

## 3-Component Measuring System

Type 9129A...

### For cutting force measurement during turning

Modular system for measurement of cutting forces when turning outside and inside diameters on turret lathes.

- Machine adapters for disk-type turrets with:
  - VDI tool holding fixtures  $\varnothing 30$  mm,  $\varnothing 40$  mm,  $\varnothing 50$  mm
  - Coromant Capto C5, C6 clamping unit
  - Direct tool holding fixtures 20x40 mm, 25x50 mm,  $\frac{3}{4}$ "x1½", 1"x2"
- Tool holders for external turning tools: 20x20 mm, 25x25 mm,  $\frac{3}{4}$ "x¾", 1"x1"
- Tool holders for internal turning tools:  $\varnothing 25$  mm,  $\varnothing 32$  mm,  $\varnothing 40$  mm
- For cutting forces up to 8 kN
- Minimal temperature error

#### Description

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

Due to the special mounting of the sensors, a minimal temperature error is achieved. The forces are measured with practically no displacement. The outputs of the four integral force sensors are passed to the 9-way flange socket.

The four sensors are mounted with ground isolation. This largely avoids ground loop problems.

The dynamometer is corrosion-resistant and protected against the penetration of coolant. Used together with connecting cables Type 1687B.../Type 1689B..., the dynamometer is protected to IP67.

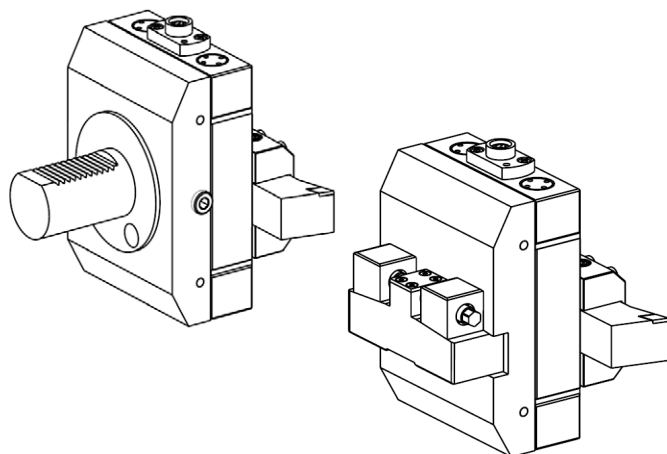


Fig. 1: Dynamometer Type 9129AA with machine adapter Type 9129AB40 (left) and Type 9129AD25 (right) and tool holder Type 9129AE25



#### Technical data

Max. permitted measuring range (Type 9129AA mounted with adapter Type 9129AB50 or 9129AC6 or 9129AD25 or tool adapter Type 9129AE25, L = 35 mm)	$F_x, F_z$ $F_y$	kN kN	–5 ... 5 –8 ... 8
Permitted measuring ranges (Type 9129AA mounted with remaining adapters)	$F_x, F_y, F_z$		see Fig. 1
Calibrated measuring range	$F_x, F_z$	kN	0 ... 5
	$F_y$	kN	0 ... 8
Calibrated partial meas. range	$F_x, F_z$	kN	0 ... 0,5
	$F_y$	kN	0 ... 0,8

Dynamometer Type 9129AA is calibrated with mounted machine adapter Type 9129AB50, tool holder Type 9129AE25 and dummy tool with 35 mm overhang.

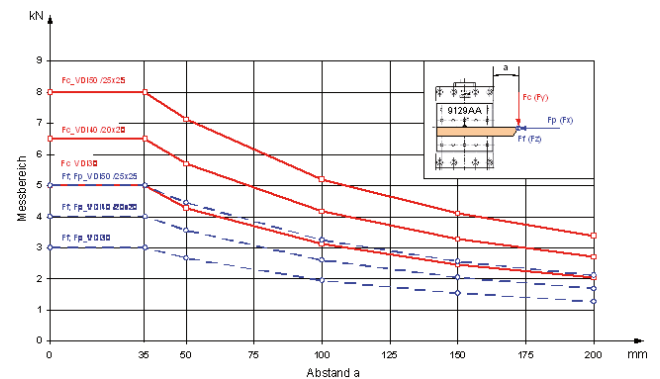
#### Further technical data

Overload	$F_x, F_y, F_z$	%	20
Threshold		N	<0,01
Sensitivity (nominal)	$F_x$	pC/N	≈-8
	$F_y$	pC/N	≈-4,1
	$F_z$	pC/N	≈-8
Sensitivity deviation dependent on the machine adapter	$F_x, F_y, F_z$	%	≤±1
Linearity, all ranges	$F_x, F_y, F_z$	±%FSO	≤±0,3
Hysteresis, all ranges	$F_x, F_y, F_z$	%FSO	≤0,3
Crosstalk	$F_z \rightarrow F_x, F_y$	%	≤±3
	$F_x \leftrightarrow F_y$	%	≤±3
	$F_x, F_y \rightarrow F_z$	%	≤±3
Natural frequency *	$f_n(x)$	kHz	≈1,5
	$f_n(y)$	kHz	≈1,5
	$f_n(z)$	kHz	≈2,5
Operating temperature range		°C	0 ... 70
Capacitance	$F_x, F_y, F_z$	pF	≈180
Insulation resistance		Ω	>10 <sup>13</sup>
Ground isolation		Ω	>10 <sup>8</sup>
Protection class EN60529			IP67
Weight	Dynamometer	kg	3,2
	Cover plate	kg	2,0
Mounting surface		mm	90x105
Connection		Fischer flange 9-pole neg.	

\* Type 9129AA with mounted machine adapter Type 9129AB40,  
tool holder Type 9129AE25, less dummy tool.

#### Application

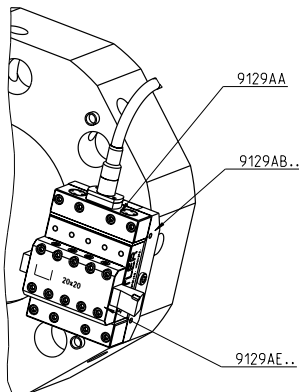
- Measurement of the three cutting forces  $F_c, F_f, F_p$  while turning outside and inside diameters on lathes with turret-type tool heads.
- Type 9129AA dynamometer alone is also suitable as a multicomponent force measuring device for general force measurements. It can be separately mounted without accessories directly on a flat base plate (table). (See data sheet for Type 9129AA 9129AA\_000-709)



## Typical design variants

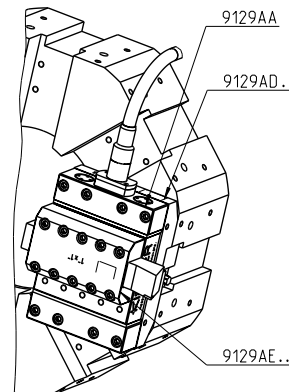
### Example 1

Axially mounted dynamometer for turning the outside diameter with machine adapter Type 9129AB... (VDI tool holding fixture) and tool holder Type 9129AE... .



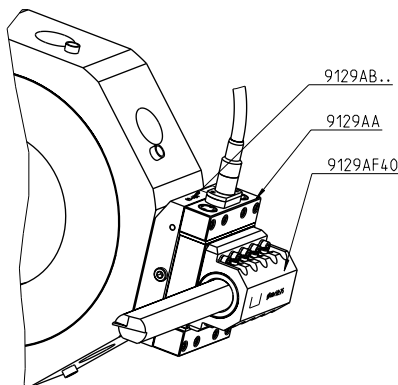
### Example 2

Axially mounted dynamometer for turning the outside diameter with machine adapter Type 9129AD... (direct tool holding fixture) and tool holder Type 9129AE... .



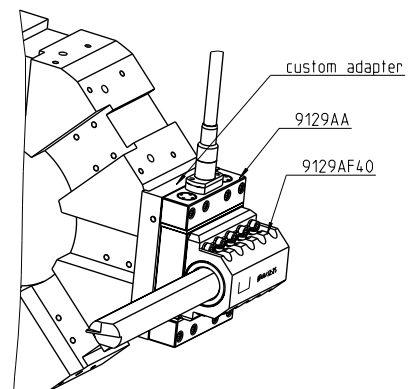
### Example 3

Radially mounted dynamometer for turning the inside diameter with machine adapter Type 9129AB... (VDI tool holding fixture) and tool holder for Type 9129AF40 boring bars.



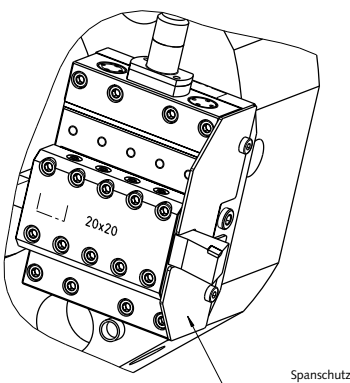
### Example 4

Radially mounted dynamometer for turning the inside diameter with special intermediate plate adapted to the interface of the turret disk (by the customer) and tool holder for Type 9129AF40 boring bars.



### Example 5

As example 1 but with additional swarf shield mounted.



Dimensions

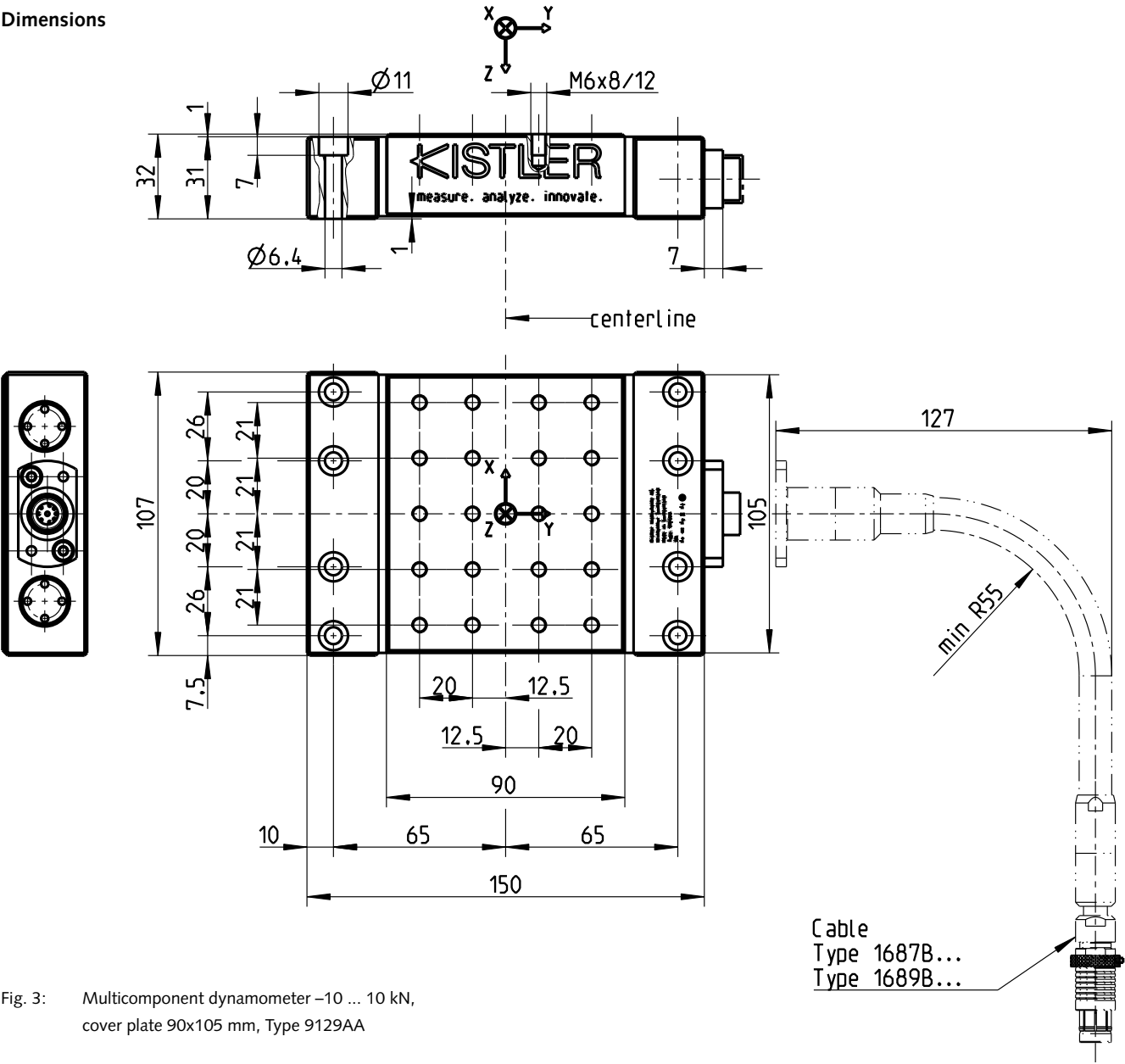


Fig. 3: Multicomponent dynamometer –10 ... 10 kN,  
cover plate 90x105 mm, Type 9129AA

Pin allocation

Pin No.	Output signals
1	Ground
2	$F_x$
3	–
4	$F_y$
5	–
6	$F_z$
7	–
8	–
9	–

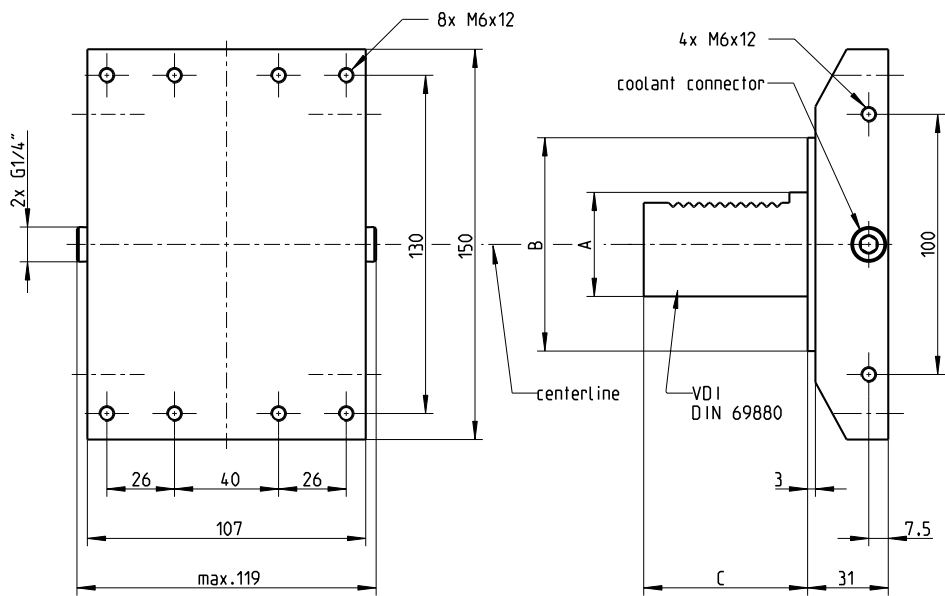


Fig. 4: Machine adapter with straight shank for disk-type turret with VDI tool holding fixture Type 9129AB...

Type	A	B [mm]	C [mm]	Weight [g]
9129AB30	VDI 30	67	55	≈3 460
9129AB40	VDI 40	82	63	≈3 870
9129AB50	VDI 50	97	78	≈4 400

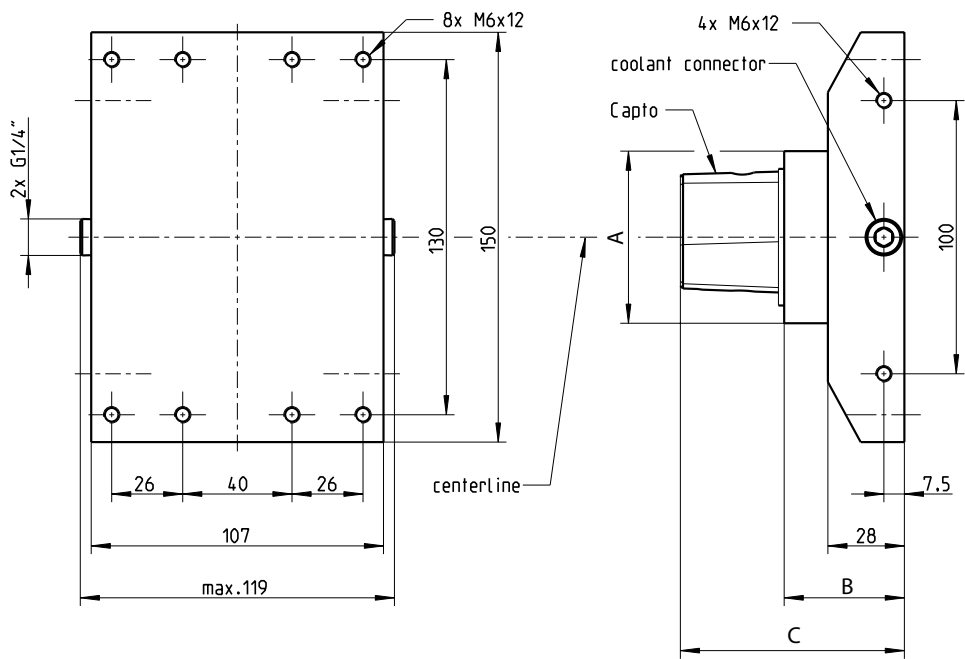


Fig. 5: Machine adapter with Capto C... for disk-type turret with Coromant Capto clamping unit, Type 9129AC...

Type	Capto Type	A [mm]	B [mm]	C [mm]	Weight [g]
9129AC5	C5	50	44	74	≈3 460
9129AC6	C6	63	44	82	≈3 808
9129AC8	C8	80	65	113	≈5 200

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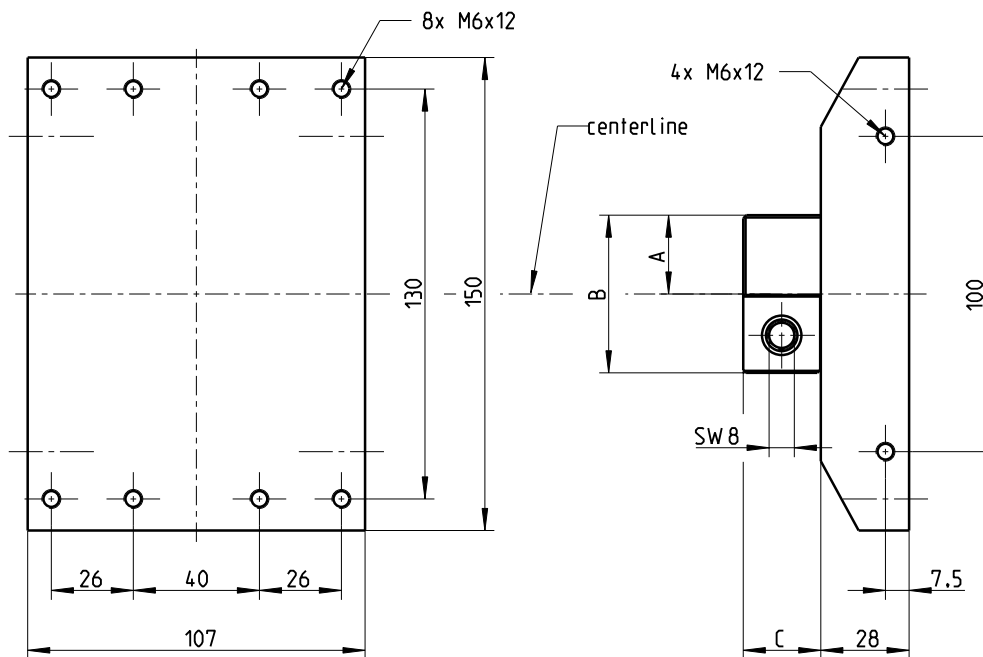


Fig. 6: Machine adapter with clamping wedge for disk-type turrets with direct tool holding fixture, Type 9129AD...

Type	A [mm]	B [mm]	C [mm]	Weight [g]
9129AD20	20	40	18,8	≈3 660
9129AD25	25	50	24,8	≈3 960
9129AD0,75	¾"	1½"	18,8	≈3 635
9129AD1	1"	2"	24,8	≈3 970

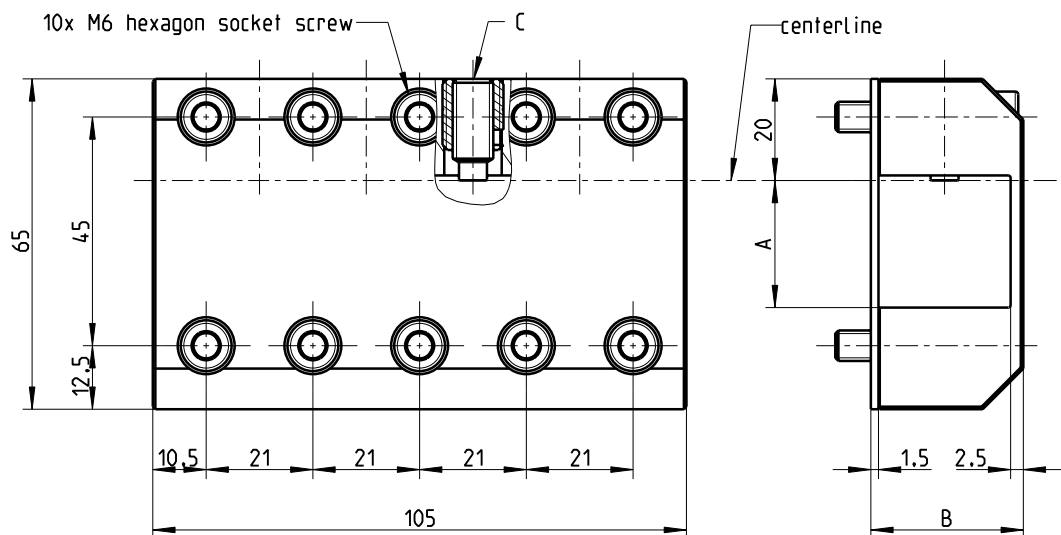


Fig. 7: Tool holder for lathe chisel for axially mounted dynamometer, Type 9129AE...

Type	A [mm]	B [mm]	C [mm]	Weight [g]
9129AE20	20	25	SW 3	≈430
9129AE25	25	30	SW 4	≈490
9129AE0,75	¾" (19,05)	24,05	SW 3	≈455
9129AE1	1" (25,4)	30,4	SW 4	≈490

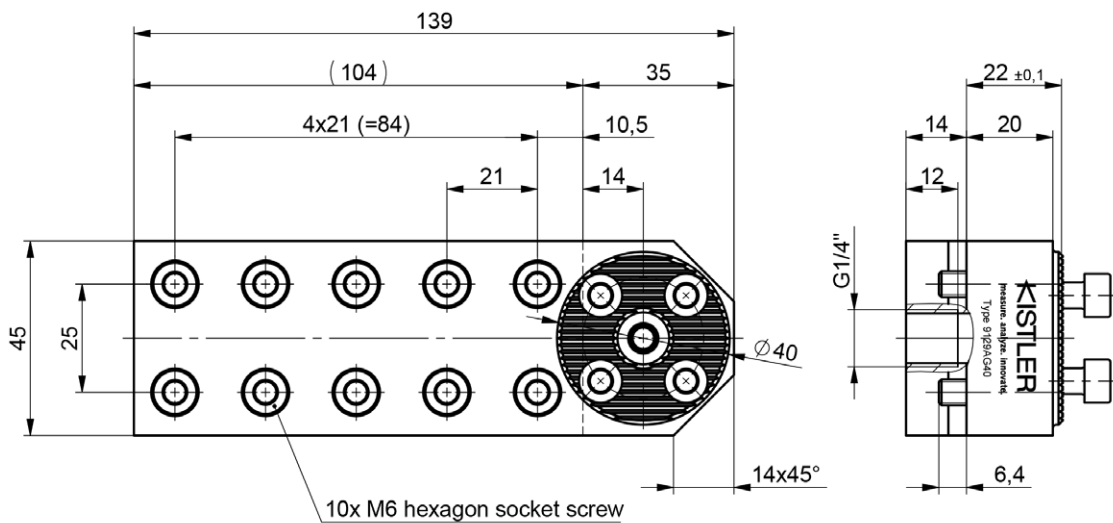


Fig. 8: Tool holder suitable for Sandvik Coroturn SL with 40 mm diameter, Type 9129AG40

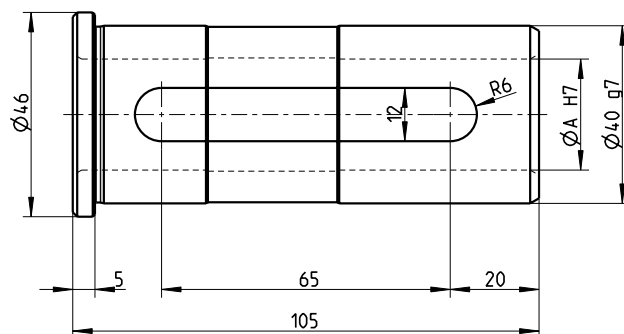
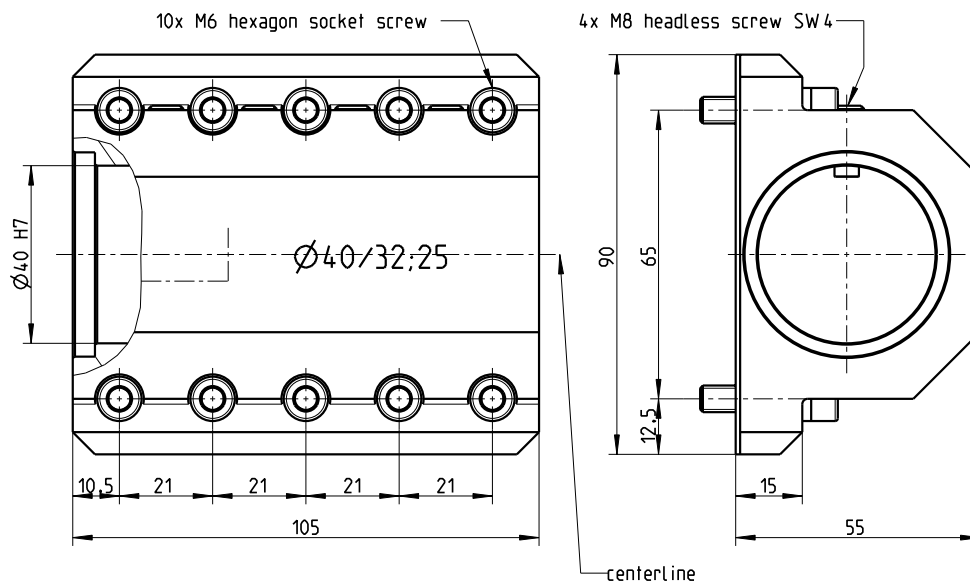


Fig. 9: Tool holder for boring bars up to  $\varnothing 40$  mm for radially mounted dynamometer with reducing bushings  $\varnothing 40/32$  mm,  $\varnothing 40/25$  mm, Type 9129AF40

$\varnothing A$ [mm]	Reducing bushing	Item No.	Weight bushing [g]	Weight [g]
40	none	—	0	≈630
32	$\varnothing 40/32$	3.710.191	122	≈755
25	$\varnothing 40/25$	3.710.192	205	≈840

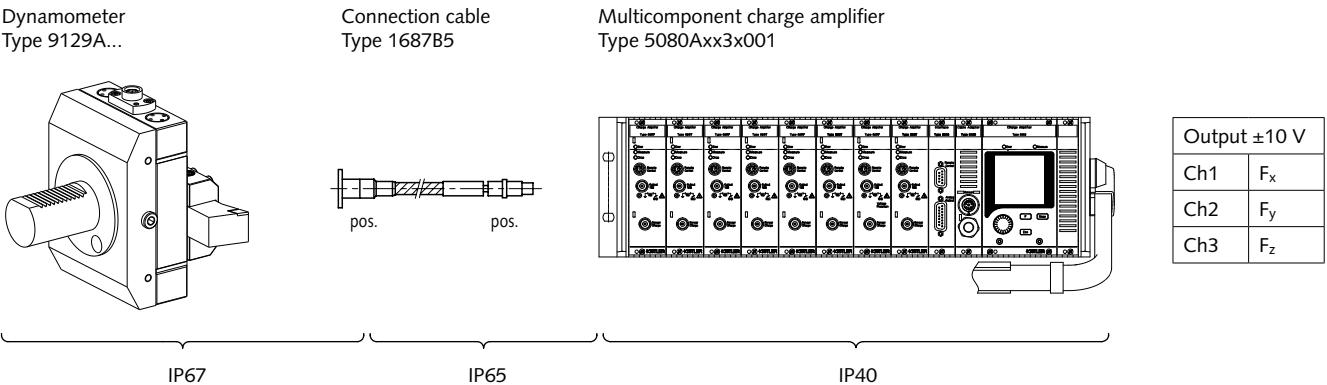
**Processing the measurement signals**

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**

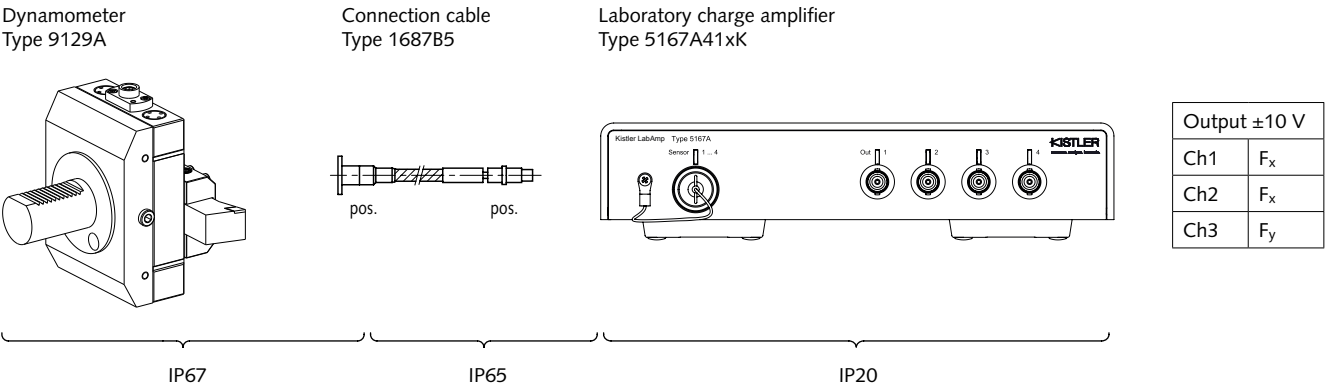
Kistler offers with the Type 5697A1 DAQ system an universal and easy to operate package, consisting of a hardware for the data acquisition and the DynoWare software. For details see data sheet 5697A\_000-745.

**3-component force measurement  $F_x$ ,  $F_y$ ,  $F_z$**



Degree of protection EN60529

Fig. 10: Measuring system for 3-component measurement with multi-channel charge amplifier






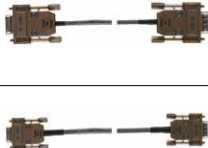

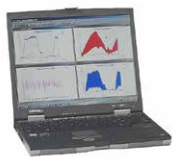
Degree of protection EN60529

Fig. 11: Measuring system for 3-component measurement with laboratory charge amplifier




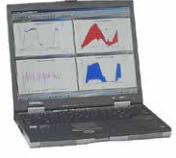
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Typical measuring chain with DAQ system Type 5697A1

					
Dynamometer	Connection cable, high impedance	Charge amplifier	Connecting cable	DAQ system	Notebook (from customer side) with DynoWare
Type 9129A...	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 9129A...	Type 16xx	Type 5167A...	

## Measuring system components

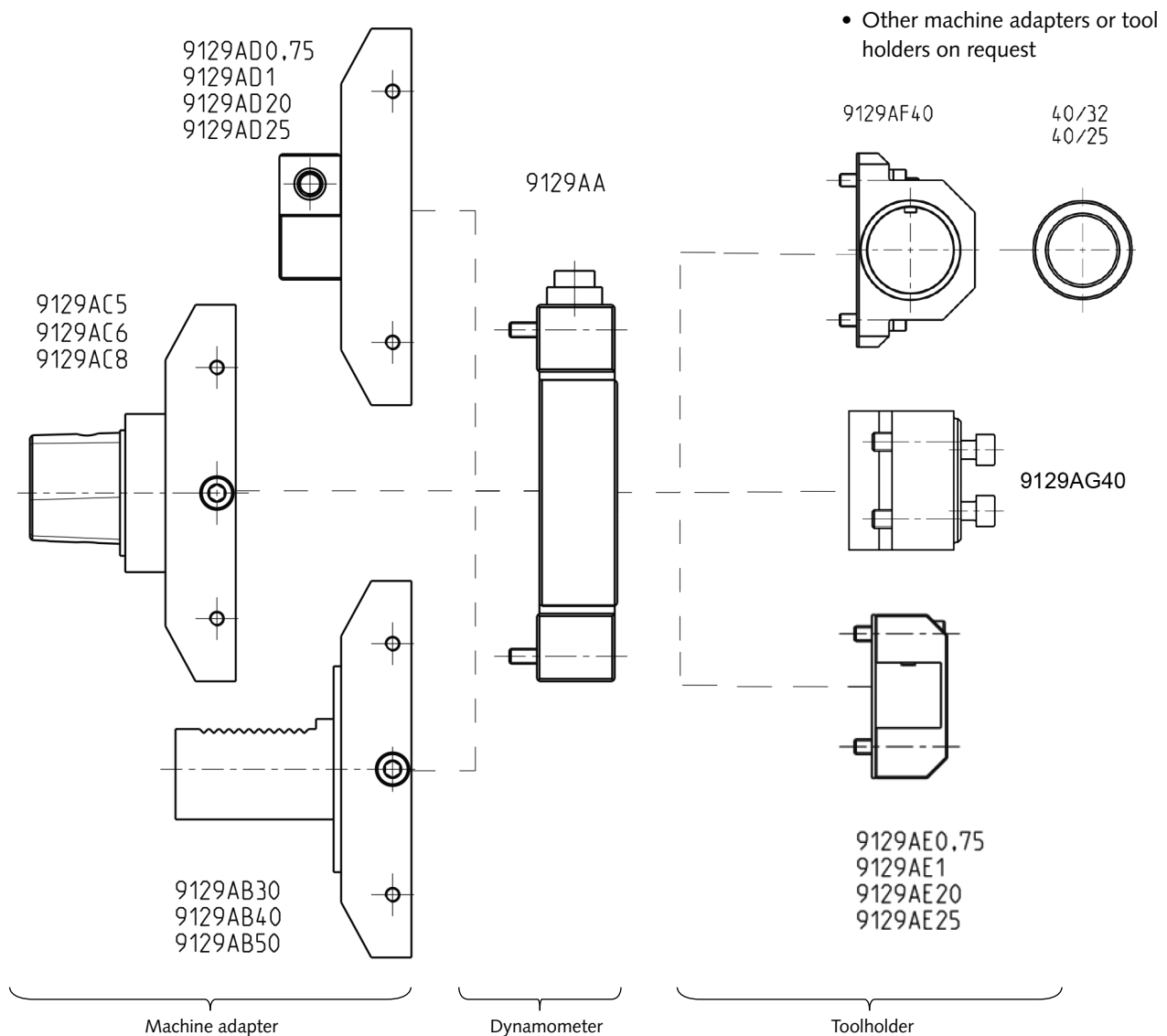


Fig. 12: Configuration of standard components

#### Ordering key

- Multicomponent dynamometer  
up to 10 kN, cover plate 90x105 mm  
Accessories included:  
– Mounting screws M6x35 (8 items)

- Machine adapter with straight shank  
ø30 mm for disk-type turret with  
VDI tool holding fixture,  
DIN 69880-30x55 for Type 9129AA

- Machine adapter with straight shank  
ø40 mm for disk-type turret with  
VDI tool holding fixture,  
DIN 69880-40x63 for Type 9129AA

- Machine adapter with straight shank  
ø50 mm for disk-type turret with  
VDI tool holding fixture,  
DIN 69880-50x78 for Type 9129AA

- Machine adapter with Capto C5 for  
disk-type turret with Coromant Capto  
clamping unit for Type 9129AA

- Machine adapter with Capto C6 for  
disk-type turret with Coromant Capto  
clamping unit for Type 9129AA

- Machine adapter with Capto C8 for disk-  
type turret with Coromant Capto clamping  
unit for Type 9129AA

- Machine adapter with clamping wedge  
¾"x1½" for disk-type turret with  
direct tool holding fixture for Type 9129AA

- Machine adapter with clamping wedge  
1"x2" for disk-type turret with  
direct tool holding fixture for Type 9129AA

- Machine adapter with clamping wedge  
20x40 mm for disk-type turret with  
direct tool holding fixture for Type 9129AA

- Machine adapter with clamping wedge  
25x50 mm for disk-type turret with  
direct tool holding fixture for Type 9129AA

#### Type/Art. No. 9129AA

65012770

9129AB30

9129AB40

9129AB50

9129AC5

9129AC6

9129AC8

9129AD0,75

9129AD1

9129AD20

9129AD25

- Tool holder for lathe chisel  
¾"x¾" for axially mounted  
dynamometer for Type 9129AA  
Accessories included:

- Hex socket head  
cap screw M6x22 (10 items)
- Swarf shield 20

- Tool holder for lathe chisel  
1"x1" for axially mounted  
dynamometer for Type 9129AA  
Accessories included:

- Hex socket head  
cap screw M6x30 (10 items)
- Swarf shield 25

- Tool holder for lathe chisel  
20x20 mm for axially mounted  
dynamometer for Type 9129AA  
Accessories included:

- Hex socket head  
cap screw M6x22 (10 items)
- Swarf shield 20

- Tool holder for lathe chisel  
25x25 mm for axially mounted  
dynamometer for Type 9129AA  
Accessories included:

- Hex socket head  
cap screw M6x30 (10 items)
- Swarf shield 25

- Tool holder for boring bars  
up to ø40 mm for radially mounted  
dynamometer for Type 9129AA  
Accessories included:

- Hex socket head  
cap screw M6x22 (10 items)
- Reducing bushing ø40/32
- Reducing bushing ø40/25

- Tool holder CoroTurn wit SL  
interface for modular system with  
cutting heads for Type 9129AA

- Packing and carrying case for  
assembled measuring system

9129AE0,75

65013776

65006803

9129AE1

65013777

65006804

9129AE20

65013776

65006803

9129AE25

65013777

65006804

9129AF40

65013776

65006801

65006802

9129AG40

9129AZ1

Other machine adapters and tool holders on request.

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**Optional accessories** **Type/Art. No.**

**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**

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