

RoaDyn P1ST, P1MT, P1HT

Wheel torque transducers for utility vehicle applications

Type 9299A...

Patent No. US7784336

The RoaDyn P1ST, P1MT and P1HT wheel torque transducers are universal sensors for measuring the traction torque M_y of utility vehicles.

- Two independent measuring ranges of 10 % and 100 % at full resolution
- Easy and quick assembly on various vehicle types with appropriate adaptations
- Short setup times
- Low additional unsprung mass and low moment of inertia
- Automatic identification of the wheel torque transducer (telemetry)
- Available as single, super-single and twin wheel

Description

The measuring system has three main components: the wheel torque transducer, the data transmission module and the on-board electronics (control unit). A wireless digital telemetry system is available for data transmission from the rotating wheel to the on-board electronics.

The RoaDyn P1...T wheel torque transducer replaces the middle part of the rim, thus enabling optimum integration into the suspension system, i.e. in the most effective position for acquiring wheel forces or torques. Mounting the wheel torque transducer on the vehicle is comparable with changing a standard wheel.

The traction torque M_y is measured with piezoelectric quartz sensors. The two switchable measuring ranges make it possible to measure small as well as very large torques extremely accurately. The signals are amplified and processed in the electronics system integrated into with the wheel.

A digital system with CAN bus (telemetry) is available for transmission to the customer's data acquisition system. The transmission modules can be quickly and easily exchanged with one another.

In addition to the traction torque M_y , the digital telemetry system (Type 9811B) is able to transmit three temperature signals (and a temperature signal of the wheel electronics).



Application

The RoaDyn P1...T transducers (Type 9299A...) have been designed and developed in close collaboration with the motor vehicle industry, specifically with practical and research applications in mind. The main focus is on:

- Driving resistance measurements for reduction of CO₂ emissions
- Research and development of ABS systems
- Research and development of dynamics control systems
- Vehicle performance measurements
- Determination of powertrain efficiency
- Recording load data for transmission development (simulation, validation)
- Analysis of fading effects on brakes

Technical data

Measuring range ¹⁾ (switchable)			P1ST	P1MT	P1HT
Torque, upper range	M _y	kN·m	±20	±30	±50
Torque, lower range	M _y	kN·m	±2	±3	±5
Maximum loads					
Max. loads for forces ^{1), 2)}	F _x , F _z	kN	±80	±90	±120
	F _y	kN	±50	±60	±90
Max. loads for torques ^{1), 2)}	M _x , M _z	kN·m	±10	±15	±25
	M _y	kN·m	±20	±30	±50
Operating temperature range	T	°C	-25 ... 80		
Max. speed ¹⁾	v	km/h	200		
Shock resistance		g	50		
Hysteresis					
Typical value	e _{Lin, My}	%FS	≈0,1		
Guaranteed value	e _{Lin, My}	%FS	≤1		
Accuracy					
Crosstalk, F _y to M _y	e _{cross, My (Fy)}	N·m/kN	≤±2		
Crosstalk, F _z to M _y	e _{cross, My (Fz)}	N·m/kN	≤±2		
Linearity ³⁾, lower range					
Typical value	e _{Lin, My}	%FS	≈0,1		
Guaranteed value	e _{Lin, My}	%FS	≤±1		
Linearity ⁴⁾, upper range					
Typical value	e _{Lin, My}	%FS	≈0,1		
Guaranteed value	e _{Lin, My}	%FS	≤±1		

Other technical data

Degree of protection (cable mounted)	IP65
Conforms to directives	89/336/EEC
EMC (emission)	EN61000-6-4: 2001 (EN55011 Class A)
EMC (immunity)	EN61000-6-2: 2001

Weight of RoaDyn P1HT, without Tires ¹⁾

Single wheel		
On 9,00x22,5"	kg	80
On 11,75x22,5"	kg	82
Compared with standard wheel (steel)	kg	52
Twin wheel		
On 2x9,00x22,5"	kg	106
Compared with standard wheel (steel)	kg	106

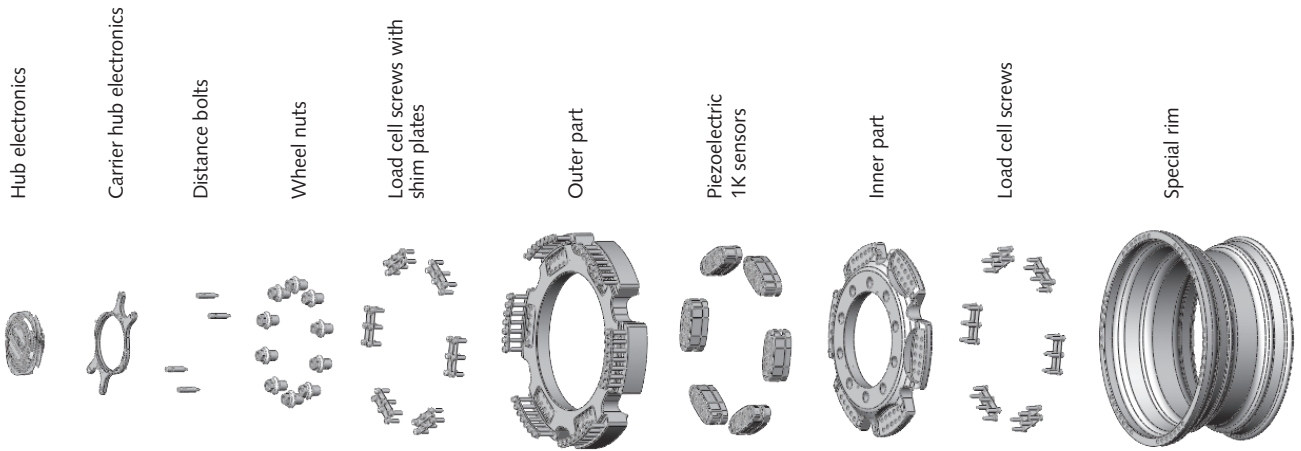
¹⁾ Base: rim diameter 22,5", load cell diameter 494 mm, 6 load cells

²⁾ It is assumed that the maximum forces and torques do not act simultaneously; the torques are specified relative to the center of the wheel

³⁾ Calibrated range = ±5 kN·m

⁴⁾ Calibrated range = ±10 kN·m

Example sensor design of a P1HT (also available as twin wheel)



Measuring Chain

	RoaDyn P1HT Type 9299A1	Telemetry Type 9811B1		On-board unit Type 9813B...	Available measurement signals
Measuring chain RoaDyn P1HT					1 x torque M_y 1 x temperature in hub electronics 1 x battery voltage 3 x temperature 1 x Q-signal strength

9299A_000-993e-02.19

Optional accessories

Transmission Modules

- Wireless transmission module for RoaDyn P1, power supply by rechargeable battery

Type/Art. No.
9811B1

Electronics

- On-board electronics for RoaDyn P1, for use with wireless transmission module Type 9811B, serves up to 4 RoaDyn P1 (digital and analog output)

Type/Art. No.
9813B...

Adaptations

- Outer part of RoaDyn S6XT/P1HT
- Inner part of RoaDyn S6XT/P1HT
- Wheel offset adapter
- Special rim
- Wheel nuts
- Shim plates
- Distance bolts

Type/Art. No.
9747A...
9745A...
9746A...
9749A...
9727A...
55088257
Z32092A...

Ordering Code

- RoaDyn P1ST
- RoaDyn P1MT
- RoaDyn P1HT

Type 9299A1
Type 9299A2
Type 9299A3

9299A_000-993e-02.19