# Technical documentation

## Oskar°-10

As of 2022

ratiotherm

Smart Energy Systems

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# TABLE OF CONTENTS

## GENERAL BASICS OF DESIGN

- Stratified storage technology relies on temperature differences, i.e. heat generators and heat consumers should be designed with a high temperature spread.
- In general, it is necessary to "pre-sort" the different temperature levels by height positioning of the flow and return connections in the stratified storage tank is necessary.
- The temperatures supplied by the heat generators and heat consumers will always be set in the stratified storage tank. This means that the temperature of the coolest return flow from a heat consumer will be found at the lowest point of the storage tank, and the temperature of the warmest flow from a heat generator will be found at the highest point.
- The maximum design flow rates per connection of the respective stratified storage tank or stratified insert must be strictly adhered to. This value is also the parameter/type used when selecting the storage tank and stratification insert size.
- Continuously running circulation pumps with a low temperature difference should be avoided, as they destroy the stratification of the storage water. Particular attention should be paid to this when selecting condensing boilers.
- When using controlled heating circuits, 3-way mixers must always be provided (no 4-way mixers, no injection circuit).
- The design of the storage volume and stratification insert when using solar energy is primarily based on the collector area or collector output.

Example:

| | | | |
|---|---|---|---|
| Oskar°-500 litres | 6 to 8 m | Oskar°-750 litres | 8 to 12 m² |
| Oskar°-1,000 litres | 10 to 14 m² | Oskar°-1,000 litres | 12 to 14 m² |
| Oskar°-1,300 litres | 14 to 18 m² | Oskar°-2,000 litres | 18 to 26 m² |
| Oskar°-3,000 litres | 24 to 32 m² | Oskar°-4,000 litres | 30 to 40 m² |

- Since stratified storage technology is designed to make efficient use of the solar system for heating support and domestic hot water preparation, a south-facing collector system with an angle of inclination of 45° to 60° should be installed.
- In the case of log wood firing, the storage tank and stratified insert are usually dimensioned according to the boiler output or the "combustion chamber volume" (combustion output, i.e. heat quantity in kWh) as well as according to the legal requirements and recognised rules of technology.
- The effectiveness of heat generators and storage systems as well as solar coverage rates increase with the minimisation of maximum flow temperatures for heat consumers.

## ADVANTAGES AND BENEFITS

- The patented thermohydraulic stratification system is based exclusively on physical principles/laws of nature and requires no control technology whatsoever to function, whether electrical, electronic or mechanical.
- The coating system operates without any (external) energy input, solely on the basis of the natural law of gravity (warm water is lighter than cold water).
- OSKAR has no wearing parts and is therefore fail-safe, maintenance-free and durable.
- OSKAR stores heat (thermal energy) in the form of neutral, unproblematic heating water, which means that there is no risk of corrosion, calcification or contamination, i.e. OSKAR has a virtually unlimited service life.
- The stratification system not only feeds heat flows from a wide variety of heat generators into the storage volume in a stratified manner, but also all return flows from the heating circuits/heat consumers, which usually have very different temperatures.
- The patented thermohydraulic stratification and connection system ensures stable and fast-reacting stratification of storage water at different temperatures.
- Universal application, as it is not tied to any specific system and is fundamentally compatible with all heat generators, heat consumption systems and associated control systems. Ideal
  Possibility of combining different heat generators, such as oil/gas boiler + solid fuel boiler/tiled stove + solar. When using OSKAR, there is no need for complicated hydraulic and electrical/electronic circuits, pipe systems, changeover valves or other actuators/control valves. The system design is simplified, the control technology is minimised and operation is safer and more efficient.
- Optimum utilisation of solar energy, e.g. almost 40% total energy savings when using solar energy for heating and domestic hot water with only 10 m² of collector area (result of a thesis at the Munich University of Applied Sciences, Department of Supply Engineering, based on a single-family home in the Bavarian Alpine foothills).
- Maximum utilisation of condensation heat in condensing boiler technology through a consistently cool return temperature; i.e. consistently maximum efficiency of the condensing boiler.
- Optimisation of burner running times, reducing burner starts by up to 70% and pollutant emissions by up to 50%.
- Minimal heat loss, even when connected, as all connections are located at the bottom, in the coolest part of the storage tank.
- Hygienic drinking water heating (domestic hot water preparation) according to the continuous flow principle.

# NOTES ON DOCUMENTATION

## GENERAL INFORMATION

The following information is a guide to the entire documentation.

Other documents are valid in conjunction with these operating and installation instructions. The ratiotherm Oskar-08 must not be operated without these instructions.

The manual must be made available to the operator and the specialist tradesman for information at all times. If the Oskar-08 is sold, the manual must be included.

The technical documentation can also be downloaded as a PDF file from our website.

We accept no liability for damage caused by failure to follow these instructions.

**TARGET GROUP:**

This operating manual is intended for

- the operator (user) and
- specialist tradesmen working on the system.

**STORAGE OF DOCUMENTS:**

Keep this manual and all applicable documents in a place where they are available when needed.

Hand over the documents to the successor when moving out or selling.

**SYMBOLS USED:**

Danger zone

Danger from electric current

Warning of hot surfaces and liquids

STOP

De-energise before working

Warning of damage

Read the operating instructions


Signs requiring the wearing of personal protective equipment

## INTENDED USE

The ratiotherm Oskar-08 is built in accordance with the state of the art
and recognised safety regulations.

Improper or unintended use may result in danger to the life and limb of the user or third parties.

Oskar-08 is not intended for use by persons (including children) with limited physical, sensory or mental abilities.

It is also not intended for use by persons with insufficient experience and/or knowledge

- unless they are supervised by a person responsible for their safety or have received instructions from that person on how to use the product.

The storage tank is intended exclusively for domestic and/or commercial use
for hot water preparation (domestic water) and for heat collection and distribution.

Any other or additional use is considered improper. The manufacturer/supplier is not liable for any damage resulting from this.

The risk is borne solely by the user (operator).

Intended use also includes observing the operating and installation instructions and all other applicable documents, as well as complying with the inspection and maintenance conditions.

# NOTES ON DOCUMENTATION

## INTENDED USE

The installation, commissioning or dismantling of the system may only be carried out by a specialist with specific knowledge necessary for the activities involved with this device.

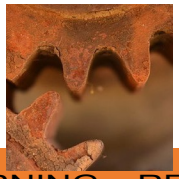
The existing regulations, rules and guidelines as well as the local installation requirements must be observed.

## CAUTION - RISK OF SCALDING

Safety valve and blow-off pipe
The volume of water increases during the heating process.
Therefore, never close the blow-off pipe of the safety valve.

Hot water may escape from the blow-off pipe. Particular caution is required here with the solar station!

## NOTE – CORROSION DAMAGE



To prevent corrosion, do not use sprays, solvents, chlorinated cleaning agents, paints, adhesives, etc. in the vicinity of the device.
Under unfavourable circumstances, these substances can lead to corrosion.

## WARNING – REPLACEMENT AND WEAR PARTS

Components that have not been tested with the system may cause damage to the system or impair its functions.

Only use original spare parts and original wear parts.

## GUIDELINES, STANDARDS AND LAWS

When setting up and installing the product, the following regulations, rules and guidelines must be observed in particular:

## IN GERMANY:

- VDE and EVU regulations and provisions (in particular VDE 0100);
- Regulations and provisions of local utility companies;
- DVGW worksheet W 382
  "Installation and operation of pressure reducers in drinking water consumption systems";
- DIN 1988 – TRWI Technical rules for drinking water installations;
- DIN 4753 – Water heating systems for drinking and service water;
- Accident prevention regulations VGB 20 Accident prevention regulations
- Energy Saving Ordinance (EnEV) – Ordinance on energy-saving thermal insulation and energy-saving building services in buildings from 2009

In addition, further local regulations and guidelines, e.g. local building regulations, may also apply.

As a general rule, the legal regulations applicable in the respective country must be observed!

According to DIN 1988 and EnEV § 10, **ball valves** must be serviced and inspected at regular intervals.
In cases of extreme stress, inspections must be carried out at shorter intervals.
Ball valves should be operated regularly at 3-month intervals to ensure smooth operation and to prevent any deposits from forming on the ball, thus ensuring long-term safe functioning!

## QUALIFICATION OF PERSONNEL

The installation, commissioning or dismantling of the system may only be carried out by a specialist with specific knowledge required for the activities involved in this system.

By personnel, we mean all persons who work on the ratiotherm system.

**Trainees are not considered qualified personnel in this sense!**

We assume that

- the operating personnel have been trained.
- the maintenance personnel adjust, check and repair the ratiotherm system in such a way that there is no danger to people or property.


To avoid injuries of any kind, the general accident prevention regulations must be observed under all circumstances and appropriate personal protective equipment must be used.

## Safe installation

To ensure safe installation, the responsible specialist tradesman must ensure that:

- the personnel have the necessary qualifications and receive the necessary training;
- the personnel have read and understood the operating instructions;
- staff have access to the operating instructions at all times;
- local accident prevention and environmental regulations are implemented and complied with;
- staff are instructed by the responsible supervisor and unauthorised persons are kept away from the ratiotherm system;

## TECHNICAL CHANGES

Safety devices must not be taken out of service.

Only original spare parts and original accessories from the manufacturer may be used.

# TECHNICAL DATA

## OSKAR-10/1.5/...

| Type: Oskar°-10/1.5/... | | 750 | 1,000 | 1,300 | 2,000 | 3,000 | 4,000 | litres |
|---|---|---|---|---|---|---|---|---|
| Actual volume approx.: | | 720 | 920 | 1,340 | 2,010 | 3,000 | 4,000 | l |
| Volume flow: | | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | l/h |
| Total height without insulation: | | 1,730-1,770 | 2,110-2,150 | 1,990-2,030 | 2,100 | 1,940 | 2,440 | mm |
| Total height with insulation: | | 1,890 | 2,270 | 2,150 | 2,220 | 2,080 | 2,560 | mm |
| Diameter without insulation: | | 790 | 790 | 1,000 | 1,200 | 1,600 | 1,600 | mm |
| Diameter with insulation: | | 990 | 990 | 1,200 | 1,440 | 1,840 | 1,840 | mm |
| Length with front and rear connections | | 1,040 | 1,040 | 1,240 | 1,500 | 1,900 | 1,900 | mm |
| Length with attachment distributor 1 | | 1,387 | 1,387 | 1,587 | 1,847 | 2,247 | 2,247 | mm |
| Length with attachment distributor 2 | | 1,420 | 1,420 | 1,620 | 1,880 | 2,280 | 2,280 | mm |
| Loading connections on the left/right side | | | | | | | | |
| Width | | 1,015 | 1,015 | 1,220 | 1,470 | 1,870 | 1,870 | mm |
| Length with attachment distributor 1 (347 mm) | | 1,362 | 1,362 | 1,567 | 1,817 | 2,217 | 2,217 | mm |
| Length with attachment distributor 2 (380 mm) | | 1,395 | 1,395 | 1,600 | 1,850 | 2,250 | 2,250 | mm |
| Weight without insulation approx.: | | 140 | 155 | 220 | 285 | 470 | 550 | kg |
| Max. tipping dimensions: | | 1,850 | 2,220 | 2,080 | 2,260 | 2,200 | 2,650 | mm |
| Dimensional tolerances | | ± 10 | ± 10 | ± 10 | ± 10 | ± 10 | ± 10 | mm |
| Maximum operating pressure: | | 3 | 3 | 3 | 3 | 3 | 3 | bar |
| Maximum operating temperature: | | 95 | 95 | 95 | 95 | 95 | 95 | °C |
| Pressure loss Oskar°: | | 20 | 20 | 20 | 20 | 20 | 20 | mbar |
| Pressure loss Oskar°: | | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | mWS |
| Standby heat loss DIN: | | 1.92 | 2.27 | 2.71 | 3.13 | 3.88 | 4.77 | kWh/d |
| Vent pipe at top: | | ½" | ½" | ½" | ¾" | ¾" | ¾" | RIG |
| Container material: | St 37-2 / S235JR / P265GH | | | | | | | |
| Paint finish: | Black anti-corrosion paint on the outside / untreated on the inside | | | | | | | |

### Position heights of standard SE connections from bottom edge of storage tank feet:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No. 1 | Heat generator (HT) VL | | 1,598 | 1,911 | 1,767 | 1,920 | 1,727 | 2,106 | mm |
| No. 2 | Heat generator (NT) RL | | 328 | 361 | 497 | 370 | 457 | 556 | mm |
| No. 3 | Heat generator (HT) RL | | 1,058 | 1,371 | 1,227 | 1,380 | 1,187 | 1,566 | mm |
| No. 4 | Consumer (NT) RL | | 473 | 506 | 642 | 515 | 602 | 701 | mm |
| No. 5 | Consumer (HT) VL | | 1,668 | 2,016 | 1,387 | 2,025 | 1,798 | 2,211 | mm |
| No. 6 | Consumer (HT) Directive | | 738 | 771 | 907 | 780 | 867 | 966 | mm |
| No. 7 | Consumer (HT/NT) VL | | 1,313 | 1,626 | 1,482 | 1,635 | 1,442 | 1,821 | mm |
| No. 8 | Solar RL | | 160 | 160 | 180 | 200 | 180 | 180 | mm |
| No. 9 | Solar VL | | 1,218 | 1,531 | 1,387 | 1,540 | 1,347 | 1,726 | mm |
| No. 10 | Heat generator (NT) VL | | 1,058 | 1,317 | 1,227 | 1,380 | 1,187 | 1,566 | mm |

### Positioning of sensors S3 and S11 in the vertical immersion sleeve:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S3 | Heating system HT / NT | | 600 | 600 | 600 | 600 | 600 | 600 | mm |
| S11 | Reference sensor Solar + WE2 | | 1,500 | 1,880 | 1,700 | 1,700 | 1,500 | 2,010 | mm |

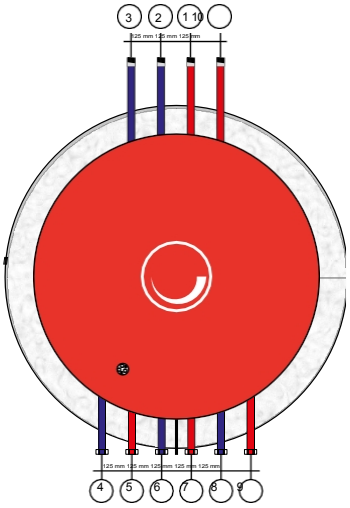


ratiotherm
Smart Energy Systems

# LOADING AND UNLOADING CONNECTIONS

Standard loading connections

Connections 1;2;3;10 = DN 25 RAG 1"
Connections 4; 5; 6; 7; 8; 9 = DN 25 flat seal Flange and union nut 1½"

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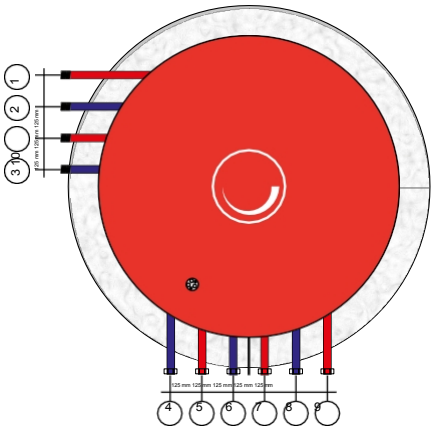


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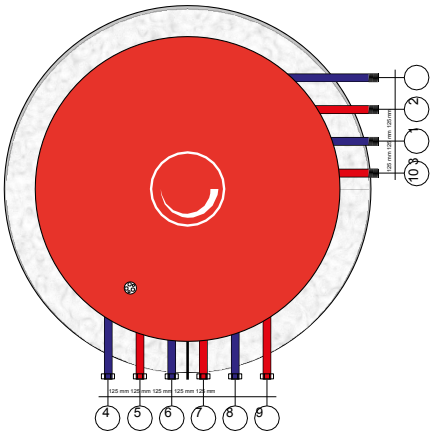
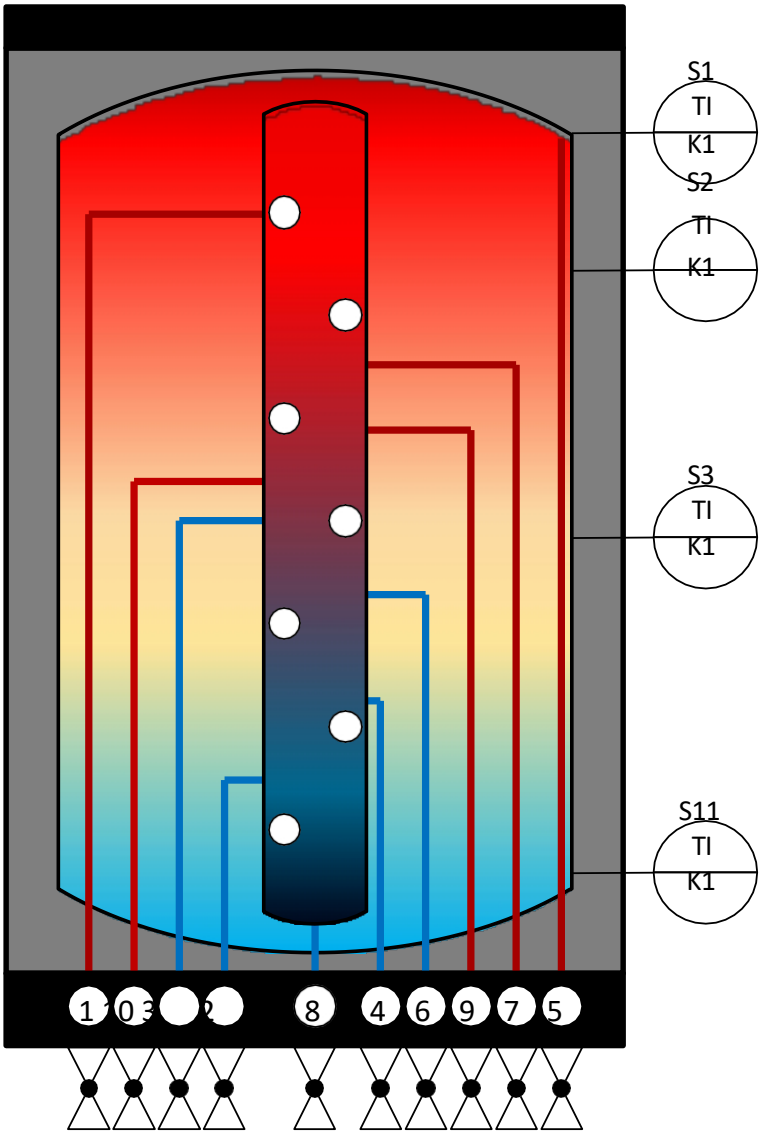



**Oskar° 10**



# TECHNICAL DATA

## OSKAR-WPS-10/1.5/...

| Type: Oskar-WPS--10/1.5/... | | 750 | 1,000 | 1,300 | 2,000 | 3,000 | 4,000 | litres |
|---|---|---|---|---|---|---|---|---|
| Actual volume approx.: | | 720 | 920 | 1,340 | 2,010 | 3,000 | 4,000 | l |
| Volume flow: | | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | l/h |
| Total height without insulation: | | 1,730-1,770 | 2,110-2,150 | 1,990-2,030 | 2,100 | 1,940 | 2,440 | mm |
| Total height with insulation: | | 1,890 | 2,270 | 2,150 | 2,220 | 2,080 | 2,560 | mm |
| Diameter without insulation: | | 790 | 790 | 1,000 | 1,200 | 1,600 | 1,600 | mm |
| Diameter with insulation: | | 990 | 990 | 1,200 | 1,440 | 1,840 | 1,840 | mm |
| Length with front and rear connections | | 1,040 | 1,040 | 1,240 | 1,500 | 1,900 | 1,900 | mm |
| Length with attachment distributor 1 | | 1,387 | 1,387 | 1,587 | 1,847 | 2,247 | 2,247 | mm |
| Length with attachment distributor 2 | | 1,420 | 1,420 | 1,620 | 1,880 | 2,280 | 2,280 | mm |
| Loading connections on the left/right side | | | | | | | | |
| Width with side connections incl. insulation | | 1,015 | 1,015 | 1,220 | 1,470 | 1,870 | 1,870 | mm |
| Length with attachment distributor 1 | | 1,362 | 1,362 | 1,567 | 1,817 | 2,217 | 2,217 | mm |
| Length with attachment distributor 2 | | 1,395 | 1,395 | 1,600 | 1,850 | 2,250 | 2,250 | mm |
| Weight without insulation approx.: | | 140 | 155 | 220 | 285 | 470 | 550 | kg |
| Max. tipping dimensions: | | 1,850 | 2,220 | 2,080 | 2,260 | 2,200 | 2,650 | mm |
| Dimensional tolerances | | ± 10 | ± 10 | ± 10 | ± 10 | ± 10 | ± 10 | mm |
| Maximum operating pressure: | | 3 | 3 | 3 | 3 | 3 | 3 | bar |
| Maximum operating temperature: | | 95 | 95 | 95 | 95 | 95 | 95 | °C |
| Pressure loss Oskar°: | | 20 | 20 | 20 | 20 | 20 | 20 | mbar |
| Pressure loss Oskar°: | | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | mWS |
| Standby heat loss DIN: | | 1.92 | 2.27 | 2.71 | 3.13 | 3.88 | 4.77 | kWh/d |
| Vent pipe at top: | | ½" | ½" | ½" | ¾" | ¾" | ¾" | RIG |
| Container material: | St 37-2 / S235JR / P265GH | | | | | | | |
| Paint finish: | Black anti-corrosion paint on the outside / untreated on the inside | | | | | | | |

### Position heights of standard SE connections from bottom edge of storage tank feet:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No. 1 | Heat generator (HT) VL | 1,598 | 1,911 | 1,767 | 1,920 | 1,727 | 2,106 | mm |
| No. 2 | Heat generator (NT) RL | 328 | 361 | 497 | 370 | 452 | 556 | mm |
| No. 3 | Heat generator (HT) RL | 1,138 | 1,461 | 1,307 | 1,470 | 1,267 | 1,656 | mm |
| No. 4 | Consumer (NT) RL | 473 | 506 | 642 | 515 | 602 | 701 | mm |
| No. 5 | Consumer (HT) VL | 1,668 | 2,016 | 1,837 | 2,025 | 1,798 | 2,211 | mm |
| No. 6 | Consumer (HT) RL | 738 | 771 | 907 | 780 | 867 | 966 | mm |
| No. 7 | Consumer (HT/NT) VL | 1,138 | 1,461 | 1,307 | 1,470 | 1,267 | 1,646 | mm |
| No. 8 | Solar RL | 160 | 160 | 180 | 200 | 180 | 200 | mm |
| No. 9 | Solar VL | 1,218 | 1,531 | 1,387 | 1,540 | 1,347 | 1,726 | mm |
| No. 10 | Heat generator (NT) VL | 1,288 | 1,611 | 1,457 | 1,620 | 1,417 | 1,806 | mm |

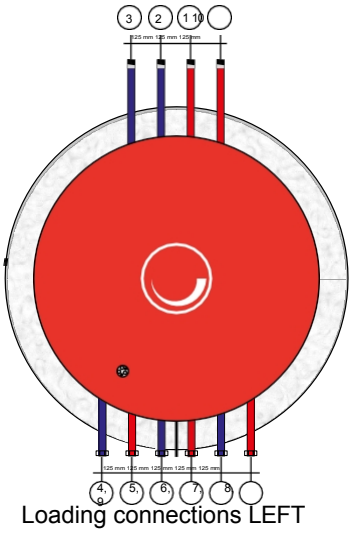
### Positioning of sensors S3 and S11 in the vertical immersion sleeve:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S3 | Heating system HT / NT | 950 | 120 | 950 | 1200 | 950 | 1200 | mm |
| S11 | Reference sensor Solar + WE2 | 1,500 | 1,880 | 1,700 | 1,700 | 1,500 | 2,010 | mm |

# LOADING AND UNLOADING CONNECTIONS

Standard loading connections

Connections 1;2;3;10 = DN 25 RAG 1"
Connections 4; 5; 6; 7; 8; 9 = DN 25 flat seal Flange and union nut 1½"

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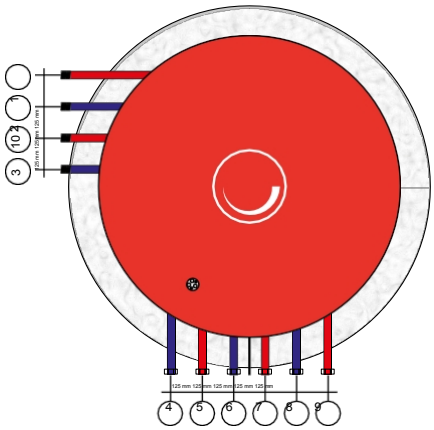


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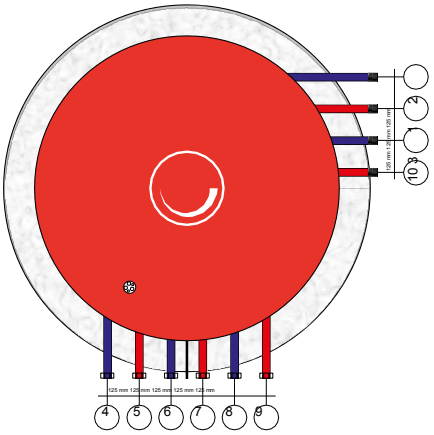
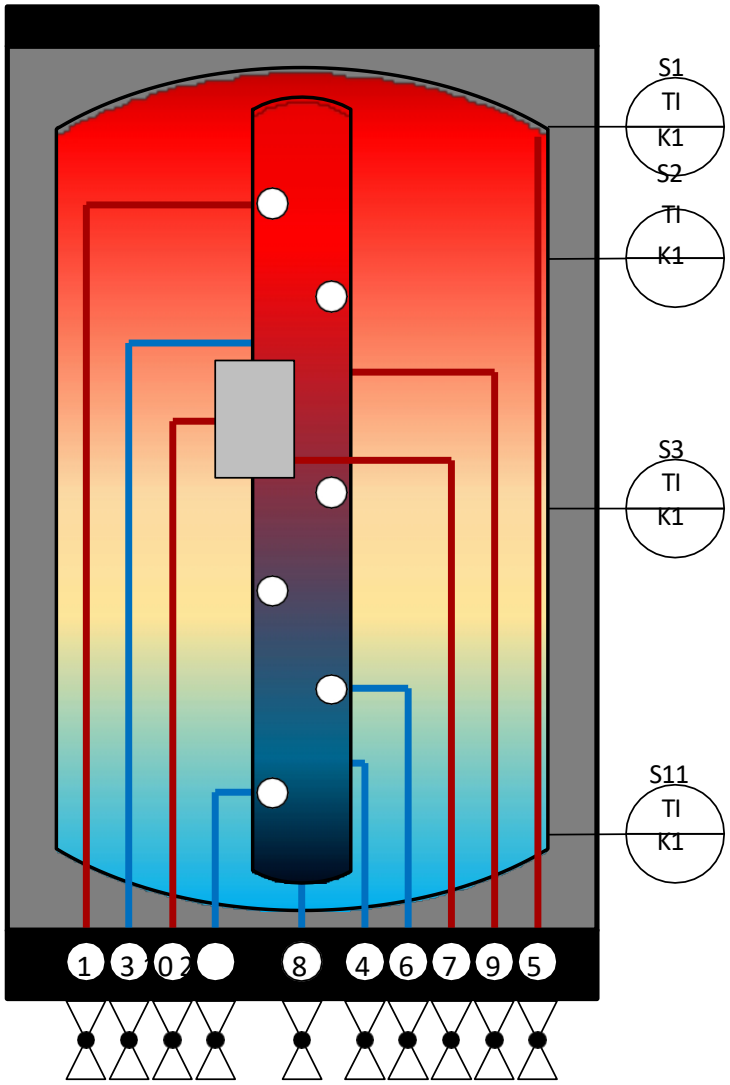



## Oskar° heat pump storage tank



# TECHNICAL DATA

## OSKAR-10/5.0/...

| Type: Oskar°-10/5.0/... | 1,000 | 1,300 | 2,000 | 3,000 | 4,000 | | | litres |
|---|---|---|---|---|---|---|---|---|
| Actual volume approx.: | 920 | 1,340 | 2,010 | 3,000 | 4,000 | | | l |
| Volume flow: | 1,500 | 1,500 | 5,000 | 5,000 | 5,000 | | | l/h |
| Total height without insulation: | 2,110-2,150 | 1,990-2,030 | 2,100 | 1,940 | 2,440 | | | mm |
| Total height with insulation: | 2,270 | 2,150 | 2,220 | 2,080 | 2,560 | | | mm |
| Diameter without insulation: | 790 | 1,000 | 1,200 | 1,600 | 1,600 | | | mm |
| Diameter with insulation: | 990 | 1,200 | 1,440 | 1,840 | 1,840 | | | mm |
| Length from front to rear | 1,040 | 1,240 | 1,500 | 1,900 | 1,900 | | | mm |
| Loading connections on the left/right side | | | | | | | | |
| Width with side connections incl. insulation | 1,015 | 1,220 | 1,470 | 1,870 | 1,870 | | | |
| Length with side connections incl. insulation. | | | 1,470 | 1,870 | 1,870 | | | |
| Weight without insulation approx.: | 155 | 220 | 315 | 470 | 550 | | | kg |
| Max. tipping dimensions: | 2,220 | 2,080 | 2,260 | 2,200 | 2,650 | | | mm |
| Dimensional tolerances | ± 10 | ± 10 | ± 10 | ± 10 | ± 10 | | | mm |
| Maximum operating pressure: | 3 | 3 | 3 | 3 | 3 | | | bar |
| Maximum operating temperature: | 95 | 85 | 95 | 95 | 95 | | | °C |
| Pressure loss Oskar°: | 20 | 20 | 45 | 45 | 45 | | | mbar |
| Pressure loss Oskar°: | 0.2 | 0.2 | 0.45 | 0.45 | 0.45 | | | mWS |
| Standby heat loss DIN: | 2.27 | 2.71 | 3.13 | 3.88 | 4.77 | | | kWh/d |
| Vent pipe at top: | ½" | ½" | ¾" | ¾" | ¾" | | | RIG |
| Container material: | St 37-2 / S235JR / P265GH | | | | | | | |
| Paint finish: | Black anti-corrosion paint on the outside / untreated on the inside | | | | | | | |

### Position heights of standard SE connections from bottom edge of storage tank feet:

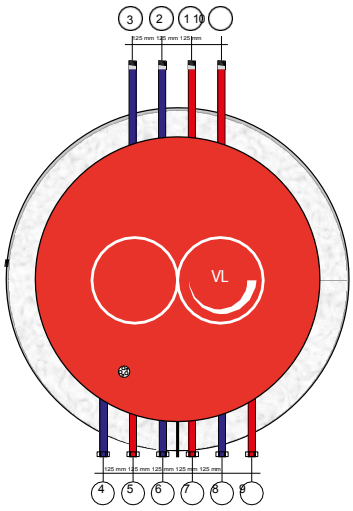
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No. 1 | Heat generator (HT) VL | 1,882 | 1,713 | 1,904 | 1,752 | 2,193 | | | mm |
| No. 2 | Heat generator (NT) RL | 372 | 468 | 474 | 377 | 673 | | | mm |
| No. 3 | Heat generator (HT) RL | 1,472 | 1,353 | 1,224 | 1,057 | 1,503 | | | mm |
| No. 4 | Consumer (NT) RL | 517 | 688 | 534 | 537 | 843 | | | mm |
| No. 5 | Consumer (HT) VL | 2,022 | 1,878 | 2,014 | 1,847 | 2,303 | | | mm |
| No. 6 | Consumer (HT) RL | 782 | 953 | 894 | 757 | 1,213 | | | mm |
| No. 7 | Consumer (HT/NT) VL | 1,472 | 1,353 | 1,554 | 1,437 | 1,853 | | | mm |
| No. 8 | Solar RL | 160 | 150 | 200 | 180 | 200 | | | mm |
| No. 9 | Solar VL | 1,542 | 1,433 | 1,554 | 1,497 | 1,853 | | | mm |
| No. 10 | Heat generator (NT) VL | 1,622 | 1,503 | 1,324 | 1,162 | 1,603 | | | mm |

### Positioning of sensors S3 and S11 in the vertical immersion sleeve:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S3 | HT / NT heating system | 1,200 | 950 | 600 | 600 | 700 | | | mm |
| S11 | Reference sensor Solar + WE2 | 1,880 | 1,700 | 1,700 | 1,500 | 2,010 | | | mm |

# LOADING AND UNLOADING CONNECTIONS

Loading connectionsStandard

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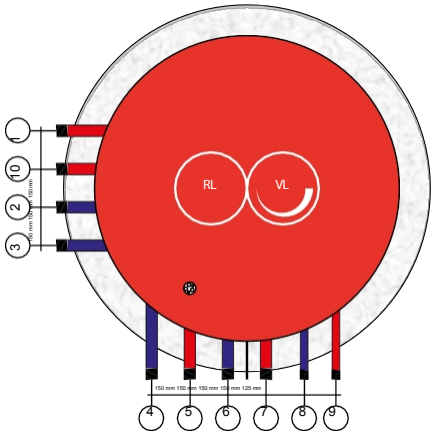
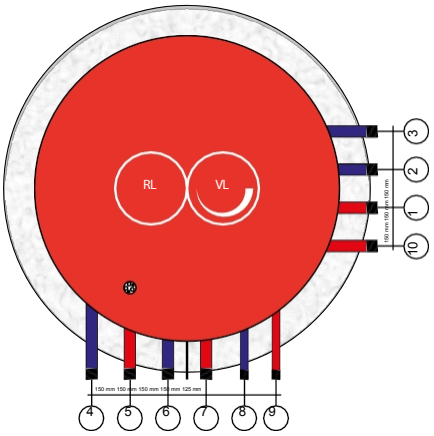


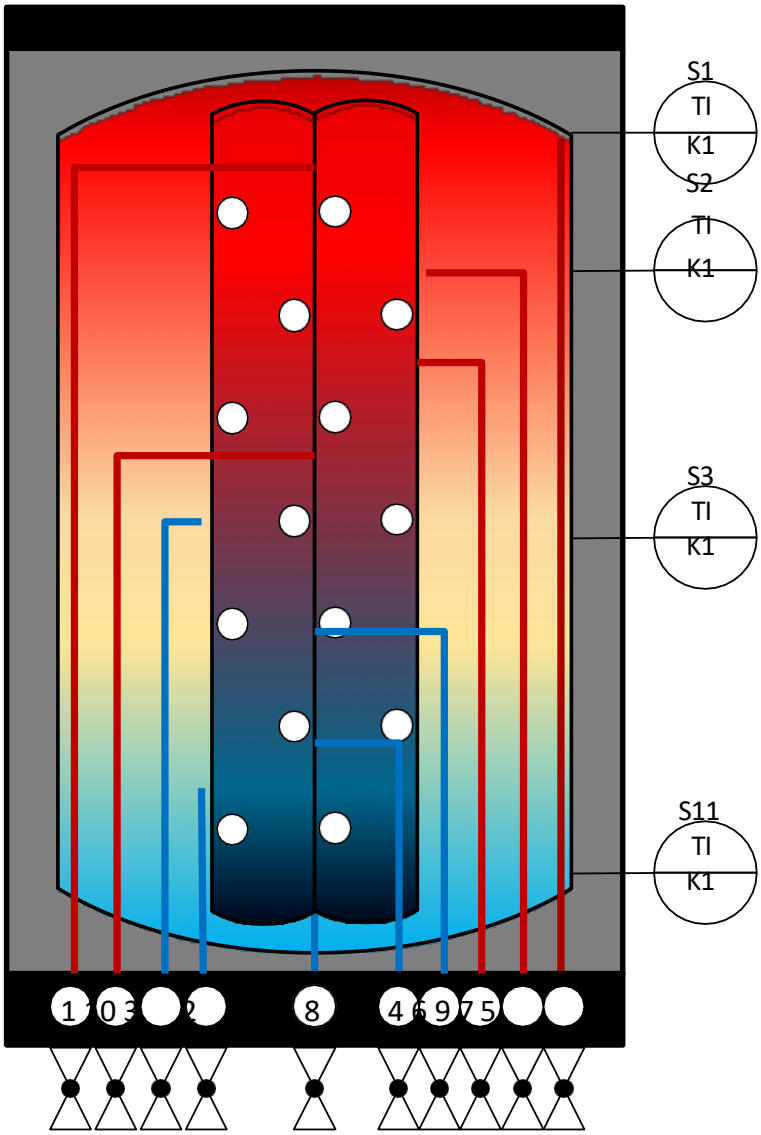

Loading connections RIGHT




Connections 1;2;3;4;5;6;7;10 = DN 40 RAG 1½"

Connections 8;9 = DN 25 RAG 1"

**Oskar° 10**



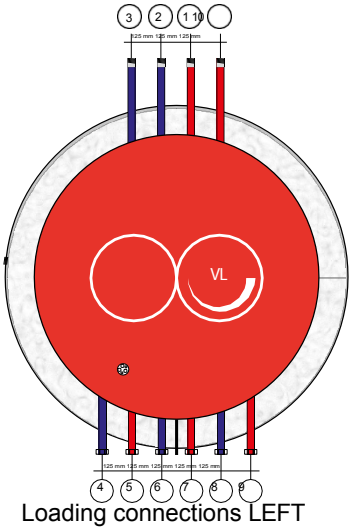
# TECHNICAL DATA

## OSKAR-WPS-10/5.0/...

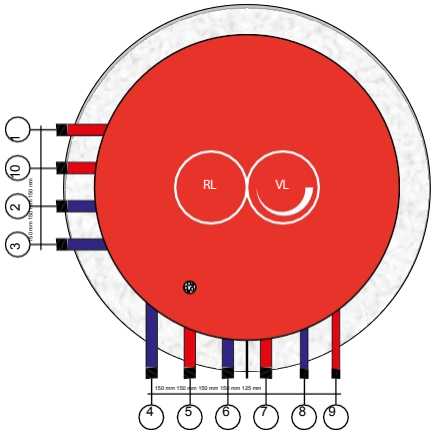
| Type: Oskar-WPS-10/5.0/... | | 2,000 | 3,000 | 4,000 | | | | | litres |
|---|---|---|---|---|---|---|---|---|---|
| Actual volume approx.: | | 2,010 | 3,000 | 4,000 | | | | | litres |
| Volume flow: | | 5,000 | 5,000 | 5,000 | | | | | l/h |
| Total height without insulation: | | 2,100 | 1,940 | 2,440 | | | | | mm |
| Total height with insulation: | | 2,220 | 2,080 | 2,560 | | | | | mm |
| Diameter without insulation: | | 1,200 | 1,600 | 1,600 | | | | | mm |
| Diameter with insulation: | | 1,440 | 1,840 | 1,840 | | | | | mm |
| Length from front to rear | | 1,500 | 1,900 | 1,900 | | | | | mm |
| Loading connections on the left/right side | | | | | | | | | |
| Width with side connections incl. insulation | | 1,470 | 1,870 | 1,870 | | | | | |
| Length with side connections incl. insulation. | | 1,470 | 1,870 | 1,870 | | | | | |
| Weight without insulation approx.: | | 315 | 470 | 550 | | | | | kg |
| Maximum tipping dimensions: | | 2,260 | 2,200 | 2,650 | | | | | mm |
| Dimensional tolerances | | ± 10 | ± 10 | ± 10 | | | | | mm |
| Maximum operating pressure: | | 3 | 3 | 3 | | | | | bar |
| Maximum operating temperature: | | 95 | 95 | 95 | | | | | °C |
| Pressure loss Oskar°: | | 45 | 45 | 45 | | | | | mbar |
| Pressure loss Oskar°: | | 0.45 | 0.45 | 0.45 | | | | | mWS |
| Standby heat loss DIN: | | 3.13 | 3.88 | 4.77 | | | | | kWh/d |
| Vent pipe at top: | | ¾" | ¾" | ¾" | | | | | RIG |
| Tank material: | | St 37-2 / S235JR / P265GH | | | | | | | |
| Paint finish: | | Black anti-corrosion paint on the outside / untreated on the inside | | | | | | | |
| **Position heights of standard SE connections from bottom edge of storage tank feet:** | | | | | | | | | |
| No. 1 | Heat generator (HT) VL | 1,904 | 1,752 | 2,192 | | | | | mm |
| No. 2 | Heat generator (NT) RL | 474 | 377 | 682 | | | | | mm |
| No. 3 | Heat generator (HT) RL | 1,334 | 1,312 | 1,602 | | | | | mm |
| No. 4 | Consumer (NT) RL | 539 | 537 | 822 | | | | | mm |
| No. 5 | Consumer (HT) VL | 2,014 | 1,807 | 2,262 | | | | | mm |
| No. 6 | Consumer (HT) RL | 794 | 757 | 1,212 | | | | | mm |
| No. 7 | Consumer (HT/NT) VL | 1,244 | 1,252 | 1,542 | | | | | mm |
| No. 8 | Solar RL | 200 | 180 | 200 | | | | | mm |
| No. 9 | Solar VL | 1,569 | 1,497 | 1,852 | | | | | mm |
| No. 10 | Heat generator (NT) VL | 1,424 | 1,372 | 1,662 | | | | | mm |
| **Positioning of sensors S3 and S11 in the vertical immersion sleeve:** | | | | | | | | | |
| S3 | Heating system HT / NT | 1100 | 1100 | 1100 | | | | | mm |
| S11 | Reference sensor Solar + WE2 | 1,700 | 1,500 | 2,010 | | | | | mm |

# LOADING AND UNLOADING CONNECTIONS

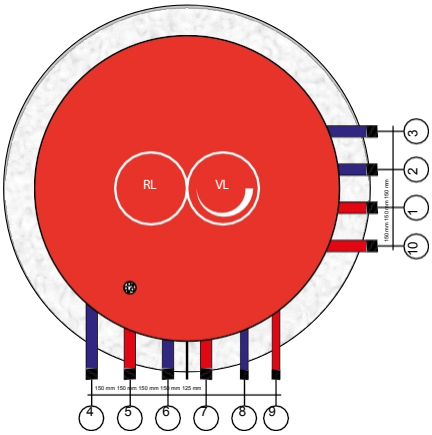
Loading connectionsStandard




Loading connections LEFT



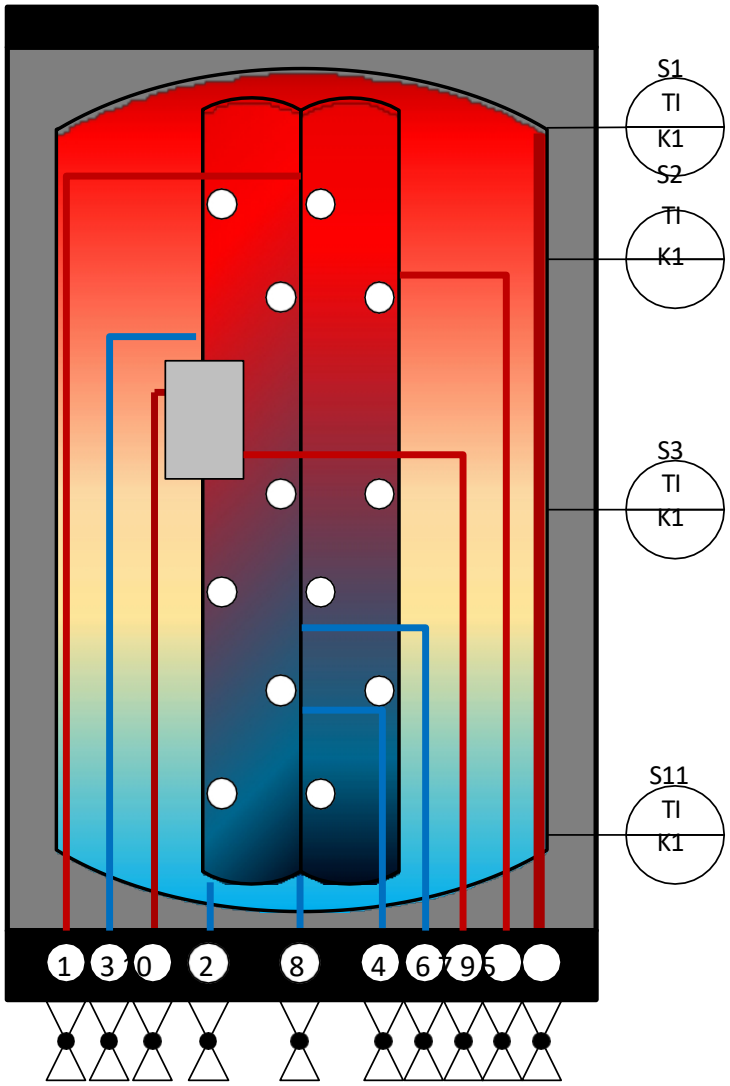

Loading connections RIGHT




Connections 1;2;3;4;5;6;7;10 = DN 40 RAG 1½"

Connections 8;9 = DN 25 RAG 1"

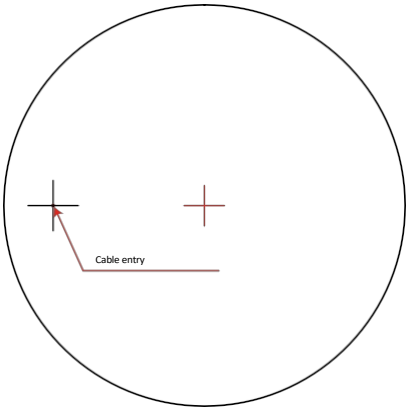
**Oskar° heat pump storage tank**



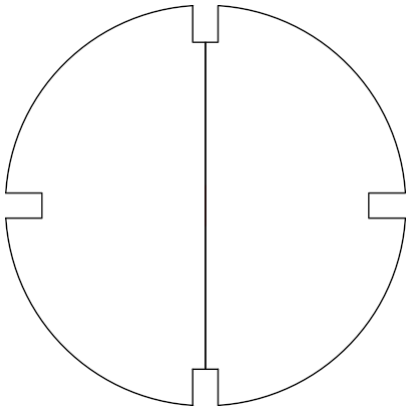
# STORAGE INSULATION

## 2-PIECE 750/1000/1300

Cover insulation fleece

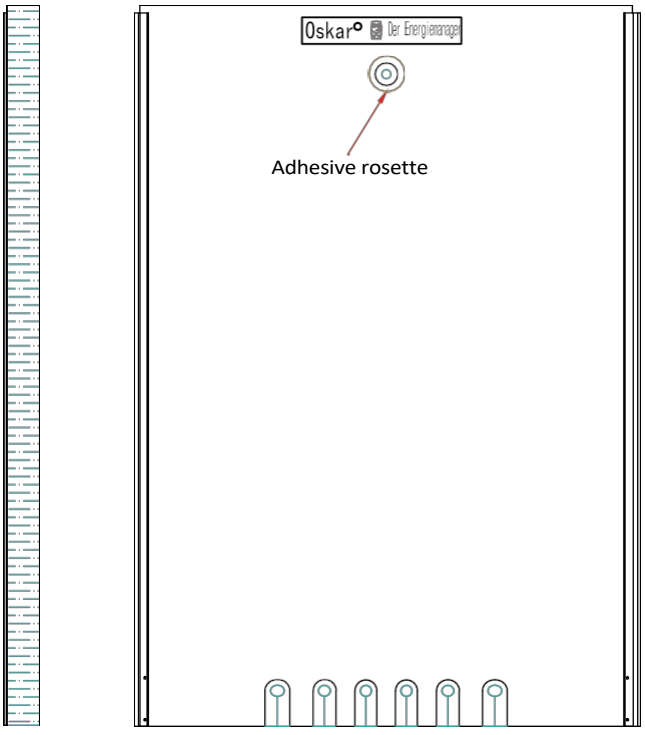



Bottom insulating fleece

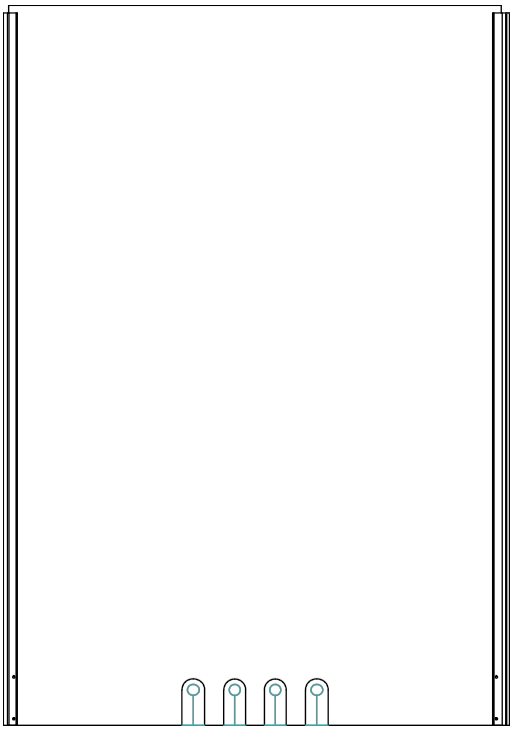


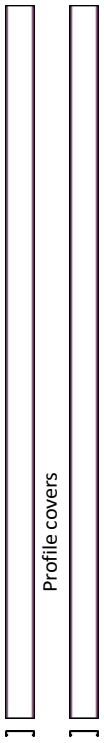
Lid plate with break


Insulating sheath at the front

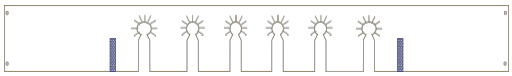



Insulating jacket at the rear

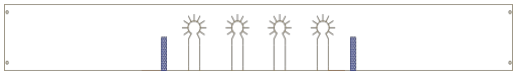





Front foot edge



Foot edge rear



Front foot panel

Foot panel, rear



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# 2-PIECE 750/1000/1300

**Parts list Thermal insulation Oskar° 750 litres**

| | |
|---|---|
| | Fleece insulation thickness 100 mm |
| 2 | PS panels, basalt grey glossy with cover film 1870 x 1560 mm |
| 1 | PS cover, basalt grey with protective film Ø 992 x 30 mm |
| 2 | Fleece insulation cover Ø 796 x 65 mm |
| 1 | Fleece insulation base with 4 x cut-outs Ø 796 x 65 mm |
| 2 | Profile cover with type plate 1846 x 250 mm |
| 1 | Front foot edge with velour tape 880 x 85 mm |
| 1 x | Foot edge at rear with velour tape 580 x 85 mm |
| 1 | Front foot panel with mushroom tape 170 x 1516 mm |
| 1 | Rear skirting board with mushroom tape 170 x 1516 mm |
| 1 | Adhesive rosette d 28 x Ø 110 mm |
| 1 | Cardboard box 2000 x 250 x 1650 mm |

**Parts list Thermal insulation Oskar° 1000 litres**

| | |
|---|---|
| | Fleece insulation thickness 100 mm |
| 2 | PS panels, basalt grey glossy with cover film 2240 x 1560 mm |
| 1 | PS cover, basalt grey with cover film Ø 796 x 30 mm |
| 2 | Fleece insulation cover Ø 806 x 65 mm |
| 1 x | Fleece insulation floor with 4 x cut-out Ø 806 x 65 mm |
| 2 | Profile cover with type plate 2216 x 250 mm |
| 1 | Front foot edge with velour tape 880 x 85 mm |
| 1 | Rear foot edge with velour tape 580 x 85 mm |
| 1 | Front foot panel with mushroom tape 170 x 1516 mm |
| 1 | Rear skirting board with mushroom tape 170 x 1516 mm |
| 1 | Adhesive rosette d 28 x Ø 110 mm |
| 1 | Cardboard 2380 x 290 x 1650 mm |

**Parts list Thermal insulation Oskar° 1300 litres**

| | |
|---|---|
| | Fleece insulation thickness 100 mm |
| 2 | PS panels, basalt grey glossy with cover film 2105 x 1890 mm |
| 1 | PS cover, basalt grey with protective film, Ø 1204 x 30 mm |
| 2 | Fleece insulation cover Ø 1006 x 65 mm |
| 1 | Fleece insulation base with 4 x cut-out Ø 1006 x 65 mm |
| 2 | Profile cover with type plate 2081 x 250 mm |
| 1 | Front foot edge with velour tape 880 x 85 mm |
| 1 | Rear foot edge with velour tape 580 x 85 mm |
| 1 x | Front foot panel with mushroom tape 170 x 1845.6 mm |
| 1 x | Rear skirting board with mushroom tape 170 x 1845.6 mm |
| 1 | Adhesive rosette d 28 x Ø 110 mm |
| 1 | Cardboard 2200 x 310 x 2100 mm |

PROPERTIES:

The thermal insulation of the "PV" storage tank consists of 100 or 120 mm thick polyester fleece in the jacket area, 120 mm thick polyester fleece in the lid area and 50 mm thick polyester fleece in the base area.

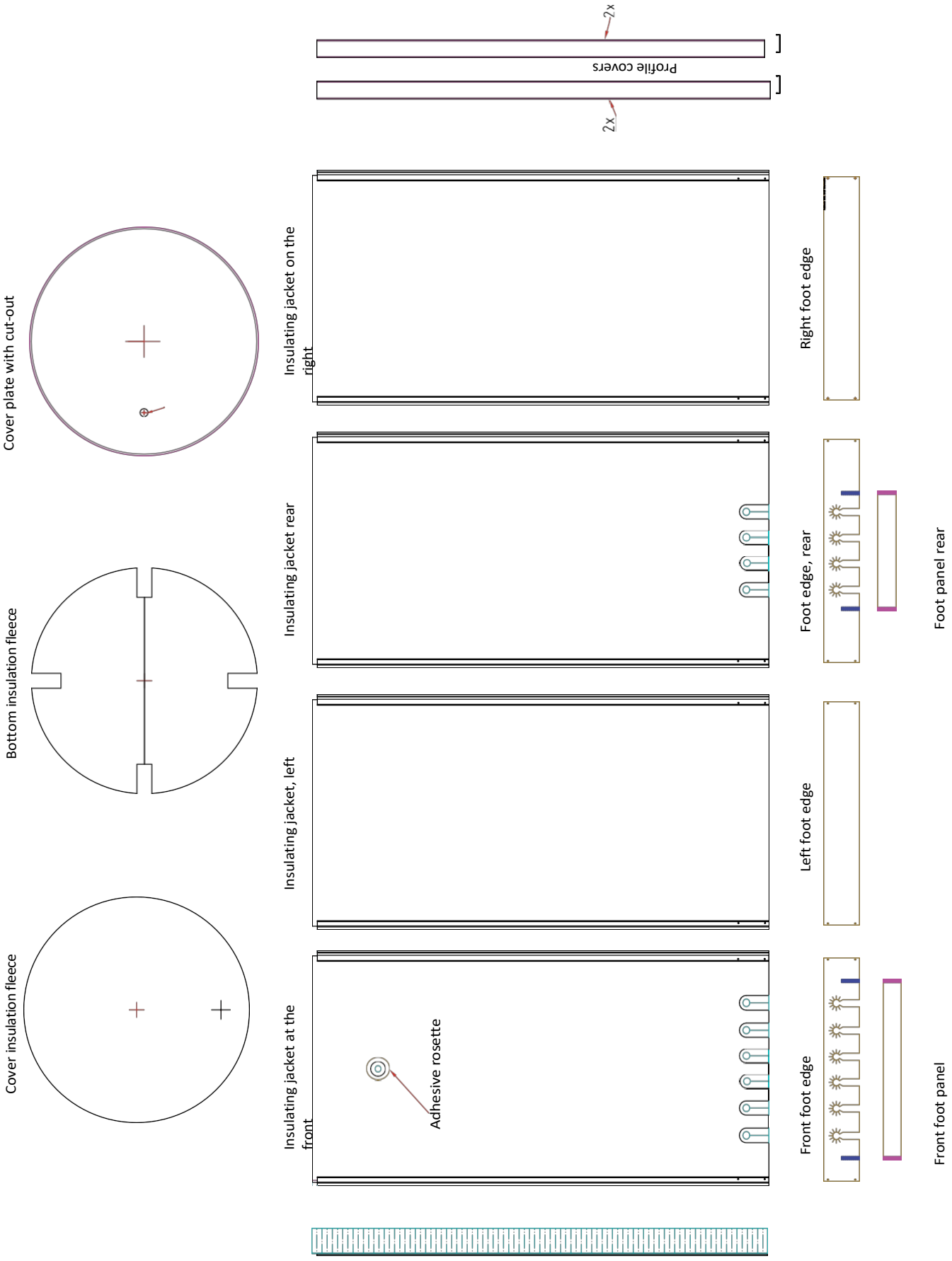
The jacket insulation is designed as composite insulation (polyester fleece with 1.3 mm thick polystyrene) and, depending on the storage tank size, in 2 to 4 segments.

The lid insulation, made of 120 mm thick polyester fleece, has a polystyrene cover (disc) as its upper finish.

- *Building material approval number Z-23.1.3-278*
- *Application temperature up to 160°C*
- *Good thermal properties up to WLG 0.035 (035) DIN 52612*
- *Hygroscopically harmless, moisture-inactive*
- *Skin-friendly, allergy-friendly, breathable*
- *Resistant to vermin infestation, house dust mites*
- *Standby heat losses according to DIN 4753-8 at 45 K temperature difference 1.75 kWh/d*
- *Fleece flame retardant, B1 according to DIN 4102 Part 1*
- *Component flame-retardant, B2 according to DIN 4102 Part 1*
- *Toxicologically safe, textile tested for harmful substances in accordance with Oeko-Tex Standard 100 Test No. 94.0.0541*
- *UV-stable and rot-proof*
- *100% pure, recyclable, flexible, dimensionally stable*
- *Resistant to mould growth DIN IEC 68, Parts 2 - 10*
- *Monitored by manufacturer*

# STORAGE INSULATION

## 4-PIECE 2000/3000/4000



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# 4-PIECE 2000/3000/4000

**Parts list Thermal insulation Oskar° 2000 litres**

| | |
|---|---|
| | Fleece insulation thickness 120 mm |
| 4 | PS panels, basalt grey glossy with cover film 2230 x 1133 mm |
| 1 | PS lid, basalt grey with cover film, Ø 1444 x 30 mm |
| 2 | Fleece insulation cover Ø 1206 x 65 mm |
| 1 x | Fleece insulation floor with 4 x cut-out Ø 1206 x 65 mm |
| 1 | Fleece strip 65 x 100 x 2850 mm |
| 1 | Fleece strip 65 x 100 x 880 mm |
| 4 | Profile cover 2 x with type plate 2206 x 250 mm |
| 1 | Front foot edge with velour tape 880 x 85 mm |
| 1 | Rear foot edge with velour tape 580 x 85 mm |
| 1 | Front foot panel with mushroom tape 170 x 1089.2 mm |
| 1 x | Rear foot panel with mushroom tape 170 x 1089.2 mm |
| 2 | Left and right foot panels 170 x 1089.2 mm |
| 1 | Adhesive rosette d 28 x Ø 110 mm |
| 2 | Cardboard box 2350 x 300 x 1340 mm |

**Parts list Thermal insulation Oskar° 4000 litres**

| | |
|---|---|
| | Fleece insulation thickness 120 mm |
| 4 | PS panels, basalt grey glossy with cover film 2550 x 1448 mm |
| 1 | PS lid, split, basalt grey with cover film Ø 1844 x 30 mm (incl. 3 screws) |
| 2 | Fleece insulation lid Ø 1606 x 65 mm |
| 1 | Fleece insulation base with 4 x cut-outs Ø 1606 x 65 mm |
| 2 | Fleece strips 65 x 80 x 2850 mm |
| 2 x | Fleece strips 65 x 80 x 2100 mm |
| 4 | Profile cover 2 x with type plate 2026 x 250 mm |
| 1 | Front foot edge with velour tape 880 x 85 mm |
| 1 | Rear foot edge with velour tape 580 x 85 mm |
| 1 | Front foot panel with mushroom tape 180 x 1403.4 mm |
| 1 | Rear foot panel with mushroom tape 180 x 1403.4 mm |
| 2 | Left and right skirting boards 180 x 1403.4 mm |
| 1 x | Adhesive rosette d 28 x Ø 110 mm |
| 2 | Cardboard box 2640 x 380 x 1620 mm |

**Parts list Thermal insulation Oskar° 3000 litres**

| | |
|---|---|
| | Fleece insulation thickness 120 mm |
| 4 | PS panels, basalt grey glossy with cover film 2050 x 1448 mm |
| 1 | PS cover, split, basalt grey with cover film Ø 1844 x 30 mm (incl. 3 screws) |
| 2 | Fleece insulation lid Ø 1606 x 65 mm |
| 1 | Fleece insulation base with 4 x cut-outs Ø 1606 x 65 mm |
| 2 x | Non-woven strips 65 x 100 x 2850 mm |
| 2 x | Non-woven strips 65 x 100 x 2100 mm |
| 4 | Profile cover 2 x with type plate 2026 x 250 mm |
| 1 | Front foot edge with velour tape 880 x 85 mm |
| 1 | Rear foot edge with velour tape 580 x 85 mm |
| 1 | Front foot panel with mushroom tape 180 x 1403.4 mm |
| 1 | Rear foot panel with mushroom tape 180 x 1403.4 mm |
| 2 x | Foot panel left + right 180 x 1403.4 mm |
| 1 x | Adhesive rosette d 28 x Ø 110 mm |
| 2 | Cardboard box 2100 x 380 x 1340 mm |

PROPERTIES:

The thermal insulation of the "PV" storage tank consists of 100 or 120 mm thick polyester fleece in the jacket area, 120 mm thick polyester fleece in the lid area and 50 mm thick polyester fleece in the base area.

The jacket insulation is designed as composite insulation (polyester fleece with 1.3 mm thick polystyrene) and, depending on the storage tank size, consists of 2 to 4 segments.

The lid insulation, made of 120 mm thick polyester fleece, has a polystyrene cover (disc) as its upper finish.

- *Building material approval number Z-23.1.3-278*
- *Application temperature up to 160°C*
- *Good thermal properties up to WLG 0.035 (035) DIN 52612*
- *Hygroscopically harmless, moisture-inactive*
- *Skin-friendly, allergy-friendly, breathable*
- *Resistant to vermin infestation, house dust mites*
- *Standby heat losses according to DIN 4753-8 at 45 K temperature difference 1.75 kWh/d*
- *Fleece flame retardant, B1 according to DIN 4102 Part 1*
- *Component flame-retardant, B2 according to DIN 4102 Part 1*
- *Toxicologically safe, textile tested for harmful substances in accordance with Oeko-Tex Standard 100 Test No. 94.0.0541*
- *UV-stable and rot-proof*
- *100% pure, recyclable, flexible, dimensionally stable*
- *Resistant to mould growth DIN IEC 68, Parts 2 - 10*
- *Monitored by manufacturer*

## INSTALLATION

The insulation should be stored in a warm room for a longer period of time before installation to make it easier to apply.

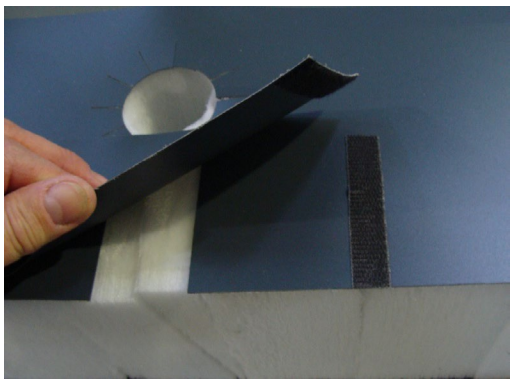
Unpack the insulation and check it for damage and completeness according to the enclosed parts list.

Align the storage tank using a spirit level.

The following insulation steps can of course also be carried out after installation.

However, this may be somewhat more difficult due to the piping and possibly limited space in the boiler room.

Insert the bottom segments at the bottom.

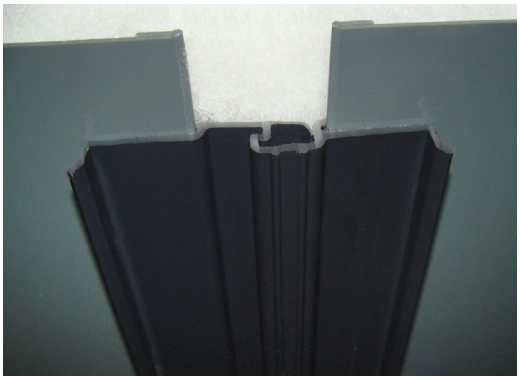


Remove the foot edge trims from the insulation segment (Velcro fastener).

Set up the front and rear insulation segments.

Carefully guide the storage tank connections through the fleece openings at the bottom.

This requires at least 2 people.



Connect the insulation segments using the tooth lock.

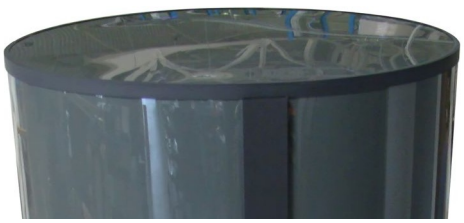
The spring secures the insulation segments and prevents them from coming apart.

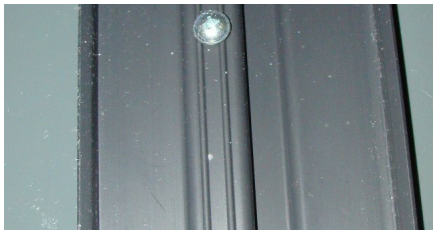
Insert additional fleece strips around the edge of the storage tank. Only for storage tank sizes 2000, 3000 and 4000 litres.

Insert both insulating fleece covers, paying attention to the opening for the immersion sleeve.

Place the upper cover with the surrounding rubber profile on the insulation.

For 3000 and 4000 litre tanks, the cover profile is divided and is connected with 3 screws.



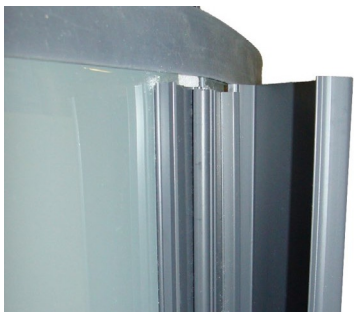


# INSTALLATION

Attach the decorative strips to the front and rear edges of the base using Velcro fasteners.

The protective film can now be removed
at the latest when the installation work is complete.

Stick on the rosette for the vent connection and attach the profile cover to the two side strips.



Fully insulated storage tanks.



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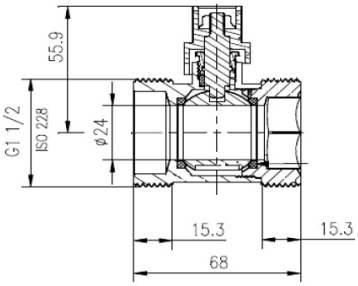
# REQUIREMENTS FOR PLANT WATER

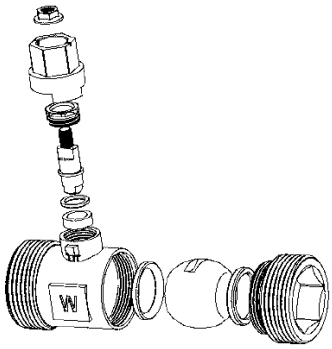
| Parameters | Unit | Concentration | Copper soldered |
|---|---|---|---|
| pH | / | < 6.0 | - |
| | | 6.0 - 7.5 | ° |
| | | 7.5 - 8.5 | + |
| | | 8.5 - 10.0 | ° |
| | | > 10 | ° |
| Conductivity | µS/cm | < 10 | + |
| | | 10 - 500 | + |
| | | 500 - 1,000 | ° |
| | | > 1,000 | - |
| Chloride | mg/L | < 10 | + |
| | | 10 - 50 | + |
| | | 50 - 80 | + |
| | | 80 - 100 | + |
| | | 100 - 1,000 | ° |
| | | > 1,000 | - |
| Free chlorine | mg/L | < 0.5 | + |
| | | 0.5 - 1.0 | + |
| | | 1.0 - 5.0 | ° |
| | | > 5.0 | - |
| Total hardness | °dH | < 5 | + |
| | | 5 - 15 | + |
| | | 15 - 30 | ° |
| | | > 30 | - |
| Ammonia ($NH_3$, $NH_4^+$) | mg/L | < 2 | + |
| | | 2 - 20 | ° |
| | | > 20 | - |
| Alkalinity ($HCO_3$) | mg/L | < 60 | + |
| | | 60 - 300 | + |
| | | > 300 | ° |
| Sulphate ($SO_4^{2-}$) | mg/L | < 100 | + |
| | | 100 - 300 | °/- |
| | | > 300 | - |
| $HCO_3$ / $SO_4^{2-}$ | mg/L | >1.5 | + |
| | | < 1.5 | °/- |
| Nitrates ($NO_3$) | mg/L | <100 | + |
| | | > 100 | ° |
| Hydrogen sulphide ($H_2S$) | mg/L | <0.05 | + |
| | | > 0.05 | °/- |
| Free carbon dioxide ($CO_2$) | mg/L | < 5 | + |
| | | 5 - 20 | ° |
| | | > 20 | - |
| Manganese | mg/L | <0.1 | + |
| | | > 0.1 | ° |
| Iron (Fe) | mg/L | <0.2 | + |
| | | > 0.2 | ° |
| Aluminium | mg/L | <0.2 | + |
| | | > 0.2 | ° |

**NOTE**

- The system water may contain a maximum of 50% glycol.
- Ensure that the water supplied to the appliance meets all requirements. If the properties are not optimal (°) for more than two criteria or if one criterion does not meet the minimum requirement (-), no warranty claim can be made.

## BALL VALVE SET (KS2)



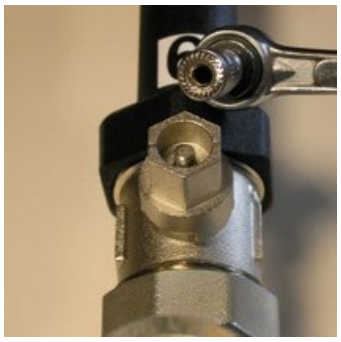

Ball valve set (KS2) DN 25 / RAG 1½"

**Procedure for resealing the ball valve using a gland:**


Ball valve
Open position Notch (I)


Ball valve
Closed position Notch (-)

Inner nut
Loosen with socket wrench




Remove retaining nut

Remove
the
adjusting
head

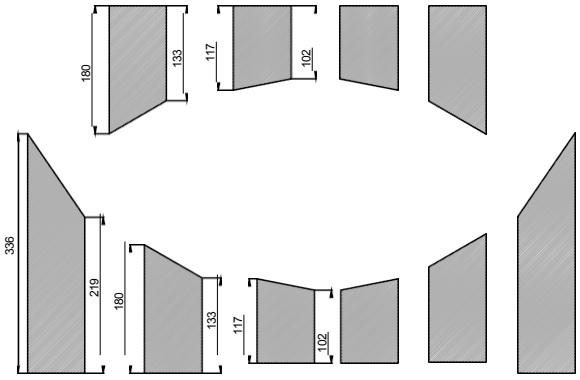

Gland
with open-end spanner

According to DIN 1988 and EnEV § 10, ball valves must be serviced and inspected at regular intervals.
In cases of extreme stress, inspections must be carried out at shorter intervals.

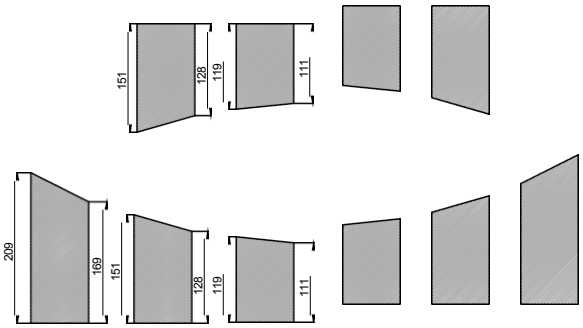
Ball valves should be operated regularly at 3-month intervals to ensure smooth operation and prevent any deposits from forming on the ball, thus ensuring long-term reliable functioning!

# INSULATION CAPSULES - CUT TO SIZE ON SITE

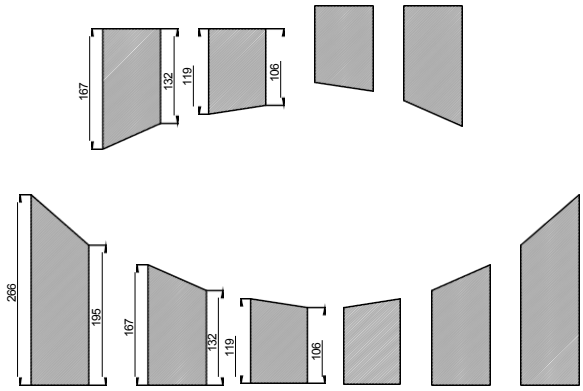
## Oskar° 400l



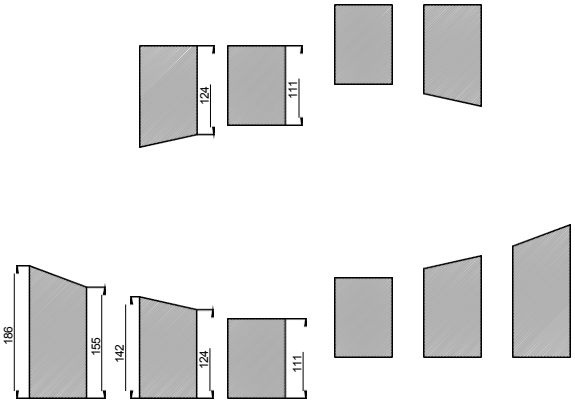

## Oskar° 2000 l/1.5



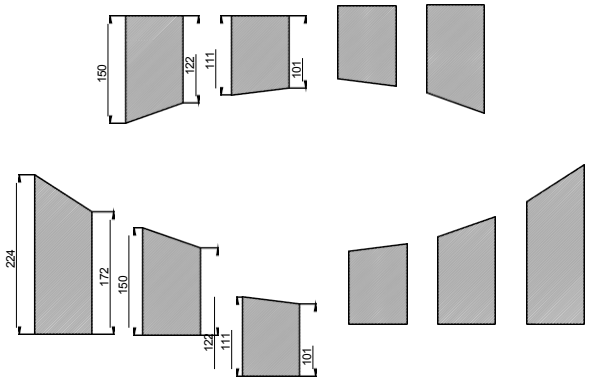

## Oskar° 750l Oskar° 1000l




## Oskar° 3000 l/1.5 Oskar° 4000 l/1.5

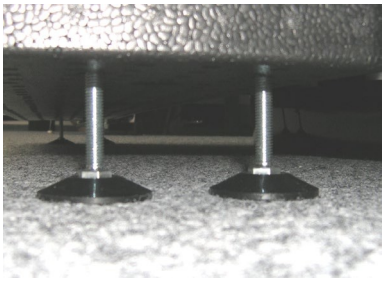



## Oskar° 1300l




# BALL VALVE SET ON ADD-ON DISTRIBUTOR 1 OR 2

Ball valve set incl. enclosed seals to the storage tank



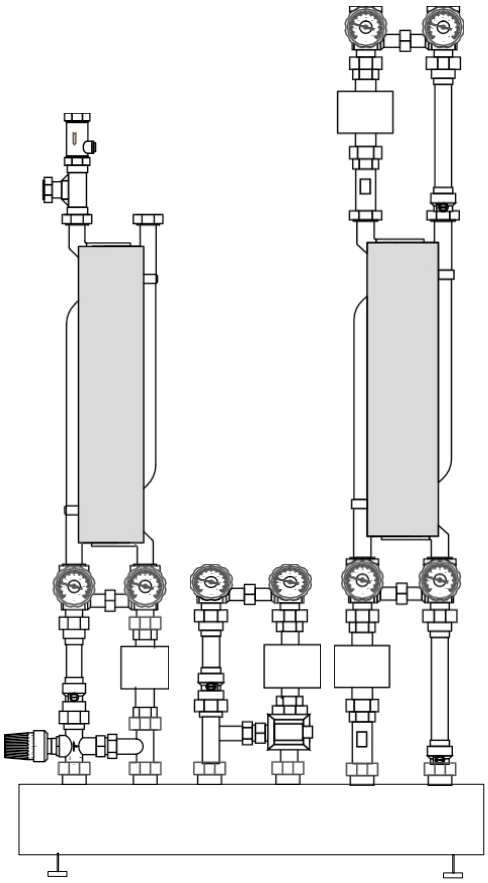
Mounting support legs on the attachment distributor Mount


Mount the attachment distributor to the ball valve set from the centre outwards

Always assemble complete assemblies from left to right. It is particularly important with TWK that the capillary tube sensor is also mounted in front of the heating circuit, as otherwise it will not be accessible later.

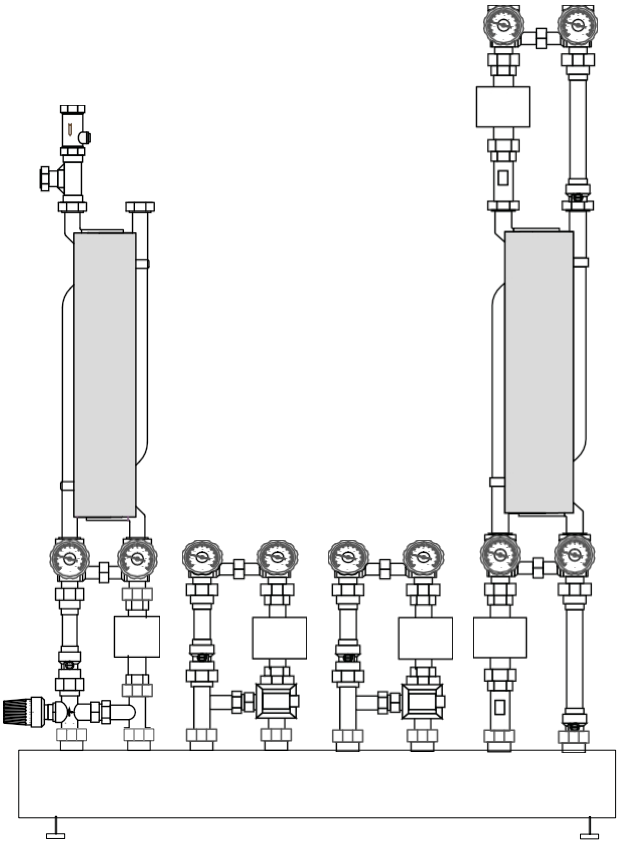
Mounting distributor 1 for max. 3 assemblies

Drinking water station - Heating circuit - Solar station



Attach distribution manifold 2 for max. 4 assemblies

Drinking water station - Heating circuit NT + HT - Solar station





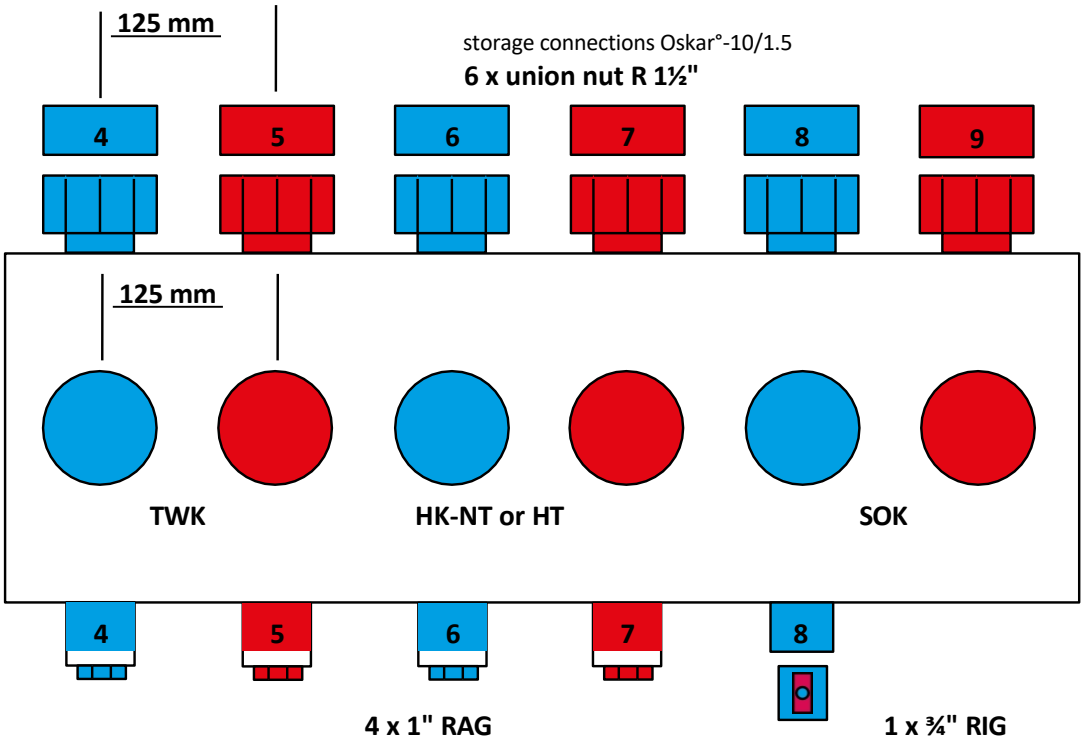
Smart Energy Systems

# ATTACHMENT DISTRIBUTOR CONNECTION ASSIGNMENT

## Add-on distributor (ABV-1) for Oskar°-10/1.5/...

for mounting 3 assemblies

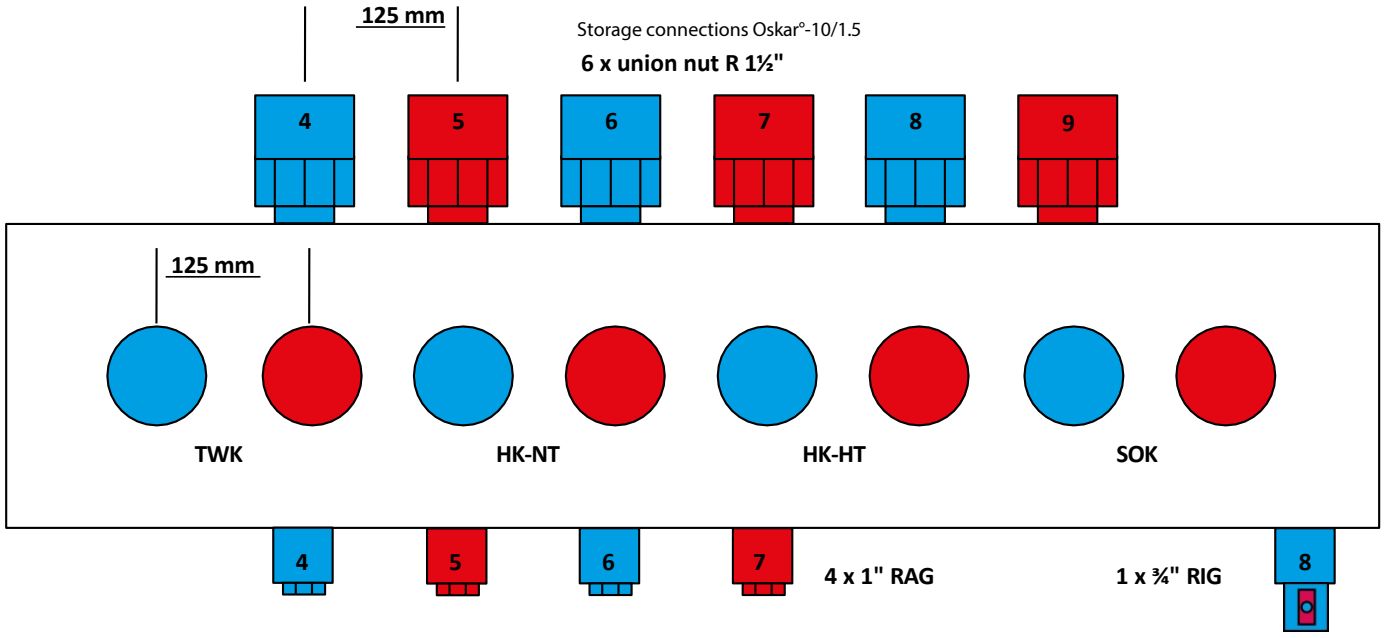
- TWK - HK1 (NT/HT) - SOK -




## Add-on distributor (ABV-2) for Oskar°-10/1.5/...

for mounting 4 assemblies

- TWK - HK1 (NT) - HK2 (HT) - SOK -

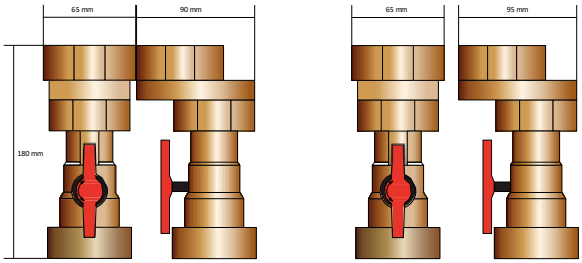


# ATTACHMENT REDUCER SET / ATTACHMENT PROBE SET

Attachment reducer sets for TWK assemblies or heating circuits DN 25 and DN 32

ARS 2
DN 40 > DN 25

ARS 3
DN 40 > DN 32

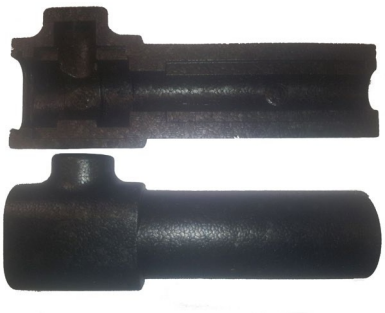



Special mounting kit (ABSS2) for solar station assembly DN 40 > DN 25

Special mounting kit with drain

Mounted on storage tank connections 8 and 9

Components supplied loose for on-site installation



Insulation shells

# HYDRAULIC CONNECTION

A = Turbine flow sensor
Cold water connection

B = Hot water connection

C = Circulation connection

D = Flow

E = Return

(1) Installation of TWK on ABV1 / ABV2 / ARS Always install assemblies completely from left to right!

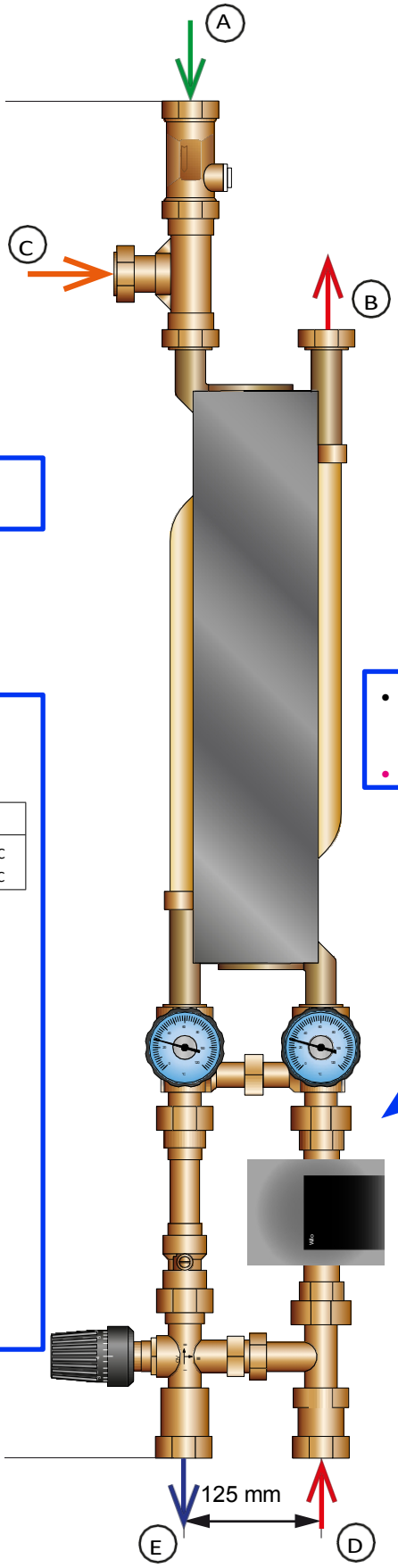
(2) Installation of actuator for heating water mixing valve

Heating water mixing valve setting values

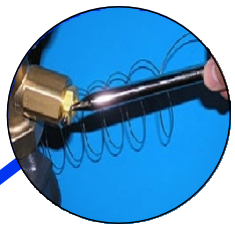
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| 40°C<br>50°C | 45°C<br>55°C | 50°C<br>60°C | 55°C<br>65°C | 60°C<br>70°C | 65°C<br>75°C | 70°C<br>80°C |

You can see which settings apply by reading the label on the capillary tube sensor.
label on the capillary tube sensor

Advantages of premixing:
- Temperature pre-regulation
- Possible reduction in energy consumption Reduction
- in limescale deposits
- Active scalding protection




- (3) Installation of capillary tube sensor for DHW mixing valve (do not kink)
- **Insert before installing the heating circuit!**

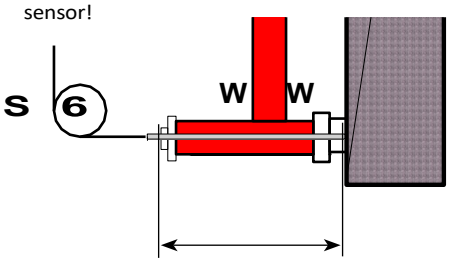


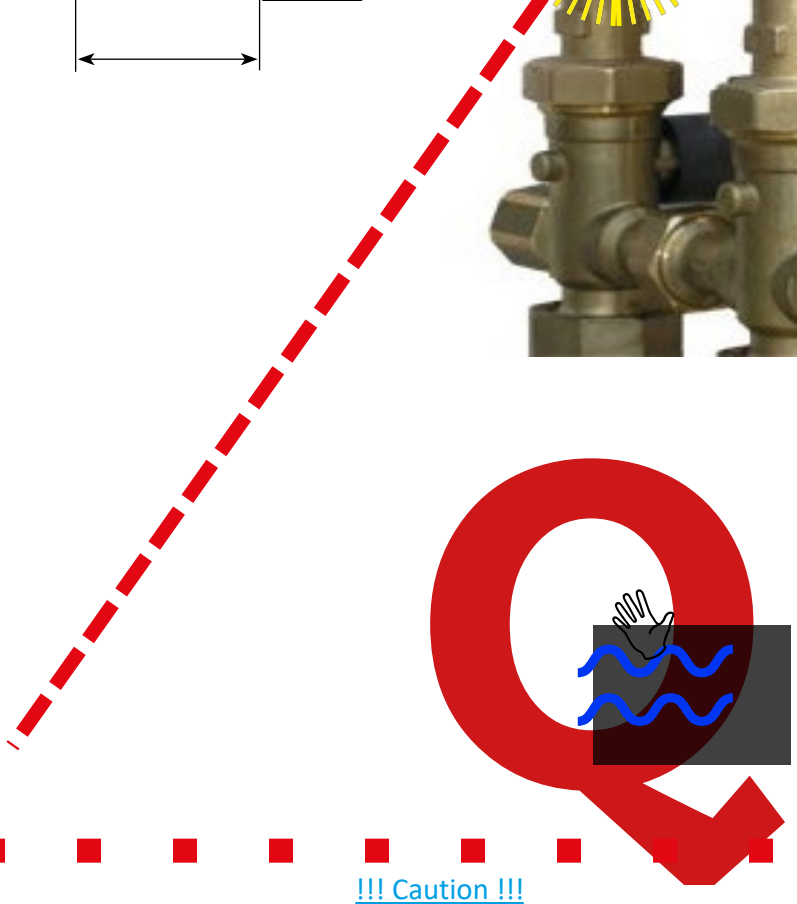
## ULTRA-FAST SENSOR

View from the "rear"

The sensor must be immersed in the medium!

Measurement only takes place at the tip of the sensor!



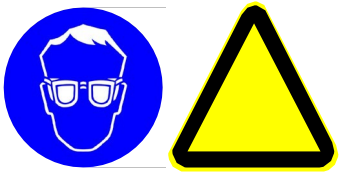
!!! Caution !!!

The lock nut for the O-ring seal of the sensor element must be tightened professionally so that the sensor cannot be pushed out by the internal water pressure.

Seal via the metal part of the sensor – not via the cable!

## Plate heat exchanger – cleaning – water values

Due to the strong turbulence in the brazed plate heat exchanger, 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 earlier in the case of very high water hardness. The heat exchanger can then be cleaned by circulating a cleaning fluid (CIP – Cleaning In Place). Carry out cleaning at regular intervals.



All acids and bases are hazardous substances and should be used with great caution!

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 through the heat exchanger alternately. For maintenance-intensive applications, we recommend CIP connections/valves installed on site to simplify maintenance. To achieve optimum cleaning results, the flow rate of the cleaning solution should be 1.5 times higher than during operation and preferably carried out 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.

## Copper-brazed stainless steel plate heat exchanger – resistance recommendation

| | | |
|---|---|---|
| Electrical conductivity | 10-500 | µS/cm |
| pH | 7.5 | |
| Carbon dioxide | <5 | CO2 |
| Total hardness | 4.5-8.5 | °dH |
| Liquid content (primary) | 1.554 | litres |
| Liquid content (secondary) | 1.665 | litres |
| Permissible operating pressure | 25 | bar |
| Permissible operating temperature | 166 | °C |

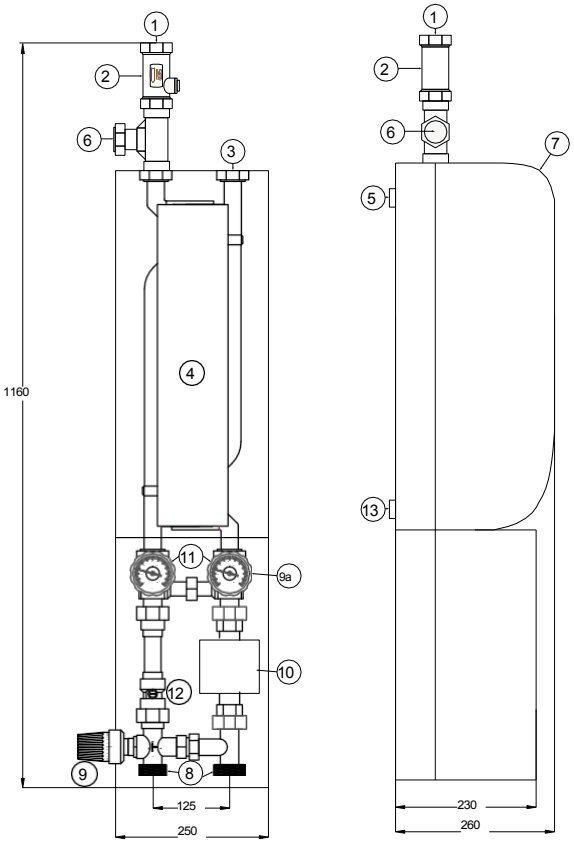
## Warranty

ratiotherm offers a 12-month warranty from the date of installation, but in no case longer 15 months after the delivery date. The warranty only covers manufacturing and material defects.

## Disclaimer

The performance of ratiotherm's 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 criteria listed in the table below.

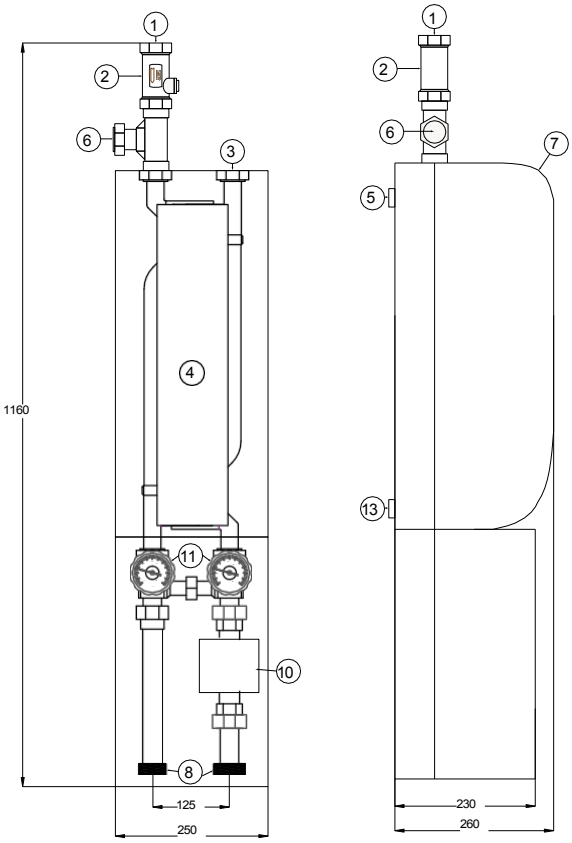
# DIMENSIONS, PERFORMANCE DATA TWK-S 70 / 90




| | |
|---|---|
| 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 | Connection heating water RL/VL 1½" RAG |
| 9 | Heating water mixing valve |
| 9 | 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, PERFORMANCE DATA TWK-S 100



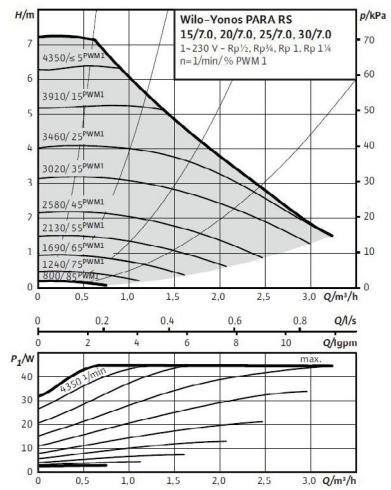

| | |
|---|---|
| 1 | Cold water connection ¾" RAG |
| 2 | Flow switch |
| 3 | Hot water connection RIG 1" |
| 4 | Plate heat exchanger |
| 5 | WT manual vent (heating water side) |
| 6 | Circulation connection ¾" RAG |
| 7 | Insulation box hot water unit |
| 8 | Connection heating water RL/VL 1½" RAG |
| | |
| 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 |

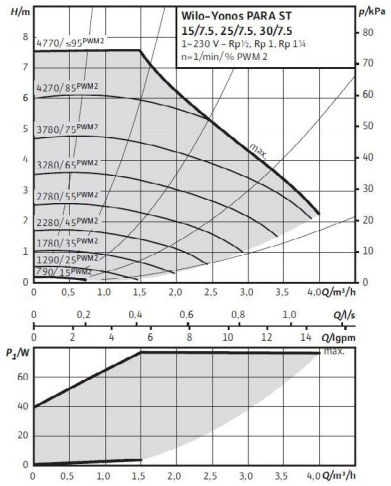
# CHARACTERISTIC CURVES TWK-S 70 / 90 / 100

**Primary pumps:**

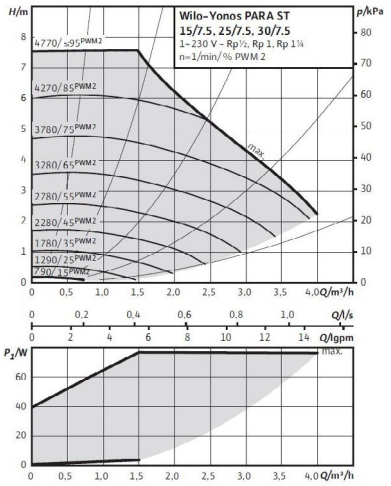
## 70 kW

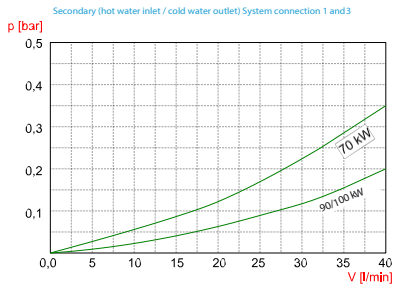


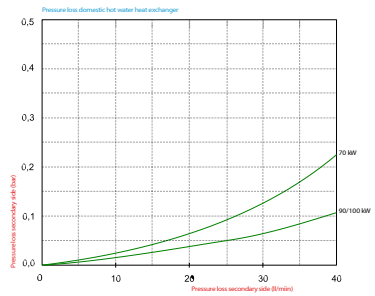

## 90 kW

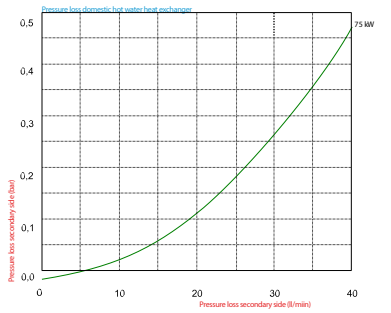


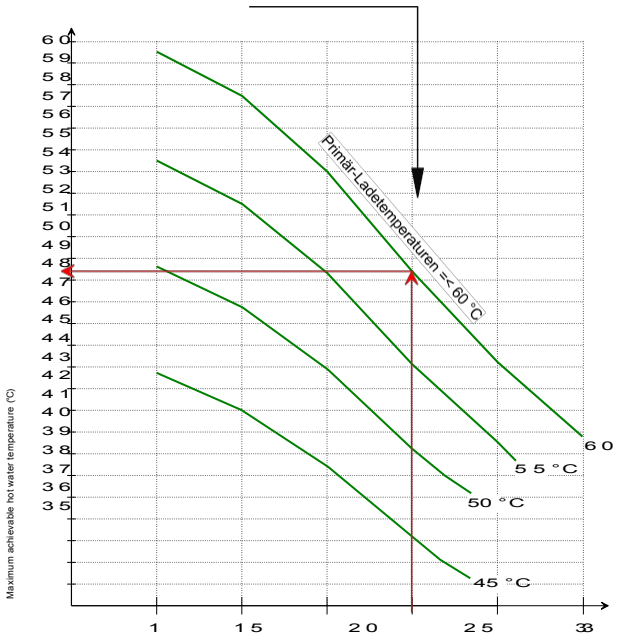

## 100 kW




**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 | 9.6 l/min |
| Washbasin tap | 10.5 l/min |
| Bath tap | 15.0 l/min |



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# POSITIONING OF SENSORS S3 AND S11

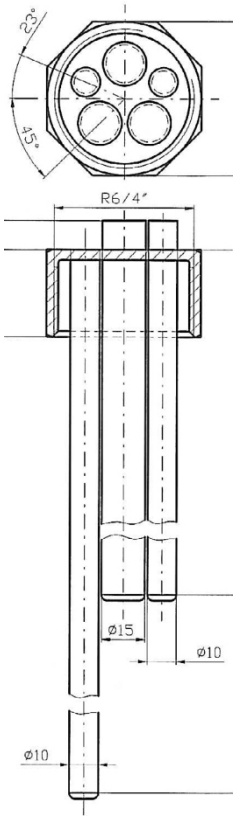
Immersion depth of the immersion tubes.
The sensors can be arranged continuously at different heights. The 2 protruding pipes reach approximately to the middle of the storage tank.

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

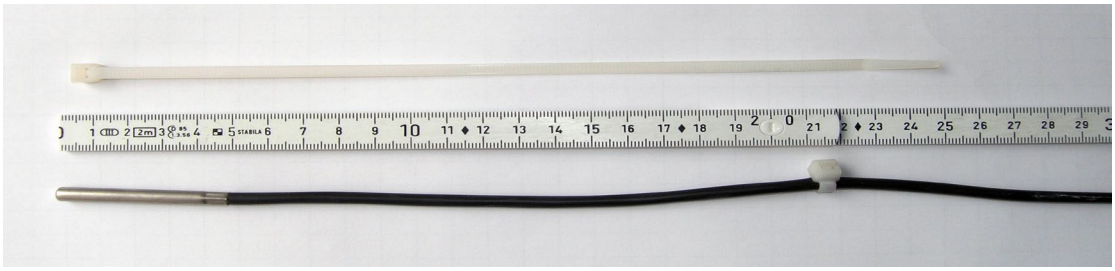
S2 (rUVR + rZR) for hot water
preparation for TWK > Table p. 39

**Stainless steel immersion sleeve with:**

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

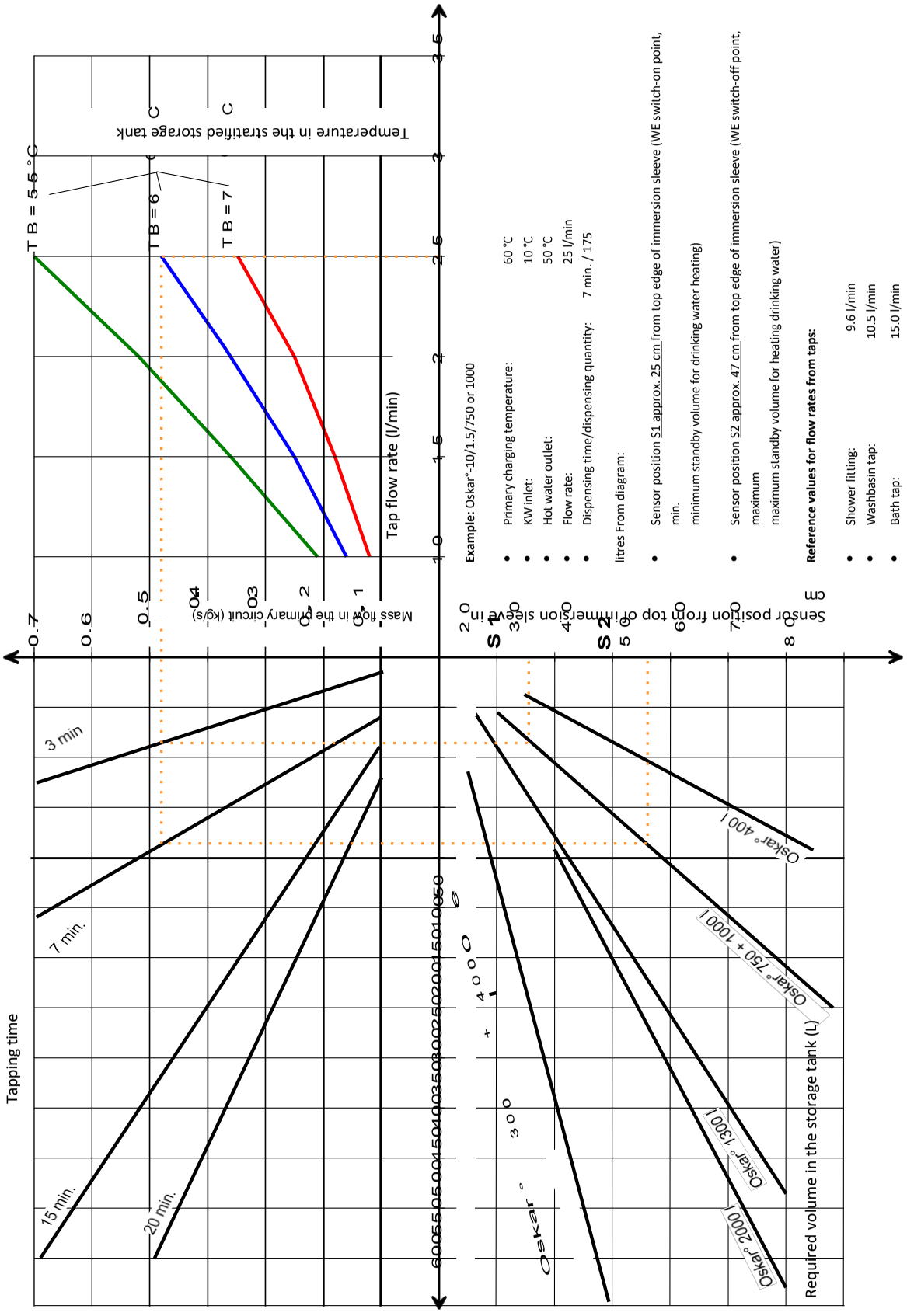



| SE | 1.0 / 1.5 | 1.0 / 1.5 | 1.0 / 1.5 | 1.0 / 1.5 | 1.0 / 1.5 | 1.0 / 1.5 | 5.0 | 5.0 | 5.0 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Type Oskar°- | 750 | 1000 | 1300 | 2000 | 3000 | 4000 | 2000 | 3000 | 4000 | mm |
| S3 Oskar° | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 700 | mm |
| S3 Osc. WPS | 950 1500 | 1200 1500 | 950 | 1200 | 950 | 1200 | | | | mm |
| S11 | 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 using the labelling material provided (shrink).
- 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 S1 AND S2 (HOT WATER)



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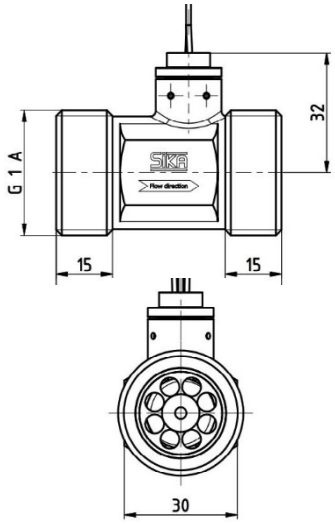
# TURBINE FLOW SENSOR - DATA




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

Virtually no series variation due to fixed pulse rate.

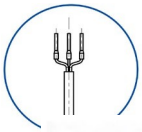
Wide measuring range (up to 1:60), insensitive to pressure surges, proven in numerous large-scale applications.

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

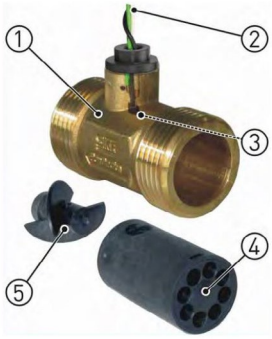
Colour code for stranded cables

!Connect all wires!

| | |
|---|---|
| green | Signal input |
| brown | GND / ground |



Electrical connection 80 mm single wires with 0.5 m PVC




## Technical data:

Material Pipe section Brass Measuring range 1...60 l/min
Measuring accuracy ±1% of the measuring range end value ±1% of the 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, reducing wear 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 frequency signal (square wave signal) proportional to the flow rate.

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

# TURBINE FLOW SENSOR – DATA

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 pipes.

The flow sensor is only suitable for use in completely filled pipes.
It is essential to avoid a free outlet.

The arrow on the flow sensor indicates the only possible flow direction.

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

!! Hold firmly in place !!

Tighten the two union nuts. Hold the turbine body of the device in place with a spanner (SW19 / SW30).

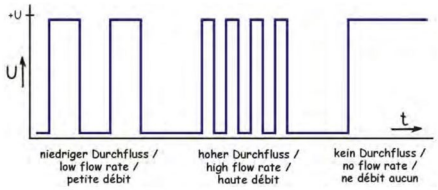
Maximum torque / spanner size

| 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.

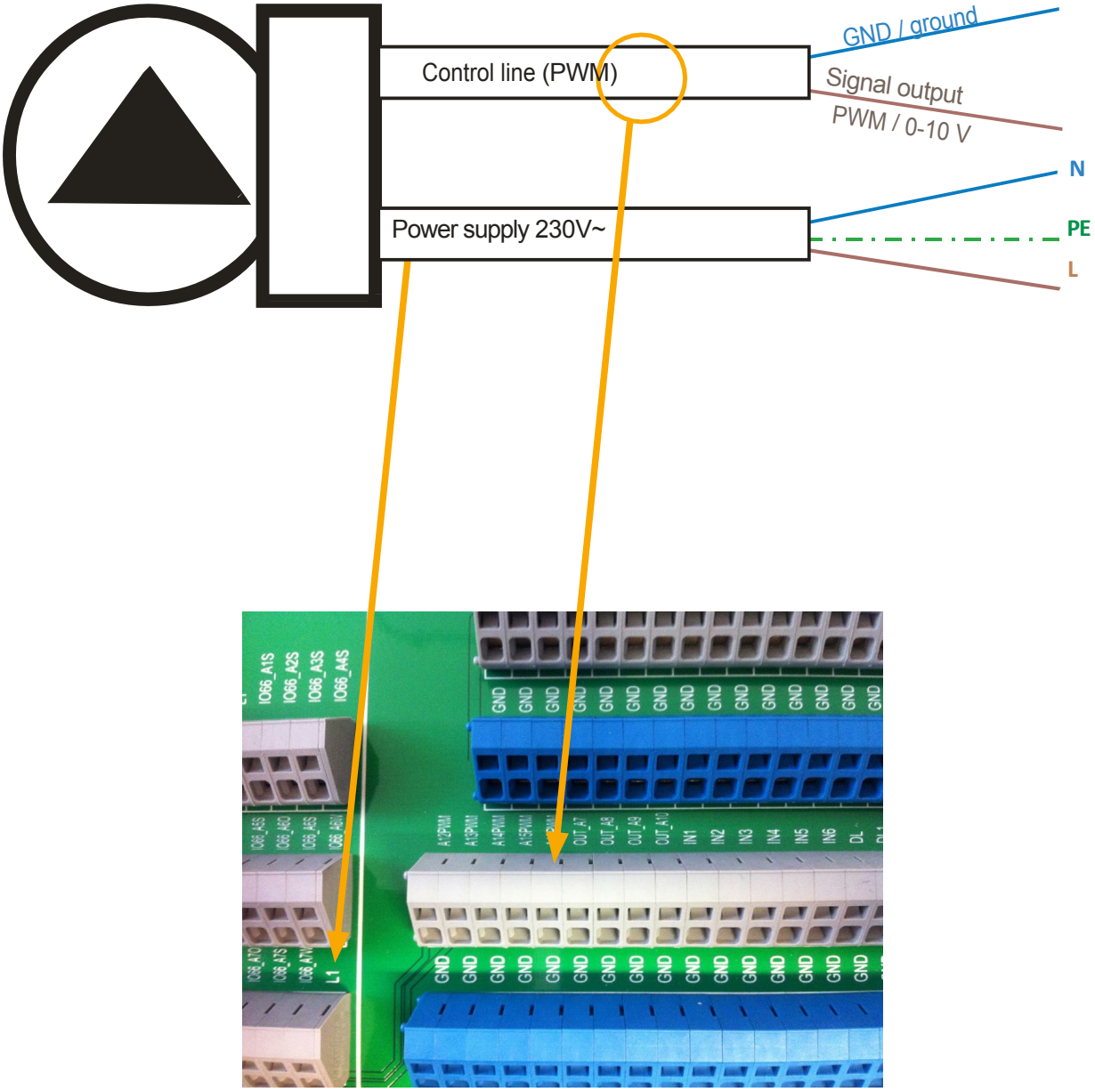



During measurement mode, the VTY delivers an NPN square wave signal proportional to the flow rate. The frequency of the output signal changes in accordance with the flow rate.

ATTENTION!

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

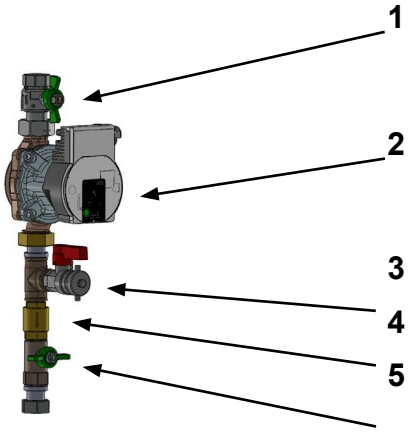
Pump signal: **green "flashing"** = standby mode (230 volts applied) Pump signal: **green steady LED** = PWM signal has switched on the pump



# CIRCULATION STATION

| | |
|---|---|
| Delivery head / volume: | 8.4 metres / 1.2 m³/h |
| Max. delivery volume: | 4.0 m³/h |
| Max. medium temperature: | 95 °C |
| Voltage: | 1 ~ 230 V +10 %/-15 %, 50/60 Hz |
| System temperature: | - 10 °C to + 95°C (non-freezing) |

## Circulation station components




1 Ball valve - RIG ½" connection

2 Circulation pump WILO Para Z BZ 15/7-50

Suitable for 1-2 family homes with a circulation pipe up to 50 metres.

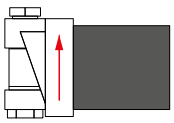
CAUTION - Operation without liquid is not permitted and can lead to irreparable bearing damage!

3 KFE tap ½"

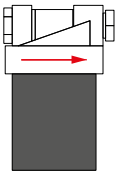
4 Non-return valve

5 Ball valve - connection ¾" ÜWM

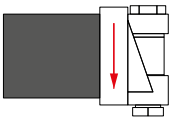
## Installation position of the circulation pump



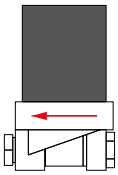
Correct



Correct



Correct

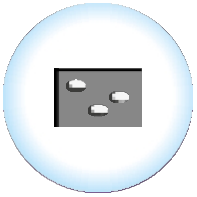


INCORRECT

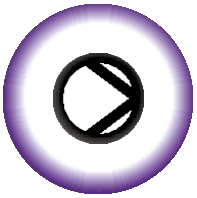
## Circulation requirement

Briefly press tap

Activates flow sensor



Activates central controller



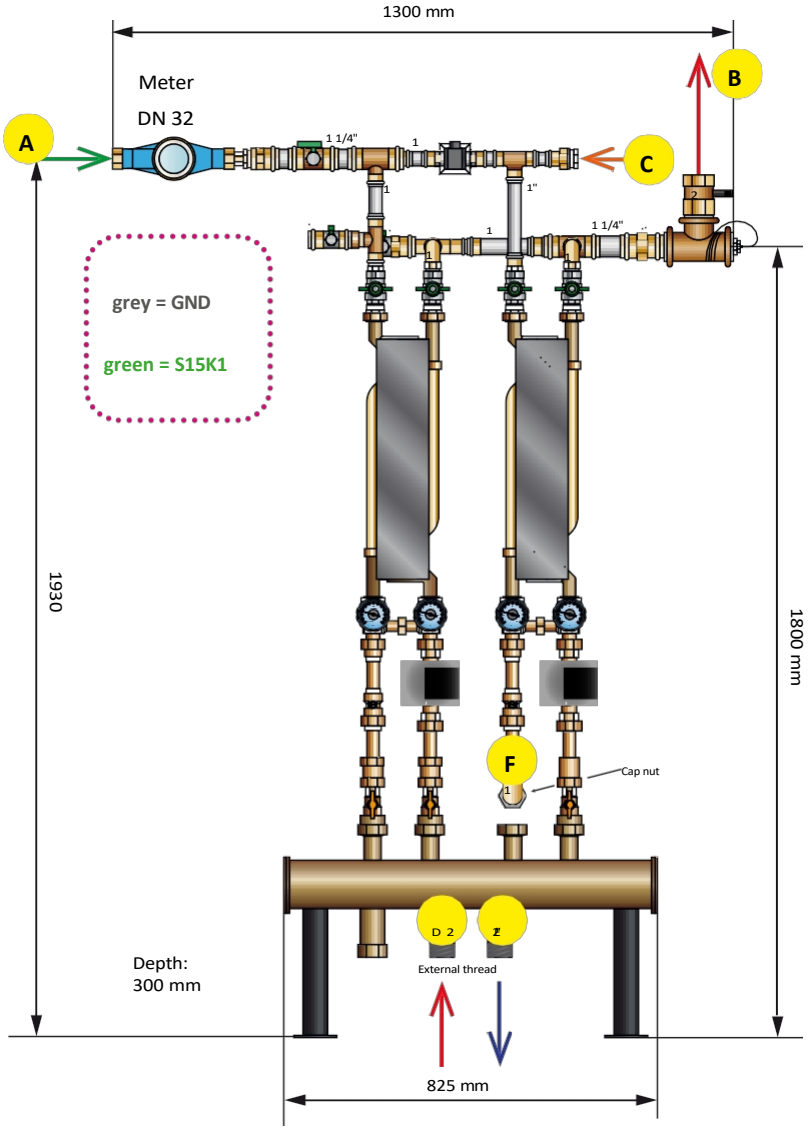
activates the charging and circulation pump

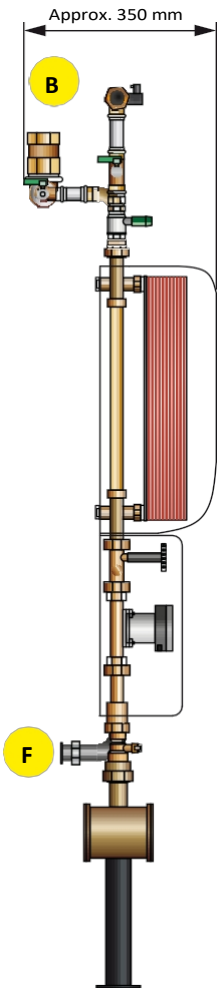
## TWKK 200 (2-STAGE)

| | | | | | | |
|---|---|---|---|---|---|---|
| **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" | |



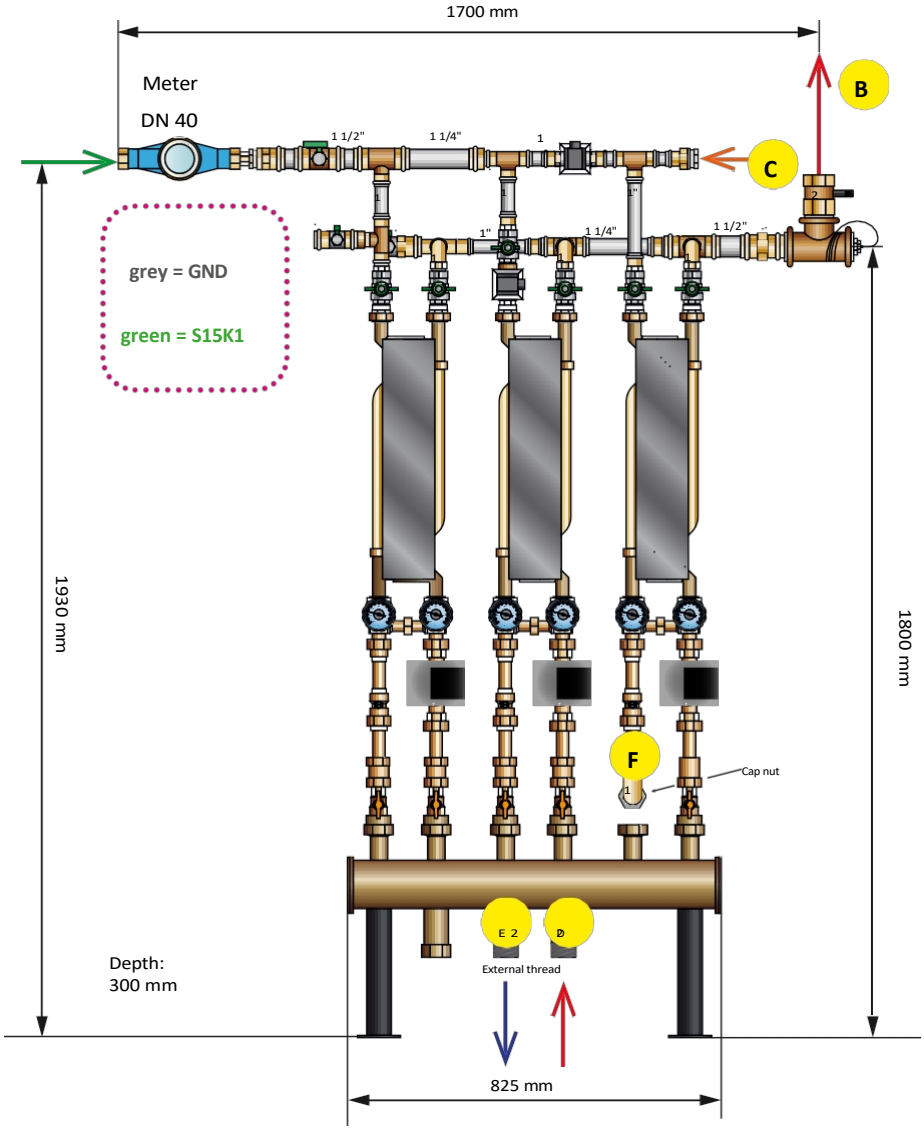



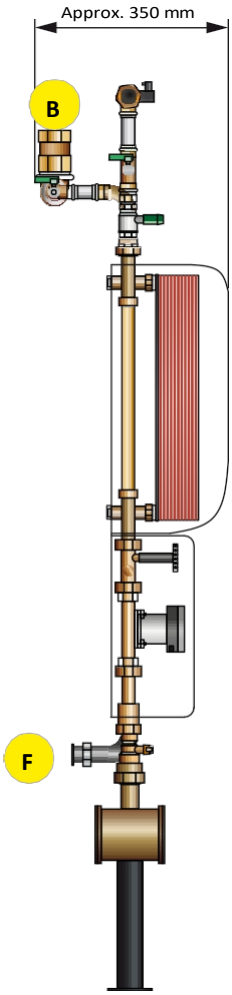
# TWKK 300 (3-STAGE)

| | | | | | | |
|---|---|---|---|---|---|---|
| **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" | |





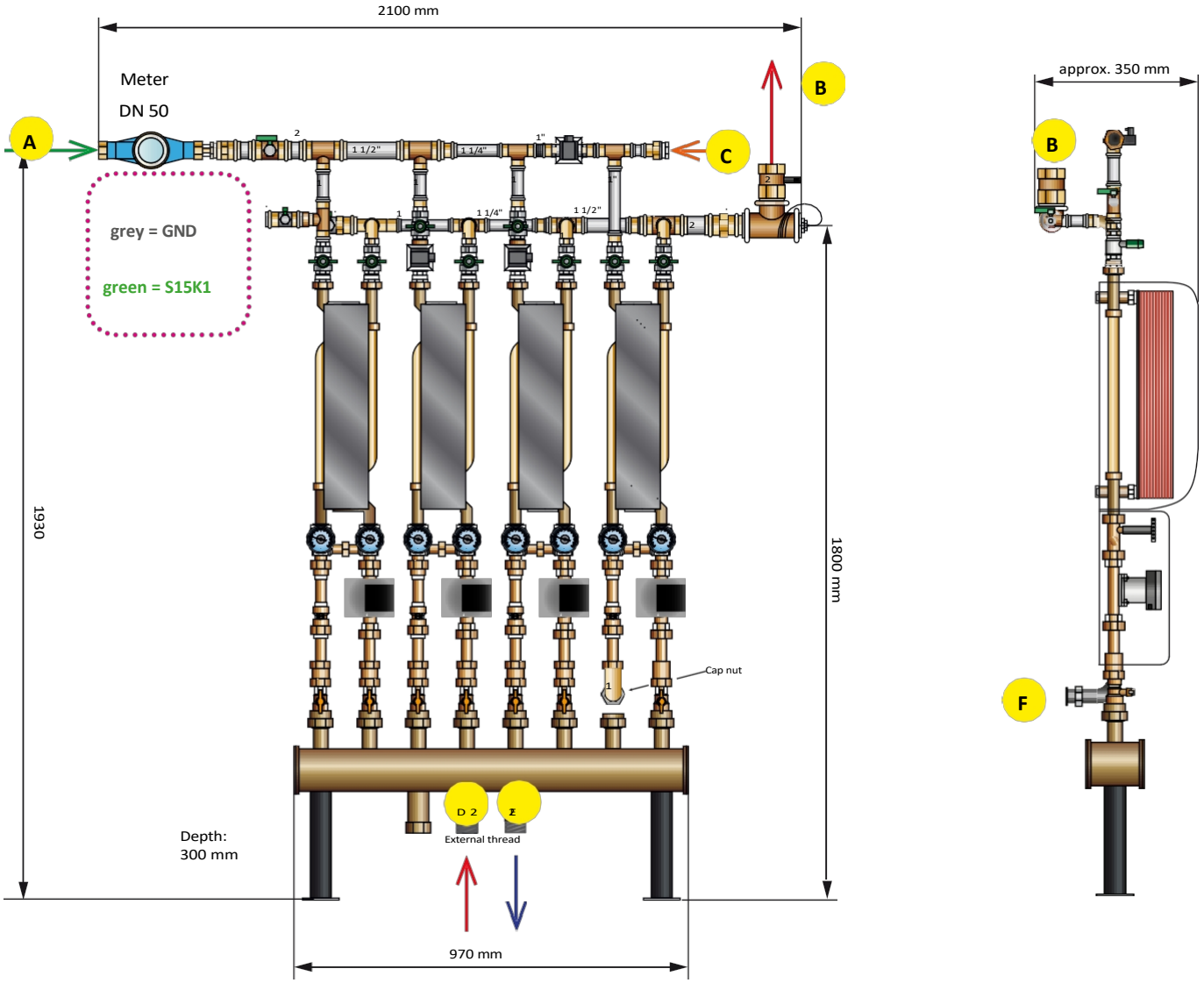

ratiotherm
Smart Energy Systems

## TWKK 400 (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

Thanks to their expandability and infinitely variable output regulation, ratiotherm TWKK heaters offer maximum flexibility for both maximum and constantly changing hot water requirements. 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 Bathtub 15.0
- DHW demand for basic requirements: 20 l/day/person at 60°C outlet temperature at the water heater DHW demand for higher requirements: 40 l/day/person at 60°C outlet temperature at the water heater

**Design example for 20 residential units based on various "n" factors according to the table on the following page.**

***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

# SIMULTANEITY TABLE

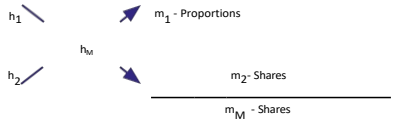
**Mixed water formulas:**

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

$$m = \frac{1}{m_2} \cdot \frac{h_2 - h_M}{h_M - h_1}$$

$$m_2 = m_1 \cdot \frac{h_M - h_1}{h_2 - h_M}$$

**Mixed water cross**




$m_1$ = Cold water mass [kg]

$m_2$ = Hot water mass [kg]

Mixed water mass [kg]

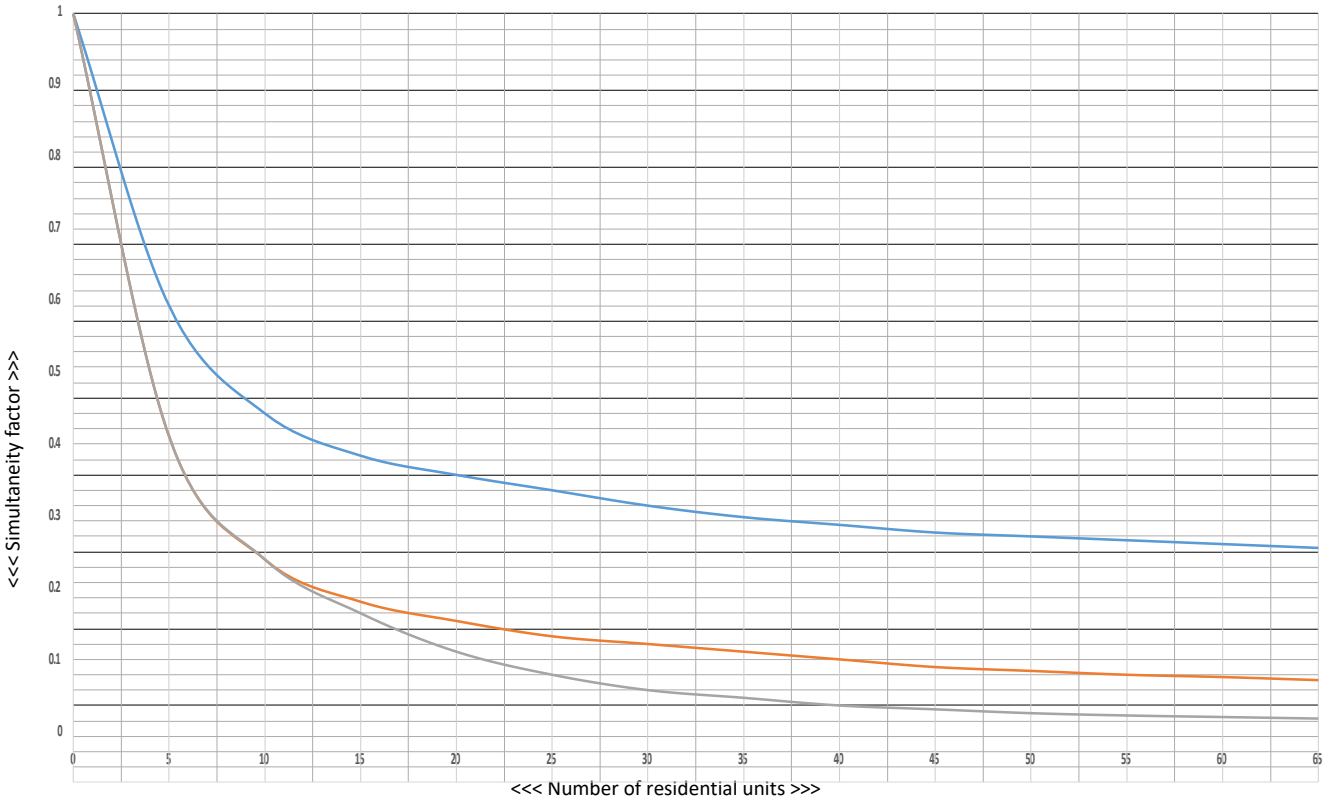
$h_{1=}$ Cold water temperature [°C]

$h_{2=}$ Hot water temperature [°C]

$h_{M=}$ Mixed water temperature [°C]

**Central water heating systems based on the flow-through system for rental properties with 3-4 room residential units,**

**3-4 persons and full bath per apartment**

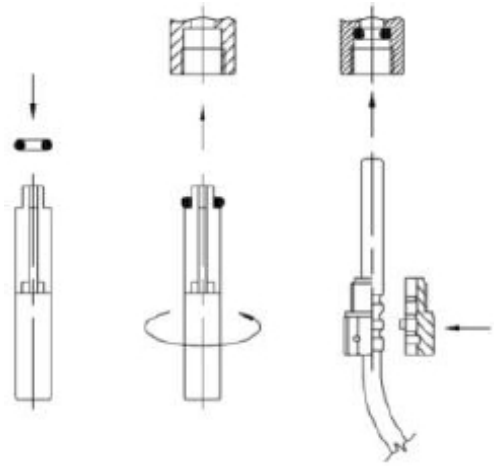


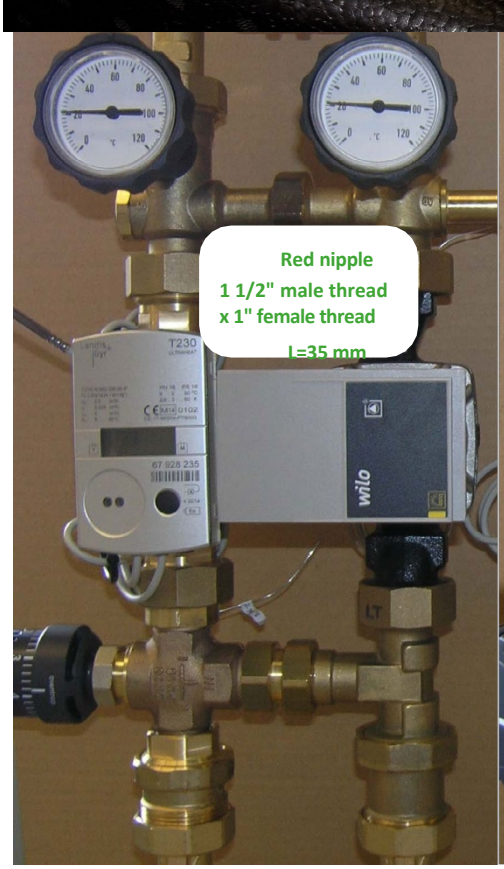

Simultaneity factors:

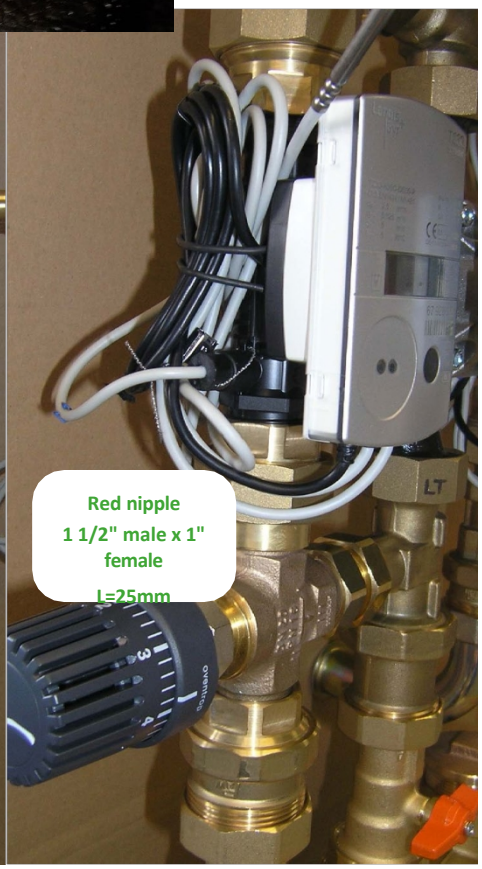
- According to Rechnagel-Sprenger-Schramek
- According to DIN 4708
- According to measurements carried out by TU Dresden


**3.3 Installation instructions for sensor adapter set**

A mounting kit is included with the WMZ 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 (professionally, tightening torque
3 - 5 Nm).



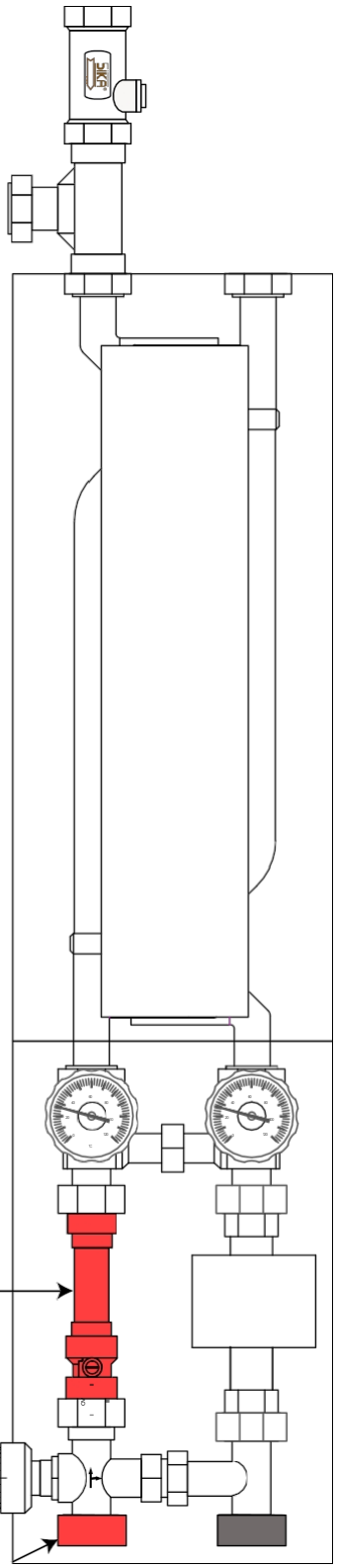



# OPTIONAL RETROFIT TWK-S 70 / 90

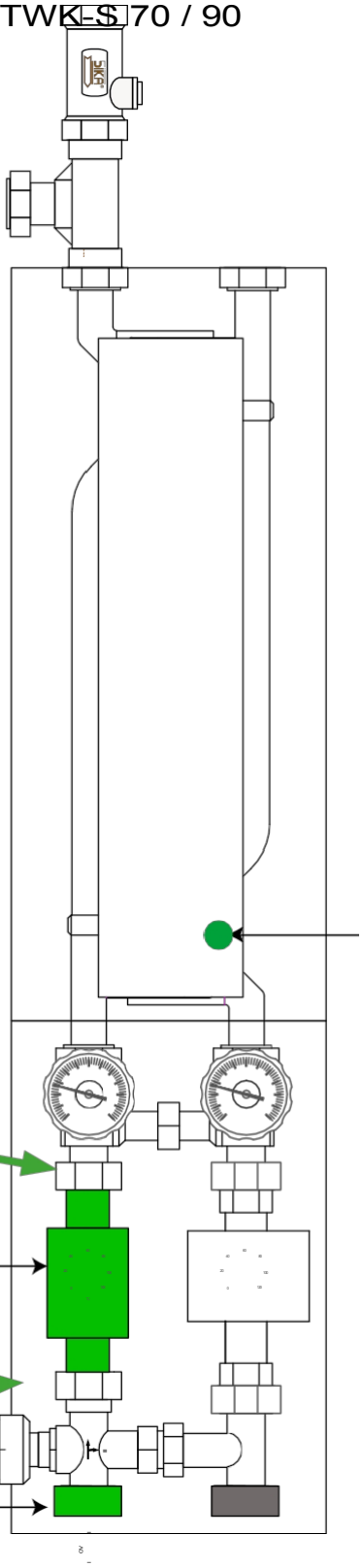
If necessary, a heat meter can be retrofitted to the compact drinking water station (BL180).
It is essential to follow the manufacturer's operating and installation instructions supplied with the meter.

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



1. Remove spacer with gravity brake

2. Spacer Remove



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

3. Fit fittings for the BL 130 mm heat meter

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

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

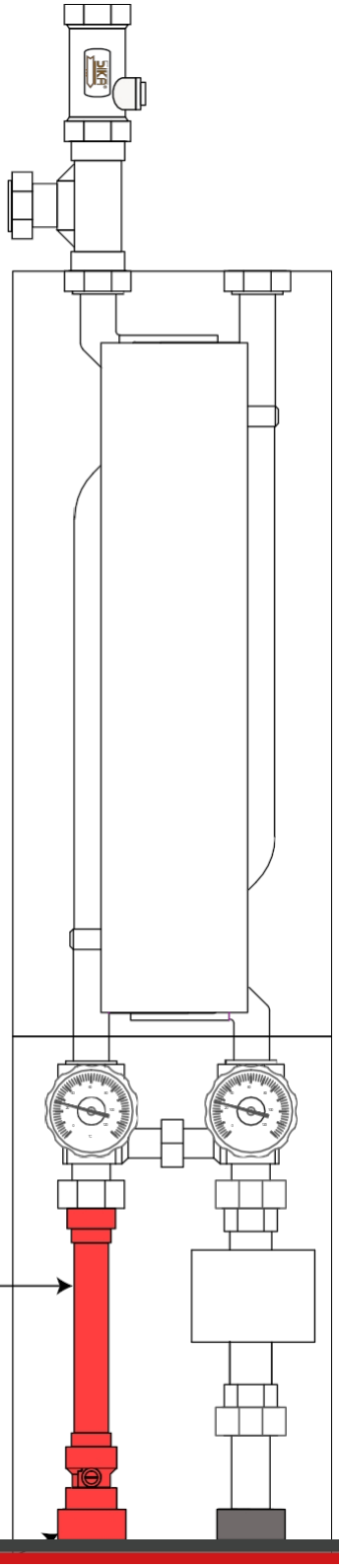
The flow sensor of the heat meter is then mounted there.

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

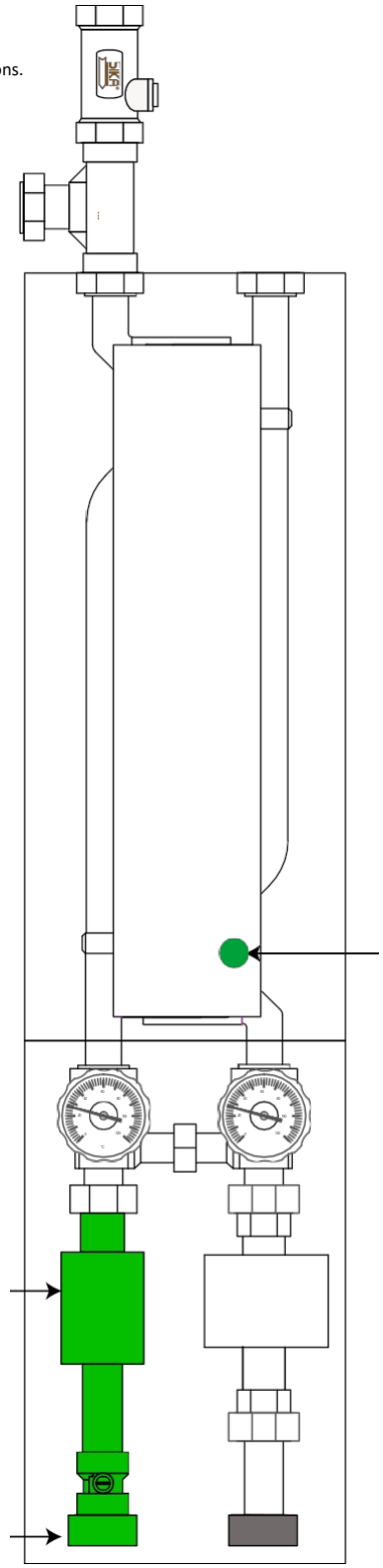
# OPTIONAL RETROFIT TWK-S 100 + CASCADES

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 heat meter

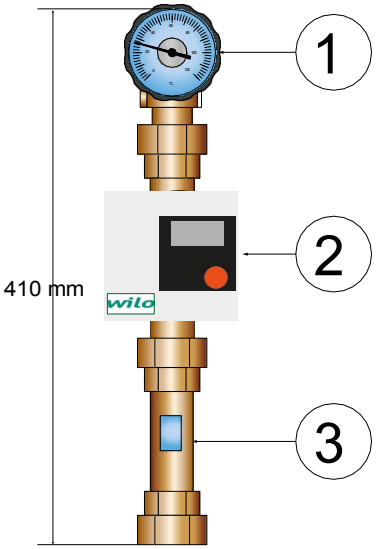
BL 130 mm

2. Installing the heat meter fittings

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

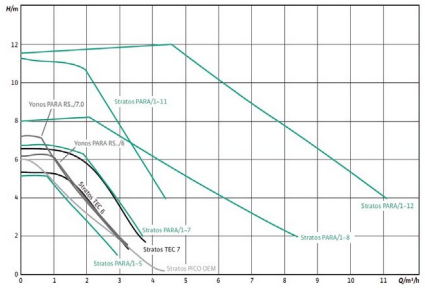
The flow sensor of the heat meter is then installed there.

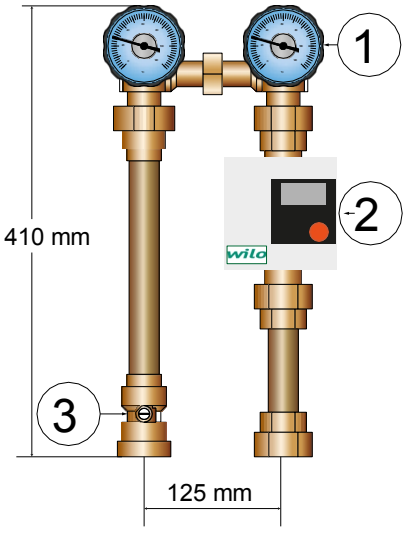
# SINGLE-STAGE PUMP, UNREGULATED HEATING CIRCUIT




**Single-line pump**

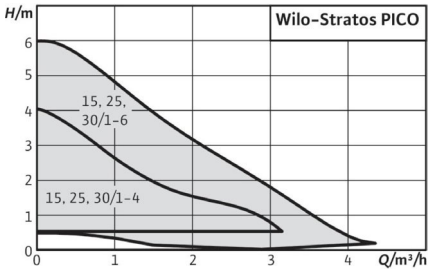
| | |
|---|---|
| 1 | Thermometer with built-in ball valve |
| 2 | Circulation pump BL 180 |
| 3 | Flow control valve |



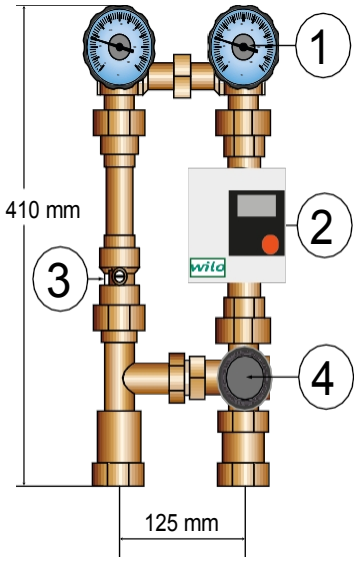



**Unregulated heating circuit UK**

| | |
|---|---|
| 1 | Thermometer with built-in ball valve |
| 2 | Circulation pump BL 180 |
| 3 | Gravity brake with manual adjustment |

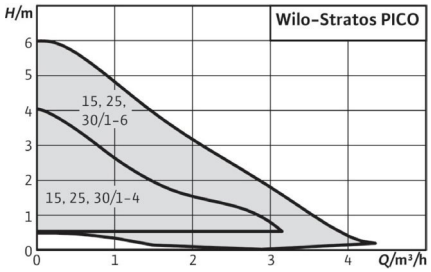


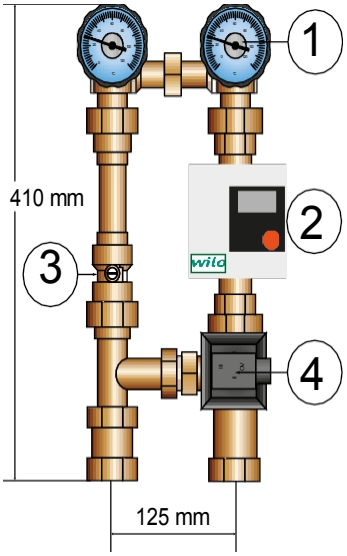
# FIXED VALUE CONTROLLED, ELECTRONICALLY CONTROLLED




## Controlled heating circuit FK

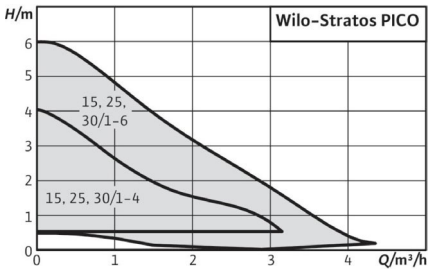
| | |
|---|---|
| 1 | Thermometer with built-in ball valve |
| 2 | Circulation pump BL 180 |
| 3 | Gravity brake with manual adjustment |
| 4 | Three-way mixing valve with actuator/controller/sensor without auxiliary power (+20°C to 50°C) |



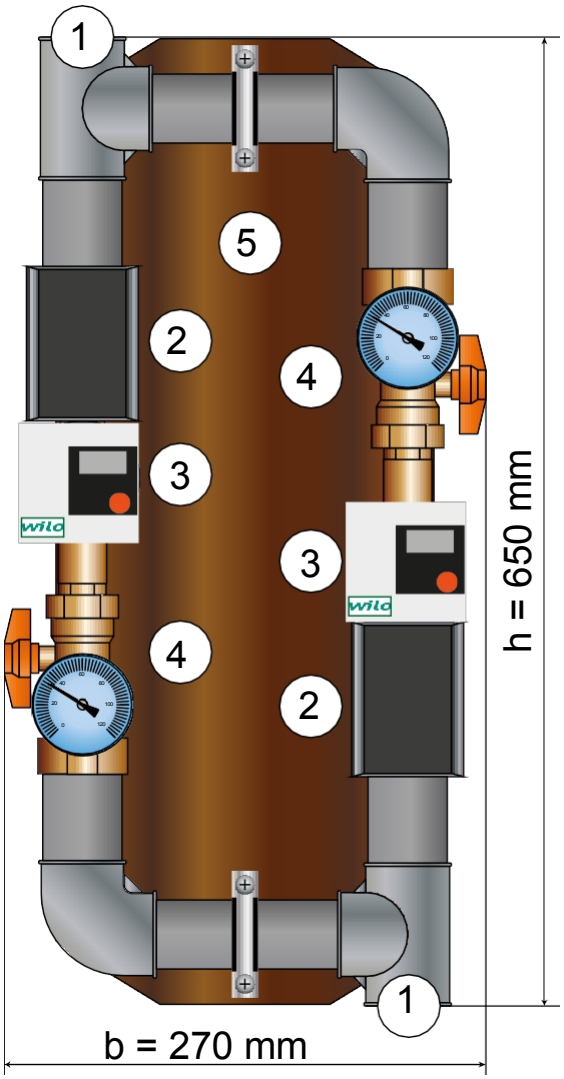




## Controlled heating circuit MK

| | |
|---|---|
| 1 | Thermometer with built-in ball valve |
| 2 | Circulation pump |
| 3 | Gravity brake with manual adjustment |
| 4 | Three-way mixing valve with servomotor |



ALST-25, ALST-32




**ALST-25 removal station**

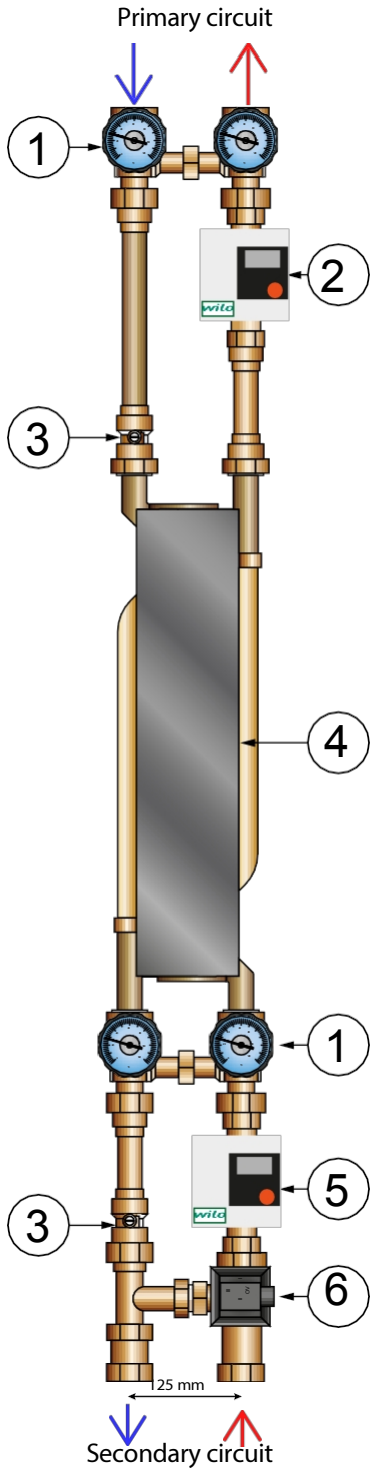
| | |
|---|---|
| 1 | Connection RIG 1" DN25 |
| 2 | Motorised straight-through ball valve with servomotor |
| 3 | Circulation pump, overall length 180 |
| 4 | Shut-off valve with thermometer |
| 5 | Mounting plate |

**ALST-32 storage station**

| | |
|---|---|
| 1 | Connection RIG 1¼" DN32 |
| 2 | Motorised ball valve with servomotor |
| 3 | Circulation pump, overall length 180 |
| 4 | Shut-off valve with thermometer |
| 5 | Mounting plate |

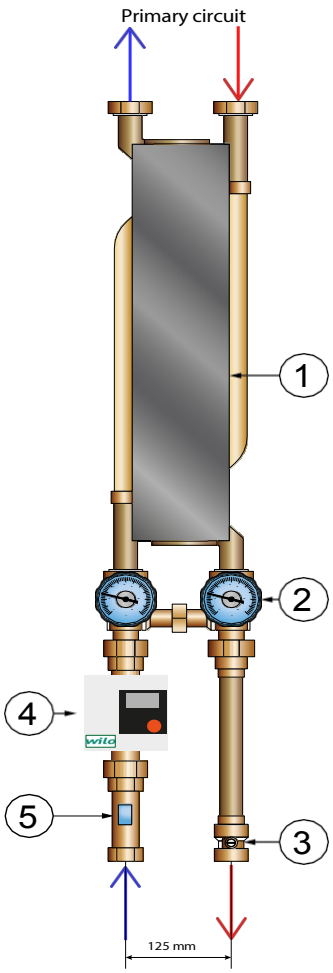
Centre distance is 165 mm +/- 1-2 mm difference

# SYSTEM SEPARATION STATION




| | System separation |
|---|---|
| 1 | Ball valve with built-in thermometer |
| 2 | Circulation pump |
| 3 | Gravity brake with manual adjustment |
| 4 | Plate heat exchanger XB37M-1-10 |
| 5 | Circulation pump, length 180 |
| 6 | Three-way mixing valve with servomotor |

# STATION FOR DISTRICT HEATING TRANSFER

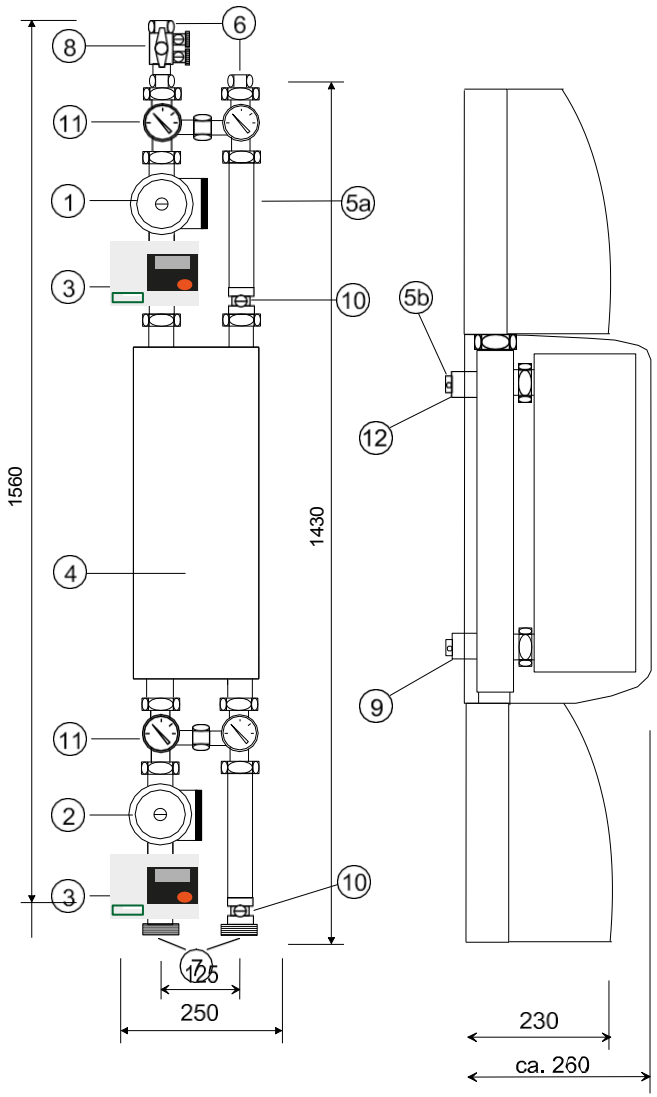



**District heating transfer station**

| | |
|---|---|
| 1 | Plate heat exchanger |
| 2 | Ball valve with built-in thermometer |
| 3 | Gravity brake with manual adjustment |
| 4 | Circulation pump, length 180 |
| 5 | Flow rate adjustment valve |

| | | | | |
|---|---|---|---|---|
| Heat output: | 10 | 20 | 35 | kW |
| Primary inlet: | 70 | 70 | 60 | °C |
| Primary Outlet: | 50 | 49 | 49 | °C |
| Secondary inlet : | 45 | 45 | 45 | °C |
| Secondary output: : | 65 | 65 | 65 | °C |
| Secondary volume flow: | 7 | 15 | 25 | l/min |

# SOLAR COMPACT STATION




| | |
|---|---|
| 1 | Circulation pump, length 180 Primary circuit |
| 2 | Circulation pump, length 180 Secondary circuit |
| 3 | Flow rate adjustment valve |
| 4 | Plate heat exchanger |
| 5 | Manual venting (secondary) |
| 6 | Clamp ring screw connection 28 x 1.5 |
| 7 | DN 25 1½" male thread |
| 8 | Flushing and filling fitting |
| 9 | Immersion sleeve for heat transfer fluid sensor (S9) |
| 10 | Gravity brake with manual adjustment |
| 11 | Ball valve with integrated thermometer |
| 12 | Immersion sleeve for solar return sensor (S12) |

Connect the solar circuit pipes to the upper connections using compression fittings. If using soft, thin-walled pipes, support sleeves must be used to provide additional stability.

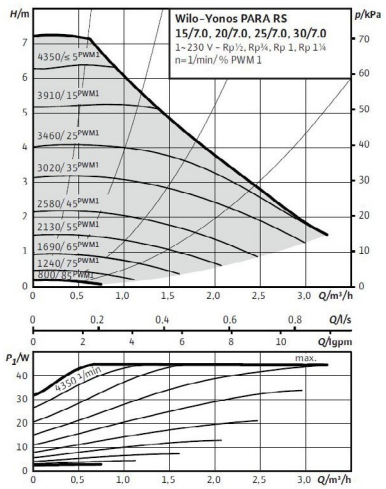
The pipe ends must be cut at right angles and free of burrs.

Insert the pipe as far as it will go and tighten the compression fittings firmly using a suitable tool (open-end wrench or similar).

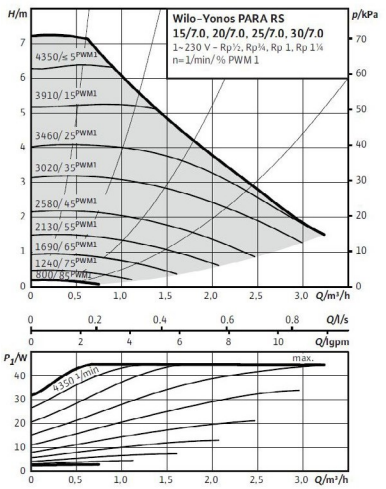
When tightening, use a suitable tool (not a pump/pipe wrench) to counteract the force.

## Primary pumps:

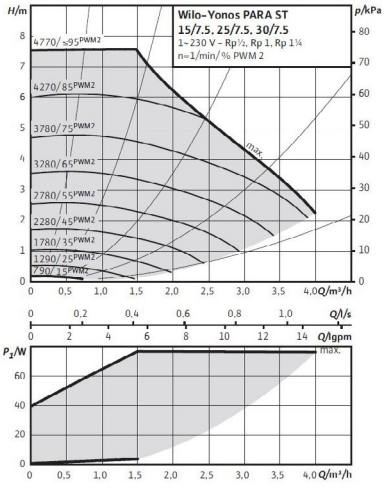
### SOK 6-16



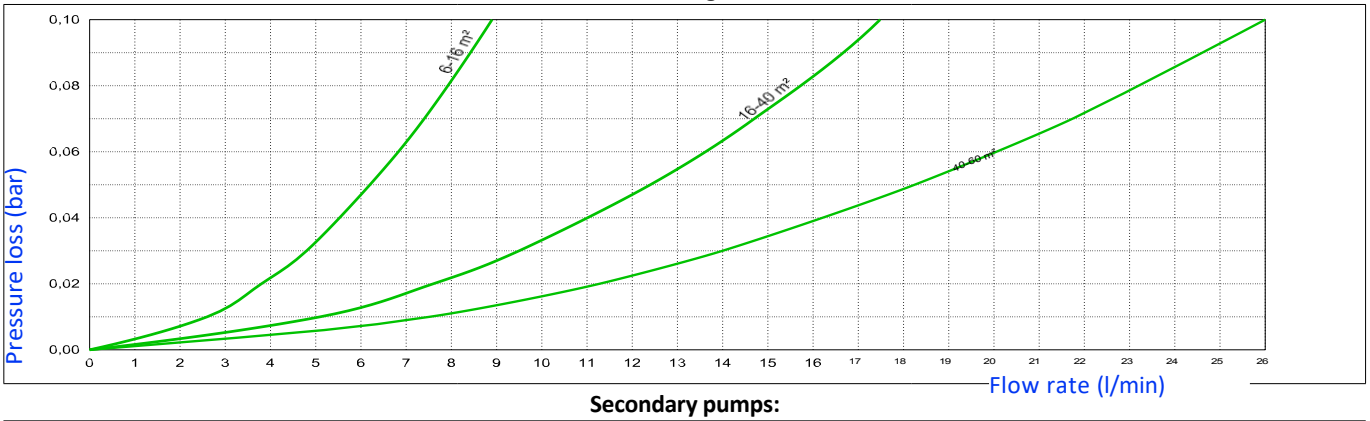

### SOK 16-40




### SOK 40-60

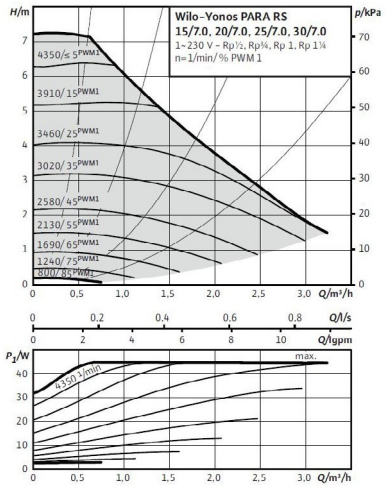



## Heat exchanger unit:

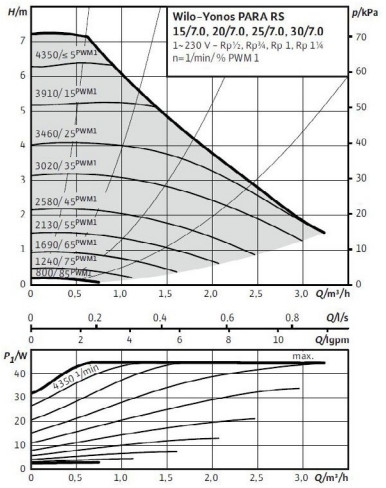



## Secondary pumps:

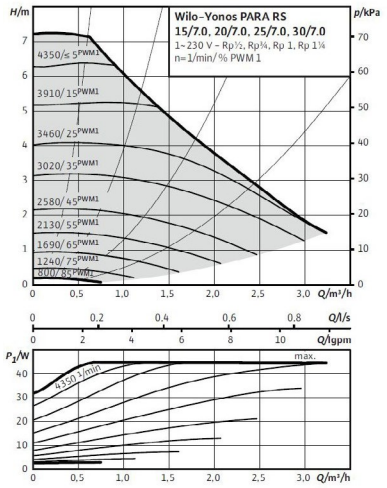
### SOK 6-16




### SOK 16-40




### SOK 40-60



# HYDRAULIC BALANCING

In general, a distinction is made between the primary pump and the secondary pump at the station, which is why they are also adjusted separately. However, the procedure is the same. They only differ in terms of the setting to be adjusted.
Flow rates and the resulting minimum and maximum speed settings of the PWM control.

**ATTENTION:**

THE SOLAR SYSTEM MUST ALREADY BE FILLED WITH HEAT TRANSFER FLUID IN THE PRIMARY CIRCUIT AND WITH WATER IN THE SECONDARY CIRCUIT, VENTED AND AT THE REQUIRED OPERATING PRESSURE.
IT IS RECOMMENDED THAT THE FOLLOWING STEPS ARE NOT CARRIED OUT IN FULL SUNLIGHT. THERE IS A RISK OF THE SYSTEM STAGNATING AND BOILING OVER!

- First, determine the gross collector area
- Then read the maximum flow rate from the flow rate table opposite. If the gross area lies between two columns, interpolate the value.
- Now remove the front insulation from both pump groups.
- The flow rate adjustment valves on the throttle devices in the solar primary circuit (collector circuit) and in the solar secondary circuit (storage circuit) must be fully open (factory setting).
- Now set the output for the 230V power supply of the two solar pumps to "Manual ON" (function A2) in the "Outputs" menu on the controller and set the manual toggle switch on the left-hand side to "Automatic". In addition, set the outputs of the PWM control ( works A14 and A15) must be set to "Manual OFF" in the "Outputs" menu on the controller, and the manual toggle switches on the right-hand side must be set to "Automatic"

  => The LEDs of the two solar pumps will now start flashing.

**Primary pump (collector circuit):**

- Set the 0-10V output for PWM control to "Manual" in the "Outputs" menu on the controller. This will open a button below where you can set any control (0-100%).
  (0%=off, <10%=min. throughput, 100%=max. throughput).
- Increase the control gradually, starting at 10%, until the mass flow at the throttle device exceeds 2 l/min.
  => this is considered the critical lower limit and is therefore the minimum control setting. Gradually increase the control setting until the volume flow to be achieved according to the table can be read at the throttle device.
  This value is considered the upper limit and is therefore the maximum control value.
- Both values must now be parameterised on the controller.
  => Go to the service menu in the function overview, enter the specialist code, confirm and select the primary pump under the solar pumps tile.
  primary pump
  => Now enter the minimum and maximum PWM control values determined earlier in % and confirm

**Secondary pump (storage circuit):**

- Set the 0-10V output for PWM control to "Manual" in the "Outputs" menu on the controller. This will open a button below where you can set any control (0-100%).
  (0%=off, <10%=min. throughput, 100%=max. throughput).
- Increase the control gradually, starting at 10%, until the mass flow at the throttle device exceeds 2 l/min.
  => this is considered the critical lower limit and is therefore the minimum control setting. Gradually increase the control setting until the volume flow to be achieved according to the table can be read at the throttle device.
  This value is considered the upper limit and is therefore the maximum control value.
- Both values must now be parameterised on the controller.
  => Enter the service menu in the function overview, enter the specialist code, confirm and select the secondary pump under the solar pumps tile
  => Now enter the minimum and maximum PWM control values determined earlier as a percentage and confirm.

# FLOW RATES

| | | | | |
|---|---|---|---|---|
| Low-flow system (m²) | 10 | 12.5 | 15 | 17.5 |
| V primary (l/min) | 4.4 | 5.2 | 6.3 | 7.3 |
| V secondary (l/min) | 3.8 | 4.4 | 5.3 | 6.2 |
| Power range max. (kW) ~ | 8.0 | 10.0 | 12.0 | 14.0 |

| | | | | |
|---|---|---|---|---|
| Low-flow system (m²) | 20 | 22.5 | 25 | 27.5 |
| V primary (l/min) | 8.3 | 9.4 | 10.4 | 11.5 |
| V secondary (l/min) | 7.1 | 8.0 | 8.9 | 9.7 |
| Power range max. (kW) ~ | 16.0 | 18.0 | 20.0 | 22.0 |

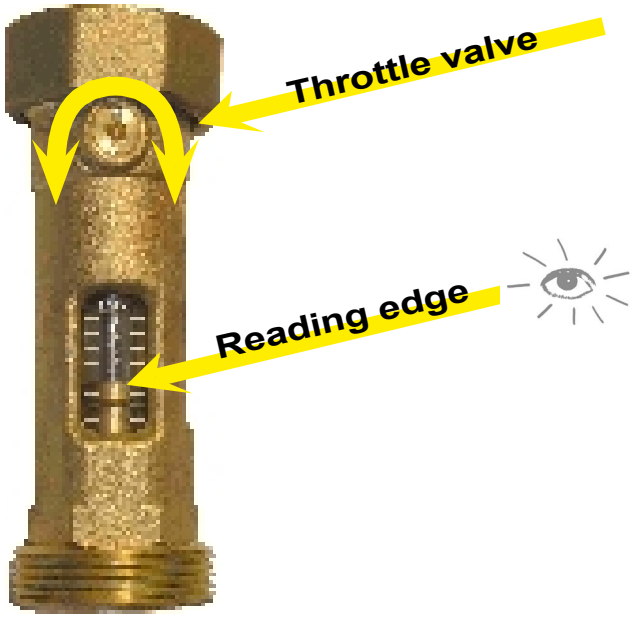
| | | | | |
|---|---|---|---|---|
| Low-flow system (m²) | 30 | 32.5 | 35 | 37.5 |
| V primary (l/min) | 12.5 | 13.5 | 14.6 | 15.6 |
| V secondary (l/min) | 10.6 | 11.5 | 12.4 | 13.3 |
| Max. power range (kW) ~ | 24.0 | 26.0 | 28.0 | 30.0 |

| | | | | |
|---|---|---|---|---|
| Low-flow system (m²) | 40 | 42.5 | 45 | 47.5 |
| V primary (l/min) | 16.7 | 17.7 | 18.8 | 19.5 |
| V secondary (l/min) | 14.2 | 15.1 | 15.9 | 16.8 |
| Max. power range (kW) ~ | 32.0 | 34.0 | 36.0 | 38.0 |

| | | | | |
|---|---|---|---|---|
| low-flow system (m²) | 50 | 52.5 | 55 | 57.5 |
| V primary (l/min) | 20.8 | 21.9 | 22.9 | 24.0 |
| V secondary (l/min) | 17.7 | 18.6 | 19.5 | 20.4 |
| Max. power range (kW) ~ | 40.0 | 42.0 | 44.0 | 46.0 |

| | | | | |
|---|---|---|---|---|
| Low-flow system (m²) | 60 | 62.5 | 65 | 67.5 |
| V primary (l/min) | 25 | 26 | 27.1 | 28.1 |
| V secondary (l/min) | 21.3 | 22.1 | 23 | 23.9 |
| Max. power range (kW) ~ | 48.0 | 50 | 52 | 54.0 |

| | | | | |
|---|---|---|---|---|
| Low-flow system (m²) | 70 | 72.5 | 75 | 77.5 |
| V primary (l/min) | 29.2 | 30.2 | 31.3 | 32.3 |
| V secondary (l/min) | 24.8 | 25.7 | 26.6 | 27.4 |
| Max. power range (kW) ~ | 56.0 | 58.0 | 60 | 62.0 |




Designed for max. power transmission at 800 W/m² collector output

Primary circuit: Ethylene glycol 40%
Inlet temperature 90°C

Secondary circuit: Heating water
Inlet temperature 30°C

Recommendation: Adjustment or readjustment for Heating support in the transition period

# PUMP WILO PARA STG 15/8-75

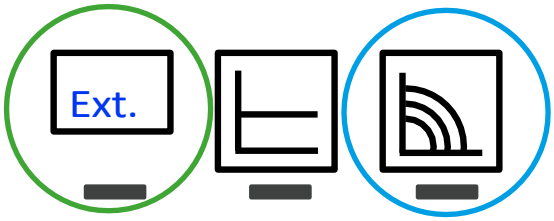
## Technical data


| | |
|---|---|
| Connection voltage | 1~230V +10%/-15%, 50/60Hz |
| Protection | IP X4D |
| Energy efficiency EEI | See type plate |
| Medium temperatures at max. ambient temperature | -20°C to +95°C (heating/GT) |
| | -10°C to +110°C (ST) |
| Ambient temperature | 0°C to +70°C |
| Max. operating pressure | 10 bar (1,000 kPa) |
| Minimum inlet pressure at +95°C/+110°C | 0.5 bar/1.0 bar (50 kPa/100 kPa) |

## LED indicator lights

Signal indicator

- **LED** lights up green during normal operation and flashes in standby mode
- **LED** lights up or flashes red in the event of a fault
- LED is off when no 230 volt voltage is applied

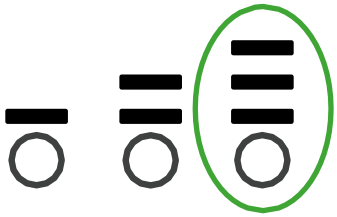



Display of the selected control mode

**Ext. = PWM = factory setting (TWK + SOK)**

PWM, Δp-c and constant speed

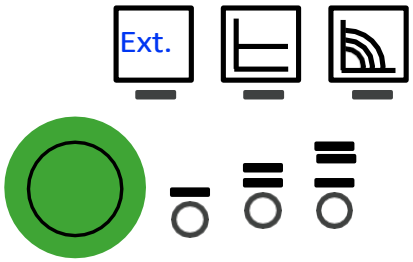
**(Constant + III = emergency mode)**



Display of the selected characteristic curve (I, II, III) within the control mode

**III = factory setting = PWM 2**

Control button




Press

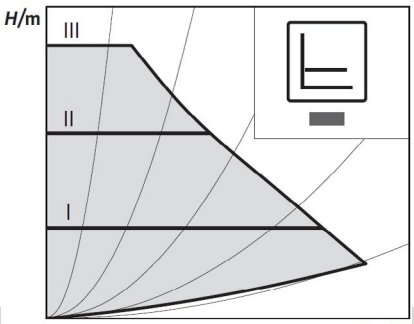
- Select control type
- Select characteristic curve (I, II, III) within the control type

Press and hold

- Press for 3 seconds = activate venting function
- Press for 5 seconds = activate manual restart
- Press for 8 seconds = lock/unlock button

# Control modes and functions

## Constant differential pressure Δp-c (I, II, III)



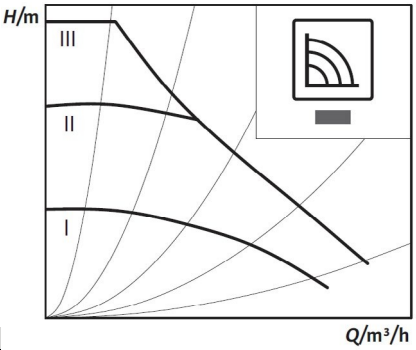

Recommended for underfloor heating systems, large-diameter pipes or all applications without variable pipe network characteristics

(e.g. storage tank charging pumps), as well as single-pipe heating systems with radiators.

The control keeps the set delivery head constant regardless of the delivered volume flow.

Three predefined characteristics (I, II, III) to choose from.

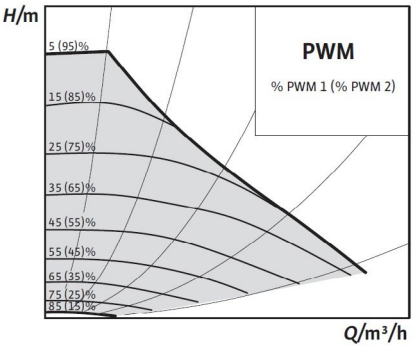
## Constant speed (I, II, III)




Recommended for systems with unchanging system resistance that require a constant volume flow.

The pump runs at three preset fixed speed levels (I, II, III).

## EXTERNAL CONTROL VIA PWM SIGNAL

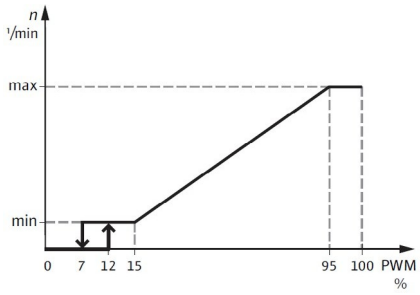



The required setpoint/actual value comparison is performed by a ratiotherm central controller for control purposes. (Factory setting PWM2 mode)

A PWM signal (pulse width modulation) is supplied to the pump as the control variable via a separate cable with plug.

The PWM signal generator sends a periodic sequence of pulses (the duty cycle) to the pump in accordance with DIN IEC 60469-1.

## PWM 2 mode




In iPWM 2 mode, the pump speed is controlled depending on the PWM input signal.

Behaviour in the event of a cable break:

If the signal cable is disconnected from the pump, e.g. due to a cable break, the pump stops.

PWM signal input [%]

| | |
|---|---|
| 0 - 7: | Pump stops (standby) |
| 7 - 15: | Pump runs at minimum speed (operation) 12 - 15: Pump runs at minimum speed (start-up) |
| 15 - 95: | The speed of the pump increases linearly from $n_{min}$ to $n_{max}$ |
| > 95: | Pump running at maximum speed |

## Emergency operation of the pump

Pump manual operation or in the event of a PWM signal fault.

Press the green control button.

Display switches to different control modes.

Press the green control button several times to set the operating mode to constant speed.

Press again to set the pump speed in 3 stages.

**Always set to level III (3) for TWK!**

## Ventilation

The venting function is activated by pressing and holding (3 seconds) the control button and automatically vents the pump.

The heating system is not vented during this process.

## Manual restart

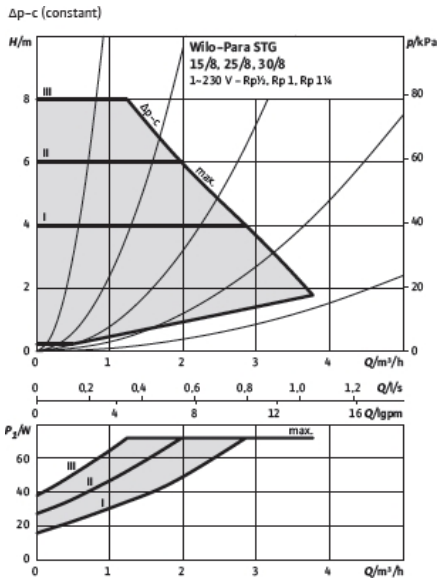
A manual restart is activated by pressing and holding (5 seconds) the control button and unblocks the pump if necessary

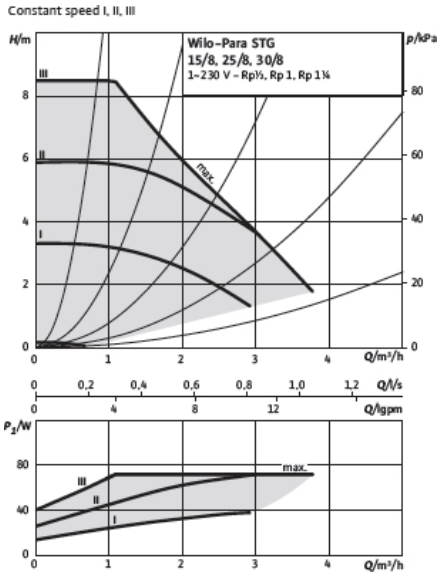
(e.g. after a prolonged period of inactivity during the summer).

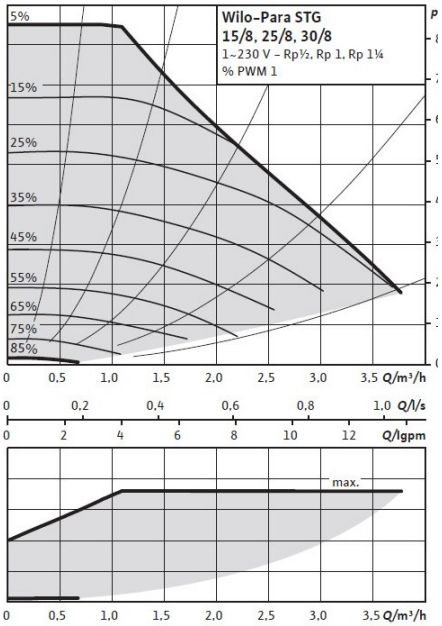
## Key lock

The key lock is activated by pressing and holding (8 seconds) the control button and locks the settings on the pump. It protects against unwanted or unauthorised adjustment of the pump.

## Characteristic curves



# WARRANTY

ratiotherm provides a warranty for material and manufacturing defects in its products, unless otherwise agreed in writing, as follows:

| | |
|---|---|
| • Oskar° series stratified storage tank | 5 years |
| • Accessories for Oskar° series stratified storage tanks | 2 years |
| • Compact stations and accessories | 2 years |
| • Heating circuit assemblies and accessories | 2 years |
| • Control/regulator units and accessories | 2 years |
| • Thermal solar collectors* | 5 years |
| • Heat generators (heat pumps, smart energy) | 2 years |

*Collector warranty
Only when using the ratiotherm ready-mix and when annual maintenance is carried out by a qualified specialist company with written proof in the form of service or maintenance logs.

Extended system warranty (for ratiotherm systems) 5 years
when using all available ratiotherm products and when annual maintenance is carried out by a qualified specialist company with written proof in the form of service or maintenance logs.

The warranty period begins on the date of delivery.
The date stated on the delivery note is decisive in this regard.

The warranty also requires that ratiotherm products have been installed and operated in accordance with the recognised rules of technology. If maintenance is required, proof must be provided in the event of a warranty claim that the maintenance was carried out properly and professionally.

If defects in the material, workmanship or performance of the item covered by the warranty become apparent within the warranty period, the customer shall send the item covered by the warranty to the guarantor at their own expense and risk.

Warranty claims cannot be considered if the warranty item has not been operated in accordance with specifications; has been damaged or destroyed by force majeure or environmental influences (frost, overvoltage, unauthorised media); or has been damaged by improper handling.

The warranty period is not extended by returning the product for repair or replacement.

Warranty claims for a ratiotherm heat pump can only be asserted if the heat pump system has been installed/assembled by the specialist company carrying out the work in a fully operational condition (i.e. hydraulically, refrigeration-technically, electrically and control-technically) and has been commissioned in their presence by ratiotherm or a company authorised by ratiotherm.

ratiotherm only provides a functional guarantee if original ratiotherm components/controls are used.

Please always submit warranty claims in writing to the following email address:
**reklamation@ratiotherm.de**

The following are excluded from warranty coverage:

- Damage caused by shipping/transport, as well as improper installation, use/operation
- Natural wear and tear
- The warranty expressly excludes consequential costs, in particular removal and installation costs, as well as further costs such as claims for damages.

The terms and conditions of ratiotherm GmbH & Co. KG apply exclusively.

# EC DECLARATION OF CONFORMITY

**(Declaration of Conformity)**

The ratiotherm GmbH & Co. KG
Wellheimer Straße 34
D-91795 Dollnstein

confirms that the products listed below and marked accordingly:

Heat accumulators, transfer stations, solar thermal collectors, heat pumps and universal/central controllers

Trade name/type:

>
>
>
> Compact drinking water station TWK-S70, S90, S100
> Compact drinking water heater TWKK-200ZD, TWKK-300ZD and TWKK-400ZD
> Compact solar station SOK 6-16 and SOK 16-40 SOK 40-60
> Solar collectors RA251-4 and RA215
> Universal/central controller rUVR1611, rZR16x2
> MAX and GRID heat pumps

comply with the relevant essential requirements of the EC directives.

This declaration loses its validity if the device is modified without our consent!

EEC Directives:

| | |
|---|---|
| 2014/68/EU | Pressure Equipment Directive |
| 2014/35/EU | Low Voltage Directive |
| 2004/108/EC | Electromagnetic compatibility |
| 2011/65/EU | RoHS Restriction of the use of certain hazardous substances |

Applied standards:

| | |
|---|---|
| DruckbehV | (Pressure Vessel Regulation) |
| Pressure Equipment Directive | (Pressure Equipment Directive) |
| TRB 500 | (Technical Rules for Pressure Vessel Regulations) |
| EN60730-1: 2011 | Automatic electrical control and switching devices for household use and similar applications - Part 1: General requirements EN61000-6-3: 2007 Electromagnetic compatibility (EMC) - Part 6-2: |
| +A1: 2011 | Emissions for residential, commercial and light-industrial environments |
| EN61000-6-2: 2005 | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments Affixing of |
| the CE marking: | On packaging, instruction manual and type plate |

Dollnstein, 1 April 2009 Alexander

Weidinger

# Here you will find
# you can find us

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Smart Energy Systems

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