

Multicomponent Dynamometer

Type 9129AA

-10 ... 10 kN, Mounting Plate 90x105 mm

Multicomponent dynamometer for measuring the three components of the resultant force vector and the three components of the resultant moment vector.

- Compact design
- Wide measuring range
- Minimal temperature error
- For cutting force measurements
- For general multicomponent force measurements

Description

The dynamometer consists of four 3-component force sensors which are mounted under high preload between the cover plate and the two lateral base plates.

Because of the special mounting of the sensors, a minimal temperature error is achieved. The force sensors each contain three crystal plates, one of which is sensitive to pressure in the y direction and the two others to shear force in the x or z directions. The forces are measured with practically no displacement. The outputs of the four built-in force sensors are passed to the 9-pole flange socket. Multicomponent force-moment measurements are possible.

The four sensors are mounted with ground isolation. This largely avoids ground loop problems.

The dynamometer is corrosion-resistant and protected against the entry of cooling lubricant. Used together with connecting cable Type 1687B... or Type 1677A..., the dynamometer is protected to IP67.

Quartz multicomponent dynamometers measure easily, directly and very accurately.

Application Examples

- Cutting force measurement in superfinishing
- Multicomponent force measurement
- Force measurement in confined spaces
- Measurement of the three cutting forces F_c , F_f , F_p while turning outside and inside diameters on lathes with turret-type tool heads (see data sheet for Type 9129A...)



Technical Data

Max. permitted measuring range (Force application point at cover plate surface)	F_x, F_y, F_z M_x, M_y, M_z	kN N·m	-10 ... 10 -500 ... 500
Calibrated measuring range 100 %	F_x, F_y, F_z	kN	0 ... 10
Calibrated partial meas. range 10 %	F_x, F_y, F_z	kN	0 ... 1
Calibrated partial meas. range 1 %	F_x, F_y, F_z	kN	0 ... 0,1
Overload	F_x, F_y, F_z	%	20
Threshold		N	<0,01
Sensitivity (rated)	F_x	pC/N	≈-8
	F_y	pC/N	≈-4,1
	F_z	pC/N	≈-8
Linearity, all ranges	F_x, F_y, F_z	±%FSO	≤±0,3
Hysteresis, all ranges	F_x, F_y, F_z	%FSO	≤0,3
Crosstalk	$F_z \rightarrow F_x, F_y$	%	≤±2
	$F_x \leftrightarrow F_y$	%	≤±2
	$F_x, F_y \rightarrow F_z$	%	≤±2
Rigidity	c_x, c_z	N/μm	≈1 000
	c_y	N/μm	≈4 000
Natural frequency (Type 9129AA mounted on rigid base)	$f_n(x)$	kHz	≈3,5
	$f_n(y)$	kHz	≈4,5
	$f_n(z)$	kHz	≈3,5
Operating temperature range		°C	0 ... 70
Capacitance	F_x, F_y, F_z	pF	≈180
Isolation resistance		Ω	>10 ¹³
Ground isolation		Ω	>10 ⁸
Degree of protection EN60529			IP67
Weight	Dynamometer	kg	3,2
	Top plate	kg	2,0
Mounting surface		mm	90x105
Connection			Fischer flange 9-pole neg.

Mounting

The dynamometer can be bolted onto any clean, surface-ground mounting surface, such as on a machine tool table. Mounting on a magnet plate is also possible. Please note that uneven mounting surfaces may cause internal distortion, placing additional heavy load on the individual measuring elements and possibly increased crosstalk.

M6 tapped blind bores are available on the cover plate for mounting the force-acting components such as workpieces or tool holders. The mounting surfaces of the force-acting components must be face-ground so that good mechanical connection to the cover plate is achieved.

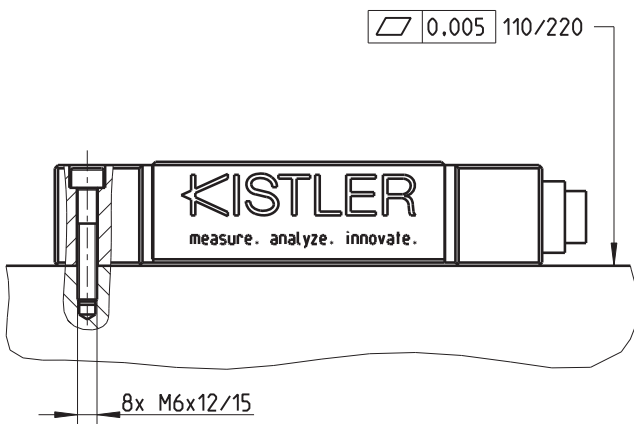


Fig. 2: Mounting the dynamometer

Signal Conditioning

A charge amplifier is also needed to build a complete measuring system. The measurement signal is converted into an electrical voltage in the individual channels. The measured value is exactly proportional to the force acting.


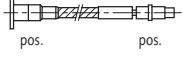
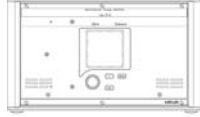

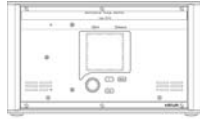
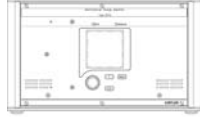
The multichannel charge amplifier Type 5070A... has been specially developed for multicomponent force measurement systems.



Fig. 3: Multichannel charge amplifier Type 5070A...

9129AA_000-709e-05.09

Measuring Chain

Multicomponent dynamometer	Connecting cable ¹⁾	Multichannel charge amplifier ²⁾	Measured value
 <p>Type 9129AA</p>	Type 1687B... 3-conductor 	Type 5070Ax01xx 	F_x F_y F_z
	Type 1677A... 8-conductor 	Type 5070Ax11xx 	F_{x12} F_{z1} F_{x34} F_{z2} F_{y14} F_{z3} F_{y23} F_{z4}
		Type 5070Ax21xx 	F_x M_x F_y M_y F_z M_z

1) see data sheet: Cables for multicomponent force sensors, dynamometers and force plates 1687B_000-545e
 2) see data sheet: Multichannel charge amplifier for multicomponent force measurement 5070A_000-485e

Supplied Accessories

- Hex head cap screw
M6x35 (8 items)

Art. No.

6.120.110

Ordering Key

- Multicomponent dynamometer
-10 ... 10 kN, mounting plate 90x105 mm

Type

9129AA

Optional Accessories

- Connecting cable, 3-conductor
(for 3-component force measurement)
- Connecting cable, 8-conductor
(for 6-component force measurement)

Type

1687B5

1677A5

9129AA_000-709e-05.09