



Series C

## Heating Controller

## RVL471

including d.h.w. heating

- **Multifunctional heating controller for use in residential and non-residential buildings**
- **Suited for:**
  - Heating zone control with or without room influence through weather-compensated flow temperature control
  - Pre-control through demand-compensated control of the main / secondary flow temperature
  - Pre-control through demand-compensated boiler temperature control; suited for integration into heat source cascades or heat source systems (with heat pump, solar collectors or wood-fired boilers)
- **Boiler temperature control with single- or 2-stage burners**
- **Control of d.h.w. heating with extended legionella function**
- **Communicating**
- **29 preprogrammed plant types with automatic assignment of the functions required for each plant type**
- **Analog or digital adjustment of the heating curve; analog room temperature readjustment; operating line principle for all other parameters**
- **Scalable voltage output DC 0...10 V for passing on the heat demand signal**
- **Multifunctional relay**
- **Operating voltage AV 230 V; CE conformity**

### Use

- Types of houses and buildings:
  - Multifamily houses
  - Single-family houses
  - Smaller 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 plant
- Types of heating systems:
  - Radiator, convector, underfloor and ceiling heating systems, or radiant panels

## Functions

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### 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. control

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

### Operating modes

-  **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)
-  **Standby**
-  **Automatic d.h.w. heating**

Frost protection is ensured in all operating modes.  
The controller can be switched to manual operation.

### Other functions

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

## Ordering

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When ordering, please give type reference **RVL471** and the language code letter (-A, -B or -C) for the Operating Instructions and the Installation Instructions in the requested language:

- A** for English, French, Italian, German (e.g. RVL471-A for English)
- B** for French, Dutch, Spanish (e.g. RVL471-B for French)
- C** for Danish, Finnish, Swedish (e.g. RVL471-C for Danish)

Sensors and, if required, room unit, actuator and valve must be ordered as separate items.

## Equipment combinations

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### Suitable sensors and room units

- Flow, return and d.h.w. temperature: All sensors with sensing elements LG-Ni 1000  $\Omega$  at 0 °C, for example:
  - Strap-on temperature sensor QAD22
  - Immersion temperature sensor QAE212... or QAP21.3
- 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 SBT HVAC Products can be used.  
For details, refer to Data Sheets N4500...N4599.

### Communication

The controller can communicate with:

- All LPB-compatible devices made by SBT HVAC Products
- The SYNERGYR OZW30 central unit (software version 3.0 or higher)

### Passing on the heat demand signal

The heat demand signal can be passed on to UNIGYR, RVL55, VISONIK or INTEGRAL RS 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.



<b>Working principle</b>	<p>The RVL471 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.</p> <p>When commissioning the system, the appropriate plant types for space heating / pre-control 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.</p> <p>All functions that are not required for the configured plant type will not be shown and are deactivated.</p>
<b>Enduser settings</b>	<p>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 readjusted with the setting knob.</p> <p>In addition, following can be entered by the enduser:</p> <ul style="list-style-type: none"> <li>• The room temperature setpoints of normal heating, reduced heating and frost protection / holidays</li> <li>• The d.h.w. temperature setpoints</li> <li>• 2 independent 7-day switching programs and a maximum of 8 holiday periods per year</li> <li>• The operating mode</li> <li>• The time of day and the date</li> </ul>
<b>Temperature acquisition</b>	<ul style="list-style-type: none"> <li>• Flow temperature: With 1 or 2 sensors (averaging)</li> <li>• Outdoor temperature: With Ni or NTC sensor; the RVL471 automatically identifies the type of sensor used. In interconnected plants, it is also possible to identify the source of the outdoor temperature</li> <li>• Room temperature: With a room sensor or room unit, or both (averaging)</li> </ul>
<b>Space heating</b>	<ul style="list-style-type: none"> <li>• 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</li> <li>• 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</li> <li>• 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.</li> </ul>
<b>3-position control</b>	<p>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).</p> <p>Minimum and maximum limitation of the flow temperature as well as maximum limitation of the rate of setpoint rise are adjustable.</p>
<b>Boiler temperature control</b>	<p>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</p>

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 RVL471 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 RVL471 is equipped with a yearly time switch featuring automatic summer- / wintertime changeover

### **D.h.w. heating**

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

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 forcedly 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

### **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 faults
- Error message in the event of data bus or room unit faults
- Flow temperature alarm; adjustable is the period of time during which the flow 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 technical features and functions and the data bus (LPB), refer to the following pieces of documentation:

- Basic Documentation RVL471: P2524
- Data Sheet Basic System Data LPB: N2030
- Data Sheet Basic Engineering Data LPB: N2032

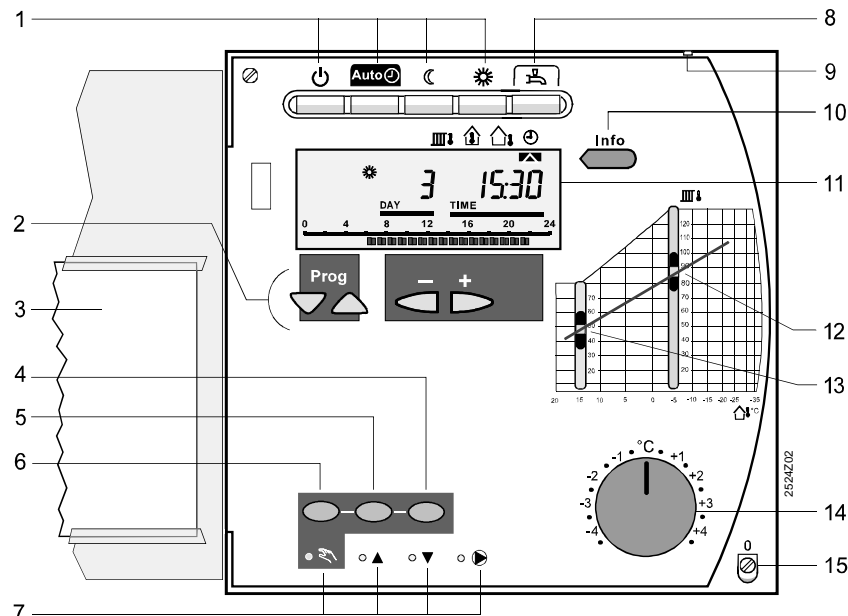
#### **Mechanical design**





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The RVL471 consists of controller insert, which accommodates the electronics, power section, output relays and – on the unit front – all operating elements, and base, with the connection terminals. The operating elements are located behind a lockable transparent cover.

The operating instructions can be inserted in the transparent cover.

The controller insert is secured to the base with 2 screws, one of which can be sealed. The cover can also be sealed.



- 1 Buttons for selecting the operating mode (selected button is lit)
- 2 Buttons for operating the display:  
**Prog** = selection of operating line  
 - + = readjustment of displayed value
- 3 Operating instructions
- 4 Button for "Close valve" or burner stage 2 on / off in manual operation
- 5 Button for "Open valve" in manual operation
- 6 Button for manual operation
- 7 LEDs for:  
 = Manual operation  
 = Valve opens / burner stage 1 on  
 = 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 Display (LCD)
- 12 Setting slider for flow temperature setpoint at  $-5^{\circ}\text{C}$  outdoor temperature
- 13 Setting slider for flow temperature setpoint at  $15^{\circ}\text{C}$  outdoor temperature
- 14 Knob for room temperature readjustment
- 15 Fixing screw with sealing facility

The RVL471 can be fitted in 3 different ways:

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

### Analog operating elements

- Buttons for selecting the operating mode
- Button for d.h.w. heating on / off
- Info button
- Direct setting of heating curve by means of the little bar (only if analog setting is selected)
- Knob for manual readjustment of the room temperature
- 3 buttons for manual operation and for manual positioning commands

### Digital operating elements

Entry or readjustment of all setting parameters, activation of optional functions and reading of actual values and states 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

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### Engineering

- The wires of the measuring circuits carry extra low voltage, those to the actuator and the pump carry AC 24...230 V.
- The local safety regulations must be complied with.
- Sensor cables should not be run parallel to mains carrying cables for loads such as actuators, pumps, burners, etc.

### Commissioning

- The plant type must be configured.
- When used in district heating plants, the district heat parameters can be locked.
- Each controller is supplied complete with installation and commissioning instructions.

## Technical data

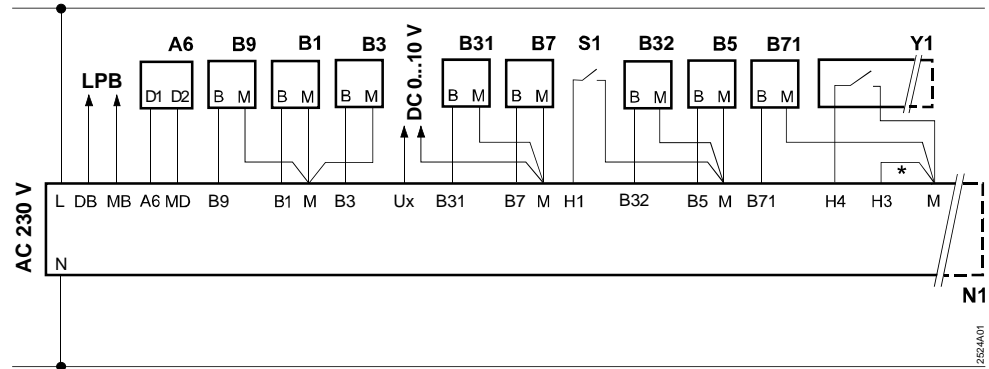
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<b>CE</b> conformity to	
EMC directive	89/336/EEC
Immunity	EN 50 082-2
Emissions	EN 50 081-1
Low voltage directive	73/23/EEC
Safety	EN 60730-1
Nominal operating voltage	AC 230 V
Frequency	50 Hz
Power consumption	9 VA
Output relays	
Nominal voltage	AC 24... 230 V
Nominal current range Y1/K4, Y2/K5, Q1, Y7, Y8	AC 0,02...2 (2) A
Nominal current range Q3/Y3, Q4, K6	AC 0,02...1 (1) A
Nominal current of ignition transformer	max. 1 A for max. 30 s
Switch-on current of ignition transformer	max. 10 A for max. 10 ms
Degree of protection (cover closed)	IP42 EN 60 529
Safety class	II EN 60 730
Perm. ambient temperature	
Transport and storage	-25...+65 °C
Operation	0...50 °C
Perm. cable lengths to the sensors, thermostats and external contacts	
Copper cable 0.6 mm dia.	20 m
Copper cable 1.0 mm <sup>2</sup>	80 m
Copper cable 1.5 mm <sup>2</sup>	120 m
Perm. cable lengths to the room unit	
Copper cable 0.25 mm <sup>2</sup>	25 m
Copper cable from 0.5 mm <sup>2</sup>	50 m
Bus loading characteristic E (LPB)	7
Backup of controller clock	12 h min.
Weight (net)	1.2 kg

## Connection diagrams

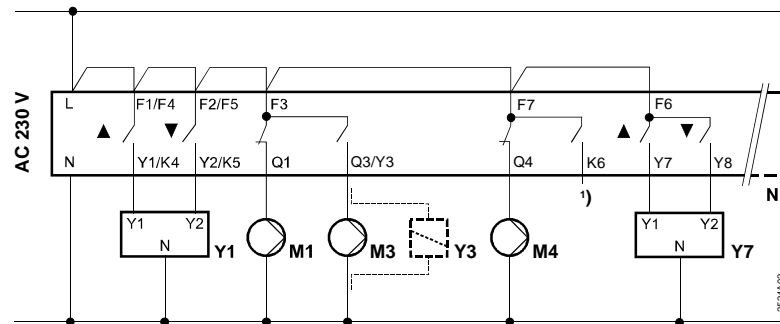
### Low voltage side

#### Basic connections

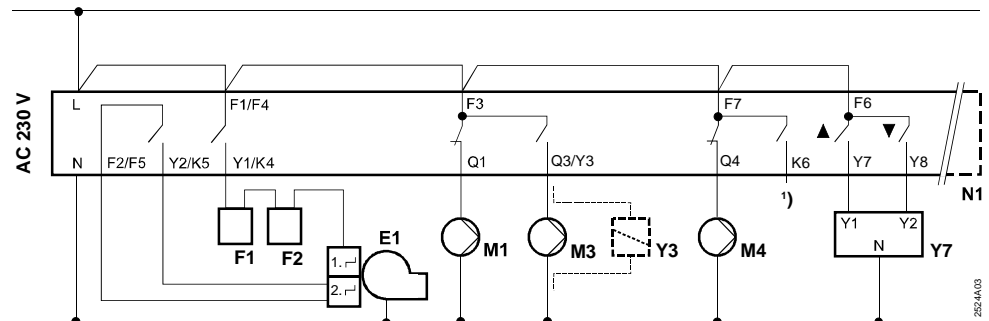


### Mains voltage side

#### Basic connections for plant types with 3-position control (seat or slipper valve)



#### Basic connections for plant types with 2-position control (boiler with a 2-stage burner)



A6 Room unit QAW50 or QAW70

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

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

N1 Controller RVL471

S1 Remote control of operating mode

Y1 Actuator heating circuit, with switch for minimum stroke limitation

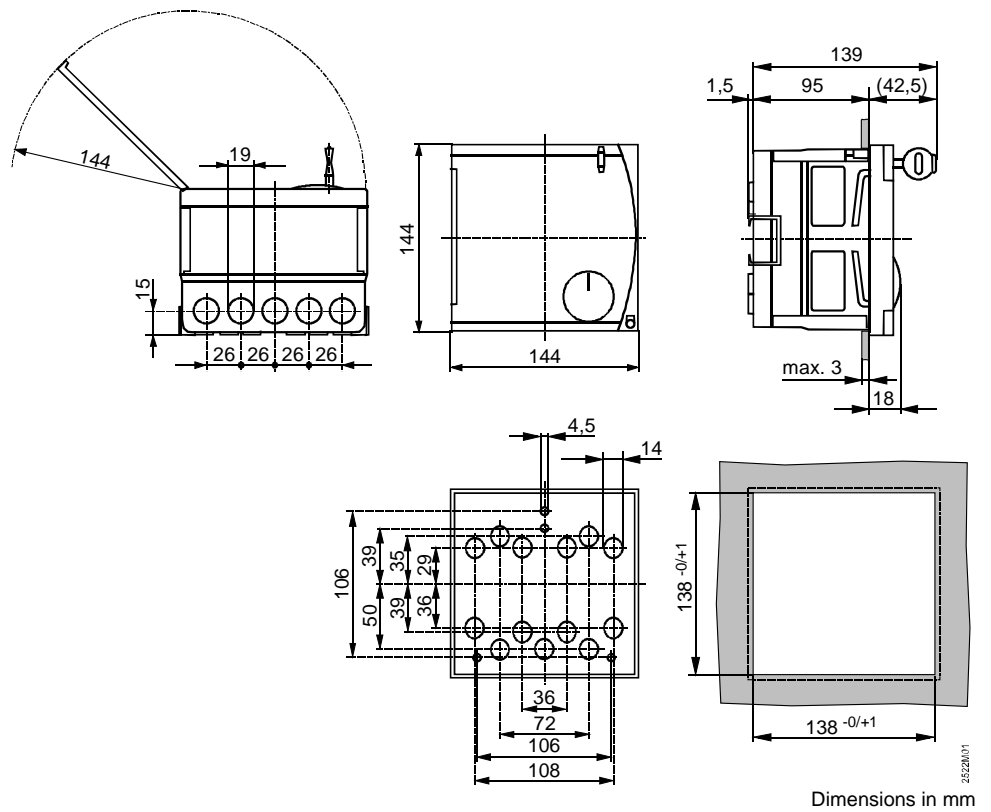
Y3 Actuator diverting valve

Y7 Actuator d.h.w. circuit

\* Wire link for locking the district heat parameters

1) Multifunctional output

## Dimensions



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Subject to alteration