FUEL FLOW METER TRD-500

USERS MANUAL

FOR FUEL FLOW METER TRD-500

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Sapsan Group

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Content

Main technical characteristics of fuel flow meter TRD-500

The fuel flow meter of differential type TRD-500 is designed for measurement of flowing fuel volume and delivery of electric impulses at installation in a fuel line of cars, tractors and other mobile and fixed machines and integral units (vehicles) according to the differential installation diagram. The fuel flow meter is nonrepairable item.

Table 1. Basic technical data of fuel flow meter

Measured fuel flow range	from 30 to 500 l/h.
Number of measurement channels	2 (supply and return flow).
Conformity of one output pulse «K1» with fuel volume, flowing through port «K1», …….. l/pulse.	150… 250
Conformity of one output pulse «K2» with fuel volume, flowing through port «K2», …….. l/pulse.	150… 250
Basic percentage error of fuel metering	± 1 %.
Operating supply voltage	12/24V.
Power supply voltage range, that provides normal operation	10-30 V.
Useful current, no more	50 mA.
Digital output	impulse, open collector.
Ambient temperature, at which normal operation of fuel flow meter is provided	From- 40 to + 65 0C.
Dimensions, mm, not above	67x73x100,5.
Weight not above	0,5 kg
Run time of fuel flow meter	twenty-four-hour
Average time to failure, not less	12500 hours
Ingress protection rating of fuel flow meter, not less	IP68.

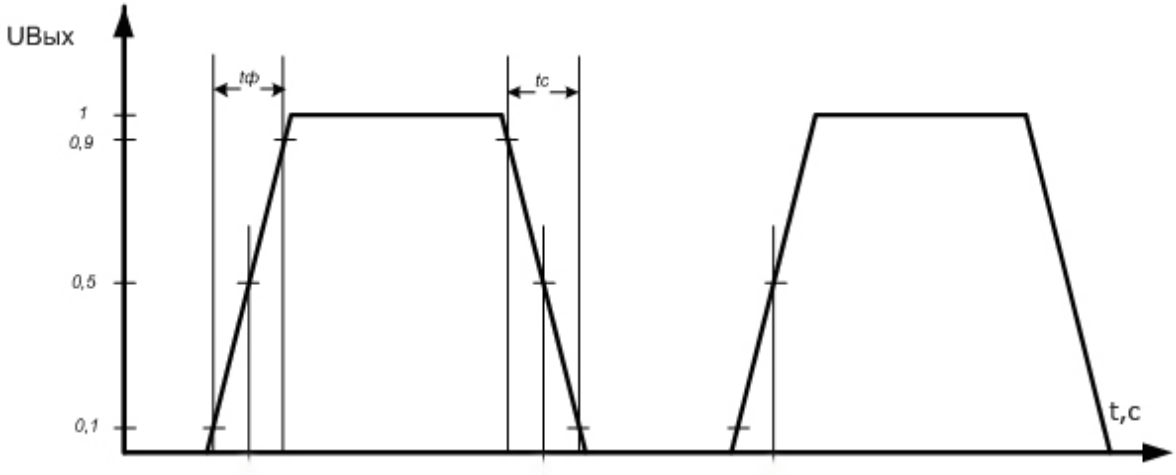

Fig. 1 Data on flow meter impulse response

Data on the precious materials content in fuel flow meter: No precious materials are used.

Delivery in complete sets

Name	Quantity
TRD-500	1 piece.
Wiring extender with interconnect plug *	1 piece.*
Hose adapters **	4 pieces.**
Joint washers **	4 pieces.**
Certificate	1 piece.
* Wire length is agreed when ordering ** It is supplied in agreement with buyer	

TRD-500 sensor installation

TRD-500 is installed according to the differential installation scheme (see fig. 2). Thus the fuel system undergoes no modifications, except for insertion of two sections of TRD into a supply and return lines. The first section is installed between the fine filter and high-pressure fuel pump; the second one (back flow) is installed into return flow line after a connection point connected high-pressure fuel pump return flow and jet return flow. Fuel consumption is determined as an indications difference of measurement chambers of supply and return flows.

TRD-500 is inappropriate for engines at which fuel flows from back flow line with some air (some engines with HP ТНВД a high pressure). In such engines measurement accuracy of back flow can be essentially reduced because of the air. To define whether there is some air at back flow you should sink back flow hose in transparent capacity to the bottom and watch whether fuel comes out with bubbles and foam while capacity filling.

The following things are necessary for installation: TRD-500, installation kit, a drill, a key set, a fuel-resistant hose, a knife to cut the hose, a bracket and self-tapping screws (bolts to fix the device to a bracket).

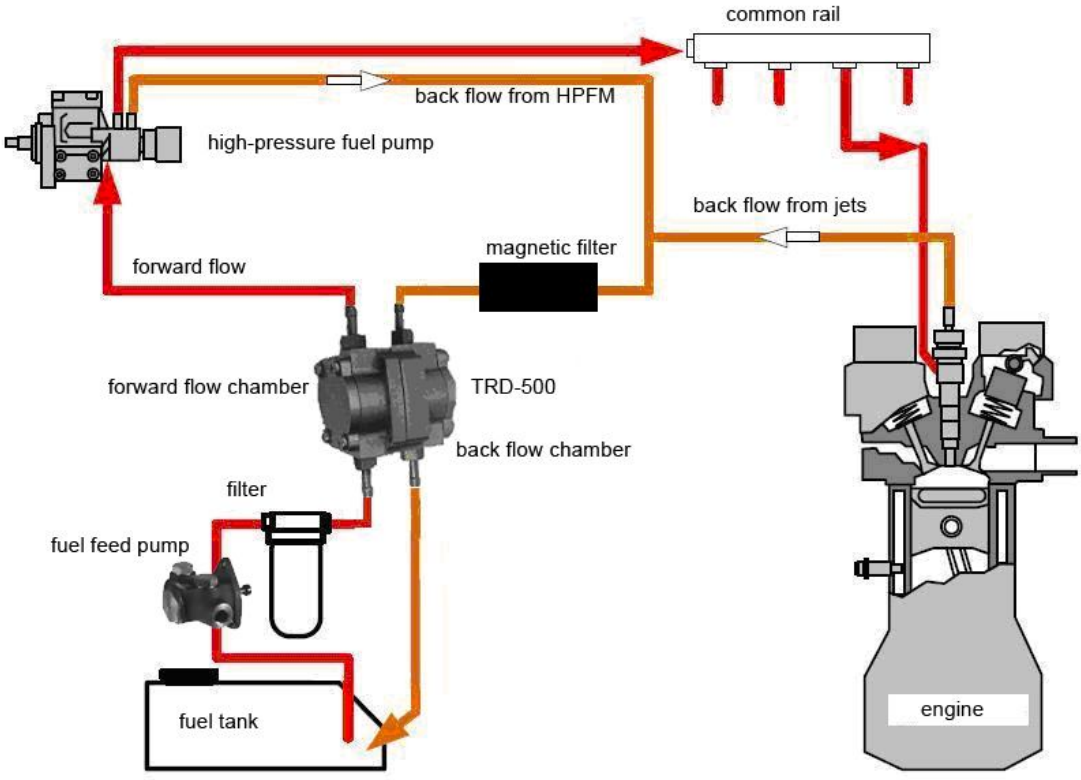

Fig. 2 Principle installation diagram for TRD-500.

Calibration of sensor TRD-500

Sensor TRD-500 has various coefficient values at various flow rates. At present coefficient adjustment with the built-in controller isn't carried out. Therefore, to increase the measurement accuracy it is necessary to calibrate the sensor at the car.

General installation sequence with system calibration:

1. Choose the place for installation proceeding from the convenience of a pipeline running and general data on TRD installation. (See section "General instructions on pipelines installation").
2. Fix the sensor on the car (on a bracket or integral unit of the car).
3. Install a magnetic filter on a return pipe.
4. Connect section of return flow measurement. Both sections are identical. Choose which section to install into supply line and which one into return line depending on the convenience of pipelines running.
5. **Temporarily connect section of supply measurement in sequence with section of return measurement on the return pipe (see fig. 3).**
6. Disconnect a return pipe from a tank and direct it into an auxiliary tank (see fig. 3).
7. Connect both chambers of the flow meter to the impulse counter. You may use the DailyScan computer of SapsanVneshTrog production to count the impulses. You may also use the recorders that enable to see current values of the impulse counter (for example, Autograph terminal when it's connected to the AutoGRAPH_control.exe program). If you use the DailyScan computer as the measuring tool you should do the following: temporarily set both coefficients equal to 1 and choose the fuel rate display mode at calibration.
8. Empty a measuring tank 10 liters in volume. Direct the return pipe to the auxiliary tank. Start the engine and set on idle rpm. Displace a hose in a measuring tank and at the same moment notice current indications of both counters. After the measuring tank is filled place a hose back and notice the indicators at this moment. Enter the data in the table 1 and calculate k1 and k2.
9. Empty the measuring tank and repeat the calibration on load rpm (2000 rpm). Enter the data in the table and calculate κ1 and κ2.
10. Reconnect supply section to a supply pipe (see fig. 2) and place a supply pipe back in the tank.
11. Pump over engine fuel system, start the engine and check working capacity.

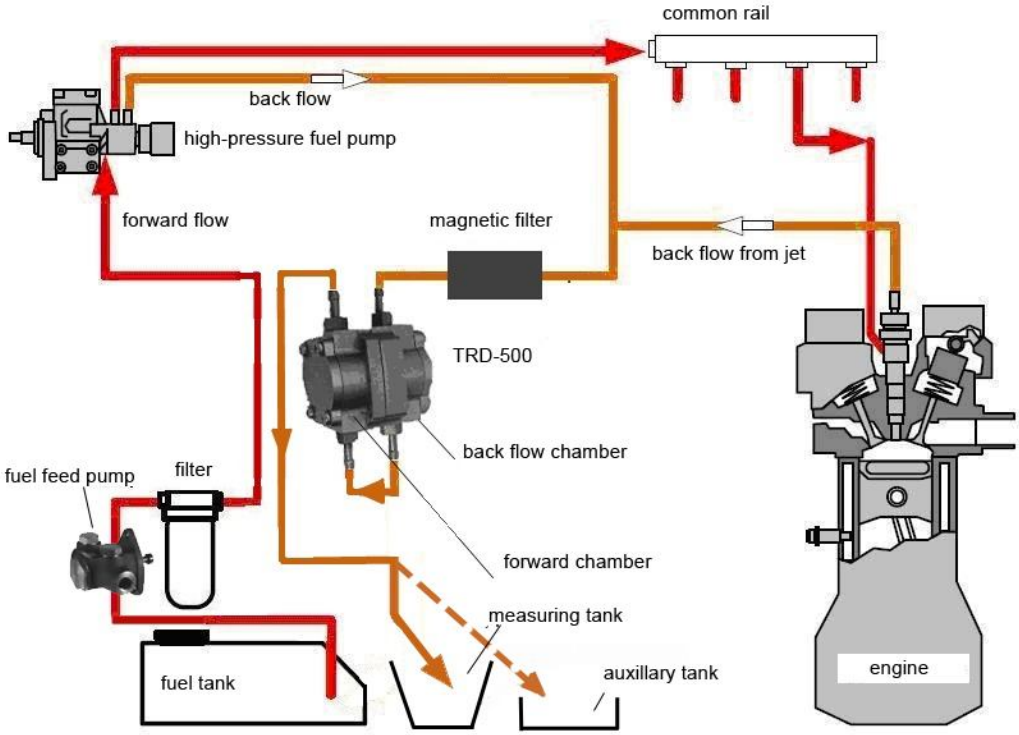

Fig. 3 Installation diagram of TRD-500 at calibration.

Table 2. Findings of fuel flow meter TRD-500 calibration

	Section 1, liter/impulse	Section 2, liter/impulse
Flow coefficient at idle speed	k1xx=capacity of measuring tank /impulse quantity=	k2xx= capacity of measuring tank / impulse quantity =
Flow coefficient at load rpm	$k1_{2000}$= capacity of measuring tank / impulse quantity =	$k2_{2000}$= capacity of measuring tank / impulse quantity =
Average low coefficient	k1=0,25*k1xx+0,75*$k1_{2000}$=	k2=0,25*k2xx+0,75*$k2_{2000}$=

General data on installation

1. The content of a gaseous component in fuel lines isn't allowed.
2. Ingress of particles at installation isn't allowed.
3. It is required to install a fuel filter before the supply chamber and a magnetic trap for a metal dust before the return chamber (to catch metal dust of worn out parts of fuel injection pump assembly). If it is not possible to install TRD after the standard fine filter, install the sensor after the additional fine filter.
4. It is recommended to seal up all fuel lines and electric connections.
5. It is not recommended to use it in Common Rail systems with open type fuel-injectors.
6. It is necessary to subtract indications of the fuel supply pipe from the return pipe indications to found out fuel consumption.
7. To get the value of fuel consumption you should subtract indications of the fuel supply line from those of the return line.
8. A direction of fuel movement through flow meter chambers are marked by arrows on chambers. Return connection is not allowed.
9. Use only steel (not aluminum) fittings!

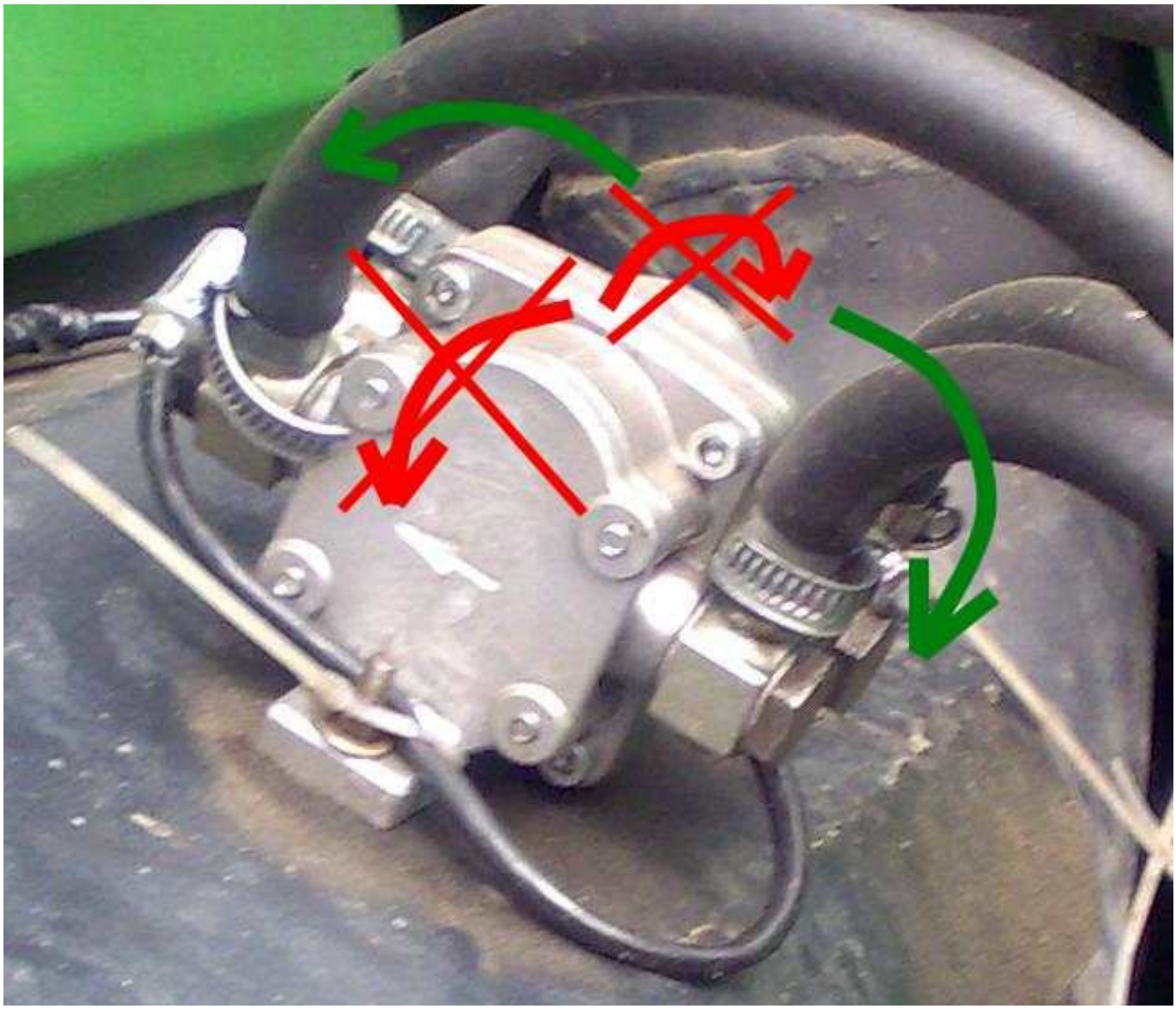

Fig. 4 choice of the installation plane.

General instructions on pipelines installation

1. Fuel lines should be laid on a vehicle in a reliably environment-proofed way and at break of their hermiticity there should be no fire danger (they should be laid under a collector/turbine not over them).
2. Protection of fuel lines from contact with sharp edges of integral units of the car and break stones flying out from under wheels should be provided;
3. Fuel lines should be a little bit longer to make up temperature changes of length;
4. It is not allowed to reduce internal profile of fuel lines at bending.
5. Fuel lines should be mounted on the vehicle with couplers (clamping devices) which don't damage a tube and allow temperature changes of fuel lines length.
6. It is not recommended to mount TRD on parts of vehicle that undergo a strong vibration and heating.
7. Keep flanges and TRD connection carvings clean! Don't touch their surface with dirty hands. **At installation don't let dust and water ingress in a flow meter.**

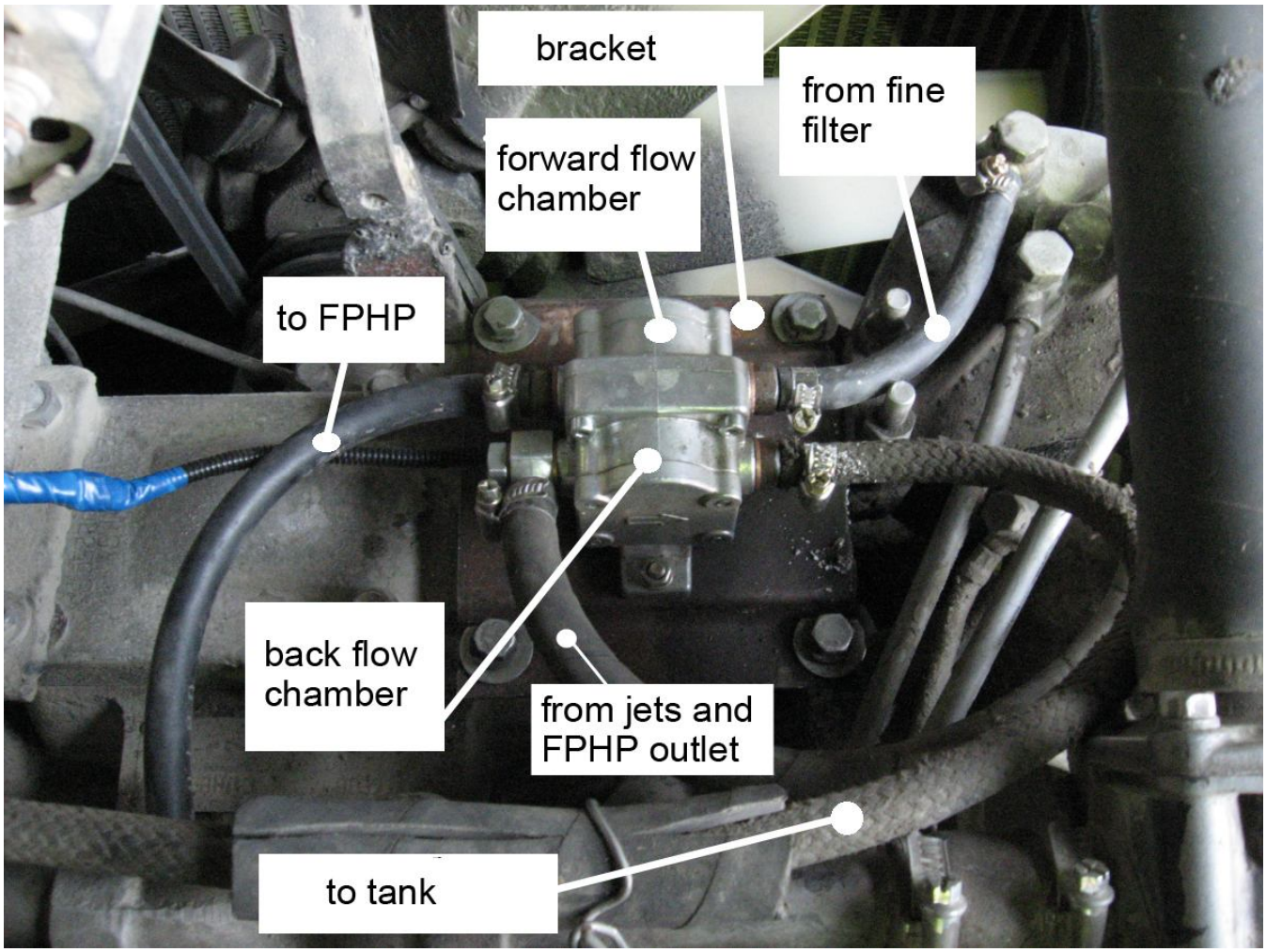

Fig. 4 An example of sensor installation on JAMZ engine

Connection of TRD-500 to recorder

Fig. 5 TRD-500 sensor slot

Wire marking and sensor socket:

Contact into split	Contact use	Color of internal sensor wires		Color of Wiring extender	
1	"-" power	Brown		Brown	
2	"+" power	Red		Blue	
3	K1 (left chamber from wire)	Grey		Yellow green	
4	K2 (right chamber from wire)	Violet		Black	

Final inspection and functional check of TRD-500

Wipe all new connections of fuel lines and check whether there is no fuel accumulation next to an exhaust system (muffler).

Take all tools, material rests, flooring and rags away from a vehicle. If it is necessary, close an engine department, lower a driver's cabin.

On engine operating indoors provide reliable removal of exhaust gases through exhaust ventilation.

Start the engine and set constant frequency of rotation idling.

Pay attention on the engine operation resistance. Check whether the engine reacts on a gas pedal and comes back to idling when you release it.

Instability of engine rpm points to problems in fuel line system (in additionally installed filter or bad pumping of fuel system).

On engine operating evaluate visually hermiticity of all fuel line connections.

Stop the engine and check whether there is no fuel leak and air drain in all union joints of fuel system, the sensor and the additional filter.

Fuel leaking in joining places of fuel lines isn't allowed.

Don't try to tight the joint places. Use new copper joint washers to tight it!

Plugging fuel system leaks should be carried out only at dead engine! In no case try to tighten the joint places at engine running!

If there is no fuel consumption indications (the consumption is equal to zero) it is recommended to check rotation of TRD mechanism through blowing it off by air. If necessary replace TRD.

Operation notes

ATTENTION! At work with a flow meter it is necessary to carry out following restrictions:
Do not apply power supply voltage exceeding +30 V on a flow meter;
Do not allow polarity violation of connected supply voltage.

Manufacturer's warranty

The manufacturer guarantees the conformity of a flow meter to requirements of the design documentation while meeting the requirements of installation, service rules, transportation and storage rules by customer.
Guaranteed storage life is 2 years from the manufacturing date. As the manufacturing date the date specified on a flow meter (in the certificate) shall be taken.
Guarantee period is 24 months from the date of introduction into service, but no more than 30 months from the manufacturing date.
During a guarantee period the manufacturer undertakes the obligation to replace a flow meter for free in case of defects and failures occurrence.
The guarantee period is prolonged for the period from the claim submission to flow meter setting into operation after replacement.
The address of the manufacturer:
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