Technical Data imc STUDIO 3.0 R4

imc Operating Software

imc STUDIO is the common framework uniting the various imc **software plug-ins** as a modular system. The combination of certain plug-ins comprise **product packages** for various applications. Depending on the product installation (order), the following plug-ins are available:

- Setup
- Panel
- Controls :
  Automotive
  Industrial
  Designer
- imc AUTOMATION
- imc SEQUENCER
- imc VIDEO

imc STUDIO is absolutely required for all plug-ins and thus it is an integral part of the product package.

Order code:

• imc STUDIO Standard	**imc STUDIO-STD**
• imc STUDIO Professional	**imc STUDIO-PRO**
• imc STUDIO Developer	**imc STUDIO-DEV**

Supported imc measurement device groups:

- imc CRONOS*compact*
- imc CRONOS*flex*
- imc CRONOS-PL/-SL as of 07/2005
- imc C-SERIES
- imc BUSDAQ with serial numbers 13xxxx
- imc SPARTAN with serial numbers13xxxx

Supported Operating Systems

- Windows XP (32 bit) as of SP2
- Windows Vista (32 bit) as of SP1
- Windows 7 (32 bit; recommended: 64 bit)

Minimum requirements for the PC [1]

- Hyper-Threading or Dual Core processor with 1 GHz clock rate
- 1 GB RAM (2 GB RAM for Windows 7 and Windows Vista)
- 10 GB free hard disk space (NTFS format)
- For installation of the software via DVD an appropriate drive is needed
- Color graphics (16-bit color resolution)
- Screen resolution 800 x 600

Recommended configuration for the PC

- Dual Core processor with 2 GHz clock rate or higher
- 2 GB RAM (32 Bit); 4 GB RAM (64 Bit)
- 10 GB free hard disk space (NTFS format)
- For installation of the software via DVD an appropriate drive is needed
- True-Color color output (32-bit color resolution)
- Screen resolution: 1280 x 1024 or more
- Windows 7 (64 bit)
- Color printer

[1] A system with minimum requirements is not adequate for connection with multiple devices and complex design tasks with the imc STUDIO Developer Edition. Use such systems preferably only for data observation purposes.

Licensing

- A license activation can be generated with the imc License Manager.
- An additional second activation is allowed.

Additional imc software products (optional)

- **imc FAMOS**
  Some **imc STUDIO 3.0 R4** plug-ins (imc AUTOMATION, imc SEQUENCER) are able to integrate imc FAMOS for data analysis purposes (sequence execution). imc FAMOS - a powerful engineering tool for the quick performance of complex signal analysis and documentation compositioin. imc FAMOS must be purchased and licensed for the PC separately. It is not a component of the **imc STUDIO 3.0 R4** installation. Details on imc FAMOS are available in the documentation for this product.
- **imc Online FAMOS Professional**
  imc AUTOMATION requires devices having imc Online FAMOS Professional. imc Online FAMOS or the Professional version is the software with which the data can be processed within the measurement device ("online"). imc Online FAMOS (Professional) must be purchased and licensed in conjunction with the device.

Overview:

Description	imc STUDIO 3.0 R4 Standard	imc STUDIO 3.0 R4 Professional	imc STUDIO 3.0 R4 Developer
imc STUDIO 3.0 R4 Framework	✓	✓	✓
User Rights Management, Startup Role	-	✓	✓
Menu and Toolbar Configuration	-	✓	✓
PlugIn Programming Interface	-	-	✓
Setup	✓	✓	✓
Editing configuration table	✓	✓	✓
Parameter Definition	✓	✓	✓
Editing additional columns (parameter combinations, meta data, pictures, doc etc)	-	✓	✓
Design-Mode: create your individual user interface with standard elements	✓	✓	✓
Layout-Designer: create individually designed user interfaces	-	-	✓
Panel	✓	✓	✓
Design-Mode: create your individual panel pages, repository	✓	✓	✓
Controls: Standard	✓	✓	✓
Controls: Automotive, Industrial, Designer	-	✓	✓
Panel full screen	-	✓	✓
imc SEQUENCER	-	✓	✓
imc AUTOMATION	-	O	✓

Further imc Software components (license of each PC)			
imcDataProcessing Framework	O	O	✓
PowerAnalyser	O	O	✓
imc SENSORS - sensor database	O	O	B
imc VIDEO	O	O	B

✓	standard
O	optional
B	Bonus package [2]
-	not available

[2] B-Bonus package: per imc STUDIO Developer package imc delivers one license of each software components offer valid until December 31, 2011

Technical data of the plug-ins

Plug-in Setup

Setup is the integrated user interface for the complete setting and storage of all measurement parameters. This user interface can be adapted to the particular intended application. This enable the possibility to link particular settings options to the user's specific level of authorization. Similarly, any interface elements which are not needed can be hidden. As a result, the training required of a user running routine experiments is kept to a minimum.

All familiar hardware properties of imc measurement devices are completely supported. Storage of the measured data can be either on the device and/or on a PC or network server.

Special advantages and applications:

- Uniform operating software for imc's Ethernet-compatible measurement devices; (see requirements of the measurement device 1)
- Setup automatically recognizes the measurement system's capabilities and offers correspondingly adapted configurations (low training requirements – high measurement reliability)
- Measurement system not required for setting an experiment ("offline")
- Configures auto-start for independent measurement operation (Diskstart/Autostart)

Channel settings:

- All inputs and outputs of a measurement system can be set using one single user interface (analog inputs/outputs, digital inputs/outputs, field-bus channels, virtual channels, etc.)
- Per-channel configuration (e.g. name, sampling interval, measurement duration, input range, characteristic curve correction, filters, and much more.)
- Opening independant curve windows, which are not connected with the Panel

Data processing:

- Data storage set on a per-channel basis
- Saving of measured data in a different file format (imc Formatconverter,e.g. ASCII, EXCEL and more)
- Storage location on the device and/or on a PC or network server
- Each trigger event can be saved to its own measurement file
- Channels can also be parameterized for internal processing only (data not saved)
- CAN Log data in the file format: Vector(CANAlyser) possible

File Manager:

- Enhances the Windows Explorer®
- Enables copying and deleting of files and folders from the devices internal storage to a PC.

Trigger-Machine:

- Simple, triggered measurement
- Starting and/or stopping by trigger
- 47 independent triggers possible
- Pre-triggers adjustable
- Various definable events (thresholds, time-in-range, signal edges, etc.)
- Logical conjunctions of multiple events possible
- Amount of trigger releases freely selectable (multitrigger)
- Event-driven digital output

Adjustments and taring function:

- Setting of the scaling and balancing performed on a per-channel basis and the results are displayed for the current experiment.

Application-oriented functions (optional):

- Device display (internal display unit with hand-held terminal)
- Display configuration / Display Editor
- Timer start
- Autostart / Diskstart
- Synchronized measurement with multiple devices
- Real-time clock (DCF 77 or GPS radio clock for synchronization to absolute time)
- Exchange of display variables via the network
- Online FAMOS is a software for real-time calculations. It is possible to perform: real-time computations, digital filtering, control commands, closed-loop control, FFT, order-tracking analysis, class-counting and much more.
- Synthesizer
- Process vectors
- Synchronized Tasks, Online FAMOS Professional necessary

Interfaces:

- Ethernet (LAN)
- Modem, external modem for PPP remote access (analog, ISDN, GSM)
- WLAN
- Field-busses (CAN + protocols, ARINC, LIN, FlexRay, AFDX, XCP on Ethernet, J1587)
- CANSAS configuration via Setup, Vector database import (optional)
- Configuration via FTP

System prerequisites for the operating system:

- The same system prerequisites apply as for imc STUDIO 3.0 R4.

Device count and supported device families:

Up to 99 devices on one PC are supported (see supported measurement devices 1).

Maximum amount of channels per device

Type	CRPL/SL/compact/flex, C-SERIES, SPARTAN, BUSDAQ	µ-MUSYCS
All **active** channels in total incl. monitor channels	512	512
Active analog channels (internal) incl. monitor channels	198	64
Active analog channels (flex) incl. monitor channels	128	-
Analog channels (internal + flex) active + passive corresponding analog channels + monitor channels	240 480	-
Administered Field-bus channels incl. monitor channels	1000	1000
Incremental counter channels (internal + flex) incl. monitor channels	16	4
DAC-outputs	16	8
DIO-Ports including monitor channels	16	2
Process vector variables	800	-

imc STUDIO software options for devices:

Components	Order code	CRPL/SL/compact/flex, C-SERIES, SPARTAN, BUSDAQ
imc STUDIO Standard		✓
imc STUDIO Professional		o
imc STUDIO Developer		o
imc DEVICES		✓
imc Online FAMOS	DEV*/OFA	o
Update of im Online FAMOS on imc Online FAMOS Professional	DEV/OFA-UP	o
imc Online class-counting package	DEV/ONLKLASS	o
imc Online order tracking analysis	DEV/ONORDER	o
Vector database linkage	DEV/VEC-DATB	o
ECU protocols for CAN Interface	DEV/ECUP	o
imc CANSAS configuration	CAN/CONSOFT	o

* DEV is to be replaced with the device's order code abbreviation.

imc DEVICES: Basic configuration of the operating software. Enables all non-optional functions such as data saving, triggering, messaging etc.

imc Online FAMOS: Online FAMOS offers a large number of real-time functions for pre-processing. The pre-processing is performed by a digital signal processor (DSP) in the device.

Online class-counting package: Functions for online class-counting and Rainflow counting

Online order tracking analysis: Functions for order tracking analysis of rotating machinery

Vector database linkage: Import of *.dbc CAN configuration files

ECU protocols: Activation of the functions for CAN-Bus subscribers which support the ECU protocol.

imc CANSAS configuration software: Assistant for the configuration of CANSAS modules.

Included accessories:

- Extensive documentation on DVD in CHM (HTML) formats in German and English
- Device software: DIAdem and LabVIEW drivers
- Tools: imc Format Converter, imcDIAdem, xConfig, Repair, PROFIBUS Configurator

Plug-in Panel

The **Panel** enables, along with the familiar 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.

Special advantages and applications

- The layout of the report pages can be designed freely and be exported in PDF (report mode).
- Compositions of Controls in freely configurable views (dialog mode)
- Special Controls can be assigned to commands, refer to the command list 8.

Basic functions

- Layout of multiple views in which display and operating elements such as curve windows, potentiometers, scales, state indicators can be positioned in any arrangement.
- Loading and saving of individual curve window configurations
- Synchronized navigation through the data sets in different curve windows along one scaled time axis

Daten-Browser

- All available channels of the device can be linked with Controls
- Opening of independent curve windows which are not linked with the Panel
- Creating of local, temporary variables

Controls

- Control elements such as state indicators, edit boxes, numeric inputs, buttons, switches etc.
- A repository is available in which settings for the Controls can be saved

Extra functions

- Loading and saving of views
- Loading and saving of curve window configurations
- Integration of text boxes within the views for entering comments
- Copying of views and Controls
- Multi-selection of Controls and various options for orientation and anchoring
- Saving of views and curve window configuration in a freely selectable storage folder
- Controls can be grouped

Plug-in imc AUTOMATION

imc AUTOMATION offers possibilities for creating a State machine. Complex routines with global and local monitoring possibilities can be created and can be achieved in real time. Up to five tasks per device can be performed at the same time. Panel Pages for operation or display of measured data can be incorporated into a task. Synchronous and asynchronous evaluation of measured data using FAMOS is possible.

The product package PRO or rather DEV is necessary for an interaction between imc STUDIO 3.0 R4 and FAMOS via **imc AUTOMATION** with FAMOS 6.0 Rev 8 or FAMOS 6.1 or higher.

Special advantages and applications:

- Program monitoring
- Real-time operation
- Quick and easy creation of a task by means of Drag & Drop
- Quick and easy integration of user-created operating interfaces
- Automated monitoring of value limit violations

Measurement device requirements:

The same hardware requirements apply as for imc STUDIO 3.0 R4

Additional device option:

- Online FAMOS Professional

Features

- Graphical display of the task flow
- Up to five parallel, synchronized tasks can be performed per measurement device, in real-time with selectable steps of 100 µs to 1 s.

Plug-in imc SEQUENCER

imc SEQUENCER is the plug-in to create an automated measurement procedure. The procedure is designed by means of a graphical Editor in an action table. The commands are listed below.

If FAMOS of at least Version 6 is installed, measured data can be automatically transferred to FAMOS during the routine and analyzed using FAMOS functions.

Commands:	**Comment:**
User interactions	Menu actions, message boxes, audio and speech output
Browse in workspace	Display the specified workspace.
Show message box	Shows a message box featuring an optional timeout.
Audio response	
Play sound file	
E-Mail	
Execute menu action	
Execute logbook	
Scripting	FAMOS sequences, Visual Basic scripts
FAMOS Sequence	Runs a FAMOS sequence
Launch FAMOS project	
Script	Runs a script (e.g. Visual Basic)
Format converter	Runs the imc Format converter
Parameter set export / import	
Set variables	
Open/Run experiment	(not available in Panel)
Open dialog: e.g.: Devices, Channels, Experiment	(not available in Panel)
Show panel page as dialog	Shows a user-defined dialog that displays panel pages
Import	Imports a panel page from a file
Export	
Print	
Sequence control:	
Loop	(not available in Panel)
If	(not available in Panel)
Switch	(not available in Panel)
Wait	

Plug-in imc VIDEO

imc VIDEO enables recording of videos within imc STUDIO 3.0 R4. Simultaneously with the capture of data from imc devices, video data from cameras are recorded and saved. The cameras are connected to a control PC on which imc STUDIO 3.0 R4 is running.

Data capture:

- Per camera, two measurement channels simultaneously are available: the main channel and the monitor channel
- Main channel for high-speed capture and storage, e.g. for snapshots
- Monitor channel at low-speed sampling rates, e.g. for long-term measurements
- Adjustable data viewing

Visualization:

- The plug-in Panel provide for imc STUDIO 3.0 R4, a video window for the display of videos.
- Multiple such video windows can be placed on the pages of the Panel.
- To each video window, a camera's main or monitor is assigned.
- In the video window, data are displayed even before release of the trigger.

Trigger:

- The main- and monitor channels can each be assigned to different imc measurement device triggers.
- The imc measurement device's triggers are also the triggers for the camera. This means that video channels are triggered at the same time as the associated imc measurement device channels.
- Pre-trigger: As for the imc measurement device channels, it is also possible to configure pretriggers for video channels. This means that the data recorded also include images of the moment when triggering occured.
- Pre-trigger duration: 0 sec to 10 minutes

Synchronization:

- Automatic synchronization of the video- and measurement data
- Synchronization via Ethernet with the imc measurement device
- The achievable accuracy is depending on the capacity of the entire system.
  Up to dt = [1 frame duration + 20 ms] is achievable.
- The device must be connected with the PC with at least a 100 MBit/s Ethernet line, with a maximum of 1 hub or switch in between.

Advisory notes:

- For compatibility issues and stabile operation, the combination of the camera and camera driver is crucial. The combinations supported are reflected in the table below. The table is necessary because, unfortunately, both cameras and drivers (especially in combination) are not always flawless. Any combinations other than those listed can lead to instable operation in the entire system and may therefore not be used and also not supported by imc.
- Systems with cameras from different manufacturers are not recommended, since the drivers could also be negatively affected.
- The line lengths for the connections between the control PC and camera depend on the connection type used and are noted in the respective technical specs.
- There are a number of other cameras with “DirectShow” drivers and frame grabbers. Connecting such devices and operating them under imc STUDIO 3.0 R4 is performed at the user’s own risk. Be aware of the danger that the technical specs may not apply and the data are incorrectly acquired or displayed. It is also no longer possible to offer support for these devices.

Data throughput:

- The data transfer rate is specified as the frame rate (frames per second).
- Frame rate: Typically 60 fps achievable.
- The frame rate is based on pictures of the size 640 * 480 pixels with 1 Byte per Pixel in Bayer encoding, meaning 300 kByte per frame. This results in 17.5 MByte per second being continually written to the data carrier.
- With the computer equipped accordingly, in Bayer format up to 100 fps can be achieved for 640 * 480 pixels or 200 fps for 320 * 240 pixels.
- The data transfer rate stated is aggregate. When multiple cameras are used, they split the transfer

rate. Thus, a camera with 60 fps has about the same transfer volume as two cameras with 30 fps apiece. One camera at full resolution of 640 x 480 generates about the same data volume as four cameras with 320 x 240 resolution.
- With other encoding (such as RGB instead of Bayer), the data volume is increased threefold. This means the achievable frame rate is reduced to one third.
- With triggered data recording data recording (all video channels not assigned to any 1-Trigger), the achievable frame rate is cut in half due to higher demands on the system made by the circular buffer memory used.

Prerequisites for achieving maximum frame rate:

- Windows 7 operating system. The performance of XP and Vista is lower in certain areas.
- Hard drives: Sold State Disk (SSD) or 3.5" SATA hard drives (at least 5400 revolutions per minute) configured as Raid 0 [1]. Please note that 2.5" hard drives are much slower. Particularly in notebooks, slower hard drives are often installed.
- The data carrier may only be filled to a maximum of 70%. Note that writing to a highly full data carrier proceeds significantly more slowly.
- The data carrier may not be fragmented. Note that high writing speed is only achieved if the write head only needs to move by the minimum amount.
- Hard drive controller: This must allow data throughput in write mode. Please note that in measurement operation, only video files can be written.
- Processor: Quadcore with 2.4 GHz (or in case of using Intel I7 2 processor core should be sufficient)
- Interface to camera: 1 GBit Ethernet, Firewire A or B or USB as of Version 2.0
- No virus scanner for video files
- No backup tool (or synchronisation tool) in use during the measurement
- No additional programs running on the computer. Also services such as hard drive defragmentation or file indexing may not be running during measurement.

[1] A RAID system consists of multiple hard drives connected together in Stripe-Mode (RAID 0). This increases the capacity as well as the data throughput. It is also possible to connect more than two hard drives, but eventually the hard drive controller imposes limits on the data throughput.

Limits on the frame rate achievable (the lowest limit determines the maximum achievable):

- The maximum frame rate is limited by the camera's technical specs.
- The interface to the camera has limitations, e.g. 400 MBit/s for Firewire A.
- Limitations of the hard drive controller and its linkage to the PC
- Limitations of the main board chip set
- Processor limitations
- Limitations of the hard drive's maximum writing speed
- Compression

Data storage:

- The video files are saved on the PC's hard drive in the same folder as the stored data for the measurement.
- The size of the video files is only limited by the hard drive.

Parameterizing:

- Resolution in pixels
- Video-format (e.g. Bayer or RGB)
- Capture rate in frames per second (fps)
- Pretrigger duration
- Recording duration
- Trigger assignment
- Camera parameters such as brightness, contrast, color, exposure etc.
- Compression

Camera/driver table

Supported and tested cameras:

Camera manufacturer	Camera model	Connect.-type	Driver manufac.	Driver version	Operating system	Limitations / Remarks
Imaging Source	DFK 21BF04	1394-Fire Wire A	Imaging Source	4.1.1.1	Windows XP / Windows Vista/ Windows 7	
Imaging Source	DFK 21BG04.H	Gigabit-Ethernet	Imaging Source	1.0.0.513	Windows XP / Windows Vista/ Windows 7	no recognition of plugging/unplugging exposure automatically regulated in response to frame rate
Imaging Source	DFK 31AF03-Z2	1394-Fire Wire A	Imaging Source		Windows 7	
Allied Vision	Marlin F-033C	1394-Fire Wire A	Allied Vision		Windows XP / Windows Vista/ Windows 7	few camera settings available
Basler [2]	Scout scA640-120fc	1394-Fire Wire B (A compatible)	Basler		Windows XP / Windows Vista/ Windows 7	no recognition of plugging/unplugging
Basler	Scout scA640-120gc	Gigabit-Ethernet	Basler		Windows XP / Windows 7	no hot-plug recognition
Basler	Ace acA640-90g	Gigabit-Ethernet	Basler		Windows XP / Windows 7	Sensor: 1/3" Sony ICX424 PoE (Power over Ethernet) no hot-plug recognition
Basler	Ace acA640-100g	Gigabit-Ethernet	Basler		Windows XP / Windows 7	Sensor: 1/4" Sony ICX618 PoE (Power over Ethernet) no hot-plug recognition
Microsoft	LifeCam Cinema	USB 2.0	Microsoft	3.20.240.0 (XP)	Windows XP / Windows Vista/ Windows 7	
Logitech	QuickCam Pro 9000 Webcam	USB 2.0	Logitech	12.0.1278.0 (XP)	Windows XP / Windows Vista/ Windows 7	no recognition of plugging/unplugging (crash)
Logitech	QuickCam Pro 9000 Webcam	USB 2.0	Microsoft	5.1.2600.2180 (XP)	Windows XP / Windows Vista/ Windows 7	MJPEG compression tilt/ pan listed by no functionality
Logitech	C600 Webcam	USB 2.0	Logitech	12.10.1110.0 (W7)	Windows XP / Windows Vista/ Windows 7	no recognition of plugging/unplugging (crash)
Logitech	C600 Webcam	USB 2.0	Microsoft	6.1.7600.16385 (W7)	Windows 7	MJPEG compression

[2] In order to achieve the full frame rate with FireWire B cameras from the company Basler, it is necessary to increase the camera's packet size to 8192. This is done under the heading Transport-Layer in the camera Properties, by means of the manufacturer-specific application (tool). Please contact your camera manufacturer for detailed information on the camera settings and other settings.

Framegrabber-Driver-Table

Framegrabber manufacturer	Frame-grabbertype	Connect.-type	Driver manufacturer	Driver version	Operating system	Limitations / Remarks
Imaging Source	DFG/USB2-it	USB 2.0/ PCI/PCIe	Imaging Source	1.1.0.3	Windows 7	video format with color min. 2 Byte per Pixel (compression recommended)
Blackmagic Design	Intensity Pro	PCIe	Blackmagic Design	8.0.1.0	Windows 7	can also record directly from the HDMI port, but then the frame rate must be set exactly
Enciris Technologies	LT-102-PCIE	PCIe	Enciris	1.40	Windows 7	Hardware Video compression WV1 (H264 similar)

Compression Tabelle

Compression manufacturer	Type	Version	Operating system	Limitations / Remarks
Pegasus Imaging	PICVideo (Motion-JPEG)	3 and 4	Windows 7	Note: external license necessary (demo version is not enough) as default a compression of ca. 1:12 will be set

If the driver manufacturer changes, the camera / framegrabber must be removed from the imc STUDIO configuration, and all experiments with the old camera settings become inoperative. This note is also valid for the compression.