B(C)-8 for imc CRONOSflex (CRFX/B(C)-8)

8-channel bridge amplifier for multi-channel, dynamic strain gauge applications

The B(C)-8 is a DC bridge amplifier with 8 differential analog inputs of higher bandwidths allowing the measurement of:

- Voltage and current (20 mA)
- Stain gauges, bridge sensors
- IEPE/ICP sensors (with optional DSUB plug)

For powering external sensors or bridge measurements, a software selectable sensor supply is integrated.

CRFX/B-8
(Fig. similar)

Highlights

- Very high signal bandwidth of up to 48 kHz
- Software selectable quarter-bridge completion between 120 and 350 Ω
- Graphical configuration wizard to set strain gauge bridges
- Supports imc Plug & Measure (Transducer Electronic Data Sheets)
- Also available with compact, high-density DSUB terminal connections (variant "C")

Typical applications

- strain gauge, load cells, pressure sensors and universal voltage measurements 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.

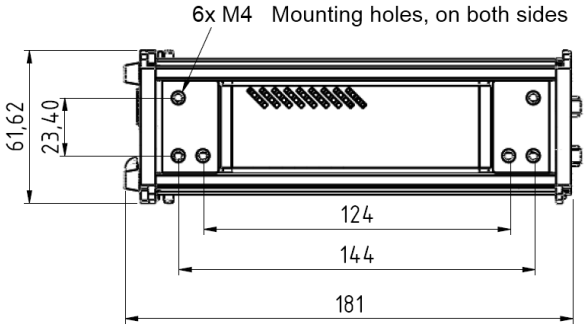
CRFX distributed system

Overview of available variants

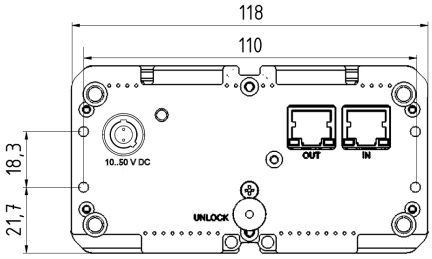
Standard version		ET-version *	
Order Code:	article no.	article no.	remarks
CRFX/B-8	11900023	11910013	with DSUB-15 sockets
CRFX/BC-8	11900024	11910014	with DSUB-26-HD (high density) sockets
CRFX/B-8-L	11900xxx	11910088	with LEMO sockets

* ET: Version for an extended temperature range

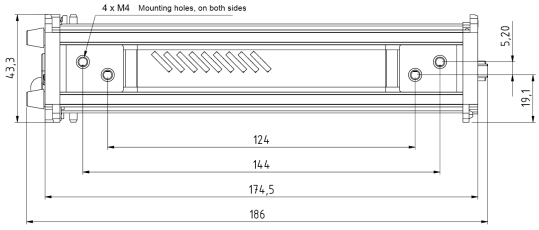
Mechanical drawings with dimensions



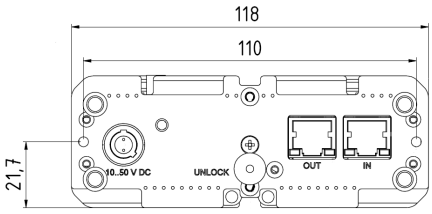
CRFX/B-8 and CRFX/B-8-L



rear view of the B-8 and B-8-L



CRFX/BC-8



rear view of the BC-8

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.

Included accessories

DSUB-15 plug for B-8 DSUB variant		
ACC/DSUBM-B2	DSUB-15 plug with screw terminals for 2-channel measurement of strain gauges, bridges and voltage	13500170

DSUB-26-HD plug for BC-8		
ACC/DSUBM-HD-B4	DSUB-26 plug with screw terminals for 4-channel measurement of strain gauges, bridges and voltage	13500197

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

Optional accessories

DSUB-15 plug		
ACC/DSUBM-TEDS-B2	Version mit TEDS Unterstützung, gemäß IEEE 1451.4 für eine Nutzung mit imc Plug & Measure	13500191

DSUB-15 plug		
ACC/DSUBM-I2	DSUB-15 plug with screw terminals for 2-channel current measurement of up to 50 mA (50 Ω shunt, scaling factor: 0.02A/V)	13500180
ACC/DSUBM-TEDS-I2	version with TEDS support, according to IEEE 1451.4 for use with imc Plug & Measure	13500193
ACC/DSUBM-ICP2I-BNC-S	DSUB-15 plug for 2 IEPE/ICP sensors, BNC connection, isolated, **slow**	13500293
ACC/DSUBM-ICP2I-BNC-F	DSUB-15 plug for 2 IEPE/ICP sensors, BNC connection, isolated, **fast**	13500294

High-Density (HD) plug		
ACC/DSUBM-HD-I4	DSUB-26-HD plug with screw terminals for 4-channel current measurement of up to 50 mA (shunt 50 Ω, scaling factor 0.02 A/V)	13500195

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.		

Technical Specs - CRFX/B(C)-8

Channels, measurement modes, terminal connection		
Parameter	**Value**	**Remarks**
Inputs	8	
Measurement modes DSUB-15	voltage measurement current measurement bridge sensor strain gauges current-fed sensors (IEPE/ICP)	 shunt-plug ACC/DSUBM-I2(-IP65) or single end (internal shunt) full, half, quarter bridge with DSUB-15 extension plug: e.g. ACC/DSUBM-ICP2I-BNC-S/-F, isolated
Measurement modes DSUB-26-HD	voltage measurement current measurement bridge sensor strain gauges	 ACC/DSUBM-HD-I4 shunt-plug or Single-ended (internal shunt) full, half, quarter bridge
Measurement modes LEMO	voltage measurement bridge sensor strain gauges current measurement	 full, half, quarter bridge Single-ended (internal shunt)
Terminal connection DSUB-15 DSUB-26-HD LEMO	 4x DSUB-15 2x DSUB-26-HD 8x LEMO.1B.307	 2 channels per plug 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	-3 dB
Filter (digital) cut-off frequency characteristic order	 10 Hz to 20 kHz	 Butterworth, Bessel (digital) 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 only with B-8 (DSUB-15)	conforming 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)	

General			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Overvoltage protection		±40 V	permanent
Input coupling	DC		
Input configuration	differential		
Input impedance	20 MΩ	±1%	
Auxiliary supply voltage available current internal resistance	 +5 V 0.26 A 1.0 Ω	 ±5% 0.2 A <1.2 Ω	only with DSUB-15 variant for IEPE/ICP expansion plug independent of integrated sensor supply, short-circuit protected power per DSUB-plug

Voltage measurement			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Input range	±10 V, ±5 V, ±2.5 V, ±1 V... ±5 mV		
Gain error	0.02%	0.05%	of the measured value, at 25°C
Gain drift	(10 ppm/K)·ΔT_a	(30 ppm/K)·ΔT_a	ΔT_a=|T_a-25°C|; with T_a = ambient temperature
Offset error	0.02%	 ≤0.05% ≤0.06% ≤0.15%	of the input range at 25°C range >±50 mV range ≤±50 mV range ≤±10 mV
Offset drift	(±0.7 µV/K)·ΔT_a (±0.1 µV/K)·ΔT_a	(±6 µV/K)·ΔT_a (±1.1 µV/K)·ΔT_a	range ±10 V to ±0.25 V range ≤±0.1 V ΔT_a=|T_a-25°C|; with T_a = ambient temperature
Nonlinearity	10 ppm	50 ppm	
CMRR (common mode rejection ratio)	 110 dB 138 dB	 >90 dB >132 dB	DC and f≤60 Hz range ±10 V to ±50 mV range ±25 mV to ±5 mV
Noise (RTI)	0.6 μV_{RMS} 0.14 μV_{RMS}	1.0 μV_{RMS} 0.26 μV_{RMS}	bandwidth 0.1 Hz to 1 kHz bandwidth 0.1 Hz to 10 Hz

Current measurement with shunt plug			
Parameter	**Value typ.**	**min. / max**	**Remarks**
Input range	±50 mA, ±20 mA, ±10 mA, ±5 mA, ±2 mA, ±1 mA		
Shunt impedance	50 Ω		external plug ACC/DSUBM-I2
Over load protection		±60 mA	permanent
Input configuration	differential		
Gain error	0.02%	0.06% 0.1%	of reading, at 25°C plus error of 50 Ω shunt
Gain drift	(15 ppm/K)·ΔT_a	(55 ppm/K)·ΔT_a	ΔT_a=|T_a-25°C|; with T_a = ambient temperature
Offset error	0.02%	0.05%	of range, at 25°C
Noise (current)	0.6 nA_{RMS} 0.15 nA_{RMS}	10 nA_{RMS} 0.25 nA_{RMS}	bandwidth 0.1 Hz to 1 kHz bandwidth 0.1 Hz to 10 Hz

Current measurement with internal shunt			
Parameter	**Value typ.**	**min. / max**	**Remarks**
Input range	±50 mA, ±20 mA, ±10 mA, ±5 mA, ±2 mA, ±1 mA		
Shunt impedance	120 Ω		internal
Over load protection		±60 mA	permanent
Input configuration	Single-ended		internal current backflow to -VB
Gain error	0.02%	0.06%	of reading, at 25°C
Gain drift	(15 ppm/K)·ΔT_a	(55 ppm/K)·ΔT_a	$\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature
Offset error	0.02%	0.05%	of range, at 25°C
Noise (current)	0.6 nA_{RMS} 0.15 nA_{RMS}	10 nA_{RMS} 0.25 nA_{RMS}	bandwidth 0.1 Hz to 1 kHz bandwidth 0.1 Hz to 10 Hz

Bridge measurement			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Mode	DC		
Measurement modes	full-, half-, quarter bridge		bridge supply ≤5 V with quarter bridge
Input ranges bridge supply: 10 V bridge supply: 5 V bridge supply: 2.5 V bridge supply: 1 V	±1000 mV/V, ±500 mV/V, ±200 mV/V, ±100 mV/V ... ... ±0.5 mV/V ... ±1 mV/V ... ±2 mV/V ... ±5 mV/V		 (as an option) (as an option)
Bridge excitation voltage (as an option)	10 V 5 V (2.5 V and 1 V)	±0.5% ±0.5%	The actual value will be dynamically captured and compensated for in bridge mode.
Min. bridge impedance Max. bridge impedance	120 Ω, 10 mH full bridge 60 Ω, 10 mH half bridge 5 kΩ		
Internal quarter bridge completion	120 Ω, 350 Ω		internal, switchable per software
Input impedance	20 MΩ	±1%	differential, full bridge
Gain error	0.02%	0.05%	of reading
Offset error	0.01%	0.02%	of input range after automatic bridge balancing
automatic shunt calibration	0.5 mV/V	±0.2%	for 120 Ω and 350 Ω
Cable resistance for bridges (without return line)	<6 Ω <12 Ω		10 V excitation 120 Ω 5 V excitation 120 Ω

Sensor 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 (+1 V) (+2.5 V) +5.0 V +10 V +12 V +15 V +24 V (±15 V)	Current 580 mA 580 mA 580 mA 300 mA 250 mA 200 mA 120 mA 190 mA	Power 0.6 W 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 upon request, also 2.5 V and 1 V settings are available, for example by replacing the +12 V or +15 V setting. An arbitrary set of 5 setting can be chosen preferred selections: +24 V, +12 V, +10 V, +5.0 V, +2.5 V +15 V, +10 V, +5.0 V, +2.5 V, +1 V upon request, special order: +15 V can be replaced by ±15 V. This eliminates the internal current- and quarter bridge measurement.
Block isolation	60 V			Isolation of the entire global sensor supply (for all 8 channels, reference ground: "-VB") as well as the internal electronics
Short-circuit protection	unlimited duration			to output voltage reference ground: "-VB"
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
Compensation of cable resistances	3-line control: SENSE line as refeed (-VB: supply ground)			calculated compensation with bridges
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	-VB, GND, TEDS_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

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		
Parameter	**Value**	**Remarks**
Input supply voltage	10 V to 50 V DC	
Power consumption	10 W	10 to 50 V DC incl. 120 Ω 5 V load to all channels
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 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	62 x 118 x 186 mm (DSUB-26 variant: 43.3 mm width)	W x H x D
Weight	ca. 878 g (DSUB-26 variant: ca. 815 g)	