Multicomponent Dynamometer

Туре 9129АА

-10 ... 10 kN, cover plate 90x105 mm

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

- Small design
- Large measuring range
- Small 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 small temperature error is achieved. The force sensors each contain three crystal crystal disks, 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 ingress of cooling lubricant. Used together with connecting cable Type 1687B... or Type 1677A..., the dynamometer is sealed according to degree of protection 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	F_x , F_y , F_z	kN	-10 10
range (Force application	M_x , M_y , M_z	N∙m	-500 500
point at cover plate surface)			
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		Ν	<0,01
Sensitivity (rated)	F _x	pc/N	≈–8,1
	Fy	pc/N	≈–4,1
	Fz	pc/N	≈–8,1
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
	с _у	N/µm	≈4 000
Natural frequency	f _n (x)	kHz	≈3,5
(Type 9129AA mounted	f _n (y)	kHz	≈4,5
on rigid base)	f _n (z)	kHz	≈3,5
Operating temperature range		°C	0 70
Capacitance	F _x , F _{y,} F _z	pF	≈180
Isolation resistance		Ω	>1013
Ground isolation		Ω	>108
Degree of protection EN60529			IP67
Weight Dynamometer		kg	3,2
Cover plate		kg	2,0
Mounting surface		mm	90x105
Connection		F	ischer flange
			9 pin neg.

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This information corresponds to the current state of knowledge. Kistler reserves the right to make technical changes. Liability for consequential damage resulting from the use of Kistler products is excluded.



Dimensions





Pin No.	Output signals 1687B/1689B	Output signals 1677A/1679A
1	Ground	Ground
2	F _x	F _{x 1 + 2}
3	-	F _{x 3 + 4}
4	Fy	F _{y1+4}
5	-	F _{y 2 + 3}
6	Fz	F _{z 1}
7	-	Fz 2
8	-	F _{z 3}
9	-	F _{z 4}



Mounting

The dynamometer can be screwed onto any clean, surfaceground 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-introducing components such as workpieces or tool holders. The mounting surfaces of the forceintroducing components must be face-ground so that good mechanical connection to the cover plate is achieved.



Fig. 2: Mounting the dynamometer

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Processing the measurement signals

Charge amplifier channels are also needed to build a complete measuring system (e.g. Type 5080A...). These convert the measurement signal into an electrical voltage. The measured value is exactly proportional to the force acting.

Data acquisition and analysis

Kistler offers with the Type 5697A1 DAQ system an universal and easy to operate package, consisting of a hardware for the data acquisition and the DynoWare software. For details see data sheet 5697A_000-745.

3-component force measurement $F_{x},\,F_{y},\,F_{z}$





Fig. 3: Measuring system for 3-component measurement with multichannel charge amplifier



Fig. 4: Measuring system for 3-component measurement with laboratory charge amplifier

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6-component measurement Fx, Fy, Fz, Mx, My, Mz



Degree of protection EN60529

Fig. 5: Measuring system for 6-component measurement with multichannel charge amplifier

Value a,b für Type 9129AA:	a	b
	mm	mm
	33	50,5



Degree of protection EN60529

Fig. 6: Measuring system for 6-component measurement with laboratory charge amplifier

Value a,b für Typ 9129AA:

a	b
mm	mm
33	50,5

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Typical measuring chain with DAQ system Type 5697A1

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Dynamometer	Connection cable, high impedance	Charge amplifier	Connecting cable	DAQ system	Notebook
Type 9129AA	Туре 16хх	Туре 5080А	Type 1700A111A2 Type 1200A27	Туре 5697А1	(from customer side) with DynoWare

Typical measuring chain with LabAmp system Type 5167A...

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Dynamometer	Connection cable, high impedance	Charge amplifier with integrated DAQ	Notebook
Туре 9129АА	Туре 16хх	Туре 5167А	(from customer side) with DynoWare

Ordering code Multicomponent dynamometer 	Type/Art. No. 9129AA	Optional accessories For 3-component force measurement F _x , F _y , F	Type/Art. No.
up to 4 kN, cover plate 90x105 mm		• Connecting cable, 3 wire, with flexible metal sheath (L = 5 m)	1687B5
Included accessoriesMounting screws M6x35 (8 pieces)	65012770	 Connecting cable, 3 wire, steel braided, flexibel (L = 5 m) 	1687BQ02
		 Extension cable, 3 wire, high insulation (L = 5 m) 	1688B5
		• Connecting cable, 3 wire, with flexible metal sheath and angle connector (L = 5 m)	1689B5
		For 6-component force and moment measure	ment
		 Fx, Fy, Fz / Mx, My, Mz Connecting cable, 8 wire, with flexible metal sheath (L = 5 m) 	1677A5
		 Connecting cable, 8 wire, with steel braided, flexibel (L = 5 m) 	1677AQ02
		• Extension cable, 8 wire, high insulation $(L = 5 m)$	1678A5
		• Connecting cable, 8 wire, with flexible metal sheath and angle connector (L = 5 m)	1679A5

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