HRENC-4 for imc CRONOSflex (CRFX/HRENC-4)

4 counter input channel signals with enhanced resolution

The imc CRONOS*flex* Module (CRFX/HRENC-4) serves to measure signals whose time- or frequency information is to be captured. In contrast to the case with analog channels, to actual measurement does not consist of repeated sampling at a fixed time interval. Instead, digital counters are used to determine either the count of pulses occurring or the time intervals between defined signal slope events. For the time measurement/ maximum frequency, a resolution of approx. 3.9 ns (256 MHz) is achieved.

When using two-track sine/cosine signal encoders, conversion to digital values for determining the rotation direction and the absolute count of increments (full periods) is performed. Additionally, detailed information about the position can be gained by analog evaluation of the sine/ cosine signal, which results in yet further increased resolution.

CRFX/HRENC-4
(Fig. similar)

Highlights

- The HRENC-4 is both a digital comparator and serves the purpose of analog evaluation (sine / cosine signals).
- Fully conditioned (differential input and filter)
- 256 MHz measurement time resolution
- Feedback of revolution speed etc. to precise time measurement

imc CRONOS*flex* - Frameless expansion, flexible modularity

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

An imc CRONOS*flex* system uses EtherCAT as an "internal" system bus for connecting various modules to the main base unit (CRFX-400 / CRFX-2000G). With the system bus, all imc CRONOS*flex* modules are guaranteed to be synchronized with each other. This allows various modules to be either connected in one central block or connected via standard network cable in a spatially distributed system.

imc Click Mechanism

Alternatively, connection can be made by means of standard Ethernet cables (RJ45, CAT5), thus creating a spatially distributed system.

CRFX distributed system
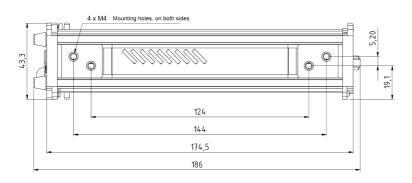
Overview of available variants

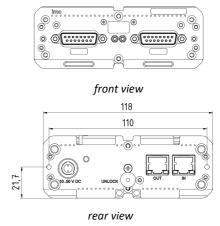| Standard version		ET-version *	
Order Code:	article no.	article no.	remarks
CRFX/HRENC-4	11900041	11910046	with DSUB-15 sockets
CRFX/HRENC-4-SUPPLY	11900124	119100xx	variant with sensor supply

* ET: Version for an extended temperature range

HRENC-4 for imc CRONOSflex (CRFX/HRENC-4)
Technical Data Sheet

Mechanical drawings with dimensions

front view

rear view

Module power supply options

- Direct connection (LEMO.EGE.1B.302 power socket)
- Adjacent module (module connector / imc Click Mechanism)
- EtherCAT network cable: Power over EtherCAT (PoEC)

For further details refer to the power options documentation.

Integrated sensor supply (ex-factory)

- Version with an integrated sensor supply, requires no extra module expansion. With adjustable supply voltages (globally selectable for 8 channels), output on reserved pins of DSUB terminal.

Included accessories

DSUB-15 plug		
ACC/DSUBM-ENC4	DSUB-15 plug for incremental inputs	13500171
Documents		
Getting started with imc CRONOS*flex* (one copy per delivery)		
Device certificate		

Optional accessories

AC/DC power adaptor 110-230 VAC 50-60 Hz (with appropriate LEMO.1B.302 plug)		article no.
48 V DC / 150 W	ACC/AC-ADAP-48-150-1B	13500148
24 V DC / 60 W	CRPL/AC-ADAPTER-60W-1B	10800066
Power plugs		
ACC/POWER-PLUG-5	Power plug for DC supply LEMO.FGE.1B.302 plug (male, E-coded: 2 coding keys)	13500150
CRFX/MODUL-PP-90	Power plug for DC supply 90° angular LEMO.FHE.1B.302 plug (male, E-coded: 2 coding keys)	11900074

Supply module (Power Handle)			article no.
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, UPS with Li-Ion battery		11900010
Passive-Handle			
CRFX/HANDLE-L	standard unpowered left handle		11900008
CRFX/HANDLE-R	standard unpowered right handle		11900007
Mounting bracket for increased stability (recommended for lifetime and robustness)			
CRFX/BRACKET-CON	assembly element for 2 modules		11900071
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/RACK	19" RACK for imc CRONOSflex Modules		11900066
CRFX/BRACKET-RACK	mounting element in the RACK		11900072

Technical Specs - CRFX/HRENC-4

Inputs, measurement modes, terminal connection		
Parameter	**Value**	**Remarks**
Inputs	4 + 1 (9 tracks)	4 channels with 2 tracks (X, Y) each 1 index-channel, all fully conditioned
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
Terminal connection	2x DSUB-15	2 channels per DSUB

General		
Parameter	**Value**	**Remarks**
Sampling rate	≤50 kHz	per channel
Measurement time resolution	3.9 ns	Counter frequency 256 MHz (primary sampling rate)
Data resolution	16 bit	
Sensor supply	+5 V, 300 mA / module	block isolated from housing (CHASSIS, PE), reference: GND

Differential-inputs		
Input configuration	differential	
Input voltage range (differential)	±10 V ±30 V	linear range maximum range
Input impedance	50 kΩ	
Common mode input voltage	max. ±30 V	
CMRR	70 dB (typ.), 50 dB (min.) 60 dB (typ.), 50 dB (min.)	DC, 50 Hz 10 kHz
Overvoltage protection	±50 V	long-term
Gain error	<1 %	25°C
Offset error	<1 %	25°C
Analog bandwidth	500 kHz	-3 dB (full power)
Analog filter	Bypass (without filter), 20 kHz, 2 kHz, 200 Hz	adjustable (per channel) Butterworth, 2nd order

Digital Analysis (comparator)		
Switching threshold	-10 V to +10 V	adjustable individual for each channels
Hysteresis	0 % to 40 % off |threshold|, min. 100 mV	adjustable individual for each channels
Switching delay	500 ns	modulation: 100 mV square wave

Analog analysis (ADC)		
SIN/COS encoder analysis	8x12 Bit A/D-converter	8 channels of simultaneous sampling
Input voltage range	±1.5 V, ±10 V	(differential)

Sensor supply (HRENC-4-SUPPLY)

Parameter	Value typ.	max.	Remarks
Configuration options	one voltage setting		must be selected out of 7 possible settings at the time of ordering
Output voltage possible settings	Voltage Current Netpower +2.5 V 580 mA 1.5 W +5.0 V 580 mA 2.9 W +10 V 300 mA 3.0 W +12 V 250 mA 3.0 W +15 V 200 mA 3.0 W +24 V 120 mA 2.9 W ±15 V 190 mA 3.0 W		must be selected at the time of ordering
Block isolation	60 V		Isolation of the entire global sensor supply (reference ground "-SUPPLY, GND") as well as the internal electronics from housing (CHASSIS, PE)
Short-circuit protection	unlimited duration		to output voltage reference ground
Accuracy of output voltage	<0.25 %	0.5 % 0.9 % 1.5 %	at terminals, no load at 25°C over entire temperature range plus with optional bipolar output voltage
Max. capacitive load	>4000 µF >1000 µF >300 µF		2.5 V to 10 V 12 V, 15 V 24 V

Block isolation

Parameter	Value	Remarks
Block isolation	60 V	all internal electronics isolated from the housing (CHASSIS, PE)
Isolation impedance	500 kΩ || 1 nF	
Internal reference ground	GND	all channels with one common, galvanically connected reference ground
External reference ground	CHASSIS, metal housing	internal electronics as an entity, galvanically isolated from housing

Note

Block isolation for improved suppression of ground loops and related interference. Does not constitute channel-wise individual isolation. Not rated nor intended for safety of equipment and personnel.

Terminal connection of the imc CRONOS*flex* module (CRFX)		
Parameter	**Value**	**Remarks**
EtherCAT connection	2x RJ45	system bus for distributed imc CRONOS*flex* components
Input supply plug (female)	LEMO.EGE.1B.302	multicoded 2 notches, for optional individually power supply
Module connector	2x 20-pin	direct connection of modules (click) supply and system bus

Power supply		
Parameter	**Value**	**Remarks**
Input supply voltage	10 V to 50 V DC	
Power consumption		10 to 50 V DC
	7.4 W	CRFX/HRENC-4
	13 W	CRFX/HRENC-4-SUPPLY
Isolation	60 V	nominal isolation specification of the supply input
Power-over EtherCAT (PoEC)	42 V to 50 V DC	supply via EtherCAT network cable

Pass through power limits	
Directly connected (clicked) imc CRONOS*flex* Modules	3.1 A (maximum current) Equivalent power with chosen DC power input: • 149 W @ 48 V DC (e.g. AC/DC line adaptor) • 37 W @ 12 V DC (typical vehicle supplied DC input)
Power over EtherCAT (PoEC) for remote imc CRONOS*flex* Modules	350 mA (maximum current, corresponding to IEEE 802.3) Equivalent power with chosen DC power input: • 17.5 W @ 50 V DC (e.g. Power Handle) • 16.8 W @ 48 V DC (e.g. AC/DC line adaptor) • 14.7 W @ 42 V DC (minimum voltage for PoEC) Note: minimum system power of 42 V DC required for PoEC

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 to50%	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 60062-2-64 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
Dimensions	43.3 x 118 x 186 mm	W x H x D
Weight	approx. 730 g	