

NAGMAN FLOW-LEVEL SYSTEMS AND SOLUTIONS LLP

TURBINE FLOWMETER



Nagman Flow-Level Systems And Solutions LLP

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1. General Information

For your safety, review the major warnings and cautions below before operating your equipment.

1. Use only fluids that are compatible with the housing material and wetted components of your turbine.
2. When measuring flammable liquids, observe precautions against fire or explosion.
3. When handling hazardous liquids, always follow the liquid manufacturer's safety precautions.
4. When working in hazardous environments, always exercise appropriate safety precautions.
5. During turbine removal, liquid may spill. Follow the liquid manufacturer's safety precautions for clean up of minor spills.
6. Do not blow compressed air through the turbine.
7. Handle the rotor carefully. Even small scratches or nicks can affect accuracy.
8. When tightening the turbine, use a wrench only on the wrench flats.
9. For best results, calibrate the meter at least 1 time per year.

1.1 Product Description

Operating Principle:

Liquid flows through the turbine housing causing an internal rotor to spin. As the rotor spins, an electrical signal is generated in the pickup coil. This signal is converted into engineering units (liters, cubic meters, gallons etc.) on the local display where is applicable. Optional accessory modules can be used to export the signal to other equipment.

Upon receipt, examine your meter for visible damage. The turbine is a precision measuring instrument and should be handled carefully. Remove the protective plugs and caps for a thorough inspection. If any items are damaged or missing, contact us.

Make sure the turbine flow model meets your specific needs. For your future reference, it might be useful to record this information on nameplate in the manual in case it becomes unreadable on the turbine. Refer to the nameplate for your customized product's specification.

2. Technical Data

Measuring system

Application range	Liquid: water; diesel; etc (1) Without Impurity (2) Low viscosity
Measured Value	
Primary measured value	Flow Rate
Secondary measured value	Volume flow

Design

Features	
Modular construction	The measurement system consists of a flow sensor and a signal converter. It is available as compact and as separate version.
Compact version converter	N Type: Pulse output without local display
	A Type: 4-20mA Output without local display
	B Type: Local Display; Lithium Battery Power; No Output
	C Type: Local Display; 24V DC Power; 4-20mA Output; Optional Function: (1) Backup Power Supply: Lithium Battery (2) Modbus RS485 (3) Pulse Output
Connection	Thread: DN4-DN50
	Flange: DN15-DN200 (DIN, ANSI, JIS)
	Wafer: DN15-DN100
Measurement Ratio	Standard – 10:1; Optional: 20:1

Measuring accuracy

Reference conditions	Flow conditions similar to EN 29104
	Medium: Water
	Electrical conductivity: $\geq 300 \mu\text{S}/\text{cm}$
	Temperature: $+10\dots+30^\circ\text{C}$ / $+50\dots+86^\circ\text{F}$
	Inlet section: $\geq 10 \text{ DN}$
	Operating pressure: 1 bar / 14.5 psig
Flow Meter Accuracy	Standard: 0.5% of rate
	Optional: 0.2% of rate

Operating conditions

Temperature	
Process temperature	T1 Level: -20...+80°C
	T2 Level: -20...+120°C
	T3 Level: -20...+150°C
Ambient temperature (all versions)	Standard (with aluminum converter housing):
	-20...+55°C
Storage temperature	-20...+70°
Pressure	
EN 1092-1	DN100...DN200: PN 16
	DN15...DN80: PN 25
	Other pressures on request
ASME B16.5	1/2" ...8": 150 lb RF
	Other pressures on request
JIS	1/2" ...8": 10 K
	Other pressures on request

Installation conditions

Installation	Take care that flow sensor is always fully filled
	For detailed information see chapter "Cautions for Installation"
Flow direction	Forward
	Arrow on flow sensor indicates flow direction.
Inlet run	≥ 10 DN
Outlet run	≥ 5 DN

Materials

Sensor housing	SS304		
	Other materials on request		
Flanges	SS202/SS304		
	Other materials on request		
Rotor			
Standard: 2Cr13	EN10088-3	1.4021	X20Cr13
	AISI	420	
	BS	420S37	
	JIS	SUS410J1	
Optional: CD4MCu	DN15...DN80		
Bearings and Shaft	Tungsten Carbide		
Converter Housing	Standard: polyurethane coated die-cast aluminum		

Process connections

Flange	
EN 1092-1	DN15...200 in PN 6...40
ASME	1/2" ...8" in 150 lb RF
JIS	1/2" ...8" in 10...20K
Design of gasket surface	RF
	Other sizes or pressure ratings on request
Thread	DN4...DN50 in PN63

Measurable Flow Rate Range:

Note: The flow range as blow is for reference only. Consult the factory if you have special requirement. Refer to the nameplate or certificate for actual flow range.

Nominal Diameter		Standard Flow Range	Extended Flow Range
(mm)	(in.)	(m3/h)	(m3/h)
4	0.15	0.04 to 0.25	0.04 to 0.4
6	0.25	0.1 to 0.6	0.06 to 0.6
10	0.4	0.2 to 1.2	0.15 to 1.5
15	0.5	0.6 to 6	0.4 to 8
20	0.75	0.8 to 8	0.45 to 9
25	1	1 to 10	0.5 to 10
32	1.25	1.5 to 15	0.8 to 15
40	1.5	2 to 20	1 to 30
50	2	4 to 40	2 to 40
65	2.5	7 to 70	4 to 70
80	3	10 to 100	5 to 100
100	4	20 to 200	10 to 200
125	5	25 to 250	13 to 250
150	6	30 to 300	15 to 300
200	8	80 to 800	40 to 800

3. Model and Selection

Model Selection (See Table 1)

Table 1: Model Selection Guidance for Liquid Turbine Flowmeter

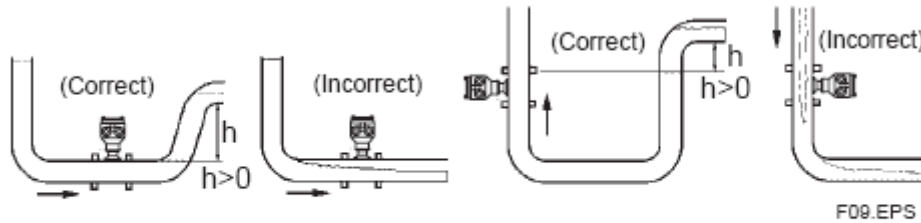
Model Suffix Code									Description
NAGBINE									
Diameter									Three Digitals; for example: 010: 10 mm; 015: 15 mm; 080: 80 mm; 100: 100 mm
Converter		N							No display; 24V DC; Pulse Output
		A							No display; 24V DC; 4-20mA Output
		B							Local display; Lithium Battery Power; No output
		C							Local display; 24V DC Power; 4-20mA Output;
		C1							Local display; 24V DC Power; 4-20mA Output; Modbus RS485 Communication
		C2							Local display; 24V DC Power; 4-20mA Output; HART Communication
Accuracy		05							0.5% of Rate
		02							0.2% of Rate
Flow Range		S							Standard Range: refer to flow range table
		W							Wide Range: refer to flow range table
Body Material		S							SS304
		L							SS316
Explosion Rating		N							Safety Field without Explosion
		E							ExIIIBT6
Pressuring Rating		N							Per Standard
		H(x)							Customized Pressure Rating
Connection								-DXX	DXX: D06, D10, D16, D25, D40 D06: DIN PN6; D10: DIN PN10 D16: DIN PN16; D25: DIN PN25 D40: DIN PN40
								-AX	AX: A1, A3, A6 A1: ANSI 150#; A3: ANSI 300# A6: ANSI 600#
								-JX	JX: J1, J2, J4 J1: JIS 10K; J2: JIS 20K; J4: JIS 40K
								-TH	Thread; DN4...DN50
Fluid Temperature								-T1	-20...+80°C
								-T2	-20...+120°C
								-T3	-20...+220°C

Explanation - Diameter: 50mm; Converter: 24V DC Power Supply, 4-20mA Output, Local Display
 Accuracy: 0.5%; Flow range: 4-40 m3/h; Body Material: SS304; No Explosion;
 Connection: ANSI 150# Flange; Fluid Temperature: -20...+80°C

4. Cautions for Installation

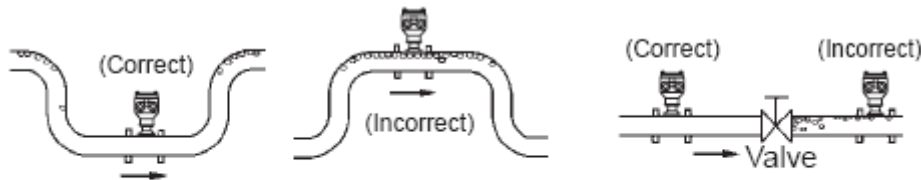
4.1 Mounting Positions

- Pipes must be fully filled with liquids. It is essential that pipes remain fully filled at all times, otherwise flow rate indications may be affected and measurement errors may be caused.



Mounting Positions

- Avoid Air Bubbles. If air bubbles enter a measurement pipe, flow rate indications may be affected and measurement errors may be caused.



Avoiding Air Bubbles

- Avoid all pipe locations where the flow is pulsating, such as in the outlet side of piston or diaphragm pumps.
- Avoid locations near equipment producing electrical interference such as electric motors, transformers, variable frequency, etc.
- Install the meter with enough room for future access for maintenance purposes.

Warning: Precaution for direct sunshine and rain when the meter is installed outside.

4.2 Required Lengths of Straight Runs

Flow altering device such as elbows, valves and reducers can affect accuracy. See diagram below for typical flow meter system installation.

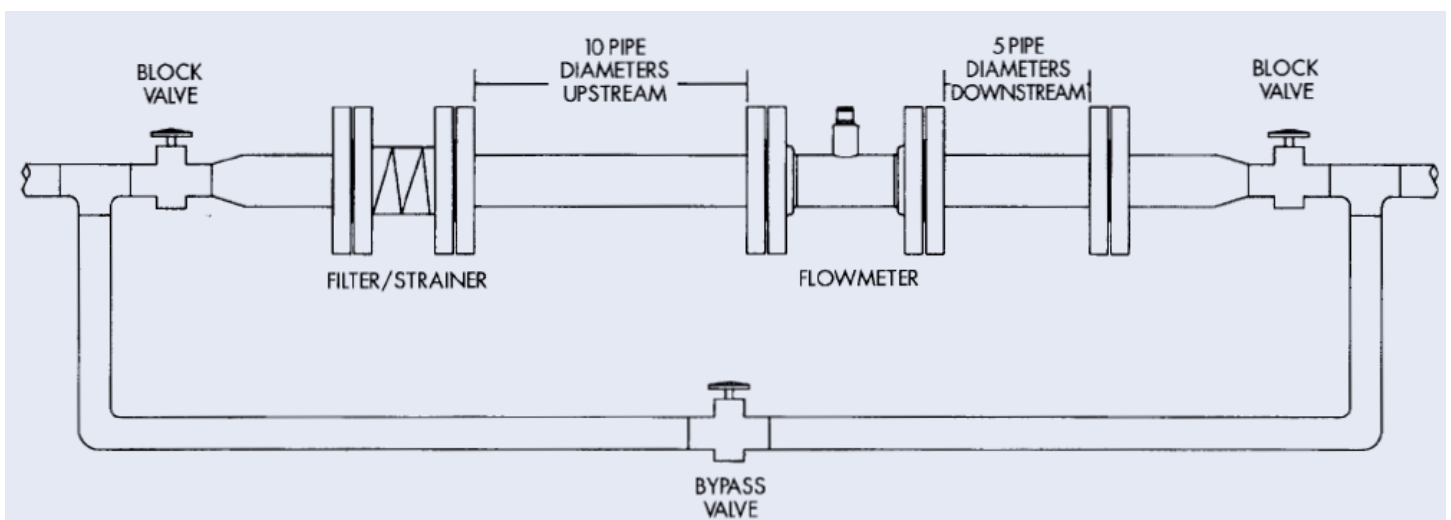
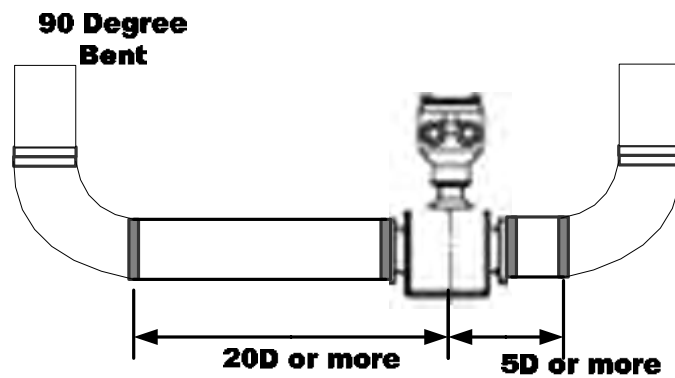
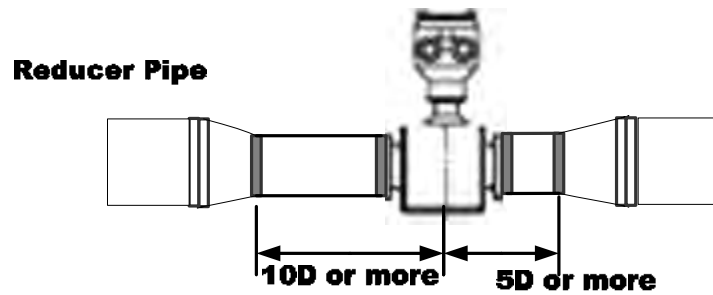
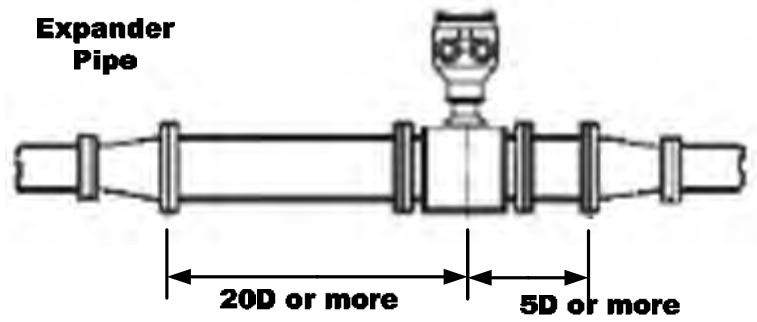


Diagram 1. Typical Flow Meter System Installation

The recommended guidelines are given to enhance accuracy and maximize performance. Distance given here are minimum requirements; double them for desired straight pipe lengths.

- Upstream: allow a minimum straight pipe length at least 10 times the internal diameter of the pipe. For example, with the 50mm pipe, there should be 500mm of straight pipe immediately upstream. Desired upstream straight pipe length is 1000mm.
- Downstream: allow a minimum straight pipe length at least 5 times the internal diameter of the pipe. For example, with the 50mm pipe, there should be 250mm of straight pipe immediately upstream. Desired upstream straight pipe length is 500mm.

4.3 Anti-Cavitation

Cavitation can be caused by entrained air, and it can seriously damage the rotor on a turbine flow meter. An amount higher than about 100 mg/l of entrained air or gas can produce error. In addition, cavitation can be caused by too little backpressure on the flow meter. For SURE turbine flow meters, you should provide a backpressure (downstream pressure) of at least 1.25 times the vapor pressure, plus 2 times the pressure drop through the flow meter. See formula 1.

$$\text{Formula 1: } P_b \geq 1.25 \times P_v + 2 \times (P_{in} - P_{out})$$

In formula 1: (P_b: Back pressure; P_v: Vapor Pressure; P_{in}: Inlet Pressure; P_{out}: Outlet Pressure)

Create backpressure by installing a control valve on the downstream side of the meter at the proper distance detailed above.

Special Notice

- ◆ Foreign material in the liquid being measured can clog the meter's rotor and adversely affect accuracy. If this problem is anticipated or experienced, install screens to filter impurities from incoming liquids.
- ◆ To ensure accurate measurement, drain all air from the system before use.
- ◆ When the meter contains removable coverplates. Leave the coverplate installed unless accessory modules specify removal. Don't remove the coverplates when the meter is powered, or electrical shock and explosion hazard can be caused.