Huba Control

FOR FINE PRESSURE AND FLOW MEASUREMENT

# 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
- Drinking water approval KTW, W270, WRAS

# 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<br>Therefore suitable for spigot use. | | Frequency output | Signal delay < 100 ms<br>Response time < 5 ms |
| | | | Analogue output | Signal delay < 2 s<br>Response time < 500 ms |

## Temperature measurement (≥ 8 DN)

| | | | | |
|---|---|---|---|---|
| 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<br>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 | 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 6 / 8 | ~ 47 g |
| DN 10 | ~ 57 g |
| DN 15 | ~ 68 g |
| DN 20 | ~ 92 g |
| DN 25 | ~ 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 6 | – | Blister 30x | Blsiter 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

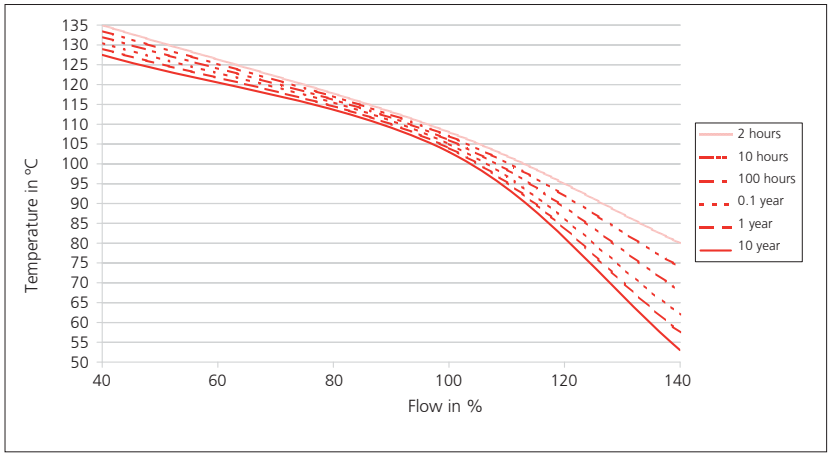
[2] incl. 3xDi inlet and outlet side

[3] Pv in Pa; Q in l/min

## 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 6 | Outside thread small | 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 * $Q^2$ |
| | Outside thread heavy | | | | | | | | |
| DN 8 | Outside thread small | 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 * $Q^2$ |
| | Outside thread heavy | | 0.631 ml | | 0.0394 * f - 0.3 | 30 ... 388 Hz | | | |
| | Connection copper tube | | 0.614 ml | | 0.0383 * f - 0.3 | 31 ... 399 Hz | | | |
| DN 10 | Outside thread small | 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 * $Q^2$ |
| | Outside thread heavy | | 1.370 ml | | 0.0832 * f - 0.2 | 24 ... 387 Hz | | | |
| | Connection copper tube | | 1.384 ml | | 0.0841 * f - 0.2 | 24 ... 383 Hz | | | |
| DN 10 | Outside thread small | 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 * $Q^2$ |
| | Outside thread heavy | | 1.373 ml | | 0.0832 * f - 0.2 | 26 ... 483 Hz | | | |
| | Connection copper tube | | 1.388 ml | | 0.0841 * f - 0.2 | 26 ... 478 Hz | | | |
| DN 15 | Outside thread small | 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* $Q^2$ |
| | Outside thread heavy | | 3.016 ml | | 0.1824 * f - 0.2 | 20 ... 275 Hz | | | |
| | Connection copper tube | | 3.077 ml | | 0.1861 * f - 0.2 | 20 ... 270 Hz | | | |
| DN 20 | Outside thread small | 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 * $Q^2$ |
| | Outside thread heavy | | 6.125 ml | | 0.3701 * f - 0.3 | 14 ... 230 Hz | | | |
| | Connection copper tube | | 6.208 ml | | 0.3751 * f - 0.3 | 14 ... 227 Hz | | | |
| DN 25 | Outside thread small | 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 * $Q^2$ |
| | Outside thread heavy | | 12.251 ml | | 0.7370 * f - 0.2 | 12 ... 204 Hz | | | |

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




[1)] incl. 3xDi inlet and outlet side

[2)] Pv in Pa; Q in l/min

## Order code selection table

| | | | | 210. | 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 | |
| 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 |

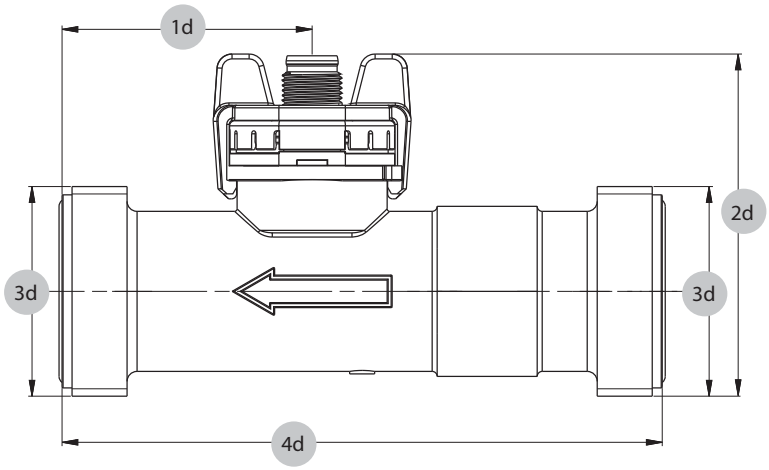
## Accessories [1]

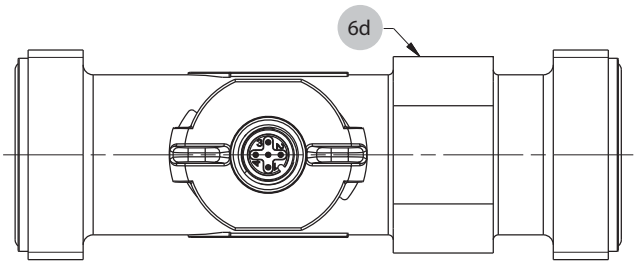
| | | | | | Order number |
|---|---|---|---|---|---|
| Connection kit [2] DN 8, 10 with copper tube | | | | | 113775 |
| Connection kit [2] DN 8, 10 with adapter Rp ⅜ | | | Stainless steel 1.4305/AISI 303 | | 113776 |
| Connection kit [2] DN 15 with copper tube | | | | | 113777 |
| Connection kit [2] 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 |
| 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 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 |

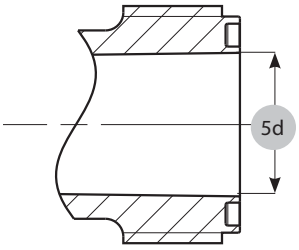
[1] Accessories supplied loose

[2] Connection set includes: 2x Clip, 2x Copper tubes or Adapter and 2x O-Ring

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

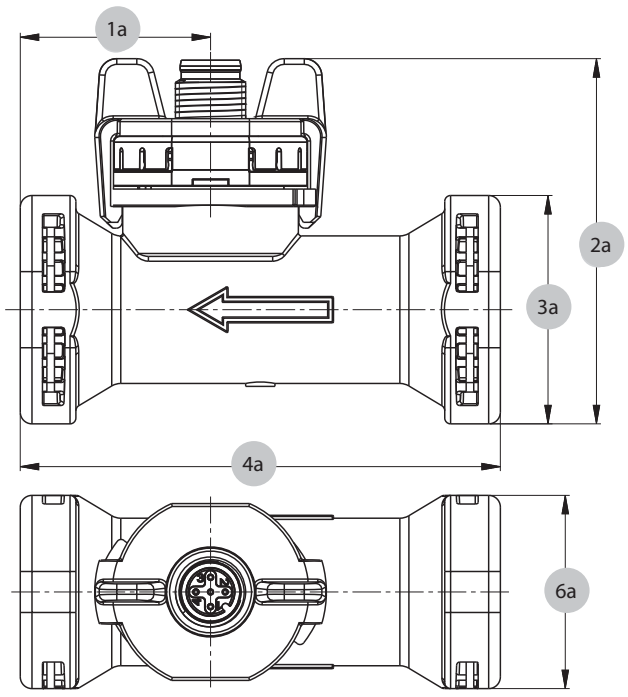


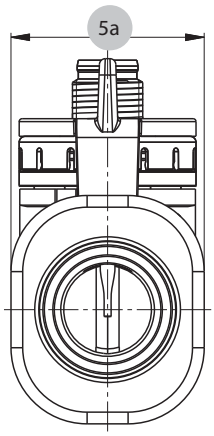




| | | 1d | 2d | 3d | 4d | 5d | 6d |
|---|---|---|---|---|---|---|---|
| DN6 | K | 43.7 | 53.0 | G ½ | 77 | 12 | 12 |
| DN6 | G | 48.2 | 55.7 | G ¾ | 86 | 12 | 12 |
| DN8 | K | 43.7 | 53.0 | G ½ | 77 | 12 | 12 |
| DN8 | G | 48.2 | 55.7 | G ¾ | 86 | 12 | 12 |
| DN10 | K | 35.0 | 51.3 | G ½ | 81 | 12 | 19 |
| DN10 | G | 39.5 | 54.1 | G ¾ | 90 | 12 | 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 |

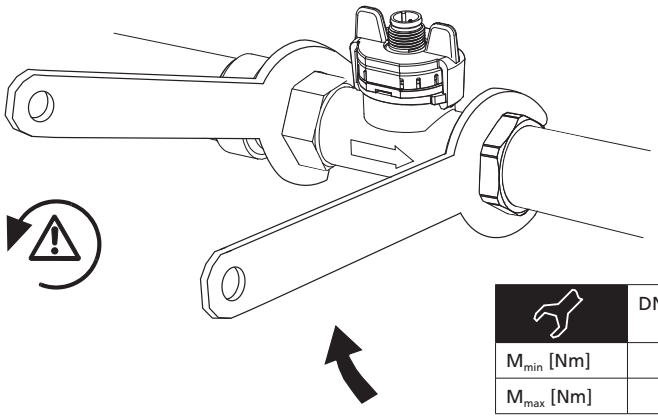
## Dimension diagram DN 8, 10, 15, 20



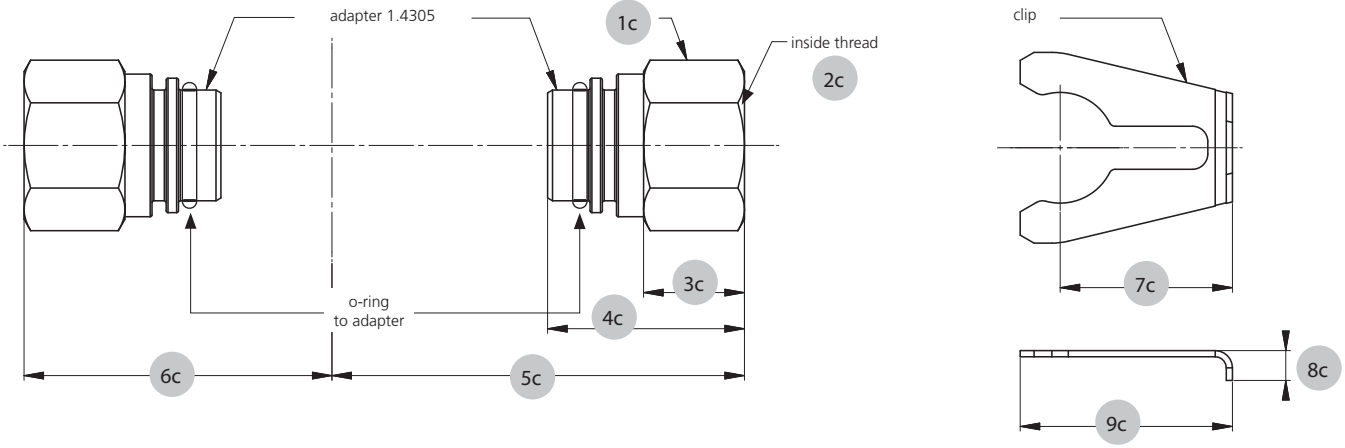

| | 1a | 2a | 3a | 4a | 5a | 6a |
|---|---|---|---|---|---|---|
| DN8 | 29.5 | 59.0 | 32.9 | 72 | 30.2 | 28.9 |
| DN10 | 32.5 | 57.3 | 32.9 | 77 | 30.2 | 28.9 |
| DN15 | 32.5 | 62.4 | 39.0 | 82 | 30.2 | 33.0 |
| DN20 | 39.3 | 66.3 | 43.0 | 105 | 30.2 | 37.4 |

## Admissible locking torque



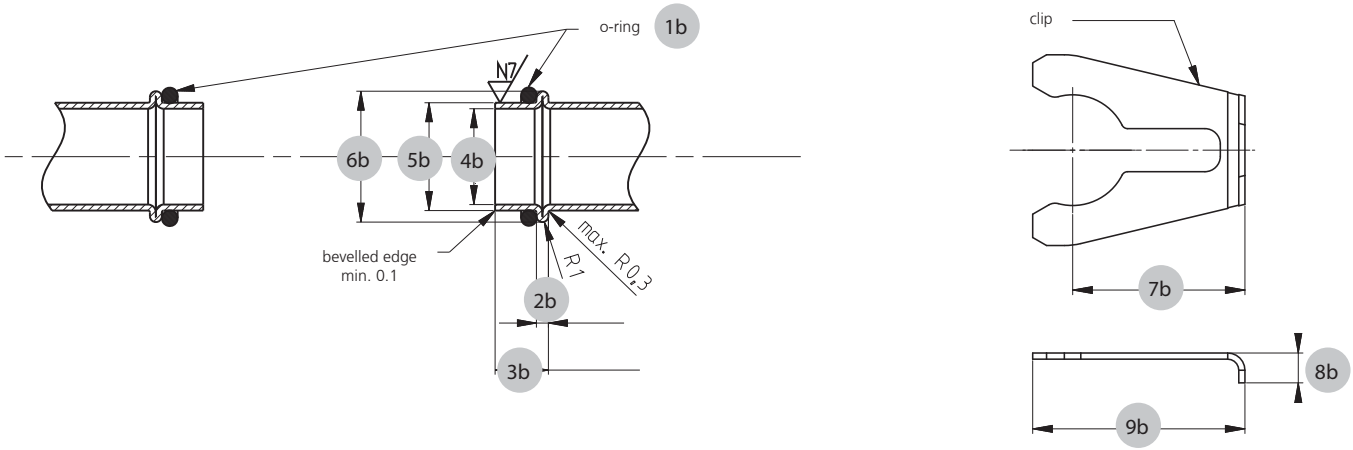
| | DN6/8/10 G ½ | DN6/8/10 G ¾ | DN15 G ¾ | DN15 G1 | DN20 G1 | DN20 G1 ¼ | DN25 G1 ¼ | DN25 G1 ½ |
|---|---|---|---|---|---|---|---|---|
| $M_{min}$ [Nm] | 1 | 1 | 1 | 2 | 2 | 2.5 | 2.5 | 2.5 |
| $M_{max}$ [Nm] | 12 | 12 | 12 | 12 | 12 | 15 | 15 | 15 |

## Accessories DN 8, 10, 15, 20




| | 1c | 2c | 3c | 4c | 5c | 6c | 7c | 8c | 9c |
|---|---|---|---|---|---|---|---|---|---|
| DN8 | 22 | Rp ⅜ DIN 2999 lenght min. 9 | 14.0 | 29 | 57.65 | 44.65 | 24.5 | 6.00 | 30.8 |
| DN10 | 22 | Rp ⅜ DIN 2999 lenght 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 ¾ DIN 2999 lenght 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

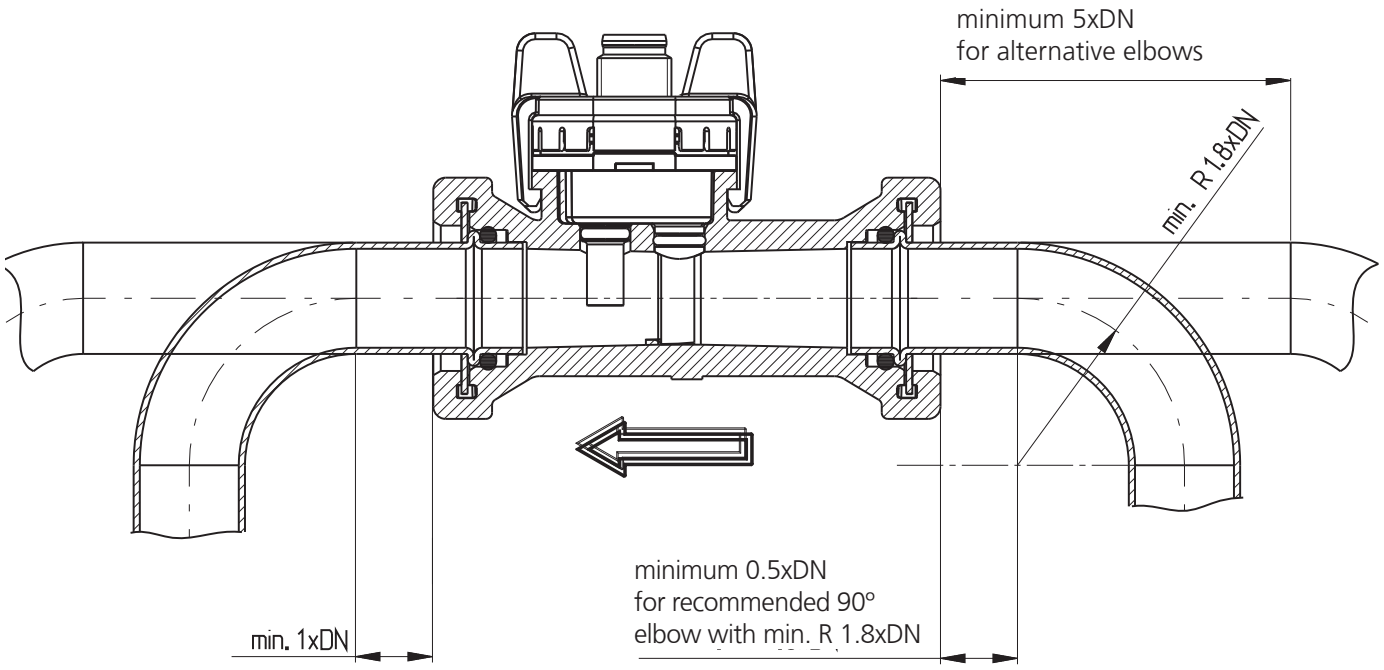



| | 1b | 2b | 3b | 4b | 5b | 6b | 7b | 8b | 9b |
|---|---|---|---|---|---|---|---|---|---|
| DN8 | ø 13.95x262 | 2 ± 0.2 | 8.9 ± 0.2 | ø 13 ± 0.2 | ø 15.00 ± 0.08 | ø 18.88 ± 0.1 | 24.5 | 6.00 | 30.8 |
| DN10 | ø 13.95x262 | 2 ± 0.2 | 8.9 ± 0.2 | ø 13 ±0.2 | ø 15.00 ± 0.08 | ø 18.88 ± 0.1 | 24.5 | 6.00 | 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 |

## Tube mounting instructions

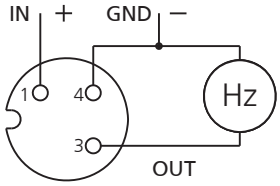
Consider the following to ensure the correct function of the sensor.

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

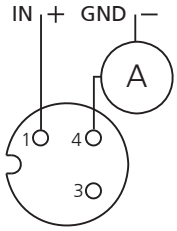



## Electrical connection

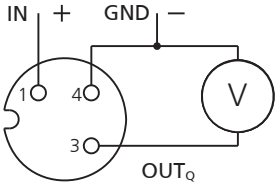
Connector M12x1 without temperature measurement (1)




Frequency output



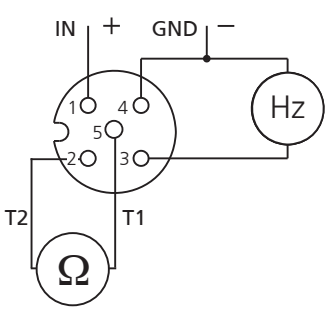

current output



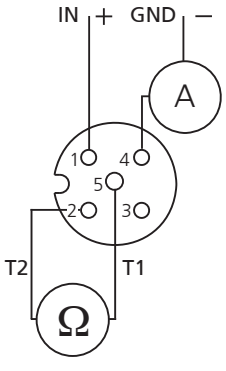

voltage output

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

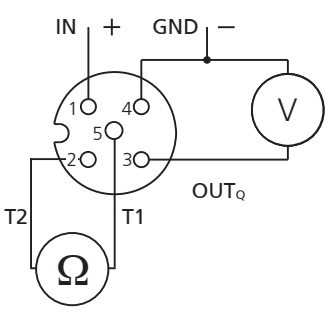
Connector M12x1 with temperature measurement (2)



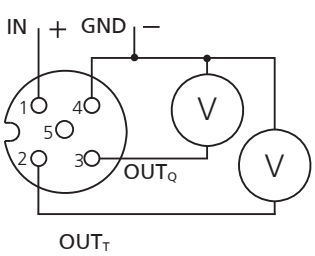

frequency output
with PT1000




current output
with PT1000




voltage output
with PT1000

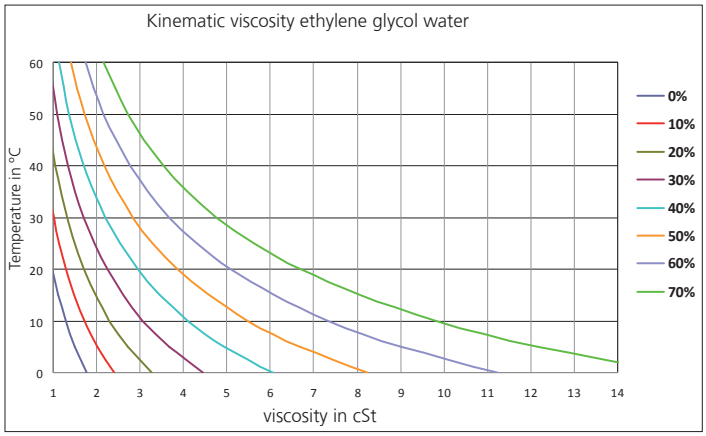


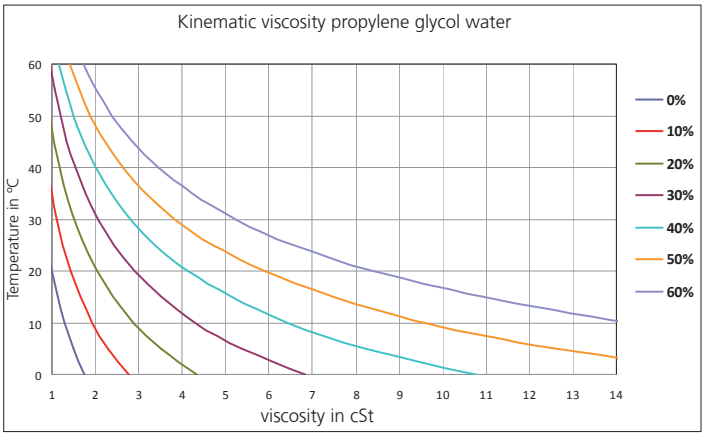

voltage output with
temperature output 0 ...10 V

# Influence of glycol

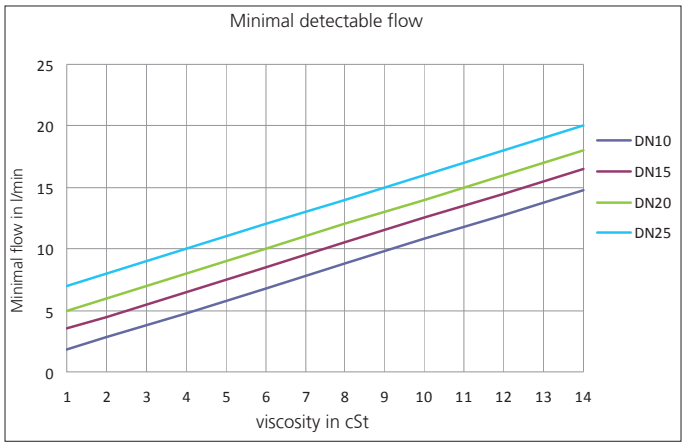
With the following definitions we are able to correct the influence of media with higher viscosity than water (= media viscosity > 1.8 cST) in order to reach a measuring accuracy of 3% fs in the range of 1.8 - 4 cST and of 4% in the range of 4 - 14 cSt ( = viscosity in cSt).

## Definition of viscosity of glycol-water-compound

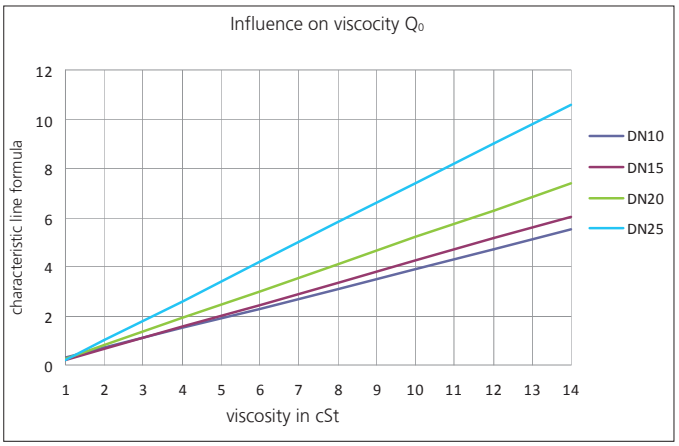



## Definition of respond threshold $Q_{min}$




## 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: $Q = 9.375 * (I - 4\ mA) - 0.80\upsilon + 0.80$