

Flow sensor for liquid media type 210

Flow range
0.5 ... 150 l/min

Nominal diameters
DN 6 / 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

Technical overview

Flow measurement

Measuring principle	Vortex	Piezoelectric sensor element
Measuring range		0.5 ... 150 l/min
Nominal diameters		DN 6 / 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	Signal delay < 2 s
	Analogue output	Response time < 500 ms

Temperature measurement (> 8 DN)

Measuring principle	Resistance	PT1000
Measuring range		-40 ... +125 °C
PT1000	Accuracy	class B DIN EN 60751
		@ T = 0 °C
		@ T ≠ 0 °C
		± 0.3 K
		± 0.3 K ± 0.005 * T
	Measuring range	-25 ... +125 °C
	Accuracy	± 0.5 K ± 0.005 * T
0 ... 10 V	Calculation temperature	T (°C) = $\frac{U_{OUT,T} - 10V}{10V} * U_{OUT,T} - 25 °C$
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	Other medium on request
	Drinking water	
Temperature	Media	< +125 °C
	Ambient	-15 ... +85 °C
	Storage	-30 ... +85 °C
	(for lifetime)	12 bar at +40 °C
	(for lifetime)	6 bar at +100 °C
Max. pressure and medium temperature	(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	PA6T/6I (40% GF)
Sealing material	EPDM (perox.)
	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 against 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 6 / 8	~ 47 g
DN 10	~ 57 g
DN 15	~ 68 g
DN 20	~ 92 g
DN 25	~ 100 g

Test / Admissions

Electromagnetic compatibility	CE conformity acc. to EN 61326-2-3
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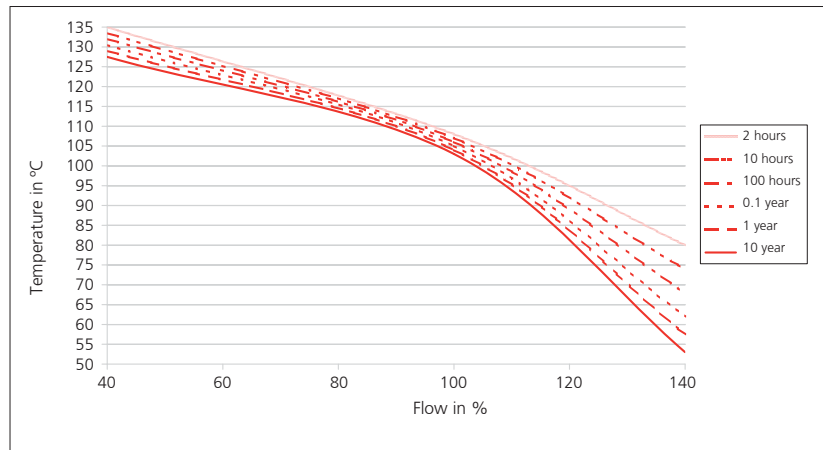
Packaging (multiple packaging)	Connection copper tube	Outside thread K	Outside thread G
DN 6	–	Blister 30x	Blister 30x
DN 8 / 10	Blister 30x	Blister 30x	Blister 30x
DN 15	Blister 30x	Blister 30x	Blister 20x
DN 20	Blister 20x	Blister 20x	Blister 15x
DN25	–	Blister 15x	Blister 15x

¹⁾ against GND only

Nominal diameters dependent variables

Nominal diameters	Tube connection	Measuring range	Quantity per puls @ 50% fs	Flow range	Characteristic line frequency output	Frequency range	Characteristic line voltage output	Characteristic line current output	Pressure drop ^{1), 2)}
DN 6	K	0.5 ... 10 l/min	0.386 ml	0.074 ... 1.474 m/s	0.0238 * f - 0.14	28 ... 427 Hz	Q = 1.0 * U _{OUT,Q}	Q = 0.625 * (I - 4 mA)	240 * Q ²
	G								
DN 8	K	0.9 ... 15 l/min	0.638 ml	0.133 ... 2.210 m/s	0.0398 * f - 0.3	30 ... 384 Hz	Q = 1.5 * U _{OUT,Q}	Q = 0.938 * (I - 4 mA)	85.00 * Q ²
	G		0.631 ml		0.0394 * f - 0.3	30 ... 388 Hz			
	N		0.614 ml		0.0383 * f - 0.3	31 ... 399 Hz			
DN 10	K	1.8 ... 32 l/min	1.399 ml	0.265 ... 4.716 m/s	0.0850 * f - 0.2	24 ... 379 Hz	Q = 3.2 * U _{OUT,Q}	Q = 2.000 * (I - 4 mA)	22.50 * Q ²
	G		1.370 ml		0.0832 * f - 0.2	24 ... 387 Hz			
	N		1.384 ml		0.0841 * f - 0.2	24 ... 383 Hz			
DN 10	K	2.0 ... 40 l/min	1.403 ml	0.295 ... 5.895 m/s	0.0850 * f - 0.2	26 ... 473 Hz	Q = 4.0 * U _{OUT,Q}	Q = 2.500 * (I - 4 mA)	22.50 * Q ²
	G		1.373 ml		0.0832 * f - 0.2	26 ... 483 Hz			
	N		1.388 ml		0.0841 * f - 0.2	26 ... 478 Hz			
DN 15	K	3.5 ... 50 l/min	3.047 ml	0.290 ... 4.145 m/s	0.1843 * f - 0.2	20 ... 272 Hz	Q = 5.0 * U _{OUT,Q}	Q = 3.125 * (I - 4 mA)	6.70 * Q ²
	G		3.016 ml		0.1824 * f - 0.2	20 ... 275 Hz			
	N		3.077 ml		0.1861 * f - 0.2	20 ... 270 Hz			
DN 20	K	5.0 ... 85 l/min	6.213 ml	0.265 ... 4.509 m/s	0.3754 * f - 0.3	14 ... 227 Hz	Q = 8.5 * U _{OUT,Q}	Q = 5.313 * (I - 4 mA)	2.50 * Q ²
	G		6.125 ml		0.3701 * f - 0.3	14 ... 230 Hz			
	N		6.208 ml		0.3751 * f - 0.3	14 ... 227 Hz			
DN 25	K	9.0 ... 150 l/min	12.412 ml	0.283 ... 4.709 m/s	0.7467 * f - 0.2	12 ... 201 Hz	Q = 15 * U _{OUT,Q}	Q = 9.375 * (I - 4 mA)	0.92 * Q ²
	G		12.251 ml		0.7370 * f - 0.2	12 ... 204 Hz			

Minimum life span on high flow rate and high temperature



Order code selection table

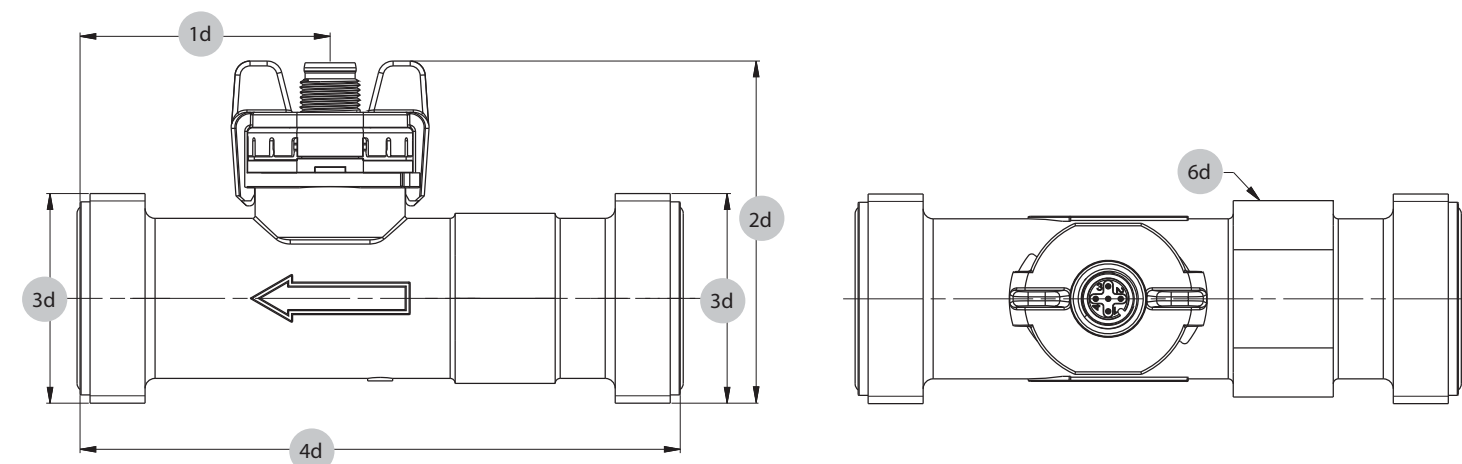
210: X X X X X X X X

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 6 0.5 ... 10 l/min.	9	0	6				K,G
	DN 8 0.9 ... 15 l/min.		0	8				
	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				
	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 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	
	FPM Fluoro elastomer						2	
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 ¹⁾

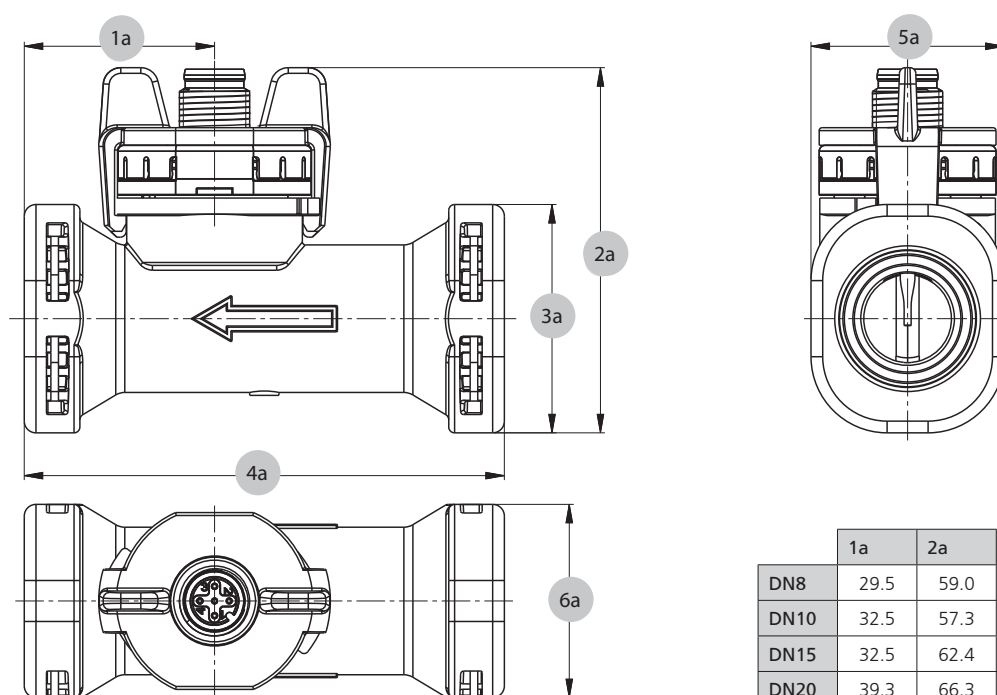
				Order number
Connection kit ²⁾ DN 8, 10 with copper tube				113775
Connection kit ²⁾ DN 8, 10 with adapter Rp ¾		Stainless steel 1.4305/AISI 303		113776
Connection kit ²⁾ DN 15 with copper tube				113777
Connection kit ²⁾ DN 15 with adapter Rp ½		Stainless steel 1.4305/AISI 303		113778
Connection kit ²⁾ DN 20 with copper tube				113779
Connection kit ²⁾ 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

¹⁾ Accessories supplied loose²⁾ Connection set includes: 2x Clip, 2x Copper tubes or adapter and 2x O-Ring

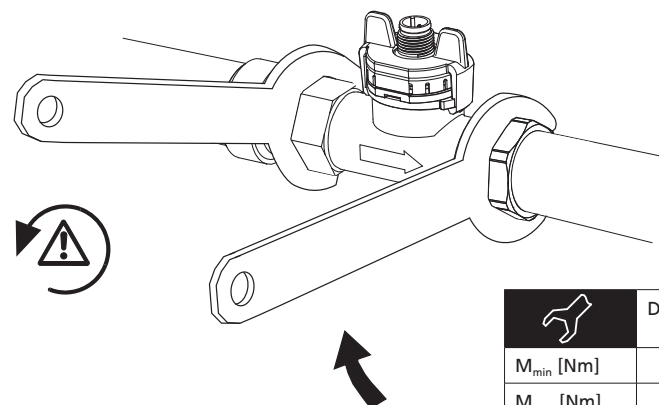


		1d	2d	3d	4d	5d	6d
DN6	K	43.7	53.0	G ½	77	11.5	12
DN6	G	48.2	55.7	G ¾	86	11.5	12
DN8	K	43.7	53.0	G ½	77	11.5	12
DN8	G	48.2	55.7	G ¾	86	11.5	12
DN10	K	35.0	51.3	G ½	81	11.5	19
DN10	G	39.5	54.1	G ¾	90	11.5	19
DN15	K	36.6	56.1	G ¾	87	16	22
DN15	G	41.6	59.5	G 1	97	16	22
DN20	K	36.6	61.5	G 1	105	20	27
DN20	G	42.6	65.8	G 1¼	117	20	27
DN25	K	50.0	68.3	G 1¼	120	26	34
DN25	G	56.0	71.3	G 1½	132	26	34

Dimension diagram DN 8, 10, 15, 20

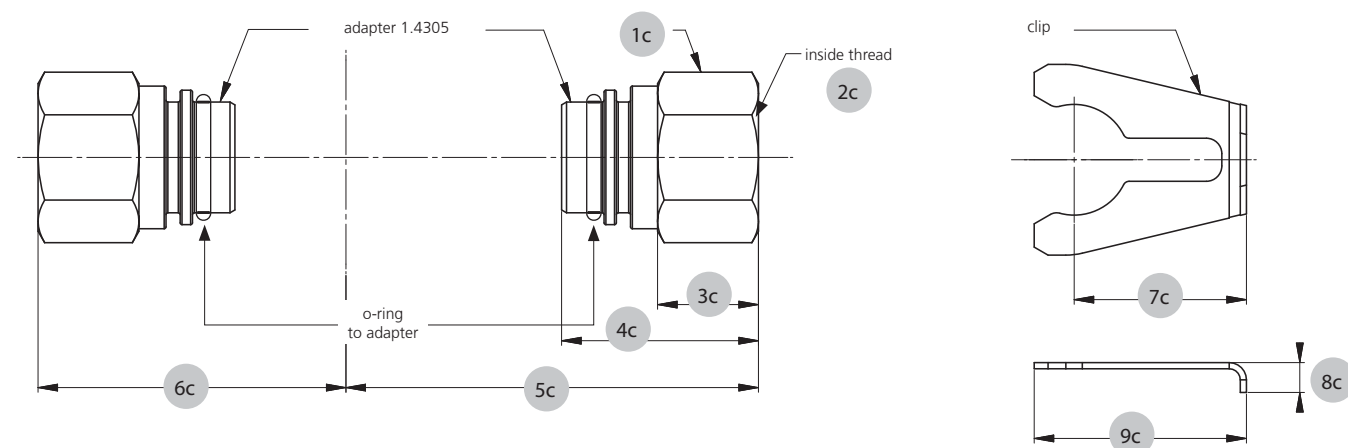


	1a	2a	3a	4a	5a	6a
DN8	29.5	59.0	32.9	72	30.2	28.9
DN10	32.5	57.3	32.9	77	30.2	28.9
DN15	32.5	62.4	39.0	82	30.2	33.0
DN20	39.3	66.3	43.0	105	30.2	37.4



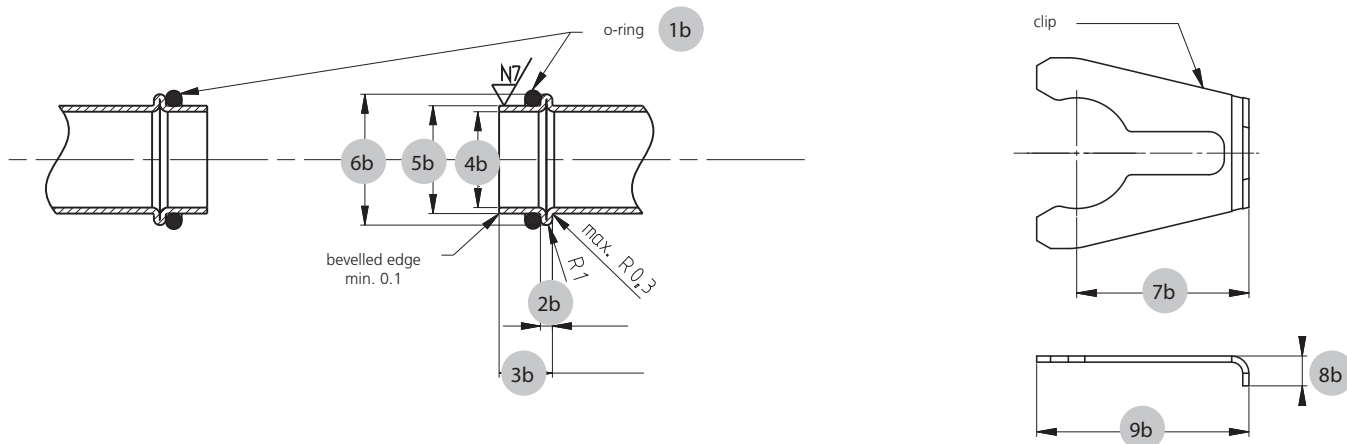
	DN6/8/10 G ½	DN6/8/10 G ¾	DN15 G ¾	DN15 G1	DN20 G1	DN20 G1 ¼	DN25 G1 ¼	DN25 G1 ½
M_{min} [Nm]	1	1	1	2	2	2.5	2.5	2.5
M_{max} [Nm]	12	12	12	12	12	15	15	15

Accessories DN 8, 10, 15, 20



	1c	2c	3c	4c	5c	6c	7c	8c	9c
DN8	22	Rp ¾ DIN 2999 length min. 9	14.0	29	57.65	44.65	24.5	6.00	30.8
DN10	22	Rp ¾ DIN 2999 length min. 9	14.0	29	59.65	47.55	24.5	6.00	30.8
DN15	24	Rp ½ DIN 2999 length min. 11.5	16.4	32	67.05	50.05	28.0	7.30	34.5
DN20	30	Rp ¼ DIN 2999 length min. 13	18.5	38	82.25	58.85	28.0	8.00	34.5

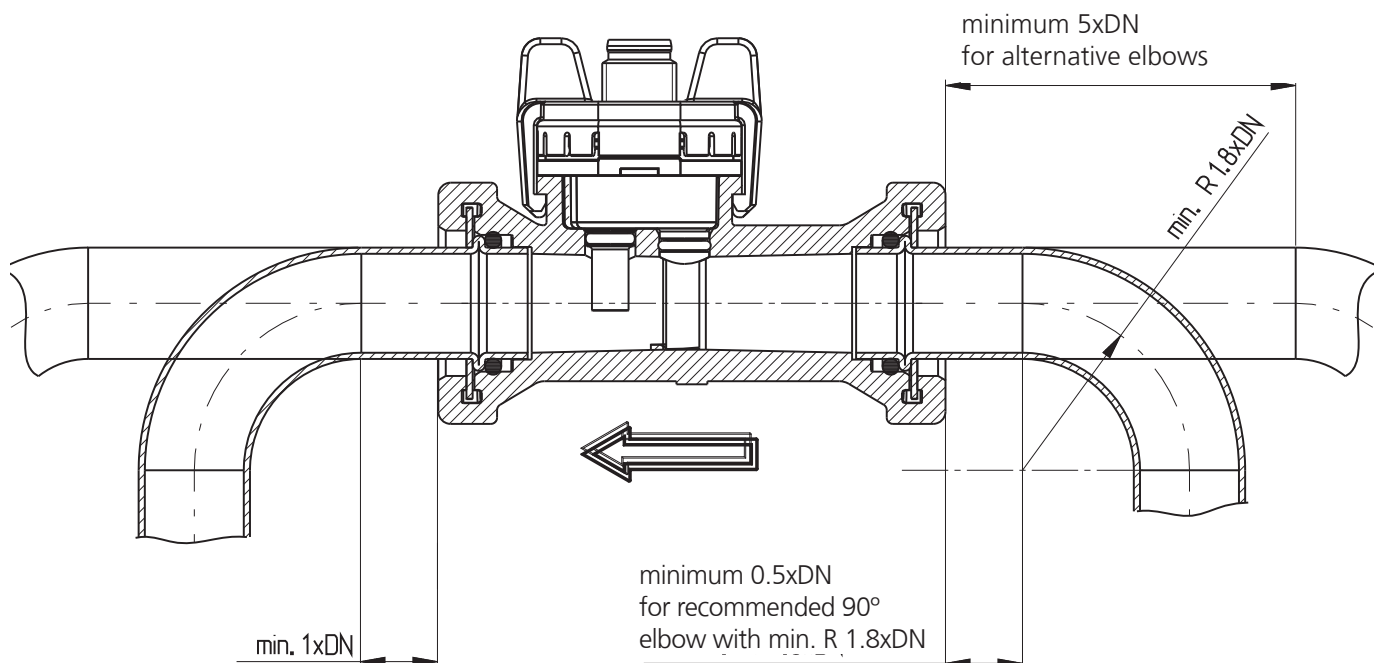
Geometry of customers connection tube DN 8, 10, 15, 20



	1b	2b	3b	4b	5b	6b	7b	8b	9b
DN8	ø 13.95x262	2 ± 0.2	8.9 ± 0.2	ø 13 ± 0.2	ø 15.00 ± 0.08	ø 18.88 ± 0.1	24.5	6.00	30.8
DN10	ø 13.95x262	2 ± 0.2	8.9 ± 0.2	ø 13 ± 0.2	ø 15.00 ± 0.08	ø 18.88 ± 0.1	24.5	6.00	30.8
DN15	ø 17.86x2.62	2 ± 0.2	8.9 ± 0.3	ø 16 ± 0.2	ø 18.00 +0.08 -0.06	ø 21.85 ± 0.1	28.0	7.30	34.5
DN20	ø 21.89x2.62	2 ± 0.2	12.9 ± 0.3	ø 20 ± 0.2	ø 22.00 +0.08 -0.06	ø 25.85 ± 0.1	28.0	8.00	34.5

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

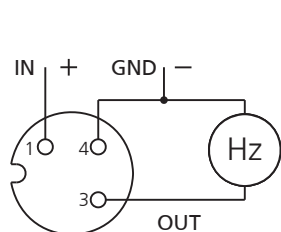
- Only diameter changes from large to small are allowed.
- Avoid repeated elbows in the same level at entryside



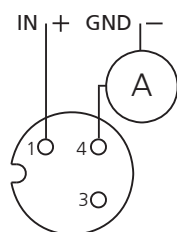
Electrical connection

Connector M12x1 without temperature measurement

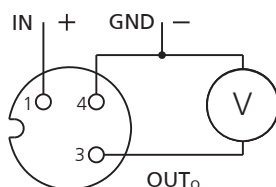
1



Frequency output



current output

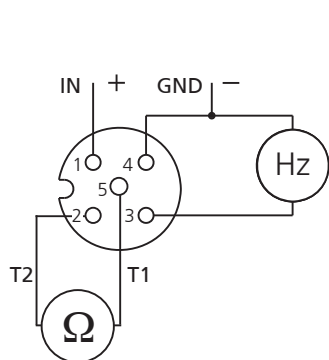


voltage output

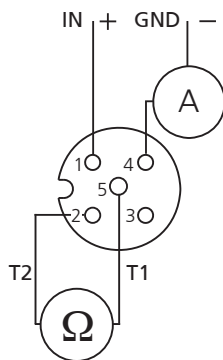
Pin		Colour
1		brown
3	1	blue
4		black
1		brown
2		white
3	2	blue
4		black
5		gray

Connector M12x1 with temperature measurement

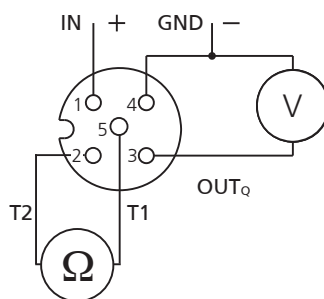
2



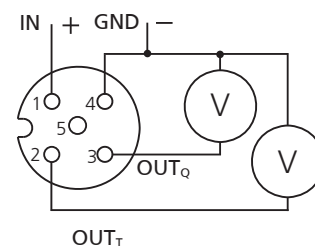
frequency output with PT1000



current output with PT1000



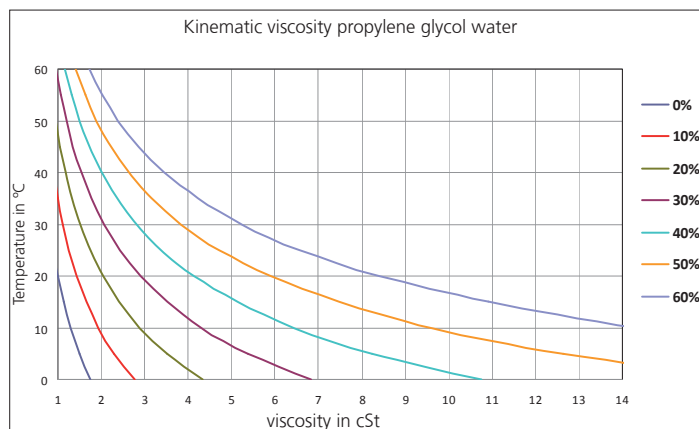
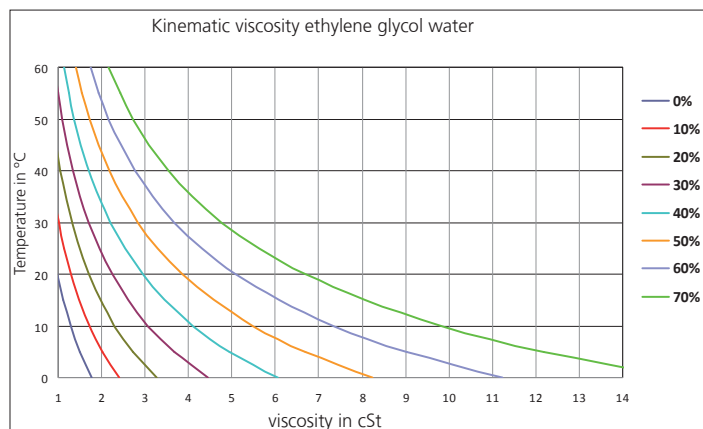
voltage output with PT1000



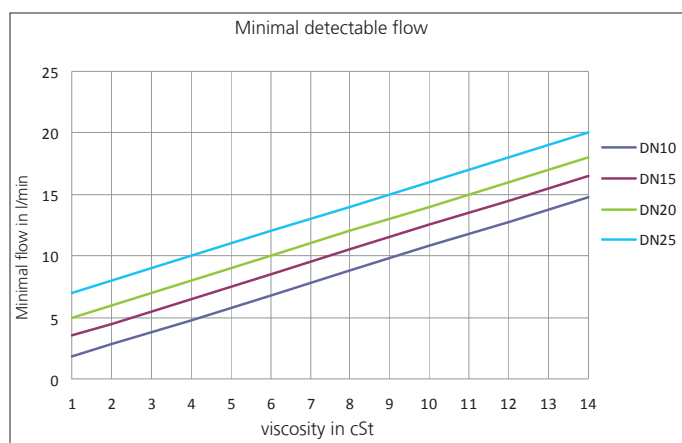
voltage output with temperature output 0 ... 10 V

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).

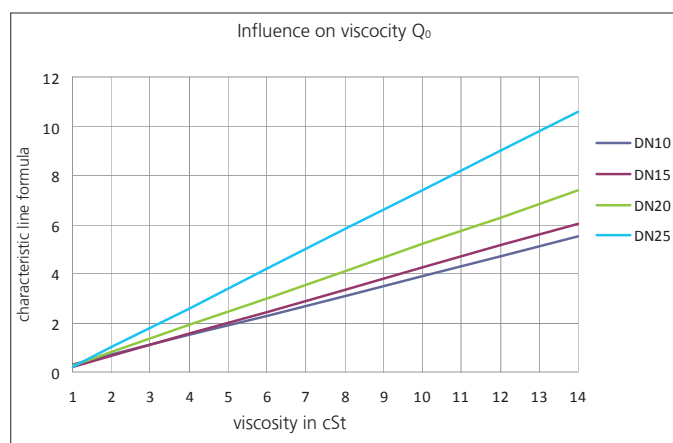
Definition of viscosity of glycol-water-compound



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 not possible

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

< DN 10 not possible

Frequency output:

DN10: $Q = 0.0832 * f - 0.40v + 0.20$

DN15: $Q = 0.1843 * f - 0.45v + 0.25$

DN20: $Q = 0.3754 * f - 0.55v + 0.25$

DN25: $Q = 0.7467 * f - 0.80v + 0.60$

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: $Q = 9.375 * (I - 4 \text{ mA}) - 0.80v + 0.80$



FOR FINE PRESSURE AND FLOW MEASUREMENT

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