Multi-Axis Wheel Force Transducer

For Automotive Road Load Data Measurement Applications

Highlights

- One-piece sensor
- Up to 8x faster and easier to mount, setup, align, and calibrate compared to other transducers in the market
- Maximum operating temperature of +302 °F (+150 °C) with superior temperature compensation of 0.003% FS/°F (0.005% FS/°C)
- Exclusive application of fastener technology to achieve robust clamp load and assembly
- Cost-effective universal hub adaptor option for alternating between European, USA, and military wheels
- 150% FS overload, simultaneously in all axes
- Superior sealing for water and dust ingress protection

Applications

- Road Load Data Acquisition (RLDA)
- Drive-file development for full vehicle and module test systems up to 6 DOF
- Development of:
  - Stability control
  - Brake systems
  - Suspension
  - Tires

Series 5400

PCB® Series 5400 Wheel Force Transducers are designed as rugged, one-piece sensors that mount between the vehicle hub and the wheel rim, delivering highly accurate road load data measurement and superior performance in a durable water-resistant package. Possessing superior temperature compensation properties and integral overload stops, these sensors provide a high level of confidence in data acquired during aggressive road events, including heavy braking tests.

Available in a wide variety of sizes for vehicles including passenger cars; light-, medium- and heavy-duty trucks; commercial vehicles including tractor trailers, buses, agriculture, and earth-moving equipment; and military vehicles. Passenger car and light truck units use a custom hub adaptor to accommodate a wide range of vehicle sizes while maintaining vehicle geometry. Heavy truck units mount directly to the vehicle hub. All units can be fitted with either slip ring or telemetry signal transmission, and come equipped with on-board signal conditioning and calibration circuitry for each channel of data measurement.

These sensors are also ideal for calibrating and adjusting biaxial wheel test machines; drive-file development of full vehicle and module test systems up to 6 Degrees of Freedom (DOF); and product development of stability control, brake systems, suspension, and tires.

To best meet your needs, Series 5400 units are available in light-weight aluminum, high-strength stainless steel, and titanium. All units accept modified rims, mounting a wide range of tire sizes, wheel diameters, and offsets. Special one-piece, forged high-strength aluminum rims are available for heavy truck applications. A universal hub adaptor is available that allows a single sensor to be used for European, USA, and military heavy vehicles. This one piece sensor design allows for the same sensor to be used for front steer, dual drive, trailer, and tag axles, as well as for various super single rims accommodating extra wide tires.

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.

Wheel Force Transducer	
Series 5400 Common Specifications	
Non-Linearity	± 0.5%
Non-Repeatability	± 0.25%
Hysteresis	± 0.5%
Crosstalk	± 1% typical ± 3% full scale, maximum
Excitation	± 15 VDC
Output (all axes)	5 VDC (± 0.2%, nominal)
Temperature Range	-13 to +302 °F -25 to +150 °C
Temperature Effect on Output (Maximum)	0.003% FS/°F 0.005% FS/°C
Angle Encoder	Sine/cosine encoder
Coordinates	SAE Standard
Bridge Resistance	Fx, Fy, Fz & My 2800 Ohm, Mx & Mz 1400 Ohm, nominal
Isolation Resistance	2000 MOhm
Overload Capacity (all axes)	150% FS overload capacity, simultaneously
Natural Frequency	> 300 Hz
Shock Tolerance	50 g pk
Environmental	Dust-tight, water resistant, short-term submersible, corrosion resistant

Model Number	Unit	5410-01A Passenger Car	5411-01A Light Truck	5412-01A Light Truck XL	5413-03A Medium Truck	5414-01A Heavy Truck 286	5415-01A Heavy Truck 335	5416-02A Heavy Truck Universal
Fx	lb N	6700 30k	9000 40k	13.5k 60k	13.5k 60k	31.5k 140k	31.5k 140k	45k 200k
Fz	lb N	6700 30k	9000 40k	13.5k 60k	13.5k 60k	31.5k 140k	31.5k 140k	45k 200k
Fy	lb N	3375 15k	4500 20k	6700 30k	6700 30k	15.7k 70k	15.7k 70k	22.5k 100k
Mx	in-lb N-m	36k 4000	45k 5000	75k 8500	88.5k 10k	265k 30k	265k 30k	398k 45k
Mz	in-lb N-m	36k 4000	45k 5000	75k 8500	88.5k 10k	265k 30k	265k 30k	398k 45k
My	in-lb N-m	50k 5600	57.5k 6500	75k 8500	88.5k 10k	265k 30k	265k 30k	398k 45k
Material		Aluminum	Aluminum	Aluminum	Titanium	Aluminum	Aluminum	Stainless Steel
Additional Versions								
Alternate Material		5410-02A SS 5410-03A Titanium	5411-02A SS 5411-03A Titanium	5412-02A SS 5412-03A Titanium	5413-02A SS	5414-02A SS 5414-03A Titanium	5415-02A SS 5415-03A Titanium	5416-03A Titanium

Recommended Signal Conditioner for Wheel Force Transducers

PCB® Model 8175-01A Transducer Interface Unit (TIU) consists of a power supply and signal conditioning electronics required to convert the six force and moment signals from the Wheel Force Transducer into equivalent signals referenced to the wheel axes. Each TIU accommodates one Wheel Force Transducer.

Model 8175-01A

The TIU provides the signal conditioning that is required to convert the wheel force transducer outputs into DC voltages. These voltages are proportional to the instantaneous forces and moments measured. During operation, the wheel is mounted on a test vehicle and the vehicle is driven along a predetermined course. An analog or digital data recorder then records the output voltages.

A TIU Remote Module permits communications between multiple stacked TIUs when more than one Wheel Force Transducer is used.

Model 8175-01A

- Six 10 VDC analog inputs
- 14-bit A/D resolution
- 8 analog outputs
- 5000 Hz signal bandwidth
- 90k Hz sample rate

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PCB® Load & Torque, Inc., designs and manufactures a full line of load cell and torque sensors for numerous industries including: aerospace & defense, automotive, medical rehabilitation, material testing, textile, process control, robotics and automation, and more. PCB® offers exceptional customer service, 24-hour technical assistance, and a **Total Customer Satisfaction** guarantee.

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