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RoaDyn S625

Type 9266A...

Wheel force transducer for passenger cars

Wheel Force Transducers for electric vehicles (EVs), vehicles with new powertrain concepts (NEVs) and traditional internal combustion engines to measure three forces and three moments on a rotating wheel; a major constituent in modern vehicle development.

- Best signal-to-noise ratio: digitization in the sensor
- Highest accuracy: vanishing crosstalk and modulation with best-in-class hexapod calibration
- Flexible data transmission: swappable inboard / outboard and wireless transmission
- Approved high quality due to durability test according to SAE J328
- User-friendly thanks to modular design

Description

The RoaDyn wheel force transducers (WFT) is a multiaxial measuring system for automotive development and testing. A RoaDyn WFT replaces a standard wheel for the measurement of three forces (F_x, F_y, F_z) and three moments (M_x, M_y, M_z) applied through the tire contact patch.

Due to the modular design of the RoaDyn WFTs, they can be adapted to most vehicles on the market.

Suitable mechanical components like inner part, outer part and wheel offset adapter are used to mount the 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.

Application

- Road load data acquisition (RLDA) as needed e.g. for vehicle durability or vehicle dynamics
- Tire testing
- Noise Vibration Harshness (NVH)
- Development of vehicle dynamics control systems (ABS, ESP, …)
- Advanced driver assistance systems (ADAS testing)

The Kistler RoaDyn WFTs are adaptable to the spinning application on vehicles driving on the road as well as on test rig, as eg. axle test rigs or driving simulators, when the wheel is not rotating.

The Kistler RoaDyn S6 Wheel Force Transducer is a high sophisticated, modular and flexible measuring unit. Thus, it is adaptable to diverse applications even if they are not stated in this document.

Signal processing

The signals are amplified before leaving the load cells and passed on to the hub electronics for filtering, digitization and encoding. The data stream is transmitted contact-free via in-, out-board or wireless transmission to the on-board electronics. Here 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. Amongst others, CAN and Ethernet are available as digital output format.

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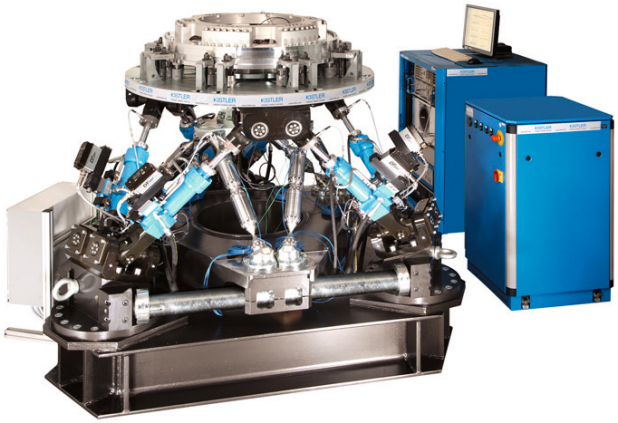
Calibration

Each RoaDyn WFT is calibrated on two levels: First each individual loadcell is calibrated. Second, the entire sensor is calibrated using an advanced and unique calibration procedure on a hexapode. These leads to a 6x6 compensation matrix, which is used to improve the accuracy by taking the sensitivity of the sensor system into account. Due to this approach, the single loadcells can be exchanged without the need for a calibration of the whole system again and the sensor shows a vanishing modulation.



Technical data

Measuring range [1]		
F_x / F_z	kN	20
F_y	kN	15
M_x/ M_z	kN·m	4
M_y	kN·m	4
Angle resolution	°	≈0.1
Measurment uncertainty [2]		
Linearity	%FS	≤0.5
Typical	%FS	≤0.15
Hysteresis	%FS	≤0.5
Typical	%FS	≤0.15
Crosstalk forces	%FS	≤0.5
Typical	%FS	≤0.1
Other technical data		
Max speed [3]	km/h	>300
Shock resistance	g	50
Degree of protection	IP	IP65
Operating temperature range	°C	< 110
Fatigue load rating		The requirements according to SAE J328 are exceeded.
Minimal rim size	inch	14
Sensor weight [4]	kg	10

[1] It is assumed that these extreme values do not occur simultaneously. The moments refer to the wheel center.
[2] The typical accuracy corresponds to the median of the results of end-of line and recalibrations.
[3] Vehicle Speed depending on the wheel diameter.
[4] With adaptation without rim, the real weight depends on the specific geometry of the sensor assembly.

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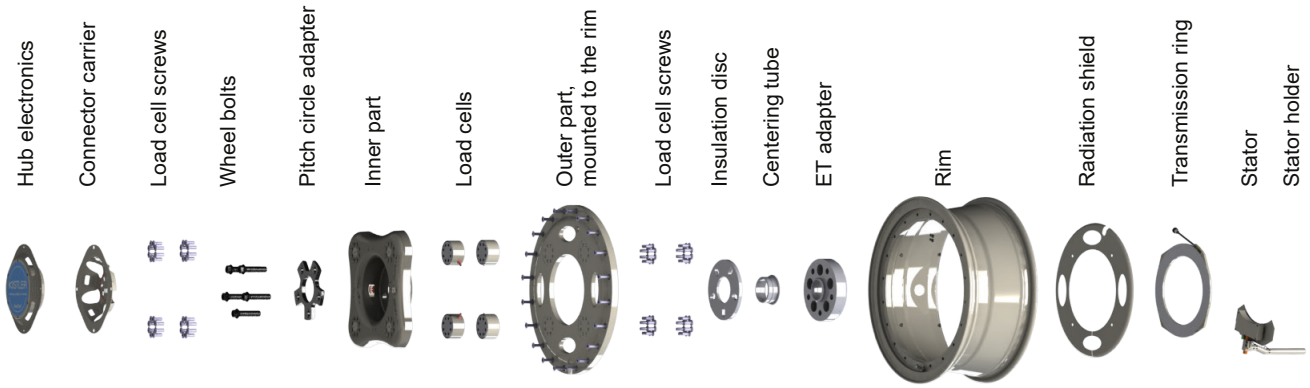
Sensor setup



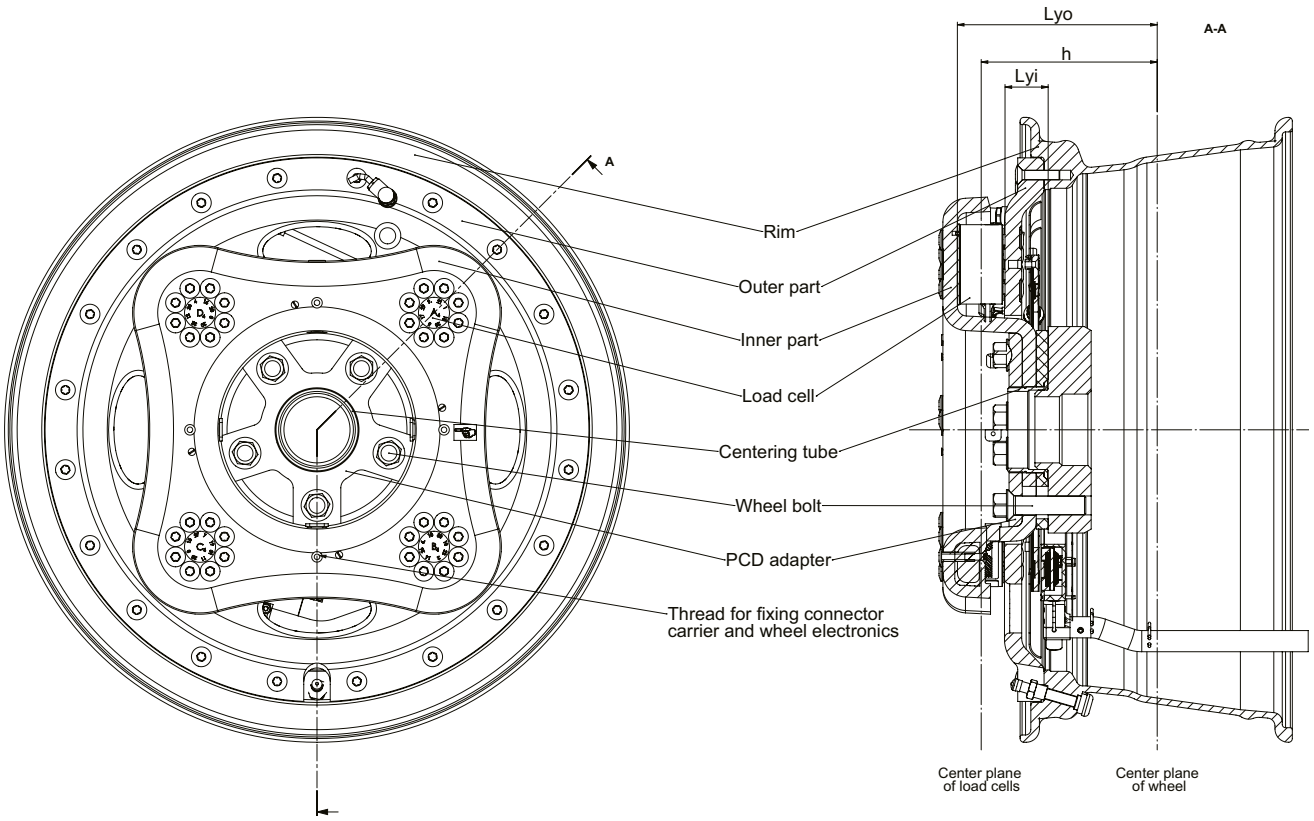


Fig.1: RoaDyn S625 structure/components with in-board transmission

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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 Z30430A... Connection between stator and on-board electronics	Type 9817B 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 Z30430A... Connection between stator and on-board electronics	Type 9817B KiRoad Performance	Type 18025602 KiCenter
				

Wireless

Wheel force transducer	Data transmission	On-board electronics	
Type 9279A1	Type 9822A Wheel unit	Type 9813C KiRoad Wireless HDR	Type 18025602 KiCenter
			

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Mounting the in-board transmission
The wireless inboard transmission unit is mounted on the inside of the rim and is thus protected against contact with obstacles. In the case of inboard transmission, a suitable mounting device for the stator is mounted on the wheel carrier or suspension strut. An adjustment gauge is then used to determine the position of the stator and the position of the mounting bracket.

Mounting the out-bord transmission
The outboard transmission is mounted together with the torque support on the outside of the wheel.
For outboard transmission, the vehicle setup needs to be extended with an additional support arm to which the on-board electronics cable is fixed.

Data Analysis with jBEAM Durability
jBEAM is an analysis and visualization software that works independently of operating system as a standalone program. Full interactivity and performance allow for quick analysis, visualization and evaluation of measurement data. The jBEAM Durability Edition continues all the key components for the optimal evaluation of load data and supports the user during vehicle and component validation at the test stand.

Included accessories	**Type/Art. no.**
• 5x load cells (strain gauge basis)	9190A4D7C
• Outer part CFRP	Z39912
• Inner part CFRP	9701A
• Rim	Z39913A
• Offset adapter	9713A
• Hub adapter package CFRP	9711A2
Signal transmission / electronics:	
• KiRoad Performance	9817B
• Wheel electronic	5241A
• In-board transmission	5240A
including stator and rotor	5242A
• Out-board transmission	5248A
• Extension cable	Z30430A
• KiRoad Wireless HDR	9813C
• Wheel Unit	9822A
• Battery with charger for Wheel Unit	
• Rotary encoder	5262A

Optional accessories	**Type/Art. no.**
• Outer part (Al)	9731A4
• Inner part (Al)	9703A
• CFRP rim	9709A
• Precision spirit level	Z30208
• Adjusting gauge for stator mounting	Z39911Q
• Tire mounting	Z30210
• 3-channel strain gauge bridge amplifier (SGAM)	2237A1
• 3-channel thermocouple amplifier (TCAM)	2237A2

Ordering code

• RoaDyn S625 CFRP Wheel force transducer for passenger cars	**Typ 9266A1**
• RoaDyn S625 Aluminium Wheel force transducer for passenger cars	**Typ 9266A3**

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