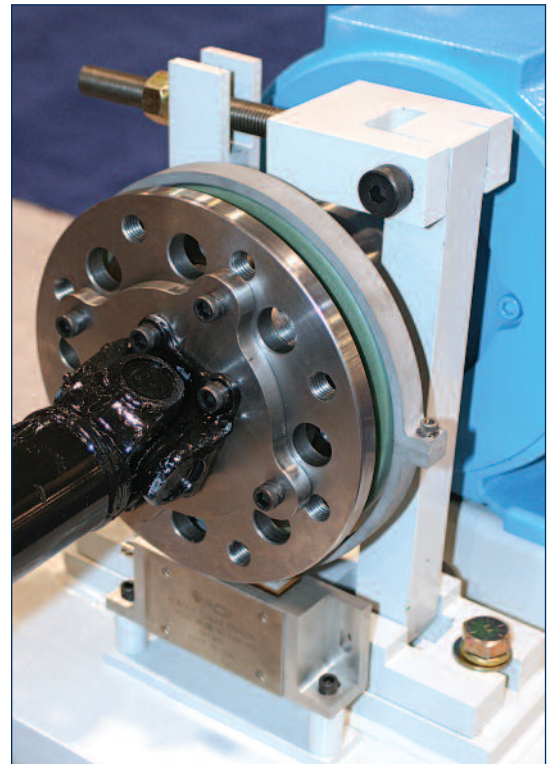




TORKDISC® In-line Rotary Torque Sensor System



Photo Courtesy of Mustang Dynamometer.



Model 5308D-02A Shown installed in chassis dynamometer.

The robust construction, high stiffness, and low rotating inertia of the TORKDISC® make it ideal for applications such as chassis and engine dynamometers. The TORKDISC® system consists of a short coupled flange mounted rotating sensor, a stator assembly, and a signal conditioning module. Torque is measured using a unique strain gage structure within the rotating flange. The measurement signal is then digitized, and is transmitted without wires to the receiving antenna. The signal is conditioned to an independent AC and DC coupled voltage analog outputs.

PCB® Automotive Sensors is a dedicated technical sales and support facility, located in Novi, Michigan, USA, devoted to the testing needs of the global transportation market. This team is focused on development and application of sensors and related instrumentation for specific vehicle development test programs, including modal analysis; driveability; ride & handling; component & system performance; durability; road load data acquisition; vehicle and powertrain NVH; legislative testing; quality control; powertrain development; and motorsport. PCB® offers exceptional customer service, 24-hour technical assistance, and a **Total Customer Satisfaction guarantee**.

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AS9100 CERTIFIED ■ ISO 9001 CERTIFIED ■ A2LA ACCREDITED to ISO 17025

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TORKDISC® In-line Rotary Torque Sensor System

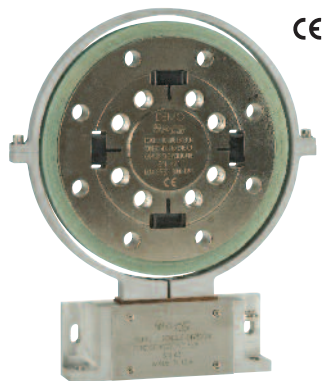
For Powertrain Development

Highlights

- DC to 8500 Hz bandwidth
- AC coupled, 0 to ± 10 volt analog output with 2-pole Butterworth high pass filter with user selectable cut off frequencies
- DC coupled, 0 to ± 10 volt analog output with 8-pole elliptical low pass filter with user selectable cut off frequencies
- Digital system alleviates noise & data corruption
- Full-scale capacities from 250 to 225k in-lb (28 to 25.4k N-m)

Applications

- Automotive Engine, Powertrain & Chassis Dynamometer Testing for:
 - Performance
 - Emissions
 - Fuel Economy
- Development of:
 - Transfer Cases
 - Axles
 - Differentials
- Rotational Dynamics Testing
- Torque Studies on Pumps, Fans, & Electric Motors
- Gearbox Efficiency Testing



Series 5300D



Photo Courtesy of Mustang Dynamometer.

PCB® Series 5300D TORKDISC® In-line Rotary Torque Sensor Systems are designed for test applications requiring a robust rotary torque transducer where axial space is at a premium. Onboard, the transducer is a field proven electronic module that 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, with no risk of noise or data corruption. A remote receiver unit converts the digital data to a high-level analog output voltage, and a serial digital output.

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 or when low levels of AC content is of particular interest. Series 5300D also features industry leading DC bandwidth to 8500 Hz, resulting in increased dynamic response characteristics. The DC coupled output features an 8-pole low pass elliptical filter with user selectable frequencies for minimal roll off at each filter selection. A 2-pole Butterworth high pass filter with a wide range of user selectable cut off frequencies is included with the AC coupled output.

As with all PCB® instrumentation, these sensors are complemented with toll-free applications assistance, 24-hour customer service, and are backed by a no-risk policy that guarantees total customer satisfaction or your money refunded.



TORKDISC® In-line Rotary Torque Sensor System

TORKDISC® Rotary Torque Sensor System

| Model Number | Unit | 5302D-05A | 5302D-01A | 5302D-02A | 5302D-03A | 5302D-04A | 5308D-01A | 5308D-02A |
|----------------------------|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Continuous Rated Capacity | in-lb | 250 | 2000 | 5000 | 1000 | 6250 | 10k | 20k |
| | N-m | 28 | 226 | 565 | 113 | 706 | 1130 | 2260 |
| Bolt Joint Slip Torque | in-lb | 3300 | 3300 | 10k | 3300 | 10k | 35k | 35k |
| | N-m | 373 | 373 | 1130 | 373 | 1130 | 4000 | 4000 |
| Safe Overload | in-lb | 750 | 6000 | 15k | 3000 | 15k | 30k | 60k |
| | N-m | 85 | 678 | 1695 | 339 | 1695 | 3400 | 6775 |
| Failure Overload | in-lb | 1000 | 8000 | 20k | 4000 | 20k | 40k | 80k |
| | N-m | 113 | 904 | 2260 | 452 | 2260 | 4500 | 9040 |
| Torsional Stiffness | in-lb/rad | 300k | 5.8M | 14.5M | 2.9M | 14.5M | 33.5M | 67M |
| | N-m/rad | 34k | 655k | 1.6M | 328k | 1.6M | 3.8M | 7.6M |
| Torsional Angle @ Capacity | degrees | 0.125 | 0.02 | 0.02 | 0.02 | 0.02 | 0.017 | 0.017 |
| Rotating Inertia | in-lb sec ² | 0.030 | 0.056 | 0.117 | 0.056 | 0.117 | 0.24 | 0.24 |
| | N-m sec ² | 0.003 | 0.006 | 0.013 | 0.006 | 0.013 | 0.027 | 0.027 |
| Axial Load Limit [1] | lb | 62.5 | 500 | 1000 | 250 | 1000 | 1350 | 2700 |
| | N | 278 | 2224 | 4448 | 1112 | 4448 | 6000 | 12k |
| Lateral Load Limit [1] | lb | 62.5 | 500 | 1000 | 250 | 1000 | 1650 | 3375 |
| | N | 278 | 2224 | 4448 | 1112 | 4448 | 7300 | 15k |
| Bending Moment Limit [1] | in-lb | 125 | 1500 | 3000 | 750 | 3000 | 5000 | 7500 |
| | N-m | 14 | 169 | 339 | 85 | 339 | 565 | 850 |
| Maximum Speed | RPM | 15k | 15k | 15k | 15k | 15k | 10k | 10k |
| Rotor Weight | lb | 2 | 3.5 | 9 | 3.5 | 9 | 10 | 10 |
| | kg | 0.91 | 1.59 | 4.08 | 1.59 | 4.08 | 4.5 | 4.5 |
| Rotor Material | | Aluminum | Aluminum | Steel | Aluminum | Steel | Steel | Steel |

| Model Number | Unit | 5308D-03A | 5309D-01A | 5309D-02A | 5310D-03A | 5310D-01A | 5310D-02A | 5310D-04A |
|----------------------------|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Continuous Rated Capacity | in-lb | 30k | 50k | 100k | 120k | 180k | 200k | 225k |
| | N-m | 3400 | 5650 | 11.3k | 13.6k | 20.3k | 22.5k | 25.4k |
| Bolt Joint Slip Torque | in-lb | 35k | 85k | 110k | 268k | 268k | 268k | 268k |
| | N-m | 4000 | 9600 | 12.4k | 30.3k | 30.3k | 30.3k | 30.3k |
| Safe Overload | in-lb | 75k | 100k | 200k | 360k | 540k | 600k | 675k |
| | N-m | 8475 | 11.3k | 22.6k | 40.7k | 61.0k | 67.8k | 76.3k |
| Failure Overload | in-lb | 100k | 125k | 250k | 480k | 720k | 800k | 900k |
| | N-m | 11.3k | 14k | 28.2k | 54.2k | 81.3k | 90.4k | 101.7k |
| Torsional Stiffness | in-lb/rad | 100M | 115M | 230M | 730k | 1.1B | 1.2B | 1.35B |
| | N-m/rad | 11.3M | 13M | 26M | 82.5k | 24M | 138M | 152.5M |
| Torsional Angle @ Capacity | degrees | 0.017 | 0.017 | 0.017 | 0.01 | 0.01 | 0.01 | 0.01 |
| Rotating Inertia | in-lb sec ² | 0.24 | 0.874 | 0.874 | 7.514 | 7.514 | 7.514 | 7.514 |
| | N-m sec ² | 0.027 | 0.099 | 0.099 | 0.849 | 0.849 | 0.849 | 0.849 |
| Axial Load Limit [1] | lb | 4000 | 5000 | 10k | 12k | 13.5k | 14k | 15k |
| | N | 17.8k | 22.2k | 44.5k | 53.4k | 60k | 62k | 66.7k |
| Lateral Load Limit [1] | lb | 5000 | 5000 | 10k | 12k | 13.5k | 14k | 15k |
| | N | 22.2k | 22.2k | 44.5k | 53.4k | 60k | 62k | 66.7k |
| Bending Moment Limit [1] | in-lb | 10k | 25k | 50k | 80k | 90k | 95k | 100k |
| | N-m | 1130 | 2825 | 5650 | 9039 | 10.2k | 10.7k | 11.3k |
| Maximum Speed | RPM | 10k | 10k | 10k | 4500 | 4500 | 4500 | 4500 |
| Rotor Weight | lb | 10 | 30 | 30 | 100 | 100 | 100 | 100 |
| | kg | 4.5 | 13.6 | 13.6 | 45 | 45 | 45 | 45 |
| Rotor Material | | Steel | Steel | Steel | Steel | Steel | Steel | Steel |

Series 5300D Common Specifications

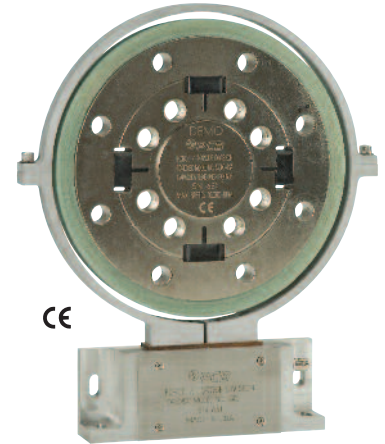
| System Output | | Temperature | |
|------------------------------|--|--|--|
| Voltage Output A | AC Coupled, 0 to ± 10 volt w/ independent coarse gain control (16 increments) | Rotor Temp. Range Compensated | +70 to +170 °F (+21 to +77 °C) |
| Voltage Output B | DC Coupled, 0 to ± 10 volt w/ independent fine and coarse gain control | System Temp. Effect on Output ¹ | ± 0.002% FS/°F (± 0.0036% FS/°C) |
| Digital Output: | QSPI | System Temp. Effect on Zero ¹ | ± 0.002% FS/°F (± 0.0036% FS/°C) |
| System Performance | | Rotor/Stator Temp. Range Usable | +32 to +185 °F (0 to +85 °C) |
| Accuracy | Overall, 0.1% FS, combined effect of Non-Linearity, Hysteresis, & Repeatability | Rotor/Stator Optional Temp. Range Usable | +32 to +250 °F (0 to +121 °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 | Receiver Temp. Range Usable | 0 to +122 °F (-17 to +50 °C) |
| Voltage Output B Filter (DC) | 8-pole elliptical low pass w/selectable cutoff frequencies of > 8.5k, 5k, 2.5k, 1.25k, 625, 313, 10, & 1 Hz | Mechanical | |
| Bandwidth | DC to 8500 Hz anti-alias | Permissible Radial Float, Rotor to Stator | ± 0.25 in (± 6.35 mm) |
| Digital resolution | 16-bit | Permissible Axial Float, Rotor to Stator | ± 0.25 in (± 6.35 mm) |
| Analog Resolution | 0.31 mV (± 10 volts/32768, 16-bit resolution) | Dynamic Balance | ISO G 2.5 |
| Digital Sample Rate | 26,484 samples/sec | Sensor Positional Sensitivity | ≅ 0.1% FS (180° rotation) |
| Group Delay | ≅ 110 microseconds at 10 kHz | Power | |
| Noise | ≤ 10 mV at 10 kHz | Power Requirements | 9 to 18 VDC, 15 watts (90 to 240VAC 50-60 Hz, adaptor is supplied) |
| Noise Spectral Density | < 0.0005%FS per root Hz typical | Miscellaneous | |
| | | 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 |

TORKDISC® In-line Rotary Torque Sensor System

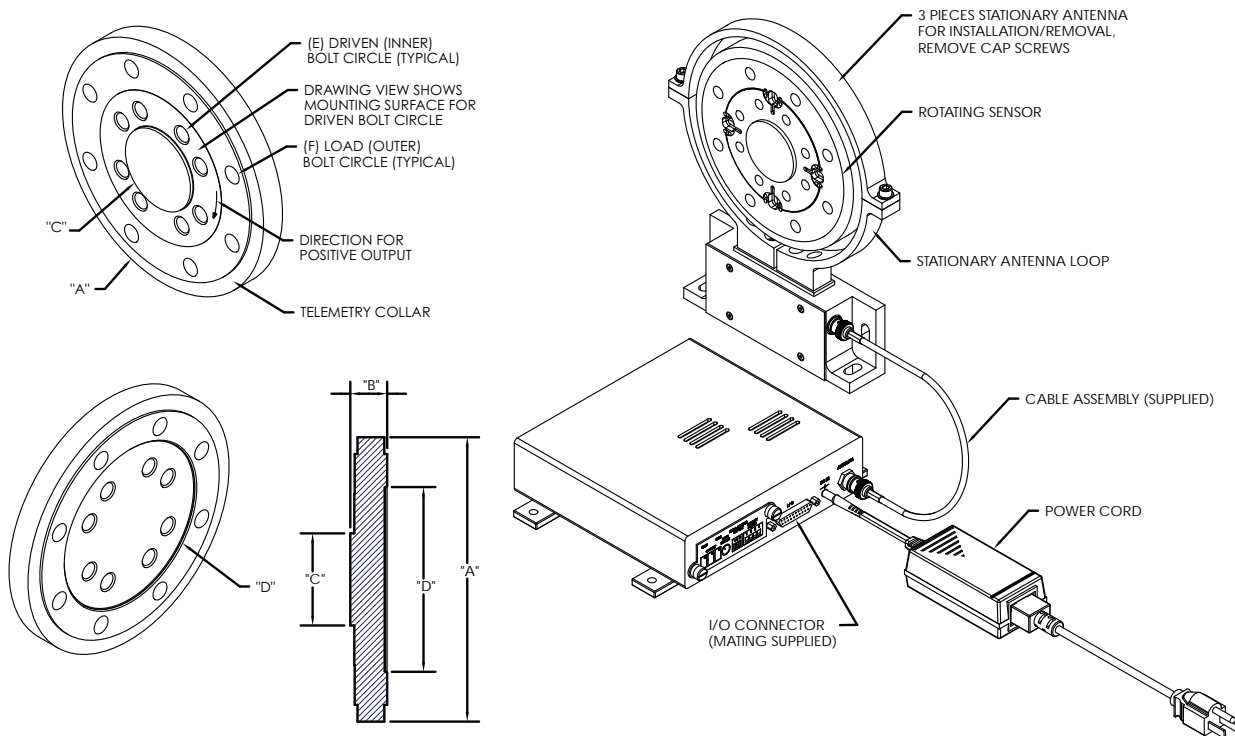
TORKDISC® In-line Rotary Torque Sensor System

PCB® Series 5300D sensors are designed for dynamometer and other test applications requiring a robust rotary torque transducer where axial space is at a premium. Onboard, the transducer is a field proven electronic module that 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, with no risk of noise or data corruption. A remote receiver unit converts the digital data to a high-level analog output voltage, and a serial digital output.

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 or when low levels of AC content is of particular interest. Series 5300D also features industry leading DC bandwidth to 8500 Hz, resulting in increased dynamic response characteristics. The DC coupled output features an 8-pole low pass elliptical filter with user selectable frequencies for minimal roll off at each filter selection. A 2-pole Butterworth high pass filter with a wide range of user selectable cut off frequencies is included with the AC coupled output.



Series 5300D



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.

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 | 7.00 in 177.8 mm | 1.10 in 27.9 mm | 1.999 in 50.8 mm | 4.375 in 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 | 8.49 in 215.5 mm | 1.10 in 27.9 mm | 2.748 in 69.9 mm | 5.513 in 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 | 10.49 in 241.0 mm | 1.64 in 41.7 mm | 3.998 in 101.5 mm | 7.500 in 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 | 17.98 in 456.7 mm | 2.09 in 53.0 mm | 5.499 in 139.7 mm | 11.001 in 279.4 mm | (12) 7/8-14 threaded holes, spaced on a 9.0 in (288.6 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. |

Note: [1] Extraneous load limits reflect the maximum axial load, lateral load, and bending moment that may be applied singularly without electrical or mechanical damage to the sensor. Where combined extraneous loads are applied, decrease loads proportionally. Request Application Note AP-1015 regarding the effects of extraneous loads on the torque sensor output.