

2-Component Sensor F_z , M_z

Type 9345B, 9365B

–20 ... 20 kN and –200 ... 200 N·m

This installation-friendly, piezoelectric 2-component sensor is suitable for measuring push/pull force F_z and a torque M_z acting on the sensor axis. Its high resolution allows measurement of the slightest dynamic changes in large forces and torques at non-rotating shafts.

- Very compact, ready to install sensor
- High rigidity and high natural frequency
- Flexible adaption with mounting threads in double flanges
- Centering seats for coaxial mounting and optimum introduction of torque
- Center hole for shaft passage

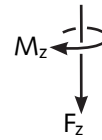
Description

Pressure and shear sensitive quartz disks are integrated under high preload between a hollow preload screw and a nut designed as the sensor case. Because of the extremely high rigidity of the sensor elements, the components F_z and M_z are measured practically without change of stroke or angle. The force and torque-proportional charge signal is picked up by electrodes and fed via a shielded cable to the charge amplifier. The latter converts the charge signals into proportional output voltages, which can be recorded and evaluated.

Flanges with tapped holes in the top and bottom sides of the sensor allow simple mounting on a shaft or adapter flange. Centering seats on both sides permit a very accurate coaxial fitting and a centric bore allows shafts to be inserted.

The sensor is rust-resistant and splash-water-protected. Together with the connecting cable Type 1698AD2, the sensor achieves the degree of protection IP65.

It should be noted that the measuring ranges are reduced by combined and eccentric loads.



Application

- Measuring feed force and torque when drilling, thread cutting etc.
- Monitoring of screw driving processes and testing threaded fasteners
- Testing springs (torsion)
- Measurements on small thrust bearings, friction clutches etc.
- Measuring starting torques, irregular motion and torsional vibration on small servo and stepping motors
- Testing rotary switches and screw caps

Technical Data

| | | Type | 9345B | 9365B |
|-----------------------------|-------|--------|------------|--------------|
| Measuring range | F_z | kN | –10 ... 10 | –20 ... 20 |
| | M_z | N·m | –25 ... 25 | –200 ... 200 |
| Overload | F_z | kN | –12/12 | –24/24 |
| | M_z | N·m | –30/30 | –210/210 |
| Calibrated measuring ranges | | | | |
| 100 % | F_z | kN | 0 ... 10 | 0 ... 20 |
| | | N·m | 0 ... 25 | 0 ... 200 |
| | M_z | N·m | 0 ... –25 | 0 ... –200 |
| | | N·m | 0 ... –200 | 0 ... –200 |
| 10 % | F_z | kN | 0 ... 1 | 0 ... 2 |
| | | N·m | 0 ... 2,5 | 0 ... 20 |
| | M_z | N·m | 0 ... –2,5 | 0 ... –20 |
| | | N·m | 0 ... –20 | 0 ... –20 |
| Sensitivity | F_z | pC/N | ≈–3,7 | ≈–3,6 |
| | M_z | pC/N·m | ≈–190 | ≈–140 |

| | Type | 9345B | 9365B |
|---|----------------------|-----------------|-----------------|
| Threshold | F_z | N | <0,02 |
| | M_z | mN·m | <0,35 |
| Linearity, all ranges | F_z | %FSO | $\leq \pm 0,3$ |
| | M_z | %FSO | $\leq \pm 0,3$ |
| Hysteresis, all ranges | F_z | %FSO | $\leq 0,5$ |
| | M_z | %FSO | $\leq 0,5$ |
| Max. bending moment | | | |
| M_x, M_y ($M_z = 25 \text{ N}\cdot\text{m}; F_z = 0$) | N·m | 70 | |
| M_x, M_y ($M_z = 200 \text{ N}\cdot\text{m}; F_z = 0$) | N·m | | 210 |
| Shear force max. | | | |
| $F_{x,y}$ ($M_z = 25 \text{ N}\cdot\text{m}; F_z = 0$) | kN | 3 ¹⁾ | |
| M_z ($M_z = 200 \text{ N}\cdot\text{m}; F_z = 0$) | kN | | 7 ¹⁾ |
| Crosstalk | | | |
| $M_z \rightarrow F_z$ | N/N·m | $\leq \pm 2$ | $\leq \pm 1$ |
| $M_b \rightarrow F_z$ | N/N·m | $\leq \pm 0,5$ | $\leq \pm 0,5$ |
| $F_{x,y} \rightarrow F_z$ (typical) | N/N | $\leq \pm 0,02$ | $\leq \pm 0,02$ |
| $F_z \rightarrow M_z$ | mN·m/N | $\leq \pm 0,04$ | $\leq \pm 0,08$ |
| $M_b \rightarrow M_z$ | N·m/N·m | $\leq \pm 0,02$ | $\leq \pm 0,01$ |
| $F_{x,y} \rightarrow M_z$ (typical) | mN·m/N | $\leq \pm 0,3$ | $\leq \pm 0,3$ |
| Rigidity | | | |
| $c_z (F_z)$ | kN/ μm | $\approx 1,7$ | $\approx 2,8$ |
| $c_\varphi (M_z)$ | N·m/ μrad | $\approx 0,19$ | $\approx 0,92$ |
| Natural frequency | | | |
| $f_n (z)$ | kHz | >41 | >33 |
| $f_n (M_z)$ | kHz | >32 | >25 |
| Operating temperature range | °C | -40 ... 120 | -40 ... 120 |
| Temperature coefficient of sensitivity | | | |
| F_z | %/°C | -0,2 | -0,2 |
| M_z | %/°C | -0,1 | -0,1 |
| Capacitance | | | |
| C_{Fz} | pF | ≈ 65 | ≈ 150 |
| C_{Mz} | pF | ≈ 340 | ≈ 350 |
| Insulation resistance at 20 °C | Ω | $>10^{13}$ | $>10^{13}$ |
| Degree of protection (with cable connected) | EN60529 | IP65 | IP65 |
| Connector | | M9x0,75 | V3 neg. |
| Case material | DIN | 1.4542 | 1.4542 |
| Weight | g | 267 | 834 |
| Tightening torque M_A (recommended) | N·m | 4 | 21 |

¹⁾ Force applied in the flange plane

Dimensions 2-Component Sensor F_z, M_z

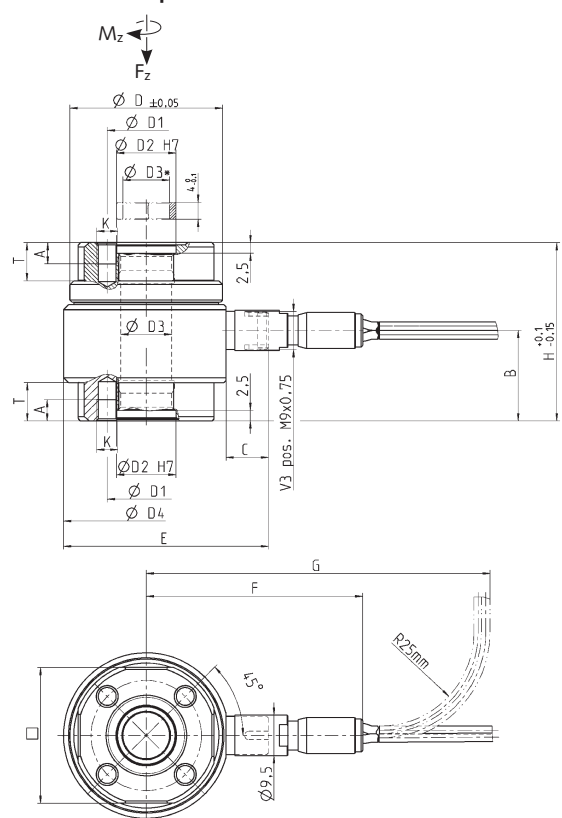


Fig. 1: Dimensions 2-component sensor F_z, M_z , Type 9345B, 9365B

| Type | D | D1 | D2 | D3 | D3* | D4 | □ | H | A |
|-------|----|----|----|----|-----|------|----|----|---|
| 9345B | 36 | 26 | 14 | 11 | 11 | 39 | 32 | 42 | 5 |
| 9365B | 54 | 40 | 21 | 17 | 17 | 56,5 | 48 | 60 | 8 |

| Type | B | C | E | F | G | K | T |
|-------|------|----|------|----|----|----|----|
| 9345B | 21,7 | 10 | 48,3 | 51 | 81 | M5 | 9 |
| 9365B | 31,8 | 10 | 66 | 60 | 90 | M8 | 13 |

Mounting

Mounting is accomplished using the flanges with tapped holes on both sides of the sensor. The contact surfaces to the sensor must be flat, rigid and clean. Centering seats and centering rings (included accessories) are provided to allow as accurate as possible coaxial fitting. Torque should be introduced with the smallest possible eccentricity ($<0,02$ mm) of the axes to be connected. Bending moments and shear forces must be avoided as far as possible.

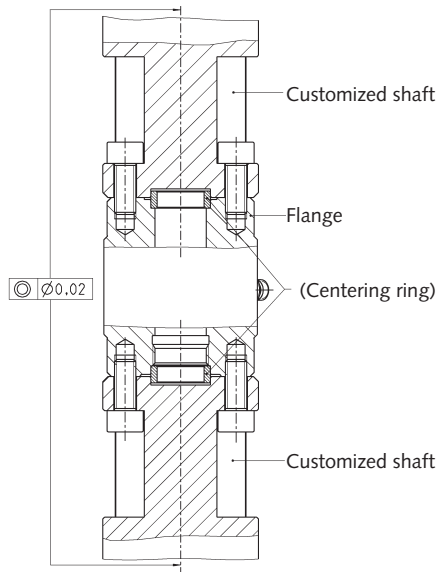


Fig. 2: Installation in shaft

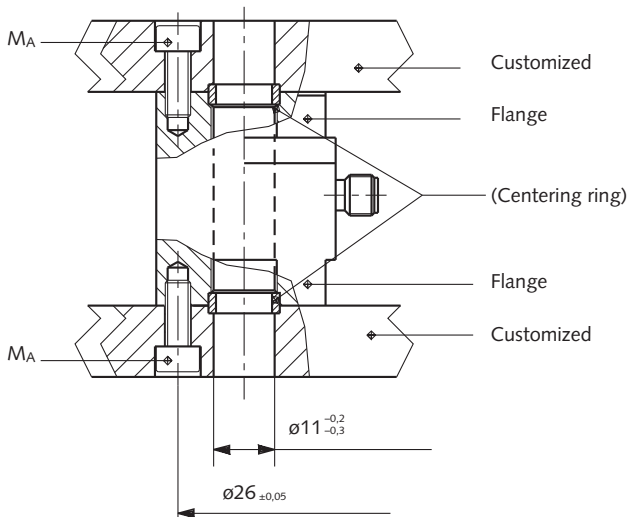
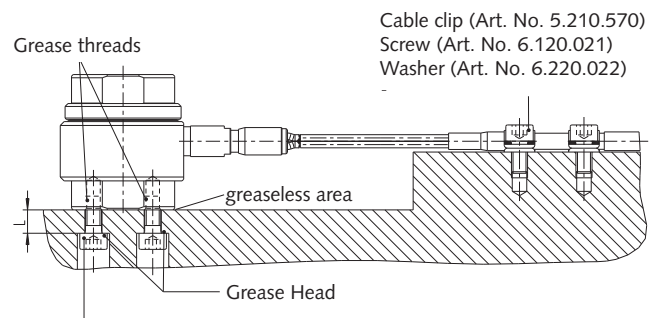


Fig. 3: Installation between base and cover plate

Installation

- The sensor is screwed onto a previously machined surface with four fixing screws. The mounting surface must not be painted or greased and the planeness of the contact surface must be within a tolerance of 5 microns.
- The connecting cable must be installed in such a way as to exclude any tangential, radial or axial forces to the sensor. The cable should be affixed as close as possible to the sensor on a suitable mounting surface.
- The tightening torque to be applied to each of the four fixing screws is 21 [N·m].



Type 9345B 4 pcs. Screw M5x12 (Art. No. 6.120.022)
Type 9365B 4 pcs. Screw M8x20 (Art. No. 6.120.038)
Tightening torques: M_v [N·m]

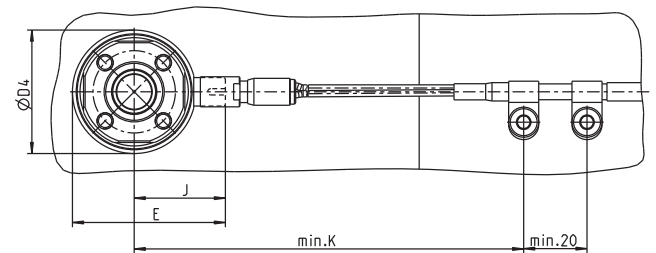
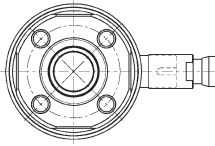
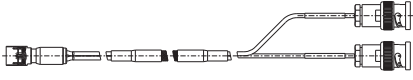
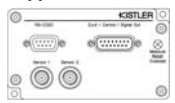



Fig. 4: Installation 2-component sensor F_z , M_z

| Type | D4 | E | J | K | L | M_v |
|-------|------|------|------|-----|------|-------|
| 9345B | 39 | 48,3 | 28,8 | 130 | 7,3 | 4 |
| 9365B | 56,5 | 66 | 37,8 | 140 | 12,6 | 21 |

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Measuring System with 2-Component Force Link

| 2-Component Force Link with V3 neg. Connector | Degree of protection EN60529 | Connecting Cable | Multi-Channel Charge Amplifier | Reading |
|---|------------------------------|---|--|--|
| <p>Type 9345B Type 9365B</p>  <p>V3 neg.</p> | <p>IP65</p> | <p>Type 1698AD2...</p>  <p>V3 pos. 2 x BNC pos.</p> | <p>Type 5073A211</p>  <p>Type 5015A... Type 5015A...</p>  <p>F_z M_z</p> | <p>F_z M_z</p> |

Included Accessories

- 2 x centering ring for Type 9345B **Art. No.** 3.420.180
- 2 x centering ring for Type 9365B 3.420.181

Optional Accessories

- Mounting flange for Type 9345B **Type** 9580A1
- Mounting flange for Type 9365B 9580A2
- Connecting cable, 2 wire 1698AD2
V3 pos. – 2 x BNC neg., Length = 2 m

(see also data sheet for cables 1687B_000-545)

Ordering Key

- 2-Component Sensor F_z , M_z **Type** **9345B**
-10 ... 10 kN, -25 ... 25 N·m
- 2-Component Sensor F_z , M_z **9365B**
-20 ... 20 kN, -200 ... 200 N·m

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