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imc
integrated measurement & control

CRONOS PL

Adaptable Modular Measurement System for Physical Signals

CRONOS PL_imc_E_Rev.2006.12.3000

The Technological Standard for Measurement of Physical Quantities

Integrated Measurement Engineering is the Latest in Testing Technology

Following its vision of "integrated measurement engineering," imc has moved to the forefront of innovation by offering the user clearly recognizable technical and commercial advantages. CRONOS PL is the most powerful embodiment of the concept. Integrated measurement engineering enables PC-independent measurement along with both open- and closed-loop control, all within the same instrument.

Data Logger with Built in Intelligence

Signal conditioning, filtering, A/D conversion, calculated virtual channels, and data storage are all integral elements of the measurement system.

Configuration is handled from the PC, via standard Ethernet, and the included operating software imcDevices. However, the PC does not actually perform the measurement, although live signal display can be seen on the PC and/or an external graphical display unit.

CRONOS PL is Ready for Measurement Challenges

Modular design and powerful operating software allow rapid, menu driven configurations, from quick, one-up measurements, to highly complex test procedures, with embedded closed- and open loop control functions.

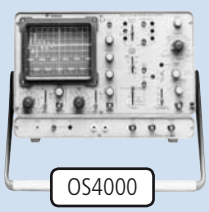
Easily retasked for all your testing needs, CRONOS PL's configurations, including all measurement properties, calculations and display styles, can be saved for later reuse.

These "Experiments" can be stored safely in the PC or the CRONOS PL itself, and called on as needed, or from within a user defined program to perform routine jobs, such as at a test stand.

Always Ready to Measure

No matter whether a measurement is automatically started from the device itself, via the PC, or the CRONOS PL Graphics Terminal, one push of the button is all it takes. This ensures quick and error-free performance of even the most complex tasks.

imc – Taking the Initiative Since 1988

1975	1981	1985	1990	1995
				
OS4000	IBM PC	PC plug-in boards	Black Box Systems	
since 1975: µP in measurement devices, e.g. DSO	since 1981: The PC makes inroads in measurement engineering	since. 1985: PC plug-in boards for measurement technology	since 1990: PC-aided Black Box measurement systems	since 1995: Ethernet connection

Highest Reliability

The essence of integrated measurement engineering is embodied by CRONOS PL's modular hardware structure, which achieves its full functionality only in conjunction with the software, both onboard and in the PC.

In practice, this means that a few base components are able to cover the wide variety of specific measurement types. Manufactured by the thousands and tested in a broad range of different environments, this concept has proven the lowest possible susceptibility to hardware and software component failure.

Affordable Pricing

CRONOS PL offers solid proof that high-end measurement engineering does not necessarily mean high cost. The platform and shared component design concept aids in minimizing costs for its development, production, system integration, testing, and maintenance.

Solid Investment

Along with the purchase price, a system's ongoing operating costs are key to determining the total cost of ownership. Calibration, adjustment and rapid adaptation to modern PCs and new operating system versions are the major cost factors to consider.

imc guarantees optimally adapted system maintenance; as a result, approximately 80 % of all measurement systems sold since 1988, imc's entire history, are still up to date, in operation, and undergo regular system inspections.

Continual Evolution

Ongoing development efforts allow imc systems to expand into new application fields and to modernize existing components.

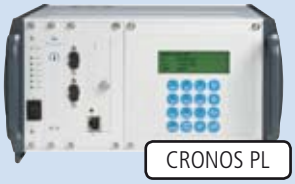
New system features, often not immediately visible on the surface, are carefully added so as to require minimal retraining for current users.

Updates to the newest state of the art are available at low cost, within the framework of system inspections and revisions. The results: long service life and high operational availability.

CRONOS PL

Since 2002: Integrated Measurement Engineering

2002



CRONOS PL

- First realization of integrated measurement engineering with CRONOS PL
- CRONOS PL supports Ethernet TCP/IP

2003

- Extension of the product palette to break into the high end strain gauge market (24 bits, DC/CF)
- Introduction of the high end bridge amplifier BR-4
- Introduction of the low cost bridge amplifier DCB-8

2004

- Introduction of the universal amplifier UNI-8
- CRONOS PL supports TEDS (automatic sensor recognition)
- imc takes TEDS concept a step further with Plug & Measure (automatic sensor recognition of any sensors, as well as automated device configuration)

2005

- Sensor Database simplifies administration of sensors and measurement equipment
- imc WAVE applies CRONOS PL to acoustics and vibration engineering

2006

- Introduction of version 2.6 of operating software imcDevices
- Online FAMOS Professional doubles the computing power
- New Curve Manager
- GPS-capable
- CAN-bus / ECU protocols

Maximum efficiency and reliability

When faced with a large variety of measurement tasks, an engineer's or test technician's time is best optimized with one all-purpose device, with just one software environment, and one learning curve. Still, such a device should neither be weighed down with excessive functions nor make compromises. CRONOS PL represents such a device, and is the fruit of 18 years of experience from a broad range of application fields.

Task-specific hardware configurations from a palette of standard components ensures the highest accuracy of measurement and maximum reliability in daily operation. A unified software environment is easy, intuitive and allows the user to focus on the measurement, not the tools.

The ideal partner for constantly changing measurement tasks

With its various portable and 19" rack-installed frames, CRONOS PL is the ideal platform for constantly changing measurement tasks in the lab, in-vehicle, or in test stands. The open system architecture allows quick integration into any environment.

Modular, Networkable, Intelligent and Universally Adaptable

CRONOS PL's modularly expandable architecture can accommodate a full range of measurement amplifiers for the direct connection, supply, filtering, and conditioning of any type of sensor.

CRONOS PL also supports modules for control tasks, such as digital I/O, analog outputs for control signals, and waveform synthesizers for a variety of control and excitation functions. CAN-Bus Interfaces for collecting distributed measurement data can also be integrated as modules into the system, supporting a range of field bus and vehicle bus protocols.

PC Independent

Many types of testing require measurement instruments which are able to act without PC support, or even independent of an operator. For such cases, CRONOS PL can operate in a stand alone mode, with previously configured settings saved directly in the system.

If desired, current measurement status and values can be communicated with the operator through a user configurable built-in device display, or a rugged graphics display which can operate between -40 and +70° C. A major advantage of these control and display units is the ability to create highly simplified measurement operations with user designed layouts saved with the measurement configuration.

The high-resolution and extremely bright (>280cd/m²) 5.7" TFT Graphics Terminal offers great operating reliability in PC-independent mode.

Upon request, the devices can be equipped with a fully configurable internal display

Ideal for in-vehicle measurements: the hand-held terminal

Ethernet and Field-bus Connectivity

For interactive operation using the imcDevices software, a PC can be connected to the CRONOS PL via Ethernet TCP/IP. This ensures maximum communication flexibility in the easiest, most universal way. The Ethernet and CAN bus interfaces also allow ready system integration with automation systems or other control units, such as test stands.

Up to 512 Measurement Channels and 400 kHz Throughput

Each CRONOS PL system is able to administer up to 512 channels and an aggregate sampling rate of 400 kHz. Efficient data utilization is ensured by per-channel configuration of sampling rates, triggering, storage, and "Result on Demand" data processing.

Two independent sampling rate groups, channel-specific sampling, and digital reduction allow users to store only the amount of data really necessary. A powerful trigger machine with 48 independent combinatorial logic triggering levels, each with separate Start and Stop functionality, multi-shot modes, and monitor channels serve to eliminate unnecessary or spurious data.

To further reduce the flood of raw data, CRONOS PL can utilize free-form digital signal processing, transcending the mere logger concept as a complete Personal Analyzer. Any type of channel-wise calculations can be performed with "Results on Demand" functionality: direct display and recording of calculated quantities for immediate, as-recorded assessment of measurement results.

Data Storage Built into the Device

PCMCIA removable storage card

CRONOS PL can save data either to an optional internal hard drive, or to a removable solid state storage card. The removable Flash memory cards are extremely robust and have a capacity of up to 8 GB. The built-in IDE hard drive option is ideal for long duration measurements, with a larger 60 GB capacity.

Synchronization guaranteed by design

Synchronization of all analog, digital and CAN bus channels is completely guaranteed, regardless of the CRONOS PL hardware configuration. This even applies to operation of multiple networked devices, which can be synchronized together by means of a Master-Slave function and synchronization line. If synchronization to absolute time is desired, for one or more devices, it is established with either a GPS or DCF 77 real time clock signal.

Reliable and Adaptable, All-in-One

Quickly Up and Ready to Measure

Like all imc measurement systems, CRONOS PL utilizes the software imcDevices for configuration and live operation.

This provides ease and convenience of configuring multiple setups, or "experiments", which can be saved to, and recalled from the PC. In addition, an experiment can be stored on the CRONOS PL itself, providing added convenience, and extra protection against accidental alteration by the user.

Real Time Calculations, Open- and Closed-Loop Control

With its multi layered digital signal processors (DSP), and easy to use interface software Online FAMOS, CRONOS PL is a multi-purpose "Personal Analyzer." Not only general calculations, Online FAMOS also supports specialized algorithms such as digital filters, spectral analysis, class-counting, and order-tracking, as well as CAN I/O, such as electronic control unit (ECU) commands, and dedicated state logic and control functions.

Without the need for complex programming, the CRONOS PL can be fine tuned for specific functionality, such as data compression, channel-wise calculations, control processes and closed-loop control functions.

Complete integration of this DSP functionality is achieved through the standard operating software imcDevices.

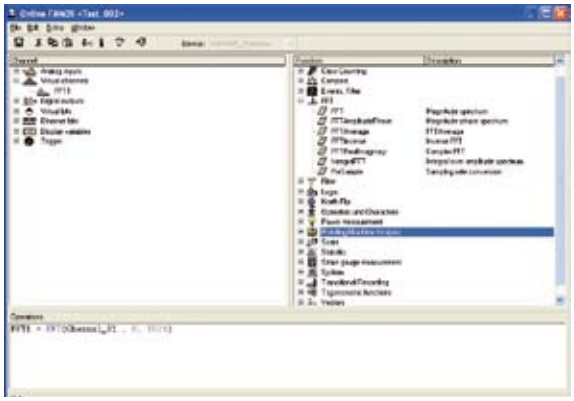
Ethernet and WLAN capable

CRONOS PL, like all imc measurement systems, is networkable with Ethernet. In addition, CRONOS PL supports wireless WLAN networking. Multiple CRONOS PL devices, as well as older imc measurement systems, can be easily combined into a decentralized measurement system.

In extended systems, trigger, data, and state information can be exchanged between the devices. All devices run in parallel, combining net sampling rates and computation power, while maintaining complete synchronization of the measurement channels.

No Data Loss from Power Outages

CRONOS PL includes an internal uninterruptible power supply (UPS) and self-starting capability. In the event of power loss, the CRONOS PL automatically halts the acquisition and deactivates itself.



Because the measurement is completed properly, all data sets acquired are safely stored.

Once power has been restored, the measurement device starts up automatically and resumes the measurement.

Battery Operation

Operation disconnected from the power network is made possible by an optional built-in 90 Wh Lithium-ion rechargeable battery. This provides up to several hours of working time, depending on the device model and configuration.

Extracting Measured Data from Field Bus Messages

CRONOS PL can accommodate from one to eight Field bus interfaces. Using these, measured data and status information can be recorded from Field buses, such as CAN, LIN, J1587 and ARINC. Additional Field bus interfaces such as Profibus DP are in preparation. Bus data is received, decoded, and acquired in parallel and synchronously with analog and digital data, and can be jointly processed, displayed and stored.

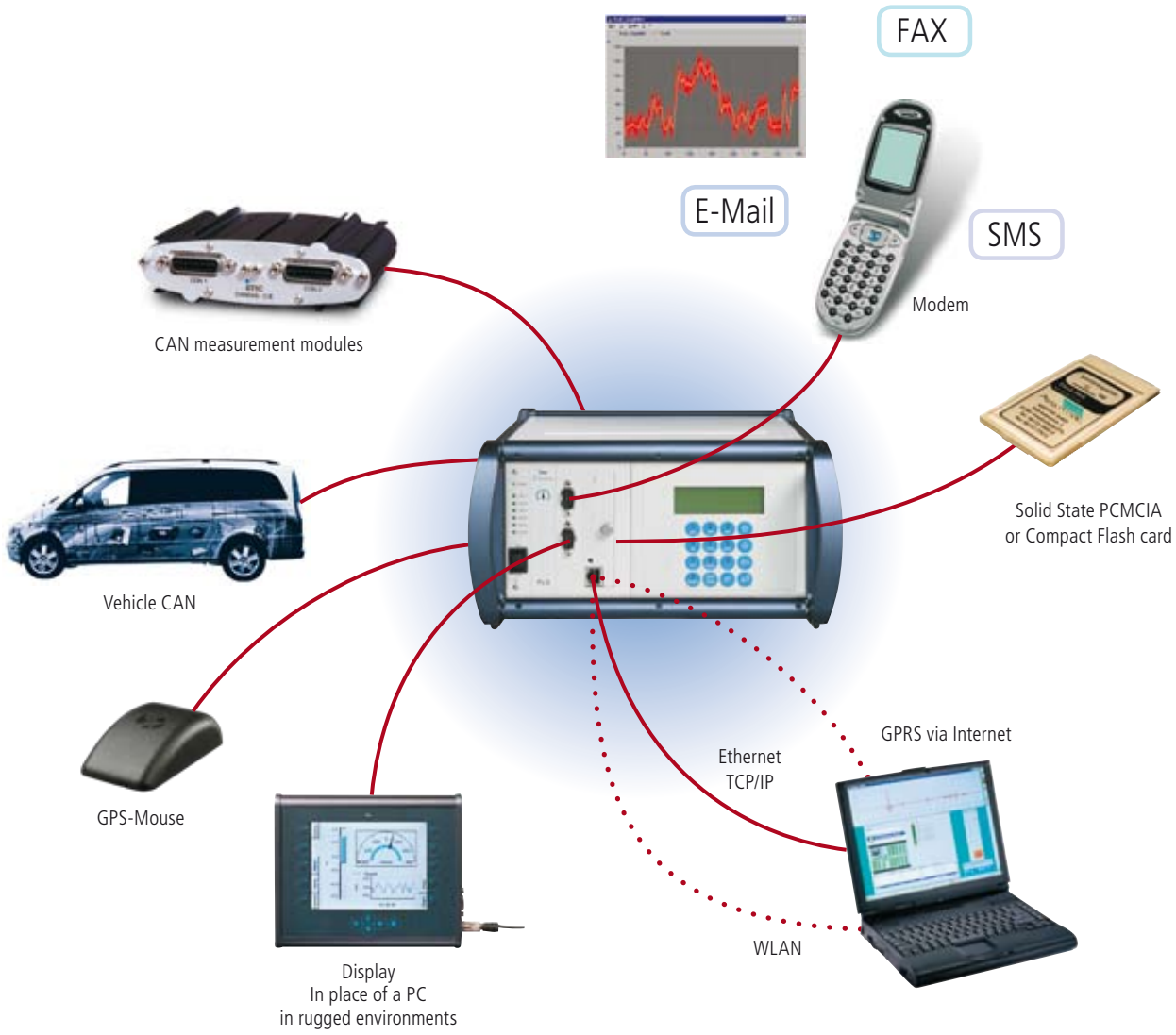
The CAN interface supports both High Speed (ISO11898) and Low Speed (ISO 11519), as well as a number of higher level protocols such as KW2000 and CCP (other protocols under development, and available by special request).

Configuration of the Field bus interface is accomplished quickly and easily by means of the imcDevices operating software, without the need for special expertise in the buses or specific protocols.

CRONOS PL – Data Analysis

The newest version of the signal analysis software imc FAMOS offers extensive possibilities for analysis, evaluation and documentation of measurement results.

CRONOS PL saves the data collected directly in the imc FAMOS data format.



Wireless remote and long-term monitoring via modem and Internet

Monitoring of system performance, localization of sporadic errors and long term monitoring for the purpose of preemptive maintenance can all be substantially simplified by means of Internet-based remote monitoring. Unmanned monitoring of vehicles, machines or entire plants, as well as wireless transfer of measurement data all save time and money.

CRONOS PL can be equipped with an internal GPRS or external modem, which can log itself into the Internet or via an Internet-based switching center (server), and set up a stable and secure online connection between the measurement device and the home PC. When a signal limit is violated, or any of a multitude of other conditions is met, the device automatically sends a report in the form of measured data, status information or alarm indications via SMS, e-mail or FAX.

Global Positioning System

With the help of a GPS receiver, it is also possible to evaluate the measured data with regard to location, and thus local circumstances and conditions. The geographical data are recorded and saved synchronously with the other measurement data.

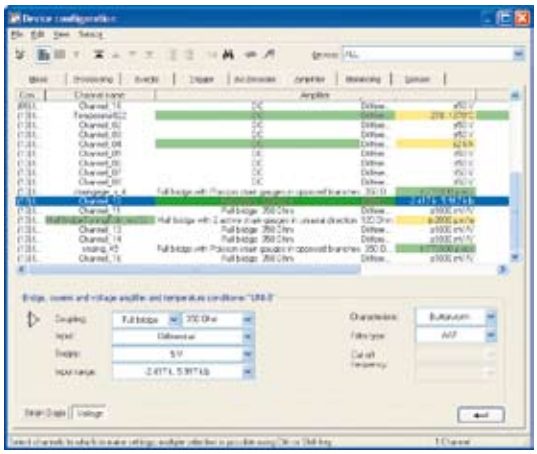
Robust System Architecture

imc operating software – imcDevices – One Program does it All

Along with all other measurement devices from imc, CRONOS PL is operated with the same multi purpose Graphical User Interface software, imcDevices.

imcDevices enables complete manual or automated configuration of all measurement parameters, real time functions, triggers and data storage modes.

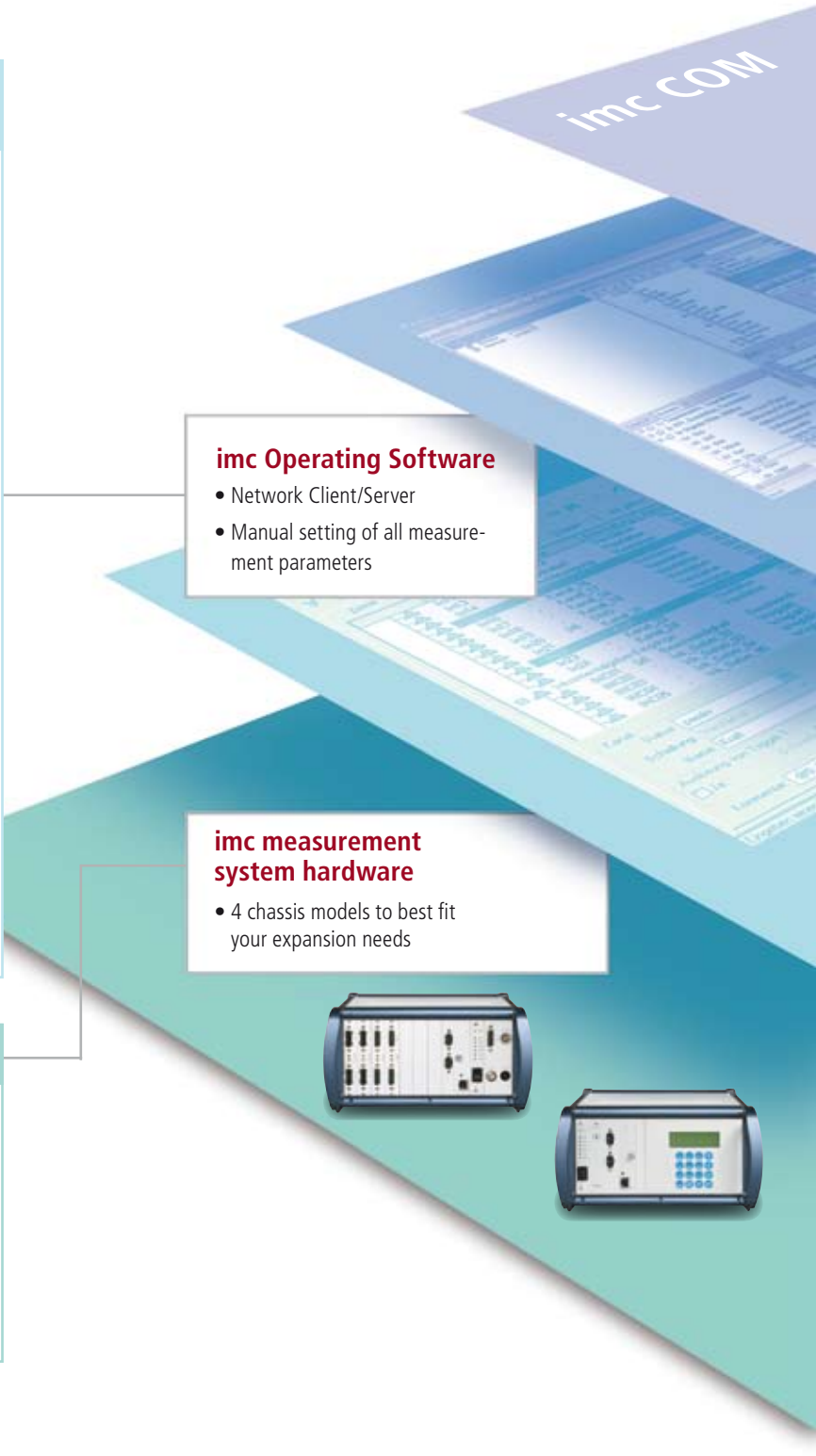
Display of live measured data in the Curve Window, and final documentation with the Report Generator, are integral elements of imcDevices. These functions are accomplished in an intuitive, menu-driven manner utilizing the terminology of measurement engineering.



CRONOS PL plays in the big league

The measurement system hardware is based on the successful integrated platform and shared component concept. Practically any signals and sensors in physical measurement engineering can be connected directly to the imc measurement amplifiers.

The CRONOS PL can operate in both PC-aided or autonomous mode; it is networkable and capable of real time analysis and control.



U Voltage | F/p Bridges | φ Angle | f Frequency | I Current | a ICP Acceleration, Vibration | ω RPM Angular Velocity

Automation

- Class library
- LabView™ interface
- DIAdem™ interface
- Independent COM interface
- Programming language-independent

imc Data Analysis Software

- imc FAMOS: signal analysis software
- imc LOOK: offline data visualization

imc FAMOS

imcDevices

CRONOS PL

Efficient System Integration with imc COM, LabView™, DIAdem™

The imc COM development environment enables system integration, independent of programming language.

The class libraries can be integrated with all modern programming languages in accordance with the worldwide COM software standard. They offer access to all functions of any imc hardware or software product families. In conjunction with the Ethernet TCP/IP and CAN interfaces, the imc device class libraries provide open interfaces and documented data formats for system integration tasks, including the capability of integration with non-imc equipment.

With LabVIEW™ or DIAdem™, CRONOS PL can easily be integrated into existing system architectures.

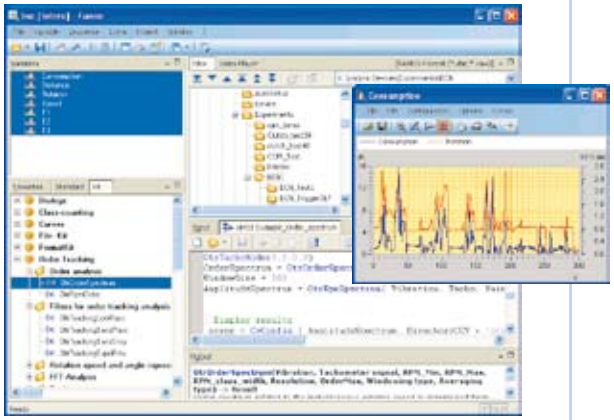
In addition, imc offers a large number of VIs™ and sample implementations which are directly accessible via the LabVIEW™ functions palette. By means of these VIs, imc devices such as CRONOS PL can be configured, started, stopped, controlled, and measurement data can be retrieved.

For DIAdem™, an interface is available which integrates imcDevices into the software's data capture portion. This way, DIAdem™ can make use of imc's entire aggregate sampling rate, as well as the measurement device's complete functional capabilities.

Analysis software – signal analysis quick and to the point

The quickest way to achieve usable results and to process measured data has a name: imc FAMOS. This signal analysis software, which can be used regardless of hardware sourcing the data, is perfectly adapted to the requirements of test and measurement.

The curve window provides extensive possibilities for data display, while the Report Generator simplifies the documentation of measurement and analysis results. Besides the imc data format, imc FAMOS supports a variety of other formats, with a File Assistant which can quickly import data from non-imc devices. The entire process can be automated by means of the FAMOS Sequence Editor.



CAN-Bus, J1587
ARINC-Bus | Temperature | Digital in- and outputs | Displacement | Signal generation | PID-Controller

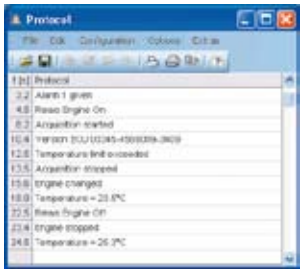
Integrated Software for all imc Measurement Systems

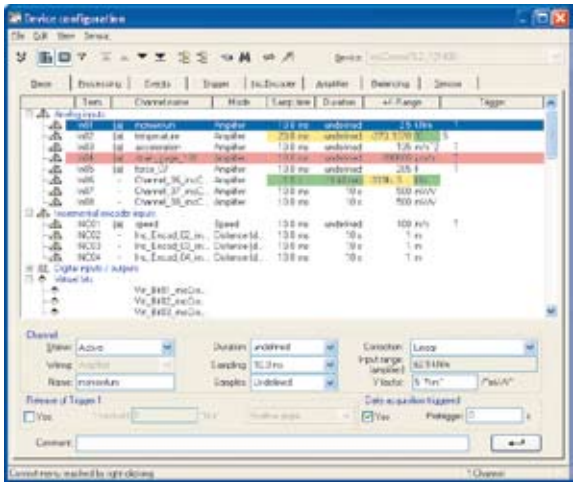
Uniform Software Package with Open System Architecture

The operating software imcDevices is designed to be both intuitive and reliable, recognizing the CRONOS PL's hardware configuration, and ready at a moment's notice to start taking measurements.

imcDevices enables complete, interactive configuration of all measurement parameters including channel configuration, triggering, real time calculations, display and storage of measured data, and composition of detailed test reports. Configuration information and measured data can be recorded both on the PC and in the CRONOS PL's internal memory.

Although the PC doesn't actually perform any of the measurement work, the PC is used to configure the CRONOS PL's parameters, and for the online display of the measurement data. Through imcDevices, automated measurement with real time analysis, control response, as well as display, documentation and data storage are all just a mouse click away.

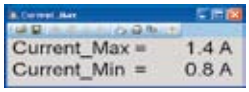


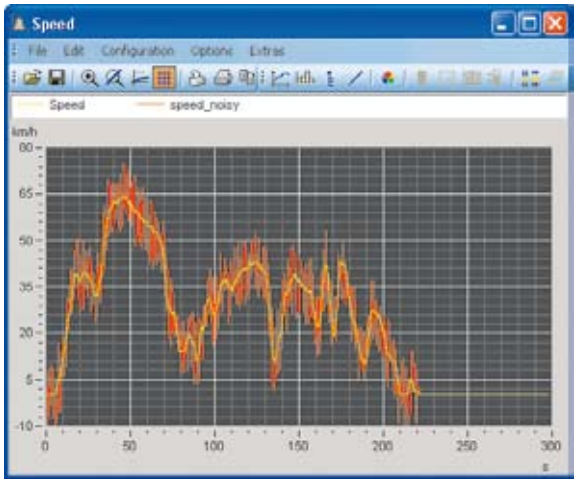


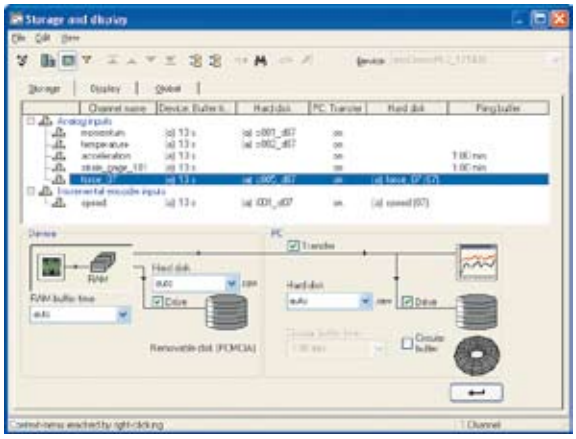
Base menu: Definition of the main measurement parameters

Direct Display of Results

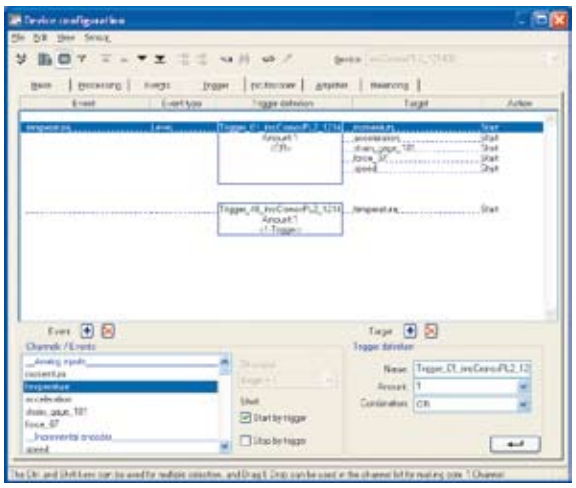
Display of live data, when desired, can be viewed on the CRONOS PL graphics terminal, and/or through the PC. Both are configurable for current values, bar charts, and strip chart views. In addition, through the PC, x-y, frequency based, and 3D displays are all possible.



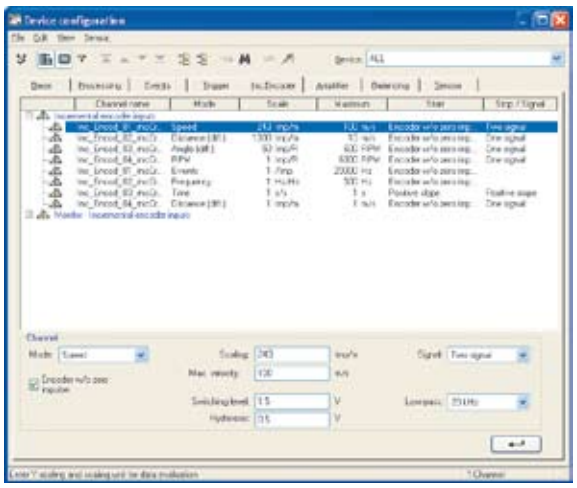




Data can be saved to CRONOS PL's internal storage and/or the PC, including the option of a circular memory buffer



The trigger machine serves the purpose of intelligent data capture as well as of data reduction. 48 trigger levels are available, combining channel associated events in logical expressions to cause a defined response on the target channel.



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

Assembly of Decentralized Measurement Networks

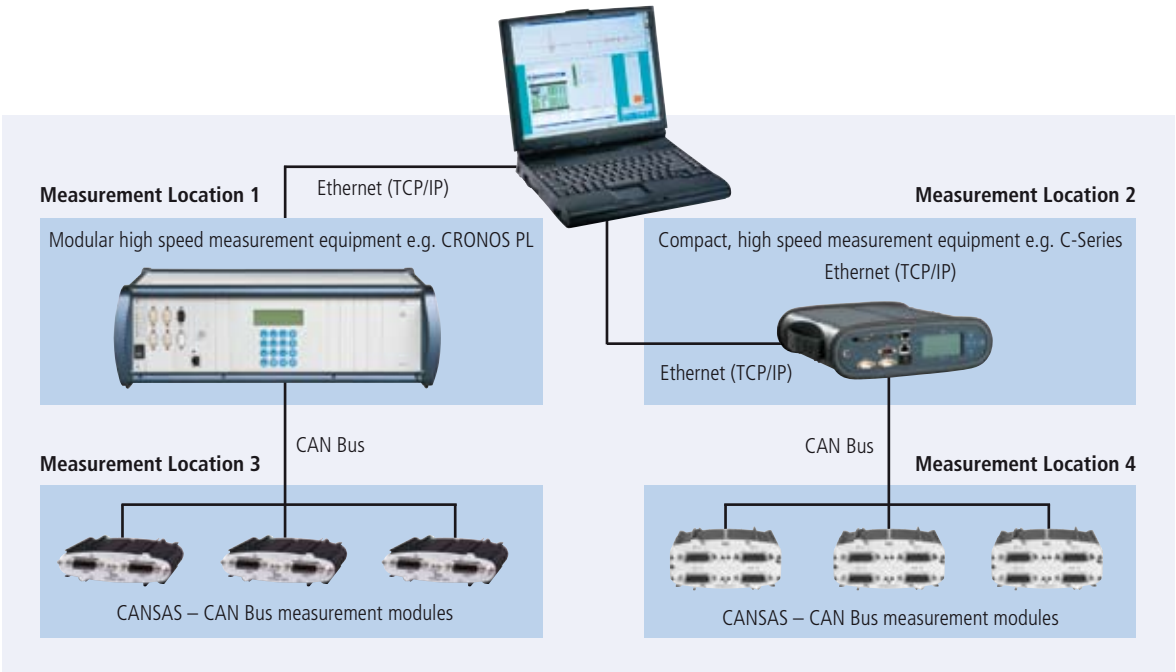
Network-wide Client/Server operation of devices from the entire range of imc product families can be achieved without any problem using the integrated imcDevices user interface.

Multiple CRONOS PL 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

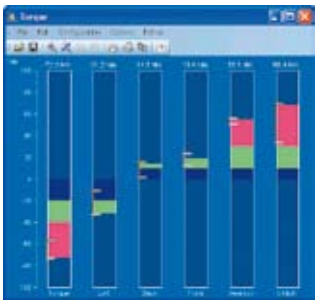
For decentralized measurement setups, various imc measurement systems can be connected via Ethernet. In addition, a very low-cost way to achieve distributed expansion is to incorporate CAN measurement modules.

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.



Decentralized measurement networks via Ethernet or CAN Bus can very easily be realized.

Viewing Live Measurement Results



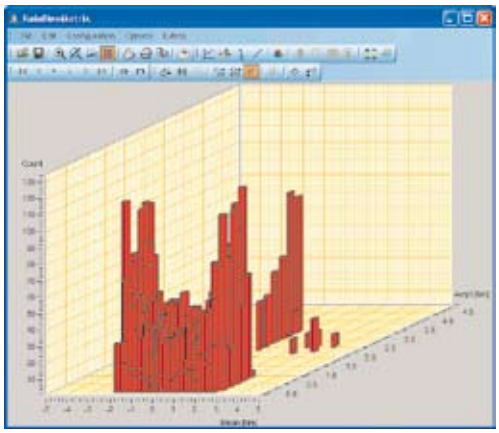
Bar meter with range indicators

Integral Elements of imcDevices: the Curve Window and the Report Generator

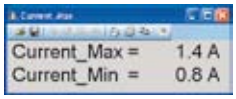
The imc Curve Window gives the user a true variety of freely configurable 1D, 2D, and 3D display types which can be displayed with a click of the mouse, and modified or adjusted during a measurement, or applied after the measurement's conclusion.

Standard display types include signal vs. time, with a combination of stacked or overlaid Y-axes; single values; measurement value tables; bar meters; and a flexible combination of 3-D displays including waterfall and color (topographic) displays.

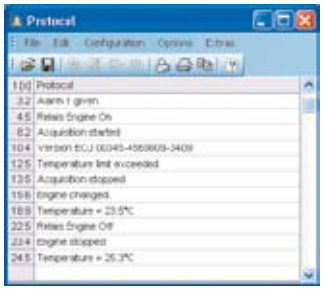
The imc curve window opens with automatic scaling, optimizing the display value range. Rescaling of the axes and of the display can be performed without interfering with an ongoing measurement. The displayed region can be zoomed and scaled to any desired size, and subjected to offline processing with measurement cursors or by immediate transfer to imc FAMOS.



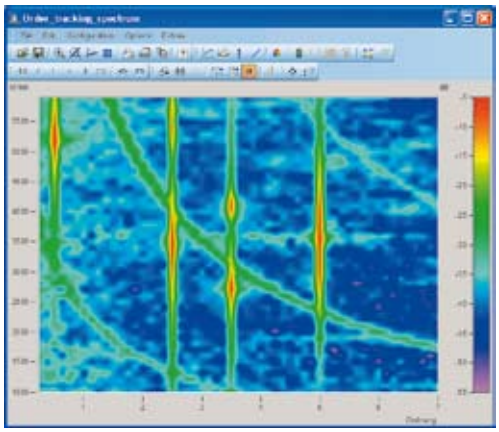
3-D class-counting representation



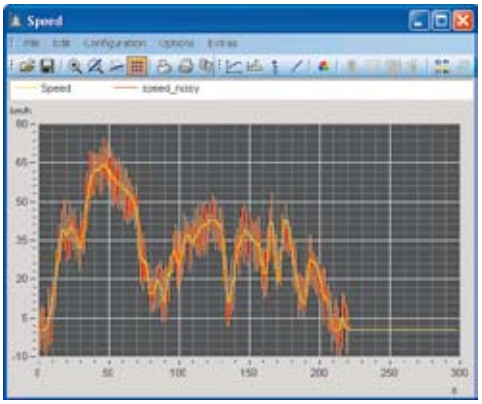
Current values



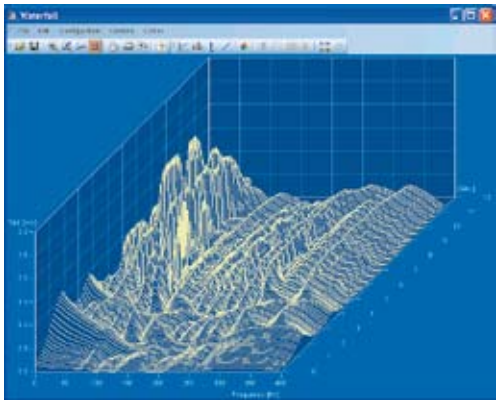
List of time stamped protocol entries



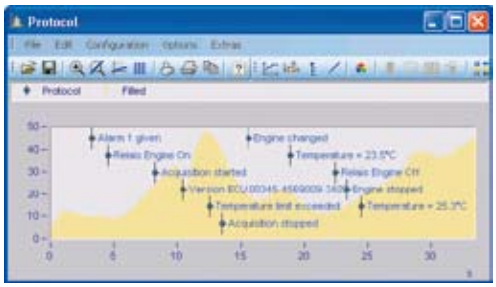
Order line representation of a measurement plotted versus angle



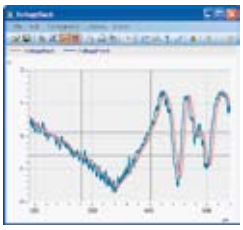
Automatic scaling



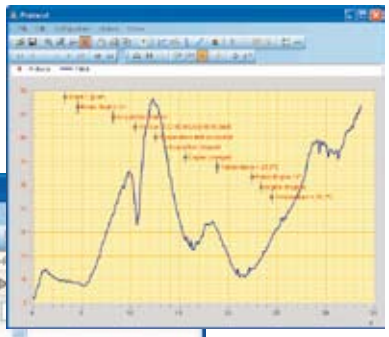
Waterfall display

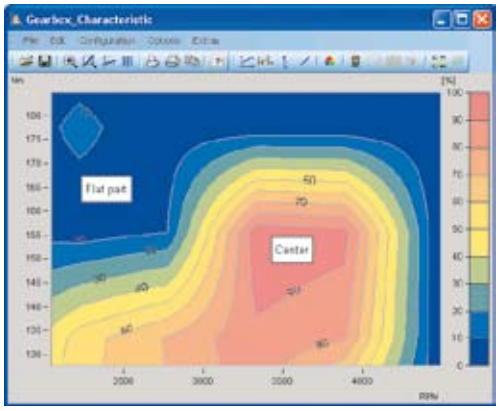


Measurement curve with automatically set time-correct report data

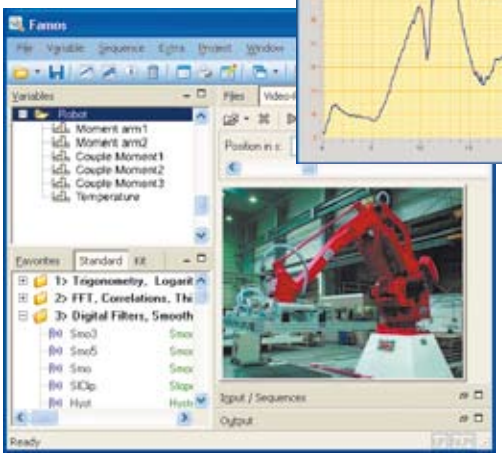


Zoomed signal segment with measurement cursors

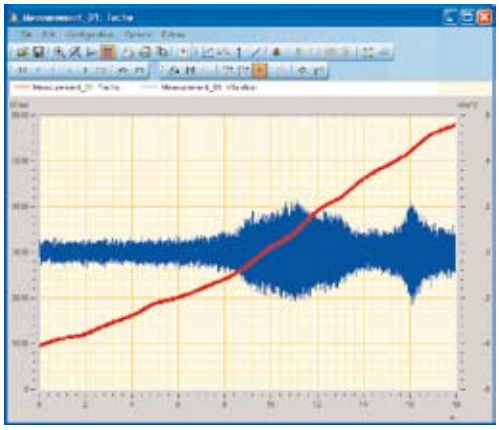




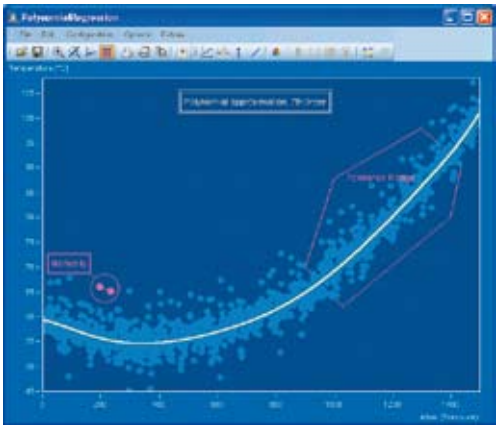
Characteristic curve field in isoline display



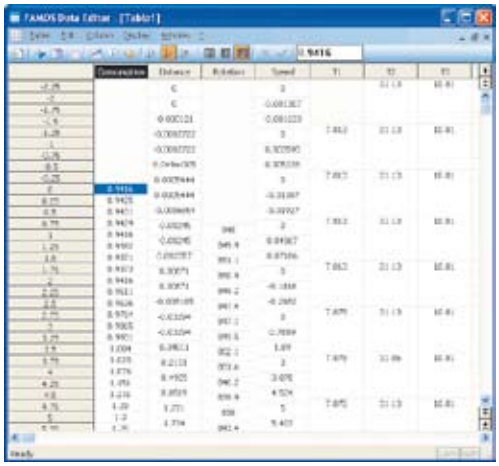
Synchronized display of measurement curves and video data



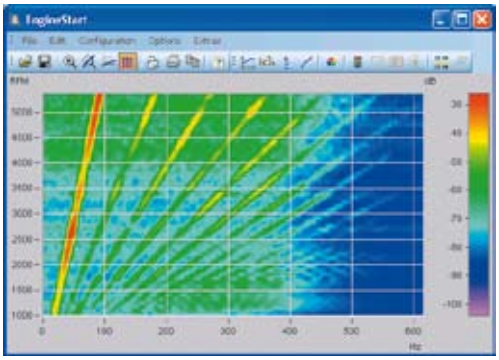
Different line thicknesses



Approximation polynomial



Display of data with different sampling rates in tabular form



3-D spectral display

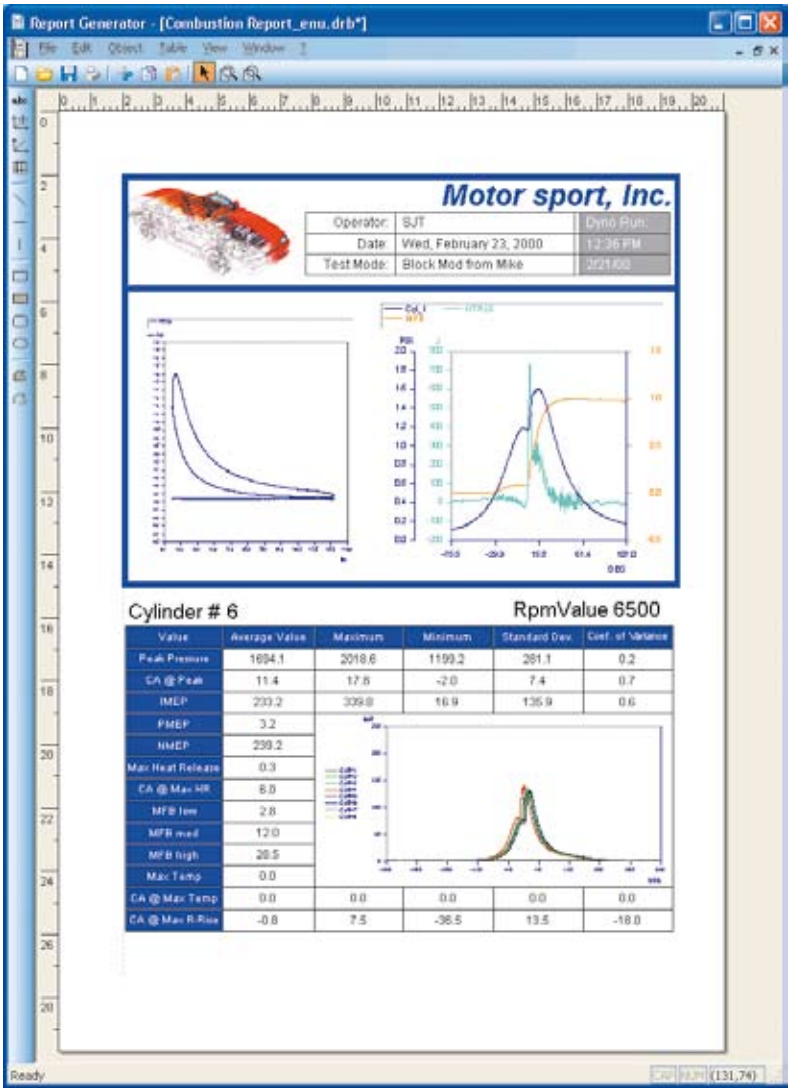
Professional Report Composition

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 predefined 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 PL a Personal Analyzer

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

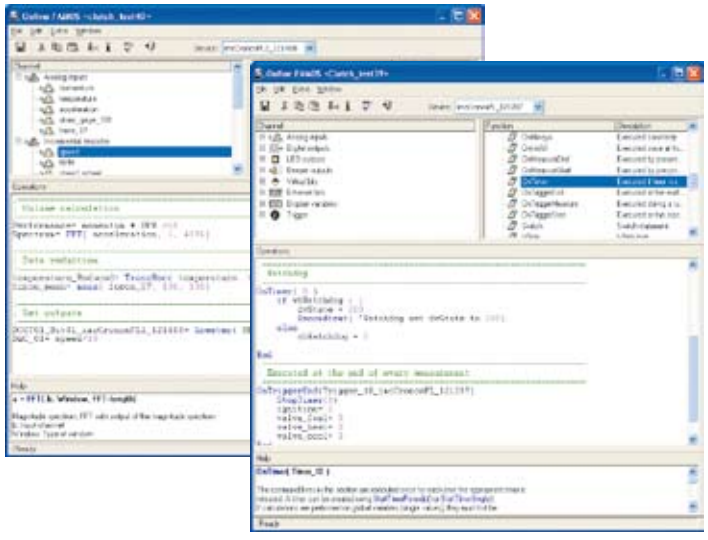
The most profound enhancement for imcDevices is the Digital Signal Processing (DSP) capability of Online FAMOS, which provides an enormous range of easily accessible real time functional enhancements.

Online FAMOS is quick and reliable because it operates independent of the PC, directly on the CRONOS PL's DSPs. Online FAMOS enables freeform definition of real time calculations, making CRONOS PL 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



Arbitrary definition of calculation and control instructions in intuitive notation. Real time execution with simultaneous display and storage of results

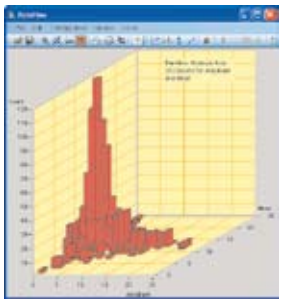
Durability and Material Fatigue Testing

Online FAMOS can be expanded with the optional Class Counting kit for the special requirements associated with material strength testing.

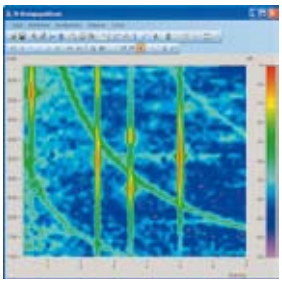
These include the standard procedures of ISO/DIN 45667:

- 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 analysis of 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)
- timer-controlled 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 PL is optimally equipped for the demands of rigorous test rig or production line testing and control.

Universal Measurements with Wire Strain Gauges

Measurement with strain gauges is a standard test requirement in many types of mechanical testing. Strain gauges determine mechanical stress and derivative quantities such as force, pressure or torque. The strain gauge is also an integral part of many high precision sensors and transducers.

Examples include fatigue testing and service life tests of relatively simple sub components, such as metal plates and tubes, to safety-related components such as vehicle axles or airfoils, all the way to structural analysis of large, complex systems such as an entire vehicles or building.

Digitalization with 24-Bit Sigma-Delta Converters

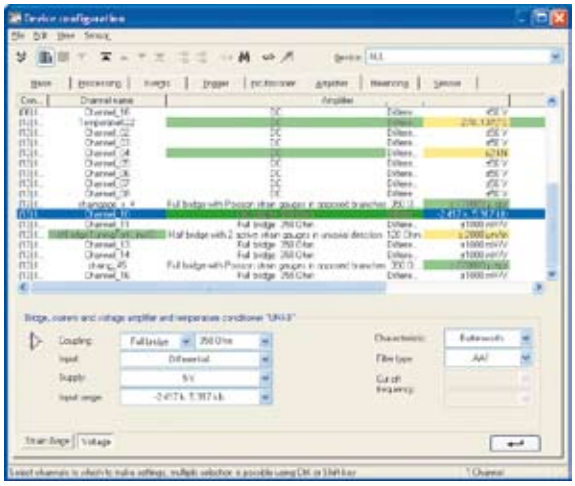
The strain gauge measurement amplifiers are designed for digital measurements with strain gauges and other bridge-type circuits, and are designed to permit high speed and high resolution digitizing of the analog signals. The strain gauge signal is processed with 24-bit internal resolution, at a sampling rate of 50 kHz per channel and with a bandwidth of 14 kHz.

Subsequent signal processing is digital, with all the speed and flexibility that DSP implies, such as zero-balancing and amplifier adjustments, every imaginable filter function, complete voltage analysis, and even real time rosette calculation and determination of the principle strains and their direction, all in real time.

A Choice of DC or Carrier Frequency Modes

The bridge sensor amplifier offers both carrier frequency (AC) and DC bridge excitation, ensuring high quality measurements, immune to the effects of cable length in any type of bridge circuit.

This eliminates the need for certain special, complex wiring techniques, while still supporting every possible arrangement of quarter, half, and full bridge sensors.



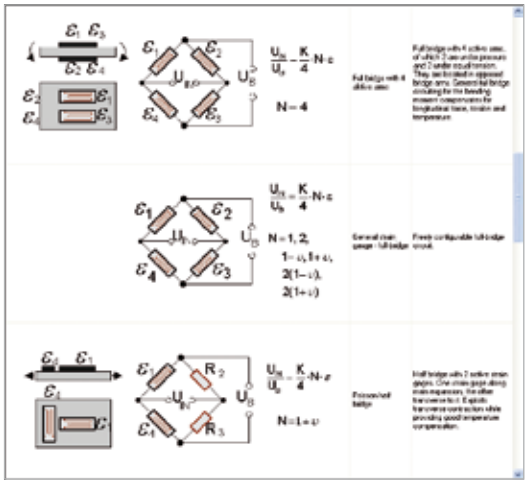
Easy, visual selection of strain gauge and sensor bridge settings

Clean and Simple with TEDS and Networked Measurements

The latest imc measurement amplifiers also support TEDS and the imc Plug & Measure technology for highly simplified measurement configuration.

Long sensor lead lines are avoided thanks to the possibility for a decentralized arrangement of measurement amplifiers. This is preferable for practical reasons, since shorter analog signal leads are lower cost and less susceptible to electrical interference, with the long distance connections handled digitally, and thus virtually immune to noise.

TCP/IP networking via Ethernet or WLAN is universally accepted, with a very low cost to implement over small and large areas alike, and so serves as the basis for CRONOS PL's distributed architecture.



Graphical selection of the strain gauge configuration

CRONOS PL can handle Long Sensor Leads

Long sensor leads, especially in low-level signal measurements such as strain gauges, used to be one of the greatest challenges for the test and measurement instrument. In cases where long measurement leads are unavoidable, and distributed measurement instruments are impractical, there is a danger that noise will disrupt or even obscure the desired signal.

Signal transmission between distant measurement sites is prone to interference. Voltage drops along long signal lines must be compensated by the measurement amplifier. Long, low-loss conductor leads are also very expensive, with the investment in sensor cables often exceeding that for the sensors, measurement amplifiers and data acquisition equipment!

The imc bridge measurement amplifiers offer a variety of compensation procedures for taking control over long measurement lines in a variety of situations. Sense lines can be used, although the additional cost of cabling can make this less desirable.

CRONOS PL also provides a software-activated shunt calibration resistor which enables the estimation of, and compensation for, the voltage drop-off along the measurement line in DC measurements, even without sense lines.

For extremely demanding situations, strain gauge line lengths of up to 500 m are handled with automatic compensation in the carrier frequency (AC excitation) mode.

Strain Gauge Measurement Networks

When dealing with high channel counts, and distributed measurement sites, multiple devices of the CRONOS PL family can be easily networked via Ethernet or WLAN.

Additionally, CANSAS measurement modules such as the universal measurement amplifier module CANSAS-UNI8 can be connected, synchronized, and stored with the CRONOS PL data. Measurement quantities like voltage, current, ICPs®, thermocouples and resistive thermal devices can be easily added.

In this way, measurement networks with a virtually unlimited number of channels can be set up, even across long distances. All measured data is captured in parallel and synchronous to the user designed master device.

When Demands are High

For such cases there is only one choice: the CRONOS PL's BR-4. This 4-channel precision measurement amplifier supports all possible arrangements of quarter, half, and full bridge circuits in both DC and CF mode.

Representing the peak of technical innovation, there is no better combination of flexibility, dynamic range, precision, and low noise floor, available on the market today.

BR-4

For Large Channel Counts and Normal Demands

For less demanding applications there is the CRONOS PL's DCB-8. By excluding the CF mode, and with somewhat looser specifications, this measurement amplifier offers an aggressive cost-per-channel, appropriate for high density, multi-channel dynamic and quasi-static strain gauge applications.

DCB-8

imc WAVE Software Platform
Workstation for Acoustic and Vibration Engineering

imc WAVE is a software platform which targets CRONOS PL for specialized noise and vibration measurements and analysis. imc WAVE supports a project-oriented methodology, and serves in place of the data acquisition oriented imcDevices software.

The CRONOS PL hardware, combined with the dedicated Audio amplifiers, and the imc WAVE software platform, achieves an entirely new functionality and ease-of-use targeted for specific noise and vibration measurements.

A wide variety of microphones and accelerometers are directly supported by the system. This makes operation of the system reliable, quick and straight-forward for even a novice user.

imc WAVE's project oriented design provides ready access to configuration, live signal, and previously recorded data, while the standard analysis tools provide direct access to a wide variety of standard analyzers, making your work faster, simpler and more efficient.

AUDIO-4

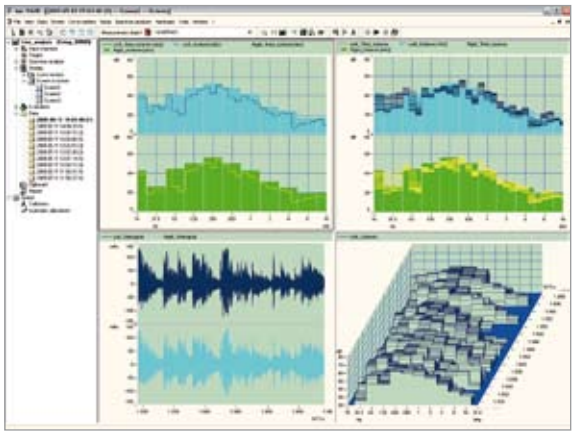
Sampling rate: 50 kHz
Bandwidth: 22.4 kHz
Output of 1/3-octave spectra
Direct connection of ICP sensors and microphones

AUDIO-4 MIC

Sampling rate: 50 kHz
Bandwidth: 22.4 kHz
Output of 1/3-octave spectra
Direct connection of ICP sensors and microphones, and condenser microphones (200 Volt polarization voltage)

Spectrum Analyzer

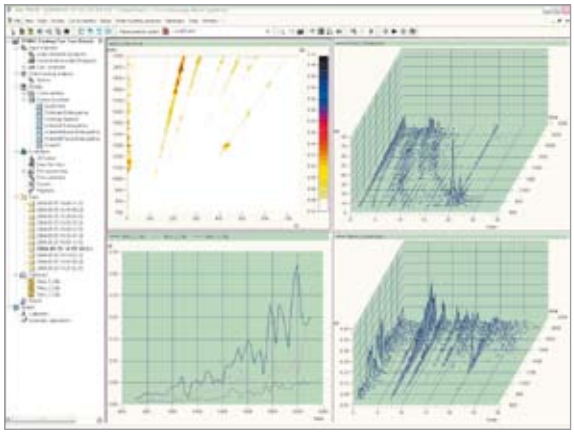
Based in the FFT algorithm, the Spectrum Analyzer gives ready access to a host of spectra representations and analysis techniques, including third octave, octave and narrow band spectra (FFT spectra). Multiple time and frequency based filtering and weighting algorithms, as well as windowing functions, are available to aid in evaluation.



Order Tracking Analyzer

Along with the various types of FFT analysis of time-domain signals, a special frequency-based analysis of signals versus RPM, in the angular domain, is also possible. By means of the analysis of harmonics, vibrations which depend on the rotation speed can be investigated and critical rotation frequencies can be determined.

With order tracking analysis it is possible to distinguish between vibrations caused by external forces and those due to resonances in the machinery's structure.



Order tracking analysis with imc WAVE

Sound Power Analyzer

The sound power is determined by means of the average sound pressure level on a predefined measurement surface enclosing the object being tested. The enclosing surface can be a sphere, hemisphere, or be defined by 1 to 6 freely defined surfaces. Measurements according to ISO 3741, 3743, 3744, 3745, 3746 and 11094 are supported.

Standards-Compliant Measurement of Workplace Noise

The workplace noise is determined in accordance with ISO 11201. This Analyzer can also be used in parallel with the Sound Power Analyzer in order to avoid time-demanding multiple measurements if sound power levels and workplace noise measurements must both be taken.

Pass-By Noise Analysis of Motor Vehicles

This module serves the special purpose of measuring the noise of passing vehicles in accordance with ISO 362, and various associated standards. In this procedure, the vehicle drives at predefined constant speed into the test area, and then accelerates under full throttle in 2nd gear past the measurement microphones.

Environmental parameters can be recorded with the test run, and during the test, additional signals from the CAN- or LIN-Bus can be synchronously captured.

Personal Wave

This special purpose analyzer allows user specific measurements and analysis algorithms to be created and used within the WAVE framework, allowing the possibility of special purpose testing which is inadequately handled by the standard analyzers.

In conjunction with imc FAMOS and the CRONOS PL's Online FAMOS, sequences can be written for the time-domain data to automatically create calculated virtual channels and test results. imc WAVE is able to import, transfer and display the quantities computed.

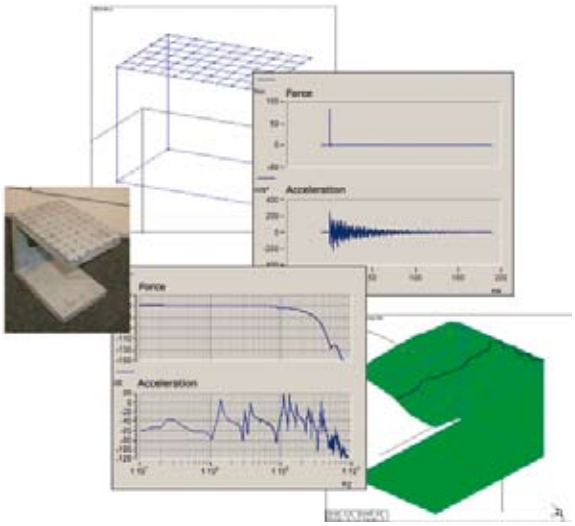
Site specific standard measurement procedures such as those stipulated by DIN 45657, EN ISO 5349-1 and ISO 2631-1 can also be carried out.

Structure Analyzer

The Structure Analyzer is specifically designed for the determination and measurement of resonances in rigid mechanical structures.

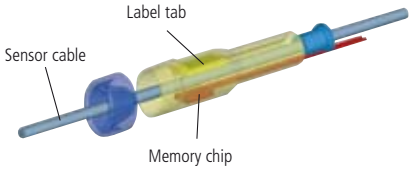
By simultaneously recording the defined force signal applied to the structure, with the resultant motion observed by one or more acceleration sensors, the transfer function can be determined. Repetitive measurements of the object under test allow a complete description of the structure's vibration behavior.

For subsequent signal processing, imc FAMOS is available, but direct transfer for the popular analysis programs ME´Scope™ and µ-Remus™ is also possible.



Investigating a mechanical structure in imc WAVE

The Logical Extension of the TEDS Standard



imc Plug & Measure – Complex Configurations are Child's Play

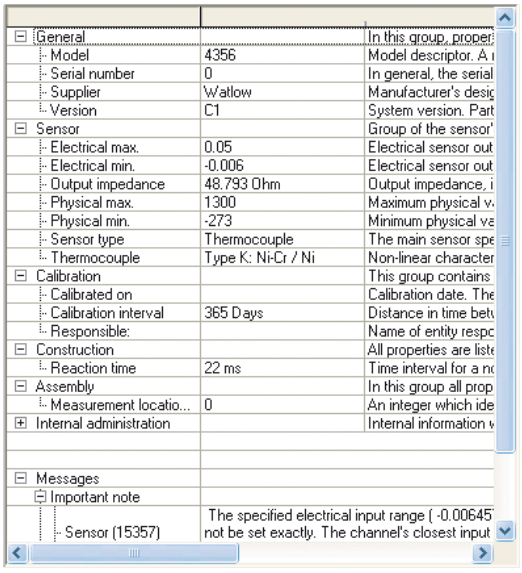
The imc Plug & Measure technology is based on the Transducer Electronic Data Sheet (TEDS) concept set out in IEEE 1451.4. The digital storage of calibration and configuration information within the sensor fulfills the dream of quick and error-free test setup, even by novice users.

A TEDS sensor, or a conventional sensor equipped with a sensor recognition memory unit, contains a record of the sensor's data and the measurement device settings.

CRONOS PL reads this info and configures itself accordingly. Mislabeling channels, or mistyping calibration information becomes impossible, and incompatible measurement channel settings are recognized automatically. What could be simpler?

Advantages and Applications

- Quick and error-free measurement configuration
- Reduction of routine work
- Recordable measurement channel recommendations (sampling rate, filter settings, etc.)
- Standardization of channel designations for sensors used
- Verification of calibration data and validity
- Quick and unambiguous traceability of calibration data, e.g. per ISO9000
- Monitoring of calibration intervals
- Measurement device-independent sensor administration



Database Driven Sensor Administration

Administration of sensor information is supported by imcSensors, the sensor database for use with the imc Plug & Measure technology.

For the measurement system, in addition to the import of information from sensor with TEDS, parameter values can also be easily transferred from the sensor database with Drag & Drop simplicity.

In this way, TEDS information can be transferred via the imcDevices software from the sensor database to the sensor, or vice versa. For more complete sensor administration, the sensor database also supports barcode readers to track and identify transducers.

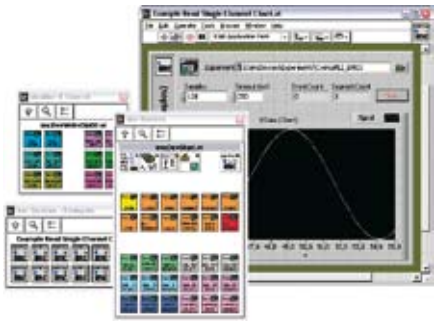
imcSensors makes the use and administration of many different sensors quick, easy and economical by the use of TEDS and imc Plug & Measure. With imcSensors it is possible to:

- Administer sensors from a central database
- Parameterize a CRONOS PL measurement channel
- Track the calibration status
- Inspect the specification sheet

imcSensors is an optional software expansion for imcDevices, although the TEDS capability of Plug & Measure is always available through imcDevices.

Especially appropriate is the CRONOS-PL's IEEE 1451.4 (TEDS) capable UNI-8 input amplifier. The all-purpose inputs of the UNI-8 allow the direct connection of a wide variety of sensors, fully exploiting the idea of "Plug & Measure".

Efficient System Integration with COM™, LabView™ or DIAdem™



CRONOS PL in the Test Cell

While the standard imcDevices software is a powerful and versatile part of the Test Engineer's toolbox, imc also realizes that Test stands and other specialized, specific test programs with repetitive, predefined measurements often benefit from a customized user interface.

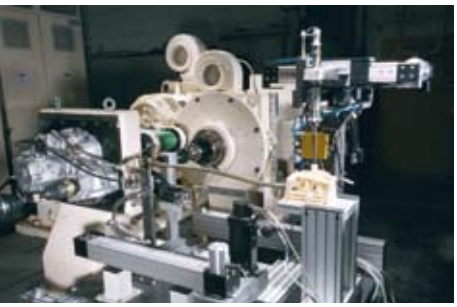
In these cases, the system integrator may require special measurement properties, measurement process control, and communication with outside devices, e.g. an automation system, other measurement devices and sensor systems.

The solution for such cases is to develop custom test control and user interface software, built on a foundation of proven, standard software components.

At issue is the efficiency of the programming and the time to implement a software project. In addition, system maintenance, updates and expansions should be made available at a rapid pace and low cost.

The CRONOS PL programming interface offers the ability to apply imc hardware and software functionality very efficiently, regardless of the system integrator's choice of programming language.

Function Calls in a Test Rig Program with only a Few Lines of Code



By means of imcDevices, the entire measurement, including all real time functions, displays of measured values, online and offline computations, data saving and generation of measurement reports can be configured, tested, and verified down to the last detail.

Then, this complete configuration, including all the hardware and real time settings, can be quickly and easily loaded with just a few lines of code in the custom test software.

The only programming tasks left for the system integrator are those specific to the measurement process control, communication with other devices and creation of the custom user interface.

COM Interface

For professional software developers, all imc functions for configuration, calculation, and graphics are accessible as COM™ libraries or ActiveX™ controls. The programmer has a choice of COM compatible programming languages, such as Visual Basic™, Visual C++™, Delphi™ and many more.

LabView Interface

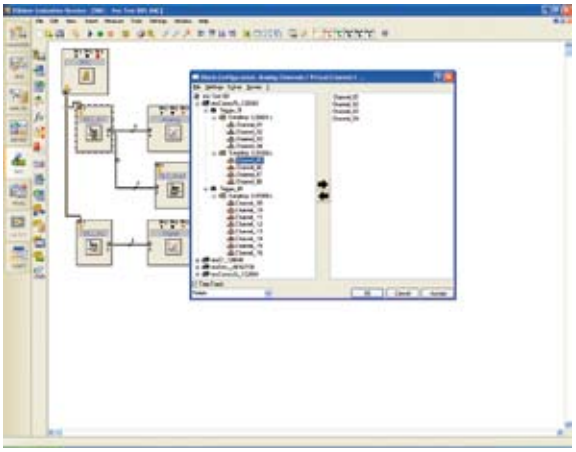
LabVIEW™ is a widely prevalent programming environment in measurement engineering. The user can appreciate the graphical programming language G™, because it uses syntax similar to circuit diagrams as well as functions pre-packaged in so-called "Virtual Instruments", or VIs™.

imc offers a number of VIs and example implementations which are directly accessible via the LabVIEW functions palette. With these VIs, imc devices such as the CRONOS PL can be configured, started and stopped, with the acquisition of input measurement data, and control of external devices though, for example, analog and digital output signals.

DIAdem Interface

DIAdem™ is another program with which control tasks can be designed on the form of simple schematic diagrams.

imcDevices is totally integrated into DIAdem's data acquisition component via the GPI-expansion, and by means of Online FAMOS it is able to outsource real time computations and open- and closed-loop control tasks from the PC to the CRONOS PL. In furtherance of this, DIAdem supports the entire aggregate sampling rate and the full scope of the CRONOS PL's functionality.



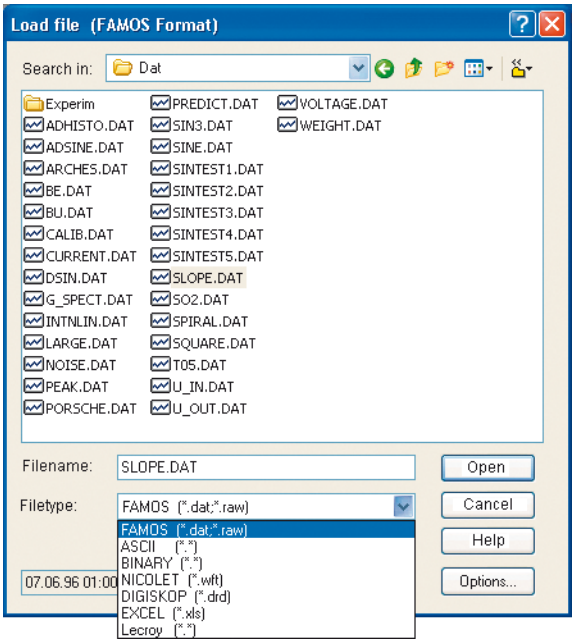
Signal Analysis with imc FAMOS

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, FAMOS' built-in macro environment.

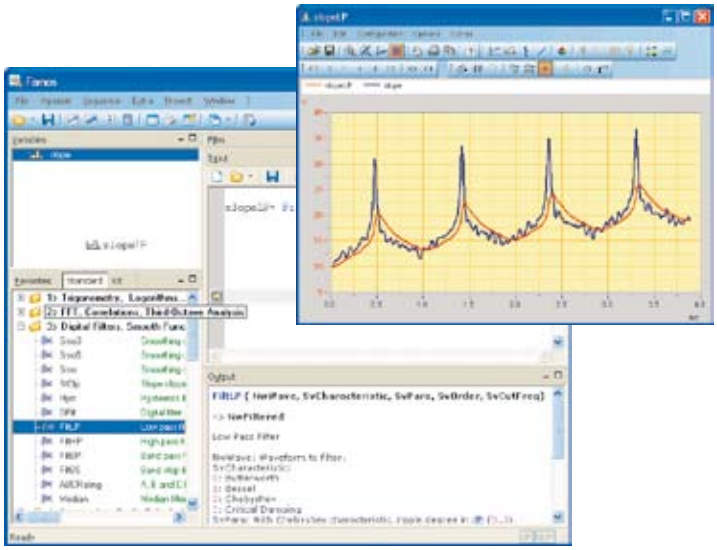


Data Exchange

Handling a Wide Variety of Data Formats

For trouble-free import and export of non-imc data formats, imc FAMOS includes the File Assistant, and a number of pre-defined format filters. The File Assistant allows users to add support for other data formats as needed.

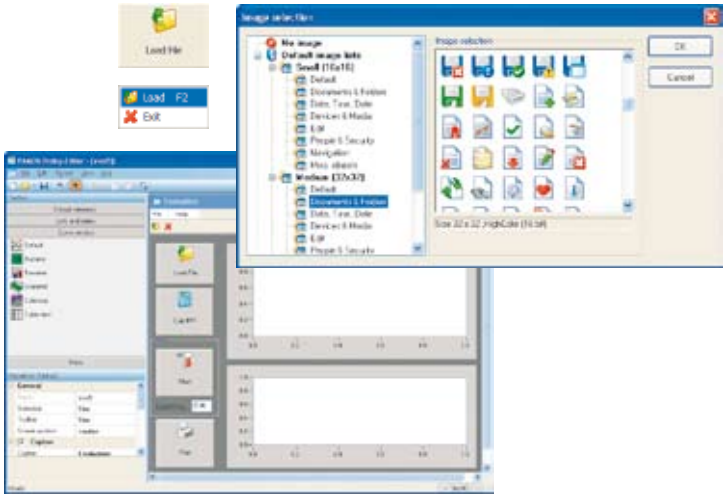
For more complex database structures, and for incorporating proprietary formats with vendor-supplied API's, a Dynamic Link Library (.dll) based import and export interface is provided in imc FAMOS. A variety of customer specified formats have also been incorporated into a standalone file conversion utility, ImExport,



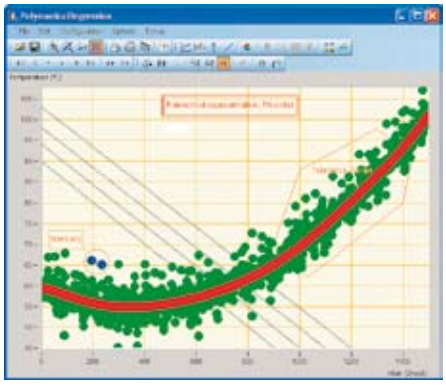
Data Analysis

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.



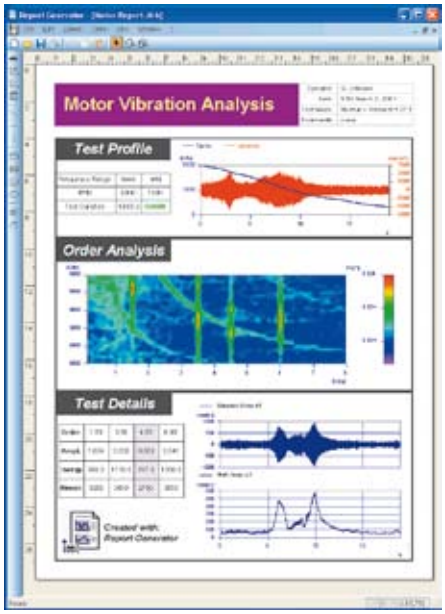
imc FAMOS 5 includes the Dialog Editor, Making it possible to quickly define a huge range of user interface dialogs which are tailored to the desired interface, function, or command.



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.



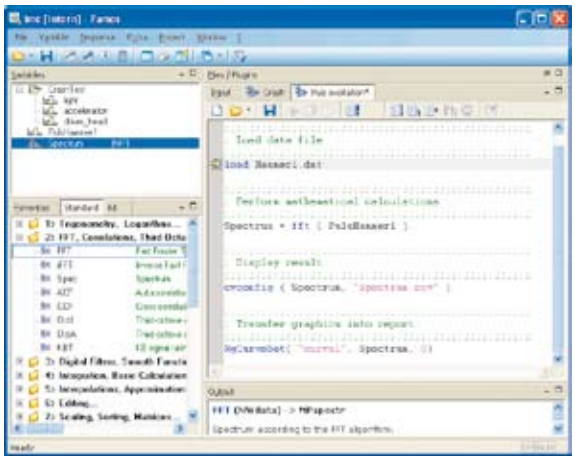
Documentation

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 5 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. Perhaps more importantly, report preparation can be automated through the FAMOS 5 macro language.

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

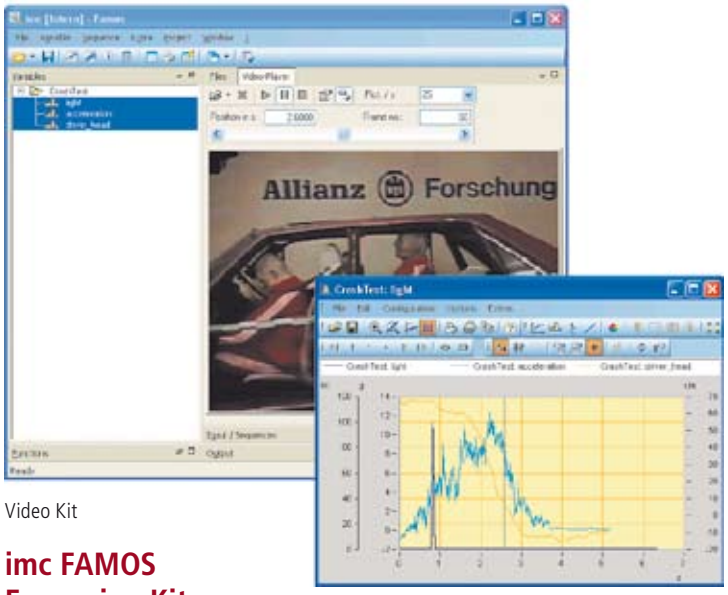


Automation

Gain Efficiency by Automating Routine Tasks

imc FAMOS 5 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.



Video Kit

imc FAMOS Expansion Kits

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

- Class Counting / Rainflow
- Order Tracking
- Filter Design
- Spectral Analysis
- Video (picture data and measurement data synchronized)
- ASAM-ODS
- COM Class Library

System Housing Options

Bench Top / Portable Enclosures

imc CRONOS PL 4 for up to 32 measurement channels*

Dimensions (W x H x D): 286 mm x 150 mm x 276 mm Weight: 7 kg Module slots: 4 Rear view

imc CRONOS PL 8 for up to 64 measurement channels*

Dimensions (W x H x D): 286 mm x 150 mm x 333 mm Weight: 8 kg Module slots: 8 Rear view

imc CRONOS PL 16 for up to 128 measurement channels*

Dimensions (W x H x D): 470 mm x 150 mm x 333 mm Weight: 9 kg Module slots: 16 Rear view

19" Rack Enclosure

imc CRONOS PL 13/15 for up to 104/120 measurement channels* in the 19'' frame for rack installation

Dimensions (W x H x D): 427 mm (19" rack) x 133 mm x 310 mm Weight: 9 kg Module slots: 13 or 15

* Channel count depends on amplifiers chosen. Measurement channel count of up to 512 with additional external modules.

Hardware Configuration

Connections	
Analog Inputs	modular [1]
Digital Inputs	modular [1]
Digital Outputs	modular [1]
Analog Outputs	modular [1]
Signal Synthesizer	modular [1]
Decentralized Expansion with imc CANSAS Modules	o
Field Bus Interface [3]	
CAN-Bus Interface	o
LIN-Bus Interface	o
J1587 Interface	o
ARINC Interface	o
Profibus DP	(in preparation)
ECU-Protocols (KWP 2000, CCP, etc.)	o
Data storage	
Continuous storage on Internal Drive	✓
Continuous storage to PC or Network Drive	✓
Circular Buffer Memory Option	✓
PCMCIA Slot for Removable Flash Drive	✓
Compact Flash slot for CF-card	o
Internal Hard Drive	o
Displays	
Connection for External Display Terminal	o
Display built into device [2]	o
Data Transfer	
External Modem Connection	✓
Ethernet Interface (TCP/IP)	✓
Wireless LAN PCMCIA card [4]	o
Radio Clock, Device Synchronization, GPS	
imc Devices Synchronization via Sync-Line	✓
Connection terminal for external DCF77 signal	✓
Device preparation for GPS real time clock	o
IRIG-B	(in preparation)
Power Supply	
Supply Voltage	10-36V DC [5]
Power Adapter 110V / 230V	✓
Battery Buffering, UPS (30 sec buffer time)	✓
Automatic Charging Control	✓
Self-Activation Following Power Outage	✓
Auto Data Saving on Power Outage	✓
Battery Operation up to 6 hours	o
Environmental Operating Conditions	
Operating temperature (-10° to 55°C)	✓
Extended temp range (-20° to 85°C)	o
Condensation Protection (0 to 100% RH)	o

[1] see list of the imc CRONOS-PL modules for voltage, current, ICP, thermocouple, PT100, strain gauge, measurement bridge, incremental counter, high voltage and current probe options on pp. 26-27
[2] Built-in display available optionally at no extra cost (except PL-4). With internal display, external hand-held terminal connection is omitted
[3] Requires one module port per interface
[4] Occupies the PCMCIA slot, in lieu of the PCMCIA removable flash drive
[5] For CRONOS PL-13, direct AC power connection only, 110 / 230VAC

Accessories

Data transfer	
PCMCIA-WLAN adapter	o
Internal analog modem	o
Internal GSM radio modem	o
Internal ISDN modem	o
Data storage	
PCMCIA Solid State (removable drive)	o
Compact Flash memory	o
Display, control peripherals	
Hand-held alpha-numeric terminal	o
B/W display (graphics terminal)	o
Color display (graphics terminal)	o
Radio clock, device synchronization, GPS	
DCF77 or GPS real time radio clock	o
External GPS receiver (1 / 5Hz)	o

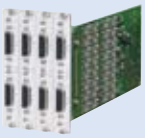
Software configuration

Operating software	
Universal applications	
imcDevices	✓
Total parameterization for CANSAS modules	o
ECU protocols for CAN Interface	o
Vector database linkage	o
Noise and Vibration Analysis	
imc WAVE Order tracking analyzer	o
imc WAVE Spectrum analyzer	o
imc WAVE Sound Power analyzer	o
imc WAVE Workplace Noise analyzer	o
imc WAVE Passy Noise analyzer	o
imc WAVE Structure analyzer	o
imc WAVE PersonalWave	o
Online Software options	
Online FAMOS	o
Online FAMOS Professional	o
Online Class-counting package	o
Online Order-tracking analysis	o
Measurement Data Analysis and Administration	
imc FAMOS signal analysis software	o
imc Sensors sensor database	o
imc LOOK data visualization software	o
Development Environment	
LabView™ interface, VI's	✓
DIAdem™ interface	✓
imc COM basic package	o

✓ = default
o = optional
– = not available

Measurement Amplifiers and Modules

Multi-Purpose Amplifiers

	Cost Effective High Density Channels	High Channel Count, Cost Effective	Flexible Voltage Measurements	High-Precision Temperature Measurement	Cost Effective Isolated Inputs	High Quality Isolated Inputs	Multi Purpose and High Performance
	SC2-32	**LV-16**	**LV2-8**	**C-8**	**OSC-16**	**ISO2-8**	**UNI-8**
							
Analog inputs	32	16	8	8	16	8	8
Differential inputs	✓	✓	✓	✓	✓	✓	✓
Isolated	–	–	–	–	✓	✓	–
Voltage	✓	✓	✓ ✓	✓	✓	✓	✓
Current	o	o	o	o	o	o	o
Thermocouples	–	–	–	✓ ✓	✓ ✓	✓	✓
PT100	–	–	–	✓ ✓	✓ ✓	✓	✓
Strain gauge / Bridge	–	–	–	–	–	–	✓
Bridge types and operation	–	–	–	–	–	–	1/4, 1/2, 1/1 DC
Current-fed sensors (ICP)	o	o	o	o	–	o	o
Max. sampling rate/channel	100 kHz	20 kHz	100 kHz	100 Hz	50 Hz	50 kHz	100 kHz
Aggregate sampling rate	400 kHz	320 kHz	400 kHz	400 kHz	400 kHz	400 kHz	400 kHz
Bandwidth	28 kHz	6.6 kHz	14 kHz	20 Hz	7 Hz	8 kHz	14 kHz
Input range (V)	±250mV ... ±10V	±250mV ... ±10V	±5mV ... ±50V	±2,5mV ... ±50V	±50mV ... ±60V	±50mV ... ±60V	±5mV ... ±50V
Input range (I)	±5mA ... ±50mA	±5mA ... ±50mA	±1mA ... ±50mA	±50µA ... ±50mA	±1mA ... ±40mA	±1mA ... ±40mA	±1mA ... ±50mA
Input range (bridge)	–	–	–	–	–	–	±0.5mV/V ... ±1000mV/V
Sensor supply	o	o	o	o	o	o	✓ ✓
TEDS	✓	✓	✓	✓	✓	✓	✓
Required slots	4	2	1	1	2	1	2

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

Modules for open- and closed-loop control

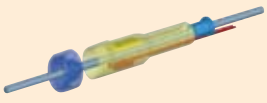
DI-16 [1] or DO-16 [2]	DIOENC	DAC-8	SYNTH
 DI-16: 16 TTL digital inputs, CMOS or 24V logic DO-16: 16 digital outputs TTL/24V	 8 DI, 8 DO, 4 counter inputs	 Target value output, ±10V	 Signal synthesizer for generating arbitrary output signal shapes and sequences

[1] Also available upon request in a 4-channel high-voltage version for voltages over 24V/TTL up to 230Veff / 400V (DI-HV-4)
[2] Also available upon request with increased current bearing capacity (DO-HC-16)

Special applications

	DCB-8	BR-4	AUDIO-4	AUDIO-4 MIC	ICPU-8	ICPU-16	HV-2U2I HV-4U
							
Analog inputs	8	4	4	4	8	16	4
Differential inputs	✓	✓	✓	✓	✓	✓	✓
Isolated	–	–	–	–	–	–	✓ ✓(CAT III)
Voltage	✓	✓	✓	✓	✓	✓	✓ ✓
Current	o	o	–	–	–	–	✓ ✓
Thermocouples	–	–	–	–	–	–	–
PT100	–	–	–	–	–	–	–
Strain gauge/ Bridge	✓	✓ ✓	–	–	–	–	–
Bridge types and operation	1/4, 1/2, 1/1 DC	1/4, 1/2, 1/1 DC/CF	–	–	–	–	–
Current-fed sensors (ICP)	o	o	✓ ✓	✓ ✓	✓ ✓	✓ ✓	–
Max. sampling rate/channel	100 kHz	20 kHz	100 / 50 kHz	100 / 50 kHz	100 kHz	20 kHz	100 kHz
Aggregate sampling rate	400 kHz	400 kHz	400 kHz	400 kHz	400 kHz	400 kHz	400 kHz
Bandwidth	5 kHz	8.6 kHz	49 / 22.4 kHz	49 / 22.4 kHz	14 kHz	6.6 kHz	17 kHz
Input range (V)	±5mV ... ±10V	±5mV ... ±50V	±25mV ... ±50V	±25mV ... ±50V	±5mV ... ±50V	±250mV ... ±10V	±2,5V ... ±1000V
Input range (I)	±1mA ... ±50mA	±100µA ... ±40mA	–	–	–	–	current input range depends on transducer
Input range (Bridge)	±0.5mV/V ... ±1000mV/V	±1mV/V ... ±2000mV/V	–	–	–	–	–
Sensor supply	✓ ✓	✓ ✓	–	✓ ✓	–	–	–
TEDS	✓	in preparation	✓	✓	✓	✓	✓
Required slots	2	1	1	2	2	4	2

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

Measurements with incremental counters	Sensor supply		Plug & Measure
HR-ENC-4, ENC-4	Sensor supply module	Microphone supply module	Sensor recognition, TEDS
 Direct connection of incremental counters, for measurement of time- and frequency signals	 This module supplies a variety of voltage levels, selected by switch Standard in UNI-8, DCB-8	 Expands AUDIO-4 to an AUDIO-4 MIC module	 Sensor recognition for connectors, Sensor recognition for cables

Support – Training – Special Assistance

High operational availability through adapted system maintenance

The purpose of our customer support is to optimize your operation with our products, and thus to protect the value of your investment for years to come. Tailored system maintenance enables ongoing trouble-free operation while minimizing total cost.

Best Utilization

To obtain the best equipment utilization, it is necessary to be well versed in all of the measurement system's functions. The quickest way to achieve this is to order system training and commissioning along with your system purchase.

Standard, customized and topical training sessions

New customers value our intensive introductory training sessions, and use them to save both time and money. Experienced users appreciate our customized training sessions and specialized workshops on a wide range of measurement engineering topics.

And when you are short handed, or for tricky jobs…

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

Problems with the hardware, software, or the testing application?

We maintain a competent and reliable Hotline for addressing your concerns. And if the problem can't be solved over the phone, we can attempt remote maintenance over the Internet, or will arrange an in-person service call.

Selectable system maintenance options

- Commissioning
- Extended guarantee
- System instruction
- Express service
- System inspection
- Remote maintenance
- System revision
- On-site support
- System update
- Technical support
- Training, and much more

"First Aid" required?

For quick help, please visit the imc web site. The answers for frequently asked questions, tips and tricks, measurement hints and solutions for general problems can be found there. To get instant information simply visit our web site under www.imc-berlin.com and click on 'Customer Support'. Sorted by diverse topics, products and problem, you'll find the assistance you need.

Calibration Certificate

imc

Data Aquisitioning System imc C-Series **Object under Test / Zu testender Gegenstand**[1]	imc_03/11/05_120265_muster **Number of Certificate / Kalibrierscheinnummer**
imc CS-6004 **Type / Typ**	120265 **Serial Number / Seriennummer**
imc MeSsysteme GmbH Voltastraße 5 13355 Berlin, Germany **Manufacturer / Hersteller**	☎ (+4930) 467090-0 FAX: (+4930) 4631576
Additive GmbH **Customer / Auftraggeber**	B-001479/05 **Order No. / Auftragsnummer**	imc KA05/10082 **imc No. / RMA No. / Service No.**
PM 215 Calibrator HBM K3607 s/n 051420188 valid until 2005-12-30 PM 220 Calibrator Fluke 5500A s/n 7000012 valid until 2005-12-30 **Measurement standard(s)**[2] **/ Normal(e)**	
PC station: P522 Calibration Station: PM 242 – MUX, PL-P1 Final Test PC: MB **Test Station / Prüfplatz**	imcDevCal 2.0.9 imcDevices 2.4 Rev. 11 **Software / Kalibriersoftware**
direct measurement / Direkte Messung[3] **Calibration procedure / Kalibrierverfahren**	23 °C +/- 5 °C / 40 % +/- 30 % relative humidity **Ambient air temperature / Umgebungstemperatur**
pass **Result / Ergebnis** [4]	*Measurement Uncertainty:* *< 0,05 % of measurement range or < 1 K* *or refer to the protocols* Messunsicherheitsangabe: < 0,05 % vom eingestellten Messbereich bzw. < 1 K wenn nicht anders im Protokoll angegeben **Remarks / Hinweise**

i. A. Dipl.-Ing. M. Schleibner - Adm **Quality Assurance Manager / Stamp**	MB **Inspected by / Geprüft durch**	03-NOV-2005 **Issue Date / Ausstellungsdatum**

Telefon: 030 / 46 70 90-0

[1] ***All tests were performed in accordance with DIN EN ISO 9001 using modern technology. This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI). The user is obliged to have the object recalibrated at appropriate intervals. This test certificate can only be reproduced in its entire form. No excerpts may be used nor may any changes be made without full express consent. Test certificates without signature and seal are not valid.***
Die Tests wurden mit aller Sorgfalt und in Anwendung der DIN EN ISO 9001 durchgeführt.
Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich. Dieses Zertifikat darf nur vollständig und unverändert verbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung von imc. Zertifikate ohne Unterschrift oder Stempel sind nicht gültig.

[2] ***The testing equipment used is subject to imc's internal test equipment monitoring; it can be identified by the respective "PM" number.*** Die verwendeten Prüfmittel und Normale werden über die imc Prüfmittelnummer "PM" identifiziert.

[3] ***The calibration was performed by comparing the value indicated by the standard instrument with the value indicated by the calibrated object. All procedures have been developed by imc itself. The certificates and reports of measured values are archived electronically and can be ordered retroactively. The members of our Quality Assurance team are happy to assist you if you have any question about calibration***
see www.imc-berlin.de/en ***=> Customer Support (call +49-30-467090-26, email:*** hotline@imc-berlin.de)
Die Kalibrierung erfolgte durch Vergleich der Anzeige der verwendeten Normale mit der Anzeige des Kalibriergegenstandes.
Sämtliche Verfahren sind von imc selbst entwickelte Verfahren. Die Zertifikate und Messwert-Protokolle werden elektronisch archiviert und sind nachstellbar. Bei Fragen zur Kalibrierung stehen Ihnen die Mitarbeiter unserer Qualitätssicherung gerne zur Verfügung.
siehe auch www.imc-berlin.de => Kundendienst (Tel. +49-30-467090-26, email: hotline@imc-berlin.de)

[4] ***Pass: The device / equipment under test fulfills the manufacturer-specifications or the specifications mentioned in the calibration instruction.*** / Der Prüfling entspricht den Herstellerspezifikation bzw. den Toleranzen der Kalibriervorschrift.

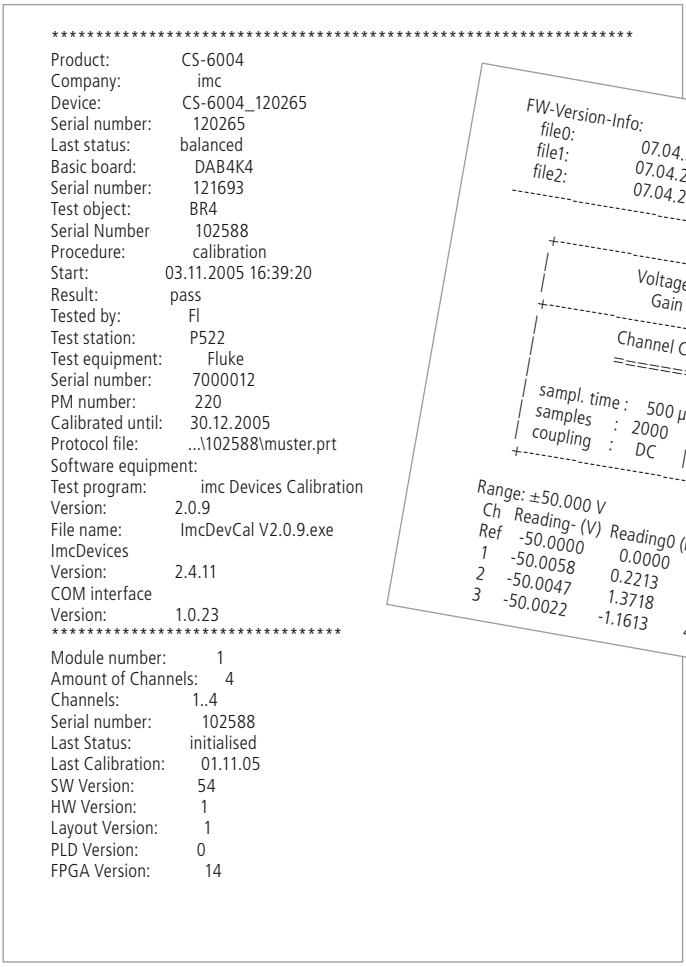
Fail: The device / equipment under test does not fulfill the manufacturer-specifications nor the specifications mentioned in the calibration instruction. / Der Prüfling entspricht nicht den Herstellerspezifikation bzw. den Toleranzen der Kalibriervorschrift.

imc MeSsysteme GmbH — calibration-certificate_master_C-Series.doc — page 1 of 1

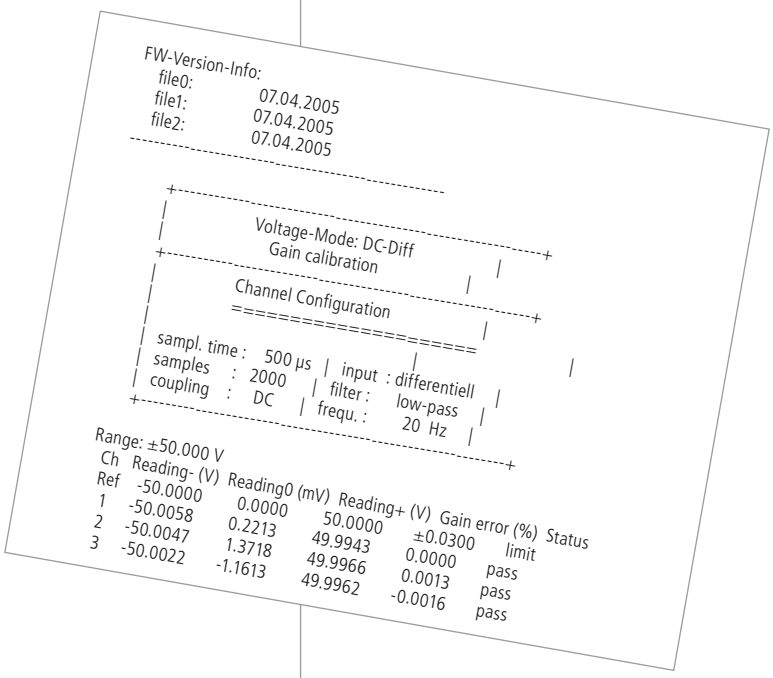
Calibration in the Framework of Measurement Equipment Monitoring

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.



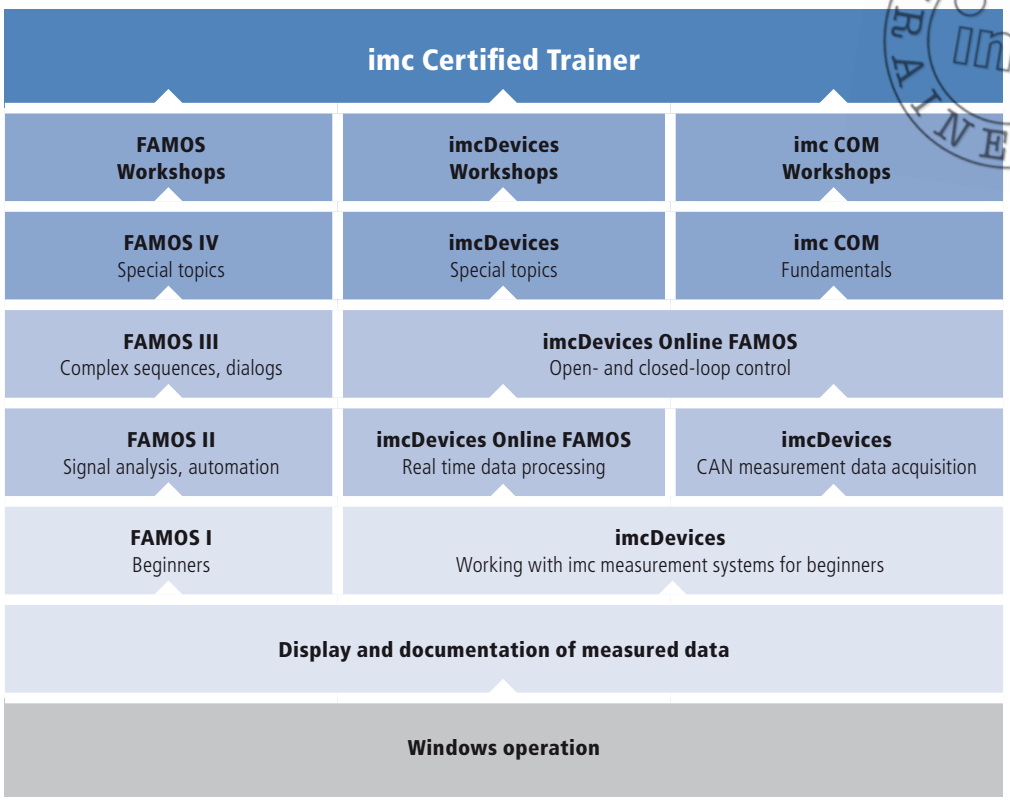
```
**********************************************************************
Product:              CS-6004
Company:                imc
Device:               CS-6004_120265
Serial number:          120265
Last status:          balanced
Basic board:            DAB4K4
Serial number:          121693
Test object:            BR4
Serial Number           102588
Procedure:              calibration
Start:              03.11.2005 16:39:20
Result:               pass
Tested by:              FI
Test station:           P522
Test equipment:          Fluke
Serial number:          7000012
PM number:              220
Calibrated until:       30.12.2005
Protocol file:          ...\102588\muster.prt
Software equipment:
Test program:             imc Devices Calibration
Version:              2.0.9
File name:              ImcDevCal V2.0.9.exe
ImcDevices
Version:              2.4.11
COM interface
Version:              1.0.23
**********************************
Module number:          1
Amount of Channels:     4
Channels:             1..4
Serial number:          102588
Last Status:          initialised
Last Calibration:       01.11.05
SW Version:             54
HW Version:             1
Layout Version:         1
PLD Version:            0
FPGA Version:           14
```



```
FW-Version-Info:
  file0:          07.04.2005
  file1:          07.04.2005
  file2:          07.04.2005
-------------------------------

  +-------------------------------------------+
  |          Voltage-Mode: DC-Diff            |
  |            Gain calibration               |
  +-------------------------------------------+
  |          Channel Configuration            |
  |          ======================           |
  | sampl. time :  500 µs | input  : differentiell |
  | samples     :  2000   | filter :  low-pass     |
  | coupling    :  DC     | frequ. :  20  Hz       |
  +-------------------------------------------+

Range: ±50.000 V
 Ch  Reading- (V)  Reading0 (mV)  Reading+ (V)  Gain error (%)  Status
 Ref   -50.0000       0.0000        50.0000        ±0.0300       limit
 1     -50.0058       0.2213        49.9943         0.0000       pass
 2     -50.0047       1.3718        49.9966         0.0013       pass
 3     -50.0022      -1.1613        49.9962        -0.0016       pass
```



Schematic structure of product training programs stretching from beginner-level training all the way to an imc Certified Trainer

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.

Notes

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integrated measurement & control