Distributed strain gauge measurement

ECAT STGMM 6 is an EtherCAT®-based, robust and extremely compact measurement module for strain gauge measurements and it is excellently suited for distributed measurement applications under challenging environmental conditions. ECAT STGMM 6 features six time-synchronous strain gauge inputs and offers the advantage of being mechanically compatible to measurement modules of the CSM MiniModule series. Up to 100 modules of the ECAT measurement module series can be electrically and mechanically connected.

If used in combination CSM’s XCP-Gateway, ECAT STGMM 6 modules can be easily configured and operated by using the configuration software CSMconfig and XCP-compatible data acquisition software (e.g. vMeasure CSM, CANape®, INCA, etc.), respectively. ECAT STGMM 6 measurement modules can be directly connected to a computer if data acquisition software supporting EtherCAT® master operation is used.

Key features

- Time-synchronous acquisition of strain gauge signals with measurement data rates up to 20 kHz per channel
- Support of full and half bridge strain gauges with 6- and 4-wire connection
- Support of quarter bridges via special cable K356
- Simple configuration via CSMconfig using a universal measurement range
- High resistance to interference due to ratiometric measuring principle and configurable software filter

Shipping content

- Measurement module ECAT STGMM 6
- Configuration software CSMconfig
- Documentation
- Device Description File (*.xml)
- Calibration certificate

Maintenance

- Calibration every 12 months recommended

Accessories

- See datasheet “ECAT Accessories”
## Technical data

<table>
<thead>
<tr>
<th><strong>Type designation</strong></th>
<th>ECAT STGMM 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technical data valid as of revision</strong></td>
<td>B013</td>
</tr>
</tbody>
</table>

### Measurement inputs
- 6 time-synchronous strain gauge inputs
- **Type of bridge**
  - Full and half bridges 120, 350, 700, 1000 Ω, quarter bridges 120 Ω und 350 Ω via special cable K356 with preconfigured TEDS
- **Bridge connection**
  - 4- and 6-wire
- **Measuring unit**
  - mV/V, µm/m
- **Input voltage range**
  - ±200 mV
- **Internal resolution**
  - eff. 21 bit
- **Bridge balancing**
  - via configuration software, up to 50 % of input voltage range
- **Time synchronization**
  - better than 1 µs

#### Measurement data rate / sending rate per channel
1. 1, 2, 5, 10, 20, 50, 100, 200, 500 Hz and 1, 2, 5, 10, 20 kHz
2. **HW input filter**
   - low-pass filter 3rd order, approx. 4 kHz at measurement data rate 1 Hz ... 10 kHz
   - low-pass filter 3rd order, approx. 8 kHz at measurement data rate 20 kHz
3. **SW input filter**
   - at measurement data rate 1 Hz ... 10 kHz:
     - low pass, 6th order Butterworth filter, range: 0.1 Hz to 2 kHz, switchable

#### Input protection
- ±20 V permanent, additional ESD protection

### Measurement deviation
- **Gain error**
  - at 25 °C
  - max. ±0.05 % of measured value
- **Offset and scaling error**
  - depending on the measurement range
  - 40 mV - 200 mV
    - max. ±0.01 %
  - 20 mV - 40 mV
    - max. ±0.02 %
  - 6 mV - 20 mV
    - max. ±0.05 %
  - 3 mV - 6 mV
    - max. ±0.1 %
- **Gain drift**
  - ±10 ppm/K
- **Zero drift**
  - 0.5 µV/K

### Noise
- at 5 V excitation voltage (peak-to-peak)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Noise level</th>
</tr>
</thead>
<tbody>
<tr>
<td>f ≤ 10 Hz</td>
<td>&lt; 1 µV/V</td>
</tr>
<tr>
<td>10 Hz &lt; f ≤ 100 Hz</td>
<td>&lt; 2 µV/V</td>
</tr>
<tr>
<td>100 Hz &lt; f ≤ 1 kHz</td>
<td>&lt; 6 µV/V</td>
</tr>
</tbody>
</table>

### Excitation voltage
- from 1 to 5 V in 0.5 V steps (adjustable per channel, optionally switchable)
- max. 42 mA per channel

### Galvanic isolation
- 3), 5)

<table>
<thead>
<tr>
<th>Component</th>
<th>Isolation level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel / channel</td>
<td>500 V</td>
</tr>
<tr>
<td>Channel / power supply</td>
<td>500 V</td>
</tr>
<tr>
<td>Power supply / bridge excitation voltage</td>
<td>500 V</td>
</tr>
</tbody>
</table>

[www.csm.de](http://www.csm.de)
**Type designation**: ECAT STGMM 6

**EtherCAT® interface**: Ethernet 100 Base-TX, 100 Mbit/s, EtherCAT® slave controller, synchronization via Distributed Clocks or Sync Manager 3

**Configuration**: with CSMconfig via XCP-Gateway or EtherCAT® master software via CANopen over EtherCAT® (CoE), settings and configurations stored in the device

**Power supply**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum</strong></td>
<td>6 V DC (-10 %)</td>
</tr>
<tr>
<td><strong>Maximum</strong></td>
<td>50 V DC (+10 %)</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>typ. 2.5 W (without sensor excitation), typ. 3 W (all channels with 350 Ω full bridges and 5 V bridge excitation voltage)</td>
</tr>
</tbody>
</table>

**LED indicator**

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECAT status / Link Activity IN / Link Activity OUT</td>
<td>Configuration / operation</td>
</tr>
</tbody>
</table>

**Housing**

- **Material**: aluminium, silver anodized
- **Protection class**: IP67
- **Weight**: approx. 790 g
- **Dimensions (w × h × d)**: approx. 200 × 35 × 50 mm / approx. 200 × 40 × 50 mm (Slide Case)

**Connectors**

<table>
<thead>
<tr>
<th>Connector</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>EtherCAT® IN</td>
<td>LEMO 1B, 8-pole, code L</td>
</tr>
<tr>
<td>EtherCAT® OUT</td>
<td>LEMO 1B, 8-pole, code A</td>
</tr>
<tr>
<td>Signal inputs</td>
<td>LEMO 1B, 8-pole, code G</td>
</tr>
</tbody>
</table>

**Operating and storage conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>-40 °C to +85 °C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5 % to 95 %</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>3</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-55 °C to +90 °C</td>
</tr>
</tbody>
</table>

**Conformity**

![CE Mark](image)

1. 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.
2. A measurement data rate of 20 kHz requires an XCP-Gateway as of hardware revision B.
3. Observe information regarding the intended use. See CSM document “Safety Instructions MiniModule”.
4. Referring to the units mV/V or µm/m measured by the module.
5. These MiniModule devices are designed for measurements in vehicles with 12 V or 24 V on-board power supply systems. Not suitable to be directly connected to systems with higher operating voltages, e.g. high-voltage batteries of hybrid or electric vehicles.
6. Typ. 4.5 W at max. load (all channels with 120 Ω full bridge strain gauges and 5 V bridge excitation voltage).

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**additional products**

**STG6 BK10**

STG6 BK10 is a robust and extremely compact CAN-based measurement module for strain gauge measurements and is excellently suited for distributed measurement applications.