ISO2-8 for imc CRONOSflex (CRFX/ISO2-8)

8-channel, isolated differential measurement amplifier

The ISO2-8 is an isolated, differential measurement amplifier with 8 galvanically-separated, floating channels for high-precision measuring:

- Voltage and current (20 mA)
- Temperature (thermocouples and PT100)
- IEPE/ICP sensors (with optional DSUB-15 plugs)

CRFX/ISO2-8 module shown in standard operating orientation

Highlights

- Channel-wise isolated, galvanically-separated inputs
- Finely adjustable input voltage range (±50 mV to ±60 V)
- High signal bandwidth up to 11 kHz
- Each channel with its own adjustable filter (e.g., anti-aliasing filter) and simultaneous A/D converter
- Supports imc Plug & Measure (Transducer Electronic Data Sheets)

Typical applications

- Ideally suited for measurements with unclear potential conditions such as in-vehicle or in the railway sector.

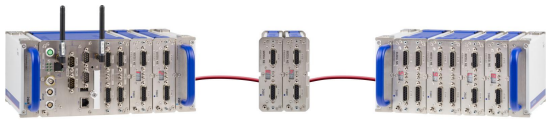
imc CRONOS*flex* - Frameless expansion, flexible modularity

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

imc Click Mechanism

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.

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



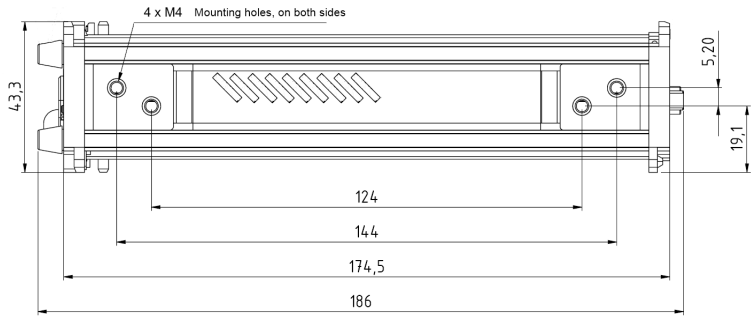
CRFX distributed system

Overview of available variants

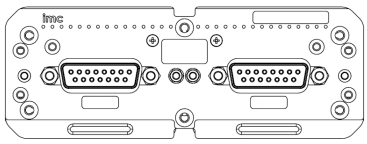
Standard version		ET-version *	
Order Code:	article no.	article no.	remarks
CRFX/ISO2-8	11900022	11910012	with DSUB-15 sockets
CRFX/ISO2-8-SUPPLY	11900095	11910054	with sensor supply
CRFX/ISO2-8-C	11900009	11910XXX	with DSUB-15, plus support of TE type C
CRFX/ISO2-8-L	11900050	11910XXX	with LEMO sockets
CRFX/ISO2-8-L-SUPPLY	11900170	11910116	with sensor supply

* ET: Version for an extended temperature range

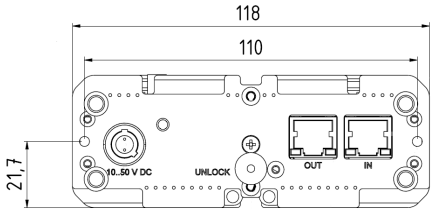
Mechanical drawings of the variant with DSUB-15



width CRFX/ISO2-8(-SUPPLY): 43.3 mm
width CRFX/ISO2-8-L(-SUPPLY): 62 mm



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

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

Included accessories

DSUB-15 plug		
ACC/DSUBM-T4	DSUB-15 plug with screw terminals for 4-channel measurement of voltages as well as temperatures with PT100 and thermocouples with integrated cold junction compensation (CJC).	13500167

Documents
Getting started with imc CRONOS*flex* (one copy per delivery)
Device certificate

Optional accessories

DSUB-15 plug		
ACC/DSUBM-TEDS-T4	T4 plug with TEDS support, according IEEE 1451.4 for use with imc Plug & Measure	13500190
ACC/DSUBM-U4	DSUB-15 plug with screw terminals for 4-channel voltage measurement.	13500166
ACC/DSUBM-TEDS-U4	U4 plug variant with TEDS support, according IEEE 1451.4 for use with imc Plug & Measure	13500189
ACC/DSUBM-I4	DSUB-15 plug with screw terminals for 4-channel current measurement of up to 50 mA (shunt 50 Ω, scaling factor 0.02 A/V)	13500168
ACC/DSUBM-TEDS-I4	I4 plug variant with TEDS support, according IEEE 1451.4 for use with imc Plug & Measure	13500192

DSUB-15 plug		
ACC/DSUB-ICP4	DSUB-15 plug with screw terminals for conditioning of 4 IEPE/ICP inputs	13500032
ACC/DSUBM-ICP2I-BNC-S	DSUB-15 plug for 2 IEPE/ICP sensors[1], BNC connection, isolated, **slow**	13500293
ACC/DSUBM-ICP2I-BNC-F	DSUB-15 plug for 2 IEPE/ICP sensors[1], BNC connection, isolated, **fast**	13500294

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 CRONOS*flex* Modules	11900066
CRFX/BRACKET-RACK	mounting element in the RACK	11900072

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.		

1 When using the 2-channel plug only two channels (first and third channel) out of four are usable.

Technical Specs - CRFX/ISO2-8

Inputs, measurement modes, terminal connection		
Parameter	**Value**	**Remarks**
Inputs	8	
Measurement modes DSUB-15	voltage measurement current measurement thermocouple, RTD (PT100) current fed sensors	 shunt plug (ACC/DSUBM-I4) thermo plug (ACC/DSUBM-T4) with IEPE DSUB-15 extension plug: ACC/DSUB-ICP4, not isolated ACC/DSUBM-ICP2I-BNC-S/-F [1], isolated, basic functionality (ICP-operation)
Measurement modes LEMO	voltage measurement current measurement RTD (PT100)	 differential (internal shunt)
Terminal connection Standard LEMO	 2x DSUB-15 or 8x LEMO.1B.307	 4 channels per plug 1 channel per plug

Sampling rate, Bandwidth, Filter, TEDS		
Parameter	**Value**	**Remarks**
Sampling rate	≤100 kHz ≤10 kHz	per channel at temperature measurement max system throughput of all module channels: 800 kHz including monitor channels
Bandwidth	0 Hz to 11 kHz 0 Hz to 8 kHz 0 Hz to 1 kHz	-3 dB -0.2 dB -0,1 dB at temperature measurement
Filter (digital) cut-off frequency characteristic type and order	 2 Hz to 5 kHz	 Butterworth, Bessel low pass filter: 8th order high pass filter: 4th order band pass: LP 8th and HP 4th order Anti-aliasing filter: Cauer 8.order with $f_{cut\text{-}off} = 0.4\ f_a$
Resolution	 16 Bit 24 Bit	output format is selectable for each channel individually: a) 16 Bit Integer b) 32 Bit Float (24 Bit Mantissa)
TEDS - Transducer Electronic DataSheets	conforming to IEEE 1451.4 Class II MMI	esp. with ACC/DSUBM-TEDS-xx (DS2433) not supported: DS2431 (typ. IEPE/ICP sensor)
Characteristic curve linearization	user defined (max. 1023 supporting points)	

1 When using the two-channel IEPE plug in combination with the analog inputs, which provide four channels per socket, only channels 1 and 3 can be used. Only the IEPE base functionality is supported by this module, see also TD ACC/DSUBM-ICP2I-BNC.

General			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Isolation	galvanically isolated		channel-to-channel and against system ground (housing, CHASSIS, PE), as well as against common reference of all PT100 current sources and TEDS. not isolated when using ICP plug and PT100 mode
nominal rating	±60 V		
test voltage	±300 V (10 s)		
Overvoltage protection	±60 V ESD 2 kV transient protection: automotive load dump ISO 7637		differential input voltage, continuous human body model R_i=30 Ω, t_d=300 µs, t_r<60 µs
Input coupling	DC		
Input configuration	differential, isolated		
Input impedance	6.7 MΩ 1 MΩ 50 Ω		range ≤±2 V and temperature mode range ≥±5 V or device powered down with shunt plug ACC/DSUBM-I4
Input current operating conditions on overvoltage condition		 1 nA 1 mA	for operation $\|V_{in}\|$ > 5 V on ranges <±5 V or device powered-down
Auxiliary supply voltage available current internal resistance	 +5 V >0.26 A 1.0 Ω	 ±5 % >0.2 A <1.2 Ω	for IEPE/ICP plug independent of optional sensor supply, short circuit proof power per DSUB-plug

Voltage measurement				
Parameter	**Value typ.**	**min. / max.**	**Remarks**	
Voltage input ranges	±60 V / ±50 V / ±25 V / ±10 V ±5 V / ±2 V / ±1 V / ±500 mV ±250 mV / ±100 mV / ±50 mV			
Gain error	<0.02 %	<0.05 %	of the measured value, at 25 °C	
Gain drift		6 ppm/K·ΔT_a 50 ppm/K·ΔT_a	ranges ≤±2 V ranges ≥±5 V	over full temp. range
Offset error	0.02 %	<0.05 %	of the measurement range, at 25°C	
Offset drift		2.5 ppm/K·ΔT_a	over entire temperature range ΔT_a=$\|T_a$ -25°C$\|$; with T_a = ambient temperature	
Non-linearity	<120 ppm		range ±10 V	
Signal noise	2.5 μV_{rms} 20 μV_{pkpk}		bandwidth 0.1 Hz to 1 kHz; in the range: ±50 mV	
IMR (isolation mode rejection)	140 dB 64 dB	>130 dB >60 dB	range ≤±2 V range ≥±5 V	R_{source}= 0 Ω, f=50 Hz
Channel isolation	>1 GΩ, < 40 pF		channel-to-ground / CHASSIS (case)	
	>1 GΩ, <10 pF		channel-to-channel	
Channel isolation (crosstalk)	>165 dB (50 Hz) >92 dB (50 Hz)		range ≤±2 V range ≥±5 V	R_{source} ≤100 Ω

Current measurement with shunt plug				
Parameter	**Value typ.**	**min. / max.**	**Remarks**	
Input ranges	±40 mA / ±20 mA / ±10 mA ±5 mA / ±2 mA / ±1 mA			
Shunt impedance	50 Ω		external plug ACC/DSUBM-I4	
Input configuration	differential			
Gain error	<0.02 %	<0.05 % <0.1%	of the measured value, with 25 °C additional error of 50 Ω in plug	
Gain drift		6 ppm/K·ΔT_a 50 ppm/K·ΔT_a	ranges ≤±2 V ranges ≥±5 V	over entire temp. range
Offset error	0.02 %	<0.05 %	of the measurement range	
Offset drift		2.5 ppm/K·ΔT_a	over entire temperature range $\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature	

Current measurement with internal shunt (variant with round connector etc.)			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Input ranges	±40 mA / ±20 mA / ±10 mA		
Shunt impedance	50 Ω		internal
Input configuration	differential		
Gain error	<0.02 %	<0.05 %	of the measured value, with 25 °C
Gain drift		30 ppm/K·ΔT_a	over entire temperature range
Offset error	0.02 %	<0.05 %	of the measurement range
Offset drift		2.5 ppm/K·ΔT_a	over entire temperature range $\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature

Temperature measurement - thermocouples			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Measurement mode	R, S, B, J, T, E, K, L, N		
	C		special variant DSUB-15: additional type C (W5Re/W26Re)
Measurement range	-270°C to 1370°C -270°C to 1100°C -270°C to 500°C		type K
	0°C to 2320°C		type C (special variant, 24 bit mode)
Resolution	0.063 K (1/16 K) 32 bit float (24 Bit mantissa)		With selected data type / output format: a) 16-Bit integer b) Float (24-Bit mode)
Measurement error		<±0,6 K	type K, range -150°C to 1200°C type T, range -150°C to 400°C type N, range 380°C to 1200°C
		<±1.0 K	type K, range -200°C to -150°C type T, range -200°C to -150°C
		<±1.5 K	type N, range -200°C to 380°C
Temperature drift	±0.02 K/K·ΔT_a		$\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature
Error of cold junction compensation		<±0.15 K	with ACC/DSUBM-T4
Temperature drift	±0.001 K/K·ΔT_a		$\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature

Temperature measurement – PT100		
Parameter	**Value**	**Remarks**
Measurement range	-200°C to +850°C -200°C to +250°C	
Resolution	0.063 K (1/16 K)	
Gain error	<±0.05%	of measured value (corresponding resistance)
Offset error	<±0.2 K	with 4-wire configuration
Offset drift	±0.01 K/K ΔT_a	$\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature
Sensor feed	250 µA	Not channel individually isolated. global block isolation, common reference: -I4, GND, TEDS_GND

Sensor supply (ISO2-8(-L)-SUPPLY)				
Parameter	**Value typ.**		**max.**	**Remarks**
Configuration options	5 selectable settings			The sensor supply module always has 5 selectable voltage settings. default selection: +5 V to +24 V
Output voltage	Voltage (+2.5 V) +5.0 V +10 V +12 V +15 V +24 V (±15 V)	Current 580 mA 580 mA 300 mA 250 mA 200 mA 120 mA 190 mA	Netpower 1.5 W 2.9 W 3.0 W 3.0 W 3.0 W 2.9 W 3.0 W	set jointly for all eight channels optional, special order: +12 V or 15 V can be replaced by +2.5 V preferred selection with 2.5 V: +2.5 V, +5.0 V, +10 V, +12 V, +24 V Special order: +15 V can be replaced by ±15 V. With the LEMO variant, TEDS support is omitted with this choice, see manual.
Block isolation	60 V			Isolation of the entire global sensor supply (for all 8 channels, reference ground "-SUPPLY, GND") as well as the internal additional 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 additional-electronics (PT100-current sources, TEDS, sensor supply) isolated from the housing (CHASSIS, PE)
Isolation impedance	500 kΩ || 1 nF	
Internal reference ground	GND, TEDS_GND, -I4, -SUPPLY	PT100 current sources and TEDS for all channels with one common, galvanically connected reference ground
External reference ground	CHASSIS, metal housing	internal additional-electronics as an entity, galvanically isolated from housing

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.

Devices or modules purchased before ca. 2012 do not feature block isolation.

Power supply of the imc CRONOS*flex* module		
Parameter	**Value**	**Remarks**
Input supply voltage	10 V to 50 V DC	
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
Power consumption		10 to 50 V DC
	7.0 W	CRFX/ISO2-8
	9.2 W	CRFX/ISO2-8 with 2x ACC/DSUB-ICP4
	12.4 W	CRFX/ISO2-8(-L)-SUPPLY (Sensor-Supply 3 W netto)

Terminal connections of the imc CRONOS*flex* module		
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

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 (width of the LEMO variant is: 62 mm)	W x H x D
Weight	ca. 740 g (DSUB-15 variant)	