

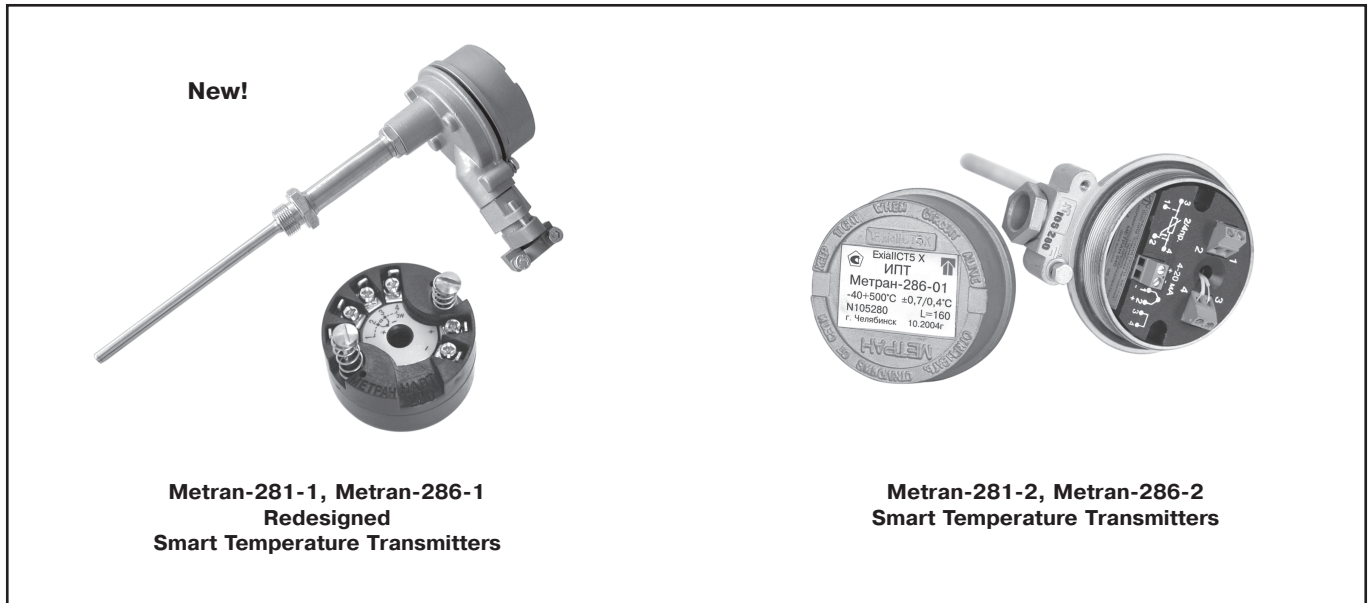
COMPARISON OF TECHNICAL CHARACTERISTICS
of Metran-270MP Microprocessor Temperature Transmitters and
Metran-280 Smart Temperature Transmitters

Characteristics, parameters, functionality	Temperature Transmitter Type			Advantages of Metran-280-1 (redesigned) vs. Metran-270MP, Metran-280-2
	Metran-270MP	Metran-280-2	Metran-280-1 (redesigned)	
Output, mA	4-20, 20-4	4-20/ HART	4-20/ HART	Digital communication protocol upgrades functionality
Open HART protocol	-	+	+	Supported by all top manufacturers of equipment and software
Remote diagnostics and parameter setting	-	+	+	Easy to test in hard-to-reach and remote area, and in hazardous production
Galvanic isolation	-	-	+	Reduced complementary error when working in EM influence area
Minimum measurement subrange, °C for standard curve of sensor HA(K)	50	100	25	Reduced minimum measurement subrange
100P	25	50	10	
Alarm level	Low	Low	High or Low	Enhanced capability of operation with imported equipment
Self-diagnostics	+	+	+	Testing of HART loop and 4-20 mA signal
	-	+	+	In case of failure, error code is available
RF interference filter	+	+	+	Guarantees reliable operation, meets requirements of: - GOST R 51317.4.6 degree of fixity 3; - NAMUR NE 21
	-	-	+	
Protection from contact and air discharges, induced or pulse interference, voltage surges	-	-	+	Guarantees reliable operation. Meets GOST R 51317.4.2 / 4.3/ 4.4/ 4.5 - degree of fixity 3 and NAMUR NE 21 requirements
Electronic filter 50/60 Hz	-	-	+	Electronic filter suppresses an interference of industrial frequency 50/60 Hz
Configuration device	Metran-671 Configurator with M-Master Software	Metran-650 or 375 Communicator Metran-681 HART-Modem with H-Master Software		One set of control devices can be used for all HART transmitters

* URL - Upper Range Limit.

Metran-280 Smart Temperature Transmitters

Code OKPO 42 1199



- **High Accuracy**
- **Output - 4-20 mA/HART**
- **Digital data transfer by HART protocol**
- **2-wire current lines for signal transfer**
- **Remote control and diagnostics**
- **Entered into the State Register of Measuring Instruments** under No.23410-02, Certificate No.12910.
- **Explosion Protection Certificate** for electrical equipment No.02.187 Metran-280Exia, No.02.188 Metran-280Exd
- **Redesigned Metran-280-1 STT**
 - galvanic isolation between input and output;
 - increased protection from EMI;
 - programmable alarm and saturation levels;
 - design of electronic converter provides high reliability during long-term usage;
 - reduced minimum measurement subrange

Metran-280 Smart Temperature Transmitters (STT) are designed for accurate measurement being a part of process control systems (PCS).

STT can be used with neutral and aggressive media to which protection tube is corrosion-resistant.

Metran-280 communicates with PCS by:

- **analog channel** - transfers data on measured temperature in the form of 4-20 mA direct current;
- **digital channel** - in accordance with HART-protocol in Bell-202 standard.

For distant data transfer 2-wire current lines are used.

DESIGN FEATURES AND PRINCIPLE OF OPERATION

Metran-280 consists of a sensor and electronic converter (EC) integrated into connection head housing.

As a sensor Metran-281 uses sensing elements from thermocouple cable KTMS (HA), Metran-286 uses platinum resistance sensing elements.

EC converts signal from sensor to unified output signal of direct current **4-20 mA** with superimposed **HART** digital signal in **Bell-202** standard.

Depending on EC, Metran-280 can be:

- Metran-280-1 - EC with galvanic isolation (code EC1);
- Metran-280-2 - EC without galvanic isolation (code EC2).

HART Communication Protocol provides two-way data exchange between Metran-280 and control devices:

- by hand-held portable Metran-650 HART-Communicator;
- computer with Metran-681 HART-Modem and H-Master software installed;
- by any device to control HART field devices, e.g. 375 Communicator (refer to "Communication Devices" Section).

STT is controlled remotely, providing the following:

- selection of main parameters;
- resetting of measurement ranges;
- information about STT (type, model, serial number, max and min measurement ranges, actual measurement range).

Metran-280 has the following measurement units: Celsius degrees, °C; Kelvin degrees, K; Fahrenheit degrees, F; Rankin degrees, R*; Ohms*; millivolts*.

* For Metran-280-1 only.

Multidrop mode

In multidrop mode Metran-280 operates only with difital output. Analog output is automatically set to 4 mA and does not depend on value of input temperature. Temperature information is read by HART protocol. Up to 15 transmitters can be connected to one pair of wires. The number depends on line length and parameters, and on transmitter power supply capacity. In multidrop mode every transmitter has its unique address from 1 to 15, according to which the transmitter is being polled. In customary mode Metran-280 has 0 address; if address from 1 to 15 is assigned to it, the transmitter automatically switches to multidrop mode and sets 4 mA output. A communicator of PCS determines all transmitters connected to the line and can operate with each of them.

Multidrop mode is not recommended if intrinsic safety is required.

Transmitter wiring diagram for multidrop mode is given in "External Wiring Diagram" Section.

FUNCTIONALITY

Electronic converter performs:

- remote resetting of measurement temperature range taking into account minimum subrange (difference between upper and lower values of measurement range being set):

- 100°C - for Metran-281-2,
- 50°C - for Metran-286-2,
- 25°C - for Metran-281-1,
- 10°C - for Metran-286-1;

- self-diagnostics. If sensor or EC failure is detected, analog signal is set to:

for EC1

- high level 21 mA < I_{out} ≤ 23 mA, or
- low level 3.50 mA < I_{out} ≤ 3.75 mA.

Alarm level is user-configured with the help of Metran-650 or 375 Communicator; Metran-681 HART Modem with H-Master Software.

EC1 failure always causes high alarm level regardless of alarm level selected (High or Low).

for EC2

I_{out} ≤ 3.77 mA.

- switches to saturation mode when sensor temperature goes out of temperature measurement range:

for EC1

- low level: between low alarm level plus 0.1 mA and 3.9 mA;
- high level: between 20.5 mA and upper value of alarm signal minus 0.1 mA;

for EC2

3.84 mA or 21.6 mA;

- linearization of standard curve of temperature sensor sensing element;
- self-compensation of thermo-emf change caused by change of sensor cold junction temperature;
- protection from accidental change of preset parameters;
- selection of damping value:

for EC1 - any value from 0 to 32 s
(default value is 5 s);

for EC2 - can be: 0.78; 3.2; 5.6; 7.8; 10.1; 19.5; 26.5; 31 s;

- filtration of AC network frequency 50/60 Hz in Metran-280-1;
- operation in active calibrator mode (capability to test EC1 with calibrators that generate different electric signals, e.g. Metran-510-PKM).

Turn-on and update time for EC are given in Table 1.

Table 1

Characteristics	EC code	
	EC1	EC2
Turn-on time (damping is zero), s	5	3
Update time, s	0.5	0.8

BASIC SPECIFICATIONS

STT type and version, temperature sensor type, measured temperature range, accuracy limits are shown in Table 2.

Table 2

STT Type and Version	Sensor Type	Measured Temperature Range, °C	Upper Range Limit, °C	Accuracy Limits, ±°C	
				Analog Signal, Δa	Digital Signal, Δd
Metran-281	K	from -50 to 1000	to 300	1	0.5
Metran-281-Exia			to 1000	2.5	2
Metran-281-Exd					
Metran-286	Pt100	from -50 to 500	to 200	0.5	0.4
Metran-286-Exia			to 500	0.7	0.4
Metran-286-Exd					

Protection Tube Material

Table 3

Material	Max Application Temperature, °C	Material Type Code
12Cr18Ni10Ti	800	N10
10Cr17Ni13Mo2Ti	800	N13
CrNi78Ti	1000	N78

Material of connection head housing - AK12 aluminum alloy.

Ingress protection - IP65 per GOST 14254.

Explosion protection

Metran-281-Ex, Metran-286-Ex can be applied in hazardous area which may contain explosive gas mixtures, vapors, combustible liquids with air of IIC category, Group T6 or T5 per GOST 12.1.011.

Explosion protection marking:

- specific explosion-proof level with "intrinsically safe electric circuit ia" explosion protection type - ExialICT6X, ExialICT5X;
- explosion-proof level with "explosion-proof enclosure d" explosion protection type - 1ExdIICT6X, 1ExdIICT5X.

Transient protection

Metran-700-BVP High Potential Barrier protects Metran-280 from transients induced on loop wiring by lightning, welding or other heavy electrical equipment, or switch gears (detailed information is given in "Functional Equipment. Secondary Equipment." Section).

Protection from EMI for Metran-280-1 is in Table 4.

Table 4

Electromagnetic Interference	Parameter	Interference Effect
Electrostatic discharge	- contact discharge of 6 kV; - air discharge of 8 kV	No
Induced	80-1000 MHz at 10 V/m	No
Pulse	1 kV for input-output	No
Surge	- 0.5 kV by "wire-wire" - 1 kV by "wire-ground"	No
Conductive	from 150 kHz to 80 MHz at 10 V	No

Supply:

- from 18 to 42 VDC - **for Metran-280, Metran-280-Exd**;

- from intrinsic-safe circuits of power supplies (barriers) with "intrinsic-safe electric circuit" explosion protection type with intrinsic safety level of electrical circuit "ia" for explosive blends of Group IIC per GOST 12.1.011 (e.g. Metran-661-Smart* Power Supply, Metran-631-Isobar* IS Barriers or active barriers D1010S (1 channel), D1010D (2 channels) produced by Valcom company, or active barriers models 9303/13-22-11, 9001/51-280-110-14 produced by Stahl company) - **for Metran-280-Exia**.

* Refer to "Functional Equipment. Secondary Equipment" Section.

Power:

- 1.0 W - for Metran-280-1, Metran-280-1-Exd;
- 0.65 W - for Metran -280-1-Exia;
- 0.9 W - for Metran-280-2, Metran-280-2-Exd;
- 0.5 W - for Metran -280-2-Exia.

Reliability

Average life time, min
 3 years for Metran-281;
 6 years for Metran-286.

Warranty

Warranty operation period: 18 months from the date of commissioning.

Verification:

Verification interval is 1 year.

Climatic type:

- U1.1 per GOST 15150 for operation at ambient temperature from -40 to +70°C;
 for Ex version of T6 temperature class from -20 to +40°C; for T5 temperature class from -40 to +70°C;
 - T3 per GOST 15150 for operation at ambient temperature from -10 to +70°C;
 for Ex version of temperature class T6 from -10 to +40°C; T5 temperature class from -10 to +70°C.

As a special order Metran-281-1, Metran -286-1 can be produced with -50 to 85°C range.

**Maximum Pressure (Pmax),
 Vibrostability Group (Vs)**

Table 5

Fig.	Pmax, MPa	Vs per GOST 12997
1, 4, 12-19	0.4	V1
2, 3, 5, 6, 7	6.3	

Thermal Inertia (T)

Table 6

Fig.	T, s
1, 2	40
3, 4, 5	20
6, 12-19	8
7	30

OVERALL AND MOUTING DIMENSIONS

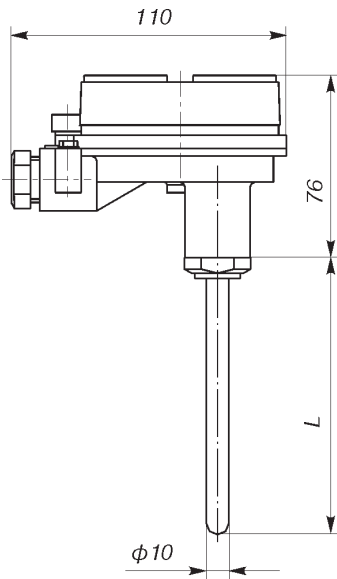


Fig. 1
 Metran-281/286-01,
 Metran-281/286-01-Exia

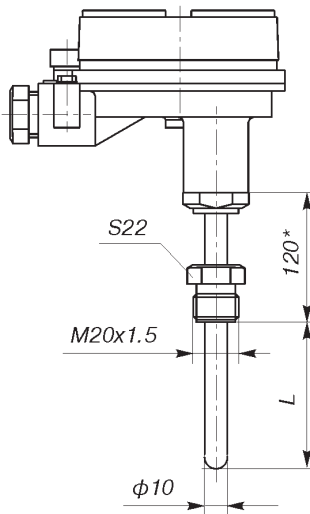


Fig. 2 (also refer to Fig. 1)
 Metran-281/286-02,
 Metran-281/286-02-Exia

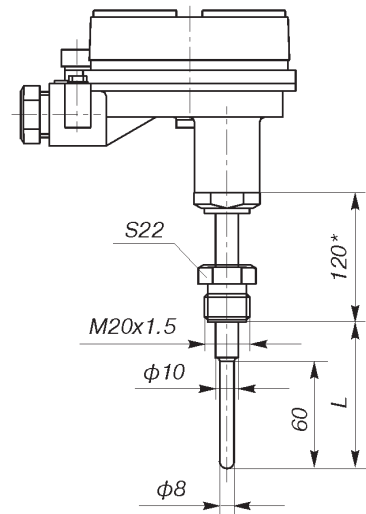


Fig. 3 (also refer to Fig. 1)
 Metran-281/286-03,
 Metran-281/286-03-Exia

* In order to reduce effect of temperature on EC operation in processes with high temperatures, Metran-281, -Exia, -Exd with external length of 160 or 200 mm can be produced as a special order. The exact external length is stated in the order.

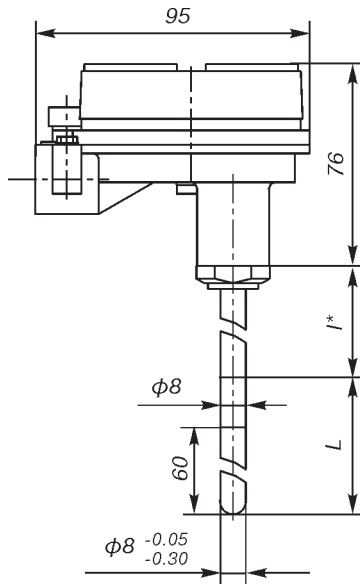


Fig.4**
Metran-281-04-Exd (l=120 mm)
Metran-286-04-Exd (l=80 mm)

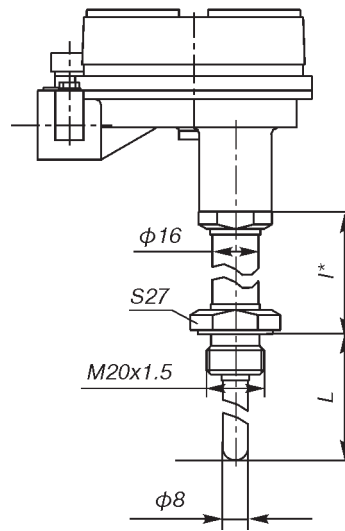


Fig.5** (also refer to Fig.4)
Metran-281-05-Exd (l=120mm)
Metran-286-05-Exd (l=80 mm)

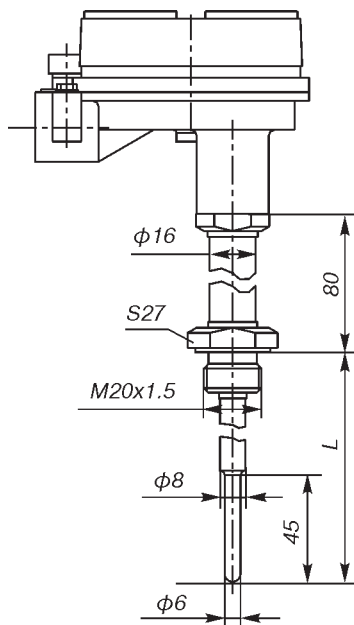


Fig.6** (also refer to Fig.4)
Metran-286-06-Exd

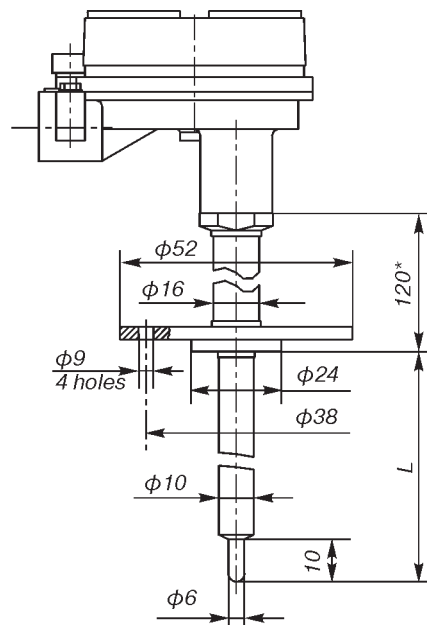


Fig.7** (also refer to Fig.4)
Metran-281-07-Exd

* In order to reduce effect of temperature on EC operation in processes with high temperatures, Metran-281, -Exia, -Exd with external length of 160 or 200 mm can be produced as a special order. The exact external length is stated in the order.

** Cable entries are not shown, refer to "Mounting Sets for Cable Entry".

Standard Sensor Lengths and Weight

Table 7

Fig.	Type and Version	Sensor Length, L, mm																
		60	80	100	120	160	200	250	320	400	500	630	800	1000	1250	1600	2000	2500
1	Metran-286, Metran-286-Exia	-	-	C	+	+	+	+	+	+	+	+	+	+	+	+	C	C
2		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3		C	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Weight, kg		0.50...0.65					0.65...0.85					1.00...1.60						
4	Metran-286-Exd	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C	C
5		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C	C
6		C	C	+	+	+	+	+	+	C	C	C	C	C	C	C	C	C
Weight, kg		0.85...1.05					0.92...1.25					1.2...1.4						
1	Metran-281, Metran-281-Exia	-	-	C	+	+	C	+	+	+	+	+	+	+	+	+	C	C
2		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Weight, kg		0.50...0.65					0.65...0.85					1.00...1.60						
4	Metran-281-Exd	C	C	C	+	+	+	+	+	+	+	+	+	+	+	+	C	C
5		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	C	C
7		+	+	+	+	+	+	+	+	C	C	C	C	C	C	C	C	C
Weight, kg		0.85...1.05					0.92...1.25					1.2...1.4						

Orders are received:



for -50...300°C range of measured temperatures

for -50...500°C range of measured temperatures

C upon additional agreement

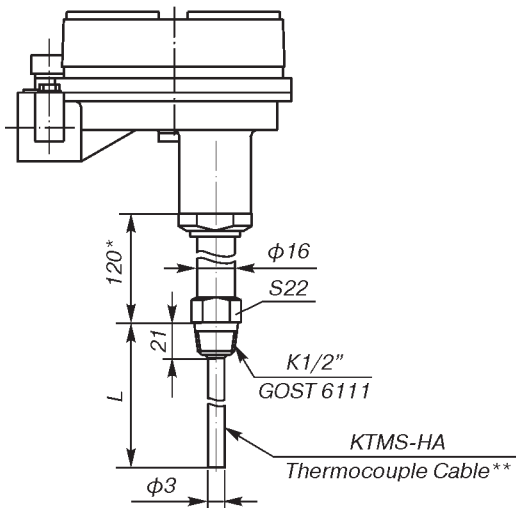


Fig. 12 (also refer to Fig.4)
Metran-281-12-Exd

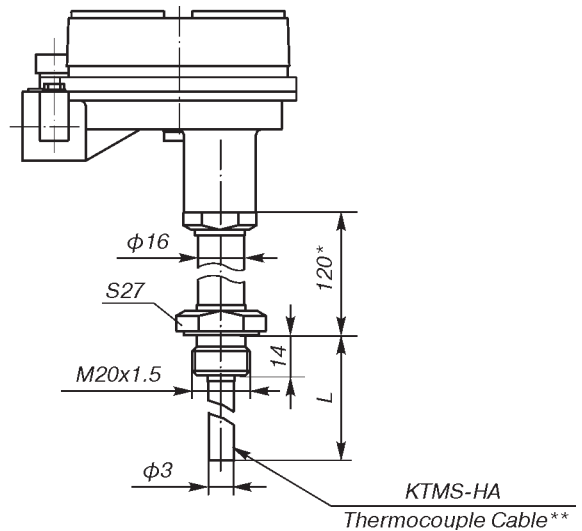


Fig. 13 (also refer to Fig.4)
Metran-281-13-Exd

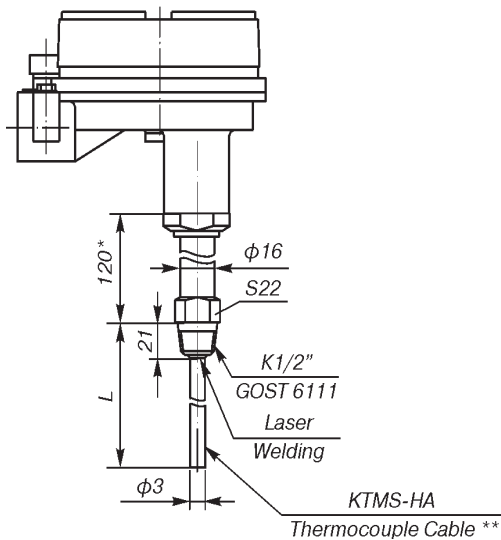


Fig.14 (also refer to Fig.4)
Metran-281-14-Exd

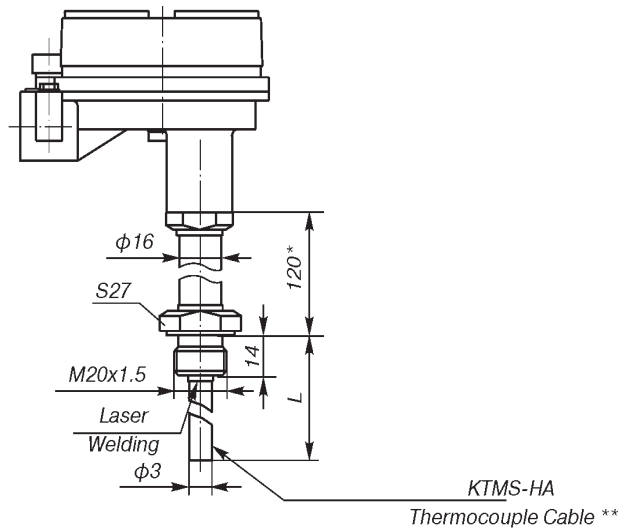


Fig.15 (also refer to Fig.4)
Metran-281-15-Exd


* In order to reduce effect of temperature on EC operation in processes with high temperatures, Metran-281-Exd with external length of 160 or 200 mm can be produced as a special order. The exact external length is stated in the order.

** Immersion length of Metran-281-12, -13, -14, -15-Exd is made from thermocouple cable KTMS-HA. During mounting the immersion length can be bent, placed into hard-to-reach places and forced against surface to measure its temperature.

Standard Sensor Lengths

Table 8

Fig.	Type and Version	Sensor Length, L, mm																		
		60	80	100	120	160	200	250	320	400	500	630	800	1000	1250	1600	2000	2500	3150	
12	Metran-281 Exd	C	C	C	C	C	+	+	+	+	+	+	+	+	+	+	+	C	C	
13		C	C	C	C	C	+	+	+	+	+	+	+	+	+	+	+	C	C	
14		C	C	C	C	C	+	+	+	+	+	+	+	+	+	+	+	+	C	C
15		C	C	C	C	C	+	+	+	+	+	+	+	+	+	+	+	+	C	C
Weight, kg		0.95			1.1			1.5			1.25			1.36						

Orders are received:
 for -50...300°C range of measured temperatures
C upon additional agreement

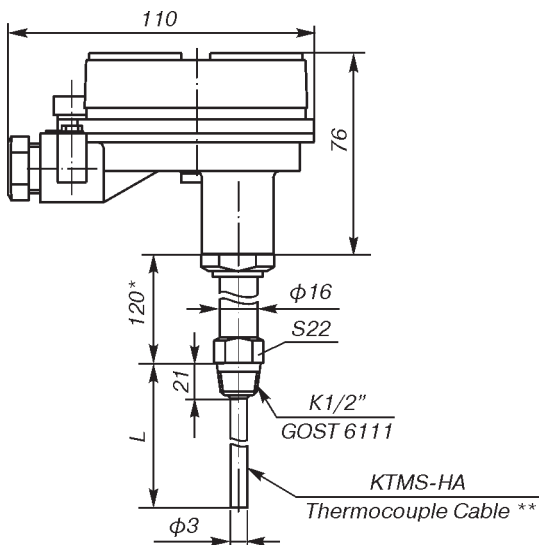


Fig.16
Metran-281-16, -Exia

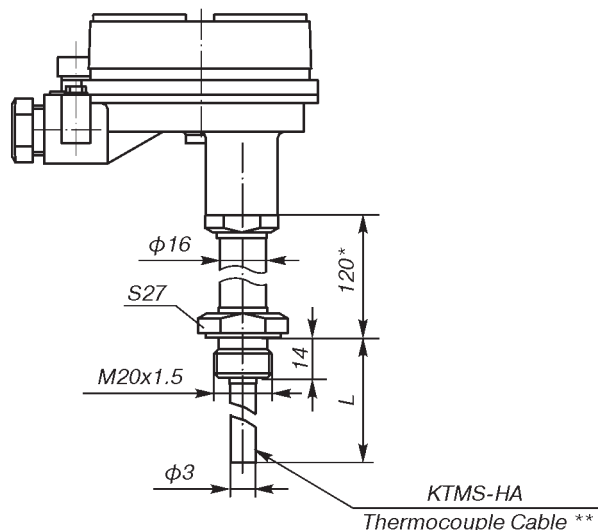


Fig.17 (also refer to Fig.16)
Metran-281-17, -Exia

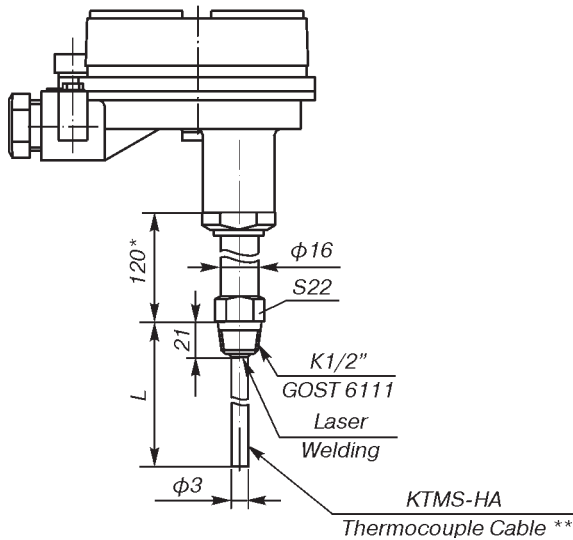


Fig. 18 (also refer to Fig.1)
Metran-281-18, -Exia

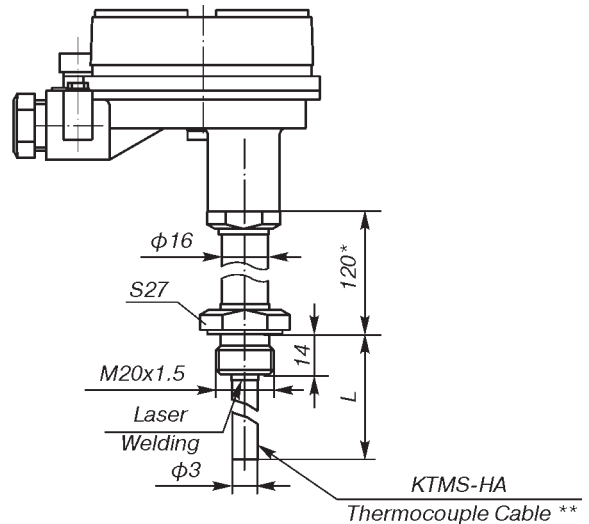



Fig. 19 (also refer to Fig.1)
Metran-281-19, -Exia

* In order to reduce effect of temperature on EC operation in processes with high temperatures, Metran-281-Exia with external length of 160 or 200 mm can be produced as a special order. The exact external length is stated in the order.

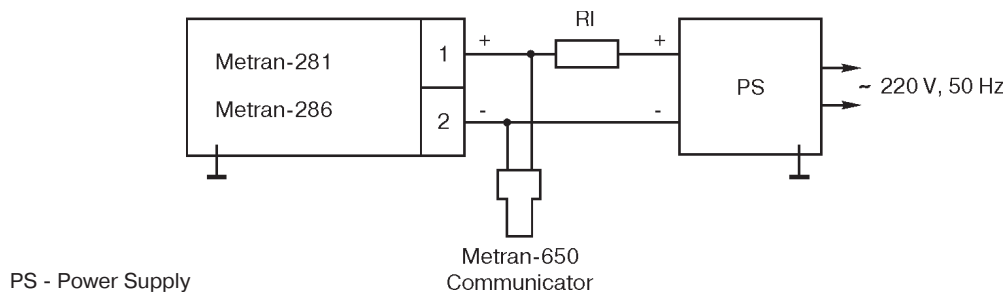
** Immersion length of Metran-281-116 (Exia), -17 (Exia), -18 (Exia), -19 (Exia) is made from thermocouple cable KTMS-HA. During mounting the immersion length can be bent, placed into hard-to-reach places and forced against surface to measure its temperature.

Table 9

Fig.	Type and Version	Sensor Length, L, mm																		
		60	80	100	120	160	200	250	320	400	500	630	800	1000	1250	1600	2000	2500	3150	
16	Metran-281, -Exia	C	C	C	C	C	+	+	+	+	+	+	+	+	+	+	+	C	C	
17		C	C	C	C	C	+	+	+	+	+	+	+	+	+	+	+	C	C	
18		C	C	C	C	C	+	+	+	+	+	+	+	+	+	+	+	+	C	C
19		C	C	C	C	C	+	+	+	+	+	+	+	+	+	+	+	+	C	C
Weight, kg		0.95			1.1			1.15			1.25			1.36						

Orders are received:
 for -50...300°C range of measured temperatures
C upon additional agreement

EXTERNAL WIRING DIAGRAM



Note: Communicator can be connected to any point of circuit. For communication the load resistance in a system must be minimum 250 Ohm.

Fig. 1. Metran-281, Metran-286.

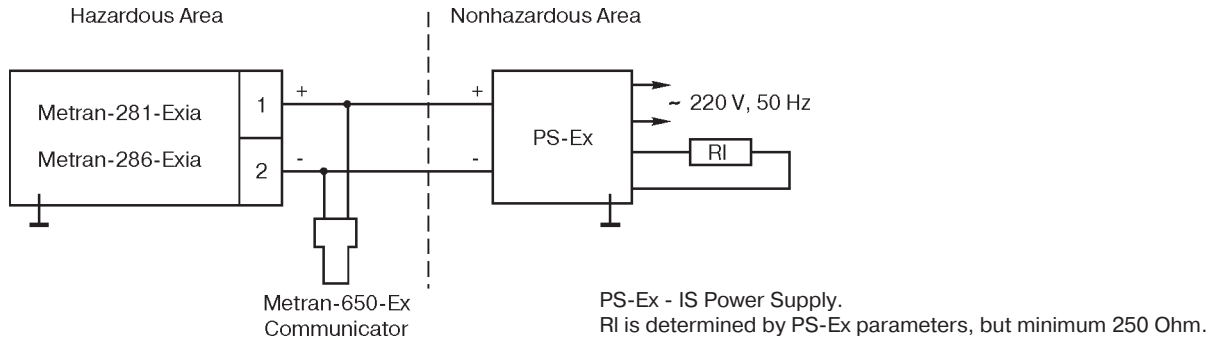


Fig.2. Metran-281-Exia, Metran-286-Exia with PS-Ex Power Supply.

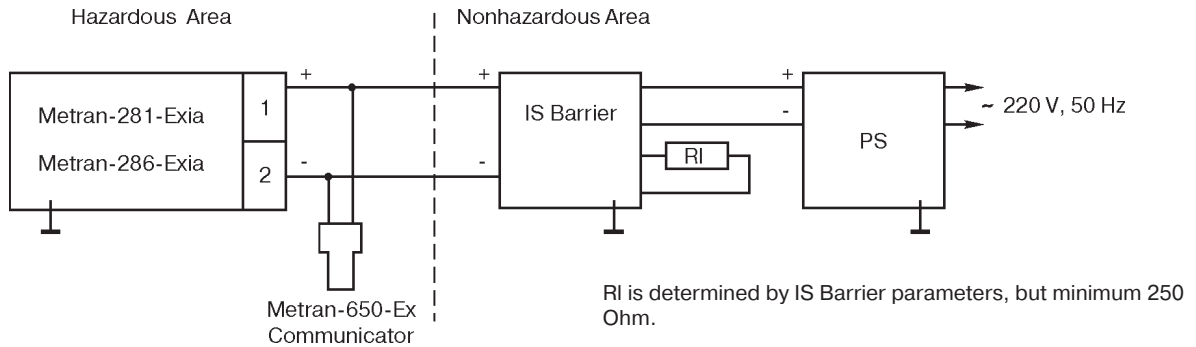


Fig.3. Metran-281-Exia, Metran-286-Exia with IS Barrier.

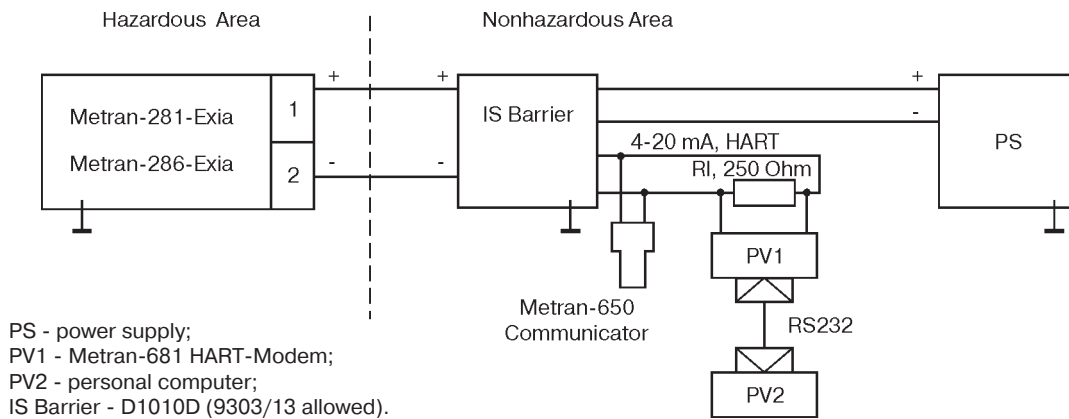


Fig.4. Metran-281-Exia, Metran-286-Exia with IS Barrier with galvanic isolation between supply and data circuit.

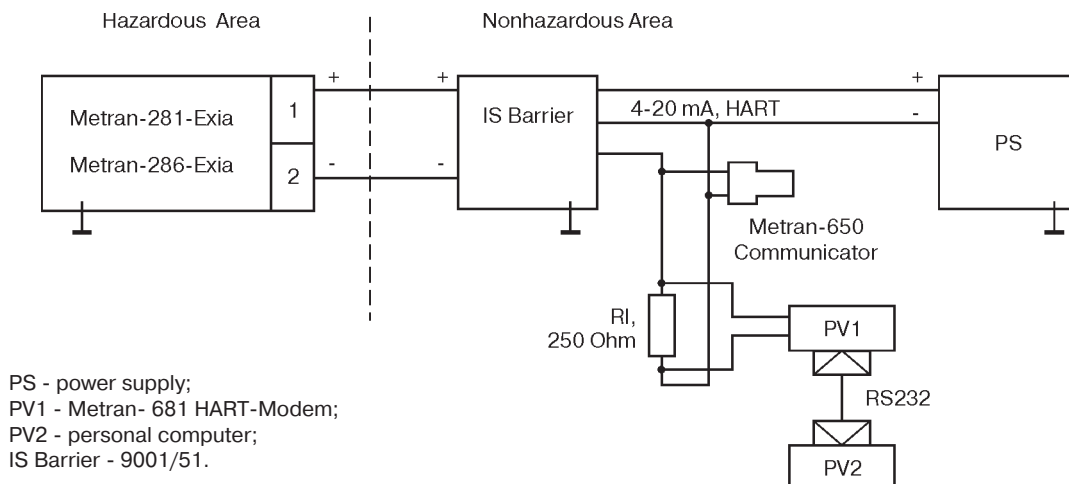


Fig.5. Metran-281-Exia, Metran-286-Exia with IS Barrier without galvanic isolation between supply and data circuits.

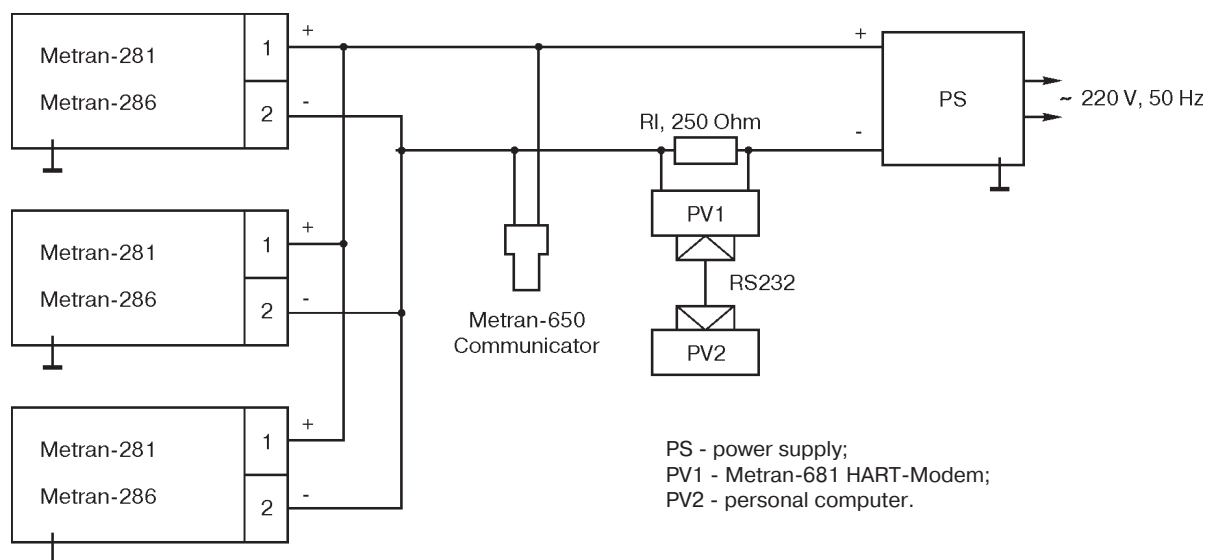


Fig.6. Metran-281, Metran-286 in multidrop mode.

ORDERING INFORMATION

Metran-286 - 05 - Exd - 1 - 500 - N10 - (-50...500)°C - AC - T6 - U1.1 - GP - TU...											
1	2	3	4	5	6	7	8	9	10	11	12

1. Smart Temperature Transmitter Type

Metran-281**Metran-286**

2. Protection tube code

- | | |
|-----------|-------------------------------|
| 01 | Fig.1 |
| 02 | Fig.2 |
| 03 | Fig.3 |
| 04 | Fig.4 |
| 05 | Fig.5 |
| 06 | Fig.6 (Metran-286-Exd only) |
| 07 | Fig.7 (Metran-281-Exd only) |
| 12 | Fig.12 (Metran-281-Exd only) |
| 13 | Fig.13 (Metran-281-Exd only) |
| 14 | Fig.14 (Metran-281-Exd only) |
| 15 | Fig.15 (Metran-281-Exd only) |
| 16 | Fig.16 (Metran-281-Exia only) |
| 17 | Fig.17 (Metran-281-Exia only) |
| 18 | Fig.18 (Metran-281-Exia only) |
| 19 | Fig.19 (Metran-281-Exia only) |

3. Explosion protection type (indicate for explosion-proof version):

- Exia** "intrinsically-safe electric circuit ia";
Exd "explosion-proof enclosure d"

4. Code of electronic converter type

- 1** with galvanic isolation
2 without galvanic isolation

5. Sensor length, L, mm (Table 5).

6. Code of protection tube material (Table 3).

7. Measured Temperature Range (Table 2).

8. Mounting set for cable entry (indicate for Exd, see "Mounting Sets for Cable Entry" Section):

- AC** for armored cable,
PM for pipe mounting

9. Temperature class per GOST R 51330.0

T5
T6

10. Climatic type per GOST 15150

U1.1
T3

11. Metrological Verification:

GP verification by Gosstandart

12. Specifications TU-4211-007-12580824-2002.