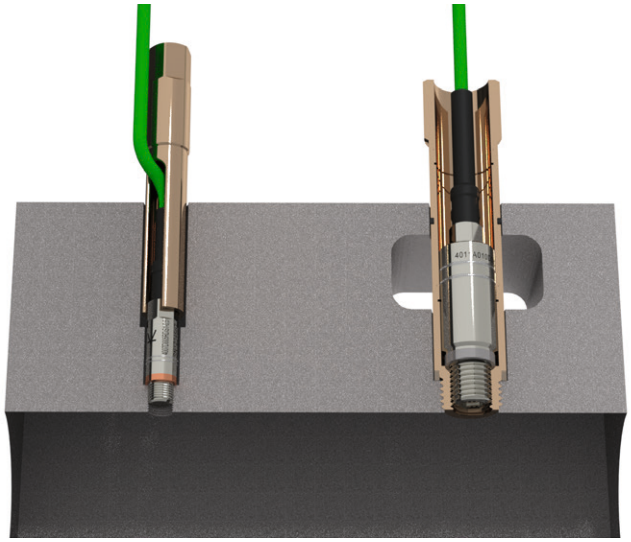
Instruction Manual



Piezoresistive pressure sensors
Types 4007...
4011... *
4012...
4017... *
4043…
4045...
4073…
4075...
4049...
4065...
4067... *

* Standard version (non-Ex-version) and explosion-proof version (Ex-ec)

CE

Ex

IECEx

RoHS

002-858e-04.25

KISTLER
measure. analyze. innovate.

Foreword

We thank you for choosing a Kistler quality product distinguished by technical innovation, precision and long life.

Information in this document is subject to change without notice. Kistler reserves the right to change or improve its products and make changes in the content without obligation to notify any person or organization of such changes or improvements.

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1. Introduction

Please take the time to thoroughly read this instruction manual. It will help you with the installation, maintenance, and use of this product.

To the extent permitted by law Kistler does not accept any liability if this instruction manual is not followed or products other than those listed under Accessories are used.

Kistler offers a wide range of products for use in measuring technology:

- Piezoelectric sensors for measuring force, torque, strain, pressure, acceleration, shock, vibration and acoustic-emission
- Strain gage sensor systems for measuring force and moment
- Piezoresistive pressure sensors and transmitters
- Signal conditioners, indicators and calibrators
- Electronic control and monitoring systems as well as software for specific measurement applications
- Data transmission modules (telemetry)

Kistler also develops and produces measuring solutions for the application fields engines, vehicles, manufacturing, plastics and biomechanics sectors.

Our product and application brochures will provide you with an overview of our product range. Detailed data sheets are available for almost all products.

If you need additional help beyond what can be found either online or in this manual, please contact Kistler's extensive support organization.

2. Important information

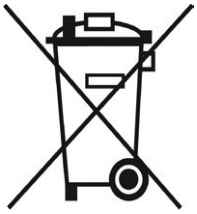
2.1 Protection and standards

The piezoresistive pressure sensor 4011AE..., 4017AE... and 4067EE… complies to CE and the following provisions of directives:

ISO 9001
2011/65/EU (ROHS)
2014/34/EU (ATEX Directive)

The following harmonized Ex-standards were applied:
EN IEC 60079-0:2018 / IEC 60079-0:2017
EN 60079-7:2015 / IEC 60079-7:2017

2.2 Disposal instructions for electronic equipment



Do not discard old electronic devices in municipal trash. For disposal at end of life, please return this product to an authorized local electronic waste disposal service or contact the nearest Kistler sales office for return instructions.

2.3 Software upgrades and updates

Kistler may from time to time supply upgrades or updates for embedded software. Such upgrades or updates must always be installed.

Kistler declines any liability whatsoever for any direct or consequential damage caused by products running on embedded software which has not been upgraded or updated with the latest software supplied.

2.4 Personal safety warnings

It is essential to note the following information to ensure your personal safety when handling these measuring chains in hazardous areas.

Labels and markings are provided to assist the system integrator in choosing appropriate interface equipment, determining safe use conditions and identifying recommended installation procedures. The format of these labels is based on the standards that dictate safe use and environmental compliance in a variety of regions and regulated settings.

WARNING: ELECTROSTAIC CHARGING HAZARD

Risk of personal injury or equipment damage

Potential for electrostatic charging hazard

Do not separated when energized

Remove power before service

Installations and maintenance activities in potentially hazardous areas must only be performed after ensuring that the area is free of hazardous materials, atmospheres and conditions.

The following situations could cause a spark sufficient to cause an explosion:
Potential of electrostatic discharge on plastic components, or removal or placement of an energized connection.

All Ex-relevant specifications have been adopted from the EU type examination and Ex-certificates in these operating instructions.

The special conditions for installation in hazardous areas must be observed in particular!

If required, the Ex-certificates can be ordered at the manufacturer.

The IECEx certificate can be viewed online at www.iecex.com

3. Preface

Piezoresistive low pressure sensors are very reliable solutions for gas exchange analysis. They are used for precise absolute pressure measurements in low pressure indication. The piezoresistive sensors can be applied direct in the intake of the engine or in the exhaust using a water-cooled adapter.

Piezoresistive high pressure sensors are essential where static and dynamic pressure measurements are required. They are ideal for accurate frequency analysis of pressure profiles in injection systems or general pressure measurements in hydraulic systems.

Fig. 1: Piezoresistive pressure sensors

3.1 Technical data and documentation

Data sheets are available on www.kistler.com

3.2 Principle of operation

The sensor measuring element is a Wheatstone bridge semiconductor. The applied pressure is changing the resistance of the Wheatstone bridge and its voltage output, which is proportional to the pressure.
In sensors of Type 4007 with Direct Chip Exposure (DCE) the pressure acts on the measuring element directly. The element is covered with a protective coating to protect it from the measurement media and increase durability.

The sensor Types 4011, 4017 and 4049... use media separated technology. The pressure acts via an oil-filling onto the measuring element – this is separated from the media by a steel diaphragm.

The sensor Types 4065 and 4067 are based on block sensor technology. The pressure acts on a steel diaphragm, which then applies a force onto a silicon block measuring element.

Fig. 2: Cross section of piezoresistive sensors (left: DCE; middle: oil-filled; right: block technology)

3.3 Media compatibility

The DCE piezoresistive sensors have limited media compatibility. The sensor Type 4007 has been successfully tested with following medias: gasoline, diesel, E15 (race fuel), engine oil (0W-40), brake fluid (DOT 4), PVE oil (air condition), air and diesel exhaust fluid (AUS 32/AdBlue).

Media-separated sensors can be used with fluids and gases compatible with stainless steel.

For measuring pressure in combustion engine exhaust paths it is recommended to use media separated sensors.

3.4 Requirements to cooling

The use of Kistler cooling system Type 2621G for cooled sensors is recommended. It is capable of providing cooling for several piezoresistive sensors as 4049 (depending on the heat load created by the application) with an optimum quantity of coolant, at the right pressure and constant temperature. This facilitates measurements with absolute reproducibility and best lifetime of the piezoresistive sensors.

Coolant temperature:
- 50 ±3°C

Coolant flow rate:
- 0.3 to 0.5 l/min

Coolant pressure:
- 1.5 ±0.2 bar

Cooling fluid specification
- Demineralized / distilled water according to norm VDE-Norm 0510
- Cooling fluid additive GLYSANTIN G30, G40 or G65 (do not mix with each other)
- Mixing ratio: The concentration of GLYSANTIN must be within 33% (min.) and 60% (max.)
- For further details see operating instructions of Temperature conditioning unit type 2621

Never connect the piezoresistive sensor to an open cooling system with water from the main supply. This water source contains calcium and lime deposits, which will accumulate inside the sensor, impacting the cooling and in the worst case, blocking the cooling channels inside the sensor.

3.5 Precautions for water cooling

The cooling system flow must be active before the engine is started. The reason for this is that exhaust gases will heat up the sensor very rapidly above its maximum temperature limit. Further, the sensor may be damaged when low temperature coolant enters the hot sensor (thermal shock effect).

Keep the cooling system on until the temperature of the installation position of the sensor in the engine cooled down to less than 100°C.

If the cooling system fails and cannot work normally, the combustion engine and the cooling system should be shut down immediately to prevent the cooling system from working intermittently, thus damaging the sensor. To continue using the cooling system, stop the engine until the temperature of the sensor drops to approximately the same temperature as the coolant.

During the operation of the cooling system, it must be ensured that the hoses and tubes are not constricted – free flow of the coolant is essential. It is recommended to use original accessories cooling hoses from Kistler (refer to the data sheet of the sensor).

Before storing the sensor, empty the coolant from the sensor, flush it with demineralized water and blow it out very carefully with compressed air.

*Glysantin BASF G30/G40/G48 is registrated trademark of BASF

4. Operation

4.1 Operation in non-hazardous areas

In non-hazardous areas the sensor Types without Ex-certification can be used.

4.2 Operation in hazardous areas

4.2.1 Important Information

In addition to the instructions for proper operation in the previous sections, the following instructions must be followed for installation and operation in potentially hazardous areas.

WARNING: HAZARDOUS ENVIRONMENT

Risk of explosive atmosphere!

A potentially explosive atmosphere occurs where there is a combination of flammable substances and oxygen. Oxygen is usually present as a component in the ambient air, which is why the warning of potential explosion hazards must be considered very seriously. Prevent corrosion and failure by checking that all components are compatible as described in the installation instructions.

Do not connect or disconnect the equipment when energized unless the area is known to be non- explosive.

IMPORTANT!

The sensor must not be modified in any way. Otherwise, all Ex-approvals will become invalid.

4.2.2 Instructions for operation in hazardous areas

- The Ex-certified sensor can be used only in zone 2.
- The sensor can be installed in the hazardous Ex-zone
- The plug (connector) is not to be installed in the hazardous Ex-zone
- All electrical connections must be properly connected
- No modifications are permitted on any equipment that is certified for use in hazardous areas
- Defective sensors must be returned to the manufacturer.

4.2.3 Sensor execution

For applications in hazardous areas the sensor versions Type 4011AE…, Type 4017AE... or Type 4067EE… (certified "Ex ec") must be used.

4.2.4 Product Marking

The Ex-certified sensors are labeled with the ATEX and IECEx designation.

Kistler Intrumente AG, Switzerland
Type 40XX…
SN: / Date of Mfg: XXXXXXX / XX.XXXX
Rated 24 VDC, 50 mW –40 ≤ Ta ≤ +180°C

ATEX and IECEx: Increased safety "Ex ec":

II 3G Ex ec IIC T3 Gc
SEV 19 ATEX 0318X

IECEx Ex ec IIC T3 Gc
IECEx SEV 19.0041X

Specific conditions of use:

- Pressure sensors are to be protected against impact during the installation, operating and maintenance.
- The plug is not to be installed in the hazardous Ex zone.
- The device must be only installed in an area with a minimum degree of pollution 2.
- The sensor must be earthed over the installation.
- The sensors can be used only in the rated ambient temperature ranges (°C):
  - for Types 4011AExxx; 4067EExxx:
    –40< Tamb < +180°C
  - for Types 4011AE250; 4011AE500:
    Tamb –40°C … 140°C

Particular recommendation:
Do not disconnect cable if power is on! Separate only in non-hazardous area.

4.2.5 Installation of the Sensor (Ex-ec) for operation in zone 2

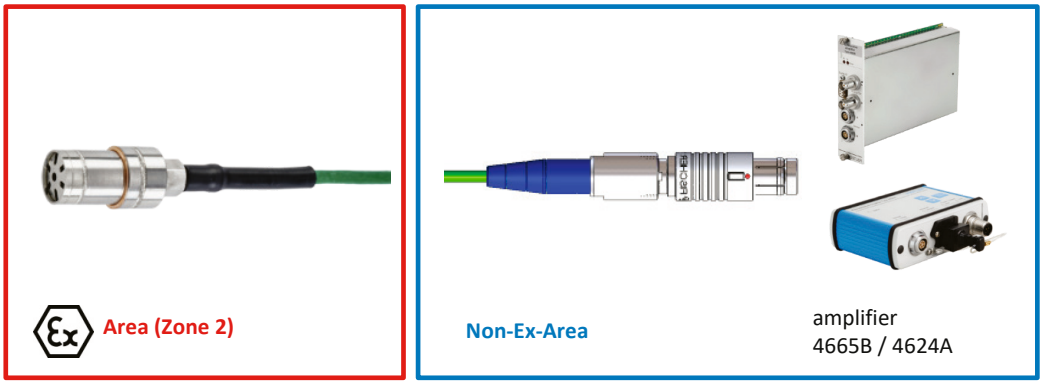


Fig. 3: Installation of the measuring chain for Zone 2 (example: sensor Type 4011AE….)

The maximal electrical values of the sensors are:

Ui	VDC	24
I	mA	1...4
Pmax	mW	50

4.3 Operation in hydrogen environments

For applications with hydrogen the sensor type 4012… can be used. The sensor must be handled with care and only by qualified personnel. The use of the sensor is only permitted with appropriate hydrogen safety precautions (risk of failure).

It is essential to regularly monitor the tightness of the sensor and adapter sealings. The tightening torque must be maintained and ensured in accordance with the specifications. To ensure optimal tightness, functionality, and durability, it is strongly recommended to replace the sealing ring after each installation.

To avoid irreversible damage to the sensor and further consequential damage, the sensor signal must be constantly monitored (e.g., regular testing of the zero measurand output ZMO, stability of zero-point ZMO_{stab}, etc.). If a sensor does not provide any output signal or shows implausible measurement data, the sensor must be checked immediately and replaced if necessary.

In critical applications, it is recommended to use a redundant sensor for pressure measurement and monitoring. The sensor may not be used to fulfill safety-related functions.

5. Installation of the piezoresistive sensor

5.1 General information

The accuracy of a measurement and quality of the data are highly dependent on careful installation of the piezoresistive pressure sensor.

The sensor bore must be machined to the specified tolerances.

The specified tightening torque of the piezoresistive sensor must be observed.

Refer to the values and instructions in the data sheet of the sensor.

5.2 Direct installation

Direct installation requires the least installation space. A direct installation is only possible if it is not necessary to cross any water or oil galleries in the cylinder head casting.

In case of repeated mounting and dismounting of a sensor, there is the risk of damaging the sealing mechanism and thread of the mounting bore. Typically, the cylinder head material is softer than that of the sensor. Before mounting the sensor in the bore, also to facilitate dismounting it at the end of the test, it is recommended to coat thread of the sensor with high temperature resistant grease (e.g. MOLYKOTE HSC plus or Metaflus 70–81). Do not apply any grease on the diaphragm.

5.3 Installation with sleeve

In the case where the point to be measured can only be accessed via an oil or cooling water gallery, a mounting sleeve is necessary to provide adequate sealing for the installation. At the front, the sleeve is screwed and sealed with a sealing ring. At the rear, sealing is achieved using O-rings and/or Loctite compound (Loctite 648 for shaft-hub, Loctite 290 for thread).

Benefits of using a mounting sleeve:
- Precise sensor bore inside the sleeve
- Machining of the bore for the mounting sleeve is simplified
- The mounting sleeve has the required strength to ensure that the sealing part can resist wear. This allows the sensor to be mounted and dismounted repeatedly without restrictions
- When removing the sensor, the mounting sleeve prevents cooling fluid from leaking into combustion chamber

Disadvantages of using a mounting sleeve:
- Can influence on the cylinder head cooling performance (depending on size and position of the sleeve with respect to the water cooling channels)

5.4 Installation examples

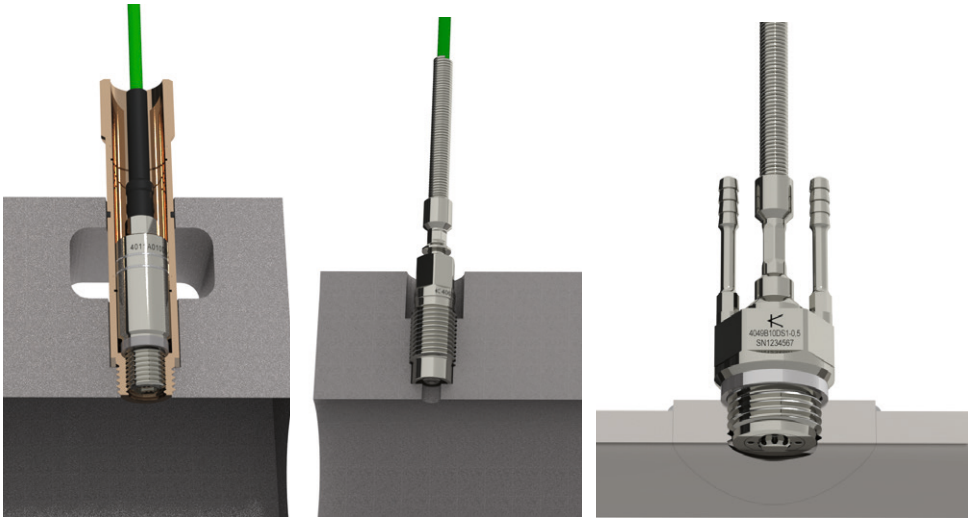


Fig. 4: Left: sleeve mounting through a cooling water gallery, sensor Type 4011A…DS...8; middle: direct mounting with small cavity in front of the diaphragm, sensor Type 4067E; right: mounting on a pipe with a welded boss, sensor Type 4049B

5.5 Machining the mounting bore

When preparing the sensor bore, ensure that the thread is concentric in relation to the relative bore diameters. The sealing part must be completely flat. Refer to the specifications and tolerances stated on the datasheet of the sensor.

All machining steps with the drill, milling cutter, reamer and screw tap must be performed with the work held securely in the same position.

High pressure piezoresistive sensors are particularly sensitive to machining bore tolerances. It is essential to use the correct machining tools and methods for creating the sensor bore and installation. This will provide a good quality installation with correct, concentric positioning of the sensor and a high quality sealing surface for optimized sensor operation.

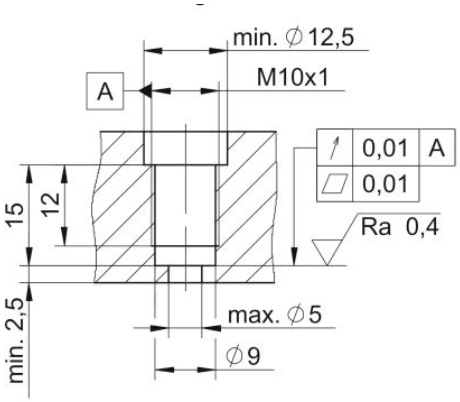


Fig. 5: Example sensor Type 4067 bore machining requirements

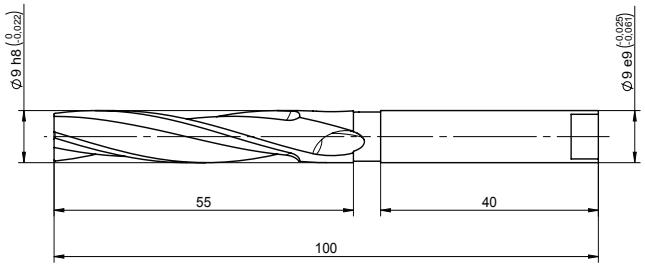


Fig. 6: Example drill Type 1327

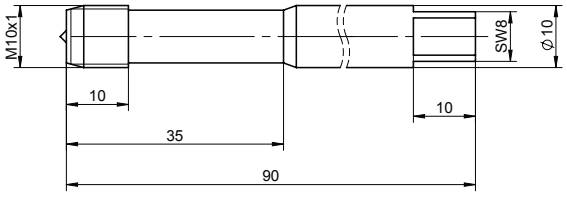


Fig. 7: Example screw tap Type 1353

The sealing face and mounting bore should be considered a service item during the lifetime of the sensor installation. The sealing face in particular requires maintenance and inspection of the seal and determination of any leakage, or imperfections in the installation itself.

Fig. 8: A handheld optical borescope suitable for inspecting

5.6 Mounting the water hose on the cooling pipe

Soak the end of the FPM (Fluorocarbon Rubber) hose in boiling water for several seconds – this allows expansion via heating to assist fitting, then fit the FPM hose on the cooling pipe of the sensor. With this procedure it is not necessary to rotate the FPM water hose back and forth whilst fitting as this creates a risk of loosening the cooling pipe. If a cooling pipe becomes loose, it must be unscrewed completely – then follow the mounting procedure as mentioned in the chapter „maintenance“.

5.7 Protector heat screen for water cooled sensor

When using the sensor in exhaust gas application soot particles may build up on the protector screen of the sensor. For the best sensor performance it may be necessary to clean or replace the protector screen. For the detailed step-by-step description please refer to the manual “Replacement of Screen”.

Fig. 9: Sensor Type 4049 and heat screen 1189A

5.8 Check points before installation

- **Water leakage** – After connecting the FPM hoses to the cooling pipes of sensor or cooling adapter, operate the cooling system and check that there is no leakage.
- **Piezoresistive cable** – Carefully check the piezoresistive cable for damages over its full length and if necessary replace it completely.
- **Sensor seal ring** – The sensors seal ring must always be applied to the sensor as shown in Figure 9. If the sealing ring is damaged, it should be replaced.

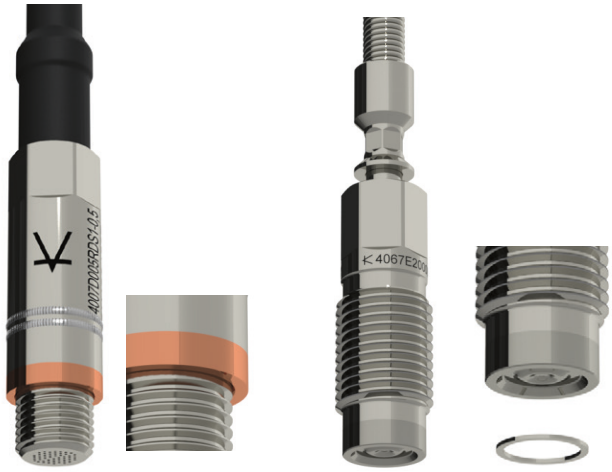


Fig. 10: Left: seal ring Type 1145 of a shoulder sealing sensor Type 4007, right: seal ring Type 1100 of a front sealing sensor Type 4067

- **Mounting bore** – Check the condition of the mounting bore, it must be machined to the specified dimensions and tolerances as described in the datasheet, and also clean and dry prior to installation.

5.9 Installing the sensor into the bore

Feed the piezoresistive cable through the mounting key and then fit the mounting key on the hex of the sensor. If using the slotted mounting wrench, pay attention to proper positioning of the piezoresistive cable in the slot (danger of squashing the cable, Fig. 11). For the applications with high temperature (e.g. engine exhaust) the thread of the sensor should be lubricated with high-temperature resistant grease (e.g. MOLYKOTE HSC plus or Metaflux 70–81) before installing the sensor in the bore. This will facilitate dismounting the sensor from the bore post-testing.

During installation and disassembly, the piezoresistive cable should be rotated with the mounting wrench to avoid damage of the cable. During use pay attention to protect the sensor cable. Do not squash, twist or pull the cable.

Screw the sensor hand-tight and then use the torque wrench for tightening to the required value as specified in the datasheet of the sensor.

For cooled sensors: when the sensor installation is completed, connect the hoses to feed and return manifolds of the cooling system.

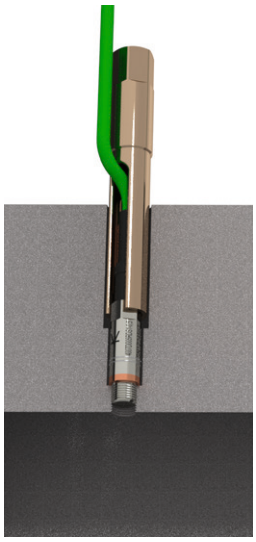


Fig. 11: Example sensor Type 4007, slotted mounting wrench Type 1300B12

6. Piezoresistive sensor cable routing

The piezoresistive cable of the sensor must be routed to avoid other high frequency or power cables as much as possible (e.g. ignition or fuel injection system cabling, dynamometer or motor power cables). If this cannot be avoided, the piezoresistive cables should be kept perpendicular to the high-frequency signal lines to reduce signal interference.

There must be no mechanical tension on the cable. It is absolutely essential to avoid deformation caused by sharp bends. During use pay attention to protect the cable: do not squash, twist or pull it. Ensure the cleanliness of the cable connector. Do not allow water, oil, dust, or other dirt in the vicinity of the cable interfaces. If the piezoresistive connector becomes contaminated during use, use an electronic cleaning spray to clean it.

7. Setting up the measuring chain

The procedure for the measuring chain setup is based on the type of the sensor.

- **Analog compensated sensors**
  When connecting an analog compensated sensor (e.g. 4007B, 4049A, 4043/45A, 4073/75A, 4065A, 4067C) the amplifier has to be manually parameterized with the data from calibration sheet such as sensor type, serial number, sensitivity and pressure range.

- **Analog sensors with type extension _V200S**
  These sensors include an integrated TEDS (Transducer Electronic Data Sheet) with functionality as sensor identification. Depending on the amplifier type manual parametrization is required. For more information please refer to related documentation.

- **Digital compensated sensors with type extension S or DS**
  The digital compensated sensors contain sensor parameters and pressure-temperature compensation stored in TEDS. When connected to a compatible amplifier (Types 4624/4665/4667) no parametrization is needed.

The sensor can be connected directly to the amplifier or using an extension cable (Fig. 12). Refer to datasheet of the sensor for a compatible extension cable type.

The length of piezoresistive cables between sensor and charge amplifier should not exceed 10 m. Interference from extraneous voltages and ground loop issues at the test cell can be avoided, or reduced, by using a short piezoresistive cable and positioning the charge amplifier close to the piezoresistive sensor.

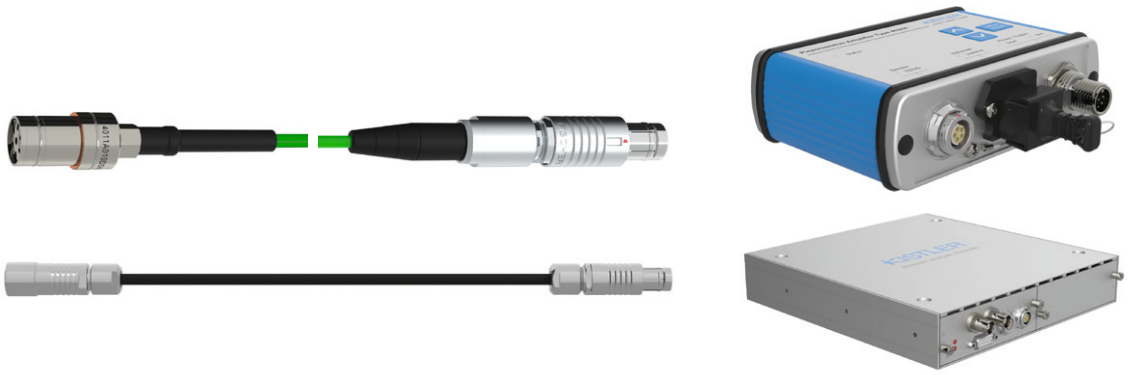


Fig. 12: Basic arrangement of a measuring chain: sensor and extension cable on the left; one channel amplifier and SCP on the right

8. Zero-point correction

For highest possible accuracy an initial zero-point correction is recommended to reduce errors such as a mounting influence and sensor drift. By performing a zero-point correction with warm sensors the thermal offset part of the deviation can usually be reduced significantly.

Procedure of zero-point correction for sensors installed without cooled switching adapters (i.e. Type 7533):

- Connect the mounted sensor to amplifier and cooling system (if applicable).
- Run engine to bring the sensors to a suitable operating temperature. If available, wait until the temperature output of the sensor has stabilized.
- Turn off engine. Immediately afterwards adjust the sensor output to barometric pressure using the amplifier function or the data acquisition system.
- Perform the measurement campaign as required.

Repeat the zero-point correction procedure before each measurement campaign for best results (e.g. at least once a day).

Example applications:	
intake: Type 4017	exhaust: Type 4049
	

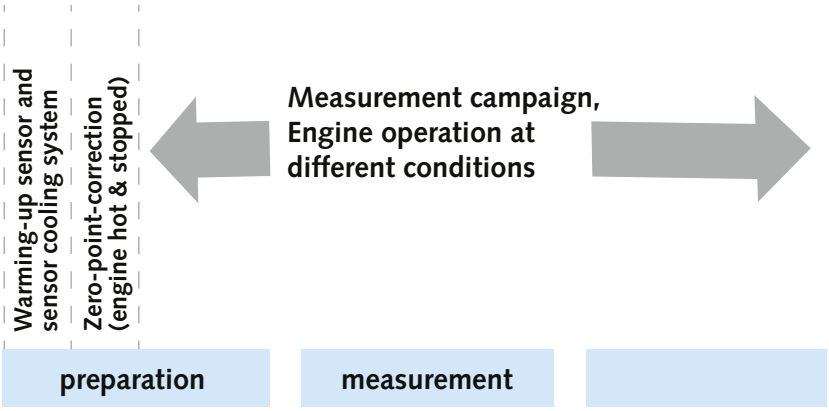


Fig. 13: Procedure of zero-point correction for sensors installed without cooled switching adapters

Procedure of zero-point correction for sensors installed with cooled switching adapters during a steady state measuring campaign (Fig. 14):

- Connect sensor to amplifier and start the cooling system. (Control pressure off)
- Start the measurement campaign.
- At each operating point the zero-point adjustment is to be performed:
  - Wait for operating point to stabilize. Keep the cooled switching adapter switched off in order to protect the sensor.
  - Once the operating point is stabilized, switch adapter on by applying control pressure of 4…6 bar.
  - Expose the sensor to engine gases for about 60s in order to warm the sensor up.
  - Switch adapter to ambient pressure by turning control pressure off.
  - Adjust the sensor output to barometric pressure. Switch adapter on by applying control pressure of 4…6 bar for 50 cycles.
  - Perform measurement of the operating point (e.g. for 200 cycles).
  - Switch adapter back to ambient to protect the sensor.

Example applications:

intake/exhaust: cooled switching adapter Type 7533B... and sensor Types 4011.../4075...

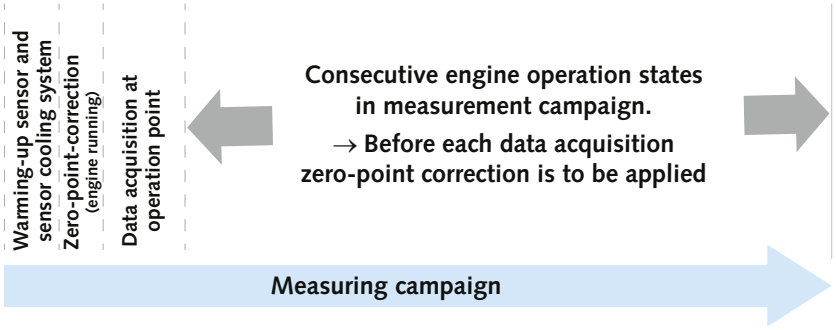


Fig. 14: Procedure of zero-point adjustment for sensors installed with cooled switching adapters during a steady state measuring campaign

9. Dismounting and maintenance

9.1 Dismounting

Allow the installation position to cool down before removing the sensor from the mounting bore. Dismount in the reverse order to an installation:

- Switch off the water cooling system
- Disconnect the water hoses of the sensor from feed and return manifold
- Disconnect the sensor cable from the amplifier / from the extension cable
- Feed the sensor cable and both FPM hoses through the mounting wrench, carefully slide it to the sensor, and then fit the mounting key on the hex of the sensor. If you are using the slotted mounting key Type 1300B12 for sensor Type 4007 and 4017, pay attention to properly posititioning piezoresistive cable in the slot (otherwise danger of squashing the cable).
- Unscrew the sensor from the bore.

9.2 Maintenance

Piezoresistive pressure sensors are precision instruments; they will deliver measurements in the specified accuracy range only if they are handled with care. Special attention is required for the front part of the sensor – the diaphragm and sealing area must always be protected against mechanical damage.

- **Visual inspection** – Sensor, cable and cooling pipes should be carefully inspected for anomalies (damage, soot deposits, overheating due to combustion gas leakage).

- **Cleaning** – After the sensor is disassembled from the engine, combustion deposits may be cleaned with a soft brush and isopropanol. The front part of the sensor (diaphragm) cannot be cleaned using mechanical means such as brushing, sand blasting, grinding, etc. as this will irreparably damage the diaphragm and thus the sensor. Do not tap the front surface of the sensor with metal or other objects to avoid damage to the diaphragm.

* Loctite is registrated trademark of Henkel
Molykote is registrated trademark of DuPont
AdBlue is a worldwide registrated trademark of VDA

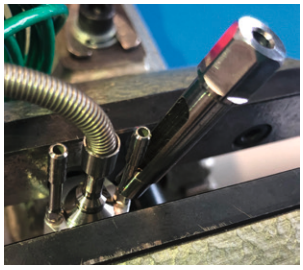
- **Visual inspection** – After cleaning, see above

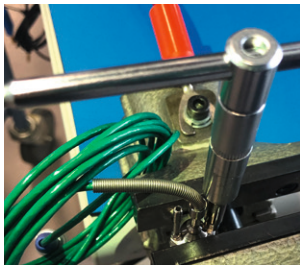
- **Pressure calibration** – Recalibration is recommended once a year after the first use.
- **Exchange of components** – it is possible to replace the sealing ring and the cooling pipes. Material numbers are listed in the datasheet of the sensor. The replacement of the sealing should be done by Kistler.

- **Removing the cooling pipes Types 1221, 1225A3**

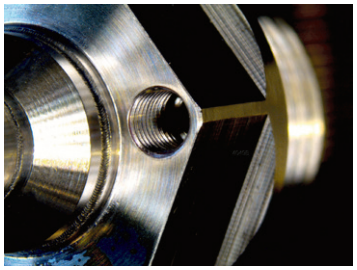
Necessary material:
- Hot-air blower with variable temperature
- Open ended wrench SW3
- Isopropanol or a similar product.

Procedure:
- Remove the FPM hose from the cooling pipe
- Locally heat by hot-air blower the contact area of the cooling pipe with the sensor body (max. air temp. 120°C). Do not expose the cable to the hot air (risk of overheating)
- Simultaneously unscrew the cooling pipe with the open ended wrench SW3





- With the means of a small brush, clean the thread M3x0.35 of the cooling pipe with isopropanol or a similar product
- Clean the M3x0.35 bores on the sensor: there should not be any Loctite residue left in the cooling channel. To achieve this, wash out the bore with isopropanol or a similar product using a small brush. Gently blow out the individual bores using compressed air



- **Installing the cooling pipes Type 1221, 1225A3**

Necessary material:
- Open ended wrench SW3
- Loctite 510

Visually inspect the piezoresistive sensor and the cooling pipes to ensure that there is no remaining Loctite residue left in the cooling channels.

Procedure:
- Using a toothpick, slightly moisten the tapped bore M3 and male thread M3 of the cooling pipe with Loctite 510

- Screw the cooling pipe into the bore
- Tighten the cooling pipe using the open ended wrench SW3

- Clean the adhesive residue with isopropanol or a similar product.

10. Kistler technical center services

In order to ensure measurement data within the specified accuracy the measuring equipment used for combustion development, performance tests, durability tests or engine calibration requires precise checking at regular intervals during its lifetime.

By using service from Kistler Technical Centers located in Europe, Asia, and America the user benefits safe and reliable operation of the measuring equipment. Thanks to the proximity to the user, the response time is reduced to a minimum; the professional technicians in the Kistler Technical Centers are able to provide complete service locally.

www.kistler.com/en/services/

11. Declaration of conformity

EU Declaration of Conformity
EU-Konformitätserklärung
Déclaration UE de conformité

The manufacturer / Der Hersteller / Le Fabricant:

Kistler Instrumente AG, Eulachstrasse 22, CH-8408 Winterthur, Switzerland

hereby declares that the product / erklärt hiermit, dass das Produkt / déclare que le présente produit:

Name / Name / Nom	**PR Pressure Sensor**
Type / Typ / Type	**4011AExxx; 4017AExxx; 4065BExxx; 4067EExxx**
Modules / Module / Modules	**none / keine / sans**
Options / Optionen / Options	**all / alle / toutes**

complies with the following provisions of directives /
die folgenden Bestimmungen der Richtlinien erfüllt /
est conforme aux dispositions suivantes des directives:

2011/65/EU (ROHS)
2014/34/EU (ATEX-Directive)

The following harmonised standards were applied /
Folgende harmonisierte Normen wurden angewandt /
Les normes harmonisées suivantes furent appliquées:

Hazardous area Zone 2 gas / Ex-Bereich Zone 2 Gas / Secteur dangereux Zone 2 gaz

EN/IEC 60079-0: 2018
EN 60079-7: 2015

Marking:	Ⓔx II 3G Ex ec IIC T3 Gc
Certificate number :	SEV 19 ATEX0318X

Kistler Instrumente AG, Winterthur
Winterthur, Dezember 2019

i.V. F.Mamani
ATEX Regulatory Specialist