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imc WAVE 2022

What is new

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imc Test & Measurement GmbH • Voltastr. 5 • 13355 Berlin • Germany

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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.

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A list of the open source software licenses for the imc measurement devices is located on the imc STUDIO/imc WAVE installation medium in the folder "*Products**imc DEVICES**OSS*" or "*Products**imc DEVICEcore**OSS*". If you wish to receive a copy of the GPL sources used, please contact our Hotline.

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Update

Along with the PC software imc WAVE (imc STUDIO), the software comprises components such as the firmware and devices driver packages imc DEVICEcore and imc DEVICES. With a firmware update, the firmware can be loaded into the system. Please check regularly whether any new software/firmware versions are available and perform an update if your version of imc WAVE (imc STUDIO) supports the new firmware. Further information can be obtained from the imc Hotline or the imc website.

Download links:

imc WAVE	https://www.imc-tm.com/imc-wave/software/

Introduction

The imc WAVE 2022 you now possess is a version which is updated to the newest level of PC technology. This version of imc WAVE is designed for 64-bit computer architecture. For this purpose, many key components have been updated, revised or even redesigned from scratch. We have invested much time in improving functions, simplifying workflow procedures and achieving greater system stability. The outcome is a modernized system architecture which provides substantial improvement of performance. To mention a few points up front:

- imc WAVE is now a multi-threading capable 64-bit version,
- thanks to the new device firmware imc DEVICEcore, communication with and control of the new devices such as imc EOS is many times faster.
- the display in the curve window is substantially more powerful and smooth.
- ...

On the following pages, you will find an exact enumeration and description of the changes. There you may find quite a lot which will be pertinent to your work.

In particular, you should read the chapter "*Update-notes and compatibility* 42" before performing the update. It presents all the functional changes and modifications which need to be observed when updating.

The imc team wishes you total success in accomplishing your measurement tasks with imc WAVE.

imc WAVE 2022 R3

1 General Changes in imc WAVE

Personal metadata in the Experiment/Meta-folder

For the purpose of saving your own personal files pertaining to the experiment, the folder "*Meta*" can be used. Previously this had been a rather hidden feature, since this folder need to have been created first. Now, the "*Meta*"-folder is automatically created in the Experiment when "*Save*" is performed or when creating an experiment using "*New*", unless this folder already exists. Along with this, a readme.txt file is also created, which describes the folder's function.

As previously, the folder is always exported along with the experiment. What is new is that it is also imported even when no measured data are imported. Previously the folder was only imported when the measured data were also included in the import.

For example, it is possible by this method to save characteristic curves, target value tables, CCV-files or reference data, for instance for the ChannelLoader .

Selecting the data format: imc2 or imc3

By default, imc WAVE saved the measured data in the imc3 format. In imc FAMOS, it is possible to set whether to save the files in either the old imc2 or the new imc3 format. imc WAVE now also applies this setting. We continue to recommend saving the measured data in the imc3 format.

With which version and which device were the measured data generated?

The saved measurement files record with which version of imc WAVE (imc STUDIO) and with which firmware/3rd-party device/DataProcessing and which device the measurement was performed. For this purpose, the *.raw-file can be opened with a text editor. This info is readable whichever file format (imc2 or imc3) is used.

2 Setup and Device Control

Display of instantaneous values for 3rd-party channels, incremental counters, device-variables etc.

The display of instantaneous values in the Setup now also includes indication of the current readings of the following devices/channel types:

- incremental counter inputs, field-bus channels, FunctionSimulator-channels, Application module-channels, GPS-channels
- pv-variables, display variables
- ethernet-bits, virtual bits

The current reading is displayed as long as the channel is returning measured data. If the measurement is not running, the last reading is retained and displayed in gray font. This makes it clearly distinguishable which value is still being updated and which value may be obsolete.

Exception: For channels having an associated pv-variable (e.g. analog channels or incremental counter inputs), the following still applies:

- The current value is displayed as soon as the action "*Prepare*" is performed (so also before and after the measurement).

Name	Status	Current value	Measurement mode
Channel type: Analog inputs			
Channel_001	Active	0.00951138 V	DC - Linear
sin3	Active	-0.00536171 V	
Channel type: Digital inputs / outputs (bits)			
Channel type: Digital inputs / outputs (ports)			
DOut001		0	
DIn002	Active	0	Sampling
Channel type: Display variables			
DisplayVar_01		12	
DisplayVar_02		123	
.....		0	
Channel type: Incremental counter inputs			
Counter_001	Active	0 m	Distance (diff.)
Channel type: Monitor: Analog inputs			
Channel type: Process vector variables			
pv.Counter_001	Active	0 m	
pv.DIn002	Active	0	
pv.Channel_001	Active	0.0080495 V	
Channel type: Virtual bits			

Display of instantaneous values for various channel types

3 Firmware and new hardware

This imc WAVE (imc STUDIO) version has been released along with the following firmware and devices driver packages (imc DEVICES).

3.1 Firmware imc DEVICES 2.15 R3

Alongside minor bug fixes, the following important improvements have also been implemented:

Area	Description
CAN-Assistant	• The system's behavior when importing CBA-files having more than one node has been improved. The settings can be loaded to the selected node individually. • In the CAN-Assistant, pv-variables generated by other Field-busses such as LIN are now also available as send-channels. OBD2-ECU Protocol • In the CAN-Assistants, additional PIDs conforming to the standard SAE J 1979DA:2021-04-21 have been implemented for the OBD2-ECU protocol. • In the CAN-Assistant, it is now possible to enter user-defined PIDs with the OBD2-ECU protocol. • The graphical illustration of the message mapping has been improved. With a message length of more than 8 bytes, the first 8 bytes are displayed correctly. CAN-Assistant - A2L • In some circumstance, after importing an A2L, the CAN-Assistant could display duplicates of an event. This was reported as an error upon running the syntax check. • When importing A2L files, it was only possible to search for labels in the A2L import dialog a few times. After that, the list of labels remained empty.
CAN- and XCPoE-Assistant	In the CAN- and XCPoE-Assistant, the maximum count of events and DAQ-lists supported has been increased to 40.
CAN-FD interface with imc CRONOS*compact* device	Performance improvements regarding the CAN-FD-interface, which reduce demands on the system.
imc Online FAMOS	The syntax check which runs upon reading values from a CAN-message has been optimized.
CRONOS-PL\DIOINC CRONOS-PL\ENC-4	With the DIOINC- and ENC-4 boards of the imc CRONOS-PL device family, in the mode "*Angle (abs)*", the angle was indicated incorrectly, since the scaling "*Imp/revolution*" was not calculated correctly.
CRFX\HISO-8	At slow sampling rates (below 2 Hz), incorrect offsets were generated in 16-bit mode.

3.2 Firmware imc DEVICEcore 3.5 R2

Alongside minor bug fixes, the following important improvements have also been implemented:

Area	Description
Calibration date	The calibration date is now displayed correctly for imc EOS-devices.
Data saving	Renamed channel names were not always correctly allied in the filename.
Synchronization	The synchronization status was not reset correctly if one of the following occurred after successful synchronization: • the connection to the device was disconnected, or • a new experiment involving the same devices was set up.

4 3rd-party devices

fos4X - Data storage of the fos4X-channels has been revised

Previous behavior:

fos4X-channels were previously saved as equidistantly sampled channels. The time stamp of the first sample returned was used as the starting time. The time stamps of any subsequent samples were ignored since it was assumed that the samples would arrive at the specified sampling rate.

This mode is now replaced with two new procedures. You can now **toggle** between **time-stamped data** and **equidistant data** (resampled).

Background:

With long-duration measurements, it can occur that the data do not arrive at exactly this rate. Deviations by as much as 0.01 per mil have been observed. This produces noticeable effects when the measurement duration is long. For this reason, the exact time stamp is important.

If you record data with "*Time stamp*",it is possible to obtain an equidistant channel by resampling with imc FAMOS, for instance, during post-processing after the measurement.

In order to avoid needing resampling, the mode "*Sampling rate*" is provided. Here imc WAVE performs the resampling directly during the data are recording. This compensates for the possible slightly deviating sampling rate.

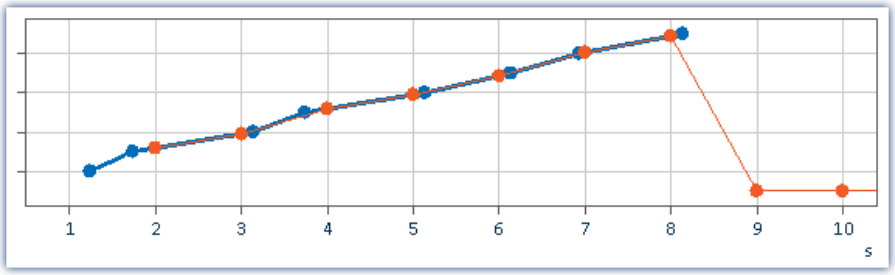
X-axis: Time stamp

- The time stamps provided by the 3rd-party fos4X device are saved. The measurement duration of time-stamped channels is limited to 800 days. Additionally, they require more memory space. The precision of a time stamp is 256 ns.
- The sampling rate set is also required for sending the requests to the fos4X-device. This is the rate at which you want to receive the data.

X-axis: Sampling rate (equidistant data)

- The data stream starts at the next full second on the clock after arrival of the first sample. The system performs linear interpolation between the values returned at the sampling rate specified. Adjacent to any error fallback values, calculation of the interpolation applies the error fallback value.

Example with exaggerated offset to illustrate:



Parameter "X-axis" set to Time stamped (blue) or Sampling rate (orange)
Values at 9 s and 10 s: error fallback values

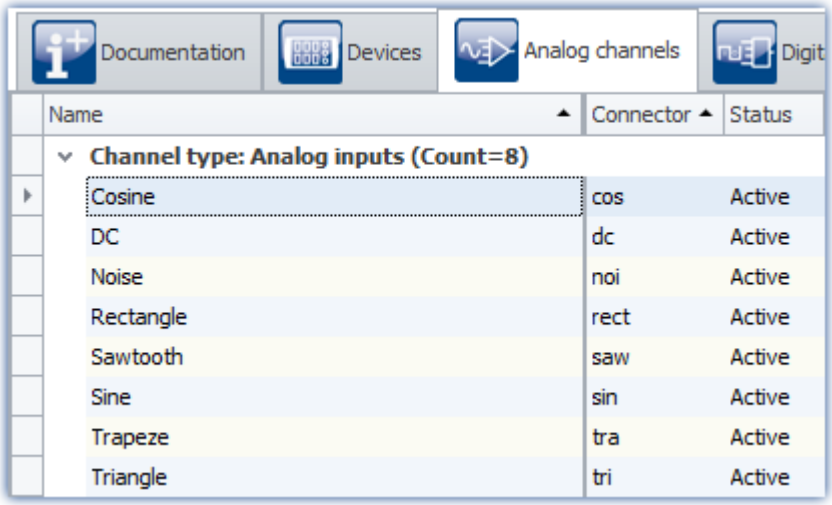
fos4X-data with time zone information

fos4X-data are now supplied with the information that they have been recorded in UTC. This ensures that the data are displayed stacked at correct reference to time in mixed operation with imc DEVICES- or imc DEVICEcore-devices, and thus can be subjected jointly to calculations.

The 3rd-party device "*FunctionSimulator*" can be used

The 3rd-party device "*FunctionSimulator*" is now available as a complete 3rd-party device which can be activated as desired.

The "*FunctionSimulator*" is a device which simulated various kinds of mathematics functions, including Sine, Cosine, Triangle, Sawtooth and Squarewave. The "*FunctionSimulators*" channels appear on the Setup page under "*Analog channels*".



Setup: FunctionSimulator (Analog channels)

The frequency, scaling or offset can be user-specified.

Notes on compatibility:

The template has been renamed and is now called: "*FunctionSimulatorTemplate*". The new 3rd-party device has the name of the former template: "*FunctionSimulator*".

If the old template is already in use, it is possible to continue using it. In order to use the new 3rd-party device, please first delete the old template by means of the "*3rd party device management*".

The 3rd-party device "*ChannelLoader*" provides information on the expected path of the missing data

If the file to be played back is missing, an error message now appears which provides the expected path and filename of the missing file.

The 3rd-party device "*ChannelLoader*" uses experiment-specific files

When a file is selected which is located below the Experiment-folder, the location is saved in "relative" terms with respect to the experiment. If the location of the experiment changes, the file will still be found as long as it is also in the new experiment. The file from the old experiment-folder is not us.

Example: You create a dat-file in the "*Meta*"-folder. If you now export the experiment and import it to a different device or under a new name, the "*Meta*"-folder is also present there (together with the dat-file). By means of the relative path, the copied dat-file is found and used.

Note: Other folder names can also be used. The advantage of the "*Meta*"-folder is that it is automatically included with the export or import. As well, it is included when copying with "*Save as*".

Whether the path is saved in relative or absolute terms depends on the relationship to the Experiment-folder. If the file is below the Experiment-folder, the path is "relative". If the file is outside of the Experiment-folder, the path is "absolute".

5 imc WAVE Spectrum Analyzer

AudioDevice can be used directly

With the imc WAVE Spectrum Analyzer, the AudioDevice is now available as a device in the project.

Measurement page also displays results without calculations

The Measurements page now also displays active channels when there is no Inline Analysis-calculation. All active analog channels and incremental counters are now available for selection on the Measurements page, regardless of whether there is any calculation.

Overmodulation

Monitoring the overmodulation of "analog channels" (violations of the specified measurement range) as per the standard: "*DIN EN 61672-1*".

For purposes of display and evaluation of the overmodulation a variable is provided: "*WAVE_OverloadVariable*". It indicates that one measurement channel is reporting overmodulation but not which channel.

When overmodulation is detected, then for **one second** the variable "*WAVE_OverloadVariable*" takes the value "1". After that one second the system checks whether the overmodulation is still happening.

- if "no", the variable reverts to "0".
- if "yes", the value "1" is retained until there is no more overmodulation. Then the variable reverts to "0".

The following channels are monitored: all active analog channels of the device belonging to the firmware-groups imc DEVICES and imc DEVICEcore. No other channels such as incremental counters or 3rd-party device channels.

Playback and re-calculation of measured data - missing function from Version 5.2 activated

The function for playback of measured data, as well as for re-calculation and re-analysis of measured data, is now available.

The following limitations currently apply:

- supported devices: devices of the firmware-group: imc DEVICES and the 3rd-party devices (however not devices belonging to the firmware-group: imc DEVICEcore)
- channel-data type: double/float-channels or int16-channels
- equidistant data (no TSA-data, no DI-ports)
- no triggered data (no data containing more than one event or which start at a different time than the "*BaseTrigger*")
- for evaluation purposes, the analyzer Inline Analysis is supported

6 Miscellaneous optimization

Alongside minor bug fixes, the following important improvements have also been implemented:

Area	Description
imc WAVE Structure Analyzer	• In rare cases, after a certain amount of trigger releases the error "*Datamanager object locking fatal error*" occurred. • Switching between delayed measurements and subsequent display of results was delayed by a few seconds if the display was plotted over the logarithmic axis in the calculation function.
imc WAVE - Calibration	Calibration of channels has been corrected. For purposes of calibration, all necessary channel parameters are now automatically set and following the calibration the are reset to their previous values.
Widgets	• The pushbutton (Designer) appeared like an Automotive-pushbutton. The property "*Background*" was initially set incorrectly. • Widget: "*Execute menu action*": Executing the menu action via the Widget did not work directly after the configuration. • DIO (Designer): The width of the Widget was too small so that after having been created, the font could not be displayed completely. • Table: When a "*Range*" was set for a cell, e.g. "*0; 10*", an object reference error was raised. • Table: PDF-export - The values displayed in a table do not contain up-to-date values if the table was not visible at the time at which export was performed.
Kurvenfenster	• Absent channels in the curve window cause very high demands on the CPU. • Load on demand: Supposing two channels are configured in the curve window for xy-display and display the saved measurements according to their measurement number. Previously, the data were not automatically loaded when a measurement was selected. They needed to be loaded manually. Now, channels which are displayed as xy channels are also loaded automatically. • The order of the channels in the free-floating curve window was mixed up when multiple channels were displayed simultaneously. • Shifting effects occasionally occurred in the display when other Widgets were present along with a curve window. The curves were then distorted at the height of the upper/lower edge of the other Widget. • Curve window selection: The list of curve window display variants has been revised. ○ Changes: "*Standard maximized*" has been eliminated "*Polar plot*" has been added ○ Renaming: "*Last value as number*" renamed to "*Numeric*" "*Waterfall diagram*" renamed to "*Waterfall*"
Setup - Performance and memory demands	• When changing a parameter of very many channels simultaneously by means of multi-selection, it took a long time until the change was applied. Now there is no longer any delay. • Optimization of memory demands for time-stamped channels. Having many time-stamped channels caused data points to stop arriving in spite of a very low data rate.
Setup - Device control	The action "*Prepare*" for the measurement reset the DOs to 0.
Setup - Firmware imc DEVICEcore	When the imcDevices2x-plugin was deactivated, the time zone information of the VRTC could no longer be obtained. In consequence, the start time for "*Automatic timed start*", could be converted to UTC incorrectly for imc DEVICEcore-devices, for example.

Area	Description
Setup - Device-Assistants e.g. Field-busses, OFA, ...	• The dropdown-box for device selection has been eliminated. Instead, all device tabs are displayed from the beginning. • After clicking on the Exit-button within an embedded Assistant, the entire dialog for all devices closes. • Minimizing an Assistant also minimizes imc WAVE. • Saved field-bus bits could often not be displayed in the curve window. • When a channel name collision occurred, e.g. due to different device-Assistants, the error message which appears now specifies exactly which channels are affected and to which Assistant they belong. • When the problem of duplicate channel names was resolved, then after "*Prepare*", in some cases the error "*Variable "<HWID>" does not exist*", would appear, even though all settings had been made correctly.
Setup - FunctionSimulator	• In the FunctionSimulator, when one channel had a defined measurement duration, but others did not, then after elapse of the measurement duration the error message "*Error in WriteData (Result = OpenExpected)*" was posted cyclically.
Setup - fos4X-Blackbird	Entering sampling rates which are not supported caused incorrect statements in the saved data. For instance, if 20 Hz was entered, a corresponding message was posted in the logbook. The device would work correctly at 50 Hz, however 20 Hz was entered in the saved file. Now during "*Prepare*", the value is automatically corrected and the new value also appears with the measured data.
Setup - 3rd-party devices	For 3rd-party devices within the system, the display of the serial number and device specs has been revised to provide a uniform appearance and unique identification.
imc Online FAMOS	• The function "*RecordEvent*" generated either no units or incorrect ones along the time axis. Now "s" is displayed correctly in both cases. • The description of the function "*NOT*" has been expanded: Notes were added to indicate that applying the function to expressions such as in "If NOT(pv.x > 0) = 0" does not return correct results.
Data storage	• It had not been possible to save more than 509 channels on the PC simultaneously. This limit has been eliminated so that from imc WAVE's side there is no limitation on the channel count. • The offset for Y-data in XY-data was always set to 0. In consequence, for saved data of this type an incorrect amplitude was displayed in the curve window. • Field-bus bits, e.g. CAN-field-bus bits had no unit (s) along the time axis.
Option: Storage location measurement data	• When a valid base path for storage of measured data was entered, but which did not yet exist, the path was not created and start of the measurement was canceled. Now the folder is created whenever possible. • The placeholder <STORAGE.MEASUREMENT> returned an incorrect time.
Inline Analysis	• Deletion of Inline Analysis-functions has been revised. For instance, if the last Inline Analysis-function was deleted, no internal cleanup was performed. The calculations deleted in this way were still present upon the next start and returned data. Similar problems also occurred when deleting devices on whose channels calculations were performed. The functions had only been deleted from the tab "*Inline Analysis*". Inline Analysis: Structure • After only a few trigger-events, the calculations were no longer performed. • Performance: Start of the measurement is now faster if there are no relevant changes for the Inline Analysis.

Area	Description
Commands	imc FAMOS • When a not (yet) existing variable was passed to imc FAMOS, a warning was posted. Normally this warning would not be desired because upon the first evaluation there would be no results channels, for example. Any results would only be available after the second evaluation. For this reason, no warning is now posted (this matches the behavior in Version 5). • Each time the imc FAMOS-command transfers a result to imc WAVE, as a result of which an existing variable was overwritten, the category of the variable was changed from "*User-defined*" to "*imc FAMOS*" or vice versa. • By means of the imc FAMOS-command, a display variable is written which is then transferred via CAN. If the imc FAMOS-calculation returned the same value to which the display variable was already set, the value was not transferred correctly via CAN. Although the display variable had the correct value, CAN transferred a "0". User-defined characteristic curve • With a default-value for "*Delay*" of "0.0", the command could not run. Previously, only whole numbers were allowed; now also decimal numbers are allowed, so that this default-value will be accepted. E-Mail • Files were blocked if they were sent with the command "*E-mail*".
Load Variable	When an event-based channel is loaded for which the events have different specified sampling rates, import is now denied. These are not files which can be created in imc WAVE or which imc WAVE can handle. Previously, the channels would be imported, but then they would have incorrect axis settings.
Installation medium	imc FAMOS • The new revision is included on the installation medium: imc FAMOS 2022 R3 fos4X • The file "*fos4TV.exe*" has been updated on the installation medium. All other files have been deleted and are available on the imc homepage. System • OS-Update: In order to avoid any problems with obsolete signatures and security holes, the previous "*.NET 4.8-Framework*" has been updated on the installation medium.
Installation	Changes to the installation: • When selecting the "*Demo*" installation variant, imc WAVE is now also selected and installed. • Since "*Shared*" and "*imc LICENSE Manager*" can not be de-selected, they no longer appear in the list for product selection.

imc WAVE 2022 R2

1 Firmware and new hardware

This imc WAVE (imc STUDIO) version has been released along with the following firmware and devices driver packages (imc DEVICES).

1.1 Firmware imc DEVICES 2.15 R2

Alongside minor bug fixes, the following important improvements have also been implemented:

Area	Description
CAN-Assistant	When importing .arxml files, when the messages' names were very long, the same new name was sometimes assigned to different messages.
XCPoE-Assistant	Opening the XCPoE Assistant raised an error.
Certificates	The installation contains a new certificate. Additionally, it is available for download on the homepage. For transfer via secure https access, a certificate obtained along with the installation purchase. This certificate has an expiration and must be renewed annually.
WFT	• Balancing via imc Online FAMOS: When performing balancing using the imc Online FAMOS function `RunAutoBalance`, an internal data overflow occurred in imc Online FAMOS. • The balancing-interval now indicates the correct count of revolutions.

1.2 Firmware imc DEVICEcore 3.5 R1

Alongside minor bug fixes, the following important improvements have also been implemented:

Area	Description
Access to the internal data carrier	Access to the internal data carrier in the device has been modified. By default, the entry to make for the user is "*imc*", and the password to enter is the device's serial number. This change was necessary because many companies had deactivated guest access without authentication as the default in their Windows OS.
Trigger	The trigger threshold was compared with the unscaled measurement range. When a factor/offset was entered, the system often incorrectly outputted that the trigger threshold was outside of the measurement range.

2 Inline Analysis - imc WAVE

Machine diagnosis

imc WAVE Vibration has been supplemented with the function: "*Machine diagnosis*" (in accordance with ISO 10816/20816).

Spectral Analyzer

The Spectral Analyzer now also comprises the functions belonging to the Inline Analysis "*imc WAVE Structure*" if the associated license and component "*imc WAVE Structure*" are additionally activated.

Name and license required	Description
imc WAVE Structure	Functions for 2-channel analysis in the frequency domain • Generation of output signals for the purpose of subsequent modal analysis • Calculation of transfer functions with noisy input- and/or output signals • Calculation of the coherence as a quality indicator • Power rating by means of the cross-power-spectrum and spectral power density • FFT analysis as 3D or averaged

Revision of the FFT-functions

Applicable to all Inline-analyses: "*Noise*", "*Vibration*", "*Rotation*" and "*Structure*"

Parameter changes:

- "*Bandwidth*" is hidden and instead "*Sampling rate*" is displayed
- "*Lines*" is hidden and instead "*Samples*" is displayed

Compatibility: The parameters are converted automatically. No modification of existing experiments is required.

New parameter: "*Result*"

Available choices: "*RMS*", "RMS^2" and "*Peak*" (Amplitude)

Compatibility: Previously, "*RMS*" was the hidden default setting so that it is selected for any existing experiments. No modifications required.

New choice for parameter: "*Averaging*"

Available choices: "*none*", "*from start*", "*Number*"

New choice: "*Number*", "*from start*" has previously been named "*Leq from start*"

New parameter "*Avg.-type*"

Available choices: "*RMS*" (quadratic mean), "*Arithmetic mean*", "*Minimum*", "*Maximum*"

Compatibility: Previously, "*RMS*" was the hidden default setting so that it is selected for any existing experiments. No modifications required.

3 Panel and Widgets

Display in the curve window is substantially more powerful and smooth

The refresh rate of extensive data sets is now up to 500 times faster.

For instance, when zooming out or when sampling data at a high rate, there are very many samples in the visible region, so instead of the individual samples a reduced min/max-curve is displayed. This difference is not visually detectable. This functionality is already familiar from imc FAMOS and now also enabled for streaming data during measurement.

Constraints:

- this option currently is only available for equidistantly sampled channels, such as analog channels, ...
- the "symbols" for each data point may not be activated

Widget - Table (Automotive, Industrial, Designer)

The count of decimal places in conjunction with the factor has been revised. In this context, there have been a variety of changes and corrections:

- "*Decimal places*": "*auto*" has been renamed to"*Automatic formatting*".
- "*Decimal places*" offers a selection list: 0, 1, 2, 3, Automatic Formatting, Inherited from Column (only in the cell) - other numbers can be entered.
- For the property: "*Decimal places*", the functionality of: "*Automatic formatting*" has been re-defined. The value selected signifies that as many decimal places are displayed as needed to make up to 5 significant digits visible, including pre-decimal places.

Example value	0.001213141 V	0.0012 V
For the factor: "*Automat...*"	1.2131 mV	1.2 mV
For the factor: "*micro*"	1213.1 µV	1200 µV

- When the "*Factor*" is set to "*Automatic formatting*", then "*Automatic formatting*" is also always used for the count of decimal places, no matter what its actual setting is. For instance, if the "*Factor*" is inherited from the column and that column has "*Automatic formatting*", then any count of decimal places can appear there; the setting for the count is ignored.

Bug fix and compatibility:

When loading older experiments, the settings are corrected if

- the "*Factor*" had been set to "*Automatic formatting*" and
- the count of decimal places had been a fixed number

In this case, the count of decimal places is also set automatically to "*Automatic formatting*" in accordance with the new definition.

Bug fix: If "*Decimal places*" was set to "*auto*", then "one" decimal place was always shown. Now "*auto*" is no longer equivalent to "*1*". In some cases, this will cause the display of existing experiments to change. If this happens, change the setting for the count of decimal places if you wish to retain exactly one decimal place.

4 Miscellaneous optimization

Alongside minor bug fixes, the following important improvements have also been implemented:

Area	Description
Curve window	An embedded curve window was no longer refreshed smoothly if a free-floating curve window was displayed at the same time.
Widget - Table	• It was no longer possible to set the table's visibility in response to a variable's value. The table was always invisible if a variable was entered. • Texts were no longer displayed: Values of text variables and contents of the property: "*Text*".
imc FAMOS-Sequences	imc WAVE 2022 is still not able to handle all data formats which can be generated in imc FAMOS-sequences. E.g. complex data types with real- and imaginary parts, or magnitude and phase, or even xy-data sets. The debugging has progressed to the point that imc FAMOS-sequences which generate these data types can still be run. In the predecessor version, no variable was returned once any of these variable types was present at the end of the sequence. The data types still can not be returned to imc WAVE.
Page Command-batches	The command "*Format converter*" has been added among the available commands.
Modified data storage location for measurement data	With the modified data storage location for measurement data, a fallback-path has been established. If the target folder at the start of data recording is not accessible, the measured data are saved to the default folder. A corresponding message is posted in the logbook.
Calling device-dialogs	Calling of various device-dialogs was impeded; e.g. Device properties, imc Online FAMOS, CAN-Assistant, ... Now all dialogs are again accessible.
3rd- party device	Compatibility: The 3rd-party device "*Profinet-Sniffer*" has been discontinued and eliminated.
Installation	• imc WAVE 5.2 and imc WAVE 2022 can now be installed in parallel. • The names of the installation variants have been changed to make them more unambiguous. Installation variant "*Demo*" is now called "*Full functionality for 30-day demo*" Installation variant "*Auto*" is now called "*Typical functionality incl. imc STUDIO Professional*"
Security vulnerability from log4net	The Assembly for Log4Net has been updated to Version 2.0.14. Note: There is no risk due to this security flaw when used in conjunction with imc STUDIO. Log4Net is used as an element of the scripting editor, so it is sporadically loaded and used. However, this scripting-editor is a programming tool for enhancing imc STUDIO with custom functionality. It is not a web-server or any similar mechanism running in the background, which could be induced by some external request to run malware (which is the problem arising from the log4j security flaw). Furthermore, the scripting-editor has no Administrator privileges. Thus, no malware could have any effects on the system beyond the effects produced by script you wrote yourself. For this reason, there is no cause for alarm in regard to any published version of imc STUDIO to date. In this version, the assembly has been updated.  See also: https://github.com/advisories/GHSA-2cwj-8chv-9pp9

5 Update-notes and compatibility

If you plan to update from Version 2022 R1 to 2022 R2, there are a few things which you may need to observe regarding any existing databases. In particular, be aware of the following points:

Area	Function
Widget - Table 17	• Interplay between settings for "*Factor*" and "*Decimal places*" has been changed. • Decimal place count: "*auto*" no longer equates to "1".
Discontinued devices	3rd-party device "*Profinet-Sniffer* 18"

This information is also presented in the chapter about the update from Version 5.2 to 2022 42.

imc WAVE 2022 R1

1 General Changes in imc WAVE

64 Bit

imc WAVE 2022 has been completely converted to 64-bit and requires a 64-bit operating system.

Advantages:

- Thanks to 64-bit, additional PC-resources become available. Under some circumstances, the demands of imc WAVE went to the limits of a 32-bit program.
- The file size for measured data and circular buffer memory is no longer limited to 2 GB (does not apply to data storage on devices belonging to the firmware group "imc DEVICES").

The list of operating systems supported has been modified

Supported operating systems
Windows 10 64-bit

This enables us to adapt better to the currently prevalent operating systems. Older component such as those required for Windows 7/8 and 32-bit systems can be deleted, in order to de-clutter the system.

Performance und parallelization

In a variety of applications, imc WAVE 2022 offers smoother operation, particularly when using high channel counts. For this purpose, the capabilities provided by modern PCs in the areas of parallelization, multitasking and multi-threading are rigorously exploited. imc WAVE is thus able to utilize the available PC resources in a more dynamic and comprehensive way. Additionally, the performance in the setup is significantly increased. This particularly applies to the selection of devices (adding devices to the measurement setup), and to the saving and loading of experiments.

Use of the new data format

The new imc file format (*imc3*) is now supported, applied and generated.

One major advantage of this format is the display of large data volumes in the curve window. It is no longer necessary to load large data volumes completely before they can be viewed. Instead, only so much data are loaded for the curve window as can also be displayed. In this way, you are able to quickly scroll and zoom, no matter how large the volume of data is.

Storage of the data is resilient to interruptions; even incomplete files can be used without the need for repairs. Furthermore, it is possible to save the imc EOS Monitor channels in the envelope curve format in which they are generated.

The prerequisite for loading the files generated is imc FAMOS 2021.

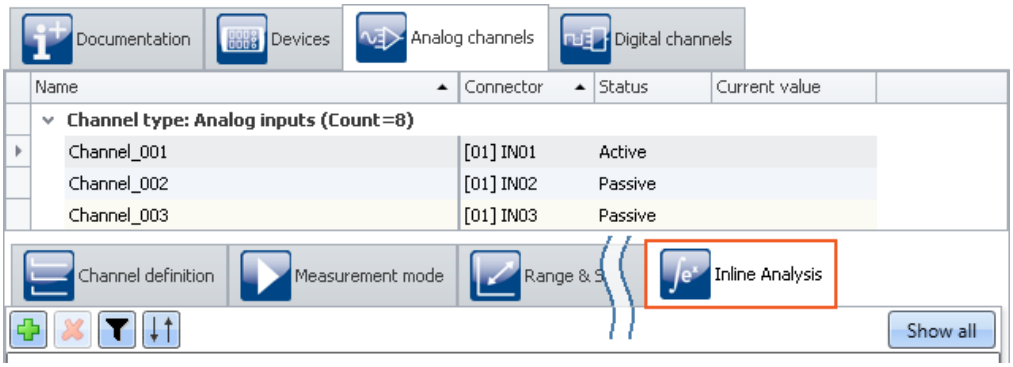
Uniform default file paths

The respective default paths for the various imc-programs have been grouped together under "*C:\Users\Public\Documents\imc*". Thus they are no longer scattered either directly under "*Public Documents*", in their own "*Documents*" or any other paths. Exception: The imc STUDIO / imc WAVE database.

This does not affect update installations, which continue to use the previously specified paths.

2 Spectrum Analyzer

The configuration page for the calculations is now located on the page "*Analog channels*" under "*Inline-Analysis*". Thus, the Analyzer's extra page is omitted.



The Analyzer's functions are subdivided into three separate functional groups and licenses:

Name and license required	Description
imc WAVE Noise	Functions for noise analysis, e.g. sound pressure level, Leq, sound intensity, FFT-spectra, 1/3-octave and 1/1-octave spectrum. • Sound level meter Standard IEC 61672-1 • 1/3- and 1/1-octave analysis as 3D or averaged Standard IEC 61260-1 • Workplace sound pressure level Standard ISO 11201 • FFT analysis as 3D or averaged
imc WAVE Rotation	Functions for analysis of rotating machinery • Resampling of time-domain channels • Order-tracking analysis as a 3D or averaged • FFT analysis as a 3D or averaged • Calculation of an input signal over time to a channel over RPMs (RPM-presentation) • Calculation of spectrum over time or revolutions, to a 3D-channel over RPMs (RPM-vector-presentation) • Calculation of 3D cross sections
imc WAVE Vibration	Functions for vibration analysis of human vibration and machine diagnostics • Filters (LP, HP, BP, BS, simple/double integration, simple/double differentiation, envelope curve) • Machine diagnostics standard ISO 10816 and ISO 20816 • Human vibration filters standard ISO 2631-1, ISO 8041, DIN EN 12299 • 1/3- and 1/1-octave analysis of vibration as 3D or averaged Standard IEC 61260-1 • FFT analysis as 3D or averaged

New and revised functions

Revised functions	Description
Sound pressure spectrum, Sound intensity spectrum, Vibrations spectrum, Order spectrum	For the selection of the overlapping, the values 10%, 33.33%, 66.67% and 90% are now also available (previously: 0%, 25%, 50%, 75%).

New function	Description
imc WAVE Rotation - "Spectrum cut"	imc WAVE Rotation has been supplemented with the function "Spectrum cut". By means of this function, it is possible to make a vertical cut in the spectrum at a given X-position. Thus for example, it is possible to determine the signal plot in the z-direction at a specific frequency or a sampling point. The input can be a frequency spectrum or an order tracking spectrum, as well as 1/3-octave and octave spectra.
imc WAVE Rotation - "RPM vector presentation"	imc WAVE Rotation has been supplemented with the function "RPM vector presentation". By means of this function, a spectrum is plotted over the RPM-values, subdivided among the classes specified.
imc WAVE Rotation - "Frequency spectrum (FFT)"	imc WAVE Rotation has been supplemented with the function "Frequency spectrum (FFT)".

3 Order Tracking Analyzer

The analyzer is no longer supported.

4 Measurement management

Placeholders - Path to the last measurement

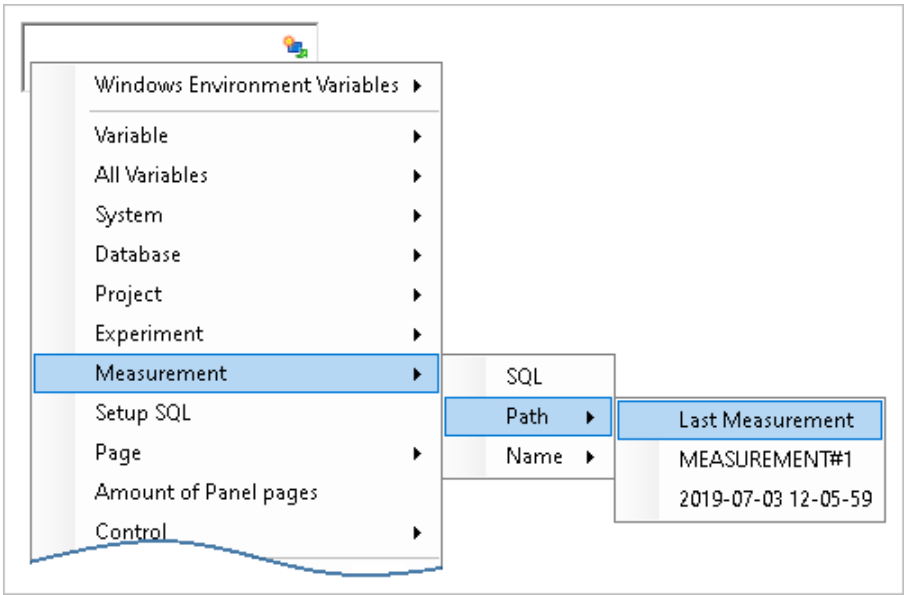
For the purpose of recovering the path to the last measurement, a new dedicated placeholder is now provided.

<MEASUREMENTS["MEASUREMENT#LAST"].PATH>

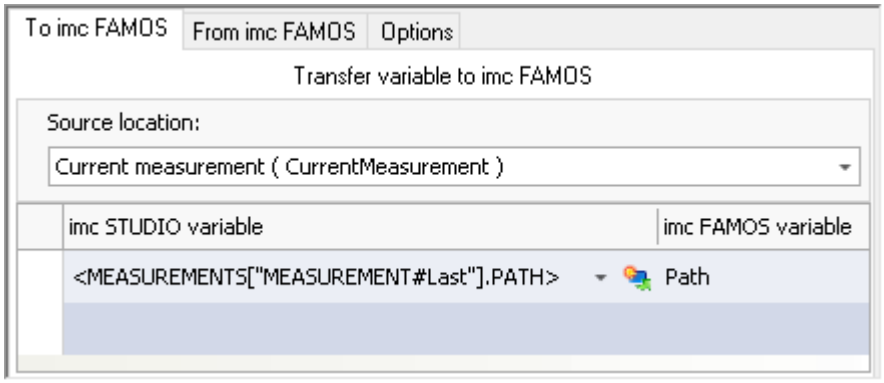
This always will provide you with the path to the last measurement. The following placeholders have been implemented:

Placeholder	Description
<MEASUREMENTS["MEASUREMENT#LAST"].PATH>	Returns the data storage path to the measurement last saved.
<MEASUREMENTS["MEASUREMENT#LAST"].NAME>	Returns the name of the measurement last saved.
<MEASUREMENTS["MEASUREMENT#<Measurement number>"].PATH>	Returns the data storage path of the measurement having the respective measurement number; e.g., you can select a measurement in the Data Browser. For example, it can be assigned the number "1". You now have the ability to find the path to this measurement by means of the placeholder.
<MEASUREMENTS["MEASUREMENT#<Measurement number>"].NAME>	Returns the name of the measurement having the respective measurement number. For an example, see "PATH".
<MEASUREMENTS["<Measurement name>"].PATH>	Returns the data storage path of the measurement having the respective name.

Currently, you can't obtain the placeholder via the Placeholder-symbol, since there is no input support. Instead, use the context menu. In this menu, under "*Measurement*" there are various examples which you can select. Subsequently, you can modify the text according to your requirements.



Creating the placeholder via the context menu



Example: Transferring the data storage path to imc FAMOS

The path to the last measurement saved remains known even when the experiment is re-loaded.

Special cases:

- If the last measurement is deleted, the last measurement performed before it becomes the last measurement.
- Measurement data folders created by different methods: In the Data Browser, only such folders are considered the "Last Measurement" if they were genuinely created by running a measurement. Whenever folders are created in a different way, e.g. imc FAMOS-events or by means of Scripting, etc., they are not treated as the "Last Measurement".
- Data storage using the menu item "*Save current measured data*": This is considered a measurement and can become the "Last Measurement".
- Subsequent adding of files: When imc FAMOS-results are saved to an already existing measurement, this does not count as a "new" "Last Measurement".

Data Browser - Measurements can be viewed without being loaded

You are able to expand the entries of all measurements without needing to load the measurements first. The information on which channels belong to the measurement is also available before the measurement has been loaded.

Automatic loading on demand - Only whatever is required is loaded

When the value of a variable belonging to a saved measurement is required, the entire measurement is no longer loaded; instead, each variable can be loaded individually. This provides advantages regarding speed: since only such variables are loaded which are really required, loading is significantly faster.

When does a variable get loaded? A variable is loaded automatically whenever the associated value is required; e.g. when the variable is displayed in a Widget or is used in a command.

The option for deactivating the function: "*Automatic loading on demand*", is no longer available.

5 Firmware and new hardware

Notes — imc DEVICES Firmware-Version as of 2.14

With this version of imc WAVE, only imc DEVICES firmware versions as of 2.14 are supported. Please perform a firmware update of your devices in case these are still running version 2.13 or any older one. The firmware update from Versions 2.7 through 2.13 to Version 2.14/2.15 is free of charge.

This imc WAVE (imc STUDIO) version has been released along with the following firmware and devices driver packages (imc DEVICES).

5.1 Firmware imc DEVICES 2.15 R1 (and 2.14)

A time zone must be set

In order to make it possible to assign a time to measured data, the measurement can only be prepared when a time zone is set for every imc device used.

Reference

Additional changes regarding the device configuration are noted in the section: "*Setup and Device Control* 28".

Miscellaneous optimization

Alongside minor bug fixes, the following important improvements have also been implemented:

Area	Description
Clock change	Some devices have determined an incorrect date of the next day when: • the time was adjusted in the last hour of the last day before switching to Daylight Saving Time. • the time was adjusted during the first hour of the day of the switch back to Standard Time.
CAN assistant	• In the CAN-Assistant, AUTOSAR (ARXML) import was conditional on enabling of the ECU-protocols. This is no longer applicable as long as no ECU protocols are imported by that means. • In devices of the types imc CRONOS and imc C-SERIES, assignments of CAN-process variables in sendable messages was lost upon closing the Assistant. • A2L-import: In some cases, the channel names are automatically modified upon import (e.g. if they are too long). In order to make the changes traceable, there is a new option: "*Save original name of imported channels in the channel comments*". If this option is activated, then upon import, each channel's name is additionally saved with the channel comment.
imc Online FAMOS	When a number with decimal places is assigned to an Integer variable, this is recognized as an error. `int var_int = 1.234` Thus, some possible causes of error are eliminated, since the data type is often not indicated by a variable's name. Assignments of Float variables to Integer variables remain possible, as previously, and do not require modifications.
Flexray	• ARXML-import: Import of AUTOSAR v4.3.1 has been implemented. • Import of Fibex files has been extended to Version 4.x.

Area	Description
IWT-Fieldbus	The interface for the IWT-Fieldbus has been supplemented with some functions.
NMEA-compatibility	Expansion of the NMEA-compatibility. The following NMEA Talker ID's are supported: • GA: Galileo Positioning System • GB: BeiDou (BDS) (China) • GI: NavIC (IRNSS) (India) • GL: GLONASS, according to IEIC 61162-1 • GN: Combination of multiple satellite systems (GNSS) (NMEA 1083) • GP: Global Positioning System (GPS) • GQ: QZSS regional GPS augmentation system (Japan)
imc Online FAMOS	The function "*AudioBaordThirds*" is no longer provided in the Functions list. However, it can still be used.

Hardware

Compatibility: Discontinuation of imc devices belonging to groups 2 and 3

In conjunction with the new firmware, the following devices and device groups are no longer officially supported: All devices belonging to groups 2 and 3. This includes all devices having serial numbers 12xxxx (including imc CRPL, imc CRSL, imc C1, imc C-SERIES).

What needs to be observed when using the devices? We no longer test the new version on older devices. In consequence, new functions may not work with these devices. Additionally, error handling is not performed for the devices.

We assume that the devices will now continue to operate as before. However, we can not guarantee that this will continue to be the case with future version.

(For your information: this does not apply to the devices imc CRSL-N, imc C1-N/FD and imc C-SERIES-N/FD. Support of these devices continues; they can be identified by the serial numbers 14xxxx.)

Please contact our hotline if you have any questions.

Compatibility: Discontinuation of imc HiL

Due to the discontinuation of imc HiL, the Setup page "*HiL + Application module*" has been renamed to "*Application module*". Additionally, the page has been assigned a new icon. (This change does not take effect on existing views)

5.2 Firmware imc DEVICEcore 3.4 R2

Our measurement device series imc CRONOS, which many customers have been using for over a decade for reliable recording and processing of multi-channel measurements at test stands or in mobile settings, has now been supplemented with a new generation of devices: imc EOS now breaks through to new dimensions of capability by providing channel data rates of up to 4 MHz.

For the configuration and control of the new measurement devices, a new driver package with new firmware is available: imc DEVICE*core*.

You are able to operate devices belonging to both firmware groups in parallel and to configure them to jointly perform an imc WAVE-experiment. Using imc DEVICE*core*, you can communicate with and control the new devices at many times higher speed.

Note

At this time, the firmware **can not yet be used** with the **imc WAVE Structural Analyzer** (see technical spec sheet).

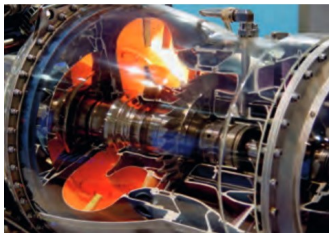
Hardware

imc EOS-U4

imc EOS - At a glance

- 4 MHz sampling rate per channel and device
- 1.8 MHz analog bandwidth
- 24 Bit A/D converter
- Wide measurement ranges: galvanically isolated precision measurement amplifiers for signals up to ±100 V
- Safe data storage with integrated 1 TB flash memory
- Able to operate without PC
- Can be networked via Gigabit Ethernet
- Click connection: mechanically compatible with imc CRONOS*flex*
- Operates synchronously in conjunction with all imc measurement systems (via IRIG-B, NTP)
- Easy to use thanks to modern imc STUDIO/imc WAVE software, uniform for all imc systems

High-speed measurement devices for the MHz range



imc EOS stands for speed! With sampling rates of up to 4 MHz, imc EOS allows the precise analysis of very fast dynamic processes. Voltage, current transducers and IEPE sensors for acceleration, sound or force can be measured at four isolated inputs.

Thanks to high-speed data acquisition technology and versatile measurement inputs, imc EOS is suitable for the analysis of very dynamic processes in material testing, vibration analysis and component testing. Along with crash tests, ballistics testing, pyro technics and blasting tests, typical application areas are rocket pro pulsion, turbines and jet engines. In automotive applications imc EOS is able to analyze fuel injection and ignition processes, acquire data on high-frequency vibration of motors, transmissions and suspension and investigate switching action and highly dynamic actuators. In the field of e-mobility, the system can be used for characterizing inverter-driven e-motors.

imc EOS systems can be operated with direct interactive PC control or as autarkic systems. The devices are equipped with integrated flash memory, allowing data storage of up to 1 TB independently of a PC. Networking imc EOS via Ethernet allows data transfer to a PC as well as archiving to Network Attached Storage (NAS).

imc EOS is compatible with all other imc data acquisition systems and can be operated synchronously with these systems in one single comprehensive measurement tasks. This is especially attractive for users who are already working with imc systems and wish to extend their existing equipment with high-speed channels.

6 Setup and Device Control

Calibrating the amplifiers

At delivery, the amplifiers are freshly calibrated. Routine calibration ensures reliable measurement. Along with the information on the amplifier type, the calibration date is now also displayed. (This change does not take effect on existing views.)

If you have any questions about your measurement amplifier's calibration, please contact the imc Hotline.

Reading out TEDS and defining the channel color directly at "*Channel definition*"

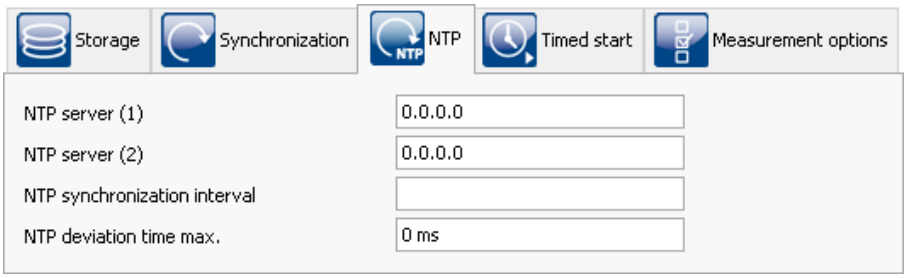
"*Complete*" view: There are now new parameters on the dialog "*Analog channels*" > "*Channel definition*": "*Color*" for the channel color in the curve window, and "*Sensor*" for reading out the information in TEDS . (This change does not take effect on existing views)

Synchronization - NTP-settings parameters in the user interface

On the Setup page "*Devices*", the NTP-settings parameters listed below are available in the table description. Thus you can insert these into the table:

- Synchronization NTP server 1 and 2
- Synchronization NTP deviation time max.
- NTP synchronization interval
- Synchronization waiting time on self start max. (applies to all synchronization types)

In addition, an NTP tab for the configuration is displayed:



Trigger - Trigger_48 omitted from the user interface

Why is the trigger for starting measurements actually the last trigger?

"*Trigger_48*" has been replaced by "*BaseTrigger*" and retains this permanent name. Wherever it is not required, it is hidden. For example, the BaseTrigger can no longer be displayed on the Setup page "*Trigger*".

Is there anything to be aware of when converting old experiments? No. The triggers are not renamed in existing experiments; they keep their names. Only newly selected devices obtain the new trigger name.

"*1-Trigger*" is now called "*Immediate*"

All channels which are not assigned to any other trigger start in response to the internal "*BaseTrigger*". The "*BaseTrigger*" previously was linked to the "*1-Trigger*". The new term for this mechanism is now "*Immediate*", since it starts the channels immediately.

Interval data storage ignores the folder "Meta"

Interval data storage no longer deletes any existing folder having the name "*Meta*". If the count of intervals is limited, the metadata folders are successively deleted once the amount specified has been reached. The folder "*Meta*" is now ignored. This applies even if the folder contains measured data.

Compatibility: Data storage - "Continuous numbering" eliminated

Previously, you could use the option: "*Path naming*" to set whether data storage is performed either with a "*time stamp*" or "*Continuous numbering*". This selection is now omitted.

By means of the option "*Storage location measurement data*" (previously: "*Measurement Storage Area*") you can design any desired setup of how to save your measured data. However, as of now, data storage to the device only supports the time stamp option.

Note the following if you load experiments having the setting "Continuous numbering" from Version 5.2 or older:

No information is posted to indicate that this setting is no longer used. The selection is still set to "Continuous numbering"

- When saving to the PC: Data storage with time stamp is used automatically. No special notes to observe in this case.
- When saving to the device: At this time, data storage is performed with "Continuous numbering". Therefore, please set the parameter manually. In future, this will no longer be supported or tested.

In the new view, this parameter is no longer displayed. However, if you use an existing database, the parameter remains visible as long as you continue to use your views.

If you use the new views and wish to correct the setting, you can still insert the parameter in the top device table and modify it there.

Compatibility: Data storage - Measurement number has been eliminated

The measurement folder generated no longer is assigned the so-called "Measurement number" (example: "*2020-03-31 10-00-00* ***(1)***"). This number had served to indicate when device settings had been changed, and this when the measurement had to be "re-prepared".

Since there are now substantially more ways to make changes to the experiment, the "device" is no longer the only determining feature which indicates to which series a measurement belongs. For this reason, the number is no longer stated.

If you wish to generate a measurement number, use the option "*Storage location measurement data*" (previously: "*Measurement Storage Area*"). Here, you can specify your own counter variable which you can iterate either upward or downward at suitable locations.

Compatibility: Data storage - "Circular buffer memory in the file" and limitation of "saved events" has been eliminated

The new file format doesn't support circular buffer memory and not a limitation of the number of saved events for the data storage. If this is active in your experiments, you are notified accordingly upon loading, indicating that this setting is no longer effective.

Please set the parameter "*Circular buffer time (PC)*" to "*Unlimited*" and "*Saved events (PC)*" to "*all*". If you use the new views, these parameters are hidden. In this case temporarily add the column to the table by means of the "*Column chooser*".

Compatibility: Data storage - Equal treatment of "Save trigger events in individual files"

Behavior when the option: "*Save trigger events in individual files*"is activated: The measured data are saved separately in individual subfolders. The names of the subfolders correspond to the respective assigned trigger names. This now also applies to the "*immediate trigger*" (Start-trigger without any defined source). Previously, all channels associated with a "immediate trigger" were saved together in the folder "*BaseTrigger*" [previously designated "*Trigger_48*"] when saving data to the PC.

7 imc Online FAMOS

Initialize variables

Whether with- or without Control Commands, variables can now always be created identically: whether "`a = 1`" or "`_a = 1`".

In simple applications without control commands, it is no longer necessary to place an underline before single-value variables.
And if the application becomes more complex over the course of developments, the control commands can be activated. Advantage: the variable-syntax remains the same and thus also the spelling and sorting order in the Channels list.

Editor – Autocomplete can be switched on/off

Via the context menu in the Editor, it is possible to activate/deactivate the Autocomplete function.

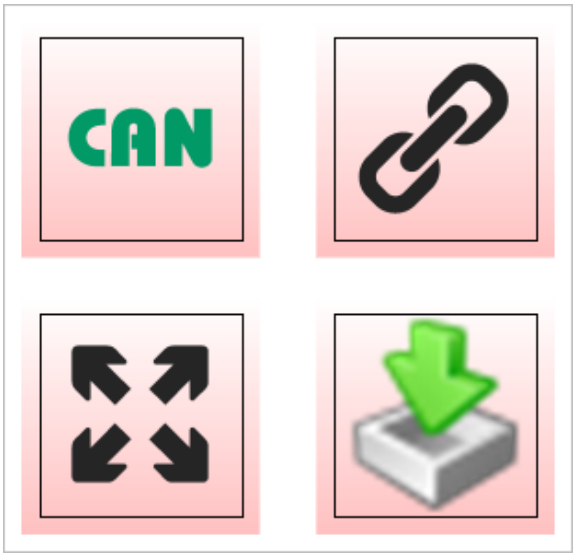
Function: FFTAverage

For the "*Overlapping*", the values 33.33% and 66.66% are now also available.

8 Panel, Widgets and Data Browser

"Execute menu action" Widget - Larger icons

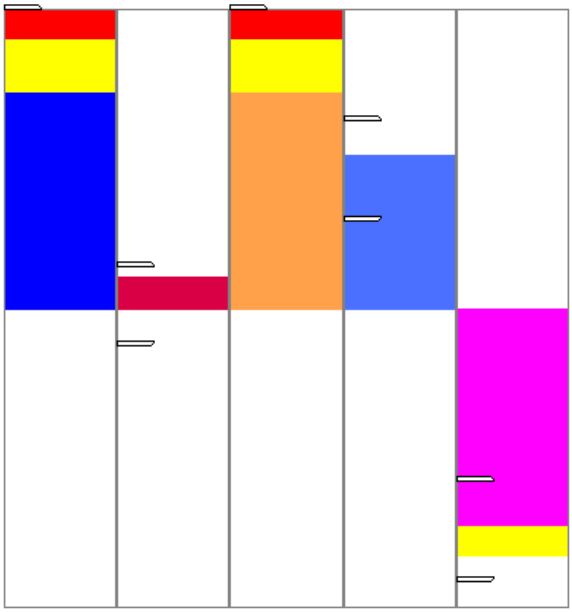
The menu ribbon icons are displayed according to scale in the Widget "*Execute menu action*". This means the icons adjust their size to the Widget's size. This makes these icons easier to recognize. The icons adjust their size while retaining high resolution; the old ones only were stretched out.



"Execute menu action" Widgets

Curve window - Level indicator

The level indicator now features a three-level color display.



Level indicator with five channels

Inserting Widget - Commonly used Widgets

When you drag a variable to the Panel, a choice of Widgets is offered. The list is automatically modified according to your previous selection. Widgets which you had recently inserted frequently have priority among the choices available.

In the subgroups, all Widgets are available for selection, as accustomed.

Data Browser - Transfer to imc FAMOS

You can conveniently transfer the variables/measurements selected to imc FAMOS by means of the context menu, and analyze and evaluate the channels measured there.

Data Browser - Event time

When a measurement has multiple different channel starting times (event times), one entry for each different event time appears in the column "*Event time*". The selection is available if the individual channels' **start times** are **different**. For instance, this is the case when in a triggered measurement the individual channels are triggered in succession by different events.

Display All

The selection list now provides a new entry: "*All available*". This entry is selected by default. It causes all channels and their associated events to be displayed, even if these were started at different points in time.

Exception: "*Save trigger events in individual files*". In this case, only the channel of the first applicable event is displayed.

Extended relationships

When a defined event is selected, the system will make every attempt to display as many channels as possible. What is new is that all channels which have any time overlap are displayed.

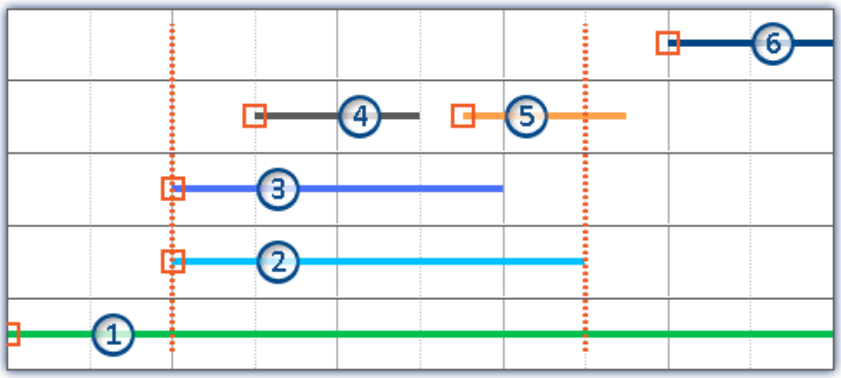
Example: One channel starts at 14:00 and ends at 15:00.

New behavior: If this channel's event time is selected, all channels are displayed which have measured data from the time between 14:00 and 15:00.

Old behavior: When this event time is selected, all channels are displayed which have any measured data at the point in time 14:00, no matter when the channel ends.

Exception: "*Save trigger events in individual files*". In this case, only the channel of the first applicable event is displayed.

Example Event time



Dotted lines: Start and stop-times of channel 2; e.g. 14:00 and 15:00 from the above example

5 channels are recorded. Counting from the bottom to the top:

- Event 1: The first channel is associated with "*BaseTrigger*" (Start-button).
- Events 2 and 3: The second and third channel are associated with the same trigger (e.g. "*Trigger_01*"). This generates one event time.
- Events 4 and 5: The fourth channel has two events. This generates 2 event times when "*Save trigger events in individual files*" is activated. Otherwise, only one event time.
- Event 6: The fifth channel is triggered once measurement has concluded on all other triggered channels (except the first channel).

Thus, the Events list shows either 4 or 5 event times, depending on the setting applicable for "*Save trigger events in individual files*".

In accordance with the respective selection, the individual channels are loaded and displayed.

New behavior: The second event time is selected (Channels 2 and 3). The time frame of the longest channel associated with the event is used for selecting the other channels (2). All channels for which there are measured data within this time frame are displayed (1, 2, 3, 4 and possibly 5, depending).

Channel 5 is displayed when "*Save trigger events in individual files*" is not activated. If this option is activated, then only one event channel can ever be displayed at a time. In that case, only the first channel is displayed (4).

Old behavior: All channels which contain vales at the event time are displayed (1, 2, 3).

Data Browser - Miscellaneous

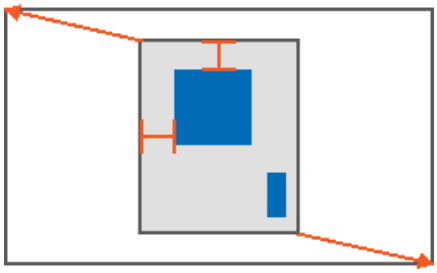
- Measurements can be viewed 24 without previous loading
- Automatic loading on demand 24 - Only whatever is required is loaded

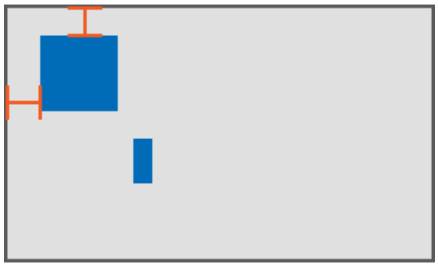
The following functions are no longer supported:

- "*Filter list*" in the Data Browser. You are still able to assemble a filter.
- "*Navigation mode*" in the Data Browser. Navigating by button through the measurement or event is no longer possible. You are still able to select any measurement using the mouse and keyboard.
- "*Shows comparison measurement*" in the Data Browser. The function is currently hidden.

Adapt Panel page to window size (keep Widget size)

New function: The Panel page adapts to the size of the currently available space by only adjusting the page size. This is like when you adjust either the right or the bottom page margin.





Result

The sizes of the individual Widgets thus remain intact.

9 Variables

Display of user name and role on Report-pages

New system variables are available: User name ("*Name*") and user role "*Role*". By means of these variables, you are able to have the user who is logged in automatically indicated in the Report.

New variables for measurement status, connection status and synchronization status

New system variables are avaiable:

Device system variable	Description
Measurement status	Returns the state of the measurement: measurement running (1), measurement stopped (0), unclear (-1) • 1: Measurement running applies when **at least one device** is performing a measurement • 0: Measurement stopped applies when **all devices** are known not to be performing measurement • -1: Unclear applies when **at least one device** is not connected, and **no connected device** is running
Synchronization status	Returns the device's synchronization status: Synchronized (1), not synchronized (0) • 1: Synchronized, when **all devices** are synchronized • 0: Not synchronized, when **at least one device** is not synchronized Devices which are not intended to be synchronized are not included in the status check.
Connection status	Returns the status of the device's connection with imc WAVE: connected (1), not connected (0) • 1: Connected, when **all devices** are connected • 0: Not connected when **at least one device** is not connected

Custom variables created in custom main category

When you create a variable having no category, it is automatically placed among the "*User-defined variables*". When you create a variable having a category, this variable is now no longer created under "*User-defined variables*" but instead in parallel with that category. This allows you to create your own custom folder structures.

If you wish to create a category within the category "*User-defined variables*", you can still do so. Just write a "\" before the category name.

Example

Category: "MeasurementPoint_1". A category called "MeasurementPoint_1" is created in **parallel with** the other categories, such as "*Analog Inputs*". It contains the variable.
Category "\MeasurementPoint_1". This creates a category "MeasurementPoint_1" **within the category** "*User-defined variables*". It contains the variable.

This applies, for example, to variables created by means of the command: "*Load variable*" or to generating a user-defined variable by means of the Data Browser.

Category-editing - No category

Category editing for user-defined variables and imported variables has been revised.

- The state "*No category*" no longer exists. Anything which previously had "*no category*" is now "*user-defined*".
- The internal identifier "__*USER*__" is no longer used for identifying the "*user-defined variables*".
- You are able to create variables outside of the category "*user-defined variables*".

Compatibility:

- Configured commands work in the same way as previously. Here, you will not need to make any changes.
  The exception are commands which have loaded variables previously created under "*no category*". The variables are now created under "*User-defined variables*".
- If you are accessing the internal identifier "__*USER*__" in any form (e.g. with imc FAMOS), please make modifications accordingly.

Compatibility: "Data table" - variable type no longer supported

User-defined variables of the type "*Data table*" can no longer be created. When an experiment having such a variable is loaded, a corresponding message is posted in the logbook. The variable is no longer present in the experiment. These variables had been needed for the SQL-command 40.

Compatibility: "Channel" - variable type no longer supported

User-defined variables of the type "*Channel*" can no longer be created. When an experiment having such a variable is loaded, a corresponding message is posted in the logbook. The variable is no longer present in the experiment.

These variables are no longer needed for initialization since variables can now be created and replaced using "*Load Variable*".

Compatibility: Audio-Report channel - variable type no longer supported

User-defined variables of the type "*Audio-Reportkanal*" can no longer be used. When an experiment having such a variable is loaded, a corresponding message is posted in the logbook.

The variable type "*Text-Report channel*" is not affected.

10 Import and export - Variable, measurement, parameter set

Replacing variables from files has been simplified

You now have the ability to **create** new variables and **replace** existing variables in the **same action**. Existing variables could previously only be overwritten using "*Import Variables*", and new variables could only be created using "*Load Variables*". These two actions have been combined.

- Now you can use the action "*Load variable*" to either create new variables from a file or to overwrite existing ones. When you overwrite, all properties of the target variable are also overwritten.
- The action "*Import Variable*" has been renamed to "*Refill variable*": With this action, you are still able to fill existing variables with new values without changing their properties.

Both actions are available in the Data Browser and as a command.

Note

Background information

A function "Load Variable" is now implemented, which resembles "Load Data" in imc FAMOS. Therefore in contrast to Version 5.2, in the new version it is permitted to overwrite existing variables. A confirmation prompt appears for each conflict of variables. If any of the confirmation prompts is canceled, the entire import automatically cancels. In this way, the system prevents the loading of an incomplete set of controller parameters, for example.

When an existing variable is overwritten in the process of loading, then it is effectively completely replaced, including all of its properties. In consequence, the old variable is neither deleted nor is any new one created, so that no "events" are triggered by the deletion or creation. This is important for scripts, curve windows, etc.

In contrast to imc FAMOS, there are variables which cannot be overwritten, e.g. channels or pv-variables. The reason is that, for instance, these variables belong to the specific device, or possess specific data formats and other properties which must be retained. If the user attempts to overwrite them, an error message is posted indicating that they can't be overwritten.

It is also not allowed to overwrite any user-defined variables whose validity range is not "temporary". These variables are assumed to have been explicitly created as having a certain data type, which must be retained. The validity range as well must be retained. Temporary user-defined variables, by contrast, are similarly volatile to data returned by imc FAMOS-sequences. For this reason, they may be overwritten by "Load Variable" and can thus, under some circumstances, take a completely different type, etc.

With the "Load Variable" command, there is an option for determining whether existing variables can be overwritten with or without a confirmation prompt. By default, this option is activated, meaning that there is no confirmation prompt for overwriting.

By using "Refill Variable", it is possible to change the content of existing variables. This resembles "Import Variable " in version 5.2. In this way it is possible, for instance, to change the content of pv-variables or user-defined variables. Since this only changes the variables' content and not their type, the target variable and the variable to be loaded must have the same properties, including, for example, the unit. This is managed more strictly than in 5.2; thus, only values and the sample count may be different. Therefore, please always use "Load Variable" in cases where changes are possible.

"*Load Variable*" - Loading into a saved measurement

When a variable was loaded from a file to a saved measurement, the variable is copied as a file to the measurement folder. The variable is now also available after loading the measurement.

The following components are affected: Command: Load Variable, loading by means of the Data Browser.

Menu action: "*Save current data*" now is equivalent to a full-featured measurement (previously "*Save current measurement data*")

Saved measurement data are secure

Any measured data which are already saved can no longer be overwritten by the menu action "*Save current data*". If a repeat attempt is made to perform "Save" to an existing file, the system refuses to perform this action. It is also not possible to perform in conjunction with measured data belonging to a continually saved measurement.

Compatibility: Only the dat-format remaining

This action only saves data in dat-format now. It does not adopt the formats which are set in the Options for the action "*Export current data*". Conversion of the measured data to other formats is possible by means of "*Export current data*" or by means of the imc Format Converter. This provides a clear separation between "*Measurement*" and "*Export*" in the Options.

Compatibility: Export Variable: imc's custom csv-format no longer supported for variables

The imc custom csv-format has been removed, which contained a csv with a specified link to a Raw/Dat-file. In the command "*Export Variables*", this format was denoted by "*.csv".

When an experiment having an existing csv-exporter is loaded, a corresponding message is posted in the Logbook. As a precaution, the export type is converted to "*dat*". Please correct this selection later if appropriate, for instance to a different csv-format.

The following components are affected: Command: Export Variable, export via the Data Browser, options for "Export current Data".

Note: "*Export parameter set*" (e.g. export of the device configuration as a parameter set) is possible in this format without any restrictions.

Compatibility: Export parameter set: XML format no longer supported

The XML format has been eliminated.

When an experiment having an existing xml-exporter is loaded, a corresponding message is posted in the Logbook. As a precaution, the export type is converted to "*csv*". Please correct this selection later if appropriate, for instance to a different format.

Compatibility: Export parameter set: User-defined text-variables can not be exported as a parameter set

For **exporting variables' values**, instead of the command: "*Export parameters*", the command "***Export variable***" should be used. This command is specially designed for variable values. User-defined text variables can no longer be exported using the command: "*Export parameters*".

11 Sequencer and commands

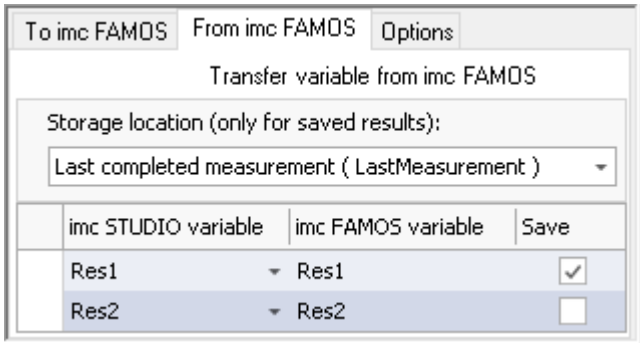
Command "*Delete Variable*" revised

Variables can be deleted from any category: Previously the command could only delete variables belonging to the category "*User-defined*". Since user-defined variables can now be created in their own categories, this limitation no longer applies.

The option "*Treat error as warning*" has been eliminated. Now a warning is categorically issued and no longer an error message. If it is not possible to delete a variable upon running, such as device variables and system variables, an appropriate warning is posted.

Command "*Run imc FAMOS sequence*" - saving of results modified

When the sequence results are transferred back to imc WAVE, they can be saved along with an existing measurement. Results which are not saved now land under "*Current Measurement*", even when a measurement is selected as the target.



Res1 is saved as a file and as a variable in the last completed measurement.
Res2 is saved as a temporary variable under "Current Measurement".

Compatibility: Command "*Run imc FAMOS Sequence*" - return values

As the target variable in imc WAVE, an appropriate data type is now expected. A channel can no longer be transferred to a "*User-defined Variable*" of the type "*Numeric*" (Single Value). Previously the system assumed that the last value would be the one to expect. But it could also be an error in the implementation. Now a message is posted to indicate when the data type is not appropriate.

Please modify the type in imc FAMOS if you wish to obtain a single value. If you need a channel, use as the target a variable created by imc FAMOS. This will then always be assigned the appropriate data type.

Compatibility: Command "*Run imc FAMOS Sequence*" - Only the dat-format remaining

This command only saves data in dat-format now. It does not adopt the formats which are set in the Options for the action "*Export current data*".

Compatibility: A variable can no longer possible be deleted using the command "*Set variable*"

The option/column "*Delete*" is no longer available. As previously recommended in the user's manual, for such a case the command "*Delete Variable*" is to be used.

When you load an experiment created in the predecessor version, in which the delete function was performed, a corresponding entry is made in the logbook. This entry records the variables which had been deleted by means of the command.

Alternative solution: You can add the command "*Delete Variable*" at the corresponding location. The existing command "*Set Variable*" no longer contains the variables to be deleted.

Discontinued: "*SQL-Command*"

The following command is no longer supported: "*SQL-Command*". It no longer meets the current requirements of SQL-communication.

When you load an experiment created in the predecessor version which contains an SQL-command, a corresponding message appears in the logbook. An "empty" command as a placeholder is inserted into the sequence where you use the command, in order to indicate the location.

Alternative solution: In such a case, please use the imc FAMOS Database Kit or the component Scripting in order to incorporate a custom solution (license required).

Discontinued: "*Playback audio channel*" and "*Record audio channel*"

The following commands are no longer supported: "*Playback audio channel*" and "*Record audio channel*". They were only needed for the equally discontinued channel type "*Audio-Report channel* 36".

When you load an experiment belonging to the predecessor version which contains either of these commands, a corresponding error message appears in the logbook. In the sequence in which you use one of these commands, an "empty" command is inserted as a placeholder in order to mark its position.

12 Miscellaneous optimization

Alongside minor bug fixes, the following important improvements have also been implemented:

Area	Description
Data Browser	• When a channel name contained one of the following characters (' and &), it was not possible to load the measurements. Now the characters can be processed correctly. • Feedback to the user - If a measurement can not be loaded, for instance because the files are defective, a message is now posted. • The context menu function "*Update Data Browser*" has been eliminated. In imc WAVE, this function is no longer needed.
Current value window	• When a variable is deleted from the Data Browser, it is automatically deleted from the "*Current value window*". • User-defined text variables having a decimal point were interpreted and displayed as a number in the "*Current value window*". • In case of an invalid value entry for a numerical variable, the variable is no longer set to 0 but retains its previous value.

Area	Description
Commands	• "*Export parameter set / variables*": When exporting variables in the csv/dat-format, the unit is included in the export. • "*Set Variable*": Numbers having a comma "," as the separator character for the decimal positions can now be subjected to calculations using the command; e.g. "Displayvar_01 + 0,1". Previously, only a period was possible "Displayvar_01 + 0.1".
Variables	• Variables which are created by means of "*Load Variable*" can now also be edited. Previously, they were always write-protected, so that values could not be changed. • After loading/importing of variable, the files were still in use, or blocked. Thus, the files on the hard drive could for instance no longer be overwritten using imc FAMOS. Now imc WAVE releases the file for editing after the action.
Setup - balancing	Taring and bridge balancing action before and during running measurement: Upon starting the next measurement after a bridge balancing action, the level indicator automatically adopts the channel's value range boundaries. If the balancing is performed during the measurement, the Widget does not display the correct value level since it only knows the previous range boundaries. The indicated measurement range in the file also retains the previous state.
3rd-party devices	Saving measured data: One sample too many was often saved. Example with the device: "*FunctionSimulator*": Measurement duration: 10 seconds at 50 Hz resulted in 501 data points. Now the result always has the correct point count.
Guardian and WatchDog	There is a separate Guardian and a separate WatchDog for the 64-bit version. In case of parallel installation with a Version 5 system, two services now run. The 64-bit variant has the suffix "*V2*".
Options	The options for the RAM-size of curve windows and FIFOs have been eliminated. They are no longer relevant for the 64-bit system.
Product configuration	Using the product configuration, you are able to activate/deactivate the device adapters.
Installation	imc DEVICES - Fieldbus selection: In the selection of components for imc DEVICES, all Fieldbusses are now automatically included in the installation. It is no longer necessary to make a selection. Thus any Fieldbus which is available in the device can always be used.
Documentation	• The program "*imc Help and Documentation*" now also lists the documentation for imc FAMOS (as of Version 2021) and imc Shared Components. • The user's manuals for imc WAVE are now stored in a folder having a version number (e.g. imc WAVE 2022), so that it is also possible to administer user's manuals for multiple versions. Previously, the manuals were installed in the folder "imc WAVE". If you have an older version of imc WAVE already installed, the folder "imc WAVE" is not automatically deleted. You will now find both folders in the program "*imc Help and Documentation*".
About-Dialog	The About-dialog has been expanded. It now presents the license texts of the currently opened Open Source components.

Update-notes and compatibility

If you plan to update from Version 5.2 to 2022, there are a few things which you may need to observe regarding any existing databases. In particular, be aware of the following points:

Area	Function
Order Tracking Analyzer	• imc WAVE Order Tracking Analyzer 22 is no longer supported.
Discontinued devices	• Devices 26 belonging to groups 2 and 3 • imc HiL 26 • 3rd-party device: "*Agilent*" • 3rd-party device "*Profinet-Sniffer* 18"
Setup	• Data storage - "*Continuous numbering* 30" has been eliminated • Data storage - "*Measurement number* 30" has been eliminated • Data storage - "*Circular buffer memory in the file* 30" has been eliminated • imc REMOTE SecureAccess is no longer supported
Measurement management	• Automatic loading on demand 24 - Only what is required is loaded.
Variables	• Category processing - "*No category* 36" no longer exists • User-defined variables: The types "*Channel* 36", "*Audio-Report channel* 36" and "*Data table* 36" are no longer supported. • Menu action: "*Save current data* 38" (previously "*Save current measurement data*"): This action only saves the data in dat-format from now on. • Export Variable 38: The csv-format is no longer supported for variables. • Export parameter set 38: The XML format is no longer supported. • Export parameter set 38: User-defined text-variables can not be exported as a parameter set.
Data Browser	• "*Filter list* 34" has been eliminated • "*Navigation mode* 34" has been eliminated • "*Shows comparison measurement* 34" has been eliminated
Widget - Table 17	• Interplay between settings for "*Factor*" and "*Decimal places*" has been changed. • Decimal place count: "*auto*" no longer equates to "1".
Commands	• It is no longer possible to delete a variable using the command "Set Variable" 40. • Discontinued: "*SQL-command* 40" • The commands: "*Playback audio channel* 40" and "*Record audio channel* 40" are no longer supported • The command "*Run imc FAMOS sequence* 39" - Channel return values can no longer be transferred back to a "*User-defined variable*" of the type "*Numeric*" (Single value). • The command "*Run imc FAMOS sequence* 39" - This command only saves data in dat-format now.
3PDI - Function Simulator	The device needs to be de-selected once and then re-selected when you load an experiment from imc WAVE 5.2.

Additional missing components and functions belonging to Version 5.2

Individual functions:

- Playback
- Compression of Digital-In-Port channels (and other reduced channels, e.g. via "`TransRec`")
- Textual Report channels (Report channels are deleted from the experiment when it is loaded)
- Data Browser - Deactivation of grouping according to category
- Data Browser - Check-in and Checkout of measurements in the Data Browser
- Load measurement settings / Traceability of measurements

If you have problems or questions, please contact our Customer Support/Hotline:

imc Test & Measurement GmbH

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

E-Mail: hotline@imc-tm.de

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

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