

imc CRONOSflex Base Unit (CRFX-400/CRFX-2000)

The heart and soul of the imc CRONOSflex system

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The imc CRONOSflex Base Unit provides the core features of the imc CRONOSflex data acquisition system extended by online processing. By simply clicking an imc CRONOSflex Module, or modules, to a Base Unit, a complete system may be created, with exactly the number of channels needed. No cables between cards, no half empty mainframe racks, and no expansion chassis to squeeze in one more channel. Just a perfect fit.

Data logging of any analog, digital and field bus channels can be managed by a single base unit, with up to 100,000 samples per second per channel, and up to 2,000,000 samples per second in total, streamed continuously to disk, flash storage, the control PC, remote viewers.

In addition extensive real-time processing together with digital I/O and analog output turns imc CRONOSflex into a complete measurement and control system.



imc CRONOSflex Base Unit
The heart and soul of the imc CRONOSflex system
(CRFX-400 / CRFX-2000)

Highlights:

- Multipurpose data acquisition
- Real time signal processor imc Online FAMOS
- TCP/IP Ethernet interface for PC connectivity
- Onboard flash and optional hard drive storage and/or network storage
- Stand alone operation and power-failure control logic
- Extensive field bus options
- Versatile digital I/O options
- GPS (for time and/or position information) and external display connectivity



imc CRONOSflex
distributed system

imc CRONOSflex - Frameless expansion, flexible modularity

An imc CRONOSflex system is composed of a base unit and one or more imc CRONOSflex modules. These modules are designed to be directly connected to one another.

The imc Click Mechanism and extruded aluminum case provide a firm mechanical and electrical connection. As a result, no mainframe or rack is needed.



imc Click Mechanism

Order Code

	article number:	Comments:
CRFX-400	1190005	400 kS/s maximum system throughput
CRFX-400-ET	1191005	400 kS/s, extended environmental range
CRFX-2000	1190006	2000 kS/s maximum system throughput ¹
CRFX-2000-ET	1191006	2000 kS/s, extended environmental range

Terminal connections	CRFX-400	CRFX-2000
PC connection: Ethernet TCP/IP	RJ45, 10/100 MBit, approvable cable length for 100 MBit Ethernet max. 100 m according IEEE 802.3	
System bus (EtherCAT) for imc CRONOSflex Modules	RJ45, cable length between two modules max. 100 m alternatively: direct module connector (clickable)	
Removable storage	CF-Card Slot	Express-Card Slot
USB 2.0 (dual ports, for external storage)	-	✓
Modem	DSUB-9	
Display / GPS	DSUB-9	
Synchronization of multiple devices	BNC	
Supply	LEMO.EGE.1B.302 (female) multicoded, compatible to connectors: FGG.1B.302 (standard); FGE.1B.302 (E-coded) alternatively: direct module connector (clickable)	
Module connector	2x 20-pin direct connection of modules (click): supply and system bus	
Remote on/off	LEMO.1B.306	

Base Unit dimensions and configuration options					
Dimensions (W x H x D in mm)	90 x 118 x 180 (standard, without any additional configuration options)				
Factory configured options for the Base Unit (CRFX-400 or CRFX-2000)	• Multi-IO	digital inputs / outputs, incremental inputs and analog out (DAC4) adds 40 mm to the width			
		<ul style="list-style-type: none"> • DI16-DO8-ENC4 ⁹ or • DI8-DO8-ENC4-DAC4 ¹⁰ 			
	• fieldbus	e.g. CAN-Bus adds 20 mm to the width, for further details refer to the fieldbus options documentation.			
		<ul style="list-style-type: none"> • 1 interface module • 2 interface modules 			
	possible combinations:				
		fieldbus Interface 1	fieldbus Interface 2	Multi-IO	width in mm (approx.)
		-	-	-	90
	✓	-	-	110	
	✓	✓	-	130	
	-	-	✓	130	
	✓	-	✓	150	
	✓	✓	✓	170	


Module power supply options

- Adjacent imc Power-Handle module (module connector / imc Click Mechanism)
- Direct connection (LEMO.EGE.1B.302 power socket)

For further details refer to the power options documentation.

Coded supply plug (2 coding notches)

The supply plug of the imc CRONOSflex devices has been changed (coded) so that the new 48 VDC power adapter can only be used with the imc CRONOSflex devices and not with other imc measurement devices with an input supply voltage of 10..32 VDC.

		plug-type (female):	
		LEMO.EGG.1B	LEMO.EGE.1B
		1 coding notch	2 coding notches
		up to 8/2011	as of 9/2011 Revision 5
connector-type (male):		power adapter:	
LEMO.FGG.1B	1 coding key	15 V, 24 V	fit
LEMO.FGE.1B	2 coding keys	48 V	fits only with ACC/FGG-ADAP-PHE
			fit
			fit

Required software version

- Supported by imc STUDIO version 3.0 R4 and imc DEVICES version 2.7 R3, or later

Included accessories

- AC/DC power adapter 110-230 VAC 50-60 Hz / 48 V DC / 150 W with cable and pre-assembled LEMO connector
- DC-power LEMO.FGE.1B.302 connector
- Ethernet network cable (2 m): both cross-over and straight-through versions
- imc screw driver
- Operating software: imcStudio Standard
- "Getting Started" documentation

Optional accessories / expansions

Power connectors

- Power connector 90° angular LEMO.FHE.1B.302 plug (male) (E-coded: 2 coding keys) 1190074 CRFX/MODUL-PP-90
- Adapter for coded power supply connector, LEMO.FGG.1B to LEMO.FGE.1B 1350151 ACC/FGG-ADAP-PHE

For all previously delivered imc CRONOSflex systems with the former power supply plug LEMO.EGG.1B (with one coding notch):
to be powered in future with 48 VDC supply with E-coded connector LEMO.FGE (with two coding keys), use the adapter cable ACC/FGG-ADAP-PHE.

Supply module ("Power-Handle")

- | | | |
|---|---------|---------------------|
| • Handle with system power supply 50 V 100 W, without UPS | 1190058 | CRFX/HANDLE-POWER-L |
| • Handle with system power supply 50 V 100 W, with lead-gel battery | 1190043 | CRFX/HANDLE-UPS-L |
| • Handle with system power supply 50 V 100 W, with Li-Ion battery | 1190010 | CRFX/HANDLE-LI-IO-L |

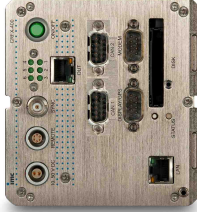
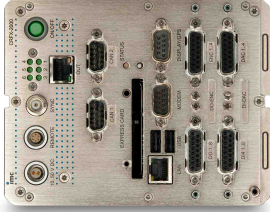
Passive-Handle

- | | | |
|-----------------------------------|---------|---------------|
| • standard unpowered left handle | 1190008 | CRFX/HANDLE-L |
| • standard unpowered right handle | 1190007 | CRFX/HANDLE-R |

Mounting brackets for fixed installations

- | | | |
|---------------------------------------|---------|-------------------|
| • mounting bracket 90° | 1190068 | CRFX/BRACKET-90 |
| • mounting bracket 180° | 1190069 | CRFX/BRACKET-180 |
| • rear panel mounting element | 1190070 | CRFX/BRACKET-BACK |
| • assembly element for 2 modules | 1190071 | CRFX/BRACKET-CON |
| • 19" RACK for imc CRONOSflex modules | 1190066 | CRFX/RACK |
| • mounting element in the RACK | 1190072 | CRFX/BRACKET-RACK |

Technical Specs: imc CRONOSflex Base Unit

General	CRFX-400	CRFX-2000
Maximum system throughput	400 kS/s	2000 kS/s ¹
	 <p>CRFX-400, shown with optional CAN-Bus Interface (specified operating position)</p>	 <p>CRFX-2000, shown with optional CAN-Bus Interface and Multi-IO extension (specified operating position)</p>

Power	CRFX-400 and CRFX-2000
Input supply voltage	10 V to 50 V DC not isolated, with power GND tied to device housing (CHASSIS)
AC/DC power adapter	110-230 VAC 50-60 Hz, 48 V DC 150 W, included
Standalone operation with autostart (delay, absolute time)	✓
Shutdown threshold (min. input supply voltage):	9.3 V (nominal) min. required voltage for restart: 10 V automatic shutdown with data saving upon power fail

	CRFX-400	CRFX-2000
Power consumption	<20 W	<45 W

Pass through power limits	
Directly connected (clicked) imc CRONOSflex Modules	3.1 A (maximum current) Equivalent power with chosen DC power input: <ul style="list-style-type: none"> • 148.8 W @ 48 V DC (e.g. AC/DC line adapter, included) • 74.4 W @ 24 V DC (e.g. AC/DC line adapter) • 37.2 W @ 12 V DC (typical vehicle supplied DC input)
Power over Ethernet (PoE) for remote imc CRONOSflex Modules	350 mA (maximum current, conforms to IEEE 802.3) Equivalent power with chosen DC power input: <ul style="list-style-type: none"> • 17.5 W @ 50 V DC (e.g. AC/DC Power Handle) • 16.8 W @ 48 V DC (e.g. AC/DC line adapter) • 14.7 W @ 42 V DC (minimum voltage for PoE) Note: minimum system power of 42 V DC required for PoE

¹ 2000 kS/s available with deactivated process vector. When using the process vector a maximum of 128 active analog channels at 2 kS/s per channel (monitor channels do count separately) plus one fieldbus interface is available. Each additional fieldbus interface module might reduce the maximum aggregate sampling rate of analog channels by a maximum of 200 kS/s.

✓ standard; O optional; - : not available

Operating conditions	CRFX-400	CRFX-2000
Operating environment (standard)	dry, non corrosive environment within specified temperature range	
Ingress Protection Rating	IP20	
Operating temperature range (standard)	-10°C to +55°C no condensation	-10°C to +55°C no condensation
Extended environmental range (optional)	-40°C to +85°C with condensation	-
Shock- and Vibration resistance	IEC 60068-2-27, IEC 61373 Category 1, Class A and B	
Extended Shock- and Vibration resistance (special order)	MIL-STD-810F Rail Cargo Vibration Exposure U.S. Highway Truck Vibration Exposure	

System key features and hardware options	CRFX-400 and CRFX-2000
Onboard data storage	✓
Remote data storage on PC or network drive	✓
Multi-triggered (multi-shot) data acquisition	✓
Extensive intelligent trigger functions pre- and post triggering	✓
Extensive real-time analysis and control functions	○ (with Online FAMOS - Personal Analyzer)
Synchronisation via GPS real time, radio clock (DCF77, IRIG-B), BNC cable	○
External GPS signal receiver	○
WLAN (Wi-Fi)	○

Onboard data storage	CRFX-400	CRFX-2000
CF-card	○	-
Express-card	-	○
Internal hard drive ²	○	○
Circular buffer memory	✓	✓
Synchronous, multi-triggered recording	✓	✓

² The integration of a hard drive into the Base Unit will increase the power consumption and the width of the housing.

✓ standard; ○ optional; - : not available

Operating software		CRFX-400 and CRFX-2000
Minimum system requirements	imc STUDIO STD, Version 3.0 R4 imc DEVICES Version 2.7 R3	
Online-analysis software options		CRFX-400 and CRFX-2000
Online FAMOS	O	
Online FAMOS Professional	O	
Online Class Counting Kit	O	
Online Order-Tracking Kit	O	
ECU Protocols for CAN	O	
Measurement data analysis		CRFX-400 and CRFX-2000
imc FAMOS Signal analysis software	O	
imc Sensors sensor data base	O	
Development environment		CRFX-400 and CRFX-2000
imc COM basic package	O	
LabVIEW™ interface, VI's	✓	

✓ standard; O optional; - : not available

Unless otherwise indicated, the technical specs given are valid for the following ambient conditions:

- temperature 23°C
- air pressure 1013 mbar
- relative humidity 40%

Synchronization and time base

Parameter	value typical	min. / max.	Remarks
<i>time base per device without external synchronization</i>			
not balanced (default)		± 50 ppm	at 25°C (accuracy of internal time base)
Drift	± 20 ppm	± 50 ppm	-40 °C to +85 °C operating temp.
Ageing		± 10 ppm	at 25°C, 10 years

<i>time base per device with external synchronization signal</i>				
Parameter	GPS	DCF77	IRIG-B***	NTP***
Supported formats	NMEA / PPS*		B002 B000, B001, B003**	version 4 (downwards compatible)
Precision	± 1 µs			< 5 ms after ca. 12 h
Jitter (max.)	± 8 µs			
Voltage level	TTL (PPS*) RS232 (NMEA)	5 V TTL level	5 V TTL level	---
Input resistance	1 kΩ (pull up)	20 kΩ (pull up)		---
Input connector	DSUB-9 connector "GPS" not isolated	BNC connector "SYNC" short circuit proof, not isolated		Ethernet
Shield potential input		system ground		---

*PPS (pulse per second): signal is necessary, **using BCD information only

*** Not available for devices with serial number less than 140000

<i>Synchronization with DCF77 for several devices (Master/Slave)</i>			
Max. cable length		200 m	BNC cable RG58
Max. number of devices		20	slaves only
Common mode	0 V		these device must have the same ground voltage level, otherwise signal quality problems (signal edges) may result. Remedy see ISOSYNC
Voltage level	5 V		
DCF input/output	connector "SYNC"		BNC
Shield potential, IRIG-input	system ground		

<i>ISOSYNC with different potentials</i>			
Isolation strength	1000 V		1 minute
Delay	5 µs		@ 25°C
Temperature range		-35°C to +80°C	

imc CRONOSflex Base Unit configuration options

CRFX/DI16-DO8-ENC4

Digital I/O with 16 digital inputs, 8 digital outputs, 4 inputs for incremental encoder.

Digital Inputs

Parameter	Value (typ. / min.max.)	Remarks
Channels	16 or 8	common ground reference for each 4-channel group, isolated from the other input group
Configuration options	TTL or 24 V input voltage range (selected globally for 8-channel groups)	configurable at the DSUB jumper from LCOM to LEVEL activates TTL-mode LEVEL unconn. activates 24 V-mode
Sampling rate	10 kHz	per channel
Isolation strength	± 150 V	to system ground (tested ± 200 V)
Input configuration	differential	isolated mutually and from supply
Input current	max. 500 μ A	
Switching threshold	1.5 V (± 200 mV) 8 V (± 300 mV)	5 V mode 24 V mode
Switching time	< 20 μ s	
Supply HCOM	5 V max. 100 mA	Reference at Level otherwise electrically isolated from system
Connector plug	DSUB-15	ACC/DSUB-DI4-8

Digital outputs

Parameter	Value (typ. / min.max.)	Remarks
Channels / bits	8 bit	Group of 8 bits, galvanically isolated as a whole, common reference potential ("LCOM") for each group
Isolation strength	± 50 V	to system ground (protection ground)
Output configuration	totem pole (push-pull) or open-drain	configurable by wire jumper ("ODRN" – "LCOM") in the connector plug
Output level	TTL or max. $U_{ext} - 0.8$ V	internal, galvanically isolated supply voltage by connecting an external supply voltage U_{ext} with "HCOM", $U_{ext} = 5$ V to 30 V
State following system start	High resistance (high-Z)	Independent of output configuration (OPDRN-pin)!
Activation of the output stage following system start	upon first preparation of measurement	with initial states which can be adjusted in the experiment (High / Low) in the selected output configuration (OPDRN-pin)
Max. output current (typ.)	<i>HIGH</i> 15 mA 22 mA --- <i>LOW</i> 0.7 A 0.7 A 0.7 A	external clamp diode needed for inductive load
Output voltage	<i>HIGH</i> >3.5 V <i>LOW</i> ≤ 0.4 V	for load current: $I_{high} = 15$ mA, $I_{low} \leq 0.7$ A $I_{high} = 22$ mA, $I_{low} \leq 0.7$ A
Switching time	< 100 μ s	
Connector plug	1x DSUB-15 / 8 Bit	ACC/DSUB-DO8

Incremental encoder channels

Parameter	Value (typ. / min.max)		Remarks
Channels	4 + 1 (5 tracks)		Four single-tracks or combining two single-into two-track encoders One index track
Measurement modes:	Displacement, Angle, Events, Time, Frequency, Velocity, RPMs		
Connection terminals	1x DSUB-15		ACC/DSUB-ENC4
Sampling rate	50 kHz / channel (max.)		
Time resolution of measurement	31.25 ns		Counter frequency: 32 MHz
Data resolution	16 bits		
Frequency stability	<100 ppm deterioration <±5 ppm / year		
Input configuration	differential		
Input impedance	100 kΩ		
Input voltage range	±10 V		(differential)
Common mode input range	max. +25 V, min. -11 V		
Switching threshold	-10 V to +10 V		adjustable per channel
Hysteresis	min. 100 mV		adjustable per channel
Analog bandwidth	500 kHz		-3 dB (full power)
Analog filter	Bypass (no Filter), 20 kHz, 2 kHz, 200 Hz		adjustable (per-channel) 2 nd order Butterworth
Switching delay	500 ns		Modulation: 100 mV squarewave
CMRR	70 dB 60 dB	50 dB 50 dB	DC, 50 Hz 10 kHz
Gain uncertainty	<1 %		of input voltage range @ 25 °C
Offset uncertainty	<1 %		of input voltage range @ 25 °C
Frequency stability	<100 ppm		deterioration <±5 ppm / year
Overvoltage strength	±50 V		to system ground
Sensor supply	+5 V, 300 mA		not isolated (reference: GND, CHASSIS)

CRFX/DI8-DO8-ENC4-DAC4

Digital I/O with 8 digital inputs (DI8), 8 digital outputs (DO8), 4 inputs for incremental encoder (ENC4) and 4 analog outputs (DAC4).

Analog outputs

Parameter	Value (typ. / min.max.)		Remarks
Channels	4		
Connection terminals	1x DSUB-15 / 4 channels		ACC/DSUB-DAC4
Output level	±10 V		
Load current	±10 mA /channel max.		
Resolution	16 Bit		
Non-linearity	±2 LSB	±3 LSB	
Max. output frequency	50 kHz		
Analog bandwidth	50 kHz		-3 dB, low pass 2. order
Gain uncertainty	<±5 mV	<±10 mV	-40 °C to 85 °C
Offset uncertainty	<±2 mV	<±4 mV	-40 °C to 85 °C