imc CRONOS*compact*

comprehensive • modular • reconfigurable

Adaptable measurement and control system for mixed signal testing

imc CRONOS*compact* at a glance

- Portable and rack-mounted enclosure options
- Modular reconfigurable hardware, adaptable to changing testing requirements
- Extensive control capabilities with multiple levels of open and closed loop and simulation
- Simultaneous recording of analog, digital and field/vehicle-bus data
- Up to 400 kS/s per system and 100 kS/s per channel
- Supports virtually any physical sensor
- Sophisticated and intuitive triggering system
- Versatile storage options including onboard removable flash media
- Networkable with other imc systems for synchronous acquisition of thousands of channels
- Onboard real-time data analysis and reduction
- Stand-alone, remote or interactive operation

imc CRONOS*compact*

Surprisingly compact given all it can do

The imc CRONOS*compact* is the single most comprehensive data acquisition system for electro-mechanical testing on the market today. Integrating measurement, control and real-time simulation into one housing provides you with the reliability of absolute synchronization, and the convenience of having all of your tools in one place.

Whether you are measuring highly dynamic signals up to the audio range, using multiple PID control loops for test stand automation, or monitoring process signals and fieldbus data throughout an entire test cell, imc CRONOS*compact* is your universal system. From high voltage to current fed, and from strain gauges to thermocouples, the integrated signal conditioning of imc CRONOS*compact* also ensures compatibility of every sensor you may need.

Incorporating the complete range of modular I/O choices and integrated signal conditioning of the imc CRONOS platform, imc CRONOS*compact* provides the versatility and broad range of capabilities that allow you to achieve the highest levels of productivity in your testing.

With wired and wireless networking options, and remote connectivity through imc LINK, you can stay on top of your data no matter where it is being collected. When unattended operation is more appropriate for your testing situation, imc CRONOS*compact* is also able to operate in a stand-alone mode, automatically starting the data acquisition, control and simulation upon power-up.

All this capability is available in modular and reconfigurable portable housings or 19“ rack systems. Thus, imc CRONOS*compact* is suitable for in-vehicle and field testing and perfectly tailored for test stand applications.

imc CRONOS*compact*: the compact solution for all of your professional testing requirements.

Voltage & high voltage

Current

Temperature

Strain gauge

Frequency speed/angle

Digital input/output

IEPE/ICP acceleration

Analog output

Productive testing with imc CRONOS*compact*

Keeping up with your changing tasks

- Reconfigurable hardware design with a wide selection of plug-in amplifier/conditioner modules
- Software based configurations are easily stored, loaded, and modified to meet test demands
- Expandable via plug-in modules or distributed synchronous CAN I/O modules
- Support all electromechanical sensors in multi-channel, mixed-signal measurements
- Easily switch between interactive, remote, or standalone operation as test requires

Use your time effectively

- Comprehensive test stand data acquisition & real-time control in one integrated unit
- Real-time data processing while the test is running so results are immediately available
- Intuitive trigger system selectively stores the important data for easier post-processing
- Fast reconfiguration with exchangable modules and/or variable setups
- Customized solutions from imc to simplify 3rd party integration

Saving your money

- Universal amplifiers incorporate signal conditioning for most sensors types, from static to highly dynamic measurements
- Synchronous recording of analog, digital and industrial field/vehicle bus in one system
- imc's unique breakout connectors provide quick connections for any existing sensor
- Supports automatic sensor recognition, and add-on TEDS from imc

Gaining your independence

- Measurement, real-time control and simulation in one unit
- Portable design goes from field to test bench as your test requires
- Stand-alone operation with the flip of a software switch when the PC cannot be used
- Li-Ion battery option for long-term operation independent from the power grid
- Includes power-up self-start capability and internal storage

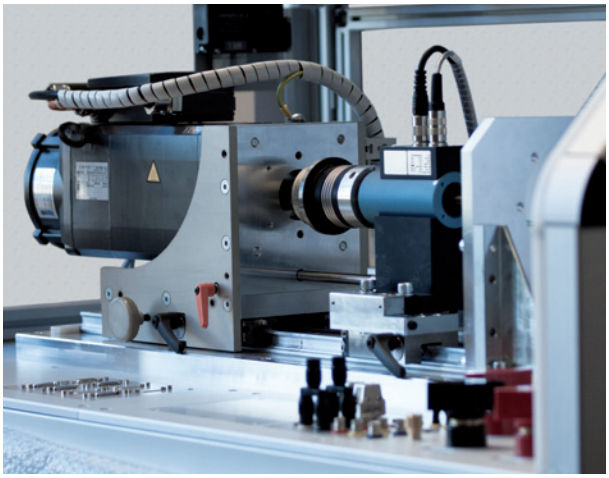
Securing your investment

- Robust power supply with backup power for uninterrupted operation
- Reliable operation assures data integrity
- Redundant data storage to local drive in parallel with network storage

In Practice

Incorporating simulated components in conventional testing

Given the short product development cycles now demanded by the market, test engineers are being called on to provide test data in early stages of the development process – often before the entire system is actually available. Using an imc CRONOS*compact* system equipped with the imc HiL option, you can quickly incorporate the Simulink models that the developers have already created directly into your test stand. Combining both virtual and real signals, tests can thus be performed on-time, following established standards and without changing existing test procedures.

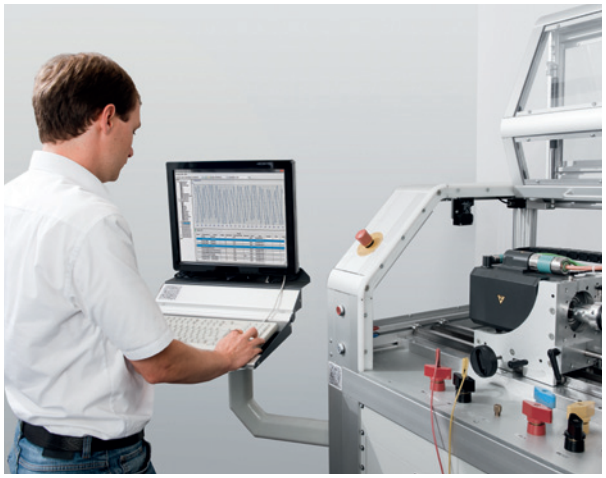


Combine analog, CAN, FlexRay, LIN, ...

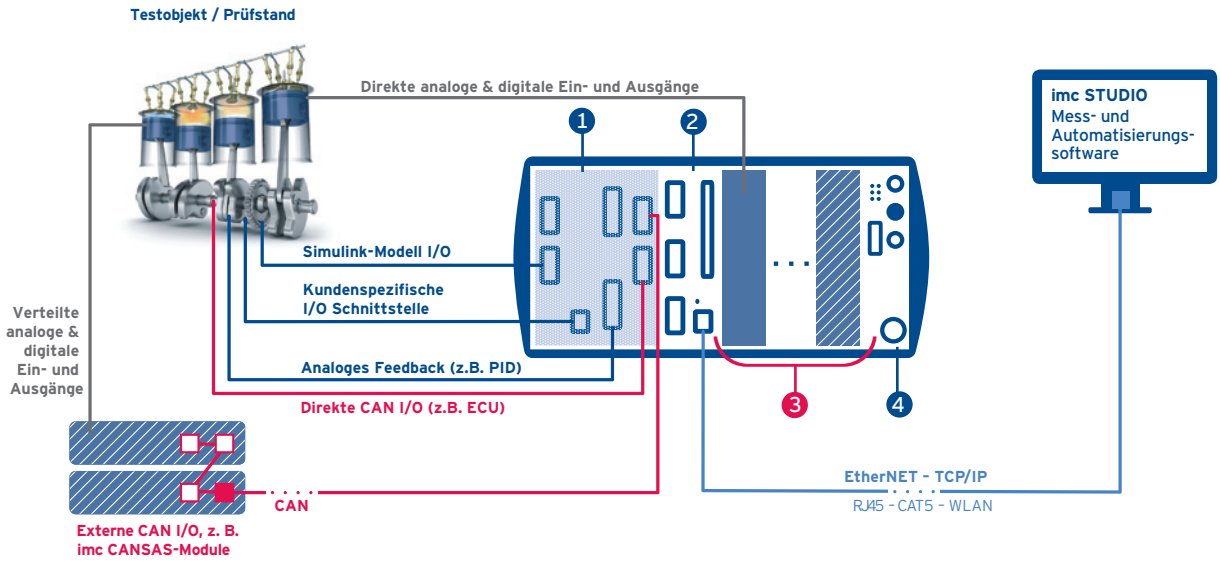
Vehicle testing has grown increasingly complex, thanks in part to almost limitless information now available via onboard ECUs. "Unfortunately, when we were conducting proof-of-concept testing, we ran into a problem of incompatible vehicle busses and protocols – some CAN, some LIN, some FlexRay even." However, since imc CRONOS*compact* systems may be ordered with multiple synchronized vehicle data bus interfaces, your testing doesn't have to slow down. You can bring all of the different subsystem data, including physical sensor signals installed on the vehicle, together into one central location.

Flexibility for test stand applications

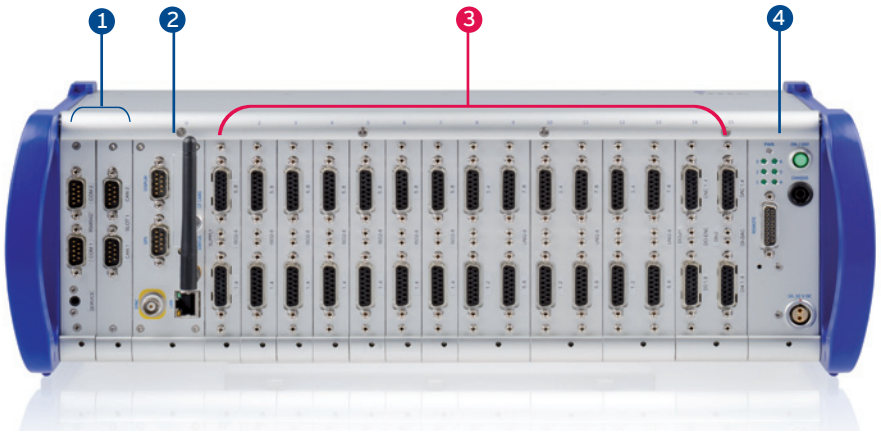
Test stand environments require flexibility of both hardware and software. On the R&D end of the product development cycle, the typical "lifetime" of any particular test is only a few days. The fact that you can easily reconfigure your imc CRONOS*compact* with different plug-in modules means that your hardware is ready for even unusual sensors that requirements sometimes demand. On the software side, imc STUDIO also gives you flexibility and versatility. Clearly structured and straight-forward, it provides the software interface to efficiently setup and run every imc CRONOS*compact*. Whether you use standard functions or advanced scripts, the combination of imc STUDIO and imc CRONOS*compact* will offer you the flexibility you need for any test stand application.



Comprehensive capabilities at the core of your automated testing



Voltage & high voltage | Current | Temperature | Strain gauge | Frequency speed/angle | Digital input/output | IEPE/ICP acceleration | Analog output



1. Application I/O: Simulink, synthesizer, PID controller, CAN and other fieldbuses, and custom interfaces
2. Base module: LAN/WLAN, data storage, etc.
3. Modular I/O: analog and digital signal connection, including integrated signal conditioning
4. Rack power and sync, including user status LEDs

Design Concept

imc CRONOS*compact* architecture

The base unit and associated chassis are the core of the imc CRONOS*compact* system:

- TCP/IP Ethernet interface for system configuration and interactive data collection
- Onboard flash storage and optional hard drive data storage
- Real-time signal processing and test control with imc Online FAMOS
- GPS (for time and/or position information) and external display connectivity
- Stand-alone startup and power-failure control logic, including several battery options

Build time options

imc CRONOS*compact* is capable of an aggregate data collection rate of up to 400 kSample/s per system. The base unit may be configured with a variety of specialized options, including CAN or other fieldbus interface extensions, synthesizer analog output and PID controller modules, as well as the imc HiL Simulink interface (embedded target processor). These options are detailed in the imc CRONOS*compact* table.

imc CRONOS*compact* plug-in modules

With up to 100kSamples/s per channel and having integrated signal conditioning and sensor power supplies, plug-in modules are up to the toughest data acquisition challenges. Fully synchronized with anywhere from a handful to hundreds of channels, imc CRONOS*compact* plug-in modules are compatible with every physical sensor and signal type, and integrate not only sensor signal conditioning, but also filtering and digitizing in one compact, field swappable unit. Refer to the table on the next page for more details of the modules available.

Real-time functionality at your fingertips

One of the core concepts of all members of the imc CRONOS familiy is integrated synchronous control: an extensive array of real-time functionality.

The imc CRONOS*compact* is well-suited to interact with the test environment, including discrete digital input and outputs, as well as analog outputs (e.g., proportional control) and CAN I/O.

Control signals and simple logic are often handled without the need for any programming, directly through imc's powerful trigger engine.

For advanced real-time analysis and control, imc Online FAMOS provides the capability of handling tasks ranging from basic statistical operations, such as min./max., average and RMS, to more demanding calculations, such as FFT spectral analysis, signal classification (fatigue analysis) and order tracking. Virtual channels are computed on the fly, in real-time.

In addition, imc Online FAMOS extends the capability of your system to easily create PLC-like control logic with minimal specialized knowledge.

Incorporating responsive real-time and closed loop control (incl. PID), the system can thus handle complete test stand automation.

One software for the entire testing process

imc STUDIO – the modular software for measurement, control and automation

Whether you want to use your imc CRONOS*compact* in a „black box“ configuration for easy data acquisition, or you want to set up Live-Monitoring on hundreds of channels during prototype testing, or you want to create a complete test stand automation routine with its own control panel – with imc STUDIO, you have full control over the entire measurement process.

Configuration & measurement
imc STUDIO Setup

- Simple measurement device selection
- Clear configuration of all hardware settings
- Intelligent trigger machine
- Flexible, real-time calculations
- Structured project management

Visualization & displays
imc STUDIO Panel (Standard)

- Versatile imc Curve Window configurations (2D/3D)
- Display live video
- Freely customize control & display elements per drag & drop
- Create reports
- Data browser for navigating through large volumes of data

Testing sequences
imc STUDIO Sequencer

- Automation of test and evaluation procedures
- Configuration per Drag & Drop
- From sequence control to automated data evaluation and report creation
- imc FAMOS & MATLAB interface

User interface
imc STUDIO Panel (Professional)

- Intelligent instruments (Widgets) and control elements
- Individually customizable GUIs
- Additional application-oriented components for user interfaces
- Full-screen display
- User rights management

Test stand automation
imc STUDIO Automation

- Real-time automation platform
- Graphical design environment for test stands and test setups per Drag & Drop or notation
- imc hardware provides the necessary deterministic timing
- Threshold monitoring in the background

Efficient system integration

- Integration of DLLs
- Scripting engine (.Net)
- Integrated workbench
- Connection to 3rd-party devices
- Implement your own data-stream analysis
- LabVIEW interface (VI's)
- DIAdem interface

imc STUDIO Standard

imc STUDIO Professional

imc STUDIO Developer

Live data analysis

imc Online FAMOS / imc Inline FAMOS

- Analyze and calculate live data streams
- "Immediate results" during the running measurement
- Autarkic in the device (imc Online FAMOS)
- PC-based with scalable performance (imc Inline FAMOS)
- Simple syntax

Analysis & documentation

imc FAMOS

- Powerful data analysis and documentation
- Full range of pre-defined calculation functions
- Create multi-layer macros
- Create user-defined GUIs
- Control large amounts of data

Video integration

imc STUDIO Video

- Time-synchronized video and measurement data acquisition
- Pre-trigger function
- Up to 4 simultaneous video cameras
- 2 redundant channels per camera with independent sampling and trigger settings (monitor channels)

Webserver

imc REMOTE

- Configurable homepage for displaying and operating imc measurement devices
- Platform-independent device access with standard internet browser
- Web Design Wizard for creating individual web pages
- Supports https (SSL) for secure connection

Sensor management

imc SENSORS

- Management of any sensor
- Measurement channel configuration from sensor database per Drag & Drop
- Descriptions from TEDS

Remote Testing

imc LINK / imc WEBDEVICES

- Remote connection for imc measurement systems via WiFi or mobile radio
- Automatic measurement data transfer to the PC or server
- Automated evaluations
- GPS data on map background
- Turnkey solutions including IT & service

imc STUDIO Plug-In

Additional software

imc CRONOS*compact* Details

imc CRONOS*compact* mainframe/housing

	CRC-400 & rack variants	CRC-400GP & rack variants
General		
Housing type	portable & 19" rack	portable & 19" rack
Extension module slots	8/11/13/17	7/10/12/16/17
Aggregate sampling rate	400 kSps	400 kSps
ext. imc CRONOSflex moduls (CRFX)		○
ext. aggregate sampling rate (incl. CRFX moduls)		2000 kSps
Operating conditions		
Standard operating temp. range	●	●
Extended temp. range (incl. condensation)	○	○
Shock vibration rating	MIL 810F (40g)	
Connectivity		
Ethernet	100 MBit	1 GBit
int. WiFi adapter IEEE 802.11.g (54 Mbit/s)	○	○
Dual Band IEEE 902.11.g (300 Mbit/s)		○
Wireless UMTS, 3G, 4G	○	○
GPS connection port	●	●
Display connection port	●	●
Remote controlled main switch	●	●
Programmable status feedback (LEDs)	●	●
Data storage		
CF card slot (Compact Flash)	●	
Storage on PC / network drive	●	●
Hard disk (internal)	○	○
Stand-alone capabilities		
PC independent complex trigger functionality	●	●
Onboard real-time data analysis (imc Online FAMOS)	●	●
Autarkic PC-less operation, self start	●	●
Synchronization & clock		
Master-slave between different imc systems	●	●
NTP network based synchronization	●	●
Via external GPS signal	●	●
Via external IRIG-B & DCF-77 signal	●	●
Field bus extensions		
CAN, CAN FD	○	○
LIN	○	○
FlexRay	○	○
MVB	○	○
ARINC	○	○
XCPoE (Master, Slave)	○	○
EtherCAT Slave	○	○
Kistler RoaDyn®	○	○
Power supply		
DC input 10V to 50V	●	●
Isolated power supply input	●	●
AC/DC adapter (110 to 230VAC)	●	●
AC input (110 to 230VAC)	for AC RACK	for AC RACK
Data integrity upon power fail	●	●
UPS	●	●
UPS (extended range Li-Ion)	○	○

CRC module with DSUB-15 connectors

CRC module with BNC connectors

CRC module with thermocouple connectors

portable system CRC-400-8

19" subrack system CRC-400-AC-Rack

Key: ● Default, ○ Optional, (●) Restricted

imc CRONOS*compact* analog amplifier modules

module name CRC/xxx	size: channels	size: slots (1 slot = 4 HP)	connector: standard connector	connector: LEMO version available	connector: TEDS	speed: max. sampling rate (per channel)	speed: signal bandwidth (-3dB)	voltage mode: isolated voltage mode	voltage mode: min. voltage range (mV)	voltage mode: voltage up to 10 V	voltage mode: voltage up to 50 / 60 V	voltage mode: voltage up to 1000 V	current: 20 mA internal shunt	current: 20mA shunt plug	temp: Thermocouple (TC)	temp: RTD (PT100)	ICP, supply: ICP mode integrated	ICP, supply: ICP plug	ICP, supply: sensor supply	ICP, supply: (per channel)	bridge mode: full bridge	bridge mode: half bridge	bridge mode: quarter bridge	bridge mode: DC excitation	bridge mode: AC excitation (CF)	bridge mode: single SENSE	bridge mode: double SENSE
Voltage measurement																											
LV-16	16	2	DSUB-15		●	20 kHz	6.6 kHz		250	●				●				○	○								
LV3-8	8	1	DSUB-15	○	●	100 kHz	48 kHz		5	●	●			●				○	○								
SC2-32	32	4	DSUB-15		●	100 kHz	28 kHz		250	●				●				○	○								
Voltage & temperature measurement																											
OSC-16	16	2	DSUB-15		●	5 Hz	1 Hz	●	50	●	●			●	●	●			○								
OSC-16-2T	16	2	Thermo			5 Hz	1 Hz	●							●												
C-8	8	1	DSUB-15		●	20 kHz	20 Hz		2.5	●	●			●	●	●			○								
C8-2T	8	1	Thermo			20 kHz	20 Hz								●												
ISO2-8	8	1	DSUB-15	○	●	100 kHz	11 kHz	●	50	●	●			●	●	●		○	○								
ISO2-8-2T	8	1	Thermo			100 kHz	11 kHz	●							●												
ISO2-8-L	8	2	LEMO.1B		●	100 kHz	11 kHz	●	50	●	●		●			●			○								
ISOF-8	8	1	DSUB-15	○	●	100 kHz	48 kHz	●	50	●	●			●	●	●		○	○								
High voltage measurement 600V CAT III																											
HV2-4U (U-chan)	4	2	Banana			100 kHz	48 kHz	●	2,500	●	●	●															
HV2-2U2I (I-chan)	4	2	Banana / Terminal blocks		●	100 kHz	48 kHz	●	2,500/ 50	(●)																	
Audio & vibration measurements																											
ICPU2-8	8	2	BNC		●	100 kHz	48 kHz		5	●	●						●										
ICPU-16	16	4	BNC		●	20 kHz	6.6 kHz		250	●							●										
AUDIO-4	4	1	BNC		●	100 kHz	48 kHz		25	●	●						●										
AUDIO-4-MIC	4	2	BNC, LEMO.1B	●	●	100 kHz	48 kHz		25	●	●						●		●								
Bridge & strain gauge measurements																											
BR2-4	4	1	DSUB-15		●	20 kHz	8.6 kHz		5	●	●			●				○	(●)		●	●	●	●	●	●	●
B-8	8	2	DSUB-15	○	●	100 kHz	48 kHz		5	●			●	●				○	●		●	●	●	●		●	
BC-8	8	1	DSUB-26-HD			100 kHz	48 kHz		5	●				●					●		●	●	●	●		●	
DCB2-8	8	2	DSUB-15	○	●	100 kHz	5 kHz		5	●			●	●				○	●		●	●	●	●		●	
DCBC2-8	8	1	DSUB-26-HD			100 kHz	5 kHz		5	●			●	●					●		●	●	●	●		●	
For universal use																											
UNI2-8	8	2	DSUB-15	○	●	100 kHz	48 kHz		5	●	●		●	●	●	●		○	●		●	●	●	●		●	
UNI-4	4	1	DSUB-15	○	●	100 kHz	48 kHz	●	2.5	●	●		●	●	●	●		○	●	●	●	●	●	●		●	●

imc CRONOS*compact* DIO, pulse counter, DAC modules

module name	size: slots (1 slot = 4 HP)	connector: standard connector	digital I/O: input Bits	digital I/O: high voltage	digital I/O: output Bits	digital I/O: high current	DAC: analog outputs	pulse counter: counter inputs	pulse counter: quadrature mode chan	pulse counter: counter frequency	pulse counter: analog sin/ cos mode
Multi functional modules											
DI16-DO8-ENC4	2	DSUB-15	16		8			4	2	32 MHz	
DI8-DO8-ENC4-DAC4	2	DSUB-15	8		8		4	4	2	32 MHz	
Pulse counter modules											
HRENC-4	1	DSUB-15						4	4	256 MHz	●
FRQ-4	1	DSUB-15						4		256 MHz	
Digital I/O modules											
DI2-16	1	DSUB-15	16								
DO-16	1	DSUB-15			16						
DO-16-HC	1	DSUB-15			16	●					
DIO-HV-4 (250V)	2	Terminals	4	●	4	●					
Analog out modules (DAC)											
DAC-8	1	DSUB-15					8				
SYNTH-8	1	DSUB-15					8				
Real-time control modules (PID, simulation, custom solutions)											
SYNTH-8	1	8 independent PID controller, arbitrary signal generator (synthesizer)									
APP-MOD	1	custom programmable real-time applications, HW-interface integrations									
HiL	2	Hardware-in-the-Loop, MATLAB / Simulink® target processor									

TEDS support
(Transducer Electronic Data Sheet)
imc CRONOS*compact* modules support direct read/ write of TEDS sensors, including imc's TEDS Clip. TEDS interfaces require either the ACC/DSUB-TEDS-x variants of our connectors (2-wire TEDS), or per-channel connectors such as Lemo. „IEPE" type TEDS is supported in direct IEPE/ICP input modules.

Digital I/O
galvanically isolated, configurable to 24V/5V (TTL/ CMOS) Level, output: 0.7A sink, high current: sink and source 0.7A

Pulse Counter
full analog input conditioning
500 kHz analog bandwidth, differential input, analog filter, software adjustable threshold levels
Modes: event counter, event counter, time, frequency, speed, RPM, differential and absolute angle and displacement

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