

# CRONOS-SL

Measurement Systems  
for Extreme Environments



# CRONOS-SL – Wherever a PC cannot Survive

Measurement under harsh environmental conditions such as extremes of heat and cold water spray, and intense vibration requires appropriately protected measurement equipment. This applies especially to long-duration measurements outdoors or testing on board moving vehicles.

imc CRONOS-SL is a highly compact, super-robust mobile measurement system, for applications in tough environments. Conforming to MIL STD810F, one of the highest standards for temperature, environmental contaminants, and shock resistance, the signal conditioning, AD-conversion, online processing and data storage are integral components of the measurement system. This makes imc CRONOS-SL ideal for measurement tasks involving long-duration testing and monitoring tasks e.g. on board vehicles, machinery or in outdoor measurement sites, where regular measurement equipment often fails to meet the environmental conditions.

Settings for the devices are made via PC, Ethernet TCP/IP or Wireless connections, using the operating software imcDevices. The PC is unnecessary during the measurement, only serving the purposes of device configuration and visualization of the captured data, if desired.



- Stand-alone and PC-independent
- Meets extreme environmental demands
- Decentralized / network-capable
- Highest-level data reliability
- Integrated universal amplifier for voltage, current, thermocouples, PT100, strain gauges, ICP and much more
- Synchronized capture of CAN-/LIN with analog signals
- Automatic self-activation following a power outage
- WLAN, GPRS / UMTS-capability
- Arbitrary real-time calculations – “Results on Demand”
- Comprehensive operating software – immediately ready to run

### Environmental conditions

Operating temperature	-40° ... +85° C
Condensation	allowed (0 - 100 % RH)
Protection rating	IP65
Shock resistance	MIL STD810F
Power supply	9 ... 36 V DC



### Direct connection of any desired analog signals and sensors

$\omega$ RPM Velocity	$f$ Frequency	$d$ Distance	$a$ (ICP) Acceleration, solid-borne noise	$p$ Pressure	$v$ Voltage	$i$ Current	F/P Bridge & Strain Gauge	T Temperature	$1$ 0 Digital I/O	$\phi$ Angle	CAN-/ LIN-Bus, J1587-Bus, ARINC-Bus	u Signal generation	K T Tc PID-Controller
-----------------------------	------------------	-----------------	----------------------------------------------	-----------------	----------------	----------------	------------------------------	------------------	----------------------	-----------------	-------------------------------------	------------------------	--------------------------

# CRONOS-SL Works without a PC



CRONOS-SL works independently of the PC. Captured data are stored within the device on ruggedized IDE hard drive or removable solid state CF-cards. The data carriers ensure seamless storage of measured data and provide the maximum safety for data.

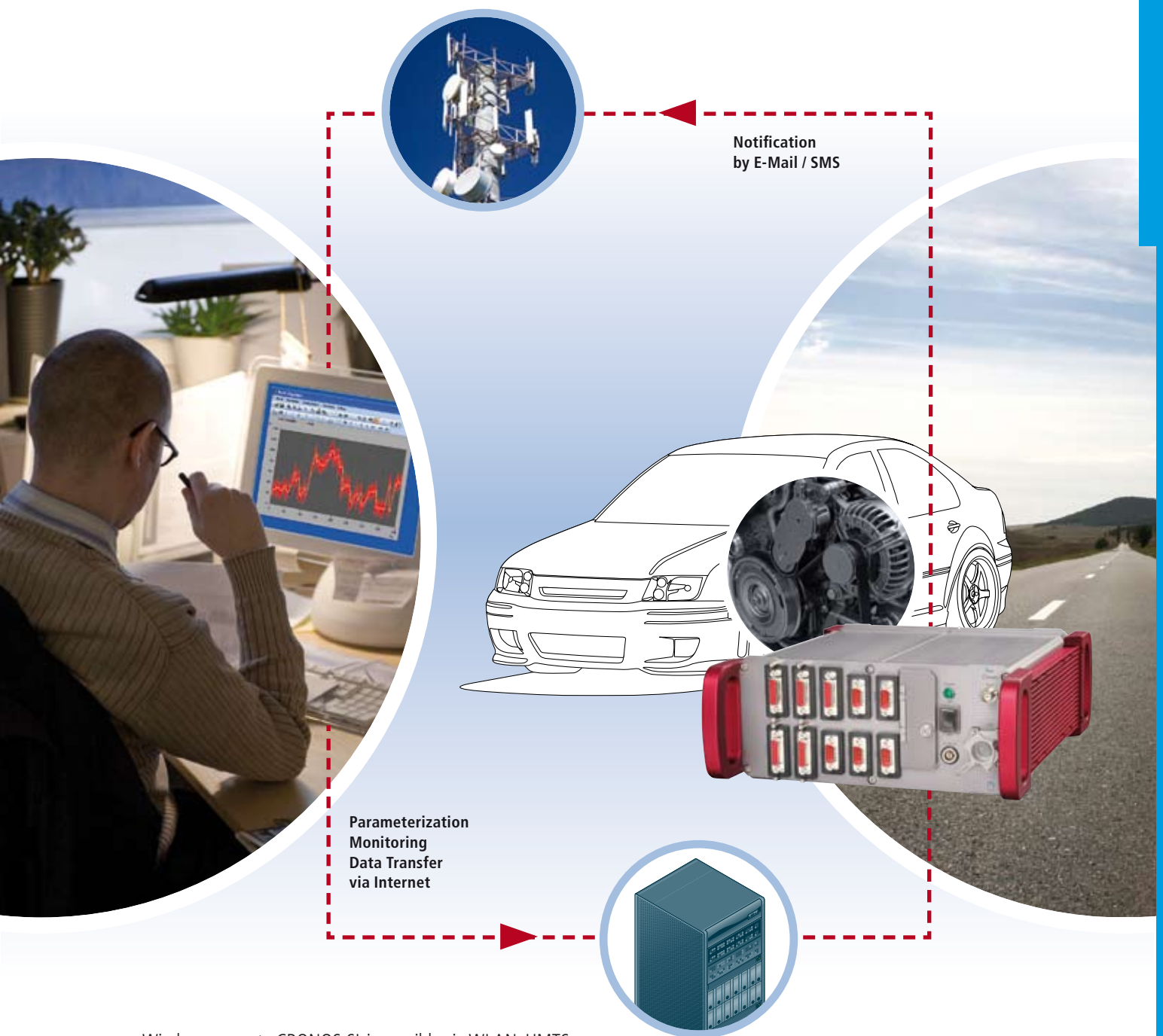


If direct live display of measured data is desired, the PC is not the only option: the robust and bright TFT graphical terminal is an excellent alternative. Its configuration, programmable buttons and display pages can be freely defined using the graphical editor in the operating software imcDevices. A variety of different setups, and graphical data display modes are available at the push of a button.



Optimal operating reliability in stand-alone mode is provided by the high-resolution, super-bright (>280cd/m<sup>2</sup>) 5.7" TFT graphics terminal.

# Remote Control and Data Transfer



Wireless access to CRONOS-SL is possible via WLAN, UMTS or GPRS data links. An internal modem allows long-term monitoring and notification of, for instance, value limit violations, by SMS or E-Mail. This can be extended with constant online monitoring and remote parameterization via the Internet.

## Universal, Network-Capable Intelligence

With its freely configurable measurement amplifier design, CRONOS-SL allows direct connection of any desired signals and sensors, and provides both power and conditioning.

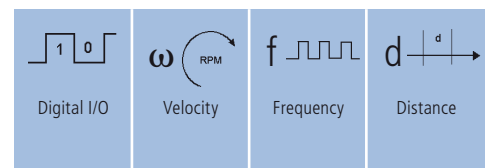
This enables ideal system adaptation to a wide variety of measurement tasks. Besides the acquisition of raw data, freely defined processing of channel signals can be performed in real time. All analog or digital channels, as well as computed data streams, are available for use in open- and closed-loop control tasks, or for value limit monitoring. Meanwhile, measurement channels carried on the CAN/LIN-Bus, and encoded in a variety of protocols, can be acquired in synchronization with the others and processed in the same way as the analog measurement channels.

CRONOS-SL is equipped with an Ethernet TCP/IP interface, by means of which it is connected with the PC. Measurement network setups with any desired additional and synchronized imc measurement devices is also possible.



### Process

Direct connection of any analog signals and sensors

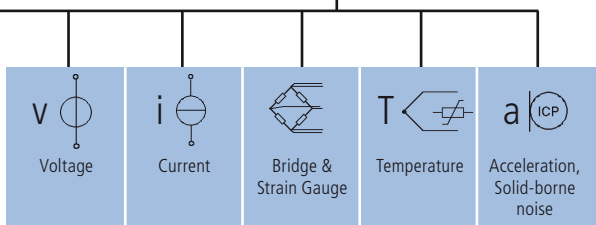
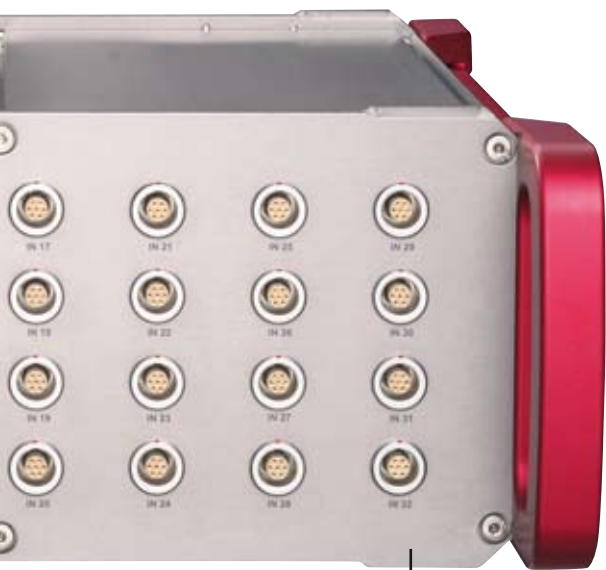


CAN-Bus

Display

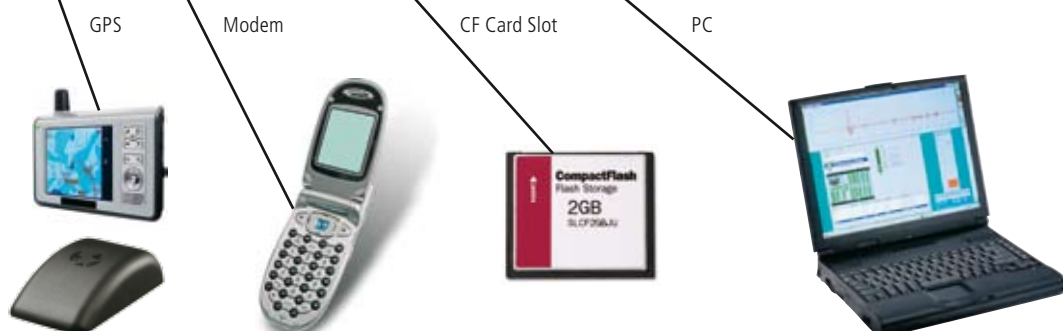
CAN-Bus  
LIN-Bus





### Global Positioning System (GPS)

A GPS receiver is available which can be directly connected to the system, so that additional geographical data can be captured synchronously with the other measured data.



## Unified Software Open System Architecture

Although CRONOS-SL is typically used without a PC, for viewing captured data during a running measurement, or adjustment the device's configuration, a PC can be connected via the standard Ethernet TCP/IP interface, without needing to interrupt the measurement.

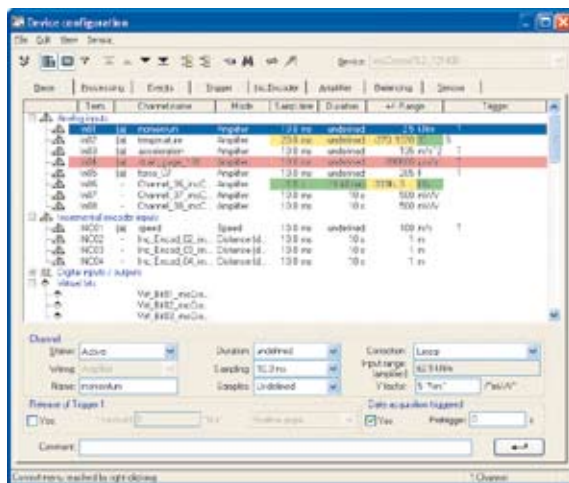
The CRONOS-SL operating software installed on the PC is intuitive and reliable, recognizing the CRONOS-SL's hardware configuration, and ready at a moment's notice to start taking measurements.

The software enables complete interactive configuration of all measurement parameters such as channel settings, triggering, real-time functions, and storage, as well as saving and archiving of data, and test report generation.

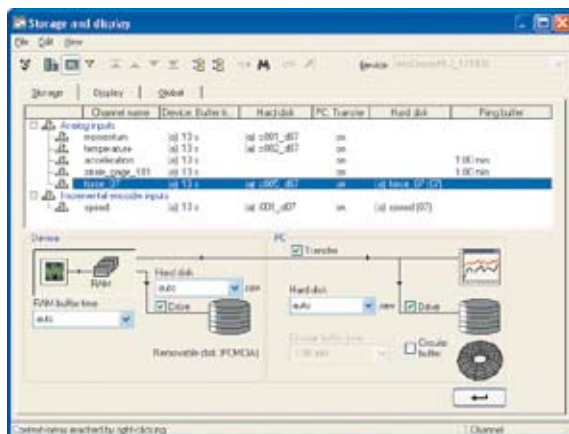
Configurations and measured data can be stored both on the PC and in internal device memory. This enables automated measurements with real-time analysis and control functions, as well as display, documentation and data storage.

### Direct display of results

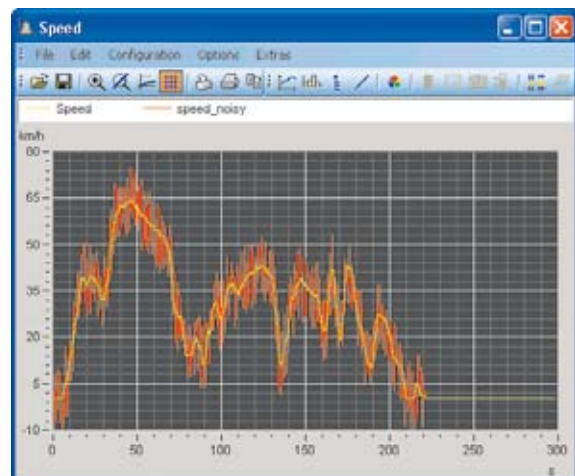
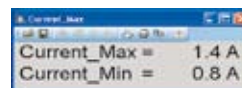
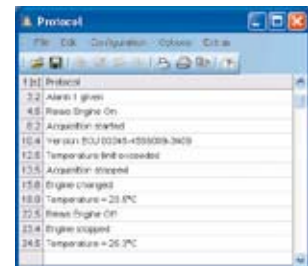
Whenever online display of measured data is desired, it can be obtained either via the graphics terminal or PC-aided. The PC doesn't actually perform any measurement work – it only serves the purpose of setting the measurement system's parameters and the online display of the measurement data.



Base menu: Defining the main measurement parameters



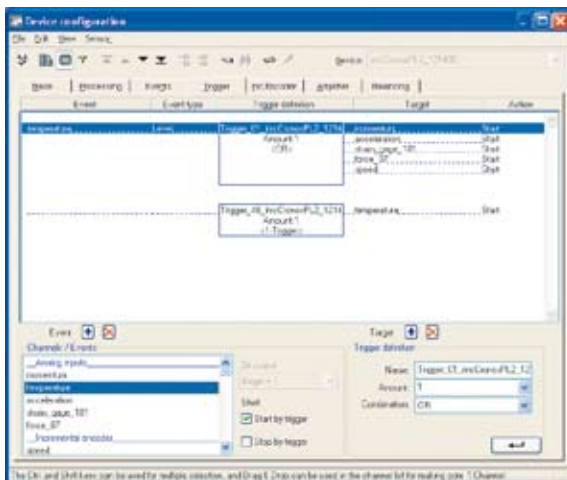
The data acquired are stored on a hard drive in the measurement device and/or on the PC, where a circular memory buffer can be set.



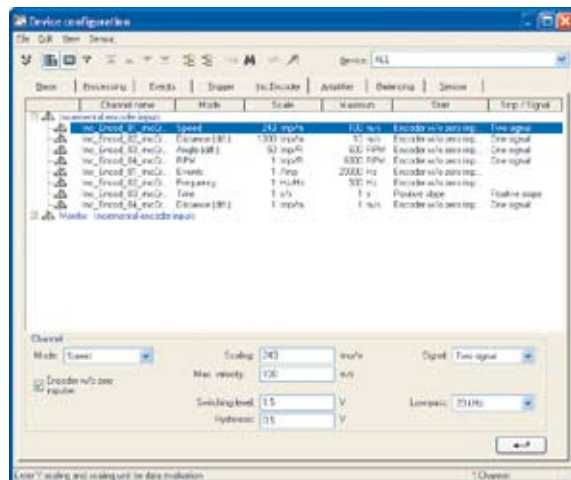
### Low Cost of Ownership

For users of multiple imc systems, the standardization of imcDevices software across all imc measurement systems dramatically reduces the necessary costs for training and software maintenance across an entire test department, while also increasing the operating reliability. Engineers find measurement tasks are quicker to solve, and can be accomplished at lower cost; the reduction of the overall "Cost of Ownership" is substantial.





The trigger machine enables intelligent data capture as well as data reduction. 48 trigger levels are available, combining channel associated events in logical expressions to cause a defined response on the target channel. Each channel can be started or stopped individually.



Settings menu for incremental quantities such as displacement, angle, velocity and frequency

## Assembly of Decentralized Measurement Networks

Network-wide Client/Server operation of devices from the entire range of imc product families can be achieved without any problem using the integrated imcDevices user interface.

Multiple CRONOS-SL units, via Ethernet or WLAN, and along with other imc measurement systems, can be joined to create a virtual measurement network. All devices work in parallel, with a single, unified software interface and fully synchronized measurement channels. Messages can even be exchanged between the devices. Assembling suitable decentralized measurement networks is possible without any trouble.

## Decentralized System Expansion

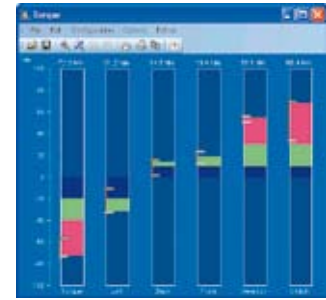
For decentralized measurement setups, various imc measurement systems can be connected via Ethernet. In addition, a very low-cost way to achieve distributed expansion is to incorporate CAN measurement modules.

CANSAS modules are intelligent, measurement amplifiers for synchronized capture, conditioning and digital processing of analog and digital signals. Multiple modules can be directly connected to the CAN interface and configured through the imcDevices software. In this way, decentralized measurement setups can be achieved which feature very short distances between the sensors and the input amplifiers of CANSAS.



The standard CANSAS-SL / CANSAS modules are optimally designed for creating decentralized measurement networks or for expanding the measurement channel count.

# Integral Elements of imcDevices



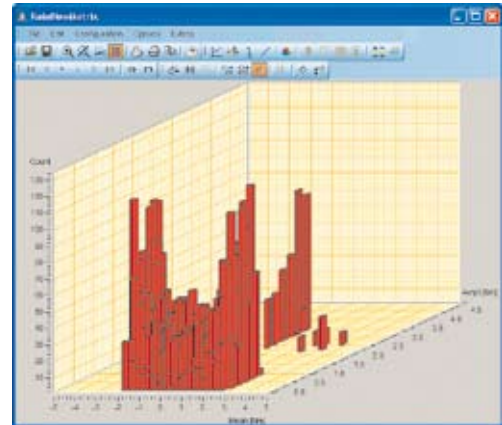
Bar meter with range indicators

## Integral Elements of imcDevices – The Curve Window and the Report Generator

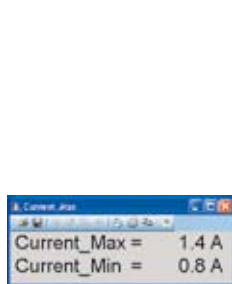
During a measurement all captured data can be displayed at a single click of the mouse. The curve window automatically opens with appropriate scaling, displaying the optimum value range. Subsequent customized re-scaling of the axes and of the display can be performed without disturbing the measurement.

A wide variety of display types, which can be freely configured and applied after the measurement's conclusion, are available. Standard (Y/t) display or with stacked Y-axes, single values, measurement value tables, bar meters, and a wide range of 3-D displays such as Waterfall, color map etc..

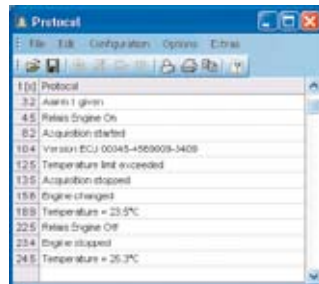
The displayed region can be zoomed and scaled to any desired size, and subjected to offline processing with measurement cursors or by immediate transfer to imc FAMOS.



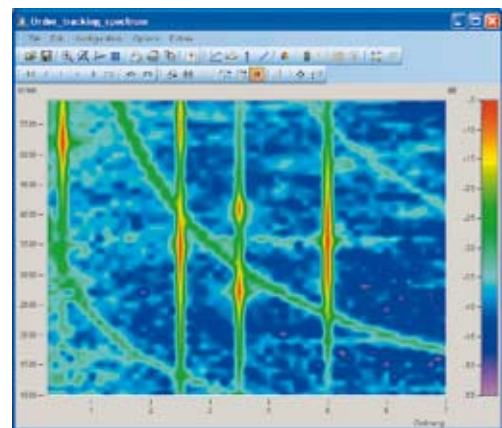
3-D class-counting representation



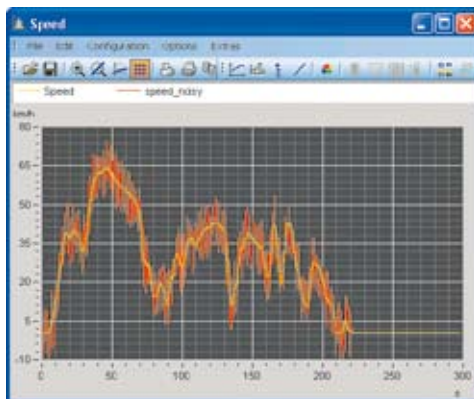
Current values



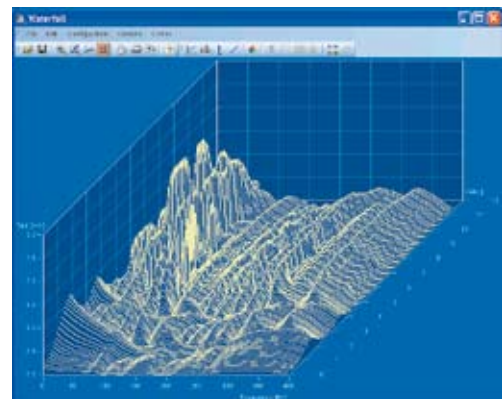
List of time stamped protocol entries



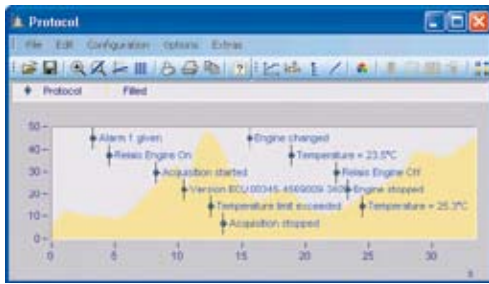
Order line representation of a measurement plotted versus angle



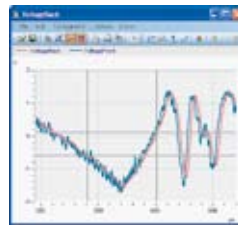
Automatic scaling



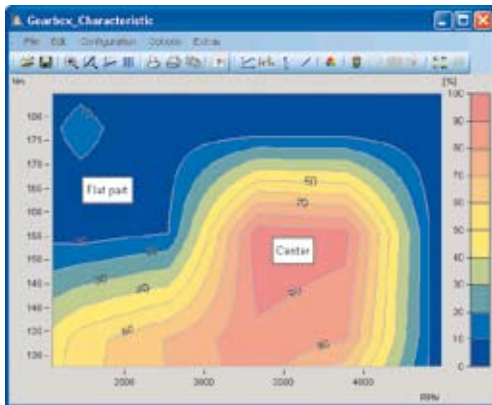
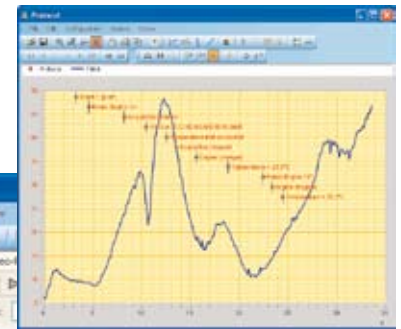
Waterfall display



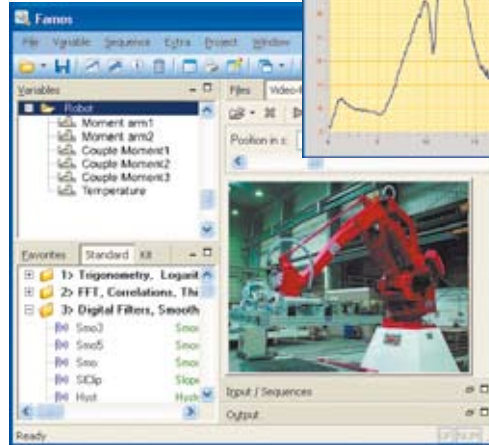
Measurement curve with automatically set time-correct report data



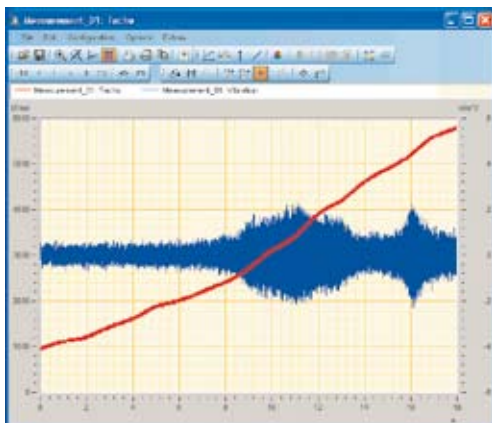
Zoomed signal segment with measurement cursors



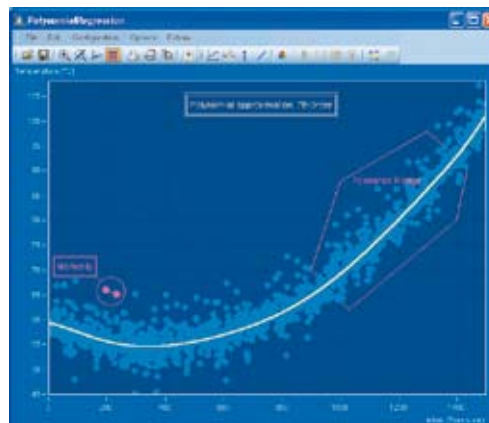
Characteristic curve field in isoline display



Synchronized display of measurement curves and video data



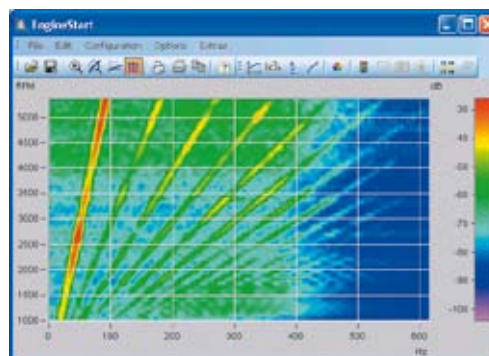
Different line thicknesses



Approximation polynomial

Conversion	Address	BitLen	Speed	T1	T2	T3
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
16	0	0	0	0	0	0
17	0	0	0	0	0	0
18	0	0	0	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0
25	0	0	0	0	0	0
26	0	0	0	0	0	0
27	0	0	0	0	0	0
28	0	0	0	0	0	0
29	0	0	0	0	0	0
30	0	0	0	0	0	0
31	0	0	0	0	0	0

Display of data with different sampling rates in tabular form



3-D spectral display

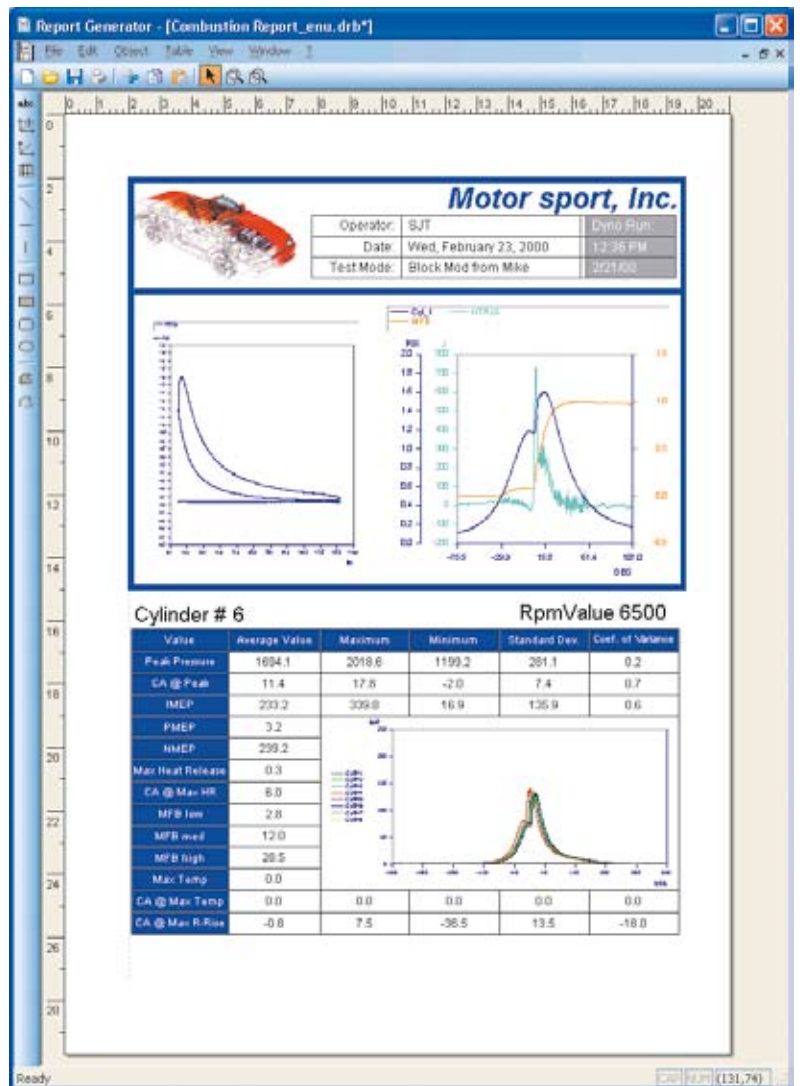
## Professional Report Composition

Every engineer and test technician wishes test reports could just write themselves at the push of a button.

The Report Generator, included in imcDevices, turns this dream into reality: measurement reports are quick and easy to make, freeform or template driven, directly printable, and exportable for use by other programs.

Any measurement signal which can be displayed can also be added to a report with a simple click-and-drag of the mouse, and just as easily resized, repositioned and aligned. Text insertions and graphical structure elements such as lines, arrows, company logos etc., are available in a variety of colors, sized and orientation angles.

For especially quick results, the Report Generator can be fully automated by making use of the signal analysis software imc FAMOS and a pre-defined template or "style sheet", save time and effort in preparing standardized reports.



Manual, partially, or fully automated creation of measurement reports

# Online FAMOS makes CRONOS-SL a Personal Analyzer

## Real-Time Calculations, Open- and Closed-Loop Control – Online FAMOS

The most profound enhancement for imcDevices is the Digital Signal Processing (DSP) capability of Online FAMOS, which provides an enormous range of easily accessible real time functional enhancements.

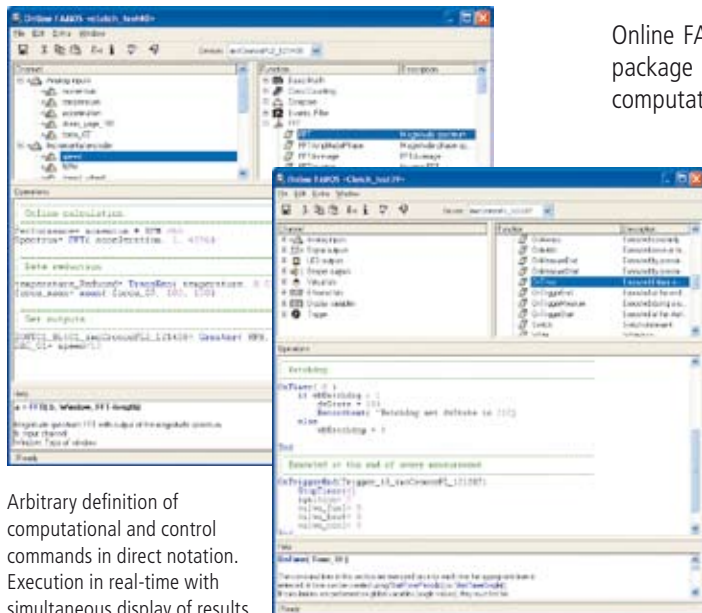
Online FAMOS is quick and reliable because it operates independent of the PC, directly on the CRONOS-SL's DSPs. Online FAMOS enables freeform definition of real time calculations, making CRONOS-SL both a data logger and a customized analyzer: a Personal Analyzer.

Data reduction, Transitional Recording, digital filters and responses to signal limit violations, for example, are as easy to use as a pocket calculator. Active channels can be jointly subjected to real time analysis calculations by simply entering formulas in the intuitive notation of the Online FAMOS Editor, or by simply selecting parameters with the Function Assistant's online instructions.

## "Results on Demand"

Freeform calculation of virtual channels based on measured data or other virtual channels

- Limit monitoring of any measurement channels, with triggered response
- Control commands for test process control and communication with other devices
- Open- and Closed-loop control algorithms



## Durability and Material Fatigue Testing

Online FAMOS can be expanded with the optional Class Counting kit for the special requirements associated with material strength testing. These include the standard procedures of ISO/DIN 45667:

- Rainflow procedure with numerous options
- 1 and 2-dimensional histograms
- Revolution class counting

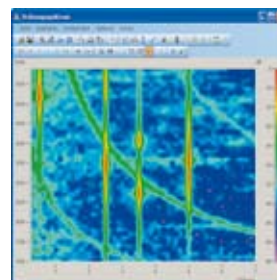
The TrueMax procedure from imc ensures that important minima and maxima are correctly recorded, even at low sampling rates.



## Order Tracking Analysis of Rotating Machinery

The optional Online FAMOS Order Tracking kit contains an extensive set of functions for the analyzing rotating machinery based on time or angle.

By measuring the spectral distribution based on the ratio of signal frequency to fundamental rotational frequency, i.e. the order, the RPM-dependent linear and 1/3-octave spectra can be calculated, dynamically and in real time, even during run-up or run-down.



## Online FAMOS Professional

Online FAMOS Professional is an optional DSP expansion package for tough, hard real time control and extremely computation-intensive signal processing.

Online FAMOS Professional includes

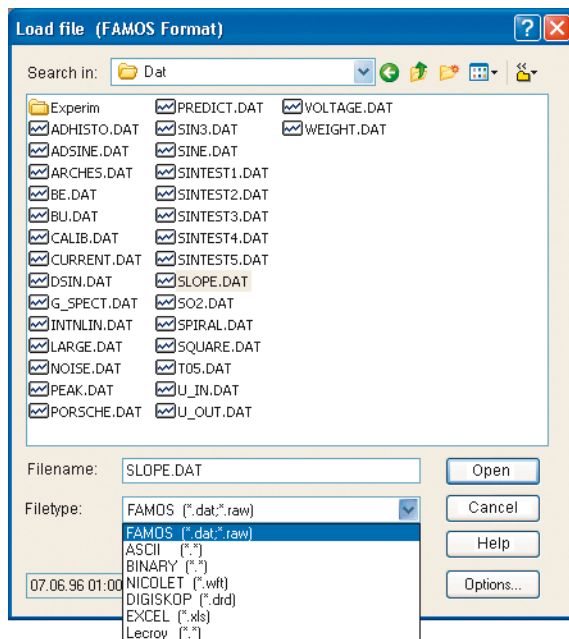
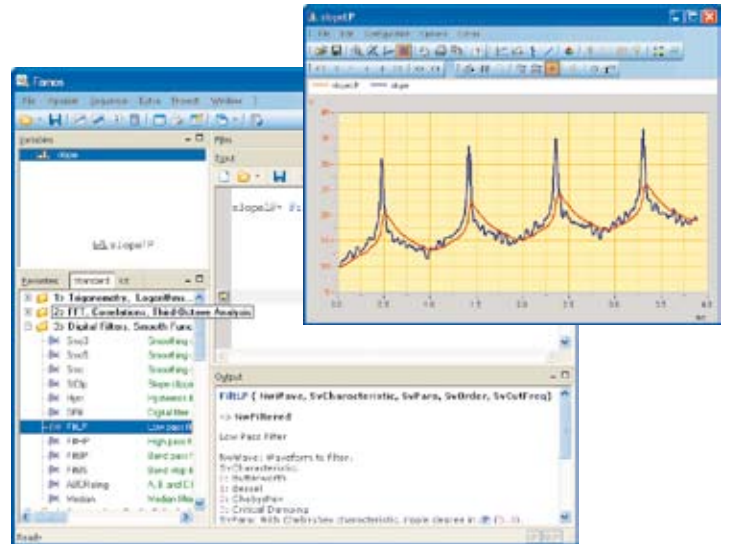
- substantially increased processing speed (up to a factor of 2.5 versus Online FAMOS)
- Quartz-timed hardware interrupts with a resolution of 100 µs
- an integrated PID controller with dynamically loadable parameters
- enhanced CAN message treatment
- additional commands for process control

With Online FAMOS Professional, CRONOS-SL is optimally equipped for the demands of rigorous test rig or production line testing and control.

# Signal Analysis with imc FAMOS

**imc FAMOS:** Simply the quickest way to process test data, display and analyze results, and prepare test reports. This imc signal analysis software, which can be applied independent of hardware or data format, is perfectly adapted to the requirements of mechanical test engineers. While the Curve Window provides extensive possibilities for data display, the Report Generator simplifies the documentation of measurement and analysis results.

In addition to the imc data format, imc FAMOS supports an unlimited variety of other formats, and includes the File Assistant which can quickly import data from other companies' devices. The entire process of data import, visualization, analysis, and report generation can be completely automated by means of the Sequence Editor, imc FAMOS' built-in macro environment.



## Data exchange

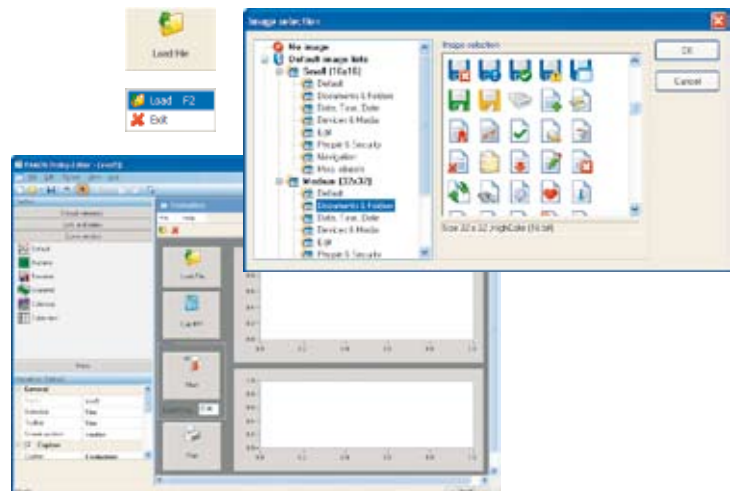
### Handling a wide variety of data formats

For trouble-free import and export of other companies' data formats, imc FAMOS comes with a File Assistant which includes a vast number of pre-defined filters. For the purpose of freely defining import and export formats, the tool ImExport is also available.

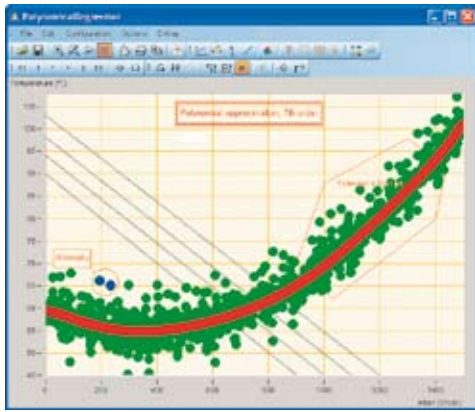
## Data Analysis

### Getting Quick Results

To actually understand measured signals, offline analysis is often necessary. imc FAMOS, the signal analysis system, provides a well-balanced combination of user-friendliness and versatility. With imc FAMOS, you can process data sets of any length and generate computation algorithms using normal mathematical notation. Advanced capabilities for displaying data either graphically or in tabular form are provided.



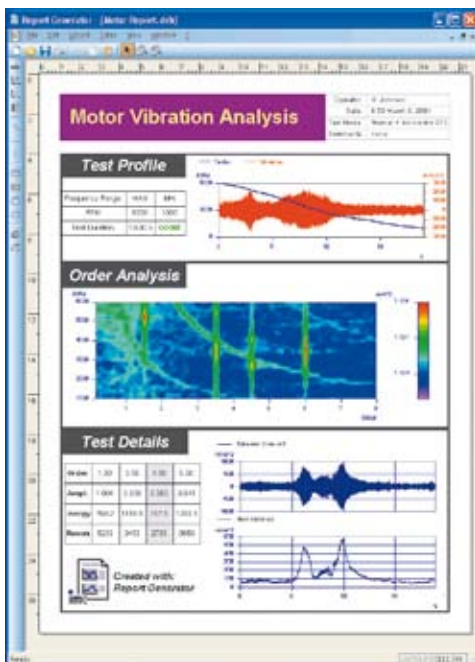
imc FAMOS 5 includes the Dialog Editor, Making it possible to quickly define a huge range of user interface dialogs which are tailored to the desired interface, function, or command.



## Data Display

### Visualization with the Curve Window

Visual representation and display of measured data is one of imc FAMOS' most fundamental program elements. The implicit Curve Manager makes it possible to freely configure curve windows, 1D, 2D and 3D data representations, alphanumeric and tabular displays and bar graphs. Adding curves to curve windows is as easy as Drag & Drop. Cursor functions and unlimited zooming, with an overview window, are standard, as is the creation and labeling of curve markers and text.



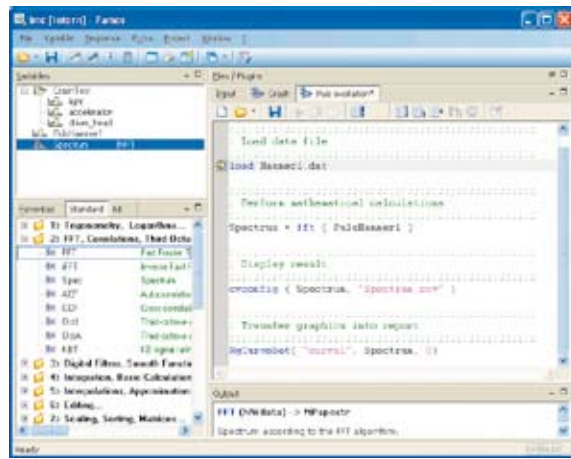
## Documentation

### Presentations Created using the Report Generator

As every engineer and measurement technician knows, performing the measurement is the most difficult part of the measurement, but composing the documentation takes the most time.

That's why imc FAMOS includes the powerful Report Generator, a built-in desktop publisher tailored to the special requirements of a measurement engineering professional. Any graphical representation of the measured signals, as well as tables, pictures and text, can be pasted into a document via the clipboard, or by means of Drag & Drop.

The report appearance and content is limited only by your imagination.

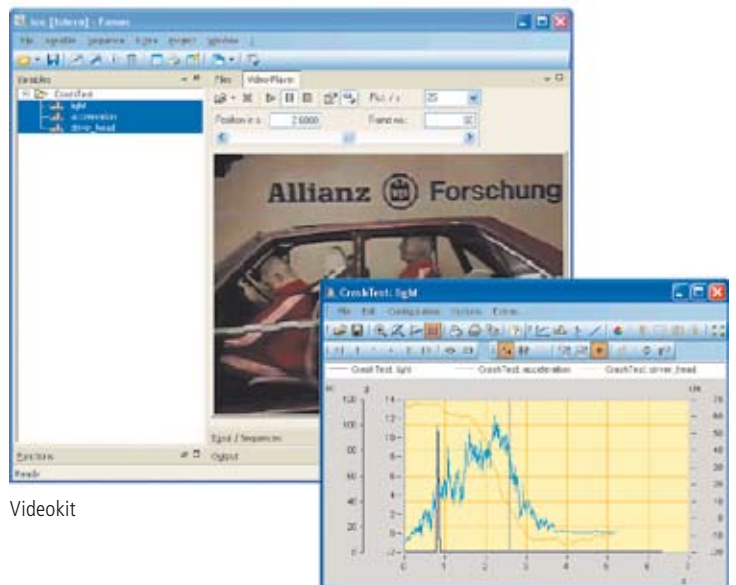


## Automation

### Gain Efficiency by Automating Routine Tasks

imc FAMOS includes the Sequence Editor for automating file manipulation, data analysis, visualization, and report generation, including the capability of loops and decision branches within the calculation procedures.

Any functions which can be executed interactively in the Formula Assistant can also be scripted in the Sequence Editor with Drag & Drop ease, significantly simplifying the creation of macros. Advanced programming experience is not required – you need only specify the formulas for your analysis. Creating macros is made so easy that even multiple complex analyses can be carried out with the push of a button.



Videokit

## imc FAMOS Expansion Kits

For imc FAMOS, a number of enhancement kits are available for special tasks:

- Class-counting
- Order tracking analysis
- Filter design
- Spectral analysis
- Video (picture data and measurement data synchronized)
- ASAM-ODS
- COM class library

### Housing models

#### SL-4



Dimensions (W x H x D): 256 mm x 116 mm x 257 mm  
Weight: approx. 8 kg  
Max. number of measurement amplifiers: 4 (up to 32 measurement channels)  
Signal connection terminals (backplane): 8 x DSUB-15 or 32 x 7-pin LEMO

#### SL-2



Dimensions (W x H x D): 256 mm x 73 mm x 257 mm  
Weight: approx. 6.5 kg  
Max. number of measurement amplifiers: 2 (up to 16 measurement channels)  
Signal connection terminals (backplane): 4 x DSUB-15 or 16 x 7-pin LEMO



## Hardware configuration

Connection options	Type and amount
Analog inputs	max. 32 (SL-4) <sup>1</sup> max. 16 (SL-2) <sup>1</sup>
Digital inputs	Configurable <sup>2</sup>
Digital outputs	Configurable <sup>2</sup>
Analog outputs	Configurable <sup>2</sup>
Signal Synthesizer	Configurable <sup>2</sup>
Decentralized expansion with imc CANSAS modules	0
<b>Field busses</b>	
CAN-Bus Interface	0
LIN-BUS Interface	0
J1587 Interface	0
ARINC Interface	0
Profibus DP Interface	in preparation
ECU protocols (KWP 2000, CCP, XCP, etc.)	0
<b>Data storage</b>	
Internal hard drive	0 <sup>3</sup>
Compact Flash Slot for CF-Card	✓
Option of removable drive or PC	✓
Option of internal hard drive or PC	✓
Circular buffer memory	✓
<b>Displays</b>	
Connection for external Display terminal or GPS	✓
<b>Data transfer</b>	
Ethernet-interface (TCP/IP)	✓
Wireless-LAN	✓
Connection for external modem	✓
<b>Radio clock, device synchronization, GPS</b>	
Terminal for external DCF77 signal	✓
Device preparation for GPS-mouse	0
IRIG-B	0
Multi-device synchronization via Sync line	✓
<b>Power supply</b>	
Supply voltage	10-36 V DC
110 V / 230 V power adapter	✓
Battery buffering / UPS (30 sec buffer time)	✓
Battery operation, approx. 2 to 6 hours <sup>4,5</sup>	0
Automatic charge control	✓
Self activation following power outage	✓
Automatic data save upon power outage	✓
<b>Environmental conditions</b>	
Operating temperature (-40° C ... +85° C)	✓
Waterproofing	IP65
Shock resistance	MIL-STD810F
Condensation protection	✓

<sup>1</sup> see list of imc CRONOS-SL measurement amplifiers for voltage, current, ICP, thermocouples, PT100, strain gauges, measurement bridges and incremental encoder on page 18/19

<sup>2</sup> see modules for open- and closed-loop control on page 18

<sup>3</sup> not available in conjunction with battery power

<sup>4</sup> not available in conjunction with IDE hard drive

<sup>5</sup> limited temperature range with battery operation: -20° C - +60° C

## Accessories

<b>Data transfer</b>	
Internal analog modem	0
Internal ISDN modem	0
Internal GSM modem	0
<b>Data storage</b>	
Compact Flash memory	0
<b>External Display- and Operating Terminal</b>	
Color display (graphical terminal)	0
<b>Radio clock, device synchronization, GPS</b>	
DCF77 or GPS real-time radio clock	0
External GPS mouse (5Hz)	0
UMTS modem	0

## Software configuration

<b>Operating software</b>	
<b>All-purpose system operation</b>	
imcDevices	✓
Parameter setting for CANSAS modules	0
ECU protocols for CAN interface	0
Vector database linkage	0
<b>Noise- and vibration analysis</b>	
imc WAVE Order Tracking Analyzer	0
imc WAVE Spectrum Analyzer	0
imc WAVE Sound power Analyzer	0
imc WAVE Workplace Noise Analyzer	0
imc WAVE Drive-by Analyzer	0
imc WAVE Structure Analyzer	0
imc WAVE PersonalWave	0
<b>Online Software options</b>	
Online FAMOS	0
Online FAMOS Professional	0
Online class-counting package	0
Online Order Analysis	0
<b>Analyse / Management of measured data</b>	
imc FAMOS Signal analysis software	0
imc Sensors sensor database	0
imc LOOK data visualization software	0
<b>Development environment</b>	
imc COM basic package	0
LabView™ interface, VI's	✓
DIAdem™ interface	✓

✓ = default  
0 = optional  
– = not available

# Measurement Amplifiers and Modules

## Multi-Purpose Amplifiers

	<i>Cost Effective High Density Channels</i>	<i>High Channel Count, Cost Effective</i>	<i>Flexible Voltage Measurements</i>	<i>High-Precision Temperature Measurement</i>	<i>Cost Effective Isolated Inputs</i>	<i>High Quality Isolated Inputs</i>	<i>Multi Purpose and High Performance</i>	
Measurement amplifier <sup>1</sup>	SC2-32	LV-16	LV2-8	C-8	OSC-16	ISO2-8	UNI-8	
Terminals	DSUB-15	8	4	2	2	4	2	4
	7-pin LEMO	8 x 4	4 x 4	2 x 4	2 x 4	4 x 4	2 x 4	2 x 4
BNC	special request	special request	special request	special request	–	special request	special request	
Analog inputs	32	16	8	8	16	8	8	
Differential inputs	✓	✓	✓	✓	✓	✓	✓	
Isolated	–	–	–	–	✓	✓	–	
Voltage	✓	✓	✓ ✓	✓	✓	✓	✓	
Current	✓	✓	✓	✓	✓	✓	✓	
Thermocouple	–	–	–	✓ ✓	✓ ✓	✓	✓	
PT100	–	–	–	✓ ✓	✓ ✓	✓	✓	
Strain gauge / Bridge	–	–	–	–	–	–	✓	
Bridge types and operation	–	–	–	–	–	–	1/4, 1/2, 1/1 DC	
Current-fed sensors (ICP)	✓	✓	✓	–	–	✓	✓	
Max. sampling rate / channel	100 kHz	20 kHz	100 kHz	100 Hz	5 Hz	50 kHz	100 kHz	
Aggregate sampling rate	400 kHz	320 kHz	400 kHz	800 Hz	80 Hz	400 kHz	400 kHz	
Bandwidth	28 kHz	6,6 kHz	14 kHz	20 Hz	1 Hz	8 kHz	14 kHz	
Input range (V)	±250 mV ... ±10 V	±250 mV ... ±10 V	±5 mV ... ±50 V	±2.5 mV ... ±50 V	±50 mV ... ±60 V	±50 mV ... ±60 V	±5 mV ... ±50 V	
Input range (I)	±5 mA ... ±50 mA	±5 mA ... ±50 mA	±1 mA ... ±50 mA	±50 µA ... ±50 mA	±1 mA ... ±40 mA	±1 mA ... ±40 mA	±1 mA ... ±50 mA	
Input range (bridge)	–	–	–	–	–	–	±0.5 mV/V ... ±1000 mV/V	
Sensor supply	o	o	o	o	o	o	✓ ✓	
TEDS	✓	✓	✓	✓	✓	✓	✓	

✓✓ = highly suitable  
 ✓ = default  
 o = optional  
 – = not available

## Modules for Open- and Closed-Loop Control

Model	DI-16 <sup>4</sup> , DO-16 <sup>4</sup>	DAC-8 <sup>3</sup>	DIOENC <sup>2</sup>	SYNTH <sup>4</sup>
Type	DI-16: 16 digital inputs TTL CMOS or 24 V logic DO-16: 16 digital outputs TTL, 24 V	Target value output, +/-10 V	16 DI, 8 DO, 4 incremental inputs	Signal synthesizer for generating arbitrary output signal shapes and sequences

<sup>1</sup> Require one measurement amplifier slot each

<sup>2</sup> Occupies no slots, only DSUB interconnections possible

<sup>3</sup> Occupies one slot, terminals: 2 x DSUB 15 or 8 x BNC

<sup>4</sup> Occupies one slot, terminals: 2 x DSUB-15

## Special applications

*Affordable, quasi-static DC measurements with strain gauges*  
*Top-quality dynamic strain gauge DC/CF measurement*  
*Noise & vibration analysis*  
*Noise & vibration analysis (Condenser Microphones)*  
*Direct connection of ICP sensors*  
*Direct connection of ICP sensors*

	Measurement amplifier <sup>1</sup>	DCB-8	BR-4	AUDIO-4	AUDIO-4 MIC <sup>2</sup>	ICPU-8	ICPU-16
Terminals	DSUB-15	4	2	–	–	–	–
	7-pin LEMO	2 x 4	4	–	4	–	–
	BNC	–	–	4	4	2 x 4	4 x 4
	Analog inputs	8	4	4	4	8	16
	Differential inputs	✓	✓	✓	✓	✓	✓
	Isolated	–	–	–	–	–	–
	Voltage	✓	✓	✓	✓	✓	✓
	Current	✓	✓	–	–	–	–
	Thermocouple	–	–	–	–	–	–
	PT100	–	–	–	–	–	–
	Strain gauge / Bridge	✓	✓ ✓	–	–	–	–
	Bridge types and operation	1/4, 1/2, 1/1 DC	1/4, 1/2, 1/1 DC/C	–	–	–	–
	Current-fed sensors (ICP)	✓	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓
	Max. sampling rate / channel	100 kHz	20 kHz	100 / 50 kHz	100 / 50 kHz	100 kHz	20 kHz
	Aggregate sampling rate	400 kHz	80 kHz	400 kHz	400 kHz	400 kHz	320 kHz
	Bandwidth	5 kHz	8.6 kHz	49 / 22.4 kHz	49 / 22.4 kHz	14 kHz	6.6 kHz
	Input range (V)	±5 mV ... ±10 V	±5 mV ... ±50 V	±25 mV ... ±50 V	±25 mV ... ±50 V	±5 mV ... ±50 V	±250 mV ... ±10 V
	Input range (I)	±1 mA ... ±50 mA	±100 µA ... ±40 mA	–	–	–	–
	Input range (bridge)	±0.5 mV/V ... ±1000 mV/V	±1 mV/V ... ±2000 mV/V	–	–	–	–
Sensor supply	✓ ✓	✓	–	✓ ✓	–	–	
TEDS	✓	in preparation	✓	✓	✓	✓	
Slots required	2	1	1	2	2	4	

✓✓ = highly suitable  
 ✓ = default  
 o = optional  
 – = not available

### Measurements with incremental counters

HRENC-4<sup>1,3</sup>, ENC-4<sup>1,3</sup>

Direct connection of incremental counters, for measurement of time- and frequency signals

<sup>1</sup> Require one measurement amplifier slot each

<sup>2</sup> occupies 8 channels (2 slots, Terminals: 4 x BNC and 4 x LEMO)

<sup>3</sup> DSUB-15 or 4 x LEMO interconnections

# Support – Training – Contract Measurements

### High Operational Availability through Adapted System Maintenance

The purpose of our system maintenance is to optimize the operational availability of our products, thus protecting the value of your investment for years to come. Tailored system maintenance enables trouble free operation at minimal cost.

### Just Start Measuring

To obtain the best system utilization, it helps to be knowledgeable with all of the measurement system's functions. The quickest way to achieve this is through an official commissioning with system instruction, to accompany your system purchase.

### Standard, Special and Topical Training Sessions

New customers value our intensive introductory training sessions, and use them to move up the learning curve faster, saving both time and money. Experienced users appreciate our customized training sessions and specialized workshops on a wide range of measurement engineering topics.

### When You Are Short Staffed, or for Tricky Jobs...

Just call us and we will arrange to send an experienced measurement technician to you.

### Problems with the System, Software, or the Testing Application?

We maintain a competent and reliable Hotline for handling your problems. If the problem cannot be solved over the phone, we can attempt remote maintenance over the Internet, or will arrange an in person service call.



### Individually selectable system maintenance components

- Commissioning
- System instruction
- System inspection
- System revision
- System update
- Guarantee extension
- Express repairs
- Remote maintenance
- On-site visits
- Training, and much more

Contact your local distributor for availability and pricing.

## Calibration in the Framework of Measurement Equipment Monitoring

Test equipment monitoring, as per ISO 9000, requires regular calibration of all test and measurement equipment used. This calibration can be performed by the customer, by an accredited inspection laboratory, or by the manufacturer.

For greatest convenience, imc offers system inspections (including system maintenance and updates) at affordable flat rates. All measurement systems come standard with a manufacturer's calibration certificate as per EN ISO 9001:2000.



# Quick Seminars and Training

## Quick Seminars

In order to familiarize you with the amazing capabilities of the CRONOS-SL, we offer practical, application-focused Quick Seminars. Owners and prospective buyers of the system receive news on current measurement technology topics in a relaxed setting. After 60 minutes of theory and 60 min of practice, there is ample time to exchange ideas and experience with our application specialists.

Our Quick Seminar Topics:

### **Where the PC is inadequate for measurement, closed- and open-loop control**

### **CRONOS-SL – Measurement system for extreme environments**

## Training Sessions

Succeeding under the day-to-day time pressures is best accomplished with better information and know-how. Competent knowledge of complex product features is critical to effective and efficient use, and quality training sessions are key to building this knowledge base. Training is available to assist users of our products, from the initial introduction to advanced use with highly complex custom applications.

### **Working with CRONOS-SL in the laboratory or in mobile settings**

Starting from the introduction of the measurement system, creation of various measurement configurations is explained in practical detail. This includes the various graphical display styles, fundamental data storing options, and the creation of simple triggers.

### **Real time computations, open- and closed-loop control with CRONOS-SL**

The use of Online FAMOS is a major feature of CRONOS-SL. Application topics such as complex calculations, data reduction, limit monitoring and control of test rig components are treated in great detail. Practical examples, involving tough real time demands, round out this course.

### **System integration with LabVIEW™, Basic™, Delphi™**

With the LabView VIs and the imc COM Class libraries, the tools for advanced system integration are available for CRONOS-SL. The goal of the training session is to convey fundamental knowledge on setting user-specific programs for measurement, control, data visualization, data processing and data documentation.

### **Noise and vibration analysis**

Learn how to use CRONOS-SL and imc WAVE to carry out measurements of noise and vibration in a training session based on industry practice.

### **Experimental, multi-channel structure analysis with CRONOS-SL**

This training program provides you with an overview of the fundamentals of strain gauge applications, electronic measurement of mechanical quantities and state-of-the-art strain gauge measurement engineering.

### **Analysis and presentation of measured data with imc FAMOS**

Introduction to measurement data analysis, sequences and functional applications. Learn the most important fundamentals for practical work with imc FAMOS.

### **Extracting measured data from the CAN-Bus**

Here you will obtain an overview of the possibilities which the CAN-Bus offers. The theoretical foundations are explained in depth and practiced on the basis of real-world examples.

## Personalized workshops

Besides our schedule of regular training programs taking place at imc offices, we can also offer tailored onsite solutions which we design in special topical workshops particular to your training needs.

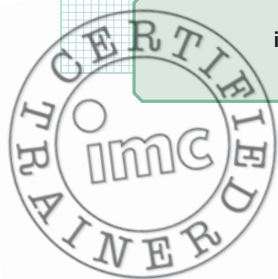
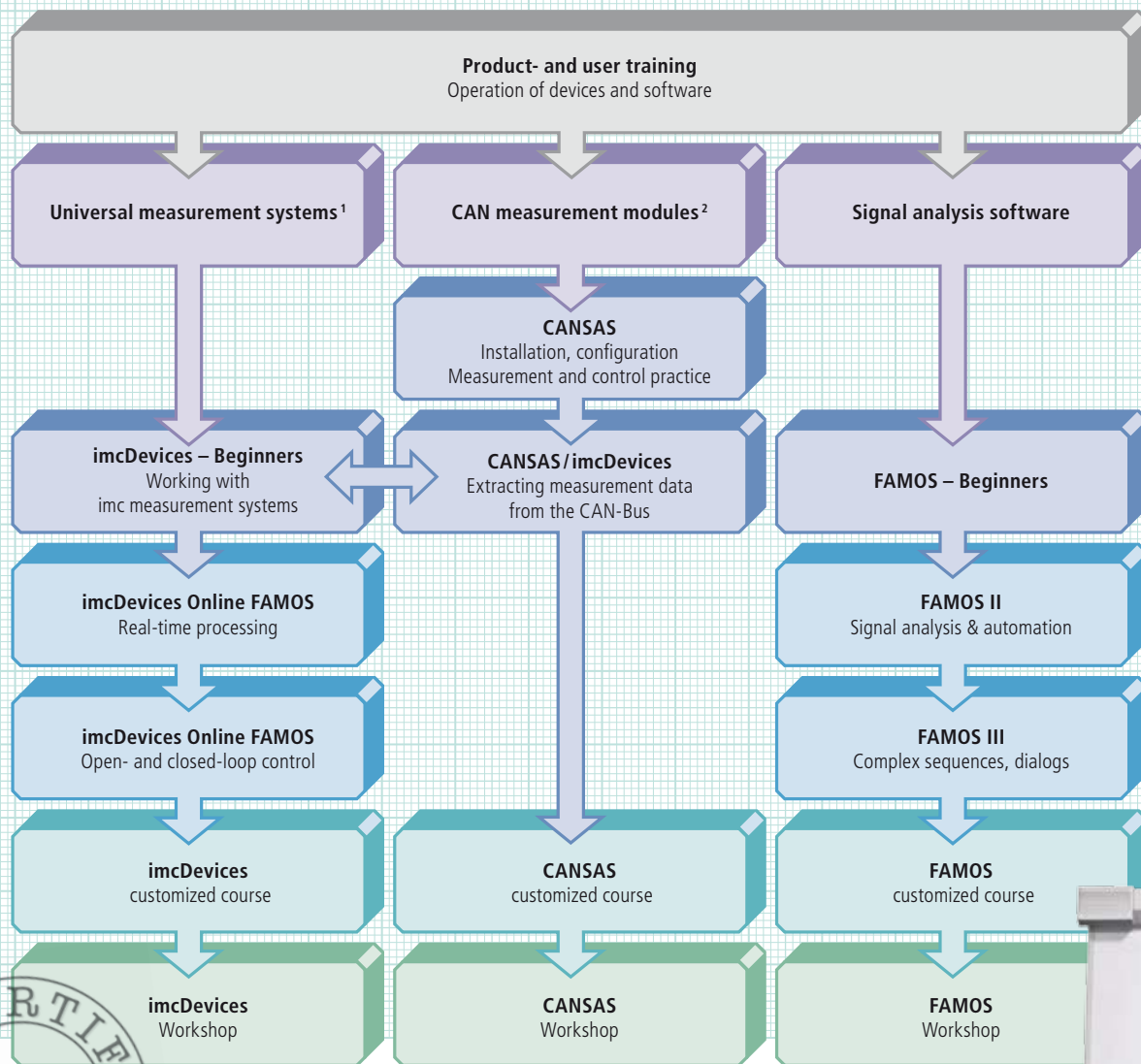
## Training session dates

Product training sessions and sessions for beginners are held at regular intervals in Germany, and throughout the imc distributor network. Contact your local distributor for availability and pricing.

For more information, contact:

Telephone: +49 (0) 30 – 46 70 90-0

[www.imc-berlin.com](http://www.imc-berlin.com)



## Training Program Overview

### One-day introductory session

- For beginners or advanced users
- On-site or at our training facilities

Application and operation of the imc products are practiced. The training sessions are conducted in small groups. Progress is ensured by the working of exercises and intensive coaching.

The aim of introductory training sessions is to gain familiarity with the basics rapidly.

More detailed and specialized skills are promoted in advanced training courses. A "train the trainer" course culminates with certification as an "imc Certified Trainer".

The course material is a proven, standardized program based on our trainers' many years of experience. This means that the training is consistently of high quality and is offered inexpensively.

### Target participant

Technicians and engineers in the fields of R&D and testing, who use our products.

### Hardware

- CRONOS-PL
- CRONOS-SL
- C-Series
- CANSAS
- busDAQ
- μ-MUSYCS
- SPARTAN
- MKAS
- Electro-motor inspection
- imc POLARES

### Software

- imc FAMOS
- LOOK
- imc COM

<sup>1</sup> All imc measurement systems are run with the uniform operating software imcDevices (CRONOS-PL/SL, C-Series, μ-MUSYCS, SPARTAN, busDAQ)

<sup>2</sup> The CANSAS measurement modules are run with the CANSAS configuration software

Errors and changes excepted. All registered trademarks are the property of their respective firms.

---

imc Meßsysteme GmbH  
Voltastraße 5  
D-13355 Berlin  
Phone +49 (0) 30-46 70 90-0  
Fax +49 (0) 30-4 63 15 76  
E-mail: [hotline@imc-berlin.de](mailto:hotline@imc-berlin.de)  
[www.imc-berlin.com](http://www.imc-berlin.com)



• • • • integrated measurement & control • • • •