imc CRONOS*flex*

flexible • expandable • fast

Frameless modular measurement system for electromechanical testing

imc – productive testing

imc CRONOS*flex* at a glance

- Flexible modularity through frameless expansion
- Click mechanism connects modules electrically and mechanically
- Centralized or distributed, put the pieces where you need
- Simultaneous recording of analog, digital, and fieldbus/vehicle bus data
- Up to 2000 kS/s per system and up to 100 kS/s per channel
- Supports virtually any physical sensor and signal type
- Synchronous acquisition of one to thousands of channels
- Integrated real-time analysis and control
- Standalone, remote or interactive operation (via Ethernet TCP/IP connection)
- Configuration and operation software included
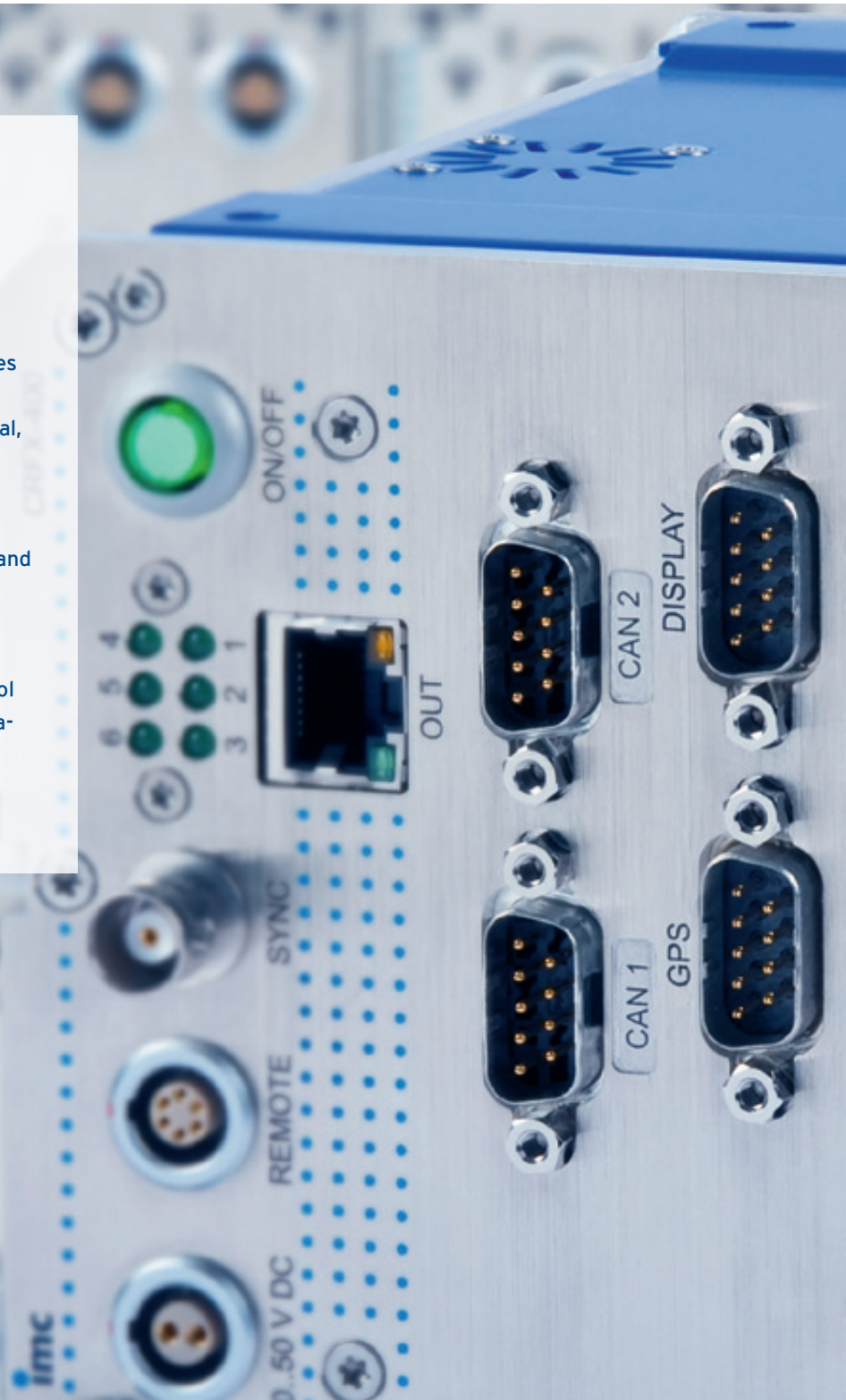
imc CRONOS*flex*

Experience true flexibility in test and measurement

imc CRONOS*flex* gives you a degree of flexibility never before possible. By simply clicking an imc CRONOS*flex* module, or modules, to an imc CRONOS*flex* base unit, you've created a complete system, with exactly the number of channels you need. No cables between cards, no half empty mainframe rack, and no expansion chassis to squeeze in one more channel.

A perfect fit every time: from test stand and bench top, to mobile testing environments, the modular imc CRONOS*flex* measurement system provides you with the versatility you need for day-to-day changes, over a diverse range of measurement and control tasks, but without the need to make any sacrifices of performance or ease of use.

Click mechanism – connects modules electrically and mechanically
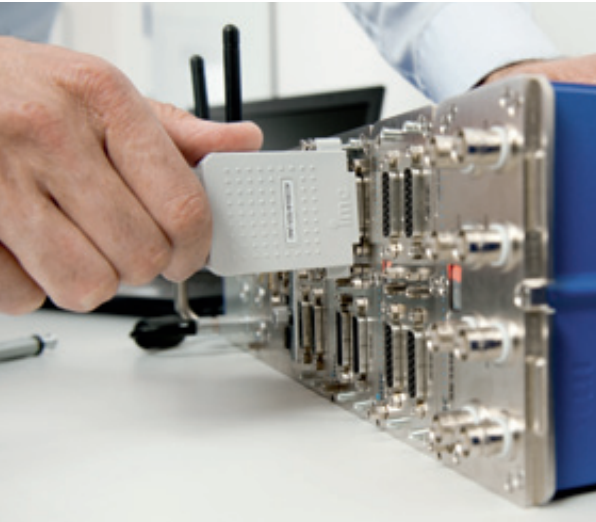
Voltage & high voltage	Current	Temperature	Strain gauge	Frequency speed/angle	Digital input/output	IEPE/ICP acceleration	Audio	Analog output

A new challenge, a trusted solution

You're facing a new test challenge. While it is similar to a test you've performed before, the signals are different and there are more channels this time. What is the best way to proceed?

Since you are using imc CRONOS*flex*, there is a fast, adaptable and cost-effective solution: simply take an additional imc CRONOS*flex* module from the equipment cabinet, click it onto the other modules and you've just added eight new universal input channels to your system. It couldn't be easier!

Because imc STUDIO operating software automatically recognizes the hardware changes, all your settings from the previous test configuration have been saved. A couple of mouse clicks later and the new data are stored automatically.

Virtually any sensor available for mechanical and electromechanical measurements is supported by imc CRONOS*flex*. 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*flex* measures it.

Giving you control

Imagine the convenience and the efficiency of always having exactly the right input channels at hand, combined with the adaptability that imc STUDIO software brings to test configuration and operations.

imc CRONOS*flex* gives you unprecedented control of your test and measurement instrumentation and makes fixed predeterminations obsolete: whether centralized or distributed, large or small, portable or rack, four channels or four hundred. You can have it all, anytime!

As test requirements evolve, the imc CRONOS*flex* evolves, too. Since additional analog input channels are simply added as needed with the "click mechanism", the system is easily made compatible with almost any physical sensor or signal type. Each module, its input channels and integrated signal conditioning and digitizers maintain absolute synchronization with other modules via the high speed EtherCAT industrial bus as the system's backbone.

imc's ingenious use of this industry standard bus allows operation of modules which are both directly connected to one another, as well as those tethered via standard Ethernet cable, ensuring both flexibility and cost-effective expandability.
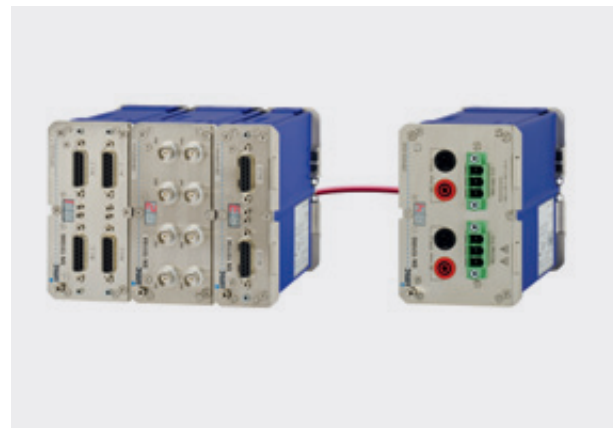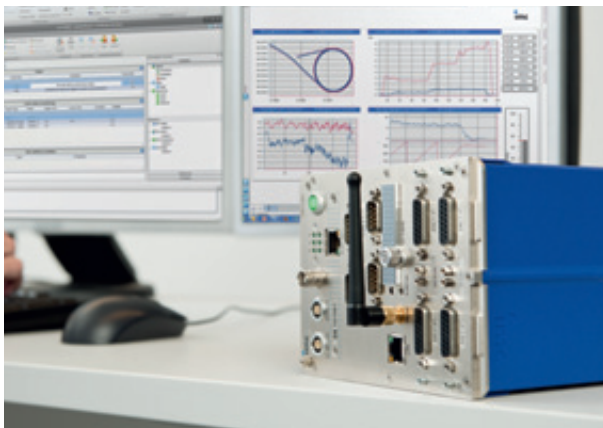
Enhancing your testing productivity
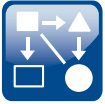
Gaining flexibility
- Frameless modular system easily adapts to changing demands of day-to-day testing in the field or on the test bench. Add, replace or relocate the modules wherever it is convenient for you, your signals and your testing
- Flexibility for remote monitoring in both centralized and Ethernet distributed networks
- Versatile expansion modules for multi-channel, mixed signal recording

Saving time
- Real-time calculations, analysis and data reduction by the measurement device itself
- With the click mechanism, an optimized solution or the reconfiguration of modules can be achieved in a matter of seconds
- Fast transition between measurement setups and locations
- imc's unique breakout connectors provide quick connections for any sensor, and optional support for automatic sensor recognition (TEDS)

Saving money
- The modular system design allows the investment to be easily tailored, segmented and spread over long-term budget planning – yet at a very low entry price for a minimum working configuration

Gaining clarity & synchrony
- No cables, no screws, no fuss – modules can simply be clicked together in order to expand or reorganize the system
- Due to the internal EtherCAT system bus, measurement modules are synchronized with each other. No further settings necessary

Gaining independence & security
- PC-less, standalone operation with internal storage. Because it can be operated PC-independent, the system maintains reliability even in harsh environments
- Intelligent power supply with optional short-term (UPS) or long-term power (Li-ion battery)
- Reliable operation and guaranteed data integrity, even in the event of power failure

Designed for both centralized and distributed operations

Base Unit

imc **STUDIO**
Data Acquisition
Software

Ethernet TCP/IP
RJ45/CAT5 & WLAN

EtherCAT
RJ45/CAT5

EtherCAT
RJ45/CAT5

1 imc CRONOS*flex* Base Unit

2 Measurement modules "clicked" to base

3 Decentralized distribution up to 100m via standard CAT5 network cable
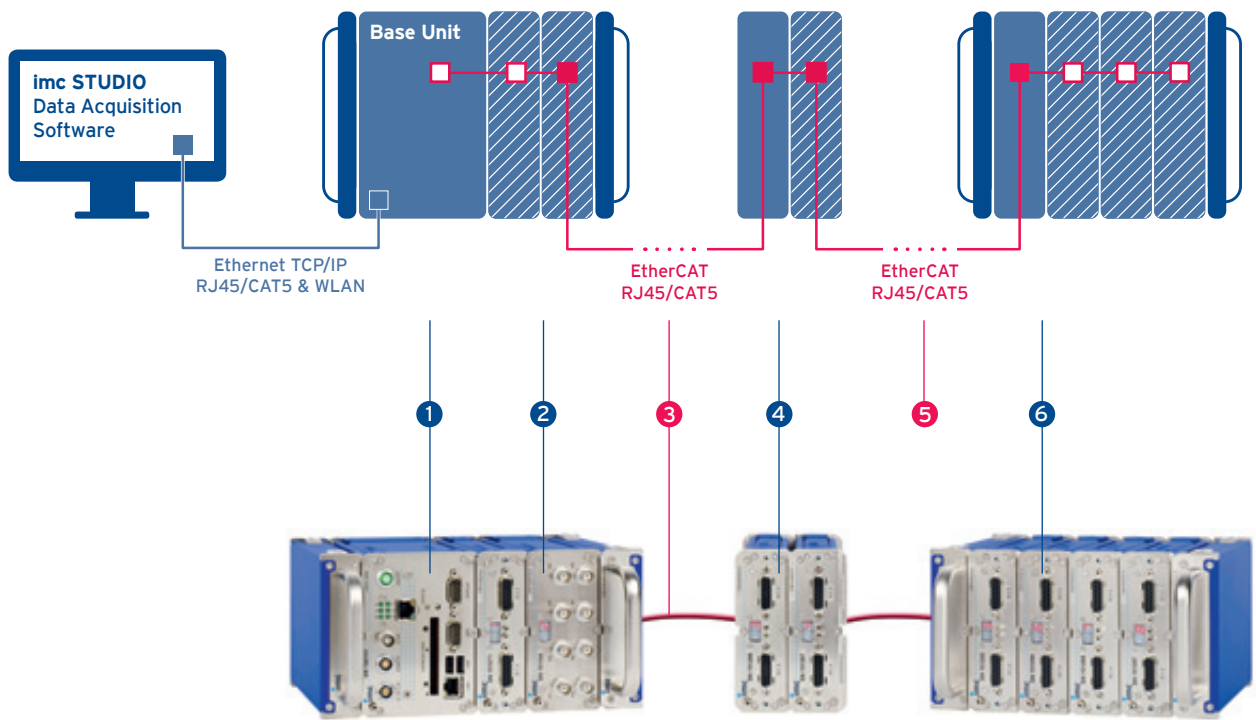
4 Modules may be located wherever convenient

5 Optional isolated fiber optic connectivity

6 Distributed measurement module satellite stack synchronously connects with only one cable

In Practice

Mix-and-match test stand expansion

When managing short-run test stands that are reconfigured every few days or weeks, the ability to easily adapt test stand hardware can save days of engineering downtime. By assigning an imc CRONOS*flex* base unit to each of your test stands, you can mix and match the input modules as the test requires. Because the configuration and operation software automatically recognizes hardware changes, you will find it easy to adapt previous configurations – proven and established – into new and expanded setups, resulting in test configuration productivity gains.

Add channels when tests demand it

"Since our initial specification for a new test system was based on an older test concept, I suspected we were going to need more channels later on." With the lower entry-price, there's no need for a large chassis or unnecessary modules "just in case." When the time comes to expand input capabilities by adding additional modules, everything you've already invested in your current imc CRONOS*flex* system still works the same. With per-module prices well below complete system prices, you can always expand without breaking your budget.

Distributed systems avoid analog noise

Solving the problem of signal noise and interference has never been easier. Unlike chassis-based systems, data collection and synchronization via the EtherCAT backbone of the imc CRONOS*flex* system can be accomplished without having the input modules installed in a mainframe chassis. Modules can be daisy-chained and distributed up to 100 meters away via noise-free standard Ethernet cable. This allows you to locate inputs and digitizers close to the signal source, especially when working in electrically "noisy" environments, like test cells and electric vehicles.

Centralized configuration

The individual imc CRONOS*flex* modules are designed to click to one another – connected electrically and mechanically to the system and supply bus. Once "clicked" into place, the modules and base unit work as a complete system; modules are automatically recognized by the base unit and imc STUDIO software.

By directly clicking modules to one another, an imc CRONOS*flex* system is "built-to-order" by the user, whenever and wherever changes are needed.

Distributed configuration

imc CRONOS*flex* is unique for its ability to connect remotely located modules, allowing you to easily create a spatially distributed or hybrid centralized/ distributed system.

The remote modules may be located as individual units or satellite blocks, created by clicking together any number of imc CRONOS*flex* modules. This allows the modules, and their integrated signal conditioning, amplifiers and digitizers, to be placed close to the sensor, thus, significantly reducing cabling and the possibility of electromagnetic signal interference.

A synchronous connection using standard Ethernet cable allows high speed data transfer from the remote module(s) to the base unit stack.

Because a distance of up to 100 meters is allowed between any two imc CRONOS*flex* modules, new distributed system topologies are possible for in-vehicle testing, test bench applications or any other spatially-challenged testing environment.

For even wider distribution possibilities, an external GPS receiver permits time synchronization between multiple imc CRONOS systems – whether separated by a short span or located on different continents.

imc STUDIO software environment

The imc CRONOS*flex* is operated by imc STUDIO – the same intuitive software 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*flex* base unit

The imc CRONOS*flex* base unit is the heart of the imc CRONOS*flex* system:

- TCP/IP Ethernet interface for system configuration and interactive data collection
- Onboard data storage on removable flash media or optional hard drive
- Onboard 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

Two speed grades and build time options

imc CRONOS*flex* is available with aggregate data collection rates of either 400 kSample/s or 2000 kSample/s per system.

In addition, a base unit may be configured with CAN or other fieldbus interface extensions, digital I/O, counter and analog output extensions. The imc CRONOS*flex* base unit options extend the general functionality of the system, detailed in the imc CRONOS*flex* base unit table (following page).

imc CRONOS*flex* modularity

With up to 100kSample/s per channel, integrated signal conditioning and sensor power supplies, imc CRONOS*flex* modules are up to the toughest data acquisition challenges, while performing under demanding environmental conditions. imc CRONOS*flex* input modules are compatible with virtually every physical sensor and signal type, and integrate not only sensor signal conditioning, but also filtering and digitizing in a single, compact, field-swappable unit.

Digital I/O, analog output and control

Logging of analog inputs is only part of the story when it comes to complete test systems. As with all imc data acquisition systems, imc CRONOS*flex* is also well-suited to interact with the test environment, including discrete digital inputs and outputs, as well as analog outputs (e.g., proportional control) and CAN I/O.

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.

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 is available as an enhancement. This option provides the capability of handling tasks ranging from basic statistical operations, such as minimum/maximum, 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 functionality 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*flex* Details

imc CRONOS*flex* base unit

	CRFX-400	CRFX-2000G
General		
Aggregate sampling rate	400 kSps	2000 kSps
Operating conditions		
Standard operating temp. range	●	●
Extended temp. range (incl. condensation)	○	○
Shock and vibration rating	MIL 810F (40g)	
Connectivity		
Ethernet	100 MBit	1 GBit
W-LAN (WiFi) IEEE 802.11.g (54 Mbit/s)	○	○
Dual antenna IEEE 802.11.n (300 Mbit/s)		○
Wireless UMTS, 3G, 4G	○	○
EtherCAT distributable system bus	●	●
GPS connection port	●	●
Display connection port	●	●
Remote controlled main switch	●	●
Programmable status feedback (LEDs)	●	●
Isolated SYNC signal	(★)	●
Data storage		
CF card slot (Compact Flash)	●	
CFast card slot		●
USB 2.0 host port (external removable storage)		●
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	○	○
Multi-functional I/O extension of base unit		
Digital in/out, pulse counter, analog out	○	○
Power supply		
DC input 10V to 50V	●	●
AC/DC adapter (110 to 230VAC)	●	●
Supply of remote modules via Power-over-EtherCAT	●	●
Data integrity upon power fail	●	●
UPS (lead gel battery)	○	○
UPS (extended capacity Li-Ion)	○	○

CRFX-400

CRFX-2000G

HANDLE-LI-IO-L

HISO-8

ICPU2-8

ISO2-8-2T

BR2-4

DCB2-8

HV-2U2I

HV-4U

imc CRONOSflex analog amplifier modules

module name CRFX/xxx	channels	width (type)	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	Charge 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																												
LV3-8	8	1	DSUB-15	○	●	100 kHz	11 kHz		5	●	●			●					○	○	○							
Voltage & temperature measurement																												
ISO2-8	8	1	DSUB-15	○	●	100 kHz	11 kHz	●	50	●	●			●	●	●			○	○	○							
ISO2-8-2T	8	2	Thermo			100 kHz	11 kHz	●							●													
ISO2-16-2T (*)	16	2	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	3	Push-in			100 kHz	11 kHz	●	50	●	●			●	●	●												
High voltage measurement 600V CAT III																												
HV-4U (U-chan)	4	3	Banana			100 kHz	14 kHz	●	2,500	●	●	●																
HV-2U2I (I-chan)	4	3	Terminal blocks		●	100 kHz	14 kHz	●	250		(●)																	
Audio & vibration measurements																												
ICPU2-8	8	2	BNC		●	100 kHz	48 kHz		5	●	●						●											
AUDIO2-4	4	2	BNC		●	100 kHz	48 kHz		5	●	●						●											
Charge																												
QI-4	4	2	BNC		●	100 kHz	48 kHz	●	5	●	●						●	●										
Bridge & strain gauge measurements																												
BR2-4	4	1	DSUB-15	○	●	100 kHz	14 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 CRONOSflex DIO, pulse counter, DAC modules

module name CRFX/xxx	width	standard connector	input Bits	high voltage	output Bits	high current	analog outputs	counter inputs	quadrature mode chan	counter frequency	analog sin/cos mode
Base unit extension											
DI16-D08-ENC4	+40mm	DSUB-15	16		8			4	2	32 MHz	
DI8-D08-ENC4-DAC4	+40mm	DSUB-15	8		8		4	4	2	32 MHz	
flex modules: pulse counter											
HRENC-4	1	DSUB-15						4	4	256 MHz	●
flex modules: digital I/O, DAC (*)											
DI2-16	1	DSUB-15	16								
DI2-32	2	DSUB-15	32								
DO-16-HV (110V)	2	Terminal blocks	16	●							
DO-16-HC	1	DSUB-15			16	●					
DO-32-HC	2	DSUB-15			32	●					
DI2-16-DO-16-HC	2	DSUB-15	16		16	●					
DAC-8	1	DSUB-15					8				
DO-16-HC-DAC-8	2	DSUB-15			16	●	8				

**TEDS support
(Transducer Electronic Data Sheet)**
imc CRONOSflex modules support direct read/write of TEDS sensors, including imc's TEDS Clip.
Connectors: TEDS interfaces require either the ACC /DSUBTEDS-x variants of our connectors or per-channel connectors such as Lemo. "IEPE" type TEDS is supported in audio modules with direct BNC input connectors.

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

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

Facts & Features

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