

Metran-300PR Vortex Flowmeter



- **Operating fluids:** water (district heating, drinking, industrial, distilled, etc.), water solutions except abrasive ones with viscosity up to $2 \cdot 10^{-6} \text{ m}^2/\text{s}$ (2 cSt)
- **Process temperature range**
1 to 150°C
- **Gage pressure**
Up to 1.6 MPa
- **Internal diameter (DN) of connected pipeline**
25...300 mm
- **Flow range**
0.18...2000 m³/h
- **Turndown** 1:100
- **Volume reference accuracy**
up to $\pm 1.0\%$
- **Outputs:**
 - Pulse (standard);
 - Unified analog 0-5, 0-20, 4-20 mA (option);
 - Digital interface: RS485/HART (option);
 - 3-line LCD (option)
- **Power Supply:** DC source with constant voltage of 16 to 36 V
- **Calibration interval**
4 years

Application: heat energy metering systems, cold water supply, hot water supply, industrial measurement of water and water solutions flow (including process control systems).

It is used together with Metran-400 and Metran-420 heat computers, Metran-310R flowmeter produced by "Metran" IG; heat computers produced by other enterprises (e.g. SPT 941K, SPT 961K, STD, TSK-5, Elf, Karat-TMK.10, TEKON-17T).

DESIGN FEATURES

The operating principle is given in the Introductory section of Metran-300PR, Metran-320 and Metran-305PR Vortex Flowmeters.

Design features of Metran-300PR flowmeter versions are given in Table 1

Table 1

Features	Flowmeter Version		
	Metran-300PR-A	Metran-300PR-B	Metran-300PR
Standard size, DN, mm	25...100	150,200	250; 300
Signal pickup diagram	single-beam		two-beam
Connecting unit design	Confuser-Diffuser, i.e. conic passages, made in flow tube	Confuser-Diffuser, i.e. branch pipes of special form, mounted on pipeline separately from flow tube	No branch pipes and conic passages

Confuser and Diffuser conic passages are used for additional stabilizing the flow velocity profile and reducing the straight run length upstream and downstream at the flow tube inlet and outlet.

The flowmeter of "B" version has Confuser-Diffuser conic passages in the form of exterior branch tubes, which are mounted on a pipeline and provides connection of the flow tube with the pipeline (refer to Fig.4).

The flowmeter of A version has Confuser-Diffuser conic passages mounted in the flow tube (refer to Fig.5).

DN 250, 300 mm flowmeters have no Confuser-Diffuser conic passages (refer to Fig.6).

The flowmeter has digital pulse output of optocouple type (passive) or analog pulse output (active). It is permissible to use both output types simultaneously if there is no jumper between 0 and 4 connectors on the terminal block.

3 additional boards are installed into the electronic module with options of analog output, digital RS485-based interface and display module. LCD is placed under the glass cover of the electronic module.

Electrical connection of the flowmeter with secondary devices via pulse outputs is provided with a socket connector (2RM22B10Sh1E1B plug) or gland lead-in (connection type is specified by order).

Electrical connection of the flowmeter via analog output and RS485 interface is provided with socket connector 2RM22B10G1V1 located on a housing sidewall symmetrically to the connector for power circuit and pulse output.

Housing covers of the electronic module are sealed with rubber gaskets to provide housing leak tightness.

BASIC SPECIFICATIONS

● Nominal diameters (DN) of the pipeline where flowmeters are mounted, flow measurement limits, pulse value and width are given Table 2.

Table 2

DN, mm	Measurement Limits, m ³ /h			Pulse Value Type			
				Version 1		Version 2	
	Qmax	Qnom	Qmin	Value, m ³ /puls.	Width, ms	Value, m ³ /puls.	Width, ms
25	9	7.5	0.18	0.001	106±4	0.01	256±4
32	20	12.5	0.25				
50	50	25	0.4				
80	120	60	1	0.01			
100	200	100	1.5				
150	400	200	5				
200	700	350	6	0.1			
250	1400	840	12				
300	2000	1200	18				

Nominal flow Qnom determined at gage pressure of 0.3 MPa (3 kgf/cm²) in a pipeline is a datum, which is used to characterize some flowmeter parameters.

If the flow rate is less than 0.8Qmin, the electronic module of the flowmeter switches off.

● **Flowmeter Outputs**

- Passive pulse of 'close-open' type: optoelectronic couple;
 - Active pulse: analog-pulse;
 - Unified analog 0-5, 0-20, 4-20 mA (optional);
 - RS-485-based digital (optional);
 - 3-line LCD (optional);
 - Digital Bell202 (4-20/HART) - optional
- Options of analog output, RS485, LCD can be ordered all together and in any combination.

● **Output parameters**

- For 'close-open' output - optoelectronic couple (max. commutated voltage is 30 V and max. commutation current is 32 mA max);
- For analog pulse - load current is 7...10 mA, load resistance is 0...1.8 kOhm (at supply voltage of 36 V). The load should be galvanically connected to a negative supply terminal;
- for unified analog signal of 0-5 mA - load resistance is up to 2.5 kOhm, and for signal of 0-20, 4-20 mA, it is up to 1 kOhm. Analog signal is supplied by 4-wire circuit and galvanically isolated from power circuits;
- for digital output (via RS485) - HART protocol, transfer rate is 1200 bit/s; number of transducers unified into integrated chain (16 transducers maximum).

● **Displayed parameters (with LCD)**

- Instantaneous flow rate, m³/h;
 - Accumulated volume, m³;
 - Flowmeter operating time, h;
 - Codes of contingency conditions (if any).
- Process variables are displayed simultaneously.

● **Contingency conditions** (NS codes on a display):

- Zero flow ("0");
- Flow ≤ 0.8Qmin ("L");
- Chaotic vortex generation ("d").

● **Volume and flow accuracy** according to flowmeter output type are provided in Table 3.

Table 3

Reference Accuracy	Accuracy Limits, %
Reference accuracy of volume measurement via pulse signals and RS485 interface, at Q flow rate: 0.08Qnom < Q ≤ Qmax 0.04Qnom < Q ≤ 0.08Qmax Qmin ≤ Q ≤ 0.04Qnom	±1.0 ±1.5 ±3.0
Reference accuracy of volume measurement via LCD, at Q flow rate: 0.08Qnom < Q ≤ Qmax 0.04Qnom < Q ≤ 0.08Qmax Qmin ≤ Q ≤ 0.04Qnom	±1.0 plus 1 low-order digit ±1.5 plus 1 low-order digit ±3.0 plus 1 low-order digit
Reference accuracy of instantaneous flow rate measurement via RS485 interface, at Q flow rate: 0.08Qnom < Q ≤ Qmax 0.04Qnom < Q ≤ 0.08Qmax Qmin ≤ Q ≤ 0.04Qnom	±1.5 ±2.0 ±3.5
Reference accuracy of instantaneous flow rate measurement via LCD, at Q flow rate: 0.08Qnom < Q ≤ Qmax 0.04Qnom < Q ≤ 0.08Qmax Qmin ≤ Q ≤ 0.04Qnom	±1.5 plus 1 low-order digit ±2.0 plus 1 low-order digit ±3.5 plus 1 low-order digit
Conventional accuracy of flow measurement via analog signal	±1.5
Reference accuracy of operation time measurement via LCD and RS485	±0.1

● **Maximum fluid pressure loss** in flowmeter at Q flow rate, MPa:

- Δp=0.02(Q/Qnom)² - for DN150...300 mm flowmeters;
- Δp=0.03(Q/Qnom)² - for DN 25...100 mm flowmeters.

● The flowmeter is **powered** by an external dc power supply of 16...36 V voltage and pulsation amplitude up to 200 mV maximum.

Flowmeter power consumption is 3.6 W max.

Caution! Power supply for the flowmeter should be with current limit threshold of 100 mA minimum or with short-circuit current of 100 mA minimum.

If a power supply is integral to a heat computer or a flow computer (i.e. secondary device), it should be galvanically isolated from other circuits.

OPERATION CONDITIONS

Process parameters

Temperature 1...150°C
 Pressure up to 1,6 MPa
 Viscosity up to $2 \cdot 10^{-6}$ m²/s
 Minimum pressure required for flowmeter performance
 $P_{min} = 3DP + 1.3P$ low limit(t),
 where DP, MPa (kgf/cm²) - pressure losses in the flowmeter at flow Q,
 P low limit (t), MPa (kgf/cm²) - saturated vapor pressure of liquid at its actual temperature.

External factors

The flowmeter withstands:

- Ambient temperature:
 Version w/o LCD -40...+60°C;
 Version w/ LCD -10...60°C;
 - Relative humidity is up to 95% at temperature $\leq 35^\circ\text{C}$;
 - Atmospheric pressure is 630...800 mmHg;
 - Intensity of external variable and constant magnetic field with up to 400 A/m.

The flowmeter is vibration-resistant as per №4 version, GOST 12997 (0.15 mm height in 5...80 Hz frequency span).

Dust and Water Tightness as per IP65, GOST 14254-

96.

PIPELINE MOUNTING

The flowmeter is installed according to "sandwich" type, i.e. it is installed between two special flanges (A, B versions) or per GOST 12820-80 (A version, and DN 250, 300 DN), using pins and nuts with washers (Fig.4-6)

Straight run lengths according to preset flow friction are given in Table 4.

Table 4

Flow Friction Type	Upstream/Downstream Straight Run Lengths
Taper angle: up to 30°, terete elbow fitting, full-open valve or ball valve	5DN/2DN
Square elbow, sludge pan, filter, array elbow fitting, control fitting*	10DN/5DN*

* When mounting the vortex meter, it is recommended to install straightening vanes after indicated flow frictions. Straightening vanes allow reducing straight run lengths up to 5DN/2DN.

The meter complete with straight run set of the required sizes (KMCh K2, K3, Table 6) is available on request. Materials of meter parts and KMCh, contacting with measured fluid are given in Table 6). Materials of wetted meter parts and mounting sets are given in Table 5.

Horizontal, vertical and sloping pipe mounting is permissible provided that total volume of straight run and flow tube is completely filled with fluid. There should not be air in a pipeline. It is not recommended to mount the meter downstream.

Internal pipeline diameter where Metran-300PR meter is installed should be in line with the values given in Table 8. Otherwise pipe-line parts neighboring to the meter should be replaced by straight runs of suitable pipe lengths given in Table 8 or KMCh straight runs, specified in the order.

List of pipes recommended for straight runs is provided in Table 8.

During meter operation, the stop valves installed upstream and downstream outside straight runs should be completely open.

Vibration frequency and amplitude in the place of meter installation should not exceed 10 Hz and 0.05 mm correspondingly.

Overall and mounting dimensions according to meter version are given in Table 7.

ELECTRIC WIRING

Cables and wires connecting the meter and secondary devices are to be laid in metal hoses or tubes.

It is recommended to use pilot cables with plastic or rubber insulation and signal cables with polyethylene insulation.

Shielded cable with insulating sheath is recommended if the meter is close to laying areas of electric installation over 0.5 kVA. Insulated conductors of the same cable can be used as signal circuits, but insulation resistance should be 50 MΩ minimum.

It is forbidden to place communication lines of the meter and secondary devices close to power cables.

One cable may include meter supply circuits and output signal circuit.

Length of communication lines for pulse and analog outputs should not exceed 200 m, resistance of each conductor is 20 Ω maximum.

Length of communication lines for RS485 interface should not exceed 1200 m. It is recommended to use Unshielded Twisted Pair based on MGShV 0.35 wire.

External meter circuits through gland lead-in (code of electrical meter wiring is C) should be connected with the help of cable with outer diameter of 8-10 mm.

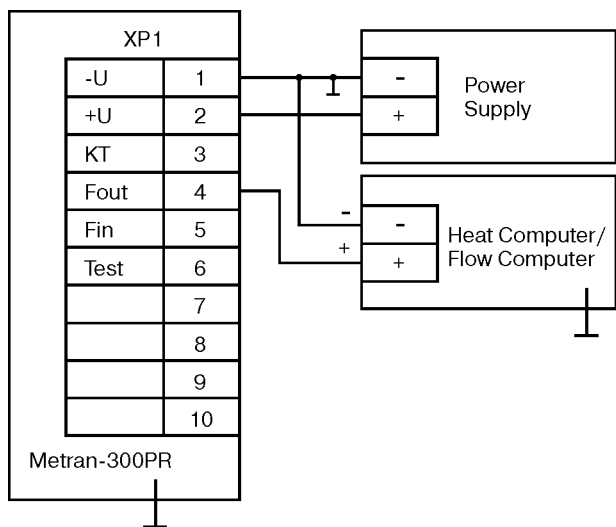
If you use a power supply integrated into a secondary device, make sure it is galvanically isolated from other circuits; electric wiring should be carried out with the help of 3- or 4-wire cable (e.g. RPSHm 3x0.35; RPSHm 4x0.35).

When using a self-contained power supply, electric wiring should be carried out with the help of 2-wire cable (e.g. RPSHm 2x0.35 or MKSh 2x0.35). It is permissible to use separate wires with 0.35 mm² section.

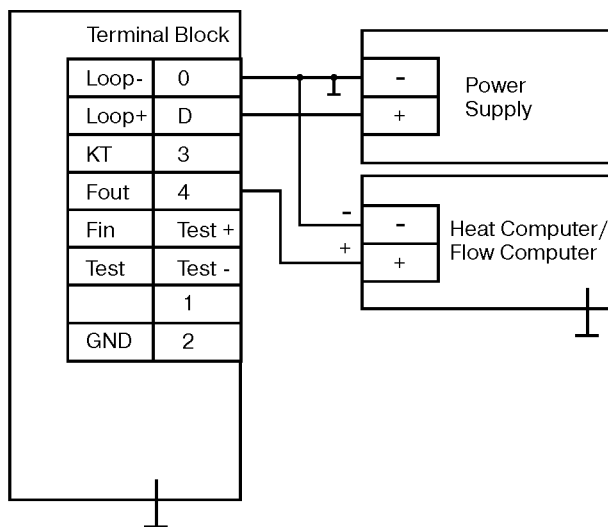
Frame grounding is not required if the meter is supplied through galvanically isolated channel. When a block of meters is supplied by a single power supply without galvanic isolation, voltage potential between flow tubes should be equal by their reliable grounding. Grounding should be carried out by connecting the wire with section of 2.5 mm² minimum from a grounding bus to a special terminal of flowmeter housing.

WIRING DIAGRAMS

Self-contained Power Supply

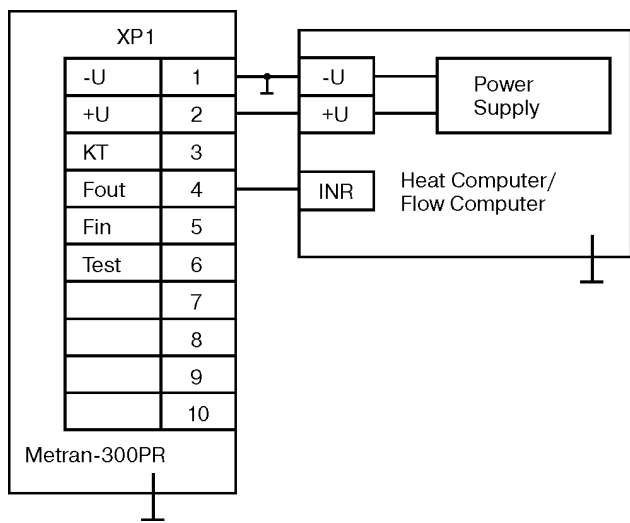


Option 1. Socket Connector (ShR).

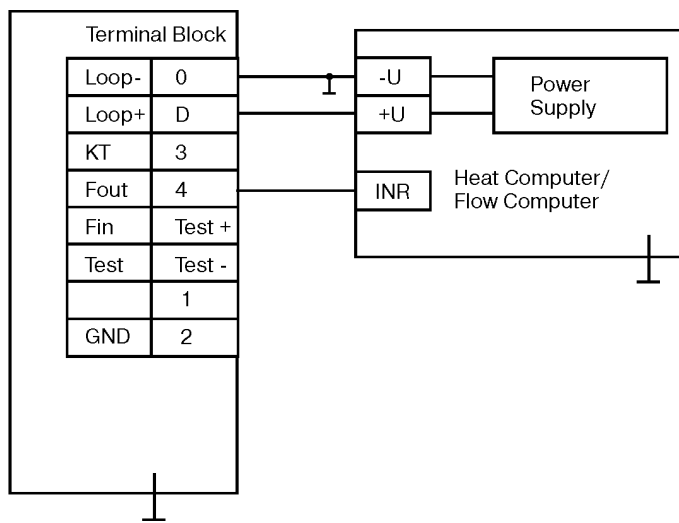


Option 2. Gland Lead-in (C).

Integral Power Supply



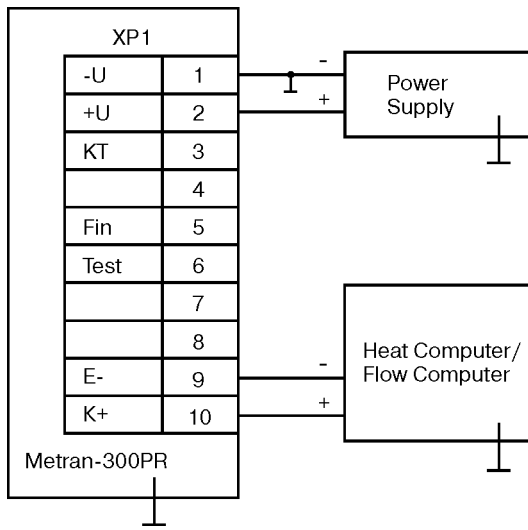
Option 1. Socket Connector (ShR).



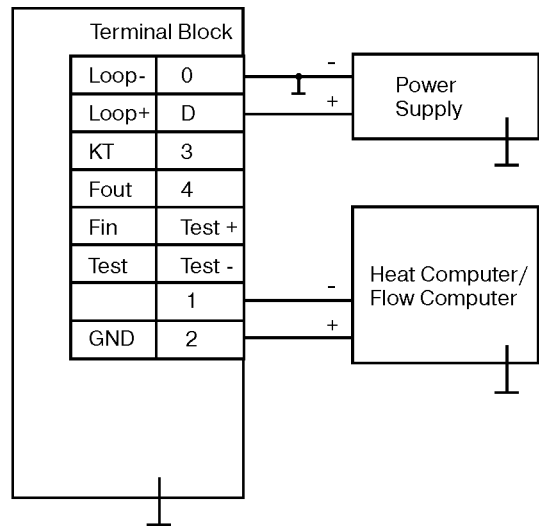
Option 2. Gland Lead-in (C).

Fig. 1. Wiring Diagram of Metran-300PR with Analog Pulse Output w/o Galvanic Isolation to Secondary Device.

Self-contained Power Supply

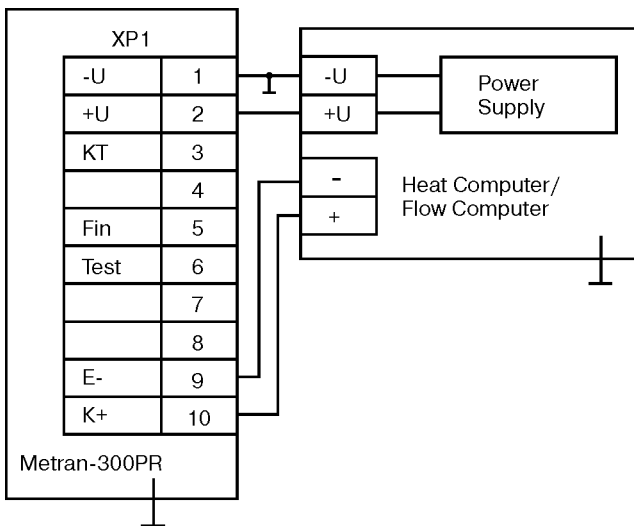


Option 1. Socket Connector (ShR).

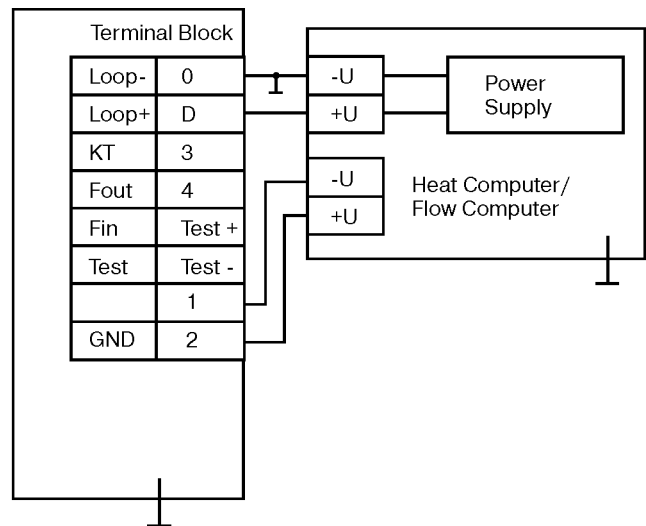


Option 2. Gland Lead-in (C).

Integral Power Supply

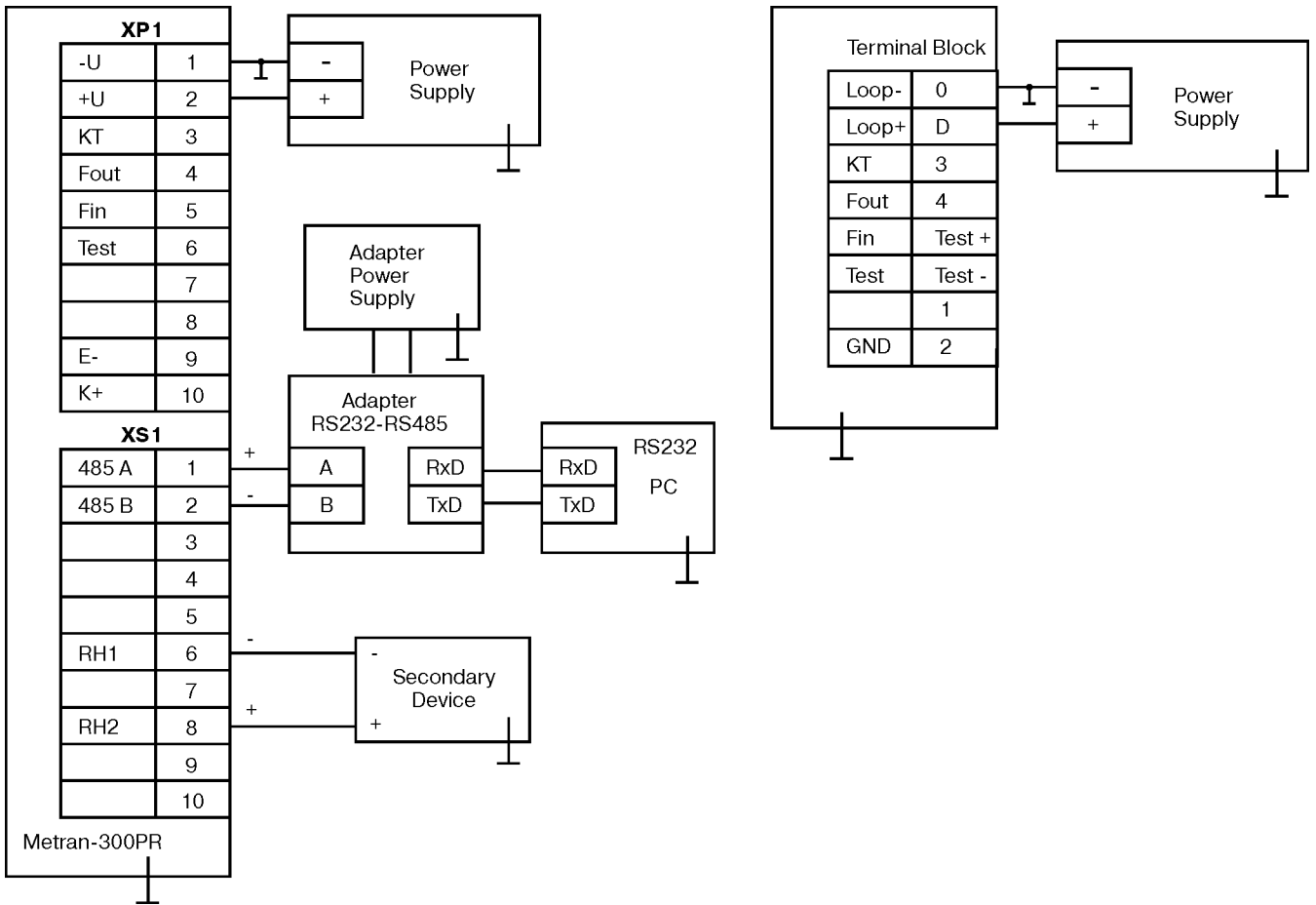


Option 1. Socket Connector (ShR).



Option 2. Gland Lead-in (C).

Fig.2. Wiring Diagram of Metran-300PR with Close-Open Output (Optoelectronic Couple) to Secondary Device.



Option 1. Socket Connector (ShR).

Option 2. Gland Lead-in (C).
Connection of circuits to XS1 plug-in socket is the same as for Option 1.

Fig. 3. Wiring Diagram of Metran-300PR with Analog Output and RS485 Interface.

RELIABILITY

Average life time is 8 years.
Mean time between failures is 50000 h.

WARRANTY

Warranty period: 18 months from the date of commissioning.

DELIVERY SET

- Flowmeter;
- Product Data Sheet;
- Operation Manual;
- Mounting kit (KMCh);
- Socket 2RM22KPN10G1V1 (for flowmeters with ShR code);
- Packaging;
- Flow Meters with analog output and/or digital interface are supplied with additional plug 2RM22KPN10Sh1V1.

The delivery set may be completed with options (refer to Section *Repair Kit*):

- Extra bluff body;
- Demounting tool;
- End cap for bluff body replacement during calibration;
- Process insert;
- Straightening vane.

ORDERING INFORMATION

Metran-300PR - 50 - A - 0.1 - 02 - OC - 42 - RS - I - S - K1 - TU 4213-026-12580824-96

1 2 3 4 5 6 7 8 9 10 11 12

1. Flowmeter type.
2. Internal pipe diameter DN (Table 2).
3. Code of meter design (Table 1).
4. Pulse value of output signal (Table 2).
5. Material type code of flow tube (Table 5).
6. Type of pulse output:
 - CP - analog-pulse;
 - OC - optoelectronic couple ("close/open").
7. Availability and code of analog signal on flow:
 - 42:** 4-20 mA,
 - 05:** 0-5 mA,
 - 02:** 0-20 mA.
8. Code of RS485 (RS) digital interface availability.
9. Code of LCD availability.
10. Electrical connection code:
 - S:** Gland lead-in,
 - ShR:** Socket Connector.
11. Code of mounting kit (Table 6).
12. Specifications.

MATERIALS OF WETTED PARTS

Table 5

Component	Code of Flow Tube Material	
	1	2
Metran-300PR-A (DN 25... 100 mm); Metran300PR (DN 250, 300 mm)		
Flange	Steel 25	Steel 12Cr18Ni10Ti
Gasket (to seal flanges)	Paronite PON or PON-A	
Housing, body	Steel 12Cr18Ni10Ti	
Bluff body	Steel 14Cr17Ni2 or 09Cr16Ni4Nb	
Ring (to seal bluff body)	Rubber IRP-1338 or K-69	
Straight run*: - Flange - Pipe	Steel 25 Refer to Table 8	Steel 12X18H10T Refer to Table 8
Metran-300PR-B (DN 150, 200 mm)		
Branch pipe	Steel 25	Steel 12Cr18Ni10Ti
Gasket (to seal branch pipes)	Paronite PON or PON-A	
Housing, body	Steel 12Cr18Ni10Ti	
Bluff body	Steel 14Cr17Ni2 or 09Cr16Ni4Nb	
Ring (to seal bluff body)	Rubber IRP-1338 or K-69	
Gaskets (to seal bluff body)	Polytetrafluorethylene, steel 12Cr18Ni10Ti	
Straight run*: - Flange - Branch pipe - Pipe	Steel 25 Steel 25 Refer to Table 8	Steel 12Cr18Ni10Ti Steel 12Cr18Ni10Ti Refer to Table 8

* For Metran-300PR-A only (on request).

CODE OF MOUNTING KIT

Table 6

Code of Mounting Kit	Mounting Parts	
	Flowmeter of A Version (DN 25...100 mm)	Flowmeter of B Version (DN 150, 200 mm)
K0	Gaskets	Gaskets
K1	Specific flanges, gaskets, nuts, spring washers, round washers, pins	Specific flanges, branch pipes, gaskets, nuts, spring washers, round washers, pins
K2	Straight run 2DN, straight run 5DN, gaskets, nuts, spring washers, round washers, pins	Flanges, straight run 2DN, straight run 5DN, gaskets, nuts, spring washers, round washers, pins
K3	Straight run 5DN, straight run 10DN, gaskets, nuts, spring washers, round washers, pins	Flanges, straight run 5DN, straight run 10DN, gaskets, nuts, spring washers, round washers, pins
K4	Flanges as per GOST 12820-80 of version 1, gaskets, nuts, spring washers, round washers, pins	-

Note:

1. Number of parts included into Mounting Kit is indicated in the Product Data Sheet.
2. DN 250 and 300 mm flowmeters are supplied with Mounting Kit as per K0 or K4 code.

DIMENSIONAL AND MOUNTING DRAWINGS

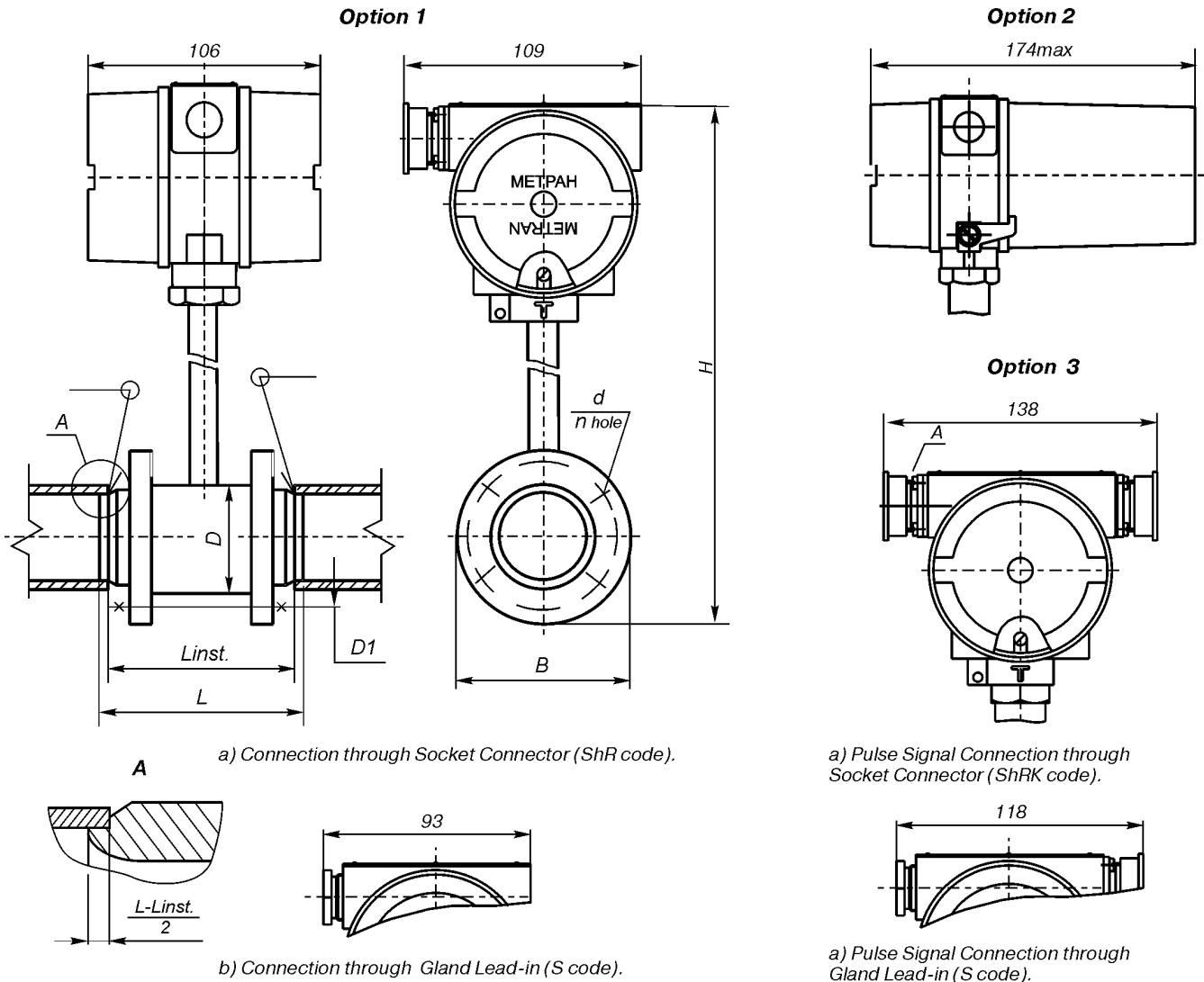


Fig.4. Metran-300PR-B Flowmeter, DN 150, 200.

- Option 1.** With analog-pulse output and close/open output (optoelectronic couple).
- Option 2.** With LCD.
- Option 2, 3.** With analog output, and/or digital output, and/or LCD.

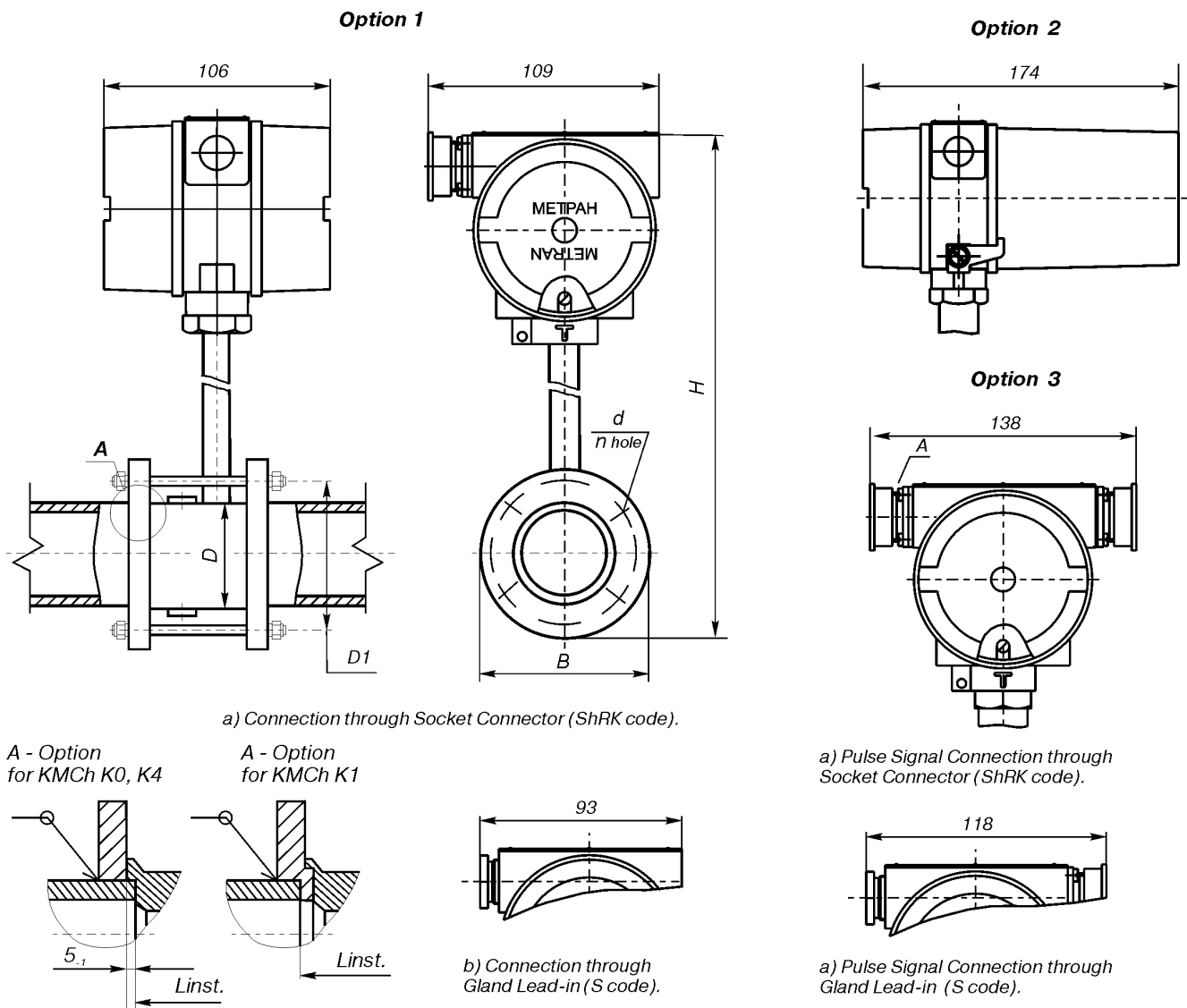


Fig.5. Metran-300PR-A Flowmeter (DN 25...100).

Option 1. With analog-pulse output and close/open output (optoelectronic couple).

Option 2. With LCD.

Option 2, 3. With analog output, and/or digital output, and/or LCD.

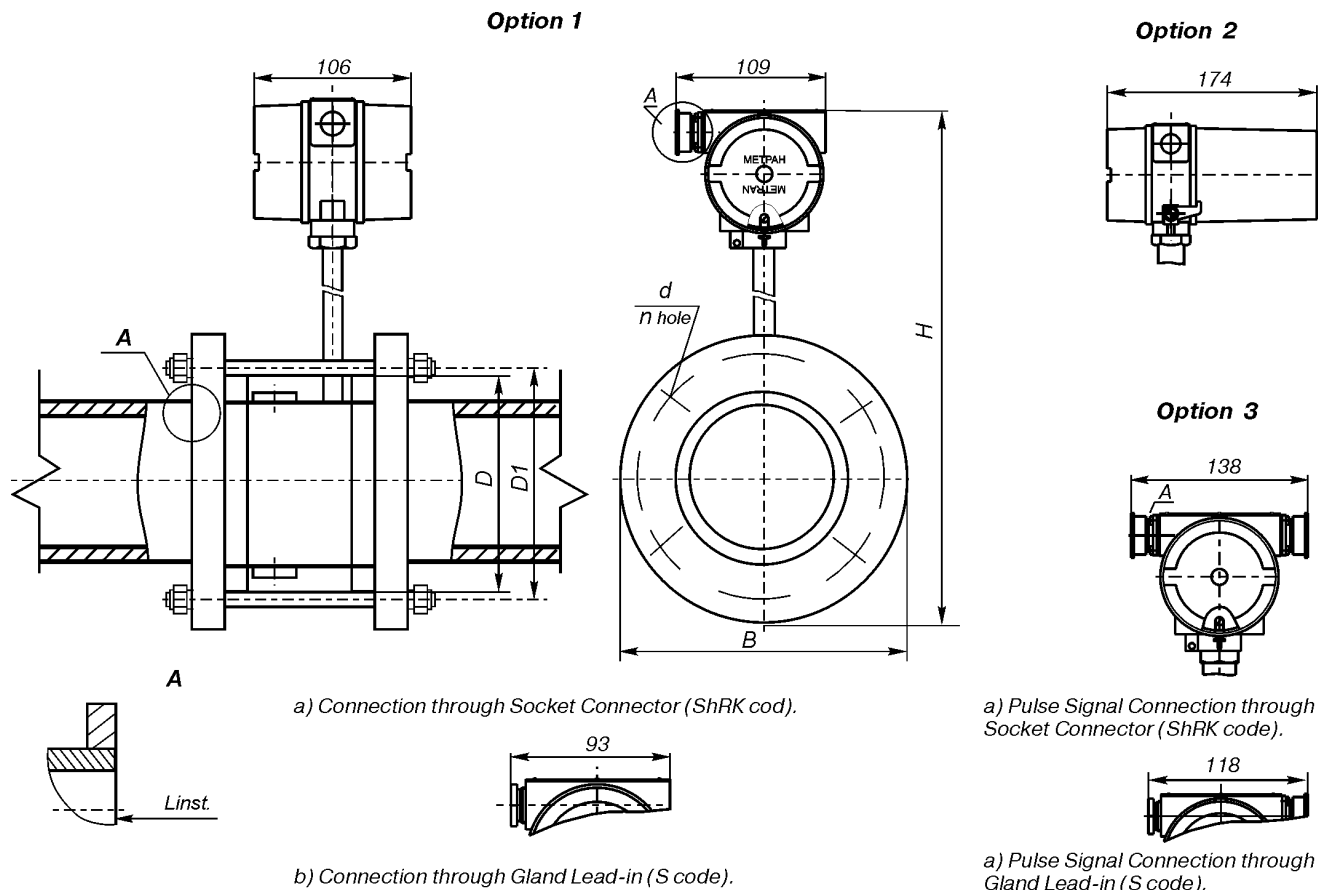


Fig.6. Metran-300PR Flowmeter, DN 250, 300.

Option 1. With analog-pulse output and close/open output (optoelectronic couple).

Option 2. With LCD.

Option 2, 3. With analog output, and/or digital output, and/or LCD.

For Figures 4-6

Table 7

DN, mm	Metran-300PR-B, DN 250, 300 mm									Metran-300PR-A								
	B, mm	D, mm	D1, mm	Linst, mm	H, mm	L, mm	d, mm	n, units	Weight, kg	B, mm	D, mm	D1, mm	Linst, mm	H, mm	d, mm	n, units	Weight, kg	
25	-	-	-	-	-	-	-	-	-	115	60	85	62/86	300	14	4	2.8	
32	-	-	-	-	-	-	-	-	-	135	65	100	64/88	314	18	4	3.0	
50	-	-	-	-	-	-	-	-	-	160/144	75	125/110	64/88	331/323	18	4	3.3	
80	-	-	-	-	-	-	-	-	-	195/178	110	160/145	99/125	358/349	18	8/4	5.3	
100	-	-	-	-	-	-	-	-	-	215/192	130	180/160	114/144	378/366	18	8	8.3	
150	244	165	210	222	457	278	18	8	17.0	-	-	-	-	-	-	-	-	
200	334	205	295	283	558	343	22	12	25.0	-	-	-	-	-	-	-	-	
250	405	329	355	210	665	-	22	12	35.0	-	-	-	-	-	-	-	-	
300	460	384	410	210	720	-	22	12	38.0	-	-	-	-	-	-	-	-	

Note:

1. Sizes for flowmeters (A version) with mounting kit K0 and K4 are indicated in numerator of fraction, and with mounting kit K1 in term of fraction.

2. Flowmeter weight is specified excluding weight of mounting kit.

PIPES FOR STRAIGHT RUN

Table 8

DN, mm	Dint, mm	Material Code		
		01		02
		Pipe	Equivalent Pipe	Pipe
25	26±0.3	Pipe $\frac{\text{Dint } 26 \times 3.0 \text{ GOST } 8734-75}{\text{GOST } 8733-74}$	Pipe $\frac{32 \times 3.0 \text{ GOST } 10704-91}{\text{VSt3sp2 GOST } 10705-80}$	Pipe 32x3.0-12Cr18Ni10Ti GOST 9941-81
32	33±0.4	Pipe $\frac{\text{Dint } 33 \times 2.5 \text{ GOST } 8734-75}{\text{GOST } 8733-74}$	Pipe or Pipe $\frac{38 \times 2.5 \text{ GOST } 10704-91}{\text{VSt3sp2 GOST } 10705-80}$ $\frac{38 \times 2.5 \text{ GOST } 8732-78}{\text{VSt3sp2 GOST } 8731-74}$	Pipe 38x2.5-12Cr18Ni10Ti GOST 9941-81
50	50±0.4	Pipe $\frac{\text{Dint } 50 \times 3.5 \text{ GOST } 8734-75}{\text{GOST } 8733-74}$	Pipe or Pipe $\frac{57 \times 3.5 \text{ GOST } 10704-91}{\text{VSt3sp2 GOST } 10705-80}$ $\frac{57 \times 3.5 \text{ GOST } 8732-78}{\text{VSt3sp2 GOST } 8731-74}$	Pipe 57x3.5-12Cr18Ni10Ti GOST 9941-81
80	82±0.66	Pipe $\frac{\text{Dint } 82 \times 3.5 \text{ GOST } 8734-75}{\text{GOST } 8733-74}$	Pipe or Pipe $\frac{89 \times 3.5 \text{ GOST } 10704-91}{\text{VSt3sp2 GOST } 10705-80}$ $\frac{89 \times 3.5 \text{ GOST } 8732-78}{\text{VSt3sp2 GOST } 8731-74}$	Pipe 89x3.5-12Cr18Ni10Ti GOST 9941-81 or Pipe 89x3.5-08Cr18Ni10Ti GOST 9940-81
100	100±0.8	Pipe $\frac{\text{Dint } 100 \times 4 \text{ GOST } 8734-75}{\text{GOST } 8733-74}$	Pipe or Pipe $\frac{108 \times 4.0 \text{ GOST } 10704-91}{\text{VSt3sp2 GOST } 10705-80}$ $\frac{108 \times 4.0 \text{ GOST } 8732-78}{\text{VSt3sp2 GOST } 8731-74}$	Pipe 108x4.0-12Cr18Ni10Ti GOST 9941-81
150	151±1.21	Pipe $\frac{\text{Dint } 151 \times 4 \text{ GOST } 8734-75}{\text{GOST } 8733-74}$	Pipe or Pipe $\frac{159 \times 4.0 \text{ GOST } 10704-91}{\text{VSt3sp2 GOST } 10705-80}$ $\frac{159 \times 4.0 \text{ GOST } 8732-78}{\text{VSt3sp2 GOST } 8731-74}$	Pipe 159x4.0-08Cr18Ni10Ti GOST 9941-81
200	208±1.64	Pipe $\frac{\text{Dint } 208 \times 6 \text{ GOST } 8734-75}{\text{GOST } 8733-74}$	Pipe or Pipe $\frac{219 \times 6.0 \text{ GOST } 10704-91}{\text{VSt3sp2 GOST } 10705-80}$ $\frac{219 \times 6.0 \text{ GOST } 8732-78}{\text{VSt3sp2 GOST } 8731-74}$	Pipe 220x6.5-12Cr18Ni10Ti GOST 9941-81
250	261±2.7	Pipe $\frac{273 \times 6.0 \text{ GOST } 10704-91}{\text{GOST } 10705-80}$	Pipe $\frac{273 \times 6.0 \text{ GOST } 8732-78}{\text{VSt3sp2 GOST } 8731-74}$	Pipe 273x6.0-08Cr18Ni10Ti GOST 9940-81
300	311±3.0	Pipe $\frac{325 \times 7.0 \text{ GOST } 10704-91}{\text{GOST } 10705-80}$	Pipe $\frac{325 \times 7.0 \text{ GOST } 8732-78}{\text{VSt3sp2 GOST } 8731-74}$	Pipe 325x7.0-08Cr18Ni10Ti GOST 9940-81