

# RoaDyn® S650 nsp System 2000

## for Test Stand Measurement with Light Trucks

Type 9268A2

Wheel force sensor for measuring three forces and three moments on non-spinning wheel for operation on vehicle test stands.

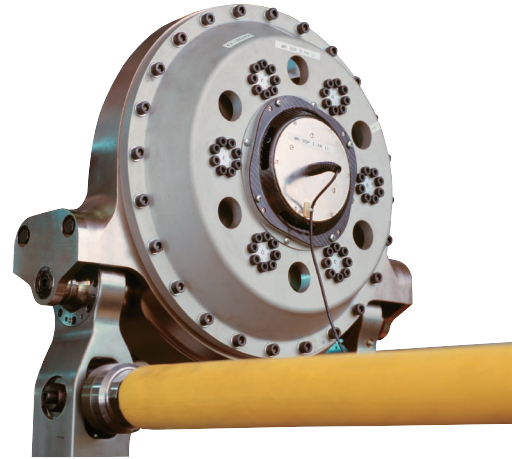
- Modular arrangement with interchangeable load cells and system components
- Used in conjunction with CAD/FEM aided design to minimize stress concentrations
- Standard version manufactured from aluminum alloy can be used during fatigue test monitoring
- Precise signal acquisition with individual calibrated strain gage load cells
- Independent identification of sensor components
- Capable of recognizing individual load cell calibration values

### Description

The modular RoaDyn S650 nsp sensor is highly adaptable to suit different hub and test stand geometries. Six individual load cells are connected to the force application system of the test stand and to the vehicle hub with adapter components. In these cells the signals are amplified and passed on to the hub electronics Type 5243A18 via short cables. There they are filtered, digitized and encoded. The stream of data is passed on to the control room electronics Type 9887A... via a cable Type 1700A88xx... and output to the test stand electronics or a data acquisition system. The control room electronics unit is described in datasheet 9887A\_000-579.

Wide brake components and different wheel/hub connections on large pitch circles and wheel offsets necessitate flexible sizing of mechanical components. Depending on the anticipated loads different designs may be required to achieve this. Adapter components manufactured from high strength aluminum connect the six load cells to rim and hub. The modular design offers maximum flexibility in adapting to a wide variety of hub geometries.

Individual load cells Type 9190A are factory calibrated and output temperature-compensated, amplified measurement signals in the three spatial directions. Identification and calibration data of the individual forces is saved and allows systematic conversion into the vehicle coordinate system on the basis of the calibrated individual values.



The high measuring accuracy is retained during transmission, as digitization takes place on the wheel to avoid transmission interference. The fact that the measured individual signals are known allows rapid troubleshooting in the event of malfunctions. Individual cells can be replaced without impairing sensor operation.

An 18-channel Type 5243A18 version of the hub electronics is available. The incoming signals are filtered at 1 500 Hz and, after being digitized, sampled at 5 kHz and a resolution of 16 bits. The signal delay arising between the measuring time and signal output is less than 1 ms.

### Application

The sensors are predominantly used as a multiaxial force measuring unit in road simulators. The test stand control data is determined with measuring wheels employing the same principle.

The sensors are mainly used in pairs, for example for testing a complete vehicle (4 wheels) or just one axle (2 wheels). Measurements with a single sensor are also used for component development. As subsequent test vehicles often necessitate adaptation to suit wheel and hub geometries, the modularity of the measuring wheels and expert support by Kistler Application Centers have proven invaluable.

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**Technical Data**

Measuring range <sup>1)</sup>	$F_x$	kN	±50
	$F_y$	kN	±30
	$F_z$	kN	±50
	$M_x$	kN·m	±6
	$M_y$	kN·m	±6
	$M_z$	kN·m	±6

**Maximum Loads**

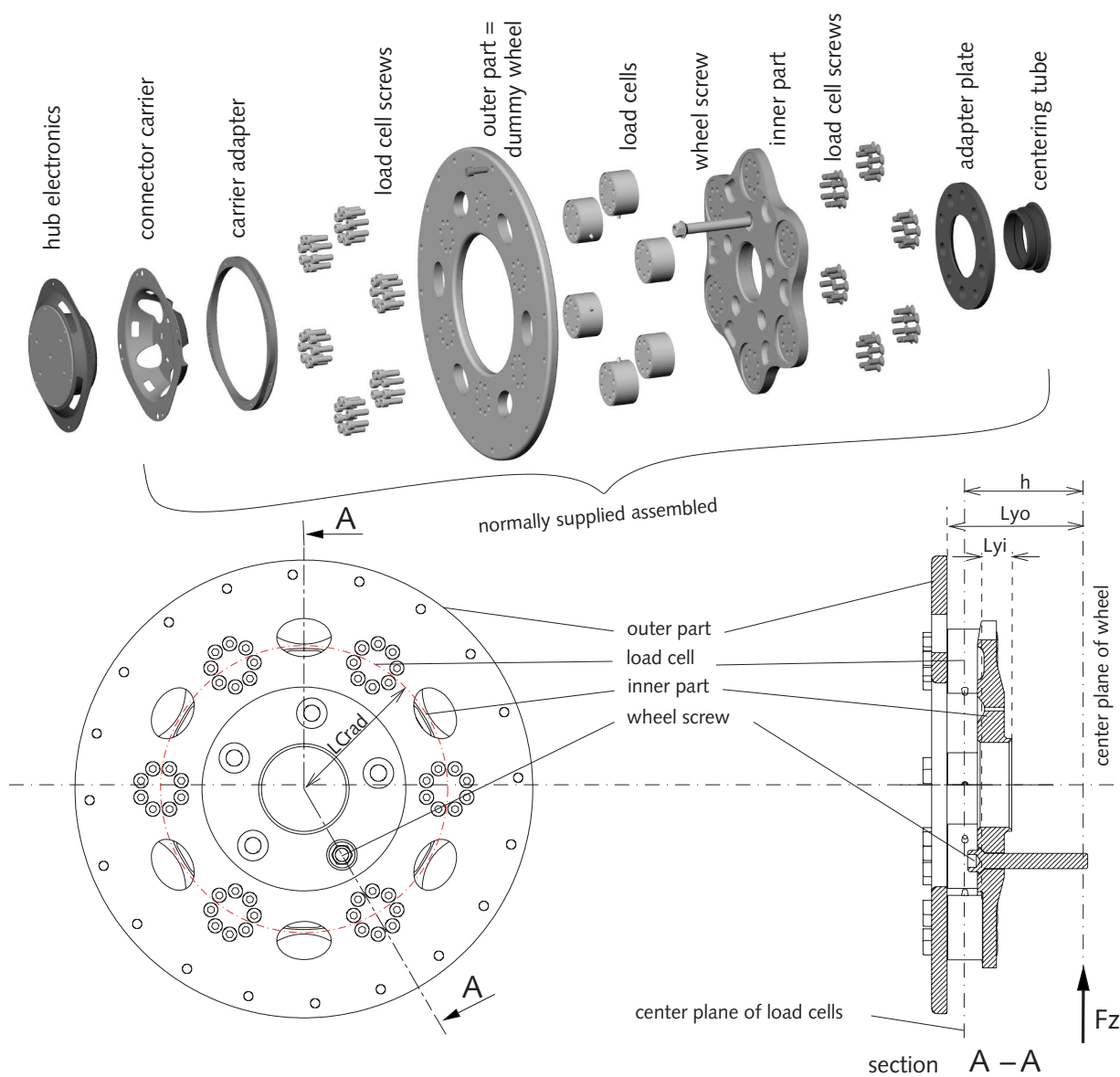
Max shock acceleration	x	g	40
	y	g	20
	z	g	40

**Accuracy**

Crosstalk	$F_y \rightarrow F_x, F_z$	%	≤1
	$F_x \leftrightarrow F_z$	%	≤1
	$F_x, F_z \rightarrow F_y$	%	≤2
Linearity		% v.E.	≤0,5
Hysteresis		% v.E.	≤0,5

Permissible reversed stress (rotating bending test);  
SAE J328 requirements are exceeded.  
500 000 cycles of reversed flexure to 5,5 kN·m

<sup>1)</sup> It is assumed that the extreme values do not act simultaneously. The moments are specified relative to the center of the wheel.



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Fig. 1: Design and components of RoaDyn S650 nsp

### Mounting

Special adapters have to be individually designed for mounting the sensors in a test stand. This requires the corresponding dimensions of the test stand force application system and the hub of the tested vehicle in order to prepare a quotation.

### Adaptation to Suit Hub

Today's vehicles encompass a considerable variety of hub geometries. They are described by the following parameters:

- Number of stay bolts or tapped holes
- Dimensions of the wheel bolts or stay bolts and nuts (thread diameter, pitch, length and threaded length)
- Wheel bolt connection pitch diameter
- Axle centering as a fitting dimension
- Wheel offset
- Brake contours
- Parts protruding from hub
- Miscellaneous

It is therefore necessary to obtain precise details in order to prepare for fabrication of the adapter. The relevant Kistler Instruction manual (002-280) contains a checklist, which can be completely filled in to considerably speed up the process of clarification.

### Accessories included

- |  |           |
|--|-----------|
| • Precision (strain gage based) load cells, fully encapsulated | 9190A46.6 |
| 1 set (6 cells) per wheel sensor                               |           |
| • Inner part   | 9729A6    |
| Pitch circle must be defined,                                  |           |
| 1 pc. per wheel sensor   |           |
| • Connector carrier for wheel electronics                      | Z39904    |
| 1 pc. per wheel sensor   |           |
| • Load cell mounting screws                                    | Z30073    |
| 1 set (of 40 pcs.) per wheel sensor                            |           |

### Optional accessories

- |   |           |
|---|-----------|
| • Outer part  | 9707Ax    |
| 1 pc. per wheel sensor  |           |
| incl. 1 set of load cell screws   | Z30073    |
| incl. 1 adapter ring for connector carrier                                  | Z30151    |
| • Hub electronics   | 5243A18   |
| 1 pc. per wheel sensor  |           |
| • Special wheel-/hub electronics for combined use on test stand and vehicle | 5443A...  |
| • Hub adapter kit   | 9711A3    |
| (contains adapter washer,   | Z39900    |
| centering sleeve  | Z39901    |
| and wheel bolts)  |           |
| 1 pc. per wheel sensor  |           |
| • Wheel offset adapter  | 9713A...  |
| 1 pc. per wheel sensor  |           |
| • Carrying case for 1 or 2 sensors  | V712.0004 |
| • Load cell tester  | 5984A     |
| 1 pc. per measuring system  |           |
| • Wrench  | Z30205    |
| for centering sleeve Type Z39901  |           |
| 1 pc. per measuring system  |           |

### Ordering Code

- |   |               |
|---|---------------|
| • RoaDyn S650 nsp   | Type          |
| Wheel force sensor for test stand measurement with light trucks | <b>9268A2</b> |

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