

Sensors and systems

Quality monitoring and process control in injection molding



Absolute Attention for tomorrow's world

Kistler develops solutions for challenges in measurement technology with a portfolio that comprises sensors, electronics, systems and services. We push the frontiers of physics in fields such as emission reduction, quality control, mobility and vehicle safety: our products deliver top performance to meet the standards of tomorrow's world, providing the ideal basis for Industry 4.0. This is how we pave the way for innovation and growth – for our customers, and with our customers.



Kistler: the byword for advances in engine monitoring, vehicle safety and vehicle dynamics. Our products deliver data that plays a key part in developing efficient vehicles for tomorrow's world.



Measurement technology from Kistler ensures top performance in sport diagnostics, traffic data acquisition, cutting force analysis and many other applications where absolutely reliable measurements are required despite extreme conditions.



By supporting all the stages in networked, digitalized production, Kistler's systems maximize process efficiency and cost-effectiveness in the smart factories of the next generation.

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Cavity pressure monitoring during injection molding reduces the costs of quality assurance.

Focusing on process efficiency

100% quality in production – that's 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-effectiveness, 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 detect 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 ensures that there is no disruption to any 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

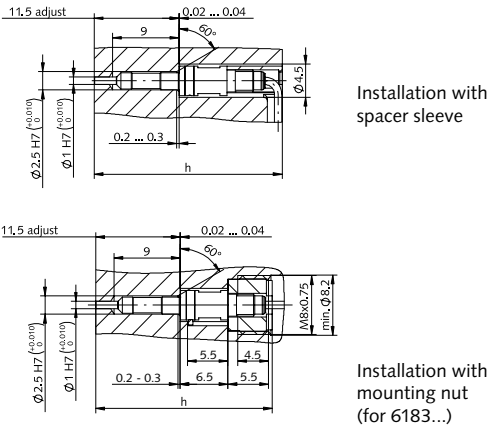


Direct cavity pressure and temperature measurement – installation-compatible sensors

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



Installation sketch



Measuring range			
Temperature (thermocouple Type K)	°C	–	0 ... 450
Pressure	bar	0 ... 2,000	0 ... 2,000
Sensitivity	pC/bar	≈–2.25 (Unisense)	≈–4.8

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	•	at Kistler

Operating temperature

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


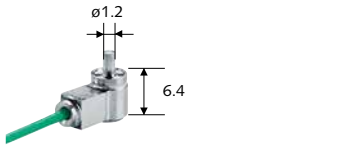

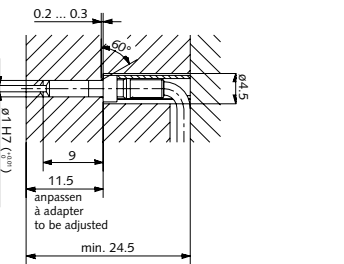
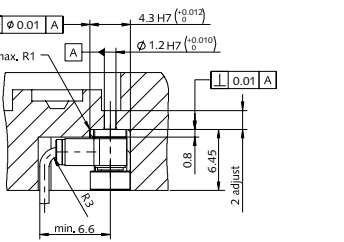
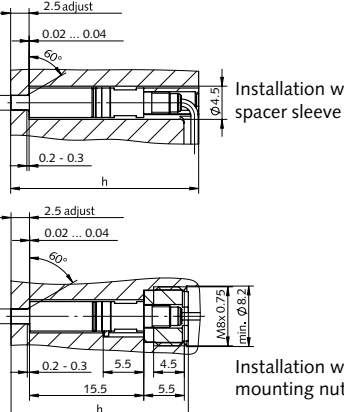
Applications + characteristics	Thermoplastics	Thermoplastics
	smallest front area waterproof (IP67)	

Accessories

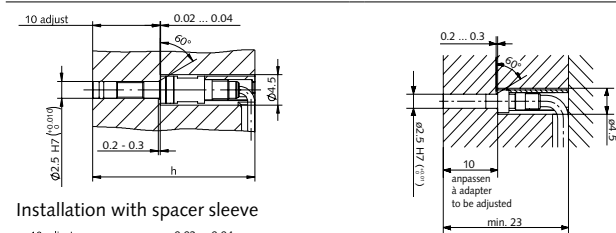
Spacer sleeve	Type	6464A1 ⁸⁾	6464A3 ⁸⁾
Minimum overall height	mm	25.5	36
Mounting nut	Type	6460A1	–
Minimum overall height	mm	24	–
Data sheet: see www.kistler.com		003-450	6188A (000-887)

• Variant available – Variant not available

¹⁾ Standard product ²⁾ Cables can be shortened by user, standard length 1.5/5 m

T 6193B... ¹⁾	1.2 mm p 6184A...	2 mm p 6185A...	2.5 mm p 6182D... ¹⁾
			
	 <p>Installation with thrust washer minimum overall height, see table</p>	 <p>Installation with spacer sleeve</p> <p>Installation with mounting nut</p>	
0 ... 450 — —	— 0 ... 2,000 ≈ -1.2	— 0 ... 2,000 ≈ -2.2	— 0 ... 2,000 ≈ -2.5 (Unisense)
• —	• •	• •	• •
— — — — • —	• • — — — —	• • • • — •	• • • • — •
<450 <450	<450 <200	<450 <200	<450 <200
Thermoplastics Elastomers LSR	Thermoplastics low overall height cable outlet 90°	Thermoplastics insensitive to installation conditions waterproof (IP67)	Thermoplastics small front area waterproof (IP67)
6464A3 ⁸⁾ 24.5 — — 6193B (000-637)	6470 (thrust washer) ⁸⁾ 8.5 6465 ⁸⁾ 11.6 6184A (000-600)	6464A1 ⁸⁾ 25.5 6460A1 24 6185A (003-263)	6464A1 ⁸⁾ 24 6460A1 22.5 003-449

³⁾ Connection to contact element 1712/1714, 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)

[illegible]

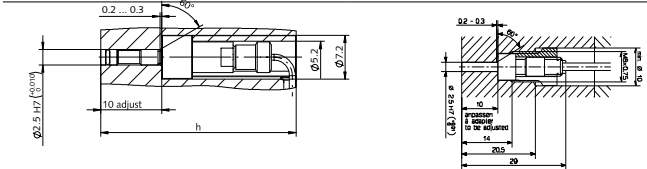
Installation with mounting nut (for 6182C and 6178A only)

-	-
-	-

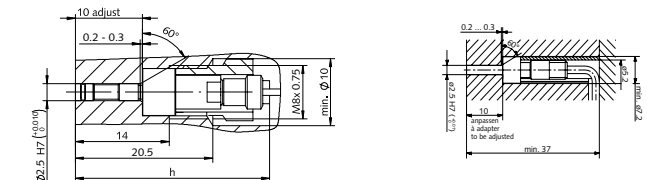
<450	<450
<200	<450

6464A3 ⁸⁾	6464A3 ⁸⁾
33	23
–	–
–	–
6189A (000-536)	6195B (000-637)

2.5 mm



Installation with spacer sleeve
similar to 6189A



Installation with mounting nut

•	—
•	—

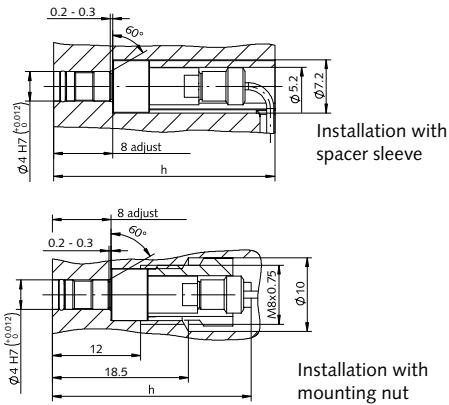
<450	<450
<200	<450

6459	6459
32	37
6457 ⁸⁾	6457 ⁸⁾
29	29
6159A (000-032)	6194B (000-637)

ory delivered with product

4 mm

p	p+T
6157C... ¹⁾	6190C... ¹⁾



–	0 ... 450
0 ... 2,000	0 ... 2,000
–9.4 (Unisense)	≈–9

•	–
•	–

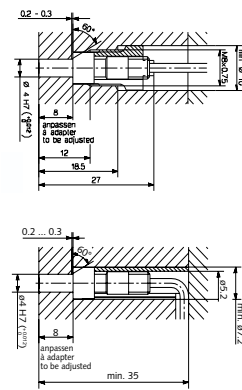
•	•
•	–
•	–
•	–
–	•
•	•

<450	<450
<300	<200

Thermoplastics Elastomers LSR	Thermoplastics Elastomers LSR
-------------------------------------	-------------------------------------

6459	6459
30	37
6457 ⁸⁾	6457 ⁸⁾
27	30
6157C (003-339)	6190C (000-680)

T
6192B...



0 ... 450
–
–

•
–

–
–
–
–
•
–

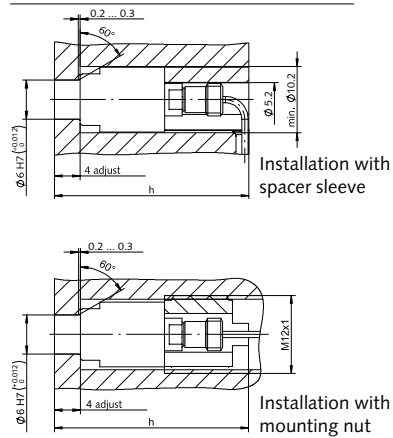
<450
<450

Thermoplastics Elastomers LSR

6459
35
6457 ⁸⁾
27
6192B (000-637)

6 mm

p
6152B... ¹⁾



–
0 ... 2,000
≈–9.4 (Unisense)

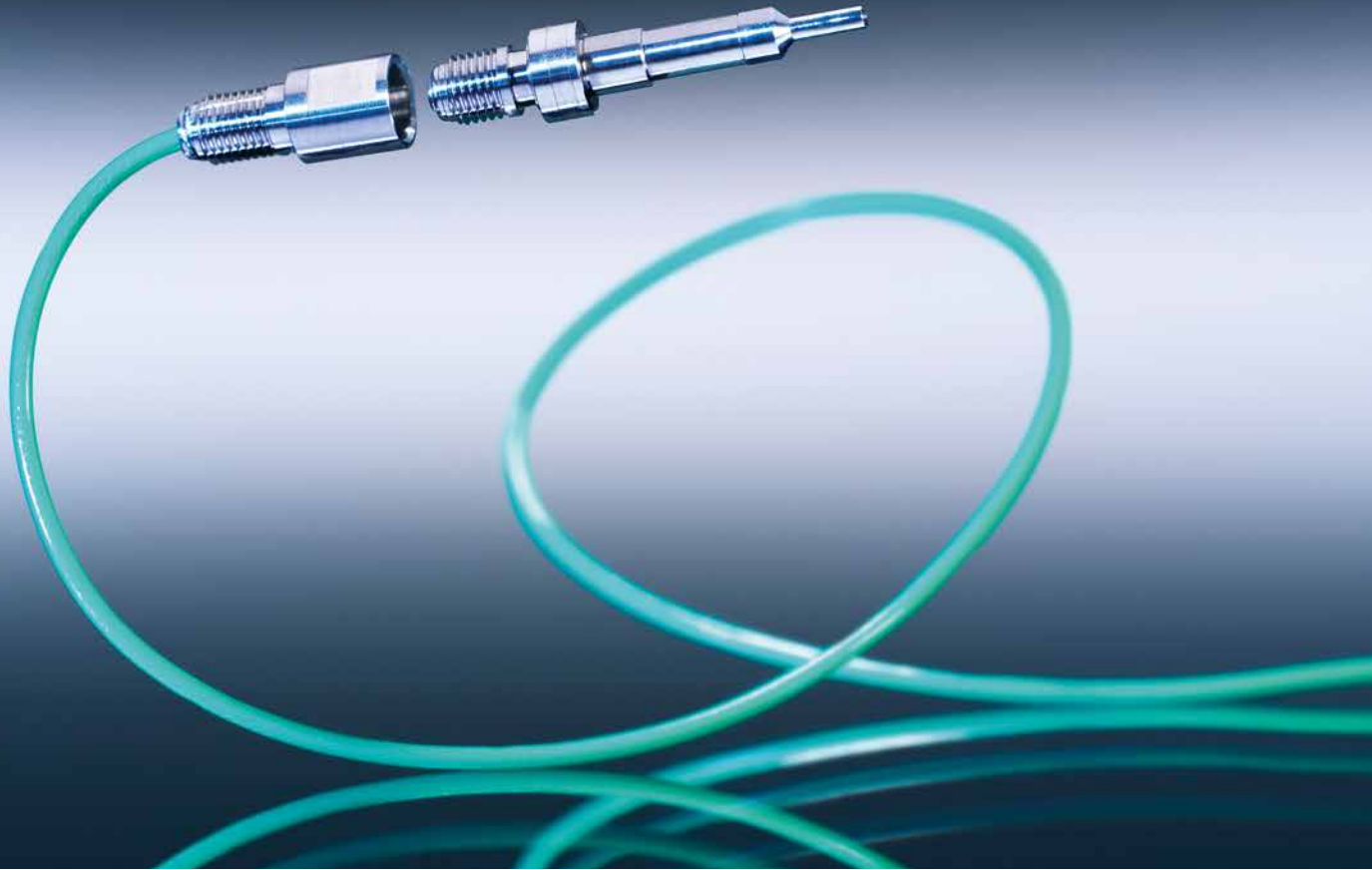
•
•

•
–
•
–
–
•

<450
<300

Thermoplastics Thermo-setting plastics Elastomers LSR
--

6462
32
6453 ⁸⁾
30
6152B (003-397)



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.

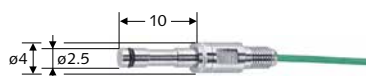
Sensors from Kistler offer virtually unlimited service lifetimes; they deliver highly linear measurement results, and they operate independently of temperature. They deliver high-precision measurements of minimal pressure variations (range up to 2,000 bar) and/or temperature changes of up to 300°C.

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 with or without an adapter. On many sensors,

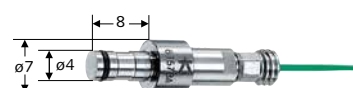
the front can be adapted to the surface of the cavity so that no mark can be seen on the part. As an alternative, the force can be measured behind an ejector pin or measurement pin; it can then be converted into the pressure with the help of the pin diameter. This method is recommended if there is insufficient 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.

Direct cavity pressure and temperature measurement—installation-compatible sensors

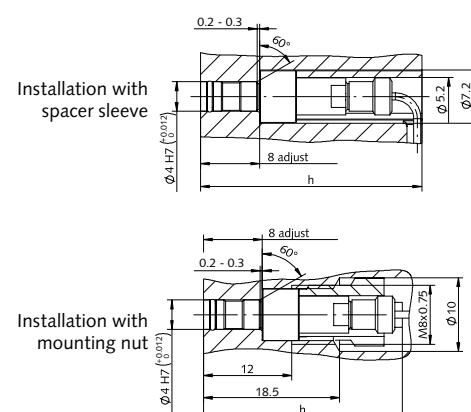
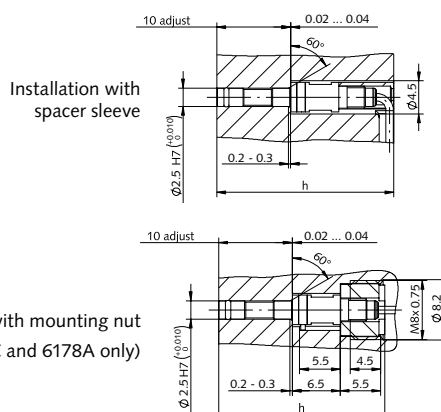
Front diameter	2.5 mm
Measurands (p: pressure; T: temperature)	p
Technical data	Type 6178C...



4 mm
p
6167A...



Installation sketch



Measuring range		
Temperature (thermocouple Type K)	°C	–
Pressure	bar	0 ... 200
Sensitivity	pC/bar	≈–12 (Unisense)
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
Mold temperature	°C	<200

-
0 ... 200
≈ -16.5
-
-
•
-
•
•
-
•
<450
<200

Applications + characteristics	Foam injection molding Compression molding Thermoplastics High sensitivity
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Low-viscosity materials

With diaphragm

Accessories		
Spacer sleeve	Type	6464A1 ⁸⁾
Minimum overall height	mm	21
Mounting nut	Type	6460A1
Minimum overall height	mm	22.5
Data sheet: see www.kistler.com		6178C (003-448)

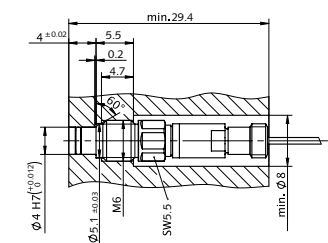
6459
30
6457 ⁸⁾
27
6167A (000-033)

• 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)

p
6165A...



—
0 ... 200
≈-4.0

—
—

•
—
•
•
—
•

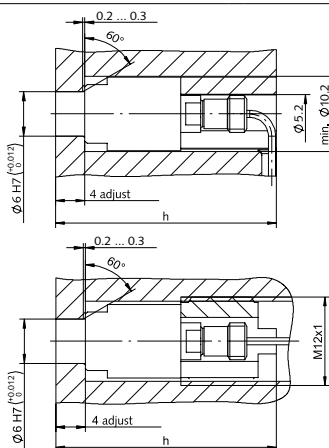
<450
<200

Low-viscosity materials SMC/transfer molding
Welded front gap

—
30
—
27
6165A (000-033)

6 mm

p	p
6162A...	6163A...



—	—
0 ... 200	0 ... 1,000
≈-18.5	≈-3.9

—	—
—	—

•	•
—	—
•	•
—	—
—	—
•	•

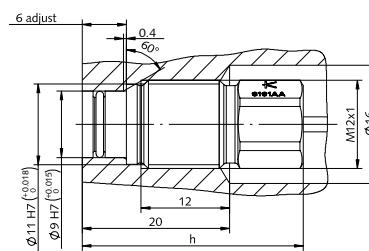
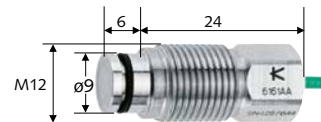
<450	<450
<200	<200

Fiber-reinforced composites SMC/RTM	Fiber-reinforced composites High-pressure RTM Composites
Welded front gap	Welded front gap

6462	6462
32	32
6453 ⁸⁾	6453 ⁸⁾
30	30
6162A (000-888)	6163A (000-889)

9 mm

p
6161A... ¹⁾



—
-0.9 ... 200
≈-18.4

—
—

—
—
•
—
—
•

<450
<200

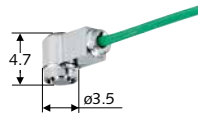
Fiber-reinforced composites SMC/RTM
Welded front gap

—
30
—
—
6161A (003-053)

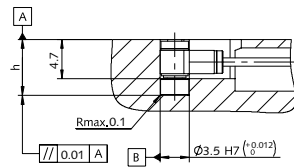
³⁾ Connection to contact element 1712/1714B, custom length (l_{min} = 0.1 m/l_{max} = 1.5 m) ⁴⁾ l = 0.2/0.4/0.6/0.8 m ⁵⁾ Custom length (l_{min} = 0.1 m/l_{max} = 5 m)
⁸⁾ Accessory delivered with product

Indirect cavity pressure measurement

Front diameter	3.5 mm
Technical data	Type 9210A... ¹⁾



Installation sketch



h = Minimum overall height, see table

Measuring range

Force ²⁾	kN	0 ... 0.25
Overload	kN	0.3
Sensitivity ²⁾	pC/N	≈ -10

Cable technology

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

Applications + characteristics

All injection molding processes

Smallest force sensor
Cable output at the side
Especially for molds with modular structure

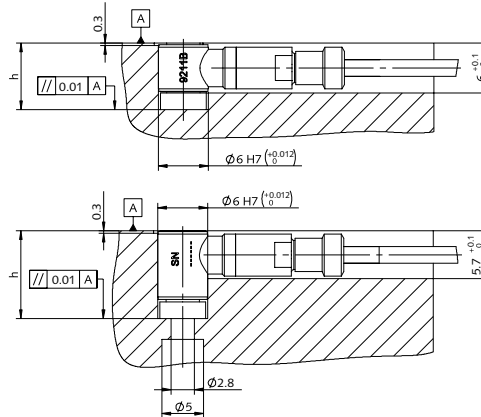
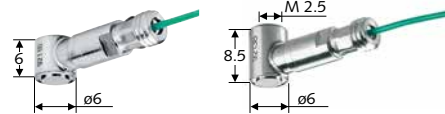
Accessories

Thrust washer	Type	9406 ⁴⁾
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Main installation dimensions

Dimensions	mm	3.5
Actual height	mm	4.7
Minimum overall height	mm	6.7
Data sheet: see www.kistler.com		9210A (000-601)

6 mm	
9211B... ¹⁾	9213B...



0 ... 2.5	0 ... 2.5
3	3
≈ -4.4	≈ -4.4

•	•
•	•
•	•
-40 ... 200	-40 ... 200

All injection molding processes

Especially for multi-cavity molds

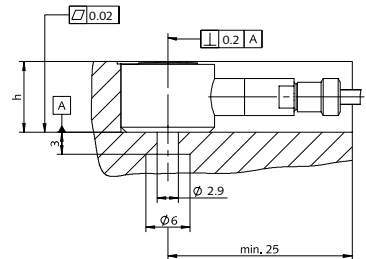
All injection molding processes

With M2.5 fastening thread, especially for multi-cavity and small molds

9411 ⁴⁾	9413 ⁴⁾
--------------------	--------------------

6	6
6	8.5
8	10.5
9211B (000-555)	9213B (000-556)

12.6 mm
9204B... ¹⁾



0 ... 10
12
≈ -1.6

•
•
•
-40 ... 200

All injection molding processes

With M2.5 fastening thread

–

12.6
9.5
9.6
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

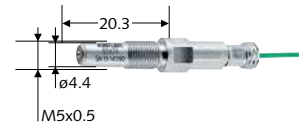
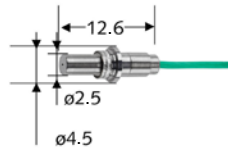
³⁾ Cables can be shortened by the user, standard length 1.5/5 m

⁴⁾ Accessories delivered with product

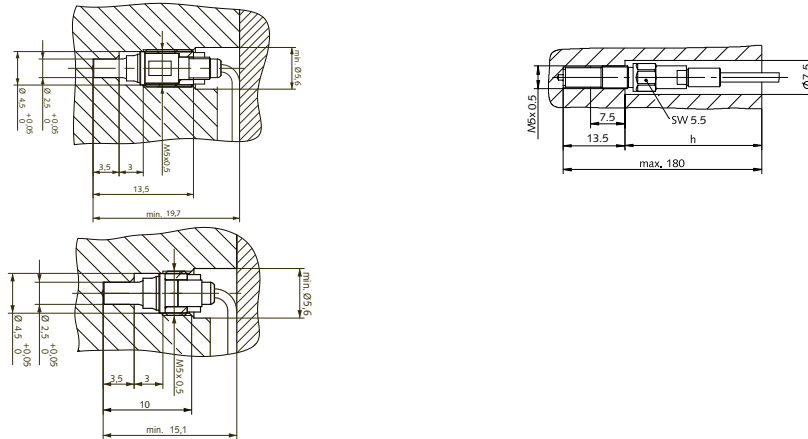
⁵⁾ Elongation is proportional to the cavity pressure

Contact-free cavity pressure measurement

Longitudinal measuring pin – thread		M5	M5
Technical data	Type	9239A...	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	pC/ $\mu\epsilon$	≈ -3.2	≈ -8.6

Cable technology

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

Applications + characteristics

Optical components
Class A surfaces
Smallest design for limited installation space

Measurement of the compression of the steel caused by the cavity pressure

Optical components
Class A surfaces

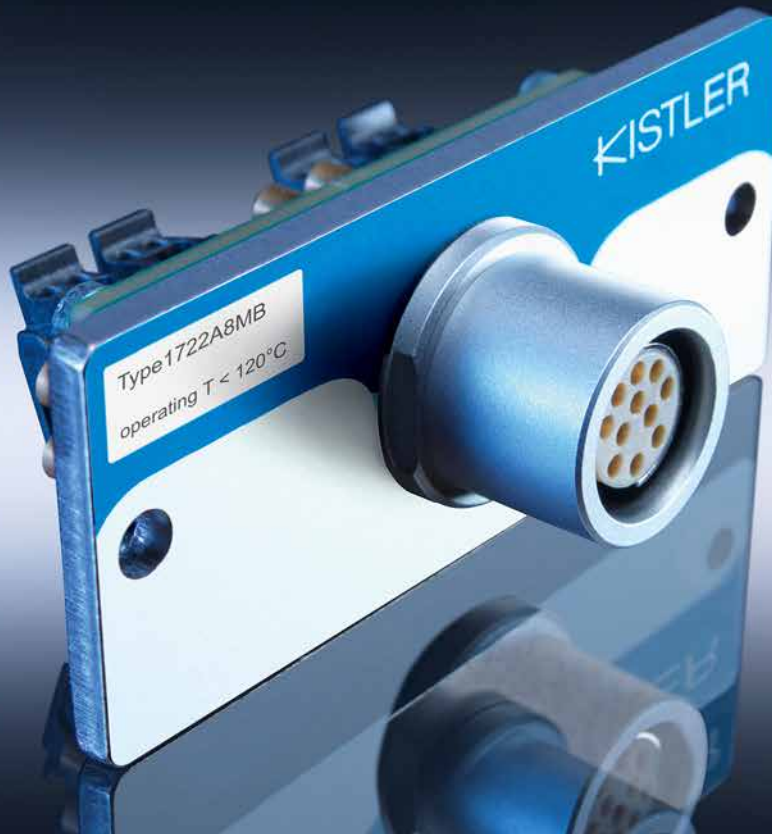
Measurement of the compression of the steel caused by the cavity pressure

Accessories

Hollow bolt	Type	9497A1/9497A2	–
Reamer	Type	–	1300A79
Socket key AF inside	mm	5	5.5
Preload tester	Type	5991	5991

Main installation dimensions

Minimum overall depth	mm	15.1	39.6
Distance to cavity wall	mm	2–3	3–5
Data sheet: see www.kistler.com		9239A (003-403)	9247A (000-143)



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 mean that the structure of injection molds is becoming more complicated. But at the same time, molds should be designed so that they are easy to maintain and disassemble. Kistler has consistently responded to these changes with its connection technology for pressure and temperature sensors.

Single-wire and multi-channel cable technologies from Kistler ensure accurate and reliable transmission of the sensor signals 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 flexibly installed in drilled channels and shortened as required.

Kistler's single-wire or coaxial technology makes it possible to connect as many as eight different sensors in molds with multiple cavities or with several sensors per cavity. This is a

space-saving method of connecting them all to the process monitoring system, and it 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 greatly simplifies mold installation as compared to 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, which greatly simplifies drilling of the installation bore for the sensor. A contact element will be 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)	ø12×9.5 (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
Sensor connection		M3 ³⁾	M3
Contact element		1712C1	1712C1
Length	mm	40	80
Operating temperature range	°C	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⁾ /M4 ²⁾	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 ... 300	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 2205A...	6190CAG1 without connector for use with Type 2205A...
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 sensors		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 sensors		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	1667B... 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 ... 200	0 ... 200	0 ... 200	0 ... 200
Covering		Fluoro-polymer	Steel	Fluoro-polymer	Steel

Cable technology: contact temperature sensors

Multi-channel temperature amplifier for temperature sensors without connector



Technical data	Type	2205A...
Measuring range	°C	0 ... 200 or 0 ... 400
Thermocouple	Type	K/J/N
Number of channels		2 or 4
Operating temperature range	°C	0 ... 125
Characteristics	2- or 4-channel temperature amplifier for installation in molds for thermocouples, Types K/J/N.	
Application	Connection of up to 4 pressure/temperature sensors (temperature signal) or 4 temperature sensors to ComoNeo Type 5887A... and CoMo Injection Type 2869B... .	
Accessories	External housing Type 5700A23, installation support Type 1300A20	
Data sheet: see www.kistler.com	2205A (000-591)	

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...
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 (lmin = 0.3 m/lmax = 20 m)

³⁾ Custom length (lmin = 0.2 m/lmax = 5 m)

⁴⁾ Custom length (lmin = 0.1 m/lmax = 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 cavity pressure-based 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.

ComoNeo is a compact system, designed to meet industry's needs; it is based on a process-oriented operating philosophy and fits flexibly into a variety of 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.

Further system upgrade options are i.e. ComoNeoMULTIFLOW (for automatic hot runner balancing) or ComoDataCenter, the central database.

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 and process visualization, monitoring and control in injection molding. To visualize the user interface, we recommend the capacitive Multi-touch display, Type 5637A1 (display area: 15.6") that has been 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	ComoDataCenter database, Type 2829D...				
Data sheet: see www.kistler.com	5887A (003-231)				

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. The ComoNeo user interface is optimized for the display format in compliance with the latest usability standards and guidelines. Furthermore, the display is fitted with a USB connection so that ComoNeo cycles, data and configurations can easily be exported and imported.	
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)	

ComoNeo 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



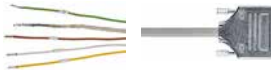
Technical data	Type	1500B42A... ¹⁾	1500B43A... ¹⁾
Connection		Bare ends	Bare ends
Length	m	0 ²⁾ /7/sp ³⁾	0 ²⁾ /7/sp ³⁾
Use		Connection to handling system or scrap gate (digital inputs/outputs, Type 5887A...), 15-pole	Connection to machine signals (digital inputs/outputs, Type 5887A...), 9-pole

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

Cable for thermocouple amplifier, Type 2205A ...



Illustrated: Type 1457A1A...

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

Supply for ComoNeo



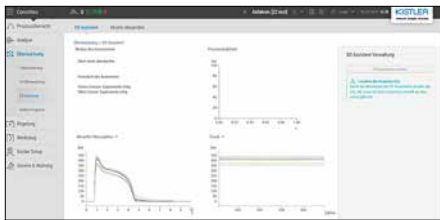
Technical data	Type	5781A5
Type		Plug-in power supply
Voltage (input)		100 ... 240 VAC
Voltage (output)	VDC	24
Connection		Mains plug
Use		Supply from mains, 100 ... 240 V

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

Add-on products for ComoNeo

Assistance systems

ComoNeoGUARD



Key characteristics	ComoNeoGUARD is a tool that generates and positions the monitoring boxes for good/bad evaluation itself – guiding users quickly and seamlessly to the scrap limits.
Application	By using the Assistant for user-prompted generation of the EO limits, users are guided through the procedure for defining the scrap limits.
Data sheet: see www.kistler.com	Assistance system included in standard scope of delivery. 5887A (000-231)

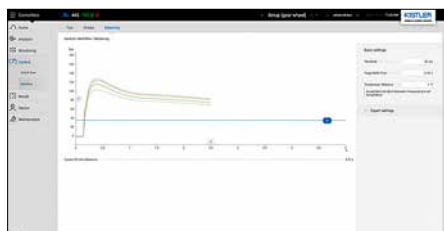
ComoNeoRECOVER



Key characteristics	The Restart module has been integrated into the system since ComoNeo Version 2.0. The purpose of this module is to reproduce the quality of an established injection molding process identically on a new machine.
Application	ComoNeoRECOVER makes it possible for users to transfer pre-established processes 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 (000-231)

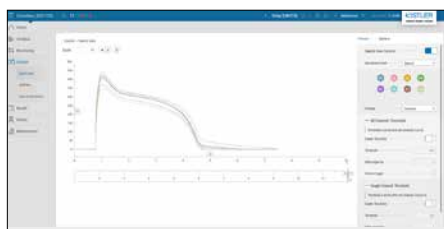
Process control systems

ComoNeoMULTIFLOW hot runner balancing, Type 2809A3



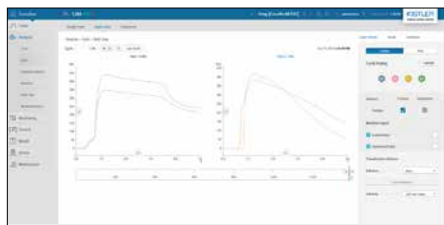
Key characteristics	Software for automatic optimization of hot runner temperatures. Its purpose: to fill all cavities of a multi-cavity mold synchronously and evenly. Closed control loop based on analysis of cavity pressure curves and automatic determination of the setpoint temperatures, and transfer 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 (000-231)

ComoNeoSWITCH



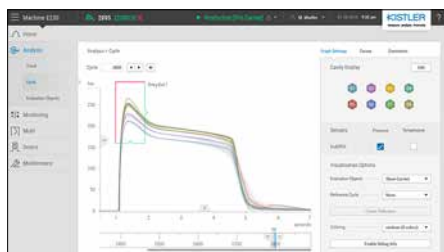
Key characteristics	ComoNeoSWITCH actively provides machine feedback. This allows ideal timing for the switchover from speed control to pressure control in response to cavity pressure.
Application	The automatic switchover control can be used in two different ways. With the first option, setup is manual; with the second, it is fully automatic.
Data sheet: see www.kistler.com	5887A (000-231)

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 (000-231)

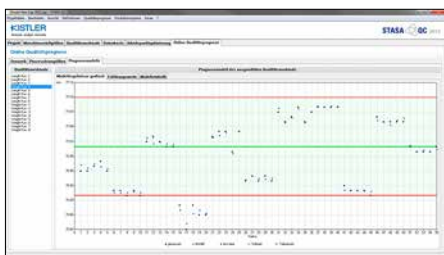
ComoNeoCOMPOSITE



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. The pressure curve is therefore indispensable as a quality assurance tool.
Data sheet: see www.kistler.com	5887A (000-231)

Prediction systems

ComoNeoPREDICT



Key characteristics	<p>Kistler's online quality prediction 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. Finally, online quality prediction 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.

ComoDataCenter

ComoDataCenter Type 2829D...



Key characteristics	<p>Database and Curve Viewer to access and analyze process data acquired with ComoNeo¹⁾.</p> <p>Data transfer via Ethernet from ComoNeo. Analysis using comfortable user interface. Data export into other systems via open database structure. One standard database is included in the scope of delivery. However, existing databases can also be used.</p>
Application	<p>Process analysis, production analysis and efficiency evaluation of all production orders monitored with ComoNeo Type 5887A. Insight into ongoing production, storage, display and analysis of the process and quality information generated by ComoNeo. Analysis based on cycles or trends of significant process values. In addition, there are statistical options for the overall evaluation of production, e.g. machine utilization or efficiency.</p>
Data sheet: see www.kistler.com	2829D (003-175)

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



Kistler's range includes the right accessories for installing the sensor and for verification or 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

Calibration and test equipment

Preload tester



Technical data	Type	5991
Measuring range	pC	±100,000
Output voltage	V	0 ... ±1
Description	Battery-operated preload tester for charge measurements	
Use	To measure and test the preload on contact-free measurement sensors. Output for the monitoring function.	
Data sheet: see www.kistler.com	5991 (000-340)	

Sensor tester for cavity pressure sensors



Technical data	Type	5495C...
For sensors	Cavity pressure and temperature sensors	
Description	Battery-operated handheld tester with test pin and connection cables to test sensor sensitivity, insulation resistance of cables and testing 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 (see page 26).

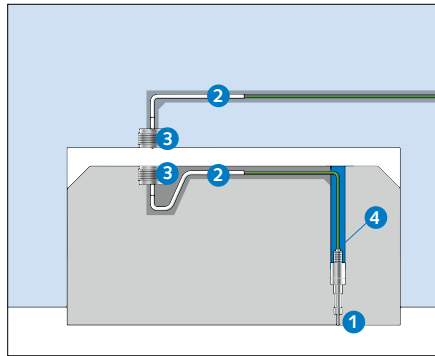
No matter what your assembly problem looks like – we have the right solution for you. Eight typical examples taken from practice are shown on the next page.

Kistler service at a glance:

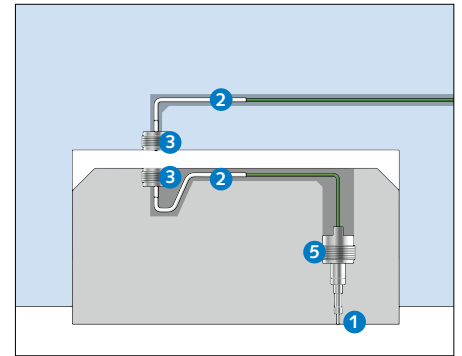
- Consulting
- Support with system commissioning
- Process optimization
- Periodic calibration of sensors used at customers' sites
- Education and training events
- Development services

Installation examples

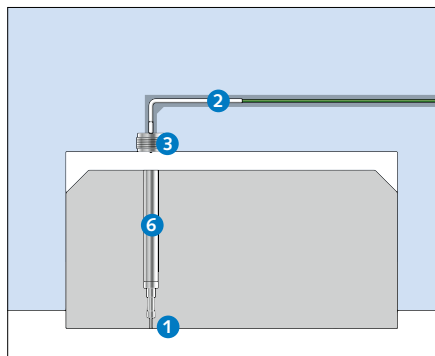
- ❶ Sensor
- ❷ Protective tube
- ❸ Contact element
- ❹ Spacer sleeve
- ❺ Mounting nut
- ❻ Conductive spacer sleeve
- ❼ Keyway pin



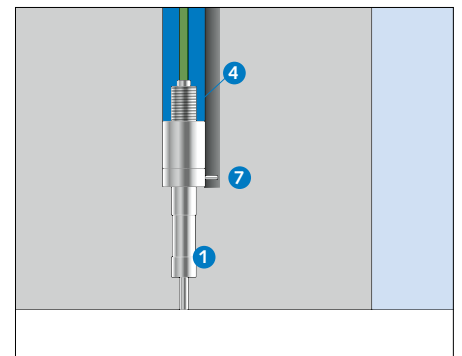
Installation with spacer sleeve and contact elements, cable with protective tube



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

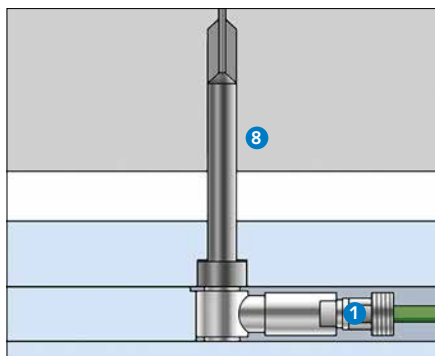


Installation with conductive spacer sleeve and contact element, cable with protective tube

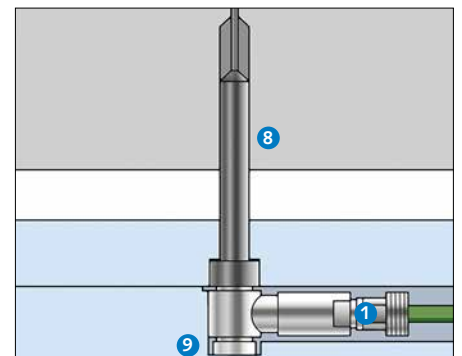


Sensor with machinable front and keyway pin, installation with spacer sleeve

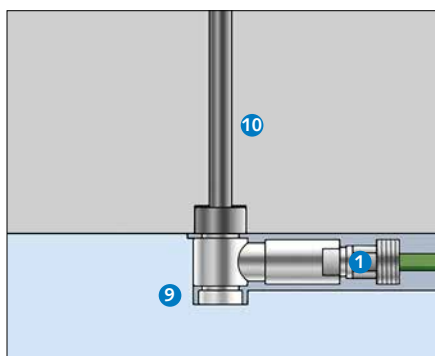
- ❶ Sensor
- ❸ Ejector pin
- ❹ Thrust washer
- ❺ Measurement pin



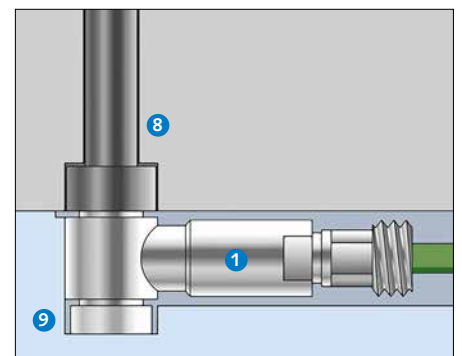
Mounted behind ejector pin in supporting plate



Mounted behind ejector pin in blind hole with thrust washer



Mounted behind measurement pin in blind hole with thrust washer



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

At our customers' service across the globe

Thanks to Kistler's global sales and service network, we are always close to our customers. Approximately 2,000 employees at 61 locations are dedicated to the development of new measurement solutions and offer customized on-site support of individual applications.



Our representatives are here to help
Whether you would like a consultation or require support during installation – our website provides the contact information for your local representative.



Data sheets and documents
Use our Online Search to download data sheets, brochures or CAD data.



Education and training events
Education and training courses, during which our sensors and measuring systems are explained by Kistler experts, are the most efficient way for you to obtain the required user knowledge.



KISTLER
measure. analyze. innovate.

Increased cost efficiency with cavity pressure-based systems

For more cost-effective production: manufacturing processes based on cavity pressure

Process monitoring and control
Efficiency in industrial injection molding production

Plastics processing
Optimized process transparency for injection molding

Composites
Process transparency and quality assurance in the production of fiber-reinforced composites

Find out more about our applications:
www.kistler.com/applications

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measure. analyze. innovate.