



SERIES 5300D

## TORKDISC® IN-LINE ROTARY

- DC to 8500 Hz bandwidth
- AC coupled, 0 to  $\pm 10$  volt analog output with 2-pole Butterworth high pass filter with user-selectable cutoff frequencies
- DC-coupled, 0 to  $\pm 10$  volt analog output with 8-pole elliptical low pass filter with user-selectable cutoff frequencies
- Digital system alleviates noise and data corruption
- Full-scale capacities from 250 to 225k lbf-in (28 to 25.4k Nm)e



### TYPICAL APPLICATIONS

- Automotive engine, powertrain, chassis dynamometer testing for:
  - Performance
  - Emissions
  - Fuel economy
- Development of:
  - Transfer cases
  - Axles
  - Differentials
- Production line validation of powertrain components including:
  - Gear mesh
  - Cold engine signature analysis
  - Chassis dynamometer
- Rotational dynamics testing
- Torque studies on pumps, fans, electric motors
- Gearbox efficiency testing

# TORQUE SENSOR SYSTEM FOR POWERTRAIN DEVELOPMENT

## Robust and Competitively Priced

PCB Load & Torque Division Series 5300D TORKDISC® In-line Rotary Torque Sensor System is a cost-effective solution for testing that requires a robust rotary torque transducer, and when axial space is at a premium. The TORKDISC® System consists of a short-coupled, flange-mounted rotating sensor, a stator assembly and a digital conditioning module. Onboard, the field-proven transmitter converts the torque signals into a high-speed digital representation. Once in digital form, this data is transmitted to a non-contacting pick-up loop, eliminating the risk of noise or data corruption. A remote receiver unit seamlessly converts the digital data to a high-level analog output voltage. The robust construction, high stiffness, and low rotating inertia of the TORKDISC® make it ideal for applications such as chassis and engine dynamometers.

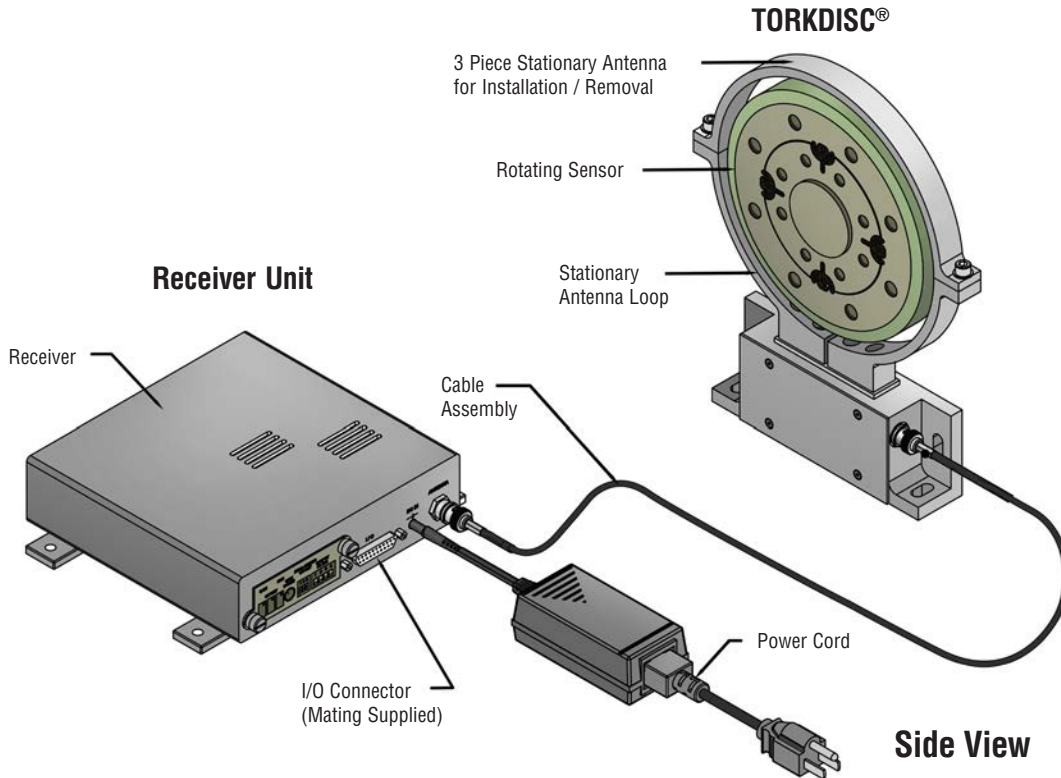
## Static and Dynamic Measurements

Series 5300D incorporates dual high-level analog outputs, AC and DC coupled, providing both static and dynamic torque measurement capability that can be recorded separately and independently scaled — which is particularly beneficial when high DC levels are present and low levels of AC content is of particular interest.

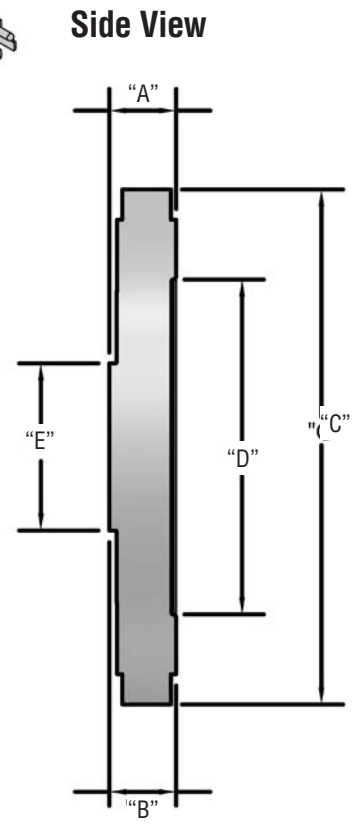
Series 5300D TORKDISC® also features industry-leading DC bandwidth to 8500 Hz, increasing the system’s dynamic response characteristics. The DC-coupled output features an eight-pole low pass elliptical filter with user-selectable frequencies for minimal roll-off at each filter selection. Included with the AC coupled output is a two-pole Butterworth high-pass filter with a wide range of user-selectable cutoff frequencies.

| FEATURES COMPARISON          |                                                                                                                                                                                  | Performance                                |                                                                         |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------|
| Performance                  |                                                                                                                                                                                  | Rotor Temp. Range Compensated              | +70 to +170 °F (+21 to +77 °C)                                          |
| Voltage Output A             | AC Coupled, 0 to ± 10 volt w/ independent coarse gain control (16 increments)                                                                                                    | System Temp. Effect on Output <sup>1</sup> | ± 0.002% FS/°F (± 0.0036% FS/°C)                                        |
| Voltage Output B             | DC Coupled, 0 to ± 10 volt w/ independent fine and coarse gain control                                                                                                           | System Temp. Effect on Zero <sup>1</sup>   | ± 0.002% FS/°F (± 0.0036% FS/°C)                                        |
| Digital Output:              | QSPI                                                                                                                                                                             | Rotor/Stator Temp. Range Usable            | +32 to +185 °F (0 to +85 °C)                                            |
| Performance                  |                                                                                                                                                                                  | Rotor/Stator Optional Temp. Range Usable   | +32 to +250 °F (0 to +121 °C)                                           |
| Accuracy                     | Overall, 0.1% FS, combined effect of Non-Linearity, Hysteresis, & Repeatability                                                                                                  | Receiver Temp. Range Usable                | 0 to +122 °F (-17 to +50 °C)                                            |
| Voltage Output A Filter (AC) | 2-pole Butterworth high pass w/ selectable cutoff frequencies of 5, 10, 20, 200, 500, & 735 Hz, & 8-pole low pass determined by the DC coupled output cutoff frequency selection | Performance                                |                                                                         |
| Voltage Output B Filter (DC) | 8-pole elliptical low pass w/selectable cutoff frequencies of > 8500, 5000, 2500, 1250, 625, 313, 10, & 1 Hz                                                                     | Permissible Radial Float, Rotor to Stator  | ± 0.25 in (± 6.35 mm)                                                   |
| Bandwidth                    | DC to 8500 Hz anti-alias                                                                                                                                                         | Permissible Axial Float, Rotor to Stator   | ± 0.25 in (± 6.35 mm)                                                   |
| Digital resolution           | 16-bit                                                                                                                                                                           | Dynamic Balance                            | ISO G 2.5                                                               |
| Analog Resolution            | 0.31 mV (± 10 volts/32768, 16-bit resolution)                                                                                                                                    | Sensor Positional Sensitivity              | 0.1% FS (180° rotation)                                                 |
| Digital Sample Rate          | 26,484 samples/sec                                                                                                                                                               | Performance                                |                                                                         |
| Group Delay                  | 110 microseconds at 10 kHz                                                                                                                                                       | Power Requirements                         | 9 to 18 VDC, 15 watts (90 to 240VAC 50-60 Hz, adaptor is supplied)      |
| Noise                        | ≤10 mV at 10 kHz                                                                                                                                                                 | Performance                                |                                                                         |
| Noise Spectral Density       | < 0.0005%FS per root Hz typical                                                                                                                                                  | Symmetry Adjustment                        | Factory and user adjustable ± 0.5% FS                                   |
|                              |                                                                                                                                                                                  | Supplied Cable, Stator to Receiver         | 24 ft. (7.3 m), RG 58/U (BNC plug /stator side, TNC plug/receiver side) |
|                              |                                                                                                                                                                                  | Optional Cable, Stator to Receiver         | 80 ft. (24.4 m), RG 58/U (contact factory for longer lengths)           |
|                              |                                                                                                                                                                                  | Output Interface                           | DB-25 female connector (mating supplied w/backshell)                    |
|                              |                                                                                                                                                                                  | Calibration                                | Unipolar shunt calibration, invoked from the receiver front panel       |
|                              |                                                                                                                                                                                  | Stator Assembly                            | Top half of loop is removable for easy installation over rotor          |

The TORKDISC® and receiver make up a complete system. No additional signal conditioning is required. The receiver box provides voltage and digital output via a 25-pin I/O connector. A standard 24-foot cable is supplied, but an 80-foot, 112-foot or 176-foot cable can be used as well.



| TORKDISC® IN-LINE ROTARY TORQUE SENSOR SYSTEM DIMENSIONS |                                                        |                   |                    |                     |                                                                        |                                                                                        |
|----------------------------------------------------------|--------------------------------------------------------|-------------------|--------------------|---------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|                                                          | A                                                      | B                 | C                  | D                   | E                                                                      | F                                                                                      |
| Series                                                   | O.D. - Outside Diameter //(including telemetry/collar) | Overall Thickness | Pilot              | Pilot               | Driven (inner) Bolt Circle                                             | Load (outer) Bolt Circle                                                               |
| 5302D                                                    | 7.0 in<br>177.8 mm                                     | 1.1 in<br>27.9 mm | 2.0 in<br>50.8 mm  | 4.4 in<br>111.1 mm  | (8) 3/8-24 threaded holes, equally spaced on a 3.00 in (76.20 mm) B.C. | (8) 0.406 in (10.31 mm) dia. through holes equally spaced on a 5.00 in (127.0 mm) B.C. |
| 5308D                                                    | 8.5 in<br>215.5 mm                                     | 1.1 in<br>27.9 mm | 2.7 in<br>69.9 mm  | 5.5 in<br>140.0 mm  | (8) 5/8-11 threaded holes, spaced on a 3.75 in (95.25 mm) B.C.         | (8) 0.531 in (13.49 mm) dia. through holes equally spaced on a 6.5 in (165.0 mm) B.C.  |
| 5309D                                                    | 10.5 in<br>241.0 mm                                    | 1.6 in<br>41.7 mm | 4.0 in<br>101.5 mm | 7.5 in<br>190.5 mm  | (12) 5/8-11 threaded holes, spaced on a 6.0 in (152.4 mm) B.C.         | (16) 0.531 in (13.49 mm) dia. through holes equally spaced on a 8.5 in (215.9 mm) B.C. |
| 5310D                                                    | 18.0 in<br>456.7 mm                                    | 2.1 in<br>53.0 mm | 5.5 in<br>139.7 mm | 11.0 in<br>279.4 mm | (12) 7/8-14 threaded holes, spaced on a 9.0 in (228.6 mm) B.C.         | (16) 0.780 in (19.8 mm) dia. through holes equally spaced on a 13.0 in (330.2 mm) B.C. |



See TORKDISC® In-Line Rotary Sensor System Dimensions Table (page 3) for measurement values.

## Superior Customer Service

As with all PCB® instrumentation, the TORKDISC® is complemented with toll-free applications assistance, 24-hour technical service, and backed by a no-risk policy that guarantees total customer satisfaction or your money refunded. We can also calibrate and repair your TORKDISC®.

| TORKDISC® ROTARY TORQUE SENSOR SYSTEM |                                                |               |               |               |               |
|---------------------------------------|------------------------------------------------|---------------|---------------|---------------|---------------|
| Model Number                          | Unit                                           | 5302D-05A     | 5302D-01A     | 5302D-02A     | 5308D-01A     |
| Continuous Rated Capacity             | lbf-in (Nm)                                    | 250 (28)      | 2000 (226)    | 5000 (565)    | 10k (1130)    |
| Bolt Joint Slip Torque                | lbf-in (Nm)                                    | 3300 (373)    | 3300 (373)    | 10k (1130)    | 35k (4000)    |
| Safe Overload                         | lbf-in (Nm)                                    | 750 (85)      | 6000 (678)    | 15k (1695)    | 30k (3400)    |
| Failure Overload                      | lbf-in (Nm)                                    | 1000 (113)    | 8000 (904)    | 20k (2260)    | 40k (4500)    |
| Torsional Stiffness                   | lbf-in/rad (Nm/rad)                            | 300k (34k)    | 5800k (655k)  | 15M (1600k)   | 34M (3800k)   |
| Torsional Angle @ Capacity            | degrees                                        | 0.125         | 0.020         | 0.020         | 0.017         |
| Rotating Inertia                      | lbf-in sec <sup>2</sup> (Nm sec <sup>2</sup> ) | 0.030 (0.003) | 0.056 (0.006) | 0.117 (0.013) | 0.240 (0.027) |
| Axial Load Limit [1]                  | lbf (N)                                        | 62.5 (278)    | 500 (2224)    | 1000 (4448)   | 1350 (6000)   |
| Lateral Load Limit [1]                | lbf (N)                                        | 62.5 (278)    | 500 (2224)    | 1000 (4448)   | 1650 (7300)   |
| Bending Moment Limit [1]              | lbf-in (Nm)                                    | 125 (14)      | 1500 (169)    | 3000 (339)    | 5000 (565)    |
| Maximum Speed                         | RPM                                            | 15k           | 15k           | 15k           | 10k           |
| Rotor Weight                          | lbf (kg)                                       | 2 (0.9)       | 3.5 (1.6)     | 9 (4.1)       | 10 (4.5)      |
| Rotor Material                        | -                                              | Aluminum      | Aluminum      | Steel         | Steel         |

| TORKDISC® ROTARY TORQUE SENSOR SYSTEM |                                                |               |               |               |               |                |
|---------------------------------------|------------------------------------------------|---------------|---------------|---------------|---------------|----------------|
| Model Number                          | Unit                                           | 5308D-03A     | 5309D-01A     | 5309D-02A     | 5310D-02A     | 5310D-04A      |
| Continuous Rated Capacity             | lbf-in (Nm)                                    | 30k (3400)    | 50k (5650)    | 100k (11k)    | 200k (23k)    | 225k (25k)     |
| Bolt Joint Slip Torque                | lbf-in (Nm)                                    | 35k (4000)    | 85k (9600)    | 110k (12k)    | 268k (30k)    | 268k (30k)     |
| Safe Overload                         | lbf-in (Nm)                                    | 75k (8475)    | 100k (11k)    | 200k (23k)    | 600k (68k)    | 675k (76k)     |
| Failure Overload                      | lbf-in (Nm)                                    | 100k (11k)    | 125k (14k)    | 250k (28k)    | 800k (90k)    | 900k (102k)    |
| Torsional Stiffness                   | lbf-in/rad (Nm/rad)                            | 100M (11.3M)  | 115M (13M)    | 230M (26M)    | 1200M (138M)  | 1350M (152.5M) |
| Torsional Angle @ Capacity            | degrees                                        | 0.017         | 0.017         | 0.017         | 0.01          | 0.01           |
| Rotating Inertia                      | lbf-in sec <sup>2</sup> (Nm sec <sup>2</sup> ) | 0.240 (0.027) | 0.874 (0.099) | 0.874 (0.099) | 7.514 (0.849) | 7.514 (0.849)  |
| Axial Load Limit [1]                  | lbf (N)                                        | 4000 (17.8k)  | 5000 (22.2k)  | 10k (44.5k)   | 14k (62k)     | 15k (66.7k)    |
| Lateral Load Limit [1]                | lbf (N)                                        | 5000 (22.2k)  | 5000 (22.2k)  | 10k (44.5k)   | 14k (62k)     | 15k (66.7k)    |
| Bending Moment Limit [1]              | lbf-in (Nm)                                    | 10k (1130)    | 25k (2825)    | 50k (5650)    | 95k (10.7k)   | 100k (11.3k)   |
| Maximum Speed                         | RPM                                            | 10k           | 10k           | 10k           | 4500          | 4500           |
| Rotor Weight                          | lbf (kg)                                       | 10 (5)        | 30 (14)       | 30 (14)       | 100 (45)      | 100 (45)       |
| Rotor Material                        | -                                              | Steel         | Steel         | Steel         | Steel         | Steel          |



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