BR2-4 for imc CRONOScompact (CRC/BR2-4)

4-channel bridge amplifier

The BR2-4 is an all-purpose bridge amplifier for 4 channels (also employable as a DC differential amplifier). It enables measurement of four bridges, load cells, strain gauges and inductive LVDTs, supplied with a software selectable choice of either DC or CF (AC carrier frequency) excitation.

The BR2-4 is a successor model of the BR-4 and available as a modular plug-in for the imc CRONOS*compact* and as a configuration module for imc CRONOS-SL.

CRC/BR2-4

Highlights

- DC and Carrier frequency mode (5 kHz)
- Lead wire compensation with single and dual sense line configurations are supported
  (e.g. 5/6-wire-circuit with full bridge)
- Symmetric bridge supply of 1 V, 2.5 V, 5 V and with DC and CF (AC) mode
- Software selectable quarter bridge completion 120 Ω and 350 Ω switchable
- Cable breakage recognition
- Supports *imc Plug & Measure* (Transducer Electronic Data Sheets (IEEE 1451.4)

imc CRONOS*compact* - modular measurement system

imc CRONOS*compact* is a modular and reconfigurable hardware a "rack"-based series of devices available in a variety of housing sizes and device frames. imc CRONOS*compact* (CRC) plug-in-modules can be inserted into the system (CRC-400GP).

Once the modules are plugged into a portable or rack-based housing, they are electrically connected to the CRC-system and are supplied by the system with power. The data storage will be managed by the CRC-system.

Rack-based modules ("-R") differ from the standard modules only in terms of the front panel's attachment mechanism.

imc CRONOScompact plug-in-modules

imc CRONOScompact portable housing

Overview of available variants

Standard version		ET version *	
Order code:	article no.	article no.	remarks
CRC/BR2-4	11700041	11710025	for imc CRONOS*compact*
CRC/BR2-4-R	11700114	11710073	for imc CRONOS*compact* RACK
CRC/BR2-4-L	auf Anfrage	--	variant with LEMO sockets

* ET: Version for an extended temperature range

Included accessory

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

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

Optional accessories

DSUB-15 plugs

• ACC/DSUBM-TEDS-B2	version with TEDS support, according to IEEE 1451.4 for use with imc Plug & Measure	13500191
• 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/DSUB-ICP2	DSUB-15 plug with screw terminals for conditioning of 2 IEPE/ICP inputs	13500036

Technical Specs - CRC/BR2-4

Inputs, measurement modes, terminal connection		
Parameter	**Value**	**Remarks**
Inputs	4	
Measurement modes DSUB-15	bridge sensor strain gauge LVDT voltage measurement current measurement current-fed sensors IEPE/ICP	ACC/DSUBM-B2 full-, half- and quarter bridge inductive transducers (CF) voltage or bridge mode globally selected for all four channels with current plug: ACC/DSUBM-I2 with IEPE/ICP extension plug (DSUB-15): ACC/DSUBM-ICP2I-BNC-S/-F, isolated, basic functionality (ICP-operation)
Measurement modes LEMO	full, half- and quarter bridge LVDT voltage measurement	
Terminal connection DSUB-15 LEMO	 2x DSUB-15 or 4x LEMO.1B.307(308)	 2 channels per plug 1 channel per plug

Sampling rate, Bandwidth, Filter, TEDS		
Parameter	**Value**	**Remarks**
Sampling rate	20 kHz (max)	per channel
Bandwidth	8.6 kHz (DC) 3.9 kHz (CF)	-3 dB -3 dB
Filter cut-off frequency characteristic order	 2 Hz to 5 kHz	 Butterworth, Bessel low pass filter 8. 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)

General	Value typ.	min. / max	Remarks
Overvoltage protection		±50 V ±80 V	long term (differential- and SENSE-inputs) short-term
Input impedance	10 MΩ 1 MΩ		range ±5 mV to ±2 V range ±5 V to ±50 V and for deactivated device
Input current		40 nA	
Input capacitance	300 pF		
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 integrated 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 ±5 V / ±2 V / ±1 V ±500 mV / ±250 mV / ±100 mV ±50 mV / ±25 mV / ±10 mV / ±5 mV		
Gain error	0.02 %	≤0.05 %	of reading (measurement value)
Gain drift	60 ppm / K	<100 ppm / K	
Offset drift	0.02 %	≤0.05 % ≤0.1 % ≤0.2 %	of measurement range range ≥±25 mV range = ±10 mV range = ±5 mV
Input offset-drift	0.05 µV / K	0.3 µV / K	DC voltage measurement
Non-linearity	<200 ppm		
Common mode voltage (max.)	±50 V ±2.8 V		ranges ±50 V to ±5 V ranges ±2 V to ±5 mV
Common mode rejection ratio (CMRR) range: ±5 mV to ±25 mV ±50 mV to ±100 mV ±250 mV to ±2 V ±5 V to ±50 V ±5 mV to ±2 V ±5 V to ±50 V all ranges	 >100 dB >68 dB 	 >120 dB >110 dB 95 dB >54 dB >90 dB >54 dB >50 dB	DC f ≤ 50 Hz f = 5 kHz
SNR (signal to noise ratio)	>90 dB >88 dB >82 dB >75 dB >69 dB		full-scale / rms-noise full bandwidth ranges ±100 mV to ±50 V range ±50 mV range ±25 mV range ±10 mV range ±5 mV
Input noise, voltage (RTI)	16 nV/√Hz$_{rms}$ 16 µV$_{pk-pk}$ 2 µV$_{rms}$		DC-Mode (range ±5 mV) spectral noise density 1 kHz 0 Hz to 10 kHz 0 Hz to 10 kHz

Voltage measurement			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
	0.6 μV_{pk-pk}		0.1 Hz to 10 Hz

Current measurement with shunt plug		
Parameter	**Value**	**Remarks**
Input ranges	±40 mA / ±20 mA / ±10 mA ±5 mA / ±2 mA / ±1 mA ±400 µA / ±200 µA / ±100 µA	
Shunt impedance	50 Ω	shunt plug ACC/DSUBM-I2, not for LEMO version

Bridge measurement			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Mode	DC, CF		
Sensors	LVDT, strain gauge: full-, half-, quarter bridge piezo-resistive bridge transducer potentiometer		directly connectable
Measurement mode	full-, half-, quarter bridge		
Input ranges	±1 mV/V to ±400 mV/V ±2 mV/V to ±800 mV/V ±5 mV/V to ±2000 mV/V		for bridge voltage: 5 V 2.5 V 1 V
Bridge supply DC CF (5 kHz)	1 V; 2.5 V; 5 V (symmetric) 1 V; 2.5 V; 5 V (peak)		set globally for 4-channel groups corresponding to ±0.5 V, ±1.25 V, ±2.5 V corresponding to RMS: 0.7 V; 1.8 V; 3.5 V
Internal quarter-bridge completion	120 Ω, 350 Ω		selectable
Min. bridge impedance Bridge impedance (max.)	120 Ω, 10 mH full bridge 60 Ω, 5 mH half bridge 5 kΩ		bridge supply = 1 V to 5 V, $I_{load} \leq 42$ mA
Gain error	<0.05 %		of measurement value
Offset after bridge balance	<0.02 %		of the range
Input offset-drift	0.01 µV/V / K	0.06 µV/V / K	DC full bridge (Bridge supply=5 V, 1 mV/V range) without ext. bridge offset
Drift of bridge balance Equivalent offset drift corresponding to balanced ext. bridge offset	50 ppm/K 0.05 µV/V/K	<90 ppm/K 0.09 µV/V/K	of compensated offset value full bridge (DC or CF), ext. bridge offset = 1 mV/V 1 mV/V input range
Half-bridge drift (int. half-bridge)	0.05 µV/V/K	1 µV/V/K	DC or CF
Bridge balancing range	≥measurement range not less than: ≥±5 mV/V ≥±10 mV/V ≥±25 mV/V		 for bridge supply = 5 V for bridge supply = 2.5 V for bridge supply = 1 V

Bridge measurement			
Parameter	**Value typ.**	**min. / max.**	**Remarks**
Cable length (max.)	500 m (one-way length)		A = 0.14 mm², R = 130 mΩ/m, 65 Ω
Cable-Compensation full bridge / half bridge quarter bridge	 4-wire-technique 3-wire-technique with shunt-calibration full compensation in 3-wire-technique		 any cable for symmetric (similar) cables one-time non-adaptive compensation including Gain-Correction!
Automatic shunt-calibration	0.5 mV/V		for 120 Ω and 350 Ω bridges
Input noise (bridge) DC full bridge	 3 $\mu V/V_{pkpk}$, 0.39 $\mu V/V_{rms}$ 0.9 $\mu V/V_{pkpk}$, 0.12 $\mu V/V_{rms}$ 0.3 $\mu V/V_{pkpk}$, 0.04 $\mu V/V_{rms}$ 0.1 $\mu V/V_{pkpk}$		range: 1 µV/V (bridge voltage = 5 V) 0 Hz to 10 kHz 1 kHz, lowpass filter 100 Hz, lowpass filter 10 Hz, lowpass filter
DC half-/quarter bridge	3.3 $\mu V/V_{pkpk}$, 0.45 $\mu V/V_{rms}$ 1.1 $\mu V/V_{pkpk}$, 0.15 $\mu V/V_{rms}$ 0.35 $\mu V/V_{pkpk}$, 0.05 $\mu V/V_{rms}$ 0.3 $\mu V/V_{pkpk}$		0 Hz to 10 kHz 1 kHz, lowpass filter 100 Hz, lowpass filter 10 Hz, lowpass filter
CF full bridge, half bridge	3.5 $\mu V/V_{pkpk}$, 0.47 $\mu V/V_{rms}$ 1.7 $\mu V/V_{pkpk}$, 0.22 $\mu V/V_{rms}$ 0.6 $\mu V/V_{pkpk}$, 0.07 $\mu V/V_{rms}$ 0.3 $\mu V/V_{pkpk}$		0 Hz to 10 kHz 1 kHz, lowpass filter 100 Hz, lowpass filter 10 Hz, lowpass filter