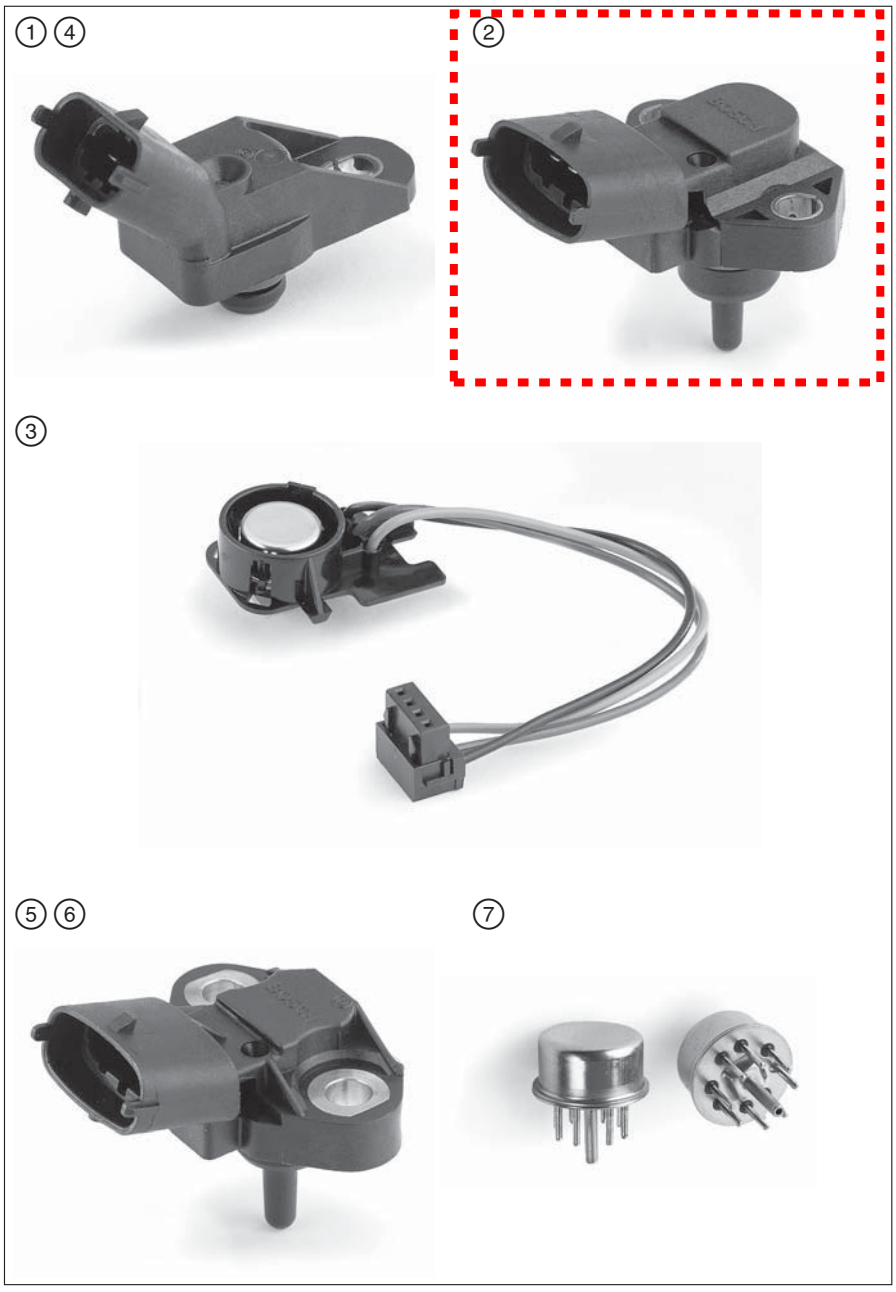
Medium-resistant absolute-pressure sensors Micromechanical type

Measurement of pressure in gases and liquid mediums up to 600 kPa

p / U

- Delivery possible either without housing or inside rugged housing.
- EMC protection up to 100 V · m^{-1}.
- Temperature-compensated.
- Ratiometric output signal.
- All sensors and sensor cells are resistive to fuels (incl. diesel), and oils such as engine lube oils.



Applications
These monolithic integrated silicon pressure sensors are high-precision measuring elements for measuring the absolute pressure. They are particularly suitable for oper-ations in hostile environments, for instance for measuring the absolute manifold pressure in internal-combustion engines.

Design and function
The sensor contains a silicon chip with etched pressure diaphragm. When a change in pressure takes place, the diaphragm is stretched and the resulting change in resistance is registered by an evaluation circuit. This evaluation circuit is integrated on the silicon chip together with the electronic calibration elements. During production of the silicon chip, a silicon wafer on which there are a number of sensor elements, is bonded to a glass plate. After sawing the plate into chips, the individual chips are soldered onto a metal base complete with pressure connection fitting. When pressure is applied, this is directed through the fitting and the base to the rear side of the pressure diaphragm. There is a reference vacuum trapped underneath the cap welded to the base. This permits the absolute pressure to be measured as well as protecting the front side of the pressure diaphragm. The programming logic integrated on the chip performs a calibration whereby the calibration parameters are permanently stored by means of thyristors (Zener-Zapping) and etched conductive paths. The calibrated and tested sensors are mounted in a special housing for attachment to the intake manifold.

Signal evaluation
The pressure sensor delivers an analog output signal which is ratiometric referred to the supply voltage. In the input stage of the downstream electronics, we recommend the use of an RC low-pass filter with, for instance, t = 2 ms, in order to suppress any disturbance harmonics which may occur. In the version with integrated temperature sensor, the sensor is in the form of an NTC resistor (to be operated with series resistor) for measuring the ambient temperature.

Installation information
When installed, the pressure connection fitting must point downwards in order that condensate cannot form in the pressure cell.

Construction
Sensors with housing:
This version is equipped with a robust housing. In the version with temperature sensor, the sensor is incorporated in the housing.
Sensors without housing:
Casing similar to TO case, pressure is applied through a central pressure fitting. Of the available soldering pins the following are needed:
Pin 6 Output voltage U_A,
Pin 7 Ground,
Pin 8 +5 V.

Range

Pressure sensor integrated in rugged, media-resistant housing

Pressure range kPa (p1...p2)	Chara. curve [1]	Features	Dimension drawing [2]		Part number
20...115	1	–	4	1	**0 261 230 020**
20...250	1	–	4	1	**0 281 002 137**
10...115	1	Integrated temperature sensor	2	2	**0 261 230 022**
20...115	1	Integrated temperature sensor	2	2	**0 261 230 013**
20...250	1	Integrated temperature sensor	2	2	**0 281 002 205**
50...350	2	Integrated temperature sensor	5	(5) [3]	**0 281 002 244**
50...400	2	Integrated temperature sensor	–	–	**0 281 002 316**
50...600	2	Integrated temperature sensor	6	6	**0 281 002 420**
10...115	1	Hose connection	1	(1) [3]	**0 261 230 009**
15...380	2	Clip-type module with connection cable	3	3	**1 267 030 835**

Pressure-sensor cells in casings similar to transistors
Suitable for installation inside devices

Pressure range kPa (p1...p2)	Chara. curve [1]	Features	Dimension drawing [2]		Part number
10...115	1	–	7	7	**0 273 300 006**
15...380	2	–	7	7	**0 273 300 017**
15...380	2	–	8	(7) [3]	**0 261 230 036**
20...105	1	–	7	7	**0 273 300 001**
20...115	1	–	7	7	**0 273 300 002**
20...250	1	–	7	7	**0 273 300 004**
50...350	2	–	7	7	**0 273 300 010**
50...400	2	–	7	7	**0 273 300 019**
50...400	2	–	8	(7) [3]	**0 261 230 033**
50...600	2	–	7	7	**0 273 300 012**

[1]) The characteristic-curve tolerance and the tolerance extension factor apply to all versions, refer to Page 42.
[2]) See Page 43/44 [3]) For similar drawing, see dimension drawing on Pages 43/44
[4]) To be obtained from AMP Deutschland GmbH, Amperestr. 7–11, D-63225 Langen, Tel. 0 61 03/7 09-0, Fax 0 61 03/7 09 12 23, E-Mail: AMP.Kontakt@tycoelectronics.com

Accessories

For 0 261 230 009, .. 020; 0 281 002 137	
Plug housing	**1 928 403 870**
Contact pin	**2-929 939-1** [4])
Individual gasket	**1 987 280 106**

For 0 261 230 013, .. 022; 0 281 002 205, ..420	
Plug housing	**1 928 403 913**
Contact pin	**2-929 939-1** [4])
Individual gasket	**1 987 280 106**

For 0 281 002 244	
Plug housing	**1 928 403 913**
Contact pin	**2-929 939-6** [4])
Individual gasket	**1 987 280 106**

For 0 281 002 420	
Plug housing	**1 928 403 736**
Contact pin	**1 928 498 060**
Individual gasket	**1 928 300 599**

Note
Each 3-pole plug requires 1 plug housing, 3 contact pins, and 3 individual gaskets.
4-pole plugs require 1 plug housing, 4 contact pins, and 4 individual gaskets.

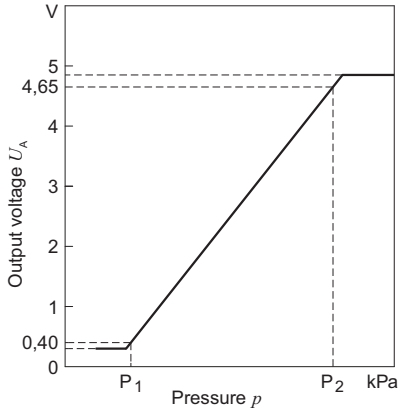
Technical data

		min.	typical	max.
Supply voltage U_V	V	4.5	5	5.5
Current input I_V at U_V = 5 V	mA	6	9	12.5
Load current at output	mA	–0.1	–	0.1
Load resistance to ground or U_V	kΩ	50	–	–
Lower limit at U_V = 5 V	V	0.25	0.30	0.35
Upper limit at U_V = 5 V	V	4.75	4.80	4.85
Output resistance to ground U_V open	kΩ	2.4	4.7	8.2
Output resistance to U_V, ground open	kΩ	3.4	5.3	8.2
Response time $t_{10/90}$	ms	–	0.2	–
Operating temperature	°C	–40	–	+125
Limit data				
Supply voltage U_V	V	–	–	16
Operating temperature	°C	–40	–	+130
Recommendation for signal evaluation				
Load resistance to U_H = 5.5...16 V	kΩ	–	680	–
Load resistance to ground	kΩ	–	100	–
Low-pass resistance	kΩ	–	21.5	–
Low-pass capacitance	nF	–	100	–
Temperature sensor				
Measuring range	°C	–40	–	+125
Nominal voltage	mA	–	–	1 [5])
Measured current at +20 °C	kΩ	–	2,5 ±5 %	–
Temperature time constant t_{63} [6])	s	–	–	45

[5]) Operation with series resistor 1 kΩ.
[6]) In air with airflow speed 6 m · s^{-1}.

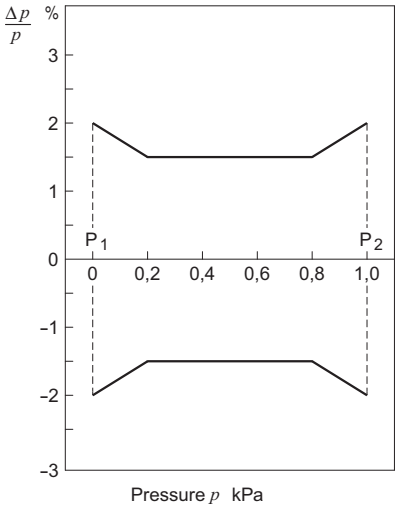
Micromechanical TO-design absolute-pressure sensors (contd.)
Measurement of pressures in gases and liquid media up to 600 kPa

Characteristic curve 1 (U_V = 5.0 V).

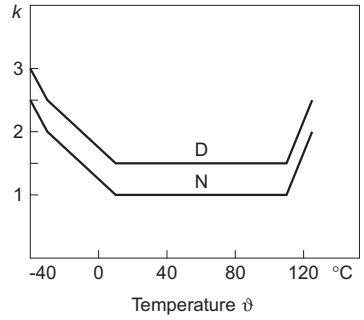


Characteristic curve 2 (U_V = 5.0 V).

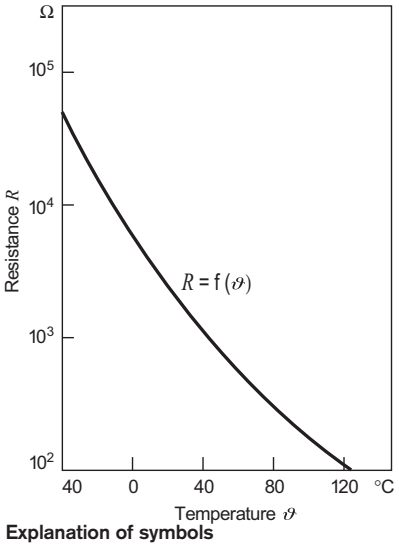
Characteristic-curve tolerance.



Tolerance extension factor.



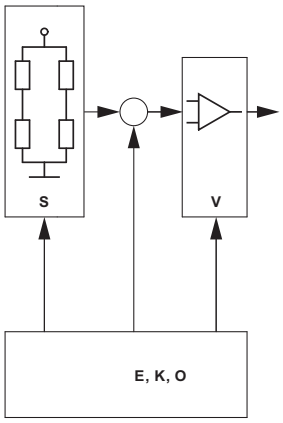
Temperature-sensor characteristic curve.



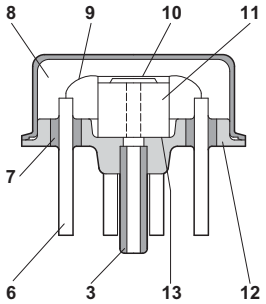
Explanation of symbols

U_A Output voltage
U_V Supply voltage
k Tolerance multiplication factor
D Following endurance test
N As-new state

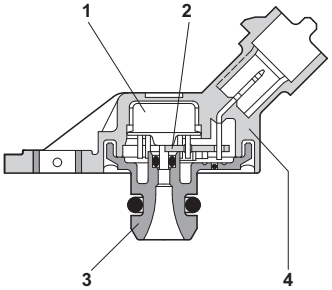
Block diagram.
E Characteristic curve: Sensitivity,
K Compensation circuit
O Characteristic curve: Offset,
S Sensor bridge, **V** Amplifier



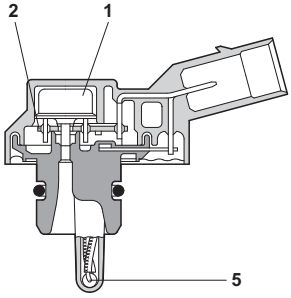
Sectional views.
Pressure sensor in housing.
1 Pressure sensor, **2** pcb, **3** Pressure fitting,
4 Housing, **5** Temperature sensor,
6 Electrical bushing, **7** Glass insulation,
8 Reference vacuum,
9 Aluminum connection (bonding wire),
10 Sensor chip, **11** Glass base,
12 Welded connection,
13 Soldered connection.



Section through the installed pressure sensor.

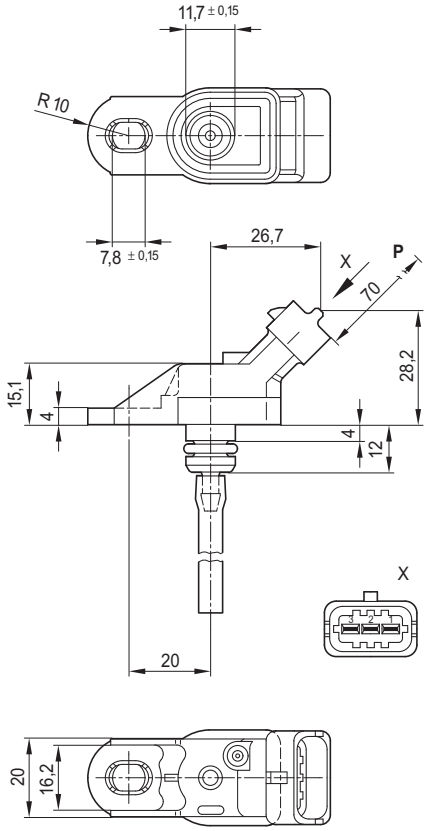


Installed pressure sensor.
Version with temperature sensor.

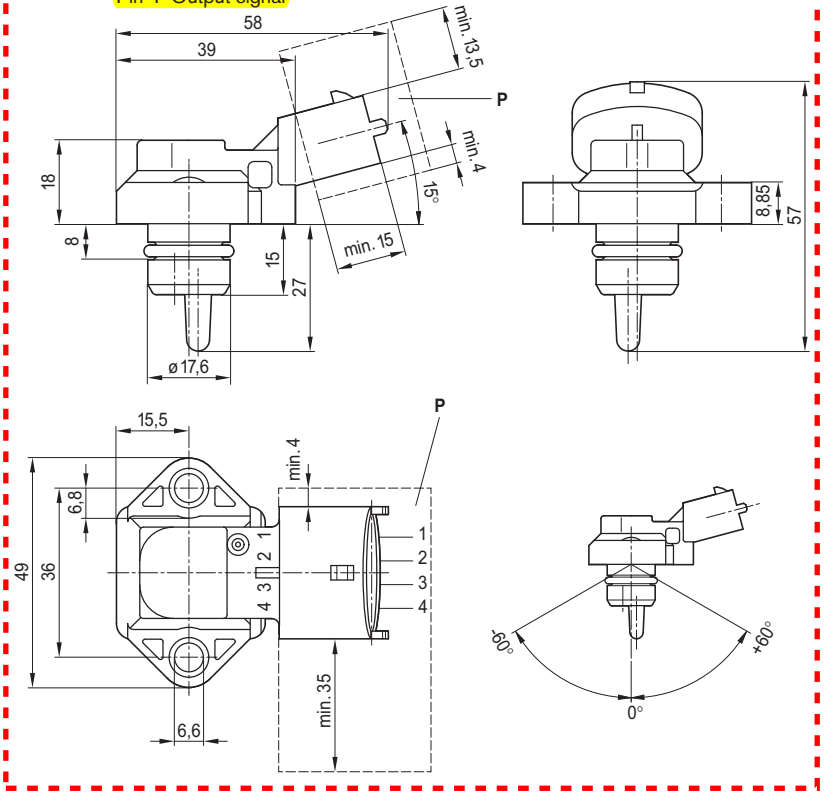


Dimension drawings. P Space required by plug and cable.

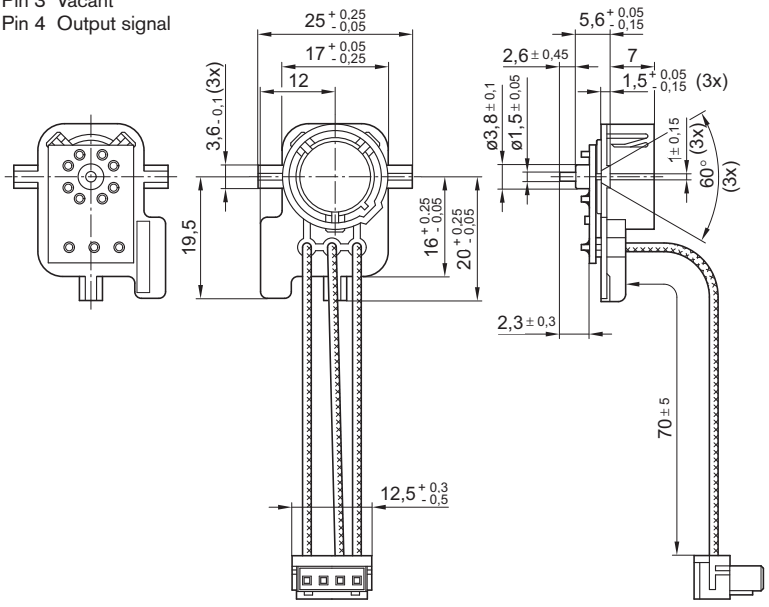
① **0 261 230 009**
Connector-pin assignment
Pin 1 +5 V
Pin 2 Ground
Pin 3 Output signal



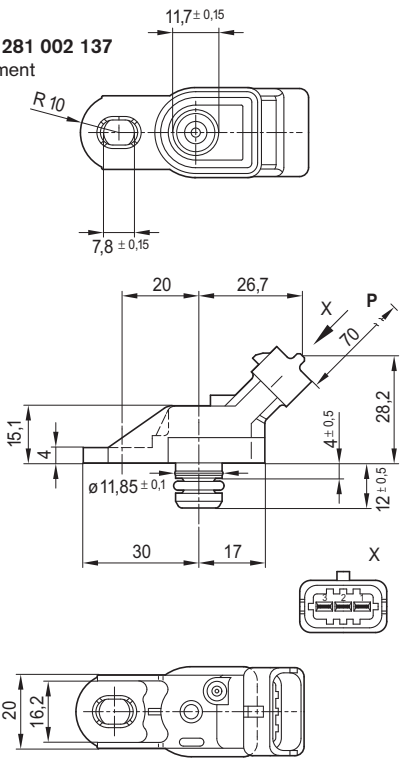
② **0 261 230 013, 0 261 230 022, 0 281 002 205**
Connector-pin assignment
Pin 1 Ground
Pin 2 NTC resistor
Pin 3 +5 V
Pin 4 Output signal



③ **1 267 030 835**
Connector-pin assignment
Pin 1 Ground
Pin 2 +5 V
Pin 3 Vacant
Pin 4 Output signal



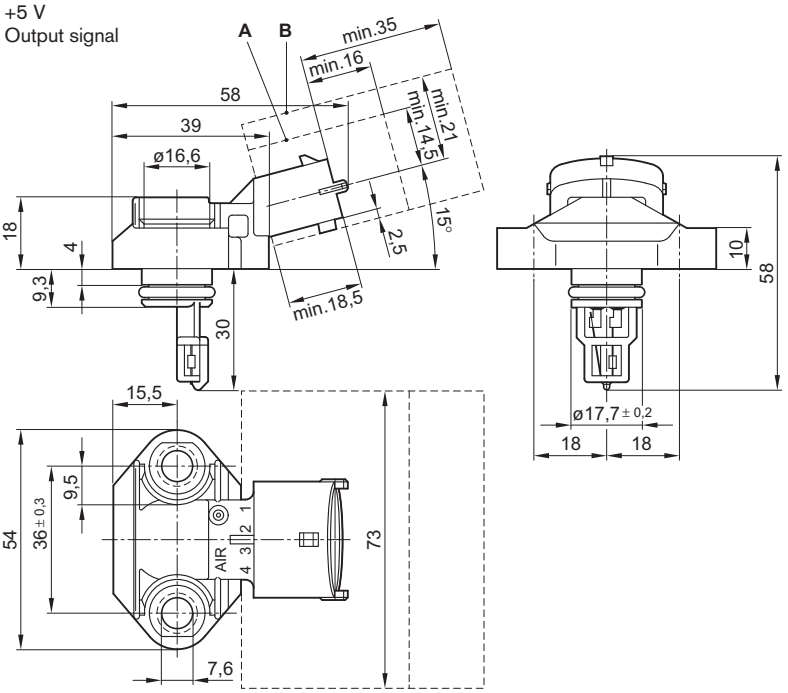
④ **0 261 230 020, 0 281 002 137**
Connector-pin assignment
Pin 1 +5 V
Pin 2 Ground
Pin 3 Output signal



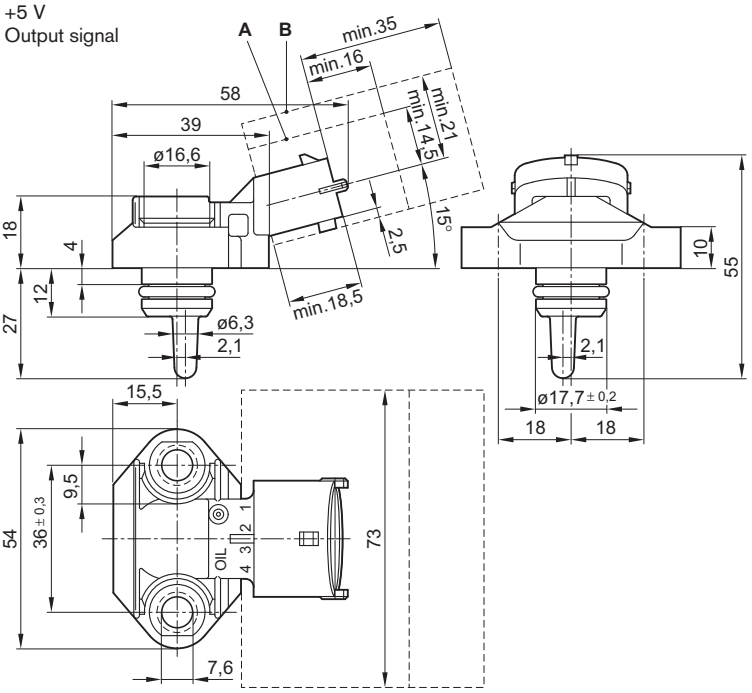
Micromechanical TO-design absolute-pressure sensors (contd.)
Measurement of pressures in gases and liquid media up to 600 kPa

Dimension drawings A Space required by plug and cable
B Space required when plugging in/unplugging

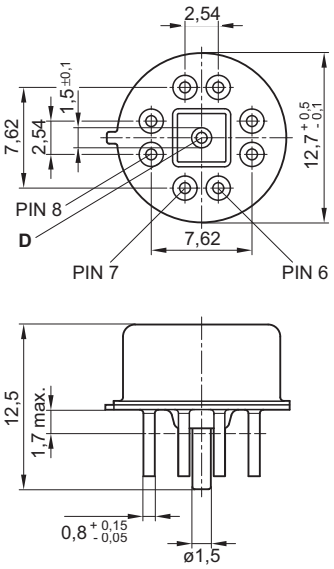
⑤ **0 281 002 244**
Connector-pin assignment
Pin 1 Ground
Pin 2 NTC resistor
Pin 3 +5 V
Pin 4 Output signal



⑥ **0 281 002 246**
Connector-pin assignment
Pin 1 Ground
Pin 2 NTC resistor
Pin 3 +5 V
Pin 4 Output signal



⑦ **0 273 300 ..**
Sensor without housing
D Pressure-connection fitting
Pin 6 Output signal
Pin 7 Soldered



⑧ **0 261 230 036 ..**
D Pressure connection
L In the area of the measuring surface