6-Axis Force Sensor K6D175 20kN/2kNm/UP13

Item number: 14462



The K6D175a multi-component sensor enables force and torque measurement in three mutually perpendicular axes. The K6D175a multi-component sensor features a wide measuring range for forces and moments.
The K6D175a is a further development of the K6D175 sensor for reduced crosstalk to approximately 1% FS, particularly for the K6D175 50kN/5kNm variant.
The K6D175a variant uses 12 measuring channels, providing a 6x12 matrix for crosstalk compensation.
Instead of a 6x12 matrix with reduced crosstalk, two 6x6 matrices can also be used for redundant applications with reduced accuracy.

This multi-component sensor uses a rod structure in the form of a "Stewart platform" that records the forces and moments directly on the pitch circle of the fastening threads. This achieves maximum rigidity and the largest possible torque measuring range. The force is applied to the 1.7 mm raised segments. The 120H8 inner diameter of the segments serves as centering. The segmented, annular face ensures optimal force application and thus the best possible reproducibility on the order of approximately 0.2%.

The multi-component force sensor is ideal for robotics applications, such as:

- Collision detection
- Teach-in
- Presence or error detection
- Force or torque-controlled operation
- Load measurement in medical technology / prosthetics / orthopedic technology / gait analysis
- Measurements in sports medicine
- Comfort measurements / ergonomics measurements

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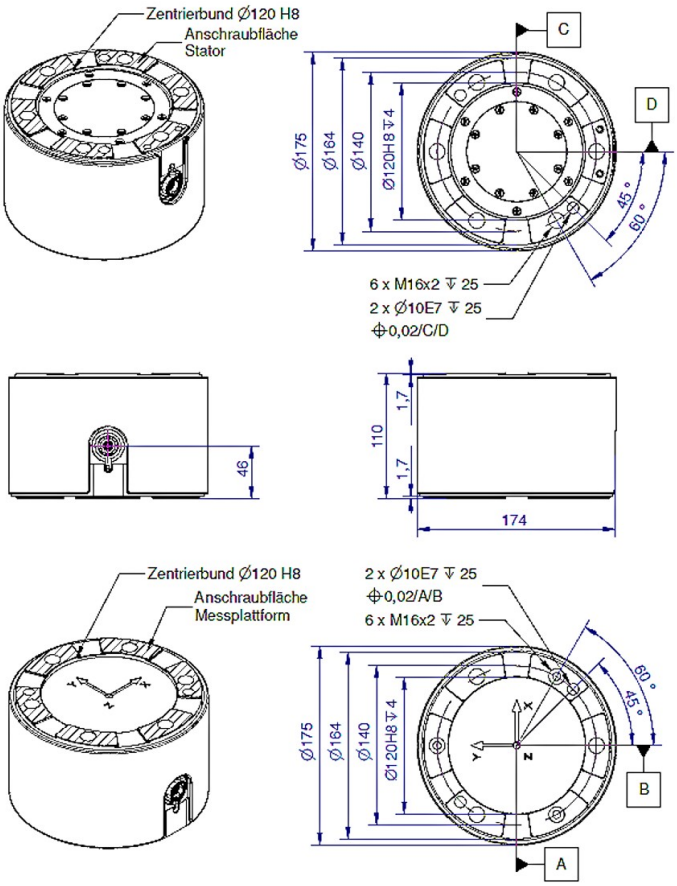
The force and moment loads are evaluated using a GSV-8DS measuring amplifier, for example.
The K6D175 sensors are made of high-strength stainless steel 1.4542.

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Technical Drawing



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Technical Data

Basic Data		Unit
Type	6-axis force sensor	
Force direction	Tension/Compression	
Rated force Fx	20	kN
Rated force Fy	20	kN
Rated force Fz	50	kN
Force introduction	Innengewinde	
Dimension 1	6x M16x2	
Sensor Fastening	Internal thread	
Dimension 2	6x M16x2	
Operating force	200	%FS
Rated displacement	0.1	mm
Twist	0.01	rad
Material	Stainless steel	
Natural frequency fx	1.7	kHz
Height	110	mm
Length or Diameter	175	mm
Rated torque Mx	2	kNm
Rated torque My	2	kNm
Rated torque Mz	5	kNm
Torque limit	300	%FS
Bending moment limit	300	%FS

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Electrical Data		Unit
Input resistance	350	Ohm
Tolerance input resistance	10	Ohm
Output resistance	350	Ohm
Tolerance output resistance	10	Ohm
Insulation resistance	2	GOhm
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
Zero signal from	-0.05	mV/V
Zero signal to	0.05	mV/V
Characteristic value range from	0.45	mV/V
Characteristic value range to	0.7	mV/V

Eccentricity and Crosstalk		Unit
Crosstalk	1	%FS

Accuracy Data		Unit
Accuracy class	0,5	
Relative linearity error	0.1	%FS
Relative zero signal hysteresis	0.1	%FS
Temperature effect on zero signal	0.1	%FS/K
Temperature effect on characteristic value	0.05	%RD/K
Relative creep	0.1	%FS
Relative repeatability error	0.5	%FS

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Environmental Data		Unit
Rated temperature range from	-10	°C
Rated temperature range to	70	°C
Operating temperature range from	-10	°C
Operating temperature range to	85	°C
Storage temperature range from	-10	°C
Storage temperature range to	85	°C
Environmental protection	IP65	

Abbreviation : RD: „Reading"; FS: „Full Scale";The application of a calibration matrix is required for the determination of the forces Fx, Fy, Fz and moments Mx, My, and Mz from the 6 measurement channels, and to compensate for the crosstalk.
The calibration data are individually determined and documented for the sensor.
The measurement error is expressed individually by the specification of the extended measurement uncertainty (k = 2) for the forces Fx, Fy, Fz, and moments Mx, My, Mz.

PIN Assignment

Channel	Symbol	Designation	Color	PIN
1	+Us	positive bridge supply	green	4
	-Us	negative bridge supply	yellow	3
	+Ud	positive bridge output	white	9
	-Ud	negative bridge output	brown	8
2	+Us	positive bridge supply	blue	10
	-Us	negative bridge supply	red	11
	+Ud	positive bridge output	gray	2
	-Ud	negative bridge output	pink	1
3	+Us	positive bridge supply	gray-pink	6
	-Us	negative bridge supply	red-blue	5
	+Ud	positive bridge output	black	12
	-Ud	negative bridge output	purple	7
4	+Us	positive bridge supply	white-yellow	23
	-Us	negative bridge supply	yellow-brown	18
	+Ud	positive bridge output	white-green	21
	-Ud	negative bridge output	brown-green	22
5	+Us	positive bridge supply	white-pink	15
	-Us	negative bridge supply	brown-pink	14
	+Ud	positive bridge output	white-gray	17
	-Ud	negative bridge output	gray-brown	16
6	+Us	positive bridge supply	white-red	20
	-Us	negative bridge supply	brown-red	24
	+Ud	positive bridge output	white-blue	13
	-Ud	negative bridge output	brown-blue	19
-	shield		transparent	

Shield: connected with sensor housing;

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Mounting

The force is applied to an annulus/to 6 segments of a circle, 155 mm – 140 mm in diameter, on the end faces of the sensor. No force is applied to the area inside the 140 mm in diameter ring.

The areas outside the annuli can be used for centring purposes. A centring hole is provided to secure the angular position.

Recommended tightening torque: 250Nm.

Stiffness Matrix

375.5 kN/mm	0.0	0.0	0.0	21800 kN	0.0
0.0	375.5 kN/mm	0.0	-21800 kN	0.0	0.0
0.0	0.0	1658.3 kN/mm	0.0	0.0	0.0
0.0	-21800 kN	0.0	4531.7 kNm	0.0	0.0
21800 kN	0.0	0.0	0.0	4531.7 kNm	0.0
0.0	0.0	0.0	0.0	0.0	4844.0 kNm

- The elements with the unit kN/mm describe the relationship between force and path.
- The elements with the unit kNm describe the relationship between torque and twist.
- The elements with the unit kN describe the relationship between torque and path (columns 1 to 3) or the relationship between force and twist (columns 4 to 6)

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