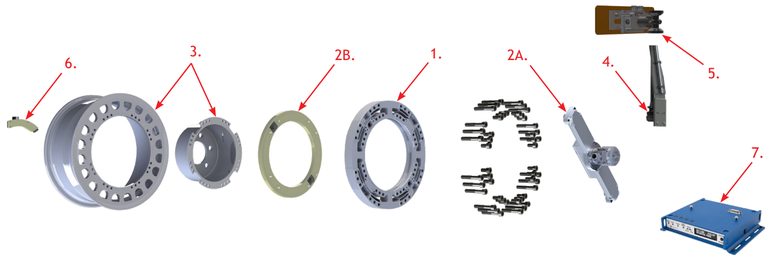
SYSTEM COMPONENTS

Michigan Scientific provides all of the components needed to implement your Wheel Force Transducer system. From custom rim and hub adapters to precision instrumentation for signal conditioning and data transfer, our team of experts will work with you to build a system configured to your specific needs.



1. Wheel Force Transducer (WFT)
   Measures: longitudinal (Fx), lateral (Fy), and vertical (Fz) forces, camber (Mx), torque (My), and steer (Mz) moments

2. Signal Conditioning
   A) Integrated Slip Ring & Amplifier Subassembly
      Spinning amplifier package digitizes all signals before being transmitted through a slip ring assembly, reducing noise and allowing for a small, flexible signal cable
      Assembly contains a high resolution encoder
      OR
   B) Wireless Telemetry Transmitter Subassembly
      Compact, inductively powered transmitter digitizes and transmits signals via radio frequency to the telemetry stator
      Assembly contains high resolution magnetic encoder

3. Custom Hub & Wheel Adapters
   Lightweight rim adapters are made from aluminum and hub adapters are made from titanium

4. Stator Restraining Rod
   Prevents rotation of the slip ring stator

5. Stator Angle Corrector
   Internal high resolution absolute encoder measures the angle of the Stator Restraining Rod and automatically corrects for its angle change.

6. Telemetry Stator Restraint and bracket
   Receives telemetry signal, contains magnetic encoder pick-ups, and induction primary coil

7. CT3 Transducer Interface Box
   Performs real-time coordinate transformations and crosstalk compensation with quick system set up to provide analog, CAN, or Ethernet signal outputs for data acquisition





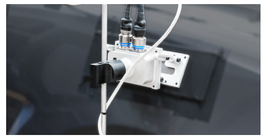
The design and increased accuracy of Michigan Scientific's latest Wheel Force Transducer models, including LW60, LW65, & LW25, allows the user to switch between outboard slip ring and inboard telemetry setups.

For a fast installation and set up, the outboard slip ring assembly is ideal, while public road testing and extreme off-road testing applications utilize the inboard wireless telemetry package.

RELATED PRODUCTS

Stator Angle Correction Device

The Michigan Scientific Stator Angle Correction Device (SAC) is compatible with any of Michigan Scientific slip ring-based Wheel Force Transducers. The SAC device enables Wheel Force Transducer set-up to be even faster and easier, and eliminates the need for over-the-wheel brackets on front-steered vehicle wheels. It adapts to many vehicle types, from small cars to heavy trucks. The SAC reduces steered-wheel errors and provides greater position for reference accuracy.



TrueSlip Slip Angle Sensor

TrueSlip makes slip angle measurements with high accuracy. The sensor optically measures the longitudinal and lateral velocities of the surface below it. TrueSlip measurements include the true SAE defined slip angle. The TrueSlip sensor is compatible with Michigan Scientific Wheel Force Transducers, providing comprehensive information on the relationship between a vehicle tire and the surface of a road.





Wheel Torque Transducer

Michigan Scientific designs and manufactures highly sensitive Wheel Torque Transducers to measure drive and braking torque. Due to the high strength material and weatherproof sealing, the transducers can be used under normal driving conditions. With High Resolution Wheel Torque Transducers it is possible to measure aerodynamic drag, brake drag, tire rolling resistance, and bearing seal drag in on road testing.





Wheel Force Transducers

Precision Instrumentation & Measurement Solutions

Michigan Scientific Corporation

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WHEEL FORCE TRANSDUCER SPECIFICATIONS

Light & Medium Duty Transducer Specifications

	LW25	LW9.5	LW12.8-30	LW12.8-50	LW50	LW55	LW60	LW65	LW9.5-H5
Application	Motorcycle, ATV, & Small Vehicle	ATV & Small Vehicle	Light Car	Passenger Car, SUV, & Light Duty Truck		Small Wheel Vehicle & Scooter	Passenger Car, SUV, & Light Duty Truck		Forklift & Construction Equipment
Rim Size	≥ 13 in * (203 mm)	≥ 10 in * (254 mm)	≥ 12 in (305 mm)	≥ 12 in (305 mm)	≥ 12 in (305 mm)	≥ 8 in (203 mm)	≥ 12 in (305 mm)	≥ 12 in (305 mm)	≥ 10 in (254 mm)
Force Nonlinearity [1] (% of Full Scale)	≤ 0.25	≤ 0.25	≤ 0.25	≤ 0.25	≤ 0.25	≤ 0.50	≤ 0.25	≤ 0.25	≤ 0.40
Transducer Weight	3.2 lb (1.5 kg)	8.0 lb (3.6 kg)	6.6 lb (3.0 kg)	10.3 lb (4.7 kg)	9.7 lb (4.4 kg)	5.7 lb (2.57 kg)	12.5 lb (5.7 kg)	17.5 lb (7.9 kg)	8.5 lb (3.9 kg)
Maximum Static Weight (Fz)	1,200 lb (550 kg)	1,600 lb (725 kg)	1,350 lb (620 kg)	2,200 lb (1000 kg)	2,250 lb (1,020 kg)	2,460 lb (1,120 kg)	2,700 lb (1,225 kg)	2,900 lb (1,320 kg)	4,200 lb (1,900 kg)
Fx, Fz Load Capacity	5,600 lbf (25 kN)	8,000 lbf (35 kN)	6,750 lbf (30 kN)	11,200 lbf (50 kN)	11,200 lbf (50 kN)	12,364 lbf (55 kN)	13,400 lbf (60 kN)	14,500 lbf (65 kN)	21,000 lbf (93 kN)
Fy Load Capacity	2,000 lbf (8.9 kN)	4,000 lbf (17.8 kN)	3,350 lbf (14.9 kN)	5,600 lbf (25 kN)	5,620 lbf (25 kN)	5,620 lbf (25 kN)	7,850 lbf (35 kN)	7,850 lbf (35 kN)	10,000 lbf (44 kN)
Mx, Mz Load Capacity	1,500 lbf·ft (2.0 kN·m)	4,000 lbf·ft (5.4 kN·m)	3,000 lbf·ft (4.0 kN·m)	4,400 lbf·ft (6.0 kN·m)	4,800 lbf·ft (6.5 kN·m)	4,348 lbf·ft (5.9 kN·m)	5,900 lbf·ft (8.0 kN·m)	7,700 lbf·ft (10.5 kN·m)	7,000 lbf·ft (9.5 kN·m)
My Load Capacity	2,500 lbf·ft (3.4 kN·m)	4,000 lbf·ft (5.4 kN·m)	3,000 lbf·ft (4.0 kN·m)	4,400 lbf·ft (6.0 kN·m)	4,800 lbf·ft (6.5 kN·m)	4,348 lbf·ft (5.9 kN·m)	6,650 lbf·ft (9.0 kN·m)	7,700 lbf·ft (10.5 kN·m)	7,000 lbf·ft (9.5 kN·m)
Version	Slip Ring and Telemetry	Slip Ring	Slip Ring	Slip Ring	Slip Ring and Telemetry				

* 8 in and larger is possible with alternative rim adapter designs.

Heavy Duty Transducer Specifications

	LW-2T-20K	LW-2T-30K	LW150	LW-2T-40K	LW-2T-50K	LW-2T-60K-S	LW-2T-100K-S	LW450	LW700
Application	Pick-up Truck & Heavy SUV	Medium Duty Truck & Bus, Skid Steer	Truck & Bus	Forklift, Truck, & Bus	Class 8 Truck, Agricultural & Construction Equipment				
Rim Size	≥ 16 in (406 mm)	≥ 15 in (381 mm)	≥ 22.5 in (495 mm)	≥ 15 in (381 mm)	≥ 19.5 in (495 mm)	≥ 20 in (508 mm)		≥ 22.5 in (572 mm)	≥ 24 in (610 mm)
Hub Size (PCD) [2]	≤ 8.2 in (210 mm)	≤ 10.4 in (265 mm)	≤ 13 in (335 mm)	≤ 10.4 in (265 mm)	≤ 11.2 in (285 mm)	≤ 13 in (335 mm)		≤ 13 in (335 mm)	≤ 16.7 in (425 mm)
Force Nonlinearity [1] (% of Full Scale)	≤ 0.50	≤ 0.50			≤ 1.00	≤ 1.00		≤ 0.50	
Transducer Weight	23.4 lb (10.6 kg)	22.0 lb (10.0 kg)	46.0 lb (20.9 kg)	23.0 lb (10.4 kg)	38.5 lb (17.5 kg)	62.5 lb (28.4 kg)	66.0 lb (29.9 kg)	78.6 lb (33.7 kg)	142.0 lb (64.4 kg)
Maximum Static Weight (Fz)	4,000 lb (1,815 kg)	6,000 lb (2,720 kg)	9,675 lb (4,400 kg)	8,000 lb (3,630 kg)	10,000 lb (4,540 kg)	13,500 lb (6,125 kg)	20,000 lb (9,070 kg)	20,000 lb (9,070 kg)	52,360 lb (23,750 kg)
Fx, Fz Load Capacity	20,000 lbf (90 kN)	30,000 lbf (133 kN)	33,700 lbf (150 kN)	40,000 lbf (178 kN)	50,000 lbf (222 kN)	67,400 lbf (300 kN)	100,000 lbf (445 kN)	101,150 lbf (450 kN)	157,360 lbf (700 kN)
Fy Load Capacity	10,000 lbf (44 kN)	15,000 lbf (66 kN)	16,850 lb (75 kN)	20,000 lbf (89 kN)	25,000 lbf (111 kN)	33,700 lbf (150 kN)	50,000 lbf (222 kN)	50,580 lbf (225 kN)	157,360 lbf (700 kN)
Mx, Mz Load Capacity	11,000 lbf·ft (14.9 kN·m)	22,000 lbf·ft (30 kN·m)	29,500 lbf·ft (40 kN·m)	29,600 lbf·ft (40 kN·m)	50,000 lbf·ft (68 kN·m)	60,000 lbf·ft (81 kN·m)	80,000 lbf·ft (108 kN·m)	100,000 lbf·ft (135 kN·m)	202,830 lbf·ft (275 kN·m)
My Load Capacity	15,000 lbf·ft (20.0 kN·m)	22,000 lbf·ft (30 kN·m)	29,500 lbf·ft (40 kN·m)	29,600 lbf·ft (40 kN·m)	50,000 lbf·ft (68 kN·m)	60,000 lbf·ft (81 kN·m)	80,000 lbf·ft (108 kN·m)	100,000 lbf·ft (135 kN·m)	202,830 lbf·ft (275 kN·m)
Version	Slip Ring and Telemetry								

[1] Nonlinearity may vary among data channels. See product datasheet for specification of each channel.
[2] Larger Hub PCDs can be accommodated by using two-piece Hub Adapters.

SYSTEM OVERVIEW

Michigan Scientific Wheel Force Transducers output three forces, three moments, three accelerations, wheel speed, and wheel position signals to provide complete spindle load data with extreme accuracy. Every system combines a high strength, lightweight transducer with weatherproofed protective coatings for superior reliability and durability in a variety of driving conditions.

Features

- Measures 3 forces and 3 moments
- Measures X, Y, and Z accelerations (slip ring version only)
- IP67-rated design for harsh environments
- Simple installation, setup, and operation
- Lightweight
- Superior reliability
- Excellent customer support
- 3-year warranty

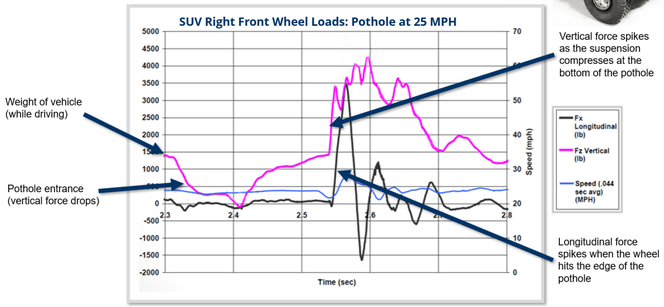
Applications

- Durability testing
- Computer model validation
- Vehicle dynamics
- Brake development
- Traction studies
- Coefficient of friction measurements
- High-speed course testing
- Off-road driving



Our Wheel Force Transducers are built for challenging conditions including off-road, military field testing, agricultural work, laboratory testing, durability courses, and road tests. They're used on motorcycles, passenger cars, trucks, buses, ATVs, tractors, and heavy equipment, delivering reliable measurements no matter the terrain or testing scenario.





CT3 WHEEL FORCE TRANSDUCER USER INTERFACE ELECTRONICS

Real-Time

- Coordinate transformation
- Crosstalk correction
- Offset correction
- Polarity correction





Embedded Webpage

Setup options, correct file type creation, firmware updates, and more can be done via the CT3 embedded webpage which can be accessed via USB connection to a computer. When multiple WFTs are used on one vehicle, the CT3 units are stacked together, and communication is shared between electronics.

User Friendly

A display on the front of the CT3 displays the serial number of the WFT connected to CT3, the current selected setting, and any error messages that may arise. The CT3 also has easy to initiate Zero, Shunt Calibration, and Zero Angle features, making WFT setup simple and quick.

Output Options

The CT3 has several options for signal outputs including; CAN FD, CAN 2.0, EtherCAT, Ethernet with IEEE 1588 synchronization, and analog.

CALIBRATION

Michigan Scientific helps our customers produce optimal test results by providing precision measurement equipment. Our calibration services ensure the ongoing accuracy and consistency of your transducer. Contact us for pricing and lead times.

Calibration Schedule

Michigan Scientific recommends that customers send in their transducers for calibration every two years.

Quality Management System

The quality management system that includes the design and manufacture of Michigan Scientific Wheel Force Transducers is certified to the ISO 9001:2015 standard. The calibrations are accredited to ISO/IEC 17025:2017 standards. All reference measurement equipment is traceable to the National Institute of Standards and Technology (NIST).

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