



This manual covers mounting and operation of APZ 3020/APZ 3020a pressure transmitter (hereinafter referred to as "transmitter" or "device"); it contains technical specifications, connection instructions and other information necessary for proper operation and maintenance.

See datasheets at <http://piezus.ru> for complete specifications.

Production regulated by TOR 0131-001-16585379-2014

### 1 Design and operation

1.1 The devices are contact pressure transmitters continuously converting differential pressure (difference in pressure between two points) into a normalized unified analog or digital (HART, Modbus RTU) output signal.

1.2 The transmitter was designed to measure pressure of non-aggressive media: steam, gases or liquids.

1.3 Application: flow metering systems registering pressure differences; gas volume correctors.

### 2 Technical specifications

#### 2.1 Basic specifications

2.1.1 See transmitter's passport and label (sticker) for span and accuracy info.

2.1.2 See Table 1 for output signal options (factory set to order).

Table 1 - Output signal options

Ordering code	Output signal	Power supply (U <sub>power</sub> )	Load impedance	Power consumption
<b>A</b>	4...20 mA / 2 wire	12...36 V	≤ 1000 Ohm	<26 mA
<b>V</b>	4...20 mA / 3 wire	12...36 V	≤ 500 Ohm	
<b>C</b>	0...20 mA / 3 wire	12...36 V	≤ 500 Ohm	
<b>D</b>	0...10 V / 3 wire	12...36 V	> 10 kOhm	<7 mA
<b>E</b>	0...5 V / 3 wire	12...36 V	> 5 kOhm	
<b>K</b>	0.5...4.5 V / 3-wire	6...15 V	> 5 kOhm	<2 mA
<b>R*</b>	0.5...4.5 V / 3-wire	5 V	> 5 kOhm	<2 mA
<b>M</b>	RS-485/Modbus RTU	5 V / 12...36 V	–	<7 mA
<b>H</b>	4...20 mA / HART	12...36 V	≥ 250 Ohm	<26 mA
<b>Q*</b>	4...20 mA / 2 wire	12...28 V	≤ 1000 Ohm	<26 mA

\* Intrinsically safe design (Ex version)

#### 2.1.3 Digital interfaces:

- RS-485: bitrate - 4800 (factory setting), 9600, 19200, 38400 bps; Modbus RTU protocol (8 data bits + 1 stop bit, no parity control);
- HART: bitrate -- 1200 bps.

#### 2.1.4 Consumed power, max - 1 W.

2.1.5 Pressure port: M12x1.5 GOST 22525 group 2; M20x1.5; G1 / 2" (EN 837).

#### 2.1.6 Overall dimensions, max:

- a) parallel ports - 130x59x34 mm;
- b) coaxial ports - 110x113x34 mm.

#### 2.1.7 Weight, max - 0.4 kg.

### 2.2 Operating conditions:

- enclosed spaces free from aggressive vapors and gases;
- intrinsically safe design (Ex versions): hazardous environments (see explosion protection markings);
- atmospheric pressure from 84 to 106.7 kPa (group R1 under GOST R 52931);
- ambient air temperature from -50 to +85 °C;
- permissible media temperatures from -40 to +125 °C (depends on seal material, may be different);
- sensor exposure to liquids, gases and vapors non-aggressive to stainless steel and seal material.

Mechanical attack resistance when in use - F3 group under GOST R 52931.

### 2.3 Operating limitations:

- medium should be free from crystallizable impurities, contaminations and dust;
- connect the device where the medium is still or almost still and produces no vortices;
- never allow contamination of the diaphragm with silt, sand etc when installing the transmitter;
- install DZ 10 pressure snubber if the system can produce hydraulic shocks;
- use impulse tubing (pre-filled with water) when measuring vapour pressure.

### 3 Safety precautions

3.1 Circuits of the device carry no dangerous voltage (class III under GOST 12.2.007.0).

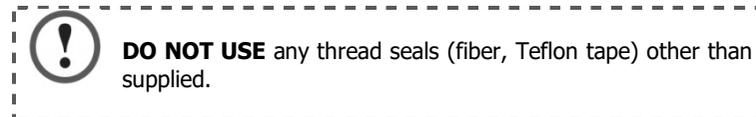
3.2 Always cut off power when connecting sensor circuits.

### 4 Installation instructions

4.1 Install the transmitter with maintenance convenience (incl. mounting, dismantling) in mind. We recommend mounting the transmitter with its pressure port pointing downwards (to allow condensate draining).

4.2 Mount the transmitter to a valve block with 40 mm between centers (parallel ports version) or to pulse lines using cap nuts. Lock the corresponding pressure port with a wrench when tightening cap nuts.

4.3 If the medium is gaseous, position the transmitter so that the pressure take-off tubes slope up uniformly (1:10 min) to the device and slope down if the medium is liquid (applies to transmitters with parallel pressure ports). In case such installation positions are impossible, mount settling vessels at lower portions of pressure take-off tubes for gaseous media and gas holders at their higher portions for liquid media.



4.4 Connect transmitter's circuits via connectors as shown in Figures 1-3; see Tables 2-4 for connection options.

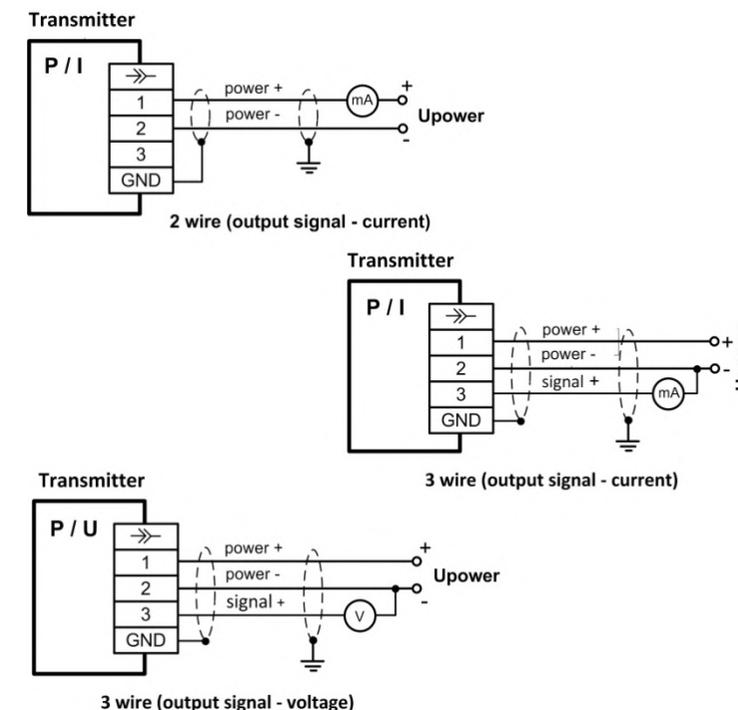
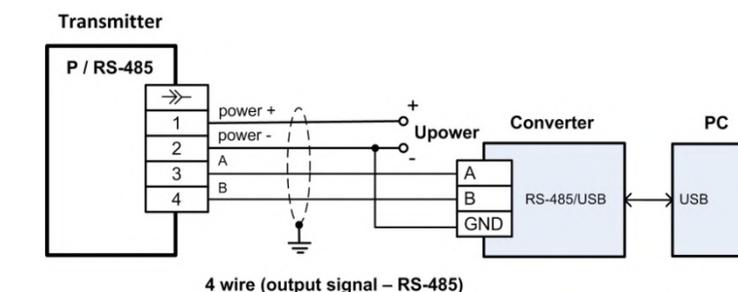


Figure 1 - DIN 43650A analog outputs connection diagram; example



Factory settings (unless otherwise ordered by the customer): address: 1; bitrate: 9600 bod; data: 8 bit; parity check: parity check bit; stop bit: 1  
**ATTENTION:** connect adapter's/controller's GND to the transmitter's minus terminal (terminal 1).

Figure 2 - RS-485 digital output connection diagram, DIN 43650A

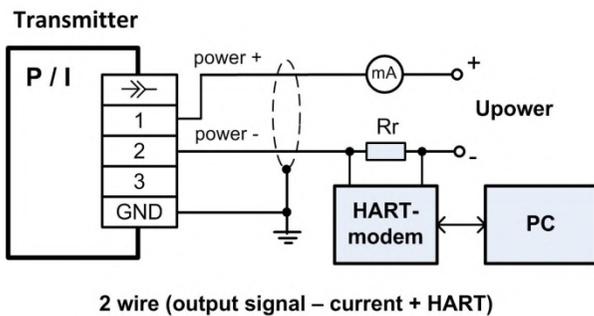


Figure 1 - HART digital output connection diagram, DIN 43650A

Table 2 - 2-wire line

Transmitter circuits	DIN 43650 pins
power +	1
power -	2
shield	GND

Table 3 - 3-wire line

Transmitter circuits	DIN 43650 pins
power +	1
power -	2
signal +	3
shield	GND

Table 4 - 4-wire line, RS-485 (Modbus RTU protocol)

Transmitter circuits	DIN 43650 pins
power +	1
power -	2
Tx	3
Rx	4 (GND)

Observe polarity when connecting the circuits; transmitters come with reverse polarity protection.

**Note: see PIEZUS Explosion Protection Guidelines for additional components connection diagrams for intrinsically safe versions.**

4.5 We recommend using a circular cross-section wire (outside diameter -- 6...8 mm) to make the cable gland seal reliable. Sealing cable gland with standard rings and gaskets is MANDATORY.



**DO NOT USE** any non-standard seals when sealing the cable.

## 5 Operation and maintenance

Check the diaphragm (it should be clean) and electrical connections on a regular basis after putting the transmitter into operation.

Never apply high pressure to the transmitter when cleaning it.

Routine checkups of the device in use follow data specified in its passport.

See the device's passport for its calibration interval and manufacturer's warranty.



## DO NOT:

- 1 allow voltage exceeding maximum specified for the transmitter;
- 2 use any objects to touch or otherwise apply mechanical force to the diaphragm;
- 3 use transmitters bearing visible signs of mechanical damage;
- 4 use transmitters in inappropriate climatic conditions;
- 5 allow medium temperatures above or below the limits specified for the transmitter; temperature above the limit may lead to medium seeping into the transmitter, temperature below the limit may render the transmitter inoperative.

All and any repairs are done by the manufacturer exclusively.

Manufacturer refuses all claims, reclamations, complaints related to transmitters with damaged manufacturer seals and showing signs of damage resulting from inappropriate operation, transportation or storage.

## 6 Transportation and storage

6.1 Use roofed transport to deliver transmitters to any destination needed; place individual packages into shipping containers if required.

6.2 Protect devices from impacts and vibrations while in transit; permissible temperature for transportation in shipping containers ranges from -50 to +85 °C.

6.3 Store devices in shipping containers in a heated (+5 to 40 °C) ventilated space.

## 7 Package contents

See Table 5 for package contents details.

Table 5 - Package contents

Name	Qty
APZ 3020 or APZ 3020a pressure transmitter	1 pc
Passport	1 copy
User manual (this paper)	1 copy*
Calibration leaflet (CM 62292-15)	1 copy**
PIEZUS Explosion Protection Guidelines (Ex versions only)	1 copy*
Optional accessories	1 set**

\* 1 copy per 10 transmitters for batch supplies to the same address.

Papers can be downloaded from the manufacturer's website.

\*\* Supplied by special order.

## 8 Resource and service life

8.1 Operating mode - 24/7.

8.2 Mean time between failures, min - 100,000 h.

8.3 Average service life - 12 years (normal working conditions: non-aggressive medium, temperature at +23 ± 3 °C, no vibrations and shaking).

## 9 Disposal

9.1 The transmitter contains no precious metals.

9.2 Dispose of as prescribed by regulations adopted by the operator.

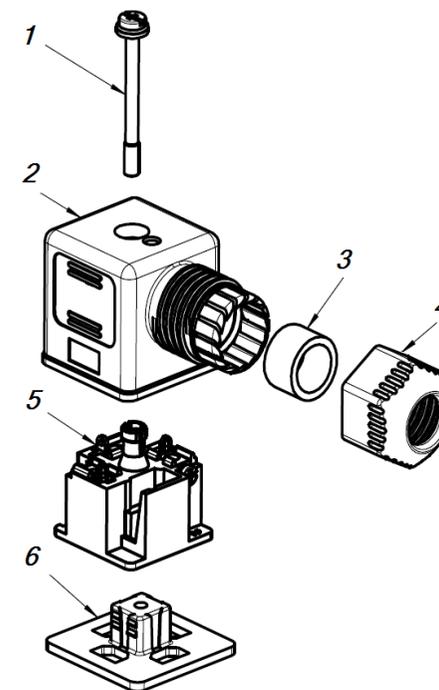
## Supplement

### Appearance of the differential pressure transmitter



**Note:** appearance may vary depending on the transmitter's configuration. Housing of Ex version (4...20 mA output signal) is 26 mm taller.

### DIN 43650 connector installation instructions



- 1) unscrew screw 1 and disassemble the connector;
- 2) insert cable into casing 2 through the sleeves 4 and 3;
- 3) connect cable circuit to corresponding terminals of terminal board 5;
- 4) insert cover 6 into board 5 and connector 2 casing;
- 5) lock the assembly with screw 1;
- 6) insert sleeve 3 into casing 2 and tighten nut 4.

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# PIEZUS

## APZ PRESSURE TRANSMITTERS

(1110, 1120, 3020, 3230, 3410, 3420, 3421)

## ALZ LEVEL TRANSMITTERS

(3720, 3721, 3820, 3821)

### Explosion Protection Guidelines Version 01



This instruction sheet applies to explosion-proof (Ex) versions of pressure transmitters. It contains technical information necessary for their correct mounting and operation in hazardous areas.

This instruction sheet is a supplement to the relevant Operation Manual; it offers typical connection diagrams for transmitters and their explosion protection components.

Explosion-proof versions have intrinsically safe circuits, level "ia", which allows bearing markings 0Ex ia IIC T4 Ga and 0Ex ia IIC T4 Ga X. X after Ex marking means there are special requirements to connection of pressure transmitters: integral communication cable must run outside of the hazardous area or in a box meeting the requirements of TP 012/2011.



**Please pay special attention to paragraphs accompanied by this mark.**

### 1 General Information

1.1 Only specialists trained in handling explosion-proof equipment can mount the transmitters; before mounting, they must read this instruction sheet and Operation Manual.

1.2 Following documents regulate mounting of explosion-proof transmitters:

- Electrical Installations Code, Chapter 7.3 "Electrical Installations in Explosion Hazard Zones";
- Electrical Equipment Operation Rules, Chapter 3.4 "Electrical Installations in Explosion Hazard Zones";
- GOST R IEC 60079-0-2011 Explosive atmospheres. Part 0. Equipment. General Requirements;
- GOST R IEC 60079-11-2010 Explosive atmospheres. Part 11. Intrinsically safe electrical circuit "i";
- GOST IEC 60079-14-2013 Explosive atmospheres. Part 14. Design, Selection and Installation of Electrical Units;
- VSN332-74 Installation of Electrical Equipment, Power and Lighting Lines in Explosion Hazard Zones: Instructions.

### 2 Safety Precautions

2.1 The source of danger associated with pressure transmitters, their mounting and/or operation, is the medium, which is typically under pressure. Always close the valve up the medium line when mounting or disconnecting pressure transmitters.

Unplug the transmitter only after medium pressure equalizes with atmospheric pressure.

2.2 GOST 12.3.019, "Consumer Electrical Installations Operation Rules" and "Safety Rules For Consumer Electrical Installations Operation" must be observed when operating, servicing and calibrating the devices.

2.3 The electric shock hazard class of the devices is III (no dangerous voltage); see GOST 12.2.007.0 for full classification.

2.4 Always cut off power when connecting circuits.



**NEVER use the device with aggressive media, i.e. media containing acids, alkalies, oils etc.**

### 3 Mounting

3.1 Ex versions of transmitters can be used in explosion hazard zones IIA, IIB, IIC, temperature classes T1 ... T4, as prescribed by regulations setting framework for application of electrical equipment in explosion hazard conditions.

3.2 Always check the exterior of the transmitter before mounting it. Check for visible mechanical damage and see if the Ex markings match the zone's category and class. The transmitter's surface must be dry and clean.

3.3 Connect or disconnect the transmitter to/from the medium only when its pressure equalizes with atmospheric pressure; alternatively, close valve up the medium line. Valves simplify routine control and maintenance operations.

3.4 See the Manual for additional recommendations pertaining to mounting.

### 4 Power Connection

#### 4.1 General

4.1.1 Depending on the version, transmitters can have two- or three-wire connection circuits. Ordering code contains information about the transmitter's communication link type, which must be taken into account when connecting the transmitter.

4.1.2 To ensure compliance with explosion safety rules applicable to transmitters in specific locations:

- connect circuits as described in Supplement A;
- use additional equipment compliant with the requirements provided in clause 4.2;
- disconnect transmitter from power source when connecting communication cable.

4.1.3 We recommend using a circular cross-section wire (see transmitter's Specifications for its diameter) to ensure a reliable seal of the cable gland. Sealing cable gland with standard rings and gaskets is MANDATORY.

4.1.4 Do not run signal cables through a conduit/channel together with power cables; avoid running signal cables next to powerful electrical equipment.

4.1.5 Ensure compliance with requirements provided below when mounting transmitters in explosion hazard zones.

**NOTE: You may use a DC power source (see Manual for voltage) for an intrinsically safe transmitter mounted outside of explosion hazard zones; in such a setup, the transmitter is no longer explosion-proof.**

#### 4.2. ia Explosion Protection

4.2.1 ia versions of transmitters are designed following guidelines provided in GOST 22782.5 and have their current and voltage limited to intrinsically safe values.

Transmitters receive power from intrinsically safe circuits of barriers (power supply units) located outside of the hazardous zones. These devices must have "Ex ia" certification good for the explosive mixtures they can come into contact with.

4.2.2 Electrical parameters of pressure transmitters (input, intrinsically safe):

**- current signal 4...20 mA (2 wire):**

$U_i \leq 28 \text{ V}$ ,  $I_i \leq 93 \text{ mA}$ ,  $P_i \leq 0.66 \text{ W}$ ;  $C_i \leq 0,015 \mu\text{F}$ ,  $L_i \leq 10 \mu\text{H}$ ;

**- voltage signal 0.5...4.5 V (3 wire):**

$U_i \leq 6 \text{ V}$ ,  $I_i \leq 60 \text{ mA}$ ,  $P_i \leq 0.1 \text{ W}$ ;  $C_i \leq 0.5 \mu\text{F}$ ,  $L_i \leq 10 \mu\text{H}$ .

**Note - Ex pressure transmitters bear the following data:**

- explosion protection type;
- electrical parameters of explosion protection;
- number of the certificate of conformity.

### 5 Explosion protection in operation

5.1 Using Ex versions of pressure transmitters, you need to follow guidelines provided in this sheet, relevant Manual, chapter 3.4 of the Electrical Equipment Operation Rules, chapter 7.3 of the Electrical Installations Code, as well as other regulations covering operation of electrical equipment in hazardous areas.

5.2 The devices need maintenance; the routine includes external inspection that aims at checking:

- reliability of transmitter's connection to the medium line, its seals;
- its mechanical integrity, contamination with dust and dirt;
- integrity of the communication cable and its insulation.



**Use of malfunctioning or damaged transmitters is strictly prohibited.**

5.3 Maximum period between maintenance checkups is one year; depending on the operating conditions, you may need to perform them more often.

5.4 Maximum medium pressure (in line, etc) should not exceed the transmitter's URL (upper range limit).

5.5. Never adjust ZERO and RANGE if the atmosphere around the transmitter is explosive.

**Supplement A**

**Analog Output Connection**

See figures A.1 and A.2 for typical transmitter circuits connection diagrams (Ex version).

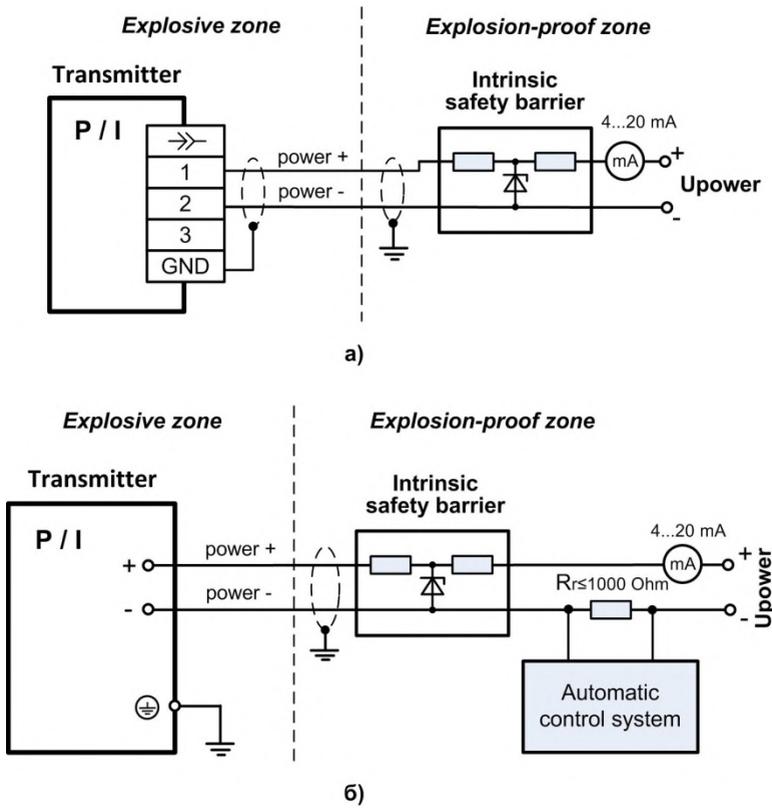


Figure A.1. Variant of analog output connection diagram, current signal: a) DIN 43650A connector; b) cable gland

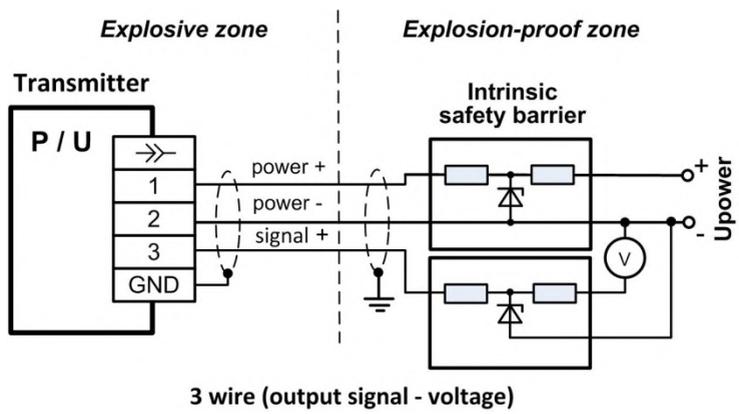


Figure A.2. Variant of analog output connection diagram, voltage signal, DIN 43650A connector