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MiniDyn

Typ 9119AA1

Multicomponent Dynamometer up to 4 000 N, Cover Plate 39x80 mm

Multicomponent dynamometer for measuring the three orthogonal components of a force. Its very low threshold and the high sensitivity allow measuring extremely small forces.

- Small design
- High sensitivity and natural frequency
- Small temperature error
- Top plate made of Titanium
- For cutting force measurements in ultra precise machining
- For general multicomponent force measurement

Description

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 dynamo-meter including connecting cable Type 1687B5 or Type 1677A5 meets the degree of protection IP67.

Application Examples

- Multicomponent force measurement of small forces
- Cutting force measurement in
  - precision machining
  - micromachining
  - Ultra-high precision machining of brittle materials

Technical Data

Measuring range (centrical)	F_x, F_y, F_z	kN	–4 ... 4
single component	M_x, M_y	N·m	–125 ... 125
	M_z	N·m	–250 ... 250
Measuring range when components act simultaneously (centrical), M_x, M_y, M_z = 0	F_x, F_y, F_z	kN	–2,0 ... 2,0
Calibrated measuring range			
100 %	F_x, F_y, F_z	N	0 ... 4 000
10 %	F_x, F_y, F_z	N	0 ... 400
1 %	F_x, F_y, F_z	N	0 ... 40
Overload (centrical)	F_x, F_y, F_z	kN	–4,5/4,5
Threshold		N	<0,002
Sensitivity	F_x, F_z	pC/N	≈–26
	F_y	pC/N	≈–13
Linearity			
Meas. range 10% ... 100%		%/FSO	≤±0,3
Meas. range 0% ... <10%		%/FSO	≤±0,5
Hysteresis			
Meas. range 10% ... 100%		%/FSO	≤±0,3
Meas. range 0% ... <10%		%/FSO	≤±0,5
Crosstalk	F_z –> F_x, F_y	%	≤±2
	F_x <–> F_y	%	≤±2
	F_x, F_y –> F_z	%	≤±2
Natural frequency	f_n (x)	kHz	≈6,0
(without additional mass)	f_n (y)	kHz	≈6,4
	f_n (z)	kHz	≈6,3
Operating temperature range		°C	–20 ... 70
Capacitance	F_x, F_y, F_z	pF	≈230
Insulation resistance (20 °C)		Ω	$>10^{13}$
Ground isolation		Ω	$>10^{8}$
Degree of protection EN60529		–	IP67 [1]
Weight			
Dynamometer		kg	0,93
Cover plate		kg	0,30
Mounting surface		mm	39x80

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

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Dimensions

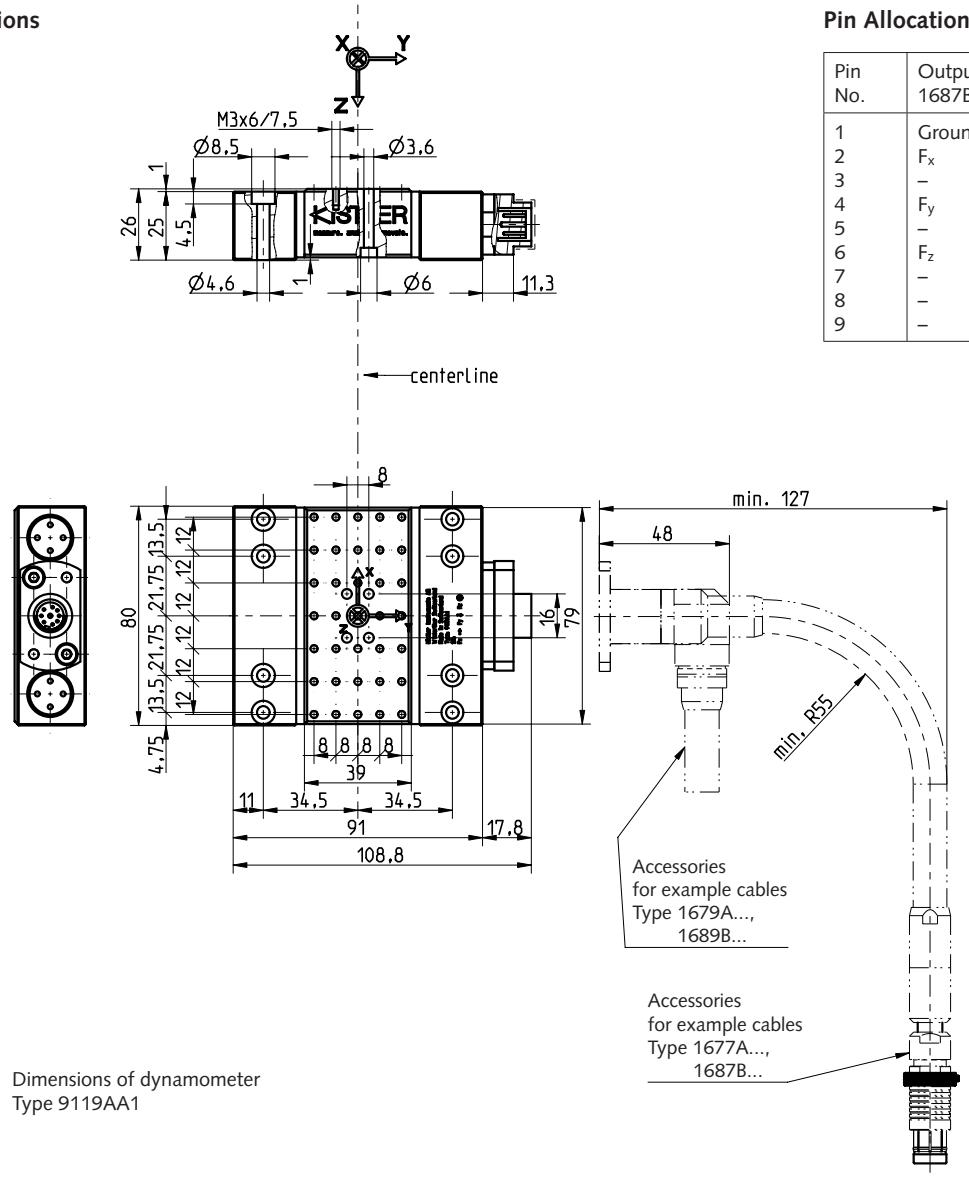

Fig 1: Dimensions of dynamometer
Type 9119AA1

Pin Allocation

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	F_y	$F_{y\,1+4}$
5	–	$F_{y\,2+3}$
6	F_z	$F_{z\,1}$
7	–	$F_{z\,2}$
8	–	$F_{z\,3}$
9	–	$F_{z\,4}$

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 M3 tapped blind holes in the mounting plate for clamping the force-introducing components such as workpieces or toolholder. The contact surfaces of the force-introducing parts must be surface ground to achieve good mechanical coupling to the mounting plate.

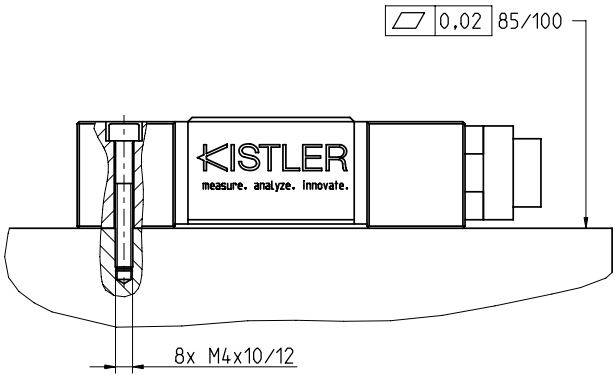

Fig. 2: Mounting of dynamometer Type 9119AA1

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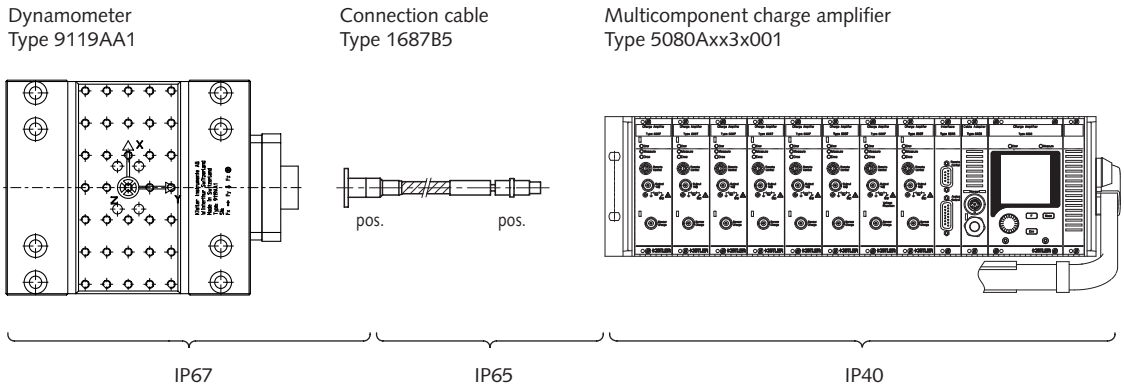
Processing the Measurement Signals
Charge amplifier channels are also needed to build a complete measuring system (e.g. Type 5080A...). These convert the measurement signal into an electrical voltage. The measured value is exactly proportional to the force acting.

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

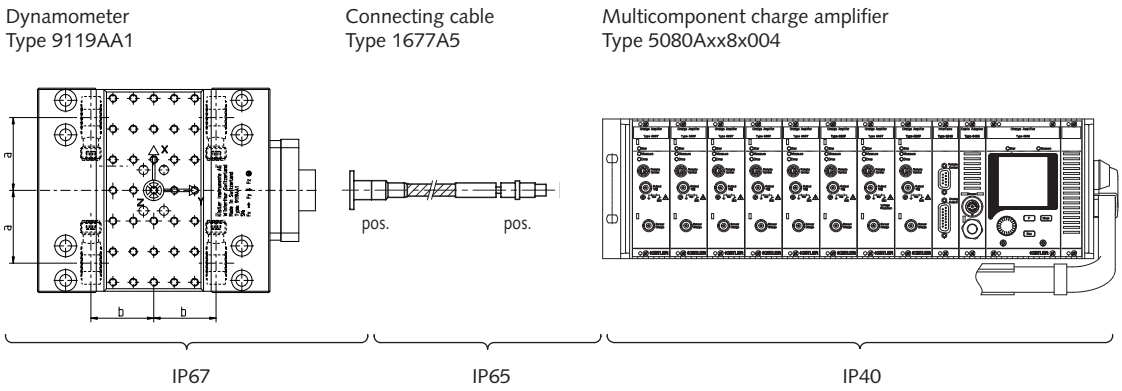


Output ±10 V	
Ch1	F_x
Ch2	F_y
Ch3	F_z

Degree of protection EN60529

Fig. 3: Measuring system for 3-component measurement F_x, F_y, F_z

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



Output ±10 V	
Ch1	F_{x1+2}
Ch2	F_{x3+4}
Ch3	F_{y1+4}
Ch4	F_{y2+3}
Ch5	F_{z1}
Ch6	F_{z2}
Ch7	F_{z3}
Ch8	F_{z4}

Degree of protection EN60529

Fig. 4: Measuring system for 6-component measurement F_x, F_y, F_z, M_x, M_y, M_z

Values a,b for Type 9119AA2:

a mm	b mm
28,5	24,5

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Ordering Code	Type/Art. No.
• Multicomponent dynamometer up to 4 kN, cover plate 39x80 mm	**9119AA1**

Included Accessories

• Mounting screws M4x25 (8 pieces)	65012704

Connecting Cables

• Connecting cable, 3 wire, with flexible metal sheath	**1687B5**
• Connecting cable, 3 wire, with flexible sheath	**1687BQ02sp**
• Connecting cable, 3 wire, with flexible metal sheath and angle connector	**1689B5**
• Connecting cable, 8 wire, with metal sheath	**1677A5**
• Connecting cable, 8 wire, with metal sheath and angle connector	**1679A5**

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