



CATALOGUE OF PRODUCTS

*«Only measurable things exist»
Max Planck*

TABLE OF CONTENTS

Industrial gas flow metering	page
Gas flow meter Turbo Flow, TFG-S series	4
Gas flow meter Turbo Flow, TFG-S series (mobile)	7
Gas flow meter Turbo Flow, GFG-F series F	10
Gas flow meter Turbo Flow, GFG-F series (40, 65, 100)	11
Gas flow meter Turbo Flow, GFG-F series (autonomous)	11
Gas flow meter Turbo Flow, GFG-F series (reverse)	12
Gas flow meter Turbo Flow, GFG-dP series	12
Ultrasonic gas flow meter Turbo Flow, UFG series	14
Gas metering points	18
TTermoelectric power generator Turbo Electric TE-30	20
Pressure sensors Turbo Flow PS	22
Level gages Turbo Flow LV	26
Municipal and domestic gas metering	
Gas flow meters Grand 1.6-3.2	28
Gas flow meters Grand 4-10	29
Gas flow meters Grand 16-25	30
Gas flow meters Grand with in-built telemetry	31
SPI-Ex Gas flow rate correctors	33
SPU-3	36
SPU-5	40
Industrial energy resources metering	
Liquid flow meter, RS-2M series	42
Multichannel probe electromagnetic heat meter Turbo Flow RS-Termo	44
Gas flow meter Turbo Flow, TFG-H series	48
Telemetry	
Don-turbo controllers with autonomous power supply	52
Don-turbo controllers with mains supply	53
Don-turbo controllers with simplified functionality	54
Don-turbo master collector	55
Modem pools	56
DONTEL HSP Software	57
Additional information	
Quality management system	58
Enabling documentation	59
Dealers for the industrial equipment sales	60
Retail chain for the sales of Grand gas meters	63



Gas flow meter Turbo Flow, TFG-S series

Flow meter Turbo Flow TFG-S is used to measure volumetric gas flow rate and volume of gas (natural, non-associated (associated) oil gas, nitrogen gas, air, inert gas and other kinds of gas) reduced to standard conditions.

Identifying features

- High accuracy: limits of percentage error when measuring the gas flow rate:
using the manufacturer's flowcell
 $\pm 1.0\%$ within the range of $0.015 Q_{\max} \leq Q \leq Q_{\max}$;
 $\pm 2.0\%$ within the range of $Q_{\min} \leq Q < 0.015 Q_{\max}$;
without using the manufacturer's flowcell
 $\pm 1.5\%$ within the range of $0.015 Q_{\max} \leq Q \leq Q_{\max}$;
 $\pm 2.5\%$ within the range of $Q_{\min} \leq Q < 0.015 Q_{\max}$;
- wide dynamic measuring range 1:600;
- probe execution makes it possible to mount the meter on the pipe without pressure removal;
- absence of moving parts improves the flow meter reliability;
- operating temperature from -60 up to +300 °C;
- availability of temperature measuring feature with accuracy of $\pm 0,3$ °C;
- option of pressure measurement;
- materials are resistant to the aggressive effects of the environment;
- modern diagnostic devices to check condition of the probe;
- Digital line channel between the flow meter and archive data recording unit is fully protected from failure and penetration;
- Full integration into automation system of collecting information (automated gas control and management system and ACS).

Flow meter configuration

- Flow-rate cabinet
- One or more flux converters

Gas flow meter Turbo Flow TFG-S is usually delivered in A version with possibility to measure the gas under the pressure up to 1.6 MPa. Other versions can operate under the pressure above 1.6 MPa.

- version B up to and including 6.3 MPa;
- version C up to and including 16 MPa;
- version D up to and including 32 MPa

Flow meter completeness

Name	Designation	Q-ty	Note
Flow meter Turbo Flow TFG	TFG-S	1 piece	depending on order
Flowcell			by additional order
lightning protection unit for power supply	TPS - 01	1 piece	
Protective cover			by additional order
Set of mounting elements	TFG.00.03.000 KM	1 set	in accordance with passport
Flow meter Turbo Flow TFG, version TFG-S. Passport	TYAC.407279.001 ПС	1 item	
Flow meters Turbo Flow TFG, version TFG-S. Operating manual	TYAC.407279.001 ПЭ	1 item	
Flow meters Turbo Flow TFG, version TFG-S. Test procedure		1 item	

Principle of measurement

The principle of the flow meter operation is based on the measurement of the gas mass flow rate at one or several points of the pipeline cross-section. The hot-wire anemometer of the temperature permanent difference is used as a primary gas flow velocity converter; platinum resistance thermal transducer is used as the primary medium temperature transmitter; the pressure is measured by remote absolute pressure sensor (transducer).

Analog-digital system in the real-time mode maintains constant temperature difference between the heated measuring element of the thermoanemometer and thermal transducer which measures the gas temperature.. The power required for maintaining constant temperature difference is proportional to the mass flow rate of gas passing through the measuring section. The current value of the gas flow rate is calculated based on the dissipated thermal power value of thermoanemometer, composition and thermal-physical properties of gas, pressure parameters as well as the size of the primary transducer measuring element and the sectional area of the pipeline.

Flow meter modification

TFG-S single channel



TFG-S single channel three-beam



TFG-S multi channel



Gas flow meter Turbo Flow TFG-S (mobile)

Flow meter Turbo Flow of TFG-S series is a portable version of TFG-S flow meter

An innovative feature of the new version is the replacement of a low-power recorder with 2 lines, 16 symbols display for the embedded PC - compatible recorder having more opportunities to extend the number of primary transducers, archive depth, quality and volume of information output on the display (7" TFT display with a resolution of 800+480, 65 536 colors)



Additional advantages of the portable TFG-S unit

- Compactness and portability;
- Easiness of assembling;
- Metering does not require pressure removal in the pipeline;
- No need in metering camera; metering is performed at any pipeline diameter within the range.

Flow meter configuration

TFG-S design has provision for a flow meter cabinet, flow-rate meter and other components in the compact case.

It is possible to use the automotive storage with 12V voltage. The gas flow meter Turbo Flow TFG-S is delivered in A version with possibility to meter the gas under the pressure up to 1.6 MPa

According to the Customer's choice, the flow meter is completed with telemetry system «Don-Turbo».

Metrological and technical characteristics of the gas flow meters Turbo Flow TFG-S:

Parameter	Value for TFG-S series (including portable)
Measuring range of the volumetric gas flow under standard conditions, m ³ /h	from 1.25 to 588000
Pipeline diameter, mm	from 50 to 1400
Limits of allowable percentage error when metering the % volumetric gas flow reduced to standard conditions using the manufacturer's flowcell without using the manufacturer's flowcell	± 1.0 within the range of $0.015 Q_{max} \leq Q \leq Q_{max}$ ± 2.0 within the range $Q_{min} \leq Q < 0.015 Q_{max}$ ± 1.5 within the range of $0.015 Q_{max} \leq Q \leq Q_{max}$ ± 2.5 within the range $Q_{min} \leq Q < 0.015 Q_{max}$
Gas temperature range, °C	from -60 up to +300
Absolute error of temperature measurement, °C	$\pm (0.3 + 0.005 \cdot t)$, Where t – measured temperature, °C
Absolute error of time measurement, s	± 1 within 24 h
Range of flow rate, m/s	from 0.03 to 350
Upper range limits of excessive pressure (URL) kPa MPa	2,5; 4; 6,3; 10; 16; 25; 40; 63; 100; 160; 250; 400; 600 1,0; 1,6; 2,5; 4,0; 6,3; 10; 16; 25; 32
Working measuring range of excessive pressure, % URL	from 33 to 100
Upper range limits of absolute pressure (URL), MPa	0,1; 0,16; 0,25; 0,4; 0,6; 1,0; 1,6; 2,5; 4,0; 6,0; 6,3; 10; 16; 25; 32
Working measuring range of absolute pressure, % URL	from 33 to 100
Limits of allowable percentage error when measuring the pressure, %	$\pm 0,5$
Dynamic range (Q_{min}/Q_{max})	1:600
Response limit	0,3 Q_{min}
Power voltage, V: - PT: - external, from FRC - from in-built SB - FRC	from 9 to 18 7,2 220; SB 12; independent power supply (12 - 18)

Metrological and technical characteristics of the gas flow meters Turbo Flow TFG-S (continued)

Parameter	Values for TFG-S modification (including portable version)
Power intake, W, maximum	15
PT operating conditions: - ambient air temperature, °C	from -60 up to 70
PT weight, kg, maximum	1,5
FRC weight, kg, maximum	4,5; (6,0)*
PT IP according to GOST 14254	IP65
FRC IP according to GOST 14254	IP54
Mean time between failures, h, minimum	60 000

*- for flow meters with two or more PT

Flow meters provide for the indication of the following parameter values:

- current gas flow-rate;
- bulk-volume of gas for the preceding and current day;
- Bulk-volume of gas immediately upon switching on the flow meter;
- bulk-volume of gas for the preceding and current month;
- Gas temperature;
- Gas pressure;
- Operating time;
- outage time;
- current date and time

Flow meters ensure memorization and outputting for printing the average hourly and daily values of the gas flow parameters for the last 12 months.



Gas flow meter Turbo Flow, GFG-F series

These flow meters are purposed for metering volumetric gas flow rate in the pipelines of the gas supply (distribution) systems. Flow meters are used in automated commercial gas metering systems (for natural gas, air, nitrogen, inert and other non-aggressive gases) at various industrial communal facilities.

Flow meters are suitable for operating in explosive environment as they have explosion-proof design with designation Ex ib IIT4.

Principle of measurement

The principle of the flow meter operation is based on the dependence of jet motion frequency in the flow meter measuring element from the volumetric gas flow. The self-oscillator of jet spurts, which frequency is directly proportional to the volumetric flow passing through the pressure drop device, is used as measuring element. Jet oscillation is perceived by piezo sensor and converted into electric signal transmitted to the computer unit. In the computer unit, the signal received from the piezo sensor is subjected to processing which convert the signal into a frequency signal proportional to the volumetric gas flow rate under operating conditions.

Identifying features

- High accuracy. Fundamental relative error of measurement:
- maximum + 2% within the flow rate range from 0.006 Q_{max} to 0.01 Q_{max};
- maximum + 1% within the flow rate range from 0.01 Q_{max} to Q_{max};
- possibility for both independent metering of flow in two directions and summary metering (with the deduction of the flow in opposite direction);
- absence of moving parts improves the flow meter reliability;
- materials are resistant to the aggressive effects of the environment;
- Possibility of up to 10 h operation using autonomous power supply;
- information storage within the space of five years upon the power supply disconnection

Flow meter configuration

- The primary unit – the primary flow transducer (FT);
- The secondary unit – flow-rate cabinet (FRC).

FT is additionally divided into the flow meter case installed on the pipeline by means of flange connection and computer unit rigidly mounted on the flow meter case.

According to the Customer's choice, the flow meter GFG-F is completed with

- Printer LX-300(+);
- Telemetry system "Don-Turbo";
- LCD indicator for FT.

Gas flow meter Turbo Flow GFG-40, GFG-65, GFG-100 in "Grand" case

Innovative feature

- Small dimensions 195*110*110;
- Maximum weight 2 kg;
- low cost installation;
- Adjustment of measured gas volume based on temperature and pressure;
- Possibility to print received data;
- Availability of archives (daily, monthly, on the flow rate, temperature, emergency situations);
- Connection to the telemetry system.

Gas flow meter Turbo Flow series GFG-F (autonomous)

Innovative feature

Independence (up to 5 years of operation using the in-built battery).

Flow meter configuration

Primary transducer, computer unit with keyboard and display. Due to the availability of autonomous power supply the present flow meter does not require to be connected to the flow-rate cabinet.

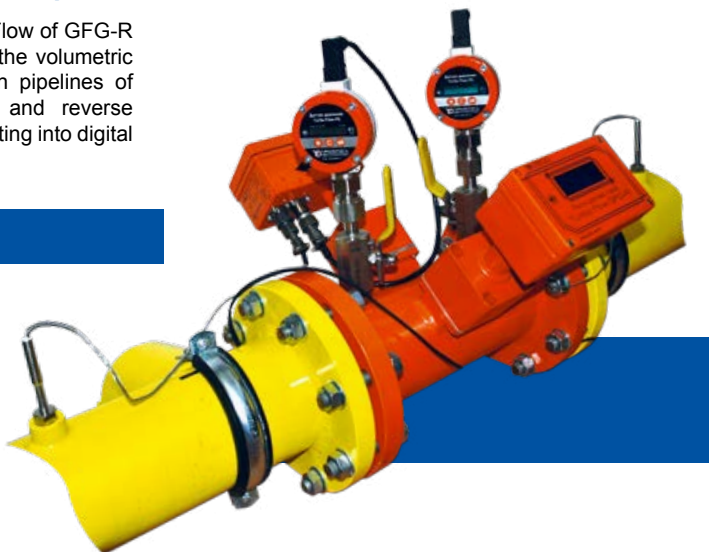


Gas flow meter Turbo Flow, GFG series (reverse)

Reverse gas flow meter Turbo Flow of GFG-R series is designed for measuring the volumetric gas flow in gas media moving in pipelines of round section both in forward and reverse directions and continuously converting into digital signal.

Innovative feature

Metering of gas flow at the pipeline sections where the change of the gas flow direction is possible.



Gas flow meter Turbo Flow, GFG-dP series

Gas meter Turbo Flow of GFG-dP series is designed to modernize metering units based on constriction device equipped with differential pressure transducer. For purpose of modernization the primary flow transducer and electronic information-processing unit are set on the standard valve assembly instead of differential manometer. Frequency recorded by the elements of the jet generator functionally depends on the gas flow through the constriction device.

Replacement of existing devices is implemented through the installation of GFG-dP primary transducer on to mounted tubes with no additional expenses for manifold mounting.

As a result, technical and metrological characteristics of the flow metering unit are improved.

Innovative feature

Possibility to modernize the gas metering units.



Metrological and technical characteristics of the gas flow meters Turbo Flow GFG

Parameter	GFG-F	GFG-F(auto-nomous)	GFG-F (reverse)	GFG-dP
Temperature of the measured medium	-50...+70			
Dynamic range	1 : 100			
Dynamic range for reverse direction	-		1 : 100	-
Limits of percentage error when measuring the gas flow rate, %	±2% within the range form 0.006 Qmax up to 0.01 Qmax ±1% within the range from 0.01 Qmax up to Qmax			
Reference pipeline diameter, mm	from 10 to 300			Standard constriction devices
Flow-rate cabinet power	220V (±10%), 50Hz (±1Hz)		-	220V (±10%), 50Hz (±1Hz)
Power input from mains, W	maximum 15	-	maximum 20	maximum 15
Mean time between failures, h	16 000	20 000	16 000	
Pressure, mPa	1,6; 7,0; 10,0			
Average service life, years	minimum 12			
Recalibration interval, years	2			

Flow meters provide for the indication of the following parameter values:

- current gas flow-rate;
- bulk-volume of gas for the preceding and current day;
- Bulk-volume of gas immediately upon switching on the flow meter;
- bulk-volume of gas for the preceding and current month;
- Gas temperature;
- Gas pressure;
- Operating time;
- outage time;
- date and current time

Flow meters ensure memorization and outputting for printing the average hourly and daily values of the gas flow parameters for the last 11 months. Mean time between failures is minimum 16 000 hours. Total service life is minimum 12 years.



Ultrasonic gas flow meter Turbo Flow, UFG series

Ultrasonic gas flow meter Turbo Flow UFG is designed for high-precision measurements in the sphere of commercial natural gas metering. Due to the use of four-chord metering system in combination with intelligent signal processing system the flow meter provides for the flow rate metering with high confidence even under severe operating conditions.

Turbo Flow USFG can be used within wide temperature range when metering high-velocity flow at excessive and atmospheric pressure.

The scope of application - commercial and technological metering of natural, associated and other gases at industrial facilities of various branches.

Principle of measurement

The principle of flow meter operation is based on the ultrasonic transducers sending and receiving ultrasonic pulses passing through the medium. The flow meter measures the time difference of the signals transmission along the flow and against of it and, using various methods of digital signal processing, determines the rate and volumetric flow rate.

Flow meter configuration

The flow meter consists of the primary transducer configured as a pipe section with ultrasonic transceivers installed inside as well as electronic unit secured outside. The flow meter design provides (depending on version) for the presence of in-built electronic unit or remote flow-measuring unit. Remote-mount primary temperature and pressure transducers are used to measure the temperature of the medium and absolute (excessive) pressure.

Identifying features

- calibration with natural gas during the production release;
- high accuracy of measurement;
- reliability due to the absence of moving parts;
- flow measurement in both directions;
- wide measuring range (up to 1:200);
- no pressure loss;
- intelligent self-test system

Flow meter modification

Turbo Flow UFG-1

It is designed for metering the gas volume and volumetric gas flow under operating conditions.

Configuration:

- Primary transducer;
- Electronic unit of the primary transducer

Turbo Flow UFG-2

Configuration:

- Primary transducer;
- Electronic unit of the primary transducer;
- Flow-measuring unit installed in the electronic unit;
- Temperature and pressure primary transducers.

Turbo Flow UFG-3

Configuration:

- Primary transducer;
- Electronic unit of the primary transducer;
- Flow-measuring unit installed out of the electronic unit;
- Temperature and pressure primary transducers.

Turbo Flow UFG-4

Configuration:

- Primary transducer;
- Electronic unit of the primary transducer;
- Temperature and pressure primary transducers;
- SuperFlow-23 gas flow rate corrector.

Turbo Flow UFG-5

Configuration:

- Primary transducer;
- Electronic unit of the primary transducer;
- Temperature and pressure primary transducers;
- Flow-measuring unit Raskhod-1.

Each configuration of the flow meter can be implemented in the following versions:

- Turbo Flow UFG - standart– one standard case has one in-built independent meter equipped with 1 or up to 8 sets of transceiver pairs and electronic unit;
- Turbo Flow UFG - double – one standard case has two in-built identical independent meters, each with its own sets of transceiver pairs (4 to 8) and electronic unit. This system allows for the full backup of the measurement results by means of a single device;
- Turbo Flow UFG - control – one standard case has two in- built independent meters one of which is equipped with a set of transceiver pairs (4 to 8) and electronic unit - measuring meter and the other is equipped with one pair of transceivers and electronic unit – control meter. This system allows monitoring the status of the measured medium for additional control of the measuring meter reading.

Metrological and technical characteristics of the ultrasound gas flow meter Turbo Flow, UFG series

Parameter	Value
Qmax, m ³ /h	650...100 000 (depending on DN flow meter)
Vmax, m/s	Up to 55 m/sec in both directions
Standard size	From DN 50 up to DN 1400
Pressure range, MPa	Up to 32
Temperature of the measured medium, °C	From -60 to +70
Ambient temperature, °C	From -40 to +50
Measurement error	Single-beam $\pm 2.0\%$; double-beam $\pm 1.0\%$; 4,6,8 beam $\pm 0.5\%$



Cabinet of the gas metering unit; GMP and GMPS series

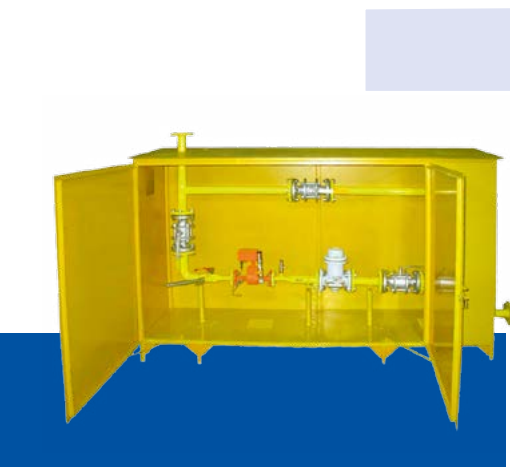


Cabinet of the gas metering unit is intended for installation of metering components and maintenance of predetermined positive air temperature in the cabinet space under reduced (below +10) ambient temperature.

Cabinet is installed as part of the gas metering unit in hard-to-reach locations for maintenance purposes. The cabinet provides the necessary features of ambient air for using the gas metering devices under conditions which guarantee its normal operation, as well as power supply and safety of all devices.

Identifying features

- Cabinets have uniform structure and different overall dimensions. The base of a structure is a rigid metal frame sheathed by sandwich thermo panels around the perimeter (profiled sheeting – lagging – profiled sheeting) and the door on the front panel. The door is insulated and well-protected.
- Gas – electric generator for autonomous active equipment GMU power supply can be installed in the version GMP-1-2500.



Technical characteristics of block-boxes (containers)

Parameter/execution	600	2000	2500	3500	4200
External overall dimensions, mm (l, w, h)	460x1000x800	1750x1200x2050	1750x1200x2850	3500x2200x2500	4200x2200x2500
Internal overall dimensions, mm (l, w, h)	360x900x700	1650x1100x1950	1650x1100x2750	3400x2100x2400	4100x2100x2400
Useful volume for equipment, m3	0,22	3,5	5,0	17	20
Weight, kg	100	500	600	1300	1500
Power supply: Industrial electrical mains	One-phase AC, U=220V				Three-phase AC, U=220V
Heater power	0,15	1,0	1,0	1,0	2,0
Operating temperature inside the cabinet, °C	From +5 up to +50 without moisture condensation				
Ambient temperature, °C	from -50 up to +50				
Precipitation	any				
Wind speed, m/s	Up to 50				
Service life, years	minimum 15				

Flow meter completeness

600	2000	2500	3500	4200
- Electric meter (1ph); - Thermo relay; - Lamp; - Electric panel	- Junction box Y-615; - Temperature sensor relay T21 BM-1-03 (explosion proof); - Heater OB3-4K; - Lamp НПП 25-100 (explosion proof).	- Lamp НПП 25-100 (explosion proof) - Heater OB3-4K; - Junction box Y-615; - Temperature sensor relay T21 BM-1-03 (explosion proof).	- Uniform 1; - Electric meter (1ph); - Thermo relay; - Lamp (2 pcs.); - Electric panel. - Heater OB3-4K.	- Control electric cabinet; - Thermo relay; - Heater (2 pcs.); "Dozor 4"; - Electric meter (3 ph); - alarm annunciator; - flame detector; - sound-and-light panel (2 pcs.); - Gas contamination annunciator; - Lamp (explosion proof).



Thermoelectric generator Turbo Electric TE-30

Thermoelectric generator is an independent electric power source, the fuel for which is natural gas, propane or propane-butane mixture.

It is designed to provide various low-power devices and equipment with DC electric power: natural gas metering units, alarm systems and communications facilities of the specialty equipment.

Internal specification

Principles of the thermoelectric generator operation is based on the direct conversion of the gas combustion thermal energy into electrical. The process is built upon the Seebeck effect. The thermo electromotive power appears in close circuit, consisting of two dissimilar conductors, when the contact sites are maintained at different temperatures and the magnitude of the force is directly proportional to the ends' temperature difference.

The main component of the thermoelectric generator is a thermoelectric generator module (TGM). The effect arises from the dependence of free electrons energy or «holes» on the temperature. In the points of different materials' contact, the charges are transferred from the conductor, where they had a higher energy, to the conductor of lower charge energy. If TGM sides are maintained at different temperatures and TGM is connected to external load with electrical resistance R , then I current flows in the circuit. To ensure the temperature difference between TGM sides, thermal current Q_h is driven to its hot side and Q_c thermal current is extracted from the cold side. Useful electrical power released by the load is proportional to the square of the temperature difference.

Flameless catalytic burner is used as the heat source. It is started on external power source such as battery. The heat removal system is a passive cooling system that does not require energy consumption and consists from the unit of special radiators.

Identifying features

- Fuel combustion passes without flaming which ensures fire-safe operation of the power source;
- complete fuel combustion significantly reduces the amount of toxic substances in the combustion products;
- have a long service life, almost unlimited storage life with full operational capability at any time, do not require special maintenance services;
- Thermo batteries are stable in operation, provide a stable voltage, short-circuit proof and operable under open-circuit condition;
- Due to the absence of moving parts thermoelectric generators are totally silent in operation which gives them an advantage over the machine DC voltage source

Owing to these properties, thermoelectric generators are used in areas that require highly reliable electric power sources with long service life and maintenance-free:

- automatic weather stations;
- sea markers

Technical characteristics of the generator Turbo Electric TE-30

Parameter	Value
Voltage, V	12
Power, W	25
Fuel type	Propane, propane-butane, natural gas
Fuel consumption, g/h	180
Overall dimensions, mm	620x700x1100
Weight, kg	48

Pressure sensors Turbo Flow PS

Pressure sensors Turbo Flow PS are used for measuring and continuously converting values of the measured parameter: absolute pressure, excessive pressure, pressure differentials and parameters determined by the pressure differentials (flow, level, density) into the unified output signals of DC and DC voltage and / or digital signals. Sensors are used in the systems of data acquisition and data processing, managing distributed controlled objects and production control in various industries. Measured media – gas, liquid, vapor.

Principle of measurement

The principle of operation is based on the usage of dependence between the measured pressure and elastic deformation of the measuring element in the primary piezoresistive transducer. Ceramic membrane with applied bridge joint tensoresistors is used as a sensitive element. The measured pressure is applied to the measuring element membrane and causes its deformation resulting in the tensoresistors' resistance change and bridge unbalance. The output electrical signal of the bridge unbalance voltage, which is proportional to the measured pressure, is supplied to the electronic conversion unit for amplifying, providing temperature compensation and compensation of the tensomodule transfer function non-linearity and converting into DC normalized electrical signal (DC voltage) and / or digital signal.

Depending on the measured pressure type, the following modifications of sensors are available:

- ДА - for measuring absolute pressure;
- ДИ - for measuring excessive pressure;
- ДД - for measuring pressure differences;
- ДВ - for measuring underpressure;
- ДИВ - for measuring negative pressure;
- ДГ - for measuring hydrostatic pressure

Metrological and technical characteristics of the pressure sensors Turbo Flow PS

Parameter	Value
Limits of allowable main conventional error when measuring the pressure (depending on modification and settings), %	±0,075; ±0,1; ±0,15; ±0,25; ±0,5
Limits of allowable additional conventional error caused by change in the ambient air temperature from 20°C within the range of operating temperature for every 10 °C (depending on modification and settings), % from the measuring range	from ±0,015 to ±0,1
Operating pressure (for pressure-difference sensors), MPa	from 0,2 to 40
Operating pressure (for pressure-difference sensors), MPa	$\gamma = K_p \times \Delta P_{pab} \times \frac{P_{max}}{P_B} \%$ where Kp= (from 0.08 up to 0.2) %/MPa
Analog outputs: - current output, mA - potential output, V	from 0 to 5; from 4 to 20; from 0 to 20; from 0.4 to 2; from 0 to 10;
Digital wire interfaces	HART protocol, MODBUS RTU protocol on RS-232, RS-232 TTL and RS-485 interfaces
Digital wireless interfaces	GSM, GPRS, Bluetooth, IrDA (IR-port), Zig Bee, M2M 433/868 MHz
Power supply voltage, V (depending on version and LCD illumination)	from 5.0 to 24.0
Independent power source: - Voltage, V - Capacity, A/h	from 3.0 to 3.6; from 1.1 to 37.0
Power intake, W, maximum	0,7
Ambient temperature, °C -For versions with LCD	from -50 up to +85 from -30 up to +80
Weight (depending on version), kg, maximum	from 0.6 to 5.5
Overall dimensions (depending on version), mm, maximum	from (175×110×65) to (290×150×190)
Mean time between failures, h, minimum	150000
Autonomous operation time, years, minimum	6

Identifying features

- function of “zero” electronic adjustment
- function of short-term or permanent LCD illumination
- structurally the sensors are made in the single case which houses the measuring element and electronic conversion unit.
- Explosion-proof and explosion-non-proof versions are available which can be used in explosion hazardous zones of the premises and outdoor installations in accordance with marking 0 Ex ia IIC T6 or 1 Ex d[ia] IIC T6 . Certificate of conformity: № РОСС RU 7505 B04068

Flow meter completeness

Name	Designation	Q-ty	Note
Pressure sensor Turbo Flow PS	TFG-S	1 piece	in accordance with order
Connector 121204-0011 C25300N2TSN		1 piece	
Sealing gasket	GFG-F.02.00.004	2 piece	
Pressure sensor Turbo Flow PS. Passport	TYAC.406233.001 ПЧ	1 item	
Pressure sensors Turbo Flow PS. Operating Manual	TYAC.406233.001 ПЗ	1 item	
Pressure sensors Turbo Flow PS. Test procedure		1 item	



Level gage Turbo Flow LV

Buoyant-element level gage Turbo Flow LV is designed for measuring and continuously converting the level of various liquid products and levels of immiscible liquids division as well as measuring the temperature and pressure of controlled medium.



Level gage configuration

- Electronic digital unit – transmitting transducer;
- hermetically isolated guide tube - primary transducer outside of which the float, filled with ring magnets, moves. When measuring liquid level, the float with embedded magnets moves freely along the guide and takes the position along its length depending on the level of the measured medium.

Identifying features

- Level readings do not depend on the liquid density change
- periodic calibration is not required
- only one moving element - float
- No zero and range drift
- Wide field of the measured media application, including foaming liquids

Metrological and technical characteristics of the level gage Turbo Flow LV

Parameter	Value
Upper range limits of level (level measurement range), m:	1,0; 1,6; 2,0; 2,5; 3,0; 3,5; 4,0; 4,5; 5,0
Lower not measured level, mm, maximum:	100
Limits of allowable conventional error when converting the medium level into standard current (potential) output signal, %	±0,15
Limits of allowable absolute error when measuring the level (depending on version), mm	±1; ±2; ±4; ±5; ±10
Measured medium temperature range (for level gages which have the temperature level channel), °C	from -40 to +80
Measured medium temperature range (for level gages which have the temperature level channel), °C	±0,5 ±2,0
Excessive pressure measuring range (for level gages which have the pressure level channel), MPa	from 0 to 2.5
Limits of allowable conventional error when measuring the pressure (depending on version), %	±0,5; ±1,0
Analog outputs: - current output, mA - potential output, V	from 0 to 5; from 4 to 20; from 0 to 20; from 0.4 to 2; from 0 to 10;
Digital wire interfaces	HART protocol, MODBUS RTU protocol on RS-232, RS-232 TTL and RS-485 interfaces
Digital wireless interfaces	GSM, GPRS, Bluetooth, IrDA (IR-port), Zig Bee, M2M 433/868 MHz
Power supply voltage, (depending on version and LCD illumination), V	from 5.0 to 24.0
Independent power source: - Voltage, V - Capacity, A/h	from 3.0 to 3.6 from 1.1 to 37.0
Power intake, W, maximum	0,7
Weight (depending on version), kg, maximum:	from 0.5 to 20
Overall dimensions (depending on version), mm, maximum:	(H+458)×160×120
Ambient temperature, °C	from -50 up to +70



Gas flow meter Grand 1.6

Maximum capacity is up to 1.6 m³/hour

Gas flow meter Grand 2.4

Maximum capacity is up to 2.4 m³/hour

Gas flow meter Grand 3.2

Maximum capacity is up to 3.2 m³/hour

Gas flow metering (natural gas and liquefied gas vapor) by individual consumers.

Hardware version

- temperature correction

Identifying features

- The meter can be mounted both vertically and horizontally (turn of indicator in any position);
- reliability due to the absence of moving mechanical parts;
- Easy installation (no welding is required);
- Availability of pulse output;
- Minimal dimensions;
- Wide range of case colors;
- reasonable price;
- 12 years of warranty

Metrological and technical characteristics of the gas flow meters

Parameter		Grand – 1,6	Grand – 2,4	Grand – 3,2
Maximum flow , m3/h		1,6	2,4	3,2
Minimum flow , m3/h		0,04		
Operating pressure, kPa		5		
Connecting thread, inch		G 1½		G 1½ , G ¾
Error limits, %	from Qmin to 0.2 Qmax	±2,5		
	from 0.2 Qmax to Qmax	±1,5		
Output signal		pulse		
Ambient temperature, °C		-10.....+50		
Recalibration interval, years		12		
Weight, kg, maximum		0,7		
Overall dimensions (length, width, height), mm, maximum		145x86x83		
IP according to GOST 14254		IP 50		

Gas flow meter Grand - 4/4TK

Maximum capacity is up to 4 m³/hour

Gas flow meter Grand - 6TK

Maximum capacity is up to 6 m³/hour

Gas flow meter Grand - 10TK

Maximum capacity is up to 10 m³/hour

Metering the consumed gas volume (natural gas and liquefied gas vapor) in flats, private houses and other municipal and domestic areas.

Hardware version

- Operation support with smart-card;
- Built-in telemetry unit;
- Temperature correction

Identifying features

- meters can be mounted both vertically and horizontally (turn of indicator in any position);
- Easy installation (no welding is required);
- Minimal dimensions;
- Wide range of case colors;
- Availability of pulse output;
- reasonable price;
- 12 years of warranty



Metrological and technical characteristics of the gas flow meters

Parameter	Grand – 4	Grand – 6	Grand – 10
Maximum flow , m ³ /h	4	6	10
Minimum flow , m ³ /h	0,04		0,06
Operating pressure, kPa	100		
Connecting thread, inch	G 3/4 , G1, G1 1/4		
Error limits, %	from Qmin to 0.2 Qmax		±2,5
	from 0.2 Qmax to Qmax		±1,5
Output signal	pulse		
Ambient temperature, °C	-40.....+50		
Recalibration interval, years	12		
Weight, kg, maximum	1,8		
Overall dimensions (length, width, height), mm, maximum	195x110x112		
IP according to GOST 14254	IP 54		



Gas flow meter Grand - 16TK

Maximum capacity is up to 16 m³/hour

Gas flow meter Grand - 25TK

Maximum capacity is up to 25 m³/hour

Fiscal measurement of consumed gas flow (natural gas and liquefied gas vapor) at the objects of municipal and domestic purpose.

Hardware version

- Operation support with smart-card;
- Built-in telemetry unit;

Identifying features

- The meter can be mounted both vertically and horizontally (turn of indicator in any position);
- Easy installation (no welding is required);
- Availability of pulse output;
- Minimal dimensions;
- Wide range of case colors;
- reasonable price;
- 12 years of warranty



Metrological and technical characteristics of the gas flow meters

Parameter		Grand – 16	Grand – 25
Maximum flow , m ³ /h		16	25
Minimum flow , m ³ /h		0,15	
Operating pressure, kPa		100	
Connecting thread, inch		G1 1/4, G2	
Error limits, %	from Q _{min} to 0.2 Q _{max}	±2,5	
	from 0.2 Q _{max} to Q _{max}	±1,5	
Output signal		pulse	
Ambient temperature, °C		-40.....+50	
Recalibration interval, years		12	
Weight, kg, maximum		3	
Overall dimensions (length, width, height), mm, maximum		220x130x135	
IP according to GOST 14254		IP 54	

Versions of municipal and domestic gas flow meter Grand with built-in telemetry unit

Problems faced by gas consumers

- inconvenience associated with the need to provide monthly meter readings to the regional gas company;
- no clear understanding of the indebtedness in respect of gas payment;
- inconvenience associated with periodic inspections of the meter reading performed by the resource-providing organization personnel;
- safety problem in respect of domestic gas facilities.

There are the following solutions for the above mentioned problems

- organization of remote data exchange with household gas meters;
- usage of advanced metering devices that support operation with a specialized microprocessor-based card (smart-card) in combination with controlled disconnecting devices. LLC SPA «Turbulentnost-DON» introduced on the market a range of municipal and domestic gas meters «Grand» with built-in telemetry functions, valve control, operation with smart-card that provides a solution for the present problems.

Advantages of installing Grand meter with telemetry system

- no need to provide monthly meter readings to the regional gas company;
- ease of payment;
- transparency in paying to the regional gas company;
- indebtedness and applicable fare can be seen at an time;
- Reliability of gas leakage monitoring;

Hardware versions of municipal and domestic gas flow meters “Grand” with built-in telemetry system

Modifications



only with corrector;



with corrector and function of transferring data from smart-card;



With corrector and function of transferring data and additional possibility to monitor the air pollution detectors and control the valve;



With corrector, function of transferring data and controlling the valve in the system with smart-card. Closing the valve based on the consumption of paid gas volume;



With corrector, function of transferring data and controlling the valve in the system with smart-card and additional control over the air pollution detector. The gas flow is shutoff based on the actuation of the air pollution detector or the consumption of paid gas volume.

The telemetry unit installed in the gas flow meters GRAND is also made as an independent device – gas volume corrector SPI-Ex which is designed for operating in combination with the gas volume meters having the pulse output signal.

Gas volume correctors SPI-Ex

Purpose of gas volume equalizers Spi - Ex is to bring the gas volume measured by gas counter to standard conditions (as per GOST 2939-63), depending on measured temperature and gas pressure and preset (calculated) gas compressibility factor.

Purpose and functions

- connection to the pulse outputs of gas flow meters, calculation and transformation of data on the gas flow rate;
- data transfer to the control unit;
- monitoring the level of gas concentration in the premises; valve control to limit the gas consumption or gas shut-off for safety purpose;
- operation with smart-card as part of prospective payment system

Corrector SPI - Ex works via GPRS channel periodically transmitting the current meter readings to the server. The restrictions on the number of users connected to the system are not applicable.



Metrological and technical characteristics of the gas volume correctors SPI – Ex

Parameter	Value
Limits of allowable percentage error when the gas volume is reduced to standard conditions, %	±0,5
Limits of allowable percentage error when converting input signals received from the gas flow meter and calculating the gas volume under operating conditions, %	±0,05
Limits of allowable fundamental percentage error when measuring operating pressure within the pressure sensor measuring range, % Upper range limits of excessive pressure, MPa	±0,4
Upper range limits of excessive pressure, MPa	0,0025-1,1
Working measuring range of absolute pressure, % URL	20-100
Limits of allowable fundamental percentage error of measuring absolute pressure within the pressure sensor measuring range, %	±0,4

Metrological and technical characteristics of the gas volume correctors SPI – Ex (continued)

Parameter	Value
Upper range limits of absolute pressure, MPa	0,2-1,2
Working measuring range of absolute pressure, % URL*	20-100
Limits of allowable absolute error of measuring the temperature within the measuring range of the temperature sensor, °C	$\pm(0,3 + 0,002 t)$
Limits of allowable absolute error of time measuring, s/day	± 3
Measuring range of the gas thermodynamic temperature, K (°C)	253–333 (from - 20 to 60)
Operating temperature range of the ambient air, °C	From - 10 to +50
Operating temperature range of the ambient air, °C	from 84 to 106.7
Ingress protection rating	IP50
Type of explosion protection	1 Ex ib IIA T4
Power supply voltage of independent DC source, V. - Electronic unit - rf modem	6 (+1,5 -1,8) 3 (+0,7 -0,9)
Power consumption, mW, maximum	2,0
Battery service life in the mode of independent power supply, years, minimum	3
Battery service life when mainly operated (more than 80% of time) form the external power supply source, years, minimum	10
Overall dimensions, mm	136 × 181 × 110
Weight, kg, maximum	1,0

*For the corrector with upper range limit of 0.2 MPa, atmospheric pressure is taken as absolute pressure the lower measuring range limit.

Gas flow meter GRAND selection chart

Installed gas-burning equipment	Maximum total Gas flow rate , m3/h	Gas flow meter GRAND		Variants of connecting thread, inch
4 gas hob stove with oven	from 1.25 to 1.56	GRAND-1.6GRAND-2.4	Qmax=1,6 m3/h, Qmax=2,4 m3/h	G ¹ / ₂
4 gas hob stove with oven, water heater etc.	3,2	GRAND -3.2	Qmax=3,2 m3/h	G ¹ / ₂ , G ³ / ₄
4 gas hob stove with oven, geyser etc.	4	GRAND-4GRAND - 4 TKGRAND-4 SPI	Qmax=4 m3/h	G ³ / ₄ , G1, G1 ¹ / ₄
4 gas hob stove with oven, boiler etc.	6	GRAND-6 TKGRAND-6 SPI	Qmax=6 m3/h	G ³ / ₄ , G1, G1 ¹ / ₄
Mini-boiler house etc.	10	GRAND-10 TK GRAND-10 SPI	3 Qmax=10 m3 /h	G ³ / ₄ , G1, G1 ¹ / ₄
Boiler house etc.	16	GRAND-16 TK GRAND-16 SPI	3 Qmax=16 m3 /h	G2
Boiler house etc.	25	GRAND-25 TK GRAND-25 SPI	3 Qmax=25 m3 /h	G2

Recommendation for selection

The maximum total flow of gas consumed by the gas consuming equipment should not exceed the rated flow rate, which is able to pass through the gas flow mete.

Certification

The gas flow meter GRAND with telemetry and the volume corrector of the gas volume corrector SPI-Ex have all necessary certificates and permits for use.



Testing unit СПУ-3 (SPU-3)



Testing unit SPU-3 is designed to check the gas flow meters G1,6; G2,5; G4; G6 and G10, G16, G25 corresponding to GOST R 50818, as well as gas flow meter of different types within the range of flow rate measured by the unit.

Principle of measurement

The principle of unit operation is based on linear dependence of gas jet frequency fluctuations in the flow transducer jet generator on the gas flow rate.

Jet fluctuations are converted by piezoelectric element into an electrical pulse signal proportional to the volume of gas passed through the unit. The pulse signal is converted in the analog-digital converter (ADC) into the gas volume value and recorded with a cumulative total.

Testing of gas meters (flow meters) is based on correlation of the results received after simultaneous measurement of the operating medium volume (flow) checked by the meter (flow meter) and unit included in series into the measuring line.

The following data is archived and can be printed:

- unit type and serial number;
- protocol number (unique for every tested gas meter);
- Time and date of testing;
- volumes, temperatures, pressure which have been used for measuring;
- error of tested gas meter.

Unit configuration

- flow transducer;
 - Excessive (absolute) pressure sensor ДИ 415 (ДА-415) (State Registry СИ № 36555-07);
 - resistive thermometer DTS (State Registry СИ № 28354-10);
- and also:
- flow computer with push-button field and LCD indicator performing backup in non-volatile memory, displaying the results of the volume (flow rate) measurements, gas temperature and pressure as well as transmission of archived data and settings on the printer (if any);
 - storage battery;
 - Charger

Metrological and technical characteristics of the testing unit SPU-3

Parameter	Value
Measured medium	Natural gas, air, Nitrogen, inert and other non-aggressive gases of known composition
Range of reproducible check flow, m3/h	from 0.016 to 16; from 0.02 to 25; from 0.04 to 40
Limits of allowable percentage error of the unit when measuring the gas volume under operating conditions, %	± 0,4
Limits of allowable percentage error when metering the gas volume reduced to standard conditions, %	± 0,5
Limits of allowable absolute error of the resistive thermometer DTS, °C	± 0,15
Limits of allowable conventional error of the excessive (absolute) pressure sensor ДИ-415 (ДА-415), %	± 0,15
Excessive pressure of the measured medium in the pipeline, kPa, maximum	50 (300)
Unit power voltage, V	12
Power intake, W, maximum	15
Operation time of units when using independent power supply source, h, minimum	10
Number of metering device tested simultaneously, pcs.	1
Operating conditions: - ambient air temperature, °C - relative air humidity, % - atmospheric pressure, kPa	from +10 up to +35 from 30 to 80 from 84.0 to 106.7
Weight, kg, maximum	15
Overall dimensions, mm	460x340x150
Mean time between failures, h, minimum	12 000
Average service life, years, minimum	12

Flow meter completeness

Name	Designation	Q-ty	Note
Testing unit SPU-3	SPU-3-0 SPU-3-1 SPU-3-2	1 piece	Modifications are based on the Customer's demand
Small-sized digital thermometer	TLQM 9410/M2	1 piece	State Registry №32156-06
Operating Manual	TYAC.407369.001 PЭ	1 item	
Passport	TYAC.407369.001 ПС	1 item	
Manual. State System for Ensuring Uniform Measurement. Testing units SPU-3. Test procedure		1 item	
Operational documentation for the components included in the unit set		1 item	



Testing unit SPU-5



Testing unit SPU-5 is designed to reproduce volumetric flow unit when testing municipal and domestic gas flow meters. The testing of gas meters is based on comparison of the results received after simultaneous measurement of the air volume checked by gas meter and unit. Result of the volume measurement by unit is taken as the actual value.

Nozzles operating in critical conditions are used as a reference. Each nozzle helps to set a certain volumetric air flow rate at the value of which depends on the size (diameter) of the nozzle throat.

Sphere of application: metrological services of enterprises and organizations as a standard measuring instrument.

Identifying features

- Simultaneous testing of up to 19 different meters;
- Possibility to test simultaneously the meters with different maximum flow rates;
- Possibility to test different types of meters: diaphragm, jet, ultrasound, rotary;
- fully automated process of calibration test which eliminates the human factor;
- Small dimensions minimizing requirements for the premises.

Unit configuration

- Set of critical micronozzles MCN;
- Absolute pressure sensor 415-ДА-8043;
- Discharge sensor 415-ДВ-8248;
- pressure-difference sensor 415-ДВ-8248;
- Humidity and temperature meter ИВТМ-7;
- thermal transducer ТСПУ 0104;
- vacuum gage ДВ 2005Cr;
- solenoid electrovalves;
- vacuum pump control system;
- PC with installed software SPU-5.APM.

Metrological and technical characteristics of the testing unit SPU-5

Parameter	Value
Checked medium	air
Range of check flow, m ³ /h	from 0,016 to 25
Limits of allowable percentage error when using micronozzles with the limits of allowable percentage error $\pm 0.25\%$, %	$\pm 0,35$
Number of simultaneously connected meters	to 19
Rated operating conditions ambient air temperature, °C	20 $\pm$ 5
AC power supply: Voltage, V	220 $\pm$ 22
Power intake, W, maximum	1500
Overall dimensions (length, width, height), mm, maximum	1500x900x1540
Weight, kg, maximum	200
Complete service life, years, minimum	12

*Possibility to use other measuring devices with similar or better metrological and technical characteristics

Flow meter completeness

Name	Q-ty	Note
Testing unit СПУ-5 (SPU-5)	1 piece	
Gas meter	1 piece	
Operating Manual	1 item	
Passport	1 item	
Operational documentation for SI included in the set	1 set	
Test procedure	1 item	By individual order



Liquid flow meter, RS-2M series

Liquid flow meter RS-2M is designed to measure volumetric liquid flow rate. Flow meter is used for calculating the volume of consumed (allocated) conductive liquid including drainage and raw water, cold and hot water in the water and heat supply systems.



Identifying features

- absence of moving parts improves the flow meter reliability;
- materials are resistant to the aggressive effects of the environment;
- Fast implementation due to simplified mounting;
- Possibility of up to 10 h operation using autonomous power supply;
- Flow meter installation or on-site measurements do not require the pressure relief in the pipeline;
- no need in measuring camera; it can be remounted several times, all the range of pipelines suits to metering at required frequency.

Principle of measurement

Principle of the liquid flow meter operation is based on the process of electromagnetic induction. Movements of electro conductive liquid in the magnetic field, created by the energizing coil of the liquid flow primary speed converter (speed sensor), electromotive force proportional to motion speed and volumetric liquid rate is stimulated.

Metrological and technical characteristics of the liquid flow meter, RS-2M series

Measurement range	Value	
	Range 1	Range 2
Liquid flow rate measuring range, m/s	from 0.015 to 0.1	from 0.1 to 5
Reference passage pipeline diameter, mm	from 50 to 1700	
Volumetric liquid flow rate measuring range, m ³ /h.	from 0.1 to 40,856.0	
Range of output signal received from the primary transducers ISP, mA	from 0 to 5, from 4 to 20	
Measuring range of the output signal received from the pressure transducer, mA	from 4 to 20	
Measuring range of the measured liquid temperature, °C	from 0 to 150	
Liquid conductivity, cm/m	from 10-5 to 10	
Maximum excessive pressure in pipeline, MPa	2,5	
Limits of allowable percentage error when measuring the flow, %	±2	±1
Limits of allowable absolute error when measuring time, s	± 5 within 24 h	
Weight, kg	25	
ISP unit dimensions, mm	from (150×300) to (400×80)	
Dimensions of the secondary unit (assembled), mm	292×392×185	

Flow meter completeness

Name	Designation	Q-ty
Liquid flow meter RS-2M in set	НКИЯ.407212.001 ТУ	ISP – 1 piece
		BB – 1 piece
		BP – 1 piece
Operating Manual and service log or passport	НКИЯ.407212.001 РЭ	1 item
Test procedure	НКИЯ.407212.001 И1	1 item
Installation kit	ТУАС.407369.001 ПС	1 piece

Multichannel probe electromagnetic heat meter Turbo Flow PC-TERMO

Heat calculators are designed for measuring electric signals corresponding to the heat carrier parameters with further calculation of heat energy and number of heat medium. Version 961 2 differs from version 961 1 by the availability of additional (second) communication port RS485 intended to enhance functional capabilities for increasing the number of serviced heat rate.

Heat calculators are designed as a part of heat flow meters for liquid and vapor heat supply systems and other measuring systems where the water, condensation, superheated vapor, dry or humid saturated vapor is used as the heat carrier.

Integrated functional capabilities of the heat calculator ensure the complex solution for the wide range of tasks:

- Commercial metering of heat energy consumption and the heat carrier, superheated and saturated vapor;
- Control of the heat consumption modes;
- Creation of dispatch control system for the heat energy consumption and heat carrier.

Identifying features

- It is universal and can be used in any water heating and consumption systems illustrated in "Regulations for heat energy and heat carriers", in two and more metering units simultaneously.
- Simple installation and implementation. Probe execution of the primary rate converters makes it possible to mount the meter without a stop and pressure relief.
- High reliability. Absence of moving parts in primary converters and materials are resistant to aggressive environment effect.

Heat meter configuration

- Probe electromagnetic flow converter RS-2M;
- Primary temperature transducer;
- Primary pressure transducer;
- Heat calculator SPT 961.

Normative basis

Heat calculators correspond to GOST P 51649, GOST P EH 1434-1, MI 2412 and MI 2451.

Functional capabilities

Heat calculator is designed to operate in combination with flow meters, volume meters, differential pressure sensors, pressure and temperature sensors. The following devices can be connected to the heat calculator at the same time:

- Eight transducers with current output signal of 0-5, 0-20 or 4-20 mA;
- Four transducers with output impulse-number or frequency signal of 0-5 kHz;
- Four resistive temperature transducers with 50Ω, 100Ω, 50M, 100M parameter

The number of services pipelines is determined by the need to use some or other sensors of the heat carrier parameters and possibility of their actual connection to the heat calculator. Up to 12 pipelines can be described at the logical level, the number of freely configurable heat circuits - up to 6.

For Model 961 2 the number of inputs for connecting sensors can be increased by connecting to the heater calculator of one or two ADS97 adapters via additional interface RS485.

Adapter ADS97 has 4 inputs for flow meters with pulse output signals, 4 inputs for sensors of different purpose with unified current output signals, 4 inputs for resistance thermal transducers.

Heat calculator performs continuous control of input electric signals and parameters of the heat carrier flow. Any inadmissible deviations of parameters and signals from the norm are recorded in archive of diagnostic messages with reference to time.

Average and total values of measured and calculated parameters are recorded in archives with reference to specified day and hour. There are three types of such archives having various depth of storage :

- Hour archives – 1080 h;
- Daily archives – 366 days;
- Monthly archives – 24 months

Special archive contains all the information on the account of total time of work and power supplies breaks.

Heat calculator has two levels of data protection (seal and password) preventing their unapproved change while in service. Change of operative parameter values is recorded in a special archive.

Communication possibilities of the heat calculator are provided with interfaces RS485, RS232C, IEC1107.

Basic technical characteristics:

- Dynamic flow measuring range 1:200
- Minimum temperature difference 2°C
- Service life 10 years
- Maximum calculation units - 4
- Availability of interface ports RS232, RS485, Optoport

Metrological and technical characteristics of multichannel probe electromagnetic heat meter Turbo Flow PC-TERMO

Parameter	Value	
	Range 1	Range 2
Reference passage pipeline diameter, mm	50 — 1700	
Volumetric liquid flow rate measuring range, m ³ /h 3	0,1 — 40856,0	
Liquid flow rate measuring range, m/s	0,015 — 0,10	1 — 5,0
Range of output signal received from primary ISP transducer, mA	0 — 5, 4 — 20	
Measuring range of the output signal received from the pressure transducer, mA	4 — 20	
Temperature measuring error, maximum	(0,2+0,001*t) °C	
Liquid temperature measuring range, °C	from 0 to 150	
Maximum excessive pressure in pipeline, MPa	2,5	
Limits of allowable percentage error when measuring the flow, %	±2	±1
Power intake, W	Maximum 20	

Metrological characteristics of the heat calculator:

Error in operating conditions does not exceed:

- $\pm 0,05/0,1\%$ (resulted) – according to the characteristic of flow, pressure and differential pressure when operating with current input signals;
- $\pm 0,05\%$ (relative) – according to the flow reading when operating with impulse-number and frequency input signals;
- $\pm 0,1/0,15^{\circ}\text{C}$ (absolute) – according to temperature reading.

Operating characteristics of the het calculator:

- Ambient air temperature from - 10 to 50°C.
- Relative humidity up to 95% at 35°C.
- Water and dust protection degree IP54.
- Overall dimensions 244×220 × 70 mm.
- Power supply 220V $\pm 30\%$, 50 Hz.
- Power intake 7 W.
- Service life 12 years
- Test interval 4 years.

Gas flow meter Turbo Flow, TFG-H series

Flow meter Turbo Flow TFG-H is used to measure volumetric gas flow rate and volume of gas (natural, non-associated (associated) oil gas, nitrogen gas, air, inert gas and other kinds of gas) reduced to standard conditions.

This flow meter is used in the municipal and domestic sector, at industrial facilities that consume gas in a small volume but with a large flow range.

Unit configuration

- Flow-rate cabinet
- One or more flux converters.

Depending on the maximum pressure in the pipeline the flow meter has the following versions:

- Version A is designed for installation in the measuring pipelines with operating pressure up to and including 1.6 MPa;
- Version B is designed for installation in the measuring pipelines with operating pressure up to and including 6.3 MPa;
- Version C is designed for installation in the measuring pipelines with operating pressure up to and including 16 MPa;
- Version D is designed for installation in the measuring pipelines with operating pressure up to and including 32 MPa.



Identifying features

- probe execution makes it possible to mount the meter on the pipeline without pressure removal;
- absence of moving parts improves the flow meter reliability;
- High accuracy when measuring low rates
- wide dynamic measuring range 1:1500;
- Easy and comfortable maintenance servicing

Metrological and technical characteristics of the gas flow meter Turbo Flow, TFG-H series

Parameter	Value
Measuring range of the volumetric gas flow under standard conditions, m ³ /h	from 0.05 to 1200
Pipeline diameter, mm	from 25 to 100
Limits of allowable percentage error when metering the volumetric gas flow reduced to standard conditions, % - using the manufacturer's flowcell without using the manufacturer's flowcell	± 1,0 within the range 0,015 Q _{max} ≤ Q ≤ Q _{max} ± 2,0 within the range Q _{min} ≤ Q < 0,015 Q _{max} ± 1,5 within the range 0,015 Q _{max} ≤ Q ≤ Q _{max} ± 2,5 within the range Q _{min} ≤ Q < 0,015 Q _{max}
Gas temperature range, °C	from -60 up to +300
Absolute error of temperature measurement, °C	± (0,3 + 0,005· t), Where t – measured temperature, °C
Absolute error of time measurement, s	± 1 within 24 h
Range of flow rate, m/s	from 0.03 to 350
Upper range limits of excessive pressure (URL) kPa MPa	2,5; 4; 6,3; 10; 16; 25; 40; 63; 100; 160; 250; 400; 600 1,0; 1,6; 2,5; 4,0; 6,3; 10; 16; 25; 32
Working measuring range of excessive pressure, % URL	from 33 to 100
Upper range limits of absolute pressure (URL), MPa	0,1; 0,16; 0,25; 0,4; 0,6; 1,0; 1,6; 2,5; 4,0; 6,0; 6,3; 10; 16; 25; 32
Working measuring range of absolute pressure, % URL	from 33 to 100
Limits of allowable percentage error when measuring the pressure, %	± 0,5
Dynamic range (Q _{min} /Q _{max})	1:1500
Response limit	0,3 Q _{min}
Power voltage, V: - PT: -external, from FRC from in-built SB - FRC	from 9 to 18 7,2 220; АКБ 12; автономный источник (12 - 18)

Metrological and technical characteristics of the gas flow meter Turbo Flow, TFG-H series (continued)

Parameter	Value for TFG-S series (including portable)
Power intake, W, maximum	15
PT operating conditions: - ambient air temperature, °C	from -60 up to 70
FRC operating conditions: - ambient air temperature, °C	from -5 up to +50
PT weight, kg, maximum	1,5
FRC weight, kg, maximum	4,5; (6,0)*
PT overall dimensions, mm, maximum	150x620x140
FRC overall dimensions, mm, maximum	160x275x130 (200x350x135)*
PT IP according to GOST 14254	IP65
FRC IP according to GOST 14254	IP54
Mean time between failures, h, minimum	60 000

*- for flow meters with two or more PT.

Flow meters provide for the indication of the following parameter values:

- Current gas flow-rate;
- Bulk-volume of gas for the preceding and current day;
- Bulk-volume of gas immediately upon switching on the flow meter;
- Bulk-volume of gas for the preceding and current month;
- Gas temperature;
- Gas pressure;
- Operating time;
- Outage time;
- Current date and time.

Flow meters ensure memorization and outputting for printing the average hourly and daily values of the gas flow parameters for the last 12 months.

Controllers “Don-turbo” with autonomous power supply



Data acquisition from the metering equipment:

- flow computers of the energy resources.
- analog and digital sensors of operational parameters and emergency warning alarm.
- Archiving of changed parameters in the internal memory of controller.
- Data exchange in GSM/GPRS networks, data transfer from the measuring equipment to the control unit.
- Local data retrieval via USB; data scanning and configuration by means of data input-output unit.
- Checking the values of measured parameters.
- front-end control and status control (angle of valve rotation).

Identifying features

- Number of digital interfaces: RS-232 -1, RS-485 -1;
- Number of analog inputs: 6;
- Type of analog inputs: Potential;
- Number of digital inputs: 6 with possibility to upgrade up to 12;
- Number of digital outputs for controlling actuating mechanisms – up to 2;
- Possibility to control actuating mechanisms via RS-485;
- Control of the position sensors via pulse and resistive inputs.
- interface protocol: MODBUS, «transparent channel»
- Active communication mode: Interval of active controller communication, adjustable:
 - Once a day, the rest of time “sleeping” up to 24 hours of communication;
 - 12 hours of communication and 12 hours of “sleeping” (recommended by default);
- Data exchange rate: 9600, 4200 Baud

- explosion protection marking:
 - Ex ib (intrinsically safe electrical circuit);
 - Ex d [ib] (explosion-proof case, intrinsically safe electrical circuit);
- Length of archive storage:
 - 400 days for every analog input,
 - 400 days for every digital input,
 - 400 days for every interface
- Controller power supply: Autonomous; rechargeable lithium-ion cells;
- Power voltage: 6-30V;
- Battery service life depends on the intensity of surveying and number of connected devices. When 3 pressure sensors are powered and operating 12 h in the network/12 h in “sleeping” mode, the battery service life is equal to 4 years.
- Power intake: Maximum 2.5 W.
- Overall dimensions and weight:
 - For Ex ib version: 300x200x155 mm, maximum 8 kg.
 - For Ex d [ib] version: 360x220x230 mm, maximum 20 kg.

Controllers “Don-turbo” with 220V power supply

Data acquisition from the metering equipment:

- flow computers of the energy resources.
- analog and digital sensors of operational parameters and emergency warning alarm.
- Archiving of changed parameters in the internal memory of controller.
- Data exchange in GSM/GPRS networks, data transfer from the measuring equipment to the control unit.
- Local data retrieval via USB; data scanning and configuration by means of data input-output unit.
- Checking the values of measured parameters.
- front-end control and status control (rotational angle).



Identifying features

- Number of digital interfaces: RS-232 - 1, RS-485 - 1; Number of analog inputs: 4;
- Type of analog inputs: Potential, current;
- Number of digital inputs: 4 with possibility to upgrade up to 8;
- Number of digital outputs for controlling actuating mechanisms – up to 2;
- Possibility to control actuating mechanisms via RS-485;
- interface protocol:
 - MODBUS,
 - «transparent channel»
- Data exchange rate: 9600, 4200 Baud
- explosion protection marking:
 - Ex ib (intrinsically safe electrical circuit);
 - Ex d [ib] (explosion-proof case, intrinsically safe electrical circuit);

- Length of archive storage:
 - 400 days for every analog input,
 - 400 days for every digital input,
 - 400 days for every interface
- Controller power supply: From external 220V mains; SB ensuring continuous supply
- Power intake: Maximum 2.5 W
- Size and weight:
 - for execution Ex ib: 300x200x155 mm, maximum 8 kg.
 - For Ex d [ib] version: 360x220x230 mm, maximum 20 kg.

Don-turbo controllers with simplified functionality



- Data acquisition from the energy resources rate meters.
- Data exchange in GSM/GPRS networks, data transfer from the measuring equipment to the control unit.

Operating mode

- As controller for data transfer via communication channels (connection of meters through RS-232, RS-485);
- As interface converter;
- For direct connection to DP.

Identifying features

- Number of connectible flow meters: From 1 to 255 (via RS-485);
- Supported interfaces: RS-232, RS-485, USB.
- Supported communication channels: GSM, GPRS;
- interface protocol:
 - «transparent channel»
- Data exchange rate (adjustable): 9600, 2400, 1200 9600 Baud. Aerial layout:
 - “ai” –coded version: internally
 - DIN rack-mounted “ao”- coded version: entry is provided to connect external aerial.
- Controller power supply: From external power supply via power adapter.
- Power voltage: 7-30V.
- Power intake: Maximum 12 W.
- Overall dimensions and weight:
 - Standard enclosure: 135x75x50 mm, maximum 0.4 kg.
 - DIN rack-mounted: 35x90x60 mm, maximum 0.3 kg.



Central controller Don-turbo

Dispatcher station received data to be transferred by controllers and telemetry system via GSM “point-to-point channel” from energy flow rate computers.



Identifying features

- Average number of flow meters to be polled: 50/ hour.
- PC interfaces: RS-232, USB.
- Supported communication channels: GSM, GPRS.
- Interface protocol:
 - «transparent channel».
- Data exchange rate (adjustable): 9600, 2400, 1200 Baud.
- Aerial layout:
 - “ai” –coded version: Internally;
 - “ao”- coded version: output is provided to connect external aerial;
- Controller power supply: From external power supply via power adapter.
- Power voltage: 7-30V.
- Power intake: Maximum 12 W.
- Overall dimensions and weight: 135x75x50 mm, maximum 0.4 kg.





Modem pools

- Modem pools are designed to provide data exchange with telemetry and telemechanics controllers via GSM cellular communication channels.
- The equipment is delivered as part of "DONTEL» Hardware and Software Package, and may be to organize data acquisition of other vendor telemetry controllers.

Hardware version

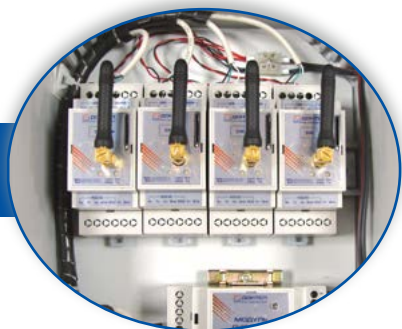
- Modem quantity-dependent: PM-4 and PM-08; 4 and 8 modems, respectively.
- External interfaces for connecting to master PC: USB-2.0, Ethernet.

Identifying features

- Average number of flow meters to be polled: 50/ hour for each modem
- GSM frequency - 850 / 900 /1800/ 1900 MHz
- Data exchange rate (single communication channel) – 14400 baud
- SIM card interface – 3 V;
- Maximum connecting cable length:
 - Up to 3 m for USB
 - Up to 100 m for Ethernet.

- 220V power supply.
- Aerial layout – by default; modem unit complete with aerials.
- Aerial assembly to be delivered on request.

- Overall dimensions and weight:
PM – 04 Modem unit 200x300x130 mm, maximum 2.8 kg.
PM – 04 Aerial assembly 200x300x130 mm, maximum 1.9 kg.
PM – 08 Modem unit 300x400x180 mm, maximum 6.0 kg.
PM – 08 Aerial assembly 300x400x180 mm, maximum 3.8 kg.



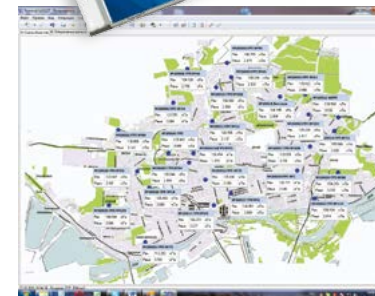
DONTEL HSP Software

Dispatcher station software configuration:

- Communication server running with Database Management System; Client work station/ terminal software.
- Dispatcher station software components can run both under a single PC or LAN-integrated multi PC.

Identifying features

- Mapped/tabular site data display;
- Audible alarm/ hazard warning;
- Current site communication status display;
- Generation of communication server commands for transmitting parameters to remotely controlled device;
- Generation of polling commands for communication server;
- Review and analysis of received data;
- Generation of graphs and reports on required parameters within the specified period of time;
- Report export to Excel application or to MS Excel 97-2003 file;
- Adjustment of telemetry parameters (map/site structure);
- Site featurig/editing;
- Featurig and editing the lists of displayed parameters;
- Featurig and editing the lists of adjusted parameters;
- User parameter listing and editing;
- User log control;
- Recording data on user operation;
- Accidental alarm/main window closing protection;
- Access control during data review/ system re-configuring.



The communication server with the database provides:

- Direct command development to communicate with controllers;
- Data reception with subsequent storage;
- Alarm reception/transfer to terminals, data storage/retrieval/ output from database;
- Protection of storage data against unauthorized access;
- Terminal session logging.

Basic technical characteristics of the communication server software:

- Maximum number of modems: 255
- Modem usage mode:
 - "incoming calls only"
 - "incoming/outgoing calls"
 - "Outgoing calls only"
- PIN-code activated SIM support.
- Maximum number of controllers installed in the system and maximum number of connected terminals are determined by the software version based on project commercial specifications.

Quality management system

All productive and metrological processes in the Turbulentnost-Don company are controlled by the internal Quality Unit. 100% of equipment manufactured by Turbulentnost-Don LLC is tested for compliance with technical requirements; the quality of products and services is confirmed by numerous certificates, licenses, diplomas and grants approved in the Russian Federation and CIS.

The company has a certified quality management system ISO 9001:2008 № 11.0787.026 allowing to minimize the occurrence of low-quality products and services.



Enabling documentation



Retail chain for the sales of GRAND gas flow meters

Altai Territory and the Republic of Altai and Republic of Altai		
Amrita LLC	Biysk, Sotsialisticheskaya street, № 13, office 37	(3854) 45-01-13, 30-66-00
Arkhangelsk Region		
Gascomplektsever LLC	Severodvinsk, Zheleznodorozhnaya street, 34	(8184) 56-12-29, 56-03-32, 8-911-679-27-22
Belgorod Region		
Electro-Impulse LLC	Belgorod, Bogdan Khmelnytskyi avenue, 137 D, building 5, office 212, 221	(4722) 34-16-67, 34-16-81
Bryansk Region		
Dunkan-Kursk LLC	Kursk, Leo Tolstoy lane, 9	(4712) 52-00-70,52-13-52
Vladimir Region		
MuromArmSnab-Import LLC	Murom, Eksploatsionnaya street, 20A	(49234) 4-20-96, 4-60-17, 4-21-08
Volgograd Region		
BIKSBIT LLC	Volgograd, Grushevskaya street,10	(8442) 26-81-93; 26-81-71
Volgograd Region		
Promtorg LLC	Vologda, Zosimovskaya street, 31	(8172) 75-15-66
Voronezh Region		
West LLC	Ivanovo Region	(473) 244-64-64, 247-57-70
Ivanovo Region		
MuromArmSnab-Import LLC	Murom, Eksploatsionnaya street, 20A	(49234) 4-20-96, 4-60-17, 4-21-08
Kostroma Region		
Gas service center LLC	Kostroma, Profsouznaya street, 28, nonresidential premises №1	(4942) 41-31-21
Krasnoyarsk Territory		
IE Kashirin V.V.	r. Krasnoyarsk, Parashyutnaya street, 9A, office 46	(3912) 53-82-80

Kursk Region		
Dunkan-Kursk LLC	Kursk, Leo Tolstoy lane, 9	(4712) 52-00-70,52-13-52
Nizhni Novgorod Region		
TH Gazpremium LLC	Nizhny Novgorod, Rodionova street, 193, building 4, office 15	(831) 438-40-61, 438-40-23
Omsk Region		
Titan BT LLC	Omsk, 10 years of October street, 219, office 107	(3812) 58-44-33, 32-93-04, 592-702
Oryol Region		
Dunkan-Kursk LLC	Kursk, Leo Tolstoy lane, 9	(4712) 52-00-70,52-13-52
Penza Region		
IE Garibyan A.M.	Penza, Perspektivnaya street, 3	(8412)38-13-38
Perm Territory		
Electro-mounting construction company LLC	Perm, Kosmonavtov high-road, 55	(342) 224-72-03, 224-70-11, 224-36-85
Republic of Adygeya		
Grand Alliance LLC	Maikop, Stroiteley street, 11, building a	
Republic of Bashkortostan		
Grand Ufa LLC	Ufa, Novocherkasskaya street, 4, office 106	(347) 257-56-12
Republic of Mari-El		
Spezsnabzhenie LLC	Ioshkar Ola, Karl Marx street, 140	(8362) 661-000, 662-000
Republic of Mordovia		
IE Garibyan A.M.	Penza, Perspektivnaya street, 3	(8412)38-13-38
Republic of Tatarstan		
GazService LLC	Kazan, Zhukovka street, 14	(843) 518-03-21
Republic of Udmurtia		
IE Varlamov S.R.	Izhevsk, Dzerzhinsky avenue, 5a, area of УПТК 800 ФГУП УССТ-8	(3412) 66-45-88, 63-78-50; 8-912-877-26-64

Rostov Region		
Metrogazservice LLC	Rostov-on-Don, Mikhail Nagibin avenue, 31a	(863)242-62-42, 275-34-00, 8-988-570-70-77
Metrogazcenter LLC	Rostov-on-Don, Salskiy lane, 101	(863) 218-51-51
Samara Region		
Ecotechnogaz LLC	Samara, Moscow high way, 41	(846) 273-87-03 (04)
Saint Petersburg and Leningrad Region		
AKTIV Company LLC	Saint Petersburg, Zaytseva street, 41, office 230	(812) 380-7860, 380-7960
Saratov Region		
Intergaz LLC		(8452) 51-47-51, 51-13-08
Sverdlovsk Region		
Astin Group TH LLC	620141 Yekaterinburg, Zavokzalnaya street, 5, office 19	(343) 379-33-71
Smolensk Region		
Dunkan LLC	Smolensk, Parkovaya street, 2	(4812) 35-09-09, 35-08-88
Stavropol Territory		
Stavropolgazstroj LLC	Stavropol, Dovatorovtsev street, 40a	(8652) 23-41-49
Tula Region		
Electro-Impulse LLC	Belgorod, Bogdan Khmelnytskyi avenue, 137 D, building 5, office 212, 221	(4722) 34-16-67, 34-16-81
Chelyabinsk Region		
Gazmarket.ru LLC		(351) 210-35-73
Chuvash Republic		
Gazpremium LLC	Nizhny Novgorod, Rodionova street, 193, building 4, office 15	(831) 438-40-61, 438-40-23

Yaroslav Region		
EnergoUnit LLC	Yaroslavl, Sverdlova street, 34, office 533	(4852) 58-08-27

Dealers for the industrial equipment sales

Vladimir Region		
Delta LLC	Vladimir, Baturina street, 30	8-910-177-5397
Republic of Bashkortostan		
SpetzGazAvtomatika LLC	Ufa, Zelenogorskaya street, 13	(347) 291-89-75
Samara Region		
AMT LLC	Samara, Zavodskoe high road, 3, office 307	(846) 979-86-44
Sverdlovsk Region		
GazTeploEngineering LLC	Yekaterinburg, Sortirovochnaya street, 22, Office 314	8-982-618-60-23
Tyumen Region		
Teplogazuchet LLC	Tyumen, 9 May street, 2	(3452) 67-57-40, 69-50-95



**Russia, Rostov-on-Don,
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Novoshakhtinsk,
building 6/7, 6/8
(863) 203 77 80, 203 77 86
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www.turbo-don.ru**