

## Multi-axis torque-sensor K6D154

Measuring ranges	F <sub>x</sub> /N	F <sub>y</sub> /N	F <sub>z</sub> /N	M <sub>x</sub> /Nm	M <sub>y</sub> /Nm	M <sub>z</sub> /Nm
K6D154 50N/5Nm	50	50	100	5	5	5
K6D154 100N/10Nm	100	100	200	10	10	10
K6D154 200N/20Nm	200	200	500	20	20	20
K6D154 500N/50Nm	500	500	1000	50	50	50



### Description

The K6D154 multi-axis sensor is designed for measuring force and torque in three mutually perpendicular axes.

The K6D154 was developed specifically for measurements in flow channels. Its particular features are

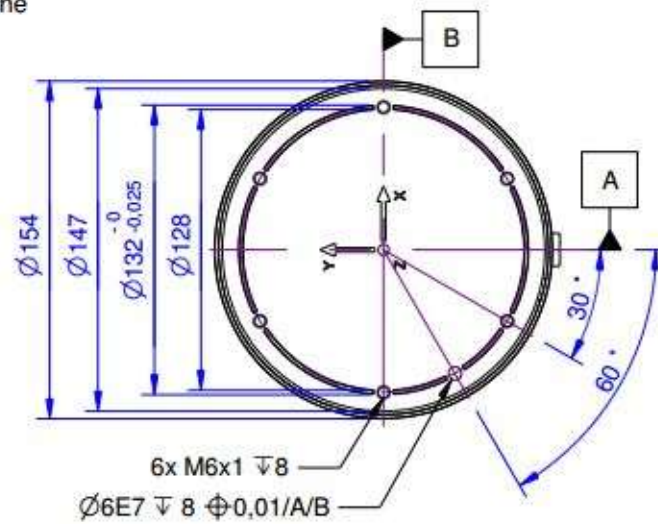
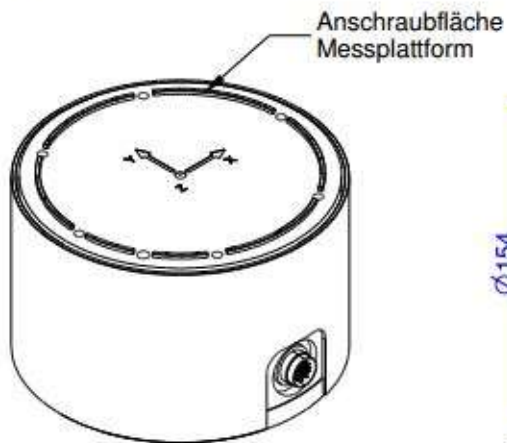
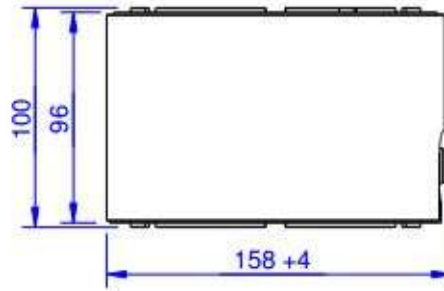
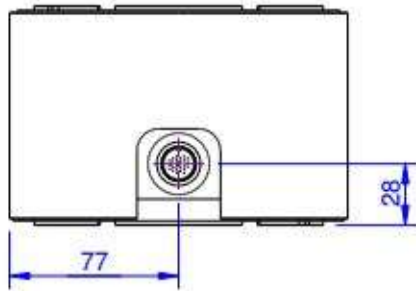
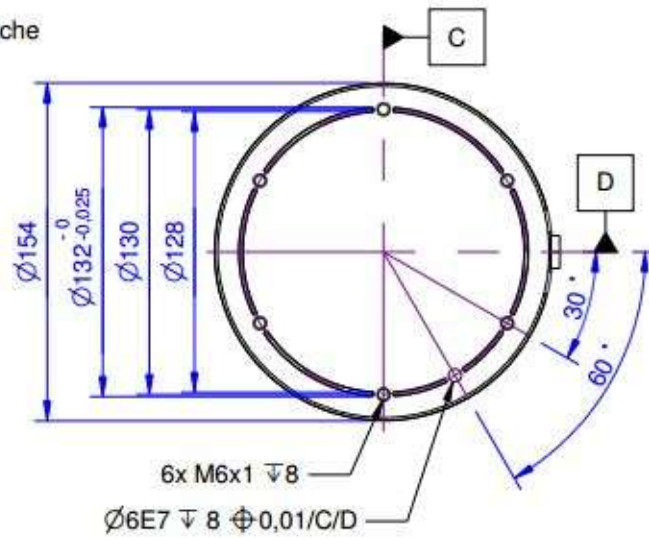
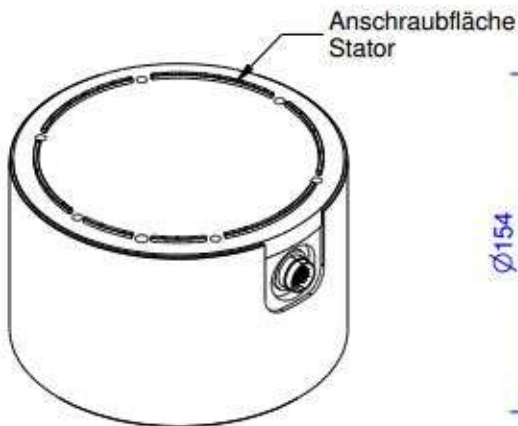
- a) high stiffness,
- b) low crosstalk,
- c) high precision.

Because of its large diameter, this multi-axis sensor can compensate for torque from an eccentric application of force particularly well.

The force and torque loadings are evaluated e.g. using a GSV-1A8USB measurement amplifier. The 6 load values can be calculated using a Windows DLL or using LabVIEW with the aid of a digital calibration document provided.

The calibration document contains the individual calibration factors and error corrections for the sensor.

### Dimensions



## Stiffness

The table lists the spring rates (spring stiffness values) for force and torque loadings in the axial directions.

Load	Force			Torque		
	x	y	z	x	y	z
Spring rate	kN/mm	kN/mm	kN/mm	kNm/rad	kNm/rad	kNm/rad
K6D154 50N/5Nm	0,6	0,6	2,7	5,8	5,8	3,8
K6D154 100N/10Nm	1,2	1,2	5,3	11,6	11,6	7,6
K6D154 200N/20Nm	2,4	2,4	11,2	24,5	24,5	16,0
K6D154 500N/50Nm	5,0	5,0	22,9	49,9	49,9	32,6

## Natural frequency

The natural frequencies obtained from the moment of inertia of the sensor mounting plate  $J_{x,y} = 690 \text{ kgmm}^2$  and  $J_z = 1369 \text{ kgmm}^2$  without additional mass are listed in the table below.

Oscillation	Translational			Rotational		
	x	y	z	x	y	z
Natural frequency	Hz	Hz	Hz	Hz	Hz	Hz
K6D154 50N/5Nm	156	156	335	462	462	265
K6D154 100N/10Nm	222	222	475	654	654	475
K6D154 200N/20Nm	321	321	688	947	947	544
K6D154 500N/50Nm	459	459	983	1353	1353	777

## Stiffness matrix

### K6D154 500N/500Nm

5 kN/mm	0,0	0,0	0,0	250 kN	0,0
0,0	5 kN/mm	0,0	-250 kN	0,0	0,0
0,0	0,0	22,9 kN/mm	0,0	0,0	0,0
0,0	-250 kN	0,0	49,9 kNm	0,0	0,0
250 kN	0,0	0,0	0,0	49,9 kNm	0,0
0,0	0,0	0,0	0,0	0,0	32,6 kNm

## Connector pin assignment

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 5 m connector cable, type 24 x 0.14/PUR with cable plug and cable socket, Binder, M16, series 423, gold-plated.

Channel	Description	PIN	Colour of wire (24x0,14mm <sup>2</sup> )
1	+Us 1	1	white
	-Us 1	2	brown
	+Ud 1	3	green
	-Ud 1	4	yellow
2	+Us 2	5	gray
	-Us 2	6	pink
	+Ud 2	7	blue
	-Ud 2	8	red
3	+Us 3	9	black
	-Us 3	10	purple
	+Ud 3	11	gray-pink
	-Ud 3	12	red-blue
4	+Us 4	13	white-green
	-Us 4	14	brown-green
	+Ud 4	15	white-yellow
	-Ud 4	16	yellow-brown
5	+Us 5	17	white-gray
	-Us 5	18	gray-brown
	+Ud 5	19	white-pink
	-Ud 5	20	pink-brown
6	+Us 6	21	white-blue
	-Us 6	22	brown-blue
	+Ud 6	23	white-red
	-Ud 6	24	brown-red

## Technical Data

Design & Material		
Type		Measuring platform
Material		aluminum alloy
Dimensions	mm x mm	Ø154 x 100
Force transmission / fastening		6x M10
Mechanical Data		
Nominal force (FS). x. y. z-Axis	N	50 ... 1000
Nominal torque (FS) Mx, My, Mz	Nm	5 ... 50
Operating force	%FS	150
Breaking force	%FS	300
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 <sup>9</sup>
Connection, 24		09-0497-00-24
Precision		
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		IP65

Abbreviation : 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;

## **K6D154 accessories**

### **Measurement amplifier**

It is recommended that the GSV-1A8-K6D measurement amplifier is used for reading the signals. The mechanical forces and torques are calculated from the 6 output voltages of the individual channels using the calibration matrix. It is however also possible to use any measurement amplifier supplied by ME-Meßsysteme.

### **Calibration matrix**

The calibration matrix is also supplied as a LabVIEW virtual instrument (VI). A LabVIEW example program that demonstrates the graphical representation and recording of the forces and torques clarifies the way in which the calibration matrix is used.

### **Software**

GSVmulti software is supplied with the sensor. This software allows the calibration matrix to be read in. The individual axes can be recorded either individually or altogether. The software also lets the user move the coordinate origin at will. To do this, the desired offset is entered into the software.

A LabVIEW VI is also available to enable users to create their own software.

### **Mounting the sensor**

The sensor features a force-sensitive ring on both top and bottom with a centring collar. The mount for the sensor should be designed such that the mount and the sensor touch only over the surface of the force-sensitive ring. If you are making an adaptor plate, please be sure to note that the groove is not deeper than 1.5 mm. This ensures that contact is solely via the force-sensitive ring.

### **Mounting plate**

The sensor features a fitting ring on top and bottom. Mounting plates to suit can be supplied on request. The mounting plate is pre-drilled with holes 3 mm in diameter. These holes can be drilled out to wider diameters or tapped with appropriate threads. (See next page for a drawing of the mounting plate)

Mounting plates are not included as standard and must be ordered separately.