



Temperature controller for ducted systems

RRV851

Multifunctional controller used for central control of ducted HVAC systems in connection with a QAX850 master room unit. Standard model without zoning functions.

Use

Comfort control of ducted HVAC systems via fan, heating and cooling output:

- Apartments
- Single-family houses
- Autonomous light commercial applications

Applications

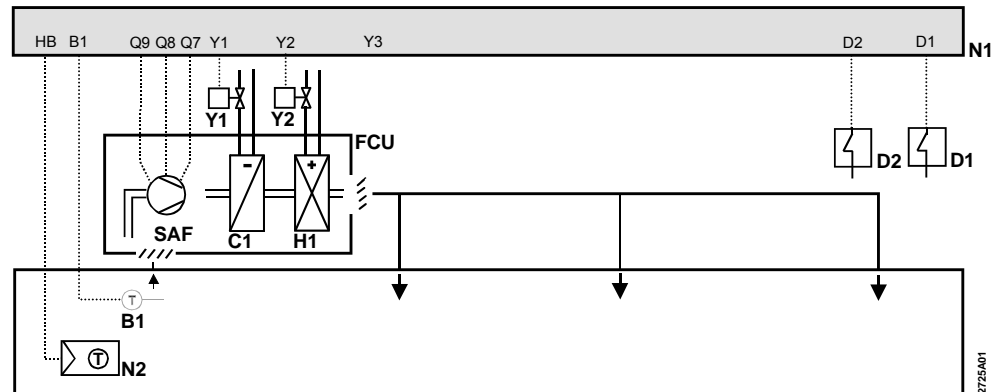
The RRV851 controller is designed for central ducted HVAC systems that require easy operation by the building occupant. The MMI to be connected to the controller is the QAX850 master room unit. Fan, heating and / or cooling outputs control the temperature in the building. The RRV851 controller can be configured for various types of HVAC equipment. These include:

- Heating only ducted systems
- Cooling only ducted systems
- DX cooling and heating (1-speed fan on heating)
- DX cooling and heating (3-speed fan)
- Air-to-air heat pumps
- Water-to-air heat pumps
- 4-pipe FCU
- 2-pipe FCU
- 1- or 3-speed fans

Functions

The controller's functionality is determined by the application selected with the DIP switches, parameter settings and operating mode selection via the QAX850 master room unit.

Application example: 4-pipe FCU system



B1	Optional remote temp. sensor	N1	RRV851 controller
C1	Cooling coil	N2	QAX850 master room unit
D1	Remote comfort mode input	SAF	Supply air fan
D2	Fault or emergency heat input	Y1	Cooling control valve
FCU	Fan coil unit	Y2	Heating control valve
H1	Heating coil		

Type summary

Type reference	Description	Compatible with
RRV851	Temperature controller	<ul style="list-style-type: none"> QAX850 Master room unit QAA32 Room temperature sensor QAH11.1 Cable temperature sensor

Note

The QAX850 is the master MMI for the RRV851 and must be ordered as a separate item. Any additional remote temperature sensors must also be ordered separately. Terminal covers are included in the RRV851 box.

Not suitable for use with the Desigo RX range of wall-mounted units.

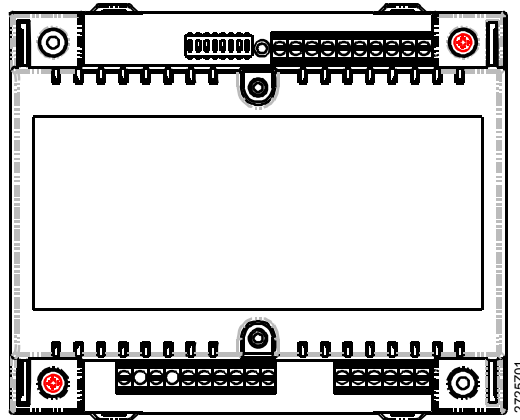
Product documentation

Document	Document number
Data sheet	N2725
Installation instructions	G2725
Operating instructions, with QAX850 room unit	B2725en01
Application manual	A2725
Declaration of conformity	T2725

Supporting documentation

Document and unit type	Document number
Data sheet QAX850	N2722
Mounting instructions QAX850	M2721

The RRV851 is a temperature controller providing connection of power supply, inputs/outputs and QAX850 master room unit.



The unit consists of the following components:

- Base for DIN rail or screwed surface-mounting
- Cable strain reliefs
- IP30 covers (when mounted directly to the wall or FCU without DIN rail)
- PCB and built-in transformer
- PCB cover
- Input / output terminals
- RS-485 terminals
- MMI bus terminals
- LED for power supply indication
- Configuration DIP switches

Connection terminals

Bus interface
(HB+ HB-)

Low-voltage power supply (DC 12 V) and communication transfer is supplied via two wires to the QAX850 from terminals HB+ and HB-. The LED on the QAX850 will flash if a communication error exists between RRV851 and QAX850 for longer than 5 seconds.

RS-485
(TX+, TX-)

The RS-485 connections are only suitable for downloading manufacturer specific parameter sets. This is for factory use only.

Digital inputs
(D1, D2)

Two digital inputs are provided. A potential-free contact closed across the D1 and D_GND terminals will override to Comfort mode only when the mode selector is set to Auto Timer mode. D2 can be configured for an emergency heating enable signal or an external fault lockout signal. Either of these functions can be selected via the configuration DIP switches.

When emergency heating is selected, a potential-free contact closed across the D2 and D_GND terminals will disable the primary heating output and enable the emergency heating output. The emergency heating output will only be activated when there is demand for heating. Not available on applications A2, A3, A4, and A5.

When external fault (default) is selected, a potential-free contact closed across the D2 and D_GND terminals will deactivate all outputs and the standby icon on the QAX850 LCD will flash to indicate the fault. The fault will disappear after the contact is opened.

Temperature sensor
input (B1, M)

An NTC temperature sensor can be connected to the B1 and M terminals for the following functions:

- Remote room temperature sensing: The QAX850 can be used as a master control unit without using the built-in temperature sensor. A separate room sensor (QAA32) can be mounted in a location more convenient for accurate temperature acquisition
- Return air temperature sensing: A temperature sensor (QAH11.1) can be mounted in the return air path of the FCU if accurate temperature acquisition in the room is not possible
- 2-pipe application heating/cooling changeover: For application A8 (2-pipe FCU) a temperature sensor (QAH11.1/ARG86.3) is clamped to the water pipe in order to activate heating/cooling mode changeover

Fan speed outputs

The RRV851 controller can be configured for a 1- or 3-speed fan. Voltage-free (SPST) relay outputs Q74, Q84 and Q94 can switch loads up to AC 250 V, 6 (4) A. Power is supplied via terminal Q71. The low-speed terminal is used when a 1-speed fan is configured. On fan startup, high-speed will be activated first for approximately 3 seconds and then resume the selected speed. In Auto Fan mode, the fan speeds will be activated automatically depending on demand. For further details on auto fan speed control, refer to the Application Manual.

Heat/cool outputs

- Output Y1: Cooling or compressor output
 - Output Y2: Heating or reversing valve output
 - Output Y3: Auxiliary output that can be configured for auxiliary heating, emergency heating, 2nd step cooling or dual compressor
- Output control is 2-position. 3-position modulating can be selected via parameter P17 for applications A1, A2 and A8 only.

Configuration

DIP switches

Initial application setup of the RRV851 controller to match the connected HVAC equipment is made by the selection of DIP switch positions. DIP switches are located on the top of the controller. An adhesive label is included in the RRV851 packaging box for the final recording of the DIP switch positions. This can be placed on the DIP switch block to avoid unauthorized changes. Further parameter settings can be made via the QAX850 if required.

DIP switch settings

Function	Selections	1	2	3	4	5	6	7
Y3 Auxiliary output	Auxiliary heating 20 min delay	off	off	-	-	-	-	-
	Auxiliary heating 10 min delay	on	off	-	-	-	-	-
	Emergency heating via D2	off	on	-	-	-	-	-
	2 nd stage cool or compressor	on	on	-	-	-	-	-
Fan speed	Single speed	-	-	off	-	-	-	-
	Three speed	-	-	on	-	-	-	-
Applica- tion	A1 – Heating only	-	-	-	off	off	off	off
	A2 – Cooling only	-	-	-	on	off	off	off
	A3 – Cool./(heat. 3 speed fan)	-	-	-	off	on	off	off
	A4 – Cool./(heat. 1 speed fan)	-	-	-	on	on	off	off
	A5 – Heat pump (comp + RV)	-	-	-	off	off	on	off
	A6 – Heat pump (heat/cool)	-	-	-	on	off	on	off
	A7 – 4-pipe FCU	-	-	-	off	on	on	off
	A8 – 2-pipe FCU	-	-	-	on	on	on	off

Default (as delivered) positions are in bold text.

Commissioning notes

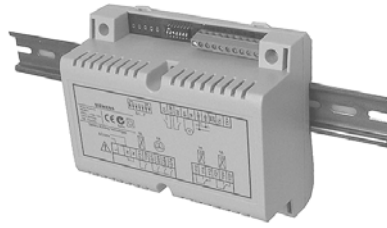
- Response on startup** When powering up, the QAX850 will display all LCD icons for approximately 3 seconds, and then the software version number for another 3 seconds. It will then revert to the normal display. The time segments will be blinking if the time needs to be set. Set the time of day as per Operating Instructions. There will be a delay before operation commences due to polling of all values.
- User operation** The user should not have access to the DIP switches or parameter settings. User operation is via the QAX850 master room unit. For user operation details, refer to the Operating Instructions included in the packaging box (document B2725en.01).
- Sensor calibration** Generally, there is no need to recalibrate the sensor. However, the room temperature displayed on the QAX850 LCD can be recalibrated if there is any discrepancy from the actual temperature measured with a certified thermometer. The calibration function can be accessed by pressing simultaneously the ▲ and ▼ buttons for 5 seconds. The displayed value can then be adjusted via the same buttons in increments of 0.1 K. The range is ±3 K.
- Commissioning** The RRV851 controller is operational after the DIP switch settings have been made and power is connected. Default parameter settings are based on the application selected and may be modified if required. Refer to the list below. Parameters cannot be accessed if the system is in Off mode. Refer to the Installation Instructions for setup details and the Application Manual for default parameter values.

Setup parameters

No.	Parameter	Range
P00	Temperature scale	°C / F°
P01	Frost protection limit in Off mode	Off / 5...8 °C
P02	Overtemperature limit in Off mode	Off / 30...35 °C
P03	Min. off time delay	0...600 s
P04	Min. on time delay	0...600 s
P05	Dead band between cooling and heating off points	0.5...6 K
P06	RV on in heating or cooling mode	Heating/Cooling
P07	Fan run on after heating output turns off	0...300 s
P08	Fan run on after cooling output turns off	0...300 s
P09	FCU flush pipe time	120...600 s
P11	Water temperature heating mode changeover	22...32 °C
P12	Water temperature cooling mode changeover	10...21 °C
P13	Fan auto speed high range	H: 80...100 %
P14	Fan auto speed medium range	M: 30...75 %
P15	Fan auto speed low range	L: 1...15 %
P17	2- or 3-position control selection	2-pos / 3-pos
P18	P-band in heating mode / switching differential	0.5...10 K
P19	P-band in cooling mode / switching differential	0.5...10 K
P20	Integration time	0...60.0 min in 0.5 min steps
P21	3-position valve actuator running time	50...300 s
P23	Ventilation in dead zone	Off, H/C, C only

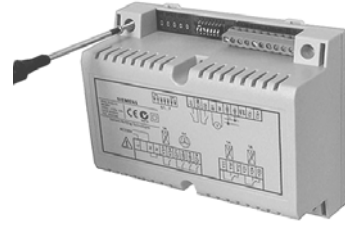
Mounting and installation notes

The RRV851 controller can be mounted in any orientation using the following fixing options:



DIN rail mounting

The housing base is designed for snap-mounting on DIN rails conforming to EN 50022-35 × 7.5 (can be released with a screwdriver).



Surface mounting

There are 2 drill holes for screw-mounting (refer to “Dimensions”).
Screws: Max. diameter 3.5 mm, min. length 38 mm.

When mounting, note the following:

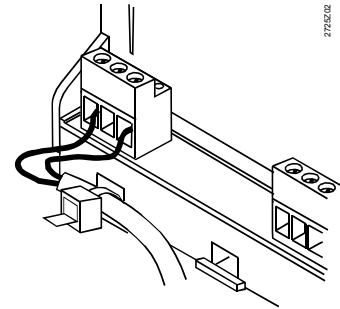
- The controller should not be freely accessible after mounting
- Ensure adequate air circulation to dissipate heat generated during operation
- Easy access is required for service personnel
- Local installation regulations must be observed

The Mounting Instructions are included in the RRV851 controller packaging.

Note!

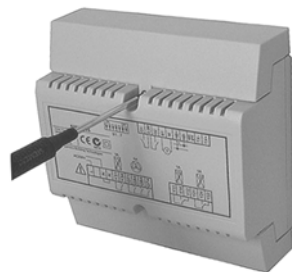
When not mounting within a panel, cable strain reliefs **must** be used for all wiring to (AC 230 V) terminals. The conductors must be secured with cable ties (see diagram).

Cable strain reliefs should be used for all wiring to avoid disconnection.




Terminal covers

Terminal covers are provided in the RRV851 packaging box. The covers include screws for fixing to the controller and knockout holes for cable entry. Covers should only be used where suitable access is restricted to authorized personnel and there is protection from ambient conditions. The covers will provide IP30 protection when surface-mounted on the wall or FCU.



Removing the terminal covers

Technical data

Power supply (L, N)	Rated voltage	AC 230 V, +10 %, –15 %
	Requirement for transformers for switch mode power supplies	EN 61 558-2-6
	Frequency	50 / 60 Hz
	Power consumption (excl. external modules)	12 VA
	Supply line fusing	max. 10 A
Functional data	Reserve of clock	max. 20 min
Analogy input (B1, M)	Passive sensor	NTC resistor, 3 k Ω at 25 °C
	Measuring range	0...49 °C
Digital input (D1, D2)	Contact sensing	
	Voltage	max. DC 5 V
	Current	typically 8 mA
	Requirements for status and impulse contacts	
	Signal coupling	Potential-free
	Type of contact	Maintained or impulse contacts
Insulating strength against main potential	AC 3750 V to EN 60 730	
Switching outputs 	External supply line fusing	
	Non-renewable fuse (slow)	max. 10 A
	Automatic line cutout	max. 13 A
	Release characteristic	B, C, D to EN 60 898
	Relay contacts (Y1x, Y2x, Y3x)	
	Relay output	potential-free
	Switching voltage	max AC 250 V min. AC 19 V
	AC current	max. 3 A res., 1 A ind. (cos φ = 0.6)
	At 250 V	min. 5 mA
	At 19 V	min. 20 mA
Switch-on current	max. 5 A (1 s)	
Contact life	1 \times 10 ⁵ cycles	
Boiler (Q1x)	Relay contacts (Q7x)	
	Relay output	potential-free
	Switching voltage	max. AC 250 V min. AC 19 V
	AC current	max. 6 A res., 4 A ind. (cos φ = 0.6)
	At 250 V	min. 5 mA
	At 19 V	min. 20 ma
	Switch-on current	max. 10 A (1 s)
	Contact life	1 \times 10 ⁵ cycles
	Insulating strength	
	Between relay contacts and system electronics (reinforced insulation)	AC 3750 V, to EN 60 730-1
Between neighboring relay contacts (operational insulation) Y1x \leftrightarrow Y2x \leftrightarrow Y3x \leftrightarrow Q7x \leftrightarrow Q8x \leftrightarrow Q9x	AC 1250 V, to EN 60 730-1	
Interfaces (S+, SG)	HCC bus	proprietary protocol
	Bus power supply voltage	DC 12 V, +10, –15% (supply to room unit QAX850)

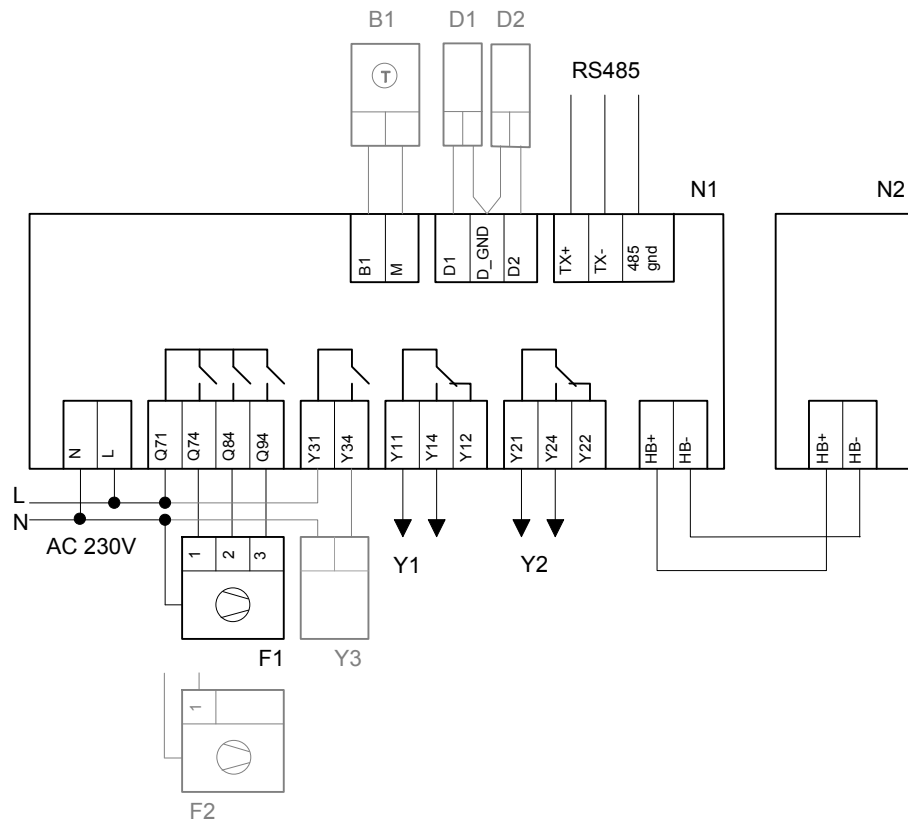
	Baud rate	9.6 kbit/s
Permissible cable lengths	For bus communication	
	A ≥ 0.5 mm ²	max. 60 m
	A ≥ 1 mm ²	max. 100 m
	Type of cable	2-wire standard installation cable (unshielded)
	Note: Twisted pair (unshielded) is recommended for enhanced immunity to external electromagnetic interference, e.g. in the vicinity of radio transmitters or variable speed drives	
Electrical connections (all terminals)	Connection terminals	screw terminals
	For wires	0.6 mm dia. ... 2.5 mm ²
Degrees of protection	Degree of protection of housing to IEC 60 529	IP 20 without terminal covers IP 30 with terminal covers
	Safety class to EN 60 730	device suited for use with equipment of safety class II
Environmental conditions	Operation to	IEC 721-3-3
	Climate conditions	class 3K5
	Temperature (housing and electronics)	0...50 °C
	Humidity	5...95 % r. h. (non-condensing)
	Mechanical conditions	class 3M2
	Transport to	IEC 721-3-2
Classification to EN 60 730	Climate conditions	class 2K3
	Temperature	-25...+70 °C
	Humidity	<95 % r. h.
	Mechanical condition	class 2M2
	Mode of operation, automatic controls	type 1B
	Degree of contamination, controls Environment	2
	Rated surge voltage	4000 V
	Software class	A
Materials and colors	Controller housing	Polycarbonate, RAL 7035 (lightgrey)
	Packaging	corrugated cardboard
Norms and standards	Product safety	
	Automatic electrical controls for household and similar use	EN 60 730-1
	Special requirements for temperature sensing controls	EN 60 730-2-9
	Electromagnetic compatibility	
	Immunity domestic section, light industry	EN 61 000-6-1
	Emissions domestic section, light industry	EN 61 000-6-3
	CE -conformity	
	EMC directive	89/336/EEC
	Low-voltage directive	73/23/EEC
	N ⁴⁷⁴ conformity to	
Australian EMC framework	Radio Communication Act 1992	
Radio interference emission Standard	AS/NZS 4251.1	
Weight	Excluding packaging	approx. 0.735 kg

Connection terminals

B1	Signal input (external sensor NTC)
M	Signal ground
D1, D2	Digital inputs
D_GND	Digital ground
HB+ HB-	Communication bus
L, N	AC 230 V supply
Q...	Digital outputs, AC 24...230 V, 6(4) A
Y...	Digital outputs, AC 24...230 V, 3(1) A

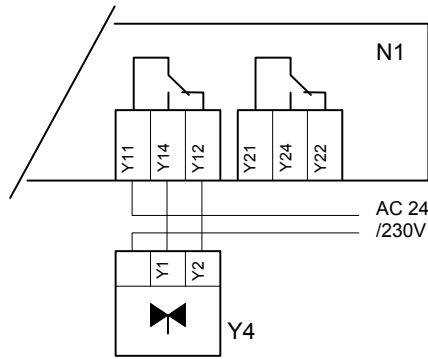
Connection diagrams

Typical connection

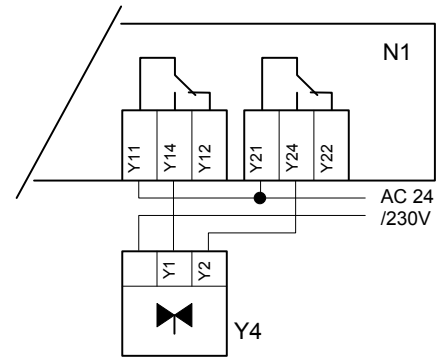


B1	External temperature sensor (optional) or pipe changeover sensor (application A8)
CR1	Compressor relay stage 1
CR2	Compressor relay stage 2
D1	Remote activation of Comfort mode
D2	Fault or emergency heating
F1	3-speed fan
F1	External supply line fusing, max. 10 A
F2	1-speed fan
N1	RRV851 controller
N2	QAX850 master room unit
RV	Reversing valve
Y1	Cooling output
Y2	Heating output
Y3	Auxiliary heating, emergency heating or 2 nd stage cooling
Y4	Valve actuator, AC 24...230 V

Output connections

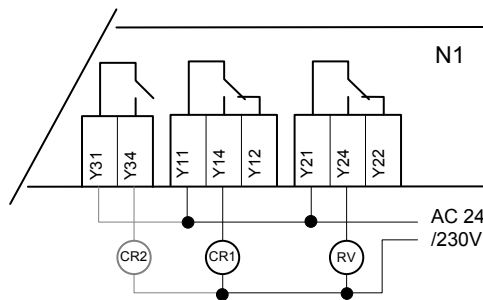


2-pipe FCU, 2-position control
(application A8)



Optional 3-position control (applications
A1, A2 and A8)

Output connections



Heat pumps (application A5)
(For single compressor heat pumps, CR2 is
not connected)

Note: Contact your local Siemens representative for application-specific wiring diagrams and information.



Note

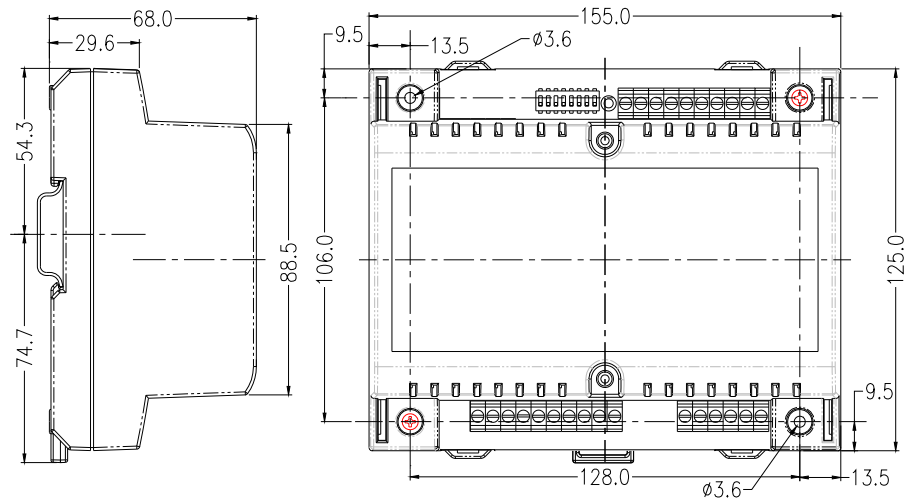
- External supply line fusing must be used.
- All input and bus terminals are not protected against connection to AC 230 V.
- Observe the technical data for fan relay outputs: Max. AC 250 V, 6(4) A.
- All output cables used must satisfy insulation requirements with regard to mains potential.
- AC 24 V outputs must be segregated from AC 250 V outputs.
- Care should be taken when cables pass through sharp metal openings, conduits or ducts.
- Double insulation on output cables is recommended.
- Local installation regulations must be observed.

Product liability

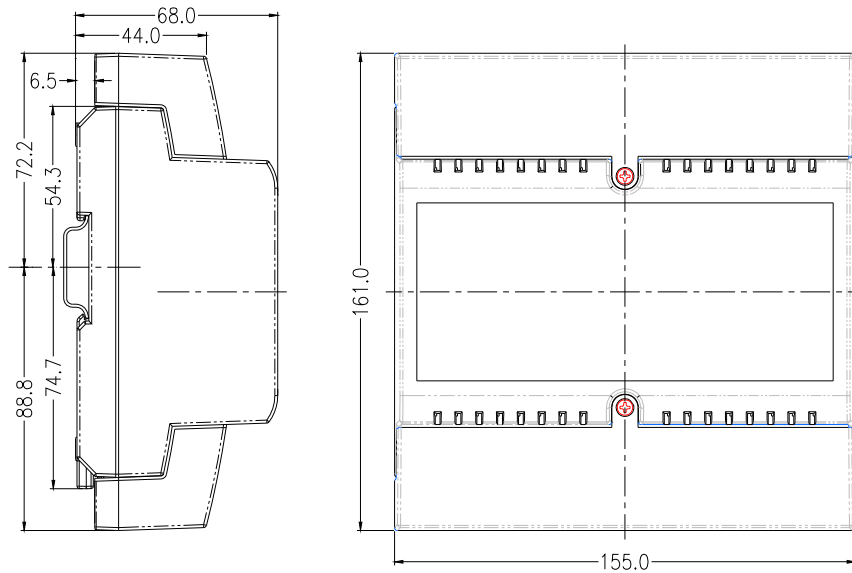
The products may only be used in building services plant and applications as described above. When using the products, all requirements specified under "Technical data" must be observed.

Dimensions

Without terminal covers



With terminal covers



Dimensions in mm