

Multicomponent Dynamometer

Type 9255C

-10 ... 60 kN, Top Plate 260x260 mm

Piezoelectric 3-component dynamometer for measuring the three orthogonal components of a force. The dynamometer has a great rigidity and consequently a high natural frequency. Its high resolution enables the smallest dynamic changes in large forces to be measured.

- Wide measuring range
- For heavy duty application
- Compact design

Description

The dynamometer consists of four 3-component force sensors fitted under high preload between a baseplate and a top plate. Each sensor contains three pairs of quartz plates, one sensitive to pressure in the z direction and the other two responding to shear in the x and y directions respectively. The force components are measured practically without displacement.

The outputs of the four built-in force sensors are connected inside the dynamometer in a way to allow multicomponent measurements of forces and moments to be performed. The eight output signals are available at the 9-conductor flange socket. The four sensors are mounted ground-insulated. Therefore ground loop problems are largely eliminated.

The dynamometer is rustproof and protected against penetration of splashwater and cooling agents. Together with the connecting cable Type 1687B5/1689B5 and Type 1677A5/1679A5 it corresponds to the protection class IP67.

Application Examples

- Dynamic and quasistatic measurement of the three orthogonal components of a force
- Cutting force measurements while milling and grinding on larger machines and in machining centers
- Measurements on stamping machines
- Measurements on wind tunnel models
- Measurements of supporting forces at machinery foundations



Technical Data

Range	F_x, F_y	kN	-30 ... 30
	F_z	kN	-10 ... 60
Calibrated range	F_x, F_y	kN	0 ... 30
	F_z	kN	0 ... 60
Calibrated partial range	F_x, F_y	kN	0 ... 3
	F_z	kN	0 ... 6
Overload	F_x, F_y	kN	-36/36
	F_z	kN	-12/72
Threshold		N	<0,01
Sensitivity	F_x, F_y	pC/N	≈-7,9
	F_z	pC/N	≈-3,9
Linearity, all ranges		%FSO	≤±0,5
Hysteresis, all ranges		%FSO	≤0,5
Cross talk	$F_z \rightarrow F_x, F_y$	%	<±1
	$F_x \leftrightarrow F_y$	%	<±2
	$F_x, F_y \rightarrow F_z$	%	<±2
Rigidity	c_x, c_y	N/μm	≈2 000
	c_z	N/μm	≈3 000
Natural frequency (mounted on flanges)	$f_n (x)$	kHz	≈2,2
	$f_n (y)$	kHz	≈1,8
	$f_n (z)$	kHz	≈2,3
Natural frequency (mounted on flanges and through top plate)	$f_n (x)$	kHz	≈2,2
	$f_n (y)$	kHz	≈2,2
	$f_n (z)$	kHz	≈3,3
Operating temperature range		°C	-20 ... 70
Capacitance (of channel)		pF	≈500
Insulation resistance (20 °C)		Ω	>10 ¹³
Ground insulation		Ω	>10 ⁸
Protection class EN60529		-	IP67 ¹⁾
Weight		kg	52

¹⁾ With connecting cable Types 1687B5, 1689B5, 1677A5, 1679A5

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Dimensions

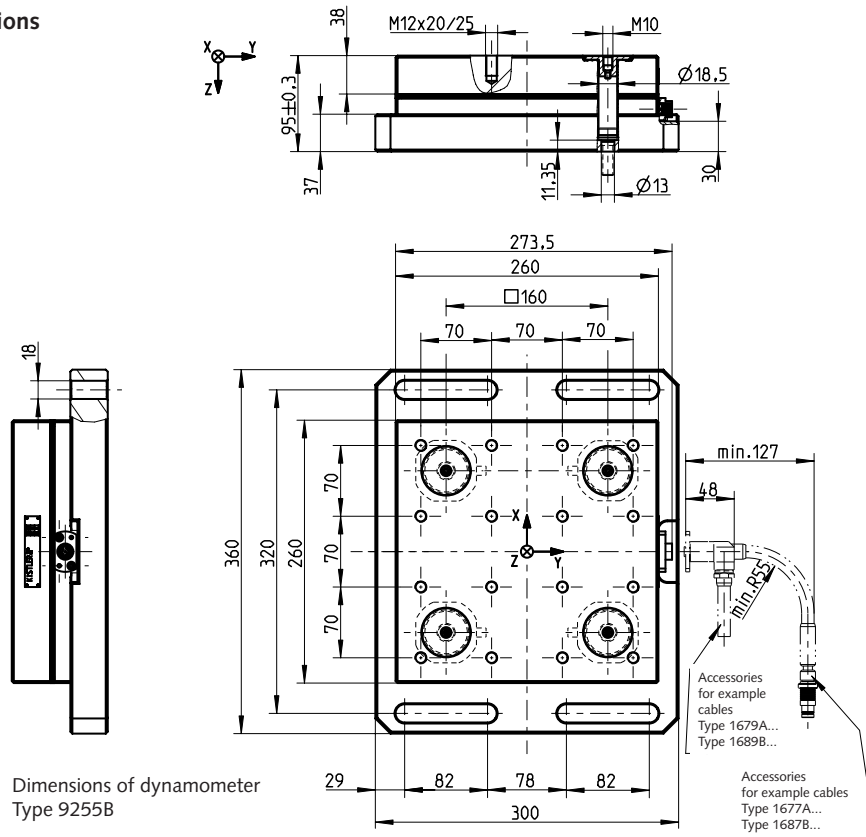


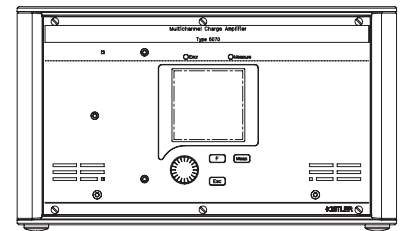
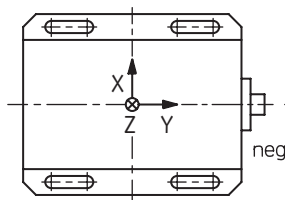
Fig. 1: Dimensions of dynamometer Type 9255B

3-Component Force Measurement F_x , F_y , F_z with 4-Channel Charge Amplifier

Dynamometer
Type 9255C

Cable

Charge Amplifier
Type 5070Ax01xx



3 output signals
from charge amplifier

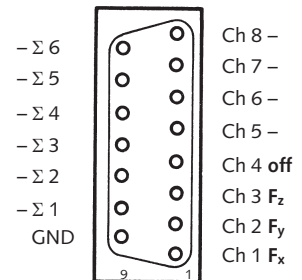


Fig. 2: Example of a measuring system with dynamometer Type 9255C

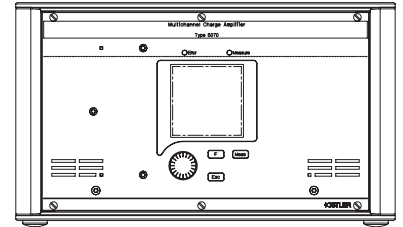
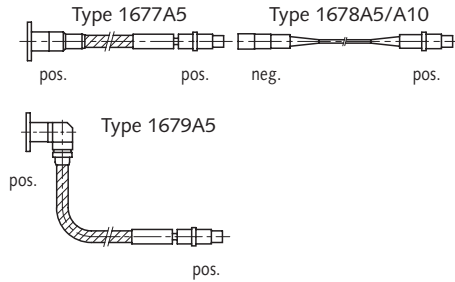
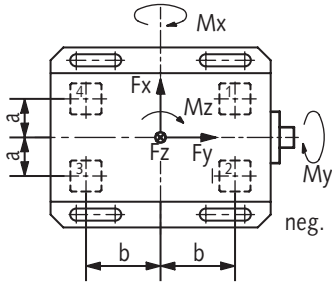
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6-Component Force and Moment Measurement $F_x, F_y, F_z, M_x, M_y, M_z$ with 8-Channel Charge Amplifier

Dynamometer
Type 9255C

Cable

Charge Amplifier
Type 5070Ax11xx



8 output signals
from charge amplifier

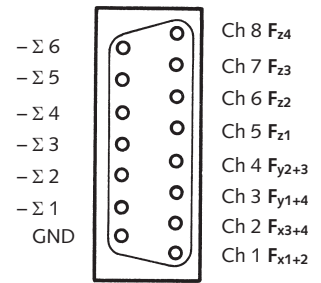


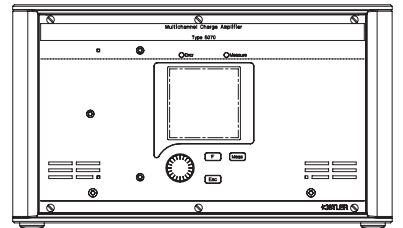
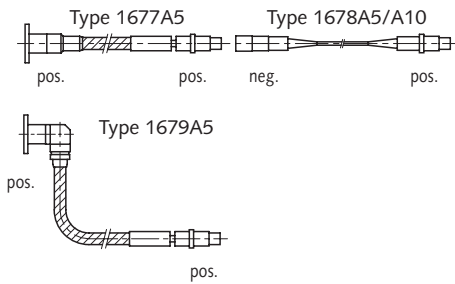
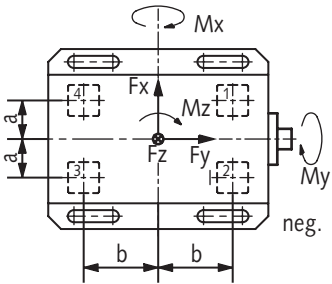
Fig. 3: Example of a measuring system with dynamometer Type 9255C

6-Component Force and Moment Measurement $F_x, F_y, F_z, M_x, M_y, M_z$ with 8-Channel Charge Amplifier with 6-Component-Summing Calculator

Dynamometer
Type 9255C

Cable

Charge Amplifier
Type 5070Ax21xx



8 output signals from charge amplifier
6 output signals from summing calculator

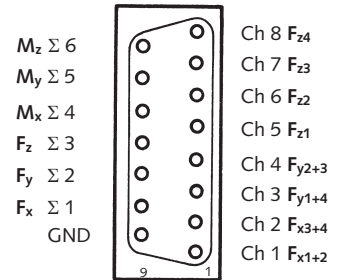


Fig. 4: Example of a measuring system with dynamometer Type 9255C

Values a,b for Type 9255C:

a mm	b mm
80	80

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Mounting

The dynamometer may be mounted with screws or claws on any clean, face-ground supporting surface, such as the table of a machine tool for example.

In order to provide a still better coupling of the measuring instrument with the mounting surface, the dynamometer can, if necessary, additionally be screwed down through the four bores in the top plate. This measure allows to reach a higher resonant frequency of the measuring system. Uneven supporting surface may set up internal stresses, which will impose severe additional loads on the individual measuring elements and may also increase cross talk.

For mounting the force-introducing components, mainly workpieces, sixteen M12 mm blind tap holes in the cover plate are available.

The supporting surfaces for the force-introducing parts must be face-ground to obtain good mechanical coupling to the cover plate.

Signal Conditioning

A multichannel charge amplifier is also needed to build a complete measuring system (i.e. Type 5070A...). The measurement signal is converted into an electrical voltage in the individual channels. The measured value is exactly proportional to the force acting.

Data Acquisition and Evaluation

Kistler offers with the DAQ system a 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.

Included Accessories

- None

Optional Accessories

For 3-Component Force Measurements

F_x, F_y, F_z	Type
• Connecting cable, length $l = 5$ m (3 leads)	1687B5
• Extension cable, length $l = 5$ m (3 leads)	1689B5
	1688B5

For 6-Component Force and Moment Measurements $F_x, F_y, F_z / M_x, M_y, M_z$

	Type
• Connecting cable, length $l = 5$ m (8 leads)	1677A5
• Extension cable, length $l = 5$ m (8 leads)	1679A5
	1678A5

Ordering Code

- Multicomponent Dynamometer
–10 ... 60 kN, top plate 260x260 mm
- Type 9255C**