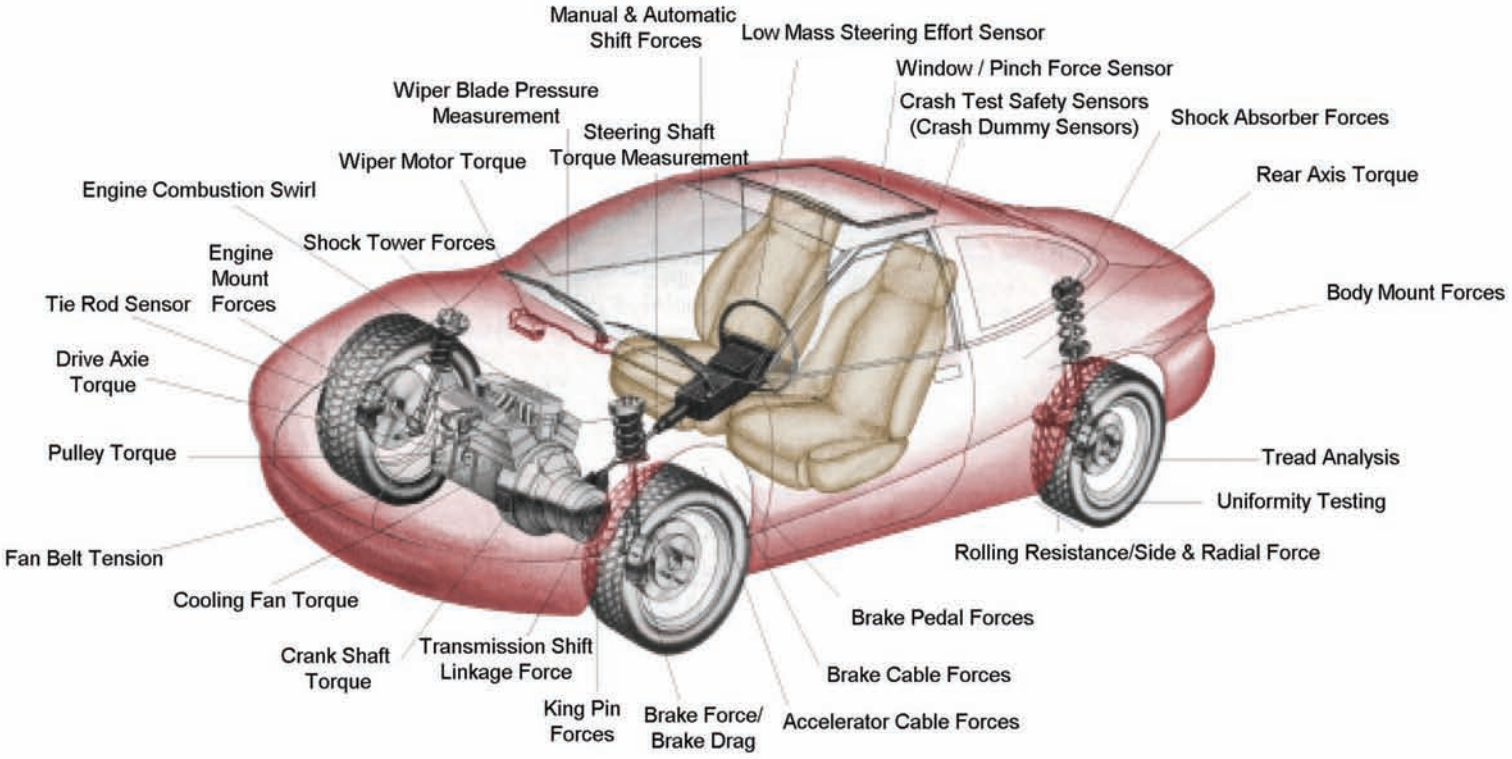
Vehicle Sensors 車輛感測器



Sensor Developments Inc.

Innovations in force measurement

Also:

- Digital FM Telemetry
- Custom Strain Gaging
- Slip Ring Assemblies
- Complete Testing Services

駿融公司代理的美國SDI公司成立於1976年，專業於測力感測器的工程諮詢/設計/製造，在力的量測及多軸感測器設計尤其卓越，提供多樣應用力測量解決方案，滿足不同工業界需求，包括 - OEM，汽車，航空，醫療，核能，紡織等。

SDI所提供全系列的力和扭矩感測器產品已長久為世界各大知名汽車製造商認可並採納，以評估他們的設備。

在下面的章節中，您會發現SDI產品，提供車輛進行各式各樣功能的性能測試，無論是在公路行駛性能，或在實驗室中。SDI感測器已被用於許多不同產業的車輛類型和各種自定義應變能力測試。一些例子包括休閒車，摩托車，高爾夫球車，建築機械，農業機械，汽車（混合動力電動汽車，商業轎車，輕型卡車，SUV），重型卡車，軍用車輛，和賽車等。

如果現有感測器不能完全滿足您的要求，請立即聯繫我們尋求幫助， SDI將很樂意提供專業知識及技術，以客製化服務，解決您的測量的需求。

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目錄

01184 Series

DIGITAL FM TELEMETRY
STEERING EFFORT SENSORS

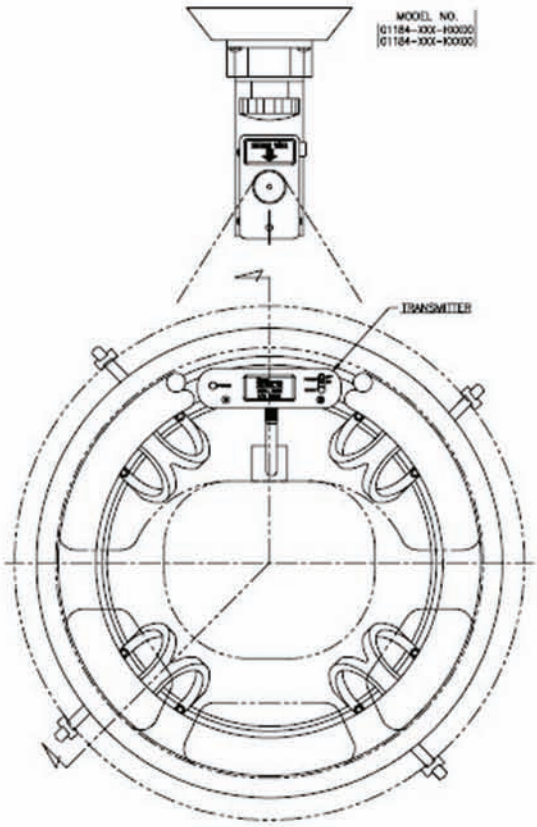
Digtial FM telemetry offers continuous, non-contact torque data from the very low mass, rotating steering sensor to a stationary receiver. This system provides a portable, state-of-the-art steering effort sensor. It can be used in the field, laboratory, or on the test track to measure steering torque and angle requirements.

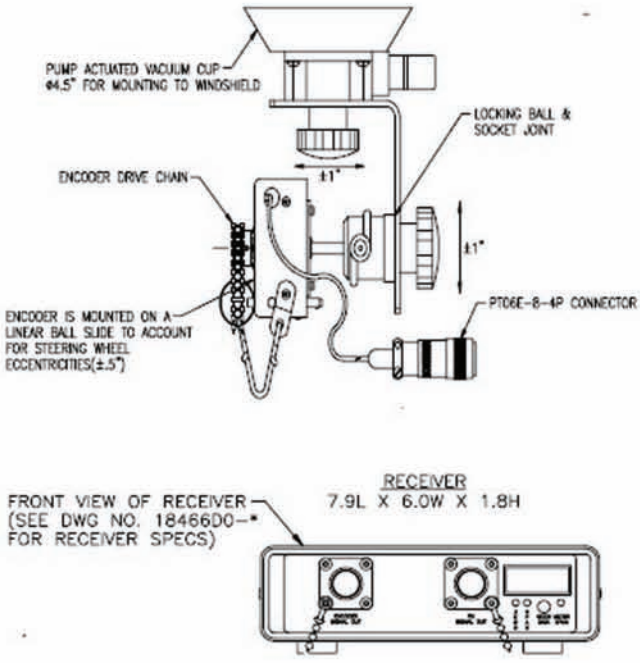
SPECIFICATIONS

Capacity (in. lbs.) F.S. ..... 200, 500, & 1,000
Output nom., F.S. ..... +/- 5 volts DC
Signal Coupling ..... FM Transmitter/Receiver
Encoder (optical) ..... 7,200 PPR w/Quadrature
High (H) Resolution (degrees) ..... .05
Max Range (degrees) ..... +/- 409
Output at max range (volts) ..... +/- 5
Low (L) Resolution (degrees) 0.2
Max Range (degrees) ..... +/- 1638
Output at max range (volts) ..... +/- 5
Rate (degrees/sec) 2.8
Range (degrees/sec) ..... +/- 1000
Output at max range (volts) ..... +/- 5
Mass Moment of Inertia (in lb sec²) ..... .20

FEATURES

- Low system mass
- Airbag compatibility
- No drag from bearings or slip rings
- Quick and easy installation
- Digital telemetry to eliminate signal interference





01227

STEERING EFFORT SENSOR

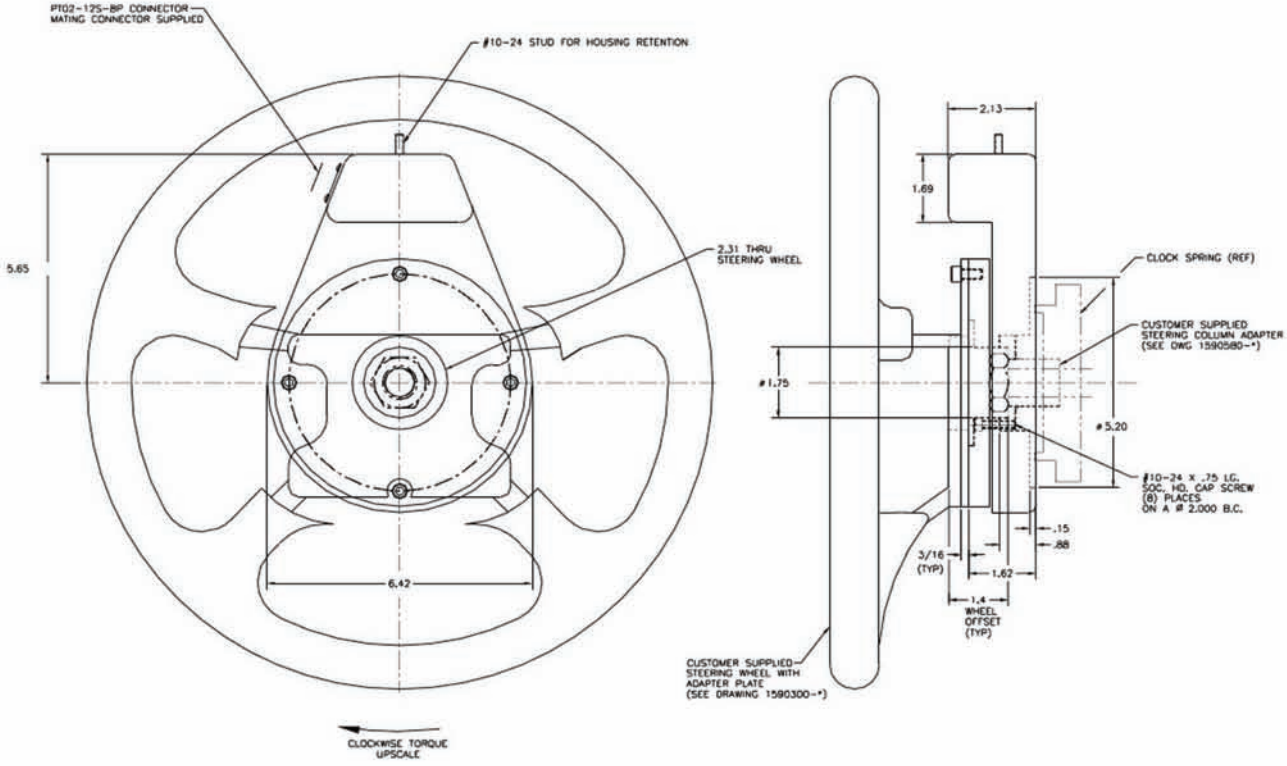
This low profile steering effort sensor is installed inline with the steering column and is virtually unnoticed by the driver. 01227 is used to evaluate steering torque and angle in new and existing steering systems and components in automobiles, trucks, and buses.

SPECIFICATIONS

Capacities..... 300 - 2000 in-lbs.
Output F.S, nominal..... 2.0 mV/V
Torque accuracy..... +/- 0.1% F.S.
Optical encoder resolution (1440 PPR)..... 0.25°/pulse
Compensated temperature..... 70 to 170°F
Useable temperature..... -65 to +250°F
Temperature effect on zero..... 0.002% of F.S./°F
Temperature effect on span..... 0.002% of Rdg./°F
Bridge resistance..... 350 Ohms
Excitation voltage, maximum..... 20 Vdc
Excitation/Signal transmission..... Slip ring coupled

OPTIONAL FEATURES

- Encoder to analog convertor
- High level analog torque signal output
- Steering column adapter plates
- Replace encoder with 10kohm potentiometer



01027 Series

STEERING EFFORT SENSOR

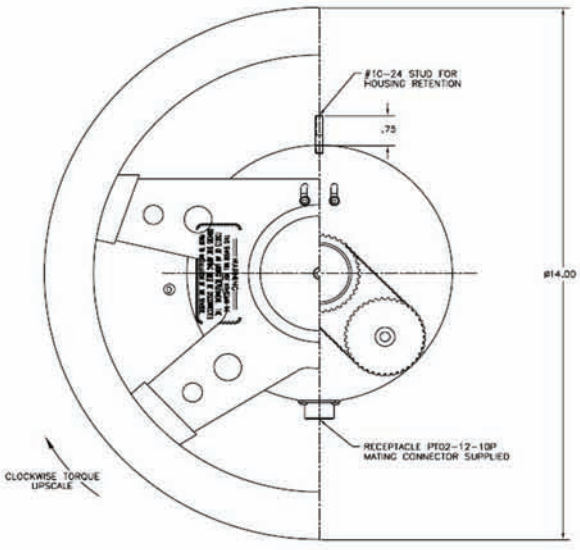
This steering effort transducer was designed to evaluate steering torque requirements of non-airbag equiped, new and existing steering systems and components used in automobile, trucks, buses, and material handling equipment. Quantitative evaluations of steering systems, steering geometries, tire interactions, and safety factors are made using this device. The steering effort sensor is equipped with a 14" steering wheel. This is fastened to the existing steering wheel by means of a fixed or optional adjustable 3 point clamp assembly. For direct steering shaft attachment, a custom adapter plate is available.

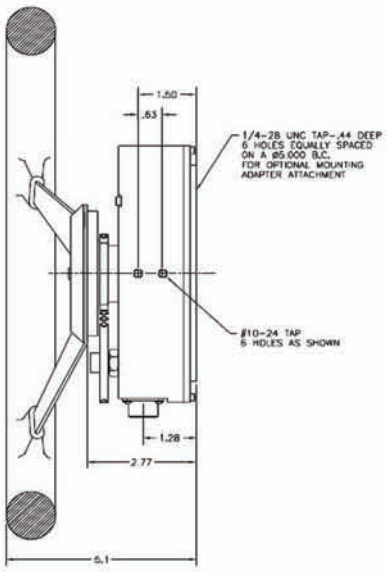
SPECIFICATIONS

Capacities	100 to 3,000 in.- lbs.
Overload capacity	150% of F.S.
Output at full scale load	2.0 mV/V nominal
Non-linearity	0.10% of F.S.
Hysteresis	0.10% of F.S.
Zero balance	1% of F.S.
Compensated temperature	70 to 170°F
Useable temperature	-65 to +250°F
Temperature effect on zero	0.002% of F.S./°F
Temperature effect on span	0.002% of Rdg./°F
Bridge resistance	350 Ohms
Excitation voltage, maximum	20 Vdc
Excitation/Signal transmission	Slip ring coupled
Resolution	Infinite
Encoder	Resistive
Encoder range	10 turns - 10K Ohms

OPTIONAL FEATURES

- High level analog torque signal output
- Steering column adapter plates
- Replace 10kohm potentiometer with optical encoder
- Encoder to analog convertor





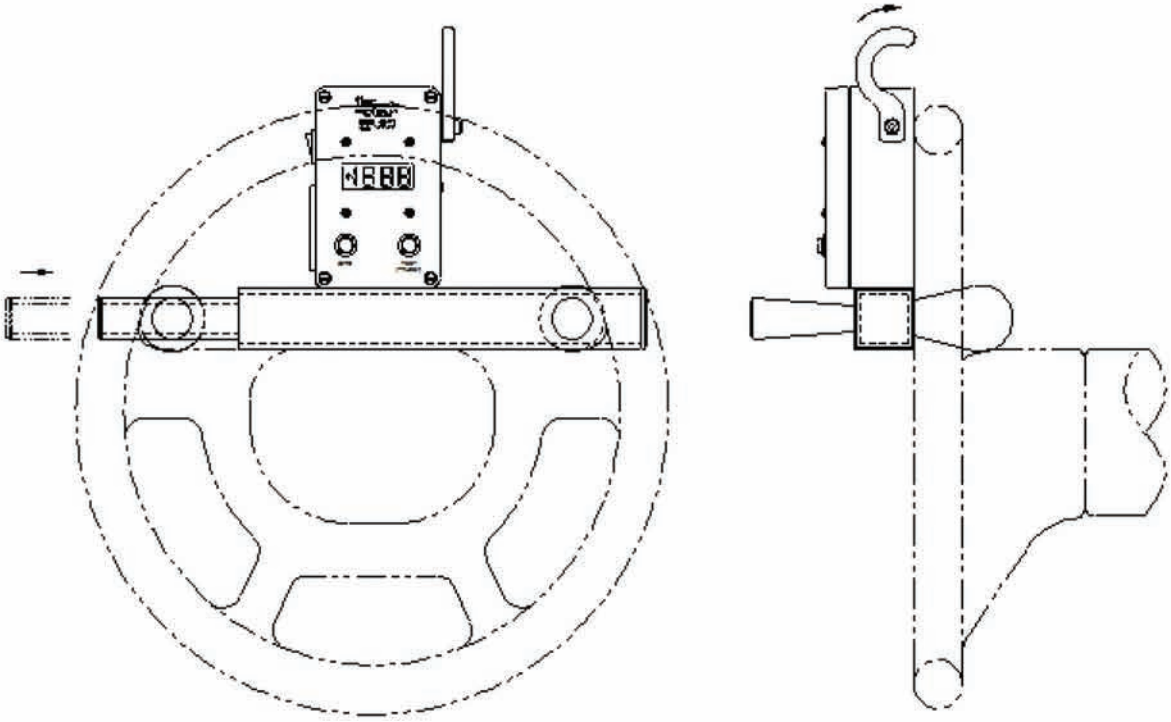
90413 Series

DRIFT ANGLE SENSOR

The Model 90413 sensor measures steering angle using a bi-directional MEMS inclinometer. The inclinometer is oriented such that one axis measures the steering angle directly, while the other axis measures the tilt angle of the wheel. When the steering wheel is tilted, the sensitivity of the steering angle measurement changes. This is not a property of the MEMS sensor, but is the result of physical reality and can be computed using geometric principles. The measurement of the tilt angle allows the Model 90413 to compensate for these changes in sensitivity, so that the sensor measures accurately within its range of tilt and steering angle.

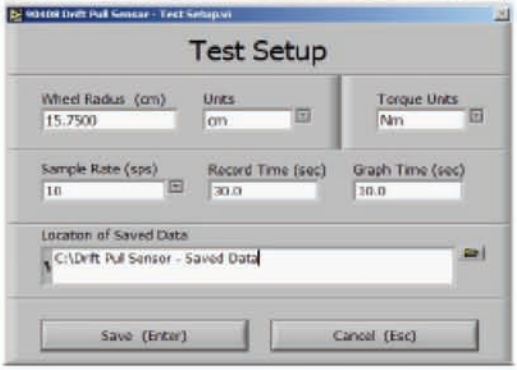
SPECIFICATIONS

Input Voltage	5 - 9VDC
Current Consumption	42mA
Recommended Battery	9VDC Alkaline
Approximate Battery Life	10 Hours
Steering Angle	+/- 19.99 degrees
Tile Angle	-0 to +40 degrees
Accuracy	+/- .1 degree
Operating Temperature	0 – 50 degC



90408 Series

DRIFT PULL SENSOR



This special steering torque and angle sensor is specifically designed to test drift pull on vehicles. Featuring integrated electronics that are powered by the USB connection, operators are able to use their laptop computer to acquire and process torque and angle.

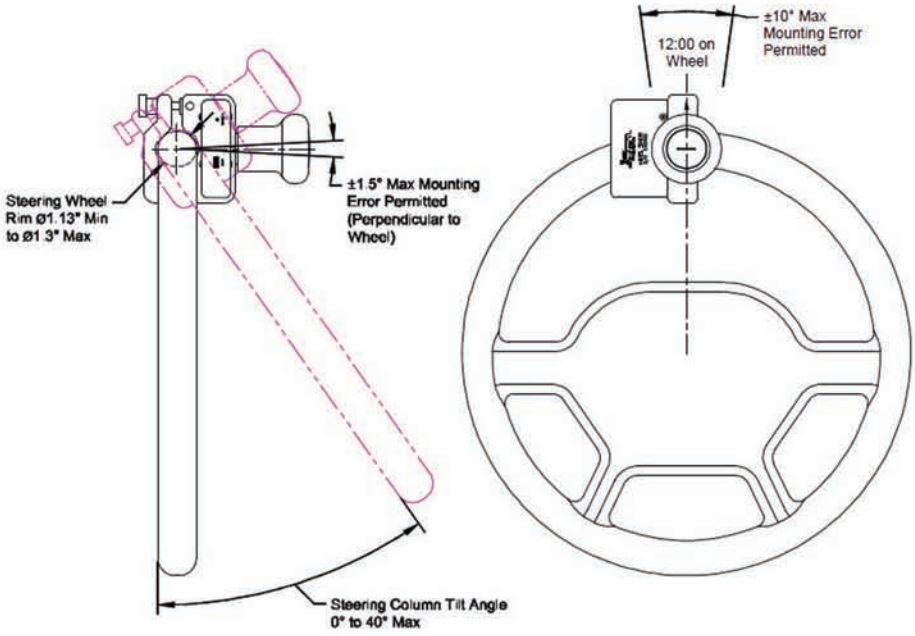
The unit is easily clampled to the vehicles steering wheel, tared to establish vehicle ground, and allowed to run at a preset recording period. The torque and angle data is then stored and available for further analysis.

SPECIFICATIONS

Capacity .... 13lbs/58Newtons of moment force (approx. 85in-lbs/9.5Nm of torque).
Overload capacity..... 150% of F.S.
Output at full scale load ..... USB 1.0/2.0 compatible
Non-linearity..... 0.10% of F.S.
Hysteresis..... 0.10% of F.S.
Zero balance..... 1% of F.S.
Temperature effect on zero..... 0.002% of F.S./°F
Temperature effect on span..... 0.002% of Rdg./°F
Bridge resistance..... 350 Ohms
Angle Resolution ..... .05 degrees
Angle Range ..... +/-20 degrees

OPTIONAL FEATURES

- Custom software
- Higher capacities



77016 Series

MULTI-AXIS WHEEL FORCE SENSOR

The multi-axis wheel force sensor is used to measure all dynamic forces and moments on the wheel with reference to the vehicle coordinate system. The 77016 series consists of three primary components: The wheel sensor, which measures all six forces and moments; the rotating electronics package which measures angular postion and converts the force and torque vectors into a non-rotating frame of reference; and the stationary electronics package which "unpacks" the data from the sensor into individual analog signals.

Wheel Sensor w/ Tire

FEATURES

- High level analog outputs for each force and moment.
- All 6 forces and moments are measured with reference to the stationary vehicle coordinate system in real time. No post processing of the data required.
- High sample rate.
- Digital transmission of signal data. No signal degradation, no slip rings or brush blocks to maintain.
- All forces and moments are overload protected to 150% of fullscale.
- Direct mating of sensor to the customer rim or wheel.
- Custom configurations are available.

System Components

SPECIFICATIONS

Full scale capacities available for passenger vehicles and light trucks. Typical ranges include:.....

Fx & Fz = ±25kN / ±36kN
Fy = ±20kN / ±28kN
Mx & Mz = ±4.5kN-m / ±8kN-m
My = ±7.5kN-m / ±13kN-m

Output at fullscale loads ..... ±5Vdc
Hysteresis ..... 0.5% of full scale
Non-Linearity..... 0.5% of full scale
Maximum speed 2500RPM
Encoder ..... 1500 pulse per revolution
Tach Generator..... ±5Vdc
Bridge output filter frequency 1000Hz
Sample Rate..... 10240Hz/channel
A/D convertor resolution ..... 14 bit
Filters, 2-pole Butterworth 1000Hz
Useable temperature (sensor only) ..... -65° F to +250° F
Cross-talk ..... <2% full scale
Wheel sizes ..... 15"-17"

90360 Series

WHEEL TORQUE SENSOR

This telemetry based wheel torque sensor is used to measure the torque, speed, and temperature of tire/brake systems without the need for wheel rim modifications or anti-rotation brackets. The 90360 series consists of three primary components: The torque sensor, vehicle adapter plates to integrate the sensor, and the digital FM telemetry to transmit and process signals. All output signals are conditioned to a high level analog output.

Wheel Sensor w/ Tire

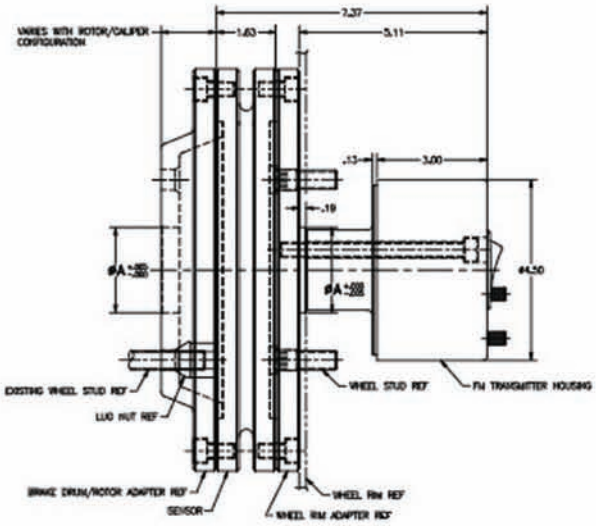
FEATURES

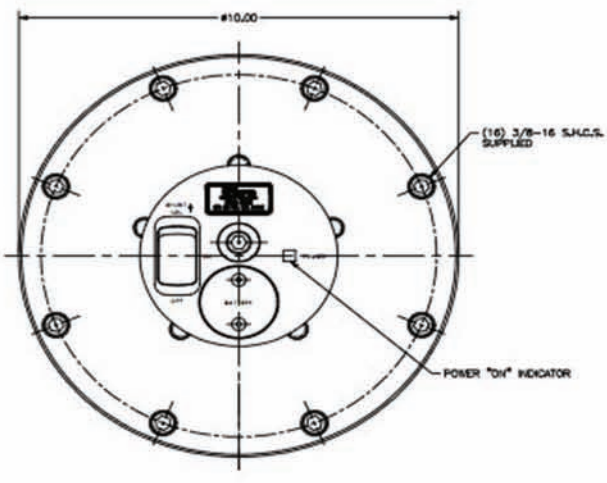
- Non-contact signal transmission.
- High level analog outputs for torque, speed, and temperature (2 temp channels).
- High extraneous load carrying capabilities.
- RS-232 serial output (torque only).
- On-board shunt calibration and power switch.
- 9V Battery powered transmitter.
- Vehicle adapter plates with minimal centerline offset (no rim modifications).
- Custom wheel rims available to maintain tire centerline.
- Custom capacities and configurations available.

System Components

SPECIFICATIONS

Typical full scale loads ..... 7,000in-lbs to 60,000inlbs
Maximum rpm 1200
Temperature reading range (RTD based) ..... -100 to +500° C
Analog output (receiver) ..... 0 to +/- 5V (FS)
Sensor low pass filter ..... 300Hz, 4-pole Butterworth type
Sensor Hysteresis ..... 0.25% of full scale
Sensor Non-linearity ..... 0.25% of full scale
Sensor signal sample rate ..... 950 Hz
Cross-talk ..... <2% full scale





10293

PINCH FORCE SENSOR

Model 10293, Window/Sunroof Pinch Force Sensor Kit, is used to measure the pinch force of automatically closing windows, doors, and sunroof systems under defined spring rates and displacements. The sensor features five inter-changeable spring packs, adjustable measurement height, and a hand held peak force display.

The user will configure the sensor spring rate by screwing in the spring packs and adjusting the window bracket to the desired window opening. In operation, the sensor is clipped onto the window and the closer actuated. The companion instrument records the peak force developed to verify compli-ance to the specifications.

The sensor was designed to help automakers and OEM's comply with FMVSS 118 and International standards for interior fittings.

SPECIFICATIONS

- Output (at 200N Max Load) ..... 2mV/V nominal
- Non-linearity (%F.S.) 0.1
- Hysteresis (%F.S.) 0.1
- Overload Capacity 1,000N
- Compensated Temperature Range (°F) ..... 70 to +170
- Usuable Temperature Range (°F) ..... -65 to +250
- Spring Rates and Maximum Load:

Spring Rate	Max Load
2 N/mm	40 N
5 N/mm	85 N
10 N/mm	125 N
20 N/mm	200 N
65 N/mm	200 N

SENSOR KIT INCLUDES THE FOLLOWING:

- 5 spring packs (2, 5, 10, 20, 65 N/mm)
- 200 mm extension bracket
- Sensor attachment assembly
- Signal cable

OPTIONAL DISPLAY UNITS INCLUDE:

- PMAC 2000, Model 90222
- PTI, peak track instrument, Model 90323
- USB Sensor Link, Model 90386

OPTIONS

- 300N Full-scale capacity
- 100mm and 150mm Extension brackets
- Custom spring rates
- **90411 Power Sliding Door Assembly** NEW!
- **90418 Vent Force Assembly** NEW!

Standard unit on window

Sensor shown with 200mm Extension

Sensor shown with 90411 Assembly

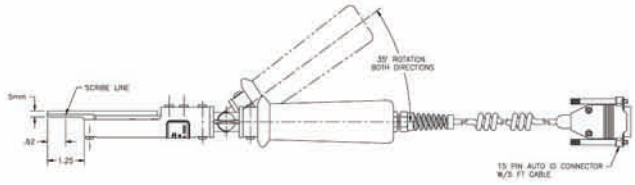
Sensor shown with 90418 Assembly

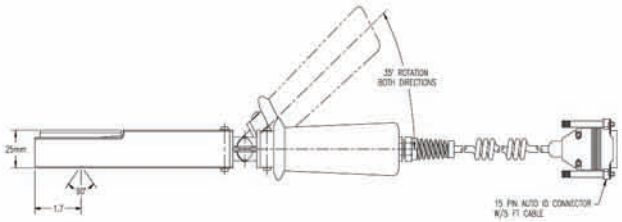
90250

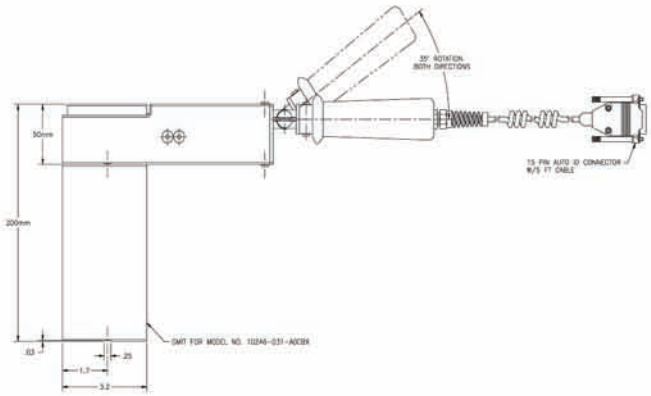
PINCH FORCE SENSOR

Model 90250, Window/Sunroof Pinch Force Sensor Kit, is used to measure pinch force of automatically closing windows, doors, and sunroof systems. It includes four sensors, the PMAC 2000 portable readout instrument, and hard shell carrying case. The hand held units measure and record the closing force of a power window or sunroof. The sensors have a tuned stiffness and were designed to help automakers and OEM's comply with FMVSS 118 (Federal Motor Vehicle Safety Standard section 571, title 49).

The instrument and sensors are Auto-ID enabled allowing self-calibration with no operator intervention.







FEATURES

- Field tested
- Easy to use
- Peak recording feature
- Auto-ID feature
- Battery pack included

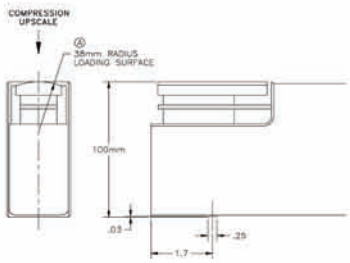
KIT INCLUDES ALL FOUR SIZES REQUIRED BY FMVSS

- 5 mm @ 65 N/mm stiffness (Model 10246-031-A0C00)*
- 25 mm @ 65 N/mm stiffness (Model 10246-031-A0000)*
- 50 mm @ 20 N/mm stiffness (Model 10246-031-A0A00)*
- 200 mm @ 20 N/mm stiffness (Model 10246-031-AB00)*
- PMAC 2000 instrument (Model 90222)
- Mar proof contact surfaces on larger units

*Each sensor is overload protected to 300% F.S.

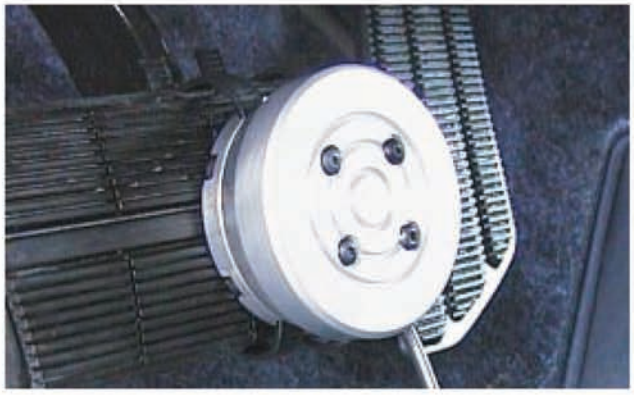
OPTIONS

- 500N FS capacity wand with 100mm @ 20N/mm stiffness (Model 10246-012-AOEBA).



10118

BRAKE PEDAL FORCE SENSOR



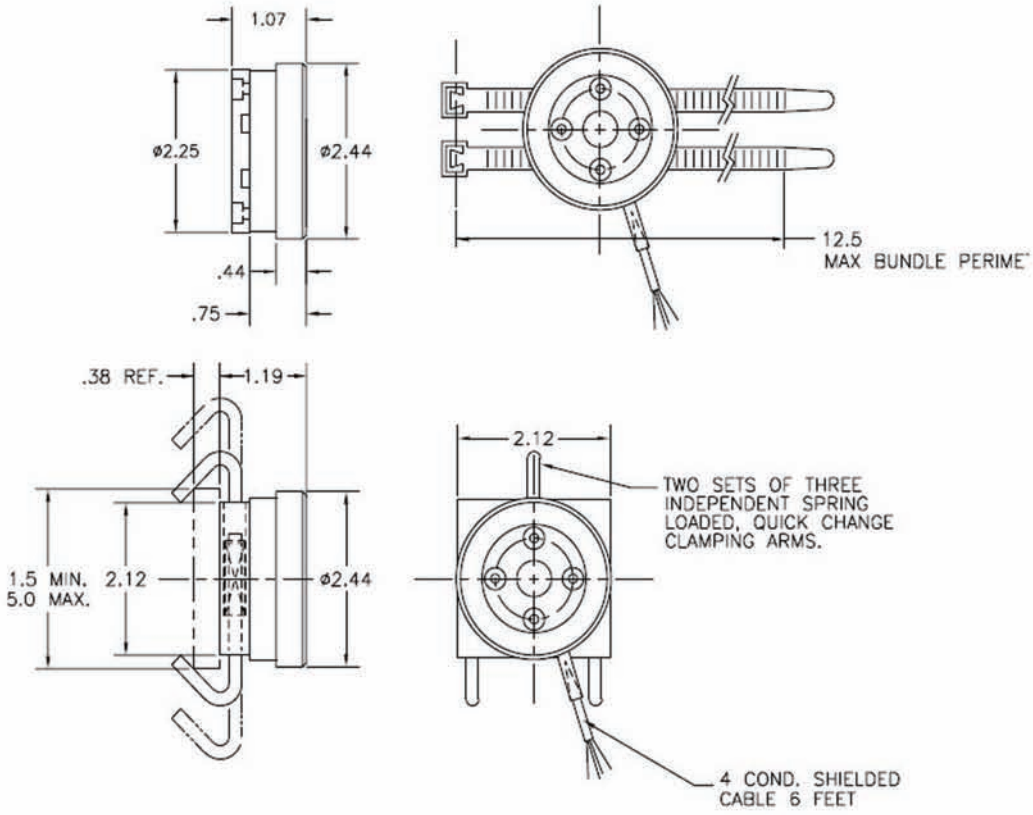
The 10118 Pedal Force sensor is used to evaluate the force requirements of new and existing brake systems. The transducer adapts to pedals in automobiles, trucks, buses, or material handling equipment. It mounts directly to the pedal with spring-loaded, quick-change clamping arms or cable ties for easy installation. The sensor is available in capacities ranging from 25 to 400 lbs. The required capacity needs to be specified at time of order.

SPECIFICATIONS

Capacities..... 25 to 400 lbs. (See chart)
Overload capacity..... 150% of F.S.
Output at full scale load..... 2.0 mV/V nominal
Non-linearity..... 0.10% of F.S.
Hysteresis..... 0.10% of F.S.
Zero balance..... 1% of F.S.
Compensated temperature..... 70 to 170°F
Useable temperature..... -65 to +250°F
Temperature effect on zero..... 0.002% of F.S./°F
Temperature effect on span..... 0.002% of Rdg./°F
Bridge resistance..... 700 Ohms
Excitation voltage, maximum..... 20 Vdc

DIMENSIONS

MODEL	CAPACITY
	LB
10118-250	25
10118-051	50
10118-012	100
10118-022	200
10118-251	250
10118-042	400



50006

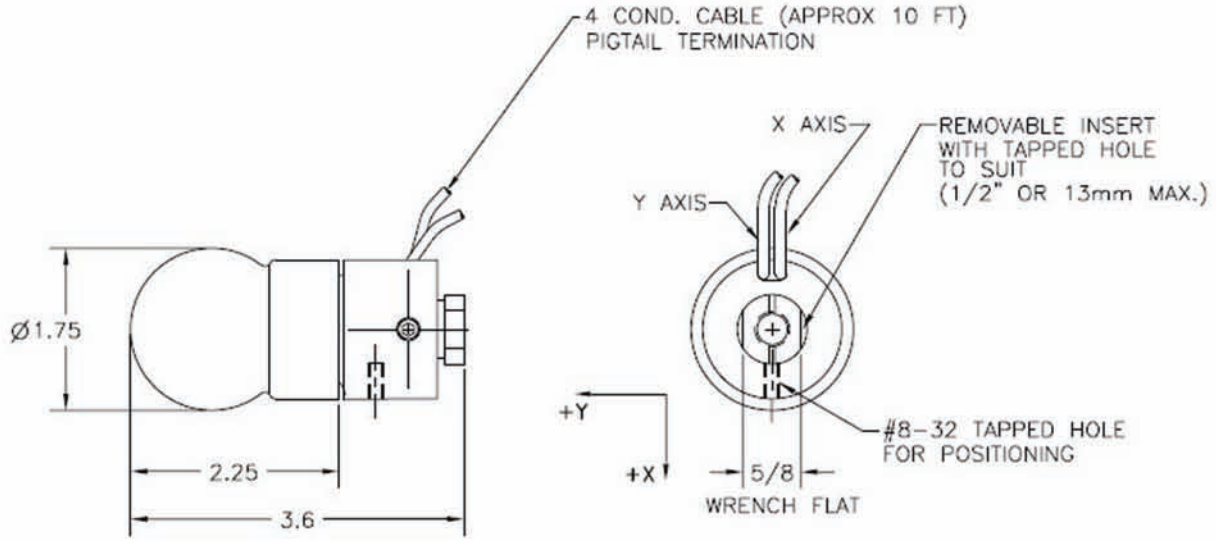
SHIFT KNOB SENSOR

The shift knob sensor mounts either directly (replacing the gear shift knob) or indirectly with a shaft gripping adapter and allows real time measurement of the "X" and "Y" force components as experienced by the driver. Dynamic recording of the signals produced by the sensor allows the design engineer to immediately verify changes in linkage mechanisms which can improve the subjective feel of the automobile to the driver.

SPECIFICATIONS

Capacities	50, 100, 200 lbs.
Overload capacity	150% of F.S.
Output at full scale load	2.0 mV/V nominal
Non-linearity	0.25% of F.S.
Hysteresis	0.25% of F.S.
Zero balance	1% of F.S.
Compensated temperature	70 to 170°F
Useable temperature	-65 to +250°F
Temperature effect on zero	0.002% of F.S./°F
Temperature effect on span	0.002% of Rdg./°F
Bridge resistance	350 Ohms
Excitation voltage, maximum	20 Vdc
Adaptor	Ordered separately

Also available in a Column Lever Sensor



10295

PARKING BRAKE CABLE CHECKER

Model 10295 was developed to measure the tension force required to engage the various parking brake cables. Automobile manufacturers utilize this easily installable transducer to check the activation force levels before vehicles leave the factory. The design of the sensor allows for quick spot checking of cable tensions while the cable is installed and in use.

MODEL	CAPACITY (LBS)	CABLE DIA
10295-351	350	3mm
10295-851	850	5/32"
10295-182	1800	3/16"
10295-252	2500	7/32"

90361

SMALL CART WHEEL TORQUE SENSOR

This sensor was created to measure wheel torques on a small utility cart. It uses much of the same technology of our 90360 wheel torque sensor, but it's design is unique to a very small brake rotor assembly used on these types of vehicles.

10020

ROAD SIMULATOR LOADS

It is not always possible to conduct on-road tests of automobile components. Automotive road simulators suspend a vehicle by its axles and servo-controlled hydraulic cylinders reproduce road induced forces. Tension and compression road end load cells 10020, 10024, 10066 (10020 shown) were installed between hydraulic actuators and the test vehicle. The sensors were used to generate feedback signals as simulated road conditions were applied to the vehicle.

Vehicle Sensors

90332

DRIVESHAFT TORQUE W/ DIGITAL FM TELEMETRY

This system combines our custom strain gaging abilities and digital FM telemetry system to make a non-contact rotating torque system. Propshaft torque can be taken as the vehicle is evaluated on the road or at the proving grounds.

92000

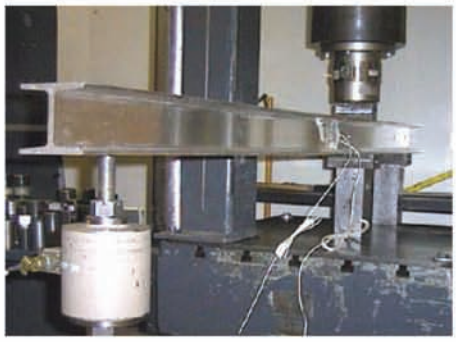
TIE ROD SENSOR

A vehicle tie rod was modified to produce a one component force sensor. This tie rod sensor was then reassembled into the steering system, interfaced with an output indicator, and data was recorded. This information is used to confirm design specifications and to set new specifications for the redesign of existing steering components. Additional options included on-board amplification.

92000

OUTRIGGER FORCE SENSOR

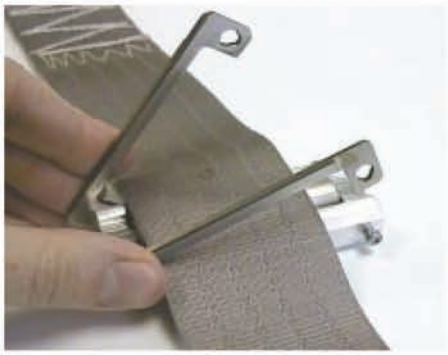
This package features our custom strain gaging abilities and versatility in calibration. Here, we turned an outrigger support into a force sensor. It maintains the safety of the vehicle against accidental rollover, as well as measure the force created by the vehicle tilt.



10287

SEAT BELT SENSOR

This sensor is designed to measure the tension forces in a seat belt system up to 3500lbs. Primarily used in the crash measurement industry, this sensor can also be used to measure the loading forces of any belt tightening system.



90333

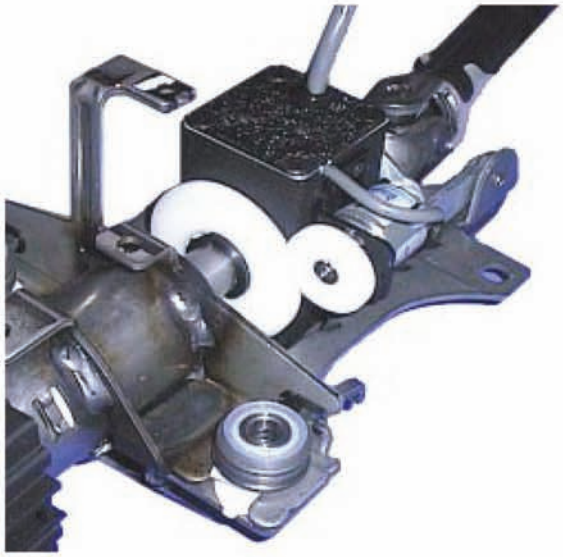
MOBILE DYNAMOMETER

This system was created to measure the torque, speed and horsepower of a refurbished large vehicle engine without the need for a fixed dynamometer station. The custom designed torque sensor featured ISO flanges to allow for direct connection to the existing driveshaft. The torque signal was transmitted using our digital FM telemetry system and combined with other signals from the vehicle for a complete mobile horsepower monitoring system. This package is also an excellent fit for monitoring the performance of refurbished engines used in propeller driven aircraft.

90366

INSTRUMENTED STEERING COLUMN

These types of projects feature our custom design and strain-gaging abilities in a single package. By using the existing vehicle steering column, we're able to turn the component into a torque/angle steering instrument. Once completed, the column is reinstalled back into the vehicle and is driven by the operator without any interference from add-on sensors or fixtures.



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STEERING DAQ BOX

This instrument is dedicated for use with the steering columns as shown above. It features three high level analog outputs for torque, rate, and angle. It also features user selectable low, medium, and high resolution ranges. An additional feature is the use of our Auto-ID system which allows the instrument to be used with multiple steering columns without the need to reprogram calibration factors.