

## RoaDyn S625

Type 9266A...

### Wheel force transducer for passenger cars

for measuring three forces and moments on a rotating wheel; a major constituent in modern vehicle development.

- Modular design with replaceable measuring cells and components
- CAD/FEM supported design: optimization of local stresses
- High strength/low WFT weight in combination with high rigidity
- Excellent signal quality due to digitization already in the wheel electronics
- Automatic identification of components by ID chip
- Calibration of the individual load cells as well as of the complete system
- Tested structural fatigue strength e.g. to SAEJ328



#### Description

The RoaDyn S625 wheel force transducer (WFT) has a modular, versatile design for mounting on hubs and rim geometries. Four 3-component strain gage load cells are connected by adapter parts to a rim and to the vehicle hub. The signals are amplified immediately in the load cells and fed via short cables to the wheel electronics. Here they are filtered, digitized and coded. The data stream is transmitted via a rotor/stator pair to the wheel inner side, transformed in the on-board electronic unit and output to a data acquisition device.

This WFT is designed for exceptionally high forces and moments associated with passenger cars. Because of often large wheel offsets, the load on the wheels is particularly high, specially with regard to moments. The anticipated stresses are determined using the FE method, and the design optimized with regard to strength, safety and weight. Dynamic cornering fatigue investigations make it possible to validate the life of the WFT structure.

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 without contact by means of out-board transmission or 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.

Additional signals on the rotating wheel, such as tire pressure, temperature, etc. can be directly connected to the wheel electronics and transmitted along with the wheel signals. Kistler offers optional amplifier modules for this purpose.

Note: see data sheets 5240A\_000-561, 5248A\_000-562 and 9817-003-233 for the transmission units and the on-board electronics.

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**Application**

- Measuring operating loads during typical vehicle driving maneuvers
- Input data for the design of new components
- Verification of design loads
- Measuring test stand control data for road simulators
- Development of active chassis control systems such as ABS, ESP, etc.
- Investigations of vehicle behavior in specific or critical driving situations
- Input data for fatigue calculations and numeric simulations
- Development of computer models

Usually 4 or 2 WFTs are used. Occasionally measurements with a single WFT are also employed for component or tire development. The various test vehicles require adaptation to new wheel/hub geometries. The modular design of the WFTs and proficient support by Kistler application centers has proved successful for this purpose.

At the same time as the WFTs, systems for wheel motion measurement or optical sensors (such as for measuring tire and body slip angle, speed or accelerations) can also be used. Adaptations for applying individual sensors to the measuring wheels are available in the Kistler product range.

The WFT system described above can also be used on a vehicle test stand. Its daily exclusive use on a test stand requires, among other things, special technical characteristics, which have led to the development of a special system. Further information is contained in the data sheet 9266A2\_000-580.

**Technical data**

Measuring range <sup>1)</sup>	F <sub>x</sub>	kN	-20 ... 20
	F <sub>y</sub>	kN	-15 ... 15
	F <sub>z</sub>	kN	-20 ... 20
	M <sub>x</sub>	kN·m	-4 ... 4
	M <sub>y</sub>	kN·m	-4 ... 4
	M <sub>z</sub>	kN·m	-4 ... 4
Rotary angle accuracy		°	≈0,1
Weight WFT <sup>2)</sup>	m	kg	≈10

**Maxium loads**

Degree of protection			IP65
Operating temperature range	Aluminum components	°C	<120
	CFR components	°C	<110
Max. speed		km/h	≈280
Max. impact acceleration	x, y, z	g	≤50

**Accuracy**

Linearity		%FS	≤0,5
	Typical <sup>3)</sup>	%FS	≤0,15
Hysteresis		%FS	≤0,5
	Typical <sup>3)</sup>	%FS	≤0,10
Crosstalk forces		%FS	≤0,5
	Typical <sup>3)</sup>	%FS	≤0,10

Permitted alternating stress (rotating bending fatigue test)

The requirements according to SAE J328 are exceeded.

500 000 LC at 4.0 kN·m

<sup>1)</sup> It is assumed that these extreme values do not occur simultaneously. The moments refer to the wheel center (ET = 0).

<sup>2)</sup> With 14" rim, hub adapter, stator – without tires

<sup>3)</sup> The typical accuracy corresponds to the median of the results of end-of-line and re-calibrations

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Sensor setup

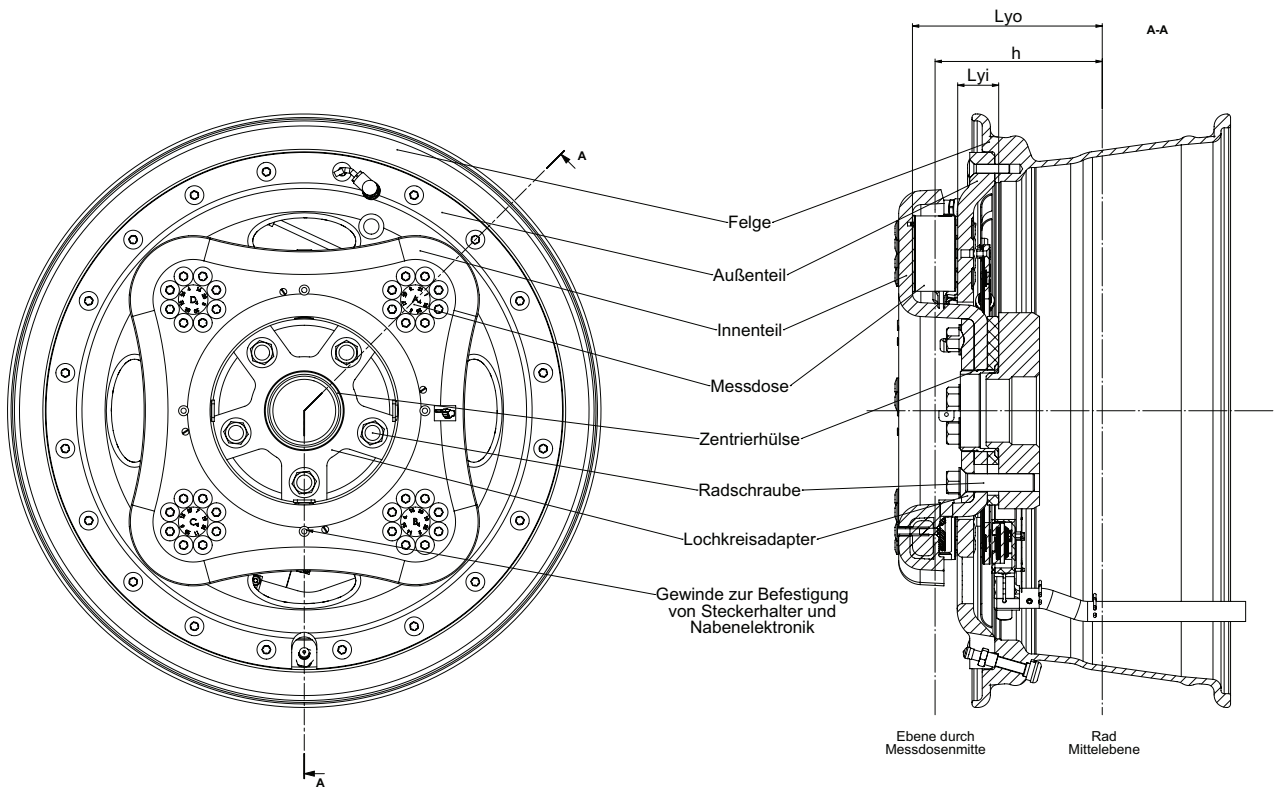
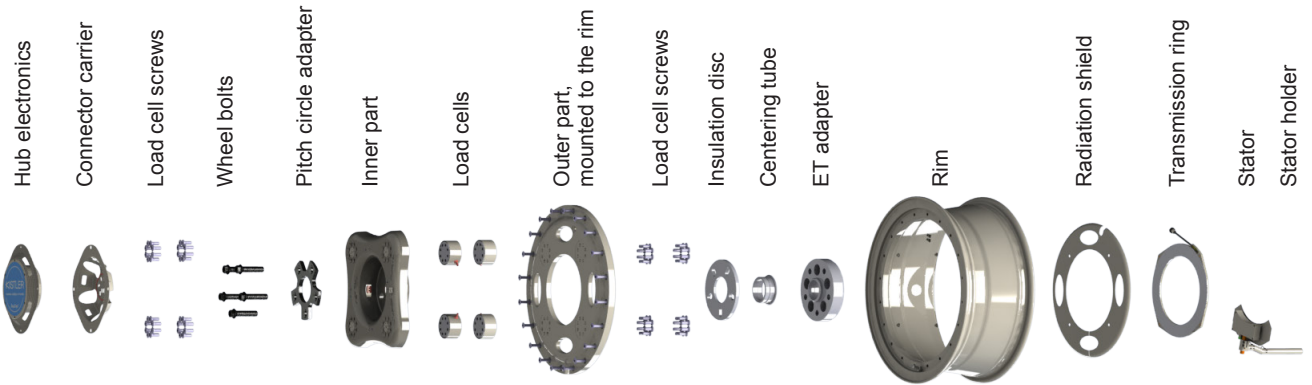




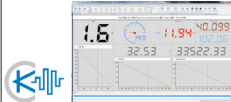







Fig.1: RoaDyn S625 structure/components with in-board transmission

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**RoaDyn S625 measuring chain configurations**

Wheel force transducer	Data transmission	Connecting cable	On-board electronics	
Type 9266A with wheel electronics Type 5241A2 and rim Type Z39913A...	Type 5240A..., 5242A... In-board transmission unit consisting of rotor and stator	Type 30430A... Connection between stator and on-board electronics	Type 9817A.. KiRoad Performance	Type 18025602 KiCenter
				

Wheel force transducer	Data transmission	Connecting cable	On-board electronics	
Type 9266A with wheel electronics Type 5241A2 and rim Type Z39913A...	Type 5248A... Out-board transmission unit	Type 30430A... Connection between stator and on-board electronics	Type 9817A.. KiRoad Performance	Type 18025602 KiCenter
				

**Mounting**

Kistler offers weight and strength optimized mechanical structural parts to adapt to the customer's vehicles.

**Mounting the stator with in-board transmission**

With in-board transmission, a suitable mounting device is mounted on the wheel carrier or suspension strut for the stator. The position of the stator and the location of the support is then established with a gage.

With the stator installed, mounting a WFT is comparable with that of a standard wheel. The stator can also remain mounted on the vehicle if this is running with standard wheels. When the WFTs are remounted, measurements can be made again immediately.

For out-board transmission, the vehicle setup needs to be extended with an additional support arm to which the on-board electronics cable is fixed.

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**Included accessories**

- Adjusting gage for stator mounting
- Precision spirit level,  
1 pc. per measuring system

**Type/Art. no.**

Z39911  
Z30208

**Ordering key**

Type 9266A

**Optional accessories**

- Load cell bolts, titanium,  
16 pcs. per load cell
- Adjusting gage for stator mounting,  
1 pc. per measuring system
- Transport case for accessories  
1 pc. per measuring system
- Transport case for 1 WFT with tire,  
1 pc. per measuring system
- Tire mounting aid,  
1 pc. per measuring system
- Universal adapter for balancing machine,  
1 pc. per measuring system
- Wrench for centering sleeve Type Z39901,  
1 pc. per measuring system
- Strain gage bridge amplifier (SGAM)
- Thermocouple amplifier (TCAM)

**Type/Art. no.**

Z30074  
Z39907  
V712.0002  
V712.0004  
Z30210  
V035.0000  
Z30205  
2237A1  
2237A2

RoaDyn S625 CFR Wheel force transducer for passenger cars	1
RoaDyn S625 aluminium Wheel force transducer for passenger cars with 12 " and 13 " rim size	3

**Ordering example**

RoaDyn S625 CFR  
Wheel force transducer for passenger cars

Type 9266A1

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