# Multi-axis force-torque-sensor K6D80

| Measuring ranges | Fx /kN | Fy /kN | Fz /kN | Mx /Nm | My /Nm | Mz /Nm |
|---|---|---|---|---|---|---|
| K6D80 2kN/100Nm | 2 | 2 | 5 | 100 | 100 | 100 |
| K6D80 5kN/250Nm | 5 | 5 | 15 | 250 | 250 | 250 |

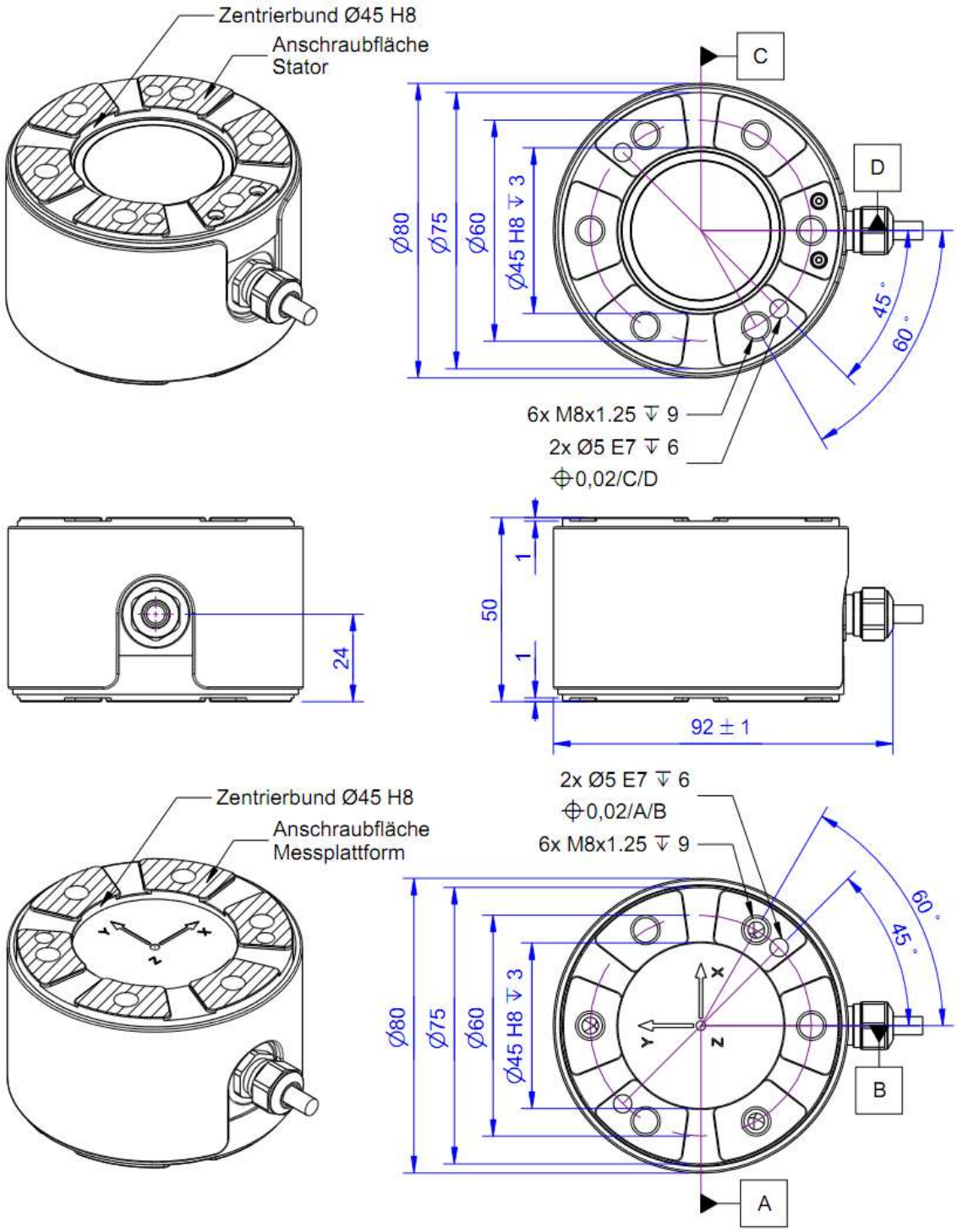
## Description

The multi-component sensor K6D80 allows force and torque measurement in three mutually perpendicular axes.
The multi-component sensor  K6D80 distinguish itself by a big measuring range for torques at the same time with the small outer diameter.
With this multi-component sensor of the „second generation“ is used rod construction, which absorbs forces and torques directly on the pitch circle of the fastening thread. Thereby, the maximum stiffness and the biggest measuring range will be achieved for the torques.
The force transmission is applied on the 1 mm raised segments. The inner diameter of segments is used for the centering. Due to segmented, ring-shaped front surface, the optimal force transmission and therefore the best possible reproducibility in the range of about 0,1 % will be obtained.
The multi-component force sensor is very well suited for use in robotics, e.g.

1. For collision detection
2. “Teach-In”
3. Presence detection and error detection
4. Force or torque-controlled operation
5. Load measurement in medicine, prosthetics, orthopaedic engineering or gait analysis
6. Measurement in sports medicine
7. Comfort / ergonomics measurements

The force and torque loadings are evaluated e.g. using a GSV-8AS measurement amplifier or an integrated electronic of type GSV-6.
The sensor K6D80 2kN/100Nm is made of aluminium alloy, the sensor K6D80 5kN/250Nm is made of high-strength stainless steel 1.4542.

## Dimensions





ME-Meßsysteme GmbH, Neuendorfstr. 18a, DE-16761 Hennigsdorf
Tel +49 (0)3302 78620 60, Fax +49 (0)3302 78620 69, info@me-systeme.de, www.me-systeme.de

## Technical Data

| **Design & Material** | | |
|---|---|---|
| Type | | measuring platform |
| Material | | al.alloy. to 2kN, stainless steel. from 5kN |
| Dimensions | mm x mm | Ø80 x 50 |
| Force transmission / fastening | | 6x M8 |
| **Mechanical Data** | | |
| Nominal force (FS) Fx, Fy, Fz | kN | 2...5 |
| Nominal torque (FS) Mx, My, Mz | Nm | 100 … 250 |
| Operating force | %FS | 300 |
| Breaking force | %FS | 600 |
| Displacement at FS 1) | mm | ca. 0,05 |
| Twist at FS 1) | rad | ca. 0,04 |
| **Elektrical Data** | | |
| Rated Output 2) | mV/V @ FS | ca. 0,8 |
| Zero signal | mV/V | <1 |
| Max. supply voltage | V | 5 |
| Input resistance | Ohm | 350 ±10 |
| Output resistance | Ohm | 350 ±10 |
| Insulation resistance | Ohm | >2 $10^9$ |
| Connection, 24 | m | 5 |
| **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 |

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;

The calibration of the individual axes and the crosstalk are individually determined and documented in a calibration matrix.

## Stiffness matrix

### K6D80 2kN/100Nm

| | | | | | |
|---|---|---|---|---|---|
| 57,2 kN/mm | 0,0 | 0,0 | 0,0 | 1432 kN | 0,0 |
| 0,0 | 57,2 kN/mm | 0,0 | -1432 kN | 0,0 | 0,0 |
| 0,0 | 0,0 | 247,7 kN/mm | 0,0 | 0,0 | 0,0 |
| 0,0 | -1432 kN | 0,0 | 120,5 kNm | 0,0 | 0,0 |
| 1432 kN | 0,0 | 0,0 | 0,0 | 120,5 kNm | 0,0 |
| 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 78,3 kNm |

### K6D80 10kN/250Nm

| | | | | | |
|---|---|---|---|---|---|
| 164,7 kN/mm | 0,0 | 0,0 | 0,0 | 4117 kN | 0,0 |
| 0,0 | 164,7 kN/mm | 0,0 | -4117 kN | 0,0 | 0,0 |
| 0,0 | 0,0 | 712,6 kN/mm | 0,0 | 0,0 | 0,0 |
| 0,0 | -4117 kN | 0,0 | 346,7 kNm | 0,0 | 0,0 |
| 4117 kN | 0,0 | 0,0 | 0,0 | 346,7 kNm | 0,0 |
| 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 225,3 kNm |

## Pin Configuration

| Channel | Signal | Description | Colour of wire | PIN |
|---|---|---|---|---|
| 1 | +Us1 | positive bridge excitation | red | 1 |
| | -Us1 | negative bridge excitation | black | 2 |
| | +Ud1 | positive bridge output | green | 3 |
| | -Ud1 | negative bridge output | white | 4 |
| 2 | +Us2 | positive bridge excitation | blue | 5 |
| | -Us2 | negative bridge excitation | yellow | 6 |
| | +Ud2 | positive bridge output | purple | 7 |
| | -Ud2 | negative bridge output | gray | 8 |
| 3 | +Us3 | positive bridge excitation | orange | 9 |
| | -Us3 | negative bridge excitation | brown | 10 |
| | +Ud3 | positive bridge output | pink | 11 |
| | -Ud3 | negative bridge output | transparent | 12 |
| 4 | +Us4 | positive bridge excitation | green-black | 13 |
| | -Us4 | negative bridge excitation | black-white | 14 |
| | +Ud4 | positive bridge output | red-black | 15 |
| | -Ud4 | negative bridge output | white-black | 16 |
| 5 | +Us5 | positive bridge excitation | purple-black | 17 |
| | -Us5 | negative bridge excitation | yellow-black | 18 |
| | +Ud5 | positive bridge output | bue-black | 19 |
| | -Ud5 | negative bridge output | gray-black | 20 |
| 6 | +Us6 | positive bridge excitation | pink-black | 21 |
| | -Us6 | negative bridge excitation | brown-black | 22 |
| | +Ud6 | positive bridge output | orange-black | 23 |
| | -Ud6 | negative bridge output | transparent-black | 24 |

Shielding: connected with plug housing;

## Accessories

### Measurement amplifier

The measurement amplifier GSV-8AS is provided with a 24-pin plug, thus allowing a 6-axis sensor to be connected. The GSVmulti software calculates the mechanical forces and torques from the 6 output voltages of the individual channels using the calibration matrix.

### Calibration matrix

The calibration matrix contains 36 calibration factors for calculating the forces and torques from the 6 output signals of the force sensor. A LabVIEW VI is available for manipulating the calibration matrix.

### Software

The GSVmulti software is supplied with the GSV-8 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 forces is applied to an annulus (Ø75-Ø45) on the end faces of the sensor. No force is applied to the area inside the ring.

A centring hole is provided to secure the angular position.

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