

Nm

## SGR523 SERIES

Digital Rotary Torque Sensor 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



### FEATURES

- Transducers from 175mNm to 20Nm. (Higher ranges to follow)
- Large fully functional overrange capability of 250%
- Minimal side and end load errors
- Low hysteresis error of  $\pm 0.05$  % FSD
- Low linearity deviation of  $\pm 0.05$  % 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.

## SOFTWARE

orqView 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.

## 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.





## 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.

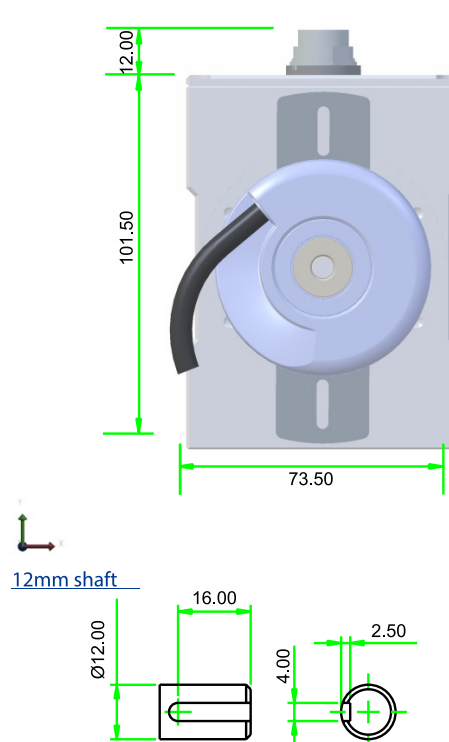
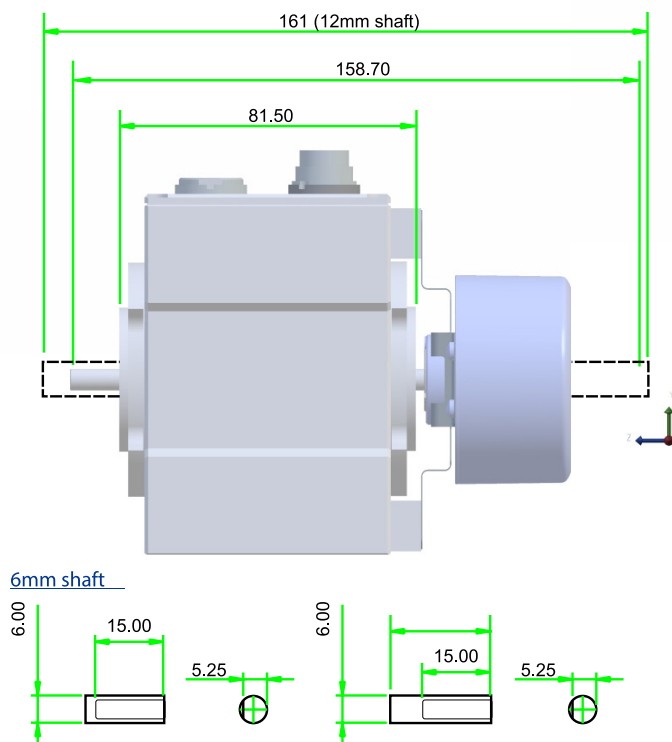
Torque peaks and dips due to interaction with cam shafts and other shaft angle dependent mechanisms can be analysed with better precision.

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 be rectified before production wastage occurs.

## BENEFITS

- Up to 10000 pulses per revolution\*
- Down to 0.009° 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
<b>Standard features</b>			
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	●		
<b>Optional features</b>			
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°.  $360 / 3600 / 4 = 0.025^\circ$

### 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.

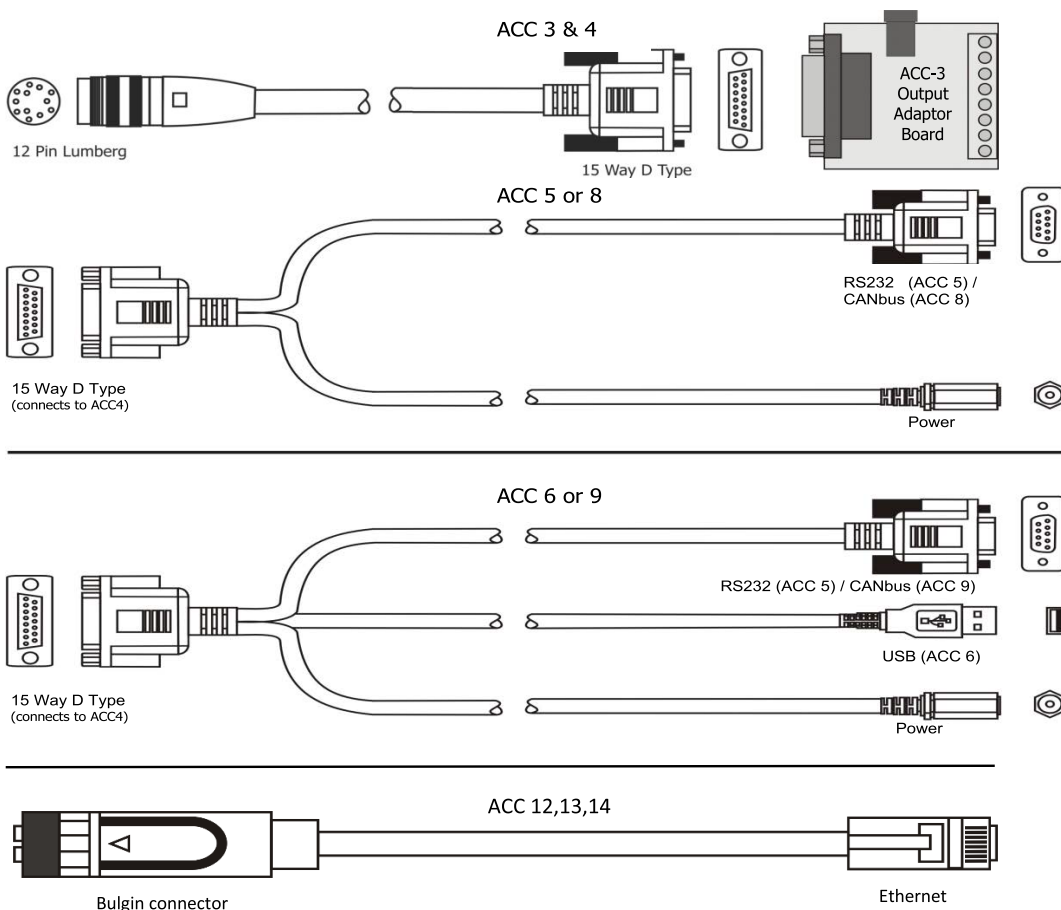
## SGR523 SERIES TORQUE TRANSDUCERS – ADDITIONAL RELATED PRODUCTS

	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
<b>Connectors &amp; Leads</b>			
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





## ORDERING

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: <b>SGR</b>	<b>523 - 15Nm -</b>	<b>KH-2048</b>	A transducer with torque and speed outputs, rated and calibrated to 15Nm FSD with keyed ends, CAN Bus and 2048 PPR
Your transducer requirement: <b>SGR</b>			
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: >5Khz Sample Rate. Up to 10Khz sample rate possible, please consult factory. Digital averaging also affects the analog output, max analog output 3dB Bandwidth = 5Khz when digital average is 1.
- Note 7: Output rate figures are calculated from the time taken to capture 10000 torque readings. Testing was conducted with each connection method configured at its maximum baud rate. The maximum output rate available for CAN and USB is dependant on the transducers setup. USB - USB is a host based bus architecture, because of this the output rate achievable will be affected by other bus traffic and host activity. USB has two transfer modes, Single Transfer which requests 1 reading at a time and Bulk Transfer which transfers readings in blocks of 50 Torque/Speed pairs. CAN Bus - to achieve a Torque reading output rate of 10KHz, the Speed reading output rate must be reduced to 100Hz.
- Note 8: 2 x analog channels available. Default settings are Channel 1 (voltage/current) – torque. Channel 2 (voltage/current) – speed or power, if ordered.
- Note 9: At very high speeds, for better balance the factory recommend plain or splined shafts.
- Note 10: Transducers fitted for IP65 will have running speeds considerably reduced, increased drag torque and accuracy can be affected.