

#### 4-channel, universale module with isolation

The UNI-4 module offer maximum flexibility and versatility for imc CRONOS-SL and for imc CRONOS*compact* measurement systems. The 4 channels enable not only the measurement of voltage, current and the connection of IEPE (ICP)-sensors but also temperature (thermocouples, PT100 and PT1000), bridges and strain gauges (full, half- and quarter bridge with internal completion:  $120 \Omega$ ,  $350 \Omega$  and  $1 k\Omega$ .

Channel-wise independently configurable supply voltages between 0.25 V to 24 V are provided for the supply of external sensors respectively bridge measurement.

The channels are individually galvanically isolated for the voltage measurement, current and thermocouple measurement. Each channel is equipped with an own simultaneous A/D converter and adjustable filter (e.g. antialiasing filter).

#### Highlights

- Individual galvanically isolated measurement of voltage-, current- and thermocouple-mode
- Channel-wise individually configurable sensor supply
- PT100 and PT1000 support
- High signal bandwidth of up to 48 kHz

### **Overview of the available variants**

Order code CRC/UNI-4 CRC/UNI-4-ET	for installation in an imc CRONOS <i>compact</i> housing version in extended temperature range	article number 1170167 1171125
CRSL/UNI-4-D	for installation in imc CRONOS-SL amplifier with DSUB-15 terminal connection	1180105
Included accessories for imc CRO	NOS <i>compact</i> variant	
ACC/DSUBM-UNI2	DSUB-15 plug with screw terminals for 2-channel voltage, current <sup>1</sup> and bridge measurement, as well as temperatures with PT100 and thermocouples with integrated cold junction compensation (CJC)	1350169

<sup>1</sup> single end current measurement, for differential measurement an external shunt or the appropriate connector (ACC/DSUB(M)-12) is necessary

#### Included accessories for imc CRONOS-SL:

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#### Requirements to the device firmware (imc DEVICES)

• For the UNI-4 it is absolutely necessary using firmware version 2.8R7 SP1 or higher.

**Technical Data Sheet** 



### **Optional accessories**

#### DSUB-15 plugs

ACC/DSUB-UNI2-IP65	sealed version, suitable for ET series	13500049
ACC/DSUBM-TEDS-UNI2	version with TEDS support, according to IEEE 1451 for use with imc Plug & Measure	13500188
• ACC/DSUB-TEDS-UNI2-IP65	sealed TEDS version	13500069
• ACC/DSUBM-12	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
<ul> <li>ACC/DSUBM-I2-IP65</li> </ul>	sealed version, suitable for SL series	13500329
• ACC/DSUBM-TEDS-I2	version with TEDS support, according to IEEE 1451 for use with imc Plug & Measure	13500193
<ul> <li>ACC/DSUBM-TEDS-I2-IP65</li> </ul>	sealed TEDS version	13500334
• 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 thermocouple measurement with built-in cold-junction compensation (CJC) via PT100	13500086
Mounting brackets for fixed instal	llations of imc CRONOScompact devices (CRC)	
<ul> <li>CRC/BRACKET-CON</li> </ul>	mounting bracket 90°	11700153
<ul> <li>CRC/BRACKET-90</li> </ul>	mounting bracket for DIN-Rail	11700152
<ul> <li>CRC/BRACKET-BACK</li> </ul>	mounting bracket for DIN-Rail	11700154
Mounting brackets for fixed instal	llations of imc CRONOS-SL devices (CRSL)	
• CRSL/BRACKET-90	mounting bracket 90°, mounting on a flat surface	11800080
Miscellaneous		

• Report set with manufacturer's calibration certificate and individual readings, as well as list of test equipment used (PDF). Meets requirements of DIN EN ISO 17025

<sup>1</sup> single end current measurement, for differential measurement an external shunt or the appropriate connector (ACC/DSUBM-I2) is necessary



# **Technical Specs - CRC/SL/UNI-4**

Inputs, measurement modes, terminal connection					
Parameter	Value	Remarks			
Inputs	4				
Measurement modes DSUB		ACC/DSUBM-UNI2 for all modes			
isolated measurement modes:	voltage measurement (differential)				
	current measurement	with Shunt-plug (ACC/DSUBM-I2)			
	thermocouple measurement				
non-isolated	voltage measurement (single-end)				
measurement modes:	current measurement	with internal Shunt			
	bridge-sensor				
	strain gauges				
	PT100/PT1000				
	(3- and 4-wire connection)				
	current fed sensors (IEPE/ICP)	with DSUB-15 extension plug ACC/DSUBM-ICP2I-BNC-S/-F, isolated			
Measurement modes LEMO					
isolated measurement modes:	voltage measurement (differential)				
	thermocouple measurement	with ACC/TH-LEM-150			
non-isolated	voltage measurement (single-end)				
measurement modes:	current measurement	with internal shunt			
	bridge-sensor				
	strain gauges				
	PT100/PT1000				
	(3- and 4-wire connection)				
Terminal connections		2 channels per plug			
LEMO	4x LEMO 1B 307	1 channel per plug			
Individual Sensor- and Bridge	supply	1			
Parameter	Value	Remarks			
Output-Voltage	channel-wise individually				
	configurable	5 possible settings			
	15 V, 12 V, 10 V, 5 V, 2,5 V	standard version			
	5 settings configurable out of:	special version, special order			
	24 V, 15 V, 12 V, 10 V, 5 V, 2.5 V, 1 V, 0.5 V, 0.25 V				
Short circuit protection	unlimited duration				
Output power	0.5 W / channel	≥5 V			
	0.2 W / channel	≤2.5 V			
Accuracy	±0.2%	At the amplifier terminals, no load.			
		Does not affect the accuracy in bridge mode (live software compensation of actual value and of additional cable loss via SENSE)			



Sampling rate, Bandwidth, Filter, TEDS				
Parameter	Value	Remarks		
Sampling rate	≤100 kHz	per channel		
Bandwidth	0 Hz to 48 kHz 0 Hz to 46 kHz	-3 dB 0.2 dB		
Filter 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 <sub>cutoff</sub> = 0.4 f <sub>s</sub>		
Resolution	16 Bit	internal processing 24 Bit		
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)			

General				
Parameter	Value	Remarks		
Isolation of voltage channels	channel-wise galvanically-isolated	voltage channels isolated against each other and against system ground (housing, CHASSIS), Isolation with IEPE/ICP plug: depending on connector type		
Bridge excitation voltage isolation	not isolated	Isolated against additional electronics (all sensor power supplies, bridge and input wiring, TEDS, etc.) with common reference ground "-VB". galvanically connected with system ground (housing, CHASSIS)		
Max common mode voltage isolated mode tested:	±60 V 300 V (10 s)	against system ground (housing, CHASSIS)		
Max common mode voltage non-isolated mode	±10 V	against system ground (housing, CHASSIS)		



General					
Parameter	Value typ.	min. / max.	Remarks		
Overvoltage protection	±100 V		differential input volt	age (continuous)	
(inputs +IN, -IN)	ESD	2 kV	human body model	human body model	
	transient protection: automotive load dump ISO 7636		R <sub>i</sub> =30 Ω, t <sub>d</sub> =300 μs, t <sub>r</sub>	<60 μs	
Input coupling	D	С			
Input impedance	10	MΩ	voltage mode (range temperature mode	voltage mode (range ≤±2 V), temperature mode	
	1 N	MΩ	voltage mode (range	≥±5 V)	
Input current					
operating conditions		2.4 nA			
on overvoltage condition	1 mA		V <sub>in</sub>   >5 V on ranges <	±2 V	
Input noise			range ≤±25 mV		
	2.2 μV <sub>rms</sub> / 15 μV <sub>pkpk</sub>		bandwidth 0.1 to 48	kHz	
	0.3 $\mu V_{rms}$ / 2.1 $\mu V_{pkpk}$		bandwidth 0.1 to 1 k	Hz	
	$0.1  \mu V_{pkpk}$		bandwidth 0.1 to 10	Hz	
	10 nV / VHz		spectral noise density	y (at 1 kHz)	
CMRR (common mode rejection ratio) / IMR	>145 dE >80 dB	8 (50 Hz) (50 Hz)	range ≤±2 V range ≥±5 V	$R_{source} = 0 \ \Omega$	
Spurious free dynamic range	>80 dB (10 kHz)		range ≤±2 V		
(SFDR)	>95 dB (1 kHz)				
	>84 dB (10 kHz) >100 dB (1 kHz)		range ≥±5 V		
Auxiliary supply			for IEPE/ICP-extensio	n plug	
voltage	+5 V	±5%	independent of integ	rated	
available current	0.26 A	0.2 A	sensor supply, short-	circuit protected	
internal resistance	1.0 Ω	<1.2Ω	power per DSUB-plug	5	



Voltage measurement				
Parameter	Value typ.	min. / max.	Remarks	
Voltage input range	±60 V, ±50 V, ±25 V, ±10 V, ±5 V, ±2 V, ±1 V, ±500 mV, ±250 mV, ±100 mV, ±50 mV, ±25 mV, ±10 mV, ±5 mV, ±2.5 mV		with single-end mode: max. ±10 V	
Input configuration	differential	/ single-end		
Gain error	<0.02%	<0.05%	of the measured value, at 25°C	
Gain drift		20 ppm/K·∆T <sub>a</sub>	range ≤ $\pm$ 2 V	
		60 ppm/K·∆T <sub>a</sub>	range ≥ $\pm$ 5 V	
			$\Delta T_a =  T_a - 25^{\circ}C $ ambient temperature $T_a$	
Offset error			of the range	
		0.01%	range ≥ $\pm$ 50 mV	
		10 μV	$range \leq \pm 25 \ mV$	
Offset drift	0.7 μV/K·∆T <sub>a</sub>		range $\leq \pm 25 \text{ mV}$ $\Delta T_a =  T_a - 25^{\circ}C $ ambient temperature $T_a$	
Current measurement with Shunt-Plug				
Parameter	Value typ.	min. / max.	Remarks	
Current input range	±40 mA, ±20	) mA, ±10 mA		
Shunt-Resistor	50	Ω (	external plug ACC/DSUBM-I2	
Input configuration	differ	ential	isolated	

Input configuration	differential		isolated	
Gain error	<0.02%	<0.05% <0.1%	of the measured value, at 25°C additional error of 50 $\Omega$ in plug	
Gain drift	10 ppm/K·∆T <sub>a</sub>	30 ppm/K·∆T <sub>a</sub>	$\Delta T_a =  T_a - 25^{\circ}C $ ambient temperature $T_a$	
Offset error		<0.01%	of the range, at 25°C	

Current measurement with internal shunt					
Parameter	Value typ.	min. / max.	Remarks		
Current input range	±50 mA, ±20 mA, ±10 mA, ±5 mA, ±2 mA, ±1 mA				
Shunt-Resistor	120 Ω		internal		
Input configuration	single-end		not isolated		
Gain error	<0.02%	<0.05%	of the measured value, at 25°C		
Gain drift	10 ppm/K·∆T <sub>a</sub>	30 ppm/K·∆T <sub>a</sub>	$\Delta T_a =  T_a - 25^{\circ}C $ ambient temperature $T_a$		
Offset error		<0.01%	of the range, at 25°C		



Bridge measurement				
Parameter	Value typ.	min. / max.	Remarks	
Mode	D	C		
Measurement modes	full, half, quarter bridge			
Measurement range				
bridge supply: 10 V	±1000 mV/V, ±500 mV/V, ±200 mV/V, ±100 mV/V, ±50 mV/V, ±25 mV/V, ±0 5 mV/V, ±0 25 mV/V			
bridge supply: 5 V	±1000 mV/V, ±400 mV/V, ±200 mV/V, ±100 mV/V, ±50 mV/V ±1 mV/V, ±0.5 mV/V			
bridge supply: 2.5 V	±800 mV/V, ±400 mV/V, ±100 mV/V, ±2	mV/V, ±200 mV/V, 2 mV/V,  ±1 mV/V		
(bridge supply: 1 V)	±1000 mV/V,	, ±2.5 mV/V	special order	
(bridge supply: 0.5 V)	±1000 mV/V	, , ±5 mV/V	special order	
(bridge supply: 0.25 V)	±800 mV/V,	, ±10 mV/V	special order	
Bridge supply	0.25 V	to 10 V	selectable for each channel possible options: see above	
Minimum bridge impedance	200 Ω 50 Ω 32 Ω		bridge supply = 10 V bridge supply = 5 V bridge supply = 2.5 V	
Cable-Compensation				
full bridge / half bridge	4-wire-technique 3-wire-technique with shunt-calibration		any cable for symmetric (similar) cables one-time non-adaptive compensation	
quarter bridge	full compensation in 3-wire-technique		including Gain-Correction!	
Quarter bridge completion	120 Ω, 35	50 Ω, 1 kΩ	switched per software / bridge supply ≤5 V	
Automatic shunt-calibration (calibration step)	0.5 mV/V		with 120 $\Omega$ and 350 $\Omega$	
Input impedance	6.7 ΜΩ	±1%	differential, full bridge	
Gain error	<0.02%	<0.05%	of the reading, at 25°C	
Gain drift		20 ppm/K·∆T <sub>a</sub>	$\Delta T_a$ = T <sub>a</sub> =25°C  ambient temperature T <sub>a</sub>	
Offset error	within residual noise band			
Offset drift		0.14 μV/V /K· $\Delta T_a$	$\Delta T_a =  T_a - 25^{\circ}C $ ambient temperature $T_a$	
Drift half bridge	0.5 μV/V / °C	1 μV/V / °C	additional drift of internal half bridge completion	
Bridge offset balancing range	≥100% of meas	surement range		
	≥±4 n	nV/V	valid for the entire meas. range	
Cable resistance	<6/	0 Ω	120 Ω bridge	
max cable length (simple)	<46	60 m	0.14 mm², 130 mΩ / m	



Temperature measurement				
Thermocouple	Value typ.	min. / max.	Remarks	
Measurement mode	J, T, K, E, N, S, R, B			
Measurement range	-270°C to 1370°C -270°C to 1100°C -270°C to 500°C		type К	
Resolution	0.063 K	(1/16 K)	16-Bit integer	
Measurement error			with type K	
(gain + offset)		<±0.6 K <±1.0 K	range -150°C to 1100°C else	
Drift		$\pm$ 0.02 K/K· $\Delta$ T <sub>a</sub>	type K, range -270°C to 1100°C	
(gain + offset)		±0.05 K/K·∆T <sub>a</sub>	type K, range -270°C to 1370°C	
			$\Delta T_a =  T_a - 25^{\circ}C $ ambient temperature $T_a$	
Error of cold junction compensation		<±0.15 K	with ACC/DSUBM-UNI2	
Cold junction drift	±0.001 K/K·∆T <sub>a</sub>		$\Delta T_a =  T_a - 25^{\circ}C $ ambient temperature $T_a$	
Temperature measurement				
PT100 / PT1000	Value typ.	min. / max.	Remarks	
Measurement range	-200°C to 850°C -200°C to 250°C			
Resolution	0.063 К (1/16 К)		16-Bit integer	
Measurement error		<±0.05%	of the measured value	
Offset error		<±0.1 K	4-wire connection	
Offset drift		+0.01 K/K·∆T <sub>a</sub>	$\Delta T_a =  T_a - 25^{\circ}C $ ambient temperature $T_a$	
Sensor feed	250 μΑ			