Huba Control

FOR FINE PRESSURE AND FLOW MEASUREMENT

Flow sensor for liquid media type 230

Flow range
1.8 ... 150 l/min

Nominal diameters
DN 10 / 15 / 20 / 25

Temperature measurement
-40 ... +125 °C

The flow sensor type 230 is based on the Kármán vortex trail. You can choose between various versions as integrated temperature measurement.

The type 230 has a rugged construction of red brass.
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
- Zinc free red brass housing
- Drinking water approval

Technical Overview

Flow measurement

Measuring principle			Vortex	Piezoelectric sensor element
Measuring range				1.8 ... 150 l/min
Nominal diameters				DN 10 / 15 / 20 / 25
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 < 100 ms Response time < 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 * T
0 ... 10 V		Measuring range		-25 ... +125 °C
		Accuracy		± 0.5 K ± 0.005 * T
		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	Red brass / PA6T/6I (40% GF)
Sealing material	EPDM (perox.)

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} oder 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	–

Weight

DN 10	outside thread L	~ 230 g
DN 15	outside thread A	~ 240 g
	outside thread L	~ 310 g
DN 20	outside thread A	~ 340 g
	outside thread L	~ 440 g
DN 25	outside thread A	~ 510 g
	outside thread L	~ 600 g

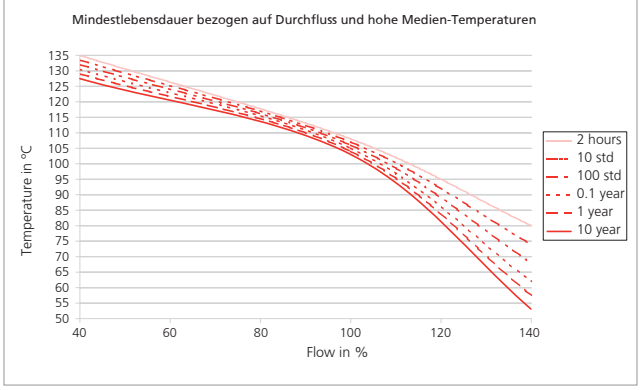
Test / Admissions

Drinking water approval	
Electromagnetic compatibility	CE-conform acc. to EN 61326-2-3

Packaging

Single packaging

Minimum life span on high flow rate and high temperature



[1] against GND only

Nominal diameters dependent variables

Nominal diameters	Connection	Measuring range	Quantity per puls	Flow range	Characteristic line frequency output	Frequency range	Characteristic line voltage outout	Characteristic line current output	Pressure drop [1), 2)]
DN 10	Outside thread heavy	1.8 ... 32 l/min	1.378 ml	0.265 ... 4.716 m/s	0.0837 * f - 0.2	24 ... 385 Hz	Q = 3.2 * U_{OUT_Q}	Q = 2.000 * (I - 4 mA)	22.50 * Q^2
DN 10	Outside thread heavy	2.0 ... 40 l/min	1.381 ml	0.295 ... 5.895 m/s	0.0837 * f - 0.2	26 ... 480 Hz	Q = 4.0 * U_{OUT_Q}	Q = 2.500 * (I - 4 mA)	22.50 * Q^2
DN 15	Outside thread small	3.5 ... 50 l/min	2.998 ml	0.290 ... 4.145 m/s	0.1813 * f - 0.2	20 ... 277 Hz	Q = 5.0 * U_{OUT_Q}	Q = 3.125 * (I - 4 mA)	6.70* Q^2
	Outside thread heavy		2.975 ml		0.1799 * f - 0.2	21 ... 279 Hz			
DN 20	Outside thread small	5.0 ... 85 l/min	6.109 ml	0.265 ... 4.509 m/s	0.3691 * f - 0.3	14 ... 231 Hz	Q = 8.5 * U_{OUT_Q}	Q = 5.313 * (I - 4 mA)	2.50 * Q^2
	Outside thread heavy		6.057 ml		0.3660 * f - 0.3	14 ... 233 Hz			
DN 25	Outside thread small	9.0 ... 150 l/min	12.114 ml	0.283 ... 4.709 m/s	0.7288 * f - 0.2	13 ... 206 Hz	Q = 15 * U_{OUT_Q}	Q = 9.375 * (I - 4 mA)	0.92 * Q^2
	Outside thread heavy		12.143 ml		0.7305 * f - 0.2				

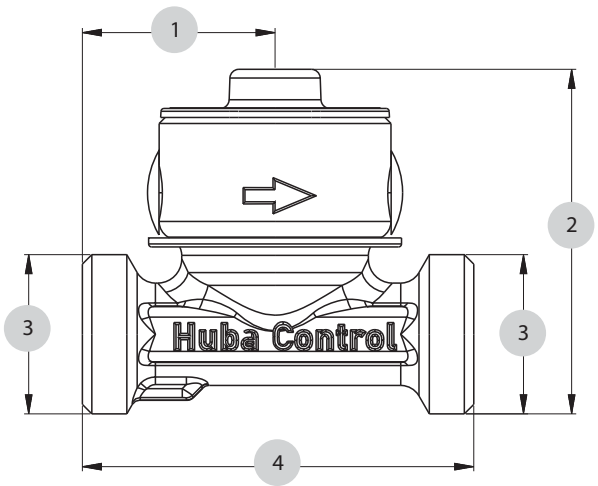
Order code selection table

				230.	X	X	X	X	X	X	X
Version	Flow				9				4		
	Flow and temperature (PT1000)				8				5		
	Flow and temperature (0 ... 10 V)				6				5		
Nominal diameters and flow range	DN 10	1.8 ... 32 l/min.				1	0				L
	DN 10	2.0 ... 40 l/min.				1	1				L
	DN 15	3.5 ... 50 l/min.				1	5				
	DN 20	5.0 ... 85 l/min.				2	0				
	DN 25	9.0 ... 150 l/min.				2	5				
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			
	Analogue signal 4 ... 20 mA		8 ... 33 VDC		8,9			4			
Electrical connection	Connector M12x1	2- or 3-pole	(condensation protection)		9				4		
	Connector M12x1	4- or 5-pole	(condensation protection)		8,6				5		
Sealing material	EPDM Ethylene propylene rubber (peroxidically cross-linked)									1	
Red brass body	Red brass armature outside thread A (see dimension diagram)										A
	Red brass armature outside thread L (see dimension diagram)										L

Accessories [3)]

				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				115024

Dimension diagram DN 10, 15, 20, 25



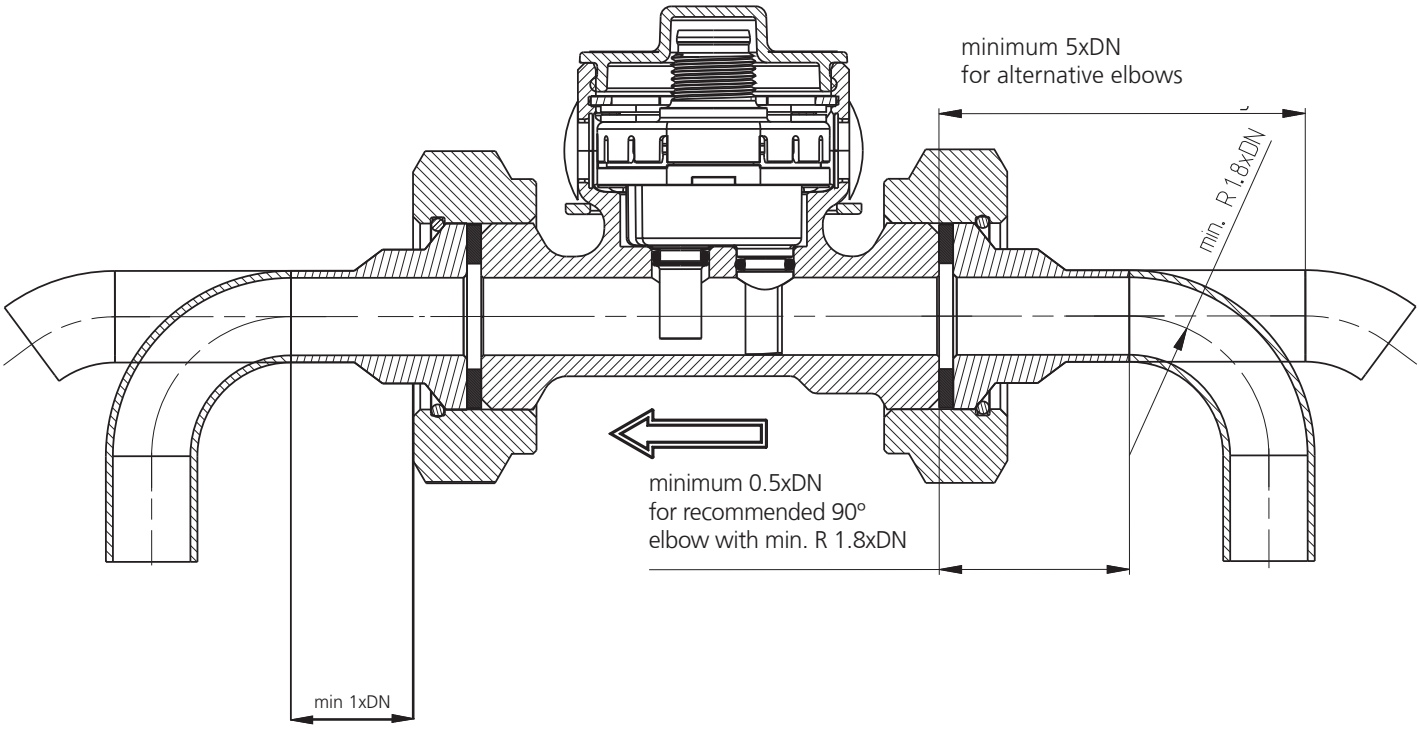
		1	2	3	4
DN10	L	32	57.22	G ¾	65
DN15	A	40	59.22	G ¾	75
DN15	L	40	62.65	G 1	75
DN20	A	49	64.62	G 1	86
DN20	L	49	68.95	G 1¼	86
DN25	A	70	71.45	G 1¼	109
DN25	L	70	74.40	G 1½	109

[1)] incl. 3xDi inlet and outlet side [2)] Pv in Pa; Q in l/min [3)] Accessories supplied loose

Tube mounting instructions

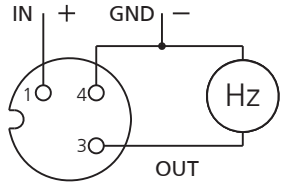
Consider the following to ensure the correct function of the sensor.

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

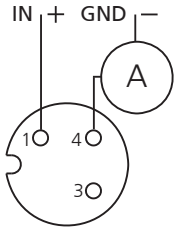


Electrical connection

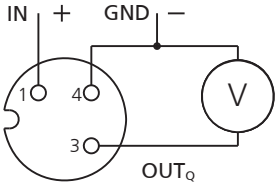
Connector M12x1 without temperature measurement (1)



Frequency output



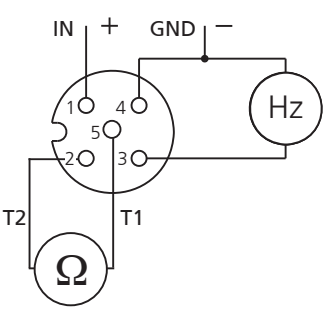
current output



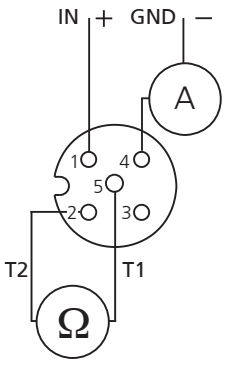
voltage output

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

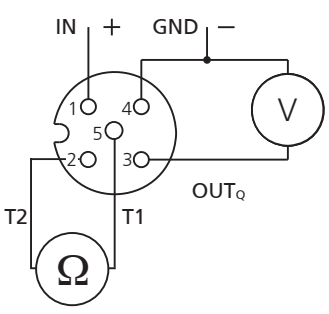
Connector M12x1 with temperature measurement (2)



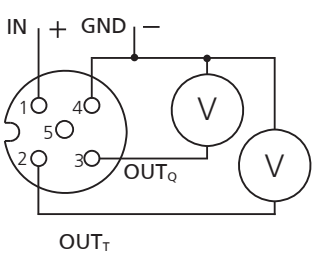
Frequency output
with PT1000



current output
with PT1000



voltage output
with PT1000

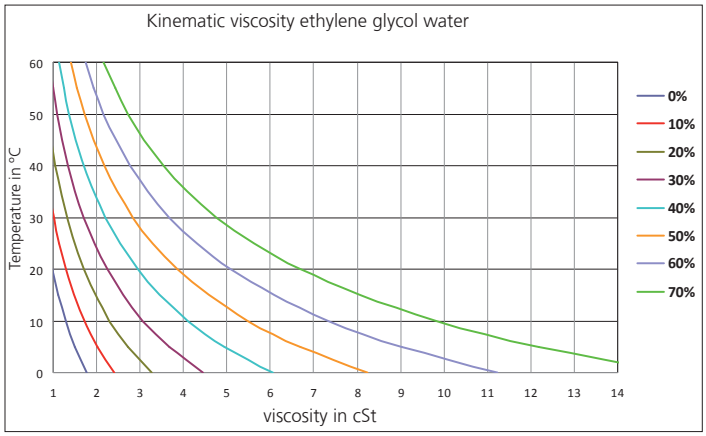


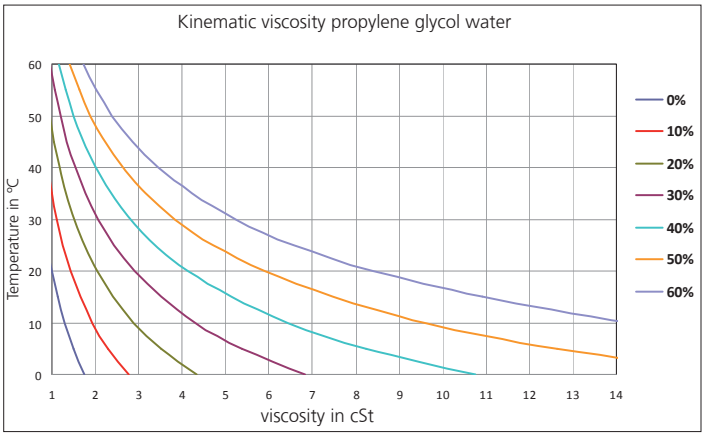
voltage output with
temperature output 0 ...10 V

Influence of glycol

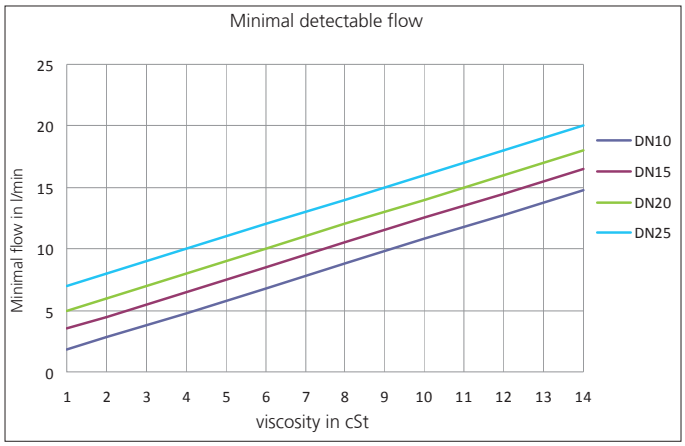
With the following definitions we are able to correct the influence of media with higher viscosity than water (= media viscosity > 1.8 cST) in order to reach a measuring accuracy of 3% fs in the range of 1.8 - 4 cST and of 4% in the range of 4 - 14 cSt (υ = viscosity in cSt).

Definition of viscosity of glycol-water-compound

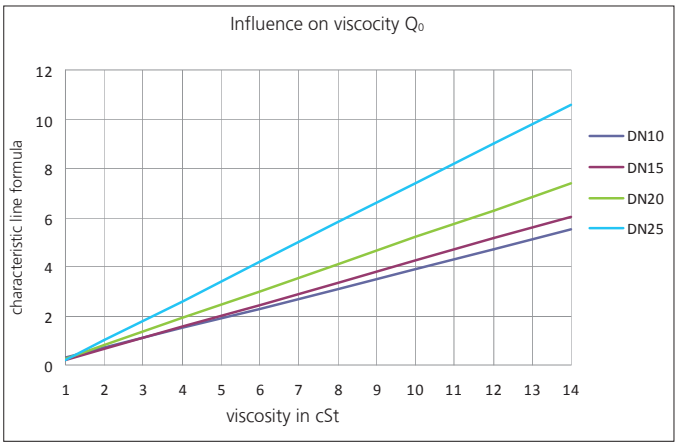




Definition of respond threshold Q_{min}



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



Formula respond threshold Q_{min} in l/min

< DN 10 not possible

DN 10: $Q_{min} = \upsilon + 0.8$
DN 15: $Q_{min} = \upsilon + 2.5$
DN 20: $Q_{min} = \upsilon + 4.0$
DN 25: $Q_{min} = \upsilon + 6.0$

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

< DN 10 not possible

Frequency output:
DN10: $Q = 0.0832 * f - 0.40\upsilon + 0.20$
DN15: $Q = 0.1843 * f - 0.45\upsilon + 0.25$
DN20: $Q = 0.3754 * f - 0.55\upsilon + 0.25$
DN25: $Q = 0.7467 * f - 0.80\upsilon + 0.60$

Voltage output 0 ...10 V
DN10: $Q = 3.2 * U_{Out} - 0.40\upsilon + 0.40$
DN15: $Q = 5.0 * U_{Out} - 0.45\upsilon + 0.45$
DN20: $Q = 8.5 * U_{Out} - 0.55\upsilon + 0.55$
DN25: $Q = 15.0 * U_{Out} - 0.80\upsilon + 0.80$

Current output 4 ... 20 mA (I in mA)
DN10: $Q = 2.000 * (I - 4\ mA) - 0.40\upsilon + 0.40$
DN15: $Q = 3.125 * (I - 4\ mA) - 0.45\upsilon + 0.45$
DN20: $Q = 5.313 * (I - 4\ mA) - 0.55\upsilon + 0.55$
DN25: $Q = 9.375 * (I - 4\ mA) - 0.80\upsilon + 0.80$