

# imc STUDIO Monitor

## Multi-Monitoring

imc STUDIO Monitor makes it possible for teams to monitor the live data on multiple PCs. In doing so, each separate work station can create its own views and thus focus on particular monitoring tasks. During a running measurement, imc STUDIO Monitor can connect with one or more measurement devices, especially for the purposes of monitoring streaming measurement data, processing and saving them.

Configuration of the devices and start of the measurement are performed by separate device software: imc STUDIO or imc WAVE. imc STUDIO Monitor is exclusively for the purpose of configuring the device monitoring mechanism.

## Available plug-ins/components

Below is a table correlating plug-ins and their functions.

Available plug-ins/components	Description	
	● : included      ○ : optional	
imc STUDIO Monitor	Framework of the multi-client monitoring	●
	User administration: Access control, roles and rights management	●
Setup	Device driver and interface for monitoring of imc devices	●
Panel	Display of measurement data	●
Widgets: Standard	Gauges and control elements (basic selection)	●
Widgets: Automotive, Industrial, Designer, Aviation	Extended selection and styles	●
Project Management	Projects and Experiment templates	●
	Display of saved measurement data in the Data Browser	●
Data Processing	User interface for configuring mathematics functions	●
	Interface for processing of data streams	●
imc Inline FAMOS	Real-time analysis on data streams (PC based platform and license)	○
Inline Analysis	imc WAVE: NVH analysis on data streams (PC based platform and license)	○
Bus Decoder	Extension package for decoding of fieldbus log channels	●
Powertrain Monitoring	Extension package for monitoring powertrains	○

## imc STUDIO Monitor properties

- Multi-client monitoring of imc measurement devices
- At most, four imc STUDIO Monitor PCs can be directly connected with one device
- Optional: real-time data processing: live analysis from running measurements
- application-oriented visualization of the live data
- storage and administration of measured data and analysis results, incl. export functions

## Licensing

License activation is performed using the **imc LICENSE Manager**. Find details in the imc LICENSE Manager documentation.

The trial **demo version**, which offers full functionality for a limited time period, requires activation and registration via the imc LICENSE Manager.

## System Requirements

### Supported operating systems

Windows 10\*/11\* (64 bit)

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

### Minimum requirements for the PC

4-core CPU 2 GHz <sup>1</sup>

8 GB RAM (recommended: 16 GB RAM) <sup>1</sup>

10 GB free hard disk space (recommended: SSD) <sup>2</sup>

Display resolution: 1366 x 768 (recommended: 1920x1080)

- 1 Requirements and recommended minimum configurations for the applied PC will rise with increasing number of connected devices and the resulting overall system data rate. Another crucial factor will be the extend of used live analysis and visualization functions on the PC (in particular Data Processing, imc Inline FAMOS and active curve windows).  
A smooth operation will also heavily rely on sufficient RAM memory resources on the PC: It must ensure to satisfy all vital functions without any outsourcing to slow external swap file (HDD/SSD) in order to guarantee sustainable performance.
- 2 The hard drive memory requirement increases if measured data are saved to the PC.

### Other operating system components

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

Component	Version	Folder in "System" directory
Microsoft .NET Framework	4.8	DotNetFx4.8
Microsoft VC 2015-2022	14.38.33135	Microsoft Visual C++ Redistributable\2022
Microsoft VC 2010	10.0.40219.1	Microsoft Visual C++ Redistributable\2010
Microsoft Build Tools 2015	14.0.23107.10	MSBuildTools2015

## Software Requirements and Installation

- Based on imc STUDIO and installed as an independent and customized instance of imc STUDIO.
- Parallel to imc STUDIO Monitor, an additional instance of imc STUDIO can be run on the same PC (Runtime, Standard, Professional, Developer). As long as this instance is based on the same version of imc STUDIO (e.g. 2023 R2), both instances are subordinated to the same program installation, which means they share resources. For this reason, the installation of both imc STUDIO Monitor and imc STUDIO must be performed in a single joint setup procedure. Any attempt to perform installation in succession or subsequently will cause the already existing instance to be deleted.

## Plug-in imc STUDIO Setup

Setup is the integrated user interface for configuring the device monitoring and data saving mechanisms. This user interface can be adapted to individual needs. Similarly, any interface elements which are not needed can be hidden.

Configuration of the devices, as well as starting of the measurement, are performed by means of separate device software: imc STUDIO or imc WAVE. The component Setup in imc STUDIO Monitor is exclusively for configuring the monitoring of the devices.

### Supported imc measurement device groups

#### Device groups

Firmware imc DEVICES - **firmware group A (A4-A7)**

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• imc CRONOS<i>compact</i></li> <li>• imc CRONOS<i>flex</i></li> <li>• imc CRONOS-SL-N</li> <li>• imc C-SERIES with sn. 14xxxx and higher</li> </ul> | <ul style="list-style-type: none"> <li>• imc CRONOS-XT</li> <li>• imc BUSDAQ<i>flex</i></li> <li>• imc BUSDAQ with sn. 13xxxx and higher</li> <li>• imc SPARTAN with sn. 13xxxx and higher</li> <li>• other customized devices with sn. 13xxxx and higher</li> </ul> |
|---|--|

### Special functions and applications

- Configuration of multi-client monitoring of imc devices belonging to the groups:  
Firmware group A (A4-A7) via firmware imc DEVICES
- Monitoring of multiple synchronized devices, networked via Ethernet.
- Customizing of configuration tables

Basic functions	Description
Channel settings	<ul style="list-style-type: none"> <li>• All inputs and outputs of a measurement system can be set using one single user interface (analog inputs/outputs, digital inputs/outputs, fieldbus channels, virtual channels, etc.)</li> <li>• Per-channel monitor configuration (e.g. circular buffer time, display ranges, etc.)</li> <li>• Opening of independent, free-floating curve windows, which are not connected with a Panel page</li> </ul>
Data saving on the PC	<ul style="list-style-type: none"> <li>• Data saving can be set for each channel separately</li> <li>• Saving of measured data in a different file format (imc Format Converter, e.g. ASCII, EXCEL and more)</li> <li>• Each trigger event can be saved to a separate data file.</li> <li>• Customized storage location for measurement data: Allows the measurements to be saved in varying (including variable-dependent) folders.</li> </ul>

## Firmware group A - imc DEVICES

Basic functions	Description
File Manager	<ul style="list-style-type: none"><li>Enhances the Windows Explorer®</li></ul>
Access to the device memory	<ul style="list-style-type: none"><li>Enables copying and deleting of files and folders from the devices internal storage to a PC.</li></ul>
Supported interfaces	Description
Connection with devices	<ul style="list-style-type: none"><li>Ethernet (LAN or WLAN - depending on the device equipment)</li><li>Via appropriate routers: LTE, 5G, etc.</li><li>Connections to external clients: Up to 4 (SN &gt; 13xxxx) imc STUDIO Monitor or imc REMOTE plus 3 Windows Explorer connections per device</li></ul> <p><i>Example: Device with SN191234 can simultaneously maintain connections with 2 imc STUDIO Monitor, 1 imc REMOTE WebServer and 1 imc REMOTE LinkSecure connections at the same time. Additionally, 3 computers can access the internal data carrier via the Windows Explorer.</i></p>

## Plug-in imc STUDIO Panel

The Panel provides, in addition to the imc curve window, a wide scope of new graphical display possibilities. It is possible to create report pages for documentation of measurement and analysis results.

### Functions

Functionality	Description
Special functions and applications	<ul style="list-style-type: none"> <li>The layout of the report pages can be designed freely and be exported in PDF (report mode).</li> <li>Compositions of Widgets in freely configurable pages (dialog mode)</li> <li>Special Widgets can be assigned to commands. (e.g. starting measurement or a imc FAMOS analysis)</li> </ul>
Basic functions	<ul style="list-style-type: none"> <li>Creation of multiple pages in which Widgets (display and control elements) such as curve windows, potentiometers, scales, state indicators can be positioned in any arrangement.</li> </ul>
Data Browser	Description
Display and navigation through data	<ul style="list-style-type: none"> <li>Navigation through structured tree diagram for visualization of various measurements</li> <li>Searching and filtering</li> </ul>
Current measurement	<ul style="list-style-type: none"> <li>Displays all channels and variables belonging to the current measurement</li> </ul>
User defined variables	Declaration of variables <ul style="list-style-type: none"> <li>Numerical, Text</li> </ul>
Display	<ul style="list-style-type: none"> <li>All available channels and variables can be linked with Widgets</li> <li>Opening of independent curve windows not associated with the Panel</li> <li>Opens an independent values window with the current values of certain variables</li> </ul>
Export / Import	Export variable <ul style="list-style-type: none"> <li>individually or all in one file</li> </ul> Import variable ( <i>refill</i> ) <ul style="list-style-type: none"> <li>imports value to an existing (device or user-defined) variable</li> </ul> Load variable <ul style="list-style-type: none"> <li>Creates or replaces a variable with the properties of the variable to be imported (user-defined)</li> </ul>

Widgets	Description
Widgets	<ul style="list-style-type: none"> <li>• imc Curve window</li> <li>• Standard control elements such as state indicators, edit boxes, numeric inputs, tables, buttons, switches etc.</li> <li>• Extended Widgets are available in four pre-defined styles (Automotive, Industrial, Designer, Aviation) <ul style="list-style-type: none"> <li>• Control elements such as state indicators, edit boxes, potentiometers, thermometer, bar meters, tables, buttons, switches etc.</li> </ul> </li> <li>• A repository is available in which settings for the Widgets can be saved</li> </ul>
Skin	<ul style="list-style-type: none"> <li>• Selection among multiple pre-defined skins for Widgets</li> <li>• Definition of one's own skin possible</li> </ul>
Extra functions	<ul style="list-style-type: none"> <li>• Copying and pasting of Widgets</li> <li>• Loading and saving of curve window configurations</li> <li>• Multi-selection of Widgets and various options for orientation and anchoring</li> <li>• Widgets can be grouped</li> </ul>
Panel page	Description
Extra functions	<ul style="list-style-type: none"> <li>• Loading and saving, copying and pasting of pages</li> <li>• Zooming to optimal possible display</li> <li>• Adapting the page to the respective monitor size</li> <li>• Access rights definable for each page separately</li> </ul>

## Plug-in imc STUDIO DataProcessing

imc STUDIO DataProcessing is the interface for the purpose of data stream processing. The following plug-ins require Data Processing:

- imc Inline FAMOS
- Inline Analysis: imc WAVE
- imc STUDIO BusDecoder
- imc STUDIO Powertrain Monitoring

### Functionality

Functionality	Description	
	● : included      ○ : optional	
Data Processing	Interface for processing of data streams	●
<b>Data analysis</b>	<b>Functions package</b>	
imc Inline FAMOS	Real-time analysis on data streams (PC based platform and license)	○
Inline Analysis	imc WAVE: NVH analysis on data streams (PC based platform and license)	○
Bus Decoder	Extension package for decoding of fieldbus log channels	●
Powertrain Monitoring	Extension package for monitoring powertrains	○

## Funktionspaket imc Inline FAMOS

### Processing and analysis of measured data during a running measurement

imc Inline FAMOS is a functions package for Data Processing.

imc Inline FAMOS enables calculations to be performed on data streams from the measurement currently running. The calculations are performed on the PC, taking advantage of the PC's processing power. By contrast, with imc Online FAMOS, the calculations are performed by the device.

### Functions

Functions	Description
Scope of functions	A number of pre-defined functions are available for calculation purposes. Most of the imc Online FAMOS functions are available in the same way and with the same syntax as in imc Inline FAMOS. There are a few additional functions exclusively in imc Inline FAMOS.
Cross-device calculations	In contrast to imc Online FAMOS, imc Inline FAMOS provides the ability to apply calculation operations to channels belonging to different devices, if the channels are assigned to "BaseTrigger" (measurement Start/Stop).
Displaying results	The results generated are treated as device variables/channels. They are configured on the Setup pages (e.g. Storage) and can be displayed on Panel pages.
Tasks	Multiple independent, complete calculation sequences ( <b>Tasks</b> ) can be processed in parallel. The maximum possible scope/amount of these tasks depends on the computational resources required by the functions used, in conjunction with the computational resources available to the PC used.

#### License:

A license must be purchased in order to use imc Inline FAMOS. In contrast to imc Online FAMOS, this license is not bound to the device used, but rather to the imc STUDIO installation on the PC.

### Enhancement kit: imc Inline FAMOS ClassCounting

This expansion kit for imc Inline FAMOS contains not only familiar functions for durability and fatigue analysis but also some very practical new ones. Diverse counting and classification procedures, particularly Rainflow analysis, are available.

#### License:

A license must be purchased in order to use imc Inline FAMOS ClassCounting.

Functions	Description
Rainflow	The Rainflow matrix and the Residue are calculated on the basis of a loading time function. Numerous options are provided in order to be able to adapt the algorithm to the user's needs.
Standard class-counting procedure	Some class-counting procedures conforming to DIN 45667 (such as level-crossing, Histogram) are available. Particularly helpful are functions for determining one- and two-dimensional histograms. Even one- and two-dimensional revolution class counts can be calculated.
TrueMax procedure	Even in a correctly sampled signal, extreme values do not always coincide with samples. However, for a Rainflow analysis, correct capture of these extremes value is crucial. Simply use the procedure specially designed for this application.

## Funktionspaket Inline Analysis: imc WAVE

The Inline Analyses "imc WAVE Noise", "imc WAVE Vibration" and "imc WAVE Rotation" offer numerous capabilities for spectral examinations in the fields of **acoustics**, **vibration analysis** and **order-tracking analysis**. What this means is taking signals measured over the time domain, typically generated by microphones and accelerometers, and performing spectral frequency analyses, such as Fast Fourier Transformation or 1/3- and octave spectrum analysis, on them in real time. For this purpose, a comprehensive variety of settings options are available in order to allow parameterization of the analyses according to established standards. This includes time- and frequency-weighting with standard procedures and filters, window functions, etc.

The Inline Analysis "imc WAVE Structure" offers functions for 2 channel **spectrum analysis**, e.g. frequency response function or coherence.

### Calculation functions and required licenses

With the corresponding license, you are able to activate the following analyzers:

Name and license required	Description
<a href="#">imc WAVE Noise</a>	<p>Functions for noise analysis, e.g. sound pressure level, Leq, sound intensity, FFT-spectra, 1/3-octave and 1/1-octave spectrum.</p> <ul style="list-style-type: none"> <li>• Sound level meter according to Standard IEC 61672-1</li> <li>• 1/3- and 1/1-octave analysis as 3D or averaged according to Standard IEC 61260-1</li> <li>• FFT analysis as 3D or averaged</li> <li>• Determining the sound intensity (time plot, narrow band spectrum and 1/3-octave spectrum) for measurements with an intensity probe</li> </ul>
<a href="#">imc WAVE Rotation</a>	<p>Functions for analysis of rotating machinery</p> <ul style="list-style-type: none"> <li>• Resampling of time-domain channels</li> <li>• Order-tracking analysis as a 3D or averaged</li> <li>• FFT analysis as a 3D or averaged</li> <li>• Calculation of an input signal over time to a channel over RPMs (RPM-presentation)</li> <li>• Calculation of spectrum over time or revolutions, to a 3D-channel over RPMs (RPM-vector-presentation)</li> <li>• Calculation of 3D cross sections</li> </ul>
<a href="#">imc WAVE Structure</a>	<p>Functions for 2-channel analysis in the frequency domain</p> <ul style="list-style-type: none"> <li>• Generation of output signals for the purpose of subsequent modal analysis</li> <li>• Calculation of transfer functions with noisy input- and/or output signals</li> <li>• Calculation of the coherence as a quality indicator</li> <li>• Power rating by means of the cross-power-spectrum and spectral power density</li> <li>• FFT analysis as 3D or averaged</li> </ul>
<a href="#">imc WAVE Vibration</a>	<p>Functions for vibration analysis of human vibration and machine diagnostics</p> <ul style="list-style-type: none"> <li>• Filters (LP, HP, BP, BS, simple/double integration, simple/double differentiation, envelope curve)</li> <li>• Machine diagnostics according to Standard ISO 10816 and ISO 20816</li> <li>• Human vibration filters according to Standard ISO 2631-1, ISO 8041, DIN EN 12299</li> <li>• 1/3- and 1/1-octave analysis of vibration as 3D or averaged according to Standard IEC 61260-1</li> <li>• FFT analysis as 3D or averaged</li> </ul>

## imc WAVE Noise

Functions	Description
Basic analysis functions	<ul style="list-style-type: none"> <li>• FFT analysis (up to 131072 data points) as 3D or averaged</li> <li>• simultaneous calculation of octaves and 1/3-octaves in real time</li> <li>• calculation of spectra with constant absolute and relative bandwidth</li> <li>• selectable frequency range for the spectrum analysis</li> <li>• A-, B-, C- and linear frequency weighting selectable</li> <li>• time-weighting: Fast, Slow</li> <li>• window functions: rectangular, Hamming, Hanning, Flattop, Blackman and Blackman-Harris</li> <li>• frequency -weighted sound level with exponential time weighting</li> <li>• calculation of frequency-weighted averaging levels</li> </ul>

### Typical applications

- acoustics measurements, fully conformant to applicable industry standards
- acceptance and certification measurements with respect to noise emission and sound levels
- product qualification tests
- product optimization in the R&D field
- in-vehicle noise levels: tests for quality assessment and optimization
- comprehensive and wholistic investigations: root cause analysis of origins, propagation paths and effects of noise and vibration
- incorporation of acoustics expertise into general application fields of physical measurement engineering

## imc WAVE Rotation

Functions	Description
Basic analysis functions	<ul style="list-style-type: none"> <li>• FFT analysis (up to 131072 data points) as 3D or averaged</li> <li>• Calculation of order-tracking spectra</li> <li>• Determining of RPMs, and Resample-functions</li> <li>• Window functions: rectangular, Hamming, Hanning, Flattop, Blackman and Blackman-Harris</li> <li>• Class-counting and representation of time data and spectra plotted over the RPMs</li> </ul>

### Typical applications

- product qualification tests
- product optimization in the R&D field
- End-Of-Line Quality Assurance
- comprehensive investigations of rotating machinery

## imc WAVE Structure

Functions	Description
Basic analysis functions	<ul style="list-style-type: none"> <li>• FFT analysis (up to 131072 data points) as 3D or averaged</li> <li>• Power density spectrum (up to 131072 points) as 3D or averaged</li> <li>• Coherence (up to 131072 points) averaged</li> <li>• Cross power density (up to 131072 points) spectrum as 3D or averaged</li> <li>• Frequency response (up to 131072 points) function as 3D or averaged</li> </ul>

### Typical applications

- product qualification tests
- product optimization
- evaluation of signal power and structural behavior

## imc WAVE Vibration

Functions	Description
Basic analysis functions	<ul style="list-style-type: none"> <li>• FFT analysis (up to 131072 data points) as 3D or averaged</li> <li>• simultaneous calculation of octaves and 1/3-octaves in real time</li> <li>• calculation of spectra with constant absolute and relative bandwidth</li> <li>• selectable frequency range for the spectrum analysis</li> <li>• Human vibration filter, high-, low-, bandpass and band rejection</li> <li>• time-weighting: Fast, Slow</li> <li>• window functions: rectangular, Hamming, Hanning, Flattop, Blackman and Blackman-Harris</li> <li>• frequency -weighted sound level with exponential time weighting</li> </ul>

### Typical applications

- standards-conformant measurements for human vibration and machine diagnostics
- acceptance and certification measurements in conjunction with impact of vibration on humans
- in-vehicle seating comfort: Measurements for qualification and optimization
- hand-arm vibration: handheld machinery
- acceptance and certification measurements in conjunction with impact of vibration on machinery
- product qualification tests
- product optimization in the R&D field
- comprehensive and wholistic investigations: root cause analysis of origins, propagation paths and effects of vibration

## Funktionspaket Bus Decoder

### Expansion package for decoding Fieldbus log channels

imc STUDIO BusDecoder is a package of functions for Data Processing.

This plug-in allows either all or individual measurement channels belonging to a log-channel to be decoded/extracted. A log-channel can be a logged Fieldbus communication ("Logfile").

The decoding information which is usually located in separate configuration files (e.g. with CAN in \*.dcb) is instead embedded in the log channel. Thus, the log channel contains all information necessary for decoding. This provides more flexibility and dynamic capability for deciding on targeted extraction of individual channels from the compressed logfile.

The decoding is performed on the basis of the data streams of the measurement currently running on the PC. This utilizes the PC's computation resources.

The following functions are available:

- Decoding of either all or individual channels from a log-channel
- Resampling of the channels
- Saving of the result channels

The results generated can be displayed on Panel pages and saved with the associated measurement data. Subsequent processing by means of imc Inline FAMOS is also possible.

## Funktionspaket Powertrain Monitoring

The component imc STUDIO Powertrain Monitoring has been developed in cooperation with the company **GfM (Gesellschaft für Maschinendiagnose mbH)** for power train diagnostics.

It is dedicated to diagnosis of powertrains. The powertrains can consist of motors, shift gearboxes and engines as well as devices for braking. The diagnosis can be used in field scenarios, test rigs or end of line tests in production.

Powertrain Monitoring offers two different kinds of diagnosis of vibrations: a **Base diagnosis** on the basis of characteristic values and a **Advanced Diagnosis** on the basis of a frequency selective search of kinematic pattern.

A configuration for a specific gear type is set up in the imc STUDIO project, from where it can be distributed to different test locations. The actual application is run in the experiment by assigning the inputs to the physical measurement channels in accordance with the configuration selected. This makes it possible to use the same configuration on different measurement systems if multiple test locations are driven with the same powertrain type.

For Powertrain Monitoring, an extra license is required, which is available from imc Test & Measurement GmbH. It can be combined and run with various base-editions of imc STUDIO.

## Plug-in imc STUDIO Project Management

The component imc STUDIO Project Management administers all files accruing from both the configuration and data acquisition processes. A database is created in which all configurations (experiments) and measured data are stored. Settings applicable across the experiment boundaries, as well as the experiments themselves are saved in projects. These associated settings are available for all experiments belonging to the respective project. Creating multiple projects allows a clear structure to be maintained.

### Basic functions

- Management of multiple projects and their respective settings
- Export/Import of projects or selected experiments
- Creation of multiple experiment templates with arbitrary default settings

## Zusätzliche imc Software Produkte (optional)

Product	Description
imc FAMOS	<p>Some imc STUDIO plug-ins (Panel) are able to integrate imc FAMOS for data analysis purposes (executing sequences). imc FAMOS is a imc software for complex analysis, display and presentation of signals on the PC ("offline"): <a href="https://www.imcfamos.com">https://www.imcfamos.com</a></p> <p>imc FAMOS must be separately purchased and licensed for the PC. Details on imc FAMOS are available in the software documentation. To execute ready to run sequences for analysis in imc STUDIO, an installation of imc FAMOS version of 2021 or higher, as a Runtime, Professional or Enterprise Edition is required.</p>



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# Contact imc

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## Tech support

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## Service and maintenance

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

## imc ACADEMY - Training center

The safe handling of measurement devices requires a good knowledge of the system. At our training center, experienced specialists are here to share their knowledge.

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

## International partners

You will find the contact person responsible for you in our overview list of imc partners:

Internet: <https://www.imc-tm.com/imc-worldwide/>

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