STG6 pro ECAT MM-Series

Type BS20

Distributed strain gauge measurement

STG6 pro BS20 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.

With the **extension of the supply voltage range**, sensors with up to 10 V supply can be used. Due to the automatic selection of the suitable input voltage range, as well as a better signal-to-noise ratio, extremely small measurement signals (e.g. strain) can be accurately recorded with the STG6 pro BS20.

In order to compensate for out-of-range measurements when the preload of the target is very high, the STG6 pro has an **additional option for bridge balancing** by means of hardware compensation.

It 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 are **cascadable** both electrically and mechanically.

Key features

- ***Time-synchronous acquisition of strain gauge signals with measurement data rates up to 20 kHz per channel***
- ***Extended range of excitation voltage from 1 to 10 V***
- ***Also suitable for extremely small measurement signals / strains due to automatic selection of input voltage range***
- ***"Ultra Low Noise" due to optimized signal-to-noise ratio***
- ***Hardware bridge balancing***
- ***High resistance to interference due to ratiometric measuring principle and configurable software filter***

If used in combination with CSM's XCP-Gateway, **STG6 pro BS20** modules can be easily configured and operated by using the configuration software CSMconfig and **XCP-compatible data acquisition software** (e.g. vMeasure exp, CANape®, INCA, etc.), respectively. **STG6 pro BS20** measurement modules can be directly connected to a computer if data acquisition software supporting EtherCAT® master operation is used.

Shipping content

- Measurement module STG6 pro BS20
- Configuration software CSMconfig
- Documentation
- Device Description File (*.xml)
- Calibration certificate

Maintenance

- Calibration every 12 months recommended

Accessories

- See datasheet "ECAT Accessories"

Technical data

Type designation	**STG6 pro BS20**
	
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 [1]
Bridge connection	4- and 6-wire
Measuring unit	mV/V, µm/m
Input voltage range	±5, ±10, ±25, ±50, ±100 mV, automatically selected on the basis of the DMS-specific configuration information
Internal resolution	eff. 21 bit
Internal sampling rate	320 kS/s
Bridge balancing	via configuration software, up to 50 % of input voltage range via hardware, up to 90 % of input voltage range at the same resolution
Measurement data rate/ sending rate per channel [2]	1, 2, 5, 10, 20, 50, 100, 200, 500 Hz and 1, 2, 5, 10, 20 kHz [3]
HW input filter	6th order anti-aliasing low-pass Bessel filter, fg approx. 16 kHz, 191 st order digital decimation linear-phase FIR-filter, fg approx. 10 kHz
SW input filter	6th order low-pass Butterworth, 0.1 Hz to 5 kHz, switchable, threshold frequency automatically adapted to measurement data rate, alternatively selectable channel by channel
Input protection [4]	-3.5 to +10 V permanent, additional ESD protection
Measurement deviation [5]	
Gain error [6] at 25 °C	max. ±0.05 % of measured value
Untarred offset error	$\text{max. } 2\,\mu V/V \times \frac{10\,V}{\text{excitation voltage}}$
Offset and scaling error	in connection with a bridge adjustment, depending on the excitation voltage
1 V	max. 4.0 µV/V +0.006 % of measurement range (corresponding to 2 LSB)
2.5 V	max. 1.7 µV/V +0.006 % of measurement range (corresponding to 2 LSB)
5 V	max. 1.0 µV/V +0.006 % of measurement range (corresponding to 2 LSB)
10 V	max. 0.7 µV/V +0.006 % of measurement range (corresponding to 2 LSB)
Gain drift [6]	±10 ppm/K
Zero drift	0.5 µV/K
Noise	at 5 V excitation voltage (measurement range 2 mV/V)
0.1 Hz ≤ f_g ≤ 10 Hz	typ. 0.004 µV/V rms
10 Hz < f_g ≤ 100 Hz	typ. 0.008 µV/V rms
100 Hz < f_g ≤ 1 kHz	typ. 0.025 µV/V rms
0.1 Hz ≤ f_g ≤ 10 kHz	typ. 0.075 µV/V rms
Excitation voltage	1, 2.5, 5, 10 V, adjustable per channel, optionally switchable, max. 42 mA per channel

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Galvanic isolation [4, 7]	no safety isolation in terms of high-voltage applications
Channel/channel	500 V
Channel/power supply	500 V
Power supply/ excitation voltage	500 V
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	
Minimum	6 V DC (-10 %)
Maximum	50 V DC (+10 %)
Power consumption [8]	typ. 5.4 W (without sensor excitation), typ. 6.1 W (all channels with 350 Ω full bridges and 5 V excitation voltage)
LED indicator	
ECAT	status, Link Activity IN, Link Activity OUT
Measurement channels	configuration, operation
Housing	aluminium, silver anodized
Protection class	IP67
Weight	approx. 580 g
Dimensions (w × h × d)	approx. 200 × 40 × 50 mm (Slide Case)
Connectors	
EtherCAT® IN	LEMO 1B, 8-pole, code L
EtherCAT® OUT	LEMO 1B, 8-pole, code A
Signal inputs	LEMO 1B, 8-pole, code G
Operating and storage conditions	
Operating temperature range	-40 °C to +85 °C
Relative humidity	5 % to 95 %
Pollution degree	3
Storage temperature	-55 °C to +90 °C
Conformity	CE

[1] A full bridge with 120 Ω and 10 V supply voltage is not supported.

[2] 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.

[3] A measurement data rate of 20 kHz requires an XCP-Gateway as of hardware revision B.

[4] Observe information regarding the intended use. See CSM document “Safety Instructions MiniModule”.

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

[6] Referring to the units mV/V or µm/m measured by the module

[7] 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.

[8] Typ. 9.8 W at max. load (all channels with 120 Ω half bridge strain gauges and 10 V bridge excitation voltage)

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