

Multicomponent Force Plate

–15 ... 30 kN, mounting plate 600x400 mm

Type 9253B...

Quartz multicomponent force plate for measuring forces and moments. Large measuring range and wide frequency response.

- Top plate: aluminum or steel
- Top plates available with tapped holes or T-slots, too
- Easy mounting
- Stable and reliable

Description

The multicomponent force plate consists of four force measuring elements. Each element contains a preloaded force sensor. The force sensor contains quartz rings which are mounted between two steel plates in the housing of the sensor.

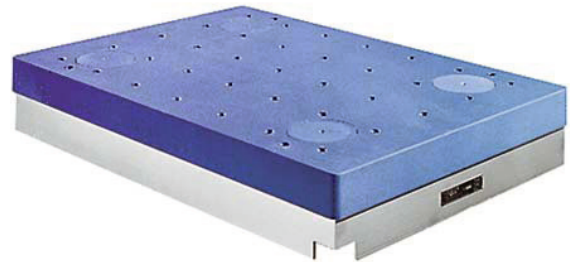
Two quartz rings are sensitive to shear and measure the force components F_x and F_y , while a quartz ring sensitive to pressure measures the component F_z of a force acting in any direction on the force plate. The electrical charges proportional to the different components are led via electrodes to the connector contacts.

The 12 outputs of the four force measuring elements are connected in the summing box so that the 3 force components F_x , F_y , F_z can be measured whereas the 3 moment components M_x , M_y , M_z can be calculated.

The four sensors are mounted ground-isolated. Therefore ground loop problems are largely eliminated.

The force plate is corrosion-resistant and protected against penetration of splashwater and cooling agents. Together with a connecting cable Type 1687B5 or 1677A5 the force plate corresponds to the degree of protection IP67.

An apron protects both sensor and cable from mechanical damage.



Applications

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

Technical data			9253B11/B12	9253B21/22	9253B23
Range	F_x, F_y	kN	–10 ... 10	–15 ... 15	–12 ... 12
	F_z	kN	–10 ... 20	–15 ... 30	–12 ... 25
Calibrated partial range	F_x, F_y	kN	0 ... 1	0 ... 1,5	0 ... 1,2
	F_z	kN	0 ... 2	0 ... 3	0 ... 2,5
Overload	F_x, F_y	kN	–15/15	–20/20	–15/15
	F_z	kN	–15/30	–20/40	–15/30
Threshold		N	<0,01	<0,01	<0,01
Sensitivity	F_x, F_y	pC/N	≈–7,8	≈–7,8	≈–7,8
	F_z	pC/N	≈–3,7	≈–3,7	≈–3,7
Variation of the sensitivity with a force acting within the top plate	F_x, F_y, F_z	%	±1	±1	±1

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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.

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Other technical data			9253B11/12	9253B21/B22	9253B23
Linearity, all ranges		%FSO	$\leq \pm 0,5$	$\leq \pm 0,5$	$\leq \pm 0,5$
Hysteresis, all ranges		%FSO	$\leq 0,5$	$\leq 0,5$	$\leq 0,5$
Cross talk		%	$\leq \pm 2$	$\leq \pm 2$	$\leq \pm 2$
Rigidity	c_x	N/ μ m	≈ 625	≈ 750	≈ 850
	c_y	N/ μ m	≈ 650	≈ 850	≈ 750
	c_z	N/ μ m	≈ 250	≈ 450	≈ 250
Natural frequency	$f_n(x)$	Hz	≈ 800	≈ 580	≈ 610
	$f_n(y)$	Hz	≈ 750	≈ 550	≈ 570
	$f_n(z)$	Hz	≈ 850	≈ 720	≈ 570
Operating temperature		$^{\circ}$ C	-20 ... 70	-20 ... 70	-20 ... 70
Capacitance (each channel)	F_x, F_y	pF	≈ 600	≈ 600	≈ 600
	F_z	pF	≈ 600	≈ 600	≈ 600
Insulation resistance (20 $^{\circ}$ C)		Ω	$> 10^{13}$	$> 10^{13}$	$> 10^{13}$
Ground isolation		Ω	$> 10^8$	$> 10^8$	$> 10^8$
Degree of protection EN60529			IP67	IP67	IP67
Weight		kg	40	90	85

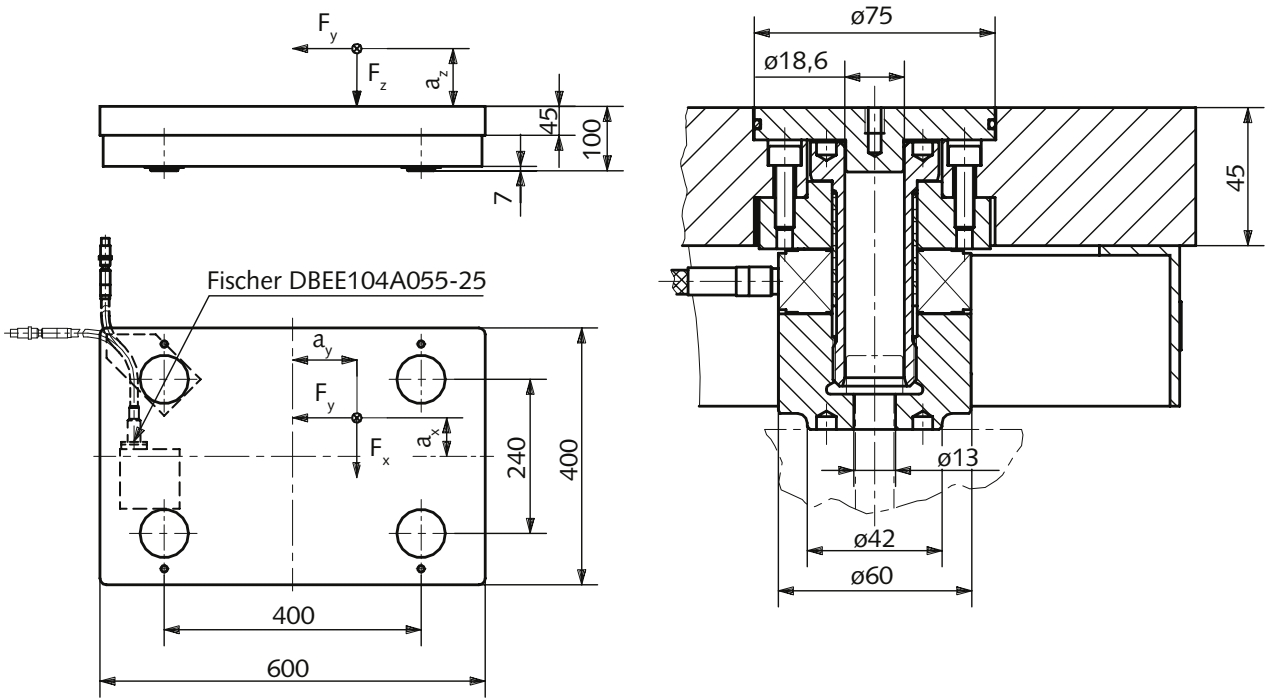


Fig.1: Type 9253B11 (aluminum top plate, smooth)

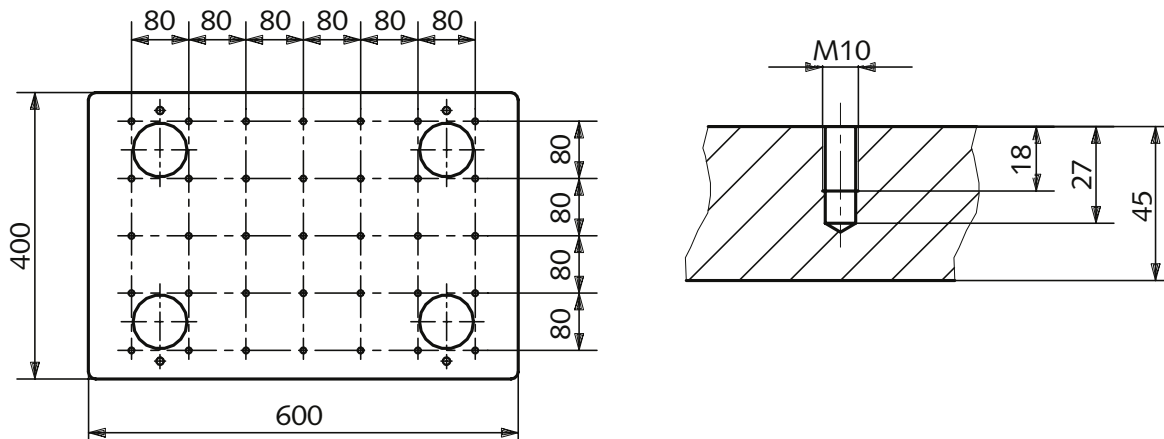


Fig. 2: Type 9253B12 (aluminum top plate with tapped holes)

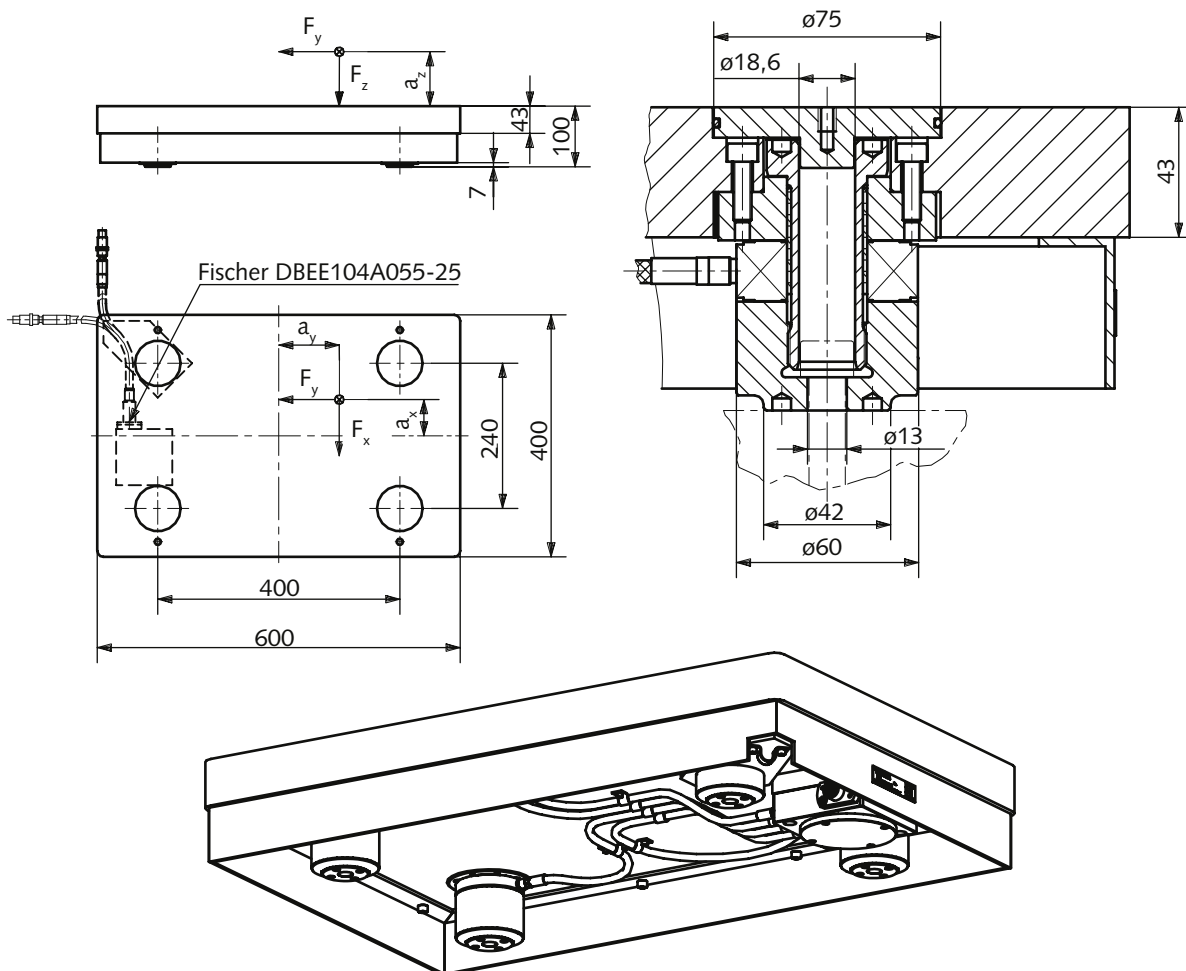


Fig. 3: Type 9253B21 (steel top plate, smooth)

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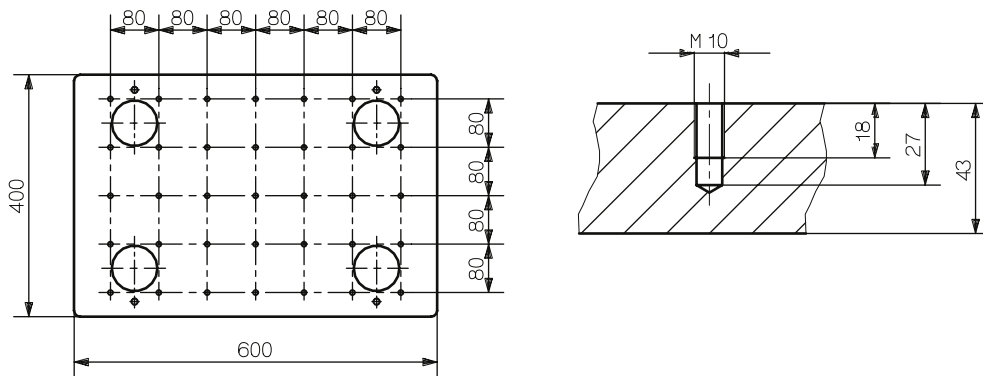


Fig. 4: Type 9253B22 (steel top plate with tapped holes)

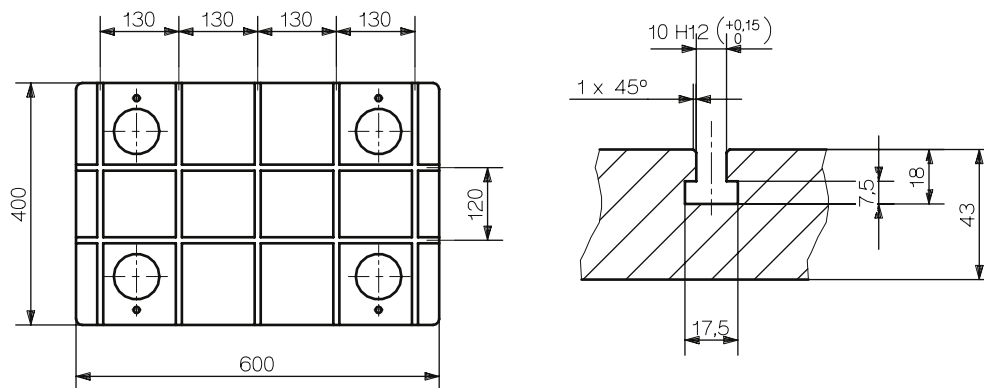


Fig. 5: Type 9253B23 (steel top plate with T-slots)

Mounting

The force plate can be fixed with four M12-bolts on a flat, clean mounting surface.

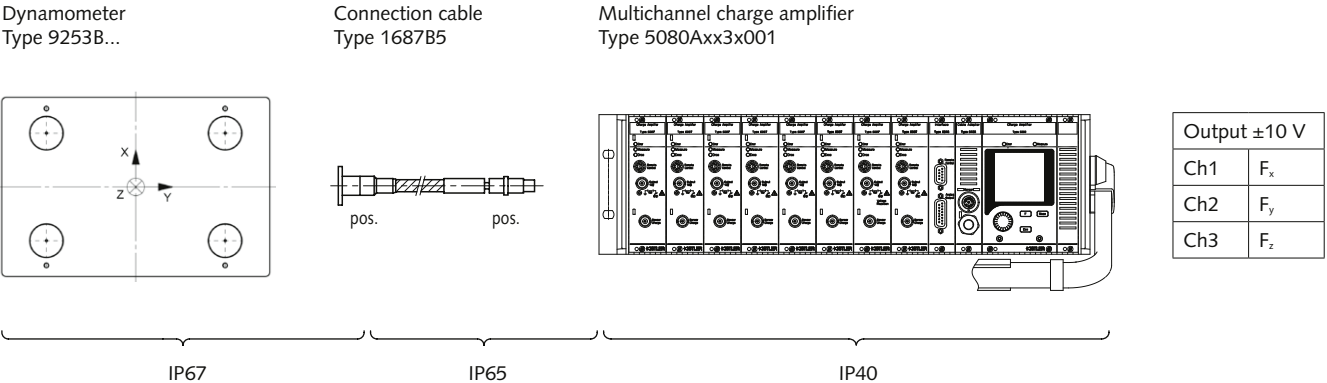
Processing the measurement signals

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

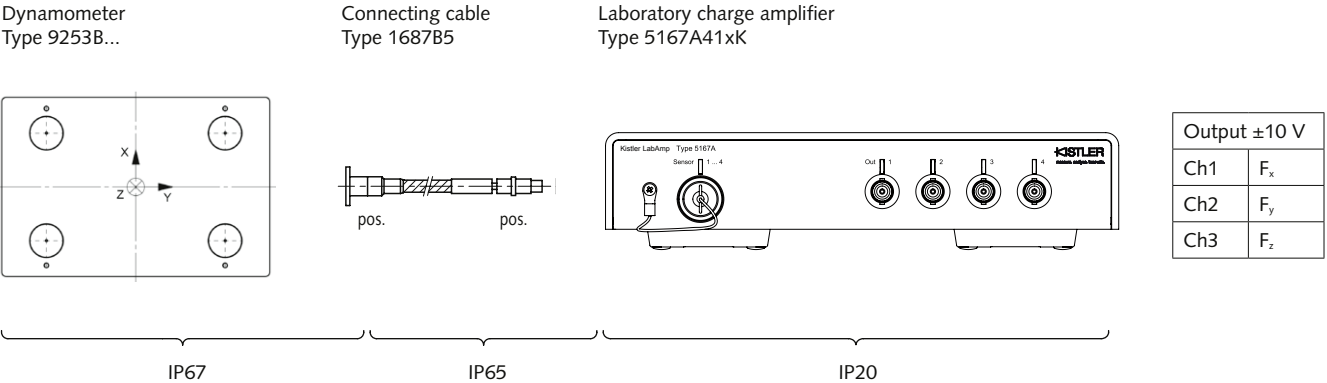
Kistler offers with the Type 5697A1 DAQ system an universal and easy to operate package, consisting of a hardware for the data acquisition and the DynoWare software. For details see data sheet 5697A_000-745.

3-component force measurement F_x, F_y, F_z



Degree of protection EN60529

Fig. 6: Measuring system for 3-component measurement with multichannel charge amplifier



Degree of protection EN60529

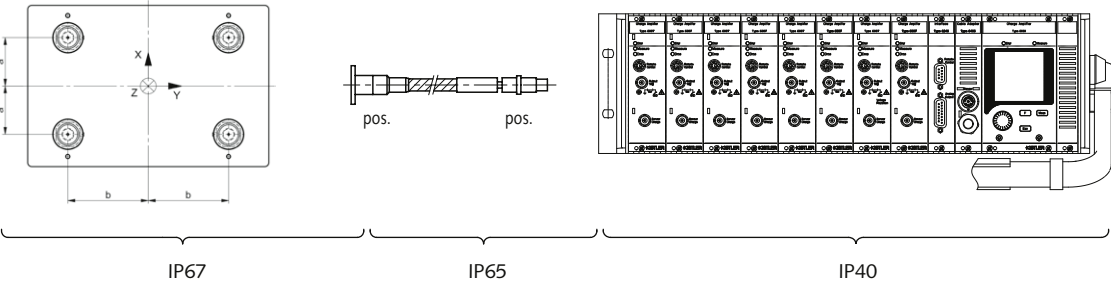
Fig. 7: Measuring system for 3-component measurement with laboratory charge amplifier

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

Dynamometer
Type 9253B...

Connection cable
Type 1677A5

Multichannel charge amplifier
Type 5080Axx8x004



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

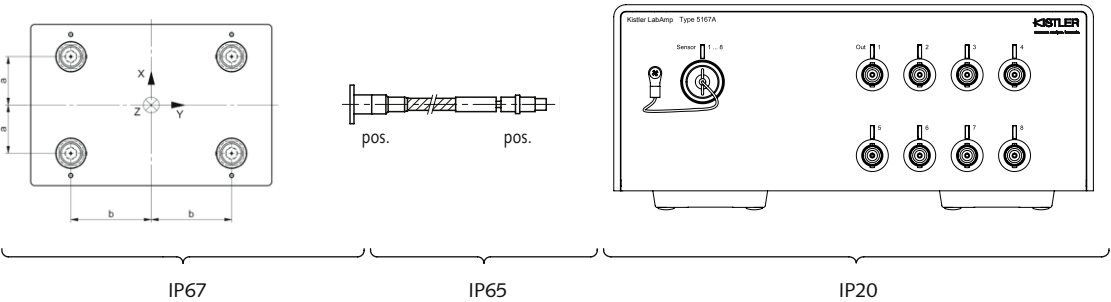
Value a,b für Type 9253B...:

a mm	b mm
120	200

Dynamometer
Type 9253B...

Connection cable
Type 1677A5

Laboratory charge amplifier
Type 5167A81xK



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

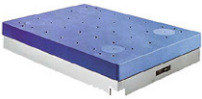


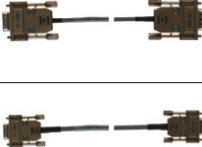

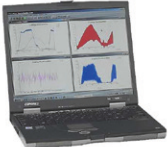
Fig. 9: Measuring system for 6-component measurement with laboratory charge amplifier

Value a,b für Type 9253B...:

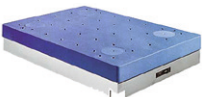


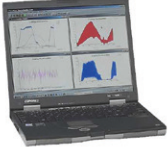
a mm	b mm
120	200

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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 9253B...	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 9253B...	Type 16xx	Type 5167A...	

Ordering code

- Multicomponent dynamometer up to 30 kN, cover plate 600x400 mm

Type/Art. No.
9253B...

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**

Type/Art. No.

Ordering key

Type 9253B ☐

Aluminum top plate

smooth	11
with tapped holes	12

Steel top plate

smooth	21
with tapped holes	22
with T-slots	23

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**

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