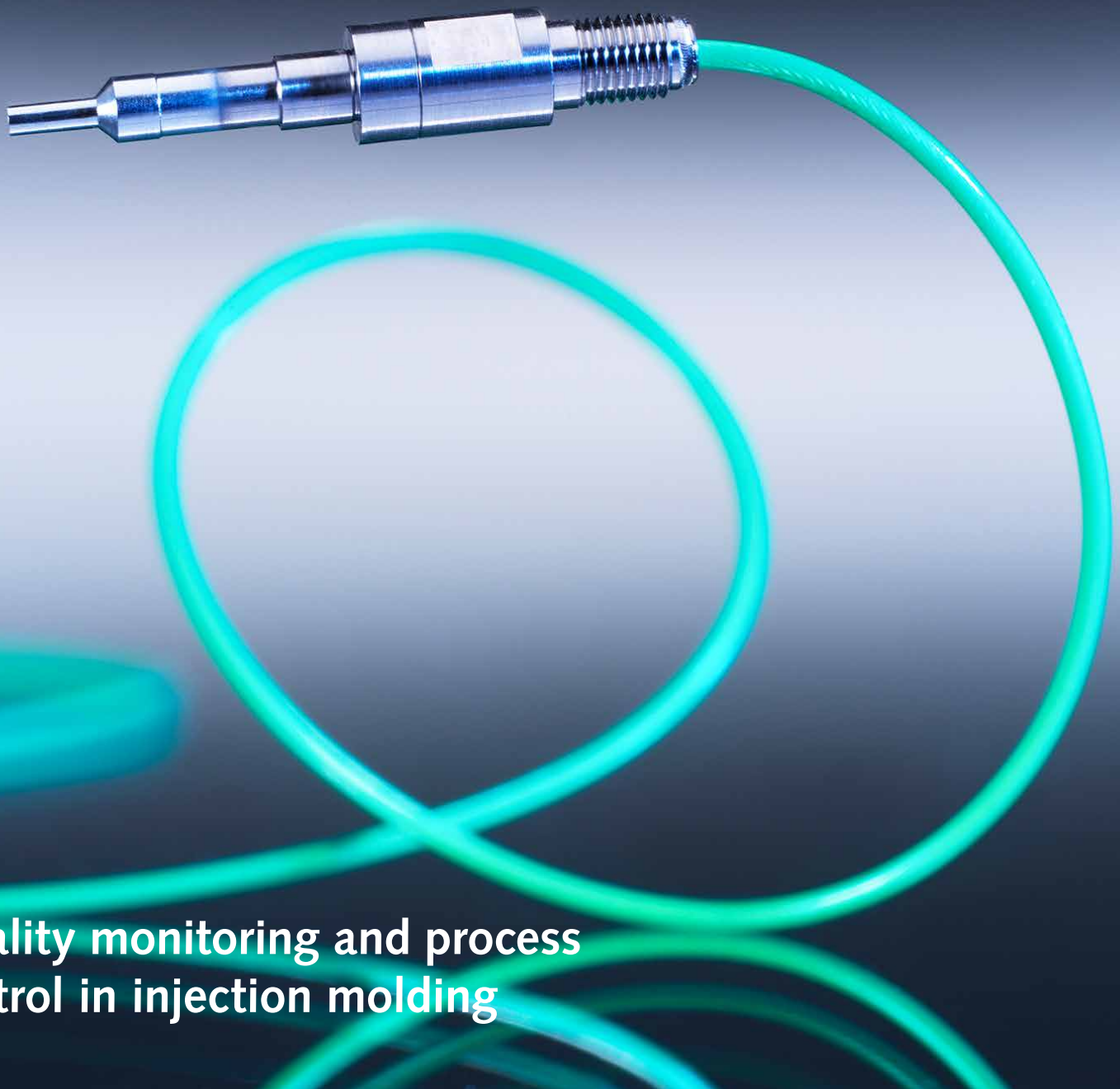

SENSORS AND SYSTEMS



Quality monitoring and process
control in injection molding

Contents

| | |
|--|-----------|
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| Connection technology for all installation conditions | 16 |
| Process monitoring systems for every application | 20 |
| Handling made simple – our range of accessories | 27 |
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Cavity pressure monitoring during the injection molding process reduces quality assurance costs.

Focusing on process efficiency

100% quality in production – the goal that all injection molders strive to achieve. The surest way to achieve zero-defect production during injection molding of plastics is by integrating quality assurance into the process. Kistler offers the technology, expertise and service you need to achieve this.

Optimized process efficiency thanks to technology from Kistler

To achieve the objective of zero defect production with maximum cost efficiency, Kistler focuses on cavity pressure. It is the most informative process variable, because it describes conditions immediately – while the molded part is actually being created. Sensors and systems based on cavity pressure determine whether or not a part is scrap at the earliest possible moment.

Lower QA costs for processors and OEMs

Process-integrated cavity pressure monitoring during injection molding cuts the costs of quality assurance. This cost-effective solution protects plant operators against the possibility of faulty parts reaching the customer; it also prevents disruptions to downstream assembly operations.

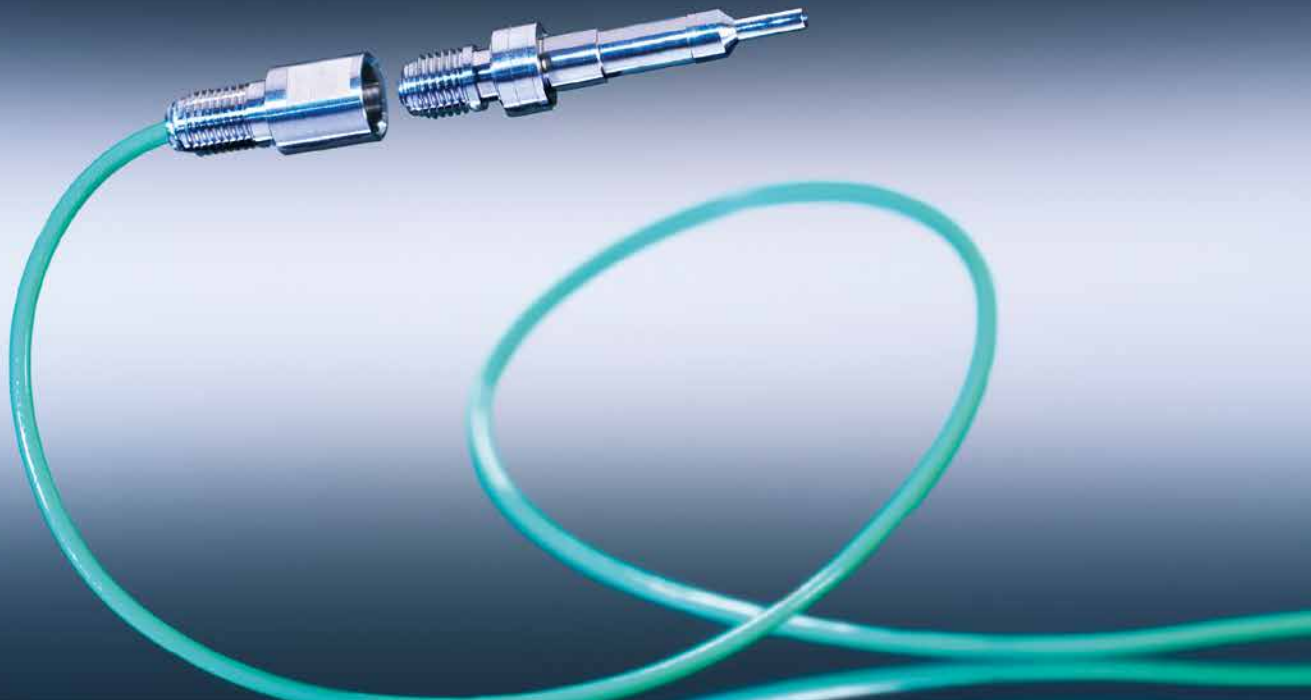


Injection molding with Kistler – now online

View our animation to experience convincing, first-class Kistler solutions – the sure way to achieve 100% quality in your production:

www.kistler.com/injection-molding





For every injection molding process, Kistler supplies the ideal sensor – tailored to the installation conditions, the part geometry and the plastic material.

Sensors for every measuring task

Exact, reproducible pressure measurement values can only be obtained with reliable sensors that measure precisely. Piezoelectric sensors from Kistler are rugged and maintenance-free.

Piezoelectric sensors

Sensors from Kistler offer virtually unlimited service lifetimes; they deliver highly linear measurement results, and they operate independently of temperature. They provide high-precision measurements of minimal pressure variations (range: up to 2,000 bar) and/or temperature changes of up to 300°C.

Cavity pressure can be determined directly, indirectly, contact-free, or together with the contact temperature. Direct-measuring sensors are in contact with the melt in the cavity, and they measure the pressure without transmission pins. They can be installed in a bore, either with or without an adapter. On many sensors, the front can be adapted to the surface of the cavity so that no mark can be seen on the part. Alternatively, the force can be measured behind an ejector pin or measurement pin; it can then be converted into the pressure with the help of the pin diameter. This method is recommended if there is insufficient space for a direct-measuring sensor. For optical components with Class A surfaces or components on which marks are not permitted, the cavity pressure can be measured contact-free with a measuring pin: the compression of the mold steel is the basis for this method. CAD data is used to simplify positioning of the sensors in the mold.

Temperature sensors

After pressure, the temperature in the mold is the most important process parameter. Anomalies in mold temperature control, flow rate fluctuations or blocked cooling channels can be detected even more reliably using sensors in the mold.

Kistler offers various temperature sensors for this purpose which measure the contact temperature in the cavity and the mold temperature. This approach ensures that the temperature is fully measured in the injection mold. As well as temperature sensors, Kistler's portfolio includes temperature amplifiers that amplify the signal from the temperature sensors to a standardized 0–10 V signal and transmit it to the ComoNeo.

Piezoresistive sensors

To monitor and control injection molding machines, hot runner systems and 3D printers, Kistler offers sensors based on piezoresistive measurement technology. They allow combined monitoring of the pressure and temperature of a plastic melt in one sensor, for virtually unlimited measuring periods.

The pressure-sensitive element is a highly stable piezoresistive cell manufactured with SOI (Silicon On Insulator) technology. Measuring chains 4021B, 4001A and 4004A – comprising the sensor, cable and amplifier – are already calibrated when delivered, and they contain no transfer media such as oil or mercury.

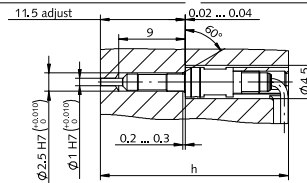
Direct cavity pressure measurement

| | | |
|--|-------------|------------------------------|
| Front diameter | 1 mm | |
| Measurands (p: pressure; T: temperature) | p | p+T |
| Technical data | Type | 6183D...¹⁾ |
| | | 6188A... |

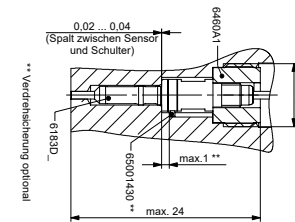


Installation sketch

Installation with spacer sleeve



Installation with mounting nut



| | | |
|---|--------|-------------------|
| Measuring range | | |
| Temperature (type K thermocouple) | °C | – |
| Pressure | bar | 0 ... 2,000 |
| Sensitivity | pC/bar | ≈–2.25 (Unisense) |
| Sensor front | | |
| Machinable | | • |
| Option: abrasion protection (not machinable) | | • |
| Cable technology | | |
| Single wire with/without connector ²⁾ | | • |
| Single wire with crimp contact ³⁾ | | • |
| Coaxial, with standard ⁴⁾ /custom cable length ⁵⁾ | | • |
| Conductive spacer sleeve | | • |
| Compensating cable with standard ⁶⁾ /custom cable length ⁷⁾ | | – |
| Exchangeable cable | | • |
| Operating temperature | | |
| Melt temperature | °C | <450 |
| Mold temperature | °C | <200 |

| | | |
|---------------------------------------|--|----------------|
| Applications + characteristics | Thermoplastics Smallest front area Waterproof (IP67) | Thermoplastics |
|---------------------------------------|--|----------------|

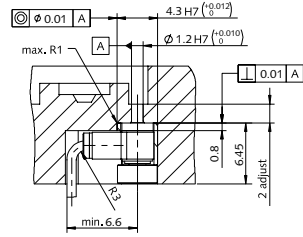
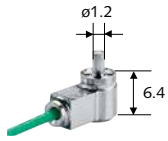
| | | |
|---|------|------------------------|
| Accessories | | |
| Spacer sleeve | Type | 6464A1 ⁸⁾ |
| Minimum overall height | mm | 25.5 |
| Mounting nut | Type | 6460A1 |
| Minimum overall height | mm | 24 |
| Data sheet: see www.kistler.com | | 6183D (003-450) |
| | | 6188A (000-887) |

• Variant available – Variant not available 1) Standard product 2) Cables can be shortened by user, standard length 1.5/5 m

⁶⁾ l = 0.4/0.8/1.2/1.6/2 m ⁷⁾ Custom length (l_{min} = 0.15 m/l_{max} = 5 m) ⁸⁾ Accessory supplied with product

1.2 mm

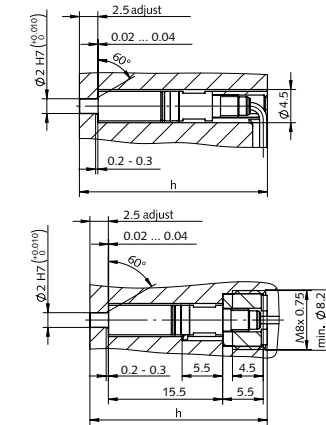
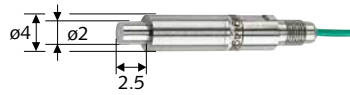
p
6184A...



Installation with thrust washer
Minimum overall height: see table

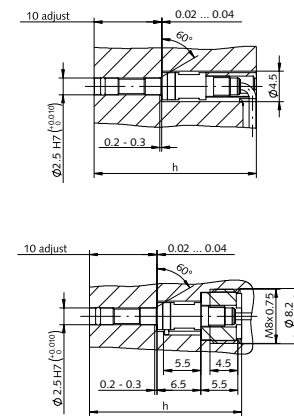
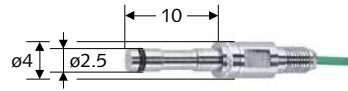
2 mm

p
6185A...



2.5 mm

p
6182D...¹⁾



| | | |
|-------------|-------------|------------------|
| - | - | - |
| 0 ... 2,000 | 0 ... 2,000 | 0 ... 2,000 |
| ≈-1.2 | ≈-2.2 | ≈-2.5 (Unisense) |

| | | |
|---|---|---|
| • | • | • |
| • | • | • |
| • | • | • |
| • | • | • |
| • | • | • |
| - | • | • |
| - | • | • |
| - | - | - |
| - | • | • |

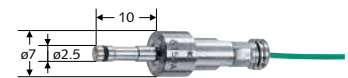
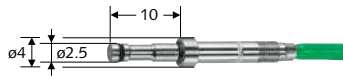
| | | |
|------|------|------|
| <450 | <450 | <450 |
| <200 | <200 | <200 |

| | | |
|--|---|---------------------------------------|
| Thermoplastics | Thermoplastics | Thermoplastics |
| Low overall height Cable outlet 90° | Insensitive to installation conditions Waterproof (IP67) | Small front area Waterproof (IP67) |

| | | |
|------------------------------------|------------------------|------------------------|
| 6470 (thrust washer) ⁸⁾ | 6464A1 ⁸⁾ | 6464A1 ⁸⁾ |
| 8.5 | 25.5 | 24 |
| 6465 ⁸⁾ | 6460A1 | 6460A1 |
| 11.6 | 24 | 22.5 |
| 6184A (000-600) | 6185A (003-263) | 6182D (003-449) |

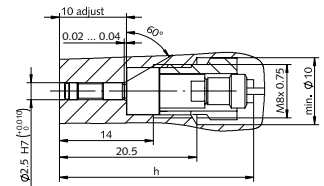
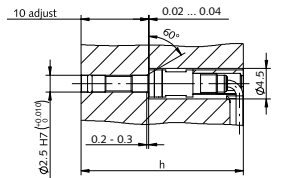
³⁾ Connection to contact element 1712/1714, custom length (l_{min} = 0.04 m/l_{max} = 1.5 m) ⁴⁾ l = 0.2/0.4/0.6/0.8 m ⁵⁾ Custom length (l_{min} = 0.1 m/l_{max} = 5 m)

| | | | |
|--|---------------|------------------------------|------------------------------|
| Front diameter | 2.5 mm | | |
| Measurands (p: pressure; T: temperature) | p+T | | p |
| Technical data | Type | 6189A...¹⁾ | 6159A...¹⁾ |

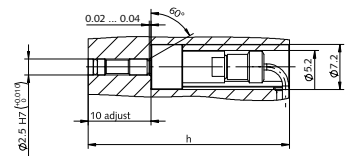
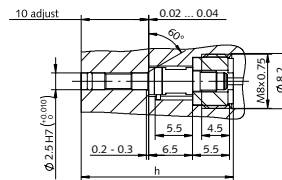


Installation sketch

Installation with spacer sleeve



Installation with mounting nut



Measuring range

| | | | |
|-----------------------------------|--------|-------------|-------------|
| Temperature (type K thermocouple) | °C | 0 ... 450 | – |
| Pressure | bar | 0 ... 2,000 | 0 ... 2,000 |
| Sensitivity | pC/bar | ≈ -6.5 | ≈ -2.5 |

Sensor front

| | | |
|--|---|---|
| Machinable | – | • |
| Option: abrasion protection (not machinable) | – | • |

Cable technology

| | | |
|---|------------|---|
| Single wire with/without connector ²⁾ | • | • |
| Single wire with crimp contact ³⁾ | – | • |
| Coaxial, with standard ⁴⁾ /custom cable length ⁵⁾ | – | • |
| Conductive spacer sleeve | – | • |
| Compensating cable with standard ⁶⁾ /custom cable length ⁷⁾ | • | – |
| Exchangeable cable | by Kistler | • |

Operating temperature

| | | | |
|------------------|----|------|------|
| Melt temperature | °C | <450 | <450 |
| Mold temperature | °C | <200 | <200 |

Applications + characteristics

| | |
|----------------|------------------|
| Thermoplastics | Thermoplastics |
| | Small front area |

Accessories

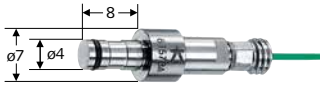
| | | | |
|---|------|------------------------|------------------------|
| Spacer sleeve | Type | 6464A3 ⁸⁾ | 6459 |
| Minimum overall height | mm | 33 | 32 |
| Mounting nut | Type | – | 6457 ⁸⁾ |
| Minimum overall height | mm | – | 29 |
| Data sheet: see www.kistler.com | | 6189A (000-536) | 6159A (000-032) |

• Variant available – Variant not available 1) Standard product 2) Cables can be shortened by user, standard length 1.5/5 m

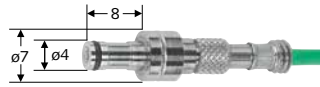
⁶⁾ l = 0.4/0.8/1.2/1.6/2 m ⁷⁾ Custom length (l_{min} = 0.15 m/l_{max} = 5 m) ⁸⁾ Accessory supplied with product

4 mm

| |
|------------------------------|
| p |
| 6157C...¹⁾ |

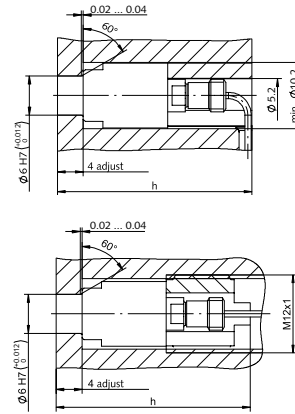
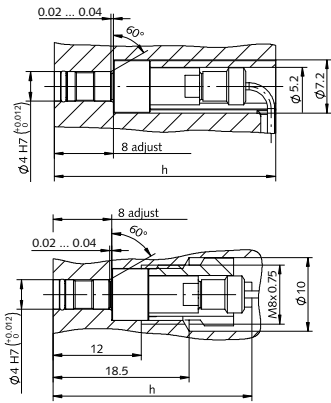


| |
|------------------------------|
| p+T |
| 6190C...¹⁾ |



6 mm

| |
|------------------------------|
| p |
| 6152B...¹⁾ |

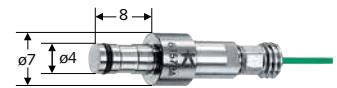
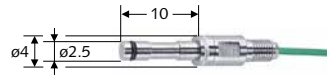


| | | |
|-------------------------------------|-------------------------------------|---|
| - | 0 ... 450 | - |
| 0 ... 2,000 | 0 ... 2,000 | 0 ... 2,000 |
| -9.4 (Unisense) | ≈ -9 | ≈ -9.4 (Unisense) |
| • | - | • |
| • | - | • |
| • | • | • |
| • | - | • |
| • | - | • |
| • | - | • |
| - | • | - |
| • | • | • |
| <450 | <450 | <450 |
| <300 | <200 | <300 |
| Thermoplastics Elastomers LSR | Thermoplastics Elastomers LSR | Thermoplastics Thermosetting plastics Elastomers LSR |
| 6459 | 6459 | 6462 |
| 30 | 37 | 32 |
| 6457 ⁸⁾ | 6457 ⁸⁾ | 6453 ⁸⁾ |
| 27 | 30 | 30 |
| 6157C (003-339) | 6190C (000-680) | 6152B (003-397) |

³⁾ Connection to contact element 1712/1714, custom length (l_{min} = 0.04 m/l_{max} = 1.5 m) ⁴⁾ l = 0.2/0.4/0.6/0.8 m ⁵⁾ Custom length (l_{min} = 0.1 m/l_{max} = 5 m)

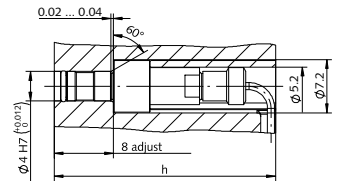
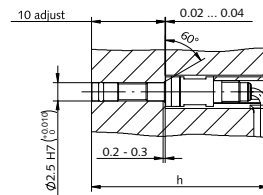
Direct cavity pressure measurement – low pressure range

| | | | |
|--|-------------|-----------------|-----------------|
| Front diameter | | 2.5 mm | 4 mm |
| Measurands (p: pressure; T: temperature) | | p | p |
| Technical data | Type | 6178C... | 6167A... |



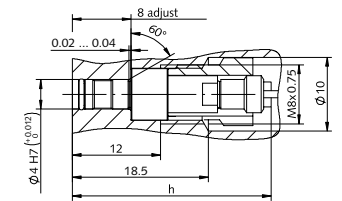
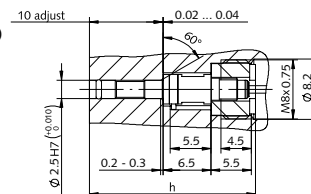
Installation sketch

Installation with spacer sleeve



Installation with mounting nut

(for 6182C and 6178A only)



Measuring range

| | | | |
|-----------------------------------|--------|------------------|-----------|
| Temperature (type K thermocouple) | °C | – | – |
| Pressure | bar | 0 ... 200 | 0 ... 200 |
| Sensitivity | pC/bar | ≈ -12 (Unisense) | ≈ -16.5 |

Sensor surface

| | | |
|--|---|---|
| Machinable | • | – |
| Option: abrasion protection (not machinable) | – | – |

Cable technology

| | | |
|---|---|---|
| Single wire with/without connector ²⁾ | • | • |
| Single wire with crimp contact ³⁾ | • | – |
| Coaxial, with standard ⁴⁾ /custom cable length ⁵⁾ | – | • |
| Conductive spacer sleeve | – | • |
| Compensating cable with standard ⁶⁾ /custom cable length ⁷⁾ | – | – |
| Exchangeable cable | – | • |

Operating temperature

| | | | |
|------------------|----|------|------|
| Melt temperature | °C | <450 | <450 |
| Mold temperature | °C | <200 | <200 |

Applications + characteristics



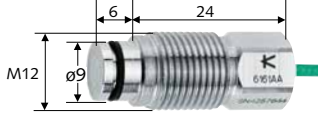
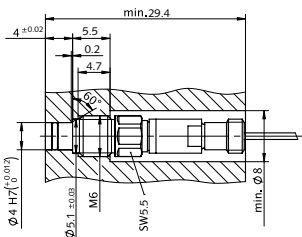
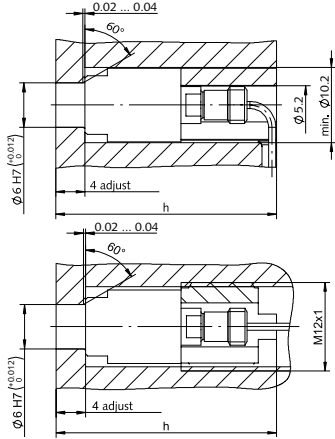
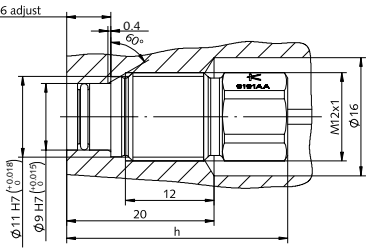
| | |
|---|---|
| Foam injection molding Compression molding Thermoplastics | Low-viscosity materials With diaphragm |
| High sensitivity | |

Accessories

| | | | |
|---|------|------------------------|------------------------|
| Spacer sleeve | Type | 6464A1 ⁸⁾ | 6459 |
| Minimum overall height | mm | 21 | 30 |
| Mounting nut | Type | 6460A1 | 6457 ⁸⁾ |
| Minimum overall height | mm | 22.5 | 27 |
| Data sheet: see www.kistler.com | | 6178C (003-448) | 6167A (000-033) |

• Variant available – Variant not available

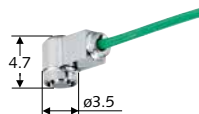
¹⁾ Standard product ²⁾ Cables can be shortened by user, standard length 1.5/5 m
⁶⁾ l = 0.4/0.8/1.2/1.6/2 m ⁷⁾ Custom length (l_{min} = 0.15 m/l_{max} = 5 m)

| | 6 mm | | 9 mm |
|---|--|--|---|
| p | p | p | p |
| 6165A... | 6162A... | 6163A... | 6161A... ¹⁾ |
|  |  | |  |
|  |  | |  |
| - | - | - | - |
| 0 ... 200 | 0 ... 200 | 0 ... 1,000 | -0.9 ... 200 |
| ≈ -4.0 | ≈ -18.5 | ≈ -3.9 | ≈ -18.4 |
| - | - | - | - |
| - | - | - | - |
| • | • | • | - |
| - | - | - | - |
| • | • | • | • |
| • | - | - | - |
| - | - | - | - |
| • | • | • | • |
| <450 | <450 | <450 | <450 |
| <200 | <200 | <200 | <200 |
| Low-viscosity materials SMC/transfer molding | Fiber-reinforced composites SMC/RTM | Fiber-reinforced composites High-pressure RTM Composites | Fiber-reinforced composites SMC/RTM |
| Welded front gap | Welded front gap | Welded front gap | Welded front gap |
| - | 6462 | 6462 | - |
| 30 | 32 | 32 | 30 |
| - | 6453 ⁸⁾ | 6453 ⁸⁾ | - |
| 27 | 30 | 30 | - |
| 6165A (000-033) | 6162A (000-888) | 6163A (000-889) | 6161A (003-053) |

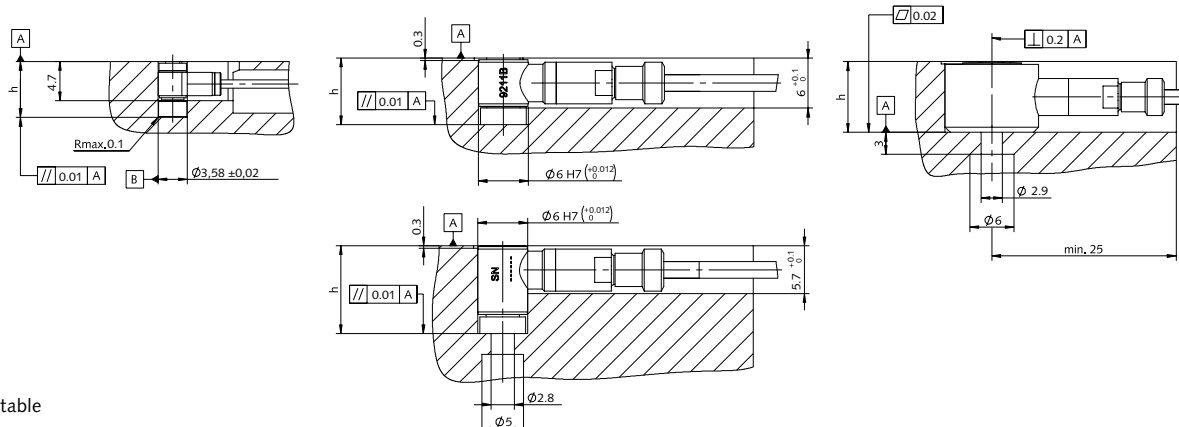
³⁾ Connection to contact element 1712/1714B, custom length (l_{min} = 0.1 m/l_{max} = 1.5 m) ⁴⁾ l = 0.2/0.4/0.6/0.8 m ⁵⁾ Custom length (l_{min} = 0.1 m/l_{max} = 5 m)
⁸⁾ Accessory supplied with product

Indirect cavity pressure measurement

| Front diameter | 3.5 mm | 6 mm | 6 mm | 12.6 mm |
|----------------|-----------------------------|------------------------|----------|------------------------|
| Technical data | Type 9210A... ¹⁾ | 9211B... ¹⁾ | 9213B... | 9204B... ¹⁾ |



Installation sketch



h = minimum overall height, see table

Measuring range

| | | | | | |
|---------------------------|------|------------|-----------|-----------|----------|
| Force ²⁾ | kN | 0 ... 0.25 | 0 ... 2.5 | 0 ... 2.5 | 0 ... 10 |
| Overload | kN | 0.3 | 3 | 3 | 12 |
| Sensitivity ²⁾ | pC/N | ≈ -10 | ≈ -4.4 | ≈ -4.4 | ≈ -1.6 |

Cable technology

| | | | | | |
|--|----|-------------|-------------|-------------|-------------|
| Single wire with/without connector ³⁾ | | • | • | • | • |
| Coaxial | | - | • | • | • |
| Exchangeable cable | | - | • | • | • |
| Operating temperature range | °C | -40 ... 200 | -40 ... 200 | -40 ... 200 | -40 ... 200 |

Applications + characteristics

| | | | |
|--|-----------------------------------|---|---------------------------------|
| All injection molding processes | All injection molding processes | All injection molding processes | All injection molding processes |
| Smallest force sensor Cable output at the side Especially for molds with modular structure | Especially for multi-cavity molds | With M2.5 fastening thread, especially for multi-cavity and small molds | With M2.5 fastening thread |

Accessories

| | | | | | |
|---------------|------|--------------------|--------------------|--------------------|---|
| Thrust washer | Type | 9406 ⁴⁾ | 9411 ⁴⁾ | 9413 ⁴⁾ | - |
|---------------|------|--------------------|--------------------|--------------------|---|

Main installation dimensions

| | | | | | |
|--|----|-----------------|-----------------|-----------------|-----------------|
| Dimensions | mm | 3.5 | 6 | 6 | 12.6 |
| Actual height | mm | 4.7 | 6 | 8.5 | 9.5 |
| Minimum overall height | mm | 6.7 | 8 | 10.5 | 9.6 |
| Data sheet: see www.kistler.com | | 9210A (000-601) | 9211B (000-555) | 9213B (000-556) | 9204B (000-128) |

¹⁾ Standard product

²⁾ Conversion formula for pressure sensitivity: pressure sensitivity [pC/bar] = nominal force sensitivity [pC/N] × area of ejector pin [mm²] × 0.1

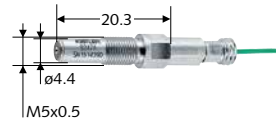
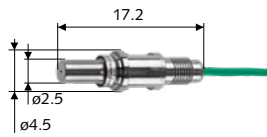
³⁾ Cables can be shortened by the user, standard length 1.5/5 m

⁴⁾ Accessories supplied with product

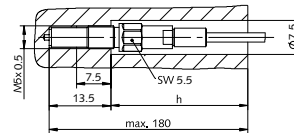
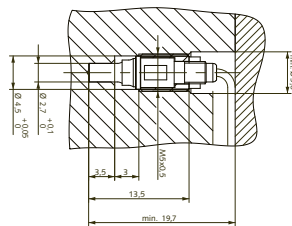
⁵⁾ Elongation is proportional to the cavity pressure

Contact-free cavity pressure measurement

| | | |
|-------------------------------------|---------------|----------|
| Longitudinal measuring pin – thread | M5 | M5 |
| Technical data | Type 9239B... | 9247A... |



Installation sketch



h = minimum overall depth, see table

Measuring range

| | | | |
|----------------------|------------------------|-----------------|----------------|
| Strain ⁵⁾ | $\mu\epsilon$ | ± 800 | $\pm 1,400$ |
| Overload | $\mu\epsilon$ | $\pm 1,000$ | $\pm 2,000$ |
| Sensitivity | $\rho C / \mu\epsilon$ | ≈ -14.4 | ≈ -8.6 |

Cable technology

| | | | |
|------------------------------------|--------------------|-----------|-----------|
| Single wire with/without connector | | • | • |
| Coaxial | | • | • |
| Exchangeable cable | | • | • |
| Operating temperature range | $^{\circ}\text{C}$ | 0 ... 200 | 0 ... 200 |

Applications + characteristics

Optical components
Class A surfaces
Smallest possible design if installation space is limited
Silicone
Measurement of compression of steel caused by cavity pressure

Optical components
Class A surfaces
Silicone
Measurement of compression of steel caused by cavity pressure

Accessories

| | | | |
|---------------------------|------|--------|---------|
| Hollow bolt | Type | 9497A1 | – |
| Reamer | Type | – | 1300A79 |
| Socket key AF inside | mm | 5 | 5.5 |
| Handheld charge amplifier | Type | 5811A | 5811A |

Main installation dimensions

| | | | |
|-------------------------|----|------|------|
| Minimum overall depth | mm | 19.7 | 39.6 |
| Distance to cavity wall | mm | 2–3 | 3–5 |

| | | |
|--|-----------------|-----------------|
| Data sheet: see www.kistler.com | 9239B (003-613) | 9247A (000-143) |
|--|-----------------|-----------------|

Temperature measurement

Cavity temperature

| Front diameter | | 1 mm | 2.5 mm | | 4 mm |
|------------------------------------|------|--------------|--------------|--------------|--------------|
| Technical data | Type | 6193B... | 6195B... | 6194B... | 6192B... |
| | | | | | |
| Thermocouple type | | K (NiCr-Ni) | K (NiCr-Ni) | K (NiCr-Ni) | K (NiCr-Ni) |
| Measuring accuracy | | IEC548 Cl. 1 | IEC548 Cl. 1 | IEC548 Cl. 1 | IEC548 Cl. 1 |
| Operating temperature range | | | | | |
| Mold (sensor and cable) | °C | 0 ... 600 | 0 ... 600 | 0 ... 600 | 0 ... 600 |
| Mold (connector) | °C | 0 ... 200 | 0 ... 200 | 0 ... 200 | 0 ... 200 |
| Melt (at the front of the sensor) | °C | 0 ... 450 | 0 ... 450 | 0 ... 450 | 0 ... 450 |
| Pressure range | bar | 0 ... 2,000 | 0 ... 2,000 | 0 ... 2,000 | 0 ... 2,000 |
| Cable | | | | | |
| Positive (+) | | green | green | green | green |
| Negative (-) | | white | white | white | white |

Mold temperature

| Description | | Mineral-insulated thermocouple | Angle thermocouple | Thermocouple with bayonet cap |
|-----------------------------|-----------------|--------------------------------|--------------------|-------------------------------|
| Technical data | Type | 6196A... | 6197A... | 6198A... |
| | | | | |
| Thermocouple type | | J (Fe-CuNi) | J (Fe-CuNi) | J (Fe-CuNi) |
| Measuring accuracy | | DIN EN 60584 | DIN EN 60584 | DIN EN 60584 |
| Operating temperature range | °C | 0 ... 400 | 0 ... 400 | 0 ... 400 |
| Lead cross-section | mm ² | 0.22 | 0.22 | 0.22 |
| Cable | | | | |
| Positive (+) | | black | black | black |
| Negative (-) | | white | white | white |

Piezoresistive sensors

| Front diameter | | 3 mm | 7.8 mm | 9 mm |
|--|------|--|--|--------------------------|
| Measured variables (p: pressure; T: temperature) | | p+T | p+T | p+T |
| Technical data | Type | 4004A... | 4021A... | 4001A... |
| | | | | |
| Measuring range | | | | |
| Temperature | °C | 0 ... 350 | 0 ... 350 | 0 ... 250 |
| Pressure | bar | 500/1,000/2,500 | 200/500/1,000/ 2,000/3,000 | ±2/5/10/20/50 |
| Sensor surface | | | | |
| Machinable | | - | - | - |
| Option: abrasion protection (not machinable) | | - | - | - |
| Operating temperature | | | | |
| Sensor front | °C | 350 | 350 | 275 |
| Amplifier | °C | 75 | 60 | 75 |
| Applications and features | | Hot runner melt pressure measuring, additive manufacturing | Melt pressure measuring for injection molding machines | Resin transfer molding |
| Accessories | | | | |
| Cables | | 1200A229A2 1200A227A2 4785A41... | 4790A1 4757A... 1787A... | 1200A229A2 1200A227A2 |



For every mold concept, Kistler offers the right connection technology – precisely tailored to the installation conditions, the number of cavities and the maintenance requirements.

Connection technology for all installation conditions

Increasing numbers of cavities and more complex temperature conditioning concepts: these factors are making the structure of injection molds more complicated. But at the same time, molds should be designed so they are easy to maintain and disassemble. Kistler has responded consistently to these changes with its connection technology for pressure and temperature sensors.

Single-wire and multi-channel cable technologies from Kistler ensure that sensor signals are transmitted accurately and reliably to the process monitoring system. In single-wire technology, the cable consists of just one conductor with a very small cross-section. It can be installed flexibly in drilled channels, and shortened as required.

Kistler's single-wire or coaxial technology makes it possible to connect up to eight different sensors in molds with multiple cavities, or several sensors per cavity. This method of connecting all the sensors to the process monitoring system saves space and avoids confusion. Signals from combined pressure/temperature measurements can also be transmitted using multi-channel cable technology and a thermocouple amplifier.

For complex and modular molds, contact elements connect cables in different mold elements. Contact surfaces in both elements establish the electrical connection. This makes mold installation far simpler than conventional connection technology.

Another option is the use of conductive spacer sleeves. If the installation is not angled, the spacer sleeve can be screwed onto the sensor instead of a cable; this makes it much simpler to drill the installation bore for the sensor. A contact element is installed on the other side to guarantee secure transmission of the charge.

Connection technology: cavity pressure sensors

Single-wire connection cables



| Technical data | Type | 1666A... ¹⁾ | 1674AZsp | 1900A17... |
|-----------------------------|------|------------------------|----------------------------|-------------------------|
| Sensor connection | | M4 ²⁾ | M4 ²⁾ | M3 ³⁾ |
| Length | m | 1.5/5 | 0.04 ... 1.5 ⁴⁾ | 1.5/5/Zsp ⁴⁾ |
| Operating temperature range | °C | 0 ... 200 | 0 ... 200 | 0 ... 200 |
| Color | | green | green | green |

Contact elements for single-wire technology



Illustrated: Type 171420

| Technical data | Type | 1712C0 ¹⁾ | 1714C0 ¹⁾ |
|--|------|-----------------------------|-------------------------------|
| Number of channels | | 1 | 4 |
| Structural dimensions | mm | M8 × 5.2 (for each element) | ø 12 × 9.5 (for each element) |
| Axial offset during installation | mm | max. 0.3 | max. 0.1 |
| Operating temperature range | °C | 0 ... 200 | 0 ... 200 |
| Data sheet: see www.kistler.com | | 1712C (003-437) | |

Conductive spacer sleeve for single-wire technology



| Technical data | Type | 1720A1 | 1720A2 | 1720A3 |
|-----------------------------|------|------------------|-----------|-----------|
| Sensor connection | | M3 ³⁾ | M3 | M4 |
| Contact element | | 1712C1 | 1712C1 | 1712C1 |
| Length | mm | 40 | 80 | 70 |
| Operating temperature range | °C | 0 ... 200 | 0 ... 200 | 0 ... 200 |

Coaxial connection cables



Illustrated: Type 1645C

| Technical data | Type | 1963A... | 1955A... | 1645C... | 1650A... | 1900A19L... |
|-----------------------------|------|----------------------|----------------------|--|--|--|
| Sensor connection | | M4 ²⁾ | M4 ²⁾ | M4 ²⁾ | M3 ^{3)/M4²⁾} | M3 ³⁾ |
| Plug connection | | Fischer | Fischer | Fischer | Mini-Coax | Fischer |
| Length | m | 0.4/sp ⁵⁾ | 0.4/sp ⁶⁾ | 0.2/0.4/0.6/ 0.8/1.0/1.2/ 1.5/1.6/2.0/ 2.5/3.0/sp ⁶⁾ | 0.2/0.4/0.6/ 0.8/1.2/sp ⁶⁾ | 0.2/0.4/0.6/ 0.8/1.0/1.2/ 1.5/sp ⁶⁾ |
| Operating temperature range | °C | 0 ... 200 | 0 ... 260 | 0 ... 200 | 0 ... 200 | 0 ... 200 |
| Covering | | Steel-braided | Steel-braided | PFA | PFA | PFA |

Combined pressure/temperature connection cables



| Technical data | Type | 2219B... | 2219BG | 2219BG1 |
|-----------------------------|------|--|--|---|
| Sensor connection | | 6190CA... with connectors | 6190CAG without connector for use with Type 2205 | 6190CAG1 without connector for use with Type 2205 |
| Length | m | 0.4/0.8/1.2/1.6/ 2/sp ⁶⁾ | 2 | 5 |
| Operating temperature range | °C | 0 ... 200 | 0 ... 200 | 0 ... 200 |

¹⁾ Standard product ²⁾ 6159.../6157.../6177.../6167.../6152.../6172.../6162.../6163.../9211.../9213.../9204... ³⁾ 6182.../6183.../9239...A... ⁴⁾ Custom length (l_{min} = 0.04 m/l_{max} = 1.5 m) with crimp contact ⁵⁾ Custom length (l_{min} = 0.1 m/l_{max} = 2 m) ⁶⁾ Custom length (l_{min} = 0.1 m/l_{max} = 5 m)

Multi-channel technology: cavity pressure sensors

Multi-channel connectors for single-wire technology



Single-wire sensors for these connectors have extensions G and G1 (example: Type 6157BAG)

| Technical data | Type | 1722A... ¹⁾ | 1708B... ¹⁾ | 1710B... ¹⁾ |
|--|------|--------------------------------------|---|---|
| Number of channels | | 4 or 8, with mold identification | 4, with mold identification up to 125°C | 8, with mold identification up to 125°C |
| Used for these sensor types | | All single-wire and coaxial sensors | All single-wire sensors | All single-wire sensors |
| Connection | | Cut-and-grip technology or mini-coax | Cut-and-grip technology | Cut-and-grip technology |
| Operating temperature range °C | | 0 ... 120 | 0 ... 200 | 0 ... 200 |
| Data sheet: see www.kistler.com | | 1722A (003-264) | 1708B (003-138) | 1710B (003-138) |

Extension cable with flexible steel-braided covering



| Technical data | Type | 1995A... ¹⁾ | 1997A... ¹⁾ |
|--------------------------------|------|------------------------|------------------------|
| Number of channels | | 4 | 8 |
| Length | m | 1/2/5/sp ²⁾ | 1/2/5/sp ²⁾ |
| Connector (system) | | 4-channel | 8-channel |
| Connector in mold | | 4-channel | 8-channel |
| Operating temperature range °C | | 0 ... 200 | 0 ... 200 |

Single-channel technology: cavity pressure sensors

Single-channel connector for single-wire technology



| Technical data | Type | 1839 |
|--------------------------------|------|-------------------------|
| Used for these sensor types | | All single-wire sensors |
| Connection | | Cut-and-grip technology |
| Operating temperature range °C | | 0 ... 200 |

Extension cables: single-channel technology, pressure



Illustrated: Type 1661A...

| Technical data | Type | 1667C... ¹⁾ | 1661A... | 1672B... | 1662A... |
|--------------------------------|------|-------------------------|-------------------------|-------------------------|------------------------|
| Length | m | 2/5/10/sp ³⁾ | 2/5/10/sp ³⁾ | 2/5/10/sp ³⁾ | 1/2/5/sp ³⁾ |
| Connector (system) | | BNC | BNC | TNC | TNC |
| Connector in mold | | 1-channel | 1-channel | 1-channel | 1-channel |
| Operating temperature range °C | | 0 ... 125 | 0 ... 200 | 0 ... 125 | 0 ... 200 |
| Covering | | Fluoropolymer | Steel | Fluoropolymer | Steel |

Cable technology: contact temperature sensors

Multi-channel temperature amplifier for temperature sensors without connector



| Technical data | Type | 2205B... |
|---|---|-----------|
| Measuring range | °C | 0 ... 400 |
| Thermocouple type | type | K/J/N |
| Number of channels | | 2/4/8 |
| Operating temperature range | °C | 0 ... 125 |
| Characteristics | 2-, 4- or 8-channel temperature amplifier for installation in molds for thermocouples of types K/J/N. | |
| Application | Connection of up to 8 pressure/temperature sensors (temperature signal) or 8 temperature sensors to ComoNeo Type 5887A... . | |
| Accessories | External housing Type 5700A23, installation support Type 1300A20 | |
| Data sheet: see www.kistler.com | 2205B (003-617) | |

High-temperature extension cables for temperature sensors with connector



Cables are also used for the thermocouple in combined sensors, Types 6189A... and 6190CA... .

| Technical data | Type | 2290A... | 2295A... |
|-----------------------------|------|-------------------------|-----------------------|
| Thermocouple type | | K/J | K/J |
| Length | m | 2/5/10/sp ⁴⁾ | 2/5/sp ⁴⁾ |
| Connector (system) | | Bare ends | 1-channel temperature |
| Connector in mold | | 1-channel | 1-channel |
| Operating temperature range | °C | 0 ... 200 | 0 ... 200 |

¹⁾ Standard product

²⁾ Custom length (l_{min} = 0.3 m/l_{max} = 20 m)

³⁾ Custom length (l_{min} = 0.2 m/l_{max} = 5 m)

⁴⁾ Custom length (l_{min} = 0.1 m/l_{max} = 30 m)



Kistler offers optimally configured system technology for every quality assurance strategy.

Process monitoring systems for every application

Process monitoring systems from Kistler for analysis, optimization, monitoring, documentation, and control of injection molding are suitable for every application. Automatic detection and separation of faulty parts mean lower quality costs.

The ComoNeo monitoring system from Kistler offers a host of pioneering innovations that will make everyday injection molding operations far easier.

In addition to process monitoring, various control and regulation modules for injection molding are included in ComoNeo, or can be added.

Examples of additional system upgrade options: LOG (audit trail), ComoNeoMULTIFLOW 2.0 (for automatic hot runner balancing) and connectivity to the central data analysis software AkvisIO IME.

ComoScout is a process monitoring system for injection molding machines. Unlike ComoNeo, it is not connected to cavity pressure sensors. Instead it makes use of signals coming from the injection molding machine and any other voltage output

sensors. ComoScout offers an ideal way to start out with process monitoring – and is equally suitable as a solution for retrofitting injection molding machines with a data interface.

ComoNeo and ComoScout are compact systems, designed to meet industry's needs; they are based on a process-oriented operating philosophy and they fit flexibly into diverse production environments. The advantage: multiple devices can be networked so that all data can be collected centrally. What's more, all integrated devices can be reached and configured from every PC – so there is no need to install additional software.

ComoNeo process monitoring system

Hardware



| Technical data | Type | 5887A1 | 5887A2 | 5887A3 | 5887A4 |
|---|-------|-----------------|-----------------|-----------------|-----------------|
| Inputs | | 8 | 8 | 16 | 32 |
| Cavity pressure (connector) | | (2 × 4-channel) | (1 × 8-channel) | (2 × 8-channel) | (4 × 8-channel) |
| Automatic choice of measuring range | | yes | yes | yes | yes |
| Voltage inputs i.e. cavity wall temperature (connector) | | 8 | 8 | 16 | 16 |
| | | (1 × 8-channel) | (1 × 8-channel) | (2 × 8-channel) | (2 × 8-channel) |
| Inputs | | 4 | 4 | 4 | 4 |
| Machine signals | | | | | |
| Measuring range | V | 0 ... ±10 | 0 ... ±10 | 0 ... ±10 | 0 ... ±10 |
| Machine signals | | | | | |
| Digital inputs | | 12 | 12 | 12 | 12 |
| Digital outputs | | 24 | 24 | 24 | 24 |
| Monitoring boxes | | 128 | 128 | 128 | 128 |
| Measuring time | min | ≤40 | ≤40 | ≤40 | ≤40 |
| Dimensions | L×H×W | 198 × 77 × 148 | 198 × 77 × 148 | 198 × 77 × 148 | 198 × 77 × 148 |
| Sampling rate per channel | kHz | 16 | 16 | 16 | 16 |
| Operating temperature range | °C | 0 ... 50 | 0 ... 50 | 0 ... 50 | 0 ... 50 |
| Degree of protection | | IP53 | IP53 | IP53 | IP53 |

| | |
|---|---|
| Characteristics | ComoNeo Type 5887A... is a compact system for data acquisition as well as visualization, monitoring and control of injection molding processes. To visualize the user interface, we recommend the capacitive multi-touch display, Type 5637A1 (display area: 15.6") that was specifically designed for ComoNeo. |
| Application | Process analysis, optimization, monitoring and control of the injection molding process. ComoNeo has an internal curve profile history that can store at least 50,000 cycles in the device – these can also be exported via a USB interface. |
| Accessories | AkvisIO IME Data Analysis Software 2878A..... |
| Data sheet: see www.kistler.com | 5887A (003-231) |

ComoScout process monitoring system

Hardware



| Technical data | Type | 5889A1 |
|---|--|----------------|
| Inputs | | 0 |
| Cavity pressure (connector) | | |
| Automatic choice of measuring range | | yes |
| Inputs: frontside sensors | | 16 |
| Inputs: backside sensors | | 4 |
| Measuring range, frontside/backside sensors | V | 0 ... ±10 |
| Digital inputs | | 12 |
| Digital outputs | | 24 |
| Monitoring boxes | | 128 |
| Measuring time | min | ≤40 |
| Dimensions | L×H×W | 198 × 77 × 148 |
| Sampling rate per channel | kHz | 16 |
| Operating temperature range | °C | 0 ... 50 |
| Degree of protection | | IP53 |
| Characteristics | ComoScout is a compact and lightweight solution for data acquisition and process visualization, monitoring and control, with the focus on signals originating from injection molding machines or sensors (other than cavity pressure sensors). To visualize the user interface, Kistler recommends the capacitive multi-touch display, Type 5637A1 (display area: 15.6") that was specifically designed for ComoNeo and ComoScout. | |
| Application | Process analysis, optimization, monitoring and control of the injection molding process. ComoNeo has an internal curve profile history that can store at least 50,000 cycles in the device – these can also be exported via a USB interface. | |
| Accessories | AkvisIO IME Data Analysis Software 2878A.. | |
| Data sheet: see www.kistler.com | 5889A (003-614) | |

Capacitive multi-touch display



| Technical data | Type | 5637A1 |
|---|---|--------|
| Display size | | 15.6" |
| Display format | | 16:9 |
| Characteristics | Multi-touch display specially designed to operate ComoNeo and ComoScout. The ComoNeo user interface is optimized for the display format in compliance with the latest usability standards and guidelines. The display is also fitted with a USB connection for easy export and import of ComoNeo cycles, data and configurations. | |
| Application | Can be connected directly to ComoNeo using the Type 1200A217A ... connection cables included in the accessories. | |
| Data sheet: see www.kistler.com | 5887A (003-231)/ 5889A (003-614) | |

ComoNeo/ComoScout process monitoring system

Cables

Cable for display, Type 5637A1



| | | |
|-----------------------|---------------------------------|---------------------|
| Technical data | Type | 1200A217A... |
| Length | m | 2.5/5 |
| Use | To connect display, Type 5637A1 | |

Cables for digital signals



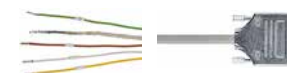
| | | | |
|-----------------------|-------------|--|---|
| Technical data | Type | 1500B42A...¹⁾ | 1500B43A...¹⁾ |
| Connection | | Bare ends | Bare ends |
| Length | m | 0 ²⁾ /7/sp ³⁾ | 0 ²⁾ /7/sp ³⁾ |
| Use | | Connection to handling system or scrap gate (digital inputs/outputs, Type 5887A...), 15-pole | Connection to machine signals (digital inputs/outputs, Type 5887A...), 9-pole |

Proximity switches



| | | |
|-----------------------|------------------------|---------------|
| Technical data | Type | 2231A1 |
| Use | Trigger (start signal) | |

Cable for analog signals



| | | |
|-----------------------|--|-------------------------------------|
| Technical data | Type | 1500B47A... |
| Connection | | Bare ends |
| Length | m | 0 ²⁾ /7/sp ³⁾ |
| Use | To connect analog machine signals, 15-pole | |

Cables for thermocouple amplifier, Type 2205



Illustrated: Type 1457A1A...

| | | | |
|-----------------------|-------------|--|--|
| Technical data | Type | 1491A1A... | 1491A2A... |
| Connection | | Connector | Connector |
| Length | m | 2/5/sp ³⁾ | 2/5 |
| Use | | To connect Type 2205 to 5887A..., 1x4 channels | To connect Type 2205 to 5887A..., 2x4 channels (Y-cable) |

Supply for ComoNeo



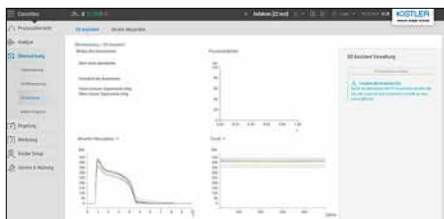
| | | |
|-----------------------|----------------------------------|---------------|
| Technical data | Type | 5781B5 |
| Type | Plug-in power supply | |
| Voltage (input) | 100 ... 240 VAC | |
| Voltage (output) | VDC | 24 |
| Connection | Mains plug (country-specific) | |
| Use | Supply from mains, 100 ... 240 V | |

¹⁾ Standard product ²⁾ Connector only ³⁾ For available lengths, see ComoNeo data sheet 003-231

Add-on products for ComoNeo/ComoScout

Assistance and connection systems

ComoNeoGUARD



| | |
|---|---|
| Key characteristics | ComoNeoGUARD is a ComoNeo tool that generates and positions the monitoring boxes for good/bad evaluation itself – guiding users quickly and seamlessly to the scrap limits. |
| Application | The Assistant for user-prompted generation of the EO limits guides the operator through the procedure for defining the scrap limits. |
| Data sheet: see www.kistler.com | Assistance system included in standard scope of delivery. 5887A (003-231) |

ComoNeoRECOVER



| | |
|---|---|
| Key characteristics | The purpose of this restart module in ComoNeo is to reproduce the quality of an established injection molding process identically on a new machine. |
| Application | With ComoNeoRECOVER, pre-established processes can be transferred from one machine to another with no problems at all. |
| Data sheet: see www.kistler.com | Assistance system included in standard scope of delivery. 5887A (003-231) |

LDAP



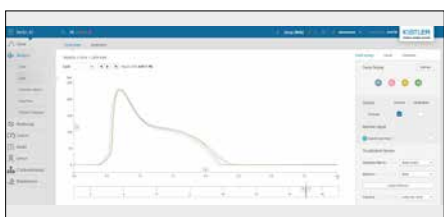
| | |
|---|---|
| Key characteristics | This software module is integrated in both ComoNeo and ComoScout so the process monitoring system can use the company's existing user management. Existing profiles as well as related rights and restrictions can be imported to ensure efficient, secure and comfortable operation of all injection molding machines. |
| Application | Direct access to devices with existing user management and use of validated password rules. |
| Data sheet: see www.kistler.com | 5887A (003-231) 5889A (003-614) |

LOG



| | |
|---|---|
| Key characteristics | With the LOG feature, ComoNeo and ComoScout provide advanced security and traceability for production: all user activities executed on the process monitoring system are stored electronically, including a time index. |
| Application | This feature – also known as the audit trail – provides enhanced transparency for all applications but is especially important for medical device manufacturing. |
| Data sheet: see www.kistler.com | 5887A (003-231) 5889A (003-614) |

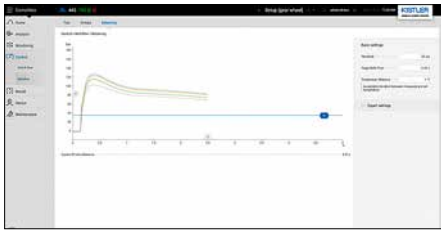
CONNECT



| | |
|---|---|
| Key characteristics | OPC UA and ComoNeoCONNECT: making process and quality data available to higher-level software solutions. |
| Application | The OPC UA interface and CONNECT make process and quality data available to a higher-level software solution. All devices include a basic dataset that can be upgraded via CONNECT license. |
| Data sheet: see www.kistler.com | 5887A (003-231) 5889A (003-614) |

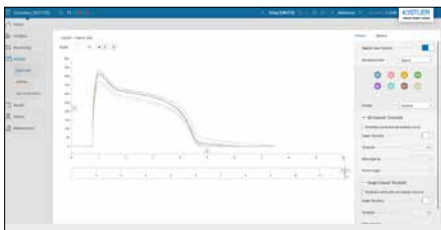
Monitoring and control systems

ComoNeoMULTIFLOW 2.0 hot runner balancing, Type 2809A3



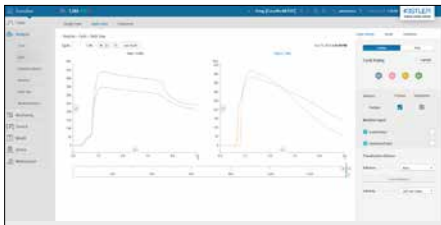
| | |
|---|--|
| Key characteristics | Software for automatic optimization of hot runner temperatures. Its purpose: to fill all cavities of a multi-cavity mold synchronously and evenly. Closed control loop based on analysis of cavity pressure curves and automatic determination of setpoint temperatures, and transfer of this data to the hot runner control device or the injection molding machine. Support for multiple hot runner controllers. See data sheet for details. |
| Application | Automatic balancing of the hot runners of multi-cavity injection molds monitored by ComoNeo Type 5887A... during production startup and series production. |
| Accessories | Ethernet serial converter, Type 2808A2 (hardware) |
| Data sheet: see www.kistler.com | 5887A (003-231) |

ComoNeoSWITCH



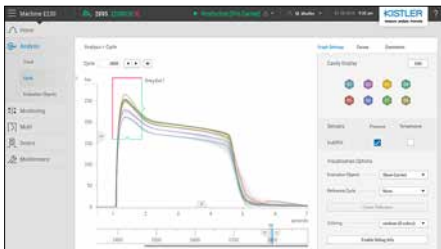
| | |
|---|--|
| Key characteristics | ComoNeoSWITCH actively provides machine feedback. This allows ideal timing for the switchover from speed control to pressure control in response to cavity pressure. |
| Application | The automatic switchover control can be used in two different ways. With the first option, setup is manual; with the second, it is fully automatic. |
| Data sheet: see www.kistler.com | 5887A (003-231) |

ComoNeoMERGE



| | |
|---|--|
| Key characteristics | ComoNeoMERGE is especially helpful with the production of multi-component parts. All the cavity pressure data measured in the manufacturing process is merged to provide a clear visual overview of the complex multi-component injection molding process. |
| Application | In multi-component injection molding processes, multiple mold types are used with different sensor positions. |
| Data sheet: see www.kistler.com | 5887A (003-231) |

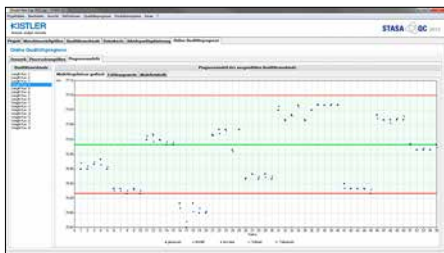
ComoNeoCOMPOSITE



| | |
|---|--|
| Key characteristics | ComoNeoCOMPOSITE ensures that users can easily recognize the characteristic phases of the process such as evacuation, filling and curing in the pressure curve – so process parameters are optimized and production becomes more cost-efficient. |
| Application | Capture and recording of the pressure signal with ComoNeoCOMPOSITE allows traceability of the individual process steps. This makes the pressure curve indispensable as a quality assurance tool. |
| Data sheet: see www.kistler.com | 5887A (003-231) |

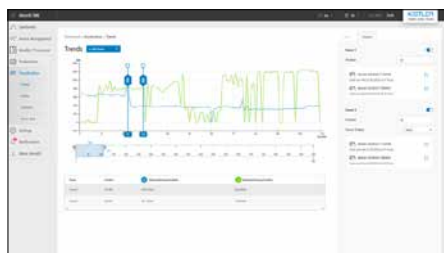
Prediction systems

ComoNeoPREDICT



| | |
|------------------------------|--|
| Key characteristics | <p>Kistler's online quality prediction in ComoNeo is based on models that make it possible to calculate part characteristics.</p> <p>The statistical DoE test planning process (Design of Experiments) helps determine relationships between pressure / temperature profiles and defined quality features. The result: reliable statements can be made in advance about each manufactured component.</p> |
| Application | <p>When manufacturing injection-molded parts, tolerance limits can be taken directly from the part specifications.</p> <p>Online quality prediction offers particular benefits for manufacturers of sensitive, high-precision parts in the medical technology sector and producers of other critical high-grade components. Online quality prediction ultimately opens up the possibility of 100% in-process predictions for all relevant quality characteristics.</p> |
| For more information: | For more information, please contact your Kistler partner directly. |

AkvisIO IME Type 2878A...



| | |
|---|---|
| Key characteristics | <p>AkvisIO IME is a database and visualization solution for accessing and evaluating process data recorded with ComoNeo and ComoScout. The server application synchronizes the high-resolution sensor data recorded during production via the Thrift interface using an Ethernet connection and saves it in an SQL database explicitly designed for time series data.</p> <p>The standard version enables the trend and cycle display of process data, automatically generates complete production reports including the relevant key figures for process capability analysis and ensures comprehensive security when dealing with tool configurations, access rights and error messages. Extensions for AI-based anomaly detection or integration of injection molding machines as an additional data source are provided by supplementary software modules.</p> |
| Application | <p>Process analysis, production analysis and efficiency evaluation of all production orders monitored with ComoNeo Type 5887A... and ComoScout Type 5889A... Insight into ongoing production, storage, display and analysis of process and quality information generated by ComoNeo and ComoScout.</p> <p>Analysis based on cycles or trends of meaningful process values. In addition, there are statistical options for evaluating the reject rate and the process capability of the entire production, such as machine utilization or efficiency.</p> |
| Accessories | 2829D01 Connectivity License per ComoNeo/ComoScout required to synchronize data with AkvisIO |
| Data sheet: see www.kistler.com | 2878A (003-652) |

¹⁾ One license is required for each ComoNeo Type 5887A.



Kistler's range includes the right accessories for installing the sensor, verification and testing.

Handling made simple – our range of accessories

Kistler offers an extensive range of helpful accessories as well as calibration and testing equipment. For inquiries about our range of accessories, please contact our local distribution partners.

Accessories such as the mounting wrench for mounting nuts or the extraction tool for sensors make it easier to handle and install sensors. The simple way to check your installation: our Sensor Tester for cavity pressure sensors. It can test the sensor's sensitivity and the insulation for the entire measuring chain.

Tools

Extraction tools for sensors



| Technical data | Type | 1315A | 1358A | 1362A |
|------------------|------|---|---|--|
| Outside diameter | mm | ø5.8 | ø3.8 | ø5.8 |
| Length | mm | 150 | 150 | 150 |
| Thread | Type | M5 | M3 × 0.35 | M5 |
| Sensors | Type | 6152BA..., 6152BC..., 6157CA..., 6159A..., 6167A..., 6177B..., 6190C..., 6192B..., 6194B..., 9223A... | 6178C..., 6182D..., 6183D..., 6185A..., 6189A..., 6193B..., 6195B... | 6152BB/BD..., 6157CB/CD..., 6190A... |

Mounting wrench for mounting nut



| Technical data | Type | 1383 | 1356 | 1363 |
|------------------|------|--|--|----------|
| Outside diameter | mm | ø10 | ø5 | ø4.4 |
| Length | mm | 300 | 150 | 60 |
| Sensors | Type | 6152B..., 6157C..., 6159A..., 6167A..., 6172B..., 6177B..., 6190C..., 6192B..., 6194B... | 6178C..., 6182D..., 6183D..., 6185A..., 6193B..., 6195B... | 6184A... |

Repair set for single-wire cable



| Technical data | Type | 1207 |
|-----------------------|------|------|
| Number of repair sets | | 5 |

Test equipment

Handheld charge amplifier



| Technical data | Type | 5811A |
|--|------|--|
| For sensors | | Cavity pressure sensors |
| Use | | Measuring the pre-tension of the measuring pin during installation Insulation measurement of sensors, cables, and complete measuring chains Measuring pressure curves with battery operation when no power supply is available |
| Data sheet: see www.kistler.com | | 5811A (003-646) |

Sensor tester for cavity pressure sensors



| Technical data | Type | 5495C... |
|--|------|---|
| For sensor types | | Cavity pressure and temperature sensors |
| Description | | Battery-operated handheld tester with wireless test pin and connection cables to test sensor sensitivity and insulation resistance of cables, and to test the charge amplifiers |
| Use | | Function checks on installed sensors, cables and charge amplifiers |
| Data sheet: see www.kistler.com | | 5495 (003-453) |

Adapters for multi-channel technology cavity pressure sensors

Adapter boxes: single-channel technology to multi-channel technology



Illustrated: Type 5415A1

| Technical data | Type | 5415A1 | 5415A2 |
|--------------------------------|------|-------------------|-------------------|
| Number of channels | | 4 | 8 |
| Connector (system) | | 4-channel | 8-channel |
| Connector in mold | | 4 × 1-channel BNC | 8 × 1-channel BNC |
| Operating temperature range °C | | 0 ... 200 | 0 ... 200 |

Adapter boxes for multi-channel technology



Illustrated: Type 5415A3

| Technical data | Type | 5415A3 | 5415A4 |
|--------------------------------|------|---------------|---------------|
| Number of channels | | 8 | 8 |
| Connector (system) | | 8-channel | 2 × 4-channel |
| Connector in mold | | 2 × 4-channel | 8-channel |
| Operating temperature range °C | | 0 ... 200 | 0 ... 200 |

Adapter cables: multi-channel technology to single-channel technology



| Technical data | Type | 1991A... | 1999A1A0.5 | 1999A2A0.5 |
|--------------------------------|------|----------------------|------------|------------|
| Number of channels | | 1 | 4 | 8 |
| Length | m | 2/5/sp ¹⁾ | 0.5 | 0.5 |
| Connector (system) | | 4-channel | 4 × BNC | 8 × BNC |
| Connector in mold | | 1-channel | 4-channel | 8-channel |
| Operating temperature range °C | | 0 ... 200 | 0 ... 200 | 0 ... 200 |

¹⁾ Custom length (l_{min} = 0.3 m/l_{max} = 20 m)



From professional advice on installation to speedy deliveries of spare parts: Kistler's comprehensive range of services and training is at your disposal across the globe.

Kistler service: customized solutions from A to Z

Kistler offers sales and service wherever plastics processors manufacture high-grade injection molded parts.

In addition to sensors and systems, Kistler offers a host of services – from professional advice on installation to speedy worldwide deliveries of spare parts. For an overview of the services we offer, visit www.kistler.com. For detailed information on our training courses, please contact our local distribution partners.

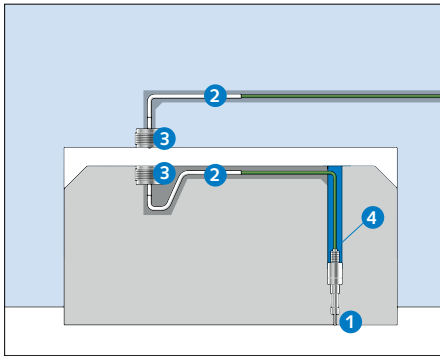
No matter what your assembly problem looks like – we have the right solution for you. Eight typical examples taken from practice are shown on the next page.

Kistler service at a glance:

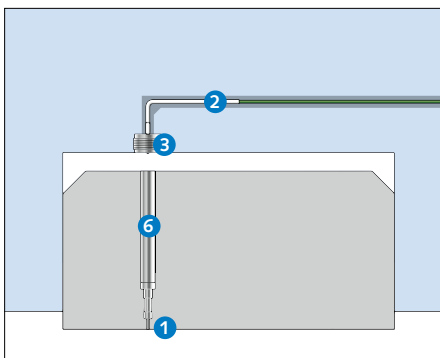
- Consulting
- Support with system commissioning
- Process optimization
- Periodic calibration of sensors used at customers' sites
- Education and training events
- Development services

Installation examples

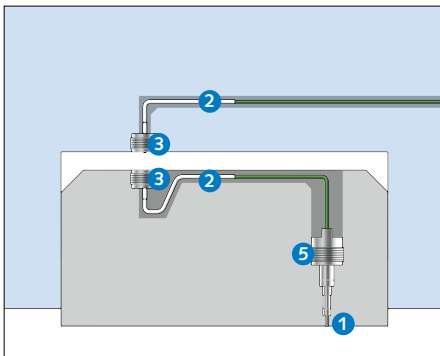
Direct cavity pressure measurement



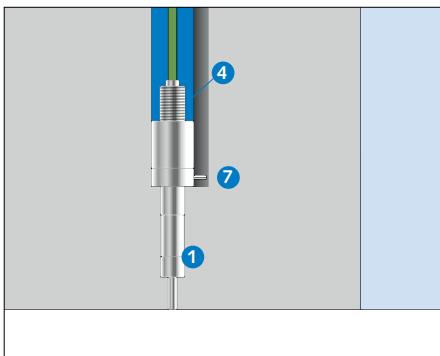
Installation with spacer sleeve and contact elements, cable with protective tube



Installation with conductive spacer sleeve and contact element, cable with protective tube

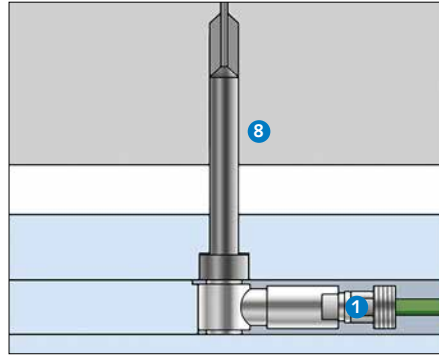


Installation with mounting nut and contact elements, cable with protective tube

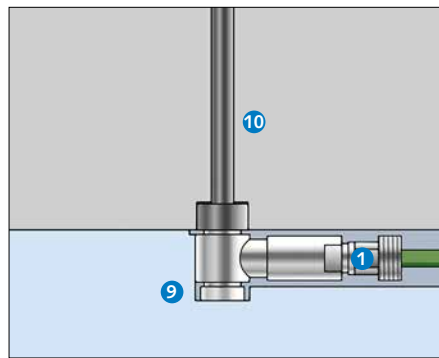


Sensor with machinable front and keyway pin, installation with spacer sleeve

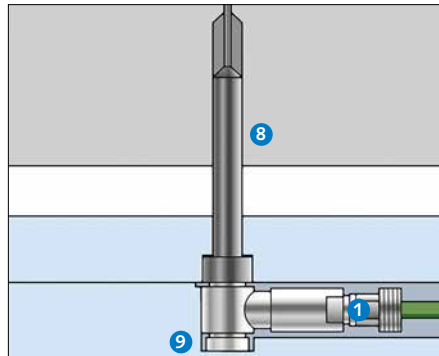
Indirect cavity pressure measurement



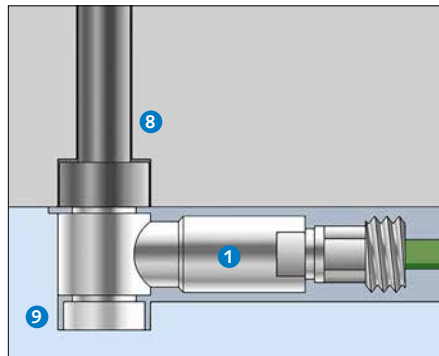
Mounted behind ejector pin in supporting plate



Mounted behind measurement pin in blind hole with thrust washer

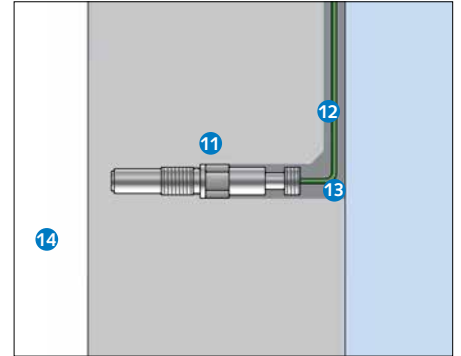


Mounted behind ejector pin in blind hole with thrust washer



Sensor installed with play, mounted behind ejector pin in blind hole with thrust washer

Contact-free cavity pressure measurement



Key

- 1 Sensor
- 2 Protective tube
- 3 Contact element
- 4 Spacer sleeve
- 5 Mounting nut
- 6 Conductive spacer sleeve
- 7 Keyway pin
- 8 Ejector pin
- 9 Thrust washer
- 10 Measurement pin
- 11 Contact-free cavity pressure sensor
- 12 Cable (single-wire or coaxial cable)
- 13 Mounting hole
- 14 Cavity

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