



Planning guide

for tradespeople, planners and architects

ratiotherm

Where innovation becomes tradition

The vision of "heating with maximum energy efficiency" lies at the heart of ratiotherm GmbH & Co. KG.

In the early 1990s, company founder Alfons Kruck developed the Oskar° stratified storage tank, which, with its patented thermohydraulics, is still the technology leader in the stratified storage tank segment today.

Almost 30 years and numerous new product developments later, ratiotherm is now a full-range supplier of renewable energy systems.

Responsibility, the highest quality standards and technological vision determine the strategic development of the owner-managed company.

As a result, a large number of product developments have been brought to patent maturity, always with a focus on renewable energy sources such as geothermal and solar energy, which are free and crisis-proof.

Production at the company headquarters in Dollnstein, Upper Bavaria, and system partnerships are further hallmarks of ratiotherm's high quality standards.

Employees with many years of experience produce state-of-the-art heating technology in a total production area of 3,500 square metres.

A good 150 companies in Germany and over 50 other partners across Europe are trained as system partners for ratiotherm energy systems.

This ensures the highest quality of products in use on site.



Our philosophy

Heating with maximum energy efficiency.

In our view, an energy system is efficient when the various heating technologies are ideally combined in such a way that the efficiency of each integrated heat source is increased, if not maximised.

Solar energy. Free and crisis-proof potential.

Whether used directly via photovoltaics or solar thermal energy on the roof, or indirectly, as generated by near-surface geothermal energy, groundwater heat or air heat and utilised by a heat pump, solar heat is free to use and crisis-proof.

Responsibility. Highest quality standards.

We take our responsibility towards our region seriously, but also towards our employees. That is why we made a conscious decision to manufacture our products at our home location in Dollnstein. In addition, system partners who are trained in rati-otherm energy systems at our own training centre ensure that we deliver on our quality promise in the field.

Inventive spirit. Trailblazers.

Over the years, we have succeeded in identifying trends and long-term developments in the heating sector at an early stage and developing smart solutions in response. Thanks to this technological foresight, we have been able to patent most of our innovative products.

High-quality energy systems: optimised for your requirements. That is why all our modules are pre-assembled. However, they are not limited to this one ideal configuration. Rather, they are completely flexible and can be connected to all other components in a variety of ways, regardless of the manufacturer.



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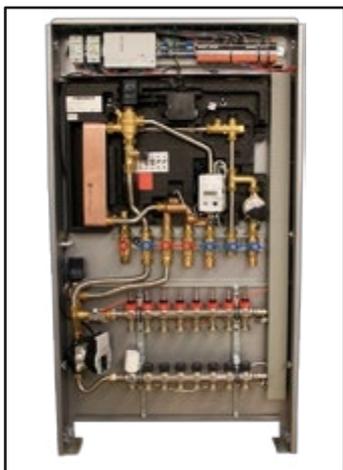
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1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

BASICS OF HEAT PUMP TECHNOLOGY

Heat pumps are currently among the best-selling heating systems in the construction sector. The basic properties of this technology enable not only efficient heat generation but also very effective cooling. ratiotherm heat pumps are the preferred choice for standard applications as well as special applications and holistic concepts. In addition, ratiotherm heat pumps are smart grid-compatible, meaning they can also be used in intelligent power grids, thus making an active contribution to the supply of renewable energies. With optional lockable maintenance contracts, this technology offers customers a comprehensive, worry-free package.

A heat pump heating system consists of three parts: the heat source system, which extracts the required energy from the environment; the actual heat pump, which makes the extracted environmental heat usable; and the heat distribution and storage system, which distributes or temporarily stores the heat energy in the house. The technical process takes place in three steps.

Step 1: Extraction

A liquid, often brine, i.e. water mixed with antifreeze, circulates in the heat source system. The liquid absorbs environmental heat, e.g. from the ground or groundwater, and transports it to the heat pump. Air heat pumps are an exception. These use a fan to draw in outside air, which supplies the heat pump with ambient heat.



1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

BASICS OF HEAT PUMP TECHNOLOGY

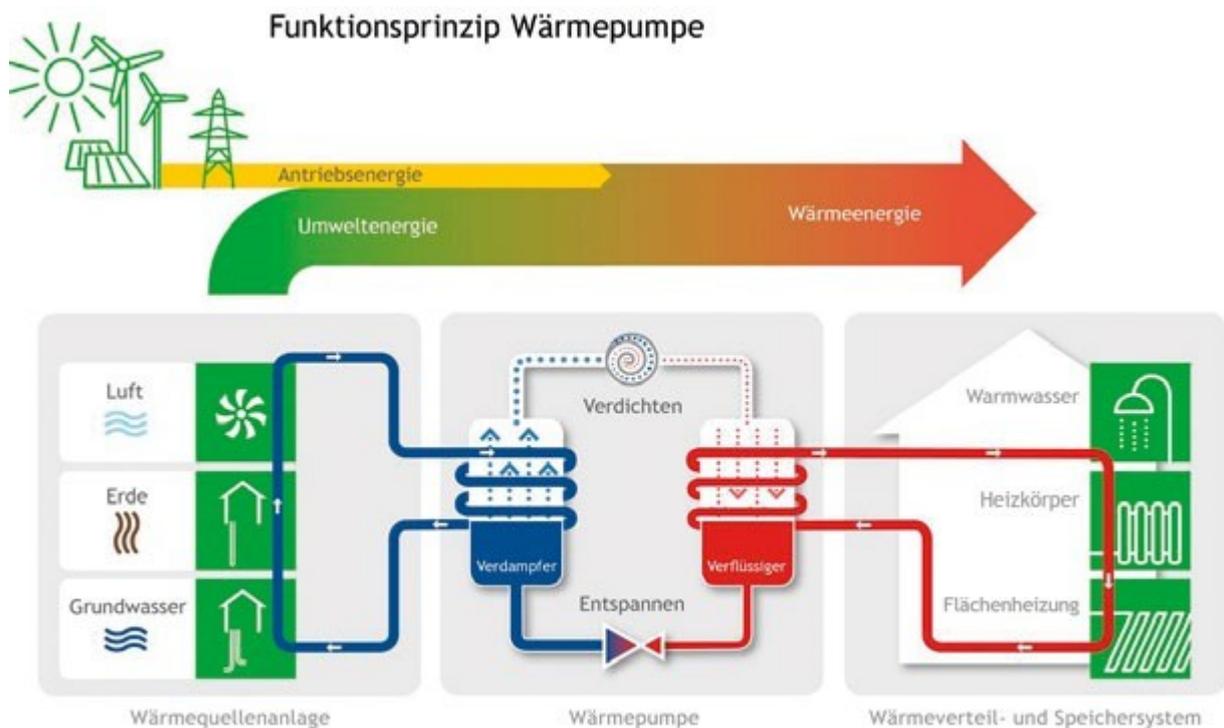
Step 2: Utilisation

The heat pump contains another circuit in which the refrigerant circulates. In a heat exchanger, the evaporator, the environmental energy is transferred from the first circuit to the refrigerant, which then evaporates. In air source heat pumps, the outside air heats the refrigerant. The refrigerant vapour is then fed into a compressor. This raises the temperature of the gaseous refrigerant, making it hotter. In another heat exchanger, known as the condenser, the hot refrigerant gas under high pressure is condensed (cooled), releasing its heat. The liquefied refrigerant is then fed to a throttle, where the pressure of the refrigerant is reduced again. The now liquid, relaxed refrigerant is finally returned to the evaporator.

Step 3: Heating

The heat distribution and storage system is now located in the building to be heated. Water usually circulates in this system as the heating medium. This water absorbs the heat released by the refrigerant in the condenser and transfers it either to a distribution system, such as panel heating or radiators, or to a heating buffer or hot water storage tank.

Source: bwp



Plann
applic

bwp Bundesverband
Wärmepumpe e.V.

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.1 WP MAX-S (BRINE/WATER)



Brine/water



Source:
-10 °C to 5 °C



Flow:
35 °C to 62 °C

The brine/water heat pump is suitable for tapping sources in **the temperature range from -10 °C to + 5 °C.**

Ground probes or ground collectors are usually considered as sources here. The source, which has a constant temperature all year round, guarantees maximum efficiency.

The maximum flow temperature is 62 °C.

Its variable-speed compressor allows for continuous power control, making it particularly efficient.

This feature is complemented by its smart grid capability, making it perfect for power-to-heat applications and grid-connected applications.

During the hot summer months, **passive cooling** can be enabled via an additional heat exchanger.



ADVANTAGES

- Maximum flexibility thanks to speed-controlled inverter operation
- Integrated energy management (smart grid-capable)
- Easy installation thanks to complete pre-assembly at the factory
- No refrigeration certificate required

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.1 WP MAX-S (GROUND/WATER)

WP Max-S		F12
Performance data heating mode		
S0/W35		
Heating output	4.0 to 16.6	kW
Power consumption	1.0 to 4.1	kW
COP at rated power	4.13	
S0/W55		
Heating capacity	3.7 to 15.3	kW
Power consumption	1.5 to 6.0	kW
COP at rated power	2.6	
Compressor		
Design	Fully hermetic, rotary piston, inverter	
Blocking current LRA	45	A
Oil quantity	0.82	litres
Evaporator		
Design	Copper-brazed plate heat exchanger	
Material	Stainless steel/copper	
Brine flow rate	5.4 (at full load, min. 2.0)	m ³ /h
Pressure loss	0.35 (at 5.4 m ³ /h)	bar
Temperature difference	3	K
Connection dimension	1 1/4" female thread	
Condenser		
Design	Copper-brazed plate heat exchanger	
Material	Stainless steel/copper	
Water flow rate	0.5 to 2	m ³ /h
Pressure loss	max. 0.5	bar
Temperature difference	5 to 8	K
Connection dimension	1 1/4", AG	
Refrigeration circuit		
Working medium	R410 A	
Filling quantity	1.76	kg
Max. operating pressure	42	bar
Electrical		
Mains connection	400 V/3~/50 Hz	
Fuse protection (slow-blow)	20	A
Max. operating current compressor	16	A
Device data		
Sound pressure level of indoor unit at a distance of 1 m	42	dB (A)
Dimensions of interior	500 x 1300 x 540	W x H x D (mm)
Weight of inner section	100	kg
Max. operating pressure water	10	bar
Max. VL temperature	62	°C

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.2 WP MAX-W (WATER/WATER)



Water/water



Source:
5 °C to 15 °C



Flow:
35 °C to 62 °C

If a drinking and swallowing well is available as an environmental source, the WP Max-W groundwater heat pump is used.

The source temperature should ideally be **in the range of 5 to 15 °C**.

The maximum flow temperature is 62 °C.

The source, which maintains a constant temperature throughout the year, guarantees maximum efficiency.

Its variable-speed compressor allows for infinitely variable power control, making it particularly efficient.

This feature is complemented by its smart grid capability, making it perfect for power-to-heat applications and grid-connected applications.

During the hot summer months, **passive cooling** can be enabled via an additional heat exchanger.



ADVANTAGES

- Maximum flexibility thanks to speed-controlled inverter operation
Integrated energy management
Smart grid-compatible
- Easy installation thanks to complete pre-assembly at the factory
- No refrigeration certificate required

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.2 WP MAX-W (WATER/WATER)

WP Max-W		F16
Performance data heating mode		
W10/W35		
Heating output	5.1 to 18.6	kW
Power consumption	0.7 to 4.9	kW
COP at rated power	5.92	
W10/W55		
Heating capacity	4.2 to 11.7	kW
Power consumption	1.3 to 4.9	kW
COP at rated power	3.3	
Compressor		
Design	Fully hermetic, rotary piston, inverter	
Blocking current LRA	45	A
Oil quantity	0.82	litres
Evaporator		
Design	Copper-brazed plate heat exchanger	
Material	Stainless steel/copper	
Brine flow rate	5.4 (at full load, min. 2.0)	m ³ /h
Pressure loss	0.35 (at 5.4 m ³ /h)	bar
Temperature difference	3	K
Connection dimension	1 1/4", AG	
Condenser		
Design	Copper-brazed plate heat exchanger	
Material	Stainless steel/copper	
Water flow rate	0.5 to 2	m ³ /h
Pressure loss	max. 0.5	bar
Temperature difference	5 to 8	K
Connection dimension	1 1/4" AG	
Refrigeration circuit		
Working medium	R410 A	
Filling quantity	1.65	kg
Max. operating pressure	42	bar
Electrical		
Mains connection	400 V/3~/50 Hz	
Fuse protection (slow-blow)	20	A
Max. operating current compressor	16	A
Device data		
Sound pressure level of indoor unit at a distance of 1 m	42	dB (A)
Dimensions of interior	500 x 1300 x 540	W x H x D (mm)
Weight of inner section	100	kg
Max. operating pressure water	10	bar
Max. VL temperature	62	°C

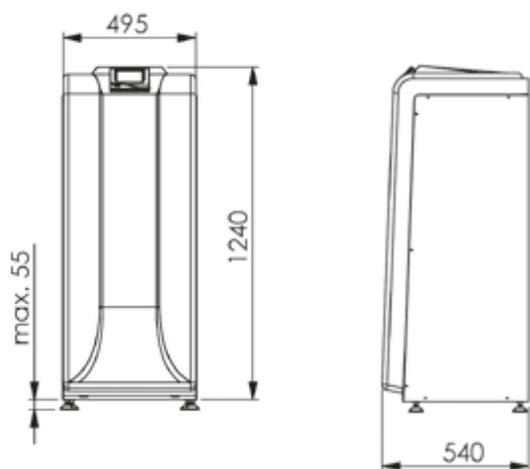
1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.1 WP MAX-S + 1.2 WP-MAX-W

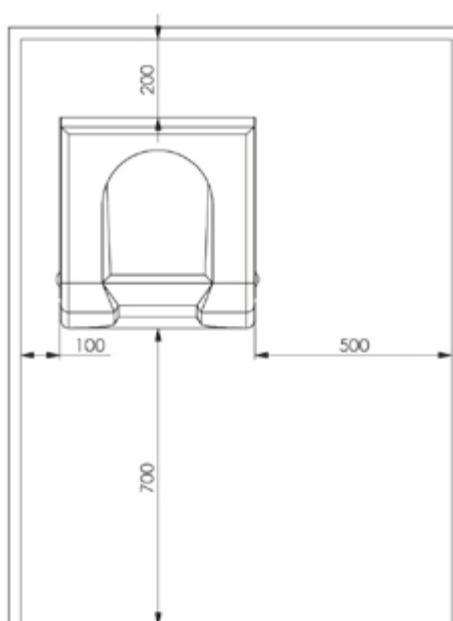
Installation conditions:

- A floor drain must be provided to protect against water damage.
- The ratiotherm WP Max-S/WP Max-W heat pump must be installed in a clean, ventilated and dry location. The ambient temperature must be permanently $>10\text{ }^{\circ}\text{C}$ and $<35\text{ }^{\circ}\text{C}$.
- The minimum distances must be observed for maintenance reasons.
- Depending on the installation location, a sound-insulated base is recommended.

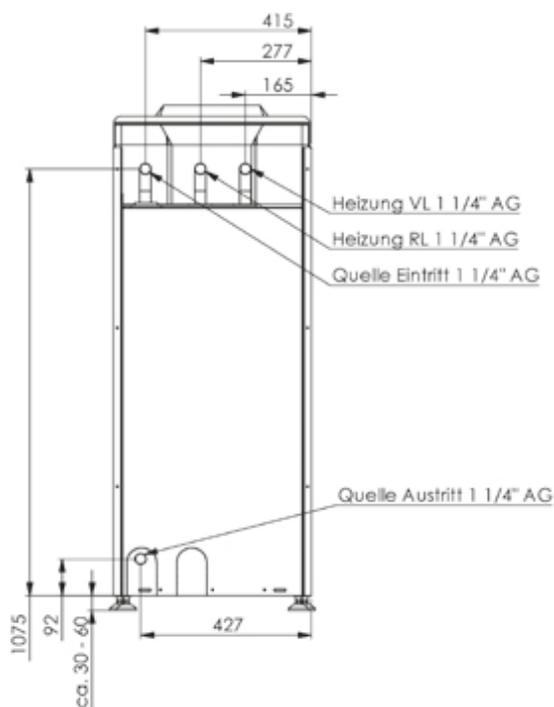
Dimensions:



Distance measurements:

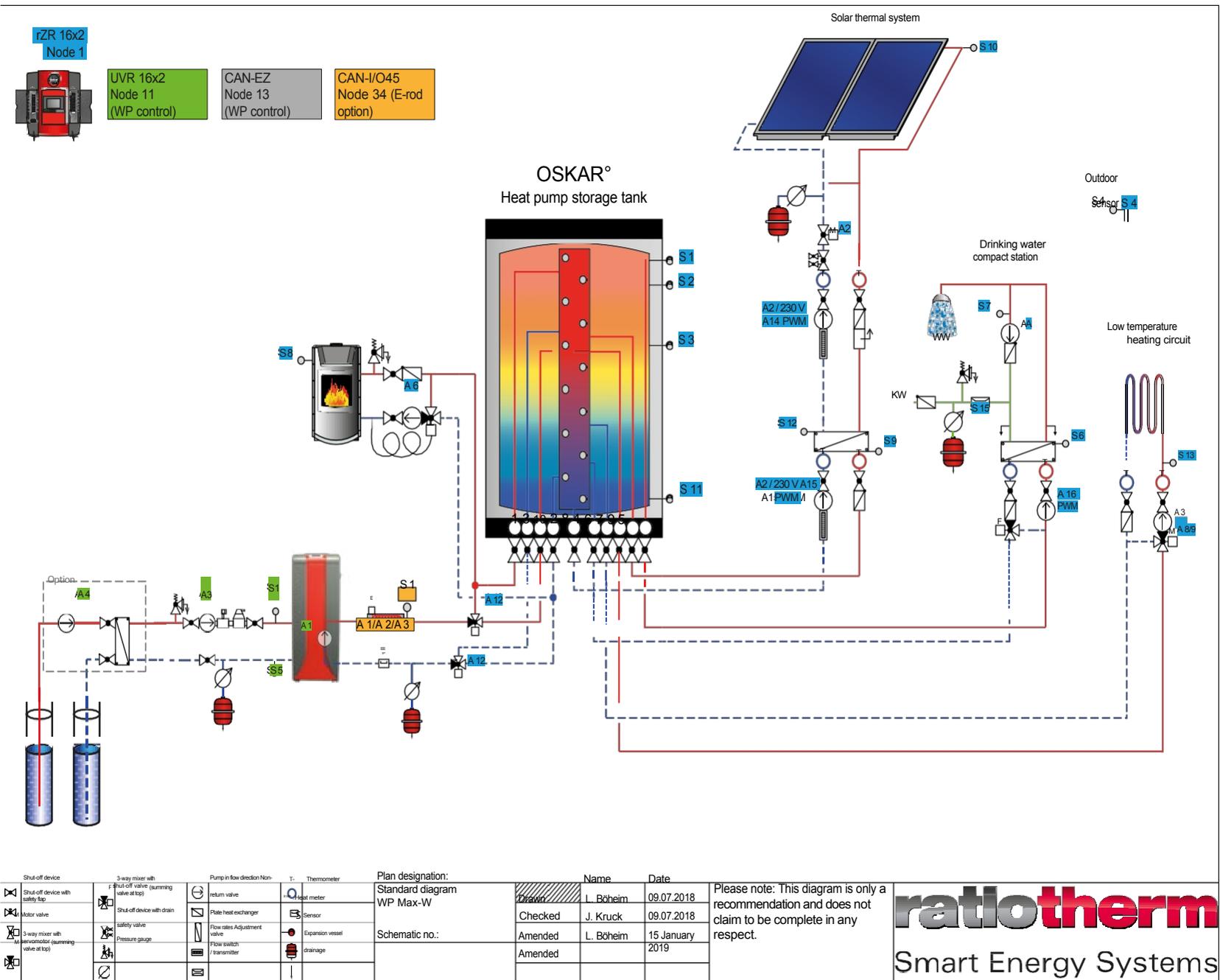


Connection information:



1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.1 WP MAX-S + 1.2 WP-MAX-W



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ATTENTION! Installation and wiring may only be carried out by authorised specialist personnel.

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.3 WP MAX-AIR (AIR/WATER)



Air/water temperature:



Source:

-35 °C to 25 °C



Flow:

35 °C to 62 °C



Outdoor

28 dBA

The use of air/water heat pumps makes it easy to tap into the energy reserves of the ambient air.

No ground or well construction work is necessary.

The maximum flow temperature is 62 °C.

Its variable-speed compressor allows for continuous power control, making it particularly efficient.

This feature is complemented by its smart grid capability, making it perfect for power-to-heat applications and grid-connected applications.

An optional **hybrid heat exchanger** allows another environmental source to be easily utilised.

Solar collectors or heat recovery systems, for example, can be connected here.

Active cooling through process reversal allows the WP Max-Air to cool efficiently; on request, this can also be done using PV excess current.



ADVANTAGES

- Maximum flexibility thanks to speed-controlled inverter operation
- Integrated energy management (smart grid-compatible)
- Easy installation thanks to complete pre-assembly at the factory
- Increased efficiency thanks to optional hybrid heat exchanger
- Whisper-quiet outdoor unit thanks to new development (owl wing technology)

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.3 WP MAX-AIR (AIR/WATER)

WP Max-Air		F12
Performance data		
A+2/W35 (heating mode)		
Heating output	3.6 to 17.7	kW
Power consumption	0.8 to 3.4	kW
COP at rated power	5.1	
W15/A35 (cooling mode)		
Cooling capacity	4.3 to 21.4	kW
Power consumption	1.0 to 4.1	kW
COP at rated power	5.19	
Compressor		
Design	Fully hermetic, rotary piston, inverter	
Blocking current LRA	44	A
Oil quantity	0.63	litres
Evaporator (outdoor unit)		
Design	Air heat exchanger	
Material	Aluminium, copper	
Air flow rate	7000	m ³ /h
Connection dimensions for refrigerant	Liquid line 12, suction gas line 28	mm
Condenser		
Type	Copper-brazed plate heat exchanger	
Material	Stainless steel/copper	
Water flow rate	0.5 to 2	m ³ /h
Pressure loss	max. 0.5	bar
Temperature difference	5 to 8	K
Connection dimension	1 1/4", AG	
Refrigeration circuit		
Working medium	R410 A	
Filling quantity for 10 m split line	6.5	kg
Max. operating pressure	42	bar
Electrical		
Mains connection	400 V/3~/50 Hz	
Slow-blow fuse	20	A
Max. operating current compressor	16	A
Device data		
Sound pressure level of indoor unit at a distance of 1 m	42	dB (A)
Sound pressure level of outdoor unit at a distance of 1 m	34	dB (A)
Dimensions of indoor unit	500 x 1300 x 540	W x H x D (mm)
Dimensions of outer section	1340 x 1410 x 660	W x H x D (mm)
Weight of inner unit	100	kg
Weight of outer unit	232 (without attachments 137)	kg
Max. operating pressure water	6	bar
Max. VL temperature	62	°C

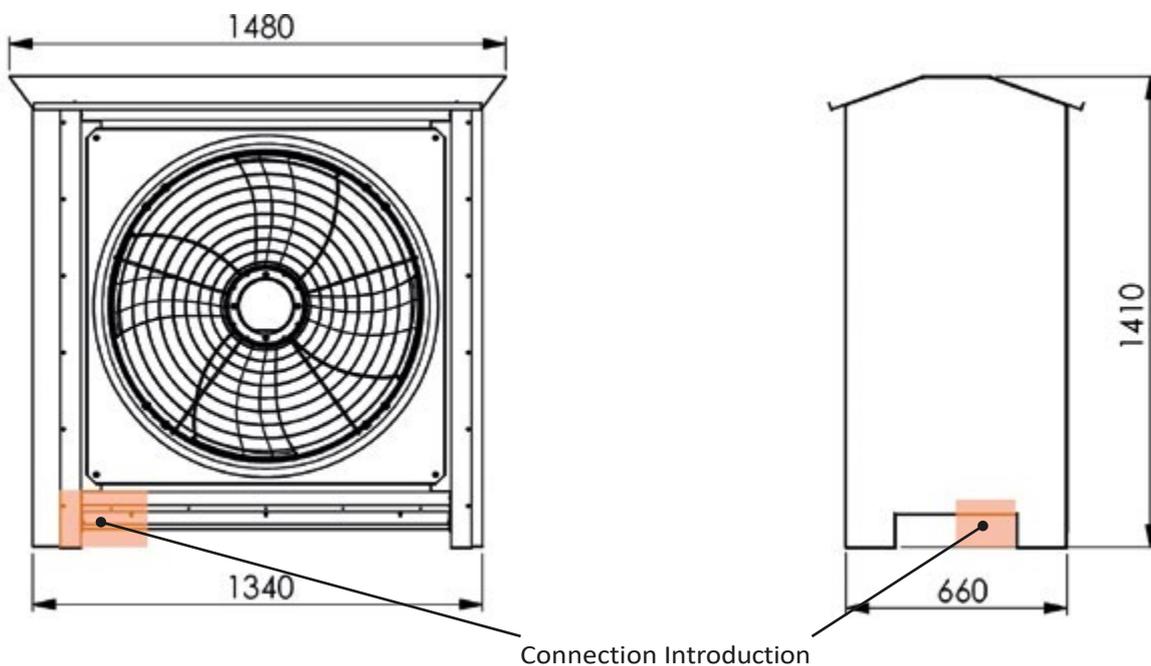
1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.3 WP MAX-AIR (AIR/WATER)

Installation conditions:

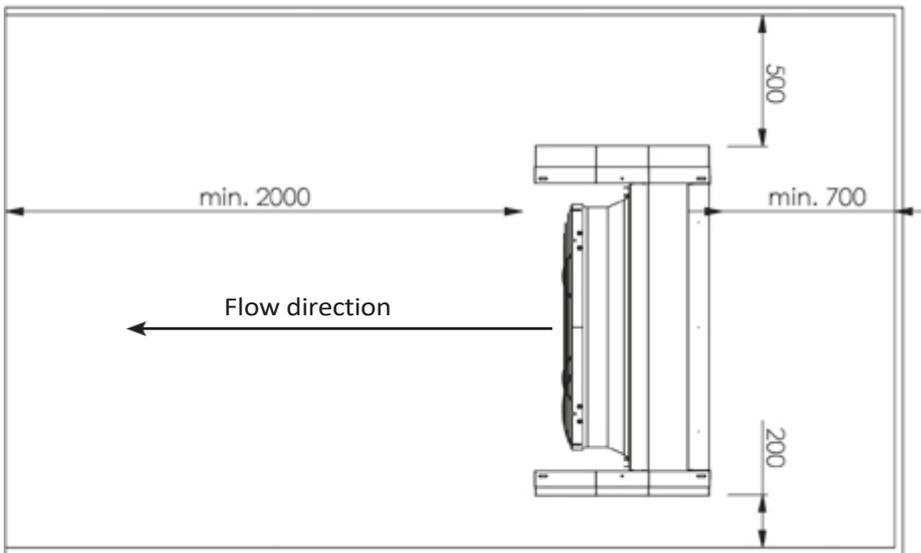
- The outdoor unit must be installed in such a way that no refrigerant can enter the building or otherwise endanger people.
- If the outdoor unit is installed close to a wall, a minimum distance of 1 metre must be maintained (sound reflection).
- A free air flow (7000 m³ /h) must be ensured. The outdoor unit must not be enclosed or covered.
- Before installing the outdoor unit, a suitable foundation must be constructed (see dimensions of outdoor unit and foundation plan).
- As heat pump operation produces a quantity of condensate depending on the output and humidity, a means of draining the condensate must be provided if the ground beneath the outdoor unit is impermeable.
- The outdoor unit can be installed at a different height to the indoor heat pump unit. The following maximum height differences are possible:
 - Outdoor unit max. 5 metres lower or 9 metres higher than the indoor unit
 - If greater differences in height are required, please enquire with ratiotherm if necessary.
- The outdoor unit can be installed at a maximum distance of 20 m (single pipe length) from the indoor unit as standard; longer pipe lengths are only possible after consultation with ratiotherm.

Distance measurements:

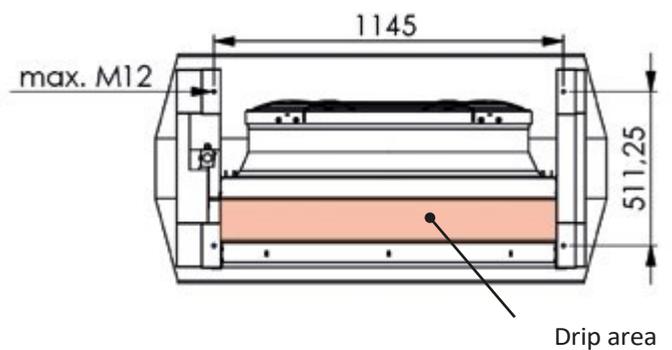
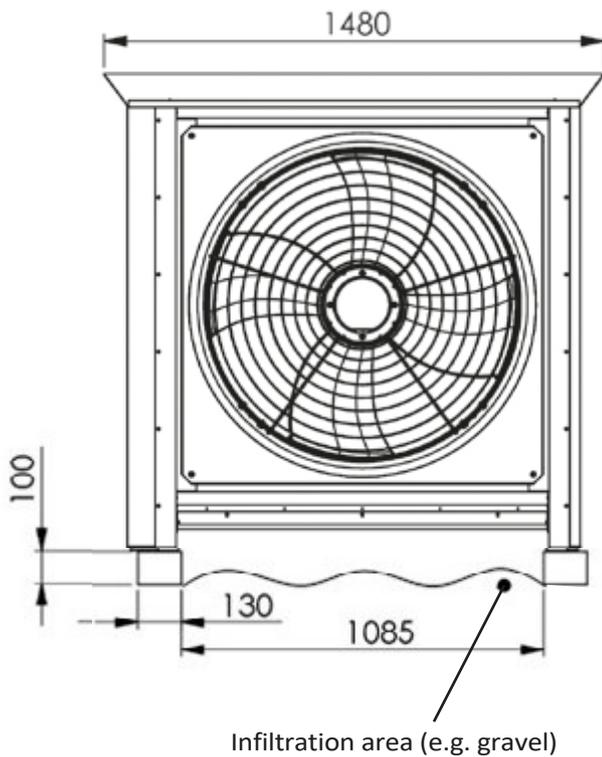


1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.3 WP MAX-AIR (AIR/WATER)



Foundation plan:



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ATTENTION! Installation and wiring must only be carried out by authorised specialists.

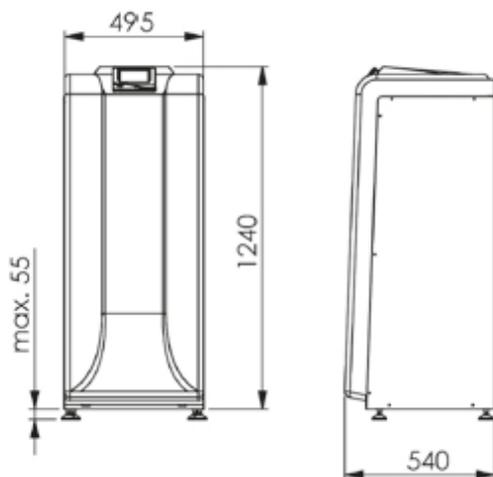
1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.3 WP MAX-AIR (AIR/WATER)

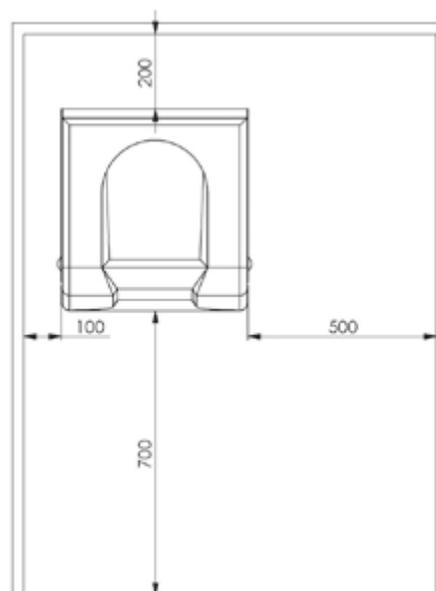
Installation conditions:

- A floor drain must be provided to protect against water damage.
- The ratiotherm WP Max-Air air source heat pump must be installed in a clean, ventilated and dry location. The ambient temperature must be permanently $>10\text{ }^{\circ}\text{C}$ and $<35\text{ }^{\circ}\text{C}$.
- The minimum distances must be observed for maintenance reasons.
- Depending on the installation location, a sound-insulated base is recommended.

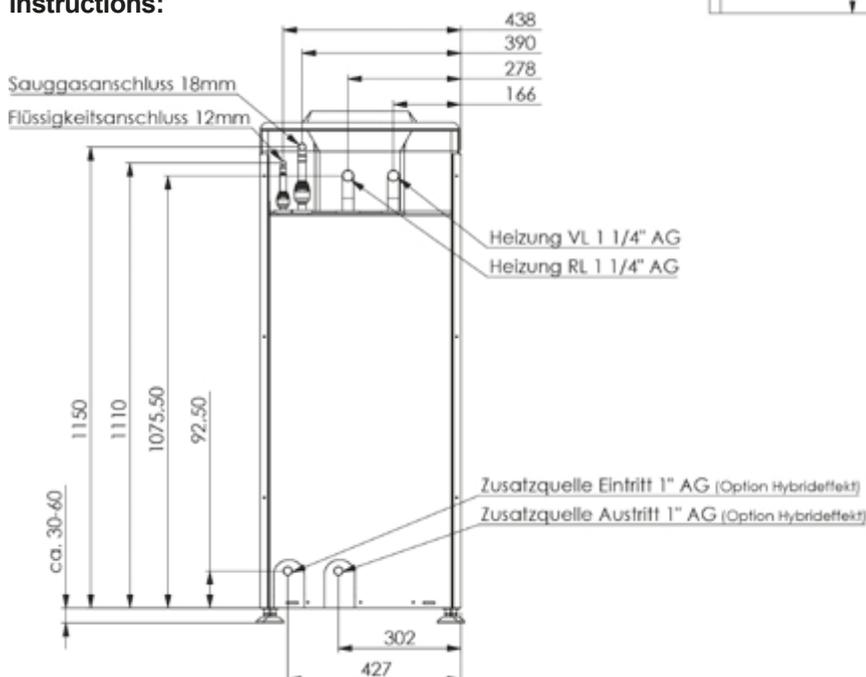
Dimensions:



Distance measurements:



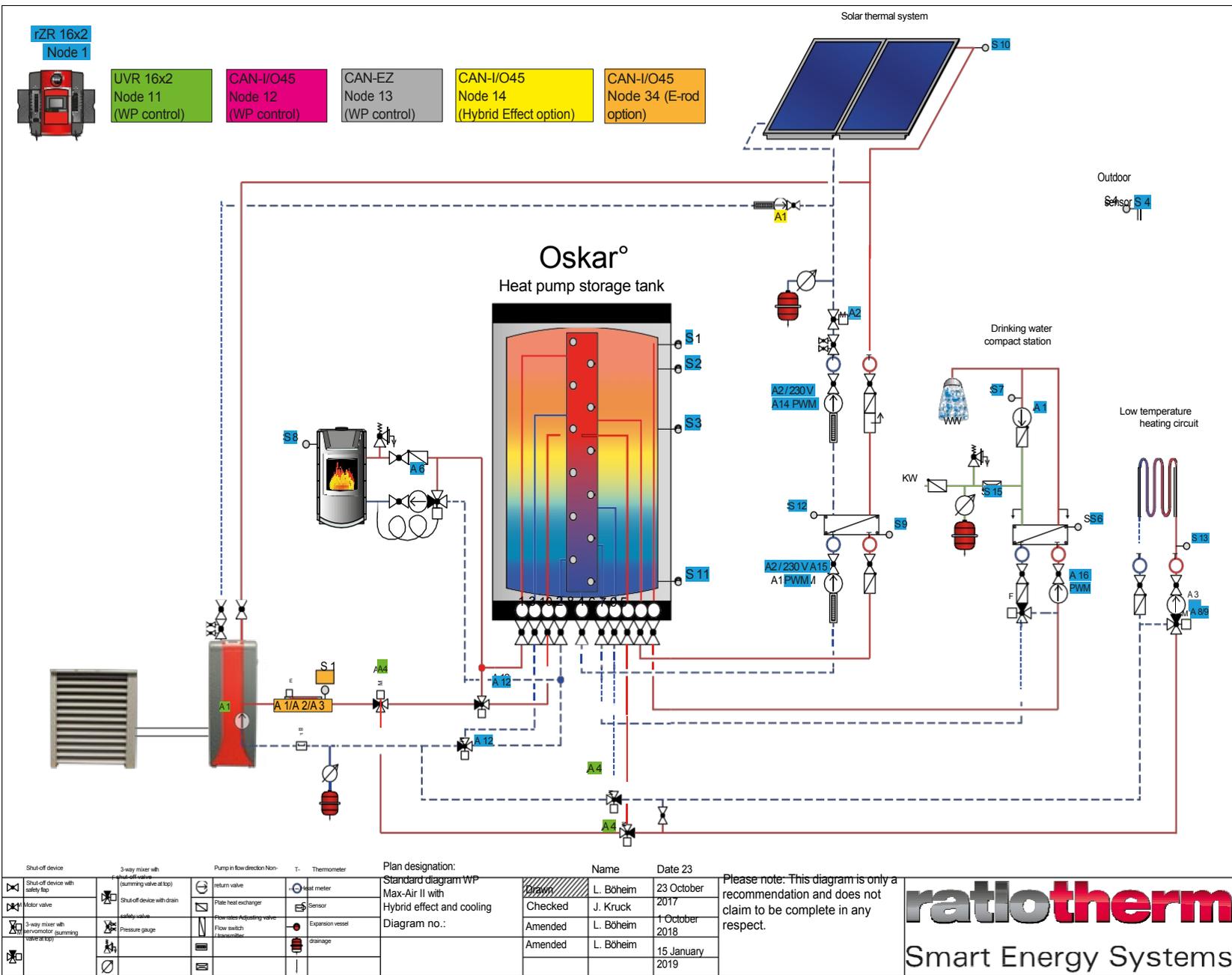
Connection instructions:



1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.3 WP MAX-AIR (AIRWATER)

Diagram: Full diagram with hybrid and cooling



ratiotherm
Smart Energy Systems

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.4 WP MAX-HIQ



Water/water



Brine/water



Source:
10 °C to 55 °C



Flow:
35 °C to 72 °C

The WP Max-HiQ high-temperature heat pump stands for maximum efficiency in an extremely compact design and is designed as a water/water or brine/water heat pump.

The refrigerant used gives it maximum flexibility in terms of possible source network temperatures ranging from 10 to 55 °C.

This flexibility is achieved through a **patented process** that enables the system to always reach the optimum operating point despite changing source temperatures.

The areas of application for this heat pump range from sustainable heating and energy networks to photovoltaic-controlled electricity use for charging large heat storage tanks to use as a conventional water/water or brine/water heat pump.

Speed control means it covers a wide range of outputs and is also ideal for use with fluctuating energy sources such as photovoltaics.



ADVANTAGES

- Use of highly fluctuating sources
- Maximum flexibility thanks to speed-controlled inverter operation
- Flow temperatures up to 72 °C possible
- Integrated energy management
Smart grid-compatible
- Easy installation thanks to complete pre-assembly at the factory
- No refrigeration certificate required

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.4 WP MAX-HIQ

WP Max-HIQ	F06	F14	F21	
Performance data heating mode				
W20/W55				
Heating output	3.06 to 8.7	5.9 to 19.8	7.8 to 25.1	kW
Power consumption	0.66 to 2.2	1.5 to 5.2	1.9 to 5.9	kW
COP at rated power	4.91	4.53	4.75	
Compressor				
design	Fully hermetic, roll piston, inverter		Fully hermetic, scroll, inverter	
Blocking current LRA	32	40	45	A
Oil quantity	0.63	2	2	litres
Evaporator				
Design	Copper-brazed plate heat exchanger			
Material	Stainless steel/copper			
Brine flow rate	0.4 to 1	0.8 to 2	1 to 4	m ³ /h
Pressure loss	0.2	0.3	0.3	bar
Temperature difference	3	5	5	K
Connection dimension	1 1/2", AG			
Capacitor				
Design	Copper-brazed plate heat exchanger			
Material	Stainless steel/copper			
Water flow rate	0.8 to 2.2	1.2 to 2.5	1.6 to 4.8	m ³ /h
Pressure loss	0.2	0.3	0.3	bar
Temperature difference	5 to 10			K
Connection dimension	1 1/2", AG			
Refrigeration circuit				
Working medium	R134 A			
Filling quantity	1.4	1.9	2.2	kg
Max. operating pressure	26			cash
Electrical				
Mains connection	230 V/1~/50 Hz		400 V/3~/50 Hz	
Fuse	25	20	25	A
Max. operating current compressor	15	15.8	19	A
Device data				
Sound pressure level Inner section at a distance of 1 m	40			dB(A)
Inner section dimensions	777 x 1800 x 512			W x H x D (mm)
Weight	210	230	250	kg
Max. operating pressure water	10			bar
Max. VL temperature	72			°C

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.5 WP MAX-LOQ



Water/water



Brine/water



Source:
-5 °C to 15 °C



Flow:
35 °C to 72 °C

The WP Max-LoQ heat pump stands for maximum efficiency in an extremely compact design and is designed as a water/water or brine/water heat pump.

It is suitable for source temperatures below 15 °C and can reach **flow temperatures of up to 72 °C**. The areas of application for this heat pump range from sustainable heating and energy networks to photovoltaic-controlled electricity use for charging large heat storage tanks to use as a conventional water/water or brine/water heat pump.

Thanks to its speed control, it covers a wide range of outputs and is therefore ideally suited for the use of fluctuating amounts of energy from photovoltaics, for example.



ADVANTAGES

- Maximum flexibility thanks to speed-controlled inverter operation
- Flow temperatures up to 72 °C possible
- Integrated energy management
Smart grid-compatible
- Easy installation thanks to complete pre-assembly at the factory
- No refrigeration licence required

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.5 WP MAX-LOQ

WP Max-LoQ	F06	F14	F21	
Performance data heating mode				
W10/W55				
Heating output	2.5 to 7.2	4.9 to 16.4	6.5 to 20.8	kW
Power consumption	0.66 to 2.2	1.5 to 5.2	1.9 to 5.9	kW
COP at rated power	3.77	3.33	3.33	
Compressor				
design	Fully hermetic, roll piston, inverter		Fully hermetic, scroll, inverter	
Blocking current LRA	32	40	45	A
Oil quantity	0.63	2	2	litres
Evaporator				
Design	Copper-brazed plate heat exchanger			
Material	Stainless steel/copper			
Brine flow rate	0.4 to 1	0.8 to 2	1 to 4	m ³ /h
Pressure loss	0.2	0.3	0.3	bar
Temperature difference	3	5	5	K
Connection dimension	1 1/2", AG			
Capacitor				
Design	Copper-brazed plate heat exchanger			
Material	Stainless steel/copper			
Water flow rate	0.8 to 2.2	1.2 to 2.5	1.6 to 4.8	m ³ /h
Pressure loss	0.2	0.3	0.3	bar
Temperature difference	5 to 10			K
Connection dimension	1 1/2", AG			
Refrigeration circuit				
Working medium	R134 A			
Filling quantity	1.4	1.9	2.2	kg
Max. operating pressure	26			bar
Electrical				
Mains connection	230 V/1~/50 Hz		400 V/3~/50 Hz	
Fuse	25	20	25	A
Max. operating current compressor	15	15.8	19	A
Device data				
Sound pressure level Inner section at a distance of 1 m	40			dB(A)
Inner section dimensions	777 x 1800 x 512			W x H x D (mm)
Weight	210	230	250	kg
Max. operating pressure water	10			bar
Max. VL temperature	72			°C

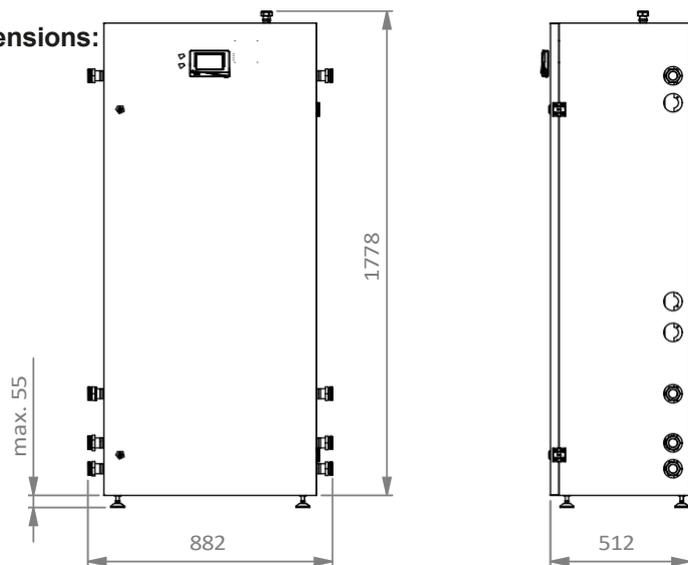
1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.4 WP MAX-HIQ + 1.5 WP MAX-LOQ

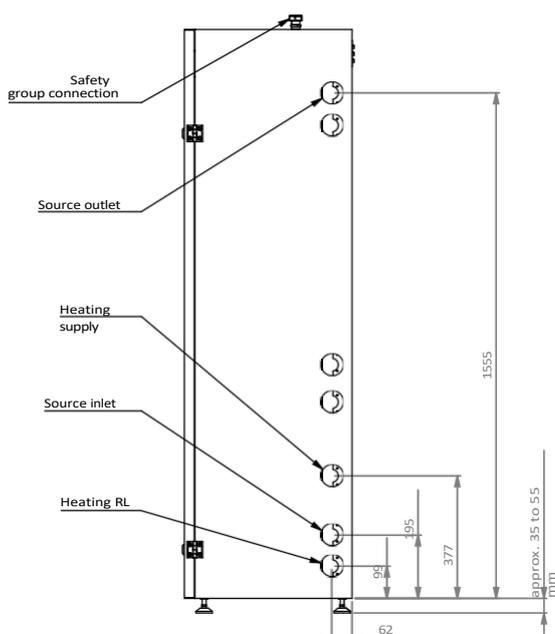
Installation conditions:

- A floor drain must be provided to protect against water damage.
- The ratiotherm WP Max-HiQ/LoQ heat pump must be installed in a clean, ventilated and dry location. The ambient temperature must be permanently $>10\text{ }^{\circ}\text{C}$ and $<35\text{ }^{\circ}\text{C}$.
- The minimum distances must be observed for maintenance reasons.
- Depending on the installation location, a sound-insulated base is recommended.

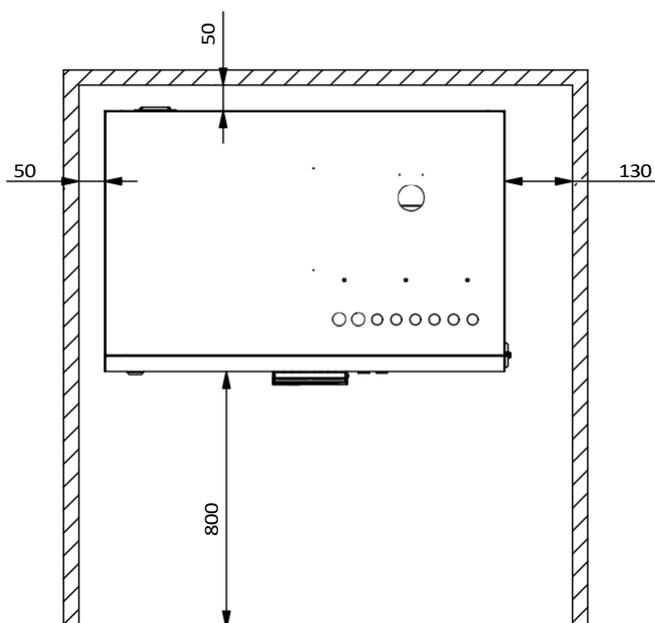
Dimensions:



Connection instructions:



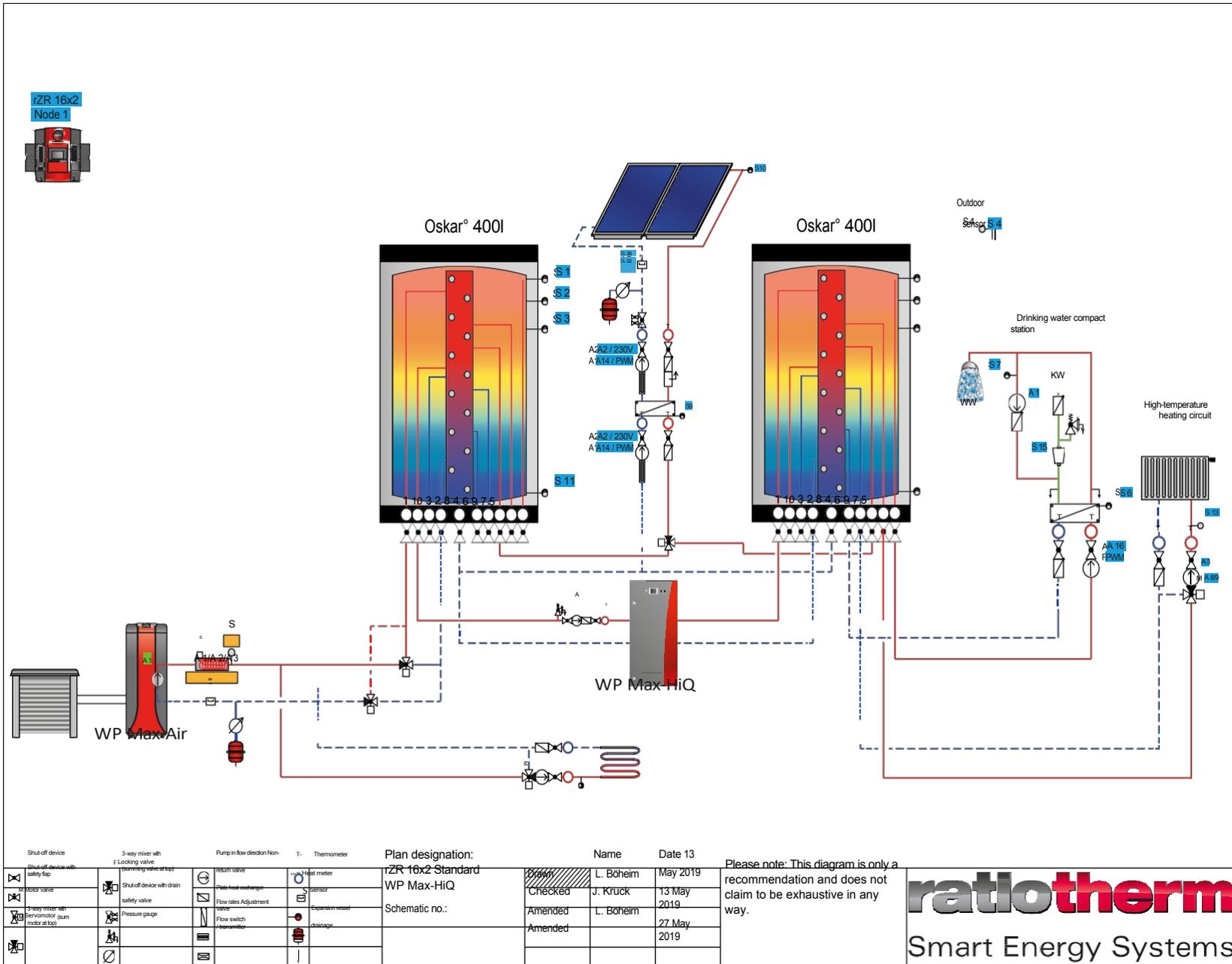
Distance measurements:



1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.4 WP MAX-HiQ + 1.5 WP MAX-LOQ

Possible combination of the WP Max-Air air source heat pump and the Max-HiQ high-temperature heat pump for existing buildings.



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ATTENTION! Installation and wiring must only be carried out by authorised specialist personnel.

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.6 WP MAX-HIQ KK



Water/water



Brine/water



Source:
10 °C to 55 °C



Flow:
35 °C to 72 °C

The WP Max-HiQ KK cascade heat pump has a design that is unique on the market. It consists of a base platform and two or three independent heat pumps in a modular design. Thanks to a wide range of power module combinations, the output of the cascade heat pump can be tailored perfectly to requirements (even retrospectively). In addition, power modules can be quickly added, exchanged or replaced in the event of damage. This dramatically increases operational reliability and output flexibility. Another advantage of the cascade design is the possibility of achieving very high outputs without falling under the obligation to perform leak tests. Each performance module consists of a complete refrigeration circuit, a condenser pump and an independent control system. The cascade heat pump is suitable for use as a brine/water or water/water heat pump.

A technology patented by ratiotherm enables the use of source temperatures in the range of 10 and 55 °C.

The environmentally friendly refrigerant R513A enables **flow temperatures of 72 °C**.



ADVANTAGES

- Use of highly fluctuating sources
- Intelligent cascade control with load and fault management (stepless power switching, operating hour compensation, etc.)
- Integrated energy management (smart grid-compatible) and power-to-heat applications possible
- Flow temperatures up to 72 °C possible
- Electrical connections to the base platform with plug-in connections for easy installation
- Optional: active cooling possible through circulation reversal

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.6 WP MAX-HIQ KK

Max-HiQ KK	F21	15	25	35	
Performance data heating mode					
W20/W55					
Heating output	7.8 to 25.1	19.14	30.8	32.5	kW
Power consumption	1.9 to 5.9	4.2	7.1	7.7	kW
COP at rated power	4.75	4.6	4.33	4.24	
Compressor					
Design	Fully hermetic, scroll, inverter		Fully hermetic, scroll, fixed speed		
Starting current	–	25	35	45	A
Blocking current LRA	–	66	96	96	A
Oil quantity	2	1.7	2.6	2.8	litres
Evaporator					
Design	Copper-brazed plate heat exchanger				
Material	Stainless steel/copper				
Max. brine flow rate	5.3	5.3	8.5	10.1	m ³ /h
Pressure loss	0.03	0.03	0.08	0.1	bar
Temperature difference	5	5	4	4	K
Connection dimension	2", AG				
Capacitor					
Design	Copper-brazed plate heat exchanger				
Material	Stainless steel/copper				
Max. water flow rate	5.4	5.0	5.1	6.1	m ³ /h
Pressure loss	0.2	0.2	0.04	0.06	bar
Temperature difference	6	6	8	8	K
Connection dimensions	2", AG				
Refrigeration circuit					
Working medium	R513A				
Filling quantity	2.5	2.2	2.8	3	kg
Max. operating pressure	26				
Electrical					
Mains connection	400 V/3~/50 Hz				
Fuse protection	35	25 (slow)	32 (slow)	40 (slow)	A
Max. operating current compressor	19	10.5	15.9	25.5	A
Device data					
Sound pressure level Interior at a distance of 1 m	50				dB(A)
Module dimensions	650 x 1760 x 450				W x H x D (mm)
Module weight	205 (155)	203 (153)	213 (163)	223 (173)	kg
Max. operating pressure water	3				
Max. VL temperature	72				

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.7 WP MAX-LOQ KK



Water/water



Brine/water



Source:
–5 °C to 15 °C



Flow:
35 °C to 72 °C

The WP Max-LoQ KK cascade heat pump has a design that is unique on the market. It consists of a base platform and two or three independent heat pumps in a modular design. Thanks to a wide range of power module combinations, the output of the cascade heat pump can be tailored perfectly to requirements (even retrospectively). In addition, power modules can be quickly added, exchanged or replaced in the event of damage. This dramatically increases operational reliability and output flexibility. Another advantage of the cascade design is the possibility of achieving very high outputs without falling under the obligation to perform leak tests. Each performance module consists of a complete refrigeration circuit, a condenser pump and an independent control system. The cascade heat pump is suitable for use as a brine/water or water/water heat pump.

The heat pump allows source temperatures in the range of –5 and 15 °C to be used. The environmentally friendly refrigerant R513A allows **flow temperatures of 72 °C**.



ADVANTAGES

- Intelligent cascade control with load and fault management (stepless power switching, operating hour compensation, etc.)
- Integrated energy management (smart grid-compatible) and power-to-heat applications possible
- Flow temperatures up to 72 °C possible
- Electrical connections to the base platform with plug-in connections for easy installation
- Optional: active cooling possible through circuit reversal

1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.7 WP MAX-LOQ KK

Max-LoQ KK	F21	15	25	35	
Performance data heating mode					
W10/W35					
Heating output	6.5 to 21.8	16.2	27.8	29.6	kW
Power consumption	1.9 to 5.9	2.8	4.8	5.4	kW
COP at rated output	5.25	5.78	5.79	5.5	
S0/W35					
Heating capacity	4.55 to 15.3	11	18.7	23	kW
Power consumption	2.0 to 6.0	2.8	4.7	5.2	kW
COP at rated power	4.10	3.98	3.99	4.41	
Compressor					
Design	Fully hermetic, scroll, inverter		Fully hermetic, scroll, fixed speed		
Starting current	–	25	35	45	A
Blocking current LRA	–	66	96	96	A
Oil quantity	2	1.7	2.6	2.8	litres
Evaporator					
Design	Copper-brazed plate heat exchanger				
Material	Stainless steel/copper				
Max. brine flow rate	5.3	4	6.7	7.8	m ³ /h
Pressure loss	0.03	0.03	0.08	0.1	bar
Temperature difference	3	3	3	3	K
Connection dimensions	2", AG				
Capacitor					
Design	Copper-brazed plate heat exchanger				
Material	Stainless steel/copper				
Max. water flow rate	2.4	1.8	3.1	3.5	m ³ /h
Pressure loss	0.2	0.2	0.04	0.06	bar
Temperature difference	8	8	8	8	K
Connection dimensions	2", AG				
Refrigeration circuit					
Working fluids	R134A		R513A		
Filling quantity	3.4	4	4.2	4.4	kg
Max. operating pressure	26				
Electrical					
Mains connection	400 V/3~/50 Hz				
Fuse protection	35	20 (slow)	25 (slow)	32 (slow)	A
Max. operating current compressor	12	10.5	15.9	20	A
Device data					
Sound pressure level Interior at a distance of 1 m	50				dB(A)
Module dimensions	650 x 1760 x 450				W x H x D (mm)
Module weight	205 (155)	203 (153)	231 (163)	223 (173)	kg
Max. operating pressure water	3				
Max. VL temperature	72				

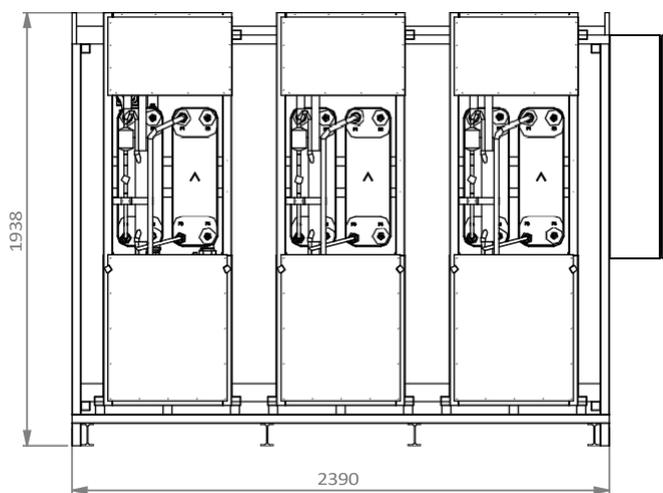
1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.6 WP MAX-HIQ KK + 1.7 WP MAX-LOQ KK

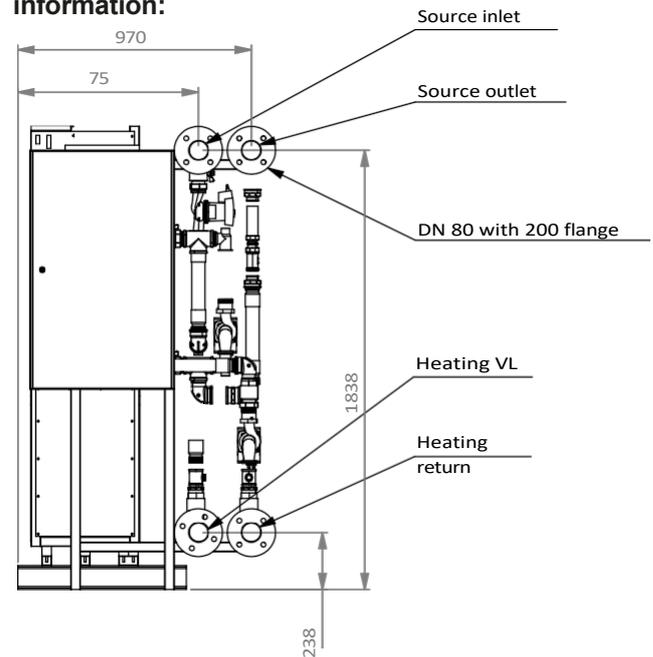
Installation conditions:

- A floor drain must be provided to protect against water damage.
- The ratiotherm WP Max-HiQ/LoQ KK heat pump must be installed in a clean, ventilated and dry location. The ambient temperature must be permanently $>10\text{ }^{\circ}\text{C}$ and $<35\text{ }^{\circ}\text{C}$.
- The minimum distances must be observed for maintenance reasons.
- Depending on the installation location, a sound-insulated base is recommended.

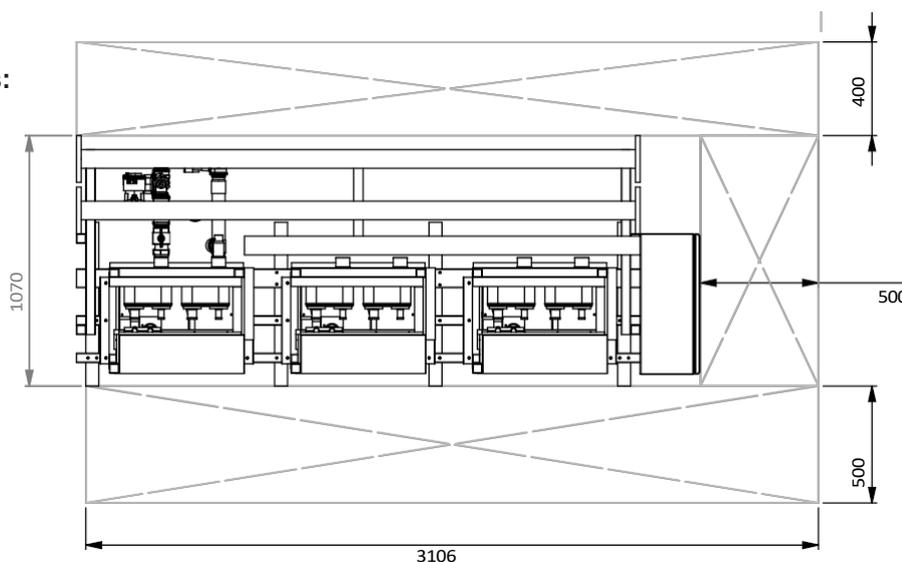
Dimensions:



Connection information:

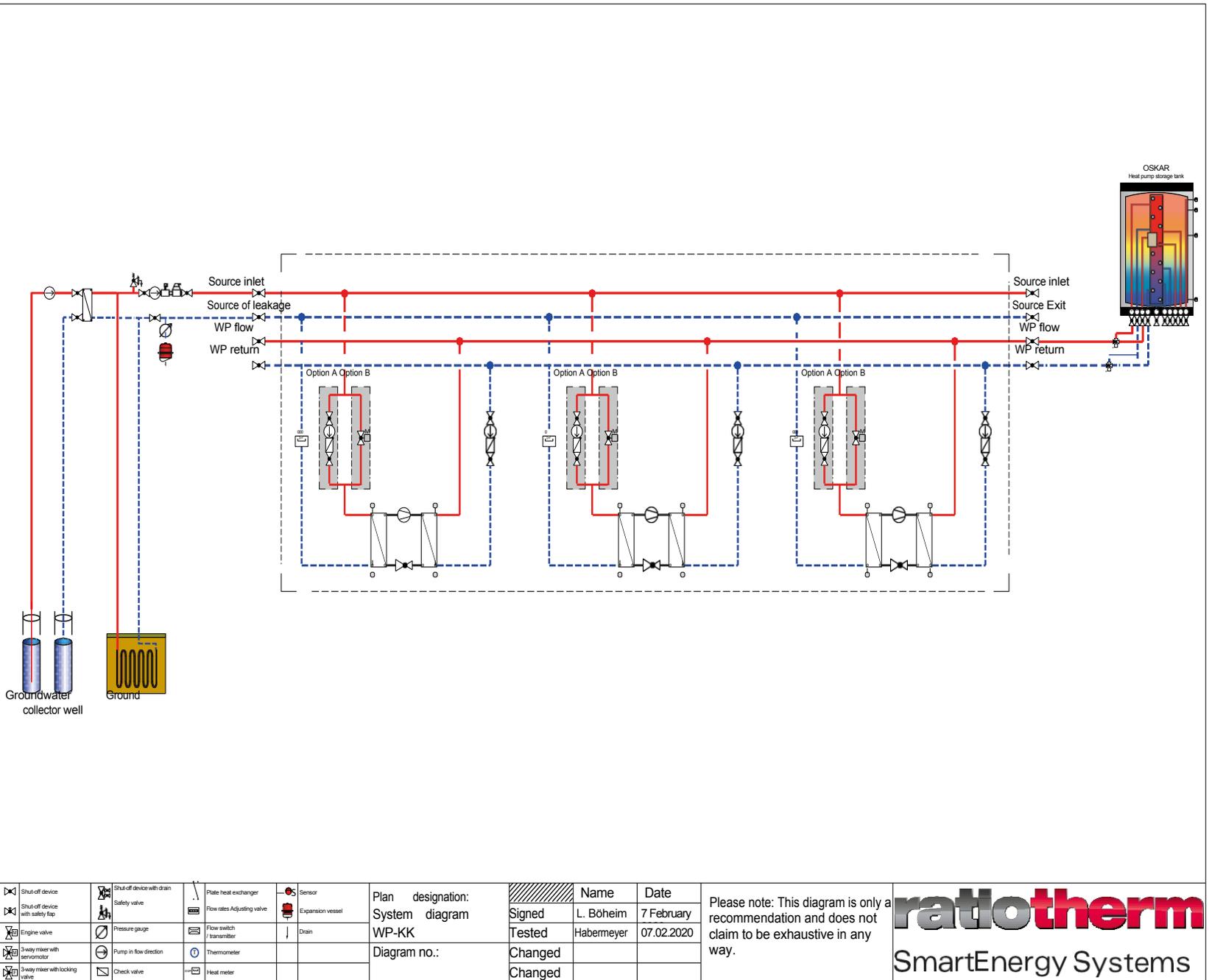


Distance measurements:



1. HEAT PUMPS AS INDIVIDUAL SYSTEMS

1.6 WP MAX-HIQ KK + 1.7 WP MAX-LOQ KK



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2. DISTRICT HEATING TECHNOLOGY

INNOVATIVE HEAT PUMP TECHNOLOGY ENABLES INNOVATIVE LOCAL HEATING CONCEPTS

ratiotherm specialises in the development of products for the utilisation of cold or variable temperature heating networks in the field of heat pumps. The term "cold local heating" refers to local or district heating networks that operate at a temperature level of less than 30 °C. These networks have been increasingly used in recent times as they combine a number of advantages and, under certain conditions, can greatly reduce the energy and emissions footprint of modern residential areas. In principle, all alternative network types ("cold local heating") belong to the energy networks and are differentiated according to the temperature levels of the supply and return flows. The frequently used term "intelligent local heating" is more of a collective term that describes the fact that a network no longer has to be operated at a high temperature level due to the lower heating loads of buildings. The temperature level required for heating and hot water supply in buildings is usually provided by decentralised heat pumps in the buildings. These use environmental heat at low temperatures, with renewable energies or surplus electricity increasingly being used for operation.

Technically, these networks are equipped with specially developed and patented heat pumps. These operate on the basis of a groundwater or brine heat pump, which also includes a conventional local heat transfer station. This transfer station enables the use of temperature levels from conventional district heating (60 to 95 °C). Depending on the configuration of the system, there are various options for connecting the transfer station and heat pump – this configuration can be adapted to specific projects according to customer requirements. This technology also enables alternative strategies in network operation, for example, a variable flow temperature (depending on the outside temperature) or cold summer operation combined with warm winter operation. ratiotherm will be happy to advise you on this topic.

BASIC ADVANTAGES OF COLD LOCAL HEAT

- Significant reduction in network losses
- Utilisation of low-temperature environmental heat for heating purposes
- Contribution to the heat transition through renewable energies in the form of electricity
- Direct use of solar energy with appropriate grid configuration



2. DISTRICT HEATING TECHNOLOGY

2.1 DISTRICT HEATING TRANSFER STATION (CLASSIC)

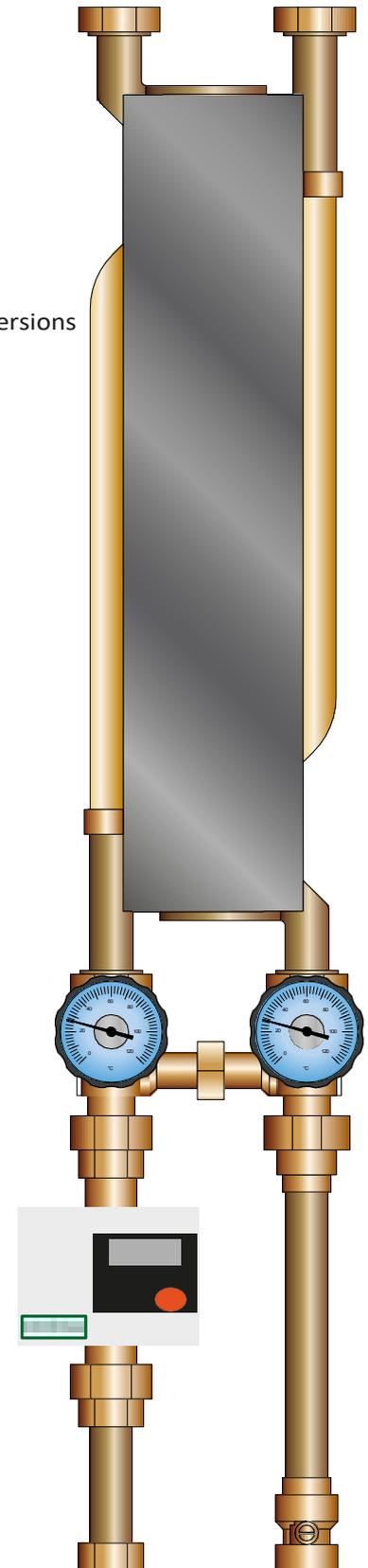
The ratiotherm district heating transfer station serves as the ideal link between a local or district heating system and your domestic heating system. Heat is transferred indirectly. The heating water in the domestic heating system is separated from the heating network by a heat exchanger. The transfer station can be operated with a storage tank charging system or a flow-through system and is suitable for hot networks.

The transfer station is available in three different versions as standard. Larger versions are available on request:

- Heat network transfer station WNÜ-10 kW (75°/60°)
- Heat network transfer station WNÜ-25 kW (75°/60°)
- Heat network transfer station WNÜ-35 kW (75°/60°)

ADVANTAGES

- Space-saving
- Robust technology
- Prepared for integration into controller networks
- Insulation for minimal radiation losses
- High-quality components for long service life



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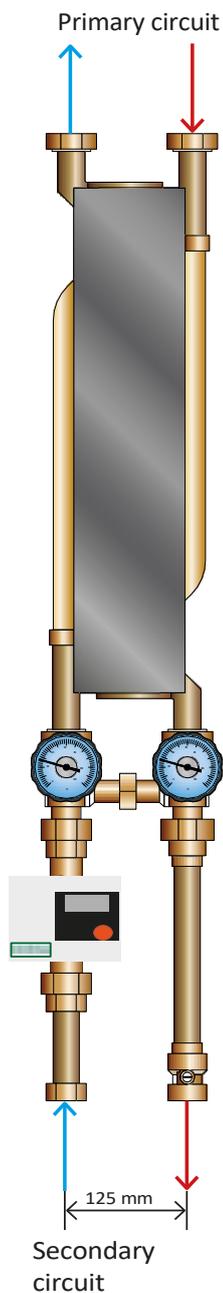
2. DISTRICT HEATING

TECHNOLOGY

2.1 DISTRICT HEATING TRANSFER STATION (CLASSIC)

Technical data:

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 outlet	65	65	65	°C
Secondary volume flow	7	15	25	L/min



Design:

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

The transfer station consists of:

• Primary side:

2 x R 1 1/2" flat-sealing screw connection, with R 1/2" IG plug Heat transfer via CU-soldered stainless steel heat exchanger with insulation and special pipe connection system, including heat capsule made of EEP (expanded polypropylene)

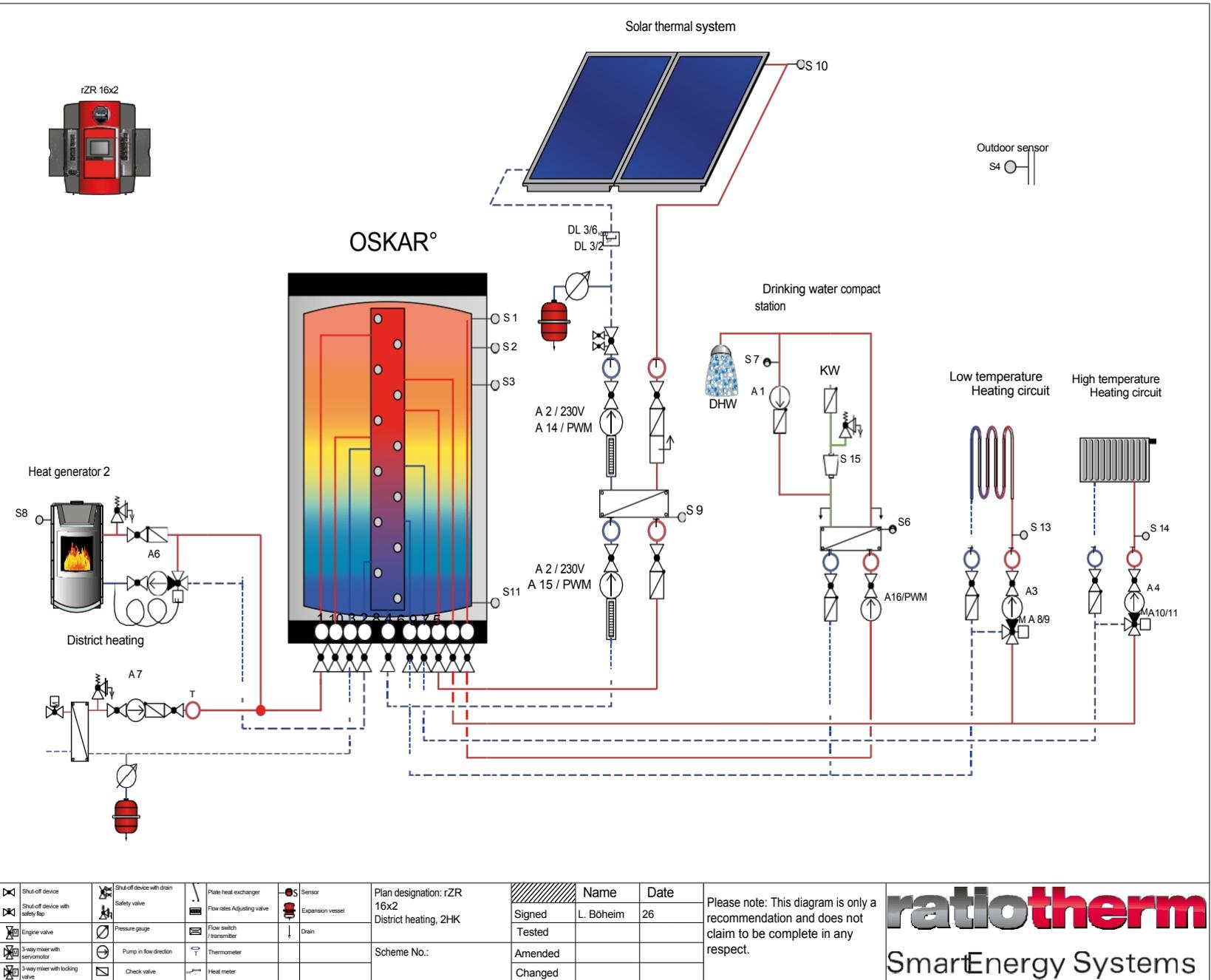
• Secondary side:

unregulated heating circuit with Wilo Yonos Para ST25/7.0-PWM2 BL 180 mm with insulation capsule, gravity brake with manual adjustment, ball valves, flow and return thermometers, flow control valve 3–12 L/min, wall bracket

• Optional:

Heat meter retrofit kit, ultrasonic heat meter, heating network primary circuit

2.1 DISTRICT HEATING TRANSFER STATION (CLASSIC)



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2. DISTRICT HEATING TECHNOLOGY

2.2 WP GRID-HIQ



Water/water



Brine/water



Source:
10 °C to 55 °C



Flow:
35 °C to 72 °C

The WP Grid-HiQ high-temperature heat pump is suitable for use in district heating networks with varying temperatures in the range from 10 to 55 °C. This flexibility is achieved through a **patented process** that enables the system to always reach the optimum operating point despite changing source temperatures.

The maximum flow temperature is 72 °C.

Thanks to speed control, it covers a wide range of outputs and enables perfect load management. Supplemented by the **optional integrated district heating transfer**, it enables a variety of network strategies.

The Grid-HiQ is expanded by numerous options, making it a complete district heating technology package.



ADVANTAGES

- Maximum flexibility thanks to speed-controlled inverter operation
- Passive and active cooling possible
- Integrated direct district heating transfer
- Integrated energy management (smart grid-compatible)
- Numerous network strategies possible
- Easy installation thanks to complete pre-assembly at the factory
- No refrigeration licence required

2. DISTRICT HEATING TECHNOLOGY 2.2 WP GRID-HIQ

WP Grid-HiQ	F06	F14	F21	
Performance data heating mode				
W20/W55				
Heating output	3.06 to 8.7	5.9 to 19.8	7.8 to 25.1	kW
Power consumption	0.66 to 2.2	1.5 to 5.2	1.9 to 5.9	kW
COP at rated power	4.91	4.53	4.75	
Compressor				
Design	fully hermetic, rotary piston Inverter		Fully hermetic, scroll, inverter	
Blocking current LRA	32	40	45	A
Oil quantity	0.63	2	2	litres
Evaporator				
Design	Copper-brazed plate heat exchanger			
Material	Stainless steel/copper			
Volume flow brine	0.4 to 1	0.8 to 2	1 to 4	m ³ /h
Pressure loss	0.2	0.3	0.3	bar
Temperature difference	3	5	5	K
Connection dimension	1 1/2", AG			
Capacitor				
Design	Copper-brazed plate heat exchanger			
Material	Stainless steel/copper			
Water flow rate	0.8 to 2.2	1.2 to 2.5	1.6 to 4.8	m ³ /h
Pressure loss	0.2	0.3	0.3	bar
Temperature difference	5 to 10			K
Connection dimension	1 1/2", AG			
Refrigeration circuit				
Working medium	R134 A			
Filling quantity	1.4	1.9	2.2	kg
Max. operating pressure	26			bar
Electrical				
Mains connection	230 V/1~/50 Hz		400 V/3~/50 Hz	
Fuse protection	25	20	25	A
Max. operating current compressor	15	15.8	19	A
Device data				
Sound pressure level Interior at a distance of 1 m	40			dB(A)
Dimensions of interior	777 x 1800 x 512			W x H x D (mm)
Weight	210	230	250	kg
Max. operating pressure water	10			bar
Max. VL temperature	72			°C

2. DISTRICT HEATING TECHNOLOGY

2.3 WP GRID-LOQ



Water/water



Brine/water



Source:
– 5 °C to 15 °C



Flow:
35 °C to 72 °C

The WP Grid-LoQ is suitable for use in district heating networks with source temperatures below 15 °C. These are usually purely cold-operated heating networks. The source is a brine circuit with geothermal probes, etc., or groundwater, which is distributed and used directly via the network.

The maximum flow temperature is 72 °C.

Thanks to its speed control, it covers a wide range of outputs and enables perfect load management. Supplemented by the **optional integrated district heating transfer**, it enables a variety of network strategies.

The Grid-LoQ is expanded by numerous options, making it a complete district heating technology package.



ADVANTAGES

- Maximum flexibility thanks to speed-controlled inverter operation
- Passive and active cooling possible
- Integrated district heating exchanger
- Integrated energy management (smart grid-compatible)
- Numerous network strategies possible
- Complete home installation in one device
- Easy installation thanks to complete pre-assembly at the factory
- No cold weather certificate required

2. DISTRICT HEATING TECHNOLOGY 2.3 WP GRID-LOQ

Grid-LoQ	F06	F14	F21	
Performance data heating mode				
W10/W55				
Heating output	2.5 to 7.2	4.9 to 16.4	6.5 to 20.8	kW
Power consumption	0.66 to 2.2	1.5 to 5.2	1.9 to 5.9	kW
COP at rated power	3.77	3.33	3.33	
Compressor				
Design	fully hermetic, rotary piston Inverter		Fully hermetic, scroll, inverter	
Blocking current LRA	32	40	45	A
Oil quantity	0.63	2	2	litres
Evaporator				
Design	Copper-brazed plate heat exchanger			
Material	Stainless steel/copper			
Brine flow rate	0.4 to 1	0.8 to 2	1 to 4	m ³ /h
Pressure loss	0.2	0.3	0.3	bar
Temperature difference	3	5	5	K
Connection dimension	1 1/2", AG			
Capacitor				
Design	Copper-brazed plate heat exchanger			
Material	Stainless steel/copper			
Water flow rate	0.8 to 2.2	1.2 to 2.5	1.6 to 4.8	m ³ /h
Pressure loss	0.2	0.3	0.3	bar
Temperature difference	5 to 10			K
Connection dimension	1 1/2", AG			
Refrigeration circuit				
Working medium	R134 A			
Filling quantity	1.4	1.9	2.2	kg
Max. operating pressure	26			bar
Electrical				
Mains connection	230 V/1~/50 Hz		400 V/3~/50 Hz	
Fuse protection	25	20	25	A
Max. operating current compressor	15	15.8	19	A
Device data				
Sound pressure level Interior at a distance of 1 m	40			dB(A)
Dimensions of interior	777 x 1800 x 512			W x H x D (mm)
Weight	210	230	250	kg
Max. operating pressure water	10			bar
Max. VL temperature	72			°C

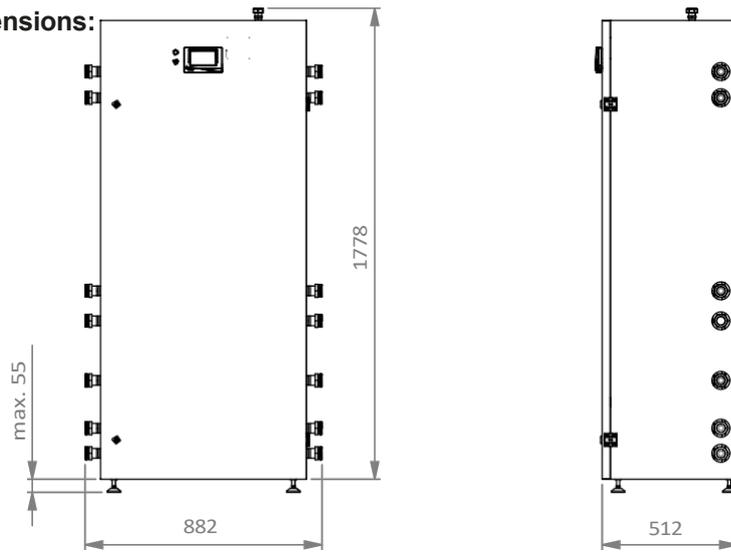
2. DISTRICT HEATING TECHNOLOGY

2.2 WP GRID HIQ + 2.3 WP GRID LOQ

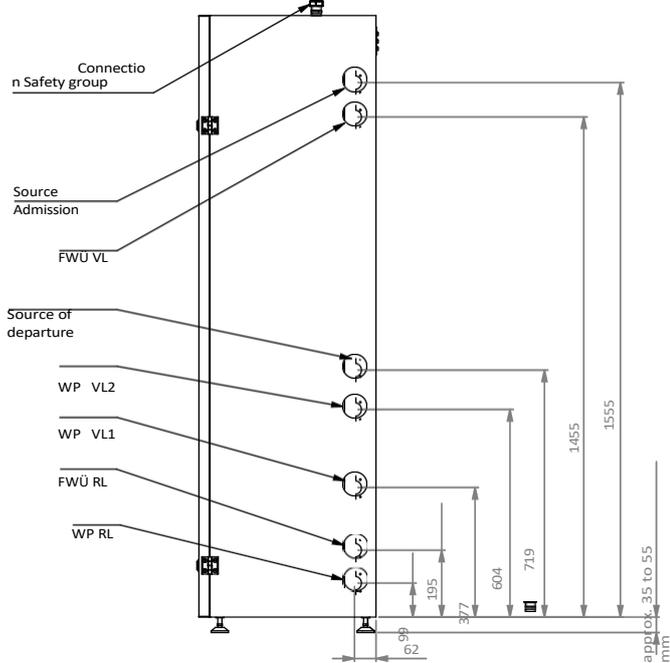
Installation conditions:

- A floor drain must be provided to protect against water damage.
- The ratiotherm heat pump must be installed in a clean, ventilated and dry location.
- The ambient temperature must be between 10 °C and 35 °C at all times.
- The minimum distances must be observed for maintenance reasons.
- Depending on the installation location, a sound-insulated base is recommended.

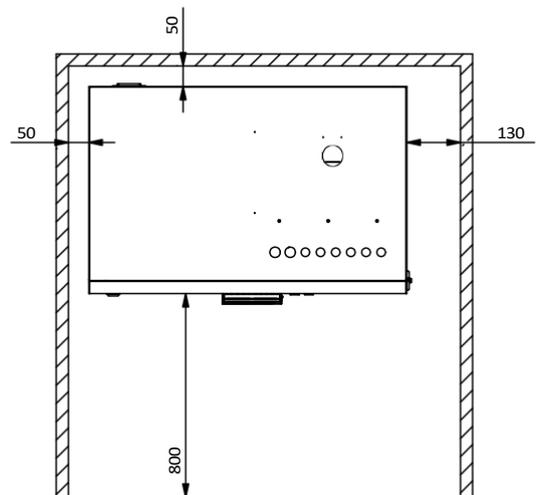
Dimensions:

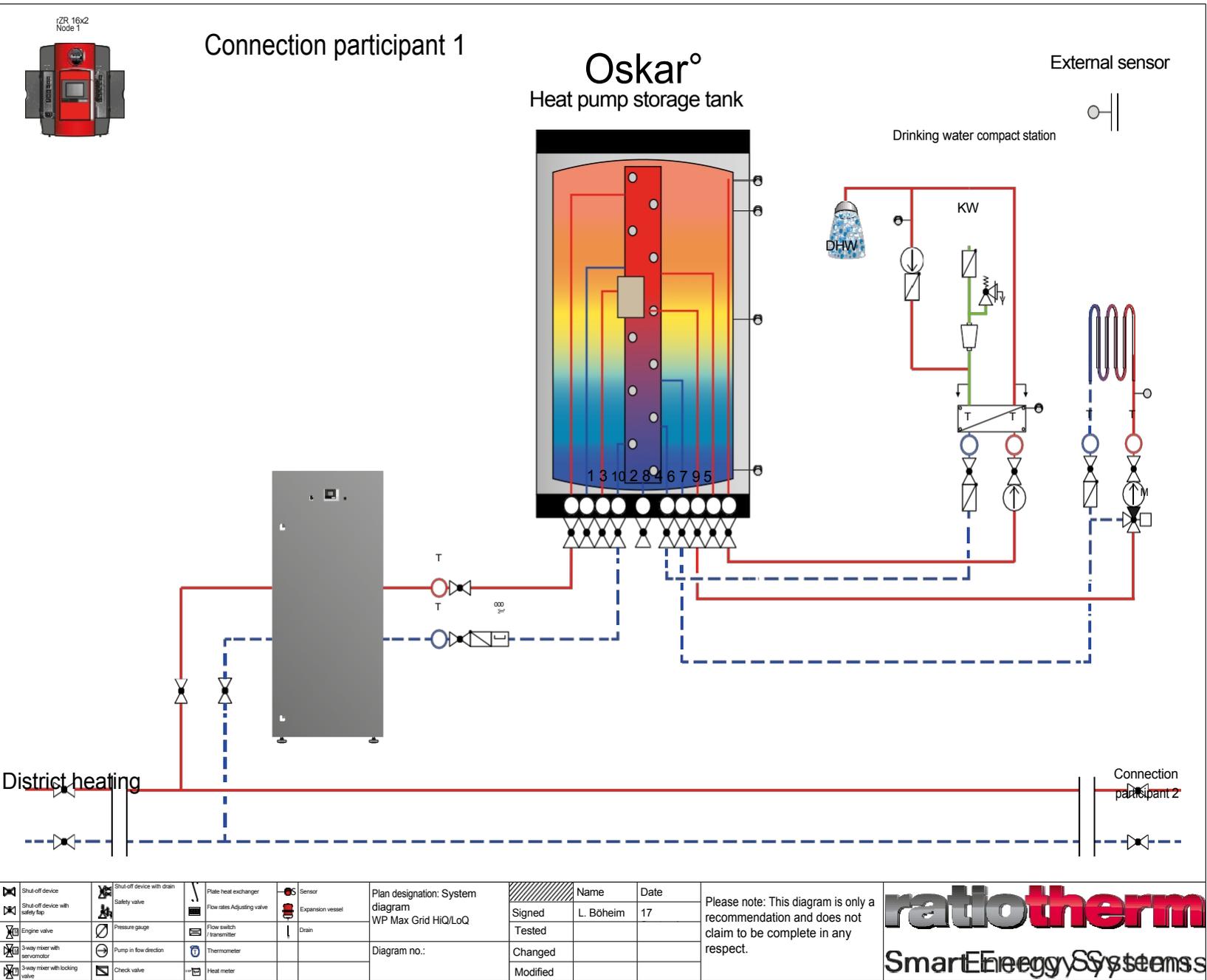


Connection information:



Distance measurements:





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ATTENTION! Installation and wiring may only be carried out by authorised specialist personnel.

2. DISTRICT HEATING TECHNOLOGY

2.4 WP GRID-HIQ C



Water/water



Brine/water



Source:
10 °C to 55 °C



Flow:
35 °C to 72 °C

The WP Grid-HiQ CF06 high-temperature heat pump is suitable for use in district heating networks with varying temperatures in the range of 10 to 55 °C.

This flexibility is achieved by a **patented process** that enables the system to always reach the optimum operating point despite changing source temperatures.

The maximum flow temperature is 72 °C.

The Grid-HiQ CF06 comprises an integrated 200 or 400 litre buffer tank including expansion vessel and heating circuit, as well as a fresh water station and domestic controller.

This means that the entire boiler room fits into one unit, enabling quick and easy installation. Supplemented by the optional integrated district heating transfer, it enables a wide range of network strategies.

The Grid-HiQ is expanded by numerous options, making it a complete district heating technology package.



ADVANTAGES

- Maximum flexibility thanks to speed-controlled inverter operation
- Passive and active cooling possible
- Integrated district heating direct transfer
- Integrated energy management
Smart grid-compatible
- Numerous grid strategies possible
- Easy installation thanks to complete pre-assembly at the factory
- No refrigeration licence required
- Can be dismantled for easy transport

2. DISTRICT HEATING TECHNOLOGY

2.4 WP GRID-HIQ C

WP Grid-HiQ C		F06
Performance data for heating mode		
W20/W55		
Heating output	3.06 to 8.7	kW
Power consumption	0.66 to 2.2	kW
COP at rated power	4.91	
Compressor		
Design	Fully hermetic, rotary piston, inverter	
Blocking current LRA	32	A
Oil quantity	0.63	litres
Evaporator		
Design	Copper-brazed plate heat exchanger	
Material	Stainless steel/copper	
Brine flow rate	0.4 to 1	m ³ /h
Pressure loss	0.2	bar
Temperature difference	3	K
Connection dimension	1", AG	
Condenser		
Design	Copper-brazed plate heat exchanger	
Material	Stainless steel/copper	
Water flow rate	0.8 to 2.2	m ³ /h
Pressure loss	0.2	bar
Temperature difference	5 to 10	K
Connection dimension	1", AG	
Refrigeration circuit		
Working medium	R134 A	
Filling capacity	1.4	kg
Max. operating pressure	26	bar
Electrical		
Mains connection	230 V/1~/50 Hz	
Fuse	25	A
Max. operating current compressor	15	A
Device data		
Sound pressure level Interior at a distance of 1 m	38	dB(A)
Dimensions of interior	930 x 1950 x 730 (1102 x 1950 x 903)	W x H x D (mm)
Weight of inner section	280 (130 + 150)	kg
Max. operating pressure water	10	bar
Max. VL temperature	72	°C

Note: For dimensions and data on the buffer and fresh water module, see p. 46.

2. DISTRICT HEATING TECHNOLOGY

2.5 WP GRID-LOQ C



Water/water



Brine/water



Source:
– 5 °C to 15 °C



Flow:
35 °C to 72 °C

The WP Grid-LoQ CF06 is suitable for use in district heating networks with source temperatures below 15 °C. These are usually purely cold-operated heating networks. The source is a brine circuit with geothermal probes, etc., or groundwater, which is distributed and used directly via the network.

The maximum flow temperature is 72 °C.

Thanks to its speed control, it covers a wide range of outputs and enables perfect load management.

Supplemented by the optional integrated district heating transfer, it enables a wide range of network strategies.

The Grid-LoQ is expanded by numerous options, making it a complete package for district heating network technology.



ADVANTAGES

- Maximum flexibility thanks to speed controlled inverter operation
- Passive and active cooling possible
- Integrated district heating direct transfer
- Integrated energy management
Smart grid-compatible
- Numerous grid strategies possible
- Easy installation thanks to complete pre-assembly at the factory
- No refrigeration licence required
- Can be dismantled for easy transport

2. DISTRICT HEATING TECHNOLOGY

2.5 WP GRID-LOQ C

WP Grid-LoQ C		F06
Performance data heating mode		
W10/W55		
Heating output	2.5 to 7.2	kW
Power consumption	0.66 to 2.2	kW
COP at rated power	3.7	
Compressor		
Design	Fully hermetic, rotary piston, inverter	
Blocking current LRA	32	A
Oil quantity	0.63	litres
Evaporator		
Design	Copper-brazed plate heat exchanger	
Material	Stainless steel/copper	
Brine flow rate	0.4 to 1	m ³ /h
Pressure loss	0.2	bar
Temperature difference	3	K
Connection dimension	1", AG	
Condenser		
Design	Copper-brazed plate heat exchanger	
Material	Stainless steel/copper	
Water flow rate	0.8 to 2.2	m ³ /h
Pressure loss	0.2	bar
Temperature difference	5 to 10	K
Connection dimension	1", AG	
Refrigeration circuit		
Working medium	R134 A	
Filling quantity	1.4	kg
Max. operating pressure	26	bar
Electrical		
Mains connection	230 V/1~ /50 Hz	
Fuse	25	A
Max. operating current compressor	15	A
Device data		
Sound pressure level Interior at a distance of 1 m	38	dB(A)
Dimensions of interior	930 x 1950 x 730 (1102 x 1950 x 903)	W x H x D (mm)
Weight of inner section	280 (130 + 150)	kg
Max. operating pressure water	10	bar
Max. VL temperature	72	°C

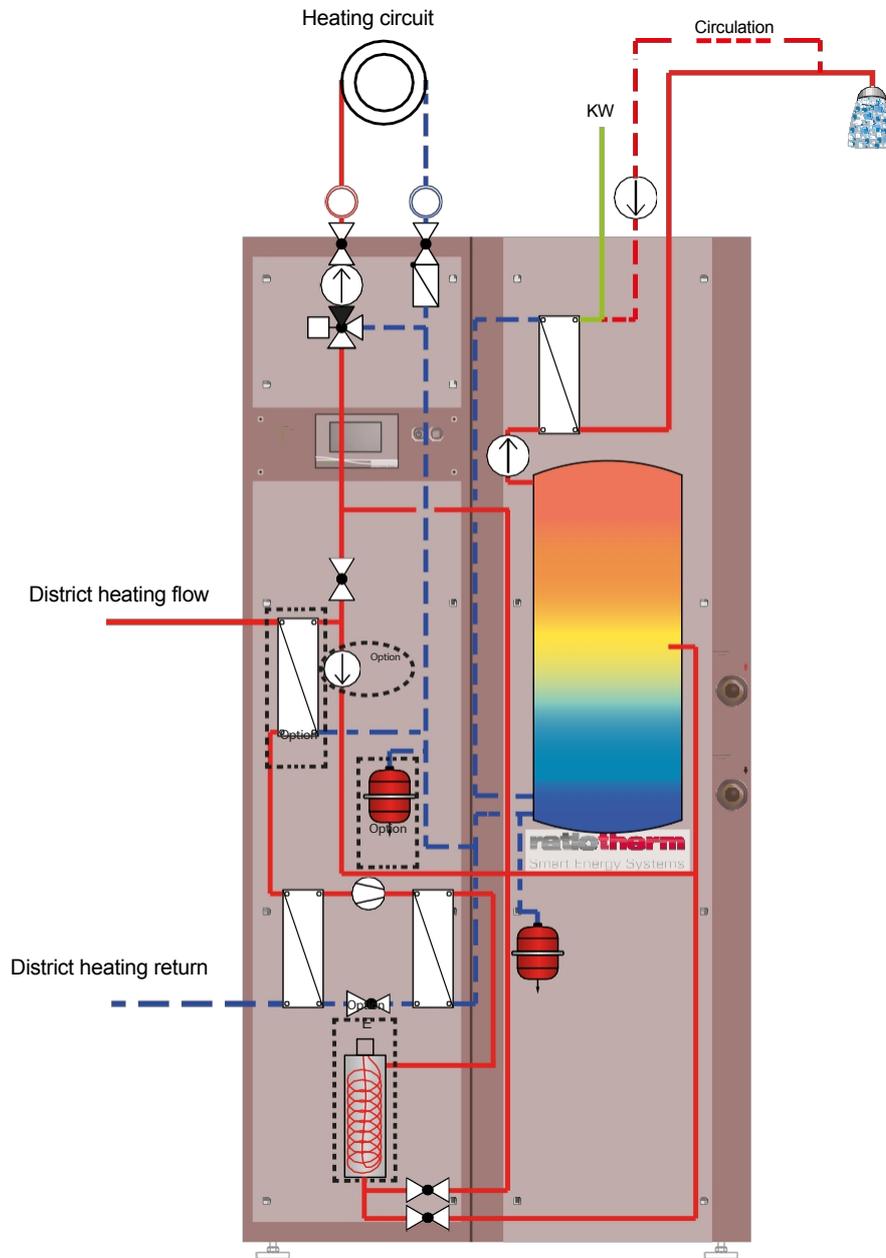
2. DISTRICT HEATING TECHNOLOGY

2.4 WP GRID-HIQ C + 2.5 WP GRID-LOQ C

WP Grid-HiQ C	F06	
Buffer storage tank		
Capacity	200 (400)	L
Max. operating pressure of buffer	3	bar
Dimensions Buffer + insulation without TWK	500 x 1950 x 500	W x H x D (mm)
Weight of buffer without TWK	approx. 100	kg
Max. operating temperature	90	°C
Fresh water station		
Max. tap volume (10 > 50 °C)	25	L/min
Pressure loss sec. at 25 L/min	80	mbar
Primary heating circuit temp.	55	°C
Temp. Hot water sec.	50	°C
Primary volume	150	L/h
Primary pressure loss	425	mbar
Max. operating pressure	10	bar
Direct transmitter		
Design	Copper-brazed plate heat exchanger	
Material	Stainless steel/copper	
Water volume flow	0.2 to 1.7	m ³ /h
Max. pressure loss	22	mbar
Temperature difference	5 to 10	K
test pressure	30	bar
Connection size	DN 20, AG	
Max. transmission power	20 kW at sec. 50 °C/prim. 55 °C	
Heating circuit		
Pump	Wilo Para 1-7	
Mixer	Three-way with 3-point drive	
Voltage pump + actuator	230 V 50 Hz	
Free pump pressure	5.5	m WS
Temperature difference	5 to 10	K
Max. operating pressure	3	bar
Connection dimension	DN 25 flange with nut	
Secondary expansion vessel	24 litres + 15 litres	

2. DISTRICT HEATING TECHNOLOGY

2.4 WP GRID-HIQ C + 2.5 WP GRID-LOQ C



Installation conditions:

- A floor drain must be provided to protect against water damage.
- The ratiotherm heat pump must be installed in a clean, ventilated and dry location.
- The ambient temperature must be between 10 °C and 35 °C at all times.
- The minimum distances must be observed for maintenance reasons.
- Depending on the installation location, a sound-insulated base is recommended.

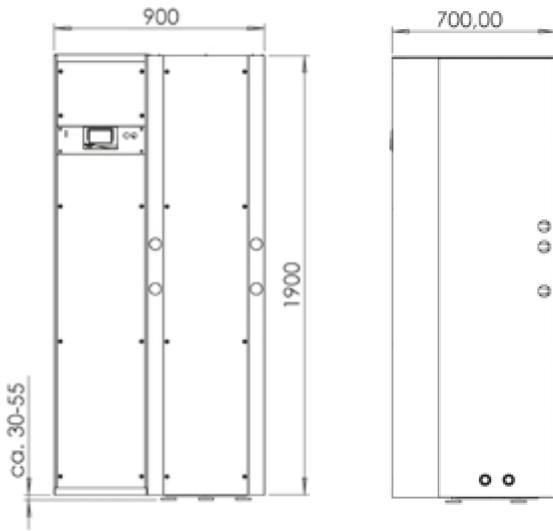
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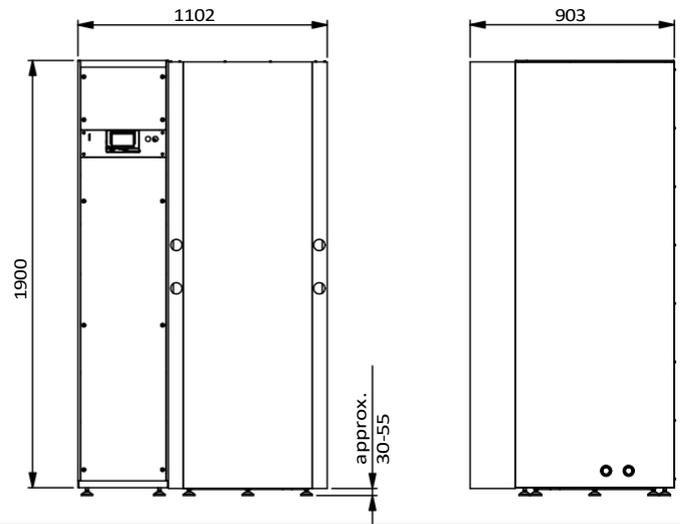
2. DISTRICT HEATING TECHNOLOGY

2.4 WP GRID-HIQ C + 2.5 WP GRID-LOQ C

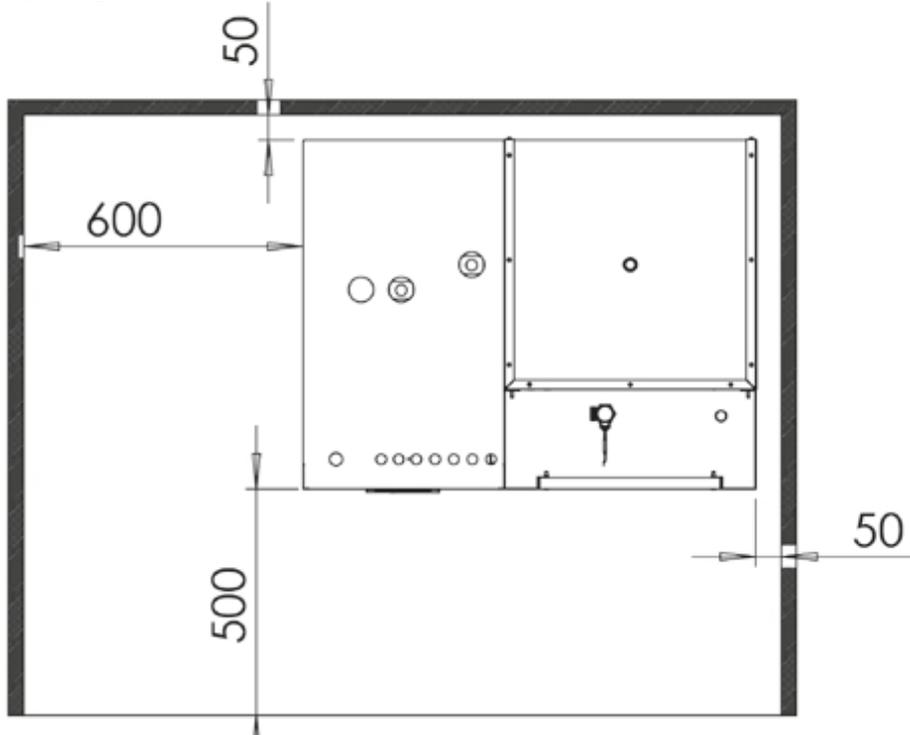
Dimensions with 200 litre buffer:



Dimensions with 400 litre buffer:

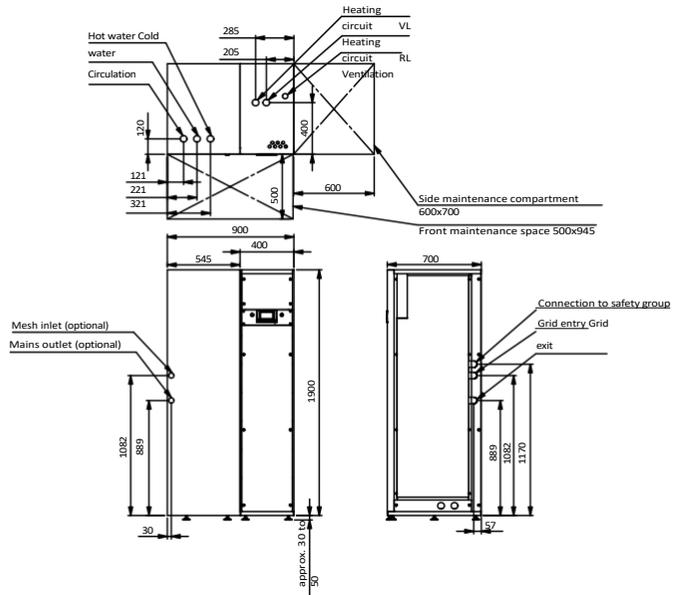


Spacing dimensions:

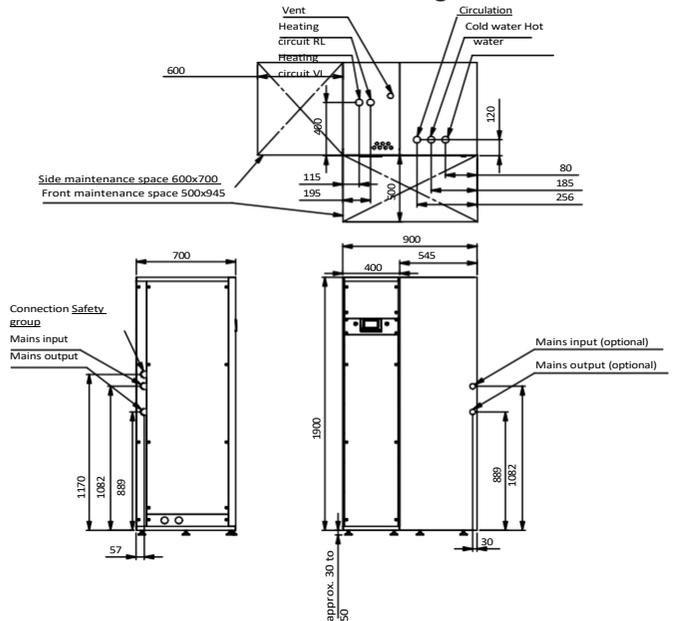


2.4 WP GRID-HIQ C + 2.5 WP GRID-LOQ C

Connection information and dimensions with 200 litre buffer tank attached on the left

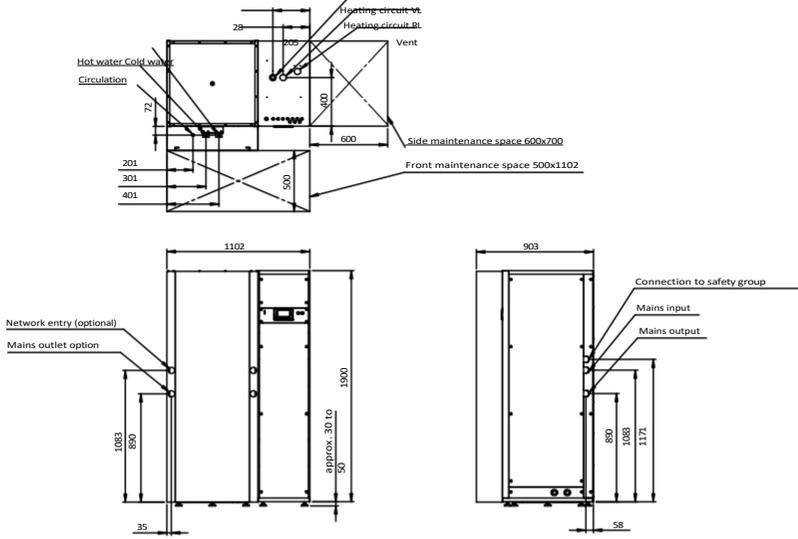


Connection instructions and dimensions with 200 litre buffer tank attached on the right



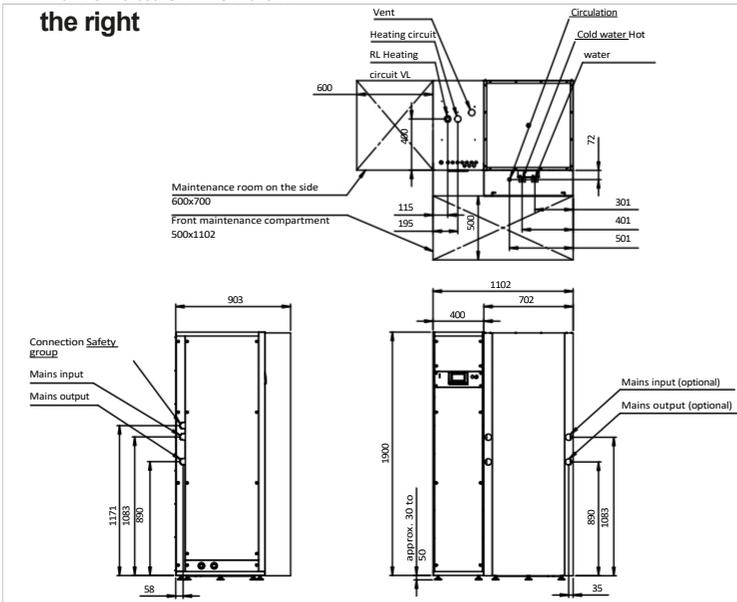
Connection instructions and dimensions with 400 litres

Buffer attachment on the left



Connection instructions and dimensions with 400 litres

Buffer attachment on the right



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3. SOLAR AND PHOTOVOLTAICS

INEXHAUSTIBLE ENERGY

Solar energy is inexhaustible. On the other hand, the amount of energy that can be generated per year and square metre is limited. This means that a given area has a limited potential output (or energy per day), which is available indefinitely and can be increased through further technical advances. Solar energy is the classic renewable energy source. It can be used as long as the sun is shining.

There are different ways of using solar energy:

- Solar collectors can be used to generate heat (solar thermal energy), which can be used, for example, for hot water production, heating systems or industrial processes (e.g. drying processes).
- Passive use of solar heat is particularly cost-effective; for example, solar radiation through the windows of buildings can cover a significant portion of the heat demand.
- If light entering through windows during the day makes it possible to largely dispense with artificial lighting, this can also be regarded as passive solar energy use.
- Solar cells (photovoltaics) can be used to convert the energy of sunlight directly into electrical energy, with an efficiency of between less than 10% and approx. 40%, depending on the technology. Photovoltaic modules are often used in decentralised applications, but also in solar power plants.
- Another possibility for the future could be the use of thermoelectric generators, which currently only work on a laboratory scale and have efficiencies of up to 4.6%, but could potentially be significantly improved.

Other indirect uses are also possible:

- Wind energy is the use of energy from wind currents driven by solar energy.
- Plants grow with the help of solar energy, and their biomass can be used to produce usable energy sources such as wood, biodiesel, bioethanol and biogas.
- In general, solar energy can be harnessed much more effectively in areas close to the equator than in regions at higher latitudes. The annual yield of solar collectors or photovoltaic systems, for example, depends heavily on climatic conditions. However, the extent of this dependence varies between different technologies. For example, solar thermal systems such as solar thermal power plants only work well in strong direct sunlight and are hardly feasible in countries such as Germany. In contrast, photovoltaic systems still deliver a good portion of their output even in diffuse light on cloudy days and generally work even better at low ambient temperatures than in hot countries.



3. SOLAR AND PHOTOVOLTAICS

3.1 SMART ENERGY (PV)

Heating support and hot water production:

The Smart Energy (PV) device was specially developed for the use of surplus electricity from natural power systems, e.g. PV systems. The associated measuring device reliably records surplus electricity and determines the available energy in real time.

This is forwarded to the continuously variable device (up to 15 kW) and thus heats the hydraulically integrated heat storage tank for later use for heating and domestic hot water. Smart Energy (PV) varies the speed of the integrated pump depending on the amount of electricity available in order to always produce water at the flow temperature set by the user – comparable to a conventional heating system. This is also the biggest advantage over conventional heating elements, as only heat at the required temperature level is produced. In this way, the surplus power from the PV system is converted into thermal energy and stored as renewable energy.

The intelligent control system increases the consumption of renewable electricity and reduces the costs of conventional generation.



ADVANTAGES

- Direct heating support and hot water production with surpluses from green electricity
- Can be used as a fully-fledged heating system if required
- Economic use and storage of natural energy outside the EEG
- Higher yields for expiring grid feed-in contracts
- Quick and easy retrofitting
- Optimal utilisation of renewable electricity generators
- Stepless power control
- Ideal for combining with existing systems
- Fixed flow temperature setting

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3. SOLAR AND PHOTOVOLTAICS

3.1 SMART ENERGY (PV)

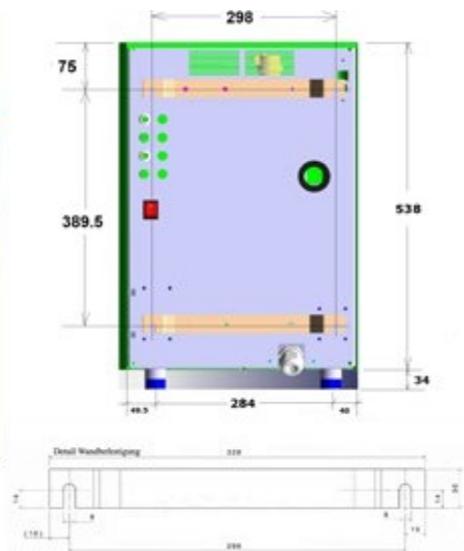
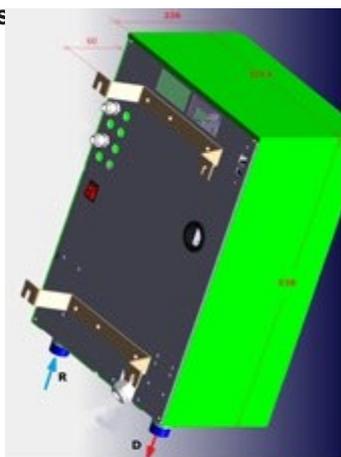
Possible implementation options for smart energy (PV):

- Use of surplus electricity for own consumption to generate hot water
- Use of surplus electricity from inverters (capped by energy suppliers)
- Combination of battery storage and smart energy (PV) possible
- Connection of additional consumers via radio-based applications possible
- Use of smart energy (PV) as sole or emergency heat generator

Technical data:

Smart Energy (PV)	15 kW	
Dimensions	374 x 538 x 236	W x H x D (mm)
Dimensions: Mounting with screws	298 x 389.5	W x H (mm)
Empty weight	27	kg
Capacity in litres	approx. 4	litres
Mass flow	0.1 – 5	m ³ /h
Connections	1" AG	
Operating pressure	1.7	bar
Maximum pressure	2.5	bar
Minimum pressure	1	bar
Internal safety pressure valve	3	bar
Power Single-phase current (230V) max.	11,660 (51 A)	W
Power three-phase current (400V) max.	15,000 (3x22 A)	W
Voltage tolerance	-10% to +6%	
Cable type (1~)	3G10 P + N + T (10 mm ²)	
Cable type (3~)	5G10 3P + N + T (4 mm ²)	
Recommended cable type	U1000R02V or Titanic Flexible	

Installation instructions



3. SOLAR AND PHOTOVOLTAICS

3.1 SMART ENERGY (PV)

PowerDog® L – Energy Management System:

The PowerDog® is one of the most innovative devices for monitoring the output of photovoltaic and other energy consumption or production systems, for recording complex sensor data, and for regulating and controlling a wide variety of consumers (e.g. functional sockets).

As an interface between the photovoltaic system and Smart Energy (PV), the PowerDog® can control when surplus electricity should be used for heat generation. Furthermore, the PowerDog® regulates the feed-in management required by law under the EEG 2012 without any loss of yield.

A variety of interfaces allows for easy integration into existing PV systems.



ADVANTAGES

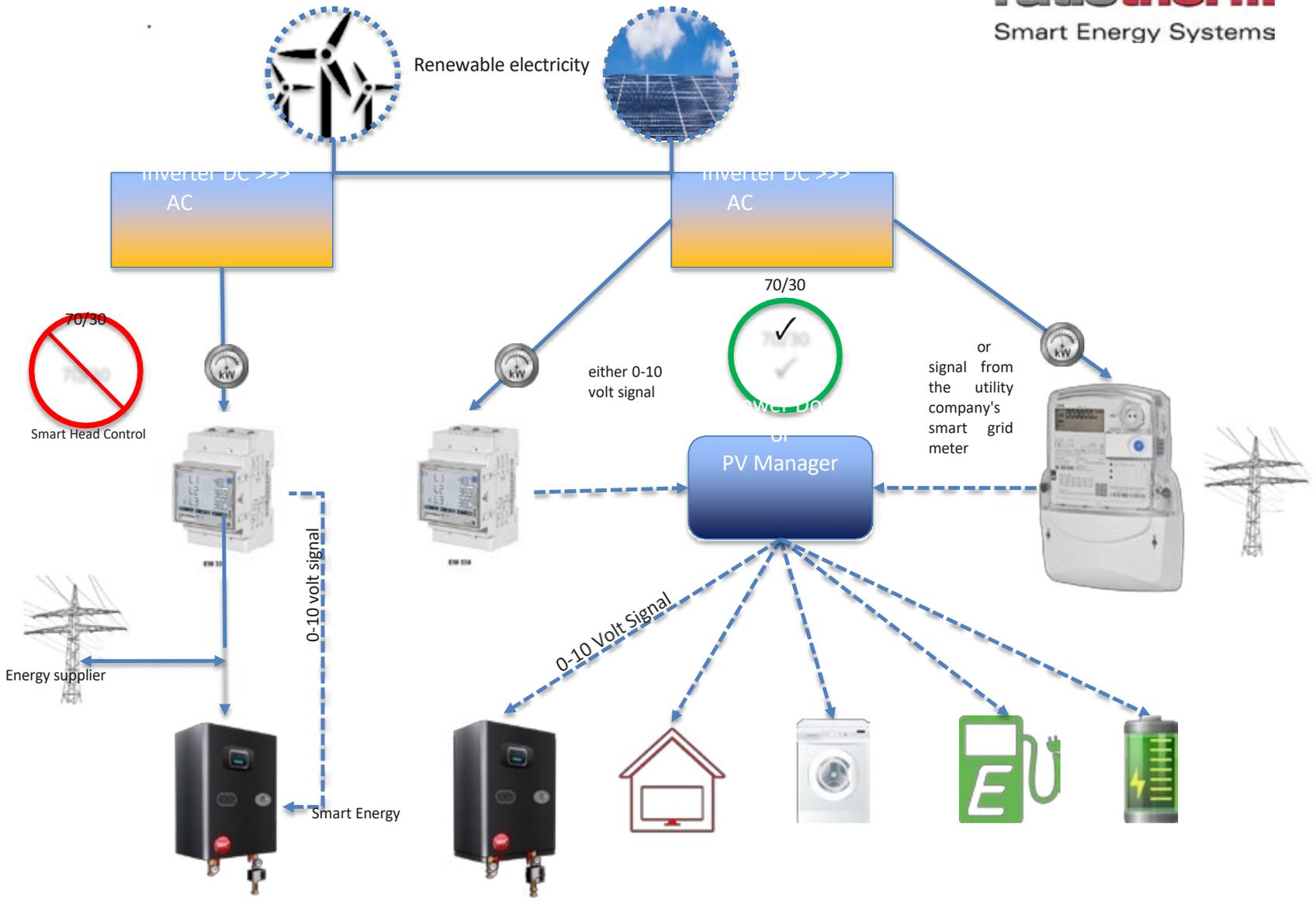
- Large 7" touch display
- Complete configuration via display – no laptop required for installation
- Up to 100 inverters possible on 2 buses
- Detailed diagnostic options available directly on the display
- Self-configurable views
- 533 MHz processor with 256 MB RAM and 2 GB memory

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3. SOLAR AND PHOTOVOLTAICS

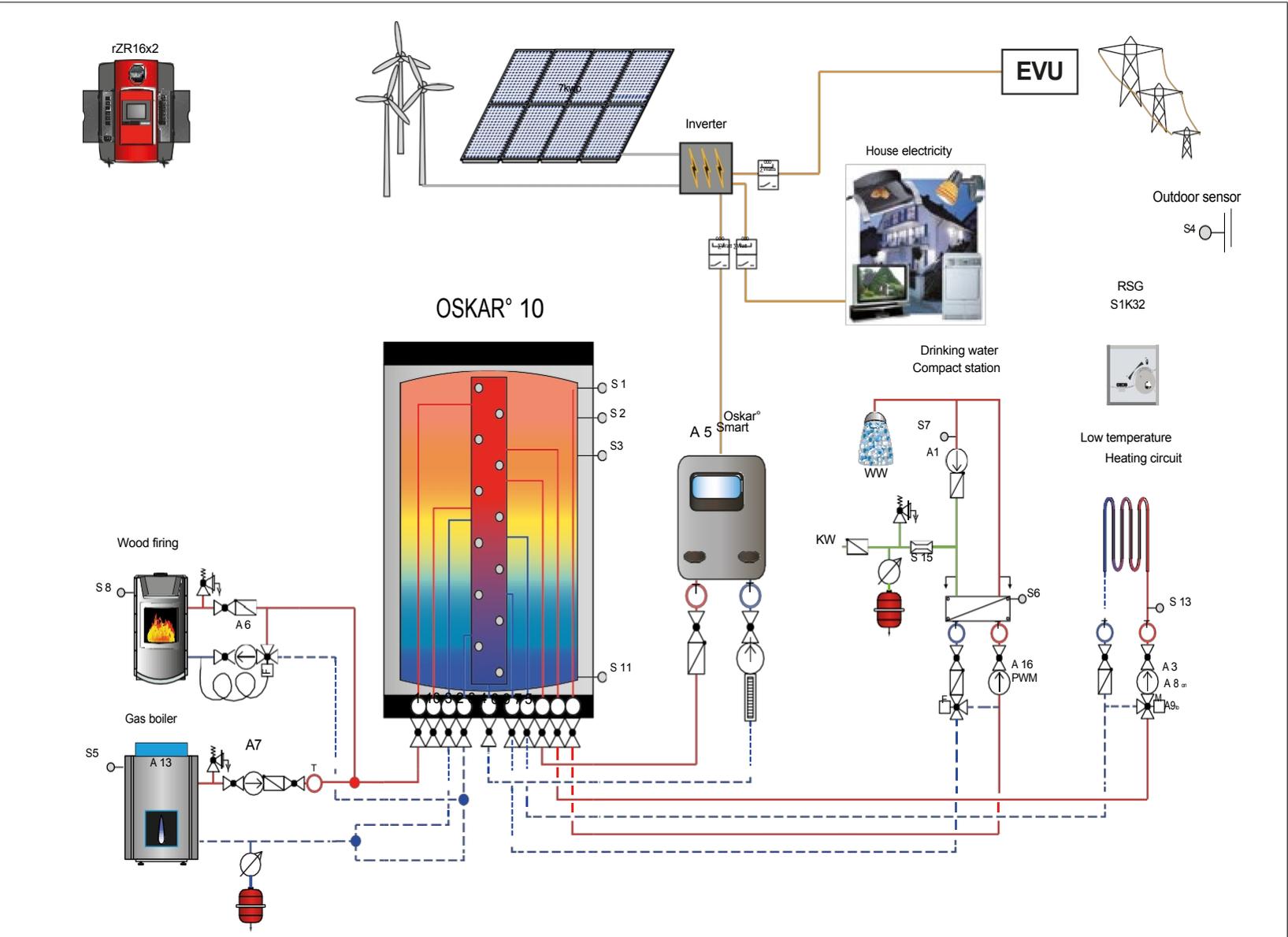
3.1 SMART ENERGY (PV)

ratiotherm
Smart Energy Systems



3. SOLAR AND PHOTOVOLTAICS

3.1 SMART ENERGY (PV)



	Shut-off device		Shut-off device with drain		Plate heat exchanger		Sensor	Plan designation: Schematic diagram Smart Energy options		Name		Date	Please note: This diagram is only a recommendation and does not claim to be exhaustive in any way.		SmartEnergy Systems
	Shut-off device with safety flap		Safety valve		Flow rates Adjusting valve		Expansion vessel	Diagram no.:	Signed	L. Boheim	28 June				
	Engine valve		Pressure gauge		Flow switch / transmitter		Drain		Tested						
	3-way mixer with servomotor		Pump in flow direction		Thermometer				Changed						
	3-way mixer with locking valve		Non-return valve		Heat meter				Changed						

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3. SOLAR AND PHOTOVOLTAICS

3.1 SMART ENERGY (PV)

ATON – Power to heat

ATON is a plug & play solution for utilising surplus PV energy – without additional cabling.

It consists of an energy meter and a continuously adjustable electric heating rod ranging from 50 W to 3 kW for installation in a buffer storage tank.

Please note: Cannot be installed in Oskar° stratified storage tanks!

Function:

Connected via x 2 radio, the energy meter (x-2-tech) specifies the power to be consumed by the heating rod.

The heating rod sends all measured values (STB, internal temperature and the values of the two external sensors) back to the energy meters.

The EHS-R heating element (included in ATON) can be directly controlled continuously from 50 W to 3000 W via PWM using the freely programmable controllers (UVR16 x 2 and RSM610).

The heating rod sends the sensor values back to the CAN-EZ3 via radio for further processing or forwarding to the CAN bus or DL bus.



ADVANTAGES

- Optimisation of the self-consumption rate
- Heating support
- Hot water preparation outside the heating period
- Remote access via C.M.I.
- DL bus for controlling power controllers for advanced energy management

3. SOLAR AND PHOTOVOLTAICS

PV management
Data sheet



Fax: +49 (0) 84 22/99 77-30
Email: vertrieb@ratiotherm.de

Please write legibly in CAPITAL LETTERS

– thank you

PV field 1		PV field 2		PV field 3	
Available <input type="checkbox"/>	Planned <input type="checkbox"/>	Existing <input type="checkbox"/>	Planned <input type="checkbox"/>	Existing <input type="checkbox"/>	Planned <input type="checkbox"/>
Capacity:	Kilowatt peak	Power:	Kilowatt peak	Power:	Kilowatt peak

Roof area 1:	Roof pitch in degrees:	Orientation:	South <input type="checkbox"/>	East <input type="checkbox"/>	West <input type="checkbox"/>
Roof area 2	Roof pitch in degrees:	Orientation:	South <input type="checkbox"/>	East <input type="checkbox"/>	West <input type="checkbox"/>
String 1	_____ kW	String 2	_____ kW	String 3	_____ kW
String 4	_____ kW				
String assignment plan enclosed <input type="checkbox"/>					

Inverter 1 Type:	Inverter 2 Type:
Inverter 3 type:	Inverter 4 type:

1 or 2-way electricity meter type:

<input type="checkbox"/> Varta battery system	<input type="checkbox"/> E3DC battery system	<input type="checkbox"/> Solaredge battery system
<input type="checkbox"/> Kostal battery system Other	<input type="checkbox"/> Fronius battery system	
battery system type:		

PV manager on site? <input type="checkbox"/> YES <input type="checkbox"/> NO If
yes – type?
Request signal: <input type="checkbox"/> On/Off <input type="checkbox"/> 0–10 volts <input type="checkbox"/> Modbus <input type="checkbox"/> Otherwise:
Data logger installed on site? If yes, what function does it perform?

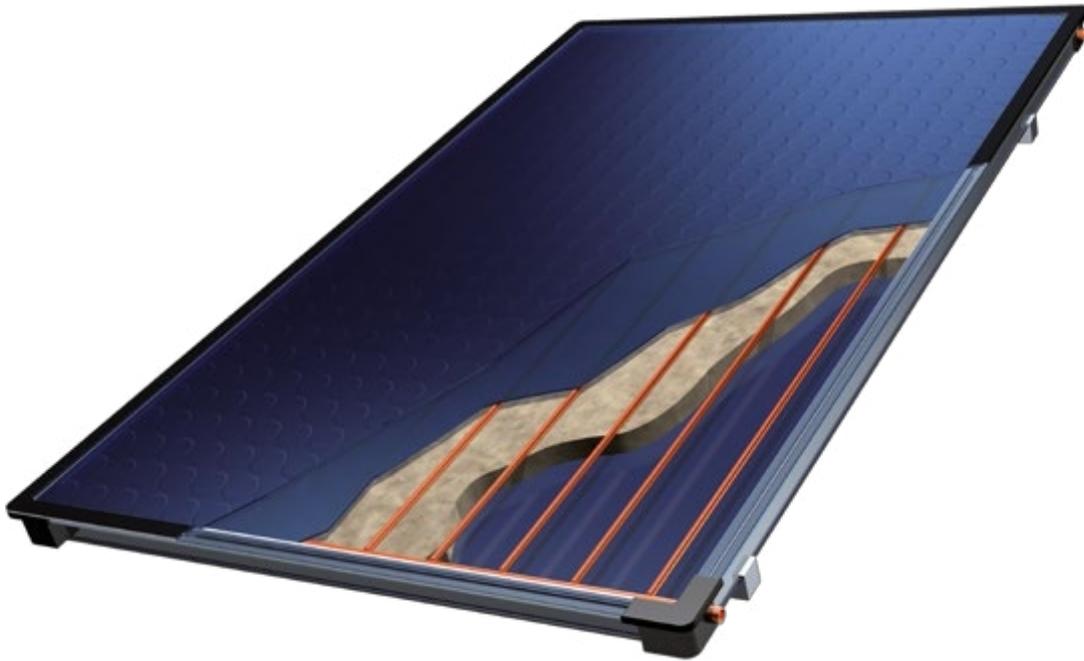
Priorities: (1, 2, 3, ...)	Household electricity	Smart grid devices	Battery storage	Electric cars	Buffer storage
	Priority:	Priority:	Priority:	Priority:	Priority:
Other:					

Ripple control technology <input type="checkbox"/> YES <input type="checkbox"/> NO	70/30 regulation <input type="checkbox"/> YES <input type="checkbox"/> NO
Other limitations:	

SEND OFFER TO:	
Company:	Commission/BV:
Street:	Contact person Mr <input type="checkbox"/> Ms <input type="checkbox"/>
Postcode/town:	For enquiries, please call:
Email:	

3. SOLAR AND PHOTOVOLTAICS

3.2 FLAT-PLATE COLLECTOR RA 251/4



Solar thermal energy has been a proven technology and solution for efficient water heating for heating and domestic hot water for decades.

ratiotherm produces a 2.5 m² high-performance collector for rooftop installation, including the necessary rooftop installation kits in a wide range of designs.

ADVANTAGES

- Maximum solar yields thanks to blue, highly selective Tinox vacuum coating
- Optimised use on ideal summer days thanks to combined harp and parallel connection for higher flow rates
- Durable thanks to hail-resistant safety glass, double-walled aluminium frames and permanently sealed cutting ring connections
- Optimal use of space through horizontal and vertical installation
- Use of minimal solar radiation through combination with the Oskar® stratified storage tank and/or a heat pump
- High-quality, stable and flexible stainless steel mounting system for secure rooftop installation
- Eligible for subsidies as tested in accordance with CEN Keymark and DIN EN12975-1
- Collectors can be mounted horizontally and vertically

3. SOLAR AND PHOTOVOLTAICS

3.2 FLAT COLLECTOR RA 251/4

Planning information:

Snow load:

- The mounting systems are designed in accordance with DIN 1055 T5 for snow load zone II up to 400 m above sea level.
- If the collectors are mounted more than 1 m below the ridge, a snow guard must be installed directly above the collector surface.
- For snow loads of more than 0.75 kN/m^2 , we recommend increasing the number of roof hooks or using metal roof tiles instead of tiles.

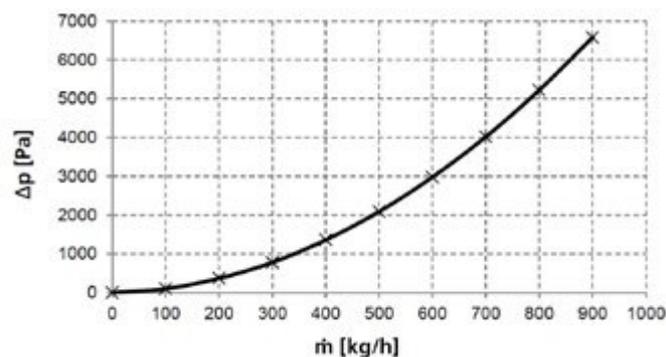
Wind load:

- For wind loads of more than $0.5 \text{ kN/m}^{(2)}$ we recommend increasing the number of roof hooks.
- A minimum distance of 2 m between the edge of the building and the collector should not be exceeded.
- If the collectors on flat roofs are not fixed to the building, they must be weighted down:
 - for installation heights up to 8 m: 75 kg per m^2 of collector area (gross)
 - For installation heights up to 20 m: 128 kg per m^2 collector area (gross)

A maximum of 6 collectors can be connected in series. Several groups must be connected in parallel according to Tichelmann. If groups of different sizes are connected, a temperature-resistant (up to at least $150 \text{ }^\circ\text{C}$) control valve is required to compensate for the pressure loss.

Collector RA 251/4 – Technical data:

Collectors	RA 251/4	
Gross collector area	2.51	m^2
Aperture area	2.22	m^2
Dimensions	1,073 x 2,340 x 90	W x H x D (mm)
Weight	40	kg
Collector frame	Anodised aluminium	
Glass	Highly transparent solar safety glass 4 mm	
Connections	2 x CU 18	mm
Energy yield	over 525	$\text{kWh/m}^2 \text{ a}$

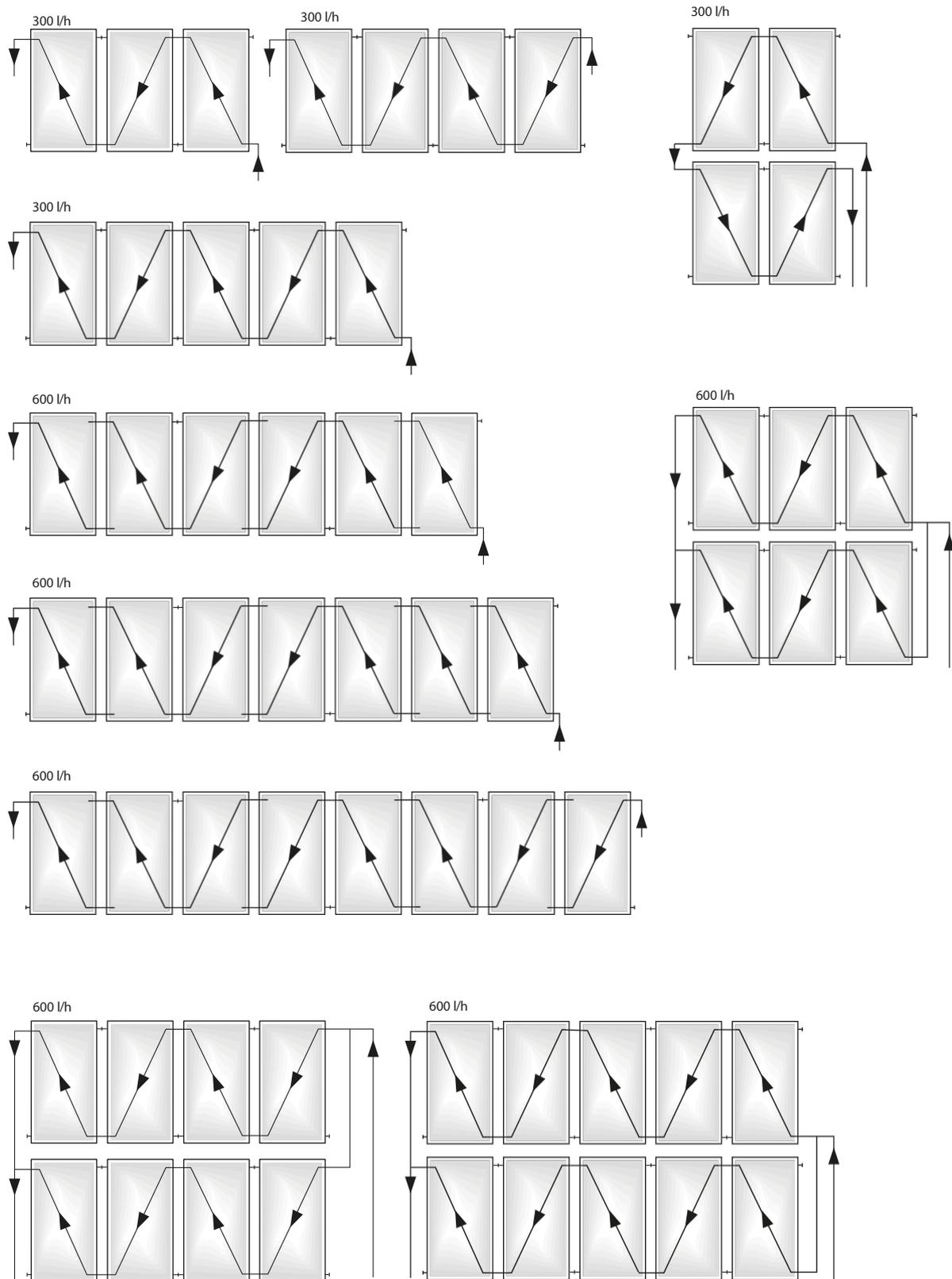


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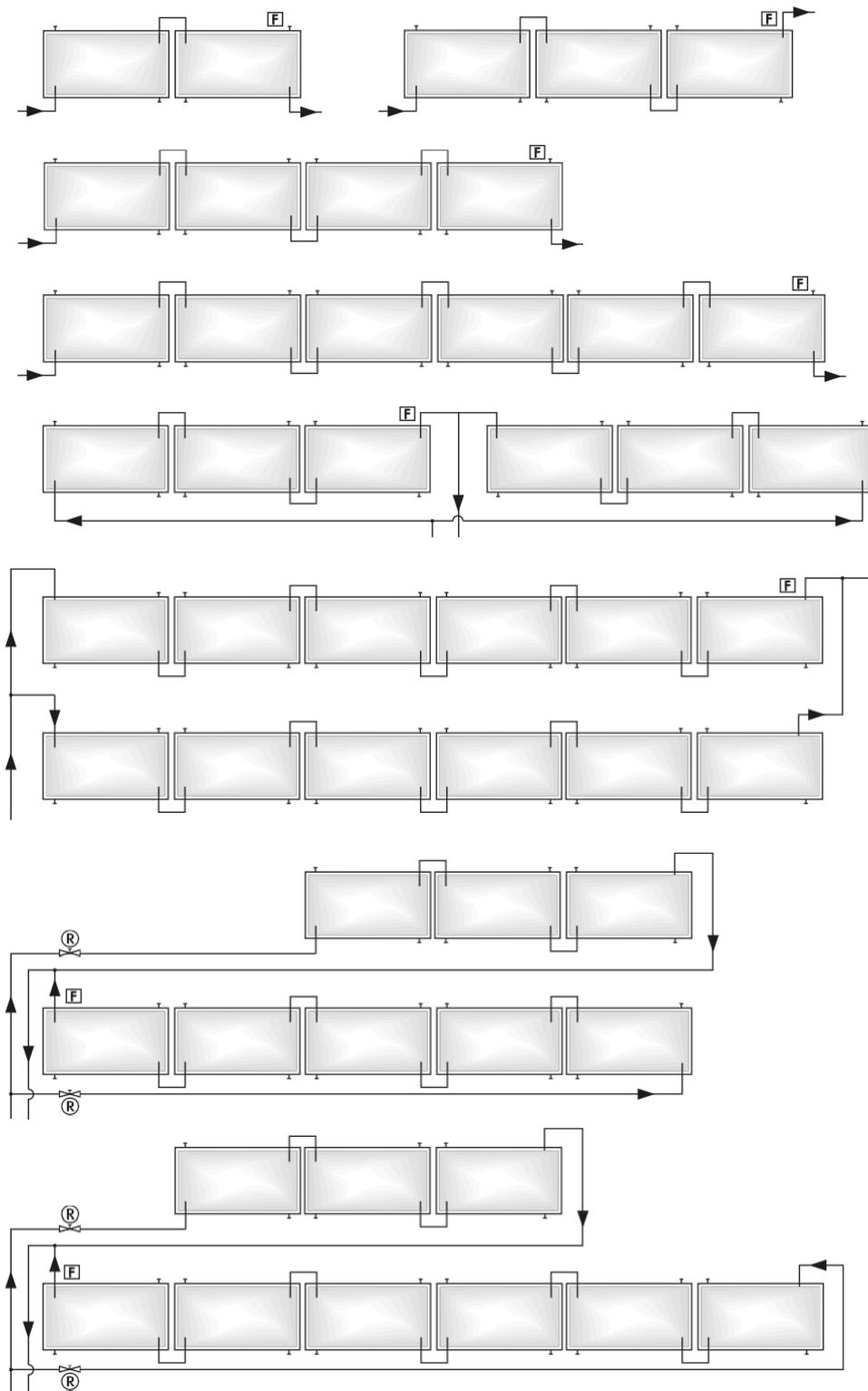
3. SOLAR AND PHOTOVOLTAICS

3.2 FLAT-PLATE COLLECTORS – WIRING – VERTICAL



3. SOLAR AND PHOTOVOLTAICS

3.2 FLAT-PLATE COLLECTORS – CONNECTION – VERTICAL



F Collector sensor

R Regulating valve for uneven collector distribution

3. SOLAR AND PHOTOVOLTAICS

3.3 SOLAR COMPACT STATION

The solar compact station consists of two separate heating circuits, which are connected to each other by a heat exchanger. The station is available in three power sizes for different collector areas. Special sizes can be produced on request. The entire station is thermally insulated, resulting in very low heat losses. The pumps used for the two circuits are highly efficient.



ADVANTAGES

- Compact unit, fully assembled and insulated, for minimal losses
- High-quality, coordinated components ensure maximum efficiency in heat transfer and minimum energy consumption.
- Even minimal solar radiation can be utilised thanks to the combination with the Oskar® stratified storage tank.
- Reduction of heat loss to a minimum

Technical data:

Solar compact station (SOK)	SOK 6-16 (6–16 sqm)	SOK 16-40 (16–40 sqm)	SOK 40-60 (40–60 sqm)	
Dimensions		250 x 1,560 x 260		W x H x D (mm)
Weight	approx. 40	approx. 43	approx. 46	kg
Pump type Primary circuit	Wilo Yonos Para ST25/7.0-PWM2 BL 180		Wilo Yonos Para ST25/7.5-PWM2 BL 180	
Pump type secondary circuit	Wilo Yonos Para ST25/7.0-PWM2 BL 180			

Special stations available on request at any time.

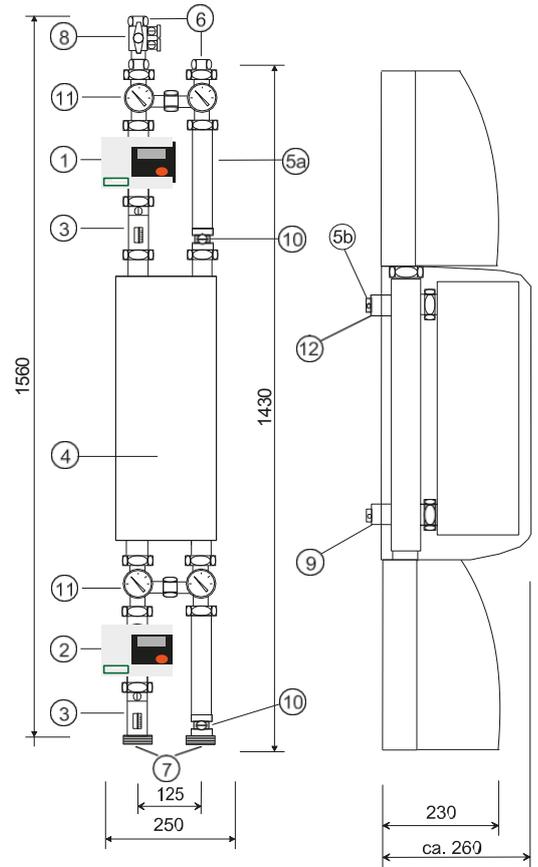
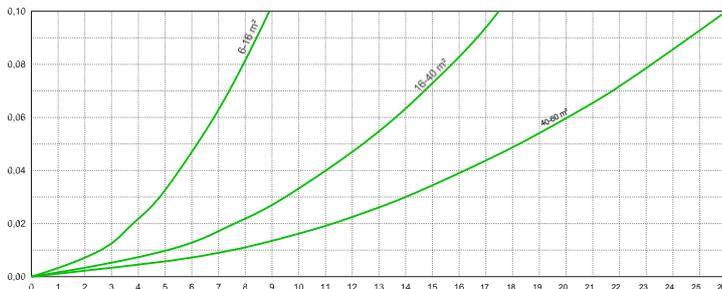
3. SOLAR AND PHOTOVOLTAICS

3.3 SOLAR COMPACT STATION

Components of the solar compact station (SOK):

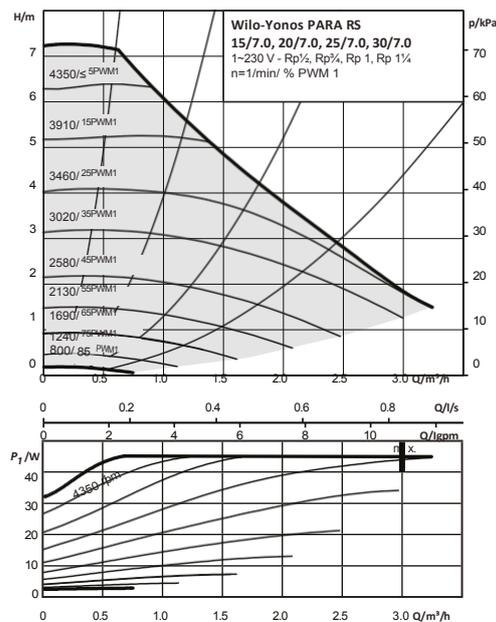
1. Primary circuit pump
2. Secondary circuit pump
3. Flow rate adjustment valve
4. Plate heat exchanger
5. Manual vent (secondary)
6. Clamp ring screw connection 28 x 1.5
7. Connections DN 25 1 1/2" AG
8. Flushing and filling fitting
9. Immersion sleeve for heat transfer fluid sensor (S9)
10. Gravity brake with manual adjustment
11. Ball valve with integrated thermometer
12. Immersion sleeve for solar return sensor

Pressure losses of the solar compact stations (SOK):



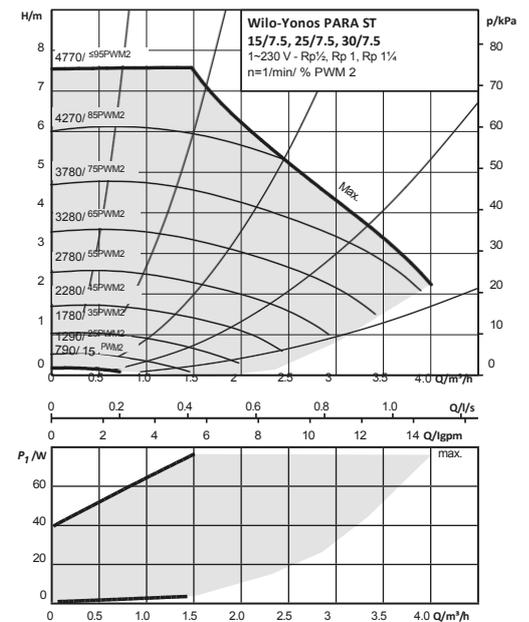
Pump characteristics: Wilo-Yonos PARA 15/7.0, 20/7, 25/7.0, 30/7.0

External control via PWM



Mi1o-Yonos PARA ST 15/7.5, 25/7.5, 30/7.5

External control via PWM



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4. OSKAR° STRATIFICATED STORAGE

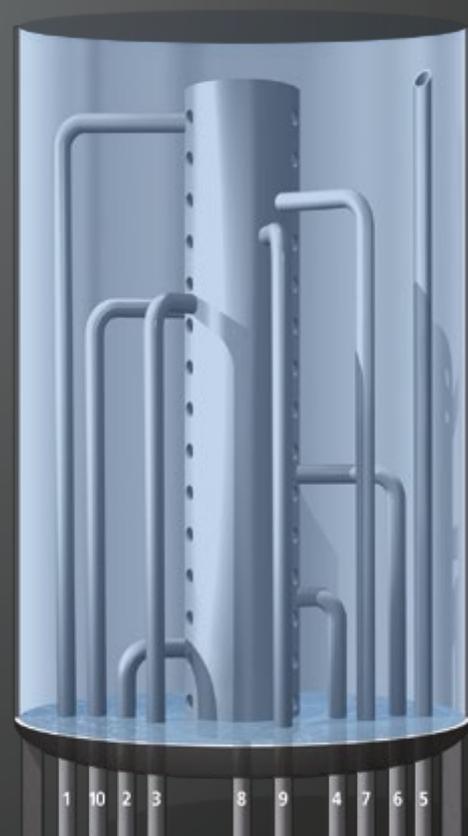
STRATIFIED STORAGE TECHNOLOGY

Heat storage is now considered one of the most important components of a heating system in connection with the energy transition. ratiotherm addressed this issue over 25 years ago and developed the Oskar° stratified storage tank with patented stratification technology.

Our heat storage tanks are available in a wide range of standard sizes as well as in any special sizes, depending on the requirements of the project. The focus here is on customised solutions, which are developed in collaboration with the responsible planner as a complete system solution. The Oskar° stratified storage tank is fundamentally system-independent and can therefore be easily integrated into other system solutions.

The patented stratification insert reduces the speed of the incoming water so that the water at different temperatures moves up or down within the stratification insert before it leaves the stratification insert and enters the actual storage volume. This makes it possible to use different heat sources (even simultaneously), such as CHP units, wood-burning stoves, oil and gas boilers, and solar thermal energy – no heat is wasted. Connection situation for an Oskar° 10, see image below.

If necessary, all ratiotherm heat storage tanks can also be welded on site, which eliminates the need for a storage cascade and at the same time increases the efficiency of the overall system.



4. OSKAR° STRATIFICATED STORAGE

LAYERED STORAGE TECHNOLOGY

Planning notes:

- The maximum design flow rate of the respective stratified storage tank must be strictly adhered to and is part of the type designation (see example on the next page).
- We offer special heat pump storage tanks for higher volume flows under the designation WPS.
- Continuously running circulation pumps with a low temperature difference should be avoided, as this impairs stratification.
- For regulated heating circuits, 3-way mixers must be used (no 4-way mixers or injection circuits).
- For log-fired boilers, the storage tank is dimensioned according to the boiler output or the combustion chamber volume, as well as the legal requirements and recognised rules of technology.
- If a storage tank with specific features is required, ratiot-herm can design and manufacture the storage tank according to customer-specific specifications – up to 30 m³ and beyond, we have the relevant experience and references.
- If necessary, the rear connections (1, 2, 3, 10) of the 10/1.5 and 10/5.0 series can also be routed at a 90° angle to the right or left of the storage tank, provided that the installation situation requires this.
- If there is little space in the boiler room for installing a large storage tank or if the installation opening is too small, the Oskar° stratified storage tank can also be welded on site.



ADVANTAGES

- Stratification means that less energy is required at different withdrawal temperatures, as heat only needs to be generated at the appropriate level according to demand.
- Heat losses are consistently avoided thanks to compact feed-in and withdrawal.
- High-quality, coordinated components ensure maximum efficiency in heat transfer and minimum energy consumption.

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4. OSKAR° LAYERED STORAGE

LAYERED STORAGE TECHNOLOGY

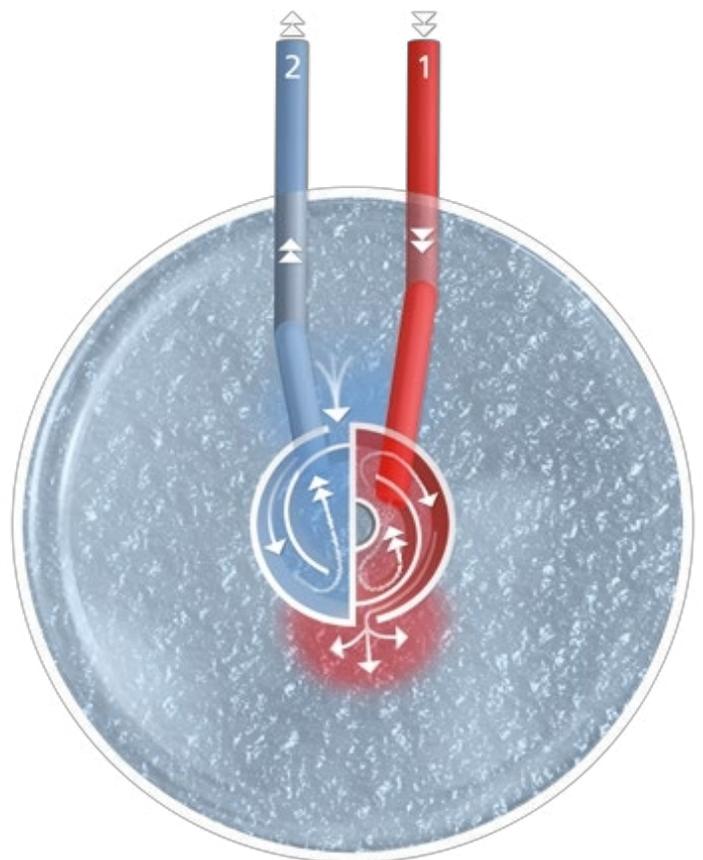
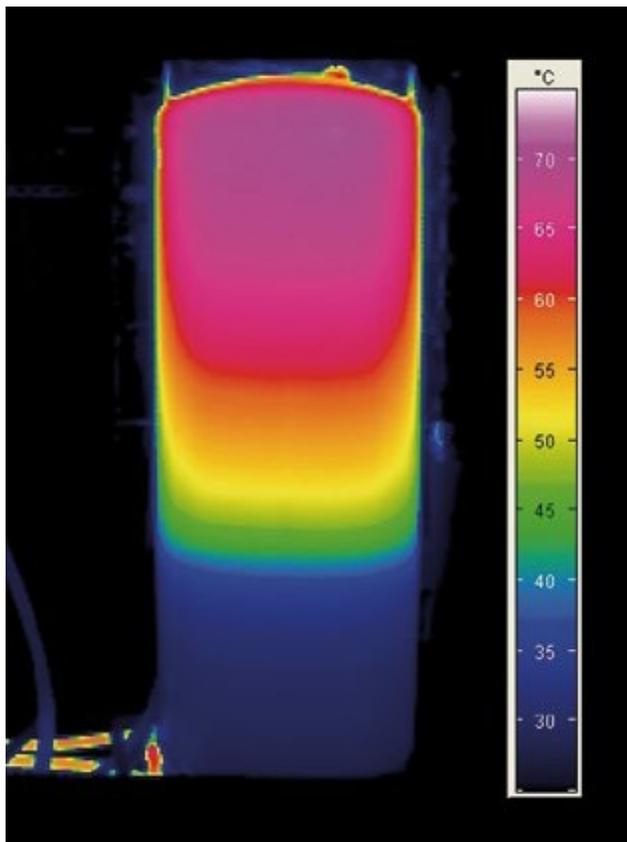
The stratification insert:

ratiotherm stratification inserts are made of plastic and are therefore completely corrosion-free. Depending on the storage tank size and application, they are available in various sizes, always matched to the maximum volume flow of the heating water per connection pair and hour (m³/h). We have the following stratification inserts (SE) as standard in our portfolio:

- SE 1.0 with a volume flow rate of 1,000 L/h
- SE 1.5 with a volume flow rate of 1,500 L/h
- SE 5.0 with a volume flow rate of 5,000 L/h

Regardless of this, the layer inserts can be implemented in any size according to the individual requirements of a project. ratiotherm has experience in the seasonal storage sector up to 6,000 m³.

Storage tank cross-section:

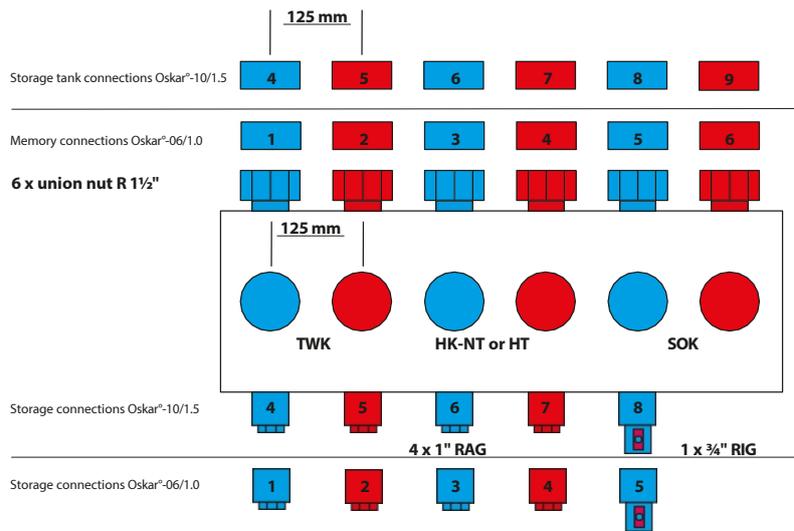


4. OSKAR° STRATIFICATED STORAGE

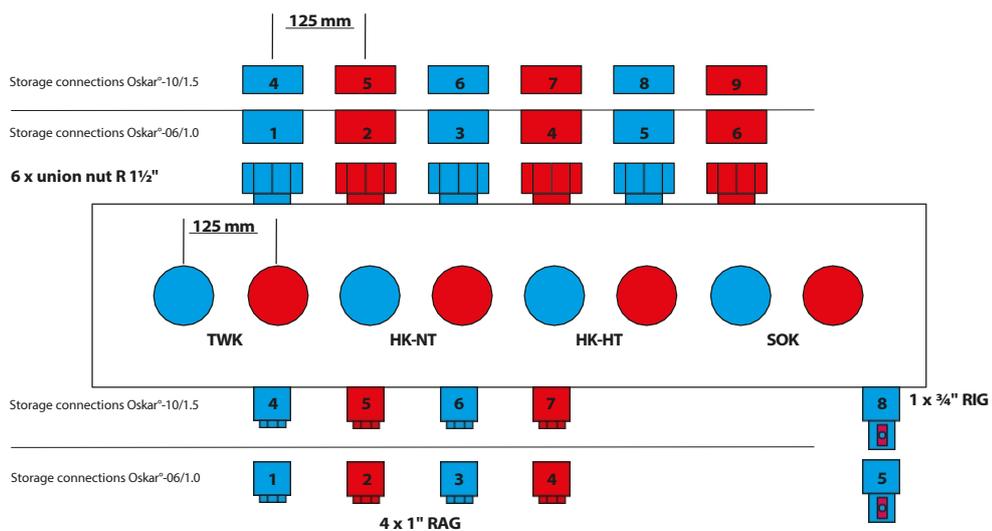
LAYERED STORAGE TECHNOLOGY

The ratiotherm ABV 1 and ABV 2 add-on distributors enable standard assemblies to be easily connected to the Oskar° stratified storage tank, series 10/1.5. The add-on distributors are supplied with complete insulation and all the materials required for quick installation of the assemblies.

ABV 1 can accommodate up to 3 assemblies (e.g. drinking water station (TWK), 1x heating circuit (NT or HT circuit), solar compact station (SOK)). This system allows installation in the smallest of spaces and is suitable for installation on all Oskar° series.



ABV 2 can accommodate up to 4 assemblies (e.g. drinking water station (TWK), 2x heating circuit (NT and/or HT circuit), solar compact station (SOK)). This system ensures minimal piping requirements and can be installed on all models in the 10/1.5 and Oskar° WPS series.



recognised rules of technology must be observed at all times!

ATTENTION! Installation and wiring must only be carried out by authorised specialists.

4. OSKAR° LAYERED STORAGE

4.1 OSKAR° 10/1.5

Oskar° stratified storage tanks from the 10/1.5/... series are used wherever several heat generators work together and high heat demand or high solar coverage is required.

Technical data:

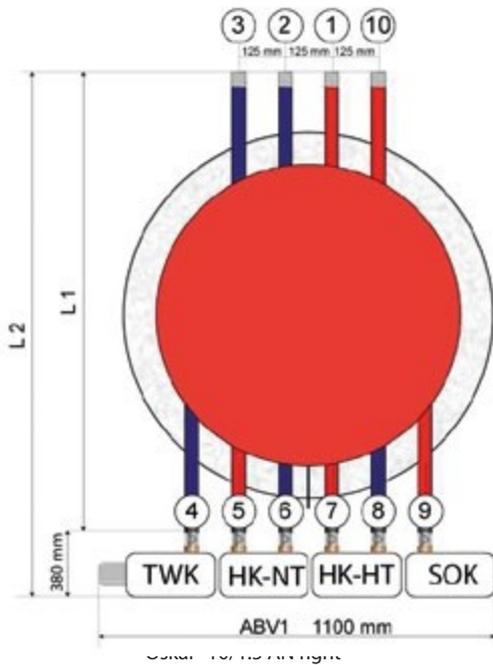
Oskar° 10/1.5	750	1,000	1,300	2,000	3,000	4,000	litres
Actual volume approx.	720	920	1,340	2,010	3,000	4,000	litres
Maximum volume flow	1,500						L/h
Total height without insulation	1,770	2,150	2,030	2,100	1,940	2,440	mm
Total height with insulation	1,890	2,270	2,150	2,220	2,080	2,560	mm
Diameter without 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 (L1)	1,040	1,040	1,240	1,500	1,900	1,900	mm
Length (L2)	1,420	1,420	1,620	1,880	2,280	2,280	mm
Weight without insulation approx.	140	155	220	285	470	550	kg
Max. tipping dimension	1,850	2,220	2,080	2,260	2,200	2,650	mm
Dimensional tolerances	+10						mm
Maximum operating pressure	3						bar
Maximum operating temperature	95						°C
Pressure loss Oskar°	20						mbar
Pressure loss Oskar°	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	1/2		3/4		3/4	3/4	RIG
Front storage connections	6x DN 25 flat-sealing flange and union nut						
	1 1/2"/pipe spacing 125 mm						
Tank connections at rear	4x DN 25 /1" RAG / pipe spacing 125 mm Tank						
material	ST 37-2/S235JR/P						
Paint	Black anti-rust paint on the outside, unpainted on the inside						

4.

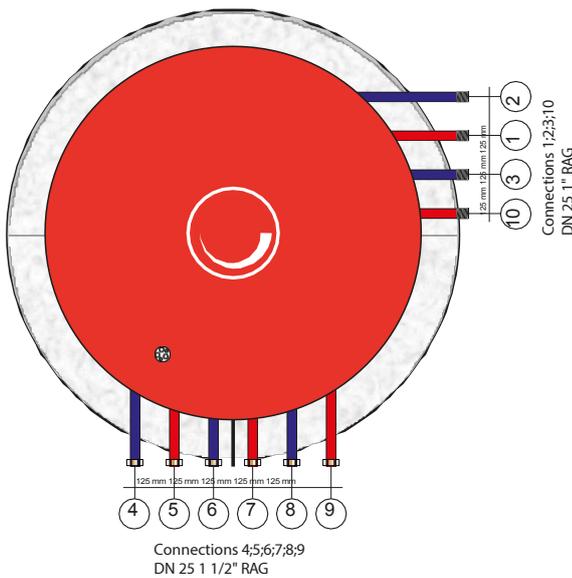
OSKAR° LAYERED STORAGE

4.1 OSKAR° 10/1.5

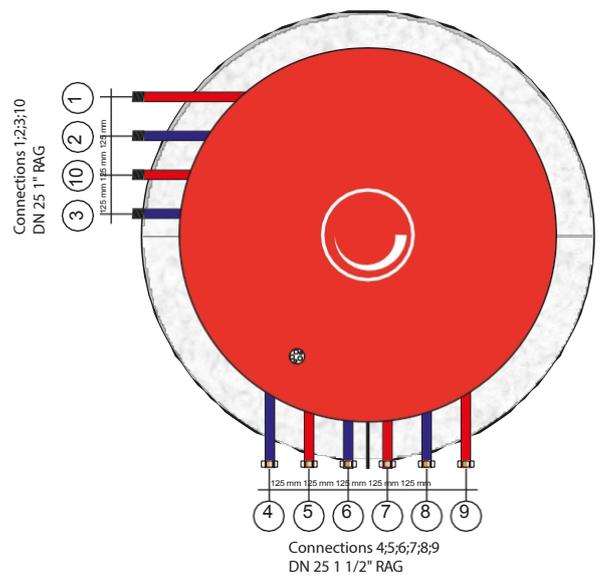
Connection assignment:



- 1: Heat generator (HT) VL 2: Heat generator (NT) RL 3: Heat generator (HT) RL 4: Consumer (NT) RL
- 5: Consumer (HT) VL 6: Consumer (HT) RL
- 7: Consumer (HT/NT) VL 8: Solar RL
- 9: Solar VL
- 10: Heat generator (NT) VL



Oskar° 10/1.5 AN left



Cross-section of stratified storage tank 10/1.5 with connection assignment and the add-on distributor 2 available as an accessory (ABV 1 also possible), as well as the possible connection situation in the left and right variants;

TWK = compact drinking water station, HK = heating circuit, NT = low temperature, HT = high temperature, SOK = compact solar station

All functions, images and drawings are subject to errors and changes. The generally applicable and recognised rules of technology must be observed at all times!

ATTENTION! Installation and wiring must only be carried out by authorised specialists.

4. OSKAR° LAYERED STORAGE

4.2 OSKAR° 10/5.0

The Oskar° stratified storage tanks of the 10/5.0/... series are primarily used in larger buildings or in properties with very high heat requirements, or wherever a very high solar coverage is to be achieved.

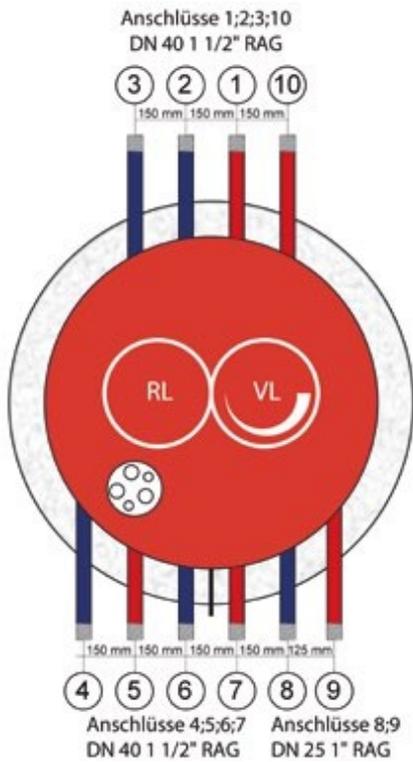
Technical data:

Oskar° 10/5.0	2,000	3,000	4,000	litres
Actual volume approx.	2,010	3,000	4,000	litres
Maximum volume flow		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	1,500	1,900	1,900	mm
Weight without insulation approx.	315	470	550	kg
Tipping dimensions max.	2,260	2,200	2,650	mm
Dimensional tolerances		+10		mm
Maximum operating pressure		3		bar
Maximum operating temperature		95		°C
Pressure loss Oskar°		45		mbar
Pressure loss Oskar°		0.45		mWS
Standby heat loss DIN	3.13	3.88	4.77	kWh/d
Vent pipe at top		3/4		RIG
Storage tank connections at front	4x DN 40 1 1/2" RAG/2x dn 25 1" RAG			
Tank connections at rear	4x DN 40 1 1/2" RAG			
Container material	ST 37-2/S235JR/P			
Paint	Black anti-rust paint on the outside, unpainted on the inside			

4. OSKAR° LAYERED STORAGE

4.2 OSKAR° 10/5.0

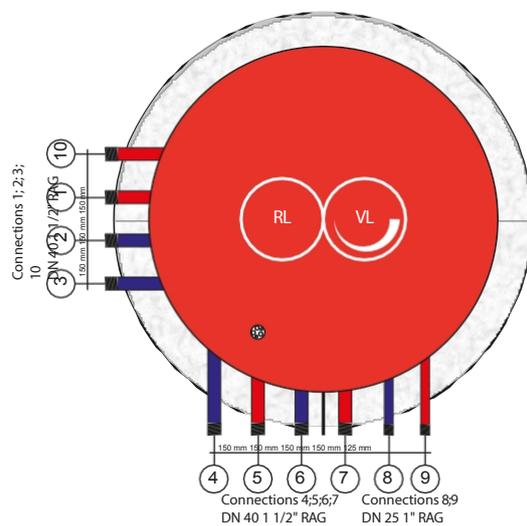
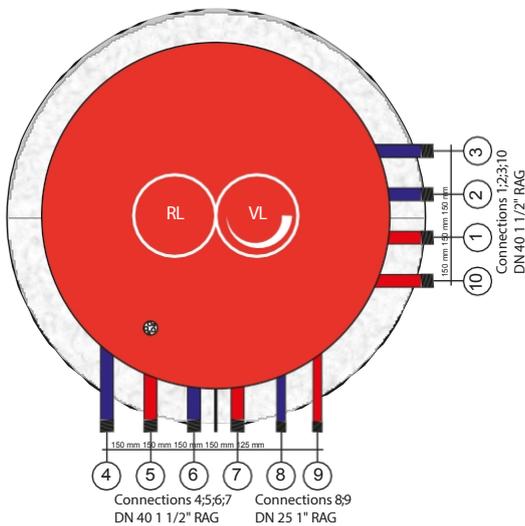
Connection assignment:



- 1: Heat generator (HT) VL 2: Heat generator (NT) RL 3: Heat generator (HT) RL 4: Consumer (NT) RL
- 5: Consumer (HT) VL 6: Consumer (HT) RL
- 7: Consumer (HT/NT) VL 8: Solar RL
- 9: Solar VL
- 10: Heat generator (NT) VL

Oskar° 10/5.0 AN on the right

Oskar° 10/5.0 AN left



Cross-section of stratified storage tank 10/5.0 with connection layout and add-on distributors 1+2 available as accessories;

TWK = compact drinking water station, HK = heating circuit, NT = low temperature, HT = high temperature, SOK = compact solar station

4. OSKAR° LAYERED STORAGE

4.3 OSKAR° HEAT PUMP STORAGE TANK (WPS)

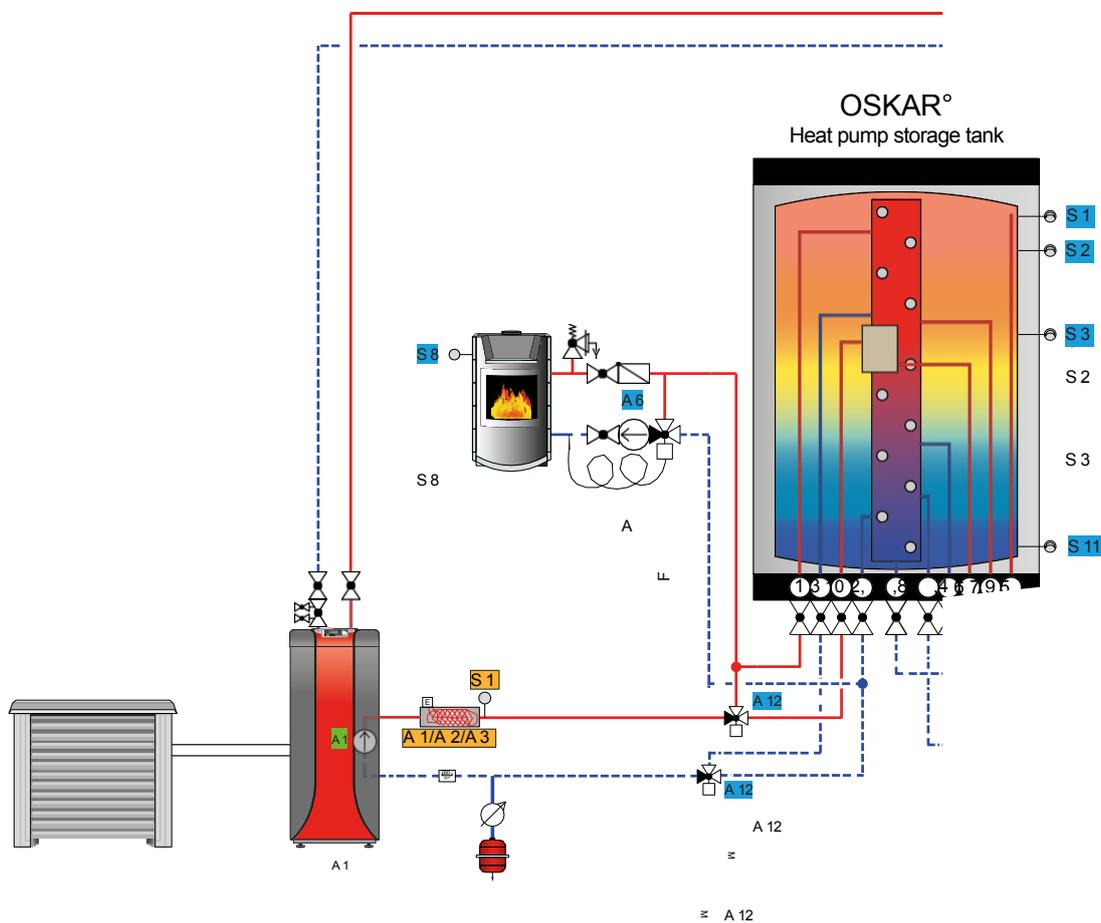
Oskar° WPS (heat pump storage tank) was developed specifically for use in combination with a heat pump. An additional insert inside the storage tank simplifies the hydraulic connection of a heat pump.

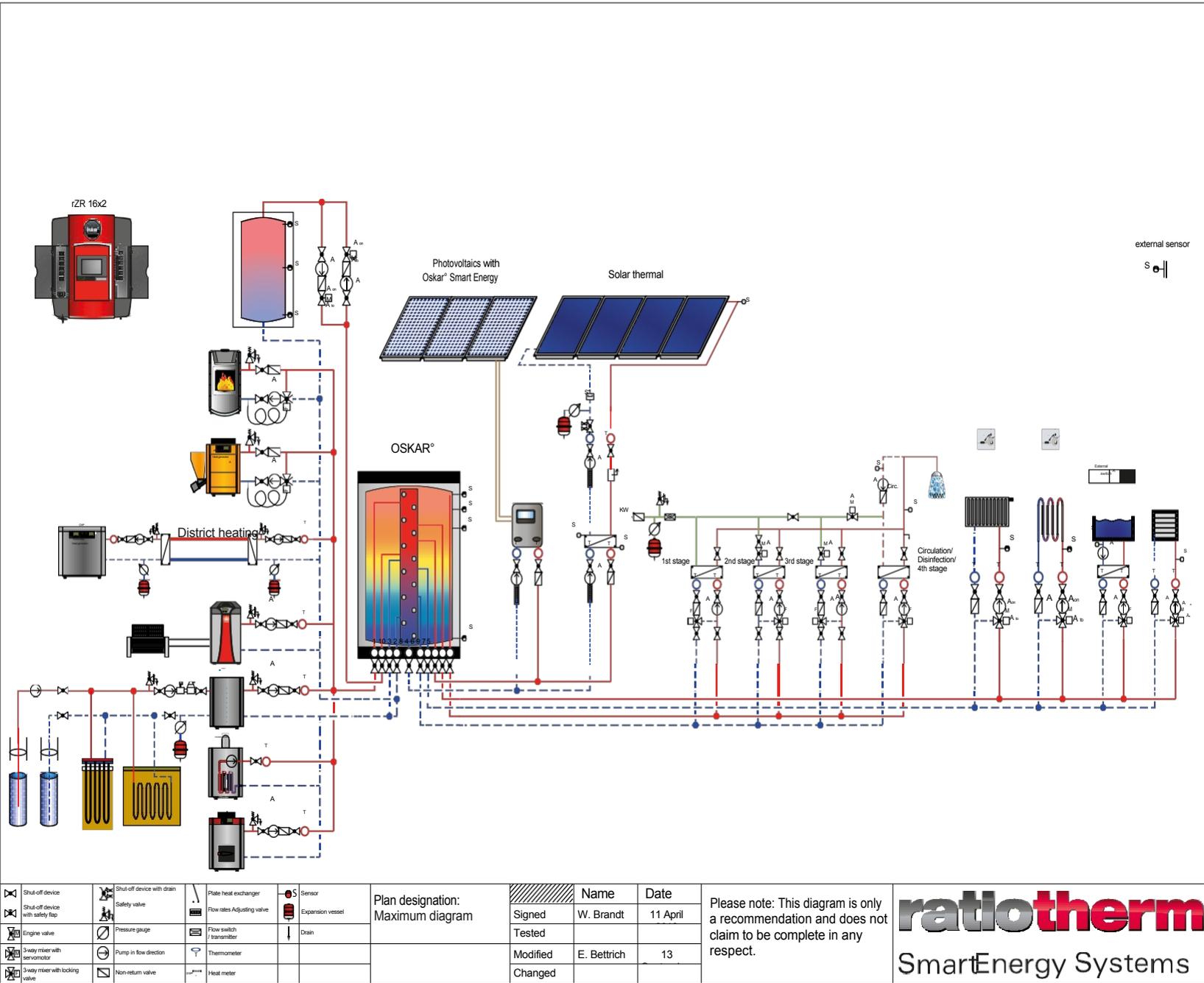
The insert allows direct heating in the heating circuit. The heat pump only has to produce the temperature that is actually required.

An additional advantage is that this storage tank can easily bridge the utility company's restricted periods.

The upper part of the storage tank remains completely available for hot water preparation.

The dimensions, weights and technical data are identical to the standard stratified storage tanks of the 10/1.5 and 10/5.0 series (see previous pages).





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ATTENTION! Installation and wiring may only be carried out by authorised specialist personnel.

4. OSKAR° LAYERED STORAGE

4.4 OSKAR° 08

With Oskar° 08, homeowners do not have to forego the flexible advantages of an Oskar° stratified storage tank, even in limited space. Oskar° 08 is ideally suited for semi-detached houses, terraced houses and detached houses with an area of up to approx. 200 m².

Oskar° 08 is ideal for use in conjunction with space-saving, wall-mounted oil and gas condensing boilers, heat pumps, automatic pellet boilers and other water-bearing heat generators up to 15 kW. Of course, Oskar° 08 also increases the efficiency of a solar system. The Oskar° 08 stratified storage tank is available **exclusively as a package** in sizes of 500 L, 750 L or 1000 L. The system is characterised by its extremely compact design.

Thanks to the **plug-and-play** installation, the hydraulics and associated controls can be installed in no time at all.

Once the Oskar° 08 stratified storage tank has been positioned in the boiler room, all that remains is to attach a pre-assembled and wired hydraulic module (weighing approx. 80 kg) and connect it to the 8 connections at the base of the stratified storage tank.

Finally, the controller is hooked in and the coded plugs are connected to the plug panel – and the installation is complete!

The controller configures the necessary hydraulic settings automatically.

This means that even heating specialists who are not yet familiar with our technology can install and commission efficient storage technology.



4. OSKAR° LAYERED STORAGE

4.4 OSKAR° 08



QR code for ratiotherm
C.M.I. APP in the
Google Play Store

CENTRAL CONTROLLER Basic equipment

- with touch display
- via an additional module (C.M.I.) Internet-enabled for online monitoring
- Plug-and-play wired
- Self-configuring

HEATING CIRCUIT 2 Optionally expandable

- Additional heating circuit
- with electric mixer and
- electronically controlled high-efficiency pump
- Overall length 130 with 230 volts ~

HEATING CIRCUIT 1 Basic equipment

- Heating circuit
- with electric mixer and
- Electronically controlled high-efficiency pump, length 130, with 230 volts ~

Basic equipment

- Drinking water station, output 70 kW
- CU-Lot stainless steel heat exchanger optionally also available in VA-Lot
- PWM high-efficiency pump, length 130, with 230 volts ~
- Thermal pre-control valve optionally expandable

Optionally expandable

- Solar transfer station with system separation via stainless steel heat exchanger
- With 2 PWM high-efficiency pumps, length 130, with 230 volts ~
- For 6–16 m² collector area (solar thermal)

Basic equipment

- Storage tank Loading and unloading hydraulics
- Connections on the side, optionally on the left and/or right
- Shut-off to the accumulator via coloured corner ball valves



... devices are subject to errors and changes. Compliance with generally applicable and recognised technical rules must be observed at all times!

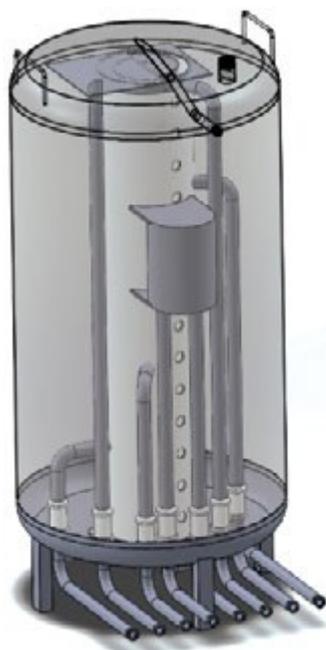
ATTENTION! Installation and wiring must only be carried out by authorised specialists.

4. OSKAR° LAYERED STORAGE

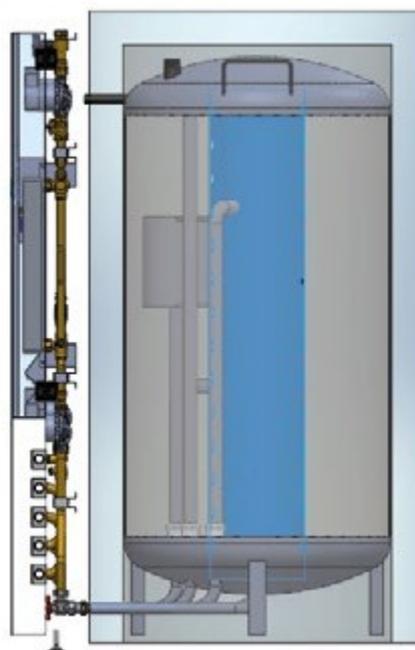
4.4 OSKAR° 08

Technical data:

Type: Oskar°-08/1.5/...	500	750	1,000	litres
Actual volume approx.	496	720	920	litres
Maximum volume flow			1,500	L/h
Total height without insulation	1,718	1,735	2,115	mm
Total height with insulation	1,838	1,855	2,235	mm
Diameter without insulation	650	790	790	mm
Diameter with insulation	890	1,033	1,030	mm
Length of storage tank incl. Storage tank connections	774	915	915	mm
Weight without insulation approx.	120	140	155	kg
Tipping dimension max.	1,840	1,870	2,230	mm
Dimension tolerances			+10	mm
Maximum operating pressure			3	bar
Maximum operating temperature			95	°C
Pressure loss Oskar°			20	mbar
Pressure loss Oskar°			0.2	mWS
Standby heat loss DIN	1.75	1.92	2.27	kWh/d
Vent pipe at top		1/2		RIG
Storage tank connections at front		8 x DN 25		
Tank material	ST 37-2/S235JR/P265GH			
Paint	Black anti-corrosion paint on the outside, unpainted on the inside			
Dimensions of the hydraulic module (W x H x D)	700 x 1860 x 192			



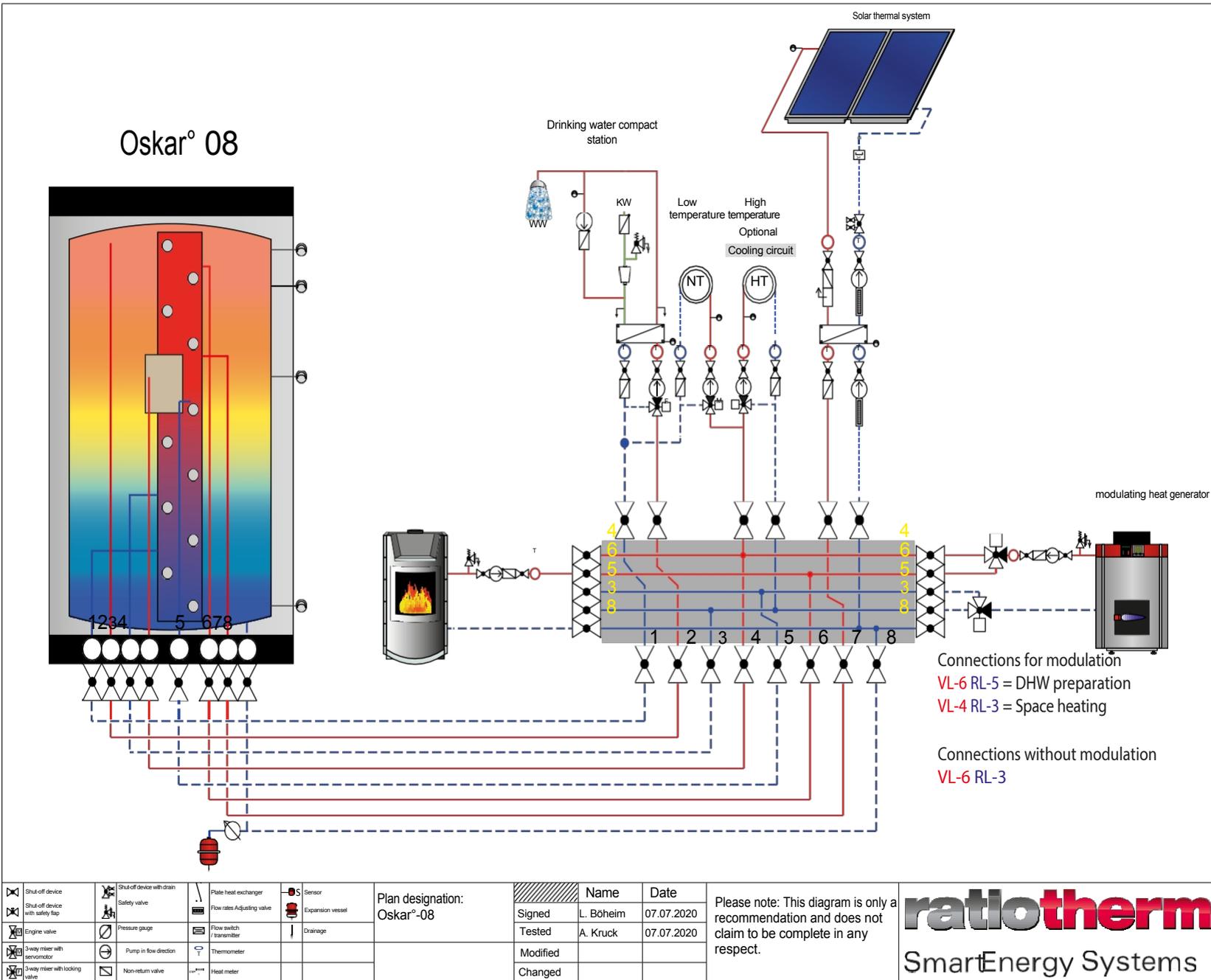
OSKAR-08 front view



OSKAR-08 side view

4. OSKAR° LAYER STORAGE

4.4 OSKAR° 08



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 ATTENTION! Installation and wiring must only be carried out by authorised specialists.

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION HEATING AND HOT WATER

Heating systems often have to perform two completely different tasks in the home. On the one hand, they provide heat to keep rooms at a comfortable temperature. On the other hand, they heat fresh water for bathing, showering, cooking and drinking. ratiotherm components for distributing heat to drinking water and radiators perform this task with maximum efficiency. We offer optimal solutions for centralised and decentralised hot water preparation.

Central hot water preparation:

When all hot water outlets in a building are connected to a common network and supplied by one or more hot water generators, this is referred to as central hot water preparation. Storage, flow-through and storage charging systems are used to heat the water. The water is heated indirectly,

i.e. the heat energy is transferred to the drinking water via a heat transfer medium. The systems are operated with gas, electricity, district heating, heat pumps, renewable energies or any combination of these energy sources.



ratiotherm consistently focuses on efficiency and the advantages of central flow-through systems. Here, the contents of the heat storage tank consist exclusively of heating water, and the energy required for heating drinking water is provided via a heat exchanger at the moment of consumption.

Advantages of central hot water preparation:

- This is not exclusively linked to electricity, as is the case with decentralised drinking water heating (e.g. instantaneous water heaters at each tap). Depending on the heating system, the operator is free to choose the fuel. Even if a homeowner decides to install a new heating system and a new energy source (e.g. switching from gas heating to pellet heating), the existing central hot water system can be connected to it.

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

HEATING AND HOT WATER

- The operating costs per litre of hot water are lower with centralised hot water heating than with decentralised supply, as the energy is also used to heat the heating circuit. In addition, heat losses are lower in a large heating water storage tank than in a small decentralised boiler, for example.
- Another advantage of centralised drinking water heating is that the technology can be combined with renewable heat sources, such as a solar water heating system, to further reduce operating costs.

Design example:

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

Here are a few tips for selecting ratiotherm drinking water heaters:

- 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.
- For multi-family residential buildings, the maximum domestic hot water demand or 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".

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

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

HEATING AND HOT WATER

Design example for 20 residential units based on various "n" factors according to the table opposite: Solution A, via

DHW heat demand

$$Q = 20 \text{ WE} \times 35 \text{ kW} \times \text{factor "n"}^{0.40} = 280 \text{ kW} \quad Q =$$

$$20 \text{ WE} \times 35 \text{ kW} \times \text{factor "n"}^{0.23} = 161 \text{ kW} \quad Q = 20$$

$$\text{WE} \times 35 \text{ kW} \times \text{factor "n"}^{0.17} = 119 \text{ kW}$$

Solution B, via DHW volume requirement

$$V = 20 \text{ WE} \times 9.6 \text{ L/min at } 60^\circ\text{C} \times \text{factor "n"}^{0.40} = 76.8 \text{ L/min at } 60^\circ\text{C} \quad V = 20 \text{ WE} \times$$

$$9.6 \text{ L/min at } 60^\circ\text{C} \times \text{factor "n"}^{0.23} = 44.6 \text{ L/min at } 60^\circ\text{C} \quad V = 20 \text{ WE} \times 9.6 \text{ L/min}$$

$$\text{at } 60^\circ\text{C} \times \text{factor "n"}^{0.17} = 32.6 \text{ L/min at } 60^\circ\text{C}$$

Heating water storage in stratified storage tank assuming 20 L/day/person; outlet temperature 60 °C: 20 L x 3.5 persons/weekend x 10 weekends = 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

Simultaneities:

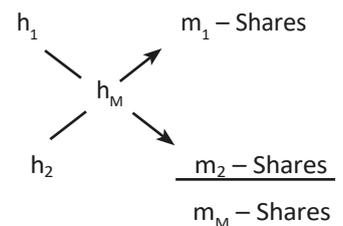
Mixed water formulas:

$$h_M = \frac{m_1 * h_1 + m_2 * h_2}{m_M}$$

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

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

Mixed water cross



m_1 = Cold water mass [kg]

h_1 = Cold water temperature [°C] m_2

= Hot water mass [kg]

h_2 = Hot water temperature [°C] m_M

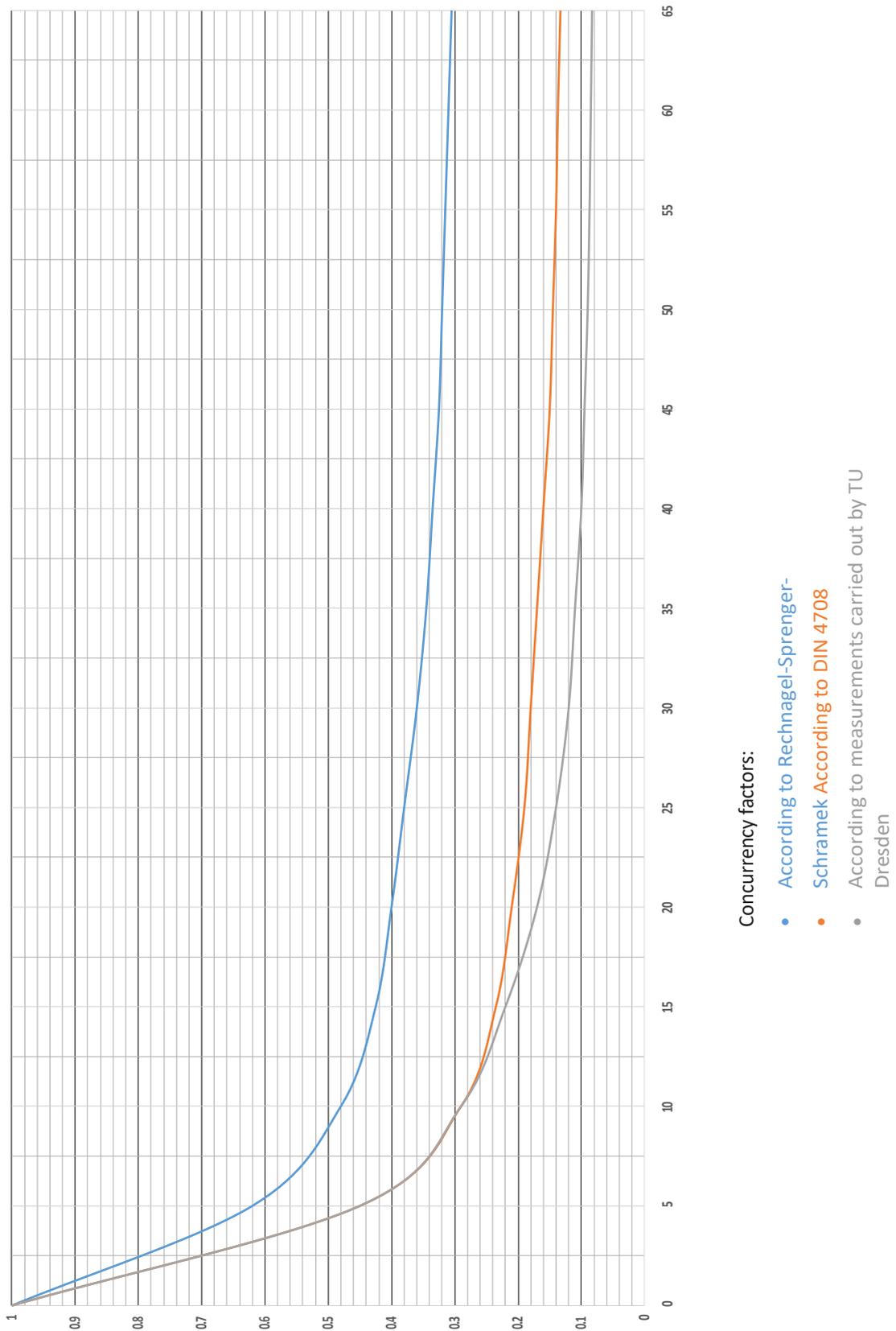
= Mixed water mass [kg]

h_M = Mixed water temperature [°C]

Central water heating systems based on the flow system for apartment buildings with 3–4 rooms, 3–4 persons and a full bath per apartment

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

HEATING AND HOT WATER



5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.1 COMPACT DRINKING WATER STATION (TWK)

Hygiene in drinking water is more important than ever. ratiotherm already uses its own fresh water systems with stratified storage technology.

It does not matter whether it is a single-family home or e.g. hotels, supplied with fresh hot water, the application is feasible.

Our drinking water solutions provide the right amount of fresh hot water for maximum efficiency and minimum

ADVANTAGES

- Fully assembled and insulated compact unit for minimal losses
- Energy savings of up to 15% by decoupling hot water preparation from the heating system, which is optimised for low water temperatures
- Fast and reliable heating of exactly the amount of water required
- Further energy savings by eliminating the need for legionella circuits in single-family homes
- Extremely short response times
- Perfectly technically matched to ratiotherm heating systems

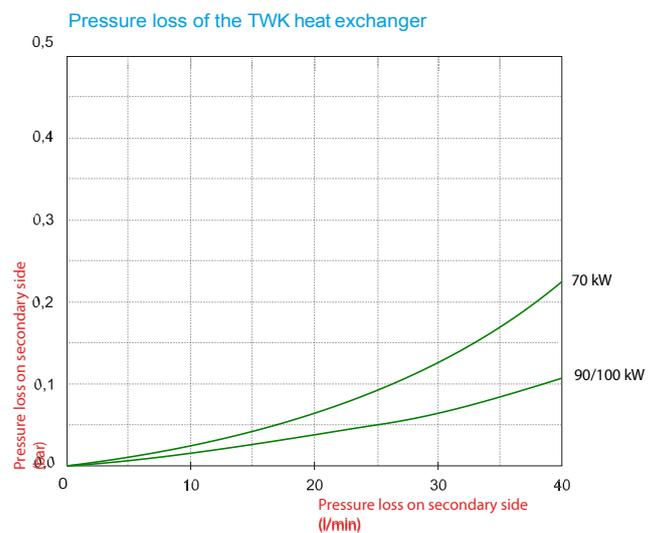
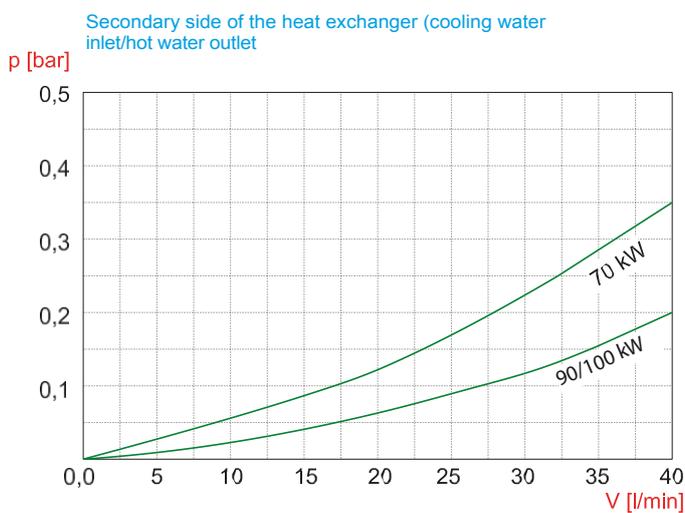


5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.1 DRINKING WATER COMPACT STATION (TWK)

1-stage drinking water heater TWK-S 70 with pre-control valve					
Heat output	80	98	70	78	kW
Hot water inlet	70	70	60	60	°C
Hot water outlet	24	14	21	15	°C
Cold water inlet	10	10	10	10	°C
Hot water outlet	60	40	50	40	°C
Hot water output	23	47	25	37	L/min
1-stage TWK-S 90 drinking water heater with pre-control valve					
Heat output	108	131	93	105	kW
Hot water inlet	70	70	60	60	°C
Hot water outlet	23	13	20	14	°C
Cold water inlet	10	10	10	10	°C
Hot water outlet	60	40	50	40	°C
Hot water output	31	63	33	51	L/min
1-stage drinking water heater TWK-S 100 without pre-control valve					
Heat output	120	146	103	118	kW
Hot water inlet	70	70	60	60	°C
Hot water outlet	24	13	20	15	°C
Cold water inlet	10	10	10	10	°C
Hot water outlet	60	40	50	40	°C
Hot water output	35	70	37	57	L/min

All connections DN 25, stainless steel heat exchanger available in CU or VA soldered



5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

applicable and recognised technical rules must be observed at all times!

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.2 DRINKING WATER CASCADE HEATING (TWKK)

Our drinking water cascade was developed especially for applications with increased fresh water requirements.

The cascade enables energy-optimised hot water production for hotels or larger residential buildings, for example.

Another advantage of the cascade is its high power reserve for high simultaneous usage. Circulation and disinfection are carried out very efficiently.

The system demonstrates its performance best in combination with an Oskar® stratified storage tank.



ADVANTAGES

- Fully assembled and insulated compact unit for minimal losses
- Energy savings of up to 15% by decoupling hot water production from the heating system, which is optimised for low water temperatures
- Fast and reliable heating of exactly the amount of water required
- Extremely short response times
- Perfectly technically matched to ratiotherm heating systems

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.2 DRINKING WATER CASCADE HEATING (TWKK)

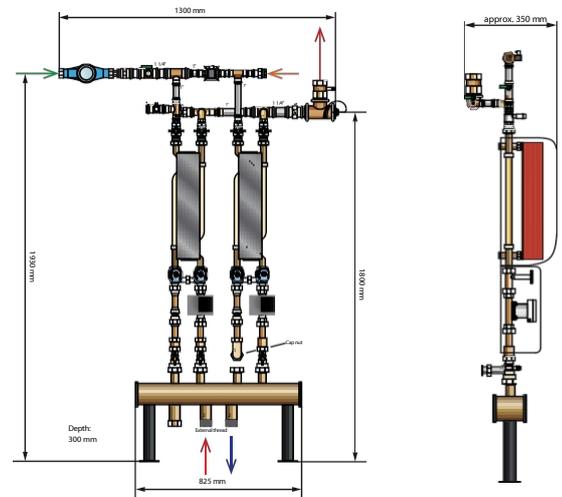
Technical data:

2-stage drinking water cascade heater TWKK-200

Heat output	239	292	206	235	kW
Hot water inlet	70	70	60	60	°C
Hot water outlet	24	13	20	15	°C
Cold water inlet	10	10	10	10	°C
Hot water outlet	60	40	50	40	°C
Hot water output	69	140	74	113	L/min

Connections

KW connection	A	DN 25	RAG	1
WW connection	B	DN 32	RIG	1 1/4"
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 Circ.	F	DN 25	ÜWM	1 1/2

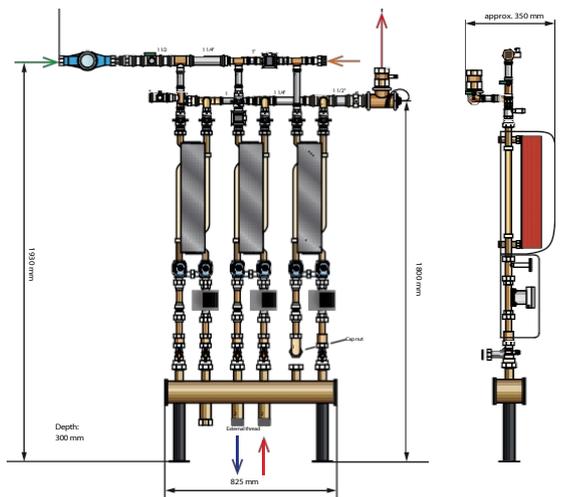


3-stage drinking water cascade heater TWKK-300

Heat output	359	43	309	352	kW
Hot water inlet	70	70	60	60	°C
Hot water outlet	24	13	20	15	°C
Cold water inlet	10	10	10	10	°C
Hot water outlet	60	40	50	40	°C
Hot water output	104	216	111	169	L/min

Connections

KW connection	A	DN 32	RAG	1 1/4
WW connection	B	DN 40	RIG	1 1/2"
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 Circ.	F	DN 25	ÜWM	1 1/2"

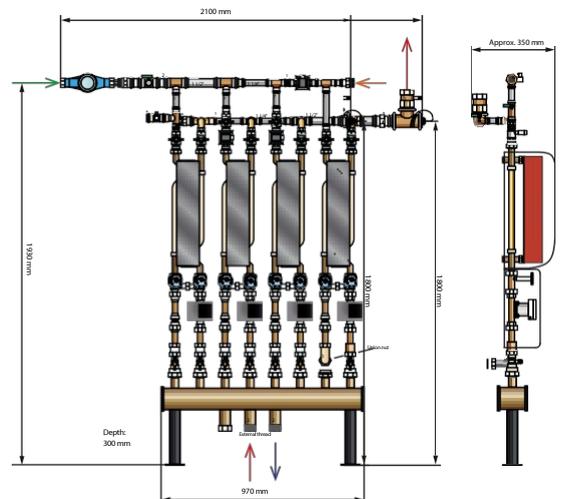


4-stage drinking water cascade heater TWKK-400

Heat output	478	584	412	470	kW
Hot water inlet	70	70	60	60	°C
Hot water outlet	24	13	20	15	°C
Cold water inlet	10	10	10	10	°C
Hot water outlet	60	40	50	40	°C
Hot water output	138	280	148	226	L/min

Connections

KW connection	A	DN 40	RAG	1 1/2
WW connection	B	DN 50	RIG	2
Circulation connection	C	DN 25	RIG	1
Heating water flow	D	DN 50	RAG	2
Heating water return flow	E	DN 50	RAG	2"
Heating water return Circ.	F	DN 25	ÜWM	1 1/2"



generally applicable and recognised rules of technology!

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

HEATING AND HOT WATER

Heating systems often have to perform two completely different tasks in the home. On the one hand, they provide heat to keep rooms at a comfortable temperature. On the other hand, they heat fresh water for bathing, showering, cooking and drinking. ratiotherm components for distributing heat to drinking water and radiators perform this task with maximum efficiency. We offer optimal solutions for centralised and decentralised hot water preparation.

Decentralised hot water preparation:

In addition to electrically operated boiler solutions, decentralised drinking water heating also includes apartment stations. Heating water flows through these stations, and the station installed in each residential unit distributes the heat as needed for space heating and hot water production. In larger rental properties in particular, property managers are often faced with the question: Which tenant has what consumption? How much heat? How much water? Apartment stations make it much easier to determine actual consumption, which is done using appropriately installed meters. There is no need to convert consumption quantities in a cumbersome manner that does not correspond to actual individual consumption based on square metres. The systems record individual consumption, which can then be billed per residential unit. Most systems are differential pressure-controlled. ratiotherm is already focusing on a future-oriented, holistic solution: electronic control as a complete heating system. This means that the apartment stations can be supplemented with electronic control and regulation technology. Cooperation with a software manufacturer has resulted in the development of a control technology that allows consumption data to be read automatically and centrally, significantly increasing time and cost efficiency. Of course, this control technology can do much more, such as preventive maintenance and targeted control of service calls.

What makes apartment stations part of modern heating and cooling systems:

- Drinking water is heated where it is needed: in the home. This eliminates the need for large centralised systems and works without hot water storage systems that are susceptible to Legionella bacteria. Hot water is always available in sufficient quantities.
- Precise and transparent: annual billing is based on actual consumption per home.
- Full control: the hottest drinking water temperature can be set individually.
- Those who want to can save money. With direct consumption billing, your own behaviour also has a direct impact on the costs incurred.



5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

HEATING AND HOT WATER

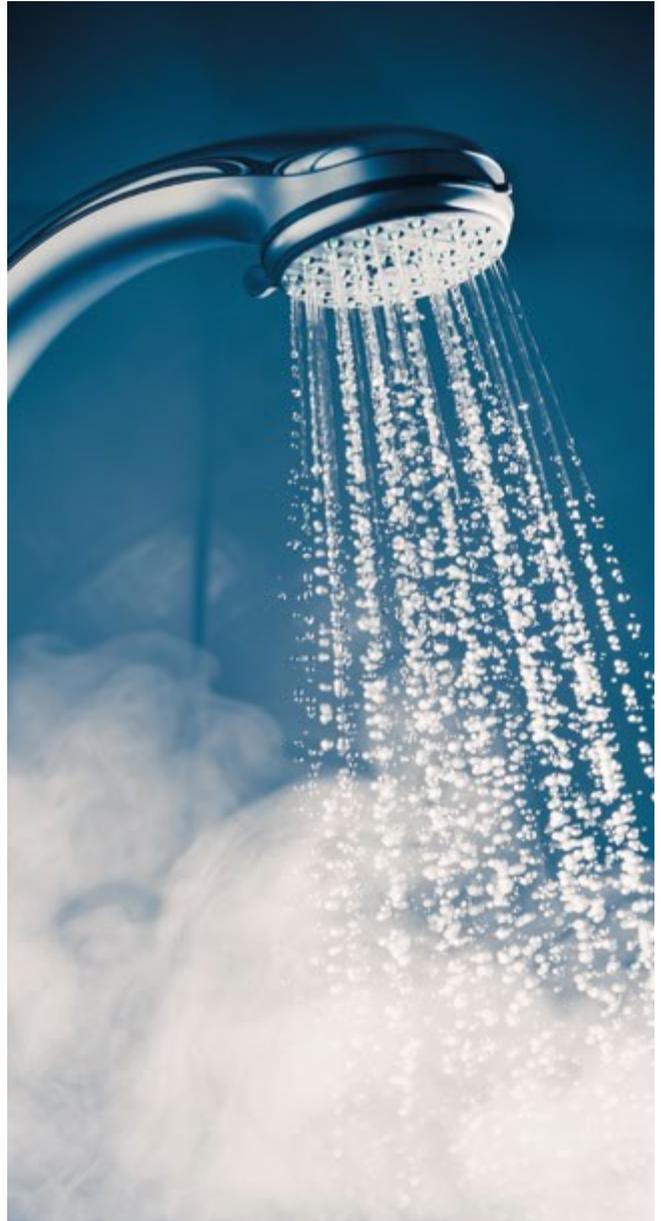
- Economical installation: no circulation or hot water pipes are required outside the flat.
- Variable and independent of the energy source: local or district heating, combined heat and power plants, solar thermal energy or geothermal energy can all be used as heat sources, either individually or in combination.

Legionella:

Drinking water is heated in all ratiotherm systems using the flow principle. During heating, it flows through a plate heat exchanger and is always in motion. If no water is drawn off, the amount of water remaining in the system is so small that it falls below the 3-litre rule according to DVGW. This is particularly important for landlords, as they are obliged as "commercial operators of large drinking water systems" to have their drinking water tested for Legionella once a year. With the right hydraulics, this test may not be necessary.

Saving on circulation through this decentralised water heating technology can result in a possible reduction in system temperature.

Note: A 1 °C lower flow temperature saves 2% fuel.



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5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.3 ELECTRONICALLY CONTROLLED APARTMENT STATION (EWS)

The ratiotherm EWS-18 CU or EWS-25 CU apartment station with electronic control enables energy-efficient and hygienic supply of hot and cold drinking water as well as heating water to an apartment.

With the aim of integrating clear and centralised operation of the entire system, ratiotherm is expanding its sensor technology to include a higher-level energy management system. This system collects information from individual units or several residential buildings managed by a property management company.

Automated billing, central fault management, central system logs with analysis: all these advantages, and more, can be conveniently organised from the office.

The energy management system, which is programmed with a self-learning algorithm, can also integrate weather forecast data into the heat generation strategy. This allows peak loads to be balanced out and further energy-saving potential to be generated.

The overall system includes a supplementary interface module for recording all relevant measurement parameters for each residential unit. This data is transferred to the central control system in real time and processed, ensuring efficient system operation with demand-based supply to each individual residential unit. One of the advantages of demand-based supply is that the overall system temperature can be reduced at defined times without any loss of comfort. This not only saves energy in the long term, but also reduces costs.

The central heat storage tank in the boiler room allows various heat sources to be integrated into the overall system. This means that renewable energies can also be easily integrated into the system. The use of heat pumps is particularly justified in such a system, as the system temperatures must be kept at a maximum of 60 °C. The reason for this is that the DVGW guideline on drinking water hygiene does not usually apply, as the subsequent supply pipes within the home usually remain below 3 litres in volume when properly planned.

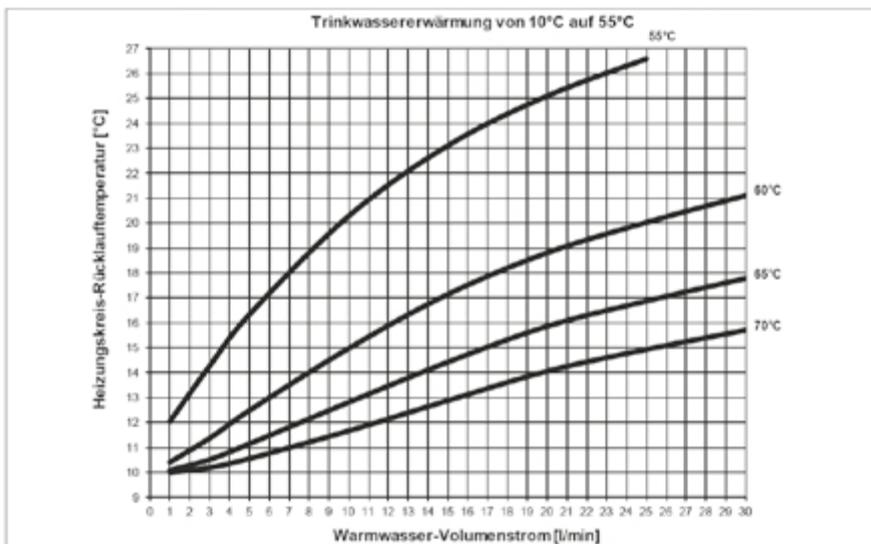
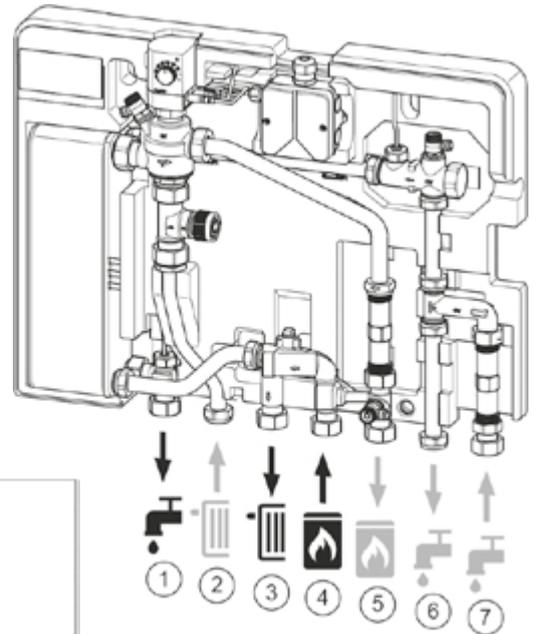


5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.3 ELECTRONICALLY CONTROLLED APARTMENT STATION (EWS)

EWS connection assignment

1	Hot water outlet Heating
2	circuit return Heating
3	circuit flow
4	Heating flow from stratified storage tank
5	Heating return from stratified storage tank
6	Cold water outlet
7	Cold water inlet from the house connection
Black	Hot water
Grey	Cold water or return



ADVANTAGES

- Fast and precise heat supply possible thanks to electronic communication between the central controller and the individual stations
- Data evaluations, such as automated billing or fault management, can be easily implemented using the energy management system (optional).
- Legionella protection is not necessary in many applications, as the drinking water is produced locally in the home.
- Compact unit completely pre-assembled on customer request
- Fast and reliable heating of exactly the required amount of water
- Automatic hydraulic balancing can be carried out in conjunction with room thermostats.

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.3 ELECTRONICALLY CONTROLLED APARTMENT STATION (EWS)

Technical data:

Electrical home station (EWS)	EWS-18 CU	EWS-25 CU	
Dimensions	455 x 600 x 110		H x W x D (mm)
Nominal pressure	PN16		
Maximum operating temperature	90		°C
Heat exchanger material	Stainless steel with CU solder (alternatively VA solder)		
Weight	20		kg
Max. operating pressure water	10		bar
Electrical connection			
Mains voltage	230 V/1~ /50 Hz		
Operating voltage	5 V DC (tolerance 10 %)		
Power consumption	0.15–3		W
Protection class	IP 44		
Heating circuit			
Medium	Heating water in accordance with DIN 1988-100, Fluoride category 1–3 (EN 1717:2000)		
Flow temperature min.	Set hot water target temperature		
Temperature sensor Heat meter	M 10 x 1 DIN EN 1434-2 Sensor type DS		
Max. volume flow (radiator)	600		L/h
Max. volume flow (surface heating)	1,200		L/h
Drinking water circuit			
Medium	Drinking water		
Adjustment range	40 to 70		°C
Hot water Volume flow max.	18	25	L/min

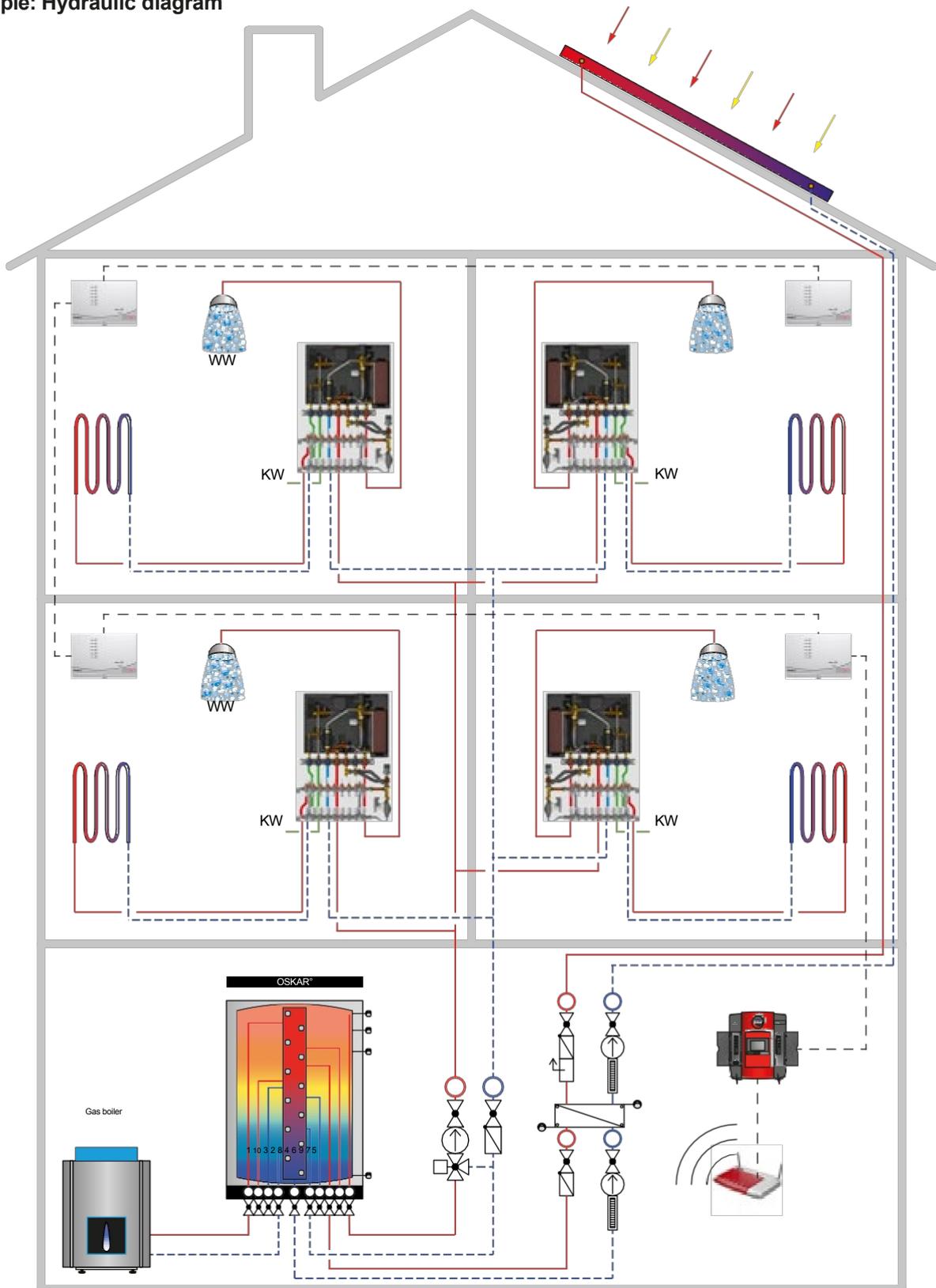
The EWS apartment station consists of the following components:

- Electronic controller with hot water setpoint adjustment 40–70 °C
- Heating circuit vent
- Control valve for large flow rates with integrated differential pressure regulator and priority circuit
- Zone valve for regulating the heating circuit
- Heating circuit return dirt trap
- plate heat exchanger, copper soldered
- Hot water temperature sensor
- Connection box for supply voltage
- Volume flow sensor
- Vent for drinking water circuit
- Connection option for the drinking water circulation module
- Adapter for heat meter
- Adapter for cold water meter
- Connection option for the temperature maintenance control set
- Dirt trap for heating flow
- Connection option for temperature sensor for heat meter M 10 x 1

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.3 ELECTRONICALLY CONTROLLED RESIDENTIAL STATION (EWS)

Example: Hydraulic diagram



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5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.3 ELECTRONICALLY CONTROLLED APARTMENT STATION (EWS)

Electronically controlled apartment station EWS-20-2 for decentralised hot water preparation in 2-pipe heating systems

The EWS-20-2 home station is designed for use with 2-pipe heating systems. This means that the heating flow and the flow for the drinking water stations are combined. The heating system is operated at a constant temperature throughout the year.

Not recommended for heat pump systems.

In summer mode, the supply pump is controlled via a bus connection to the boiler room. The number of taps open determines the speed of the central supply pump for the stations. If no tap is active, the pump is switched off completely. In this operating mode, only the keep-warm mode is active. In winter mode, the heating demand determines the speed of the pump.

The generously dimensioned drinking water heat exchanger enables a low flow temperature in the heat supply. This means that a 3 Kelvin increase is sufficient to achieve the desired tap temperature and maximum return cooling. If required, thermal disinfection can also be carried out using the ratiotherm apartment station.

Fittings for the installation of apartment meters for heat and water consumption are provided. Meters can also be pre-installed at the factory. The meter readings can be transferred to a building management system via an M-Bus interface in the meters. An app reading by the user can be enabled as an option.

The station is equipped with a leakage monitoring system. The slightest leak anywhere in the station triggers an alarm. The entire cold and hot water network in the home is also monitored. If water leaks uncontrollably, the alarm is also activated. The alarm can be transmitted via a LAN connection. The ratiotherm home station thus offers the greatest possible security to prevent water damage.

The stations are usually installed in wall niches and covered.

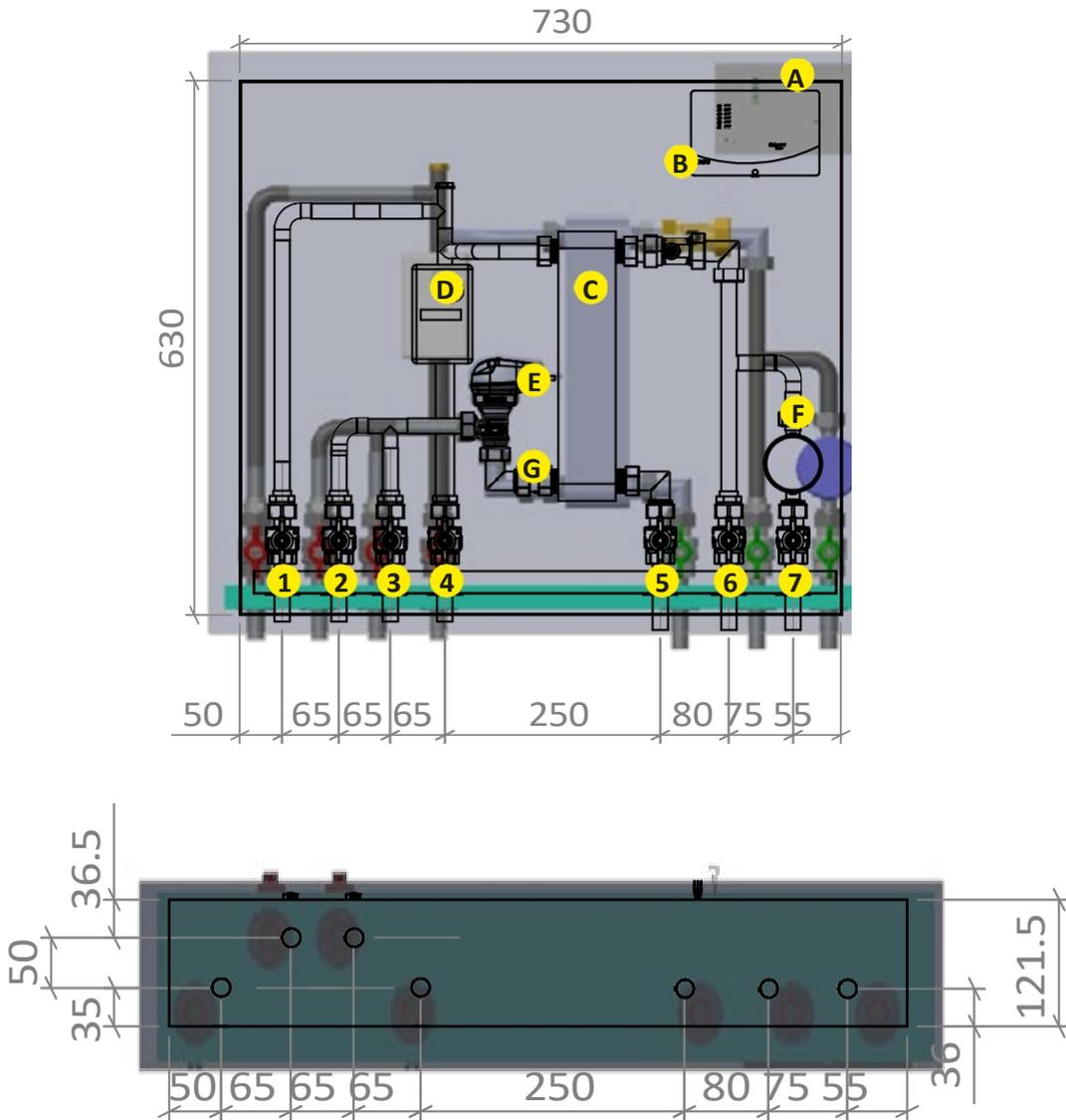
Tap capacity 20 litres per minute

- at HZL-VL 50 °C/RL 24 °C; KW 10 °C/WW 45 °C: – Pressure drop: 6 kPa
- Required volume flow for heating: 1,490 l/h at pressure drop: 9.2 kPa;
- Max. operating pressure: 16 bar

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.3 ELECTRONICALLY CONTROLLED APARTMENT STATION (EWS)

Electronically controlled home station EWS-20-2



1 Heating circuit return Apartment

2 Heating circuit flow, flat

3 Heating room/heat generator flow

4 Heating room/heat generator return flow

5 Domestic hot water in the flat

6 Domestic cold water in the home

7 Cold water supply line from the energy supplier

A Controller

B Flow turbine VTY

C VA-soldered heat exchanger

D Heat meter (optional)

E Electronic control valve

F Cold water meter (optional)

G Ultra-fast sensor

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.3 ELECTRONICALLY CONTROLLED APARTMENT STATION (EWS)

Electronically controlled apartment station EWS-20-3 for decentralised hot water preparation in conjunction with heat pump heating systems

The ratiotherm EWS 20-3 domestic station has been specially developed for heat pump systems.

A 3-pipe system separates the heating flow and the flow for the apartment station. This enables sliding operation of the heating system (high heating load) and constant operation for the hot water stations (low heating load). This mode of operation significantly reduces the load on the heat pump, which has a noticeable effect on energy consumption and service life.

The supply pump is controlled via a bus connection to the boiler room. The number of taps opened determines the speed of the central supply pump for the stations. If no tap is active, the pump is switched off completely. In this operating mode, only the keep-warm mode is active. Cooling can also be achieved via the heating system. The generously dimensioned drinking water heat exchanger enables a low flow temperature in the heat supply. This means that a 3 Kelvin increase is sufficient to achieve the desired tap temperature and maximum return cooling.

If required, thermal disinfection can be carried out using the ratiotherm home station. Fittings are provided for the installation of home meters for heat and water consumption. Meters can also be pre-installed at the factory.

The meter readings can be transferred to a building management system via an M-Bus interface in the meters.

An app for reading by the user can be enabled as an option.

The station is equipped with a leakage monitoring system.

The slightest leak anywhere in the station triggers an alarm. The entire cold and hot water network in the home is also monitored. If water leaks uncontrollably, the alarm is also activated. The alarm can be transmitted via a LAN connection. The ratiotherm home station thus offers the greatest possible security to prevent water damage.

The stations are usually installed in wall niches and covered.

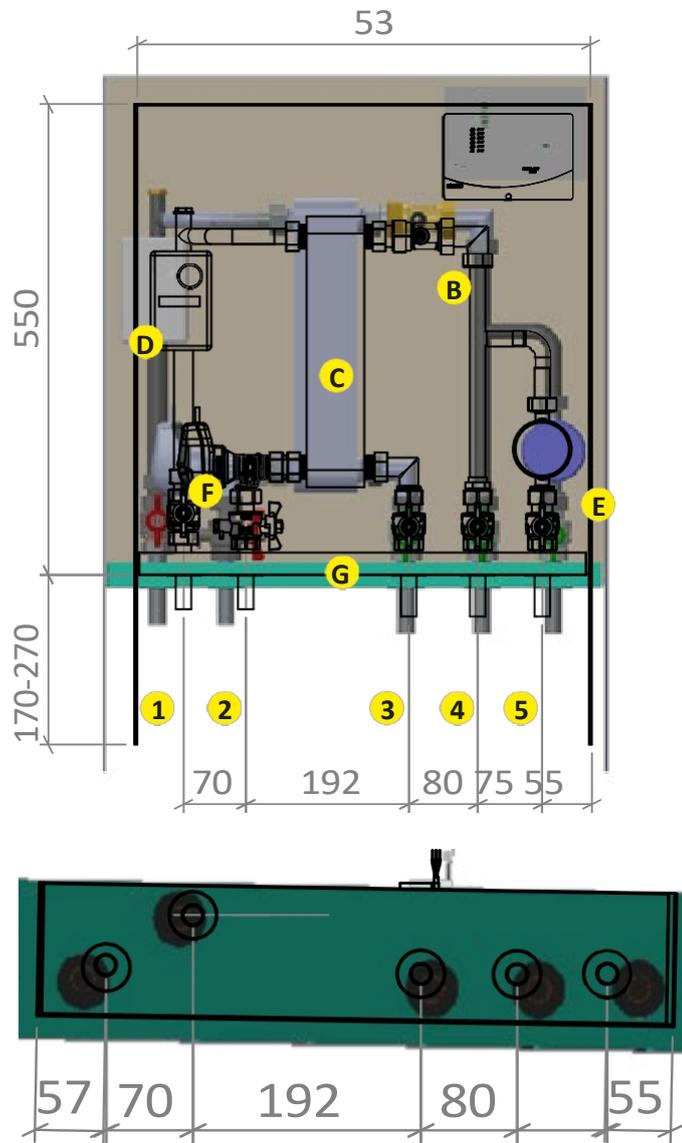
The apartment station consists of the following components:

- Generously dimensioned stainless steel soldered heat exchanger, fully insulated
- Electric control valve for maintaining a constant outlet temperature and maximum return cooling
- Shut-off valves on the heating and drinking water side
- Installation section for WMZ and cold water floor meters
- Electronic control unit ...
- Leak monitoring system for station and entire residential installation
- M-Bus ...

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.3 ELECTRONICALLY CONTROLLED APARTMENT STATION (EWS)

Electronically controlled apartment station EWS-20-3

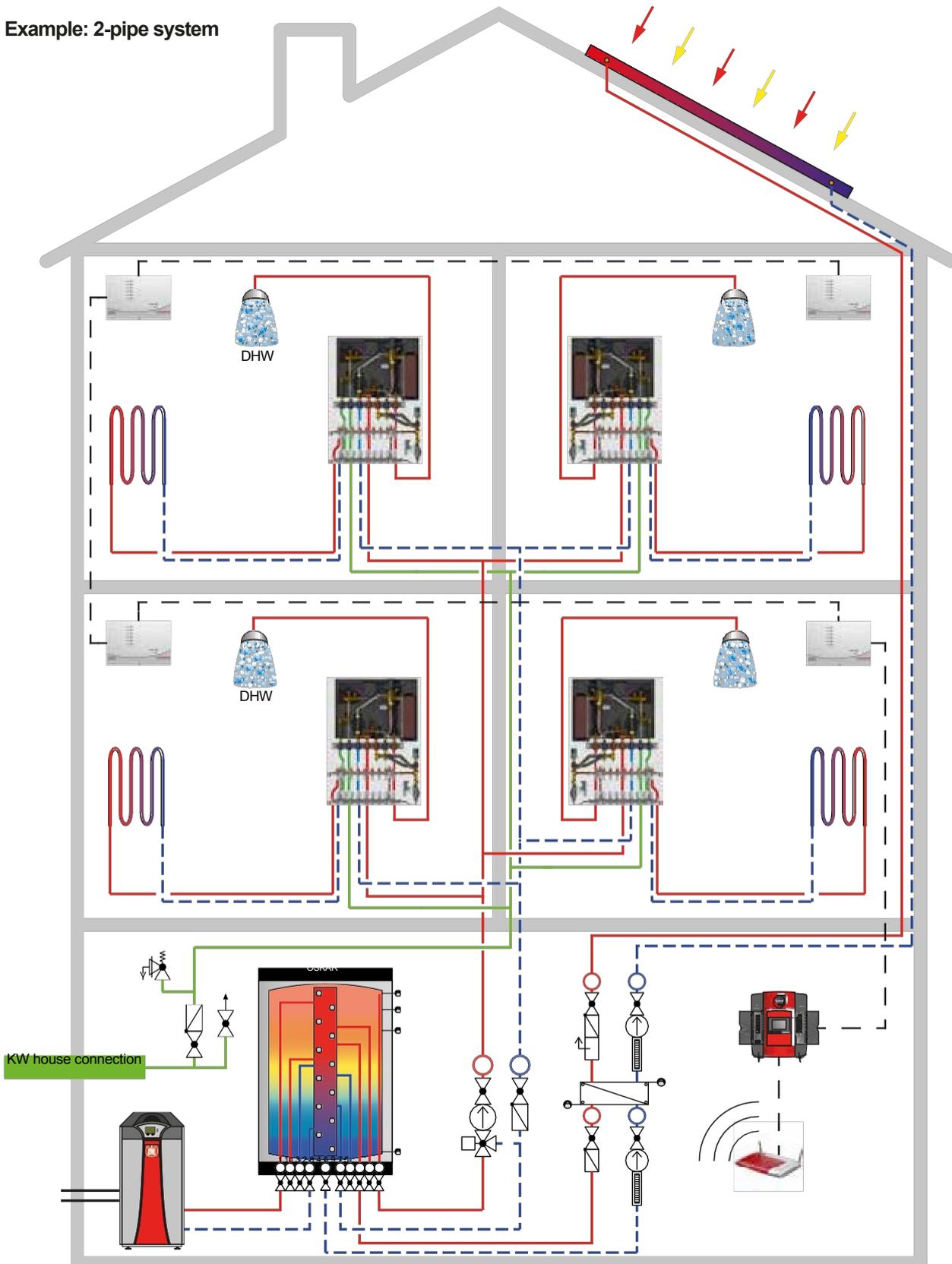


1	Return flow from boiler room / heat exchanger	A	Controller
2	Heating room flow / heat exchanger.	B	Flow turbine VTC
3	Domestic hot water	C	Heat exchanger VA soldered
4	Domestic – cold water	D	Heat meter (optional)
5	Cold water supply from the energy supplier	E	Cold water meter (optional)
		F	Electronic control valve
		G	Ultra-fast sensor

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.3 ELECTRONICALLY CONTROLLED RESIDENTIAL STATION (EWS)

Example: 2-pipe system



5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.4 FRESH WATER SYSTEM FWS-4

Our FWS-4 combines the advantages of fresh water technology in terms of hygiene and comfort with the advantages of a larger buffer volume for the heating system, as the boiler needs to start up much less frequently and therefore requires less fuel.

The FWS-4 can also be retrofitted or equipped with a radio-controlled heating element (fully modulating up to 3 kW) as an option. This option enables the integration of PV electricity and thus increases the proportion of self-generated electricity. A corresponding energy meter must be installed in the control cabinet, which sends a radio signal to the heating element.

The fresh water station consists of a buffer filled with heating water and the efficient compact drinking water station (TWK), which has proven itself over many years. In the compact overall system, a plate heat exchanger works on the counterflow principle, with warm heating water flowing through one side and fresh cold water through the other. The heating water transfers the required heat to the fresh water, heating it precisely and flexibly in exactly the amount required by the user, for maximum efficiency, minimum losses and absolute hygiene in drinking water production.



ADVANTAGES

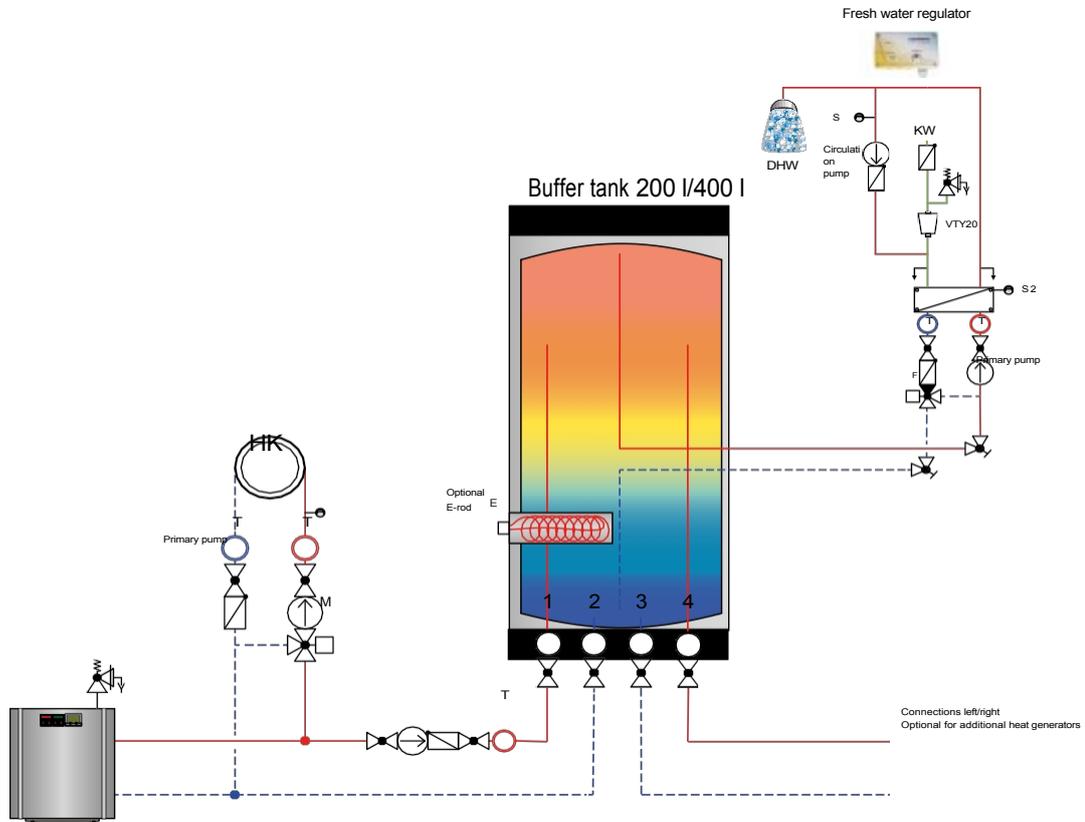
- Reduced cycling of the heat generator due to increased heating water volume
- Hygienic drinking water preparation
- Efficient hot water production using fresh water technology
- Easy installation thanks to pre-assembled components
- Integrated control of fresh water technology

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.4 FRESH WATER SYSTEM FWS-4

Technical data:

Fresh water system	FWS-4/200	FWS-4/400	
Nominal volume	200	400	litres
Actual volume	202	400	litres
Total height with insulation	1,900	1,900	mm
Height including adjustable feet	1,900–1,930	1,900–1,930	mm
Diameter without insulation	400	550	mm
Diameter with insulation	560	710	mm
Width including WE connections	610	760	mm
Depth + TW station	560+250	710+250	mm
Weight without insulation	50	60	kg
Maximum operating pressure	3		bar
Maximum operating temperature	95		°C
Pressure loss HWS/TWK	0.1		mWS
Storage connections	4 x DN 25 1"		RAG
Vent pipe	½"		RIG
Container material	St 37-2, primed on the outside, raw on the inside		
Sleeve for E-rod	1 ½		RIG
TWK connections	1		RIG



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ATTENTION! Installation and wiring must only be carried out by authorised specialists.

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

5.5 HEATING CIRCUIT SUPPLY

The ratiotherm product range is rounded off with the corresponding heating circuit groups in standard sizes from DN 25 to DN 50.

The high-quality components are precisely matched to each other and, in combination with ratiotherm's system technology, ensure efficient heat supply and distribution.

Specific special solutions are also available on request for project applications.



ADVANTAGES

- Fully assembled and insulated compact unit for minimal losses
- Minimal energy consumption of the entire system thanks to highly efficient pump technology
- Technically ideally matched to ratiotherm heating systems

5. CENTRALISED AND DECENTRALISED SUPPLY & DISTRIBUTION

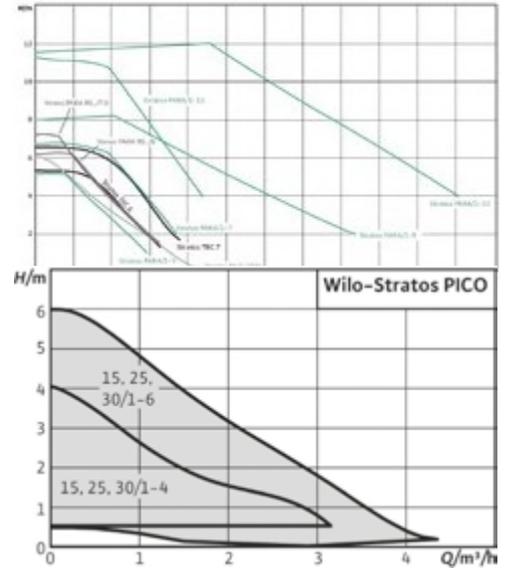
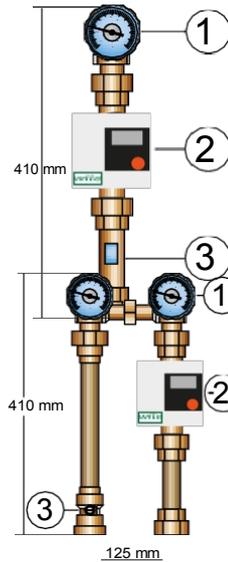
5.5 HEATING CIRCUIT SUPPLY

Technical data:

All heating circuit types are supplied with block insulation and are ideally suited for direct installation on the ABV 1 or ABV 2 extension manifolds. Other heating circuit variants, such as boiler return flow elevation, system separations or storage stations for additional external buffer tanks, are available on request.

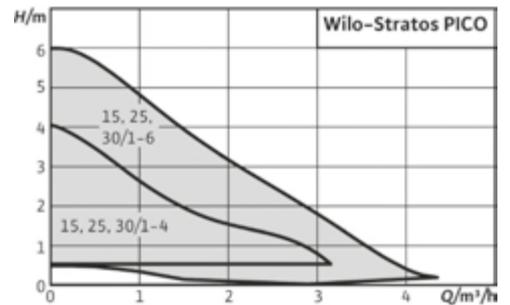
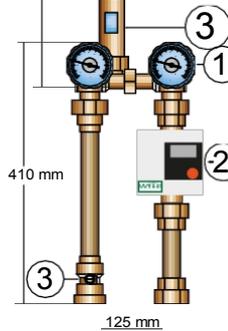
Single-line pump

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



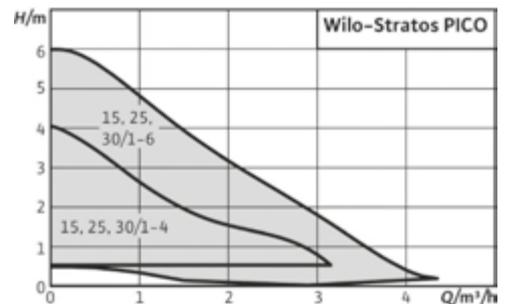
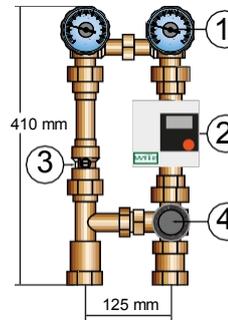
Unregulated heating circuit UK

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



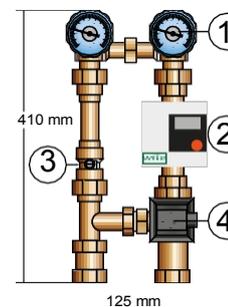
Fixed value controlled heating circuit FK

- 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 to 50°C



Controlled heating circuit MK (DN 25 or 32)

- 1 Thermometer with built-in ball valve
- 2 BL 180 circulation pump
- 3 Gravity brake with manual release
- 4 Three-way mixing valve with servomotor



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6. CONTROL TECHNOLOGY

6.1 INDIVIDUAL PROGRAMMING

For a heating system to run smoothly, the individual components of the system must work well together. In addition to the high-quality technical components from ratiotherm, this is ensured by intelligent control technology that is tailored to the project. The heat can then be distributed optimally throughout the house, significantly increasing living comfort. At the same time, energy can be saved, which translates into cash savings.

Do you need flexible control technology for large, medium or small projects?

ratiotherm offers solution components and integrated systems for individual rooms and entire buildings, for distributed branches and properties or individual buildings, as well as for special building types and industries. From pre-programmed standard controllers to freely programmable controllers, ratiotherm's control technology is characterised by a diverse and coordinated range of high-performance hardware and software products.

Thanks to the simple integration of third-party systems and rapid project planning based on our many years of experience, we offer you a real advantage, enabling you to implement your building technology projects quickly and with the highest possible efficiency.



6. CONTROL TECHNOLOGY

6.1 CENTRAL CONTROLLER 16 x 2

In addition to all the control accessories required for recording operating parameters in buildings, the ratiotherm controller range primarily includes the rZR16x2 central controller as the control centre and brain of the building services.

The control system offers maximum flexibility and is supplied in the basic version with 16 inputs and outputs.

The system can be expanded and supplemented with appropriate extension modules. Various interface modules allow signals to be exchanged between different BUS systems.



ADVANTAGES

- Pre-configured programming, only parameters need to be adjusted on site
- Software optimised for the consistent avoidance of energy losses and increased renewable energy gains
- Maximum flexibility thanks to freely configurable inputs and outputs and corresponding expansion options for managing additional sensors and actuators

! This information is subject to errors and changes. Compliance with generally applicable and recognised technical rules must be observed at all times!

ATTENTION! Installation and wiring must only be carried out by authorised specialists.

6. CONTROL TECHNOLOGY

6.1 CENTRAL CONTROLLER 16 x 2

Planning notes:

To avoid fluctuations in measured values, ensure that signal transmission is free from interference so that the sensor cables are not exposed to external negative influences from 230 V cables:

- The sensor cables must not be routed together with the mains voltage in a single cable.
- When using unshielded cables, sensor cables and 230 V mains cables must be laid in separate or partitioned cable ducts and at a minimum distance of 5 cm.
- Sensor cables for PT100 or PT500 sensors must be shielded.
- All sensor cables with a cross-section of 0.5 mm² can be extended up to 50 m. With this cable length and a Pt1000 temperature sensor, the measurement error is approx. +1 K. For longer cables or a lower measurement error, a correspondingly larger cross-section is required.

Brief overview of control modules:

Below is a selection of the most common controllers from the ratiotherm product portfolio – however, customised solutions are also standard, so please contact us directly if required.

Control technology – accessories	
rZR16x2withstandard programme	Central control unit for operating all downstream control elements . See next page for separate description.
Room setpoint transmitter – RSG	Available in various versions and designs (wireless, with display, etc.) Room remote
control RFB	4.3" touch display for controlling the central controller (same operating concept), additional programming of any screen pages possible
CAN Touch module	10" LCD display for convenient control of the central controller RSM 610 expansion in separate plastic housing or plug-in circuit board version, with 6 inputs and 4 outputs
Additional module ZM-01 (CAN-I/O45) inseparateplastic housing	with 4 inputs and 5 outputs (3x relays, 2x multifunction 0-10V or PWM)
WNA router	Extension of the C.M.I. module (WLAN connection or UMTS stick)
C.M.I. in plastic housing or as design	interface for convenient system monitoring, remote control, plug-in data log circuit board and visualisation of all ratiotherm controllers with DL and CAN bus.
Bus converter(Basic module)	Expansion modules for KNX and Modbus are also available from ratiotherm. from ratiotherm.
Fresh water station controllerFWR22	Controller for controlling a compact drinking water heater using PWM signal and circulation pump control
Volume flow pulse generator	in mechanical or electronic design
CAN energy meter	The meter records electrical and thermal energy quantities. The electrical measuring unit records current, voltage, cos phi, reactive, active and apparent power for all 3 phases. On the heating side, several heat meters can be recorded.
Valve actuators	available in various versions (on/off, 0-10 volts, radio)

6. CONTROL TECHNOLOGY

6.1 CENTRAL CONTROLLER 16 x 2

Specification of the central controller inputs

All inputs	Temperature sensors of types PT1000 (standard sensor for ratiotherm), KTY 10 (2 k Ω /25 °C), KTY 10 (1 k Ω /25 °C), PT100, PT500, Ni1000, Ni1000TK5000 and room sensors RAS or RASPT, radiation sensor GBS01, thermocouple THEL, humidity sensor RFS, rain sensor RES01, pulses max. 10 Hz, voltage up to 3.3 V DC, resistance (1–100 k Ω), and as digital input
input 7	additional voltage (0–10 volts DC)
Input 8	additional current loop (4–20 mA DC), voltage (0–10 volts DC)
Inputs 15, 16	Additional pulse input max. 20 Hz, e.g. for volume flow sensor VIG or SO signals

Specification of the outputs of the central controller

1, 2, 3, 4, 6, 7, 8, 9, 10, 11	Relay outputs, some normally closed and normally open (max. switching capacity 230 volts/3 amps)
Output 5 (12, 13 optional)	Relay changeover contact – potential-free
Outputs 12, 13, 14, 15, 16	Analogue outputs 0–10 volts (max. 20 mA) or PWM (10 V/1 kHz) or expansion option as switching outputs via additional relays
Max. bus load (DL bus)	100
CAN bus	Standard data rate 50 kbit/s, adjustable from 5 to 500 kbit/s
Differential temperatures	with separate switch-on and switch-off difference
Threshold values	with separate switch-on and switch-off differential or with fixed hysteresis
Temperature measuring range	–49.9 °C to +249.9 °C with a resolution of 0.1 K
Temperature accuracy	typ. 0.4 K, max. \pm 1 K in the range from 0 to 100 °C for PT1000 sensors
Voltage accuracy	Typ. 1%, max. 5% of the maximum measuring range of the input

Control cabinet project planning:

For many larger-scale projects, the control technology required is significantly more extensive and complex than can be represented by a single central controller. For such projects, it is necessary to deviate from the standard and design and manufacture a complete control cabinet with the necessary switching and control technology. In most cases, such systems are also equipped with higher-level control technology or energy management software. To this end, ratiotherm offers relevant experience in this sector in many project references from industry and local heating.

Example: local heating

Complete control of the heating centre with five different generators: CHP, gas boiler, solar thermal system, CO₂ heat pump, as well as the decentralised heat pumps within the cold network in the buildings of local heating customers. The control technology and visualisation of the entire process landscape is carried out using the SiMon energy management software developed in cooperation with a software company and ratiotherm (see the following chapter for details).

Planning guide_2020.11-wi – All information, images and drawings are subject to errors and changes. Compliance with generally applicable and recognised technical rules must be observed at all times!

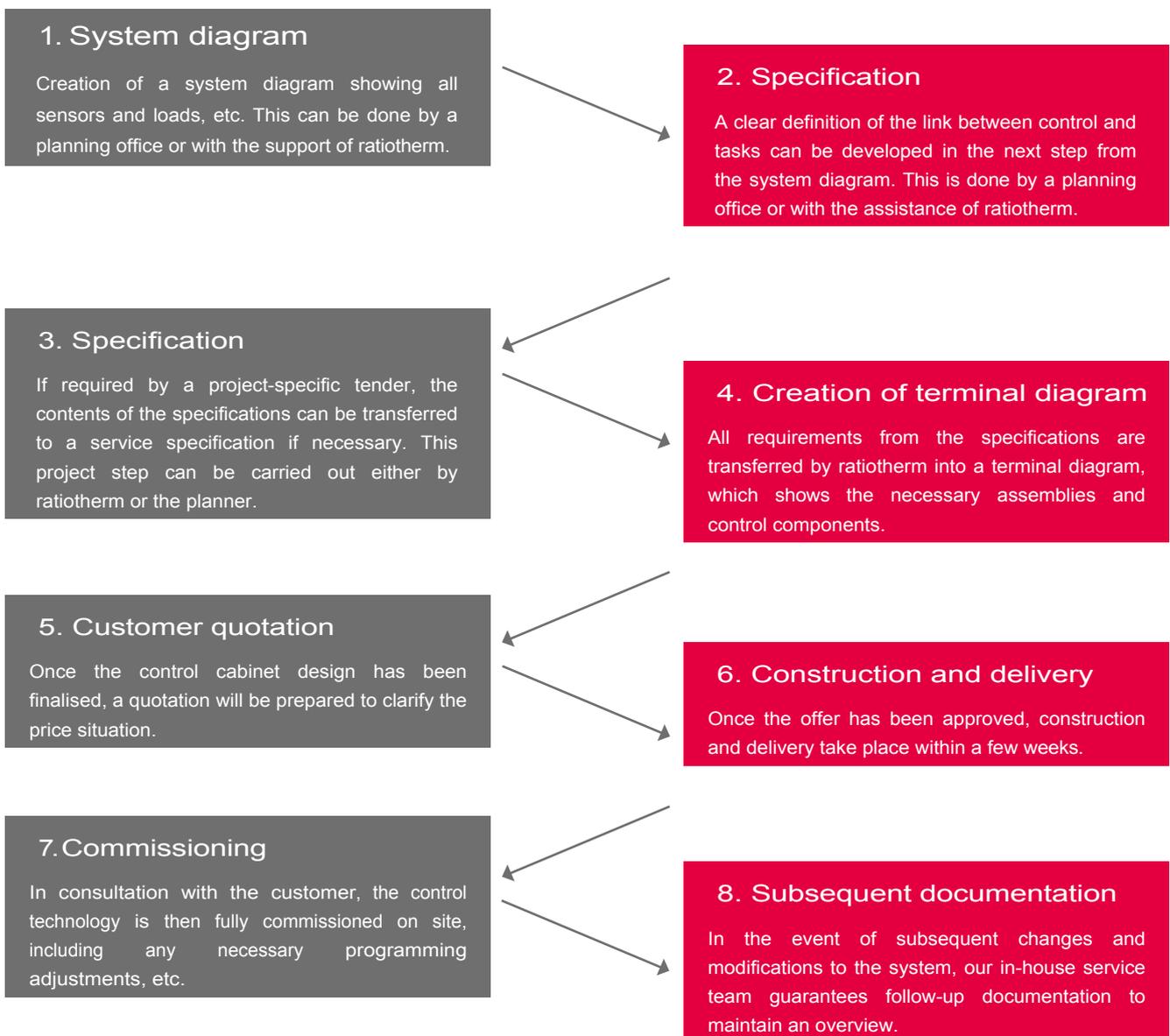
6. CONTROL TECHNOLOGY

6.1 CENTRAL CONTROLLER 16 x 2

Example: Industry/commerce:

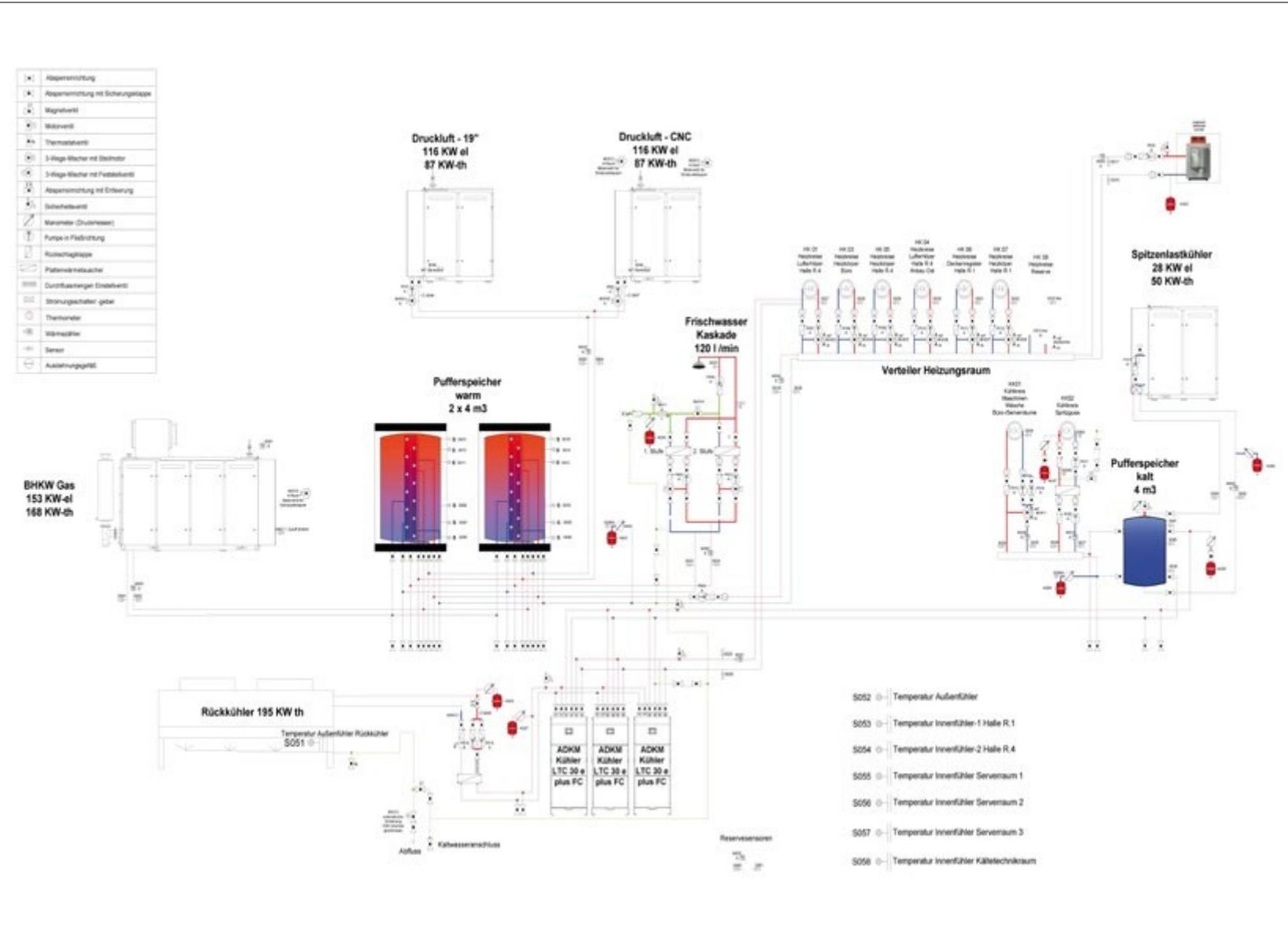
In this application, the entire control technology is divided between two control cabinets, which are networked with each other and located in different areas of the building for functional reasons. The in-house SiMon control software visualises and manages a wide variety of heating and cooling generators. These include a CHP unit, peak load boiler, heat recovery from a compressed air system, several heating and cooling circuits, an adsorption chiller, peak load cooler, individual room control for the offices and other control tasks such as fault management, etc.

Below is an overview of the process for such a project:



6. CONTROL TECHNOLOGY

6.1 CENTRAL CONTROLLER 16 x 2



	Shut-off device		Shut-off device with drain		Plate heat exchanger		Sensor
	Shut-off device with safety flap		Safety valve		Flow rates Adjusting valve		Expansion vessel
	Engine valve		Pressure gauge		Flow switch / parameter		Drain
	3-way mixer with servomotor		Pump in flow direction		Thermometer		
	3-way mixer with locking valve		Non-return valve		Heat meter		

Plan designation: Plant diagram for commercial hall
Diagram no.:

Name	Date
Signed	
Tested	
Changed	
Changed	

Please note: This diagram is only a recommendation and does not claim to be complete in any respect.

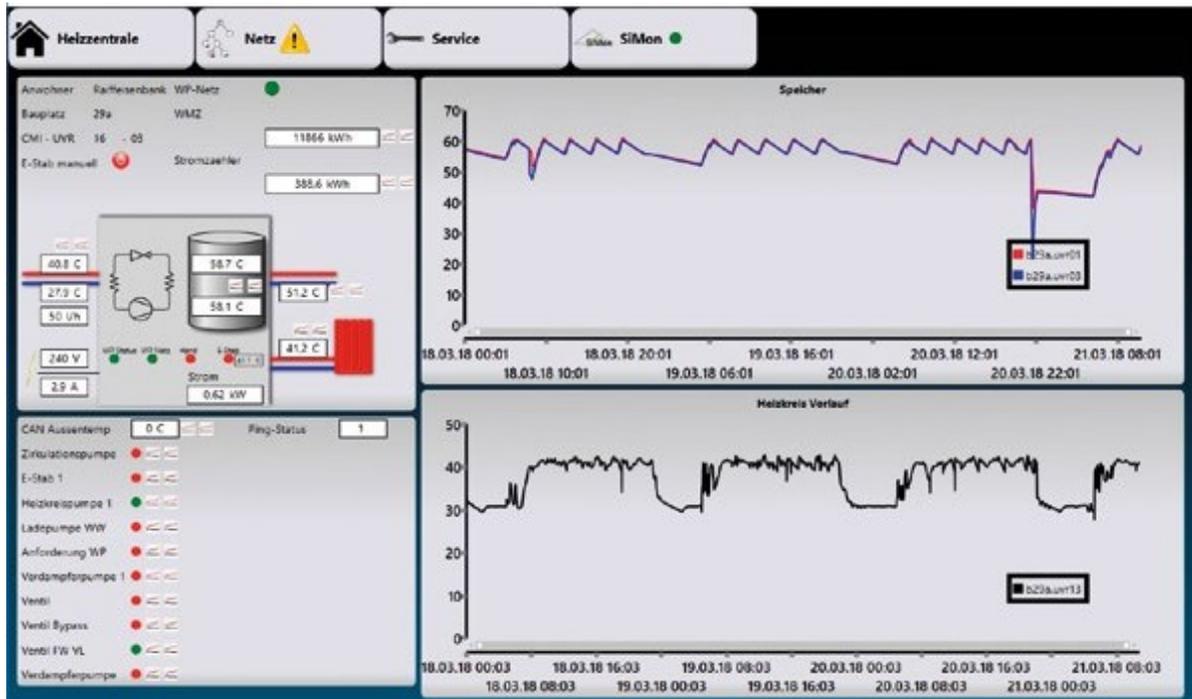


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ATTENTION! Installation and wiring may only be carried out by authorised specialist personnel.

6. CONTROL TECHNOLOGY

6.2 SIMON ENERGY MANAGEMENT SOFTWARE

SiMon is a freely programmable software that intelligently monitors and/or controls energy systems. It can record any number of data points in real time. Its main feature is the integrated, self-learning optimisation function based on artificial intelligence. Past data is analysed to derive generation strategies for the future, supplemented with forecast data. In conjunction with integrated function modules, such as weather forecasts or sun position calculations, the economic efficiency of a local heating network or the heating system of a larger building can be significantly optimised.



ADVANTAGES

- Open architecture guarantees unlimited adaptation to existing and future infrastructures
- Automatic billing procedure, e.g. from heat meters in central systems
- Complete fault management of the entire system at a central location
- Comprehensive and centralised documentation of all system data, measuring points and fault messages

6. CONTROL TECHNOLOGY

6.2 SIMON ENERGY MANAGEMENT SOFTWARE

DATA RETENTION

- Real-time recording of any data sources
- Archiving of databases
- Evaluation of historical data
- Connection to cloud data

MONITORING

- Permanent monitoring of incoming data
- Detection of fault messages and errors
- Automatic data analysis to identify deviations
- Information via e-mail, SMS, etc.

VISUALISATION

- Visualisation of any processes and data at a central location or via the Internet
- Evaluation and availability of historical data
- Configuration of any graphical user interface

DATA EXPORT

- Collection and provision of data e.g. as a basis for energy management systems or energy audits
- Archiving or export to external files

OPTIMISATION

- Evaluation of collected data using self-learning algorithms
- Intelligent control of connected components

CONTROL

- Event-oriented control
- Control of any IO components
- Mapping of any number of logic functions and mathematical functions
- Management of any number of macros

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6. CONTROL TECHNOLOGY

6.2 SIMON ENERGY MANAGEMENT SOFTWARE

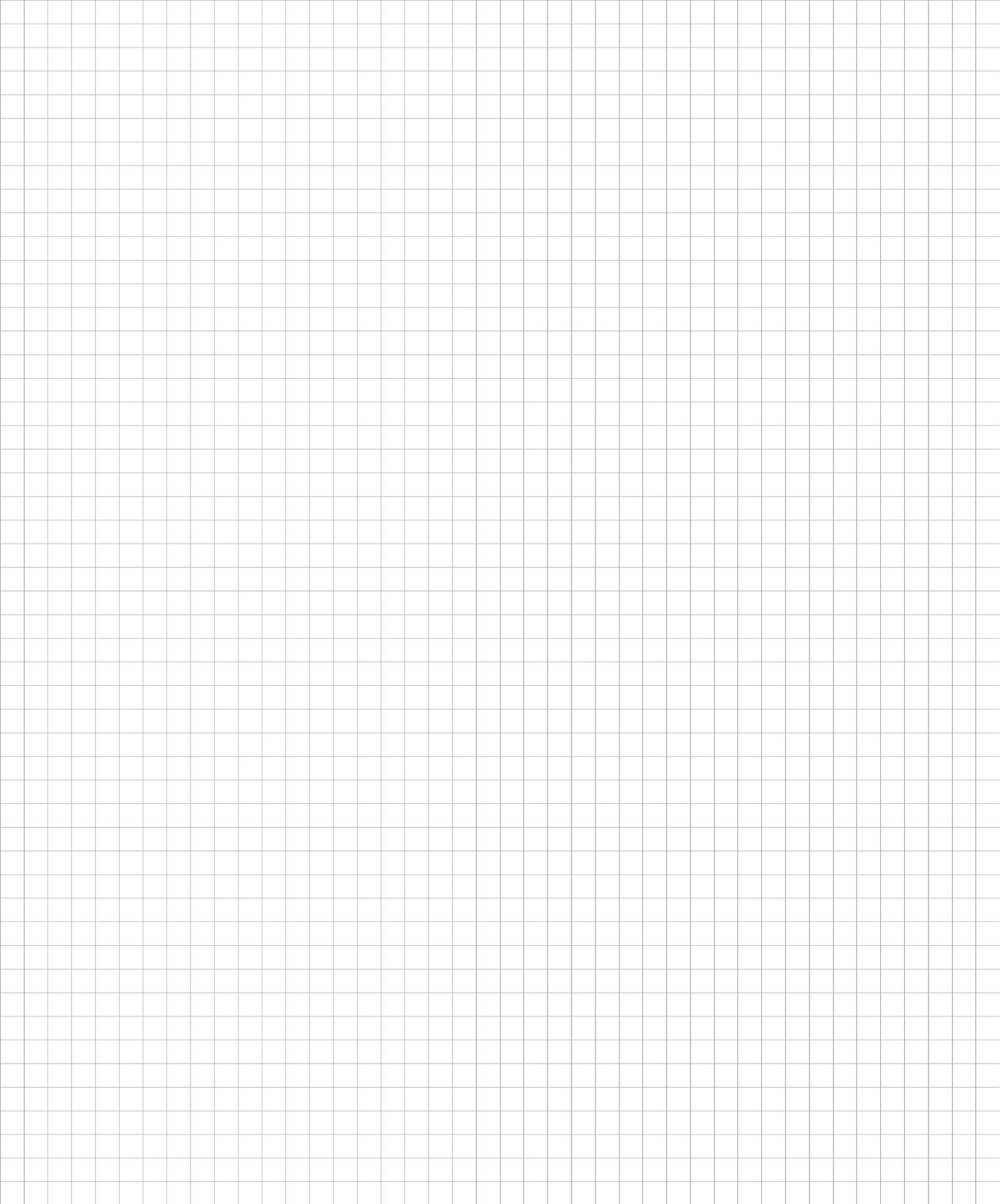
Overview of variants SCADA energy management software SiMon:

Version	SiMon Home	SiMon Home Advanced x	SiMon Complex	SiMon Neighbourhood
SiMon software licence	x		x	x
Maximum number data points	10,000	50,000 ¹	unlimited ¹	Unlimited ¹
history records	Max. 200 data points at 10,000 each history values	max. 2,000 ¹ Data points of 10,000 each history values	Unlimited ¹	Unlimited ¹
Audit-proof storage Data storage	/	/	possible	possible
Optimisation	/	/	Automated data analysis integrated and usable in all programming (macros)	
Artificial intelligence	/	/	/	Integrated and usable in all programming (macros)
Redundant installation for high availability	/	/	/	possible

Typical areas of application:

Version	
SiMon Home	Control, monitoring and visualisation of systems with low programming requirements
SiMon Home Advanced	Control, monitoring and visualisation of systems with low programming requirements but a higher number of data points
SiMon Complex	Control, monitoring and visualisation of systems in industrial environments with advanced programming requirements
SiMon Quartier	Control of complex systems with high automation and optimisation requirements and reliability, such as: <ul style="list-style-type: none"> • Local heating networks • e-mobility infrastructure

¹) Maximum number of possible data points, as far as the available storage space allows



You can find us here



ratiotherm

Smart Energy Systems

ratiotherm GmbH & Co. KG

Wellheimer Straße 34

91795 Dollnstein

T +49 (0) 84 22.99 77-70

F +49 (0) 84 22.99 77-30

vertrieb@ratiotherm.de www.ratiotherm.de

We are a member of:

bwp Bundesverband
Wärmepumpe e.V.


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