

## 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

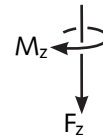
### Description

Several layers of pressure and shear sensitive quartz disks are integrated under high preload between a hollow preload screw and a nut designed as the sensor case. The two components are measured practically without displacement. The force-proportional charge signal and the charge signal proportional to the effective torque, i.e. the shear stresses produced, is picked up by electrodes and fed via a shielded cable to a 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 has 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 ... 2,5	0 ... 20
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 ... 2,5	0 ... –20
Sensitivity	$F_z$	pC/N	≈–3,7	≈–3,6
	$M_z$	pC/N·m	≈–200	≈–140

	Type	9345B	9365B
Threshold	$F_z$	N	<0,02
	$M_z$	mN·m	<0,35
Linearity, all ranges	$F_z$	%FSO	$\leq \pm 1$
	$M_z$	%FSO	$\leq \pm 0,5$
Hysteresis, all ranges	$F_z$	%FSO	$\leq 1$
	$M_z$	%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 <sup>1)</sup>	
$M_z$ ( $M_z = 200 \text{ N}\cdot\text{m}; F_z = 0$ )	kN		7 <sup>1)</sup>
Crosstalk			
$M_z \rightarrow F_z$	N/N·m	$\leq \pm 2$	$\leq \pm 1$
$M_b \rightarrow F_z$	N/N·m	$\leq \pm 1$	$\leq \pm 1$
$F_{x,y} \rightarrow F_z$ (typical)	N/N	$\leq \pm 0,1$	$\leq \pm 0,1$
$F_z \rightarrow M_z$	mN·m/N	$\leq \pm 0,03$	$\leq \pm 0,03$
$M_b \rightarrow M_z$	mN·m/N·m	$\leq \pm 10$	$\leq \pm 10$
$F_{x,y} \rightarrow M_z$ (typical)	mN·m/N	$\leq \pm 0,3$	$\leq \pm 0,3$
Rigidity			
$c_z$ ( $F_z$ )	kN/ $\mu\text{m}$	$\approx 1,7$	$\approx 2,8$
$c_\varphi$ ( $M_z$ )	N·m/ $\mu\text{rad}$	$\approx 0,19$	$\approx 0,92$
Natural frequency			
$f_n$ ( $F_z$ )	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	$\approx 65$	$\approx 150$
$C_{Mz}$	pF	$\approx 340$	$\approx 350$
Insulation resistance at 20 °C	$\Omega$	$>10^{13}$	$>10^{13}$
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 (recommended)	$M_A$	N·m	4

<sup>1)</sup> Force applied in the flange plane

Dimensions 2-Component Sensor  $F_z, M_z$

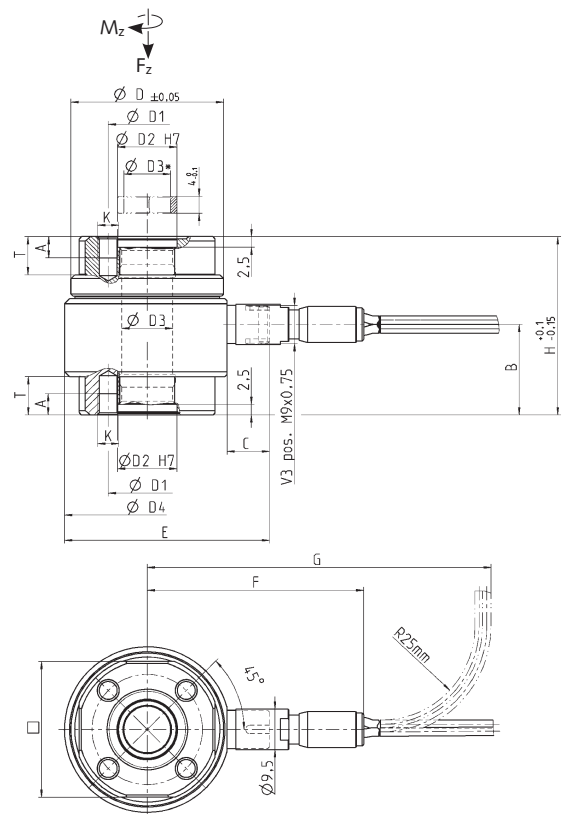


Fig. 1: Dimensions 2-component sensor  $F_z, M_z$ , Type 9345B, 9365B

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.

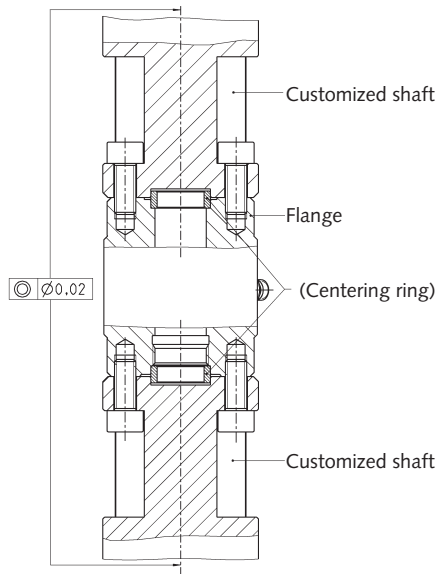


Fig. 2: Installation in shaft

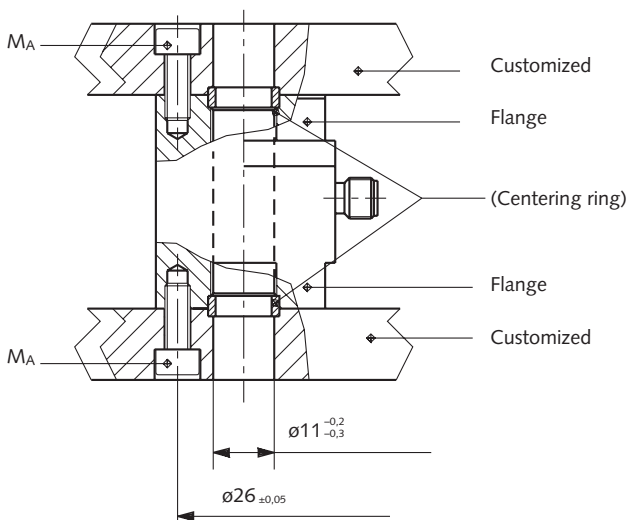
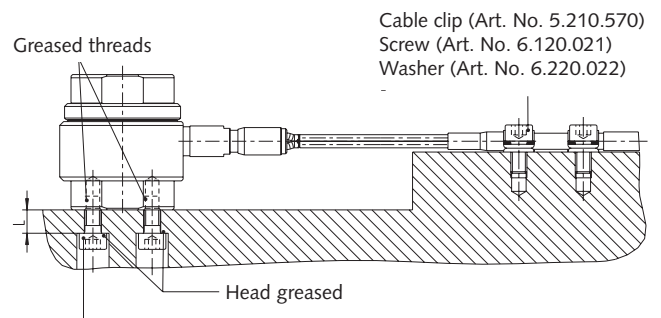


Fig. 3: Installation between base and cover plate

**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 cable connected must be installed in such a way as to exclude any tangential, radial or axial forces or shocks 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]

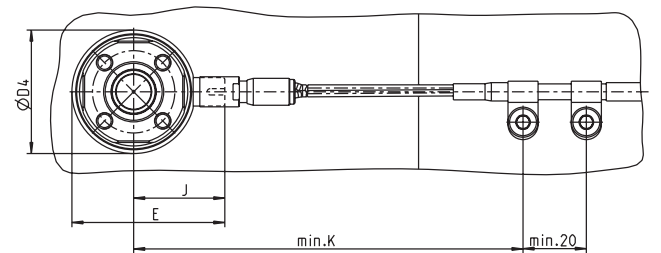
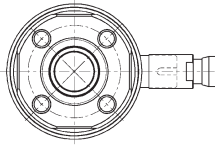

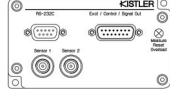



Fig. 4: Installation 2-component sensor  $F_z$ ,  $M_z$

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

9345B\_000-630e-11.07

**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>	IP65	<p>Type 1698AD2...</p>  <p>V3 pos.                      2 x BNC pos.</p>	<p>Type 5073A211</p>  <p>Type 5015A...                      Type 5015A...</p>  <p><math>F_z</math>                                      <math>M_z</math></p>	<p><math>F_z</math> <math>M_z</math></p>

**Included Accessories**

- |                                     | Type      |
|-------------------------------------|-----------|
| • 2 x centering ring for Type 9345B | 3.420.180 |
| • 2 x centering ring for Type 9365B | 3.420.181 |

**Optional Accessories**

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

(see also data sheet for cables 1687B\_000-545)

**Ordering Key**

- |  | Type         |
|--|--------------|
| • 2-Component Sensor $F_z, M_z$<br>-10 ... 10 kN, -25 ... 25 N·m   | <b>9345B</b> |
| • 2-Component Sensor $F_z, M_z$<br>-20 ... 20 kN, -200 ... 200 N·m | <b>9365B</b> |