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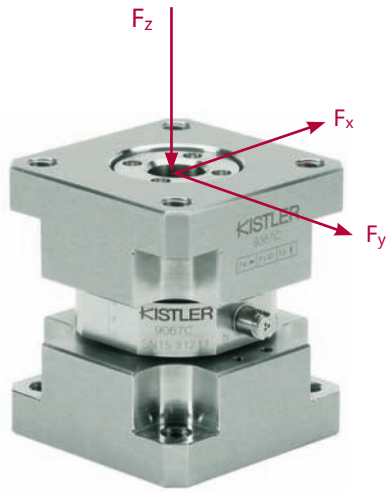
3-Component Force Link

Type 9367C

80x80x90 mm, –60 … 60 kN

Quartz force link for measuring the three orthogonal components of a dynamic or quasistatic force acting in an arbitrary direction.

- Accurate measurement independent of the force application point
- Wide frequency range
- Easy installation
- Stainless, sealed sensor case
- Rugged multipole plug connection



Description

The 3-component force sensor is mounted under preload between two plates and can therefore measure both tensile and compression forces in all directions.
In accordance with the piezoelectric principle, a force produces a proportional electric charge. This is conducted via an electrode to the appropriate connector.
The simple and vibration-resistant design of the force link is very rigid resulting in a high natural frequency, which is a requirement for highly dynamic force measurements.
The 3-pole connector V3 neg. (design protected) is provided with a positioning aid. This guarantees accurate assignment and centering of the connector pins and sockets before connection. The plug connection is protected against rotation.
After correct installation, the sensor is ready to use immediately without recalibration.
Quartz 3-component force links allow simple, direct and very precise measurements.

Application

3-component force links measure:

- Cutting forces during machining
- Impact forces in crash tests
- Recoil forces of rocket engines
- Vibration forces of components for space travel
- Friction forces
- Forces in product testing
- Ground reaction forces in biomechanics
- Vehicle forces on a road and a test stand
- Forces on a wind tunnel balance

Technical Data

Range (Without moment loading, e.g. when four force links are mounted in a force plate)	F_x, F_y	kN	–30 … 30
Range (Example with force application point on the surface of the cover plate)	F_x, F_y	kN	–10 … 10
Range (Force application point centric)	F_z	kN	–60 … 60
Overload	F_x, F_y, F_z	%	10
Calibrated Range (Force application point 10 mm below the surface of the cover plate)	F_x, F_y	kN	0 … 10 0 … 1
Calibrated Range (Force application point centric)	F_z	kN	0 … 60 0 … 6
Permissible moment load (M_z = 0; F_z = 0)	M_x, M_y	N·m	–500/500
Permissible moment load ($M_{x,y}$ = 0, F_z = 0)	M_z	N·m	–500/500
Threshold		N	<0,01
Sensitivity	F_x, F_y	pC/N	≈–7,6
	F_z	pC/N	≈–3,9

9367C_000-613e-04.07

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Other Technical Data

Linearity, each axis		%FSO	≤±0,5
Hysteresis, each axis		%FSO	≤0,5
Crosstalk	$F_z \rightarrow F_x, F_y$	%	≤±1
(Crosstalk F_x, Fy $\rightarrow F_z$	$F_x \leftrightarrow F_y$	%	≤±2
is ≤±2 % when, for example, four force links are mounted in a dynamometer)	$F_x, F_y \rightarrow F_z$	%	≤±3
Rigidity	c_x, c_y	N/µm	≈600
	c_z	N/µm	≈4 000
Natural frequency	f_n (x)	kHz	≈2,4
	f_n (y)	kHz	≈2,4
	f_n (z)	kHz	≈6
Operating temperature range		°C	–40 … 80
Insulation resistance at 20 °C		Ω	$>10^{13}$
Ground insulated		Ω	$>10^{8}$
Capacitance, each channel		pF	100
Connecting plug			V3 neg.
Weight		kg	3,0

Mounting

The two contact surfaces of the component which transfer the forces onto the force link must be flat, rigid and clean. When four force links are used to construct a dynamometer, they must be machined to the same level. The base and cover plates of the dynamometer must be selected for sufficient rigidity.
The force links can be secured either from the outside using four M10 screws in each case or from inside also using four M8 screws in each case. An additional screwed joint is possible by using a central screw.

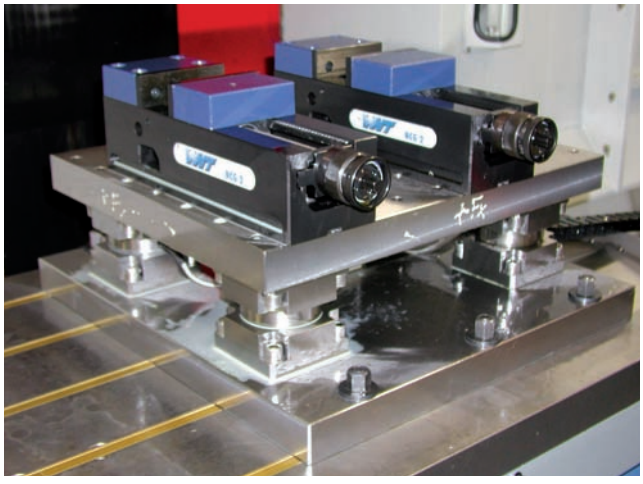

Fig. 1: Cutting force dynamometer constructed with four 3-component force links

Dimensions 3-Component Force Link Type 9367C

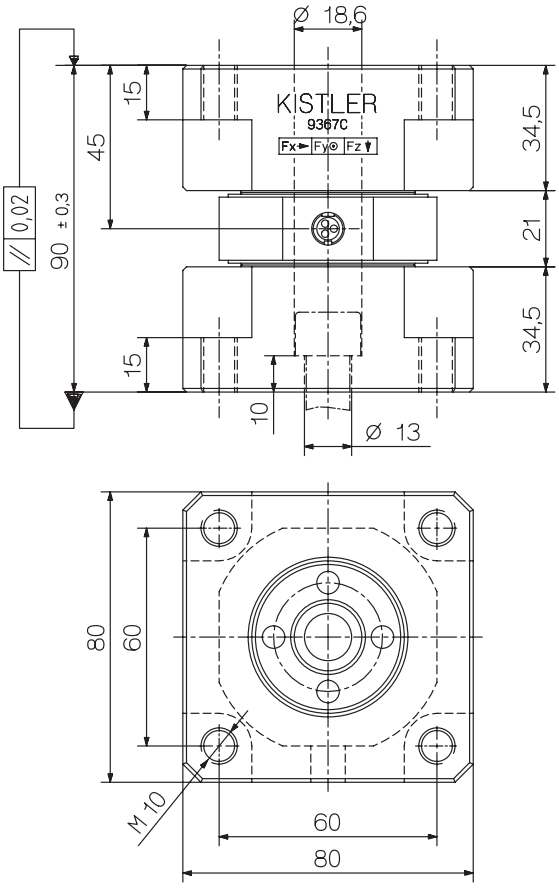

Fig. 2: Dimensions 3-component force link Type 9367C

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3-Comp. Force Link with V3 neg. Connector Type 9367C SUNSTAR传感与控制 http://www.sensor-ic.com/ TEL:0755-83376549 FAX:0755-83376182E-MAIL:szss20@163.com

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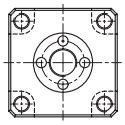
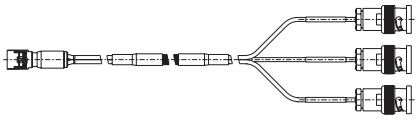
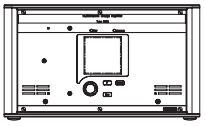
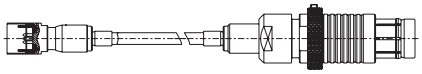
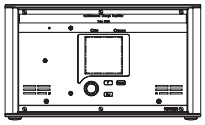
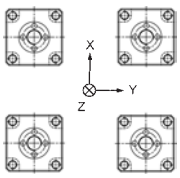
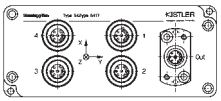
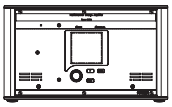
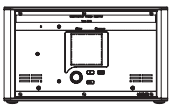
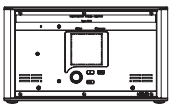
Measuring System with 3-Component Force Link

3-Comp. Force Link with V3 neg. Connector	Degree of Protection EN60529	Connecting Cable[1]	Multi-Channel Charge Amplifier[2]	Reading
Type 9367C  V3 neg.	**IP65**	**Type 1698AA…**  V3 pos. 3 x BNC pos.	**Type 5070Ax00xx** 	F_x F_y F_z
		Type 1698AB…  V3 pos. Fischer 9-pole pos.	**Type 5070Ax01xx** 	
	IP67 cable welded to sensor	**Type 1698ACsp**  V3 pos. Fischer 9-pole pos.		

Measuring System with four 3-Component Force Links (Dynamometer)

3-Comp. Force Link with V3 neg. Connector	Degree of Protection EN60529	Connecting Cable[1]	Summing Box	Connecting Cable[1]	Multi-Channel Charge Amplifier[2]	Reading
Type 9367C 4 pcs.  4 x V3 neg.	**IP65**	**Type 1698AB…** 4 pcs.  V3 pos. Fischer 9-pole pos.	**Type 5417** IP65  148x62x35 mm 4 x Fischer 9-pole neg. Fischer Flange 9-pole neg.	**Type 1687B…** 3 wire  pos. pos.	**Type 5070Ax01xx** 	F_x F_y F_z
	IP67 cable welded to sensor	**Type 1698ACsp** 4 pcs.  V3 pos. Fischer 9-pole pos.		**Type 1677A…** 8 wire  pos. pos.	**Type 5070Ax11xx** 	F_{x12} F_{x34} F_{y14} F_{y23} F_{z1} F_{z2} F_{z3} F_{z4}
					Type 5070Ax21xx 	F_x F_y F_z M_x M_y M_z

[1] see data sheet cables for multi-component force sensors, dynamometers and force plates 1687B_000-545.
[2] see data sheet multi-channel charge amplifier for multi-component force measurement 5070A_000-485.

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3-Component Force Link 80x80x90 mm, –60 … 60 kN, Type 9367C SUNSTAR传感与控制 http://www.sensor-ic.com/ TEL:0755-83376549 FAX:0755-83376182E-MAIL:szss20@163.com

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Introduction of Force

When only one force link is used, then if at all possible the resulting force vector should run through the center of the sensor. An eccentric introduction of force produces a moment load on the sensor. This is allowed only up to the specified values. The maximum force ranges must be reduced accordingly.
A sufficiently rigidly constructed dynamometer with four force links largely prevents moment loads on the sensor element.

Parallel Connection

When a dynamometer is constructed, the four force links are connected mechanically in parallel. The measuring signals (electric charge) of the four sensors can also be connected in parallel (summed). The summed signal corresponds to the algebraic sum of the individual forces. The summing box Type 5417 allows simple and reliable connection of the measuring signals for the desired type of multi-component force measurement.

Fig. 3: Summing box Type 5417

Measuring Signal Processing

Charge amplifier channels are additionally required for the complete measuring system. These convert the measuring signal into a voltage. The reading is exactly proportional to the force applied.
The multi-channel charge amplifier Type 5070A… has been designed specifically for multi-component force measuring systems.

Fig. 4: Multi-channel charge amplifier Type 5070A…

Included Accessories

- None

Optional Accessories	Type
• Connecting cable, 3 wire	1698AA…
• Connecting cable, 3 wire	1698AB…
• Connecting cable, 3 wire	1698ACsp
• Summing box	5417

Ordering Key	Type
• **3-Component Force Link** 80x80x90 mm, –60 … 60 kN	**9367C**

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