HUBA
236 Series Vortex Flow Transmitter
Freq. & Analog Outputs, 1/4" to 1.25" Pipe Sizes, Rugged Brass Construction

DESCRIPTION

Type 236 flow transmitter is similar to other Huba series 200 product except it incorporates a brass housing. Type 236 is available with a range of power supply and analog and frequency output signals.

With no moving parts the flow sensor is not sensitive to debris, has marginal pressure loss and high accuracy.

Versions with a 1000 Ohm RTD temperature sensor built-in to the bluff are available.

SPECIFICATIONS

Medium: Suitable for water & water glycol based heat exchange systems with the usual additives and other fluids compatible with the materials of construction (consult factory). For media with viscosity greater than 2 millipascal seconds (2 centipoise), higher flow rates are required to form vortices raising the minimum measurable flow rate value.

Flow ranges: From 0.48 to 63.4 GPM (1.8 ... 240 litres per minute). See Table 3**.**

Temperature measurement:
Optional PT1000 RTD imbedded in flow sensor bluff
    Measure range: -40°F to +257°F (– 40 to > +125 °C)
    Accuracy: Class B DIN EN 60751, @ T= 0 ,
        ±0.3 °C ±0.005 * ΔT
0-10 V analog output option:
    Range: -25 to +125°C
    Accuracy:±0.5°C ±0.005 * ΔT
    Calculate Temperature: $T(°C)=150°C/10V*U_{outT}-25°C$
Temperature Influences:
    Self-heating at temperature sensor: 1 K/mW
    Conduction resistance to connector: 0.8 Ohm

Operating Temperature:
Media: less than or equal to 257°F (+125°C)
Ambient: 5° to185°F (–15 to + 85 °C),
In storage: -22° to 185°F (–30 to + 85 °C)

Max. pressures and medium temperature:

Table 1

psi	bar	°F	°C	Duration
174	12	104	40	Lifetime
87	6	212	100	Lifetime
58	4	257	125	600 hours
58	4	284	140	2 hours

Loss of pressure / cavitation: A minimum inlet pressure of 10.2 psi (0.7 bars) is required to avoid cavitation issues at maximum flow.

Wetted materials:
Sensor vane: ETFE
Sealing material: EPDM or FPM
Flow sensor and bluff:
    Brass (CuZN40Pb2)
    ISO-PA6T/6I, Grivory 40%GF

Response time Frequency Output: Signal delay <100 ms, response time <5 ms

Response time Analog Ouput:: Signal delay <2 s, response time <500 ms

Features
- **Low cost product with high levels of accuracy**
- **Temperature insensitive measuring principle**
- **Excellent media resistance (measuring element not in contact with the media)**
- **Minimal pressure loss**
- **Measuring element not sensitive to debris**
- **Direct temperature measurement in the medium**

Power/Output Options:

Table 2

	Square Pulse Frquency Output	Voltage Output	Current Output
Power (U_{in})	4.75-33 VDC	11.5-33 VDC	8-33 VDC
Signal	$<0.5...>U_{in}$-0.5 V	0-10 V	4-20 mA
Load Against GND	<1 mA/<100 nF	<6 mA/<100 nF	$<(U_{in}$-8 V)/20 mA
Current Consumption load free I_{in}	<2 mA	<5 mA	-

Electrical connection/Protection Class: M12x1/IP 65

Polarity reversal protection: Short circuit, reverse voltage and external voltage protected within the admissible supply voltage.

Mounting position: In principle universal. We recommend that, when the sensor is mounted in horizontal pipe runs that the electrical connection/sensor assembly be mounted off vertical (3 o'clock or 9 o'clock best).

Piping connection fittings: See table 4

Accuracy:
Accuracy specifications are valid for media with a viscosity <2 centipoise (2 millipascal seconds):

For water in temperature range 41 to 212°F (5 to 100°C) or for water with maximum 20% glycol at ≥77°F (≥25°C)
Up to 50% fs: ≤ 1% fs
From 50% fs: ≤ 2% of measured value

Table 3- Model Size Selection

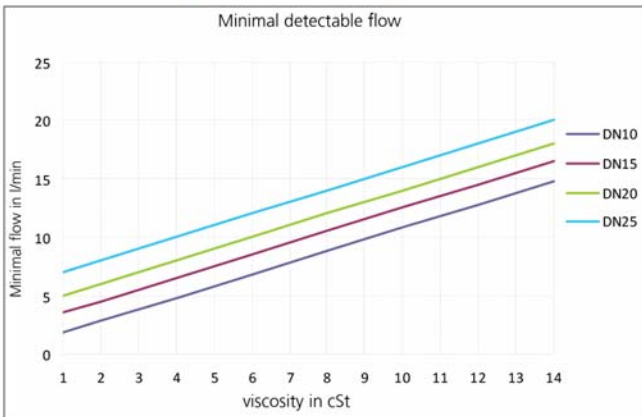| Size	Pipe Size	Full Scale Range (Gal/min)	Full Scale Range (l/min)	Volume per Pulse (at 50% F.S.)	Frequency Range (Hz)	Q_o	K_f	K_u	K_1	Pressure Drop (pa) Where Q is flow (l/min)
DN10	3/8"	0.238 to 3.96	1.8 to 32.0	1.386 ml/min	24 to 380	-0.2	0.0487	3.2	2.000	$22.5*Q^2$
DN10	3/8"	0.528 to 10.6	2.0 to 40	1.386 ml/min	26 to 479	-0.2	0.0840	4.0	2.500	$22.5*Q^2$
DN15	1/2"	0.925 to 13.20	3.5 to 50.0	2.993 ml/min	20 to 277	-0.2	0.1810	5.0	3.125	$6.70*Q^2$
DN20	3/4"	1.32 to 22.50	5.0 to 85.0	6.140 ml/min	14 to 230	-0.3	0.3710	8.5	5.313	$2.50*Q^2$
DN25	1"	2.38 to 39.6	9.0 to 150.0	12.134 ml/min	13 to 206	-0.2	0.7300	15	9.375	$0.92*Q^2$
DN32	1-1/4"	3.7 to 63.4	14 to 240	27.513 ml/min	9 to 145	-1.47	1.6710	24	15.000	$0.25*Q^2$

Characteristic line Formulas:

Frequency Output- $Q_v = K_f * f + Q_o$
Quantity per Pulse (liters/pulse)- Quantity/Pulse = $Q_v * Kf/60 * (Q_v - Q_o)$
Current Output- $Qv = K_1 * (I_{out} - 4\ mA)$
Voltage Output- $Qv = K_u * U_{out}$

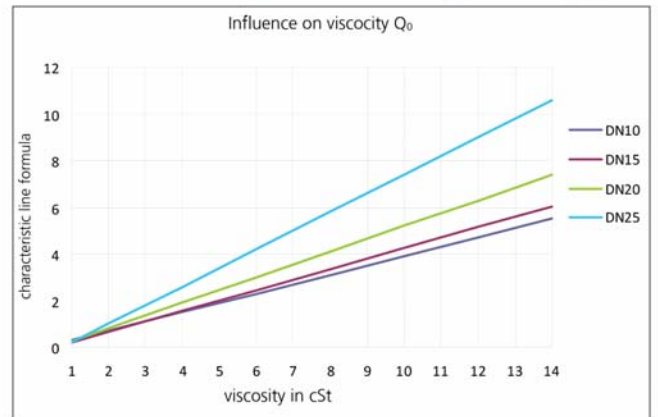|		
Q_v	Volume Flow Rate	[l/min]
Q_o	Axis Intercept	[l/min]
K_f	Coefficient Frequency Output	[(l/min)/f]
K_u	Coefficient Voltage Output	[(l/min)/V]
K_l	Coefficient Current Output	[(l/min)/f]
f	Frequency	[Hz]
U_{out}	Voltage	[V]
I_{out}	Current	[mA]
Qty/Pulse	Quantity per Pulse	liters/pulse

Influence of Glycol: Following definitions correct the influence of media with higher viscosity than water (media viscosity (v) > 1.8 cST. Corrections result in measuring accuracy of 3% FS in range of 1.8-4 cST & 4% FS in the range of 4-14 cST.

Kinematic viscosity ethylene glycol water

Kinematic viscosity propylene glycol water
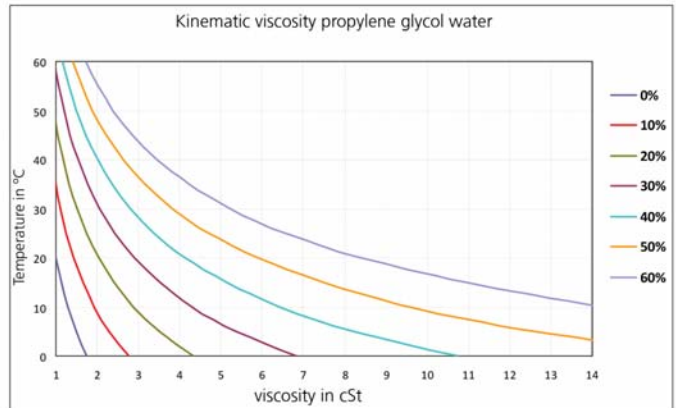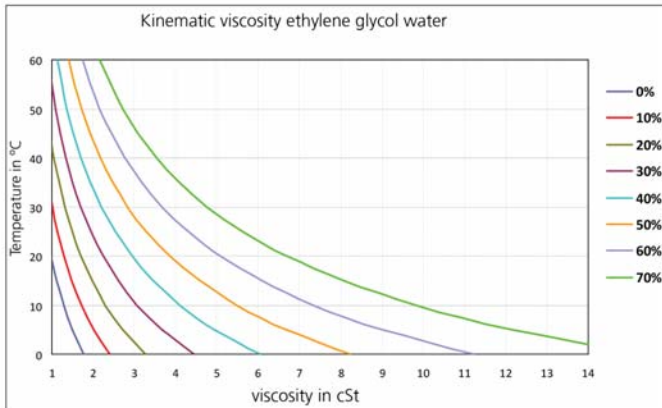
Definition of respond threshold Q_{min}

Definition of characteristic line formula $Q = k * f - Q_0$

Minimal detectable flow

Influence on viscocity Q_0

Response threshold Q_{min} (minimum flow in l/min)

DN 10: $Q_{min} = v + 0.8$
DN 15: $Q_{min} = v + 2.5$
DN 20: $Q_{min} = v + 4$
DN 25: $Q_{min} = v + 6$

(Multiply liters x 0.264 to convert to gallons)

Formula characteristic line for Q > Qmin in l/min

Frequency output:
DN10: $Q = K_f * f - 0.40v + 0.20$
DN15: $Q = K_f * f - 0.45v + 0.25$
DN20: $Q = K_f * f - 0.55v + 0.25$
DN25: $Q = K_f * f - 0.80v + 0.60$
DN32: $Q = K_f * f - 0.85v + 0.60$
Voltage output 0 ...10 V
DN10: $Q = K_u * U_{Out} - 0.40v + 0.40$
DN15: $Q = K_u * U_{Out} - 0.45v + 0.45$
DN20: $Q = K_u * U_{Out} - 0.55v + 0.55$
DN25: $Q = K_u * U_{Out} - 0.80v + 0.80$
DN32: $Q = K_u * U_{Out} - 0.85v + 0.85$

Current output 4 ... 20 mA (I in mA)
DN10: $Q = K_1 * (I - 4\ mA) - 0.40v + 0.40$
DN15: $Q = K_1 * (I - 4\ mA) - 0.45v + 0.45$
DN20: $Q = K_1 * (I - 4\ mA) - 0.55v + 0.55$
DN25: $Q = K_1 * (I - 4\ mA) - 0.80v + 0.80$
DN32: $Q = K_1 * (I - 4\ mA) - 0.80v + 0.80$
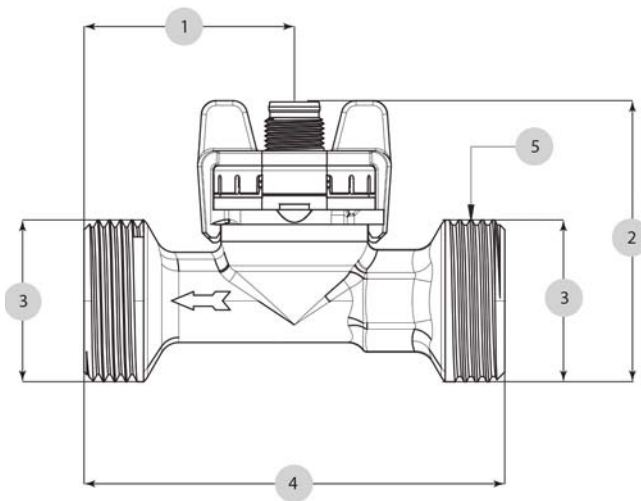
DIMENSIONS DN 8, 10, 15, 20

Table 4

Size/Thread Type	1 (mm)	2 (mm)	3 Thread	4 (mm)	5 (mm)
DN10/K	43	51.1	G 1/2	86	19
DN10/M	43	54.1	G 3/4	86	19
DN10/G	43	57.3	G 1	86	19
DN15/K	41	55.9	G 3/4	87	22
DN15/G	41	59.3	G 1	87	22
GN20/K	40.6	61.6	G 1	105	27
DN20/G	40.6	65.6	G 1-1/4	105	27
DN25/K	50	68.1	G 1-1/4	120	34
DN25/G	50	71.1	G 1-1/2	120	34
DN32K	50	74.9	G 1-1/2	134	41

Table 5: BSP to NPT Adapters

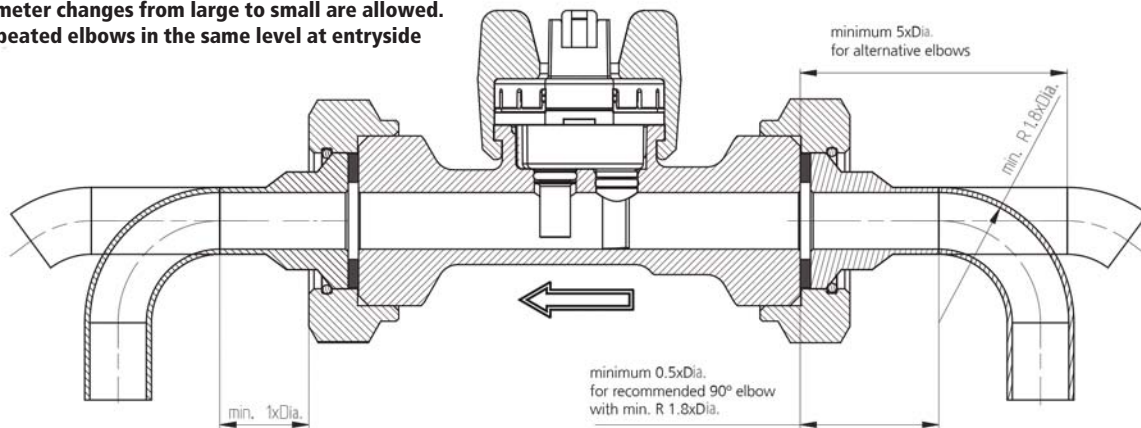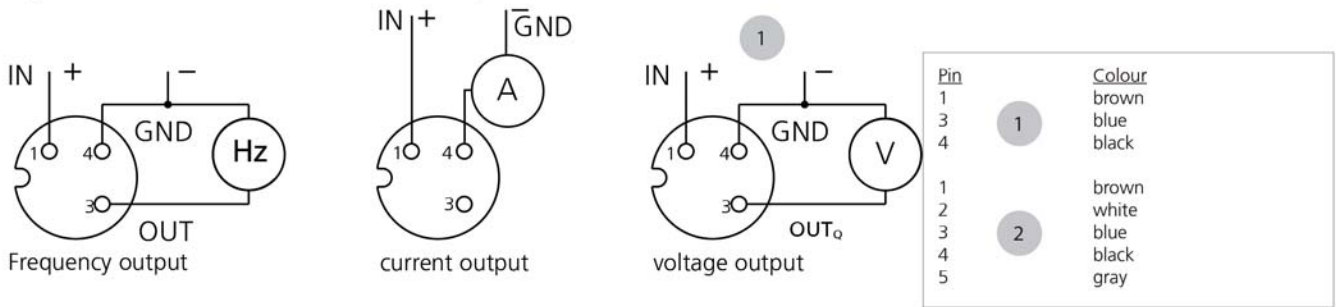| *Model	Description	Material
ADSG1NPT	Adapter G1-1/4 to 1" NPT Female	303 Stainless Steel
ADPG1NPT	Adapter G1-1/4 to 1" NPT Female	Polypropylene
* Two R25E EPDM sealing o-rings are supplied with model DN25		
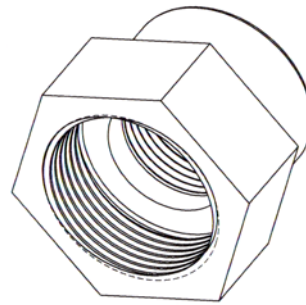
MOUNTING

Consider the following to ensure the correct function of the sensor.
-Only diameter changes from large to small are allowed.
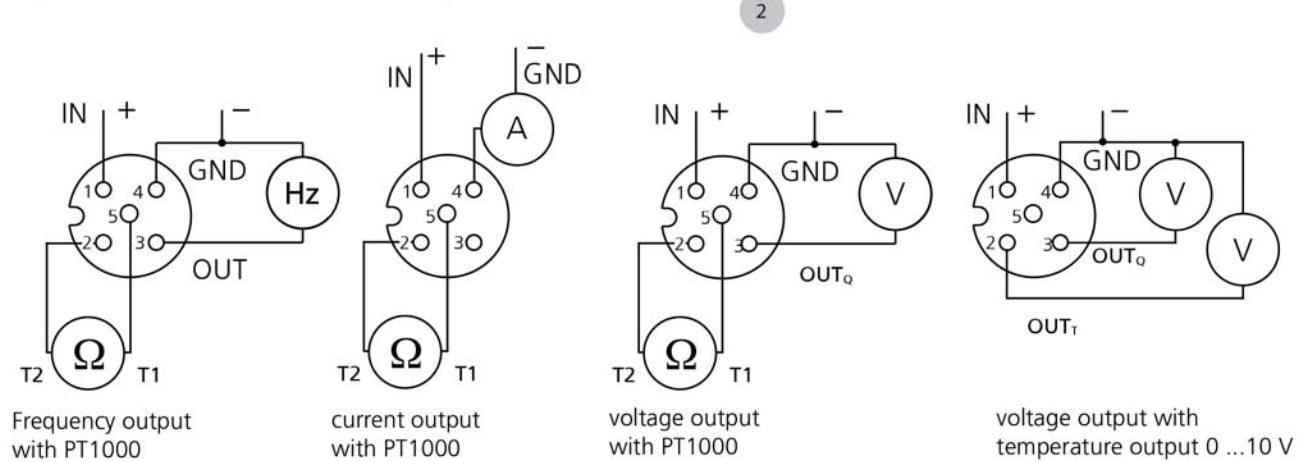**-Avoid repeated elbows in the same level at entryside**

minimum 5xDia.
for alternative elbows

min. R 1.8xDia.

minimum 0.5xDia.
for recommended 90° elbow
with min. R 1.8xDia.

min. 1xDia.

WIRING

3-pole circual connection M12x1 without temperature measurement

Frequency output

current output

voltage output

Pin		Colour
1		brown
3	1	blue
4		black
1		brown
2		white
3	2	blue
4		black
5		gray

5-pole circual connection M12x1 with temperature measurement

Frequency output
with PT1000

current output
with PT1000

voltage output
with PT1000

voltage output with
temperature output 0 ...10 V

ORDERING INFORMATION

1) Order flow sensor model from table 7 -ABCDEF
Example: 21091044

2) Order End Connection adapters, O-rings and adapter clips

Flow Sensor Order Table						
A **Model**	**B** **Version**	**C** **Size**	**D** **Output**	**E** **Electrical Connection**	**F** **Seal Material**	**G** **Pipe Connections**
236	9=Flow 8=Flow & Temperature (1000 Ohm RTD) 6=Flow & Temperature (0-10VDC)	10=DN10, 32 l/min F.S. 11=DN10, 40 l/min F.S. 15=DN15, 50 l/min F.S 20=DN20, 85 l/min F.S 25=DN25, 150 l/min F.S 32=DN32, 240 l/min F.S	2=Frequency 3= 0-10V 4= 4-20 mA	4= 2 or 3 Pole M12X1 5= 4 or 5 Pole M12X1	1=EPDM 2=FPM	Brass with outside thread- see table 4 K=K M=M G=G

Component Parts	
Part Number	**Description**
	Electrical
114605	Straight-wire box for connector M12x1, 3 pole plug with 78.7" (200 cm) cable
114604	Corner-wire box for connector M12x1, 3 pole plug with 78.7" (200 cm) cable
114564	Straight-wire box for connector M12x1, 5 pole plug with 78.7" (200 cm) cable
114563	Corner-wire box for connector M12x1, 5 pole plug with 78.7" (200 cm) cable
114563	Straight-wire box for connector M12x1, screw terminal
ADSG1NPT	Stainless Steel Adapter G1-1/4 to 1" NPT Female
ADPG1NPT	Polypropylene Adapter G1-1/4 to 1" NPT Female