

Compact Sensors for Cavity Pressure with Quick Disconnect and Quick Disconnect Cables



- Very easy, safe and fast mounting
- Variable lengths up to ca. 160 mm
- Easy handling between multiple cavities and interchangeable inserts

Description and Application

The piezoelectric cavity pressure sensors are the standard for industrial monitoring and control in injection molding. For decades sensors of this kind have been used to determine – and to change if necessary – the physical properties of a molded part even during production.

Piezoelectric measuring technology has established such a large monitoring applications because the sensor is so well suited for these applications. Due to the fast injection processes, certain requirements occur which can only be met by very compact and stiff sensor designs. The reason for this is the high resulting natural frequency. The piezoelectric sensor is an active sensor, that means no power supply and electronics in the sensor are needed. Consequently these sensors can also be used at higher temperatures as they can occur during the injection molding process. Other technologies, e.g. strain gauge, do not fulfill these requirements.

Numerous injection molded parts are not directly created in the mold platen, but with the help of mold inserts. This facilitates the manufacture of the cavities and the handling at servicing. The insertion of cavity pressure and cavity temperatures sensors often set boundaries because of lack of space. Furthermore, by mounting and dismounting the mold inserts, the use of cables with fixed installation points are not suitable for these types of applications.

As a favored solution and an alternative to the flexible quick disconnects with cable, the so-called compact sensors for pressure and temperature measuring in the injection molding process have been developed. Instead of connecting sensors within the mold insert by a sensor cable with a quick disconnect, the compact sensor is connected by a distance piece with the quick disconnect. That way an extremely compact and very manageable solution is generated, which is, depending on the application and the required space, available in different sizes. The length of the compact sensors is variable and must be specified when ordering. The complementary sensor cable in the mold plate has a quick disconnect on one end of the cable and a plug on the other end of the cable.

The compact sensors are available for PRIAMUS® cavity pressure sensors with and without sensitivity detection (PRIASED®) as well as with and without PRIASAFE® technology.

Special Technologies: PRIASED® and PRIASAFE®

A cavity pressure sensor is a highly sensitive measuring instrument which can – if not mounted properly or by deformation from the injection mold – give wrong measuring results. A possible cause is the so called force shunt which generates a sensitivity loss of the sensor when the sensor front touches the bore.

To prevent this, the PRIASAFE® cavity pressure sensors are mounted into housing first and calibrated after that. This procedure has the advantage that the sensitivity does not change after the sensor has been installed into the mold because it is “protected” by the housing.

PRIASED® cavity pressure sensors have the advantage of having the sensitivity saved inside the sensor by use of a hardware code. With the help of this hardware code the sensor sensitivity can be detected automatically without being influenced by the sensor installation. Therefore the sensor is easy to use and



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is most suitable for industrial production. Confusion or false correlation of the sensor sensitivity as well as incorrect entries are eliminated.

Engineering – Suggestion for Mounting Places

For general applications the cavity pressure sensors were mounted on the beginning of the flow path. Differing therefrom for special purpose they were also placed on other positions, where relevant properties of an injection molding part should be detected, for example mold filling detection, consistency monitoring etc. By using existing molds, error images of parts, filing studies, new projects, and filling simulations are a helpful way to correctly determinate the best sensor location.

Gladly we offer the assistance by the sensor selection and placing.

Application	Mounting place suggestion
Process optimization General monitoring	- near the gate - on thick wall thickness - before first baffle
Consistency monitoring	on 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“)	on the end of the flow path

Sensor Mounting

The compact sensors were fixed easily over a ringlike mounting nut in the bore hole of the mold insert.

The quick disconnect cable should be displaced in the behind mold platen in a channel, which at the least were covered by a thin plate to avoid damages. The angles in the mold, around which the cables are placed, must be added with a phase (3 x 45°) or a radius R2), therewith the cable will not be damaged.

A pre-centering of the inserts with two alignment pins ist necessary for the quick disconnect. The fitting of the pre-centering should be in the quality H7/g6 and the length minimum 10 mm. Generally aligning pins with bund and two fitting diameters (for easier mounting) are used.

The protecting cap has to be fixed on the mounting plate of the connector and should not be placed too close to the junction of the mold therewith the connector doesn't get crushed by the mold closing.

Handling and Cleaning

Before dismantling the mold insert from the mold, the cooling water must be imperatively evacuated and / or the channels have to steamed out to prevent that the cooling water gets into the quick disconnect.

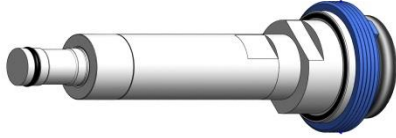
The contact plug must be kept clean and dry to avoid false signals. The quick disconnects have to be capped directly after dismantling with the protective caps in the scope of delivery.

The mold inserts can be cleaned in an ultrasonic bath without former dismantling of the compact sensors. For this the protective cap included in the scope of delivery must be used. (Cleaning agent: aqueous tenside solution.) The cleaning of the sensor front with dry ice is also possible.

In the not connected status the protecting cap for the connector at the quick disconnect cable must be plugged on. In the connected status the connector will be connected with the cap of the connecting cable, therewith defilements in the protection cap will be avoided.

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Compact Sensor for Cavity Pressure with Quick Disconnect



Technical Data

Properties	Unit	Specifications
Measuring range	bar psi MPa	0 ... 2000 0 ... 29008 0 ... 200
Overload	bar psi MPa	2500 36259 250
Sensitivity ¹⁾	pC / bar	ca. -10 (6001A/B) ca. -5 (6002B) ca. -5 (6003A/B) ca. -2 (6006BC / 6008AA / 6010BC)
Maximum melt temperature (plastics) in the cavity ²⁾	°C / °F	no limitation
Maximum mold temperature ³⁾	°C °F	200 392
Deviation of linearity	%	< ± 1
Natural frequency ⁴⁾	kHz	> 80
Insulation resistance	Ω	> 10 ¹³ (bei 20 °C)
Sensor front		machinable

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

²⁾ The plastic melt cools immediately after contacting the cavity wall. The melt temperature is therefore without any practical meaning for the sensor (thermoplastics). For thermosets and elastomers the permanent melt temperatures are usually below 200 °C.

³⁾ The permanent temperature of the sensor body can be higher than the specified value of the mold temperature. The temperature at the cable connector however is limited. In practice there are no mold temperatures higher than 200 °C expected.

⁴⁾ The actual natural frequency of the sensor is far higher than the frequency spectrum of the effective signal.

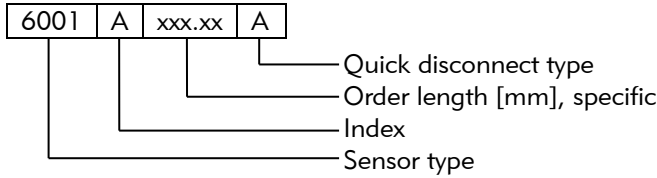
Variants

Type	With machinable sensor front	Automatic sensitivity detection	Possible length in [mm]
6001Axxx.xxA		-	xxx.xx = 44 ... 160
6001Bxxx.xxA		PRIASED®	
6002Bxxx.xxA		PRIASAFE® / PRIASED®	xxx.xx = 46 ... 160
6003Axxx.xxA		-	xxx.xx = 44 ... 160
6003Bxxx.xxA		PRIASED®	
6006BCxxx.xxA		PRIASAFE® / PRIASED®	xxx.xx = 41 ... 160
6006BCxxx.xxA1		PRIASAFE® / PRIASED®	xxx.xx = 24 ... 160
6008AAxxx.xxA		-	xxx.xx = 50 ... 160
6008AAxxx.xxA1		-	xxx.xx = 33 ... 160
6010BCxxx.xxA		PRIASAFE® / PRIASED®	xxx.xx = 41 ... 160
6010BCxxx.xxA1	PRIASAFE® / PRIASED®	xxx.xx = 24 ... 160	

Specify compact sensor length xxx.xx in [mm] when ordering (length = distance between cavity and insert base).

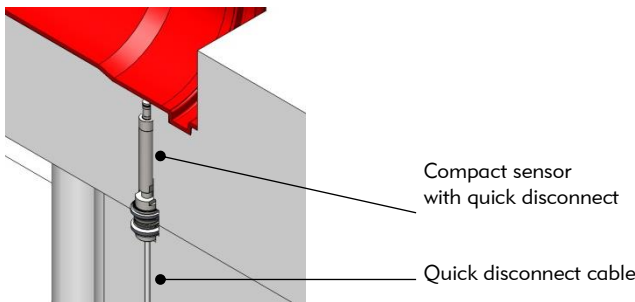
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Marking Example



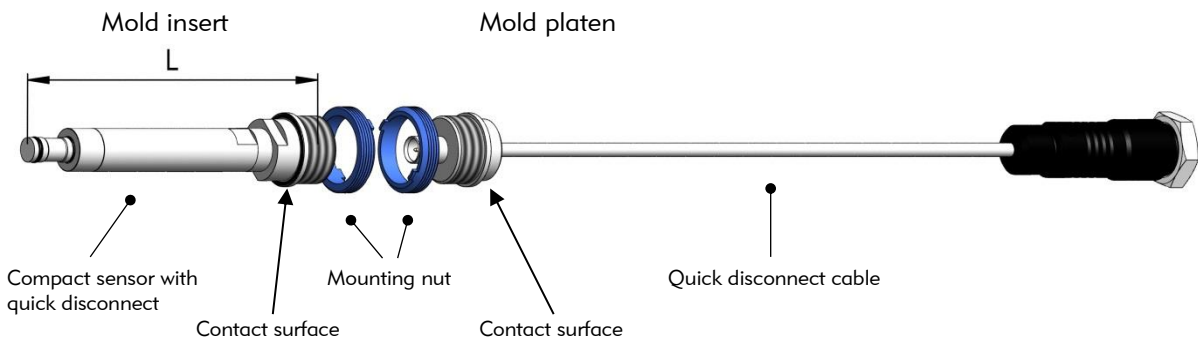
Mounting Example

Mounting of a compact sensor with quick disconnect and quick disconnect cable



Compact Sensor with Quick Disconnect and Quick Disconnect Cable

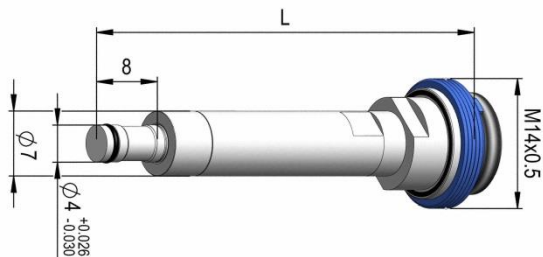
Mounting in bore hole and cable channel



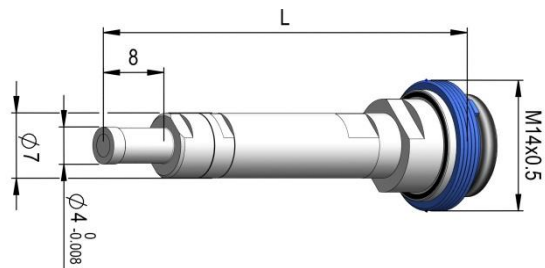
Dimensions

Compact sensors with quick disconnect type „A“

Type 6001A/Bxxx.xxA

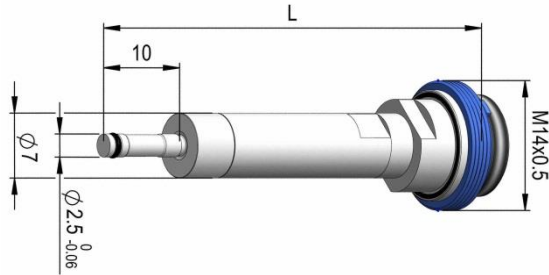


Type 6002Bxxx.xxA

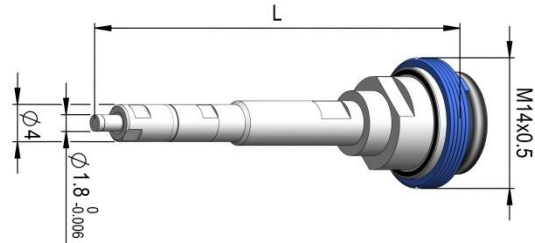


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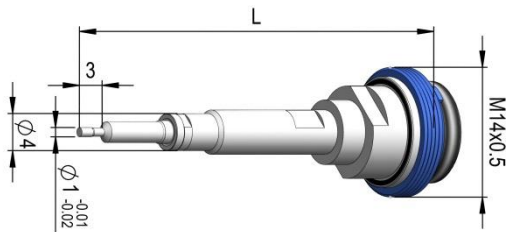
Type 6003A/Bxxx.xxA



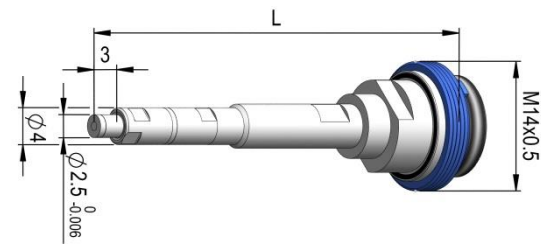
Type 6006BCxxx.xxA



Type 6008AAxxx.xxA

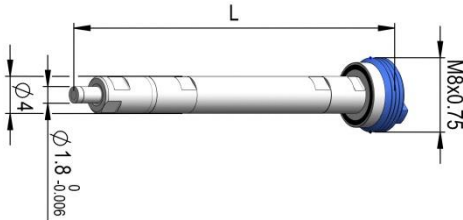


Type 6010BCxxx.xxA

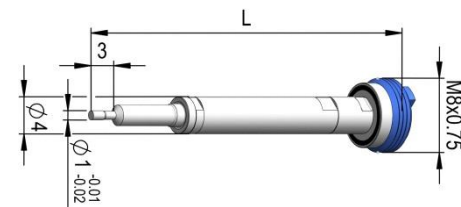


Compact sensors with quick disconnect type „A1“

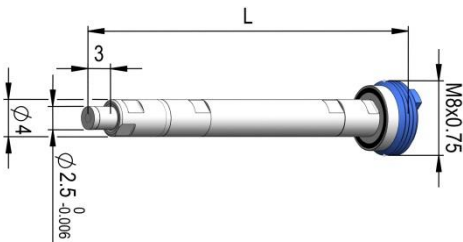
Type 6006BCxxx.xxA1



Type 6008AAxxx.xxA1



Type 6010BCxxx.xxA1

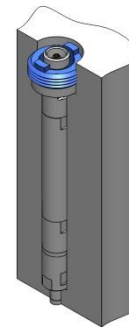
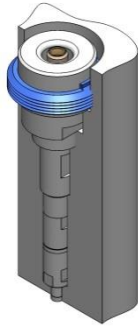


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Examples for Installation Situation with Mounting Nut

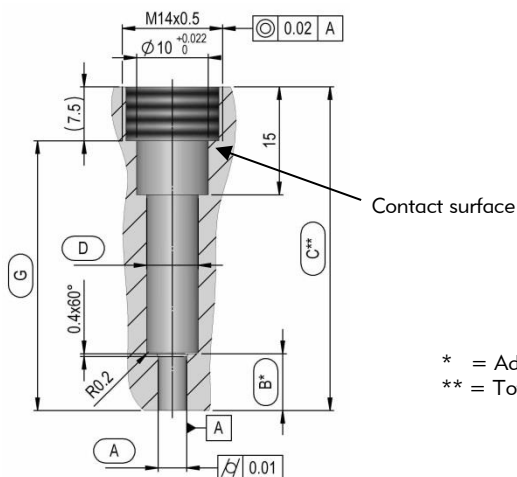
Compact sensors with quick disconnect type „A“

Compact sensors with quick disconnect type „A1“



Mounting Holes with Mounting Nut

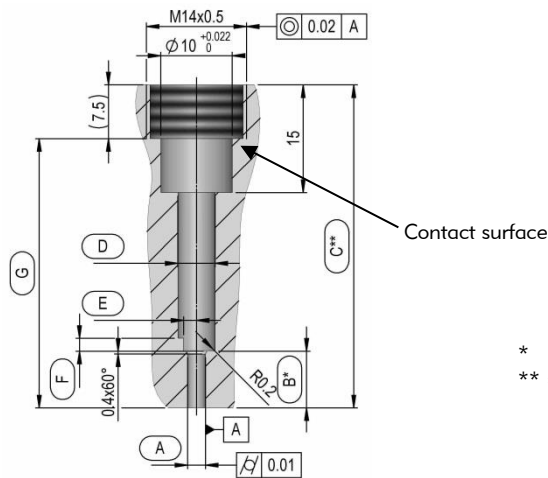
Compact sensors with quick disconnect type „A“



* = Adjust dimension
 ** = Total assembly dimension

Type	A ^{0.012/0}	B*	C**	D ^{0.05/0}	G ^{0.01/-0.01} min.
6001A/Bxxx.xxA	4	7.9	44 - 160	7.2	36.5
6002Bxxx.xxA	4	7.9	46 - 60	7.2	38.5
6003A/Bxxx.xxA	2.5	9.9	44 - 160	7.2	36.5

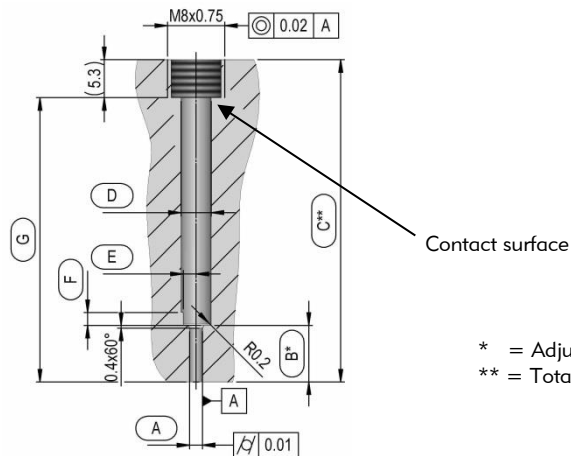
Optional the sensor front can be machined und the surface can be adapted to the cavity.
 In this case the sensor has to be secured against twisting by a positioning surface. Both process steps can be operated by the mold maker (see operation instruction OI60xx_012e).



* = Adjust dimension
 ** = Total assembly dimension

Type	A ^{0.012/0}	B*	C**	D ^{0.05/0}	E ^{0.05/0}	F	G ^{0.01/-0.01 min.}
6006BCxxx.xxA	1.8	2.9	41 - 160	5.2	1.8	1.8	33.5
6008AAxxx.xxA	1.0	2.4	50 - 160	5.2	1.8	0.8	42.5
6010BCxxx.xxA	2.5	2.9	41 - 160	5.2	1.8	1.8	33.5

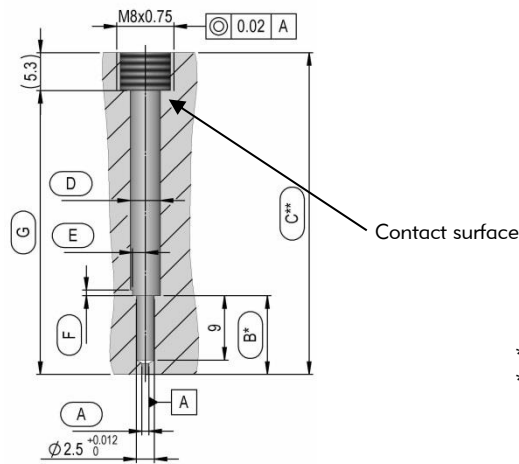
Compact sensors with quick disconnect type „A1“



* = Adjust dimension
 ** = Total assembly dimension

Type	A ^{0.012/0}	B*	C**	D ^{0.05/0}	E ^{0.05/0}	F	G ^{0.01/-0.01 min.}
6006BCxxx.xxA1	1.8	2.9	24 - 160	4.2	1.8	1.8	18.7
6010BCxxx.xxA1	2.5	2.9	24 - 160	4.2	1.8	1.8	18.7

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* = Adjust dimension
 ** = Total assembly dimension

Type	A ^{0.012/0}	B*	C**	D ^{0.05/0}	E ^{0.05/0}	F	G ^{0.01/-0.01} min.
6008AAxxx.xxA1	1	11.4	33 - 160	4.2	1.8	0.8	27.7

Mounting of Compact Sensors with Mounting Nut

By mounting with mounting nut the compact sensors were put on with the following tightening torques.

Compact sensor	Tightening torques
With quick disconnect type „A“	3.5 Nm (with mounting nut type 6546A)
With quick disconnect type „A1“	2.0 Nm (with mounting nut type 6549A)

Scope of Delivery

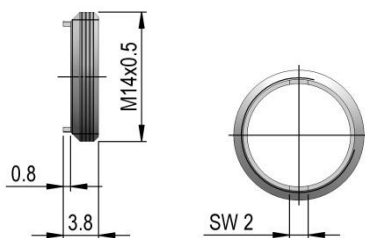
Compact sensors with quick disconnect type „A“

Article	Type	Article	Type
Mounting nut	6546A	Identification plate	-
Protective cap	1308A		

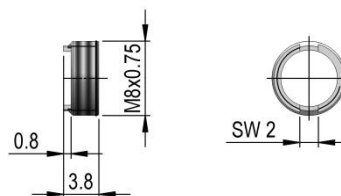
Compact sensors with quick disconnect type „A1“

Article	Type	Article	Type
Mounting nut	6549A	Identification plate	-
Protective cap	1313A		

Mounting nut type 6546A



Mounting nut type 6549A



Accessories (Optional)

Connecting and extension cables

Type	Coat	Sensitivity detection	Bending radius [mm] (* bundled)	Connector ⁽¹⁾ TRIAx / ⁽²⁾ Code 1)
Connecting cables:				
1041A	Plastic	with and without	12	Fischer Type S 102 male ¹⁾ – Fischer Type S 102 male ¹⁾
1049B	Metal hose	with and without	20	Fischer Type S 102 male ¹⁾ – Fischer Type S 102 male ¹⁾
Multi pin connecting cables:				
1045B	Plastic	with and without	12 (25*)	Fischer Type S 104 fem. 16-pin ²⁾ – 4 x Fischer Type S 102 male ¹⁾
1046B	Plastic	with and without	9 (40*)	Fischer Type S 104 fem. 16-pin ²⁾ – 8 x Fischer Type S 102 male ¹⁾
1047A	Plastic	with and without	12	Fischer Type S 104 fem. 16-pin ²⁾ – 1 x Fischer Type S 102 male ¹⁾
1048B	Plastic	with and without	12 (20*)	Fischer Type S 104 fem. 16-pin ²⁾ – 2 x Fischer Type S 102 male ¹⁾
1054B	Plastic	with and without	50	Fischer Type S 104 fem. 16-pin ²⁾ – Fischer Type S 104 fem. 16-pin ²⁾
Extension cable:				
1043B	Metal hose	with and without	20	Fischer Type S 102 male ¹⁾ – Fischer Type KBE 102 fem. ¹⁾

Compact sensors with quick disconnect type „A“

Article	Type	Article	Type
Mounting / extraction tool for compact sensors with quick disconnect	6573A	Assembly tool for mounting nut	6563B
Quick disconnect cable for mounting in bore hole and cable channel	6100Ex.x-102	Dummy for - 6001A/Bxxx.xxA - 6002Bxxx.xxA - 6003A/Bxxx.xxA - 6006BCxxx.xxA - 6008AAxxx.xxA - 6010BCxxx.xxA	6501A/Bxxx.xxA 6502Bxxx.xxA 6503A/Bxxx.xxA 6506BCxxx.xxA 6508Axxx.xxA 6510BCxxx.xxA
Multi channel connecting box	1195A-8p	BlueLine amplifier	5070A-2p2T
BlueLine amplifier	5080A-xp		

Compact sensors with quick disconnect type „A1“

Article	Type	Article	Type
Mounting / extraction tool for compact sensors with quick disconnect	6576A	Assembly tool for mounting nut	6575A
Quick disconnect cable for mounting in bore hole and cable channel	6102Dx.xA1-102	Dummy for - 6006BCxxx.xxA1 - 6008AAxxx.xxA1 - 6010BCxxx.xxA1	6506BCxxx.xxA1 6508Axxx.xxA1 6510BCxxx.xxA1
Multi channel connecting box	1195A-8p	BlueLine amplifier	5070A-2p2T
BlueLine amplifier	5080A-xp		

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Quick Disconnect Cables



Overview

Type	For:	Mounting in:	Cable length in [m]									
Quick disconnect cable 6100Ex.x-102, male	Compact sensors with quick disconnect type "A", female	Bore hole and cable channel	$l = x.x$ Minimum length: 0.1 m Production tolerance: <table border="1"> <thead> <tr> <th>Cable length in [m]</th> <th>Tolerance +.../-0 mm</th> </tr> </thead> <tbody> <tr> <td><0.5</td> <td>5</td> </tr> <tr> <td>>0.5 ... 1.0</td> <td>10</td> </tr> <tr> <td>>1.0 ... 5.0</td> <td>20</td> </tr> </tbody> </table>		Cable length in [m]	Tolerance +.../-0 mm	<0.5	5	>0.5 ... 1.0	10	>1.0 ... 5.0	20
Cable length in [m]	Tolerance +.../-0 mm											
<0.5	5											
>0.5 ... 1.0	10											
>1.0 ... 5.0	20											
Quick disconnect cable 6102Dx.xA1-102, male	Compact sensors with quick disconnect type "A1", female											

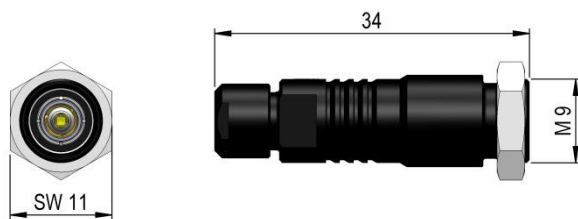
Front view of the particular quick disconnect side

Front view of the particular quick disconnect side

Specify cable length x.x in [m] when ordering (length over all, incl. quick disconnect and connector).

One Pin TRIAX Connector

Easy connection by TRIAX format



Fischer Type KBE 102 fem. TRIAX

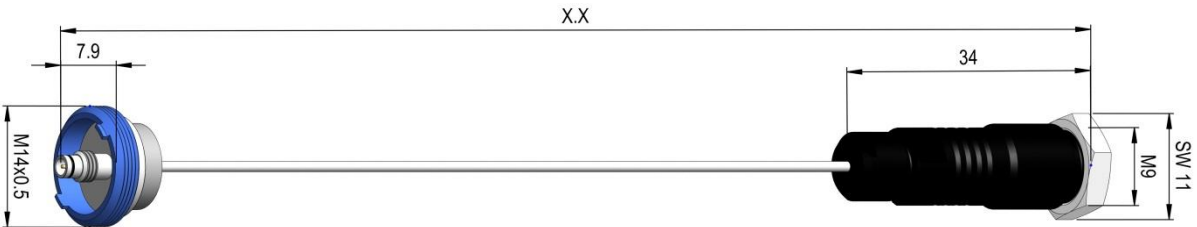
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Dimensions

Type 6100Ex.x-102
 Bending radius = 9 mm

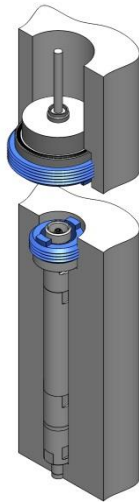


Type 6102Dx.xA1-102
 Bending radius = 9 mm

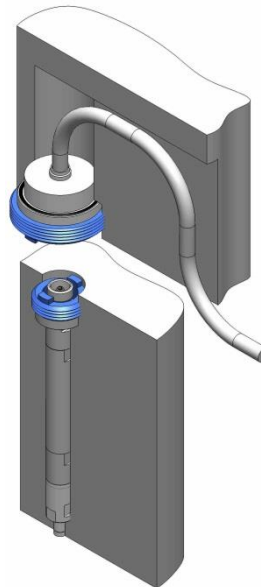


Examples for Installation Situation with Mounting Nut

Mounting in bore hole



Mounting in cable channel

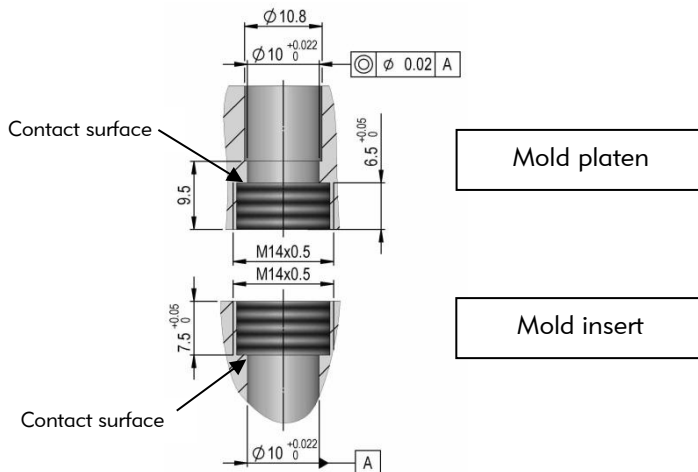


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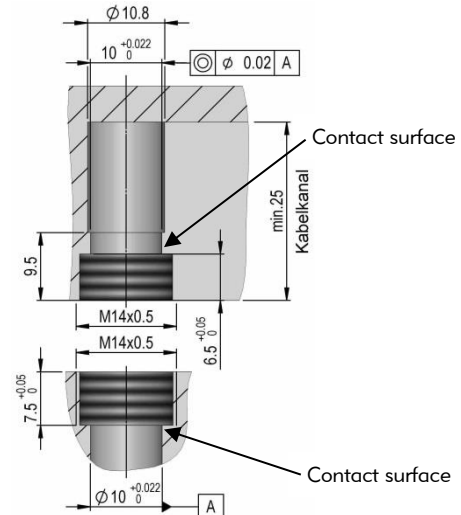
Mounting Holes with Mounting Nut

Type 6100Ex.x-102

Mounting in bore hole

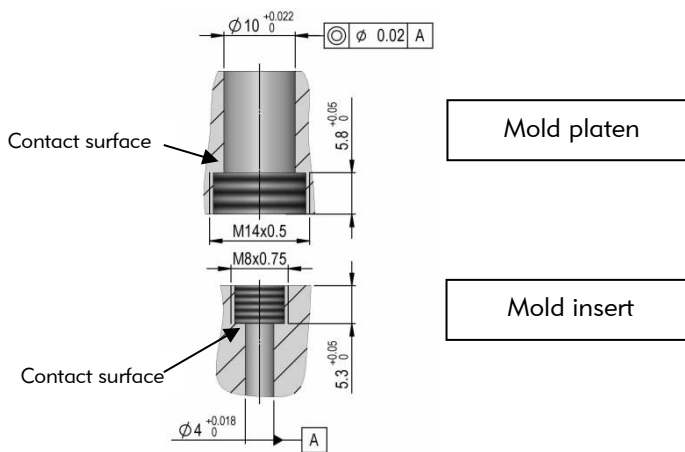


Mounting in cable channel

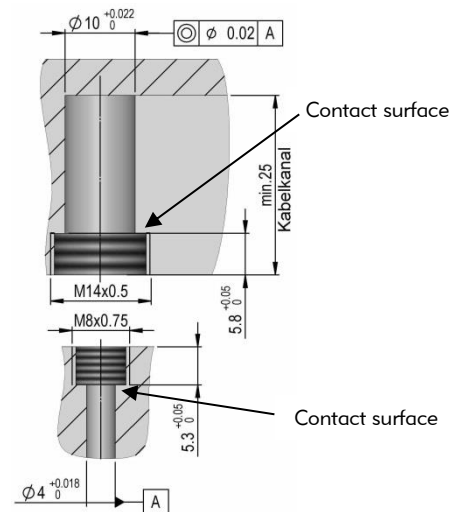


Type 6102Dx.xA1-102

Mounting in bore hole



Mounting in cable channel

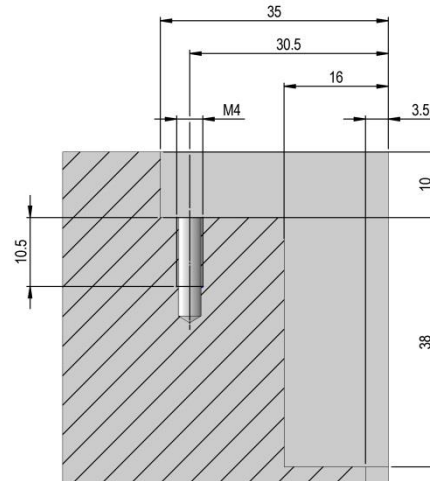
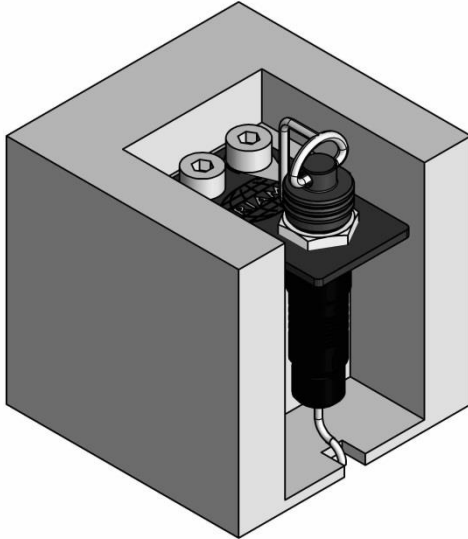


Mounting of Quick Disconnect Cables with Mounting Nut

By mounting with mounting nut the quick disconnect cables were put on with the following tightening torques.

Quick disconnect cable	Tightening torques
6100Ex.x-102 6102Dx.x-102	3.5 Nm (with mounting nut type 6546A)

Installation Situation – Connector with Mounting Plate

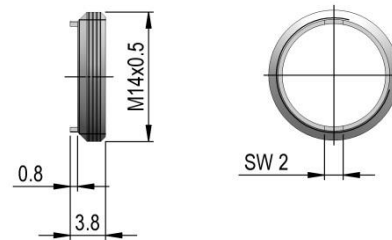
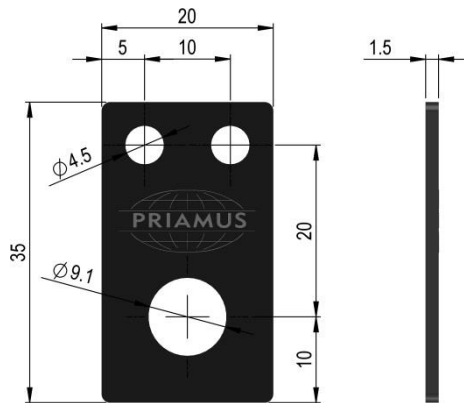


Scope of Delivery

Article	Type	Article	Type
Mounting nut	6546A	Mounting plate	6581B
Protective cap for quick disconnect cable type 6100Ex.x-102	1308A	Protective cap for quick disconnect cable type 6102Dx.xA1-102	1313A

Mounting plate type 6581B

Mounting nut type 6546A



Accessories (Optional)

Article	Type	Article	Type
Mounting / extraction tool for quick disconnect cable type 6100Ex.x-102	6573A	Mounting / extraction tool for quick disconnect cable type 6102Dx.xA1-102	6576A
Assembly tool for mounting nut	6563B		