

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)

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.



CRFX/ISO2-8 module shown in standard operating orientation

imc CRONOSflex - 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 CRONOSflex 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 CRONOSflex 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.



imc Click Mechanism



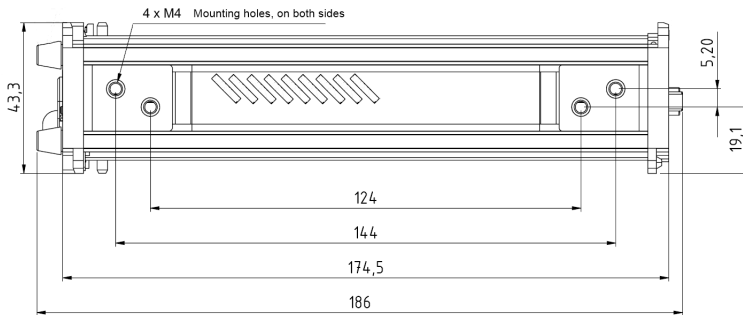
CRFX distributed system

Overview of available variants

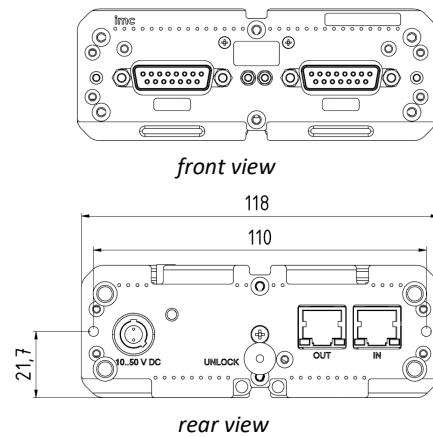
Standard version		ET-version *	
Order Code:	article no.	article no.	remarks
CRFX/ISO2-8	11900022	11910012	with DSUB-15 sockets
CRFX/ISO2-8-SUPPLY	11900095	11910054	with sensor supply
CRFX/ISO2-8-C	11900009	11910XXX	with DSUB-15, plus support of TE type C
CRFX/ISO2-8-L	11900050	11910XXX	with LEMO sockets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



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
Miscellaneous		
Calibration certificate with test equipment verification as per ISO 9001 (manufacturer's calibration certificate, PDF)		
Getting started with imc CRONOSflex (one copy per delivery)		

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
ACC/DSUB-ICP4	DSUB-15 plug with screw terminals for conditioning of 4 IEPE/ICP inputs	13500032

DSUB-15 plug		
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-UPS-L	Handle with system power supply 50 V 100 W, UPS with lead-gel battery	11900043
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
Miscellaneous		
CRFX/CAL-P Calibration report set for each device	Report set with manufacturer's calibration certificate and individual readings, as well as list of test equipment used (PDF). Meets requirements of ISO 17025	11900051

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 expansion plug: ACC/DSUB-ICP4, not isolated ACC/DSUBM-ICP21-BNC-S/-F ¹ , isolated
Measurement modes LEMO	voltage measurement current measurement RTD (PT100)	differential (internal shunt)
Terminal connection Standard	2x DSUB-15 or	4 channels per plug
LEMO	8x LEMO.1B.307	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 $f_{\text{cut-off}} = 0.4 f_a$
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-ICP21-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 $R_i=30 \Omega$, $t_d=300 \mu s$, $t_r<60 \mu s$
Input coupling	DC		
Input configuration	differential, isolated		
Input impedance	6.7 M Ω 1 M Ω 50 Ω		range $\leq \pm 2$ V and temperature mode range $\geq \pm 5$ V or device powered down with shunt plug ACC/DSUBM-I4
Input current		1 nA 1 mA	for operation $ V_{in} > 5$ V on ranges $< \pm 5$ V or device powered-down
Auxiliary supply			for IEPE/ICP plug
voltage	+5 V	±5 %	independent of optional sensor supply, short circuit proof power per DSUB-plug
available current	>0.26 A	>0.2 A	
internal resistance	1.0 Ω	<1.2 Ω	

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 $\leq \pm 2$ V ranges $\geq \pm 5$ 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 $\Delta T_a = T_a - 25^\circ C $ ambient temperature T_a
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 $\leq \pm 2$ V range $\geq \pm 5$ V $R_{source} = 0 \Omega$, $f=50$ Hz
Channel isolation	>1 G Ω , < 40 pF		channel-to-ground / CHASSIS (case)
	>1 G Ω , <10 pF		channel-to-channel
Channel isolation (crosstalk)	>165 dB (50 Hz) >92 dB (50 Hz)		range $\leq \pm 2$ V range $\geq \pm 5$ V $R_{source} \leq 100 \Omega$

Current measurement with shunt plug			
Parameter	Value typ.	min. / max.	Remarks
Input ranges	$\pm 40 \text{ mA} / \pm 20 \text{ mA} / \pm 10 \text{ mA}$ $\pm 5 \text{ mA} / \pm 2 \text{ mA} / \pm 1 \text{ mA}$		
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 $\cdot \Delta T_a$ 50 ppm/K $\cdot \Delta T_a$	ranges $\leq \pm 2 \text{ V}$ over entire temp. range ranges $\geq \pm 5 \text{ V}$
Offset error	0.02 %	<0.05 %	of the measurement range
Offset drift		2.5 ppm/K $\cdot \Delta T_a$	over entire temperature range $\Delta T_a = T_a - 25 \text{ °C} $ ambient temperature T_a

Current measurement with internal shunt (variant with round connector etc.)			
Parameter	Value typ.	min. / max.	Remarks
Input ranges	$\pm 40 \text{ mA} / \pm 20 \text{ mA} / \pm 10 \text{ mA}$		
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 $\cdot \Delta T_a$	over entire temperature range
Offset error	0.02 %	<0.05 %	of the measurement range
Offset drift		2.5 ppm/K $\cdot \Delta T_a$	over entire temperature range $\Delta T_a = T_a - 25 \text{ °C} $ ambient temperature T_a

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		ΔT _a = T _a - 25°C ambient temperature T _a
Error of cold junction compensation		<±0.15 K	with ACC/DSUBM-T4
Temperature drift	±0.001 K/K · ΔT _a		ΔT _a = T _a - 25°C ambient temperature T _a

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	ΔT _a = T _a - 25°C ambient temperature T _a
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 CRONOSflex 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	7.0 W 9.2 W 12.4 W	10 to 50 V DC CRFX/ISO2-8 CRFX/ISO2-8 with 2x ACC/DSUB-ICP4 CRFX/ISO2-8(-L)-SUPPLY (Sensor-Supply 3 W netto)

Terminal connections of the imc CRONOSflex module		
Parameter	Value	Remarks
EtherCAT connection	2x RJ45	system bus for distributed imc CRONOSflex 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 CRONOSflex Modules	3.1 A (maximum current) Equivalent power with chosen DC power input: <ul style="list-style-type: none"> • 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 CRONOSflex Modules	350 mA (maximum current corresponding 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. 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 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 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)	