

Multicomponent Dynamometer

Type 9139AA

Wide Force Measuring Range, up to 30 kN, Cover Plate 140x190 mm

Multicomponent dynamometer for measuring the three orthogonal components of a force. The stiff and robust design as well as the large measuring range permit the measurement of large forces, for example in high-performance cutting applications.

- Wide measuring range
- Patented and largely temperature-compensated design
- Compact and very robust design
- High natural frequency

Description

By using piezoelectric force sensors, this dynamometer not only measures large forces, but can also accurately measure small forces in the Newton range. The high natural frequency and the high sensitivity of piezoelectric sensors permit the acquisition of high-quality measuring signals of very dynamic processes in machining or in general force measurement applications.

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

A low temperature error is obtained by this special mounting of the sensors. Each force sensor contains three crystal rings, of which one is sensitive to pressure in the y-direction and the two others to shear in the x- and z-directions. The forces are measured practically without displacement.

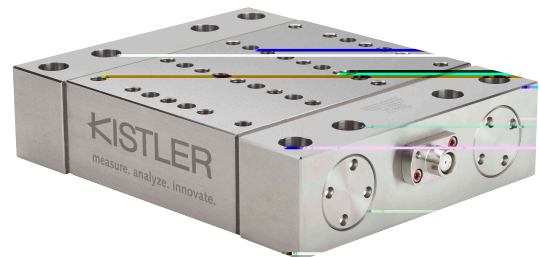
The outputs of the four mounted force sensors are fed to the 9-pole flanged socket. There are also multicomponent force-moment measurements possible.

The four sensors are fitted so that they are ground-isolated. This largely eliminates ground loop problems.

The dynamometer is corrosion-resistant and protected against penetration by splashing water or cutting fluid. The dynamometer including connecting cable Type 1687B5 or Type 1677A5 meets the degree of protection IP67.

Application Examples

- Multicomponent force measurement of large forces
- Cutting force measurement in high performance applications for example in
 - milling
 - surface grinding
 - drilling



Technical Data

Measuring range (central) single component	F_x, F_y, F_z	kN	-30 ... 30	
	M_x, M_y, M_z	N·m	-3 000 ... 3 000	
Measuring range when components act simultaneously (central) 71 mm above dynamometer, $M_x, M_y, M_z = 0$	F_x, y, z (Force vector)	kN	-20 ... 20	
Calibrated measuring range	100 %	F_x, F_y, F_z	N	0 ... 30 000
	10 %	F_x, F_y, F_z	N	0 ... 3 000
	1 %	F_x, F_y, F_z	N	0 ... 300
Threshold		N	<0,01	
Sensitivity	F_x, F_z	pC/N	-8,2	
	F_y	pC/N	-4,2	
Linearity	Meas. range 1 ... 100 %		%/FSO	±0,3
	Meas. range 0 ... <1 %		%/FSO	±0,5
Hysteresis	Meas. range 1 ... 100 %		%/FSO	0,3
	Meas. range 0 ... <10 %		%/FSO	0,5
Crosstalk	$F_z \rightarrow F_x, F_y$	%/FSO		±2
	$F_x \leftrightarrow F_y$	%/FSO		±2
	$F_x, F_y \rightarrow F_z$	%/FSO		±2
Natural frequency (without additional mass)	$f_n (x)$	kHz		2,9
	$f_n (y)$	kHz		2,9
	$f_n (z)$	kHz		3,0
Operating temperature range		°C		-20 ... 70
Insulation resistance (20 °C)				>10 ¹³
Ground isolation				>10 ⁸
Degree of protection EN60529		-		IP67 ¹⁾
Weight	Dynamometer	kg		12,9
	Cover plate	kg		6,5
Mounting surface		mm		140x190

¹⁾ with connection cables Type 1687B5, 1689B5, 1677A5, 1679A5

Dimensions

Pin Allocation

Fig 1: Dimensions of dynamometer
Type 9139AA

Mounting

The dynamometer can be mounted with eight screws to any face-ground, clean mounting surface such as on a machine tool table. The measuring instrument can also be mounted on a magnetic plate. It must be noted that uneven contact surfaces may cause internal distortions, placing additional heavy stresses on the individual measuring elements and increasing the cross talk.

There are M10 tapped blind holes in the mounting plate for clamping the force-introducing components such as work-pieces. It is also possible to mount parts from below. The contact surfaces of the force-introducing parts must be surface ground to achieve good mechanical coupling to the cover plate.

Fig. 2: Mounting of dynamometer Type 9139AA

3-Component Force Measurement F_x , F_y , F_z

Dynamometer
Type 9139AA

Connection cable
Type 1687B5

Multicomponent charge amplifier
Type 5080Axx3x001



Output ± 10 V	
Ch1	F_x
Ch2	F_y
Ch3	F_z

Measuring System for 6-Component Force Measurement F_x , F_y , F_z , M_x , M_y , M_z

Ordering Code

- Multicomponent dynamometer
up to 30 kN, cover plate 140x190 mm

Type/Art. No.

9139AA

Included Accessories

- Mounting screws M10x60 (8 pieces) 65012838
- Packaging (wooden box) 55139656

Connecting Cables

- Connecting cable, 3 wire, with flexible metal sheath (l = 5 m) **1687B5**
- Connecting cable, 3 wire, with flexible hose, steel braided (l = 5 m) **1687BQ02**
- Connecting cable, 3 wire, with flexible metal sheath and angle connector (l = 5 m) **1689B5**
- Connecting cable, 8 wire, with metal sheath (l = 5 m) **1677A5**
- Connecting cable, 8 wire, with flexible hose, steel braided (l = 5 m) **1677AQ02**
- Connecting cable, 8 wire, with metal sheath and angle connector (l = 5 m) **1679A5**