

Pretensioning Elements

Type 9451A..., 9455..., 9456...,
9460, 9461..., 9465...

Set of Pretensioning Elements for Multicomponent and Single-Component Force Sensors

These standardized pretensioning elements are used for mounting 3-component force sensors Type 9017C ... 9077C and 9018C ... 9078C, and single-component quartz load washers Types 9081B and 9091B.

- Recessed ring nut for minimum overall height
- Elastic preloading bolt, optimized for measuring tensile and compression forces
- Low force shunt

Description

A set of pretensioning elements consists of a pretensioning bolt (high-strength, stainless tool steel), a centering sleeve, an anti-friction washer and a nut.

Applications

Multicomponent and single-component force sensors have to be mounted under pretension to allow the shear forces F_x and F_y to be transferred by static friction from the base and cover plates to the surfaces of the force sensor. The necessary pretension depends on the magnitude of the shear forces to be transferred.

Mounting

Before assembly, the bearing surfaces of the base plate, cover plate and sensor must be carefully cleaned with a degreasing cleaner.

The anti-friction washer between cover plate and nut reduces the friction and hence the tightening torque. Before assembly, lubricating grease Type 1063 must be applied sparingly to the anti-friction surface, the outside surface of the nut and the thread of the pretensioning bolt. The pretensioning bolt must be screwed into the base plate and the thread secured with adhesive (e.g. Loctite® 221™). The centering sleeve must be slipped over the pretensioning bolt, then the sensor fitted and oriented with the aid of the alignment surfaces and the connector of the sensor. The cover plate must be slipped on, the anti-friction washer inserted and the nut tightened with the special wrench Type 947x, which has to be ordered separately. Connecting the output of the z-component of the sensor to a charge amplifier allows direct measurement of the pretensioning force.



Technical Data

Type		9460...	9461...	9465...	9451A...
for sensor	Type	9017C/ 9018C	9027C/ 9028C	9047C/ 9048C	9067C/ 9068C
Inside ø	mm	6,5	8,1	14,1	26,5
Pretensioning bolt					
Thread		M6x0,75	M8x1	M14x1,5	M20x1,5
Length L	mm	29	40	57	78
Pretensioning force F_v	kN	10	20/25	60	140
Pretensioning bolt					
Proof stress $R_{p0,2}$	N/mm ²	1250	1 250	1 250	1 250
Stress at F_v σ_v	N/mm ²	629	915	631	790

Type		9455...	9455...	9456...
for sensor	Type	9077C/ 9078C	9081B ¹⁾	9091B ²⁾
Inside ø	mm	40,5	40,5	72
Pretensioning bolt				
Thread		M40x2	M40x2	M64x3
Length L ³⁾	mm	105	105	140
Pretensioning force F_v	kN	300 ⁴⁾ /400 ⁵⁾	325 ⁴⁾	600 ⁵⁾
Pretensioning bolt				
Proof stress $R_{p0,2}$	N/mm ²	1 250	1 250	1 250
Stress at F_v σ_v	N/mm ²	520/690	560	720

¹⁾ One pair of insulating washers can be ordered as an option for ground-isolated mounting (Type 9455A1)

²⁾ One pair of insulating washers can be ordered as an option for ground-isolated mounting (Type 9456A1)

³⁾ Other lengths possible on request

⁴⁾ Maximum pretensioning force F_v with torque wrench

⁵⁾ Pretensioning forces can generally only be applied hydraulically. Hydraulic pretensioning is offered by Kistler as a service

Overview of Set Components

for Sensor Type	Pretensioning set Type	consisting of			
		Pretensioning bolt Type	Centering sleeve Type	Sliding washer Type	Ring nut Type
9017C/9018C	9460	3.322.401	3.221.316	3.322.352	3.322.402
9027C/9028C	9461...	3.322.269	3.750.037	3.322.271	3.322.272
9047C/9048C	9465...	3.322.403	3.221.317	3.322.405	3.322.404
9067C/9068C	9451A...	3.322.091	3.750.020	3.322.094	3.322.093
9077C/9078C	9455...	3.322.220	3.750.029	3.322.226	3.322.221
9081B	9455...	3.322.220	3.750.029	3.322.226	3.322.221
9091B	9456...	3.322.190	3.750.147	3.322.562	3.322.194

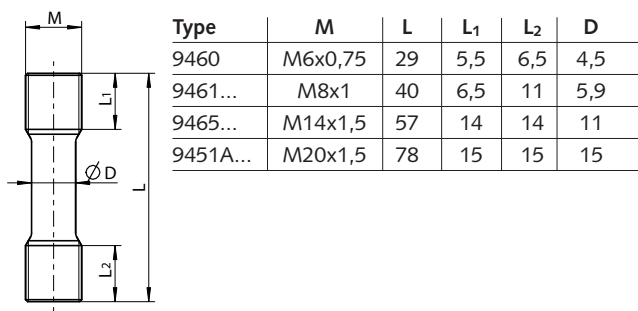


Fig. 1: Pretensioning bolt

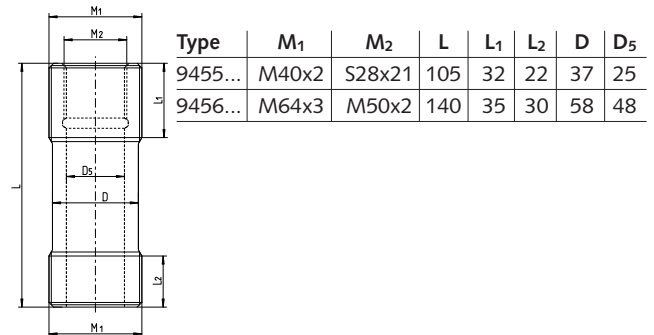


Fig. 2: Pretensioning bolt Type 9455/9456

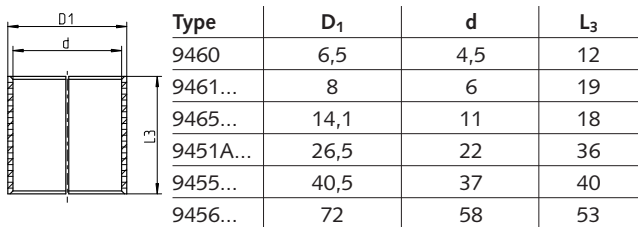


Fig. 3: Centering sleeve

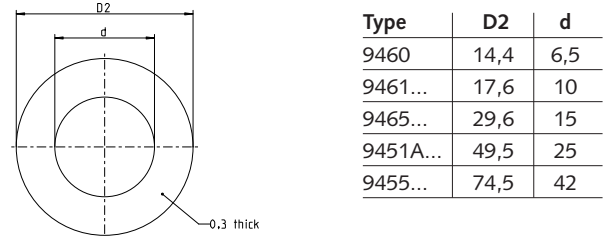


Fig. 4: Sliding washer

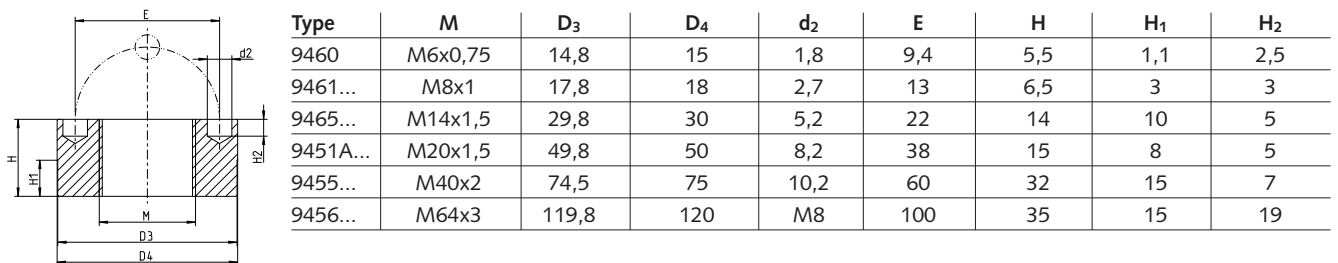
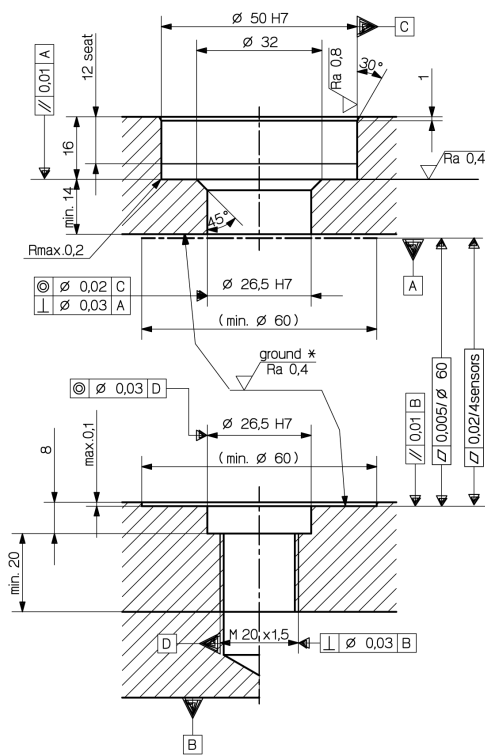


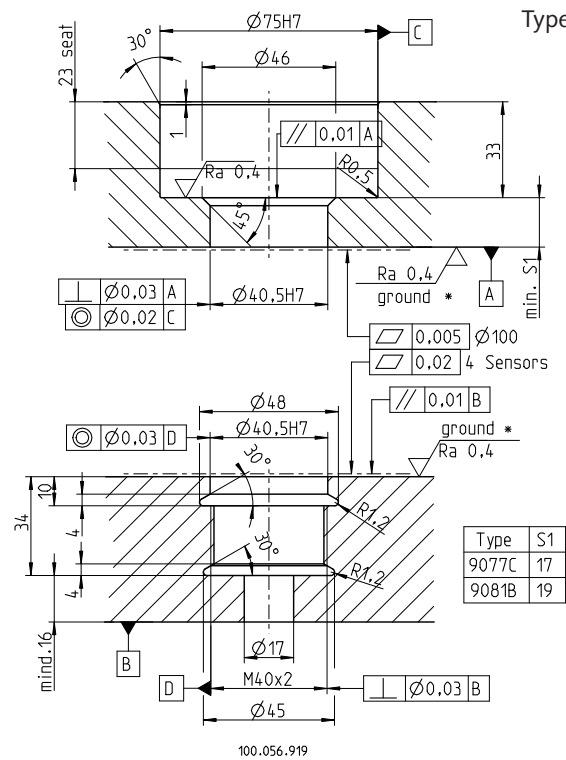
Fig. 5: Ring nut

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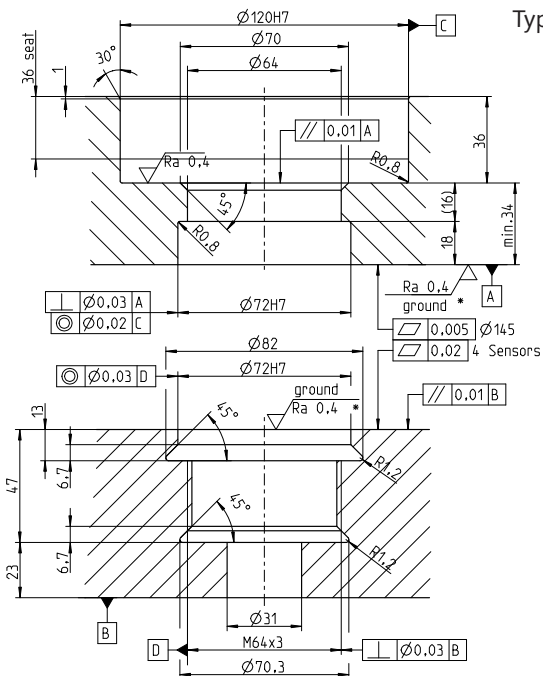
Preparing the Mounting Surfaces and the Bore in the Base and Cover Plates



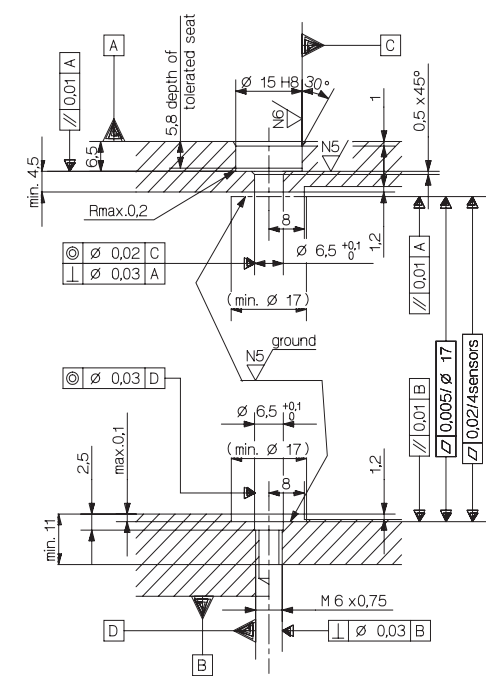
Type 9451A...



Type 9455...

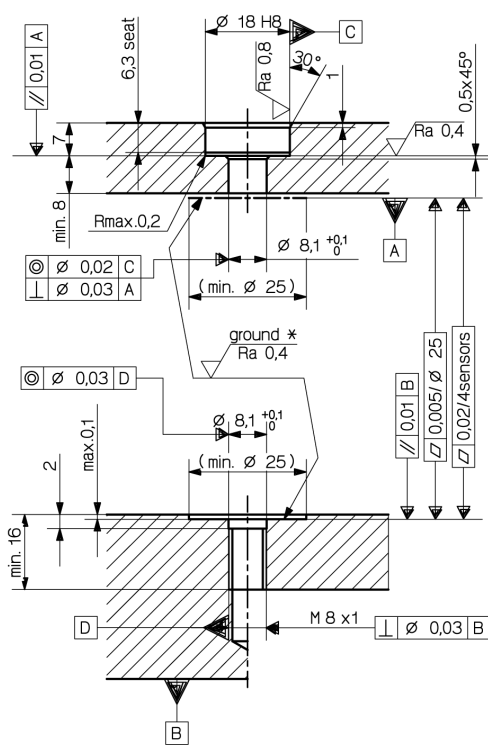


Type 9456...

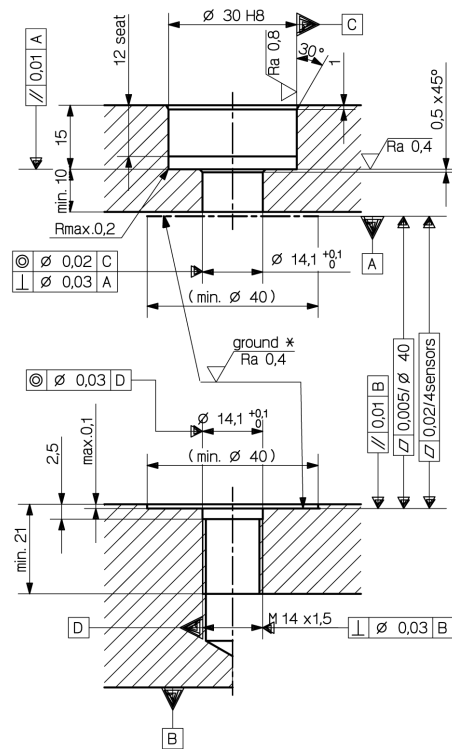


Type 9460...

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Type 9461...



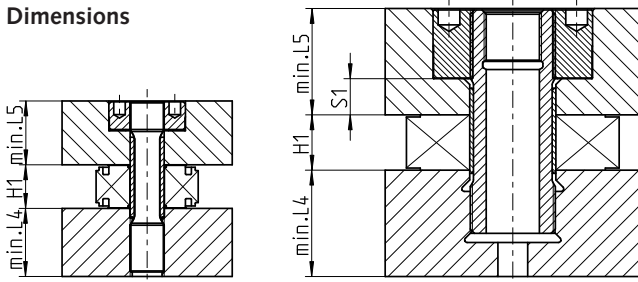
Type 9465...

Recommended Materials for Base and Cover Plates,
heat treated

Material	1st recommend.	2nd recommend.	3rd recommend.
W.-Nr.	1.4045*	1.4021*	1.1191
DIN	x22CrNi17	x20Cr13	Ck45
AFNOR	Z15CN16-02	Z20C13	xC45
B.S.	431S29	420S37	M46
JIS	SUS431	SUS420J1	S45C
AISI/SAE	431	420	1045

* Stainless

Dimensions



Type 9017C/18C

Type 9027C/28C

Type 9047C/48C

Type 9067C/68C

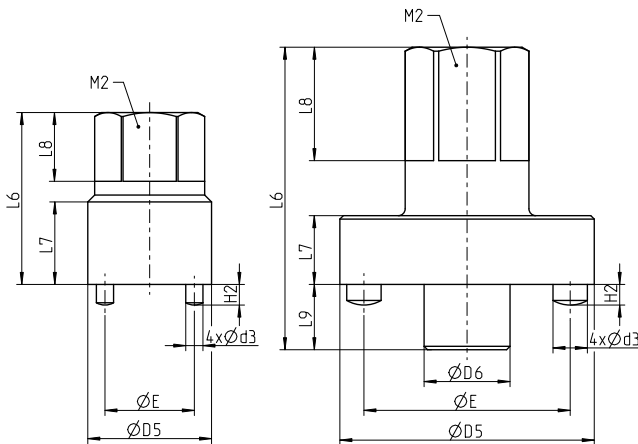
Type 9077C/78C/81B

Type 9097C/98C/91B

Type	H1	min. L4	min. L5
9017C/9018C	10	11	11
9027C/9028C	12	15	15
9047C/9048C	14	20	25
9067C/9068C	21	30	30
9077C/9078C	26	50	50
9081B	22	50	50
9091B	28	70	70

Wrench Adapter

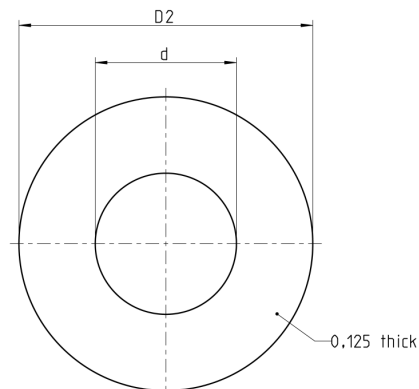
Type	for pretensioning set Type	M2	L6	L7	L8	L9	d3	H2	E	D5	D6
9479	9460	6x SW11	25	12	10	–	1,5	2,5	9,4	14,5	–
9475	9461...	6x SW14	25	12	10	–	2,5	3	13	18	–
9472	9465...	6x SW19	45	15	20	–	5	6	22	29,6	–
9471	9451A...	6x SW32	70	30	30	–	8	5	38	49	–
9473	9455...	6x SW32	88	20	33	19	10	6	60	74	25



Type 9475/72/71

Type 9473

Insulating Washer



Optional Accessories

- Wrench adapter for pretensioning set Type 9460
- Wrench adapter for pretensioning set Type 9461...
- Wrench adapter for pretensioning set Type 9465...
- Wrench adapter for pretensioning set Type 9451A...
- Wrench adapter for pretensioning set Type 9455...
- One pair of insulating washers for Type 9081B
- One pair of insulating washers for Type 9091B

For pretensioning set Type	Insulating washer Type	D2	d
9455...	9455A1	87	41,8
9456...	9456A1	129,9	72

Ordering Key

Type 9460

Length L = 29 mm	-
Length L = please specify in mm	sp

Type 9461

Length L = 40 mm	-
Length L = please specify in mm	sp

Type 9465

Length L = 57 mm	-
Length L = please specify in mm	sp

Type 9451A

Length L = 78 mm	-
Length L = please specify in mm	sp

Type 9455

Length L = 105 mm	-
Length L = please specify in mm	sp

Type 9456

Length L = 140 mm	-
Length L = please specify in mm	sp

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