TORQSENSE®

SGR523 Series

Rotary Torque Transducer

With Incremental Angle Encoder

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Digital SGR523 with incremental angle encoder

Torqsense Digital rotary strain gauge series (SGR) Transducers use non contact technology eliminating the need for noisy slip rings. They are suitable for torque measuring, testing, feedback control of drive mechanisms and process control applications.

The SGR series transducers use modern strain gauge signal conditioning techniques to provide a high bandwidth low cost torque measuring solution with high overrange and overload capabilities.

Benefits & Features

- Transducers from 175mNm to 20Nm. *(Higher ranges to follow)*
- Large fully functional overrange capability of 250%
- Minimal side and end load errors
- Low linearity deviation of ± 0.05 % FSD
- Low hysteresis error of ± 0.05 % FSD
- Zero variation in torque signal with rotation (cyclic variation)
- Non contact signal transmission, no slip rings to wear out
- High digital sample rate of 4000 samples per second
- Adjustable torque data smoothness, low pass filter
- Speed measurement / Angle / Power computation
- Wide power supply range 12-32 VDC
- Optional integrated Ethernet allows a transducer to be accessed by multiple users simultaneously, from anywhere the connected network reaches.

Technology

The SGR series torque transducers use a full four element strain gauge bridge to measure the torsion present on a shaft. The full bridge helps to diminish errors from any off-axis forces that are sometimes unintentionally applied to the transducer in some test setups. The full bridge also increases the sensitivity and the temperature performance of strain measurement.

A rotor mounted ultra-miniature microcontroller measures the strain gauge bridge and transfers the information back to the stator digitally eliminating any noise pickup usually associated with slip ring and other analog methods of transferring torque data from rotor to stator. External noise pickup into the gauge wiring is virtually eliminated due to the short distance between the strain gauge elements and the rotors measuring circuits.

A multipoint calibration method reduces any linearity errors within the sensor. A large functional overrange capability allows the peaks of a torque signal to be captured more faithfully without any clipping when operating the sensor close to its full scale rating.

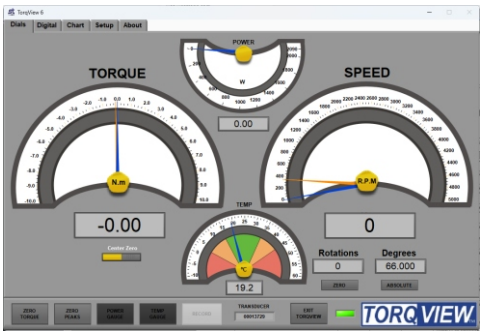
All this combined with a mechanical overload capability of over 400% make the SGR series torque sensors a very robust and accurate torque measuring solution.

TorqSense SGR523 series transducers offer:

- BIT Self-diagnostics - Diagnostic system checks internal systems and operational conditions for faults, and monitors torque, speed and temperature for overscale conditions.
- Transducer status LED and simple “Sensor status” output pin, provide transducer health feedback.
- Sensors to monitor shaft temperature for better compensation and accuracy
- Digital outputs for interfacing with modern instrumentation and computer systems. RS232 and USB are provided as standard, CAN Bus and Ethernet are optional.
- Transducer Control configuration software is provided to setup and configure the transducer.
- Analog outputs are made user configurable. The 3 analog channels are individually configurable, allowing changes to scaling and data assignment.
- Analog channels assignable to torque, speed, power, temperature, and angle (see manual for full list).
- Ability to connect up to 10 transducers using USB
- Optional integrated Ethernet provides distributed access and multiple simultaneous user/device use

TORQVIEW Software

TorqView is an easy to use advanced torque monitoring software, available to assist data recording and instrumentation displays that interface with Windows based PCs.



LabView VI's are available for users to design their own process control applications. DLLs are also available for users to write their own custom software. Get data from across your network using the ethernet module.

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Incremental angle encoder

The external incremental encoder is an add to the existing range of transducers, using a longer shaft and externally mounted.

Precision angle measurement is a useful option for torque transducers used for mechanical test stands, bolt or bottle cap tightening test stands and machines. Torque versus angle plots can be analysed to determine issues that may arise and losses can be better understood.

Knowing the shaft angle when the torque peaks or dips can be beneficial to test stand engineers. Rotational stiction that may occur only at certain shaft positions can be analysed allowing mechanical processes to be better understood.

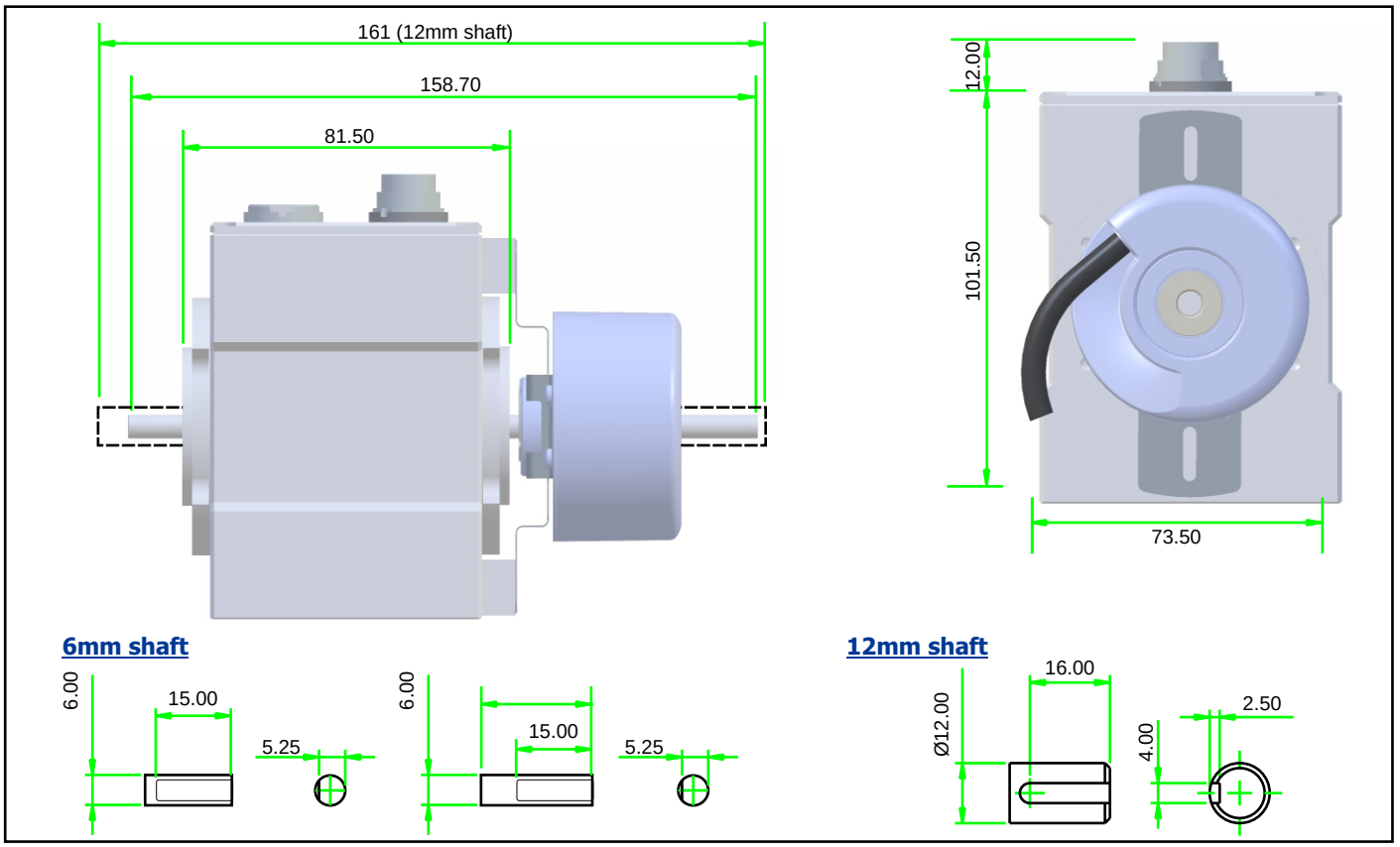
Torque peaks and dips due to interaction with cam shafts and other shaft angle dependent mechanisms can be analysed with better precision.

Changes in process control applications can be monitored by knowing the window of expected torque values at certain shaft angles. If the angle at which maximum or minimum torque suddenly changes, something may have changed in the process that needs to rectified before production wastage occurs.

Benefits

- Up to 10000 pulses per revolution*
- Down to 0.009º resolution*
- Speed up to 9000 RPM*
- Bi-directional angle and rotation count

Dimensions (175mNm to 20Nm)



Parameter	Data										Units
Mechanical Properties											
Torque (Max)	0.225	0.6	1	2.5	3.5	6	8.5	13	17.5	20	Nm
Shaft Code	CD	CE	CF	DA	DF	DB	DC	DG	DD	DE	
Standard Shaft Type	Plain	Plain	Flat	Keyed							
Shaft Size (Diameter)	6			12							mm

Features

● – Standard feature ◇ – Optional feature

	SGR523	Option Code	Remarks/Purpose
Standard features			
Keyed Shaft Ends	●	K	*1Nm will have flats*
Voltage outputs from ±1v to ±10v FSD and unipolar (Variable)	●		*Output is user selectable*
USB 2.0 full speed 12 Mbps Digital output	●		
RS232 output	●		
Torque Averaging and Torque Peak	●		
Self Diagnostics	●		
Internal temperature measurement	●		*Value available on SGR520 series only*
Deep grooved shielded bearings with oil lubrication	●		
Ingress Protection (IP) 54	●		
Optional features			
Current output 0-20mA, 4-20mA & 12±8mA (Variable)	◇	F	*Current output is user selectable and in place of Voltage output. However user can reselect a Voltage output, if required.*
CAN Bus output	◇	H	*In place of RS232 output*
Integrated Ethernet	◇	I	
Sealed Bearings	◇	S	*Consult factory.*

Incremental Encoder Options and Notes

The SGR transducer electronics reads encoder pulses from the in phase and quadrature phase channels on both edges. This increases the encoder resolution by four times. For example, a 3600 pulses per revolution encoder will have a resolution of 0.025°. 360 / 3600 / 4 = 0.025°

Possible Encoder Resolution options & option codes

Encoder pulses per revolution	Total Resolution Degrees	Maximum speed	Option Code
2048	0.0439°	9000	OPTN-2048
2400	0.0375°	7000	OPTN-2400
2500	0.036°	7000	OPTN-2500
3000	0.03°	6000	OPTN-3000
3600	0.025°	5000	OPTN-3600
4096	0.0219°	4500	OPTN-4096
5000	0.018°	3500	OPTN-5000
6000	0.015°	3000	OPTN-6000
7200	0.0125°	2500	OPTN-7200
8192	0.0109°	2250	OPTN-8192
10000	0.009°	1500	OPTN-10000

To select the encoder required, choose the max speed of the transducer, then the required resolution to get the encoder PPR.

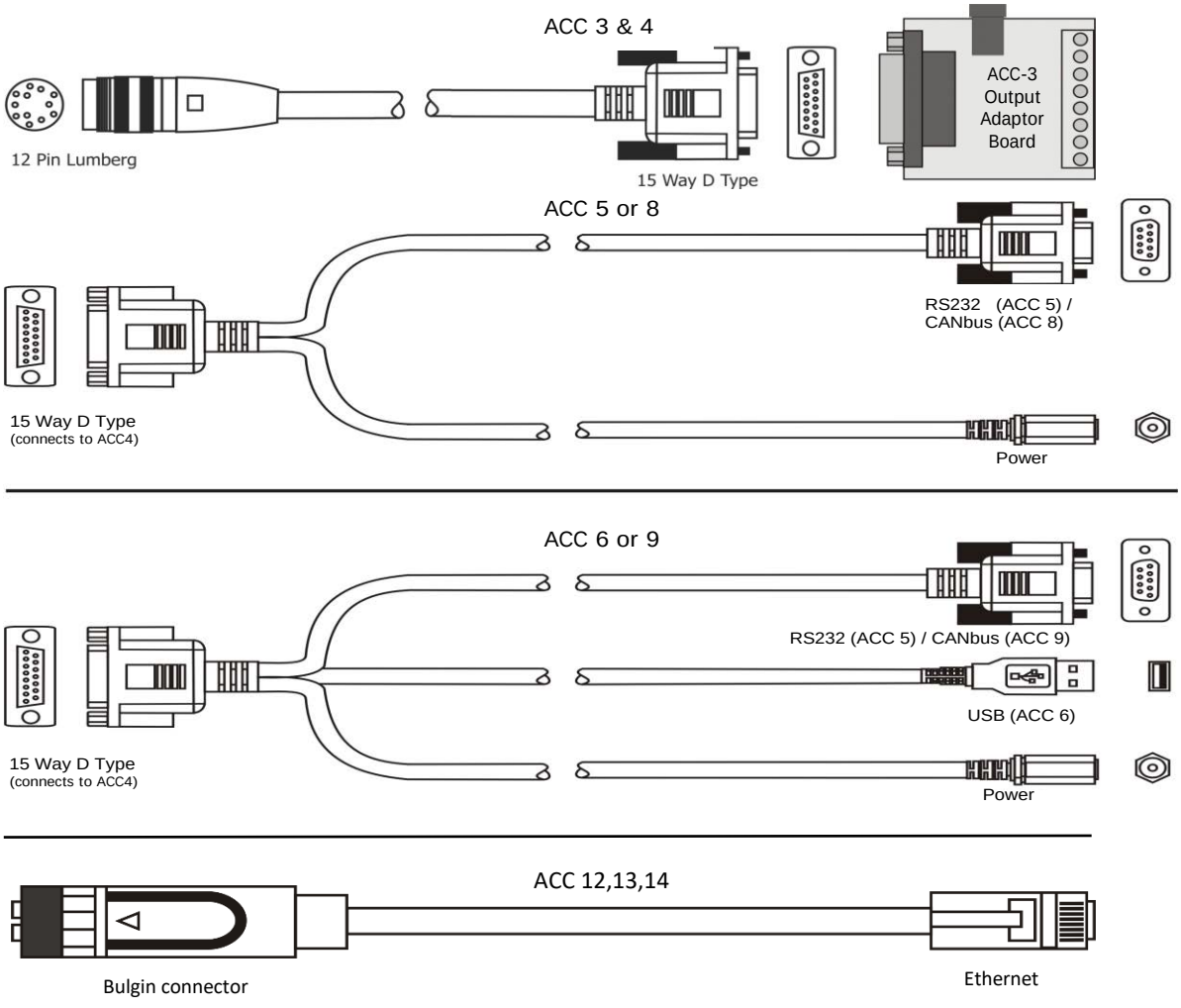
SGR523 Series Torque Transducers – Additional related products

	Code	Remarks/Purpose
Transducer Display ETD	ETD	*Display readout*
AC Mains Adapter Power Supply	PSU 1	*For providing 12-32Vdc*
Transducer Signal Breakout Unit	SBU 1	
TorqView	TV	*Torque Monitoring Software*

Data parameters measured at +20°C

SGR523 Series Torque Transducers – Connector and Lead Options

	SGR523 Series	Option Code	Remarks/Purpose
Connectors & Leads			
Analog Connector *12 Pin Lumberg (female)*	◇	ACC 1	*For user to self wire*
Digital Connector *12 Pin Lumberg (male)*	◇	ACC 2	*For user to self wire*
Analog Lead (Length 2.5m) *12 Pin Lumberg (female) to 15 way 'D' type connector (female)*	◇	ACC 3	*For connecting SGR to user's system via 15 pin 'D' connector*
Digital Lead (Length 2.5m) *12 Pin Lumberg (male) to 15 way 'D' type connector (male)*	◇	ACC 4	*For connecting SGR to user's system via 15 pin 'D' connector*
Digital Lead Adapter (Length 1m) *15 Way 'D' type (female) to RS232 and Power Connectors*	◇	ACC 5	*For connecting SGR to PC via RS232* *[Also needs Digital Lead (ACC4) to connect to SGR]*
Digital Lead Adapter (Length 1m) *15 Way 'D' type (female) to RS232, USB and Power Connectors*	◇	ACC 6	*For connecting SGR to PC via USB (Option G) or RS232* *[Also needs Digital Lead (ACC4) to connect to SGR]*
Digital Lead Adapter (Length 1m) *15 Way 'D' type (female) to CANbus and Power Connectors*	◇	ACC 8	*For connecting SGR to PC via CANbus (Option H)* *[Also needs Digital Lead (ACC4) to connect to SGR]*
Digital Lead Adapter (Length 1m) *15 Way 'D' type (female) to CANbus, USB and Power Connectors*	◇	ACC 9	*For connecting SGR to PC via USB (Option G) or CANbus (Option H)* *[Also needs Digital Lead (ACC4) to connect to SGR]*
Ethernet cable (Length 2M)	◇	ACC 12	*Connecting SGR to LAN*
Ethernet cable (Length 5M)	◇	ACC 13	*Connecting SGR to LAN*
Ethernet cable (Length 10M)	◇	ACC 14	*Connecting SGR to LAN*



When ordering a Torque Transducer please note that any torque/FSD is possible between ranges – please specify rated torque and options using the following format:

For example: *SGR*	*523 - 15Nm -*	*KH-2048*	A transducer with torque and speed outputs, rated and calibrated to 15Nm FSD with keyed ends, CAN Bus and 2048 PPR
Your transducer requirement: *SGR*			
Max speed (if applicable)		RPM	
Connector or Lead options			
Additional related products			

Glossary of terms and definitions used in this datasheet

- *Accuracy* – The degree of conformity of a measured or calculated quantity, which will show the same or similar results. Accuracy of the overall TorqSense system is limited by the combined error of several factors such as linearity, hysteresis, temperature drifts and other parameters affecting measurements. If errors in the system are known or can be estimated, an overall error or uncertainty of measurement can be calculated.
- *Digital averaging* – The application of algorithms to reduce white noise. In any electronic system, electronic white noise is mixed with the signal and this noise usually limits the accuracy. To reduce the influence of white noise and increase the accuracy of the system different averaging algorithms can be applied. In the TorqSense system a flying digital averaging technique is applied to reduce the white noise commensurate with the level of accuracy required. However, as any averaging algorithm works as a low pass filter, the more averaging that is applied the lower the frequency response. Therefore, each Torqsense system should be optimised to the customer's requirements by choosing the right combination of accuracy/frequency response. Please see relevant part of the Datasheet and User Manual.

Note 1: *Any torque/FSD is possible between ranges – please specify max rated torque.*

Note 2: *Max rated torque should not be exceeded.*

Note 3: *Please consult factory for applications requiring rotational speeds that exceed maximum figures given. Transducers fitted for IP65 will have running speeds considerably reduced, increased drag torque and accuracy can be affected.*

Note 4: *SM – Static Mode. Dynamic values will depend upon user application and has to be adjusted accordingly.*

Note 5: *Digital averaging can be configured by user to optimise accuracy/frequency response for specific user applications. Digital averaging default setting is N=16. For details see User Manual.*

Note 6: *4kHz approximate sample rate, actual rate may be slightly under.*

Note 7: *Output rate figures were calculated from the time taken to capture 100,000 torque readings. Testing was conducted with each connection method configured at its maximum baud rate. Each connection method was tested in isolation on an Intel 7th generation i7 PC running Windows 10. The CAN bus, RS232 and USB interfaces were tested using a stripped-down capture program, while Ethernet was tested via the DLL.*
USB - USB is a host-based bus architecture, because of this the output rate achievable may be affected by other bus traffic and host activity.
CAN Bus – CAN Bus is a shared bus technology, where other bus traffic may affect the maximum output rate achievable.
Ethernet – Ethernet carries a much greater overhead than the other connection methods. Ethernet can be affected by dropped packets and other network traffic.
The digital output rate does not in any way influence the internal sampling rate of the transducer. The internal sampling and digital interfaces run asynchronously; the digital interface merely copies data from a buffer at the requested rate.

Note 8: *3 x analog channels are available.*
Default assignments for an SGR523 (torque only) are Channel 0 – torque, Channel 1 – torque peak, Channel 2 – torque auto reset.
Default assignments for an SGR52x (torque and speed) are Channel 0 – torque auto (torque/torque peak, switched by peak input), Channel 1 – speed, Channel 2 – power.
Voltage/Current scaling set per option selection, or via Transducer Control on advanced models.

Note 9: *At very high speeds, for better balance the factory recommends plain or splined shafts.*

Note 10: *Transducers fitted for IP65 will have running speeds considerably reduced, increased drag torque and accuracy can be affected.*

Note 11: *The RPM reading update rate is directly related to the square wave frequency produced from a shaft mounted grating passing through an opto switch. The values specified are based on a standard 60-line grating, for models fitted with an angle encoder or different grating size, replace the RPM with the square frequency in Hz. The square wave frequency can be calculated by this formula: SQWaveFrequencyHz = (RPM / 60) x GratingSize (for quadrature-based encoders, double the grating size).*