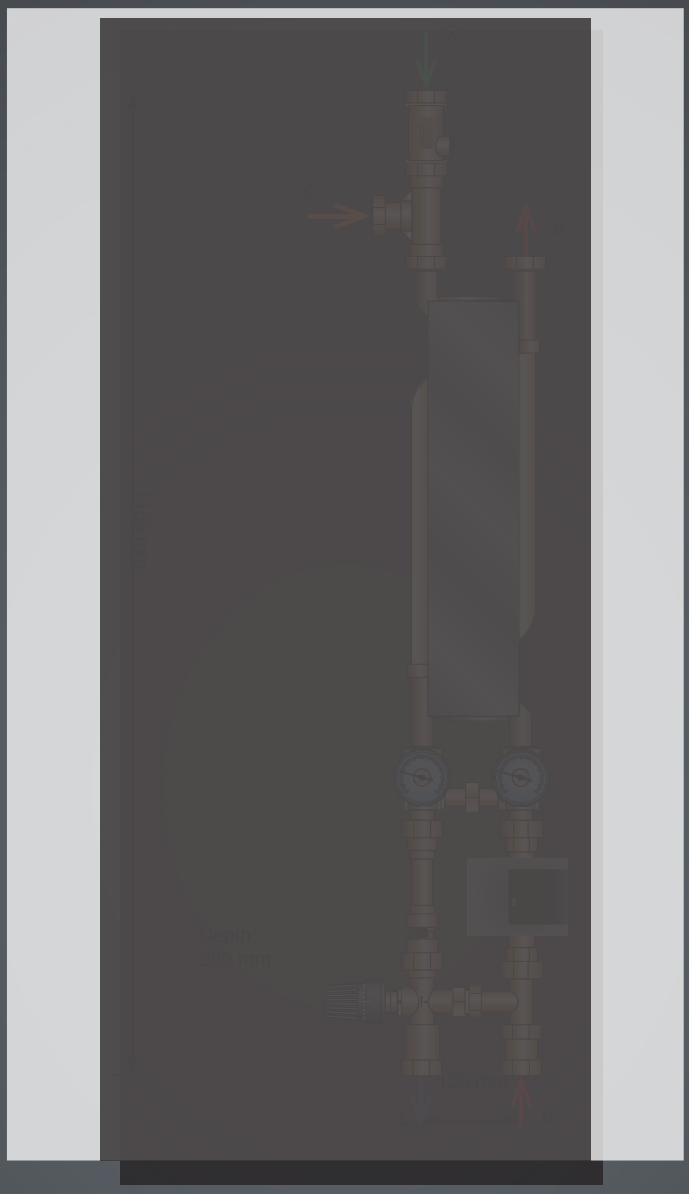


Technical supplement

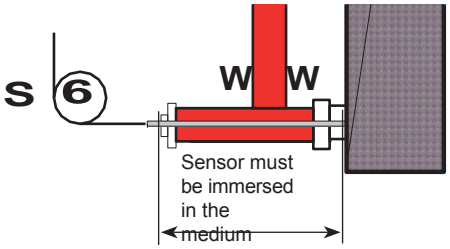
Drinking water heating

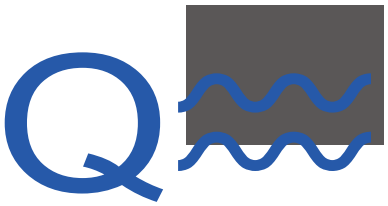
Status 28/01/2019-wi

ratiotherm
Smart Energy Systems

Installation/positioning of the "ultra-fast sensor" on TWK-S70

View from the "rear"





!!! Achtung !!!

Die Kontermutter für die O-Ring-Dichtung des Fühlerelements muss fachmännisch angezogen werden, damit der Fühler nicht durch den inneren Wasserdruck herausgedrückt werden kann !!!

Plate heat exchangers – cleaning/water values

Due to the strong turbulence in brazed plate heat exchangers, there is a high self-cleaning effect in the channels.

Nevertheless, in some applications, fouling can be very high; this is the case, for example, with extremely hard water and high temperatures.

We recommend installing a suitable water softener and checking the condition of the heat exchanger no later than one year after commissioning and establishing a cleaning/maintenance cycle – or sooner in the case of very hard water.

It is then possible to clean the heat exchanger by circulating a cleaning fluid (CIP – Cleaning In Place).

Use a container with a weak acid, either 5% phosphoric acid or, if the heat exchanger is cleaned more frequently, 5% oxalic acid. Pump the cleaning fluid alternately through the heat exchanger.

For maintenance-intensive applications, we recommend CIP connections/valves installed on site to simplify maintenance.

For optimal cleaning results, the flow rate of the cleaning solution should be 1.5 times higher than during operation and preferably performed in backwash mode.

After cleaning, do not forget to rinse the heat exchanger thoroughly with clean water.

A solution containing 1-2% sodium hydroxide (NaOH) or sodium bicarbonate (NaHCO) before the final rinse ensures that all three acids are neutralised.

Perform cleaning at regular intervals.

All acids and bases are hazardous substances and should be used with great care.

WARRANTY

ratiotherm offers a 12-month warranty from the date of installation, but in no case longer than 15 months after the delivery date.

The warranty only covers manufacturing and material defects.

DISCLAIMER

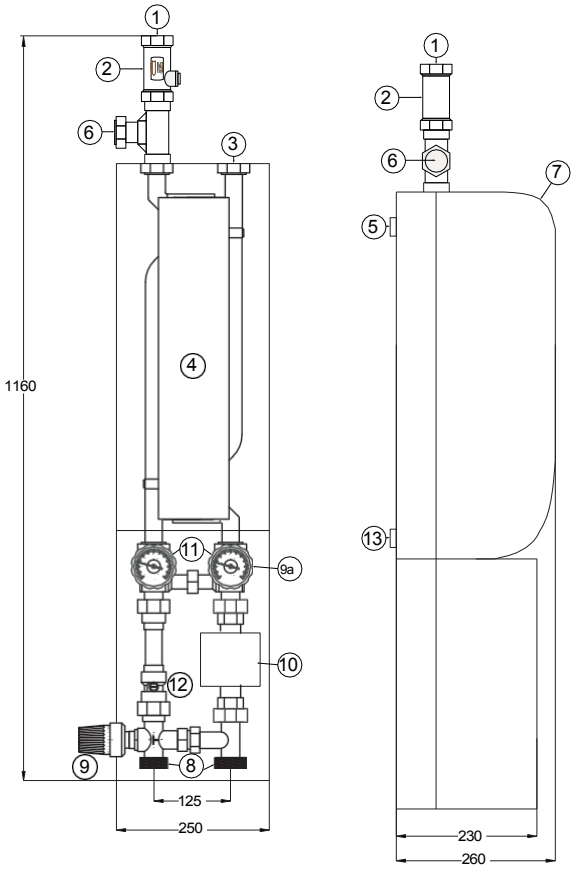
The performance of ratiotherm brazed compact heat exchangers can only be achieved if the installation, maintenance and operating conditions comply with the specifications in the manual.

ratiotherm is not liable for brazed compact heat exchangers that do not meet the criteria listed in the following table.

Copper-brazed stainless steel plate heat exchanger

Recommended resistance of copper solder:	
Electrical conductivity (µS/cm):	10-500
pH value:	7.5 - 9.0
Carbon dioxide (CO2):	< 5
Total hardness (°dH):	4.0 - 8.5
Primary liquid content (litres):	1.554
Secondary liquid capacity (litres):	1.665
Permissible operating pressure (bar):	25
Permissible operating temperature (°C):	155

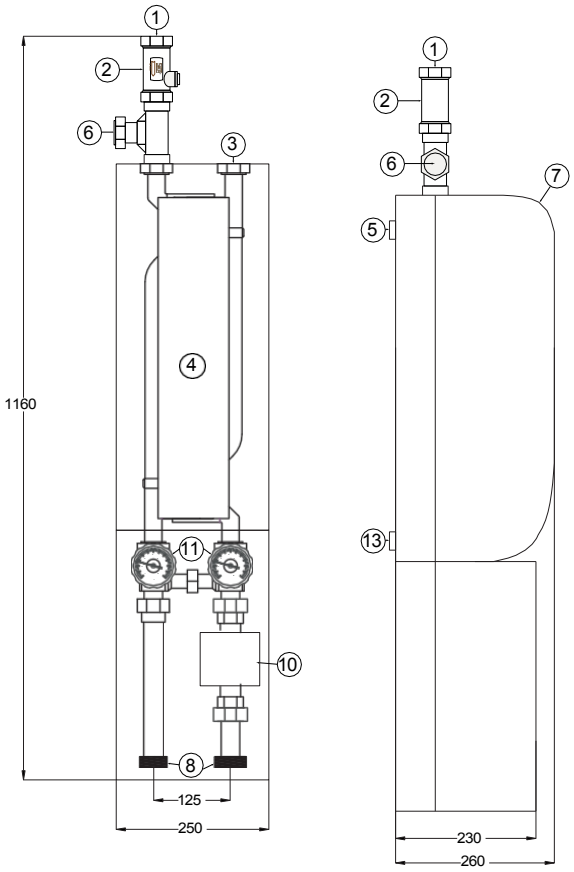
Dimensions and main parts designation for TWK-S 70/90



1	Cold water connection ¾" RAG
2	Flow switch
3	Hot water connection RIG 1"
4	Plate heat exchanger
5	WT manual vent (heating water side)
6	Circulation connection ¾" RAG
7	Insulation box hot water unit
8	Heating water connection RL/VL 1½" RAG
9	Heating water mixing valve
9 a	Capillary tube immersion sensor sleeve
10	Circulation pump BL 180 (PWM)
11	Ball valve with thermometer
12	Gravity brake with manual adjustment
13	Hot water outlet sensor (drinking water side)

TWK-S	70	90	70	90	70	90	70	90
Heat output (kW)	80	108	98	131	70	93	78	105
Heating water inlet (°C)	70		70		60		60	
Heating water outlet (°C)	24	23	14	13	21	20	15	14
Cold water inlet (°C)	10		10		10		10	
Hot water outlet (°C)	60		40		50		40	
Hot water output (l/min)	23	31	47	63	25	33	37	51

Dimensions and main parts designation for TWK-S100



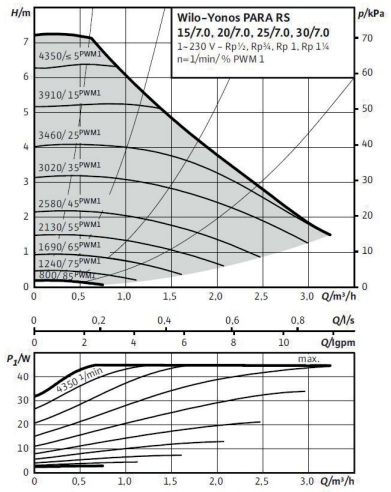
1	Cold water connection ¾" RAG
2	Flow switch
3	Hot water connection RIG 1"
4	Plate heat exchanger
5	WT manual vent (heating water side)
6	Circulation connection ¾" RAG
7	Insulation box hot water unit
8	Connection heating water RL/VL 1½" RAG
10	Circulation pump BL 180 (PWM)
11	Ball valve with thermometer
12	Gravity brake with manual adjustment
13	Hot water outlet sensor (drinking water side)

TWK-S 100	Performance data			
Heat output (kW)	120	146	103	118
Heating water inlet (°C)	70	70	60	60
Heating water outlet (°C)	24	13	20	15
Cold water inlet (°C)	10	10	10	10
Hot water outlet (°C)	60	40	50	40
Hot water output (l/min)	35	70	37	57

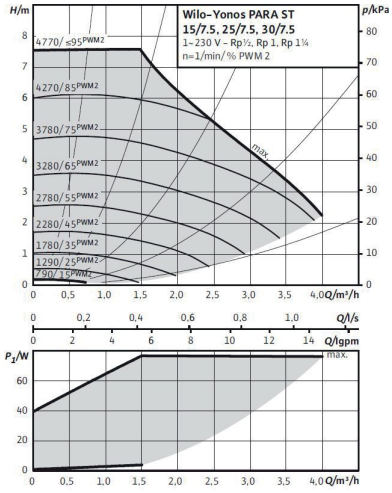
Performance diagrams of drinking water stations

Primary pumps:

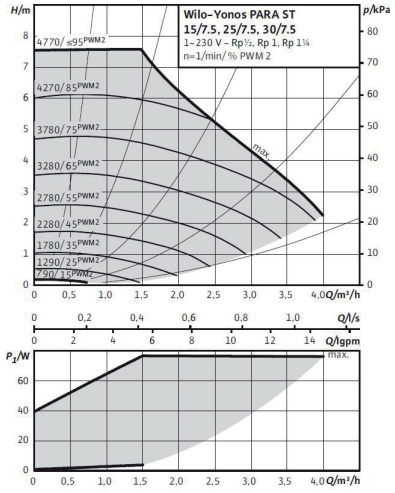
70 kW

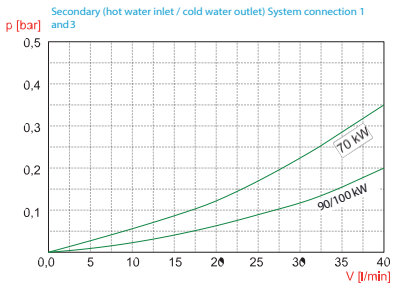


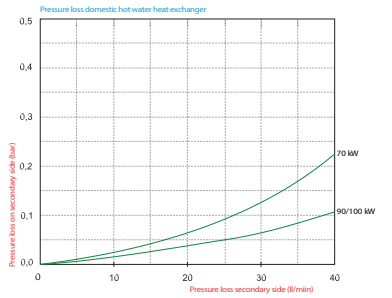
90 kW

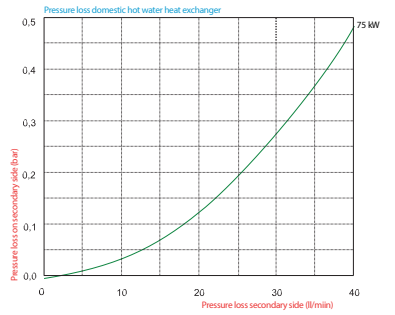


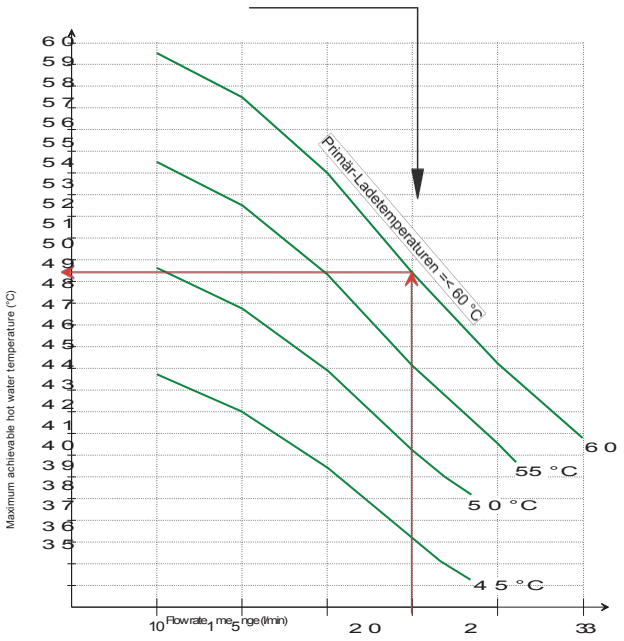
100 kW











Example 70 kW station:

Primary charging temperature	60
Cold water inlet	10
Hot water outlet	49.5°C
Flow rate	25 l/min

Diagram boundary conditions

Cold water inlet temperature	10
Primary volume flow	0.414 l/s

Attention!

The values in the diagram are calculated. The actual values may vary due to the flow conditions in the heat exchanger and possible contamination.

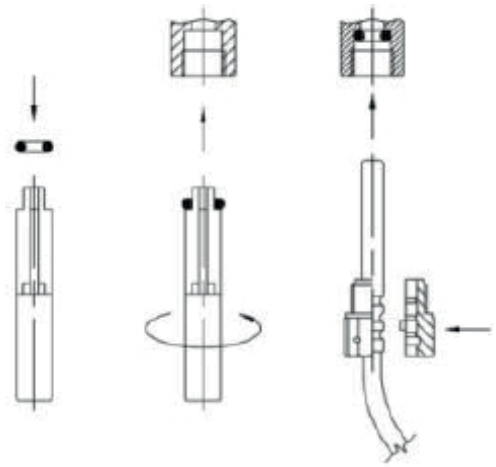
Reference values for flow rates of taps Shower tap Washbasin tap Bath tap

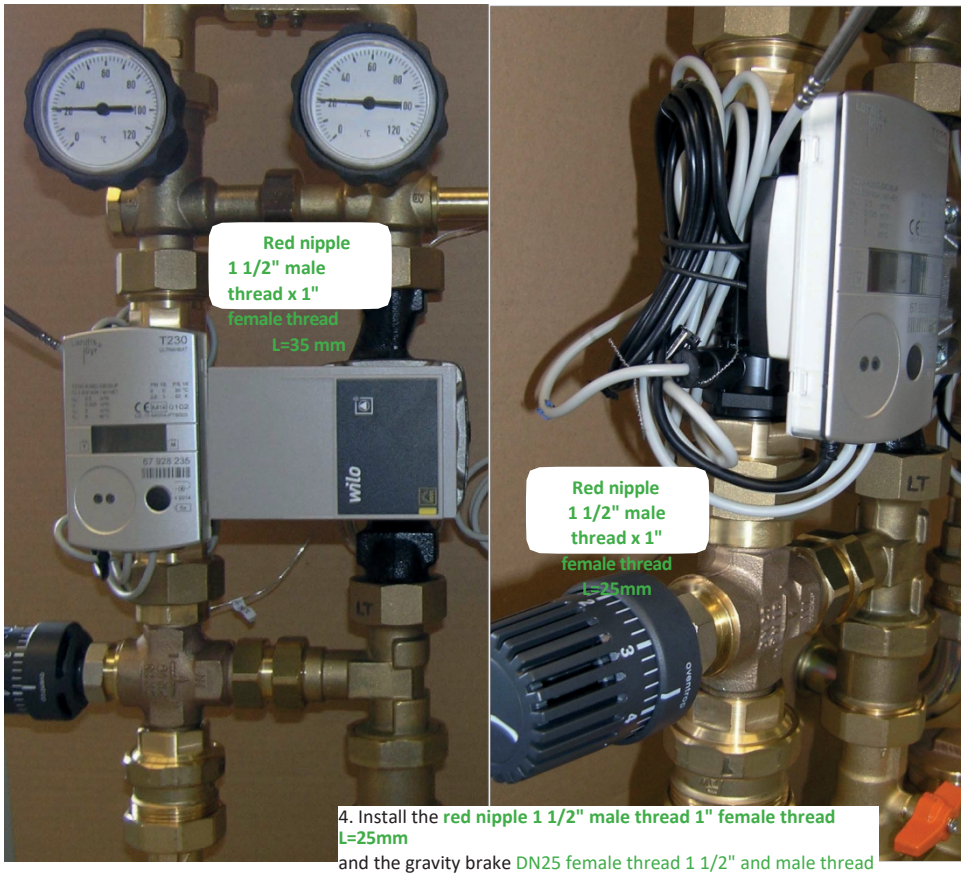
	9.6 l/min
	10.5 l/min
	15.0 l/min

Installation of an optional ratiotherm heat meter

3.3 Installation instructions for sensor adapter set

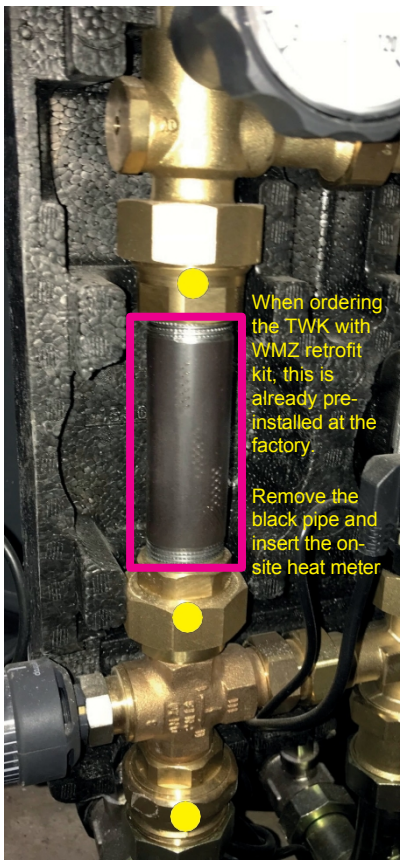
A mounting kit is included for the WM meter with temperature sensor 5.2 x 45 mm supplied by us. This can be used to mount the sensor.
e.g. mounted directly in a fitting or ball valve. Installation note (see image): Install the O-ring in the installation site using the enclosed installation aid/pin. Place the two halves of the plastic screw connection around the 3 grooves of the sensor, press them together and screw them into the installation site until they stop (professional tightening torque
3 - 5 Nm).





4. Install the **red nipple 1 1/2" male thread 1" female thread L=25mm**
and the gravity brake DN25 female thread 1 1/2" and male thread 1 1/2"

Installation situation with ratiotherm heat meter

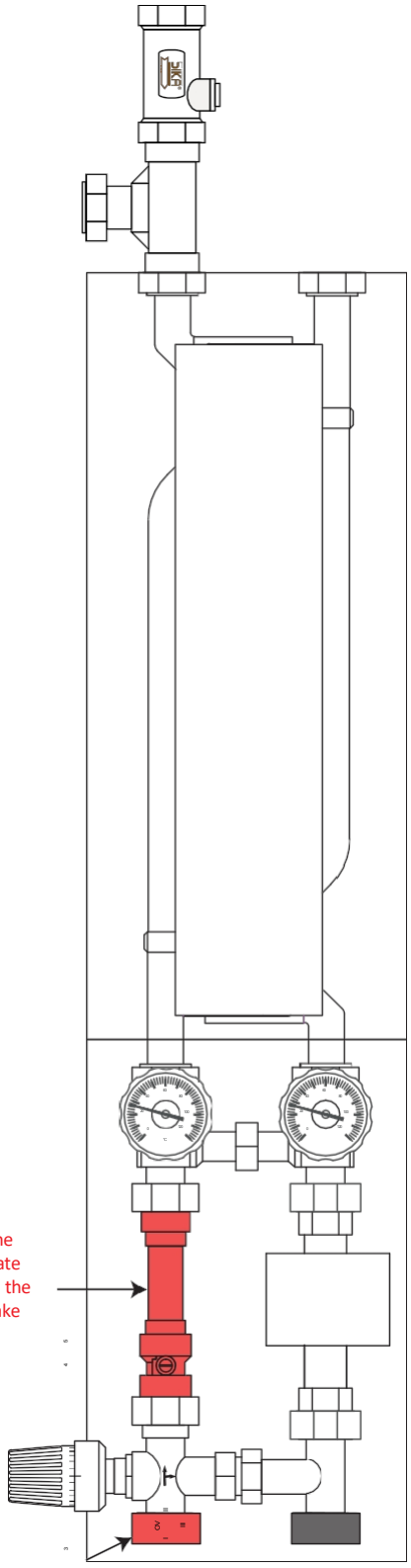


without ratiotherm heat meter

Installation of an optional heat meter (TWK 70/90 kW)

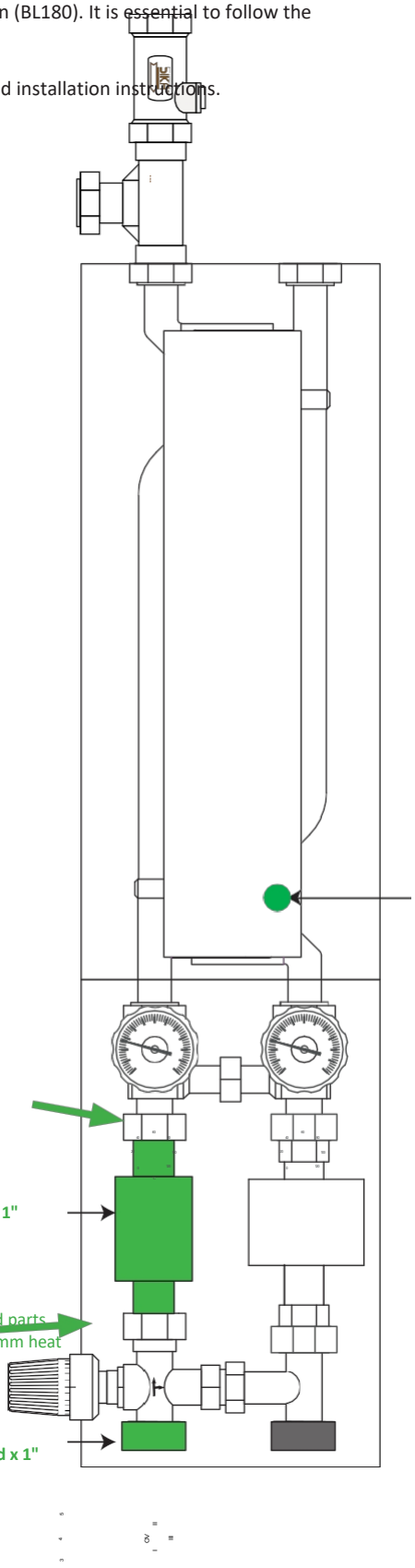
If necessary, a heat meter can be retrofitted to the compact drinking water station (BL180). It is essential to follow the manufacturer's operating and installation instructions supplied.

The use and the various displays are explained in the manufacturer's operating and installation instructions.



1. Remove the intermediate piece with the gravity brake

2. Remove the spacer



Red nipple
1 1/2" male x 1"
female
L=35 mm

3. Fit the moulded parts for the BL 130 mm heat meter

Red nipple
1 1/2" male thread x 1"
female thread
L=25 mm

5. On the rear side, the 1/2" brass plug must be removed and replaced with a suitable reducer.

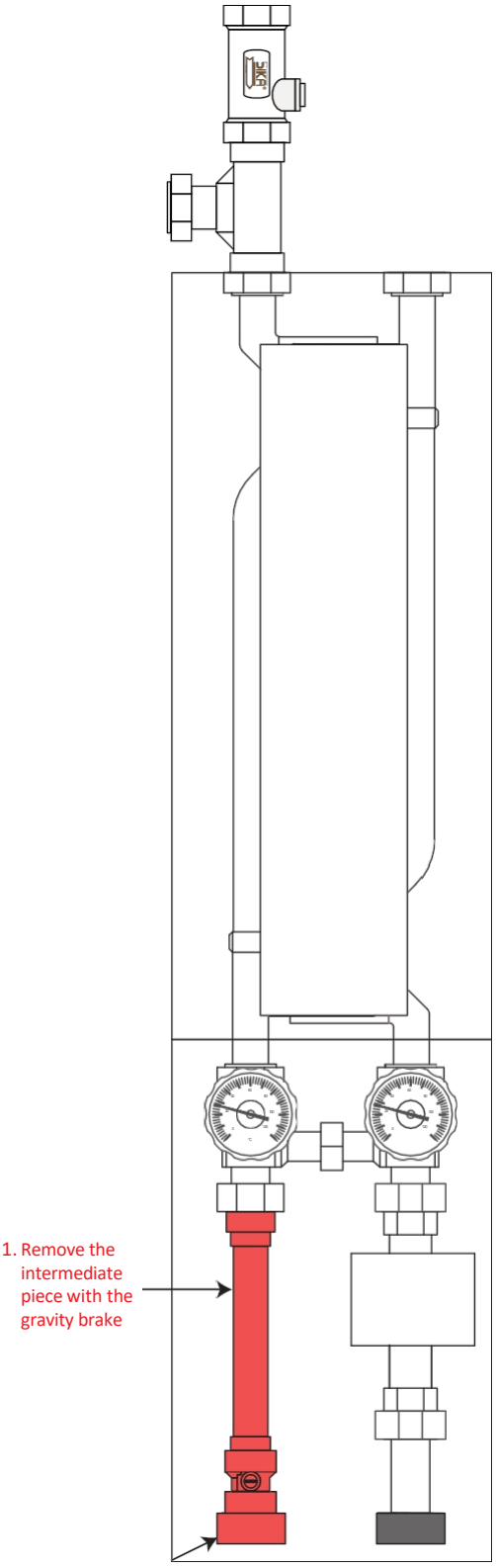
The flow sensor for the heat meter is then installed there.

4. **Red nipple 1 1/2" male thread 1" female thread L=25 mm** and install the gravity brake DN25 female thread 1 1/2" and male thread 1 1/2"

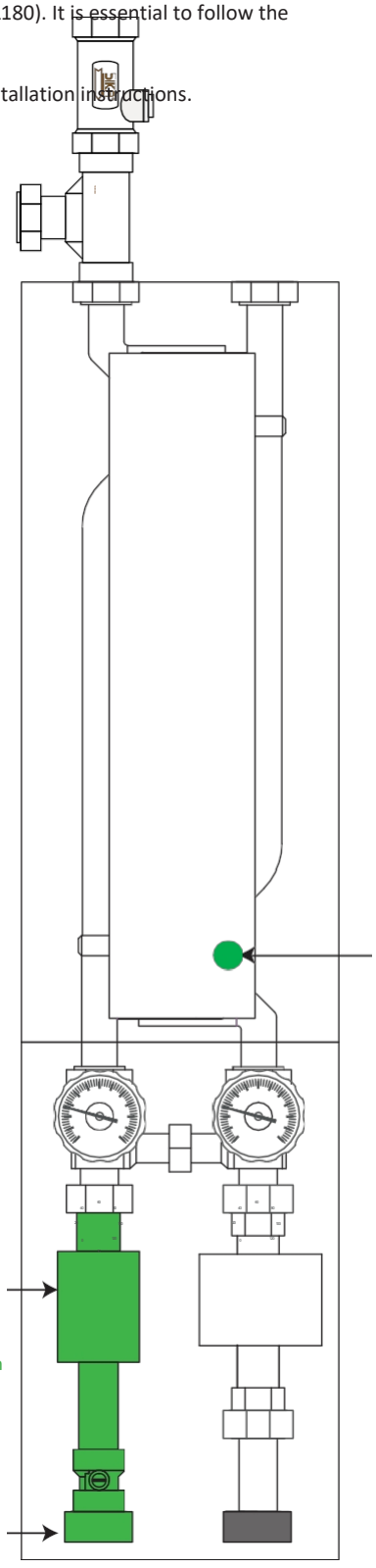
Installation of an optional heat meter (TWK 100 kW)

If necessary, a heat meter can be retrofitted to the compact drinking water station (BL180). It is essential to follow the manufacturer's operating and installation instructions supplied.

The use and the various displays are explained in the manufacturer's operating and installation instructions.



1. Remove the intermediate piece with the gravity brake



3. Installation of the BL 130 mm heat meter

2. Installation of the heat meter fittings

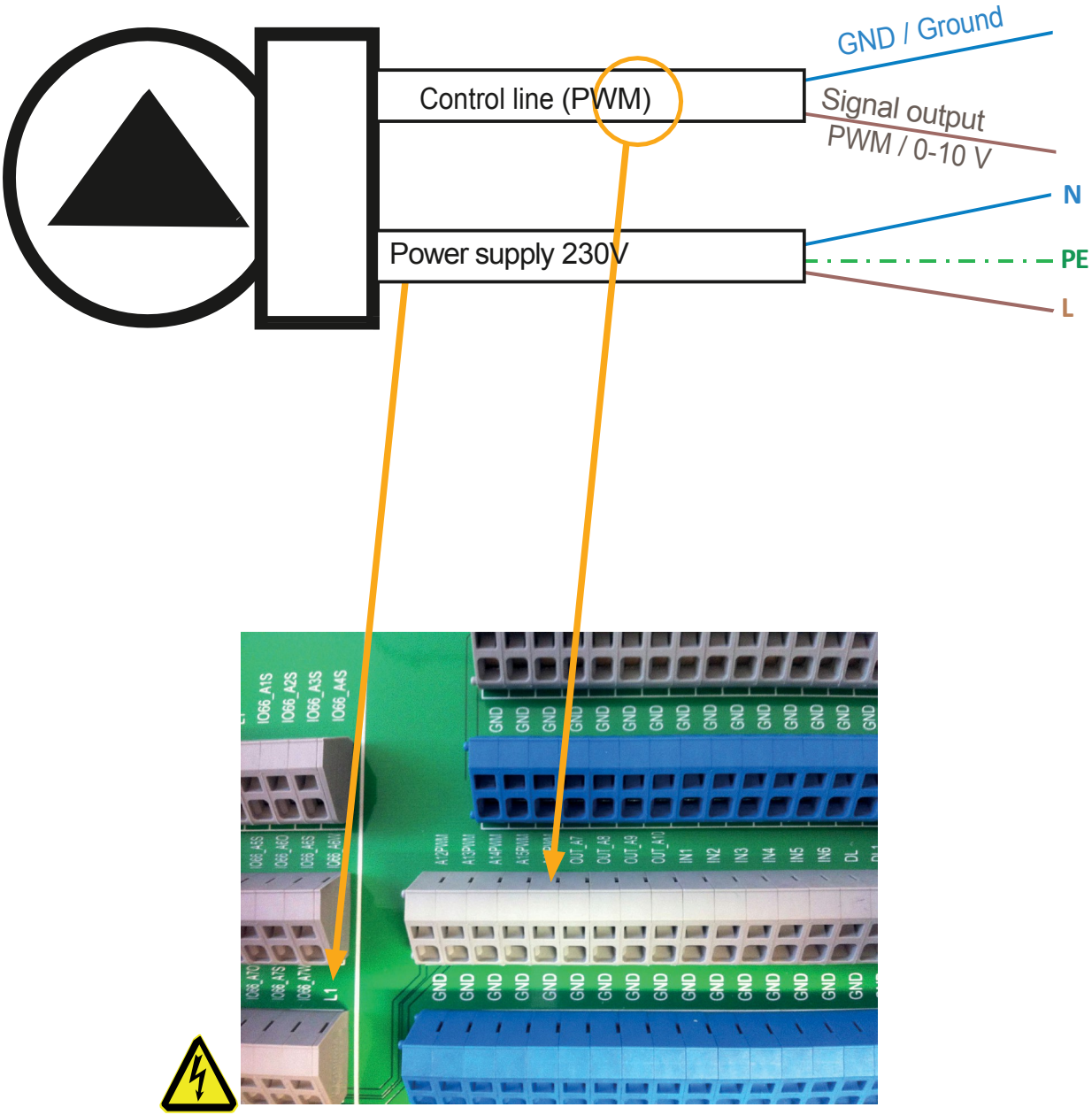
4. On the rear side, the 1/2" brass plug must be removed and replaced with a suitable reducer.

The flow sensor of the heat meter is then mounted there.

ATTENTION!

The **2-core cable** is for connecting the PWM control line (A16PWM). The **3-core cable** is for connecting to the 230V ~ mains (continuous voltage). Mixing them up can result in the destruction of the pump!

Pump signal: **green "flashing"** = standby mode (230 volts applied) Pump signal: **green continuous LED** = PWM signal has switched on the pump

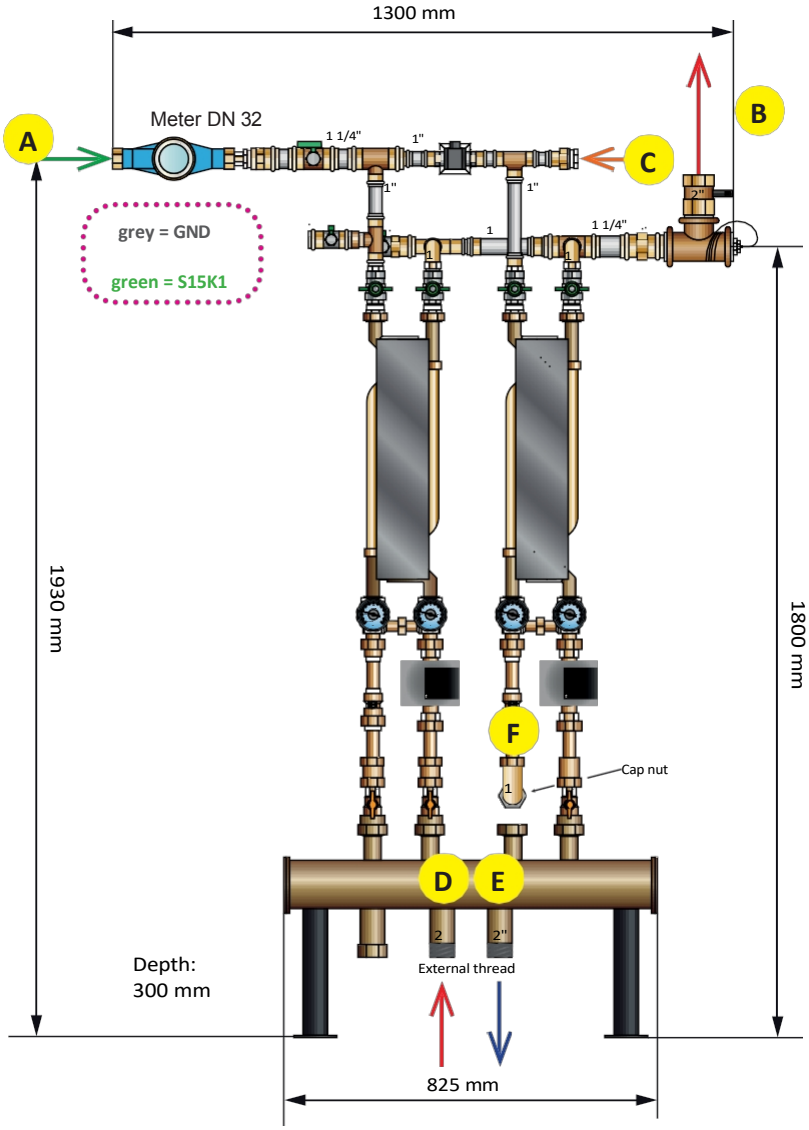


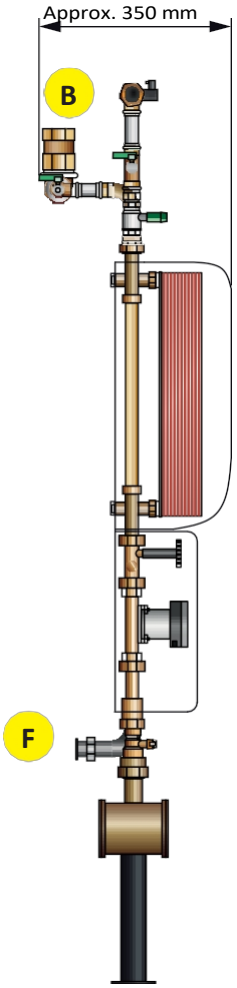
TWKK-200 drinking water cascade heater (2-stage)

HEAT OUTPUT:		239	292	206	235	kW
Heating water inlet:	D	70	70	60	60	°C
Heating water outlet:	E	24	13	20	15	°C
Cold water inlet:	A	10	10	10	10	°C
Hot water outlet:	B	60	40	50	40	°C
Hot water output:		69	140	74	113	l/min
Weight approx.:					75	kg

CONNECTIONS:

KW connection:	A	DN 25	RAG	1	Water meter screw connection
Hot water connection:	B	DN 32	RIG	1¼"	
Circulation connection:	C	DN 25	RIG	1	
Heating water flow:	D	DN 50	RAG	2"	
Heating water return:	E	DN 50	RAG	2	
Heating water return circulation:	F	DN 25	ÜWM	1½"	



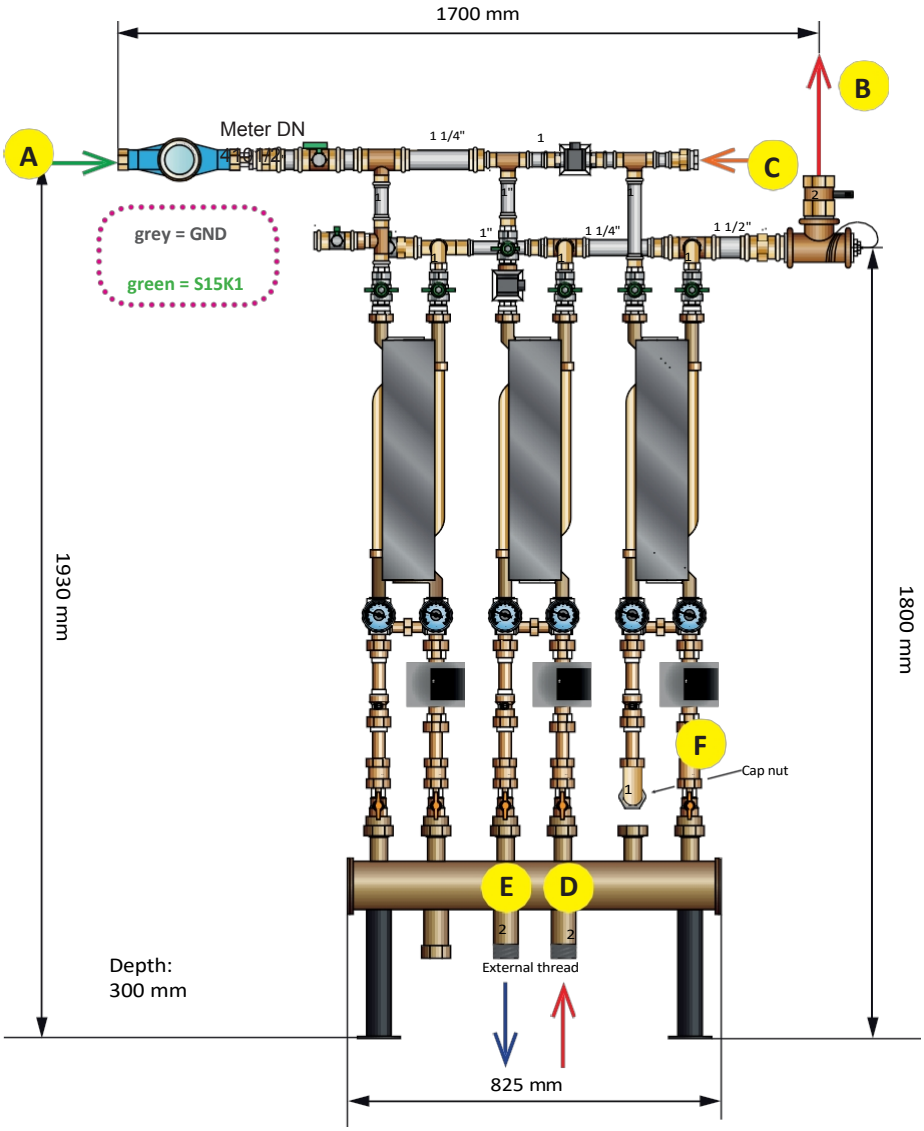


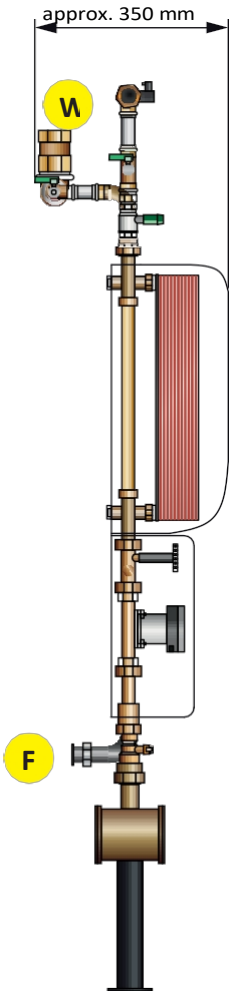
TWKK-300 drinking water cascade heater (3-stage)

HEAT OUTPUT:		359	438	309	352	kW
Heating water inlet:	D	70	70	60	60	°C
Heating water outlet:	E	24	13	20	15	°C
Cold water inlet:	A	10	10	10	10	°C
Hot water outlet:	B	60	40	50	40	°C
Hot water output:		104	216	111	169	l/min
Weight approx.:					125	kg

CONNECTIONS:

KW connection:	A	DN 32	RAG	1¼"	Water meter connection
Hot water connection:	B	DN 40	RIG	1½"	
Circulation connection:	C	DN 25	RIG	1	
Heating water flow:	D	DN 50	RAG	2	
Heating water return:	E	DN 50	RAG	2	
Heating water return circulation:	F	DN 25	ÜWM	1½"	



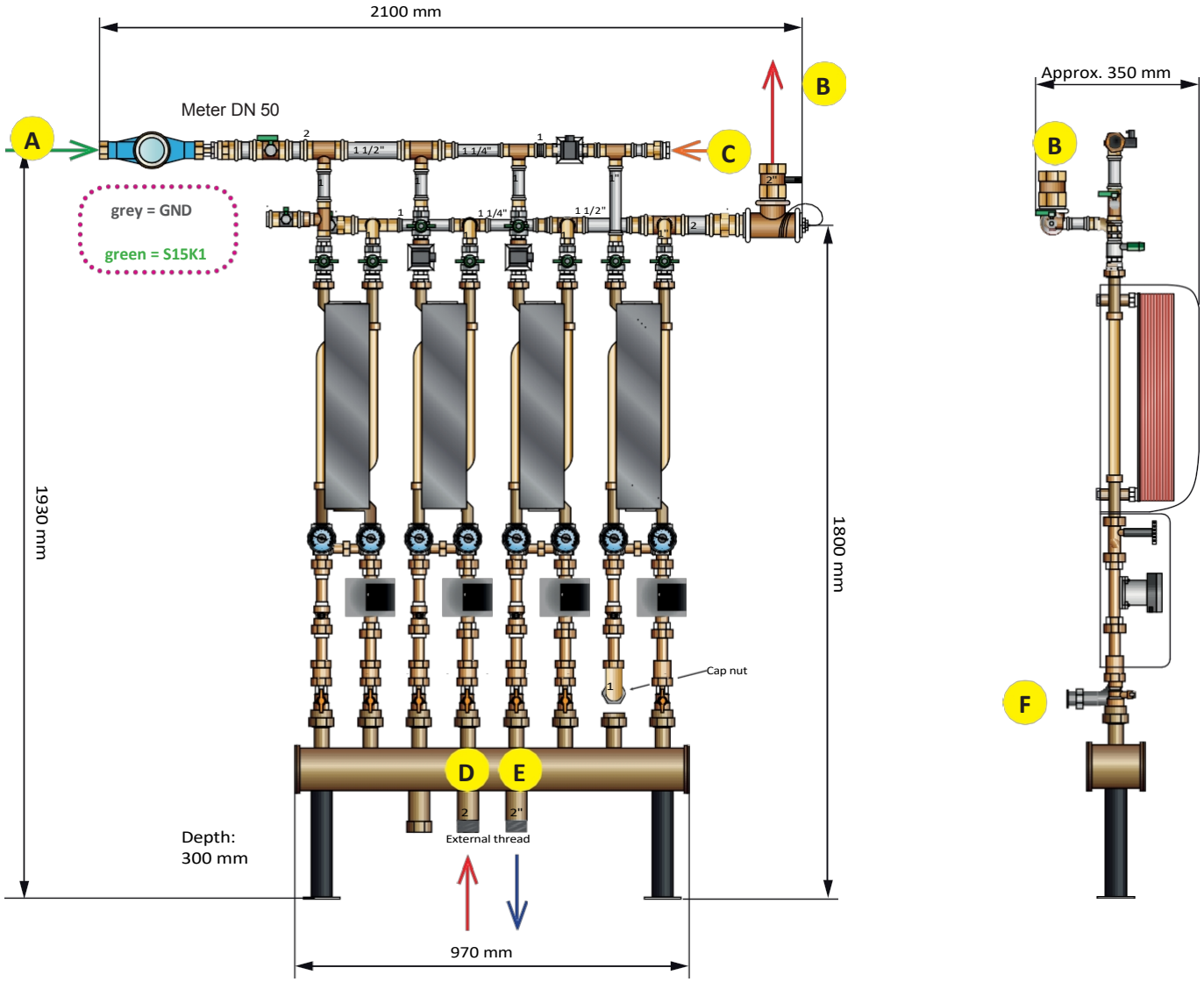


TWKK-400 drinking water cascade heater (4-stage)

HEAT OUTPUT:		478	584	412	470	kW
Heating water inlet:	D	70	70	60	60	°C
Heating water outlet:	E	24	13	20	15	°C
Cold water inlet:	A	10	10	10	10	°C
Hot water outlet:	B	60	40	50	40	°C
Hot water output:		138	280	148	226	l/min
Weight approx.:					150	kg

CONNECTIONS:

KW connection:	A	DN 40	RAG	1½"	Water meter connection
Hot water connection:	B	DN 50	RIG	2	
Circulation connection:	C	DN 25	RIG	1	
Heating water flow:	D	DN 50	RAG	2	
Heating water return:	E	DN 50	RAG	2"	
Heating water return circulation:	F	DN 25	ÜWM	1½"	



Calculation of hot water output

ratiotherm TWKK heaters offer maximum flexibility in terms of maximum and constantly changing hot water requirements thanks to their expandability and infinitely variable power regulation. This results in optimum investment and operating costs for modern, hygienic fresh water heating systems.

Here are a few tips for selecting ratiotherm TWKK heaters:

1. According to DVGW worksheet "W551", a hot water temperature of at least 60°C must be maintained at the hot water outlet of a drinking water heater in large systems (see DVGW worksheet "W551").

2. For multi-family residential buildings, the maximum domestic hot water demand or DHW heat demand must be designed according to the number of bathtubs or showers.

   When determining the actual power requirement, the peak hot water output required for the number of residential units or their number of bathtubs or showers is multiplied by a simultaneity factor "n".

3. Design assumptions:

- To fill a bathtub with 200 litres of mixed water at 40°C (80 litres of cold water at 10°C + 120 litres of hot water at 60°C) in 12 minutes, a heat output of approx. 35 kW (heat quantity 7 kWH) is required.

- Flow rates in l/min at 40°C for: Shower fitting 9.6 / Washbasin 10.5 / 15.0

- DHW demand for basic requirements: 20 l/day/person at an outlet temperature of 60°C at the water heater

- DHW demand for higher requirements: 40 l/day/person at an outlet temperature of 60°C at the water heater

Design example for 20 residential units based on various "n" factors according to the table on page 29:

Solution A, via DHW heat demand:

- Q = 20 residential units x 35 kW x **factor "n"** 0.40 = **280 kW**

- Q = 20 residential units x 35 kW x **factor "n"** 0.23 = **161 kW**

- Q = 20 WE x 35 kW x **factor "n"** 0.17 = **119 kW**

Solution B, based on DHW volume requirement:

- V = 20 WE x 9.6 l/min at 60°C x **factor "n"** 0.40 = **76.8 litres/min** at 60°C

- V = 20 WE x 9.6 l/min at 60°C x **factor "n"** 0.23 = **44.6 litres/min** at 60°C

- V = 20 WE x 9.6 l/min at 60°C x **factor "n"** 0.17 = **32.6 litres/min** at 60°C

- Heating water storage in stratified storage tank assuming 20 l/day/person Outlet temperature 60°C: 20 l x 3.5 persons/dwelling unit x 10 dwelling units = 700 l/heating water at 70°C

- Heating water storage in stratified storage tank assuming 40 l/day/person, outlet temperature 60°C: 40 l x 3.5 persons/weekend x 10 weekends = 1400 l/heating water at 70°C

Concurrency table

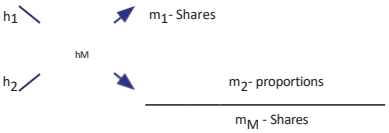
Mixed water formulas:

$$h_{M=} = \frac{m1 \cdot h1 + m2 \cdot h2}{mM}$$

$$m_1 = m_2 \cdot \frac{h_2 - h_M}{h_M - h1}$$

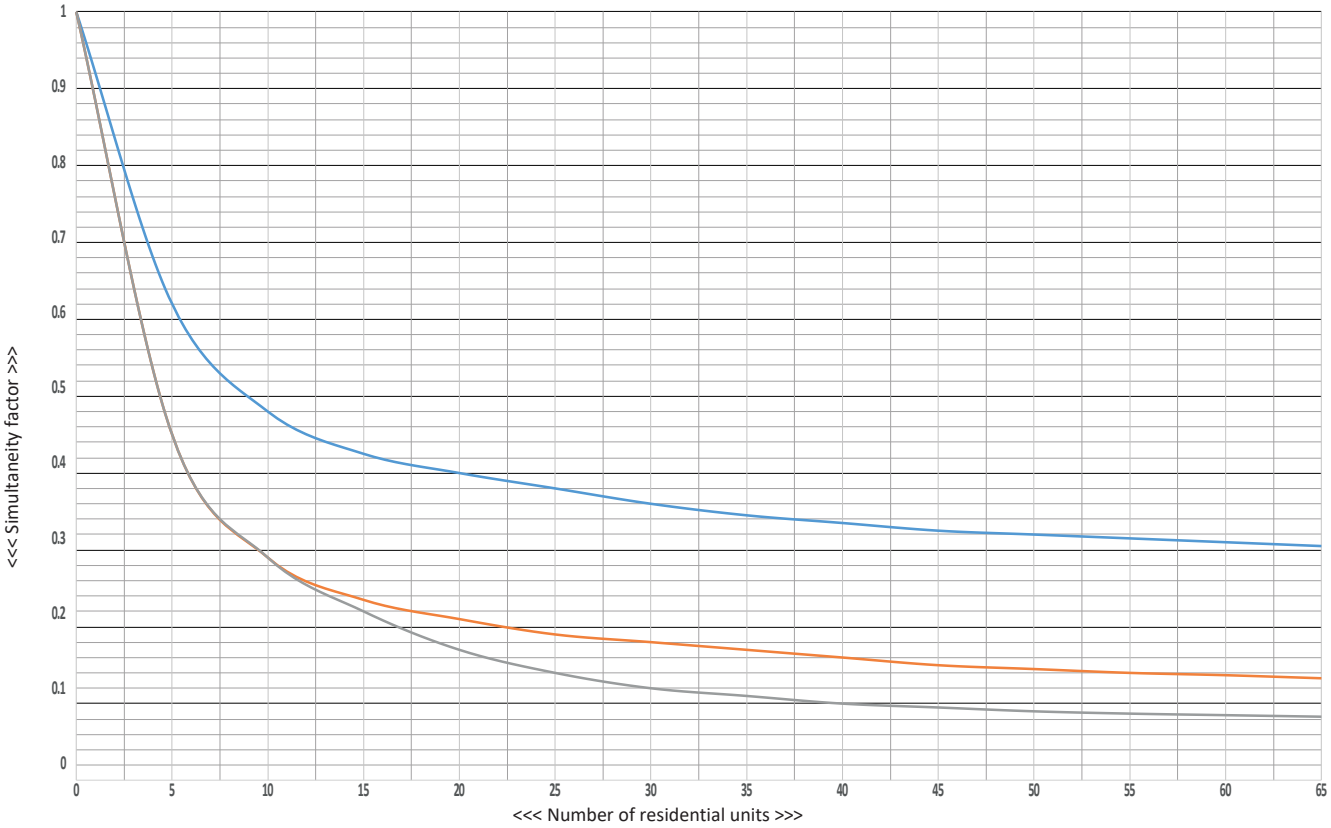
$$m_2 = m_1 \cdot \frac{h_M - h1}{h2 - h_M}$$

Mixed water cross



m_1 =	Cold water mass	[kg]	$h_{1=}$	Cold water temperature	[°C]
m_2 =	Hot water mass	[kg]	$h_{2=}$	Hot water temperature	[°C]
	Mixed water mass	[kg]	$h_{M=}$	Mixed water temperature	[°C]

Central water heating systems based on the flow-through system for rental properties with 3-4 room apartments, 3-4 persons and full bath per apartment



Simultaneity factors:

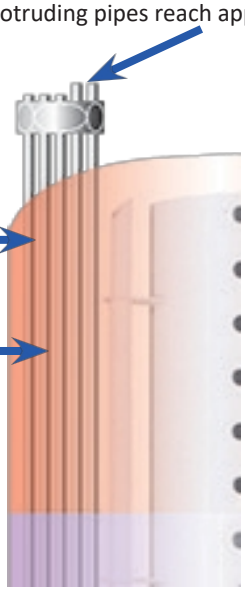
- According to Rechnagel-Sprenger-Schramek
- According to DIN 4708
- According to measurements carried out by TU Dresden

Positioning of the sensors in the vertical immersion sleeve

Immersion depth of the immersion pipes.
The sensors can be arranged continuously at different heights. The two protruding pipes reach approximately to the middle of the storage tank.

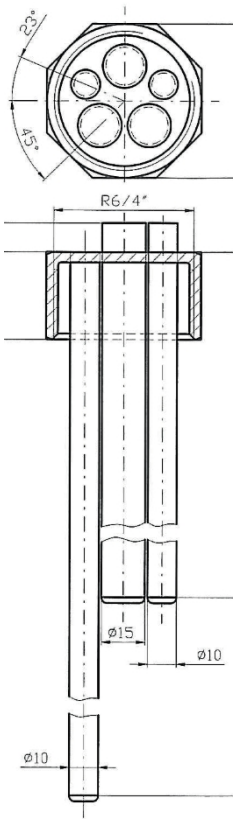
S1 (rUVR + rZR) for hot water preparation for TWK > Table p. 39

S2 (rUVR + rZR) for hot water preparation for TWK > Table p. 39

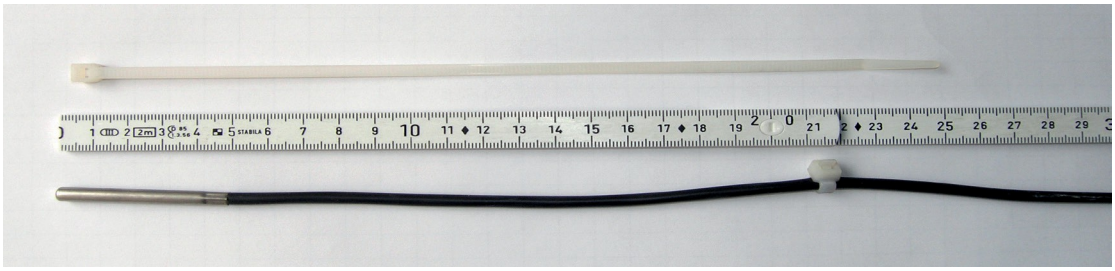


Stainless steel immersion sleeve with:

- 3 immersion tubes 15/1 mm
- 2 immersion tubes 10/1 mm

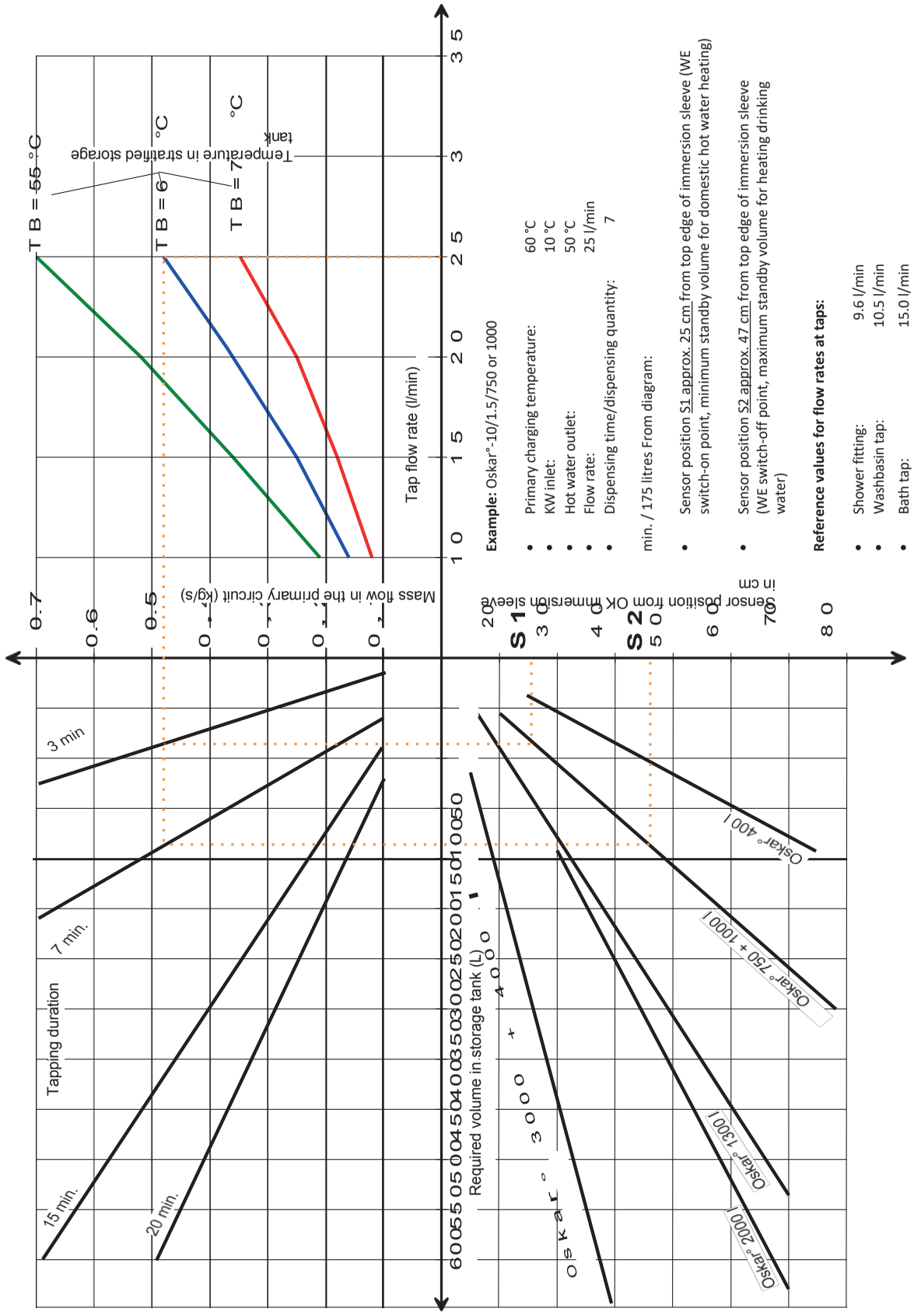


SE	1.0 / 1.5	1.0 / 1.5	1.0 / 1.5	1.0 / 1.5	1.0 / 1.5	1.0 / 1.5	1.0 / 1.5	5.0	5.0	5.0	
Type Oskar°-	400	750	1000	1300	2000	3000	4000	2000	3000	4000	mm
S3 Oskar°	500	500	500	500	500	500	600	500	500	600	mm
S3 Osc. WPS	800	800	800	800	800	800	900				mm
S11	1500	1500	1880	1700	1700	1500	2010	1700	1500	2010	mm

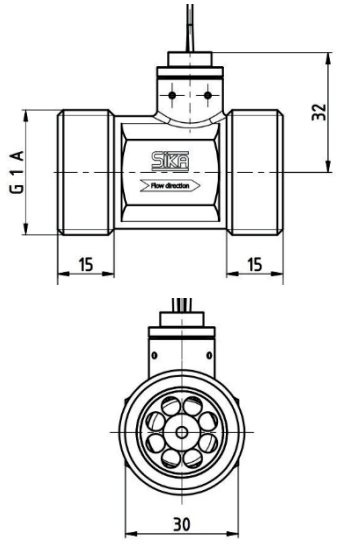


- Determine the sensor immersion depth using the diagrams and secure it to the cable with heat-resistant plastic cable ties.
- Mark the sensor on both sides with the enclosed labelling material (shrink wrap).
- Insert the sensor up to the cable tie position. The cable tie should ensure the immersion depth.
- If necessary, extend the sensor in accordance with VDE regulations to ensure a secure connection.

Positioning of sensors for hot water preparation Min/Max



Turbine flow sensor VTY 20 – Data



Low wear and extremely long service life thanks to high-quality bearings.

Virtually no series variation due to fixed pulse rate.

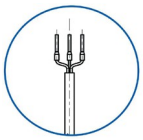
Wide measuring range (up to 1:60), insensitive to pressure surges, proven in numerous large-scale applications.

High measuring accuracy, largely independent of installation position due to integrated flow rectifiers.

Colour code for stranded cables

!Connect all wires!

White	4.5 - 24 VDC Power supply
Green	S 15 Signal input
brown	GND Ground



Electrical Connection 80 mm single wires with 0.5 m PVC cable

Technical data:

Material Pipe section Brass Measuring
range 1...60 l/min
Measuring accuracy ±1% of full scale ±1% of measured value Repeatability ±1%
Signal output From 0.8 l/min
Media temperature 0...90 °C
Ambient temperature 0...70 °C
Nominal pressure PN 16
Nominal diameter DN 20
Process connection G 1 external thread
Measuring sensor Hall effect sensor
Output signal Square wave frequency signal, NPN open collector Duty cycle 50:50
Pulse rate / K factor 119 pulses/l Supply voltage 4.5...24 VDC Pressure loss 0.33 bar (at Q = 60 l/min)

Function

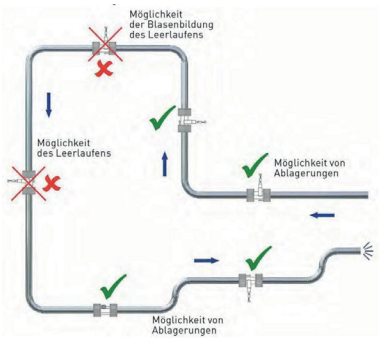
The fluid flowing into the VTY causes the rotor ⑤ to rotate.
The forces generated during rotation are largely cancelled out by the symmetrical shape of the rotor, and wear is reduced to a minimum.

The rotor ⑤ of the VTY is equipped with a magnet.

A Hall effect sensor ③ detects the rotation of the rotor and converts it into a flow-proportional frequency signal (square wave signal).

The extremely hard bearing materials, sapphire and carbide, also guarantee an exceptionally long service life.

Turbine flow sensor VTY 20 – Installation



In principle, the VTY can be installed at any point in the pipeline. Straight pipe sections are preferable.

It can be installed in both horizontal and vertical pipelines.

The flow sensor is only suitable for use in completely filled pipes. You must avoid a free outlet at all costs.

The arrow (⍰) on the flow sensor indicates the only possible flow direction.

Be sure to hold it steady!

CAUTION! Material damage!

Observe maximum torque. When tightening the union nut on the turbine body of the device, hold it in place! Failure to hold it in place may damage the VTY.

Tighten the two union nuts. Hold the turbine body of the device with an open-end spanner (SW19 / SW30).

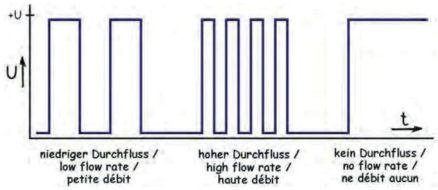
Maximum torque / spanner size

VTY10MA • G½	VTY10K5 • G¾	VTY20MA • G1
20 Nm	8	20 Nm
SW19	SW19	SW30

COMMISSIONING:

Check that
- the VTY has been installed correctly and all screw connections are tight.
- the electrical connections have been made correctly.
- the measuring system has been vented by flushing.

- The VTY has no switch and cannot be switched on or off independently.
- It is switched on and off via the connected supply voltage.
- Switch on the supply voltage.
- The VTY is ready for operation and switches to measurement mode.



In measurement mode, the VTY delivers an NPN square wave signal proportional to the flow rate. The frequency of the output signal changes in accordance with the flow rate.

You can find us here

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