

Multi-axis force-torque-sensor K6D27

Components	F _x	F _y	F _z	M _x	M _y	M _z
Measuring ranges	50N	50N	200N	1Nm	1Nm	1Nm



The K6D27 multi-element sensor is suitable for measuring the forces in three spatial axes and for measuring the torque acting on the three spatial axes.

This '3D force' and '3D torque' sensor is integrated into a cylinder which is just 27 mm in diameter.

The sensor features 24 high-impedance ultra-miniature strain gauges of the newest generation. Despite its small dimensions, however, this multi-element sensor is highly robust: it offers IP 67 protection and its Teflon connector cable is temperature-resistant, extremely flexible and suitable for use in medical applications. The 24 connector leads are divided between two AWG 32 Teflon cables, each of which are less than 2 mm in diameter. This allows the best possible flexibility to be obtained.

The connector cables are fixed to one of the two mounting flanges. This prevents any measurement error being caused by the elasticity of the cables.

The two mounting flanges are symmetrically designed. They each have two centring collars, 23 mm and 17 mm in diameter, plus one locating hole 2 mm in diameter.

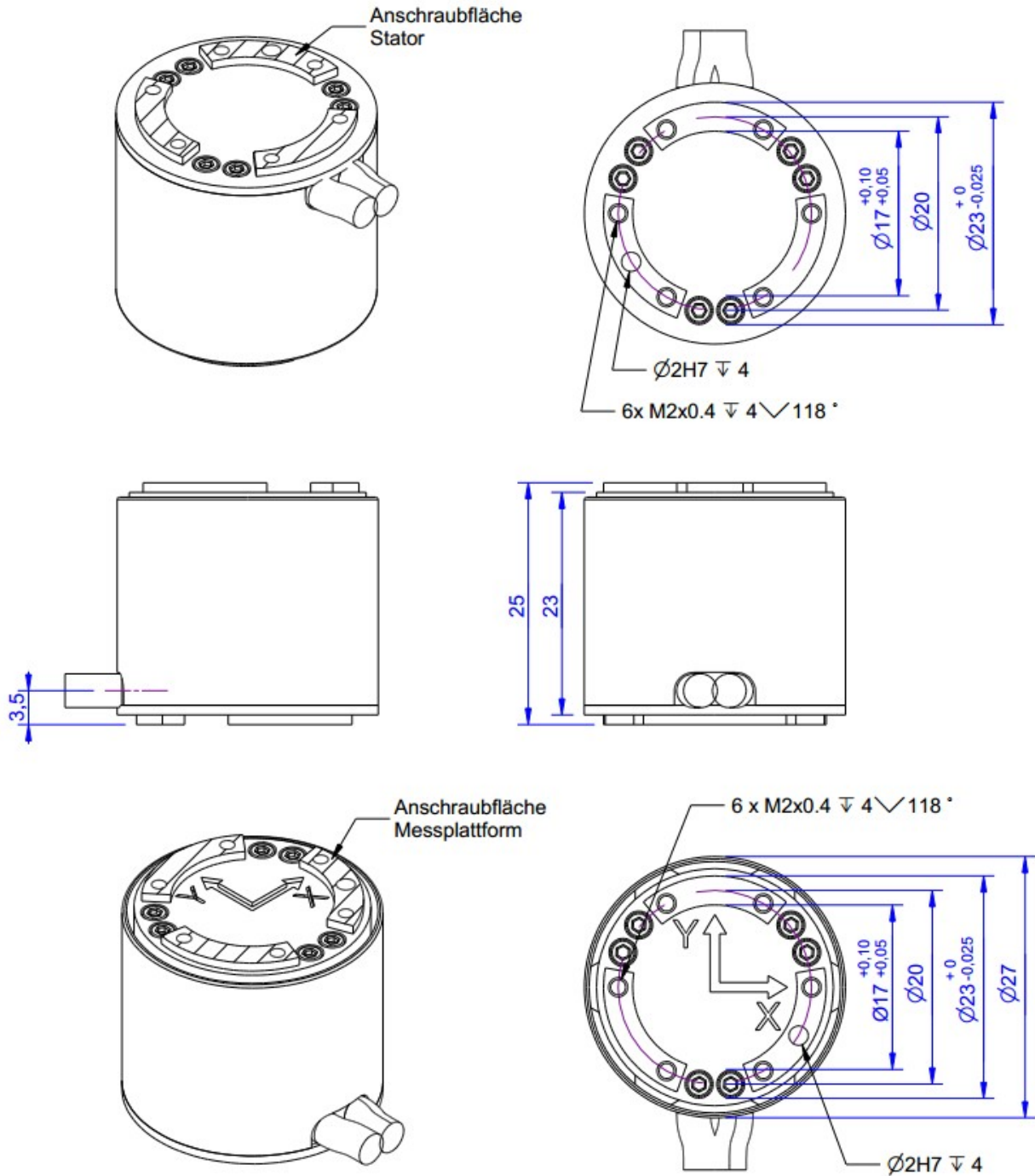
The stiffness of the sensor to forces is roughly 5000 N/mm. The stiffness of the sensor to torque is roughly 106 Nmm/rad.

Possible uses for the sensor include:

- Integration into wind-tunnel models,
- Integration into handgrips and tools in medicine
- Measurement in sports medicine and biomechanics,
- For regulating fitting and handling processes in micromechanics.

By combining the sensor with the GSV-1A8USB K6D amplifier and GSVmulti software, for example, it is possible to measure forces from 50 micronewtons and torques from 1 millinewton metre.

Dimensions



Technical Data

Design & Material		
Type		Measuring platform
Material		stainless steel / aluminum
Length x wide x height	mm x mm	Ø27 x 25
Force transmission / fastening		Segments Ø23 x 1,5
Mechanical Data		
Nominal force (FS). x. y. z-Axis	N	50, 50, 200
Nominal torque (FS) Mx, My, Mz	Nm	1, 1, 1
Operating force	%FS	150
Breaking force	%FS	300
Displacement at FS 1)	mm	ca. 0,01
Twist at FS 1)	rad	ca. 0,001
Elektrical Data		
Rated Output 2)	mV/V @ FS	ca. 0,4
Zero signal	mV/V	<2
Max. supply voltage	V	5
Input resistance	Ohm	1000 ±10
Output resistance	Ohm	1000 ±10
Insulation resistance	Ohm	>2 10 ⁹
Connection, 24	m	3
Accuracy class		
rel. span width 3)	%FS	0,5
rel. linearity deviation	%FS	<0,1
rel. reversal error	%FS	<0,1
Temp. coeff. of the zero signal	%FS/K	<0,1
Temp. coeff. of the nominal output	%RD/K	<0,05
rel. Creep error (30 min)	%FS	<0,1
Temperature		
Nominal temperature range	°C	-10... +70
Operating temperature range	°C	-10 ... +85
Storage temperature range	°C	-10 ... +85
Environmental protection		IP67

Abbreviations: RD: Reading; FS: Full scale;

1. Measured displacement with single-axis loading Fx or Fy or Fz;
2. Reference value with single-axis loading Fz
3. Repeatability with same installation position and multi-axis loading;

Pin Configuration

Channel	Description	PIN	Colour of wire 2xSTC-32T-12 (K6D27)
1	+Us 1	1	brown
	-Us 1	2	white
	+Ud 1	3	green
	-Ud 1	4	yellow
2	+Us 2	5	pink
	-Us 2	6	gray
	+Ud 2	7	blue
	-Ud 2	8	red
3	+Us 3	9	purple
	-Us 3	10	black
	+Ud 3	11	orange
	-Ud 3	12	transparent
4	+Us 4	13	brown
	-Us 4	14	white
	+Ud 4	15	green
	-Ud 4	16	yellow
5	+Us 5	17	pink
	-Us 5	18	gray
	+Ud 5	19	blue
	-Ud 5	20	red
6	+Us 6	21	purple
	-Us 6	22	black
	+Ud 6	23	orange
	-Ud 6	24	transparent

Us: bridge input (supply voltage) to one strain gauge, full bridge;

The sensor features a 24-pin M16 flange socket, type 09-0497-00-24 (male).

The GSV-1A8USB K6D measurement amplifier has a 24-pin M16 flange socket type 09-0498-00-24 (female). Sensor and amplifier are connected by a 3 m connector cable, type 2x STC32T-12 with cable plug and cable socket, Binder, M16, series 423, gold-plated.

Measurement amplifier

The signals from the 6 full-bridge strain gauges of the K6D27 sensor are connected to measurement amplifiers with inputs for full-bridge strain gauges. The recommended measurement range is 2 mV/V. The recommended supply voltage is 2.5 V - 5 V. A total of 6 measurement channels are required, e.g. 6 GSV-1 analogue measurement amplifiers or one GSV-1A8-K6D multi-channel amplifier. The mechanical forces and torques are calculated from the 6 output voltages of the individual channels using a calibration matrix.

Calibration matrix

The calibration matrix describes the arithmetic operations required to calculate the three force and the three torque values from the six output signals of the measurement amplifier. The calibration matrix is also available as a LabVIEW virtual instrument (VI). The GSVmulti software supplied enables the forces and torques to be graphically displayed and recorded.

It is also possible to integrate the calibration matrix into the user's own software. For more information, see the user manual.

Software

The GSVmulti software is supplied with the GSV-1A8USB/K6D measurement amplifier. This software enables the calibration matrix to be used and lets the user move the coordinate origin so as to display the moments about any chosen reference point. A LabVIEW VI is also available to enable users to create their own software.

Mounting the sensor

The sensor features 6 segments arranged in a circle on both top and bottom to which the forces are applied. The forces should be applied to the segments. If you are making an adaptor plate, please ensure that the heights of the centring collars 17 mm and 23 mm in diameter are not more than 0.9 mm.

The connector cable is arranged on the 'fixed' side.