

Flow sensor, Vortex type **VORTEX**



USER MANUAL

BAMO INTERNATIONAL

22, Rue de la Voie des Bans · Z.I. de la gare · 95100 ARGENTEUIL

Tel +33 (0)1 30 25 83 20 Web www.bamo.eu

Fax +33 (0)1 34 10 16 05 E-mail export@bamo.fr

Flow sensor, Vortex type
VORTEX

FLO

777-01 /1

30-03-2022

M-777.01-EN-AB

1. SAFETY INSTRUCTIONS

- Installation, commissioning and maintenance work must be carried out in compliance with the applicable directives in force and by qualified technicians.
- The instrument must be operated in conformity with its function and limited to its applications, as any other use may affect the measuring system.
- Non-observance of the safety rules and directives, as well as improper use of the device can be dangerous to the safety of persons. The manufacturer cannot be held responsible for damage caused by improper use.
- Disposal of the instrument must be carried out in accordance with the regulations in force.
- Technicians working on the device during installation or maintenance tasks, must use adequate personal protective equipment.
- Carry out a check of the device and safety equipment before powering up the unit.
- For maintenance or repair please contact the BAMO Mesures technical service.
If you need to return the unit, please contact the service department.

2. APPLICATIONS

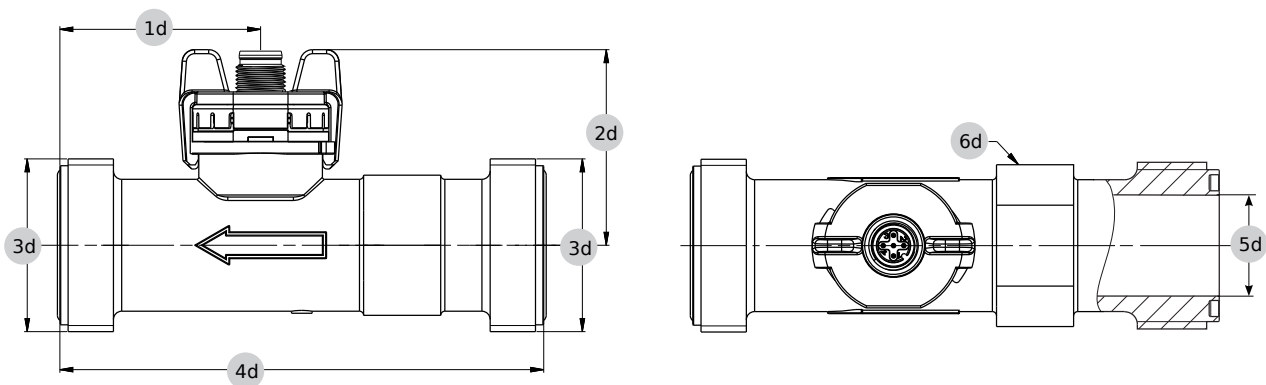
- Flow measurement on domestic hot water, drinkable water or non-conductive liquids such as demineralised water or reverse osmosis water.

3. DESCRIPTION

This flowmeter, which has no moving mechanical parts, is not affected by a pollution; It is distinguished by a low pressure drop and a good accuracy.

The flow sensor is based on the principle of Karman vortex trail. The frequency of vortices generated by the obstacle located in the flow path, is proportional to the flow speed. Vortices are evaluated by a piezoelectric paddle, operated by an integrated electronics.

4. DIMENSIONS



	1d	2d	3d	4d	5d	6d
ND 8	43.7	53	BSP-M 1/2"	77	11.5	Hex. wrench; 12 mm
ND 10	39.5	54.1	BSP-M 3/4"	90	11.5	Hex. wrench; 19 mm
ND 15	41.6	59.5	BSP-M 1"	97	16	Hex. wrench; 22 mm
ND 20	42.6	65.8	BSP-M 1 1/4"	117	20	Hex. wrench; 27 mm
ND 25	56	71.3	BSP-M 1 1/2"	132	26	Hex. wrench; 34 mm

BAMO INTERNATIONAL

22, Rue de la Voie des Bans · Z.I. de la gare · 95100 ARGENTEUIL

Tel +33 (0)1 30 25 83 20 Web www.bamo.eu

Fax +33 (0)1 34 10 16 05 E-mail export@bamo.fr

Flow sensor, Vortex type
VORTEX

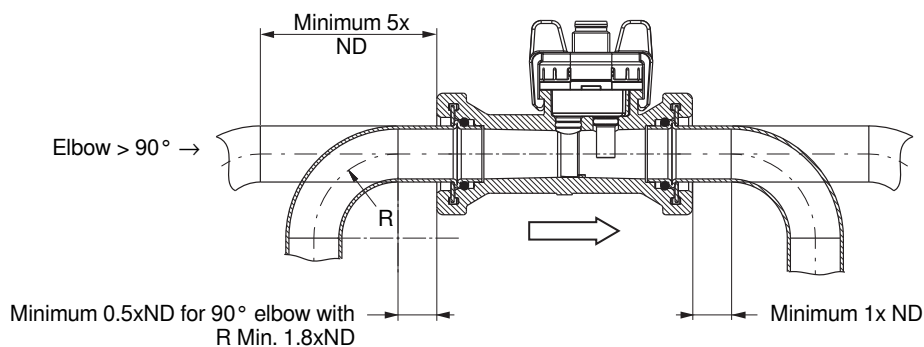
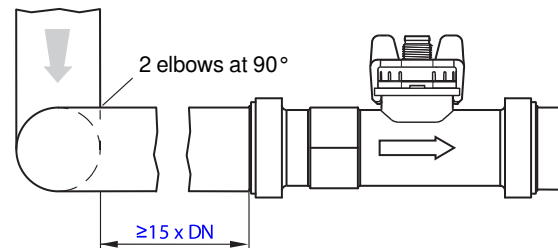
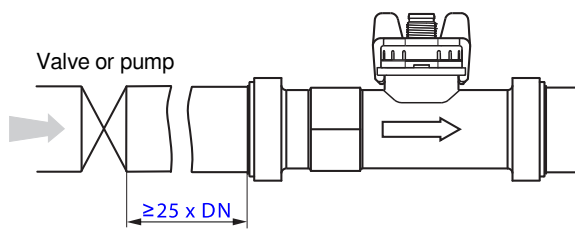
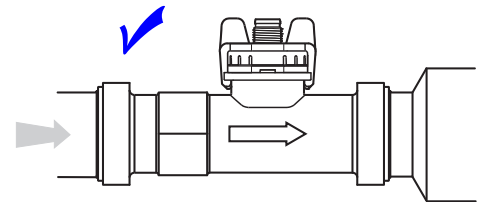
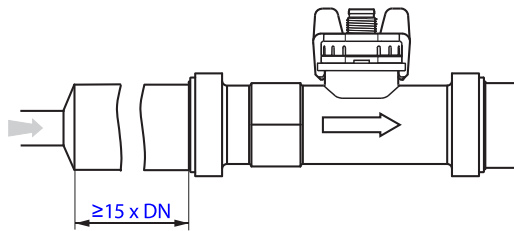
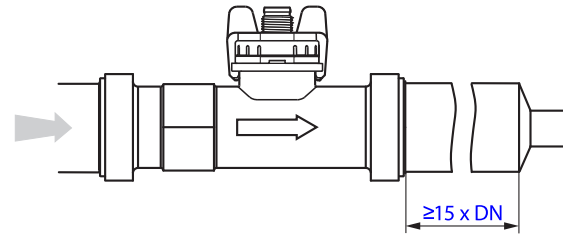
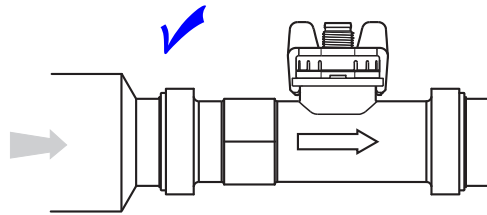
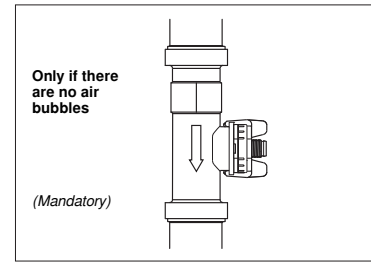
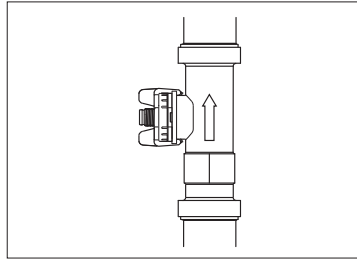
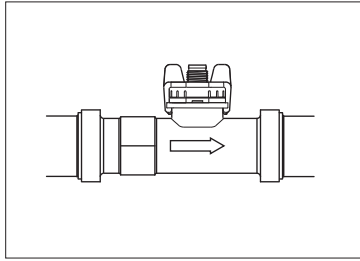
30-03-2022

M-777.01-EN-AB

FLO

777-01/2

5. PRECAUTIONS



For correct operation of the sensor the following instructions must be followed:

- The inner diameter of the piping must never be smaller than the inner diameter of the measuring tube.
- Bends pipes that are not in the same plane are to be avoided on the inlet side (vortex).

BAMO INTERNATIONAL

22, Rue de la Voie des Bans · Z.I. de la gare · 95100 ARGENTEUIL

Tel +33 (0)1 30 25 83 20 Web www.bamo.eu

Fax +33 (0)1 34 10 16 05 E-mail export@bamo.fr

Flow sensor, Vortex type
VORTEX

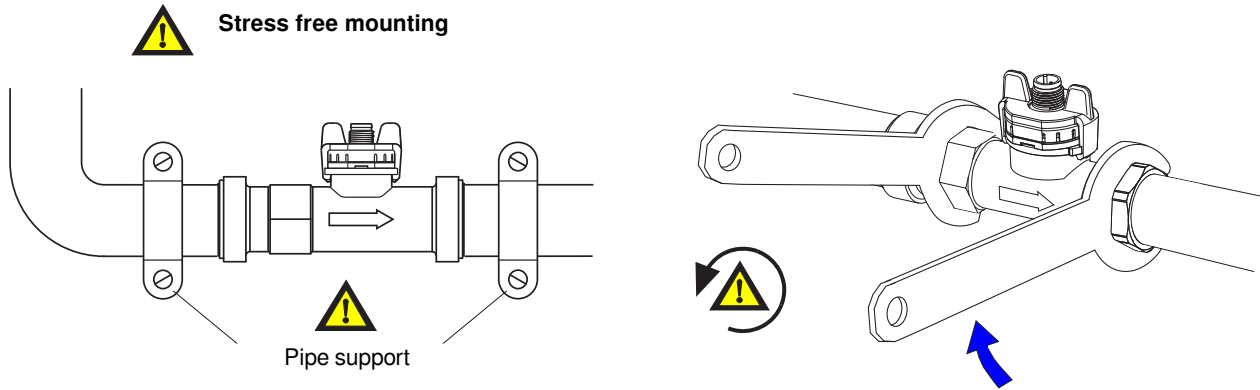
FLO

777-01 /3

30-03-2022

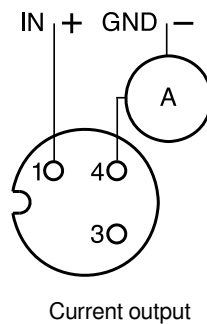
M-777.01-EN-AB

6. TORQUE SETTINGS

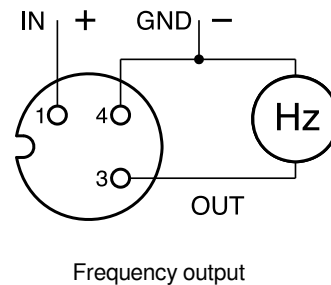


	ND 8 – 1/2" G	ND 10 – 3/4" G	ND 15 – 1" G	ND 20 – 1 1/4" G	ND 25 – 1 1/2" G
	Hex. wrench; 12 mm	Hex. wrench; 19 mm	Hex. wrench; 22 mm	Hex. wrench; 27 mm	Hex. wrench; 34 mm
Minimum torque [Nm]	1	1	2	2.5	2.5
Maximum torque [Nm]	12	12	12	15	15

7. ELECTRICAL CONNECTIONS



Connector 3-pin, M12x1			
Terminal	1	3	4
Colour	Brown	Blue	Black



BAMO INTERNATIONAL

22, Rue de la Voie des Bans · Z.I. de la gare · 95100 ARGENTEUIL

Tel +33 (0)1 30 25 83 20 Web www.bamo.eu

Fax +33 (0)1 34 10 16 05 E-mail export@bamo.fr

Flow sensor, Vortex type
VORTEX

FLO

777-01 /4

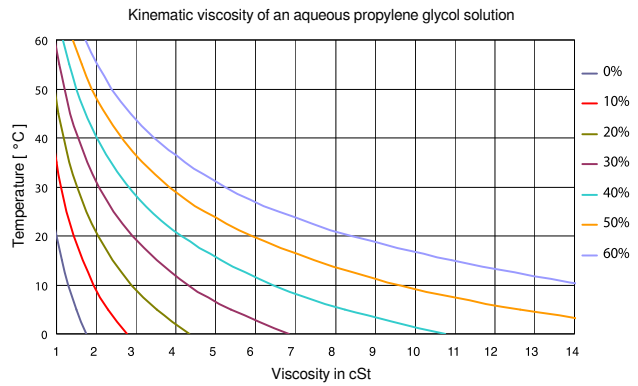
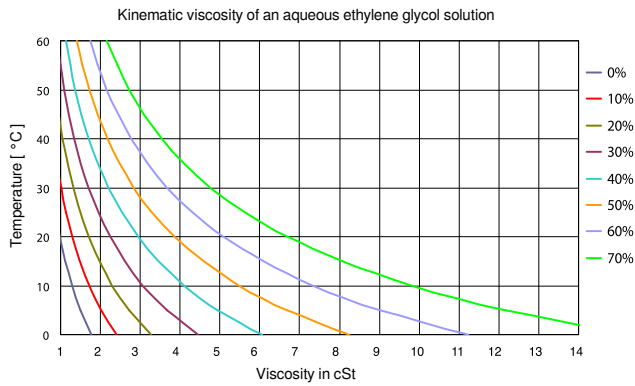
30-03-2022

M-777.01-EN-AB

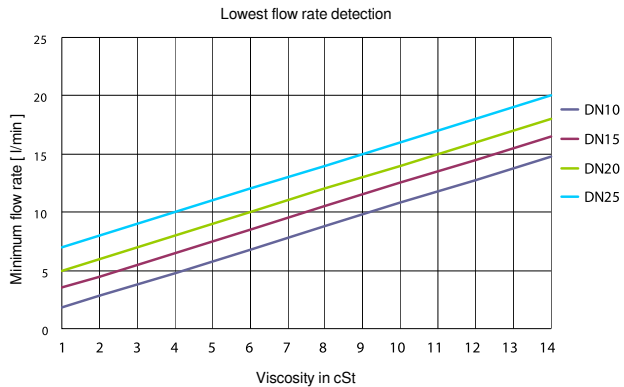
8. EFFECTS OF GLYCOL

Indications below to largely correct effects of viscosity of liquids of a higher viscosity than water (viscosity > 1.8 cSt). After correction, accuracies of 3% F.S. for $\nu = 1.8$ to 4 cSt, and of 4% F.S. for $\nu = 4$ cSt to 14 cSt are achieved ($\nu =$ kinematic viscosity).

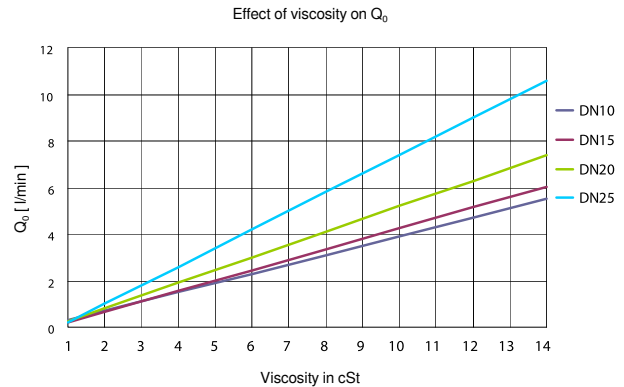
Viscosity of water-glycol mixture



Low limit of detection Q_{min}



Formula for the output $Q = k \cdot f - Q_0$



Low limit of detection Q_{min} [l/min]

ND10 : $Q_{min} = \nu + 0.8$
 ND15 : $Q_{min} = \nu + 2.5$
 ND20 : $Q_{min} = \nu + 4.0$
 ND25 : $Q_{min} = \nu + 6.0$

($\nu =$ Kinematic viscosity in cSt)

Output for $Q \geq Q_{min}$ [l/min]

Frequency output

ND10 : $Q = 0.0845 \cdot f - 0.40\nu + 0.20$
 ND15 : $Q = 0.1870 \cdot f - 0.45\nu + 0.25$
 ND20 : $Q = 0.3730 \cdot f - 0.55\nu + 0.25$
 ND25 : $Q = 0.7440 \cdot f - 0.80\nu + 0.60$

Voltage output 0 ... 10 V

ND10 : $Q = 3.2 \cdot U_{out} - 0.40\nu + 0.40$
 ND15 : $Q = 5.0 \cdot U_{out} - 0.45\nu + 0.45$
 ND20 : $Q = 8.5 \cdot U_{out} - 0.55\nu + 0.55$
 ND25 : $Q = 15.0 \cdot U_{out} - 0.80\nu + 0.80$

Current output 4-20 mA (I in mA)

ND10 : $Q = 2.000 \cdot (I - 4 \text{ mA}) - 0.40\nu + 0.40$
 ND15 : $Q = 3.125 \cdot (I - 4 \text{ mA}) - 0.45\nu + 0.45$
 ND20 : $Q = 5.313 \cdot (I - 4 \text{ mA}) - 0.55\nu + 0.55$
 ND25 : $Q = 9.375 \cdot (I - 4 \text{ mA}) - 0.80\nu + 0.80$

BAMO INTERNATIONAL

22, Rue de la Voie des Bans · Z.I. de la gare · 95100 ARGENTEUIL

Tel +33 (0)1 30 25 83 20 Web www.bamo.eu

Fax +33 (0)1 34 10 16 05 E-mail export@bamo.fr

Flow sensor, Vortex type
VORTEX

30-03-2022

M-777.01-EN-AB

FLO

777-01 /5

9. TECHNICAL FEATURES

Flow-rates:

Measuring principle	Vortex, piezo-ceramic sensor
Measuring range	From 0.9 up to 150 l/min
Accuracy (for water at 20 °C)	Flow-rate < 50 % F.S.: ± 1 % F.S
Accuracy (for water at 20 °C)	Flow-rate > 50 % F.S.: ± 2 % F.S
Response time	Analogue output: < 500 ms Frequency output: < 5 ms

Operating conditions:

Liquids	Domestic hot water, potable water, demineralized water
Liquid temperature limit	< 125 °C
Ambient temperature limits	-15 ... +65 °C
Storage temperature	-30 ... +85 °C
Pressure limits vs. Temperature	Max. 12 bar at 40 °C / Max. 6 bar at 100 °C (Maximum test pressure is 18 bar at 40 °C)
Cavitation	Respect the following relation (Pabs = absolute pressure) to prevent cavitations [Outlet Pabs. / Differential pressure] > 5.5

Wet parts FDA compliant:

Sensor paddle	ETFE
Body with damming insert	PA6T/6I (40 % FV)
Sealing	Peroxide cured EPDM (FPM on request)

Tests and approvals:

For drinking water	ACS ; KTW ; W270 ; WRAS
Electromagnetic compatibility	EC conformity according to EN 61326-2-3

Electrical features for model with analogue output:

Power supply	8 ... 33 V DC
Output signal	4-20 mA
Connector	3-pin, M12x1 (IP 65)
Load to GND or IN	< [(U _{IN} - 8 V) / 20 mA]

Electrical features for model with frequency output (without filter):

Power supply	4.75 ... 33 V DC
Output signal:	Square pulse < 0.5 ... > (U _{IN} - 0,5 V)
Connector	3-pin, M12x1 (IP 65)
Load to GND or IN	< 1 mA / < 100 nF
Consumption I _{IN}	< 2 mA

Specific parameters vs. bore:

Bore	Flow-rate	Flow speed	Pressure drop*	Mass
ND 8	0.9 ... 15 l/min	0.133 ... 2.210 m/s	P _v = 85.00 x Q ²	~ 47 g
ND 10	1.8 ... 32 l/min	0.265 ... 4.716 m/s	P _v = 22.50 x Q ²	~ 57 g
ND 15	3.5 ... 50 l/min	0.290 ... 4.145 m/s	P _v = 6.70 x Q ²	~ 68 g
ND 20	5.0 ... 85 l/min	0.265 ... 4.509 m/s	P _v = 2.50 x Q ²	~ 92 g
ND 25	9.0 ... 150 l/min	0.283 ... 4.709 m/s	P _v = 0.92 x Q ²	~ 100 g

*: Includes distances upstream and downstream of 3 ND (P_v in Pa, Q in l/min)

Frequency output:

Bore	Frequency	Volume per pulse**
ND 8	30 ... 384 Hz	0.628 ml
ND 10	24 ... 387 Hz	1.370 ml
ND 15	20 ... 275 Hz	3.016 ml
ND 20	14 ... 230 Hz	6.125 ml
ND 25	12 ... 204 Hz	12.251 ml

** : at 50 % of F.S.

BAMO INTERNATIONAL

22, Rue de la Voie des Bans · Z.I. de la gare · 95100 ARGENTEUIL
 Tel +33 (0)1 30 25 83 20 Web www.bamo.eu
 Fax +33 (0)1 34 10 16 05 E-mail export@bamo.fr

Flow sensor, Vortex type
VORTEX

30-03-2022

M-777.01-EN-AB

FLO

777-01 /6