

Piezoelectric Force Sensors



- Easy installation
- Integrated sensor cable
- Secure ground connection even without shielding from the mold
- No single-wire cable
- For indirect pressure measuring behind the ejector pin (sleeve ejector)
- Maximum operating temperature: 120 °C

Description and Application

The piezoelectric force sensors types 6413A, 6414A and 6415A are used for indirect pressure measuring behind the sleeve of the ejector pin (→sleeve ejector). The actual ejector pin is passed through the central bore hole and doesn't influence the force measuring. The indirect pressure measuring is used when the mounting of direct sensors isn't possible because of the space available.

The force sensors are not only suitable for injection molding process but can also be used for general industrial force measurement, e.g. for monitoring production processes.

Engineering - Suggestion for Sensor Positioning

The piezoelectric force sensors are installed behind the sleeve of the sleeve ejector pins, and measure the cavity pressure indirectly. Therefore the sensors themselves do not come directly into contact with the plastic melt. For this reason the mounting place depends on the position of the sleeve ejector pin and thus cannot be chosen freely.

We gladly offer assistance in determining the best sensor location.

Application	Mounting place suggestion dependings on the sleeve ejector position
- Process optimization - General monitoring	- near the gate respectively at critical position - on a thick wal - before first baffle
Consistency monitoring	in the relevant position
Monitoring and control of viscosity and compression	previous of the cavity temperature sensor
Monitoring and control of shrinkage	around the cavity temperature sensor
Mold filling control („Short Shots“)	in the end of the flow path

Sensor Mounting

The force sensors are mounted directly without additional fastening elements behind the sleeve of sleeve ejector pins in a pocket created for the sensor. Thus the bearing surface of the sleeve should be finely polished and machined so that it contours (plain and parallel) on the sensor surface.

By mounting a force sensor in the ejector set, the sensor cable is passed through freely and can move. A single wire cable could not be used in an application like this. This is due to the fact that single wire cable must be protected by the metal of the mold to provide shielding. PRIAMUS sensor cables always have their own shielding available.

The sensor cable should be displaced in a channel, which is at least covered by a thin plate to avoid damages. The angles in the cable channel must be added with a phase of $3 \times 45^\circ$ or a radius of, therewith the cable will not be damaged.

The protecting cap should be fixed on the mounting plate of the connector.

Handling

The contact plug must be kept clean and dry to avoid false signals.

In the not connected status the protecting cap for the sensor must be plugged on. In the connected status the protecting cap will be connected with the cap of the connecting cable, therewith defilement in the cap will be avoided.

Technical Data

Properties	Type	Specifications
Measuring range	6413A	0 ... 7 kN
	6414A	0 ... 26 kN
	6415A	0 ... 62 kN
Overload	6413A	max. 8 kN
	6414A	max. 30 kN
	6415A	max. 70 kN
Nominal force sensitivity ¹⁾	All types	-4.3 pC/N
Maximum mold temperature ²⁾	All types	-20 ... 120 °C
		-4 ... 248 °F
Deviation of linearity	All types	< +/-1%
Natural frequency	6413A	105 kHz
	6414A	120 kHz
	6415A	140 kHz
Insulation resistance	All types	> 10 ¹³ Ω (room temperature)
Protection class nach DIN EN 60529 ³⁾	All types	IP65

1) The exact sensitivity is provided on a separate calibration sheet.

2) Parts, which surround the sensor directly, must not pass the stated temperature. Parts, which are further away, can have > 120 °C.

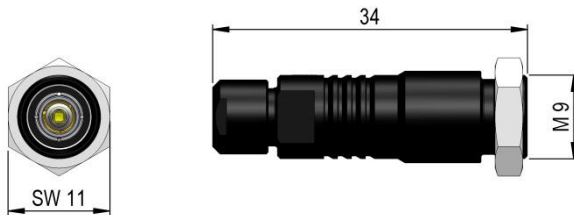
3) With connected connecting cable.

Versions

Type	Connector	Cable length in [m]	Connection to
6413Ax.x-102	Fischer KBE 102 fem., TRIAX	x.x = 0.2 / 0.4 / 0.6 / 0.8 / 1.0 / 1.2	Multi Channel Connecting Box 1195A-8p
6414Ax.x-102		x.x = 0.2 / 0.4 / 0.6 / 0.8 / 1.0 / 1.2	or Connecting Cable 1041Ax 1049Bx
6415Ax.x-102		x.x = 0.2 / 0.4 / 0.6 / 0.8 / 1.0 / 1.2	Multi-Pin Connecting Cable 1045Bx 1047Ax 1054Bx

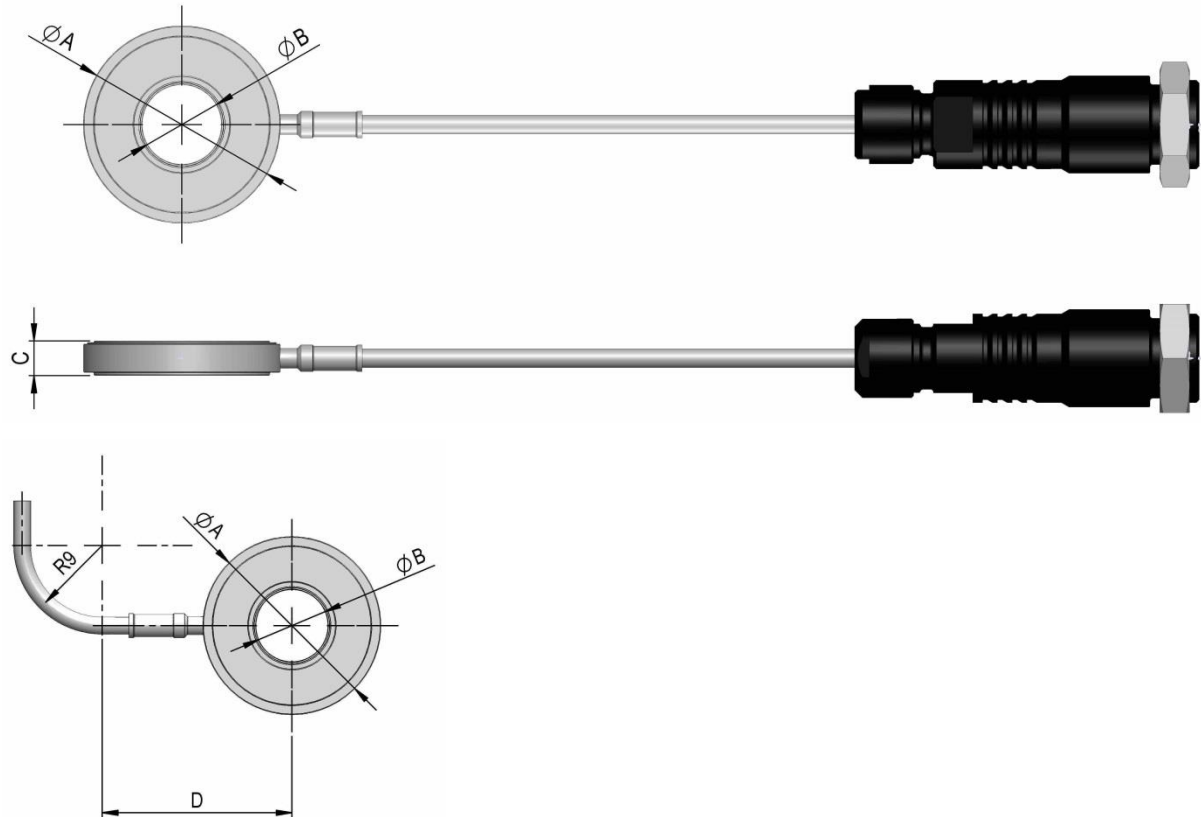
One Pin TRIAX Connector

Easy connection by TRIAX format



Fischer Type KBE 102 female TRIAX

Dimensions

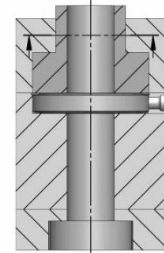
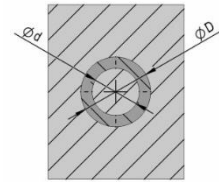


Type	A 0.05/-0.05	B 0.012/0	C 0/-0.05	D
6413Ax.x-102	12 mm	4.1 mm	3 mm	16 mm
6414Ax.x-102	20 mm	8.1 mm	3.5 mm	22 mm
6415Ax.x-102	30 mm	12.1 mm	4 mm	30 mm

Calculation for Pressure Sensitivity

The effective cavity pressure results from a projected area of the sleeve ejector (circular ring area). Therefore, the stated force sensitivity in the calibration certificate has to be converted into a pressure sensitivity that is dependent on the circular ring area.

$$E_p[\text{pC/bar}] = \frac{(D^2 - d^2)[\text{mm}^2] \cdot \pi \cdot 0.1}{4} E_f[\text{pC/N}]$$

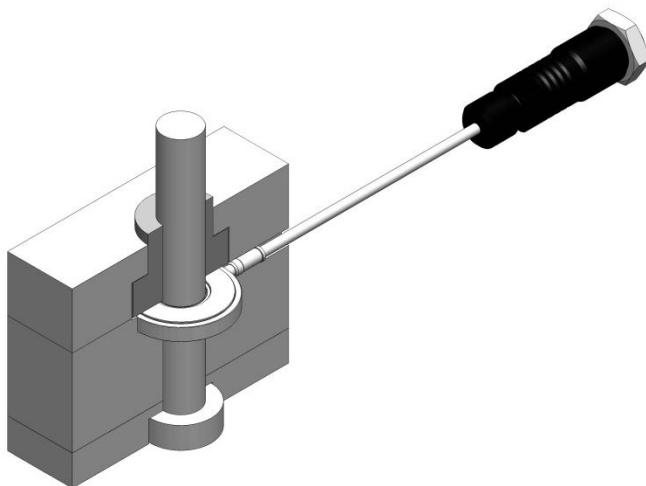


Nominal force sensitivity E_f : -4.3 pC/N¹⁾

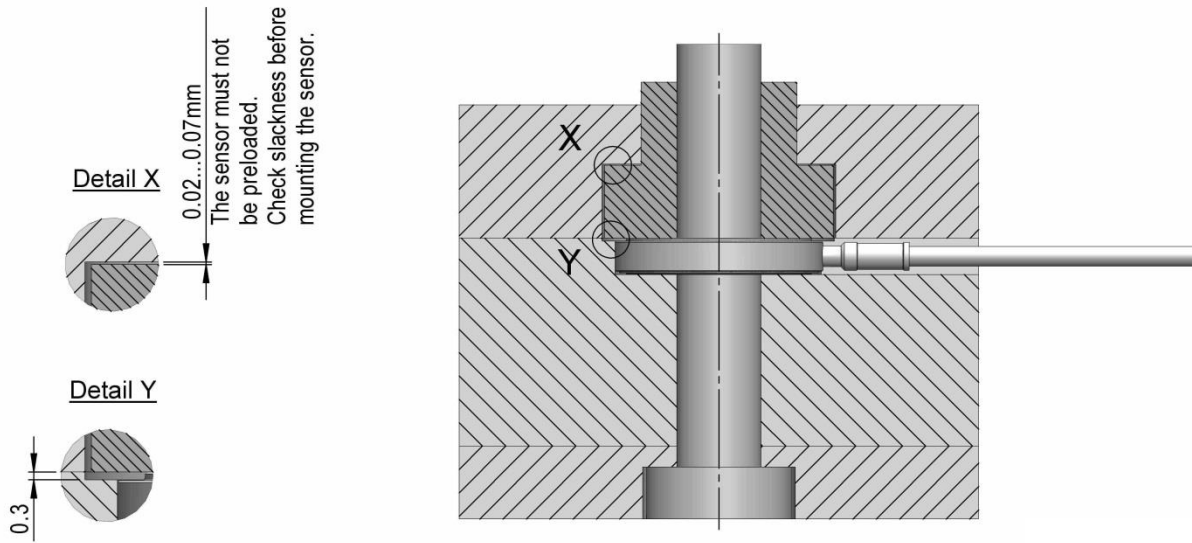
Type	Outer diameter sleeve D	Inner diameter sleeve d	Pressure sensitivity E_p
6413A	6 mm	4.2 mm	-6.20 pC/bar
6413A	8 mm	4.2 mm	-15.66 pC/bar
6414A	12 mm	8.2 mm	-25.92 pC/bar
6415A	16 mm	12.2 mm	-36.19 pC/bar

¹⁾ The exact sensitivity is provided on a separate calibration sheet.

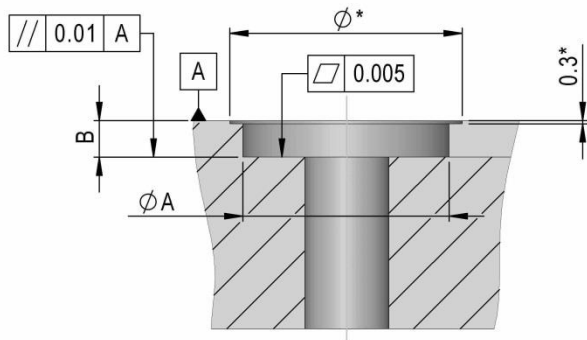
Examples for Installation Situation



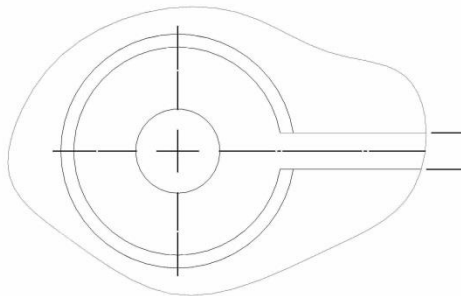
Force sensor type 6413A for indirect measuring. Mounted behind the sleeve of the sleeve ejector in the ejector set



Mounting Holes

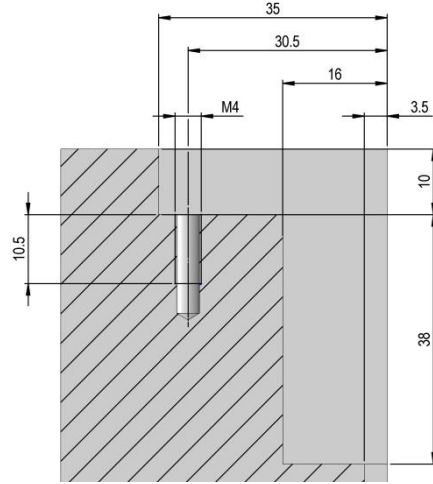
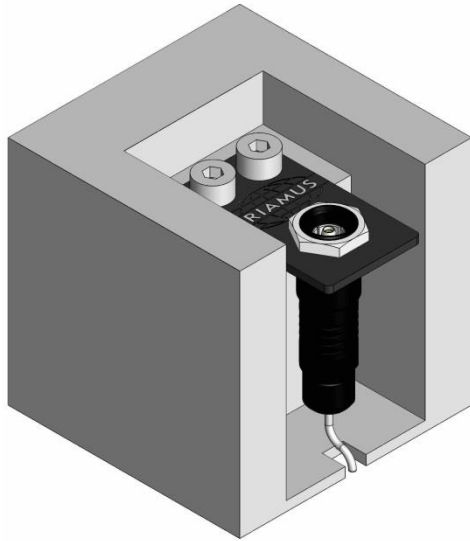


Type	A ^{0.05/0.12}	B ^{-0.05/0}
6413Ax.x-102	12	3.0
6414Ax.x-102	20	3.5
6415Ax.x-102	30	4.0



* = Recess 0.5 mm bigger than the diameter of the sleeve ejector head (0.3 deep)

Installation Situation – Connector with Mounting Plate

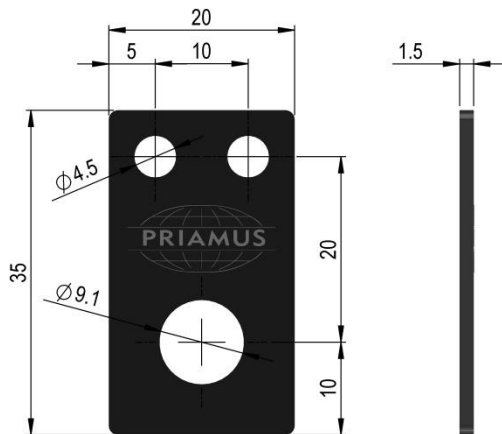


Scope of Delivery

Article	Type
Mounting plate	6581B

Article	Type
Identification plate	-

Mounting plate type 6581B





BLUELINE

Accessories (optional)

Type	Coat	Bending radius	Connector ¹⁾ TRIAx / ²⁾ Code 1
Connecting cables:			
1041Ax	Plastic	12	Fischer Type S 102 male ¹⁾ Fischer Type S 102 male ¹⁾
1049Bx	Metal hose	20	Fischer Type S 102 male ¹⁾ Fischer Type S 102 male ¹⁾
Multi pin connecting cables:			
1045Bx	Plastic	12 (bundled: 25)	Fischer Type S 104 fem. 16-pin ²⁾ 4 x Fischer Type S 102 male ¹⁾
1047Ax	Plastic	12	Fischer Type S 104 fem. 16-pin ²⁾ 1 x Fischer Type S 102 male ¹⁾
1054Bx	Plastic	50	Fischer Type S 104 fem. 16-pin ²⁾ Fischer Type S 104 fem. 16-pin ²⁾
Extension cable:			
1043Bx	Metal hose	20	Fischer Type S 102 male ¹⁾ Fischer Type KBE 102 fem. ¹⁾

Article	Type
Multi channel connecting box	1195A-8p
BlueLine amplifier	5070A-2p2T

Article	Type
BlueLine amplifier	5080A-xp