

## Press Force Sensor

Type 9313AA1, 9313AA2

0 ... 50 N to 0 ... 20 kN

This lightweight miniature compression force sensor is particularly suitable for measuring dynamic forces and also quasistatic forces. Preloaded and provided with practical adaptation options, the sensor is ready for immediate use. It comes in two different sizes which not only differ in their dimensions but also in their measuring ranges.

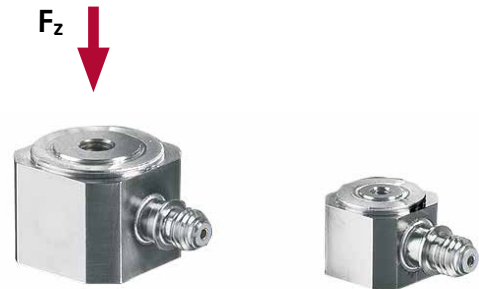
- Compression forces from 0 ... 50 N to 0 ... 20 kN in 2 sizes
- Extremely wide measuring range with one sensor
- Calibration certificate for 3 measuring ranges:  
100 %, 10 %, 1 %
- SCS calibration (optional)
- Easy adaptation using the axial threaded bores on both ends
- Easy to mount in connecting rods or plungers
- Low mass of the force introducing elements. Hence the dynamic force curves remain largely unaffected
- Up to 100x overload capacity in the lower ranges in each case

### Description

These press force sensors are based on the piezoelectric measuring principle. The force acting on the crystal element produces a proportional electric charge at the signal output. A measuring amplifier connected downstream to the sensor for example ICAM Type 5073A... typically converts this charge into a process signal which can be evaluated, for example 0 ... 10 V. The particularly square shape of the sensor body and the force introduction at both ends via axial threaded bores bring advantages in special mounting situations. Tensile forces up to 10 % of the compression force range are measured. These ranges are not calibrated. However, they are often used for the detection of tool withdrawal forces, for example after press-fitting processes.

### Technical data

Press Force Sensor	Type	9313AA1	9313AA2
Measuring range $F_z$ , max.	kN	0 ... 5	0 ... 20
Measuring ranges, calibrated <sup>1)</sup>			
100 %	kN	0 ... 5	0 ... 20
10 %	kN	0 ... 0,5	0 ... 2
1 %	kN	0 ... 0,05	0 ... 0,2
Overload tension/pressure, max.	kN	-0,5/5,5	-2/22
Threshold	N	0,01	0,01
Sensitivity	pC/N	-10	-10



### Application

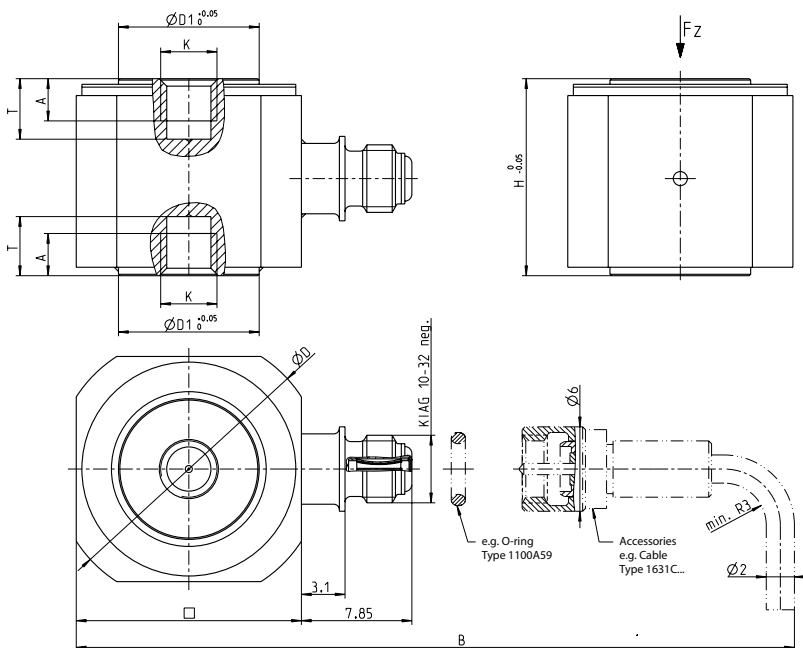
The square geometry of the sensor makes it particularly useful for confined spaces, such as mounting in force application dies and also for measurement of reaction force under workpiece holders. Because of the special properties of the piezoelectric measuring element – measuring accuracy is practically constant over a wide range of forces – the same press force sensor can be used for a large spectrum of forces. The facility to switch measuring ranges by using suitable amplifiers such as ICAM Type 5073A... provides an additional advantage here and thus allows for the general trend towards more component diversity in manufacturing and measuring stations. The wide-range measuring chain also offers decisive advantages in laboratory applications, where frequent change of sensors is a common occurrence. In addition, the extremely high overload capacity when using the respective lower measuring ranges makes preventive measures unnecessary.

Press Force Sensor	Type	9313AA1	9313AA2
Linearity incl. Hysteresis <sup>2)</sup>	%FSO	≤±0,5	≤±0,5
Tightening torque M <sub>z</sub> , max.	N·m	0,3	1,4
Temperature coefficient of sensitivity	%/°C	0,05	0,05
Bending moment M <sub>x,y</sub> , max.			
at F <sub>z</sub> = 100 %	N·m	0,2	0,6
at F <sub>z</sub> = 0 %	N·m	1,3	6
Shear force F <sub>x,y</sub> , max. <sup>3)</sup>	kN	0,1	0,27
Crosstalk			
F <sub>x,y</sub> → F <sub>z</sub>	N/N	<0,29	<0,65
M <sub>x,y</sub> → F <sub>z</sub>	N/N·m	<72	<98
Rigidity c <sub>z</sub>	N/μm	≈560	≈1 500
Natural frequency	kHz	>38	>35
Operating temperature range	°C	-40 ... 120	
Connector, electrical		KIAG 10-32 neg.	
Protection class EN60529			
with connected cable	IP	65	
with cable Type 1983AD... and welded sensor	IP	67	
Case material	DIN	1.4542	
Weight (without cable)	grams	10	25

<sup>1)</sup> Only the compressive force direction is calibrated. Tensile force as shown above against "overload" is measurable but not calibrated  
<sup>2)</sup> Relating to FSO of the respective calibrated (!) measuring range

<sup>3)</sup> Equals lateral force at the joint

**Dimensions Types 9313AA1 and 9313AA2**



**Dimensions [mm]**

Type	D	D1	□	H	K	T	A	B
9313AA1	13	5	11	10	M2,5	2,8	2	35
9313AA2	19	10	16	14	M4	4,2	3	40

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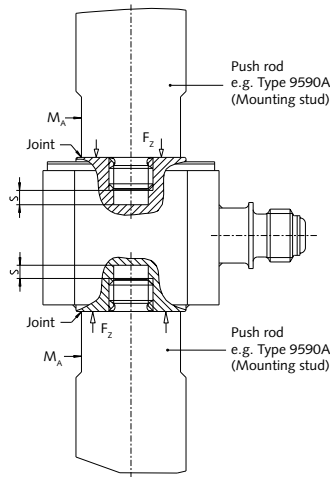
### General mounting instructions

- Off-center force introduction should be avoided. Introduce the force as concentrically as possible.
- Do not exceed the bending moments, shear forces or torques given in the table.

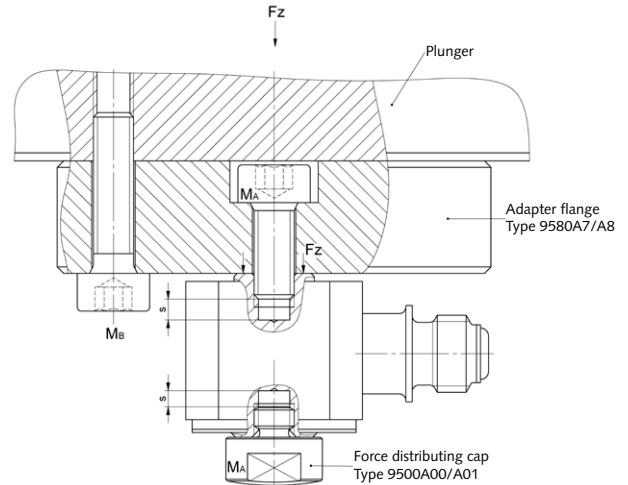
- Ensure all force transmission joint faces are maintained flat and free of dirt, oil or grease.
- The threaded connection tightening stop limit is the particular joint face and not the end of the thread. The bottom of the threaded hole must not be reached.

### Mechanical mounting of the sensor (examples)

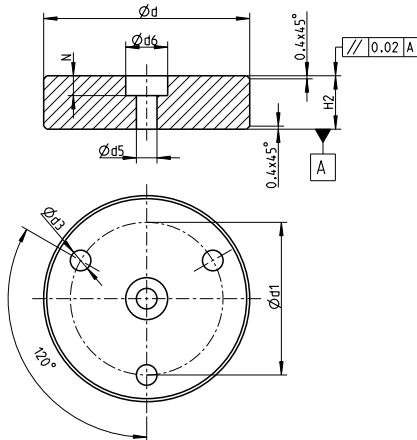
#### A: Sensor mounted in a connecting rod



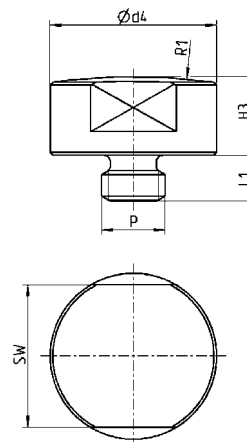
#### B: Sensor mounted with front on a press plunger



#### Flange Type 9580A...



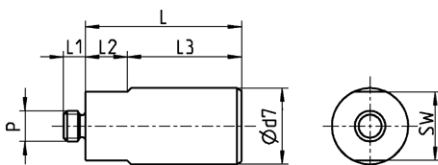
#### Force Distributing cap Type 9500A...



to Type	Type	d	d1	d3	d5	d6	H2	N
9313AA1	9580A7	27	20	2,7	2,7	5,5	7	2,6
9313AA2	9580A8	35	27	3,2	4,3	8	8	4,5

to Type	Type	d4	H3	L1	P	R1	SW
9313AA1	9500A00	6	3	1,9	M2,5	15	5
9313AA2	9500A01	10,5	5	2,9	M4	35	9

#### Mounting Stud Type 9590A...



to Type	Type	d7	L	L1	L2	L3	P	SW
9313AA1	9590A7	5	12,5	1,9	2,5	10	M2,5	4,5
9313AA2	9590A8	10	20,5	2,9	5,5	15	M4	9

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### Electrical connection

We recommend that only Kistler connection cables be used. Problems concerning insulation resistance, triboelectricity and

cable breaks will then be avoided right from the start.

**Sensor**  
Type 9313AA1/AA2



**Connecting cable**  
Type 1631C



**Charge amplifier**  
Type 5073A111



**maXYmos**  
Type 5867B...



### Optional accessories

- |  |               |
|--|---------------|
| • Flange   | Type/Mat. No. |
| • Force distributing cap                             | 9580A...      |
| • Mounting stud                                      | 9500A...      |
| • Cleaning and insulating spray 250 ml               | 9590A...      |
| • Connecting cable, KIAG 10-32 pos. – BNC pos.       | 1003          |
| • Connecting cable, KIAG 10-32 pos. – TNC pos.       | 1631C...      |
| • Connecting cable, KIAG 10-32 pos. –                | 1633C...      |
| • Connecting cable, KIAG 10-32 pos. –                | 1635C...      |
| • Connecting cable, KIAG 10-32 pos. –                | 1900A23A11... |
| • Connecting cable, KIAG 10-32 pos. –                | 1900A23A12... |
| • Connecting cable, KIAG 10-32 pos. –                |               |
| • Connecting cable, KIAG 10-32 pos., highly flexible |               |
| • Connecting cable, KIAG 10-32 pos. –                |               |
| • Connecting cable, KIAG 10-32 pos., highly flexible |               |

### Ordering code

- |                                  |                |
|----------------------------------|----------------|
| • Press Force Sensor 0 ... 5 kN  | <b>9313AA1</b> |
| • Press Force Sensor 0 ... 20 kN | <b>9313AA2</b> |

For connection, extension, and connecting cables, see data sheet for Cables for Force, Torque, and Strain Sensors (Dok. No. 000-346).

For cable connectors, couplings, and accessories, see data sheet for Coaxial Cable Connectors (Doc. No. 000-347).