



M16

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

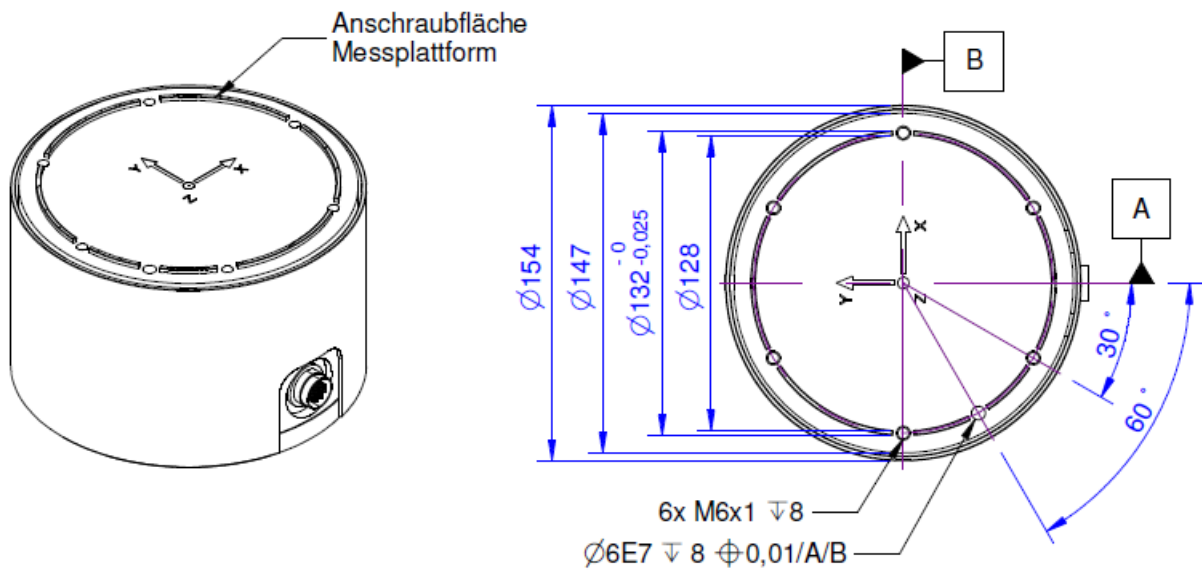
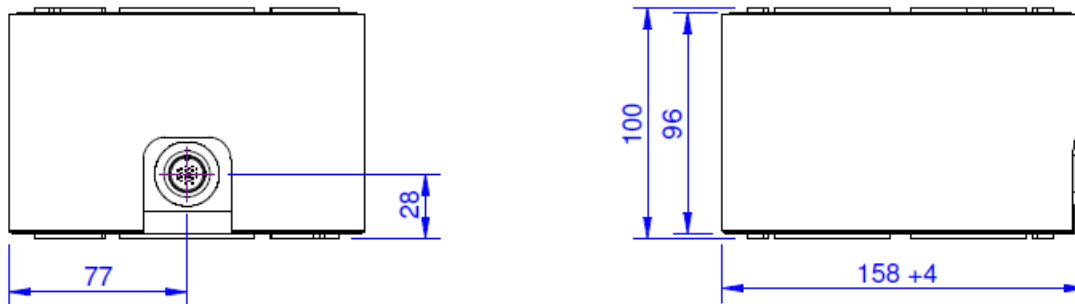
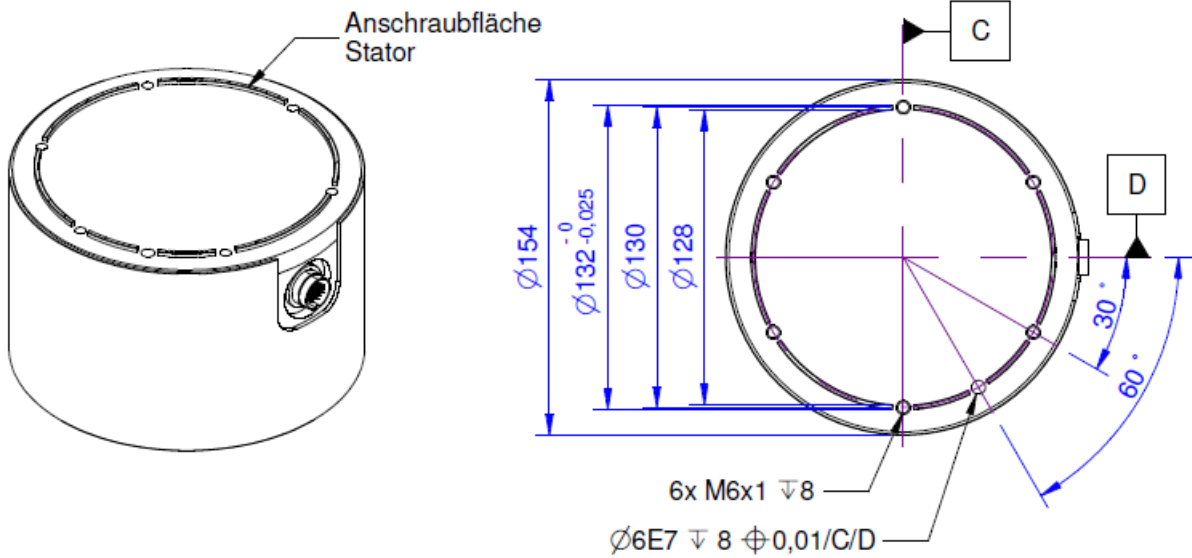
- high stiffness,
- low crosstalk,
- high precision.

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.

Technical characteristics

Modèles	K6D154 (50N/5Nm/M16)	K6D154 (100N/10Nm/M16)	K6D154 (200N/20Nm/M16)	K6D154 (500N/50Nm/M16)
Fx [N]	50	100	200	500
Fy [N]	50	100	200	500
Fz [N]	100	200	500	1000
Mx [Nm]	5	10	20	50
My [Nm]	5	10	20	50
Mz [Nm]	5	10	20	50
Connectique	Connecteur	Connecteur	Connecteur	Connecteur
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Dimensions (M16)



Specification : Model K6D154 - 50N/5Nm/M16

Force sensor	
Type	6-Axis force sensor
Force direction	Tension / Compression
Rated force Fx	50 N
Rated force Fy	50 N
Rated force Fz	100 N
Force introduction	Inner thread
Dimension 1	6x M6x1
Sensor Fastening	Inner thread
Dimension 2	6x M6x1
Operating force	400 %FS
Material	Aluminium alloy
Natural frequency	350 Hz
Dimensions	Ø154 x 100 mm
Height	100 mm
Length or Diameter	150 mm
Rated torque Mx	5 Nm
Rated torque My	5 Nm
Rated torque Mz	5 Nm
Torque limit	0 %FS
Bending moment limit	200 %FS
Breaking force	300 %FS

Electrical Data	
Input resistance	1000 Ohm
Tolerance input resistance	10 Ohm
Output resistance	1000 Ohm
Tolerance output resistance	10 Ohm
Insulation resistance	2 GOhm
Rated range of excitation voltage f	2.5 ... 5 V
Operating range of excitation voltage f	1 ... 5 V
Zero signal to	-0.05 mV/V
Zero signal from	0.05 mV/V
Rated output	0.4 mV/V / FS

Precision	
Accuracy class	0,2%
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

Connection Data	
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Specification : Model K6D154 - 50N/5Nm/M16

Connection type	Connector
Name of the connection	M16 round plug connector
Eccentricity and Crosstalk	
Crosstalk	1 %FS
Temperature	
Rated temperature range f	-10 ... 70 °C
Operating temperature range f	-10 ... 85 °C
Storage temperature range f	-10 ... 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 F_x , F_y , F_z and moments M_x , M_y , and M_z 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 F_x , F_y , F_z , and moments M_x , M_y , M_z .

Specification : Model K6D154 - 100N/10Nm/M16

Force sensor

Type	6-Axis force sensor
Force direction	Tension / Compression
Rated force Fx	100 N
Rated force Fy	100 N
Rated force Fz	200 N
Force introduction	Inner thread
Dimension 1	6x M6x1
Sensor Fastening	Inner thread
Dimension 2	6x M6x1
Operating force	400 %FS
Material	Aluminium alloy
Natural frequency	500 Hz
Dimensions	Ø154 x 100 mm
Height	100 mm
Length or Diameter	150 mm
Rated torque Mx	10 Nm
Rated torque My	10 Nm
Rated torque Mz	10 Nm
Torque limit	200 %FS
Bending moment limit	200 %FS

Electrical Data

Input resistance	1000 Ohm
Tolerance input resistance	10 Ohm
Output resistance	1000 Ohm
Tolerance output resistance	10 Ohm
Insulation resistance	2 GOhm
Rated range of excitation voltage f	2.5 ... 5 V
Operating range of excitation voltage f	1 ... 5 V
Zero signal to	-0.05 mV/V
Zero signal from	0.05 mV/V
Rated output	0.4 mV/V / FS

Precision

Accuracy class	0,2%
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

Connection Data

Connection type	Connector
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Specification : Model K6D154 - 100N/10Nm/M16

Name of the connection	M16 round plug connector
Eccentricity and Crosstalk	
Crosstalk	1 %FS
Temperature	
Rated temperature range f	-10 ... 70 °C
Operating temperature range f	-10 ... 85 °C
Storage temperature range f	-10 ... 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 F_x , F_y , F_z and moments M_x , M_y , and M_z 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 F_x , F_y , F_z , and moments M_x , M_y , M_z .

Specification : Model K6D154 - 200N/20Nm/M16

Force sensor

Type	6-Axis force sensor
Force direction	Tension / Compression
Rated force Fx	200 N
Rated force Fy	200 N
Rated force Fz	500 N
Force introduction	Inner thread
Dimension 1	6x M6x1
Sensor Fastening	Inner thread
Dimension 2	6x M6x1
Operating force	400 %FS
Material	Aluminium alloy
Natural frequency	750 Hz
Dimensions	Ø154 x 100 mm
Height	100 mm
Length or Diameter	150 mm
Rated torque Mx	20 Nm
Rated torque My	20 Nm
Rated torque Mz	20 Nm
Torque limit	200 %FS
Bending moment limit	200 %FS

Electrical Data

Input resistance	1000 Ohm
Tolerance input resistance	10 Ohm
Output resistance	1000 Ohm
Tolerance output resistance	10 Ohm
Insulation resistance	2 GOhm
Rated range of excitation voltage f	2.5 ... 5 V
Operating range of excitation voltage f	1 ... 5 V
Zero signal to	-0.05 mV/V
Zero signal from	0.05 mV/V
Rated output	0.4 mV/V / FS

Precision

Accuracy class	0,2%
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

Connection Data

Connection type	Connector
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Specification : Model K6D154 - 200N/20Nm/M16

Name of the connection	M16 round plug connector
Eccentricity and Crosstalk	
Crosstalk	1 %FS
Temperature	
Rated temperature range f	-10 ... 70 °C
Operating temperature range f	-10 ... 85 °C
Storage temperature range f	-10 ... 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 F_x , F_y , F_z and moments M_x , M_y , and M_z 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 F_x , F_y , F_z , and moments M_x , M_y , M_z .

Specification : Model K6D154 - 500N/50Nm/M16

Force sensor

Type	6-Axis force sensor
Force direction	Tension / Compression
Rated force Fx	500 N
Rated force Fy	500 N
Rated force Fz	1000 N
Force introduction	Inner thread
Dimension 1	6x M6x1
Sensor Fastening	Inner thread
Dimension 2	6x M6x1
Operating force	400 %FS
Material	Aluminium alloy
Natural frequency	1 kHz
Dimensions	Ø154 x 100 mm
Height	100 mm
Length or Diameter	150 mm
Rated torque Mx	50 Nm
Rated torque My	50 Nm
Rated torque Mz	50 Nm
Torque limit	200 %FS
Bending moment limit	200 %FS

Electrical Data

Input resistance	1000 Ohm
Tolerance input resistance	10 Ohm
Output resistance	1000 Ohm
Tolerance output resistance	10 Ohm
Insulation resistance	2 GOhm
Rated range of excitation voltage f	2.5 ... 5 V
Operating range of excitation voltage f	1 ... 5 V
Zero signal to	-0.05 mV/V
Zero signal from	0.05 mV/V
Rated output	0.4 mV/V / FS

Precision

Accuracy class	0,2%
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

Connection Data

Connection type	Connector
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Specification : Model K6D154 - 500N/50Nm/M16

Name of the connection	M16 round plug connector
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Eccentricity and Crosstalk

Crosstalk	1 %FS
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Temperature

Rated temperature range f	-10 ... 70 °C
Operating temperature range f	-10 ... 85 °C
Storage temperature range f	-10 ... 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 F_x , F_y , F_z and moments M_x , M_y , and M_z 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 F_x , F_y , F_z , and moments M_x , M_y , M_z .

Pin Configuration (M16)

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

Shield: connected with sensor housing;

Mounting

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.

Manual

Stiffness Matrix K6D154 (50N/5Nm/M16)

1.3 kN/mm	0.0	0.0	0.0	62 kN	0.0	u_x
0.0	1.3 kN/mm	0.0	-62 kN	0.0	0.0	u_y
0.0	0.0	5.7 kN/mm	0.0	0.0	0.0	u_z
0.0	-62 kN	0.0	12.5 kNm	0.0	0.0	ϕ_x
62 kN	0.0	0.0	0.0	12.5 kNm	0.0	ϕ_y
0.0	0.0	0.0	0.0	0.0	8.7 kNm	ϕ_z

Stiffness Matrix K6D154 (100N/10Nm/M16)

2.6 kN/mm	0.0	0.0	0.0	125 kN	0.0	u_x
0.0	2.6 kN/mm	0.0	-125 kN	0.0	0.0	u_y
0.0	0.0	11.4 kN/mm	0.0	0.0	0.0	u_z
0.0	-125 kN	0.0	25.1 kNm	0.0	0.0	ϕ_x
125 kN	0.0	0.0	0.0	25.1 kNm	0.0	ϕ_y
0.0	0.0	0.0	0.0	0.0	17.4 kNm	ϕ_z

Stiffness Matrix K6D154 (200N/20Nm/M16)

5.4 kN/mm	0.0	0.0	0.0	262 kN	0.0	u_x
0.0	5.4 kN/mm	0.0	-262 kN	0.0	0.0	u_y
0.0	0.0	23.9 kN/mm	0.0	0.0	0.0	u_z
0.0	-262 kN	0.0	52.7 kNm	0.0	0.0	ϕ_x
262 kN	0.0	0.0	0.0	52.7 kNm	0.0	ϕ_y
0.0	0.0	0.0	0.0	0.0	36.6 kNm	ϕ_z


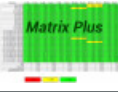





Stiffness Matrix K6D154 (500N/50Nm/M16)

11.1 kN/mm	0.0	0.0	0.0	534 kN	0.0	u_x
0.0	11.1 kN/mm	0.0	-534 kN	0.0	0.0	u_y
0.0	0.0	48.8 kN/mm	0.0	0.0	0.0	u_z
0.0	-534 kN	0.0	107.5 kNm	0.0	0.0	ϕ_x
534 kN	0.0	0.0	0.0	107.5 kNm	0.0	ϕ_y
0.0	0.0	0.0	0.0	0.0	74.7 kNm	ϕ_z

Caption

Element	Description
[kN/mm]	force- displacement
[kNm]	torque- twist
[kN]	force- twist and torque- displacement

Accessories

Description	Description
 <p>K6D-CalibrationMatrix SL</p>	Standard calibration matrix "Small load" for the sensors with small measuring ranges
 <p>K6D-CalibrationMatrix SL/Plus</p>	High accuracy calibration matrix for 6-axis force/torque sensors;
 <p>GSV-8DS</p>	8-channel amplifier with USB port, analog output, UART interface. Other versions GSV-8AS CAN with Canbus and GSV-8AS EC with EtherCAT fieldbus.
 <p>GSV-8AS</p>	8-channel amplifier with USB port, analog output, UART interface. Other versions GSV-8AS CAN with Canbus and GSV-8AS EC with EtherCAT fieldbus.
 <p>Connection cable M16/24p/f-SubD44HD/m</p>	Connection cable for K6D sensor to 8-channel measuring amplifier GSV-8DS D-Sub44HD;
 <p>Connection cable M16/24p/f-m16/24p/m</p>	Connection cable for K6D sensor to 8-channel measuring amplifier GSV-8AS;
 <p>K6D-Adapter Development</p>	Indicative offer for an adapter set, Consisting of e.g. 2 plates, For mounting a device / flange on K6D sensor;