UNI2-8 for imc CRONOSflex

8-channel, high-performance universal measurement amplifier

The UNI2-8 is a universal measurement amplifier. With 8 differential analog inputs, it is capable of measuring:

- Voltage and current (20 mA)
- Temperature (thermocouple and PT100)
- Bridge and strain gauge (quarter-, half and full-bridge)
- IEPE/ICP-sensors (via the optional DSUB terminal connector)

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

Highlights

- An amplifier for all relevant measurement quantities
- Very high signal bandwidth of up to 48 kHz
- Finely adjustable input voltage range (±5 mV to ±50 V)
- Each channel with its own adjustable filter (e.g., anti-aliasing filter) and simultaneous A/D converter
- Graphical configuration wizard to setup strain gauge bridges
- Software selectable quarter bridge completion 120 and 350 Ω
- Supports imc Plug & Measure (Transducer Electronic Data Sheets)

CRFX/UNI2-8-L

Typical applications

- Provides maximum flexibility for changing measurement and sensor requirements.

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/UNI2-8	11900020	11910010	with DSUB-15 sockets
CRFX/UNI2-8-L	11900048	11910021	with LEMO sockets

* ET: Version for an extended temperature range

Mechanical drawings with dimensions

6x M4   Mounting holes, on both sides

module shown in preferred position of use
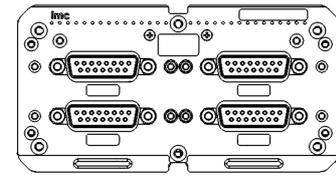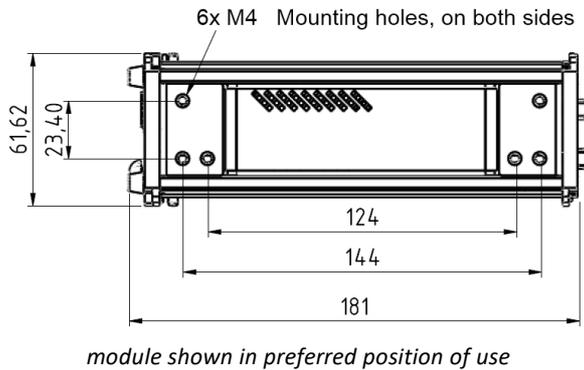
front view
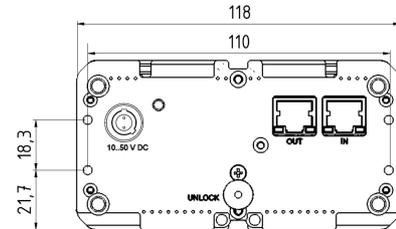
rear view

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.

Included accessories

DSUB-15 plug		
ACC/DSUBM-UNI2	DSUB-15 plug with screw terminals for 2-channel voltage, and bridge measurement as well as temperatures with PT100 and thermocouples with integrated cold junction compensation (CJC)	13500169

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

Optional accessories

DSUB-15 plug		
ACC/DSUBM-TEDS-UNI2	version with TEDS support, according to IEEE 1451.4 for use with imc Plug & Measure	13500188
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

LEMO plug		
ACC/TH-LEM-150	LEMO.1B plug for 1-channel thermocouple measurement with built-in cold-junction compensation (CJC) via PT100	13500086

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
CRFX/Set-Li-ION	Battery set for CRFX/HANDLE-Li-IO	11900276

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/1/2-19"	1/2 19" RACK for CRFX Modules	11900106
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/UNI2-8

Inputs, measurement modes, terminal connection		
Parameter	**Value**	**Remarks**
Inputs	8	
Measurement modes DSUB-15	voltage measurement current measurement bridge sensor strain gauge thermocouple measurement PT100 (3- and 4-wire configuration) current-fed sensors (IEPE/ICP)	ACC/DSUBM-UNI2 Single-ended (internal shunt) or shunt plug ACC/DSUBM-I2 full, half, quarter bridge with DSUB-15 expansion plug: (ACC/DSUBM-ICP2I-BNC-S/-F, isolated)
Measurement modes LEMO	voltage measurement current measurement thermocouple measurement bridge sensor strain gauge PT100 (3- and 4-wire configuration)	LEMO plug with built-in cold-junction compensation (CJC) ACC/TH-LEM-150 full, half, quarter bridge
Terminal connection DSUB-15 LEMO	4x DSUB-15 8x LEMO.1B.307	2 channels per plug 1 channel per plug

Sampling rate, Bandwidth, Filter, TEDS			
Parameter	**Value typ.**	**min. / max.**	**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 0 Hz to 10 Hz		-3 dB -0.1 dB -3 dB for temperature measurement
Max. Signal Slew-Rate	1.2 V/µs		

Filter (digital)
  cut-off frequency
  characteristic
  type and 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 8th 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 Transducer Electronic Data Sheets	conforming to IEEE 1451.4 Class II MMI		esp. with ACC/DSUBM-TEDS-xx (DS2433) supports also: DS2431 (typ. IEPE/ICP sensor)

Sampling rate, Bandwidth, Filter, TEDS

Parameter	Value typ.	min. / max.	Remarks
Characteristic curve linearization	user defined (max. 1023 supporting points)		

General

Parameter	Value typ.	min. / max	Remarks
Overvoltage protection		±80 V ±50 V	permanent, differential input range >±10 V or device 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			for IEPE/ICP-expansion plug
voltage	+5 V	±5 %	independent of integrated
available current	0.26 A	0.2 A	sensor supply, short-circuit protected
internal resistance	1.0 Ω	<1.2 Ω	power per DSUB-plug

Voltage measurement

Parameter	Value typ.	min. / max.	Remarks
Input range	±50 V, ±25 V, ±10 V, ±5 V, ±2.5 V, ±1 V to ±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 measured value, at 25 °C
Gain drift	10 ppm/K·ΔT_a	30 ppm/K·ΔT_a	$\Delta T_a = |T_a\text{-}25°C|$; with T_a = ambient temperature
Offset error	0.02 %	≤0.05 % ≤0.06 % ≤0.15 %	of the range, at 25 °C range >±50 mV range ≤±50 mV range ≤±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 $\Delta T_a = |T_a\text{-}25°C|$; with T_a = ambient temperature
Non-linearity	30 ppm	90 ppm	
CMRR (common mode rejection ratio)	80 dB 110 dB 138 dB	>70 dB >90 dB >132 dB	DC and f≤60 Hz range ±50 V to ±25 V range ±10 V to ±50 mV range ±25 mV to ±5 mV
Noise	3.6 µV$_{rms}$ 0.6 µV$_{rms}$ 0.14 µV$_{rms}$	5.5 µV$_{rms}$ 1.0 µV$_{rms}$ 0.26 µV$_{rms}$	range 0.1 Hz to 50 kHz range 0.1 Hz to 1 kHz range 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
Maximum input voltage		-11 V to +15 V	between ±IN and CHASSIS
Input configuration	differential		
Gain error	0.02 %	0.06 % 0.1 %	of the reading, at 25 °C additional error of 50 Ω in plug
Gain drift	15 ppm/K·ΔT_a	55 ppm/K·ΔT_a	$\Delta T_a = |T_a-25°C|$; with T_a = ambient temperature
Offset error	0.02 %	0.05 %	of the range, at 25 °C
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

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
Maximum input voltage		-11 V to +15 V	between ±IN and CHASSIS
Input configuration	Single-ended		internal current sink to -VB
Gain error	0.02 %	0.06 %	of the reading, at 25 °C
Gain drift	15 ppm/K·ΔT_a	55 ppm/K·ΔT_a	$\Delta T_a = |T_a-25°C|$; with T_a = ambient temperature
Offset error	0.02 %	0.05 %	of the range, at 25 °C
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

Bridge measurement

Parameter	Value typ.	min. / max.	Remarks
Mode	DC		
Measurement modes	full, half, quarter bridge		bridge supply ≤5 V with quarter bridge
Input range	±1000 mV/V, ±500 mV/V, ±200 mV/V, ±100 mV/V ...		
with bridge supply: 10 V	... ±0,5 mV/V		
with bridge supply: 5 V	... ±1 mV/V		
with bridge supply: 2.5 V	... ±2 mV/V		(as an option)
with bridge supply: 1 V	... ±5 mV/V		(as an option)
Bridge supply	10 V	±0.5 %	The actual value will be dynamically captured and compensated for in bridge mode.
	5 V	±0.5 %	
(as an option)	2.5 V and 1 V		
Minimum bridge impedance	120 Ω full bridge		
	60 Ω half bridge		
Maximum bridge impedance	5 kΩ		
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 the reading, at 25 °C
Gain drift	20 ppm/K·ΔT_a	50 ppm/K·ΔT_a	ΔT_a= |T_a-25°C|; with T_a = ambient temperature
Offset error	0.01 %	0.02 %	of input range, at 25°C, after automatic bridge balancing
Automatic shunt-calibration (calibration jump)	0.5 mV/V	±0.2 %	for 120 Ω and 350 Ω

Temperature measurement - Thermocouples

Parameter	Value typ.	min./ max.	Remarks
Measurement mode	J, T, K, E, N, S, R, B		
Measurement range	-270 °C to 1370 °C		type K
	-270 °C to 1100 °C		
	-270 °C to 500 °C		
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		0.06 % 0.05 %	type K of measurement range, at 25 °C of reading (total uncertainty min. 0.85 K)
Drift	0.02 K/K·ΔT_a	0.05 K/K·ΔT_a	ΔT_a= |T_a-25°C|; with T_a = ambient temperature
Error of cold junction compensation		±0.15 K	with ACC/DSUBM-UNI2, at 25 °C
Cold junction drift	±0.001 K/K·ΔT_a		ΔT_a= |T_a-25°C|; with T_a = ambient temperature

RTD (PT100)			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Input range	-200 °C to 850 °C -200 °C to 250 °C		
Resolution	0.063 K		
Measurement error			
4-wire measurement		0.25 K +0.02 %	-200 °C to 850 °C of measured value of resistance
		0.1 K +0.02 %	-200 °C to 250 °C of measured value of resistance
3-wire measurement		0.42 K +0.03 %	-200 °C to 850 °C of measured value of resistance
		0.38 K +0.02%	-200 °C to 250 °C of measured value of resistance
			Precision for 3-wire mode: with individual adjustment, only (special version upon request)
Drift		$0.01\ K/K \cdot \Delta T_a$	$\Delta T_a = |T_a - 25°C|$; with T_a = ambient temperature
Sensor feed (PT100)	1.25 mA		

Sensor supply

Parameter	Value typ.		max.	Remarks
Configuration options	5 selectable settings			always 5 selectable voltage settings default selection: +5 V to +24 V
Output voltage	Voltage	Current	Power	set jointly for all eight channels
	(+1 V)	580 mA	0.6 W	upon request, also 2.5 V and 1 V settings are
	(+2.5 V)	580 mA	1.5 W	available, for example by replacing the +12 V or
	+5.0 V	580 mA	2.9 W	+15 V setting. An arbitrary set of 5 setting can be
	+10 V	300 mA	3.0 W	chosen
	+12 V	250 mA	3.0 W	preferred selections:
	+15 V	200 mA	3.0 W	+24 V, +12 V, +10 V, +5.0 V, +2.5 V
	+24 V	120 mA	2.9 W	+15 V, +10 V, +5.0 V, +2.5 V, +1 V
	($\pm$15 V)	190 mA	3.0 W	upon request, special order: +15 V can be replaced by $\pm$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 from housing (CHASSIS, PE)
Short-circuit protection	unlimited duration			to output voltage reference ground: "-VB"
Compensation of cable resistances	3-line control: SENSE line as refeed (-VB: supply ground)			calculated compensation with bridges
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	-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	10.1 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 distributed imc CRONOS*flex* components
Input supply plug (female)	LEMO.EGE.1B.302	multicoded, 2-notch connector for optional individual power supply
Module connector	2x 20 pin	Click-mechanism provides direct connection of modules (supply and system bus) without additional cabling

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 according 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 60068-2-64 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	W x H x D
Weight	approx. 878 g	

Contact imc

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Service and maintenance

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imc ACADEMY - Training center

The safe handling of measurement devices requires a good knowledge of the system. At our training center, experienced specialists are here to share their knowledge.

E-Mail:	schulung@imc-tm.de
Internet:	https://www.imc-tm.com/service-training/imc-academy

International partners

You will find the contact person responsible for you in our overview list of imc partners:

Internet:	https://www.imc-tm.com/imc-worldwide/

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