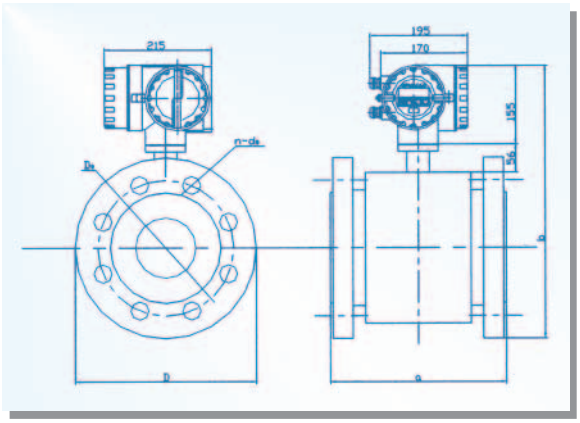
RPmag62

Electromagnetic flowmeter

825B092D

Features

- Pipe dimension range: DN15 ÷ DN1600
- Measure range: <0,6m³/h ÷ >70000m³/h
- Fluid conductivity: >5µS/cm
- Sensor material: SS 321
- Lining materials: rubber; polyurethane; PTFE; FEP
- Housing material: aluminum
- Electrodes materials: SS 316Ti, Hastelloy B; Hastelloy C; Titanium; Tantalum
- Remote version operating temperature: rubber <80°C; polyurethane <60°C; PTFE <150°C (180°C peak value)
- Compact version operating temperature: <70°C
- Max. accuracy: ±0,2%
- Max. repeatability: ±0,07%
- Fluid velocity: 0.5m/s ÷ 15m/s
- Open-collector output: 30V; 250mA
- Analog output: 4÷20mA; max. load 750Ω
- Pulse output: 1÷5000Hz
- Power supply: 85÷265V 48÷63Hz or 24Vdc
- Consumption: <20W
- Housing protection: IP67 or IP68 (rem. vers. only)



- ***Compact digital system, for conductive liquids (>5µS/cm), even with a content of suspended solids.***
- ***Measurement range: from <0,6m³/h to >70000m³/h***
- ***Best measurement accuracy: ±0.2%***
- ***Power supply: 85÷265Vac or 24Vdc***
- ***Self-cleaning electrodes***
- ***Empty pipe control***

General

An electromagnetic flowmeter consists of a sensor and a transmitter. According to Faraday is Law, the flowmeter is used to measure volumetric flowrate for conductive liquids and pulps. Several output signals are available. The main application range can be found in the following fields: chemical industry, power generation and distribution, mine, water treatment, paper industry, pharmaceutical industry, food and environmental protection. The measurement is independent of the density, viscosity, temperature, pressure and conductivity of the measured fluid. No moving parts in the measuring tube. No pressure loss. Low requirement for the upstream and downstream straight pipes. It has a special suitability for pulp measurement. The analog output or frequency output is proportional to velocity of fluid. Wide measuring range. Magnetic field excitation with low frequency pulse. Low consumption. Stable zero point.

GESINT

1. FEATURES

1.1 Application condition

Ambient temperature: -25°C ÷ +55°C;

Relative humidity: 5%÷100%;

Ambient pressure: 86÷106kPa.

1.2 Process condition

Fluid conductivity: >5µS/cm;

Pressure: 4.0MPa (DN15÷DN150)
1.6MPa (DN100÷DN150)
1.0MPa (DN200÷DN1000)
0.6MPa (DN1200÷DN1600)

Operating temperature:
remote version: < 80°C, Rubber lining
< 60°C, Polyurethane lining
< 150°C, max. 180°C (not continuous), PTFE lining
compact version: < 70°C

Power supply: 85÷265V 48÷63Hz or 24Vdc

1.2 Self-cleaning electrodes

Self-cleaning electrodes system; run every 4 minutes

2. TECHNICAL DATA

2.1 Sensor

Pipe DN: 15, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1200, 1400, 1600

Velocity range: 0.5m/s÷15m/s

Accuracy: ±0.2%, ±0.3%, ±0.5% of the measured value for DN15÷DN350; ±0.5% of the measured value for DN400÷DN1600

Measuring tube material: stainless steel AISI321

Lining material: rubber, polyurethane, PTFE, FEP

Electrodes material: stainless steel SS 316TI, Hastelloy B, Hastelloy C, Titanium, Tantalum

Connecting flange material: carbon steel

Housing protection: IP68 (only for remote versions sensor, RPmag62F)
IP67 (compact)

2.2 Transmitter

It is a microprocessor-controlled transmitter. It displays measured values and messages in both Italian and English. There are two versions: remote and compact.

2.2.1 Special feature

- The magnetic field excitation is a programmable rectangular wave with low frequency. It increases the stability of flow measurement and has low consumption.
- It uses a 16-bit microprocessor, fast processing and high accuracy.
- All digital processing, high disturbing resistance, reliable measurement, high accuracy, wide measuring range.
- Switching power supply is suitable for the wide changing range of voltage, EMC according to CE requirements.
- Operating menu in Italian and English is easy to operate.
- Back lighted LCD display with high definition.
- Dual direction measurement function. It can display forward direction flowrate and reverse direction flowrate. Three

inside counters can respectively display forward direction volume, reverse direction volume and the different volume of both directions. Optionally it is possible to communicate via RS485 using MODBUS protocol.

- Big range of constant coil current for sensor can fit different type sensor of electromagnetic flowmeter.
- Multifunction intelligent transmitter has self-test and self-diagnosis function.
- EEPROM can save the setting and the counters when power off.
- Remote version and compact version.

2.3 Technical data

2.3.1 Process condition

Ambient temperature: -25÷+60°C

Relative humidity: 5%÷90%

Power supply: 85÷265V AC, 48÷63Hz or 24V DC

Consumption: less than 20W

2.3.2 Accuracy

±0,2%, ±0,3%, ±0,5%

2.3.3 Repeatability

0,07%, 0,1%, 0,17% of the measured value.

2.3.4 Analog outout

Current output: 0÷10mA e 4÷20mA

Load resistance: 0÷1,5Kohm for 0÷10mA; 0÷750ohm for 4÷20mA

Basic error: measured value plus basic error ±10μA

2.3.5 Frequency and pulse output

Frequency: For forward direction and reverse direction, the maximum frequency can be set between 1÷5000Hz. The output is an open collector transistor with galvanic isolation. External power supply should be less than 30V, and maximum current for the collector is 250mA when it works.

Pulse: For forward and reverse direction. The pulses can be up to 15000 per second. The pulse width is up to 25ms. The output is an open collector transistor with galvanic isolation. External power supply should be less than 30V, and maximum current for the collector is 250mA when it works. Via an inside pull-up resister, frequency and pulse output can use the 24V power supply. The maximum current for the collector is 2.3mA when it works.

2.3.6 Display

Display with Italian and English, five characters for flowrate and ten characters for volume.

2.3.7 Alarm

Two alarms are the open collector transistor output with galvanic isolation. External power supply should be less than 30V, and maximum current for the collector is 250mA when it works.
Alarm output for the following faults: Empty pipe direction, analog exceeds its range, frequency exceeds its range and the fault for magnetic field excitation.

2.3.8 Digital output

Communication serial output with RS485. It has protection against a lightning strike.

2.3.9 Damping

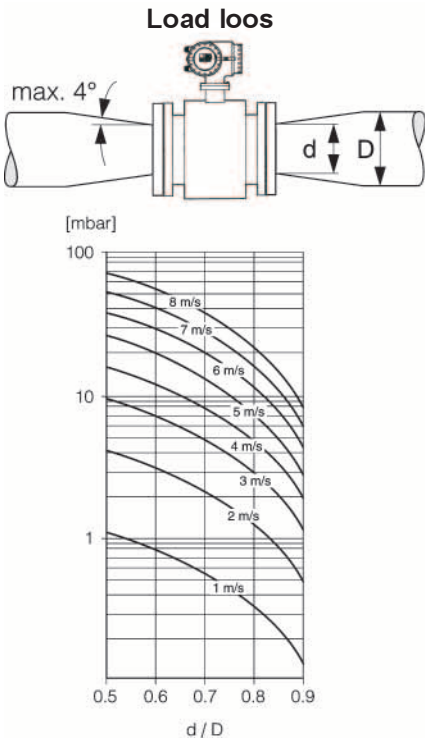
2÷100s (90%)

2.3.10 Isolation

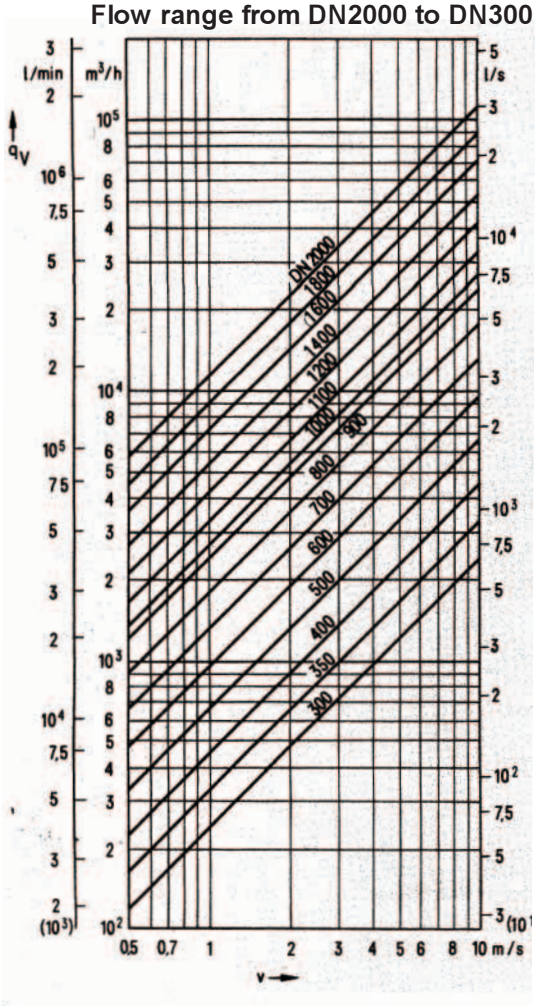
The isolating voltage is more than 500V between analog output, pulse (frequency output), alarm and ground.

3. FLOW TABLES

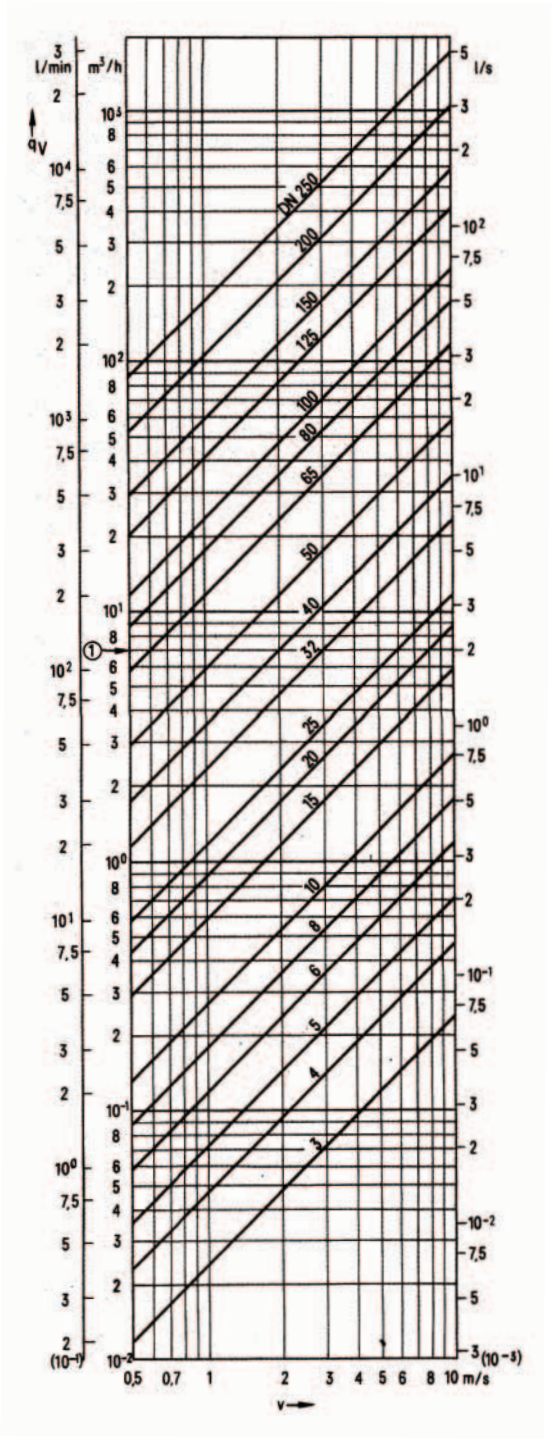
Load loos



Flow range from DN2000 to DN300



Flow range from DN250 to DN3



4. FUNCTION

4.1 Measuring principle

All electromagnetic flowmeters accord with Faraday Law: (fig.1):

$$Um = K \times B \times V \times D$$

Um – Induced signal voltage measured from both electrodes.

K – Sensor corrected factor.

B – Magnetic flux density (Induction)

V – Velocity of fluid.

D – Inner diameter of the measuring tube.

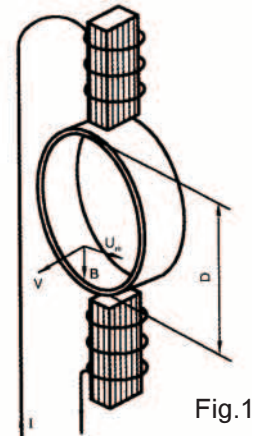


Fig.1

An induced signal voltage will be generated when the inductive liquid flows through a magnetic field. The magnetic field produced by the energized coils in sensor penetrates the magnetically and non-inductive measuring tube and the medium flowing through it. A voltage is generated in the medium, which is proportional to the velocity of the medium. The voltage can be picked up by the electrodes. There are two type of magnetic fields: constant pulse magnetic field and alternative pulse magnetic field.

5. DIMENSION

5.1 Compact version dimension (RPmag62Y)

RPmag62Y electromagnetic flowmeter dimension (fig.2)

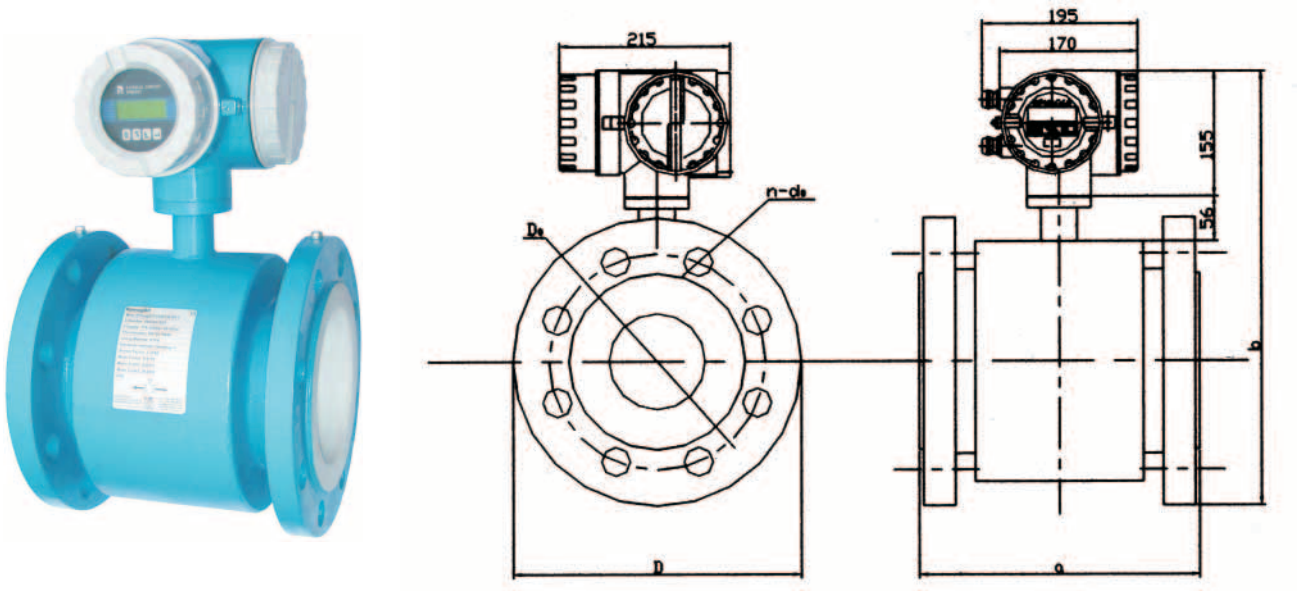


Fig.2

RPmag62Y electromagnetic flowmeter dimension (tab.1)

DN (mm)	Pressure (Mpa)	Sensor dimension (mm)		Connecting flange dimension (mm)		
		a	*b*	*D*	*D0*	*n-d0*
15	4.0	200	315	95	65	4-14
25	4.0	200	330	115	85	4-14
32	4.0	200	342	140	100	4-18
40	4.0	200	350	150	110	4-18
50	4.0	200	365.5	165	125	4-18
65	4.0	200	380	185	145	8-18
80	4.0	200	396	200	160	8-18
100	4.0	250	425.5	235	190	8-22
125	4.0	250	456.5	270	220	8-26
150	4.0	300	485	300	250	8-26
200	1.0	350	540	340	295	8-22
250	1.0	450	610	395	350	12-22
300	1.0	500	655	445	400	12-22
350	1.0	550	695	505	460	16-22
400	1.0	600	755	565	515	16-26
450	1.0	600	820	615	565	20-26
500	1.0	600	865	670	620	20-26
600	1.0	600	965	780	725	20-30
700	1.0	700	1070	895	840	24-30
800	1.0	800	1180	1015	950	24-33
900	1.0	900	1300	1115	1050	28-33
1000	1.0	1000	1410	1230	1160	28-36
1200	0.6	1200		1405	1340	32-33
1400	0.6	1400		1630	1560	36-36
1600	0.6	1600		1830	1760	40-36

Tab.1

5.2 Remote version dimension (RPmag62F)

RPmag62F electromagnetic flowmeter dimension (fig.3)

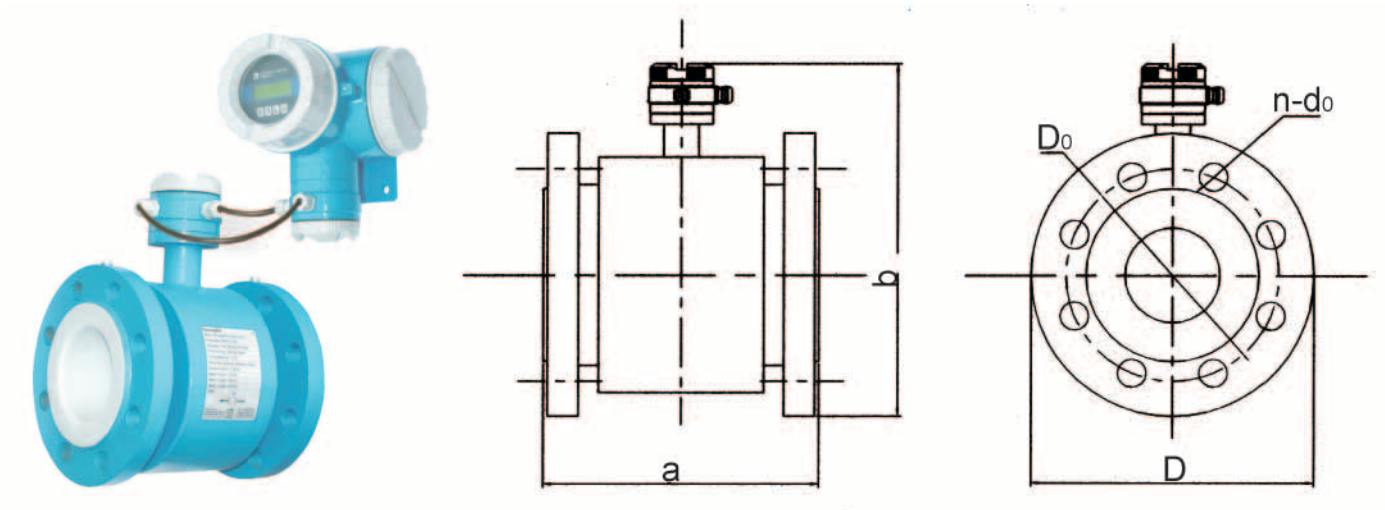


Fig.3

RPmag62F electromagnetic flowmeter dimension (tab.2)

DN (mm)	Pressure (Mpa)	Sensor dimension (mm)		Connecting flange dimension (mm)		
		a	*b*	*D*	*D0*	*n-d0*
15	4.0	200	219	95	65	4-14
25	4.0	200	234	115	85	4-14
32	4.0	200	246	140	100	4-18
40	4.0	200	254	150	110	4-18
50	4.0	200	269.5	165	125	4-18
65	4.0	200	284	185	145	8-18
80	4.0	200	300	200	160	8-18
100	4.0	250	329.5	235	190	8-22
125	4.0	250	360.5	270	220	8-26
150	4.0	300	389	300	250	8-26
200	1.0	350	450	340	295	8-22
250	1.0	450	520	395	350	12-22
300	1.0	500	565	445	400	12-22
350	1.0	550	605	505	460	16-22
400	1.0	600	665	565	515	16-26
450	1.0	600	730	615	565	20-26
500	1.0	600	775	670	620	20-26
600	1.0	600	875	780	725	20-30
700	1.0	700	980	895	840	24-30
800	1.0	800	1090	1015	950	24-33
900	1.0	900	1210	1115	1050	28-33
1000	1.0	1000	1320	1230	1160	28-36
1200	0.6	1200		1405	1340	32-33
1400	0.6	1400		1630	1560	36-36
1600	0.6	1600		1830	1760	40-36

Tab.2

5.3 Selection of flange

Normally you select the flanges with the metric system. The connecting flanges to sensor are produced according to the metric system. When you select the connecting flanges to sensor, you should note the specification of your operating pipe in the order contract. The dimension of the connecting flanges should accord to the following standards.
For the dimension, see table 4, 5, 6, 7 and figure 4.

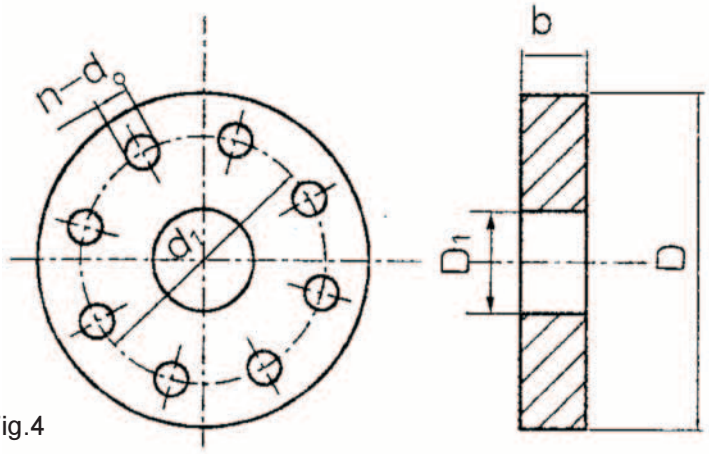


Fig.4

4.0 MPa (DN25÷DN150)	GB9119-2000
1.6 MPa (DN25÷DN150)	GB9115.1-2000
1.0 MPa(DN200÷DN1000)	GB9115.1-2000
0.6 MPa(DN1200÷DN1600)	GB9119-2000

Tab.3

DN(mm)	4.0MPa						
	D	d1	d0	Th	n	b	D1
25	110	85	14	M12	4	18	34.5^{+1}_{0}
40	150	110	18	M16	4	20	49.5^{+1}_{0}
50	165	125	18	M16	4	20	61.5^{+1}_{0}
65	185	145	18	M16	8	22	77.5^{+1}_{0}
80	200	160	18	M16	8	22	90.5^{+1}_{0}
100	235	190	22	M20	8	26	116.5^{+1}_{0}
150	300	250	26	M24	8	28	170.5^{+2}

Tab.4 GB9119-2000

DN(mm)	1.6MPa						
	D	d1	d0	Th	n	b	D1
25	110	85	14	M12	4	16	35.5^{+1}_{0}
40	150	110	18	M16	4	18	49.5^{+1}_{0}
50	165	125	18	M16	4	20	61.5^{+1}_{0}
65	185	145	18	M16	4	20	77.5^{+1}_{0}
80	200	160	18	M16	8	20	90.5^{+1}_{0}
100	220	180	18	M16	8	22	116.5^{+1}_{0}
150	285	240	22	M20	8	24	170.5

Tab.5 GB9115.1-2000

DN(mm)	1.0MPa				
	D	d1	d0	n	D1
200	340	295	22	8	221.5^{+2}_{0}
250	395	350	22	12	276.5^{+2}_{0}
300	445	400	22	12	327.5^{+2}_{0}
350	505	460	22	16	359.5^{+2}_{0}
400	565	515	26	16	411^{+2}_{0}
450	615	565	26	20	462^{+3}_{0}
500	670	620	26	20	513.5^{+3}_{0}
600	780	725	30	20	616.5^{+3}_{0}
700	895	840	30	24	
800	1015	950	33	24	
900	1115	1050	33	28	
1000	1230	1160	36	28	

Tab.6 GB9115.1-2000

DN(mm)	0.6MPa				
	D	d1	d0	n	D1
1200	1405	1340	33	32	
1400	1630	1560	26	36	
1600	1830	1760	36	40	
1800	2045	1970	39	44	
2000	2265	2180	42	48	
2200	2475	2390	42	52	
2400	2685	2600	42	56	

Tab.7 GB9119-2000

Note: The dimension in the cells with will be defined according to the operating pipe.

6. INSTALLATION

The design, test and power supply for flowmeters all have their safe rules. You must observe strictly the relative items in this operating instruction to ensure the safety of the operation and application for flowmeters.

6.1 Safety measure

In order to ensure the safety of person and equipment, it must be observed as follows:

a) You should compare the details in the operating instruction and think over the environment requirement for the flowmeter, before both selecting the installing position and installing the flowmeter.
b) The persons for installation and repair should be trained professionally.
c) Correctly install the sensor and accessories of the flowmeter, ensure the leakage. The operating pressure of medium must not exceed the maximum operating pressure marked on the nameplate of the flowmeter.
d) Take some measure to prevent from electric shock.
e) The lift machine should reach the requirement of the relative safety rules.

6.2 Check before installation

a) Check the flanges, lining, housing and cable gland.
b) Open the lid of the connecting box to check the cable connection and PCB board if they are flexible or damaged.
c) Check if the type on the nameplate is same as the order data in the contract.

6.3 Lift

The flowmeter can be lifted using the lift as shown in Figure 5. The safe load and measure for the lift should reach to the relative requirement. Don't lift the flowmeter using the rope to tie the connection between the sensor and the transmitter (compact version) or the connecting box (remote version).

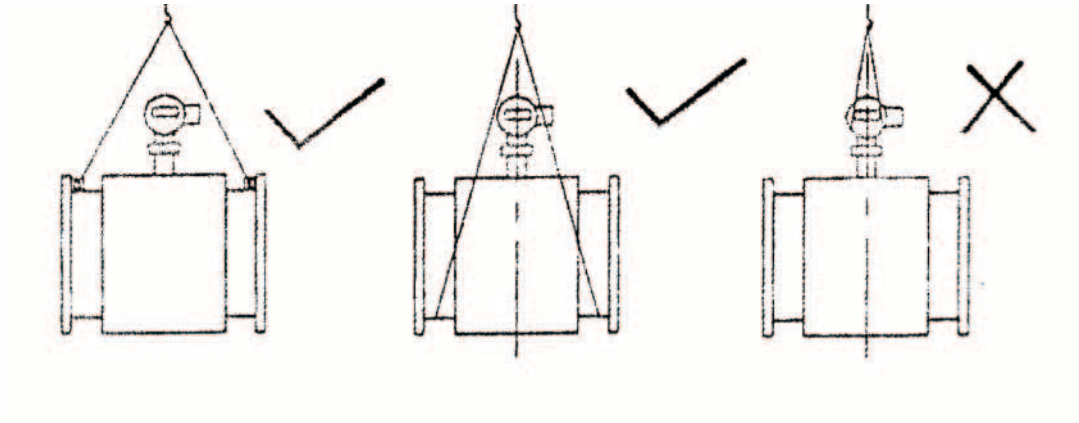


Figure 5.

6.4 Installation of sensor

The flowmeter can test automatically flow direction. Because the direction arrow marked on the nameplate is flow direction when calibration in factory, you should install the flowmeter to make the actual flow direction is same as the flow direction arrow marked on the nameplate.
The upstream straight pipe should be longer than 5 × DN to guarantee the accuracy of measurement. When the distance is more than 5×DN between the device (e.g. Cone tube, orifice plate, valve) and the sensor of flowmeter, their affection is negligible. And the downstream straight pipe should be more than 3×DN.

6.5 Installation in pipeline

In principle, the measurement of the electromagnetic flowmeter is independence of the distribution of velocity as long as the distribution of velocity in measuring tube is symmetrical.

Installation may be horizontal or vertical, but make sure no deposit on the electrodes when horizontal installation. See Figure 6.

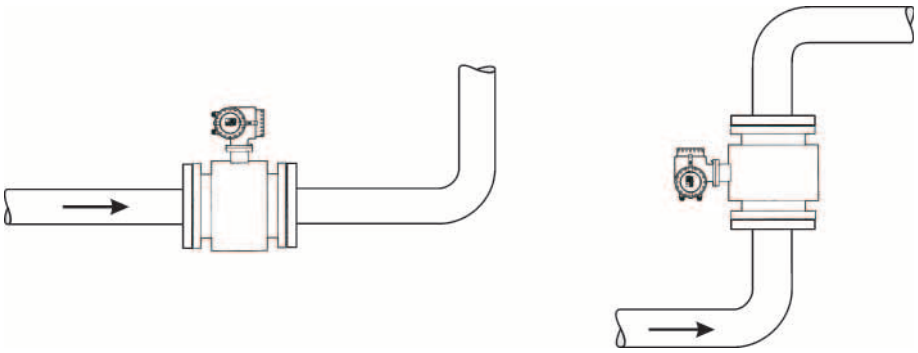


Figure 6. Installation in horizontal or vertical pipeline

It is necessary to install an rectifier or straight pipe to normalize the flow profile if there are pipe elbow, flow regulation valve or half-open ball valve in front of the sensor. See figure 7.

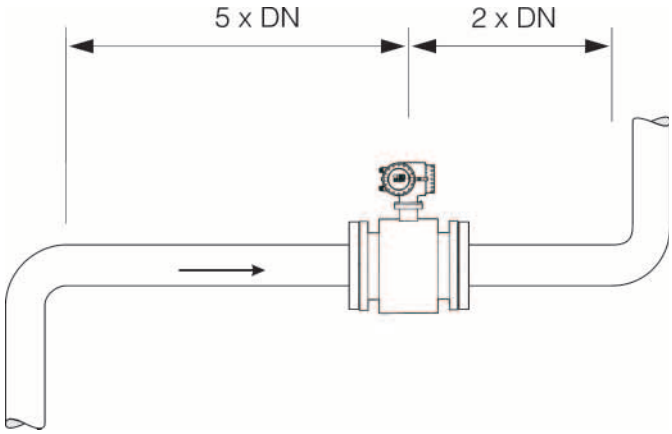


Figure 7. Requirement for straight pipes to install the flowmeter

The electromagnetic flowmeter must be installed in the pipe fully filled with medium. The flowmeter must be installed in the culvert with siphon phenomena in the case of an unfilled pipe. See figure 8.

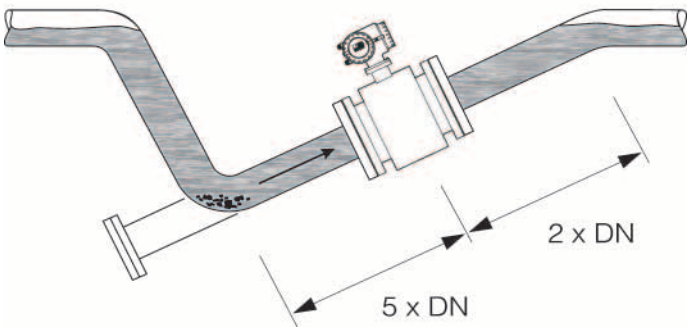


Figure 8. Installation in a constantly filled pipe

The electromagnetic flowmeter should not be installed in the pipe section with a free pipe outlet that could run empty. When installation in a downstream pipe, please make sure the pipe is always fully filled with medium. See figure 9.

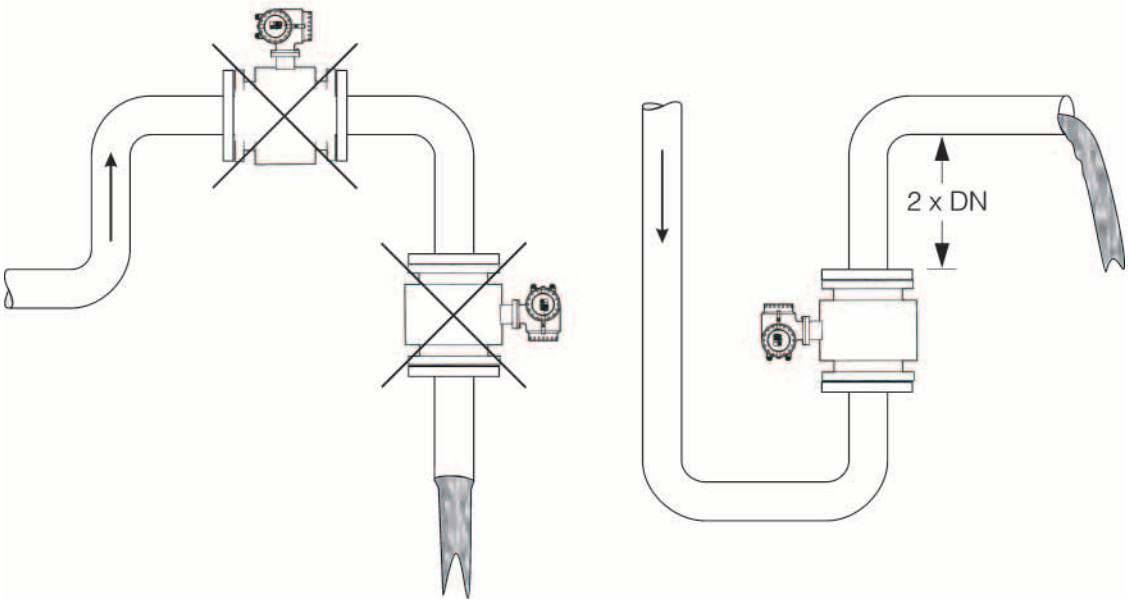


Figure 9. Installation in pipe without emptying

The electromagnetic flowmeter should not be installed at the highest point of the pipe because of the accumulation of gas. See figure 10.

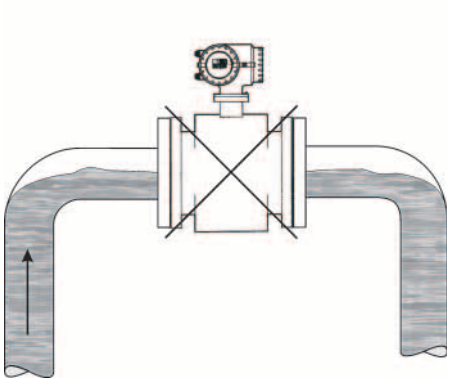


Figure 10. Installation at highest pipe

Do not install the sensor on the intake side of a pump. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. See figure 11.

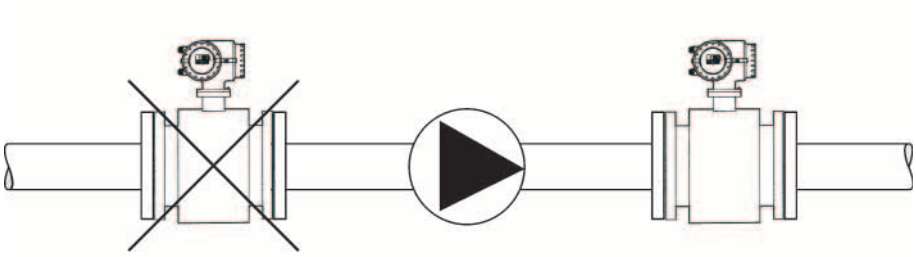


Figure 11. Near pumps installation

Install a siphon (fig. 12/a) with a vent valve (fig. 12/b) downstream of the sensor in down pipes longer than 5 meters. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. See figure 12

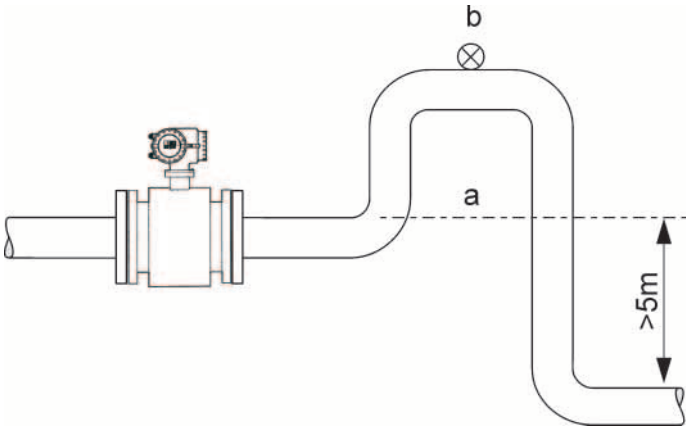


Figure 12. Down pipe installation

6.6 Location of installation

The all-weather cover should be used to prevent the housing from the direct sunlight or rain when the device in the open. The flowmerter should avoid the excessive vibration, high changing ambient temperature and long-time shower. It should be prevent from the leakage of the corrosive liquid. The intensity of magnetic field should be less than 400A/M.

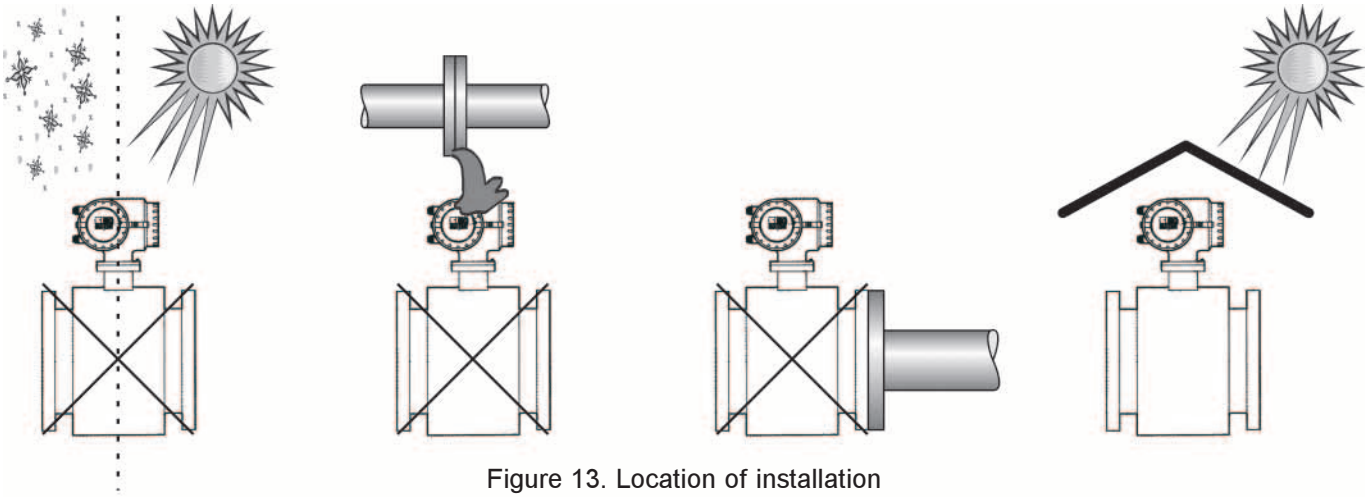


Figure 13. Location of installation

6.7 Connection of pipes

The sensor itself can not be as its support, it should be supported to the connecting pipes. And the sensor should not withstand too big fastening stress. It should be taken to account to eliminate the affection of the stress caused by thermal expansion. See figeres 14/A/B

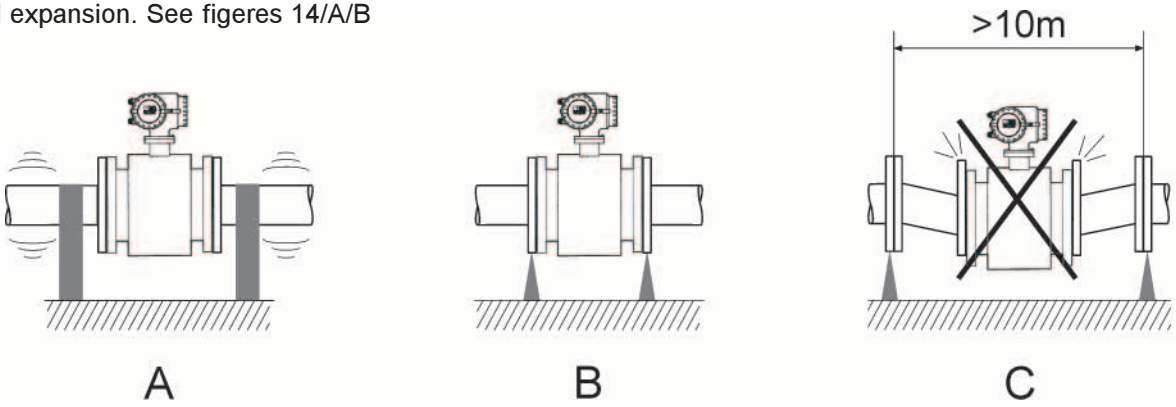


Figure 14/A. Support

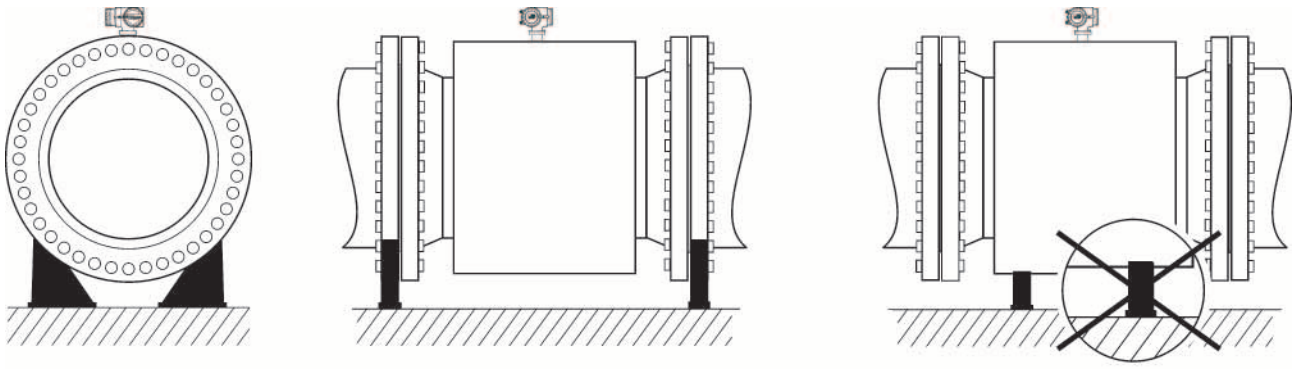


Figure 14/B. Support

6.8 Mounting requirements

a) It should make sure the same axis between the measuring tube and operating pipe. For the sensors under DN50, The axial difference between the measuring tube and operating pipe should be less than 1.5mm; for the sensors from DN65 to DN300, it should be less than 2mm; for the sensor over DN350, it should be less than 4mm.

b) The gasket between flanges should have a good corrosive resistance. The gasket must not extend to the pipe inside.

c) The threads of he fasten bolts and nuts should be in good condition. The bolts should be fastened using torque spanner with certain torque according the size of flange.

d) It should take separate measure to prevent the lining from heat when weld or flame cutting in the pipe closed to sensor. If the sensor is installed in a well or immersed in the water, the connecting box for sensor must be filled and sealed with sealing glue after commissioning.

6.9 Special rings

a) Grounding ring

Material: AISI321
Thickness: 3mm
For the non-conductive pipe, the grounding rings should be installed between the flanges of sensor and pipe to make the flowmeter and measured medium same potential.

b) Protective ring

If the measured medium is with solid, the protective rings should be installed in the entrance of sensor. The lip of protective ring should extend into the sensor to reduce the abrasion of lining.

Figure 15. Special rings

6.10 Potential equalization and measure for resistance of electric interfere

The measuring circuit considers the measured fluid as zero potential. The measured fluid is grounding potential in most of application, therefor grounding connection actually means connecting to measured fluid. The grounding cable for sensor is connected to metal tube welding with flanges. The metal tube isolates from the measuring fluid because of lining, so the flanges of sensor should be connected to the flanges contacting directly measuring fluid using wires. The resistance for grounding connection should be less than 10ohm.
In most of application, it is unnecessary to take special measure for installing sensor, only require the signal cable separate from the main cable.
If the sensor with cathode protection or the process with electroanalysis, the following measure should be taken:

a) The main current must not go through the measuring fluid in the sensor.

b) Any main current going through the sensor itself should be less than 10A (virtual value).

The following measure should be taken in order to reduce the affection of magnetic flied:

a) In metal piping, the device is made potential equalization via the connection between the sensor and the adjoin pipe. See figure 15. Using this connection, the current going through the sensor itself should be less than 10aA(virtual value). The bolt connection for flanges can not be instead of the electric connection, it should have an additional electric connection as shown in figure 16.

b) For the non-inductive pipe, the grounding rings should be installed between the both flanges for sensor and the both flanges for pipe. See figure 17.

c) Some system, e.g. the piping with cathode protection, it will have disturbing potential because not whole system is grounding potential. In order to eliminate this interfere, you can connect two tubes without lining to the sensor as shown in figure 18.

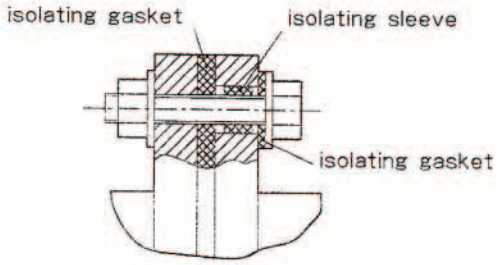


Figure 15. Isolating sleeve and gasket

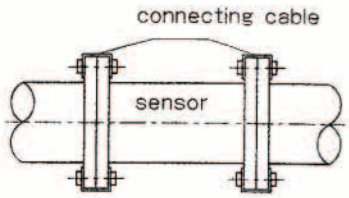


Figure 16. The connection for sensor

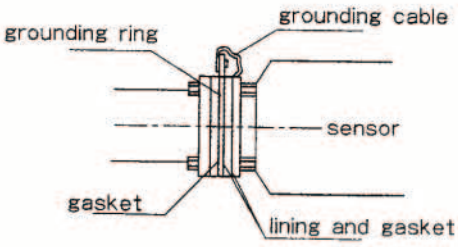


Figure 17. Connection for a non-inductive pipe

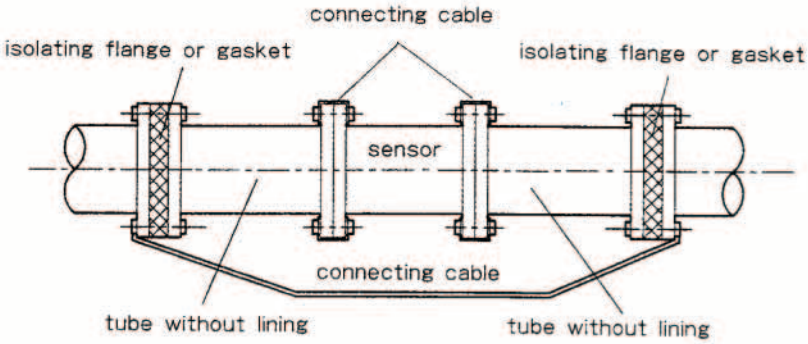


Figure 18. Connection using tubes without lining

7. ELECTRIC CONNECTION

You should use the cable with circular section when electric connection because of the seal of the cable glands.

7.1 Electric connection between sensor and transmitter

Electric connection between sensor and transmitter for the flowmeter with compact version has been finished before the flowmeter leaves from factory. The content in this chapter is only for the flowmeter with remote version. See the section “12” TRANSMITTER. If the location of installing sensor is in the water or easy to be immersed, the connection box must be filled and sealed with silicon gel. It must be observed according to this operating instruction. For the vertical installation, the electric connection and seal should be done before installation.

7.2 Electric connection for output and power supply

See the section “12” TRANSMITTER. You prepare the cables for output and power supply.

7.3 Requirement for electric connection

Switch off power supply before electric connection.

a) After checking the type of cables, please observe the instruction and regulation to connect cables correctly and firmly.

b) When peeling the cable, please be careful not to damage the isolation that should be left. For the signal cable, the shield for cable should be in good condition.

c) The cable length between sensor and transmitter is relative to the factors, such as the conductivity of fluid, electric interfere and so on. The cable length can be simply evaluated as the following formula:

L= δ*4

Here, L is cable length, δ is conductivity of fluid (μs/cm).
However, the cable length should be less than 100m. In order to guarantee the measuring accuracy and reduce interfere, please make close installation as possible between sensor and transmitter.

d) The type for the magnetic current cable and signal cable are two-core cable with braided shield which type is RVVP2×32/0.5.

7.4 Terminal strips (remote version)

Connect cables to terminal strips as follows.

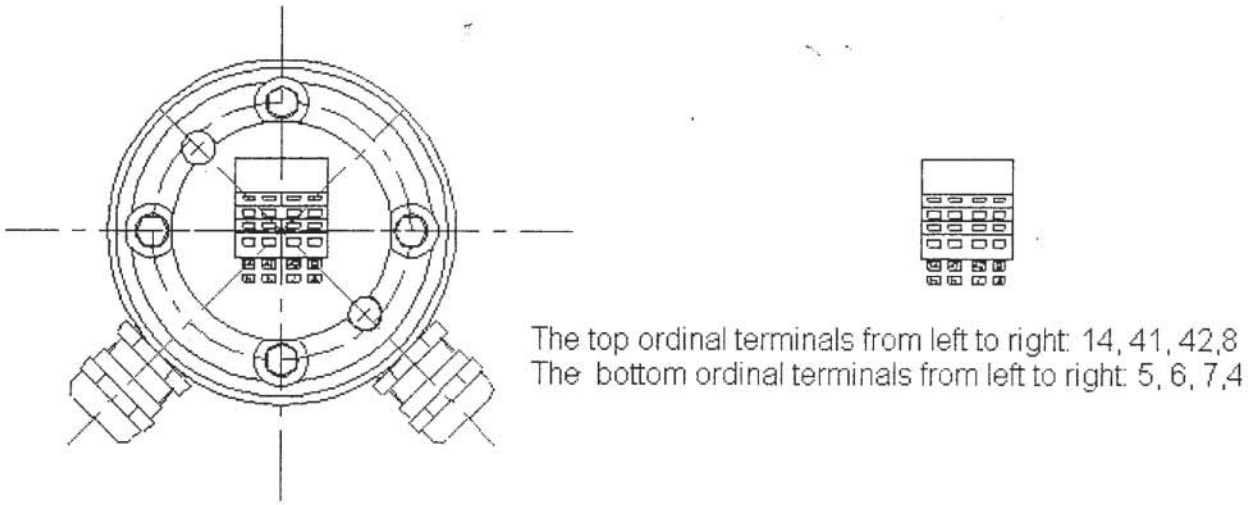


Figure 20. Terminal strips for the remote version

	Terminal number	Function	*Cable color (for IP68 version)*	
Top terminals	14	Free		Magnetic field current cable
	41	Magnetic field current 1	Brown	
	42	Magnetic field current 2	Black	
	8	Measuring ground	Yellow-Green	Electrode power supply cable
Bottom terminals	5	Shield for electrode 1		
	6	Electrode 1 power supply	Brown	
	7	Electrode 2 power supply	White	
	4	Shield for electrode 2		

Tab. 8. Cables connection of the remote version sensor to the terminal strips.

8. COMMISSIONING

All above safe item and rules should be observed.
The follows should be checked before commissioning:

a) If there is any damage for the electromagnetic flowmeter during transfer and installation.

b) If the power supply is same as marked on the nameplate.

c) If the fuse is suitable.

d) If the flowmeter is potential equalization.

After above check, switch on the pipe valve to fill fully the piping. There should be no leakage and the gas in the piping should be eliminated. Switch on the power supply for the flowmeter, the flowmeter can work well after warming up about 30 minutes.

9. REPAIR

You must read the safe item in each section before repair. Please contact the manufacturer after confirming the sensor is fault.

9.1 Simple repair

Using eyes to check whether the electric connection is in good conditions and the meter can work or not.

9.2 Diagnosis

If the meter can not work well, you can check it as the follows:

a) Check if all valves in the piping are opened, if the pipe is filled fully with fluid, if the actual flow rate is close to the upper limit of scale.

b) Check if the power supply, switch and fuse can work.

c) Check the fault is in the meter or in the cable.

d) Check if the number and sensor factor for the transmitter is same as the ones for the sensor.

e) Check if the setting of maximum flowrate is correct.

f) Check if the output connection is correct and the connection for potential equalization is in good condition.

g) Check the transmitter according to the relative items as shown in the section “12” TRANSMITTER.

10. WHOLE SET

Whole set of meter consists of sensor and transmitter. For remote version, the standard cables length is 5m.

11. TRANSPORT AND STORAGE

In order to keep from damage during transport, the packing of the meter should be kept during storage.
The requirement of storage is as bellows:

a) Rainproof and dampproof, avoiding to be stroked.

b) The storage temperature is -20°÷ +60°C relative humility should be less than 80%, about 50% is better

c) Before the storage of the used sensor, the medium adhering on the lining and electrodes should be eliminated.

12. TRANSMITTER

12.1 Construction of transmitter

There are two versions for the combination of sensor and transmitter: Compact version and Remote version.

12.1 Electric connection

12.1.1 Connection between transmitter and sensor

The content in this section is only suitable for the electromagnetic flowmeter with remote version. See figure 19.
Both magnetic cable and signal cable: two cores PVC cable with braided copper shield, which type is RWP2x32/0.5, capacitance is ≤ 200pF/m

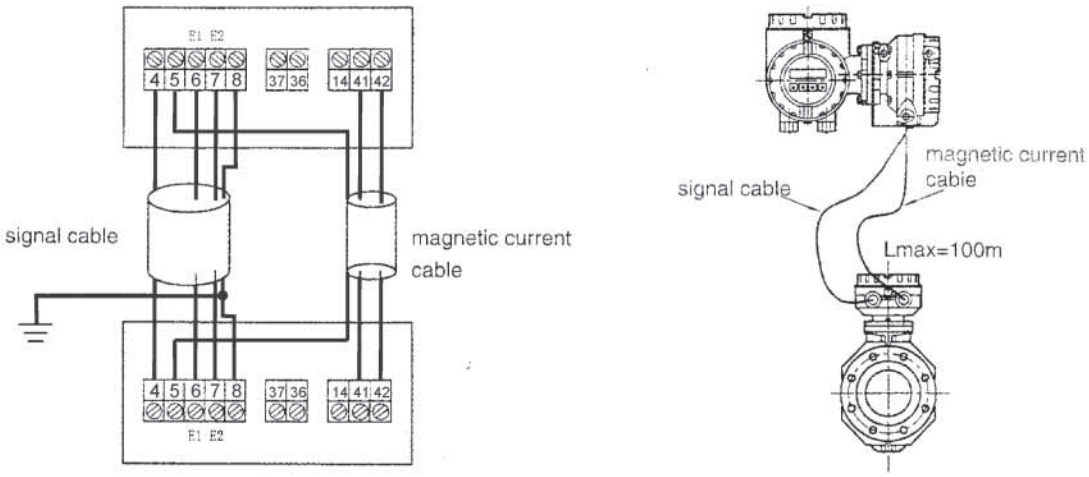


Figure 19. Connection between transmitter and sensor

12.1.2 Connection for compact version

The content in this section is only suitable for the electromagnetic flowmeter with compact version. See figure 20.

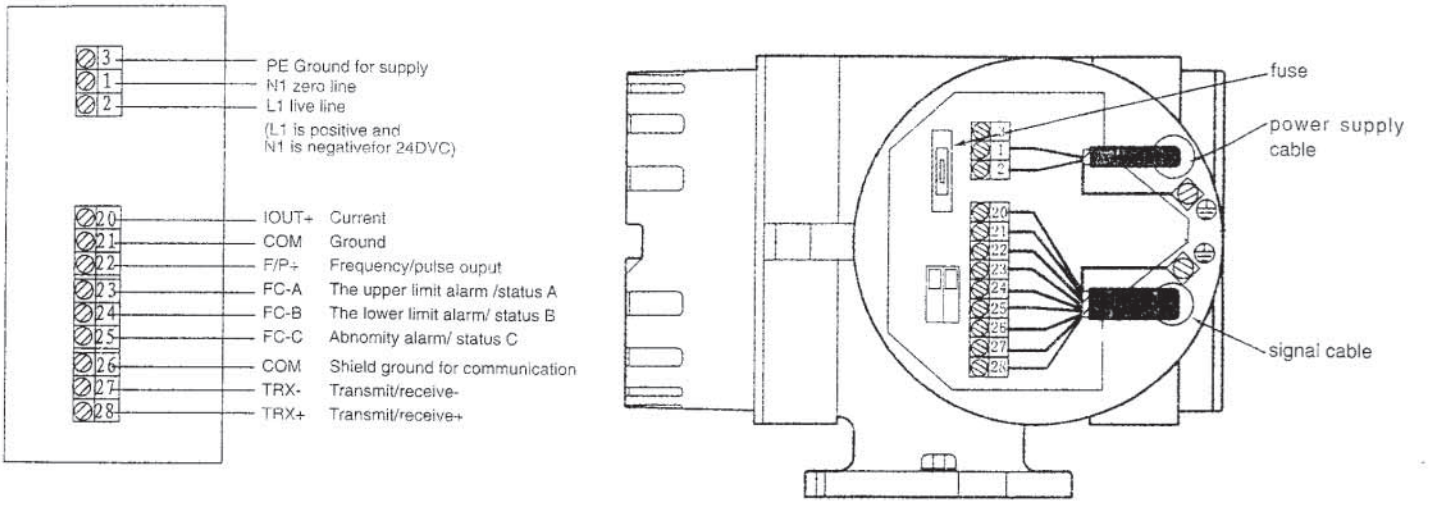


Figure 20. Connection of output and signal for compact version

12.1.3 Signal Cable

The signal cable may use the PVC cable with braided shield which type is RVVP2x32/0.2 for the remote version flowmeter combined with sensor and transmitter as the conductivity of fluid is more than 5μS/cm. The length of cable should be less than 100m. The processing of signal cable is shown as figure 21.

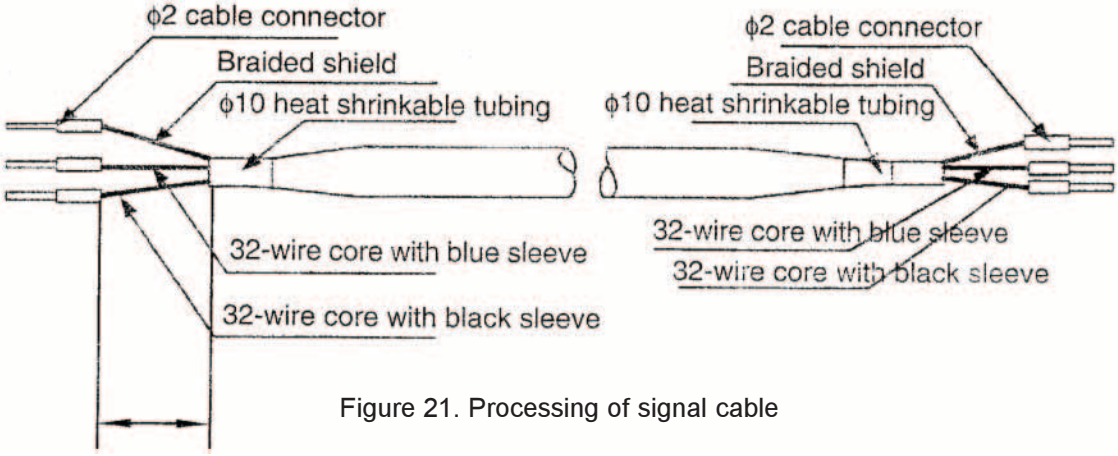


Figure 21. Processing of signal cable

13. SETTING

There are two operating modes with measuring automatically mode and parameter setting mode.
In measuring automatically mode, the flowmeter can carry out every measuring function and display the relative measuring values. In parameter setting mode, you can use the four keys in the panel to set the corresponding parameters.

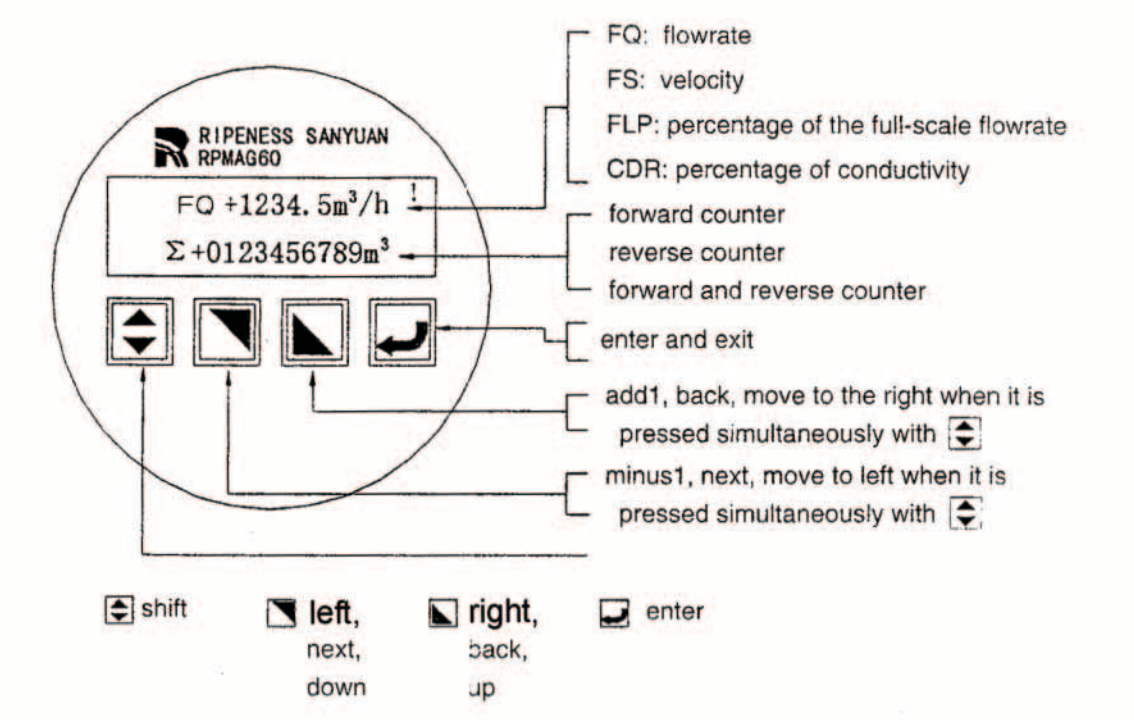


Figure 22. Key and display for transmitter

13.1 Key function

13.1.1 Key function in "RUN" mode

: next page

: last page

: enter and exit

13.1.2 Key function in "SETTING" mode

: The figure with cursor minuses 1(circularly)

: The figure with cursor adds 1(circularly)

+ : The cursor moves to left

+ : The cursor moves to right;

+ : Access to menu for setting parameters

: Access to submenu, saving the parameters, exit and return to the measuring automatically mode (In any case of being continuously pressed two seconds).

Note: In the parameter setting mode, the meter will return to the measuring automatically mode after no any key operation lasts 2 minutes.

13.2 Display

Display function with two-line display is shown as figure 23. The upper line is main display with flowrate, velocity, percentage of the full-scale flowrate, percentage of conductivity and alarm message. The lower line displays counter.

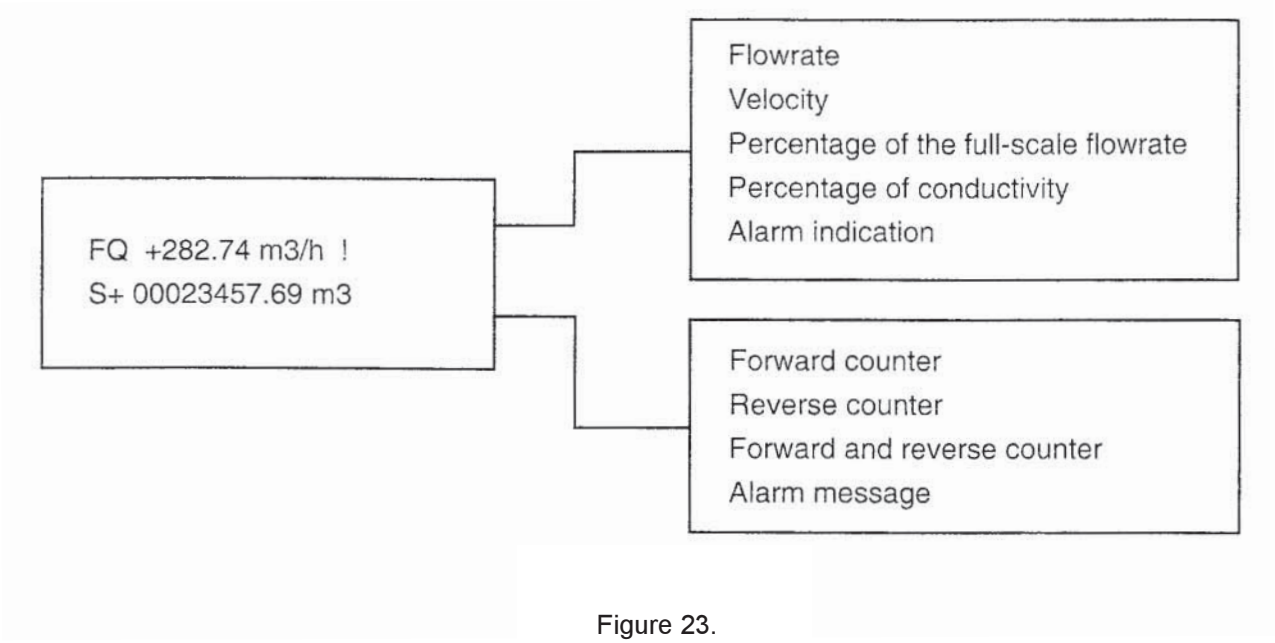


Figure 23.

The display in the upper line is toggled using , and the display in the lower line is toggled using .

13.3 "SETTING" mode access

In the measuring mode, after pressing + the password (0000) will be displayed. Before access to the menu to find the item that you want to change, you should enter the password and press + .
Then you can change the parameter after pressing . Pressing to confirm your enter and exit after changing the parameter.
Three level passwords (level 1, 2 and 3) are given to you:
Level 1 password: "0521", is available for the operating and installing persons to read the parameters.
Level 2 password: "3210", is available for the relative functionary to change some parameters.
Level 3 password: "7206: is available to reset the counters.
You can contact the manufacturer to ask for level 4 password if necessary.

13.3.1 Operation for parameter setting

Basic operation:

(1) Selection of function class and function: or
(2) Left movement of cursor: +
(3) Right movement of cursor: +
(4) Access to the submenu for parameter setting:
(5) Saving your entry for password:
(6) Return to the upper menu:
(7) Exit from parameter setting to the main menu: pressing lasting 2 seconds.

13.3.2 Menu of parameter setting

List for parameter setting menu for a glance:

Item	Description	Setting	level	Par. range	Item	Description	Setting	level	Par. range
1	LANGUAGE	Select	2	Italian, English	24	ALM LOW VAL	Enter	2	000.0÷199.9%
2	COM ADDRES	Enter	2	0÷99	25	CLEAR TOTAL	Password	3	XXXXX
3	BAUD RATE	Select	2	600÷14400	26	TOTAL KEY	Enter	3	XXXXX
4	COM PROTOCOL	Select	2	Type1 / Type2	27	SENSOR CODE 1	Factory set.	4	Date
5	SENSOR SIZE	Enter	2	3÷3000	28	SENSOR CODE 2	Factory set	4	Production No.
6	FLOW RANGE	Select	2	0÷99999	29	SENSOR FACTOR	Factory set	4	0.0000÷3.9999
7	FLOW RSPNS	Select	2	2÷100	30	FIELD TYPE	Factory set	4	Type 1, 2, 3, 4
8	FLOW DIRECT	Enter	2	Forward, reverse	31	FLOW FACTOR	Factory set	4	0.0000÷3.9999
9	FLOW ZERO	Enter	2	±0.000mm/s	32	MULT FACTOR	Factory set	4	0÷1.9999
10	FLOW CUTOFF	Select	2	0÷99%	33	ANALOG ZERO	Factory set	4	0.0000÷3.9999
11	CUT DISP ENA	Select	2	Enable/ disable	34	ANALOG RANGE	Factory set	4	
12	TOTAL UNIT	Select	2	0.00001L÷1m	35	METER FACTOR	Factory set	4	
13	SEGMA N ENA	Select	2	Enable/ disable	36	METER CODE 1	Factory set	4	
14	ANALOG TYPE	Select	2	0÷10/4÷20mA	37	METER CODE 2	Factory set	4	
15	PULSE TYPE	Select	2	Frequency/pulse	38	FWD TOTAL LO	Demand	4	
16	PULSE FACTOR	Select	2	0.00001L÷1m	39	FWD TOTAL HI	Demand	4	
17	FREQUEN MAX	Select	2	1÷5000Hz	40	REV TOTAL LO	Demand	4	
18	MTSENSOR ENA	Select	2	Enable/ disable	41	REV TOTAL HI	Demand	4	
19	MTSNSR TRIP	Enter	2	999.9%	42	PASSWORD 1	Enter	2	XXXX
20	MTSENSOR CRC	Enter	2	0.0000÷3.9999	43	PASSWORD 2	Enter	2	XXXX
21	ALM HIGH ENA	Select	2	Enable/ disable	44	PASSWORD 3	Enter	3	XXXX
22	ALM HIGH VAL	Enter	2	000.0÷199.9%	45	PASSWORD 4	Enter	4	XXXX
23	ALM LOW ENA	Select	2	Enable/ disable	46	LOAD PRESET	Password		Only for manufacturer

13.4 Parameters

13.4.1 LANGUAGE

With this function LANGUAGE, you can define the display language. It may be toggled between Italian and English.

13.4.2 COM ADDRES

With this function COM ADDRES, you can set the identifying code for the flowmeter when the flowmeter communicate with the master computer. It can be set from 0 to 99.

13.4.3 COM PROTOCOL

COM PROTOCOL means the protocol type between the flowmeter and the relevant master. TYPE1 is the default setting, normally it is direct protocol between the computer and the flowmeter. TYPE2 is the MOD-BUS protocol, normally it is the protocol between the flowmeter and the PLC; DCS or other control system.

13.4.4 BAUD RATE

With this function BAUD RATE, you can select the baud rate for communicating with the master computer according to the communicating ability of the master computer. You can select the baud rate from 600 bit/s ÷ 14400 bit/s.

13.4.5 SENSOR SIZE

With this function SENSOR SIZE, you can select the nominal diameter of the flowmeter from 3÷3000m.

13.4.6 FLOW RANGE

FLOW RANGE means the full scale of flowrate. The upper limit is for output and the percentage display. It is relative to the upper limit of output and frequency (pulse), 100% display value. It also is corresponding to flow cut off and alarm over limit with percentage.
You can select the unit of flowrate with this function FLOW RANGE. According to the process and operating tradition you can select a suitable unit of flowrate among l/s, l/min, l/h, m^3/s, m^3/min and m^3/h.

Note: There are five efficient numbers to display the flowrate. After the last figure, the unit of flowrate is displayed. If the selected unit is not suitable, the message “overflow” or “underflow” for the incorrect setting will display. In this case that the efficient numbers couldn’t be displayed, you should select another unit.

13.4.7 FLOW RSPNS

Increasing flow response time can improve the stability for both flowrate display and output signal. You can select one in the flowmeter.

13.4.8 FLOW DIRECT

If you consider the actual flow direction is forward and the display is reverse, you can select REVERSE; vice versa.

13.4.9 FLOW ZERO

When the pipe is full of standing fluid, the transmitter has corrected intelligently zero point. If the zero fluctuating range is over the corrected ability, it is necessary that you correct the zero point. The zero point is indicated with velocity in mm/s. The zero correction is shown as the following:

FS= 00000
± 0.000

In the display, the upper line indicates zero measuring value, the lower line indicates zero correction. When FS is not 0000, it should be corrected to zero.

Note: If FS increases when changing the correction value in the lower line, you should changeplus or minus in the lower line to make FS equals zero.

Caution: Zero correction should be in the condition: The sensor is full of with standing fluid.

13.4.10 FLOW CUTOFF

The value for flow cut off is stated as a percentage that relates to the upper range value of the flowrate. When the flow cut off is enabled, the flowrate, velocity and percentage display are included.

13.4.11 CUT DISP ENA

You can select ENABLE or DISABLE. Only when you select “DISABLE”, it will display zero when the flowrate is under the value in FLOW CUTOFF.

13.4.12 TOTAL UNIT

There is 10 characteristic numbers for counter in the transmitter. The maximum value for the counter is 4294967295. The unit for counter is l and m3 with their multiples, such as 0.00001l, 0.0001l, 0.001l, 0.01l, 0.1l, 1l, 0.00001m^3, 0.0001m^3, 0.001m^3, 0.01m^3, 0.1m^3, 1m^3.

13.4.13 SEGMA N ENA

Enable or disable the possibility to measure the reverse direction flow and consequently also the differential measure.

13.4.14 ANALOG TYPE

You can select 0÷10mA or 4÷20mA for current output.

13.4.15 PULSE TYPE

There are frequency and pulse outputs for your selection in this function. Frequency output is continuous rectangle wave. Pulse output is rectangle wave with gap. Frequency output is often used for digital flowrate measurement and counter in short times. Pulse output is often used for counter in long times.

13.4.16 PULSE FACTOR

PULSE FACTOR means how many volumes per pulse. When the unit of flowrate is in l, the unit for pulse factor is in l^{-1}. When the unit of flowrate is in m^3, the unit for pulse factor is in m^{-3}. You can select one among 0.00001l^{-1}, 0.0001l^{-1}, 0.001l^{-1}, 0.01l^{-1}, 0.1l^{-1}, 1l^{-1}, 0.00001 m-3, 0.0001 m^{-3}, 0.001 m^{-3}, 0.01 m^{-3}, 0.1 m^{-3}, 1 m^{-3}. At the same flowrate, pulse factor is smaller and frequency of pulse output is higher. The maximum for pulse output is 5000 per second. For mechanical counter, the maximum for pulse output is 25 per second. The maximum pulse width is 20ms. It will change automatically to rectangle wave as high frequency.

13.4.17 FREQUEN MAX

The maximum frequency is relative to the upper range of flowrate. You can enter the value from 1 to 5000HZ for frequency.

13.4.18 MTSENSOR ENA

This function can detect empty pipe. If you select ENABLE in this function, analog output, digital output will be set to zero and the value for flowrate will also display zero when the pipe is empty. If you select DISABLE, the meter will not detect empty pipe.

13.4.19 MTSNSR TRIP

It regulates the threshold for detecting the empty pipe. If the percentage of conductivity CDR, displayed during measure, grows up to the setted value, instrument will display an alarm. This CDR value grows up when the fluid conductivity falls down, this means that pipe is emptying.

13.4.20 MTSENSOR CRC

It regulates range for detecting empty pipe and its sensibility and stability. Stability is given with less sensibility. It regulates the percentage of conductivity CDR value displayed while pipe is empty.

13.4.21 ALM HIGH ENA

You can select ENABLE or DISABLE.

13.4.22 ALM HIGH VAL

The value of the upper limit alarm is a percentage that relatives the upper range of flowrate. You can enter one value between 0% and 200%. When the flowmeter works, it will give an alarm output when the percentage of flowrate is over this value.

13.4.23 ALM LOW ENA

You can select ENABLE or DISABLE.

13.4.24 ALM LOW VAL

Its definition is same as ALM HIGH VAL.

13.4.25 CLEAR TOTAL

With this function, three counters will be reset to zero and restart to count after the password is entered and checked.

13.4.26 TOTAL KEY

It is for password for resetting counters.

13.4.27 SENSOR CODE 1

It records the date and code of production for making sure the sensor factor is correct.

13.4.28 SENSOR CODE 2

It records the order data for the flowmeter.

13.4.29 SENSOR FACTOR

Sensor factor is marked on the nameplate for the sensor. You should enter the sensor factor in this function.

13.4.30 FIELD TYPE

IThere are three modes for magnetic field excitation. You can select one according to the process condition. Normally TYPE 1 is used. TYPE 2 and TYPE 3 is used for the measurement of clean water with big diameter.
Caution: The flowmeter should be calibrated under the same condition as the process condition.

13.4.31 FLOW FACTOR

It is a calculating factor available to be set. With this function, you can enter the density of medium so that the display can be changed from volume to mass.

13.4.32 MULT FACTOR

It is a calculating factor available to be set. The measured value will multiply this factor to get the flowrate for the calculation in the transmitter. E.g. the measurement for opened channel using the diving electromagnetic flowmeter with simulating sensor.

13.4.33 ANALOG ZERO

With this function, you adjust the current output at zero flowrate (0mA or 4mA).

13.4.34 ANALOG RANGE

With this function, you adjust the current output at end flowrate range (10mA or 20mA).

13.4.35 METER FACTOR

This is a factor for consistency test of transmitter. It is set by manufacturer to guarantee the interchangeability of transmitters for fitting the sensors.

13.4.36 METER CODE 1

It is identified code of the transmitter for manufacturer.

13.4.37 METER CODE 2

It is identified code of the transmitter for manufacturer.

13.4.38 FWD TOTAL LO

It is the low five figures for forward counter

13.4.39 FWD TOTAL HI

It is the high five figures for forward counter.

13.4.40 REV TOTAL LO

It is the low five figures for reverse counter.

13.4.41 REV TOTAL HI

It is the high five figures for reverse counter.

13.4.42 PASSWORD 1

You can change this password 1 which level is 1. When shipping the device from factory, the password is 0521.

13.4.43 PASSWORD 2

You can change this password 2 which level is 2. When shipping the device from factory, the password is 3210.

13.4.44 PASSWORD 3

You can change this password 3 which level is 3. When shipping the device from factory, the password is 7206.

13.4.45 PASSWORD 4

You can ask the manufacturer for password 4 which level is 4. It can be changed.

13.4.46 LOAD PRESET

It is for loading the default parameters

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