

Electromagnetic Flow Meter

RF3300-E



HART, RS 485 communication



High accuracy and stability



Integrated/ Remote version.



Compact and rugged (IP65 protection)

**Product
Datasheet**

ROCKSENSOR AT A GLANCE (ABOUT US)

Rocksensor is one of the global leaders specializing in Process Instrumentation, Research and Development, and Designing of Industrial Automation Equipment. We provide highly precise pressure sensors and transmitters, flow metres, level transmitters, and temperature transmitters with a prime focus to help our clients efficiently, safely, and economically run complex industrial processes.

Rocksensor, headquartered in Switzerland has its footprint in various geographical regions such as the US, Russia, South Korea, Italy, Germany, Singapore, Malaysia, Morocco, China, Taiwan, Australia, UAE, Brazil, and India. Our clients come from some of the major industries such as Oil and Gas, Petrochemicals, Pharmaceuticals, FMCG, Automobiles, Water, Cement, Metal & Mining, and mainly from the Power Industry like Nuclear, Thermal, Hydro, and Solar.

Rocksensor deals in a wide range of highly accurate industrial automation instruments ensuring that even the complex industrial processes happen efficiently.

To fulfill the needs of our clients we make sure that our instruments work in even the harsh environmental conditions offering accurate recordings and communication.

We, at Rocksensor, believe in creating bonds that last a lifetime and create a success story for each and every client. Rocksensor aims to achieve a perfect fit in the global market landscape and establish our footprints across the globe.



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1.Introduction

Flow measurements are essential to running a plant efficiently and safely. Electromagnetic flow meter is one of the application used for flow measurements. Electromagnetic flow meter is a volumetric flow meter which does not have any moving parts and is ideal for wastewater applications or any dirty liquid which is conductive or water based. Electromagnetic flow meters will generally not work with hydrocarbons, distilled water and many non-aqueous solutions.

Electromagnetic flow meter are selected as because they are:

- Obstruction less
- Cost effective for aggressive chemicals
- Provide highly accurate flow measurements

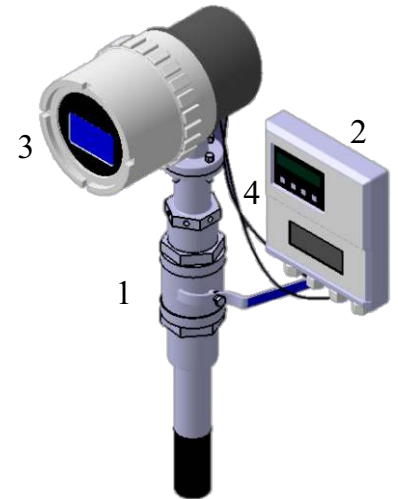
Compact Version



Remote Version



Insertion Version



- 1 Sensor
- 2 Convertor
- 3 Connection Housing
- 4 Connection Cables

2. Identification

- 1 Product/ model code
- 2 K-Factor
- 3 Lining material
- 4 Electrodes material
- 5 Serial number
- 6 Working Temperature
- 7 Maximum Pressure
- 8 Power supply
- 9 Line Size

Electromagnetic Flowmeter	
1 — Model Code: REF3300-E050SM1X1002	
2 — Factor: 1.9080	Size: 50mm — 9
3 — Lining: Rubber	Power Supply: 220V/DC — 8
4 — Electrode: 316L	Pressure: 150LB — 7
5 — Serial No.: 20214271g	Working Temp.: 80°C — 6
Rocksensor Automation	

3. Working Principle

Electromagnetic flow meters use Faraday's Law of Electromagnetic Induction to determine the flow of liquid in a pipe. In a Electromagnetic flow meter, a magnetic field is generated and channeled into the liquid flowing through the pipe. The electromagnetic flow meter is placed in line and measure an induced voltage generated by the flow. The transmitter takes the measured voltage generated by the sensor, converts into a flow measurement and transmit that flow measurement to a control system where it compute the flowrate using the equation of conductivity.

3.1 Mathematical Representation

E.M.F induced is given by:

$$U = B \times V \times D \times C$$

Where,

U = Induced Voltage

V = Average Velocity

D = Internal Dia. of Flow Tube

C = Instrument Constant

B = Magnetic Field Strength

Flowrate equation is:

$$Q = V \times A$$

Where,

V = Average Velocity

A = Area occupied by the flow

4. Key Application

This electromagnetic flow meter being non-intrusive type, can be used in general for any fluid which is having a reasonable electrical conductivity above 5μ Siemens/cm.

Fluids like sand water slurry, coal powder, sewage, wood pulp, chemicals, water other than distilled water in large pipe lines, hot fluids, high viscous fluids specially in food processing industries, cryogenic fluids can be metered by the electromagnetic flow meter.

- Raw Water
- Beverage Industry
- Pharma & Chemical
- Industrial Waste Water
- Mining/ Minerals processing
- Sewage and sludge
- All conductive liquids
- Sea water
- Waste Water
- Cooling water
- Leakage detection
- Drinking water distribution networks
- Revenue metering or billing
- Water purification and desalination
- Liquid chemicals

5. Salient Features

1. High accuracy and stable performance.
2. No moving parts, so pressure loss is negligible.
3. Easy installation and operation.
4. Minimal maintenance with self-diagnostic features.
5. Advanced model with advanced features of: RS 485 communication, HART.
6. Microprocessor based designs offering exceptional configuration flexibility.
7. Easy programmability using key board on Alpha numeric display.
8. With isolated current output.
9. Compact and rugged, IP 65 protection class.
10. The display can be rotated in desired angle to offer ease in viewing.
11. Integrated / Remote version.
12. Range can be modified as per user requirement, at the site.

5.1 Self-diagnostic Feature:

1. Flow Noise Diagnosis
2. Low Conductivity Diagnosis
3. Electrode Insulation Deterioration Diagnosis
4. Electrode Adhesion Detection
5. Sensor Empty Check
6. Wiring Connection Diagnosis

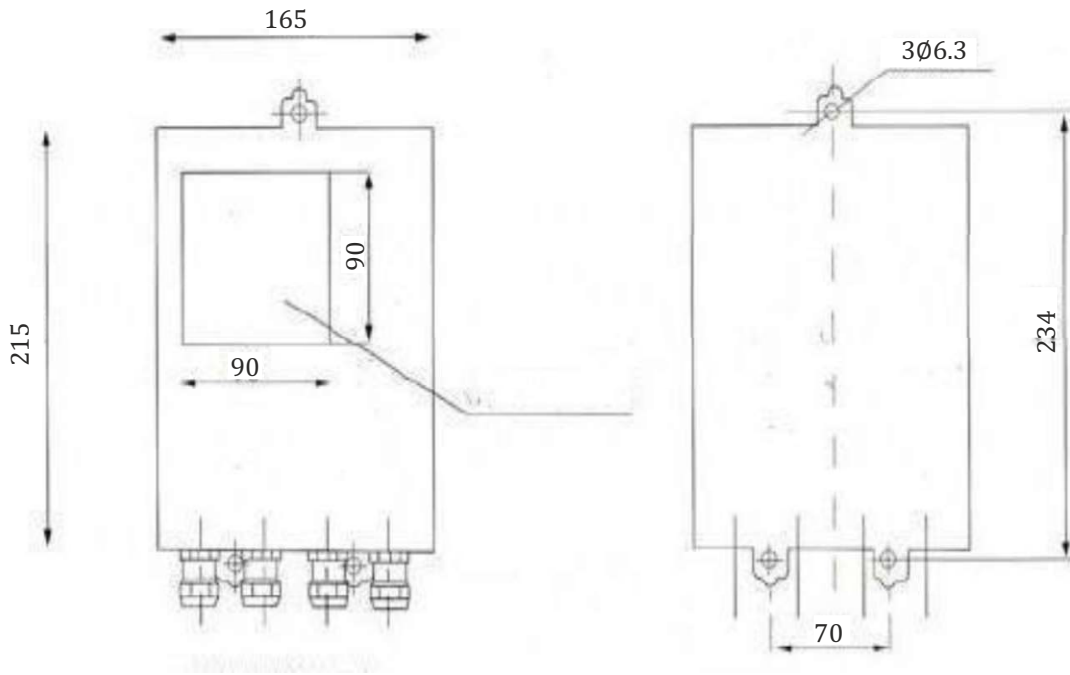
6. Advantages

1. The obstruction to the flow is almost nil and therefore this type of meters can be used for measuring heavy suspensions, including mud, sewage and wood pulp.
2. There is no pressure head loss in this type of flow meter other than that of the length of straight pipe which the meter occupies.
3. They are not very much affected by upstream flow disturbances.
4. They are practically unaffected by variation in density, viscosity, pressure and temperature.
5. Electric power requirements can be low (15 or 20 W), particularly with pulsed DC types.
6. These meters can be used as bidirectional meters.
7. The meters are suitable for most acids, bases, water and aqueous solutions because the lining materials selected are not only good electrical insulators but also are corrosion resistant.
8. The meters are widely used for slurry services not only because they are obstruction less but also because some of the liners such as polyurethane, neoprene and rubber have good abrasion or erosion resistance.
9. They are capable of handling extremely low flows.

7. Technical Specifications

Model No prefix	RF3300 -E
Type	Electromagnetic
Principle	Faraday's Law of Electromagnetic Induction
Transmitter	Integrated/ Remote
Flow Rate Range	RF3300 - E can process signals from fluids with flow velocity 0.1m/s ~ 15m/s in both directions (Bidirectional meter)
Line Size (Inline/ Full Bore)	DN10 ~ DN1400(mm); different line size is available as per lining material
Line Size Insertion	above DN200
Accuracy	±0.2, ±0.3, ±1.0, ±0.5(standard)
Repeatability	±0.1% of measured value
Flow tube Material	Carbon steel(standard), SS304/SS316(optional)
Electrode Material	SS316L, Titanium, Hastelloy C, Platinum, Nickle, Tantalum
Lining Material	Rubber, PTFE, PFA, Polyurethane
Housing Material	Die-Cast Aluminum with Epoxy Coating, Stainless Steel (optional)
Start-up Time	0.5 seconds
Fluid Conductivity	≥20μS/ cm (integration)
Power Supply	85 ~ 265V AC, 24V DC
Power Consumption	<20 W
Ambient Temperature Limit	(-)25 ~ 60°C; medium temperature is different for different lining material
Operating Temperature	(-)25 ~ 85°C
Communication Protocol	RS-232, RS-485, HART
Signal Output	4 ~ 20 mA / 1 ~ 5KHz
Alarm output	2 relays, 3A 230VAC NO (not available for 12VDC Power Supply version)
Damping	Adjustable between 0.1 & 99sec
Output Load	Max. 750Ω
Flow Measurement Direction	Forward, Reverse, Bidirectional
Output Testing	Current Source: Transmitter can be Commanded to supply a specified test current between 4.0 and 20.0 mA Frequency Source: Transmitter can be Commanded to supply a specified test frequency between 0.1 and 5000 Hz
Low Flow Cutoff	Adjustable between 0.0 and 9.9% Qmax. Below selected value, output is driven to the zero flow rate signal level.
Humidity Limit	5% ~ 95% RH
IP Rating	Compact Version: IP65; Remote Version: Sensor IP67/ IP68 (opt.) –Converter IP65, IP67 (opt.)
Excitation Frequency	DC Excitation: 3.125~12.5 Hz; AC Excitation: 50 ~ 60 Hz
Excitation Method	Single excitation (AC/DC)
Anti-Condensation/ Noise Filter	Installed in Converter
Ground Ring	Without ground loop; With ground ring; With ground electrode
Length of Straight Pipe	Upstream ≥ 5DN, Downstream ≥ 2DN

8. Dimensions



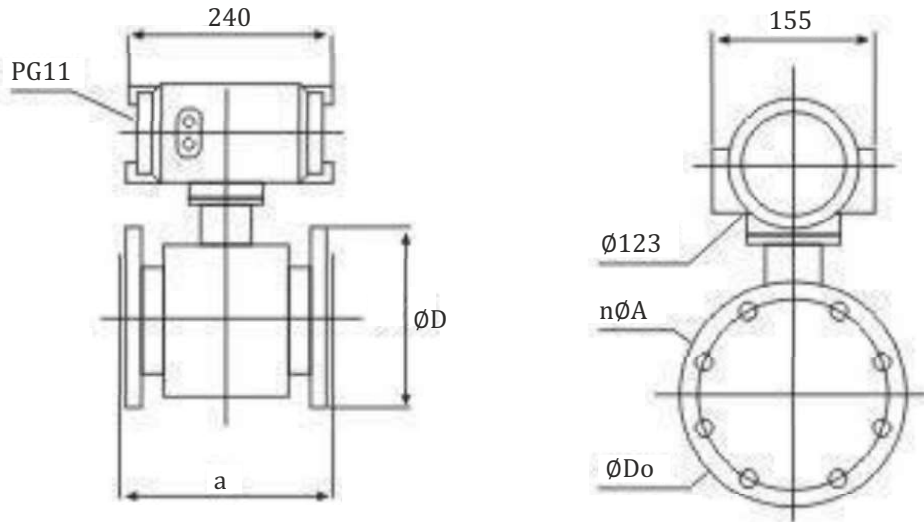
CAD Model (Isometric View)



RF3300-E Compact Version



RF3300-E Remote Version



DN	a	D	Do	n*A
10	200	90	60	4*14
15	200	95	65	4*14
20	200	105	75	4*14
25	200	115	85	4*14
32	200	140	100	4*18
40	200	150	110	4*18
50	200	165	145	4*18
65	250	175	145	4*18
80	250	200	160	8*18
100	250	220	180	8*18
125	280	250	210	8*18
150	300	285	240	8*22
200	350	340	295	8*22
250	450	395	350	12*22
300	500	445	400	12*22
350	550	505	460	16*22
400	600	565	515	16*26
450	600	615	565	20*26
500	600	670	620	20*26
600	600	780	725	20*30
700	700	895	840	24*30
800	800	1015	950	24*33
900	900	1115	1050	28*33
1000	1000	1230	1160	28*36
1200	1200	1405	1340	32*33
1400	1400	1630	1560	36*36
1600	1600	1830	1760	40*36
1800	1800	2045	1970	44*39
2000	2000	2265	2180	48*42
2200	2200	2405	2315	52*45

9. Flow Range & Velocity Table

Inner Diameter (mm)	Flow Range m ³ /h
15	0.4 ~ 4
20	0.7-7
25	1 ~ 10
32	2 ~ 20
40	3 ~ 30
50	4.5 ~ 45
65	8 ~ 80
80	11 ~ 110
100	15 ~ 150
125	27 ~ 270
150	35 ~ 350
200	60 ~ 600
250	100 ~ 1000
300	140 ~ 1400

10. Model Selection Table

RF3300 Intelligent Electro Magnetic Flow Meter	
Code	1 2 3 4 5 6 7 8 9 10 11
Diameter	10, 15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, 450,, 1400
Transmitter	Integrated (S) Remote (10m Cable) (L) Insertion (300DN-4000DN) (I)
Electrode Material	SS316L (M) Ti titanium (T) Ta Tantalum (D) Hastelloy (H) Pt platinum (P) Ni nickel (N) Customised (X)
Output	None (0) 4 - 20 mA /1 - 5KHz (1) 4 - 20mA (2)
Lining	PFA (A) Rubber (X) Teflon (F) Polyethylene (P) Polyurethane rubber (J) Customised (X)
Flange Material	C Carbon Steel S1 SS304 S2 SS316 X Customised
Body Material	C Carbon Steel S1 SS304 S2 SS316 X Customised
Power supply	1 24VDC 2 220VAC
Ground loop	0 None 1 With ground ring 2 With ground electrode
Communication	0 No communication 1 RS-485 2 RS-232 3 Modbus 4 HART
Display	0 None 1 Display

Example: RF3300-40ST1F1322XX

40 - Diameter: 40

S - Transmitter: Integrated

T - Electrode Material: Ti titanium

1 - Output: 4 - 20 mA /1 - 5KHz

F - Lining: Te: 316L

1 - Display: Display

3 - Communication: Modbus

2 - Ground loop: With ground electrode

2 - Power supply: 220VAC

X - Flange Material: Customised

X - Body Material: Customised

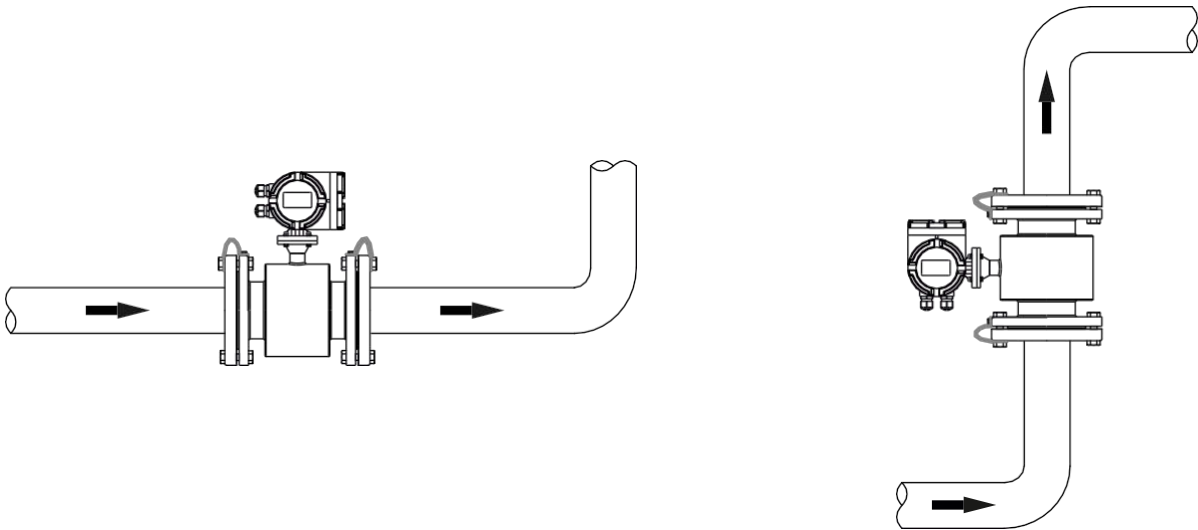
*For any customisation, contact our sales team

11. Installations Precautions

- Installations locations should be such that Flowmeter will always remain full with liquid.
- A minimum 5D upstream & 2D downstream straight lengths should be maintained at installation locations, where D is the pipe diameter.
- The Flowmeter installation location should be free of bends, elbows, tees, valves, etc.
- It is recommended to install a flowmeter at the rear end of the pump outlet to avoid the bubble stay.
- Avoid installation of Flowmeter at the inlet, to avoid negative pressure inside the pipe.
- An all-weather cover should be used to prevent the housing from the direct sunlight or rain when the device in outdoors.

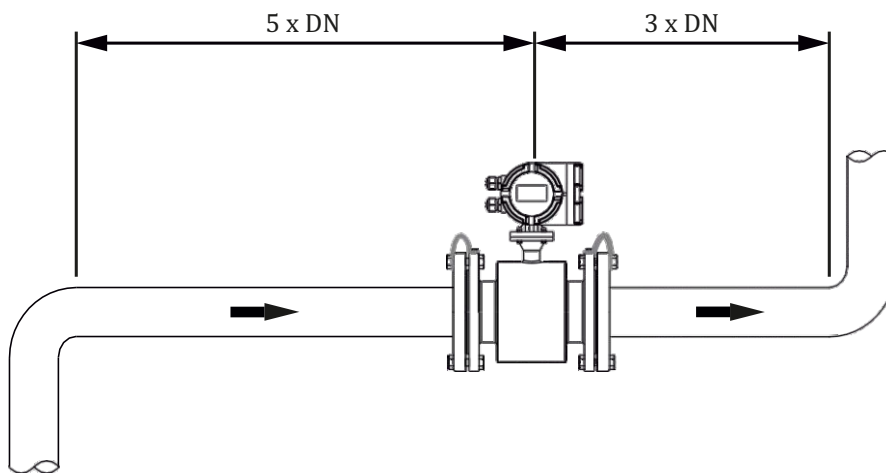
12. Installations Requirements

- The sensor can be installed either on a straight pipe or on a horizontal or inclined pipe, but it requires that the central connection of the two electrodes be horizontal.



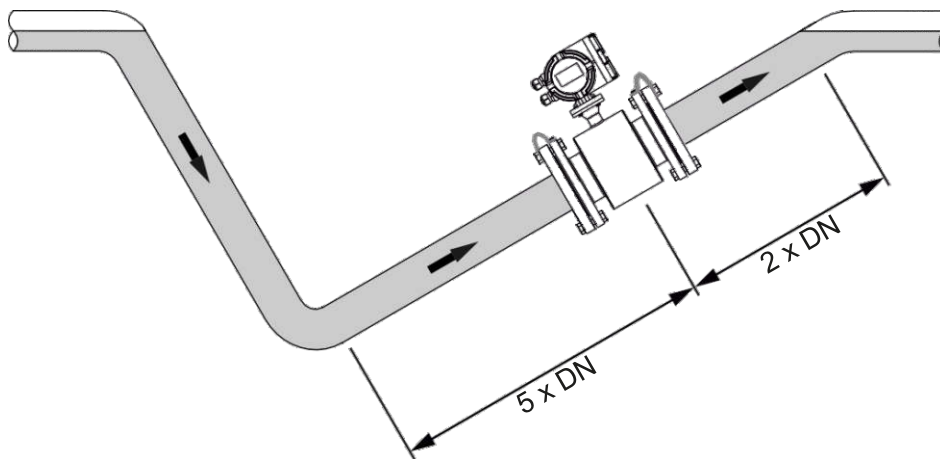
Installation in horizontal or vertical pipeline

- The front and rear straight pipe sections are the wiring of the flow meter $\geq 5DN$ at the front of the flow meter and the rear $\leq 3DN$



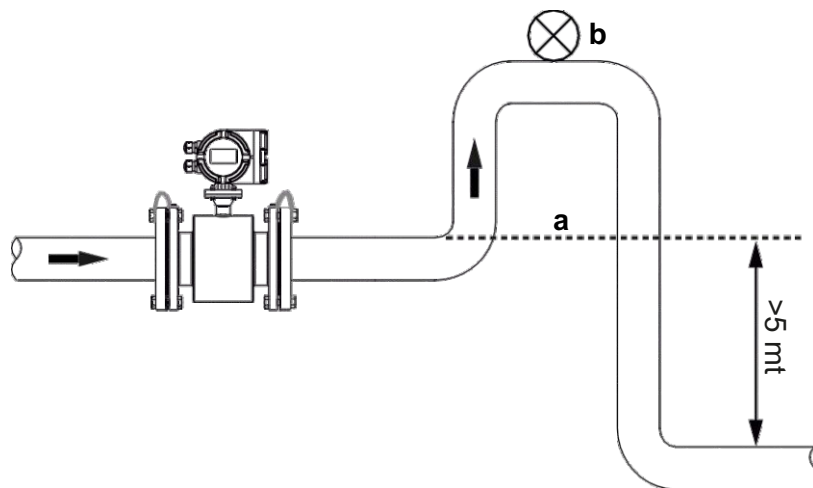
Requirement to install the flowmeter straight pipes

- The electromagnetic flowmeter must be installed so that the pipe is always completely filled with fluid. In a partially filled pipe case, the flowmeter must be installed with the siphon phenomenon, for which the pipe stretch where the meter is installed is kept always full.



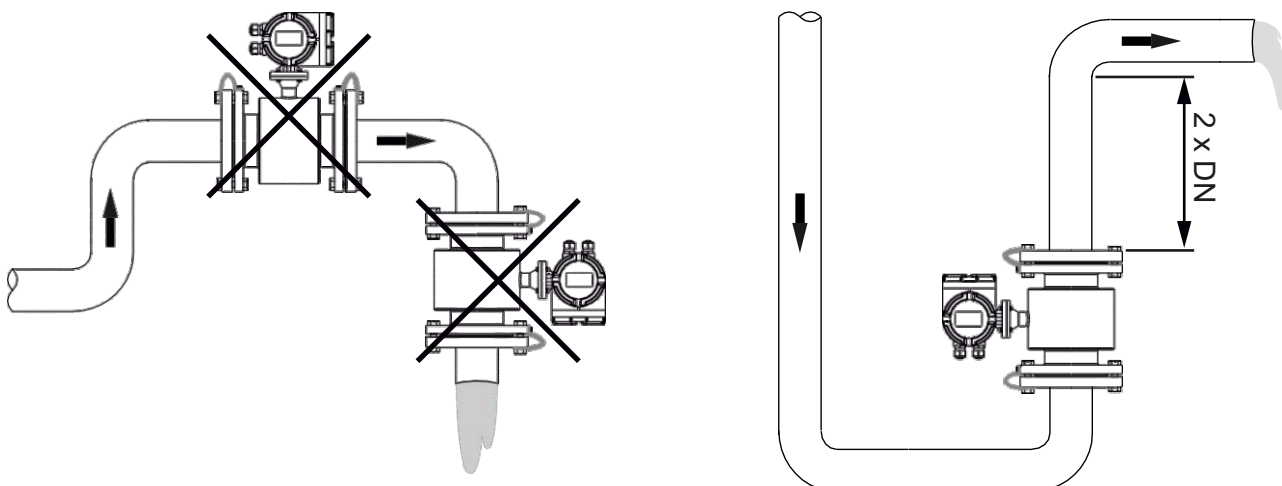
Installation in partially filled pipes

- Install a siphon (a) with a vent valve (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.



Installation in proximity of a > 5m down pipe section

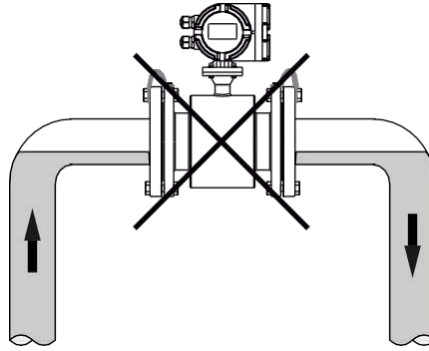
- The electromagnetic flowmeter must not be installed in the pipe section with a free pipe outlet that could run empty. When installing in a downstream pipe, please make sure the pipe is always fully filled with medium.



Installation in pipe without emptying

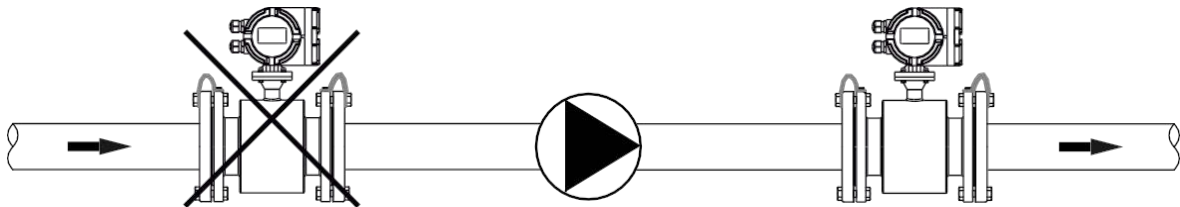
Electromagnetic Flowmeter RF3300-E

- The electromagnetic flowmeter can not be installed at the pipe highest point, because air or gas accumulations may occur in the measuring pipe.



Installation at highest point

- The electromagnetic flowmeter can not be installed upstream of a pump to prevent cavitation, which can damage the sensor lining.



Near pumps installation