

BR2-4 for imc CRONOS-SL/compact

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.

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)



CRC/BR2-4

- Symmetric bridge supply of 1 V, 2.5 V, 5 V and with DC and CF (AC) mode
- Software selectable quarter bridge completion 120 and 350 switchable

Additionally highlights with BR2-4:

- 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-400 / CRC-2000G).

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

Order code	article number	remarks
CRC/BR2-4	11700041	for installation in a imc CRONOS compact housing
CRC/BR2-4-ET	11710025	Version in extended temperature range
CRC/BR2-4-L	special order	for installation in a imc CRONOS compact housing
		with 7 pin LEMO interconnections (8-pin LEMO with TEDS)
CRC/BR2-4-R	11700114	for installation in a imc CRONOS compact 19" RACK
CRC/BR2-4-R-ET	11710073	Version in extended temperature range



Order code CRSL/BR2-4-D	article numb 11800103	er remarks for installation in a imc CRONOS-SL housing with DSUB connections	
Included accessories for	or CRC/BR2-4:		
• 2x ACC/DSUBM-B2		DSUB-15 plug with screw terminals for 2-channel measurement of strain gauges, bridges and voltage	13500170
Included accessories for	or imc CRONO	S-SL:	
Optional accessories DSUB-15 plugs			
 ACC/DSUBM-E 	32-IP65	sealed version, suitable for SL series	13500218
ACC/DSUBM-1	TEDS-B2	version with TEDS support, according to IEEE 1451.4 for use with imc Plug & Measure	13500191
ACC/DSUBM-T	reds-b2-ip65	sealed TEDS version	13500xxx
 ACC/DSUBM-I 	2	DSUB-15 plug with screw terminals for 2-channel current measurement of up to 50 mA (50 shunt, scaling factor: 0.02A/V)	13500180
 ACC/DSUBM-I 	2-IP65	sealed version, suitable for SL series	13500xxx
ACC/DSUBM-1	reds-12	version with TEDS support, according to IEEE 1451.4 for use with imc Plug & Measure	13500193
ACC/DSUBM-1	reds-12-IP65	sealed TEDS version	13500xxx
ACC/DSUB-ICP2		DSUB-15 plug with screw terminals for conditioning of 2 IEPE/ICP inputs	13500036



Technical Specs - CRC/CRSL/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 expansion plug (DSUB-15): ACC/DSUBM-ICP2I-BNC-S/-F, isolated	
Measurement modes LEMO	full, half- and quarter bridge LVDT voltage measurement		
Terminal connection DSUB-15	2x DSUB-15 or	2 channels per plug	
LEMO	4x LEMO.1B.307(308)	1 channel per plug	
Sampling rate, Bandwidth, Fi	Iter, 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)	
Characteristic curve linearization	user defined (max. 1023 supporting points)		

Full sensor TEDS support, including the DS2431 type used in most current IEPE sensors, is only available for modules of the imc CRONOS *flex* (CRFX) and imc CRONOS-XT (CRXT) device platforms.



General	Value typ.	min. / max	Remarks
Overvoltage protection		±50 V ±80 V	long term (differential- and SENSE-inputs) short-term
Input impedance	10 M 1 M		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			for IEPE (ICP)-expansion plug
voltage available current internal resistance	+5 V >0.26 A 1.0	±5 % >0.2 A <1.2	independent of integrated sensor supply, short circuit proof power per DSUB-plug
Voltage measurement			
Parameter	Value typ.	min. / max.	Remarks
Input ranges	±50 V / ±2 ±5 V / ±2 ±500 mV / ±250 ±50 mV / ±25 mV	5 V / ±10 V 2 V / ±1 V) mV / ±100 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: $\pm 5 \text{ mV to } \pm 25 \text{ mV}$ $\pm 50 \text{ mV to } \pm 100 \text{ mV}$ $\pm 250 \text{ mV to } \pm 2 \text{ V}$ $\pm 5 \text{ V to } \pm 50 \text{ V}$ $\pm 5 \text{ mV to } \pm 2 \text{ V}$ $\pm 5 \text{ V to } \pm 50 \text{ V}$ $\pm 100 \text{ mV}$ $\pm 5 \text{ V to } \pm 50 \text{ V}$ $\pm 100 \text{ mV}$ $\pm 5 \text{ V to } \pm 50 \text{ V}$ $\pm 100 \text{ mV}$ $\pm 100 \text{ mV}$	>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)			full-scale / rms-noise full bandwidth
	>90 dB >88 dB >82 dB >75 dB >69 dB		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 μ	V _{pk-pk}	0.1 Hz to 10 Hz	
Current measurement with s	hunt plug			
Parameter	Val	ue	Remarks	
Input ranges	±40 mA / ±20 mA / ±10 mA			
	±5 mA / ±2	mA / ±1 mA		
Shunt impedance	<u>±400 μΑ7 ±200</u> 50))	shunt plug ACC/DSUBM-I2, not for LEMO version	
Bridge measurement				
Parameter	Value typ.	min. / max.	Remarks	
Mode	DC,	CF		
Sensors	LVI	DT,	directly connectable	
	strain gauge: full-, ł	half-, quarter bridge		
	piezo-resistive b	oridge transducer		
Measurement mode	full-, half-, q	uarter bridge		
Input ranges		-	for bridge voltage:	
	±1 mV/V to	±400 mV/V	5 V	
	±2 mV/V to	±800 mV/V	2.5 V	
	±5 mV/V to	±2000 mV/V		
Bridge supply	1 \/· 2 5 \/· 5 \	(symmetric)	set globally for 4-channel groups	
CF (5 kHz)	1 V; 2.5 V;	5 V (peak)	corresponding to RMS: 0.7 V; 1.8 V; 3.5 V	
Internal quarter-bridge	120 , 350		selectable	
completion				
Min. bridge impedance	120,10 m 60,5 mH	H full bridge	bridge supply = 1 V to 5 V, $I_{load} \le 42 \text{ mA}$	
Bridge impedance (max.)	5	k		
Gain error	<0.0)5 %	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	50 ppm/K	<90 ppm/K	of compensated offset value	
Equivalent offset drift corresponding to balanced ext	0.05 μν/ν/κ	0.09 µV/V/K	ext bridge (DC OF CF),	
bridge offset			1 mV/V input range	
Half-bridge drift	0.05 µV/V/K	1 µV/V/K	DC or CF	
(int. half-bridge)				
Bridge balancing range	≥measurer	ment range		
	not less than:		for bridge summer 5 V	
	≥±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		A = 0.14 mm², R = 130 m /m, 65
	(one-way length)		
Cable-Compensation			
full bridge / half bridge	4-wire-technique		any cable
	3-wire-te	echnique	for symmetric (similar) cables
	with shunt-calibration		one-time non-adaptive compensation
quarter bridge	full compensation i	n 3-wire-technique	including Gain-Correction!
Automatic shunt-calibration	0.5 r	mV/V	for 120 and 350 bridges
Input noise (bridge)			range: 1 µV/V (bridge voltage = 5 V)
DC full bridge	3 μV/V _{pkpk} ,	$0.39\mu\text{V/V}_{\text{rms}}$	0 Hz to 10 kHz
	0.9 µV/V _{pkpk'}	$0.12 \mu V/V_{rms}$	1 kHz, lowpass filter
	0.3 µV/V _{pkpk'}	$0.04 \ \mu V/V_{rms}$	100 Hz, lowpass filter
	0.1 μ\	//V _{pkpk}	10 Hz, lowpass filter
DC half-/quarter bridge	3.3 µV/V _{pkpk'}	$0.45 \ \mu V/V_{rms}$	0 Hz to 10 kHz
	1.1 μV/V _{pkpk} ,	0.15 µV/V _{rms}	1 kHz, lowpass filter
	0.35 μV/V _{pkpk}	, 0.05 µV/V _{rms}	100 Hz, lowpass filter
	0.3 µ\	//V _{pkpk}	10 Hz, lowpass filter
CF full bridge, half bridge	3.5 μV/V _{pkpk} ,	$0.47 \mu V/V_{rms}$	0 Hz to 10 kHz
	1.7 μV/V _{pkpk} ,	$0.22\mu\text{V/V}_{rms}$	1 kHz, lowpass filter
	0.6 μV/V _{pkpk'}	$0.07 \ \mu V/V_{rms}$	100 Hz, lowpass filter
	0.3 µ\	//V _{pkpk}	10 Hz, lowpass filter