Huba Control

FOR FINE PRESSURE AND FLOW MEASUREMENT

Flow sensor type 236 for liquid media

Flow range
1.8 … 240 l/min

Nominal diameters
DN 10 / 15 / 20 / 25 / 32

Temperature measurement
-40 … +125 °C

The type 236 is based on the type 210 but incorporates a brass housing. The Vortex Sensor type 236 has a rugged construction of brass connection. This flow sensor is available with a larger variety concerning power supply and outputs.

You can choose between various versions as integrated temperature measurement. With no moving parts the flow sensor is not sensitive to debris, has marginal pressure loss and high accuracy.

- Flow measuring with voltage, current or frequency output
- Temperature non-sensitive measuring principle
- Excellent media resistance (measuring element not in contact with the media)
- CE conformity
- Wide application temperature range
- Marginal loss of pressure
- Measuring element not sensitive to debris
- Direct temperature measurement in the medium
- Drinking water approval WRAS, ACS

Technical Overview

Flow measurement

Measuring principle			Vortex	Piezoelectric sensor element
Measuring range				1.8 ... 240 l/min
Nominal diameters				DN 10 / 15 / 20 / 25 / 32
Accuracy at < 50% fs (water)			< 1% fs	
Accuracy at > 50% fs (water)			< 2% measuring value	
Response time	Immediately Therefore suitable for spigot use.	Frequency output	Signal delay Response time	≤ 100 ms < 5 ms
			Analogue output	Signal delay < 2 s Response time < 500 ms

Temperature measurement

Measuring principle	Resistance			PT1000
PT1000	Measuring range			-40 ... +125 °C
	Accuracy	class B DIN EN 60751	@ T = 0 °C	± 0.3 K
			@ T ≠ 0 °C	± 0.3 K ± 0.005 * ΔT
0 ... 10 V		Measuring range		-25 ... +125 °C
		Accuracy		± 0.5 K ± 0.005 * ΔT
		Calculation temperature		$T(°C) = \frac{+150\,°C}{10\,V} * U_{OUT\_T} - 25\,°C$
Temperature influences		Self-heating at temperature sensor		1 K/mW
		Conduction resistance to connector		0.8 Ohm

Operating conditions

Medium	Suitable for heating circuit water with the usual additives Drinking water		Other medium on request
temperature		Media	≤ +125 °C
		Ambient	-15 ... +85 °C
		Storage	-30 ... +85 °C
Max. pressure and medium temperature		(for lifetime)	12 bar at +40 °C
		(for lifetime)	6 bar at +100 °C
		(for 600 hours)	4 bar at +125 °C
		(for 2 hours)	4 bar at +140 °C
		(max. test pressure)	18 bar at +40 °C
Cavitation	The following equation is valid to prevent cavitation:	$P_{abs\ outlet} / P_{difference} > 5.5$	

Materials in contact with medium (FDA-conform)

Sensor paddle	ETFE
Case with damming body	Brass (CuZn40Pb2), PA6T/6I (40% GF)
Sealing material	EPDM (perox.) (for drinking water)
	FPM

Electrical overview			Frequency output	Voltage output	Current output
Power supply		U_{IN}	4.75 ... 33 VDC	11.5 ... 33 VDC	8 ... 33 VDC
Output	Frequency square pulse signal	$U_{OUT\_Q\_frequency}$	< 0.5 ... > U_{IN} - 0.5 V	–	–
Flow (Q)	Analogue signal	U_{OUT_Q} or I_{OUT}	–	0 ... 10 V	4 ... 20 mA
Output	Resistant signal	$R_{OUT\ PT1000}$	PT1000 class B DIN EN 60751		
temperature (T)	Voltage signal	U_{OUT_T}	–	0 ... 10 V	–
Electrical connection and protection class			M12x1 (IP 65)	M12x1 (IP 65)	M12x1 (IP 65)
Load agianst GND or IN			< 1 mA / < 100 nF	< 6 mA / < 100 nF [1)]	< (U_{IN} - 8 V) / 20 mA
Current consumption load free (I_{IN})			< 2mA	< 5 mA	–
Electrical reliability			Short circuit, reverse voltage and external voltage protected within the admissible supply voltage.		

Weight	with thread K	with thread M	with thread G
DN 10 with condensation protection	~ 200 g	~ 241 g	~ 307 g
DN 15 with condensation protection	~ 250 g	-	~ 310 g
DN 20 with condensation protection	~ 378 g	-	~ 490 g
DN 25 with condensation protection	~ 303 g	-	~ 707 g
DN 32 with condensation protection	-	-	~ 696 g

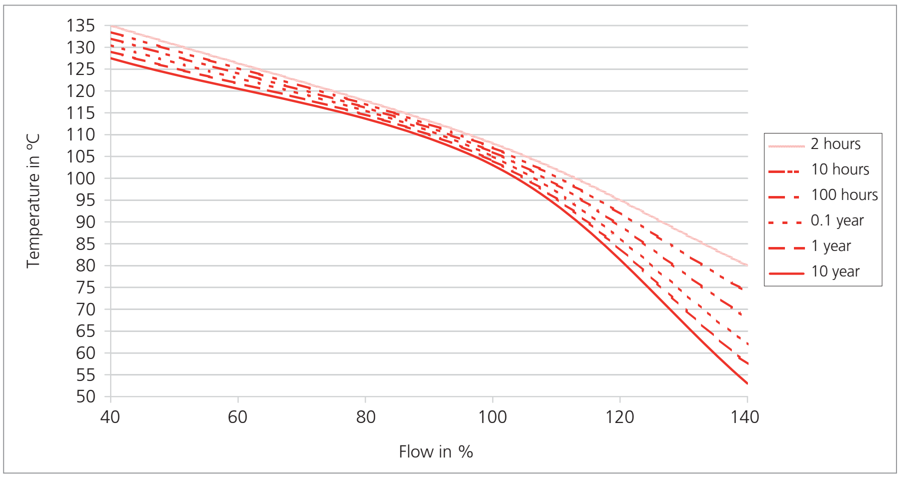
Test / Admissions

Electromagnetic compatibility	CE conformity acc. to EN 61326-2-3
Drinking water approval	WRAS, ACS
	Plastic parts with KTW and W270 approval

Packaging

Single packaging	
Multiple packaging	

Minimum life span on high flow rate and high temperature



Nominal diameters dependent variables

Nominal diameters	Tube connection	Measuring range	Quantity per pulse @ 50% fs	Flow range	Frequency range	Q_0	K_f	K_U	K_I	Pressure drop [1), 2)]
DN 10	K	1.8 ... 32 l/min	1.416 ml	0.265 ... 4.716 m/s	23 ... 374 Hz	-0.2	0.0860	3.2	2.000	22.50 * Q^2
	G, M		1.386 ml		24 ... 380 HZ		0.0847			
DN 10	K	2.0 ... 40 l/min	1.419 ml	0.295 ... 5.895 m/s	26 ... 467 Hz	-0.2	0.0860	4.0	2.500	22.50 * Q^2
	G, M		1.386 ml		26 ... 479 Hz		0.0840			
DN 15	K	3.5 ... 50 l/min	3.036 ml	0.290 ... 4.145 m/s	20 ... 273 Hz	-0.2	0.1836	5.0	3.125	6.70* Q^2
	G		2.993 ml		20 ... 277 Hz		0.1810			
DN 20	K	5.0 ... 85 l/min	6.173 ml	0.265 ... 4.509 m/s	14 ... 229 Hz	-0.3	0.3730	8.5	5.313	2.50 * Q^2
	G		6.140 ml		14 ... 230 Hz		0.3710			
DN 25	K	9.0 ... 150 l/min	12.201 ml	0.283 ... 4.709 m/s	13 ... 205 Hz	-0.2	0.7340	15	9.375	0.92 * Q^2
	G		12.134 ml		13 ... 206 Hz		0.7300			
DN 32	K	14 ... 240 l/min	27.513 ml	0.290 ... 4.974 m/s	9 ... 145 Hz	-1.47	1.6710	24	15.000	0.25 * Q^2

Characteristic line formula frequency output
$Q_V = K_f * f + Q_0$

Characteristic line formula voltage output
$Q_V = K_U * U_{OUT}$

Characteristic line formula current output
$Q_V = K_I * (I_{OUT} - 4\ mA)$

Formula quantity per pulse [litres/pulse]
$$\frac{quantity}{pulse} = \frac{Q_V * K_f}{60 * (Q_V - Q_0)}$$

Legend

Q_V	Volume flow rate	[l/min]
Q_0	Axis intercept	[l/min]
K_f	Coefficient frequency output	[(l/min) / f]
K_U	Coefficient voltage output	[(l/min) / V]
K_I	Coefficient current output	[(l/min) / mA]
f	Frequency	[Hz]
U_{OUT}	Voltage	[V]
I_{OUT}	Current	[mA]
$\frac{quantity}{pulse}$	Quantity per pulse	$\frac{litres}{pulse}$

Order code selection table

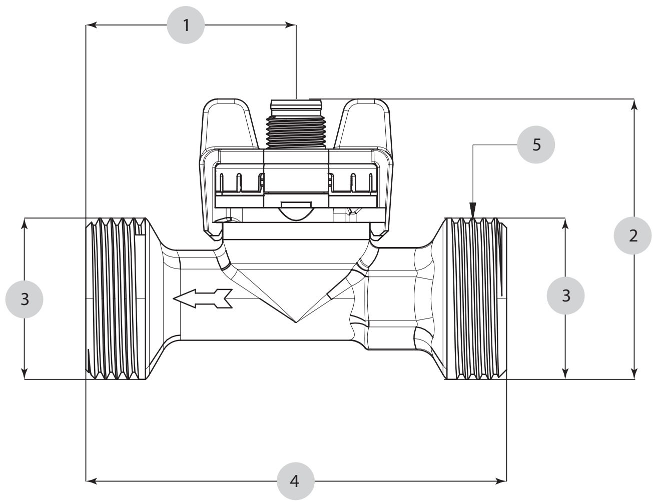
				1	2	3	4	5	6	7
			236.	X	X	X	X	X	X	X
Version	Flow			9				4		
	Flow and temperature (PT1000)			8				5		
	Flow and temperature (0 ... 10 V)			6			3	5		
Nominal diameters and flow range	DN 10	1.8 ... 32 l/min.			1	0				
	DN 10	2.0 ... 40 l/min.			1	1				
	DN 15	3.5 ... 50 l/min.			1	5				K,G
	DN 20	5.0 ... 85 l/min.			2	0				K,G
	DN 25	9.0 ... 150 l/min.			2	5				K,G
	DN 32	14.0 ... 240 l/min.			3	2				K
Output and power supply	Frequency output (Square pulse signal)		4.75 ... 33 VDC	8,9			2			
	Analogue signal	0 ... 10 V	11.5 ... 33 VDC				3			
		4 ... 20 mA	8 ... 33 VDC	8,9			4			
Electrical connection	Connector M12x1	2- or 3-pole	(condensation protection)	9				4		
		4- or 5-pole	(condensation protection)	8,6				5		
Sealing material	EPDM	Ethylene propylene rubber (peroxidically cross-linked)							1	
	FPM [3)]	Fluoro elastomer							2	
Tube connection	Brass with outside thread	K (DN 10 - G ½; DN 15 - G ¾; DN 20 - G 1; DN 25 - G 1 ¼; DN 32 - G 1 ½)								K
		M (DN 10 - G ¾)								M
		G (DN 10 - G 1; DN 15 - G 1; DN 20 - G 1 ¼; DN 25 - G 1 ½)								G

Accessories [4)]

				Order number
Straight-wire box for connector M12x1 with cable	3-pole	200 cm		114605
Corner-wire box for connector M12x1 with cable	3-pole	200 cm		114604
Straight-wire box for connector M12x1 with cable	5-pole	200 cm	(with temperature)	114564
Corner-wire box for connector M12x1 with cable	5-pole	200 cm	(with temperature)	114563
Straight-wire box for connector M12x1 screwing terminal	5-pole			115024

1) incl. 3xDi inlet and outlet side 2) Pv in Pa; Q in l/min 3) No drinking water approval 4) Accessories supplied loose

Dimension diagram

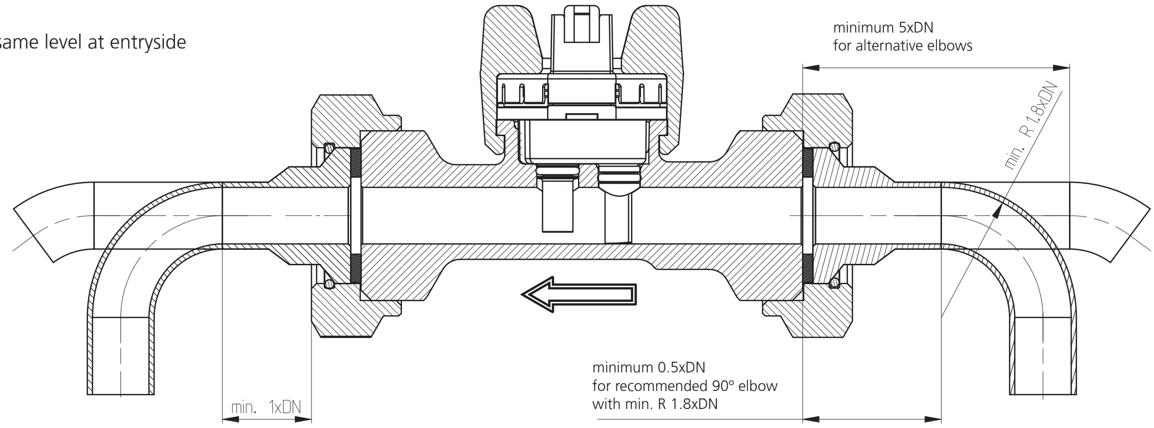


	1	2	3	4	5
DN10 K	43	51.1	G ½	86	19
DN10 M	43	54.1	G ¾	86	19
DN10 G	43	57.3	G 1	86	19
DN15 K	41	55.9	G ¾	87	22
DN15 G	41	59.3	G 1	87	22
DN20 K	40.6	61.6	G 1	105	27
DN20 G	40.6	65.6	G 1 ¼	105	27
DN25 K	50	68.1	G 1 ¼	120	34
DN25 G	50	71.1	G 1 ½	120	34
DN32 K	50	74.9	G 1 ½	134	41

Tube mounting instructions

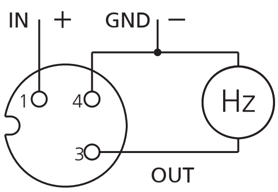
Consider the following to ensure the correct function of the sensor.

- Only diameter changes from large to small are allowed.
- Avoid repeated elbows in the same level at entryside

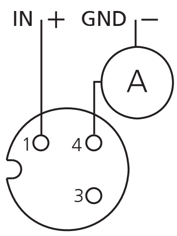


Electrical connection

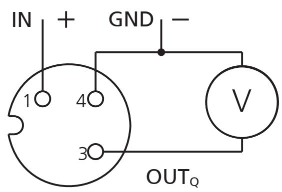
Connector M12x1 without temperature measurement (1)



Frequency output



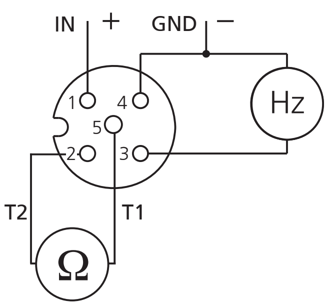
current output



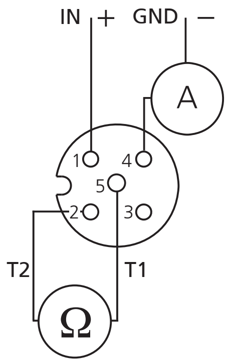
voltage output

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

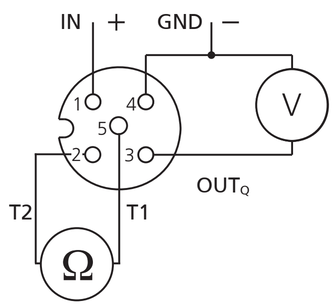
Connector M12x1 with temperature measurement (2)



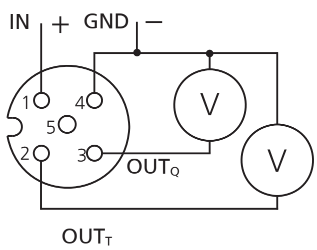
Frequency output
with PT1000



current output
with PT1000



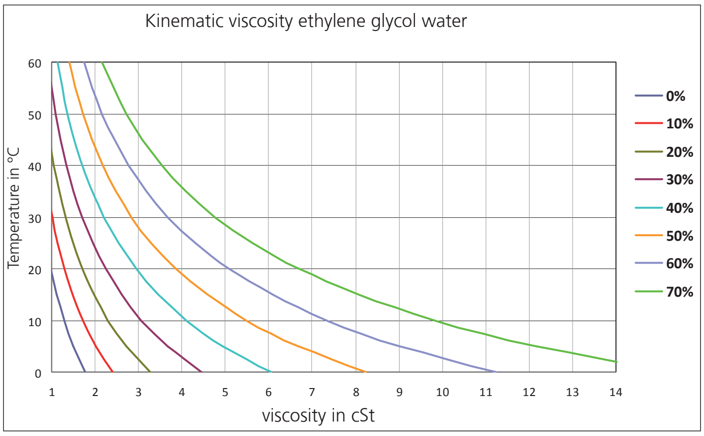
voltage output
with PT1000

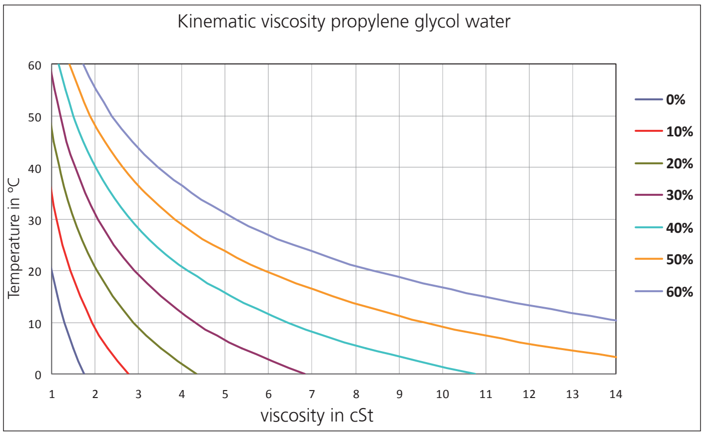


voltage output with
temperature output 0 ...10 V

With the following definitions we are able to correct the influence of media with higher viscosity than water (= media viscosity > 1.8 cST) in order to reach a measuring accuracy of 3% fs in the range of 1.8 - 4 cST and of 4% in the range of 4 - 14 cSt (υ = viscosity in cSt).

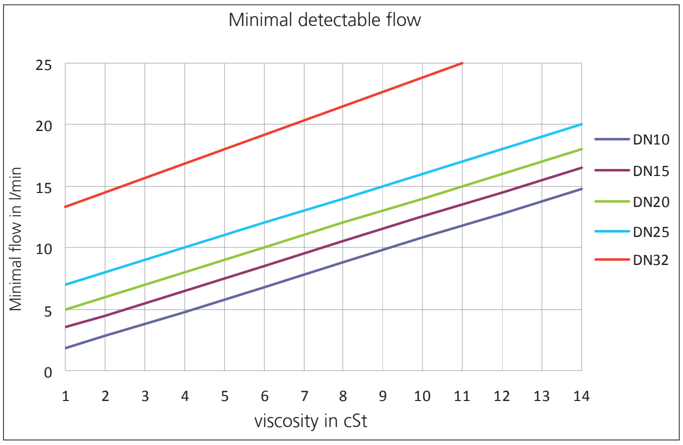
Definition of viscosity of glycol-water-compound

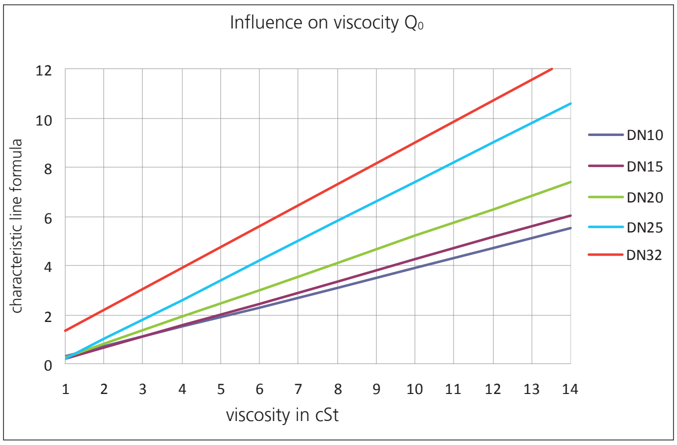




Definition of respond threshold Q_{min}

Definition of characteristic line formula $Q_V = k_f * f + Q_0$





Formula respond threshold Q_{min} in l/min

< DN10 not possible

DN10: $Q_{min} = \upsilon + 0.8$
DN15: $Q_{min} = \upsilon + 2.5$
DN20: $Q_{min} = \upsilon + 4$
DN25: $Q_{min} = \upsilon + 8$
DN32: $Q_{min} = \upsilon + 13$

Formula characteristic line for $Q \geq Q_{min}$ in l/min

< DN10 not possible

Frequency output:
DN10: $Q = K_f * f - 0.40\upsilon + 0.20$
DN15: $Q = K_f * f - 0.45\upsilon + 0.25$
DN20: $Q = K_f * f - 0.55\upsilon + 0.25$
DN25: $Q = K_f * f - 0.80\upsilon + 0.60$
DN32: $Q = K_f * f - 0.85\upsilon - 0.55$

Voltage output 0 ...10 V
DN10: $Q = K_U * U_{Out} - 0.40\upsilon + 0.40$
DN15: $Q = K_U * U_{Out} - 0.45\upsilon + 0.45$
DN20: $Q = K_U * U_{Out} - 0.55\upsilon + 0.55$
DN25: $Q = K_U * U_{Out} - 0.80\upsilon + 0.80$
DN32: $Q = K_U * U_{Out} - 0.85\upsilon + 0.85$

Current output 4 ... 20 mA (I in mA)
DN10: $Q = K_I * (I - 4\ mA) - 0.40\upsilon + 0.40$
DN15: $Q = K_I * (I - 4\ mA) - 0.45\upsilon + 0.45$
DN20: $Q = K_I * (I - 4\ mA) - 0.55\upsilon + 0.55$
DN25: $Q = K_I * (I - 4\ mA) - 0.80\upsilon + 0.80$
DN32: $Q = K_I * (I - 4\ mA) - 0.85\upsilon + 0.855$

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