

3-Component Force Link

25 x 25 x 30 mm up to 2 kN

Type 9317B

Miniature force link for measuring the three orthogonal components of a dynamic or quasistatic force acting in an arbitrary direction.

- Very extended measuring range
- High rigidity
- Minimal cross talk
- Calibrated force link
- Simple installation
- Multipol connector

Description

The force sensor is mounted under preload between two plates and, therefore can measure compression and tensile forces. The piezo element yields an electric charge which is proportional to the force. This is picked off by electrodes and transferred via a connector. The charge signal is fed via a screened cable to a charge amplifier, which converts it into a proportional output voltage. An appropriate evaluation circuit can record and further process the measurand.

Thanks to their high rigidity they cover a wide frequency range. The elastic behaviour of the test object is practically not influenced. Quasistatic measurements, are possible, too.

The sensor is mounted ground-isolated. This largely eliminates ground loop problems.

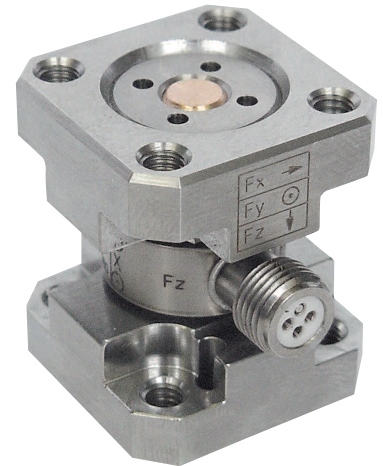
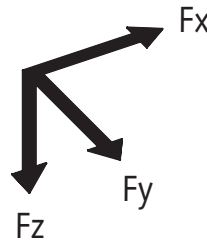
The force link is supplied calibrated. After correct installation, it is immediately ready for use without re-calibration.

Application

The force links can measure the 3 orthogonal force components easily, directly and precisely, because these sensors feature an inherently low cross talk.

Application examples

- Cutting forces
- Impact forces
- Determination of coefficients of friction



Technical Data

Range (Without moments if e.g. four force links are mounted into one force plate)	F_x, F_y	N	-1 000 ... 1 000
Range (Example with point of force application $F_{x,y}$ 12 mm above top plate)	F_x, F_y	N	-200 ... 200
Range (Point of force application F_z centric)	F_z	N	-2 000 ... 2 000
Overload		%	10
Calibrated range (Point of force application $F_{x,y}$ 7,5 mm below top plate surface)	F_x, F_y	N	0 ... 600; 0 ... 60
Calibrated range (Point of force application F_z centric)	F_z	N	0 ... 2 000; 0 ... 200
Max. moments ($M_z = 0; F_z = 0$)	$M_{x,y}$	N·m	-5/5
($M_{x,y} = 0; F_z = 0$)	M_z	N·m	-4/4
Threshold		N	<0,01

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Sensitivity	F_x, F_y	pC/N	≈ -26
	F_z	pC/N	≈ -11
Linearity, each axis		% FSO	$\leq \pm 0,5$
Hysteresis, each axis		% FSO	$\leq 0,5$
Cross talk (Cross talk $F_x, F_y \rightarrow F_z$ is $\leq \pm 3\%$ if e.g. four force links are mounted in to one force plate)	$F_z \rightarrow F_x, F_y$	%	$\leq \pm 1$
	$F_x \leftrightarrow F_y$	%	$\leq \pm 3$
	$F_x, F_y \rightarrow F_z$	%	$\leq \pm 4$
Natural frequency	$f_n(x)$	kHz	≈ 5
	$f_n(y)$	kHz	≈ 5
	$f_n(z)$	kHz	≈ 21
Operating temperature range		$^{\circ}\text{C}$	$-50 \dots 80$
Insulation resistance		Ω	$\geq 10^{13}$
Ground insulation		Ω	$> 10^8$
Capacitance, each channel		pF	≈ 39
Connector			3 pole M8 x 0,75
Weight		g	85

Multicomponent Force Plate with 4 Force Links

Four force links can be mounted together with a common top plate. Such we gain a multicomponent force plate.

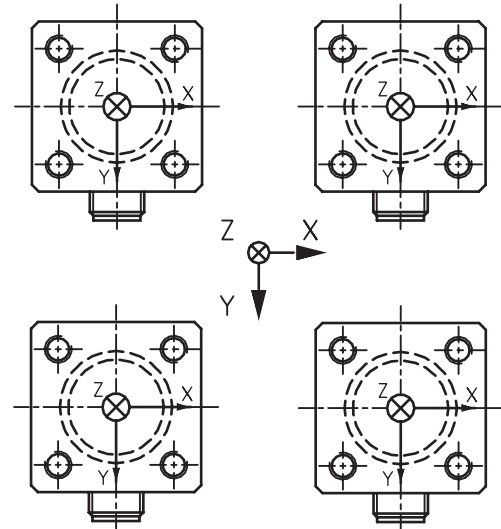


Fig. 1: Force plate with 4 force links Type 9317B

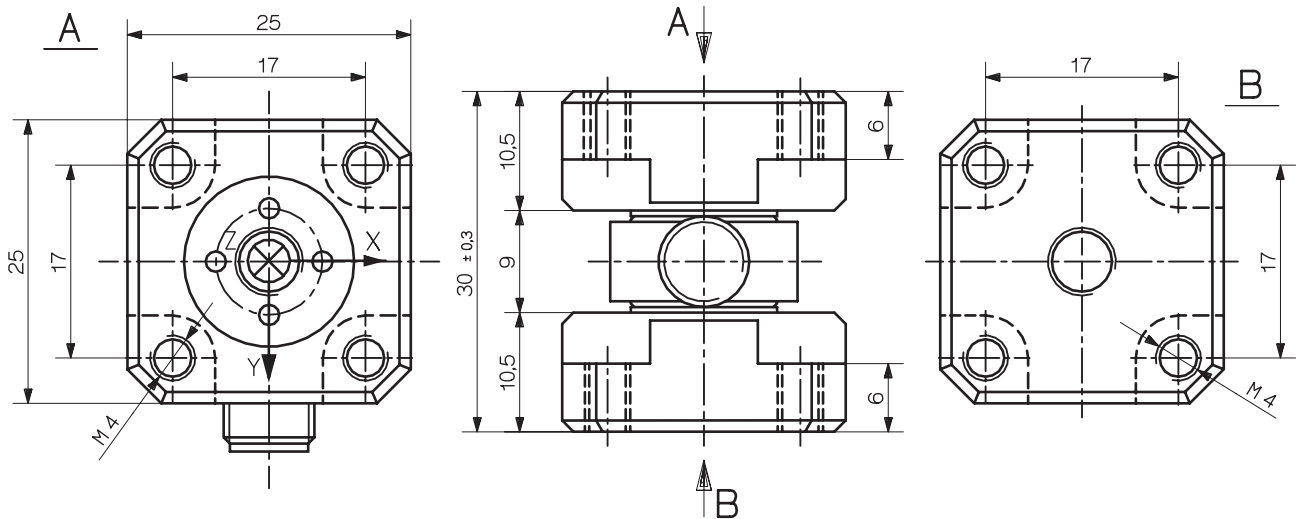


Fig. 2: Dimensions Type 9317B

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Mounting

The contact surfaces that transfer the forces onto the force link must be flat, rigid and clean.

When four force links are used to construct a force plate, they must be machined to the same level.

The force links can be fastened either from outside with four screws M4 in each case or from the center again in each case with four screws M3.

The screws must be tightened sufficiently so that even with maximum force exerted, no gap occurs between the contact surfaces.

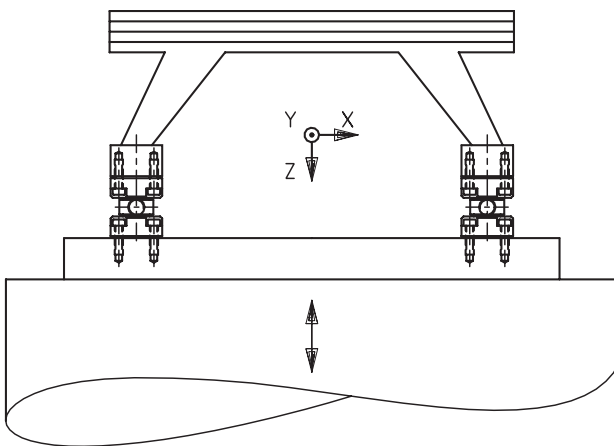


Fig. 3: Mounting example: Force limited vibration testing

Force Introduction

When only a single force link is used, then as far as possible, the center of pressure should be within the cover plate.

Eccentric force introduction produces a moment of force on the sensor element and is permitted only up to specified values. If such a moment prevails, then the areas of force must be reduced accordingly.

A rigidly constructed force plate with four force links largely prevents moment stresses on the sensor element.

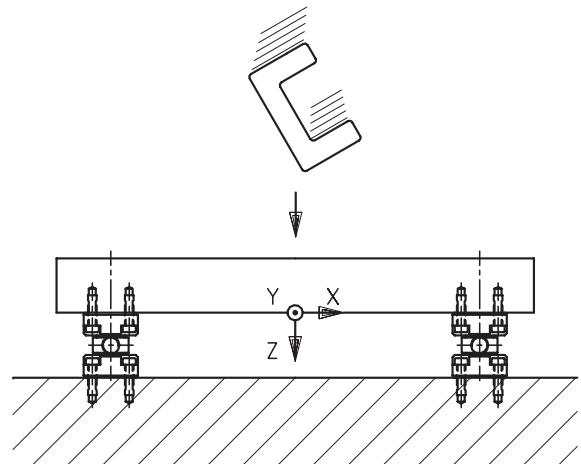


Fig. 4: Mounting example: Drop test measurement

Parallel Switching

Several force links of identical sensitivities can be paralleled directly. The charge amplifier connected then gives an output voltage which corresponds to the sum of all forces acting.

This is a great advantage when building force plates with which only the 3 components of the resulting force must be measured.

Electronics

Besides the force sensors, a 3-component force measuring system also requires 3 charge amplifiers, which convert the electrical charge signals of the sensor into voltages exactly proportional to the three components F_x , F_y and F_z of the acting force.

In order to construct multicomponent force plates for measuring three forces and three moments, special multichannel charge amplifiers are available.

Systems for Multicomponent Measurements

Information concerning cable concept see data sheet for Multicomponent Measurements of Types 9017A, 9047B, 9067B and 9077B.

Optional Accessories

- Connecting cable
- Connecting cable

Type

1693A...
1694A...

Ordering Key

- 3-Component Force Link

Type

9317B