

Nm

SGR525/526 SERIES

Digital Rotary Torque Transducers with Square Drives

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 1Nm to 265Nm.
- Large fully functional overrange capability of 250%
- Minimal side and end load errors
- Low hysteresis error of ± 0.05 % FSD
- Low linearity deviation 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.

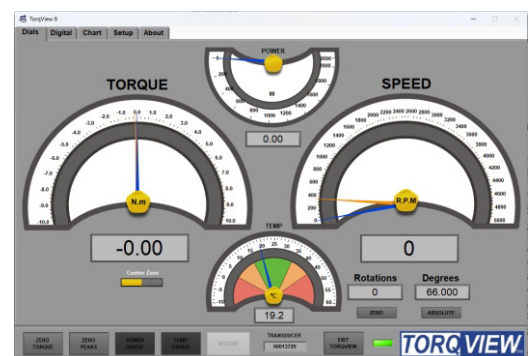
■ SOFTWARE

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.

■ TORQSENSE SGR525/526 TRANSDUCERS OFFER:

- **SGR525** - Torque measurement only
- **SGR526** - Torque, speed/angle & power measurement (360 pulses per revolution incremental encoder)
- 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 - RS232 and USB (standard), CAN Bus and Ethernet (optional).
- Transducer Control configuration software is provided to setup and configure the transducer.
- 3 analog channels are individually configurable, allowing changes to scaling and data assignment.
- Ability to connect up to 10 transducers using USB.
- Optional integrated Ethernet provides distributed access and multiple simultaneous user/device use.





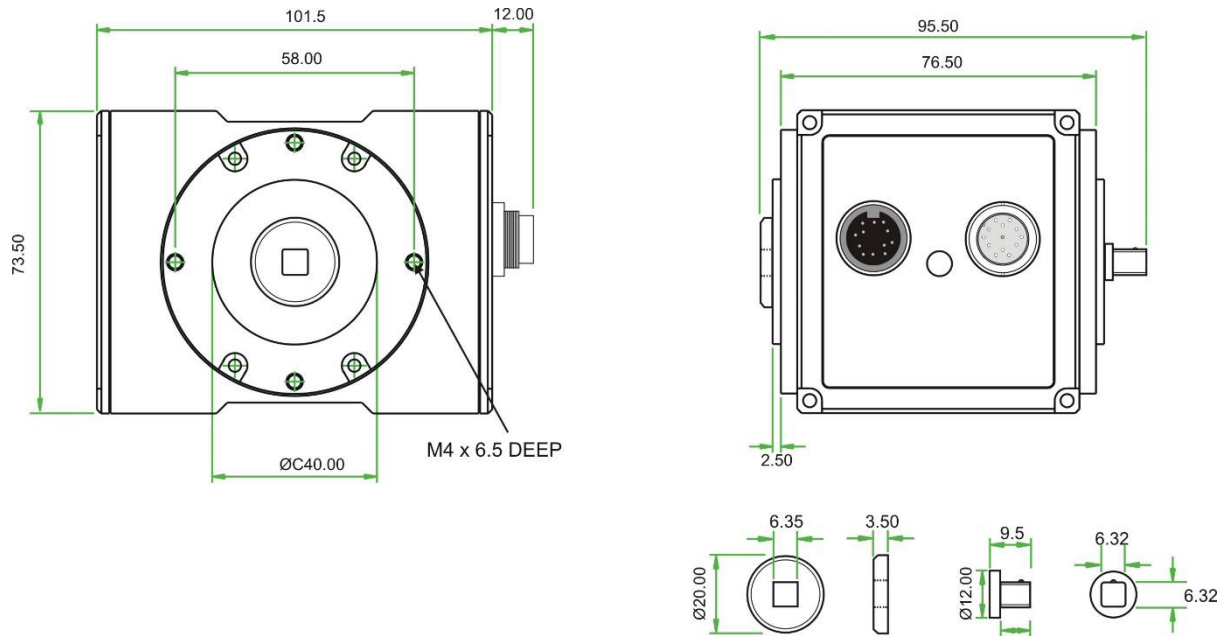
SPECIFICATION

Parameter	Condition	Data								Units
SGR525/526 Torque measurement system										
Measurement method		Full bridge strain gauge								
Torque range	(Notes 1 & 2)	0 - 20				0 - 265				Nm
		0 - 200				0 - 2650				[lbf·in]
Shaft size (diameter)		¼" Square				½ " Square				mm
Specifications										
Combined non-linearity and hysteresis		±0.1								%FS
Resolution		0.01								%FS
Repeatability		0.05								%FS
Accuracy	20°C, SM (Note 4)	±0.1								%FS
Digital averaging	(Note 5)	2	4	8	16	32	64	128	256	N
Noise Floor	20°C, SM (Note 4)	0.06	0.04	0.03	0.02	0.015	0.01	0.01	0.01	%FS
3dB Bandwidth	(Note 6)	2000	1000	500	250	125	62	31	15	Hz
Analog output										
Output voltages (Torque/Speed/Power)		Options available: ±1 / ±5 / ±10 / Unipolar (SGR520 Series output voltages are user selectable)								Vdc
Load impedance		Maximum 1								KΩ
Output currents (Torque/Speed/Power)		Options available: 4-20 / 0-20 / 12±8 (SGR520 Series output currents are user selectable)								mA
4-20mA Loop resistance		Should not exceed 400								Ω
Digital output										
Connections		CAN Bus		Ethernet		RS232		USB		
Configuration		CAN 2.0B, 11bit Message Identifiers		IEEE 802.3 10BASE-T, 100BASE-TX		Data Bits: 8, Parity: None, Stop Bits:1		USB 2.0 Full-Speed		
Baud Rate(s)		1Mbps, 500Kbps, 250Kbps, 100Kbps		10Mbps, 100Mbps		115200bps, 38400bps, 9600bps		12 Mbps		
Output Rate	(Note 7)	Up to 4 kHz		Up to 1.9 kHz		Up to 1.1 kHz		Up to 4kHz		
Rotation speed/angle of rotation measurement system										
Measurement method		Opto switch through slotted disc								
Direct output signal		Pulse output direct from opto switch (TTL, 5V square wave)								
Accuracy		Speed: ±1rpm up to 30,000rpm				Angle: ±1° (360 encoder only)				
Rotational speed (max)	(Note 3)	30,000	20,000	15,000	12,000	9,000	6,000			RPM
Digital Processing Techniques Processing modes run simultaneously and can be applied to either analog channel or accessed individually via a digital connection.		Processing Method			Update rate for analog and digital outputs					
	Based on a standard 60-line grating. (Note 11)	Mode 1 (Slow Method) Frequency Count			1					Hz
		Mode 2 (Fast Method) Period Count	0 RPM		1			Hz		
			> 0 RPM		$\frac{\text{RPM}}{\lceil \frac{\text{RPM}}{1000} \rceil}$					
Temperature										
Temperature accuracy		±1								°C
Reference temperature T _{RT}		20								°C
Compensated range, ΔT _O		0 to +90								°C
Usable range, ΔT _S		-40 to +90								°C
Temperature		Coefficient of zero 0.002								%
Temperature		Coefficient of span 0.01								%
Power supply										
Nominal voltage, V _S		12 to 32 (max)								V
Current consumption, I _S		250 (max) @ 12 VDC								mA
Power consumption, W _S		3								W
Allowed residual ripple of supply voltage, V _{ripple}		500 (above nominal supply voltage)								mVp-p
Electromagnetic compatibility										
EMC compatibility		EN 61326:2006								

* For notes, please see glossary page



DIMENSIONS (1Nm TO 20Nm)



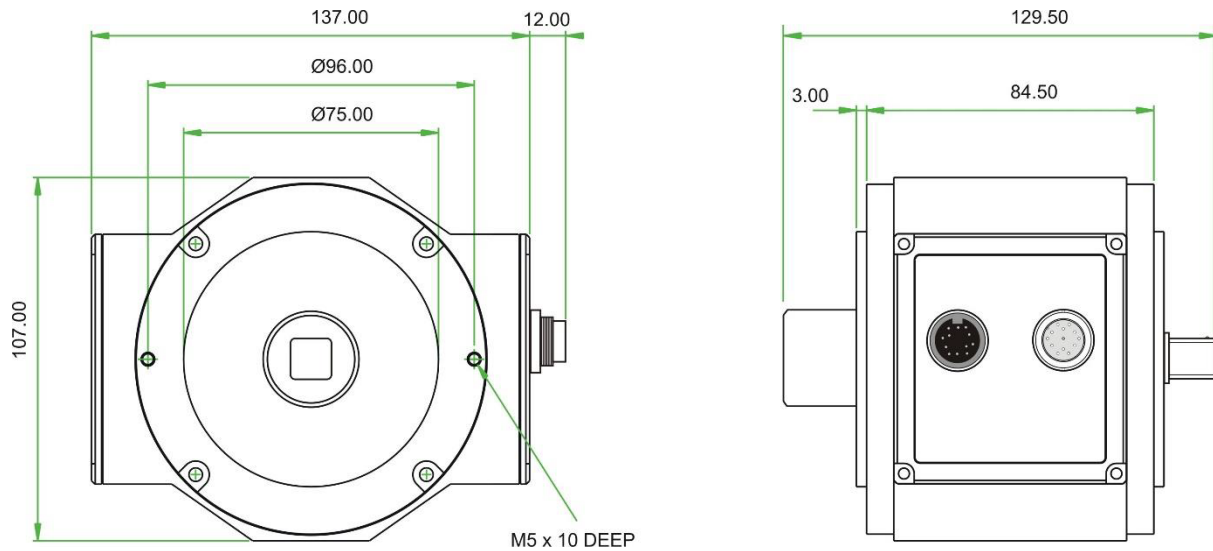
Measurement units: Millimetres (mm)

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	Square										
Shaft Size (Diameter)	Standard ¼" Square										
Torsional Stiffness	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	KNm/rad
Mass moment of inertia, L _v	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	×10 ⁻⁶ kg·m ²
Max measurable load limit	250 (of rated torque)										%
Static safe load breaking	400 (of rated torque)										%
Shaft weight, approx											kg
Transducer with shaft weight, approx											kg

Data parameters measured at +20°C



DIMENSIONS (100 Nm TO 265Nm)



Measurement units: Millimetres (mm)

Parameter	Data		Units
Mechanical Properties			
Torque (Max)	175	265	Nm
Shaft Code	FA	FB	
Standard Shaft Type	Square		
Shaft Size (Diameter)	Data parameters measured at +20°C Standard 1/2" Square		
Torsional Stiffness	TBC	TBC	KNm/rad
Mass moment of inertia, L _v	TBC	TBC	×10 ⁻⁶ kg·m ²
Max measurable load limit	250 (of rated torque)		%
Static safe load breaking	400 (of rated torque)		%
Shaft weight, approx			kg
Transducer with shaft weight, approx			kg

Data parameters measured at +20°C



■ SGR525/526 SERIES TORQUE TRANSDUCERS - STANDARD RANGE

● – Standard feature ◇ – Optional feature

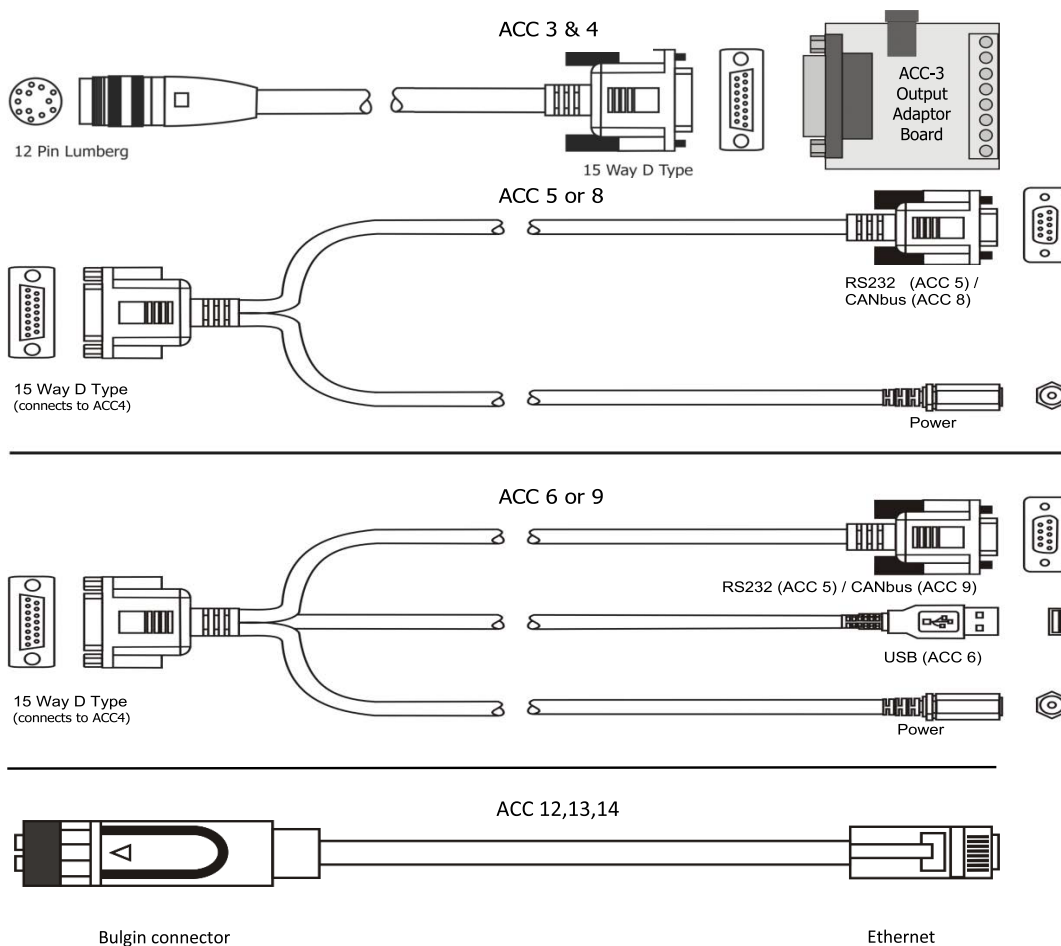
	SGR525/526 Series	Option Code	Remarks/Purpose
Torque, Speed, Power Outputs			
Torque only	525		
Torque & Speed (360 pulses/rev) or Power	526		
Standard features			
Voltage outputs from $\pm 1\text{V}$ to $\pm 10\text{V}$ FSD and unipolar (Variable)	●		<i>Output is user selectable</i>
USB 2.0 full speed 12 Mbps Digital output	●		
RS232 output	●		
Torque Averaging and Torque Peak	●		
Self Diagnostics	●		
Internal temperature measurement	●		
Deep grooved shielded bearings with oil lubrication	●		
Ingress Protection (IP) 54	●		
Optional features			
Current output 0-20mA, 4-20mA & $12\pm 8\text{mA}$ (Variable)	◇	F	<i>Current output is user selectable and in place of Voltage output. However user can reselect a Voltage output, if required. (Note 8)</i>
CAN Bus output	◇	H	<i>In place of RS232 output</i>
Integrated Ethernet	◇	I	
High Speed Bearings (See Note 9 below)	◇	J	<i>Consult factory for maximum speed allowance.</i>
Sealed Bearings	◇	S	
Ingress Protection (IP) 65 (See Note 10 below)	◇	L	

SGR525/526 Series Torque Transducers – Additional related products

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

SGR525/526 SERIES TORQUE TRANSDUCERS – CONNECTOR AND LEAD OPTIONS

	SGR525/526 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





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: SGR	525 - 15Nm -	L	A transducer with torque and speed outputs, rated and calibrated to 15Nm FSD and IP65 protection.
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: >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 dependent 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.