

# BR2-4 for imc CRONOS-SL (CRSL/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 CRONOScompact and as a configuration module for imc CRONOS-SL.



*imc CRONOS-SL-2 (rear)*



*imc CRONOS-SL-2 (front)*

### 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))

### Overview of available variants

Order Code	article no.	remarks
CRSL/BR2-4-D	11800103	with DSUB-15 sockets

### Included accessories

Documents
Getting started with imc CRONOScompact & imc CRONOS-SL (one copy per delivery / system)
Device certificate

## Technical Specs - 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 extension plug (DSUB-15): ACC/DSUBM-ICP21-BNC-S/-F, isolated, basic functionality (ICP-operation)
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, 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 $f_{\text{cutoff}} = 0.4 f_s$
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			for IEPE (ICP)-expansion plug independent of integrated sensor supply, short circuit proof power per DSUB-plug
voltage	+5 V	±5 %	
available current	>0.26 A	>0.2 A	
internal resistance	1.0 Ω	<1.2 Ω	

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:			DC
±5 mV to ±25 mV		>120 dB	
±50 mV to ±100 mV		>110 dB	
±250 mV to ±2 V		95 dB	
±5 V to ±50 V		>54 dB	
±5 mV to ±2 V	>100 dB	>90 dB	f ≤ 50 Hz
±5 V to ±50 V	>68 dB	>54 dB	
all ranges		>50 dB	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 <sub>rms</sub> 16 μV <sub>pk-pk</sub> 2 μV <sub>rms</sub>	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 $\mu\text{V}_{\text{pk-pk}}$		0.1 Hz to 10 Hz
Current measurement with shunt plug			
Parameter	Value		Remarks
Input ranges	$\pm 40 \text{ mA} / \pm 20 \text{ mA} / \pm 10 \text{ mA}$ $\pm 5 \text{ mA} / \pm 2 \text{ mA} / \pm 1 \text{ mA}$ $\pm 400 \mu\text{A} / \pm 200 \mu\text{A} / \pm 100 \mu\text{A}$		
Shunt impedance	50 $\Omega$		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	$\pm 1 \text{ mV/V}$ to $\pm 400 \text{ mV/V}$ $\pm 2 \text{ mV/V}$ to $\pm 800 \text{ mV/V}$ $\pm 5 \text{ mV/V}$ to $\pm 2000 \text{ mV/V}$		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 $\pm 0.5 \text{ V}$ , $\pm 1.25 \text{ V}$ , $\pm 2.5 \text{ V}$ corresponding to RMS: 0.7 V; 1.8 V; 3.5 V
Internal quarter-bridge completion	120 $\Omega$ , 350 $\Omega$		selectable
Min. bridge impedance	120 $\Omega$ , 10 mH full bridge 60 $\Omega$ , 5 mH half bridge		bridge supply = 1 V to 5 V, $I_{\text{load}} \leq 42 \text{ mA}$
Bridge impedance (max.)	5 k $\Omega$		
Gain error	<0.05 %		of measurement value
Offset after bridge balance	<0.02 %		of the range
Input offset-drift	0.01 $\mu\text{V/V} / \text{K}$	0.06 $\mu\text{V/V} / \text{K}$	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. bridge offset	0.05 $\mu\text{V/V/K}$	0.09 $\mu\text{V/V/K}$	full bridge (DC or CF), ext. bridge offset = 1 mV/V 1 mV/V input range
Half-bridge drift (int. half-bridge)	0.05 $\mu\text{V/V/K}$	1 $\mu\text{V/V/K}$	DC or CF
Bridge balancing range	$\geq$ measurement range not less than: $\geq \pm 5 \text{ mV/V}$ $\geq \pm 10 \text{ mV/V}$ $\geq \pm 25 \text{ mV/V}$		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 mm <sup>2</sup> , 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	$3 \mu\text{V}/\text{V}_{\text{pkpk}'}$ $0.39 \mu\text{V}/\text{V}_{\text{rms}}$ $0.9 \mu\text{V}/\text{V}_{\text{pkpk}'}$ $0.12 \mu\text{V}/\text{V}_{\text{rms}}$ $0.3 \mu\text{V}/\text{V}_{\text{pkpk}'}$ $0.04 \mu\text{V}/\text{V}_{\text{rms}}$ $0.1 \mu\text{V}/\text{V}_{\text{pkpk}}$		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	$3.3 \mu\text{V}/\text{V}_{\text{pkpk}'}$ $0.45 \mu\text{V}/\text{V}_{\text{rms}}$ $1.1 \mu\text{V}/\text{V}_{\text{pkpk}'}$ $0.15 \mu\text{V}/\text{V}_{\text{rms}}$ $0.35 \mu\text{V}/\text{V}_{\text{pkpk}'}$ $0.05 \mu\text{V}/\text{V}_{\text{rms}}$ $0.3 \mu\text{V}/\text{V}_{\text{pkpk}}$		0 Hz to 10 kHz 1 kHz, lowpass filter 100 Hz, lowpass filter 10 Hz, lowpass filter
CF full bridge, half bridge	$3.5 \mu\text{V}/\text{V}_{\text{pkpk}'}$ $0.47 \mu\text{V}/\text{V}_{\text{rms}}$ $1.7 \mu\text{V}/\text{V}_{\text{pkpk}'}$ $0.22 \mu\text{V}/\text{V}_{\text{rms}}$ $0.6 \mu\text{V}/\text{V}_{\text{pkpk}'}$ $0.07 \mu\text{V}/\text{V}_{\text{rms}}$ $0.3 \mu\text{V}/\text{V}_{\text{pkpk}}$		0 Hz to 10 kHz 1 kHz, lowpass filter 100 Hz, lowpass filter 10 Hz, lowpass filter