



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 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.

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.



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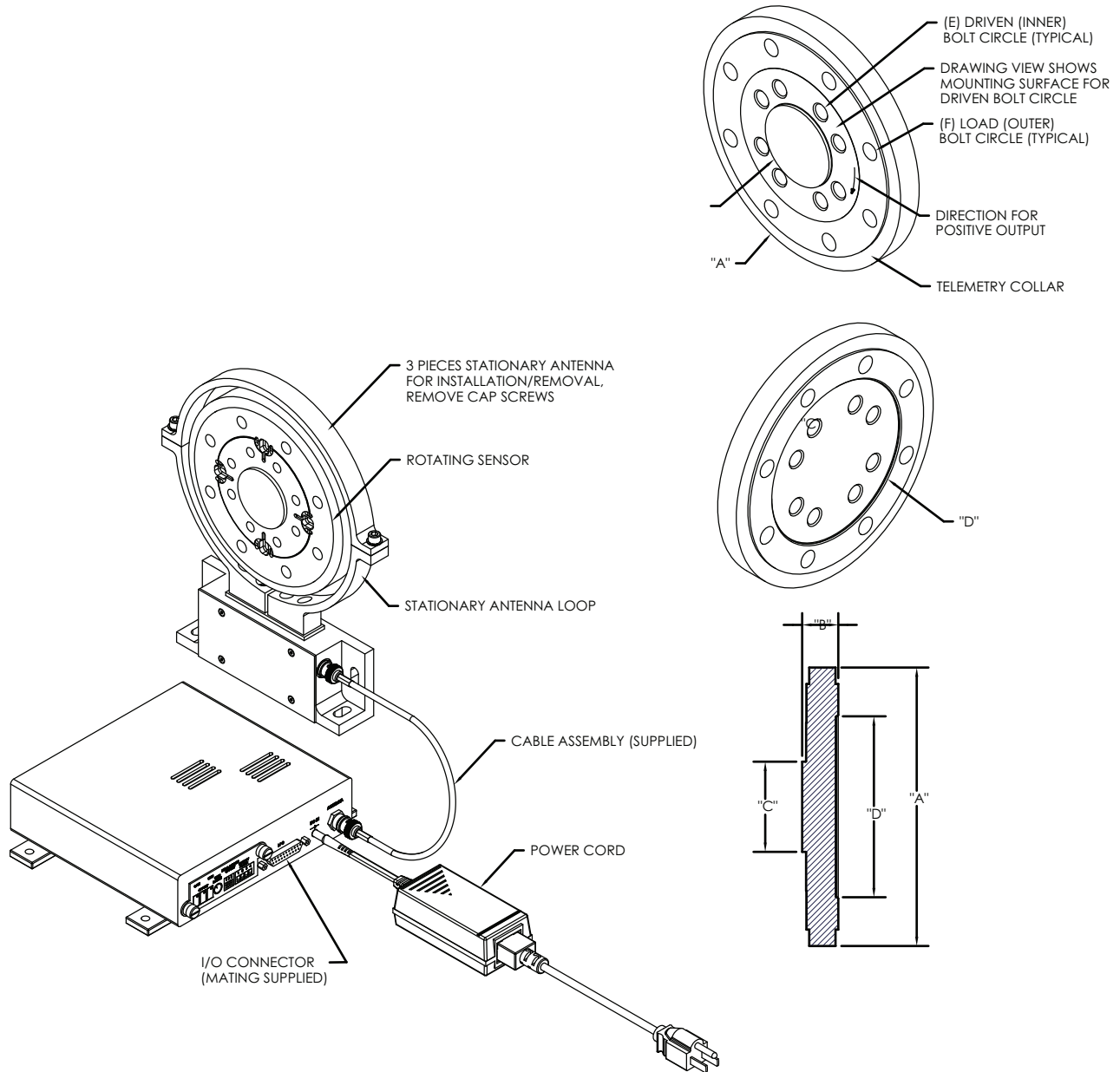
Model Number	Unit	5302D-05A	5302D-01A	5302D-02A	5302D-03A	5302D-04A	5308D-01A	5308D-02A
Continuous Rated Capacity	in-lb	250	2000	5000	1000	6250	10k	20k
	N-m	28	226	565	113	706	1130	2260
Bolt Joint Slip Torque[1]	in-lb	3300	3300	10k	3300	10k	35k	35k
	N-m	373	373	1130	373	1130	4000	4000
Safe Overload	in-lb	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[2]	lb	62.5	500	1000	250	1000	1350	2700
	N	278	2224	4448	1112	4448	6000	12k
Lateral Load Limit[2]	lb	62.5	500	1000	250	1000	1650	3375
	N	278	2224	4448	1112	4448	7300	15k
Bending Moment Limit[2]	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-01A	5310D-02A	5310D-04A
Continuous Rated Capacity	in-lb	30k	50k	100k	180k	200k	225k
	N-m	3400	5650	11.3k	20.3k	22.5k	25.4k
Bolt Joint Slip Torque[1]	in-lb	35k	85k	110k	268k	268k	268k
	N-m	4000	9600	12.4k	30.3k	30.3k	30.3k
Safe Overload	in-lb	75k	100k	200k	540k	600k	675k
	N-m	8475	11.3k	22.6k	61.0k	67.8k	76.3k
Failure Overload	in-lb	100k	125k	250k	720k	800k	900k
	N-m	11.3k	14k	28.2k	81.3k	90.4k	101.7k
Torsional Stiffness	in-lb/rad	100M	115M	230M	1.1B	1.2B	1.35B
	N-m/rad	11.3M	13M	26M	24M	138M	152.5M
Torsional Angle @ Capacity	degrees	0.017	0.017	0.017	0.01	0.01	0.01
Rotating Inertia	in-lb sec ²	0.24	0.874	0.874	7.514	7.514	7.514
	N-m sec ²	0.027	0.099	0.099	0.849	0.849	0.849
Axial Load Limit[2]	lb	4000	5000	10k	13.5k	14k	15k
	N	17.8k	22.2k	44.5k	60k	62k	66.7k
Lateral Load Limit[2]	lb	5000	5000	10k	13.5k	14k	15k
	N	22.2k	22.2k	44.5k	60k	62k	66.7k
Bending Moment Limit[2]	in-lb	10k	25k	50k	90k	95k	100k
	N-m	1130	2825	5650	10.2k	10.7k	11.3k
Maximum Speed	RPM	10k	10k	10k	4500	4500	4500
Rotor Weight	lb	10	30	30	100	100	100
	kg	4.5	13.6	13.6	45	45	45
Rotor Material		steel	steel	steel	steel	steel	steel

5300D Series 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°F to +170°F
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
		System Temp. Effect on Zero ¹	± 0.002%FS/°F
Digital Output:	QSPI	Rotor/Stator Temp. Range Usable	+32°F to +185°F
		Rotor/Stator Optional Temp Range Usable	+32°F to +250°F
System Performance		Receiver Temp. Range Usable	0°F to 122°F
Accuracy	Overall, 0.1% FS, combined effect of Non-Linearity, Hysteresis, & Repeatability	Mechanical	
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.	Permissible Radial Float, Rotor to Stator:	± 0.25 in.
		Permissible Axial Float, Rotor to Stator	± 0.25 in.
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	Dynamic Balance	ISO G 2.5
		Sensor Positional Sensitivity	≅ 0.1% FS (180° rotation)
-3dB Bandwidth	DC to 8.5 kHz anti-alias	Power	
Digital resolution	16 bit	Power Requirements	9 to 18 VDC, 15 watts (Note: 90 to 240VAC 50-60 Hz, adapter is supplied)
Analog Resolution	0.31 mV (± 10 volts/65536 (16 bit resolution))	Miscellaneous	
Digital Sample Rate	26,484 samples/sec	Symmetry Adjustment	Factory and User Adjustable ± 0.50% FS
Group Delay	≅ 110 microseconds at 10 kHz	Supplied Cable, Stator to Receiver	24 ft., RG 58/U (BNC plug on stator side, TNC Plug on receiver side)
Noise	≤ 10 mV at 10 kHz	Optional Cable, Stator to Receiver	80 ft. RG 58/U (contact factory for longer lengths)
Noise Spectral Density	< 0.0005%FS per root Hz typical	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



The TORKDISC® and receiver make up a complete system. No additional signal conditioning is required. The receiver box provides voltage, frequency, and digital output via a 25-pin I/O connector.

TORKDISC® Sensor Dimensions

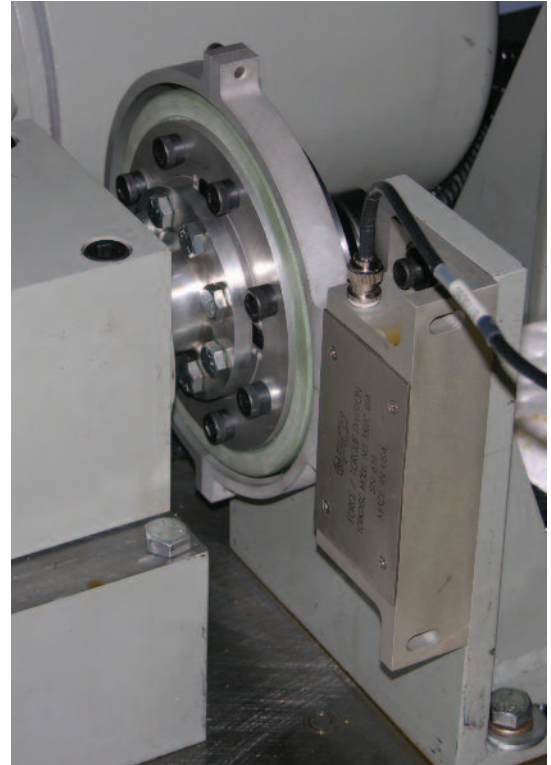
	A	B	C	D	E	F
Series	O.D. - Outside Diameter (including telemetry collar)	Overall Thickness	Male Pilot	Female Pilot	Driven (inner) Bolt Circle	Load (outer) Bolt Circle
5302D	7.00 in (177.8 mm)	1.10 in 27.9 mm	1.999 in 50.8 mm	4.375 in 111.1 mm	(8) 3/8-24 threaded holes, equally spaced on a 3.00 in (76.20 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.



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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.

Note: The acceptable cable lengths between the electronics box and the stator portion of the TORKDISC® is 24, 80, or 112 ft (7.3, 24.4, or 34.1 m), as supplied from factory. Do not shorten cable; coil any excess. [1] Bolt joint slip torque is calculated assuming a coefficient of friction (μ) of 0.1 and that grade 8 socket head cap screws are used and tightened to 75% of yield for steel sensors and 30% of yield for aluminum sensors. Model 5309D-02A requires the use of Supertanium bolts on the inner bolt circle diameter to maintain proper clamping frictional forces, tightened to 70% of yield. [2] 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. [3] Request Technical Note FTQ-STN5 regarding digital output signal.



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AUTO-TORKD-1008

Printed in U.S.A.

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