

MANUAL

D2411

Gauge and Absolute Pressure Transmitters with Ceramic Diaphragm



- Gauge and absolute pressure measurement of liquids, gases and steams
- Measuring ranges from 100 kPa to 40 MPa
- Current or voltage output signal
- Accuracy 0.5 %, 1 %, high operational reliability
- Sensor with ceramic diaphragm without oil filling, also for oxygen measurement up to 125 °C
- For mediums compatible with stainless steel 1.4301, ceramics Al₂O₃ 96 % in combination with Viton

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1. General instructions and information

1.1 Symbols used



Symbol of warning; for safe use it is necessary to proceed according to the instructions



Symbol CE certifies compliance of the product with the respective government directives



Symbol of "Output"



Symbol of "Supply"



This product does not belong to public waste and it is subjected to separate collection

1.2 Safety warnings and cautions



The equipment shall be supplied from a safe voltage source that meets all requirements of the standard EN 61010-1 and must be installed in compliance with national requirements and standards providing safety.

The equipment may only be installed by a qualified personnel who are familiar with national and international laws, directives, standards and with the instructions manual. The instrument may not be used for other purposes than as specified in this instruction manual.

For elimination of a risk of injury from electric shock or fire the maximum operational parameters of the instrument may not be exceeded, particularly range of operating temperature because of exposure to heat from connected or surrounding technological equipment must not be exceeded!

The equipment should be installed in suitable environment without any direct sunlight, occurrence of dust, high temperatures, mechanical vibrations and shocks and protected against rain and excessive moisture.

1.3 Scope of delivery

With the product is delivered:

- Manual for installation, operation and maintenance
- Certificate of calibration (only with calibrated sensors)

1.4 Description of the delivery and packing

The product is packaged in a protective cover and provided with an identification label with a mark of the output control.

The product must not be exposed to direct rain, vibrations and shocks during transport.

1.5 Storage

Store the instrument in dry rooms at temperatures from -40 to +85 °C without condensation of water vapours.

1.6 Installation, operation and maintenance

During installation, commissioning, operation and maintenance follow the instructions in chapter 4.

1.7 Spare parts

Any of the compact parts of the product can be also ordered as a spare part if there are not required special procedures or technological operations for the exchange.

1.8 Repairs

Products are repaired by the manufacturer. The products for repair should be sent together with description of the fault or defect in a packing that guarantees damping of shocks and vibrations and protects against damage during transport.

1.9 Warranty

Products are covered by a warranty for a period of 24 months from the delivery date on the delivery note. The manufacturer guarantees technical and operational parameters of the products within scope of the applicable documentation. Warranty period is specified with individual items and begins from the day of takeover of the goods by the purchaser or delivery to the carrier. Any claims concerning to defects of the goods together can be filed with the seller within the warranty period and the claimed product shall be presented. The claiming party shall give identification of the product, number of the delivery note and description of the fault or defect.

The manufacturer is not responsible for any defects caused by improper storage, incorrect connection, damages caused by external effects, in particular by effects of factors with excessive values, unqualified installation, improper operation or common wearing.

2. End of service and disposal

2.1 End of service

Dismounting and disposal of the device is possible after disconnecting of power supply.

2.2 Disposal



The products do not contain any environmentally hazardous parts. When disposing the packing and destroyed or irreparably damaged product proceed according to the local regulations.

3. Product description

D2411 Gauge and Absolute Pressure Transmitters with Ceramic Diaphragm

- Gauge and absolute pressure measurement of liquids, gases and steams
- Measuring ranges from 100 kPa to 40 MPa
- Current or voltage output signal
- Accuracy 0.5 %, 1 %, high operational reliability
- Sensor with ceramic diaphragm without oil filling, also for oxygen measurement up to 125 °C
- For mediums compatible with stainless steel 1.4301, ceramics Al₂O₃ 96 % in combination with Viton



3.1 Application

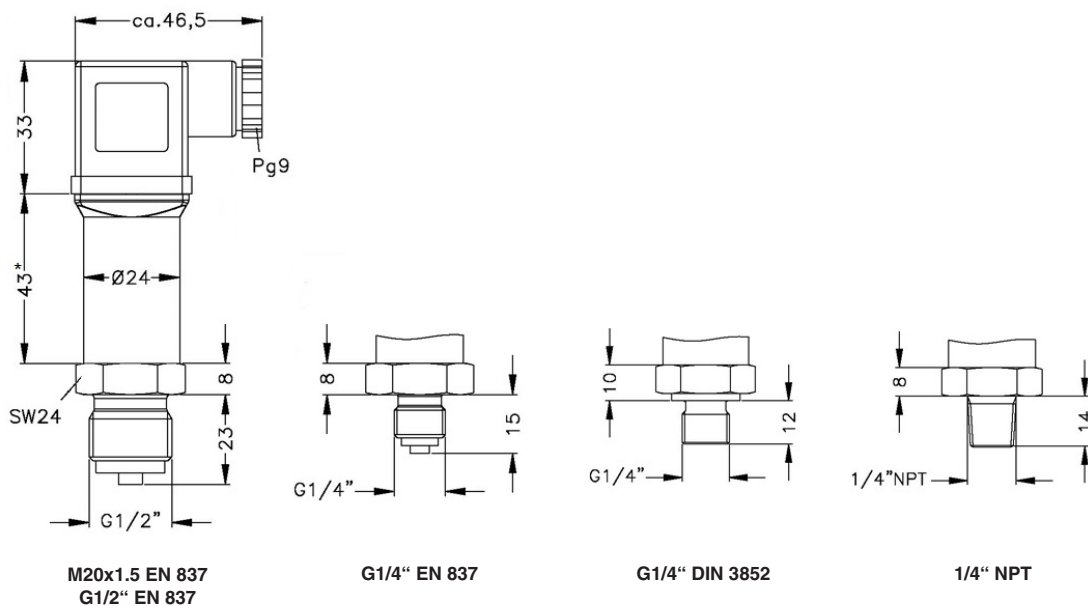
Pressure transmitters D2411 are designed for absolute and gauge pressure measurement. They are used mainly in chemical and pharmaceutical industry, medical technology, galvanization, test equipment, general pressure measurement and food industry.

3.2 Description

Transmitters convert gas or liquid pressure into the electrical signal. These transmitters are manufactured in version for the gauge pressure (gauge or negative) or in version for absolute pressure. Pressure ranges are from 0.1 to 40 MPa. Transmitters are suitable for static and also dynamic pressure measurement and for all mediums that are compatible with stainless

steel 1.4301, ceramics Al₂O₃ or FKM. It is possible to supply transmitters and gaskets from different materials. The main element of the transmitter is pressure sensor in ceramic housing with ceramics diaphragm without oil filling. When the pressure transmitter is exposed to pressure, it provides output signal, that is temperature compensated. Signal is also magnified and standardized by built-in electronics. Pressure sensor and electronics are built into the stainless steel housing. Resistance against shock and vibration is assured by way of mounting. Pressure connection is made with threaded inlet, electrical connection is made by plug or directly by cable. Sensors are characterized by small dimensions. Zero value of the sensor corresponds to the vacuum in version with absolute pressure and to atmospheric pressure in version with gauge pressure.

3.3 Dimensional drawings



* Pressure range PN = 40 MPa: total length increases by 12 mm

4. Installation, operation and maintenance

4.1 Installation and commissioning

4.1.1 General information

- * Do not use any force when installing the device!
- * Keep in mind that this is an electronic device.
- * Handle this high-sensitive electronic precision measuring device with care to prevent damage of the device.
- * To avoid damaging the diaphragm, remove protective cap (if delivered) directly before starting assembly.
- * The protective cap has to be stored! Place the protective cap on the pressure port again immediately after disassembling.
- * Handle the unprotected diaphragm very carefully - it is very sensitive and may be easily damaged.
- * After installation and proper connection, check the tightness of pressure connections.
- * When measuring small gauge pressures, use an electric cable with interconnecting capillary tube to supply correct reference pressure.
- * Device is put into operation by switching on the power supply.

4.1.2 Special information

- * Take note that no assembly stress occurs at the pressure connection, since this may cause a shifting of the characteristic curve. This is especially important for very small pressure ranges.
- * If there is any danger of damage by lightning or overpressure when the device is installed outdoor, we suggest putting a sufficiently dimensioned overpressure or overvoltage protection between the supply or switch cabinet and the device.
- * For outdoor and damp areas installations follow these instructions:
 - Choose an assembly position, which allows the flow-off of splashed water and condensation.
 - Avoid permanent fluid at sealing surfaces!
 - When using a cable outlet device, turn the outgoing cable downwards. If the cable has to be turned upwards, then point it downward so the moisture can drain.
 - Install the device in such a way that it is protected from direct solar irradiation. Direct solar irradiation can lead to the permissible operating temperature being overstepped. By this the operability of the device can be affected or damaged. If the internal pressure increases due to solar irradiation, measurement errors may be caused.
- * For devices with gauge reference in the housing (small hole next to the electrical connection), take note to:
 - Check and verify the protection and suitability of the device for the intended application.

- Install the device in such a way, that the gauge reference (small hole next to the electrical connection) is protected from dirt and moisture. If the device is exposed to fluid admission, the functionality will be blocked by the gauge reference. An exact measurement in this condition is not possible. Furthermore this can lead to damage on the device.



If there is probably contact of the gauge pressure sensor with occasional liquid splashes, for electrical connection we recommend to use cable outlet and cable with air tube (IP 67). This adjustment can be done by JSP, s.r.o.

4.1.3 Installation steps

Follow detailed instructions according to specific pressure connection below:

Installation steps for DIN 3852

DO NOT USE ANY ADDITIONAL SEALING MATERIALS, LIKE YARN, HEMP OR TEFLON TAPE!

- * Check to ensure the proper groove fitting of the o-ring and additionally to ensure no damage to the o-ring.
- * Ensure that the sealing surface of the taking part is perfectly smooth and clean.
- * Screw the device into the corresponding thread by hand.
- * If you have a device with a knurled ring, the transmitter has to be screwed in by hand only.
- * Devices with a spanner flat have to be tightened with an open-end wrench (for G1/4": approx. 5 Nm).

Installation steps for EN 837

- * Use a suitable seal, corresponding to the medium and the pressure input (e. g. a cooper gasket). Sealing is not part of the supply.
- * Ensure that the sealing surface of the taking part is perfectly smooth and clean.
- * Screw the device into the corresponding thread by hand.
- * Tighten it with a wrench (for G1/4": approx. 20 Nm; G1/2" and M20x1.5: approx. 50 Nm).

Installation steps for NPT

- * Use a suitable seal (e. g. a PTFE-strip).
- * Screw the device into the corresponding thread by hand.
- * Tighten it with a wrench (for 1/4" NPT: approx. 30 Nm).



When both connections of threaded parts are made of stainless steel, there is danger of galling (formation of cold weld). This can also occur during ordinary screwing by hand without using tightening key. If the cold weld is made, the thread is then damaged and parts are unusable. Before first screwing, it is therefore necessary to check whether threads are free of impurities (and clean if needed) and then treat the threads against galling (formation of cold weld) by appropriate lubricant. For example use paste G-Rapid plus or Lukosan M11 (in case of connection for oxygen). For tapered threads is usually used Teflon tape.

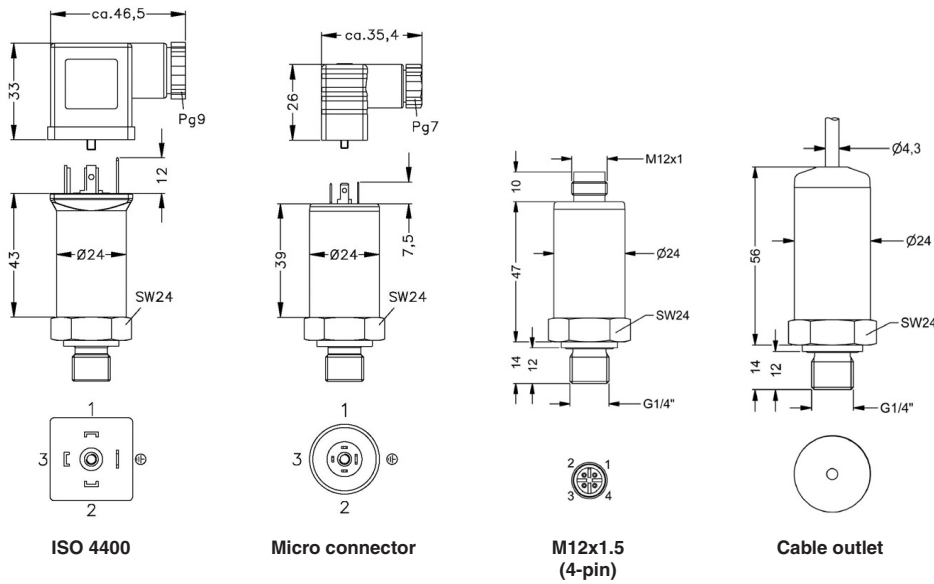
4.1.4 Electrical connection

See the following figure.

4.2 Operation and maintenance

The device is maintenance free. In case of the contamination clean the pressure connection regularly and clean it regardless to medium and contamination. Do not use aggressive cleaning solvents. Do not use pressurized water.

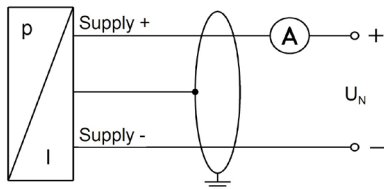
Electrical connection



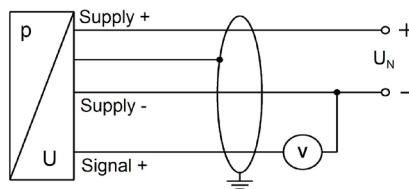
Pin configuration:

Connection	ISO 4400	Micro (contact distance 9.4 mm)	M12x1 (4-pin)	Wire colors (IEC 60757)
Supply +	1	1	1	White
Supply -	2	2	2	Brown
Signal + (for 3-wire)	3	3	3	Green
Grounding	Ground pin	Ground pin	4	Yellow-green

2-wire connection (current):



3-wire connection (voltage):



4.3 Error handling

Malfunction	Possible cause	Error detection / corrective
no output signal	faulty connection	inspect the connection
	line break	inspect all line connections necessary to supply the device (including the connector plugs)
	defective amperemeter (signal input)	inspect the amperemeter (fuse) or the analogue input of the PLC
analogue output signal too low	load resistance too high	verify the value of the load resistance
	supply voltage too low	verify the output voltage of the power supply
	defective energy supply	inspect the power supply and the applied supply voltage at the device
small shift of output signal	diaphragm is highly contaminated	careful cleaning with non-aggressive cleaning solution and a soft brush or sponge; incorrect cleaning can cause irreparable damages on diaphragm or seals
	diaphragm is calcified or coated with deposit	if possible, it is recommended to send the device to JSP, s.r.o. for decalcification or cleaning
large shift of output signal	diaphragm is damaged (caused by overpressure or manually)	check the diaphragm; if it is damaged, please send the device to JSP, s.r.o. for repair
wrong or no output signal	manually, thermally or chemically damaged cable	check the cable; a possible consequence of a damaged cable is pitting corrosion on the stainless steel housing; if you determine this please return the device to JSP, s.r.o. for repair

5. Product specifications

5.1 Technical specifications

Supply voltage:

- $U_N = 8$ to 32 VDC (two-wire CR1)
- $U_N = 14$ to 30 VDC (three-wire VR1)
- $U_N = 2.7$ to 5 VDC (three-wire ratiometric VR2)

Power consumption:

- two-wire: max. 25 mA
- three-wire: 7 mA (short-circuit current: max. 20 mA)
- three-wire ratiometric: 1.5 mA

Operating temperature:

- temperature of measured medium: -25 to +125 °C
- ambient temperature: -25 to +85 °C

Storage temperature:

- 40 to +85 °C

Working position:

- arbitrary (for lower pressure zero calibration after installation may be needed)

Connection of wires:

- connector ISO 4400 (DIN 43650) (IP 65)
- micro connector, pitch 9.4 mm (IP 65)
- M12x1, 4-pin (Binder 713 plastic) (IP 67)
- cable outlet with 2 m PVC cable (IP 67)

Housing:

- IP 65, IP 67 (according to connector)

Dimensions:

- see dimensional drawings

Weight:

- approx. 120 g

Used materials:

- pressure connection - stainless steel 1.4301
- housing - stainless steel 1.4301
- diaphragm - ceramics Al_2O_3 96 %
- material in contact with the medium - pressure connection, gasket, diaphragm

Reference conditions:

- temperature 20 ± 2 °C
- vertical working position with pressure connection down
- supply voltage 24 VDC
- load resistance 250 Ω

5.1.1 Input

Ranges and overload capacity

- see ordering table

Pressure connection:

- M20x1.5 EN 837-1/-3
- G1/2" EN 837-1/-3
- G1/4" EN 837-1/-3
- G1/4" DIN 3852
- 1/4" NPT

5.1.2 Output

Output signal:

- current 4 to 20 mA (two-wire)
- voltage 0 to 10 V (three-wire)
- ratiometric 10 to 90 % $U / U = 2.7$ to 5 VDC (three-wire)

Accuracy:

- $\leq \pm 1$ % HMR (for under-pressure)
- $\leq \pm 0.5$ % HMR

Time response:

- ≤ 10 ms (two-wire)
- ≤ 3 ms (three-wire)

Sampling rate:

- approx. 1000 samples per second

Load resistance:

- $R_{max} = [(U_N - U_{Nmin}) / 0.02 \text{ A}] \Omega$ (two-wire, current)
- $R_{min} = 10 \text{ k}\Omega$ (three-wire, voltage)

5.2 Supplementary parameters

Lifetime:

- $> 100 \times 10^6$ of pressure cycles

Long-term stability:

- $\leq \pm 0.3$ % HMR / year (at reference conditions)

Influence of supply voltage:

- ≤ 0.05 % HMR / 10 V

Influence of load resistor:

- ≤ 0.05 % HMR / $\text{k}\Omega$

Influence of ambient temperature to accuracy:

- $\leq \pm 0.3$ % HMR / 10 K
- (in compensated range -25 to +85 °C)

EMC (electromagnetic compatibility):

- emission and immunity according to EN 61326

Short circuit rating:

- permanent (version VR2 without protection)

Reverse polarity protection:

- no damage, but also no function

Mechanical stability:

- vibration 10 g RMS (25 to 2000 Hz)
- shock 500 g / 1 ms

HMR ... upper range limit

6. Ordering information

6.1 Ordering table

Type	Description	
◦ D2411	Cheap pressure transmitter	
Code	Version	
◦ G	Gauge pressure	
◦ A	Absolute pressure	
Code	Range	Overload capacity
◦ 110	0 to 100 kPa	300 kPa
◦ 116	0 to 160 kPa	500 kPa
◦ 125	0 to 250 kPa	500 kPa
◦ 140	0 to 400 kPa	1.2 MPa
◦ 160	0 to 600 kPa	1.2 MPa
◦ 210	0 to 1.0 MPa	2 MPa
◦ 216	0 to 1.6 MPa	5 MPa
◦ 225	0 to 2.5 MPa	5 MPa
◦ 240	0 to 4.0 MPa	12 MPa
◦ 260	0 to 6.0 MPa	12 MPa
◦ 310	0 to 10 MPa	20 MPa
◦ 316	0 to 16 MPa	40 MPa
◦ 325	0 to 25 MPa	40 MPa
◦ 340	0 to 40 MPa	65 MPa
◦ 910	-100 to 0 kPa (with accuracy 1 %)	300 kPa
999	Other range (overpress)	
Code	Pressure connector	
◦ GE2	G1/2" EN 837-1/-3 (manometric)	
◦ GD4	G1/4" DIN 3852	
◦ GE4	G1/4" EN 837-1/-3 (manometric)	
◦ ME2	M20x1.5 EN 837-1/-3 (manometric)	
◦ N4	1/4" NPT	
999	Other	
Code	Sealing	
◦ 1	Viton (FKM)	
9	Other	
Code	Accuracy	
◦ P10	1 % (under-pressure)	
◦ P05	0.5 %	
P99	Other	
Code	Calibration	
◦ KTL	Certificate of calibration	
Code	Output signal	
◦ CR1	4 to 20 mA / 2-wire	
◦ VR1	0 to 10 V / 3-wire	
◦ VR2	10 to 90 % U / 3-wire (ratiometric) / U = 2.7 to 5 VDC	
Code	Electrical connection	
◦ KN1	ISO 4400 (DIN 43650) connector (IP 65)	
◦ KN2	Micro connector, 4-pin (IP 65)	
◦ KN3	M12x1, 4-pin (Binder 713 plastic) (IP 67)	
◦ KN4	Cable outlet / cable 2 m (IP 67) (other lengths of cable consult with supplier)	
999	Other	
Code	Special version	
KY	Degrease version for oxygen	
Code	Optional accessories	
• VZNM	Testing valve of stainless steel with M20x1.5 nut, (1 110 416, see data sheet No. 0082)	
• VZNG	Testing valve of stainless steel with G1/2" nut, (1 110 492, see data sheet No. 0082)	
Example of order: D2411 G160 GD4 1 P05 KTL CR1 KN1		

◦ ... Ex stock version ◦ ... Marked version can be dispatched up to 10 working days



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Your Supplier: