

imc CRONOSflex Base Unit

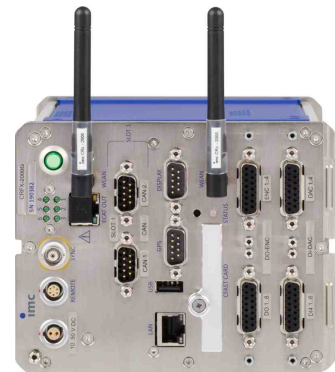
The heart and soul of the imc CRONOSflex system

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 fieldbus 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.



CRFX-2000G Base Unit with additional WiFi extension and DI8-DO8-ENC4-DAC4

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 fieldbus 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

Special features of the "GP" series

"✓" standard; "O" optional; "-" not available

Parameter	CRFX-400	CRFX-2000G(P)	Remarks
Ethernet TCP/IP	100 MBit	1 GBit	
Max. sampling rate	400 kS/s	2000 kS/s	
Flash removable storage	CF-Card slot	CFast-Card slot	
USB 2.0 (Host)	-	✓	for data storage media
PTP synchronization	-	✓	requires 2000GP version with suitable switch
Internal WiFi-adaptor	O	O	802.11g, 54 MBit/s, 2.4 GHz
Dual Band WiFi option	-	O	802.11n, 300 MBit/s, 2.4 / 5 GHz
Enhanced performance		✓	for multi-monitoring, Web-Server, high-speed fieldbus modules

Overview of the available variants

Standard version		ET version *	
Order code	article no.	article no.	properties
Standard: 10 - 50 V DC power supply input			
CRFX-400	11900139	11910081	400 kS/s
CRFX-2000GP	11900192	11910119	2000 kS/s (PTP)
CRFX-2000GP-WFT	11900197		für den Einsatz mit WFT-2
CRFX-2000GP-WFT-UPS	11900287		additionally with UPS (Li-Ion)
Special variants: isolated power supply input 20 - 50 V DC (e.g. for rail way applications)			
CRFX-400-I	11900140	11910083	400 kS/s
CRFX-2000GP-I	11900207	11910125	2000 kS/s (PTP)
CRFX-2000G-I	11900138	11910080	2000 kS/s (obsolete)

Extra options (factory order options)

The CRFX base units can be equipped with extra options: such expansions can be implemented in a maximum of three modules, which can only be ordered as factory options and are installed permanently. The housing is correspondingly wider. The available options are:

Multi-IO unit

- Digital inputs
- Digital outputs
- Pulse counter unit (incremental counter inputs, encoder)
- Analog outputs (DAC)
- Available in different varieties: DI16-DO8-ENC4 or DI8-DO8-ENC4-DAC4

Fieldbus interfaces and further special functions

- Automotive buses: CAN, CAN FD, LIN, FlexRay, ARINC, XCPoE (master and slave)
- Railway buses: MVB, IPTCom
- Industry buses: EtherCAT (slave), Profibus
- Application module for custom applications (CRFX/APPMOD)
- Controller module and synthesizer/signal generator (CRFX/SYNTH)
- SSD hard drive integrated in the device

Software minimum requirements:

Operation requires operating software of the following group:

imc STUDIO 5.0 R9 associated with firmware and driver package imc DEVICES 2.9 R6

Power supply options

- Direct connection (LEMO.EGE.1B.302 power socket)
- Power supply via "Power-Handle" (handle with system supply, imc Click Mechanism)
- Power supply via "Power-Handle" with [UPS functions](#) 

For further details refer to the power options documentation in the manual.

* ET: Version in extended temperature range

Overview of the available configuration options (fixed configuration ex-factory)

Standard version		ET version	
Order code	article no.	article no.	properties
Fieldbus modules			
CRFX/CAN2	11900028	11910019	2 CAN nodes
CRFX/CAN-FD	11900202	11910114	2 CAN FD nodes
CRFX/LIN	11900029	11910066	2 LIN nodes
CRFX/ARINC-8RX-4TX	11900226	11910130	ARINC Bus, 8x Receive, 4x Transmit
CRFX/ARINC-8RX	11900030	11910044	ARINC Bus, 8x Receive
CRFX/FLEXRAY2	11900031	11910022	1 FlexRay node
CRFX/XCPOE2-MASTER	11900211	11910122	XCPOE Master
CRFX/XCPOE2-SLAVE	11900212	11910123	XCPOE Slave
CRFX/MVB-EMD	11900081	11910023	MVB-Bus (type EMD)
CRFX/MVB-ESD+	11900xxx	11910xxx	MVB-Bus (type ESD+)
CRFX/MODBUS	11900272	11910xxx	Modbus RTU (RS485 and Modbus TCP (Ethernet)
CRFX/IPT-COM	11900097	11910028	IPTCom Interface
CRFX/IWT	11900146	11910084	IWT Interface
CRFX/ECAT-SLAVE	11900040	11910038	EtherCAT Slave Interface
CRFX/PROFIBUS	11900093	11910xxx	Profibus Interface
Special expansions			
CRFX/APPMOD-NET-COM	11900190	11910014	Ethernet, RS232/422/485
CRFX/SYNTH-8	11900143	11910126	PID controller, synthesizer
CRFX/HDD-FRAME	11900223	11910xxx	removable frame for SSD drive, max. 1x per device (occupying 1 slot)
CRFX/400-SSD-960GB	11900282	X	SSD drive, 0°C to 70°C, occupying 1 slot
CRFX/2000GP-SSD-960GB	X	11900284	SSD drive, -40°C to 85°C, occupying 1 slot
CRFX/2000GP-SSD-480GB	X	11900283	SSD drive, -40°C to 85°C, occupying 1 slot
Multi-IO (digital in-output, pulse signals and if required with analog outputs, -DAC4)			
CRFX/DI16-DO8-ENC4	11900018	11910008	without analog output
CRFX/DI8-DO8-ENC4-DAC4	11900019	11910009	with analog output
WiFi (WLAN)			
CRFX/400-WLAN-I	11900035	11910068	WLAN, 2.4 GHz
CRFX/2000G-WLAN-I	11900109	11910060	Dual Band (2.4 / 5 GHz)
Additional device software (upgrade options)			
CRFX/OFA-UP	11900013	update from imc Online FAMOS to OFA-Professional	
CRFX/VEC-DATB	119000xx	vector data base interface	
CRFX/imc-REMOTE	11900123	imc REMOTE	
CRFX/ECU-P	11900016	ECU protocols for the CAN Interface	

Technical data of the fieldbus modules and further special functions are specified in separate data sheets.

Base units dimensions and configuration options				
Dimensions (W x H x D in mm)	90 x 118 x 180 (standard, without any additional configuration options)			
Ex factory configuration options of base unit	• Multi-IO	adds 40 mm to the width		
		• DI16-DO8-ENC4 ¹³ or • DI8-DO8-ENC4-DAC4 ¹⁴		
	• special interface, fieldbus interface	adds 20 mm to the width		
Possible combinations				
fieldbus interface 1	fieldbus interface 2	fieldbus interface 3	Multi-IO	width in mm
-	-	-	-	90
✓	-	-	-	110
✓	✓	-	-	130
✓	✓	✓	-	150
-	-	-	✓	130
✓	-	-	✓	150
✓	✓	-	✓	170

Overview of the available software options for the base unit, e.g. CRFX-400 and CRFX-2000GP

Software options	features	licensing	
		license model	included
	• : included ○ : optional		
Operating software			
imc STUDIO Standard	operating software, integrated test and measurement suite	PC	○
imc STUDIO Professional / Developer	customized operation, scripting, application development	PC	○
imc CANSAS	configuration of CANSAS modules		•
imc SENSORS	sensor data base	PC	○
Real-time data analysis			
imc Online FAMOS	real-time calculations, immediate results	Device	•
imc Online FAMOS Professional	real-time control extensions, PID control etc.	Device	○
imc Online FAMOS Kits	class counting (fatigue analysis), order tracking	Device	○
Post Processing			
imc FAMOS Reader	data visualization	PC	•
imc FAMOS Standard / Professional	data visualization, analysis, reporting, scripting	PC	○
imc FAMOS Enterprise	incl. class counting, order tracking, ASAM-ODS browser	PC	○
Remote Access			
imc LINK	remote device access, automatic data transfer	PC	○
imc REMOTE	Web Server, secure https device access	Device	○
CAN			
Vektor database (*.dbc import)	Vector database interface	Device	•
ECU Protokolle	for CAN interface: KWP 2000, CCP, OBD-2	Device	○
Application development			
imc API	.NET programming interface (API) for imc STUDIO	PC	○

Accessories and Plugs

Included accessories

AC/DC power adaptor 110-230V AC (with appropriate LEMO plug)				
ACC/AC-ADAP-48-150-1B	48 V DC, 150 W, LEMO.1B.302			13500148
Power plug				
ACC/POWER-PLUG5	DC supply plug LEMO FGG.1B.302, with solder contact, max. 0.34 mm ²			13500150
DSUB-15 plug for Multi-IO expansion of the Base Unit:		11900018	11900019	
ACC/DSUBM-DI4-8	plug for digital inputs	2x	1x	13500174
ACC/DSUBM-DO8	plug for digital outputs	1x	1x	13500173
ACC/DSUBM-ENC4	plug for incremental inputs	1x	1x	13500171
ACC/DSUBM-DAC4	plug for analog outputs	-	1x	13500177
Documents				
Getting started with imc CRONOSflex (one copy per delivery)				
Device certificate				
Miscellaneous				
1x Ethernet network cable with latch protection (uncrossed, 2 m)				

Optional accessories

Power connector				
ACC/FGG-ADAP-PHE	adaptor for coded power supply plug, LEMO.FGG.1B to LEMO.FGE.1B 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).			13500151
CRFX/MODUL-PP-90	DC power plug 90° angular, plug: LEMO.FHE.1B.302 (E-coded: 2 coding keys) When installing CRFX modules with their back panel side onto a flat surface (using CRFX/BACKET-BACK), the resulting limited headroom requires an angular type power plug rather than the standard LEMO connector. For more information, please refer to the technical data sheet "Mounting Systems".			11900074
Supply module in left handle ("Power-Handle")				
CRFX/HANDLE-POWER-L	handle with system power supply 50 V 100 W, without UPS			11900058
CRFX/HANDLE-NIMH-L	Handle with system power supply 50 V 100 W, UPS with NiMH battery			11900273
CRFX/HANDLE-LI-IO-L	handle with system power supply 50 V 100 W, USV with Li-Ion battery			11900010
Passive handle				
CRFX/HANDLE-L	standard unpowered left handle			11900008
CRFX/HANDLE-R	standard unpowered right handle			11900007

Mounting brackets for fixed installations		
CRFX/BRACKET-90	mounting bracket 90°	11900068
CRFX/BRACKET-180	mounting bracket 180°	11900069
CRFX/BRACKET-BACK	rear panel mounting element	11900070
CRFX/BRACKET-CON	assembly element for two modules	11900071
CRFX/RACK	19" RACK for imc CRONOSflex modules	11900066
CRFX/BRACKET-RACK	mounting element in the RACK	11900072
Miscellaneous		
ACC/SYNC-FIBRE	optical synchronization adaptor, for extended temperature range	13500156
Documents		
SERV/CAL-PROT	Calibration protocol per amplifier imc manufacturer calibration certificate with measurement values and list of calibration equipment used (pdf).	150000566
SERV/CAL-PROT-PAPER	Calibration protocol per amplifier (paper print) imc manufacturer calibration certificate with measurement values and list of calibration equipment used with signature and seal.	150000578
Device certificates and calibration protocols: Detailed information on certificates supplied, the specific contents, underlying standards (e.g. ISO 9001 / ISO 17025) and available media (pdf etc.) can be found on our website, or you can contact us directly.		

Further accessories (see separate price list of the accessories)

- recommended and verified removable flash storage media
- external display (via DSUB-9)
- GPS-receiver (with DSUB-9 connection)
- Fibre Optic Converter for EtherCAT system bus, FH/FO-CONV-ECAT-ENET-MM (13300017)

Technical Specs imc CRONOSflex Base Unit

"✓" standard; "O" optional; "-" not available

Parameter	CRFX-400	CRFX-2000G(P)	Remarks
Max. aggregate sampling rate	400 kS/s	2000 kS/s	data rate of analog channels ¹
Terminal connections			
PC / network	RJ45	RJ45	max. 100 m cable with 100 MBit (according to IEEE 802.3)
Ethernet TCP/IP	100 MBit	1 GBit	
System bus for flex-modules (EtherCAT)	RJ45 alternatively: module connector		max. 100 m cable between 2 modules
Additional connections	<4 +3		with imc STUDIO Monitor or imc REMOTE Windows Explorer connections
Flash removable storage	CF-Card slot	CFAST-Card slot	can also be read out via network
USB 2.0 (Host)	-	✓	for alternative storage media instead of CFAST: such as ext. storage, USB stick etc.
Internal hard drive (SSD)	O	O	option, only ex factory: SSD; 400 kS/s data storage achievable with 16 bit / sample
Internal WiFi (WLAN) adaptor (optional)	1 antenna IEEE 802.11g max. 54 MBit/s 2.4 GHz	2 antennas IEEE 802.11n max. 300 MBit/s dual band (2.4 / 5 GHz)	
Sync	BNC		isolated (marked with yellow ring)
External display	DSUB-9		
External GPS module	DSUB-9		
Power supply	type LEMO.1B (2-pin)		compatible with LEMO.EGE.1B.302 multicoded 2 notches compatible with connectors FGG.1B.302 (standard) or FGE.1B.302 (E-coded, 48 V)
Remote control terminal	type LEMO.1B (6-pin)		connector LEMO FGG.1B.306
Module connector	2 x 20-pin		direct connection of modules (click) supply and system bus

1 2000 kS/s achievable with deactivated process vector, without trigger and in 16 Bit mode only.

When using the process vector a maximum of 128 active analog channels (monitor channels do count as well) at 2 kS/s per channel plus one fieldbus interface are possible. Each additional fieldbus interface might reduce the aggregate sampling rate of analog channels by a maximum of 200 kS/s.

Power supply	CRFX-xxx	CRFX-xxx-I	Remarks
DC supply input	-	✓	galvanically isolated of housing (CHASSIS)
Isolated system-electronics	-	✓	USB, display and GPS
Power supply	10 V to 50 V DC	20 V to 50 V DC	
Power-on threshold (typ.)	10.0 V	20.0 V	min. input voltage required for power-on (open circuit)
Shutdown threshold (typ.)	9.2 V	18.1 V	input voltage at which the automatic deactivation is triggered (data backup protected by internal UPS buffering)
Power consumption	CRFX-400: typ. 20 W CRFX-2000G(P): typ. 35 W		depending on model and equipment (e.g. fieldbus, SSD)
AC/DC power adaptor	48 V DC, 150 W 110-230 V AC 50-60 Hz		included in delivery
Pass through power	via module connector and onto RJ45 (EtherCAT): PoEC		min. 42 V required for PoEC

Pass through power limits

Directly connected imc CRONOSflex modules via module connector	3.1 A (max.), equivalent power with chosen DC power input: 149 W at 48 V DC (standard AC/DC power adaptor resp. DC/DC Power Handle) 37 W at 12 V DC (typ. DC input voltage)
Power-over EtherCAT (PoEC) for remote imc CRONOSflex modules	350 mA (max., corresp. to IEEE 802.3), equivalent power with DC power input: 17.5 W at 50 V DC (e.g. DC/DC Power Handle) 16.8 W at 48 V DC (e.g. AC/DC power adaptor) 14.7 W at 42 V DC (minimum voltage for PoEC) Note: minimum system power of 42 V DC required for PoEC

UPS and Data integrity	Value	Remarks
Autarkic operation without PC	✓	
Self start (Automatic data acquisition operation)	configurable	timer, absolute time, automatic start when power supply is available
Auto data-saving upon power outage	✓	buffering (UPS) with "auto-stop" auto-stop of measurement, data storage and automatic shutdown
UPS	integrated	Super-Caps, CRFX-xxx: delivery since Q2/2017 before: Lead gel batteries ² CRFX-xxx-I: Super-Caps at all times
Charging time of the Super-Caps	6 min.	minimum required active operation for full UPS functionality
UPS coverage	CRFX base unit	no buffering of directly connected CRFX modules (to be covered by separate UPS module CRFX/HANDLE-xx)
UPS delay	0 s	"buffer-time constant": required duration of a continuous outage that will trigger auto shutdown procedure

2 see reference to lead batteries on device identification plate

Data acquisition, trigger	Value	Remarks
Channel individual sampling rates	selectable in 1–2–5 steps	
Number of sampling rates: analog channels, DI and counter	2	usable simultaneously in one configuration
Number of sampling rates: fieldbus channels	arbitrary	
Number of sampling rates: virtual channels	arbitrary	data rates generated via imc Online FAMOS (e.g. via reduction)
Monitor channels	✓ for all channels of the types: analog, DI and counter (incremental counter) and CAN	doubled channels with independent sampling and trigger settings
Intelligent trigger functions	✓	e.g. logical combination of multiple channel events (threshold, transition) to create triggers that start and stop acquisition of assigned channels
Multi.triggered data acquisition	✓	multiple trigger-machines and multi-shot
Max. Trigger events per CRFX module	8	each CRFX module
Multi-triggered data acquisition	✓	Multiple trigger-machines and multi-shot
Independent trigger-machines	48	start/stop, arbitrary channel assignment

Maximum channel count per device									
Active channels within a systems...		512		Active channels of the current configuration: Total number of analog, digital, fieldbus and virtual channels, as well as monitor channels, if any.					
...of which active analog channels		198 ⁽¹⁾		Active analog channels of the current configuration (sum of primary channels + monitor channels)					
Fieldbus channels		1000		Number of defined channels (active and passive); Currently activated channels are limited by the total number of activated channels (512).					
Process vector variables		800		Single value variables, each containing the last measured values. A process vector variable is automatically created for each channel.					
		without monitor channels			with monitor channels				
Channel type	determined by	limit (active+passive)		activated	total activated	limit (active+passive)		activated	total activated
Analog channels	system-expansion	Channel	240	198 ⁽¹⁾	512	Channel	240	198 ⁽¹⁾	512
						Monitor	240		
Incremental counter	system-expansion	Channel	16	16		Channel	16	16	
						Monitor	16	16	
DIO/DAC-Ports	system-expansion	Port	16	16		Port	16	16	
						Monitor	16	16	
Fieldbus channels	flexible	Channel	1000	512		Channel	1000	512	
						Monitor			
Virtual channels (OFA)	flexible	-	-	512		-	-	512	

Occupancy for ports (examples):

- one DO module (e.g. DO-16) occupies 1 port
- one DI8-DO8-ENC4-DAC4 module occupies 3 ports
- one DAC module (e.g. DAC-8 or DAC-4) occupies 1 port



Monitor-ports: DI-ports (respectively channels) have monitor-ports, DO/DAC-ports in contrary do not have monitor-ports

(1): 128 with imc CRONOSflex (CRFX) and imc CRONOS-XT (CRXT), incl. output channels of type DAC-8 and DIO-Ports of type DI / DO, incl. 18 channels per CRFX/WFT-2 input

Storage, signal processing		
Parameter	Value	Remarks
Removable flash storage	CF (CRFX-400) CFast, USB (CRFX-2000GP)	recommended media available at imc; the specified operating temperature range of the media is relevant
Storage on NAS (network storage)	✓	alternatively to onboard Flash storage SMBv2+3
Arbitrary memory depth with pre- and post trigger	✓	maximum pretrigger limited by size of Circular Buffer RAM; posttrigger only limited by available mass storage (Flash)
Circular buffer mode	✓	cyclic overwrite of circular buffer memory on mass storage media
Synchronization	DCF 77 GPS IRIG-B NTP PTP	Master / Slave via external GPS-receiver TTL via network for CRFX-2000GP devices
Extensive real-time analysis and control functions	✓ imc Online FAMOS included in standard delivery	device-option, licensed via activation code

Operating conditions		
Parameter	Value	Remarks
Operating environment	dry, non corrosive environment within specified operating temperature range	
Rel. humidity	80% up to 31°C, above 31°C: linear declining to 50%	according IEC 61010-1
Ingress protection rating	IP20	
Pollution degree	2	
Operating temperature (standard)	-10°C to +55°C	without condensation
Operating temperature (extended: "-ET" version)	-40°C to +85°C	condensation temporarily allowed
Shock- and vibration resistance	IEC 61373, IEC 60068-2-27 IEC 60068-2-64 category 1, class A and B MIL-STD-810 Rail Cargo Vibration Exposure U.S. Highway Truck Vibration Exposure	
Extended shock- and vibration resistance	upon request	specific tests or certifications upon request

Time base of individual device without external synchronization			
Parameter	Value typ.	min. / max.	Remarks
Accuracy RTC		±50 ppm 1 µs (1 ppm)	not calibrated (standard devices), at 25°C calibrated devices (upon request), at 25°C
Drift	±20 ppm	±50 ppm	-40°C to +85°C operating temperature
Ageing		±10 ppm	at 25°C; 10 years

Time base of individual device with external synchronization					
Parameter	GPS	DCF77	IRIG-B	NTP	PTP ⁽⁴⁾
Supported formats	NMEA / PPS ⁽¹⁾		B000, B001, B002, B003 ⁽²⁾	Version ≤4	Version 2
Precision	±1 µs			<5 ms after ca. 12 h ⁽³⁾	<1 µs under good conditions
Jitter (max.)	±8 µs			---	
Voltage level	TTL (PPS ⁽¹⁾) RS232 (NMEA)	5 V TTL Pegel		---	
Input impedance	1 kΩ (pull up)	20 kΩ (pull up)		---	
Input connection	DSUB-9 "GPS" not isolated	BNC "SYNC" (isolated) (test voltage 300 V, 1 min.)		RJ45 "LAN"	
Cable shield connection		BNC: isolated Signal-GND (marked with a yellow ring)		---	

Synchronization of multiple devices via DCF (Master/Slave)			
Parameter	Value typ.	min. / max.	Remarks
Max. cable length		200 m	BNC cable type RG58 (propagation delay of cable needs to be considered)
Max. number of devices		20	only slaves
Common mode SYNC not-isolated	0 V		with non-isolated BNC connector: devices must have the same ground voltage level, otherwise signal integrity issues (signal artifacts and noise) may result. Available optional external isolation: see ISOSYNC
SYNC isolated		max. 50 V	with isolated BNC connector: SYNC-signal is already internally isolated, for reliable operation even with different ground voltage level (ground loops)
Voltage level	5 V		
DCF input/output	"SYNC" connection		BNC

ISOSYNC (optional external device for an isolated decoupling of the SYNC signal)			
Isolation strength	1000 V		1 minute (test voltage)
Delay	5 µs		@ 25°C
Temperature range		-35°C to +80°C	

- (1) PPS (Pulse per second): signal with an impulse >5 ms is required; max. current = 220 mA (2) Using BCD information only
 (3) Max. value, concerning the following condition: first-synchronization
 (4) Only available for devices with "-GP" suffix and in conjunction with imc STUDIO 5.0 R5 or higher. Please read the Software manual for detailed information of the PTP synchronization (chapter: "External clock: PTP").

CRFX/DI16-DO8-ENC4

Multi I/O with 16 digital inputs, 8 digital outputs, 4 incremental counter channels.

Digital Inputs

Parameter	Value	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	configurable at the DSUB globally for 8 Bits: - jumper from LCOM to LEVEL: activates TTL-mode - LEVEL unconnected: activates 24 V-mode
Sampling rate	≤ 10 kHz	
Isolation strength	± 50 V	tested ± 200 V isolated to system ground, supply and channel-to-channel
Input configuration	differential	
Input current	max. 500 μ A	
Switching threshold	1.5 V (± 200 mV) 8 V (± 300 mV)	5 V level 24 V level
Switching time	< 20 μ s	
Supply HCOM	5 V max. 100 mA	electrically isolated from system (case), Configuration signal "LEVEL" is referenced to HCOM, LCOM
Terminal connection	DSUB-15	ACC/DSUBM-DI4-8

Digital outputs

Parameter	Value		Remarks
Channels / bits	8 bit		Group of 8 bits, galvanically isolated; common reference potential ("LCOM") for each group
Isolation strength	± 50 V		to system ground (case, CHASSIS)
Output configuration	totem pole (push-pull) or open-drain		configurable at the DSUB globally for 8 Bits: - jumper from OPDRN to LCOM: totem pole - OPDRN unconnected: open-drain
Output level	TTL or max. $U_{\text{ext}} - 0.8$ V		internal, galvanically isolated supply voltage by connecting an external supply voltage U_{ext} with "HCOM", $U_{\text{ext}} = 5$ V to 30 V
State upon system power up	high impedance (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 selected in the experiment (High / Low) in the selected output configuration (OPDRN-pin)
Max. output current (typ.)	HIGH	LOW	
TTL	15 mA	0.7 A	external clamp diode needed for inductive load
24 V-logic	22 mA	0.7 A	
open-drain	---	0.7 A	
open-drain with intern. 5 V supply		160 mA	for all outputs
Output voltage	HIGH	LOW	for load current:
TTL	> 3.5 V	≤ 0.4 V	$I_{\text{high}} = 15$ mA, $I_{\text{low}} \leq 0.7$ A
24 V-logic ($U_{\text{ext}} = 24$ V)	> 23 V	≤ 0.4 V	$I_{\text{high}} = 22$ mA, $I_{\text{low}} \leq 0.7$ A
Internal supply voltage	5 V, 160 mA (isolated)		available at terminals
Switching time	< 100 μ s		
Terminal connection	DSUB-15		ACC/DSUBM-DO8

ENC4: Pulse counter for incremental encoder

Parameter	Value		Remarks
Channels	4 + 1 (5 tracks)		four single-tracks or two two-track channels one index track
Measurement modes	Displacement (abs), Displacement (diff), Angle (abs), Angle (diff), Event, Frequency, Speed, Velocity, Time and Puls Time Measurement		only if the sampling rate is ≤ 1 ms
Sampling rate	≤ 50 kHz		per channel
Time resolution of measurement	31.25 ns		counter frequency: 32 MHz
Data resolution	16 bits		
Input configuration	differential		
Input impedance	100 k Ω		
Input voltage range	± 10 V		differential
Common mode input range	min. -11 V	max. +25 V	
Switching threshold	-10 V to +10 V		detection level selectable per channel
Hysteresis	min. 100 mV		selectable per channel
Analog bandwidth	500 kHz		-3 dB (full power)
Analog filter	Bypass (no Filter), 20 kHz, 2 kHz, 200 Hz		selectable (per-channel) 2 nd order Butterworth
Switching delay	500 ns		signal: 100 mV squarewave
CMRR	70 dB 60 dB	50 dB 50 dB	DC, 50 Hz 10 kHz
Gain error	<1 %		of input voltage range @ 25 °C
Offset error	<1 %		of input voltage range @ 25 °C
Overvoltage strength	± 50 V		to system ground
Sensor supply	+5 V, 300 mA		not isolated (reference: GND, CHASSIS)
Terminal connection	DSUB-15		ACC/DSUBM-ENC4

CRFX/DI8-DO8-ENC4-DAC4

Multi I/O with 8 digital inputs, 8 digital outputs, 4 incremental counter channels and 4 analog outputs.

Analog outputs

Parameter	Value typ.	min. / max.	Remarks
Channels	4		
Output level	± 10 V		
Load current	max. ± 10 mA / channel		
Resolution	16-bit		15-bit, no missing codes
Non-linearity	± 2 LSB	± 3 LSB	
Max. output frequency	50 kHz		
Analog bandwidth	50 kHz		-3 dB, low pass 2nd order
Gain error	$< \pm 5$ mV	$< \pm 10$ mV	-40 °C to 85 °C
Offset error	$< \pm 2$ mV	$< \pm 4$ mV	-40 °C to 85 °C
Terminal connection	DSUB-15		ACC/DSUBM-DAC4