LV3-8 for imc CRONOSflex (CRFX/LV3-8)

8-channel differential measurement amplifier

The LV3-8 is a differential measurement amplifier with 8 channels for measuring:

- Voltage and current (20 mA)
- IEPE/ICP sensors (with optional DSUB-15 plug)

CRFX/LV3-8

CRFX/LV3-8-L-SUPPLY

Highlights

- Economical, high-resolution measuring of current and voltage
- Finely adjustable input voltage range (±5 mV to ±50 V)
- High signal bandwidth up to 48 kHz
- Each channel with its own adjustable filter (e.g., anti-aliasing filter) and simultaneous A/D converter
- Supports imc Plug & Measure

Typical applications

- Ideally suited for measurements of signals, voltage-based sensors as well as 20 mA
- Process variables with higher bandwidths.

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.

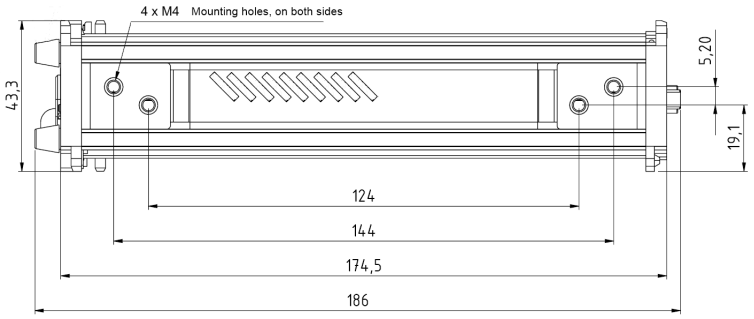
CRFX distributed system

Overview of available variants

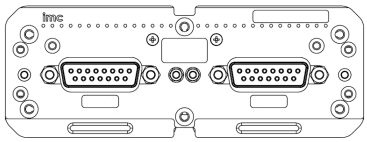
Standard version		ET-version *	
Order Code:	article no.	article no.	remarks
CRFX/LV3-8	11900021	11910011	with DSUB-15 sockets
CRFX/LV3-8-SUPPLY	11900096	11910059	with sensor supply
CRFX/LV3-8-L	11900XXX	11910XXX	with LEMO sockets
CRFX/LV3-8-L-SUPPLY	11900233	11910XXX	with sensor supply

* ET: Version for an extended temperature range

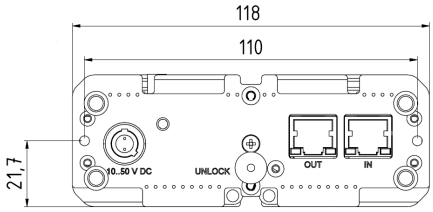
Mechanical drawings



The LEMO variant is 61.62 mm wide instead of 43.3 mm (DSUB-15).



front view (DSUB-15 variant)



rear view (DSUB-15 variant)

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 (CRFX/LV3-8-SUPPLY, CRFX/LV3-8-L-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-U4	DSUB-15 plug with screw terminals for 4-channel voltage measurement	13500166

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

Optional accessories

DSUB-15 plug		
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
ACC/DSUBM-ICP2I-BNC-S	DSUB-15 plug for 2 IEPE/ICP sensors[1], BNC connection, isolated, **slow**	13500293

DSUB-15 plug		
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/LV3-8

Inputs, measurement modes, terminal connection		
Parameter	**Value**	**Remarks**
Inputs	8	
Measurement modes DSUB	voltage measurement current measurement current feed sensors	 shunt plug (ACC/DSUBM-I4) with DSUB-15 expansion plug: ACC/DSUB-ICP4, not isolated ACC/DSUBM-ICP2I-BNC-S/-F [1], isolated
Measurement modes LEMO	voltage measurement current measurement	 with external shunt
Terminal connection Standard LEMO	 2x DSUB-15 8x LEMO.1B.307	 4 channels per plug 1 channel per plug

Sampling rate, Bandwidth, Filter, TEDS		
Parameter	**Value**	**Remarks**
Sampling rate	≤100 kHz	per channel, max system throughput of all module channels: 800 kHz including monitor channels
Bandwidth	0 Hz to 48 kHz 0 Hz to 30 kHz	-3 dB -0.1 dB
Filter (digital) cut-off frequency characteristic order	 10 Hz to 20 kHz	 Butterworth, Bessel low pass or high pass filter: 8th order band pass: LP 4th and HP 4th order Anti-aliasing filter: Cauer 8.order with f_{cutoff} = 0.4 f_s
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	conforming to IEEE 1451.4 Class II MMI	esp. with ACC/DSUBM-TEDS-xx (DS2433) supports also: 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.

General			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Overvoltage protection		±80 V ±50 V	permanent, differential input range >±10 V or device switched off input range ≤±10 V
Input coupling	DC		
Input configuration	differential		
Input impedance	1 MΩ 20 MΩ		range >±10 V range ≤±10 V
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 expansion plug independent of optional sensor supply, short circuit proof power per DSUB-plug

Voltage measurement			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Input ranges	±50 V, ±25 V, ±10 V, ±5V, ±2.5 V, ±1 V... ±5 mV		
Maximum input voltage		-11 V to +15 V	between ±IN and CHASSIS; input range ≤±10 V
Gain error	0.02 %	0.05 %	of the reading
Gain drift	10 ppm/K·ΔT_a	30 ppm/K·ΔT_a	ΔT_a=|T_a-25 °C|; T_a = ambient temperature
Offset error	0.02 %	 ≤0.05 % ≤0.06 % ≤0.15 %	of the range, at 25 °C >±50 mV ≤±50 mV ≤±10 mV
Offset drift	±40 µV/K·ΔT_a ±0.7 µV/K·ΔT_a ±0.1 µV/K·ΔT_a	±200 µV/K·ΔT_a ±6 µV/K·ΔT_a ±1.1 µV/K·ΔT_a	range >±10 V range ±10 V to ±0.25 V range ≤±0.1 V ΔT_a=|T_a-25 °C|; T_a = ambient temperature
Nonlinearity	30 ppm	≤90 ppm	
Common mode rejection ranges ±50 V to ±25 V ±10 V to ±50 mV ±20 mV to ±5 mV	 80 dB 110 dB 138 dB	 >70 dB >90 dB >132 dB	Common mode voltage (DC..60 Hz): ±50 V ±10 V ±10 V
Noise	 3.6 μV_{rms} 0.6 μV_{rms} 0.14 μV_{rms}	 5.5 μV_{rms} 1.0 μV_{rms} 0.26 μV_{rms}	bandwidth 0.1 Hz to 50 kHz 0.1 Hz to 1 kHz 0.1 Hz to 10 Hz

Current measurement with shunt plug			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Input ranges	±50 mA, ±20 mA, ±10 mA, ±5 mA, ±2 mA, ±1 mA		50 Ω shunt in terminal plug
Shunt impedance	50 Ω		external plug ACC/DSUBM-I4
Over load protection		±60 mA	permanent
Maximum input voltage		-11 V to +15 V	between ±IN and CHASSIS
Input configuration	differential		50 Ω shunt in terminal plug
Gain error	0.02 %	≤0.06 % ≤0.1 %	of reading plus error of 50 Ω shunt
Gain drift	+15 ppm/K·ΔT_a	+55 ppm/K·ΔT_a	ΔT_a=|T_a-25 °C|; T_a = ambient temperature
Offset error	0.02 %	≤0.05 %	of the range
Current noise	40 nA_{rms} 0.7 nA_{rms} 0.17 nA_{rms}	70 nA_{rms} 12 nA_{rms} 0.3 nA_{rms}	Bandwidth: 0.1 Hz to 50 kHz 0.1 Hz to 1 kHz 0.1 Hz to 10 Hz

Sensor supply module (LV3-8-SUPPLY, LV3-8-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 optional, special order: +15 V can be replaced by ±15 V
Block isolation	60 V			Isolation der gesamten globalen Sensorversorgung (für alle 8 Kanäle, Bezug "-SUPPLY, GND") sowie der internen Messelektronik gegenüber Gehäuse (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, TEDS_GND, -SUPPLY	all channels with one common, galvanically connected reference ground
External reference ground	CHASSIS, metal housing	internal 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 module		
Parameter	**Value**	**Remarks**
Input supply voltage	10 V to 50 V DC	
Power consumption		10 to 50 V DC
	6.4 W	CRFX/LV3-8
	8.8 W	CRFX/LV3-8 with 2x ACC/DSUB-ICP4
	12.4 W	CRFX/LV3-8-SUPPLY, CRFX/LV3-8-L-SUPPLY (Sensor-Supply 3 W netto)
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

Terminal connections of the module		
Parameter	**Value**	**Remarks**
EtherCAT connection	2x RJ45	system bus for expanded 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	640 g (DSUB-15 variant) 1000 g (LEMO variant)	