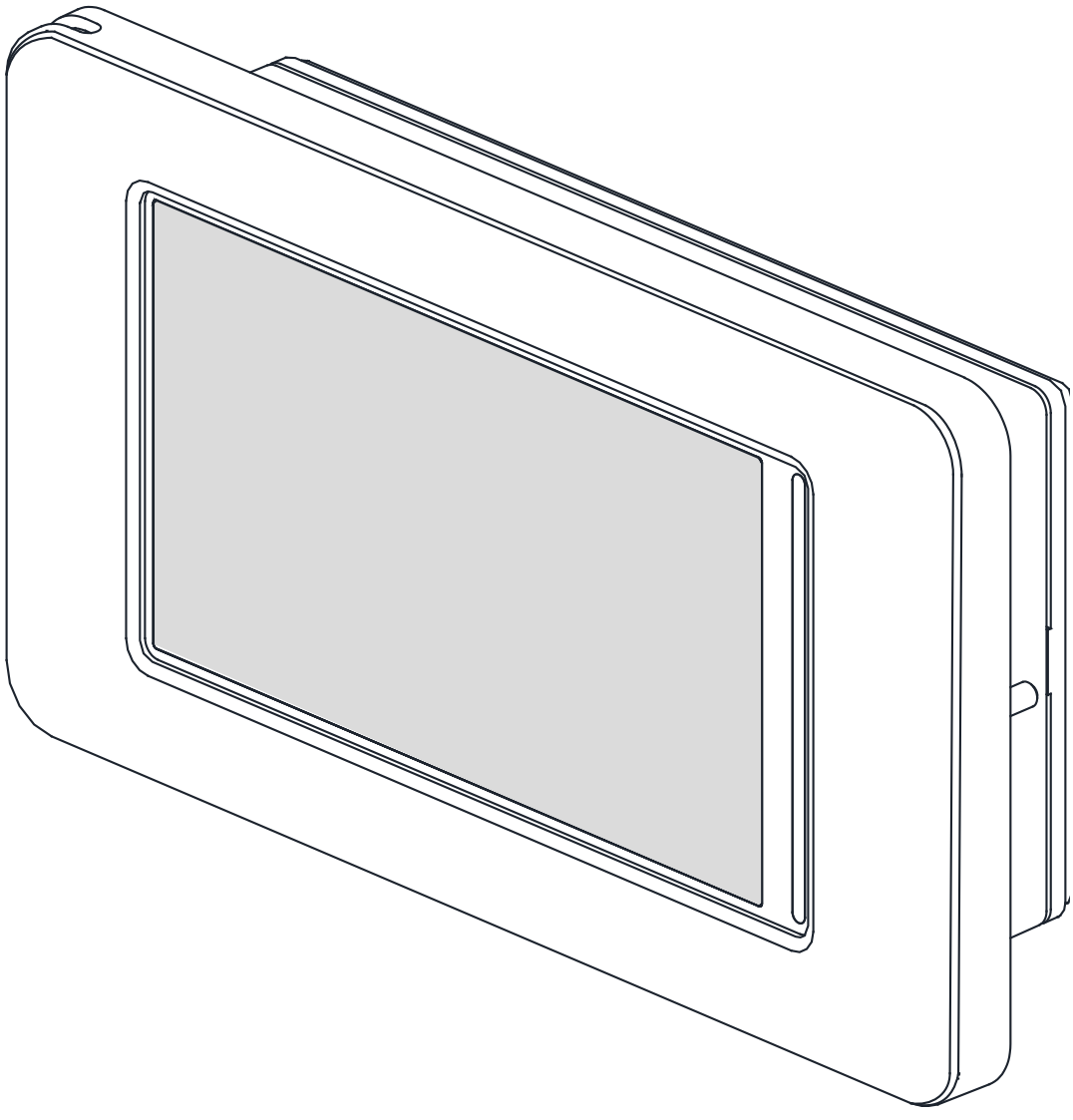
–weishaupt–

manual

Installation and operating instructions



Cascade controller WPM 6.0 operation

83324802 · 1/2022-02

1 User instructions

1.1 General

The installation and operating instructions must be observed during installation, operation and maintenance. This device may only be installed and repaired by trained specialists. Incorrect repairs can result in significant danger for the user. According to the valid regulations, the installation and operating instructions must be available at all times and be handed over to the specialist for their information when working on the device. We therefore ask that the instructions be handed over to the new tenant or owner when moving house. If there is visible damage on the device, it must not be connected. In this case, always consult with the supplier. Ensure that only genuine spare parts are used to avoid consequential damage. Environmentally-relevant requirements with regard to recovery, reuse and disposal of operating materials and components in accordance with the valid standards must be observed.

1.2 Regulations and safety notes!

- Adjustment work inside the device may only be carried out by an approved installer.
- The cascade controller may only be operated in dry rooms with temperatures between 0 °C and 35 °C. Condensation is not permitted.
- In order to guarantee that the frost protection function on the heat pump works correctly, the cascade controller must not be deenergised and there must be a flow through the heat pump.

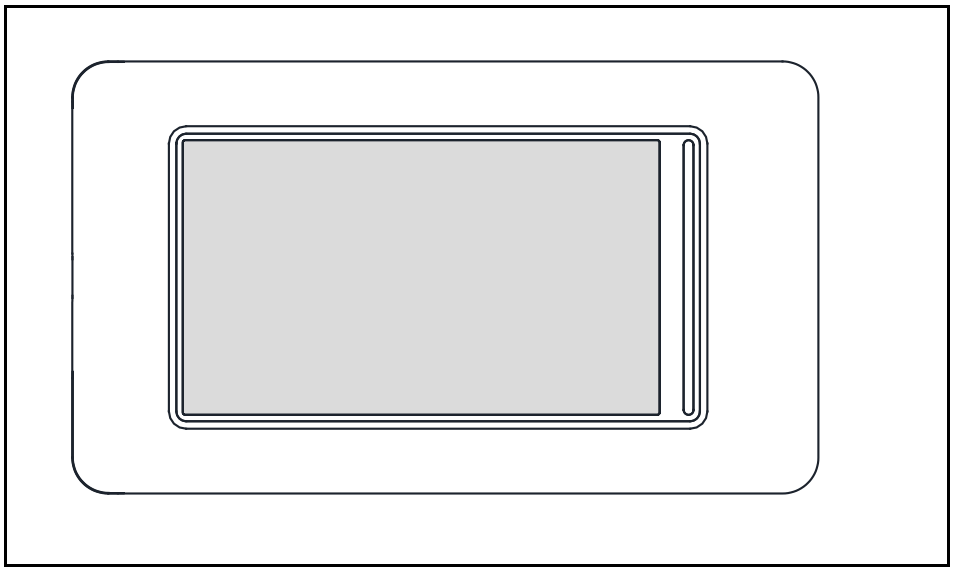
1.3 Symbols

 **DANGER**	Immediate danger with high risk. Failure to observe will result in severe injury or death.
 **WARNING**	Danger with moderate risk. Failure to observe can result in environmental damage, severe injury or death.
 **CAUTION**	Danger with low risk. Failure to observe can result in material damage or minor to moderate injury.
	Important note

2 Operation

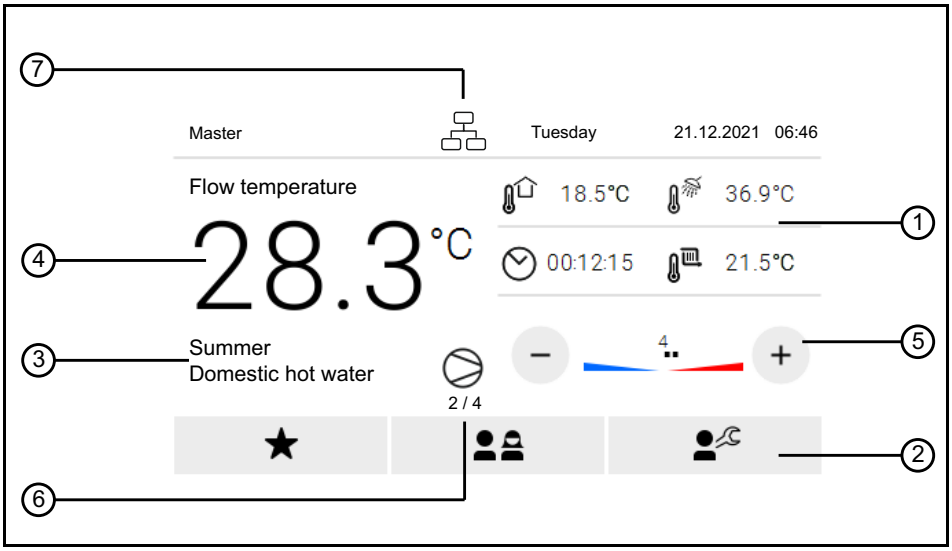
The cascade controller is essential for parallel control of up to 14 air, brine or water-to-water heat pumps and a 2nd heat generator. The cascade controller enables up to 28 performance levels of a monovalent or up to 29 performance levels of a mono energy or bivalent heat pump heating system to be controlled. The status values are displayed in plain text on the touch display.

2.1 Display and operating unit



2.2 Display

Start screen



①	Information ▪ Outside temperature ▪ Domestic hot water temperature ▪ Elapsed time ▪ Return temperature
②	Level selection ▪ ★ Favourites level ▪ User level ▪ Expert level
③	Status and operating mode display
④	Flow temperature
⑤	Hotter/colder Heating curve shift
⑥	▪ 2 / 4 Compressor “On” Value 1: Number of compressors currently used for requirement Value 2: Number of compressors currently available for requirement ▪ Compressor and 2nd heat generator “On” ▪ 2nd heat generator “On”
⑦	▪ Connection status to cascade controller

3 Favourites level

Oper. mode	Select the operating mode. The “Auto” operating mode can only be selected if operating mode switching depending on outside temperature is activated at the expert level.	**Auto** Summer Winter Party Holiday 2nd heat generator Cooling
Party	Duration of a party mode in hours. After this time has elapsed, the system automatically switches back to the previous operating mode. The value for the raise is set in the menu by selecting Heating circuit 1 - Increase times - Raise value.	0 ... **4 hours** ... 72
Holiday	Duration of a holiday mode in days. After this time has elapsed, the system automatically switches back to the previous operating mode. The value for the lower is set in the menu by selecting Heating circuit 1 - Lower times - Lower value.	0 ... **15 days** ... 150
Hot water setp. temperature	Setting for the desired domestic hot water set temperature.	30 ...**50 °C** ... 85
Setback times	Setting for the desired domestic hot water lower time.	
Setback time 1	Setting for the domestic hot water lower times.	00:00 ... 23:59 Mon ... Sun
Setback time 2		00:00 ... 23:59 Mon ... Sun
Setback value	Setting for the desired domestic hot water set temperature, which is also to be maintained during an active domestic hot water lower time.	0 ... **10 °C** ... Domestic hot water set temperature
Room setp. temperature	Setting for the desired room set temperature in heating operation with room temperature control selected.	15.0 ... **20.0 °C** ... 30.0
Increase times 1.Heat circuit	Settings for raising the heating characteristic curve for heating circuit 1.	
Increase time 1	Setting for the times when a raise for heating circuit 1 should be carried out.	00:00 ... 23:59 Mon ... Sun
Increase time 2		00:00 ... 23:59 Mon ... Sun
Increase value	Setting for the difference value by which the heating characteristic curve or room temperature for heating circuit 1 should be increased during a raise.	0 ... **2 K** ... 19 0 ... **2 K** ... 5
Setback times 1.Heat circuit	Settings for lowering the heating characteristic curve for heating circuit 1.	
Setback time 1	Setting for the times when a lower for heating circuit 1 should be carried out.	00:00 ... 23:59 Mon ... Sun
Setback time 2		00:00 ... 23:59 Mon ... Sun
Setback value	Setting for the difference value by which the heating characteristic curve or room temperature for heating circuit 1 should be lowered during a setback time.	0 ... **2 K** ... 19 0 ... **2 K** ... 5
Increase times 2.Heat circuit	Settings for raising the heating characteristic curve for heating circuit 2.	

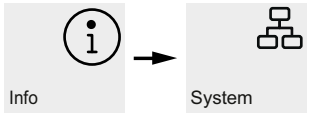
3 Favourites level

Increase time 1	Setting for the times when a raise for heating circuit 2 should be carried out.	00:00 ... 23:59 Mon ... Sun
Increase time 2		00:00 ... 23:59 Mon ... Sun
Increase value	Setting for the difference value by which the heating characteristic curve or room temperature for heating circuit 2 should be increased during a raise.	0 ... **2 K** ... 19 0 ... **2 K** ... 5
Setback times 2.Heat circuit	Settings for lowering the heating characteristic curve for heating circuit 2.	
Setback time 1	Setting for the times when a lower for heating circuit 2 should be carried out.	00:00 ... 23:59 Mon ... Sun
Setback time 2		00:00 ... 23:59 Mon ... Sun
Setback value	Setting for the difference value by which the heating characteristic curve or room temperature for heating circuit 2 should be lowered during a setback time.	0 ... **2 K** ... 19 0 ... **2 K** ... 5
Increase times 3.Heat circuit	Settings for raising the heating characteristic curve for heating circuit 3.	
Increase time 1	Setting for the times when a raise for heating circuit 3 should be carried out.	00:00 ... 23:59 Mon ... Sun
Increase time 2		00:00 ... 23:59 Mon ... Sun
Increase value	Setting for the difference value by which the heating characteristic curve or room temperature for heating circuit 3 should be increased during a raise.	0 ... **2 K** ... 19 0 ... **2 K** ... 5
Setback times 3.Heat circuit	Settings for lowering the heating characteristic curve for heating circuit 3.	
Setback time 1	Setting for the times when a lower for heating circuit 3 should be carried out.	00:00 ... 23:59 Mon ... Sun
Setback time 2		00:00 ... 23:59 Mon ... Sun
Setback value	Setting for the difference value by which the heating characteristic curve or room temperature for heating circuit 3 should be lowered during a setback time.	0 ... **2 K** ... 19 0 ... **2 K** ... 5

4 User level

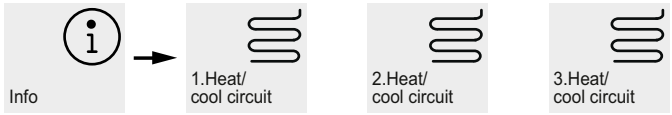
4.1 Information

4.1.1 System



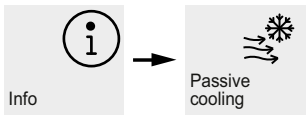
Information		Description
	External temperature	The outside temperature is used, among other things, for calculating the return set temperature, for frost protection functions and for defrosting.
	Heating / Cooling demand	Shows whether and from which heating/cooling circuit there is a heating/cooling requirement. Even if there is a requirement, the heat pump may not be running (e.g. down times, scavenging times). This block is indicated with the lock symbol.
	Setp. temperature heating / cooling	Display of the calculated return set temperature for heating/cooling.
	Act. temperature heating / cooling	Display of the measured return temperature for heating/cooling
	Storage temperature renewable	Display of the measured temperature in the renewable cylinder.

4.1.2 Heating/cooling circuit 1/2/3



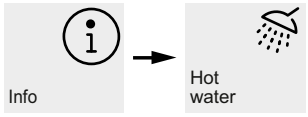
Information		Description
	Status	Shows whether there is an active heating/cooling requirement. Even if there is a requirement, the heat pump may not be running (e.g. down times, scavenging times). This block is indicated with the lock symbol.
	Mixer	If a mixer is used, the last and current status is indicated by a symbol (open, closed, open, close).
	Setp. temperature	Display of the calculated set temperature for heating/cooling circuit 1/2/3.
	Act. temperature	Display of the measured actual temperature for heating/cooling circuit 1/2/3.
	Dewpoint	Display of the calculated dew point temperature without dew point distance.
	Room humidity	Display of the measured humidity when using a room climate station or RTM Econ.
	Room setp. temperature	Display of the room set temperature.
	Room temperature	Display of the measured room temperature when using a room climate station, RTM Econ or room temperature sensor.

4.1.3 Cooling



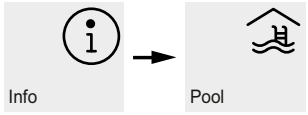
Information		Description
	Flow temperature	Display of the measured flow temperature on the passive cooling station during cooling operation.
	Return temperature	Display of the measured return temperature on the passive cooling station during cooling operation.

4.1.4 Domestic hot water



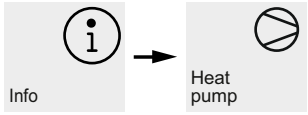
Information		Description
	Demand	Shows whether there is an active domestic hot water request. Even if there is a requirement, the heat pump may not be running (e.g. programmed shut-off time, operating limits, heat up). This block is indicated with the lock symbol.
	Setp. temperature	Display of the current domestic hot water set temperature.
	Act. temperature	Display of the measured domestic hot water temperature.

4.1.5 Swimming pool



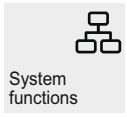
Information		Description
	Demand	Shows whether there is an active swimming pool request. Even if there is a requirement, the heat pump may not be running (e.g. programmed shut-off time, operating limits, heat up). This block is indicated with the lock symbol.
	Setp. temperature	Display of the current swimming pool set temperature.
	Temperature	Display of the current swimming pool temperature.

4.1.6 Heat pump



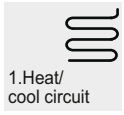
Information		Description
	Status	Shows the current status of the heat pump. Off, Heating, Domestic hot water, Swimming pool, Cooling, Defrost, Flow rate monitoring, Operating mode switching, Block
	Flow temperature	Display of the measured flow temperature. This temperature is used for the frost protection functions, operating limits and for air-to-water heat pumps to ensure defrosting.
	Return temperature	Display of the measured return temperature
	Heat source inlet	Display of the heat source inlet temperature on brine and water-to-water heat pumps.
	Heat source outlet	Display of the heat source outlet temperature on brine and water-to-water heat pumps.

4.2 System functions



Setting		Description	Setting range
	Oper. mode	Select the operating mode. The “Auto” operating mode can only be selected if operating mode switching depending on outside temperature is activated at the expert level.	**Auto** Summer Winter Party Holiday 2nd heat generator Cooling
	Party	Duration of a party mode in hours. After this time has elapsed, the system automatically switches back to the previous operating mode. The value for the raise is set in the menu by selecting Heating circuit 1- Increase times - Raise value.	0 ... **4 hours** ... 72
	Holiday	Duration of a holiday mode in days. After this time has elapsed, the system automatically switches back to the previous operating mode. The value for the lower is set in the menu by selecting Heating circuit 1 - Lower times - Lower value.	0 ... **15 days** ... 150

4.3 Heating/cooling circuit 1



During commissioning, the heating characteristic curve is adapted according to the local and structural conditions. This heating characteristic curve can be adjusted to the individual temperatures requirements with the hotter / colder arrow keys in the main display.

The plus key is used to increase the temperature; the bar display moves to the right.

The minus key is used to reduce the temperature; the bar display moves to the left.

For heating circuit 2/3, this setting is made in the “Heating circuit 2/3” menu.

The set heating characteristic curves can be lowered or raised on a time-controlled basis. E.g. the heating characteristic curve can be lowered at night in poorly insulated buildings or excessive cooling of the heating surfaces can be prevented by raising heating characteristic curve before the shut-off time.

If the raise and lower overlap, the raise function has priority.

TIP

For energy efficient operation of the heat pump heating system, the temperature level to be achieved by the heat pump should be as low as possible.
In well-insulated buildings, even heating operation without lower times usually results in lower energy costs, as power peaks with high flow temperatures are avoided and the same level of comfort is achieved with lower temperatures.
Shut-off times can be compensated for with a raise - which commences approx. 1 hour before the shut-off time.

Setting	Description	Setting range
Room setp. temperature	Setting for the desired room set temperature in heating operation with room temperature control selected.	15.0 ... **20.0 °C** ... 30.0
Setback times	Settings for lowering the heating characteristic curve for heating circuit 1.	
Setback time 1	Setting for the times when a lower for heating circuit 1 should be carried out.	00:00 ... 23:59 Mon ... Sun
Setback time 2		00:00 ... 23:59 Mon ... Sun
Setback value	Setting for the difference value by which the heating characteristic curve or room temperature for heating circuit 1 should be lowered during a setback time.	0 ... **2 K** ... 19 0 ... **2 K** ... 5
Increase times	Settings for raising the heating characteristic curve for heating circuit 1.	
Increase time 1	Setting for the times when a raise for heating circuit 1 should be carried out.	00:00 ... 23:59 Mon ... Sun
Increase time 2		00:00 ... 23:59 Mon ... Sun
Increase value	Setting for the difference value by which the heating characteristic curve or room temperature for heating circuit 1 should be increased during a raise.	0 ... **2 K** ... 19 0 ... **2 K** ... 5
Silent cooling	Setting for the room set temperature with silent cooling. The actual value is measured on room climate station 1.	15.0 ... **20 °C** ... 30.0

Setting		Description	Setting range
	Dynamic cooling	Setting for the desired return set temperature with dynamic cooling selected. The return set value is adapted on a linear basis depending on the outside temperature. A characteristic curve is used for this, which is set at two specific operating points. The return set value is defined with the fixed outside temperatures of 15 °C and 35 °C.	
	Blocking time 1		10 ... **15 °C** ... 30
	Blocking time 2		10 ... **15 °C** ... 30

4.4 Heating/cooling circuit 2/3

2./3.Heat/
cool circuit

Setting		Description	Setting range
	Setback times	Settings for lowering the heating characteristic curve for heating circuit 2/3.	
	Setback time 1	Setting for the times when a lower for heating circuit 2/3 should be carried out.	00:00 ... 23:59 Mon ... Sun
	Setback time 2		00:00 ... 23:59 Mon ... Sun
	Setback value	Setting for the difference value by which the heating characteristic curve or room temperature for heating circuit 2/3 should be lowered during a lower time.	0 ... **2 K** ... 19 0 ... **2 K** ... 5
	Increase times	Settings for raising the heating characteristic curve for heating circuit 2/3.	
	Increase time 1	Setting for the times when a raise for heating circuit 2/3 should be carried out.	00:00 ... 23:59 Mon ... Sun
	Increase time 2		00:00 ... 23:59 Mon ... Sun
	Increase value	Setting for the difference value by which the heating characteristic curve or room temperature for heating circuit 2/3 should be increased during a raise.	0 ... **2 K** ... 19 0 ... **2 K** ... 5
	Silent cooling	Setting for the room set temperature with silent cooling. The actual value is measured on the room climate station 1/2.	15.0 ... **20.0 °C** ... 30.0

4.5 Domestic hot water

The cascade controller automatically determines the maximum possible domestic hot water temperature during heat pump operation. The desired domestic hot water temperature can be set in the menu by selecting “Domestic hot water - Domestic hot water set temperature” .

TIP

Because the domestic hot water preparation is carried out with high flow temperatures, which can result in high energy costs, it is advisable to adapt the domestic hot water preparation to the user behaviour. This can be achieved with domestic hot water set temperatures optimally adapted to the requirements, with corresponding domestic hot water lower times and a large hysteresis.

Domestic hot water temperature HP maximum

In order to achieve the highest possible heat pump proportion in domestic hot water preparation, the cascade controller automatically determines the maximum achievable hot water temperature in heat pump operation depending on the current heat source temperature. The lower the heat source temperature (e.g. outside temperature, brine temperature), the higher the achievable hot water temperature.

Domestic hot water preparation without flange heater

If the domestic hot water set temperature is higher than the maximum domestic hot water temperature that can be achieved by the heat pump, domestic hot water preparation is interrupted as soon as the “HP maximum temperature” is reached.

Domestic hot water preparation with flange heater

If the domestic hot water set temperature is higher than the maximum domestic hot water temperature that can be achieved by the heat pump, the domestic hot water preparation is carried out using the installed flange heater from the “HP maximum temperature”.

Reheating with flange heater
After domestic hot water preparation with the heat pump, reheating for higher temperatures can be carried out with systems with a flange heater. The next domestic hot water heating is only carried out once the temperature drops below the HP maximum temperature so that the basic heating can be carried out using the heat pump.

Domestic hot water lower times

Block times for the hot water heating can be programmed by selecting “Domestic hot water - Lower times” in the menu. During this time, the domestic hot water heating is only carried out at minimum temperature.

If a sufficiently large cylinder is available, it is advisable to switch the domestic hot water heating or reheating to overnight in order to use the low-tariff periods that are often cheaper.

Thermal disinfection

Using the “Domestic hot water - Thermal disinfection” option in the menu means that on bivalent systems or with domestic hot water cylinders with installed flange heater, thermal disinfection can be carried out with domestic hot water temperatures of up to 85 °C. The thermal disinfection can be carried out at a start time that can be set for each day of the week.

4 User level

Circulation

Selecting “Domestic hot water - Circulation” in the menu enables control of the circulation pump to be programmed. A maximum of two time windows can be defined. A maximum of two circulation times can be assigned to each day of the week. Exceeding demands are activated or deactivated at midnight.

TIP

A circulation line uses large amounts of energy. To save on energy costs, circulation should not be used. If this is unavoidable, it is advisable to adapt the time window to the optimal conditions. A better approach is to have the circulation running using a pulse for a specific time. This function is also possible with the cascade controller.

Setting	Description	Setting range
Hot water setp. temperature	Setting for the desired domestic hot water set temperature.	30 ... **50 °C** ... 85
Hot water setback time	Setting for the desired domestic hot water setback time.	
Setback time 1	Setting for the domestic hot water setback times.	00:00 ... 23:59 Mon ... Sun
Setback time 2		00:00 ... 23:59 Mon ... Sun
Setback temperature	Setting for the desired domestic hot water set temperature, which is also to be maintained during an active domestic hot water lower time.	0 ... **10 °C** ... Domestic hot water set temperature
Thermal disinfection	Thermal disinfection results in one-off domestic hot water heating up to the desired temperature. The status is ended automatically when thetemperature is reached, at 24:00 or at the latest after 4 hours.	
Start time	Setting for the start time for thermal disinfection.	00:00 ... 23:59
Temperature	Setting for the desired domestic hot water set temperature to be achieved with thermal disinfection.	**60 °C** ... 85
Circulation	The circulation pump is actuated by a time function or a pulse input.	
Time program 1	Setting for the times when the circulation pump is to be controlled.	00:00 ... 23:59 Mon ... Sun
Time program 2		00:00 ... 23:59 Mon ... Sun
Impulse time	Setting for the runtime of the circulation pump with activation after an impulse.	1 ... **5 minutes** ... 15

4.6 Swimming pool

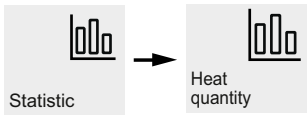
Setting		Description	Setting range
	Setp. temperature	Setting for the desired swimming pool set temperature.	5 ... **25 °C** ... 60
	Blocking time	Setting for the time programs for blocking swimming pool preparation.	
	Blocking time 1	Setting for the times for a swimming pool block.	00:00 ... 23:59 Mon ... Sun
	Blocking time 2		00:00 ... 23:59 Mon ... Sun
	Temperature	Setting for the desired swimming pool set temperature, which is also to be maintained during an active swimming pool block.	0 ... **10 °C** ... Swimming pool set temperature
	Priority	Setting for the time programs for prioritising swimming pool preparation.	
	Start time	Setting for the start time for swimming pool priority.	00:00 ... 23:59 Mon ... Sun
	Priority hours	Setting for the desired number of hours for swimming pool priority.	1 ...**1 hours** ... 10

4.7 Statistics

Setting		Description
	Compressor 1	Runtime compressor 1 The runtime can be reset.
	Compressor 1 total	The total runtime cannot be reset.
	Compressor 2	Runtime compressor 2 The runtime can be reset.
	Compressor 2 total	The total runtime cannot be reset.
	Fan	Fan runtime The runtime is lower than the sum of the compressor runtimes due to defrosting. The runtime can be reset.
	Fan total	The total runtime cannot be reset.
	Primary pump	Runtime of the primary pump or the well pump The runtime is higher than the sum of the compressor runtimes due to pump flow and pump delay. The runtime can be reset.
	Primary pump total	The total runtime cannot be reset.

Setting		Description
	2.heat exchanger	Runtime for 2nd heat generator The runtime can be reset.
	2.heat exchanger total	The total runtime cannot be reset.
	Heating pump	Runtime of the heat circulating pump The runtime can be reset.
	Heating pump total	The total runtime cannot be reset.
	Add. pump	Runtime of the auxiliary circulating pump The runtime can be reset.
	Add. pump total	The total runtime cannot be reset.
	Hot water pump	Runtime of the domestic hot water circulating pump The runtime can be reset.
	Hot water pump total	The total runtime cannot be reset.
	Flange heating	Runtime of the flange heater The runtime can be reset.
	Flange heating total	The total runtime cannot be reset.
	Pool pump	Runtime of the swimming pool circulating pump The runtime can be reset.
	Pool pump total	The total runtime cannot be reset.
	Renewable	Renewable runtime The runtime can be reset.
	Renewable total	The total runtime cannot be reset.
	Cooling	Runtime of the compressor in cooling operation The runtime can be reset.
	Cooling total	The total runtime cannot be reset.

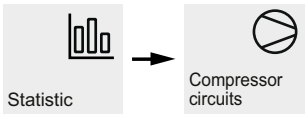
4.8 Quantity of thermal energy



Setting		Description
	Heat pump	The quantity of thermal energy emitted from the heat pump is added up and displayed. The quantity of thermal energy can be reset.
	Heat pump total	The total quantity of thermal energy cannot be reset.
	Heating	Display of the emitted quantity of thermal energy from the heat pump in heating operating mode. For parallel operation (with additional heat exchanger: DHW and heating), the quantity of thermal energy is included in the calculation here. The quantity of thermal energy can be reset. The quantity of thermal energy for heating can be reset.

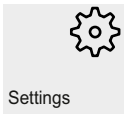
Setting		Description
	Heating total	The total quantity of thermal energy for heating cannot be reset.
	Domestic hot water	Display of the emitted quantity of thermal energy from the heat pump in domestic hot water operating mode. The quantity of thermal energy can be reset. The quantity of thermal energy for domestic hot water can be reset.
	Domestic hot water total	The total quantity of thermal energy for heating cannot be reset.
	Swimming pool	Display of the emitted quantity of thermal energy from the heat pump in swimming pool operating mode. The quantity of thermal energy can be reset. The quantity of thermal energy for the swimming pool can be reset.
	Swimming pool total	The total quantity of thermal energy for the swimming pool cannot be reset.
	Environm. energy	Display of the environmental energy used The quantity of environmental energy can be reset.
	Environm. energy total	The total quantity of environmental energy cannot be reset.

4.9 Switch cycle counter



Setting		Description
	Compressor 1 total	Display of the total compressor 1 switching cycles.
	Compressor 1 Heating	Display of the compressor 1 switching cycles in heating operation.
	Compressor 1 Hot water	Display of the compressor 1 switching cycles during domestic hot water preparation.
	Compressor 1 Pool	Display of the compressor 1 switching cycles in swimming pool preparation.
	Compressor 1 Cooling	Display of the compressor 1 switching cycles in cooling operation.
	Compressor 2 total	Display of the total compressor 2 switching cycles.
	Compressor 2 Heating	Display of the compressor 2 switching cycles in heating operation.
	Compressor 2 Hot water	Display of the compressor 2 switching cycles during domestic hot water preparation.
	Compressor 2 Pool	Display of the compressor 2 switching cycles in swimming pool preparation.
	Compressor 2 Cooling	Display of the compressor 2 switching cycles in cooling operation.

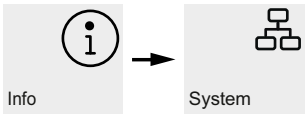
4.10 Settings



Parameter	Setting		Setting range
 Language	Setting for the desired language. Depending on the software version, not all languages listed may be available.		Deutsch English Français Nederlands Italiano Svenska Dansk Magyar Český Slovenský Hrvatski Slovenski Norsk
 Time	Setting for the time.		00:00 ... 23:59
 Date	Setting for the day, month, year and day of the week.		04.02.19 Mon ... Sun
 Time change	Automatic switching between summer and winter time can be selected.		Yes / No
 Network	Protocol	The Protocol setting is used to define the type of interface installed and the transmission protocol.	**LAN** Modbus RTU EIB / KNX Modbus TCP
	Address	When Modbus is used, every terminal device in the network must be assigned an address. This address is used to communicate with the desired terminal device.	000 ... **001** ... 199
	Baud rate	When Modbus is used, the baud rate must be adapted to the system baud rate. It is important to ensure that the same baud rate is set on both sides of the communication.	1200 2400 4800 9600 **19200**
	Parity	If Modbus is selected, the parity can be selected here.	**None** Even Odd
	Stop bits	If Modbus is selected, the stop bits can be selected here.	1 **2**
 NWPM Settings	IP address Netmask Gateway DNS1 DNS2	Reading out the IP address Reading out the subnet mask Reading out the gateway address Reading out the DNS1 address Reading out the DNS2 address	000 ... 255 000 ... 255 000 ... 255 000 ... 255 000 ... 255
 Display	Brightness Light strip Restart	Setting for the display brightness Setting for whether the light strip should be “Permanent On” and therefore lights up green or “Permanent Off”. The display can be restarted manually, without disconnecting the power supply to the heat pump completely.	0 ... 255 On / Off Yes

5 Expert level

5.1 System



Parameter	Description
1.1.1 External temperature	The outside temperature is used, among other things, for calculating the return set temperature, for frost protection functions and for defrosting.
1.1.2 Heat circuit	Shows whether and from which heating circuit there is a heating request. Even if there is a requirement, the heat pump may not be running (e.g. down times, scavenging times). This block is indicated with the lock symbol.
1.1.3 Cool circuit	Shows whether and from which heating/cooling circuit there is a cooling requirement. Even if there is a requirement, the heat pump may not be running (e.g. down times, scavenging times). This block is indicated with the lock symbol.
1.1.4 Passive cooling	Display of the calculated return set temperature in heating operation.
1.1.5 Passive cooling	Display of the measured return temperature in heating operation.
1.1.6 Renewable	Display of the calculated return set temperature in cooling operation.
1.1.7 Renewable	Display of the measured return temperature in cooling operation.
1.1.8 Bivalent	Display of the measured temperature in the renewable cylinder.
1.1.9 Flow temperature master	Display of the flow temperature when the master function block is active.
1.1.10 Return temperature master	Display of the return temperature when the master function block is active.
1.1.11 Load stage Heating	The heating performance level is displayed if master is active
1.1.12 Load stage Cooling	The cooling performance level is displayed if master is active.

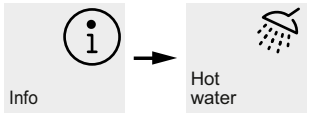
5.2 Heating/cooling circuit 1/2/3

Parameter	Description
1.2.1/1.3.1/1.4.1 Heating/Cooling	Shows the current operating mode of the relevant circuit. If the circuit is blocked for an operating mode, this is indicated by a lock symbol. A mixer symbol indicates the current status of the mixer.
1.2.2/1.3.2/1.4.2 Setp. temperature	Display of the calculated set temperature for heating/cooling circuit 1/2/3.
1.2.3/1.3.3/1.4.3 Act. temperature	Display of the measured actual temperature for heating/cooling circuit 1/2/3.
1.2.4/1.3.4/1.4.4 Dewpoint	Display of the calculated dew point temperature without dew point distance when using the RTM Econ room controller.
1.2.5/1.3.5/1.4.5 Dewpoint	Display of the calculated dew point temperature without dew point distance when using a room climate station.
1.2.6/1.3.6/1.4.6 Room humidity	Display of the measured humidity when using a room climate station or RTM Econ.
1.2.7/1.3.7/1.4.7 Room setp. temperature	Display of the room set temperature.
1.2.8/1.3.8/1.4.8 Room temperature	Display of the measured room temperature when using a room climate station, RTM Econ or room temperature sensor.

5.3 Passive cooling

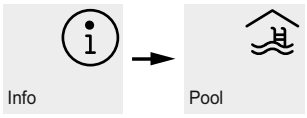
Parameter	Description
1.5.1 Flow temperature	Display of the measured flow temperature on the passive cooling station during cooling operation.
1.5.2 Return temperature	Display of the measured return temperature on the passive cooling station during cooling operation.

5.4 Domestic hot water



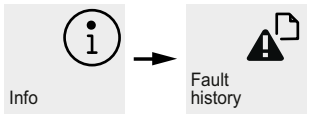
Parameter	Description
1.6.1 Demand	Shows whether there is an active domestic hot water request. Even if there is a requirement, the heat pump may not be running (e.g. programmed shut-off time, operating limits, heat up). This block is indicated by the lock symbol
1.6.2 Setp. temperature	Display of the current domestic hot water set temperature.
1.6.3 Act. temperature	Display of the measured domestic hot water temperature.
1.6.4 Load stage	The domestic hot water performance level is displayed if master is active

5.5 Swimming pool



Parameter	Description
1.7.1 Demand	Shows whether there is an active swimming pool request. Even if there is a requirement, the heat pump may not be running (e.g. programmed shut-off time, operating limits, heat up). This block is indicated with the lock symbol.
1.7.2 Setp. temperature	Display of the current swimming pool set temperature.
1.7.3 Act. temperature	Display of the current swimming pool temperature.
1.7.4 Load stage	The swimming pool performance level is displayed if master is active.

5.6 Error history



In the event of faults, the heat pump is blocked. With bivalent systems, the second heat generator takes over the heating and the domestic hot water preparation. With mono energy systems, the domestic hot water preparation is stopped. The immersion heater maintains the minimum permissible return temperature.

The cascade controller displays the active faults in plain text. The heat pump is blocked. Once the fault has been remedied, the heat pump can be commissioned again by pressing the key. (Switching off the control voltage also acknowledges an active fault.)

With mono energy systems, switching to the 2nd heat generator operating mode enables the heating to be taken over the by the immersion heater and the domestic hot water preparation by the flange heater.

Low pressure switch brine

If a “low pressure switch brine” available as a special accessory is installed in the primary circuit of a brine-to-water heat pump, a fault is triggered if there is a drop in brine pressure.

Fault diagnostics - Alarm - Block

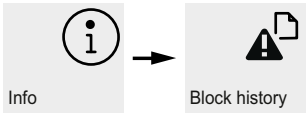
Selecting “Info - Error history/Block history” in the menu documents the last 10 causes for a fault and block. The documentation is carried out with date, time, heat source temperature, flow temperature, return temperature andthe status message.

Error code	Error	Message	Action
F1	Expansion N17.1	The “Cooling general” expansion module is not recognised	• Check the connecting cable - Cable interrupted - Connector loose - Individual wires mixed up • Check the power supply
F2	Expansion N17.2	The “Cooling active” expansion module is not recognised.	
F3	Expansion N17.3	The “Cooling passive” expansion module is not recognised.	
F5	Expansion N17	The “Cooling” expansion module is not recognised.	
F6	Electronic expansion valve	The electronic expansion valve is not recognised.	
F7	Room controller RTH Econ	The reference room modulator is not recognised.	
F8	Expansion ODU	The refrigeration circuit controller is not recognised	
F10	Expansion WPIO		
F12	Inverter error	The inverter is reporting an error. This can have a range of causes.	• Inform after-sales service
F15	Sensor technology	An error has occurred on the required sensor technology, the exact cause is shown in the plain text.	• Check the connecting cable - Cable interrupted - Connector loose - Individual wires mixed up Check the power supply
F16	Brine pressure monitor	The brine pressure monitor in the brine circuit has switched.	• Check the brine pressure
F19	Primary circuit	Fault due to primary pump or fan motor protection	• Primary pump or fan motor protection • Check the setting or function

Error code	Error	Message	Action
F20	Defrost	Defrosting of the air-to-water heat pump could not be initiated or could not be properly completed. This message can have multiple causes.	• Check the heating water flow rate • Check the heating water pressure • Check the flow and return temperature • Inform after-sales service
F21	Brine pressure monitor	The brine pressure monitor in the brine circuit has switched.	• Check the brine pressure
F22	Domestic hot water	Domestic hot water temperatures in heat pump operation below 35 °C	• Flow of the domestic hot water circulating pump too low • Heating check valve faulty • Check the domestic hot water sensor
F23	Compressor load	Direction of rotation incorrect Phase failure Start-up current of the compressor too high Undervoltage operating current of compressor too high Overtemperature soft starter Mains frequency incorrect	• Check the rotary field • Check the supply voltage • Inform after-sales service
F24	Coding	Coding does not match the heat pump type	• The detected heat pump type is shown in the Version overview menu
F25	Low pressure	The heat source is supplying too little energy	• Clean the filter in the dirt trap • Purge the heat source system • Check the brine or water flow • Inform after-sales service • Evaporator iced over or system temperatures too low (return < 18 °C)
F26	Frost protection	The flow temperature in heating operating mode is below 7 °C.	• Increase the heating water temperature
F28	High pressure	The heat pump has been switched off by the high pressure sensor or pressure switch.	• Lower the heating curve setting • Increase the heating water flow rate • Check the overflow valve
F29	Temperature difference	The temperature difference between the flow and return for defrosting is too large (>12 K) or negative.	• Check the heating water flow rate • Check the overflow valve and pump size • Flow and return mixed up
F30	Hot gas thermostat		• Inform after-sales service

Error code	Error	Message	Action
F31	Flow	The heat pump has been switched off due to a lack of flow in the primary or secondary circuit.	• Water flow in the well or brine circuit too low • Water flow in the secondary circuit too low • Flow direction incorrect
F38	Communication Heat pump	The cascade controller no longer has a connection to a heat pump. All heat pumps are offline.	• Check the settings • Check the communication connection • Inform after-sales service
F39	Fault Heat pump	All heat pumps connected to the cascade controller have a fault.	• Remedy the fault on the relevant heat pumps

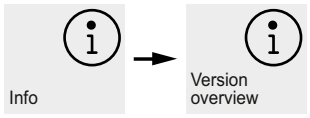
5.7 Block history



Block code	Block	Brief description
S5	Function control	The control function has been activated by a user.
S7	System control	The system control has been activated by a user for approx. 24 hours.
S8	Delay Op. mode switch.	The delay time protects the heat pump from a quick temperature change with a cooling and domestic hot water demand.
S9	Pump forerun	The heat pump starts after the set pump forerun has elapsed
S10	Minimum pause time	The heat pump starts after the minimum pause time has elapsed in order to fulfil a pending demand. The minimum pause time protects the heat pump and can last for up to 5 minutes.
S11	Line load	The heat pump starts after the line switch-on load in order to fulfil a pending demand. The line switch-on load is a requirement from the utility companies and can last for up to 200 seconds after the voltage is restored or utility blocks.
S12	Switch cycle block	The heat pump starts after the switch cycle block in order to fulfil a pending demand. The switch cycle block is a requirement from the utility companies and can last for up to 20 minutes.
S13	Domestic hot water reheating	The domestic hot water reheating using the flange or pipe heating is active
S14	Renewable	If “bivalent-renewable” operating mode is selected, the temperature in the cylinder is high enough to process the active demand.
S15	Utility block	There is an active utility block.
S16	Soft starter	Switch-off of the heat pump due to soft starter
S17	Flow	The heat pump has been switched off due to a lack of flow in the primary or secondary circuit. The message is reset automatically after 4 minutes.
S18	2nd heat generator	The heat pump has been blocked due to the outside temperature being too low and the 2nd heat generator has been activated
S19	High pressure	The permissible high-pressure values for the heat pump have been exceeded.
S20	Low pressure	The permissible low-pressure values for the heat pump have not been reached.
S21	Operating limit	The heat source temperature is below the operating limit for the heat pump.
S22	4-way valve	The 4-way valve has not switched back to the initial state after defrosting.
S23	System limit	The system temperatures are too low to operate the heat pump.
S24	Load primary circuit	The heat pump was blocked due to the fan motor protection. The heat pump restarts automatically.
S25	External block	The system was switched to blocked state by an external blocking signal on input ID4. The function can be configured in the menu.

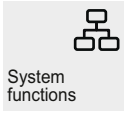
Block code	Block	Brief description
S26	WPIO	Communication between the heat pump manager and WPIO refrigeration circuit controller is interrupted. Unable to establish a connection, a fault has been triggered.
S29	Inverter	The inverter has been blocked. This can have a range of causes. An attempt is made to cancel the block automatically
S30	Maximum blocks	The maximum permitted number of blocks per day has been exceeded. The block will be cancelled automatically at 00:00.
S31	Warm-up	The “Warm-up” function is intended to prevent an excessive concentration of liquid refrigerant in the oil when starting up the compressor. The maximum warm up time can be up to 9 hours.
S32	Maximum operating mode switching	The permitted number of operating mode switching cycles per day has been exceeded. The block will be cancelled automatically at 00:00.
S33	EvD initialisation	The communication with the electronic expansion valve is established
S34	2nd heat generator	The 2nd heat generator operating mode has been selected. The heat pump is switched off. Heat generation is performed exclusively by the 2nd heat generator
S38	Communication Heat pump	The cascade controller no longer has a connection to a heat pump. One or more connected heat pumps are offline.
S39	Fault Heat pump	One or more of the heat pumps connected to the cascade controller have a fault.

5.8 Version overview



Parameter	Description
1.9.1 Heat pump type	Display of the heat pump type.
1.9.2 Heat pump code	Display of the heat pump code.
1.9.3 WPM Software	Display of the cascade controller software version.
1.9.4 WPM BIOS	Display of the cascade controller BIOS version.
1.9.5 WPM BOOT	Display of the cascade controller BOOT version.
1.9.6 WPM Hardware	Display of the cascade controller hardware version.
1.9.7 IO Software	IO is an additional extension. If an IO extension is present, the software version is shown here.
1.9.8 IO BIOS	Display of the IO extension BIOS version.
1.9.9 IO BOOT	Display of the IO extension BOOT version.
1.9.10 IO Hardware	Display of the IO extension hardware version.
1.9.11 pGD Software	Display of the pGDx display software version.
1.9.12 pGD Run Time	Display of the pGDx display run time version.
1.9.13 pGD Main OS	Display of the pGDx display main OS version.

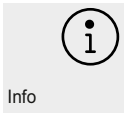
5.9 System function

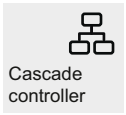


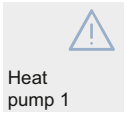
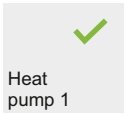
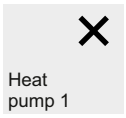
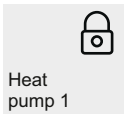
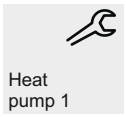
Parameter	Setting	Setting range
2.1 Oper. mode change-over	Setting for whether operating mode switching should be carried out automatically.	Yes / No
2.2 Oper. mode change-over	If operating mode switching depending on outside is activated, the operating mode is changed automatically depending on an adjustable limit temperature. A change is made if the limit temperatures are exceeded or not reached in a row for the set time.	**1 h** …150
2.3 External temperature Heating < 2.4 External temperature Cooling >	Limit temperatures at which the operating mode of the heat pump is switched automatically. The summer operating mode is active between the limit temperatures.	-30 … **15 °C** … 40 -30 … **25 °C** … 40

5.10 Cascade controller

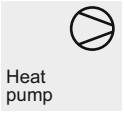
Status overview for the heat pumps used for cascade control





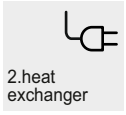
Parameter	Setting
	There is a fault on the connected heat pump.
	Everything is OK on the connected heat pump.
	The heat pump to be connected is not yet connected to the cascade circuit.
	There is a block on the connected heat pump.
	The connected heat pump is recognised by the cascade controller, but is not yet programmed for the cascade circuit.

5.11 Heat pump



Parameter	Setting	Setting range
3.1 Compressor qty.	The setting for the number of compressors is dependent on the heat pump type, the relevant quantity can be found in the operating the installation instructions for the heat pump or the heat pump type plate.	**1** / 2
3.2 Fan setback times	Settings for lowering the fan speed. The lower results in an output reduction by approx. 15%.	
3.2.1 Setback time 1 3.2.2 Setback time 2	Settings for the times for lowering the fan speed. For each day of the weekyou can select separately whether Setback time 1 and/or Setback time 2 for the fan speed is to be activated. Lowers extending beyond a day of the week are activated or deactivated at midnight.	**00:00** ... 23:59 MON ...SUN
3.2.3 Setback value	Value for lowering the fan speed during cooling. A fixed value applies during heating.	0.0 … **1.0 V** … 1.5
3.3 Heat pump code	The 4-digit heat pump code printed on the type plate can be corrected with these settings.	
3.4 Freeze protection	Setting for the lower operating limit for using the ground water or waste heat recovery heat source using an intermediate heat exchanger. Depending on the heat pump type, the usage range (brine) of the heat source can be expanded as required. In this case, the minimum brine concentration must be adjusted to 30 %.	15 ... -**9 °C** … -13
3.5 Primary pump M11 3.6 Primary pump manual	Setting for the speed of the electronically regulated primary circulating pump heat source (M11).	Manual Level 1 Level 2 **Level 3** Automatic 20 ... **50** ... 100
3.7 Fl. rate swit. for sec. circ.	Is flow rate monitoring carried out in the secondary circuit?	Yes / No
3.8 Fl. rate swit. for prim. circ.	Is flow rate monitoring carried out in the primary circuit?	Yes / No

5.12 2nd heat generator



Parameter	Setting	Setting range
4.1 Limit temperature parallel	The limit temperature for the 2nd heat generator must be selected according to the design of the heat pump heating system. Below the limit temperature parallel, the heat pump and the 2nd heat generator run to heat the building. The 2nd heat generator is only switched on when the temperature falls below the set parallel limit temperature and performance level 3. If parallel operation is not desired, the limit temperature parallel should be adapted to the limit temperature alternative.	*Limit temperature alternative* ... **-5 °C** … Limit temperature 2nd compressor
4.2 Limit temperature alternative	If the limit temperature alternative and performance level 3 are undercut, only the 2nd heat generator is then used to heat the building. The heat pump is blocked from this point	*Lower application limit* ... **-10 °C** … Limit temperature parallel
4.3 Operating mode	A 2nd heat generator with gliding regulation has its own regulation and the full volume can flow through it if required. A constantly regulated 2nd heat generator is set to a constant temperature. The mixer regulation is active.	**Sliding (valve)** Constant (mixer)
4.4 Mixer run time	The runtime between the OPEN and CLOSED end positions varies according to the mixer used. The mixer runtime should be adjusted to ensure optimum temperature regulation of the bivalent heat generator.	1 ... **4 minutes** … 6
4.5 Mixer hysteresis	The hysteresis of the mixer forms the neutral zone for operation of the bivalent heat generator. If the set temperature plus hysteresis is reached, a “Mixer closed” signal is generated. If the set temperature minus hysteresis is undershot a “Mixer open” signal is generated	0.5 …**2 K**
4.6 EVU block release	This setting indicates the behaviour of the 2nd heat generator during a utility block (interruption of the supply voltage). Load stage 3: The 2nd heat generator is only released at performance level 3 during the utility block. The immersion heater of mono energy systems is always blocked. Constant: The 2nd heat generator is released during the utility block. Limit temp. dep.: The 2nd heat generator is released during the utility block if the limit temperature is also undercut.	**Load stage 3** Constant Limit temp. dep.
4.7 EVU block limit temperature	Limit temperature for releasing the 2nd heat generator when Limit temp. dep. is set.	-10 ... **0 °C** … +10
4.8 Special program	The special program should be used for old boilers or bivalent systems with main cylinders to help prevent corrosion caused by condensation. When the 2nd heat generator is released, it remains in operation for at least the number of hours set.	0 ... **1 hour** … 99
4.9 Mixer run time	The runtime between the OPEN and CLOSED end positions varies according to the mixer used. The mixer runtime should be adjusted to ensure optimum temperature regulation of the bivalent-renewable heat generator.	1 ... **4 minutes** … 6
04:10 Mixer hysteresis	The hysteresis of the mixer forms the neutral zone for the operation of the bivalent-renewable heat generator. If the set temperature plus hysteresis is reached, a “Mixer closed” signal is generated. If the set temperature minus hysteresis is undershot a “Mixer open” signal is generated	0.5 …**2 K**

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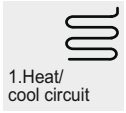
Parameter	Setting	Setting range
04:11 Heating temperature Bivalent-Renewable 04:12 Heating Bivalent-Renewable	Temperature difference between cylinder renewable and flow temperature that must be overshot if the heat pump is to be blocked when a heating request is pending. *Comfort:* A renewable heating block is only active when the temperature in the renewable cylinder is higher than the current return set temperature minus hysteresis. *Energy optimised:* A renewable heating block is independent of the return set temperature.	2 ... **10 K** ... 20 **Comfor**t / Energy opt.
04:13 Domestic hot water Bivalent-Renewable	Temperature difference between renewable cylinder and domestic hot water temperature that must be overshot if the heat pump is to be blocked when a domestic hot water request is pending.	2 … **5 K** … 50
04:14 Swimming pool Bivalent-Renewable	Renewable cylinder temperature that must be overshot if the HP is to be blocked when a swimming pool water request is pending.	10 … **35 °C** … 50
04:15 Voltage burner off	Setpoint for a bivalent heat generator using a 0-10V signal. Setting for the burner off voltage	0.2 … **2.5 V** … Voltage minimum
04:16 Voltage minimum	Minimum voltage setting value for minimum system temperature.	Voltage burner off … **3.0 V** … Voltage maximum
04:17 Voltage maximum	Maximum voltage setting value for maximum system temperature.	Voltage minimum … **3.0 V** … Voltage maximum
04:18 System temp. minimum	Minimum system temperature setting value for minimum voltage.	8 °C … System temperature maximum
04:19 System temp. maximum	Maximum system temperature setting value for maximum voltage.	System temperature minimum … 80 °C

5.13 Heating/Cooling

Parameter	Setting	Setting range
5.1 Heating hysteresis return setp. temperature	The hysteresis of the return set temperature forms the neutral zone for the heating operation of the heat pump. If the “return set temperature plus hysteresis” is reached, the heat pump switches off. If the “return set temperature minus hysteresis” is reached, the heat pump switches on.	0.5 … **2.0 K** … 5.0
5.2 Cooling hysteresis return setp. temperature	The hysteresis of the return set temperature forms the neutral zone for the cooling operation of the heat pump. If the “return set temperature minus hysteresis” is reached, the heat pump switches off. If the “return set temperature plus hysteresis” is reached, the heat pump switches on.	0.5 … **2.0 K** … 5.0
5.3 Cooling 2.refrig. unit	Setting for whether a 2nd refrigerator is to be used on the installation.	**No** / Yes
5.4 Cooling limit ext. temperature	Setting for the outside temperature, below which the cooling is stopped with reversible brine-to-water heat pump or passive cooling.	-20 ... **3 °C** … 35
5.5 Cool. passive hysteresis	If the current cooling return set temperature minus passive hysteresis is higher than the current brine temperature, passive cooling is carried out.	0.1 … **2.0 K** … 9.9
5.6 Heating room control I-portion minimal 5.7 Heating room control I-portion maximum	Settings for control with room temperature control selected during heating I * gain factor minimum number of minutes / maximum number of minutes P * gain factor (grade rule) value after voltage is restored in % between 18 °C and 50 °C	0 … **4** … 9
5.8 Heating room control ventilation reset	Reset of the room control, detection of an open window.	**No** / Yes
5.9 Cooling room control I-portion	Setting for the I-portion with room temperature control selected during cooling	001 … **060** … 999
5.10/5.11 Heating compressor 2 limit temperature	The limit temperature of the 2nd compressor must be selected according to the design of the heat pump heating system. Below the limit temperature of the 2nd compressor, the heat pump runs with 2 compressors for heating the building. The 2nd compressor is only switched on from temperatures below the set limit temperature parallel and performance level 2.	*Limit temperature parallel* ... **+35 °C** … +99
5.12/5.13 Cooling compressor 2 limit temperature	The limit temperature of the 2nd compressor must be selected according to the design of the heat pump heating system. Below the limit temperature of the 2nd compressor, the heat pump runs with 2 compressors for heating the building. The 2nd compressor is only switched on from temperatures below the set limit temperature parallel and performance level 2.	15 ... **+15 °C** … +99
05:14 Heating M16 05:15 Heating M16 manual	Setting for the speed of the electronically regulated circulating pump (M16) in heating operation.	Manual Level 1 Level 2 Level 3 Automatic 30 ... 50 % ... 100

Parameter	Setting	Setting range
05:16 Cooling M16 05:17 Cooling M16 manual	Setting for the speed of the electronically regulated circulating pump (M16) in cooling operation.	Manual Level 1 Level 2 Level 3 Automatic 30 ... 50 % ... 100
05:18 Pump type M16	Setting for the pump type at the analogue output for the circulating pump (M16)	0-10V PWM
05:19 Pump stop M16	Setting for the voltage value for the pump stop at the analogue output for the circulating pump (M16)	0.1 … 0.7 V … 1.0 0.1 … 99.9 % … 99.9

5.14 Heating/cooling circuit 1

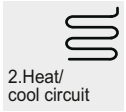


Parameter	Setting	Setting range
6.1 Heating curve end point (-20°C)	The heating curve end point should be set according to the design of the heat pump heating system. The maximum return set temperature must be entered here, which is determined based on the calculated maximum flow temperature, minus the temperature difference in the heating system (spread).	20 … **30 °C** … 70
6.2 Fixed value reg. return setp. temperature	Setting for the desired return set temperature with fixed value regulation selected	*Min. setp. temp.* … **40 °C** … 60
6.3 Room control room setp. temperature	Setting for the desired room set temperature and the I-portion with room temperature control selected	15.0 … **20.0 °C** … 30.0
6.5 Return temperature minimal Heating 6.6 Return temperature minimal Heating manual	Setting for the minimum return set temperature for heating operation. If room control is activated, it is possible to select whether the minimum return set temperature is adapted automatically to the set room set temperature.	Manual / Automatic Minimum … **20 °C** … 30
6.7 Return temperature maximum Heating 6.8 Return temperature maximum Heating manual 6.9 Return temperature maximum Heating automatic	For panel and radiator heating systems, different maximum temperatures are permitted. The upper limit for the return set temperature can be set between 25 °C and 70 °C.	Manual / Automatic Minimum … **50 °C** … 70 1 ... **10 K** ... 20
06:10 Mixer hysteresis	The hysteresis of the mixer forms the neutral zone for the operation of heating/cooling circuit 1. If the set temperature plus hysteresis is reached, a “Mixer closed” signal is generated. If the set temperature minus hysteresis is not reached, a “Mixer open” signal is generated.	0.5 … **2.0 K** … 5.0
06:11 Mixer run time	The runtime between the OPEN and CLOSED end positions varies according to the mixer used. To achieve optimum temperature regulation in heating/cooling circuit 1, the mixer runtime should be set.	1 ... **4 minutes** … 6

5 Expert level

Parameter	Setting	Setting range
06:12 Room control limit temperature	Below the set limit temperature, the rooms with a lower room set temperature are not taken into account for overheating with activated Smart-Grid function.	15 … **19 °C** … 30
06:13 Room control hysteresis bottom	To prevent unnecessary cycling of the control valves, the hysteresis for opening and closing the control valves can be adapted to the room actual temperature depending on the room set temperature.	0.0 … **0.3 K** … 2.0
06:14 Room control hysteresis top		0.0 … **0.8 K** … 2.0
06:15 Room control flow 06:16 Room control flow manual	It is possible to select whether the flow temperature required for the mixer during room control is carried out automatically based on the determined spread of the system, or manually using a fixed set value.	Manual / **Automatic** 0 … **5 K** … 10
06:17 Silent cooling dewpoint diff.	Increase of the minimum permissible flow temperature, calculated from the measured values from room climate station 1. An increased value reduces the risk of condensate formation.	1.5 … **3.5 K** … 5.0
06:18 Heating M13 06:19 Heating M13 manual	Setting for the speed of the electronically regulated circulating pump (M13) in heating operation.	Manual Level 1 Level 2 **Level 3** Automatic 30 ... **50 %** ... 100
06:20 Cooling M13 06:21 Cooling M13 manual	Setting for the speed of the electronically regulated circulating pump (M13) in cooling operation	Manual Level 1 Level 2 **Level 3** Automatic 30 ... **50 %** ... 100

5.15 Heating/cooling circuit 2/3



Parameter	Setting	Setting range
7.1/8.1 Temperature sensor	Is the sensor for heating circuit 2/3 installed in the flow or return? If return is set, the calculated setpoint for heating circuit 2 is also used for heat pump heating requests. Setting flow means it is only used for mixer control.	**Return** / Flow
7.2/8.2 Heating curve end point (-20°C)	The heating curve end point should be set according to the design of the heat pump heating system. This should be done by entering the maximum flow or return temperature depending on the position of the sensor.	20 … **30 °C** … 70
7.3/8.3 Heating curve parallel shift	Parallel shift of the set heating curve for heating circuit 2/3. Pressing the arrow keys once shifts the heating curve up (hotter) or down (colder) by 1K.	-19 ... 0 K ... 19
7.4/8.4 Fixed value reg. return setp. temperature/flow setp. temperature	Sets the desired set temperature when fixed value regulation is selected	*Min. setp. temp.*. … **40 °C** … 60
7.5/7.6 8.5/8.6 Return setp. temperature/Flow setp. temperature minimal Heating	Setting for the minimum return set temperature for heating operation. If room control is activated, it is possible to select whether the minimum return set temperature is adapted automatically to the set room set temperature.	**Manual** / Automatic 15 … 20 °C … 30
7.7/8.7 Return setp. temperature/ Flow setp. temperature maximum Heating 7.8/8.8 Return setp. temperature/ Flow setp. temperature maximum Heating manual 7.9/8.9 Return setp. temperature/ Flow setp. temperature maximum Heating automatic	For panel and radiator heating systems, different maximum temperatures are permitted. The upper limit for the set temperature can be set between 25 °C and 70 °C.	Manual / Automatic 30 … **50 °C** … 70 1 ... 10 K ... 20
7.10/8.10 Mixer hysteresis	The hysteresis of the mixer forms the neutral zone for the operation of heating/cooling circuit 2/3. If the set temperature plus hysteresis is reached, a “Mixer closed” signal is generated. If the set temperature minus hysteresis is not reached, a “Mixer open” signal is generated.	0.5 … **2.0 K** … 5.0
7.11/8.11 Mixer run time	The runtime between the end positions OPEN and CLOSED varies according to the mixer used. To achieve optimum temperature regulation in heating/cooling circuit 2/3, the mixer runtime should be set.	1 … **4 minutes** … 6
7.12/8.12 Room control limit temperature	Below the set room control limit temperature, the rooms with a lower room set temperature are not taken into account for overheating with activated Smart-Grid function.	15 … **19 °C** … 30

5 Expert level

Parameter	Setting	Setting range
7.13/8.13 Room control hysteresis bottom	To prevent unnecessary cycling of the control valves, the hysteresis for opening and closing the control valves can be adapted to the room actual temperature depending on the room set temperature.	0.0 … **0.5 K** … 2.0
7.15/8.15 Room control flow 7.16/8.16 Room control flow manual	It is possible to select whether the flow temperature required for the mixer during room control is carried out automatically based on the determined spread of the system, or manually using a fixed set value.	Manual / Automatic 0 … **5 K** … 10
7.17/8.17 Silent cooling dewpoint diff.	Increase of the minimum permissible flow temperature, calculated from the measured values from room climate station 1/2. An increased value reduces the risk of condensate formation.	1.5 … **3.5 K** … 5.0

5.16 Domestic hot water

Parameter	Setting	Setting range
9.1 Change-over compressor 2	Setting for the outside temperature below which the domestic hot water preparation is carried out with 2 compressors with 2 compressor heat pumps.	-30 … **-25 °C** … 35 *(10)*
9.2 Hysteresis	The hysteresis of the domestic hot water set temperature forms the neutral zone which, if not reached, triggers a domestic hot water request.	2 … **7 K** … 15
9.3 Parallel cooling hot water	Is parallel operation of cooling and domestic hot water possible due to the hydraulic decoupling of cooling circuit and domestic hot water circuit?	**No** / Yes
9.4 Setp. temperature	Setting for the desired domestic hot water set temperature.	30 ... **50 °C** … 85
9.5 Minimum temperature	Setting for the desired domestic hot water set temperature which is also to be maintained during an active domestic hot water lower time or external domestic hot water block.	0 ... 10 °C ... Hot water setp. temp.
9.6 Maximum temperature	Setting for the desired domestic hot water set temperature to be achieved in parallel operation.	30 … **60 °C** … 85
9.7 Reheating	Setting for whether the existing flange heater should also be used for reheating. If “No” is set, the domestic hot water preparation is only carried out up to the current heat pump maximum temperature depending on the heat source temperature.	**No** / Yes
9.8 Circulation shut-off delay	The circulation pump is started using a paddle switch, for example. When the paddle switch switches back again, the circulation pump continues to run for the set time.	1 … **5 minutes** … 15
9.9 Domestic hot water reset maximum	If reset Yes is set, the determined maximum domestic hot water temperatures in heat pump operation are reset to the value 65 °C. The setting value is returned automatically to No.	**No** / Yes
09:10 Maximum temperature 1 compressor	Display of the determined maximum domestic hot water temperatures depending on the heat source temperature.	
09:11 Maximum temperature 2 compressor		
09:12 Hot water pump 09:13 Hot water manual	Setting for the speed of the electronically regulated domestic hot water circulating pump (M18).	Automatic Level 1 Level 2 **Level 3** Manual 30 …**50 %**…100
09:14 Pump type M18	Setting for the pump type at the analogue output for the domestic hot water circulating pump (M18)	0-10V PWM
09:15 Pump stop M18	Setting for the voltage value for the pump stop at the analogue output for the domestic hot water circulating pump (M18)	0.1 … 0.7 V … 1.0 0.1 … 99.9 % … 99.9

5.17 Swimming pool

Parameter	Setting	Setting range
10.1 Change-over compressor 2	Setting for the outside temperature below which the swimming pool preparation is carried out with 2 compressors with 2 compressor heat pumps	-30 … **-25 °C** … 35 *(10)*
10.2 Hysteresis	The hysteresis of the swimming pool set temperature forms the neutral zone which, if not reached, triggers a swimming pool request.	0.0 … **5 K** … 20
10.3 Setp. temperature	Setting for the desired swimming pool set temperature.	5 … **25 °C** … 60
10.4 Minimum temperature	Setting for the desired swimming pool set temperature, which is also to be maintained during an active swimming pool block.	0 ... **10 °C** ... Swimming pool set temperature
10.5 Maximum temperature	Setting for the desired swimming pool set temperature to be achieved as a maximum.	30 … **60 °C** … 85
10.6 Waste heat utilisation cooling	Setting for whether the waste heat recovery during cooling should be carried out depending on the thermostat switching state or in continuous operation.	**No** / Yes
10.7 Swimming pool reset maximum	With the reset Yes setting, the determined maximum swimming tool temperatures in heat pump operation are reset to the value 65 °C. The setting value is returned automatically to No.	**No** / Yes
10.8 Maximum temperature 1 compressor	Display of the determined maximum swimming pool temperatures depending on the heat source temperature.	
10.9 Maximum temperature 2 compressor		
10:10 Pool pump 10:11 Pool pump manual	Setting for the speed of the electronically regulated swimming pool circulating pump (M19).	Automatic Level 1 Level 2 **Level 3** Manual 30 …**50 %**…100

5.18 Pump control

Pump control

The settings must be selected based on the system hydraulics.

Parameter		Setting	Setting range
M16 function M13		Is the auxiliary circulating pump M16 to take on the function of the heat circulating pump M13?	Yes / No
Optimisation heating pump	11.2.1 Heating limit temperature 1	The heating limit temperature refers to the outside temperature. Below heating limit temperature 1, the heating pump is permanently on. At temperatures between heating limit temperature 1 and 2, the heating pump runs in pump optimisation mode.	- 10 … **15 °C** … Heating limit temperature 2
	11.2.2 Heating limit temperature 2	Above heating limit temperature 2, the heating pump is permanently off. Above the heating limit temperature, the heating pump only runs with a scavenging time request. This results in a demand-based scavenging.	Heating limit temperature 1 … **25 °C** … 35
	11.2.3 Cooling limit temperature 1	Below cooling limit temperature 1, the heating pump is permanently off. Below the cooling limit temperature, the heating pump only runs with a scavenging time request. This results in a demand-based scavenging.	- 10 … **15 °C** … Cooling limit temperature 2
	11.2.4 Cooling limit temperature 2	Above cooling limit temperature 2, the heating pump is permanently on. At temperatures between cooling limit temperature 1 and 2, the heating pump runs in pump optimisation mode.	Cooling limit temperature 1 … **15 °C** … 35
Pump supply secondary pump		Setting for the lead time of the secondary pump before the compressor starts.	10 … **60 s** … 420
Pump run-on secondary pump		Setting for the delay time of the secondary pumps after the compressor is switched off.	0 … **5 s** … 420

5.19 Outputs

Outputs

Parameter	Description
12.1 Compressor 1	
12.2 Compressor 2	
12.3 Fan/M11	
12.4 M11 Primary pump	
12.5 Internal 4-way valve	

12.6 Nozzle ring heating	
12.7 M16 Add. circulation pump	
12.8 Y12 External 4-way valve	
12.9 H5 Remote fault indicator	
12:10 M12 Primary pump cooling mode	
12:11 M17 Cool. circulation pump	
12:12 Y5 3-way valve	
12:13 E10.1 Immersion heater	
12:14 M21 Mixer bivalent	
12:15 M21 Mixer renewable	
12:16 M13 Heat circulation pump	
12:17 M21 Mixer 2. heat circuit	
12:18 M15 Heat circulation pump	
12:19 M22 Mixer 2. heat circuit	
12:20 M20 Heat circulation pump	
12:21 M21 Mixer 3. heat circuit	
12:22 N9 Room thermostat	
12:23 E13 2.Refrig. unit	
12:24 M18 Hot water pump	

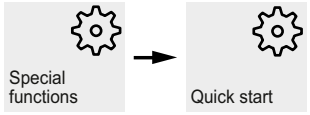
12:25 E9 Flange heating	
12:26 M24 Circulation pump	
12:27 M19 Pool pump	

5.20 Inputs

Parameter	Description
13.1 Pressure stat Low pressure	Low pressure contact open = error (Setting low pressure switch NC contact)
13.2 Pressure stat High pressure	High pressure contact open = error (Setting high pressure switch NC contact)
13.3 Pressure stat Defrost	Contact closed = defrost end
13.4 Brine press. switch	Contact open = error
13.5 Throughput switch primary	Contact open = error
13.6 Throughput switch secondary	Contact open = error
13.7 Thermostat Hot gas	Contact open = error
13.8 Thermostat Freeze protection	Contact open = error
13.9 Thermostat Hot water	Contact closed = domestic hot water request
13:10 Thermostat Pool	Contact closed = swimming pool request
13:11 Motor protect. compressor	Contact open = error
13:12 Motor protect. primary pump	Contact open = error
13:13 Motor protect. fan	Contact open = error
13:14 EVU block	Contact open = utility company block
13:15 External block	Contact open = external block
13:16 Demand circulation pump	Contact closed = circulation pump demand

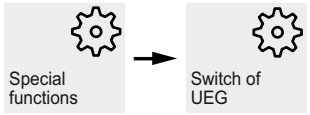
5.21 Special functions

5.21.1 Quick start



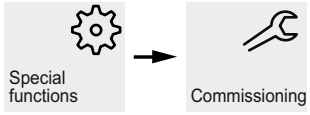
Parameter	Setting	Setting range
14.1 Quick start	By activating the "Quick start" function, the heat pump can start up after the safety-related periods have elapsed. A switch cycle block is ignored here.	**No** / Yes

5.21.2 Lower operating limit deactivate



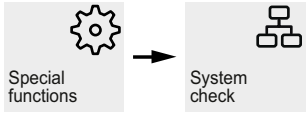
Parameter	Setting	Setting range
14.2 Lower operating limit deactivate	Activating the “Switch off lower application limit” function, means that the heat pump can start up after the safety-related periods have elapsed. The lower operating limit undershoot monitor is turned off.	**No** / Yes

5.21.3 Commissioning



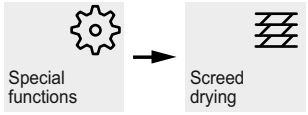
Parameter	Setting	Setting range
14.3 Commissioning mode	When this function is activated, the defrost with air-to-water heat pumps is suppressed for one hour and the 2nd heat generator is released. If a defrost process is already running, it is cancelled.	**No** / Yes

5.21.4 System control



Parameter	Setting	Setting range
14.4 System control	System control on pumps and mixers	
14.4.1 Output M11 14.4.2 Output M18 14.4.3 Output M24 14.4.4 Output M13/M15/M16	When this function is activated, the pumps on the primary side are switched on permanently for a period of 24 hours. The heat pump remains blocked during this time.	**No** / Yes
14.4.5 Mixer M21/M22	When this function is activated, the mixers are first switched to the OPEN direction for the set mixer runtime, and then to CLOSED.	**No** / Yes

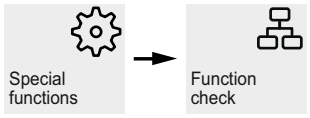
5.21.5 Screed program



Parameter	Setting	Setting range
15.1 Maximum temperature	Setting for the maximum return temperature to be achieved during initial heating.	25 … **35 °C** … 50
15.2 Hot water / Pool	If this function is selected, a potential domestic hot water or swimming pool demand is permitted during the initial heating.	**No** / Yes
15.3 Function heating	Activates the heating function program.	**No** / Yes
15.4 Standard program line heating	Activates the standard program for screed drying.	**No** / Yes
15.5 Individual program line heating		
15.5.1 Heat-up duration	Setting for the duration for the individual steps of the heat-up phase.	1 … **24** … 120
15.5.2 Hold duration	Setting for the maintaining time.	1 … **24** … 480
15.5.3 Duration Cool down	Setting for the duration for the individual steps of the cool-down phase.	1 … **24** … 120

Parameter	Setting	Setting range
15.5.4 Differential temperature heat-up	Setting for the temperature difference between two steps in the heat-up phase.	1 … **5 K** … 10
15.5.5 Differential temperature Cool down	Setting for the temperature difference between two steps in the cool-down phase.	1 … **5 K** … 10
15.5.6 Individual program line heating	Activation of the individual program for screed drying.	**No** / Yes

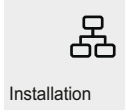
5.21.6 Function control



During function control, the connected actuators (pump, mixer, etc.) can be switched manually for testing purposes. The function control is active for the set activation time. The actuators are active for the set runtime. If function control is activated, the actuators can be switched manually in the Outputs menu.

Parameter	Setting	Setting range
14.5 Function control	Function for the installer	
14.5.1 Function control	Activating this function activates function control for a selectable number of minutes. During this time, individual output functions can be activated in the Outputs menu. The heat pump remains blocked during this time.	**No** / Yes
14.5.2 Activation time		1 ... **30 minutes** ... 60
14.5.3 Run time		1 … **10 seconds** … 99

5.22 System



Parameter	Setting	Setting range
16.1 Flex input ID1 + ID2	Is digital input ID1 + ID2 used? What function should be assigned to this input?	Thermostat Load stage Smart-Grid
16.2 Flex input ID4	Is digital input ID4 used? What function should be carried out when this input is opened?	Frost protect. Holiday Hot water Block Summer

5.23 Cascade controller master

With cascade control, multiple settings are possible on the master and on the individual heat pumps.

Cascade controller

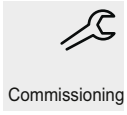
Parameter	Setting	Setting range
19.1 Priority air/brine External temperature	Setting for the limit temperature at which the priority is changed between air and brine heat pumps.	-20 … 5 °C … 20
19.3 Delay heating output increase	Delay time for a heating request before switching up to the next higher performance level.	1 … 20 minutes … 60
19.4 Delay heating output reduction	Delay time after completion of a heating request before switching down to the next lower performance level.	1 … 15 minutes … 60
19.5 Delay cooling output increase	Delay time for a cooling request before switching up to the next higher performance level.	1 … 20 minutes … 60
19.6 Delay cooling output reduction	Delay time after completion of a cooling request before switching down to the next lower performance level	1 … 15 minutes … 60
19.7 Delay output increase	Delay time for a domestic hot water request before switching up to the next higher performance level.	1 … 20 minutes … 60
19.8 Delay output reduction	Delay time after completion of a domestic hot water request before switching down to the next lower performance level.	1 … 15 minutes … 60
19.9 Delay output increase	Delay time for a swimming pool request before switching up to the next higher performance level.	1 … 20 minutes … 60
19:10 Delay output reduction	Delay time after completion of a swimming pool request before switching down to the next lower performance level.	1 … 15 minutes … 60

5.24 Cascade controller heat pump

Cascade controller

Parameter	Setting	Setting range
20.1 Heat pump	Is the heat pump connected to a cascade controller and should be used in the group?	**No** / Yes
20.2 External temperature	Should the outside temperature from the heat pump be adopted by the cascade controller?	No / **Yes**

6 Commissioning wizard



The commissioning wizard guides you automatically through carrying out all system settings relevant for operation. The menu items available for selection are based on the heat pump type used and hardware. The commissioning wizard must be run through entirely and completed. It is not possible to cancel the process during the commissioning.

Parameter	Description	Setting range
Language	Setting for the desired language. Depending on the software version, not all languages listed may be available.	Deutsch English Français Nederlands Italiano Svenska Dansk Magyar Český Slovenský Hrvatski Slovenski Norsk

Advanced settings for network operation

Parameter	Description	Setting range
Login	Password entry required for the cascade control settings	
No cascade control	This setting resets the controller for the cascade control.	
Master	The cascade controller is set as the master.	
Heat pump 1 - 14	Setting for which heat pump 1 – 14 to which the controller is to be assigned in network operation.	
Network operation number of heat pumps	Setting for the number of heat pumps integrated in network operation	0 ... 14

To adopt the setting for network operation, a restart must be carried out using the display.

6 Commissioning wizard

Parameter	Description	Setting range
Heat pump code	The 4-digit heat pump code printed on the type plate can be corrected with these settings.	
Functions	The setting for the desired function should be selected based on the system hydraulics. Note: The Direct circuit and Mixer circuit 1 functions are mutually exclusive. The maximum possible number of available functions depends on the hardware used.	Domestic hot water Direct circuit Mixer circuit 1 Mixer circuit 2 Mixer circuit 3 Bivalent Renewable Swimming pool Active Cooling Passive Cooling
Function blocks	The colour assignment must be chosen depending on the wiring of the functions on the controller. To assign a function to the “Blue” and “Orange” function blocks, the expansion controller WPM 6.0 with two function blocks is required.	Yellow Green Red ---------- Blue Orange
Central demand function	With a central request for the selected function, the cascade controller requests the necessary heat pumps centrally. If no central request is selected, each heat pump will carry out the request independently of the cascade controller and thus decentrally.	Domestic hot water Swimming pool
2.heat exchanger	Is a pipe heater installed in the system hydraulics? Is an immersion heater installed in the buffer, which is used for heating support?	Pipe heating Immersion heater
Domestic hot water Demand	Is domestic hot water preparation carried out with the heat pump? Is a thermostat or a sensor used for this purpose?	Sensor Thermostat
Domestic hot water 2.heat exchanger	Is a pipe heater installed in the system hydraulics, which can be used for hot water reheating? Has a flange heater for reheating and thermal disinfection been installed in the domestic hot water cylinder?	Pipe heating Flange heating
Domestic hot water circulation	Is there a circulation pump and is it controlled by the cascade controller? Is this controlled by a pulse or a timer function?	Impulse Time
1.Circuit	How is heating circuit 1 used?	Heating Cooling
1.Heat circuit control	What control option should be used for heating circuit 1? • External: Return temperature control depending on the outside temperature and set heating curve • Fixed value: Return temperature control using fixed-setpoint • Room temperature: Return temperature control depending on the room temperature of a reference room	External Fixed value Room temperature
1.Heat circuit room control	What hardware is used for the heating room control?	RTM Econ RTH ECon R13 BMS
1.Cool circuit control	What control option should be used for cooling circuit 1? • Fixed value: Return temperature control using a fixed-setpoint • Silent cooling: Return temperature control depending on the room temperature of a reference room	Fixed value Silent cooling
1.Cool circuit room control	What hardware is used for the cooling room control?	RTM Econ RKS BMS

Parameter	Description	Setting range
1.Circuit number RTM Econ	How many RTM Econ are used for circuit 1?	1 … 10
2.Circuit	How is heating circuit 2 used?	Heating Cooling
2.Heat circuit	What control option should be used for heating circuit 2? • External: Return temperature control depending on the outside temperature and set heating curve • Fixed value: Return temperature control using a fixed-setpoint • Room temperature: Return temperature control depending on the room temperature of a reference room	External Fixed value Room temperature
2.Heat circuit room control	What hardware is used for the heating room control?	RTM Econ BMS
2.Cool circuit control	What control option should be used for cooling circuit 2? • Silent cooling: Return temperature control depending on the room temperature of a reference room	Silent cooling
2.Cool circuit room control	What hardware is used for the cooling room control?	RTM Econ BKS BMS
2.Circuit number RTM Econ	How many RTM Econ are used for circuit 2?	1 … 10
3.Circuit	How is heating circuit 3 used?	Heating Cooling
3.Heat circuit control	What control option should be used for heating circuit 3? • External: Return temperature control depending on the outside temperature and set heating curve • Fixed value: Return temperature control using a fixed-setpoint • Room temperature: Return temperature control depending on the room temperature of a reference room	External Fixed value Room temperature
3.Heat circuit room control	What hardware is used for the heating room control?	RTM Econ BMS
3.Cool circuit control	What control option should be used for cooling circuit 3? • Silent cooling: Return temperature control depending on the room temperature of a reference room	Silent cooling
3.Cool circuit room control	What hardware is used for the cooling room control?	RTM Econ RKS BMS
3.Circuit number RTM Econ	How many RTM Econ are used for circuit 3?	1 … 10
Pool Demand	Is swimming pool water heating carried out with the heat pump? Is a thermostat or a sensor used for this purpose?	Sensor Thermostat

Parameter	Description	Setting range
Cooling	Is a 2nd refrigerator used in the system?	2nd refrigerator
4-way valve	Is an external 4-way valve installed in the system hydraulics for optimized heating and cooling operation? What function is the 4-way valve used for?	Without 4-way valve (cooling and heating) With 4-way valve (cooling and heating) Without 4-way valve (heating)
Function M16	What function is the auxiliary circulating pump used for in the system hydraulics?	Heating Cooling Domestic hot water Swimming pool 2nd heat generator Renewable

7 Function description

The cascade controller activates and deactivates up to 14 individual heat pumps with heat pump manager, controls up to 3 heating/cooling circuits, and takes care of domestic hot water and swimming pool water preparation. In mono energy or bivalent systems, in addition to the request from the compressors the cascade controller also controls activation of the second heat generator. The request from the compressors and activation of the 2nd heat generator is dealt with using performance level switching. There are the same number of performance levels as compressors in parallel operation, up to a maximum of 28. With an additional heat generator for bivalent or mono energy operation, a maximum of 29 performance levels are available. The heat pump manager on the individual heat pumps is responsible for control of the compressors, the domestic water and swimming pool circulating pump and the primary pump (fan / brine circulating pump / well water pump). It also monitors and controls the auxiliary circulating pump that ensures the appropriate heating water flow rate through the individual heating pump.

7.1 Priority specification

To ensure that the heat pump heating system operates as efficiently as possible, the cascade controller controls the heat pump managers for the individual heat pumps with different priorities. For a combination of different heat pump types, the different heat pumps are actuated depending on the outside temperature:

- Priority use of air-to-water heat pumps above an adjustable limit temperature
- Priority use of brine-to-water or water-to-water heat pumps below an adjustable outside temperature
- To achieve as uniform a distribution of runtimes as possible, the cascade controller prioritises starting the compressor with the lowest runtime. The cascade controller receives a response from the individual heat pumps, detects a request from blocked heat pumps and shifts the priorities to achieve optimum utilisation.

7.2 Heating and cooling circuits

Control of the mixers for heating/cooling circuit 2 or 3 or the bivalent mixer in bivalent operation is also performed by the cascade controller. Other mixed heating circuits (maximum 28) can be implemented by control of the mixers by the relevant heat pump managers for the individual heat pumps. Here, the setpoint is specified in the heat pump manager for the relevant heat pump and this is not possible using the cascade controller.

7.3 Domestic hot water and swimming pool water preparation

Domestic hot water and swimming pool water preparation can be configured to be centralised or decentralised. The setting must be synchronised with the hydraulic integration and impacts both control of the circulating pumps and the evaluation of the temperature sensors.

7.4 Centralised domestic hot water and swimming pool water preparation

With a centralised configuration, the cascade controller also performs the central domestic hot water and swimming pool water preparation. In order to implement the centralised domestic hot water and swimming pool water preparation function, it is necessary to install the domestic hot water and swimming pool temperature sensors on the cascade controller. The setting for the domestic hot water and swimming pool set temperature is made on the cascade controller, which also controls the performance levels.

7.5 Decentralised domestic hot water and swimming pool water preparation

With a decentralised configuration, the heat pump managers for the relevant heat pumps carry out the domestic hot water and swimming pool water preparation and control the circulating pumps. From the time of a domestic hot water or swimming pool request, the heat pumps are blocked for heating requests by the cascade controller. In order to implement the decentralised domestic hot water and swimming pool water preparation function, it is necessary to install the domestic hot water and swimming pool temperature sensors on the heat pump manager for the relevant heat pump.

8 Energy-efficient operation

If heating operation is carried out depending on the outside temperature, the cascade controller calculates a return set temperature from the set heating characteristic curve and the current outside temperature.

The heating curve should be set to the calculated maximum return temperature of the heating system. The plus + and minus – keys can be used to move the heating curve up or down in parallel on a customer-specific basis to achieve the actual desired room temperatures.

Regulation using the return temperature

Regulating a heat pump heating system using the return temperature has the following advantages:

1) Long runtimes of the heat pump with demand-based heating of the entire circulated heating volume.
2) Recording of the disturbance variables of the heating system.
3) Reducing the temperature spread results in lower flow temperatures with a constant return temperature, thus achieving a more efficient operation.

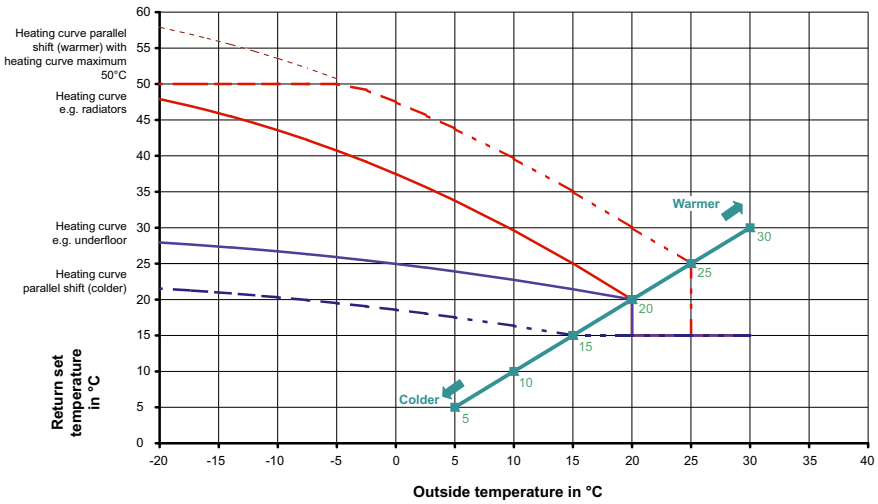
TIP

The heating curve should be set as high as necessary and as low as possible!

8.1 Outside temperature-dependent heating curve

The heating curve must be adapted to the local and structural conditions - separately for heating circuits 1, 2 and 3 - so that the desired room temperature is achieved even with changing outside temperatures. If the outside temperature rises, the return set temperature is lowered, thus ensuring energy-efficient operation of the heating system.

1) In the settings, the maximum required return temperature at –20 °C outside temperature is entered. The goal is to achieve an average, constant room temperature even with changing outside temperatures.
2) All heating characteristic curves meet at an outside temperature of +20 °C and a return temperature of +20 °C, so that heat output is no longer required at this operating point. The bar display (plus and minus keys) can be used to shift this operating point between 5 °C and 30 °C along the inclined marked axis. This shifts the entire heating curve by a constant value of 1K per bar unit upwards or downwards in parallel. The user can carry out this setting according to their individual desired temperature.
3) Each heating curve is limited by the maximum set value. Each heating curve has a lower limit of 18 °C (air-to-water HP) or 15 °C (brine or water-to-water HP).



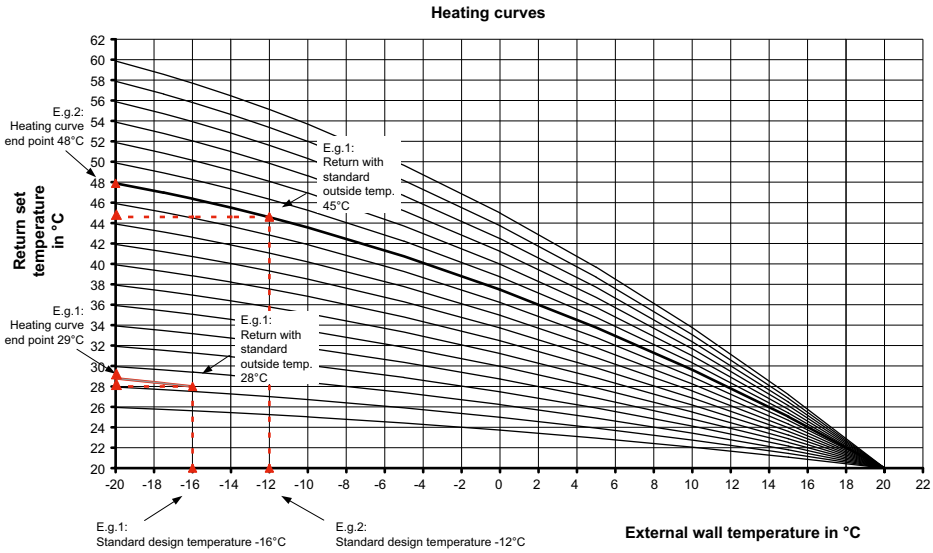
8.1.1 Setting examples

	Underfloor heating 35 °C / 28 °C			Radiators 55 °C / 45 °C		
Standard outside air temperature °C	-12	-14	-16	-12	-14	-16
Required flow temperature (at standard design temperature)	35 °C	35 °C	35 °C	55 °C	55 °C	55 °C
Temperature spread flow/return	7 °C	7 °C	7 °C	10 °C	10 °C	10 °C
Required return temperature (at standard design temperature)	28 °C	28 °C	28 °C	45 °C	45 °C	45 °C
Setting for heating curve end point	30 °C	29 °C	29 °C	48 °C	47 °C	46 °C
	Example 1			Example 2		

A heat distribution system (e.g. underfloor heating) is designed for a maximum flow temperature with a specific standard outside temperature. This is dependent on the location of the heat pump and is between -12 and -18 °C in Germany.

The max. return temperature to be set on the heating controller must be entered for an outside temperature of –20 °C. To do this, the maximum return temperature for the specified standard outside temperature in fig. on page 56 must be entered. From the array of curves, the setting value at -20 °C can be read.

Step 1:
Adjustment of the heating curve to local and structural conditions by setting the gradient (heating curve end point)
Step 2:
Setting of the desired temperature level by parallel shifting of the heating curve up or down (bar display)



8.1.2 Optimisation of the heating curve

There are two setting options for optimising the heating curve:

- Changing the gradient using a higher or lower “heating curve end point”
- Raising or lowering the entire heating curve with the plus and minus keys

If	outside temperature is		
	below -7 °C	**-7 to +7 °C**	**above +7 °C**
too cold	“Heating curve end point” value 2 °C to 3 °C higher	Plus 1 °C to 2 °C scale graduations higher	Plus 1 °C to 2 °C higher and “Heating curve end point” value 2 °C to 3 °C lower
too hot	“Heating curve end point” value 2 °C to 3 °C lower	Minus 1 °C to 2 °C scale graduations lower	Minus 1 °C to 2 °C scale graduations lower and “Heating curve end point” value 2 °C to 3 °C higher

8.2 Room temperature control

With highly insulated houses and open design in particular, or when heating individual large rooms, the calculation of the return set temperature can be carried out using the room temperature of a reference room.

Control behaviour

The larger the deviation between the room and the room set temperature, the faster the return set temperature is adapted.

Where necessary, the response time can be changed using the adjustable interval value (I-value). The larger the interval value, the slower the adjustment of the room set temperature.

The minimum return set temperature adjusts automatically to the set room temperature. If this is not desired, there is the option of switching from “automatic” to “manual” in the menu by selecting “*Heat circuit - Return temperature minimal*”.

Requirements:

- For systems with silent cooling, the RTM Econ reference room modulator is used to determine the room temperature.
- Deactivation of an existing individual room control in the reference room
- The required return temperature is recommended as an input for a maximum return set temperature with standard design temperature.
- Even room set temperature, mostly free from raises and lowers

When room temperature control is activated or the room set temperature is changed, the room temperature may initially be overshot.

8.2.1 Setting examples

Recommended settings for room set temperature 22 °C	Minimum return temperature	Maximum return temperature
Surface heating (35/28 °C) (underfloor, wall, ceiling	22 °C	30 °C
Low temperature radiators (45/38 °C)	25 °C	40 °C
Radiators (55/45 °C)	30 °C	50 °C

For optimum control, the control range between the minimum and maximum return temperature should be as small as possible. The automatic operating mode switching enables heating operation to be blocked above a selectable outside temperature.

8.2.2 Optimisation of the room temperature control

	1st action	2nd action
Building too warm	Reduce the room set temperature	
Building not getting warm	Increase the room set temperature, increase the volume flow	Increase the maximum return temperature
Reference room warm, individual rooms (e.g. bathroom) too cold	Hydraulic alignment (reduce volume flow in the reference room)	
Reference room not reaching the room set temperature, individual rooms (e.g. bathroom) are warm	Hydraulic alignment (increase volume flow in the reference room)	Increase the maximum return temperature

8.3 Fixed-setpoint control

For special cases (e.g. charging a buffer to constant temperature), an outside temperature-dependent characteristic curve can be set. When room temperature control is activated or the room set temperature is changed, the room temperature may initially be overshot.

9 Domestic hot water preparation

For domestic hot water preparation, domestic hot water cylinders with sufficiently large heat exchange surfaces must be used, that are able to consistently transfer the maximum heat output of the heat pump.

Control is carried out using a sensor (R3) installed in the domestic hot water cylinder, which is connected to the cascade control for a centralised request.

The achievable temperatures in pure heat pump operation are below the maximum flow temperature of the heat pump.

For higher domestic hot water temperatures, the cascade controller provides the option of actuating a flange heater.

Alternatively, control can be carried out using a thermostat. In this application, targeted reheating using a flange heater is not possible.

9 Domestic hot water preparation

9.1 Basic heating

A domestic hot water request is detected if the current

domestic hot water temperature is < domestic hot water set temperature - domestic hot water hysteresis.

A domestic hot water request is ended if the domestic hot water set temperature heat pump maximum temperature determined depending on the heat source is reached.

The domestic hot water preparation can be interrupted by defrosting or by the high pressure protection program.

Menu	Submenu	Setting
Preconfiguration	Domestic hot water preparation	Yes with sensor
Preconfiguration	Flange heating	No

9.1.1 Achievable domestic hot water temperatures

The maximum domestic hot water temperature that can be achieved in pure heat pump operation depends on:

- The heat output of the heat pump
- The heat exchanger surface installed in the cylinder
- The volume flow depending on the pressure drop and delivery rate of the circulating pump.

9.1.2 Heat source-dependent domestic hot water temperatures

The heat pump manager automatically determines the maximum possible domestic hot water temperature, referred to as the heat pump maximum temperature.

The heat pump maximum temperature is also dependent on the current temperature of the heat source air, brine or water. To ensure that the maximum possible domestic hot water temperature is always achieved, the permissible range of the heat source temperature is divided into temperature ranges. A specific heat pump maximum temperature is assigned to each range, and each heat pump maximum temperature is set to 65 °C as the default value.

If the high pressure switch is triggered during domestic hot water preparation with the heat pump, the current heat source temperature is recorded and the corresponding heat pump maximum temperature is determined as follows:
1 K is deducted from the current measured domestic hot water temperature and saved as the heat pump maximum temperature.

9.2 Reheating

Reheating means that the heat pump takes over the domestic hot water preparation until the heat pump maximum temperature is reached. Another heat generator then takes over the domestic hot water preparation until the desired domestic hot water set temperature is reached. Reheating is only activated if the desired set temperature is higher than the current heat pump maximum temperature.

Reheating is started if

- the domestic hot water temperature is higher than the maximum temperature that can be achieved with the heat pump.

If the domestic hot water temperature falls below the domestic hot water set temperature hysteresis hot water during reheating, the reheating is stopped and basic heating is started using the heat pump.

The selection of the relevant heat generator for the domestic hot water generation depends on the mode of operation of the heat pump heating system, the configurations and the current statuses of the system.

The reheating must be released in the menu by selecting "*Settings – Hot water reheating*".

Menu	Submenu	Setting
Preconfiguration	Domestic hot water preparation	Yes with sensor
Preconfiguration	Flange heating	Yes
Settings	Domestic hot water reheating	Yes

9.3 Thermal disinfection

A start time is specified for thermal disinfection. When the thermal disinfection is started, the system immediately attempts to reach the set temperature. The selection of the heat generator used for this depends on the mode of operation of the heat pump heating system, the configurations and the current statuses of the system. Thermal disinfection is ended when the set temperature is reached.

For the thermal disinfection setting menu to be released, a bivalent heating system and/or flange heater must be set with "Yes" in the preconfiguration.

If the set temperature is not reached after 4 hours, the thermal disinfection is cancelled. The set start time can be activated or deactivated individually for each day of the week.

9.4 Domestic hot water lower time

A domestic hot water lower time can be set for two different times and days of the week. Despite a domestic hot water lower time, a minimum domestic hot water temperature can be defined for comfort purposes. The minimum domestic hot water temperature is always maintained during a domestic hot water block. A domestic hot water request is carried out if the minimum domestic hot water temperature hysteresis is not reached.

10 Program description

10.1 Limit temperature

The outside temperature at which the heat pump just covers the heat consumption is known as the 2nd heat generator limit temperature or the bivalence point. This point is marked by the transition from pure heat pump operation to bivalent operation together with immersion heater or boiler.

The theoretical bivalence point can deviate from the optimal point. Particularly in transition periods (cold nights/ warm days), a lower bivalence point can reduce the energy consumption according to the wishes and habits of the operator. Therefore, a limit temperature for enabling the 2nd heat generator can be set on the cascade controller by selecting *"2.heat exchanger – Limit temperature"* in the menu.

Usually, the limit temperature is only used with mono energy systems with air-to-water heat pumps or with bivalent systems in combination with boilers.

In *mono energy* operation, a limit temperature of –5 °C is the aim. The limit temperature is determined from the outside temperature-dependent building heat consumption and the heat pump heat output curves.

10.2 Blocking requests

Different statuses and settings can result in the heat pump request being blocked. The indicated blocks are reset automatically or are removed once they have been addressed.

10.2.1 Utility block

The utility company (*E*nergie-*V*ersorgungs-*U*nternehmen - EVU) can make a temporary switch off of the heat pump a condition for low-cost electricity tariffs. During a utility block, the Connector no. input (1) on the "General" function block is opened.

For systems without a utility block, the link cable provided must be inserted at the relevant terminal points.

The utility block is set in the menu by selecting *"2.heat exchanger – EVU block".*

With bivalent systems, different responses to a utility block are possible:

Perf. level 3 only

Heat pump blocked, the 2nd heat generator is only released at performance level 3.

Constant:

The 2nd heat generator is always released in the event of a heat request during a utility block.

Limit temperature dependent

Heat pump blocked, the 2nd heat generator is released below the selectable limit temperature EVU3.

For mono energy and monovalent systems, the 2nd heat generator is generally blocked during a utility block. The setting for the utility block is hidden.

For an external heat pump operation block that does not reset automatically after max. 2 hours, the external disable contactor (contact X3/A2) must be used. If the minimum permissible return temperature is not reached, the heat pump is also released when a blocking signal is present.

10.2.2 Line load

The line switch-on load is a requirement of the utility companies. It can last for up to 200 seconds after the voltage is restored or after a utility block. The line load cannot be bypassed.

10.2.3 Minimum pause time

To ensure adequate pressure compensation in the refrigeration circuit and to protect the heat pump, it can take up to 5 minutes to switch on the compressor again. The heat pump starts after the minimum pause time has elapsed in order to fulfil a pending demand. The minimum pause time cannot be bypassed.

10.2.4 Switch cycle block

According to the connection conditions of the utility companies, the heat pump may only switch on 3 times per hour. The heat pump manager will therefore only allow a switch-on every 20 minutes as a maximum.

10.3 2nd heat generator

10.3.1 Control of immersion heaters

In mono energy systems, additional electric heaters are used. They are switched on or off depending on the heat consumption requirements, if "*Mono energy*" operating mode is selected in the preconfiguration menu and the set limit temperature is not reached.

10.3.2 Constant control boiler

With this type of boiler, the boiler water is constantly heated to a fixed set temperature (e.g. 70 °C) if released by the cascade controller. The set temperature must be set high enough that the domestic hot water preparation can also be carried out using the boiler if necessary. The mixer is controlled by the cascade controller, which issues a request to the boiler as necessary and adds enough hot boiler water to reach the desired return set temperature or domestic hot water temperature. The boiler is requested using the 2nd heat generator output on the cascade controller and the operating mode of the 2nd heat generator must be coded to "constant".

10.3.3 Gliding control boiler

In contrast to a constant control boiler, the gliding control boiler directly supplies a heating water temperature to match the outside temperature. The 3-way reversing valve or 4-way reversing valve has no control function and is only responsible for directing the heating water flow past the boiler circuit or through the boiler depending on the operating mode.

In pure heat pump operation, the heating water is directed past the boiler to avoid losses due to the heat emission of the boiler. If weather-compensated burner regulation is already in place, the power supply for the burner regulation must be interrupted during exclusive heat pump operation. To do this, control of the boiler must be connected to the "Bivalent" function block on the cascade controller and the operating mode of the 2nd heat generator must be coded to "gliding". The characteristic curve for the burner regulation is set according to the cascade controller.

10.3.4 Special program for older boilers and central cylinder systems

If a request has been issued to the second heat generator and the special program is activated in the menu by selecting *"2. heat exchanger"*, the 2nd heat generator remains in operation for at least 30 hours. If the heat consumption reduces in this time, the second heat generator switches to "standby mode" (2nd heat generator connected to voltage, but mixer CLOSED). It is only switched off completely if no request is issued for the 2nd heat generator for 30 hours.

10 Program description

This function can be used for bivalent systems as follows:
1. With older oil or gas boilers to prevent corrosion damage due to frequent dropping below the dew point.
2. In central cylinder systems so that cylinder charging is guaranteed for the following day irrespective of the current heat consumption.

10.3.5 Bivalent-parallel

The “Limit temperature parallel” is defined in the *“2.heat exchanger”* menu. If the parallel limit temperature is not reached, a parallel request is sent to the heat pump and the 2nd heat generator if required.

10.3.6 Bivalent-alternative

The “Limit temperature alternative” is defined in the *“2.heat exchanger”* menu. If the alternative limit temperature is not reached, the heat pump is blocked and the 2nd heat generator is released for both heating and domestic hot water preparation.

If alternative operation rather than parallel is always desired, the alternative and parallel limit temperatures must be set to the same value.

10.3.7 Renewable

When integrating a renewable heat source (e.g. solar, wood), it must be given priority over heat pump operation. To this end, bivalent-renewable is coded in the preconfiguration. While the renewable cylinder is cold, the system behaves like a mono energy system.

On the “Renewable” connector no. function block (3), the sensor R13 for the renewable cylinder is connected. The mixer outputs of the bivalence mixer are active.

Basic function:

The temperature in the renewable cylinder is recorded and compared with the flow temperature of the relevant request (domestic hot water, heating or swimming pool). If the temperature is higher than the conditions listed below, the heat pump is blocked, the renewable cylinder is used as a 2nd heat generator and the bivalence mixer is controlled accordingly.

Block by heating request:

If the temperature in the cylinder is 2-20 K higher than the current flow temperature, the heat pump is blocked in the event of a heating request. It is only released again when the difference between the renewable cylinder and the flow is less than half of the switching value.

For solar integrations, the selectable overtemperature must be set to the maximum value to prevent the heat pump from cycling.

Block by domestic hot water request:

If the temperature in the cylinder is 2-5 K higher than the current domestic hot water temperature, the heat pump is blocked in the event of a domestic hot water request. It is only released again when the difference between the renewable cylinder and the domestic hot water is less than half of the switching value.

Block by swimming pool request:

If the temperature in the cylinder is higher than 35 °C (value can be set in the menu by selecting - Settings - 2.heat exchanger, overtemperature of 10–50 °C), the heat pump is blocked in the event of a swimming pool request. It is only released when the temperature in the parallel buffer is 5K below the switching temperature again.

As soon as one of the three blocks outlined above is in place, the heat pump is blocked and the display shows: HP waiting, block BR. The 2nd heat generator output is not actuated.

Mixer control:

If no bivalent-renewable block is in place, the mixer is switched to permanently CLOSED.

If a bivalent-renewable block is in place due to domestic hot water or swimming pool, the mixer is switched to permanently OPEN.

If a bivalent-renewable block due to heating is in place, the mixer regulation is active.

10.4 Power control

Performance level is defined by the compressors + 2nd heat generators in the group. If the heat consumption rises, it switches up to the next higher performance level and if the heat consumption falls, it switches down to the next lower performance level.

In the following example there are 2 heat pumps, each with 2 compressors and a 2nd heat generator. Overall, 5 performance levels are available to the cascade circuit in this example.

Criteria for increasing and reducing the performance levels:

Load stage		Number of requested compressors	Description (values for performance level increase and reduction are adjustable)
from	to		
L1		1 compressor cycling	
L1	L2	2 compressors	if the cascade controller requests “more heat” for longer than 20 minutes
L2	L3	3 compressors	
L3	L4	4 compressors	
L4	L5	4 compressors 2 heat generators	if the cascade controller requests “more heat” for longer than 20 minutes and the 2nd heat generator limit temperature is not reached
L5	L4	4 compressors	if the cascade controller requests “less heat” for longer than 15 minutes or the 2nd heat generator limit temperature is exceeded
L4	L3	3 compressors	if the cascade controller requests “less heat” for longer than 15 minutes
L3	L2	2 compressors	
L2	L1	1 compressor	

After commissioning or after a power failure, the cascade controller always starts at performance level L1.

10.5 Hysteresis

The so-called hysteresis can be set for different requirements in the menu. The hysteresis forms a “neutral zone” around the relevant set temperature. If the current temperature is lower than the set temperature reduced by the hysteresis, a request is detected. This remains in place until the current temperature has exceeded the upper limit of the neutral zone. This results in a switch cycle around the setpoint.

Hysteresis return set temperature

For the heating request, a hysteresis can be set around the return set temperature.

If the hysteresis is large, the heat pump runs for longer and the temperature fluctuations in the return are correspondingly high. With a small hysteresis, the compressor run times are reduced and the temperature fluctuations are lower.

For surface heating systems with relatively flat characteristic curves, a hysteresis of approx. 1 K should be set, as an excessively large hysteresis can prevent the heat pump from switching on.

10.6 Control of the circulating pumps

The control of the heating, domestic hot water or swimming pool circulating pump determines where the heat generated by the heat pump should flow. The separate processing of different requests enables the heat pump to always work with the minimum possible flow temperature, thus ensuring energy-efficient operation.

With heat pumps for heating and cooling, additional cooling circulating pumps can be controlled.

Pump assemblies with check valves guarantee defined flow directions.

In Summer operating mode, the circulating pump runs for 1 minute every 150 hours.
This prevents the shaft from jamming.

10.6.1 Frost protection

Irrespective of the heat circulating pump settings, they always run in heating, defrost mode and when there is a risk of frost. For systems with multiple heating circuits, the 2nd/3rd heat circulating pump has the same function.

CAUTION

In order to guarantee the frost protection function on the heat pump, the heat pump manager must not be deenergised and there must be a flow through the heat pump.

10.6.2 Heat circulating pump

For the heat circulating pump (M13, M15, M20), an outside temperature-dependent heating pump optimisation is set in the menu "*Pump control - Optimisation heating pump*".

If the selected limit temperature is not reached, the heating pump optimisation is inactive. The heat circulating pumps are permanently in operation, except during domestic hot water, swimming pool preparation and in "*Summer*", operating mode.

If the selected limit temperature is exceeded, the heating pump optimisation is active. The heat circulating pumps run after a mains switch-on and for 30 minutes after the heat pump is switched off. If the heat circulating pumps had been switched off for longer than 40 minutes or if the return set temperature has intentionally been increased by a raise, the heat circulating pumps are activated for a 7 minute scavenging time to supply the representative temperature of the heating circuits to the return sensor (R2.1) or the demand sensor (R2.2) again.

If a switch is made from heating to domestic hot water or swimming pool preparation, the heat circulating pump carries out an after-run.

The heat circulating pumps are constantly in operation if the minimum system temperatures are not reached and at temperatures below 10 °C on the frost protection sensor (R9) of air-to-water heat pumps.

In Summer operating mode, the circulating pump runs for 1 minute every 150 hours. This prevents the shaft from jamming.

10.6.3 Domestic hot water circulating pump

The domestic hot water circulating pump (M18) runs during domestic hot water preparation. If a domestic hot water request is issued during heating operation, the heat circulating pump is deactivated while the heat pump is running and the domestic hot water circulating pump is activated.

10.6.4 Swimming pool circulating pump

The swimming pool circulating pump (M19) runs during swimming pool preparation. A running swimming pool preparation is interrupted at any time by a domestic hot water request, defrosting or by a raise in the heating characteristic curve (e.g. after night lowering), but not by a cascade controller "more" signal. If the request is still in place after a 60-minute swimming pool preparation, the swimming pool circulating pump is deactivated for 7 minutes and the heat circulating pump is activated for a 7-minute scavenging time to supply the representative temperature of the heating circuit to the return sensor again. If the cascade controller generates a "more" signal during these 7 minutes, the heating request is processed first.

In Summer operating mode, the swimming pool preparation is not interrupted by a scavenging time after 60 minutes.

10.6.5 Auxiliary circulating pump

The auxiliary circulating pump output (M16) can be configured to achieve parallel operation of the auxiliary circulating pump with the compressor of the heat pump. A configuration for heating, domestic hot water and swimming pool preparation is possible. It also runs if the minimum system temperatures are not reached.

In Summer operating mode, the circulating pump runs for 1 minute every 150 hours. This prevents the shaft from jamming.

10.6.6 Primary pump for heat source

The primary pump (M11) supplies the energy of the heat source to the heat pump

Heat pump type	Primary pump
Air-to-water heat pump	Fan
Brine-to-water heat pump	Brine circulating pump
Water-to-water heat pump	Well pump

The well water pump or brine circulating pump always runs if the heat pump is switched on. It starts up 1 minute before the compressor and switches off 1 minute after the compressor.

For air-to-water heat pumps, the fan is switched off during defrosting.

10.6.7 Circulation pump

If there is the option of connecting a circulation pump (M24), it can be requested using a pulse input or using time programs.

If the circulation pump is requested using the pulse input (T31 / connector no. 1), the delay time can be defined in the "*Hot water circulation*" menu. If the request is carried out using a time program, it can be set for two different times and days of the week.

 TIP

A circulation line uses large amounts of energy. To save on energy costs, circulation should not be used. If this is unavoidable, it is advisable to adapt the time window to the optimal conditions. A better approach is to have the circulation running using a pulse for a specific time. This function is also possible with the cascade controller.

10.7 Building management system

There are two options for connecting the heat pump to a building management system.

- Transferring the set values using an interface via the BMS (Building Management System). Different protocols and interfaces are available for this.
- Wiring digital inputs with the option of influencing the power control described on the cascade controller. There is also the option of influencing the operating mode using digital inputs, both by switching from heating to cooling and using a configurable external block (frost protection/domestic hot water/holiday/summer).

CAUTION

In all cases, the primary pump (M11) and the secondary pump (M16) or, depending on the hydraulic integration, the heat circulating pump (M13) must be connected to the cascade controller. This is the only way to ensure that the pump fore-runs and afterruns required for operation are observed and the necessary safety measures are effective

10.7.1 BMS interface

On the BMS interface, the extensions available as special accessories for connection to:

- LAN
- KNX
- Modbus RTU/TCP

are provided.

These extensions allow the operating data and history to be read out and enable settings such as Mode or setpoint specifications to be made, among other things.

In general, a request from the heat pump in conjunction with the building management system should be favoured over an interface.

If an interface such as this is used, the following programming is suggested on the cascade controller. Depending on the number of heating or cooling circuits, they are set to a fixed setpoint control. The set temperature calculated by the building management system is transferred to the cascade controller as the fixed value temperature. The heat pump is also switched to the Auto, Summer and Cooling mode via the building management system.

Further information on these options can be found in the description for the relevant product.

10.7.2 External block

The heat pump can be blocked or released for one of the following functions using the digital input N1-J5/ID4-X3/G (external block):

- Frost protection
  - Heat pump maintains minimum system temperatures, domestic hot water and swimming pool preparation is blocked
- Domestic hot water block
  - Heat pump is released, minimum domestic hot water temperature is maintained
- Holiday mode
  - Heat pump maintains lower value, domestic hot water is blocked
- Summer mode
  - Heat pump maintains minimum system temperature, domestic hot water and swimming pool preparation is released

Block external	Connector no. (2) input
Active	Open
Inactive	Closed

Frost protection is guaranteed in all cases.

If the “Performance level switching” and “External block” functions are to be used, these functions must be activated by after-sales service during the commissioning of the heat pump.

10.7.3 Switching heating/cooling

Switching the Heating/Cooling operating mode is carried out using a digital input on the “Cooling” function block at connector no. (5).

Operating mode	Connector no. (5) input
Heating	Open
Cooling	Closed

11 Initial heating program (screed drying)

The initial heating of a screed is carried out in accordance with defined standards and directives, which have, however, been adapted to the requirements of a heat pump heating system.

The individual programs are activated in the menu by selecting "*Special functions - Screed drying*").

The following applies during initial heating:

- The heat circulating pumps for heating circuits 1, 2 and 3 run constantly
- Programmed lowers or raises are ignored; a fixed hysteresis of ± 0.5 K applies (regardless of the configuration in the menu)
- Limit temperature for the 2nd heat generator fixed at +35 °C (regardless of the configuration in the menu)
- The calculated set temperature applies for all heating circuits
- The mixer for heating circuit 2/3 is switched to permanently open
- In the event of a fault or an interruption in voltage, the selected program is only interrupted. Once the voltage is restored or the fault is acknowledged, the selected program is continued.

If there are no special requirements from the manufacturer, the use of the standard screed drying program is recommended (max. return temperature 35-40 °C).

If no key is pressed for 3 minutes after an initial heating program is activated, the display switches every minute.
The current heat up step, set temperature, elapsed hours and required hours are shown in the bottom display line.

11.1 Implementation of the directive for a heat pump heating system

The directive is based on whole days for which a defined temperature is to be reached or maintained.

With high humidity levels in the screed, the defined temperatures are often not reached in the specified time. For sufficient drying, however, it is essential that the temperature level is maintained for a specific period of time.

For this reason, the days described in the standard are converted to program steps, where one program step corresponds to the combination of the number of days or hours and the relevant temperature.

Depending on the ratio of heat output from the heat pump and heated living area, the specified minimum heat up times can also be significantly exceeded, as the required minimum number of hours is only totalled up after the set temperature is reached.

The relevant standards and directives describe the flow temperature of the heating system in each case. The return temperature is key for controlling the heat pump.

The maximum return temperature must be entered for the initial heating program. This is calculated from the maximum flow temperature minus the temperature spread (e.g. 7 K).

11.2 Heating function program in accordance with DIN EN 1264-4

This program serves as a function test for underfloor heating and is only carried out after the specified rest time of the screed.

This is designed to highlight any faults in the screed and in the underfloor heating.

1). Step: A constant return temperature of 20 °C must be maintained for 72 hours (3 days).

2). Step: The maximum return temperature (selectable) must be maintained for 96 hours (4 days).

3). Step: The heat pump remains off until the return temperature has dropped below 20 °C.

The duration of step 3 is limited to a maximum of 72 hours, as, in high outside temperatures, the return temperature may not fall below 20 °C.

The heating function program should be carried out to check the function of the underfloor heating system. With cement screed, this may be carried out after 21 days at the earliest, with calcium sulphate screed, after 7 days at the earliest after the screed work is complete.

Once the screed has been created, after the required rest time and after the heating function program, the readiness for further processing must be confirmed before applying the upper floor covering.

11.3 Screed drying

11.3.1 General notes

This program reduces the humidity in the screed to a level where the floor covering can be applied.

The moisture content must be measured, however, and additional drying carried out where necessary.

The guidelines for drying the screed specify a fixed number of steps with defined temperatures and durations. This sequence can be selected in the menu as *"Standard program line heating"*.

The standard program should be used in most cases in agreement with the screed installer. The sequence defined for the standard program should only be individually adapted if there are special requirements for the heating. In this case, select *"Individual program line drying"* in the menu.

11.3.2 Screed drying standard program

This program consists of 8 steps and is usually suitable for all underfloor heating systems. Before activation, the maximum permissible return temperature must be entered, e.g. 32 °C.

Step 1-4: Heat up processes
Step 5: Maintaining
Step 6-8: Heat down processes

Steps 1 to 4 are heat up processes lasting 24 hours each. With each step, the return set temperature is increased from 20 °C up to the maximum return temperature.

To end a program step, two conditions must be met. The corresponding set temperature must have been reached or exceeded and the duration of 24 hours must have elapsed. If the temperature is reached before the 24 hours have elapsed, the heat pump maintains the relevant set temperature for the remaining duration. No evaluation is carried out of how long this temperature was actually reached for.

In step 5, the maximum return temperature should be maintained for a period of 264 hours.

The duration for which the maximum return temperature was actually reached is totalled up. Upper limit open, lower limit setpoint - hysteresis.

Only when the totalled time has reached the value of 264 hours is this program step ended.

Steps 6 to 8 are cool down steps lasting 24 hours each. With each step, the return set temperature is lowered from the maximum return temperature to 20 °C.

To end a program step, two conditions must be met. The value must be lower than the corresponding set temperature and the duration of 24 hours must have elapsed. If the value drops below the temperature before the 24 hours have elapsed, the heat pump maintains the corresponding set temperature for the remaining duration. No evaluation is carried out of how long this temperature was actually reached for, however.

The duration of the cool down processes is limited to a maximum of 72 hours, as, in high outside temperatures, the value may not drop below the required return temperature.

Example:

Max. return temperature: 32 °C

Step 1-4: 20 / 24 / 28 / 32 °C
Step 5: Maintaining
Step 6-8: 28 / 24 / 20 °C

11.3.3 Screed drying individual program

This program enables the following settings to be made:

- *Heat up temp difference:*
  Starting from the initial temperature 20 °C up to the set maximum temperature, the set temperature is increased by the set difference with each program step.
  The number of steps is therefore based on these factors.

- *Heat-up period:*
  The number of hours in which the relevant set temperature must be reached and maintained (function as described above) can be entered here.

- *Maintaining time:*
  The number of hours for which the maximum set temperature must be maintained can be entered here.

- *Heat-down temp difference:*
  Starting from the set maximum temperature down to the initial temperature 20 °C, the set temperature is reduced by the set difference with each program step.
  The number of steps is therefore based on these factors.

- *Heat-down period:*
  The number of hours in which the relevant set temperature must be reached and should be maintained can be entered here.

12 Cooling

12.1 Active cooling

The cold generation is carried out actively by heat pump process reversal. The switching of the refrigeration circuit from heating to cooling operation is carried out using an internal four-way reversing valve.

When switching from heating to cooling operation, the heat pump is blocked for 10 minutes so that the different pressures of the refrigeration circuit can balance out.

The requests are processed as follows:

- Domestic hot water before
- Cooling before
- Swimming pool

During domestic hot water or swimming pool preparation, the heat pump works as in heating operation.

12.2 Passive cooling

Deep down, groundwater and the ground are significantly colder than the ambient temperature in summer. A plate heat exchanger installed in the groundwater or brine circuit transfers the refrigeration capacity to the heating/cooling circuit. The compressor of the heat pump is not active and is therefore available for domestic hot water preparation.

12.3 Cooling program description

12.3.1 Cooling operating mode

The functions for cooling are activated manually as a 6th operating mode. An outside temperature-dependent switching of the “cooling” operating mode is also possible. External switching is possible on the “Cooling” function block using the connector no. (2) input.

The *“Cooling”* operating mode can only be activated if the cooling function (active or passive) is released in the preconfiguration.

Switching off refrigeration generation

The following limits are in place for protection:

- The flow temperature is below a value of 7 °C
- Triggering of the dew point monitor in sensitive parts of the cooling system
- Reaching the dew point with purely silent cooling

12.3.2 Activating the cooling functions

When cooling operation is activated, special control functions are carried out. These cooling functions are carried out by the cooling controller separately from the other control functions.

The following can prevent the activation of the cooling function:

- The outside temperature is below 3 °C (risk of frost)
- The outside temperature is below the cooling operating limit with reversible air-to-water heat pumps.
- Neither silent nor dynamic cooling was selected in the heating/cooling circuit settings

In these cases, the Cooling operating mode remains active, but the control behaves in the same way as in the Summer operating mode.

12.3.3 Circulating pumps in cooling operation

With a heat pump heating system, which circulating pumps are activated or deactivated in which operating mode is defined in the preconfiguration of the relevant heating circuits.

The heat circulating pump for heating/cooling circuit 1 (M13) is only active in cooling operation if fixed-setpoint (dynamic cooling) or silent cooling is configured.

The heat circulating pump for heating/cooling circuit 2 (M15) is not active if only “Heating” is selected.

The heat circulating pump for heating/cooling circuit 3 (M20) is not active if only “Heating” is selected.

Switching components to heating or cooling operation can only be carried out with the 230V contact using connector no. (5) on the “Cooling” function block (e.g. room temperature controller).

Passive cooling

The supply for the cooling system can be carried out using the existing heat circulating pump (M13) or using an additional cooling circulating pump (M17).

The cooling circulating pump (M17) runs constantly in “Cooling” operating mode.

Depending on the hydraulic integration with passive cooling, the running behaviour of the heat circulating pump (M13) can be changed under *“Settings - Pump control”*.

12.3.4 Silent and dynamic cooling

Different system configurations can be achieved depending on the integration diagram. The selection is made during guided commissioning.

- **Pure dynamic cooling** (e.g. fan convectors)
  The control corresponds to fixed setpoint control. The desired return set temperature is set using the Settings menu option.
- **Pure silent cooling** (e.g. underfloor, wall surface or ceiling cooling)
  The control is carried out based on the room temperature. The key factor is the temperature of the room where the room climate station 1 is connected according to the connection diagram. The desired room temperature is set using the Settings menu option.
  The maximum transferable cooling capacity is heavily dependent on the relative humidity during silent cooling. A high humidity reduces the maximum cooling capacity, as the flow temperature is not reduced further once the calculated dew point is reached.
- **Combination of dynamic and silent cooling**
  The control is carried out separately in two control circuits.
  The control of the dynamic circuit corresponds to fixed setpoint control (as described under dynamic cooling).
  The control for silent cooling is based on the room temperature (as described under silent cooling) by controlling the mixer for heating circuit 2/3 (silent heating/cooling circuit).

If the refrigerator switches off because the minimum flow temperature of 7 °C is reached, either the water flow must be increased or a higher return set temperature (e.g. 16 °C) must be set.

12.4 Room temperature control

Heating technology systems are usually equipped with automatic mechanisms for controlling the room temperature on a room-by-room basis.

In heating operation, the room thermostats record the current temperature and open the controller (e.g. actuator) if the value is below the specified set temperature.

In cooling operation, the room thermostats must either be deactivated or replaced by ones suitable for heating and cooling.

In this case the room thermostat behaves in the opposite way in cooling operation, meaning that the controller opens when the set temperature is exceeded.

–weishaupt–

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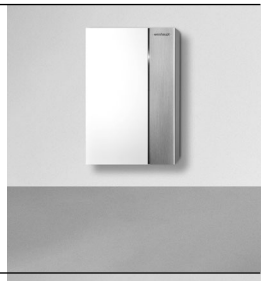

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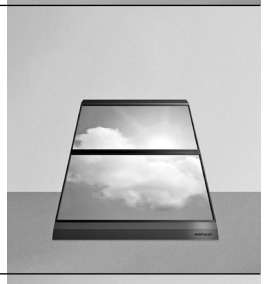

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