EQJW 146: Heating and district heating controller, equitherm

How energy efficiency is improved

Convenient time programme that enables the system to be adjusted to the individual requirements of the user, and also to be switched off temporarily if required

Features

- Weather-dependent supply temperature control by heating curve or 4-point characteristic and drinking water heating
- 29 system models, for example for district heating, single-stage boilers, drinking water heating with solar energy or buffer tank
- Convenient to use with modern operating concept (turn and press) and large LCD
- Convenient weekly and annual switching programmes with optimisation of switching times
- Automatic summertime/wintertime changeover
- Min./max. limitation of supply temperature and max. limitation of return temperature
- Frost-protection facility and anti-jamming function for valve and pump
- Floor-drying function
- Function for protecting against legionellae
- Room temperature switching using room-temperature sensors
- Ni/PT1000 inputs for the outside, supply, drinking water, return flow and room temperature
- Relay outputs with varistor suppression for activating control units and pumps
- Manual mode
- Logbook
- Configurable input/output 0...10 V
- External demand processing, binary or analogue (0..10 V)
- Interface for various accessories such as modem, gateway, data logging module etc.

EQJW146F002
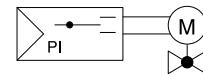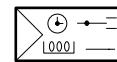
Technical data

Power supply

Power supply	Power supply	230 VAC, ±15%, 50...60 Hz
	Power consumption	Approx. 1.5 VA

Parameters

Control characteristic	Supply temperature	PI control
	Drinking water temperature	2-point
Control parameters	Amplification KP	0.1...50
	Integral action time	1...999 seconds
	Switching difference for drinking water	1...30 K
Temperature ranges	Normal temperature	0...40 °C
	Reduced temperature	0...40 °C
	Supply temperature	0...140 °C
	Return temperature	0...140 °C
	Outdoor temperature	−50...50 °C
	Drinking water temperature	20...90 °C
	Frost-protection temperature	−15...3°C
	Running time of valve	30...300 seconds
	Cycle time	Running time of the valve ÷ 15

Ambient conditions

	Ambient temperature	0...40 °C
	Ambient humidity	5...95% rh, no condensation
	Storage and transport temperature	−10...60 °C

Inputs/outputs

	Number of outputs	7 relays
	Pump relay[1]	3 × 2 A, 250 VAC, cos φ > 0,5

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[1] *Start-up current max. 16 A (1 second)*

	Actuator relay[2]	4 × 2 A, 250 VAC, cos φ > 0,5
	Continuous input/output[3]	1 × 0...10 V
	Number of inputs	2 digital, 8 analogue
	Analogue inputs	8 Ni1000/Pt1000

Function		
Timer	Backup power supply	Min. 24 hours, typically 48 hours
	Accuracy	< 10 minutes/year
Weekly switching programme	Number of programmes	3
	Number of switching commands	42 each
	Min. switching interval	15 minutes
Annual switching programme	Number of programmes	1 (for heating circuits)
	Number of switching commands	20 each
	Min. switching interval	1 day

Interfaces, communication		
Communication	Interface	RJ45
	Protocol	Modbus, device bus (TAP)

Construction		
	Weight	0.5 kg
	Dimensions W × H × D	144 × 98 x 54 mm
	Housing	Light-grey
	Housing material	Fire-retardant thermoplastic
	Fitting	Wall, switch panel, DIN rail
	Screw terminals	For electrical cables of up to 2.5 mm²

Standards, directives		
	Type of protection	IP40 (EN 60529) (when fitted in panels)
	Protection class	II (IEC 60730-1)
	Software class	A (IEC 60730-1, Appendix H)
CE conformity according to	EMC Directive 2014/30/EU	EN 61000-6-1, EN 61000-6-3
	Low-Voltage Directive 2014/35/EU	EN 60730-1

Overview of types

Type	Features
EQJW146F002	Heating and district heating controller with graphic display

Accessories

Type	Description
AVF***	Motorised valve actuator (see product data sheet)
AVM***	Motorised valve actuator (see product data sheet)
AXM***	Motorised valve actuator (see product data sheet)
EGT***	External temperature sensor Ni1000 (see product data sheet)
0440210001	Communication module for connecting EQJW 126/146 controllers to RS-232 (PC)
0440210002	Communication module for connecting EQJW 126/146 controllers to modem
0440210003	Communication module for connecting EQJW 126/146 controllers to RS-485 bus
0440210004	Communication module for connecting EQJW 126/146 controllers to RS-485 bus (master)
0440210005	ModBus-TCP gateway
0440210006	ModBus-MBus gateway
0440210007	Converter/repeater for RS-232 or RS-485 interfaces
0440210008	RS-485 overvoltage protection
0440210010	Parameter storage module for transferring controller parameters
0440210011	ModBus-GPRS gateway
0440210012	Cable converter for 2-conductor RS-485 interface
0440210013	Mounting base for wall and DIN rail, 53 mm

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[2] *Extra low voltage not admissible*

[3] *As input for requirement or outside temperature signal. As output for continuous control or requirement request, load > 5 kΩ*

Description of operation

The EQJW 146 heating controller performs weather-dependent control of the secondary supply temperature. Depending on the application, drinking-water control is also performed. Furthermore, the primary return temperature can be limited. Various control models are stored in the EQJW 146 for the different applications.

The outside temperature and the supply temperature and, if applicable, the room, drinking water or return temperature are determined by means of precision sensors. The microprocessor in the controller uses the digitalised temperature values to calculate the signals for the outputs. Using the stored control model, the calculation of the output signals is based on the specified setpoints, the current control offset, the set control parameters and the operating mode, along with the current actual values. These signals are processed further via switching amplifiers. The results are the ON/OFF commands of the relay outputs for the control unit and the pump.

The room is supplied with the heat required to keep the room temperature constantly at the current setpoint. If a room-temperature sensor is connected to the EQJW 146 and parameterised, the current room temperature is considered in the calculation of the setpoint for the supply temperature. For the drinking water preparation, the actual value of the drinking water temperature is compared with the setpoint. If the actual value is smaller than the setpoint, the supply temperature required for the drinking water circuit is regulated and the charge pump is switched on.

The switching programmes, which the user can adapt individually, provide an optimal comfort level at the lowest energy consumption. The setpoint for the room temperature and the drinking water can be adjusted. The menu navigation makes it easy to select the operating mode, e.g. the heating or the drinking water warming can be switched off during longer absences. The frost-protection facility prevents the system from freezing. The "Temporary temperature change" function can be used to activate the party function or switch easily to another operating mode for a specific period, thus saving energy. The current operating status of the system is indicated in the display, where the user can see it easily at all times.

Communication with the controller is possible using an interface with various accessories; see the technical manual for EQJW 126/146, Communication connection.

Intended use

This product is only suitable for the purpose intended by the manufacturer, as described in the "Description of operation" section.

All related product regulations must also be adhered to. Changing or converting the product is not admissible.

Engineering note

The equitherm EQJW 146 controller must be connected to the mains power supply all year round.

Abbreviations			
AF	Outdoor temperature (sensor)	T_I	Initial point (foot point)
VF	Supply temperature (sensor)	T_n	Integral action time
RüF	Return temperature (sensor)	T_y	Running time of valve
RF	Room temperature (sensor)	T_A	Outdoor temperature
SF1	Storage temperature (sensor) 1 (upper)	X_p	Proportional band
SF2	Storage temperature (sensor) 2 (lower)	S	Slope of heating characteristic
UP	Heating pump	T_{WW}	Drinking water temperature (warm)
SLP	Drinking water charging pump	☾	Reduced mode
ZP	Circulation pump	☼	Normal mode (nominal mode based on EN12098)
RK	Control unit with 3-point motorised actuator	⏻	Off or back-up mode (with/without frost-protection facility)

Indexes		Example	
X_s	Setpoint	VF_s	Supply temperature setpoint
X_i	Actual value	VF_i	Actual value of the supply temperature
max	Maximum	VF_{smax}	Maximum supply setpoint
min	Minimum	RF_{smin}	Minimum room setpoint

Additional technical data

Measuring accuracy	Better than ±0.3 K at 25 °C
Time constant for processing of measured values	< 1 sec for all
Sensors in neutral zone, supply temperature	± 0.5 K
Minimum pulse duration for control unit	125 milliseconds (ms)
Follow-on time for heating pump	$2 \times T_Y$
Follow-on time for SLP	Adjustable on the configuration level
Heating characteristic	Curved or 4-point characteristic
Delayed adjustment for outside temperature	1.0 to 6.0 °C/h
Summertime/wintertime heating limit	Date adjustable and outside temperature limit value 0...30 °C
Backup power supply	Typically 48 h (min. 24 h). The device must have been supplied with mains power for at least 4 hours
Input for temperature sensor	Ni1000/Pt1000
Binary input (Voltage between terminals 9/10 and 12 (COM))	Signal "contact closed" at < 1.5 V Signal "contact open" at > 2.5 V Current across the contacts: approx. 1 mA Open-circuit voltage: approx. 5 VDC
Switching frequency, mechanical	> 5 million switching cycles
Maximum closing time, control unit	Twice the running time of the valve. The control unit is constantly actuated
Temporary temperature change	Temperature change from 15 minutes to 48 hours
Proportion of extraneous heat	Continuous occurrence of extraneous heat, e.g. caused by heat loss from machines
Outdoor temperature switch-on value in normal operation (design temperature)	If the device is in automatic mode and the outdoor temperature is lower than the set outdoor temperature switch-on value in normal mode, the heating is controlled in normal mode independently of the switching programme

Special functions

|	
Room-temperature connection	The room-temperature connection is activated on the configuration level. A room-temperature sensor is required
Frost protection programmes I and II	Frost protection programme I: Limited frost protection when the heating circuit is in OFF mode and frost protection has been activated on the configuration level. Frost protection programme II: If the temperature falls below the frost limit, the heating pump (UP) is always switched on. The frost limit is adjustable from −15...+3 °C
Anti-jamming function for pump	If the heating circuit pumps have not been activated for 24 hours, forced operation takes place between 12.02 and 12.03 a.m. This stops the pumps from jamming due to being stationary for too long. In the drinking water circuit, the circulation pump is operated between 12.04 and 12.05 a.m. The other pumps are operated between 12.05 and 12.06 a.m. The valves are also actuated with a delay
Limitation of supply temperature	The maximum and minimum setpoints for the supply temperature are limited. If a setpoint is calculated for the supply temperature that is outside these limits, the limit temperature is regulated. The limit value is set on the configuration level. In manual mode, the supply-temperature control is not active and therefore the limitation of the supply temperature does not apply. When the frost-protection facility is active, the limitation of the supply temperature is disabled
Limitation of T_{WW}	The maximum setpoint for T_{WW} can be limited on the configuration level
Anti-legionellae function	The weekly switching programme can be used to increase T_{WW} at regular intervals

Limitation of the return temperature	The maximum actual value of RüF can be monitored.
	If the actual value of RüF exceeds the limit, the setpoint for VF is reduced. A limiting characteristic dependent on the outside temperature (fixed-value + schedule + fixed-value) can be defined for the heating circuit, and a fixed limit value for the drinking water circuit. The limiting function, or the limit value, and the influence on the setpoint for VF are parameterised on the configuration level
Minimum throughflow limitation	The minimum throughflow can be limited. This is done using a pulse signal from a throughflow measuring device or the signal from an auxiliary contact of a control unit. If the function is activated, the valve is closed on the primary side and is only opened again when the setpoint of VF is 5 K higher than the actual value
Limitation of throughflow and power limitation	The maximum throughflow and the maximum power consumption can be limited. Limit values can be specified for the heating, the drinking water circuit and the combination of heating and drinking water circuit. If the limit value is exceeded, the supply temperature is reduced. The limit values and the degree of intervention when the limits are exceeded are parameterised on the configuration level
Optimising the switching times	A room sensor is required for this function. Optimising causes the heating to be switched on and off at the optimal times in automatic mode when the system changes between reduced mode or back-up mode and normal mode. The times are selected to ensure that the room-temperature setpoint is reached at the time specified in the switching programme. At the same time, energy is saved by switching the heating on as late as possible, and turning it off as early as possible
Manual mode	In manual mode, the pump and the valve can be activated separately. The setting is made using a menu
Automatic cut-off	The heating controller uses its automatic cut-off to save energy without any loss of comfort.
	Possible conditions for automatically switching off the heating controller:
	• Device is in OFF mode
	• Outside temperature limit value for "Summer" is exceeded
	• Outdoor temperature is above the initial point (T_I) of the heating characteristic
Floor-drying function	The following parameters can be set for the automatic floor-drying function:
	• Start temperature: 20...60 °C
	• Temperature increase/decrease/day: 0...10 °C
	• Maximum temperature: 25...60 °C
	• Holding period Tmax: 0...10 days
Switching programmes	A weekly switching programme with a maximum of 42 switching commands and an annual switching programme with a maximum of 20 switching commands are available.
	The minimum switching interval is 15 minutes and 1 day respectively.
	The operating mode from the weekly and annual switching programme (holidays) with lower energy consumption has priority
Logbook	A logbook is available. Events that occur, e.g. a control offset that is too big or incorrect measured values, are logged.

Disposal

When disposing of the product, observe the currently applicable local laws.

More information on materials can be found in the Declaration on materials and the environment for this product.

Heating characteristic for foot point T_I = 20 °C
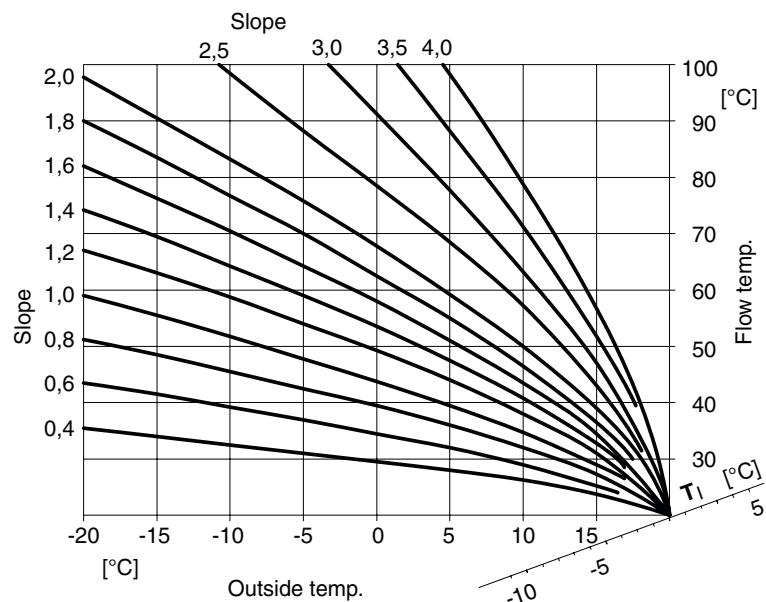

Example applications

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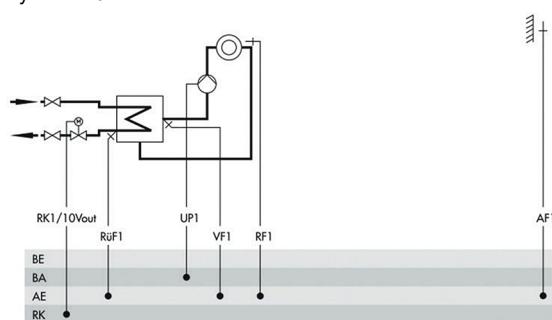

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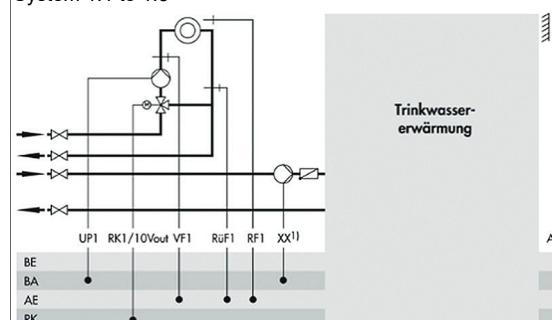
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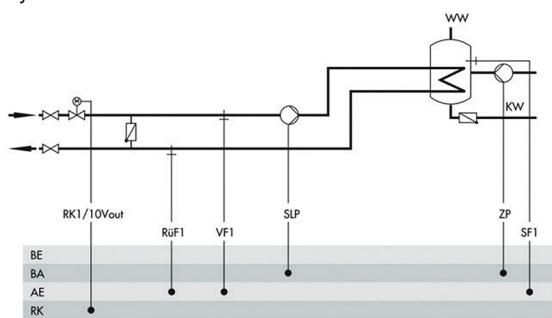
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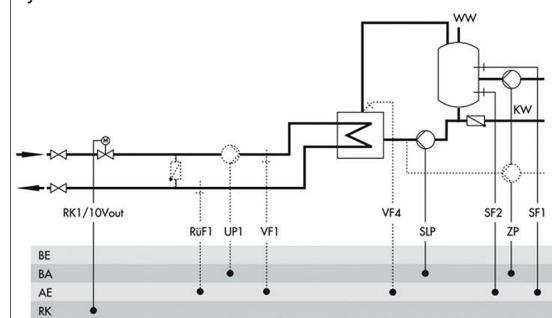
[4]   *Selection of types for drinking water heating for systems 1.x, see page 9*

System 1.9
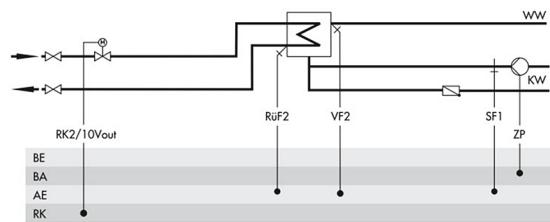
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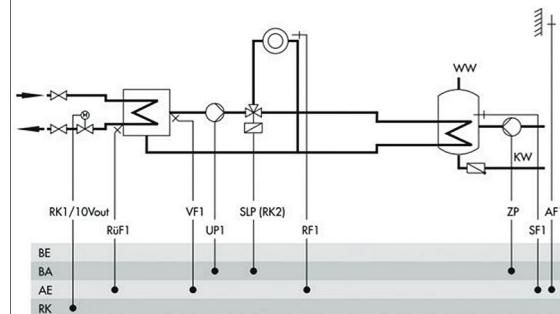
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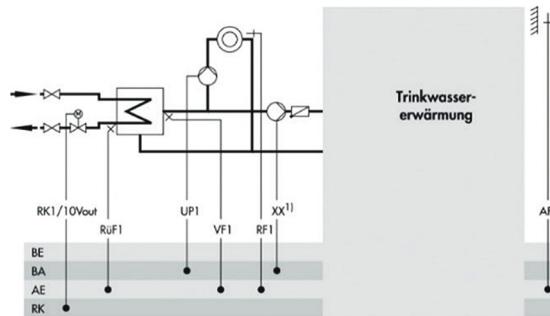
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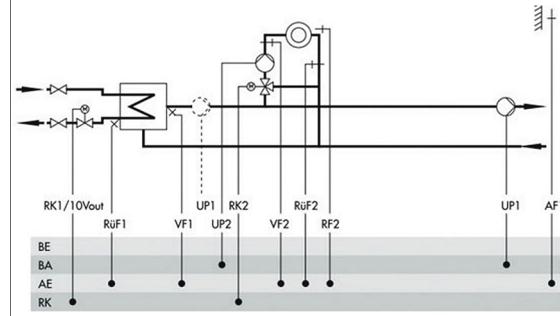
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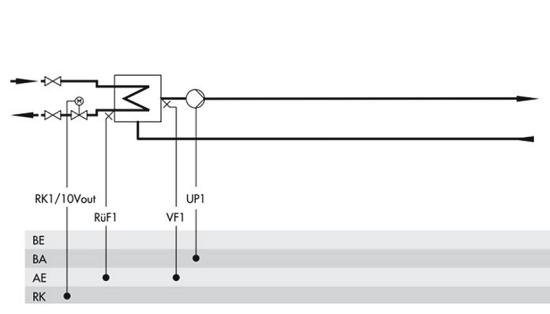
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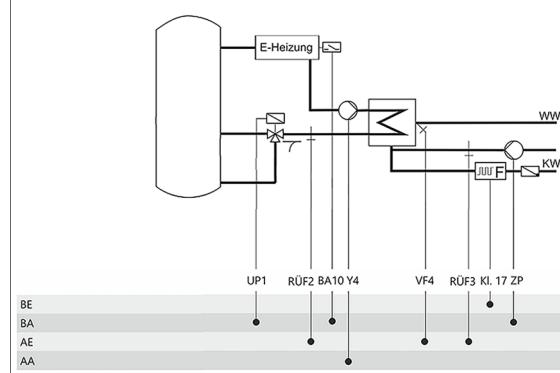
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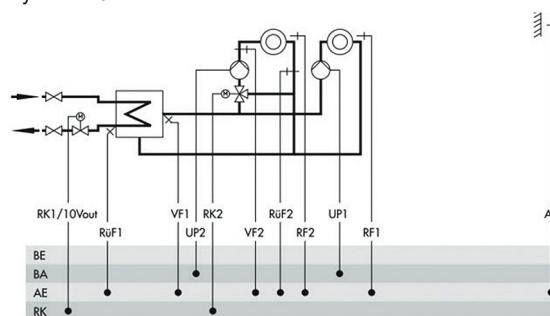
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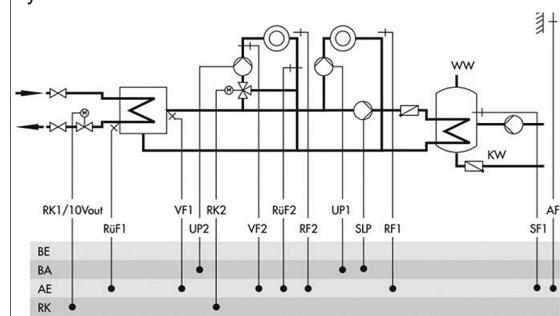
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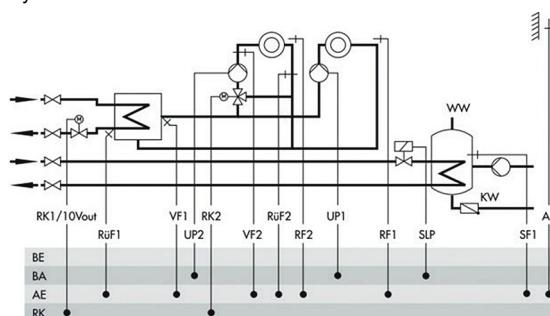
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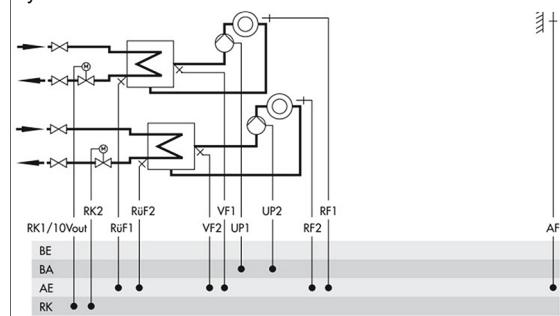
[5)]   *Selection of types for drinking water heating for systems 2.x, see page 9*

System 11.0
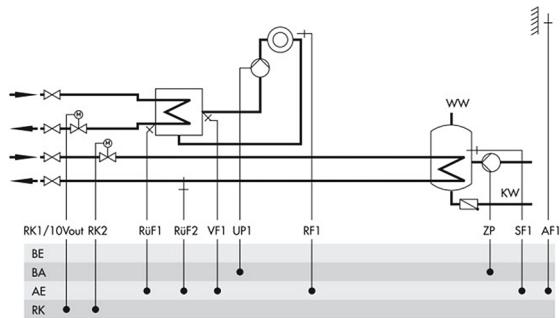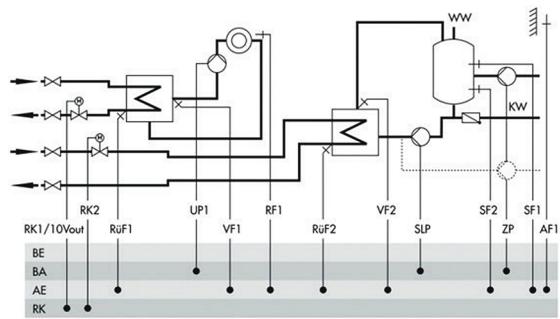
System 11.1

System 11.2
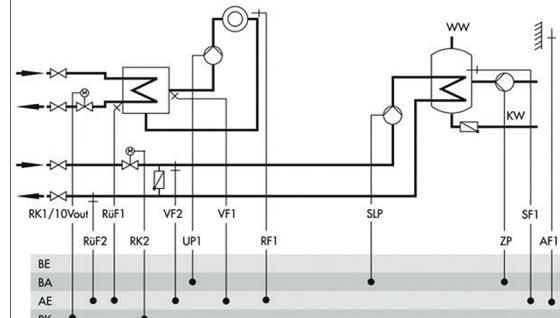
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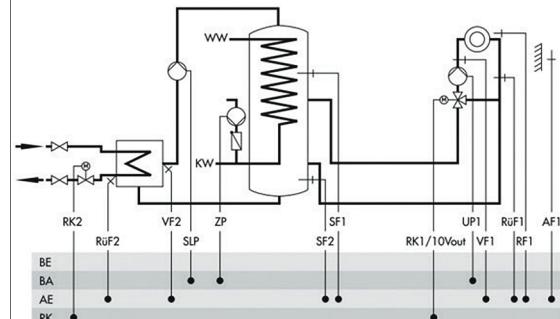
System 11.5


System 11.6
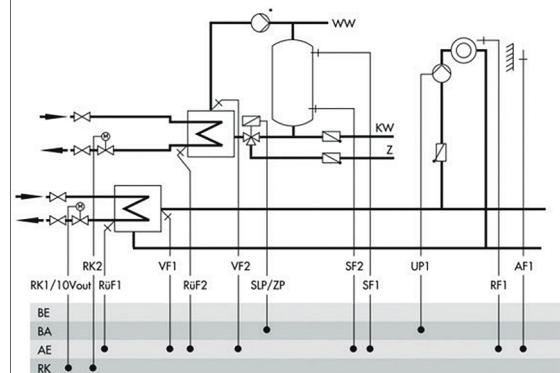
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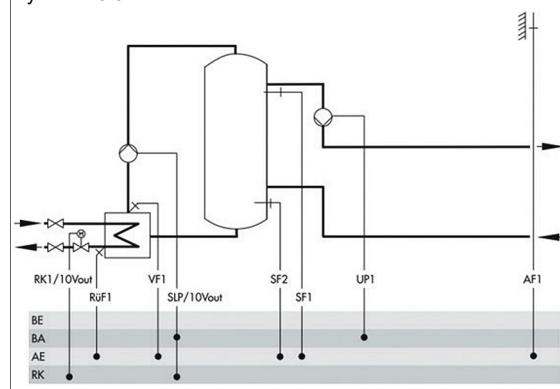

System 16.0

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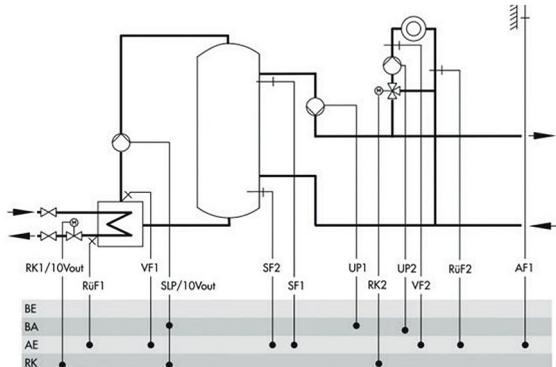

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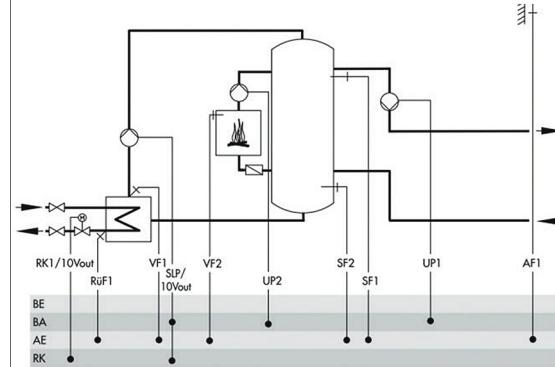
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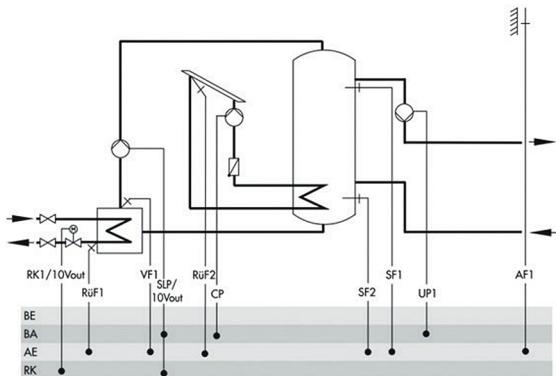
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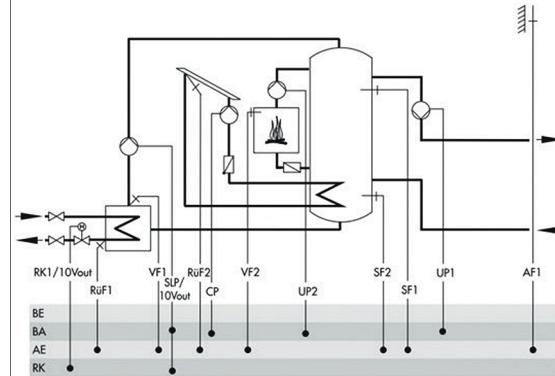
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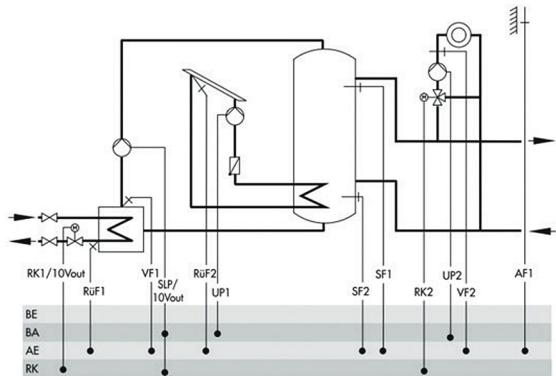
**Types for drinking water heating (systems 1.x and 2.x)**
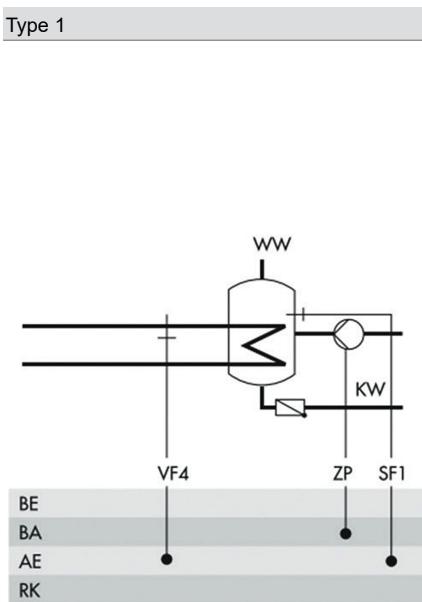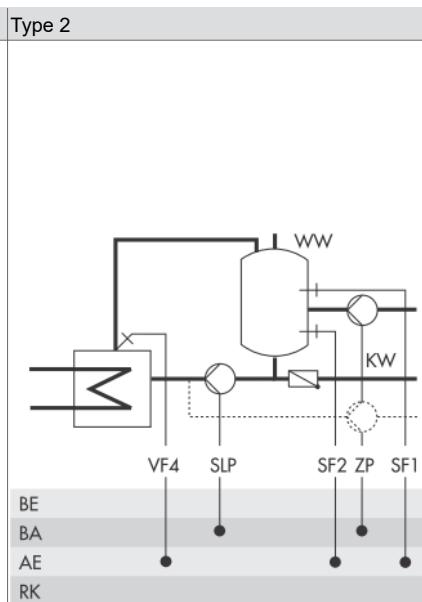
Type 1	Type 2	Type 3

Connection diagram

1	AF1
2	SF1
3	SF2/RF2
4	RüF2
5	RF1
6	RüF1
7	VF1
8	VF2/3/4
9	BE1/FG1
10	BE2/FG2
11	10Vin/10Vout
12	Fühler COM

L1	18
N	19
L1	20
UP1	21
L1	22
SLP	23
ZP/UP2	24
L1	25
Rk1_3-Pkt	26
	27
Rk1_2-Pkt L1	28
Rk2_3-Pkt	29
	30
Rk2_2-Pkt/TLP/CP	
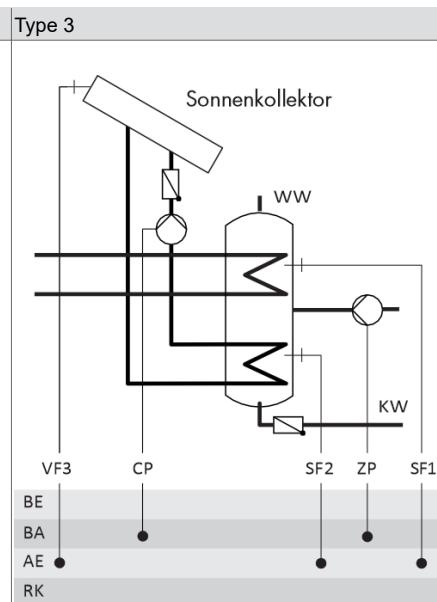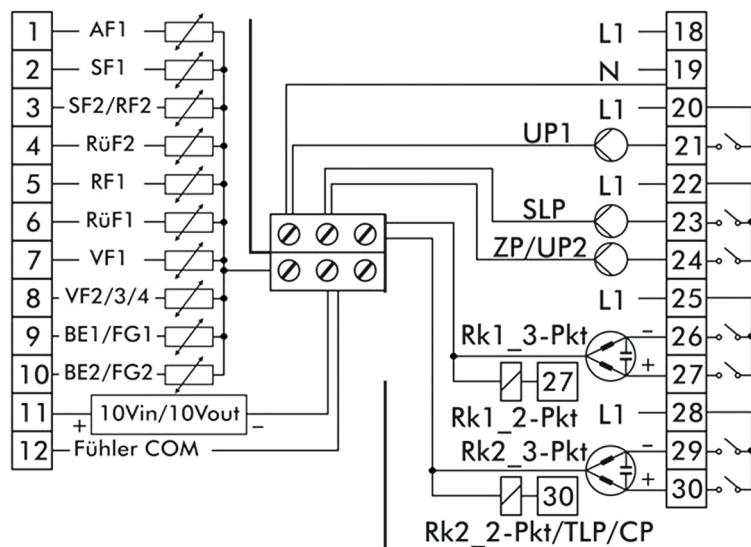
Dimension drawing

All dimensions in mm.

With standard base (included)

144
61
54
98
92
138
92 +0,5 / 0
138 +1 / 0
4
138 × 92 DIN 43700
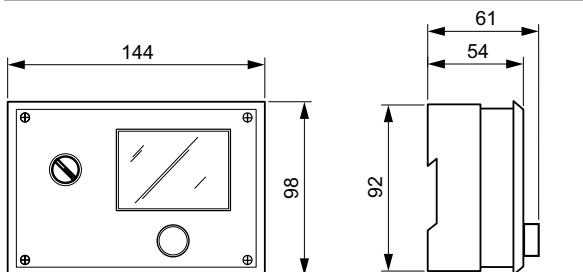
With mounting base 53 mm (0440210013)

144
82
75
98
92
138
92 +0,5 / 0
138 +1 / 0
4
138 × 92 DIN 43700