

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

9255C_003-051e-07.18

Dimensions

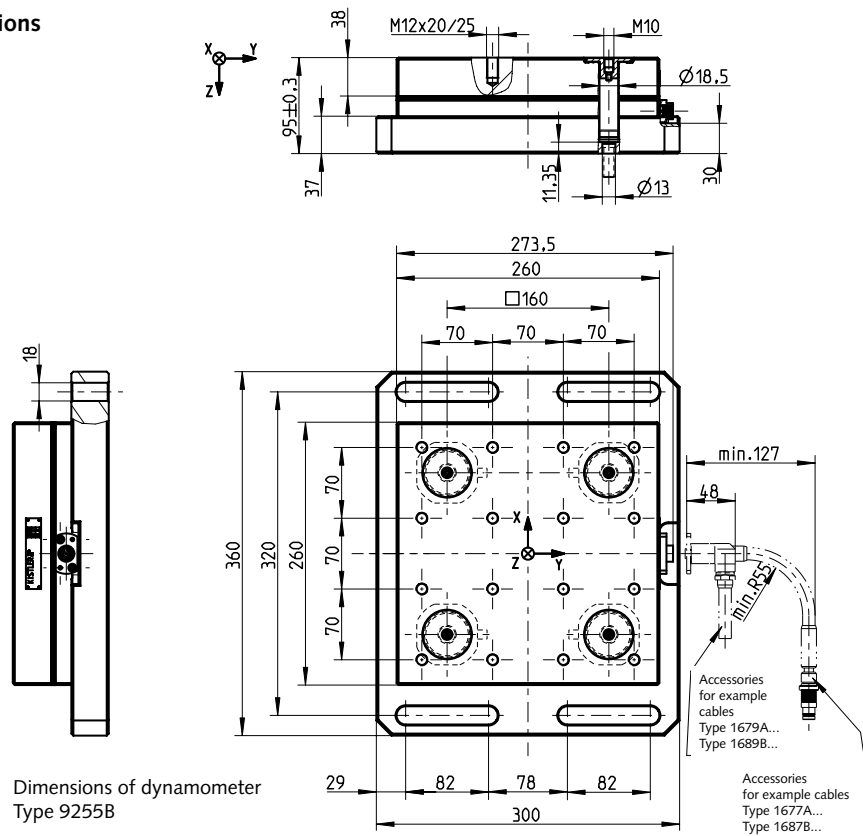


Fig. 1: Dimensions of dynamometer Type 9255B

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.

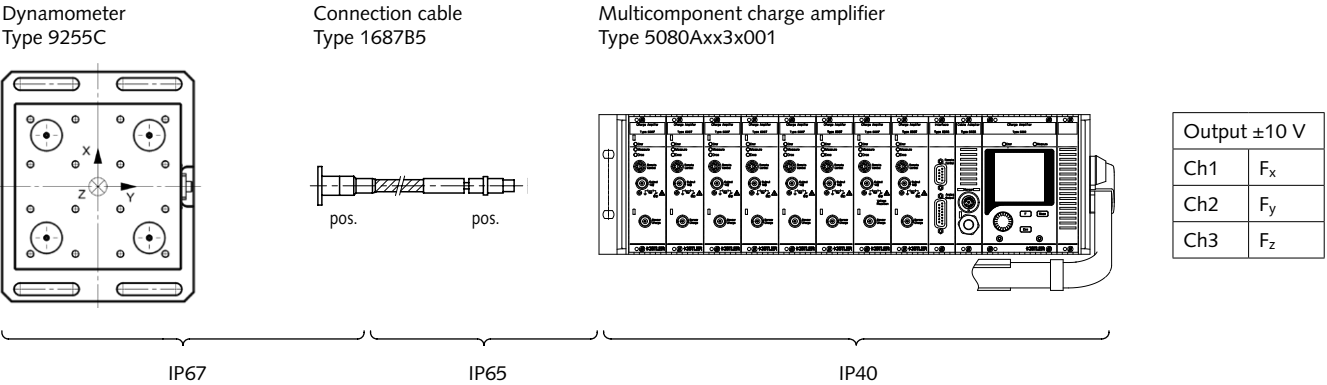
Processing the measurement signals

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

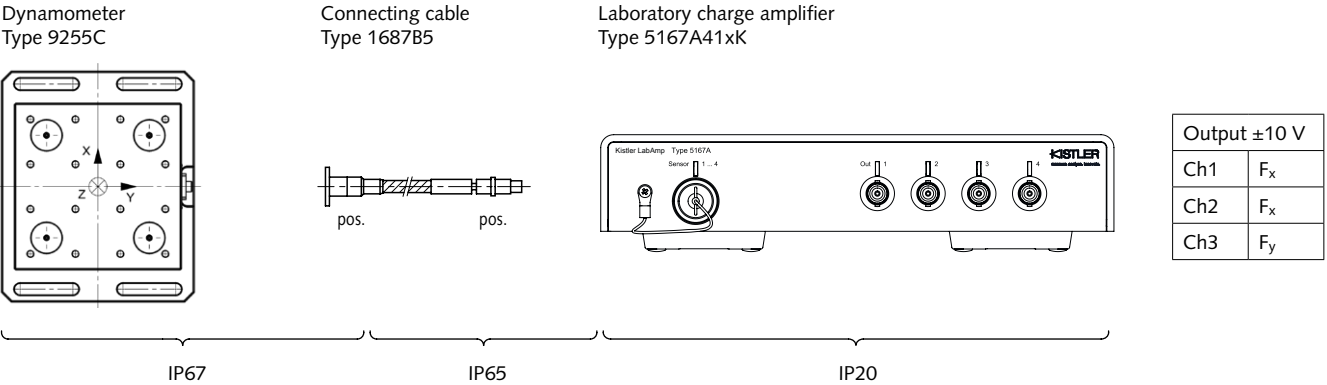
Kistler offers with the Type 5697A1 DAQ system an universal and easy to operate package, consisting of a hardware for the data acquisition and the DynoWare software. For details see data sheet 5697A_000-745.

3-component force measurement F_x , F_y , F_z



Degree of protection EN60529

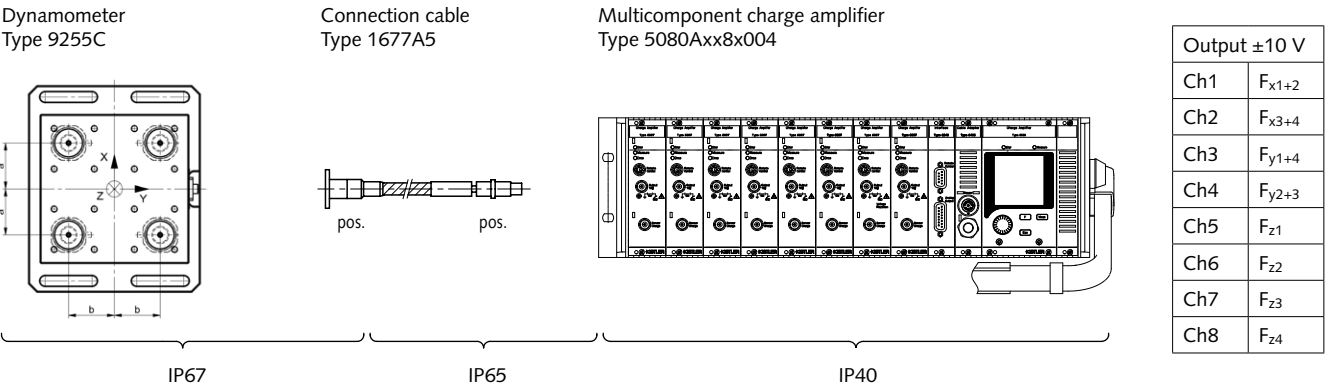
Fig. 2: Measuring system for 3-component measurement with multi-channel charge amplifier



Degree of protection EN60529

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

6-component force measurement $F_x, F_y, F_z, M_x, M_y, M_z$

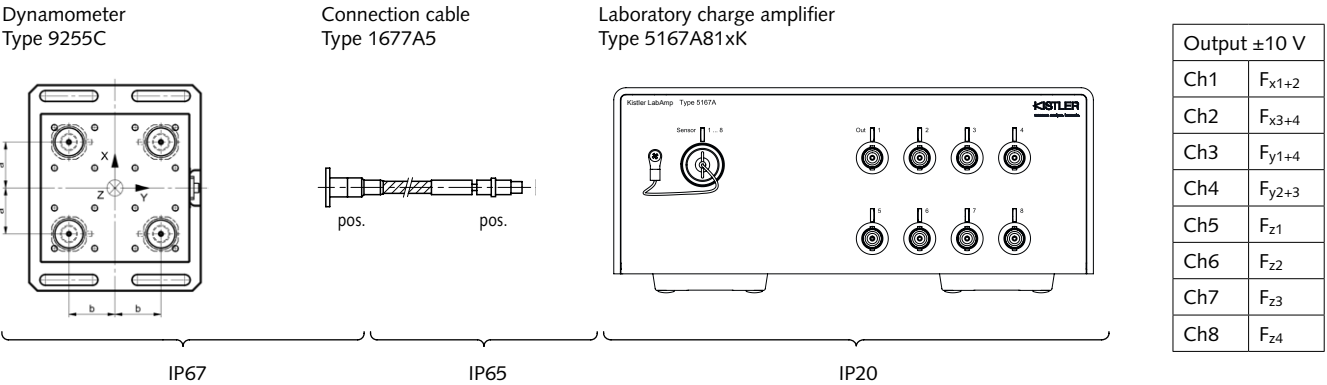


Degree of protection EN60529

Fig. 4: Measuring system for 6-component measurement with multi-channel charge amplifier

Value a,b for Type 9255C:

a	b
mm	mm
80	80






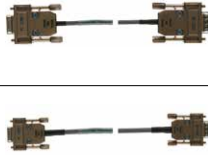

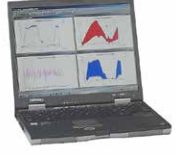
Degree of protection EN60529

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




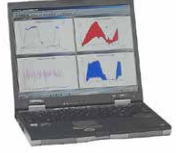
Value a,b for Type 9255C:

a	b
mm	mm
80	80

Typical measuring chain with DAQ system Type 5697A1

					
Dynamometer	Connection cable, high impedance	Charge amplifier	Connecting cable	DAQ system	Notebook (from customer side) with DynoWare
Type 9255C	Type 16xx	Type 5080A	Type 1700A111A2 Type 1200A27	Type 5697A1	

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

			
Dynamometer	Connection cable, high impedance	Charge amplifier with integrated DAQ	Notebook (from customer side) with DynoWare
Type 9255C	Type 16xx	Type 5167A...	

Ordering Code

- Multicomponent dynamometer up to 60 kN, cover plate 260x260 mm

Type/Art. No.
9255C
Optional accessories
For 3-component force measurement F_x , F_y , F_z

- Connecting cable, 3 wire, with flexible metal sheath (L = 5 m) **1687B5**
- 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 measurement
 F_x , F_y , F_z / M_x , M_y , M_z

- 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**
- Waterproof protective cover for cable **1431A1**