



HV Breakout Module

Typ 1.2 +S



Product description

CSM's HV Breakout Modules (BM) 1.2 +S have been specifically designed for **single-phase measurement applications** on cables carrying high voltage. They are suited for power, current, shield current and voltage evaluation of DC and high speed AC.

The HV BM 1.2 +S is to be inserted into the HV power cables (HV+/HV-) by feeding the cables through PG cable glands into the module and connecting them there. Typical applications are for example measurements between inverter and electric motor.

Voltage is measured directly. Current measurement is performed by a shunt module. This module contains a differential amplifier, a temperature sensor and a memory chip for calibration data for automatic online temperature compensation.

The HV BM 1.2 +S outputs the measured data with a maximum data rate of up to 1 MHz via EtherCAT® interface and simultaneously with a data rate of up to 10 kHz via the additional CAN interface. This allows high speed data acquisition via Ethernet and data recording via CAN data logger at the same time.

Maintenance

- ▶ HV isolation at least every 12 months, see EN 61010 for scope of testing
- ▶ Calibration every 12 months recommended

Key features



- ▶ **Single-phase measurement of voltage (U), current (I) and shield current (I) in HV applications**
 - ▶ Voltages up to $\pm 1,000$ V (measurement range up to $\pm 2,000$ V)
 - ▶ Currents up to $\pm 1,400$ A (peak)
 - ▶ Shield currents ± 500 A (Peak)
- ▶ **Online power calculation with 1 MHz data rate calculation, 100 % synchronous**
- ▶ **Simultaneous EtherCAT® and CAN bus communication**
- ▶ **Output of voltage, current, shield current and power with up to 1 MHz measurement data rate**

Shipping content

- ▶ HV Breakout Module 1.2 +S
- ▶ Configuration software CSMconfig
- ▶ Documentation
- ▶ Device Description File (*.xml)
- ▶ Test report
- ▶ HV isolation test protocol

Accessories

- ▶ See "ECAT Accessories" and "CAN Accessories" datasheets

Technical data

Type designation	HV BM 1.2 +S
Inputs	HV power cables for HV+ and HV- When connecting the HV power cables, please observe the "Safety Instructions HV Breakout Module" document.
Number of measured phases	1
Number of PG cable glands	2 (per side)
Cable outer diameter	from 9 mm up to 25 mm (depending on the PG cable gland used) ¹⁾ ▶ see "PG cable glands" section
Measurement signals	voltage, current, shield current and power
Measurement ranges	
Voltage	±100, ±200, ±500, ±1,000 V (extended ±2,000 V) ²⁾
Current, shield current	four configurable measurement ranges ($I_{\text{meas.}}$) depending on mounted shunt module ¹⁾ $I_1 = I_{\text{peak}}, I_2 = I_{\text{rated}}, I_3, I_4$ ▶ see "Shunt modules" section
Power ³⁾	results from the product of the configured measurement ranges $P_{\text{meas.}} = U \times I_{\text{meas.}}$ $P_{\text{meas.}}, P_{\text{meas.}}/2, P_{\text{meas.}}/4, P_{\text{meas.}}/8$
Internal resolution	16 bit
Internal sampling rate	1 MHz
Power calculation	permanently online with 1 MHz
Measurement data rate / sending rate	
ECAT	1, 2, 5, 10, 20, 50, 100, 200, 500, 1,000 kHz ⁴⁾
CAN	1, 2, 5, 10, 20, 50, 100, 200, 500 Hz, 1, 2, 5, 10 kHz ⁵⁾
HW input filter	8th order Butterworth filter, threshold frequency approx. 250 kHz
SW input filter	switchable 6th order Butterworth filter, threshold frequency automatically adjusted to measurement data rate, alternatively individually adjustable for voltage, current and power
ECAT	threshold frequency up to 200 kHz
CAN	threshold frequency up to 2 kHz, additional average value filter
Measurement deviation⁶⁾	
Voltage	
Gain error at 25 °C	max. ±0.05 % of measured value
Offset and scaling error	max. ±0.02 % of range
Gain drift	max. ±20 ppm/K of measured value
Zero drift	max. ±10 ppm/K of range
Current, shield current	online calculation with stored calibration data, with temperature compensation
Gain error at 25 °C	max. ±0.15 % of measured value
Offset and scaling error	max. ±0.05 % of range
Gain drift	max. ±25 ppm/K of measured value
Zero drift	max. ±15 ppm/K of range
Fields of application⁷⁾	for measurements in HV environments ⁸⁾ For details see co-applicable document: "Technical Information: Fields of Application for CSM HV Measurement Modules".

Type designation	HV BM 1.2 +S
Measurement voltages (unipolar & bipolar)	up to 1,000 V peak
Routine test ⁷⁾	isolation test ⁸⁾ is to be performed at least every 12 months
EtherCAT® interface	Ethernet 100 Base-TX, 100 Mbit/s, EtherCAT® slave controller, synchronization via Distributed Clocks or Sync Manager 3
Configuration	with configuration software CSMconfig via CAN bus, settings and configurations stored in the device
CAN interface	CAN 2.0B (active), High Speed (ISO 11898-2:2016), 125 kBit/s to max. 1 MBit/s, up to 2 MBit/s with CSMcan Interface, data transfer free running
Configuration	via CAN bus using CSMconfig, settings and configurations stored in the module
Power supply	
Minimum	7 V DC (-10 %)
Maximum	30 V DC (+10 %)
Power consumption	typ. 2.8 W
LED indicators	
ECAT	status / link Activity IN / link Activity OUT
CAN	power / status
Measurement channel	configuration / operation
Housing	aluminum with HV designation (RAL 2003)
Protection class	IP67 ⁹⁾
Ground connection	M8 threaded hole
Weight	approx. 2,000 g incl. shunt modules, without PG cable glands
Dimensions (w × h × d)	approx. 200 × 45 × 168 mm without PG cable glands
Connectors	
EtherCAT® IN	LEMO 1B, 8-pole, code L
EtherCAT® OUT	LEMO 1B, 8-pole, code A
CAN ¹⁰⁾	LEMO 0B, 5-pole, code G
Power HV+ / HV- cables	PG cable glands
Operating and storage conditions	
Operating temperature range	-40 °C to +120 °C
Relative humidity	5 % to 95 % (non-condensing)
Operating altitude	max. 5,000 m above sea level
Pollution degree	4 ⁹⁾
Storage temperature	-40 °C to +125 °C
Conformity	CE (in preparation)
Device safety	EN 61010-1:2010

¹ PG cable glands and shunt module are selected separately.

² The measurement ranges of the analog inputs are dimensioned for ±2,000 V for acquiring transient overvoltages.

³ Power is calculated for the current and not for the shield current.

⁴ All measurement data rates are configurable via XCP-Gateway. When configuring via a standard EtherCAT® master, a maximum measurement data rate of 10 kHz/channel is supported.

⁵ In order to be able to use a measurement data rate of 10 kHz for all measurement signals, a CAN interface with 2 MBit/s is required.

⁶ Further information can be found in the Technical Information document on the subject of "Deviation of Measurement".

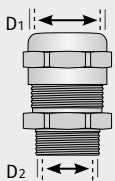



⁷ Please read the CSM document "Safety Instructions HV Breakout Module".

⁸ According to EN 61010-1:2010

⁹ Only if installed correctly, please follow the assembly instructions in the installation manual.

PG cable glands

Depending on the cable outer diameters, different PG cable glands must be adapted to the **HV BM 1.2 +S**. Only suitable combinations (cables + PG cable glands) ensure the tightness of the housing. The PG cable glands are selected separately and included in the shipping content. The following types are currently available:

Type	9/14	11/20	15/25
			
Cable outer diameter			
D ₁ maximum	14 mm	20 mm	25 mm
D ₁ minimum	9 mm	11 mm	15 mm
D ₂ maximum	12 mm	17 mm	21 mm
Part number	ART1520202	ART1520201	ART1520200

Shunt modules

For the **HV BM 1.2 +S**, CSM offers shunt modules with different measurement ranges. The shunt modules are selected separately and installed permanently. The maximum operating time depends, among other things, on the ambient temperature and the resulting power loss in the measurement module. Under certain circumstances, the rated current cannot be applied permanently without the shunt module overheating. Its temperature must not exceed +120 °C.

Current

Rated current I_{rated} [A]	±50	±125	±250	±500	±800
Peak current I_{peak} [A]	±100	±250	±500	±1,000	±1,400
Measurement ranges I_1, I_2, I_3, I_4 [A]	±100, ±50, ±25, ±10	±250, ±125, ±50, ±25	±500, ±250, ±125, ±50	±1,000, ±500, ±250, ±125	±1,400, ±800, ±500, ±250
Resolution at I_{peak} [mA/digit]	3	7	15	30	43
Resistance [$\mu\Omega$]	500	200	100	50	35

Shield Current

Rated current I_{rated} [A]	±50	±125	±250		
Peak current I_{peak} [A]	±100	±250	±500		
Measurement ranges I_1, I_2, I_3, I_4 [A]	±100, ±50, ±25, ±10	±250, ±125, ±50, ±25	±500, ±250, ±125, ±50		
Resolution at I_{peak} [mA/digit]	3	7	15		
Resistance [$\mu\Omega$]	500	200	100		
Voltage V_{max} [V]	60	60	60		

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