



# HV STG4 ECAT MM Series

## Type BK20 | BS20



### Product description

CSM's **HV STG4 BK20** and **BS20** are EtherCAT®-based, robust and extremely compact measurement modules for strain gauge measurements in high-voltage environments. With four time-synchronous strain gauge inputs, they are ideally suited for distributed measurement applications under challenging conditions.

Thanks to complete galvanic isolation half and full bridges and standard strain gauge-based sensors, which are normally used in conventional low-voltage applications, can be used as well if they are combined with specific, high-voltage safe sensor cables.

The modules are especially suitable for applications in the fields of electric mobility – electric and hybrid vehicles – for stationary and mobile use.

### Shipping content

- ▶ Measurement module HV STG4 BK20 | HV STG4 BS20
- ▶ Configuration software CSMconfig
- ▶ Documentation
- ▶ Device Description File (\*.xml)
- ▶ Calibration certificate
- ▶ HV isolation test protocol

### Key features



- ▶ **4 time-synchronous strain gauge inputs with reinforced insulation, galvanically isolated**
- ▶ **Measurement data rate up to 20 kHz per channel**
- ▶ **Supports full and half bridge strain gauges with 6- and 4-wire connection**
- ▶ **High resistance to interference due to ratiometric measuring principle and configurable software filter**



### Maintenance


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

### Accessories

- ▶ See datasheet "ECAT Accessories"

## Technical Data

| Type designation   | HV STG4 BK20  | HV STG4 BS20  |
|--|---|---|
|  |    |  |
| <b>Inputs</b>  | 4 time-synchronous strain gauge inputs  |   |
| Type of bridge   | full and half bridges 120, 350, 700, 1,000 $\Omega$   |   |
| Bridge connection  | 4- and 6-wire   |   |
| Measuring unit   | mV/V, $\mu\text{m}/\text{m}$  |   |
| Input voltage range  | $\pm 200 \text{ mV}^{1)}$   |   |
| Internal resolution  | eff. 21 bit   |   |
| Bridge balancing   | via configuration software, up to 50 % of input voltage range   |   |
| Time synchronization   | better than 1 $\mu\text{s}$ from channel to channel   |   |
| Measurement data rate / sending rate per channel <sup>2)</sup> | 1, 2, 5, 10, 20, 50, 100, 200, 500 Hz and 1, 2, 5, 10, 20 kHz   |   |
| HW input filter  | low-pass, 3rd order, 4 kHz at measurement data rate 1 Hz ... 10 kHz<br>low-pass, 3rd order, 8 kHz at measurement data rate 20 kHz   |   |
| SW input filter  | at measurement data rates 1 Hz ... 10 kHz:<br>low-pass, 6th order Butterworth, 0.1 Hz to 2 kHz, switchable<br><br>threshold frequency automatically adjusted to measurement data rate, alternatively adjustable per channel |   |
| Input protection   | $\pm 20 \text{ V}$ permanent, additional ESD protection   |   |
| <b>Measurement uncertainty</b>                                 |   |   |
| Gain error <sup>3)</sup> at 25 °C                              | max. $\pm 0.05 \%$ of measured value  |   |
| Offset and scaling error                                       | depending on the measurement range  |   |
| 40 mV - 200 mV   | max. $\pm 0.01 \%$  |   |
| 20 mV - 40 mV  | max. $\pm 0.02 \%$  |   |
| 6 mV - 20 mV   | max. $\pm 0.05 \%$  |   |
| 3 mV - 6 mV  | max. $\pm 0.1 \%$   |   |
| Gain drift <sup>3)</sup>                                       | $\pm 10 \text{ ppm/K}$  |   |
| Zero drift   | 0.5 $\mu\text{V/K}$   |   |
| <b>Noise</b>   | at maximum excitation voltage (peak-to-peak)  |   |
| $f_g \leq 10 \text{ Hz}$                                       | $< 1 \mu\text{V/V}$   |   |
| $10 \text{ Hz} < f_g \leq 100 \text{ Hz}$                      | $< 2 \mu\text{V/V}$   |   |
| $100 \text{ Hz} < f_g \leq 1 \text{ kHz}$                      | $< 6 \mu\text{V/V}$   |   |
| <b>Excitation voltage</b>                                      | from 1 to 5 V   | from 8 to 10 V  |
|  | adjustable per channel in 0.5 V steps, optionally switchable, max. 42 mA per channel  |   |
| <b>Fields of application <sup>4)</sup></b>                     | for measurements in HV environments <sup>5)</sup><br>For details see co-applicable document:<br>"Technical Information: Fields of Application for CSM HV Measurement Modules".  |   |
| Measurement voltages (unipolar & bipolar)                      | 200 mV peak<br>for working voltages <sup>5)</sup> up to 1,000 V DC  |   |
| <b>Routine test <sup>4)</sup></b>                              | test voltage <sup>5)</sup> 3,100 V DC,<br>isolation test is to be performed at least every 12 months  |   |

| Type designation                               | HV STG4 BK20  | HV STG4 BS20 |
|--|---|--------------|
| <b>Reinforced insulation</b> <sup>4), 5)</sup> |   |              |
| Channel / channel                              | 1,000V RMS  |              |
| Channel / ECAT                                 | 1,000V RMS  |              |
| Channel / power supply                         | 1,000V RMS  |              |
| Power supply / bridge excitation voltage       | 1,000V RMS  |              |
| <b>EtherCAT® interface</b>                     | Ethernet 100 Base-TX, 100 Mbit/s<br>EtherCAT® slave controller, synchronization via Distributed Clocks or Sync Manager 3  |              |
| Configuration                                  | with configuration software CSMconfig via XCP-Gateway or EtherCAT® master software via CANopen over EtherCAT® (CoE), settings and configurations stored in the device |              |
| <b>Power supply</b>                            |   |              |
| Minimum  | 6V DC (-10 %)   |              |
| Maximum  | 30V DC (+10 %)  |              |
| Power consumption                              | typ. 2 W  |              |
| <b>LED indicators</b>                          |   |              |
| ECAT   | Status / Link Activity IN / Link Activity OUT   |              |
| Measurement channels                           | configuration / operation   |              |
| <b>Housing</b>                                 | aluminium with HV designation on the front-side (RAL 2003)  |              |
| Protection class                               | IP67  |              |
| Ground connection                              | M6 threaded hole  |              |
| Weight   | approx. 600 g   |              |
| Dimensions (B × H × T)                         | approx. 200 × 40 × 76 mm (Slide Case)   |              |
| <b>Connectors</b>                              |   |              |
| EtherCAT® IN                                   | LEMO 1B, 8-pole, code L   |              |
| EtherCAT® OUT                                  | LEMO 1B, 8-pole, code A   |              |
| Signal inputs                                  | LEMO Redel 2P, 8-pole, code E (grey/black)  |              |
| <b>Operating and storage conditions</b>        |   |              |
| Operating temperature range                    | -40 °C to +125 °C   |              |
| Relative humidity                              | 5 % to 95 % (non-condensing)  |              |
| Operating altitude                             | max. 5,000m above sea level   |              |
| Pollution degree                               | 4   |              |
| Storage temperature                            | -40 °C to +125 °C   |              |
| <b>Conformity</b>                              |  (in preparation)  |              |
| <b>Device safety</b>                           | EN 61010-1:2010   |              |

<sup>1</sup> Smaller ranges on request

<sup>2</sup> The following measurement data rates can be configured via XCP-Gateway: 10, 20, 50, 100, 200, 500 Hz and 1, 2, 5, 10, 20 kHz.

<sup>3</sup> Referring to the units mV/V or µm/m measured by the module

<sup>4</sup> Please also read the CSM document "Safety Instructions HV STG4 ECAT MM"!

<sup>5</sup> According to EN 61010-1:2010



**CSM GmbH**  
**Computer-Systeme-Messtechnik**

Raiffeisenstr. 36, 70794 Filderstadt, Germany

☎ +49 711 - 77 96 40 ✉ [info@csm.de](mailto:info@csm.de)

[www.csm.de](http://www.csm.de)

Our company is certified.



To product page  
at [www.csm.de](http://www.csm.de)



EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

All trademarks mentioned are property of their respective owners.  
This document is subject to change without notice.

Copyright © 2020 CSM Computer-Systeme-Messtechnik GmbH

HV\_STG4\_ECAT\_MM\_DS\_0100\_ENG

2020-05-25