

OEM Flow sensor for liquid media type 200

Flow range

0.5 ... 150 l/min

Nominal diameters

DN 6 / 8 / 10 / 15 / 20 / 25

Temperature measurement

-40 ... +125 °C



The flow sensor type 200 is based on the Kármán vortex trail. Vortex trail principle and is available in various options with and without temperature measurement. With no moving parts the flow sensor is not sensitive to debris, has marginal pressure loss and high accuracy.

- Low cost product with high levels of accuracy
- Temperature non-sensitive measuring principle
- Excellent media resistance (measuring element not in contact with the media)
- Wide application temperature range
- Marginal loss of pressure
- Measuring element not sensitive to debris
- Direct temperature measurement in the medium with PT1000 or NTC

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

Temperature measurement (≥ DN 8)

Measuring principle	Resistance		PT1000
			NTC
PT1000	Measuring range		-40 ... +125 °C
	Accuracy	Class B DIN EN 60751	@ T = 0 °C @ T ≠ 0 °C
			± 0.3 K ± 0.3 K ± 0.005 * T
	Measuring range		-40 ... +125 °C
NTC	Accuracy	NTC 10 kOhm @ 25 °C β = 4050	@ T = +25 °C @ T < +25 °C @ T > +25 °C
			± 0.7 K ± 0.7 K ± 0.025 * T ± 0.7 K ± 0.050 * T
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-conform)

Sensor paddle	ETFE
Case with damming body	PA6T/6I (40% GF)
Sealing material	FPM
	EPDM (perox.)

Electrical overview

Power supply		U _{IN}	5 VDC ±5%
Output flow (Q)	Frequency Square pulse signal	U _{OUT_Q_Frequency}	< 0.1 ... > 4.75 V
Output temperature (T)	Resistant signal	R _{OUT_PT1000} R _{OUT_NTC}	PT1000 class B DIN EN 60751 NTC 10 kOhm @ 25 °C; β = 4050
Electrical connection and protection class	Connector RAST 2.5 / 2.54		IP 20
Load against GND or IN	Connector M12x1		IP 65
			> 10 kOhm / < 10 nF
Current consumption I _N load free		standard raised noise resistant	< 6 mA < 10 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

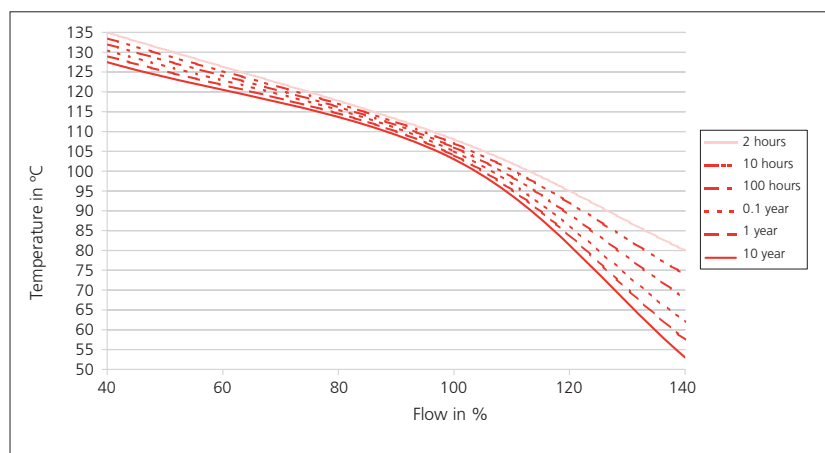
Electromagnetic compatibility	acc. to EN 61326-2-3 (no protection at surge)
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Packaging (multiple packaging)	Connection copper tube	Outside thread K	Outside thread G
DN 6	–	Blister 30x	Blister 30x
DN 8 / 10	Blister 30x	Blister 30x	Blister 30x
DN 15	Blister 30x	Blister 30x	Blister 20x
DN 20	Blister 20x	Blister 20x	Blister 15x
DN25	–	Blister 15x	Blister 15x

Nominal diameters dependent variables

Nominal diameters	Tube connection	Measuring range	Quantity per puls @ 50% fs	Flow rate	Characteristic line frequency output	Frequency range	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	27 ... 426 Hz	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	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	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	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	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	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	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

200. X X X X X X X X

Version	Flow	9							
	Flow and temperature (PT1000)	8			1				
	Flow and temperature (NTC)	7			1				
Nominal diameters / flow range	DN 6 0.5 ... 10 l/min.	9	0	6	1				K,G
	DN 8 0.9 ... 15 l/min.		0	8	1				
	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, 0 ... 5 VDC (Square pulse signal) 5 VDC standard	9			0				
	Frequency output, 0 ... 5 VDC (Square pulse signal) 5 VDC raised noise resistant				1				
Electrical connection	3-pole connector RAST 2.5	9				0			
	2x3-pole connector RAST 2.5	7,8			1	1			
	3-pole connector RAST 2.5 (condensation protection)	9				2			
	2x3-pole connector RAST 2.5 (condensation protection)	7,8			1	3			
	3-pole circular connector M12x1 (condensation protection)	9			1	4			
	5-pole circular connector M12x1 (condensation protection)	7,8			1	5			
Sealing material	EPDM Ethylene propylene rubber (peroxidically cross-linked)							1	
	FPM Fluoro elastomer							2	
Tube connection	Plastic PA6T/6I connection copper tube (max. DN 20)								N
	Plastic PA6T/6I outside thread K (see dimension diagram)								K
	Plastic PA6T / 6I outside thread G (see dimension diagram)								G

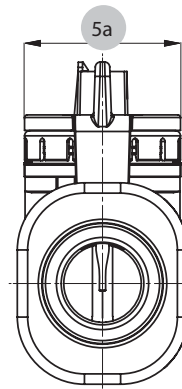
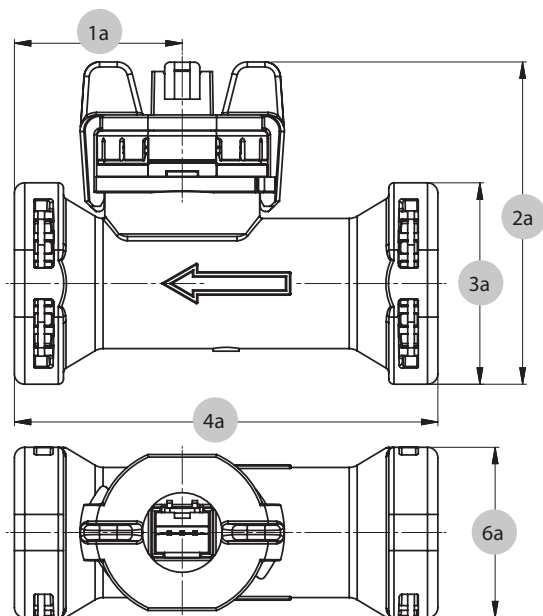
Accessories ¹⁾

					Order number
Connection kit ²⁾ DN 8, 10 with copper tube					113775
Connection kit ²⁾ DN 8, 10 with adapter Rp ⅜ 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
Connector RAST 2.5 with cable 3-pole 30 cm					111668
Connector RAST 2.5 with cable 3-pole 110 cm					101817
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
Connector RAST 2.54 with cable 2x3 pole 110 cm (with temperature)					114629
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 ⅜ 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

AMP connector ³⁾	Manufacturers order number	Colour	for flexible wire
	3-829868-3	grey	7 x 0.20 mm = 0.22 mm ² 12 x 0.20 mm = 0.35 mm ²
	1-966194-3	beige	7 x 0.25 mm = 0.35 mm ²

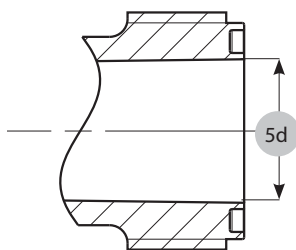
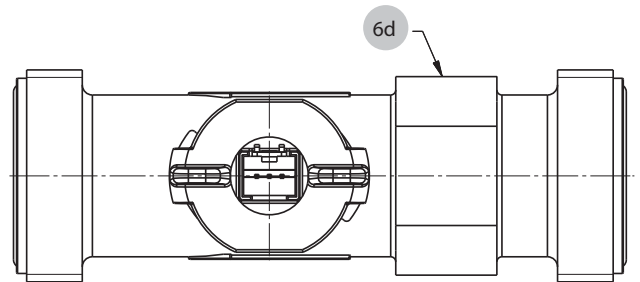
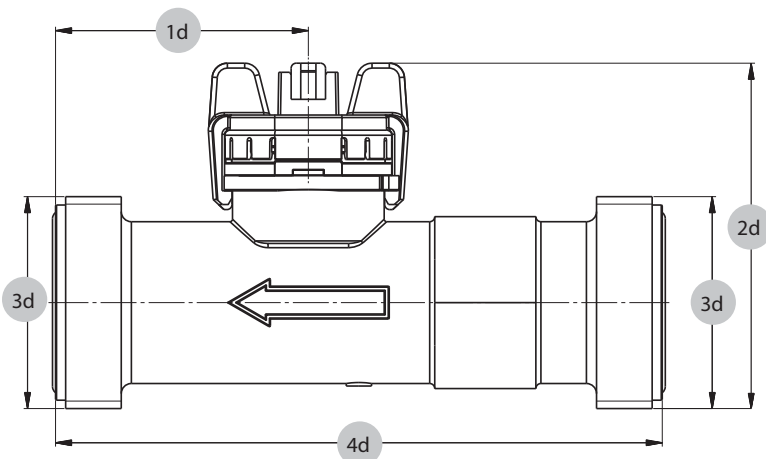
¹⁾ Accessories supplied loose²⁾ Connection set includes: 2x Clip, 2x Copper tube or Adapter and 2x O-Ring³⁾ To order separately directly from the manufacturer. Find further information in the manufacturer's specification 1811418049

Dimension diagram DN 8, 10, 15, 20

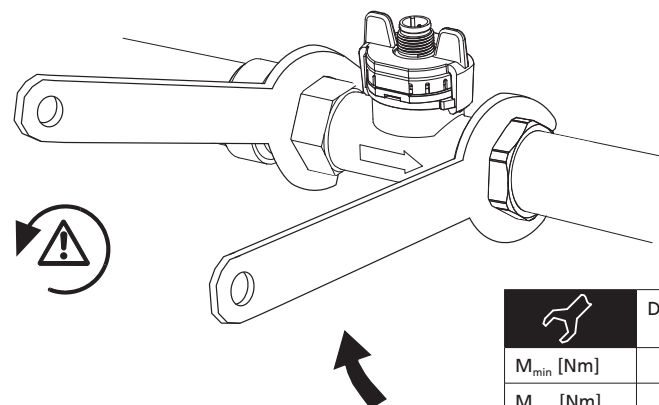


	1a	2a	3a	4a	5a	6a
DN8	29.5	59.0	32.9	72	30.2	28.9
DN10	32.5	57.3	32.9	77	30.2	28.9
DN15	32.5	62.4	39.0	82	30.2	33.0
DN20	39.3	66.3	43.0	105	30.2	37.4

Dimension diagram DN 6, 8, 10, 15, 20, 25

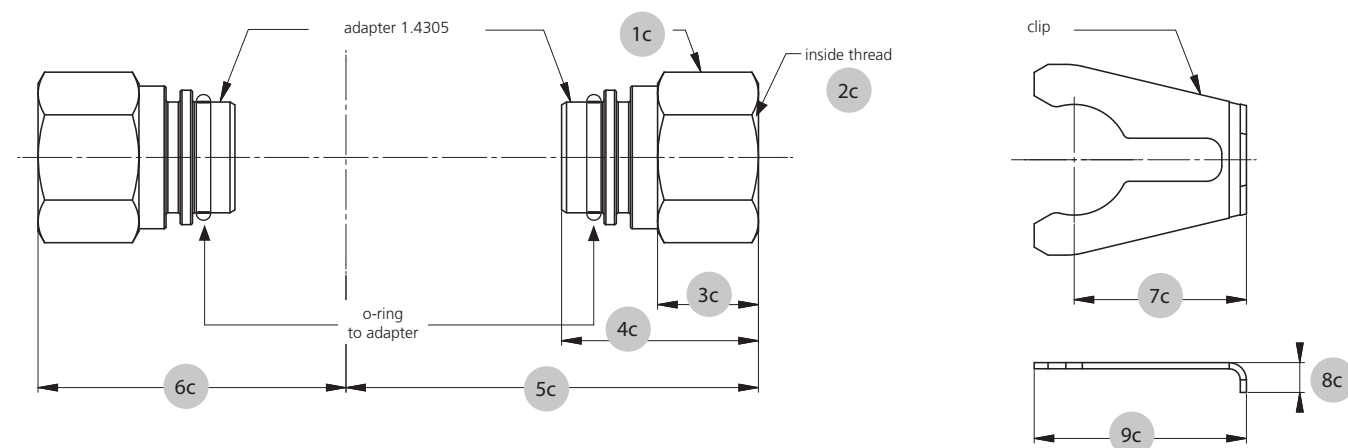


		1d	2d	3d	4d	5d	6d
DN6	K	43.7	53.0	G ½	77	11.5	12
DN6	G	48.2	55.7	G ¾	86	11.5	12
DN8	K	43.7	53.0	G ½	77	11.5	12
DN8	G	48.2	55.7	G ¾	86	11.5	12
DN10	K	35.0	51.3	G ½	81	11.5	19
DN10	G	39.5	54.1	G ¾	90	11.5	19
DN15	K	36.6	56.1	G ¾	87	16	22
DN15	G	41.6	59.5	G 1	97	16	22
DN20	K	36.6	61.5	G 1	105	20	27
DN20	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



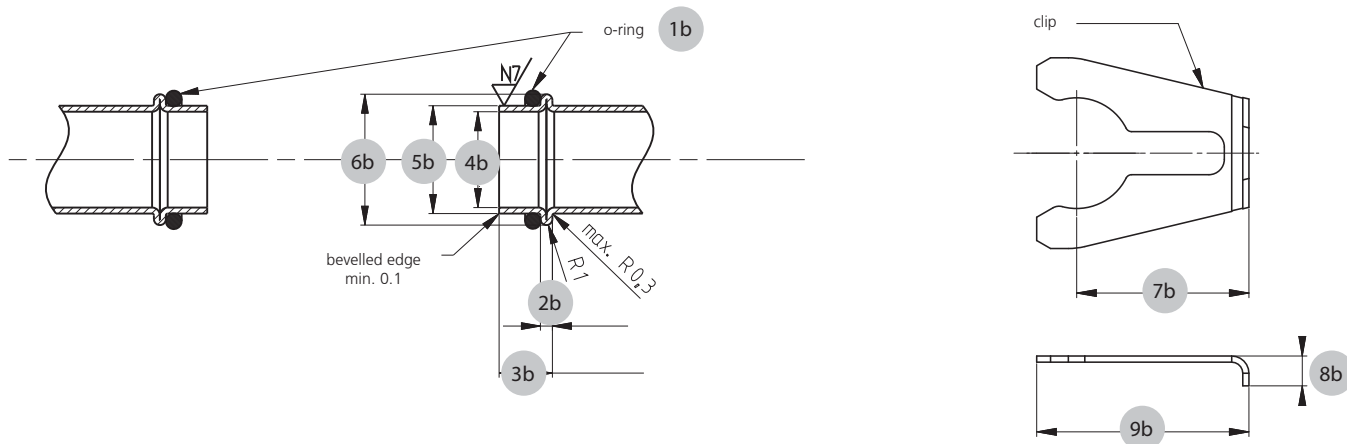
	DN6/8/10 G ½	DN6/8/10 G ¾	DN15 G ¾	DN15 G1	DN20 G1	DN20 G1 ¼	DN25 G1 ¼	DN25 G1 ½
M_{min} [Nm]	1	1	1	2	2	2.5	2.5	2.5
M_{max} [Nm]	12	12	12	12	12	15	15	15

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

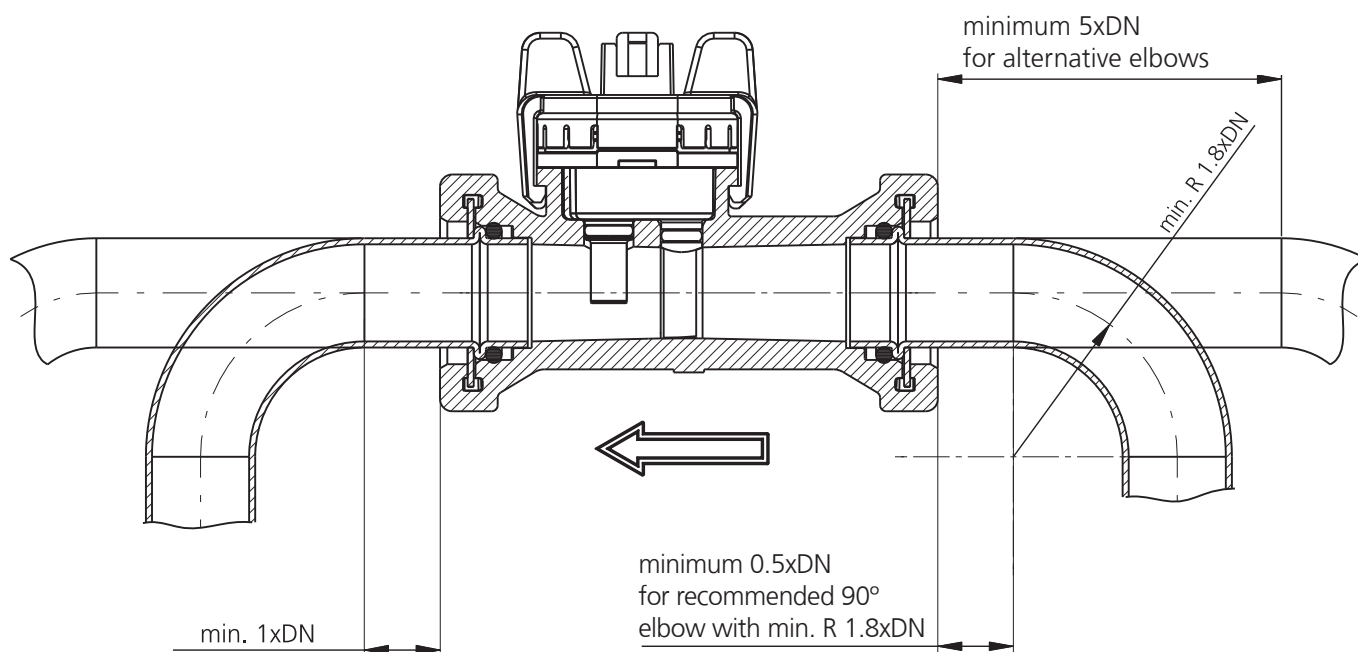
Geometry of customers connection tube DN 8, 10, 15, 20



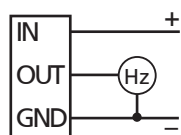
	1b	2b	3b	4b	5b	6b	7b	8b	9b
DN8	ø 13.95x262	2 ± 0.2	8.9 ± 0.2	ø 13 ± 0.2	ø 15.00 ± 0.08	ø 18.88 ± 0.1	24.5	6.00	30.8
DN10	ø 13.95x262	2 ± 0.2	8.9 ± 0.2	ø 13 ± 0.2	ø 15.00 ± 0.08	ø 18.88 ± 0.1	24.5	6.00	30.8
DN15	ø 17.86x2.62	2 ± 0.2	8.9 ± 0.3	ø 16 ± 0.2	ø 18.00 ^{+0.08} _{-0.06}	ø 21.85 ± 0.1	28.0	7.30	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.

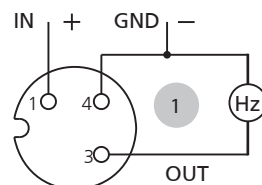
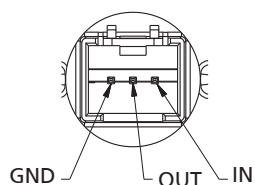
- Only diameter changes from large to small are allowed.
- Avoid repeated elbows in the same level at entryside



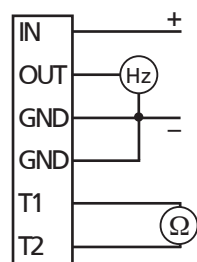
Electrical connections



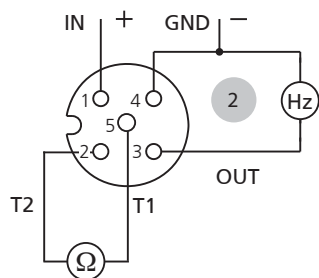
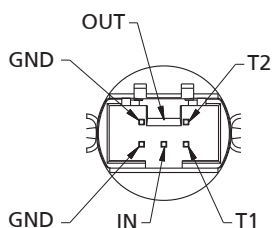
RAST 2.5 without temperature output



Connector M12x1 without temperature output



Connector 2x3-poles with temperature output

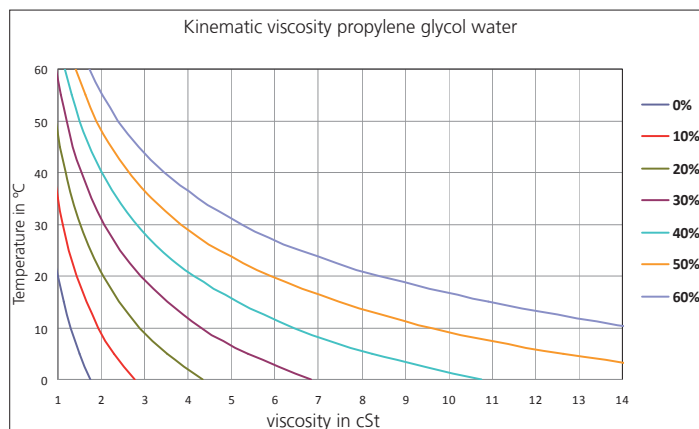
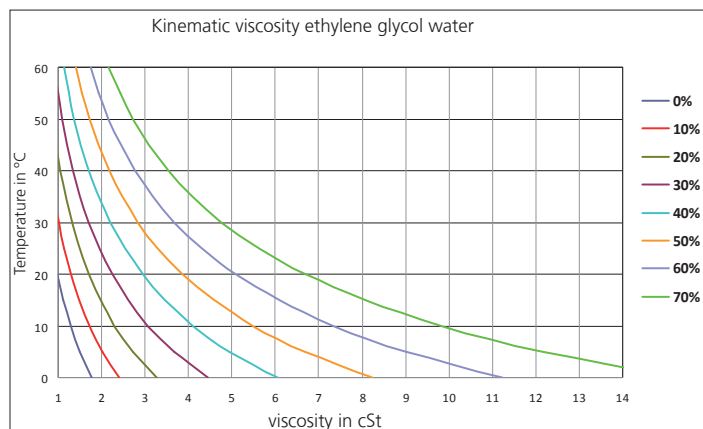


Connector M12x1 with temperature output

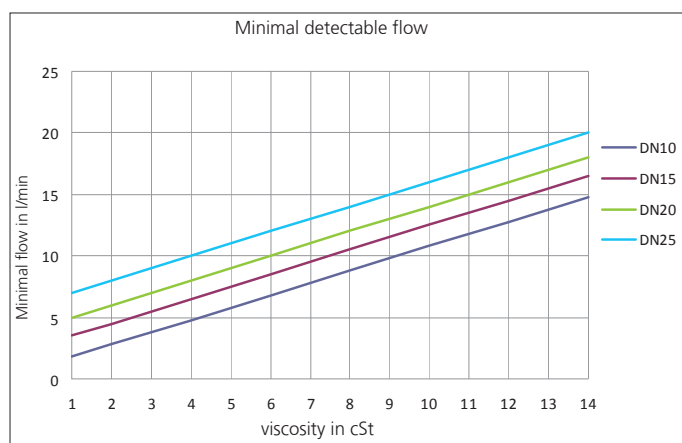
Pin		Colour
1	1	brown
3		blue
4		black
2		black
1	2	brown
2		white
3		blue
4		black
5		gray

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 (ν = viscosity in cSt).

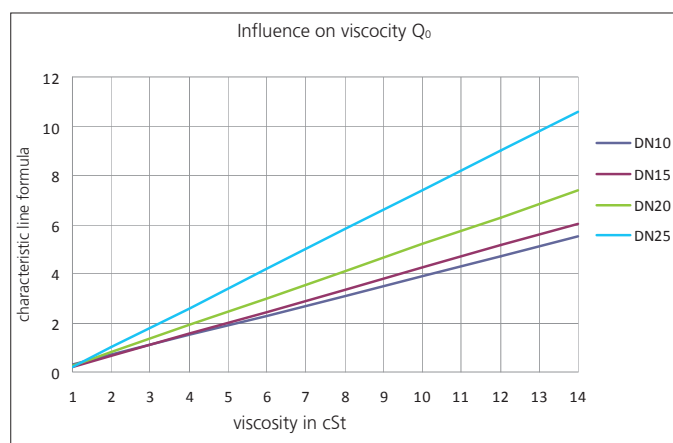
Definition of viscosity of glycol-water-compound



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: $Q_{min} = \nu + 0.8$

DN 15: $Q_{min} = \nu + 2.5$

DN 20: $Q_{min} = \nu + 4.0$

DN 25: $Q_{min} = \nu + 6.0$

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

< DN 10 not possible

Frequency output:

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

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

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

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



FOR FINE PRESSURE AND FLOW MEASUREMENT

Huba Control AG
Headquarters

Industriestrasse 17
5436 Würenlos
Telefon +41 (0) 56 436 82 00
Telefax +41 (0) 56 436 82 82
info.ch@hubacontrol.com

Huba Control AG
Niederlassung Deutschland

Schlattgrabenstrasse 24
72141 Walddorfhäslach
Telefon +49 (0) 7127 23 93 00
Telefax +49 (0) 7127 23 93 20
info.de@hubacontrol.com

Huba Control SA
Succursale France

Rue Lavoisier
Technopôle Forbach-Sud
57602 Forbach Cedex
Téléphone +33 (0) 387 847 300
Télécopieur +33 (0) 387 847 301
info.fr@hubacontrol.com

Huba Control AG
Vestiging Nederland

Hamseweg 20A
3828 AD Hoogland
Telefoon +31 (0) 33 433 03 66
Telefax +31 (0) 33 433 03 77
info.nl@hubacontrol.com

Huba Control AG
Branch Office United Kingdom

Unit 13 Berkshire House
County Park Business Centre
Shrivenham Road
Swindon - Wiltshire SN1 2NR
Phone +44 (0) 1993 776667
Fax +44 (0) 1993 776671
info.uk@hubacontrol.com

www.hubacontrol.com