

# Flow sensor for liquid media type 210

Flow range  
0.9 ... 150 l/min

Nominal diameters  
DN 8 / 10 / 15 / 20 / 25

Temperature measurement  
-40 ... +125 °C

In comparison to the OEM flow sensor (type 200), the type 210 is available with an increased range of power supply and output signals all with and without 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 KTW, W270, WRAS

## Technical overview

### Flow measurement

Measuring principle	Vortex	Piezoelectric sensor element
Measuring range		0.9 ... 150 l/min
Nominal diameters		DN 8 / 10 / 15 / 20 / 25
Accuracy at < 50% fs (water)		< 1% fs
Accuracy at > 50% fs (water)		< 2% measuring value
Response time	Immediately	Signal delay < 100 ms
	Therefore suitable for spigot use.	Response time < 5 ms
		Frequency output
		Analogue output
		Signal delay < 2 s
		Response time < 500 ms

### Temperature measurement

Measuring principle	Resistance	PT1000
	Measuring range	-40 ... +125 °C
PT1000	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) = $\pm 150 \frac{U_{OUT}}{10 V} * U_{OUT,T} - 25$ °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
	(for lifetime)	12 bar at +40 °C
Max. pressure and medium temperature	(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-konform)

Sensor paddle	ETFE
Case with damming body	PAGT/6I (Grivory 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 against GND or IN		< 1 mA / < 100 nF	< 6 mA / < 100 nF <sup>1)</sup>	< ( $U_{IN} - 8 V$ ) / 20 mA
Current consumption load free ( $I_{IN}$ )		< 2mA	< 5 mA	–

### Characteristic line:

	Frequency output		Voltage output	current output
	Characteristic line	Frequency range	Quantity per puls	Characteristic line
DN 8	$Q = 0.0350 * f - 0.3$	~ 34 ... 437 Hz	~ 0.56 ml	$Q = 1.5 * U_{OUT,Q}$
DN 10	$Q = 0.0845 * f - 0.2$	~ 24 ... 382 Hz	~ 1.40 ml	$Q = 3.2 * U_{OUT,Q}$
DN 15	$Q = 0.1870 * f - 0.2$	~ 19 ... 269 Hz	~ 3.09 ml	$Q = 5.0 * U_{OUT,Q}$
DN 20	$Q = 0.3730 * f - 0.3$	~ 14 ... 229 Hz	~ 6.22 ml	$Q = 8.5 * U_{OUT,Q}$
DN 25	$Q = 0.7440 * f - 0.2$	~ 12 ... 202 Hz	~ 12.40 ml	$Q = 15.0 * U_{OUT,Q}$
				$Q = 0.938 * (I - 4 mA)$
				$Q = 2.000 * (I - 4 mA)$
				$Q = 3.125 * (I - 4 mA)$
				$Q = 5.313 * (I - 4 mA)$
				$Q = 9.375 * (I - 4 mA)$

### Nominal diameters dependent variables

	Measuring range	Flow rate	Pressure drop <sup>2), 3)</sup>	Weight
DN 8	0.9 ... 15 l/min	0.30 ... 5.0 m/s	$P_v = 85.00 * Q^2$	~ 47 g
DN 10	1.8 ... 32 l/min	0.32 ... 5.6 m/s	$P_v = 22.50 * Q^2$	~ 57 g
DN 15	3.5 ... 50 l/min	0.33 ... 4.7 m/s	$P_v = 6.70 * Q^2$	~ 68 g
DN 20	5.0 ... 85 l/min	0.29 ... 5.0 m/s	$P_v = 2.50 * Q^2$	~ 92 g
DN 25	9.0 ... 150 l/min	0.33 ... 5.5 m/s	$P_v = 0.92 * Q^2$	~ 100 g

### Test / Admissions

Drinking water approval	KTW / W270 / WRAS
Electromagnetic compatibility	CE conformity acc. to EN 61326-2-3

### Packaging (multiple packaging)

	Connection copper tube	Outside thread K	Outside thread G
DN 8 / 10	Blister 30x	Blister 30x	Blister 30x
DN 15	Blister 30x	Blister 30x	Blister 20x
DN 20	Blister 20x	Blister 20x	Blister 15x
DN25	–	Blister 15x	Blister 15x

<sup>1)</sup> against GND only

<sup>2)</sup> incl. 3xDI inlet and outlet side

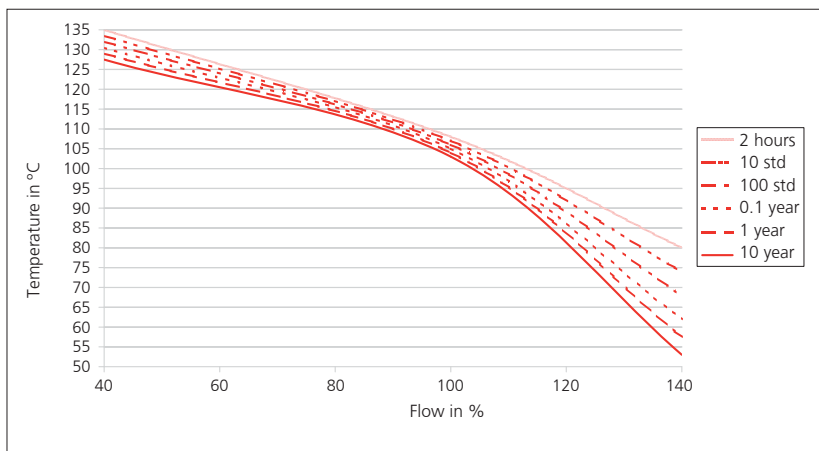
<sup>3)</sup>  $P_v$  in Pa;  $Q$  in l/min

Order code selection table				210.	X	X	X	X	X	X	X	X
Version	Flow			9								
	Flow and temperature (PT1000)			8								
	Flow and temperature (0 ... 10 V)			6								
Nominal diameters and flow range	DN 8	0.9 ... 15 l/min.			0	8						
	DN 10	1.8 ... 32 l/min.			1	0						
	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						K,G
Output / 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		3-pole (condensation protection)	9					4			
	Connector M12x1		5-pole (condensation protection)	8,6					5			
Sealing material	EPDM Ethylene propylene rubber (peroxidically cross-linked)									1		
Tube connection	Plastic PA6T / 6l		connection copper tube (max. DN 20)									N
	Plastic PA6T / 6l		outside thread K (see dimension diagram)									K
	Plastic PA6T / 6l		outside thread G (see dimension diagram)									G

### Accessories <sup>1)</sup>

				Order number
Connection kit <sup>2)</sup> DN 8, 10 with copper tube				113775
Connection kit <sup>2)</sup> DN 8, 10 with adapter Rp ¾			Stainless steel 1.4305/AISI 303	113776
Connection kit <sup>2)</sup> DN 15 with copper tube				113777
Connection kit <sup>2)</sup> DN 15 with adapter Rp ½			Stainless steel 1.4305/AISI 303	113778
Connection kit <sup>2)</sup> DN 20 with copper tube				113779
Connection kit <sup>2)</sup> DN 20 with adapter Rp ¾			Stainless steel 1.4305/AISI 303	113780
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
Clip for DN 8,10				112116
Clip for DN 15				110941
Clip for DN 20				112122
O-Ring for DN 8, DN 10	EPDM	ø 13.95 x 2.62	Copper tube and adapter	112124
O-Ring for DN 15	EPDM	ø 17.86 x 2.62	Copper tube and adapter	112265
O-Ring for DN 20	EPDM	ø 21.89 x 2.62	Copper tube and adapter	112723
O-Ring for DN 25	EPDM	ø 31 x 3	(as a replacement, already assembled)	112792
Connection copper tube for DN 8, 10			L=150 mm	112121
Connection copper tube for DN 15			L=150 mm	112211
Connection copper tube for DN 20			L=150 mm	112306
Adapter for DN 8 und DN 10	Rp ¾		Stainless steel 1.4305/AISI 303	112655
Adapter for DN 15	Rp ½		Stainless steel 1.4305/AISI 303	112660
Adapter for DN 20	Rp ¾		Stainless steel 1.4305/AISI 303	112661

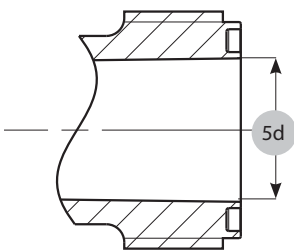
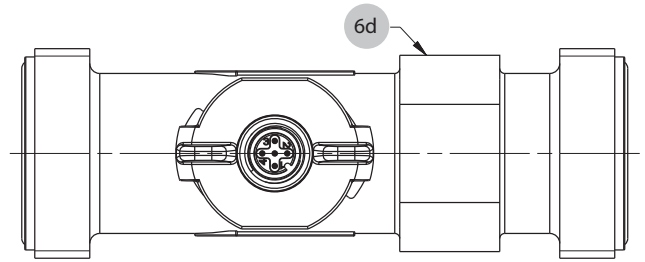
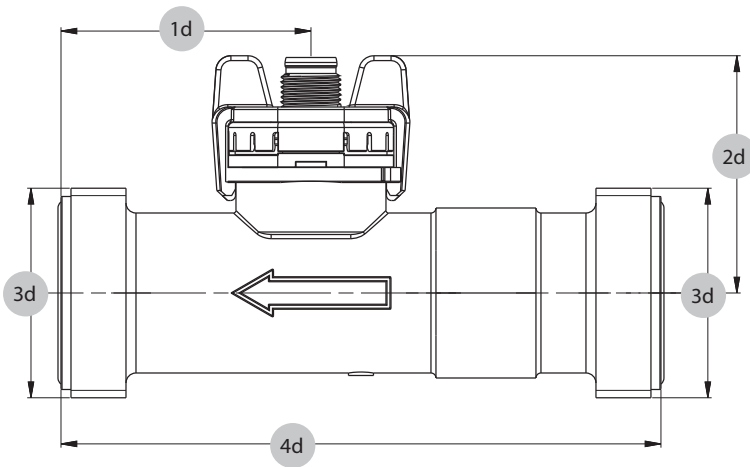
### Minimum life span on high flow rate and high temperature



<sup>1)</sup> Accessories supplied loose

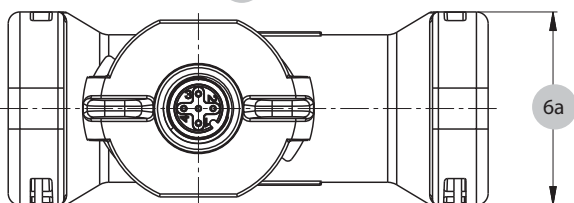
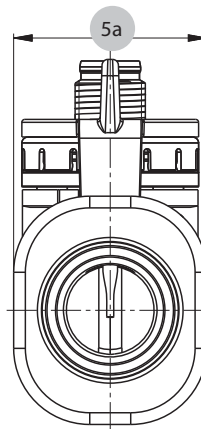
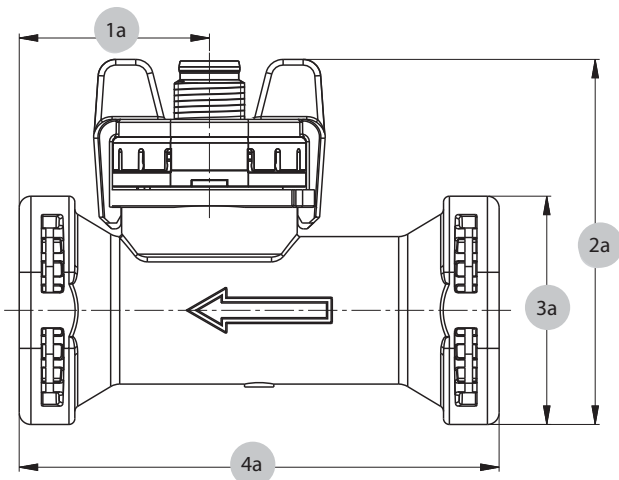
<sup>2)</sup> Connection set includes: 2x Clip, 2x Copper tubes or Adapter and 2x O-Ring

Dimension diagram DN 8, 10, 15, 20, 25



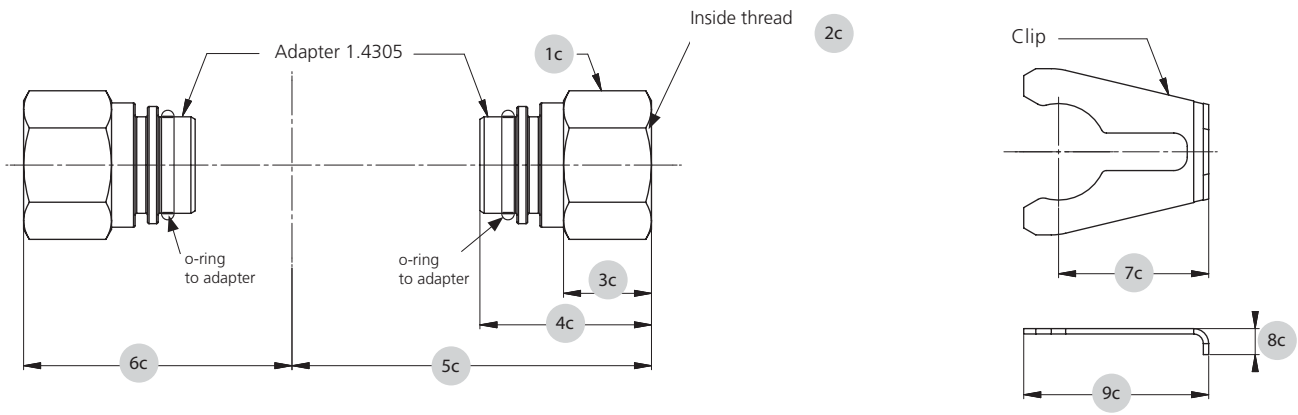
		1d	2d	3d	4d	5d	6d
DN8	K	43.7	42.50	G ½	77	12	12
DN8	G	48.2	42.50	G ¾	86	12	12
DN10	K	35.0	40.85	G ½	81	12	19
DN10	G	39.5	40.85	G ¾	90	12	19
DN15	K	36.6	42.85	G ¾	87	16	22
DN15	G	41.6	42.85	G 1	97	16	22
DN20	K	36.6	44.85	G 1	105	20	27
DN20	G	42.6	44.85	G 1¼	117	20	27
DN25	K	50.0	47.35	G 1¼	120	26	34
DN25	G	56.0	47.35	G 1½	132	26	34

Dimension diagram DN 8, 10, 15, 20



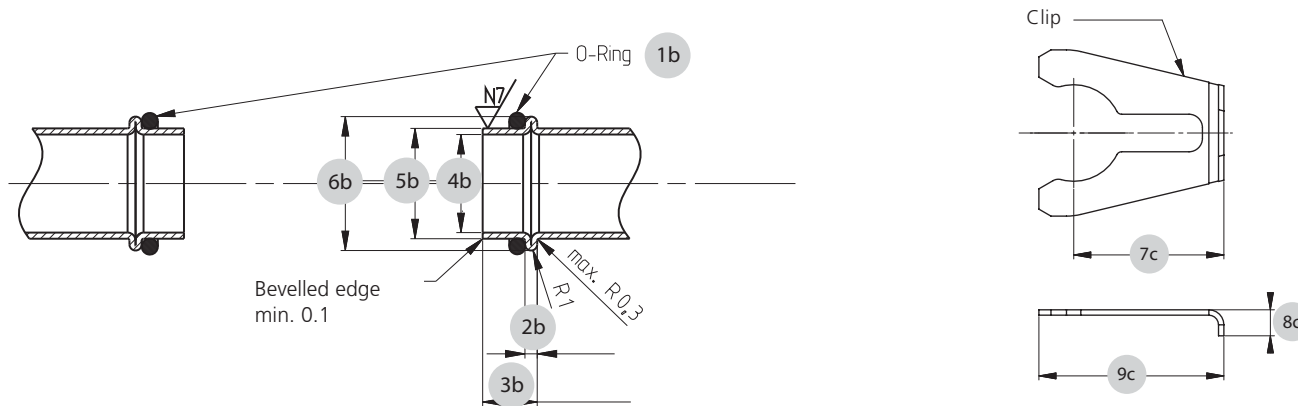
	1a	2a	3a	4a	5a	6a
DN8	29.5	59.0	32.9	72	30.2	28.9
DN10	32.5	57.3	32.9	77	30.2	28.9
DN15	32.5	62.4	39.0	82	30.2	33.0
DN20	39.3	66.3	43.0	105	30.2	37.4

## Accessories DN 8, 10, 15, 20



	1c	2c	3c	4c	5c	6c	7c	8c	9c
DN8	22	Rp 3/8 DIN 2999 length min. 9	14.0	29	57.65	44.65	24.5	6.00	30.8
DN10	22	Rp 3/8 DIN 2999 length min. 9	14.0	29	59.65	47.55	24.5	6.00	30.8
DN15	24	Rp 1/2 DIN 2999 length min. 11.5	16.4	32	67.05	50.05	28.0	4.85	34.5
DN20	30	Rp 3/4 DIN 2999 length min. 13	18.5	38	82.25	58.85	28.0	8.00	34.5

## Geometry of customers connection tube DN 8, 10, 15, 20

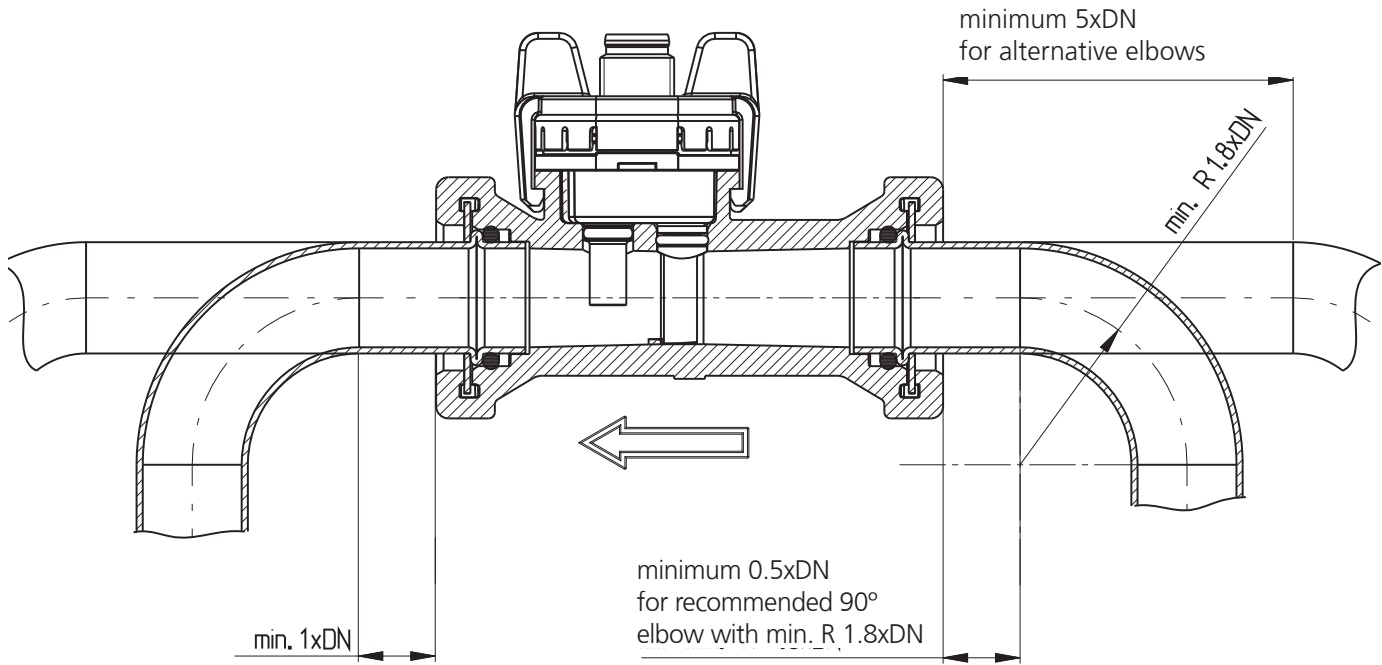


	1b	2b	3b	4b	5b	6b	7c	8c	9c
DN8	∅ 13.95x2.62	2 ± 0.2	8.9 ± 0.2	∅ 13 ± 0.2	∅ 15.00 ± 0.08	∅ 18.88 ± 0.1	24.5	6.00	30.8
DN10	∅ 13.95x2.62	2 ± 0.2	8.9 ± 0.2	∅ 13 ± 0.2	∅ 15.00 ± 0.08	∅ 18.88 ± 0.1	24.5	6.00	30.8
DN15	∅ 17.86x2.62	2 ± 0.2	8.9 ± 0.3	∅ 16 ± 0.2	∅ 18.00 <sup>+0.08</sup> <sub>-0.06</sub>	∅ 21.85 ± 0.1	28.0	4.85	34.5
DN20	∅ 21.89x2.62	2 ± 0.2	12.9 ± 0.3	∅ 20 ± 0.2	∅ 22.00 <sup>+0.08</sup> <sub>-0.06</sub>	∅ 25.85 ± 0.1	28.0	8.00	34.5

## Tube mounting instructions

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

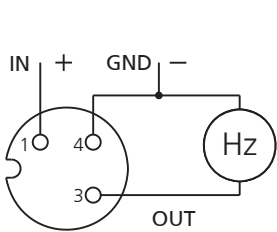
- Only diameter changes from large to small are allowed.
- Avoid repeated elbows in the same level at entryside



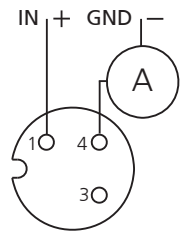
## Electrical connection

Connector M12x1 without temperature measurement

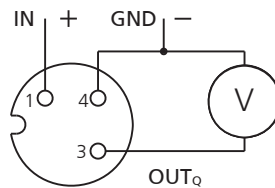
1



Frequency output



current output

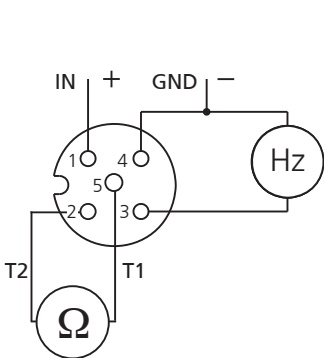


voltage output

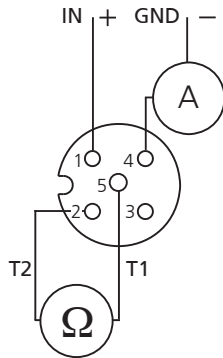
Pin	Colour
1	brown
3	blue
4	black
1	brown
2	white
3	blue
4	black
5	gray

Connector M12x1 with temperature measurement

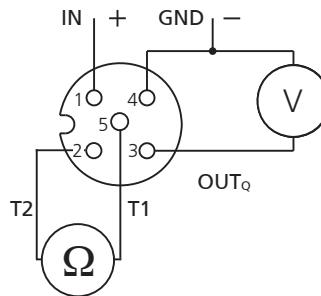
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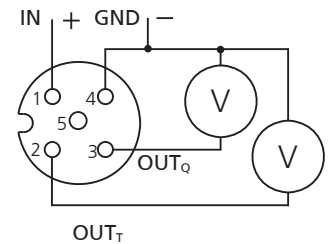
frequency output with PT1000



current output with PT1000



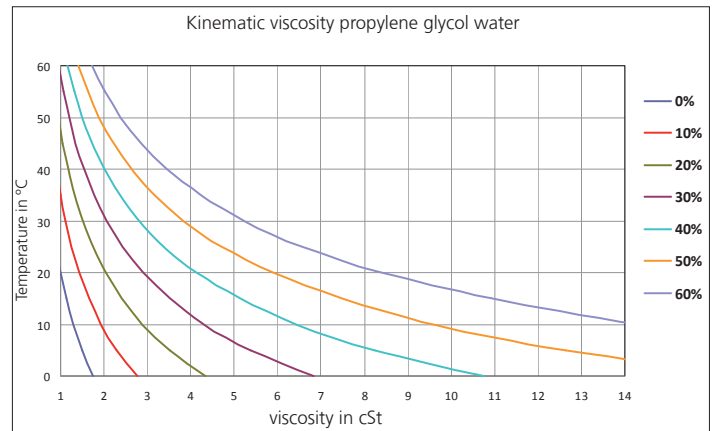
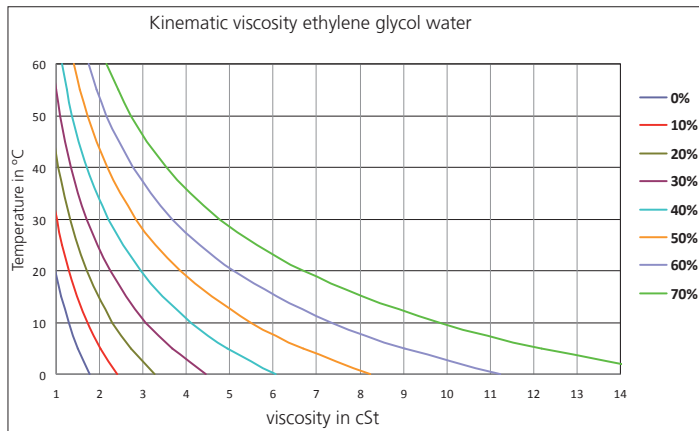
voltage output with PT1000



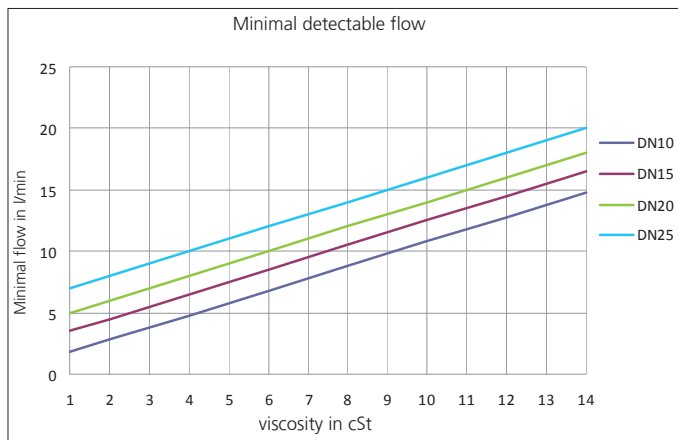
voltage output with temperature output 0 ... 10 V

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 (= viscosity in cSt).

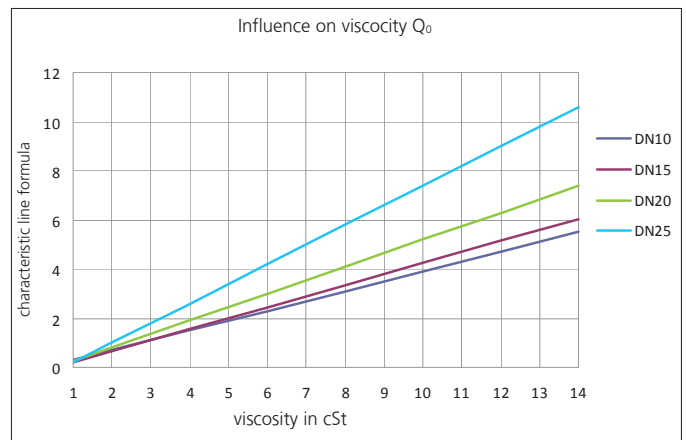
## Definition of viscosity of glycol-water-compound



## 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:  $Q_{min} = v + 0.8$
- DN 15:  $Q_{min} = v + 2.5$
- DN 20:  $Q_{min} = v + 4.0$
- DN 25:  $Q_{min} = v + 6.0$

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

Frequency output:

- DN10:  $Q = 0.0845 * f - 0.40v + 0.20$
- DN15:  $Q = 0.1870 * f - 0.45v + 0.25$
- DN20:  $Q = 0.3730 * f - 0.55v + 0.25$
- DN25:  $Q = 0.7440 * f - 0.80v + 0.60$

Voltage output 0 ... 10 V

- DN10:  $Q = 3.2 * U_{Out} - 0.40v + 0.40$
- DN15:  $Q = 5.0 * U_{Out} - 0.45v + 0.45$
- DN20:  $Q = 8.5 * U_{Out} - 0.55v + 0.55$
- DN25:  $Q = 15.0 * U_{Out} - 0.80v + 0.80$

Current output 4 ... 20 mA (I in mA)

- DN10:  $Q = 2.000 * (I - 4 \text{ mA}) - 0.40v + 0.40$
- DN15:  $Q = 3.125 * (I - 4 \text{ mA}) - 0.45v + 0.45$
- DN20:  $Q = 5.313 * (I - 4 \text{ mA}) - 0.55v + 0.55$
- DN25:  $Q = 9.375 * (I - 4 \text{ mA}) - 0.80v + 0.80$

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