UNI-4 for imc CRONOScompact (CRC/UNI-4)

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 Ω, 350 Ω and 1 kΩ.

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. anti-aliasing 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

Standard version		ET Version *	
Order Code:	article no.	article no.	Remarks
CRC/UNI-4	11700167	11710125	for imc CRONOS*compact*
CRC/UNI-4-R	11700089	117100xx	for imc CRONOS*compact* RACK

Included accessories

DSUB-15 plug		
ACC/DSUBM-UNI2	DSUB-15 plug with screw terminals for 2-channel voltage, current[1] and bridge measurement, as well as temperatures with PT100 and thermocouples with integrated cold junction compensation (CJC)	13500169

Documents
Getting started with imc CRONOS*compact* (one copy per delivery / system)
Device certificate

* ET: Version in extended temperature range

Optional accessories

DSUB-15 plugs

• ACC/DSUBM-TEDS-UNI2	version with TEDS support, according to IEEE 1451 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 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 thermocouple measurement with built-in cold-junction compensation (CJC) via PT100	13500086

Mounting brackets for fixed installations of imc CRONOS*compact* devices (CRC)

• CRC/BRACKET-CON	mounting bracket 90°	11700153
• CRC/BRACKET-90	mounting bracket for DIN-Rail	11700152
• CRC/BRACKET-BACK	mounting bracket for DIN-Rail	11700154

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

Technical Specs - CRC/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 thermocouple measurement	 with Shunt-plug (ACC/DSUBM-I2)
non-isolated measurement modes:	voltage measurement (single-end) current measurement bridge-sensor strain gauges PT100/PT1000 (3- and 4-wire connection) current fed sensors (IEPE/ICP)	 with internal Shunt 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 measurement modes:	voltage measurement (single-end) current measurement bridge-sensor strain gauges PT100/PT1000 (3- and 4-wire connection)	 with internal shunt
Terminal connections Standard LEMO	 2x DSUB-15 4x LEMO.1B.307	 2 channels per plug 1 channel per plug

Individual Sensor- and Bridge supply		
Parameter	**Value**	**Remarks**
Output-Voltage	channel-wise individually configurable 15 V, 12 V, 10 V, 5 V, 2,5 V	 5 possible settings standard version
	5 settings configurable out of: 24 V, 15 V, 12 V, 10 V, 5 V, 2.5 V, 1 V, 0.5 V, 0.25 V	special version, special order
Short circuit protection	unlimited duration	
Output power	0.5 W / channel 0.2 W / channel	≥5 V ≤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 $f_{cutoff} = 0.4\ f_s$
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 (inputs +IN, -IN)	±100 V ESD 2 kV transient protection: automotive load dump ISO 7636		differential input voltage (continuous) human body model R_i=30 Ω, t_d=300 µs, t_r<60 µs
Input coupling	DC		
Input impedance	10 MΩ 1 MΩ		voltage mode (range ≤±2 V), temperature mode voltage mode (range ≥±5 V)
Input current operating conditions on overvoltage condition	1 mA	2.4 nA	$\|V_{in}\|$ >5 V on ranges <±2 V
Input noise	2.2 μV_{rms} / 15 μV_{pkpk} 0.3 μV_{rms} / 2.1 μV_{pkpk} 0.1 μV_{pkpk} 10 nV / √Hz		range ≤±25 mV bandwidth 0.1 to 48 kHz bandwidth 0.1 to 1 kHz bandwidth 0.1 to 10 Hz spectral noise density (at 1 kHz)
CMRR (common mode rejection ratio) / IMR	>145 dB (50 Hz) >80 dB (50 Hz)		range ≤±2 V range ≥±5 V R_{source} = 0 Ω
Spurious free dynamic range (SFDR)	>80 dB (10 kHz) >95 dB (1 kHz) >84 dB (10 kHz) >100 dB (1 kHz)		range ≤±2 V range ≥±5 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-extension plug independent of integrated sensor supply, short-circuit protected power per DSUB-plug

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·ΔT_a 60 ppm/K·ΔT_a	range ≤±2 V range ≥±5 V ΔT_a= |T_a-25°C|; with T_a = ambient temperature
Offset error		 0.01% 10 µV	of the range range ≥±50 mV range ≤±25 mV
Offset drift	0.7 µV/K·ΔT_a		range ≤±25 mV ΔT_a= |T_a-25°C|; with T_a = ambient temperature

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	differential		isolated
Gain error	<0.02%	<0.05% <0.1%	of the measured value, at 25°C additional error of 50 Ω in plug
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		<0.01%	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·ΔT_a	30 ppm/K·ΔT_a	ΔT_a= |T_a-25°C|; with T_a = ambient temperature
Offset error		<0.01%	of the range, at 25°C

Bridge measurement			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Mode	DC		
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, ±200 mV/V, ±100 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, 350 Ω, 1 kΩ		switched per software / bridge supply ≤5 V
Automatic shunt-calibration (calibration step)	0.5 mV/V		with 120 Ω and 350 Ω
Input impedance	6.7 MΩ	±1%	differential, full bridge
Gain error	<0.02%	<0.05%	of the reading, at 25°C
Gain drift		20 ppm/K·ΔT_a	$\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature
Offset error	within residual noise band		
Offset drift		0.14 µV/V /K·ΔT_a	$\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature
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 measurement range ≥±4 mV / V		valid for the entire meas. range
Cable resistance	<60 Ω		120 Ω bridge
max cable length (simple)	<460 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 K
Resolution	0.063 K (1/16 K)		16-Bit integer
Measurement error (gain + offset)		<±0.6 K <±1.0 K	with type K range -150°C to 1100°C else
Drift (gain + offset)		±0.02 K/K·ΔT_a ±0.05 K/K·ΔT_a	type K, range -270°C to 1100°C type K, range -270°C to 1370°C $\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature
Error of cold junction compensation		<±0.15 K	with ACC/DSUBM-UNI2
Cold junction drift	±0.001 K/K·ΔT_a		$\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature

Temperature measurement			
PT100 / PT1000	**Value typ.**	**min. / max.**	**Remarks**
Measurement range	-200°C to 850°C -200°C to 250°C		
Resolution	0.063 K (1/16 K)		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·ΔT_a	$\Delta T_a = \lvert T_a - 25°C \rvert$; with T_a = ambient temperature
Sensor feed	250 µA		