

## RoaDyn<sup>®</sup> S6HT sp System 2000

Type 9269A...

### 6-Component Wheel Force Transducer (WFT) for Heavy Trucks, Commercial and Special Vehicles

Wheel force transducer for measuring 3 forces and 3 torques on a rotating wheel in order to determine road load data on heavy trucks, commercial and special vehicles.

- Modular design consisting of six replaceable 3-component heavy load strain gage load cells
- Adaptable to suit different rim sizes, hub geometries and wheel offsets
- Each load cell individually calibrated
- Automatic identification of components using integral ID chip
- Measurement signals amplified and digitized before leaving wheel force transducer
- System 2000 digital wireless data transfer with external transmission unit
- Online conversion of signals from rotating wheel into non rotating vehicle coordinate system
- Analog and digital data output (CAN, Ethernet or proprietary formats)
- Durability and weight of mechanical components optimized through CAD/FEM aided design
- Available as single, super single and dual wheel
- Certified calibration procedure

#### Description

The RoaDyn S6HT System 2000 is a multiaxial precision measuring system for use in the development and testing of complete chassis and chassis components of heavy commercial and special vehicles. Suitable mechanical components like inner part, outer part and wheel offset adapter are used to mount the six 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. Dual wheel configuration or upgrading merely requires the use of special mechanical adapters.

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 System 2000 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 stream of data is transmitted without contact by means of the rotor (ring antenna) to the fixed stator. A cable then supplies it to the System 2000 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.

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The system is operated with either a practical remote control or optional remote control emulation software running on a PC/ laptop. As a further option additional analog signals required by the customer can be acquired synchronously by means of the on-board electronics.

The design of the adapters takes account of the particular high 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

- 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 stands
- Determination of characteristic tire data for tire and chassis development
- Use of special load cases in damage analysis of vehicle components
- Special applications on trailers, semi-trailers, construction machinery and special vehicles

### Technical Data

#### RoadDyn S6HT<sup>1)</sup>, without Tire

Single wheel		
on 9,00x22,5	kg	72
on 11,75x22,5	kg	74
compared with standard wheel (steel)	kg	52
Dual wheel		
on 2x9,00x22,5	kg	96
compared with standard wheels (steel)	kg	106
Shock resistance x, y, z	g	50
Maximum speed	km/h	200
Degree of protection		
standard (against dust and moisture)		IP65
optional		IP67
Operating temperature range	°C	-20 ... 110

#### Standard Measuring Range<sup>2)</sup>

$F_x$	kN	±180
$F_y$	kN	±100
$F_z$	kN	±180
$M_x$	kN·m	±25
$M_y$	kN·m	±50
$M_z$	kN·m	±25

#### Wheel Rigidity as Standard Wheel

Natural frequency range	Hz	>400
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#### Measuring Errors

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

<sup>1)</sup> Consisting of complete wheel force transducer with its electronics and external transmission unit

<sup>2)</sup> It is assumed that the maximum forces and torques do not act simultaneously. The torques are specified relative to the center of the wheel

**Available Rim Sizes (Single and Dual Wheel)**

Standard sizes	22,5"	7,50x22,5"	8,25x22,5"	9,00x22,5"
Other sizes available on request				
smallest diameter	19,5"			
largest diameter (manufactured to date)	28"			

**Available Rim Sizes (Super Single Wheel)**

Standard sizes	22,5"	11,75x22,5"	12,25x22,5"	13x22,5"	14,0x22,5"	17,0x22,5"
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**Hub Connection**

Standard	Number of hub studs	Pitch circle diameter in mm
EU standard	10	335
US standard	10	285,75
JPN standard	8	285

other hub geometries available on request

**Configurations of Measuring Chain with RoaDyn® S6HT sp System 2000**

Wheel Sensor	Wheel Electronics	Data Transmission	Mounting	Connecting Cable
Type 9269A1	Type 5241A...	Type 5248A0 External transmission unit	Type 9893A... for single wheel	Type 30430A... Connection between stator and on-board electronics
				
			Type Z31006Q... for dual wheel 	

**Control Unit**

Type 9891A... System 2000 on-board electronics	Type 5685A... remote control
	

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**Mounting**

When suitably prepared the S6HT System 2000 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 external transmission unit is attached to the vehicle with a fixing arm. The on-board electronics are then installed in the vehicle and connected to the customer's data acquisition system.

**Typical Configurations of RoaDyn® S6HT System 2000 Wheel Force Transducer**

**1. Sensor Hardware**

- |   |                                |
|---|--------------------------------|
| • RoaDyn S6HT System 2000 wheel force transducer consisting of: | <b>Type/Art. No.</b><br>9269A1 |
| • Six precision load cells                                      | 9190A66...                     |
| • Outer part of RoaDyn S6HT System 2000                         | 9747A...                       |
| • Inner part of RoaDyn S6HT System 2000                         | 9745A...                       |
| • Wheel offset adapter  | 9746A...                       |
| • Special rim for single wheel                                  | 9749A...                       |
| • Wheel nuts  | 9727A...                       |

**2. Mounting External Transmission Unit**

- |                                     |            |
|-------------------------------------|------------|
| • Arm for fixing on cab of vehicle  | 9893A1     |
| • Arm for fixing on axle components | 9893A2     |
| • Rear arm for fixing dual wheel    | Z31006Q... |

**3. Dual Wheel Adapter**

- |                              |          |
|------------------------------|----------|
| • Special rim for dual wheel | 9748A... |
|------------------------------|----------|

**4. Wireless Electronics**

- |  |            |
|--|------------|
| • Hub electronics carrier                                    | Z31720     |
| • Connector holder   | Z39904     |
| • Wheel electronics, 20-channel with electronic spirit level | 5241A20    |
| • External transmission unit                                 | 5248A0     |
| • Extension cable  | Z30430A... |
| • On-board electronics                                       | 9891A...   |
| • Remote control   | 5685A...   |

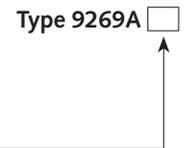
**Optional Accessories**

- |   |                                 |
|---|---------------------------------|
| • 4-channel analog input card   | <b>Type/Art. No.</b><br>5293A11 |
| • SGAM module (three additional strain gage signals)  | 2237A1                          |
| • TCAM module (three additional analog signals for temperature sensors)                                       | 2237A2                          |
| • RoaDyn DAQ software   | 2837A10                         |
| • Driver for CAN interface  | 2837A02                         |
| • Driver for Ethernet interface   | 2837A01                         |
| • RoaDyn UDP, SCoUt, version 4.01 sp universal configuration tool for RoaDyn on-board electronics System 2000 | 2885A4.01                       |
| • Remote control emulation software   | 2887A                           |
| • Carrying case for on-board electronics  | V712.0005                       |
| • Carrying case for tools and accessories   | V712.0002                       |

**Ordering Key**

**RoaDyn® S6HT sp System 2000**

Single wheel	1
Dual wheel	3
Super single wheel	4



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