3-Axis Force Sensor K3D35 500mN

Item number: 11683

Highlights

- miniature 3-axis force sensor
- versions from 500mN
- compact design
- Resolution from 10 µN
- Compensation matrix "s" for minimized crosstalk

The K3D35 3-axis force sensor is suitable for force measurement in three mutually perpendicular axes.
It features a particularly compact design with a diameter of 35 mm and a total height of only 28 mm.
The K3D35 3-axis force sensor is available for forces of 500 mN, 2 N, and 10 N. It is particularly suitable for measuring the smallest forces. With the K3D35 500 mN variant, forces from 10 µN to 100 µN can be resolved - depending on the measuring amplifier.

The K3D35 3-axis force sensor is equipped with full-bridge strain gauges. The signals from the strain gauge full bridges each correspond to a force component in the x-, y-, and z-directions.
The vector decomposition is therefore achieved mechanically, by three orthogonally arranged spring-joint guides (double cantilever beams), and additionally by the arrangement of the strain gauges in the Wheatstone bridge, so that residual transverse forces and moments are also compensated electrically/circuit-wise. The three double cantilever beams are connected in series in this 3D force sensor.

Calibration of 3-Axis Force Sensors – From Standard (cv) to High Precision (s)

A key characteristic of 3D force sensors is crosstalk: applying a force also triggers a measurement in the two unloaded axes. Thanks to several compensation mechanisms (mechanical and electrical), crosstalk is typically less than 3% of the nominal load. Crosstalk is reproducible and proportional to the amplitude of the applied force. By applying an additional compensation matrix, crosstalk in all axes can be reduced to a maximum of less than 1%.

By default, you receive two factory calibrations, each with two measurement points:

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one **without a compensation matrix (“cv”)** and one **with extended matrix compensation (“s”)**.

For detailed proof of the sensor's linearity, you can optionally **extend the calibration to 4 or 6 measurement points:**

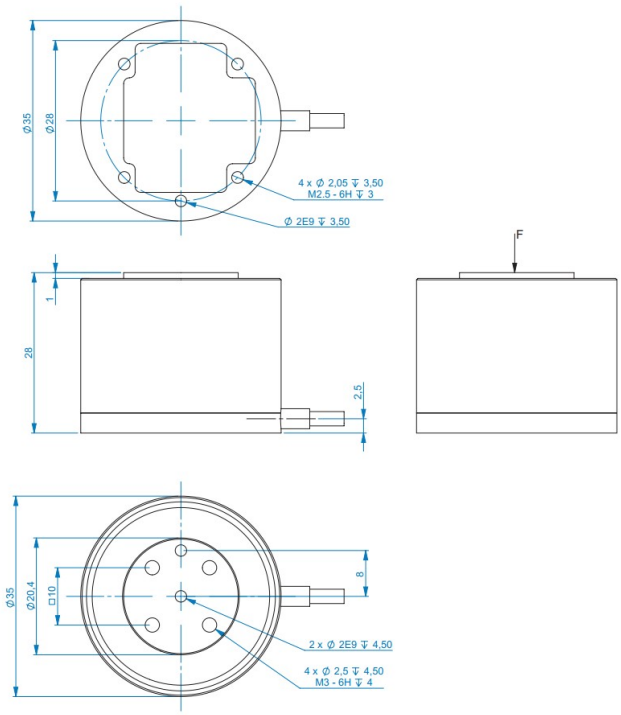
- Factory calibration certificate SL/4 (4 measurement points)
- Factory calibration certificate SL/6 (6 measurement points)

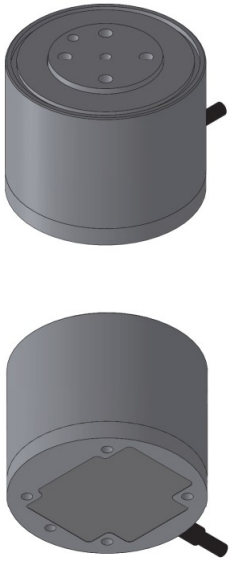
This ensures your sensor is optimally calibrated to your application from the very first measurement.

Optional special version

- Pressure range up to 8 bar

Technical Drawing





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Technical Data

Basic Data		Unit
Type	3-axis force sensor	
Force direction	Tension/Compression	
Rated force Fx	500	mN
Rated force Fy	500	mN
Rated force Fz	500	mN
Force introduction	Internal thread	
Dimension 1	4x Internal thread M3, 2x fitting hole Ø2mm E9	
Sensor Fastening	Internal thread	
Dimension 2	4x Internal thread M2,5, 1x fitting hole Ø2mm E9	
Operating force	150	%FS
Lateral force limit	150	%FS
Material	alluminum-alloy	
Natural frequency fx	223.27	Hz
Dimensions	Ø35 x 28	mm²
Torque limit	0.2	Nm
Bending moment limit	0.2	Nm
Variants	500mN...10N	

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Electrical Data		Unit
Characteristic value range from	0.5	mV/V
Characteristic value range to	1	mV/V
Zero signal tolerance	0.1	mV/V
Rated range of excitation voltage from	2.5	V
Rated range of excitation voltage to	5	V
Operating range of excitation voltage from	1	V
Operating range of excitation voltage to	10	V
Input resistance x-axis	350	Ohm
Output resistance x-axis	350	Ohm
Input resistance y-axis	350	Ohm
Output resistance y-axis	350	Ohm
Input resistance z-axis	350	Ohm
Output resistance z-axis	350	Ohm
Tolerance input resistance	5	Ohm
Tolerance output resistance	5	Ohm

Eccentricity and Crosstalk		Unit
Influence of eccentric load to FS	1	%FS/10mm
Crosstalk from x to y at rated load	1	%FS
Crosstalk from y to x at rated load	1	%FS
Crosstalk from z to x/y at rated load	1	%FS
Crosstalk from x/y to z at rated load	1	%FS

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Accuracy Data		Unit
Accuracy class	0,2	
Relative linearity error	0.2	%FS
Relative zero signal hysteresis	0.05	%FS
Temperature effect on zero signal	0.2	%FS / K
Temperature effect on characteristic value	0.1	%RD / K
Relative creep	0.2	%FS

Environmental Data		Unit
Rated temperature range from	15	°C
Rated temperature range to	30	°C
Operating temperature range from	10	°C
Operating temperature range to	40	°C
Storage temperature range from	10	°C
Storage temperature range to	40	°C

- Abbreviations: RD: Actual value ("Reading"); FS: Full Scale;
- For the electrical data alternatively: 1000±200 Ohm possible
- The exact characteristic value is shown in the test report
- Note: The natural frequency only takes into account the load-conducting sensor parts with their specific geometries, masses and stiffnesses, but not other sensor components. The natural frequency is an indication of the dynamic design of the built environment for sensor integration and changes in frequency and direction as soon as additional masses are mounted on the sensor.
- Crosstalk is less than 1% when using the compensation matrix (type s).
  Without using the compensation matrix, crosstalk is less than 3% (matrix type cv).

Pin Assignment

Channel	Symbol	Description	Wire color	PIN
1	+Us	positive bridge supply	brown	
	-Us	negative bridge supply	white	
	+Ud	positive bridge output	green	
	-Ud	negative bridge output	yellow	
2	+Us	positive bridge supply	pink	
	-Us	negative bridge supply	grey	
	+Ud	positive bridge output	blue	
	-Ud	negative bridge output	red	
3	+Us	positive bridge supply	purple	
	-Us	negative bridge supply	black	
	+Ud	positive bridge output	orange	
	-Ud	negative bridge output	transparent	

Pressure load: positive output signal.Shield- transparent.

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