

## RoaDyn<sup>®</sup> S6MT sp System 2000

Type 9270A...

### 6-Component Wheel Force Transducer (WFT) for Medium Size Trucks

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

- Modular design consisting of five 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 and dual wheel
- Certified calibration procedure

#### Description

The RoaDyn S6MT System 2000 is a multiaxial precision measuring system for use in the development and testing of complete chassis and chassis components of medium size trucks. Suitable mechanical components like inner part, outer part and wheel offset adapter are used to mount the five 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.

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

### Technical Data

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

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 <sub>x</sub>	kN	±120
F <sub>y</sub>	kN	±70
F <sub>z</sub>	kN	±120
M <sub>x</sub>	kN·m	±18
M <sub>y</sub>	kN·m	±30
M <sub>z</sub>	kN·m	±18

#### 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	17,5" (16" with reduced range)			
largest diameter (manufactured to date)	24"			



**Hub Connection**

Standard	Number of hub studs	Pitch circle diameter in mm
	6	245

other hub geometries available on request

**Configurations of Measuring Chain with RoaDyn® S6MT sp System 2000**

Wheel Sensor	Wheel Electronics	Data Transmission	Mounting	Connecting Cable
Type 9270A1	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 S6MT 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® S6MT System 2000 Wheel Force Transducer**

<b>1. Sensor Hardware</b>	<b>Type/Art. No.</b>
• RoaDyn S6MT System 2000 wheel force transducer consisting of:	9269A1
• Five precision load cells	9190A66...
• Outer part of RoaDyn S6MT System 2000	9747A...
• Inner part of RoaDyn S6MT System 2000	9745A...
• Wheel offset adapter	9746A...
• Special rim for single wheel	9749A...
• Wheel nuts	9727A...
 <b>2. Mounting External Transmission Unit</b>	
• Arm for fixing on cab of vehicle	9893A1
• Arm for fixing on axle components	9893A2
• Rear arm for fixing dual wheel	Z31006Q...
 <b>3. Dual Wheel Adapter</b>	
• Special rim for dual wheel	9748A...
 <b>4. Wireless Electronics</b>	
• 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**

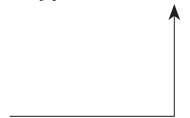
	<b>Type/Art. No.</b>
• 4-channel analog input card	5293A11
• SGAM module (three additional strain gage signals)	2237A1
• TCAM module (three additional analog signals for temperature sensors)	2237A2
• RoaDyn DAQ software	2837A10
• Driver for CAN interface	2837A02
• Driver for Ethernet interface	2837A01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

**Ordering Key**

**RoaDyn® S6MT sp System 2000**

Single wheel	<b>1</b>
Dual wheel	<b>3</b>

Type 9270A



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