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SlimLine Sensors (SLS)

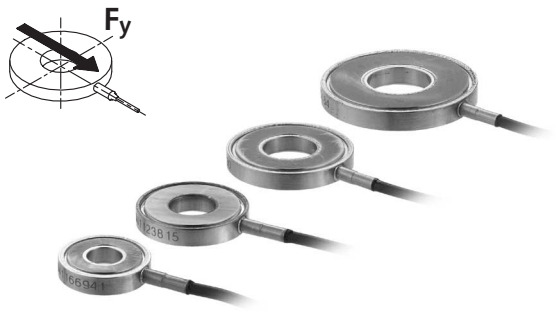
Type 9143B..., 9144B..., 9145B..., 9146B...

Measurement of dynamic and quasistatic shear forces

Quartz sensor with extremely flat design for measuring dynamic and quasistatic shear forces in one direction. Maximum resolution, high rigidity, extremely small dimensions. Ideal for installation in structures. Welded construction with integrated connecting cable sealed in the case and with a selection of plug connectors.

SlimLine sensors are supplied **uncalibrated** and must be calibrated in situ **after** installation.

- Extremely small size with up to 5 kN measuring range (shear force)
- Flexible mounting in structures
- Sealed case (IP 65)
- Integral non-detachable cable with Viton sheath



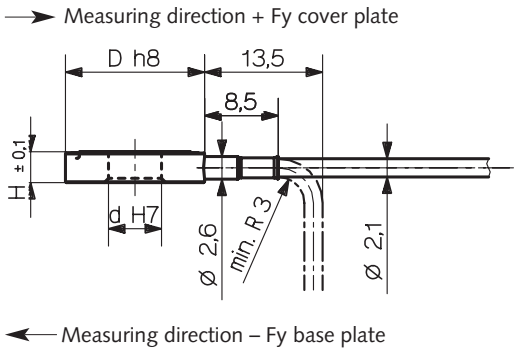
Technical Data

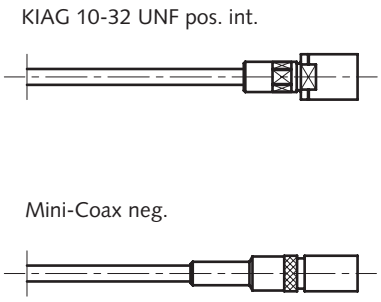
Linearity (preloaded)	% FSO	≤±1
Hysteresis (preloaded)	% FSO	≤1
Response threshold	N	<0,1
Operating temperature range	°C	–20 ... 120
Degree of protection		IP 65

Description

The sensor contains two quartz elements sensitive to shear force in one direction. The force to be measured is transmitted by stiction to the quartz elements and these produce an electrical charge directly proportional to the force applied.

The cable connection to the sensor case is tightly sealed to provide degree of protection IP 65. The sensor is equipped with the following plug connectors.





Basic type	Range F_y [kN]	Overload F_y [kN]	Sensitivity [pC/N]	Rigidity (axial) [kN/µm]	Preloading force (axial)[1)] [kN]	External diameter D [mm]	Internal diameter d [mm]	Height H [mm]	Weight m [g]
9143B...	0,9	1,1	–6,5	≈2,5	9,0	16,0	6,1	3,5	3,0
9144B...	1,7	2,0	–7,5	≈5,6	17,0	20,0	8,1	3,5	5,0
9145B...	2,7	3,3	–7,5	≈7,0	27,0	24,0	10,1	3,5	7,0
9146B...	4,0	4,7	–7,5	≈8,0	40,0	30,0	12,1	4,0	14,0

1) Cannot be measured by the sensor itself (see Page 2)

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Reduction in measuring range with additional bending moment for SlimLine sensors (SLS)

• Basic type fitted with **preloading bolt**:

Basic type	max. bending moment (F_z = 0) [Nm]	Force per additionally occurring bending moment [kN/Nm]	Preloading force [kN]	Tightening torque [Nm]	Measuring range Fy [kN]
9143B...	15,2	0,0461	7,0	7,0	0,7
9144B...	35,0	0,0371	13,0	18,0	1,3
9145B...	61,7	0,0291	18,0	30,0	1,8
9146B...	133,0	0,0233	31,0	62,0	3,1

Example

The preloaded sensor reduces the measuring range by the bending moment occurring as follows: for example a bending moment of 8 Nm is applied to sensor Type 9144B… . This reduces the measuring range by 8 Nm x 0,0371 kN/Nm = 0,3 kN. The **valid Fy range** 1,3 kN minus 0,3 kN is **1 kN = ±0,5 kN shear force**.

• Basic type fitted with **set screw**:

Basic type	max. bending moment (F_z = 0) Nm	Force per additionally occurring bending moment kN/Nm	Preloading force kN	Tightening torque Nm	Measuring range Fy kN
9143B...	10,2	0,0912	9,0	10,0	0,9
9144B...	24,0	0,0708	17,0	23,0	1,7
9145B...	30,5	0,0889	27,0	46,0	2,7
9146B...	96,5	0,0410	40,0	79,0	4,0

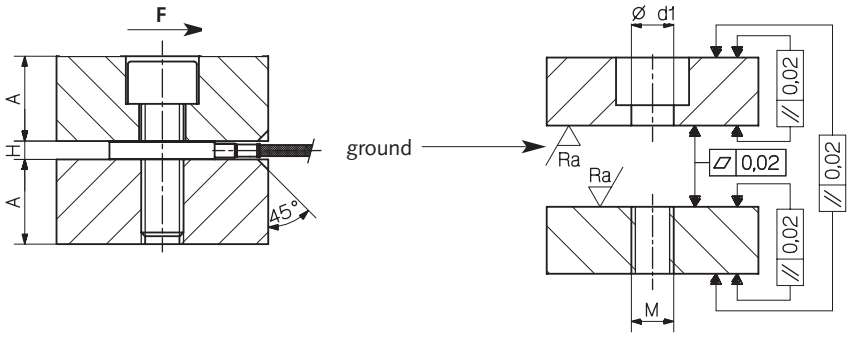
Installation

A shear force sensor must always be fitted under preload, since the shear forces are transmitted by stiction. The contact surfaces with the sensor must be absolutely free of grease, finish machined and rigid. The adjacent table contains the most important information concerning preloading.
Note: The stated tightening torque applies only to the screw thread M mentioned (lightly greased).

Markings on the sensor case facilitate its alignment. Two pins can be used to prevent the sensor from turning during its installation (Fig. 1).

Information for installation

For SLS sensor Type		9143B...	9144B...	9145B...	9146B...
Thread M		M6	M8	M10	M12
Bore d1	mm	6,4	8,4	10,5	13
Plate thickness A	mm	12	16	20	24
Distance T	mm	13	15	17	20
Max. tightening torque for preloading	Nm	10	23	46	79



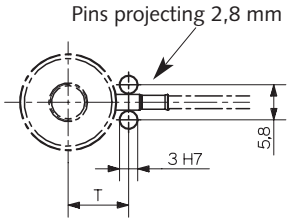


Fig. 1: Two pins prevent the sensor from turning

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Calibration

The preloading bolt needed for fitting the sensor forms a force shunt, i.e. the sensor measures only about 90% of the entire force. Accordingly, the exact sensitivity of a sensor can only be determined after preloading.

The SlimLine sensor is therefore delivered uncalibrated. Its sensitivity can be determined by calibration only after it has been fitted.

Examples of application

- Monitoring of shear forces in machinery, tools and assembly processes.
- Construction of platforms and dynamometers with small dimensions.

Installation examples in shear force plates

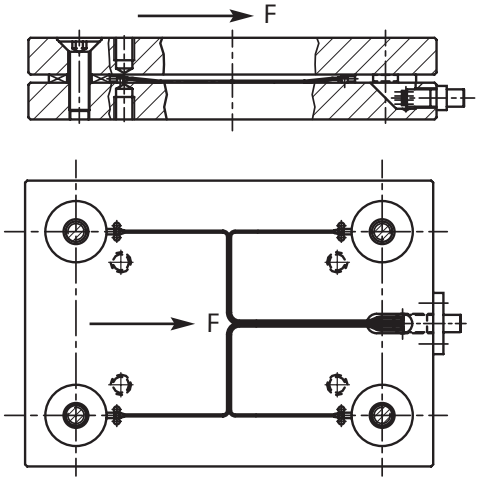


Fig. 2: Single-component dynamometer. Measurement of shear forces Fy. Note: two sensors must be fitted so that they are arranged around the connector axis.

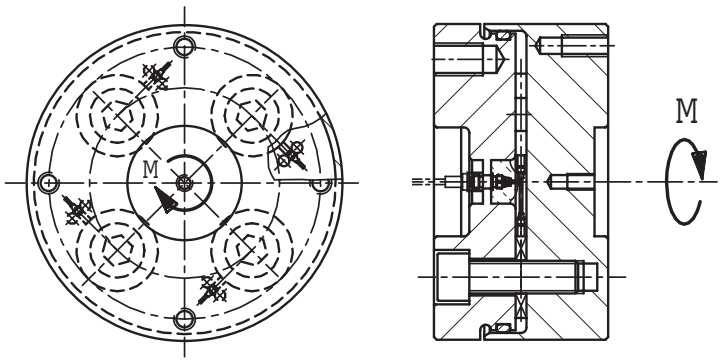
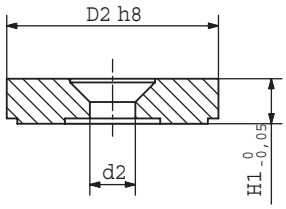
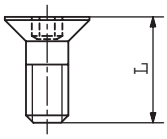


Fig. 3: Torque dynamometer. The resultant torque M can be calculated by measuring the shear forces Fy.

Accessories

Preloading disk





One countersunk screw is supplied with each preloading disk

Type	For SLS sensor Type	Thread size	External diameter	Internal diameter	Disk thickness	Screw length
			D2	d2	H1	L
9410A3	9143B...	M3	16,0	3,2	4,25	10,0
9410A4	9144B...	M4	20,0	4,3	4,25	10,0
9410A5	9145B...	M5	24,0	5,3	4,25	10,0
9410A6	9146B...	M6	30,0	6,4	5,5	14,0

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Cable/connector

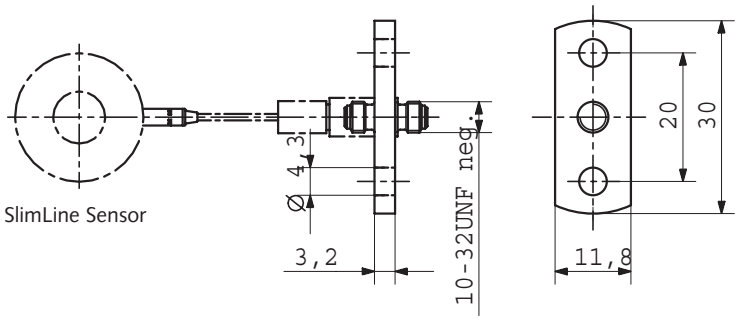


Fig. 4: Coupling Type 1729A1 with steel support; connector KIAG 10-32 UNF neg. on both sides.

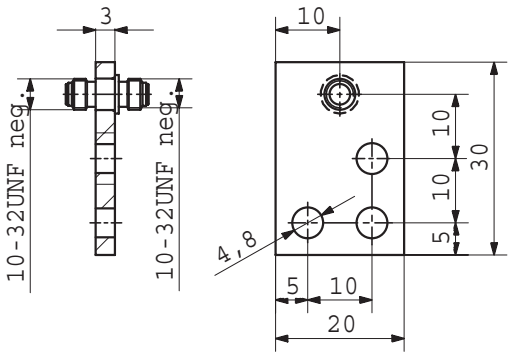


Fig. 5: Coupling Type 1729A2 with plastic support; connector KIAG 10-32 UNF neg. on both sides.

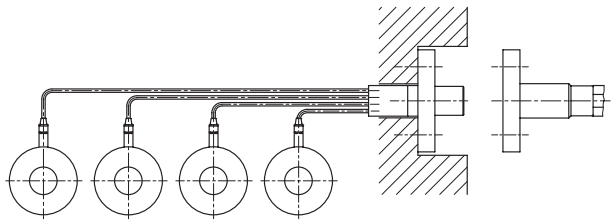
Insulating foils

Insulating foils are available for ground-insulated installation. The friction between sensor and base or cover plate is not reduced by this foil, but increased.

For sensor	Type	9143B...	9144B...	9145B...	9146B...
Insulating foil	Art. No.	3.221.284	3.221.285	3.221.286	3.221.287
Ext. Ø	mm	16	20	24	30
Int. Ø	mm	6,1	8,1	10,1	12,1
Thickness	mm	0,125	0,125	0,125	0,125

SLS assembly

2, 3 or 4 SlimLine sensors are incorporated in a sealed (IP 65) plug connection with an individually selected cable length. Either individual signals or the summation signal (all sensors connected in parallel) appear at the output. See data sheet No. 6.016AA.



Order code

Type 914 □ B □□

Sensor basic type	**3 ... 6**
With KIAG UNF 10-32 pos. integrated	**2**
With mini-coax neg.	**3**
Cable length l = 2 m (standard)	**1**
Cable length l = 0,1 … 2 m (please indicate)	**9**

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