FileName$ = PnGetItemText(PA1, PA2)
      fh = FileOpenDSF( FileName$,0)
      IF fh > 0
        ;...
        FileClose(fh)
      END
```

13.2.2.4 Page



This event is triggered when the associated page is activated.

In order for page-activated events to be detected, the following condition must be met:



- it must be enabled when designing the Panel-page (property: 'Page activated' event set to 'active').

You can use this event to make initializations for specific pages. The event is triggered in the following cases:

- After loading a panel (for the initially displayed page).
- After the use changes which page is active, e.g. by clicking on the associated tab.
- Upon running the commands PnSetActivePage() or PnInsertPage(), if they change which page is active.

Remark: The event is not triggered when the Panel is in Design-Mode.

Example:

In a 2-page Panel, the first page serves the purpose of entering various parameters for analysis and contains, among other things, a droplist presenting all available variables, plus 2 textual input widgets which serve the purpose of entering filter cutoff frequencies and which are linked with the variables "*Freq_Min*" and "*Freq_Max*". After selection of the variables and setting of the filter parameters, the user goes to the 2nd page, where the results are displayed. This move is accomplished either by clicking on the page's tab or on a button "Next" on the first page. Activating the second page simultaneously starts the calculation automatically.

Event-sequence 'Panel Initialization'

```
;Initialization of the variables and associated input boxes
Freq_Min = 100
Freq_Max = 1000
;fills the droplist with the variables available
count = VarGetInit(2)
FOR i = 1 TO count
     PnInsertItem( "ListVarNames", 0, VarGetName?(i), 0)
END
```

Event-Sequence 'Button pressed' belonging to the 'Next'-button on the 1st Panel page

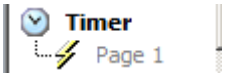
```
PnSetActivePage(2)
```

Event-Sequence 'Page activated' belonging to the 2nd Panel page

```
;Perform calculations, including filtering of the variables selected
iSel = PnGetSelectedItem( "Page1.ListVarNames")
TxVarName = PnGetItemText( "Page1.ListVarNames", iSel)
Filtered = FiltBP(<TxVarName>, 0, 0, 2, Freq_Min, Freq_Max)
```

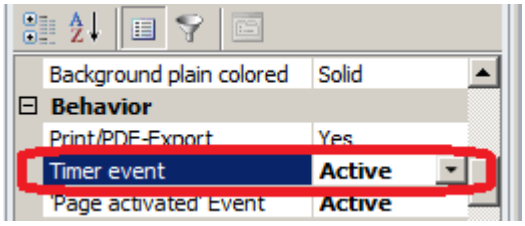
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13.2.2.5 Timer



The event occurs when the specified interval for a timer assigned to a Panel-page has elapsed.

In order for timer events to be detected, the following conditions must be met:



- The timer must be enabled during the Panel-page's Design stage (set the property 'Timer' to 'active').
- The timer needs to have already been started (function PnSetTimer). In this function, enter also the desired time interval. For instance, you could have the timer start automatically upon opening the Panel (a call of 'Initialize Panel' in the event-sequence) or the user can have the timer start by manually clicking a button (event-sequence 'Button pressed').

The event can not occur while the Panel in Design mode.

imc FAMOS attempts to conform to the interval set as well as possible, but can not guarantee that the event will be triggered at exactly the clock rate specified. If either the operating system or imc FAMOS is currently busy with other tasks, then generation of the timer event may be subject to unpredictable delays. In particular, the event-sequence 'Timer' can only be performed if imc FAMOS is not currently (or no longer) performing any other sequences. If Timer events occur while a different sequence is running, the event-sequence assigned to the Timer are performed exactly one time as soon as imc FAMOS has completed running the current sequence.

In consequence, it is clear that no time-consuming routines should be programmed to run within one Timer event-sequence. For example, a timer with a clock rate of 1s is practically impossible to realize if it takes more than 1s to run the associated event-sequence.

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Example:

On a Panel page, measurement of the preceding data set 'speed' is to be simulated and the growing data set is to be displayed in a curve window. Along with the curve window, the page is also supplied with a button to use for starting/stopping the simulation; the button caption alternates between 'Start' and 'Stop'.

The curve window displays a temporary file 'Speed_Sim', to which the respective values of the original data set are appended cyclically (governed by the timer).

Event-Sequence 'Initialize Panel'

```
SimIsRunning = 0
Speed_Sim = Empty
```

Event-Sequence 'Pressed' belonging to the 'Start/Stop'-button

```
IF NOT(SimIsRunning)
     ; Start
     Speed_Sim = Empty
     PnSetTimer(1, 0.5) ; Update-Interval 500ms
     SimIsRunning = 1
     PnSetText( "Button1", "Stop")
ELSE
     ; Stop
     PnSetTimer(1, 0)
     SimIsRunning = 0
     PnSetText( "Button1", "Start")
END
```

Event-Sequence 'Timer'

```
ori_len= leng?(Speed)
next_index= leng?(Speed_Sim)+1
IF next_index <= ori_len
     ; appends 5 new values every 0.5s...
     Speed_Sim = Join( Speed_Sim, GrenIndex( Speed, next_index,
LowerValue( next_index+5, ori_len)))
ELSE
     ; Finished, stop timer...
     PnSetTimer( 1, 0)
     SimIsRunning = 0
     PnSetText( "Button1", "Start")
END
```

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13.2.3 Start via shortcut

A panel can be set as dialog and started with imc FAMOS Runtime and start parameter /S so that the panel can be used directly.

Runtime execution can be performed on a computer with an Enterprise Edition. Otherwise, a runtime license must be activated.

Examples for desktop shortcuts can be found here 62.

13.2.4 Tab-key

The property "*Tab-Index*" enables support of the Tab-key as the means for switching the focus from one element to the next.

Available values:

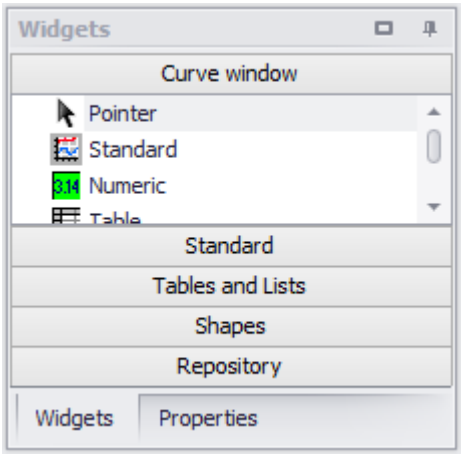
- **-1** (or "**-**"): Not accessible using the Tab-key
- **1, 2,…** In this order, the elements pass the focus from one to the next
- **0** or "***<auto>***": These elements are selected in the order of the tab index. The order corresponds to the order in which they were created. This order can be subsequently edited by means of the context menu commands "*To Back*" or "*To Front*".

Note Widgets not supported

Navigation by means of the Tab-key can not be applied to the dialog elements *Text box, Image* and *curve window*.

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13.3 Widgets



The "Widgets" toolbox is only displayed when in Design Mode 433 and contains the various tools for displaying data, as well as tools for labeling and for interactions with imc FAMOS sequences (variables).

Adding widgets

The easiest way to add an widget is by moving one from the toolbox to the page using the drag&drop technique. When you release the left mouse button, the widget is created in its default size and is selected. You can adjust its size and position later.

Copy widgets

Widgets placed on the page can be copied by an easy method:

Click on the widget you wish to copy. The widget is thus selected. Then hold down the Ctrl-button. Now you can use the drag&drop technique to place a copy of the widget on the page

Moving Widgets (alternative method to mouse operation)

Using the cursor key, it is possible to move whichever widgets are selected. The step size is either one pixel or one grid unit if "*Align to grid* 139".

While the CTRL-key is held down, the distance is increased by a factor of 10.

With widgets which themselves respond to cursor keys while in Design mode, (*Combobox, DateTime*), it is additionally necessary to press SHIFT.

During runtime it is possible to set the widget's position using the function *PnSetPosition*() and to request is using *PnGetPosition*().

Selecting widgets

While in Design mode, the widgets are selected when you click on them. Using CTRL+A, you can select all of the widgets on a Panel page.

If you draw a frame with the mouse around the desired widgets, they will be selected with the following dependency:

- When dragging the selection from **right to left**, the selection **only affects objects** that are **completely within** the selection rectangle.
- When dragging the selection from **left to right**, the selection **affects all objects** that **intersect the selection** rectangle.

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Widget properties

Depending on its type, an widget may have a large number of properties. Use the the Properties window located at the lower right of the standard view.

The following table indicates which properties categories are associated with which widgets:

	General	Layout	Appearance	Data-binding	Text	Structure	Behavior	Toolbar	Timeline
curve window	X	X	X						
Label	X	X	X	X	X				
Image	X	X	X						
Pushbutton	X		x		X				
Switch	X	X			X				
Editbox (single)	X		X	X	X				
Editbox (multi)	X		X		X				
Slider	X	X	X	X			X		
TimeSpan	X	X	X	X	X		X		
NumericRange	X	X	X	X	X		X		
SpinEdit	X	X	X	X	X		X		
DateTime	X	X	X	X	X		X		
Radiogroup	X	X	X	X	X		X		
Video player	X	X	X	X			X	X	X
Table	X	X	X	X	X	X	X		
List box (single)	X	X	X		X		X		
List box (multi)	X	X	X		X		X		
Droplist	X	X	X		X		X		
Combobox	X	X	X		X		X		
Datagrid	X	X	X		X	X	X		
FileExplorer	X	X	X		X		X		
Treeview	X	X	X		X		X		
CCV file selector	X	X	X		X		X		
Line	X	X	X						
Rectangular Frame	X	X	X						
Rounded Frame	X	X	X						
Circle	X	X	X						
Elipse	X	X	X						
GroupBox	X	X	X						

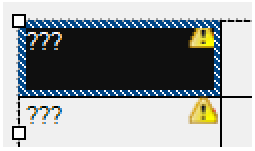
Behavior -Print /Export

Some widgets can be switched to invisible for the purposes of printing or graphical export: Widget *Properties > Behavior > Print/Export : Yes / No*

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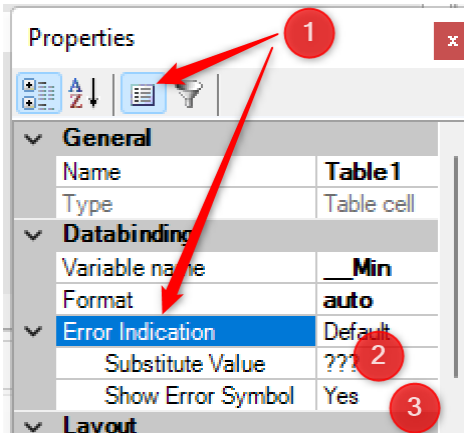
Treatment of missing variables in case of data binding

By default, any missing variables are denoted by a yellow warning triangle:



If this is not desired, it is possible to display substitute values for the missing variables. For this purpose, the display filter must be switched off.

Under ***Error Indication***, the value is entered for the property ***Substitute Value*** . By means of the property ***Show Error Symbol*** , you can control whether the yellow warning triagnle is displayed or hidden.



The settings only are in force during runtime. In Design-mode, the warning triangle is always visible.

The default behavior showing the yellow warning triangle is restored when the entry in *Error Indication* is deleted.

Visible/Enabled

The widget-properties "*Visible*" and "*Enabled*" can be set to "*Yes*" or "*No*" with lasting effect and changed during runtime by means of the *functions PnShow*() and *PnEnable*().

You additionally have the ability to change the properties using a ***control variable***. For this purpose, there is the option "*Control variable*", by means of which you can control the property during runtime: 0= *invisible* or *disable*; else *visible* or *enabled.*

When the option *Control variable* is used, the functions *PnEnable()* and *PnShow()* have no effect!

Entering text in Design-Mode 433

Applies to Label, Input box (single line), Input box (multi line), Button, Table cell:

The text for these widgets can not only be entered in the Property window, but also by doubleclicking on the particular widget. After doubleclicking an overlapping input field will open, where you can enter the required text. Close the input field with the key combination <Alt>+<ENTER> or by clicking outside the input field.

In the category *Text*, it is possible to add a ***tooltip***. This appears when the mouse hovers over the widget without moving for 1 second.

Pointer

The pointer is not actually a tool, strictly speaking. The pointer allows you to select one or more widgets by clicking on them. To select multiple widgets, you must additionally use the keyboard, as described in the table "Key combinations for making selections 214". You can also select widgets by dragging the mouse pointer to capture a rectangular region inside of which all widgets are then selected.

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13.3.1 Arrangement and alignment

Arrange widgets

Align with cursor buttons

In Design mode, the cursor buttons can now be used to move the widgets.

Select all widgets

Using CRTL+A 109, it is possible to select all widgets on the page.

Alignment to the grid 139 by means of the page's context menu.

By means of the *Edit* menu or right-clicking the mouse over the widget in Design mode.

Align > (To foreground, To background)



Widgets which overlap can be placed in the foreground or the background. By this means, you can, for example, place a frame in the background if it is located above a button which it is thus making inaccessible.

Align > (Align Top, Align Left...)



Aligns all selected widgets. While holding down the CTRL-key, select all the widgets in succession which you wish to align.

Align > (Space Evenly Across, Space Evenly Down)



Alignment at equal spacing. At least three widgets must be selected.

Dock > (Free, Left, Right...)



These functions are only available for tiled dialogs. Widgets can be permanently docked in a section.

Same size > (Width, Height, Both)

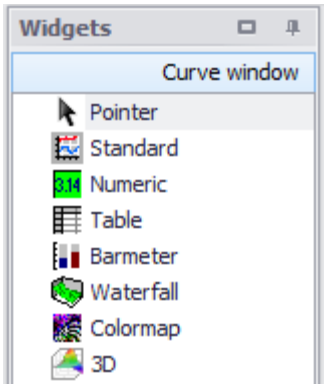


The width, height or width and height of the widget selected are applied to the other selected widgets.

Notes on programming:

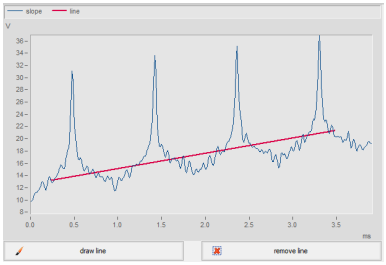
- During runtime, a widget's position can be requested using *PnGetPosition* and set by using *PnSetPosition*().

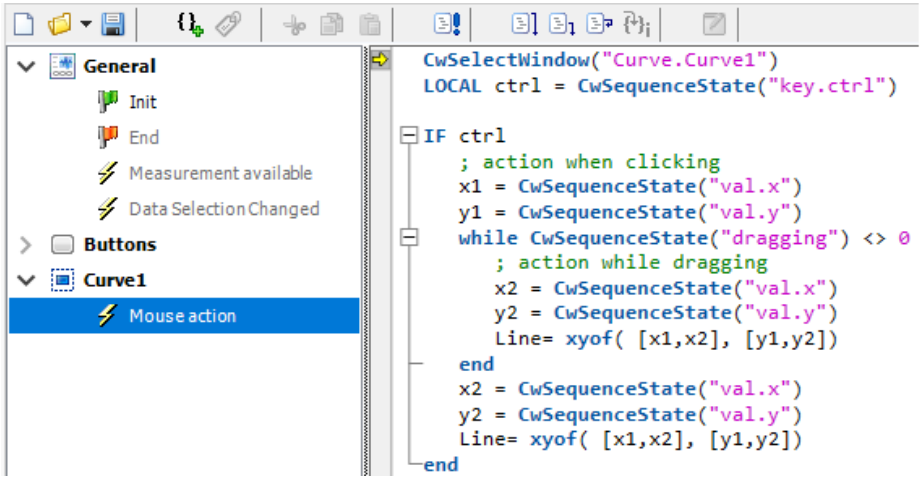
13.3.2 Curve window



Curve window toolbox

This toolbox contains the various curve window display styles. Details on the use of these options are presented in the documentation on the curve window.





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Notes on programming

Events

- "***Mouse action***": The following actions can be evaluated:

  Left or right mouse button clicked; "Drag"-operation has been started (while he left mouse button remains pressed); mouse has been moved; left mouse button double-clicked.

Prerequisite: By default, the events are deactivated and are activated by means of the curve window's property "*Mouse-Events*". Furthermore, the curve widget need to have been configured using the function *CwSequenceEnable*(). Sample applications are presented in the online help on *Mouse-Action* in the Editor.
Remarks: Be aware that in consequence, the curve window's default operation is affected. If for instance, right-clicking the mouse is enabled for the event sequence, then right-clicking the mouse will subsequently no longer open the context menu. For this reason, the event sequence should be programmed in such a way its execution time is as brief as possible.

Example 3: "Drag"-mode, display regression line for curve segment

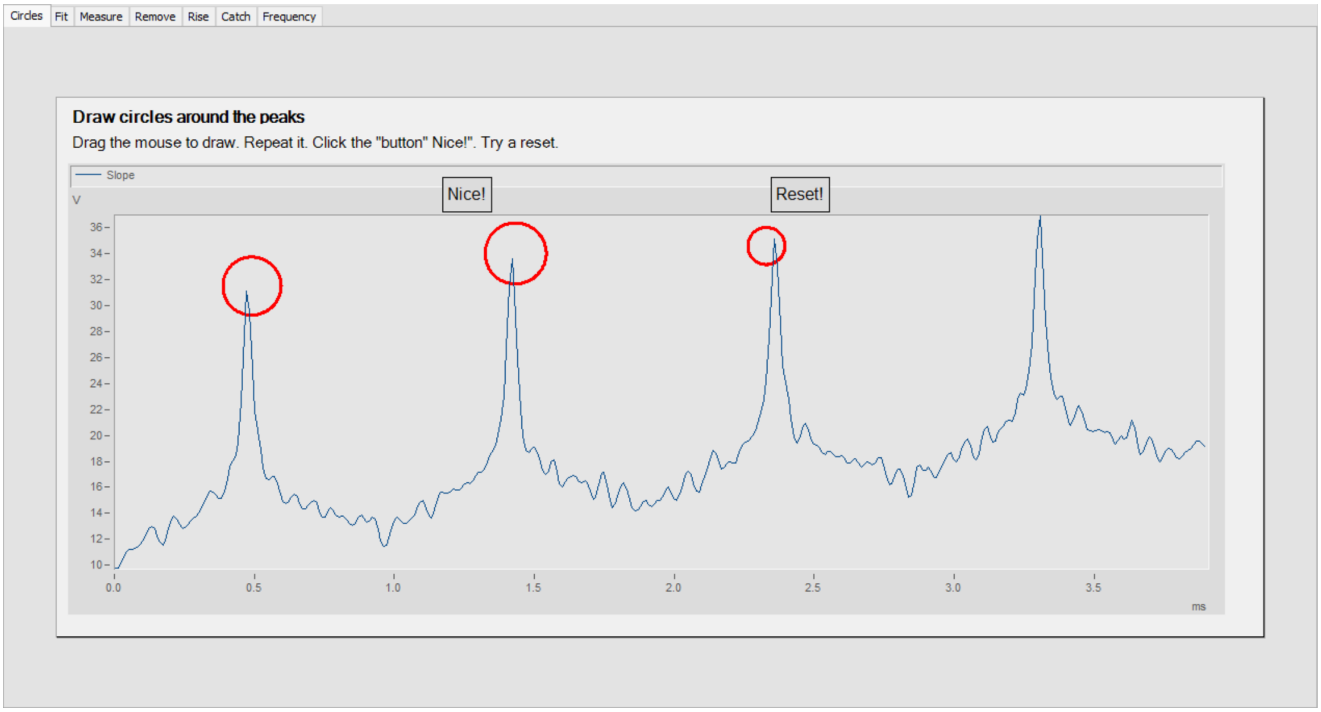
The curve window displays a data set named 'channel1', the Panel additionally contains a button named 'Regression'. When the button is clicked, a special mode is activated: By dragging the mouse (press and hold down left mouse button, then move mouse) the user demarcates an x-region in which the regression line for 'channel1' is continually calculated and displayed.

```
=Xbî ÉåíJëÉèì ÉåÅÉ=Ð ì ííçå=Eo ÉÖ¤ÉëëáçåFÐ
=¸ ï pÉäÉÅíj çQÉE?ÍáäÉ?F
=¸ ï pÉäÉÅít ä¤Ççï E? ì ¤ ÉN?F
=éÉÖ¦ ä¤äÉ=Z=Epj mqv
=fc= ï a¤ëéä¬ód ÉíE?Ç~í~hÅçì åí?F=Z=N
=¸¸ ï k Éï ` Ü~åäÉäE?~ééÉåÇ¬ä¬ëí=~ñä¤?1=éÉÖ¦ ä¤äÉF=
=bk a
=¸ ï pÉèì ÉåÅÉbå~Ä¤ÉE?Åçëóë?1=?Çê~Ö?F
=Xbî ÉåíJëÉèì ÉåÅÉ=Ð çì ëÉJ~Åíáçå Ð
=ï l ` ^i =ñG
=pÉíl éíáçåE=?cì åÅhk çfåÑçj Éëë~ÖÉë?1=?v Éë?F=Xåç=ï cá=éÉëì ä¤ë=å¤=çì íéì í=ï å¤ÇçÏ >
=ñN=Z=¸ ï pÉèì ÉåÅÉpí~íÉE?1 ~åk?F
=t efi b=¸ ï pÉèì ÉåÅÉpí~íÉE?Çê~ÖÖ¤åÖ?F=Y[ =M
=¸¸ñO=Z=¸ ï pÉèì ÉåÅÉpí~íÉE?1 ~åk?F
=¸¸éÉÖ¦ ä¤äÉ=Z=ï cáE ì íEÄÜ~åäÉäN=ñN=ñOFF
=bk a
```

Additional examples are provided in the help material on the event *Mouse action* directly in FAMOS' Editor.

Sample project: Curve and Mouse

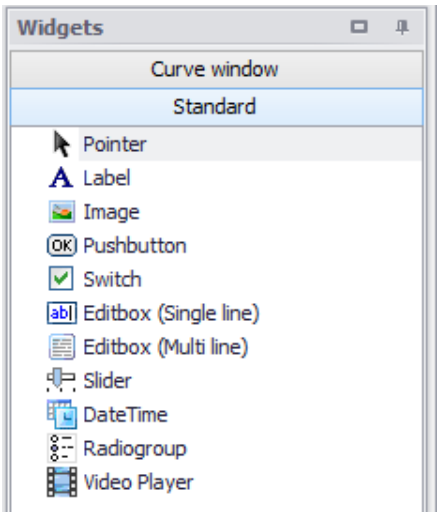
Among the sample projects 418 included in the product package, you have the project "***Curve and Mouse***". On multiple pages, this project illustrates a variety of applications whose code you can copy.



Reference Curve window - Events

- Help material in the Panel [code] on the event ***Mouse action***.
- Functions references *CwSequenceEnable*(); *CwSequenceState*()
- Included sample project ***Curve and Mouse***

13.3.3 Standard

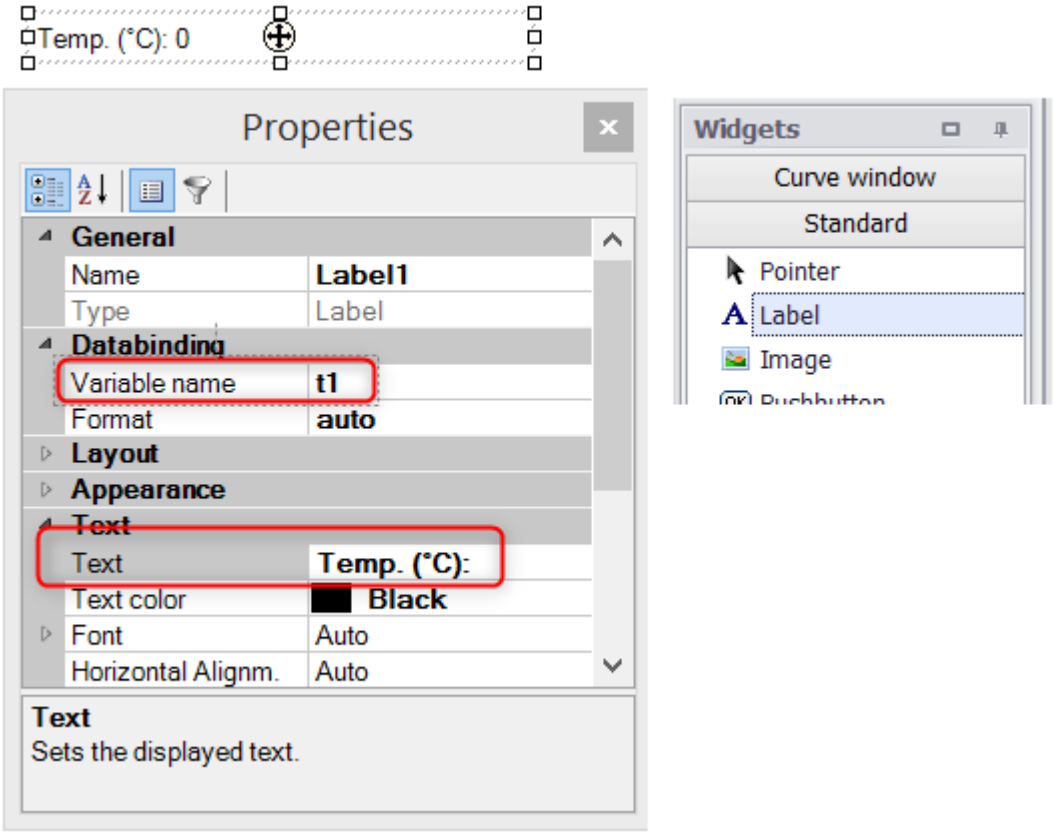


Toolbox for standard widgets

Using these options, you can fill reports with texts, pictures, and interactive widgets (buttons, input boxes, slider, date & time, video).

13.3.3.1 Label

Not only a permanent text can be displayed, but also the content of a linked text or text array variable (**Data binding**).



Label (example)

Line breaks are created by the keyboard combination SHIFT+ENTER or CTRL+ENTER. Pressing the ENTER key closes the Edit-mode.

Displaying text and a value

If you **assign** a permanent text to the label (in this example "Temp. (°C)"), then this text is also displayed if you set up data binding with an imc FAMOS variable.

For the example above, if the variable "t1" takes the value **"450"**, the label displays:

Temp. (°C): 450

In order to enter additional text after the value, use **placeholders** 504.

Example text: The text "Temp1: 450 °C" is to be displayed.

The placeholder for a variable's value is <VAR.VALUE>. The text to enter would then be:

"Temp.1 <VAR.VALUE> °C".

If you wish to adopt the variable's unit, the text would be:

"Temp.1 <VAR.VALUE> <VAR.UNIT>".

Example text array: The names of three temperature variables and their respective values are to be displayed in a label:

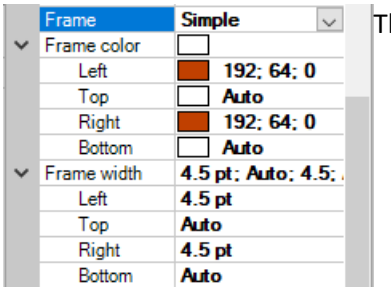
"Temp1: 450 °C"
"Temp2: 123 °C"
"Temp3 60 °C"

The names are located in the variable "TxName[]" and the values in the variable "Res". The text in the widget should then appear as follows:

<VARS["TxName"].VALUE[1]> : <VARS["Res"].VALUE[1]> °C
<VARS["TxName"].VALUE[2]> : <VARS["Res"].VALUE[2]> °C
<VARS["TxName"].VALUE[3]> : <VARS["Res"].VALUE[3]> °C
<VARS["TxName"].VALUE[4]> : <VARS["Res"].VALUE[4]> °C

Frames and text-formatting

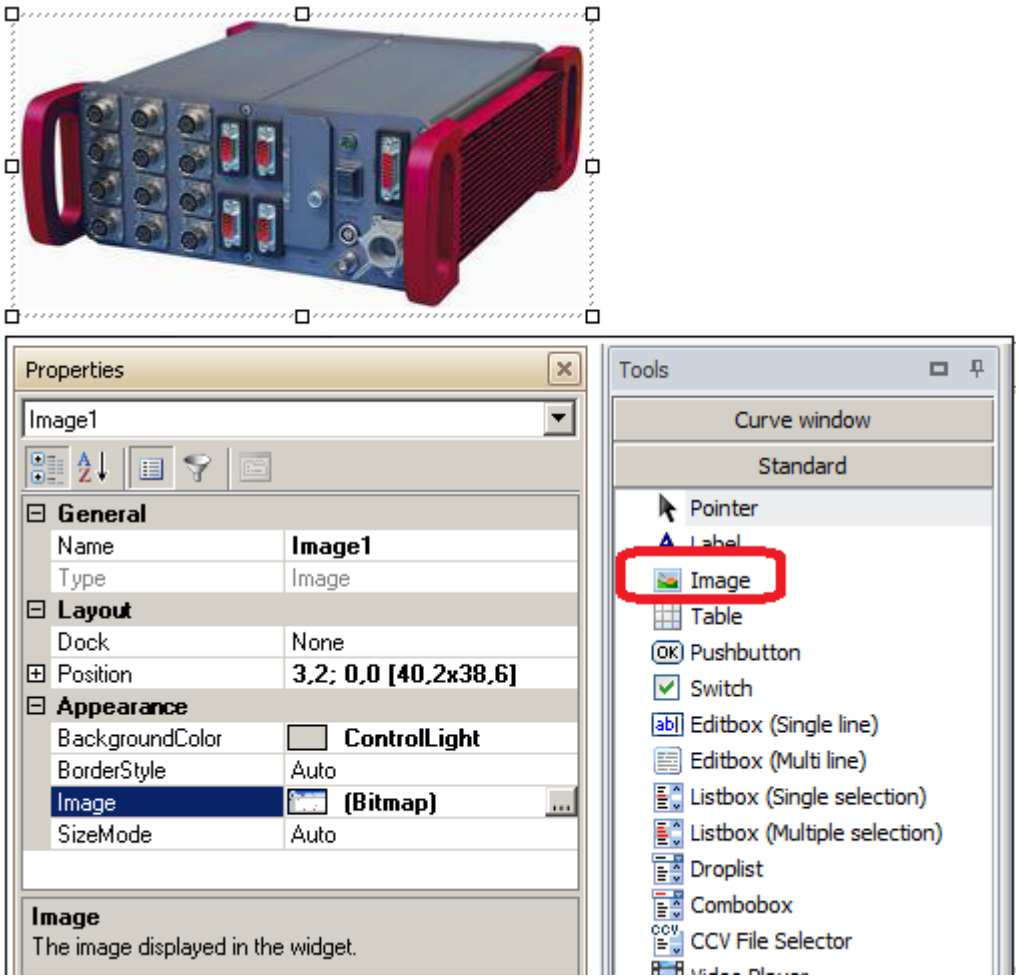
When the property ***HTML formatting*** is activated, display of the text with HTML tags 513 (bold, italics, underlines, etc.) can be set.



The ***Frame*** can be set for each page separately in the Properties.

13.3.3.2 Image

For integrating a graphic.



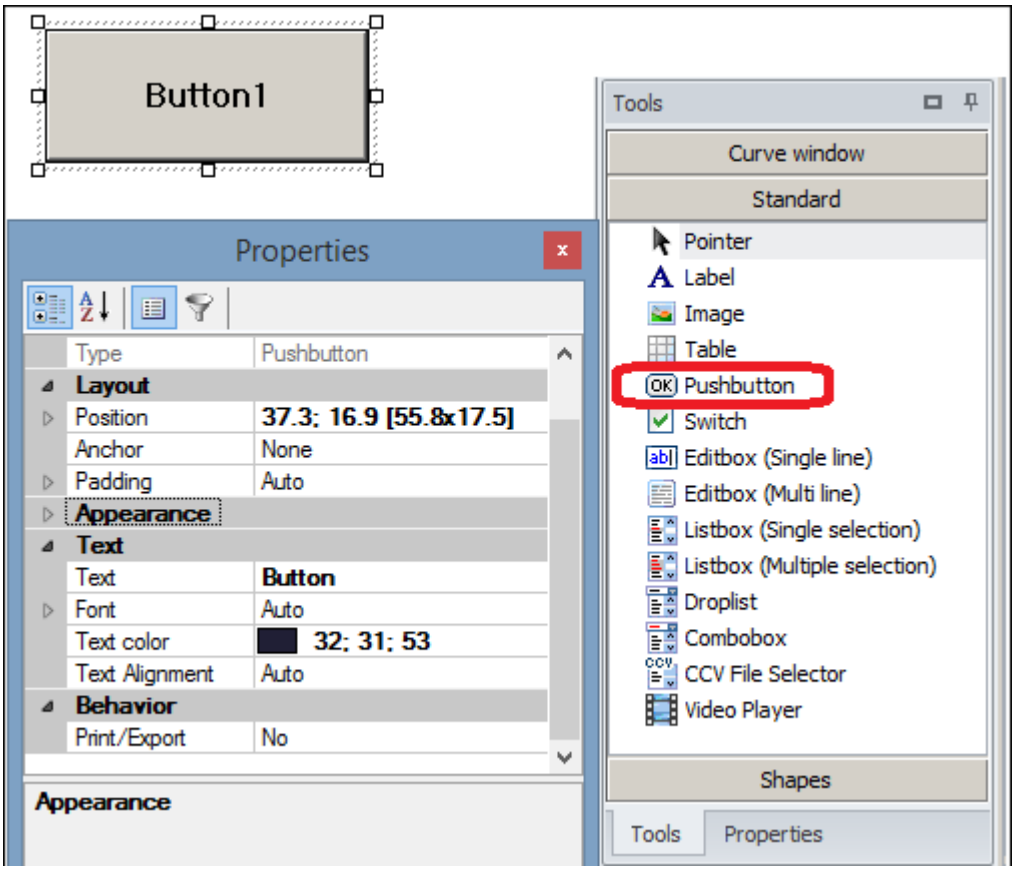
Images (example)

You can use this widget to display a picture. To do this, select the file containing the picture in the Properties window under "*Appearance*"> "*Image*" (highlighted in the picture above). Files of a variety of graphics formats can be displayed. The picture can also be magnified/reduced in various ways.

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13.3.3.3 Pushbutton

A classic button:



Regular button (example)

If you create a button, then the associated event is available in the main imc FAMOS window. You can therefore design the sequence to react to a click on the button.

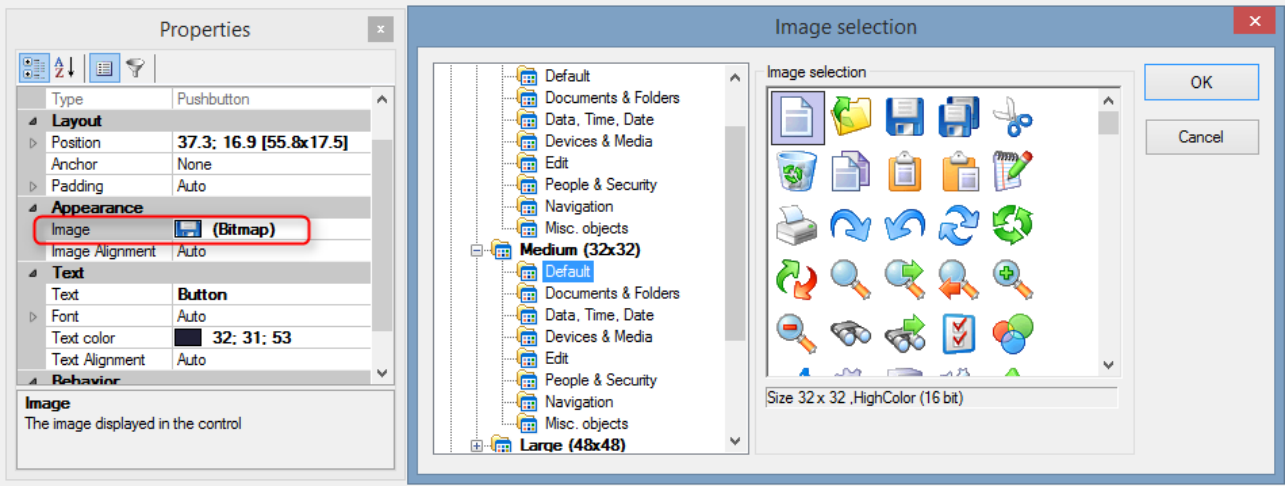
Position, Anchor, Padding

besides the choice of a fixed ***Position***, the widget can also be permanently ***anchored*** to one or more sides, in case automatic rescaling 440 of the Panel's size occurs.

The property "Padding" sets the text's distance from the edge.

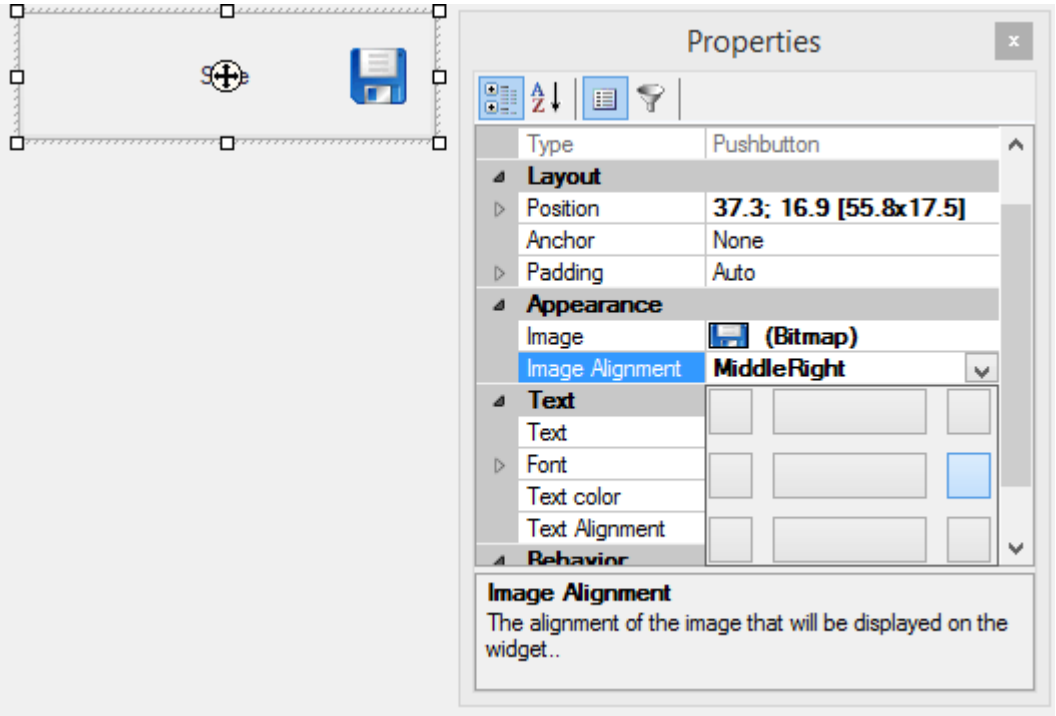
Image and color

In addition to a caption, an ***image*** can also be displayed. For this purpose, imc FAMOS provides a library of symbols of various sizes:



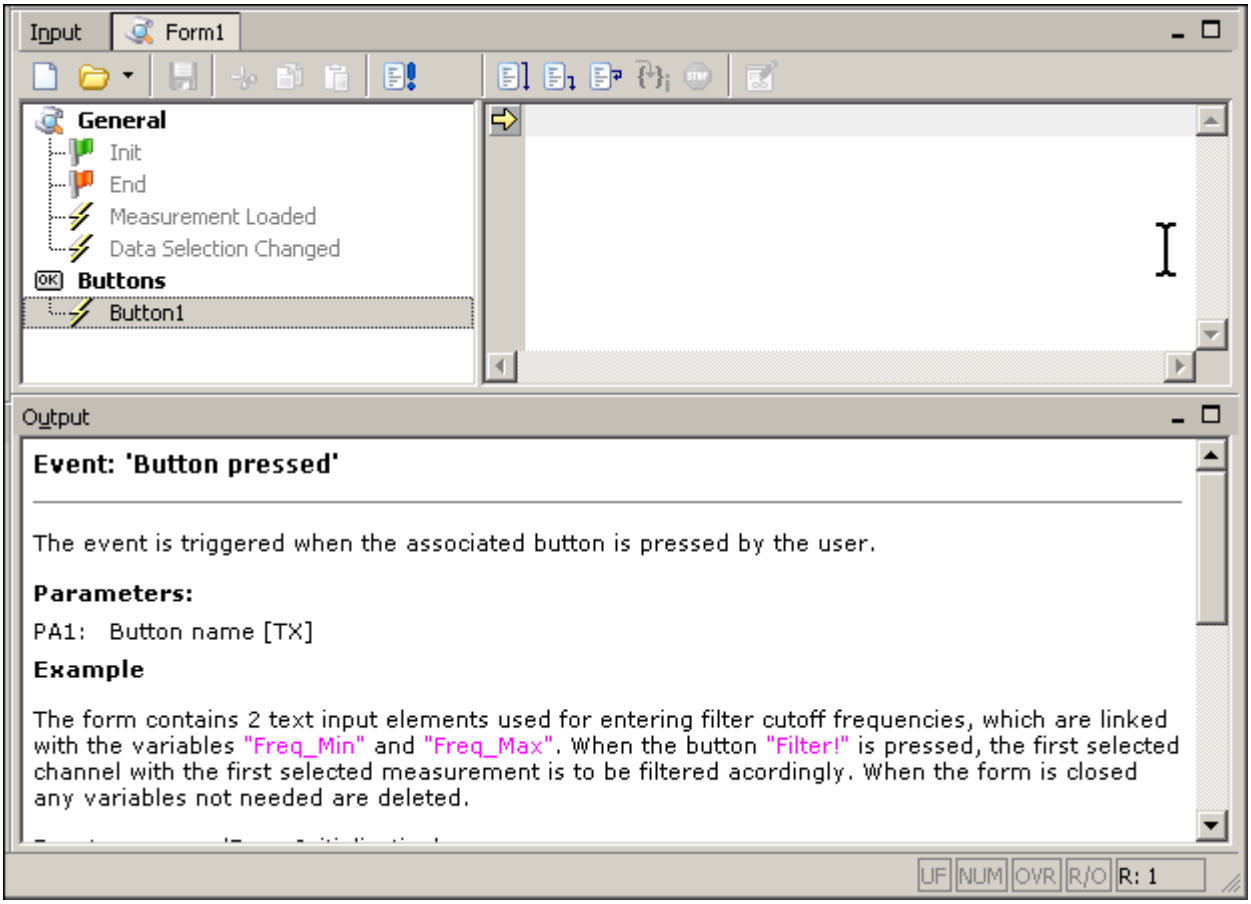
The captioning and the background can be modified by means the properties "*Text color*" and "*Background color*".

The ***Image-Alignment*** determines the position:



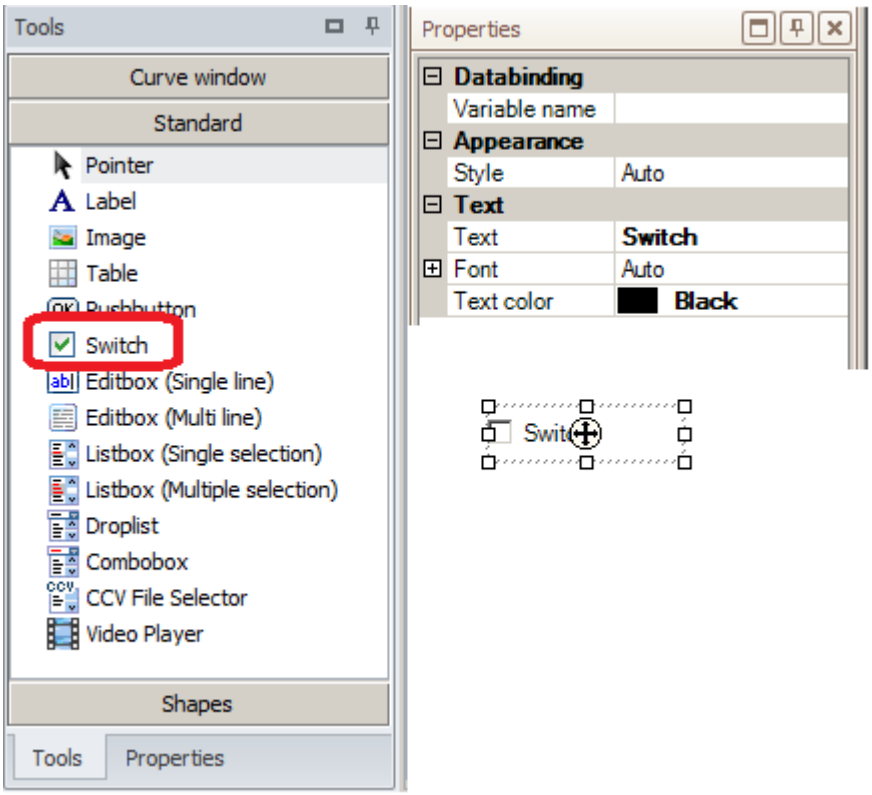
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For details and examples, look in the main imc FAMOS window's help window, as shown in this picture:



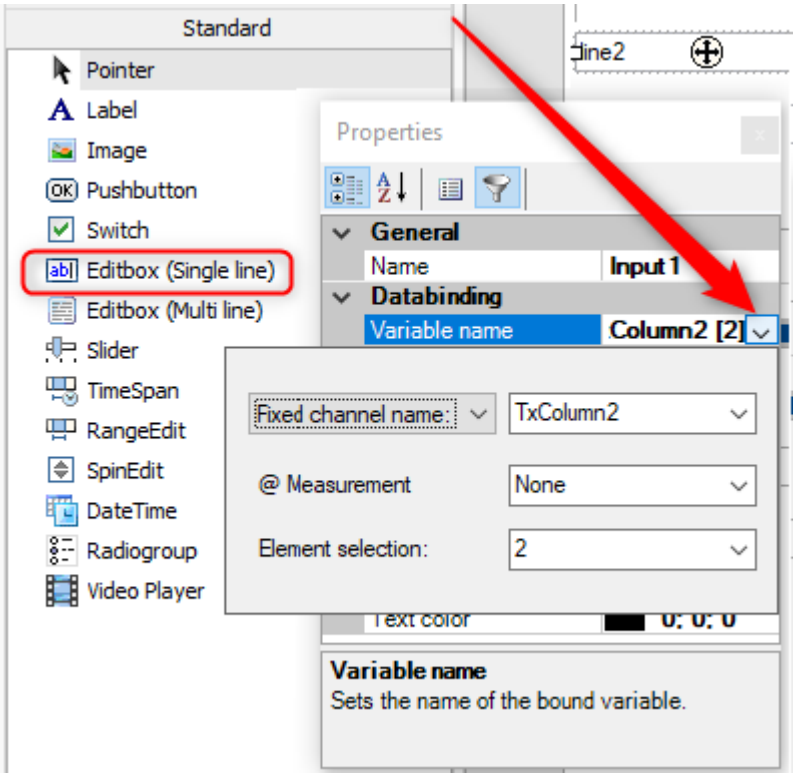
13.3.3.4 Switch

A switch can take either of two states. Linked with a variable, it is possible, for example, to allow the user to decide whether or not an expression in a sequence is applied.



Switch (example)

13.3.3.5 Editbox (Single line)



Input box (single line) with Data Binding

You can link the *Editbox (Single line)* with a **text** or **text array** variable by means of the Data Binding 499. The variable always reflects the input box's current contents. There is no event reflecting a change of the content.

A **text array** shows all elements consecutively or, if as shown in the image, an element selected by index.

In the category *Behavior*, the widget can be placed in ***Password-input*** mode. In this case, the entry is not displayed in plain text but instead in asterisks.

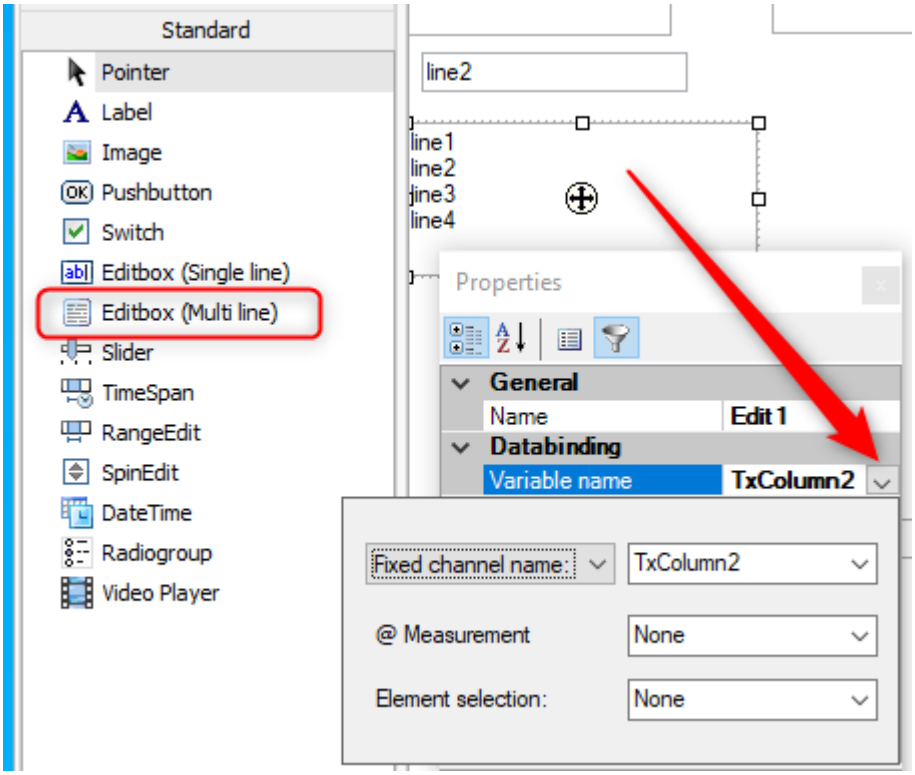


- The event "*Changed*" is triggered when the value of the linked variable is changed.
- The branch is only displayed if a data linkage exists.

13.3.3.6 Editbox (Multi line)

Widget for displaying and entering of multi-line texts. This widget's functionality matches that of the Editbox (Single-line) 468.
A text array variable linked to the widget by means of data binding can either be expanded using a line break (CTRL-key + Enter), or shortened by deleting a line.

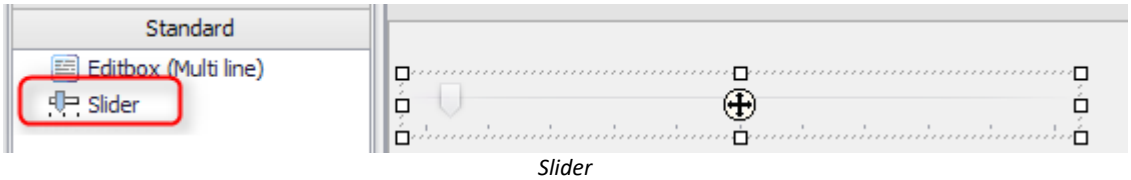
Individual elements of a text array are specified according to the formula "Name" + Space + "[Index]". Alternatively, you can use the popup-dialog as the image below shows.



Input box (multi line)

13.3.3.7 Slider

A virtual slider control is often used when the user is to be offered to ability to select a value out of a defined value range. Toward this end, a knob can be slid along a linear scale. The actual value set depends on the knob's position and the definitions for the scale's end values.



Slider

Notes on designing

A slider control can be oriented either horizontally (the scale is horizontal with the minimum at left) or vertically (the scale is vertical, with the minimum on the bottom). The orientation is determined in the properties.

The properties "***Range Minimum***" and "***Range Maximum***" set the corresponding numerical values for the lower and upper ends of the slider, respectively.

The property "***Small steps***" applies whenever the user operates the control using the arrow buttons. A typical value would be 1% of the value range.

The property "***Large steps***" applies whenever the user operates the control by means of the keys [PGUP] or [PGDN]. A typical value would be 10% of the value range.

Notes on programming

Events

- "***Changed***": Generated once the user has changed the current value. When the slider is moved, it continually transfers the instantaneous values, which can cause the underlying sequence code to be executed multiple times. The property "*Change value delay*" can be used to optimize the system response.

Important functions:

- PnSetValue, PnGetValue: Setting and getting the current value.

Data-Binding:

A slider control can be linked to a imc FAMOS variable, in order to display/ edit its current value. If the variable is a data set, the data set's most recent value is always accessed.

The linkage can be made by moving the variables onto the slider using drag&drop.

If the value lies outside of the slider control's value range, the closest scale end value is indicated.

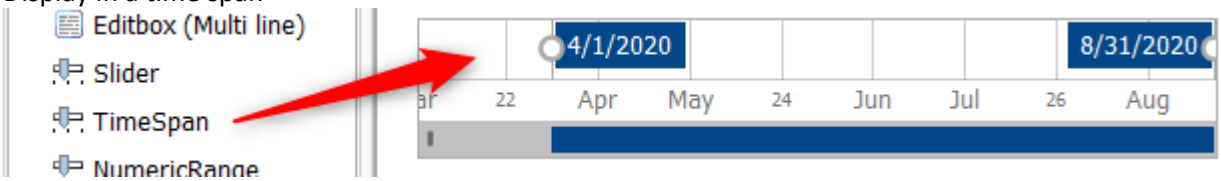
Notes on operation

When the slider control holds the input focus (distinguishable by a dashed-line frame around the caption), the keyboard can be used as follows:

POS1	Positions the knob at the left/lower end of the slider
END	Positions the knob at the right/upper end of the slider
ARROW KEYES	Moves the slider control in the corresponding direction by the value set in the property "***Small steps***"
PGUP PGDN	Moves the slider control in the corresponding direction by the value set in the property "***Large steps***"

13.3.3.8 TimeSpan

Display in a time span



TimeSpan

Notes on the design

- The properties "***Minimum***" and "***Maximum***" determine the ruler's range.
- The two blue markers an be linked with variables.
- What resolution is possible can be specified by means of the property *TimeResolution*. If it is not possible to display this resolution, an optimized display of the the next possible resolution is provided.
- It is possible to modify the background color.

Notes on programming

Events

- "***Changed***": This is triggered whenever one of the two markers has been changed. No distinction is made between the two markers for this purpose.

Important functions:

- *PnSetValue, PnSetValue2:* if there is no data binding. *Left Marker* or *Right Marker* will be set. This does not trigger a "*Changed*"-event.
- *PnGetValue,PnGetValue2*: Gets the date (rounded up to the next day) of the first or second marker.
- *PnSetProp*: *Minimum, Maximum* can be changed at runtime.

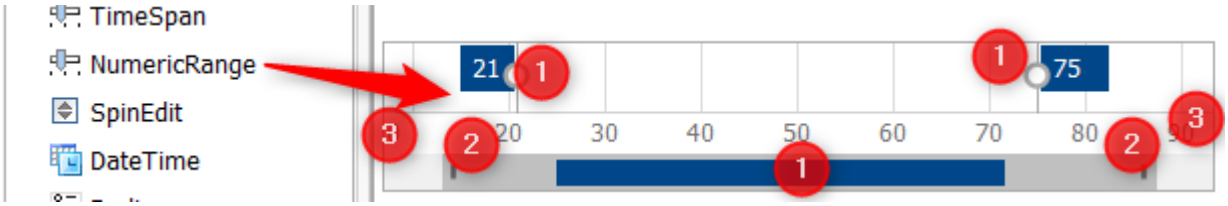
Data-binding:

Linkage (data binding) of the markers can be accomplished by using drag&drop 502 to move a variable to the widget's respective marker. For a value outside of the value range specified, the corresponding *Minimum* or *Maximum* is used.

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13.3.3.9 NumericRange

Display of a numeric range.



NumericRange

Notes on the design

- The properties "***Minimum***" and "***Maximum***" set the ruler's range. ③
- The two blue markers can be linked with variables. ①
- The ruler's two edges can be slid over up to the ends of the highlighted range. This enables display of the range at different resolution levels. ②
- What resolution is possible can be specified using the property *RulerDelta*.
- The background color can be modified.

Notes on programming

Events

- "***Changed***": This is triggered whenever one of the two markers has been changed. No distinction is made between the two markers for this purpose.

Important functions:

- *PnSetValue, PnSetValue2:* if there is no data binding. *Left Marker* or *Right Marker* will be set. This does not trigger a "*Changed*"-event.
- *PnGetValue,PnGetValue2*: Gets the date (rounded up to the next day) of the first or second marker.
- *PnSetProp*: *Minimum, Maximum* of the ruler can be changed at runtime.

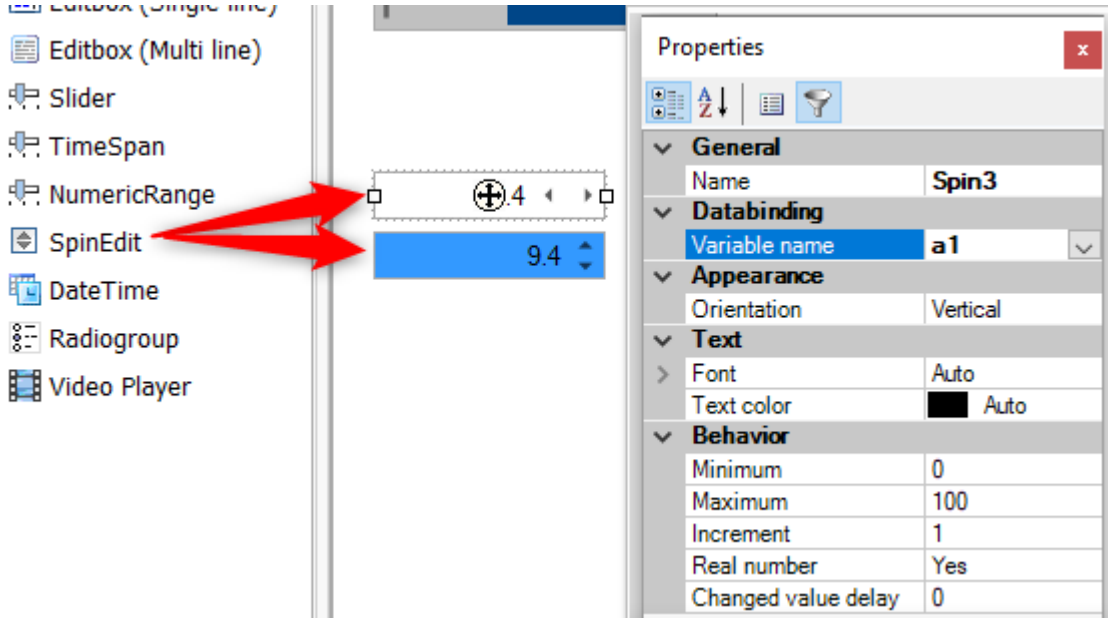
Data-binding:

Linkage (data binding) of the markers can be accomplished by using drag&drop 502 to move a variable to the widget's respective marker. For a value outside of the value range specified, the corresponding *Minimum* or *Maximum* is used.

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13.3.3.10 SpinEdit

An input box allowing incremental value changes.



SpinEdit

Notes on the design

- It is possible to place both horizontal and vertical increment arrows.
- The properties "***Minimum***" and "***Maximum***" set the respective numerical value range for the lower/upper end of the widget.
- The property "***Increment***" sets the size of incremental steps.
- Decimal numbers are possible by setting the property *Real number = Yes*. The maximum count of decimal places is permanently set to 4. If the resulting value has fewer decimal places, the extras are not displayed.
- The values automatically increment higher while the mouse button is pressed down; initially slowly, then faster.
- Along with the font type, the background color and font color can be modified.

Notes on programming

Events

- "***Changed***": This event is generated whenever the user has changed the current value or releases the mouse button. In order to prevent repeated execution of the sequence functions due to changes made by repeated clicking, it is possible to use the property "*Value change delay*".

Important functions:

- *PnSetValue:* If there is no data binding. For a number outside of the value range defined, the respective *Minimum* or *Maximum* is used. This does not trigger a "*Changed*"-event.
- *PnGetValue*: Gets the current value.
- *PnSetProp*: *Minimum, Maximum* and *Increment* can be changed at runtime.

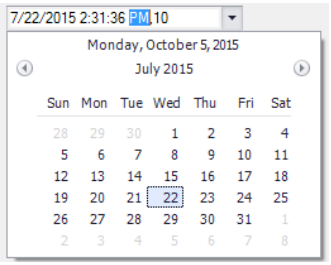
Data binding:

The *SpinEdit* widget can be linked with a FAMOS variable for the purpose of displaying/editing is current value. If the variable is a data set, the data set's last value is always displayed.

The linkage between the widget and the variable can be made using drag&drop 502. For a value outside of the value range defined, the corresponding *Minimum* or *Maximum* is used.

13.3.3.11 DateTime

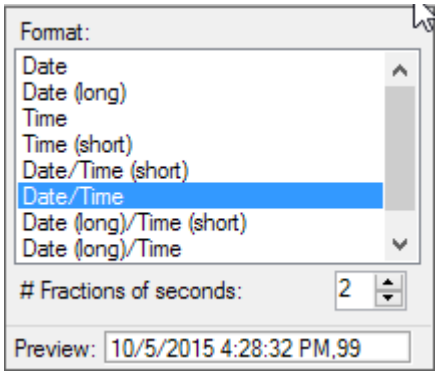
The DateTime widget can be used to enter and display the date and/or time.



Datum und Uhrzeit

Notes on designing

- The property "***Format***" affects the display format.



- With the property "*Read-only*", the linked variable can not be changed with the widget.
- It is also possible to prevent expansion of the view.

Data-linking

A calendar (datepicker) widget can be linked with a variable for the purpose of displaying/changing its current value. If the variable is a data set, the data set's most recent value is always accessed.

A linkage only makes sense if the variable concerned is expressed in the imc time format. Use the functions belonging to the group *Variables> Date, Time* for creating and processing them.

Notes on programming

Events:

- "***Changed***": generated once the user has changed the current value.

Important functions:

- PnSetValue, PnGetValue: Setting and getting the current value. The number value is transferred in the imc time format. Use the functions belonging to the group *Variables> Date, Time* for creating and processing them.

Notes on operation

Along with direct entry of the date by means of the digit keys, the following additional possibilities are available:

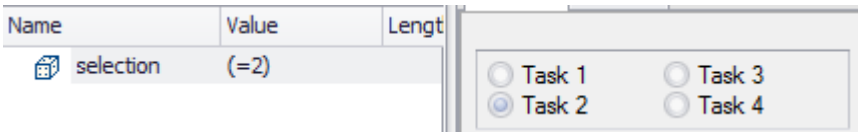
Clicking on the arrow button at the right of the input box (keyboard operation: [*ALT*]+ "*ARROW DOWN*") opens a dedicated calendar window for easily selecting the date.

In the widget's basic, "shut" state, it's also possible to click on individual components of the date (e.g. the year) and use the arrow keys to make adjustments.

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13.3.3.12 Radiogroup

An associated group of radio/option buttons among which exactly one can be selected at any time.



Radio group

The count and captioning of the options is set as the property "*Entries"/"Items*". A options/radio group can be linked to a variable. The running index of the respective selected option is defined as the current state of the option group and this as the value of the linked variable. An option group with 3 options can thus take the value 1, 2 or 3.

Notes on the design

The arrangement is influenced by the size and aspect ratio of the box.

Notes on programming

Events

- "***Entry selected***": Triggered when the user manually selects a different option

Important functions:

- *PnSetValue, PnGetValue*: Sets and gets the current value
- *PnShow/PnEnable*: Controls visibility/operability
- *PnSetProperty*: For changing the font color and fill color
- *PnGetItemCount*: Gets the count of available options
- *PnGetItemText*: Gets the captions of the option chosen
- *PnSetItemText*: Sets the label of the option chosen
- *PnSelectItem*: Sets the option choice
- *PnGetSelectedItem*: Gets the current option

Data binding:

The option/radio group can be linked with a FAMOS variable for the purpose of displaying or changing its current value. If this is a data set, the last value of the data set is always the one applied.

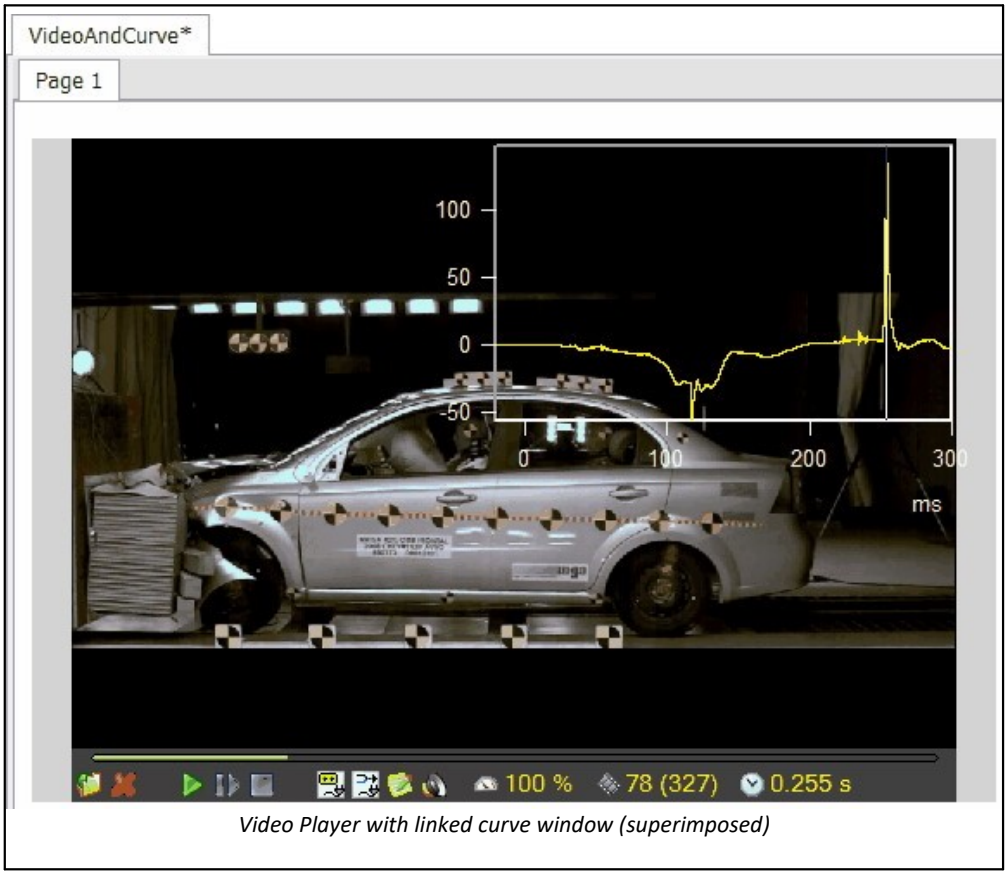
The linkage can be performed by moving the variable onto the widget using drag&drop.

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13.3.3.13 Video Player

The *Video Player* control provides the ability to play back video files. It also enables synchronized viewing of measurement data along with associated videos in a linkage between the curve window and the Video Player.

It is also possible to display multiple instances of the Video Player in one Panel. The sample project "PanelVideo-Demo" which is installed with the software illustrates this.



Video Player with linked curve window (superimposed)

You can link the Video Player control with a imc FAMOS variable (type: Video-Reference 272) by means of the Data Linking 499. In that case, the linked to the variable is always displayed. By using symbolic variable names ("... @ Measurement #"), it is possible to move between the displays of various video files just as easily and flexibly as between the displays of files of measured data.

For the purpose of controlling the Video Player by means of sequences, a corresponding function library (Video-Kit) is available. This is a component of the Video Player plug-in which is included in system packages of and imc FAMOS Professional 55 or higher.

The VideoPlayer plug-in can play all **formats** which can be played by the **Windows Media Player**. If any format is not supported, then it can be supplied subsequently by installing the corresponding Direct Show-compatible Codecs.

13.3.3.13.1 Operation

The Video Player is operated by means of a toolbar on the video's bottom edge. The visibility of the individual buttons and display widgets can be specified when designing the Panel.

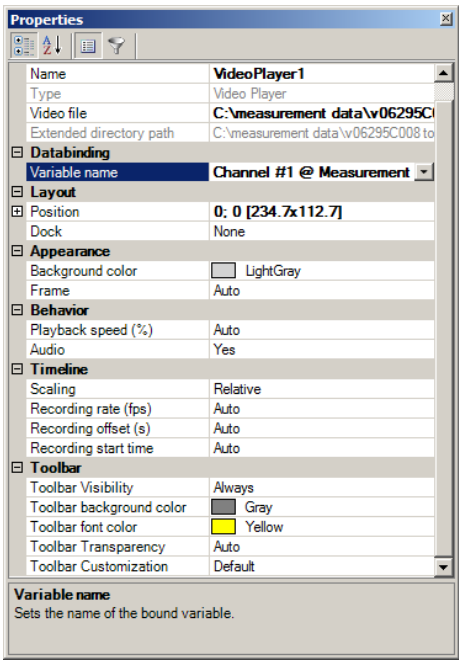


	**Time line**: Displays the current position in the video. If you move the mouse over the time bar, the two arrows, right and left (clicking which moves the video by one frame in the respective direction), as well as a slider button which can be grabbed by mouse and moved in the desired direction, appear.
	**Load Video-file**. By clicking on this button, you call a dialog by means of which you can select the file desired.
	**Click video**.
	**Play back video** (from beginning)
	**Interrupt playback** (Pause)
	**Resume playback** from current position
	**Stop playback** and position video at the beginning
	Setup of an **x-linkage** 480 (synchronized playback) with another video or curve window
	**Synchronization** of an x-linkage with a curve window
	Calls the **Video Properties dialog** 479
	**Sound** On/Off
	Displays the current **playback speed** in percent of the original recording speed. Clicking activates the dialog for making changes. 

73 (327)	Display of the current **frame number** (of a total of # frames). Clicking opens a dialog by means of which it is possible to skip to any arbitrary frame number.  Using the button, the current setting is applied without having to close the dialog. 
7.253 s	Displays the current video time. Indicated as a choice of either relative time in seconds since file start, or as absolute date/time. Clicking opens a dialog by means of which it is possible to skip to a different time in the video. 

13.3.3.13.2 Configuration

Configuration is performed in Design-Mode by means of the Properties tool window.



Name: Name of the widget; only required for remote control via Kit function.

Video file: Name of a permanently assigned video file.

Extended directory path: Currently displayed video file, giving consideration to any applicable data binding (content of a text variable, or video-reference).

Variables-Name: Linked variable (type: Text/Video-Reference). You can also set the variable to be linked by using drag&drop from the Measurement- or Channel-list.

Playback speed: Expressed in percent of the original recording rate. Can also be edited at runtime by means of the toolbar.

Audio: Sound On/Off. Also editable by toolbar.

Toolbar: Configuration of the toolbar. **Visible = auto** means that the toolbar only becomes visible when the mouse is moved to over the corresponding position. Selecting "*Toolbar Customization*" calls a dialog with which you can set the visibility and adjustability of each of the toolbar items separately.

Timeline/Scaling: This sets whether the video is displayed in the mode "*Relative time in seconds*" or "*Date/Time*". What is affected is the display of the current video position and any existing x-linkage.

Recording Offset/Rate/Start Time: Configuration of the video's time axis. These settings are only relevant the video has an x-linkage with, for example a curve window, in order to ensure synchronized playback. If "auto" is selected,the video's original values are used. See also Video-Properties 479.

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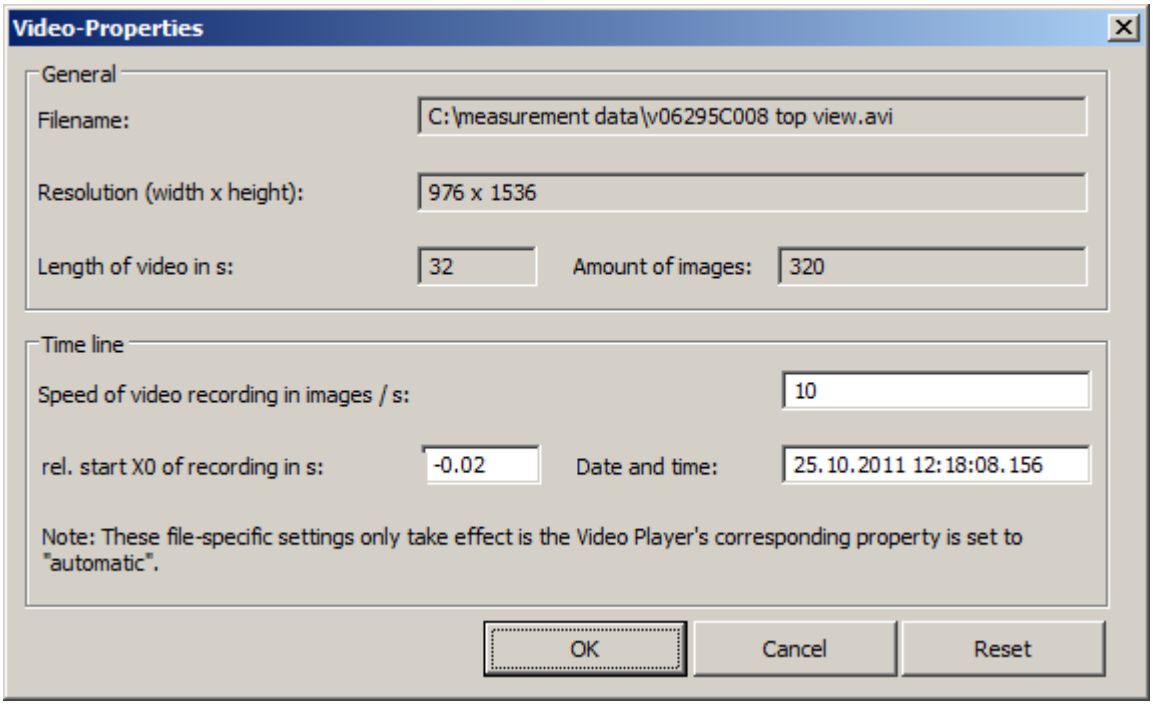
13.3.3.13.3 Video-Properties

Along with general information on the video, it provides input boxes for viewing and adjusting the *frame rate*, the *offset* (in seconds) of the first frame, and the video's *absolute start time*.

These factors determine the video's time axis (in analogy to the trigger time, pretrigger and sampling rate for measurement data), and are of particular interest when the video is to be displayed in synchronization with measured data by means of an x-linkage with a curve window.

In most video formats, the only parameters are the *frame rate*, and the video's *start time* corresponds to the video's file time. In this case, if recording of the video starts separately from the actual measurement, it is possible to synchronize the video to the measurement retroactively by adjusting the *offset* or *start time*.

Adapting the frame rate is necessary in more rare instances; sometimes the frame rate recorded in the video file is not correct (e.g. for high-speed videos, a substantially lower rate is specified in order to enable proper playback even with standard players), or it is not sufficiently exact for the purpose of ensuring adequate synchronization for long-term measurements.



OK

Applies the settings made and closes the dialog. By default, the settings are recorded in a file which then has the same name as the video file, but the file extension ".ivi".

Video files generated by imc STUDIO with the Video plug-in are a special case. The parameters required for the time axis are determined here directly and depending of the video-format) and are entered either directly in the video file's header or in an *.ivi-file saved in parallel. In the former case, the changes made here are also entered directly into the video file itself.

Reset

Resets to the original default values.

Remarks

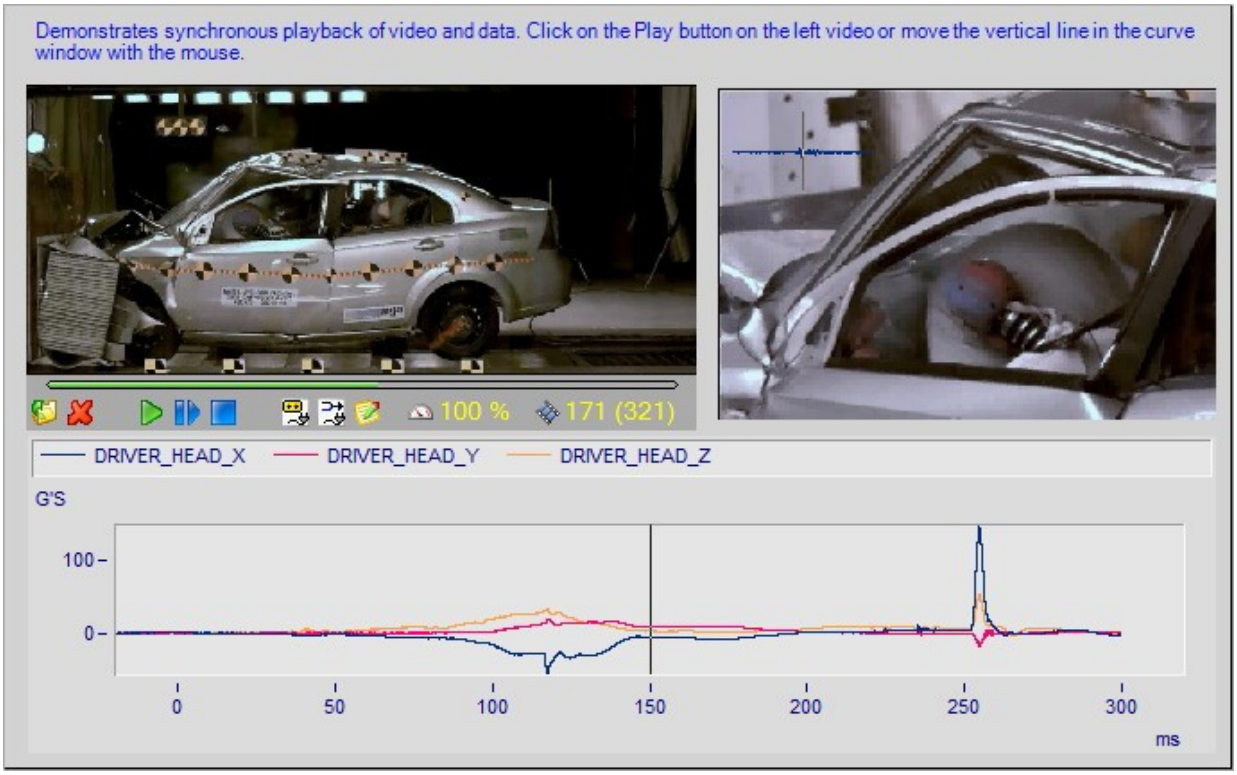
- The settings made here only take effect if the corresponding Video Player property is set to "automatic". Otherwise, the setting for the Video Player takes precedence.
- In order to synchronize video data with measurement data, you can also determine the parameters needed in a semi-automatic manner by manually-graphically selecting synchronization points; see Synchronized playback (x-linkage) 480.

13.3.3.13.4 Synchronized playback (x-linkage)



In order to set up an x-linkage with a different Video Player or with a curve window, use the drag&drop technique to drag this button over the widget () to be linked.

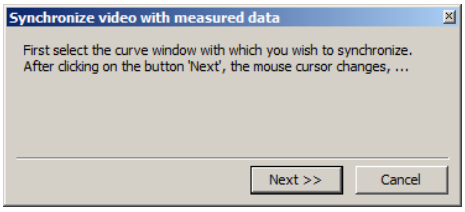
You can also establish such a linkage while working with the curve window; the corresponding curve window menu item is called "*Connect (X)*", in the menu *"Edit\Move"*. The measurement data position corresponding to the currently displayed video frame is indicated by a vertical line. You can now change either the current video position (e.g. by means of "Playback" or skipping to the desired frame) or the curve window position (moving the vertical line), the respective other widget then follows the movement accordingly.



It is often necessary to adapt the video's time axis in order to play back both the measurement data and the video in true synchronicity.



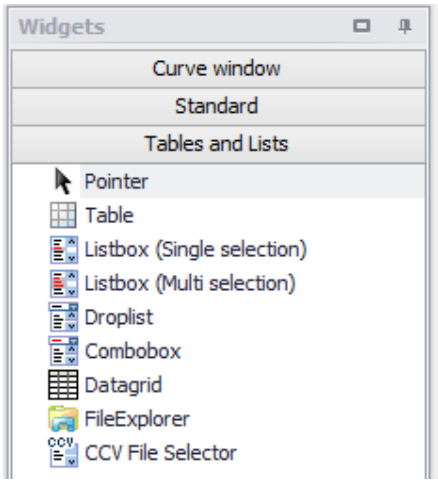
Toward this end, you can use either the dialog "*Video-Properties*" or the button shown at left, which starts an Assistant with which the necessary parameters are set in an almost-automatic manner. Simply follow the Assistant's instructions.



If the video is not yet linked, you are first prompted to select the curve window to link. Next you can navigate through the video to a significant position which can be uniquely identified with a position in the measured data in the curve window, where you can mark this spot using the measurement cursor.

By this means, the time-offset between the video and measurement data is already defined. If you also must adjust the video's frame rate, repeat the procedure for a second synchronization point. The calculated values for the *offset/start time* and frame rate are then displayed and permanently recorded, as described under Video-Properties 479.

13.3.4 Tables and Lists



Toolbox for tables and listboxes

These widgets can be used to create tables and list boxes.

13.3.4.1 Table

Table objects can be used to display sequences of numbers, as well as for structuring texts easily.

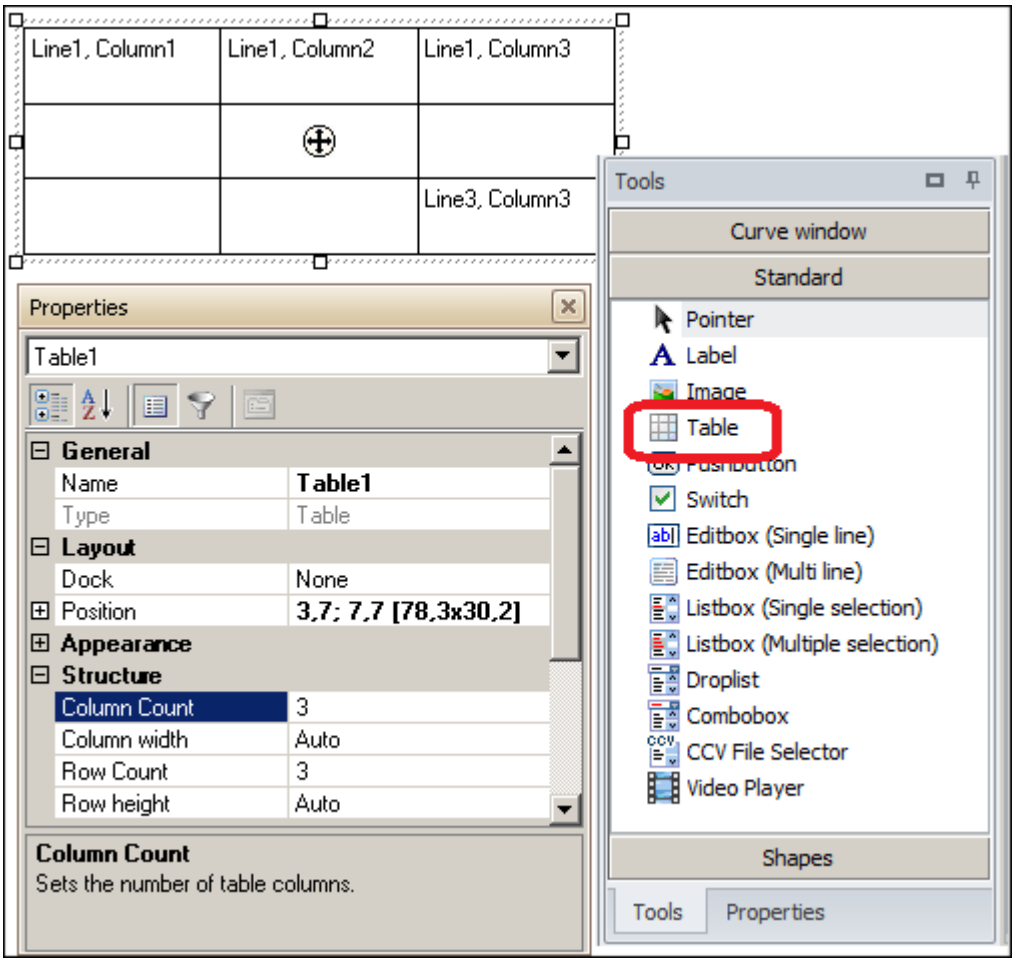
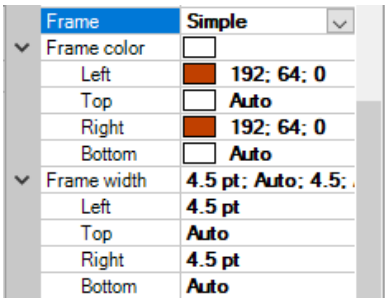


Table (example)

Line breaks are created by the keyboard combination SHIFT+ENTER or CTRL+ENTER. Pressing the ENTER key closes the Edit-mode.

Frames and text-formatting

Each cell of a table possesses the same properties as a text object. Attributes such as content, font, orientation, frame and background can be defined **separately for every cell**.When the property ***HTML formatting*** is activated, display of the text with HTML tags 513 (bold, italics, underlines, etc.) can be set.



The ***Frame*** can be set for each page separately in the Properties.

Aside from the content of the various individual cells the distinguishing feature of a table is its **dimension**, i.e. the number of its columns and cells. The width of columns and the height of rows can be set arbitrarily.

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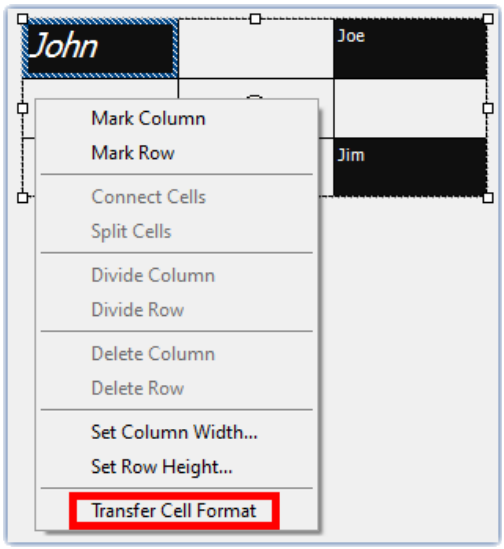
Extended design option: If the dividing line between two columns or cells is moved with the mouse while holding down the Shift key, the width/height of the right/bottom adjacent column/cell is now retained. The width/height of the entire table is adjusted accordingly.

The number of columns and rows determines the amount of cells. Element cells can be combined or conglomerated to larger cells.

During runtime, the **count of columns and rows** can be modified using the function *PbTableSetDim*().

By double-clicking on a table cell, the text (Property "Text") can be entered in-place.

Transfer formatting of a table cell to other cells



The entry in the context menu of a table: “Transfer cell format” can only be used if more than one table cell is selected.

When executed, the current properties of the focused cell are transferred to all other selected cells.

Note

The text and any data binding 499 remain the same, all other design properties such as font, colors, alignment and margins are adopted.

Example

1. Select the "John" cell by clicking on it with the mouse.
2. Also select the other two cells by clicking on them with the mouse while holding down the [CTRL] key.
3. Open the context menu (right-click on the table) and select the menu command "Transfer cell format".



Data binding with text or text array

If you select a single cell, you can define **Data Binding** 499 (a linkage) with a text or text array variables in the "Properties". Data binding can also be set up by using drag&drop from the Variables list.

Data binding with a text array

A column can also be linked with a text array 273. When you use drag&drop to put a text array on a column, a prompt is posted which asks whether to distribute the text array elements onto the lines of the column. If you respond in the negative to the prompt, all texts in the text array are written in one cell, with line breaks.

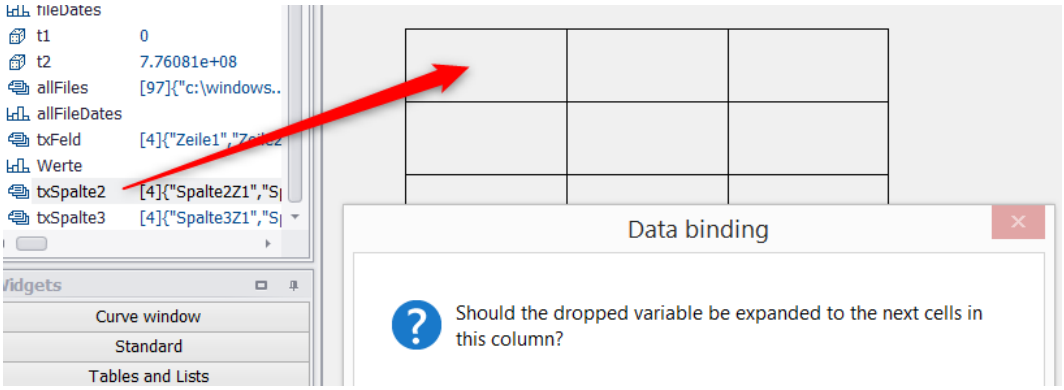


Table with text array

Changing the value of the linked variables during runtime

Tester	John Miller
Weather	rainy
No#	ABC545435

Furthermore, when a cell is selected the property "*Editable*" appears. When this property is set, then at runtime it is possible to double-click on the cell to make an entry and thereby edit the variable linked to it.

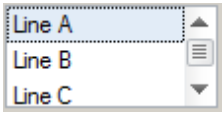
- Double-clicking changes the cell to Edit-mode.
- Single-clicking gives the cell the focus. Pressing the Enter-key places the cell in Edit-mode and displays the variable's current value. This can now be changed and is applied upon a subsequent click of the Enter-key.
- Using the Tab- or the arrow keys it is possible navigate to adjacent cells.
- Only in Design-mode:
  - With SHIFT + cursor, it is possible to select multiple cells.
  - With SHIFT+CTRL+ cursor or arrow keys, the complete row/column can be selected.

Notes on programming

Events

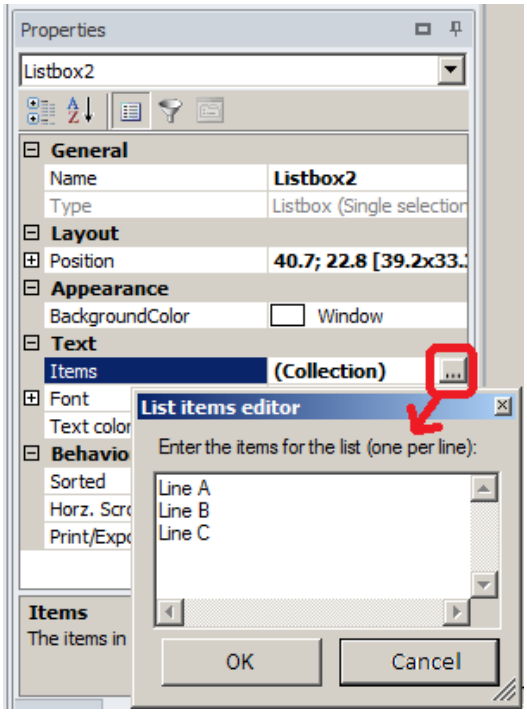
- "***Changed***": If at least one cell is assigned the property Editable, the event "Changed" appears in the code. This event is now also triggered when the variable's value is changed.

13.3.4.2 Listbox (Single selection)



List boxes with single selection are used to give the user the option of selecting exactly one entry from a list of available entries.

Notes on design:



The property "***List-Entries***" defines the contents which the list shows when the dialog is started. By clicking in the Properties-Explorer, you access an edit box in which you can enter the initial content desired.

To add a new line, use the [ENTER]-key. To apply the changes which were made, use the combination of keys [CTRL]+ [ENTER], and to cancel, the [ESCAPE] key or the corresponding button at the bottom of the edit box.

Notes on programming

Events:

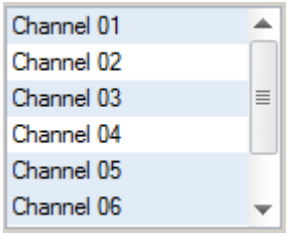
- "***Double-clicked***": Generated when the user double-clicks the mouse over an entry.
- "***Selected***": Generated when the current selection is changed by an action of the user (click of the mouse, arrow keys).

Important functions in the Panels Kit 337:

- PnInsertItem: For inserting entries (text or text arrays)
- PnDeleteItem: For deleting entries
- PnFindItem: Searches for an entry
- PnGetItemText, PnSetItemTex: Gets and sets selected entry
- PnGetSelectedItem,PnSetItemSelection, PnIsItemSelected, PnSelectItem: Gets or edits index of the current selection

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13.3.4.3 Listbox (Multi selection)



List boxes with multiple selection capability are used to give the user the option of selecting one or more entries from a list of available entries.

Notes on design

Making entries to the list is accomplished in the same way as for 'List box (single selection) 485'.

Notes on operation

To add an entry to the current selection or to remove one from the current selection, click on the entry while holding down the [CTRL]-key.

To select a series of entries, first click on the first entry in the series and then on the last entry in the series while holding down the [SHIFT]-key. Alternatively, you can use the [ARROW]-keys while holding down the [SHIFT]-key.

If an empty listbox is filled for the first time with PnInsertItem(), the first item is initially marked gray. The marking can be removed with PnSetItemSelection().

Notes on programming

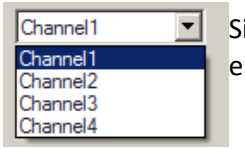
Events:

- "***Ddouble-clicked***": Generated when the user double-clicks the mouse over an entry.
- "***Selected***": Generated when the current selection is changed by an action of the user (click of the mouse, arrow keys).

Important functions in the Panels Kit 337:

- PnInsertItem: For inserting entries (text or text arrays)
- PnDeleteItem: For deleting entries
- PnFindItem: Searches for an entry
- PnGetItemText, PnSetItemTex: Gets and sets selected entry
- PnGetSelectedItem,PnSetItemSelection, PnIsItemSelected, PnSelectItem: Gets or edits index of the current selection

13.3.4.4 Droplist



Similarly to list boxes, droplists are used to give the user the option of selecting exactly one entry from a list of available entries.

Notes on designing

Creating list entries is accomplished analogously to the case of 'List box (single selection) 485'.

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Notes on programming

Events:

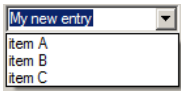
- "***Selected***": Generated when the current selection is changed by an action of the user (click of the mouse, arrow keys).

Important functions in the Panels Kit 337:

- PnInsertItem: For inserting entries (text or text arrays)
- PnDeleteItem: For deleting entries
- PnGetText: Gets selected entry
- PnGetSelectedItem, PnSelectItem: Gets or edits index of the current selection

13.3.4.5 Combobox

A combobox is a combination of the editbox and a droplist.



The user is offered a number of alternatives, but one can also make one's own entry.

Notes on designing

Creating list entries is accomplished analogously to the case of 'Listbox (Single selection) 485'.

Notes on programming

Events:

- None

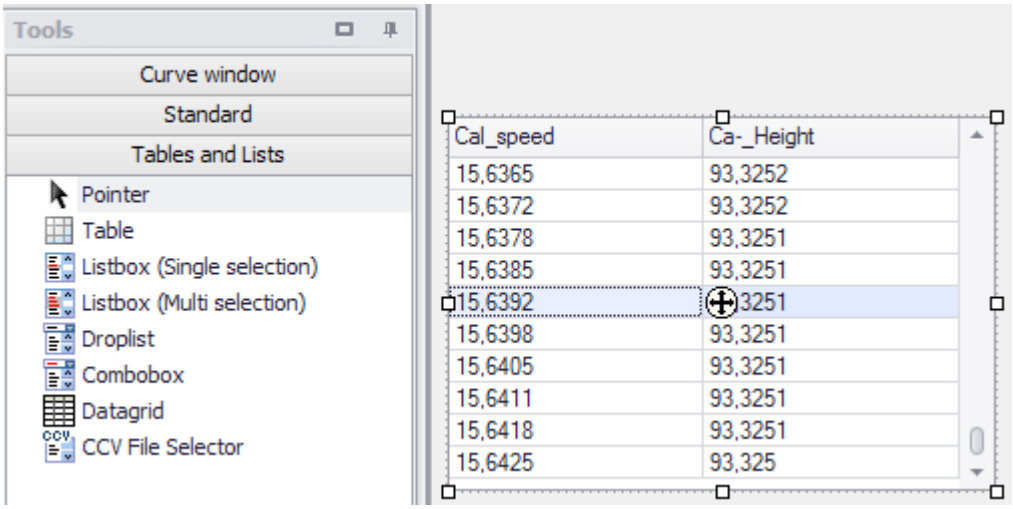
Important functions in the Panels Kit 337:

- PnInsertItem: For inserting entries (text or text arrays)
- PnDeleteItem: For deleting entries
- PnSetText, PnGetText, PnSetValue, PnGetValue - Setting and getting the content of the input box.

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13.3.4.6 Datagrid

The datagrid serves to display data in tabular form. In contrast to the cell-oriented element "Table", is is optimized for displaying data in columns. Along with **data sets**, it is also possible to display **text arrays**.



Datagrid

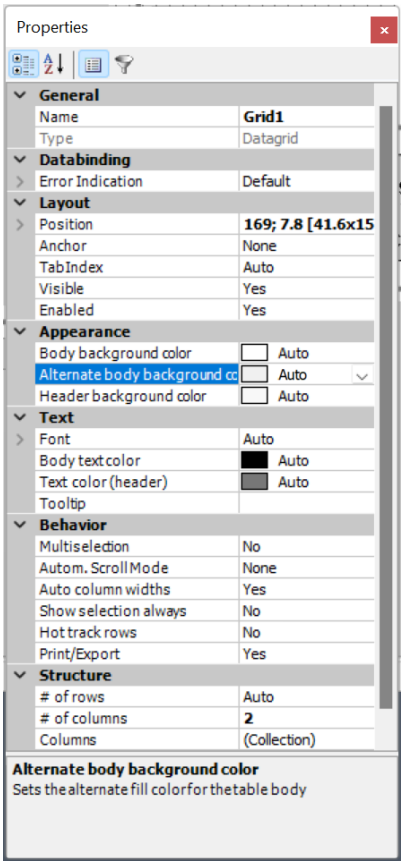
Displaying values

For each column in the grid, it is possible to set up a linkage with a variable (or a part of a variable, such as a selected event or segment). The display format (Numeric/Date/Time, numerical format, decimal places, etc.) can be freely selected at design time.

The linked variable is typically also set at design time, but can also be changed by the user at runtime by means of drag&drop – dragging the desired variable from a Variables list to the column header.

Values of 10^{35} are regarded as a substitute value for *"No value"*; the corresponding cell remains empty.

Notes on Design Mode



With the datagrid, there is a distinction between global properties (e.g., *number of columns/rows, selection type*, *font*; see figure at right) and column-based properties (e.g. *Databinding*, text in the column header, see below).

For the purpose of **better legibility**, the backgrounds can be shaded under the category *Appearance*. Every other row can additionally be distinguished by a different **color**.

of rows: Here you can select either a fixed amount, or "*auto*". Automatic means that the number of rows is calculated from the maximum length of the displayed data sets. The **maximum** possible number of rows is limited to 50000.

of columns: Here, enter the desired number of columns. The **maximum number of columns is 255**. The column count can also be changed by means of the column properties dialog.

Automatic Scroll Mode: This controls the behavior of the grid in regard to its vertical display position, when values of the linked variables change.

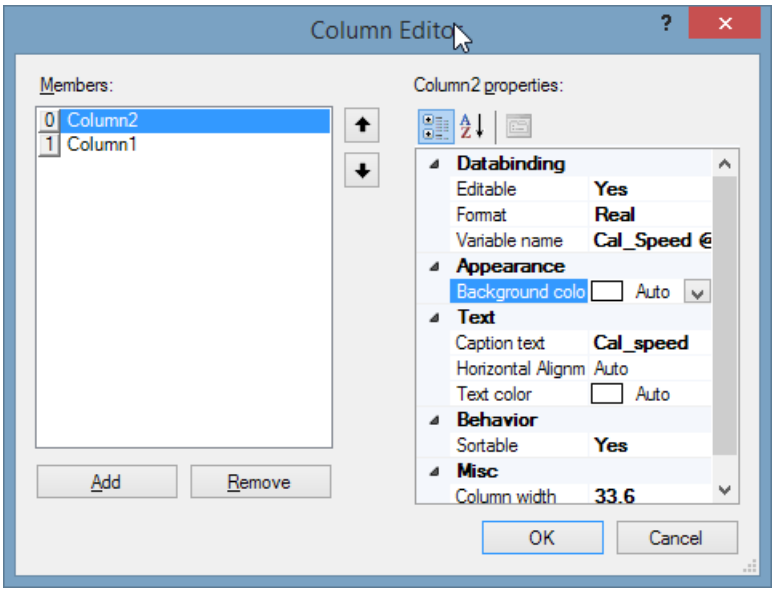
None: The system attempts to retain the display position (meaning the index of the top row displayed) after the update.

First row: After updating, the grid scrolls to the first row.

Last row: After the update, the grid scrolls to the last row. This is useful when data are appended.

Auto column widths: If this is on, the column widths are automatically modified so that the columns share the available space (meaning the width of the grid).

Changing column properties



Toolbox for tables and listboxes

The dialog for defining the column-specific properties is reached by clicking on the entry "*Columns*" in the properties window, or by double-clicking on the table body. These properties are not to be confused with the global table properties.

Whenever there is no text explicitly assigned to a column as the *Caption text*, and a variable linkage exists, the variable's name is automatically displayed.

It is also possible to make this behavior mandatory by using the placeholder <VAR.NAME>.

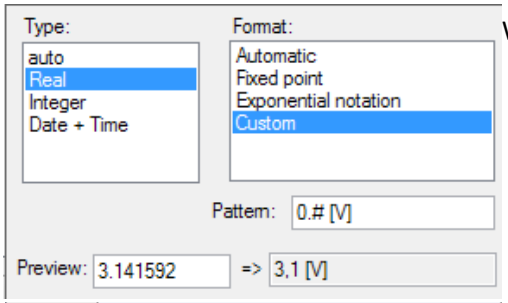
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In the list on the left side, select the column to be changed. You can also select multiple columns simultaneously. Changes to properties are then applied to all columns selected.

Databinding

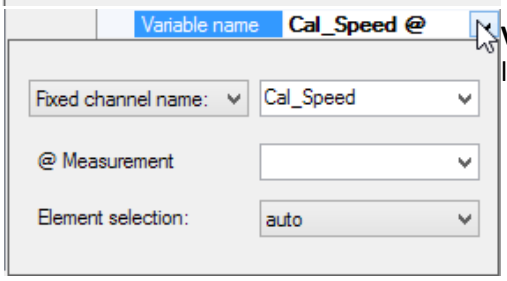
Editable: Sets whether the values can be changed by the datagrid during runtime.

Format: Along with the variable's basic type, you can specify the output format exactly here. For **Text variables,** please select the type "*auto*".



With *Real, Integer* and *Date + Time*, you set the desired formatting.

For "*Custom*", it is possible to freely specify a format; the syntax for the pattern is as described under Data Binding:Formatting the output 507.



Variable-name: Sets the variable to be linked. You can establish the linkage by moving the variables to the column using drag&drop.

Alternatively, select the variable to be linked in the input box. As described under Data binding 499, you can also use advanced designations with symbolic addressing of channels and measurements.

Additionally, if needed you can also address parts of the variable (Component/Event/Segment).

Caption: Sets the text for the column header. If the column is linked with a variable, it is also possible to use placeholders such as <VAR.NAME> or <VAR.PROP["propname"]>.

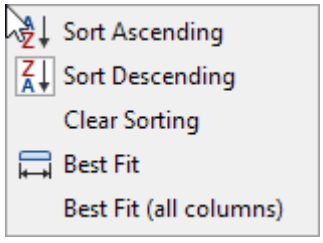
Sortable: When this is activated, the user can sort the grid according to the values of this column during runtime.

Changing values

For each column, it is possible to set whether the values displayed can be changed by the user. If so, the input mode is started by clicking in a cell. Pressing the key [Enter] or activating a different cell confirms the value entered, which is immediately adopted in the linked data set. Using [ESCAPE], the entry can be canceled.

Context menu

Right-clicking on a column header during runtime opens a context menu containing sorting commands (if activated) and automatic column fitting.



Notes on programming:

Events:

- *"Double-clicked":* Triggered when the user has double-clicked the mouse over an entry.
- *"Selected":* Triggered when the current selection has been changed by a user action (mouse click, arrow keys).
- *"Changed":* Triggered once the user has changed the value of a linked variable. This event is only displayed when the column is set to *Editable= Yes*.

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Important functions in the Panel-Kit:

- PnTableSetColumn: Fills table column with values
- PnTableSetCell: Sets text for column header
- PnTableGetSelectedRows(): Queries selected rows
- PnTableShowColumn(): Hides columns

Tip for practical use:

Initialize: If you wish to use the datagrid for entering numbers or texts which do not represent the values of an existing variable, use a temporary data set for databinding. This can be created with an appropriate type and length in the event sequence *"Init"*.

For entering texts, use a text box (created using the function *TxArrayCreate*); for entering numbers use a normal data set (created by means of the function "*Leng*", for example).

In the event sequence "*Changed*", you can react to the entry, import the changed value from the temporary variable and subject it to appropriate further processing.

Example: A 2-column data grid is to be used for the display and editing of the properties "Comment", "y-init" and the sampling interval of the variables "channel1".

The 1st column contains the corresponding designator and is linked with the variable "grid_rows". The 2nd column is linked with the variable "grid_data" and can be edited.

Event sequence 'Panel Initialization'

```
grid_rows = TxArrayCreate(3)
grid_rows[1] = "Comment"
grid_rows[2] = "Y-Unit"
grid_rows[3] = "Samplerate"

grid_data = TxArrayCreate(3)
grid_data[1] = Comm?(channel1)
grid_data[2] = Unit?(channel1, 1)
grid_data[3] = TForm(xdel?(channel1), "")
```

Event sequence 'Value changed' of datagrid

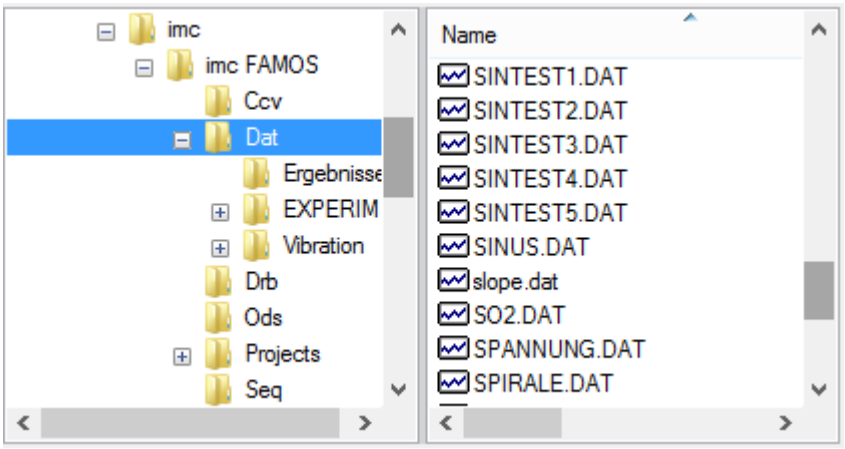
```
IF PA2 = 2
   SWITCH PA3
     CASE 1
       SetComm(Channel1, grid_data[1])
     CASE 2
       SetUnit( Channel1, grid_data[2], 1)
     CASE 3
       Channel1 = Xdel( Channel1, TtoSv( grid_data[3], "e"))
   END
END
```

Constraints

Data of the type TimeStampASCII can not be displayed.

13.3.4.7 File Explorer

This widget replicates the functionality of Windows Explorer.



File Explorer

Notes on programming:

Events:

- *"Double-clicked":* Double-click or Enter-key in the list of files or folders. Only generated if the associated property "*Double-click/Enter*" is set to "*User-defined*".
- *"Selected":* Changing of the selection by the user

Important functions in the Panel-kit:

- *PnSetFolder/PnGetFolder*: Sets/gets the current folder
- *PnSetFileSelection/PnGetFileSelection* : Sets/gets the current selection in the file list
- *PnSetProperty*: Options:
  - "*RootFolder*" for setting the root directory
  - "*FileFilter*" to set a filter for the file extension
  - "*SortOrder*"ascending or descending sorting
  - "*SortColumn*" Index of the column to be sorted
- *PnShow/PnEnable*: Controls visibility/operability

Behavior in the response to double-click and Enter key

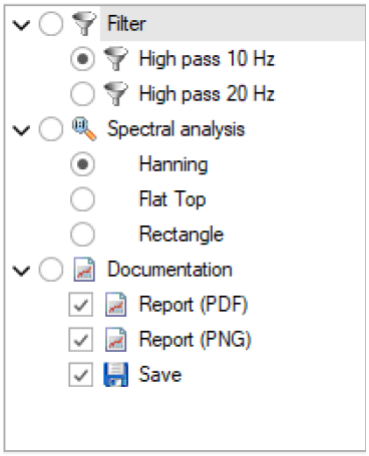
The behavior is governed by the properties "*File Double-click/Enter*" or respectively "*Folder double-click/Enter*".

- "*No action*": No further action is initiated. This is the default behavior for files.
- "*Standard*": Replicates the behavior of the Windows Explorer.
  - **Folders**: In the folder tree diagram, the respective node is expanded/collapsed. In file list the respective folder is opened. This is the default behavior for folders.
  - **Files**: The default action set in Windows for the respective file type is performed. Files with the extension "txt", for example, are typically opened with the default text editor.
- "*User-defined (event)*": The Panel-event "*Element double-clicked*" is triggered. The associated event sequence is called.

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13.3.4.8 Tree View

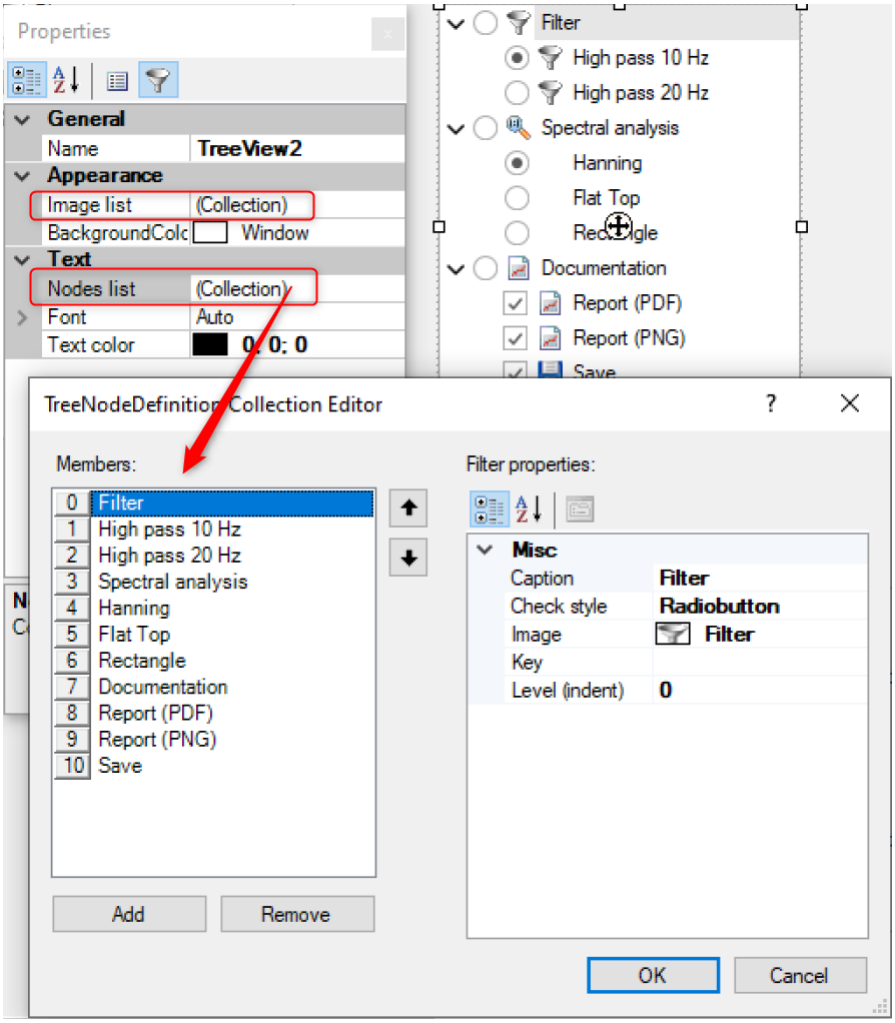
This widget makes it possible to call functions and sequences by means of a **tree diagram structure**. You can create **switches** (check-boxes) and **radio button groups** which allow either **single**- or **multiple-selection**. It is also possible to alter the widget contents during runtime by means of sequence functions.



Tree View

Notes on programming:

In the Widget-Editor, such fundamental properties as the background color, font and font color are defined. For the images attached to the nodes, a collection of choices is first created and placed below "**Image list**". Subsequently, the nodes can be created, defined, moved and deleted.



Definitions-Editor

Image list

Any entry in the image list is distinguished by the image itself and also by a user-selected unique key.

When clicking on the **Image**-property, a dialog for selecting the image appears, in which either a default image from its integrated image collection or an external image file can be selected. The image's displayed size is adjusted automatically and is determined by the node's row height (font size). In general, it is recommended to select a small image, e.g. 16x16 or 32x32 pixels.

When defining the node, the image to be used is selected with the **key**.

The following properties are defined for the nodes:

"**Caption**": Text displayed for the node

"**Image**": Icon for the node, which is displayed to the left of the text. The images to used must previously have been defined in the widget-property *Image list*.

"Level (indent)": The node's indentation in the tree. Nodes of the root level are on Level 0.

"**Key"**: The text specified here can be used as a key by which the associated node can later easily be applied in functions for controlling the tree view. For this purpose, the key needs to be unique. Keys are not case-sensitive. Alternatively, the key text can be used to save additional information with the node. For instance, when filling the tree with filenames, it would be possible to display only the "short" filename as the caption, while recording the complete file path in the key.

"Check-style": Specifies the behavior of the child-node.

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"***Default***": The global preset for the widget is applied.

"***None***": No special elements for highlighting

"***Checkbox***": Switch for activating the direct child node. Multi-selection is possible here.

"***Radiobutton***": All direct child nodes comprise a radio button group allowing an exclusive selection, i.e. a maximum of 1 child node can be selected.

Node-checking

Optionally, the tree view can show additional elements for the purpose of highlighting of nodes. The available choices are checkboxes or a radio group. The specifications made apply respectively to all direct children of a node. With radio boxes, the selection is exclusive, i.e. only one node belonging to the respective branch can be highlighted.

"Default check style": Default setting for all nodes. "*Default*" and "*None*" signify no highlighting capability.

"Root node check style": Separate specification for the root level node. Here, "*Default*" means that the global style is applied.

"Check mode": Specifies whether subordinate nodes are automatically activated/deactivated when the user activates/deactivates the respective checkbox of the next higher-level node, and vice-versa.

"***Default***": Select/un-selecting of a node takes no effect on the state of the parent node or subordinate nodes.

"***Recursive***": When the selection of a higher-level node is changed, the new state is applied to all child nodes. When a child node is select/unselected and then all child nodes have the same highlighting state, the next higher level node is also correspondingly select/unselected. When the highlighting states of the child nodes are different, the next higher level node goes into the undetermined highlighting state.

Events:

There are three event types among which FAMOS distinguishes:

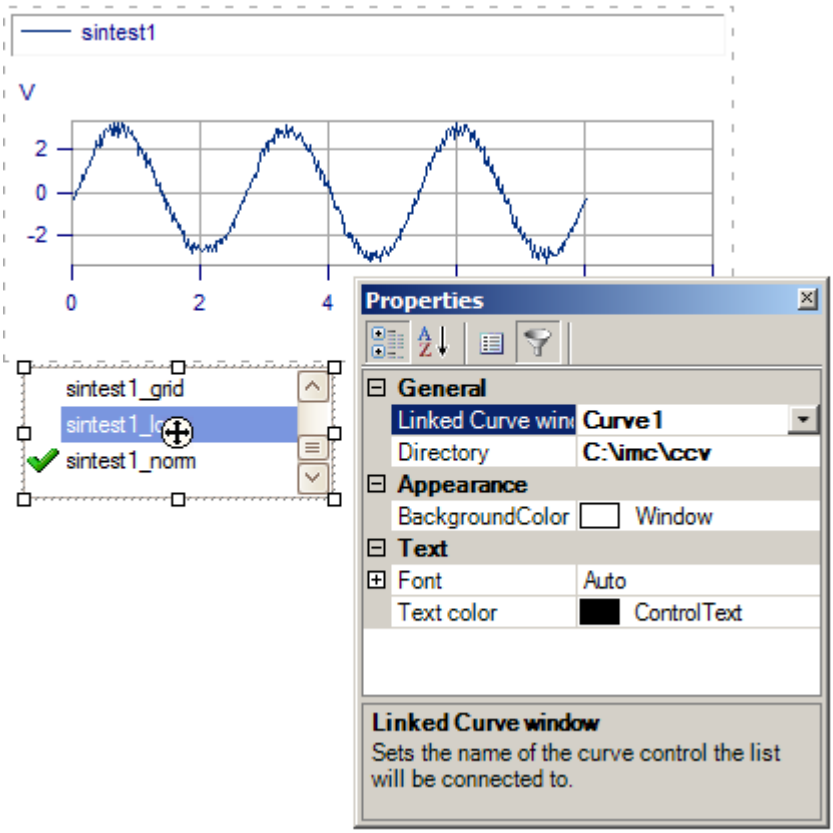
- ***Double-clicked***: triggered by double-clicking on a leaf without any children
- ***Selected***: triggered by navigating to an entry with the arrow key, or by clicking on its text
- ***Checked***: triggered when the state of either a checkbox or of a radio group is changed.

- *PnTreeInsertNode*: Inserts nodes
- *PnTreeDeleteNode*: Deletes nodes
- *PnTreeSetNodeProp*: Sets node properties (caption, key, image, checkbox-style of the children)
- *PnTreeGetNodeProp*: Gets node properties (caption, key, image)
- *PnTreeGetNodeCount*: Gets the count of nodes (throughout the tree, or count of an specified node's children)
- *PnTreeSetNodeState*: Sets node-status (selected, checked, expanded, visible)
- *PnTreeGetNodeState*: Gets the node-status (selected, checked, expanded, Level, parent-nodes, root-nodes, position among the child nodes, absolute index, leaf or parent node)
- *PnTreeFindNodes*: Finds node (throughout the tree, or among the children of a specified node, according to name or key; optionally with wildcards; always case-insensitive)
- *PnTreeGetNodes*: Gets list of the selected /highlighted nodes, or list of the child nodes belonging to the specified node
- *PnShow*: Hides widget
- *PnEnable*: Disables widget
- *PnSetProperty*: Sets color of text and background color

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13.3.4.9 CCV File Selector

CCV file selection enables a curve window to be switched between various previously saved curve configurations. In the properties, the control must be kinked with a curve window. The folder specifies the location of the CCV files.

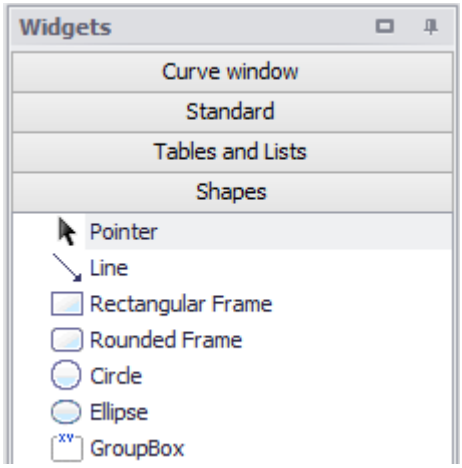


CCV File Selector (example)

Note

In order to make all necessary settings, you must display all widgets with both the curve window and with the CCV file selection. The widget can be remotely controlled by means of the function *PnGetSelectedItem*().

13.3.5 Shapes

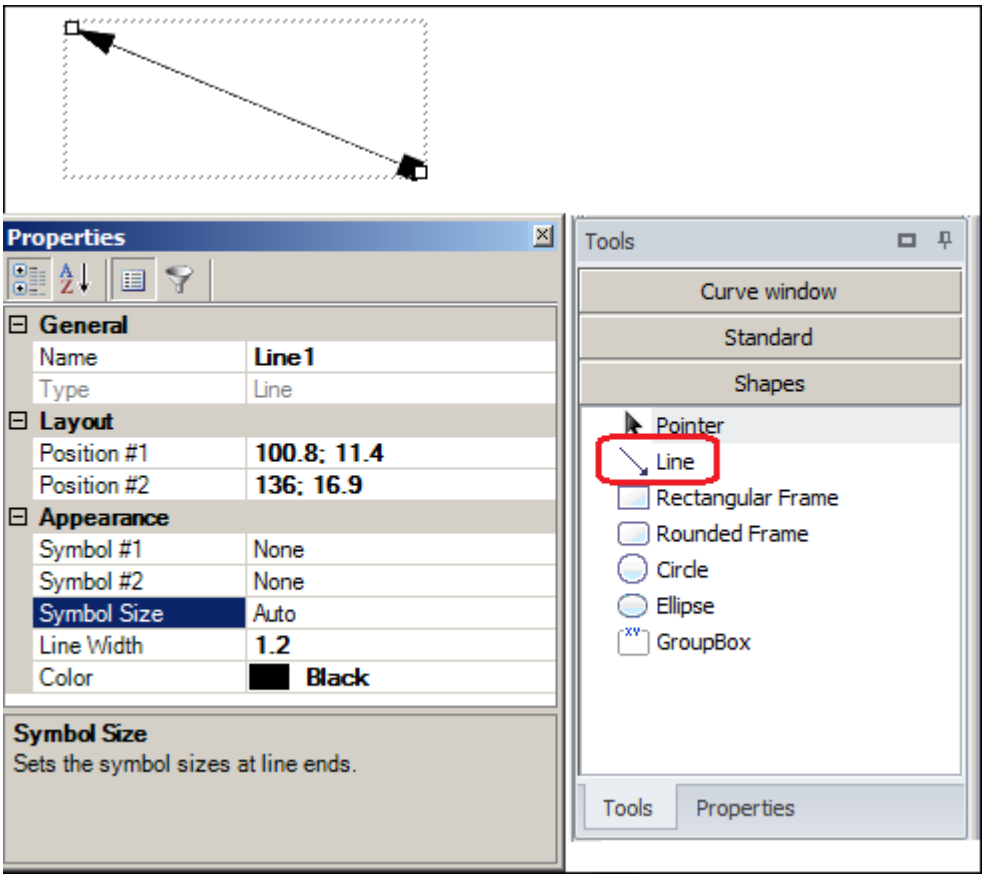


Shapes toolbox

In the Shapes toolbox, you can find various geometric shapes such as rectangles, rounded frames, circles and ellipses. The line thickness and color are determined in the Properties.

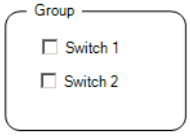
13.3.5.1 Line

The line can have any of a variety of symbols (arrows) at each end. The line thickness is entered as a numerical value in mm (e.g. "0.25" "0.5", "1" etc.).



Line (example)

13.3.5.2 Group box



Sample Group box with two switches

For a better overview, you can place the widgets as desired within a group. The grouped widgets are not anchored within the group. In order to move a group with widgets, drag a selection frame over the group, and then move the objects thus selected all together.

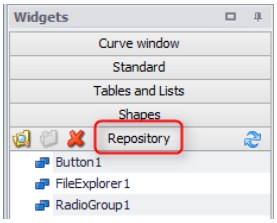
The color and the thickness of the group frame, like the filling, can be set with the Properties. The same applies to the font and font color.

13.3.6 Repository

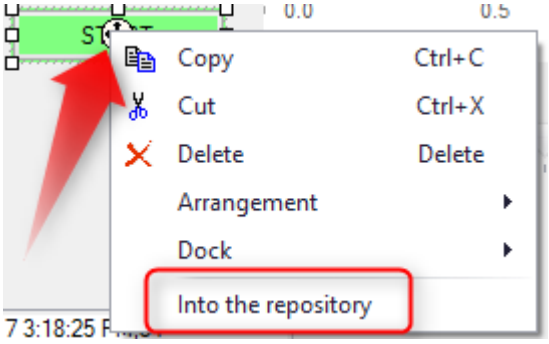
In the widget repository, it is possible to store configured widgets. These copied widgets remain there independent of the Panel and project and can be used in other panels. imc FAMOS provides some configured widgets with the installation.

Add widget

In the Design mode, the widgets can be dragged from the panel to the repository while holding down the CTRL-key. Alternatively, the widget context menu "*Into the repository*".



Group: "Repository"



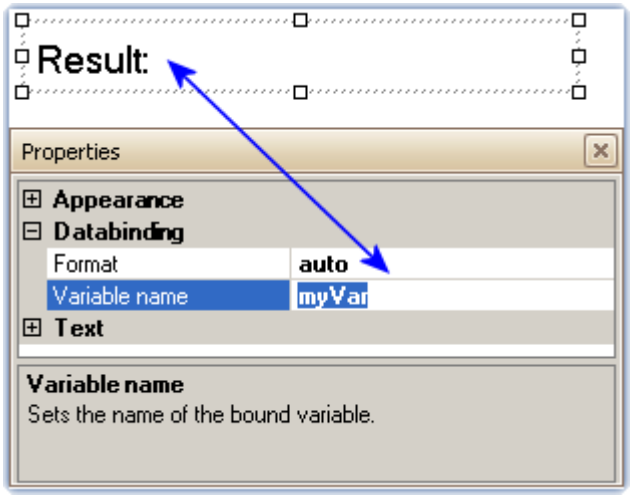
Widget context menu: "Into the repository"

13.4 Data Binding

Most widgets can be linked directly to a variable.

Examples:

- A *text variable* can be displayed along with a **label** which can be read, or edited with a **Editbox**.
- A variable of the type *Text array* can be displayed/edited in a **table, datagrid, label** or in a multi-line **editbox**.
- *Data sets* can not only be displayed in various types of curve windows, but also in a **datagrid** or in a **table**.
- It is possible to assign a variable to each cell of a **table**. The value of the variable will be updated during the execution of the Panel.



The text after the "Result" is linked with the variable "myVar"

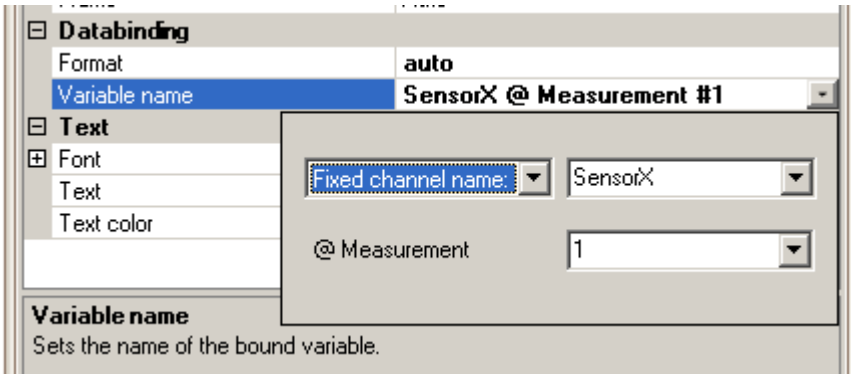
The variable is stated in the Properties window in the branch Data Binding, as the following example illustrates for the *label*.

Analogously, the enter a variable's name in the *Editbox*, whose value you wish to enter (edit) while running the panel.

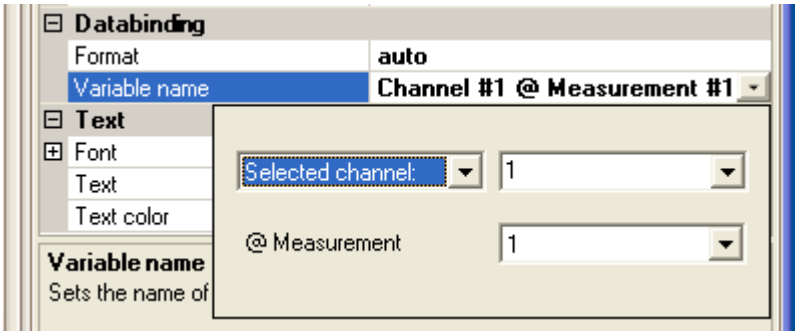
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Extended Variable-Names

Instead of a fixed variable name you can also refer to the current selection of the measurements and Channels list. For that purpose there is a dropdown selection list next to the input field, which you can use to compose the extended variable name.



Choosing a fixed channel namefrom the first selected measurement



Choosing the first selected channel from the measurement no. 1

Entering values in Run Mode

"*Editbox (single line)*" widgets with data bindings can be assigned values in Run Mode.

To do so, click on the widget and enter the required values using the keyboard. After clicking, an overlapping input field will open, where you can enter the required text.

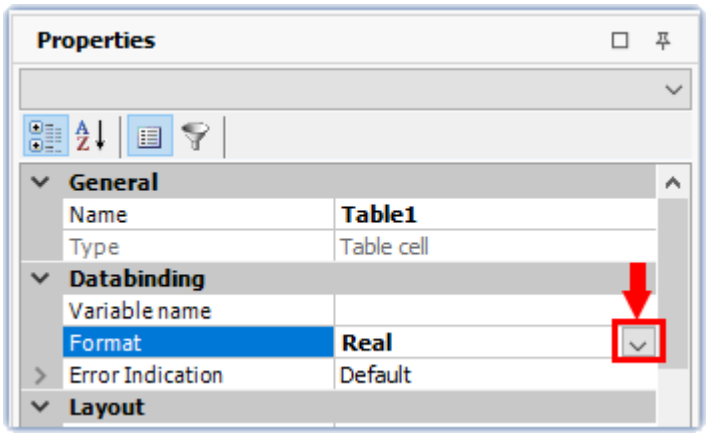
The value will be taken over to the bound variable after pressing the <ENTER> key. To cancel the input, press the <ESCAPE>-key. After that the widget will be displayed in the normal fashion.

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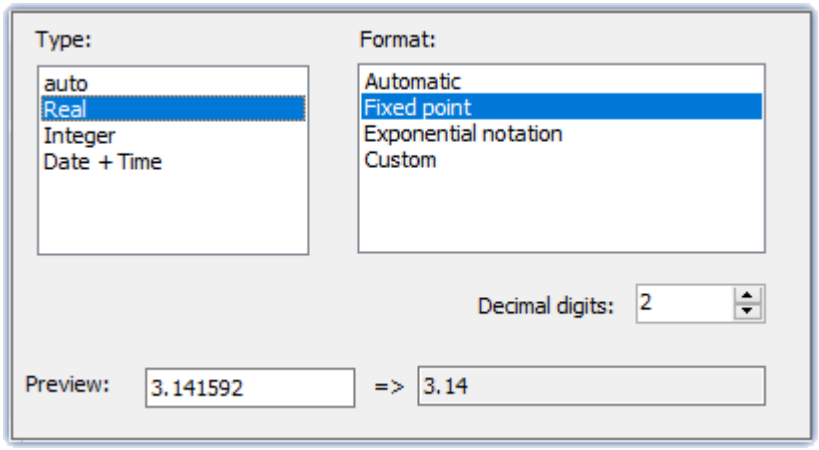
Table and Label Widget with Data Binding: Output format (e.g. decimal digits) can be specified as a design property

If the display format of table and label widgets with a data connection needed to be specified more precisely (e.g. number of decimal places to be displayed), this previously had to be done using a correspondingly configured placeholder [VAR.VALUE]. Now the format can be precisely defined via the widget properties.

Previously (before V2025), only the basic output format (e.g. real or integer) could be selected from a list via the "Data Binding / Format" property.



The desired format can be set in the following dialog, which appears after pressing the dropdown button:



Note

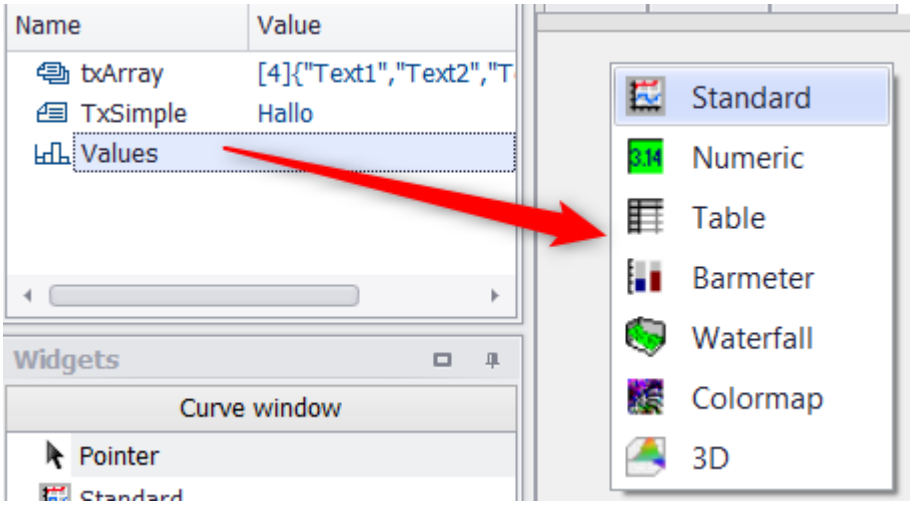
If a variable placeholder [VAR.VALUE] with its own format specification is also defined in the widget, the specification "wins" at the placeholder.

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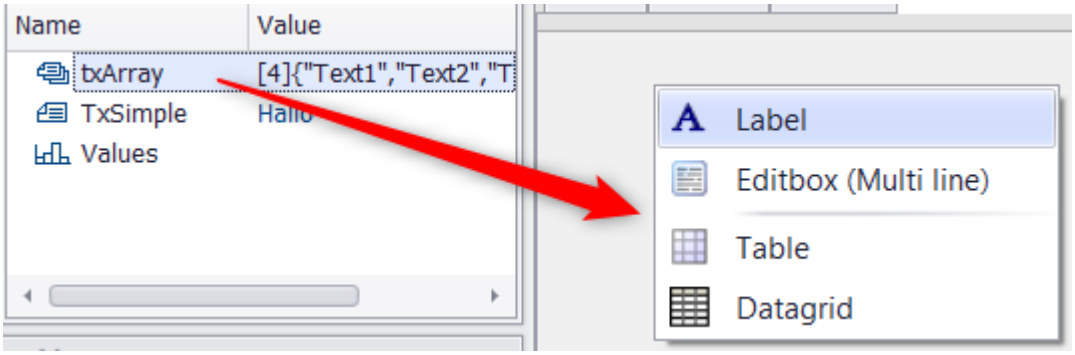
13.4.1 Drag&drop

Variables can be dragged to the Panel from the Variables list. The kinds of widgets respectively possible for the data type 267 are offered: 20 km mm

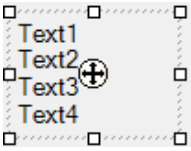
Example of single value or data sets



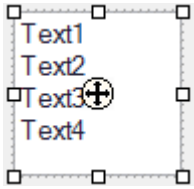
Example: Variable of the type Text or Text-Array



When you drag a variable of the type Text Array to a Panel, you have the following possibilities:



Label: Each text element is displayed in a separate line. The height is determined automatically from the count of lines, but is limited to 10 lines.



Editbox (Multi-line): Each text element is displayed as a new line.

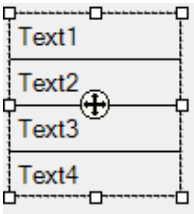
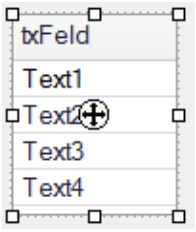


Table: A single-column table is created. The row count matches the array size, but with a maximum of 20. The table height is determined automatically according to the row count.

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Datagrid: A single-column data grid is created.

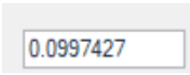
Performing drag&drop to move data sets or text arrays to widgets for individual display



Text array->Label: Following drag&drop, if you enter an index in the label's properties under *Data Binding - Variable-Name*, the label only shows the corresponding text array entry. Example: *"TextArray[3]"*



Text array->edit box (single-line): Following drag&drop, all text arrays are initially displayed without any line breaks. In accordance with the index after the *Variable-Name*, only the corresponding entry is displayed here as well. Example: *"TextArray [2]"*



Data set->Label/edit box (single-line): Following drag&drop, if you enter an index in the label's properties under *Data Binding - Variable-Name*, the widget only displays the variable value specified. Example: *"Data [3]"*

Reference Indexed variables

Detailed information on the indexing of variables is presented here 283.

Note Constraints

Variables having the following data formats can not be linked with a widget by means of the Data-Binding:

- XY-data sets
- complex data sets MP, RI, DP (Spectrum.M, Spectrum.P, etc.)
- segmented data sets (e.g. Rainflow matrices, spectral plots etc.)

13.4.2 Placeholders

One special form of data linking is the **Placeholder**. This refers to a predefined name whose value is outputted in one of the following controls:

- Labels
- Tables

The pre-defined names are structured as follows:

<ROOTOBJECT.PROPERTY>

Placeholder identifiers are bracketed in the characters <..>

`ROOTOBJECT` stands for one of the values in the table below:

`PAGE`	page-specific info, e.g. page number
`PANEL`	panel-specific info, e.g. page number, filename...
`VAR`	properties of the linked variables, e.g. value, units...
`VARS["name"]`	like VAR, however with explicit specification of the variable name
`SYSTEM`	System info, e.g. current time
`PROJECT`	Project info, e.g. project name

Data linking (VAR) can not be linked to a table.

Placeholders which are used especially frequently are assigned an extra (short) alias (PAGE, VALUE).

These names are case-insensitive.

Some placeholders support optional formatting rules; the syntax is then

<ROOTOBJECT.PROPERTY("FormatPattern")>

See: Formatting the output 507

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The context menu belonging to widgets helps you to enter pre-defined placeholders:

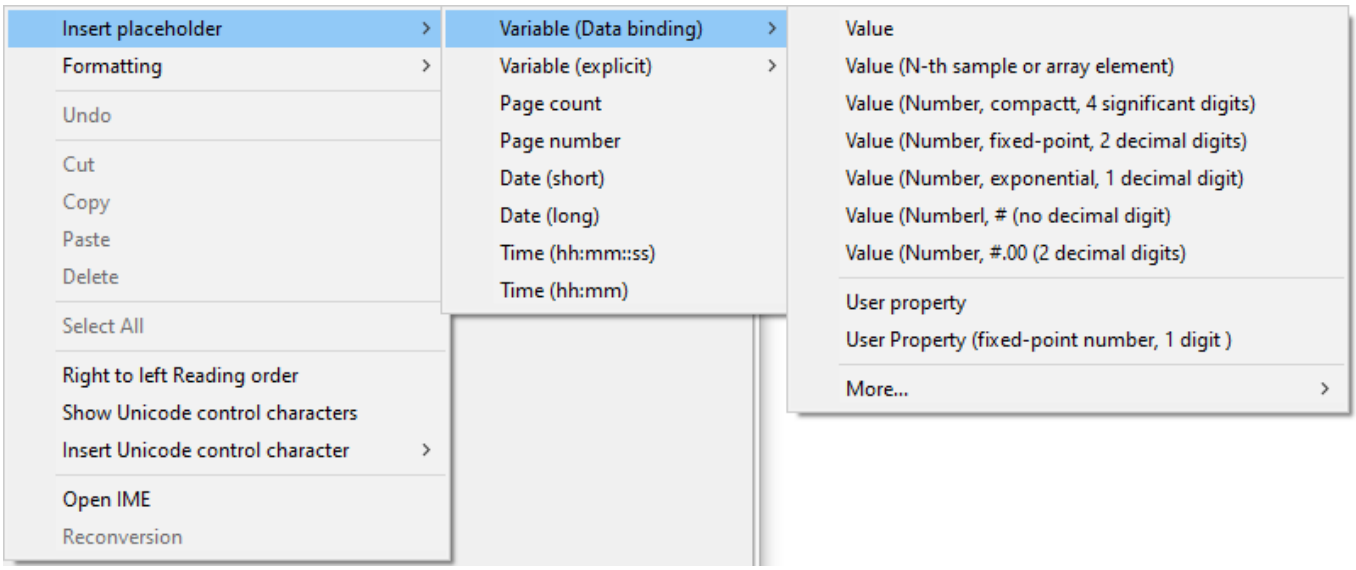


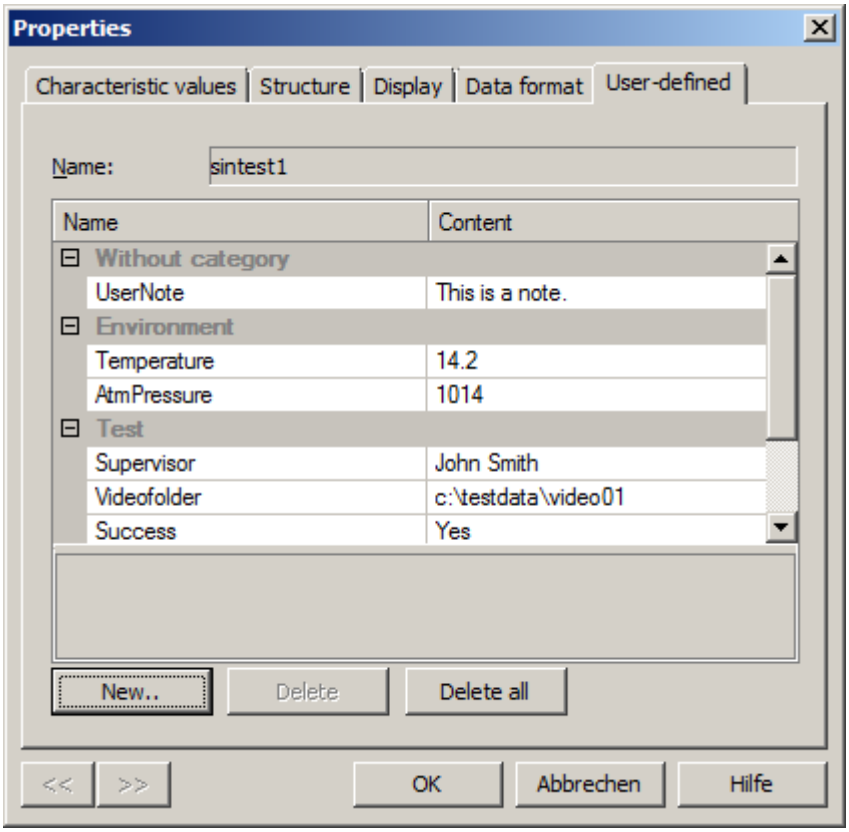
Table of placeholder names

Definition	**Full name**
Page number	PAGE.**NUMBER** (Alias: PAGE)
Page count	PANEL.**PAGECOUNT**
Value of the linked variable. Last value for variables with multiple values.	VAR.**VALUE** (Alias: VALUE) VARS["name"].VALUE
Specific value of a variable with several samples per index. Only for data with one component, without events or segments.	VAR.VALUE[**1**] VARS["channel1"].VALUE[**50**]
Y-unit of the linked variable	VAR.**YUNIT** or VAR.**UNIT** VARS["name"].YUNIT
Y2-unit of the linked variable	VAR.**YUNIT2** VARS["name"].YUNIT2
X-unit of the linked variable	VAR.**XUNIT** VARS["name"].XUNIT
Z-unit of the linked variable	VAR.**ZUNIT** VARS["name"].ZUNIT
Content of a user-defined property	VAR.**PROPS**["propname] VARS["name"].PROPS["propname"]
Current date	SYSTEM.**DATE**
Current time	SYSTEM.**TIME**
Project path	PROJECT.**PATH**
Project name	PROJECT.**NAME**

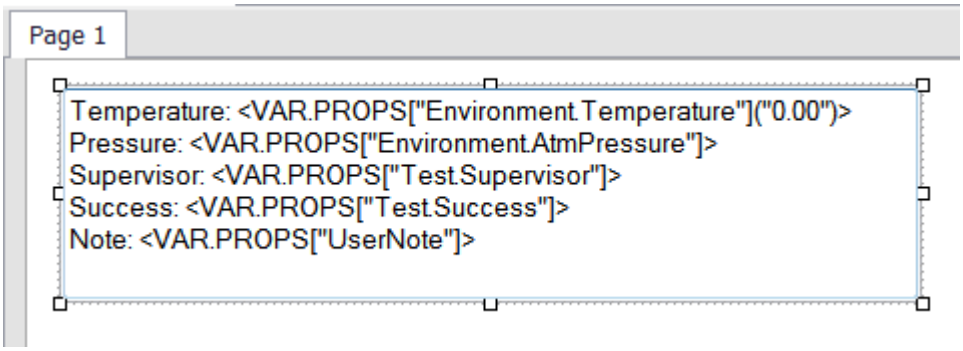
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Example of placeholders for user-defined properties

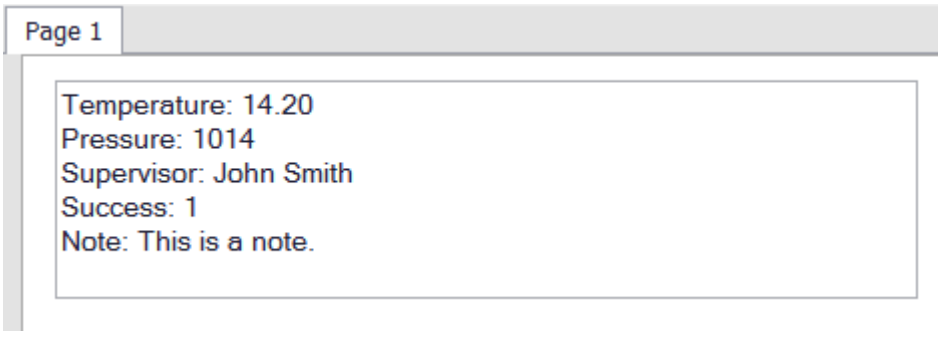
Variable <sintest1> with user-defined properties:



Defining a multi-line input box linked with the variable "sintest1":



Output:



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13.5 Formatting the output

It is possible to set the formatting for the **display of texts and values**.

Variables which are displayed by a widget by means of data binding can be configured with formatting instructions in the placeholder 507. In this way it is possible to specify, for instance, the number of **decimal places** or the formatting for **date and time**.

The format pattern depends on the type of content to be outputted:

- Formatting numerical values 507
- Formatting date/time 510

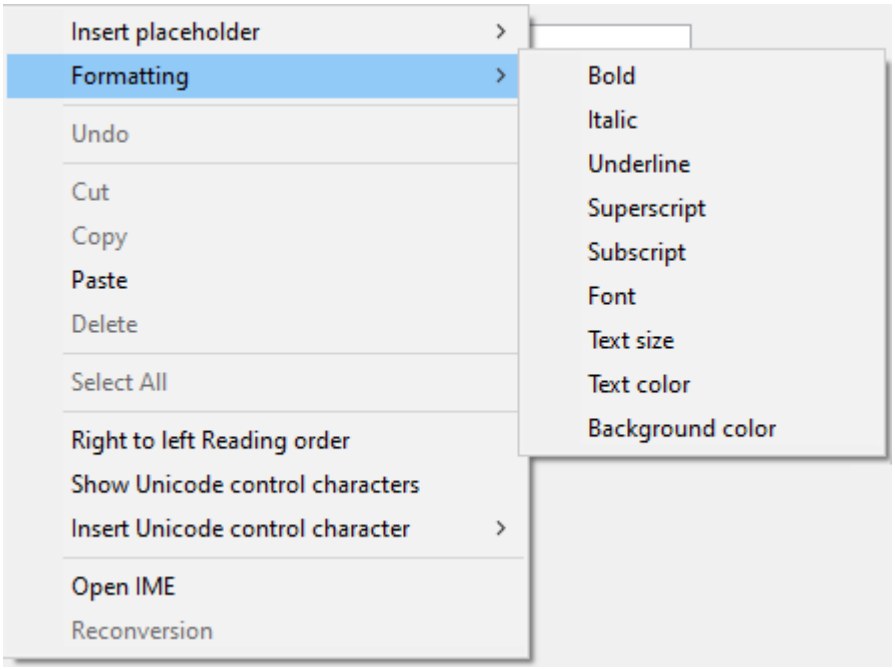
Some placeholders support additional formatting rules governing the formatting of the output.

Syntax:

```
<ROOTOBJECT.PROPERTY("FormatMuster")>
```

Additionally, it is possible to format labels and texts in table cells to have **HTML tags, separately for each portion** 513.

These can also be entered by means of the context menu.



The orientation can also be changed by means of the context menu: To do this, select "*Right-to-Left-Reading order*".

13.5.1 Formatting placeholders

The following properties of variables can be used as placeholders.

VAR.VALUE 508 VARS["name"].VALUE	Value, content of the variables; thus a string or number
VAR.COMMENT 509 VARS["name"].COMMENT	Comment
VAR.ORIGIN 510 VARS["name"].ORIGIN	Origin (filename with path)

VAR.PROPS["userpropname"] 510 VARS["name"].PROPS["userpropname"]	User-defined property

Formatting numerical values

Supported by the following placeholders if the variable's or property's content is a numerical value:

Default pattern; the designation can be supplemented with a number indicating the precision level.

Designation	Name	Description	Examples
"E" or "e"	Exponential	Exponential notation; the optional precision parameter indicates the amount of decimal digits (default: 6).	1052.0329112756 "E" -> 1.052033E+003 "e2"-> 1.05e+003
"F" or "f"	Fixed point	Fixed-point notation; the optional precision parameter indicates the amount of decimal digits.	1234.567 "F" -> 1234.57 "F4" -> 1234.5600
"G" or "g"	General	The most compact fixed-point or exponential notation. The optional precision parameter indicates the amount of significant digits.	123.456 "G4" -> 123.5 -1.234567890e-25 "G" -> -1.23456789E-25
"D" or "d"	Decimal	Only for <VAR.VALUE> and data linkage = "Integer" Integer; the optional precision parameter indicates the minimum amount of decimal digits.	1234 "D" -> 1234 -1234 "D6" -> -001234
"X" or "x"	Hexadecimal	Only for <VAR.VALUE> and data linkage = "Integer" Hexadecimal string; the optional precision parameter indicates the amount of digits in the result string.	255 "X" -> FF "x4" -> 00ff

Using the context menu of widgets, predefined placeholders can also be formatted, see here 504.

Examples of <VAR.VALUE>:

Value of the variable linked: 1234.567

Placeholder	Output
<VAR.VALUE>	1234.57
<VAR.VALUE("e2")>	1.23e+003
<VAR.VALUE("f0")>	1235
<VAR.VALUE("f2")>	1234.57
<VAR.VALUE("g7")>	1234.567

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User-defined patterns which can be combined as desired:

Designation	Name	Description	Examples
"0"	0-placeholder	Replaces each "0" with any actual number appropriate to the decimal place; otherwise, the number 0 appears in the resulting string.	1234.5678 "00000" -> 01235 0.45678 "0.00" -> 0.46
"#"	Digit placeholder	Replaces the hash character (#): Decimal places corresponding to the number of hashs or any number of digits before the decimal point.	1234.5678 "#" -> 1235 0.45678 "#.##" -> .46
"."	Decimal separator	Determines the position of the decimal separator in the resulting string.	0.45678 "0.00" -> 0.46
"E0" "E+0" "E-0" "e0" "e+0" "e-0"	Exponential notation	Formats the result in exponential notation, if at least one 0 (zero) follows. The capitalization status of the spelling ("E" or "e") determines how the symbol for the exponent appears in the result string. The amount of zeros following the character "E" or "e" determines the minimum amount of digits in the exponent. A plus sign (+) indicates that the exponent is always preceded by a sign. A Minus sign (-) indicates that only negative exponents are preceded by a sign.	987654 "#0.0e0" -> 98.8e4 1503.92311 "0.0##e+00" -> 1.504e+03 1.8901385E-16 "0.0e+00" -> 1.9e-16

Examples of user-defined patterns:

Value of the linked variable: 1234.567

Placeholder	Output
<VAR.VALUE("#")>	1235
<VAR.VALUE("00000.0")>	01234.6
<VAR.VALUE("#####.#")>	1234.6
<VAR.VALUE("#.#E+000")>	1.2E+003

Example of a comment:

Placeholder	Output
<VAR.COMMENT>	"This text comes from the comment"

Example of an origin:

Placeholder	Output
<VAR.ORIGIN>	"C:\imc\dat\sintest1.dat"

Examples of user-defined properties:

A property called "weather" was created, with the content "rainy".

Placeholder	Output
VAR.PROPS["weather"]	"rainy"

13.5.2 Formatting of date and time

Formatting of date/time

Some placeholders for Date/Time support additional formatting rules governing the output formatting.

Syntax:

```
<ROOTOBJECT.PROPERTY("FormatMuster")>
```

Supported by the following placeholders:

```
SYSTEM.DATE
SYSTEM.TIME
```

Default for date/time

Pattern	Meaning	Example
d	short form date (default for date)	12.10.2011
D	long form date	Wednesday, October 12th, 2011
f	long form date + time	Wednesday, October 12th, 2011, 13:32
F	long form date + long form time	Wednesday, October 12th, 2011, 13:32:38
g	short form date + time	12.10.2011 12:32
G	short form date + long form time	12.10.2011 12:32:38
t	short form time (default for time)	12:32
T	long form time	12:32:38

Examples of default pattern:

Placeholder	Output
<SYSTEM.DATE("D")>	Wednesday, October 12th, 2011
<SYSTEM.DATE("F")>	Wednesday, October 12th, 2011, 13:32:38
<SYSTEM.TIME>	12:32
<SYSTEM.DATE>	12.10.2011
<SYSTEM.TIME("T")>	12:32:38

User-defined patterns for Date/Time, which can be combined as desired:

Pattern	Meaning
d, %d	The day of the month. Single-digit statements have no initial 0. Use "%d", if the format pattern is not combined with other format patterns.
dd	The day of the month. Single-digit statements have an initial 0.
ddd	The abbreviated name of the weekday.
dddd	The complete name of the weekday.
f, %f	The fraction of seconds with precision to one decimal place. The remaining digits are truncated. Use "%f", if the format pattern is not combined with other format patterns.
ff	The fraction of seconds with precision to two decimal places. The remaining digits are truncated.
fff	The fraction of seconds with precision to three decimal places. The remaining digits are truncated.
h, %h	The hours in 12-hour notation. Single-digit statements have no initial 0. Use "%h", if the format pattern is not combined with other format patterns.
hh	The hours in 12-hour notation. Single-digit statements have an initial 0.
H, %H	The hours in 24-hour notation. Single-digit statements have no initial 0. Use "%H", if the format pattern is not combined with other format patterns.
HH	The hours in 24-hour notation. Single-digit statements have an initial 0.
m, %m	The minute. Single-digit statements have no initial 0. Use "%m", if the format pattern is not combined with other format patterns.
mm	The minute. Single-digit statements have an initial 0.
M, %M	The month expressed numerically. Single-digit statements have no initial 0. Use "%M" an, if the format pattern is not combined with other format patterns.
MM	The month expressed numerically. Single-digit statements have an initial 0.
MMM	The abbreviated name of the month
MMMM	The complete name of the month
s, %s	The seconds. Single-digit statements have no initial 0. Use "%s", if the format pattern is not combined with other format patterns.
ss	The seconds. Single-digit statements have no initial 0.

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Pattern	Meaning
tt	Indication of AM/PM
yy	The year number without the century. If the statement of the year is less than ten, it appears with an initial zero.
yyyy	The year with four or five digits (depending on the calendar used), including the century.
:	Default separator for statements of time.
/	Default separator for statements of time.

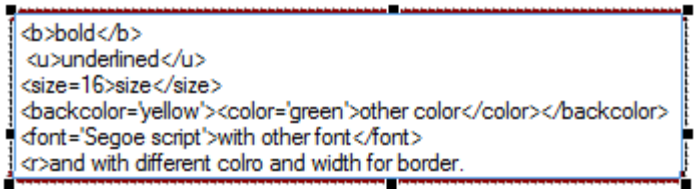
Examples of user-defined patterns:

Placeholder	Output
`<SYSTEM.DATE("MMMM, dd")>`	October, 10
`<SYSTEM.DATE("%M")>`	10
`<SYSTEM.TIME("HH:mm:ss,fff")>`	12:32:38,211

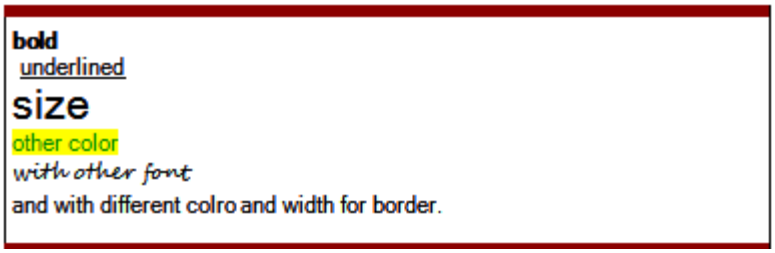
13.5.3 Formatting text using HTML tags

Texts displayed by either of the widgets *Label* 462 or *Table* 482 can be formatted using HTML tags.

The following are supported:

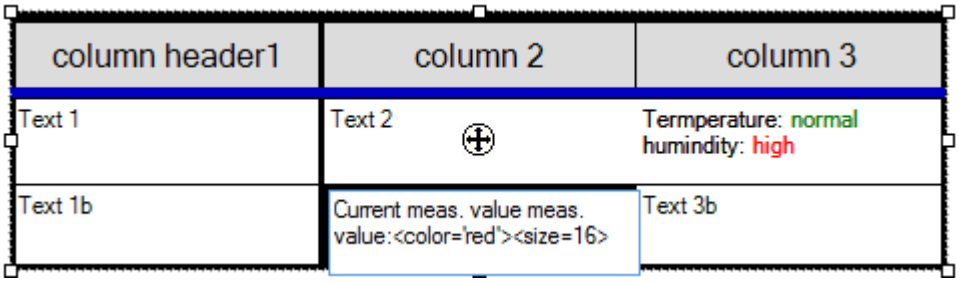


Label with text in HTML formatting



Display implementing the HTML formatting

Example of a table



column header1	column 2	column 3
Text 1	Text 2	Termperature: normal humindity: high
Text 1b	Current meas. value meas. value: 23.15	Text 3b

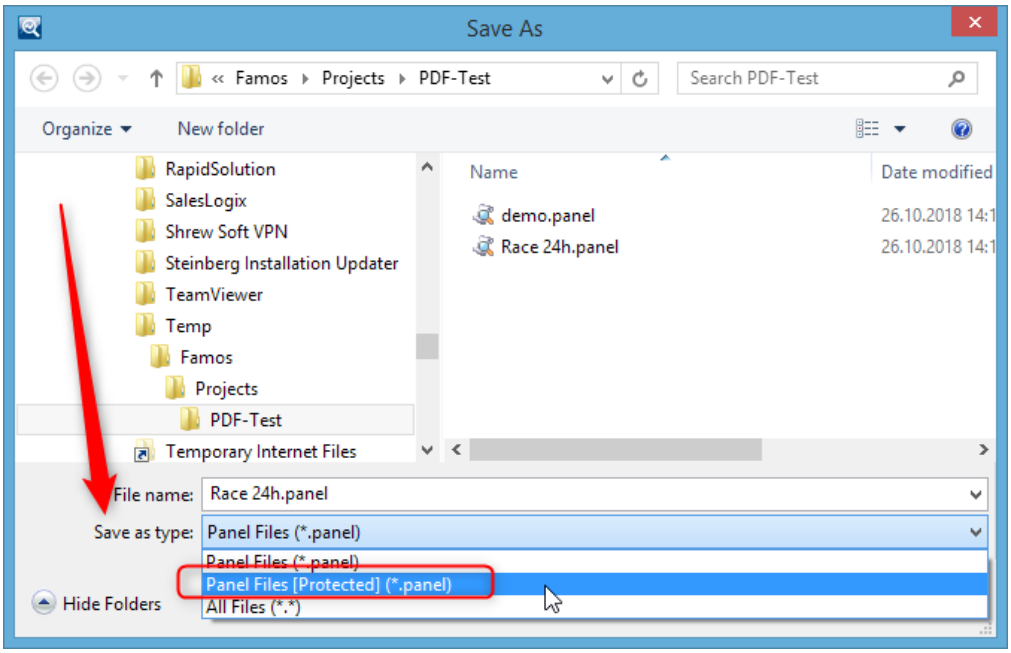
The following are not supported: <image> , <p>, <a> and <href>

In the Properties, it is also possible to deactivate implementation of tags in the display under *Text:HTML Formatting*.

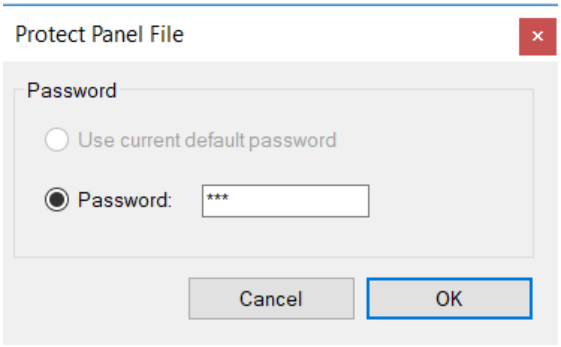
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13.6 Panels with password protection

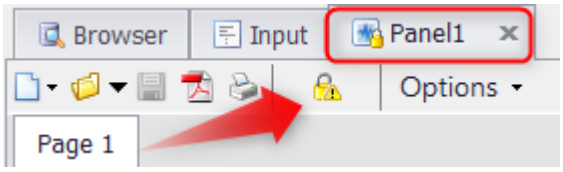
You can protect the Panel's code with a password. To do this, when saving the Panel select the file type "*Panel Files [Protected]*"



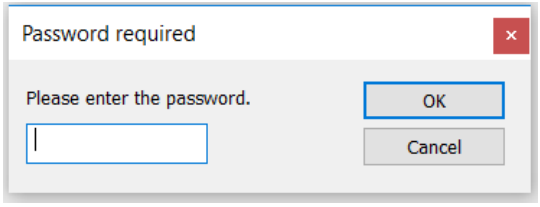
Once this selection has been made, the dialog for entering the password appears:



When a protected Panel is loaded, the system checks whether the current default password matches ("*Extras"/Options" - "Editor* 103"). If so, the file is immediately unlocked, meaning that the Design-mode is available for it. Otherwise, the buttons "Design-Mode" and other buttons in the Panel's toolbar for editing operations are hidden. Instead, there is a button (with a padlock icon) for unlocking the Panel. (A corresponding command is also provided in the File menu.)



After having clicked on this button, the user is prompted to enter the password.



Note

Protected Panels can only be loaded as of imc FAMOS versions 7.4 and higher!

13.7 Tutorial: Panel pages

In this exercise, you will learn how to:

- configure curve windows,
- perform calculations and display single values,
- create and display data sets,
- save created data in the measurement data path,
- compose reports.

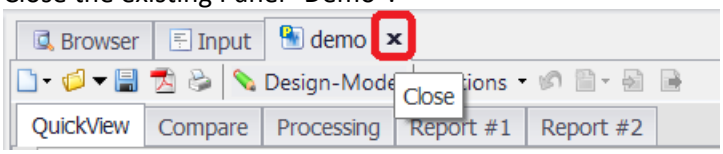
Use the project "**DataBrowser-Train stops**", located in the Project folder, as a model.

13.7.1 Exercise: Page Measurement

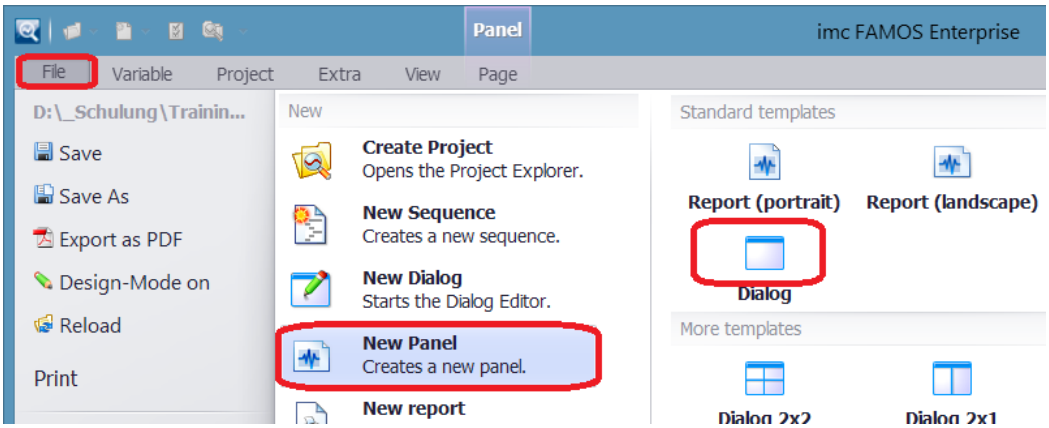
13.7.1.1 Creating a Panel

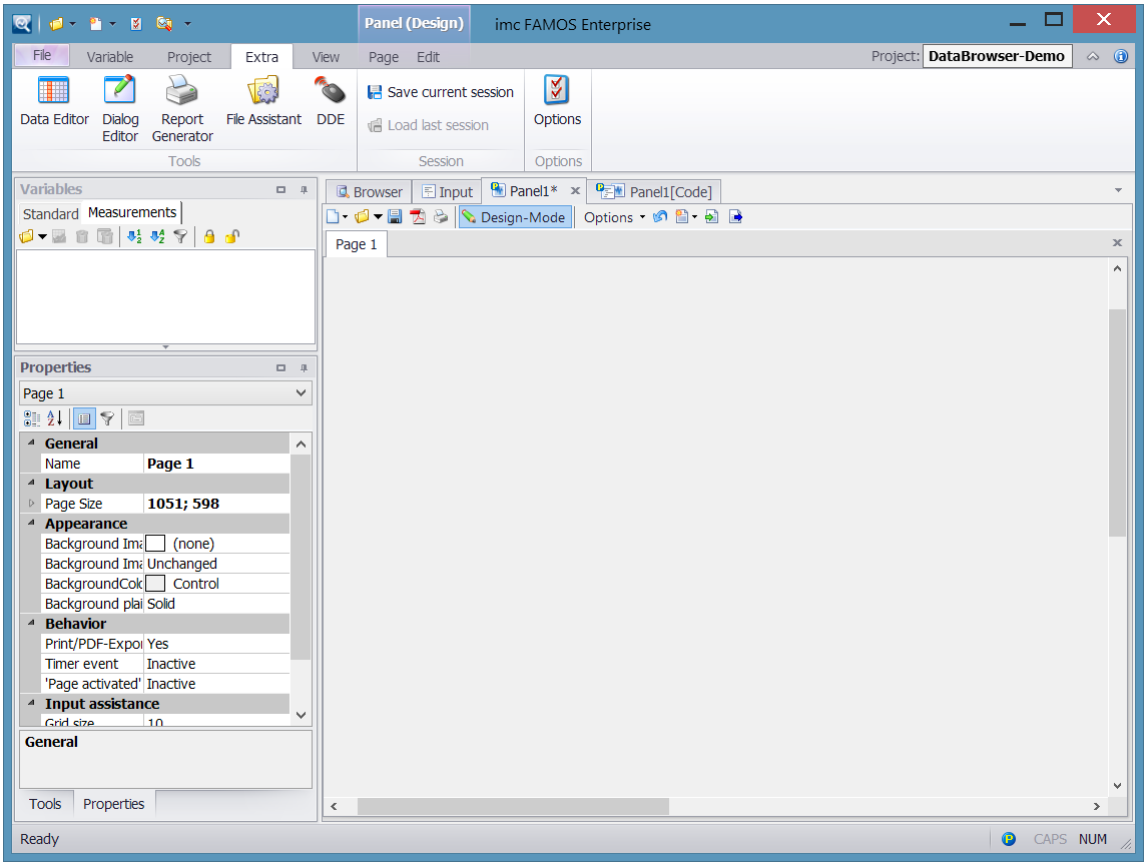
- Load the project **DataBrowser-Train stops**.

- Close the existing Panel "Demo".



- Create a new panel as Standard Dialog.

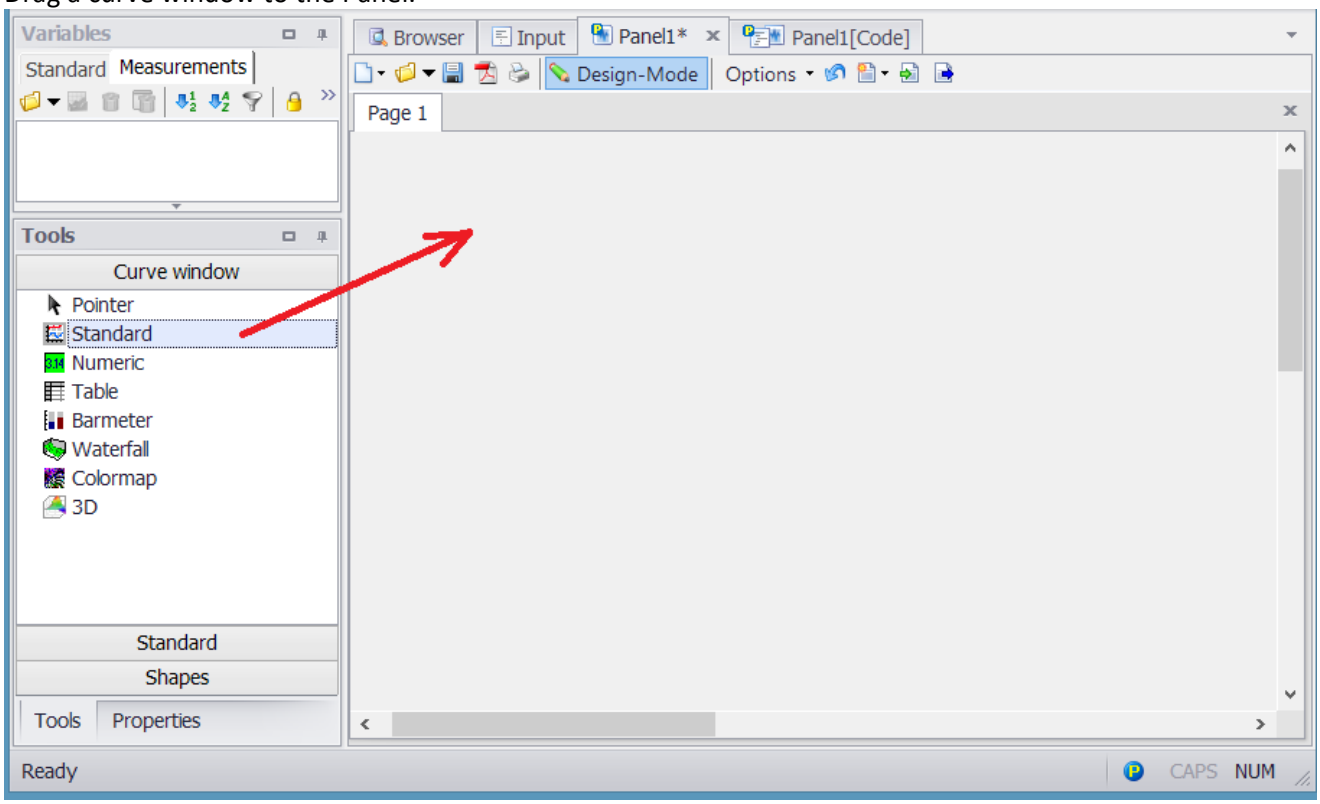




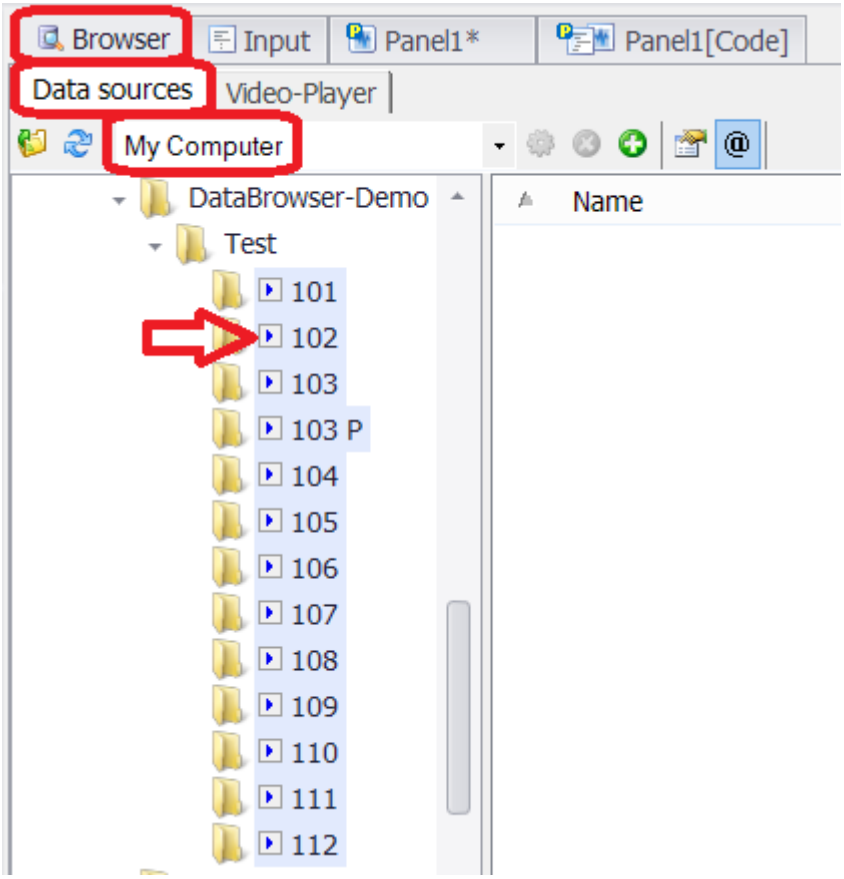
- Rename "*Page1*" to "*Measurement*" by double-clicking on the page name "Page 1".

13.7.1.2 Creating curve windows

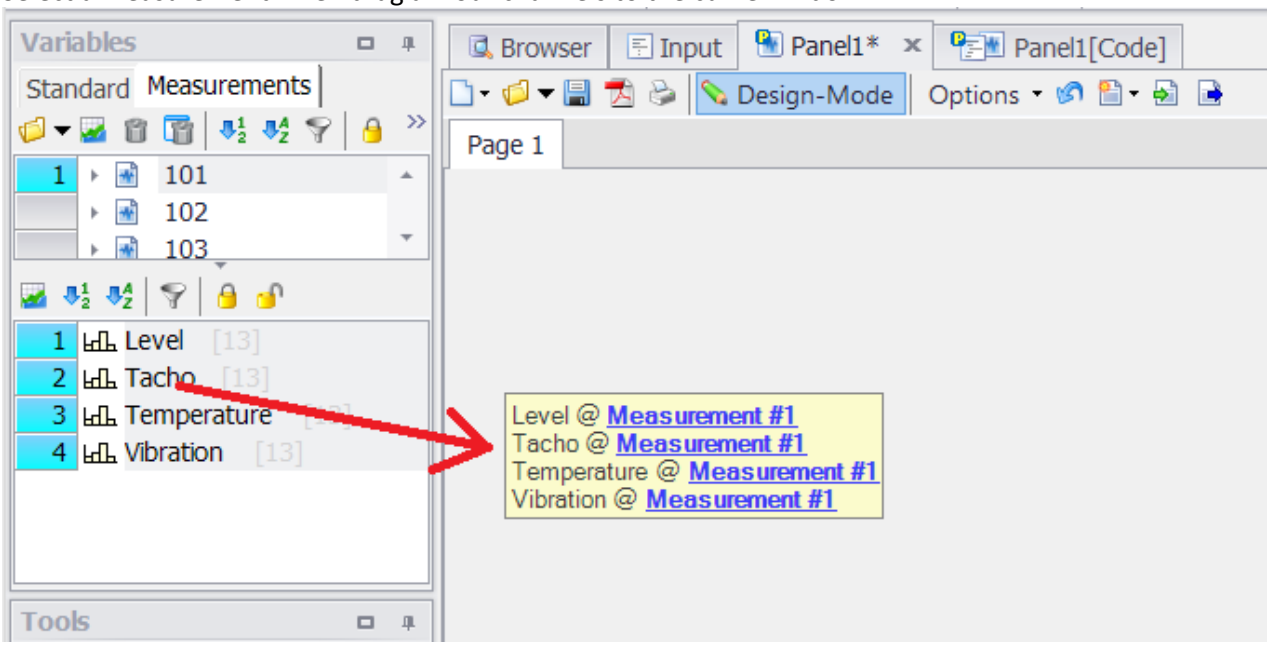
1. Drag a curve window to the Panel.



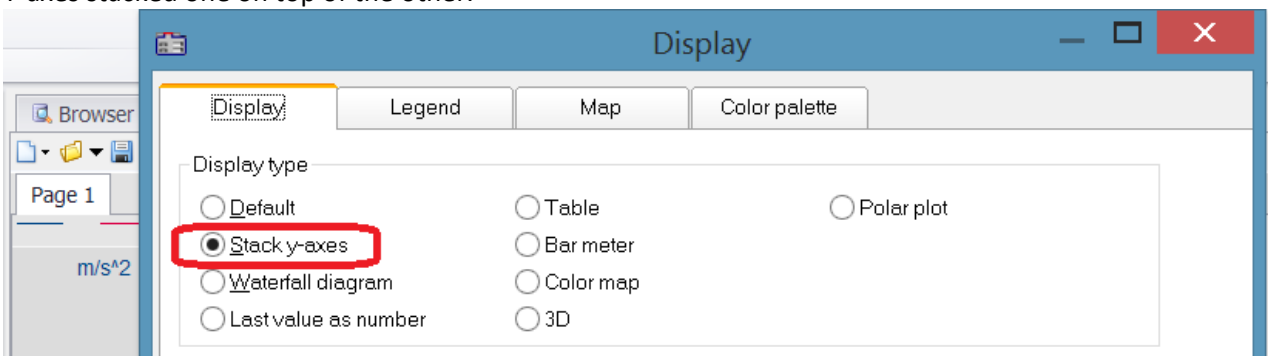
2. Load the data...



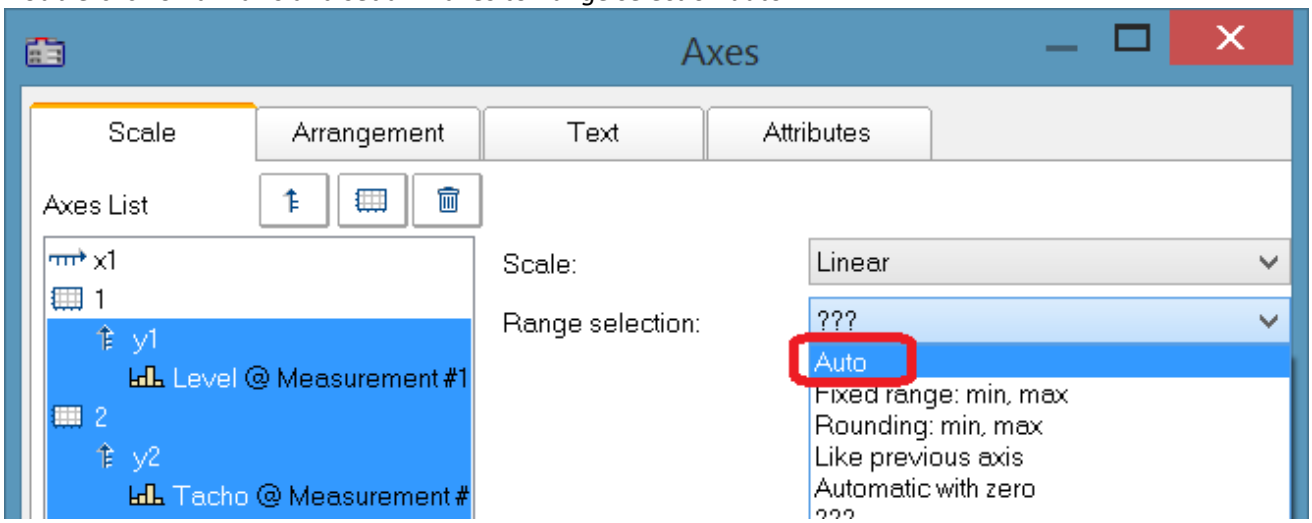
3. Select a measurement. Then drag all four channels to the curve window.



4. Right-click the mouse in the curve window and select *"Configuration\Display"*. Display the channels with their Y-axes stacked one on top of the other.



Double-click on a Y-axis and set all Y-axes to *Range selection auto*.



13.7.1.3 Calculations performed upon switching measurements

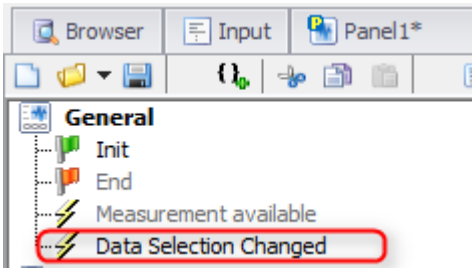
Assignment

When we jump to a different measurement, we wish for certain regions, such as where the signal "**Level**" is above 40 mm/s^2, to be located automatically. For this purpose, the signal must first be smoothed.

The statistics maximum value, mean value and duration are to be determined.

Procedure

1. Ensure that the **Design mode** is activated. Then go to imc FAMOS and enter the following lines into the region "***Data selection Changed***":



A new channel is calculated. This channel's Max, RMS and Mean values are determined.

```
If SelUseMeasurement(1)
   Level_Smo = Smo(Level, 1) ; Smooth dataset

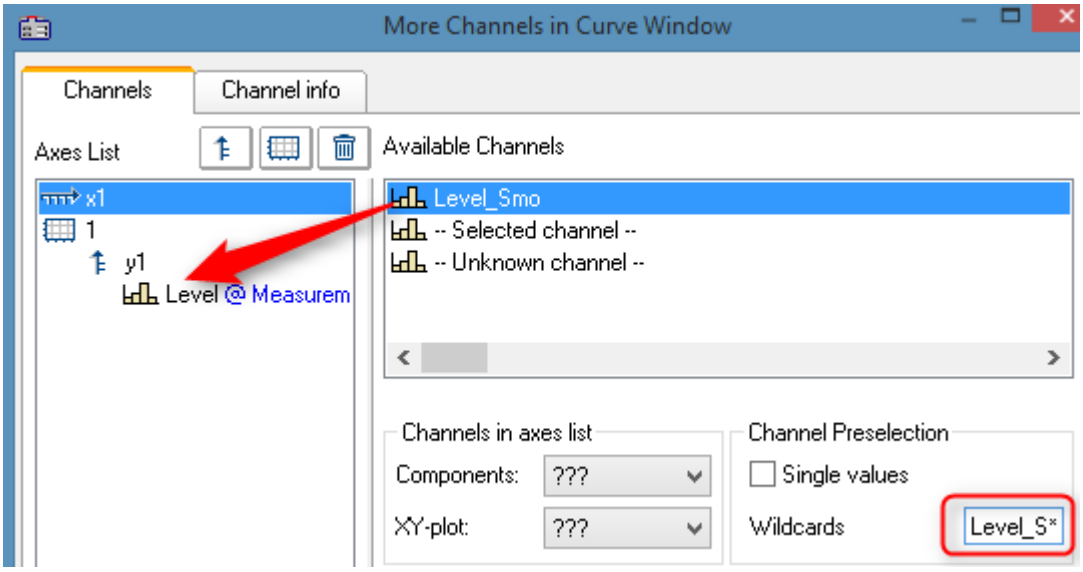
   ; Cut section above threshold
   Start = SearchLevel(Level_Smo, 2, Threshold/1000, 0, 0, 0, 0, 1)
   Stop  = SearchLevel(Level_Smo, 1, Threshold/1000, 0, 0, 0, 0, 1)
   Section = Cut(Level, Start[1].x, Stop[1].x)

   Maximum  = Max(Section) * 1000 ; Maximum scaled in mm/s^2
   Average = Mean(Section) * 1000 ; Average scaled in mm/s^2
   Duration = (Stop[1].x - Start[1].x) ; Duration of section
End
```

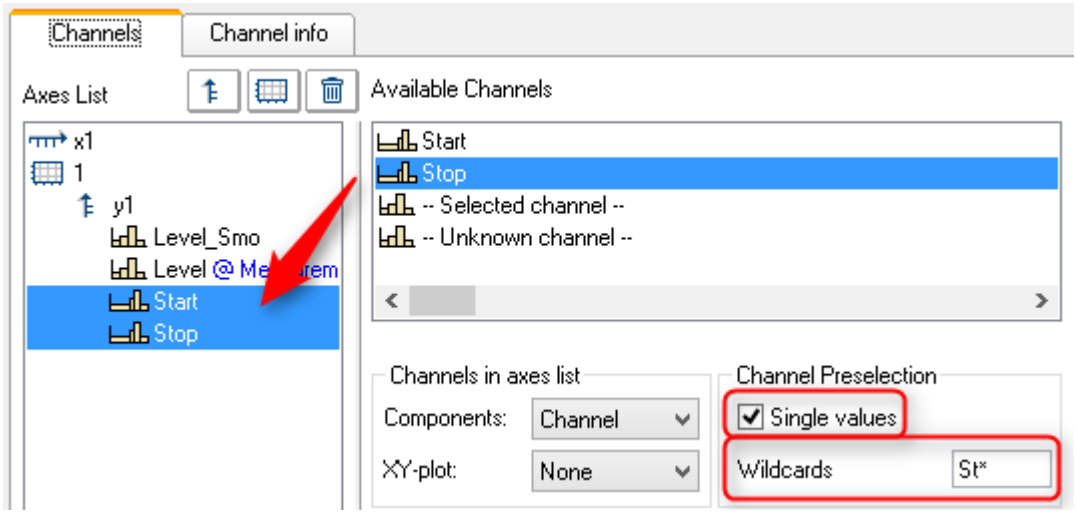
2. Run these command lines one by one. The results are graphed as they are produced.

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3. Display the results in an additional curve window. To do this, drag the channel Level from the Channels list to the Panel and create an additional standard curve window.
   You can place the channel "***Level_Smo***" by means of the dialog *More Channels in curve Window*. By means of the filter "***Level_s****" in the box "*Wildcards*", it is easy to find the variable.



- Next, add the calculated ***Section*** and the two single values ***Start*** and ***Stop***. The single valued are only visible if the box is check marked.

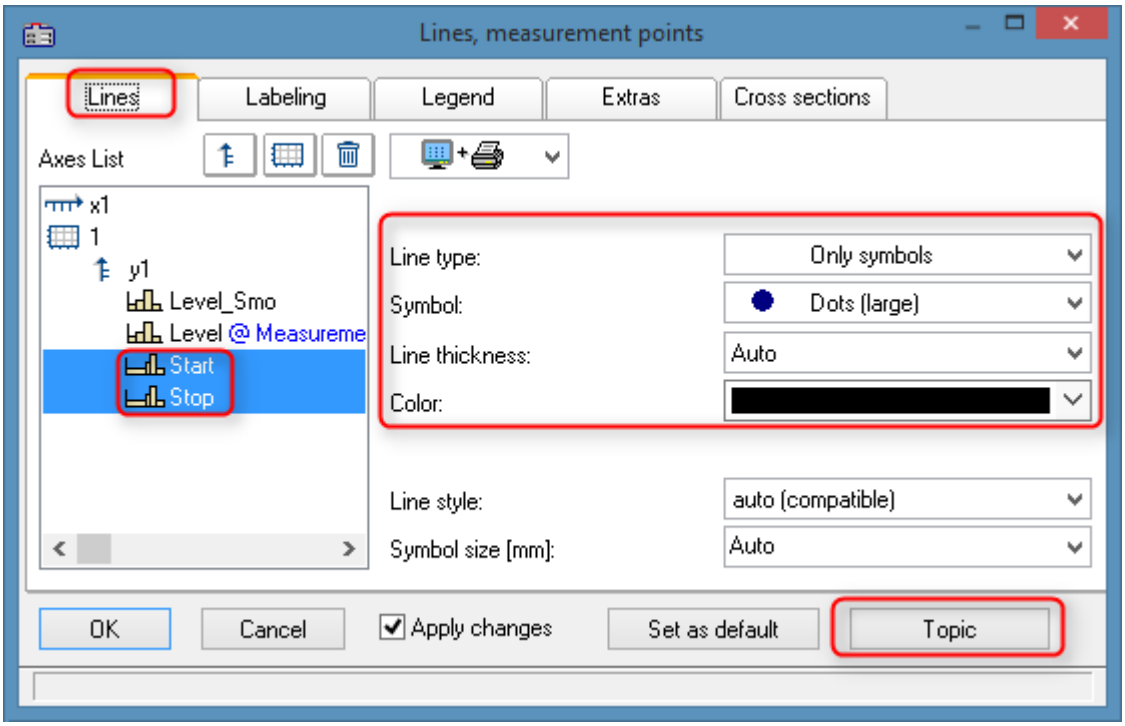


Use the button "*Topic*" to jump to "*Lines*". Select "*Start*" and "*Stop*" and make the following changes:

"*Line type*": *Only symbols*"

"*Symbol*": "*Dots (large)*"

"*Color*": black



Then on the page "*Labeling*"-> "*Labeling"*: "*Yes*"; "*Text color"*: Black

4. Select various measurements in succession and test whether the calculated channel is also updated. Note that the sequence is only run if the Panel is no longer in Design mode .

Remarks

- The command SelUseMeasurement(1) checks whether a measurement is selected. The number 1 stands for the index of the first selected measurement. If multiple measurements are to be selected, it is thus possible to access the second, third, etc. measurement. With this command, FAMOS generates a reference to the channels available in the Variables list. For example, the channel *Level* in the measurement *0001* appears in the Variables list as *Level@0001*. If measurement *0001* is selected, the function SelUseMeasurement(1) now internally generates the suffix "*@0001*" for the variable *Level*, which then is directly available for use within the sequence. The calculated **static values** are to be displayed later in a little analysis table.
- The results channels are not assigned to any measurement! If you want to achieve this, you must use the function SetMeasurementName; see the exercise: Advanced > Saving result data sets: Var 2 with measurement assignment 535
- The calculated **statistical values** are later to be displayed in a small evaluation table.

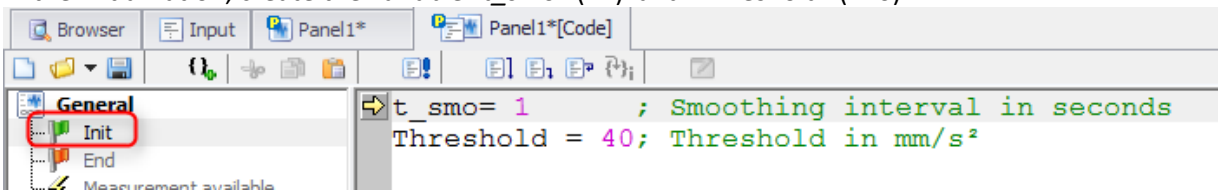
13.7.1.4 Calculations upon changes to values

Assignment

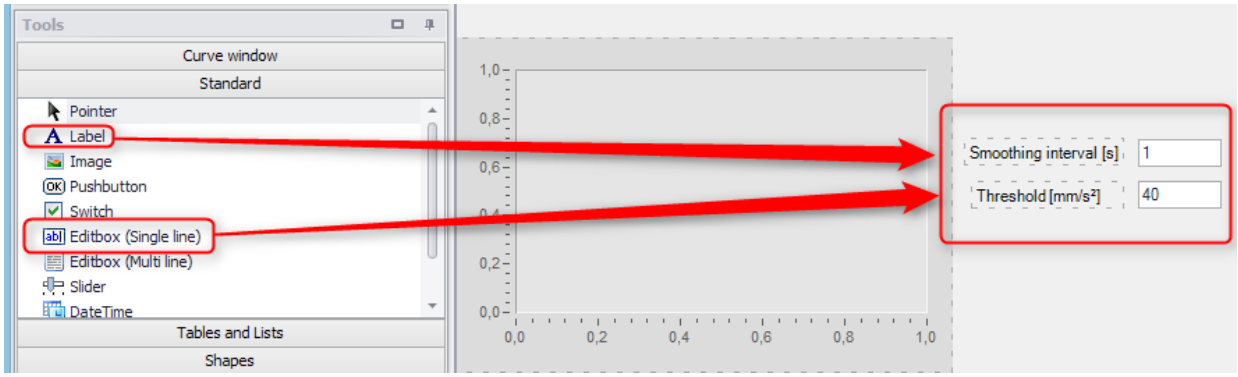
The window width for the smoothing, and the signal range threshold are to be adjusted using input boxes. When the user enter a changed value, the system is to perform the calculation again.

Procedure

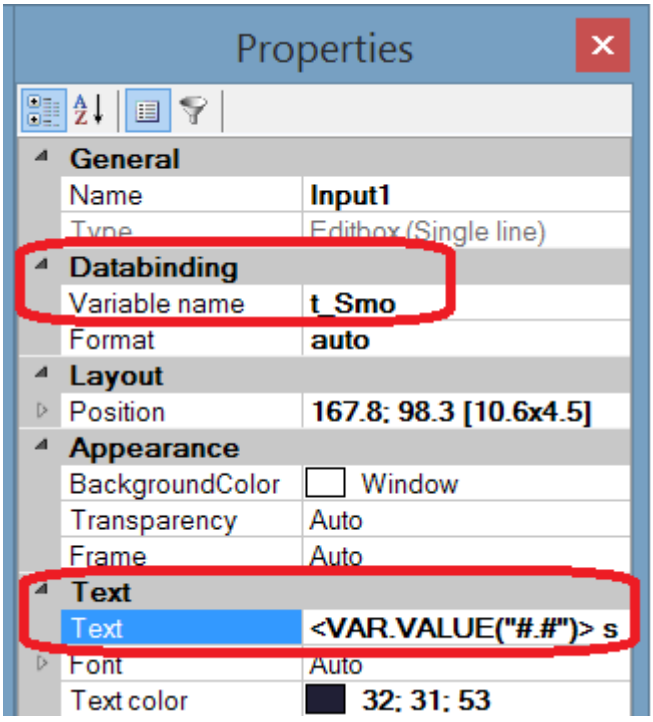
1. In the initialization, create the variable "*t_smo*" (=1) and "Threshold" (=40).



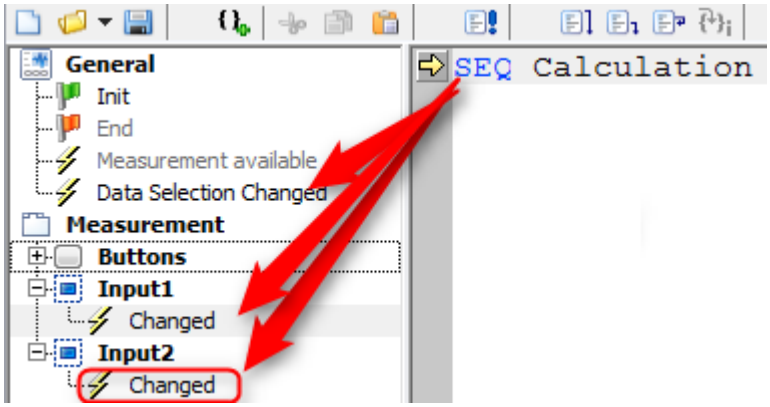
2. Insert a "*label*" and an "*Editbox (Single line)*" from the group "*Standard*".



3. Link the input box with the variable "*t_smo*" via the variable name. We will set up this link subsequently but we can already prepare for it. As the text, enter *"<VAR.VALUE("#.#")> s*". This placeholder will adopt the value of the variable "*t_smo*" and format the number to have one decimal digit. The "s" for seconds simply appears after it.



4. Copy the text box and the input box and insert them again. Repeat the last step for the threshold specification. The variable's name is "*Threshold*"; the unit "mm/s^2"
5. Now create a sequence from the branch *Data Selection Changed*:
   - Create a sub-sequence by right-clicking the mouse in the Panel colde's Functions tree diagram. Designation: "*Calculation*"
   - Select *Data Selection Changed*, select and copy the whole branch
   - Insert the contents into the subsequence.
6. Next, replace the content of the branch *Data Selection Changed* with the call *SEQ Calculation*
7. Insert the same sequence call in the branch *input1 -> Changed* and *input2 -> Changed*



8. In order for the variables to take effect, they must be incorporated into the sequence. The sequence now appears as follows:

```
If SelUseMeasurement(1)
   Level_smo = Glatt(Level, t_smo) ; Smooth dataset

   ; Cut section above threshold
   Start = SearchLevel(Level_smo, 2, threshold/1000, 0, 0, 0, 0, 1)
   Stopp = SearchLevel(Level_smo, 1, threshold/1000, 0, 0, 0, 0, 1)
   Section = Cut(Level, Start[1].x, Stop[1].x)

   MaxValue = Max(Bereich) * 1000 ; MaxValue scaled for mm/s^2
   MeanValue = Mean(Bereich) * 1000 ; MeanValue sclaed for mm/s^2
   Duration = (Stop[1].x - Start[1].x) ; Duration of section
End
```

9. Note that the threshold must be divided by a factor of 1000, since the values belonging to Level lie in the range **mm**/s^2. The curve window automatically scales the unit **m**/s^2 to **mm**/s^2 um.
9. Change the values for the smoothing window width and the threshold and click on the button. As always, execution of the function can occur only when Design mode is deactivated.

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Remarks

- Although the command SelUseMeasurement(1) selects a measurement, the results channels are not assigned to this measurement! If you wish to achieve this, you must use the function SetMeasurementName; see the exercise: Advanced > Saving result data sets: Var 2 with measurement assignment 535
- If the threshold is outside of the domain of Level_Smo, calculation errors will occur. Such errors should be avoided. An example of this is presented in the supplemental exercises 538.

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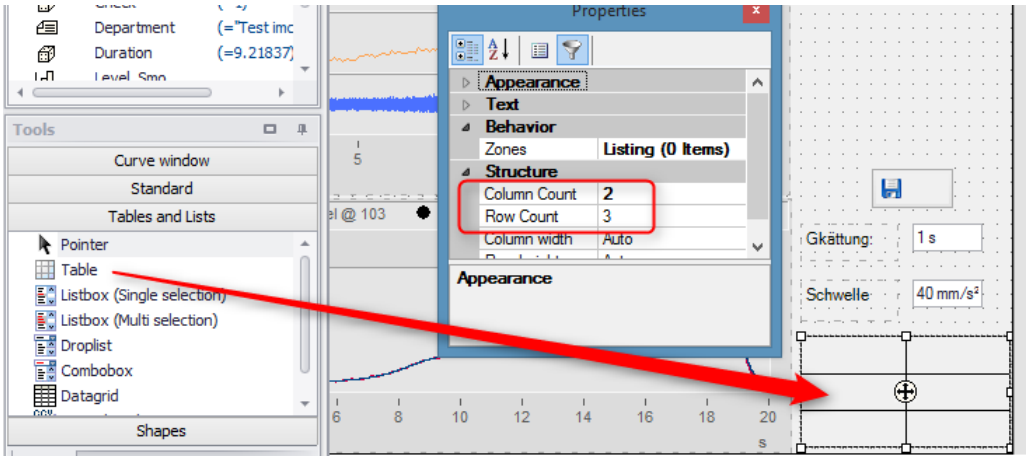
13.7.1.5 Display of single values in a table

Assignment

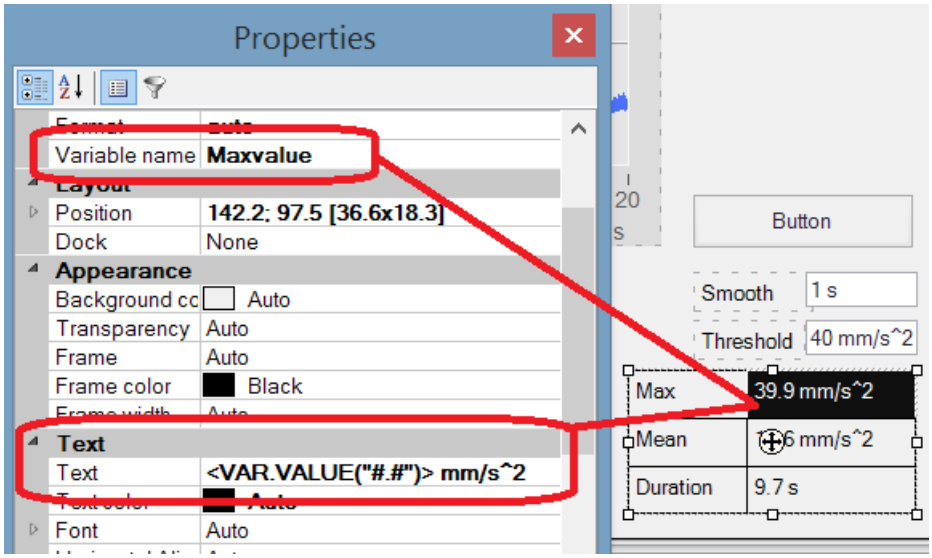
A table is filled in, and the maximum, mean values and duration are listed.

Procedure

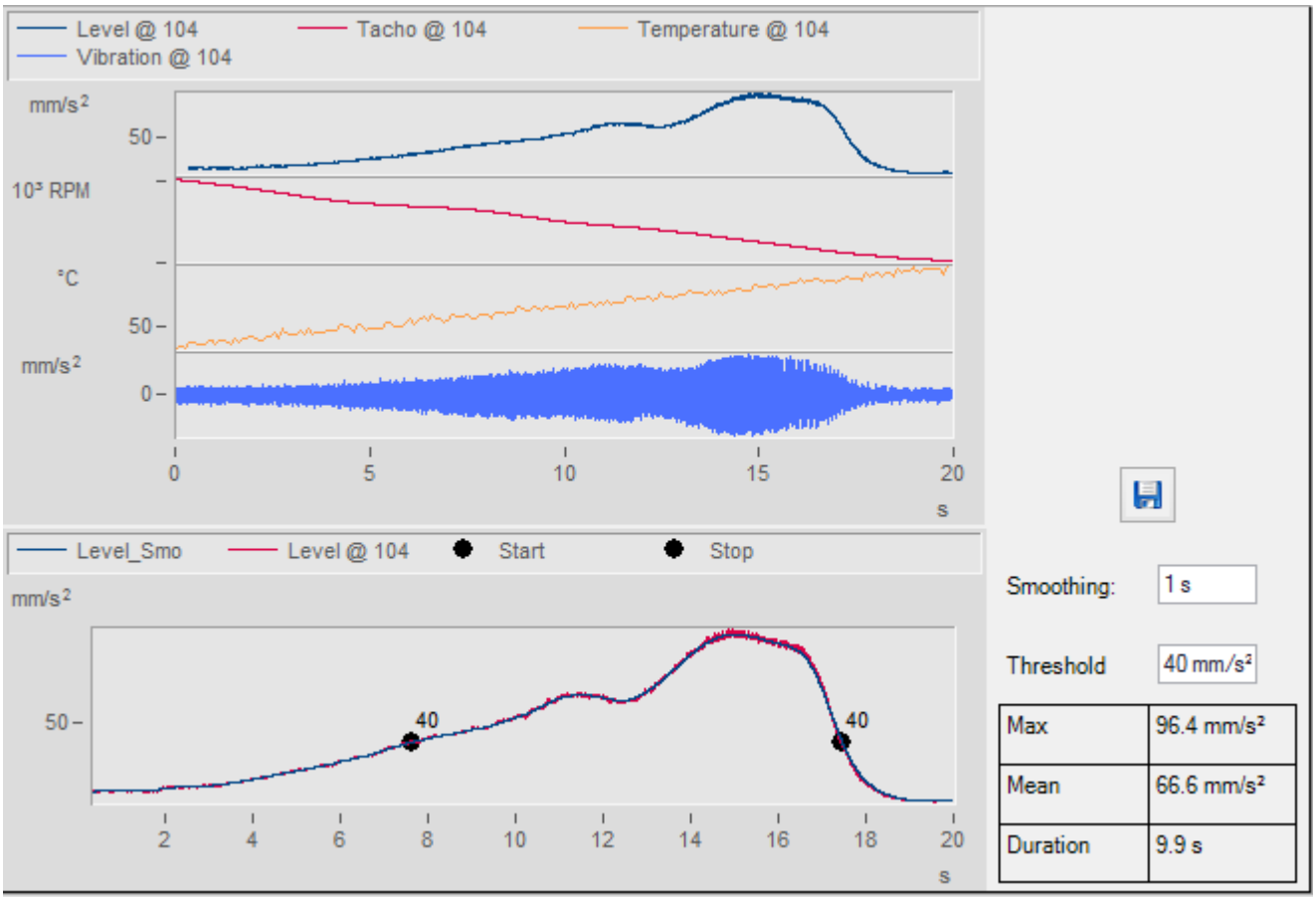
1. Add a table to the Data Browser.
2. The table is structured as 2 columns and 3 rows. Note that the table itself possesses different properties than a cell in the table. For that reason, no cell may be currently selected, while you intend to enter the amount of columns.



3. Click in the cells of the left column and write *“Max”, “Mean”* and *“Duration”*. In the right column, set the link to the single values and under “*Text*” set the placeholder as " *<VAR.VALUE("0.0")> mm/s^2*. Format the table as desired.
4. Link the cells with the variables from the Variables list by moving them by means of drag&drop to the cells.



13.7.1.6 Page Measurement



13.7.2 Exercise: Page Report

13.7.2.1 Creating a panel page

Assignment

A Report page is created in which the results can be printed out or saved in PDF format.

Procedure

1. Create a new Panel page.
2. Select Report (Landscape format)
3. Name this page "*Report*"

13.7.2.2 Incorporating the curve window and the table

Assignment

Already existing elements of the page "*Measurement*" can be re-used for the page "*Report*".

Procedure

1. Go to the page "*Measurement*" and select the two curve windows and the table. To do this, hold down the key CTRL.)
2. Copy these controls by pressing the keys **CTRL+C**. Switch over to the Report page and insert these elements by clicking **CTRL+V**.

13.7.2.3 Table Header

Assignment

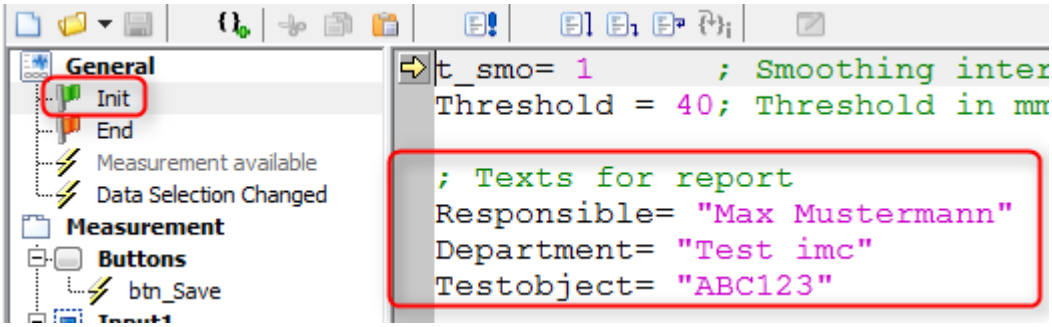
A table header is added; it will display metadata.

Procedure

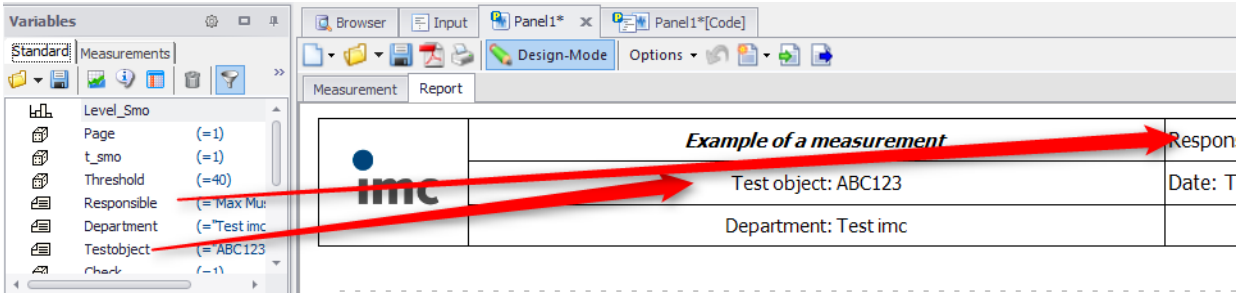
1. Arrange the elements/controls in such a way that there is enough room at the top for a table.

2. Insert a table from the group *Tables and Lists*: Structure: 3 columns, 3 rows.
Note: The group *Curve window* also offers a table widget, which is only suitable for channels, however.

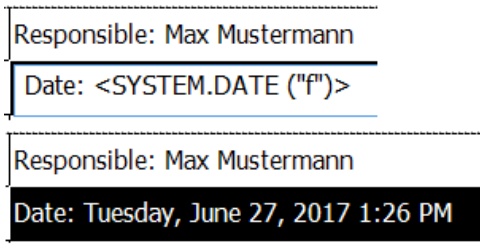
3. The table presents information on the experiment. The information is represented by variables. These in turn can also be saved and later loaded again as texts. Go to Initialization and create the following variables:



4. Link the table cells with the variables *Test_object, Responsible, Department*:



5. The Date box indicates the current date. Enter into the text box just the text" *Date: <SYSTEM.DATE ("f")>".*
The "f" formats the date according to the long version with the weekday and month. Additional possibilities are available in FAMOS' online help: Index: *Placeholders (Panel)*, then *Formatting*.



13.7.2.4 Enter additional info by page Measurement

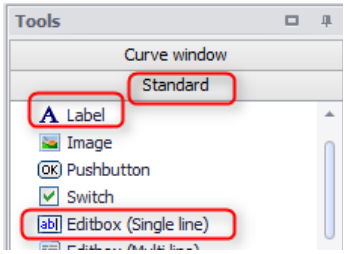
Assignment



It is not possible to make text entries in the table during runtime. For this reason, any entries must be made by means of additional input boxes. These are placed on the page *Measurement*.

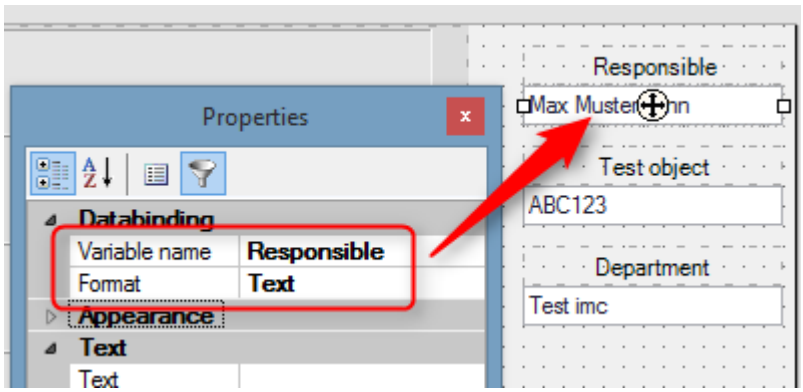
Procedure

1. On the page *Measurement*, add three labels and three edit boxes for *Responsible, Test_object* and *Department*.



2. Link the input boxes with the variables by means of drag&drop from the Variables list.

3. Set the property *Format* to *Text*, otherwise it shows "???" when entering.



4. Create a "*Group box"* around the controls. Click the context menu of the group box and set it "*To Backround*"

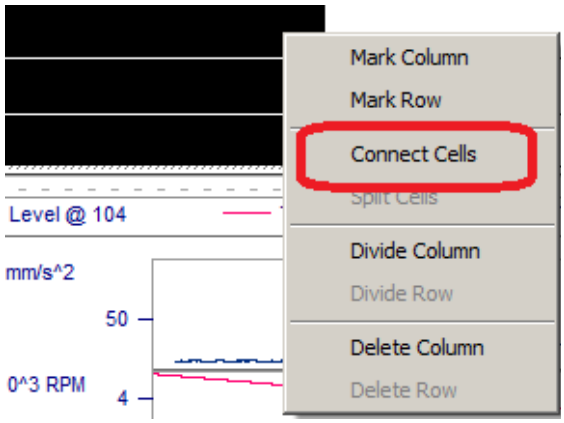
13.7.2.5 Add a picture

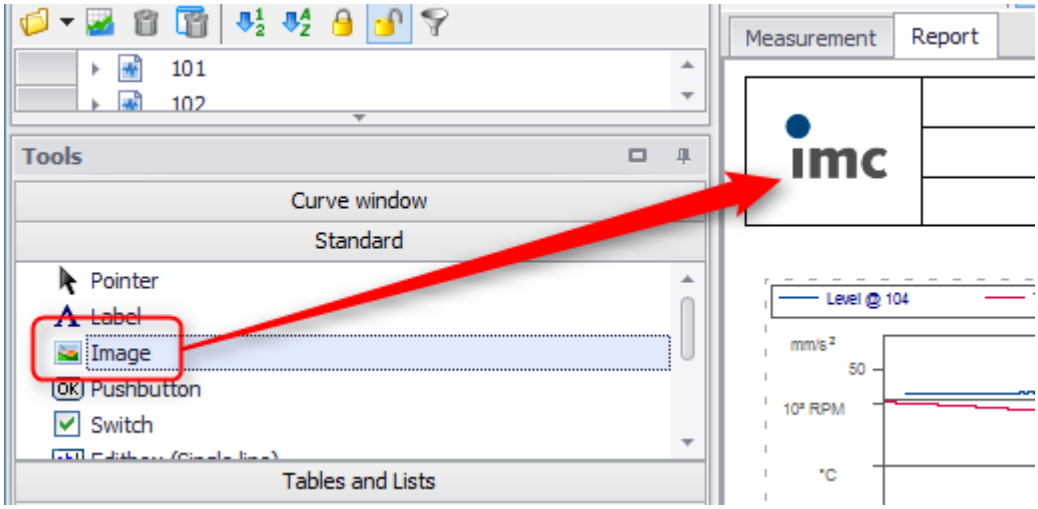
Assignment

The company logo will be added as image and placed inside into the table. To get enough space, connect the three cells of the left column.

Procedure

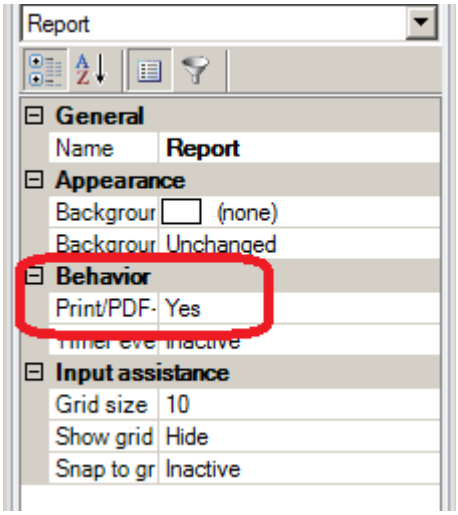
- To do this, drag the object **Image** to the table from the Standard-tools. Go to the image object's properties, and there under "Image" select the desired file from the USB-stick (imc FAMOS\bitmaps).



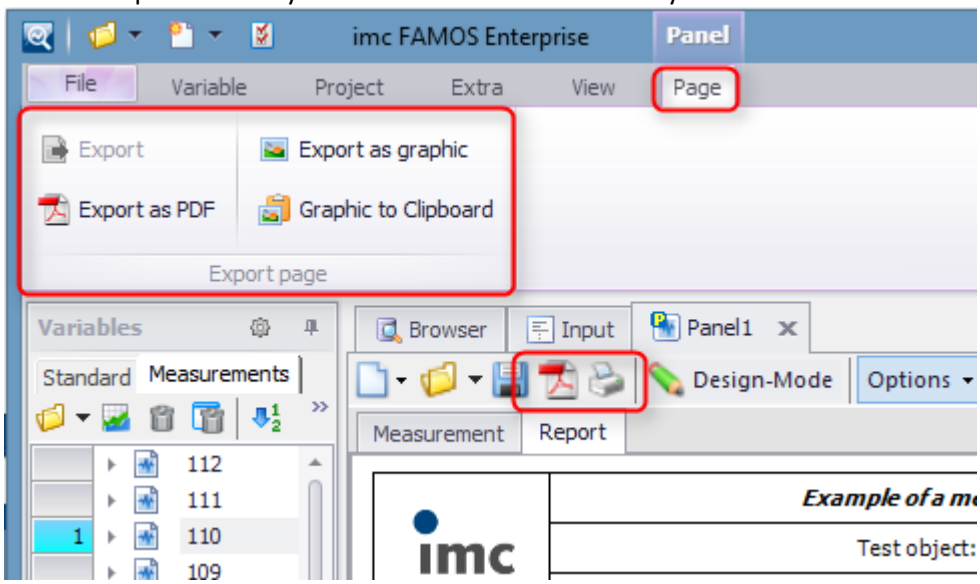


13.7.2.6 Creating or printing a PDF

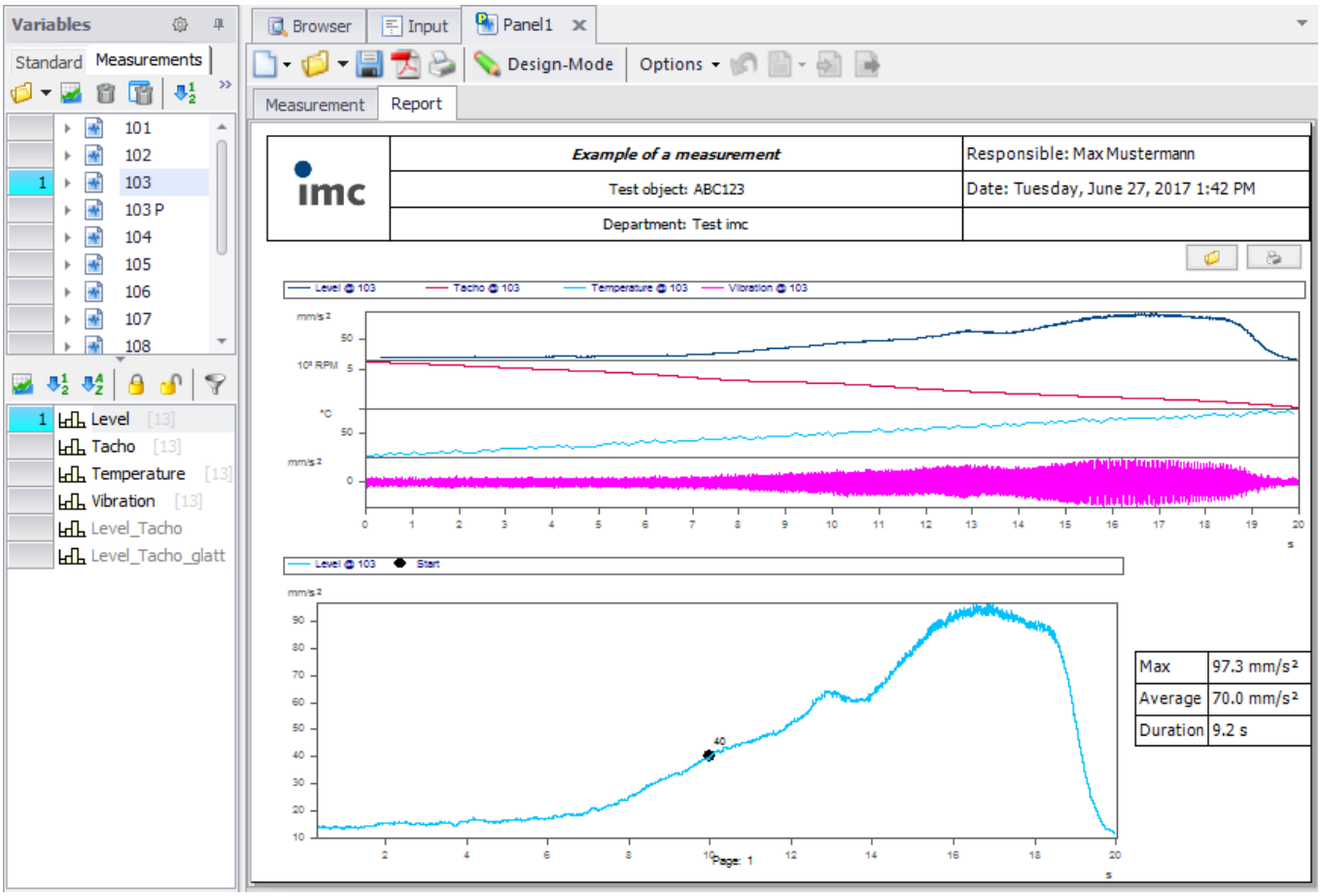
1. Each Panel page has the property "*Print/PDF-Export*". Set only such pages to "*Yes*" which you wish to print out.



2. Printout is performed by means of the Panel menu or by means of the toolbar icons.



13.7.2.7 Page Report



13.7.3 Exercise: Advanced

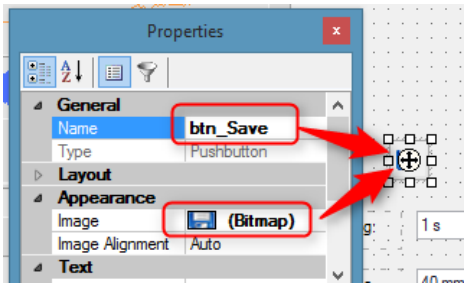
13.7.3.1 Saving result data sets: Var 1

Assignment

A "*Pushbutton*" is inserted for the purpose of saving data.

Procedure

- Add a "*Pushbutton*". Delete the caption and instead add the image of a diskette.
- Show all properties (filter is not active) and change the name to "*btn_Save*". *Image Alignment: MiddleCenter.*



- The property *Print /Export* is set by default to "*No*". This means the button will not appear in the printout.

The following lines are added to the result **Measurement.btn_save**:

```
If SelUseMeasurement(1)
    Measurement_path = FileName?(Level) ; Source-path
    local Path = FsSplitPath(Measurement_path, 8) ; Drive + Dir

    local Save_File = Path + "\Results.dat" ; Result file
    ret = FileSave(Save_File, "", 0, section, Maximum, Average,Duration)
    If ret > 0
        BoxMessage("Store results", "The results have been saved at "+
Save_File, "I1")
    else
        BoxMessage("Error", "Saving failed!", "S1")
    end
end
```

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13.7.3.2 Saving result data sets: Var 2 with measurement assignment

Assignment

In previous exercises, results of certain measurements were calculated, e.g. the channels *Maximum* and *Average*. These are to be assigned directly to the respective measurement on the basis of which they were calculated. In a subsequent step, they can also be saved in the respective measurement subfolder.

Procedure

- Load your project from the exercise "Calculations at value changes" 523
- There, you have calculated the results channels Maximum and Average for ***'Data selection changed'***:

```
If SelUseMeasurement(1)
   Level_Smo = Smo(Level, 1) ; Smooth dataset

   ; Cut section above threshold
   Start = SearchLevel(Level_Smo, 2, Threshold/1000, 0, 0, 0, 0, 1)
   Stop = SearchLevel(Level_Smo, 1, Threshold/1000, 0, 0, 0, 0, 1)
   Section = Cut(Level, Start[1].x, Stop[1].x)

   Maximum = Max(Section) * 1000 ; Maximum scaled in mm/s^2
   Average = Mean(Section) * 1000 ; Average scaled in mm/s^2
   Duration = (Stop[1].x - Start[1].x) ; Duration of section
End
```

- Add before the line '**End**':

```
local Measurementname = SelMeasListName?(1)  ; Name of the selected
measurement
SetMeasurementName(Maximum, Measurementname) ; Assign result to that
measurement
SetMeasurementName(Average,  Measurementname); Assign result to that
measurement
; Save measurment
local filename = FileName?(Level)           ; path&file of source data
local filepath = FsSplitPath(filename, 8)    ; path only
local res1 = FileSave(filepath + "Maximum", "", 0, Maximum)
local res2 = FileSave(filepath + "Average",  "", 0, Average)
```

Results

- Each time the measurement is changed, results channels are generated and assigned to the associated measurement. This assignment by means of the function 'SetMeasurementName' does not generate any copy of the channel but rather moves it, so to speak, into the measurement, i.e. the channels Maximum and Mean are subsequently only located in that measurement from that moment on.
- The channels are automatically also saved in the measurement folder.

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13.7.3.3 Remember last settings

Assignment



At the end of the measurement, the settings are to be saved to a file. Once this has been done, these settings can be restored upon the next launch of the program.

Procedure

To do this, insert the following sequence into the branch ***General \ End***:

```
; Get project path and add filename for settings.
local project_Ini = GetOption("Dir.CurrentProject")+"\settings.ini"
; Save all variables into "settings.ini"
If FileSave(project_Ini, "", 0, threshold, t_smo, Responsible, Department,
Testobject)= 0
      BoxMessage("Save panel settings", "Saving failed!!", "S1")
End
```

The branch ***General \ Initialization*** is altered as follows:

```
; Default values
t_smo= 1 ; time interval for smo function
threshold= 40 ; in mm/s^2

; Report text variables
Responsible= "Name Surname"
Department= "My Department"
Testobject= "My test sample"

; If setting.ini exists, use last settings
local project_Ini = GetOption("Dir.CurrentProject")+"\settings.ini"
If FsGetFileSize(project_Ini) > 0
    FileLoad(project_Ini, "", 0)
End
```

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13.7.3.4 Setting markers at threshold

Assignment



The points in time for starting/stopping are to be entered using the curve window's markers.

Procedure



The following code must be inserted at the end of the sequence ***Calculation***.

```
CwSelectWindow( "Curve2")     ; select curve window

CwSelectByIndex("marker", 1) ; Delete previous markers
CwDeleteElement("marker")
CwSelectByIndex("marker", 1)
CwDeleteElement("marker")

; Set markers
CwNewElement("marker")        ; Create first marker
CwMarkerSet("x.type", 1)      ; physical units
CwMarkerSet("y.type", 1)

CwMarkerSet("x", start[1].X) ; Set left position
CwMarkerSet("y", start[1].Y)
CwMarkerSet("angle", 120)     ; Set left angle
CwMarkerSet("border", 0)      ; no border
CwMarkerSet("text", "Threshold of "+ TForm(threshold, "F00")+ mm/s^2 ("+
                                          TForm(start[1].x, "F01")+"s )")

CwNewElement("marker")        ; Create second marker
CwMarkerSet("x.type", 1)      ; physical units
CwMarkerSet("y.type", 1)
CwMarkerSet("x", stop[1].X)   ; Set right position
CwMarkerSet("y", stop[1].Y)
CwMarkerSet("angle", 190)     ; Set right angle
CwMarkerSet("border", 0)
CwMarkerSet("text", "("+TForm(stop[1].x, "F01")+"s )")
```

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13.7.3.5 Check value

Assignment

If a threshold is entered which causes an incorrect calculation, FAMOS reports an error. In that case, execution of the routine must be stopped.

It would be better to check the threshold before performing the calculation. For that purpose, the threshold value must lie between the maximum and minimum.

Procedure

- Toward this end, supplement the calculation with a call of a sub-sequence *Check_value* with the parameter *Level_smo*:

```
If SelUseMeasurement(1)
   Level_Smo = Smo(Level, 1) ; Smooth dataset
   seq Check_Value Level_Smo
   If Check = 1

      ; Cut section above threshold
      Start = SearchLevel(Level_Smo, 2, Threshold/1000, 0, 0, 0, 0, 1)
      Stop = SearchLevel(Level_Smo, 1, Threshold/1000, 0, 0, 0, 0, 1)
      Section = Cut(Level, Start[1].x, Stop[1].x)

      Maximum = Max(Section) * 1000 ; Maximum scaled in mm/s^2
      Average = Mean(Section) * 1000 ; Average scaled in mm/s^2
      Duration = (Stop[1].x - Start[1].x) ; Duration of section
   End
End
```

- In the sub-sequence "***Check_value***", the variable "*Check*" is set to 1 if the calculation is possible:

```
; local variable s with threshold in m/s²
local s= Threshold/1000
; Threshold outside of section?
If s > max(PA1)OR s < min(PA1)
   ; Prepare infotext
   local msg= "Enter a value between "+ TForm( min(PA1)*1000, "F01")
   msg= msg+ " and " + TForm( max(PA1)*1000, "F01")

   BoxMessage("Threshold is out of range", msg, "!1")
   Check= 0 ; Yes, Returnvalue = 0
Else
   Check= 1 ; No, Returnvalue = 1
End
```

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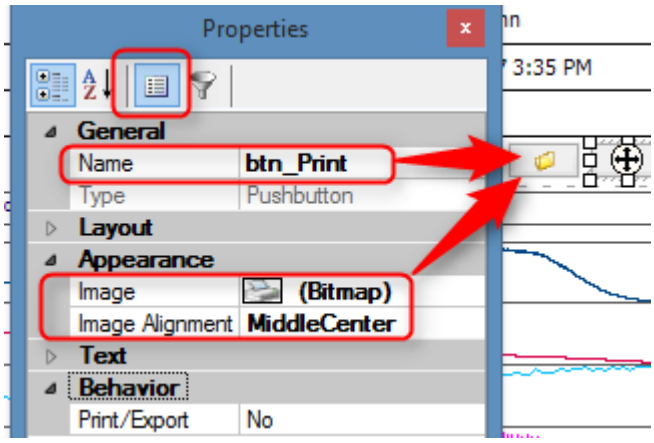
13.7.3.6 Report for all measurements

Assignment

The goal is to create a **report for all measurements**. It is to be performed **at the push of a button**. The **page number** is to be observable.

Procedure

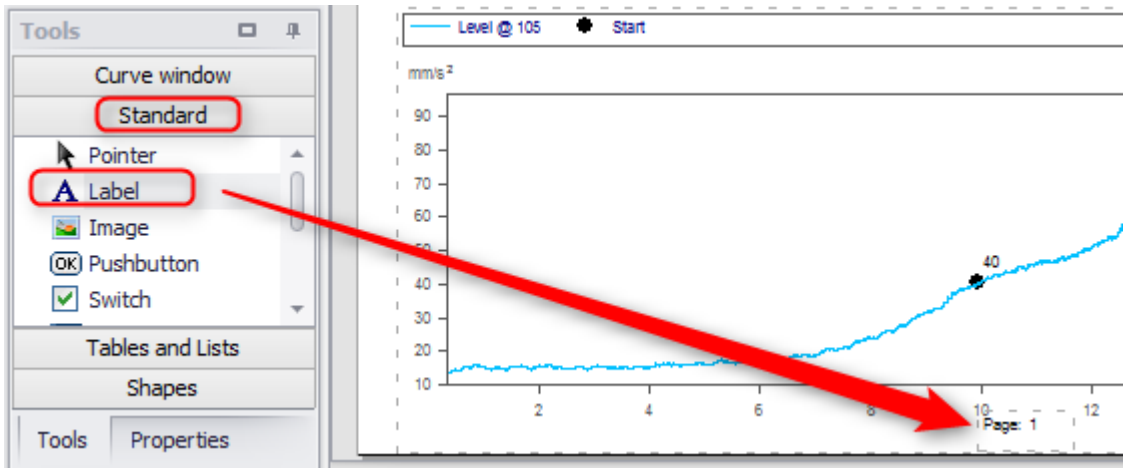
- Load your project from the exercise Creating a panel page 527.
- Add a "*Pushbutton*". Delete the caption and instead of it, add an image of a printer.
- Show all properties (filter not active) and change the name to *"btn_Print". Image Alignment: Middle Center.*



- By default, the property *Print /Export* is set to "*No*". This means that the button does not appear in the printout.
- For the purpose of displaying the page number, create the associated variable in the branch ***General/Initialization***:

```
Page= 1 ; Page number in report
```

- A label for the page is added to the panel and linked with the variable Page.



- In the panel [Code], a new branch *Buttons: btn_Print* has been created.
- There is to be a loop through all measurements. The function *MeasNames?()* in the group *Variables\@Measurement* generates a text box witht he names of all measurements.
- In a FOREACH loop, all of the measurements are selected in succession by their respective names.
- The sub-sequence *Calculation* is run and the Report page is added to the PDF.
- Beforehand, the Report file's path is queried. The variable "*Page*" still needs to be initialized:

Code von btn_Print:

```
; Reportfile with path and name
local Reportfile= Filename?( Level)
Reportfile = FsGetParentDirectoryName(FsSplitPath(Reportfile, 8))
Reportfile = Reportfile+ "\Report.pdf"

Page = 1 ; Initialize Page

measurements = MeasNames?("")
FOREACH ELEMENT name IN measurements
   SelMeasListSetName( 1, name)
   SEQ Calculation ; Update panel
   If Page = 1
      PnExportPDF(Reportfile, -1, 0) ; First page-> Overwrite report
   Else
      PnExportPDF(Reportfile, -1, 1) ; Append next pages
   End
   Page = Page+1
END
```

Result



- Clicking on the button "Print" causes all measurements to be selected in succession and creates a PDF in the experiment folder.

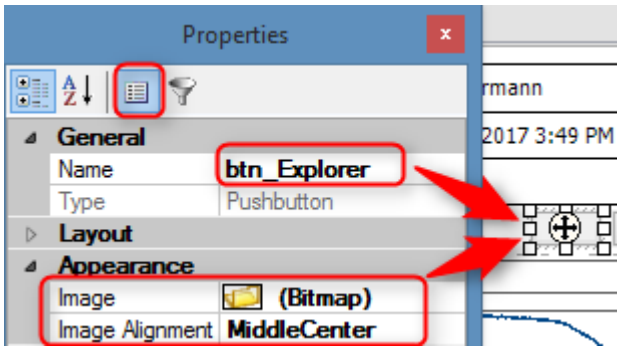
13.7.3.7 Open MS Explorer with measurement path

Assignment

A button opens the Explorer at the experiment path.

Procedure

- Load your project from the exercise Creating a panel page 527.
- Add a "*Pushbutton*". Delete the caption and add instead a folder image.
- Show all properties (filter not active) and change the name to "*btn_Explorer*". *Image Alignment: Middle Center.*



- By default, the property *Print /Export* is set to "*No*". This means that the button does not appear in the printout.

Code for the btn_Explorer:

```
; Get path to experiment
SelUseMeasurement( 1)
local Measurement_path = FileName?(Level)
local Experiment_path = FsGetParentDirectoryName(FsSplitPath(Measurement_path,
8))


; Execute programm explorer with paht as parameter
Execute("C:\Windows\explorer.exe", Experiment_path, "", 0, 0)
```

Results

- Clicking opens the Explorer and displays the Experiment folder.

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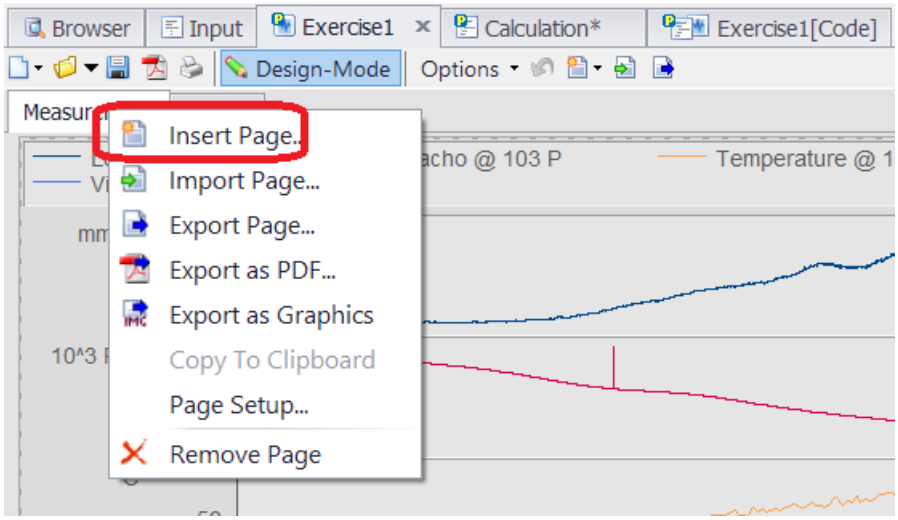
13.7.3.8 Quickview Fenster

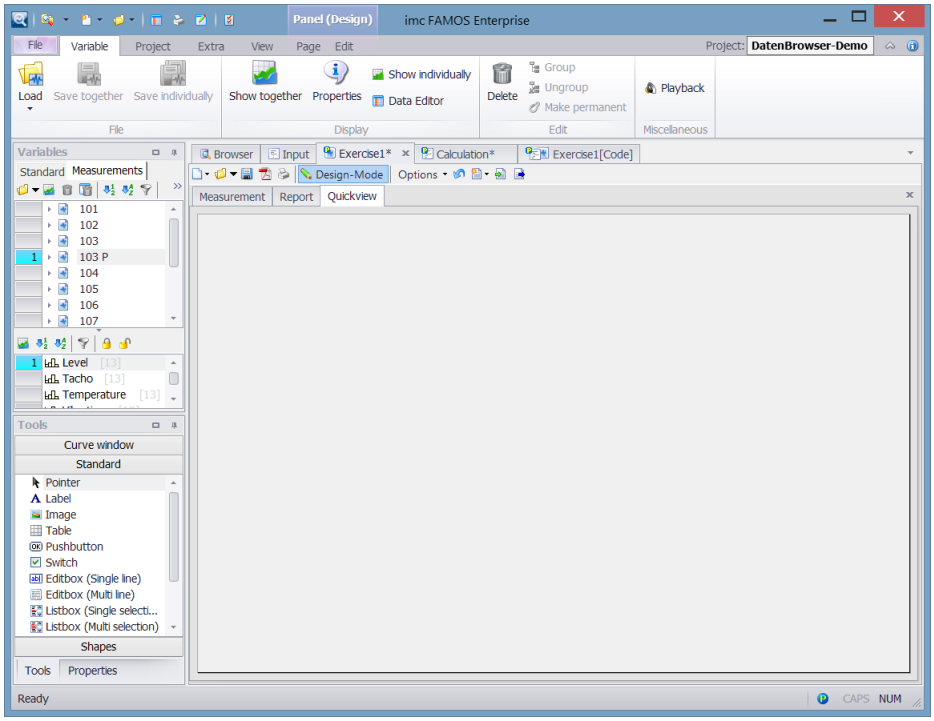
Assignment

An additional page is added for the purpose of quick viewing of the measurements. The intention is to be able to compare selected channels of the selected measurements.

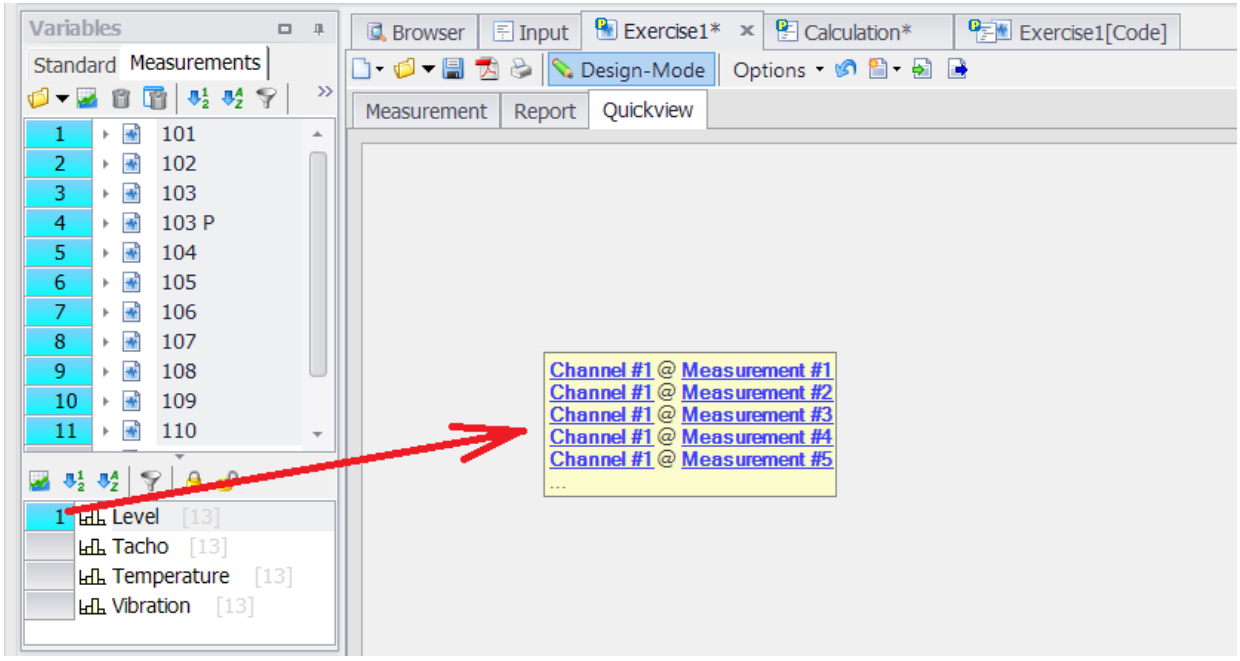
Procedure

- Add an additional page to the Panel as a standard dialog. Name the page "*Quickview*"

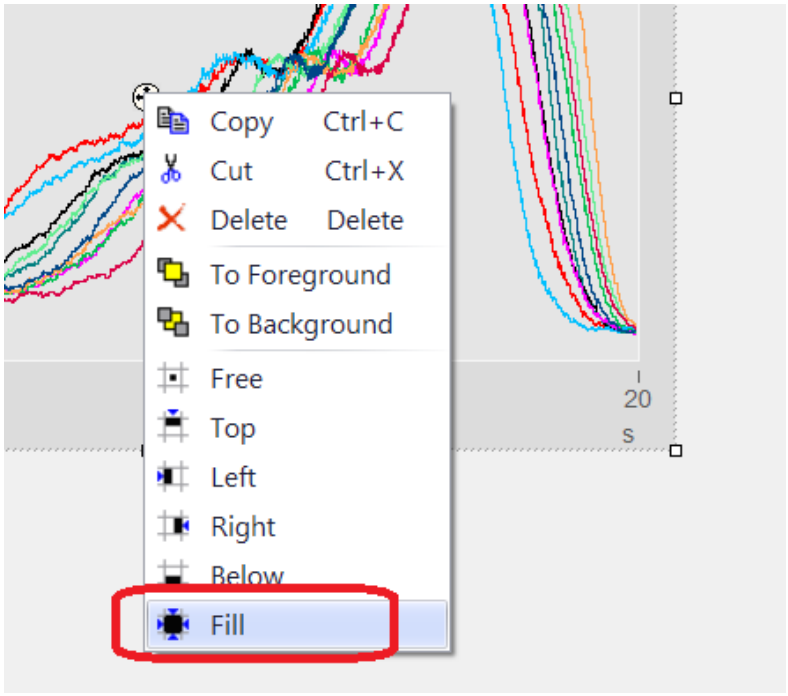




2. Select **all (!)** the measurements. Then select some random channel and drag it from its **index number** into the curve window. Select the standard curve window.

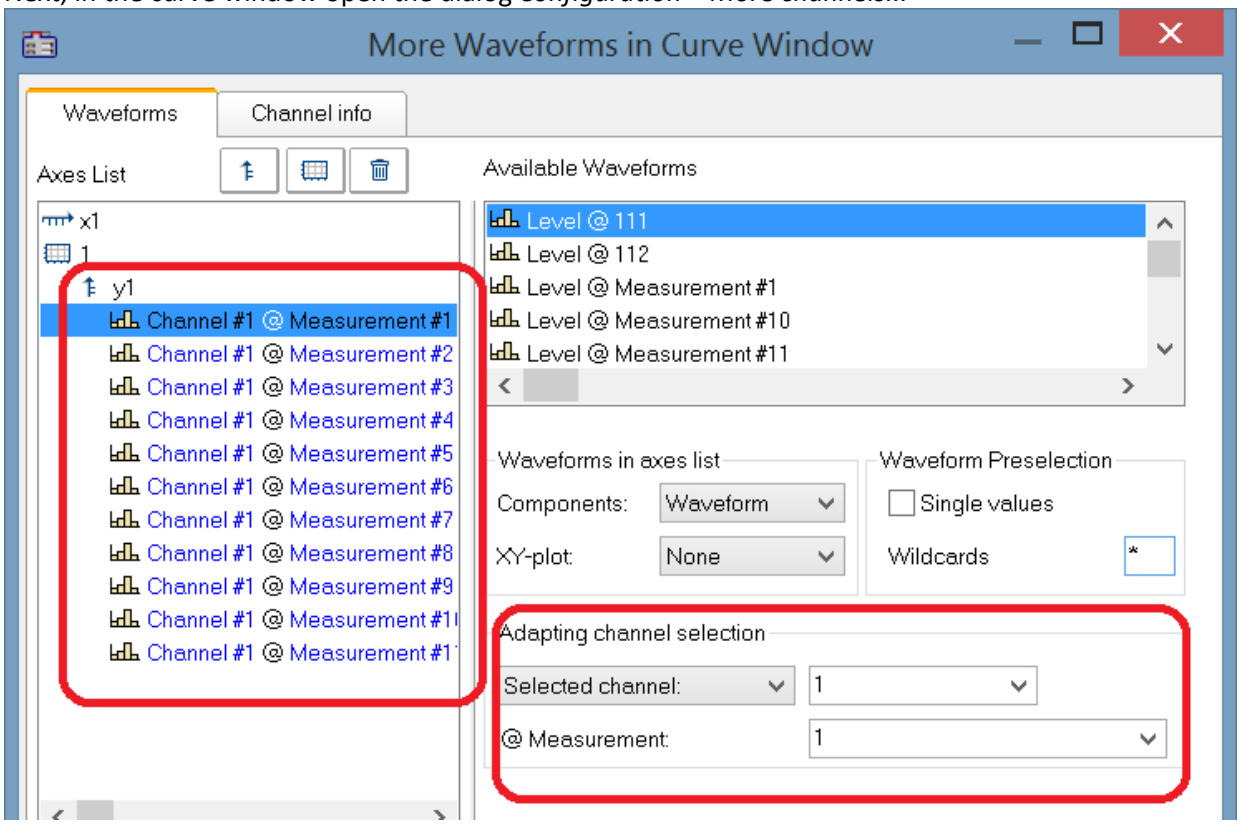


3. Right-click the mouse over the cross and select the context menu item "*Fill*". This completely fill the Panel with the curve window.



4. Now change the number of measurements selected. Then change the channels.
Result: The curve window always shows the first channel selected among all the measurement selected. If an additional channel is selected, it is not displayed.

5. Next, in the curve window open the dialog *Configuration > More channels...*



The curve window shows placeholders which are linked via their index. You can subsequently change the index for each entry under *Adapting channel selection*.

14 User-defined dialogs

14.1 Introduction and terminology

User-Defined Dialogs come with the editions imc FAMOS Professional and imc FAMOS Enterprise.

During a sequence's run-time, communication with the user is often necessary; for instance, the user could be prompted to make an entry to be used in the subsequent processing of the sequence, or could be presented with preliminary results to view.

For this purpose, such functions as *BoxWert?* (for entering a value), *BoxText?* (for entering a text) or *BoxOutput / BoxMessage* (for displaying text) can be used in imc FAMOS .

The input or readout windows generated by such functions have a fixed appearance which the user cannot influence. Therefore, they are only suitable for simple, routine applications.

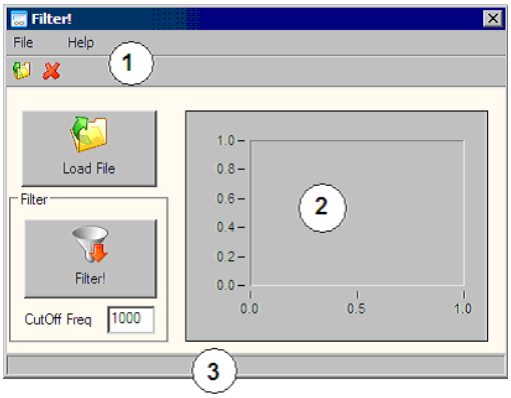
imc FAMOS offers the user the additional option of freely defining input/output windows. Such a window, serving the purpose of interacting with the user, will be referred to below as a "dialog".

To create a dialog, it is necessary both to determine its appearance (for instance its size, color and button caption) and to define its function (what is to happen when the user presses the button).

14.1.1 Designing

The dialog's design determines its visual appearance. This includes the dialog window's size and position, as well as the types and locations of any embedded controls and display widgets.

Examples of such **dialog widgets** include buttons, text input boxes, lists, images, curve displays and tables.



The illustration shows a typical dialog with a menu and a toolbar **[1]**, various dialog widgets **[2]** (buttons, input box and curve window) and a status bar **[3]**.

For designing the dialog, the **imc FAMOS Dialog Editor** is provided. Using this, all aspects of the dialog's graphic appearance can be set. This mainly encompasses the number, positions and types of dialog widgets included, and their properties. Here you can supply the dialog with a button (softkey), for example, and then set that button's caption, size and color.

Reference

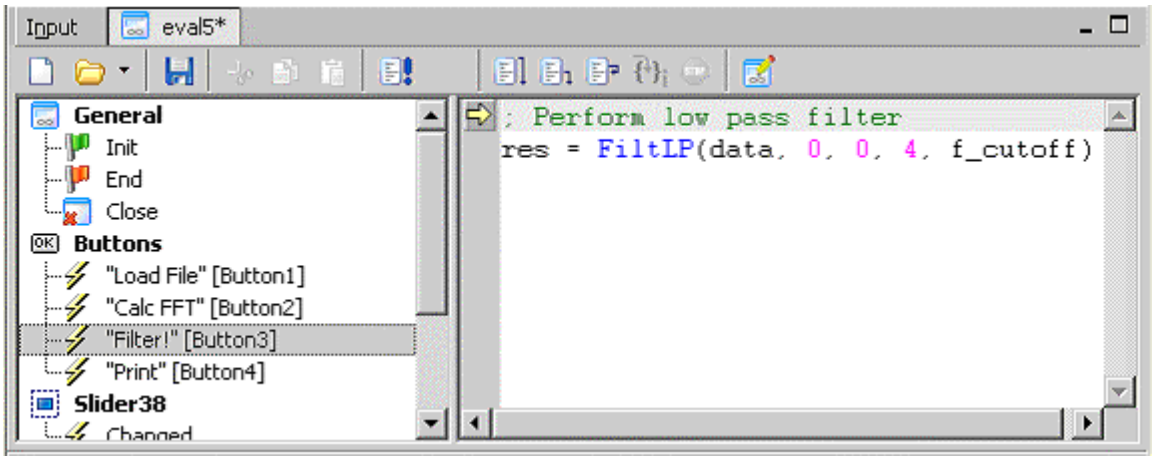
Operation of the Dialog-Editor is described in detail in the section 'The Dialog-Editor 547'.

14.1.2 Programming

Actions widgets can be saved in sequences. If, for instance, the user presses a button in the dialog, imc FAMOS ' reaction to this push of the button must be defined.

Creation and testing of such sequences, as well as of any other imc FAMOS sequences, are accomplished through the use of the Sequence Editor in the imc FAMOS -Editor.

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The figure above shows a dialog in the imc FAMOS Sequence Editor. On the left side, the events belonging to the dialog are listed, on the right side, the sequence code for the currently selected event is displayed.

The information on the dialog's appearance is saved along with the associated event-sequences in a **dialog file**, which has the file extension ".DLG".

For the purposes of editing and testing dialog files, they can be opened by either the Dialog Editor or the Sequence Editor.

To call an already prepared dialog from within a sequence, use the imc FAMOS function ***Dialog*.**

The **expansion-kit "*Dialogs*"** is of particular value for creating user-defined dialogs in imc FAMOS . This kit is included in a proper installation of the software.

The "Dialog-Kit" contains functions for controlling the dialog during runtime. These include functions for querying and setting the current contents of control widgets. A description of the Dialog-Kit functions is provided in the imc FAMOS online help under "FAMOS-Functions reference"/"Functions-reference".

14.1.3 Start without imc FAMOS GUI

A dialog can be started with imc FAMOS Runtime in such a way that the imc FAMOS interface is not visible.

Runtime execution can be performed on a computer with an Enterprise Edition. Otherwise, a runtime license must be activated.

Examples for desktop shortcuts can be found here.

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14.2 The Dialog-Editor

The Dialog-Editor is used to set a dialog's appearance, structure (in other words, the dialog widgets it contains), as well as its main properties.

14.2.1 Calling the Dialog-Editor

There are a variety of ways to start the Dialog Editor:

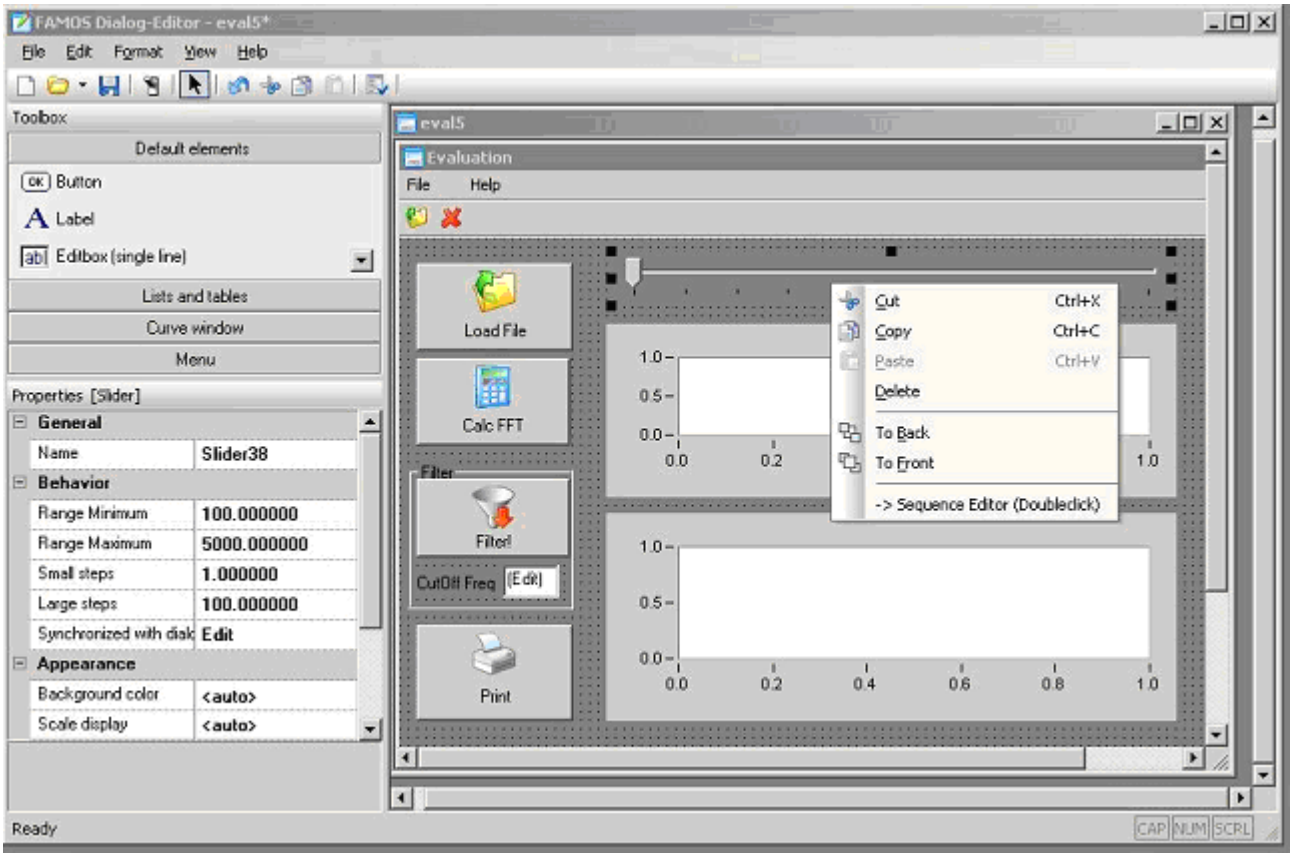
- Selecting the menu item "*Extra: Dialog - Editor* 128" or the corresponding button in the imc FAMOS toolbar.
- Opening a dialog file in the imc FAMOS Editor window (menu item "Sequence : Load"), or selecting the corresponding button in the Editor window's toolbar).
- When the cursor in the Editor window is positioned over the function name *Dialog*, the Editor's context menu (opened by right-clicking the mouse) contains the additional item 'Dialog-Editor'. This starts the Dialog Editor and opens the dialog which is specified by the function's first parameter.

After starting the editor, the working window appears at the same position as at the end of the last session.

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14.2.2 Main window

The picture below shows the Dialog Editor's main elements:



Below the **menu- and toolbar [1]**, you see the **dialog window [2]**. Each **dialog [3]** currently under construction is displayed in its own separate dialog window. This is the actual workspace where you set the dialog's size and place the widgets which it contains. By right-clicking the mouse over the dialog, you call a **context menu [4]**. The context menu's contents depend on where the mouse pointer is positioned when you call it.

The **toolbox [5]** lets you select new widgets to add. The available widgets are organized in groups which each become active when you click on their respective buttons. A description of the available widgets is provided in the chapter 'dialog widgets 560'. The Panel "Menu" is a special feature used to define the dialog's menu- or toolbar; see the section 'Menu- and Toolbar 577'.

The **Properties-Explorer [6]** lists the properties of the object currently selected (for instance a widget). To change a property, simply click on the readout of its current value on the right side of the table. Then, depending on the type of property, an input box, selection list or a dialog will appear, which you can use to change the property as desired. In the lower portion of the Properties-Explorer, a brief explanation of the currently selected entry's meaning is displayed.

The toolbox and the Properties-Explorer can be moved around by first gripping their title bars with a click of the mouse and then using the drag&drop technique; they can be "docked" at another point or positioned to float alone freely. Double-clicking on the title bar of a free-floating window causes it to be re-docked.

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14.2.3 Dialogs: creating, opening and saving

To create a new dialog, use the menu item "*File: New*". The dialog initially bears a default name ("*Dialog*" + running number) which can be edited as desired upon saving.

An existing dialog can be opened using the menu item "*File: Open*". The Editor note which dialog you last worked on. An easy way to re-open such a document is to click on its name where it appears in the lower portion of the "FILE" menu.

Once this has been accomplished, a new working window opens and the dialog is displayed.

When a dialog is displayed, the associated sequence code is automatically loaded into the imc FAMOS Sequence Editor. Conversely, opening a dialog file in the Sequence Editor also causes the dialog to be displayed in the Dialog Editor.

To save a dialog, use one of the appropriate menu items in the "FILE" menu of either the Dialog- or Sequence Editor. The complete record of how the dialog is defined - in other words its graphic appearance and its sequence code - is saved.

14.2.4 Changing a dialog's size

At a dialog's right and lower edges there are black squares, so-called "Grips". These can be "grabbed" by the mouse, and dragged by moving the mouse while holding down its button, in order to alter the dialog's size.

14.2.5 Adding dialog widgets

- First select the desired widget from the **toolbox**.
- Then click the mouse with its pointer at the position within the dialog window where you wish the new widget's left upper corner to be, hold down the mouse button and drag the mouse to demarcate the widget's desired dimensions. Once the mouse button is released, the new widget is created in the area outlined.
- Depending on what type of widget is involved, another dialog may appear, in which you must specify fundamental properties for initializing the widget.

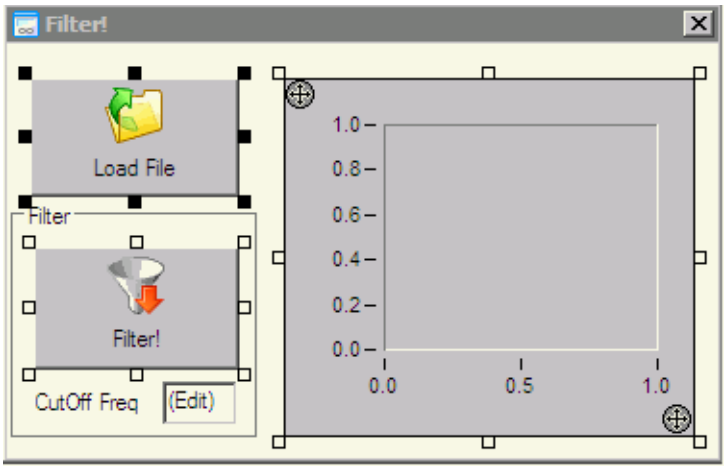
Another way of creating widgets is by **pasting them from the Clipboard**. By using Copy/Paste, it is possible to create copies of one or more widgets.

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14.2.6 Selecting dialog widgets

In order to edit (for example, move, change properties of, or copy) one or more dialog widgets, they must first be selected.

A selected widget is distinguished by black squares at its corners and edges. These squares are known as "**Handles**". Besides indicating the object's selection status, these grips serve to change the size or shape of widgets.



When multiple widgets are selected, one of them is defined as the so-called **reference object**, distinguished by solid black grips, while the other selected objects' grips only consist of a black frame. The reference object is relevant to the commands in the "FORMAT" menu. In the picture above, 3 widgets are selected, and the button "Load File" is the reference object.

Single selection

There are a variety of possibilities for selecting a single object:



- If it's not yet active, select the selection tool from the main window's toolbar. Then click the left mouse button on the desired widget.
- By clicking the **right mouse button** over a widget, it is selected and the associated context menu is called.

Group selection

There are different ways to select a group of widgets. Such a group can then be jointly moved, copied or deleted.

- You can **demarcate an area using the mouse**, within which all widgets are then selected. To do this, first select the selection tool from the toolbar, if it's not yet active. Then left-click the mouse over one corner of the selection area desired and drag the mouse while holding down its button to where you intend the selection area's opposite corner to be. During this operation, the currently valid area will be denoted by a dashed line. All widgets are then selected which overlap (even partially) the area demarcated. The selection can be canceled using the right mouse button or [ESCAPE].
- To **add a widget to an existing selection**, click on it while holding down the [CTRL]-key and while the selection tool is active.
- To **remove** a widget from an existing selection group, click on it while holding down the [CTRL]-key and while the selection tool is active.
- To change the **reference object**, click the left mouse button again on an already selected widget while holding down the [ALT]-key.

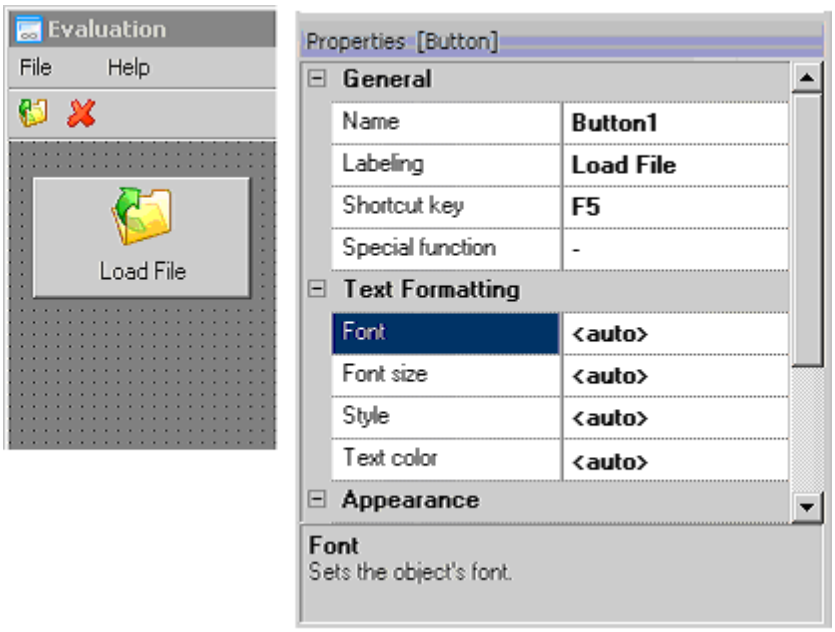
If you're unable to click the mouse over a certain widget because it's covered by another object, first place the other object in the background using the menu command "*Format: Arrange: To Back*".

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14.2.7 Properties of dialog elements

Besides its position and size, each widget is distinguished by a number of other properties which determine its appearance and behavior.

First, select the desired widget in the dialog. The Properties Explorer then shows the available properties for the particular widget.



To change a property, simply click on the readout of its current value on the right side of the table. Depending on the property's type, an input box, selection list or dialog then appears, which you can use to change the property.

Most properties' designations are self-explanatory. Any peculiarities are listed in the section "widgets" of the respective property's description. In addition, there are a number of default properties which most widgets feature:

Name

Every widget has a name which must be unique within its respective dialog. The name (in contrast to the "caption") isn't visible to the user. It serves to identify a widget for the Dialog-Kit functions, to which it is supplied as the first parameter.

When a widget is created, a default name is at first formed based on the widget's type and a serial number; this name can be subsequently changed at any time. However, when changing a name, note that it may already be used in event sequences and thus may need to be changed there as well.

A name may only consist of letters, digits and underlines; spaces, for example, are not permitted.

Caption and text formatting

Many widgets come with a text to display, which is specified using the standard property "***Caption***". Additionally, its font can be determined by means of the property in the group "***Text-formatting***" regarding its type, size, style and color.

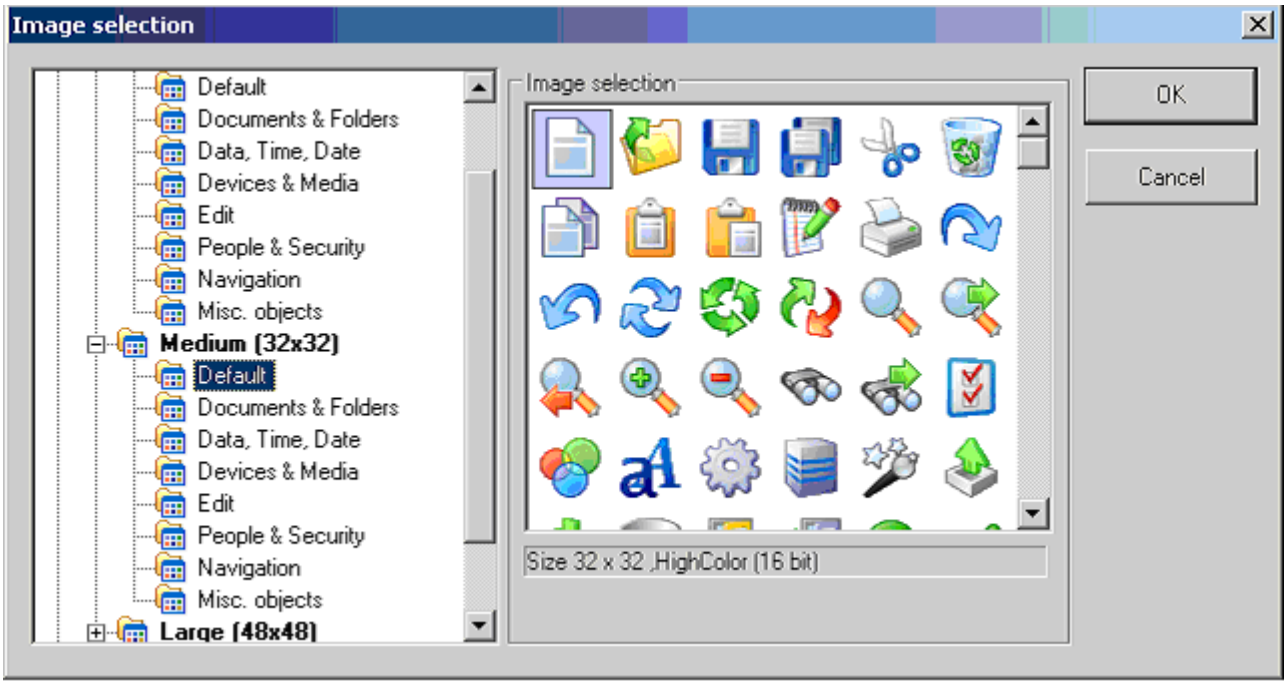
A special feature in this matter is the setting "***auto***". This means that the value of the corresponding dialog setting is applied. For example, in order to increase the font size for all of a dialog's widgets, you don't need to adapt the font for every single widget. It's enough to change the dialog's property "***font size***" - then all widgets with the font size = <auto> automatically "inherit" the setting.

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Image

An important property of many widgets is the image displayed. Examples include buttons or menu items, which show a picture in addition to the text in order to clarify the widget's function.

If you click over the entry for "Image" in the Properties Explorer, the following dialog for selecting the desired image appears.



imc FAMOS already provides a variety of images in the usual standard sizes 16x16 pixels (e.g. for menu elements/toolbar or list entries) as well as 32x32 and 48x48 (e.g. for buttons), which are organized in various groups for the sake of greater clarity. First select the desired size in the tree diagram and then the appropriate subgroup. In the image preview on the right side, you will find all the associated images. The desired image can be selected by clicking on it with the mouse or by using the arrow keys.

Naturally, it's also possible to import image files from outside sources. One typical application, for example, is the display of a company logo. Toward this end, click on the entry "Files" to expand in the tree diagram at left, and select the desired file from among the entries which then appear. The following formats are supported: Bitmap (*.bmp), Enhanced Metafile (*.emf), Windows Metafile (*.wmf), JPEG, PNG, GIF and TIFF.

Subfolders which don't contain any image files in any supported format aren't displayed.

Please note that some applications require a certain image size**. For menu elements, a size of 16x16 pixels is required.**

If the checkbox "**Transparent**" is marked, the image appears transparent. All pixels in the image's background color are replaced by the color of the background behind the image (i.e. the background color of the dialog or menu, for example). The image's background color is defined as the color of the top left pixel.

Data linking and input validation

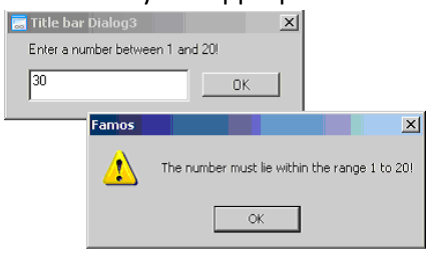
Some widgets can be linked directly to a imc FAMOS variable (property: "***Data-linking: Variable Name***").

This means on the one hand that the widget always displays the variable's current state. Changes of the linked variable are recognized automatically, and the display updated accordingly.

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Remarks

- **Important:** A variable to be linked with a widget must either already exist before the dialog is called or be created and initialized in the event-sequence "***Dialog Init***". For variables created later, the linkage isn't in effect.
- Conversely, changes made by the user to the widget are adopted by the variable. At what moment the changed value is written to the variable is determined by the property "***Data-linking: Apply***". In general, the available selections are "***auto***" (i.e. adoption immediately upon entry by the user) or "***On command***". The latter means that adoption of changes is controlled either by the function *DlgApplyData* or upon pressing a button with the special function "Apply".
- Additionally, a data type can be assigned to some widgets ("***Data-linking: Data type***"). The data type determines on the one hand the formatting of the current value's display, and on the other hand can be used to verify the appropriateness of the user's input.



The group "***Input Validation***" also serves the purpose of validating the entries made by the user. If the widget is for entering numeric values, you can use this group to define the permitted value range. If the user enters a number outside of the permitted range or if the entry cannot be converted into a number, a message box provides notification of this.

14.2.8 Moving dialog elements

In order to be able to move objects with the mouse, the selection tool must be activated (denoted by the status of the corresponding toolbar button).

Moving an object

Left-click the mouse over the object and while holding down the button, drag the object to the position desired.

Moving groups of objects

First select the desired group of objects (see the section 'Selecting widgets 550'). Then left click the mouse on the reference object (or, with the [SHIFT]-key pressed, on any selected object) and keep the mouse button pressed down. While the button is pressed down, it's possible to move the group of objects to the desired position.

Instead of the mouse, you can also use the **arrow keys**, in order to move the current selection in the desired direction

Remarks

When the **grid with snap function** (menu item "View: Options") is active, the edges of the objects are forced to align with the grid points. The objects don't move smoothly with the motion of the mouse, but "hop", rather.

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14.2.9 Aligning widgets with each other

In order to achieve neat arrangements of multiple widgets (e.g. all with left justification, all same width), it's convenient to begin work with the grid activated (menu item "*View: Options*").

There's also the possibility to arrange a number of objects in relation to a reference object.

Begin by selecting the desired widgets and specify the **reference widget** in relation to which the other widgets are to be located. One way to do this is to click on all the widgets in sequence while holding down the [SHIFT]-key.

The reference element is denoted by making a final click on it (after it had already been clicked) while still holding down the [SHIFT]-key. See the section 'Selecting widgets 550' to learn additional ways to select object groups and to set the reference object.

In the menu "Format", the following commands are available:

Alignment: Left, Top, Bottom, Right, ...to Center
: All selected widgets are aligned to the respective edge or center line of the reference object. Their size doesn't change.

Alignment: To grid
: All edges of the selected widgets are forced to move to the closest grid point.

Same size
: All selected widgets are adjusted to the same height or width as the reference element. The position of the widget's left upper corner remains unchanged.

Same distance
: After alignment, all widgets are equally far from each other in the specified direction.

Centered
: After alignment, all widgets are centered with respect to the specified direction, meaning that they are all equally far from the dialog's outer edge.

14.2.10 Widgets overlapping each other

The individual widgets are drawn in a fixed order. Elements drawn later can overlap ones already present either partially or completely.

To control the order in which widgets are drawn, and thus in what way they overlap each other, the commands in the menu "*Format: Arrange*" are provided. The same commands are also in the widget's context menu. The widget to change must be selected previously.

To front
: The selected widget is moved to the foreground. It is on top of all other widgets and can't be covered by any other widget.

To back
: The selected widget is moved to the background. It is beneath all other widgets and can't cover any other widget.

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14.2.11 Changing the size of widgets

To change the size of a widget, it must be selected as the only one. Also make sure that the selection tool is activated.

When a widget is in the selected state, its edges have black squares, so-called "grips". If you move the mouse over such a grip, the mouse cursor changes to a standard WINDOWS cursor for changing the size of or moving a window. Then you can left-click the mouse ("grab the grip") and while keeping the mouse button down, drag the element's edge or corner to the position desired.

14.2.12 Deleting widgets

To delete one or more widgets, they must first be selected. To do this, select the command "*Delete*" from the "*Edit*" menu or from the widget's context menu.

Alternatively, you can use the command "*Edit: Cut*" or the corresponding toolbar button. 

In contrast to deleting, in this case the selected widgets are removed to the Clipboard.

14.2.13 Clipboard

The "*Copy and Paste*" method, using the Clipboard is a convenient way to make duplicates of existing widgets in the same dialog, or even to exchange widgets between dialogs.

Once you have selected the desired widgets, select either of the commands "*Cut*" or "*Copy*" from the menu "*Edit*" or from the widget's context menu, or the corresponding toolbar buttons. 

With "Cut", the previously selected widgets disappear.

To insert the copied or cut widget, use the menu item "*Edit: Paste*". 

Since the widget names must be unique, the pasted widgets are assigned default names. All other properties remain unchanged.

14.2.14 Grid

For convenience in positioning the widgets, you can have a grid displayed. To configure the grid, select the menu item "*View: Options*". In the Properties explorer, the available settings are indicated.

Show grid

Sets whether to display the grid.

Snap function

When this is activated, the widgets' edges are forced to adhere to the grid points. The snap function also applies if the grid isn't visible.

Horizontal / Vertical distance

Determines the distance between grid points in the respective direction.

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14.3 Programming

14.3.1 Principles

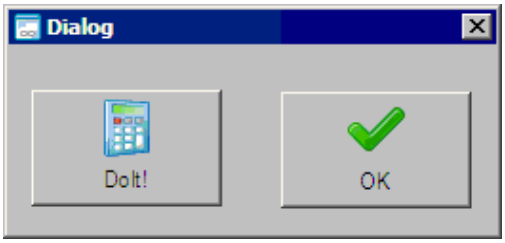
Along with the design of a dialog, which determines the dialog's appearance, the sequence code associated with the dialog (and thus the dialog's behavior while being run) must also be defined.

When a dialog is run, events occur in consequence of which an associated sequence is also run. Examples of events include starting the dialog (in the associated sequence, necessary variables can be generated and widgets initialized), or pushing a button (in the associated sequence, a calculation could be performed, for example).

To run a dialog, use the function *Dialog*.

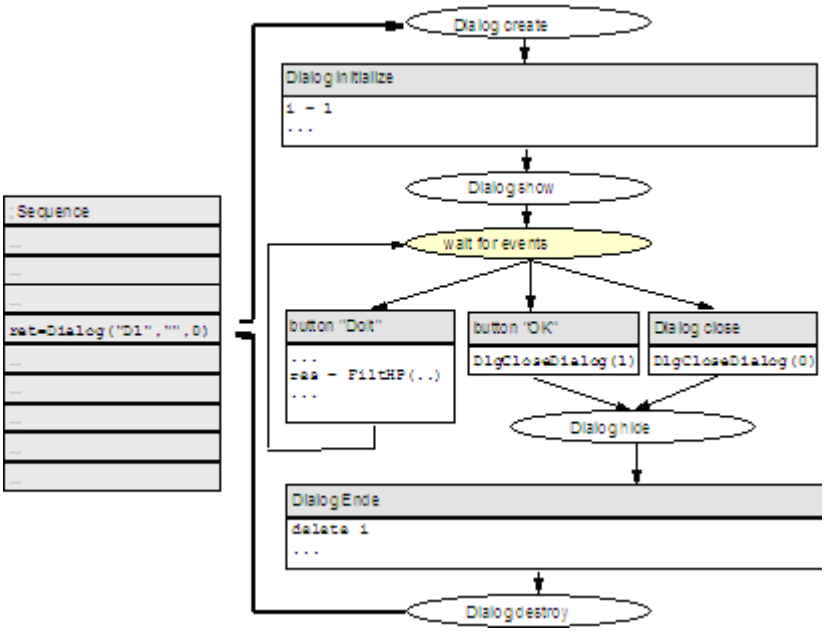
The dialog is closed when the command *DlgCloseDialog* from the Dialog-Kit is called within an event sequence (this could happen, for example, as a reaction to pressing a button with the caption '*OK*'). Only after the end of the dialog does the function *Dialog* return.

Let's consider the following simple example:



A dialog consists of only 2 buttons, one for carrying out a certain calculation, and the other for closing the dialog.

The dialog additionally has a title bar with a system menu, so that it can also be ordered to close by means of the key combination [ALT+F4] or by a click on the "*Exit*"-button in the title bar (which initiates "***Dialog Close***").



The function *Dialog* loads the specified dialog file and forms the dialog, without displaying it. Subsequently, the event '***Dialog Init***' is triggered. Here, variables can be generated or widgets initialized.

After processing the initialization sequence, the dialog is displayed, and the system waits for further events. In the example, only three possible events could occur:

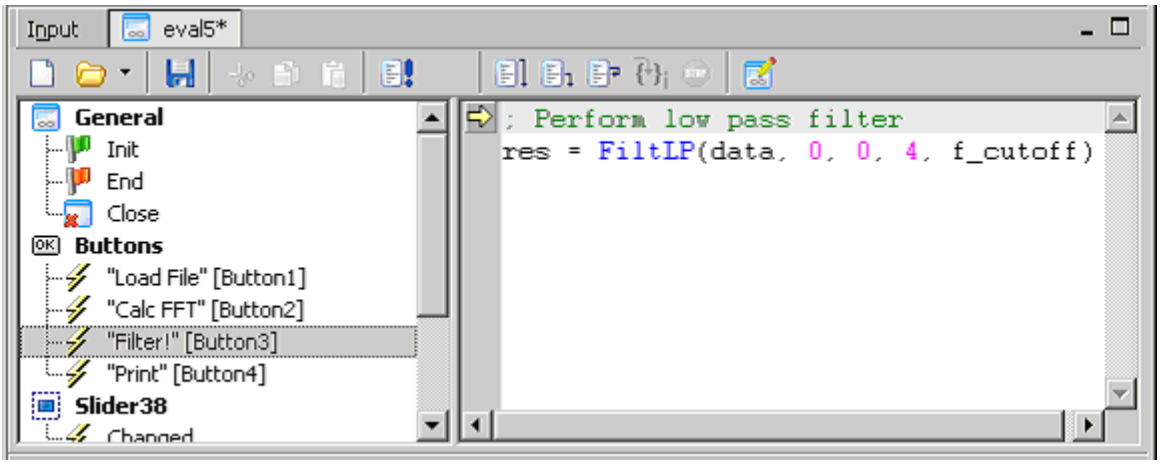
- The user presses the button "**DoIt**". In the associated event sequence, a calculation could be carried out, for instance. After the sequence is run, the system waits for further events.
- The user presses the **[OK]** button. In order for the dialog to be subsequently closed, the associated event sequence must contain the command *DlgCloseDialog.*
- The user presses the Exit button in the title bar or the combination of keys **[**ALT+F4**]**. The associated event-sequence "***Dialog Close***" must also contain the command *DlgCloseDialog*. This command is entered automatically when the dialog is created.

A call of the command *DlgCloseDialog* leads to the dialog being closed. For this purpose the dialog is first hidden and then later the event '***Dialog End***'. Here, for example, no longer necessary variables can be deleted. After the sequence is run through, the dialog is permanently deleted and the function *Dialog* returns. The return value in this case corresponds to the parameter passed to the function *DlgCloseDialog*.

14.3.2 Editing event-sequences

The event-sequences have the same syntax as "normal" imc FAMOS -sequences and are also created and tested using the sequence editor in the imc FAMOS main window. For information on the principles of operating the Sequence Editor, refer to the chapter 'Sequences 358'.

When a dialog is opened for editing (no matter whether by the Dialog-Editor or the Sequence-Editor), the working window is divided into a tree diagram list of events on the left side, and the actual editing box on the right side. In the editing box, the sequence assigned to the currently selected event is the one shown.



For a better overview, the event list is organized into various groups:

- **General**: Events triggered by the dialog itself.
- **Buttons:** Buttons have only one event ("***pressed***"), which is triggered by pressing the button. For a simple assignment, the button's caption is displayed, followed by the button's name in square brackets.
- **Menu/Toolbar:** Menu items or toolbar buttons also have just one event ("***selected***"). The menu item's caption is displayed, followed by the name in square brackets.
- **Additional widgets:** For each other **widget** (which is neither button nor menu), a separate group with the widget's name is displayed, and the events supported by this widget are listed. The picture above shows the list box "List" with the two assigned events "***selected***" and "***double-clicked***".

Events to which no sequence code was yet assigned are displayed in a gray typeface.

The output box in the imc FAMOS main window shows a short help text about the currently selected event.

A double-click of the mouse on a widget in the Dialog-Editor brings the imc FAMOS main window into the foreground and selects the first event sequence belonging to this widget.

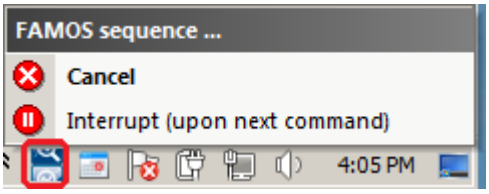
14.3.3 Testing and running dialogs

n comparison to "simple" sequences, there are certain differences and particularities:

The menu items "Run" and "Start (Debug)" don't refer to the currently displayed event sequence, but to the entire dialog.

If the running of the dialog is interrupted (e.g. due to a syntax error in an event-sequence or due to a breakpoints), many operations in imc FAMOS are disabled- for example, in this state, no other sequence can be started. The run running of the dialog must previously be explicitly quit by menus of the "Stop"-button in the toolbar.

To cancel the run of a dialog, use the sequence context menu in the notification area of the Windows taskbar.



- "Cancel" completely cancels the running of the dialog.
- "Interrupt (upon next command)" interrupts the running of the dialog before executing the next line in the sequence.

This is especially helpful for testing dialogs while the dialog is "idling", in other words, waiting for the next event to occur. After selecting this menu item, the dialog remains at first in the waiting state, but upon the occurrence of the next event (e.g. push of a button), it interrupts the associated event-sequence before executing the first line.

To call an existing dialog within a sequence, use the imc FAMOS function *Dialog*.

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14.3.4 Tab-key

The property "Tab-Index" enables support of the Tab-key as the means for switching the focus from one element to the next.

Available values:

- **-1** (or "**-**"): Not accessible using the Tab-key
- **1, 2,…** In this order, the elements pass the focus from one to the next
- **0** or "***<auto>***": These elements are selected in the order of the tab index. The order corresponds to the order in which they were created. This order can be subsequently edited by means of the context menu commands "*To Back*" or "*To Front*".

Note

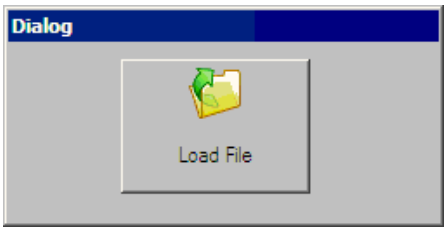
Navigation by means of the Tab-key can not be applied to the dialog elements *Text box, Groupbox, Image* and *curve window*.

14.4 Dialog elements

The widgets available are briefly described below. Most of them are standard Windows controls whose functioning we assume to be familiar.

14.4.1 Button

Virtual switch which causes a certain action when clicked.



Notes on designing

Along with a caption which is as descriptive as possible, an image is often displayed on the button as well, which gives the user a clue as to its function.

Function key

As an alternative to clicking with the mouse, it's possible to set a combination of keys in order to achieve control from the keyboard.

Special function "Apply"

If this special function is activated, then when the button is pressed, the data are adopted by all affected widgets. This means all widgets which either are linked to a variable or for which input validation was set. The associated event-sequence is only called once the input validation was successful for every widget.

A typical case is for an [OK]-button in a dialog with several input boxes for each of which a permitted value range has been set. When the [OK]-button is pressed by the user, a check is first made of whether the current entries are all valid. Only in that case, the button's event sequence is called, after which the dialog is typically closed.

This special function thus saves the trouble of explicitly validating/ adopting the data in the event sequence by means of the function *DlgApplyData*.

Notes on programming

Events:

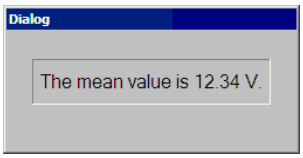
- "***Button pressed***": Triggered when the user clicks the mouse over the button, or presses the corresponding combination of keys.

Important functions (Dialog-Kit):

- DlgSetText - Changes what text is displayed
- DlgEnable - Disables operation

14.4.2 Label

Widget for outputting text



Notes on designing

The decisive property is, of course, the text to be displayed. Labels can be linked with imc FAMOS variables; see the section "Data-linking" for details.

Notes on programming

Events: None.

Important functions (Dialog-Kit):

- DlgSetText - Changes the text displayed

Data-linking

A label can be linked to a imc FAMOS variable in order to display its current value. If the variable is a data set, the data set's most recent value is always accessed.

If in addition to this a permanent text (property: "***Caption***") was included with the design, the numerical value is combined with the text. If the text includes the placeholder %1, the number value is inserted at the placeholder's position. Otherwise, the value is appended to the text.

Example: Let a linked variable have the value 3.14.

Caption	Display
"" (empty)	3.14
"Mean value is: "	"Mean value is: 3.14"
"Mean value is: %1 Volt: "	"Mean value is: 3.14 Volt"

The formatting of the number value for the display is independent of what data type is specified ***("Data-linking: Data type").***

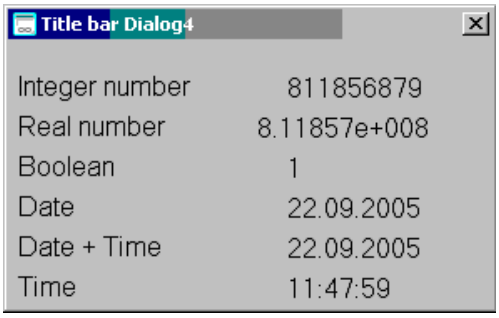
Integer	The value is rounded to the next integer. Readout always without exponent.
Real number	The value is displayed in the numerical format "real" with up to 6 decimal places. Depending on the numerical value's magnitude, either fixed- or floating point numerical format is selected.
Bool	If the value is equal to 0, a 0 is returned, otherwise always 1
Date	Readout as a date
Date+Time	Readout as a date and time
Time	Readout as time

Remarks:

The last 3 formats only make sense if the value is expressed in imc time format. Use the functions of the function group "*Variables > Data types > Date, Time*" for creating and processing them.

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Example

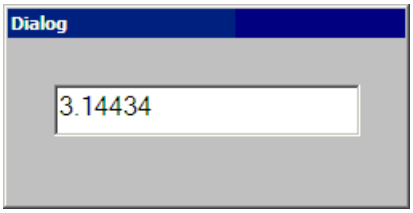


The following dialog contains on the right side 6 labels with various data types which are all linked to the same variable. The variable contains the current system time (found by means of the function *TimeSystem?*).

The variable linkage is "read only", meaning that any change of the label's contents, for example by means of the Kit function *DlgSetValue*, isn't adopted by the linked variable.

14.4.3 Single-line input box

Widget for entering and displaying short texts or numbers.

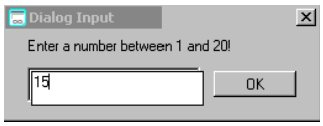


Notes on designing

Single-line input boxes can be linked with variables. Additionally, a permitted value range can be specified, against which entries by the user will be checked. For details, see the section "*Data-linking*".

A unique feature of this widget is the property "***Operation***". This controls how the widget responds to entries made to it.

- "***Standard***": "Normal" input box behavior.
- "***With input confirmation***": Inputs must be explicitly verified by the user by means of the [ENTER]-key, or rejected using the [ESCAPE] button. To call the user's attention to this special behavior, the input box appears slightly shifted over, as soon as it gets the input focus (e.g. after clicking the mouse on it):

  To the user, it appears as if a separate input box was opened. It is only closed once the input has been confirmed with [ENTER], and its contents are adopted. Conversely, clicking the mouse outside of the input box, or clicking on [ESCAPE] closes the window and rejects any entries made.

  If the input box is linked to a variable or if an input validation is defined, and if the property "*Apply*" is set to "*automatic*", this is the mode to be recommended, since in this case the moment in time at which the entries are adopted is exactly defined.
- "***Auto***": If the input box is linked to a slider control, the mode "***With input confirmation***" is implemented. Otherwise, it's always "***Default***".

Notes on programming

Events: None.

Important functions:

- DlgSetText, DlgGetText, DlgSetValue, DlgGetValue - Setting and getting the input box's contents.

Data-linking

An input box can be linked to a imc FAMOS -variable in order to display or edit its current value. If the variable is a data set, the data set's most recent value is always accessed.

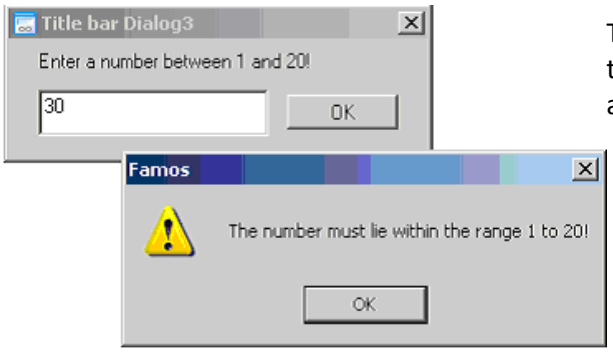
The formatting of the number value for the display is independent of what data type is specified ("***Data-linking: Data type***").

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Integer	The value is rounded to the next integer. Readout always without exponent.
Real number	The value is displayed in the numerical format "real" with up to 6 decimal places. Depending on the numerical value's magnitude, either fixed- or floating point numerical format is selected.

If the user changes the input box's contents, then the system checks before adopting the new content whether it can be converted to the data type specified.

In the group "***Input Validation***", it's additionally possible to define a permitted value range. If the user enters a number outside of the permitted range, or if the input can't be converted to a number, the user is notified by a message box.

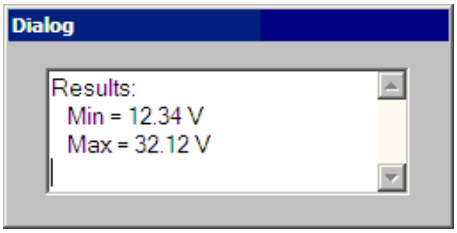


The property "***Data-linking: Apply***" determines when the content of a user input is to be validated and adopted by a linked variable.

- "***Auto***": Validation and adoption happens automatically upon user entry. When an entry is finally completed is recognized as follows, depending on the prevailing value of the property "***Operation***":
  - ***"Operation" =*** "***Default***": Entry only applied at the moment that a dialog button is pressed or a menu item is selected.
  - ***"Operation"*** = "***With input confirmation***": The input is adopted as soon as the user explicitly verifies the entries using the [ENTER]-key. This is the recommended mode, since the moment at which the data are adopted is evident to the user.
- "***On* command**": Validation and adoption only happen upon calling the function *DlgApplyData* or upon the special function button "Apply" being pressed.

14.4.4 Multiple-line input box

Widget for entering and displaying multi-line texts.



Notes on designing

An input box can be linked to a text variable in order to display/ edit its current value.

Notes on programming

Events: None.

Important functions:

- DlgSetText, DlgGetText: Setting and getting the input box contents

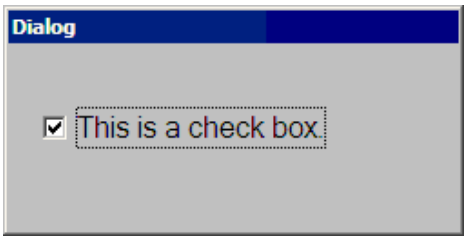
Notes on operation

Input boxes each have a context menu (called by right-clicking the mouse over the box). This menu contains, among other things, commands for copying and pasting text via the Clipboard.

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14.4.5 Check boxes

This widget serves the purpose of activating or deactivating a setting or option. A click on it toggles its state from "On" (the box has a checkmark or X inside) to "Off" (empty box) or vice versa.



Notes on programming:

Events:

- "***Changed***": Generated each time the widget is clicked.

Important functions:

- DlgGetValue, DlgSetValue: Setting and getting the widget's state

Data-linking

A checkbox can be linked to a imc FAMOS variable, in order to display/ edit its current value. If the variable is a data set, the data set's most recent value is always accessed.

When the variable is changed, the checkbox is activated, if the variable's (rounded) value is 1. If the (rounded) value is 0, the checkbox is deactivated. For all other values, the widget's state remains unchanged.

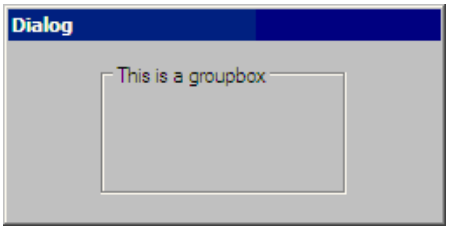
If the checkbox's state is switched (by clicking on it, or by the action of a Kit function), the new state (number 0 or 1) is written to the variable. The moment at which the writing takes place depends on the property "***Apply***":

- "***Auto***": The variable is updated immediately whenever the widget is changed.
- "***On command***": The variable is only updated when the function *DlgApplyData* is called or when the special function button "*Apply*" is pressed.

Notes on operation

If the checkbox currently holds the input focus (distinguishable by a dashed-line frame around the caption), the [SPACE]-key can be used to switch its state.

14.4.6 Groupbox



This widget consists of a labeled frame. It's used to organize multiple logically related widgets under a joint heading.

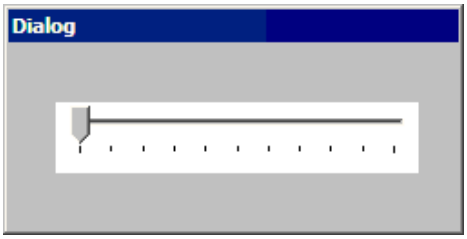
14.4.7 Image



This widget serves to display a (small) picture. It can be used, for instance, to display a company logo or something similar. The image is set permanently when the dialog is designed and cannot be changed during runtime.

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14.4.8 Slider control



A virtual slider control is often used when the user is to be offered to ability to select a value out of a defined value range. Toward this end, a knob can be slid along a linear scale. The actual value set depends on the knob's position and the definitions for the scale's end values.

Notes on designing

A slider control can be oriented either horizontally (the scale is horizontal with the minimum at left) or vertically (the scale is vertical, with the minimum on the bottom). The orientation is determined automatically by the control's shape: if its width is greater than its height, the orientation is horizontal.

The properties "***Range Minimum***" and "***Range Maximum***" set the corresponding numerical values for the lower and upper ends of the slider, respectively.

The property "***Small steps***" applies whenever the user operates the control using the arrow buttons. A typical value would be 1% of the value range.

The property "***Large steps***" applies whenever the user operates the control by means of the keys [PGUP] or [PGDN]. A typical value would be 10% of the value range.

An additional special property of this control is "***Synchronized with widget***". Here, you can enter the name of a text box or single-line input box to be linked to the slider control. Such a widget then always displays the value currently set by the slider. If it's an input box, the linkage works in both directions - if the user changes the value in the input box, the slider is adjusted to the corresponding position.

Notes on programming

Events

- "***Changed***": Generated once the user has changed the current value.

Important functions:

- DlgSetBarRange: Sets the value range
- DlgSetValue, DlgGetValue: Setting and getting the current value

Data-linking:

A slider control can be linked to a imc FAMOS variable, in order to display/ edit its current value. If the variable is a data set, the data set's most recent value is always accessed.

If the value lies outside of the slider control's value range, the closest scale end value is indicated.

Conversely, when changes made on the slider are written to the variable depends on the property "***Apply***".

- "***Auto***": The variable is updated after every change (already when "dragging" the slider knob).
- "***On command***": The variable is only updated upon a call to the function DlgApplyData, or upon clicking the special function button "*Apply*".

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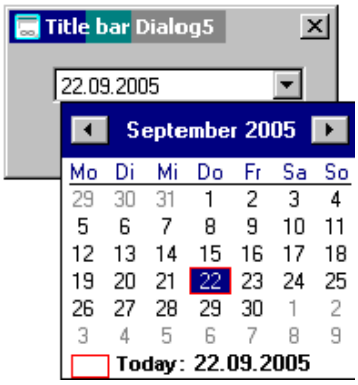
Notes on operation

When the slider control holds the input focus (distinguishable by a dashed-line frame around the caption), the keyboard can be used as follows:

POS1	Positions the knob at the left/lower end of the slider
END	Positions the knob at the right/upper end of the slider
ARROW KEYES	Moves the slider control in the corresponding direction by the value set in the property "***Small steps***"
PGUP PGDN	Moves the slider control in the corresponding direction by the value set in the property "***Large steps***"

14.4.9 Datepicker

The datepicker (calendar) widget serves to display and set the date.



Notes on designing

The property "***Format***" affects the display format.

- "***Date (short)***": Short format, e.g. "12.07.2005".
- "***Date (long)***": Long format with weekday, e.g. "Thursday, July 28, 2005"

Under "***Range Minimum***" and "***Range Maximum***", you can set what the permitted value limits are. User entries lying outside of the range defined here aren't accepted.

Data-linking

A calendar(datepicker) widget can be linked with a variable for the purpose of displaying/changing its current value. If the variable is a data set, the data set's most recent value is always accessed.

A linkage only makes sense if the variable concerned is expressed in the imc time format. Use the functions belonging to the group "*Variables> Date, Time*" for creating and processing them.

The moment at which a date entered by the user is written to the variable depends on the value of the property "***Apply***":

- "***Auto***": The variable is updated immediately when the change is made.
- "***On command***": The variable is only updated upon a call to the function DlgApplyData, or upon clicking the special function button "Apply".

Notes on programming

Events:

- "***Changed***": generated once the user has changed the current value.

Important functions:

- DlgSetValue, DlgGetValue: Setting and getting the current value. The number value is transferred in the imc time format. Use the functions belonging to the group "*Variables> Date, Time*" for creating and processing them.

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Notes on operation

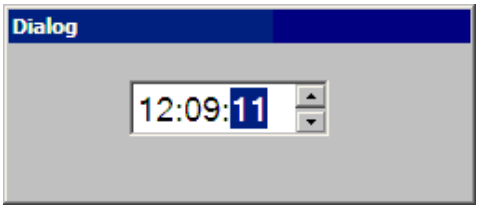
Along with direct entry of the date by means of the digit keys, the following additional possibilities are available:

Clicking on the arrow button at the right of the input box (keyboard operation: [*ALT*]+ "*ARROW DOWN*") opens a dedicated calendar window for easily selecting the date.

In the widget's basic, "shut" state, it's also possible to click on individual components of the date (e.g. the year) and use the arrow keys to make adjustments.

14.4.10 Timepicker

The timepicker widget serves the purposes of displaying and entering the time.



Notes on designing

Under "***Range Minimum***" and "***Range Maximum***", you can set what the permitted value limits are. User entries lying outside of the range defined here aren't accepted.

Data-linking

A time-widget can be linked with a variable for the purpose of displaying/ changing its current value. If the variable is a data set, the data set's most recent value is always accessed.

A linkage only makes sense if the variable concerned is expressed in the imc time format. Use the functions belonging to the group "18> Date, Time" for creating and processing them.

The moment at which a time entered by the user is written to the variable depends on the value of the property "***Apply***":

- "***Auto***": The variable is updated immediately when the change is made.
- "***On command***": The variable is only updated upon a call to the function DlgApplyData, or upon clicking the special function button "Apply"

Notes on programming

Events

- "***Changed***": generated once the user has changed the current value.

Important functions:

- DlgSetValue, DlgGetValue: Setting and getting the current value. The number value is transferred in the imc time format. Use the functions belonging to the group "*Variables > Data types > Date, Time*" for creating and processing them.

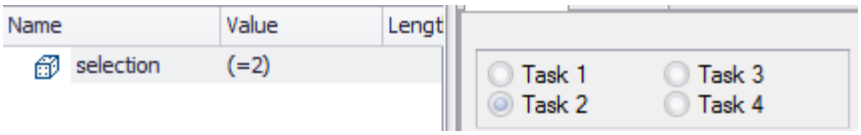
Notes on operation

Along with direct entry of the time using the digit keys, it's also possible to select individual components of the time (e.g. hours) and to use the arrow keys or the arrow buttons at the right edge of the control to "scroll" through the available values.

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14.4.11 Radiogroup

An associated group of radio/option buttons among which exactly one can be selected at any time.



Radio group

The count and captioning of the options is set as the property "*Entries"/"Items*". A options/radio group can be linked to a variable. The running index of the respective selected option is defined as the current state of the option group and this as the value of the linked variable. An option group with 3 options can thus take the value 1, 2 or 3.

Notes on the design

The arrangement is influenced by the size and aspect ratio of the box.

With the property setting "*Frame*" = "*With caption*", the design conforms to that of a groupbox.

Notes on programming

Events

- "***Entry selected***": Triggered when the user manually selects a different option

Important functions:

- *DlgGetValue(), DlgGetSelectedItem()*: Sets and gets the current value. Both functions behave in the same way.
- *DlgSelectItem(), DlgSetValue()*: Sets the option choice. Both functions behave in the same way.
- *DlgGetItemCount()*: Gets the count of available options
- *DlgEnable(), DlgShow()*: Controls visibility/operability
- *DlgSetBackColor(), DlgSetTextColor()*: Sets the background and text color, respectively.
- *DlgSetText(), DlgGetText()* : Sets and gets the frame text if the property setting is "*Frame*" = "*With caption*"
- *DlgApplyData():* Checks the validity of any changes made, and/or applies them to the variables specified

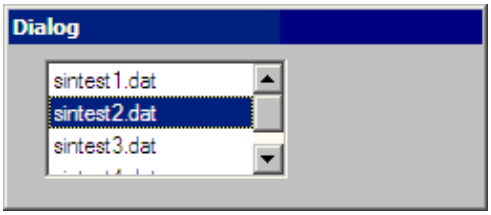
Data binding:

The option/radio group can be linked with a FAMOS variable for the purpose of displaying or changing its current value. If this is a data set, the last value of the data set is always the one applied.

The linkage can be performed by moving the variable onto the dialog element using drag&drop.

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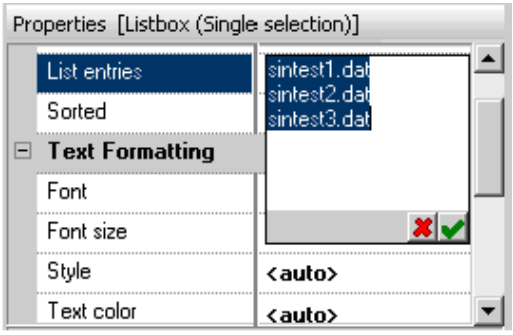
14.4.12 Listbox (single selection)



Listboxes with single selection are used to give the user the option of selecting exactly one entry from a list of available entries.

Notes on designing:

The property "***List-Entries***" defines the contents which the list shows when the dialog is started. By clicking in the Properties-Explorer, you access an edit box in which you can enter the initial content desired.



To add a new line, use the [ENTER]-key. To apply the changes which were made, use the combination of keys [CTRL]+ [ENTER], and to cancel, the [ESCAPE] key or the corresponding button at the bottom of the edit box.

Notes on programming

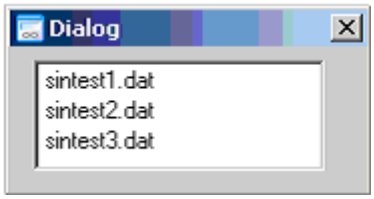
Events:

- "***Double-clicked***": generated when the user double-clicks the mouse over an entry.
- "***Selected***": generated when the current selection is changed by an action of the user (click of the mouse, arrow keys).

Important functions:

- DlgInsertItem, DlgDeleteItem: Inserting and deleting entries
- DlgGetText: Gets selected entry
- DlgGetSelectedItem, DlgSelectItem: Gets or edits index of the current selection
- If the list only contains numbers, the function DlgGetValue can also be used to get the currently selected number.

14.4.13 Listbox (multiple selection)



Listboxes with multiple selection capability are used to give the user the option of selecting one or more entries from a list of available entries.

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Notes on designing

Creating list entries is accomplished analogously to the case of 'Listbox (single-selection) 569' described below.

Notes on programming

Events:

- "***Double-clicked***": generated when the user double-clicks the mouse over an entry
- "***Selected***": generated , when the current selection is changed by an action of the user (click of the mouse, arrow keys)

Important functions:

- DlgInsertItem, DlgDeleteItem: for inserting and deleting entries
- DlgGetItemText: gets an entry's text
- DlgGetSelectedItemCount, DlgIsItemSelected, DlgSetItemSelection: gets and set the selection

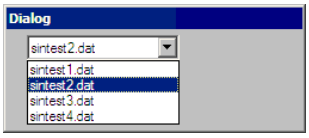
Notes on operation

To add an entry to the current selection or to remove one from the current selection, click on the entry while holding down the [CTRL]-key.

To select a series of entries, first click on the first entry in the series and then on the last entry in the series while holding down the [SHIFT]-key. Alternatively, you can use the [ARROW]-keys while holding down the [SHIFT]-key.

14.4.14 Droplist

Similarly to listboxes, **droplists** are used to give the user the option of selecting exactly one entry from a list of available entries.



Since the actual selection list only pops down on demand, these widgets are mostly used when trying to conserve space in the dialog, or when there are a large number of entry alternatives.

Notes on designing

Creating list entries is accomplished analogously to the case of 'Listbox (single-selection) 569' described above.

Notes on programming

Events:

- "***Selected***": generated when the current selection is changed by an action of the user (click of the mouse, arrow keys)

Important functions:

- DlgInsertItem, DlgDeleteItem: inserting and deleting entries
- DlgGetText: gets selected entry
- DlgGetSelectedItem, DlgSelectItem: gets/edits index of the current selection
- If the list only contains numbers, the function DlgGetValue can also be used to get the currently selected number.

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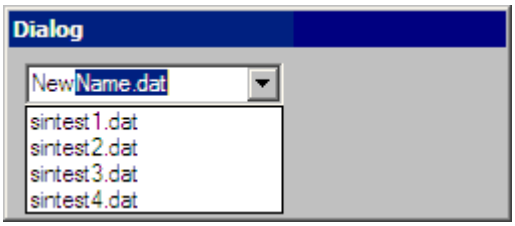
Data-linking:

A droplist can be linked to a imc FAMOS variable. The imc FAMOS -variable's value is the index of the currently selected entry. A value of 1, for instance, means that the first list entry is selected. If the variable is a data set, the data set's most recent value is always accessed.

The moment when a changed selection is adopted by the linked variable depends on the value of the property "***Apply***":

- "***Auto***": The variable is updated immediately when the change is made.
- "***On command***": The variable is only updated upon a call to the function DlgApplyData or upon clicking the special function button "Apply".

14.4.15 Combobox



A **combobox** is a combination of the single-line input box and a droplist. It is used whenever the user is supposed to have a large selection of already available alternatives, but also the option of making a freely specified entry.

Notes on designing

Creating list entries is accomplished analogously to the case of 'Listbox (single-selection) 569' described above.

Notes on programming

Events: None

Important function:

- DlgInsertItem, DlgDeleteItem: for inserting/deleting entries
- DlgSetText, DlgGetText, DlgSetValue, DlgGetValue - setting/getting the box's contents

Data-linking:

A combobox can be linked with a variable for the purpose of displaying/ changing its current value. If the variable is a data set, the data set's most recent value is always accessed.

The formatting of the number value for the display is independent of what data type is specified ("***Data-linking: Data type***").

Integer	The value is rounded to the next integer. Readout always without exponent.
Real number	The value is displayed in the numerical format "real" with up to 6 decimal places. Depending on the numerical value's magnitude, either fixed- or floating point numerical format is selected.

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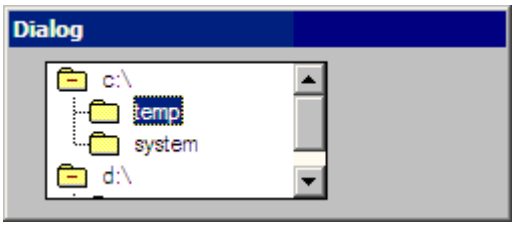
If the user changes the input box's contents, then the system checks before adopting the new content whether it can be converted to the data type specified.

In the group "***Input Validation***", it's additionally possible to define a permitted value range. If the user enters a number outside of the permitted range, or if the input can't be converted to a number, the user is notified by a message box.

The property "***Apply***" sets when the entries made by the user are validated and adopted in a linked variable.

- "***Auto***": Validation and adoption of the entry occurs immediately when another entry is selected from the list. If entries in the input box are edited, they are only applied once a dialog button is pressed or a menu item is selected.
- "***On command***": Validation and adoption happen only when the function DlgApplyData is called, or upon clicking on the special function button "*Apply*".

14.4.16 Tree diagram

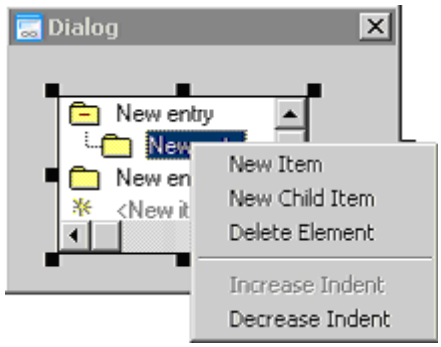


This widget is used to display data in a hierarchical branching diagram. A filing system diagram would be an example of this.

Notes on designing:

To **initialize the tree diagram with items,** proceed as follows:

- Select the tree diagram
- To add an item to the end, double-click on the gray entry "*New item*"
- To add an item after an existing item, select it first and then in the **context menu** (accessed by right-clicking the mouse) select the menu item "*New item*" or "*New Child Item*"



- To delete an entry or to change its indent (distance to the left edge), there are also corresponding items available in the context menu.
- Using the drag&drop technique with the mouse, you can re-position an item vertically in the hierarchy.

To **change a line's properties**, first select the desired line. In the Properties Explorer, you can then change the caption and image. For changing the caption it's also possible to double-click the corresponding line.
Each line can be assigned its own **image**. Please note that all the images must be of the same size!

Notes on programming

Events:

- "***Widget double-clicked***": Generated when the user double-clicks the mouse over an item's caption (to the right of the image). In keyboard operation, the [**ENTER**]-key is also interpreted as a double-click.
- "***Item selected***": Generated when the current selection is changed by an action of the user (mouse click, arrow keys).

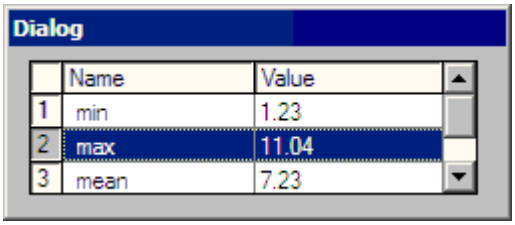
Important functions:

- DlgInsertTreeItem - inserts items
- DlgSelectItem / DlgGetSelectedItem - sets/gets the selection
- DlgGetItemText - gets an item's caption

Notes on operation

The buttons **[+]** and **[-]** expand or collapse branches, respectively. The [**ENTER**]-key has the same effect as double-clicking on the caption of the selected entry and also triggers the event "Double-clicked".

14.4.17 Table



The **table view** offers tabular display of data. Optionally, the user can have the opportunity to directly edit the contents of individual cells at runtime.

One example of an application would be a list of data sets; the first column contains the data set's name and the following columns contain additional information such as the size, sampling interval and data type.

The amount of columns is set permanently during the designing phase and cannot be changed during runtime.

A table's maximum size is 128 columns x 1024 rows.

Note: This widget is quite unsuitable for displaying large amounts of measured data in tabular form. Instead, use a curve window in tabular mode.

Notes on designing

For all of the following actions, the corresponding table widget must be selected.

Setting the column/row header text

Move the mouse to the upper edge of the column header / to the left edge of the row header.

The cursor's shape changes to: 

Click the mouse and enter the desired text, then hit [ENTER] to confirm entries or [ESCAPE] to reject them.

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Setting the column width

There are 3 different modes available for determining the column width:

Optimum width:	The column widths are automatically adjusted so that all cell contents are completely visible, without being truncated. If the sum of all the column widths is greater than the table's width, a horizontal scroll bar is automatically added.
Full visibility:	The available table width is divided equally among the columns. This can cause the cell contents to appear truncated during runtime.
Fixed:	The column width set during the design phase is retained. In order to change the column width during runtime, move the mouse over the dividing line between two column headers. The cursor changes its shape to: ✢ By means of the drag&drop technique, the column borders can now be shifted.

The width of the column with the row headers is always set automatically, so that all the texts it contains are completely visible.

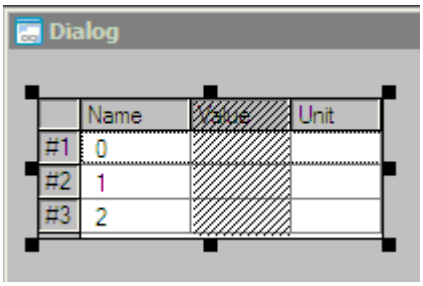
Column-specific properties

Some properties can be set for each column individually. These include the colors, for instance, or the data format and whether the user has permission to edit cells.

To change these properties, first move the mouse to the desired table column's upper border.

The cursor's shape changes: ⬇

Then, click on the mouse. The selected column appears in hatching and the corresponding properties are displayed in the Properties Explorer.



Notes on programming

Events:

- "***Item selected***" : generated when the user changes the row selected in the table.
- "***Changed***" : Generated when the user changes the content of a table cell. The table column must possess the property "***Cells editable***".

Important functions:

- DlgInsertItem: adds table rows
- DlgSetCellText, DlgSetCellValue, DlgGetCellText, DlgGetCellValue: sets/gets the cells' contents

Data-linking

Each column can be set to have its own data format. This is only used for formatting the output if a numerical value is assigned to the cell by means of the function DlgSetCellValue or by user input during runtime. The formatting is accomplished in a manner analogous to that for 'Text box 561'.

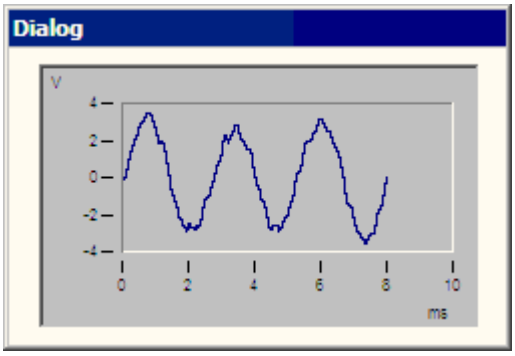
Notes on operation

If the property "***Cells editable***" was assigned to a column of the table, the user can edit the cells contents while the dialog is up. After double-clicking on the desired cell, an edit box appears in which the desired changes can be made. The key [ENTER] causes entries to be adopted, [ESCAPE] cancels them.

If the table column is assigned a special data format, the new entry is only accepted if the format matches.

14.4.18 Curve window

Curve windows which are used to display measured data in imc FAMOS and other imc applications can also be adopted as widgets.

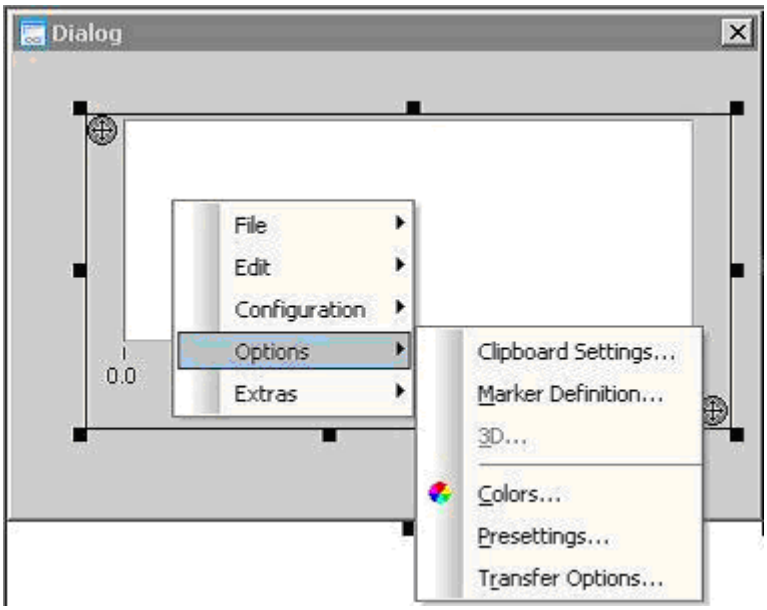


Notes on designing

To set up a curve window, select the group "Curve Window" from the toolbox and then select the desired display mode. The display mode can be changed at any later time.

The waveforms to be displayed can be configured either during the designing phase or can be specified using Kit functions during runtime. For details, see the section *"Selecting waveforms to display"* below.

To configure the curve window, use the context menu (accessed by right-clicking the mouse).



Double-clicking on an axis calls the dialog for setting the respective axis.

When the dialog is saved, the complete curve configuration (which can include the display mode, axis scaling, names of the variables displayed, etc.) is saved along with it.

If you wish to use the mouse to change the curve window's position, click the mouse over the symbol ⊕ (in the upper right or lower left corner), and use the drag&drop technique to move it to the position desired. Clicking the mouse once on the symbol additionally calls the standard context menu for widgets ("Cut", "Copy" etc.).

To learn about the configuration and operation of the curve window, see the online help for the curve window or refer to the imc FAMOS manual "*Shared Components*".

Notes on programming

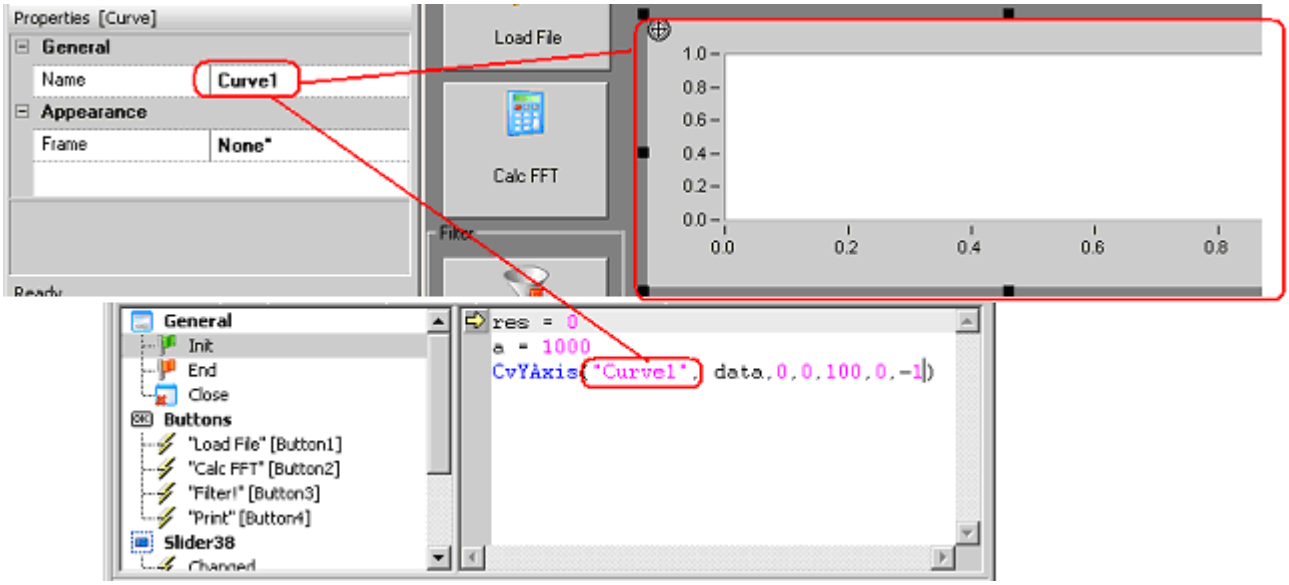
Events: None.

Important functions:

- To govern the curve window, use the functions belonging to the "**Curve**"**-Kit**. This is included when the program is properly installed ("Kits" page in the imc FAMOS functions list). **The curve widget's name must be supplied as the first parameter of all these functions..**

Example

Adding the data set "*Data*" to the curve widget "*Curve1*" (with its own y-axis, scaled from 0 to 100):



Selecting the data sets to display

Case 1:

The names of the variables to be displayed are fixed; for example, while the dialog is up, the variables "Data" and "Result" should always be displayed.

Procedure: Create data sets in imc FAMOS with the desired names, never mind the contents. Configure the curve window in the Dialog-Editor as desired (context menu: "*Configuration": "More channels..*"). When the dialog is saved, the curve configuration thus made is also saved.

When the dialog is loaded at runtime, the system checks whether variables whose names match the names in the curve configuration exist . These are then automatically displayed.

Case 2:

The names of the data sets to be displayed are variable, while the basic curve window structure (display mode, amount of data sets displayed) is fixed.

Procedure: While designing, created the necessary amount of waveforms with self-explanatory names, such as "Placeholder1", "Placeholder2"... and then proceed as in Case 1.

Then you use the function CvReplaceChannel, (from Curve Kit) to fill the placeholders during runtime with the actual data sets to be displayed.

```
CvReplaceChannel("Curve1", Data, "Placeholder1")
```

Case 3:

The composition and structure of the curve window aren't yet known during the design phase.

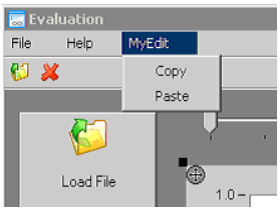
Procedure: Use the functions from the Curve-Kit like CvYAxis, CvXAxis, CvAttrib etc., in order to build up the curve window "from scratch" during runtime.

Notes on operation

Like in the design mode, here, too, all configuration and operating capabilities (context menu, double-clicking on axes) are available.

Operation of the imc curve window is extensively described in the online help for the curve window, as well as in the imc FAMOS manual "*Shared Components...*".

14.4.19 Menu- and Toolbar



Dialogs can have a menu bar, which always appears at the dialog's upper edge directly below the title bar. Especially for more complex applications, a well-structured menu provides a convenient overview and total access to the available actions. To each menu item, its own event sequence is assigned, which is run when the respective menu item is selected.

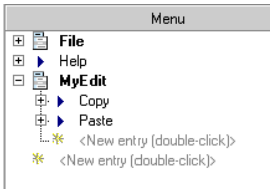
Dialogs with a menu bar can also have a toolbar directly under the menu. Here, the items can be called directly via a corresponding icon button. Typically, menu commands which are used often are placed in the toolbar as well in order to provide quick access.

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Notes on designing

Creating a menu

To create a menu or to add or remove items, use the "Menu" page in the toolbox. A representation of the current menu appears in tree diagram form.



Here, the top-level menu positions appear as the root items in the tree diagram, which, when expanded, show their respective submenus.

All menu positions at which an additional entry would be possible have a placeholder in gray typeface called "New item". To **add a new item**, simply double-click on such a placeholder and enter the desired menu text in the edit box which appears.

To **delete an item**, open the context menu (right mouse click) and select the command "*Delete*".

By means of drag&drop you can **change an item's position**. To do this, click on the entry to be moved and drag it to the desired position while holding the mouse button down.

Altering properties

To display the properties for a menu item, click either on the menu item (or the toolbar button assigned to it) or on the corresponding item in the menu editor.

In order to also place a menu item on the toolbar, set the value of the property "***Toolbar***" to "Yes".

You can also use the property "***Shortcut key***" to set a combination of keys, which then initiates the same menu command.

Images assigned to the menu items must have the fixed size 16x16 pixels.

Notes on programming

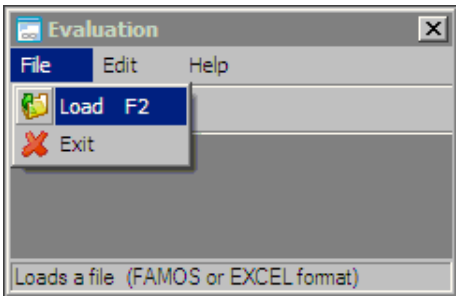
Events:

- ***"Menu item selected"***: Generated when a menu item is selected or if the corresponding toolbar button is pressed.

Important functions:

- DlgEnable: disables menu items

14.4.20 Status bar



The **status bar** is always shown on the dialog's bottom edge and generally serves the purpose of displaying the application's current status or the status of an operation. A typical use is to display a short help text for the menu item which has been selected.

Notes on designing

If your dialog has a menu, it's a good idea to supply a short help text for the menu items under their property "***Infotext***", which explains the menu item's function. If the user then selects a menu item at runtime, this text is automatically displayed in the status bar.

Notes on programming

Events: None.

Important functions:

- DlgSetText: Changes the status bar's text. The function's first parameter must be set to the fixed name "#Status".

Example

```
DlgSetText("#Status", "Please wait...")
; ...performing long calculation...
DlgSetText("#Status", "Done.")
```

15 Exporting a report

Pages which were created with the **Report Generator**or the **Panel** can be exported in a variety of graphics formats. Alongside Adobe's PDF format, there are a number of standard Windows graphics formats from which to choose, in order to insert your reports into other Windows programs.

This table indicates the techniques for perform export from each source:

	Toolbar	Menu	Sequence
Panel	icon 438	Menu:Page 135 or context menu 439	PnExportPDF and PnExportGraphics
Reportgenerator	icon	Menu:File:Export	RgDocExport and RgDocExportEx

imc FAMOS supports the following export formats:

	EMF	*WMF*	*BMP*	*PNG*	*JPEG*	*PDF*
Report generator	√	√	√	√	√	√
Panel	√		√	√	√	√

Portable Networks Graphics (PNG)

Bitmap-format with a special compression algorithm. Used especially in the Internet. It was developed as a free alternative to the GIF-format, which requires a license.

JPEG-Format (JPG)

Bitmap-format with special compression algorithm. Used especially for image and photo editing and in the Internet.

Enhanced Metafile (EMF)

This graphics format doesn't store graphics data pixel-by-pixel, but consists of a list of graphics commands which can re-create the graphic.

Windows Metafile (WMF)

"*Windows Metafile*", also known as "Aldus Placeable Metafile". The Basic structure is the same as for EMF, but contains additional info on the scaling and positioning of the graphic.

Windows Bitmap (BMP)

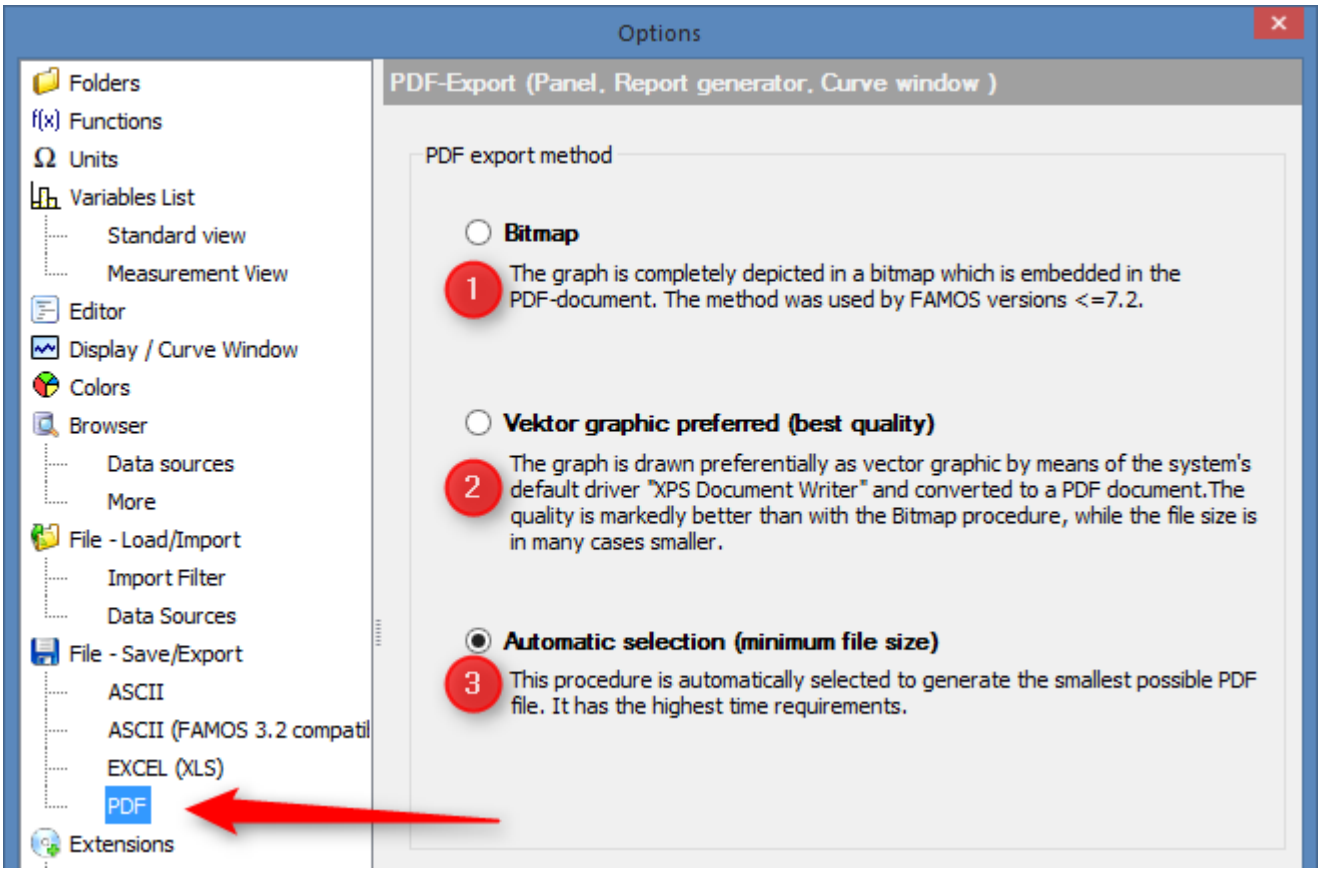
Standard Windows format for pixel graphics. Color data is stored for every single point in the image. The data are not compressed.

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PDF-Format

Adobe PDF (Portable Document Format) is an open file format developed by Adobe Systems which has become the industry standard format for documents.

Under *Extras:Options:File - Save/Export:PDF*, you can set the export behavior:



PDF-Export settings

When creating the PDF file, graphics can be generated either as a bitmap or vector graphic. The rule of thumb is:

- Documents having a **high proportion of texts** and **simple curve graphics** produce smaller files with the **vector method**.
- Documents having **complex curve graphics** and **large numbers of symbols** produce smaller files with the **bitmap method**.

1. ***Bitmap:*** Graphics and text are embedded as a bitmap. With curve windows having normal time plots, this generally produces larger files of lesser quality than with vector graphics.
2. ***Vector graphic preferred:*** By means of Windows XPS Document Writer, texts and graphical sections are exported as individual objects and thus displayed in **highest and most scalable quality**. For text and "simple" graphics, this setting provides the best quality and smallest file size. However the file size advantage is reversed when the graphics are complex. Curve windows with symbols representing each measurement point, or with very many values, have much higher memory requirements for this technique.
3. ***Automatic selection:*** With this setting, FAMOS produces the file according to the procedure which produces the smallest file size.

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Notes on selecting the graphics format

The format to use of course depends on the importing capabilities of the target application (in other words, of the program which is to later load and display the file). Therefore, check first what graphics formats are supported by the program. If it supports several formats, take the following considerations into account:

- **PDF** is optimally suited if the completed report is to be passed on to others for viewing and printing out. For these purposes, the program "Adobe Acrobat Reader" is available free of charge.
- The **Metafile formats** (**EMF, WMF**) are **generally well** adapted to saving **texts** and **line graphics**. The stored graphics files are relatively small and the graphics can be re-scaled without sacrificing quality. However, these advantages only apply if the graphic doesn't contain large grid graphics such as curve representations as color maps. For reports containing only text, tables and curve displays in standard or waterfall representation, this is a well-suited format in principle. But: many programs have problems displaying metafiles. Therefore, make sure that the target application is able to display the graphic correctly.
- In contrast to metafiles, the **Bitmap-formats** (**BMP, PNG, JPG**) save color data for each point in the image. Thus, a certain resolution (and thus file size) for the graphic is determined, and subsequent changing of its size generally leads to a reduction in quality.
  - **Bitmap-formats** should be used if the report itself contains large embedded bitmap graphics (e.g. **color map representation**) or if the target application can display metafiles only incorrectly or not at all. Since no data compression is performed, however, the files can become awkwardly large (depending on the color depth set).
  - In such cases, it would be better to use a compressed format like **PNG** or **JPEG**. PNG is preferable where it is possible, since it generally offers better configurability and, in the case of line graphics which are mainly involved, better quality in conjunction with smaller file size.

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16 Data-Editor

16.1 Introduction

The integrated Data Editor allows you to display, compare and change data sets in a table. In addition to the standard edit functions such as copy, cut and paste, there are several special functions available for processing data.

Data sets can be displayed with reference to trigger instant and sampling rate. This makes it easier to find and evaluate events occurring at the same time.

The integrated search function allows you to find values which lie within or outside of predefined interval.

The curve window and table display can be linked so that they both display the same position in the data set. This allows you to "roll through" a data set and observe the current section in the curve window as well as in the table window.

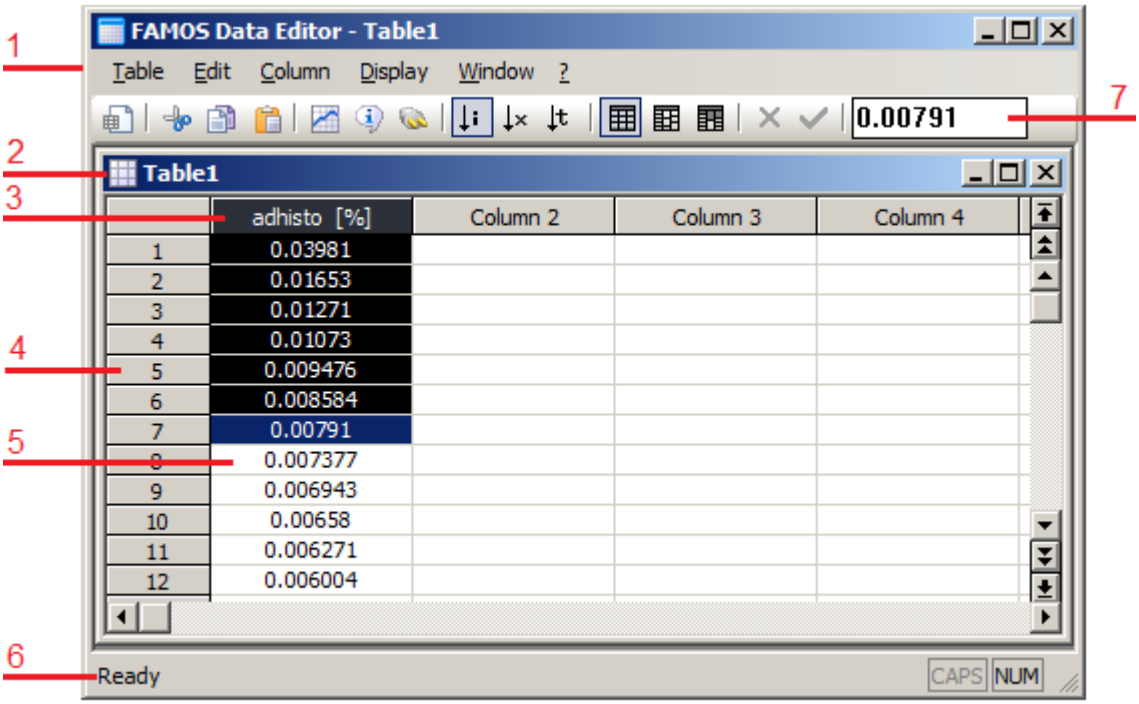
Use the Data Editor to edit existing data sets by adding, appending or deleting values. Completely new data sets may be generated, which can then be used as reference curves or as parameter sets for mathematical functions.

16.2 Start

Start the Data Editor using menu item "Extra / Data Editor", the button in the tool bar or the <F10> function key. If variables are selected in the list when the Editor is started, these are displayed in the first table window.

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16.3 Interface elements

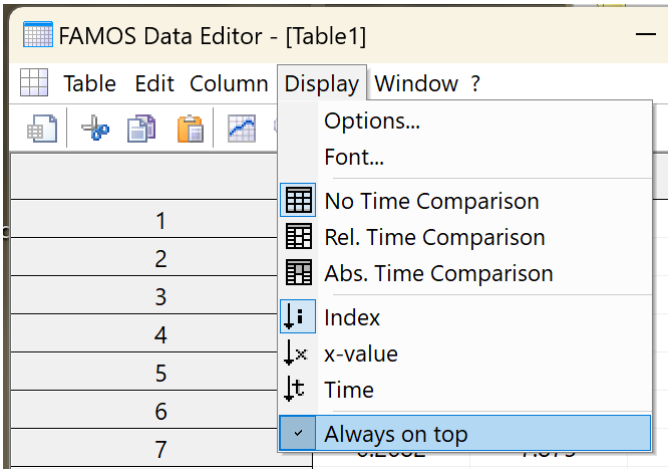


The main window's editor has a **menu- and toolbar [1]**. Along with various buttons which provide quick access to selected menu commands, the toolbar also has an **input box [7])** for entering or editing values. At the bottom edge is a **status bar [6]** which displays either status info or brief descriptions of the menu item currently selected.

The main window's workspace displays **table windows [2]**. Starting the editor generates a table window of maximum size. If desired, additional tables can be created and positioned wherever the user wishes.

A table window's workspace consists of the **table header [3]** showing the names of the variables currently being displayed, a **scaling column [4]**, and the **data columns [5]** containing the values.

Always on top



By default, the editor behaves like a separate program, independent of the FAMOS main window. This can lead to the editor being completely hidden by the main window or a curve window.

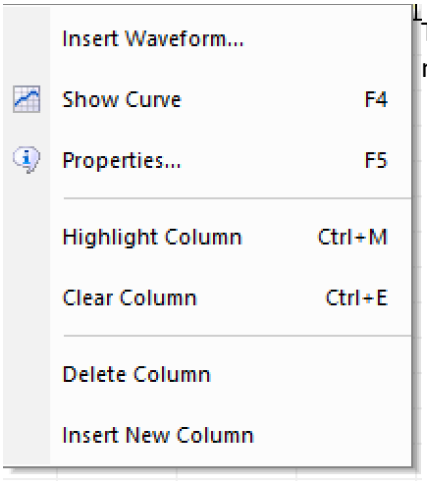
The menu item "*Display\Always on top*" provides a remedy so that the Data-Editor always remains in the foreground.

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16.4 Context menus

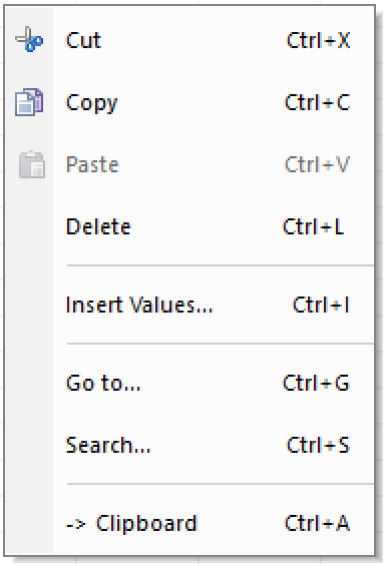
Many menu items are more readily accessible via the context menu.

By right-clicking the mouse on the table header, the corresponding column is activated and the context menu depicted below appears.



The same items can be found under the heading "Column" of the main menu.

By right-clicking the mouse in the core of the table, a different context menu is called, which offers items for use in editing the current selection.



These items are also available in the menu "Edit."

16.5 Opening and closing a cable

A table window is created and displayed immediately when the Data Editor is started. Open new tables using menu item "Table / New", or the corresponding button in the tool bar.

To close an active table window, use menu item "Table / Close", the key combination <Ctrl> + <F4>, or the system menu in the table window

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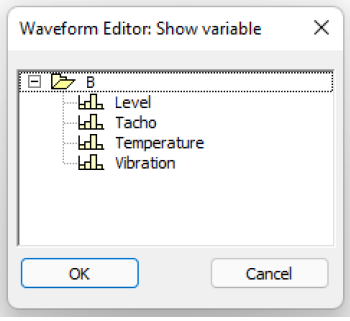
16.6 Activating tables and columns

When several tables are open, activate the desired table by clicking with the mouse on the table or by clicking above the "Window" menu in the main window. Use the key combination *<CTRL> + <F6>* or *<CTRL> + <SHIFT> + <F6>* to go through the list of open windows either forwards or backwards.

Each table has an active column (column head displayed in negative) which contains the active input cell. Select the active column by clicking on the head or by horizontal movement of the input cell.

16.7 Show Variable

If variables where selected in the variable list when the Data Editor is started, they are displayed immediately in the first table. To display further variables, double-click on the head of the desired column or use the menu item "*Column / Insert Data set*". A list appears in which one or several variables can be selected from those presently available. The selected variables are then displayed in the table starting from the active column.



Data Editor, dialog: Show Variable

The same presettings are valid for displaying channels in groups and components in this list as for the variable list in the imc FAMOS main window (menu item Extra / Options / Variable list").

If a variable is already displayed in a column which should be assigned a new variable, it is deleted from the table and the new variable is displayed in the column.

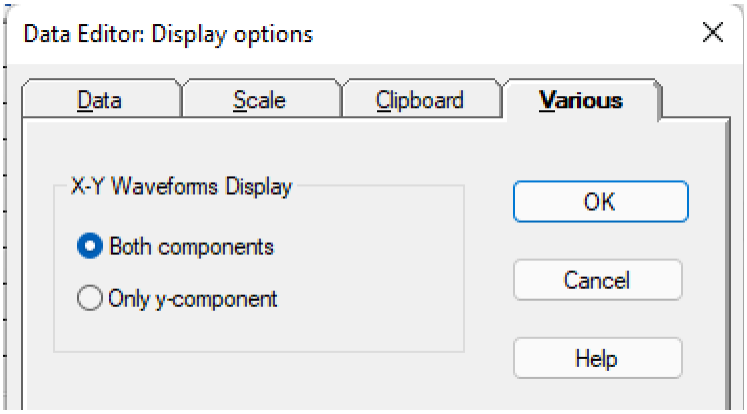
Drag&drop can also be used to "drop" variables from the variable list in the main window or from the curve window above the column head, which are then displayed starting from this column.

To release a column, i.e. to end the display of the variable in this column, activate the column and use menu item "Column / Clear column. You may also close the table and continue working in a new, empty table.

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XY-data sets

For the display of XY-data sets you can specify whether to display both components of the data set by default or whether to display only the y-values. The setting is performed in the dialog "*Display / Options*", on the page "*Various*".



Data Editor, dialog: Display / Options / Miscellaneous

Both components

The x-component is displayed in the active column, the y-component in the adjacent column to the right.

Only Y-component

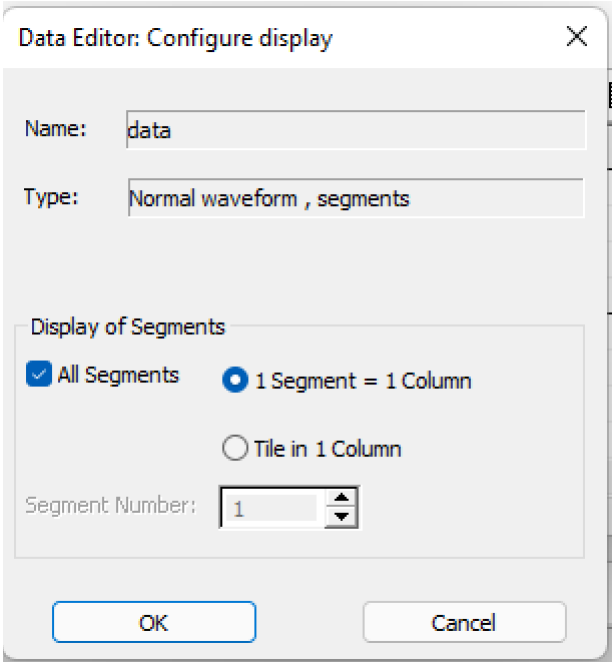
The y-component is displayed in the active column.

The option is the sensible one in cases where several data sets, all having the same (non-equidistant) time stamp, are being displayed alongside each other; the x-component (= time stamp) is the same in any case and it can be displayed in the scaling column at left.

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Segmented data sets

Whenever a segmented data set is selected for display in the Data Editor, the dialog depicted below, which allows you to specify details of the display, automatically appears.



Data Editor, dialog: Configure Display, segments

All Segments

All segments of the data set are displayed.

If the option "**Tile**" is activated, the individual segments are listed in separate columns one beside the other. Otherwise, the values of the entire data set is displayed in one continuous column, each event after the last.

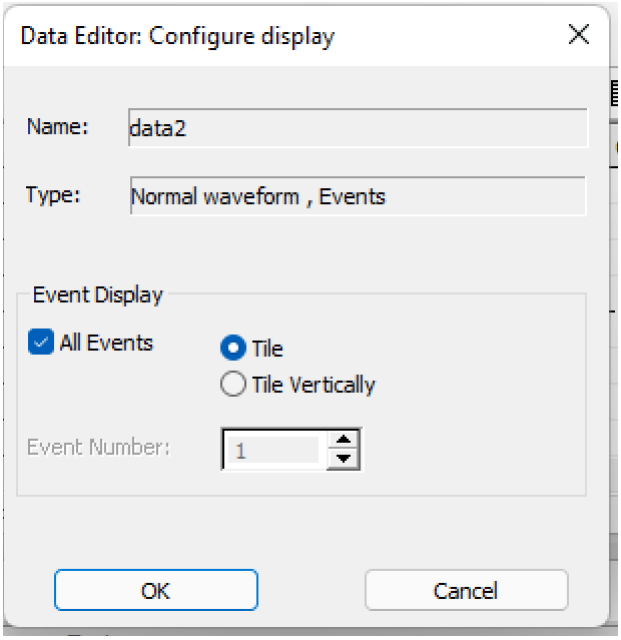
Segment Number

This input box becomes accessible when the option "*All Segments*" is deactivated. The ("serial") number or "index" of the particular segment desired (a number between "1" and the total amount of segments in the data set) is entered here.

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Multi-event data set

Whenever a multi-event data set is selected for display in the Data Editor, the dialog depicted below, which allows .you to specify details of the display, automatically appears.



Waveform Editor,: dialog Configure Display, events

All Events

All events of the data set are displayed. If the option "**Tile**" is activated, the individual events are listed in separate columns one beside the other. Otherwise, the values of the entire data set is displayed in one continuous column, each event after the last.

Event Number

This input box becomes accessible when the option "All Events" is deactivated. The ("serial") number or "index" of the particular event desired (a number between "1" and the total event count in the data set) is entered here.

16.8 Inserting and deleting columns

Menu item "*Column / Delete Column*" erases an entire column from the display. The columns located to the right of the deleted column are shifted to the left in order not to leave an empty column in the deleted column's stead (this contrasts with the effect of "*Column / Clear Column*").

The menu item "*Column / Insert New Column*" inserts a new, empty column to the left of the active column; the columns following are shifted to the right.

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16.9 Positioning the input cell, scrolling and marking

In order to enter or change a value, the active input cell must be positioned on the specified value. Click with the mouse on the cell or use the direction keys to change the position of the input cell. The active input cell is highlighted in the color of the buttons, usually gray.

The section of the table currently visible can be changed by moving the input cell with the direction keys or by using the scroll bars in the table. The section is changed so that the input cell is always visible.

The vertical scroll bar always refers to the position of the active column. The inner arrow key causes scrolling around a cell, the middle direction key around 1/100th of the total length of the displayed waveform; the outer direction keys are positioned at the beginning or the end of the data set in the active column.

The direction keys have the following meanings:

← → ↑ ↓	once cell in the specified direction
HOME	1st value in the active column
END	last value in the active column
PAGE ↑	1 page up
PAGE ↓	1 page down
CTRL+ HOME	1st column
CTRL+ END	last column
CTRL+ PAGE ↑	1 page left
CTRL+ PAGE ↓	1 page right

Use menu item "Edit / Go to" to go directly to a value or "Edit / Search" to search for values in a specified range.

To **mark** a section of the table, drag the mouse across the desired range (hold down the left mouse button) or use the arrow keys and press <SHIFT> at the same time.

Several columns can be selected only when the table is in the basic display mode (menu item "Display/ No time comparison").

To completely mark an active column, use menu item "Column/ Highlight Column".

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16.10 Entering and editing individual values

In order to enter or change a specified value, the active input cell must first be positioned on this value. Click with the mouse on the desired cell or move the input cell with the arrow keys.

To enter a new value or overwrite an existing value, simply enter the new value using the keyboard. The table changes from the "*READY*" mode to the "*INPUT*" mode (see status bar). Confirm the entry with <Return> or a direction key, if the next value is to be entered in the adjacent cell. <Esc> cancels the entry and the "old" value is restored in the cell.

The "*CHANGE*" mode must be active in order to change an existing value. Click on the input box in the tool bar or use the key combination <Ctrl> + <F2>. The value in the input box may then be changed in the usual way. Confirm changes by selecting <Return>, reject changes with <Esc> . The buttons found to the left of the input box may be used as an alternative to the keys. The table then returns to the "*READY*" mode.

The differences between the three input modes are emphasized in the following:

READY:	The direction keys move the input cell. Change to INPUT mode by pressing a number or letter key.
INPUT:	Overwrite the content of a cell. The direction keys end the input mode and reposition the input cell.
CHANGE:	Change the content of a cell in an input box in the tool bar. The direction keys move the cursor in the input box.

16.11 Cut, Copy, Paste, Delete

All of these options are accessed by selecting menu item "*Edit*". Apart from "*Delete*", the buttons in the tool bar can be used.

Cut

The current marking is cut out of the displayed waveforms and inserted in the clipboard. This marking contains at least the current input cell and can be extended (<*SHIFT*>+ direction key, drag the mouse).

Copy

Select this option to copy the current marking to the clipboard.

Paste

Values cut or copied to the clipboard using "*Cut*" or "*Copy*" are inserted in front of the active input cell. The length of the data set increases.

Remarks

The commands Cut, Copy and Paste use a basic text format when exchanging values in the Clipboard, which stores numbers by line and separates columns by a space. This format can be created or imported by many other Windows applications.

To transfer data to other applications using the Clipboard, use menu item "*Edit / -> Clipboard*". The actual format (e.g. separators between columns) can be predefined using menu item "*Display / Options*".

If you wish to transfer number series to the Report Generator, please refer to the section 'Transfer to Report Generator'.

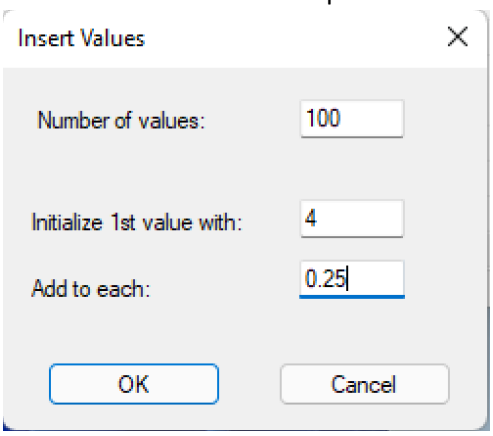
Delete

Select this option to delete the marked cells from the displayed waveforms, which shortens the length of the data sets.

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16.12 Insert Values

Enter a defined number of pre-initialized values in front of the active input cell using "*Edit/ Insert Values*".



Data Editor, dialog: Insert Values

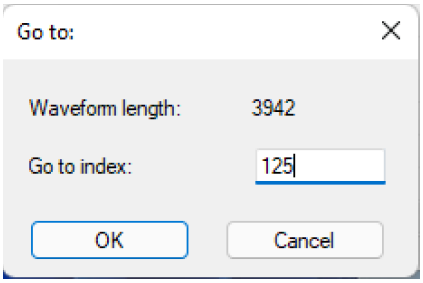
Enter in the dialog the number of values you wish to insert. Specify the values in the input boxes "*Initialize 1st value with:*" and "*Add..*". If a zero (0) is entered in "*Add..*", a series of constant values is inserted; a value not equal to zero (0) results in a ramp with the specified slope.

If the the values are to be inserted into a two-component data set, specifications must be made for both components, since the length of the components must always be the same

16.13 Creating a new variable

Move the input cell over an empty column to the first position. The first value in the data set can now be entered or use "*Paste*" or "*Insert Values*" to insert a series of values. The new data set is given a default name (de_+ current number) and also appears in the variable list in the main window. The name, as well as all other characteristics of the data set can be changed in the dialog "*Properties*" (menu item "*Column / Properties / Charact.*").

16.14 Go to...

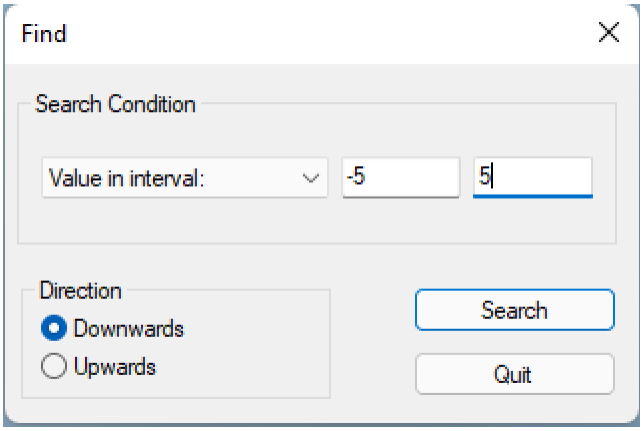


Data Editor: Go To... dialog

In the active column, you can skip straight to the value having a specified index (position in data set). Then the input cell is at the position desired.

16.15 Value Search

Search in the active column for values fulfilling specified conditions using menu item "Edit/ Search", beginning at the current input cell.



Data Editor: Search dialog

Specify the direction and criteria ("condition") for the search in this dialog.

The conditions (criteria) available in the list are:

Value less than:	value to find < specified amount
Value greater than:	value to find > specified amount
Value equal to:	value to find = specified amount
Value in interval:	specified amount 1 < value < specified amount2
Value NOT in interval:	value < specified amount OR value > specified amount2

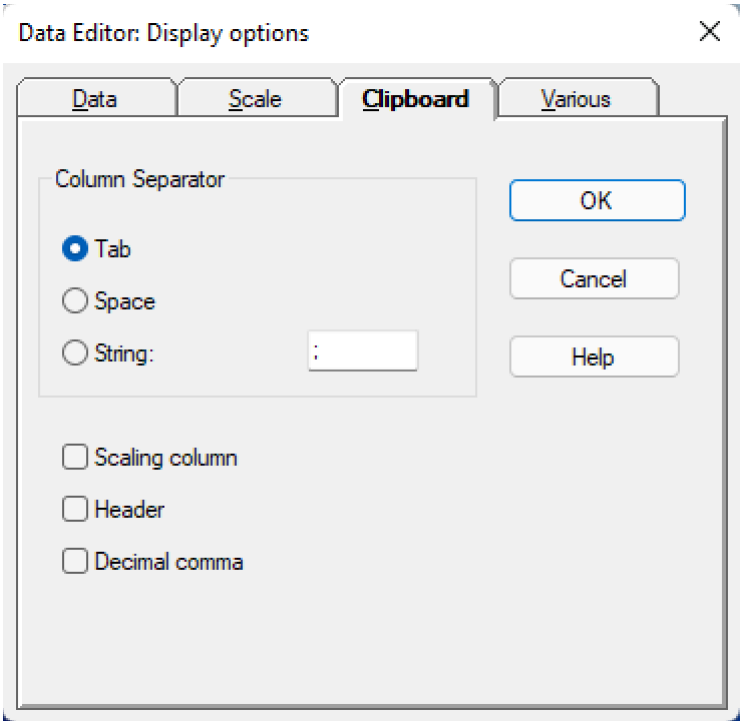
When you click on the button "*Search*", the search commences. If any value fulfilling the conditions is found, the input cell is positioned at this value, otherwise a message box appears.

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16.16 Copying a selection to the Clipboard

Select "*Edit/ ->Clipboard*" to transfer data to other applications via the Clipboard. The specific format can be specified using "*Display/ Options*".

If you wish to transfer number series to the Report Generator, please refer to the section "*Transfer to Report Generator*".



Data Editor: Display Options/ Clipboard

Column Separator

Choose between a tab, a space or a freely definable character string. For example, EXCEL requires a tab as separator.

Scaling column

The scaling column is stored in the Clipboard when this option is selected.

Header

Specify here whether the header (i.e. names of the variables) should be stored.

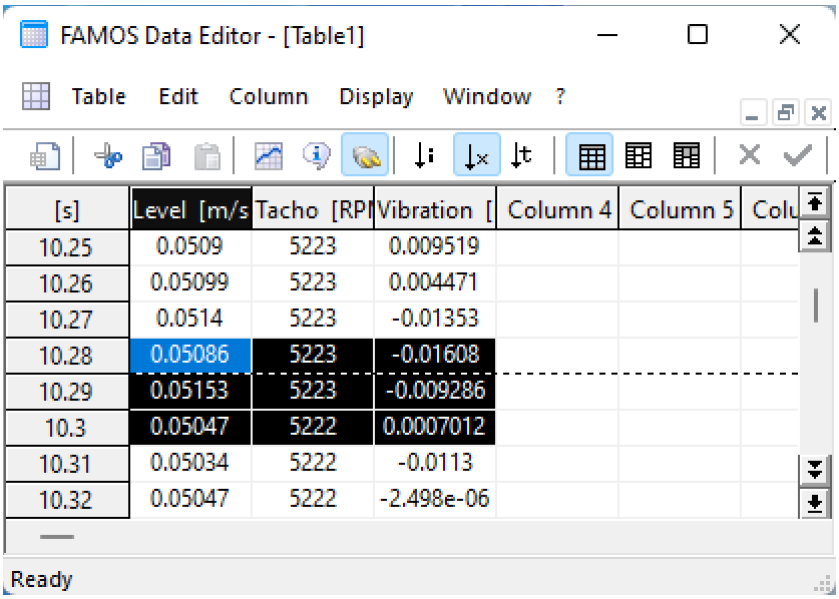
Decimal comma

imc FAMOS uses a decimal point when displaying numbers. Specify here if a decimal comma should be used. Otherwise, numbers and the scaling column are saved in a manner analogous to the representation currently set in the table window.

Example

The marking below is to be copied to the clipboard using menu item "Edit"/ "Clipboard".

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Options: Separators " ; ", no header, no scaling

```
362.7 ; 0.00122074
362.8 ; 0.00122074
362.9 ; 0.00122074
363 ; 0.00122074
363.1; 0.00122074
```

Options: separator tab, header, scaling and decimal comma

```
                    E0_6_113.X   E0_6_113.Y
10.06.93  19:24:22    362,7       0,00122074
10.06.93  19:24:22    362,8       0,00122074
10.06.93  19:24:22    362,9       0,00122074
10.06.93  19:24:23    363          0,00122074
10.06.93  19:24:23    363,1       0,00122074
```

16.17 Show curve

Use menu item "Column/ Show Curve" to open a curve window in which the variables in the active column are displayed.

Drag&drop can also be used to display a table column in an existing curve window.

Move the mouse in the beginning of the desired column, click to the left, hold down the mouse button and move the mouse over the desired curve window. Release the mouse button there.

The variable is displayed in the following form, depending on the position of the mouse when it is released:

- above/below a coordinate system: a new coordinate system is created and the variables are displayed in the new system.
- within a coordinate system: the variables are displayed with a new axis in this coordinate system.
- on one y-axis: the variables are displayed in this coordinate system with reference to the y-axis.

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16.18 Properties

Select menu item "*Column / Properties*" to call a dialog in which the characteristics of the variable in the active column can be viewed and changed. The dialog can be also be called in the main window using "*Variable/ Properties*".

Reference

The dialog is described in detail in the chapter 'Variables', section 'Showing and changing properties 295'.

16.19 Cell height and width, font

Set the desired **font** for the table window using menu item "*Display/ Font*". Select the desired font from the list which appears in the dialog and specify the font size.

The **cell height** complies with the set font. It is automatically set somewhat larger than the selected font size.

The **cell width** can be defined separately for the scaling and data columns. Set the width in the dialog "*Display/ Options*" (info about column width in the *pages* "*Data*" and "*Scale*") or change the column width using the mouse. Move the mouse in the heading line on the separating line between 2 columns; the mouse cursor changes its shape. Shift the position of the separating line while holding down the mouse button. To set the scaling column, move the mouse on the separating line to the first data column.

16.20 Configuring the scaling column

The following three menu items affect the display of the scaling column: "*Index*", "*X-value*" and "*Time*" in the menu "*Display*", one of which is always active (labeled with a checkmark). You can also use the corresponding toolbar buttons.

Index

Indices (positions in data set) for the values shown in the active column are displayed in the scale column. Single values are numbered consecutively, beginning with one ("1").

X-value

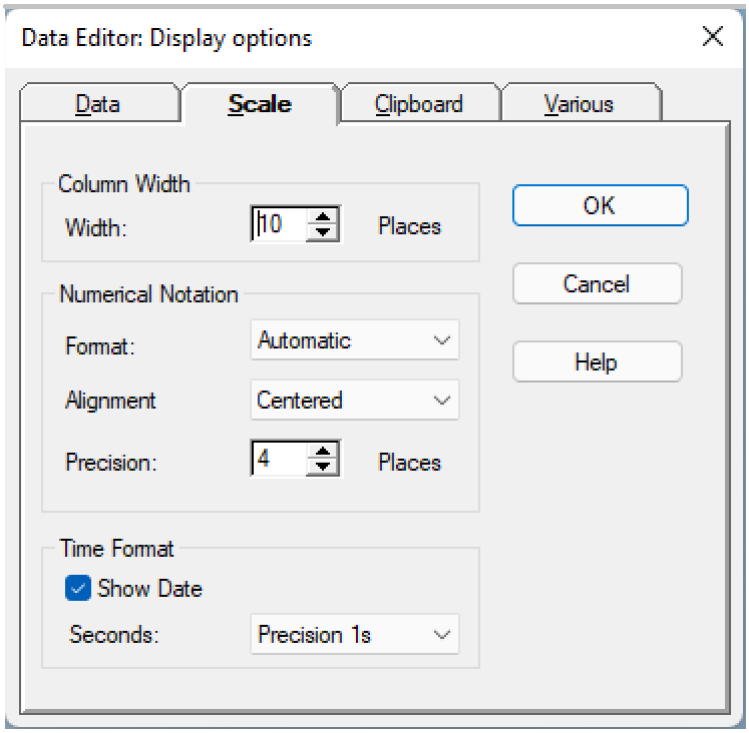
The x-value for the values shown in the active column are displayed in the scale column. In equidistant data sets, the x-value is calculated from the x-offset of the first value in the data set and the x-distance of two consecutive values. In xy-data sets, this is the accompanying value in the x-component of the data set.

Time

The time is displayed for the values shown in the active column. In displaying time, the trigger time of the data set is used and assumes that the x-axis of the data set is scaled in seconds. Time is displayed according to the set date and time format in Window Control Panel.

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The display in the scaling column is also affected by the dialog "*Display/ Options*", index card "*Scale*".



Waveform-Editor: Display Options/ Scale

Column Width

Specify the width of scaling columns here, based on the middle width of a character in the set font. The column width may also be changed in the table window directly by clicking with the mouse in the table head on the separating line between the scale column and first data column and holding the mouse button down. The separating line can now be shifted.

Format

Specify here whether numerical values should always be displayed in exponential notation, decimal notation or automatically. In this case, automatic means that the shortest display is automatically selected, depending on the value.

Precision

The numbers in the text box specify the number of significant positions to be generated in the 'automatic' display mode. Otherwise, they correspond to the number of positions to be specified after the decimal point.

Alignment

Specify here the alignment of numbers within the scale column.

Time Format

This setting only matters if time display is selected in the scale column.

Show Date

When this option is selected, both date and time are displayed; otherwise only time is displayed.

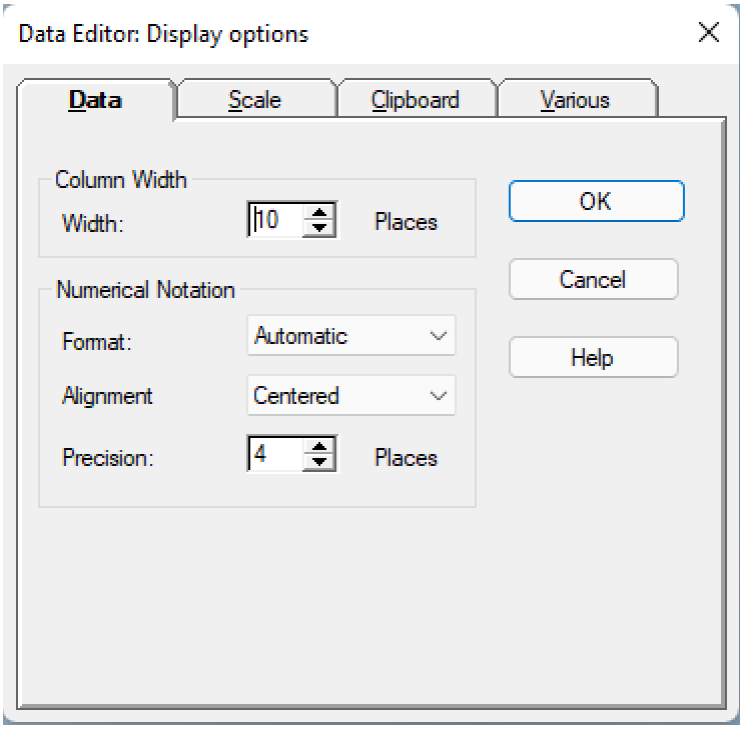
Seconds

Specify here how precisely the time should be resolved. Fractions of seconds are readjusted after the time, separated by a comma.

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16.21 Configuring the data column

The display of numerical values in the data columns is affected by the dialog "*Display/ Options*", file card "*Data*".



Data Editor: Display options/ Data

Column Width

Specify the width of scaling columns here, based on the middle width of a character in the set font. The column width may also be changed in the table window directly by clicking with the mouse at the head if the table on the separating line between two data columns while holding down the mouse button. The separating line can now be shifted.

Format

Specify here whether numerical values should always be displayed in exponential notation, decimal notation or automatically. In this case, automatic means that the shortest display is automatically selected, depending on the value.

Precision

The numbers in the text box specify the number of significant positions to be generated in the 'automatic' display mode. Otherwise, they correspond to the number of positions to be specified after the decimal point.

Alignment

Specify here the alignment of numbers within the data columns.

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16.22 Display modes

The display mode is set using menu items "*No Time Comparison*", "*Relative Time Comparison*" or "*Absolute Time Comparison*" in the "*Display*" menu. One of these options is always active (labeled by a checkmark). The corresponding buttons in the toolbar can also be used.

No Time Comparison 

This is the default setting in the Editor. Data sets are listed without regard to the x-scaling. Individual cells all have the same height.

Relative synchronization 

Data sets are displayed so that adjacently shown samples have the same x-value.

Individual data sets are shifted in the columns according to their x-offset. Differing sampling times (or x-delta) cause the cell height to vary in the columns. The normal cell height (corresponding to the set font) are used as a reference for the smallest x-distance occurring in the data sets currently displayed in the table. This prevents numbers from overlapping in the output.

This mode is useful only when the sampling times and offsets of all displayed data sets are in the same order of magnitude.

Select this mode only if several data sets should be compared with reference to their x-axes (ignoring trigger time).

The Editor is clearly much slower in this mode than in the basic display mode. Selecting several columns at the same time is not possible; not every data set or combination of data sets can be displayed in this mode.

For example, xy-data sets can be displayed only if their x-axis is monotonic, because otherwise, values would have to be plotted one over the other. The ratio of offset and sampling time may not exceed a specified value, otherwise individual positions of numerical values in the table could no longer be reconciled with each other. In such cases, an error message is generated and the table returns to the basic display mode.

Absolute synchronization 

Unlike in the display mode "Relative Synchronization", the data set's trigger time is taken into account.

Data sets are displayed so that adjacently shown samples have the same time base. Individual Data sets are shifted in the columns according to the sum of trigger time and their x-offset. Differing sampling times (or x-delta) cause varying cell height in the columns. The normal cell height (corresponding to the set font) is used as reference for the smallest x-distance occurring in the Data sets currently displayed in the table. This prevents numbers from overlapping in the output.

This mode is useful only when the sampling times and trigger times of all displayed data sets are in the same order of magnitude.

Select this mode only when several data sets are to be compared in terms of their relative positions in time. The Editor is considerably slower in this mode than in the basic display mode. Selecting several columns at the same time is not possible; not every data set or combination of data sets can be displayed in this mode.

For example, xy-data sets can be displayed only if their x-axis is monotonic, because otherwise, values would have to be plotted one over the other. The ratio of offset and sampling time may not exceed a specified value, otherwise individual positions of numerical values in the table could no longer be reconciled with each other. In such cases, an error message is generated and the table returns to the basic display mode.

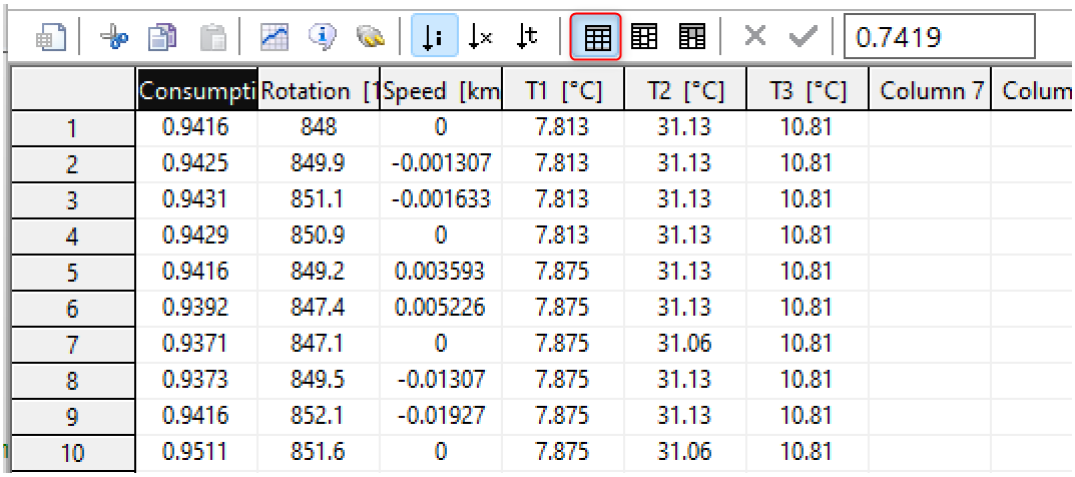
Example

Three data sets are displayed in the table which have the following characteristic values:

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	Channel1	Channel2	Channel3
X-offset (pretrigger) in seconds	0	0	0.5
X-delta (sampling time) in seconds	0.1	0.25	0.3
Trigger time	2:09:00	2:09:01	2:09:00

When menu item "*Display / No time comparison*" is active (selected), the table looks like this:

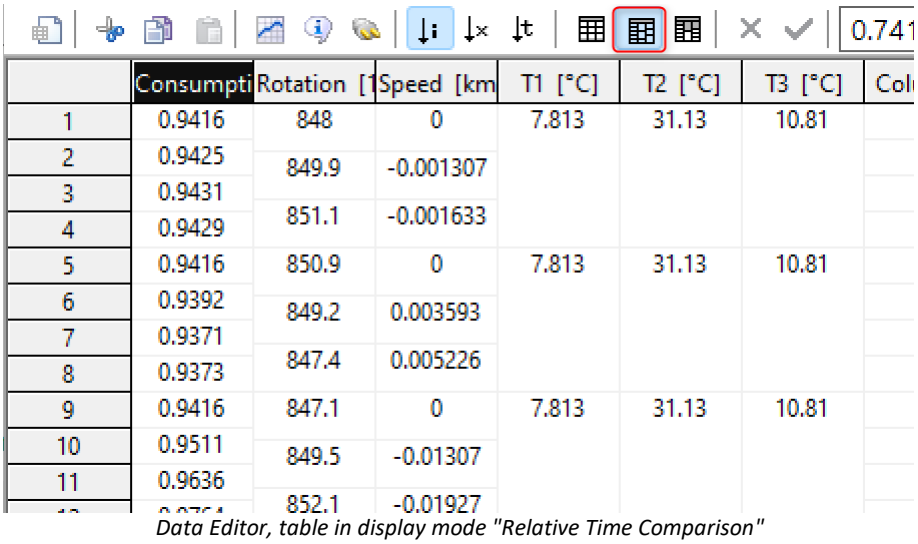


	Consumpti	Rotation [1	Speed [km	T1 [°C]	T2 [°C]	T3 [°C]	Column 7	Colum
1	0.9416	848	0	7.813	31.13	10.81		
2	0.9425	849.9	-0.001307	7.813	31.13	10.81		
3	0.9431	851.1	-0.001633	7.813	31.13	10.81		
4	0.9429	850.9	0	7.813	31.13	10.81		
5	0.9416	849.2	0.003593	7.875	31.13	10.81		
6	0.9392	847.4	0.005226	7.875	31.13	10.81		
7	0.9371	847.1	0	7.875	31.06	10.81		
8	0.9373	849.5	-0.01307	7.875	31.13	10.81		
9	0.9416	852.1	-0.01927	7.875	31.13	10.81		
10	0.9511	851.6	0	7.875	31.06	10.81		

Data Editor, table in display mode "No Time Comparison"

Display follows without reference to time, the scaling column (here in absolute time) complies with the active column in the example "Channel 1".

When menu item "*Display / Relative time comparison*" is active, the table looks like this:

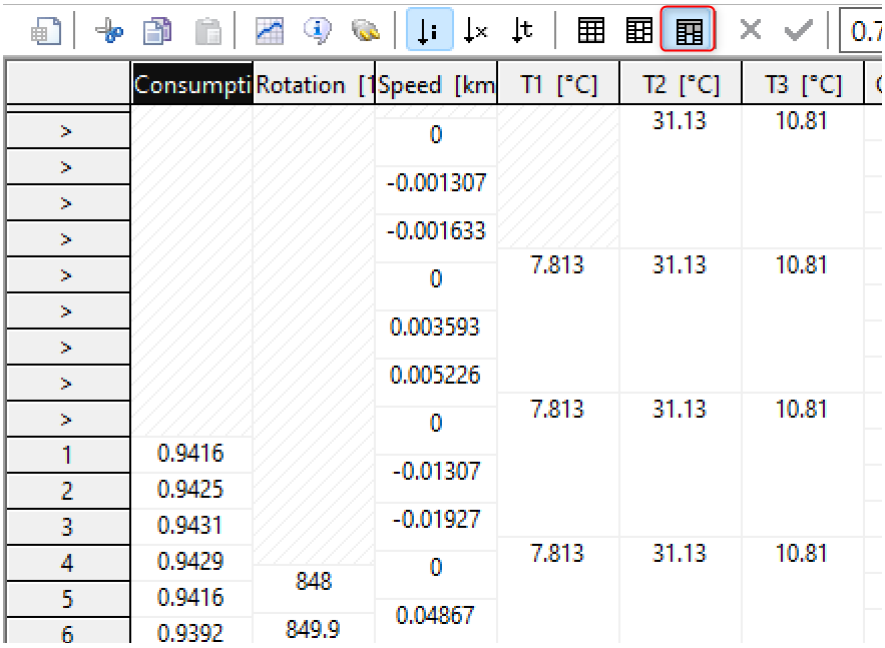


	Consumpti	Rotation [1	Speed [km	T1 [°C]	T2 [°C]	T3 [°C]	Col
1	0.9416	848	0	7.813	31.13	10.81	
2	0.9425	849.9	-0.001307				
3	0.9431						
4	0.9429	851.1	-0.001633				
5	0.9416	850.9	0	7.813	31.13	10.81	
6	0.9392	849.2	0.003593				
7	0.9371						
8	0.9373	847.4	0.005226				
9	0.9416	847.1	0	7.813	31.13	10.81	
10	0.9511	849.5	-0.01307				
11	0.9636						
		852.1	-0.01927				

Data Editor, table in display mode "Relative Time Comparison"

The differing sampling times and the offset of the third channel are taken into account. The scaling column (display x-value) is not dependent on the active column. The relative cell heights correspond proportionally to the sampling intervals.

When "*Display / Absolute Time Comparison*" is active, the table looks like this:



	Consumpti	Rotation [1	Speed [km	T1 [°C]	T2 [°C]	T3 [°C]
>			0		31.13	10.81
>			-0.001307			
>			-0.001633			
>			0	7.813	31.13	10.81
>			0.003593			
>			0.005226			
>			0	7.813	31.13	10.81
1	0.9416		-0.01307			
2	0.9425		-0.01927			
3	0.9431		0	7.813	31.13	10.81
4	0.9429	848	0.04867			
5	0.9416					
6	0.9392	849.9				

Data Editor, table in display mode "Absolute time comparison"

Explicit consideration is given to the differing trigger time of channel2. The scaling column (if displayed in absolute time) is not dependent on the active column.

16.23 Scroll-linking of tables and curve windows

It is possible to link table windows and curve windows to each other in such a way that the x-scaling of the windows (scaling column in the table, horizontal axis of the coordinate system in the curve window) always display the same value range. As a practical matter, when scrolling in one window, the display in the respective linked window automatically scrolls along to show the corresponding region of data.

The following example illustrates how to create a scroll-link:

Load one of the example variables, e.g. `slope.dat` and display it in the new table window.

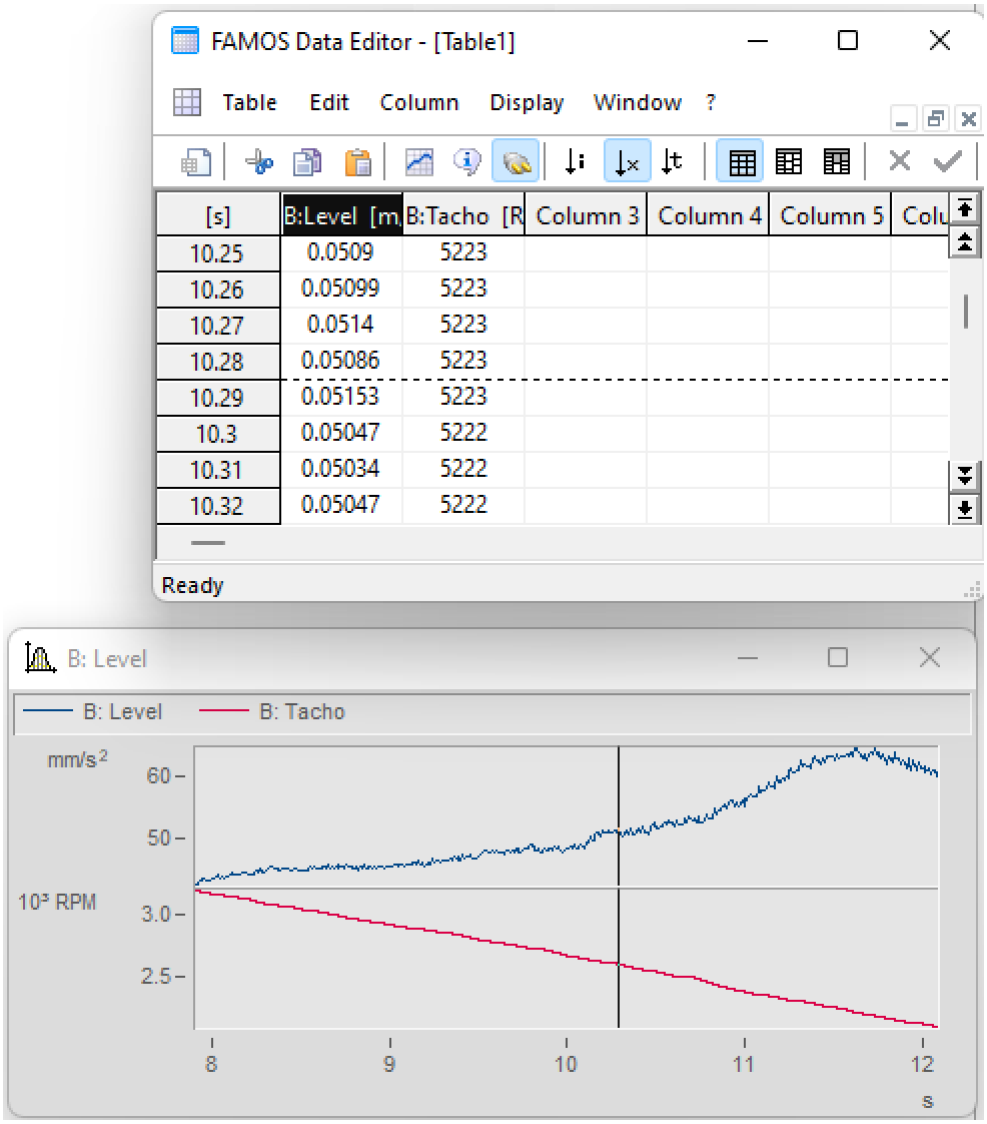
Display the data set in a curve window. Zoom in to a portion of near the y-axis (i.e. x = 0) so that the beginning of the curve is visible.

Click in the toolbar on the button and hold the mouse button down. Drag the mouse across the curve window and then release the mouse button.

The actual link position is shown in the Data Editor by a horizontal line in the table, in the curve window by a vertical line. It is at exactly this position that the table and curve window have the same x-position.

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If you scroll down in the table, the curve window moves with the table. Likewise, scrolling in the curve window also scrolls the table.



Data Editor, linked table and curve window

Now open another table window and display a variable in this window. Insert this data set using the same procedure as before in the linked window. It is irrelevant which window is scrolled, the linked window is constantly updated according to the current position. This allows any number of tables and curve windows to be linked with one another.

Linking can also be executed from the curve window using the corresponding button in the communicator toolbar (call using the context menu: click with the right mouse button in the window, option Communicator).

A table or curve window is removed from the linked windows by clicking again on the appropriate button in the table or curve window.

In a table with several data sets, the scaling of the active column is used as a reference. All linked windows should use the same display mode (relative scaling or scaling over an absolute time).

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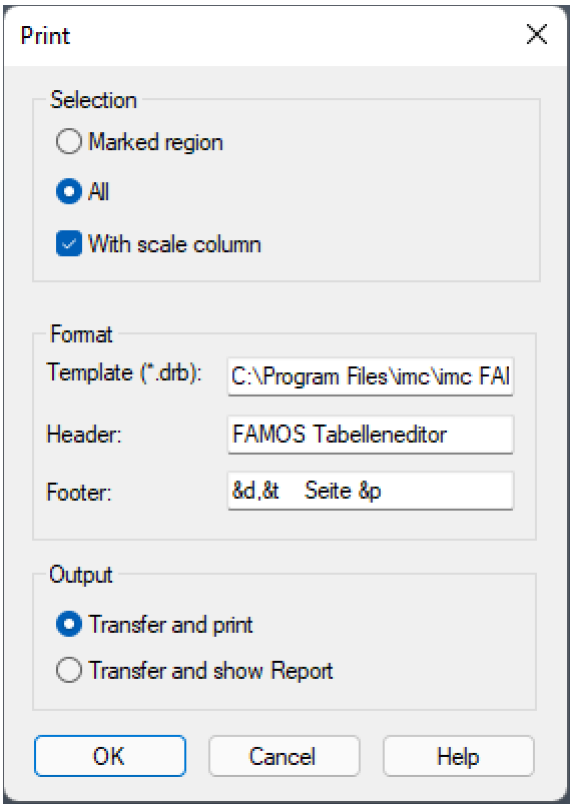
16.24 Printout

The printing function in the Data Editor operates by way of the imc Report Generator. A selected section is first transferred to a standard form and then printed out.

The advantage of this manner of proceeding is that the appearance of the printout can, by simply changing the form settings, be adapted and customized to fulfill to your particular wishes and requirements. The printout function, then, is a convenient tool for representing lists of numbers as a visually appealing table on paper.

For more intricate reports, which incorporate tables, texts and graphs, the preferable course would be to manually layout a report form first and subsequently supply it with the applicable data (number series, texts, curve graphs etc.) by means of remote control functions or drag&drop.

Accessing menu item "*Table / Print..*" calls the dialog depicted below, which lets you select the printout region and specify the appearance of the printout.



Data Editor, dialog: Print

Selection

Specifies the region to print out.

All

The entire table content is printed out. The longest data set included determines the overall length of the printout. The rightmost occupied column determines the width, in other words, the number of columns in the printout.

With scale column

The scaling column is included in the printout.

Template (Report)

Enter the name of the report here which is to be used as a template for the printout. Normal installation of imc FAMOS provides the "*DEFORM.DRB*"-file as the default report.

To adapt this form to your requirements, load it into the Report Generator, change it and save the new report under a different name. The name of the new report can be entered into this input box. Unless you supply the complete directory path, the program will search the preset default directory for report files (specified via "*Options / Directories*").

Please observe the following when defining your own template:

- The actual table data are transferred to a table object which must be designated as "*TABLE1*". The number of rows and columns in this table is indicative of the number of pages required for the printout.
- The title specified is transferred to a text object which must be designated as "*HEAD1*". The specified footer must be called "*FOOT1*".

It is also possible to assign place holders for the title and footer texts, which are furnished with particular data on the occasion of the printout. The following place holders are predefined:

&p	current page number
&t	current system time
&d	current system date

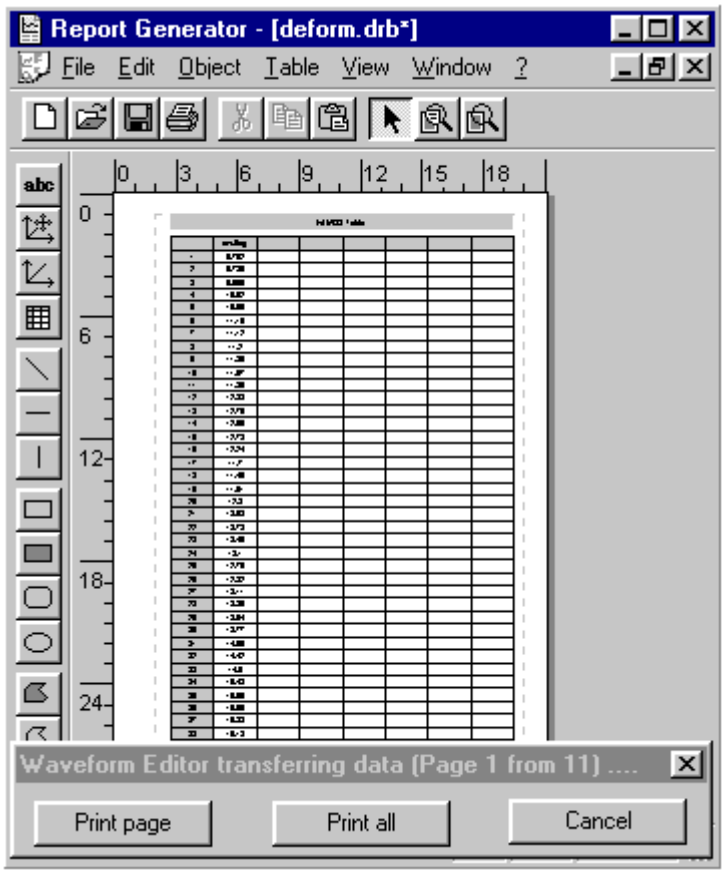
Transfer and print

If this option is activated, the table is transferred in the background to the Report Generator and printed out. If the Report Generator wasn't already open, it will be closed again upon completion of the printout.

If more that 5 pages will be needed to accomplish the printout, a message will appear, prompting you to confirm the procedure.

Transfer and show Report

If this option is selected, the Report Generator will display a preview of the finished document following transfer.



This allows you to verify that the printout reflects your wishes and, if necessary, to edit it before ultimately approving printout. The printing procedure can be executed page by page or on the whole document at once; it can also be interrupted as desired.

16.25 Transfer to Report Generator

For manually transferring lists of numbers from the Data Editor to the Report Generator there are two principal possibilities: data transfer via the Windows Clipboard and the use of drag&drop.

16.25.1 Drag&drop

This transfers only the actual numerical values, in other words not the title in the header, nor the scaling column.

Transferring a column

To transfer the content of a whole column, left-click the mouse on the column header, move the mouse - while holding its button down- to over the Report Generator and release the button where you wish the column to be.

Transferring a highlight

To transfer the current, highlighted selection (also multiple columns) to the Report Generator, press <Ctrl> and at the same time the left mouse button with the mouse pointer over the highlighted area. Then proceed as described above.

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How the data are handled upon being inserted depends upon the mouse's particular position at the release of the button:

1. Over a text object:

DThe placeholders for real numbers (#f, #e) are replaced with the current numerical values.

2. Over a table object:

Starting at the current mouse position and proceeding downward and -with multiple columns highlighted in the Data Editor- to the right, the cells of the table are furnished with numerical values. The numerical notation reflects the notation set for the table object and can be changed retroactively via the Properties-dialog for the table object.

3. Other:

A new table object is created. The number of rows and columns is determined automatically by the dimensions of the highlighted region in the Data Editor and from the maximum amount feasibly displayable. The height of the cells is determined by the default font for table objects. All other properties' (numerical format, font) initial settings are taken from the valid default settings for table objects, as well, and can be changed subsequently.

16.25.2 Copying and pasting

You must highlight the region of interest and access either menu item "*Edit/ Copy*" or "*Edit/ -> Clipboard*" to copy it to the Clipboard.

"*Copy*"

The command "*Copy*" places only the highlighted region into the Clipboard.

"*->Clipboard*"

"*->Clipboard*" makes the inserted data reflect the valid settings in the dialog "*Display / Options*", on the page "*Clipboard*". This means that you can, for example, transfer the column header and the scale column along with the data. Please note that a "Tab" serves to indicate the separation between columns, the option "*decimal comma*" may not be activated.

You now can either create a new table object in the Report Generator or furnish an existing table with new values.

Creating a new table object

To crate a new table object, use the Report Generator menu item "*Edit / Paste As..*" or the command "*Paste As...*" from the context menu. In the dialog which then appears, select "Table".

The number of rows and columns is then determined automatically from the content of the Clipboard and the maximum number feasibly displayable.

The height of the cells is determined by the default font for table objects. All other properties' (numerical format, font, frame, background) initial settings, as well, are taken from the valid default settings for table objects in the Report Generator, and can be changed subsequently. The numerical notation set for the table is ignored, as the data has been transferred in text format. The numbers are displayed just as in the Data Editor.

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Updating an existing table object

First select a table object, in order to update it. If you wish only to change a part of the table, highlight the cells concerned. Then access menu item "*Edit / Contents / Paste*" from either the menu bar or the context menu.

The numerical notation set for the table is ignored, as the data has been transferred in text format. The numbers are displayed just as in the Data Editor.

Reference

User's Manuals 'Curve Manager, Report Generator'

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17 DDE-Interface

17.1 Overview

Note Microsoft support of DDE interface has been discontinued

Microsoft has discontinued support for the DDE interface.
In Microsoft's January 2022 updates, two security enhancements were released as defense-in-depth measures for Excel. These security enhancements disable Dynamic Data Exchange (DDE) and Object Linking and Embedding (OLE) auto-enablement in all supported versions of Excel.

DDE (Dynamic Data Exchange) is a fixed protocol used to communicate both data and instructions between Windows applications. The type of data and instructions exchanged is therefore application-oriented. DDE can be integrated easily into macro-languages, making it possible to automate processes involving the use of several programs.

Communication begins when the first program, the **client**, informs another program that it would like to commence with a transaction. This second program, the **server**, then decides whether or not it is able to carry out this transaction. When this is possible, the transaction is executed.

When transferring instructions, the target application, the topic and the instruction itself must all be specified in the declaration.

When transferring data, the target application, the topic, the item to be set or requested and the data format must all be specified in the declaration. The actual data is then sent in a global memory object.

The available topics as well as the topic and data element syntax are to be taken from the documentation associated with the target application.

When data is to be transferred, a suitable format understood and supported by both sides should be chosen. Although the supported formats may vary according to the application, nearly every DDE capable Windows application supports a simple text format, enabling at least an interaction on this basis.

imc FAMOS supports DDE-Poke (sending of data), DDE-Request (requesting of data) and DDE-Execute (sending of instructions) both as a client and a server. One can therefore send data and instructions to imc FAMOS as well as requesting imc FAMOS to send it to another application.

Supported data formats include, in addition to the text format, a special imc format allowing simultaneous transfer of data sets with characteristic data set values.

17.2 imc FAMOS as a DDE-Client

When using imc FAMOS to transact with other applications, imc FAMOS acts as a client and the target application as the processor (DDE-Server) of your request.

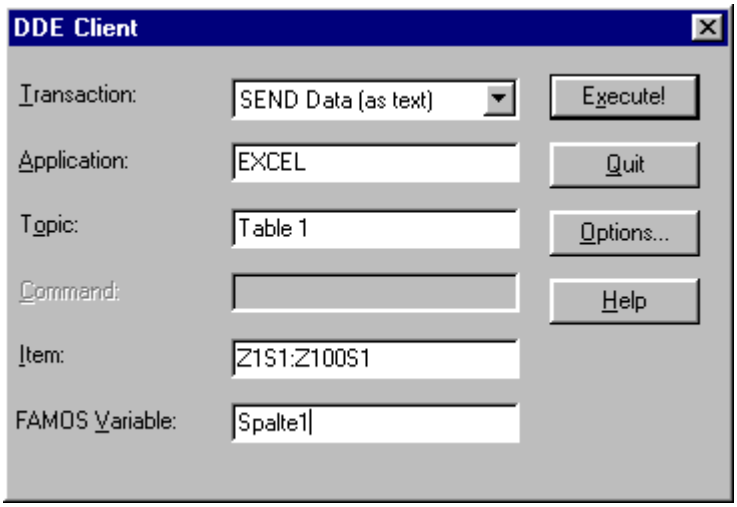
A transaction can be started directly using appropriate functions and control commands as well as from a dialog box. Use the dialog box to first test DDE-calls in dialog before building DDE-functions with the tested parameters directly into a sequence.

The material below describes the procedure using dialogs; references to the corresponding functions and commands are provided.

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17.2.1 Dialog DDE-Client

The dialog box is called from the menu item "*Extra / DDE...*".



Transaction

The drop-down menu is used to determine the mode of communication. The other input field entries change depending on this selection.

Application

In the input box, type the name used to access the other application over DDE. This is often the name of the application itself but with some programs this can be freely specified by the user.

Topic

DDE transactions are always assigned a topic name. The topic "SYSTEM" should be supported by all DDE-capable applications. Other topic names depend on the application. MS Word for Windows, for example, starts a new topic with every newly opened document.

Command

This input field is only active when "Send command" is selected from the transaction drop-down menu. The command syntax must correspond to the required syntax of the target application. One can also often use macro instructions from the target application directly as commands.

Item

This input field is only active when data is to be transferred. Supply the name of the target application data element which is to be either requested or set.

imc FAMOS -Variable

This input field is only active when data is to be transferred. Supply the name of the imc FAMOS variable used to either transfer or request data.

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Execute!

This begins a DDE transaction using the parameters as set in the dialog. An error message appears if a transaction is not possible. The most common error message "*Conversation could not be established*" indicates either that the DDE partner could not be found (server name incorrect or application not started) or that the chosen topic/element combination is not supported by the partner application.

Quit

The dialog is closed. Please note, however, that it is also possible to continue working in imc FAMOS with an opened dialog box.

Options

This calls up a dialog with various DDE settings for imc FAMOS . The next section of this chapter describes these settings in detail.

17.2.2 Send command

This instructs other applications to execute certain control commands. The following settings cause EXCEL to open a new table:

```
Transaction:    Send command
Application:    EXCEL
Topic:          SYSTEM
Command:        [NEW]
```

You can also use the function "*DDESend*" or the command "*CONTROL*".

17.2.3 Send data (FAMOS)

This sends a data set to another application using the special imc-DDE-format. This is supported by other imc-applications.

```
Transaction:    Send data (imc FAMOS )
Application:    FRAME
Topic:          VARS
Element:        imc FAMOS Data
Variable:       imc FAMOS Var
```

The global variable "FamosWave" in the imc program generator "Frame" is updated with the current content of the imc FAMOS variable "FamosVar".

The "DDESet" function can also be used.

17.2.4 Send data (Text)

A imc FAMOS data set is converted to the DDE text format and then sent to the partner application. The text format is supported by most DDE-capable Windows programs. The parameters determining the manner in which numerical values get converted to text can be set in the "*Options"/ "DDE" ("Options" button)* dialog.

It is particularly important to choose the correct separator character for separating adjacent numerical values. For example, sending numerical values to EXCEL using tab separators causes the values to be entered row-wise. However, using the combination of "Carriage Return / Line Feed" (ASCII 0x0d/0x0a) causes the numerical values to be entered to the table column-wise.

```
Transaction:    Send data (Text)
Application:    EXCEL
Topic:          TAB1
Element:        Z1S1:Z1S100
Variable:       imc FAMOS Var
```

In EXCEL, the first 100 values of the data set "*FamosVar*" are sent to the first row. A tab separator must be inserted between values and a comma is used as the decimal point.

The "*DDESet*" function can also be used.

17.2.5 Send text

```
This sends the contents of a imc FAMOS text variable to another application:
Transaction:    Send Text
Application:    EXCEL
Topic:          TAB1
Item:           Z1S1
Variable:       TxHello
```

The contents of the "*TxHello*" text variable is sent to the upper left cell of the EXCEL table "*TAB1*".

The "*DDESet*" function can also be used.

17.2.6 Request data

imc FAMOS makes a request for the contents of a data element in another application. In its first attempt, imc FAMOS makes the request for data in the imc format. When not supported by the partner application, however, the request is remade using the text format.

```
Transaction:    Request data
Application:    EXCEL
Topic:          TAB1
Element:        Z1S1:Z100S1
Variable:       imc FAMOS Var
```

In EXCEL, the first 100 values from the first column in table "*TAB1*" are requested and copied to the variable "*FamosVar*". The length of the variable depends on the number of successfully read values.

The "*DDEInq*" function or the "*REQUEST*" control command can also be used.

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17.2.7 Request text

The content of a data element from another application is requested and, when successful, copied into a imc FAMOS text variable.

```
Transaction:   Request Text
Application:   EXCEL
Topic:         TAB1
Element:       Z1S1:Z1S1
Variable:      imc FAMOS Var
```

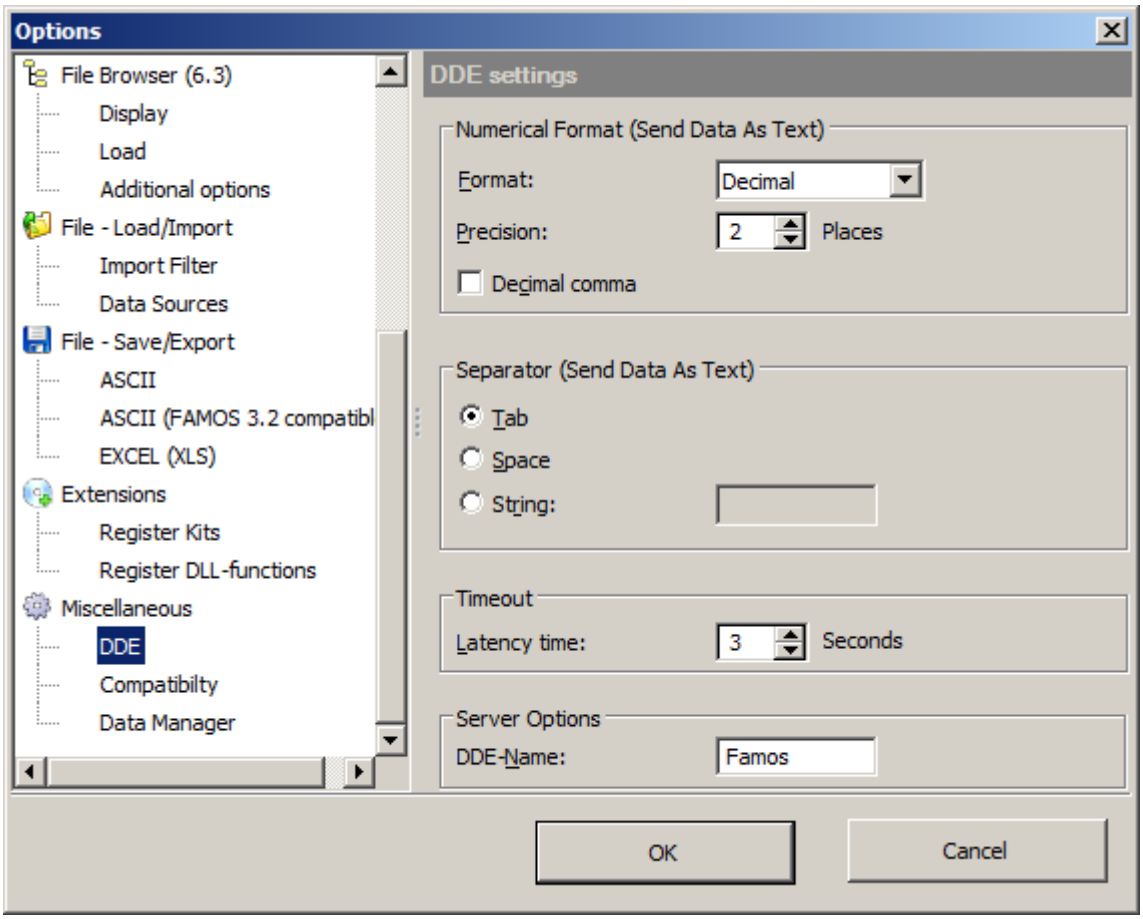
The contents of the upper left cell in an EXCEL table "*Tab1*" are requested and a imc FAMOS text variable "*FamosVar*" is created.

The "*DDEInq*" function can also be used.

17.3 The "DDE Settings" dialog

This dialog is can be accessed from the menu option "*Extra / Options / Miscellaneous-DDE*" or from the "*Options*" button in the DDE client dialog described above.

One can set various preferences here controlling the behavior of imc FAMOS during DDE transactions.



Numerical format (Send data as text)

This group controls how numbers are converted to text when data are to be transferred as text.

Format

You can set whether the numerical values are always expressed in **exponential notation,** always in **decimal notation** or **automatic**. "Automatic" means that the shortest notation, which depends on the particular value, is used.

Precision

DThis setting determines the number of significant digits in the "automatic" setting or the number digits following the decimal when using the text format.

Decimal comma

When this option is selected, a comma is used as the decimal character. Otherwise a decimal point is used as is customary in imc FAMOS . EXCEL, for example requires the use of a decimal comma meaning that the text "1.23" will not be recognized as a number.

Separator

This determines the type of separator used in separating adjacent numerical values from one another. One can choose between using a tab, an empty space or a freely defined character combination.

For example, sending numerical values to EXCEL using tab separators causes the values to be entered row-wise. However, using the combination of "Carriage Return / Line Feed" (ASCII 0x0d/0x0a) causes the numerical values to be entered to the table column-wise.

The following non-printable character symbols can be used in the input box:

\n	Line feed, hexadecimal 0x0A
\r	Carriage return, hexadecimal 0x0D
\t	Tabulator

TimeOut

This value determines the maximum time that imc FAMOS waits before ending an unsuccessful transaction. When the error message "*Time-out*" appears while transferring large amounts of data, this value is to be increased.

Server-Name

This supplies the name other applications use in addressing imc FAMOS for DDE transactions. This name has been preset to imc FAMOS in the initial settings and should only in exceptions be changed.

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17.4 imc FAMOS as DDE-Server

When imc FAMOS is addressed from an another application in a DDE communication, imc FAMOS becomes the DDE server and the partner application becomes the DDE client.

In order to have access to imc FAMOS by DDE, the correct imc FAMOS server name must be used. This is preset to "*imc FAMOS* " in the initial settings and can only be changed by the Options dialog described above.

17.4.1 Sending commands

When sending a command (DDE-Execute), the topic name **SYSTEM** is to be used. One can transfer any instructions which can also be executed in the imc FAMOS editor box. This can include, for example, mathematical formulas or sequence calls (SEQUENCE command).

To quit imc FAMOS , send the command "[**Exit**]".

Reference

An alternative to sending imc FAMOS -files by DDE is to call imc FAMOS using command line parameters. This works even if imc FAMOS has already been started before the moment the call is made; in that case, the command is forwarded to the already open instance of the program.

Example for *Microsoft Visual Basic*:

```
Private Sub Command1_Click()
   Shell "C:\Program Files\imc\Famos\Bin\famos.exe /S crash.seq /X"
End Sub
```

FAMOS is instructed to run the sequence "crash.seq". After it is run, imc FAMOS is closed.

An overview of available command line parameters is presented in the section 'Introduction: Starting with parameters 57'.

17.4.2 DDE info request

The following items can be requested in the **SYSTEM** topic (DDE Request). These requests always return a text string. Every DDE-capable application should support these predefined items in order to enable other applications an insight into the DDE capabilities of the program.

SYSITEMS

Returns a list of all available items in SYSTEM-TOPIC. These are:

"*SYSITEMS TOPICS FORMATS STATUS*"

TOPICS

Returns a list of all DDE topics supported by imc FAMOS :

"*SYSTEM VARS TXVARS*"

FORMATS

Returns a list of all data formats recognized by imc FAMOS :

"*TEXT imc FAMOS Wave*"

"*imc FAMOS Wave*" is the name given to special imc-format used to exchange data.

STATUS

Returns either "*BUSY*" (imc FAMOS cannot execute DDE transaction at the given moment) or "*READY*" (DDE is possible now).

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17.4.3 Setting and requesting data variables

Data variables can be passed to imc FAMOS (DDE poke) or requested from imc FAMOS (DDE request) from another application. Use **VARS** as the topic name.

When performing a DDE poke, specify a new variable name for the item, and when performing a DDE request, specify an existing variable name.

The predefined item **TOPICITEMLIST** contains a list of all presently existing data sets.

Channels in the data groups are specified in the usual way:
`GroupName:ChannelName`

Either the imc-DDE-format ("*FamosWave*") or the text format can be used.

Two-component data (complex, X-Y data) cannot be transferred in parallel.

The numerical format parameters used in text data request are set in the dialog "Options DDE".

The format used when sending data in text format is open. Both periods and commas are allowed as a decimal point. All non-numbers (except 'e' for exponent, + , -) are ignored.

17.4.4 Setting and requesting text variables

Text variables can be passed to imc FAMOS (DDE poke) or requested from imc FAMOS (DDE request) from another application. Use **TXVARS** as the topic name.

When performing a DDE request, use the name of an existing text variable as the item name, or when performing a DDE poke, specify an appropriate variable name.

The predefined item **TOPICITEMLIST** contains a list of all presently existing text variables.

Channels in the data groups are specified in the usual way:
`GroupName:ChannelName`

The data format to use is the TEXT-format.

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18 Determining the measurement uncertainty

No measurement is exact.

A measurement reading consists not only of a numerical value and a unit, but also an indication of its reliability. While in the past, the maximum error (margin) was stated, today it is the measurement uncertainty.

With FAMOS, for almost every algorithm written as a FAMOS sequence, the effects of measurement uncertainty can be analyzed and the measurement uncertainty of results can be calculated:

- Calculation of the propagation of measurement uncertainty
- Determining the measurement uncertainties of results of a mathematical analysis
- Signals biased by interference
- Analysis of the effects of interference on existing algorithms
- Testing the resilience of algorithms

Comparison with conventional error margin calculation

Example: Two voltages are measured. The readings are 100V and 50V. The sum is to be determined. Upon considering the error sources, the maximum error of the first is 4V, while that of the second is 2V.

The total error aggregates: the sum voltage is 150V with an error of 6V.

By contrast, with the measurement uncertainty, not the maximum error, but the standard deviation is used. This is typically 2 or 3 times less than the stated maximum error. So the measurement uncertainties in this example are accordingly 2V and 1V. The root mean square of the measurement uncertainties is taken, resulting in a total measurement uncertainty of sqrt(2*2+1*1) = sqrt(5) = 2.2.

This is less than the result of simple addition 2 + 1 = 3. The calculation of the measurement uncertainty takes into account that, statistically, errors sometimes cancel each other.

Applicable standards

GUM Evaluation of measurement data – **G**uide to the expression of **u**ncertainty in **m**easurement

JCGM 100:2008

JCGM 101:2008

JCGM 104:2009

JCGM 200:2012

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18.1 Terms

18.1.1 Measurement uncertainty

Measurement uncertainty is a non-negative parameter characterizing the dispersion of the quantity values being attributed to a measurand, based on the information used.

When speaking of measurement uncertainty, generally the standard measurement uncertainty is meant.

18.1.2 Standard measurement uncertainty

Uncertainty of the result of a measurement expressed as a standard deviation.

The measurement uncertainty according to GUM is a symmetrical interval around the reading.

Note that the standard measurement uncertainty is not defined as a coverage interval with a certain coverage probability, but as a standard deviation. Thus, the standard measurement uncertainty does not contain any statement on probabilities.

18.1.3 Expanded uncertainty

Definition according to GUM (JCGM 101:2008]: Quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand.

Definition according to GUM (JCGM 200:2012): Product of a combined standard measurement uncertainty and a factor larger than the number one.

The expanded measurement uncertainty is thus, according to GUM, a symmetrical interval around the reading.

The expanded measurement uncertainty is a coverage interval. For a known distribution, however, the coverage interval can be calculated from the standard deviation if a certain coverage probability can be assumed. Thus for instance, for a normal distribution, the expanded measurement uncertainty can be calculated at 95% coverage probability by multiplying the standard deviation (which corresponds to the standard measurement uncertainty) by 2. In line with this, the definition per JCGM 200:2012 is the applicable calculation method, once the multiplication factor has been determined using probability calculation methods.

Along with the stated expanded measurement uncertainty, the coverage probability is also stated, e.g. 95% or 99%. This statement is also provided indirectly when the distribution and coverage factor are stated.

18.1.4 Propagation

In subsequent calculations with variables which come with a measurement uncertainty, the uncertainty affects the calculation results. This is referred to as propagation of the measurement uncertainty and of the distribution.

18.1.5 Monte Carlo method (MCM)

Numerical solution method for complex problems, based on high numbers of trials with random numbers. The law of large numbers is the foundational basis. Typically, an algorithm is run M times in a loop for each of the M Monte-Carlo trials. A statistical distribution of results is derived from this.

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18.1.6 PDF, distribution density

Probability density

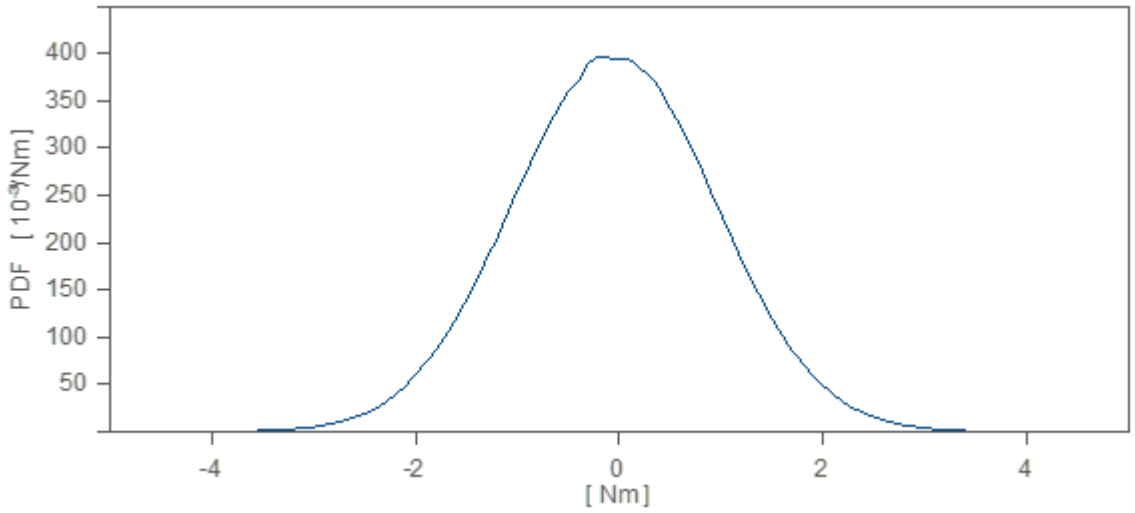
Derivative of the distribution function.

PDF: Probability density function

Its integral is always 1.

One typical representative is the normal distribution. Its distribution density takes the characteristic bell-curve shape.

In the regions where there are high accumulations of values, it is possible to say that the probability is especially high. in the example below, it is around the value 0 Nm.



an empirically determined distribution density

For instance, if the probability with which a value is located between -2 and +2 is to be determined, the integral between -2 and +2 is calculated.

The amplitude of the PDF for a particular point is not defined to have any meaning. The shape and width are the meaningful attributes.

18.1.7 Coverage probability

Definition according to GUM (JCGM 200:2012): The probability that the set of true quantity values of a measurand is contained within a specified coverage interval.

In older standards (JCGM 100:2008), also referred to as *confidence level*. The newer GUM avoids the term *confidence level.*

The statistical term confidence level is defined differently and should not be confused with the coverage probability.

However, it is worth noting that an uninitiated user who has a feeling for the meaning of the confidence level can thus also imagine the coverage probability.

Typical coverage probabilities include 95% and 99%.

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18.1.8 Coverage interval

Definition per GUM (JCGM 200:2012): Interval containing the set of true quantity values of a measurand with a stated probability, based on the information available.

Also "coverage region".

In older standards, also called *confidence interval*.

While the new GUM avoids the term confidence interval, the technical literature does use the term confidence interval along with coverage probability.

The statistics term confidence interval is defined slightly differently from the coverage interval.

However, it is worth noting that an uninitiated user who has a feeling for the meaning of the confidence interval can thus also imagine the coverage interval.

For instance, if the coverage probability's value is 95%, then in accordance with the above definition, it can be said that it is 95% likely that the true value is within the coverage interval. However, observe the following section on how to interpret this.

18.1.8.1 Interpreting the coverage probability and coverage interval

In determining the expanded measurement uncertainty, the coverage probability plays an important role. The following remarks pertain to a case where the coverage probability is 95%.

Direct application of the definition in the GUM yields the statement: "The chance that the true value is located in the coverage interval is 95%". But use caution when interpreting this!

Correct statement: "In 95% of all calculations in which a coverage interval is determined, the true value lies within the coverage interval." This means that man if one performed the complete calculation of the expanded measurement uncertainty in FAMOS 100 times, the true value will lie in the determined coverage interval in about 95 cases. The 95% is a statement of the reliability of the estimation method (i.e. the calculation in FAMOs).

Incorrect statement: "The probability of the true value lying within the coverage interval which has just been calculated with FAMOS is 95%." The question of whether the current coverage interval contains the true value is not determined by a probability, instead its answer is yes or no.

18.1.9 Coverage factor

Definition per GUM (JCGM 200:2012): Number larger than one by which a combined standard measurement uncertainty is multiplied to obtain an expanded measurement uncertainty

The coverage factor depends on the coverage probability and on the shape of the distribution.

For a normal distribution, the following applies:

Coverage factor	Probability
1	68.3 %
1.96 = approx. 2	95 %
2.6	99 %
3	99.7%

[Expanded measurement uncertainty] = [Standard measurement uncertainty] * [Coverage factor]

The coverage factor is applied when the distribution is known. But most commonly in conjunction with normal distribution.

18.1.10 Relative standard measurement uncertainty

Definition per GUM (JCGM 200:2012): The relative measurement in percent is determined as the standard measurement uncertainty divided by the absolute value of the measured quantity value

[Relative Measurement Uncertainty] = Measurement uncertainty * 100% / abs (reading)

Just as classical error analysis yields absolute and relative errors, along with the measurement uncertainty, there is also relative measurement uncertainty.

It is worth noting that the error is often stated as a percentage of a measurement range (= reference value).

18.2 Calculation in imc FAMOS

imc FAMOS handles the issue of propagation of measurement uncertainty through calculations. The input data are supplied to an algorithm or a calculation formula in FAMOS. These input data have a certain measurement uncertainty which is regarded as already known. The algorithm to be calculated returns results which in turn come with a measurement uncertainty, which is determined by imc FAMOS.

18.2.1 Procedure

imc FAMOS applies the Monte-Carlo Method (MCM). In the GUM, a number of different calculation methods are specified. Direct analytical calculation is possible for many simple formulas, but is not sustainable in practice for most imc FAMOS commands. The MCM method has no problems with non-linearity, or complex algorithms, or distributions deviating from normal distribution, or relatively strong interference, thus yielding a systematic approach for any algorithms.

The MCM procedure is based on superimposing some (slight) noise on the input data. This entails simulating deviations by admixing the data with random numbers. These deviations then affect the algorithm to be calculated as deviations of the results. The standard deviation is calculated and represents the measurement uncertainty of the results.

Note that the adding of noise does not necessarily mean simply adding a noise signal in the most narrow sense. Instead it may involve superimposing a variety of types of interference.

The MCM procedure is a statistical procedure and requires a sufficiently high number of random numbers in order to produce significant results.

The GUM uncertainty framework is taken into account, but not applied.

18.2.2 Foundational principles

Evaluation without determining measurement uncertainty:

Input data are available. The input data may be measured readings or other inputs for the algorithm. E.g. current, voltage
Calculation as per the **algorithm**

The desired evaluation. This is a call to a mathematics function or to the imc FAMOS sequence which processes the input data. E.g. the multiplication of current and data
Result of the algorithm The algorithm returns these data: E.g. the power represented by the result of the multiplication.

Evaluation with determination of measurement uncertainty:

Input data are available. Input data are assigned a measurement uncertainty
Calculation as per the algorithm with unaffected input data
Unaffected results are available
Loop through M Monte-Carlo trials Input data are distorted with noise Calculation as per the algorithm, with noise-affected input data Algorithm returns noisy results Iterative calculation of the measurement uncertainty from the noisy results
Repeat calculation of the algorithm with unaffected input data
Analysis of the measurement uncertainty found for the results

The input data exhibit some measurement uncertainty. Running the algorithm causes the measurement uncertainty to propagate. Thus, the results ultimately are affected by measurement uncertainty.

Numerical example

The analysis without measurement uncertainty:

```
Input1 = 7
_In1 = Input1
Result =_In1 ^ 2
```

The final value of Result is 49.

The analysis with measurement uncertainty:

```
Input1 = 7
UncertaintySet( Input1, "Uncertainty", 0.1)
UNCERTAINTY_LOOP 1000 1
   _In1 =UncertaintyModify( Input1)
   Result=_In1^2
   UncertaintyCalc( Result )
END
uc = UncertaintyGet( Result, "Uncertainty")
```

The input data Input1 have a measurement uncertainty of 0.1.

The final value of Result is 49.

Result's measurement uncertainty, uc, has the value 1.44. In accordance with the GUM uncertainty Framework, the resulting value is given by

2*7*0.1 = 1.4 .

As one would expect, the two outcomes are similar, but they are not the same.

Note that the measurement uncertainty is not stated to many decimal places, as it is generally only an estimate.

Example with comments

The data from a voltage channel Input1 with 10V measurement range and 0.1V measurement uncertainty is subjected to an algorithm (low-pass filter, maximum value) to obtain the resulting value named Result.

The algorithm without determining the measurement uncertainty:

```
_In1 = Input1
Result = max ( filtlp (_In1, 0, 0, 1, 0.02 ) )
```

The same algorithm, this time with the measurement uncertainty determined:

```
; state the measurement uncertainty of the input data:
UncertaintySet ( Input1, "Uncertainty", 0.1)

; perform all Monte-Carlo trials; here count M = 1000
UNCERTAINTY_LOOP 1000

; apply noise to input data
_In1 = UncertaintyModify ( Input1 )

; run the actual algorithm and calculate the result
Result = max ( filtlp ( _In1, 0, 0, 1, 0.02 ) )
; calculate the measurement uncertainty of the result
UncertaintyCalc (Result )
End

; query the measurement uncertainty of the result
uc = UncertaintyGet(Result, "Uncertainty")
```

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18.2.3 Functions, syntax elements

UNCERTAINTY_LOOP	The framework for the measurement uncertainty calculation
UncertaintySet	Sets the measurement uncertainty for input data
UncertaintyGet	Queries the measurement uncertainty of results
UncertaintyCalc	Calculation of the measurement uncertainty
UncertaintyModify	Applies noise to input data
UncertaintySnapshot	Expanded assessment of the calculation

18.2.4 Determining the measurement uncertainty of the input data

The measurement uncertainty may have previously been determined in accordance with GUM. Error possibilities along the entire measurement chain should be taken into account. The measurement uncertainty can also be estimated. In any case, it is never zero.

```
UncertaintySet ( Input1, "Uncertainty", 4.5)
```

The GUM presents a systematic way to determine the measurement uncertainty of a measured value. To this end, the measurement uncertainty is filled out. There, all influencing factors and their effects are collected.

Only if the measurement uncertainty for each input variable has been determined can FAMOS determine the propagation as it progresses through the algorithm. The determination of the measurement uncertainty also includes the determining of the distribution density.

Beyond the scope of the GUM, FAMOS offers the user the ability to use typical interference quantities such as noise, mains hum or an offset drift, for the especial purpose of calculations with time series. These are not listed in the GUM and are only insufficiently modeled by a distribution density. But its time-based shape in particular is able to cause considerable measurement uncertainty in the calculated results.

If the relative measurement uncertainty of the input data is known, the measurement uncertainty is first determined:

```
uc = uc_relativ *max( Input1)
UncertaintySet ( Input1, "Uncertainty", uc)
```

See the discussion below on the relative measurement uncertainty.

Not all of the algorithm's input data must exhibit measurement uncertainty.

using the function *UncertaintySet*, it is possible to set the type of disturbance/influence affecting the input data. This may be noise, mains hum, spikes or the like.

The process of determining the measurement uncertainty of the input data and their distribution density must be carried out with sufficient uncertainty. Otherwise, no amount of precision in determining the propagation of measurement uncertainty through an algorithm will be of any use.

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Performing the calculations of measurement uncertainty

```
UNCERTAINTY_LOOP 1000
    _In1 = UncertaintyModify ( Input1 )
    Result = _In1 * _In1
    UncertaintyCalc (Result )
End
uc = UncertaintyGet(Result, "Uncertainty")
```

The measurement uncertainty is determined in the program loop and is assigned to the result as a user-defined property. It can be queried by the command *UncertaintyGet()*.

The loop is necessary for running all M Monte-Carlo trials.

The loop is run M+2 times:

A first run calculates the uninfluenced result from the uninfluenced input data. In this context, *UncertaintyModify* works like the assignment _In1 = Input1. *UncertaintyCalc* only initializes.

Next come the M Monte-Carlo runs. In the process, *UncertaintyModify* adds noise to the input data. The noisy result of these runs is called Result. *UncertaintyCalc* improves the value of the estimate of measurement uncertainty with each run.

In a final run, all unaffected values are restored. UncertaintyModify only copies. The uninfluenced result is calculated. UncertaintyCalc concludes the calculation of the measurement uncertainty.

Performing the calculations of extended measurement uncertainty

In the *UncertaintyCalc ()* function, the overlay probability must be entered as parameter, e.g. 95% or 99%.

```
UNCERTAINTY_LOOP 1000
    _In1 = UncertaintyModify ( Input1 )
    Result = _In1 * _In1
    UncertaintyCalc (Result, 95 )
End
uc = UncertaintyGet(Result, "Uncertainty")
U = UncertaintyGet(Result, "Expanded uncertainty")
```

With *UncertaintyGet* and parameter "*Expanded uncertainty*" the extended measurement uncertainty is queried.

18.2.5 Mean value

FAMOS proceeds from the assumption that the best result of the algorithm is achieved in the first (or equivalently also in the last) iteration of the loop. In all other Monte-Carlo trials, additional noise is added. The purpose is to simulate the effects of noise on the result and ultimately to determine the measurement uncertainty. However, the result of each individual Monte-Carlo trial is surely no better than the unaffected result of the first run. On the contrary, it is worse.

The GUM states unequivocally: *"The measurement result itself is the best estimate of the true value." FAMOS complies with this statement in that the best result is returned by the first/last iteration of the loop.*

On the other hand, the GUM suggests determining the mean value and standard deviation solely from the Monte-Carlo trials. According to the GUM, the mean value is the best estimate. FAMOS offers the user this mean value, but does not base the calculation of the standard deviation on this mean value. From the standpoint of FAMOS, one would only use the mean value of the noisy results if one did not have the uninfluenced results.

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FAMOS offers the mean value of all Monte-Carlo trials as one of the extended analysis functions. The mean value is then to be interpreted as the mean result in the cause of added noise. If the mean value deviates from the uninfluenced result, this is to be interpreted as sensitivity of the algorithm to the impacting interference.

If FAMOS calculates the standard deviation for the purpose of calculating the measurement uncertainty, then the mean value appears in the formula for the standard deviation. At this point, FAMOS uses the best estimate: thus not the mean value of the Monte-Carlo trials, but the value from the first run of the loop, the uninfluenced result.

The goal of determining the measurement uncertainty in FAMOS is not to determine the mean value, but rather to determine the measurement uncertainty for the existing, meaning the uninfluenced result.

Some calculation operations obtain the mean value, i.e. when the count of Monte-Carlo trials is high, the mean value converges toward the uninfluenced result. This includes linear operations such as multiplication with a fixed factor, or addition of a constant offset. If the noise itself is zero-mean, then the linearly calculated noise will also be zero-mean.

Many even quite simple calculation operations cause a deviating mean value. E.g. squaring or commutation: The mean value of commutated, previously zero-mean noise is no longer zero.

If the mean value from the Monte-Carlo trials deviates from the uninfluenced result, this is also reflected in the measurement uncertainty determined. Because no matter for what reason the result of a Monte-Carlo experiment deviates from the uninfluenced result, just this deviation from the uninfluenced result is always used.

Interpreting the results: Measurement uncertainty

The results of the algorithm are assigned the user-defined property "Uncertainty". It is stated as the standard deviation.

What is determined is the measurement uncertainty which results from all of the deviations. This includes all M Monte-Carlo runs and all of the channel's readings. In the calculation of the standard deviation, all deviations from the mean value are determined. Attention: at this point, FAMOS sensibly uses the best value, namely the first run of the loop without any distortion, in other words the uninfluenced result.

For example, suppose existing individual values of force and distance are to be used to determine the work according to a formula. In the command *UNCERTAINTY_LOOP*, the amount of Monte-Carlo trials is set as M = 1000. In each individual Monte-Carlo trial, a result is obtained. The standard deviation is then determined (or more precisely: estimated) from all M=1000. This is then the measurement uncertainty.

As another example, consider the difference of 2 time series of 1000 temperature reading each. In the command *UNCERTAINTY_LOOP*, the amount of Monte-Carlo trials is set as M = 100. In each individual Monte-Carlo trial, a result is obtained. The result is itself a time series of 1000 temperature differentials. For each of the temperature differentials, there are M=100 values. The standard deviation is then formed (or more precisely: estimated) from all 100*1000 values. Thus, the resulting measurement uncertainty is obtained from all of the data.

Interpreting the results: Expanded measurement uncertainty

If a coverage probability is stated in the *UncertaintyCalc()* function, the expanded measurement uncertainty is calculated. Toward this end, *UncertaintyCalc* calculates the distribution density of the deviations from the uninfluenced result. From this, the coverage interval is determined, in which the stated percentage of random samples is located. All values included in the calculation of the measurement uncertainty itself are also used for calculating the expanded measurement uncertainty. Thus, if the result is a time series consisting of 1000 values and M=100 Monte-Carlo trials are performed, an expanded measurement uncertainty calculated from 100*1000 value sis formed.

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Since the GUM assumes a symmetrical distribution for the numerical value of the expanded measurement uncertainty, FAMOS also determines the shortes coverage interval as a symmetrical one. If a more thorough analysis, particularly for asymmetrical distributions is required, see "Advanced Analyses".

Calculating the expanded measurement uncertainty by means of the expansion factor

The expanded measurement uncertainty can alternatively be determined from the measurement uncertainty by means of an expansion factor. This factor depends on the coverage probability and the distribution density. In the case of coverage probability of 95% and a normal distribution, the factor is then 2. See the definition of the term expansion factor, above.

However, if the user knows the distribution density, then working with a factor is very convenient and in conformance with the GUM.

FAMOS does not use this technique, since it does not assume a normal distribution.

Instead, FAMOS determines the distribution density itself.

Calculation of the relative measurement uncertainty

Example in FAMOS:

```
UNCERTAINTY_LOOP 1000
   _In1 = UncertaintyModify ( Input1 )
   Result = _In1 * _In1
   UncertaintyCalc (Result )
End
uc = UncertaintyGet(Result, "Uncertainty")
relative_uc = uc / Result
relative_uc_percent = relative_uc * 100
```

Initially, the standard measurement uncertainty is determined. By means of referencing the result, the relative measurement uncertainty is calculated. By multiplying with 100 (or, precisely 100%), the value is expressed as a percentage.

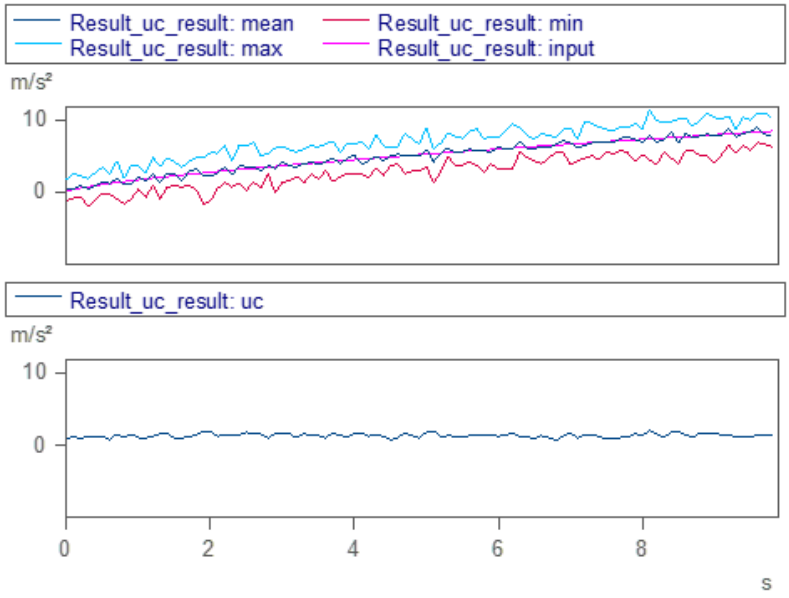
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18.3 Advanced analyses

When the measurement uncertainty of the result has been determined, the purpose is basically already accomplished. However, an explanation of the value is sometimes needed. The *UncertaintyCalc()* funtion offers a number of extra analyses which help to understand and interpret the measurement uncertainty calculated.

E.g.

```
UncertaintyCalc( Result, 99, 0, "uc", "pdf0", "min/max", "mean")
```

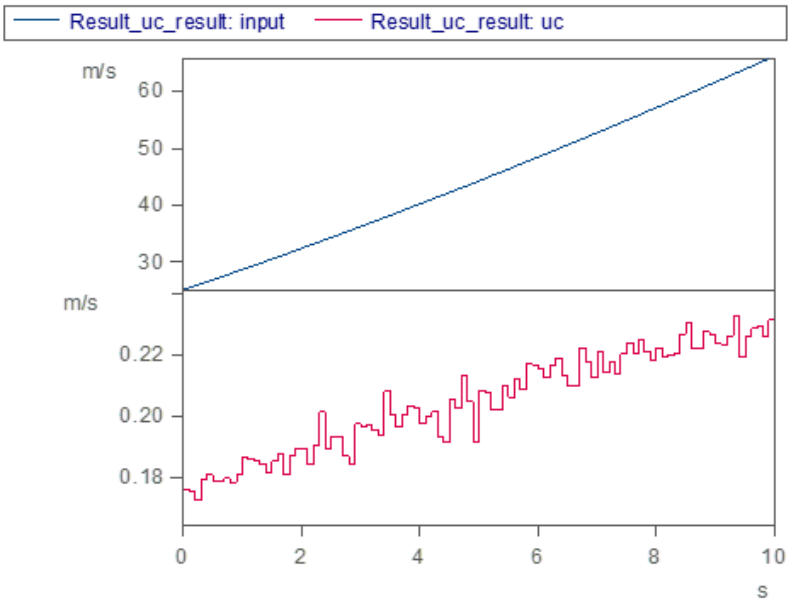


18.3.1 "uc"

For each measurement point in the result, the measurement uncertainty is stated separately.

If the result consists of many measurement points, a much more detailed picture emerges than with the summary user-defined property "*Uncertainty*". For each measurement point itself, the measurement uncertainty is determines by calculating the standard deviation from the values of this measurement point across all Monte-Carlo trials. Here, too, for the mean value used in the formula for the standard deviation, the best estimate is taken, which is the corresponding measurement point from the uninfluenced result.

In order for the value to be meaningful, the count M of Monte-Carlo trials must be accordingly high.



result: for each sample, the measurement uncertainty (red)

In this example, the user-defined measurement uncertainty is calculated as 0.21 m/s, meaning across all measurement points. This is an "average" value. However, the more precise statement is that the measurement uncertainty increases as the time/amplitude, and is by no means constant. It increases from approx. 0.18m/s to 0.22m/s. There is a clear trend to observe. Only from the user's point of view is it possible to say whether "Measurement uncertainty across data" is a meaningful value. FAMOS does not make the decision, but provides a basis for calculation.

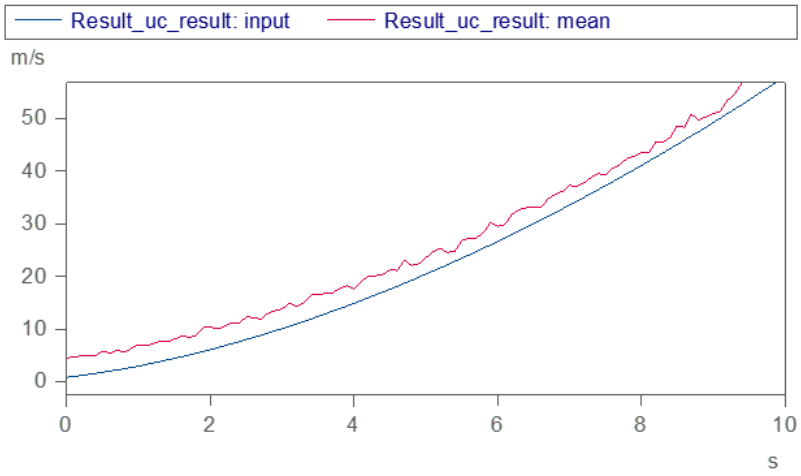
If the measurement uncertainty is of a similar size in ever single point, then it is quite possible for a single numerical value to characterize the measurement uncertainty of the entirety of measurement points.

If the result is a single value, the same value is entered in the "*uc*" –variable as in the user-defined property "*Uncertainty*".

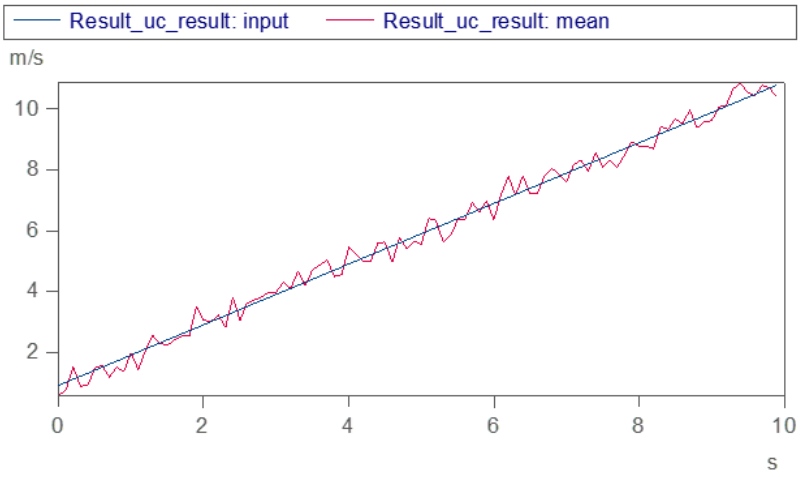
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18.3.2 "mean"

For each measured point in the result, the mean value of all Monte-Carlo trials is returned. This may deviate from the uninfluenced result; see above.



Example in which the mean value tends to deviate from the unaffected result.



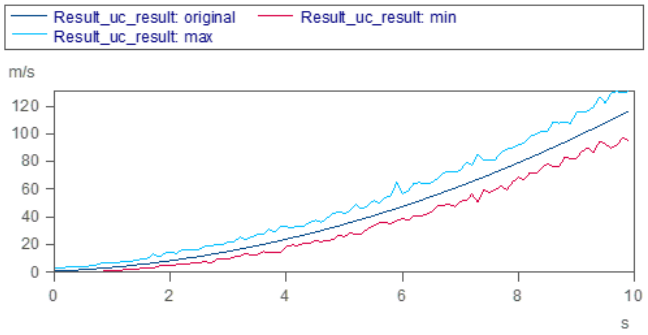
Example in which the mean value fluctuates around the unaffected result.

18.3.3 "min/max"

The upper and lower envelope curves are determined. They are calculated for each individual measurement point. For each measurement point, the minimum and maximum throughout all Monte-Carlo trials is found. This makes all outliers visible, which are not as noticeable in the standard deviation.

These analysis results are not obtained through summation/mean-value-calculation as in the calculation of the standard deviation. Thus, outliers are completely revealed. Even as the count of Monte-Carlo trials increases, they do not even converge in dependence on the distribution density. For example, if there is a normal distribution, then in the course of time, there will be ever more rare but ever more widely deviating values, thus increasing the spread of the band between the minimum and maximum.

Thus, although this statistic is quantitatively not decisively relevant, it does provide an impression of the deviations which occur. And particularly, of where they can occur.



unaffected result and the upper, lower envelope of all noisy results

The envelope curves generated here are not defined in the GUM.

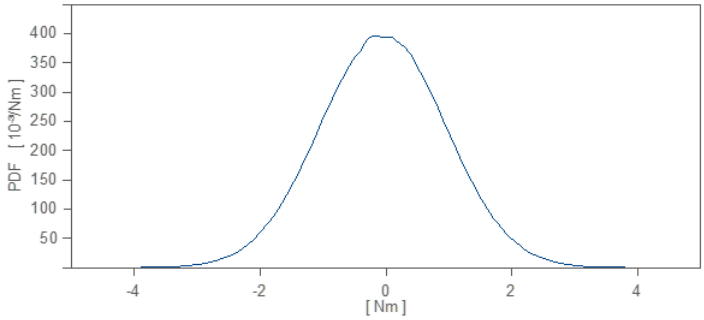
18.3.4 "pdf0" distribution density, zero-based

The zero-based distribution density of the deviations across all M Monte-Carlo trials and all measurement points is determined. The integral over the distribution density is 1. For instance, if the result's y-unit "N", then the x-unit of the distribution density is also "N", and its y-unit is "1/N". The distribution density is stated as a virtual result around zero. Not the result's distribution density, but the deviations are determined.

The deviation of the noise-distorted result from the unaffected result is determined. This deviation is determined for each measurement point in each Monte-Carlo trial. If, for example, the result has 100 measurement points and 1000 Monte-Carlo trials are performed, then 100*1000 deviations are generated, which then jointly produce the distribution density. The distribution density is determined for the entire data.

If in special situations, the distribution density of particular segments of the result is of interest, this part of the result is to be excerpted and processed as an additional result by means of the function UncertaintyCalc.

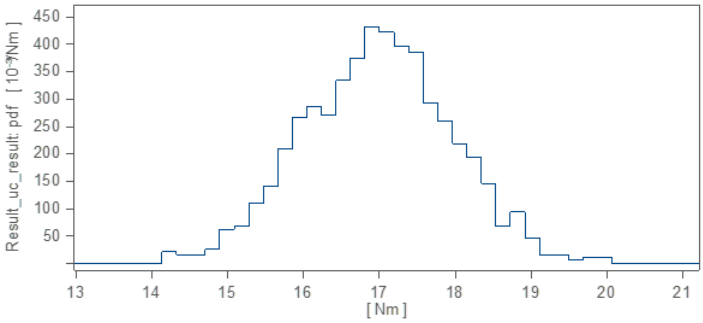
If the result is a single value and the result's distribution density is to be determined in accordance with GUM, then the x-axis needs to be shifted by the amount of the result. In this way, the distribution density of the deviations becomes the distribution density itself.



Direct analysis result, distribution density of variances

In FAMOS, the offset shift can be performed using the following calculation:

```
pdf = xoff ( pdf, xoff? ( pdf ) + result )
```



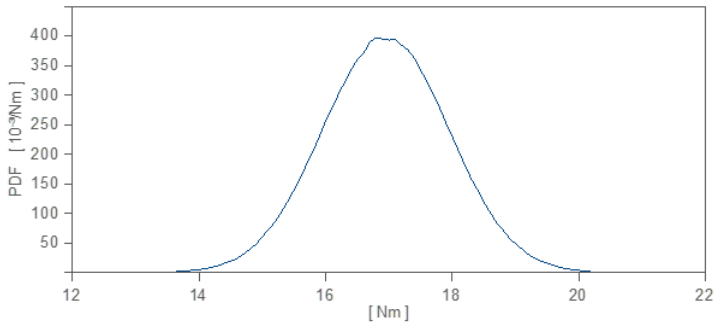
Distribution density of the result

If the result consists of multiple different values, then an appropriate representation of the distribution density is not possible. This is also the reason why FAMOS determines the distribution density around the zero line. Then it is easy to imagine the result being at zero. Particularly with non-symmetric distributions, the result does not need to be displayed separately for the purpose of clarity, since zero is always very visibly displayed.

Be aware, the observer of a distribution density can too easily assume that the uninfluenced result is located in the center, in other words, at the "mass center". That is only where the mean value of the distribution; see the segment "Mean Value 624". The uninfluenced result may be significantly removed from it! In the case that the distribution is centered around the apparent result of zero, this is easily seen. One sees that the "mass center" is not located at zero.

18.3.5 "pdf" distribution density

If the result is a single value, its distribution density can be determined directly. The advantages of "pdf0" are described in the associated section. But "pdf0" determines the distribution density of deviations. By contrast, "pdf" directly determines the distribution density of the result. "pdf" can only be applied to single values. The procedure for determining it takes all of the noise-affected single values of the M Monte-Carlo trials into account.



Distribution density of the result that exists as a single value.

18.3.6 Constraints

All Monte-Carlo trials are taken into account in the expanded analysis procedure. But the very first and very last iterations of the loop, which return the uninfluenced result, are not taken into account.

For the analyses "uc", "mean", and "min/max", the following applies: The data sets generated have exactly the same structure as the data set with the result (the variable "Result" in the example). If the results have different lengths in the various iterations of the loop, the analysis is correctly calculated only for measurement points which exist in all loop iterations. The data set generated is only as long as the very first iteration. If more measurement points or segments or events are generated in later iterations, they will not be taken into account.

The expanded analysis results are only read during the loop iterations and not changed.

18.3.7 Group with analysis results

The results of the expanded analysis are written in a group.

The group is initialized/updated upon each iteration of the loop.

For a result channel with the name x, the group is structured as follows:

`x_uc_result:original`	The uninfluenced result, from the first loop iteration
`x_uc_result:uc`	Measurement uncertainty as per the option "uc"
`x_uc_result:min`	Lower envelope curve as per the option "min/max"
`x_uc_result:max`	Lower envelope curve as per the option "min/max"
`x_uc_result:pdf0`	Zero-based distribution density as per the option "pdf0"
`x_uc_result:pdf`	Distribution density for single values as per the option "pdf"
`x_uc_result:mean`	Mean value as per the option "mean"

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If the input channel named x is an element of a group g, then the resulting group name is formed as g_x_uc_result.

Only the requested analysis results appear in the group. Additionally, always the uninfluenced result for purposes of simplified comparison.

"pdf" and "pdf0" can not both be used at the same time.

18.3.8 Use in determining the count M of Monte-Carlo trials

The expanded analysis also helps in determining whether the count M of Monte-Carlo trials is sufficiently high. If it is too low, the distribution density is not a nice smooth curve. The calculations of "uc" and "mean" also fluctuate strongly int hat case.

The fluctuating calculations of "min/max" should not contribute substantially to the assessment, since these statistics do not experience any averaging effect as the count M increases.

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18.4 Advanced evaluations

The function UncertaintySnapshot allows advanced evaluation of the influence on the input data, intermediate results and final results.

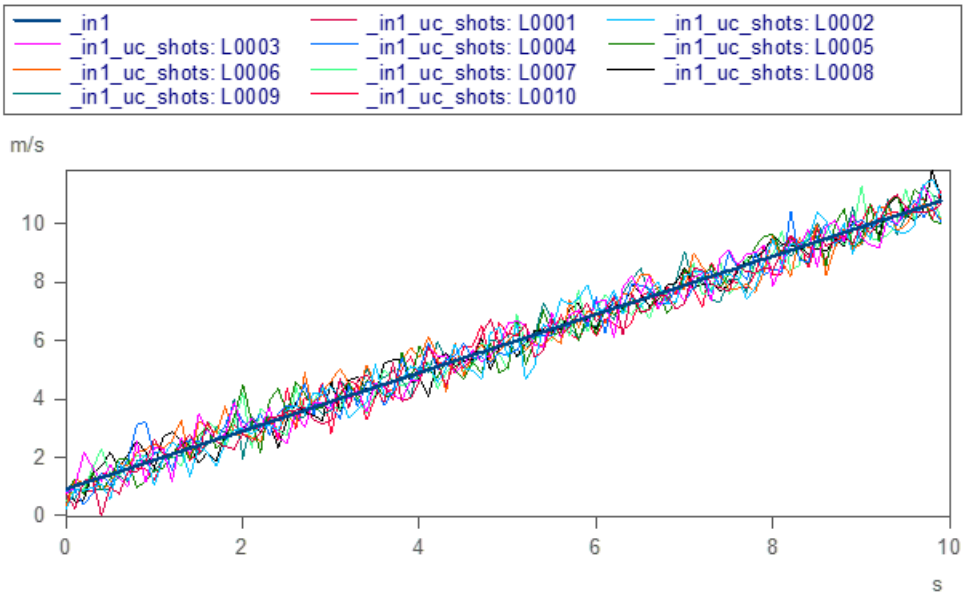
The goal is to visually assess the noise, the superimposed interference, over the count of Monte-Carlo trials.

It is true that in principle, all of these data could be viewed in single-step execution of the commands or by means of the existing instruction set. But a convenient way to perform the evaluation would be as follows:

```
UNCERTAINTY_LOOP 1000
    _In1 = UncertaintyModify ( Input1 )
    UncertaintySnapshot ( _In1, 0 )
    Result = _In1 * _In1
    UncertaintyCalc (Result )
End
```

In this case, the UncertaintySnapshot function generates a group:

```
_In1_uc_shots:L0001
_In1_uc_shots:L0002
…
_In1_uc_shots:L1000
```



Representation _In1 and first 10 variations

This group contains the data set _In1 for each of the 1000 Monte-Carlo trials. Using the Quickview window, or by displaying them jointly in a shared curve window, it is now convenient to compare and assess the patterns which appear.

In the same way, the data set "Result" can be evaluated:

```
UncertaintySnapshot ( Result, 0 )
```

The technique of having all patterns in one group is advantageous for the purposes of joint display and conciseness of the Variables list.

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Alternatively, the measurement approach can be used:

```
UncertaintySnapshot ( _In1, 1 )
```

In this case, the UncertaintySnapshot function generates measurements. Each Monte-Carlo trial is defined as a separate measurement:

```
_In1@uc_loop0001
_In1@uc_loop0002
…
_In1@uc_loop1000
```

Evaluation following the measurement approach is especially advantageous in multi-channel applications, where the Data Browser can be used to easily navigate from measurement to measurement. Particularly for all channels jointly. Note the measurements are not actual measurements, instead, the approach of *@Messung* is merely used to advantage.

In order to keep the accumulating data volume to manageable levels, for such advanced evaluations, a small to mid-sized count M of Monte-Carlo trials should be generated. Even a number like 10 can provide a good indication of what patterns are possible. Of course, this depends on the type of interference and on the algorithm used.

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18.5 Precision, selection of the count M of Monte-Carlo trials

The degree of precision which the selected procedure can achieve depends on a variety of factors. As a general rule, the greater the sample size used in the calculation, the more reliable and precise is the calculation of the standard deviation, which is the basis of the calculation of measurement uncertainty. But it is also important for the samples themselves to be well distributed, so that they provide good coverage over their range.

After all, the procedure does not calculate the measured value itself, bu only its measurement uncertainty. Generally, the measurement uncertainty does not need to be determined to the level of very many decimal places. With this in mind, there is a relevant distinction between a measurement uncertainty of 2mV or 3mV, but stating a measurement uncertainty of 2.3971mV is surely not sensible.

For instance, supposing the variable Work is to be determined by a formula from available single values of force and displacement. A count M of 10 Monte-Carlo trials is surely not enough. If the entire procedure of determining the measurement uncertainty is performed, then each time, a widely varying result will be obtained. This shows that M = 10 samples is not sufficient for determining the standard deviation. For M = 100, the fluctuations are significantly less, but still well visible. At M = 1000, the result appears to stabilize.

Suppose we have a time series containing 10000 readings. From this time series, a result is determined by means of filtering, etc. The result itself is a single value. Here it can be shown that already after M = 50 Monte-Carlo trials, a quite good result can be obtained. This is because the calculation of the standard deviation takes n=10000*50 values into account.

There are algorithms which have branches which depend on the value of the reading. To obtain adequate precision, it is important for each branch of the calculation to be run a sufficient amount of times.

Sufficiently exact determination of the measurement uncertainties and of the input data are necessary conditions for adequate precision of the measurement uncertainty determined. In many cases, in spite of the appearance of precision and of correctly budgeted measurement uncertainty measures, the estimate of the input data's measurement uncertainty is still rather rough. Determining the distribution densities is not even possible in many practical cases. Instead, a normal distribution is resorted to. But this is often also just a (rough) approximation. In consequence, apparently high precision of the determined measurement uncertainty may not truly be precise.

The Monte-Carlo procedure converges in proportion to sqrt (M). Thus for a significantly more stable measurement uncertainty result, the count of Monte-Carlo trials must be increased by the power of two. For example, for an improvement by a factor of 10 (one decimal place more precise), the count of trials must be increased by a factor of 100. This is generally only practicable with short algorithms or single-value calculations.

For determining the expanded measurement uncertainty, the following consideration applies: the expanded measurement uncertainty is estimated from the empirically determined distribution density. For instance, of a coverage probability of 99% is required, then 1% of the values of the distribution density may lie outside of the coverage interval. However, this 1% may not consist of only one value, but must comprise many. When working with n=1000 values, for example, the coverage interval is selected so that 10 values lie outside of it. Thus, the value of the expanded measurement uncertainty depends on these 10 random values. This shows that the precision involved can not be very high. On the other hand, n=10000 values would be needed so that 100 values lie outside, which is significantly better.

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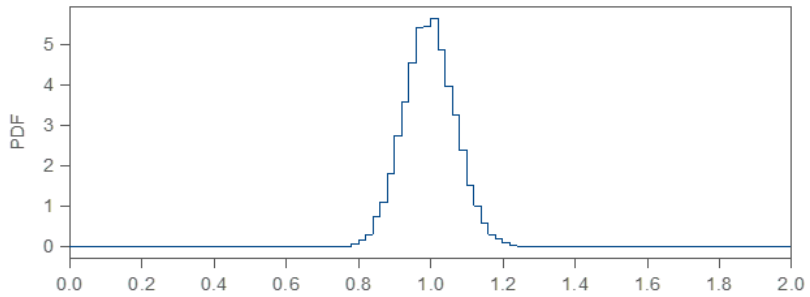
18.5.1 Quantitative evaluation

Let n represent the amount of values included in the calculation of the measurement uncertainty.

```
n = [count M of Monte-Carlo trial] * [count of readings in the result]
```

E.g. n = 100 with M=10 Monte-Carlo trials and a result length of 10.

From the count n it is possible to estimate how reliable the calculation of the measurement uncertainty is:



Exemplary distribution of the determined measurement uncertainty. True value = 1 and n = 100

To see this, let the determination of the measurement uncertainty be repeated (in a though experiment) very many times. Suppose the precise measurement uncertainty to be 1.0. Each time, the result is slightly different. For n=100, for instance, the values will lie roughly in a range of 0.8 .. 1.2; see the illustration. Most of these will of course be near 1. The measurement uncertainty is determined to a precision of around ±0.2. Keep in mind that the precise value, 1.0, is not known. With one measurement uncertainty determining procedure performed, the value obtained may be 0.8, for example. This is to be interpreted as follows: The value is too low by a factor of 1/0.8. If a value of 1.2 is obtained another time, this value would be too high by a factor of 1.2. Thus, the interval = [0.8*1/1.2 … 0.8*1/0.8]. To be more exact: the true value lies within the interval with a certain probability. As with the coverage interval, the interpretation is as follows: If one performs very many measurement uncertainty determining procedures, then in that portion of procedures (corresponding to the given probability), the true value lies within the interval.

Thus as an example, for n=100 it is possible to say: the value lies within the interval with a probability of 95%.

[0.88*[calculated measurement uncertainty] … 1.16*[calculated measurement uncertainty]]

The condition for this is normal distribution of the readings. Otherwise, this is only approximately applicable. However, as n increases the approximation gets increasingly better.

The following table illustrates this:

n	Probability	Min	Max
10	95%	0.70	1.75
	99%	0.63	2.15
	99.7%	0.59	2.48
100	95%	0.88	1.16
	99%	0.84	1.22
	99.7%	0.82	1.26
1000	95%	0.96	1.05
	99%	0.95	1.06

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	99.7%	0.94	1.07
10000	95%	0.986	1.014
	99%	0.982	1.019
	99.7%	0.979	1.021

Table: Confidence interval for measurement uncertainty of 1.0 based on a normal distribution

The table is interpreted as follows:

When calculating based on n values, with the probability stated, the precise value lies within the interval

[Min*[calculated measurement uncertainty] … Max*[calculated measurement uncertainty]]

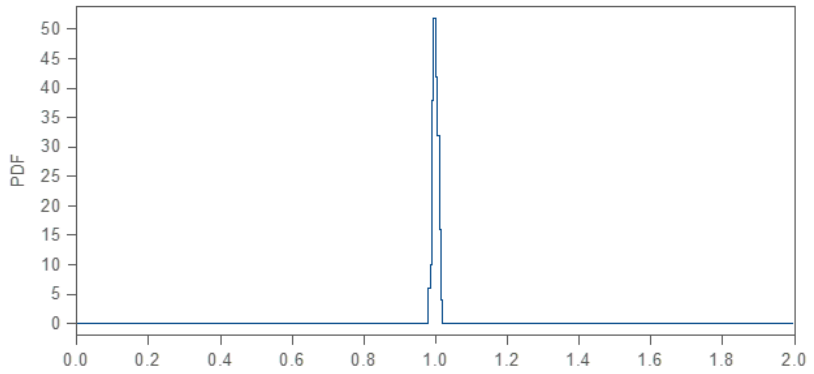
Example:

When applying the calculation to 100 values and a computed measurement uncertainty of 1000Nm, the probability is 99% that the measurement uncertainty lies within the range:

[0.84 * 1000Nm … 1.22 * 1000Nm] = [840Nm … 1220Nm]

The table clearly shows how inexact the measurement uncertainty is for n = 10. In general, that is not sufficient, since the true value could be more than twice as high as the one calculated! For n = 100, the measurement uncertainty is precise to within approx. 20%. In many applications, this is adequate. For n=1000, it is precise to within approx. 6%.

It is also clearly seen that increasing the sample size from 100 to 10000 (meaning by a factor of 100), the confidence interval becomes approx. 10 times smaller, so that the standard measurement uncertainty is determined 10 times as exactly.



Exemplary distribution of the determined measurement uncertainty. True value = 1 and n = 10000

The table is obtained by determining the confidence interval for the unknown variance, with known mean value. For this purpose, the Chi-squared distribution with n degrees of freedom is used.

Confidence interval = [sqrt (n/c1) * uc … sqrt (n/c2) * uc]

with uc = calculated measurement uncertainty, c1 = 1-α/2 Quantile, c2 = α/2 Quantile.

For example, with n = 100 and a probability of 95%, the value is α=0.05, thus the quantiles 129.6 and 74.2, and the confidence interval = [0.88 * uc … 1.16 * uc]

18.5.2 Enhancement versus the GUM

The GUM in its basic form (up to and including 2012) treats the measured value as a single value in the sense used in FAMOS. While the GUM does deal with multi-dimensional measurement values in JCGM 102:2011, these concepts can only partially be applied to time series and volume data as are typically analyzed in FAMOS. FAMOS provides enhancements in accordance with the purposes of GUM. Thus, calculations of the measurement uncertainty can be performed both for individual measurement points but also for entire time series.

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The GUM models interference variables only by means of their distribution density. Measurement technicians know what undesirable effects of network hum, offset drifts etc. can have. Since these are relevant to everyday practice, FAMOS offers these techniques as a supplement.

18.5.3 Defining one's own interference signal

Many typical interference patterns are pre-implemented. The input data are provided the appropriate user-defined properties before the algorithm is calculated.

Here, for instance, the definition of an offset drift:

```
UncertaintySet( Input1, "Uncertainty Source.Drift Offset", 0.01) ; [mV]
UncertaintySet( Input1, "Uncertainty Source.Drift Time", 1000) ; [s]
UNCERTAINTY_LOOP 1000
  ...
```

Instead of calling the function UncertaintyModify(), it is also possible to create one's completely own interference pattern. This can be necessary of, for example, there is a distribution density which is not reflected in the user-defined properties listed below. This is the case, for instance, when the distributions have value limits due to cutoff limits in the physical system modeled. As an example, Mass >=0, Temperature >= 0K, Efficiency coefficient < 1. This is also the case with certain shapes of the interference signal.

It is important that there be no distortion of the input data in the first and last iterations of the loop.

```
i=0
UNCERTAINTY_LOOP 1000
   …
   If i >= 1 AND i <= 1000
      _In1 = Input1 + random (leng?(Input1 ),2,0,0,0 )
   else
      _In1 = Input1
   end
   _In2 = UncertaintyModify (Input2 )
   …
```

While _In2 is determined automatically, _In1 can now be individually distorted with interference.

Even the superposition of automatic and personally-defined interference is possible:

```
_In1 = UncertaintyModify (Input1 ) + random (leng?(Input1 ),2,0,0,0 )
```

It is important to ensure that non-correlating random numbers are always used. This applies for all channels within a loop iterations, as well as between the loop iterations.

Specifically, this means that the random() function may only be used with SvInit=0 = "No re-initialization of the random number generator" within the loop. If reproducible behavior is desired, then the random() function must be called before the loop with an appropriate parameter for SvInit > 0.

Only when correlation is genuinely intended, see below.

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18.5.4 Mutually correlated interference

this is achieved by means of personally-defined interference patters which are applied proportionally to multiple signals.

```
Störung1 = random (leng?(Input1 ),2,0,0,0 )
_In1 = UncertaintyModify (Input1 ) + 0.3 * Störung1
_In2 = UncertaintyModify (Input2 ) + 0.2 * Störung1
```

See also the GUM's covariance matrix.

Typical representatives of correlated interference are network hum and noise pulses such as those from an inverter. This can certainly affect multiple channels, in which case the interference occurs simultaneously or with the same phase.

There can be practical value in specifying these interference patters for a channel. The interference is then added to other channels, if desired, with a different weighting factor.

```
_In1 = UncertaintyModify (Input1 )
  Disturbance1 = _In1 - Input1
_In2 = UncertaintyModify (Input2 ) + 1.5 * Disturbance1
```

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18.6 Activating, testing the loop; debugging

It is permitted to run code line-by-line. That works like in a FOR loop. Line-by-line running is urgently recommended for the purpose of inspecting the routine's behavior.

It is possible to set the input channels' properties in the loop. Then the loop can be run one time completely. In the 2nd run, the properties can be set and changed. With the UncertaintyModify function, it is then possible to check whether the calculated deviations meet expectations. Thus, these calls can be performed repeatedly. However, following successful commissioning, the code lines with UncertaintySet() are moved in front of the loop for improved performance.

```
UNCERTAINTY_LOOP 1000
   UncertaintySet ( Input1, "Uncertainty", 4.5)
   _In1 = UncertaintyModify ( Input1 )
   ...
```

All results, even those of the expanded analysis, are improved iteratively with every Monte-Carlo trial.

```
UNCERTAINTY_LOOP 1000
   ...
   UncertaintyCalc (Result, 95, 0, "uc" )
   uc = UncertaintyGet(Result, "Uncertainty")
   r = Result_uc_result:uc
   ...
```

After running UncertaintyCalc, the user-defined properties of the result are updated.

The UncertaintyCalc function may also not be run repeatedly for a result within a loop iteration. The exception is the very first loop iteration, in which the function call itself is being first activated.

Resuming after an error

After certain errors, it is not possible to continue within the UNCERTAINTY_LOOP. This is because some commands are not designed to be repeated within the same loop iteration. Then it only helps to run the loop from the start. However, as also with FOR loops, FAMOS has a memory of which loop it is located. In the UNCERTAINTY_LOOP, FAMOS even knows in which iteration it is currently located. For that reason, it is not sufficient to start running the loop again from the beginning. Instead, it is necessary to start from the beginning of the sequence. If there are many code lines between the sequence start and the loop start, which one does not wish to run, they can be skipped:

1. Running the first line of the sequence. These can also be empty. In consequence, FAMOS deletes the memory of which number of loop it is currently in.
2. Immediately afterward, go to the beginning of the loop or to that of the next appropriate one before the loop. But from there, resume running.

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18.7 Data types, constraints

Calculation of the measurement uncertainty is supported for the following data types:

- equidistant data
- y-component of xy-data
- magnitude of complex data

The measurement uncertainty pertains to the measurement value, which is then the y-component. The magnitude of complex data is then to be seen as a y-component in this sense.

Not supported are:

- complex data in real/imaginary representation
- phase in complex data
- x-component of xy-data
- Time Stamp Ascii data
- digital bits, BOOL (0 or 1)
- text variables
- video data

Some calculations within UncertaintyModify () are only carried out for equidistant data. In the case of the y-track of xy-data, then at most the y-component can be selected with .y.

If the calculation is to be applied to the phase of a complex data set, then this value can be assigned to its own variable, e.g. A_P = A.P. This can then contain its own specifications for interference and its own measurement uncertainty.

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18.8 UNCERTAINTY_LOOP for experts

An initial run of the loop is performed, in which *UncertaintyModify()* dows not generate any deviations. The algorithm is calculated without any data distortion. The results are interpreted as the best estimate. *UncertaintyCalc()* generates a group with empty results.

Next, the loop is run M times for the M Monte-Carlo trials. *UncertaintyModify()* generates different deviations each time. The calculation of the measurement uncertainty and of the expanded results improves with each iteration.

Subsequently, final run is started, which like the first works without any additional deviations. This returns all variables back to the uninfluenced results.

Interference signals not correlated

```
UNCERTAINTY_LOOP 1000
    _In1 = UncertaintyModify ( Input1 )
    _In2 = UncertaintyModify ( Input2 )
    …
   …
```

Even if Input1 and Input2 have the same measurement uncertainty, _In1 and _In2 receive non-correlated interference, so that, for example, _In1 + _In2 can be calculated correctly in accordance with the Monte-Carlo method.

Rules

Rule: The input data must be the same in every loop iteration.

Not allowed:

```
UNCERTAINTY_LOOP 1000
    Input1 = UncertaintyModify ( Input1 )
    …
```

Because in each iteration, the variable is increasingly distorted!

Not allowed:

```
UNCERTAINTY_LOOP 1000
    if …
       input1 = …
    end
    _In1 = UncertaintyModify ( Input1 )
    …
```

Because the input data are different in different loop iterations.

Rule: The calculation by means of UncertaintyCalc must be performed the same way in every iteration

Not allowed:

```
UNCERTAINTY_LOOP 1000
    …
    If …
       UncertaintyCalc ( Result)
    …
```

Rule: For each result, the calculation of the measurement uncertainty may only be performed once

Not allowed:

```
UNCERTAINTY_LOOP 1000
   ...
   UncertaintyCalc ( Result)
   UncertaintyCalc ( Result )
   ...
```

Rule: The algorithm must be the same in every loop iteration

Not allowed:

```
i=1
UNCERTAINTY_LOOP 1000
   …
   If i = …
      Result = …
   else
      Result = …
   end
   UncertaintyCalc ( Result)
   i=i+1
```

Rule: While it is allowed to change the expanded analysis, afterward it may no longer be updated further by UncertaintyCalc. When debugging, if the content of the expanded analysis group is changed by the user, the change is initially allowed. But UncertaintyCalc can then no longer be called, so that the running of the loop is canceled and it it is necessary to start all the way from the beginning.

Not allowed:

```
UNCERTAINTY_LOOP 1000
   UncertaintyCalc ( Result, 95, 0, '"pdf0")
   Result_uc_result:pdf0 = …
```

Rule: The UNCERTAINTY_LOOP can not be nested.

Not allowed:

```
UNCERTAINTY_LOOP 1000
   UNCERTAINTY_LOOP 1000
      …
```

This also doesn't work if the inner call is hidden in a sub-sequence.

Rule: The loop may not be controlled.

Not allowed:

```
UNCERTAINTY_LOOP 1000
   break
```

Not allowed:

```
UNCERTAINTY_LOOP 1000
   continue
   …
```

18.9 User-defined properties

The following properties are set by UncertaintySet and queried by UncertaintyGet, unless described differently.

18.9.1 General remarks

"Uncertainty"

The measurement uncertainty, more precisely the standard measurement uncertainty, stated as a real number in the channel's y-unit. The function UncertaintyCalc() calculates this property.

This property is also taken into account by the function UncertaintyModify(); see below.

"Expanded uncertainty"

The expanded measurement uncertainty, stated as a real number in the channel's y-unit. The function UncertaintyCalc() calculates this property when parameterized accordingly.

"Uncertainty evaluation"

The method according to which the measurement uncertainty and or the expanded measurement uncertainty are determined. The function UncertaintyCalc() calculates this property.

The property is a text, e.g. the following:

“MCM, M=100“

where MCM stands for the Monte-Carlo method as per GUM, M is the number of Monte-Carlo trials, or the first parameter of UNCERTAINTY_LOOP.

This property is queried by the function UserPropText?.

"Coverage probability"

The coverage probability, stated in percent. E.g. 95 or 99.7.

The function UncertaintyCalc() sets this property when parameterized accordingly.

18.9.2 Influencing quantities and deviations

These are the quantities which the function UncertaintyModify() takes into account in order to determine real deviations. The properties listed are real numbers. The purpose is to model interfering influences as found in real-world situations. Particularly when calculating with long time series, it is far from sufficient to model interference by just its distribution density. Rather, algorithms can respond more or less sensitively to offset drift, parasitically coupled mains hum, etc. Various interference sources can be superimposed on the signal by assigning the associated properties to the channel. The mechanisms for this purpose are described below.

It is recommended to perform a test run in order to check the shape of the interference signal. Most can be assessed well with a signal given by input signal * zero. In the case of gain error, use input signal * zero + 1.

The properties defined below change the data's y-coordinate. The definition is designed for equidistant data. With XY-data, the change is made only for the Y-coordinate while ignoring the X-coordinate, just as if only the y-component was passed. The magnitude of a complex data set is handled the same way. Some interference types, which are based on time, only make sense with equidistant time-based data, e.g. superposition of mains hum. This is then also only supported for equidistant data.

"Uncertainty"

The input channel's y-values are distorted with \normally distributed interference:

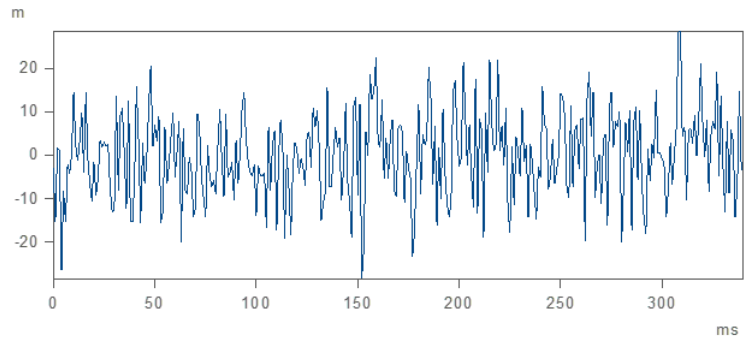
```
[New Value] := [Old Value] + RandomNumber * [“Uncertainty“]
```

The random number is normally distributed with a standard deviation of 1.

The standard deviation of the interference corresponds to the value of the property.

All unknown interference influences can best be modeled with this property. This includes unknown noise.

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normally distributed error for measurement uncertainty 10.0

"Uncertainty Source.Rectangular"

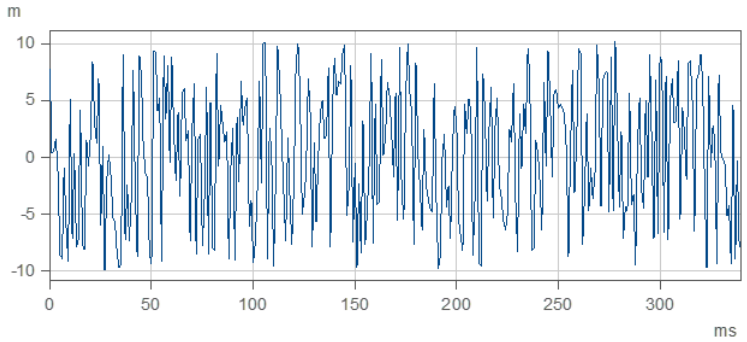
The y-values of the input channel are distorted with uniformly distributed interference:

```
[New Value] := [Old Value] + RandomNumber * ["Uncertainty Source.Rectangular"]
```

The random number is uniformly distributed within the range -1.0 .. + 1.0.

This property specifies the width of half of the symmetrical uniform distribution.

Uniformly distributed interference can occur, for example, in consequence of discretization, meaning in analog-digital conversion. But also when rounding to a certain number of decimal places, for instance when taking a reading from a digital multimeter.



Equally distributed noise with parameter 10

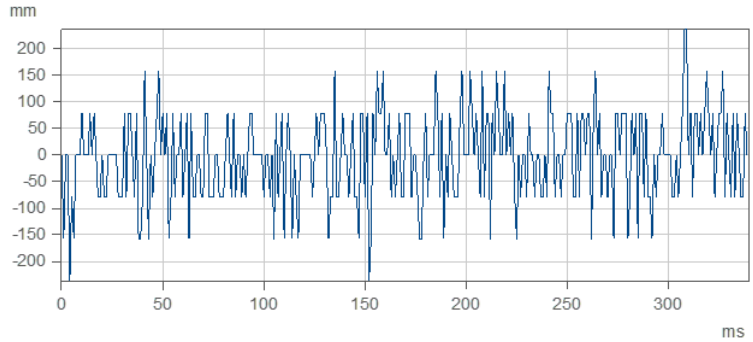
"Uncertainty Source.LSBs"

The y-values of the input channel are distorted with interference which corresponds to the bit noise of an analog-digital converter (ADC). The procedure can only be used with data sets which are kept in an integer format internally (plus any scaling information). The interference itself is an integer multiple of one bit or LSB (Least Significant Bit), according to the amplitude resolution.

```
[New Value] := [Old Value] + RandomNumber* ["Uncertainty Source.LSBs"]
```

The random number is an integer multiple of an LSB and fluctuates around zero.

The standard deviation of the interference corresponds to the value of the property.



Failure of 1 LSB effective. 1LSB corresponds to approx. 80mm

18.9.3 Offset- and gain error

"Uncertainty Source.Amplitude"

Deviation of the amplitude is replicated. Thus for example, a sensor's unknown gain error, or that of a measurement amplifier is replicated. This deviation is constant during the entire measurement. A measurement of this type corresponds to one run of the loop UNCERTAINTY_LOOP.

The deviation is stated in relative terms to the value 1.0, meaning as a dimensionless proportion. A value of 0.01, for example, means that the amplitude on average over many measurements deviates by approx. 1%.

The resulting change of the measurement value (y-value of the input data) is given by the following formula:

```
A = 1 + RandomNumber * ["Uncertainty Source.Amplitude"]
```

[New Value] := [Old Value] * A

The random number is normally distributed with a standard deviation of 1.

A is determined one single time for the entire measurement.

"Uncertainty Source.Offset"

A zero error is replicated. This deviation is constant during the entire measurement. A measurement of this type corresponds to one run of the loop UNCERTAINTY_LOOP.

The offset is specified as a real number in the channel's y-unit.

The resulting change of the measurement value (y-value of the input data) is given by the following formula:

```
Off = RandomNumber * ["Uncertainty Source. Offset"]
```

[New Value] := [Old Value] + Off

The random number is normally distributed with a standard deviation of 1.

Off is determined one single time for the entire measurement.

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18.9.4 Drift

Drift refers to a creeping change of the offset while the measurement is running. The calculation is performed only for equidistant data.

For a calculation of the drift, both properties "Uncertainty Source.Drift Offset" and "Uncertainty Source.Drift Time" must have valid defined values.

"Uncertainty Source.Drift Offset"

A measure of the height of the drift, stated as a real number in the channel's y-unit.

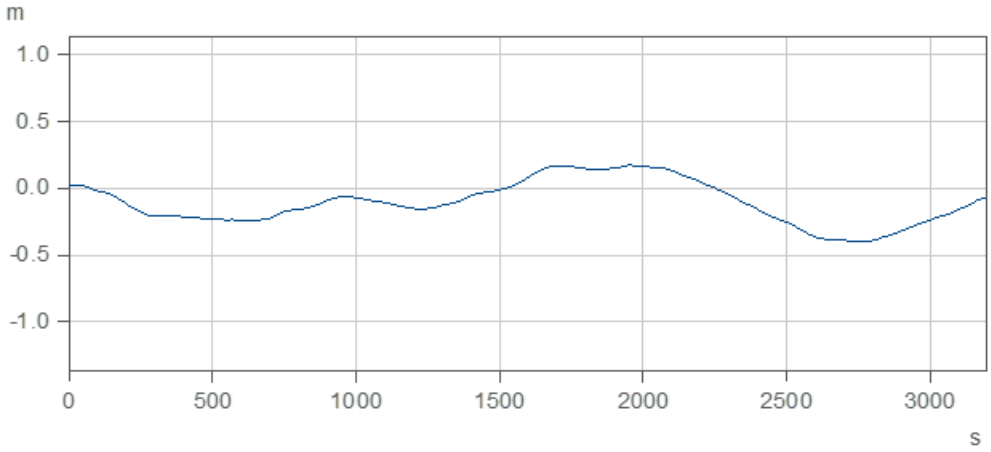
The resulting change of the measurement value is given by the following formula:

```
[New Value] := [Old Value]  + ["Uncertainty Source.Drift Offset" ] *
DriftValue
```

The DriftValue is a random number and its standard deviation is approx . 1.

"Uncertainty Source.Drift Time"

A measure of the drifting offset's change over time, stated as a real number in the channel's x-unit, greater than zero.Within this time, there is a noticeable change of the offset. The specification is rather qualitative in nature. But the time response changes in proportion to this property.



Drift with offset 1m and time = 100s

18.9.5 Hum, mains hum

The signal is distorted with mains hum. At minimum, the property "Uncertainty Source.Hum Amplitude" must be defined. The calculation is ponly performed for equidistant data. It can only be sensibly applied to time-based data.

If multiple channels measured at the same time are affected by mains hum, see the section "Mutually correlated interference". Otherwise, there is a danger that mains hum with differing phase is added, which generally does not reflect reality.

"Uncertainty Source.Hum Amplitude"

The amplitude of the fundamental oscillation, stated as a real number in the channel's y-unit, greater than zero. The amplitude is constant during the entire measurement. A measurement of this type corresponds to one run of the loop UNCERTAINTY_LOOP.

Observed across many measurements, the amplitude is normally distributed. The standard deviation of this normal distribution is specified here as a property.

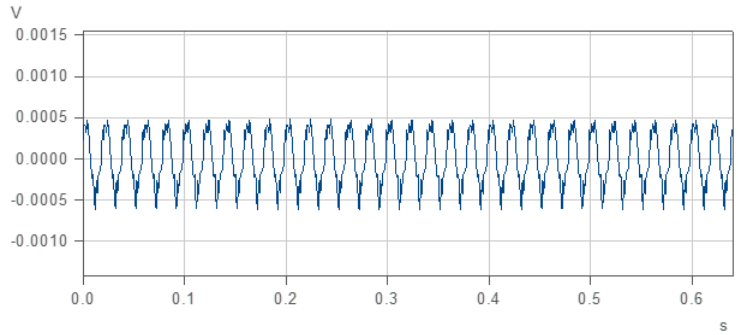
The phase of the fundamental oscillation varies from measurement to measurement and is uniformly distributed.

"Uncertainty Source.Hum Frequency"

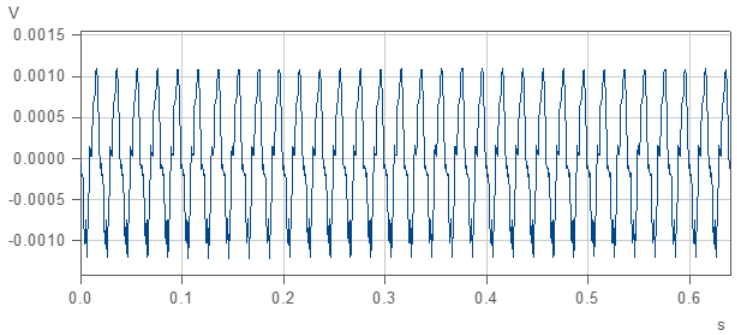
The frequency of the fundamental oscillation, stated as the reciprocal of the channel's x-unit. The frequency is the same across all measurements. If this property is not specified, 50Hz is assumed.

"Uncertainty Source.Hum Harmonics"

Ration of the power of all upper harmonics to the power of the fundamental frequency. For instance, a value of 0.01 means that the total power of all upper harmonics is 1% of the power of the fundamental oscillation. If this property is not specified, 0.1 is assumed.



Mains hum with parameter amplitude = 0.001V, frequency = 50Hz, harmonics=0.1



A next Monte-Carlo run with the same parameters

18.9.6 Spikes, interference pulses

Rare spikes can be superimposed on the signal. Their height and time behavior is to be defined. The calculation is only performed for equidistant data.

The height of the spikes lies between a minimum and a maximum value. Every single spike and every single measurement point of an interference pulse is assigned an individualized random value. The values are uniformly distributed. Between the spikes, the signal remains unaffected.

"Uncertainty Source.Spikes Max"

The maximum value of the spike's amplitude, stated as a real number in the channel's y-unit. If this property is not specified, zero is assumed.

"Uncertainty Source.Spikes Min"

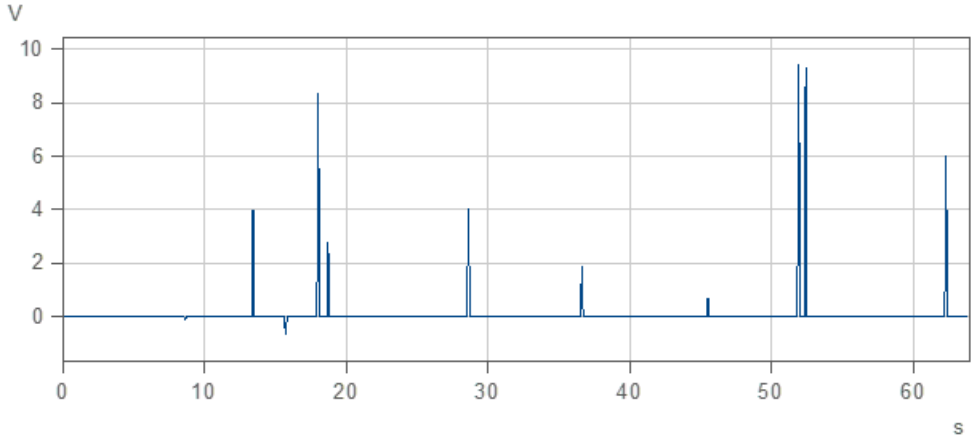
The minimum value of the spike's amplitude, stated as a real number in the channel's y-unit. If this property is not specified, zero is assumed.

"Uncertainty Source.Spikes Width"

The width of the spike, stated as a real number in the channel's x-unit. If this property is not specified, a sampling rate is assumed. The maximum width is specified. The particular width is uniformly distributed and is determined randomly for each pulse.

"Uncertainty Source.Spikes Time"

Distance between spikes, stated as a real number in the channel's x-unit. Measured from the beginning of one spike to the beginning of the next. If this property is not specified, the 1000-fold width is assumed.



Spikes with Min=-2V, Max=10V, Width=0.1s, Time=10s

18.9.7 High frequency noise

Noise consisting mainly of higher frequency components. The calculation is only performed for equidistant data.

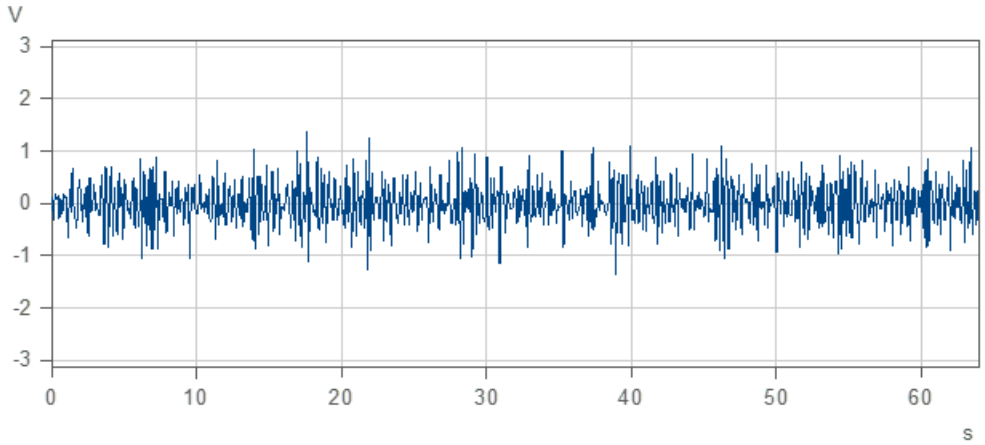
"Uncertainty Source.Noise RMS"

The y-values of the input channel are distorted with noise.

The standard deviation of the interference corresponds to the value of this property.

"Uncertainty Source.Noise Frequency"

The lower cutoff frequency of the noise, stated as the reciprocal of the channel's x-unit. The lower cutoff frequency is the same across all measurements. If no specification is made for this property, 20% of the sampling frequency is assumed.



Noise above 2Hz, RMS = 0.01V, sampling frequency 10Hz

19 Sample Applications

19.1 Analysis using the "Smo" function

The function "*Smo*" (imc FAMOS Function Reference) realizes a digital smoothing filter. The filter characteristic is investigated in depth in this analysis.

Quantities of interest are for cut-off frequency, transfer function, filter order, step-function response and unit impulse response.

Step 1

A test data set with the highest possible constant amplitude spectrum is created for use as a stimulus for the filter.

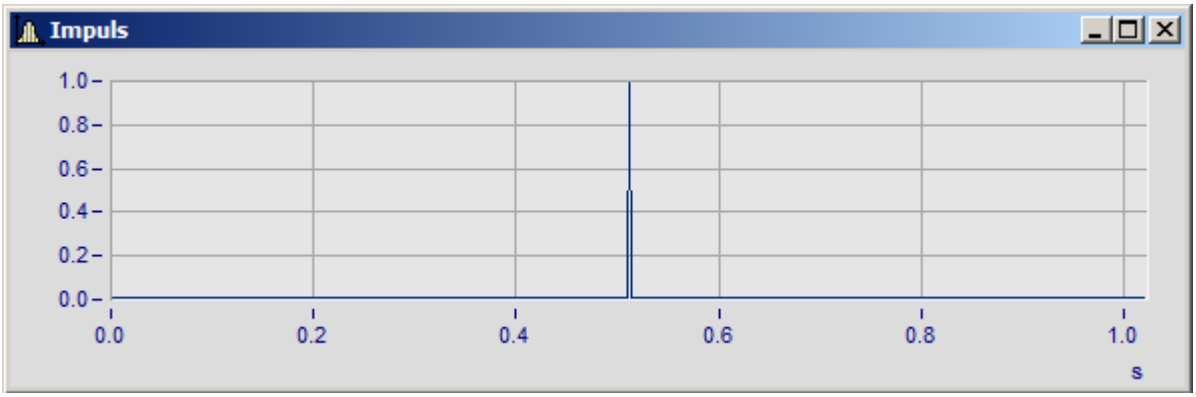
White noise fulfills this condition, as does a simple, short impulse. The data set should have a constant value of zero, but should contain an impulse with height 1 at the middle. The data set length is set to 1024, so that an FFT can be performed later.

Execute the following operations in succession:

```
Impulse = Set( Ramp( 0, 1e-3, 1024)*0 , 0.512, 1)
xUnit Impulse s
```

A sampling time of 1 ms is selected.

Select F4 to show the data set Impulse.



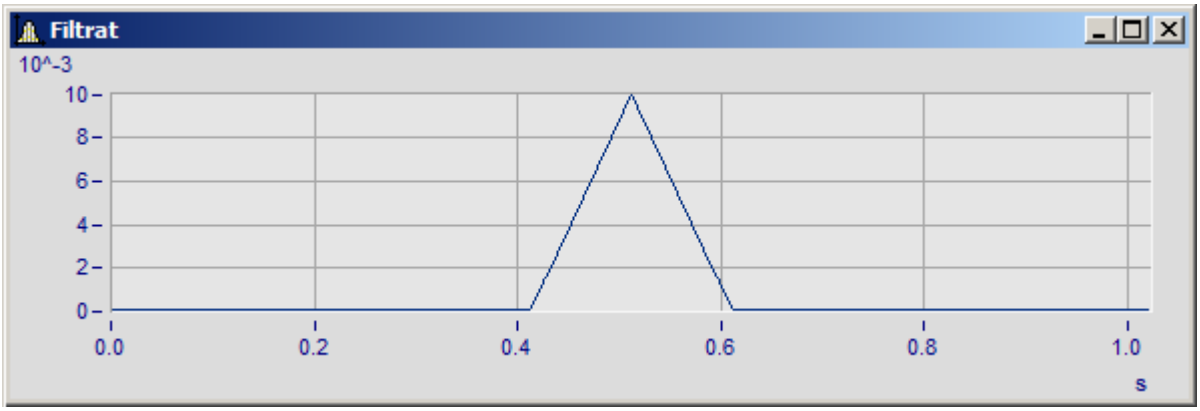
Step 2

Filter the created test data set.

The channel duration is greater than 1s, so a filter time of 200 ms can be selected.

```
Filtrat = Smo( Impulse, 0.2's')
```

Select F4 to show this waveform.



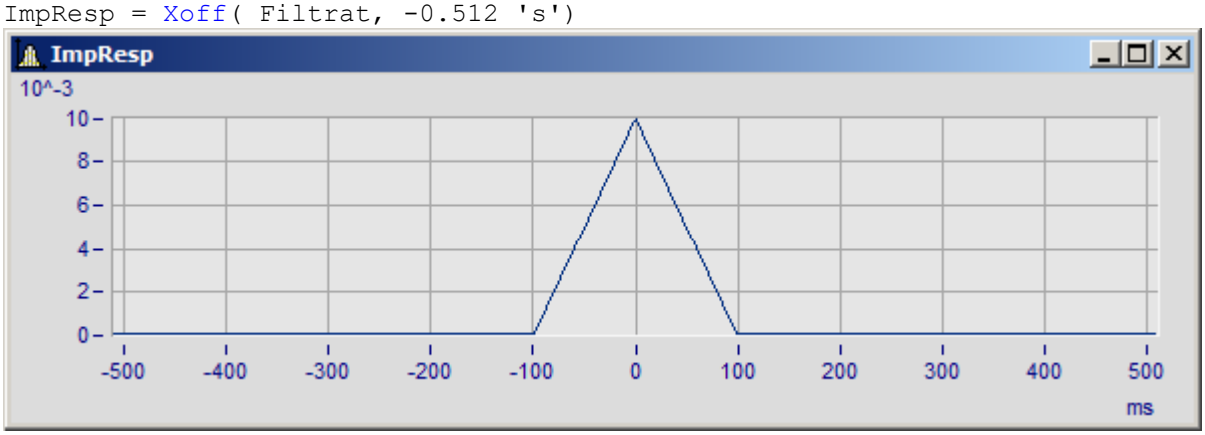
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Step 3

The impulse response of a filter is the reaction of a filter to a unit impulse at t = 0 . Because the impulse in the test data set occurs later, the impulse response must be shifted in the x-direction by this time difference.

The following formula yields the impulse response:

```
ImpResp = Xoff( Filtrat, -0.512 's')
```



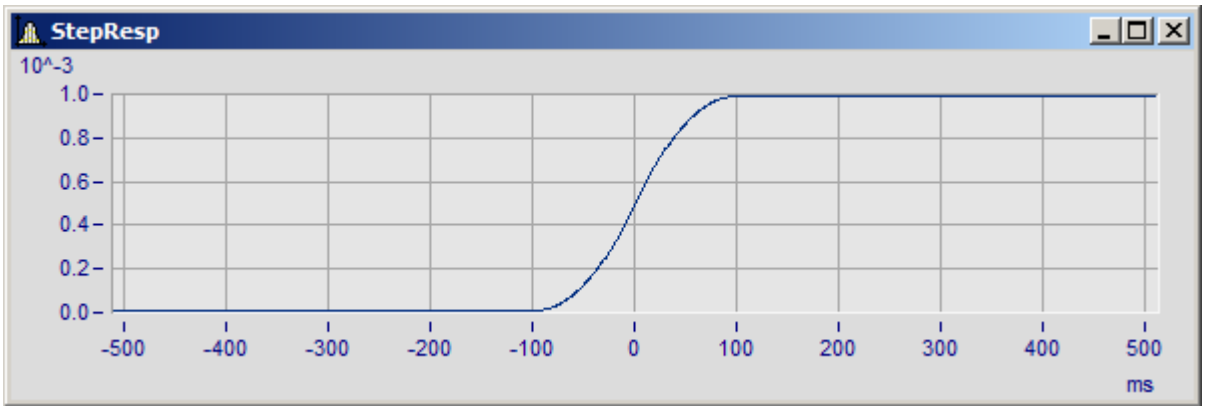
The impulse response is symmetrical around the axis t = 0.

Step 4

The step response of a filter is the reaction of a filter to the unit step at t = 0 . It can be calculated as the integral of the impulse response. The unit should be corrected.

```
StepResp = Int( ImpResp ) / 1 's'
```

The step response is formed from parabolic parts of second order.



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Step 5

The transfer function of the filter is determined by dividing the spectra of the filtered and the original test data set.

First open the dialog under "*Extra / Options / Functions*".

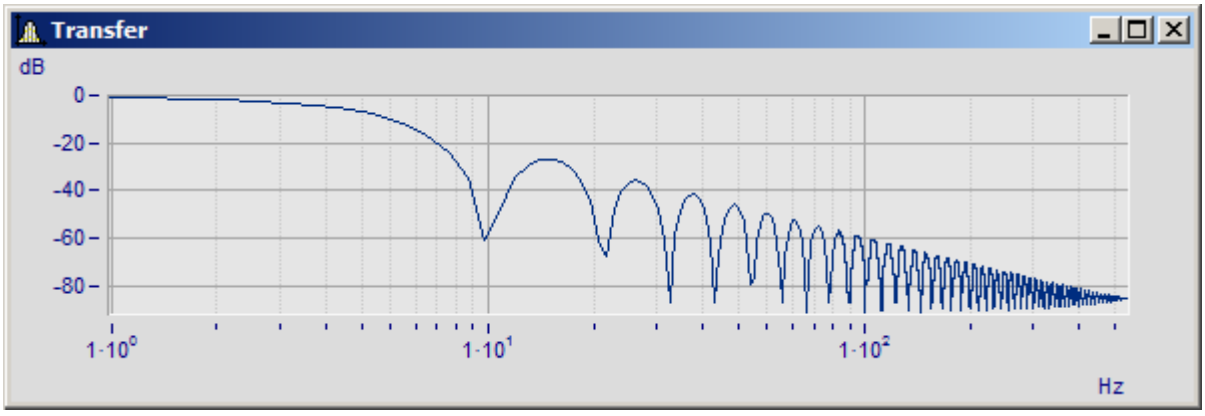
Here, set the FFT window function to "*Rectangular*". In the ideal case here, - the signal length is a power of two - no other window functions need to be selected. By selecting another window function, the result would be distorted slightly.

```
Transfer = FFT(Filtrat) / FFT(Impulse)
```

Display the transfer function by pressing function key F4. The result appears to be almost zero, since initially only the magnitude of the transfer function is represented.

Select a double logarithmic representation for the transfer function.

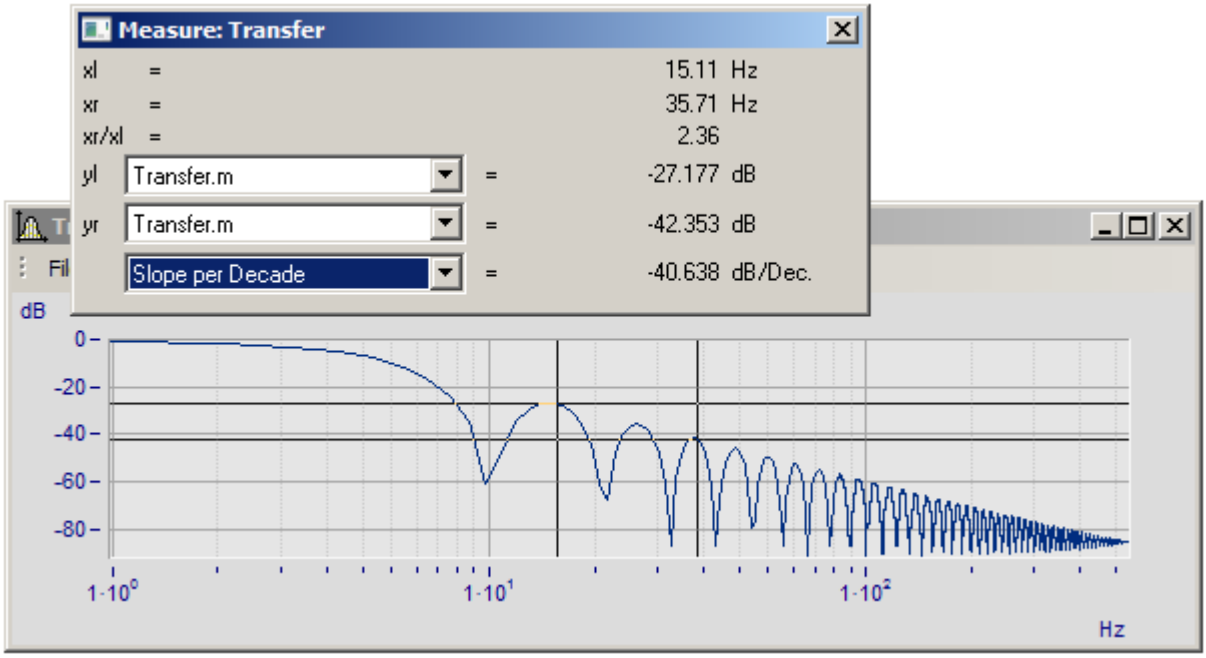
- First select the menu item "*Configuration: Axes...*" and then select the item "*Transfer.M*" in the axes list. Set the "*Scale*" option to "*dB*".
- Then select the x-axis in the axes list, and then under "*Scale*" the "*Logarithmic*" representation. Close the dialog box.
- Then select menu item "*Configuration: Grid*" to overlay the curve with a grid.



Step 6

Enlarge the window displaying the magnitude of the transfer function. Select "*Measure*" from the menu "*Edit*" in the curve window. A measurement value window with a crosshair appears.

Drag the crosshairs in the asymptotically decreasing range of the transfer function (in the right-hand curve section), using the left mouse button. Position the crosshairs on two maxima located somewhat apart, and then select "*Slope per decade*" from the lower list box. The measurement value window now indicates a slope of approximately -40dB/decade. Because the transfer function with filter order decreases at 20dB/decade, the filter order must be 2.



Step 7

To determine the cut-off frequency of the filter, drag one crosshair to the left until the measurement window displays 3dB. The corresponding frequency (x-value) can be read in the measurement window.

Execute the following operations to automatically determine the cut-off frequency:

```
CuttoffFr = Pos( Transfer.M, idB(-3) )
```

Display this single value by pressing F4; the cut-off frequency lies at 3.2 Hz. The function "*idB*" converts decibel to linear values, since the magnitude of the spectrum *'Transfer.M'* is in linear form. The "*Pos*" function determines the first occurrence of a value in a data set.



Step 8

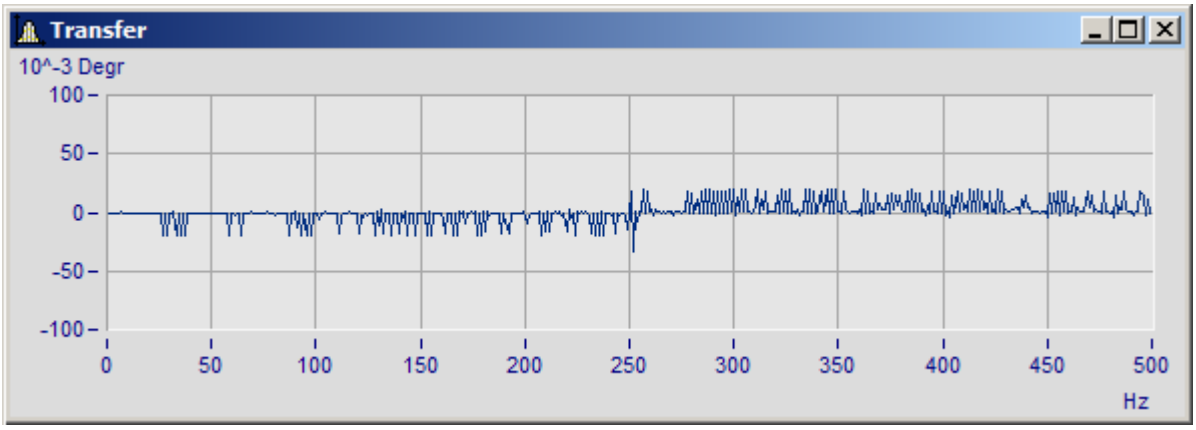
To view the phase of the transfer function alone in a window,

- display the entries "*Transfer.M*" and "*Transfer.P*" in the variable list by selecting "*Show components*".
- Select "*Transfer.P*" (phase) and press F4.

Note that the phase has only values of 0 or 360 degrees. Both values have the same meaning. Use the following operation to set the phases at 360 degrees to phases of zero:

```
Transfer.P = mod ( Transfer.P, 359.96 )
```

A phase of zero can be expected only if there were no inaccuracies in calculation.



Remarks

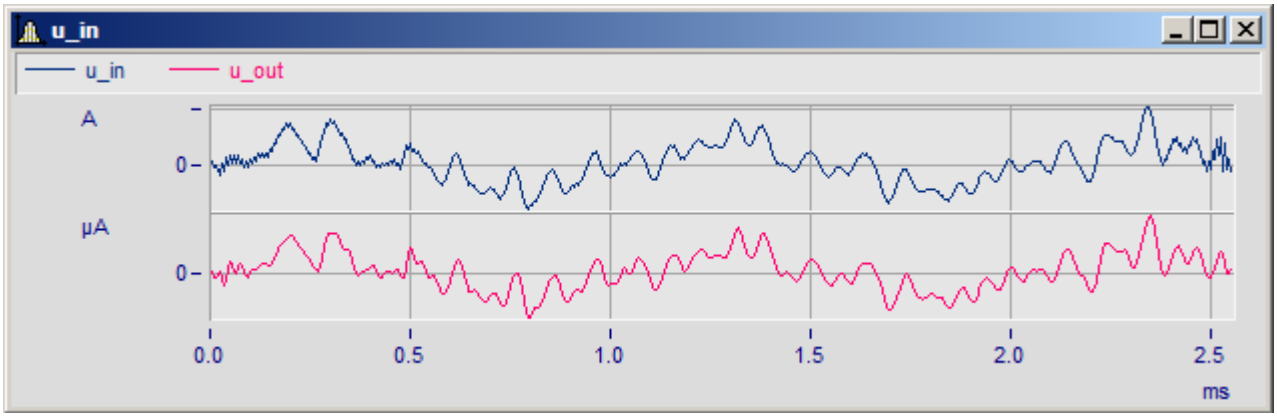
The transfer function can also be calculated directly as spectrum of the impulse response.

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19.2 Frequency response calculation

The input and output data $U_e(t)$ and $U_a(t)$ of a dynamic system are measured to determine the transfer function.

The input and output data are **measured currents** and are called "*U_IN*" and "*U_OUT*" respectively. Both "u_out.dat" and "u_in.dat" are found in imc FAMOS sample data files.



The transfer function G(jω) of this system can be expressed in the frequency domain by

$$G(j\omega) = U_a(j\omega)/U_e(j\omega)$$

The spectra Uout(jω) and Uin(jω) can be calculated from the time signals u_out(t) and u_in(t) using Fourier transformation.

```
u_out_spec = FFT(u_out)
u_in_spec = FFT(u_in)
```

Magnitude and phase of the transfer function then result from:

```
g_spec = ua_spec / ue_spec
```

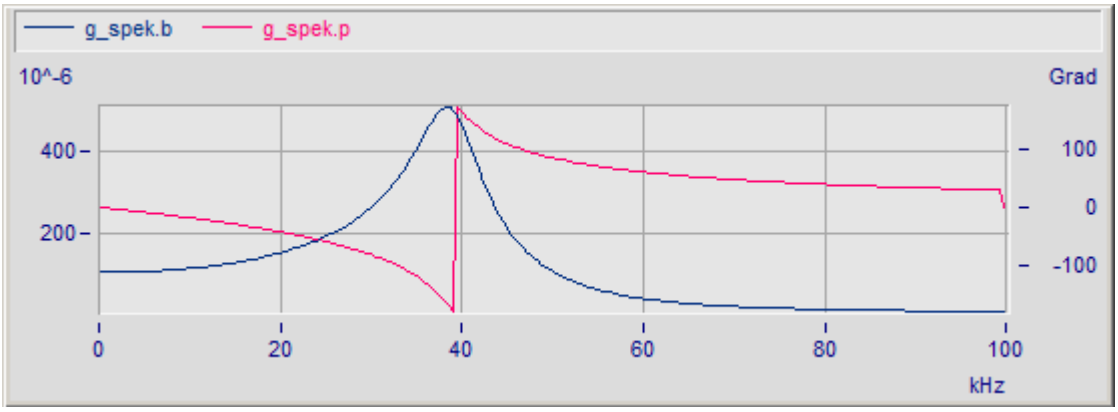
The result g_spec is a complex function and represents G(jω).

Use the formula:

```
g_spec = Pol( Rect(g_spec))
```

to obtain the phase between -180° and +180°.

If g_spec is represented in dB and the frequency axis is displayed logarithmically, the following graph results:

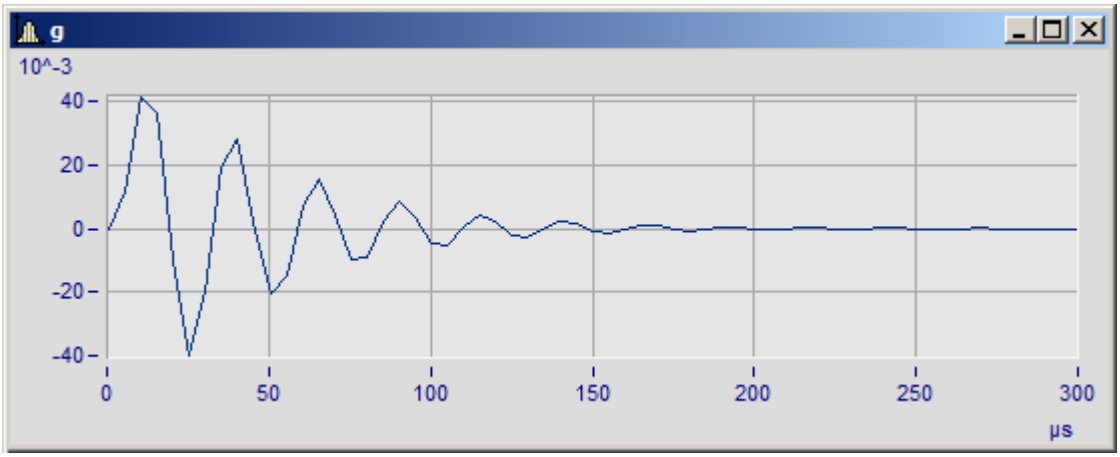


Using inverse FFT, the weighting function g(t) can be represented in the time range:

```
g = iFFT (g_spec)
```

The dialog under "*Extra / Options / Functions*" contains a selection of other window functions. Window functions can be used to process data sets to eliminate Steps at the beginning and end of a data set, which arise from periodic concatenation.

In the following example, the rectangular window was selected. The range 0..0.3 ms is displayed in the curve window.



Note FFT() and Spec()

The Functions library contains the FFT and Spec functions. The FFT() function strictly adheres to the mathematical algorithm which returns a mirrored negative axis along with a positive frequency axis. However, only the positive portion is returned. For this reason, the magnitudes of the harmonics can not be directly interpreted as amplitudes. If you are interested in the ability to interpret the amplitudes, use the function Spec().

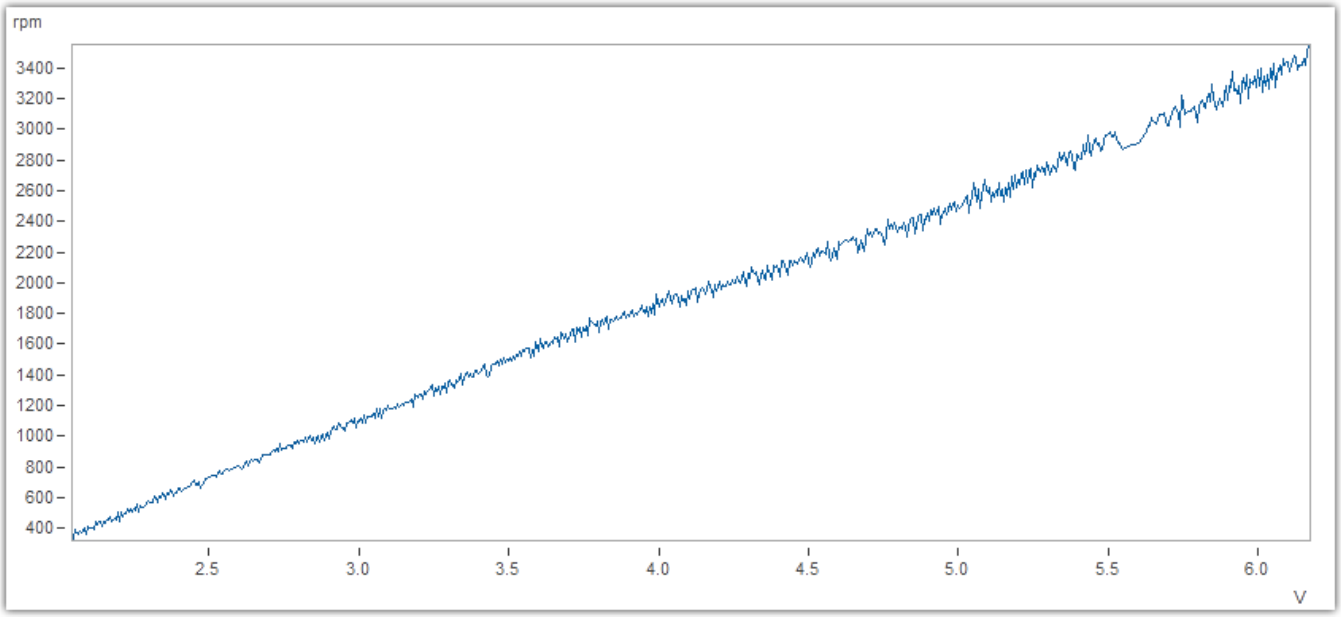
19.3 Regression and non-linear data fitting

When a data set under investigation is described by a math formula which is given, a variety of FAMOS functions are able to determine the associated constants. The following are some examples of major ways to use these capabilities:

- Linear regression 659: Using the method of least squares, the slope of a linear function and its y-intercept are determined. E.g. the linear correlation between an RPM-value and the driving voltage set.
- Polynomial regression 661: Using the method of least squares, the coefficients of a polynomial are determined. This procedure for a 2nd degree polynomial corresponds to linear regression.
- Non-linear optimization 662: This method attempts to obtain the minimum deviation between the data points and a specified formula containing coefficients by varying the constants.

19.3.1 Linear regression

In a certain installation, a motor is powered and governed by a control voltage; the data set "rpm_V.dat" in the sample files demonstrates the correlation. Later when the installation is delivered to the customer, no measurement of the RPM-values are conducted; instead the RPM-value is to be derived from the input voltage set and displayed accordingly.



For this installation, since the plot of the curves above indicates a linear correlation, the linear function is given by:

```
rpm_over_ControlVoltage = LFit(rpm_V)
```

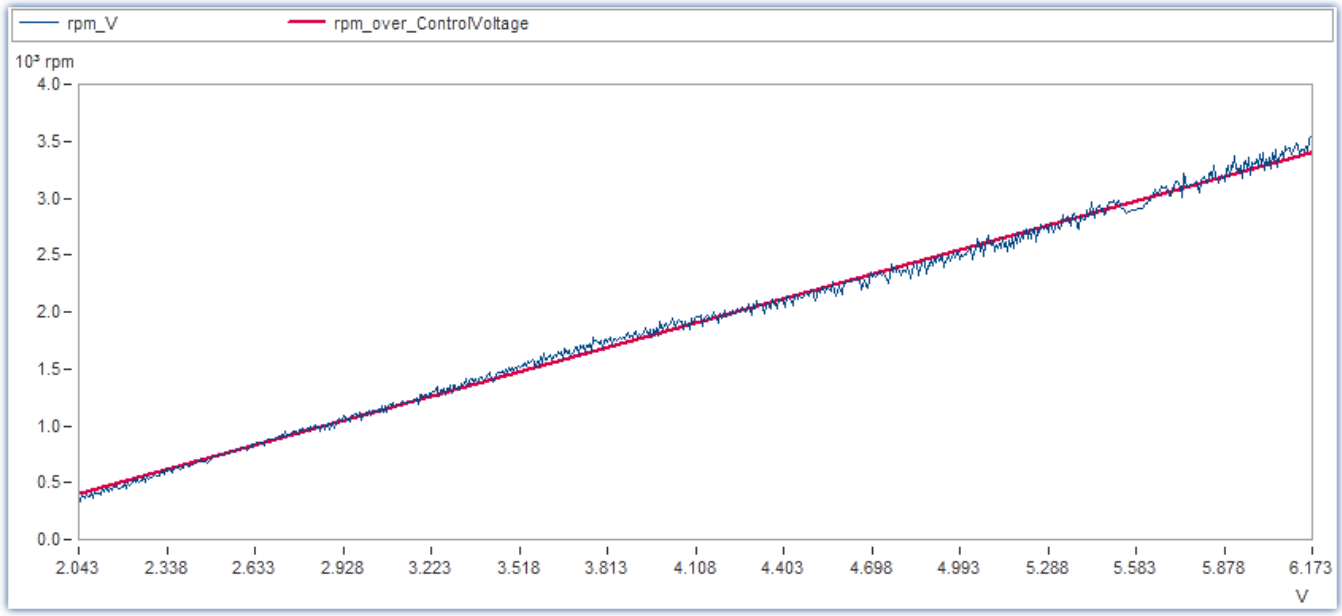
As the result, the function *LFit()* returns an equidistant data set containing up to 100 points in which y-values are associated with the x-values.
By calling the function again, the data set's coefficients can be found:

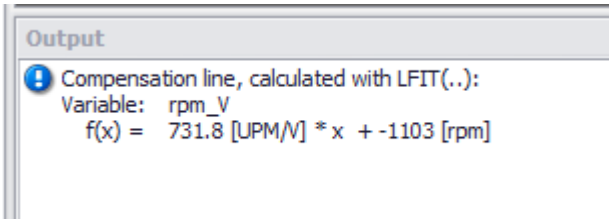
```
Coefficients = LFit("")
Factor_rpm_V = Coefficients[1]
Offset_rpm_V = Coefficients[2]
```

However, no units are provided with the coefficients. If the output data include the appropriate units, it is also possible to determine these:

```
SetUnit(Factor_rpm_V , Unit?(rpm_V , 1) + "/" +  Unit?(rpm_V,0),1)
SetUnit(Offset_rpm_V , Unit?(rpm_V, 1),1)
```

One this obtains the following result:





Calculation of the fitted linear function is performed in accordance with the generalized least-square approximation procedure; see the following chapter 661.

19.3.2 Polynomial approximation and additional least-square approximations

Besides the linear approximation, it is also possible perform additional curve fitting in accordance with the generalized least-square approximation. Except in cases of especially problematic initial input data, all of these procedures have in common the existence of a unique solution and a calculation technique for finding it. The file "*distance_free_fall.dat*" plots the distance traveled by an object over time. Since this is a case of a free fall, the distance should be proportional to the square of the time elapsed:

$$s = \frac{1}{2}at^2$$

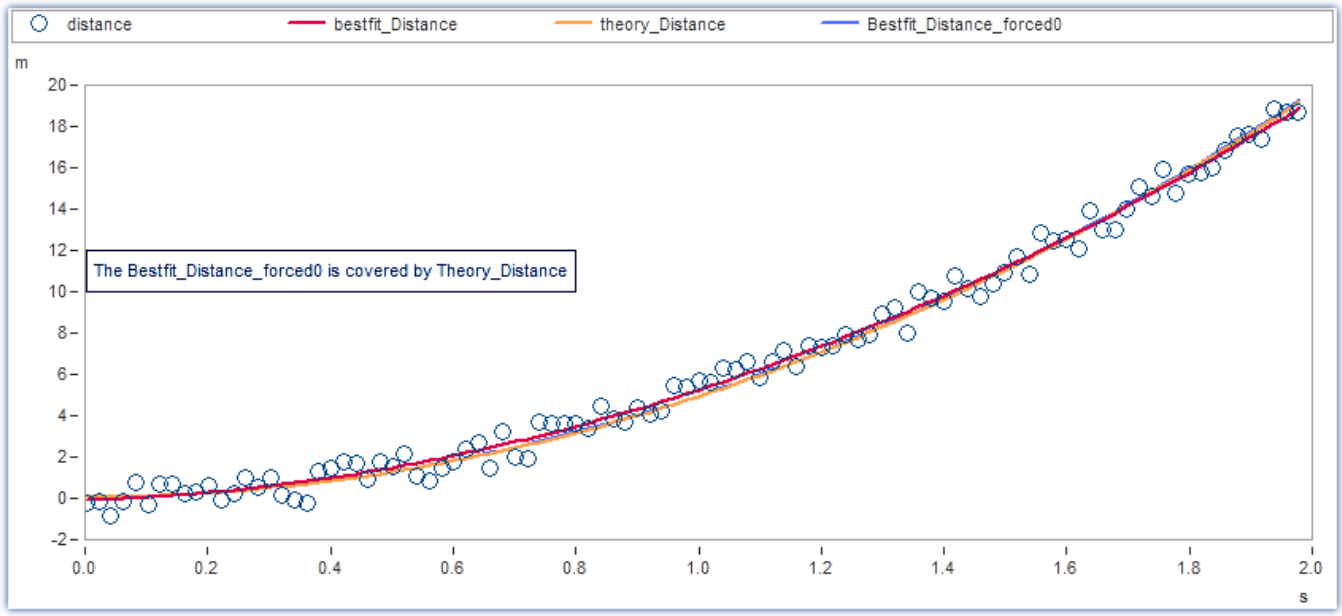
```
theory_accel = 9.81 'm/s^2' ; free-fall acceleration
FileLoad("distance_free_fall.dat","", 0)
bestfit_Distance = Poly(distance ,2,1)
theory_Distance = 1/2*theory_accel*Ramp(xoff?(distance), xdel?(distance), Leng?(distance))^2
setunit(theory_Distance ,"s",0)
coeff = Poly(distance, 2,2)
; In the regression procedures, values near zero cannot be determined accurately
; so here the speed and offset should be zero; but they are not
offset_dist = coeff[1]
initial_speed = coeff[2]
acceleration = coeff[3] * 2; due to 1/2 a t^2
```

Here, the command *Poly()* is used to determine an approximated distance from the measured distance. The value of the acceleration determined in this manner is 8.6885 m/s^2.

If it is known that the best value for a certain coefficient in the polynomial is zero, as is the case in this experimental setup, then it is possible to fit the approximation by means of the command *Appro()*:

```
; Force approximation with 0 as offset and 0 as initial speed
timeline = Ramp(xoff?(distance), xdel?(distance), Leng?(distance))*1's'
quadratic_term = timeline^2
Accel_with_forced0 = Appro(distance, quadratic_term,0,0,0,0,0,0 )*2
```

The value for the acceleration determined in this manner is 9.8522 m/s^2, which is significantly closer to the result expected based on theory, since additional information was included in the approximation procedure by setting the first two coefficients of the polynomial to zero.



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19.3.3 Approximation to an "arbitrary" formula, illustrated by the example of a damped harmonic oscillator and exponential decay to a final value

The file "*Damped_Harmonic_Oscillator.dat*" contains a data set representing the plot of a voltage in a damped oscillating circuit over time.

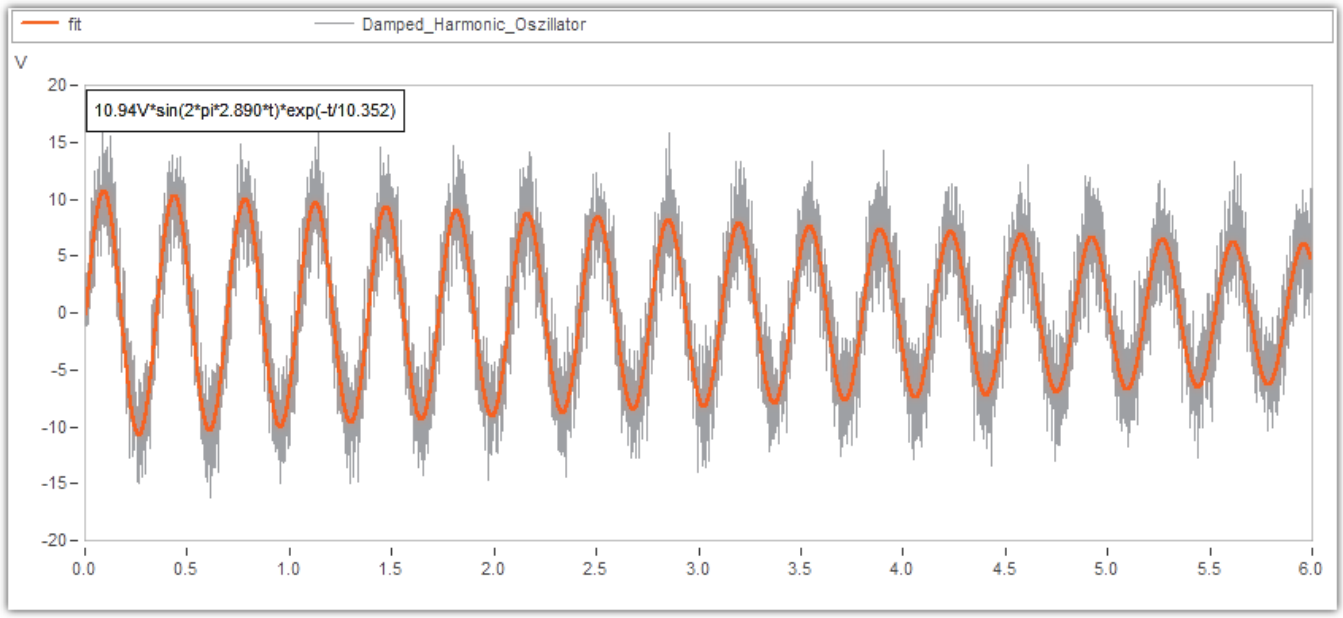
$$u(t) = Asin(2\pi ft)e^{-\frac{t}{\tau}}$$

Looking at this plot in a curve window, it is not easy for the viewer to determine the damping (attenuation) from the measured curve.

Using the command *ApproNonLin()*, it is possible to find the parameters in mathematical expressions which optimally approximate a given data plot. However, only local minima are found, so that it is possible for there to be significantly better combinations than the ones found. But in reality, this rarely occurs.

```
data= Damped_Harmonic_Oscillator
coefficients = ApproNonLin(data , "A1*sin(pi2*A2*x)*exp(-1*x/A3)-y",0)
timeline = Ramp(xoff?(data ), xdel?(data), Leng?(data ))*1's'
Amplitude = Coefficients[1]*1'V'
frequency = Coefficients[2]*1'Hz'
damping = Coefficients[3]*1's'
fit = Amplitude * sin(pi2*frequency*timeline)*exp(-1*timeline/damping )
del data
```

Thus the damping determined here is 10.35 s.



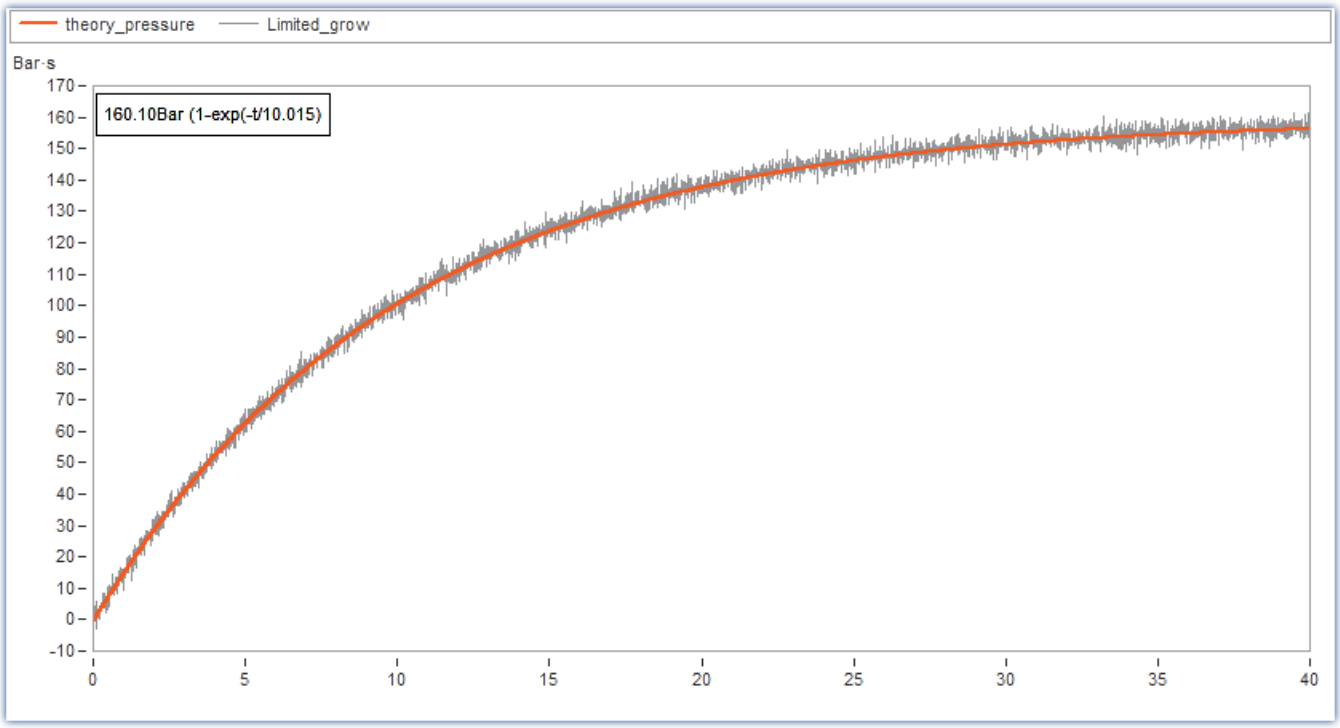
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In the file "*Limited_grow.dat*" a measured increase of pressure is plotted; it asymptotically approaches a final value:

$$P(t) = P_0\left(1 - e^{-\frac{t}{\tau}}\right)$$

With just a measurement, the final value can only be guessed; by means of *ApproNonLin()*, it is possible to obtain reproducible values for the final value and time constants, which do not depend on the user's judgment.

```
data= Limited_grow
coefficients = ApproNonLin(data ,"A1*(1-exp(-1*x/A2))-y", 1200, 1, "")
timeline = Ramp(xoff?(data ), xdel?(data), leng?(data ))*1's'
P_0 = Coefficients[1]*1'Bar'
time_exp = Coefficients[2]
theory_pressure = P_0*(1-exp(-1*timeline/time_exp))
del data
```



19.4 Correlation coefficient

The correlation coefficient is a significant indicator for assessing the degree of linear dependence between signals. It provides a quantitative description of the similarity of two signals.

The correlation coefficient is a normalized quantity:

A value of +1 means complete dependence between the signals, i.e. they are proportional to each other and their signs are always the same.

The correlation coefficient is defined as follows:

$$c = \left(\sum u_i v_i\right) / \left(\sum u_i u_i \sum v_i v_i\right)^{0,5}$$

Here the u_i values represent numeric values of one data set, the v_i values represent the values of the other data set. To calculate the correlation coefficient **c**, several sums of the products of all elements of the data sets u and v are calculated. It is important that neither **u** nor **v** have a **DC offset**! If they do, subtract this value before computing the correlation coefficient!

The **SO2-concentration** of the air was measured over a long period of time. These measurement values make up one data set. During the same period of time, the SO2-concentration was predicted using mathematical models. These values make up the second data set.

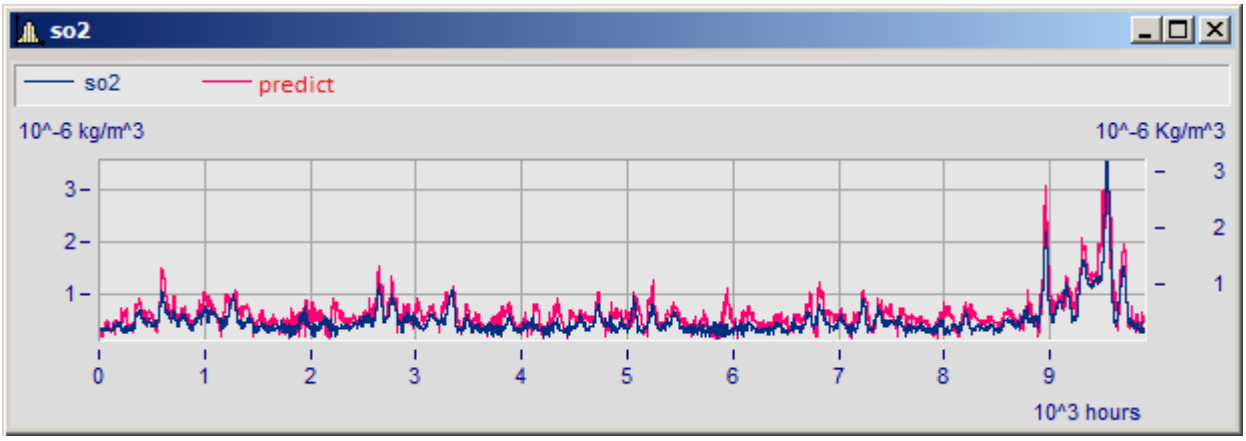
The reliability of the prediction methods are to be evaluated. A value of 0 means that both signals are statistically independent of each other on average.

In the present example, a large correlation coefficient (e.g. > 0.6) would indicate a successful prediction.

A very small value (e.g. < -0.6) means that the prediction was the opposite of the measurement.

Step 1

The two data sets are called "SO2" and "Predict".



To compute the correlation coefficient, a number of summations must be made of all values in a data set. The integral function "*Int*" can be used to add values if the sampling time of the data sets is 1.

In the first step, two temporary data sets are created with a sampling time of 1 and the mean value subtracted.

Execute both of the following operations in succession:

```
u = Xdel(SO2     - Mean(SO2)    ,1 )
v = Xdel(Predict - Mean(Predict),1 )
```

Step 2

According to the equation for the correlation coefficient, the values of data sets u and v are multiplied and then added together with the function "Int". The end value of the integrals is the sum.

```
Coef =  Value( Int ( u * v), 1E20) /  Sqrt( Value( Int(u * u), 1E20) *
        Value( Int ( v * v), 1E20) )
```

The end value is always returned by the function "Value" if its second parameter is set to a sufficiently large value (e.g. 10^{20}).

Note that the required sums can also be determined by multiplying mean values by the data set lengths.

Step 3

The temporary data sets "*u*" and "*v*" can now be deleted from the variable list. Display the correlation coefficient.

Execute the following three operations in succession:

```
Delete  u
Delete  v
Show    Coef
```

As an alternative to these operations, select the corresponding options in the "*Variable*" menu.



Automatic calculation

The calculation of the correlation coefficient is saved in the sequence "*CorrCoef*", which transfers three parameters when the sequence is started:

```
Sequence CorrCoef Coef SO2 Predict
```

The sequence is:

```
x1_ = Xdel( PA2  - Mean( PA2 ), 1)
x2_ = Xdel( PA3  - Mean( PA3 ), 1)
PA1 = Value( Int(x1_* x2_), 1E20) /
   Sqrt(Value(Int(x1_* x1_), 1E20) *
   Value (Int (x2_* x2_), 1E20))
Delete x1_
Delete x2_
Show  PA1
```

Sequence execution is equivalent to the three steps above.

Remarks

The correlation coefficient can also be determined with the "*CCF*" function. Note that for CCF,

- the data sets must have no DC offset
- the data set lengths must be equal to a power of two or they will automatically be truncated by the *CCF* function.

The first value of the cross-correlation function is the correlation coefficient.

However, calculation using *CCF* is not recommended, since it takes significantly more time and extremely long data sets cannot be processed with the *CCF* function.

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19.5 Calculating electric power

There are multiple possibilities for calculating the electric power and RMS values, etc. First of all, it is possible to use FAMOS to run the classical calculation formulas 666. Additionally for amperage and voltage, the function EFF() is available, which determines the RMS value over the entire measurement duration, as well as the moving RMS value (MvRMS()) for a specified interval.

In conjunction with its interval-based functions, FAMOS provides the ability to determine the calculated variables exactly, even when the frequency fluctuates.

19.5.1 AC power calculation

The measurements performed are of the variables current and voltage of an electrical load.

The variables to find are real (or "effective", or "active") power P, apparent power S and the reactive power Q, as well as the power factor Lambda.

These quantities are related to each as follows:

The instantaneous power is the product of voltage and current at any instant of time
`p(t) = u(t) * i(t)`

The average mean value of the instantaneous power is the **real (active) power** P:

$$P = \frac{1}{T} \cdot \int_0^T p(t)\ dt$$

The real power is the power which is converted to heat in an ohmic resistor.

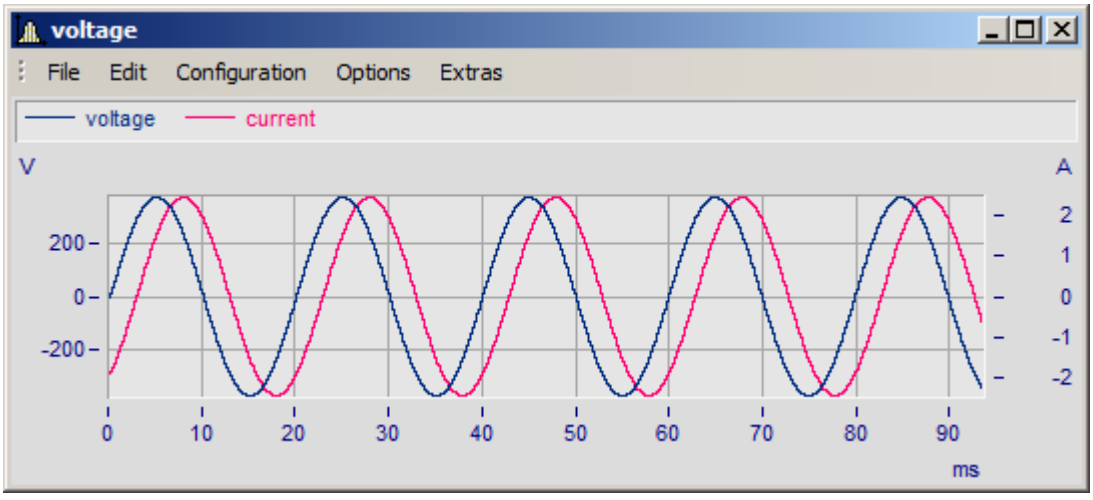
The product of the true RMS of the voltage and the true RMS of the current is called **apparent power S**
`S = U * I`

The **reactive power** is defined as:
`Q = Sqrt( S^2 - P^2 )`

The **power factor** Lambda is defined as the ratio of true power to apparent power:
`Lambda = P / S`

Next, load the imc FAMOS example files `current` and `voltage` and display them in curve windows:

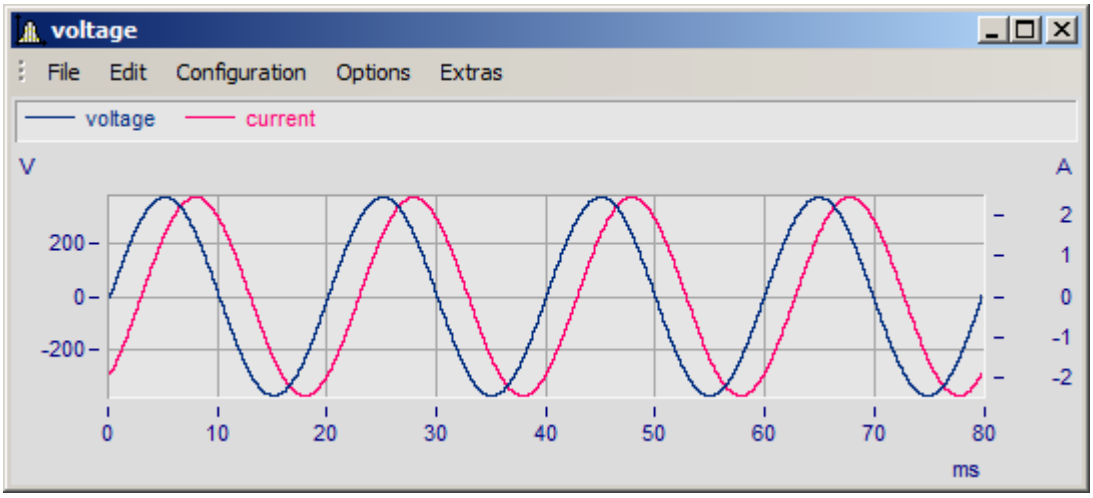
The variables measured are plotted below:



These channels were measured on 50 Hz mains. Both of these are periodic quantities which appear to be roughly sinusoidal. The power can only be computed over an integer multiple of periods. In this example, the power is to be computed over four periods. Use the "*Cut*" function to extract the signal sections over four periods (4 x 20 ms = 80 ms = 0.080 s):

```
CURRENT = Cut( CURRENT  , 0's', 0.08's')
VOLTAGE = Cut( VOLTAGE, 0's', 0.08's')
```

The cut sections are as follows:



It is also possible to cut a section out of a curve using the measurement cursors. Select the beginning and end of the curve using the cursors and then choose "*Send curve segment to imc FAMOS* ". Note that this method is not as precise as using the "*Cut*" function.

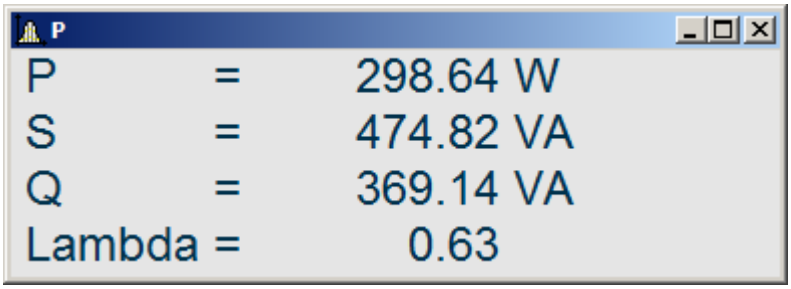
The real power P is computed as the mean value of the product over an integer multiple of the period:

```
P = Mean(CURRENT * VOLTAGE)
```

The other quantities can be computed from:

```
S    = RMS(CURRENT) * RMS(VOLTAGE)
yUnit S VA
Q    = Sqrt(S * S - P * P)
yUnit Q VA
Lambda = P / S
```

The units for true power are Watts (W). The units for reactive and apparent power are VAR (Volt-Ampere-Reactive) and VA (Volt-Ampere), respectively.



19.5.2 Power calculations with interval functions

With this kind of power calculation, the frequency is either assumed to be constant, or it is determined at the outset by means of an interval function. The functions PowerSelect() and PowerParameter() must previously be called in order to completely parameterize the function.

The function PowerSelect() allows specific selection of the variables to calculate. These are returned as a group variable. When no parameter is provided for PowerSelect(), only default variables are calculated.

Single-phase power calculation for a specified frequency, over each period

If the parameter Interval Data (here ivl) is not specified, the calculation applies the frequency which was specified in PowerParameter(). The count of signal periods over which to perform the measurement, multiplied by the period duration, must result in an integer multiple of the sampling interval. Thus, at 50Hz it is common to specify either 1 or 10 periods; but at 60Hz it would be 12 periods, with a typical sampling rate of 10kHz.

```
PowerSelect()
PowerParameter(50, 1)
g1 = Power1 ( u1, i1 )
P = g1:P
Q = g1:Q
```

Single-phase power calculation with calculation of the interval

If the parameter Interval Data is specified, the interval lengths determine the period lengths. Thus, the result returned for the power is correct even if the frequency fluctuates. Calculation of the frequency and also of the other results becomes (significantly) more precise when the analysis is performed over multiple periods. If it is not possible to determine the interval, the function resorts to the frequency specified in PowerParameter().

```
; without parameters, only the reactive and real power are calculated.
PowerSelect()
PowerParameter ( 50, 1)
ivl = IntervalFromLevel ( U1, 0, 0, 0, 1, 0.0, 1e35, 0, "")
g1 = Power1 ( U1, I1, ivl )
P = g1:P
Q = g1:Q


; with all calculations: P, S, Q, Ieff, Ueff, p_t, cosphi, f
PowerSelect(1, 1, 1, 1, 1, 1)
PowerParameter ( 50, 1)
ivl = IntervalFromLevel ( U1, 0, 0, 0, 1, 0.0, 1e35, 0, "")
g1 = Power1 ( U1, I1, ivl )
```

For a three-phase network, use the functions Power2 and Power3.

Three-phase power measurement in a 4-wire three-phase network. Frequency fluctuates

For a three-phase network, use the functions Power2 and Power3.

```
PowerSelect(1, 1, 1, 1, 1, 1)
PowerParameter ( 50, 1)
ivl = IntervalFromLevel ( U1, 0, 0, 0, 1, 0.0, 1e35, 0, "")
g3 = Power3 ( U1, I1, U2, I2, U3, I3 , ivl )
```

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```
PowerSelect ()
PowerParameter ( 50, 1)
ivl = IntervalFromLevel ( U12, 0, 0, 0, 1, 0.0, 1e35, 0, "")
g2 = Power2 ( U12, I1, U32, I3, ivl )
```

Extensive help material and examples regarding the functions in the FAMOS Editor are available.

19.6 Calculations of time in events and states

The pause time of a bus trip is to be determined based on velocity data. Further, the engine load in hp is to be determined at a torque > 50%.

Procedure

Create a new project.

Load the file **BusTrip.dat** from *C:\Users\Public\Documents\imc\imc FAMOS\dat*. It contains three data sets: **speed** in kmh, **Torque** in % and **Power_Engine** in hp

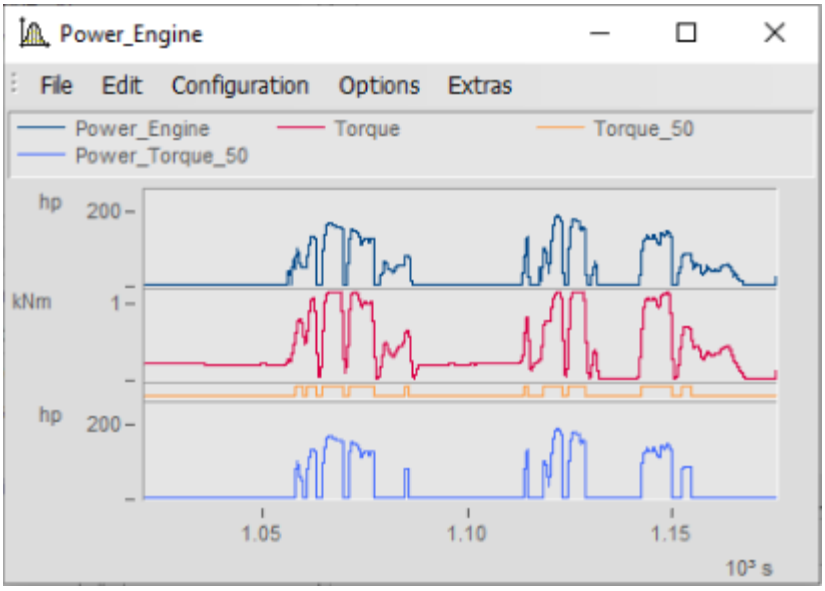
- Write the following command lines in the Input box and run them:

```
Stop_level = 0.5 'km/h'
Busstop = speed < Stop_level
Busstop_duration= Max(Int(Busstop))
Time_Complete= xdel?(speed)*(leng?(speed)-1)
Busstop_duration_percent= Busstop_duration/Time_Complete * 100'%'

Torque_50= Torque > 0.5* max(Torque)
Power_Torque50= Power_engine* Torque_50
```

- Display "**Busstop**" and "**speed**" in a curve window.
- In a second curve window, display **Power_Engine**, **Torque**, **Torque_50** and **Power_Torque50**. Display the results and if desired, zoom into a certain region.

Save the contents of the Input box as a sequence and save the project.



Signal recordings in response to a threshold

Result

- Comparison of data sets yields a binary results data set. By means of simple integration, the duration during which the data return the result "1" can be determined.
- The binary result data set multiplied by another of the experiment's channels sets all values at which the result is "0" to zero.

Remarks

- Besides the comparison operators < (less than) and > (greater than) there are also <= (less than or equal), >= (greater than or equal) and <> (unequal). They can be used on complete waveforms if they have the same sampling interval and sample count.
- The result of a comparison is always either 0 (false) or 1 (true). Thus, the whole resulting waveform will consist of a series of zeroes and ones. Such a digital waveform has its own symbol in the Variables window and is displayed in the curve window together with other data types in a narrow band without y-axis scaling.
- In order to have the constant value threshold displayed in the curve window, the checkmark for "Single values" must be set in the More Channels… window.
  [Configuration > More Channels…]

19.7 Logical operations

If a waveform's value exceeds or falls below a certain threshold, the value of a different waveform is determined.

Procedure

If it has not already been done, load the file **BusTrip.dat** from the USB flash drive (imc FAMOS\dat\).

Write and run the following sequence:

```
v_RSamp= RSamp(speed, Torque)
v_Analyis= v_RSamp *((Torque > 0.4*max(Torque)) AND (Power_Engine >
0.5*max(Power_Engine)))
```

- Open a curve window with **Torque**, **Power_engine, v_rsamp** and **v_Analysis**.
- For these waveforms, the y-axes should appear stacked on top of each other again

Save the sequence and the project.

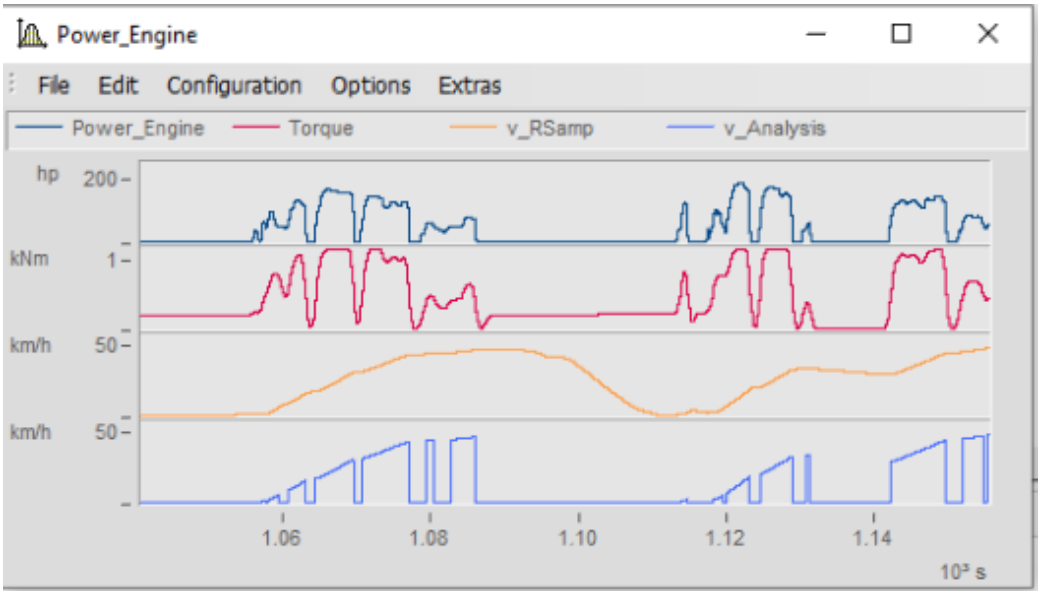
Result

As soon as a signal falls above or below a threshold, a different signal's value is recorded. In the process, the time axis remains intact.

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Remarks

- You can perform logic operations on combinations of two or more channels. For this purpose, imc FAMOS comes with the logical operators AND, OR, NOT and XOR.
- If the waveforms do not have the same length, the operations are only performed up to the end of the shorted one.
- Using the **RSamp** function, the waveform **speed** is sampled at the sampling times of the waveform **torque** and clipped to the same length.



Recording of a signal in response to two thresholds

19.8 Determining slopes and isolating values

Assignment

- The bus velocity is to be assessed on the basis of acceleration (>0.8 m/s²) within a particular value range (30-40 km/h).
- A data set's values are to be recorded at the points in time found.
- The subsequent recording of data should not include a time axis.

Procedure

Load the data sets belonging to the file **BusTrip.dat** from *C:\Users\Public\Documents\imc\imc FAMOS\dat*.

Run this command line:

```
Level = SearchLevel(speed, 3, 30, 40, 2, 0.8*3.6, 0, 0)
```

[SearchLevel function in group Anaylsis > Seek]

- Open the waveforms **v** and **level** in a curve window with one y-axis.
- Change the display style for **level** to "*Only symbols*" and "*Dots (large)*"

Now complete this line:

```
Torque_level = Value(Torque, Level.X)
```

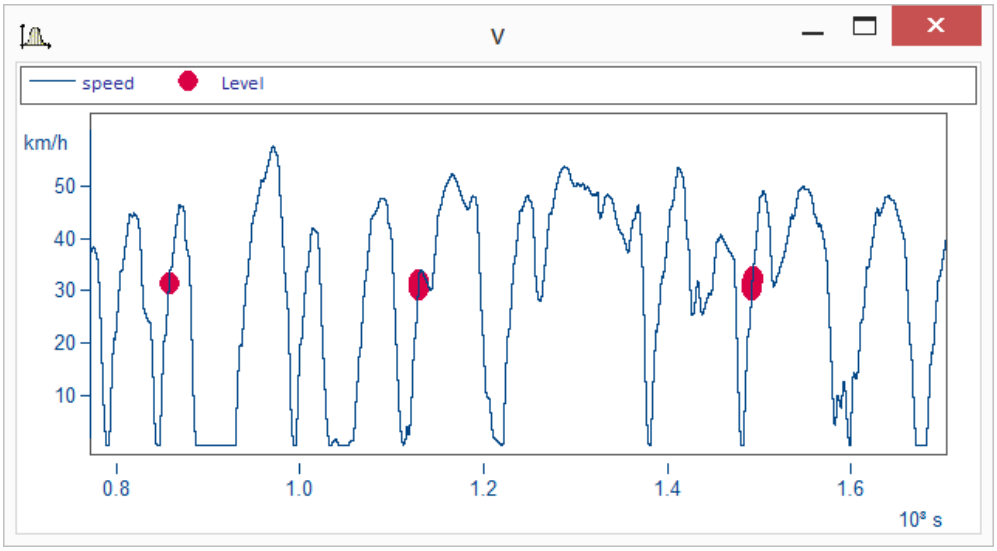
In a second curve window, have the new waveform **Torque_level** displayed twice, to get the value (line style: only symbols) along with the waveform (line style: spikes).

Save your project.

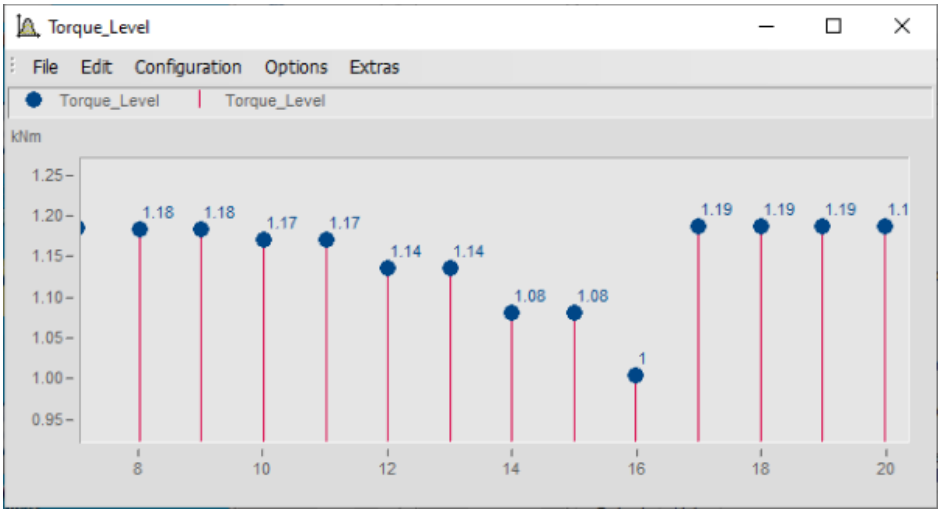
Result

- If a signal crosses a threshold and has a particular slope, a different signal is recorded.
- The result is not a continuous signal, but consists of points to be observed in isolation.

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The slopes of a signal found with SearchLevel



Isolated values of the waveform "noise"

Remarks

- The **SearchLevel** function only returns those points in a waveform which have both a certain level and a certain slope.
- The result of the **SearchLevel** function is an xy-waveform, where the x-axis contains the positions of the points found and the y-axis their values.
- With the **Value**-function, the values of the other waveform are imported at the points found in the first waveform.
- In order to have the waveform **Torque_level** displayed both as spikes and as dots, you must display it twice in the curve window, once as dots and once as spikes.

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19.9 Tolerance test

A number of transducers are sinusoidally excited and the resulting voltage is measured. This voltage is to be used to evaluate the transducers.

The following procedure should be used:

- The voltage generated by the transducers follows a curve with positive and negative deviations from the ideal. Tolerance bands are positioned around the ideal curve.
- As long as the measured voltages stay within these tolerance limits, a transducer is judged acceptable. However, when the voltages leave the tolerance band, the transducer fails the quality control test.

The ideal voltage curve is created as a data set with a sampling rate of 20µs - identical to the measurement:

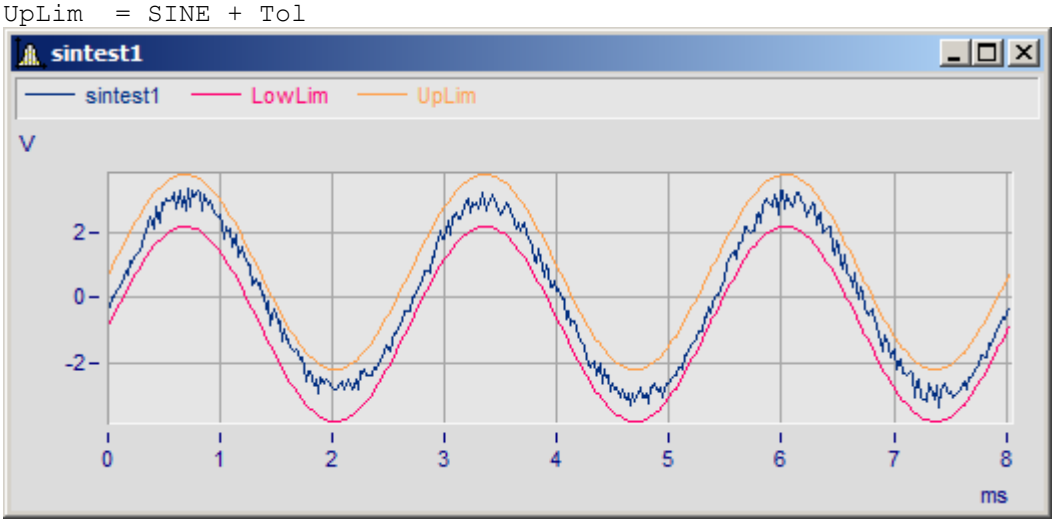
```
SINE = 3 'V' * sin( Ramp(0, 20E-6, 403) * 2340)
xUnit SINE s
```

The variables to be analyzed are called:

```
SINTEST1.DAT
SINTEST2.DAT
SINTEST3.DAT
SINTEST4.DAT
SINTEST5.DAT
```

The upper and lower limits of the tolerance bands result from a predefined tolerance:

```
Tol    = 0.8 'V'
LowLim = SINE - Tol
UpLim  = SINE + Tol
```



To determine whether the signal leaves the tolerance band, the temporary variables are calculated TooLarge and TooSmall.

```
Load SINTEST1
TooLarge = Max (SINTEST1 - UpLim)
TooSmall = Max (LowLim - SINTEST1)
```

When the variables TooLarge and TooSmall are greater than zero, the tolerance band was left. This can be formulated as a condition in a sequence:

```
If TooLarge OR TooSmall
   Show SINTEST1
End
```

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The condition TooLarge > 0 is checked in the first line. If the condition is true, the operations between the "If" command and the "End" command are executed. In this sequence, the data set is only displayed when the condition is true.

The sequence for the condition TooSmall > 0 is analogous. Note: The SINTEST1 in the sample files lies within the tolerance band and thus will not be displayed.

A general sequence is to be created which can be used to check for compliance with tolerance bands.

A sequence with parameters is used so that the names of the files to be tested and the tolerance band itself can be specified for each sequence call. This sequence can then be used to test for various tolerance band widths for various data sets.

The parameters of this sequence are:

```
PA1   data set to be tested
PA2   tolerance
PA3   reference data set
```

First the data set to be tested, PA1, is loaded, and the variables TooSmall and TooLarge are calculated using the tolerance, P2 and the ideal reference data set:

```
Load    PA1
TooLarge = Max( PA1  - ( PA3  +  PA2 ))
TooSmall = Max(( PA3  -  PA2 ) -  PA1 )
```

The following lines calculate a variable equal to 1 when the waveform leaves the tolerance band, and otherwise has a value of 0:

```
Beyond    = 0
If TooLarge OR TooSmall
  Beyond    = 1
End
```

The sequence will check whether the variable "*Beyond*" is set; if so, the data set PA1 saves the data of the failed test in the directory currently selected for storing. The directory for storing files should therefore not be the same as the directory for loading files. Use the "*Directories*..." index card in the "*Options*" menu. Then the data set with the unsatisfactory data is assigned to the variable *'Bad'* and displayed:

```
If  Beyond
  ; -- Error, so save and display
  Save PA1
  Bad = PA1
  Show Bad
End
```

Finally the temporary variables created only for use in this sequence are deleted from the variable list:

```
Delete P1
Delete TooLarge
Delete TooSmall
Delete Beyond
```

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The entire sequence text (under the name "Toltest.seq") is available in the sample sequence folder:

```
; -- Sequence TOLTEST
; -- Determines, whether a data set is
; -- within a tolerance band
; --
; -- Is called from the TOLERANCE sequence
; -- with three parameters
; -- Saves all unsatisfactory data sets
; --
; --  PA1 : data set to be tested
; --  PA2 : tolerance
; --  PA3 : reference data set
; --
Load  PA1
TooLarge  = Max( PA1 - ( PA3 + PA2 ))
TooSmall  = Max(( PA3 - PA2 ) - PA1 )
Beyond = 0
If TooLarge OR ToSmall
   Beyond = 1
   ; -- Error, so save and display
   Save  PA1
   Bad = PA1
   Show Bad
End
Delete  PA1
Delete TooLarge
Delete TooSmall
Delete Beyond
```

Now the sequence can be called. Execute the following operations, which in turn are also saved as sequence:

```
...
; -- Creates a reference data set and checks
; -- a series of data sets for compliance to a
; -- tolerance band.
; --
SINE = 3 'V' * sin ( Ramp (0, 2e-5, 403) * 2340)
xUnit SINE s
Tol = 0.8 'V'
Sequence toltest sintest* Tol SINE
...
```

The sequence is available under the name TOLERANCE.

The sequence TOLTEST can be called with the "Sequence" command, followed by the name of the sequence to be executed. Then the parameters for the function call are specified.

The formal parameters of the sequence (PA1 , PA2 and PA3) are replaced by SINTEST*, TOL and SINE when the function is called.

Use the input editor box to enter the commands. The '*' character is used to process all files whose names begin with SINTEST, one after the other. The sequence will be called automatically for every file which fulfills the condition.

To solve the sample problem, perform the following:

Set the directory for saving files to a directory other than the one for loading files.

Enter the command 'Sequence TOLERANCE'.

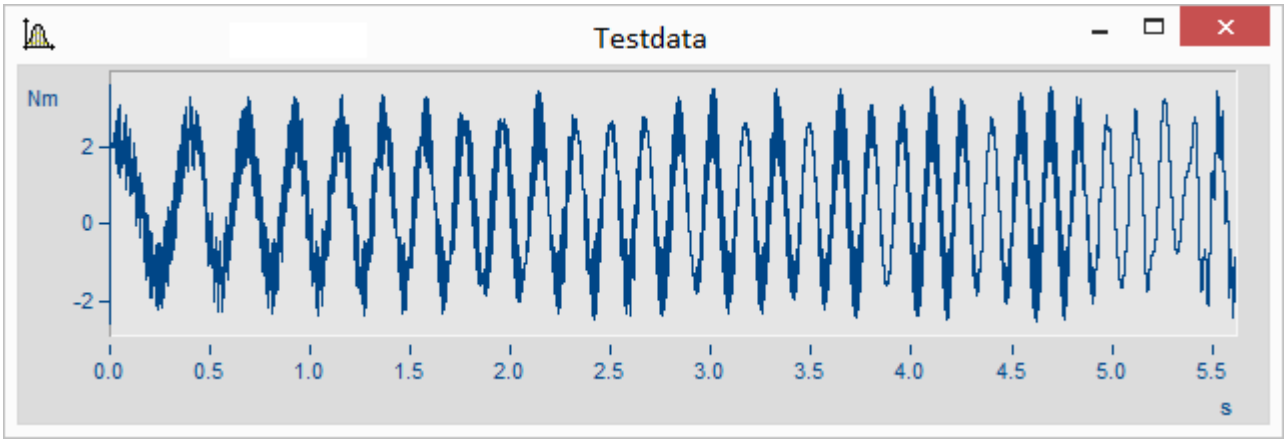
The first five test files are checked automatically. Two of them do not meet the tolerance conditions and are stored in the specified directory.

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19.10 Statistical frequency and class counting

The data of the following example can be found in the "Class_Counting" project in the example projects *C:\Users\Public\Documents\imc\imc FAMOS_Demo Projects.*

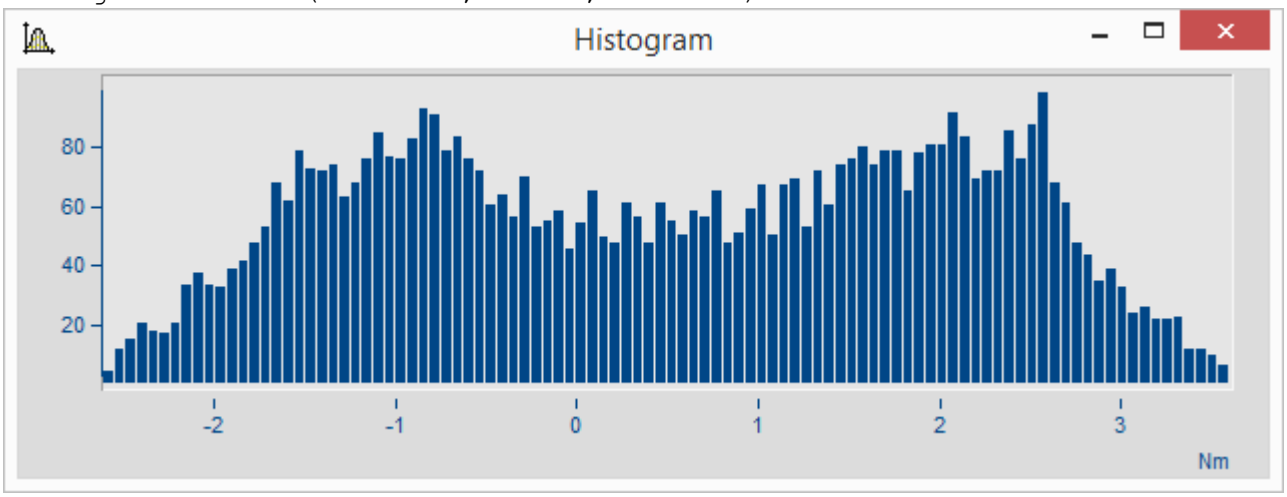
The distribution of a signal plot's data points over the measurement value range is represented by a **histogram**:



Signal plot of a torque signal

The following sequence starts by finding the value range and then arbitrarily apportions the range among 100 classes.

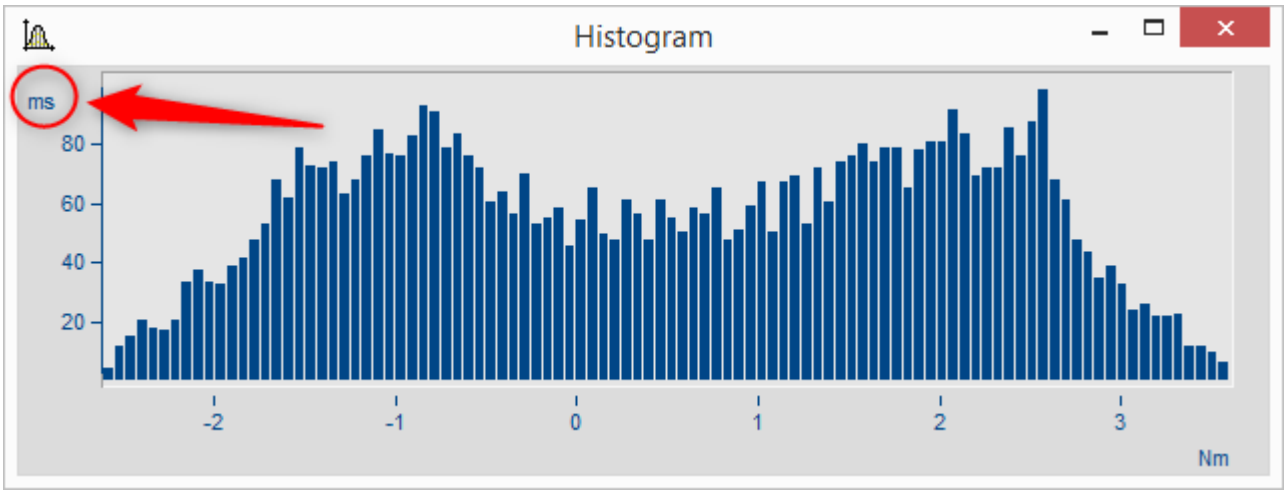
```
classes= 100
width= (max(Testdata)-min(Testdata))/classes
Histogram = Histo(Testdata, width, classes)
```



Histogram. Bar chart display

The Histo() function takes every sample into account. Thus for equidistantly sampled data sets, it is possible to directly convert the result to obtain the dwell time:

```
Histogram= Histogram*xdel?( Testdata)
```



Same histogram scaled by dwell time

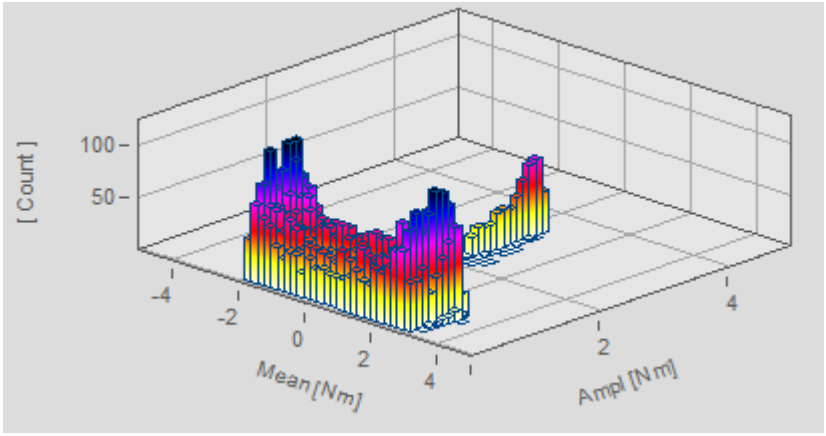
Class counting with the Rainflow algorithm

In an examination of the stresses applied to a material, the course of the stress over time is crucial. The fundamental inputs for the calculation are the frequency and magnitude of the changing direction of the applied stress. The Rainflow calculation algorithm takes all of these factors into account. Any distorting signal noise can be filtered out by means of a hysteresis.

The following example "CLS_01" is available in the Projects folder "Class_Counting" in the example projects *C:\Users\Public\Documents\imc\imc FAMOS_Demo Projects*, which comes automatically along with the FAMOS setup. Here, an excerpt of the code:

```
...
ClsHandle = ClsOffRainflowInit1 ( _NumberClasses, _TypeOfUnit, _UnitX, _UnitZ,
_UnitCount, _UnitRes, 0)
ClsOffRainflowInit2 ( ClsHandle, _Min, _Max, _Hysteresis, _Axis, _Type, _Border,
_CalcOptions)
ClsOffRainflowInit3 ( ClsHandle, _IgnoreSmallSpans, _Precise, _CountStartEnd, 0, 0,
0 )
ClsOffRainflowFeedSamples ( ClsHandle, Testdata)
CLS02_RainflowMatrix = ClsOffRainflowGetMatrix ( ClsHandle )
```

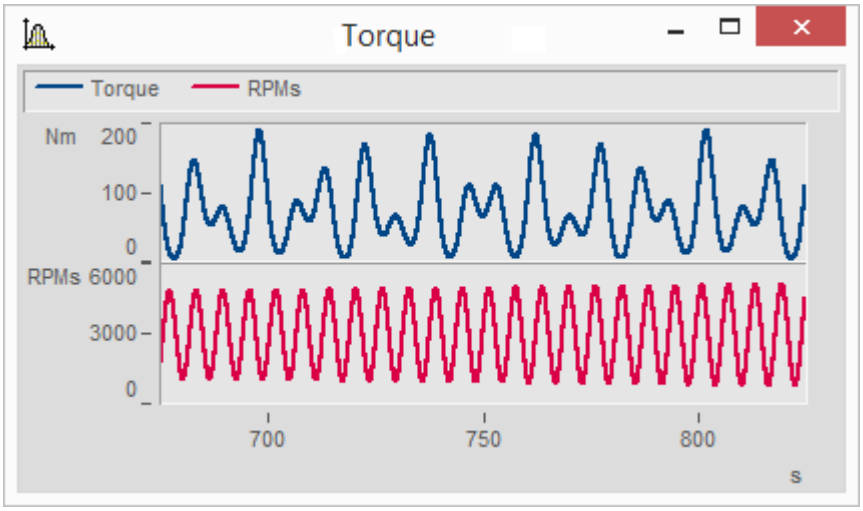
The parameters are set in the preceding sequence and can be linked with widgets in the Panel in order to achieve optimization of the calculations and the display.



Rainflow-calculation as a 3D display

Count of revolutions in conjunction with a specific combination of RPMs and torque

In the following example, a count of revolutions is prepared to reflect the RPMs and the measured torque at which they occurred.

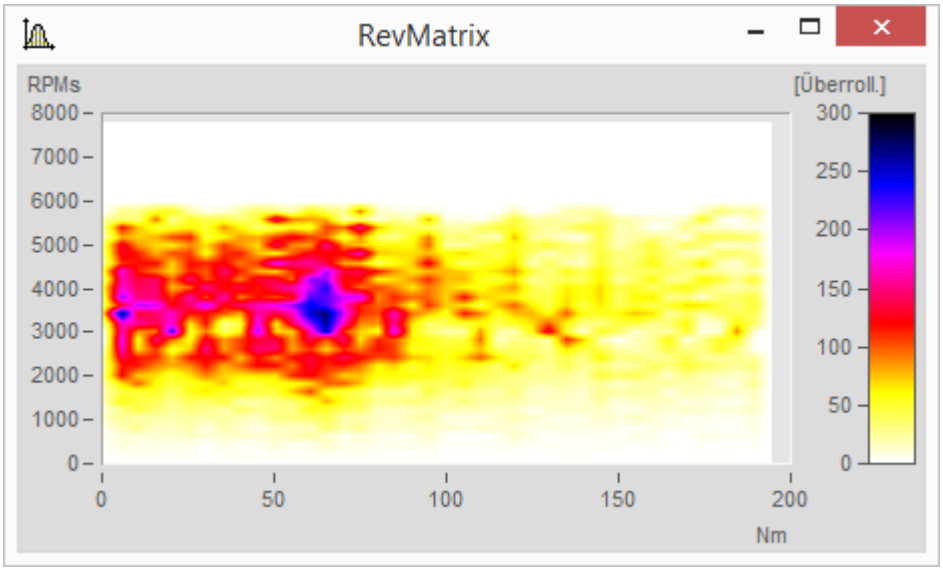


Excerpt from the plot of RPMs and torque

The complete example is also found in the included FA72_CLS01 on page 8.

```
...
RevHistogram = ClsOffRevolutionsHistogram ( Torque, RPMs, _Min1, _Max1,
_Classes1, _OpenEnd, _UnitOption)
RevMatrix = ClsOffRevolutionsMatrix( Torque, RPMs, _Min1, _Max1, _Classes1,
_MinRpm, _MaxRpm, _ClassesRpm, _Options)
...
```

The result obtained is a three-dimensional color map with revolutions plotted over the RPMs/torque combinations.



Count of revolutions, indicated by color, over the RPM and torque

19.11 Applying calculations to data from non-linear sensors

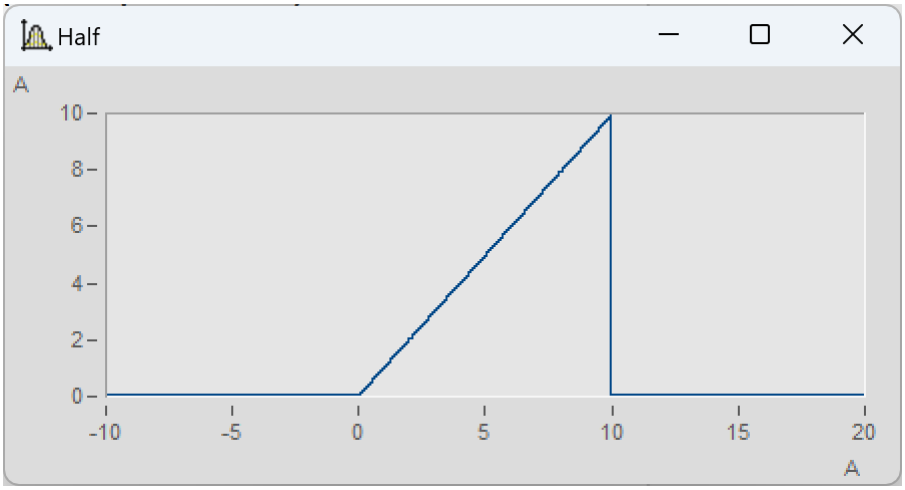
Physical measurement quantities cannot usually be directly measured. Such quantities (e.g. acceleration, displacement, etc.) they are converted to an electrical quantity (e.g. voltage, charge, etc.) using a sensor of some type. These very often have non-linear measurement "characteristics", i.e. the electrical output signal is not transformed one-to-one from the input signal. The imc FAMOS function "*Chrct*" is available to compensate a sensor output signal using its *characteristic*.

To correct a data set, first the sensor characteristic has to be known. This can be defined either mathematically or entered directly into imc FAMOS .

It is assumed that the function can be described by a relatively simple curve. For example, a characteristic could be defined as follows:

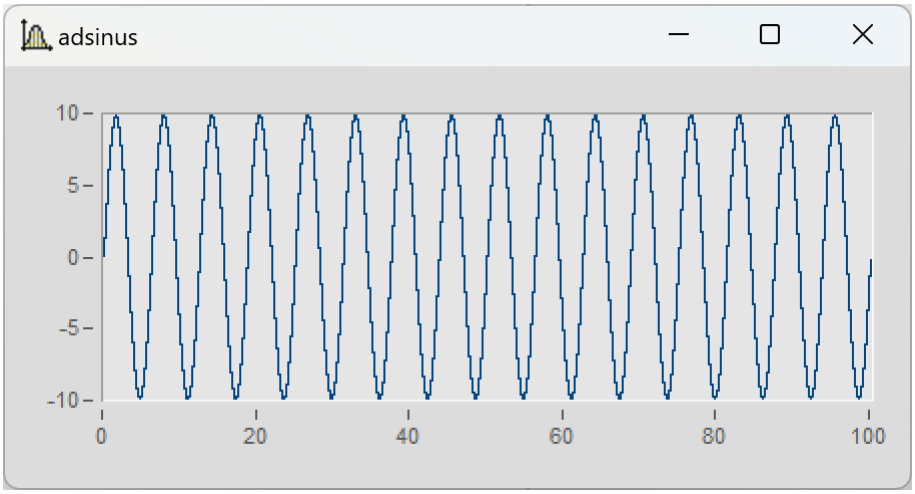
```
Half = Ramp( 0, 0.01, 1001) * 1'A'
xUnit Half A
Half = Cut( Half, -10, 20)
```

In this example, we are simulating the characteristic of a typical diode to illustrate usage of the "Chrct" function.



We now want to apply this characteristic to the imc FAMOS example file `adsine`. Begin by loading and scaling this waveform:

```
Load   ADSine
xUnit  ADSine s
yUnit  ADSine A
Show   ADSine
```

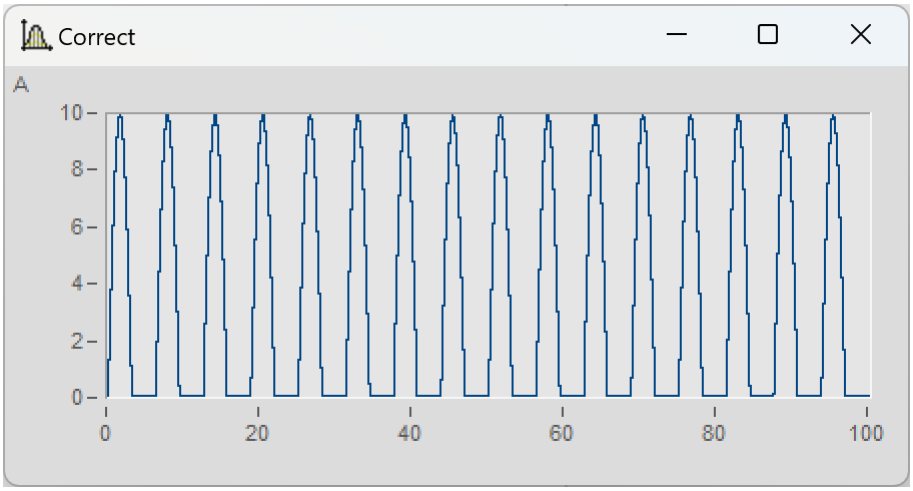


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Now the data set can be processed using the characteristic.

```
Correct = Chrct( ADSINE, Half)
```

The negative half-waves were rectified to simulate a typical diode characteristic (rectifier).



Remarks

Values which lie between individual points of the characteristic data set always occur during correction. In this case, the "*Chrct*" function automatically linear-interpolates between the relevant characteristic points. For extremely non-linear characteristic curves, the error can be reduced significantly by having as many points in the characteristic file as possible

19.12 Digital filters

imc FAMOS allows filtering of data sets with digital filters which, in regard to their frequency and phase response, resemble the analog filters which they mimic. For these purposes, high-pass filters (*FiltHP*), low-pass filters (*FiltLP*), bandpass filters (*FiltBP*) and band-stops (*FiltBS*) are provided.

We start by creating a data set representing a noisy signal with a voltage jump at a 1kHz sampling rate:

```
noise = Random( 5000, 0, -0.1, 0.1, 0)
noise= xdel(noise, 0.001)
temp = noise + 1
jump  = [ noise, temp, temp]* 1'V'
SetUnit(jump, "s", 0)
Delete temp
Delete noise
Show jump
```

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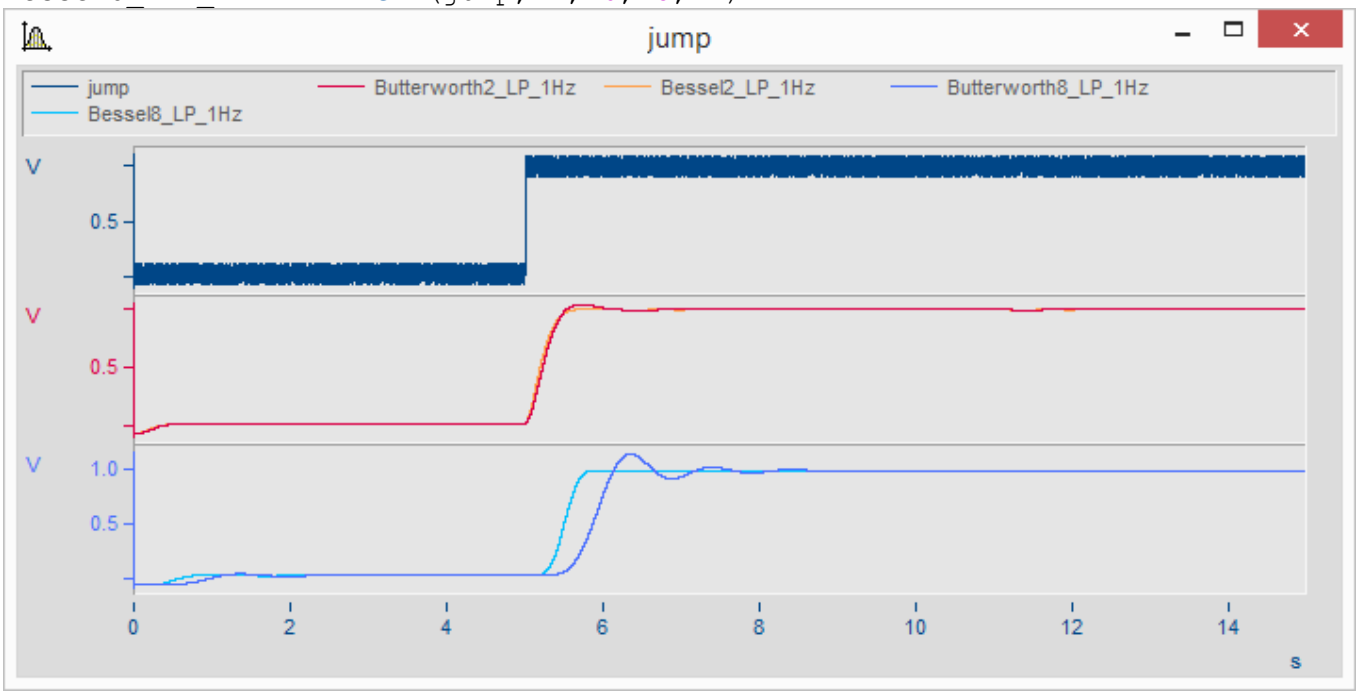
As an illustration, this voltage jump will be passed through a Bessel and a Butterworth low-pass filter. A 1Hz cutoff frequency and 2nd and 8th order respectively:

```
; 2nd-order Butterworth low pass at 1Hz
Butterworth2_LPz_1Hz = FiltLP(jump, 0, 0, 2, 1)

; 2nd-order Bessel low pass at 1Hz
Bessel2_LPz_1Hz = FiltLP(jump, 1, 0, 2, 1)

; 8th-order Butterworth low pass at 1Hz
Butterworth8_LPz_1Hz = FiltLP(jump, 0, 0, 8, 1)

; 8th-order Bessel low pass at 1Hz
Bessel8_LPz_1Hz = FiltLP(jump, 1, 0, 8, 1)
```



Digital lowpass filter Bessel and Butterworth

As the order increases, the pass-through time visibly increases accordingly, just as with original analog filters.

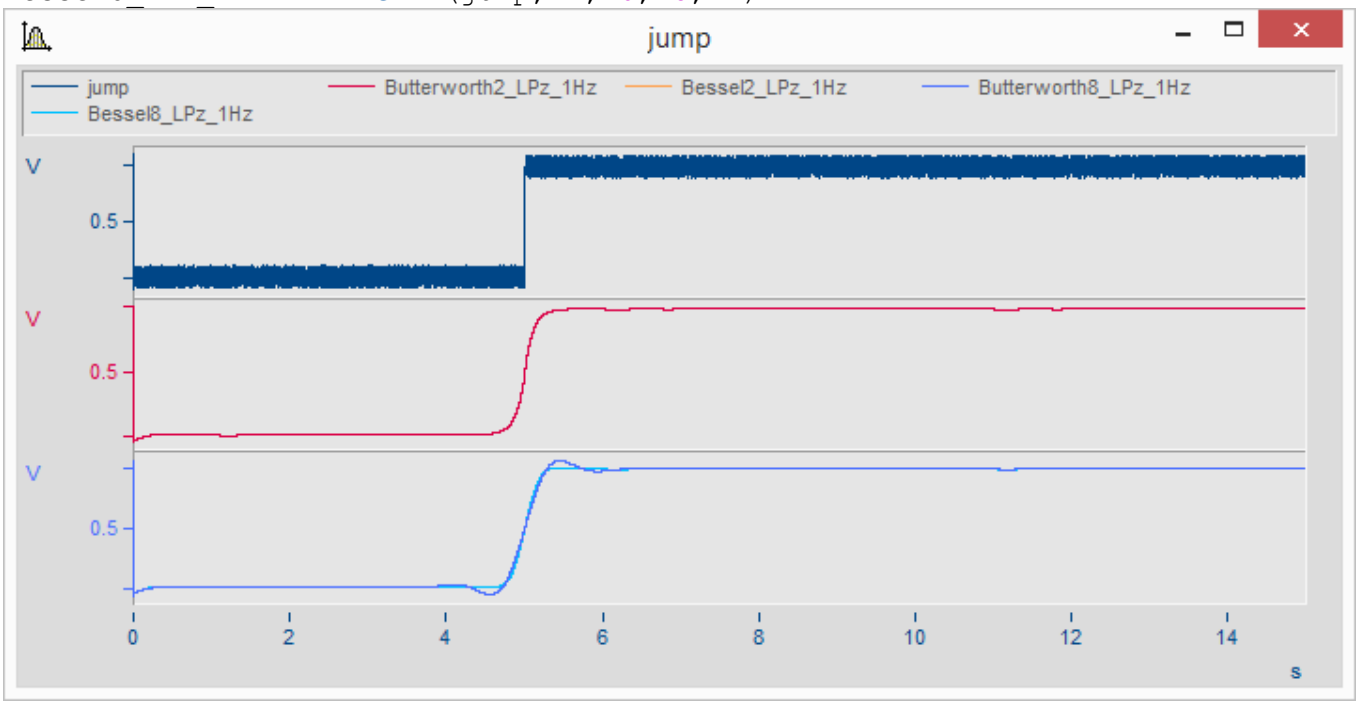
Offline-processing enables the user to skip the processing time while maintaining the filter characteristics. To do this, append the suffix "z" to the filter function name:

```
; 2nd-order Butterworth low pass at 1Hz
Butterworth2_LPz_1Hz = FiltLPz(jump, 0, 0, 2, 1)

; 2nd-order Bessel low pass at 1Hz
Bessel2_LPz_1Hz = FiltLPz(jump, 1, 0, 2, 1)

; 8th-order Butterworth low pass at 1Hz
Butterworth8_LPz_1Hz = FiltLPz(jump, 0, 0, 8, 1)

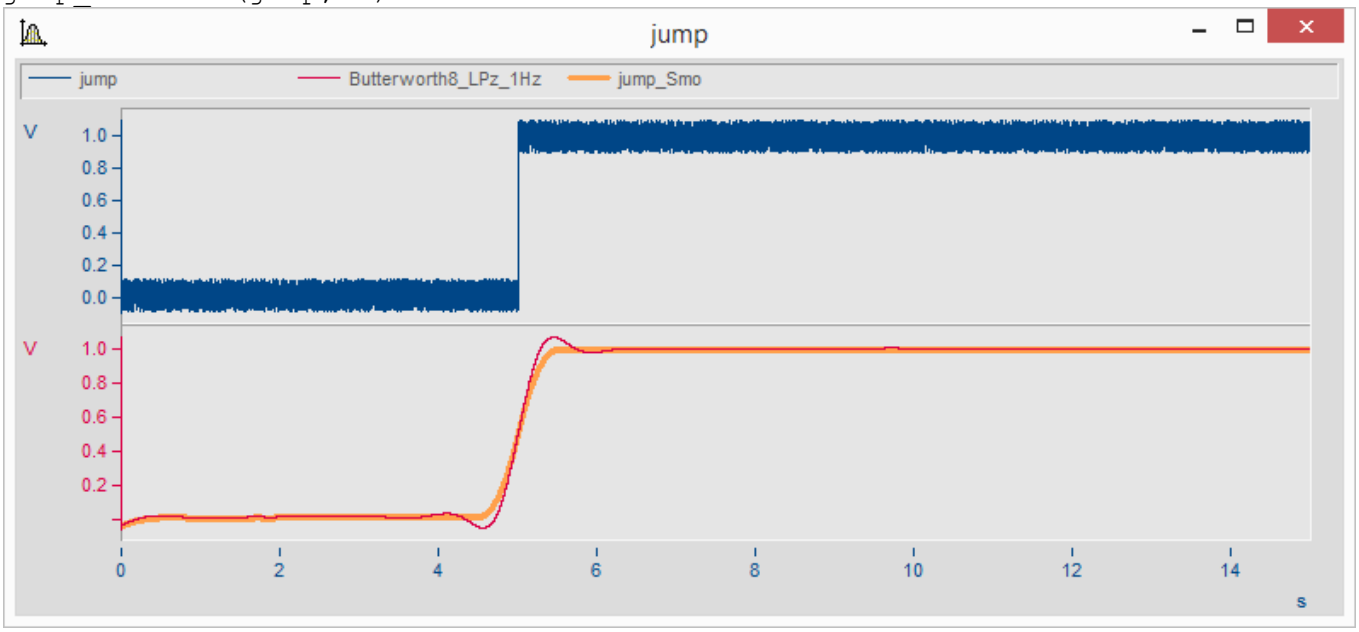
; 8th-order Bessel low pass at 1Hz
Bessel8_LPz_1Hz = FiltLPz(jump, 1, 0, 8, 1)
```



Digital low-pass filter Filt_LPz Bessel and Butterworth without phase offset

However, for many analyses it is not important to compute a typical filter characteristic. Instead it is necessary to locate any significant signal changes while ignoring noise and without any phase offset. For this purpose, the **Smo()** function is especially well suited. In the following example, the signal is smoothed as a width of 1 second.

```
jump_smo= Smo(jump, 1)
```

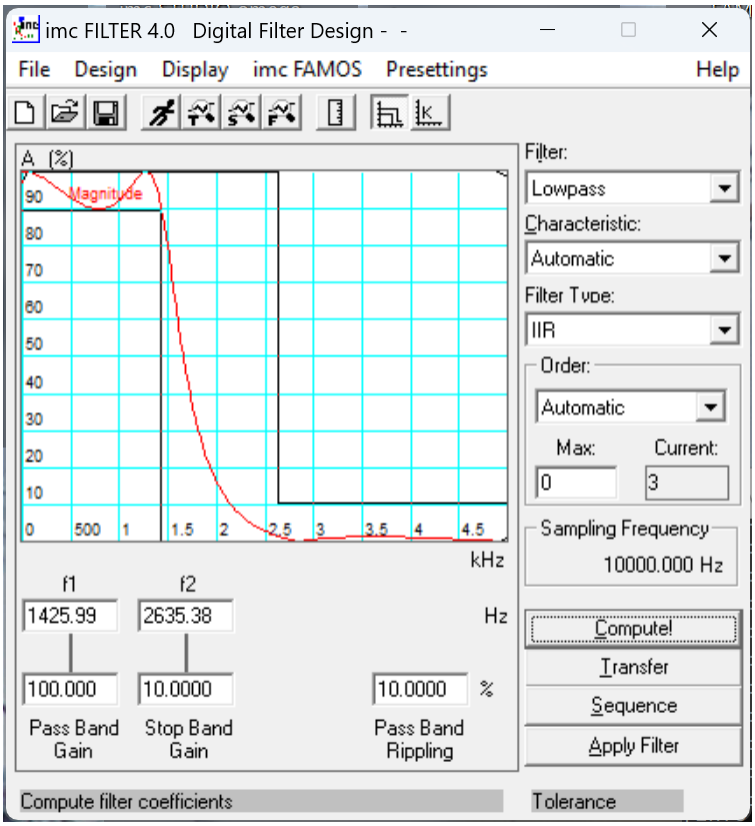


Smoothing without phase offset by means of the Smo() function

For special tasks in filtering, the *DFilt()* function is provided. This function enables the use of filter coefficients. For this purpose, imc offers the filter design program ***imc FILTER***, which is available separately.

The function ***DFilt()*** is available for special filtering tasks. This function allows the use of filter coefficients. If the filter coefficients are available as a data set, the data can be filtered directly with *DFilt()*.

For convenient calculation of the filter coefficients, imc offers the separately available filter design programme ***imc FILTER***.



By using this program, you can also create non-recursive filters and define the transition by means of the graphical editor.

The coefficient data set can be transferred directly to FAMOS and used in the DFilt() function.

Example:

```
Res_Filter = DFilt( Data, coefficients )
```

19.13 Dokumentation der Ergebnisse

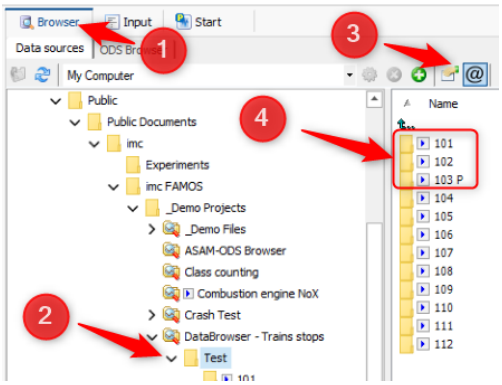
19.13.1 Composing a PDF report using the Panel

The Panel provides widgets for displaying and controlling the analysis. Besides the dialog view, it is also possible to display Panel pages as pages in a report, in either landscape or portrait orientation. This allows you to easily layout reports on your monitor screen for subsequent printout. In the example which follows, we will:

- use the Data Browser to load data 688 from a variety of measurements,
- link a curve window 689 with the selected measurement,
- create a brief analysis sequence 690 which runs automatically upon changing measurements,
- display the results in a table 691,

- save and print out the report as a PDF 693.

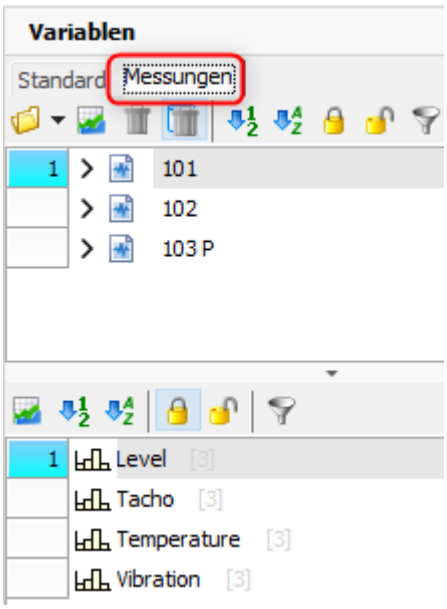
19.13.1.1 Loading data



Loading the measured data with option "@" (measurement naming)

Open the Browser ❶, navigate to the Project folder > *>C:\Users\Public\Documents\imc\imc FAMOS_Demo Projects\DataBrowser - Train stops\Test -> Test* ❷.

Ensure that the *measurement naming* "@" is activated ❸ and select the first three folders on the right side ❹.

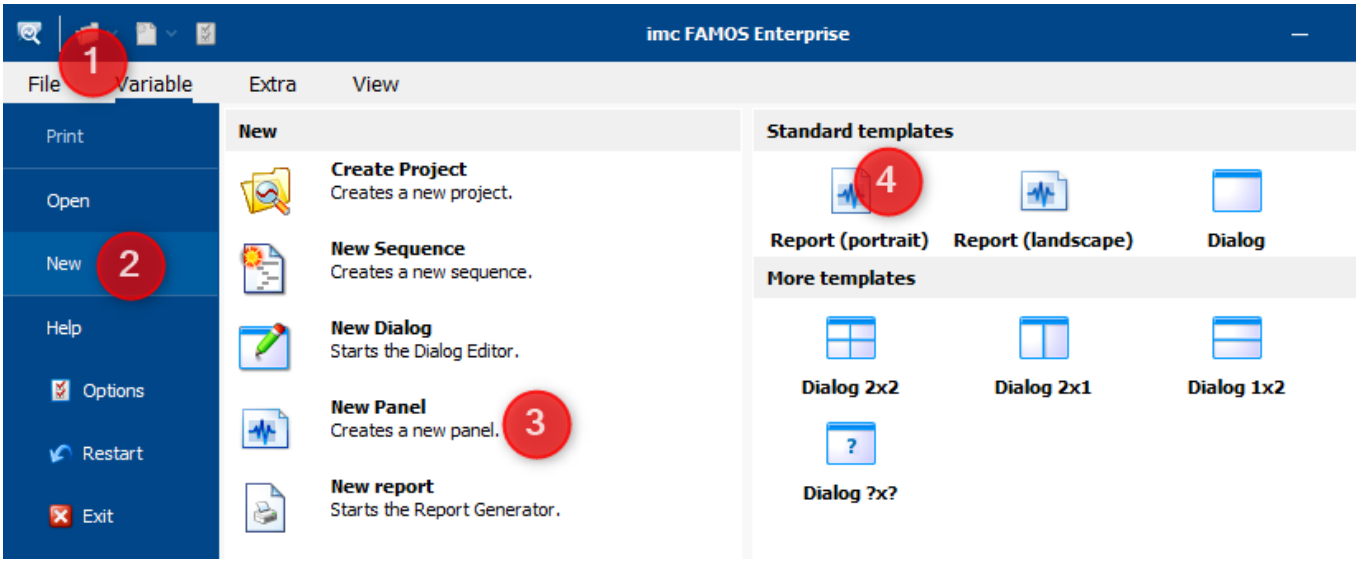


Variablenliste Messungen

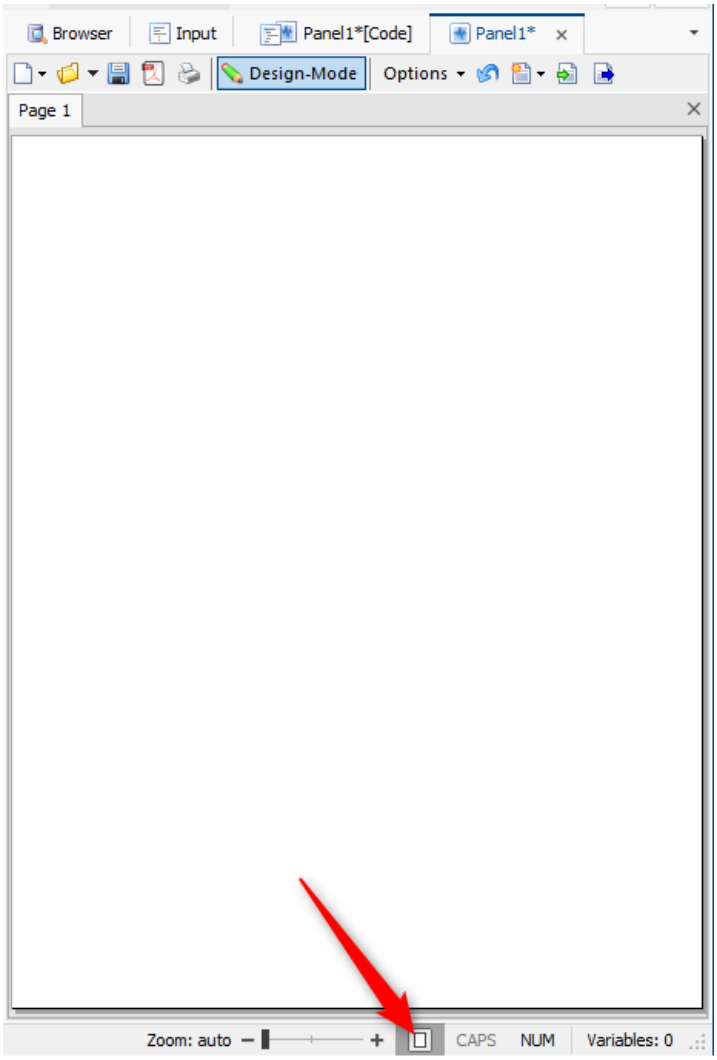
By clicking on the ENTER-key, you load the data. The activated measurement association ❸ causes "@FolderName" to be appended to the channel names. This makes all of the channel names unique and causes them to appear clearly sorted in the Variables list under *Measurements*.

19.13.1.2 Curve windows in the Panel

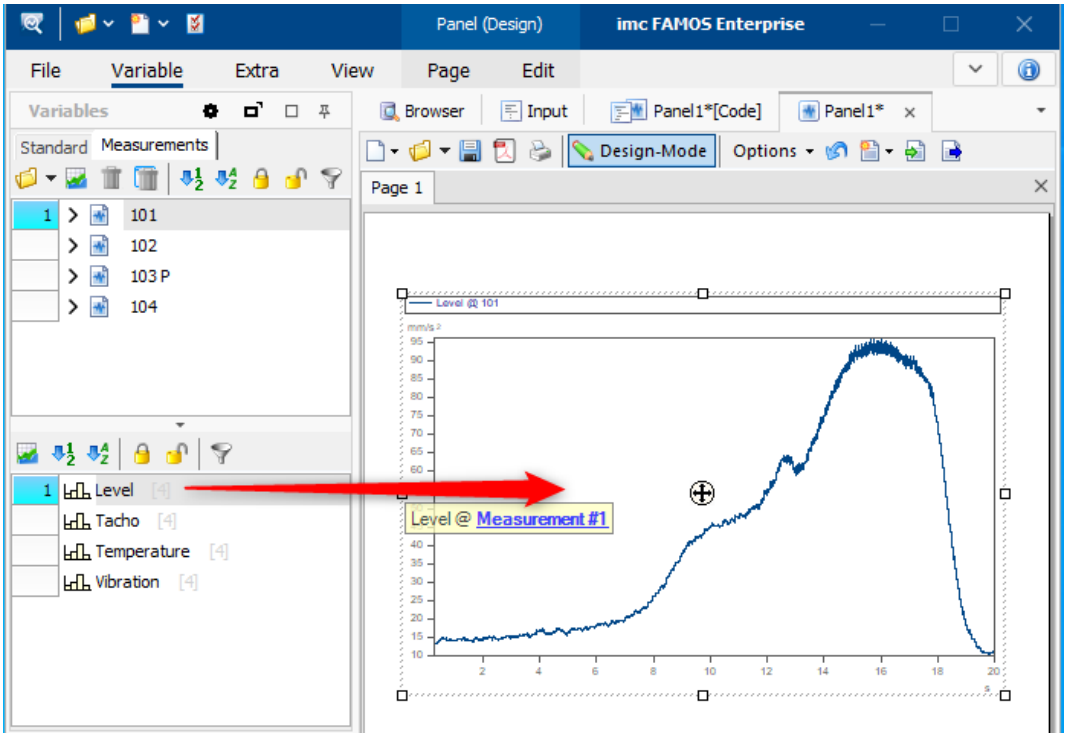
Using the *File* menu, create a Panel as a report in *portrait* orientation:



Datei- Neu - Neues Panel - Reprot (Hochformat)

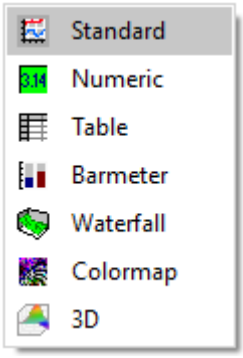


A white page is inserted. In order to be able to see the complete page, click on the *Automatic Zoom* button:



Use drag&drop to move the channel *Level* to the Panel page. A small help bubble text appears in order to indicate what association is being made. In this case we see "*Level@Messung#1*", which means that a placeholder is created for the channel *Level*, which belongs to the selected measurement having the index (blue number) 1.

When you release the mouse button to perform the drop, a selection menu appears which offers the widgets available:



Select the Standard widget.

Next, click on a different measurement in the list of measurements. The data belonging to the associated channel are displayed automatically.

19.13.1.3 Creating an analysis sequence

Next we wish to perform a brief statistics analysis on the channel Level, which is to be run each time the measurement is changed.

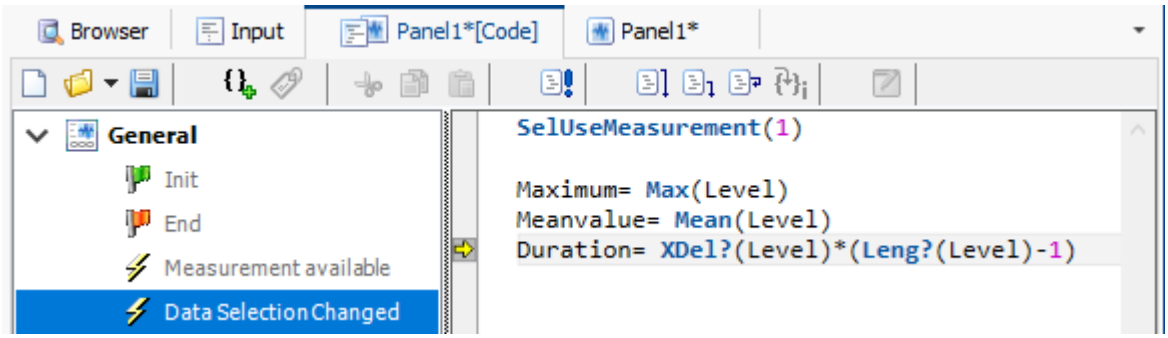
Go to the sequence editor for *Panel [Code]* and select *Data selection changed.*

To begin with, FAMOS needs to know which measurement's data are to be processed. For this purpose, use the command *SelUseMeasurement(1)* from the functions group *Variables > Measurements, Data selector.* The *(1)* indicates that the measurement whose index is 1 will be evaluated.

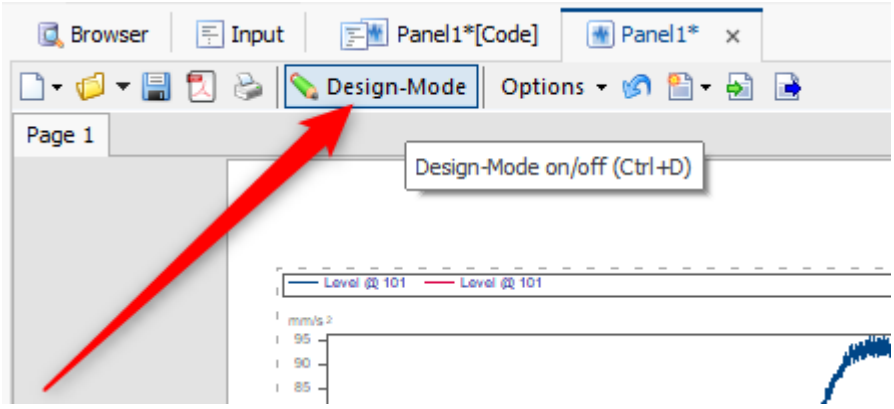
Now the channel name *Level* is sufficient for FAMOS to internally generate the complete name, e.g. *Level@101*.

For the analysis, we determine the following statistics:

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The code lines can be tested by pressing F7 (Run Sequence). In order to run the sequence upon changing the measurement selection, it is necessary to exit Design mode. At the latest, it is necessary to save the Panel at this moment. We will name it "*Demo1.panel*".

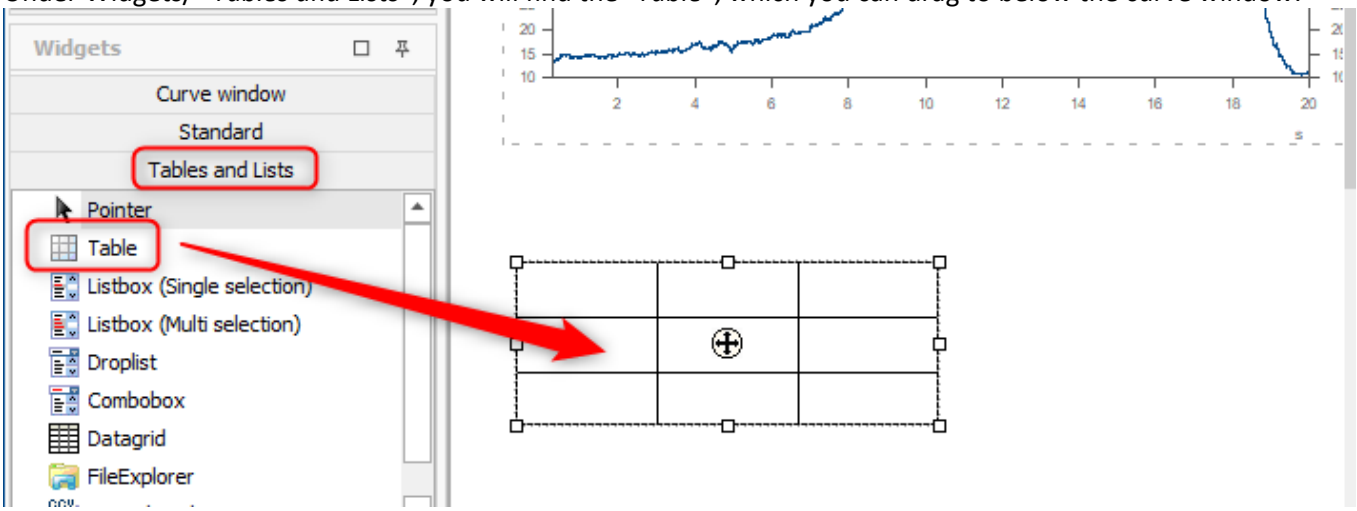


19.13.1.4 Table

The results of the analysis will now be displayed in a table.

For this purpose, the Panel is restored to Design mode.

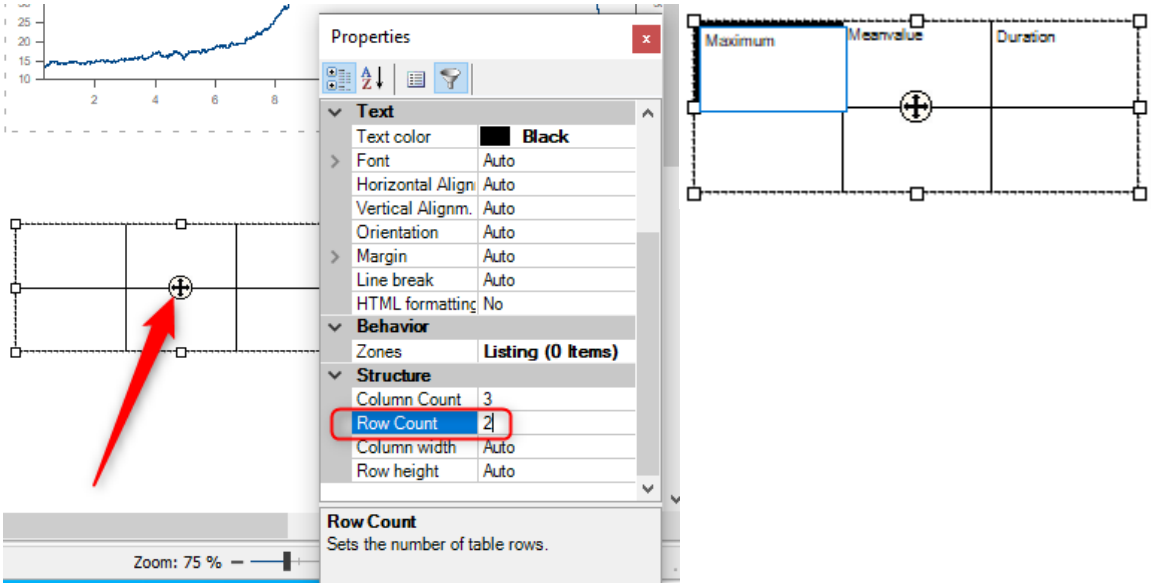
Under Widgets/ "*Tables and Lists*", you will find the "*Table*", which you can drag to below the curve window:



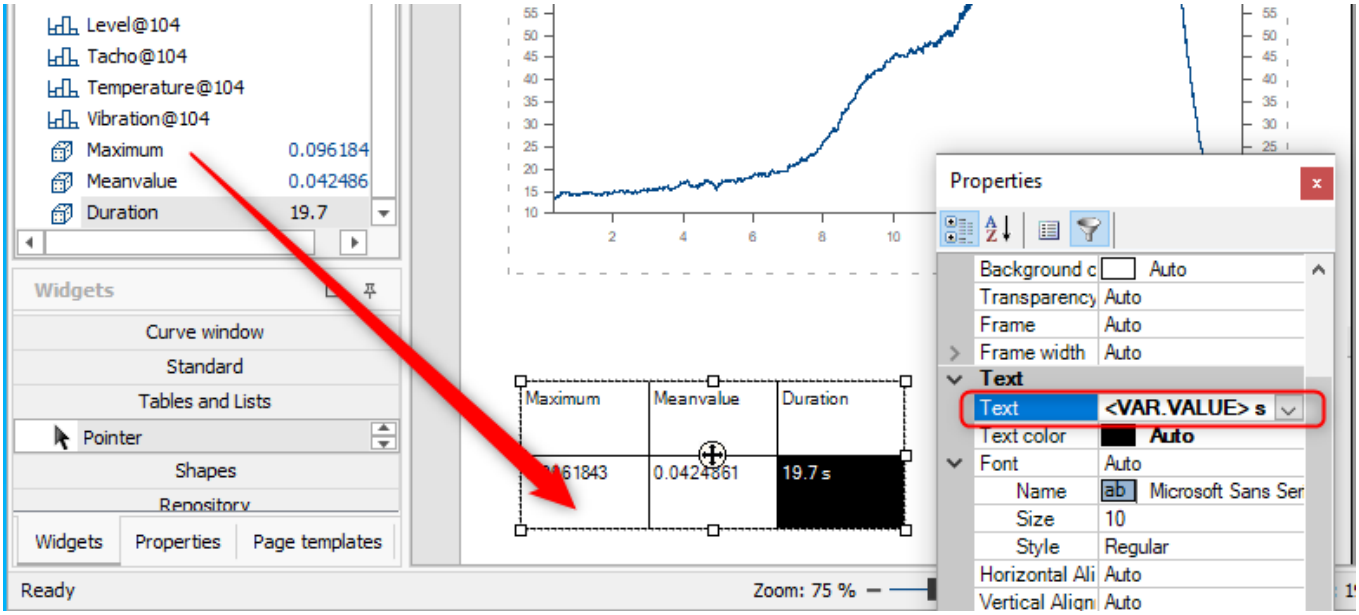
When you double-click on the circle, the table's properties are opened. Change the row count to 2.

When you double-click in the cells, you can enter titles.

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Next, drag the variables to the associated cells.

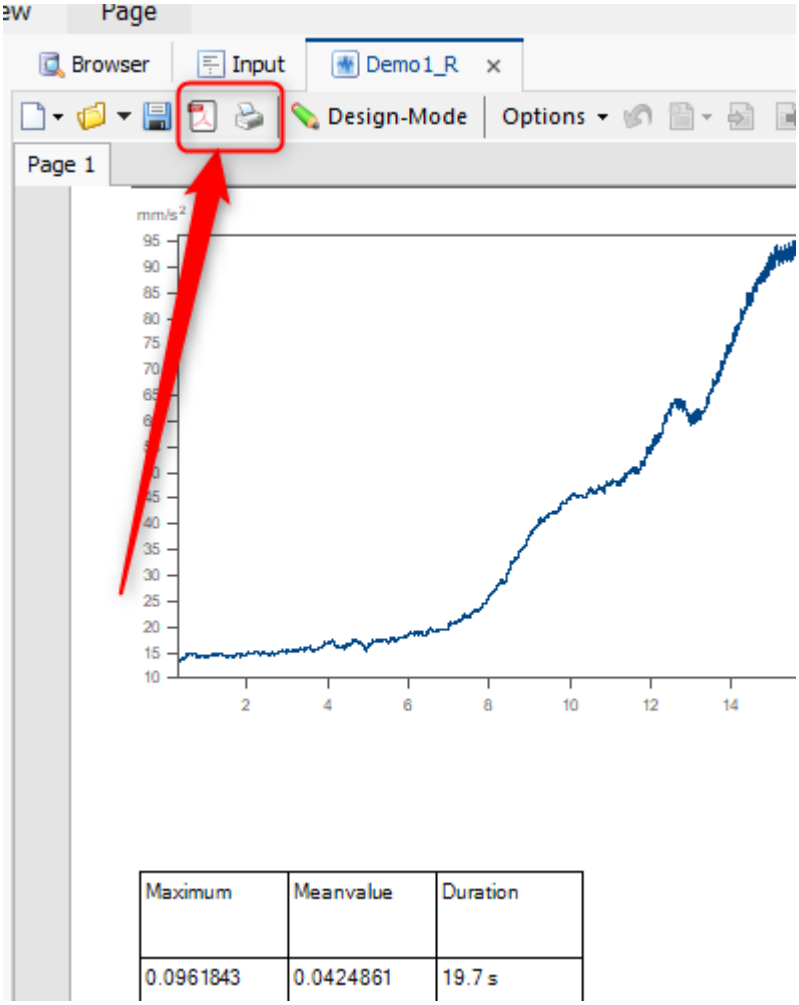


Using placeholders, you can insert additional formatting settings [507] in the field Text.

To conclude, exit Design mode and change the measurement selection. The values in the table must bow update automatically.

19.13.1.5 Creating a printout and PDF

Create a printout or a PDF of the page by clicking on the associated symbol.



Maximum	Meanvalue	Duration
0.0961843	0.0424861	19.7 s

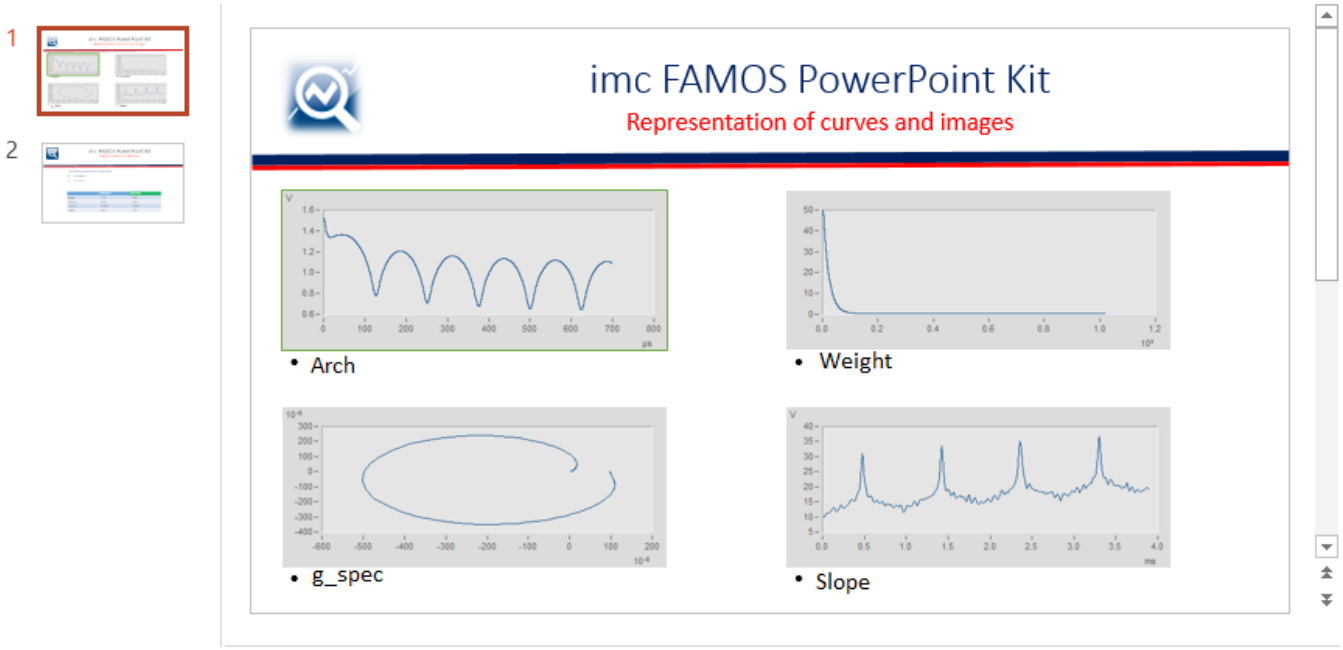
Printout via the toolbar

19.13.2 Power Point automation

Alongside the customary PDF documents, PowerPoint has also become prevalent among many users as a tool for documenting results.

imc FAMOS provides all functions necessary for automated creation of a PowerPoint presentation.

In the Projects folder, you will find the following sample project "*PowerPoint*". A template is filled with a few curve windows and results:



The functions are located in the library under *Presentation > PowerPoint-Kit*.

```
; ========================================================
; PptSample1
; Sequence using the PowerPoint Kit
; used the PowerPoint files:
;       PowerPointTemplateCurve.pptx contains 1 slide
;       PowerPointTemplateTable.pptx contains 1 slide
; ========================================================

Delete *

; --- Preparing of the curve windows ---------------------
FileLoad("arch.dat","",0)
CwNewWindow( arch,"show")
CwNewChannel( "append new axis", arch)
FileLoad("Weight.dat","",0)
CwNewWindow( Weight,"show")
CwNewChannel( "append new axis", Weight)
FileLoad("g_spec.dat","",0)
CwNewWindow( g_spec,"show")
CwNewChannel( "append new axis", g_spec)
FileLoad("Slope.dat","",0)
```

```
CwNewWindow( Slope,"show")
CwNewChannel( "append new axis", Slope)
SetOption( "Dir.Sequences","RESET")
dirseq = GetOption("Dir.CurrentProject")

; --- Open PowerPoint template "PowerPointTemplateTable" --
result=PptOpenPresentation( dirseq +"\Ppt\PowerPointTemplateTable.pptx",1)
; --- Add slides from "PowerPointTemplateCurve.pptx" ------
result=PptAddSlides( 0,dirseq + "\Ppt\PowerPointTemplateCurve.pptx")

; --- Set FAMOS-Logo on slide 1 and slide 2 ---------------
; Logo on slide 1 has soft edge.
result=PptSetPicture( 2,"Logo",dirseq+"\Ppt\FAMOS.PNG",2,0)
result=PptSetPicture( 1,"Logo",dirseq+"\Ppt\FAMOS.PNG",2,0)

; === Set objects on slide 1 ==============================
slideindex=1
; --- Set Master- and subtitle ----------------------------
result=PptSetText( slideindex, "Mastertitle", "imc FAMOS PowerPoint Kit")
result=PptSetText( slideindex, "Subtitle", "Representation of curves and
images")

; --- Transfer curves window 'arch' ----------------------
; The picture has a green frame
PrinterOrScreen="screen"
sizeoption=2
CwSelectWindow(arch)
result=PptSetcurve(1,"CW1",sizeoption,0,PrinterOrScreen)
result=PptsetText( 1,"CWNAME1","arch")

; --- Transfer curves window 'g_spec' --------------------
CwSelectWindow(g_spec)
result=PptSetcurve(slideindex,"CW3",sizeoption,0,PrinterOrScreen);
result=PptsetText(slideindex,"CWNAME3","g_spec")

; --- Transfer curves window 'Weight' --------------------
CwSelectWindow(Weight)
result=PptSetcurve(slideindex,"CW2",sizeoption,0,PrinterOrScreen);
result=PptsetText( slideindex,"CWNAME2","Weight")

; --- Transfer curves window 'Slope' ---------------------
CwSelectWindow(Slope)
result=PptSetcurve(slideindex,"CW4",sizeoption,0,PrinterOrScreen);
result=PptsetText( slideindex,"CWNAME4","Slope")
```

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```
; === Set objects on slide 2 ==============================
slideindex=2
; --- Set Master- and subtitle ---------------------------
result=PptSetText( slideindex, "Mastertitle", "imc FAMOS PowerPoint Kit")
result=PptSetText( slideindex, "Subtitle", "Representation in table form")

; --- Set text with paragraphs ---------------------------
cr="~013"
text="The following features were determined:"+cr+"Maximum"+cr+"Minimum"
PptSetText(slideindex,"Text1",text)
; --- Set table content ----------------------------------
result=PptSetCellText( slideindex,"Table1",1,2,"Maximum")
result=PptSetCellText( slideindex,"Table1",1,3,"Minimum")

maximum= max(arch)
minimum= min(arch)
result=PptSetCellText( slideindex,"Table1",2,1,"arch")
result=PptSetCellText( slideindex,"Table1",2,2,TForm(maximum,"f4.2"))
result=PptSetCellText( slideindex,"Table1",2,3,TForm(minimum,"f4.2"))

maximum= max(Weight)
minimum= min(Weight)
result=PptSetCellText( slideindex,"Table1",3,1,"Weight")
result=PptSetCellText( slideindex,"Table1",3,2,TForm(maximum,"f4.2"))
result=PptSetCellText( slideindex,"Table1",3,3,TForm(minimum,"f4.2"))

maximum= max(g_spec.B)
minimum= min(g_spec.B)
result=PptSetCellText( slideindex,"Table1",4,1,"g_spec")
result=PptSetCellText( slideindex,"Table1",4,2,TForm(maximum,"f4.4"))
result=PptSetCellText( slideindex,"Table1",4,3,TForm(minimum,"f4.4"))

maximum= max(Slope)
minimum= min(Slope)
result=PptSetCellText( slideindex,"Table1",5,1,"Slope")
result=PptSetCellText( slideindex,"Table1",5,2,TForm(maximum,"f4.2"))
result=PptSetCellText( slideindex,"Table1",5,3,TForm(minimum,"f4.2"))


; --- Save presentation ----------------------------------
result=PptSavePresentation(dirseq+"\ppt\PptSample1.pptx")
result=PptSavePresentation(dirseq+"\ppt\PptSample1.pdf",1)
result=PptSavePresentation(dirseq+"\ppt\PptSample1_jpg.jpg",2)
result=PptSavePresentation(dirseq+"\ppt\PptSample1_png.png",3)
```

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```
result=PptSavePresentation(dirseq+"\ppt\PptSample1_bmp.bmp",4)
result=pptClosePresentation( )

result = execute( "Explorer", dirseq+"\ppt", "", 0, 0)
BoxMessage("End", "Presentation created", "!1")
Delete *
```

20 Appendix

20.1 Concepts and abbreviations

' (single quote)	The single quotation mark is entered in Windows by pressing the ' key and then the SPACEBAR or SHIFT and #.
^ (power)	The exponent sign is entered in Windows by pressing the ^ key and then the SPACEBAR.
ALT	Keyboard key used to change the function of another key; usually held down while another key is pressed.
Application	A program which runs under Windows
BACKSPACE	Keyboard key used to delete the last character entered; labeled with an arrow pointing left or with BS, generally located above the ENTER or RETURN key.
Browser	Program for navigating through filing / directory organization structures.
Check-mark	Small mark displayed next to certain menu options to indicate that the corresponding option is activated.
Click	Short press of the left mouse button, i.e. short selection and immediate release; in some cases it is required to hold down the button after clicking. The right and left mouse buttons can be switched in the control panel.
COM	Abbreviation for "Component Object Model". Microsoft software standard designed to simplify communication between processes and programs. COM defines its own object-oriented interface for this purpose.
Context menu	Special menu adapted to particular object and offering commands which affect the same object. Usually called by right-clicking on the object, but sometimes via SHIFT+F10 or some other special key.
CTRL	Keyboard key used to enter control characters; usually held down while another key is pressed.
DELETE	This is the keyboard delete key: the character located at the marked position or to the right of the cursor is deleted; usually labeled with Del.
Direction keys	The four keyboard keys labeled with arrows in all four directions; used to move objects or the cursor on the screen; also called cursor keys.
Directory	Windows file container which may hold files and/or other directories; used to add structure to hard disks and diskettes. Also known as "Folder".
Double-click	Clicking the mouse button twice in quick succession; the speed can be specified in Windows (Control Panel/ Mouse).
DOWN	Direction key with arrow pointing downward

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Drag&drop	A method of moving objects with the mouse. Click on an object and move the mouse while keeping its button down to move the object; release the mouse button over the desired new location for the object.
Editor	Program or program component for entering or editing data (often text).
END	Keyboard key used to move the cursor to the right edge of the screen.
ENTER	Keyboard input key, sometimes labeled as Return, Enter, CR or an arrow pointing down and then left.
ESCAPE	Keyboard key, sometimes labeled with Esc; used to cancel commands or interrupt operations.
Folder	see "Directory"
Function key	Function keys are available as a block at the top or the left of the keyboard, usually labeled with F1, F2,...; used to execute commands.
HOME	Keyboard key used to move the cursor to the left edge of the screen.
Kit	In imc FAMOS , the name of special extension libraries providing additional functions which can be called in formulas or sequences.
LEFT	Direction key with arrow pointing left.
Mouse cursor	Mouse cursor; in Windows usually an arrow, moved across the screen with the mouse.
OLE	Abbreviation of "Object Linking and Embedding". A method of shared use of information where data from a source document are linked to or embedded in a destination document. If the embedded data are selected in the destination document , the source document is reopened so that the data can be processed using the appropriate functions in the original environment. A special implementation of the interface standard COM (which see).
Parameter	Characteristic assigned to a function; called an argument in mathematics.
Path	Trail through a memory volume's directory structure to the folder containing a desired file.
PgDn	Keyboard key which moves the image displayed one page downward; labeled with PgDn and an arrow pointing downward.
PgUp	Keyboard key which moves the image displayed one page upward; labeled with PgUp and an arrow pointing upward.
Plug-in	General term for an auxiliary program extending an application's functionality. In imc FAMOS , it means an expansion module having its own user interface, which can be seamlessly integrated into the imc FAMOS main window.
Rezoom	Command to undo the zoom, shows entire page.
RIGHT	Direction key with arrow pointing right.

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SHIFT	Keyboard key used to switch between upper and lower case characters, located twice on every keyboard for the right and left hands; is usually held down while other keys are pressed.
SPACEBAR	Keyboard key which inserts a space; the longest key.
TAB	Keyboard key used to indent in word-processing programs, used in Windows to move to the next control in a dialog; tabulator function.
UP	Direction key with arrow pointing upward.
Waveform	A data set representing a signal which can be plotted as a curve.
Zoom	Enlarges a section of a window; opposite function is Unzoom.

20.2 Constants and pre-defined variables

sRms	Root-mean-square of a data set or data set
e	Euler's constant e
InDegr	Constant for converting radians to degrees
InRad	Constant for converting degrees to radians
sMax	Maximum of a data set
sMaxPos	X-coordinate of the maximum of a data set
sMin	Minimum of a data set
sMinPos	X-coordinate of the minimum of a data set
PI	Circle constant pi (P)
PI2	2 x circle constant pi (P)
StDev	Standard deviation of a data set

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20.3 Units

Supported SI Units

A	Ampere	Electric current
cd	Candela	Light intensity
K	Kelvin	Temperature
kg	Kilogram	Mass
m	Meter	Length
s	Second	Time

Additionally Supported SI Units

Unit	Name	Definition	Conversion
°C	Celsius	Temperature	1 °C = 1 K for temperature differences
C	Coulomb	Electric charge	1 C = 1 As
F	Farad	Electric capacity	1 F = 1 As/V
H	Henry	Inductivity	1 H = 1 Vs/A
Hz	Hertz	Frequency	1 Hz = 1 1/s
J	Joule	Energy	1 J = 1 Nm = 1 Ws
lm	Lumen	Light flux	
lx	Lux	Illumination	1 lx = 1 lm/m^2
mol	Mol	Amount of substance	
N	Newton	Force	1 N = 1 kgm/s^2
Ohm	Ohm	Electric resistance	1 Ohm = 1 V/A
Pa	Pascal	Pressure	1 Pa = 1 N/m^2
S	Siemens	Conductivity	1 S = 1 A/V
T	Tesla	Magnetic field strength	1 T = 1 Vs/m^2
V	Volt	Voltage	
W	Watt	Power	1 W = 1 VA
Wb	Weber	Magnetic flux	1 Wb = 1 Vs

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Additional units and pseudo-units recognized by imc FAMOS

dB	Decibel	Not a unit, logarithmic representation
Degr	Degrees	Angle, range 0 ... 360
Empty		Not a unit
%	Percent	Not a unit
Rad	Radian	Angle, range 0 ... 2*Pi

20.4 Maximum values

Maximum number of drives for temporary files	5
Max. data set length (in Bytes)	unlimited
Maximum formula length	510 characters
Maximum number of variables	300 000
Maximum length of a variable name	255 characters
Length of texts (text variables, units, comments) text constants per line	2^{31}-1 characters 255
Maximum nesting depth in a formula	10
Maximum nesting depth in a sequence (macro)	20
Maximum nesting depth in control structures (If, FOR, WHILE...) in a sequence	20
Largest possible number (magnitude)	10^{100}
Smallest possible number (magnitude)	10^{-100}

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