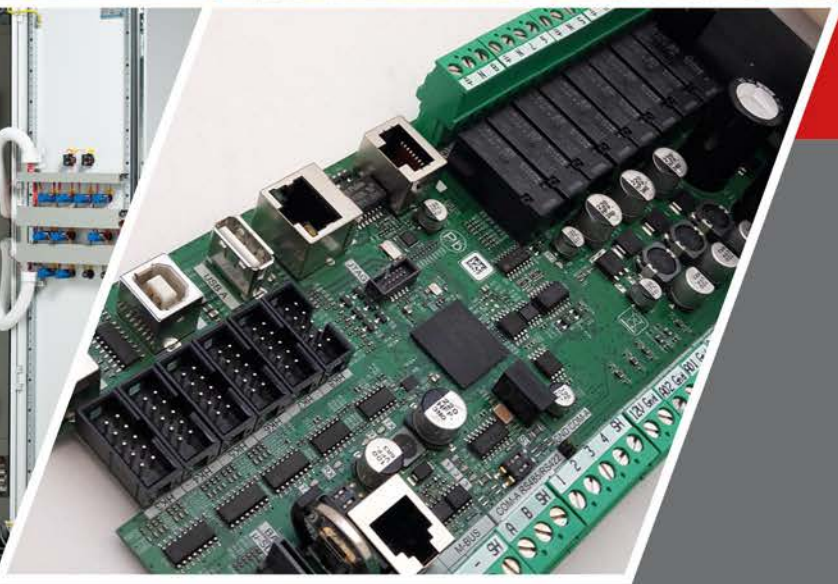


aqotec RM360 v360.00a

Complete controller description

Version 11/2018

aqotec®
progressive energy solutions

Product data sheets, documentation and information

can be found atwww.aqotec.com/infoor by scanning the QR code:


Hersteller
zertifiziert
TÜV
SÜD
EN ISO 3834-2


TÜV
AUSTRIA
ZERTIFIZIERT
TÜV AUSTRIA GMBH
EN ISO 14001
20104203009520
ISO 45001
20116203009521


TÜV
AUSTRIA
ZERTIFIZIERT
EN ISO 9001
ZERTIFIKAT NR. 20100062001477
TÜV AUSTRIA GMBH

Table of contents

1 Safety instructions

Risk of scalding:

Note that settings can be made that can lead to temperatures above 55 °C (e.g. for combustion thresholds, see EN 563). Inform persons who use or care for the system of any potential danger areas (e.g. accessible areas, high water temperatures).

Legionella heating:

ATTENTION! Depending on the configuration, the service water setpoint temperature is raised to an adjustable value once a week or daily, which usually leads to significantly higher service water temperatures - scalding hazard!

Permissible temperatures:

Make appropriate settings to ensure that the permissible temperatures of the hydraulic system are not exceeded, even at low outside temperatures (e.g. underfloor heating, plastic pipes, etc. can be damaged if temperatures are too high).

Risk of freezing:

Make sure that the station is not de-energised or that the primary and secondary ball valves are opened. The heating or boiler supply lines may otherwise freeze.

De-energised: There is no frost protection monitoring!

Notes on el. connection:

- To disconnect the device from the mains, press the on-site all-pole main switch.
- The device may only be opened by a specialist.
- When using high-efficiency pumps, a sufficiently-sized relay must be provided due to increased inrush currents.

  You can get more information from the pump manufacturer.

- Care must be taken to ensure that grounding and line protection for the feed exist which comply with national and local regulations.

2 Technical data

Electronic control unit for flush installation

- aqotec brand
- Type RM360
- Operating voltage 230V ~ tolerance: -15% and +10%
- Power consumption of the controller without connected components max. 60VA
- Output voltage of power outputs 230V ~ 50Hz
- Max. Rated current "A1" 3.15A
- Max. Rated current "A2" 3.15A
- Max. Rated current total 9.45A
- Max. Rated current per output 1A
- Max. Inrush current per output 20A <3ms
- Lifetime of relay output 500,000 switching operations; however, this depends on the inrush current of the connected device (the higher the inrush current, the shorter the lifetime)
- Connection type of pluggable screw terminals max. 2.5mm² for solid or fine-stranded core / sheathed cables (with fine-stranded cores, the use of ferrules is recommended)
- Degree of protection of the controller in the tray: IP00 - can only be used when installed in the controller housing!
- Mounting type modular design in DIN rail housing
- Ambient temperature for storage -20 °C to + 70 °C
- Ambient temperature for operation 0 °C to + 50 °C
- Continuous operation operating time 100%
- Degree of contamination 2 (only board in the tray)
- Rated impulse voltage at the 2500V supply voltage connection
- Sensor type temperature sensor PT 1000

2.1 General control specifications

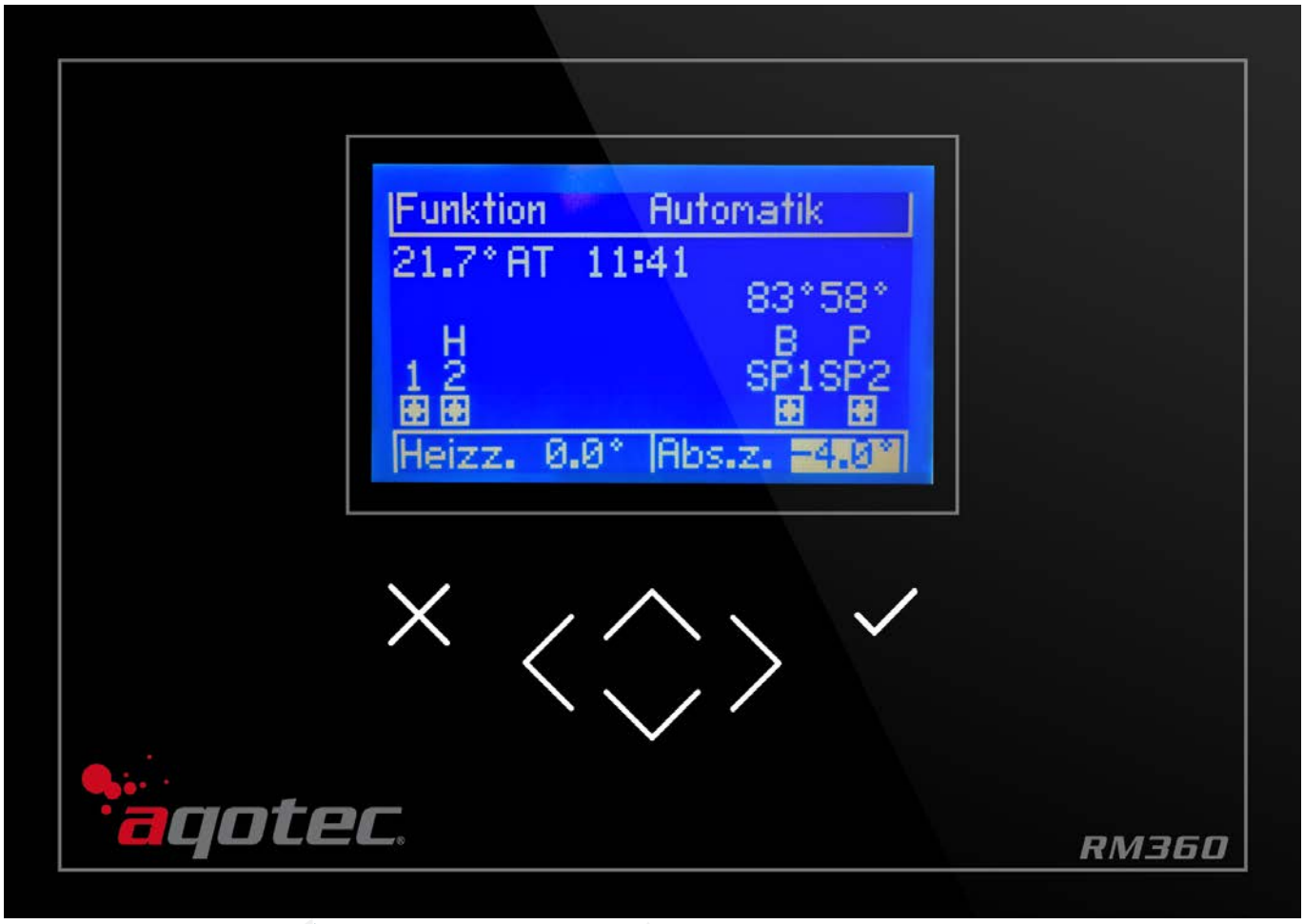
- Power-limited heat or cold transfer with built-in heat meter communication
- Outside temperature-dependent heat or cold transfer
- Outside temperature-dependent return limit
- Connection of six expansion modules for 6 additional heating or special circuits
- Control of a direct heating circuit and 7 direct or mixer heating circuits
- Outside temperature-dependent heating curve control
- Selectable whether setpoint calculation is from heating curve or 4-point curve
- Outdoor temperature-dependent pump shutoff
- Room temperature-dependent pump shutoff
- Freely selectable periods for heating / reduction / locking per day / per circuit over time diagram (15min interval)
- 5 higher-level special use periods (daytime operation) and non-use periods (optional lowering or OFF) per heating circuit
- Adjustable outdoor temperature averaging up to 96 hours using building coefficient (= building storage capacity) for heating circuit shutoff according to OT
- Adjustable outside temperature averaging for setpoint calculation of the heating circuits
- Control via room sensors
- Control via adjustable room influence
- Room control via thermostat function
- Remote control for each heating circuit (FBR6 with analogue control or FBR7 with touch display)
- Two external 0-10V / 0-20mA analogue inputs, e.g. for setpoint specification to heating circuit, pressure evaluation or valve position feedback ...
- Control of boiler circuits in various designs
- Boiler priority / boiler parallel operation adjustable per heating circuit
- Various boiler hydraulic variants such as charging module / with mixer / primary etc.
- Various boiler charging criteria such as periods / minimum temperature / setpoint charge etc.
- Various boiler shutoff criteria such as upper setpoint / lower setpoint below / charging time etc.
- Extensively adjustable boiler disinfection (automatic according to temperature, after manual activation…)
- Boiler charging locks after temperature / non-achievement of setpoints
- Speed control of the boiler charging pump, optionally also with four sensors instead of two (also necessary in heating circuit)
- Control of one or more circulation pumps (instead of tank 2 or one or more heating circuits)
- Integration of the circulation pump selectable (directly in tank, reheated via charging module, reheated via fresh water module or as own heat exchanger)
- Speed control according to return sensor, time and / or temperature shutoff of the circulation pump possible (0-10V or PWM)

- Control of up to 6 fresh water modules in different variants (with regulated pump, with regulated pump and return switching, with premixing and controlled pump)
- Control of direct buffer charging with adjustable request (boiler / heating circuits / sub-controller request individually adjustable)
- Optional buffer control with four instead of two sensors (additionally one heating circuit required)
- Direct switching, PWM or 0-10V output for the buffer charging pump via the motherboard
- Control of boiler / buffer combinations (switching output or regulated pump, optionally with or without switching valve)

2.2 Extended control specifications

- Integration of a wood boiler / other energy source as an alternative generator (boiler sensor necessary, control of a switching valve)
- Integration of an oil boiler / other energy source as additional generator (standby) via switching valve
- Control of a solar system with a collector sensor or flow sensor and switching valve for switching from tank 1 to tank 2 (priority adjustable), switching output or PWM / 0-10V control of the solar pump
- Control of a burner instead of a transfer station (return increase, power or temperature specification, control of boiler pump)
- Control of 2 feeder pumps for the entire station (primary or secondary) or individually adjustable with which (boiler) circuits the feeder pump activates.
- 0-10V temperature or power request to generator when used as a secondary control
- For HC3-8, using HC Multi, constant control (0-10V) possible instead of 3-pt. 230 V control
- 0-10V or PWM control of the primary valve
- For heating curve control, speed control of the heating circuit pump to HC return
- 0-10V or PWM control of the boiler charging pump
- Control of a second heat exchanger with several control options (reordering and / or power connection)
- A heating circuit can be configured as "error outputs" from which 3 freely configurable error outputs can be output from a list of errors (sensor break, set temp. undercut, communication interruption, ...)
- Instead of 8 heating circuits, up to 4 heating circuits possible with the double pump system (e.g. heating circuit 1 = double pump for heating circuit 2, potential-free malfunctions of both pumps can be applied for error reordering, otherwise reordering only after operating hours)
- Freely configurable differential controller based on input temperatures (e.g. outp. ON for T1>T2 + hysteresis), for T1 and T2, a sensor connected to the device can be assigned.
- Readout of up to 40 compatible meters (heat, water, gas, electricity)
  (Compatibility can be queried at service.request@aqotec.com)
- Data query of the controller and all connected meters via Mod-bus RTU or TCP, among others (physical interface RS485 or TCPIP)
- Data query via aqotec data network systems, e.g. via RS422, TCPIP, RS485
- Connection of up to 20 additional RM360 controllers via CAN bus (setpoint and outdoor temperature transmission)
- Connection of 8 FBR7 remote controls via COM-C (Mod-bus, RS485)
- Storage (down- and upload) of the setting data as CSV-like file (editable with Excel) on micro SD card or USB stick
- Ring buffer logging on the micro SD card as CSV-like file (editable with Excel)

2.3 Key assignment



"ESC"

Cancel button
Operating mode
Code entry
..

Arrows:

"LEFT",
"RIGHT"
"UP"
"DOWN"

"ENTER"

Confirmation key

3 Electrical connection

3.1 Monochrome control panel

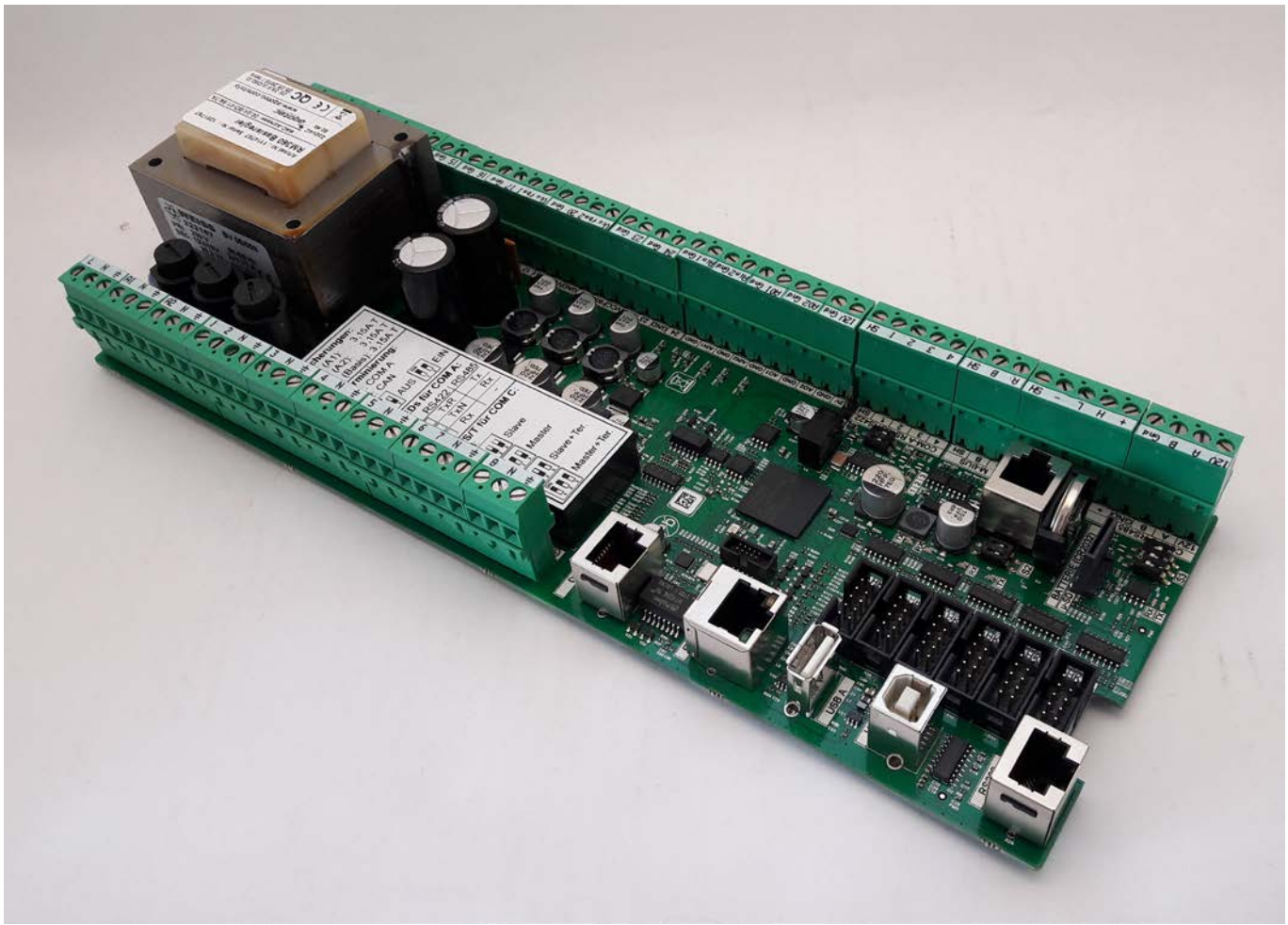
The control panel is connected at the designated socket ("Display" label) to the base controller via a highly flexible RJ45 cable and serves only as a local HMI; it is not necessary for the control function.

The maximum cable length is 1.2m, the control panel must be mounted near the basic controller.

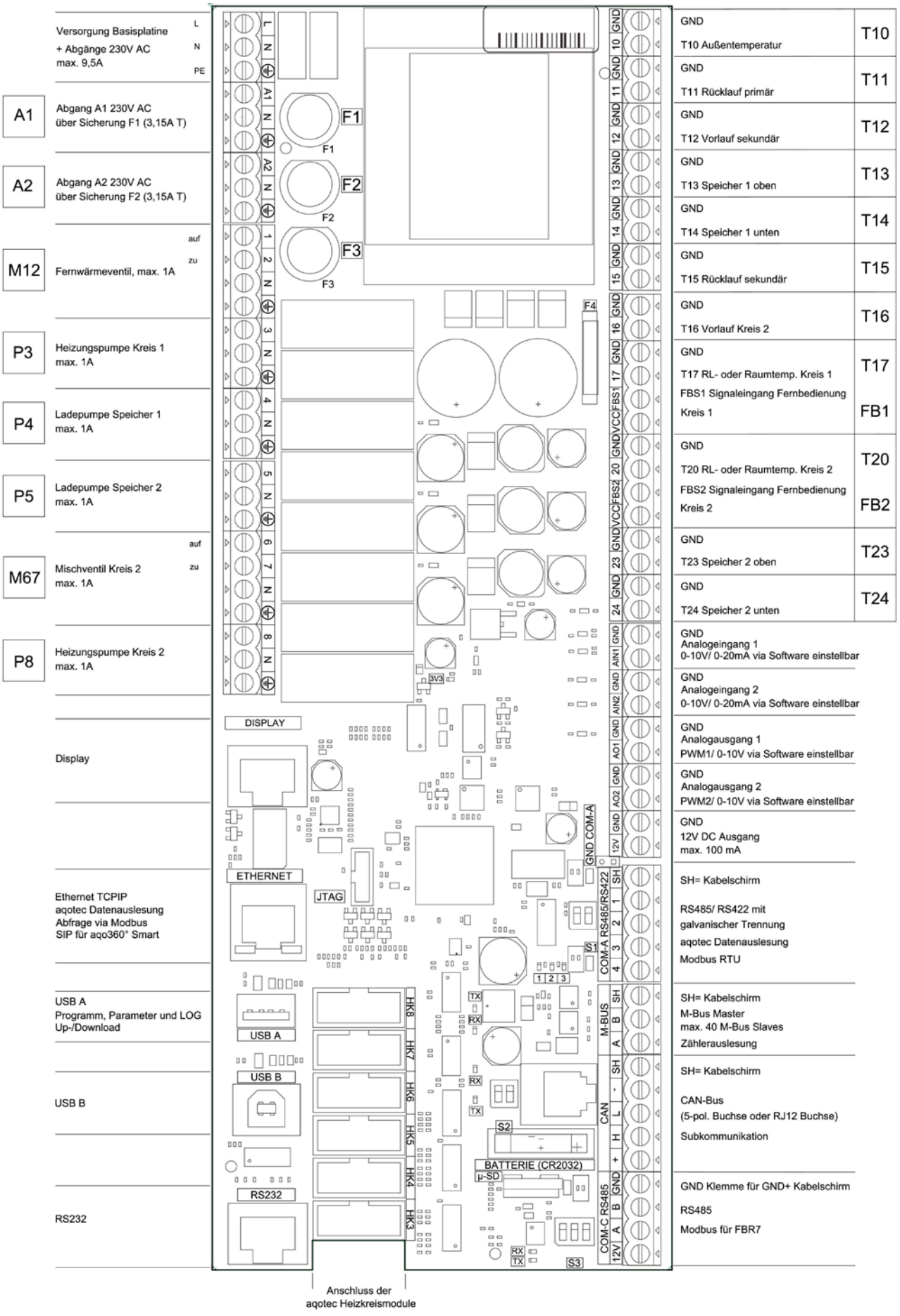
3.2 Basic controller

The basic controller is the central control unit with which the following functions can be implemented even without expansion modules:

- 3-point primary valve control or mixer for heating circuit 1 (if sub-controller)
- Heating circuit 1 unmixed
- Heating circuit 2 mixed
- Tank circuit for pure hot water heating
- Tank circuit for hot water or heating tank, feeder pump, circulation, charging module...
- 2x analogue input 0-10V or 0-20mA for temperature specifications on a circuit, pressure sensing, valve position feedback...
- 2x analogue output 0-10V or PWM for temperature or power specification to a generator and speed control of pump tank circuit 2
- Readout of up to 40 compatible meters via M-bus
- Connection of 2 FBR6 remote controls for heating circuits 1 and 2
- Connection of 8 FBR7 remote controls for all heating circuits (COM-C Mod-bus RS485)
- Connection of up to 20 sub-controllers
- Data readout via TCPIP or RS422 / RS485 Mod-bus or aqotec bus
- Connection of up to 6 expansion modules (Standard or HC Multi heating circuit module)



3.2.1 Connection diagram



3.2.2 Fuses

F1 ... Fuse for outlet A1, supplied directly from the supply terminal. Value: 3.15A T
F2 ... Fuse for outlet A2, supplied directly from the supply terminal. Value: 3.15A T
F3 ... Fuse for the entire control itself and the 8 relay outputs of the basic controller.
Value: 3.15A T

Size: 5x20mm
Necessary switching capacity: 1.5kA (usually fuse with sand filling, ceramic tube)

3.2.3 Analogue input technical specifications

Resolution of the evaluation at 0-10V / 2-10V or 0-5V: 2.6mV
Resolution of the evaluation at 0-20mA / 4-20mA: 5.7µA

Analogue inputs AIN1 and AIN2 can be supplied with 0 (2) - 10V or 0 (4) - 20mA as required. Signal selection takes place via the software-side configuration:
P748 Signal def. AIN1 25
P759 Signal def. AIN2 26

Configuration 0 (2) - 10V:

Input load: about 17kOhm

If voltages greater than 10V or less than -10V are applied to the input, it can be damaged.

Configuration 0 (4) - 20mA:

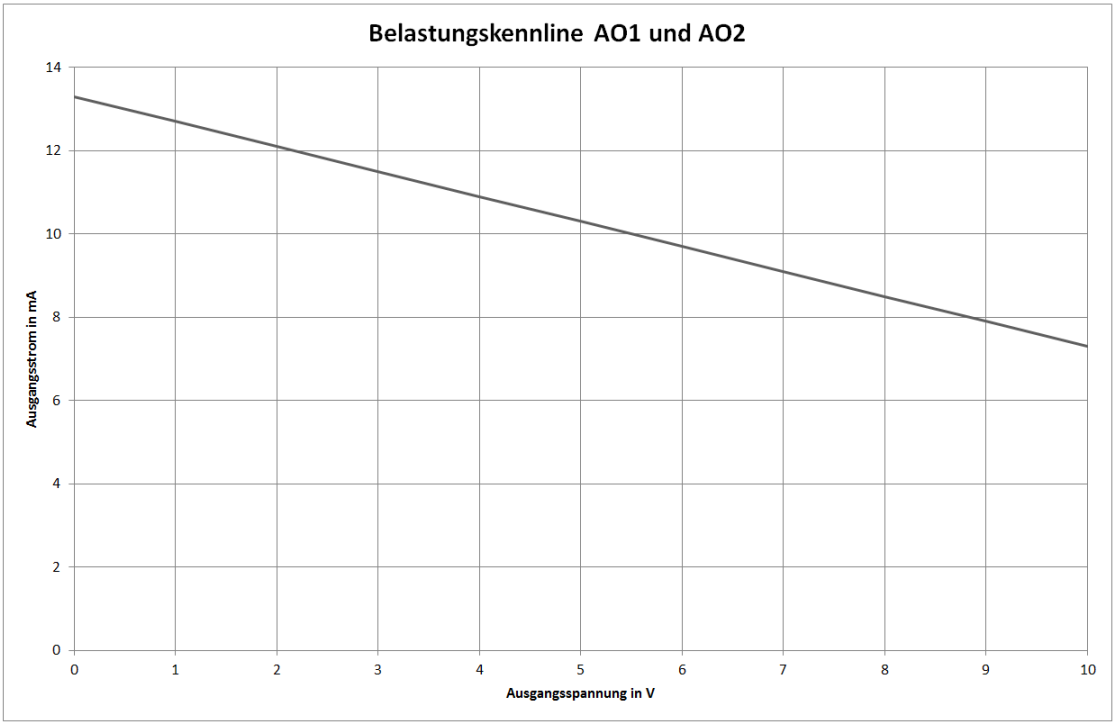
Input load: 100Ohm

If currents greater than +/- 100mA occur at the input, it can be damaged or the shunt may be damaged during extended periods of non-standard use (thermal damage or destruction).

3.2.4 Analogue output technical specifications

Output accuracy: 1%

Load capacity of the outputs:



Analogue outputs AO1 and AO2 can be switched from 0-10V (factory setting) to PWM as required:
P42 Output def. AO1
P600 Output def. AO2

When selecting PWM, a peak voltage of 10V is output.
The carrier frequency is adjustable to 100Hz or 1kHz:
P83 PWM frequency AO1
P601 PWM frequency AO2

If voltages greater than 24V occur at the analogue output, it could be damaged.

3.2.5 MESH supply, 12VDC output

The output can be charged with max. 100mA (1.2W).
The output is short-circuit proof; however, in the event of a short circuit, the entire control function may be impaired (e.g. relays on the HC modules can no longer switch).

3.2.6 COM-A RS422/RS485

The COM A interface is a galvanically isolated interface for RS422 or RS485.

ATTENTION! If a connected data cable leaves the electrical protection area, an external surge arrester must be installed. For data networks from aqotec, the 12-pin. data socket with integrated surge arrester (part. no. 1100588) is typically used. Important here is corresponding grounding and positioning of the data socket. More detailed information can be found in the documentation of the data box.

Which bus is used can be set using the software:

P772

The connection is made as follows:
(Designations refer to the controller - Tx is therefore the response path from the controller to the control system)

Terminal	1	2	3	4
RS422	Tx+	Tx-	Rx+	Rx-
RS485	D+	D-	-	-

If, for example, a bus GND is also required for a Mod-bus request, the provided "GND COM-A" pin header must be used because of the galvanic isolation.
There is an adapter cable with 500mm length for this pin header:
Part no. 1114477 connecting cable RM360 GND COM A
If another controller GND is used, the galvanic isolation is useless.
With a data network system from aqotec with RS422, the GND is not necessary.

To activate the query via Mod-bus RTU, **P914** "Mod-bus query" must be set to "RS485".

If the Tx / Rx pairs are terminated, this can be done using **switch S1**:
If both of these are ON, the pairs are terminated at 120 ohms.
(For a RS222 data network system from aqotec, the termination must not be switched on)

To enable optical detection of active communication, there are 3 LEDs to the left of the terminal 4 of COM-A, which mean:

LED	1 (green)	2 (red)	3 (red)
RS422	TxR	TxN	Rx
RS485	Tx	Rx	-

TxR ... exactly this controller is currently sending a response to the control system
TxN ... another controller in the same network is currently sending a response to the control system
Rx ... the controller is receiving a question from the control system
Tx ... another or this controller is currently sending a response to the control system

3.2.7 M-BUS meter reading (M-bus master interface)

Up to 40 meters can be read out via this interface.
The bus may be loaded with max. 120mA and is short-circuit proof.

To the left of the B terminal are the LEDs labelled Tx and Rx, which are used to visually detect bus activity:
Tx (green) ... the controller is sending a question to a meter
Rx (red) ... the controller is receiving a response from a meter

For configuration of heat meter reading, see chap. "**8.3Meter reading via M-bus**"

3.2.8 CAN bus (sub-communication to other RM360s)

The 24VDC output of the CAN bus (terminals "+" and "-") can be connected with max. 5W.

Should a termination with 120 ohms be necessary, this can be done using **switch S2** :
When both are ON, "H" and "L" are terminated at 120 ohms.

The RJ12 socket and the terminals are connected in parallel and can also be used together.
If only one sub-controller is connected, the direct connecting cable can be used with the RJ12 socket:

Part no. 1200316	Cable for sub-controller RM360 0.6m
Part no. 1200317	Cable for sub-controller RM360 1.5m
Part no. 1200318	Cable for sub-controller RM360 2.8m

To the left of the L terminal are the LEDs labelled Tx and Rx, which are used to visually detect bus activity:
Rx+ Tx (orange) ... the controller is sending a question to a sub-controller (if the master is considered) or a response to the master (if the sub-controller is considered)
Rx (orange) ... the controller is receiving a question from the sub-controller (if the master is considered) or is receiving a question from the master (if the sub-controller is considered)

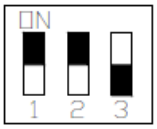
ATTENTION! If a connected data cable leaves the electrical protection area, an external surge arrester must be installed. In this case, a separate data socket with integrated surge arrester is available (part no. 1201067). Important here is corresponding grounding and positioning of the data socket. More detailed information can be found in the documentation of the data box.

3.2.9 COM-C RS485

The COM-C interface is intended for connection to remote control FBR7, so the 12V clamp must not be used for other purposes.

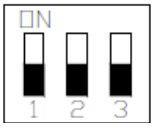
connection:
Terminal A ... D +
Terminal B ... D-

Since the interface can act both as a slave and as a master, **switch S3** is provided to configure the bus accordingly:



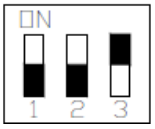
M

Master... The controller works as a master and queries slaves (e.g. remote control FBR7).
In order not to receive a faulty signal if there is no connection or a bad cable shield, switches are used to switch D+ to 5V via a resistor and D- to GND via a resistor in order to obtain defined potentials.



S

Slave... the controller works as a "slave" ... it must be actively queried by a master to answer. D + and D- are not affected here.



S+T

Slave+ termination... the controller works as a "slave" ... it must be actively queried by a master to answer. D + and D- are "terminated" here via a 120 ohm resistor.

M+T

Master+ termination... The controller works as a master and queries slaves (e.g. remote control FBR7). In order not to receive a faulty signal if there is no connection or a bad cable shield, switches are used to switch D+ to 5V via a resistor and D- to GND via a resistor in order to obtain defined potentials. In addition, D+ and D- are "terminated" via a 120 ohm resistor.

The "Master" setting should be used for the query of remote control FBR7.
The termination ("M+T") can be used if the bus has a large voltage input (external voltage induction).

To the left of the 12V terminal are the LEDs labelled Tx and Rx, which are used to visually detect bus activity:
Tx (green) ... the controller is sending a question to an FBR7
Rx (red) ... the controller is receiving a response from an FBR7

3.2.10 Ethernet

The Ethernet interface can be used for data readout by means of aqo360 visualisation, for Mod-bus reading (RTU or TCP protocol, automatic switching) or for data transmission to the aqoSmart server.

To enable the query via Mod-bus TCP or Mod-bus RTU ("tunnelled" via TCPIP), **P914** "Mod-bus query" must be set to "TCPIP".

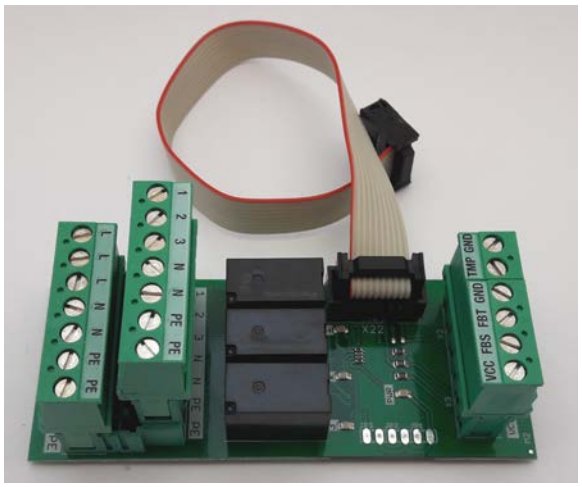
The Ethernet interface is configured as a DHCP client by default (IP address is obtained automatically by a DHCP server).
If a static IP address is to be used, the DHCP client can use **P773** "Obtain IP address" to change to "manual". The controller is restarted automatically to change the parameter.
The interface can be defined with the following parameters:
P774 IP address
P775 Subnet mask TCPIP
P776 Default gateway TCPIP
P777 Port TCPIP

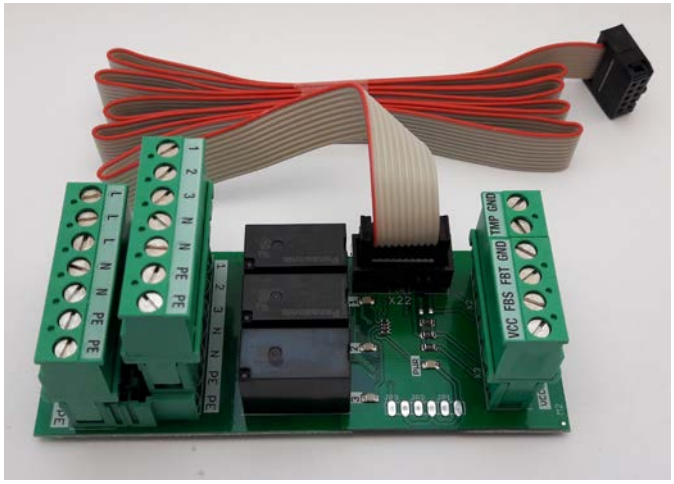
If the Ethernet interface is to be used for data transmission to the aqoSmart server, then **P779** "Use TCPIP SIP?" must be changed to YES (may only be done after consultation with aqotec!)
For this data transmission, the destination IP of the smart server must be assigned **P780** and the SIP number assigned **P781** .

Since an active TCPIP-SIP leads to major problems with normal data queries by means of the aqo360 visualisation, this configuration is only possible on service level 4

3.3 Standard heating circuit module

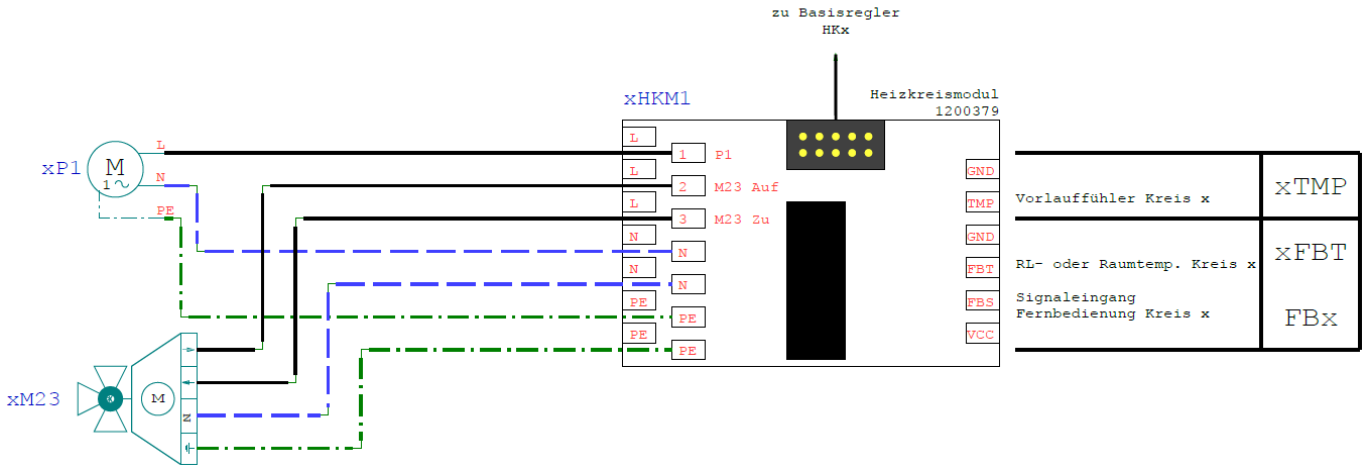
Part no. 1201464 Standard heating circuit module + plug-in terminals + FBK 200mm (200mm ribbon cable)
Part no. 1201465 Standard heating circuit module + plug-in terminals + FBK 1100mm (1100mm ribbon cable)





With the Standard heating circuit module, the controller can be extended with another direct or mixed heating circuit or a special function.

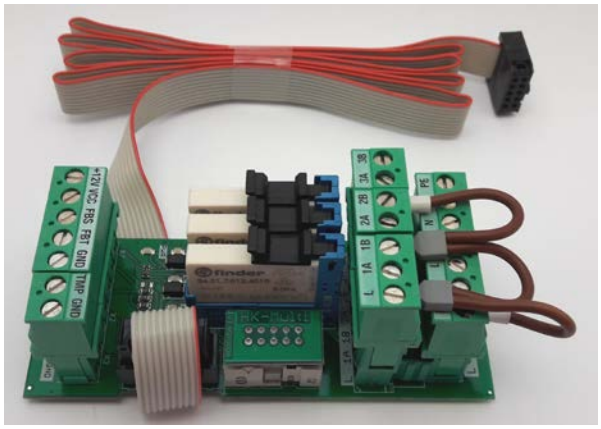
- 230VAC pump output (max.1A continuous current, max 20A <3ms inrush current)
- 230VAC outputs for a 3-pt. mixer (max.1A continuous current, max 20A<3ms inrush current)
- Flow sensor input PT1000
- Return or room sensor input PT1000
- Direct connection of remote control FBR6 (alternatively potential-free contacts)



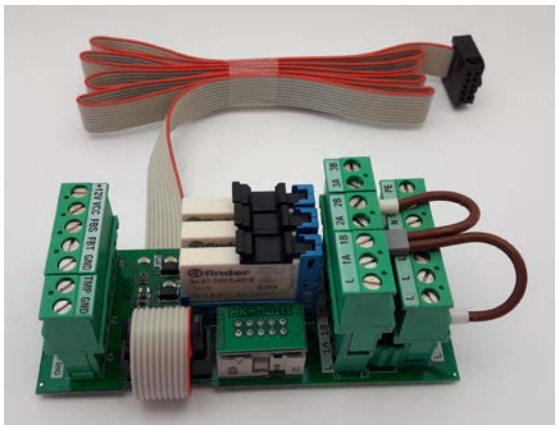
The "x" in the connection diagram relates to the respective heating circuit number.

3.4 Multi variant 5 heating circuit module (potential-free switching contacts)

Part no. 1111820 HCMMB 3x230VAC switching relay



3x 230VAC output



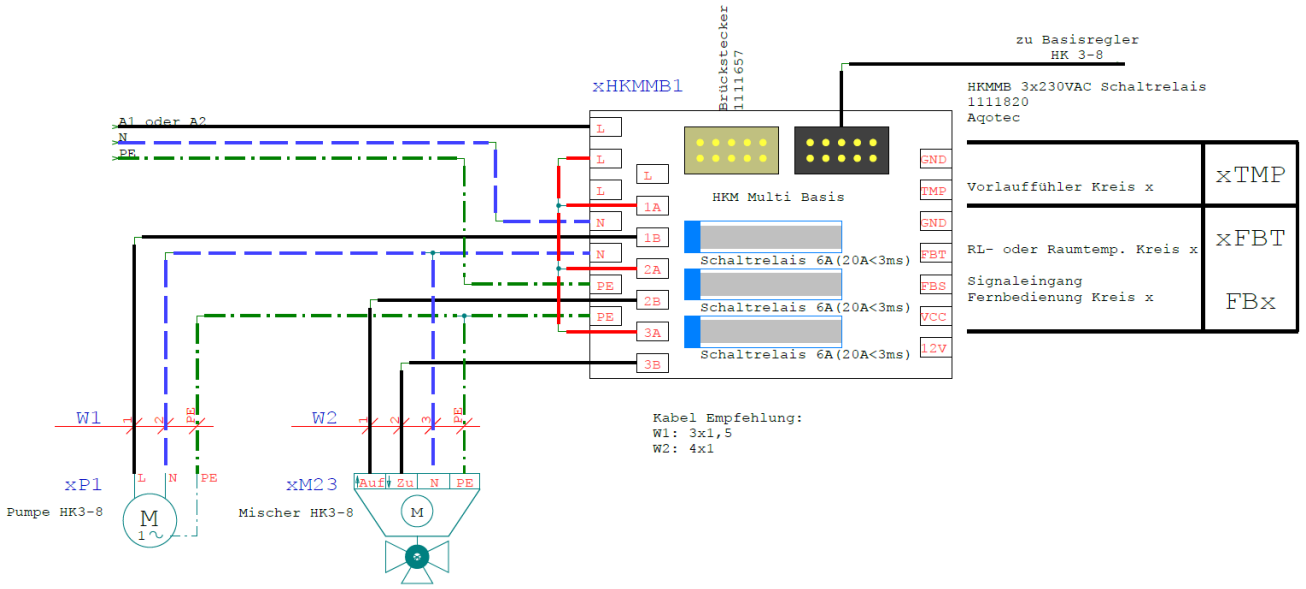
Potential-free pump output
and 230AC mixer output

With the Multi heating circuit module, the controller can be extended with another mixed heating circuit or a special function.

- 230VAC or potential-free pump output
- 230VAC or floating outputs for a 3-pt. mixer
- Flow sensor input PT1000
- Return or room sensor input PT1000
- Direct connection of remote control FBR6 (alternatively potential-free contacts)

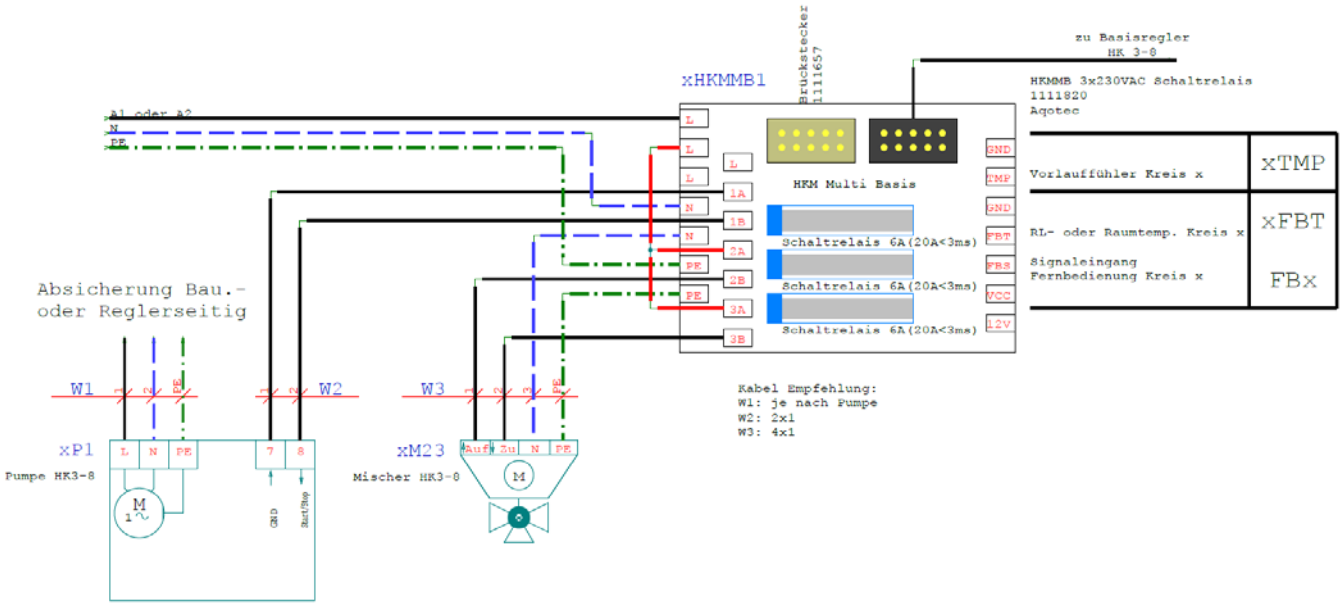
All outputs are equipped with replaceable Finder relays.
Data sheet is available at www.agotec.com under Support / Downloads.

Connection example 5a: 3x 230V AC outputs for pump and 3-pt. mixer



The "x" in the connection diagram relates to the respective heating circuit number.

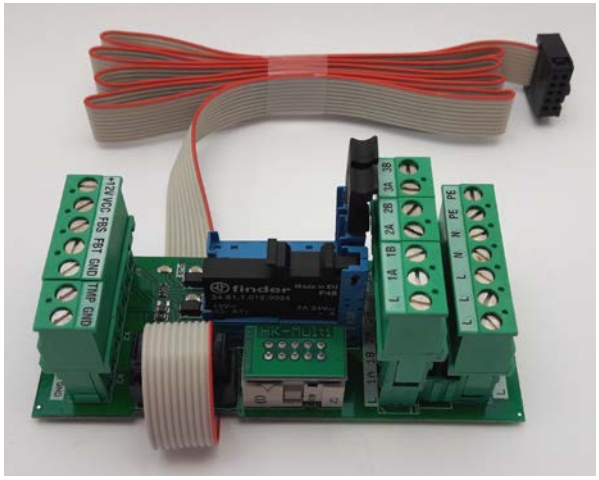
Connection example 5b: 1x potential-free pump output and 2x 230V AC 3-pt. mixer



The "x" in the connection diagram relates to the respective heating circuit number.

3.5 Multi variant 1 heating circuit module (PWM pump control)

Part no. 1111448 HCMMB 1x24VDC PWM



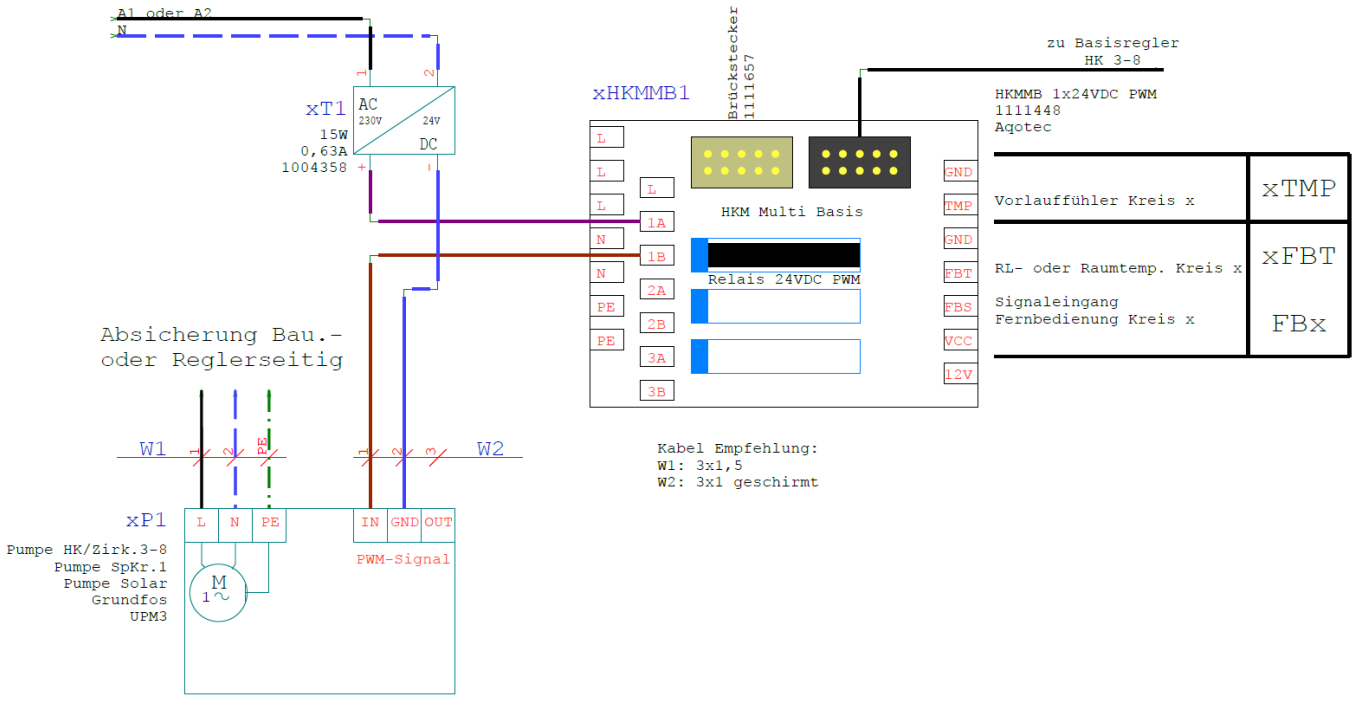
Representation in the image:
Variant 1a

With this module, an electronic pump can be controlled by a PWM signal.
Data sheet is available at www.aqotec.com under Support / Downloads.

Use:

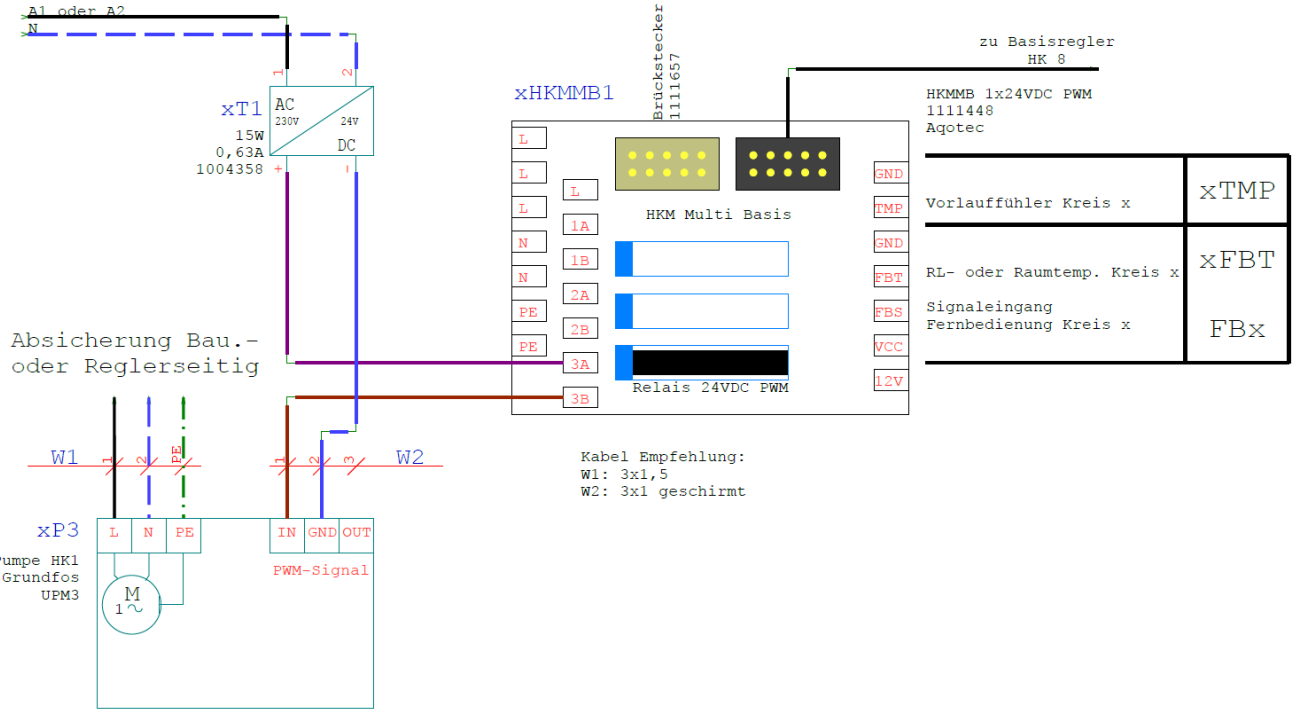
- Control of solar pump (no tank switching)
- Control of fresh water module pump (no premixing or return switching)
- Control of tank circuit 1 pump (when using HC8 "analogue outputs")
- Control of heating circuit 1 pump (when using HC8 "analogue outputs")
- Control of heating circuit 3-8 pump (heating circuit without mixer)

Connection example 1a: Control of solar pump, tank circuit 1 and heating circuit 3-8

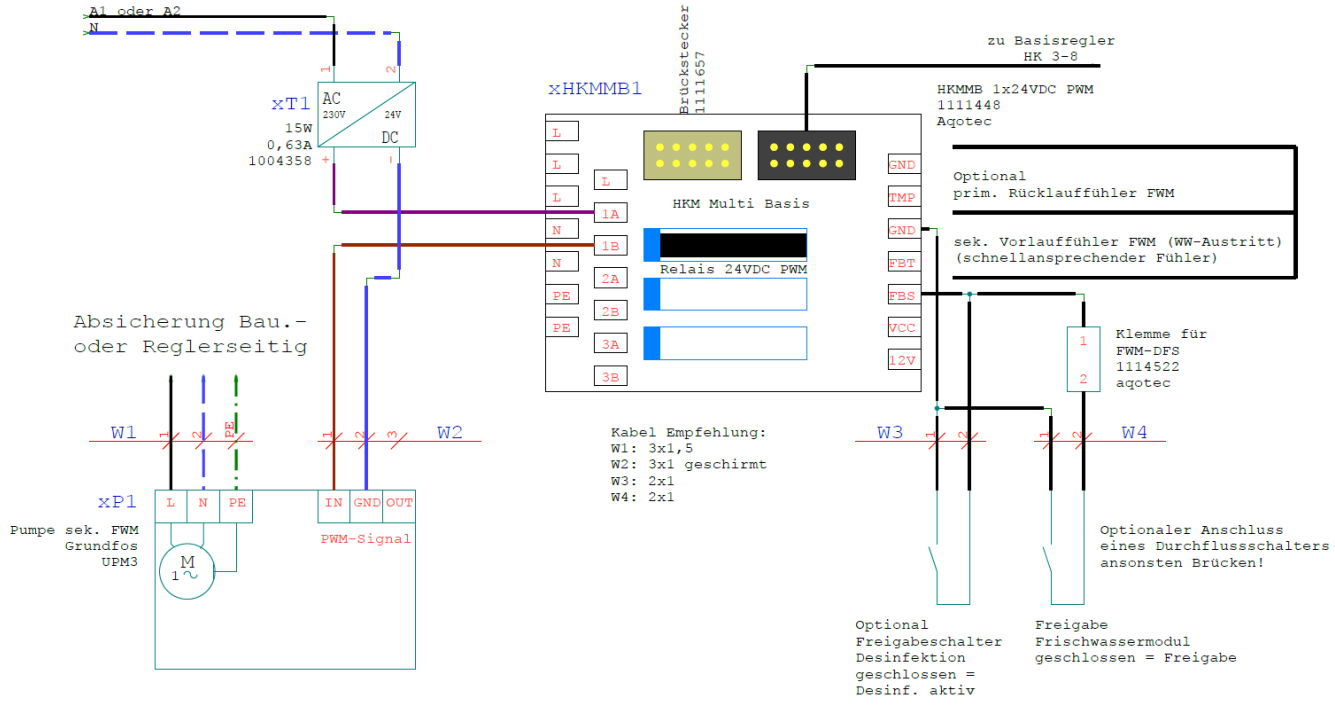


The "x" in the connection diagram relates to the respective heating circuit number.

Connection example 1b: Control of heating circuit 1 pump



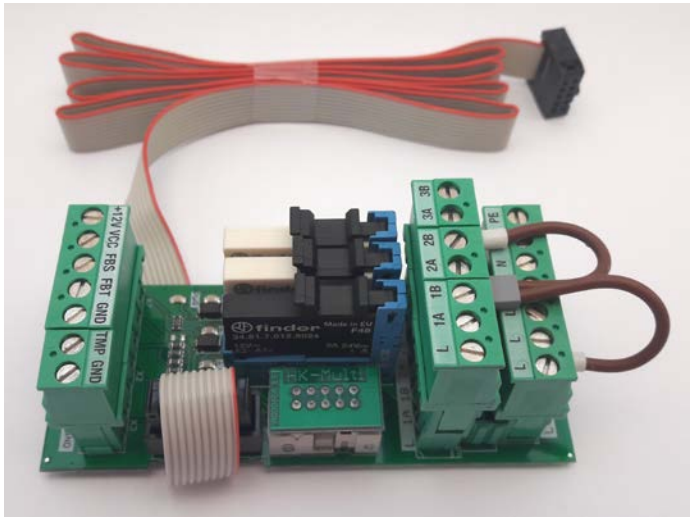
Connection example 1c: Control of fresh water module pump (without flow sensor)



The "x" in the connection diagram relates to the respective heating circuit number.

3.6 Multi variant 6 heating circuit module (PWM pump and 3-pt. mixer control)

Part no. 1111821 HCMMB 1x24VDC PWM.,2x230VAC switching relay



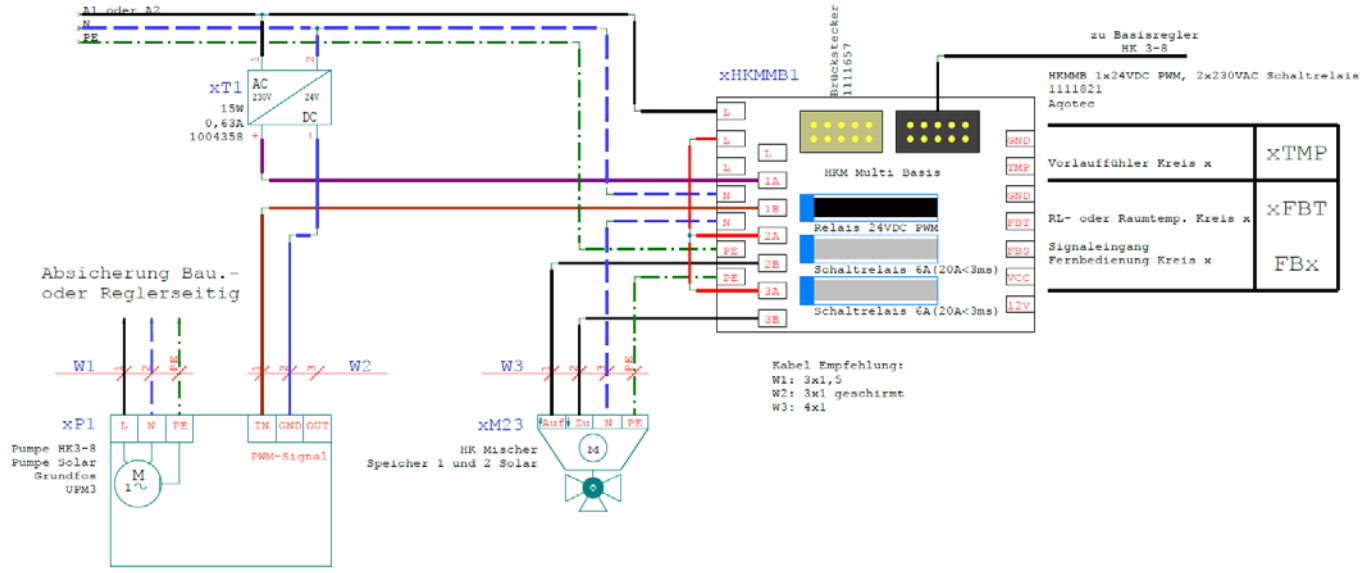
With this module, an electronic pump can be controlled by a PWM signal, and 2x 230VAC or potential-free switching outputs are also available.

Data sheet is available at www.agotec.com under Support / Downloads.

Use:

- Control of solar pump + 3-pt. switching valve tank 1 and 2
- Control of pump HC3-8 + 3-pt. mixer

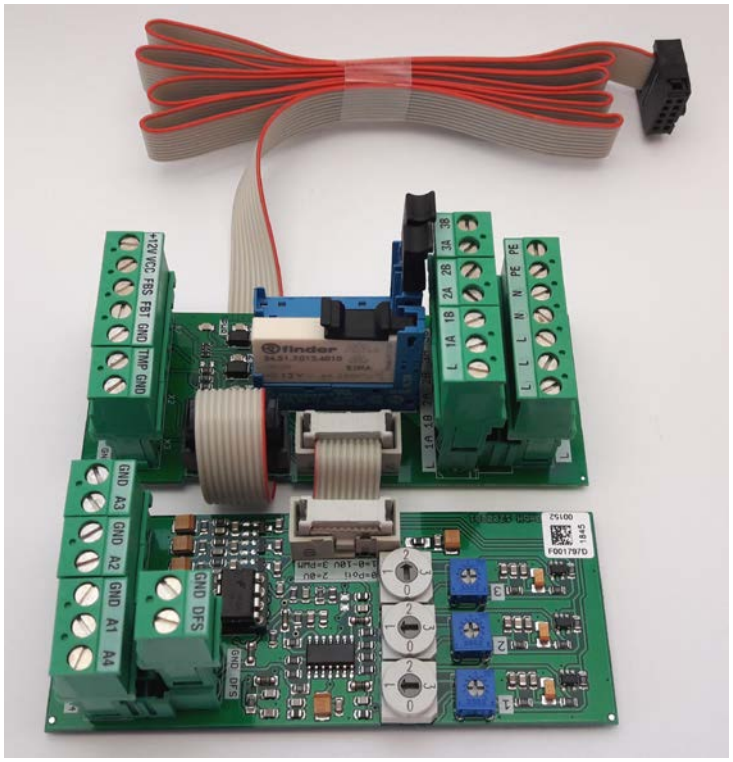
Connection example 6a: Control of PWM pump and 3-pt. 230V AC mixer / switching valve



The "x" in the connection diagram relates to the respective heating circuit number.

3.7 Multi variant 8 heating circuit module (3x0-10V/PWM output, 1x switching contact)

Part no. 1111867 HCMMB+EM 1x230VAC switching relay



Representation in the image:
Variant 8a / 0-10V

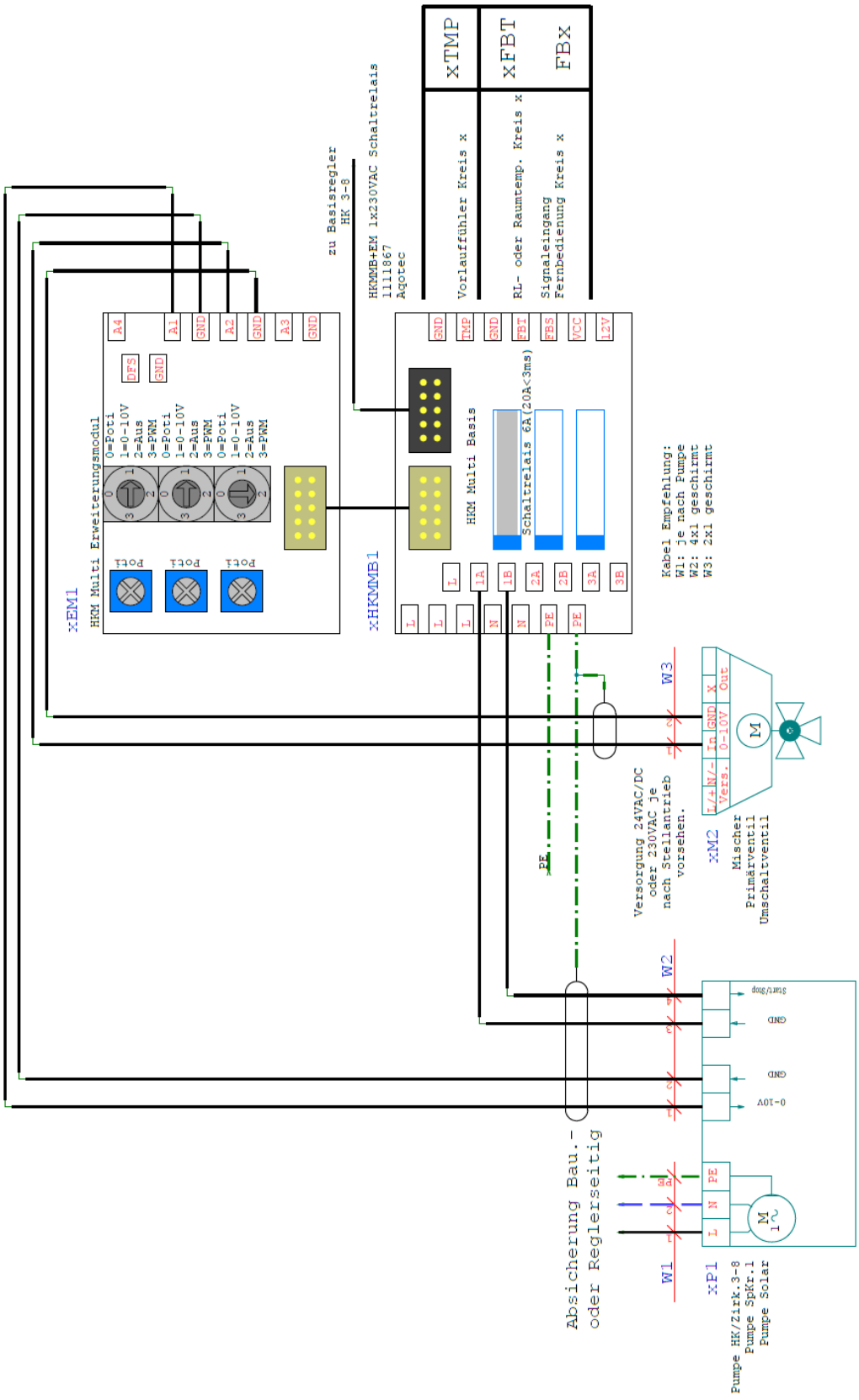
With this module, an electronic pump with 0-10V or PWM input + potential-free release or 230V AC output and a 0-10V mixer can be controlled.

Data sheet is available at www.agotec.com under Support / Downloads.

Use:

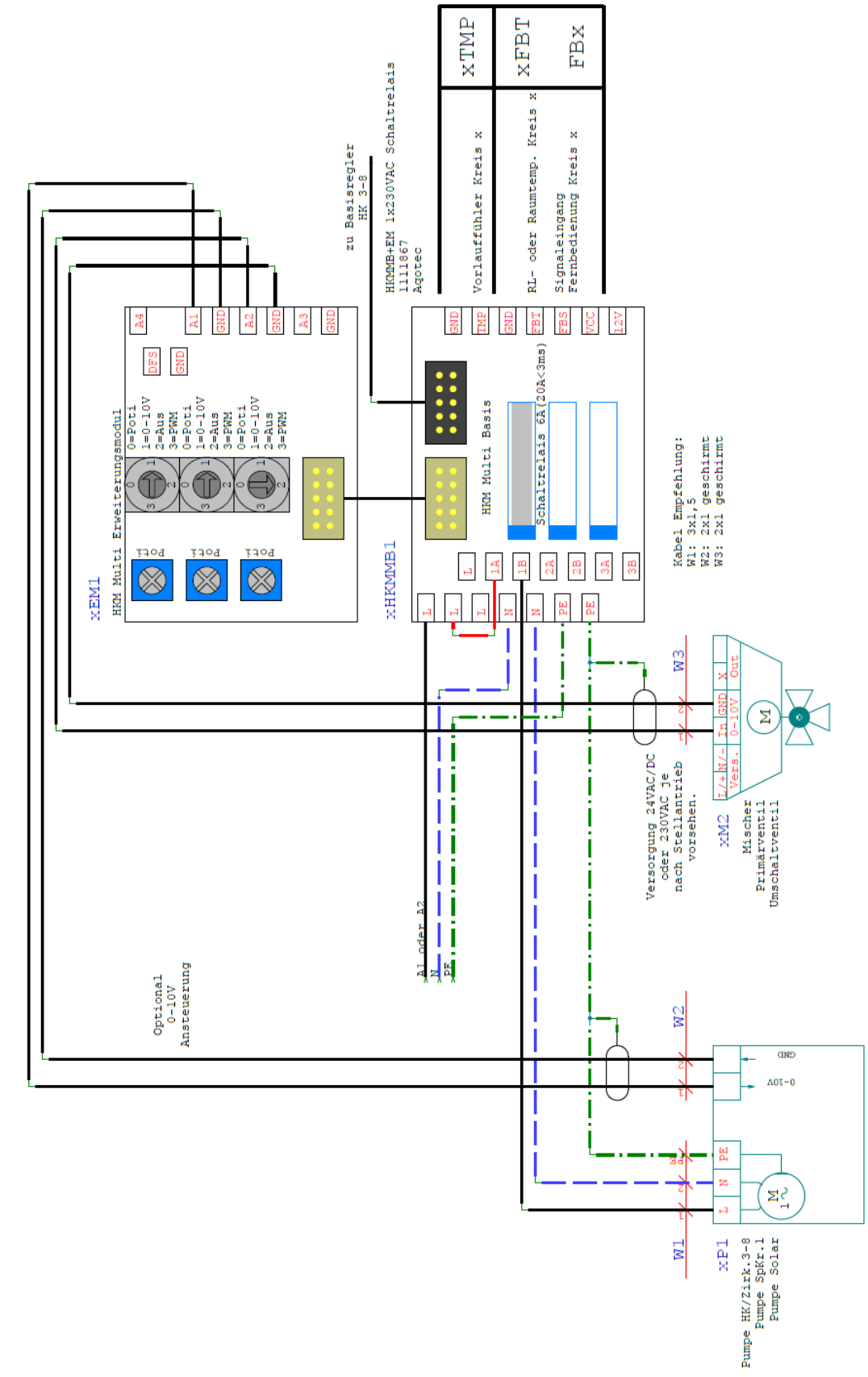
- Control of solar pump (for tank switching, only 0-10V output)
- Control of fresh water module pump (for premixing or return switching, only 0-10V output) with or without flow sensor
- Control of tank circuit 1 pump (when using HC8 "analogue outputs") and optional 0-10V control of primary valve
- Control of heating circuit 1 pump (when using HC8 "analogue outputs") and optional 0-10V control of primary valve
- Control of heating circuit 3-8 pump (without or only with 0-10V mixer)
- 0-10V control of primary valve / jet pump of a primary-side fresh water module with or without flow sensor

Connection example 8a / 0-10V: Control of 0-10V + potential-free release of solar pump, TC1, HC3-8 and 0-10V mixer / switching valve or primary valve



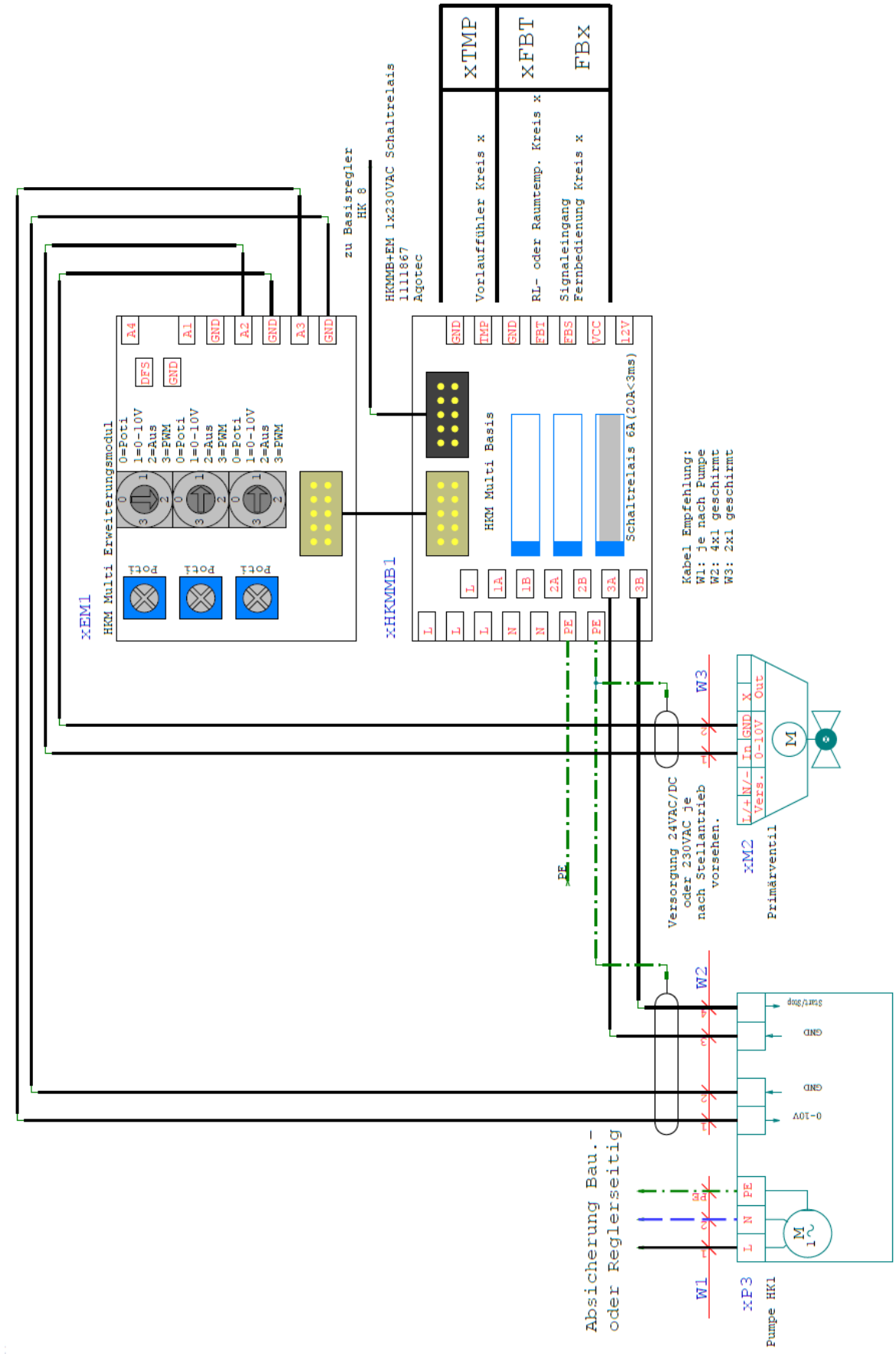
The "x" in the connection diagram relates to the respective heating circuit number.

Connection example 8b: Control 0-10V + 230VAC release of solar pump, TC1, HC3-8 and 0-10V mixer / switching valve



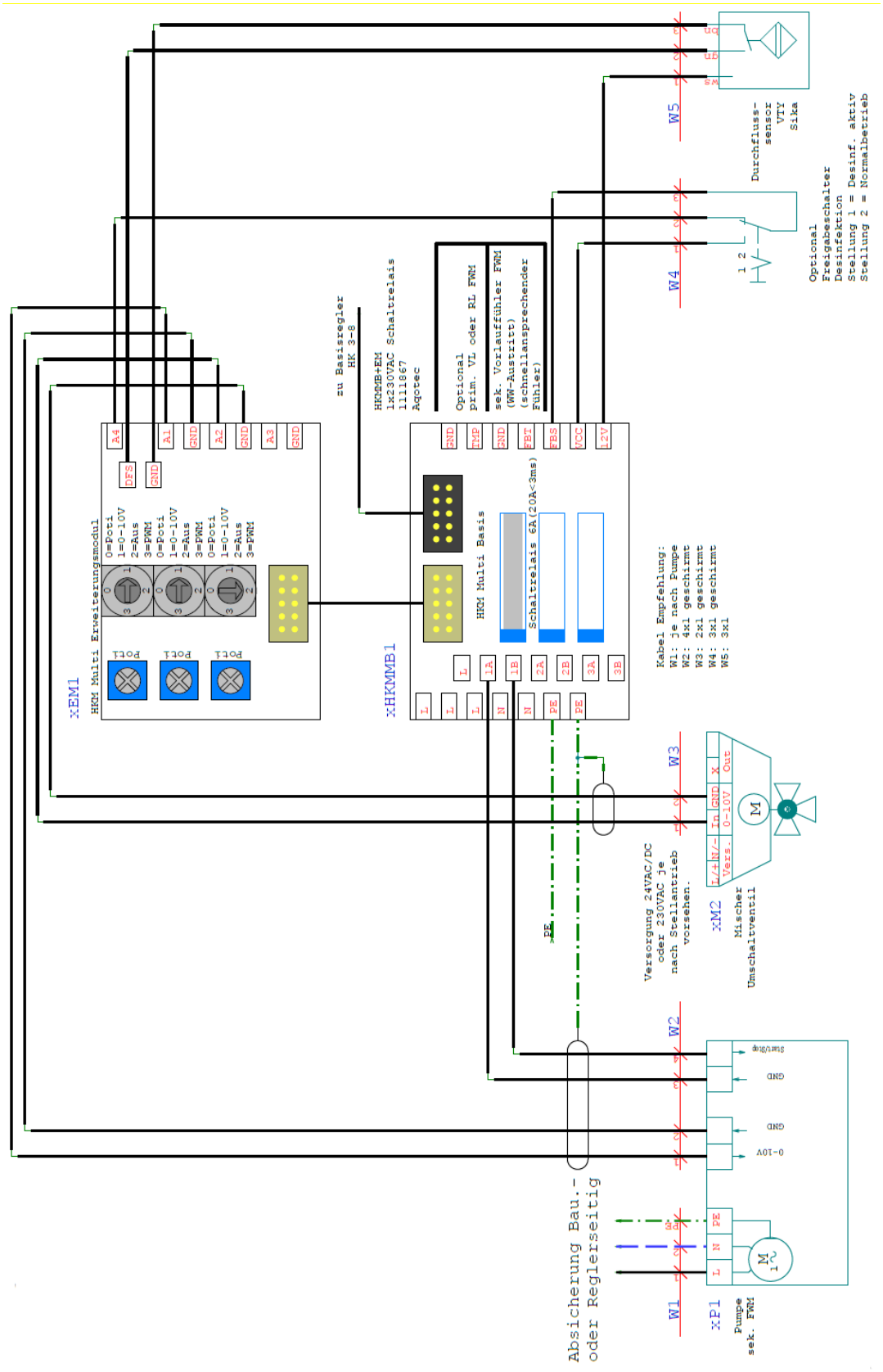
The "x" in the connection diagram relates to the respective heating circuit number.

Connection example 8m / 0-10V: Control of 0-10V + potential-free release of pump, HC1-8 and 0-10V primary valve



Connection example 8n / 0-10V:

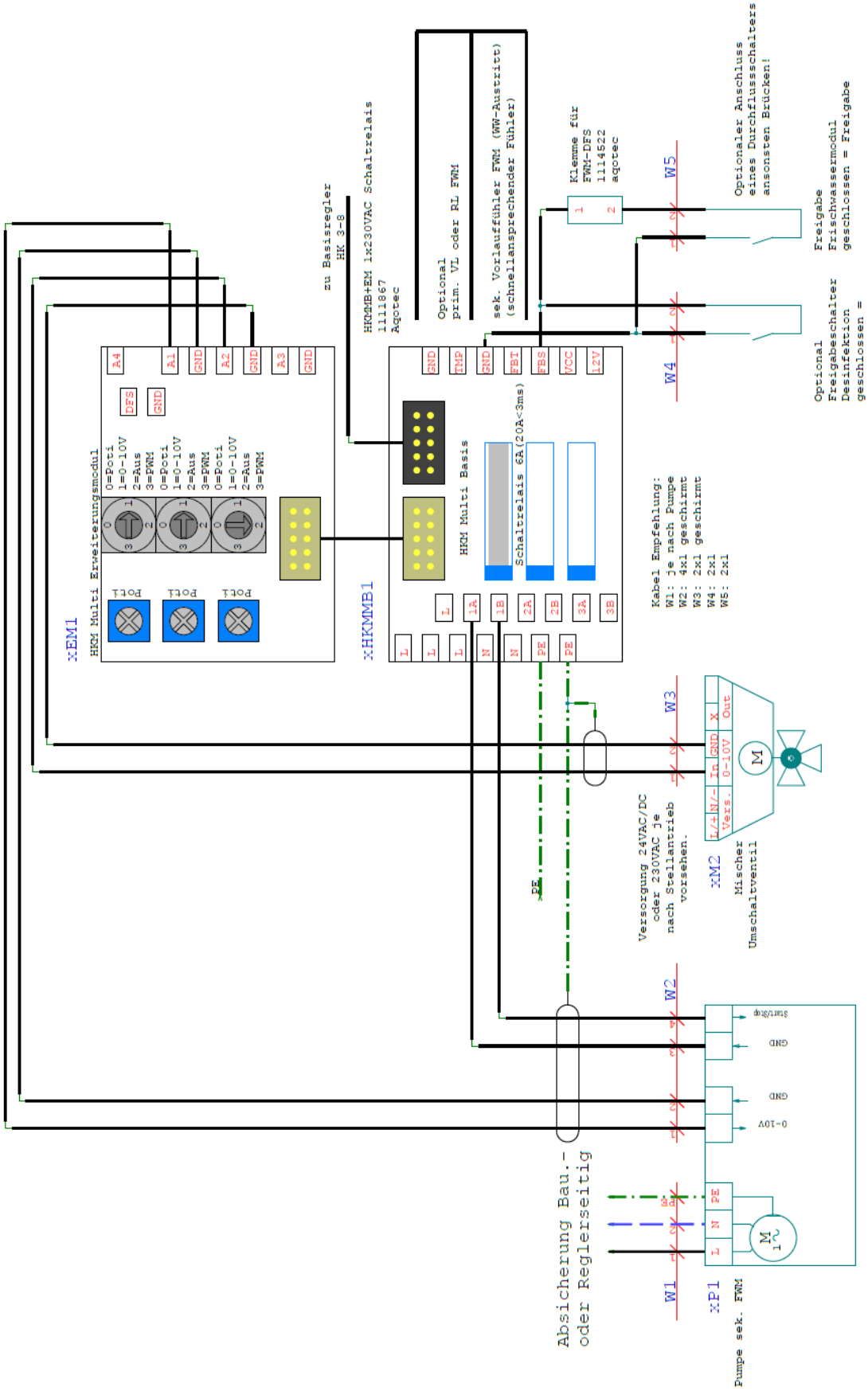
Control of 0-10V + potential-free release of FWM pump, 0-10V output for prim. return switching valve or prim. flow premixing and connection of a flow sensor



The "x" in the connection diagram relates to the respective heating circuit number.

Connection example 8o / 0-10V:

Control of 0-10V + potential-free release of FWM pump, 0-10V output for prim. return switching valve or prim. Return premixing (without flow sensor, only continuous operation or switching contact)

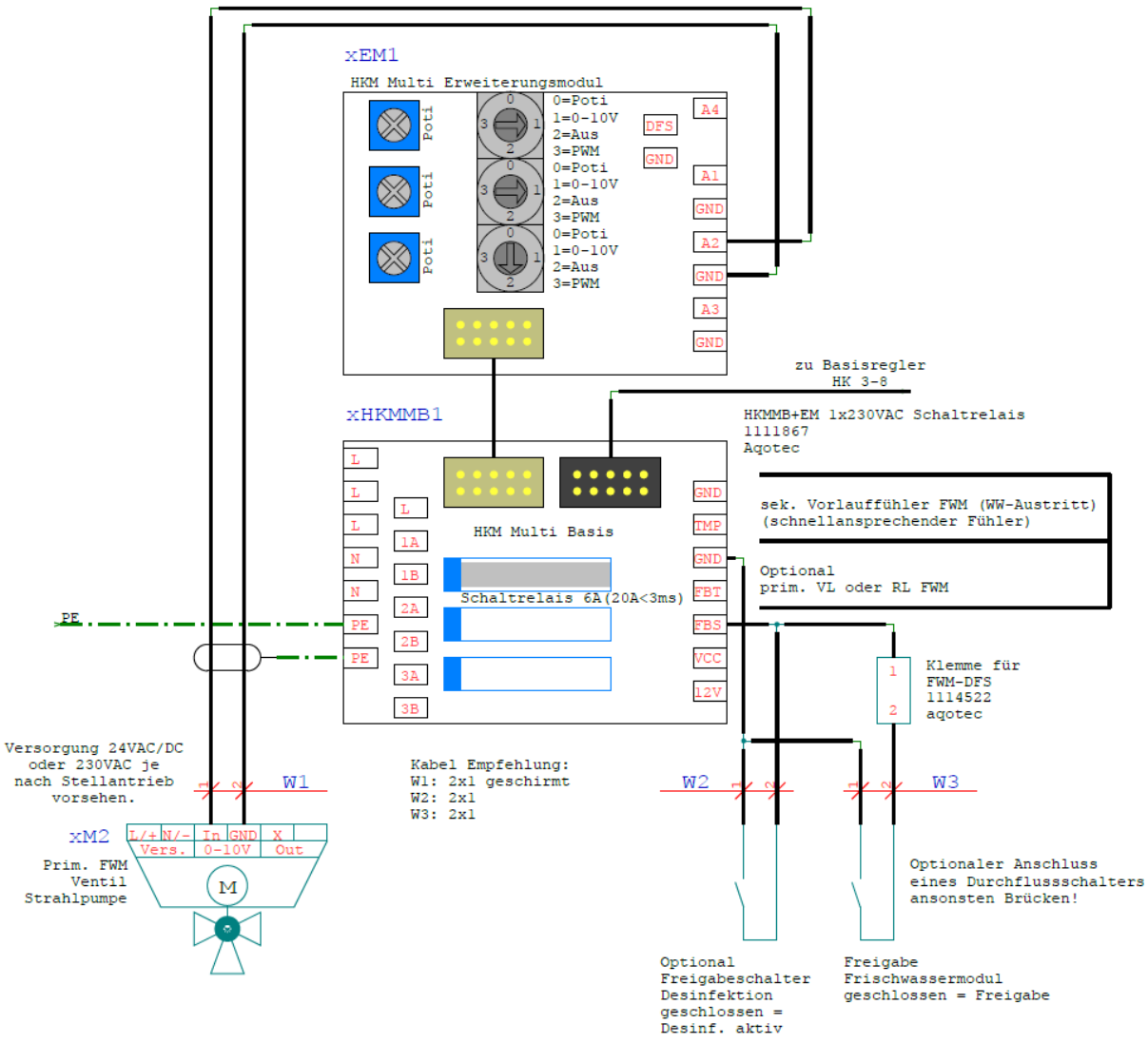


The "x" in the connection diagram relates to the respective heating circuit number.

Connection example 8p / 0-10V:

Control of 0-10V valve or jet pump of a primary-side fresh water module

(without flow sensor, only continuous operation or switching contact)

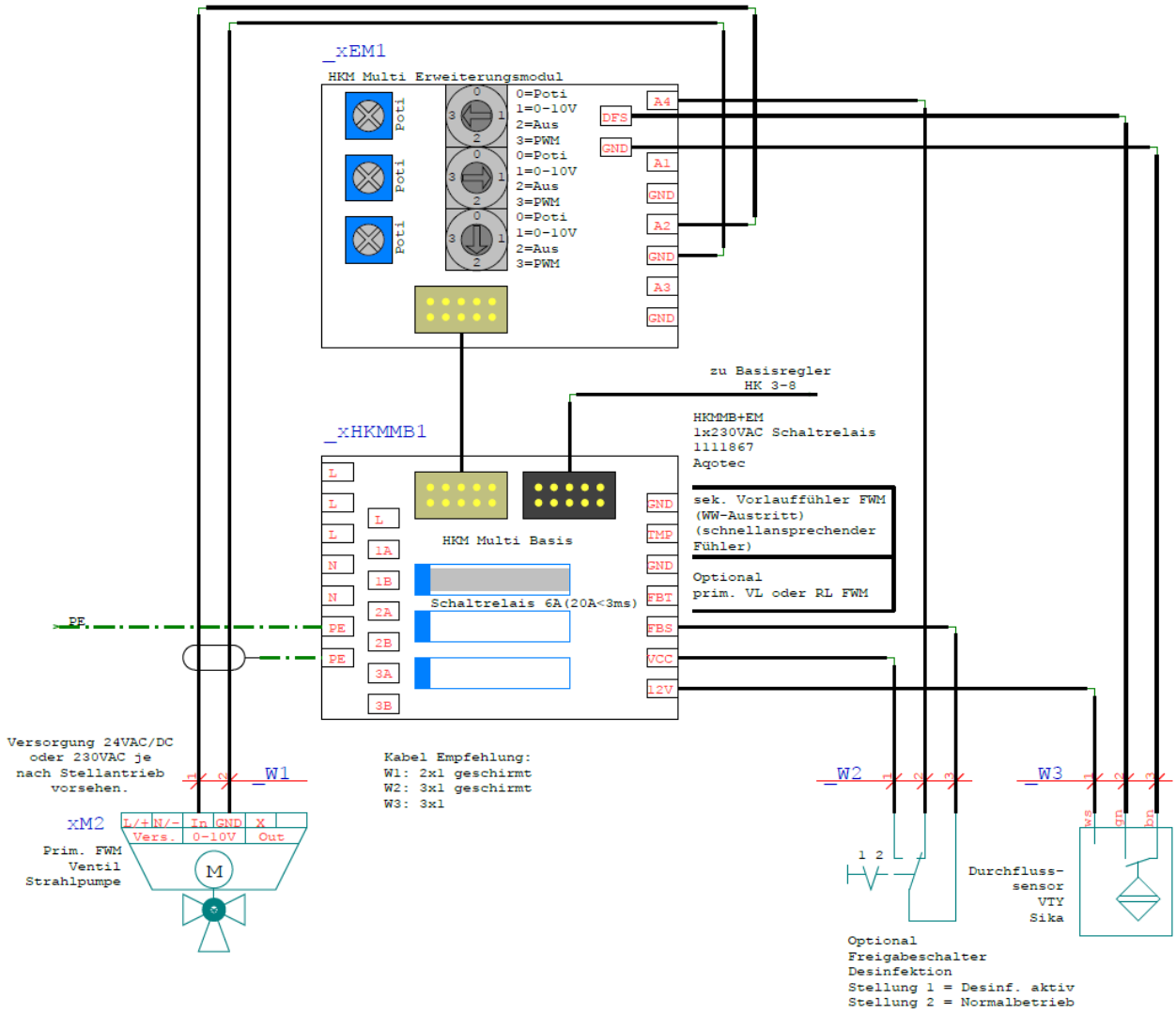


The "x" in the connection diagram relates to the respective heating circuit number.

Connection example 8q / 0-10V:

Control of 0-10V valve or jet pump of a primary-side fresh water module

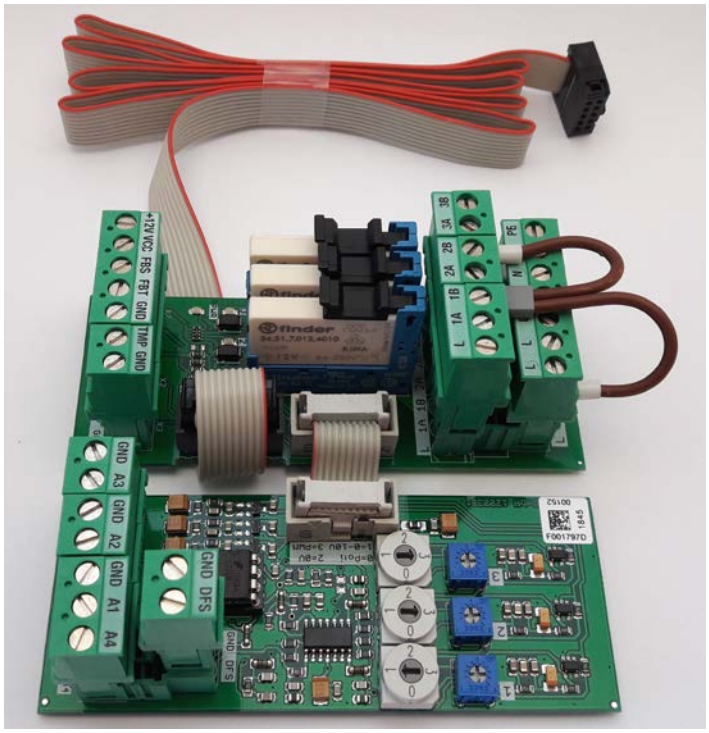
(fresh water module with flow sensor)



The "x" in the connection diagram relates to the respective heating circuit number.

3.8 Multi variant 10 heating circuit module (3x0-10V/PWM output, 3x switching contact)

Part no. : 1112269 HCMMB+EM 3x230VAC switching relay.



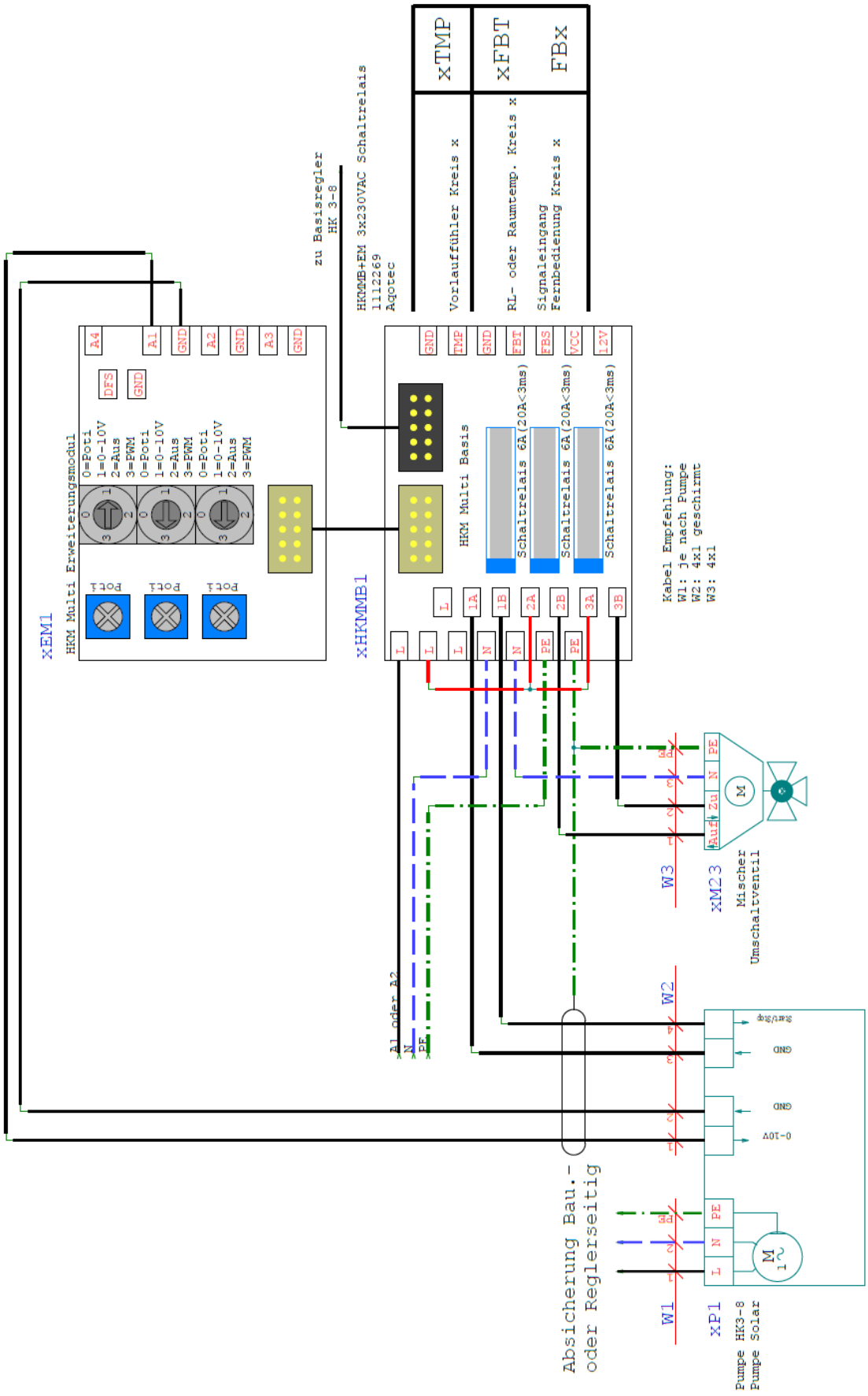
Representation in the image:
Variant 10a

With this module, up to 3 electronic pumps with 0-10V or PWM input and potential-free or 230V AC release can be controlled.
Data sheet is available at www.agotec.com under Support / Downloads.

Use:

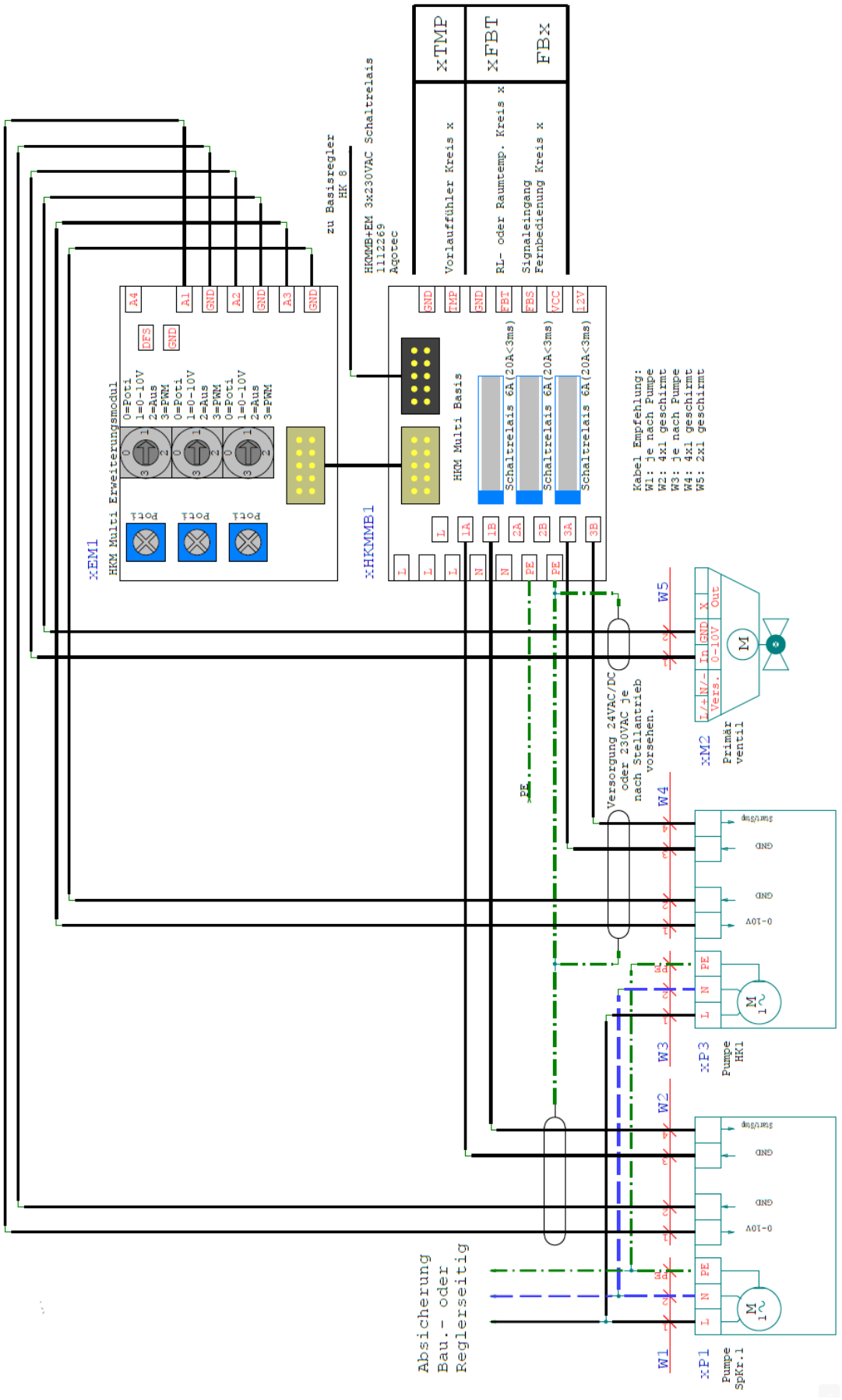
- Control of solar pump + 3-pt./0-10V switching valve tank 1 and 2
- Control of pump HC3-8 + 3-pt./0-10V mixer
- All control variants for HC8 "Analogue outputs" configuration

Connection example 10a: Control of 0-10V + potential-free release of solar pump, HC3-8 and 3-pt. 230V AC control of mixer / switching valve



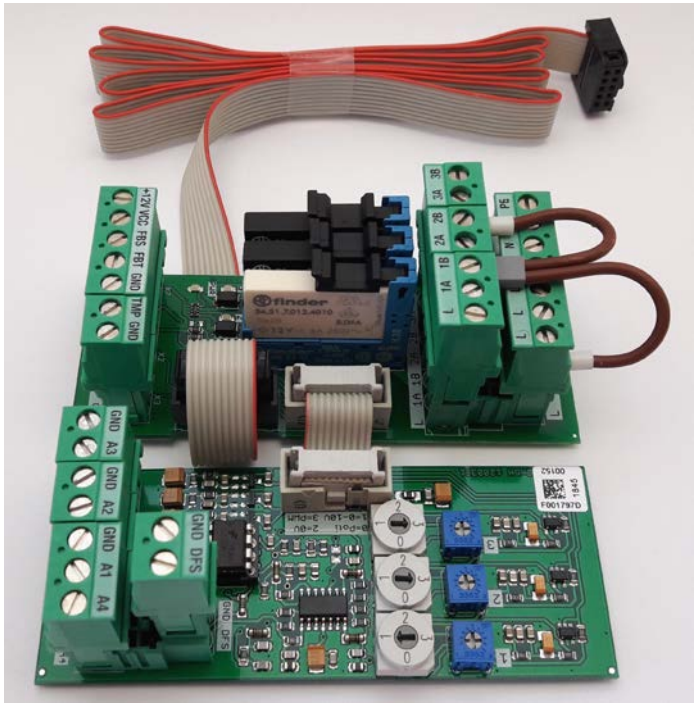
The "x" in the connection diagram relates to the respective heating circuit number.

Connection example 10k / 0-10V: Control of 0-10V + potential-free release of pump, HC1-8 +TC1 and 0-10V control of primary valve



3.9 Multi variant 11 heating circuit module (1x0-10V/PWM output, 3x switching contact)

Part no. **:** 1200617 HCMMB+EM 1x switching relay 2xSSR 230VAC



Representation in the image:

Variant 11a / 0-10V

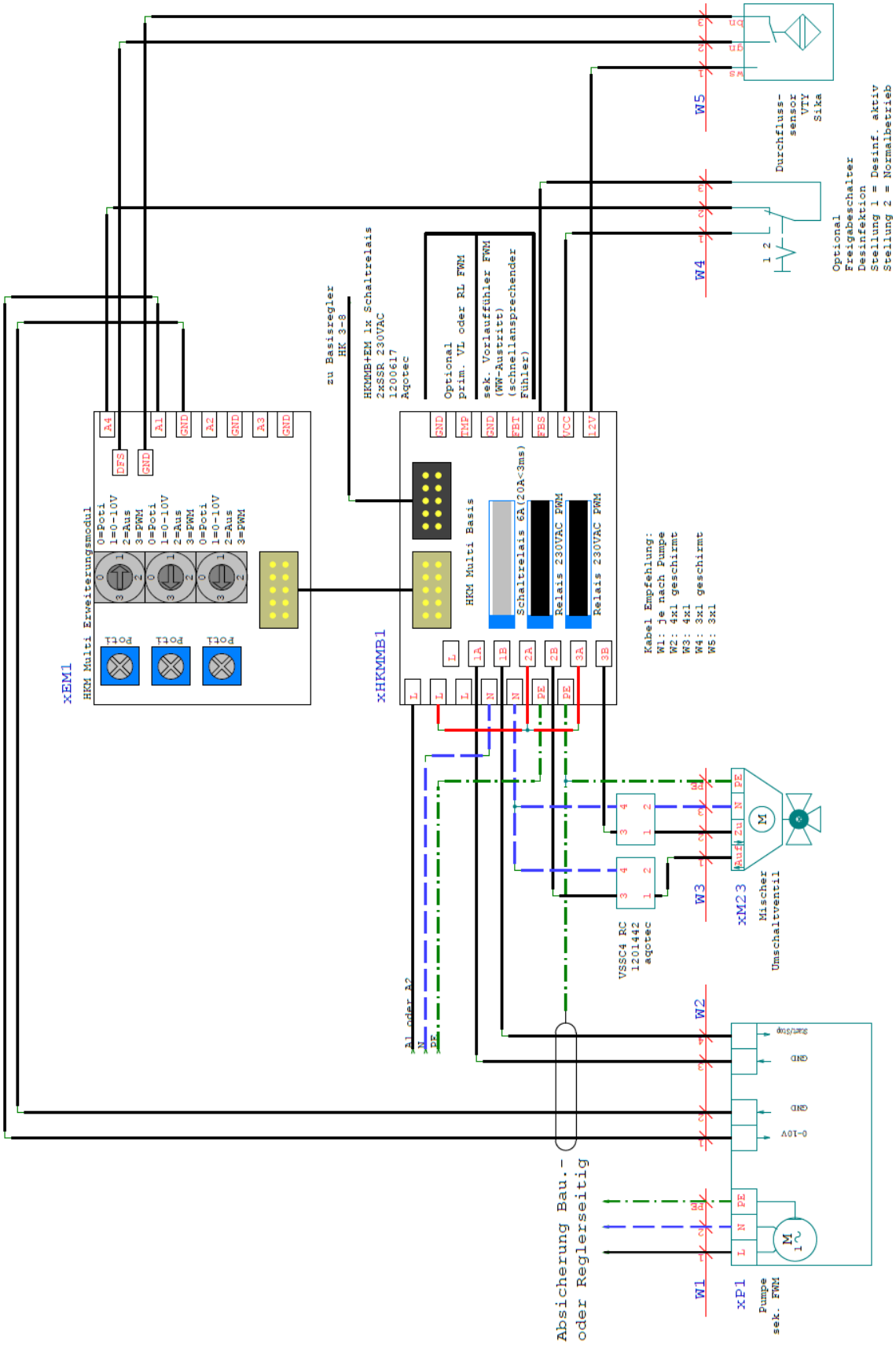
With this module, an electronic pump with 0-10V or PWM as well as a potential-free or 230VAC release can be controlled. In addition, a 3-pt. 230VAC output for a mixer / switching valve with electronic relays is available (for high switching frequency)
Data sheet is available at www.aqotec.com under Support / Downloads.

Use:

- 0-10V control of fresh water module pump HC3-8 and 3pt. 230V AC control of premixing or return switching valve and optional connection of a flow sensor.
- 3-pt. 230VAC control of primary valve / jet pump of a primary-side fresh water module with flow sensor

Connection example 11a / 0-10V:

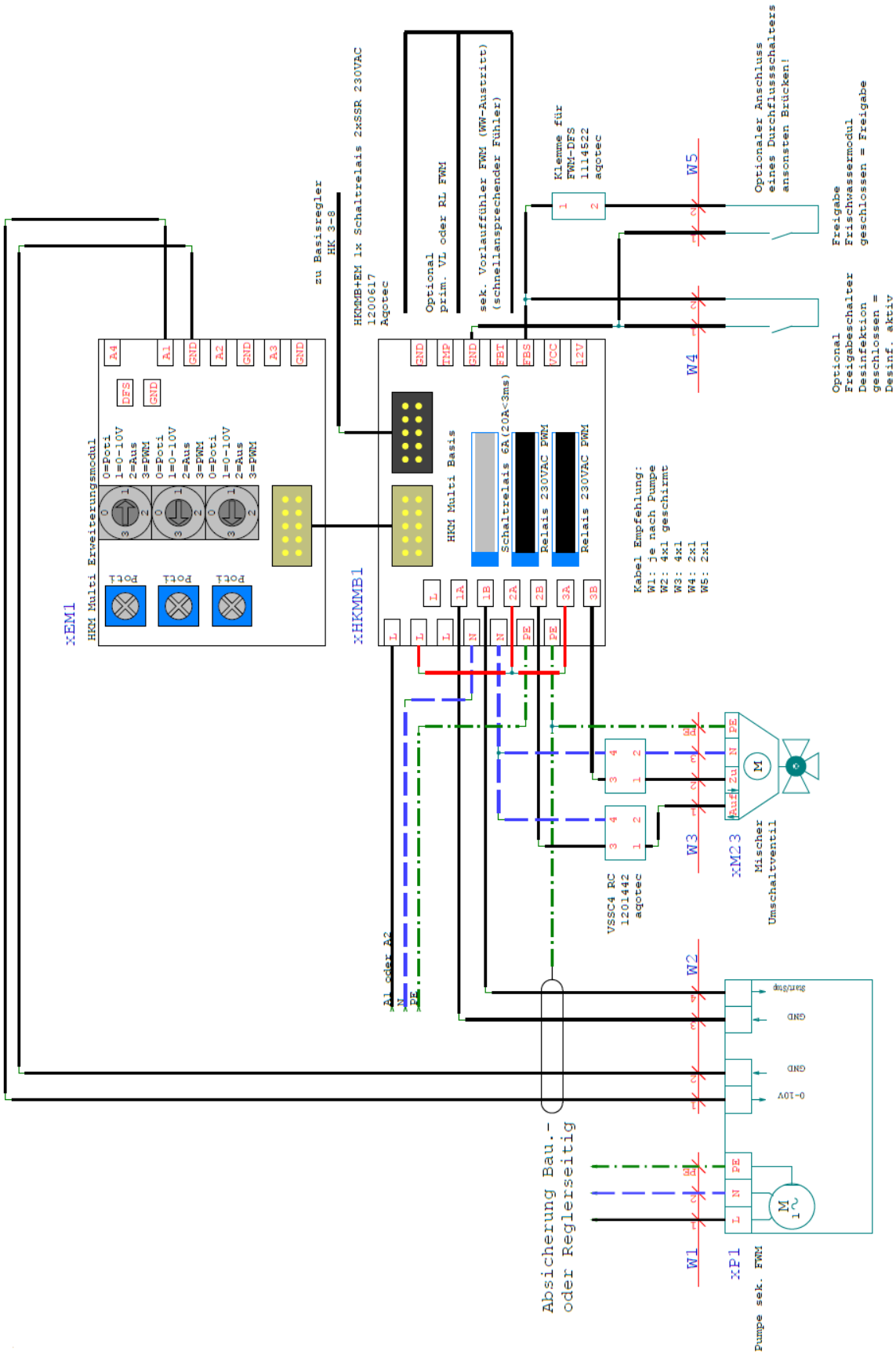
FWM pump with 0-10V control + potential-free release, 3-pt. 230VAC control of premixer or return switching valve and connection of a flow sensor



The "x" in the connection diagram relates to the respective heating circuit number.

Connection example 11b / 0-10V:

FWM pump with 0-10V control + potential-free release, 3-pt. 230VAC control of premixer or return switching valve without flow sensor (only continuous operation or switching contact)

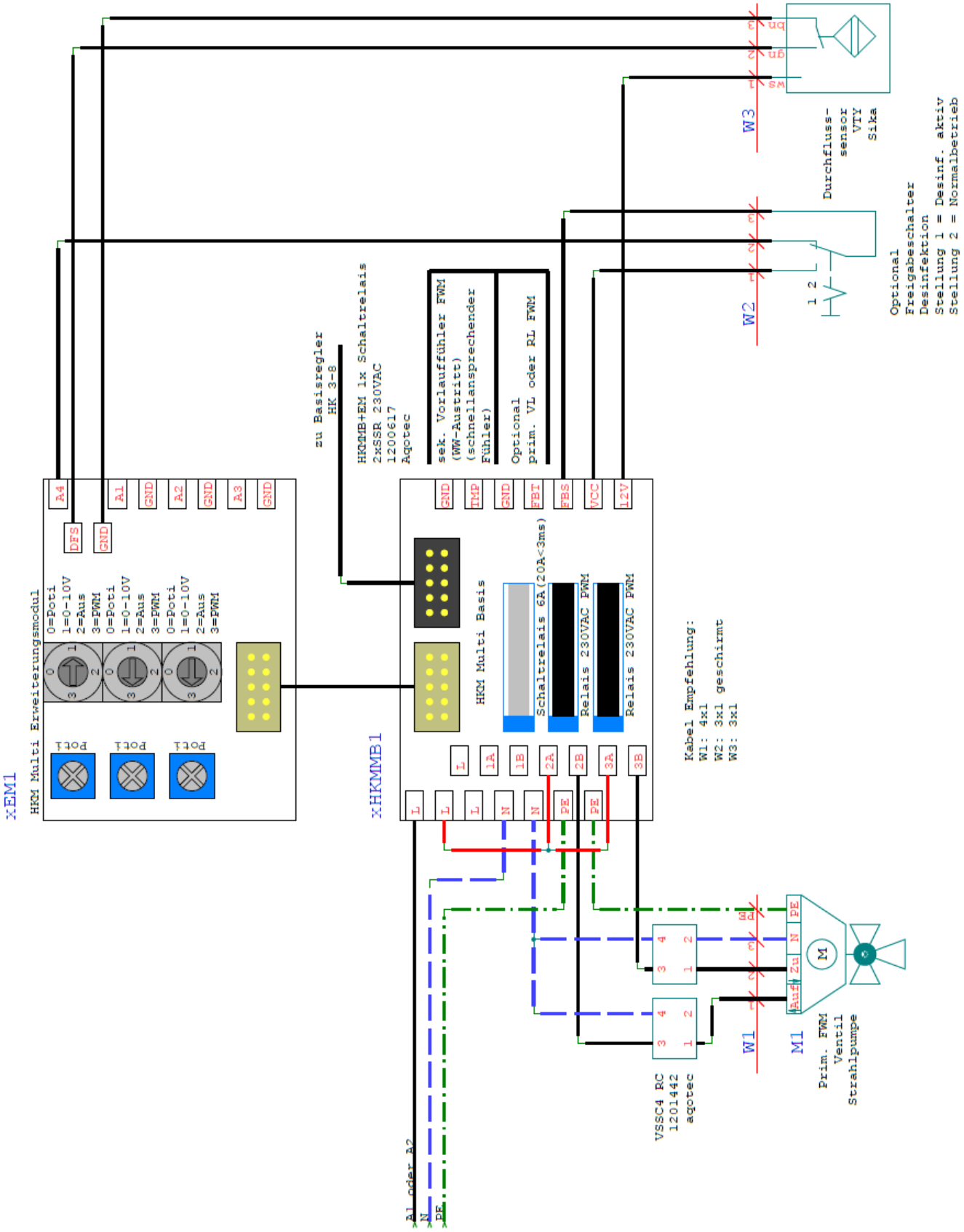


The "x" in the connection diagram relates to the respective heating circuit number.

Connection example 11c:

Control of 3-pt. 230V valve or jet pump of a primary-side fresh water module

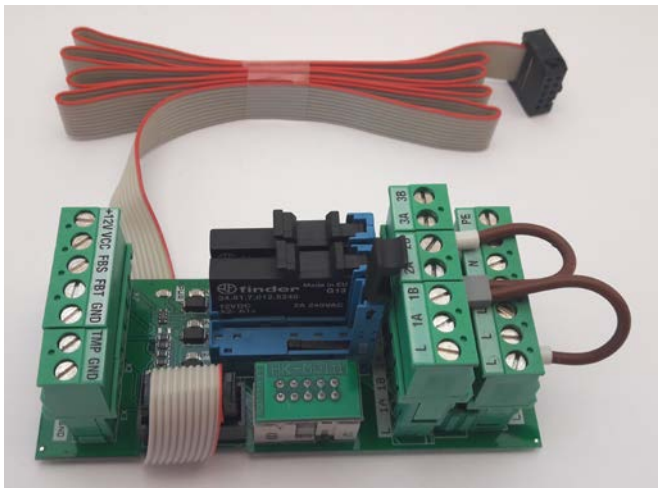
(fresh water module with flow sensor)



The "x" in the connection diagram relates to the respective heating circuit number.

3.10 Multi variant 12 heating circuit module (2x 230VAC switching output with SSR)

Part no. **:** 1200624 HCMMB 2xSSR 230VAC



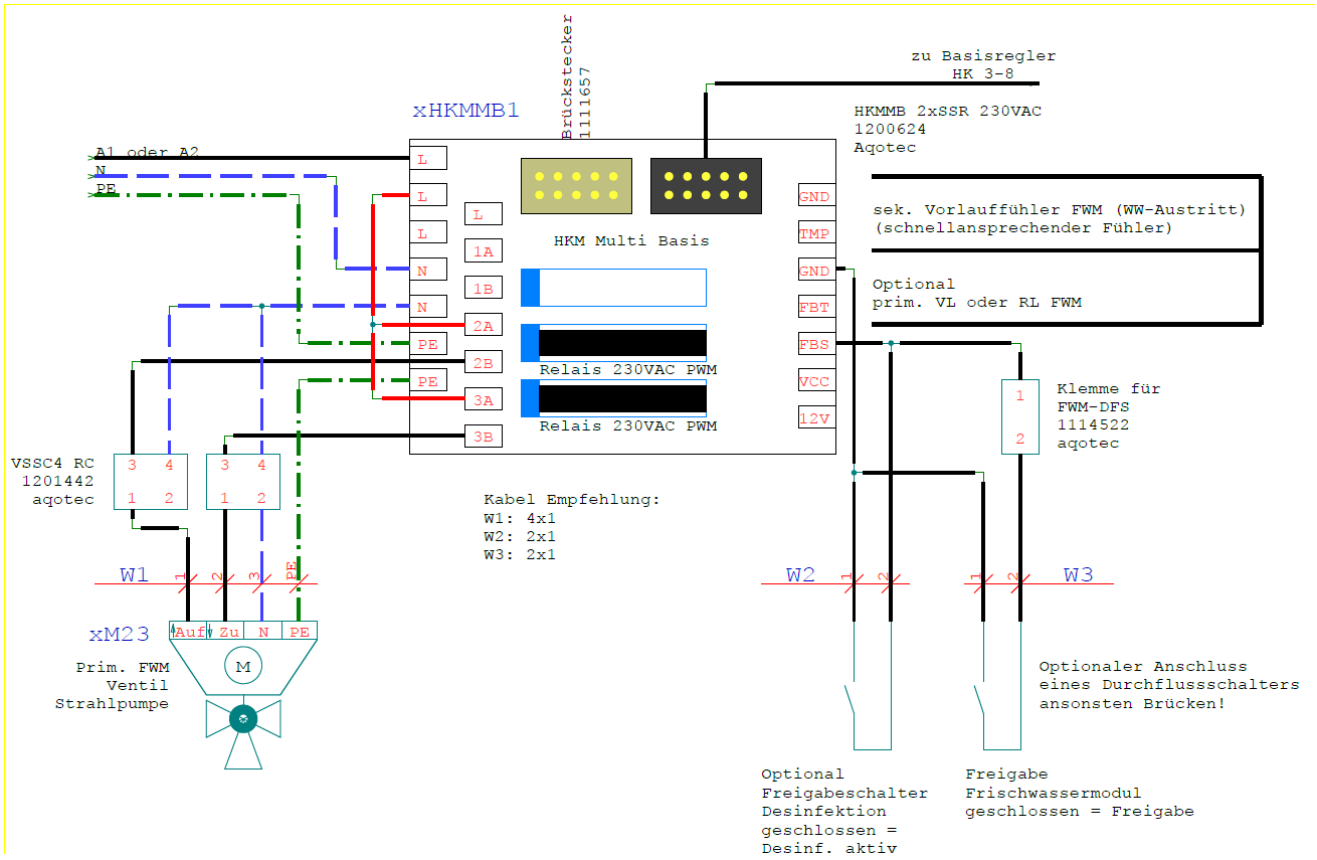
With this module, a 3-pt. 230VAC mixer / valve is controlled with high switching frequency.

Data sheet is available at www.aqotec.com under Support / Downloads.

Use:
Control of 3-pt. 230V valve or jet pump of a primary-side fresh water module

(fresh water module without flow sensor)

connection:



The "x" in the connection diagram relates to the respective heating circuit number.

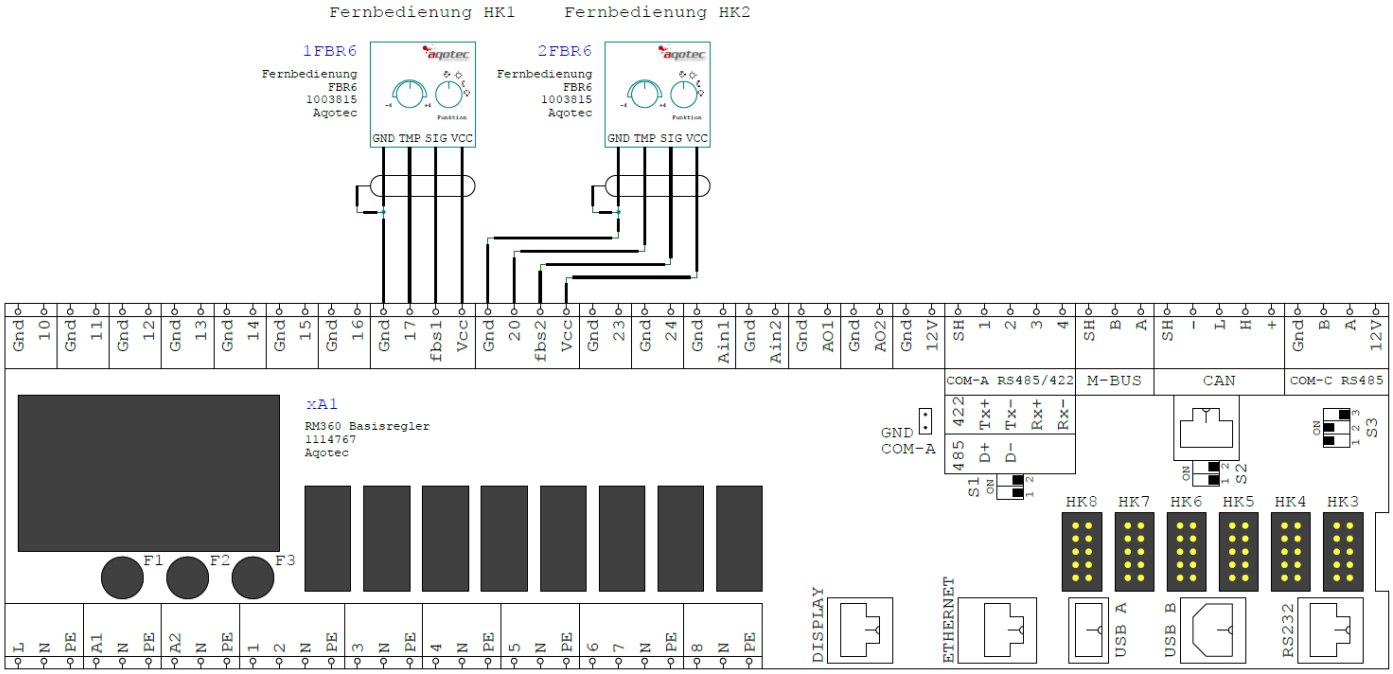
3.11 Remote controls

3.11.1 Remote control FBR6

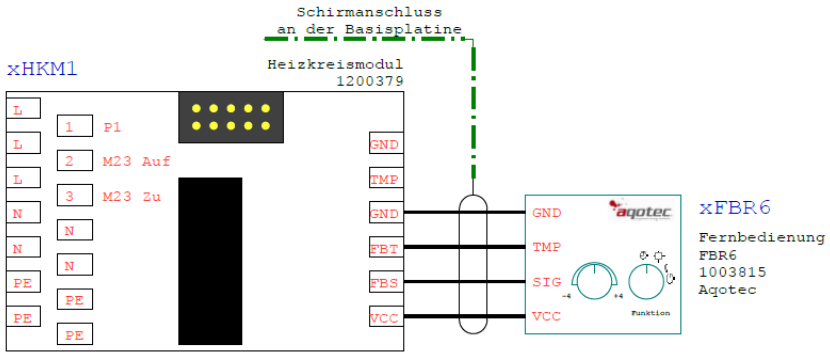
Part no. 1003815 remote control FBR6

Analogue remote control with room sensor for surface mounting.
An OFF / DAY / NIGHT / AUTOMATIC selector switch is provided for selection of the heating circuit mode.
To change the room set temperature, a setting potentiometer with a range of plus / minus four degrees Celsius is available (valid for AUTO or DAY). A room sensor is installed in the remote control which can be used for room control (flow temperature modulation and, if necessary, shutoff) or room thermostat control (circuit switch on / off according to room temp., flow control according to heating curve). The remote control is connected directly to the motherboard or the respective heating circuit module via four wires (e.g. telephone cable / modem line).

Connection for heating circuit 1 and 2:



Connection to the heating circuit module (HC3-8):



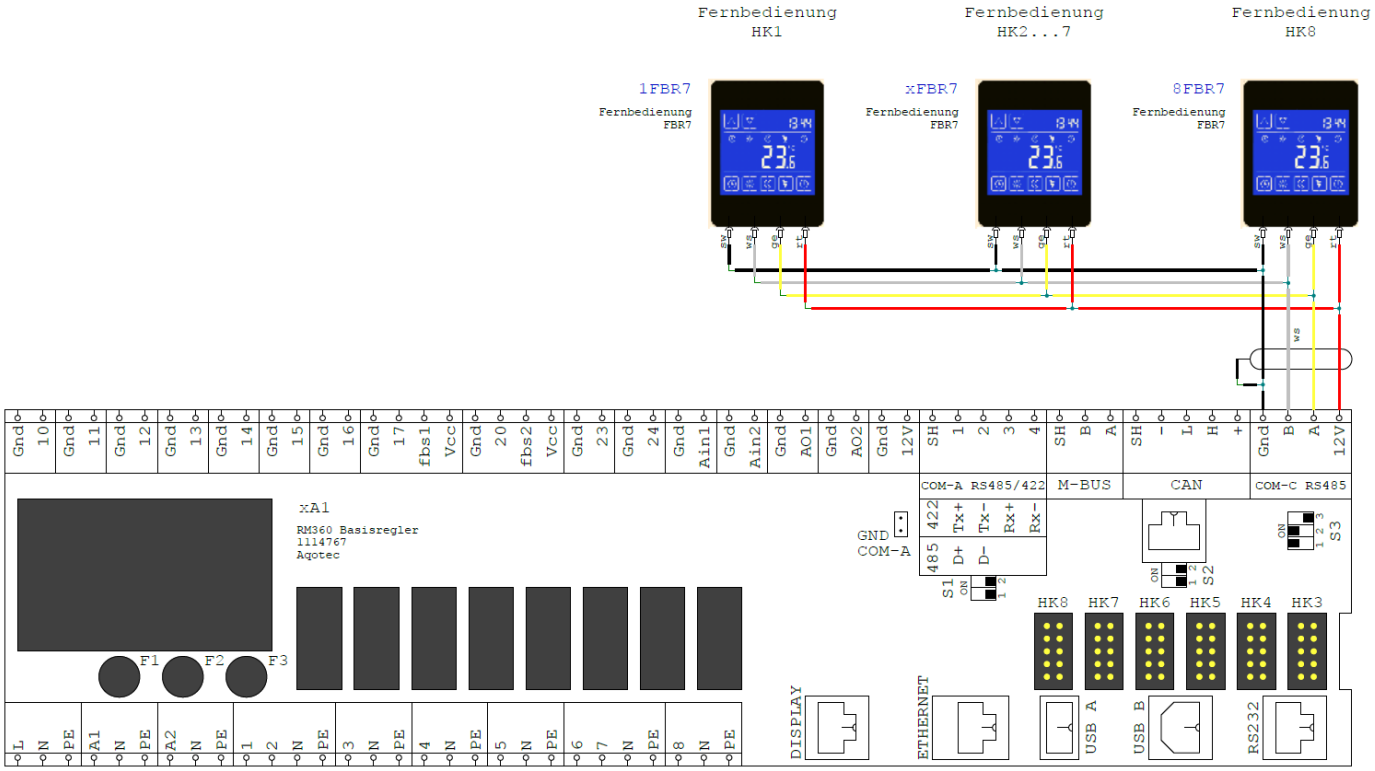
The "x" in the connection diagram relates to the respective heating circuit number.

3.11.2 Remote control FBR7

Part no. 1107551 remote control FBR7 black
Part no. 1107599 remote control FBR7 white

The control panel with touchscreen offers the display of the current room temperature and time in addition to the functions of the FBR6, thus making the operation of customer systems even more convenient. The connection is made via a four-pin, shielded cable. (e.g. telephone cable / modem line).

Connection of the remote control:



4 Input / output test and communication test

4.1 Activation and entry into the parameter level

- Press the RIGHT arrow key until "Service level" appears on the display
- Press ESC to enter the code
- Change numbers with the UP or DOWN arrow key
- Continue to the next number with ENTER
- At the last number, confirm with ENTER
- The parameter level is now released
- Open the service menu with the RIGHT arrow key
- Selection of the respective function described below (arrow keys and ENTER)

4.2 Monitoring of sensor values and analogue inputs, analogue outputs

Selection of "**Input / output overview**"

The menu pages can be called up by pressing the UP or DOWN arrow keys.
This menu contains all the sensor values, analogue inputs, signal inputs of the remote control (if the flow sensor is connected, also the l / min value) as well as the currently output value of the analogue outputs or the status of the switching outputs.

If a sensor value of 150 °C is displayed, the input is "open" (high resistance); there may be a sensor break.
If a sensor value of -40 °C is displayed, the input is "short-circuited" (low resistance).

However, these states are normal if the sensor input is used as a digital input (e.g. boiler charging via contact).

4.3 Output test

"**Output test**" selection

The respective outputs can be called up by pressing the UP or DOWN arrow keys. If an output is selected, it is activated and all other outputs are deactivated.
If a pump is controlled by an analogue output, 100% is specified.
If a continuous mixer (0-10V) is activated, if "OPEN" is selected, the continuous output is continuously increased from 0% with an increment of 2% per second. If "CLOSED" is then selected, the same increment is used to lower to 0%.

When leaving the menu with the left arrow key, the controller returns to automatic mode.

4.4 Communication test COM-A RS422 / RS485

"**Communication overview**" selection - "**COM-A**" image

The top right shows the set baud rate and the bus type (set with P**771** and **772**).
The bottom right shows the set controller address (set with P**770**).

The Rx line shows whether the controller is receiving data from the visualisation (active communication when the numbers and letters change).
The Tx line shows whether the controller (only this exact controller) is sending data from the visualisation (active communication when the numbers and letters change).

If the Rx line changes, but the Tx line remains as it is, this exact controller does not answer; the wiring of the Tx path as well as the setting of controller number and baud rate must be checked here.

In addition to the lines in the test level, the LEDs attached to the basic controller can be checked, see chap. "**3.2.COM-A RS422/RS485**"

4.5 Communication test M-bus meter request

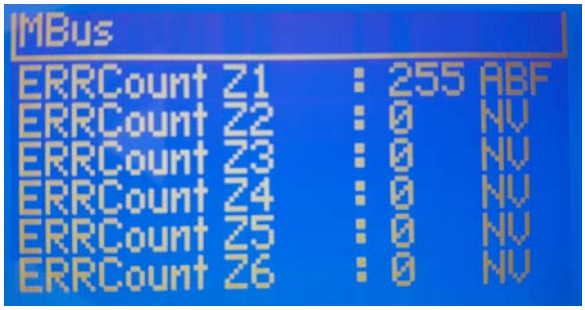
"**Communication overview**" selection - "**M-bus**" image

The M-bus menu pages can be called up by pressing the UP or DOWN arrow keys.

The top right shows the number of queried M-bus devices.
The bottom right shows a read meter ... if the requested meter is sending a response, it shows how much of the log has already been read.

In the Tx line, the 5th and 6th digits in HEX indicate which meter number is currently being queried (when querying via primary address).

If only one counter is read out, "FE" is displayed for 254. At this address, each meter responds independently of the set primary / secondary address.
In the Rx line, the response from the meter is displayed in HEX.
The following pages show the current status per meter:



Status definition:
OK ... communication okay
ABF ... current query of the meter
ERR ... faulty communication with the meter
NV ... meter is not being requested / does not exist
PAU ... meter query is currently paused due to the set request interval.

The error meter counts the faulty queries. (Maximum value 255)
If the response from the meter is correct, it will be set to 0.

In addition to the lines in the test level, the LEDs attached to the basic controller can be checked, see chap. **3.2.7** "**M-BUS meter readout (M-bus master interface)**"

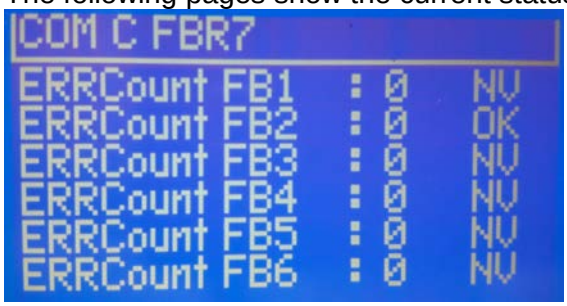
4.6 Communication test COM-C RS485 (FBR7)

"**Communication overview**" selection - "**COM-C**" image

In the Tx line, the 1st and 2nd digits in HEX indicate which remote control is currently being queried:
Remote control circuit 1: Tx: 65…
Remote control circuit 2: Tx: 66…
Remote control circuit 3: Tx: 67…
Remote control circuit 4: Tx: 68…
Remote control circuit 5: Tx: 69…
Remote control circuit 6: Tx: 6A…
Remote control circuit 7: Tx: 6B…
Remote control circuit 8: Tx: 6C…

In the Rx line, the response of the FBR7 is displayed in HEX; the first two digits here must be the same as the Tx line.

The following pages show the current status per remote control:



Status definition:
OK ... communication okay
ABF ... current query of the remote control
ERR ... faulty remote control communication
NV ... remote control is not being queried

The error meter counts the faulty queries. (Maximum value 255)
If the response from the remote control is correct, it will be set to 0.

In addition to the lines in the test level, the LEDs attached to the basic controller can be checked, see chap. "**3.2.9COM-C RS485**"

4.7 Communication test CAN bus (sub-controller)

"**Communication overview**" selection - "**CAN**" image

The top right shows the number of queried CAN bus devices (sub-controllers).
The bottom line displays the RxID and TxID.
The TxID is the identification number of the sending controller (subcom master), this address is always 100.
The RxID is the identification number of the receiving controller (a subcom slave). The number 101 shown here stands for the first sub-controller (sub-controller 20 would have the number 120).

There is no separate communication page to check the function of the subcom, since the setpoint or the current return limit is displayed by each sub-controller in the "**Controller values**" menu.

The communication to the sub-controller can be checked as follows:

- Check on the sub-controller whether the outside temperature is transmitted by the subcom master
- Check on the subcom master if the setpoint from the sub-controller is applied (if necessary, change the setpoint on the sub-controller via the operating mode and check whether the setpoint also changes on the subcom master).

In addition to the lines in the test level, the LEDs attached to the basic controller can be checked, see chap. "**3.2.8CAN bus**"

5 Configuration description (basic settings)

5.1 Basic configuration

5.1.1 Activation and entry into the parameter level

- Press the RIGHT arrow key until "Service level" appears on the display
- Press ESC to enter the code
- Change numbers with the UP or DOWN arrow key
- Continue to the next number with ENTER
- At the last number, confirm with ENTER
- The parameter level is now released
- Access the service level using ENTER
- In the service level, select "All parameters" (arrow keys and ENTER)

The service code can be used by employees of **aqotec** or the heating plant operator.

In principle, changes to settings may only be made by qualified persons.
Any system damages caused by parameter adjustment by third parties are the responsibility of these parties and they must bear the resulting costs!

5.1.2 Factory settings

Adjustable with parameter **1026**
Entering "YES" restores the factory settings.

ATTENTION! Set controller texts or bus parameters are not reset

5.1.3 Language

Adjustable with parameter **561**
Defines the language in which the controller texts are displayed.

5.1.4 Brightness display

Adjustable with parameter **560**
Changes the brightness of the display illumination.

5.1.5 Start authorisation and definition of authorisation level

Adjustable with parameter **1014**
Operation is divided into 5 different user levels. The current operator level is displayed in the service level as a number in the header to the right of the words "service level". The parameter indicates the level at which the controller is automatically located after a restart. By setting a corresponding code in the service level, the authorisation level can be increased. If the controller is not operated for 15 minutes, the authorisation level is reset to the level set here.
On delivery, the controller starts with authorisation level 1.

0.. no adjustment possible except time and date.

1.. only basic settings can be changed:
- Operating mode in the main screen of the controller (higher-level) and the heating circuit
- Change of the heating curve correction in- and outside the heating time in the main image of the controller (higher-level) and the heating circuit
- Heating: Switch-off values according to outside temperature and room set temperature

2.. Basic temperature settings for hot water and heating circuits. (caretaker or heating engineer)

3.. Heating engineer or commissioning level ... all configurations possible except Ethernet-SIP
.

4.. Supervisor level ... with freely configured service codes, level 3 code can be changed or reset, all parameters are visible and adjustable.

5.1.6 Individual code system

If desired or necessary, the factory service codes for levels 1-3 can be changed / assigned individually. Each service code can edit its own and all underlying levels and also change the code.
The code system can be used in level 3 with parameter **1015** .
Once the code system is activated, it can only be deactivated again in level 4.

In level 4, when the code system is active, you can only access with a special TAN code which is only requested from **aqotec** employees in emergencies (e.g. code level 3 misplaced)

In general, we recommended storing the set password on the heating plant PC, for example, or keeping them at hand so that they can be used in case of support.

ATTENTION! The set codes are not reset even with factory settings.

Parameters for code entry:

Parameter number	Designation
1016	Code level 1.1 (party 1, heating circuit 1)
1017	Code level 1.2 (party 2, heating circuit 2)
1018	Code level 1.3 (party 3, heating circuit 3)
1019	Code level 1.4 (party 4, heating circuit 4)
1020	Code level 1.5 (party 5, heating circuit 5)
1021	Code level 1.6 (party 6, heating circuit 6)
1022	Code level 1.7 (party 6, heating circuit 7)
1023	Code level 1.8 (party 8, heating circuit 8)
1024	Code level 2 (caretaker, heating engineer)
1025	Code level 3 (operator, commissioning)

5.1.7 Frost protection

If the controller has an outdoor sensor connected, frost protection for the heat exchanger, tank and lines is available from the factory.
The following frost protection functions come into effect when the outdoor sensor undercuts the "OT threshold for frost protection" set with parameter **551**.

5.1.7.1 Frost protection of a heat transfer station

A station with HC0 or HC3 (if HC3 is set to "second station HE"), or both if not already active, activates if sec. flow and prim. return undercuts the "Flow temp. for frost protection" set with parameter **552**.

The station remains active until both sensors have exceeded the set "Flow temp. for frost protection" by 5K.

5.1.7.2 Frost protection of a cold transfer station

A station with HC0 or HC3 (or both), if not already active, activates if sec. flow and prim. return undercuts the set "Flow temp. for frost protection" set with **parameter** 552<t2/>.

The station remains active until both sensors have exceeded the set "Flow temp. for frost protection" by 5K.

Setting example:
If, for example, a "Flow temp. frost protection" of 0 °C is set, sec. flow and prim. return must exceed a temperature of 5 °C, which should be possible with conventional cooling networks (flow temperatures > 5K necessary).

If the flow temperature is lower, an alternative frost protection function measure must be considered.

5.1.7.3 Frost protection when controlling a boiler via HC0

Unless already active, the boiler gets the release (and the boiler circuit is activated) if the boiler sensor AND the return sensor undercut the "Flow temp. for frost protection" set with parameter **552.**
The boiler is then active for at least the set minimum runtime - after the minimum runtime has elapsed, it can be switched off if both sensors have undercut the set Flow temp. for frost protection by 5K.

For a temperature request via AO1, the set "Flow temp. for frost protection" + 10K is requested.

For a power request, as in regular operation, the calculated power is output according to the set flow temperature (set "Flow temp. for frost protection" + 10K) via AO1.

5.1.7.4 Frost protection with configured boiler via tank circuit 1 and / or 2

If one of the two sensors falls below 10 °C, recharging is performed at a charging temperature of 25 °C (this is also requested at the station or tank 2 or the charging module, depending on the setting of the request) until both sensors have exceeded 15 °C.

If a sensor is not connected, it will be ignored for frost protection
This function is independent of the selected boiler charging mode.

5.1.7.5 Frost protection with configured boiler charging module

Unless activated by boiler charging, a BCM (whether mixed or not) must activate, if sec. flow and prim. return undercut the Flow temp. for frost protection set with parameter **552**.
The BCM remains active until both sensors have undercut the set "Flow temp. for frost protection by 5K.
During frost protection charging, the BCM requests the set Flow temp. for frost protection + 5K + request increase CM depending on the request of the associated tank circuit .
With the primary-side BCM (standalone tank circuit), the request is eliminated, but the control itself is identical.

If a sensor is not connected, it will be ignored for frost protection.

If no sensor is connected (unmixed CM), the frost protection function is eliminated.

5.1.7.6 Frost protection with configured buffer via tank circuit 2

Applies for the "Off / Frost protection" operating mode or whenever all requesting heating circuits or the boiler itself are in the frost protection function.
As soon as a requesting circuit or the boiler is in regular operation, the regular control function also applies to the buffer.

If the upper buffer sensor drops below the request of the heating circuits or boiler (flow temp. frost protection or 25 °C with boiler recharge), is recharged independently of the buffer charging mode until the request from the upper sensor has exceeded 2K AND the lower sensor 10K.

If no single circuit requests at the buffer, the buffer setpoint temperature is automatically 10 °C.
This means recharging if the upper buffer sensor has undercut 10 °C until the upper buffer sensor has exceeded 12 °C and the lower sensor has exceeded 10 °C.
The buffer requests the request + charge hysteresis during frost protection recharging.

5.1.7.7 Frost protection with configured fresh water module

The fresh water module falls under the "HW preparation" operating mode so only one frost protection is necessary if the controller is set to Off - frost protection, or no tapping or no circulation operation occurs.

In this case, the FWM should be activated if the sec. flow (=HW sensor) falls under 5 °C and remains active until the sec. flow has undercut 10 °C.
If the FWM requests at the buffer, the temperature of 10 °C + "hysteresis request" should be requested at the buffer during frost protection operation.
With the "Standalone" or "TC1" request, the request is not forwarded; only the FWM is activated.

5.1.7.8 Frost protection with a configured circulation pump

P558 "Circulation active with FS" can be used to define whether a configured circulation pump should be activated in the frost protection function:

YES selection:
Circulation runs with frost protection (OT falls below the adjustable threshold) as if a continuous circulation time had been set:

- Without circulation sensor, permanent
- With circulation sensor, the circulation pump is switched off when the sensor exceeds the Flow temp. for frost protection set in parameter **522** by the circulating pump switch-off hysteresis
  It is switched back on when the circulation sensor undercuts the set Flow temp. for frost protection set with parameter <t0/>552<t1/>.

NO selection:
Frost protection does not affect the circulation pump

By default, the parameter is set to "YES"

5.1.7.9 Room frost protection for "room control" or "room thermostat"

If a heating circuit is set to "Heating curve control" (with remote control FBR6 or FBR7 setting), "Room control w/ or w/o switch-off" or "Room thermostat", the heating circuit goes into operation in the "Off / FS" operating mode of the respective circuit or in the "Off / FS" or "Only HW preparation" general operating mode if the room sensor undercuts the "Room frost protection threshold" adjustable with parameter **559** .

If this threshold is undercut, the circuit is activated, controls to the "Flow setpoint temp. at FS" set with parameter **552** and remains in operation until the "room frost protection threshold" has been exceeded by 2K.
This function applies regardless of the other frost protection function. It is also theoretically possible that, although the room frost protection is no longer active, the OT will still be below the set frost protection threshold. The circuit still remains in operation in this case.

5.1.8 Building coefficient

The building coefficient is used to set the duration of outside temperature averaging for outside temperature switch-off of the heating circuits:
P553 "OT averaging for HC switch off. (building coef.)"

By default, the parameter is set to 60min.
Averaging can be set from 1min to 5760min.

5.1.9 Outside temperature average for setpoint calculation

With parameter **554** "OT averaging for setpoint calculation", the duration of outside temperature averaging can be set in minutes.
This average outside temperature is used to calculate the heating curve or 4-point curve.

By default, the parameter is set to 15min.
The averaging can be set from 1min to 255min.

5.1.10 Duration of the party mode function of the heating circuits

If party mode is activated via the heating circuit operating mode or remote control FBR7, the heating circuit regulates in day mode for this set duration independently of the time program.
The duration of party mode is set with parameter **557** "Duration of party mode heating circuits".

By default, the parameter is set to 120min.
The duration can be set from 0 to 1440min.

5.2 Configuration of the system scheme

5.2.1 Heating circuit 0 (with basic controller, "main energy source")

Heating circuit 0 relates to sensor inputs T11, T12 and T15 as well as valve output M12 and analogue output 1.
The following options are available for this circuit and can be configured with parameter **1**:

- **Heat transfer station** (factory configuration)

Control of a heat transfer station, control of the primary valve and control to sec. flow setpoint temperature (T12 sec. flow necessary) as well as the limit of prim. return temperature (T11 prim. return necessary) and maximum power (heat meter must communicate with the controller via M-bus).

The station controls to the highest request of the requesting circuits or to the boiler charging setpoint temperature (depending on the boiler variant and boiler request).

At analogue output 1, the current sec. flow setpoint temperature is output.

For exact configuration, see chap. **7.1"Detailed configuration of transfer station"**

- **Cold transfer station**

Control of a cold transfer station, control of the primary valve and control to sec. flow setpoint temperature (T12 sec. flow necessary) as well as the limit of prim. return temperature (T11 prim. return necessary) and maximum power (heat meter must communicate with the controller via M-bus).

The station controls to the lowest request of the requesting circuits.

At analogue output 1, the current sec. flow setpoint temperature is output.

For exact configuration, see chap. **7.1"Detailed configuration of transfer station"**

- **Burner**

Control of a boiler, control of return increase to min. return (T11 boiler return required) and setpoint flow (T12 boiler sensor required).

The setpoint flow temperature results either from the set min. flow temperature or a higher request.

At analogue output 1, either a temperature request or a power request is output to the boiler.

If necessary, a release of the boiler can be switched with HC1, configuration HC1 (**P3**) to "Burner release".
If necessary, TC 2 can be used to control a boiler pump (also speed-controlled), configuration TC2 (**P11**) to "Burner pump in distributor" or "Burner pump in buffer"

For exact configuration, see chap. **7.2"Detailed configuration of burner control"**

- **Mixer for HC1**

If the controller is used as a sub-controller or secondary controller, the primary valve output can be used as a mixer for heating circuit 1 (T12 required as heating circuit flow sensor).
T11 and T15 are not used in this configuration.

At analogue output 1, a temperature request is output (it counts the highest temperature request of those circuits which are set to the "Station" request although the station is not present).

5.2.2 Heating circuit 1 (with basic controller)

Heating circuit 1 relates to pump outlet P3 and remote control input FB1 (or sensor input T17).
The following options are available for this circuit and can be configured with parameter **2**:

0	Not available	
1	Heating curve control (factory configuration)	Heating curve control acc. to OT
2	Room control w/o shutoff	Stored heating curve control acc. to OT and room control with FB1 or room sensor T17
3	Room control with switch-off	Stored heating curve control acc. to OT and room control with FB1 or room sensor T17
4	Room thermostat	Heating curve control acc. to OT and switch on/off with FB1 or room sensor T17
5	Circulation pump	Circulation pump with opt. circulation sensor T17
6	Ext. setpoint specification 0-10V	Setpoint specification of AIN1 or AIN2, P3 as a feeder pump
7	Standby generator	State of generator in case of insufficient supply by main energy source, P3 as generator release
8	Feeder pump 1	P3 as primary feeder pump, sec. or individually configurable per circuit
9	Feeder pump 2	P3 as primary feeder pump, sec. or individually configurable per circuit
10	Sub-controller feeder	P3 as a feeder pump for a sub-controller
11	Differential controller	Special control to two measured temperatures or a temperature and a setpoint
12	Direct charging module for boiler 1	P3 as a charging module pump and opt. T17 as a sec. flow charging module
13	Direct charging module for boiler 2	P3 as a charging module pump and opt. T17 as a sec. flow charging module
14	Direct charging module for boiler 1+2	P3 as a charging module pump and opt. T17 as a sec. flow charging module
15	Release for burner	Release for burner with HC0
16	Pump feedback UPM3	Evaluation of feedback of Grundfos UPM3, P3 as error output (always switched except in case of error)
17	Second pump to HC2	Second pump with error and operating hour reordering. FBS1 as an error input of pump HC2 (main pump), T17 as an error input of the pump to P3 (second pump)

For selection options 1-4, 6 and 10, parameter **12** "HC1 request" must be used to define the hydraulic integration (from where is the heating circuit supplied?):

- To station // temperature request to HC0 (station or burner)
- To TC 2 // e.g. for a buffer or boiler in buffer variant
- Standalone // special circuit, no temperature request

For the circulation pump, parameter **127** "Integration of circ. HC1" must be used to define the hydraulic integration of the circulation pump.
- Direct integration into the tank
- Reheating via a charging module
- Reheating via a fresh water module

For more details on integration of a circulation pump and configuration, see chap. "**7.8Detailed configuration of circulation pump**".

ATTENTION! Selection options 7-9, and 12-14 may only be configured for one heating circuit.

5.2.3 Heating circuit 2 (with basic controller)

Heating circuit 2 relates to pump outlet P8, mixer output M67, flow sensor input T16 and remote control input FB2 (or sensor input T20).
The following options are available for this circuit and can be configured with parameter **3**:

0	Not available	
1	Heating curve control (factory configuration)	Heating curve control acc. to OT
2	Room control w/o shutoff	Stored heating curve control acc. to OT and room control with FB2 or room sensor T20
3	Room control with switch-off	Stored heating curve control acc. to OT and room control with FB2 or room sensor T20
4	Room thermostat	Heating curve control acc. to OT and switch on/off with FB2 or room sensor T20
5	Circulation pump	Circulation pump with opt. Circulation sensor T16
6	Ext. setpoint specification 0-10V	Setpoint specification of AIN1 or AIN2, P8 as a feeder pump, M67 and T16 as premixing
7	External energy source	Integration of an external energy source (e.g. existing wood stove), switching of a boiler pump with P8, switching of a switching valve, station / ext. energy source with output 6 and 7, boiler sensor T16 and opt. return flow sensor T20
8	Standby generator	State of generator in case of insufficient supply by main energy source, P8 as generator release
9	Feeder pump 1	P8 as feeder pump, primary, sec. or individually configurable per circuit
10	Feeder pump 2	P8 as feeder pump, primary, sec. or individually configurable per circuit
11	Sub-controller feeder	P8 as a feeder pump for a sub-controller, M67 and T16 can be used as premixing
12	Error outputs	3 configurable "sum errors" can be output with outputs 6, 7 and 8.
13	Differential controller	Special control to two measured temperatures or a temperature and a setpoint
14	Direct charging module for boiler 1	P8 as charging module pump, T16 as sec. flow charging module, T20 as prim. return charging module (sensor optional)
15	Direct charging module for boiler 2	P8 as charging module pump, T16 as sec. flow charging module, T20 as prim. return charging module (sensor optional)
16	Direct charging module for boiler 1+2	P8 as charging module pump, T16 as sec. flow charging module, T20 as prim. return charging module (sensor optional)
17	Mixed charging module for boiler 1	P8 as charging module pump, M67 as charging module mixer, T16 as sec. flow charging module, opt. T20 as prim. return charging module
18	Mixed charging module for boiler 2	P8 as charging module pump, M67 as charging module mixer, T16 as sec. flow charging module, opt. T20 as prim. return charging module
19	Mixed charging module for boiler 1+2	P8 as charging module pump, M67 as charging module mixer, T16 as sec. flow charging module, opt. T20 as prim. return charging module
20	Pump feedback UPM3	Evaluation of feedback of Grundfos UPM3, P8 as error output (always switched except in case of error)
21	Signal inputs	3 potential-free signal inputs T16, T20 and FBS2 and corresponding circuit of outputs 6,7 and 8

For selection options 1-4, 6 and 11, parameter **13** "HC2 request" must be used to define the hydraulic integration (from where is the heating circuit supplied?):

- To station // temperature request to HC0 (station or burner)
- To TC 2 // e.g. for a buffer or boiler in buffer variant
- Standalone // special circuit, no temperature request

For the circulation pump, parameter **166** "Integration of circ. HC2" must be used to define the hydraulic integration of the circulation pump.

- Direct integration into the tank
- Reheating via a charging module
- Reheating via a fresh water module

For more details on integration of a circulation pump and configuration, see chap. "**7.8Detailed configuration of circulation pump**".

For integration of the external energy source, parameter **650** "Integration ext. energy source" must be used to define the hydraulic integration of the energy source:

- Directly into tank circuit 1 (e.g. a configured boiler)
- Directly into tank circuit 2 (e.g. a configured buffer)
- Directly on the entire heating circuit distributor

More details on integration of the external energy source and configuration, see chap. "**7.15Detailed configuration of external energy source**".

ATTENTION! Selection options 7-10, 12, 14-19 may only be configured for one heating circuit.

5.2.4 Heating circuit 3-8 (with Standard or HC Multi heating circuit module)

Heating circuit 3-8 relates to one standard or HC Multi heating circuit module each (depending on the connection).
In principle, the heating circuit module has a pump output xP1, a mixer output xM23, a flow sensor input xTMP and a remote control input FBx or a room sensor input xFBT.
With the corresponding HC Multi variant, as an alternative to the 3-pt. mixer, a 0-10V mixer or, instead of the switching output, a PWM or 0-10V control of the pump can be implemented.

The following options are available for circuits 3.8 and can be configured with parameters **4-9**:

0	Not available	
1	Heating curve control	Heating curve control acc. to OT
2	Room control w/o shutoff	Stored heating curve control acc. to OT and room control with FBx or room sensor xFBT
3	Room control with switch-off	Stored heating curve control acc. to OT and room control with FBx or room sensor xFBT
4	Room thermostat	Heating curve control acc. to OT and switch on / off with FBx or room sensor xFBT
5	Circulation pump	Circulation pump with opt. Circulation sensor xTMP
6	Ext. setpoint specification 0-10V	Setpoint specification of AIN1 or AIN2, xP1 as a feeder pump, xM23 and xTMP as premixing
7	External energy source	Integration of an external energy source (e.g. existing wood stove), switching of a boiler pump with xP1, switching of a switching valve, station / ext. energy source with output xM23, boiler sensor xTMP and opt. return flow sensor xFBT
8	Standby generator	State of generator in case of insufficient supply by main energy source, xP1 as generator release
9	Feeder pump 1	xP1 as feeder pump, primary, sec. or individually configurable per circuit
10	Feeder pump 2	xP1 as feeder pump, primary, sec. or individually configurable per circuit
11	Sub-controller feeder	xP1 as a feeder pump for a sub-controller
12	Error outputs	3 configurable "sum errors" can be output with outputs xP1, xM1 and xM2.
13	Differential controller	Special control to two measured temperatures or a temperature and a setpoint
14	Direct charging module for boiler 1	xP1 as charging module pump, xTMP as sec. flow charging module, xFBT as prim. return charging module (sensor optional)
15	Direct charging module for boiler 2	xP1 as charging module pump, xTMP as sec. flow charging module, xFBT as prim. return charging module (sensor optional)
16	Direct charging module for boiler 1+2	xP1 as charging module pump, xTMP as sec. flow charging module, xFBT as prim. return charging module (sensor optional)
17	Mixed charging module for boiler 1	xP1 as charging module pump, xM23 as charging module mixer, xTMP as sec. flow charging module, opt. xFBT as prim. return charging module
18	Mixed charging module for boiler 2	xP1 as charging module pump, xM23 as charging module mixer, xTMP as sec. flow charging module, opt. xFBT as prim. return charging module
19	Mixed charging module for boiler 1+2	xP1 as charging module pump, xM23 as charging module mixer, xTMP as sec. flow charging module, opt. xFBT as prim. return charging module

20	Solar system in TC1	Differential control of solar system on collector sensor xTMP and lower sensor TC1 T14, optional flow sensor solar xFBT for speed control of solar pump xP1 (without flow sensor, only switching of the pump)
21	Solar system in TC2	Differential control of solar system on collector sensor xTMP and lower sensor TC2 T24, optional flow sensor solar xFBT for speed control of solar pump xP1 (without flow sensor, only switching of the pump)
22	Solar system in TC1 + 2	Differential control of solar system on collector sensor xTMP and lower sensor TC1 T14 or TC2 T24, optional flow sensor solar xFBT for speed control of solar pump xP1 (without flow sensor, only switching of the pump), control of a switching valve for charging tank 1 and tank 2, charging priority can be set
23	fresh water module	Control of pump xP1 with PWM / 0-10V, control to sec. flow FWM xFBT, optional premixing with xM23 on prim. flow xTMP or return switching with xM23 to prim. return xTMP
24	Second pump for HCx	Can be configured on circuits 3,5 and 7 as second pump for circuits 4, 6 and 8, operating hours or error reordering. FBSx as main pump error input (circuit 4,6 and 8), xFBT as second pump error input (circuit 3,5 and 7)
25	Signal inputs	3 potential-free signal inputs xTMP, xFBT and FBSx and associated circuit of outputs xP1, xM2 and xM3
26	Second station heat exchanger	Only configurable with HC3. Control of a second station heat exchanger, control to the same setpoint sec. flow or same return limit. In combination with a circuit, standby generator or double pump function, heat exchanger reordering or summer / winter switching according to temperature possible
27	State of TC1 sensor	Only configurable with HC6: Serves for better control of the tank charging pump or the tank charging valve. 6TMP: Sensor in the upper third of the tank 6FBT: Sensor in the lower third of the tank
28	State of TC2 sensor	Only configurable with HC7: Serves for better control of the tank charging pump or the tank charging valve. 7TMP: Sensor in the upper third of the tank 7FBT: Sensor in the lower third of the tank
29	Analogue outputs	Only configurable with HC8: 8P1 ... PWM / 0-10V control pump TC1 8M1 ... PWM / 0-10V control of primary valve HC0 8M2 ... PWM / 0-10V control pump HC1

For selection options 1-4, 6 and 11, parameters **14-19** "HCx request" must be used to define the hydraulic integration (from where is the heating circuit supplied?):

- To station // temperature request to HC0 (station or burner)
- To TC 2 // e.g. for a buffer or boiler in buffer variant
- Standalone // special circuit, no temperature request

For the circulation pump, parameters **216**, **279**, **340**, **403**, **464** and **527** "Integration of circ. HCx" must be used to define the hydraulic integration of the circulation pump.

- Direct integration into the tank
- Reheating via a charging module
- Reheating via a fresh water module

For more details on integration of a circulation pump and configuration, see chap. "**7.8Detailed configuration of circulation pump**".

For the external energy source, parameter **650** "Integration ext. energy source" must be used to define the hydraulic integration of the energy source:

- Directly into tank circuit 1 (e.g. a configured boiler)
- Directly into tank circuit 2 (e.g. a configured buffer)
- Directly on the entire heating circuit distributor

More details on integration of the external energy source and configuration, see chap. "**7.15Detailed configuration of external energy source**".

For a fresh water module, the respective "FWM request" parameter must be used to define from where the FWM is supplied.

- From TC1
- From TC2
- Standalone

Furthermore, the respective "Use of FWM mixer output" parameter must be used to define how the primary circuit of the fresh water module is constructed:

- No use, only regulated pump from the tank into the FWM
- Premixing to prim. flow FWM
- Prim. return switching, tank up / down acc. to return temperature

Parameter number	HC3	HC4	HC5	HC6	HC7	HC8
FWM request	**226**	**287**	**350**	**411**	**474**	**535**
Use of FWM mixer output	**236**	**297**	**360**	**421**	**484**	**545**

ATTENTION! Selection options 7-10, 12, 14-22 may only be configured for one heating circuit.

5.2.5 Tank circuit 1 (with basic controller)

Tank circuit 1 relates to switching output P4 and sensor inputs T13, T14.
If HC8 is configured to "analogue outputs" and the corresponding HC Multi variant is installed, a 0-10V or PWM signal is output at output 8P1 for a TC1 regulated pump.

If heating circuit 6 is set to "Add. sensor TC1", 2 more sensor inputs are available for the tank. This allows for better control of the regulated charging pump or the 0-10V charging valve.
Sensor 1: T13 (upper), sensor 2: 6TMP (upper third), sensor 3: 6FBT (lower third), sensor 4: T14 (lower)

0	Not available	
1	Boiler	Register boiler with charging pump
2	Boiler with direct charging module	Drinking water tank with unregulated charging module (only pump without control) and pump in the drinking water circuit. For the charging module pump, a heating circuit or tank 2 must be configured to "Direct charging module for boiler 1" or "Direct charging module for boiler 1 + 2".
3	Boiler with mixed charging module	Drinking water tank with premixed charging module and pump in drinking water circuit. For the charging module pump, a mixed heating circuit must be configured to "Mixed charging module for boiler 1" or "Mixed charging module for boiler 1 + 2".
4	Switching valve for BiB	If there is a combination tank ("boiler in the buffer") with switching valve in the charging circuit (switching: charge in HW section, charge in buffer section), this selection must be selected. Tank circuit 2 must be set to "Boiler in buffer with switching valve" for correct function. Sensor T13 must be placed in the HW section.
5	Temp request HW section	If a combination tank ("boiler in the buffer") is regulated without a switching valve in the charging circuit (recharging via HW section only), this selection must be selected. Tank circuit 2 must be set to "Boiler in buffer without switching valve" for correct function. Sensor T13 must be placed in the HW section.
6	Boiler with switching HC1	In this variant, P4 switches a switching valve, which switches the flow from HC1 to the boiler. The prerequisite for this is the heating curve control, room thermostat or room control configuration for HC1. A set charging lock in this variant relates to heating circuit pump output P3 when charging the boiler. The valve with output 4 is switched immediately.

For all selection options, parameter **20** "TC1 request" must be used to define the hydraulic integration (from where is the heating circuit supplied?):

- To station // temperature request to HC0 (station or burner)
- To TC 2 // e.g. boiler supplied from buffer
- Standalone // special circuit, no temperature request (e.g. primary-side)

If boiler charging is done with a charging module, only the set request from the tank circuit is relevant. The setting of the request of the heating circuit configured as the charging module is not considered.

If a heating circuit remains in operation during boiler charging, the respective "Boiler priority HCx" parameter must be set to NO.

P31 Boiler priority HC1
P32 Boiler priority HC2
P33 Boiler priority HC3
P34 Boiler priority HC4
P35 Boiler priority HC5
P36 Boiler priority HC6
P37 Boiler priority HC7
P38 Boiler priority HC8

By default, this parameter is set to YES, the heating circuit is switched off independently of the request with active boiler charging to the end of charging + stopping time of the boiler charging pump.

5.2.6 Tank circuit 2 (with basic controller)

Tank circuit 2 relates to switching output P5 and sensor inputs T23, T24 and analogue output AO2.

If heating circuit 7 is set to "Add. sensor TC2", 2 more sensor inputs are available for the tank. This allows for better control of the regulated charging pump or the 0-10V charging valve.
Sensor 1: T23 (upper), sensor 2: 7TMP (upper third), sensor 3: 7FBT (lower third), sensor 4: T24 (lower)

0	Not available	
1	Boiler	Register boiler with charging pump
2	Boiler with direct charging module	Drinking water tank with unregulated charging module (only pump without control) and pump in the drinking water circuit. For the charging module pump, a heating circuit must be configured to "Direct charging module for boiler 2" or "Direct charging module for boiler 1 + 2".
3	Boiler with mixed charging module	Drinking water tank with premixed charging module and pump in drinking water circuit. For the charging module pump, a mixed heating circuit must be configured to "Mixed charging module for boiler 2" or "Mixed charging module for boiler 1 + 2".
4	Buffer	Heating accumulator with charging pump and 2 (optionally 4) sensors.
5	Boiler in the buffer with switching valve	If there is a combination tank ("boiler in the buffer") with switching valve in the charging circuit (switching: charge in HW section, charge in buffer section), this selection must be selected. Tank circuit 1 must be set to "Switching valve for BiB" for correct function. The 2 (optional 4) sensors are placed in the buffer section, P5 / AO2 are used to control the charging pump for the combination tank.
6	Boiler in the buffer without switching valve	If a combination tank ("boiler in the buffer") is used without a switching valve in the charging circuit (recharging via HW section only), this selection must be selected. Tank circuit 1 must be set to "Temp request HW section". The 2 (optional 4) sensors are placed in the buffer section, P5 / AO2 are used to control the charging pump for the combination tank. For recharging, only the set "tank charging temperature" from the boiler circuit is used.
7	Burner boiler pump on distributor	If heating circuit 0 is set to burner (control of a boiler), the

		boiler pump can be controlled with P5 / AO2.
8	Burner boiler pump in buffer	If heating circuit 0 is set to burner (control of a boiler), the boiler pump can be controlled with P5 / AO2. With this selection, TC2 is also a heater tank, the burner would charge the buffer directly with P5 / AO2, P5 serves both as a boiler pump and as charging pump TC2 here.
9	Feeder pump 1	P5 as feeder pump primary, sec. or individually configurable per circuit
10	Circulation pump	Circulation pump P5 / AO2 with opt. circulation sensor T23

For selection options 1-8, parameter **21** "TC2 request" must be used to define the hydraulic integration (from where is the heating circuit supplied?):

- To station // temperature request to HC0 (station or burner)
- Standalone // special circuit, no temperature request (e.g. primary-side)

If boiler charging is done with a charging module, only the set request from the tank circuit is relevant. The setting of the request of the heating circuit configured as the charging module is not considered.

If a heating circuit remains in operation during boiler charging, the respective "Boiler priority HCx" parameter must be set to NO.

P31 Boiler priority HC1
P32 Boiler priority HC2
P33 Boiler priority HC3
P34 Boiler priority HC4
P35 Boiler priority HC5
P36 Boiler priority HC6
P37 Boiler priority HC7
P38 Boiler priority HC8

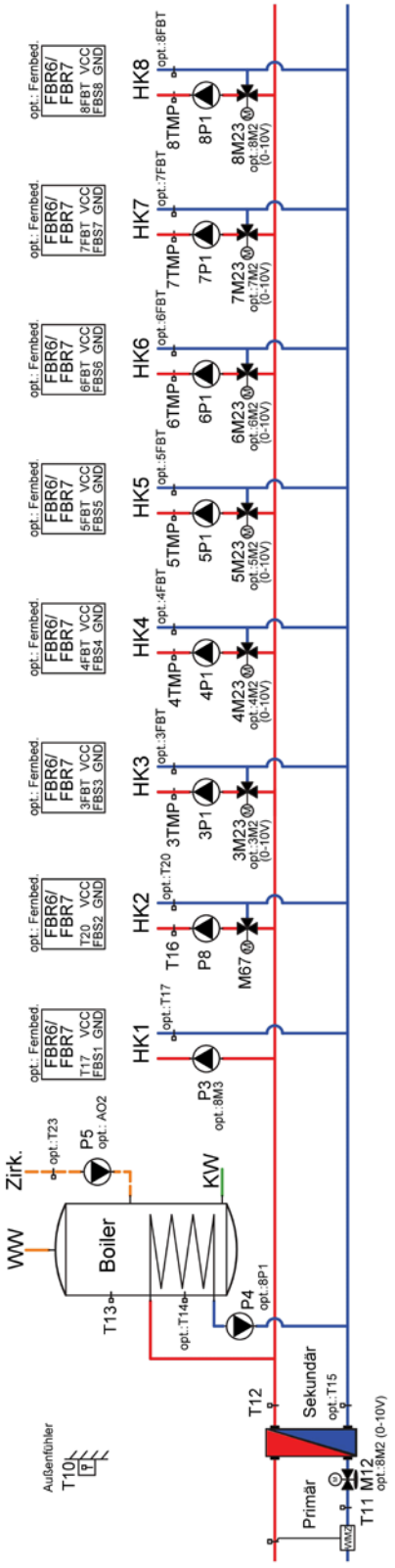
By default, this parameter is set to YES, the heating circuit is switched off independently of the request with active boiler charging to the end of charging + stopping time of the charging pump.

For the circulation pump, parameter **620** "Integration of circ. TC2" must be used to define the hydraulic integration of the circulation pump.
- Direct integration into the tank
- Reheating via a charging module
- Reheating via a fresh water module

For more details on integration of a circulation pump and configuration, see chap. "**7.8Detailed configuration of circulation pump**".

6 Example diagrams with basic configuration

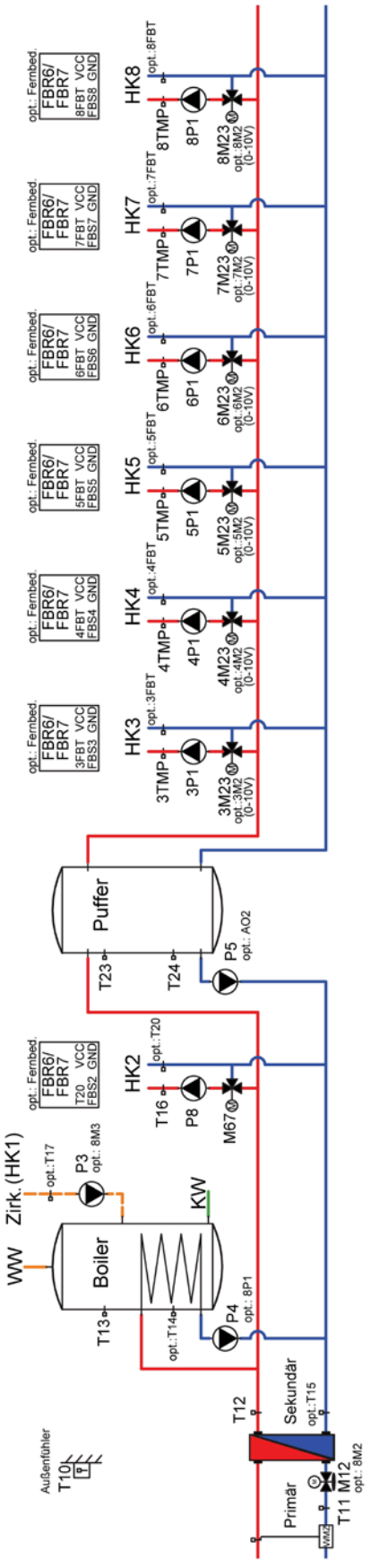
6.1 Station with (sec.) boiler, circulation pump and heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Heating curve control
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Heating curve control
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler
P11 Tank 2: Boiler
P12 Request HC1: To station
P13 Request HC2: To station
P14 Request HC3: To station
P15 Request HC4: To station
P16 Request HC5: To station
P17 Request HC6: To station
P18 Request HC7: To station
P19 Request HC8: To station
P20 Request TC1: To station
P31 Boiler priority HC1: YES
P32 Boiler priority HC2: YES
P33 Boiler priority HC3: YES
P34 Boiler priority HC4: YES
P35 Boiler priority HC5: YES
P36 Boiler priority HC6: YES
P37 Boiler priority HC7: YES
P38 Boiler priority HC8: YES
P620 Integration of circ. TC2: Directly in tank

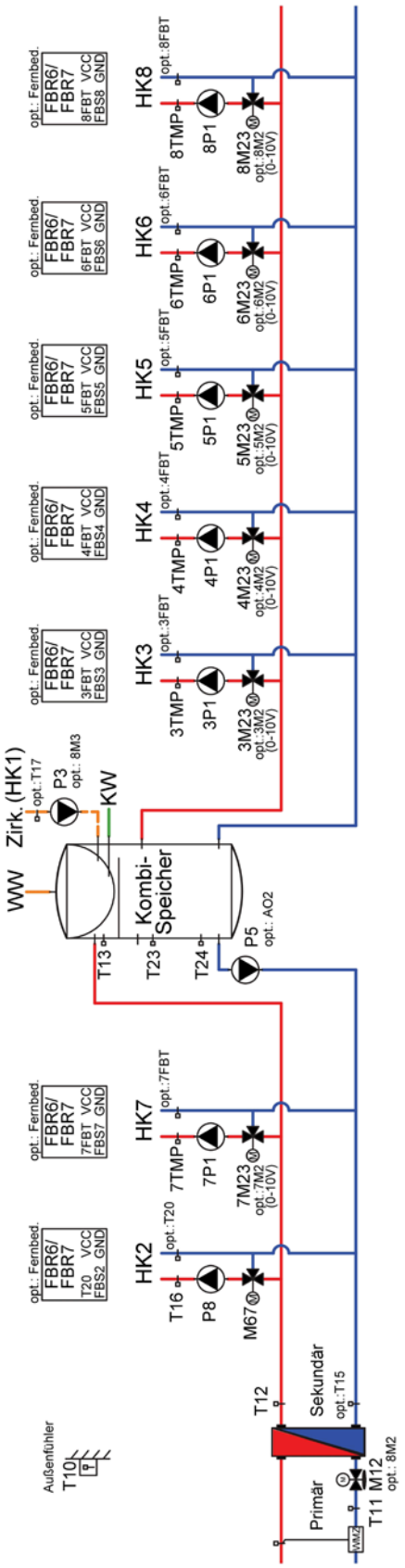
6.2 Station with buffer, (sec.) boiler and heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Circulation pump
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Heating curve control
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler
P11 Tank 2: Buffer
P13 Request HC2: To station
P14 Request HC3: To TC 2
P15 Request HC4: To TC 2
P16 Request HC5: To TC 2
P17 Request HC6: To TC 2
P18 Request HC7: To TC 2
P19 Request HC8: To TC 2
P20 Request TC1: To station
P21 Request TC2: To station
P32 Boiler priority HC2: YES
P33 Boiler priority HC3: NO
P34 Boiler priority HC4: NO
P35 Boiler priority HC5: NO
P36 Boiler priority HC6: NO
P37 Boiler priority HC7: NO
P38 Boiler priority HC8: NO
P127 Integration of circ. HC1: Directly in tank

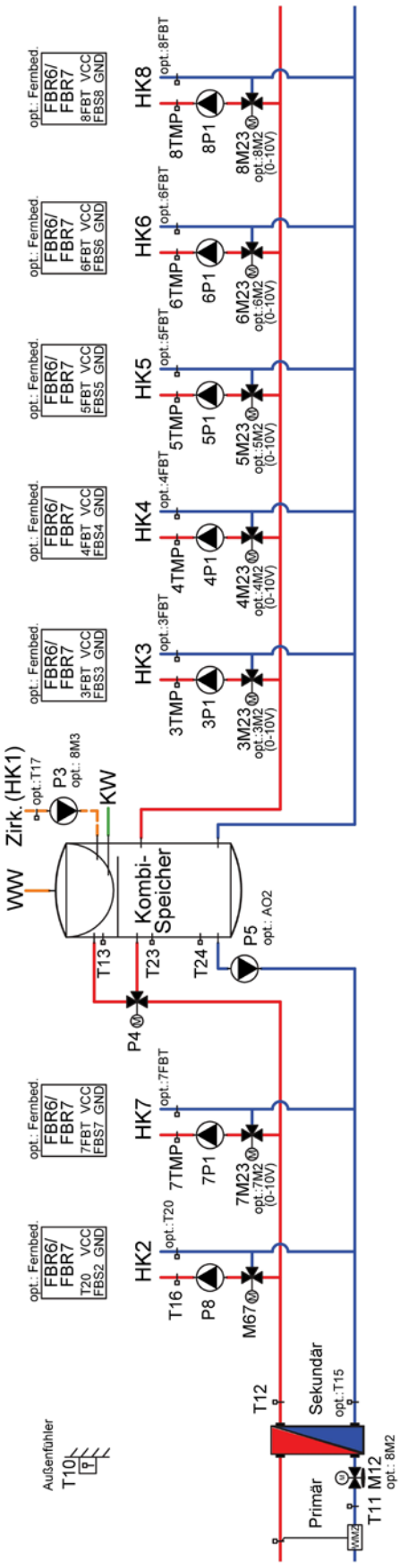
6.3 Station with buffer-boiler combination without switching valve and heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Circulation pump
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Heating curve control
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Temp. request HW section
P11 Tank 2: Boiler in the buffer without switching valve
P13 Request HC2: To station
P14 Request HC3: To TC 2
P15 Request HC4: To TC 2
P16 Request HC5: To TC 2
P17 Request HC6: To TC 2
P18 Request HC7: To station
P19 Request HC8: To TC 2
P20 Request TC1: To station
P21 Request TC2: To station
P32 Boiler priority HC2: YES
P33 Boiler priority HC3: NO
P34 Boiler priority HC4: NO
P35 Boiler priority HC5: NO
P36 Boiler priority HC6: NO
P37 Boiler priority HC7: YES
P38 Boiler priority HC8: NO
P127 Integration of circ. HC1: Directly in tank

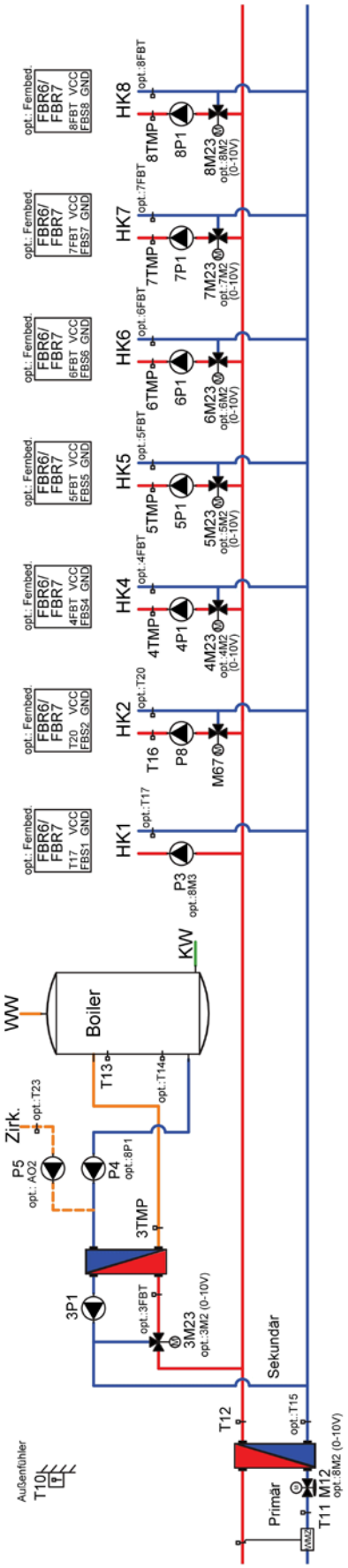
6.4 Station with buffer-boiler combination with switching valve and heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Circulation pump
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Heating curve control
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Switching valve for BiB
P11 Tank 2: Boiler in the buffer with switching valve
P13 Request HC2: To station
P14 Request HC3: To TC 2
P15 Request HC4: To TC 2
P16 Request HC5: To TC 2
P17 Request HC6: To TC 2
P18 Request HC7: To station
P19 Request HC8: To TC 2
P20 Request TC1: To station
P21 Request TC2: To station
P32 Boiler priority HC2: YES
P33 Boiler priority HC3: NO
P34 Boiler priority HC4: NO
P35 Boiler priority HC5: NO
P36 Boiler priority HC6: NO
P37 Boiler priority HC7: YES
P38 Boiler priority HC8: NO
P127 Integration of circ. HC1: Directly in tank

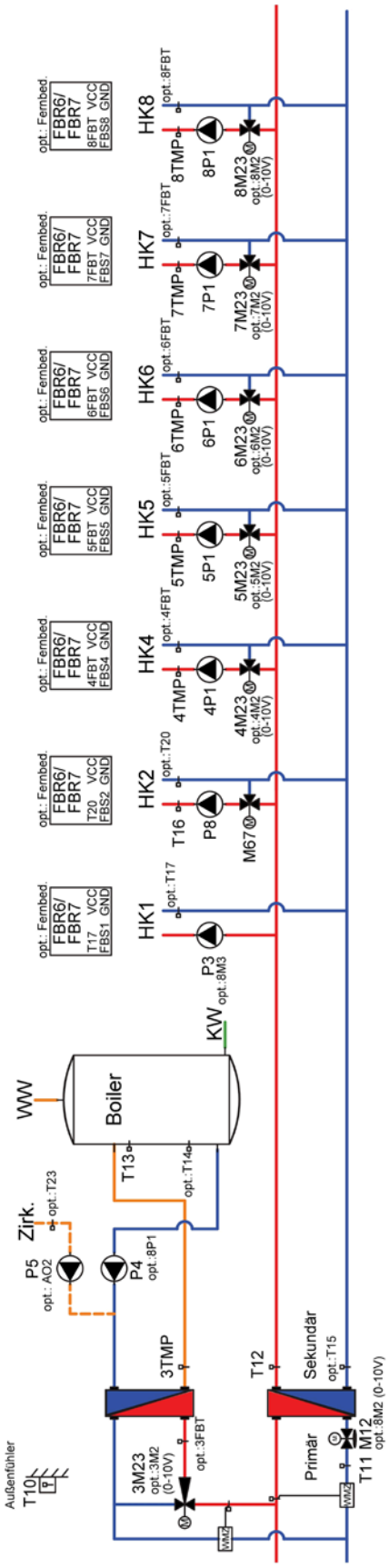
6.5 Station with sec. boiler charging module and heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Heating curve control
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Mixed charging module for boiler 1
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler with mixed charging module
P11 Tank 2: Boiler
P12 Request HC1: To station
P13 Request HC2: To station
P14 Request HC3: To station (setting not relevant)
P15 Request HC4: To station
P16 Request HC5: To station
P17 Request HC6: To station
P18 Request HC7: To station
P19 Request HC8: To station
P20 Request TC1: To station
P32 Boiler priority HC2: YES
P33 Boiler priority HC3: NO (setting not relevant)
P34 Boiler priority HC4: YES
P35 Boiler priority HC5: YES
P36 Boiler priority HC6: YES
P37 Boiler priority HC7: YES
P38 Boiler priority HC8: YES
P620 Integration of circ. TC2: Via CM1, time ON

6.6 Station with prim. boiler charging module (CM jet pump) and heating circuits

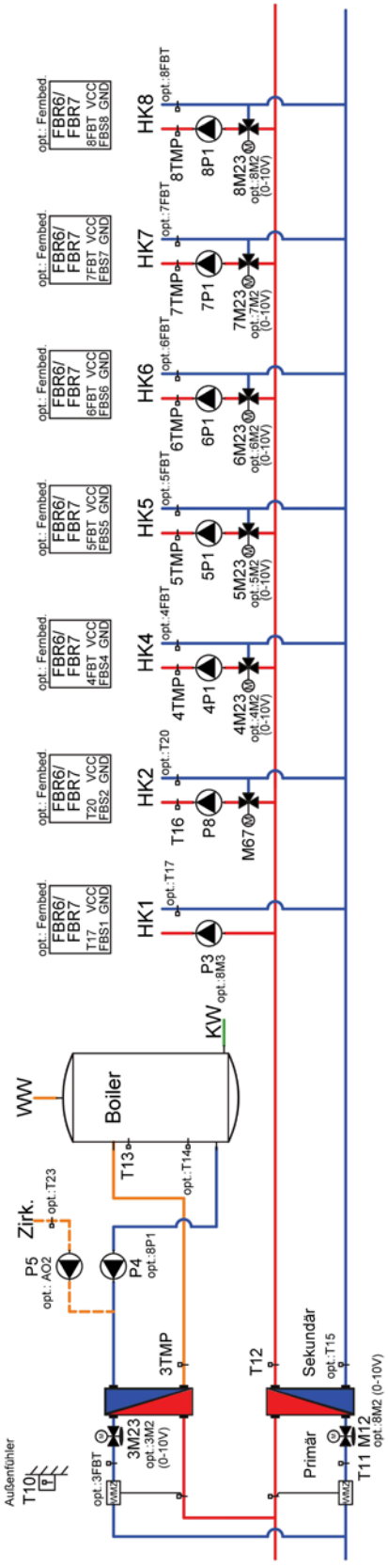


Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Heating curve control
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Mixed charging module for boiler 1
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler with mixed charging module
P11 Tank 2: Boiler
P12 Request HC1: To station
P13 Request HC2: To station
P14 Request HC3: Standalone (setting not relevant)
P15 Request HC4: To station
P16 Request HC5: To station
P17 Request HC6: To station
P18 Request HC7: To station
P19 Request HC8: To station
P20 Request TC1: Standalone
P32 Boiler priority HC2: NO
P33 Boiler priority HC3: NO (setting not relevant)
P34 Boiler priority HC4: NO
P35 Boiler priority HC5: NO
P36 Boiler priority HC6: NO
P37 Boiler priority HC7: NO
P38 Boiler priority HC8: NO
P620 Integration of circ. TC2: Via CM1, time ON
P677 Charging module in position calculation: YES

With the use of a jet pump, a limit can be set on the prim. flow to prevent fast calcifying by excessively high prim. flow temperatures.
If a separate heat meter is used for the charging module, a power limit could also be realised (only sensible for speed control of the tank charging pump).

6.7 Station with prim. boiler charging module (CM primary valve) and heating circuits

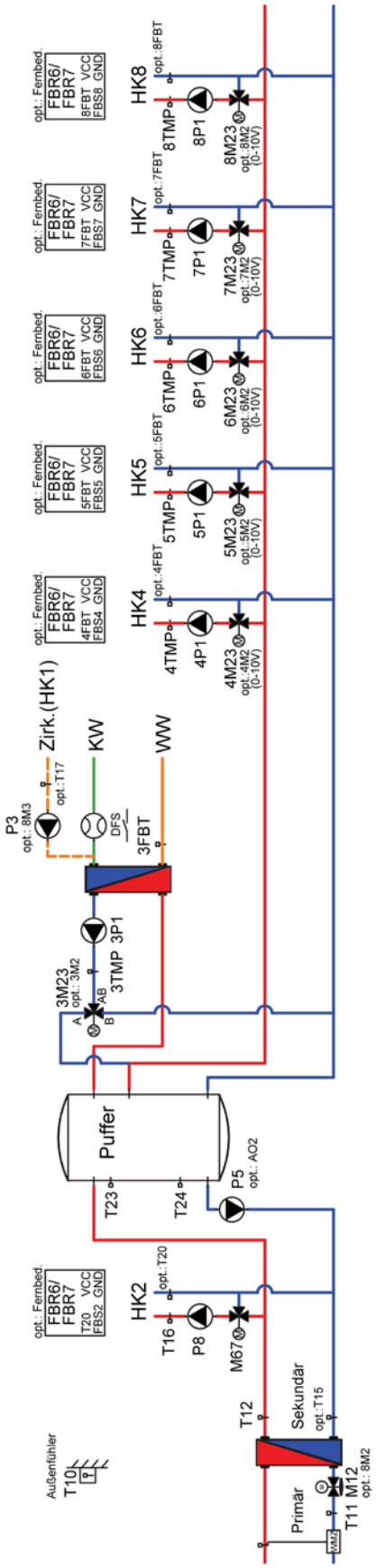


Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Heating curve control
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Mixed charging module for boiler 1
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler with mixed charging module
P11 Tank 2: Boiler
P12 Request HC1: To station
P13 Request HC2: To station
P14 Request HC3: Standalone (setting not relevant)
P15 Request HC4: To station
P16 Request HC5: To station
P17 Request HC6: To station
P18 Request HC7: To station
P19 Request HC8: To station
P20 Request TC1: Standalone
P32 Boiler priority HC2: NO
P33 Boiler priority HC3: NO (setting not relevant)
P34 Boiler priority HC4: NO
P35 Boiler priority HC5: NO
P36 Boiler priority HC6: NO
P37 Boiler priority HC7: NO
P38 Boiler priority HC8: NO
P620 Integration of circ. TC2: Via CM1, time ON
P677 Charging module in position calculation: YES

With the use of a another primary value, a charging module can be set on the prim. return (not recommended).
If a separate heat meter is used for the charging module, a power limit could also be realised (only sensible for speed control of the tank charging pump).

6.8 Station with buffer, fresh water module (return switching) and heating circuits



Basic configuration:

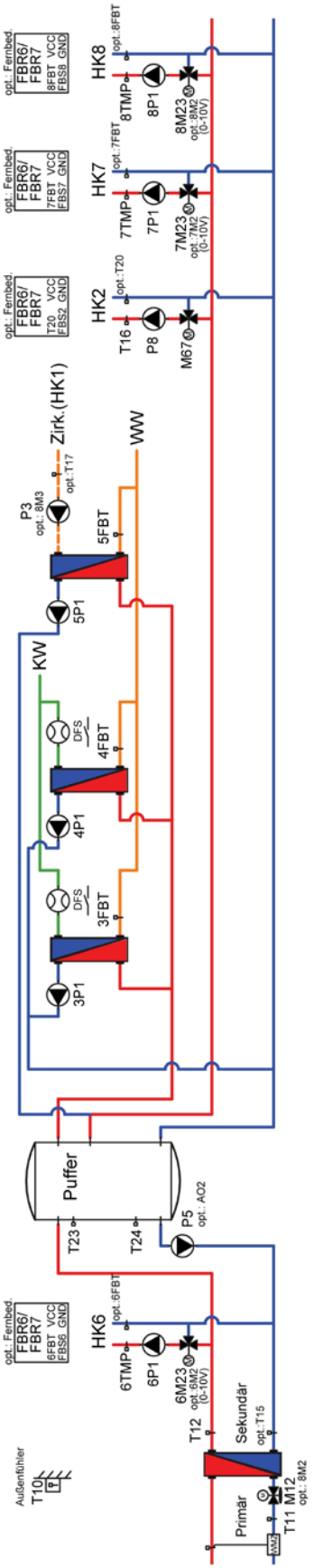
P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Circulation pump
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Fresh water module
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Not available
P11 Tank 2: Buffer
P13 Request HC2: To station
P14 Request HC3: To TC2 (setting not relevant)
P15 Request HC4: To TC2
P16 Request HC5: To TC2
P17 Request HC6: To TC2
P18 Request HC7: To TC2
P19 Request HC8: To TC2
P20 Request TC1: To station (setting not relevant)
P21 Request TC2: To station
P127 Integration of circ. HC1: Via FWM, time ON
P226 Request FWM HC3: To TC2
P227 Activation FWM HC3: FS + circ
P236 Used mixer output FWM HC3: prim. return switching

This variant is recommended in particular if the fresh water module requires the highest temperature (higher requesting heating circuits to station or other FWM variant).

If a flow switch is installed in the cold water input, the terminal FWM-FS Part no. 1114522 must also be installed at the end.

For a flow sensor in the cold water input, the Multi variant 11 heating circuit module is required.

6.9 Station with buffer, 2x fresh water module, circulation module and heating circuits



Basic configuration:

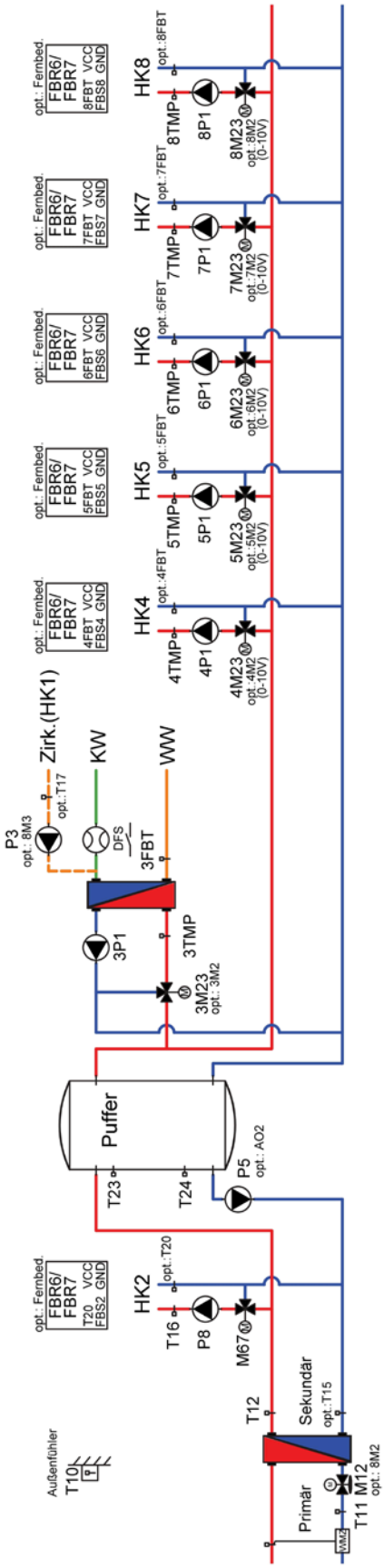
P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Circulation pump
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Fresh water module
P5 Heating circuit 4: Fresh water module
P6 Heating circuit 5: Fresh water module
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Not available
P11 Tank 2: Buffer
P13 Request HC2: To TC2
P14 Request HC3: To TC2 (setting not relevant)
P15 Request HC4: To TC2 (setting not relevant)
P16 Request HC5: To TC2 (setting not relevant)
P17 Request HC6: To station
P18 Request HC7: To TC2
P19 Request HC8: To TC2
P20 Request TC1: To station (setting not relevant)
P21 Request TC2: To station
P127 Integration of circ. HC1: Via FWM, time ON
P226 Request FWM HC3: To TC2
P227 Activation FWM HC3: FS
P236 Used mixer output FWM HC3: Not used
P287 Request FWM HC4: To TC2
P288 Activation FWM HC4: FS
P297 Used mixer output FWM HC4: Not used
P350 Request FWM HC5: To TC2
P351 Activation FWM HC5: FS + circ (FS not connected)
P360 Used mixer output FWM HC5: Not used

Return switching of the fresh water module ensures
that at high return (circulation mode only), buffer layering is not
completely destroyed.
This variant is recommended in particular if the fresh water modu
requires the highest temperature
(higher requesting heating circuits to station or other
FWM variant).

If a flow switch is installed in the cold water input,
the terminal FWM-FS
Part no. 1114522 must also be installed at the end.

For a flow sensor in the cold water input, the Multi variant 11
heating circuit module is required.

6.10 Station with buffer, fresh water module (premixing) and heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Circulation pump
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Fresh water module
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Not available
P11 Tank 2: Buffer
P13 Request HC2: To station
P14 Request HC3: To TC2 (setting not relevant)
P15 Request HC4: To TC2
P16 Request HC5: To TC2
P17 Request HC6: To TC2
P18 Request HC7: To TC2
P19 Request HC8: To TC2
P20 Request TC1: To station (setting not relevant)
P21 Request TC2: To station
P127 Integration of circ. HC1: Via FWM, time ON
P226 Request FWM HC3: To TC2
P227 Activation FWM HC3: FS + circ
P236 Used mixer output FWM HC3: Prim. flow premixing

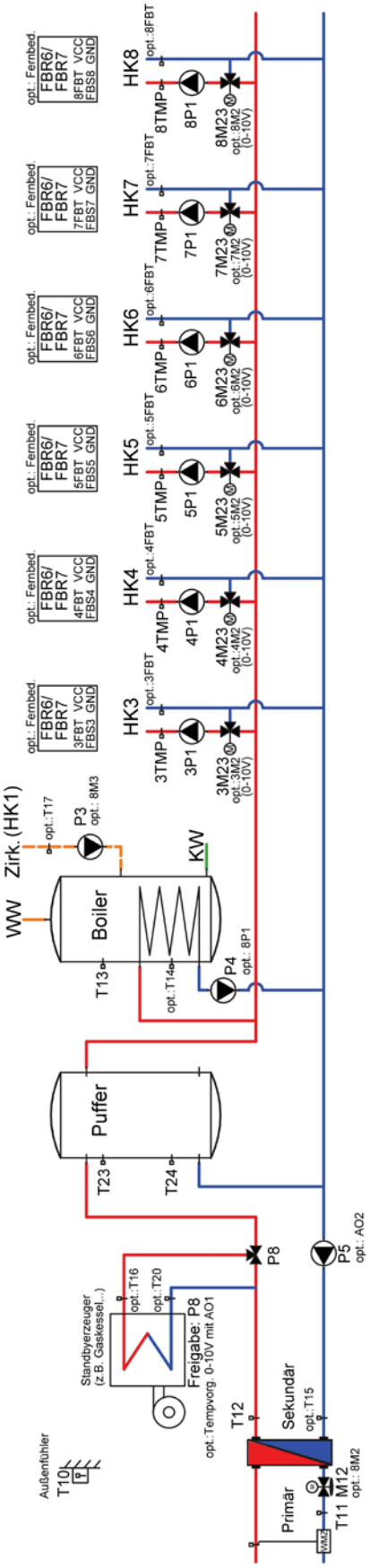
If the buffer is charged much higher than required for the fresh water module (>15K for HW set temp.), premixing to prim. flow should be used.

If good layering is necessary in the buffer, return switching can be implemented via a thermal mixer.

If a flow switch is installed in the cold water input, the terminal FWM-FS Part no. 1114522 must also be installed at the end.

For a flow sensor in the cold water input, the Multi variant 11 heating circuit module is required.

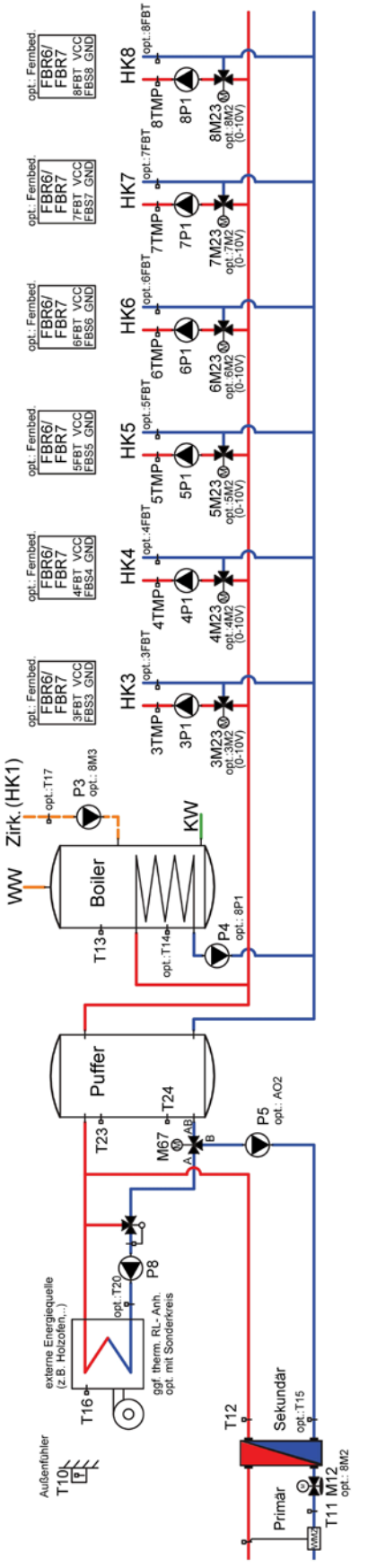
6.11 Station with standby generator, buffer, (sec.) boiler and heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Circulation pump
P3 Heating circuit 2: Standby generator
P4 Heating circuit 3: Heating curve control
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler
P11 Tank 2: Buffer
P12 Request HC1: To station (setting not relevant)
P13 Request HC2: To station (setting not relevant)
P14 Request HC3: To TC2
P15 Request HC4: To TC2
P16 Request HC5: To TC2
P17 Request HC6: To TC2
P18 Request HC7: To TC2
P19 Request HC8: To TC2
P20 Request TC1: To TC2
P21 Request TC2: To station
P31 Boiler priority HC1: NO (setting not relevant)
P32 Boiler priority HC2: NO (setting not relevant)
P33 Boiler priority HC3: NO
P34 Boiler priority HC4: NO
P35 Boiler priority HC5: NO
P36 Boiler priority HC6: NO
P37 Boiler priority HC7: NO
P38 Boiler priority HC8: NO
P127 Integration of circ. HC1: Directly in tank

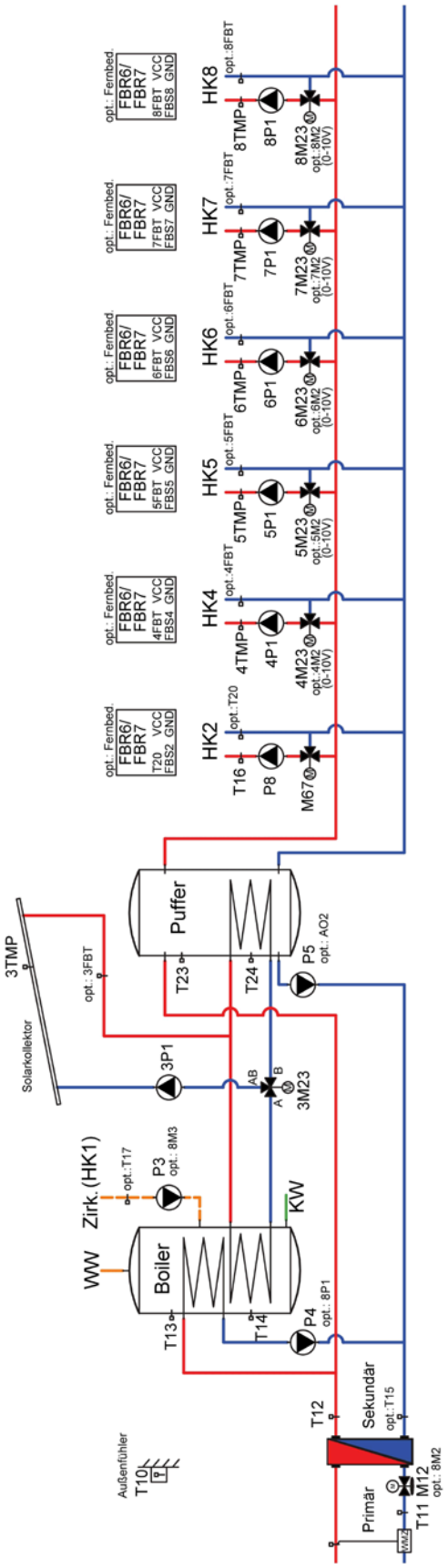
6.12 Station with external energy source, buffer, (sec.) boiler and heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Circulation pump
P3 Heating circuit 2: External energy source
P4 Heating circuit 3: Heating curve control
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler
P11 Tank 2: Buffer
P12 Request HC1: To station (setting not relevant)
P13 Request HC2: To station (setting not relevant)
P14 Request HC3: To TC2
P15 Request HC4: To TC2
P16 Request HC5: To TC2
P17 Request HC6: To TC2
P18 Request HC7: To TC2
P19 Request HC8: To TC2
P20 Request TC1: To TC2
P21 Request TC2: To station
P31 Boiler priority HC1: NO (setting not relevant)
P32 Boiler priority HC2: NO (setting not relevant)
P33 Boiler priority HC3: NO
P34 Boiler priority HC4: NO
P35 Boiler priority HC5: NO
P36 Boiler priority HC6: NO
P37 Boiler priority HC7: NO
P38 Boiler priority HC8: NO
P127 Integration of circ. HC1: Directly in tank
P650 Integration of ext. energy source: return switching to TC2
P657 Station OFF during operation of ext. energy source: YES

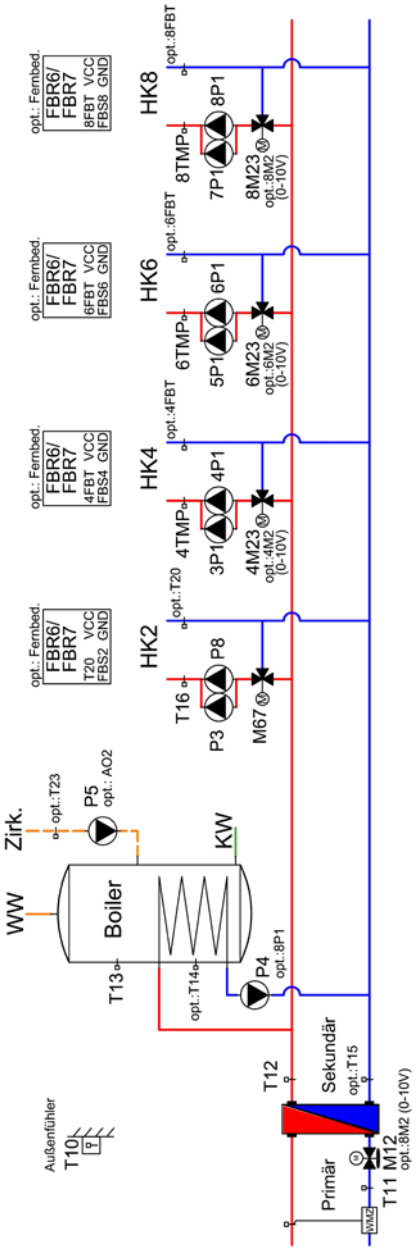
6.13 Station with external energy source, buffer, (sec.) boiler and heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Circulation pump
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Solar in TC1+2
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler
P11 Tank 2: Buffer
P12 Request HC1: To station (setting not relevant)
P13 Request HC2: To TC2
P14 Request HC3: To TC2 (setting not relevant)
P15 Request HC4: To TC2
P16 Request HC5: To TC2
P17 Request HC6: To TC2
P18 Request HC7: To TC2
P19 Request HC8: To TC2
P20 Request TC1: To station
P21 Request TC2: To station
P31 Boiler priority HC1: NO (setting not relevant)
P32 Boiler priority HC2: NO
P33 Boiler priority HC1: NO (setting not relevant)
P34 Boiler priority HC4: NO
P35 Boiler priority HC5: NO
P36 Boiler priority HC6: NO
P37 Boiler priority HC7: NO
P38 Boiler priority HC8: NO
P127 Integration of circ. HC1: Directly in tank
P642 Solar charging priority: Tank circuit 1
P643 Tank charging prevention during solar operation: YES

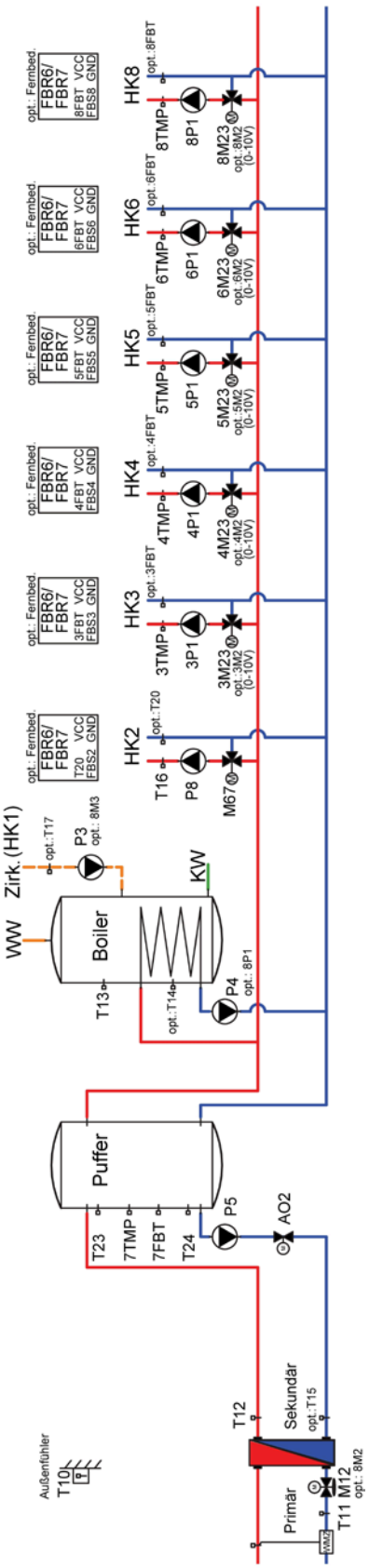
6.14 Station with (sec.) boiler and 4 double pump heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Second pump to HC2
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Second pump to HC4
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Second pump to HC6
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Second pump to HC8
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler
P11 Tank 2: Boiler
P12 Request HC1: To station (setting not relevant)
P13 Request HC2: To station
P14 Request HC3: To TC2 (setting not relevant)
P15 Request HC4: To TC2
P16 Request HC5: To TC2 (setting not relevant)
P17 Request HC6: To TC2
P18 Request HC7: To TC2 (setting not relevant)
P19 Request HC8: To TC2
P20 Request TC1: To station
P21 Request TC2: To station (setting not relevant)
P31 Boiler priority HC1: YES (setting not relevant)
P32 Boiler priority HC2: YES
P33 Boiler priority HC3: YES (setting not relevant)
P34 Boiler priority HC4: YES
P35 Boiler priority HC5: YES (setting not relevant)
P36 Boiler priority HC6: YES
P357 Boiler priority HC7: YES (setting not relevant)
P38 Boiler priority HC8: YES
P620 Integration of circ. TC2: Directly in tank

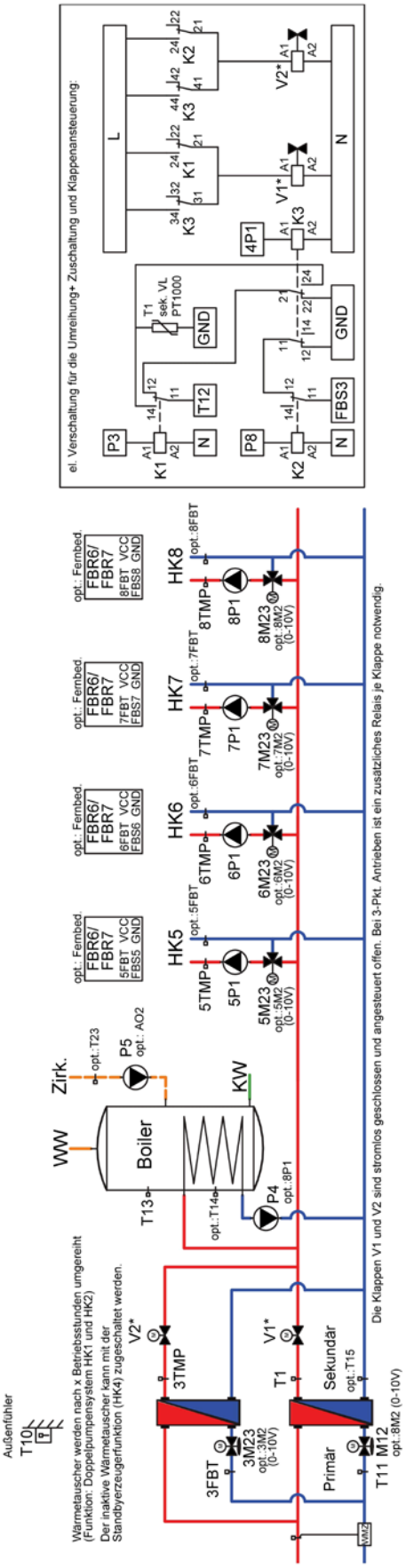
6.15 Station with buffer (4 sensors + charging valve), (sec.) boiler and 6 heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Circulation pump
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Heating curve control
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Additional sensor TC2
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler
P11 Tank 2: Buffer
P12 Request HC1: To TC2 (setting not relevant)
P13 Request HC2: To TC2
P14 Request HC3: To TC2
P15 Request HC4: To TC2
P16 Request HC5: To TC2
P17 Request HC6: To TC2
P18 Request HC7: To TC2 (setting not relevant)
P19 Request HC8: To TC2
P20 Request TC1: To TC2
P21 Request TC2: To station
P31 Boiler priority HC1: YES (setting not relevant)
P32 Boiler priority HC2: YES
P33 Boiler priority HC3: YES
P34 Boiler priority HC4: YES
P35 Boiler priority HC5: YES
P36 Boiler priority HC6: YES
P37 Boiler priority HC7: NO (setting not relevant)
P38 Boiler priority HC8: YES
P127 Integration of circ. HC1: Directly in tank

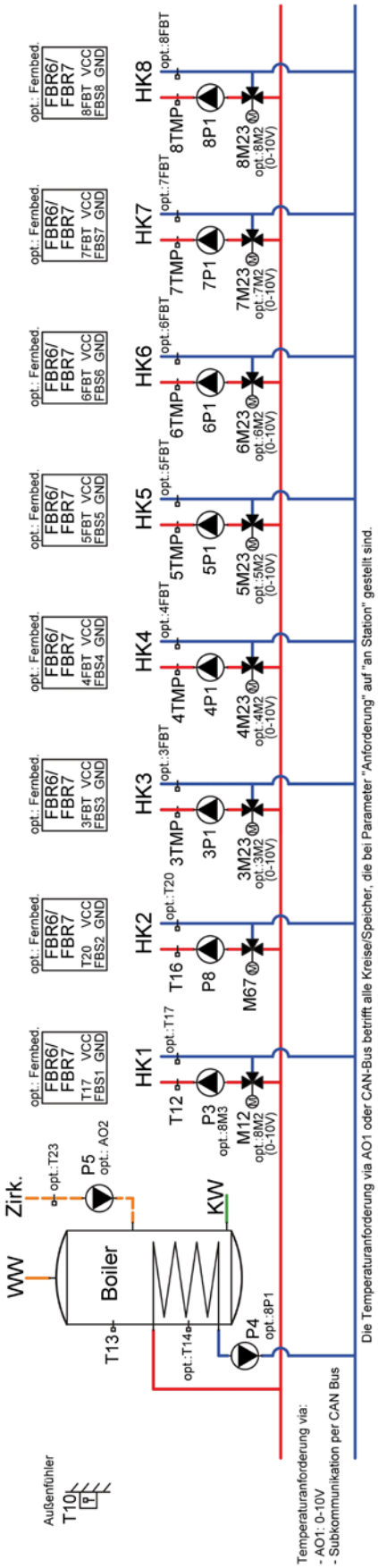
6.16 Station with 2 heat exchangers (bypass + connection), (sec .-) boiler, heating circuits



Basic configuration:

P1 Heating circuit 0: Heat transfer station
P2 Heating circuit 1: Second pump to HC2
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Second station HE
P5 Heating circuit 4: Standby generator
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler
P11 Tank 2: Boiler
P12 Request HC1: Standalone (setting not relevant)
P13 Request HC2: Standalone
P14 Request HC3: Standalone (setting not relevant)
P15 Request HC4: To station
P16 Request HC5: To station
P17 Request HC6: To station
P18 Request HC7: To station
P19 Request HC8: To station
P20 Request TC1: To station
P21 Request TC2: To station
P31 Boiler priority HC1: NO (setting not relevant)
P32 Boiler priority HC2: NO
P33 Boiler priority HC1: NO (setting not relevant)
P34 Boiler priority HC4: NO (setting not relevant)
P35 Boiler priority HC5: YES
P36 Boiler priority HC6: YES
P37 Boiler priority HC7: YES
P38 Boiler priority HC8: YES
P620 Integration of circ. TC2: Directly in tank
P139 OT shutoff temp.. in heating period HC2: 50 °C
P140 OT switch-off temp. in reduction period HC2: 50°C

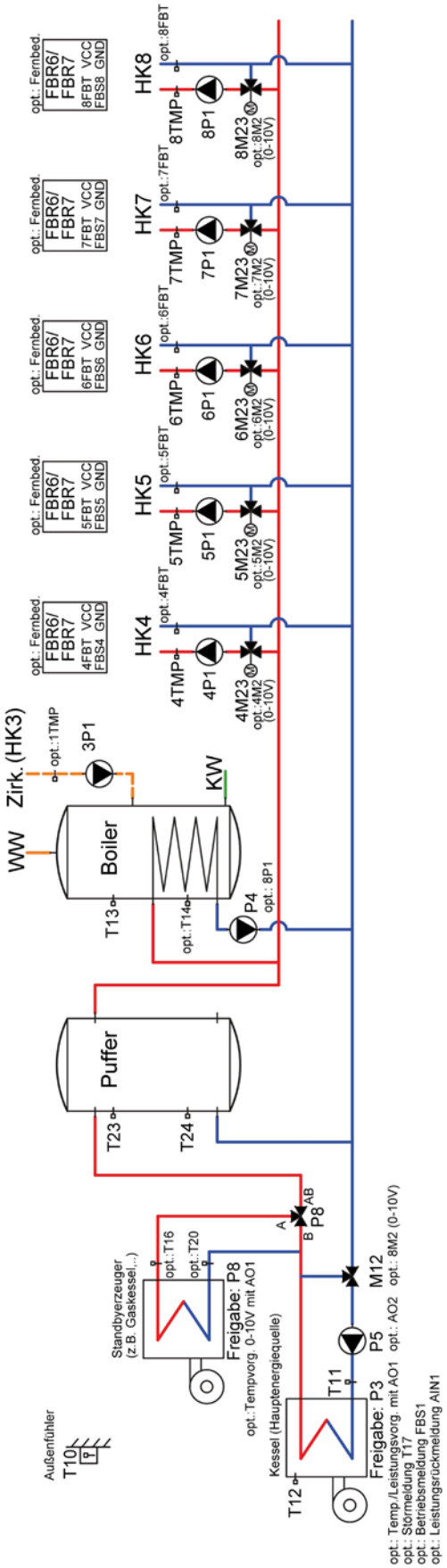
6.17 Boiler, circulation and 8 mixed heating circuits



Basic configuration:

P1 Heating circuit 0: Mixer for HC1
P2 Heating circuit 1: Heating curve control
P3 Heating circuit 2: Heating curve control
P4 Heating circuit 3: Heating curve control
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler
P11 Tank 2: Boiler
P12 Request HC1: To station
P13 Request HC2: To station
P14 Request HC3: To station
P15 Request HC4: To station
P16 Request HC5: To station
P17 Request HC6: To station
P18 Request HC7: To station
P19 Request HC8: To station
P20 Request TC1: To station
P21 Request TC2: To station (not relevant)
P31 Boiler priority HC1: YES
P32 Boiler priority HC2: YES
P33 Boiler priority HC3: YES
P34 Boiler priority HC4: YES
P35 Boiler priority HC5: YES
P36 Boiler priority HC6: YES
P37 Boiler priority HC7: YES
P38 Boiler priority HC8: YES
P620 Integration of circ. TC2: Directly in tank

6.18 Boiler with standby generator, buffer, (sec.) boiler and heating circuits

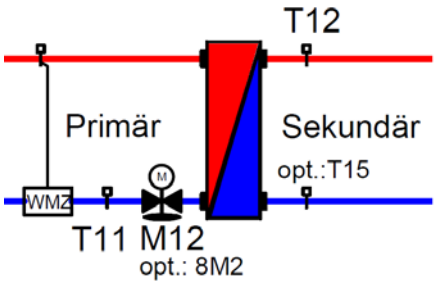


Basic configuration:

P1 Heating circuit 0: Burner
P2 Heating circuit 1: Release at burner
P3 Heating circuit 2: Standby generator
P4 Heating circuit 3: Circulation
P5 Heating circuit 4: Heating curve control
P6 Heating circuit 5: Heating curve control
P7 Heating circuit 6: Heating curve control
P8 Heating circuit 7: Heating curve control
P9 Heating circuit 8: Heating curve control
P10 Tank 1: Boiler
P11 Tank 2: Burner boiler pump in buffer
P12 Request HC1: Standalone (setting not relevant)
P13 Request HC2: To station (setting not relevant)
P14 Request HC3: To TC2 (setting not relevant)
P15 Request HC4: To TC2
P16 Request HC5: To TC2
P17 Request HC6: To TC2
P18 Request HC7: To TC2
P19 Request HC8: To TC2
P20 Request TC1: To TC2
P21 Request TC2: To station
P31 Boiler priority HC1: NO (setting not relevant)
P32 Boiler priority HC2: NO (setting not relevant)
P33 Boiler priority HC1: NO (setting not relevant)
P34 Boiler priority HC4: NO
P35 Boiler priority HC5: NO
P36 Boiler priority HC6: NO
P37 Boiler priority HC7: NO
P38 Boiler priority HC8: NO
P216 Integration of circ. HC3: Directly in tank

7 Detailed configuration of the functions

7.1 Detailed configuration of the transfer station



7.1.1 Entry into the parameter level

- ➔ Press the right arrow key repeatedly until the "Service level" menu appears
- ➔ Press the ESC key
- ➔ Enter the service code (change number with up / down arrow, next number with Enter)
- ➔ Check if the right level now appears (numerical value at the top right next to service level should have changed)
- ➔ Press the left arrow key repeatedly until the "Transfer station" image appears (prerequisite: HC0 configured to "Transfer station", see chap. **5.2** "**Configuration of the system scheme**")
- ➔ Press the Enter key, use the up / down arrow keys to select the Parameter field and open with the Enter key
- ➔ Navigation in the parameter menu with the up / down arrow keys
- ➔ If necessary, change by pressing the Enter key (value flashes), change with the up / down arrow keys and confirm with the Enter key
- ➔ Exit the menu with the left arrow key or ESC key

7.1.2 Output definition of valve, manual mode

With parameter **49**, the output definition for the primary valve can be defined.
By default, this parameter is set to "3-pt. M12". With this configuration, a 230VAC 3-pt. signal is output via outputs 1 (open) and 2 (closed) of the basic controller .

If heating circuit 8 is configured to "Analogue outputs" and the corresponding heating circuit module Multi is installed, the parameter can be set to "PWM with HC8-2" or "PWM inv with HC8-2 " for PWM or 0-10V control of the primary valve.

The "PWM with HC8-2" selection means a 100% output for a fully open valve and a 0% output for a closed valve; if an inverted output is required (closed 100%, open 0%), selection " PWM inv with HC8-2 " is made. Switching outputs 1 and 2 are switched on from 10% specification and can be used for a required release.

The actual setting, whether 0-10V or PWM output, is made via the HC Multi, selection "PWM" is made in both cases for the controller.

For a valve controlled via 3-pt. M12, manual mode is available with parameter **52**.

For a valve controlled via PWM / 0-10V, a minimum position can still also be set when operating the transfer station with parameter **51**.
If, for example, a speed-controlled pump is used instead of a primary valve, this parameter can be used as the "minimum speed".

With parameter **50**, the output frequency of the PWM signal can be set.
(With 0-10V output with HC Multi. use setting 100Hz)

With parameter **53** , manual mode is also available for a steady valve (0-100% and auto.).

!ATTENTION!In manual mode, there is no control and no frost protection!

7.1.3 Temperature control

In normal operation of the transfer station (no return or power limit), the sec. flow setpoint temperature is adjusted with a PI controller .

Heat transfer station: Valve is opened by PI controller if setpoint is undercut until the setpoint is reached.

Cold transfer station: Valve is opened by PI controller if setpoint is exceeded until the setpoint is reached.

As the sec. flow setpoint temperature, the highest request of all requesting heating circuits, etc. generally applies.

A request increase can also be set with parameter **41** to request the heating circuits. This request increase (3 °C in the factory) is added to the highest setpoint of the heating circuits and thus gives the setpoint for the station.

If a boiler without mixed charging module should request at the transfer station, the setpoint of the transfer station is limited to the charging temperature which can be adjusted in the boiler menu.

The control characteristic can be set with the following parameters:

Parameter	Designation	Factory setting
54	Valve timer	15s
55	P-factor valve temp. controller	13
58	I-part valve temp. controller	30s

The timer determines the total cycle time of the controller.
If a slow controlled section is present (large heat exchanger, sec. flow sensor is poorly positioned), the cycle time can be increased slightly to avoid oscillation behavior.

The proportional factor of the PI controller is set with the P-factor.
The higher the P-factor is selected, the more aggressive the controller reacts to an actual value change (e.g. if there is a rapid increase in temperature at the sensor, the controller will counteract depending on the size of the P-factor)

ATTENTION! The P-factor must not be set to 0, as this disturbs the entire control function!

The integral part of the PI controller is set with the I-part.
The value in seconds is the so-called "reset time" and indicates the period in which the controller attempts to "correct" a deviation from the setpoint / actual value.
The smaller the I-part is selected, the more aggressive the controller will try to compensate for the deviation.
A very small I-part is not recommended, because this usually results in "oscillation behavior".

7.1.4 Valve runtime

If a primary valve position feedback is not implemented via an analogue input or the valve is controlled continuously (0-10V), the runtime can be entered to calculate the valve position.

The valve runtime is indicated on the actuator of the valve, usually by specifying the valve lift and the actuating speed.
The runtime can be calculated from this information as in the following example:
s= 8mm
v = 15s/mm
Runtime = s * v = 8mm * 15s / mm = 120sec.

If the runtime specification is missing, the runtime can also be determined via manual mode of the valve and a stopwatch by stopping until the drive has moved to the end position.

If a valve has different runtimes (e.g. longer runtime from open to closed than vice versa), a runtime can be entered for both directions.

If the difference in the runtimes is not relevant, both values must be set the same:
Parameter **47** Valve runtime open>closed (from open to closed state)
Parameter **48** Valve runtime closed>open

When connecting the controller to a control system from aqotec, the runtime must be set.

7.1.5 Power limit

With parameter **39** "Nominal output", the nominal output or the contractual output can be entered in kW.
If YES is set for parameter **40** "Power limit?", the transfer station is limited to this power.
If the nominal power is exceeded, the primary valve is adjusted back to nominal power by means of a PI controller.
A P-factor and an I-part can be set to set the control behaviour (aggressiveness of the power limitation).

The power measured from heat exchanger 1 is used as the actual power value.
If the communication to this heat meter is disturbed, the power limit is inactive.

Setting parameter:

Parameter number	Parameter designation	Factory setting
39	Nominal power	15kW
40	Power limit?	Yes
57	P-factor valve power limit	5
60	I-part valve power limit	45sec

7.1.6 Prim. return limit

With priority over temperature control on sec. flow, the prim. return of the transfer station can be limited. If the set maximum return is exceeded at a heat transfer station, the primary valve is adjusted back to the maximum return using the PI controller.

If the set maximum return is undercut at a heat transfer station, the primary valve is adjusted back to the maximum return using the PI controller.

With a pure heating circuit request, the maximum return results from an adjustable outside temperature-dependent line, which is defined with parameter **66** (maximum return at -20 °C outside temperature) and parameter **67** (maximum return at + 20 °C outside temperature).

If tank circuit 1 requests at the station (possibly also in addition to the heating circuits), the maximum return set at P**68** is used.
If tank circuit 2 requests at the station (possibly also in addition to the heating circuits), the maximum return set at P **69** is used.
If both tank circuits request at the station at the same time, the maximum return set at P**68** is used.

If a sub-controller requests at the station, the return limit of the transfer station is switched even in the case of tank charging of the sub-controller:

- If TC 1 is requested at the station and TC 2 requests from the sub-controller (assuming the sub-controller requests temperature at the station), the return limit from TC 1 of the transfer station controller (=master) is used.
- If TC 2 is requested at the station and TC 2 requests from the sub-controller the return limit from TC 2 of the transfer station controller (=master) is used.

Setting parameter:

Parameter number	Parameter designation	Factory setting
56	P-factor valve return limit	15
59	I-part valve return limit	20sec
66	Return limit HC -20 °C OT	65°C
67	Return limit HC +20°C OT	55°C
68	Return limit TC1	99°C
69	Return limit TC2	99°C

7.1.7 Setpoint output via analogue output 1

If an analogue temperature request is required for the request to the primary energy source, it can be output to analogue output 1.

The type of output signal (0-10V, PWM or PWM inverted) can be defined with parameter **42** .
When selecting "PWM", the output frequency can be set with parameter **43**.

For the definition of the temperature output, parameter **44** can be used to set the temperature at 0% specification (factory setting 0 °C) and parameter **45** can be used to set the temperature at 100% specification (factory setting 100 °C).

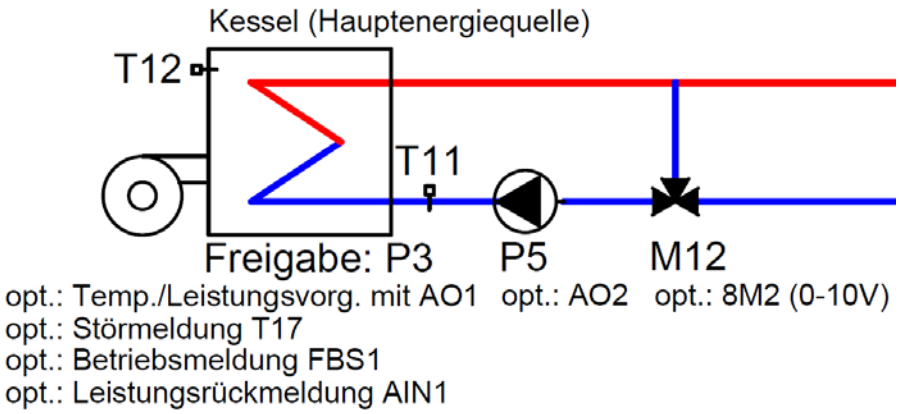
As an example:
P44 Temperature at 0% specification: 30°C
P45 Temperature at 100% specification: 80°C

Setpoint in °C	Analogue output 1 in %
20	0
30	0
40	20
50	40
60	60
70	80
80	100
90	100

7.1.8 External deactivation via potential-free contact

If sensor input T12 is connected to GND, the primary valve is closed for the duration of the applied contact regardless of the request, thus deactivating the transfer station. However, the setpoint is still output via AO1.

7.2 Detailed configuration of burner control



7.2.1 Entry into the parameter level

- ➔ Press the right arrow key repeatedly until the "Service level" menu appears
- ➔ Press the ESC key
- ➔ Enter the service code (change number with up / down arrow, next number with Enter)
- ➔ Check if the right level now appears (numerical value at the top right next to service level should have changed)
- ➔ Press the left arrow key repeatedly until the "Burner" image appears (prerequisite: HC0 configured to "Burner", see chap. **5.2** "**Configuration of the system scheme**")
- ➔ Press the Enter key, use the up / down arrow keys to select the Parameter field and open with the Enter key
- ➔ Navigation in the parameter menu with the up / down arrow keys
- ➔ If necessary, change by pressing the Enter key (value flashes), change with the up / down arrow keys and confirm with the Enter key
- ➔ Exit the menu with the left arrow key or ESC key

7.2.2 Basic function

As the setpoint temperature for the boiler, the highest request of all requesting heating circuits, etc. generally applies.

A request increase can also be set with parameter **41** to request the heating circuits. This request increase (3 °C in the factory) is added to the highest setpoint of the heating circuits and thus gives the setpoint for the boiler.

If a boiler without mixed charging module should request at the transfer station, the setpoint of the boiler is limited to the charging temperature which can be adjusted in the boiler menu.

Should the specified setpoint be less than the "Min. flow setpoint temp." (factory setting 75 °C) set with parameter **75** , the "Minimum flow setpoint temp." applies as the setpoint for the boiler.

With the return increase, the system is generally controlled to to the "Min. return temp set with parameter **76** and the flow setpoint, a return sensor (T11) and a boiler sensor (T12) are therefore required.

The return increase goes into operation as soon as the boiler receives a request from a heating circuit, etc., and is only deactivated (closed) when there is neither a request, a release, nor an operating message via FBS1 and GND (the operating message can only be connected if HC1 is set to "Release at burner", if there is another configuration, no evaluation is made).
If tank circuit 2 is set to "Burner boiler pump on distributor" or "Burner boiler pump in buffer", the return increase is generally always in operation, even if the boiler pump is in operation.

If there is a case in which the return increase is active due to an operating message but no setpoint is present, the system is controlled to the set minimum return temperature and minimum flow temperature.

An overtemperature threshold can be defined with parameter **77** (factory setting 95 °C).
If boiler sensor T12 exceeds this threshold, all circuits requesting the boiler will be set to the set maximum flow temperature and any requesting boiler is charged to the disinfection setpoint temperature.
If the boiler sensor undercuts the overtemperature by 5K, the normal control function of the circuits / boiler follows.

The control characteristic of the return increase can be set with the following parameters:

Parameter	Designation	Factory setting
54	Valve timer	15s
55	P-factor valve temp. controller	13
58	I-part valve temp. controller	30s

The timer determines the total cycle time of the controller.
If a slow controlled section is present (high water content boiler, sensor is poorly positioned), the cycle time can be increased slightly to avoid oscillation behavior.

The proportional factor of the PI controller is set with the P-factor.
The higher the P-factor is selected, the more aggressive the controller reacts to an actual value change (e.g. if there is a rapid increase in temperature at the sensor, the controller will counteract depending on the size of the P-factor)

ATTENTION! The P-factor must not be set to 0, as this disturbs the entire control function!

The integral part of the PI controller is set with the I-part.

The value in seconds is the so-called "reset time" and indicates the period in which the controller attempts to "correct" a deviation from the setpoint / actual value.
The smaller the I-part is selected, the more aggressive the controller will try to compensate for the deviation.
A very small I-part is not recommended, because this usually results in "oscillation behavior".

7.2.3 Output definition of return flow increase, manual mode

With parameter **49**, the output definition for the return increase can be defined.
By default, this parameter is set to "3-pt. M12". With this configuration, a 230VAC 3-pt. signal is output via outputs 1 (open) and 2 (closed) of the basic controller .

If heating circuit 8 is configured to "Analogue outputs" and the corresponding heating circuit module Multi is installed, the parameter can be set to "PWM with HC8-2" or "PWM inv with HC8-2 " for PWM or 0-10V control of the return increase.

The "PWM with HC8-2" selection means a 100% output for a fully open return increase and a 0% output for a closed return increase; if an inverted output is required (closed 100%, open 0%), selection " PWM inv with HC8-2 " is made. Switching outputs 1 and 2 are switched on from 10% specification and can be used for a required release.

The actual setting, whether 0-10V or PWM output, is made via the HC Multi, selection "PWM" is made in both cases for the controller.

For a return increase controlled via a 3-pt. M12, manual mode is available with parameter **52**.

For a return increase controlled via PWM / 0-10V, a minimum position can still also be set when operating the boiler with parameter **51**.
If, for example, a speed-controlled pump is used instead of a mixer, this parameter can be used as the "minimum speed".

With parameter **50**, the output frequency of the PWM signal can be set.
(With 0-10V output with HC Multi. use setting 100Hz)

With parameter **53** , manual mode is also available for a steady return increase (0-100% and auto.).

ATTENTION! In manual mode, there is no control and no frost protection!

7.2.4 Release of boiler

If HC1 is set to "Release at burner", output 3 also enables a 230VAC release of the boiler.
The boiler is released immediately when the boiler receives a request through a heating circuit, etc., and then remains active at least for the "Boiler minimum running time" set with parameter **80**.

After the boiler minimum runtime has expired and the existing request remains, the release can be deactivated if boiler sensor T12 exceeds the setpoint temperature by the "Hyt. rel. OFF" set with parameter **79**.

The release will only become active again if the "Release ON" time set with parameter **81** has expired and boiler sensor T12 has undercut the setpoint temperature + parameter **78** "Hyst. rel. ON".
As soon as the release is active again, it remains active at least for the set boiler minimum runtime, only then can the release be deactivated either by loss of the setpoint or if boiler sensor T12 exceeds the setpoint temperature + **P79** Hyst. rel. OFF.

7.2.5 Control of boiler pump

If tank circuit 2 is set to "Burner boiler pump on distributor" or "Burner boiler pump in buffer", control of the boiler pump is possible with output 5 and analogue output 2.

The boiler pump is active as soon as the boiler receives a release by means of a request and only becomes inactive again when the boiler has neither a request nor a release, no operating message is present at FBS1 and GND and the stopping time set with parameter **617** has expired (the operating message can only be connected if HC1 is set to "Release with burner", no evaluation is performed if there is another configuration).

If a controlled pump is used, control of the boiler return can be implemented via analogue output 2:
If boiler return T11 exceeds the set minimum return, the speed is reduced.
How aggressively the speed is reduced is defined via the "Temp band for pump control TC2“ adjustable with parameter **607**.
T11 = set minimum return → specification 100%
T11 = set minimum return + temp band → specification of minimum speed set at **P602**

All operating points in between are interpolated linearly.

If the boiler goes into overtemperature, the pump is controlled independently of the return temperature with 100%.

With parameter **600**, the output definition for the analogue output of the boiler pump can be defined.
By default, this parameter is set to "0-10V". With this configuration, a 0-10V signal for 0-100% is output at analogue output 2.
Switching output 5 on the basic controller is switched on from 10% specification AO2.
If output 5 is used to release the pump, a minimum speed >10% must be set.

By selecting "PWM" or "PWM inv", a PWM signal can also be output for control, the carrier frequency of the PWM signal can be set with parameter **601** .

Manual mode is available for analogue output 2 and output 5 with parameter **603** .
Output 5 is active in manual mode from 10% or inactive at less than 10%.

ATTENTION! In manual mode, there is no control and no frost protection!

Parameter	Designation	Factory setting
600	Output def. AO2 (pump TC2)	0-10V
601	PWM frequency AO2	100Hz
602	Min. speed pump TC2	30%
603	Manual mode AO2+P5	Auto
607	"Temp. band for pump controller TC2	10°C
617	TC 2 pump stopping time	30s

7.2.6 Temperature or power request to the boiler

Parameter **82** can be used to define whether either a temperature request or a power request is output to boiler analogue output 1.

For both specifications, the output type of the signal can also be defined in the same parameter: 0-10V, PWM or PWM inverted - when selecting a PWM specification, it is also possible to define the PWM frequency with parameter **83** .

For the definition of the temperature output, parameter **85** can be used to set the temperature at 0% specification (factory setting 0 °C) and parameter **86**can be used to set the temperature at 100% specification (factory setting 100 °C).

As an an example:
P86 Temperature at 0% specification: 30°C
P87 Temperature at 100% specification: 80°C

Setpoint in °C	Analogue output 1 in %
20	0
30	0
40	20
50	40
60	60
70	80
80	100
90	100

For a power specification, a "hysteresis for power specification" and a PI controller for power control are available with parameter **87** :

If the boiler sensor falls below the current boiler temperature setpoint plus hysteresis power specification, the power specification is increased via the PI controller until the boiler sensor has reached the setpoint + hysteresis.

If this value is exceeded, the power specification is lowered again.
It makes sense to set this hysteresis to be positive so that the power control does not conflict with the return increase.

Parameter	**Designation**
87	Hyst. power process
88	Power supply timer
89	P-factor power specification
90	I- part power specification

7.3 Detailed configuration of boiler

7.3.1 Hydraulic variant

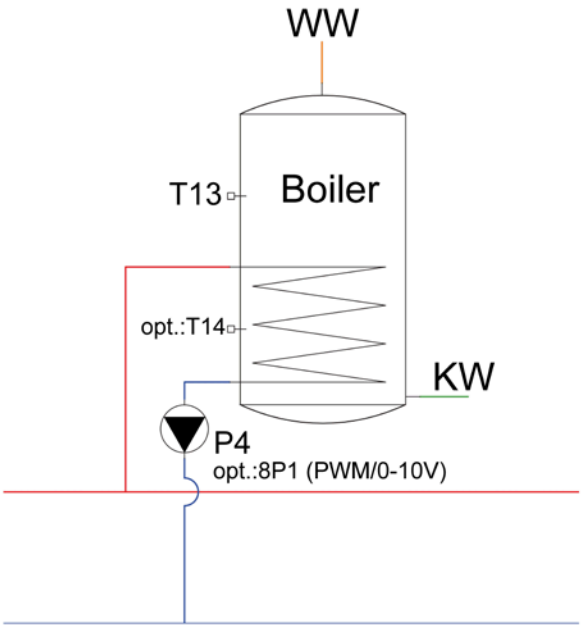
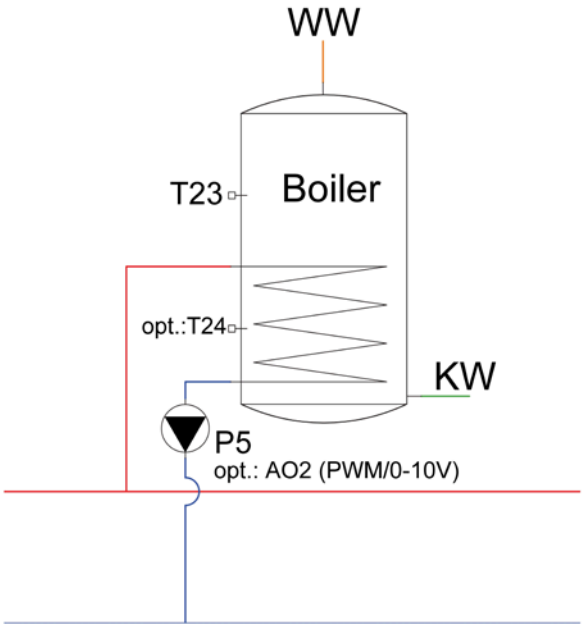
As already described in chapter "**5.2 Configuration of the system scheme**", several hydraulic variants are possible for boiler charging.

In general, with this controller, tank circuit 1 can be configured completely independently of tank circuit 2, the following basic variants are differentiated:

- Charging from one (or two) register boilers with charging pump or charging valve
- Charging of one (or two) drinking water tanks via a direct charging module (without pre-regulation)
- Charging of one (or two) drinking water tanks via a premixed charging module

The boiler priority or parallel operation can be defined individually for each heating circuit, see chap. "**5.2.5**" or. "**5.2.6**".
For charging a register boiler, only the tank circuit itself is necessary (charging pump and one or optionally. two sensors).
If a direct or premixed charging module is used, a heating circuit or tank circuit 2 must also be used for boiler charging. The hydraulic variant is defined depending on which charging module is configured for heating circuit / tank circuit 2.

7.3.1.1 Register boiler with charging pump or valve

Tank circuit 1	Tank circuit 2
	
Configuration: P10 tank circuit 1: Boiler	Configuration: P10 tank circuit 2: Boiler

With this boiler charging variant, the flow setpoint temperature during boiler charging is limited to the boiler charging temperature. If, for example, the boiler requests at the transfer station, the flow setpoint temperature of the transfer station is limited.
If, for example, the boiler at tank circuit 2 requests (buffer), the buffer setpoint is limited.

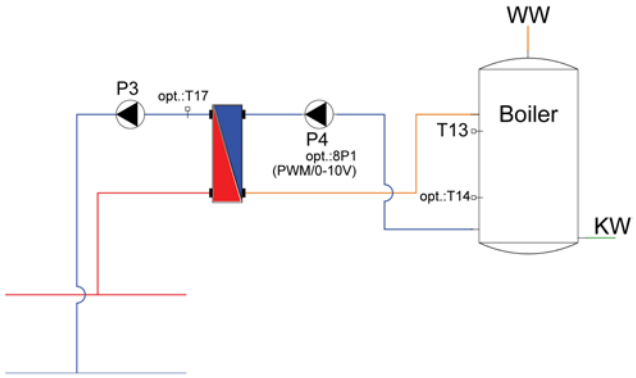
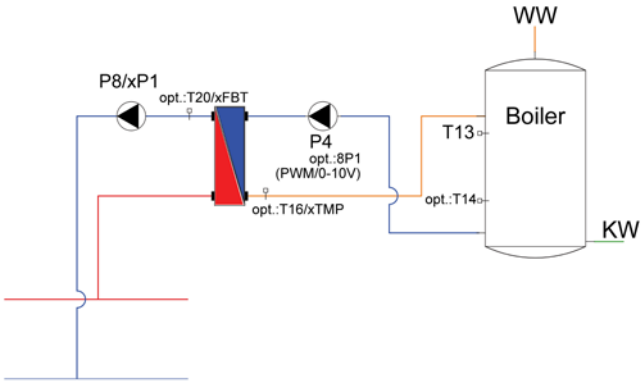
7.3.1.2 Drinking water tank with direct charging module

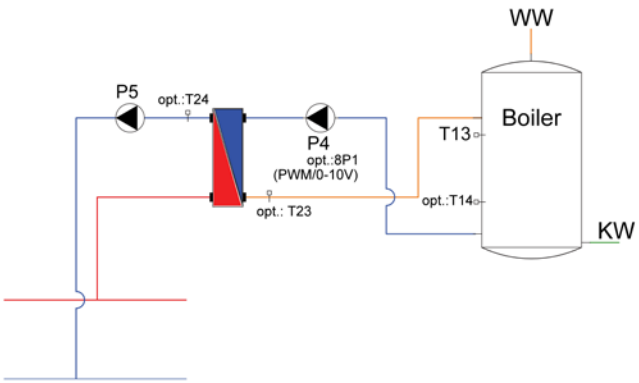
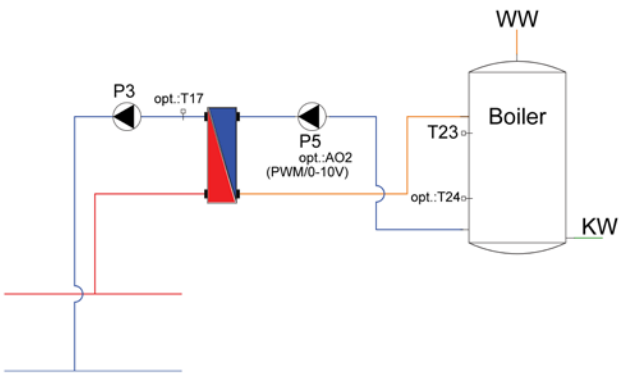
For control of a drinking water tank with a premixed charging module, a heating circuit is also required for the tank circuit for controlling the charging module.
The configuration of the heating circuit defines the hydraulic variant:

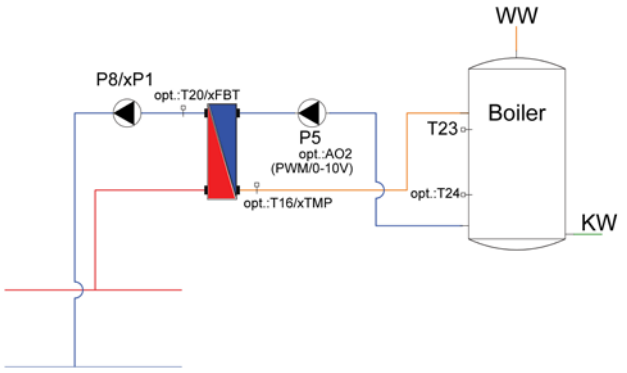
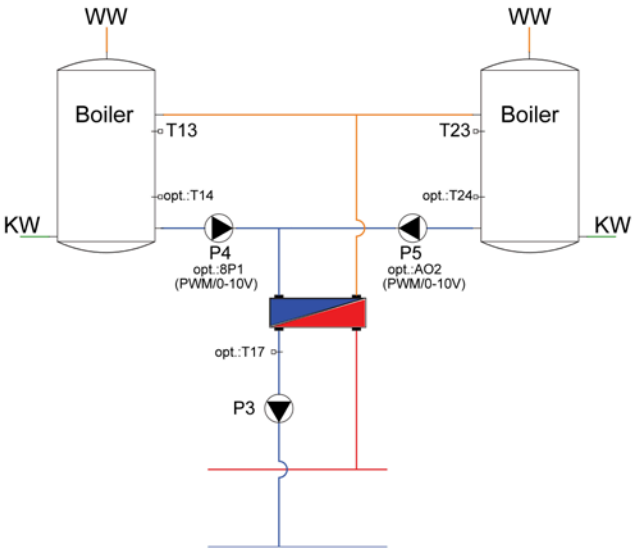
- Direct charging module for tank circuit 1
- Direct charging module for tank circuit 2
- Direct charging module for tank circuit 1 and 2 (both tanks are charged via a charging module)

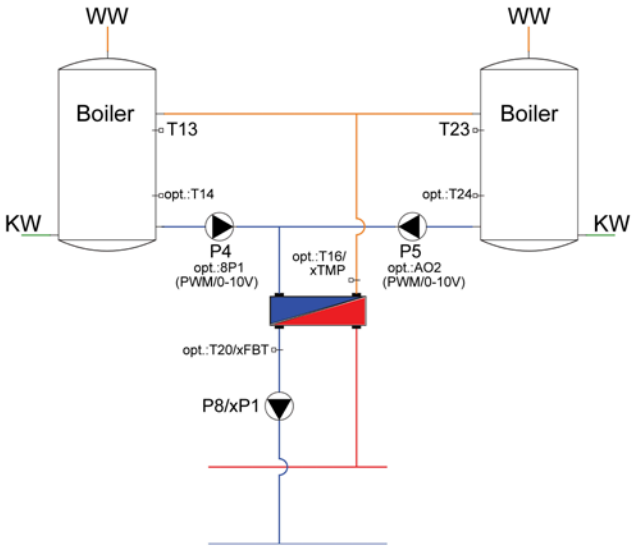
Only one heating circuit may be configured as a charging module per tank circuit.
However, it is possible, for example, to configure a direct or mixed charging module for tank circuit 1 with one heating circuit and a direct or mixed charging module for tank circuit 2 with another circuit.
If a heating circuit is configured for a direct or mixed charging module for tank circuit 1 + 2, no other circuit may be configured for a charging module.

As a special case, it is also possible to control the direct charging module of tank circuit 1 via tank circuit 2.

Tank circuit 1 with HC1 as charging module	Tank circuit 1 with HC2 to 8 (one of them) as charging module
 Configuration: P2 Heating circuit 1: Direct charging module for boiler 1 P10 Tank circuit 1: Boiler with di. charging module	 Configuration: P3-P9 Heating circuit 2-8 (one of them): Direct charging module for boiler 1 P10 Tank circuit 1: Boiler with di. charging module

Tank circuit 1 with tank circuit 1 as charging module	Tank circuit 2 with HC1 as charging module
 Configuration: P10 Tank circuit 1: Boiler with di. charging module P11 Tank circuit 2: Charging module for boiler 1	 Configuration: P2 Heating circuit 1: Direct charging module for boiler 2 P11 Tank circuit 2: Boiler with di. charging module

Tank circuit 2 with HC2 to 8 (one of them) as a charging module	Tank circuit 1+2 with HC1 as charging module
 Configuration: P3-P9 Heating circuit 2-8 (one of them): Direct charging module for boiler 2 P11 Tank circuit 2: Boiler with di. charging module	 Configuration: P2 Heating circuit 1: Direct charging module for boiler 1+2 P10 Tank circuit 1: Boiler with di. charging module P11 Tank circuit 2: Boiler with di. charging module

Tank circuit 1+2 with HC2 to 8 (one of them) as a charging module
 Configuration: P3-P9 Heating circuit 2-8 (one of them): Direct charging module for boiler 1+2 P10 Tank circuit 1: Boiler with di. charging module P11 Tank circuit 2: Boiler with di. charging module

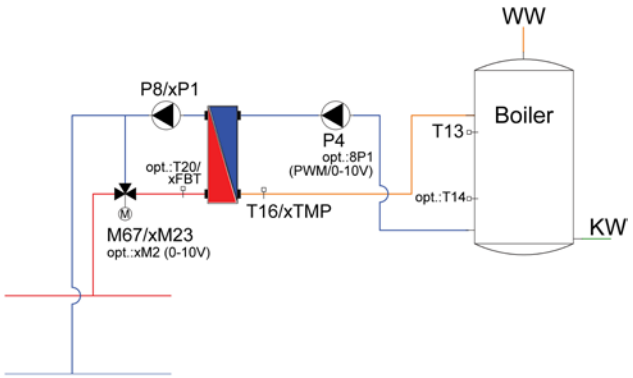
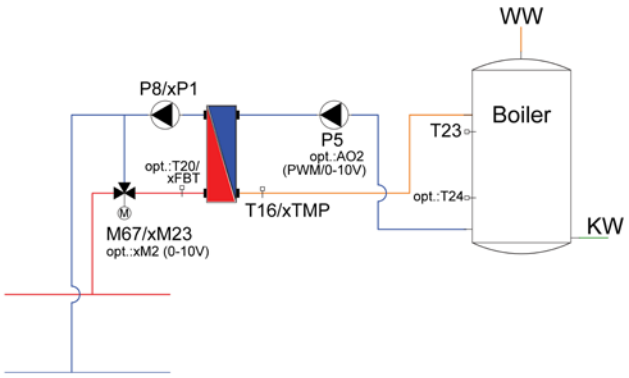
With this boiler charging variant, the flow setpoint temperature during boiler charging is limited to the boiler charging temperature. If, for example, the boiler requests at the transfer station, the flow setpoint temperature of the transfer station is limited.
If, for example, the boiler at tank circuit 2 requests (buffer), the buffer setpoint is limited.

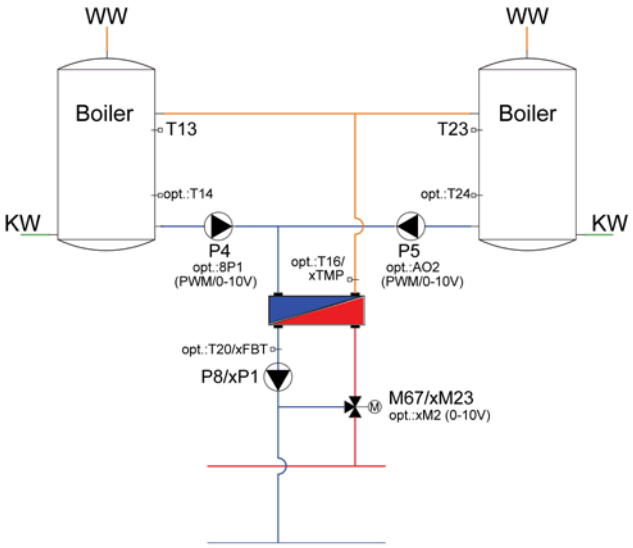
7.3.1.3 Drinking water tank with premixed charging module

For control of a drinking water tank with a direct charging module, a heating circuit is also required for the tank circuit for controlling the charging module.
The configuration of the heating circuit defines the hydraulic variant:

- Mixed charging module for tank circuit 1
- Mixed charging module for tank circuit 2
- Mixed charging module for tank circuit 1 and 2 (both tanks are charged via a charging module)

Only one heating circuit may be configured as a charging module per tank circuit.
However, it is possible, for example, to configure a direct or mixed charging module for tank circuit 1 with one heating circuit and a direct or mixed charging module for tank circuit 2 with another circuit.
If a heating circuit is configured for a direct or mixed charging module for tank circuit 1 + 2, no other circuit may be configured for a charging module.

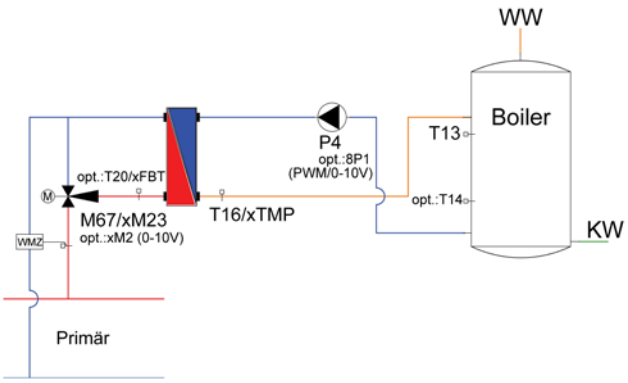
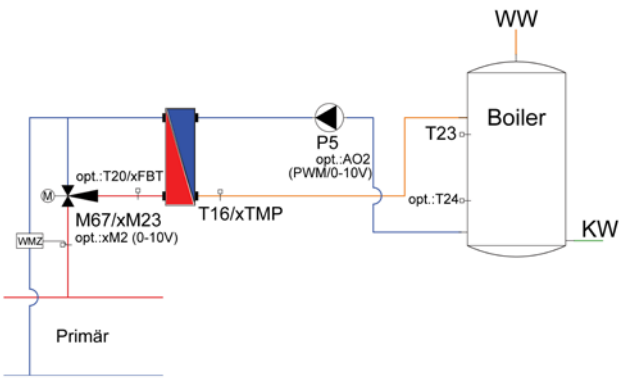
Tank circuit 1 with HC2 to 8 (one of them) as charging module	Tank circuit 2 with HC2 to 8 (one of them) as a charging module
 Configuration: P3-P9 Heating circuit 2-8 (one of them): Mixed charging module for boiler 1 P10 Tank circuit 1: Boiler with mixed charging module	 Configuration: P3-P9 Heating circuit 2-8 (one of them): Mixed charging module for boiler 2 P11 Tank circuit 2: Boiler with mixed charging module

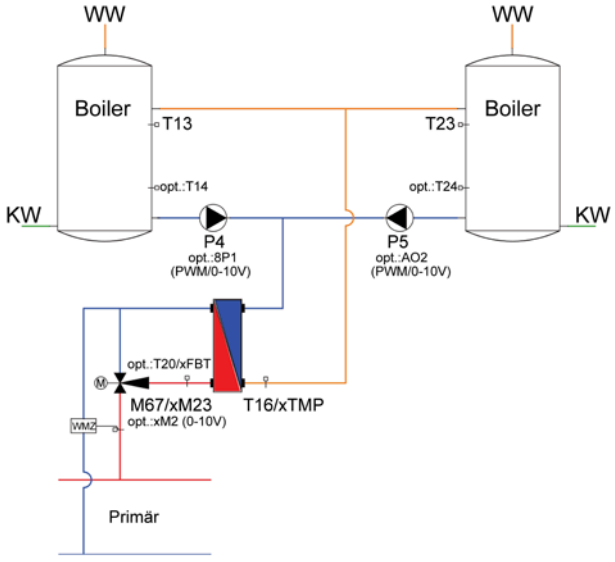
Tank circuit 1+2 with HC2 to 8 (one of them) as a charging module	
	Configuration: P3-P9 Heating circuit 2-8 (one of them): Mixed charging module for boiler 1+2 P10 Tank circuit 1: Boiler with mixed charging module P11 Tank circuit 2: Boiler with mixed charging module

7.3.1.4 Drinking water tank with primary-side charging module with jet pump

In principle, the configuration of a primary-side charging module does not differ from a secondary-side premixed charging module. The only difference is in the configuration of the request (in the case of a primary-side charging module, the request of the tank(s) must be set to "standalone").
The configuration of the request is described in chap. "**5.2.5**" or. "**5.2.6**".

In the case of a primary-side charging module with jet pump, a constant "primary flow temperature limit" can be set in order to prevent rapid calcification of the heat exchanger. A power limit with an assignable heat meter is also possible.

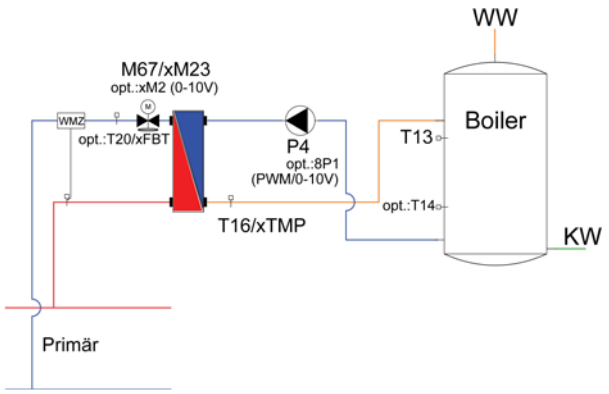
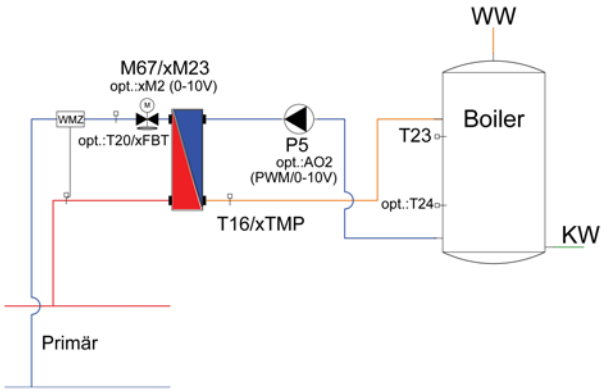
Tank circuit 1 with HC2 to 8 (one of them) as charging module	Tank circuit 2 with HC2 to 8 (one of them) as a charging module
	
Configuration: P3-P9 Heating circuit 2-8 (one of them): Mixed charging module for boiler 1 P10 Tank circuit 1: Boiler with mixed charging module P20 Request TC1: Standalone	Configuration: P3-P9 Heating circuit 2-8 (one of them): Mixed charging module for boiler 2 P11 Tank circuit 2: Boiler with mixed charging module P20 Request TC2: Standalone

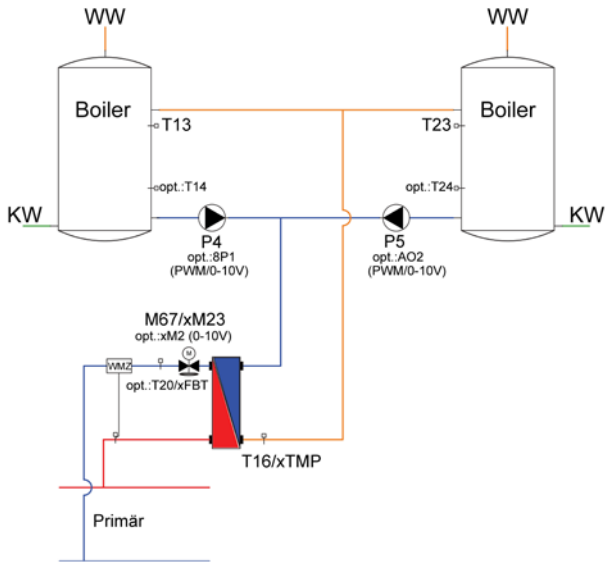
Tank circuit 1+2 with HC2 to 8 (one of them) as a charging module	
	Configuration: P3-P9 Heating circuit 2-8 (one of them): Mixed charging module for boiler 1+2 P10 Tank circuit 1: Boiler with mixed charging module P11 Tank circuit 2: Boiler with mixed charging module P20 Request TC1: Standalone P20 Request TC2: Standalone

7.3.1.5 Drinking water tank with primary-side charging module with primary valve

In principle, the configuration of a primary-side charging module does not differ from a secondary-side premixed charging module. The only difference is in the configuration of the request (in the case of a primary-side charging module, the request of the tank(s) must be set to "standalone").
The configuration of the request is described in chap. "**5.2.5**" or. "**5.2.6**".

In the case of a primary-side charging module with primary valve, a constant "primary return temperature limit" as well as a power limit can be set to an assignable heat meter in order to prevent rapid calcification of the heat exchanger.

Tank circuit 1 with HC2 to 8 (one of them) as charging module	Tank circuit 2 with HC2 to 8 (one of them) as a charging module
 Configuration: P3-P9 Heating circuit 2-8 (one of them): Mixed charging module for boiler 1 P10 Tank circuit 1: Boiler with mixed charging module P20 Request TC1: Standalone	 Configuration: P3-P9 Heating circuit 2-8 (one of them): Mixed charging module for boiler 2 P11 Tank circuit 2: Boiler with mixed charging module P20 Request TC2: Standalone

Tank circuit 1+2 with HC2 to 8 (one of them) as a charging module	
	Configuration: P3-P9 Heating circuit 2-8 (one of them): Mixed charging module for boiler 1+2 P10 Tank circuit 1: Boiler with mixed charging module P11 Tank circuit 2: Boiler with mixed charging module P20 Request TC1: Standalone P20 Request TC2: Standalone

7.3.2 Boiler charging type

With parameter **594** for tank circuit 1 or parameter **631** for tank circuit 2, the charging type (charging behavior, how to turn on / off) can be specified.
The following chapters describe the options for selecting the boiler charging type.

7.3.2.1 Boiler charging type "Up to setpoint temp. upper" (factory setting)

Outside the charging period:

If, outside of the period, the upper sensor undercuts the set "minimum temperature", the "charging temperature outside the period" is requested at the station or at tank circuit 2 (depending on the setting of the request). For a boiler variant with a charging module, this value is the setpoint temperature for the charging module.
Depending on the set charging lock, the charging pump then switches on either immediately or after reaching the switch-on condition of the charging lock (see chap. **7.3.6 Boiler charging lock**").

Charging is carried out until either the upper sensor exceeds the "setpoint temperature" or the lower sensor (if available, only optionally connected) exceeds the "switch-off temperature".
If the switch-off condition is met, the boiler will no longer request anything at the station or at tank circuit 2 and the pump will switch off after the set "stopping time" has expired.

If the system is switched off after the lower sensor, recharging can be carried out again (the upper sensor undercuts the minimum temperature) if the lower sensor is 3K below the "switch-off temperature".

Within the charging period:

If the upper sensor undercuts the "setpoint temperature" + "hysteresis in the time period" within the period (wisely set to be negative), the "charging temperature in the period" is requested at the station or at tank circuit 2 (depending on the set request). For a boiler variant with a charging module, this value is the setpoint temperature for the charging module.
Depending on the set charging lock, the charging pump then switches on either immediately or after reaching the switch-on condition of the charging lock.

Charging is carried out until either the upper sensor exceeds the "setpoint temperature" or the lower sensor (if available, only optionally connected) exceeds the "switch-off temperature".
After the lower sensor, however, it may only be switched off if the upper sensor is above the set "minimum temperature".

If the switch-off condition is met, the boiler will no longer request anything at the station or at tank circuit 2 and the pump will switch off after the set "stopping time" has expired.

If the system is switched off after the lower sensor, recharging can be carried out again (the upper sensor undercuts the minimum temperature) if the lower sensor is 3K below the "switch-off temperature" or the upper sensor undercuts the set "minimum temperature".

Parameter:	Tank circuit 1	Tank circuit 2
Pump stopping time	**583**	**617**
Setpoint temperature	**584**	**621**
Minimum temperature	**585**	**622**
Switch-off temperature	**586**	**623**
Charging temp. in the period	**587**	**624**
Charging temp. outside the period	**588**	**625**
Hysteresis in the period	**589**	**626**

7.3.2.2 Boiler charging type "Up to setpoint temp. lower"

Both tank sensors are necessary for this function.

Outside the charging period:

If, outside of the period, the lower sensor undercuts the set "minimum temperature", the "charging temperature outside the period" is requested at the station or at tank circuit 2 (depending on the setting of the request). For a boiler variant with a charging module, this value is the setpoint temperature for the charging module.
Depending on the set charging lock, the charging pump then switches on either immediately or after reaching the switch-on condition of the charging lock (see chap. **7.3.6 Boiler charging lock**").

Charging is performed until the lower sensor reaches the "setpoint temperature".
If the switch-off condition is met, the boiler will no longer request anything at the station or at tank circuit 2 and the pump will switch off after the set "stopping time" has expired.

Within the charging period:

If the lower sensor undercuts the "setpoint temperature" + "hysteresis in the time period" within the time (wisely set to be negative), the "charging temperature in the period" is requested at the station or at tank circuit 2 (depending on the set request). For a boiler variant with a charging module, this value is the setpoint temperature for the charging module.
Depending on the set charging lock, the charging pump then switches on either immediately or after reaching the switch-on condition of the charging lock.

Charging is performed until the lower sensor exceeds the setpoint temperature.
If the switch-off condition is met, the boiler will no longer request anything and the pump will switch off after the set "stopping time" has expired.

The upper sensor does not affect the on / off behavior in this type of charging; it is only used for a charging lock that may have been set.

Parameter:

	Tank circuit 1	Tank circuit 2
Pump stopping time	**583**	**617**
Setpoint temperature	**584**	**621**
Minimum temperature	**585**	**622**
Switch-off temperature	**586**	**623**
Charging temp. in the period	**587**	**624**
Charging temp. outside the period	**588**	**625**
Hysteresis in the period	**589**	**626**

7.3.2.3 Boiler charging type "Hold min temp. upper"

Outside the charging period:

If, outside of the period, the upper sensor undercuts the set "minimum temperature", the "charging temperature outside the period" is requested at the station or at tank circuit 2 (depending on the setting of the request). For a boiler variant with a charging module, this value is the setpoint temperature for the charging module.
Depending on the set charging lock, the charging pump then switches on either immediately or after reaching the switch-on condition of the charging lock (see chap. **7.3.6 Boiler charging lock**").

Charging is carried out until either the upper sensor exceeds the "minimum temperature" or the lower sensor (if available, only optionally connected) exceeds the "switch-off temperature".
If the switch-off condition is met, the boiler will no longer request anything at the station or at tank circuit 2 and the pump will switch off after the set "stopping time" has expired.

If the system is switched off after the lower sensor, recharging can be carried out again (the upper sensor undercuts the minimum temperature) if the lower sensor is 3K below the "switch-off temperature".

Within the charging period:

If the upper sensor falls below the "minimum temperature" outside of the period, the "charging temperature in the period" is requested at the station or at tank circuit 2 (depending on the set request). For a boiler variant with a charging module, this value is the setpoint temperature for the charging module.
Depending on the set charging lock, the charging pump then switches on either immediately or after reaching the switch-on condition of the charging lock.

Charging is done until the upper sensor exceeds the "minimum temperature" + 2K, the lower sensor is ignored during the charging period.
If the switch-off condition is met, the boiler will no longer request anything at the station or at tank circuit 2 and the pump will switch off after the set "stopping time" has expired.

Parameter:

	Tank circuit 1	Tank circuit 2
Pump stopping time	**583**	**617**
Minimum temperature	**585**	**622**
Switch-off temperature	**586**	**623**
Charging temp. in the period	**587**	**624**
Charging temp. outside the period	**588**	**625**
Hysteresis in the period	**589**	**626**

7.3.2.4 Boiler charging type "Hold min temp. lower"

Both tank sensors are necessary for this function.

Outside the charging period:

If, outside of the period, the lower sensor undercuts the set "minimum temperature", the "charging temperature outside the period" is requested at the station or at tank circuit 2 (depending on the setting of the request). For a boiler variant with a charging module, this value is the setpoint temperature for the charging module.
Depending on the set charging lock, the charging pump then switches on either immediately or after reaching the switch-on condition of the charging lock (see chap. **7.3.6 Boiler charging lock**").

Charging is performed until the lower sensor exceeds the minimum temperature.
If the switch-off condition is met, the boiler will no longer request anything at the station or at tank circuit 2 and the pump will switch off after the set "stopping time" has expired.

Within the charging period:

Within the period, the on / off behavior does not differ; only the "charging temperature in the period" is requested at the station or tank circuit 2 (depending on the setting of the request) .

The upper sensor does not affect the on / off behavior in this type of charging; it is only used for a charging lock that may have been set.

Parameter:

	Tank circuit 1	Tank circuit 2
Pump stopping time	**583**	**617**
Minimum temperature	**585**	**622**
Switch-off temperature	**586**	**623**
Charging temp. in the period	**587**	**624**
Charging temp. outside the period	**588**	**625**
Hysteresis in the period	**589**	**626**

7.3.2.5 Boiler charging type "Hold min temp. upper+lower"

Both tank sensors are necessary for this function.

Outside the charging period:

If, outside of the period, the lower sensor undercuts the set "minimum temperature", OR the lower sensor undercuts the "switch-off temperature", the "charging temperature outside the period" is requested at the station or at tank circuit 2 (depending on the setting of the request). For a boiler variant with a charging module, this value is the setpoint temperature for the charging module.
Depending on the set charging lock, the charging pump then switches on either immediately or after reaching the switch-on condition of the charging lock (see chap. **7.3.6 Boiler charging lock**").

Charging is done until the upper sensor exceeds the "minimum temperature" + 2K AND the lower sensor reaches the "switch-off temperature" +2K.
If the switch-off condition is met, the boiler will no longer request anything and the pump will switch off after the set "stopping time" has expired.

Within the charging period:

Within the period, the on / off behavior does not differ; only the "charging temperature in the period" is requested at the station or tank circuit 2 (depending on the setting of the request) .

Parameter:

	Tank circuit 1	Tank circuit 2
Pump stopping time	**583**	**617**
Minimum temperature	**585**	**622**
Switch-off temperature	**586**	**623**
Charging temp. in the period	**587**	**624**
Charging temp. outside the period	**588**	**625**
Hysteresis in the period	**589**	**626**

7.3.3 Time program for boiler charging

As already described in the boiler charging mode chapter, the charging strategy can be changed via a time program.
3 states can be set at a time for both tanks:
CHARGING ... charging time active
NORMAL ... charging time inactive (outside the charging period, factory setting)
LOCK ... boiler charging is blocked during the period (exception: frost protection program intervenes)

The times can be set for each tank under "PARA" and "Boiler charging times".
An individual daily setting or a higher-level setting of "Mon-Sun" and / or "Sat-Sun" is available.

This figure shows an example of the period of Monday for tank circuit 1:
Setting:
12:00 am - 12:00 pm normal operation
12:00 pm - 3:30 pm charging time
3:30 pm - 12:00 am normal operation

If the "white line" were only one point high for a period of time, this would mean a locked period.

7.3.4 Disinfection of boiler

There are several options for disinfecting the boiler:

- Disinfection via an adjustable time and weekly program
- Disinfection via an external potential-free contact
- Disinfection via the boiler operating modes

7.3.4.1 Disinfection with time / week program

If a weekday or "daily" is set for parameter **590** (boiler 1) or parameter **627** (boiler 2), a disinfection period can be set with parameter **591** (boiler 1) or parameter **628** (boiler 2).
At the beginning of the period, at the transfer station / charging module / buffer (depending on the set request), "Charging temp. during disinfection charging" is requested.

Depending on the set charging lock, the boiler charging pump is switched on either immediately or after fulfilling the charging lock condition. If the pump is then in operation, it cannot be switched off by the charging lock.

The boiler is charged until either the "disinfection setpoint temperature" of both sensors has been reached, or the period is over.
If only one sensor is connected, the disinfection ends when one of the sensors has reached the "setpoint temperature for disinfection".
If the disinfection ends due to the disinfection period (setpoint temperature not reached), error 44 (boiler 1) or 45 (boiler 2) is set (see chap.**7.16Detailed configuration of error output**") until the setpoint temperature is reached again during the next disinfection charging process.

Parameter:	Tank circuit 1	Tank circuit 2
Activate disinfection charging?	**590**	**627**
Disinfection charging period	**591**	**628**
Charging temp. during disinfection charging	**592**	**629**
Setpoint temp. during disinfection	**593**	**630**

7.3.4.2 Disinfection via "Disinfection until deactivation" operating mode

If the boiler operating mode is changed to "Disinfection until deactivation", the "Transfer temp. during disinfection" is requested at the station / charging module / buffer (depending on the set request) .

Depending on the set charging lock, the boiler charging pump is switched on either immediately or after fulfilling the charging lock condition. If the pump is then in operation, it cannot be switched off by the charging lock.

The boiler is charged until the operating mode is changed back to another status (usually automatic).

If the operating mode is not reset, disinfection charging is automatically stopped at 12:00 am (no error is set).

Parameter:	Tank circuit 1	Tank circuit 2
Charging temp. during disinfection charging	**592**	**629**

7.3.4.3 Disinfection via "Disinfection until temp. reached" " operating mode

If the boiler operating mode is set to "Disinfection until temp. reached", at the transfer station / charging module / buffer (depending on the set request), "Charging temp. during disinfection charging" is requested.

Depending on the set charging lock, the boiler charging pump is switched on either immediately or after fulfilling the charging lock condition. If the pump is then in operation, it cannot be switched off by the charging lock.

The boiler is charged until the "Setpoint temperature during disinfection" of both sensors has been reached.
If only one sensor is connected, the disinfection ends when one of the sensors has reached the "setpoint temperature for disinfection".

If the disinfection setpoint temperature is not reached by 12:00 am, error 44 (boiler 1) or 45 (boiler 2) is set (see chap.**7.16Detailed configuration of error output**") until the setpoint temperature is reached again during the next disinfection charging process.

7.3.4.4 Disinfection via external contact

Regardless of the set boiler charging type, the disinfection can be started externally:
If the lower sensor input is connected to GND, "Charging temp. disinfection charging" is requested (depending on the set request) and the boiler charging pump activated (any set charging lock is only valid for the activation of the boiler charging pump).
The disinfection is valid for the duration of the contact.
When the contact is open, the external disinfection is deactivated and it can be charged according to the set boiler charging type.

Parameter:	Tank circuit 1	Tank circuit 2
Charging temp. during disinfection charging	**592**	**629**

7.3.5 "Start single charge" boiler operating mode

Depending on the set boiler charging mode, charging is started when the sensor responsible for starting charging is 1K below the switch-off temperature:

- At "Up to upper set temp.": Lower boiler sensor 1K below the setpoint temperature
- At "Up to lower set temp.": Lower boiler sensor 1K below the setpoint temperature
- At "Hold min temp. upper": Upper boiler sensor 1K below minimum temperature + 2K
- At "Hold min. temp. lower": Lower boiler sensor 1K below minimum temperature + 2K
- At "Hold min. temp upper or lower": One of the two sensors is 1K below the respective switch-off temperature (either minimum temperature + 2K or switch-off temperature + 2K)

After a normal end of charging (setpoint reached), the system switches back to automatic mode.

7.3.6 Boiler charging lock (switch-on lock of the boiler charging pump)

To avoid unintentional discharging of the boiler, a boiler loading lock can be set.
When the boiler charge starts, the boiler charging pump will not be switched on until the set switch-on condition has been fulfilled.
If, during boiler charging, this condition is undershot for the duration of the set locking timer, the boiler charging pump is deactivated until the switch-on condition is fulfilled again.

Options:

- **No charging lock**

The boiler charging pump is immediately switched on independently of the temperatures.

- **A sec. flow>SpFO + 5K**

The boiler charging pump does not switch on until the sec. flow sensor of the transfer station or the boiler temperature (burner control) is 5K higher than the current upper boiler actual temperature.

- **A prim. return/sVL>SpFO+8/5 (factory setting)**

The boiler charging pump does not switch on until the sec. Flow sensor of the transfer station 5K higher OR the prim. return sensor of the transfer station is 8K higher than the current upper boiler actual temperature.
To activate the boiler charging pump, only one of the two conditions must be fulfilled (either flow 5K higher or return 8K higher).
For the pump to be relocked, both conditions no longer have to be met (flow and return are less than the boiler sensor + the respective hysteresis).

- **A sec. flow>StatSW-3K**

The boiler charging pump does not switch on until the sec. flow sensor of the transfer station or the boiler temperature (with burner control) has reached the setpoint minus 3K (setpoint of the transfer station or the boiler).

- **A CMFL>SpFO + 2K (only with boiler with a charging module)**

The boiler charging pump does not switch on until the sec. flow sensor of the upstream charging module is 2K higher than the current upper boiler actual temperature.
This charging lock is also possible with a direct charging module if the sec. flow sensor of the charging module (used only as a display for the charging module) is connected.

- **A CMFL>CM-SW-3K (only with boiler with a charging module)**

The boiler charging pump does not switch on until the sec. flow sensor of the upstream charging module has reached the setpoint minus 3K (setpoint of the charging module).
This charging lock is also possible with a direct charging module if the sec. flow sensor of the charging module (used only as a display for the charging module) is connected.

- **A PFO>BFO+5K (only if the boiler requests the buffer)**

The boiler charging pump is only switched on if the upper buffer sensor is 5K higher than the current upper boiler actual temperature.
(charging lock is also possible with interposed charging module)

- **A PFO>BufferSW-3K (only if the boiler requests the buffer)**

The boiler charging pump is only switched on if the upper buffer sensor has reached the buffer setpoint minus 3K.
(charging lock is also possible with interposed charging module)

Parameter:

	Tank circuit 1	Tank circuit 2
Boiler charging lock	**581**	**615**
Lock timer	**582**	**626**

7.3.7 External activation of boiler charging via potential-free contact

Regardless of the set boiler charging type, boiler charging can be started externally:
If the upper sensor input is connected to GND via a potential-free contact, the "Boiler charging temperature outside the period" is requested (depending on the set request) and the boiler charging pump activated (any set charging lock is not valid).
During the period, the "Boiler charging temperature in the period" is requested when the contact is activated, and the boiler charging pump is activated (any set charging lock is not valid).
Boiler charging is then active for the duration of the contact.

In principle, it is also possible that a connected sensor is only bridged with the contact.
If this is the case, charging should be carried out with an open contact according to the set boiler charging mode.
If the upper sensor is then "bypassed", boiler charging is then activated as described above independently of the lower / upper sensor.

If the boiler charge is only activated by contact (no upper sensor available), the lower sensor can also be connected to obtain the frost protection function.
If, for example, the "Up to setpoint temp. lower" charging type is set, charging can only be carried out according to this charging mode with a sensor connected below and an open contact.

Since the upper sensor is missing, a charging lock relating to the upper sensor will be ignored.

In principle, the external request can be implemented in combination with external disinfection.
Boiler charging is only active here when one of the contacts is present.
Depending on the contact and the period setting (inside / outside the charging period), the corresponding charging temperature is requested.
ATTENTION! If boiler charging / boiler disinfection is only activated via potential-free contacts, frost protection is not possible (since no sensor is connected).

7.3.8 Request limit for boiler charging

Depending on where the boiler is requesting (at the station or at the buffer), the setpoint temperature of the generator is limited to the current boiler loading temperature during boiler charging in order to avoid excessively high charging temperatures.
This request limit applies to all boiler variants without a mixed or primary-side loading module.

Example:
If the boiler requests at the station and there is also a buffer requesting at the heating circuit (upper buffer setpoint), then only the request at the station is limited, the (possibly higher) request at the buffer is still active. - Any resulting buffer recharging is limited to the boiler charging temperature with active boiler charging (since the buffer and boiler then request at the station).

7.3.9 Boiler charging break for circuits that are set to HW priority

If a circuit (or several circuits) is set to HW priority (circuit is deactivated with active boiler charging), boiler charging is interrupted for 15 minutes after 45 minutes of continuous charging and the heating circuit is activated so that the heating circuits do not cool down completely in the event of boiler charging with poor hydraulics.
This charging break applies only in the "automatic" boiler mode, not for disinfection or boiler charging by external contact.

7.3.10 Output definition (switching / PWM / 0-10V) and manual mode of boiler charging pump

For tank circuit 1:

With parameter **572** "Output definition of pump TC 1 ", the output definition for the pump used can be specified.

By default, this parameter is set to "Switching contact". In this configuration, a switching signal is output via output P4.

If heating circuit 8 is configured to "analogue outputs" and the corresponding Multi heating circuit module is installed (see chap. **3.4** to **3.10**.), the parameter can be set to "PWM" or "PWM inv" for a PWM or 0-10V control of the pump.

With a PWM or 0-10V control, switching output P4 is switched from 10% specification and can be used as a release.
The "PWM" selection means a 100% output for the maximum speed and a 0% output for a switched-off pump; if an inverted output is required, selection " PWM inv" is made.

The actual setting, whether 0-10V or PWM output, is made via the HC Multi, selection "PWM" is made in both cases for the controller.

With a "switched" pump, manual mode can be set with parameter **576**.
ATTENTION! In manual mode, there is no control and no frost protection!

With a pump controlled via PWM / 0-10V, it is possible to also set a minimum speed with parameter **574**.

If the pump is controlled with a PWM signal, the frequency can be set via parameter **573** . (With 0-10V output with HC Multi. use setting 100Hz)

For a speed-controlled pump, parameter **575** is available for manual mode
(0-100% and auto).
ATTENTION! In manual mode, there is no control and no frost protection!

For tank circuit 2:

With parameter **600** "Output def. AO2 (pump TC2)", you can specify whether a 0-10V signal or a PWM signal (10V peak voltage) should be output to analogue output 2 of the basic controller.
Regardless of this setting, switching contact P5 is automatically switched on from 10% specification and can be used either as a "switching output" for an uncontrolled pump or as a "release" for a controlled pump.

With parameter **602** , a minimum speed can be set for pump tank circuit 2.
If an unregulated pump is activated, this parameter must be set to at least 10% (factory setting is 30%).

If the pump is controlled with a PWM signal, the frequency can be set via parameter **601** .

Manual mode (0-100% and auto) is available for analogue output 2 and switching output 5 is available with parameter **603** . If an uncontrolled pump is only activated with switching output 5, manual mode must be set to 0% for "OFF" and >10% for "ON".
ATTENTION! In manual mode, there is no control and no frost protection!

7.3.11 Control of the boiler charging pump

7.3.11.1 Boiler with 2 sensors

The speed control pays attention to two "differences":

1.) Deviation of the charging temperature to the charging setpoint temperature
- For request to station: Deviation of sec. flow sensor to setpoint
- For request to buffer: Deviation of upper buffer sensor to setpoint
- For mixed charging module: Deviation of flow sensor charging module to setpoint

Depending on the deviation, the speed is regulated back by a PI controller.

Parameter:	Tank circuit 1	Tank circuit 2
Pump timer TC x	**577**	**604**
P-factor pump TC x	**578**	**605**
"I-factor pump TC x	**579**	**606**

2.) Approach of the lower sensor to the switch-off point

Depending on the boiler charging type, the pump is regulated back when the lower boiler approaches the switch-off point. To adjust the "aggressiveness" of the control, a "temperature band" can be set with parameter **580** (boiler 1) or parameter **607** (boiler 2).

- Control with "Up to setpoint temp upper" or "Hold min. temp. upper" charging type:

If the lower boiler sensor exceeds the "switch-off temperature" minus the temperature band, the pump is regulated back in a linear manner. If the lower boiler sensor reaches the "switch-off temperature", only the set minimum speed is specified.

- Control with "Up to setpoint temp lower" or "Hold min. temp. lower" charging type:

If the lower boiler sensor exceeds the "setpoint temperature" minus the temperature band, the pump is regulated back in a linear manner. If the lower boiler sensor reaches the "setpoint temperature", only the set minimum speed is specified.

For the "Hold min. temp. lower" charging type, a temperature band of 0 can optionally be set to ignore this criterion; the pump will then only be regulated back if the heat generator (e.g. the station if a station is requested) has not yet reached the charging setpoint temperature.

- Control with "Hold min. temp. upper+lower" charging type:

If the average value of both boiler sensors (= (boiler sensor upper + lower) / 2) exceeds the average value of both setpoint temperatures (= ("minimum temperature" + 2K + "switch off temperature" + 2K) / 2) minus the temperature band, the pump is regulated back in a linear manner. If the average value of both boiler sensors reaches the average value of both setpoint temperatures, only the set minimum speed is specified.

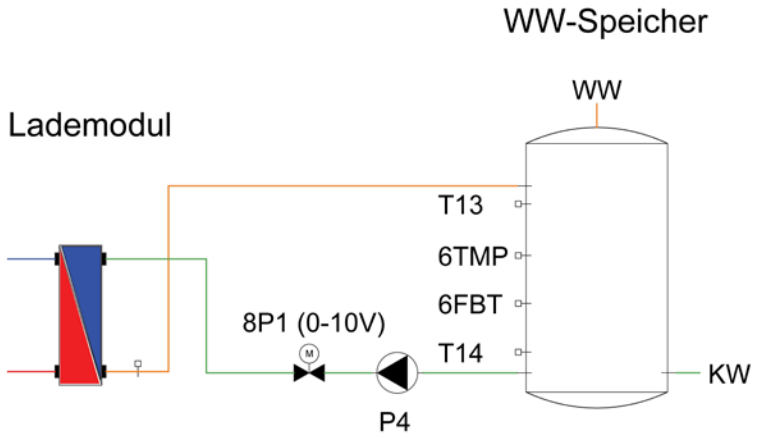
For disinfection, the speed control according to condition 2 is disabled irrespective of the boiler charging type.

7.3.11.2 Boiler with 4 sensors

If boiler charging (no matter which hydraulic variant) is realised with a 0-10V or PWM controlled charging pump or a 0-10V charging valve, the control can be changed to four sensors to improve charging.

Connection and basic configuration for tank circuit 1:

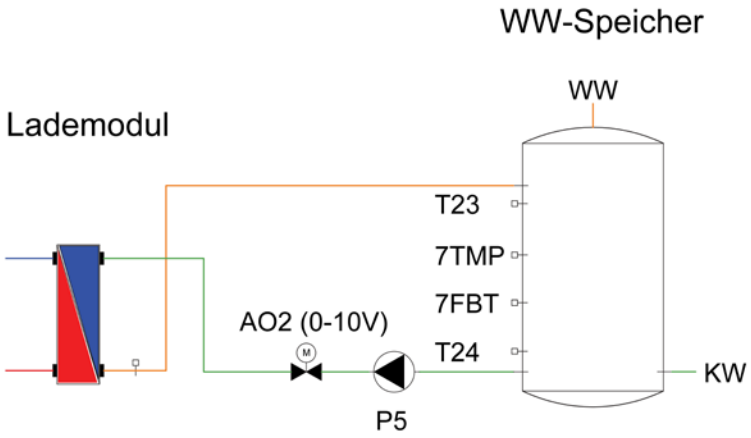
If heating circuit 6 (parameter **7**) is set to "Add. sensor TC1", two additional tank sensors can be connected to the flow sensor or room sensor input:



If a boiler with 4 sensors is controlled, the control of the regulated charging pump (drawn here with a self-regulated pump that is released and a 0-10V charging valve because of the higher control range) changes, the on / off behavior according to the boiler charging mode set (see chap.**7.3.2**") is not affected.
For the controlled charging pump, heating circuit 8 must be set to "analogue outputs" and the corresponding HC Multi variant must be installed, see chap. "**07/03/10**".

Connection and basic configuration for tank circuit 2:

If heating circuit 7 (parameter **8**) is set to "Add. sensor TC2", two additional tank sensors can be connected to the flow sensor or room sensor input:



If a boiler with 4 sensors is controlled, the control of the regulated charging pump (drawn here with a self-regulated pump that is released and a 0-10V charging valve because of the higher control range) changes, the on / off behavior according to the boiler charging mode set (see chap.**7.3.2**") is not affected.
Analogue output 2 must be configured accordingly for the controlled charging pump, see chap. "**7.3.10**".

Configuration of the control after 4 sensors:

After heating circuit 6 is set to "Add. sensor TC1" (boiler 1) or heating circuit 7 is set to "Add. sensor TC2 " (boiler 2), further parameters for configuring the control are displayed in the parameter menu of the boiler.

Parameter:	Tank circuit 1	Tank circuit 2	Factory setting
Weighting Tx3 (upper)	**595**	**632**	**200%**
Weighting xTMP (upper third)	**596**	**633**	**150%**
Weighting xFBT (lower third)	**597**	**634**	**120%**
Weighting Tx4 (lower)	**598**	**635**	**100%**

The weighting determines how "aggressively" the sensor engages in the regulation of the pump / valve. A high weighting means that if the sensor deviates from the setpoint, the pump / valve will receive a higher setpoint than with a lower weighting.
Due to the weighting per sensor, a slightly less favorable sensor positioning can be compensated or a charging strategy can be defined (fast charging when undercutting the upper sensor and only slow recharging if the lower sensor is undercut).

In addition to the weighting, a "temperature band" can be set with parameter **580** (boiler 1) or parameter **607** (boiler 2). The temperature band specifies the maximum deviation from the respective setpoint per sensor which still intervenes in the control. If the sensor has a higher deviation than the set temperature band, the temperature band is used for the control influence.

For the regulation to work properly, the following guidelines must be observed when setting the temperature band and weighting:

$$\frac{(weighting\ Tx3\ +\ weighting\ xTMP\ +\ weighting\ xFBT\ +\ weighting\ Tx4)}{100} \cdot Temp.band\ =\ 100$$

If a sensor is not connected, it will be ignored for regulation. The weighting of the sensor must be set to "0" and the weighting of the other sensors must be increased accordingly.

aqotec recommends a temperature band of 20K for the above weighting setting.

In addition to this setpoint calculation, attention is also paid to the deviation of the charging temperature from the setpoint temperature of the generator:

- For request to station: Deviation of sec. flow sensor to setpoint
- For request to buffer: Deviation of upper buffer sensor to setpoint
- For mixed charging module: Deviation of flow sensor charging module to setpoint

Depending on the deviation, the speed is regulated back by a PI controller regardless of the valve setpoint specified above.

Parameter:	Tank circuit 1	Tank circuit 2
Pump timer TC x	**577**	**604**
P-factor pump TC x	**578**	**605**
"I-factor pump TC x	**579**	**606**

7.3.12 Control of a configured charging module

If a boiler variant with charging module is configured, certain settings can also be made for the charging module.

- Request increase from the charging module setpoint to the station / buffer (depending on the request of the associated boiler)
- Flow setpoint temperature if the charging module is only active due to circulating reheating
- Charging lock of the charging module pump (for all charging module variants, if the corresponding sensors are installed)
- Manual mode and output definition of the charging module pump
- Control characteristic of any charging module mixer or the charging module primary valve
- Return / Flow temperature limit with mixed or primary-side charging module
- Nominal power of the charging module (with primary-side charging module, a power limit to a "assignable" heat meter can be realised)
- Runtime of the charging module valve (in the case of primary-side charging module, the charging module is included in the valve position calculation)

For the output definition setting of the pump, see chap. "**7.4.10**"
The charging module pump is only switched on / off if PWM control should still be set, only "0%" or "100%" are specified.

For the output definition setting of the mixer / primary valve, see chap. "**7.4.8"**

For the setting of the control characteristic of the mixer / primary valve, see chap. "**7.4.9**"

Parameter:	Tank circuit 1	Tank circuit 2
Request increase CMx	**681**	**697**
Flow setpoint temp. CMx with only circ. oper.	**680**	**696**

7.3.12.1 Charging lock (switch-on lock) of the charging module pump

In order to avoid an unwanted "mixing" of an upstream buffer or a bad return of an upstream transfer station, a charging lock can be set for the charging module pump.
When the boiler charge starts, the charging module pump will not be switched on until the set switch-on condition has been fulfilled.
If, during boiler charging, this condition is undershot for the duration of the set locking timer, the charging module pump is deactivated until the switch-on condition is fulfilled again.

Options:

- **No charging lock (factory setting)**

The charging module pump is immediately switched on independently of the temperatures.

- **A secFL>BFO+5K**

The charging module pump does not switch on until the sec. flow sensor of the transfer station or the boiler temperature (burner control) is 5K higher than the current upper boiler actual temperature.

- **A pRT/sFL>BFO+8/5**

The charging module pump does not switch on until the sec. Flow sensor of the transfer station 5K higher OR the prim. return sensor of the transfer station is 8K higher than the current upper boiler actual temperature.
To activate the charging module pump, only one of the two conditions must be fulfilled (either flow 5K higher or return 8K higher).
For the pump to be relocked, both conditions no longer have to be met (flow and return are less than the boiler sensor + the respective hysteresis).

- **A secFL>Charg.t.-3K**

The charging module pump does not switch on until the sec. flow sensor of the transfer station or the boiler temperature (with burner control) has reached the setpoint minus 3K (setpoint of the transfer station or the boiler).

- **A secFL>CMFL+3K**

The charging module pump does not switch on until the sec. flow sensor of the transfer station or the boiler temperature (burner control) is 3K higher than the current boiler module flow temperature.

- **A pRT/sFL>CMFL+5/3**

The charging module pump does not switch on until the sec. Flow sensor of the transfer station 3K higher OR the prim. return sensor of the transfer station is 5K higher than the current charging module flow temperature.
To activate the charging module pump, only one of the two conditions must be fulfilled (either flow 3K higher or return 3K higher).
For the pump to be relocked, both conditions no longer have to be met (flow and return are less than the charging module flow sensor + the respective hysteresis).

- **A PFO>CMFL+3K (only if the boiler requests with CM at the buffer)**

The charging module pump is only switched on if the upper buffer sensor is 3K higher than the current charging module actual temperature.

- **A PFO>BFO+5K + 5K (only if the boiler requests with CM at the buffer)**

The charging module pump is only switched on if the upper buffer sensor is 5K higher than the current upper boiler actual temperature.

- **A PFO>SW-3K (only if the boiler requests with CM at the buffer)**

The charging module pump is only switched on if the upper buffer sensor has reached the buffer setpoint minus 3K.

Parameter:	Charging module 1 or 1 + 2	Charging module 2
Lock CMx pump	**678**	**694**
Lock timer for CMx pump	**679**	**695**

7.3.12.2 Return / flow temperature limit with mixed or primary-side charging module

With priority over temperature control on sec. Flow of the charging module can be limited to the prim. return or prim. flow (depending on the sensor positioning) of the charging module.
If the set return limit is exceeded, the mixer / primary valve is adjusted back to the set return limit by means of the PI controller.

Parameter:	Charging module 1 or 1 + 2	Charging module 2
P-factor valve return limit	**670**	**686**
I-part valve return limit	**672**	**688**
Return limit CM	**674**	**690**

7.3.12.3 Power limit with primary-side charging module

For each charging module, the nominal power or contractual power can be entered in kW or a heat meter read out by the controller via M-Bus can be assigned for a power limit to the set power.
If the nominal power is exceeded, the primary valve of the charging module is adjusted back to nominal power by means of a PI controller.
A P-factor and an I-part can be set to set the control behaviour (aggressiveness of the power limitation).

The power measured from the assigned heat exchanger is used as the actual power value.
If the communication to this heat meter is disturbed, the power limit is inactive.

Parameter:	Charging module 1 or 1 + 2	Charging module 2
Nominal power CM	**682**	**7698**
Power limit to M-bus dev. no.?	**683**	**699**

For parameter "Power limit to M-bus dev. no.? ", the heat meter number is entered by the controller (e.g."3" for the third heat meter read out by the controller), the parameter in no way refers to the address of the heat meter itself.

7.3.12.4 Running time with primary-side charging module

If the valve is not controlled continuously (0-10V), the runtime can be entered to calculate the valve position.

The valve runtime is indicated on the actuator of the valve, usually by specifying the valve lift and the actuating speed.
The runtime can be calculated from this information as in the following example:
s= 8mm
v = 15s/mm
Runtime = s * v = 8mm * 15s / mm = 120sec.

If the runtime specification is missing, the runtime can also be determined via manual mode of the valve and a stopwatch by stopping until the drive has moved to the end position.

If a valve has different runtimes (e.g. longer runtime from open to closed than vice versa), a runtime can be entered for both directions.

If the difference in the runtimes is not relevant, both values must be set the same:

- "Charging module valve open>closed runtime" parameter (from open to closed state)
- "Charging module valve closed>open runtime“

When connecting the controller to a control system from aqotec, the runtime must be set.

With a primary-side charging module, it must also be set so that the charging module valve intervenes in the valve position calculation by the controller, for which the "Valve in position calculation" parameter must be set to YES.

Parameter:	Charging module 1 or 1 + 2	Charging module 2
Charging module closed>open runtime	**675**	**691**
Charging module closed>open runtime	**676**	**692**
Charging module valve in position calculation?	**677**	**693**

7.4 Detailed configuration of heating curve control

With heating curve control, the flow temperature of the heating circuit is regulated only by its dependence on the outside temperature.
For each heating circuit, the "Setpoint calculation after?" parameter can be used to specify separately how the setpoint calculation is performed:

- Heating curve: Setting of a heating curve and a foot, additional setting of min. and max. flow temperature
- 4-point curve: Setting of four points at defined outside temperatures, linear interpolation between the points, additional setting of minimum and maximum flow temperature

In addition, this parameter determines whether a "heating circuit" or a "cooling circuit" is controlled.
If a cooling circuit is controlled, outdoor temperature switch-off is controlled in inversion to a heating circuit or any existing mixer (OPEN if the temperature is exceeded).

Parameter:

HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
98	**141**	**181**	**244**	**305**	**368**	**429**	**492**

7.4.1 Setting the heating curve

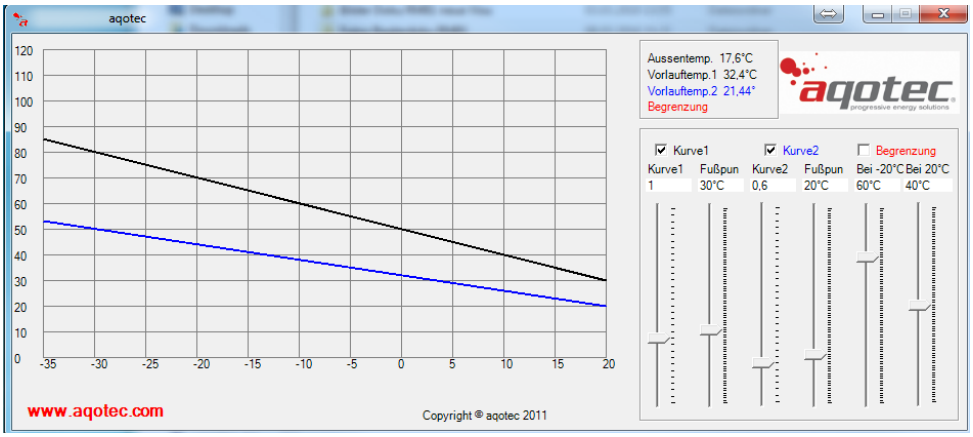
The "foot" parameter specifies the setpoint temperature at 20 °C outside temperature, the "heating curve" parameter increases the flow temperature at lower outside temperatures.
Mathematically, the flow temperature is calculated using a linear function, where the base represents the offset at 20 °C AT and the heating curve represents the slope:
$T_{FL(OT)} = HC*(20-AT)+FP$

$T_{FL(OT)}$...heating circuit setpoint temperature
HC...set heating curve
OT...currently averaged outside temperature
FP...set foot

The outdoor temperature value is not the current measured value, but rather an average value with adjustable averaging time, see chapter "**5.1.9Outdoor temperature average for setpoint calculation**".

Some heating curves are shown in the following diagram:

For relatively easy use, **aquotec** developed a tool to graphically display the set heating curve and to read out values using the cursor:



This program is available for purchase, please ask for the "aqoKurvenprogramm" at angebot@aqotec.com.

Parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Foot	**99**	**142**	**182**	**245**	**306**	**369**	**430**	**493**
Heating curve	**100**	**143**	**183**	**246**	**307**	**370**	**431**	**494**

7.4.2 Setting the 4-point curve

As an alternative to the factory-set heating curve with the foot and heating curve, a defined function can also be set by four points. The four points each relate directly to the flow temperature at the respective outside temperature. Outside temperatures in between are interpolated linearly.

The outdoor temperature value is not the current measured value, but rather an average value with adjustable averaging time, see chapter "**5.1.9Outdoor temperature average for setpoint calculation**".

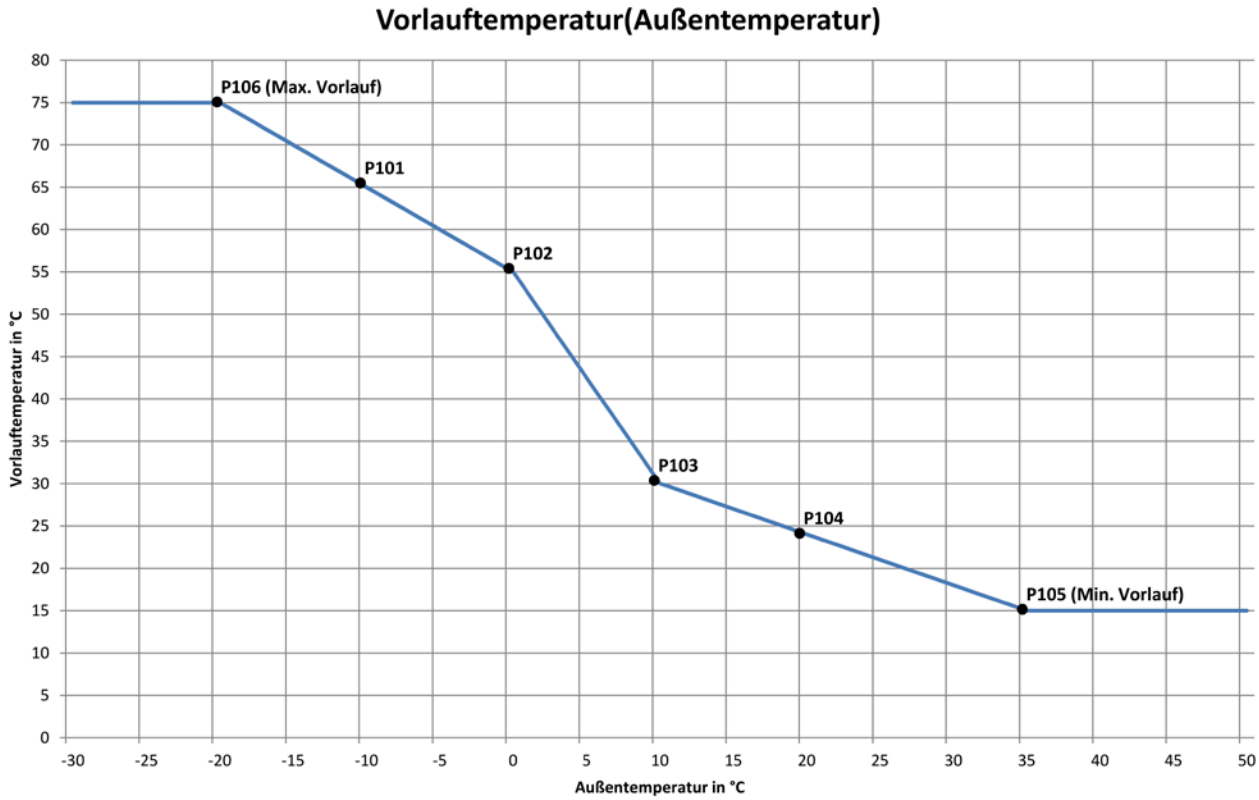
Parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Flow temp. at -10°C OT	**101**	**144**	**184**	**247**	**308**	**371**	**432**	**495**
Flow temp. at 0°C OT	**102**	**145**	**185**	**248**	**309**	**372**	**433**	**496**
Flow temp. at 10°C OT	**103**	**146**	**186**	**249**	**310**	**373**	**434**	**497**
Flow temp. at 20°C OT	**104**	**147**	**187**	**250**	**311**	**374**	**435**	**498**

The following diagram can be considered an example of the four-point curve:

Values used:

P101 "Flow temp. at -10 °C OT":	65°C
P102 "Flow temp. at 0°C OT":	55°C
P103 "Flow temp. at 10 °C OT":	30°C
P104 "Flow temp. at 20 °C OT":	24°C
P105 "Min. flow temperature":	15°C
P106 "Max. flow temperature":	75°C



7.4.3 Setting the min. / max. flow heating circuit

Since the heating curve can reach very high flow values at low outside temperatures, a maximum temperature can be set via "Max. flow temperature".
If the heating curve reaches or exceeds this value, the flow remains at this set value.

Conversely, a "Min. flow temperature" can be set, as pre-set values are often specified at high outside temperatures, which are no longer effective.

Parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Min. flow temperature	**105**	**148**	**188**	**251**	**312**	**375**	**436**	**499**
Max. flow temperature	**106**	**149**	**189**	**252**	**313**	**376**	**437**	**500**

7.4.4 Day / Night correction setting

The adjustable "+/- heating" and "+/- reduction" values in the heating circuit menu can be used to change the heating curve.
The values set here mean a "calculated room temperature change" and influence the flow temperature according to the following formula:

Change of flow temperature = scale unit x 2.8 x heating curve

An example:
Setting +1 (1K calculated room temperature increase) with heating curve 1.2:
Change of flow = 1 x 2.8 x 1.2 = 3.36K

ATTENTION! Changing the heating curve is not only influenced by the "+/- heating" and "+/- reduction" in the heating circuit menu!
The general "Heating time correction" and "Reduction time correction", adjustable in the main menu of the controller, intervene here.

Example 1:
- Circuit in daytime operation
- General heating time correction: +2K
- Heating circuit specific "+/- heating": + 2K
- Heating curve: 1,2

Calculated room temperature increase for this circuit: + 2K (general) + 2K (HC-specific) = 4K
Change of flow = 4 x 2.8 x 1.2 = 13.44K
Example 2:
- Circuit when reducing
- General reduction time correction: -4K (standard)
- Heating circuit specific "+/- reduction": + 2K
- Heating curve: 1,2

Calculated room temperature reduction for this circuit: -4K (general) + 2K (HC-specific) = -2K
Change of flow = -2 x 2.8 x 1.2 = -6.72K

Furthermore, in automatic mode, the "Day correction" and "Night correction" can be set by means of potentiometer on remote control FBR6 or on the display of the FBR7 in addition to the corrections mentioned above:

An example:
- General heating time correction: -2K
- Heating circuit specific "+/- heating": + 1K
- Setting on remote control: +3K

Effective correction = -2K +1K +3K = +2K

The setting of the remote control applies to both the "Day correction" and the "Night correction", depending on the heating / reduction time.

Exception: If the remote control is set to reduction, only the corrections from the controller (general and specific to the heating circuit) apply.

7.4.5 Sliding night reduction acc. to outside temperature

As described in section "**7.4.4Setting of day / night correction**", the reduction is entered by means of

the corrections, whereby a general "Night correction "of -4K and "Day correction" of 0K is stored in the controller by default.

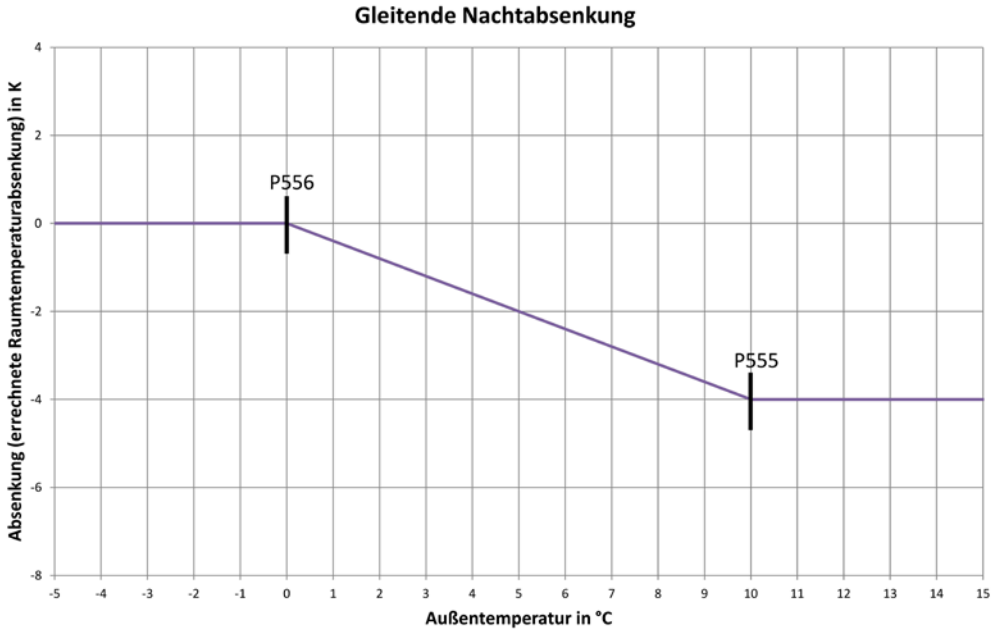
This would mean - if no additional correction was entered via the remote control or specific to the heating circuit - that at full reduction, the room temperature is reduced by -4K (via the flow temperature control of the heating circuit).

However, depending on the outside temperature, the reduction can be lowered down to 0K, and the setting of parameter **555** "Full night reduction to OT" and parameter **556** "No night reduction from OT" is necessary.
Reduction is carried out until the "Full night reduction to OT" set value according to the set correction is reached.
If the average outside temperature falls below the "Full reduction to OT" value, reduction is reduced.
The degree of reduction depends on the difference between the "Full reduction to OT" and "No reduction from OT" points or from the adjusted correction.
In principle, interpolation between the two points is linear.

If the outside temperature ultimately falls below the "No reduction" value, reduction is no longer carried out, that is to say, it is also controlled in reduction mode to the same flow temperature as in daytime operation.

An example:

- Reduction correction: -4K
- Daily operation correction: 0K
- "Full reduction" to 10 °C outside temperature
- "No reduction" below 0 °C outside temperature



P555... "Full reduction to OT"
P556... "No reduction from OT"

The example shows a setting in which no reduction occurs below 0° C outside temperature.
From 10 °C outside temperature, the full set reduction temperature comes into force (here 4 °C).

7.4.6 Heating circuit shutoff acc. to outside temperature

In order to deactivate the heating circuit at high outside temperatures, it is possible to deactivate the circuit (pump off, mixer closed) by means of the adjustable parameters "Shutoff temperature daytime operation" and "Shutoff temperature reduction" (according to averaged outdoor temperature).

Depending on the set heating time, either the "Shutoff temperature in the heating period" (within the heating time) or the "Shutoff temperature in the reduction period" (in the reduction period) applies.

The averaging of the outside temperature is described in chapter "**5.1.8Building coefficient**" and can also be set via the parameter described there.

Closing the circuit again is carried out directly after the averaged outside temperature falls below this shutoff temperature.

Another reason for switching back on can be the change from "Reduction" to "Heating time", since the "Daily operation shutoff temperature" is usually higher and this "change" causes the value to fall below the temperature.

Parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Shutoff temperature in the heating period	**96**	**139**	**179**	**242**	**303**	**366**	**427**	**490**
Reduction temperature in reduction period	**97**	**140**	**180**	**243**	**304**	**367**	**428**	**491**

7.4.7 Time program setting (heating, reduction, locking)

The time program defines when the circuit is in "Heating mode" or "Reduction mode" in the "Automatic" operating mode (in the controller and on the remote control).

The times can be set for each heating circuit under "PARA" and "Heating times".
An individual daily setting or a higher-level setting of "Mon-Sun" and / or "Sat-Sun" is available.

3 states can be set at a time for all circuits:
DAYM ... heating time active (factory setting 6:00 am - 10:00 pm)
RED. ... Reduction time active (factory setting from 12:00 - 6:00 am and 10:00 pm - 12:00 am)
LOCK ... heating circuit is locked (switched off) ... the exception is frost protection mode

This figure shows an example of the period of Monday to Friday for tank circuit 1:
Setting:
12:00 - 6:00 am reduction
6:00 - 11:30 am heating operation
11:30 am - 1:00 pm reduction time
1:00 - 10:00 pm heating time
10:00 pm - 12:00 am reduction time

If the "white line" were only one point high for a period of time, this would mean a locked period.

7.4.8 Output definition of heating circuit mixer (3-pt./constant) and manual mode

With the "Output definition mixer HCx" parameter, the output definition for the mixer used can be defined.

	HC0 (for mixer for HC1)	HC3	HC4	HC5	HC6	HC7	HC8
Output definition mixer HCx	**49**	**200**	**263**	**324**	**387**	**448**	**511**

By default, this parameter is set to "3-pt. HCx-23 ". With this configuration, a 3-pt. signal is output via outputs xM2 (open) and xM3 (closed) .

If the respective Multi heating circuit module is installed, the parameter can be set to "PWM" or "PWM inv" for PWM or 0-10V control of the mixer.

PWM or 0-10V control is only possible from heating circuit 3 with the corresponding Multi heating circuit module variant, see chap. **3.4** to **3.10**.

If heating circuit 0 is configured to "Mixer for HK1", theoretically PWM or 0-10V control of the mixer would also be possible, however heating circuit 8 must be configured to "Analogue outputs".

The "PWM" selection means a 100% output for a fully open valve and a 0% output for a closed valve; if an inverted output is required (closed 100%, open 0%), selection " PWM inv" is made.

The actual setting, whether 0-10V or PWM output, is made via the HC Multi, selection "PWM" is made in both cases for the controller.

For a 3-pt-controlled mixer, the parameters are available for manual mode:

	HC0 (for mixer for HC1)	HC2	HC3	HC4	HC5	HC6	HC7	HC8
3-pt. Manual mode	**52**	**155**	**203**	**266**	**327**	**390**	**451**	**514**

ATTENTION! In manual mode, there is no control and no frost protection!

With a mixer controlled via PWM / 0-10V, a minimum position can also be set:

	HC0 (for mixer for HC1)	HC3	HC4	HC5	HC6	HC7	HC8
Min. specification of continuous mixer	**51**	**202**	**265**	**326**	**389**	**450**	**513**

If, for example, a speed-controlled pump is used instead of a mixer, this parameter can be used as the "minimum speed".

If the mixer is controlled with a PWM signal, the frequency can be set via the following parameters.

	HC0 (for mixer for HC1)	HC3	HC4	HC5	HC6	HC7	HC8
PWM frequency HCx-2	**50**	**201**	**264**	**325**	**388**	**449**	**512**

(With 0-10V output with HC Multi. use setting 100Hz)

For a continuously controlled mixer, the following parameters are available for manual mode (0-100% and auto):

	HC0 (for mixer for HC1)	HC3	HC4	HC5	HC6	HC7	HC8
Constat manual mode	**53**	**204**	**267**	**328**	**391**	**452**	**515**

ATTENTION! In manual mode, there is no control and no frost protection!

7.4.9 Control behaviour of heating circuit mixer

The control characteristic can be set with the following parameters:

Designation	Factory setting
Timer mixer HCx	15s
P-factor mixer HCx	13
I-part mixer HCx	45s

The timer determines the total cycle time of the controller.
If a slow controlled section is present (flow sensor is poorly positioned), the cycle time can be increased slightly to avoid oscillation behavior.

The proportional factor of the PI controller is set with the P-factor.
The higher the P-factor is selected, the more aggressive the controller reacts to an actual value change (e.g. if there is a rapid increase in temperature at the sensor, the controller will counteract depending on the size of the P-factor)

ATTENTION! The P-factor must not be set to 0, as this disturbs the entire control function!

The integral part of the PI controller is set with the I-part.
The value in seconds is the so-called "reset time" and indicates the period in which the controller attempts to "correct" a deviation from the setpoint / actual value.
The smaller the I-part is selected, the more aggressive the controller will try to compensate for the deviation.
A very small I-part is not recommended, because this usually results in "oscillation behavior".

For mixers up to approx. 2min runtime, the default values as stated above have been reliable.
The P-part can be increased for slower mixers.
For mixers that adjust too fast, the I-part can be increased or the P-factor slightly reduced.

The control characteristic can be set with the following parameters per heating circuit:

	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Timer	**156**	**205**	**268**	**329**	**392**	**453**	**517**
P-factor	**157**	**206**	**269**	**330**	**393**	**454**	**518**
I-part	**158**	**207**	**270**	**331**	**394**	**455**	**519**

7.4.10 Output definition (switching / PWM / 0-10V) and manual mode of heating circuit pump

With the parameter "Output definition pump HCx", the output definition for the pump used can be defined.

	HC1	HC3	HC4	HC5	HC6	HC7	HC8
Output definition pump HCx	**111**	**200**	**263**	**324**	**387**	**448**	**511**

By default, this parameter is set to "Switching contact". With this configuration, a switching signal is output via outputs P3 (HC1) or xP1 (HC3-8).

If the respective Multi heating circuit module is installed, the parameter can be set to "PWM" or "PWM inv" for PWM or 0-10V control of the pump.

PWM or 0-10V control is only possible from heating circuit 3 with the corresponding Multi heating circuit module variant, see chap. **3.4** to **3.10**.

If heating circuit 8 is configured to "Analogue outputs", the pump of heating circuit 1 can also be controlled via PWM or 0-10V, switching output P3 is then switched from 10% specification and can be used as a release.

The "PWM" selection means a 100% output for the maximum speed and a 0% output for a switched-off pump; if an inverted output is required, selection " PWM inv" is made.

The actual setting, whether 0-10V or PWM output, is made via the HC Multi, selection "PWM" is made in both cases for the controller.

For a "switched" pump, the following parameters are available for manual mode:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Manual mode	**115**	**154**	**198**	**261**	**322**	**385**	**446**	**509**

ATTENTION! In manual mode, there is no control and no frost protection!

With a pump controlled via PWM / 0-10V, it is also possible to set a minimum speed:

	HC1	HC3	HC4	HC5	HC6	HC7	HC8
Min. speed pump HCx	**113**	**196**	**259**	**320**	**383**	**444**	**507**

If the pump is controlled with a PWM signal, the frequency can be set via the following parameters.

	HC1	HC3	HC4	HC5	HC6	HC7	HC8
PWM frequency HCx-1	**112**	**195**	**258**	**319**	**382**	**443**	**506**

(With 0-10V output with HC Multi. use setting 100Hz)

For a speed-controlled pump, the following parameters are available for manual mode (0-100% and auto):

	HC1	HC3	HC4	HC5	HC6	HC7	HC8
0-100% manual mode	**114**	**197**	**260**	**321**	**384**	**445**	**508**

ATTENTION! In manual mode, there is no control and no frost protection!

7.4.11 Control behaviour of heating circuit pump

With a circuit configured to "Heating curve control", the pump can be regulated to the heating circuit return.

This requires a return sensor connected to the T17 (HC1) or FBT (HC3-8) input and the "Contact open ON" or "Contact closed ON" configuration selected in parameter "Remote control HCx" (see chap. **7.4.13**)

If the return sensor reaches the outside temperature-dependent return threshold minus the temperature band, the pump is regulated back in a linear manner. If the return sensor reaches or exceeds the return threshold, only the set minimum speed is specified.

Example:
Currently valid RT threshold: 45°C
Temperature band: 10K
Minimum speed: 10%

Return sensor value	Speed specification
0- 35	100%
37.5	77.5%
40	55%
42.5	32.5%
45 up	10%

Setting parameter:

	HC1	HC3	HC4	HC5	HC6	HC7	HC8
RT threshold at -20 °C OT	**122**	**211**	**274**	**335**	**398**	**459**	**522**
RT threshold at +20 °C OT	**123**	**212**	**275**	**336**	**399**	**460**	**523**
Temperature band	**116**	**199**	**262**	**323**	**386**	**447**	**510**

7.4.12 Remote control of the heating circuit

If remote control FBR6 or FBR7 is connected to the heating circuit (see section "**3.11Remote controls**"), the remote control type must be defined via parameter "Remote control HCx ".

If the parameter is set to FBR7, the bus is automatically activated on COM C and the corresponding remote control is read out.

Parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Remote control	**117**	**159**	**208**	**271**	**332**	**395**	**456**	**519**

7.4.13 External release or lock of the heating circuit

If no FBR6 / FBR7 remote control is connected, the heating circuit can be released (daytime operation or setting on the controller) or disabled (off / frost protection) via a potential-free contact.

The logic of the contact can be defined with parameter "Remote control HCx":

- "Contact open on" (factory configuration): FBS and GND open → circuit is active
- "Contact closed on": FBS and GND closed → circuit is active

Parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Remote control	**117**	**159**	**208**	**271**	**332**	**395**	**456**	**519**

The room sensor input can continue to be used permanently in this configuration.

If, with configuration "Room control with / w/o shutoff" or "room thermostat ", the room sensor input is used as a room sensor regardless of the setting the "Remote control HCx" parameter.

In the "Heating curve control" configuration, the room sensor input is evaluated as a heating circuit return sensor if the "Remote control HCX" parameter is set to "Contact open on" or "Contact closed on".

If remote control FBR6 is connected, it is also possible to switch off the circuit with two potential-free contacts (FBS→GND and FBT→sensor remote control wire), but then the remote control is completely inoperative during the external lock.

External release with remote control FBR7 connected is not possible.

!ATTENTION!With active frost protection, the heating circuit is activated even when the lock is activated and regulated to the set frost protection flow temperature. (see Chapter "**5.1.7Frost protection**")

7.4.14 External fixed temperature request

If the room sensor input of the heating circuit is connected to GND for longer than 10 seconds, the heating circuit goes into fixed temperature request mode.

The heating circuit then requests the set "Max. flow temperature" (see chapter "**7.4.3Setting min./max. flow heating circuit**").

If the connection between the room sensor input and GND is disconnected, the heating circuit returns to the previously set operating mode.

ATTENTION! If the circuit on the controller is switched off manually, no fixed temperature request is possible.

If remote control FBR6 is connected, fixed temperature request is also possible as described above, the request also works here if the circuit has been switched off via the remote control.

ATTENTION! If remote control FBR7 is connected, this function is not possible.

7.4.15 External activation of party mode

If the room sensor input of the heating circuit is connected to GND for between 2 and 8 seconds, party mode is activated.

To do so, the operating mode must be set either in automatic mode, in reduction mode or in day mode, no activation in the Off / Frost protection operating mode.

This function can also be implemented with remote control FBR6 connected, but the remote control must not be set to "Off / Frost protection", otherwise no function is possible as already mentioned above.

ATTENTION! If remote control FBR7 is connected, this function is not possible.

7.4.16 Special periods of use or non-use periods (holiday periods)

For each heating circuit, 5 different "periods of use" or "periods of non-use" can be set (date from-to).

During the period of use, the heating circuit is permanently controlled in daytime mode in relation to the time program (as if a permanent heating time had been set).

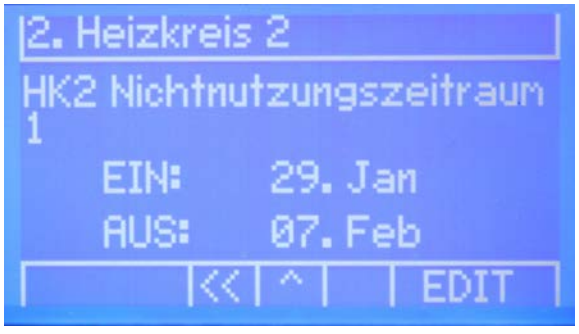
In the period of non-usage, the heating circuit is permanently regulated with priority over the time program either in reduction mode (as if a permanent reduction time had been set) or deactivated (frost protection still takes effect). Whether "reduction" or "lock" is active is defined per heating circuit with the "Control type in the period of non-usage" parameter.

Parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Control type in period of non-usage	**118**	**160**	**209**	**272**	**333**	**396**	**457**	**520**

ATTENTION! If a general holiday period is entered in the transfer station menu, this has priority over any set period of usage / non-usage.

The times can be set for each heating circuit under "PARA" and "Period of usage / Periods of non-usage".



ATTENTION! At the end of the period of usage or non-usage, the period will not be reset automatically, the reset must be done manually by changing the period.

7.4.17 Heating circuit operating mode

In the respective heating circuit side, the heating circuit-related operating mode can be changed; simply press the ESC key (X).

The white highlighted symbol is the currently active operating mode.

The symbols represent the following operating modes:

- Automatic mode

Automatic switching between day mode / reduction mode depending on heating times.
Automatic shutoff acc. to outside temperature.

- Day mode

Fixer operation in "Day mode" independent of the set heating times.
Automatic shutoff acc. to outside temperature.

- Reduction mode

Fixer operation in "Reduction mode" independent of the set heating times.
Automatic shutoff acc. to outside temperature.

- Party time

When selecting this function, the heating circuit is in Day mode for the duration set in parameter **557**.
After expiration, the operating mode automatically returns to the previously set operating mode.

- Off / Frost protection

Heating circuit is deactivated, exception is the frost protection function as described in section "**5.1.7Frost protection**".

7.4.17.1 Operating mode setting with remote control FBR6 connected

When remote control FBR6 is connected, the priorities of the operating mode must be observed:
- Controller operating mode: Automatic → selector switch on remote control applies
- Remote control operating mode: Off / Frost Protection → remote control operating mode has priority
- For all other remote control operating modes, the controller operating mode has priority

7.4.17.2 Operating mode setting with remote control FBR7 connected

If an FBR7 remote control is configured on the affected heating circuit, the operating mode can also be changed here.
The operating mode accepted on the controller is always the last input, either on the FBR7 or directly on the controller.
If the setting on the controller is changed, the updated operating mode is displayed on the remote control and vice versa.

7.5 Detailed configuration of room control

In addition to the "Heating curve control", the "Room control" function is used to control to the room setpoint using the room sensor.

For this type, either the connection of a room sensor or a FBR6/7 remote control is necessary (see "**3.11**" and "**7.4.15**").

An adjustable "room influence" determines how far the flow setpoint temperature of the heating circuit may deviate from the calculated heating curve.

By comparing the room actual value and room setpoint (= adjustable room set temperature plus the correction in general, heating circuit specific and remote control) and an adjustable control factor, the setpoint is either increased or decreased within this range.

In addition, with this function, the pump can be switched off if the flow setpoint undercuts an adjustable "threshold" due to the room control. The pump is switched on again when the setpoint exceeds the threshold.

Parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Pump shutoff from flow setpoint temp.	**110**	**153**	**193**	**256**	**317**	**380**	**441**	**504**

By default, this parameter is set to 10 °C.

As already described in section "**7.4.1**" and "**7.4.2**", the flow setpoint temperature is calculated according to the heating curve using the following formula:

$T_{FL(OT)}$ = HC*(20-OT)+FP + correction *2.8*HC

$T_{FL(OT)}$...heating circuit setpoint temperature
HC...set heating curve
OT...current or current averaged outside temperature
FP...set foot
Correction ... total heating circuit correction (sum of higher-level correction, heating circuit specific correction and potentiometer remote control)

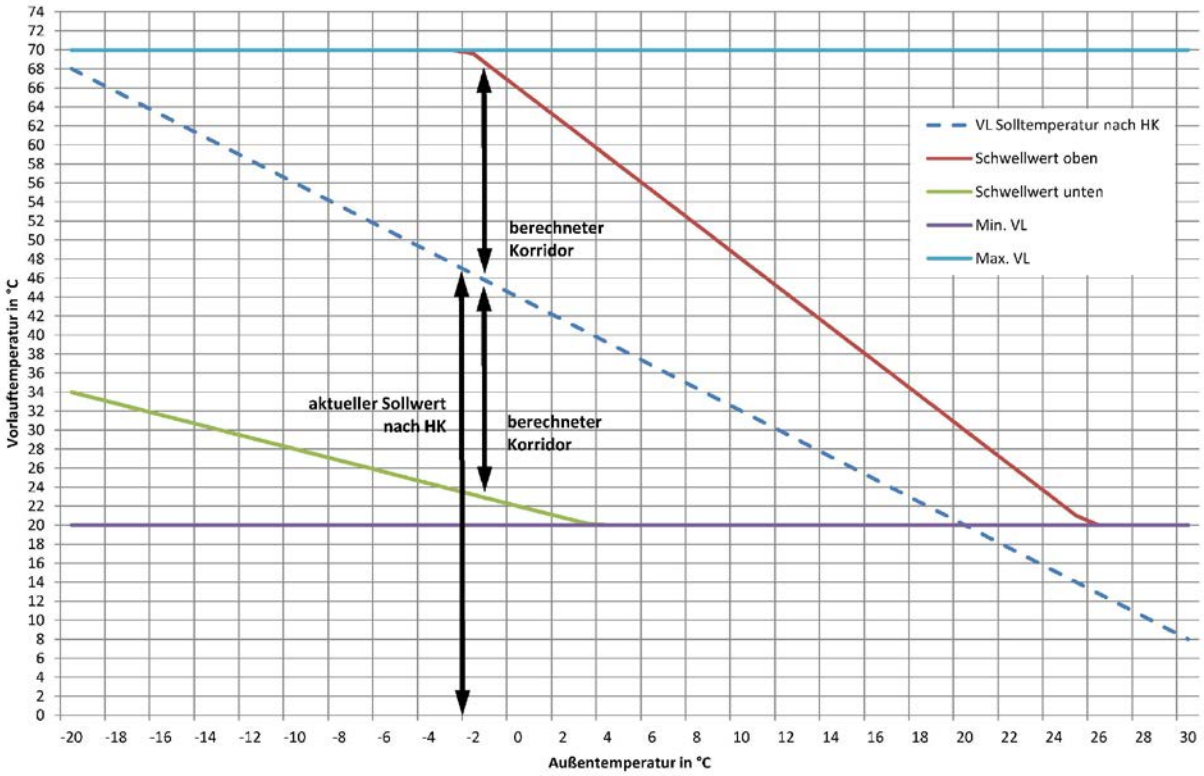
With the "Room influence" parameter, a "corridor" is defined as the control area of the room control. The setting in % refers to the currently calculated flow temperature according to the heating curve:

Corridor = room influence * (HC*(20-OT)+FP + correction*2.8*HC)

This calculated corridor applies both upwards and downwards from the calculated heating curve.

In addition to this corridor, the flow min. and max. limit applies as described in section "**7.4.3Setting min./max. flow heating circuit**".

The following diagram shows the corridor as an example:



For this example, the following settings were applied:
Heating curve: 1.2
Foot: 20°C
Correction: 0K
Max. Flow: 70°C
Min. flow: 20°C
Room influence: 50%

The heating circuit setpoint ultimately results from the control according to the room sensor:
If the sensor falls below the "room setpoint", the heating curve within the corridor is corrected upwards.
If the room setpoint is exceeded by the sensor, the heating curve within the corridor is corrected downwards.
If the corridor allows values < the "Pump deactivation from flow setpoint temp." setting parameter, the heating circuit pump might also be switched off in this phase.

A correction made on the remote control or on the controller changes the flow setpoint as described above and also the "setpoint room temperature".

An example:
Higher-level correction: 0K
HC-specific correction: -2K
Remote control potentiometer position: 4K
Room setpoint temperature: 20°C

The total correction is calculated from the sum of all corrections and is 2K in this example.
The new room setpoint temperature is therefore 22 °C.

The aggressiveness of the control (PI controller) is set with the adjustable "room factor", a smaller factor causes a slower change, a higher factor causes a more aggressive change of the heating curve within the corridor.
For poorly positioned room sensors (i.e. direct sunlight or falsification by drafts), a slower control is generally recommended.

The default setting is a factor of 100%, which is a good compromise between response and sensor positioning for most applications.

When setting the factor, the type of heating must be observed. Underfloor heating requires a considerably lower factor than heating by means of fans or radiators (for large rooms and fan heating, a factor of up to 500% can be set).

In order to correct a possible measurement error of the room sensor, an offset can be set for this sensor.

Shutoff as described in chap. "**7.4.6**" also applies here.

The sliding night reduction or the mixer control as described in chap. "**7.4.5**", "**7.4.8**" and "**7.4.9**" also applies.

The adjustable time program as described in chap. "**7.4.7**" also applies for the room control.
The correction relates to the flow setpoint and also to the room setpoint.

Parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Room setpoint temperature	**107**	**150**	**190**	**253**	**314**	**377**	**438**	**501**
Room influence	**108**	**151**	**191**	**254**	**315**	**378**	**439**	**502**
Room control factor	**109**	**152**	**192**	**255**	**316**	**379**	**440**	**503**
Room temperature offset	**993**	**994**	**998**	**1001**	**1003**	**1005**	**1007**	**1009**

7.6 Detailed configuration of room control with shutoff

The "room control with shutoff" configuration differs from the normal "room control" (see chap.**7.5**") only in that the heating circuit is deactivated from the transition of the heating time to the reduction time until the actual room temperature has reached the new room setpoint temperature. If, for example, a "reduction correction" of -4K is set, the room setpoint temperature will be reduced by 4K during the reduction time. The heating circuit pump is then deactivated until the actual room temperature has fallen by 4K.

7.7 Detailed configuration of room thermostat

This setting is used when the function of a room thermostat is to be achieved with a remote control (FBR6 or FBR7) or a PT1000 sensor connected to the room sensor input.

If the room sensor exceeds the current room setpoint (= adjustable room temperature plus the general correction, specific to the heating circuit and remote control) plus the "thermostat controller hysteresis", the heating circuit is deactivated.
If the room sensor falls below the current room setpoint, the heating circuit is reactivated and regulated according to the heating curve without the influence of the room sensor.

The room setpoint can be changed via the time program and the corrections (general, specific to the heating circuit or via the remote control), thus changing the on / off point.
In principle, a regulation according to the 4-pt. curve is possible if the room sensor falls below the room setpoint temperature.

For more exact configuration of the control in heating mode, see chap. "**7.4Detailed configuration of heating curve control**".

Parameters for room thermostat control:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Room setpoint temperature	**107**	**150**	**190**	**253**	**314**	**377**	**438**	**501**
Hysteresis at room thermostat control	**124**	**163**	**213**	**276**	**337**	**400**	**461**	**524**
Room temperature offset	**993**	**994**	**998**	**1001**	**1003**	**1005**	**1007**	**1009**

When remote control FBR6 is connected, the priorities of the operating mode must also be observed:
- Controller operating mode: Automatic → selector switch on remote control applies
- Remote control operating mode: Off / Frost Protection → remote control operating mode has priority
- For all other remote control operating modes, the controller operating mode has priority

When remote control FBR7 is connected, there are no priorities; the last set operating mode applies here.
Changing the operating mode on the controller is indicated on remote control FBR7 and vice versa.

7.8 Detail configuration of circulation pump

Heating circuit 1-8 or TC2 can be configured as a circulation pump (multiple configuration also possible). The hydraulic integration must be defined for every circulation pump:

0	Directly in the tank (factory setting)	Circulation is guided to the tank, no reheating, pump is switched on / off according to period and optionally according to circulation temperature
1	via LM1, time ON	Circulation is conducted via the charging module from boiler 1 and reheated. The pump is constantly in operation during the period, as an option reheating with the circulation sensor can be activated and deactivated.
2	via LM1, temp. OFF	Circulation is conducted via the charging module from boiler 1 and reheated. The pump and reheating are switched on / off according to the period and optionally according to the circulation temperature.
3	via LM2, time ON	Circulation is conducted via the charging module from boiler 2 and reheated. The pump is constantly in operation during the period, as an option reheating with the circulation sensor can be activated and deactivated.
4	via LM2, temp. OFF	Circulation is conducted via the charging module from boiler 2 and reheated. The pump and reheating are switched on / off according to the period and optionally according to the circulation temperature.
5	via LM1 + 2, time ON	Circulation is conducted via the charging module from boiler 1+2 and reheated. The pump is constantly in operation during the period, as an option reheating with the circulation sensor can be activated and deactivated.
6	via LM1 + 2, temp. OFF	Circulation is conducted via the charging module from boiler 1+2 and reheated. The pump and reheating are switched on / off according to the period and optionally according to the circulation temperature.
7	via FWM, time ON	Circulation is led through a fresh water module and reheated. The pump is constantly in operation during the period, as an option reheating with the circulation sensor can be activated and deactivated. Prerequisite for reheating is the "FS + Circ" selection for "FWM activation" parameter
8	via FWM, temp. OFF	Circulation is led through a fresh water module and reheated. The pump and reheating are switched on / off according to the period and optionally according to the circulation temperature. Prerequisite for reheating is the "FS + Circ" selection for "FWM activation" parameter

For integration types 1-8, the corresponding configuration of the boiler variant (charging module with a different circuit) or a fresh water module is required.

For the switching the circulation pump on / off or reheating using the circulation sensor, the corresponding configuration of the "circulation switch-on temperature" and the switch-off hysteresis are required:

Pump and / or reheating is activated when the circulation sensor falls below the "circulation switch-on temperature".

Pump and / or reheating is deactivated when the circulation sensor has exceeded the "circulation switch-on temperature" plus the "circ. switch-off hysteresis".

Optionally, the circulation pump can also be speed-controlled:
If the circulation sensor falls below the "switch-off temperature" (= switch-on temperature + switch-off hysteresis) minus the "temp band. pump control ", the pump is controlled with 100%.
If the temperature at the circulation sensor rises, the speed is reduced linearly until only the set "minimum speed" is specified when the "switch-off temperature" is reached.

To output the speed specification at the output, the "output definition" of the pump must be set to "PWM" or "PWM inv.".
For the heating circuits, the corresponding HC Multi variant is necessary (conversion to 0-10V if required via the HC Multi)
For tank circuit 2, the output is made with analogue output 2, here you can also set 0-10V directly.

Setting parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8	TC2
Circ. integration	**127**	**166**	**216**	**279**	**340**	**403**	**464**	**527**	**620**
Circulation switch-on temperature	**125**	**164**	**214**	**277**	**338**	**401**	**462**	**525**	**618**
Switch-off hysteresis	**126**	**165**	**215**	**278**	**339**	**402**	**463**	**526**	**619**
Pump output definition	**111**	**-**	**194**	**257**	**318**	**381**	**442**	**505**	**600**
Temp. band for pump control	**116**	**-**	**199**	**262**	**323**	**386**	**447**	**510**	**607**
Pump minimum speed	**113**	**-**	**196**	**259**	**320**	**383**	**444**	**507**	**602**

If a circulation pump with heating circuit 1 is to be speed-controlled, heating circuit 8 must be configured to "Analogue outputs", connection is made at output 3 of heating circuit 8 (via HC Multi).
Speed control with HC2 is no longer possible.

7.9 Setup of analogue inputs

In order to be able to use the analogue inputs, "AINx signal definition" must be configured for each analogue input (factory setting to "no input signal"). This signal definition also defines the signal type; the following input signals are possible:

- 0-10V
- 2-10V
- 0-5V
- 0-20mA
- 4-20mA

As soon as the signal definition of an analogue input is set to an input signal, a display image appears in the controller where the input signal of the analogue input is displayed.

In order to define the use of the analogue input, the "AINx function" parameter must be configured accordingly:

- Temp.- specification HCx
- Pressure prim. flow
- Pressure prim. return
- Differential pressure prim.
- pressure sec.
- primary valve position feedback
- Burner performance feedback
- Other display

If an external setpoint specification is implemented for a heating circuit, the analogue input must be set to "Temperature specification" for the respective circuit.

If a differential pressure sensor is detected via the analogue input, the function must be set to "Differential pressure prim.". The controller evaluates the pressure accordingly and transfers the pressure value to the visualisation for any necessary higher-level control functions. However, the value has no influence on the control itself.

If no differential pressure sensor is used and instead two relative pressure sensors are used for differential pressure detection,function setting "Pressure prim. flow" and "Pressure prim. return" must be set in the controller to define where which pressure sensor is connected so that the differential pressure is correctly calculated. However, the value has no influence on the control itself.

If a secondary pressure is detected via a relative pressure sensor, the "Pressure sec." selection should be made for correct display in the visualisation. However, the value has no influence on the control itself.

If necessary, primary valve position feedback for a transfer station configured with HC0 can be connected via an analogue input. The returned value is then displayed as a valve position on the controller and transmitted to the visualisation for any required higher-level control functions.

If a "burner" is controlled with heating circuit 0, performance feedback from the burner can be evaluated via an analogue input and transmitted to the visualisation.

For all other functions (evaluation of another function which is not relevant for the control), the "Other display" selection should be made.
If "Other display" is selected, a free text can be entered via a designation parameter for which the analogue input is used. (e.g. room humidity display ...)

Regardless of the function of the analogue input, the value range of the connected device must be set. The "initial value" and "final value" parameters are available for this.

If, for example, a 0-6 bar pressure sensor is connected, "0" must be set for the start value and "6" for the end value.

If necessary, an "offset" can also be entered for each analogue input. The offset already refers to the evaluated area.
If an offset of "0.5" is set with the pressure sensor in the example above, a pressure higher by 0.5 bar is displayed for the same input level.

So that the display on the controller and in the visualisation can be shown correctly, the "unit" of the measured variable can be set via a parameter (e.g. V, mA, bar, %, kW, ohm, ...).

Parameter:	AIN1	AIN 2
AINx signal definition	**748**	**759**
AINx function	**753**	**764**
AINx initial value	**749**	**760**
AINx end value	**750**	**761**
Offset AINx	**751**	**762**
AINx unit	**752**	**763**

7.10 Detailed configuration of external setpoint specification

If a heating circuit is set to "external setpoint specification", a temperature specification can be set at the heating circuit in combination with an analogue input via an analogue signal. With the pump output, a feeder pump or, if present (from HC2), temperature premixing can be implemented by means of mixer output and flow sensor via this circuit.
The temperature request is either passed onto the station or a configured buffer depending on the setting of the respective "Request HCx" (see chap. "**5.2**"). The "Boiler priority" setting is also valid for this heating circuit configuration (see chap.**5.2**").

If, for example, at analogue input 1, a 0-10V signal for 0-100°C is specified on the transfer station and HC1 should be used as a feed pump, the following parameters must be configured:

Parameter name:	**Number:**	**Setting value**
Heating circuit 1	**2**	Ext. setpoint specification
Request HC1	**12**	To station
Boiler priority HC1	**31**	No
AIN1 signal definition	**748**	0-10V
AIN1 function	**753**	temp. spec. HC1
AIN1 initial value	**749**	0°C
AIN1 end value	**750**	100°C
AIN1 offset	**751**	0K
AINx unit	**752**	°C

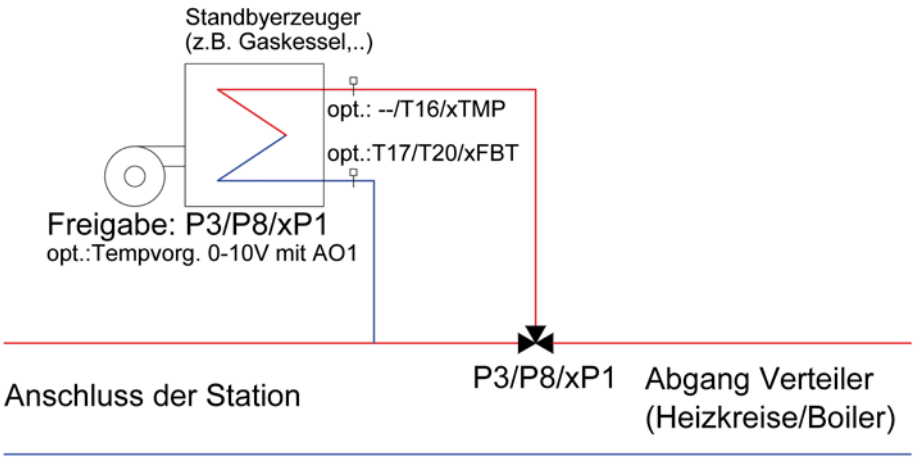
!ATTENTION!Even with this configuration, heating circuit deactivation according to the outside temperature (see chap.**7.4.6**") applies. If the shutoff goes into force, the specified setpoint is ignored, the pump output is deactivated and the mixer is closed.

If signals <10% are specified by the signal range, the external setpoint specification is deactivated (on / off threshold):

Signal input 0-10V: <1V off
Signal input 0-5V: <0.5V off
Signal input 2-10V: <2.8V off
Signal input 0-20mA: <2mA off
Signal input 4-20mA: <5.6mA off

In addition, the external setpoint specification can be activated / deactivated with priority over the specification signal via a potential-free contact at the associated FBS input to GND.
The specification logic can be defined with the "Remote control HCx" parameter, see chap. "**7.4.13**"

7.11 Detailed configuration of standby generator



If the transfer station is not sufficient for the sole supply of the distributor, a "standby generator" can be controlled as an additional power generator (the station remains in operation). A circuit can be set to "standby generator" for this purpose (attention: may only be configured for a circuit!).

The standby generator is connected (release with the pump output from the heating circuit set to standby) when the sec. flow sensor of the transfer station permanently falls below the sec. flow setpoint plus "hysteresis connection" for the duration of the "connection timeout" (usually set negative).

After the connection has been made, the release for the standby generator remains active for the set "minimum runtime".

Depending on the set "limit switching logic", the standby generator can be switched off again after the minimum runtime has elapsed according to the following criteria:

- "Temp reached" limit switching logic:

Standby generator is switched off when the sec. flow sensor of the station has exceeded the setpoint plus hysteresis limit switching.

- "Temp. err+power lower" limit switching logic:

Standby generator is switched off when the sec. flow sensor of the station has exceeded the setpoint plus hysteresis limit switching AND the station heat meter has fallen below the set "threshold power".

In addition to the connection and disconnection of the standby generator, a temperature request for the standby generator can be specified via the 0-10V signal output at analogue output 1, see chap. "**7.1.7**".

Parameter designation	**Parameter number**	**Factory setting**
Hysteresis connection	**663**	**-5K**
Limit switching hysteresis	**664**	**0K**
Connection timeout	**665**	**15min**
Minimum runtime	**666**	**30min**
Limit switching logic	**667**	**Temperature reached**
Threshold power	**668**	**100kW**

7.12 Detailed configuration of feeder pump

Two different feeder pump functions can be defined via the controller.
Each feeder pump function can then be configured on one or more heating circuits (or tank circuit 2).

The parameter "Activation feeder pump x" defines according to which criteria the feeder pump activates:

- Acc. to station request

The feeder pump activates as soon as the station (HK0) has a setpoint.

For example, this setting is used for a primary-side feeder pump or for a feeder pump for the entire secondary distributor (if no buffer is configured).

- Acc. to request at the buffer

The feeder pump activates as soon as a circuit or boiler sends a request to the buffer.

This setting is used, for example, for a distributor with a feeder pump coming from the buffer.

- After single line selection

With this selection, it can be individually defined for each circuit (heating circuits and tank circuit) whether or not the pump starts operating when the circuit is operating.
For example, this selection can be used for a pre-pressure pump in injection circuits.

Parameter:	Feeder pump 1	Feeder pump 2
Activation of feeder pump x?	**701**	**713**
Activation of feeder pump x with HC1?	**702**	**714**
Activation of feeder pump x with HC2?	**703**	**715**
Activation of feeder pump x with HC3?	**704**	**716**
Activation of feeder pump x with HC4?	**705**	**717**
Activation of feeder pump x with HC5?	**706**	**718**
Activation of feeder pump x with HC6?	**707**	**719**
Activation of feeder pump x with HC7?	**708**	**720**
Activation of feeder pump x with HC8?	**709**	**721**
Activation of feeder pump x with TC1?	**710**	**722**
Activation of feeder pump x with TC2?	**711**	**723**

7.13 Detailed configuration of differential controller

The differential controller can be used for a special function referring to two adjustable references.

Main function:
Pump output ON, if reference 1 > reference 2 plus "Differential controller hysteresis"
Pump output OFF if reference 1< reference 2 (prerequisite: "Minimum runtime" has expired)

In addition to the main function, the differential controller can be locked via a potential-free contact, see chap. "**7.4.13**". If the lock is released and the differential controller activates, the minimum runtime starts again.

Furthermore, a deactivation according to the outside temperature can be set with priority over the main function, see chap. "**7.4.6**". With this function, however, only the "OT shutoff temp. in the heating period " is used regardless of the time program.

All sensor values, the values of the two analogue inputs, the setpoint of the transfer station, the setpoint of tank circuit 2 (buffer) and the setpoints of heating circuits 1-5 can be set as a reference.

The frost protection function of the controller has no influence on the differential controller.

Setting parameter:	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Reference 1	**130**	**167**	**217**	**280**	**341**	**404**	**465**	**528**
Reference 2	**131**	**168**	**218**	**281**	**342**	**405**	**466**	**529**
Differential controller hysteresis	**132**	**169**	**219**	**282**	**343**	**406**	**467**	**530**
Minimum runtime	**133**	**170**	**220**	**283**	**344**	**407**	**468**	**531**

7.14 Detailed configuration of second pump

If, for example, heating circuit 1 is set to "second pump to HK2" (analogous to HC3, 5 and 7 for main circuits 4, 6 and 8), a double pump system can be activated together with heating circuit 2.
Here, the second pump is connected to the pump output of heating circuit 1 (output 3) and the main pump is connected to the pump output of heating circuit 2 (output 8) (analogous to all other circuits).

For correct operation, two potential-free contacts of the pump errors must be connected to the "second pump circuit". The switching logic is designed to be break-proof (contact closed→ error inactive, contact open→ error active).

For HC1 at "second pump for HC2":
FBS1 and GND: Error of main pump (HC2)
T17 and GND: Error of second pump (HC1)

For HC3 at "second pump for HC4“:
FBS3 and GND: Error of main pump (HC4)
3FBT and GND: Error of second pump (HC3)

For HC5 at "Second pump for HC6"
FBS5 and GND: Error of main pump (HC6)
5FBT and GND: Error of second pump (HC5)

For HC7 at "second pump for HC8“:
FBS7 and GND: Error of main pump (HC8)
7FBT and GND: Error of second pump (HC7)

If pumps without error outputs are used, the two error inputs must be bridged.
If the bridge is not made or there is an error in both pumps, there can be no reordering, the currently active pump remains in operation.

In addition to disturbance reordering, regular reordering can take place after operating hours. The number of operating hours per double pump system can be set with one parameter.
Furthermore, there is also a manual operating parameter to avoid reordering (e.g. in case of a pump error): "main pump only", "second pump only" or "automatic reordering".
Automatic reordering works logically only if the manual operating parameter is set to "automatic reordering".

The output definition or manual mode of the pump itself is done with the parameter of the main pump.

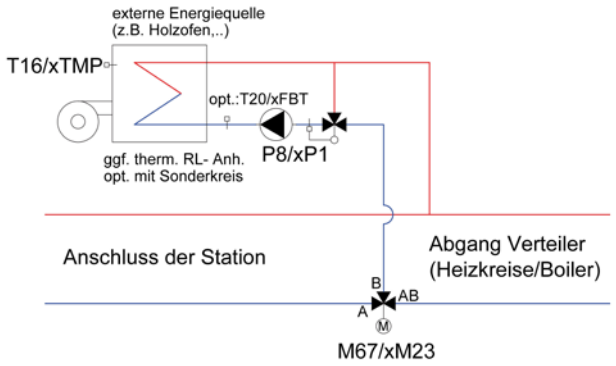
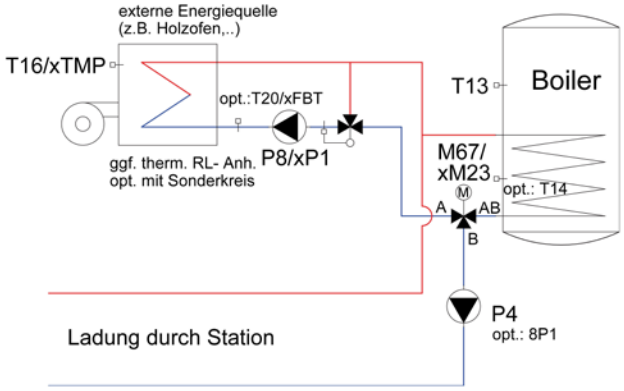
Setting parameter:

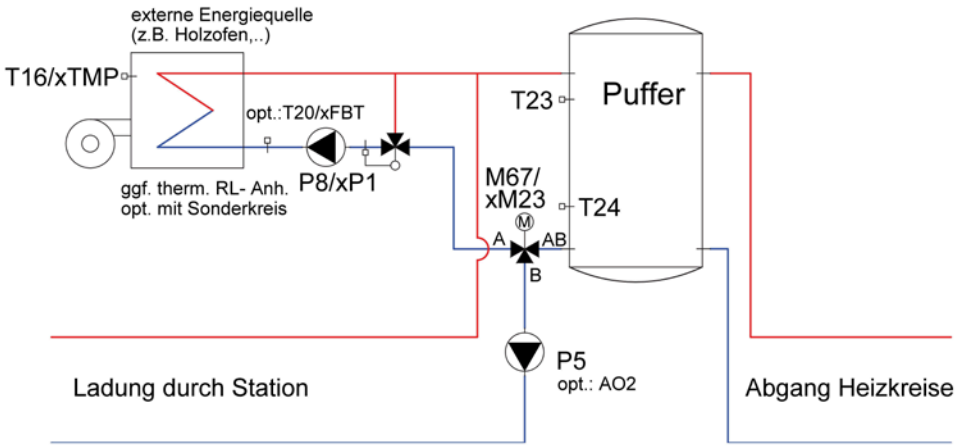
	HC1	HC3	HC5	HC7
Pump selection with double pump	**128**	**224**	**348**	**472**
Operating hours for reordering	**129**	**225**	**349**	**473**

7.15 Detailed configuration of external energy source

If an alternative energy generator is integrated into the station, a circuit can be set to the "External energy source" function (multiple configuration not possible!).

With parameter **650**, the hydraulic integration of the external energy source must be defined as shown in the following schematic diagrams:

External energy source on distributor ("RT switching to distributor" selection)	External energy source in tank circuit 1 (boiler) ("RT switching in TC1" selection)
	

External energy source in tank circuit 2 (buffer without boiler) ("RT switching in TC2" selection)


Depending on the setting of the hydraulic integration, another reference for the connection of the energy source is used:

- With return switching to the distributor, the sec. flow setpoint of the station applies as the reference
- For return switching in TC1 or TC2, the respective upper tank actual temperature is used as a reference.

In general, the energy source is "connected" via the mixer output (mixer OPEN is permanently switched) if the boiler sensor (flow sensor input from the heating circuit) is higher than the "reference" (sec. flow setpoint temperature or actual tank temperature) plus "switching to energy source hysteresis".

With parameter **657** , regardless of the integration of the external energy source, it can also be determined whether the station (HK0) should remain in operation or be deactivated during operation of the external energy source.

If the boiler sensor of the external energy source falls below the reference plus "Hysteresis switchback to station", the external energy source is switched off again (mixer CLOSED is permanently switched) and any deactivated station with HC0 is put into operation again.

Comparing the control with the schematic representations, the following valve positions are assigned to the outputs:

Mixer output switched OPEN (output 6 or output 2 of a heating circuit module): AB-A position
Mixer output switched CLOSED (output 7 or output 3 of a heating circuit module): AB-B position

If the external energy source is integrated into a tank circuit, tank charging is prevented during operation of the energy source, the charging pump of the tank (P4 or P5) is deactivated for this period.

In addition to the connection based on the reference (sec. flow setpoint or actual tank temperature), connection can also be carried out due to an adjustable temperature threshold ("fixed switchover temp." parameter).
If a connection is made on the basis of the "fixed switching temp.", it is switched back again if the boiler sensor falls below the "fixed switching temp." by the "switchback to station hysteresis".

As an alternative to switching to the temperature reference, the connection can also be made via a potential-free contact: If the boiler sensor input (= flow sensor input of the heating circuit) is connected to GND, the external energy source is connected for the duration of the applied contact.

Regardless of the activation of the switching valve, a boiler pump can also be controlled:
If the boiler sensor exceeds the set "Switch-on temp. of boiler pump ", the boiler pump (= pump output of the heating circuit) is switched on.
After switching on, the boiler pump remains in operation at least for the set "min. boiler pump runtime".
After the min. runtime has elapsed, the boiler pump remains in operation until it has fallen below the set "Switch-on temperature of boiler pump" from the boiler sensor.

Regardless of the regular switching of the valve (reference temperature, fixed connection temperature, contact connection), an overtemperature protection function is available:
If the boiler sensor exceeds the adjustable "overtemperature", (if not already done) the system switches to the energy source and all hydraulically connected heating circuits are controlled to the set max. flow temperature and a hydraulically connected boiler switches to disinfection mode.

If an external energy source is connected to the distributor, all circuits or boilers requesting at the station are affected.
If an external energy source is connected to the TC2. all circuits or boilers requesting at tank circuit 2 are affected.
If an external energy source is connected to TC1, an overtemperature function is not possible in this form.

Overtemperature mode is ended when the boiler sensor falls below the "overtemperature" setting by 5K.

Parameter designation	Parameter number	Factory setting
Integration of the ext. energy source	**650**	RT switching to dist.
switch-on temp. Boiler pump	**651**	40°C
Min. runtime of boiler pump	**652**	10min
Hyst. Switching to energy source	**653**	5K
Hyst. Switchback to station	**654**	-5K
Excess temperature	**655**	90°C
Fixed switching temperature	**656**	75°C
Station OFF when operating ext. energy source	**657**	YES

7.16 Detailed configuration of error output

If a heating circuit (only from heating circuit 2, multiple configuration not possible) is set to "error outputs", three freely selectable "sum errors" can be output via the three switching outputs of the respective heating circuit from a permanently programmed list of errors.
In addition, all existing errors in the menu of the error outputs can be "scrolled through" with the current status display.

The following output logic is used: Output active with active error.

All errors are self-acknowledging if the error does not occur again.

The following parameters can be used to select the output at which the error is to be output:

Parameter number	Parameter designation
939	Station in RT limit (longer than 30min)
940	Station in power limit (longer than 30min)
941	Primary valve does not close (flow despite closed valve, at 60min without heat request flow >20lph)
942	Overtemperature ext. energy source (immediate error output)
943	Burner overtemperature with HC0 (immediate error output)
944	Fresh water module overtemperature (the adjustable setpoint falls below 10K for a duration of 15min)
945	RT limit charging module 1 (longer than 30min)
946	RT limit charging module 2 (longer than 30min)
947	Meter communication error (only station meter) longer than 15min
948	HM not counting (no power despite flow)
949	Setpoint not reached sec. flow station (actual value 10 °C below setpoint for a duration of 15 minutes)
950	Setpoint not reached HC2 (5°C under setpoint for a duration of 10min)
951	Setpoint not reached HC3 (5°C under setpoint for a duration of 10min)
952	Setpoint not reached HC4 (5°C under setpoint for a duration of 10min)
953	Setpoint not reached HC5 (5°C under setpoint for a duration of 10min)
954	Setpoint not reached HC6 (5°C under setpoint for a duration of 10min)
955	Setpoint not reached HC7 (5°C under setpoint for a duration of 10min)

956	Setpoint not reached HC8 (5°C under setpoint for a duration of 10min)
957	Measurement error T10 (measured below -40° C or over 120° C for longer than 2min)
958	Measurement error T11 (measured below -40° C or over 120° C for longer than 2min)
959	Measurement error T12 (measured below -40° C or over 120° C for longer than 2min)
960	Measurement error T13 (measured below -40° C or over 120° C for longer than 2min)
961	Measurement error T14 (measured below -40° C or over 120° C for longer than 2min)
962	Measurement error T15 (measured below -40° C or over 120° C for longer than 2min)
963	Measurement error T16 (measured below -40° C or over 120° C for longer than 2min)
964	Measurement error T17 (measured below -40° C or over 120° C for longer than 2min)
965	Measurement error T20 (measured below -40° C or over 120° C for longer than 2min)
966	Measurement error T23 (measured below -40° C or over 120° C for longer than 2min)
967	Measurement error T24 (measured below -40° C or over 120° C for longer than 2min)
968	Measurement error 3TMP (measured below -40° C or over 120° C for longer than 2min)
969	Measurement error 3FBT (measured below -40° C or over 120° C for longer than 2min)
970	Measurement error 4TMP (measured below -40° C or over 120° C for longer than 2min)
971	Measurement error 4FBT (measured below -40° C or over 120° C for longer than 2min)
972	Measurement error 5TMP (measured below -40° C or over 120° C for longer than 2min)
973	Measurement error 5FBT (measured below -40° C or over 120° C for longer than 2min)
974	Measurement error 6TMP (measured below -40° C or over 120° C for longer than 2min)
975	Measurement error 6FBT (measured below -40° C or over 120° C for longer than 2min)
976	Measurement error 7TMP (measured below -40° C or over 120° C for longer than 2min)
977	Measurement error 7FBT (measured below -40° C or over 120° C for longer than 2min)
978	Measurement error 8TMP (measured below -40° C or over 120° C for longer than 2min)
979	Measurement error 8FBT (measured below -40° C or over 120° C for longer than 2min)
980	Com. fail FBR7 (no response from a FBR7 remote control for 15min)
981	Com. fail. sub-con (no answer from a sub-controller for 15min)
982	TC1 desinf. temp. not reached (if, after the end of the period or at 12:00 am, the set temperature has not been reached, the error is active until the next successful disinfection)
983	TC3 desinf. temp. not reached (if, after the end of the period or at 12:00 am, the set temperature has not been reached, the error is active until the next successful disinfection)

For all parameters either "no output", "output 1", "output 2" or "output 3" can be selected.

In the case of heating circuit 2, the following outputs are affected:
"Output 1" selection: Switching output 8 of the basic controller
"Output 2" selection: Switching output 6 of the basic controller
"Output 3" selection: Switching output 7 of the basic controller

For heating circuits 3-8, the assignment is the same.

Parameter **984** "Output logic of error outputs" defines whether the outputs are switched on or off when the error is active:
For ON error: Error present→ output ON, error not present→output OFF
For OFF error:Error present→ output OFF, error not present→output ON

7.17 Detailed configuration of signal inputs

If a circuit is set to "signal inputs", three potential-free messages can be applied to the controller for display and visualisation.
This configuration is possible as of heating circuit 2, with this function multiple configuration is also permitted.
Thanks to the multiple configuration (heating circuits 2 to 8 used as "signal inputs"), up to 21 digital messages can be recorded.

For each signal, a free designation can be entered in the controller, which is also transmitted to the visualisation.
Furthermore, an "input logic" per contact can be specified. According to this logic, the contacts are also switched with the associated outputs (looping of the contact possible).

For heating circuit 2, the following inputs / outputs are linked:

T16 and GND	Output 8 of the basic controller
T20 and GND	Output 6 of the basic controller
FBS21 and GND	Output 7 of the basic controller

For all other heating circuits, the following inputs / outputs are linked:

xTMP and GND	xP1 (HCx-1)
xFBT and GND	xM2 (HCx-2)
FBSx and GND	xM3 (HCx-3)

Setting parameter:	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Signal 1 logic	**171**	**221**	**284**	**345**	**408**	**469**	**532**
Signal 2 logic	**172**	**222**	**285**	**346**	**409**	**470**	**533**
Signal 3 logic	**173**	**223**	**286**	**347**	**410**	**471**	**534**

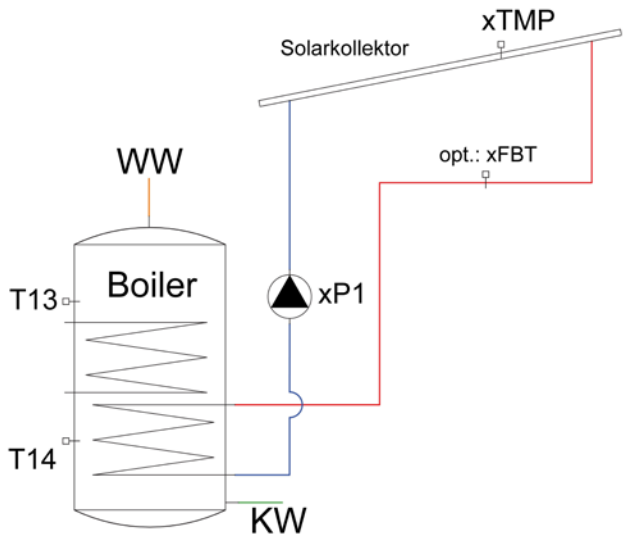
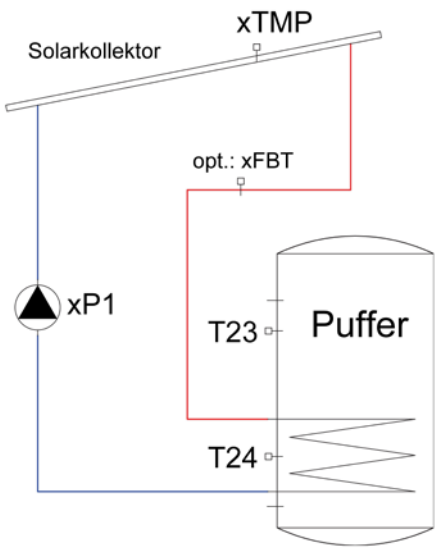
The logic of all messages are set to "contact open → output ON " at the factory.

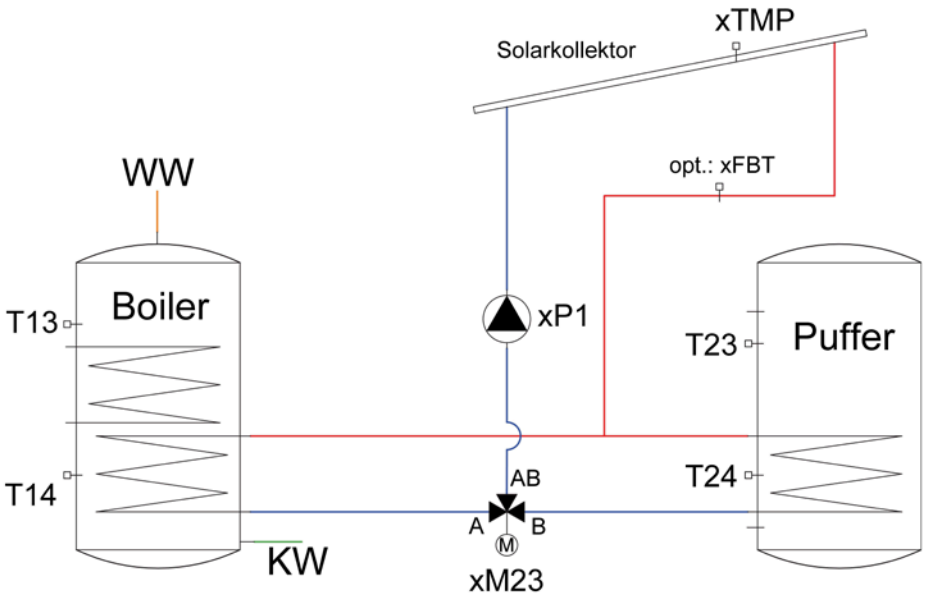
The status of the output is shown on the display of the controller (box rotates when the output is switched).

7.18 Detailed configuration of solar system

If a solar system is also to be integrated into the transfer station, there are several hydraulic variants to choose from which are already selected via the basic configuration of the heating circuit.
The solar system can be configured from heating circuit 3, but no multiple configuration is permitted here (only one heating circuit may be installed on the solar system).

The following hydraulic variants are available:

Solar in TC1	Solar in TC2
	

Solar in TC 1 + 2 (with priority switching)


Both tank sensors are required in the tank in which the solar system charges.
With the variant in both tank circuits, logically both tanks also need the lower sensor.

7.18.1 General control function of solar system

The solar system works as a pure "differential controller" between the lower tank sensor and the collector sensor.
If the collector sensor exceeds the actual value of the lower tank sensor plus the "switch-on difference of coll. / tank lower", the solar pump is activated.
The solar pump then remains in operation for at least the set "Min. runtime of solar pump".
After expiration of the minimum runtime, it can be deactivated by one of the following criteria:

- The difference between lower collector and tank falls below the set "Switch-on difference of coll. / tank lower" by 3K
- The collector sensor exceeds the set "Max. collector temp.“
  (switching on again permitted if the collector sensor falls 5K below the "Max. collector temp.)
- The lower tank sensor exceeds the respective "Max. tank temp. lower"
  (switching on again permitted if the tank sensor falls 3K below the "Max. tank temp.)

If parameter "Tank charging interrupted during solar operation " is activated, recharging of the tank by the station is prevented (tank charging pump off and no temperature request).
Recharging is also prevented if, for example, the set minimum temperature has already been undercut.

Mapped pump xP1 can optionally also be speed-controlled in addition to the on / off release, therefore it is necessary to specify the type of control, see chap. "**7.18.2**".

If the pump is only switched on / off, a solar flow sensor does not have to be connected.
If the pump is also speed-controlled, a solar flow sensor is absolutely necessary because the control of the pump refers to the difference between the solar flow sensor and the lower tank sensor.

The setting of the "Temperature band solar pump control" is also necessary for controling the pump. This temperature band defines the control characteristic:

- When the above condition is activated, the pump will be activated at 100% for 1 minute.
- At the end of the minute, the difference between the solar flow sensor and the lower tank sensor is used for the control: ΔT_sol control = solar flow - lower tank sensor [K]

ΔT_sol control = 0 or negative	"Minimum speed"
ΔT_sol control = "Temperature band solar pump control" / 2	(100% - "minimum speed") / 2
ΔT_sol control = "Temperature band solar pump control"	100%

All intervening points are interpolated in a linear manner.

If solar charges in both tanks, in addition to the pump, a solar switching valve can also be controlled.
In principle, instead of the switching valve, a second pump can be controlled. One relay each must be switched with the outputs of the switching valve. The switching contact of the relay is then switched in series for potential-free release or 230V control of the pump, the control signal is applied to both pumps.

When charging into both tanks, a "charging priority" must be set. The tank set here will be loaded first until it reaches its "Max. tank temp. lower". When reaching the "Max. tank temp." of the prioritised tank, the switching valve is switched to the second tank. If the "prioritised" tank falls below its "Max. charging temp lower" by 3K during charging of the second tank, it is switched back until the tank has reached the "Max. tank temp. lower" again.
Regardless of the charging priority, the control of the switching valve works.

Mixer output CLOSED (xM3) switched:	Charging in tank circuit 1
Mixer output OPEN (xM2) switched:	Charging in tank circuit 2

If necessary, the switching valve of the solar system can also be switched with a 0-10V signal, so it is also necessary to define the type of control here, see chap. "**7.18.3**"

Parameter designation	Parameter number	Factory setting
Switch-on difference of coll. / tank lower	**637**	15K
Max. collector temp.	**638**	120°C
Max. tank temp. 1 lower	**639**	75°C
Max. tank temp. 2 lower	**640**	75°C
Temperature band solar pump control	**641**	10K
Charging priority	**642**	Tank circuit 1
Tank charge interrupted during solar op?	**643**	No
Min. solar pump runtime	**644**	5min

7.18.2 Output definition (switching / PWM / 0-10V) and manual mode of solar pump

With the parameter "Output definition pump HCx", the output definition for the pump used can be defined.

	HC3	HC4	HC5	HC6	HC7	HC8
Output definition pump HCx	**200**	**263**	**324**	**387**	**448**	**511**

By default, this parameter is set to "Switching contact". In this configuration, a switching signal is output via outputs xP1 (on / off).

If the respective Multi heating circuit module is installed, the parameter can be set to "PWM" or "PWM inv" for PWM or 0-10V control of the pump.

PWM or 0-10V control is only possible from heating circuit 3 with the corresponding Multi heating circuit module variant, see chap. **3.4** to **3.10**.

The "PWM" selection means a 100% output for the maximum speed and a 0% output for a switched-off pump; if an inverted output is required, selection " PWM inv" is made.

The actual setting, whether 0-10V or PWM output, is made via the HC Multi, selection "PWM" is made in both cases for the controller.

For a "switched" pump, the following parameters are available for manual mode:

	HC3	HC4	HC5	HC6	HC7	HC8
Manual mode	**198**	**261**	**322**	**385**	**446**	**509**

ATTENTION! In manual mode, there is no control and no frost protection!

With a pump controlled via PWM / 0-10V, it is also possible to set a minimum speed:

	HC3	HC4	HC5	HC6	HC7	HC8
Min. speed pump HCx	**196**	**259**	**320**	**383**	**444**	**507**

ATTENTION! If the pump is both controlled and released by the HC Multi (on / off with the release relay), a min. speed >10% must be set.

If the pump is controlled with a PWM signal, the frequency can be set via the following parameters.

	HC3	HC4	HC5	HC6	HC7	HC8
PWM frequency HCx-1	**195**	**258**	**319**	**382**	**443**	**506**

(With 0-10V output with HC Multi. use setting 100Hz)

For a speed-controlled pump, the following parameters are available for manual mode (0-100% and auto):

	HC3	HC4	HC5	HC6	HC7	HC8
0-100% manual mode	**197**	**260**	**321**	**384**	**445**	**508**

ATTENTION! In manual mode, there is no control and no frost protection!

7.18.3 Output definition of solar switching valve (3-pt./constant) and manual mode

With the "Output definition mixer HCx" parameter, the output definition for the switching valve used can be defined.

	HC3	HC4	HC5	HC6	HC7	HC8
Output definition mixer HCx	**200**	**263**	**324**	**387**	**448**	**511**

By default, this parameter is set to "3-pt. HCx-23 ". With this configuration, a 3-pt. signal is output via outputs xM2 (open) and xM3 (closed) .

If the respective Multi heating circuit module is installed, the parameter can be set to "PWM" or "PWM inv" for PWM or 0-10V control of the mixer.

PWM or 0-10V control is only possible from heating circuit 3 with the corresponding Multi heating circuit module variant, see chap. **3.4** to **3.10**.

The "PWM" selection means a 100% output for a fully open valve and a 0% output for a closed valve; if an inverted output is required (closed 100%, open 0%), selection " PWM inv" is made.

The actual setting, whether 0-10V or PWM output, is made via the HC Multi, selection "PWM" is made in both cases for the controller.

For a 3-pt-controlled mixer, the parameters are available for manual mode:

	HC2	HC3	HC4	HC5	HC6	HC7	HC8
3-pt. Manual mode	**155**	**203**	**266**	**327**	**390**	**451**	**514**

ATTENTION! In manual mode, there is no control and no frost protection!

With a mixer controlled via PWM / 0-10V, a minimum position can also be set:

	HC3	HC4	HC5	HC6	HC7	HC8
Min. specification of continuous mixer	**202**	**265**	**326**	**389**	**450**	**513**

When controlling the switching valve, this parameter must be set to "0".

If the mixer is controlled with a PWM signal, the frequency can be set via the following parameters.

	HC3	HC4	HC5	HC6	HC7	HC8
PWM frequency HCx-2	**201**	**264**	**325**	**388**	**449**	**512**

(With 0-10V output with HC Multi. use setting 100Hz)

For a continuously controlled mixer, the following parameters are available for manual mode (0-100% and auto):

	HC3	HC4	HC5	HC6	HC7	HC8
Constat manual mode	**204**	**267**	**328**	**391**	**452**	**515**

ATTENTION! In manual mode, there is no control and no frost protection!

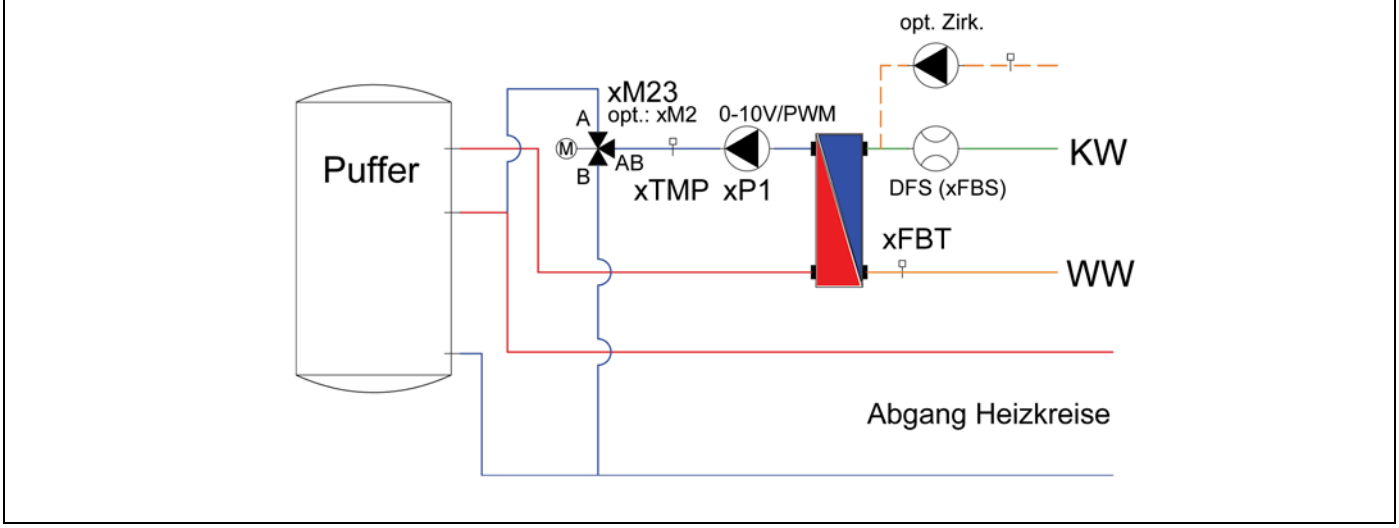
7.18.4 External activation of solar system

If collector sensor input xTMP is connected to GND by means of potential-free contact, the solar system is in operation for the duration of the applied contact. Solar pump control on the flow sensor or tank switching is still possible with this function

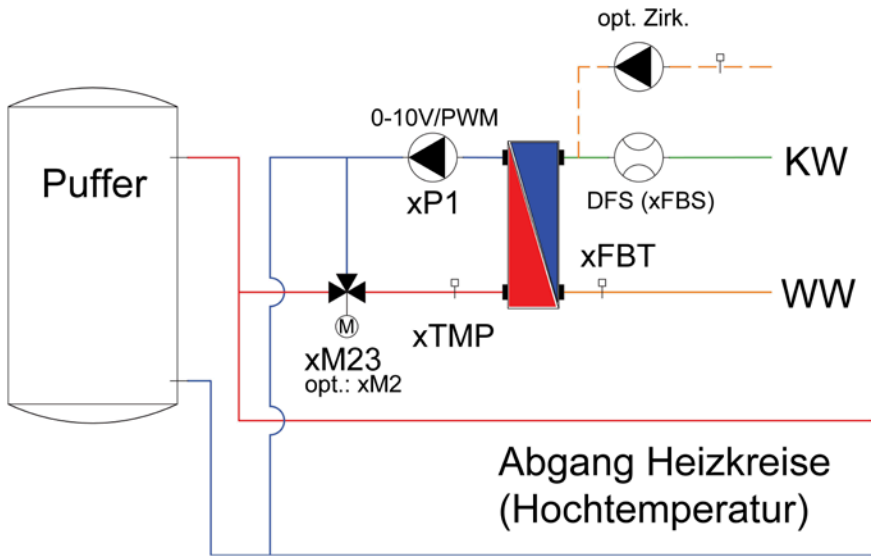
7.19 Detailed configuration of sec. fresh water module

If drinking water is prepared via one (or several) fresh water module(s), a fresh water module can be configured from HC3.
In general, three different hydraulic variants are possible per FWM, as shown below.
The hydraulic variant is defined with the "Use of mixer output FWM" parameter.

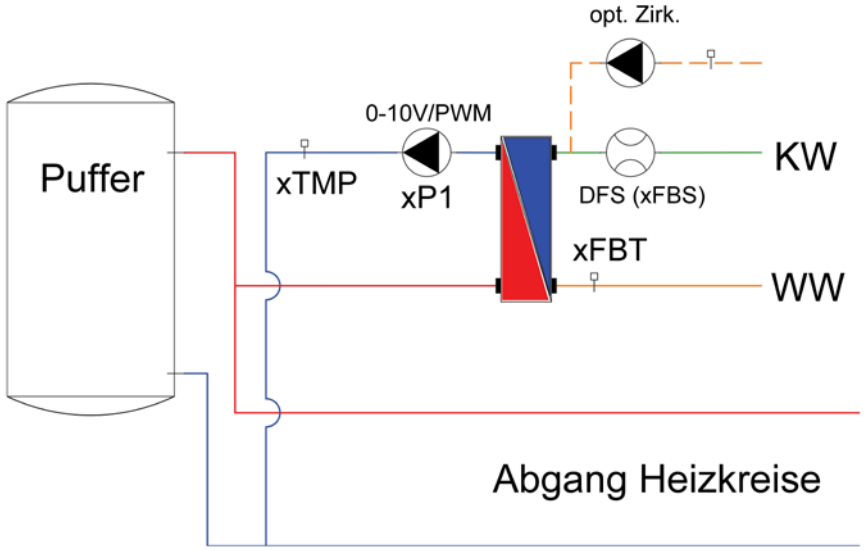
FWM with prim. return switching



FWM with prim. flow premixing



Direct FWM (no use from mixer output)



7.19.1 General control function of fresh water module

Regardless of the use of the mixer output, the xP1 pump controls to the hot water setpoint temperature with speed control by means of a PI controller. Since large leaps in power can occur especially in the case of a tap and rapid control is therefore necessary, the xFBT sensor must be implemented as a fast-response direct dip sensor, as shown in the diagram.

Since the hot water temperature is controlled with the pump, the corresponding HC Multi variant is necessary, see chap. "**3.5**" to "**3.10**".

The "Activation FWM" parameter must determine according to which criteria the FWM (consequently the pump) goes into operation:

- FS — Fresh water module is only active if the flow sensor or switch has detected a "tap"
- FS + circ FWM — Fresh water module is active when either a circulation pump configured to the FWM is in operation or the flow sensor or switch detects a "tap".

If the fresh water module is activated via the flow sensor / switch, the "Pump duration 100% with FS FWM" parameter can be used to set how long the pump should run at 100% until it goes into normal control mode.

In order for a connected flow switch / sensor to be correctly evaluated, the "BCM / FWM flow sensor type" must be set correctly. This parameter is set to "switch" by default - this setting must be made for all variants where no sensor evaluation takes place via the HC Multi expansion module (variants 1c, 8o, 11b and 12). For flow sensor evaluation (measurement in l / min), the corresponding type must be set. When evaluating a flow sensor, "FS control influence" determines how much a flow change affects the control (the higher the percentage setting, the more aggressive the pump controller will react to a flow change).

The "FWM request" parameter must specify where the fresh water module requests the temperature (one of the two tank circuits or standalone).

The requested temperature corresponds to the current hot water setpoint temperature (either "HW setpoint temp. FWM" or "Disinfection temp. FWM" setting parameter) plus the "FWM request hysteresis".

If the tank is currently at a lower temperature than requested, the current hot water setpoint temperature will be temporarily lowered to the upper tank actual temperature minus the "FWM request hysteresis". For the FWM status (top right), the abbreviation "SA" (setpoint temperature reduction) stands for this operating case.

If, despite control of the pump, high temperatures occur at the hot water outlet of the heat exchanger, if the current hot water setpoint temperature plus "Hysteresis shutoff FWM pump" is exceeded, the pump is deactivated until the hot water sensor falls below the hot water setpoint temperature plus the "Pump switch-on hysteresis". During deactivation of the pump, operating status "ü" (overtemperature) is displayed in the top right.

For control of the mixer or switching valve, the "Hysteresis prim. setpoint" parameter is available. When using the output as a premixer, this parameter is used as temperature increase for the prim. flow setpoint of the FWM. If, for example, the current HW temperature is 60 °C and the hysteresis is set to 5K, the premixer would control to 65 °C with the prim. flow sensor.
If the mixer output is used as a switching valve, the hysteresis defines the "switching threshold", the switching threshold corresponds to the current HW setpoint plus the "Hysteresis prim. setpoint" (set to be negative). If the prim. return temperature is above the switching threshold, output CLOSED (xM3) is permanently actuated, the switching valve as shown above must assume position AB-A for this control. If

the prim. return temperature is below the switching threshold, output OPEN (xM2) is permanently actuated, the switching valve as shown above must assume position AB-B for this control.

For disinfection of the fresh water module, a "Disinfection temp. FWM" can be set.
During disinfection, this set value applies as the set HW temperature.
Disinfection can be done either via the adjustable operating mode, via a potential-free contact or via an adjustable time program.
Depending on the type of disinfection, the "DM" (disinfection based on operating mode), "DK" (disinfection based on contact) or "DZ" (disinfection based on time program) operating status is displayed on the top right of the screen.

To allow disinfection to be done during the period, the "Autom. disinf acc. to heating time" parameter must be set to "Yes". The heating times of the respective heating circuit then count as disinfection times (if the time is set to "heating time", the disinfection is active).

Parameter:	HC3	HC4	HC5	HC6	HC7	HC8
FWM request	**226**	**287**	**350**	**411**	**474**	**535**
FWM activation	**227**	**288**	**351**	**412**	**475**	**536**
HW setpoint temp. FWM	**228**	**289**	**352**	**413**	**476**	**537**
FWM prim. setpoint hysteresis	**229**	**290**	**353**	**414**	**477**	**538**
FWM request hysteresis	**230**	**291**	**354**	**415**	**478**	**539**
FWM pump shutoff hysteresis	**231**	**292**	**355**	**416**	**479**	**540**
FWM pump switch-on hysteresis	**232**	**293**	**356**	**417**	**480**	**541**
Pump duration 100% at FS FWM	**233**	**294**	**357**	**418**	**481**	**542**
Autom. disinf acc. to heating time FWM	**234**	**295**	**358**	**419**	**482**	**543**
Disinfection temp. FWM	**235**	**296**	**359**	**420**	**483**	**544**
Use of FWM mixer output	**236**	**297**	**360**	**421**	**484**	**545**
BCM/FWM flow sensor type	**177**	**301**	**364**	**425**	**488**	**549**
FS control influence	**178**	**302**	**365**	**426**	**489**	**550**

7.19.2 Output definition (switching / PWM / 0-10V) and manual mode of FWM pump

With the parameter "Output definition pump HCx", the output definition for the pump used can be defined.

	HC3	HC4	HC5	HC6	HC7	HC8
Output definition pump HCx	**200**	**263**	**324**	**387**	**448**	**511**

By default, this parameter is set to "Switching contact". In this configuration, a switching signal is output via outputs xP1 (on / off).

If the respective Multi heating circuit module is installed, the parameter can be set to "PWM" or "PWM inv" for PWM or 0-10V control of the pump.

PWM or 0-10V control is only possible from heating circuit 3 with the corresponding Multi heating circuit module variant, see chap. **3.4** to **3.10**.

The "PWM" selection means a 100% output for the maximum speed and a 0% output for a switched-off pump; if an inverted output is required, selection " PWM inv" is made.
The actual setting, whether 0-10V or PWM output, is made via the HC Multi, selection "PWM" is made in both cases for the controller.
For a "switched" pump, the following parameters are available for manual mode:

	HC3	HC4	HC5	HC6	HC7	HC8
Manual mode	**198**	**261**	**322**	**385**	**446**	**509**

ATTENTION! In manual mode, there is no control and no frost protection!

With a pump controlled via PWM / 0-10V, it is also possible to set a minimum speed:

	HC3	HC4	HC5	HC6	HC7	HC8
Min. speed pump HCx	**196**	**259**	**320**	**383**	**444**	**507**

ATTENTION! If the pump is both controlled and released by the HC Multi (on / off with the release relay), a min. speed >10% must be set.

If the pump is controlled with a PWM signal, the frequency can be set via the following parameters.

	HC3	HC4	HC5	HC6	HC7	HC8
PWM frequency HCx-1	**195**	**258**	**319**	**382**	**443**	**506**

(With 0-10V output with HC Multi. use setting 100Hz)

For a speed-controlled pump, the following parameters are available for manual mode (0-100% and auto):

	HC3	HC4	HC5	HC6	HC7	HC8
0-100% manual mode	**197**	**260**	**321**	**384**	**445**	**508**

ATTENTION! In manual mode, there is no control and no frost protection!

7.19.3 Control characteristic of FWM pump

The control characteristic can be set with the following parameters:

Designation	**Factory setting**
Timer pump HCx	5s
P-factor pump HKx	20
I-part pump HKx	5s

The timer determines the total cycle time of the controller.
If a slow controlled section is present (flow sensor is poorly positioned), the cycle time can be increased slightly to avoid oscillation behavior.

The proportional factor of the PI controller is set with the P-factor.
The higher the P-factor is selected, the more aggressive the controller reacts to an actual value change (e.g. if there is a rapid increase in temperature at the sensor, the controller will counteract depending on the size of the P-factor)

ATTENTION! The P-factor must not be set to 0, as this disturbs the entire control function!

The integral part of the PI controller is set with the I-part.
The value in seconds is the so-called "reset time" and indicates the period in which the controller attempts to "correct" a deviation from the setpoint / actual value.
The smaller the I-part is selected, the more aggressive the controller will try to compensate for the deviation.
A very small I-part is not recommended, because this usually results in "oscillation behavior".

For small fresh water modules, the default values as stated above have been reliable.
The P-part can be increased for slower mixers.
For mixers that adjust too fast, the I-part can be increased or the P-factor slightly reduced.

Parameter:	HC3	HC4	HC5	HC6	HC7	HC8

Timer pump HCx	**239**	**298**	**361**	**422**	**485**	**546**
P-factor pump HKx	**240**	**299**	**362**	**423**	**486**	**547**
I-part pump HKx	**241**	**300**	**363**	**424**	**487**	**548**

7.19.4 Output definition of mixer / switching valve (3-pt./constant) and manual mode

With the "Output definition mixer HCx" parameter, the output definition for the switching valve or the premixer used can be defined.

	HC3	HC4	HC5	HC6	HC7	HC8
Output definition mixer HCx	**200**	**263**	**324**	**387**	**448**	**511**

By default, this parameter is set to "3-pt. HCx-23 ". With this configuration, a 3-pt. signal is output via outputs xM2 (open) and xM3 (closed) .

If the respective Multi heating circuit module is installed, the parameter can be set to "PWM" or "PWM inv" for PWM or 0-10V control of the mixer.

PWM or 0-10V control is only possible from heating circuit 3 with the corresponding Multi heating circuit module variant, see chap. **3.4** to **3.10**.

The "PWM" selection means a 100% output for a fully open valve and a 0% output for a closed valve; if an inverted output is required (closed 100%, open 0%), selection " PWM inv" is made.

The actual setting, whether 0-10V or PWM output, is made via the HC Multi, selection "PWM" is made in both cases for the controller.

For a 3-pt-controlled mixer, the parameters are available for manual mode:

	HC2	HC3	HC4	HC5	HC6	HC7	HC8
3-pt. Manual mode	**155**	**203**	**266**	**327**	**390**	**451**	**514**

ATTENTION! In manual mode, there is no control and no frost protection!

With a mixer controlled via PWM / 0-10V, a minimum position can also be set:

	HC3	HC4	HC5	HC6	HC7	HC8
Min. specification of continuous mixer	**202**	**265**	**326**	**389**	**450**	**513**

When controlling the switching valve, this parameter must be set to "0".

If the mixer is controlled with a PWM signal, the frequency can be set via the following parameters.

	HC3	HC4	HC5	HC6	HC7	HC8
PWM frequency HCx-2	**201**	**264**	**325**	**388**	**449**	**512**

(With 0-10V output with HC Multi. use setting 100Hz)

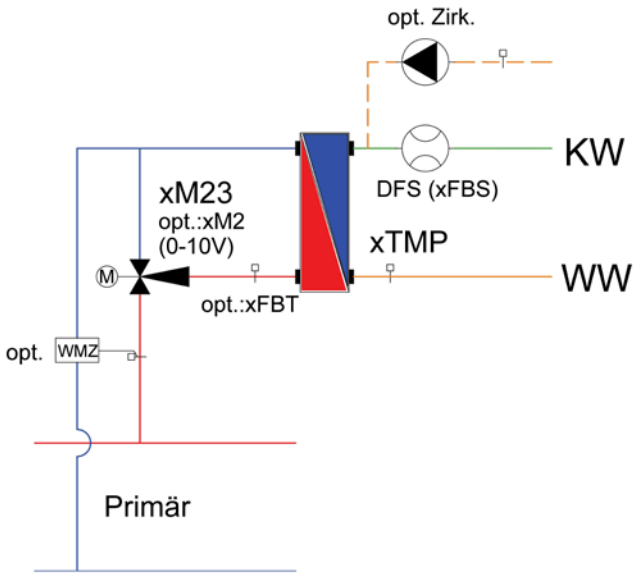
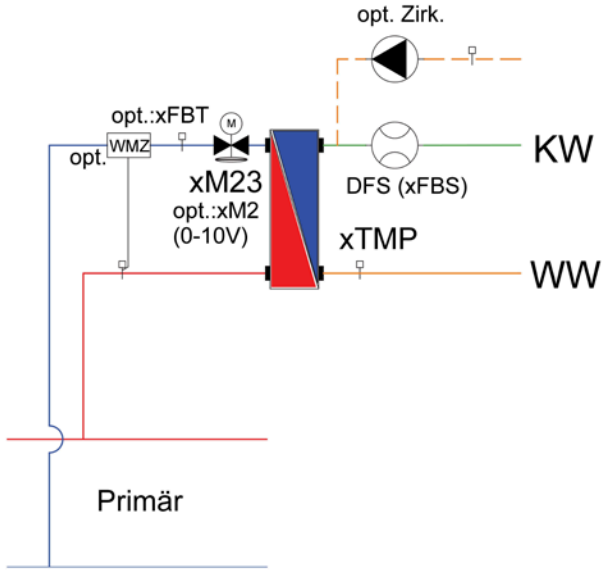
For a continuously controlled mixer, the following parameters are available for manual mode

(0-100% and auto):

	HC3	HC4	HC5	HC6	HC7	HC8
Constat manual mode	**204**	**267**	**328**	**391**	**452**	**515**

ATTENTION! In manual mode, there is no control and no frost protection!

7.20 Detailed configuration prim. fresh water module

Prim. FWM with jet pump and opt. prim. flow limit	Prim. FWM with primary valve and opt. prim. return limit
	

From the controller-side configuration, the prim. FWM does not differ from a prim. boiler charging module since the prim. BCM can also be activated by a flow switch or flow sensor. A circulation line led over the prim. FWM (circulation pump configuration) is thus configured to the corresponding charging module. Will a prim. FWM is configured, the associated tank circuit can no longer be used. The tank circuit must be set to "not available" and the "TC x request" parameter of the associated tank circuit must be set to "standalone ", since only this setting defines the charging module / FWM as the primary side.
A primary-side charging module can be configured as of heating circuit 3. The corresponding HC Multi variant must be used to control the valve, see chap. "**3.9**" or "**3.10**".

If necessary, up to two primary-side fresh water modules can be controlled, a circuit is then set to "Acc. to charging module 1 ", the second to "Acc. to charging module 2". Both tank circuits must have the "standalone" and configuration "not available" request set here.
If the FWM is activated via the flow switch or flow sensor, the primary valve or the jet pump is set to the set "HW temp. FWM".

In order for a connected flow switch / sensor to be correctly evaluated, the "BCM / FWM flow sensor type" must be set correctly. This parameter is set to "switch" by default - this setting must be made for all variants where no sensor evaluation takes place via the HC Multi expansion module (variants 8 and 12). For flow sensor evaluation (measurement in l / min), the corresponding type must be set.
When evaluating a flow sensor, "FS control influence" determines how much a flow change affects the control (the higher the percentage setting, the more aggressive the valve / jet pump controller will react to a flow change).

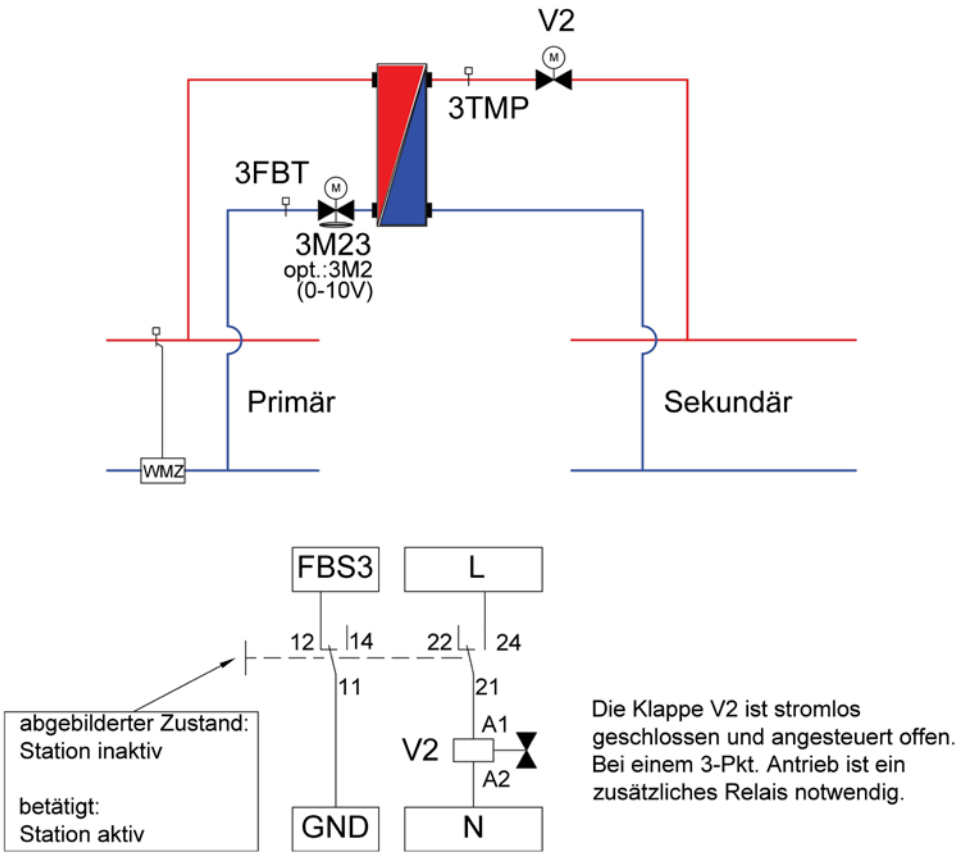
Both hydraulic variants shown above do not differ from the configuration. In the variant with jet pump, only the parameter for return limit for the prim. flow limit is used.

For configuration of the charging module, see chap. "**7.3.12Control of a configured charging module**".

Parameter:	HC3	HC4	HC5	HC6	HC7	HC8
HW setpoint temp. FWM	**228**	**289**	**352**	**413**	**476**	**537**
BCM/FWM flow sensor type	**177**	**301**	**364**	**425**	**488**	**549**
FS control influence	**178**	**302**	**365**	**426**	**489**	**550**

If a disinfection program is desired, the associated boiler must be configured; the "disinfection request" of a configured boiler is still possible and has priority over activation via the flow switch / sensor, see chap. "**7.3.4Disinfection of the boiler**".

7.21 Detailed configuration of second station heat exchanger (HC3)



7.21.1 General control function

If a transfer station is to be controlled with two heat exchangers switched in parallel, heating circuit 3 can be configured to "2nd station HE".

The second station heat exchanged can be activated / deactivated via a potential-free contact:
Active: FBS3 and GND open
Inactive: FBS3 and GND closed

If the heat exchanger is active, it regulates to the same sec. flow setpoint or uses the same return limit as the first station heat exchanger. The second station heat exchanger also responds to a set power limit; the power value from heat meter 1 and the set nominal power are used (with the "Nominal power"

parameter, the sum of both heat exchanger powers must therefore be set). For the power limit to work properly, the station heat meter must be mounted in the common return / flow line.

For the second station heat exchanger, a separate control characteristic for the temperature control (return and power limit uses the same parameter as station heat exchanger 1) and valve runtime can be entered, the function is the same as described in chap. "**7.1Detailed configuration of transfer station**".

Parameter name	Parameter number
Timer mixer HC3	**205**
P-factor mixer HC3	**206**
I-part mixer HC3	**207**
Valve runtime open→closed	**237**
Valve runtime closed→open	**238**

7.21.2 Output definition of 2 stat. HE primary valve (3-pt./constant) and manual mode

With parameter **200** "Output definition mixer HC3", the output definition for the primary valve can be defined.

By default, this parameter is set to "3-pt. HCx-23 ". With this configuration, a 3-pt. signal is output via outputs xM2 (open) and xM3 (closed) .

If the respective Multi heating circuit module is installed, the parameter can be set to "PWM" or "PWM inv" for PWM or 0-10V control of the primary valve.

The "PWM" selection means a 100% output for a fully open valve and a 0% output for a closed valve; if an inverted output is required (closed 100%, open 0%), selection " PWM inv" is made.

The actual setting, whether 0-10V or PWM output, is made via the HC Multi, selection "PWM" is made in both cases for the controller.

For a primary valve controlled via 3-pt., parameter **203** is available for manual mode.
ATTENTION! In manual mode, there is no control and no frost protection!

With a primary valve controlled via PWM / 0-10V, a minimum position can also be set with parameter **202**.

If, for example, a speed-controlled pump is used instead of a primary valve, this parameter can be used as the "minimum speed".

If the primary valve is controlled with a PWM signal, the frequency can be set via parameter **201**. (With 0-10V output with HC Multi. use setting 100Hz)

For a constantly controlled primary valve, parameter **204** is available for manual mode.
(0-100% and auto).
ATTENTION! In manual mode, there is no control and no frost protection!

7.22 Detailed configuration of analogue outputs (HC8)

If heating circuit 8 is set to "analogue outputs", the following control outputs can also be output as an analogue output by the basic controller:

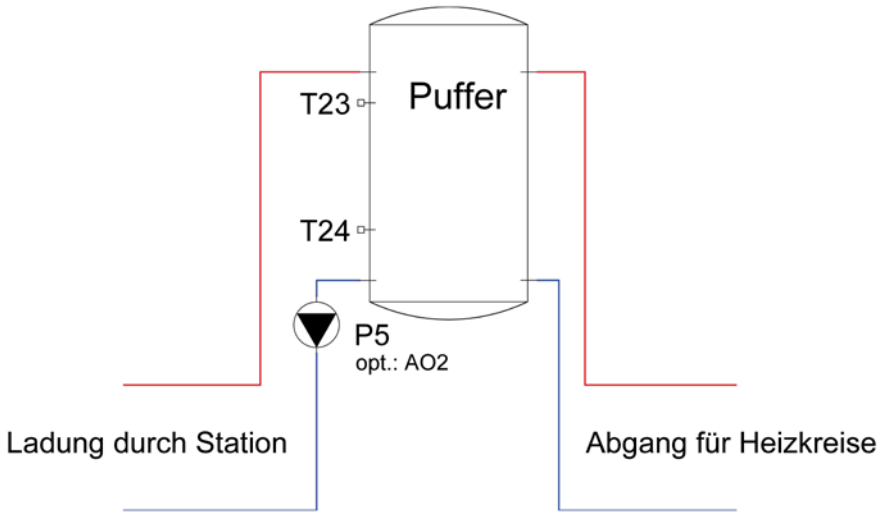
Output 1: Tank circuit 1 pump
Output 2: Steady primary valve / steady return increase
Output 3: Heating circuit 1 pump

The definition of the outputs is made via the respective output definition, see chap. "**7.1.2**", "**7.2.3**" "**7.3.10**" and "**7.4.8**".

The prerequisite for the analogue outputs is the connection of the corresponding HC Multi variant, see chap. "**3.4**" to "**3.8**".

7.23 Detailed configuration of buffer

If tank circuit 2 is configured to "buffer", a heating tank with 2 sensors and charging pump can be controlled as shown here in the schema:



The charging pump drawn here can be controlled without expansion modules via analogue output 2 of the basic controller with a PWM or 0-10V signal. If, in addition, a potential-free release of the pump is required, a coupling relay must be installed.
Output P5 of the basic controller is switched from a 10% specification. If a potential-free release is realised via this output, a minimum speed of 10% must be set.

7.23.1 General control function

The control function of the buffer can be defined with parameter **611** "Buffer charging type":

- T24>Swoff&T23>SP+2K:

Buffer charging is started when sensor T23 falls below the upper setpoint.
The upper setpoint is either the set "Buffer minimum temp. PFO T23" parameter **608** or a higher request from a heating circuit / boiler / fresh water module.

Buffer charging is ended when upper sensor T23 exceeds the upper setpoint + 2K AND lower sensor T24 exceeds the switch-off point. The switch-off point is defined with parameters **609** "Buffer switch-off point lower at -20 °C OT" and **610** "Buffer switch-off point lower at + 20 °C OT" (with intervening outside temperatures, interpolation is performed in a linear manner).

- "OffT24>topSP-hyst"

Buffer charging is started when sensor T23 falls below the upper setpoint.
The upper setpoint is either the set "Buffer minimum temp. PFO T23" parameter **608** or a higher request from a heating circuit / boiler / fresh water module.

Buffer charging is ended when upper sensor T23 exceeds the upper setpoint + 2K AND lower sensor T24 exceeds the upper setpoint plus "Buffer switch-off hysteresis" parameter **614**.

- OffT24>Swoffpt. :

Buffer charging is started when sensor T23 falls below the upper setpoint.
The upper setpoint is either the set "Buffer minimum temp. PFO T23" parameter **608** or a higher request from a heating circuit / boiler / fresh water module.

Buffer charging is ended when lower sensor T24 exceeds the switch-off point. The switch-off point is defined with parameters **609** "Buffer switch-off point lower at -20 °C OT" and **610** "Buffer switch-off point lower at + 20 °C OT" (with intervening outside temperatures, interpolation is performed in a linear manner).

With this charging type, switch-off has priority (it is also switched off if the upper buffer sensor has not yet reached the setpoint).
Recharging is not permitted until lower buffer sensor T24 falls below the switch-off point plus "Buffer switch-off hysteresis" parameter **614.**

The control functions described here refer to normal buffer charging (no buffer charging period).

In the buffer charging period, the following function applies to all buffer load types:

- At the beginning of the period, buffer charging is started until the switch-off condition is satisfied as described above.

- Within the period, in addition to the function described above, recharging is performed as soon as lower buffer sensor T24 falls below the lower switch-off point plus "Hysteresis in period" parameter **626** until the switch-off condition is met again.

The current upper setpoint temperature is displayed in the controller display at "min-o", the current lower switch-off temperature is displayed at "off-u".

When buffer charging starts, the upper setpoint temperature (either the "Buffer minimum temp. PFO T23" parameter **608** or a higher request by a heating circuit) plus the "charging hysteresis" set with parameter **613** is requested.

If buffer charging is temporarily not possible due to a defect, for example, a threshold for switching off the heating circuit can be set: If upper buffer sensor T23 falls below the "HC shutoff threshold" set with parameter **612**, all heating circuits requesting the buffer are deactivated. The "Buffer low temperature shutoff" status is displayed on the deactivated heating circuit.
The heating circuit is reactivated when upper buffer sensor T23 has exceeded the "HC shutoff threshold" by 1K.

With parameter **617**, a stopping time can be set for the buffer charging pump (factory setting 30s).

7.23.2 Output definition (switching / PWM / 0-10V) and manual mode of buffer charging pump

Parameter **600** "Output definition AO2 (pump TC2)" can be used to define whether a 0-10V or a PWM or PWM inverted signal with a peak voltage of 10VDC should be output.
By default, this parameter is set to "0-10V".

Regardless of this setting, switching output P5 is switched from a 10% specification. With this output, either an uncontrolled pump can be switched directly or a potential-free release can be realised in combination with a coupling relay.

The "PWM" selection means a 100% output for the maximum speed and a 0% output for a switched-off pump; if an inverted output is required, selection " PWM inv" is made.

For analogue output AO2 and switching output P5, manual mode is available with parameter **603** "Manual mode AO2+P5 pump TC2".
ATTENTION! In manual mode, there is no control and no frost protection!

With a pump controlled via PWM / 0-10V, it is possible to also set a minimum speed with parameter **602**.

ATTENTION! If the pump is released or switched with switching output P5, a minimum speed >10% must be set.

If the pump is controlled with a PWM signal, the frequency can be set via parameter **601** .

7.23.3 Control of the buffer charging pump

The speed determination for the buffer charging pump is based on two criteria:
1. Difference from the lower buffer sensor to the switch-off temperature
2. Buffer charging temperature at sec. flow with buffer charging setpoint temperature

With parameter **607** "Temp band f. pump control TC2 "a P-band can be set for criterion 1.
This defines the speed control range and is assigned to the difference from the lower buffer sensor to the switch-off temperature.

An example:
Current switch-off temperature lower 50°C
P-band 10 K

If the lower buffer sensor is < 40 °C, the pump speed according to criterion 1 is controlled at 100%. From 40 °C, the speed is reduced steadily, until finally only the minimum speed is output when the switch-off point is reached.
If this is set to 10%, for example, the following speeds would be specified according to criterion 1:

- At 42.5 °C at lower buffer temperature: 77.5%
- At 45 °C at lower buffer temperature: 55%
- At 47.5 °C lower buffer temperature: 32.5%

For criterion 2, a PI controller can be defined for the control characteristic:

Parameter designation	**Parameter number**
TC2 timer pump	**604**
P-factor pump TC2	**605**
I-factor pump TC2	**606**

Should the sec. flow temperature be lower than the sec. flow setpoint temperature, the speed is controlled up to the minimum speed depending on the temperature deviation.

A speed value is determined for each criterion, the total speed value (= pump specification) corresponds in each case to the lower determined speed.

Normally (with correctly sized / regulated pump), the sec. flow setpoint temperature is reached even at full speed, so criterion 2 is always close to 100%.

In this case, criterion 1 is takes effect almost exclusively.

ATTENTION! In order to avoid pendulum operation (on / off), the pump must be regulated so that the nominal power of the station is not exceeded in any operating condition.
Too large a pump causes too high a flow rate, which inevitably leads to a secondary power overrun. When the power limit is active, the primary valve is closed due to a power overshoot in interval-cycle mode, which leads to undercutting of the sec. flow temperature and therefore to the charging lock (if set) of the buffer.
If the buffer charging pump is deactivated due to the charging lock, the sec. flow temperature is reached again, which leads to renewed activation of the buffer charging pump and the scenario can be restarted from the beginning.

7.23.4 Buffer charging lock (switch-on lock of the buffer charging pump)

To avoid unintentional discharging of the buffer, a buffer charging lock can be set.
When buffer charging starts, the buffer charging pump will not be switched on until the set switch-on condition has been fulfilled.
If, during buffer charging, this "Lock for pump TC2" parameter **615**condition is undercut for the duration of the set "lock timer" parameter **616** , the buffer charging pump is deactivated until the switch-on condition is fulfilled again.

Selection options, parameter **615** "Lock for pump TC2":

- **No charging lock (factory setting)**

The buffer charging pump is immediately switched on independently of the temperatures.

- **A sec. flow>SpFO + 5K**

The buffer charging pump is only switched on when the sec. flow sensor of the transfer station or the boiler temperature (burner control) is 5K higher than the current upper buffer actual temperature.

- **On priRT/secFL>UTS+8/5K**

The buffer charging pump is only switched on when the sec. Flow sensor of the transfer station 5K higher OR the prim. return sensor of the transfer station is 8K higher than the current upper buffer actual temperature.
To activate the buffer charging pump, only one of the two conditions must be fulfilled (either flow 5K higher or return 8K higher).
For the pump to be relocked, both conditions no longer have to be met (flow and return are less than the buffer sensor + the respective hysteresis).

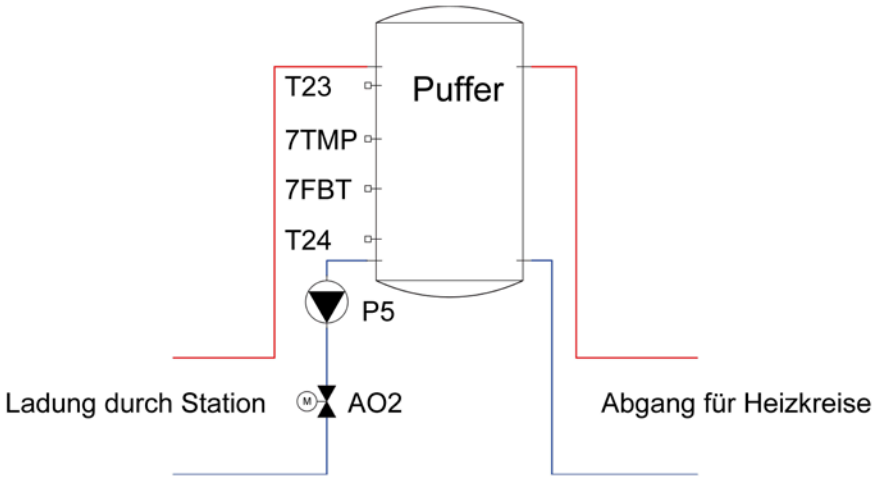
- **A sec. flow>StatSW-3K**

The buffer charging pump is only switched on when the sec. flow sensor of the transfer station or the boiler temperature (with burner control) has reached the setpoint minus 3K (setpoint of the transfer station or the boiler).

Parameter designation	**Parameter number**	**Factory setting**
Lock for TC2 pump	**615**	**On priRT/secFL>UTS+8/5K**
Lock timer	**616**	**60sec.**

7.24 Detailed configuration of buffer with 4 sensors

If heating circuit 7 (parameter **8**) is set to "Add. sensor TC2", two additional tank sensors can be connected to the flow sensor or room sensor input:



If a buffer with 4 sensors is controlled, the control of the regulated charging pump (drawn here with a self-regulated pump that is released and a 0-10V charging valve because of the higher control range) changes, the on / off behavior according to the buffer charging mode set (see chap.**7.21.1**") is not affected.
Analogue output 2 must be configured accordingly for the controlled charging pump, see chap. "**7.23.27.3.10**".

After heating circuit 7 has been set to "Add. sensor TC2", additional parameters for configuring the control are displayed in the parameter menu.

Parameter designation	Parameter number	Factory setting
Weighting T23 (upper)	**632**	**200%**
Weighting 7TMP (upper third)	**633**	**150%**
Weighting 7FBT (lower third)	**634**	**120%**
Weighting T24 (lower)	**635**	**100%**

The weighting determines how "aggressively" the sensor engages in the regulation of the pump / valve. A high weighting means that if the sensor deviates from the setpoint, the pump / valve will receive a higher setpoint than with a lower weighting.
Due to the weighting per sensor, a slightly less favorable sensor positioning can be compensated or a charging strategy can be defined (fast charging when undercutting the upper sensor and only slow recharging if the lower sensor is undercut).

In addition to the weighting, a "temperature band" can be set with parameter **607**. The temperature band specifies the maximum deviation from the respective setpoint per sensor which still intervenes in the control. If the sensor has a higher deviation than the set temperature band, the temperature band is used for the control influence.

For the regulation to work properly, the following guidelines must be observed when setting the temperature band and weighting:

$$\frac{(weighting\ T23\ +\ weighting\ 7TMP\ +\ weighting\ 7FBT\ +\ weighting\ T24)}{100} \cdot Temp.band\ =\ 100$$

If a sensor is not connected, it will be ignored for regulation. The weighting of the sensor must be set to "0" and the weighting of the other sensors must be increased accordingly.

aqotec recommends a temperature band of 18K for the above weighting setting.

In addition to this setpoint calculation, attention is also paid to the deviation of the charging temperature from the setpoint temperature of the generator:

- For request to station: Deviation of sec. flow sensor to setpoint

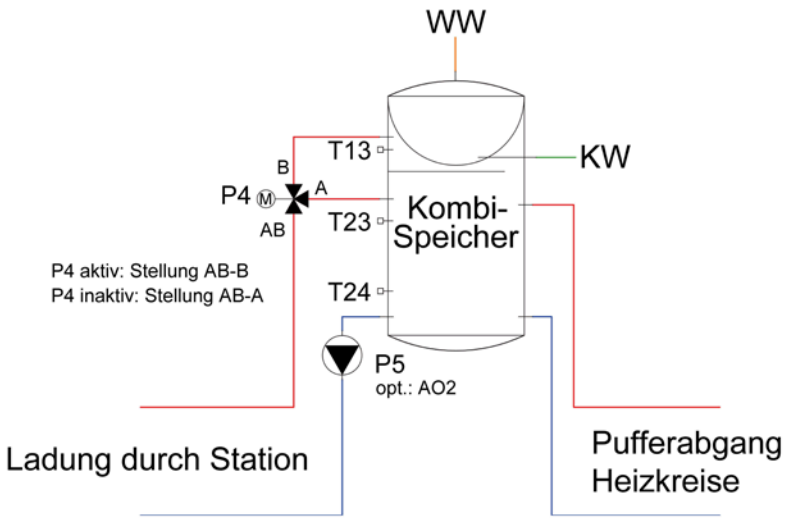
Depending on the deviation, the speed is regulated back by a PI controller regardless of the valve setpoint specified above.

Parameter designation	**Parameter number**
Pump timer TC 2	**604**
P-factor pump TC 2	**605**
"I-factor pump TC 2	**606**

7.25 Detailed configuration of boiler in buffer with switching valve

If a combined tank (fresh water area integrated in the buffer tank as a coil or delimited part) is controlled by the transfer station with a charging switching valve, the following configuration is necessary:
P10 Tank circuit 1: Switching valve for BiB
P11 Tank circuit 2: Boiler in the buffer with UV
P21 Request HC2: To station

The connection to the controller is made as shown here:



From a control point of view, buffer control is implemented via sensors T23 and T24 as described in chap. "**7.23**" and boiler control via sensor T13 as described in chap. "**7.3.2**". The boiler function is used here to keep the "fresh water area" at the desired temperature.
If necessary or desired for a control point of view, the second boiler probe T14 can also be placed in the "fresh water area" (boiler control).
The buffer function is used for this purpose for sufficient supply of the heating circuits, the buffer setpoint is calculated from all circuits that are set to "request to TC2", boiler charging has no influence here.

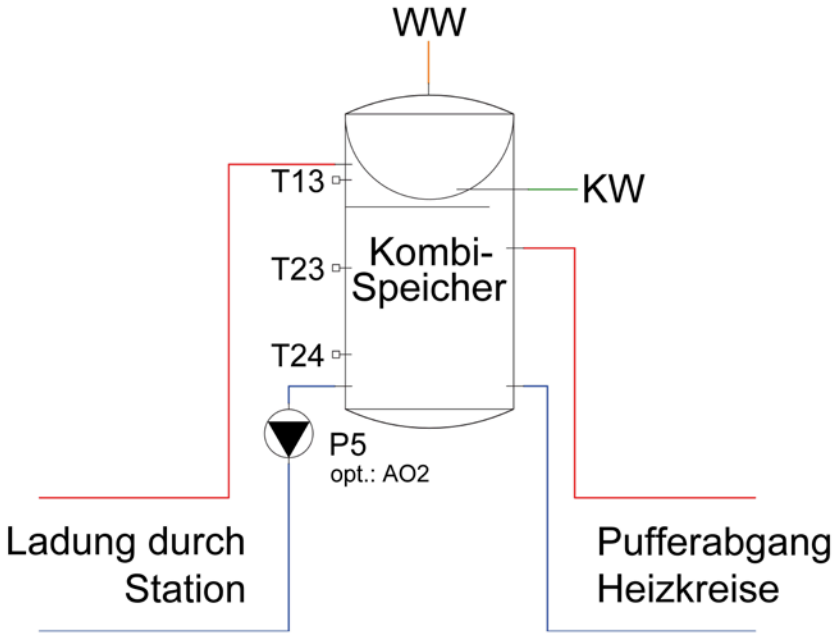
Recharging of the tank can be started either by the boiler function or the buffer function. When charging via the boiler function, either the "Charging temp. in the period" **P587** or the "Charging temp. outside the period" **P588** is requested at the transfer station, depending on the set boiler charging time. A charging lock set with **P581** in this case refers to both output P4 (switching valve) and output P5 (charging pump).
If the charging pump is speed-controlled, the control parameters or the control function of the speed control of TC1 (boiler) are used, see chap. "**7.3.11**". If lower sensor T14 is not connected, the control is inactive according to the "P-band" - the pump will only be adjusted back if the setpoint temperature is not reached at the transfer station.
If charging is performed via the buffer function, the charging lock set for tank circuit 2 is used for the charge pump. Also in the case of speed control, the control parameters or the control function are used by the buffer. When the buffer is recharged, the transfer station controls the current buffer setpoint plus set charging hysteresis **P613**.
Regardless of through which function the charge is being charged, the stopping time of the TC2 pump parameter **617** applies at the end of charging.

If both functions request temperature, boiler charging has priority. In the case of a speed-controlled charging pump, the control parameters from boiler charging then also apply.

7.26 Detailed configuration of boiler in buffer without switching valve

If a combined tank (fresh water area integrated in the buffer tank as a coil or delimited part) is controlled by the transfer station without a charging switching valve, the following configuration is necessary:
P10 Tank circuit 1: Temp request HW section BiB
P11 Tank circuit 2: Boiler in the buffer
P21 Request HC2: To station

The connection to the controller is made as shown here:



From a control point of view, buffer control is implemented via sensors T23 and T24 as described in chap. "**7.23**" and boiler control via sensor T13 as described in chap. "**7.3.2**". The boiler function is used here to keep the "fresh water area" at the desired temperature.
If necessary or desired for a control point of view, the second boiler probe T14 can also be placed in the "fresh water area" (boiler control).
The buffer function is used for this purpose for sufficient supply of the heating circuits, the buffer setpoint is calculated from all circuits that are set to "request to TC2", boiler charging has no influence here.

Recharging of the tank can be started either by the boiler function or the buffer function. When charging via the boiler function, either the "Charging temp. in the period" **P587** or the "Charging temp. outside the period" **P588** is requested at the transfer station, depending on the set boiler charging time. A charging lock set with **P581** in this case refers to output P5 (charging pump). If the charging pump is speed-controlled, the control parameters or the control function of the speed control of TC1 (boiler) are used, see chap. "**7.3.11**". If lower sensor T14 is not connected, the control is inactive according to the "P-band" - the pump will only be adjusted back if the setpoint temperature is not reached at the transfer station.

If charging is performed via the buffer function, the charging lock set for tank circuit 1 (which also refers to sensor T13) still applies. In the case of speed control, the control parameters or the control function are used by the buffer. However, the transfer station also regulates to the set boiler charging temperature **P587** or **P588** as stated above when charging the buffer.

If both functions request temperature, boiler charging has priority. In the case of a speed-controlled buffer charging pump, the control parameters from boiler charging then also apply.
ATTENTION! In any case, the boiler charging temperature must be selected such that a heating circuit request at the buffer does not produce a setpoint that is higher than the boiler charging temperature, since in this case the buffer is charged continuously.

It is therefore necessary to request the "max. flow temperature" accordingly. The boiler charging temperature must be set to at least the value of the highest request plus 8K.

Of course, this function can also be used for a buffer tank to which a fresh water module is connected to the "hot water zone" (hot water zone, for example, separated from the heating zone by a laminated sheet).
The product aqoNPS is an example (aqotec local heat buffer tank).

8 Configuration of communication

8.1 Data readout via RS422 / RS485 (aqotec protocol or Mod-bus RTU)

As already described in chap. "**3.2.6**, parameter **772** must be used to define whether the query is made via RS422 or RS485.

In order to read out the controller, the controller address must be set with parameter **770** and the baud rate (bus speed) with parameter **771** .
By default, the controller address is set to 0 at a baud rate of 2400baud.

If the controller is read out via the aqo360 ° visualisation, no further configuration is necessary.

If the controller is read out via Mod-bus RTU, parameter **914** must be set to "RS485".

ATTENTION! The Mod-bus readout of the controller only works on one interface on the controller, either via Ethernet or RS485 / RS422, simultaneous reading via Mod-bus is not possible.

If a double reading of the controller is required, this can be done, for example, once via the COM-A interface via Mod-bus RTU and once via Ethernet via the aqo360 visualisation. Of course, the controller can also be read out via two separate aqo360° visualisations (once interface COM-A and once Ethernet).

With readout by means of aqo360 ° visualisation, protocols are already predefined in the controller in order to be able to achieve the fastest possible data readout.

The Mod-bus list for the controller can be requested from an aqotec technician, please contact us at service.request@aqotec.com.

8.2 Data readout via Ethernet (aqotec protocol or Mod-bus RTU / TCP)

If a readout of the controller is to be implemented via the Ethernet interface, only the necessary network parameters must be set directly on the controller display (possible from service level 3), no additional tool is necessary here.

If the readout is done via aqo360° visualisation in a static IP network, it is usually sufficient to assign the IP address and the port.
By default, the IP address is set to 10.1.0.1 and the port is set to 2002.
Optionally, you can also the set subnet mask and default gateway.
Furthermore, it can also be determined whether the controller should obtain the IP address automatically or whether the set IP address should be used.
When reading out by means of aqo360° visualisation, the factory setting must be left at "manual".
If this parameter is changed, the control restarts automatically.

Parameter designation	Parameter number	Factory setting
Get IP address?	**773**	**Manual**
IP address TCPIP	**774**	**10.1.0.1**
Subnet mask TCPIP	**775**	**255.0.0.0**
Default gateway TCPIP	**776**	**10.0.0.254**
Port no.	**777**	**2002**

If the controller is read out via Mod-bus RTU or TCP (the controller recognises automatically, no setting required), parameter **914** must be set to "TCPIP".

ATTENTION! The Mod-bus readout of the controller only works on one interface on the controller, either via Ethernet or RS485 / RS422, simultaneous reading via Mod-bus is not possible.

If a double reading of the controller is required, this can be done, for example, once via Ethernet via Mod-bus RTU or TCP and once via interface COM-A via the aqo360 visualisation. Of course, the controller can also be read out via two separate aqo360° visualisations (once interface COM-A and once Ethernet).

With readout by means of aqo360 ° visualisation, protocols are already predefined in the controller in order to be able to achieve the fastest possible data readout.

The Mod-bus list for the controller can be requested from an aqotec technician, please contact us at service.request@aqotec.com.

8.3 Meter readout via M-bus

Up to 40 compatible meters (e.g. heat or water meters) can be read out via the M-bus interface. The interface can be used with up to 80 M-bus loads (so-called. U-loads).

If only one counter is read out (factory setting), the broadcast address is queried (address 254) - at this address, the connected counter responds regardless of the set primary address. Here, only the heat meter type and the baud rate (bus speed) and readout frequency must be defined ,

The baud rate must be the same for all connected meters and for the controller. At the controller, this can be set with parameter **785**, the meter must already be programmed or reprogrammed accordingly. With many meter manufacturers (e.g. Kamstrup or Sharky), the meter automatically detects the query baud rate and answers with the respective rate (for the manufacturers mentioned, only 300 or 2400baud).

If several meters are read out, the number of connected meters must be set with parameter **784** - from two meters the address can be entered for each meter.
With priority, parameter **786** can be used to define whether the connected meters should be read out via the primary address or the secondary address.

For most meters, the secondary address is the serial number of the device.
The primary address usually corresponds to the last 3 digits of the secondary address, if possible (primary address can be addressed from 0-250).
By default, the readout of the primary address is set here, the primary addresses set correspond to the meter number in the controller.

ATTENTION! The transfer station meter must be configured on M-bus device 1.

The readout frequency (adjustable per meter) must be used to define at what interval in minutes the meter is read out. The parameter can be set for up to 1440 minutes (reading once a day). By default, the parameter is set to "0" for a permanent reading.

Parameter:	Meter type	Address	Query interval
M-bus device 1	**787**	**788**	**789**
M-bus device 2	**790**	**791**	**792**
M-bus device 3	**793**	**794**	**795**
M-bus device 4	**796**	**797**	**798**
M-bus device 5	**799**	**800**	**801**
M-bus device 6	**802**	**803**	**804**
M-bus device 7	**805**	**806**	**807**
M-bus device 8	**808**	**809**	**810**
M-bus device 9	**811**	**812**	**813**
M-bus device 10	**814**	**815**	**816**
M-bus device 11	**817**	**818**	**819**
M-bus device 12	**820**	**821**	**822**
M-bus device 13	**823**	**824**	**825**
M-bus device 14	**826**	**827**	**828**
M-bus device 15	**829**	**830**	**831**
M-bus device 16	**832**	**833**	**834**
M-bus device 17	**835**	**836**	**837**
M-bus device 18	**838**	**839**	**840**
M-bus device 19	**841**	**842**	**843**
M-bus device 20	**844**	**845**	**846**
M-bus device 21	**847**	**848**	**849**
M-bus device 22	**850**	**851**	**852**
M-bus device 23	**853**	**854**	**855**
M-bus device 24	**856**	**857**	**858**
M-bus device 25	**859**	**860**	**861**
M-bus device 26	**862**	**863**	**864**
M-bus device 27	**865**	**866**	**867**
M-bus device 28	**868**	**869**	**870**
M-bus device 29	**871**	**872**	**873**
M-bus device 30	**874**	**875**	**876**
M-bus device 31	**877**	**878**	**879**
M-bus device 32	**880**	**881**	**882**
M-bus device 33	**883**	**884**	**885**
M-bus device 34	**886**	**887**	**888**
M-bus device 35	**889**	**890**	**891**
M-bus device 36	**892**	**893**	**894**
M-bus device 37	**895**	**896**	**897**
M-bus device 38	**898**	**899**	**900**
M-bus device 39	**901**	**902**	**903**
M-bus device 40	**904**	**905**	**906**

In addition to the direct selection of the counter type, two further settings are possible per counter:

- Auto detection (factory setting)

When the meter responds, the controller automatically adjusts whether the meter protocol is known (if the heat meter is programmed) and assigns the log. In most cases, the heat meter type can be left at this setting. However, if reading errors occur (eg for a tariff), the meter must be set to the respective protocol - this case can occur, for example, with meters that have a very similar protocol.

- Data frame analysis

If the connected counter is not programmed, the "Data frame analysis" setting can be selected. With this setting, the controller will automatically try to assign values from the meter's response protocol. However, this is only possible for the standardised values of the M-bus. Manufacturer-specific data such as the error status or special tariffs, etc. cannot be evaluated with this function.
Since there are many different M-bus protocols, reading with this function is not guaranteed.

If the counter is not compatible, it is possible to export the data frame of the meter to a USB stick. This exported file can then be evaluated by aqotec (a meter with status may be necessary). After evaluation, the so-called "M-bus clients" file can again be imported to the controller via USB stick, the meter is then compatible with the controller.

If data frame evaluation of the meter is necessary, please contact an aqotec technician at service.request@aqotec.com. The integration will be charged depending on the amount of effort.

Export of the data frame from the meter is set with parameter **908**:
After the USB stick has been inserted into the control, the parameter is set to the meter number from the controller. Then M-bus communication to the counter is established and the file is stored. The USB stick must not be removed during this process.
The file is saved in a folder named after the serial number of the controller with file name "MBUSD.inf".

Import of the "M-bus clients" file works as follows:

- Save the "MBCL.jsn" received from aqotec in the folder named after the serial number of the controller (if it is the same USB stick as when exporting, simply save along with the "MBUSD.inf" file)
- Set parameter **907** to "USB import" ... the "M-bus clients" file is then copied from the USB stick to the controller (USB stick may not be removed at this time)
- Subsequently, parameter **907**must be changed to "most recent" (control may restart here)

After importing the "M-bus clients", the meter counter should be included in the list of the "Counter type" parameter and must be set for the respective M-Bus device.
Communication with the meter must then be checked for correctness in all values.

8.4 Readout of remote control FBR7

8.4.1 Configuration of controller for the FBR7

For a configured FBR7 to be able to communicate with the controller, the "Remote control?" parameter must be set to "Remote control FBR7" for the respective heating circuit.
If this selection is made for one or more circuits, communication is active and the remote control is read out.

Parameter:

	HC1	HC2	HC3	HC4	HC5	HC6	HC7	HC8
Remote control	**117**	**159**	**208**	**271**	**332**	**395**	**456**	**519**

In addition, the baud rate can be set with parameter **918**.
For reading out the FBR7, the parameter should be left at 4800baud.

For the hardware connection, see chap. "**3.11.2Remote control FBR7**" or "**3.2.9COM-C RS485**".
For the communication check, see chap. "**4.6Communication test COM-C RS485 (FBR7)**".

8.4.2 Configuration of remote control FBR7

- By simultaneously pressing the "UP"  and "DOWN" button 
in the main screen for 5 seconds, you reach th setup menu:

SETUP SCREEN 1

- With the "UP"  and "DOWN"  buttons, can you set the ID from 00 to 99,
according to the address of the heating circuit (e.g.: heating circuit 1 = address 01).
- The "automatic" button  confirms the entry or the "OFF" key  leaves the menu without saving.
- The display changes to setup screen 2 when saving.

SETUP SCREEN 2

- The baud rate is selected in this menu, designation B0-B5 corresponds to the following baud rates:

B0 300 Baud
B1 600 Baud
B2 1200 Baud
B3 2400 Baud
B4 4800 baud (standard)
B5 9600 Baud

ATTENTION! The baud rate must match the settings of the controller on COM-C.

- The "Automatic" button confirms and changes to setup screen 3.

SETUP SCREEN 3

- The response delay is selected in this menu.

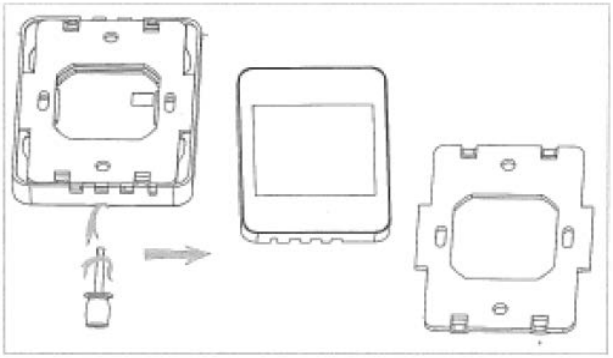
The response delay is set to a default value of 60msec.
This setting must be left at this default value when connected to aqotec communication components.

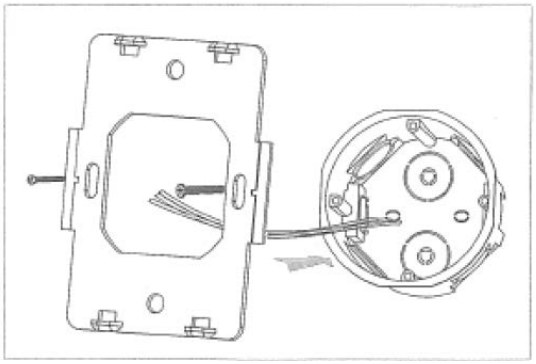
- The "Automatic" button confirms the entry and the setup is complete

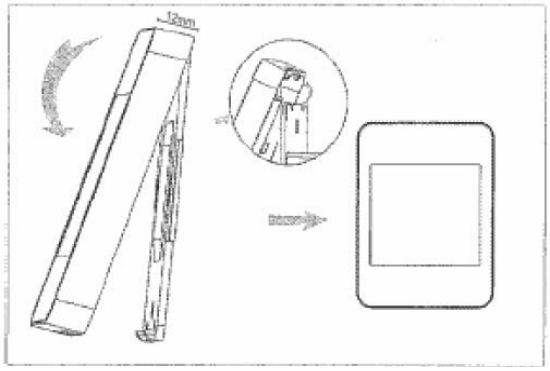
ATTENTION! If the controller is already configured on the remote control, the bus connection to the remote control may not be established until it has been configured. (only connection of voltage supply) The remote control may only be configured for a heating circuit, reconfiguring it during operation is not permitted as this may lead to an indefinable control behavior of the heating circuits concerned.

8.4.3 Assembly of FBR7

In order to mount the FBR7, a flush-mounted box is necessary which can fit the terminals for the wire connections.







8.5 Subcom (controller to controller connection) via CAN bus

With the so-called sub-communication connection of two or more RM360 control units, an extension of the secondary control or a connection to remote control devices in the same hydraulic system can be made.
For this function, the controller on the transfer station or at the boiler (i.e. the central supply unit of the overall system) is defined as "master", all extensions or sub-controllers are set as "slaves" (for this reason, parameter **909** is set to the corresponding function).
In addition to the "Slave" setting, a subcom address (1-20) must be assigned with parameter **911** for the slaves so that the sub-controller can be assigned in the main controller.
For the main controller, the number of connected sub-controllers must be set for correct read-out of the sub-controller with parameter **910** (e.g. "2" with two connected sub-controllers).
To ensure smooth operation, the same software should be used on each controller.
The prerequisite for the communication of the controllers is that the same baud rate is set (factory default 50kbit) for all slaves as well as for the master with parameter **912** .

When sub-communication is active, all sub-controllers (slaves) request their setpoint temperature (either the highest request of all circuits set to "to station" request or, with priority, the boiler charging setpoint of a boiler set to "to station" request) at the master, and vice versa, the external sensor value is transmitted from the master to all sub-controllers.
This has the advantage that only one outdoor sensor has to be installed for the entire system.

Since all controllers connected by sub-communication are considered to be one large hydraulic system, booster priority operation also works across controllers. If, for example, a boiler is charged by a sub-controller, the heating circuits are also switched off by all other sub-controllers or by the main controller, which are set to boiler priority "YES".
Accordingly, the return limit of a transfer station is adjusted, see chap. "**7.1.6**".

The main operating mode (automatic, hot water only, heating only, off), however, only refers to the respective controller. If, for example, the main controller (transfer station) is set to "hot water only" and a sub-controller requests temperature due to a heating circuit, this temperature request is nevertheless taken into account.

ATTENTION! With a configured boiler instead of a transfer station and / or a configured external energy source, the overtemperature protection function only works on the circuits of its own controller (e.g. with external power source on the sub-controller, only the circuits are controlled by the sub-controller to the max. flow).

A standby generator configured with the sub-controller also only controls the request from the sub-controller. In this case, the configuration of a (possibly fictitious) transfer station and the installation of a sec. flow sensor is necessary for the sub-controller.

At the master, where the sub-controller should request the temperature must also be defined per sub-controller:

- **To station**

The sub-controller sends its temperature request directly to the station (or to the boiler)

- **To tank circuit 2**

The sub-controller sends its temperature request to a buffer configured on the main controller (to determine the buffer setpoint).

ATTENTION! Switching off the circuits due to insufficient buffer temperature has no influence on the sub-controller, whose operation remains unchanged.

- **To heating circuit x** (prerequisite of the relevant heating circuit is set to "feeder sub-controller"!)

The sub-controller sends its temperature request to the selected heating circuit, the pump output of the heating circuit can be used as a feeder pump or the mixer output with flow sensor input can be used as premixing e.g. for the distributor of the sub-controller.
Setting the temperature request of the heating circuit can define whether the request is forwarded to a station or to a configured buffer.

ATTENTION! Switching off the circuits due to insufficient buffer temperature has no influence on the sub-controller and the feeder heating circuit for the sub-controller, whose operation remains unchanged.

Since each sub-controller can be individually configured for one heating circuit and the "sub-controller feeder" setting is also possible for several heating circuits, for example heating circuit 2 can also be used as premixing / feeder pump for sub-controller 1- 2, heating circuit 5 as premixing / feeder pump for sub-controller 3- 8 and heating circuit 7 can be used as premixing / feeder pump for all other sub-controllers. (the request can be set separately for the first 8 sub-controllers, for sub-controllers 9-20 only a selection of the request is available).

Parameter designation	Parameter number	Factory setting
Sub-con request 1	**22**	**To station**
Sub-con request 2	**23**	**To station**
Sub-con request 3	**24**	**To station**
Sub-con request 4	**25**	**To station**
Sub-con request 5	**26**	**To station**
Sub-con request 6	**27**	**To station**
Sub-con request 7	**28**	**To station**
Sub-con request 8	**29**	**To station**
Req from sub-con 9	**30**	**To station**

If the sub-communication is only used to avoid having to install another external sensor on the system, but the "sub-controller" does not forward any request to the main controller, parameter **913** "Setpoint transfer to subcom master?" must be set to NO for the sub-controller. In this case, the sub-controller will only receive the outdoor sensor value, but will not send a setpoint to the master.
For an ordinary sub-controller with temperature request, this parameter must be set to YES (factory setting).

If a sub-controller is connected to a visualisation in addition to the sub-communication, then in addition to the connection via CAN bus, either connection of the COM-A interface or integration of the controller into the same internal network via Ethernet interface is necessary.

- Example 1: RS422 data network

COM- A terminals 1-4 connected directly from the slave to the master or to the data outlet.

- Example 2: TCPIP or fibre optic data network

Ethernet interface with patch cable connected directly to the network port of the network, use switch if necessary.

ATTENTION! If the electrical protection area is left during connection, suitable overvoltage protection must be used each time the protection zone is left (usually directly at the controller output).
(for RS422 a data socket, for TCPIP use suitable overvoltage protection).

8.6 Connection to the aqoSmart server (web server function) via the internet

If the controller is to communicate with the aqoSmart server via a direct internet connection, aqotec must configure the controller as well as install the service device (for more information, see service.request@aqotec.com).
All data required for the configuration is specified by a technician of aqotec.

- Activation of server communication, "Use TCPIP SIP" parameter **779** set to "YES"
- Setting of the destination IP address with parameter **780**(specified by aqotec)
- Entry of the SIP password with parameter **782** (specified by aqotec)

ATTENTION! The setting of parameters is only possible at service level 4 (supervisor level, only a technician of aqotec) or via the aqo360° visualisation.

9 Special functions of the controller

9.1 Adjustable sensor offsets

An offset is necessary, for example, if the sensor value is falsified by a large line impedance (long connection line of the sensor) or poor positioning.
With the offset, the measured sensor value is corrected, the set offset is added to the current measured value of the controller, the sum of the measured value and offset is then used by the controller as the actual value.
The offset can be set for all sensor inputs, the offset designation depends on the connection terminal of the controller:

Parameter designation	**Parameter number**
Offset T10	**986**
Offset T11	**987**
Offset T12	**988**
Offset T13	**989**
Offset T14	**990**
Offset T15	**991**
Offset T16	**992**
Offset T17	**993**
Offset T20	**994**
Offset T23	**995**
Offset T24	**996**
Offset 3TMP	**997**
Offset 3FBT	**998**
Offset 4TMP	**999**
Offset 4FBT	**1001**
Offset 5TMP	**1002**
Offset 5FBT	**1003**
Offset 6TMP	**1004**
Offset 6FBT	**1005**
Offset 7TMP	**1006**
Offset 7FBT	**1007**
Offset 8TMP	**1008**
Offset 8FBT	**1009**

9.2 Higher-level holiday time program

In the sub-menu of the "Service level" page, a higher-level holiday period can be set for the entire controller.

During the holiday period, there is no water heating (frost protection operation) and all heating circuits are permanently controlled for reduction.

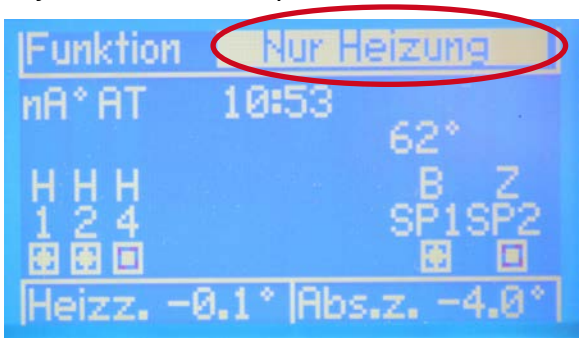
This set holiday period applies with priority over any special usage period or non-usage period that has been set, so it can only be set from service level 2 onwards.

After the end of the holiday period, the set period is automatically reset.

9.3 Higher-level main operating mode

In the main menu of the controller, the general operating mode (normally "Automatic") is displayed at the top right.

Using the UP / DOWN arrow keys, the general operating mode can be highlighted in white; the ENTER key can be used to open the sub-menu for adjusting the operating mode.



In this sub-menu, the currently selected operating mode is displayed in white, another operating mode can be selected using the LEFT / RIGHT arrow keys and ENTER.

- Automatic function, heating circuits and buffer / boiler are in automatic mode

- Only heating mode, heating circuits in automatic mode, water heating (boiler, fresh water module, ...) in frost protection mode

- Only water heating, boiler, fresh water module, etc. in automatic mode, heating circuits to "Off / Frost protection" operating mode (see section "**5.1.7Frost protection**")

- Off / Frost protection, water heating in frost protection mode, heating circuits in "Off / Frost protection" mode

9.4 General heating time / reduction time correction

In the main menu of the controller, at the lower left and right, the reduction correction (left) and heating time correction (right) are displayed.

The correction of the heating time or correction of the reduction time can be highlighted in white using the UP / DOWN arrow keys; the ENTER key can be used to open the sub-menu for adjustment.

The correction can be changed with the UP / DOWN arrow keys and confirmed with ENTER.

This set correction represents a calculated or actual correction of the room temperature and has priority for all heating circuits.

A more detailed description of the correction is available in section "**7.4.4**".

9.5 Protective function against pump blockage during long downtimes

In order to avoid "rusting" or blocking during a long downtime of a pump (e.g. heating circuit pump in summer), all pumps are switched on for a period of 1 minute every Monday at 5:00 pm. Special functions and releases are excluded from this function.

9.6 Management functions for communication with the aqo360° visualisation

In combination with the aqo360 ° visualisation, management functions for intelligent district heating networks can also be implemented.

For example, the controller transmits the prim. differential pressure to the visualisation for bad point control.

Valve positions of transfer station, prim. charging modules and / or prim. fresh water modules as well as the operating status (heat required YES / NO) are also transferred through network control for valve management or pump management.

With priority, the controller can also transmit an external sensor value through the visualisation if mounting of the outdoor sensor is not possible or the installed outdoor sensor is badly placed. (**!ATTENTION!** If an outdoor sensor is not directly connected, there is no guarantee of the frost protection function!)

Many additional functions, such as a higher-level network buffer management system, etc., are also possible on customer request. For these functions, you should consult an aqotec technician at service.request@aqotec.com.

9.7 Valve synchronisation with primary valves

Since the valve position in valves with 3-pt. control is calculated based on the runtime in most cases, the valve position is adjusted once a week.

For adjustment, the valve is controlled and the valve position is set to 0% accordingly for twice the duration of the respective set Open→Close valve runtime.

This function applies to a configured transfer station, possibly also to the second heat exchanger of the transfer station and all configured primary-side charge modules or fresh water modules.

Depending on the COM-A controller address and the IP address of the Ethernet interface, synchronisation takes place on a specific day of the week. On this day, synchronisation is always carried out when the time program of heating circuit 1 changes from heating time to reduction time (with factory setting at 10:00 pm).

9.8 Saving the parameter+ controller software to a USB stick

To save the set parameters and the controller software in a CSV-like format on a USB stick, a USB stick with at least 5MB of free space must be plugged into the controller.

ATTENTION! The USB interface is not designed for an external hard disk, a USB stick must be used here.

The USB stick must be formatted in FAT32, maximum size 32GB.

Subsequently, parameter **562** must be changed to YES (in the "Para basic config" sub-menu of the "Service level" page). Then the parameters and the controller software are stored on the USB stick, the controller creates a folder named after the serial number of the controller on the USB stick. The USB stick must not be removed during this process; the control will show on the display when the USB stick can be removed.

Two files are generated in the created folder:

RM360.bin ... controller software

PARAM.par ... CSV file with the set parameters

These files should be saved after the controller has been commissioned. With these two files, the controller can be completely restored in case of emergency.

9.9 Using the commissioning tool from aqotec

As described in chap. "**9.8**", the parameter file is stored on a USB stick, a commissioning protocol can be created with the commissioning tool which can be downloaded for free on the aqotec homepage (for Windows computers, laptops or tablets).

The commissioning protocol then already contains all set data (also the station number, if this was entered in the control in the "Designations" menu in the sub-menu of the "Service level" page), additional customer data and notes can be added in the input fields.

If the commissioning tool is run on a tablet, for example, the signature field for technicians, operators and end customers can also be used via the touchpad with a suitable pen.

The created protocol will ultimately be saved as a PDF file. It is advisable to save the created PDF protocol with the parameter file and the controller software, as the protocol is purposefully no longer editable or "playable" into the controller.

For detailed use of the commissioning tool, please refer to the description of the commissioning tool on the aqotec homepage.

9.10 Floor drying / heating program

For screed heating, an adjustable heating program is integrated in the controller which can be started separately for each circuit (also with a time delay if necessary).
The heating program can be defined with the following parameters:

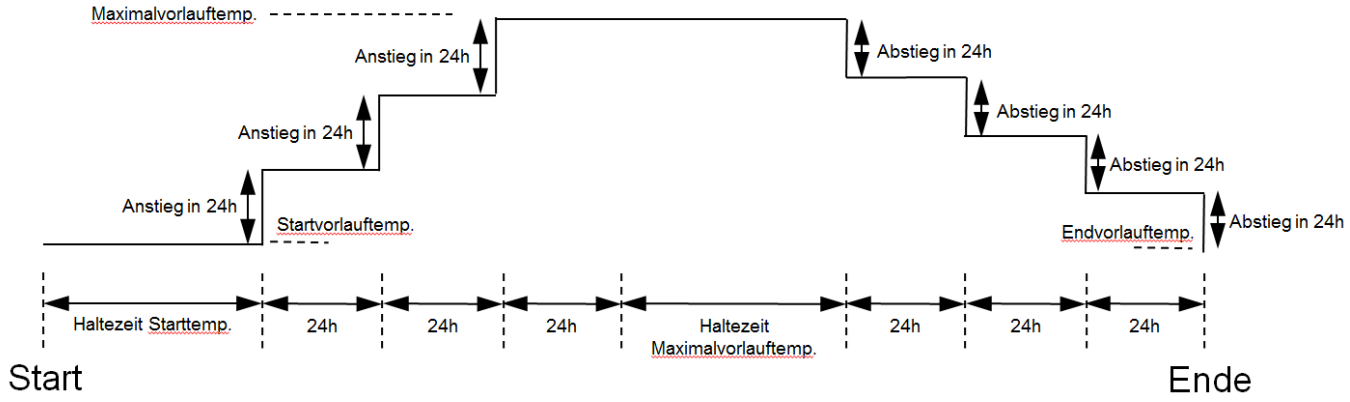
Parameter	Designation	Factory setting	Description
728	Start flow temp.	25°C	When starting the program, this flow temperature applies **ATTENTION!** The set min. flow temperature of the heating circuit must be set equal to or lower than this temperature!
729	Start temp. holding time	0 days	Duration of how long the start temperature is held until the daily increase starts. **ATTENTION!** Up to version 360.00ay, the first day on which the start flow temperature should be kept must be taken into account (set at least 1 day).
730	Rise in 24h	5K	After expiration of the holding time start temp., the flow temperature is increased daily by this temperature (in the 24h interval at the beginning of the program).
731	Maximum flow temp.	45°C	It is increased until the maximum flow temp. has been reached. **ATTENTION!** The set max. flow temperature of the heating circuit must be set equal to or higher than this temperature!
732	Max. flow temp. holding time	5 days	If the maximum flow temp. has been reached, it is maintained for this duration. **ATTENTION!** Up to version 360.00ay, the max. flow temp. is automatically maintained for one day. This day may need to be deducted from the total holding time (set for one less day).
733	Drop in 24h	5K	After expiration of the holding time, the maximum flow temp. is reduced by this temperature daily.
734	End flow temperature	25°C	It is reduced until the final flow temperature has been reached, then the program is ended and the heating circuit operates in normal operating mode. **ATTENTION!** The set min. flow temperature of the heating circuit must be set equal to or lower than this temperature!

Parameter	Designation	Factory setting	Description
735	Start program for circuit 1?	No	With this parameter, the heating program for heating circuit 1 can be started (independently and possibly also with a time delay to another circuit).
736	Start program for circuit 2?	No	Ident to parameter **735**
737	Start program for circuit 3?	No	Ident to parameter **735**
738	Start program for circuit 4?	No	Ident to parameter **735**
739	Start program for circuit 5?	No	Ident to parameter **735**
740	Start program for circuit 6?	No	Ident to parameter **735**
741	Start program for circuit 7?	No	Ident to parameter **735**
742	Start program for circuit 8?	No	Ident to parameter **735**

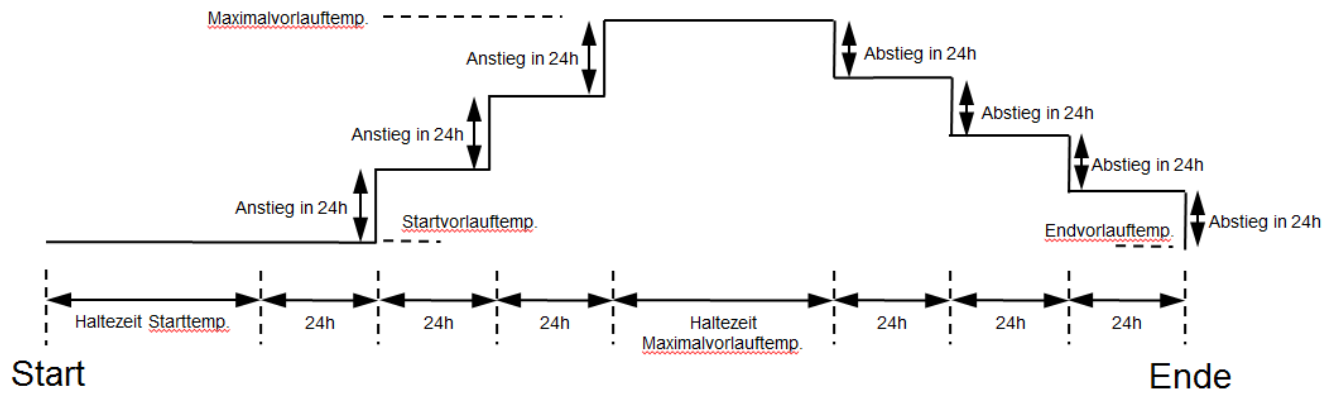
ATTENTION! The heating program is controlled according to the controller time. The time and date must be checked or set before starting the heating program.
If a power failure occurs, the program will resume normally after power returns.

The following diagrams show the flow temperature curve graphically:

- **Up to version 360.00ay:**



- **From version 360.00az:**



9.11 Loading the parameter+ controller software from a USB stick

If parameter **563** switches to YES, a parameter file ("PARAM.par") saved on the USB stick is loaded into the controller and all configuration parameters as well as texts and communication parameters are accepted.
The USB stick must be formatted in FAT32, maximum size 32GB.

ATTENTION! If different, the station number and the communication parameters must be adapted later.

Since several parameter files can be stored on the USB stick, different procedures must be used depending on the version of the controller software:

- For version 360.00 up to and including 360.00av:

The parameter file must be copied to a folder named with the serial number of the controller in which the file should be loaded.

- From version 360.00aw:

When parameter 563 is changed to "YES", a list of the serial number folders of this or other controllers appears - it is possible to select from which controller the parameter file is to be imported.

The import of the parameter file works independently of the version of the controller software.
In general, however, carrying out the import only for versions that are not too different from each other is recommended. If there is a marked deviation of the software versions, some of the versions have parameters which are not available in the other (older) versions, these are of course not set and remain at the factory setting, which may lead to a controller malfunction.
In the case of large deviations of the software versions, bringing the controller software up to the same level or consulting an aqotec technician at service.request@aqotec.com is recommended.

9.12 Logging (LOG and actual value storage) on micro SD card

If a micro SD card is inserted into the controller (slot is located below the CR2032 battery), a LOG file is automatically recorded.

The following data is logged in this LOG file:
- Control start
- Error messages
- Adjustment of the system time via the visualisation
- Parameter change (including cause - on-site or via visualisation and current user level)

The LOG file is saved on the card with the name MSG_xxxx.csv, if the file exceeds 256kB or if the controller is restarted, a new file is created. The period containing the respective file can be reconstructed using the modification date.
There is a ring buffer of 40 files for the log files ... if 40 files are available when creating a new file, the oldest file is deleted.

To simplify handling, the files stored on the SD card can be copied to a USB stick via the controller; a FAT32-formatted USB stick with at least 5MB of free space can be plugged into the controller and parameter **566** must be set to "YES". During the copying process, neither the SD card nor the USB stick may be removed.
The files with the same file name are then stored on the USB stick in a subfolder named with the serial number of the controller.

In addition to the LOG files, all actual values and variable setpoints relevant for the control (depending on the configuration of the controller) can be stored in a ring buffer on the SD card in 1 minute intervals.

To use this feature, parameter **564** must be changed to "YES".

After changing, the DAT_xxxx.csv file is created on the SD card according to the following criteria:

- 1min after each control restart
- If the old file has reached a max. size of 20MB
- If the basic configuration has been changed (parameter 1-11)

The period of time that can be saved in a file depends on the configuration of the controller, but in a standard configuration, this size should amount to around 2 weeks of logging.

Depending on the size of the SD card used, logging can take place for a variable period of time. The controller automatically detects the size of the SD card; if a new 20MB file of the logging is no longer possible, the oldest file is deleted, thus creating a ring buffer function. Depending on the size of the SD card, recording can also take place over several years ...

The saved DAT file can be opened and evaluated on a PC, e.g. with Excel, each saved value has its own column, the column header (which value is shown here) is displayed in plain text on the first line. The first column shows the timestamp.
Subsequently, evaluations can be made with this file (e.g. via the "Diagram function").

ATTENTION! Before the SD card is removed from the control, parameter 565 "Remove SD card?" must be changed to YES.
If the SD card is removed without using this function, the SD card may be damaged until it is unusable and the data will be lost.

In addition to logging, the parameters are also stored in a PAR_xxxx.csv file for each newly created DAT_xxxx.csv file (same file as described in chapter "**9.8**").

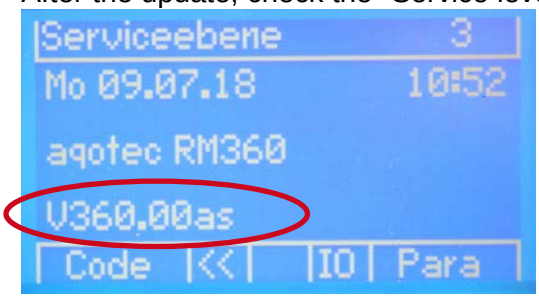
9.13 Software update via USB stick or micro SD card

To update the controller software, a USB stick or an SD card and the RM360.bin file are required (can either be downloaded from the aqotec homepage or requested at service.request@aqotec.com).

The * .bin file is copied to the storage medium on a computer with the appropriate card / USB slot and then inserted into the controller.

ATTENTION! The file may neither be renamed nor copied to a directory.

After the storage medium has been inserted into the controller, parameter **567** is used to select from which storage medium the update should be made.
After this selection, the controller software is copied to the controller from the storage medium.
The controller will then be restarted automatically, and the software will be checked and loaded.
The storage medium must not be removed during the entire process!
After the update, check the "Service level" page to determine if the software was correctly applied.



Before updating, saving the parameter file and the old software is always recommended, see chap. "**9.8**".

9.14 Software updates via visualisation

If the controller is connected to an aqotec data network (Ethernet or COM-A), a remote update can also be made via the aqo360° visualisation on the master computer.

The prerequisite for this is active communication with the controller unit.

9.15 Input of individual texts (heating circuit designation, station number, etc.)

In the "Designations" sub-menu of the "Service level" page, the designations for all heating circuits, tank circuits, analogue inputs as well as an "emergency numbers" and a "station number" can be entered from authorisation level 1 onwards.

If the station number is entered, this is also visible in the visualisation, which greatly simplifies things in the case of service.

An entered emergency number is displayed in the screensaver of the controller (with a single press of a button, the screensaver remains and is illuminated (from version 360.00aw), the screensaver disappears only when pressed again), a support number can be set here by the district heating company or the responsible installer / heating engineer ,

All designations can also be displayed and changed in the visualisation.

10 Troubleshooting

10.1 Communication

10.1.1 Data readout with RS422

The following levels can be measured and checked with an oscilloscope:

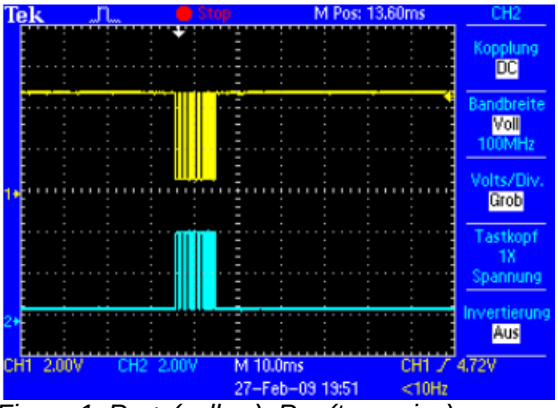


Figure 1: Rx + (yellow), Rx- (turquoise)

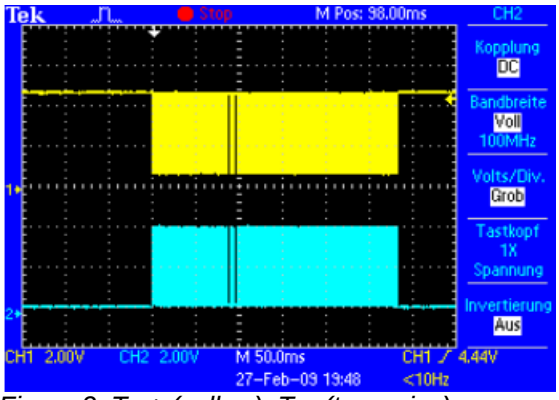


Figure 2: Tx + (yellow), Tx- (turquoise)

The Rx + and Rx- levels form the query of the controllers from the visualisation and must be applied to the corresponding terminals (measured against GND COM-A).

The recessive level (idle level) for Rx + is 5V, the dominant is 0V. For Rx-, the inverted levels apply.
The Tx + and Tx- levels form the response of a controller and should be able to be measured at the corresponding terminals.
The recessive level (idle level) for Tx + is 5V, the dominant is 0V. For Tx-, the inverted levels apply.
The 0V low level must not exceed 0.5V for any of the signals.
The 5V high level must not fall below 4V for any of the signals.
The signals must not oscillate, or contain no external harmonics (e.g. sine harmonic wave with 20ms period, when laying the data cable with 230V lines)

If one of these distortions occurs, the cable shielding must be checked and reestablished if necessary. A repeat module can provide assistance if needed in the signal is too weak or if signal separation is necessary.

10.1.1.1 Problems and solutions

1.) The Rx and Tx LEDs flash alternately, the TxR LED is off

This means that other controllers will respond from the data network, but no response will be sent from this controller.

Possible causes:
- No query by the visualisation system
- Controller has set wrong controller address or baud rate
- Defect on the control unit

Troubleshooting options:

- Setting the baud rate and controller address (see section "**8.1**")
- Measuring the signals by oscilloscope, if the signals are too weak, a signal amplifier in the data network (so-called. "repeater") may be necessary, with "unclean" signals, the routing of the data line can be checked and changed if necessary or the shield can be connected properly.
- Component defect: Replacement of the basic controller (save parameters and reload if the board is new!)

2.) (Up to) all LEDs on the RS422 module are lit continuously

If one or more LEDs are permanently lit, this indicates a faulty connection. This can be caused either by wire breakage, incorrect connection or defective data sockets / surge arresters.

Exact error finding options:
- Measuring the signals with an oscilloscope on the controller: Determine whether the signals are connected to the correct terminals and that the levels are correct. (see section "**10.1.1**")
- If necessary, correct the wiring errors detected by the measurement.
- Measuring the signals on the data socket

If the signals on the data socket are correct but do not get to the controller, the data socket is usually the cause of the error.
Here, a defective surge arrester, scorched tracks or simply an incorrectly connected surge arrester can be the problem.
Connection to the wrong terminals is also possible here.

Troubleshooting options:

- Correct the wiring
- Exchange of possibly defective parts:
  Surge arrester in the data socket
  Terminal board of the data socket
- Basic controller (save parameters and reload if the board is new!)

10.1.2 M-bus - meter reading

At the beginning, check the operation of the heat meter (power supply) and the correct wiring from the M-bus; if necessary, also measure the signal and shield it if the signals are unclean.

ATTENTION! For multiple heat meters, care should be taken when connecting to maintain the polarity of all meters (M + and M-).

The LEDs can be checked along with this test, see chap. "**4.5**"

If the query number or the number of requested meters is not plausible, the set heat meter type or the number of heat meters (see chap.**8.3**") are checked or corrected.

If these measures still fail to establish communication, the following steps can still be taken:

- M-bus slave module of the meter defective?

Check or replace the module

- Meter is battery operated and therefore has a limited readout frequency?

Correct setting of the readout frequency, see chap. "**8.3**".

- Built-in meter is not compatible with the controller?

An **aqotec** service technician can provide information (service.request@aqotec.com).

10.2 Control inputs

10.2.1 Temperature sensors

- **Sensor is connected, but displays unrealistic values:**

It should be noted that only sensor type PT1000 can be read correctly.

In principle, a sensor reading of 150 °C (for boiler 99 C, for outdoor sensor 0 or 1° C) indicates an open input.
A sensor reading of -40 °C indicates a short circuit of the sensor input (connection to GND)
In both cases, the wiring must be checked for wire breakage or if the sensor is connected correctly (see chap."**3**").
If the wiring is correct, the sensor can be terminated on the controller and measured using a multimeter (resistance measurement function) - the measurement result must be between 850 and 1500 ohms.
If the measurement result deviates, the sensor is almost certainly defective and must be replaced.

- **One or more sensor values jump:**

If an unshielded sensor line is laid next to or with a more heavily loaded line (pump supply, etc.), it may happen that an external voltage is induced in the sensor line due to the magnetic field of the loaded line, which negatively influences the measurement result.
In this case, it is advisable to either change the laying method of the cable (disconnection of the cables) or to use a shielded cable which is placed with the shield on PE on one side.

10.2.2 Remote control FBR6

- **The switch positions of the remote control are not accepted:**

This may be due to a faulty wiring, a faulty switch in the remote control or an incorrect configuration, see chap. "**07/04/12**".

In order to check if the wiring is correct, voltage should be measured on the remote control at terminal VCC and GND with the multimeter when the controller is active; approx. 5V DC must be present.
If 5V is not present, check the operation of the controller or the connection of the remote control cable on the controller.

If this voltage is present, you can measure between SIG and GND.
With AUTO and correction potentiometer set to 0, approx. 3.3V must be present.
With DAY and correction potentiometer set to 0, approx. 1.1V must be present.
With NIGHT and OFF set, no voltage may be present.

If these voltages are not present, the switch is faulty, the remote control must be replaced in this case.

The same voltages as between SIG and GND must therefore also be measured at the controller at terminals FBS and GND (where the remote control is connected), otherwise the FBS (controller)→SIG line (remote control) is interrupted.

If the voltages are measured correctly but the switch positions are still not applied correctly, check whether additional wiring for the remote control does not influence the switch position (e.g. via potential-free contacts).

- **The room temperature of the remote control is not displayed:**

When the switch position is OFF, no temperature indication is possible; in this case there is no error.
For all other switch settings, the temperature must be displayed.

If this is not the case, the connection to the controller or the room sensor can be checked:
If the FBT wire is not connected to the controller, it is possible to measure between FBT and GND by means of a multimeter (resistor measurement function). The result of the measurement must be between 850 and 1500 ohms.
If this is not the case, the wiring to the remote control must be checked.
The same measurement can also be performed directly on the remote control between terminal TMP and GND (no wire connected to TMP!). If the measurement result is not between 850 and 1500 ohms, the remote control must be replaced.

10.2.3 External release - heating circuit

If the heating circuit is not released or is always released, this is usually due to incorrect logic of the potential-free contact or an incorrect connection.
See chap. "**7.4.13**".

ATTENTION! A released heating circuit may also be locked with active boiler charging in priority mode or if the buffer temperature is too low (buffer low temperature shutoff).
The heating circuit is inactive even with the "Off / Frost protection" main function selection or active shutoff according to the outside temperature.

If this does not solve the problem, there may also be a defect in the basic controller or the heating circuit module.

10.2.4 External release - boiler

If boiler charging is not released or is always released, this is usually due to incorrect logic of the potential-free contact or an incorrect connection.
See chap. "**7.3.7**"

If boiler charging is not activated despite the closed contact, this may be due to a charging lock (see chap.**7.3.6**").

If boiler charging is not completed despite the open contact, this may be due to a boiler sensor connected in parallel which has not reached the setpoint temperature.

10.3 Control outputs

10.3.1 Pump control

- **A pump connected to the basic controller is not switched on or not switched off:**

In most cases, this problem is caused by a defective relay or a missing supply.

If the pump output is on the motherboard, it can be assumed that the problem is not an incorrectly connected ribbon cable or a defective fuse.

In order to determine the real state of the output, measurement is necessary. The "Output test" menu should be used here, see chap. "**4.3**".

After selecting the correct output in the menu, the output should be measured with a multimeter once with and once without a connected pump, between the output and neutral conductor a voltage of 230V AC must be present.

After this test, the "All outputs off" option should be selected in the same menu and measured again, between the output and neutral conductor no voltage may be present.

(**!ATTENTION!** Disconnect the pump from the output to avoid possible measuring errors due to pump reverse voltages)

If there is no voltage either in case 1 or voltage is present in case 2, then the relay is defective; in this case, either the output function must be configured to another output (e.g. use of another heating circuit) or the basic controller must be replaced.

In this case, checking the electrical data of the pump is strongly recommended.
A nominal current above 1A or starting currents > 20A (e.g. Grundfos Alpha 2 or Wilo Stratos) will inevitably lead to the destruction of the relay. In this case, use a coupling relay as described in chapter "**11.3**".

If the voltage is measured correctly in both cases, then the supply line of the pump should be checked, the voltage measurement can be repeated directly at the pump.

If voltage is applied correctly to the pump, then the error is not on the control unit, the pump must be checked for functionality.

- **A pump connected to the heating circuit is not switched on or not switched off:**

Unlike with the motherboard, the heating circuit module also has an LED for every 230V output which indicates the status of the output.

Using this LED, you can determined whether the output should be switched from the controller.

If this LED does not light up, first check whether the PWR LED of the heating circuit module (green) is lit.
If this is not the case, the ribbon cable connection to the basic controller must be checked.
If the PWR LED lights up but the output LED does not, check the controller based on the sensor values and configuration to determine why the output is deactivated.

To check the output, the "Output test" menu can also be used here, see chap. "**4.3**".

After selecting the correct output in the menu, the output should be measured with a multimeter once with and once without a connected pump, between the output and neutral conductor a voltage of 230V AC must be present.

If no voltage is present although the output LED on the heating circuit module is lit, the error may also be due to a missing 230V supply.
In this case, the "L" and "N" terminals (see chap. "**3**") should be measured to determine whether the 230V AC voltage is applied here.
If this is not the case, the wiring or the fuse of the controller must be checked.

If the previous test was successful, the "All outputs off" option should be selected in the same menu and measured again, between the output and neutral conductor no voltage may be present. (**!ATTENTION!** Disconnect the pump from the output to avoid possible measuring errors due to pump reverse voltages)

If there is no voltage either in case 1 or voltage is present in case 2, then the relay is defective; in this case, the heating circuit module must be replaced.

In this case, checking the electrical data of the pump is strongly recommended.
A nominal current above 1A or starting currents > 20A (e.g. Grundfos Alpha 2 or Wilo Stratos) will inevitably lead to the destruction of the relay. In this case, use a coupling relay as described in chapter "**11.3**".

If the voltage is measured correctly in both cases, then the supply line of the pump should be checked, the voltage measurement can be repeated directly at the pump.

If voltage is applied correctly to the pump, then the error is not on the control unit, the pump must be checked for functionality.

10.3.2 Valve / mixer control

With the 3-point control, there are two contacts for activation on the output side, in the example of the station's primary valve, these would be:
1- 230V output valve OPEN
2- 230V output valve CLOSED

If 230V AC is present at terminal 1, the valve is opened by the actuator of the controller. In this mode, voltage must not be applied to terminal 2.

If 230V AC is present at terminal 1, the valve is closed by the actuator of the controller. In this mode, voltage must not be applied to terminal 2.

If neither terminal 1 nor terminal 2 has 230V AC, the valve position will not be changed.

As already described in section "**10.3.1**", a defective relay as a source of error should be ruled out by measuring the outputs using a multimeter.

If the outputs are switched correctly, but the mixer / valve still does not change the position, measurement can again be done directly at the connection terminals of the actuator; a missing neutral conductor could be the problem here.

If the correct voltages are also present on the mixer / valve, the actuator or the mixer itself must be checked for proper functioning.

In the case of the primary valve (if present), the safety function of the valve can also be active.
In the case of an actuator with safety function, in addition to the normal 3-point control, a magnetic lock with spring is also installed.
If the magnet is no longer supplied with voltage, the lock is released and the actuator closes the valve using spring force.

Opening of the valve with a 3-point control is then put out of operation until the magnet lock of the actuator is again supplied with voltage.
Usually you can see at the connection terminals if the installed actuator has a safety function:
In addition to the "OPEN", "CLOSED" and "Neutral" contacts, there are two additional terminals, "L" and "Neutral conductor" for the magnet lock in the connection field.
The phase connected here may under certain circumstances have been interrupted by a safety temperature limiter.
The following applies again for finding errors: Measure the voltage at the terminals of the magnet lock in the actuator.
If there is no voltage, the relevant safety devices or the power supply must be checked for function.

If the valve / mixer work correctly in the initial test but always remain closed in automatic mode or supply insufficient temperatures, the respective flow sensor of the heating circuit or the sec. flow sensor of the station and the associated setpoints must be checked.
An unconnected flow sensor in a mixed heating circuit will permanently close the mixer.

In addition to the faulty sec. flow sensor or to the safety function, a set return limit or a set power limit can also cause the primary valve to close.

11 Accessories with part number

11.1 Basic controller and control panel

Part no.	Designation	Brief description / Reference
1200222	Basic controller RM360	See section "**3.2Basic controller**", controller in the module tray
1200221	Monochrome control panel	See section "**3.1 Monochrome control panel**", control unit in housing with connection cable 1m

11.2 Standard / Multi heating circuit module

Part no.	Designation	Brief description / Reference
1201464	Standard heating circuit module + plug-in terminals + FBK 200mm	Standard heating circuit module with 3x 230VAC switching outputs and 200mm long ribbon cable (for use in the tray below the basic controller). Please refer "**3.3Standard heating circuit module**"
1201465	Standard heating circuit module + plug-in terminals + FBK 1100mm	Standard heating circuit module with 3x 230VAC switching outputs and 1100mm long ribbon cable (for use in the trays which have longer distances to the connection port on the basic controller). Please refer "**3.3Standard heating circuit module**"
1111448	HCMMB 1x24VDC PWM	Multi Basis heating circuit module with bridging plug and 1100mm ribbon cable, equipped with a 24VDC 2A solid state relay for a PWM output. See "**3.5Multi variant 1 heating circuit module (control PWM pump)**"
1111820	HCMMB 3x230VAC switching relay	Multi Basis heating circuit module with bridging plug and 1100mm ribbon cable, equipped with 3 switching relays for a 230VAC or potential-free switching output. See "**3.4Multi variant 5 heating circuit module (potential-free switching contacts)**"
1111821	HCMMB 1x24VDC PWM, 2x230VAC Switching relay	Multi Basis heating circuit module with bridging plug and 1100mm ribbon cable, equipped with a 24VDC 2A solid state relay for the PWM heating circuit pump output and two switching relays for the 230VAC 3-pt. mixer output. See "**3.6Multi variant 6 heating circuit module (control PWM pump and 3-pt. mixer)**"
1111867	HCMMB+EM 1x230VAC switching relay	Multi Basis heating circuit module with extension module and 1100mm ribbon cable, equipped with a switching relay for a 230VAC or potential-free release. See "**3.7 Multi variant 8 heating circuit module (3x0-10V/PWM output, 1x switching contact)**"
1112269	HCMMB+EM 3x230VAC switching relay	Multi Basis heating circuit module with extension module and 1100mm ribbon cable, equipped with 3 switching relays for 3 230VAC or potential-free releases. See "**3.8 Multi variant 10 heating circuit module (3x0-10V/PWM output, 3x switching contact)**"
1200617	HCMMB+EM 1x switching relay 2xSSR 230VAC	Multi Basis heating circuit module with extension module and 1100mm ribbon cable, equipped with a switching relay and 2 solid state relays for a 230VAC or potential-free release and mixer control with frequent switching. **ATTENTION!** With inductive loads, 2x part no. 1201442 may also be necessary! See "**3.9 Multi variant 11 heating circuit module (1x0-10V/PWM output, 3x switching contact)**"

1200624	HCMMB 2xSSR 230VAC	Multi Basis heating circuit module with bridging plug and 1100mm ribbon cable, equipped with a 2 230VAC solid state relays for a 3-pt. mixer output with frequent switching. **ATTENTION!** With inductive loads, 2x part no. 1201442 may also be necessary! See 1**3.10 Multi variant 12 heating circuit module (2x 230VAC switching output with SSR)**"

11.3 Accessories for Standard / Multi heating circuit module

Part no.	Designation	Brief description / Reference
1004358	Switching power supply 264VAC / 24VDC / 0.63A / 15W	24V DC rail power supply for supplying HC Multi variant 1 and 6
1103359	Finder relay 230VAC 2 changer-over contact 6A	Relay with two change-over contacts, 6A each, for connecting larger pumps to the controller: Either control via potential-free contact (pump release) or direct switching of the pump supply via the relay.
1107025	Pump connector for Grundfos Alpha 2 (starting current limit) 2m	If a Grundfos Alpha / Alpha 2 is to be connected, this pump plug must be used for the starting current limit. If the pump is connected directly without this plug, the high start-up currents destroy the relay of the controller.
1106763 1002682 1106764 1002687	Finder relay 230VAC 1 changer-over contact 80A	If a high efficiency pump with high starting currents is connected, this relay must be used. Starting currents of up to 80A can be covered with this relay. The relay consists of the four individual part numbers.
1201442	Protective circuit SSR for inductive loads VSSC4 RC 240VAC / DC "	Protective circuit SSR relay for inductive loads.
1114522	Terminal for FWM-DFS RM360	If a flow switch is connected to a fresh water module, this terminal must be closed in series with the switch contact so that the switch can be correctly detected. For connection and description, see chap. "**3.5**" to "**3.10**"

11.4 Spare parts and direct accessories for basic controller

Part no.	Designation	Brief description / Reference
1200284	Replacement screw terminal set RM360	Complete screw terminal set for the RM360 basic controller
1200285	Replacement spring terminal set RM360	Complete spring-loaded terminal set for the RM360 basic controller (only on request, not recommended)
1200286	Replacement screw terminal supply RM360	Single screw terminal as spare part
1200287	Replacement screw terminal outlet A1 RM360	Single screw terminal as spare part
1200288	Replacement screw terminal outlet A2 RM360	Single screw terminal as spare part
1200289	Replacement screw terminal output 1+2 RM360	Single screw terminal as spare part
1200290	Replacement screw terminal output, 3 RM360	Single screw terminal as spare part
1200291	Replacement screw terminal output 4 RM360	Single screw terminal as spare part
1200292	Replacement screw terminal output 6+7 RM360	Single screw terminal as spare part
1200293	Replacement screw terminal output 5 RM360	Single screw terminal as spare part
1200294	Replacement screw terminal output 8 RM360	Single screw terminal as spare part
1200295	Replacement screw terminal input T10 RM360	Single screw terminal as spare part
1200296	Replacement screw terminal input T11 RM360	Single screw terminal as spare part
1200297	Replacement screw terminal input T12 RM360	Single screw terminal as spare part
1200298	Replacement screw terminal input T13 RM360	Single screw terminal as spare part
1200299	Replacement screw terminal input T14 RM360	Single screw terminal as spare part
1200300	Replacement screw terminal input T15 RM360	Single screw terminal as spare part
1200301	Replacement screw terminal input T16 RM360	Single screw terminal as spare part
1200302	Replacement screw terminal input Remote ctr. 1 RM360	Single screw terminal as spare part
1200303	Replacement screw terminal input Remote ctr. 2 RM360	Single screw terminal as spare part
1200305	Replacement screw terminal input T23 RM360	Single screw terminal as spare part
1200306	Replacement screw terminal input T24 RM360	Single screw terminal as spare part
1200307	Replacement screw terminal AIN1 RM360	Single screw terminal as spare part
1200308	Replacement screw terminal AIN2 RM360	Single screw terminal as spare part
1200309	Replacement screw terminal AO1 RM360	Single screw terminal as spare part
1200310	Replacement screw terminal AO2 RM360	Single screw terminal as spare part
1200311	Replacement screw terminal 12VDC RM360	Single screw terminal as spare part
1200312	Replacement screw terminal CAN RM360	Single screw terminal as spare part
1200313	Replacement screw terminal COM A RM360	Single screw terminal as spare part
1200314	Replacement screw terminal COM C RM360	Single screw terminal as spare part
1200315	Replacement screw terminal M-bus RM360	Single screw terminal as spare part

1200316	Cable for sub-controller RM360 0.6m	Cable with 0.6m length for direct connection of a sub-controller to the master (via the RJ12 socket)
1200317	Cable for sub-controller RM360 1.5m	Cable with 1.2m length for direct connection of a sub-controller to the master (via the RJ12 socket)
1200318	Cable for sub-controller RM360 2.8m	Cable with 2.8m length for direct connection of a sub-controller to the master (via the RJ12 socket)
1114477	Connection cable RM360 GND COM A	If a bus GND is required for the COM-A interface, this cable is required (due to galvanic isolation, the general GND is not identical to the GND of this interface!) Length 0.5m

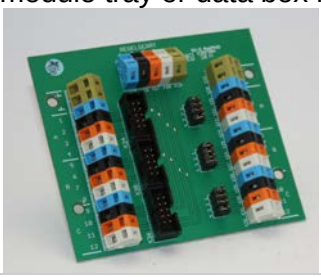
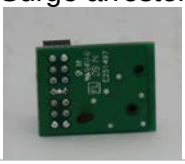
11.5 Remote controls

Part no.	Designation	Brief description / Reference
1003815	Remote control FBR6	See "**3.11.1Remote control FBR6**" Connection via four wires (e.g. shielded telephone cable) directly to the basic controller or to the heating circuit module. With potentiometer for room temperature correction, operating mode selector switch and integrated room sensor. 
1107551	Remote control FBR7 black	See "**3.11.2Remote control FBR7**" Connection via four shielded wires (shielded telephone cable) With room temperature correction setting, operating mode display / selection and integrated room sensor. 
1107599	Remote control FBR7 white	See "**3.11.2Remote control FBR7**" Connection via four shielded wires (shielded telephone cable) With room temperature correction setting, operating mode display / selection and integrated room sensor. 

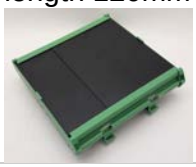
11.6 Sensors

Part no.	Designation	Brief description / Reference
1003572	Cable sensor Pt1000 1.2m 6x32x0.4mm	Sensor for immersion sleeve with 1.2m cable without terminal box. Up to max. 105 °C
1003574	Cable sensor Pt1000 2m 6x32x0.4mm	Sensor for immersion sleeve with 2m cable without terminal box. Up to max. 105 °C
1003576	Cable sensor Pt1000 5m 6x32x0.4mm	Sensor for immersion sleeve with 5m cable without terminal box. Up to max. 105 °C
1003575	Cable sensor Pt1000 5m silicone	Sensor for immersion sleeve with 5m cable without terminal box. Up to max. 150 °C
1003156	Contact sensor Pt1000 2m	Attachment sensor including mounting clamp with 2m cable without terminal box. Up to max. 105 °C
1003157	Contact sensor Pt1000 5m	Attachment sensor including mounting clamp with 5m cable without terminal box. Up to max. 105 °C
1003095	Outdoor sensor Pt1000 IP65 + aqotec logo	Outdoor sensor in surface-mounted housing (protection class IP65) Measuring range: -50 ° ... + 100 °C Connection terminals: Screw terminal max. 1.5mm² (two-wire) 
1003816	Room sensor FBR6	Room sensor for connection directly to the motherboard or to the heating circuit module (2 wires) in the surface-mounted housing.

11.7 Data network accessories

Part no.	Designation	Brief description / Reference
1100588	aqotec data socket 12pin + surge	Data socket 12pin for RS422 data network with surge arrester (image left) and bridging plug (image right, not used!). 
1003213	Terminal board f. data socket 12pin	12pin Motherboard for surge arresters or bridging plugs (for module tray or data box installation) 
1005071	Surge arrester f. data socket+diode	Surge arrester for 12pin motherboard 
1201067	Data socket + surge arr. CAN-Bus (RM360 Subcom)	CAN bus protection module for sub-communication of controllers of different electrical protection areas (controllers in different buildings) Information on application and installation can be found in the documentation for the "CAN bus protection module" (can be downloaded from the aqotec homepage). 

11.8 Other accessories

Part no.	Designation	Brief description / Reference
1107523	Controller housing of station construction without cut-out	Simple controller box without controller or thermometer cut-out (station extension housing) Required if a the controller is extended later: - From basic controller and 3x heating circuit modules When using a HC Multi, note that variants 8, 10 and 11 need space for two heating circuit modules. The housing is screwed to the left of the main housing. 
1106981	Controller housing of station construction with cut-out	Simple controller box with controller but without thermometer cut-out (station extension housing) 
1001090	Blind cover for controller box	Blind cover for control panel cut-out on controller box 
1200559	Adapter frame for display RM360	If the RM360 controller is installed in a housing with a control panel cut-out for controller model Schneid MR05 (T-print) or MR06 (module controller), this adapter frame must be used for the display.
1200223	Mounting tray for basic controller RM360	Module tray with DIN rail for use with circuit boards, max. board length 275mm 
1200224	Mounting tray for 3 heating circuits RM360	Module tray with DIN rail for use with circuit boards, max. board length 120mm 

11.9 Controller sets (conversion of an old controller or standalone controller)

Part no.	Designation	Brief description / Reference
1200704	SET RM360 0HC + G + V	Basic controller and control panel in IP54 control box including tray for 3 expansion modules.
1200225	SET RM360 0HC Austausch RM01/MR08	Basic controller and tray for 3 extension modules mounted on a DIN rail and control panel. The DIN rail is screwed into the existing box and then the controller + tray for the expansion modules are inserted. The control panel cut-out matches, new control panel only has to be inserted.
1200227	SET RM360 0HC replacement MR06	Basic controller and tray for 3 extension modules mounted on a DIN rail, control panel and adapter frame. The DIN rail is screwed into the existing box and then the controller + tray for the expansion modules are inserted. The adapter frame is placed on the front and screwed on from the back (adapter frame with cut thread and screws are included in the set). The control panel can be inserted into this adapter frame.
1200226	SET RM360 1HC replacement MR05/T-Print	Basic controller and tray for 3 extension modules mounted on a DIN rail, control panel, adapter frame and connection terminals. The DIN rail is screwed into the existing box and then the controller + tray for the expansion modules and the connection terminals (connection of the supply voltage) are inserted. The adapter frame is placed on the front and screwed on from the back (adapter frame with cut thread and screws are included in the set). The control panel can be inserted into this adapter frame.
1200599	District heating test case RM360	Basic controller, control panel and Multi variant 10 heating circuit module installed in a handy outdoor case with potentiometer, LEDs and voltmeter displays for sensor simulation and display of switching and analogue outputs. With this case, any problems can be simulated on a system and a solution can be found.

12 Notes

Notes

13 Contact

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