

BR-4 for CRONOS-PL/-SL

4-channel bridge amplifier



The **BR4** is an all-purpose bridge amplifier for 4 channels (also employable as a DC differential amplifier) available as a modular plug-in for the imc CRONOS-PL and as a configuration module for CRONOS-SL. It enables measurement of four measurement bridges or strain gauges which are excited with your choice of either DC or CF.

The amplifier's specialties are:

- Carrier frequency excitation (5 kHz) for bridges
- Double probe leads (6-wire configuration) possible
- Symmetric bridge supply

Among the available amplifiers for imc CRONOS-PL, the BR-4 is the optimal amplifier for capturing strain gauges channels.

Order code:

	Article #	Remarks
CRPL/BR-4	1080091	for installation in a CRONOS-PL housing
CRPL/BR-4-ET	1081055	for installation in a CRONOS-PL-ET housing with an extended temperature range
CRSL/BR-4-D	1180028	for installation in a CRONOS-SL housing with DSUB interconnections
CRSL/BR-4-L	1180029	for installation in a CRONOS-SL housing with LEMO interconnections

Physical structure:

- Retrofitted plug-in for imc CRONOS-PL systems, occupying one slot.

Terminal connections:

- 2x DSUB-15 terminals for each channel pair
- 4x 7-pin LEMO connectors for one channel (only with CRSL/BR-4-L)

Included accessories for CRONOS-PL:

Connector plugs:

- 2x **CRPL-BR-4-BR** for measurement with strain gauges, bridges, and of voltages with 2 channels per plug

Included accessories for CRONOS-SL:

Power supply:

- provided by imc CRONOS-PL/-SL unit
- Additional power consumption by plug-in module: 4,5 W

Operating conditions:

- The module varieties' respective operating conditions (with or without an extended temperature range) depend on the corresponding housing type.

Installed software:

- The module is fully supported by the imc CRONOS-PL/-SL operating software. The entire functionality, particularly the parameterization, storage and online computations is provided.

Data storage:

- handled via imc CRONOS-PL/-SL

Optional accessories:

Connection terminals:

- **ACC/DSUB-ICP2**, 15-pin DSUB terminal connectors with conditioning for 2 ICP inputs
- **ACC/DSUB-I2**, 15-pin DSUB terminal connectors for each channel pair (50 Ω shunt). For measurement of currents of up to 50 mA (scaling factor: 0,02 A/V)
- **ACC/DSUB-BR2-IP65**, 15-pin DSUB clamp terminal adapted to CRONOS-SL for measurement with strain gauges, bridges, and of voltages; 2 channels per terminal
- **ACC/DSUB-ICP2-IP65**, 15-pin DSUB clamp terminal adapted to CRONOS-SL with signal conditioning for 2 ICP inputs
- **ACC/DSUB-I2-IP65**, 15-pin DSUB clamp terminal adapted to CRONOS-SL for each channel pair (50 Ω shunt). For measurement of currents of up to 50 mA (scaling factor: 0,02 A/V)

BR-4 Bridge, Voltage, Current

Technical Specs (4 differential analog inputs)

Parameter	Value (typ. / max.)	Remarks
Inputs	4	
Measurement modes with DSUB	full bridge half bridge quarter bridge voltage current current-fed sensors	Voltage or bridge mode global for all four channels. with ACC/DSUB-I2 ACC/DSUB-ICP2
Measurement modes with LEMO	full bridge half bridge quarter bridge voltage	
Connection terminals standard	2x DSUB-15 / 2 channels	ACC/DSUB-B2(-IP65) ACC/DSUB-I2(-IP65) ACC/DSUB-ICP2(-IP65)
Lemo	or 4x LEMO / 1 channel	

General		
Parameter	Value (typ. / max.)	Remarks
Filter cut-off frequency, order	2 Hz to 5 kHz	digital low pass, Butterworth 6th order
Bandwidth	8,6 kHz (DC) 3,9 kHz (CF)	
Sampling rate/ channel	20 kHz (max)	per channel
Resolution	16 Bit	internal 24 Bit
Surge protection	±50 V ±80 V	long term (differential- and SENSE-inputs) short-term

Voltage, current, current feed sensors			
Parameter	Value (typ. / max.)		Remarks
Input impedance	10 MΩ 1 MΩ		ranges ±5 mV to ±2 V ranges ±5 V to ±50 V and for deactivated device
Input current	40 nA (max.)		
Input capacitance	300 pF (typ.)		
Common mode voltage (max.)	±2,8 V ±50 V		ranges ±5 mV to ±2 V ranges ±5 V to ±50 V
Non-linearity	<200 ppm		
Input offset-drift	0,05 μV / K 0,01 μV/V / K	0,3 μV / K 0,06 μV/V / K	DC voltage measurement DC full bridge (Vb=5 V, 1 mV/V range) without ext. bridge offset
Gain drift	60 ppm / K	< 100 ppm / K	
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
Min. measurement resolution	0,31 μV		15 Bit

Voltage, current, current feed sensors		
	0,06 $\mu\text{V/V}$ 0,12 $\mu\text{m/m}$	
Common mode rejection ratio (CMRR)	>100 dB >68 dB	> 120 dB > 110 dB > 95 dB > 54 dB >90 dB >54 dB > 50 dB
Current feed sensors (e.g. ICP, Deltatron)		DC ranges ± 5 mV to ± 25 mV ranges ± 50 mV to ± 100 mV ranges ± 250 mV to ± 2 V ranges ± 5 V to ± 50 V 50 Hz ranges ± 5 mV to ± 2 V ranges ± 5 V to ± 50 V 5 kHz all ranges
Auxiliary supply	+5 V (max. 160 mA / plug) not isolated	with ICP-Stecker: ACC/DSUB-ICP2(-IP65) not for CRSL/BR-4-L e.g. for ICP-expansion plugs (ACC/DSUB-ICP2)

Bridge and strain gauges		
Parameter	Value (typ. / max.)	Remarks
Sensors	strain gauge: full-, half-, quarter bridge piezo-resistive bridge transducer potentiometer voltage	directly connectable
Bridge input ranges	± 1 mV/V to ± 400 mV/V ± 2 mV/V to ± 800 mV/V ± 5 mV/V to ± 2000 mV/V corresponding to strain gauge: $\pm 2\ 000$ $\mu\text{m/m}$ to $\pm 800\ 000$ $\mu\text{m/m}$ $\pm 4\ 000$ $\mu\text{m/m}$ to $\pm 1\ 600\ 000$ $\mu\text{m/m}$ $\pm 10\ 000$ $\mu\text{m/m}$ to $\pm 4\ 000\ 000$ $\mu\text{m/m}$	for bridge voltage: 5 V 2,5 V 1 V for bridge voltage: 5 V 2,5 V 1 V
Bridge voltage DC CF Carrier frequency	1 V; 2,5 V; 5 V (symmetric) 1 V; 2,5 V; 5 V (peak) 5 kHz	set globally for 4-channel groups corresp. $\pm 0,5$ V, $\pm 1,25$ V, $\pm 2,5$ V corresp. RMS: 0,7 V; 1,8 V; 3,5 V
Bridge balance range	\geq measurement range minimally: $\geq \pm 5$ mV/V $\geq \pm 10$ mV/V $\geq \pm 25$ mV/V	for $V_b = 5$ V for $V_b = 2,5$ V for $V_b = 1$ V
Min. bridge impedance	120 Ω , 10 mH full bridge 60 Ω , 5 mH half bridge	$V_b = 1$ V to 5 V, $I_{\text{load}} \leq 42$ mA
Bridge impedance (max.)	5 k Ω	
Cable length (max.)	500 m (one-way length)	0,14 mm ² , 130 m Ω /m, 65 Ω
Cable compensation technique	4-wire Sense 3-wire Sense by means of shunt-calibration	3 techniques available: any cables; for cables of same type; one-time (not controlled) compensation
Internal quarter-bridge completion	120 Ω , 350 Ω	selectable
Automatic shunt-calibration	0,5 mV/V	for 120 Ω and 350 Ω bridges
Gain uncertainty	<0,05%	23°C
Offset after bridge balance	<0,02%	23°C
Drift of bridge balance Equivalent offset drift by	50 ppm/K 0,05 $\mu\text{V/V/K}$	<90 ppm/K 0,09 $\mu\text{V/V/K}$ of compensated amount full bridge (DC or CF),

Bridge and strain gauges			
Parameter	Value (typ. / max.)		Remarks
means of balanced ext. bridge offset			ext. bridge offset = 1 mV/V 1 mV/V input range
Half-bridge drift (int. half-bridge)	0,5 μ V/V / K	1 μ V/V / K	DC or CF bridge
Input noise (bridge) DC full bridge	3 μ V/V pk-pk, 0,39 μ V rms 0,9 μ V/V pk-pk, 0,12 μ V rms 0,3 μ V/V pk-pk, 0,04 μ V rms 0,1 μ V/V pk-pk		range: 1 mV/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 μ V/V pk-pk, 0,45 μ V rms 1,1 μ V/V pk-pk, 0,15 μ V rms 0,35 μ V/V pk-pk, 0,05 μ V rms 0,3 μ V/V pk-pk		0 Hz to 10 kHz 1 kHz, lowpass filter 100 Hz, lowpass filter 10 Hz, lowpass filter
CF full bridge, half bridge	3,5 μ V/V pk-pk, 0,47 μ V rms 1,7 μ V/V pk-pk, 0,22 μ V rms 0,6 μ V/V pk-pk, 0,07 μ V rms 0,3 μ V/V pk-pk		0 Hz to 10 kHz 1 kHz, lowpass filter 100 Hz, lowpass filter 10 Hz, lowpass filter

Voltage			
Parameter	Value (typ. / max.)		Remarks
Voltage input ranges	± 5 mV / ± 10 mV / ± 25 mV / ± 50 mV / ± 100 mV / ± 250 mV / ± 500 mV / ± 1 V / ± 2 V / ± 5 V / ± 10 V / ± 25 V / ± 50 V		
Input noise, voltage (RTI)	16 nV/ \sqrt Hz rms 14 μ V pk-pk 2 μ V rms 0,6 μ V pk-pk		DC-Mode (range ± 5 mV) 0 Hz to 1 kHz 0 Hz to 10 kHz 0 Hz to 10 kHz 0,1 Hz to 10 Hz

Current			
Parameter	Value (typ. / max.)		Remarks
Current input ranges	± 100 μ A / ± 200 μ A / ± 400 μ A / ± 1 mA / ± 2 mA / ± 5 mA / ± 10 mA / ± 20 mA / ± 40 mA		with special shunt connector pod (shunt 50 Ω)