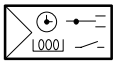
EQJW 135: Heating controller for boiler control systems


T10422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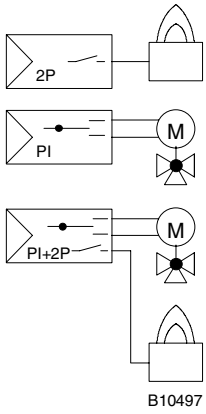

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Heating controller with communication capability, with digital user interface, for weather-compensating boiler- and/or flow-temperature control, and for providing domestic hot water (DHW). Room-temperature connection in conjunction with a room-temperature sensor or remote control unit. For use in conjunction with Ni1000 temperature sensors. Outside temperature transmitted via device bus. Outputs for motorised drive to valves or control valves (3-pt.), pumps (on/off), for 2-point control for controlling the burner and for configurable functions. Suitable for all types of building.
Intuitive user prompting with easy-to-use operating elements (turn and press) and clear LCD. Fixed basic program for use when putting into service for the first time. Max./min. limitation of the flow and boiler temperatures and of the boiler return temperature (min.). Automatic change-over between summer and winter modes (heating-limit function). Frost-protection function. Time-switch with weekly and annual programmes. Switching programme for protection against legionellae. Function for optimising the switching times. Automatic change-over between summertime and wintertime. Demand-led pump control with anti-jamming function. Floor-drying function. Manual mode for valve and pump. SERVice level protected by password. Communication with building management system via MOD bus, or amongst several controllers via proprietary device bus. Alarms are sent in the form of an SMS via modem.
Housing (144 × 96 mm) of fire-retardant, pure-white (RAL 9010) thermoplastic. Rotary switch for selecting the operating mode (Automatic/Normal/Reduced/Manual) and adjusting the setpoints. For mounting onto walls, into panels or onto top-hat rails as per DIN/EN 50022 and DIN/EN 50024. Plug-in baseplate of fire-retardant, black thermoplastic with screw terminals for cable of up to 2.5 mm².

Type	Features	Power	Weight [kg]
EQJW 135 F001	with DHW control	230 V~	0.4

Power supply 230 V~	± 15%, 50 Hz
Power consumption	approx. 1 VA
Outputs	6 relays
Switch rating	
Relay: pumps [1]	2 A, 250 V~, cos φ > 0.5
Relay: drive [2]	0.5 A, 250 V~, cos φ > 0.5
Relay: enable burner	0.5 A, 250 V~, cos φ > 0.5
Relay: configurable [1] [2]	2 A, 250 V~, cos φ > 0.5
Inputs	1 binary, 6 analogue
Binary input	switching current approx. 1 mA
Analogue inputs	5 Ni1000 1 Ni1000 or remote-control unit
Control characteristic	
Boiler temperature	2-point
Flow temperature	PI control
DHW temperature	2-point
Control parameters	
P-band	2...100 K
Integral action time	15...1000 s
Switching difference, boiler	1…9 K
Switching difference, DHW	1…19 K
Temperature ranges	
Normal temperature	0...+40°C
Reduced temperature	0...+40°C
Flow/return temperature	0...+130°C
Boiler temperature	0...+130°C
Outside temperature	–50...+50°C
DHW temperature	+20…+90°C
Valve's running time	30...300 s
Cycle time	Valve's running time/15
Frost-protection temp.	+3°C
Communication	
Interface	RS485, similar to RS232
Protocol	MOD bus, device bus

Digital time-switch for weekly/annual programme	
Running capacity	min. 24 h; typical 48 h
Accuracy	< 1 sec per day
Weekly switching programme:-	
number of programmes	3
nbr. of switching commands	48 each
min. switching period	10 min.
Annual switching programme:-	
number of programmes	1
nbr. of switching commands	20 each
min. switching period	1 day
Ambient temperature	0...+50°C
Storage temperature	-25...+65°C
Ambient humidity	5...95 %rh non-condensating
Degree of protection (in panels)	IP 40 (EN 60529)
Protection class	II (IEC 60730 - 1)
Conformity	EN 12098; CE
EMC immunity	EN 61000-6-1, 2
EMC irradiation	EN 61000-6-3, 4
Safety	EN 60730 - 1

Documentation

Wiring diagram	A10381
Dimension drawing	M10401
Fitting instructions	MV 505942
Abridged operating instr.[3]	BA 505945
Operating instructions	7 001059
Declaration of materials used	MD 44.430

Accessories

-**EGS 52/15**	Remote-control unit with analogue user surface, see Section 44
-**EDB 100**	Remote-control unit with digital user surface
-**EGT . . .**	Temperature sensors, see Section 36 in the catalogue
-**AVM, AXM**	Motorised actuators (3-point), see Sections 51 & 55 in the catalogue
-**Modem**	Modems tested with **EQJW 135** are available on request

1) Start-up current max. 7 A, (1 s)
2) Low voltage not permissible
3) Supplied with every controller, in 5 languages (Ger., Eng., Fre., Ital. & Span.)

Engineering notes

The *equitherm*® **EQJW 135** controller should be permanently connected to the mains power supply.

General description of operation

The EQJW 135 heating controller provides weather-compensating flow-temperature control, plus, depending on the application, domestic-hot-water control and boiler-temperature control. The EQJW 135 contains several different control models for various applications.

The temperatures (outside, flow and, where applicable, boiler, return, DHW and room) are measured by precision sensors and digitalised in the controller. The microprocessor employed in the controller uses these temperatures to calculate the signals for the outputs. Using the control model stored in the controller, the setpoints, the current control offset and the set control parameters – along with the actual values – are taken into account when the output signals are worked out. These signals are processed further by circuit amplifiers; the on/off commands of the relay outputs for the drive, the pump and the burner are derived from here.

The necessary heat is fed into the room and the room temperature is kept constant at the setpoint. If a room sensor is connected to the EQJW 135 and has been parameterised accordingly, the prevailing room temperature is taken into account when calculating the setpoint for the flow temperature. The charge pump for the DHW is switched on if the measured DHW temperature necessitates it. The output relay that enables the burner is switched in accordance with the heating requirements and the prevailing boiler temperature.

The switching programmes, which can be set up by the user to meet his particular requirements, ensure a minimum of energy consumption while providing optimum room conditions. The setpoint for the room temperature and the domestic hot water is variable. The operating mode is chosen using the rotary switch provided. For instance, the heating or the DHW can be switched off for long periods, yet the installation is protected against freezing thanks to the anti-frost function.

The 'temporary temperature change' function acts as an override, enabling the user to change to another operating mode for a certain period of time, thereby saving energy. The prevailing operating condition is indicated to the user on a clear LCD display.

It is possible to communicate with the controller via a Modbus interface. It is also possible to link several controllers with each other and to connect a room remote-control unit with digital user surface. If necessary, alarms can be sent via SMS using a separate modem.

Abbreviations

T_A	outside temperature	T_I	initial point (foot point)
T_F	flow temperature	T_R	room temperature
T_{RF}	return temperature	T_B	boiler temperature
T_W	DHW temperature	X_p	proportional band
T_n	integral action time	SP	SERVice parameters
T_y	running time of valve	V	valve
UP	heating pump	LP	charge pump for DHW
$T_{S/W}$	heating limit	S	slope of heating characteristic
KW	cold water	BW	DHW
	factory setting		normal mode (rating as per EN 12098)
	reduced mode		off/stand-by mode (with/without frost protection)
Indices:-		Example:	
X_s	setpoint	T_{Rs}	room-temperature setpoint
X_i	actual value	T_{Fi}	actual value of flow temperature
X_{ged}	attenuated value	T_{Aged}	attenuated outside temperature
max	maximum	T_{Fsmax}	maximum flow setpoint
min.	minimum	T_{Rsmin}	minimum room setpoint

Additional technical data

Measuring accuracy	better than ± 0.3 K @ 25°C
Time constant: data processing	approx. 10 sec for T_A, < 5 sec for T_R and T_F
Neutral zone: flow temperature	< 1.0 K
Minimum pulse duration: control unit	250 msec
Integral action time for pump	2 × T_y
Integral action time for charge pump	can be set in the SERVice level
Heating characteristic	curved, uninfluenced by extraneous heat (see page 5)
Attenuation of outside temperature	Time constant approx. 21 hours; can be (de)activated in the SERVice level

Summer/winter heating limit	ON equals summer → winter OFF equals winter → summer ON when $T_{Aged} < T_{S/W} - 1$ K; OFF when $T_{Aged} > T_{S/W}$ T_A can also be used for T_{Aged} $T_{S/W}$ can be set at SERVice parameters
Running capacity	Typically 48 (> 24) hours The EQJW 135 should have been connected to the mains for at least 4 hours.
Input for temperature sensor	Ni1000
Zero-point correction for room temp.	up to ± 6 K is possible
Zero-point correction for outside temp.	up to ± 9 K is possible
Zero-point correction for return temp.	up to ± 10 K is possible
Binary input	If the voltage between terminals 22 and 21 (DGND) are < 1.5 V, the contacts are interpreted as being closed. If it is greater than 2.5 V, the contacts are interpreted as being open. The current across the contacts is approx. 1 mA; the open-circuit voltage is approx. 12 V d.c.
Outputs	Relay (with indication of switching status)
Switching frequency, mechanical	> 5 million switching operations
Maximum closed time for control unit	Twice the valve's running time. The control unit is activated again every 15 minutes.
Temporary temperature change	Change to room-temperature setpoint in automatic mode. A change up to the next switching command (but for at least 2 hours) or from 3 hours to 19 days is possible. Remaining time shown in display. Change can be aborted.
Portion of extraneous heat.	A continuous occurrence of extraneous heat (e.g. caused by heat loss from machines) can be taken into account in the heating control model.
Design temperature	If the EQJW 135 is in automatic mode and T_A is lower than the set design temperature, the heating is controlled in normal mode, regardless of the switching program. The design temperature is parameterised in the SERVice level.

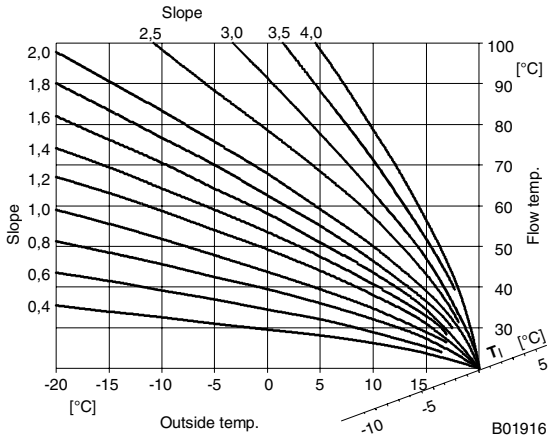
Special functions

Connection of room temperature	The room-temperature connection is activated in the SERVice level, but a room-temperature sensor must be connected. The influence of the room-temperature connection can be set in the SERVice level Maximum change in T_F due to the room-temperature connection is ± 30 K.
Frost-protection function.	The anti-frost function cuts in if the operating mode of a control loop is in the OFF mode and the anti-frost function in the SERVice level has been enabled. In addition, the anti-frost limit should have been undercut. This limit is 3°C for the outside temperature. The anti-frost function is de-activated when the outside temperature rises above 4°C. When the anti-frost function cuts in, the flow temperature of the heating circuits is regulated to 10°C. If the DHW temperature is < 5°C, it is charged to 10°C.
Anti-jamming function for pump	This function is enabled in the SERVice level. The pump is switched on every day at midnight for 60 seconds if it has not been in operation at any time in the previous 24-hours. The function is active in all operating modes except manual mode.
Multi-functional relay output	One of the output relays (terminal 8) can be parameterised for various different functions. This allows the output to be used: as a pilot-timer output; as a collective alarm; for controlling a second burner level, a boiler circulation pump or a heating pump for a second heating circuit; or for compulsory control of the heating pump of heating circuit 1.

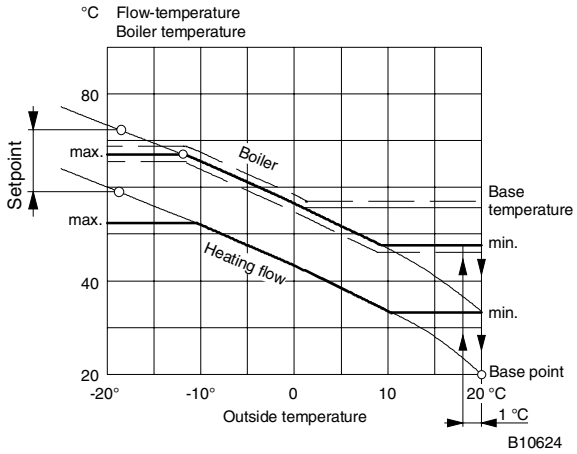
Limitation of the flow temperature	The maximum and minimum setpoints for the flow temperature are limited. If the calculation for the setpoint for the flow temperature is outside of the limit, then the limit temperature will be in force. The limit value can be set in the SERVice level. The flow-temperature control is not active in manual mode, so there is no limitation of the flow temperature. If the anti-frost function is active, the limitation of the flow temperature is not in force.
Limitation of T_W	The maximum setpoint for T_W can be restricted in the SERVice level.
Anti-legionellae function	There is a separate switch available which provides a higher T_W over a longer period of time, regardless of the switching programme.
Limitation of the boiler temperature	The maximum and minimum setpoints for the boiler temperature can be limited. There is a choice of different conditions in which the minimum limitation is valid. A base temperature can be parameterised for the boiler.
Control of 2nd burner level	One of the outputs of the EQJW 135 (terminal 8) can be used to activate a second burner level. The conditions – such as outside temperature, temperature difference, delay – under which the second burner level is activated, should be parameterised in the SERVice level.
Boiler start-up relief	If the boiler temperature is too low, the boiler start-up relief function is activated. This cuts off the load until the boiler temperature has increased sufficiently. This function is (de-)activated in the SERVice level.
Maintenance of return temperature	T_{RF} can be monitored with regard to the minimum actual value. If a limit for the actual value of T_{RF} is undercut, the setpoint for T_F is reduced. The limit for the actual value of TRF and the influence on the setpoint of T_F are parameterised in the SERVice level.
Optimisation of switching times	The optimisation function causes the heating to be switched on/off at the optimum time in automatic mode when changing from reduced or back-up mode into normal mode. The switching times are chosen so that the room temperature's setpoint is reached at the time that is set in the switching programme. At the same time, energy is saved by switching on as late as possible and off as early as possible.
Manual mode	In manual mode, the relays for the various outputs can be activated separately. The setting for this is menu-led if manual mode has been enabled (which is done in the SERVice level). The ex-works setting for manual mode is ‘not enabled’.
Automatic cut-off	With the automatic cut-off facility, the heating controller saves energy without any loss of comfort levels, wherever possible. The heating controller can switch off a heating circuit in the following ways:- a) The present operating mode for the heating circuit is OFF b) Summer/winter heating limit is OFF c) $T_A \geq T_{Rs}$ (when $T_A \leq T_{Rs} – 1$ K, controller switches back on)
Floor-drying function.	EN 1264, Part 4 describes how anhydrite cement floors should be treated during operational heating before the floor covering is laid. This entails, first of all, maintaining an inlet temperature of 25°C for 3 days. Thereafter, the maximum inlet temperature should be maintained for four days. This function has been included on the EQJW 135; it can be activated via the SERVice level.
Switching programmes	Three weekly switching programmes, each with up to 48 switching commands, and a calendar switching programme with up to 20 switching commands are available. The minimum switching intervals are 10 minutes and one day respectively. Operating mode with weekly and calendar switching programme with lower energy consumption has priority. This function is enabled in the SERVice level. The ex-works setting for the calendar switching programme is ‘not enabled’. The commands in the calendar switching programme are not erased after they have been carried out.

Multiplication T_A	The outside temperature is registered by an EQJW 135 and made available as a measured value to the other controllers via the device bus. The parameterising for this is done in the communication level.
Modbus communication	It is possible to communicate with the EQJW 135 via an RS 485 interface using the Modbus RTU protocol. Data can be exchanged. In so doing, the EQJW 135 is always used as a slave.
Alerting via SMS	Alarm texts are sent as an SMS (via a provider) to a mobile telephone through a modem. An interface that is similar to RS 232, plus the TAP (Telocator Alphanumeric Protocol) protocol are used for this.

Characteristics

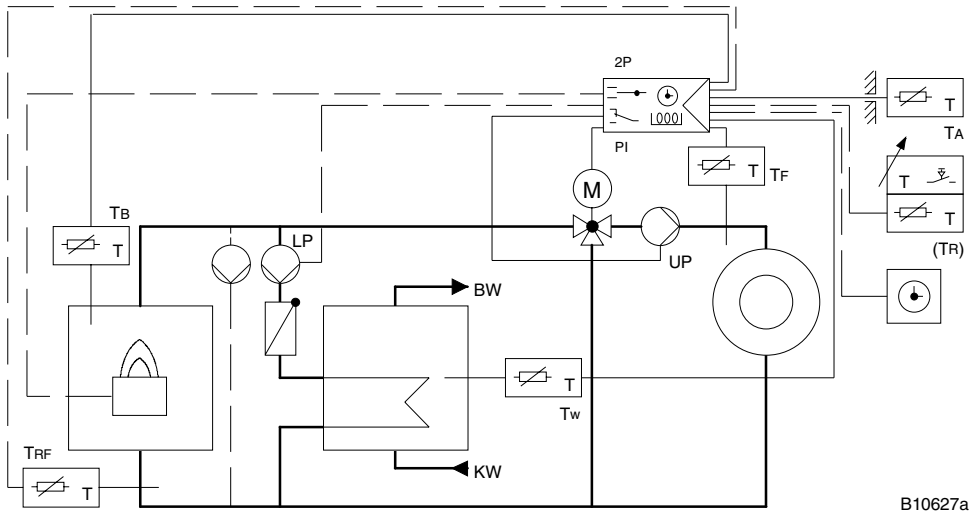


Heating characteristics for base point T_I = 20°C

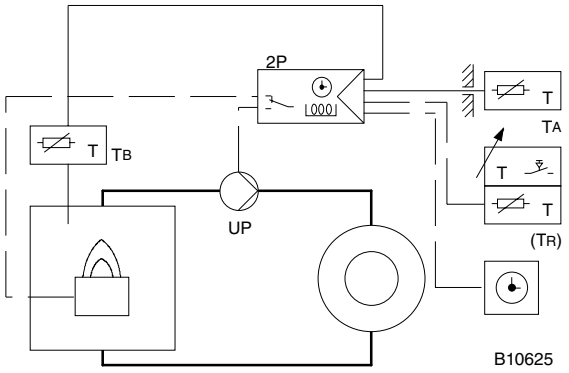


Characteristic for flow and boiler temperature

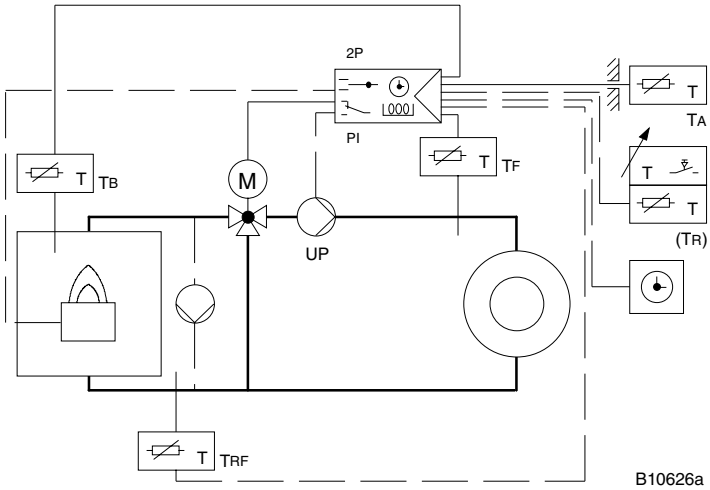
Examples of use



Weather-compensating control of the flow temperature with pre-control of the boiler temperature, plus DHW control.

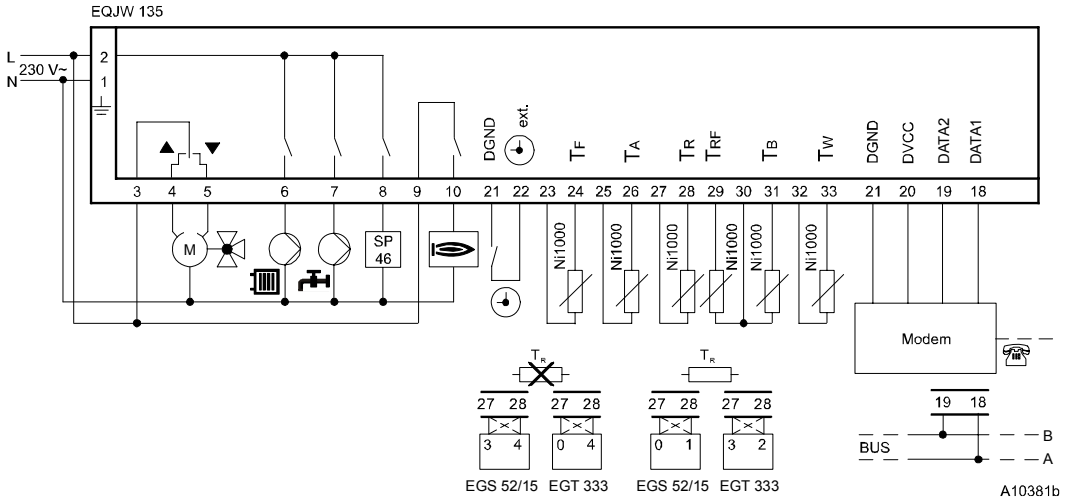


Weather-compensating boiler-temperature control

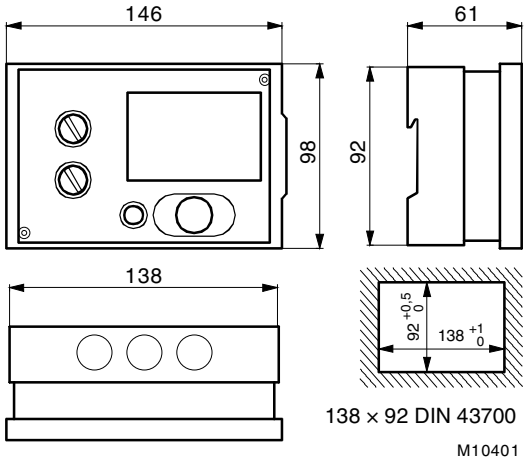


Weather-compensating PI control of the flow temperature with pre-control of the boiler temperature.

Wiring diagram



Dimension drawing



Sauter Components