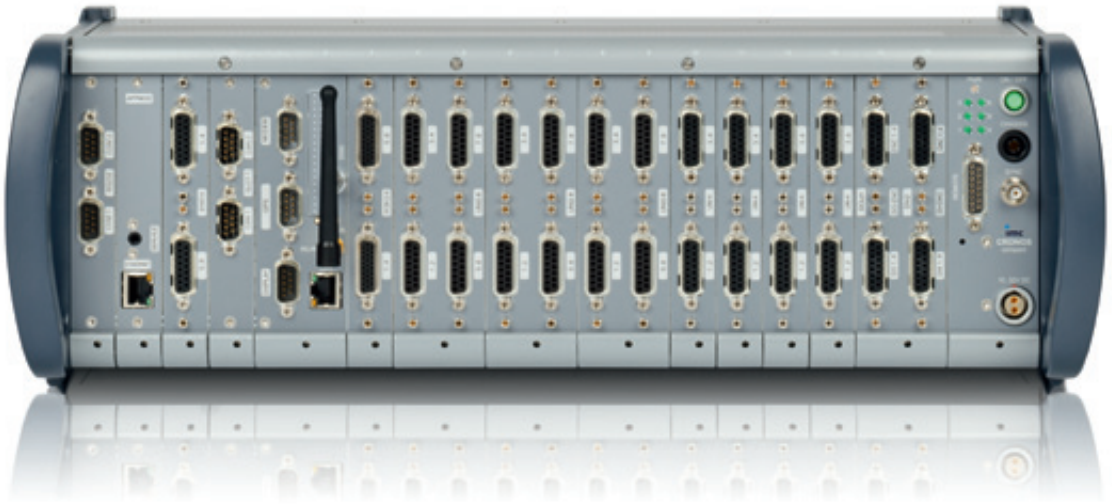
imc CRONOS*compact*

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
- Configuration and operation software included

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

When time is of your concern

Testing is a dynamic field. Every day, you face changes: standards are updated, testing requirements modified, new components developed, and new signals added. You need to be sure, that you are ready to quickly and efficiently meet these new challenges. Day in and day out, imc CRONOS*compact* and the configuration and operation environment imc STUDIO are there for you.

Virtually any sensor available for mechanical, electro-mechanical, and mechatronic measurements is supported by imc CRONOS*compact*: Multi-channel mixed signals, whether analog inputs, incremental encoder signals, or fieldbus and vehicle bus communication such as CAN, GMLAN, LIN or FlexRay – you name it, imc CRONOS*compact* measures it.

Control you can count on

The design of imc CRONOS*compact* lets you control your data acquisition in three ways: reconfigurable hardware so you have the right signal conditioning and amplifiers; smart triggering and extensive real-time process control including closed-loop PID controllers; and user level control through the included imc STUDIO software for interactive display, test sequencing and complete test stand automation.

And since control is integral to imc CRONOS*compact*, synchronization of all measurement channels, processing and control signals is assured.

When testing advances to real components interacting with simulated environments or subsystems, the optional imc HiL module offers a standardized Simulink target for model deployment, fully integrated and also synchronized with your existing measurements and tests.

For a quarter century, imc has been on the leading edge of progress in mechanical test and measurement, persistently adapting and updating to the changing demands on the testing engineer. As our flagship product, imc CRONOS*compact* represents the culmination of this experience, and reflects the feedback and input of hundreds of clients worldwide.

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

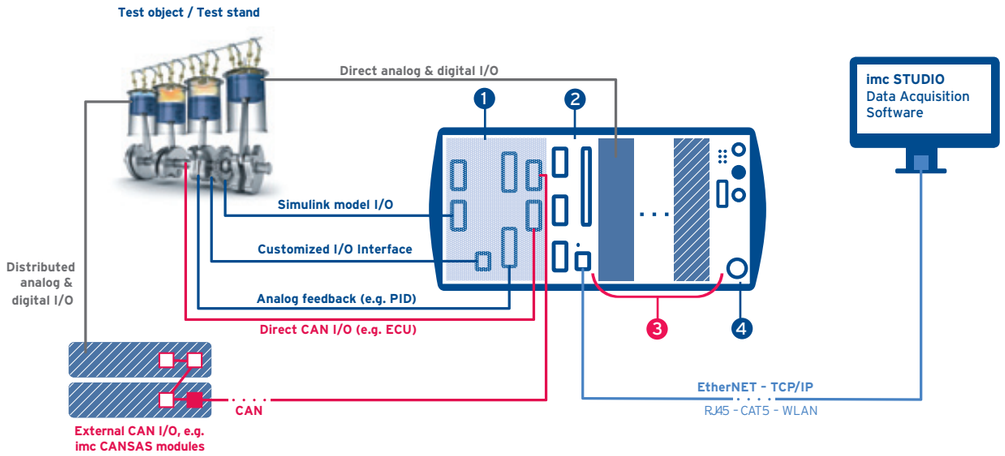
Gaining your independence

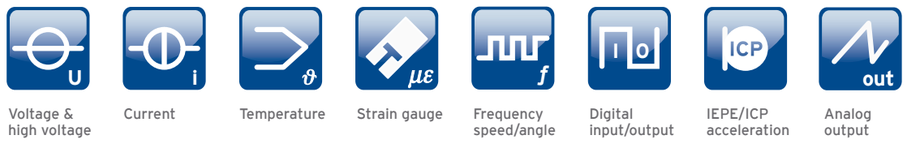
- Measurement, real-time control and simulation in one unit
- Portable design goes from field to test bench as your test requirements dictate
- Stand-alone operation with the flip of a software switch when the PC cannot be used
- Li-Ion battery option for long-term operation independent from the power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

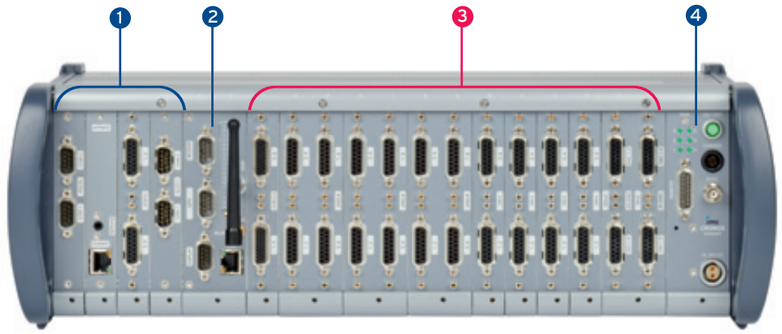
Securing your investment

- 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

Comprehensive capabilities at the core of your automated testing





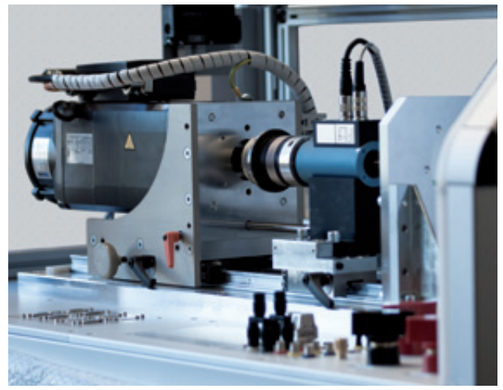


1. Application I/O: Simulink, synthesizer, CAN and other fieldbuses, and custom interfaces
2. Base module: LAN/WLAN, data storage, etc.
3. Modular I/O: analog and digital signal connection, including integrated signal conditioning
4. Rack power and sync, including user status LEDs

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 test stand solutions

The extensive I/O capabilities of imc CRONOS*compact*, addressing all types of electromechanical sensors and signal sources for acquisition, combined with the ability to incorporate real-time calculation, control and simulation, provides you with the most comprehensive set of tools available to professional test engineers. Integrating all this into one system, operating under the imc STUDIO software environment, simplifies and streamlines your test configuration and maintenance tasks, ultimately boosting your testing productivity: less time configuring, more time testing.

Modular approach to system reconfiguration

The advantage of a modular approach to system design is proven with the imc CRONOS*compact* system's adaptability. The broad applicability of imc CRONOS*compact* ensures that you will always be prepared when unexpected surprises arise. By allowing you to reconfigure the hardware to meet your testing needs, you reduce overall operating costs and the burden of completely redesigning your system, or even adapting external hardware, every time your test environment changes.

Since any of the imc systems may be linked together, and be equipped with a CAN interface, the imc CRONOS*compact* is almost limitless in its expandability, in both centralized and distributed testing topologies.

imc STUDIO software environment

The imc CRONOS*compact* utilizes imc STUDIO – the same intuitive software imc users know from all other imc data acquisition systems.

Whether preparing a system for stand-alone "black box" in-vehicle operation; monitoring live analog and CAN signals for a prototype evaluation; or providing a complete operator panel interface for test stand control, imc STUDIO is the versatile, scalable solution that allows you to design, control, manage and automate your entire test and measurement workflow.

imc STUDIO offers a number of different user levels, adapting the user experience to varying skills and working situations. In addition, imc STUDIO integrates with other imc software environments, including imc FAMOS for analysis and imc LINK for remote data management.

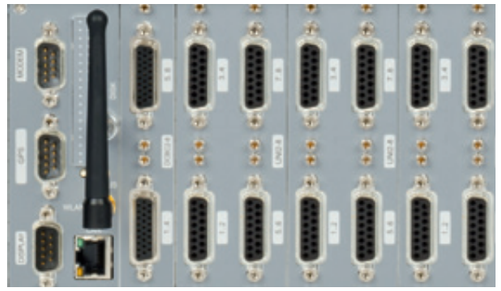
For more information on imc STUDIO, refer to www.imc-studio.com

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 (see following page).

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.

imc CRONOS*compact* Details

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

imc CRONOS*compact* mainframe/housing

	CRC-400 -08 / 11 / 13 / 17	CRC-400 -DC[AC]-RACK
General		
Housing type	portable	19" rack
Extension module slots	8/11/13/17	17 [16]
Aggregate sampling rate	400 kSps	400 kSps
Operating conditions		
Standard operating temp. range	●	●
Extended temp. range (incl. condensation)	○	○
Shock vibration rating	MIL 810F (40g)	
Connectivity		
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)	●	●
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 (timer, absolute time)	●	●
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	○	○
LIN	○	○
FlexRay	○	○
MVB	○	○
ARINC	○	○
XCPoE	○	○
EtherCAT Slave	○	○
Kistler RoaDyn®	○	○
Power supply		
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)	○	○

CRC module with DSUB-15 connectors

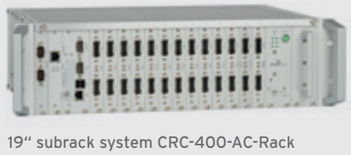
CRC module with BNC connectors

CRC module with thermocouple connectors

CRC module with banana jacks

CRC module with push-in spring cage terminals

portable system CRC-400-8



19" subrack system CRC-400-AC-Rack

imc CRONOS*compact* analog amplifier modules

	size		connector			speed		voltage mode					current	temp		ICP, charge, suppy					bridge mode								
module name CRC/xxx	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	Charge plug	sensor supply	(per channel)	full bridge	half bridge	quarter bridge	DC excitation	AC excitation (CF)	single SENSE	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	●	●			●	●	●		○	(★)	○								
HISO-8	8	2	Push-in			100 kHz	11 kHz	●	50	●	●		●		●	●												
High voltage measurement 600V CAT III																												
HV-4U (U-chan)	4	2	Banana			100 kHz	14 kHz	●	2,500	●	●	●																
HV-2U2I (I-chan)	4	2	Terminal blocks		●	100 kHz	14 kHz	●	250	(●)																		
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

	size	connector	digital I/O				DAC	pulse counter				
module name	slots (1 slot = 4 HP)	standard connector	input Bits	high voltage	output Bits	high current	analog outputs	counter inputs	quadrature mode chan	counter frequency	analog sin/ cos mode	
Multi functional modules												
DI16-D08-ENC4	2	DSUB-15	16		8			4	2	32 MHz		
DI8-D08-ENC4-DAC4	2	DSUB-15	8		8		4	4	2	32 MHz		
Pulse counter modules												
HRENC-4	1	DSUB-15						4	4	256 MHz	●	
FRO-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, differential and absolute angle and displacement, time, pulse width (PWM), phase difference, frequency, speed, RPM

imc Meßsysteme GmbH
Voltastraße 5
13355 Berlin
Germany

Tel.: +49 (0)30 - 46 70 90 26
Fax: +49 (0)30 - 463 15 76
hotline@imc-berlin.de
www.imc-berlin.com

imc CRONOS*compact*_01/13_international // Printed in Germany 2013 // Errors and changes excepted. All registered trademarks are the property of the respective companies.