

# imc CRONOScompact

comprehensive • modular • reconfigurable



Adaptable measurement and control system for mixed signal testing

### imc CRONOScompact 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 CRONOScompact

## Surprisingly compact given all it can do

The imc CRONOScompact 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 CRONOScompact is your universal system. From high voltage to current fed, and from strain gauges to thermocouples, the integrated signal conditioning of imc CRONOScompact 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 CRONOScompact 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 CRONOScompact 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 CRONOScompact is suitable for in-vehicle and field testing and perfectly tailored for test stand applications.

imc CRONOScompact: 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 CRONOScompact



### 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 exchangeable 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



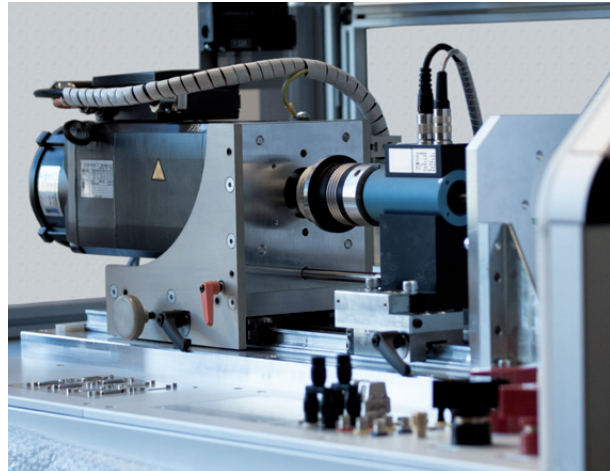
### Securing your investment

- 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 CRONOScompact 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 buses and protocols – some CAN, some LIN, some FlexRay even.” However, since imc CRONOScompact 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.

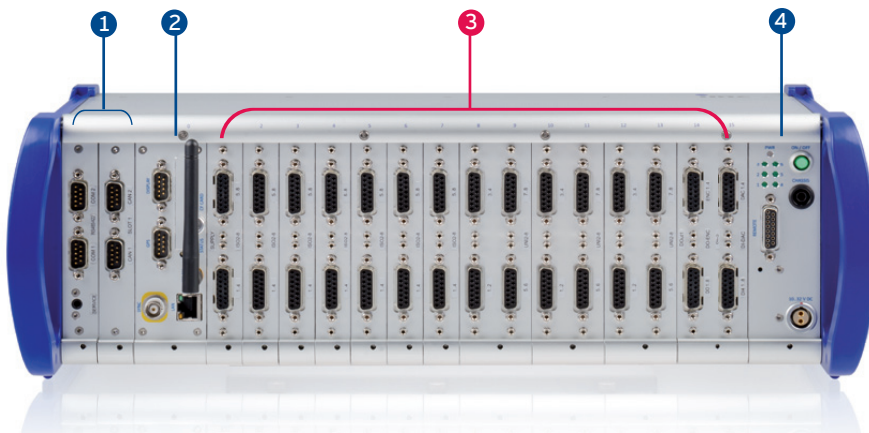
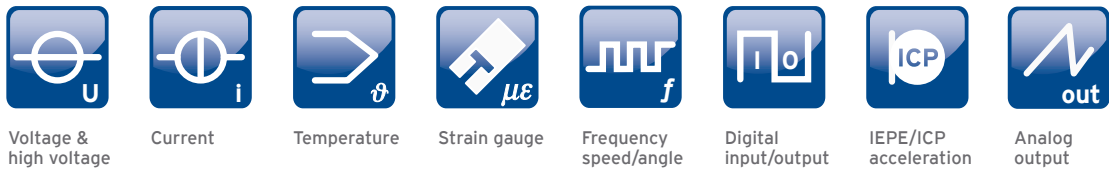
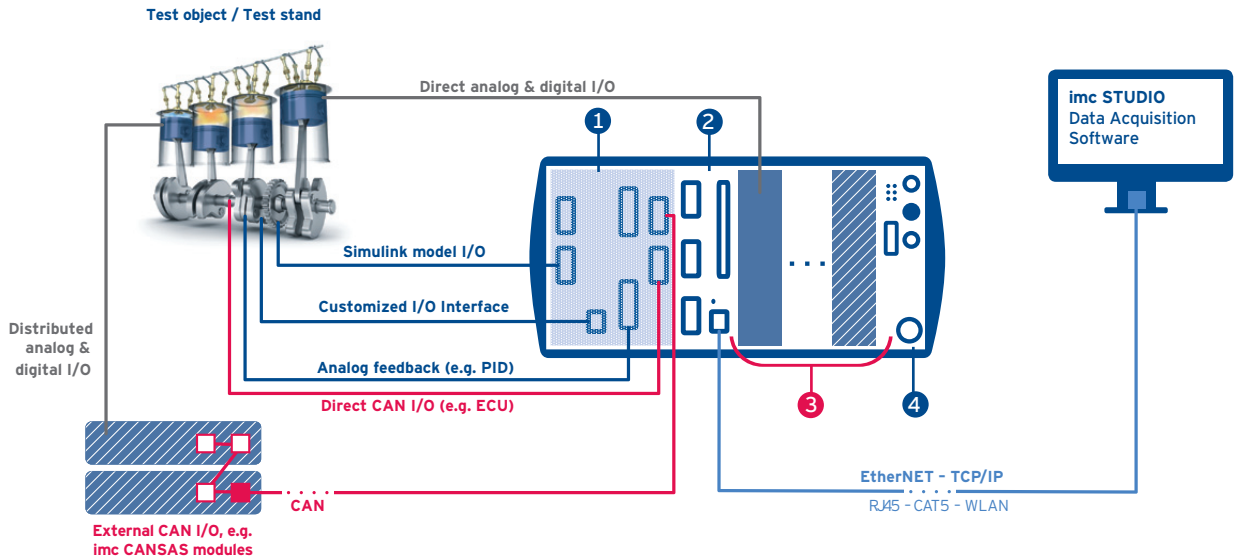


## Flexibility for test stand applications

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 CRONOScompact 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 CRONOScompact. Whether you use standard functions or advanced scripts, the combination of imc STUDIO and imc CRONOScompact will offer you the flexibility you need for any test stand application.



## Comprehensive capabilities at the core of your automated testing



- 1 Application I/O: Simulink, synthesizer, 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 CRONOScompact architecture

The base unit and associated chassis are the core of the imc CRONOScompact 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 CRONOScompact 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 CRONOScompact table.

### imc CRONOScompact 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 CRONOScompact 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 family is integrated synchronous control: an extensive array of real-time functionality.

The imc CRONOScompact 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 CRONOScompact 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

- Analyze and calculate live data streams
- “Immediate results” during the running measurement
- Autarkic in the device (imc Online 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
- Automatic measurement data transfer to the PC or server
- Automated evaluations
- GPS data on map background
- Turnkey solutions including IT

imc STUDIO Plug-In

Additional software

# imc CRONOScompact Details

## imc CRONOScompact mainframe/housing

	CRC-400 -08/11/13 /17	CRC-400 -DC[AC]-RACK
<b>General</b>		
Housing type	portable	19" rack
Extension module slots	8/11/13/17	17 [16]
Aggregate sampling rate	400 kSps	400 kSps
<b>Operating conditions</b>		
Standard operating temp. range	●	●
Extended temp. range (incl. condensation)	○	○
Shock vibration rating	MIL 810F (40g)	
<b>Connectivity</b>		
Ethernet	100 MBit	100 MBit
W-LAN (WiFi) IEEE 802.11.g (54 Mbit/s)	○	○
Wireless UMTS, 3G, 4G	○	○
WLAN/wireless router	○	○
GPS connection port	●	●
Display connection port	●	●
Remote controlled main switch	●	●
Programmable status feedback (LEDs)	●	●
<b>Data storage</b>		
CF card slot (Compact Flash)	●	●
Storage on PC / network drive	●	●
Hard disk (internal)	○	○
<b>Stand-alone capabilities</b>		
PC independent complex trigger functionality	●	●
Onboard real-time data analysis (imc Online FAMOS)	●	●
Autarkic PC-less operation, self start	●	●
<b>Synchronization &amp; clock</b>		
Master-slave between different imc systems	●	●
NTP network based synchronization	●	●
Via external GPS signal	●	●
Via external IRIG-B & DCF-77 signal	●	●
<b>Field bus extensions</b>		
CAN	○	○
LIN	○	○
FlexRay	○	○
MVB	○	○
ARINC	○	○
XCPoE	○	○
EtherCAT Slave	○	○
Kistler RoaDyn®	○	○
<b>Power supply</b>		
DC input 10V to 32V	●	●
Isolated power supply input	●	●
AC/DC adapter (110 to 230VAC)	●	●
AC input (110 to 230VAC)		●
Data integrity upon power fail	●	●
UPS (lead gel battery)	●	●
UPS (extended range Li-Ion)	○	○



Key: ● Default, ○ Optional, (●) Restricted, [●] Variant, (★) In preparation

### imc CRONOScompact analog amplifier modules

module name CRC/xxx	size		connector		speed		voltage mode			current temp		ICP, supply		bridge mode															
	channels	slots (1 slot = 4 HP)	standard connector	LEMO version available	TEDS	max. sampling rate (per channel)	signal bandwidth (~3dB)	isolated voltage mode	min. voltage range (mV)	voltage up to 10 V	voltage up to 50 / 60 V	voltage up to 1000 V	20 mA internal shunt	20mA shunt plug	Thermocouple (TC)	RTD (PT100)	ICP mode integrated	ICP plug	sensor supply	(per channel)	full bridge	half bridge	quarter bridge	DC excitation	AC excitation (CF)	single SENSE	double SENSE		
<b>Voltage measurement</b>																													
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	●				●				○	○										
<b>Voltage &amp; temperature measurement</b>																													
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	●	●			●	●			○	○										
HISO-8-L	8	2	LEMO.1P REDEL	●		100 kHz	11 kHz	●	50	●	●	●		●	●														
HISO-8-8T-L	8	2	LEMO.2P REDEL	●		100 kHz	1 kHz							●															
<b>High voltage measurement 600V CAT III</b>																													
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	●	●	(●)																	
<b>Audio &amp; vibration measurements</b>																													
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	●	●							●											
<b>Bridge &amp; strain gauge measurements</b>																													
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	●				●	(★)				●		●	●	●	●	●	●	●	●	
<b>For universal use</b>																													
UNI2-8	8	2	DSUB-15	○	●	100 kHz	48 kHz		5	●	●	●	●	●	●	●		○	●	●	●	●	●	●	●	●	●	●	
UNI-4	4	1	DSUB-15	○	●	100 kHz	48 kHz	●	2.5	●	●	●	●	●	●	●		○	●	●	●	●	●	●	●	●	●	●	

### imc CRONOScompact DIO, pulse counter, DAC modules

module name	size slots (1 slot = 4 HP)	connector standard connector	digital I/O			DAC		pulse counter			analog sin/cos mode
			input Bits	high voltage	output Bits	high current	analog outputs	counter inputs	quadrature mode chan	counter frequency	
<b>Multi functional modules</b>											
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	
<b>Pulse counter modules</b>											
HRENC-4	1	DSUB-15						4	4	256 MHz	●
FRQ-4	1	DSUB-15						4		256 MHz	
<b>Digital I/O modules</b>											
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	●					
<b>Analog out modules (DAC)</b>											
DAC-8	1	DSUB-15						8			
SYNTH-8	1	DSUB-15						8			
<b>Real-time control modules (PID, simulation, custom solutions)</b>											
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 CRONOScompact 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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