

## RoaDyn S6ST sp

Type 9282A...

### 6-component wheel force transducer for light commercial vehicles

Wheel force transducer (WFT) for measuring 3 forces and 3 torques on a rotating wheel in order to determine road load data on heavy commercial vehicles and off-highway machines.

- Modular design consisting of 4 replaceable 3-component heavy load strain gage load cells
- Each load cell individually calibrated
- Adaptable to fit different rim sizes, hub geometries and wheel offsets
- Automatic identification of components using integral ID chip
- Measurement signals amplified and digitized before leaving wheel force transducer
- Digital wireless data transfer with external transmission unit
- Online conversion of signals from the rotating wheel into the non-rotating vehicle coordinate system
- Analog and digital data output (CAN, Ethernet or proprietary formats)
- Durability and weight of mechanical components optimized by CAD/FEM
- Suited for operation with vehicles and on axle test benches

#### Description

The RoaDyn S6ST sp is a multiaxial precision measuring system for use in the development and testing of complete chassis and chassis components of light commercial vehicles. Suitable mechanical components like inner part, outer part and wheel offset adapter are used to mount the four replaceable 3-component load cells between wheel hub and rim ring. This modularity offers an extremely high degree of versatility. All of the standard components of the system apart from the mechanical elements can be retained when it is adapted to suit different rim sizes and wheel hub geometries.

Each load cell is individually calibrated to allow replacement by the user without the entire wheel force transducer system having to be re-calibrated. The ID chip integrated into each load cell stores all important component parameters and prevents a misidentification of the load cell data. When the measuring system is powered up, the data of the components currently in use is imported into the connected on-board electronics.

The signals are amplified before leaving the load cells and passed on via short connecting cables to the hub electronics



for filtering, digitization and encoding. The data stream is transmitted contact-free via out-board transmission or, optionally, digital via in-board transmission. A cable then supplies it to the on-board electronics, where the physical quantities  $F_x$ ,  $F_y$ ,  $F_z$ ,  $M_x$ ,  $M_y$  and  $M_z$  are calculated from the raw signals and transformed from the rotating coordinate system of the wheel into the non-rotating vehicle coordinate system. The measurement data is output in both analog and digital form. The digital output is available in CAN, Ethernet or other proprietary data acquisition system formats. To facilitate rapid troubleshooting the raw signals from the load cells or converted signals can be chosen for output.

The design of the adapters takes account of the expected forces and torques acting on the vehicles on which they are used. The wheel force transducer and adapter stresses are therefore calculated using the finite element method (FEM) in order to optimize the durability, safety and weight of the individual components. Fatigue strength tests on individual components and wheel force transducers of different sizes make it possible to estimate their service life.

### Application

- Acquisition of load spectra and application profiles for fatigue strength analyses
- Road profile categorization: recording of typical load profiles for selected stretches of road for chassis design
- Individual maneuvers generally involving high loads for verifying design loads and design data
- Input data for multibody simulation and other virtual loading methods
- Dynamic chassis tuning and development of active braking, traction and chassis control systems
- Recording of control data for chassis test stands. Use for iteration on multiaxial vehicle test benches
- Determination of characteristic tire data for tire and chassis development
- Use of special load cases in damage analysis of vehicle components
- Special applications on special vehicles, such as earth-moving machines, agricultural, forestry and off-road vehicles, municipal vehicles and industrial trucks

### Mounting

When suitably prepared, the RoaDyn S6ST sp wheel force transducer can be mounted on the vehicle in the same way as a standard wheel. The wheel nuts are tightened to the specified torque. The wireless outboard transmission is mounted together with the anti-rotate device on the outside of the wheel. The optional wireless internal transmission unit is mounted to the inner face of the rim and therefore it is protected against touching obstacles. An internal transmission can only be installed if enough space is available.

The on-board electronics are then installed in the vehicle and connected to the customer's data acquisition system.

### Technical data

Shock resistance	g	50
Maximum speed	km/h	200
Degree of protection		
Standard (against dust and moisture)		IP65
Optional		IP67
Operating temperature range	°C	-30 ... 110

### Standard measuring range <sup>1)</sup>

F <sub>x</sub>	kN	±80
F <sub>y</sub>	kN	±50
F <sub>z</sub>	kN	±80
M <sub>x</sub> <sup>2)</sup>	kN·m	±15
M <sub>y</sub>	kN·m	±25
M <sub>z</sub> <sup>2)</sup>	kN·m	±15
Rotation angle accuracy	°	≈0,1

### Measurement uncertainty

Linearity	% FS	≤1
Hysteresis	% FS	≤1
Crosstalk forces	%	≤1

### Available rim sizes (single and twin wheel)









Standard sizes	"	22,5
	"	7,50x22,5
	"	8,25x22,5
	"	9,00x22,5
Other sizes		on request

<sup>1)</sup> The standard measuring range refers to a standard wheel with a 9 x 22.5 " rim and a bolt circle of 10 x 335 mm. Since the structure of the RoaDyn S6ST sp is designed for the vehicle-specific conditions, other measuring ranges can be realized in individual cases. It is assumed that the maximum forces and torques do not act simultaneously.







<sup>2)</sup> The torques M<sub>x</sub> and M<sub>z</sub> are specified relative to the center of the wheel

**Configurations of the measuring chain of the RoaDyn S6ST sp wheel force transducer (WFT)**

**Standard: External transmission**

WFT	Wheel electronics	Data transmission	Anti-rotate device	Connecting cable	On-board electronics	
Type 9282A...	Type 5241A...	Type 5248A0 External transmission	Type 9893A... for single wheel	Type Z30430A... connection between stator and on-board electronics	Type 9817A.. KiRoad Performance	Type 18025602 KiCenter
			 Type Z31006Q... for twin wheel 			

**Optional: Internal transmission (only if enough space is available)**

WFT	Wheel electronics	Data transmission	Anti-rotate device	Connecting cable	On-board electronics	
Type 9282A...	Type 5241A...	Type 5240A..., 5242A... Internal transmission unit (optional) con- sisting of rotor, stator	—	Type Z30430A... connection between stator and on-board electronics	Type 9817A.. KiRoad Performance	Type 18025602 KiCenter
			—			

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## Typical configuration of the RoaDyn S6ST sp WFT

### Sensor hardware

	Type/art. no.
• RoaDyn S6ST sp wheel force transducer consisting of:	9282A...
- 4 precision load cells (IP67)	9190A11...
- Outer part RoaDyn S6ST sp single or outer part RoaDyn S6ST sp twin	9747A5 9747A6
- Inner part RoaDyn S6ST sp	9745A4
- Wheel offset adapter (optional)	9746A...
- Spezial rim for single wheel	9749A...
- Wheel nuts	9727A...

### Fixing of the external transmission unit

• Fixing arm	
- to vehicle cabin	9893A1
- to axle parts	9893A2
- rear (for twin wheel)	9893A3

### Twin wheel adaption

• Special rim for twin wheel	9748A...
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### Signal transmission / electronics

• Hub electronics carrier	Z31720
• Connector holder	Z39904
• Wheel electronics 20-channel (IP65/IP67)	5241A20...
• External transmission unit (IP65/IP67)	5248A0...
• Alternative: internal transmission unit	
- Rotor	5442A...
- Stator	5240A...
- Accumulator (optional)	55180175
• Extension cable	Z30430A...
• KiRoad Performance	9817A...

## Ordering key

Type 9282A

### WFT

RoaDyn S6ST sp for single wheel	1
RoaDyn S6ST sp for twin wheel	3

### Degree of protection

IP65	1
IP67	2

## Ordering example

Type 9282A11

RoaDyn S6ST sp WFT for single wheel,  
degree of protection IP65