SIEMENS

Heating Controller RVL481

including d.h.w. heating

Multifunctional and communicating heating controller for use in residential and non-residential buildings. Suited for heating circuit control with demand-compensated boiler temperature control or precontrol. Suited for heat source systems like burners and district heat. Control of d.h.w. heating. 29 programmed plant types. Operating voltage AC 230 V

Use

- Types of houses and buildings:
  - Multifamily houses
  - Single-family houses
  - Non-residential buildings
- Types of plant:
  - Heating zones and d.h.w. heating plants with own heat source
  - Heating zones and d.h.w. heating plants with district heat connection
  - Interconnected plants consisting of heat source, several heating zones and central or decentral d.h.w. heating
- Types of heating systems:
  - Radiator, convector, underfloor and ceiling heating systems, or radiant panels

Functions

Heating zone control
- Weather-compensated flow temperature control through control of the mixing valve in one of the heating zones
- Weather-compensated flow temperature control through control of the burner in one of the heating zones
- Weather-compensated flow temperature control through control of the valve in the primary return in one of the heating zones with a district heat connection (substation)

Precontrol
- Demand-compensated control of the main flow temperature through control of the mixing valve in the main flow; heat demand signal via data bus
- Demand-compensated control of the boiler temperature through control of the burner; heat demand signal via data bus
- Demand-compensated control of the secondary flow temperature through control of the valve in the primary return of a district heat connection; heat demand signal via data bus

D.h.w. heating
- D.h.w. heating:
  - Through control of the charging pump
  - Through control of the changeover valve
  - Through control of the mixing valve
  - Via heat exchanger through control of the valve in the primary return
  - Via solar collector
- Control of a circulating pump and of an electric immersion heater

Operating modes

Auto⏲ **Automatic mode**
Automatic changeover from the NORMAL to the REDUCED room temperature, and vice versa, according to the 7-day program, automatic changeover to holiday mode, demand-compensated control of the heating system (ECO function)

☾ **Setback mode**
Continuous heating to the REDUCED temperature (with ECO function)

☼ **Comfort mode**
Continuous heating to the NORMAL temperature (without ECO function)

⌂ **Protection**

🚰 **Automatic d.h.w. heating**

🖐 **Manual operation**
No control, circulating pumps in service

Frost protection is ensured in all operating modes.

Other functions
- Optimization functions
- Protective functions
- Remote control
- Commissioning aids
- Communication functions

Ordering

When ordering, please give type reference **RVL481**.
The controller is supplied complete with Operating Instructions and Installation Instructions.
Sensors and, if required, room unit, actuator and valve must be ordered as separate items.

Product documentation

Type of documentation	Document no.	Part no.
Basic Documentation	P2541	–
Installation Instructions (languages: de, en, fr, nl, sv, fi, da, it, es)	G2541	74 319 0618 0
Operating Instructions (languages: de, en, fr, nl, sv, fi, da, it, es)	B2540	74 319 0616 0
CE Declaration of Conformity	T2540	–
Environmental Declaration	E2541	–

Heating controller RVL481

Equipment combinations

Suitable sensors and room units

- Flow, return and d.h.w. temperature: All sensors with sensing elements LG-Ni 1000, for example:
  - Strap-on temperature sensor QAD22
  - Immersion temperature sensor QAE212… or QAP21.3
  - Collector temperature sensor (solar) QAP21.2
- Room temperature:
  - Room unit QAW50 or QAW70
  - Room temperature sensor QAA24
- Outdoor temperature:
  - Outside sensor QAC22 (LG-Ni 1000 sensing element)
  - Outside sensor QAC32 (NTC measuring element)

Suitable actuators

All electromotoric and electrohydraulic actuators for 3-position control made by Siemens can be used.

Communication

The controller can communicate with:
- All LPB-compatible devices made by Siemens
- The SYNERGYR OZW30 central unit (software version 3.0 or higher)

Note

The heating controller RVL481 **cannot** be used as partner unit for the RVL469!

Plant types

Heating circuit plant types

1 Heating circuit control with mixing group Can be combined with d.h.w. types: – with types 1, 2 and 4 via hydraulic connection at ○ and □ – with type 5 without hydraulic connection		
2 Heating circuit control with boiler Can be combined with d.h.w. types: – with types 1, 2 and 3 via hydraulic connection at ○ and □ – with type 5 without hydraulic connection		
3 Heating circuit control with heat exchanger Can be combined with d.h.w. types: – with types 2, 4 / type 1 / type 3 via hydraulic connection at ○ and □ – with type 5 without hydraulic connection		
4 Precontrol with mixing group Can be combined with d.h.w. types: – with types 1 and 2 via hydraulic connection at ○ and □ – with type 5 without hydraulic connection		
5 Precontrol with boiler Can be combined with d.h.w. types: – with types 1, 2 and 4 via hydraulic connection at ○ and □ – with type 5 without hydraulic connection		
6 Precontrol with heat exchanger Can be combined with d.h.w. types: – with types 1 and 2 via hydraulic connection at ○ and □ – with type 5 without hydraulic connection		

D.h.w. circuit plant types

0 No d.h.w. heating	
1 D.h.w. heating with charging pump (optional solar and/or electric immersion heater)	
2 D.h.w. heating with mixing group (optional solar and/or electric immersion heater)	

4/12

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Heating controller RVL481

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3 D.h.w. heating with changeover valve (optional solar and/or electric immersion heater)	
4 D.h.w. heating with heat exchanger	
5 D.h.w. heating with electric immersion heater (optional solar heating)	
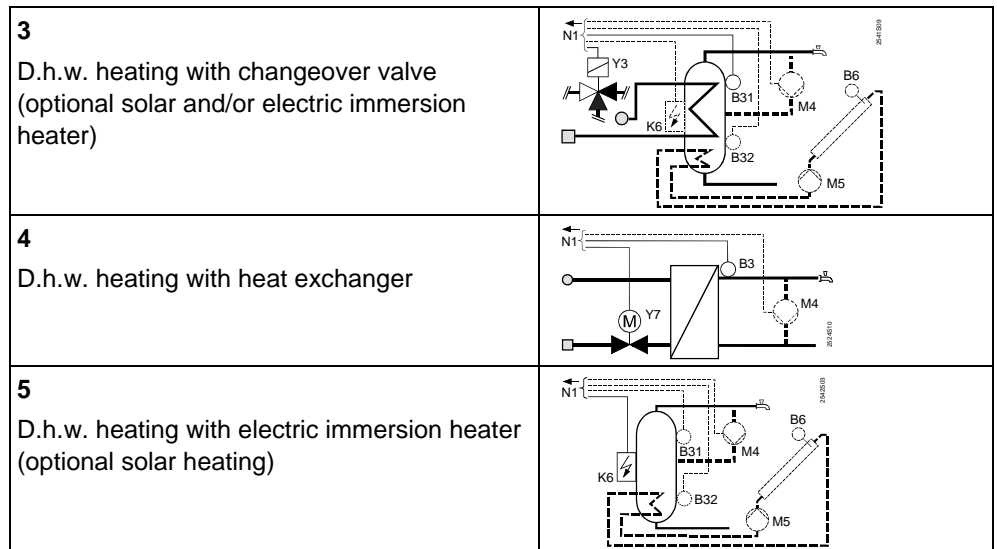
A6	Room unit	E2	Load (space)
B1	Flow / boiler sensor	LPB	Data bus
B3	Flow sensor for d.h.w.	K6	Electric immersion heater
B31	D.h.w. storage tank sensor / thermostat 1	M1	Heating circuit pump / circulating pump
B32	D.h.w. storage tank sensor / thermostat 2	M3	Charging pump
B5	Room sensor	M4	Circulating pump
B6	Collector sensor	M5	Collector pump
B7	Return sensor (primary circuit)	N1	Controller RVL481
B71	Return sensor (secondary circuit)	Y1	Heating circuit mixing valve / 2-port valve
B9	Outside sensor	Y3	Changeover valve
E1	Heat source (boiler / heat exchanger)	Y7	D.h.w. valve

Working principle

The RVL481 offers 6 different plant types for space heating and precontrol, and 5 plant types for d.h.w. heating all of which are ready programmed. By combining the different plant types, a total of 29 plants can be configured.

When commissioning the system, the appropriate plant types for space heating or precontrol and d.h.w. heating need to be entered. This activates all functions required for the respective type of plant. The default settings are practice-oriented.

All functions that are not required for the configured plant type will not be shown and are deactivated.

Enduser settings

With weather-compensated control, the flow temperature is controlled via the heating curve as a function of the outdoor temperature. Its basic setting is made with the little bar on the front of the unit or on an operating line. The room temperature can be read-justed with the setting knob.

In addition, following can be entered by the enduser:

- The room temperature setpoints of NORMAL heating, REDUCED heating and frost protection / holidays
- The d.h.w. temperature setpoints
- 2 independent 7-day switching programs and a maximum of 8 holiday periods per year
- The operating mode
- The time of day and the date

Temperature acquisition

- Flow temperature: with LG-Ni 1000 sensor
- Outdoor temperature: with LG-Ni 1000 or NTC 575 sensor; the RVL481 automati-cally identifies the type of sensor used. In interconnected plants, it is also possible to identify the source of the outdoor temperature
- Room temperature: With a room sensor or room unit, or both (averaging)

Space heating

- The room temperature is included in the control. It can be acquired with a sensor or can be simulated by a room model that uses an adjustable building time constant. When using a sensor, the impact on the control can be adjusted. It is also possible to limit the maximum room temperature

5/12

- The heating is switched on and off depending on demand (ECO function). It is switched off when the amount of heat stored by the building structure is sufficient to maintain the required room temperature. In that case, the controller takes into account the progression of the room temperature and the building's heat storage capacity. It is possible to set 2 heating limits, one for NORMAL heating and one for REDUCED heating
- The control is optimized. Switching on, heating up and shutting down are controlled such that, during occupancy times, the required room temperature is always maintained.
  At the end of each occupancy period, the heating will be shut down (circulating pump) until the room temperature setpoint for the nonoccupancy time is reached (quick setback, can be deactivated). During heating up, the room temperature setpoint can be boosted (boost heating). It is possible to set maximum limits for the heating up time and for early shutdown

3-position control

3-position control operates as weather- or demand-compensated flow temperature control. P-band and integral action time are adjustable. The flow temperature is controlled via the controlling element (seat or slipper valve).
Minimum and maximum limitation of the flow temperature as well as maximum limitation of the rate of setpoint rise are adjustable.

Boiler temperature control

Weather- or demand-compensated boiler temperature control is accomplished via 2-position control. The boiler temperature is controlled through cycling of the single- or 2-stage burner (direct burner control). 2-stage operation is enabled when the release limit of burner stage 2 is reached, and disabled when the reset limit of burner stage 2 is reached. The limits can be adjusted. When there is no demand for heat, the boiler will either be shut down or maintained at the minimum temperature limit (selectable).
Both minimum and maximum limitation of the boiler temperature are adjustable.

District heat

The secondary flow temperature is controlled via the valve in the primary return, either weather- or demand-compensated.
Maximum limitations act on the:
- Primary return temperature, whereby the following selections can be made: Type of compensation (local outside sensor or bus signal), slope of limit curve, and start of compensation
- Difference of primary return and secondary return temperature (DRT)
Minimum stroke limitation (Y_{min} function) prevents measuring errors in connection with heat metering when flow rates fall below a certain level.
The integral action time of the limit functions is adjustable.

Minimum limitation of the return temperature

Minimum limitation of the return temperature acts with both 3-position control and demand-dependent control of the boiler temperature and helps prevent flue gas condensation.

Locking functions

On the software side, all settings can be locked to prevent tampering. The district heat settings can be locked on the hardware side.

Time switches

- The RVL481 has 3 independent 7-day time switches whose assignment can be selected. Each 7-day time switch affords 3 daily on periods which may differ from one weekday to the other.
  The heating circuit, d.h.w. heating, the circulating pump and the multifunctional relay can be assigned to one of the three 7-day time switches
- For entering a maximum of 8 holiday periods, the RVL481 is equipped with a yearly time switch featuring automatic summer- / wintertime changeover

D.h.w. heating	D.h.w. heating source can be

D.h.w. heating source can be
- Boiler
- Heat exchanger
- Precontroller
- Solar collector (charging is shown in the LCD with ☼⁄)
- Electric immersion heater (summer operation)

D.h.w. heating is controlled independent of the heating circuit. Charging to the NORMAL or REDUCED d.h.w. temperature setpoint can be adjusted to meet individual needs. It can be released:
- According to its own 7-day program
- According to the switching program of the heating circuit (one hour before space heating starts)
- According to the switching programs of the zone controllers on the data bus
- Continuously (24 hours a day)

D.h.w. heating features a legionella function that can be deactivated. It is activated at a pre-determined date and time and for a selected duration.
The d.h.w. temperature is acquired:
- With 1 or 2 sensors
- With 1 or 2 thermostats (not possible with solar d.h.w. heating)

D.h.w. control also includes the control of a circulating pump and of an electric immersion heater. The impact of the legionella function on the circulating pump can be disabled. The d.h.w. storage tank can be forcibly charged once a day.

Remote control
- Changeover of operating mode with the QAW50 room unit
- Overriding the major controller functions with the QAW70 room unit
- Selection of another (programmable) operating mode with an external switch

Note on QAW70

The day of the week is set automatically with the date by the controller; an adjustment from the room unit QAW70 is not possible.

Passing on the heat demand signal

The heat demand signal can be passed on via the scalable DC 0…10 V output (corresponding to 0…x °C). The value of "x" can be adjusted in the range of 30…130 °C.

Communication

Communication with other devices takes place via data bus and allows:
- Signaling of heat demand to the heat source
- Exchange of locking and enforced signals
- Exchange of measured values such as outdoor temperature, return temperature, flow temperature and of clock signals
- Integration of heat source cascades or heat source systems (heat pump, solar panels, wood-fired boiler)
- Reception of heat demand signal from the SYNERGYR OZW30 central unit (from software version 3.0)
- Exchange of error messages

Error messages and flow temperature alarm
- Error messages in the event of sensor, data bus or room unit faults
- Flow temperature alarm; adjustable is the period of time during which the flow or boiler temperature may stay outside the set limits; an error message is delivered when the time has elapsed

Other functions
- One multifunctional relay. Choice of functions:
  Outdoor temperature switch, on / off according to the time switch, alarm contact in the event of error messages, on / off according to the occupancy period, on / off according to the occupancy period including optimization, on / off according to heat demand, on / off manually
- DC 0…10 V output for passing on the heat demand signal
- Display of parameters, actual values, operating states and error messages

- Simulation of outdoor temperature
- Relay test; all relays can be controlled manually
- Sensor test; all measured values from sensors and thermostats can be displayed
- Testing the contacts connected to terminals H1–M, H3–M and H4–M
- Outdoor temperature-dependent frost protection for the plant; a minimum flow temperature is maintained; its setpoint and the response threshold can be adjusted
- Pump overrun to prevent the buildup of heat
- Periodic pump run (pump kick) to prevent seizing of the pumps in the summer
- Controller hours run meter

For more detailed information about data bus (LPB), refer to the following pieces of documentation:
- Data Sheet Basic System Data LPB: N2030
- Data Sheet Basic Engineering Data LPB: N2032

Mechanical design
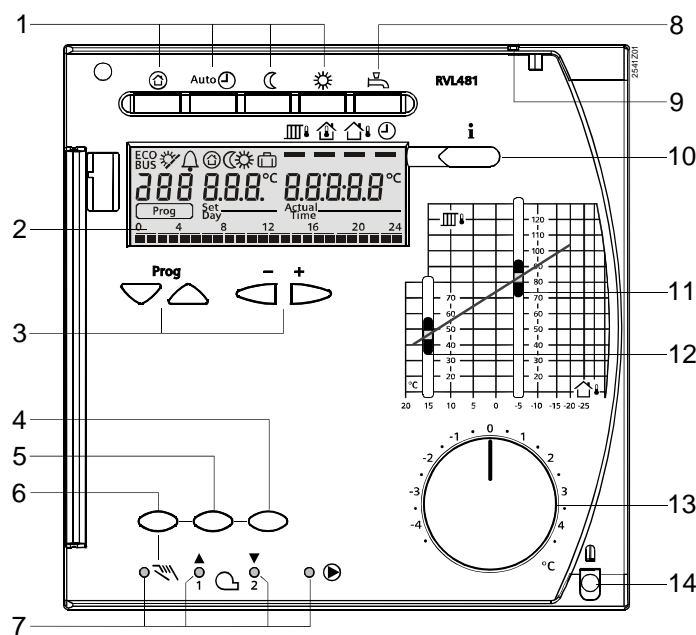
1 Operating mode buttons (selected button is lit)
2 Display (LCD)
3 Buttons for operating the display:
   Prog = selection of operating line
   – + = adjustment of displayed value
4 Button for "Close heating circuit mixing valve" or burner stage 2 ON/OFF in manual operation
5 Button for "Open heating circuit mixing valve" in manual operation
6 Button for manual operation
7 LEDs for:
   ⚒ Manual operation
   ◠ / ▲ Heating circuit mixing valve opens / burner stage 1 ON
   ◠ / ▼ Heating circuit mixing valve closes / burner stage 2 ON
   ◉ Pump runs
8 Button for d.h.w. heating ON/OFF (ON = button lit)
9 Sealing facility in the cover
10 Info button for the display of actual values
11 Setting slider for flow temperature setpoint at an outside temperature of –5 °C
12 Setting slider for flow temperature setpoint at an outside temperature of 15 °C
13 Setting knob for readjustment of room temperature
14 Fixing screw with sealing facility

The RVL481 is comprised of controller insert, which accommodates the electronics, the power section, the output relays and – on the front – all operating elements, and the base, which carries the connection terminals. The operating elements are located behind a lockable transparent cover.

The operating instructions can be inserted in the transparent cover.
All values are read in the display (LCD) featuring background lighting.
The controller insert is secured to the base with two screws, one of which can be sealed. The cover can also be sealed.
The RVL481 can be fitted in 3 different ways:

- Wall mounting (on a wall, in the control panel, etc.)
- Rail mounting (on a top hat rail)
- Flush panel mounting (control panel door, etc.)

Analog operating elements

- Buttons for selecting the required operating mode
- Info button
- Direct adjustment of the heating curve with the help of the SIGMAGYR setting facility
- Knob for manual readjustment of the room temperature
- 3 buttons for manual operation and manual positioning commands

Digital operating elements

The entry or readjustment of all setting parameters, activation of optional functions and reading of actual values and statuses is made according to the operating line principle. An operating line with an associated number is assigned to each parameter, each actual value and each function that can be selected.
One pair of buttons is used to select an operating line and one pair to readjust the display.

Notes

Engineering

- The wires of the measuring circuits carry extra low voltage
- The wires to the actuators and the pumps carry AC 24…230 V
- The local electrical regulations must be complied with
- Sensor cables must not be run parallel to mains carrying cables for loads such as actuator, pump, burner, etc. (insulation class II EN 60730)

Commissioning

- The plant type must be selected
- When used in district heating plants, the district heat parameters can be blocked

Disposal

In terms of disposal, the RVL481 are classified as electronic scrap conforming to the European Directive 2002/96/EG (WEEE) and must not be disposed of as domestic waste. The relevant national legal requirements must be complied with and the units must be disposed of through the relevant channels. Local and currently valid legislation must be observed.

Warranty

When using the RVL481 together with third-party devices not specifically mentioned, correct functioning must be ensured by the user. In that case, Siemens will assume no responsibility for service and warranty.

Technical Data

Power supply	Rated operating voltage	AC 230 V (±10 %)
	Frequency	50 Hz
	Power consumption (no external load)	max. 9 VA
	Supply line fusing	10 A

Output relays	Switching capacity	AC 24…230 V
	Switching current Y1/K4, Y2/K5, Q1, Y7, Y8	AC 0.02…2 (2) A
	Switching current Q5, Q3/Y3, Q4, K6	AC 0.02…1 (1) A
	Rated current of ignition transformer	max. 1 A (max. 30 s)
	Switch-on current of ignition transformer	max. 10 A (max. 10 ms)

Permissible cable lengths to sensors and room unit	Copper cable 0.6 mm $\varnothing$	20 m
	Copper cable 0.5 mm^2	50 m
	Copper cable 1.0 mm^2	80 m
	Copper cable 1.5 mm^2	120 m

Connection terminals	Screw terminals for wire section	up to 2.5 mm^2

Communication by wire	Bus protocol/type	LPB
	Bus loading characteristic E	7

Backup	Backup of controller clock	12 h

Standards	$C\!\epsilon$-conformance to	
	EMC directive	2004/108/EC
	– Immunity	– EN 61000-6-1 / -2
	– Emissions	– EN 61000-6-3 / -4
	Low voltage directive	2006/95/EC
	– Safety	– EN 60730-1 / EN 60730-2-9

Protective data	Safety class	II to EN 60730
	Degree of protection (cover closed)	IP42 to EN 60529
	Degree of contamination	2 to EN 60730

Dimensions		refer to "Dimensions"

Weight	Unit (net)	1.2 kg

Colors	Controller insert	Light grey RAL 7035
	Terminal base	Pigeon blue RAL 5014

| **Environmental conditions**		Operation EN 60721-3-3	Transport EN 60721-3-2	Storage EN 60721-3-1
	Climatic conditions	class 3K5	class 2K3	class 1K3
	Temperature	0…+50 °C	–25…+70 °C	–20…+65 °C
	Humidity	<95 % r.h. (non-condensing)	<95 % r.h.	<95 % r.h. (non-condensing)
	Mechanical conditions	class 3M2	class 2M2	class 1M2
	Use above sea level	max. 3000 m above sea level		

10/12

Connection diagrams
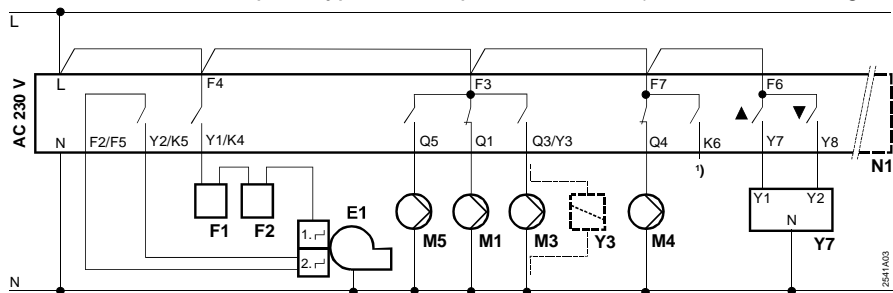
Low voltage side

Basic connections
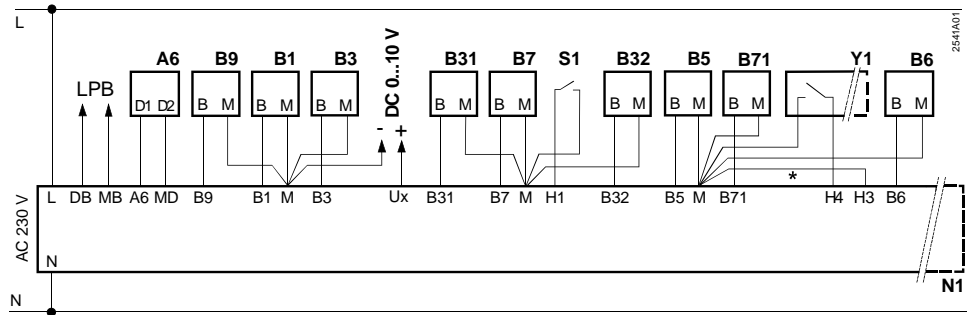
Mains voltage side

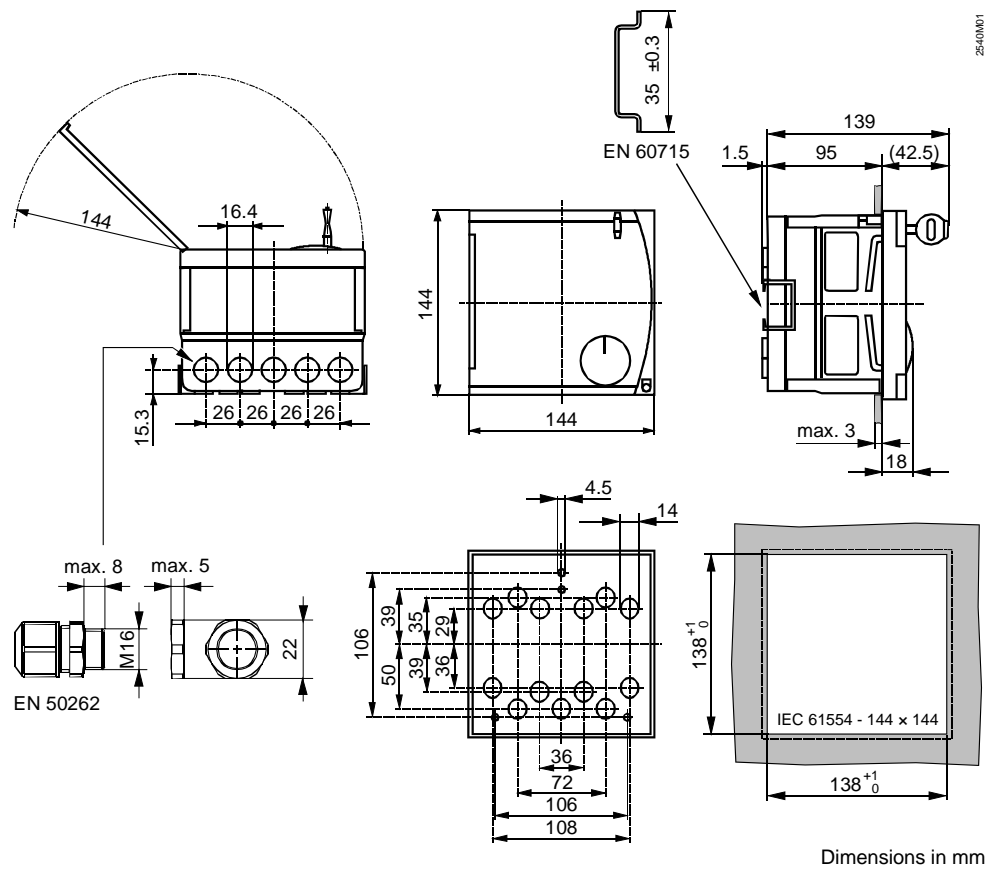*Basic connections for plant types with 3-position control (seat or slipper valves)*
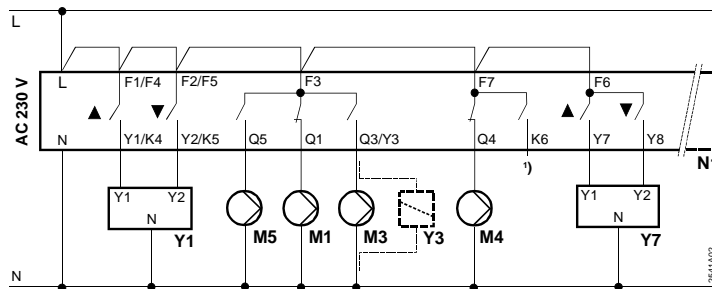
Basic connections for plant types with 2-position control (boiler with a 2-stage burner)

A6   Room unit
B1   Flow / boiler sensor
B3   Flow sensor for d.h.w.
B31 D.h.w. storage tank sensor / thermostat 1
B32 D.h.w. storage tank sensor / thermostat 2
B5   Room sensor
B6   Collector sensor
B7   Return sensor (primary circuit)
B71 Return sensor (secondary circuit)
B9   Outside sensor
E1   2-stage burner
F1   Limit thermostat
F2   Safety limit thermostat
LPB Data bus
M1   Heating circuit pump / circulating pump
M3   Charging pump
M4   Circulating pump
M5   Collector pump
N1   Controller RVL481
S1   Remote control of operating mode
Ux   Heat demand output
Y1   Actuator heating circuit, with switch for minimum stroke limitation
Y3   Actuator changeover valve
Y7   Actuator d.h.w. circuit
*   Wire link for locking the district heat parameters
[1]   Multifunctional output

Dimensions

2540M01

EN 60715

EN 50262

IEC 61554 - 144 × 144

Dimensions in mm

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