SIEMENS

Flush-mounted room thermostat with RS485 Modbus communications

RDF660MB/MM, RDF660MB

For 2-pipe, 2-pipe with electric heater and 4-pipe fan coil units

- AC 230 V operating voltage
- Large, backlit display
- On/off or 3-position control outputs
- Automatic or manual fan speed control
- ECM fan DC 0...10 V output
- Operating modes: Comfort, Economy and Protection
- Control depending on the room or the return air temperature
- Automatic or manual heating/cooling changeover
- Minimum and maximum limitation of room temperature setpoint
- 2 inputs for external or changeover sensor, keycard or window contact
- Commissioning and control parameters via local HMI or RS485 Modbus
- RS485 communicative interface in Modbus RTU slave mode
- User and parameter settings can be retained or restored with power loss to previous mode, Comfort mode or Protection mode
- Mounting on both round and square conduit boxes, 60 mm fixing centers

Use

Applications

Room temperature control (heating or cooling) in individual rooms and zones by means of:

- 2-pipe fan coil units
- 2-pipe fan coil units with electric heater
- 4-pipe fan coil units

The room thermostat controls:

- One ECM fan
- One or two on/off valve actuators
- One on/off valve actuator and one 1-stage electric heater
- One 3-position valve actuator
- One 1-stage compressor with electric heater

Used in systems with:

- Heating or cooling
- Automatic heating/cooling changeover
- Manual heating/cooling changeover
- Heating and cooling (e.g. 4-pipe system)

The room thermostat is delivered with a fixed set of applications.
The relevant application is selected and activated during commissioning using one of the following tools:

- Local DIP switch and HMI
- Modbus commissioning tools

Functions

- Maintain room temperature via built-in temperature sensor or external room temperature/return air temperature sensor
- Changeover between heating and cooling mode (automatic changeover via local sensor/bus or manual changeover via buttons)
- Select application via DIP switches or commissioning tools
- Select operating mode via operating mode button on the thermostat
- ECM fan control (automatic or manual)
- Display current room temperature or setpoint in °C and/or °F
- Minimum and maximum limitation of room temperature setpoint
- Key lock (automatic, manual or via bus)
- B1 input freely selectable for (RDF660MB/MM only):
  - External room temperature sensor or return air temperature sensor
  - Automatic heating/cooling changeover sensor
- S1 input freely selectable for (RDF660MB/MM only):
  - Window contact
  - Presence detector
  - Hotel keycard
- 2 multifunctional inputs (X1 and X2), freely selectable for (RDF660MB only):
  - External room temperature sensor or return air temperature sensor (AI)
  - Automatic heating/cooling changeover sensor (AI)
  - Window contact (DI)
  - Dew point sensor (DI)

  - Electric heater enabled (DI)
  - Fault input (DI)
  - Monitor input (DI)
  - Monitor input (AI)
  - Automatic heating/cooling changeover sensor (DI)
  - Presence detector (DI)
  - Hotel keycard (DI)
- Advanced fan control function, e.g. fan kick, fan start, selectable fan operation (enable, disable or depending on heating or cooling mode)
- Purge function together with 2-port valve in a 2-pipe changeover system
- Reminder to clean filters
- Floor heating temperature limit
- Reload factory settings for commissioning and control parameters
- User and parameter settings can be retained with power loss and operating mode can be returned to previous operating mode, Comfort mode or Protection mode (depends on P27)
- RS 485 Modbus (terminals +, - and REF) for communication with Modbus compatible devices
- Display on a secondary line: room temperature, outdoor temperature or time of day via Modbus
- Mounting on both round and square conduit boxes, 60 mm fixing centers

Type summary

Product no.	Stock no.	Operating voltage	Control outputs			Fan types		Backlit LCD	Input	Suitable conduit box	Color
			On/Off	3-pos	DC 0...10 V	3-speed	DC 0...10 V				
RDF660MB/MM	S55770-T433	AC 230 V	✓	✓	-	-	✓	✓	Basic B1, S1	Square or round	White
RDF660MB	S55770-T439	AC 230 V	✓	✓	-	-	✓	✓	Basic X1, X2	Square or round	White

Ordering

When ordering, specify both product number/stock number and name:
e.g. **RDF660MB/MM / S55770-T433 Modbus room thermostat**
Order valve actuators and accessories separately

Accessories

Description		SSN	Data sheet
Changeover mounting kit (50 pcs / package)		ARG86.3	N3009
Plastic mounting spacer for flush-mounted thermostats to increase the headroom in the conduit box by 10 mm		ARG70.3	N3009

Note: Order accessories separately.

Equipment combinations

Type of unit		Product no.	Data sheet *)
Cable temperature or changeover sensor, cable length 2.5 m NTC (3 kΩ at 25 °C)		QAH11.1	1840
Room temperature sensor NTC (3 kΩ at 25 °C)		QAA32	1747
Cable temperature sensor cable length 4 m NTC (3 kΩ at 25 °C)		QAP1030/UFH	1854
Condensation monitor / Dewpoint monitor		QXA2601 / QXA2602 / QXA2603 / AQX2604	3302

On/Off actuators

Type of unit		Product no.	Data sheet *)
Electromotive On/Off actuator		SFA21..	4863
Electromotive On/Off valve and actuator (only available in AP, UAE, SA and IN)		MVI../MXI..	A6V11251892
Zone valve actuator (only available in AP, UAE, SA and IN)		SUA..	4832
Thermal actuator (for radiator valves)		STA321	A6V12986007
Thermal actuator (for small valves 2.5 mm)		STP321	A6V12986007

3-position actuators

Type of unit		Product no.	Data sheet *)
Electric actuator, 3-position (for radiator valves)		SSA31..	4893
Electric actuator, 3-position (for 2- and 3-port valves/V..P45)		SSC31	4895
Electric actuator, 3-position (for small valves 2.5 mm)		SSP31..	4864
Electric actuator, 3-position (for small valves 5.5 mm)		SSB31..	4891
Electric actuator, 3-position (for small valve 5 mm)		SSD31..	4861
Electric actuator, 3-position (for valves 5.5 mm)		SAS31..	4581

*) The documents can be downloaded from http://siemens.com/bt/download.

For the maximum number of actuators in parallel, refer to information in the data sheets of the selected actuators and to this list, depending on which value is lower:

- Parallel operation of max 6 SS… actuators (3-pos) is possible.
- Parallel operation of max 10 On / Off actuators is possible.
- Parallel operation of SQS35 is not possible.

Mechanical design

The thermostats consist of 2 parts:

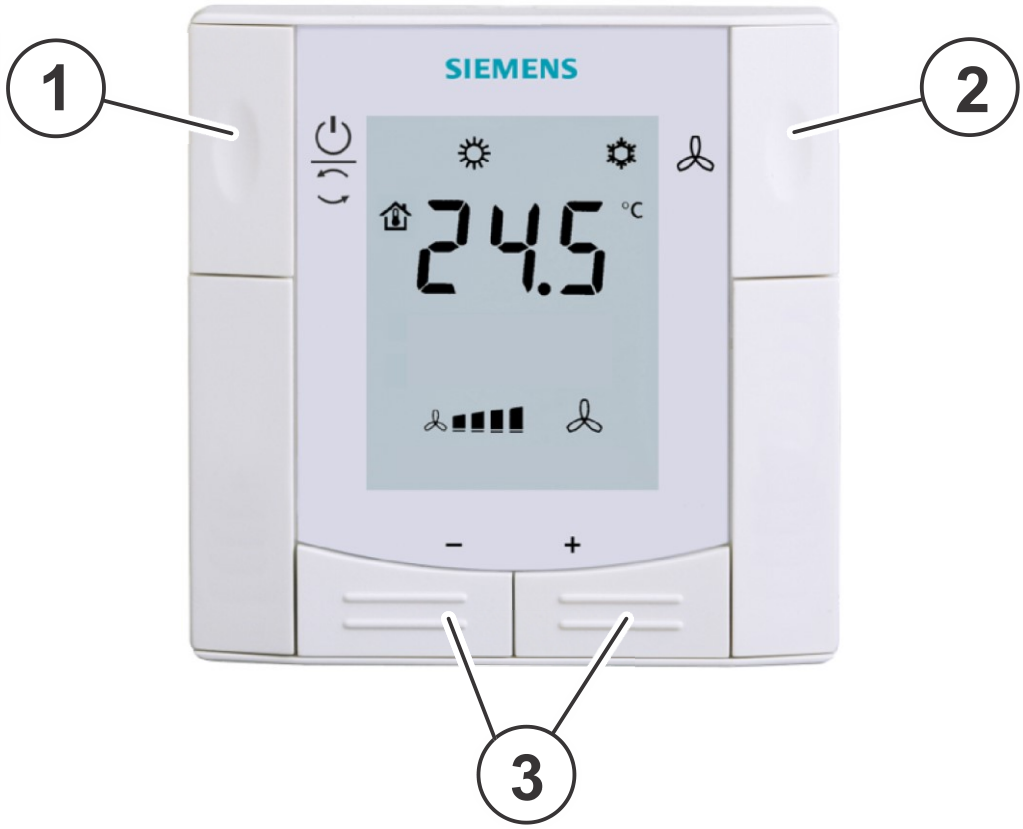
- Front panel with electronics, operating elements and built-in room temperature sensor.
- Mounting base with power electronics.

The rear of the mounting base contains the screw terminals.

The base fits on a square conduit box with 60 mm fixing centers.

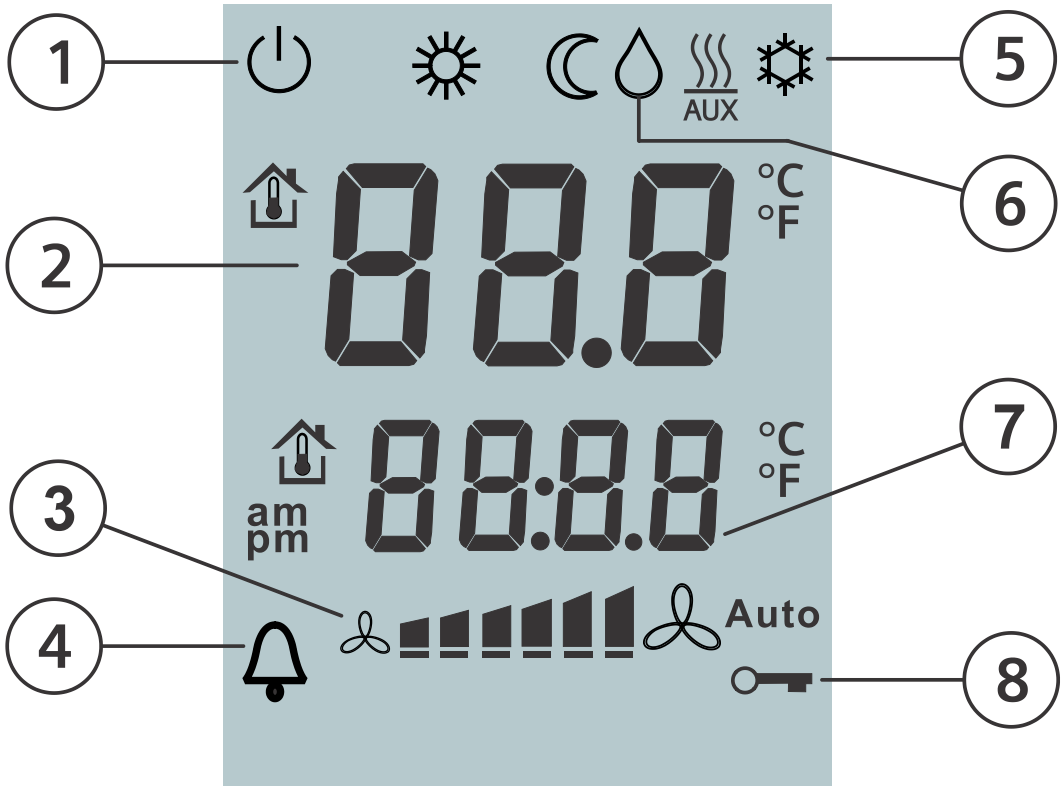
Slide the front panel in the mounting base and snap on.

Operation and settings



1. Operating mode selector
2. Change fan operation
3. Adjust setpoints and control parameters

Display



1. Operating mode
   - Protection
   - Comfort
   - Economy
2. Displays room temperature, setpoints and control parameters
   - Symbol indicates current room temperature
3. Fan mode
   - Auto fan active
   - Fan speed: low, medium, high
4. Indicates fault or reminder
5. Heating/cooling mode
   - Cooling
   - Heating
   - Electrical heater active (RDF660MB only)
6. Condensation in room (dew point sensor active)
7. Additional user information, like room temperature, outdoor temperature ( ) or time from Modbus (selectable via parameters)
8. Key lock active

Product documentation

Title	Document ID
Operating instructions	A6V12060783
Basic documentation	A6V12114068
CE declarations	A5W00156993A
RCM	A5W00156996A
Environmental product declaration	A5W00139322A

Related documents such as environmental declarations, CE declarations, etc., can also be downloaded at the following Internet address:
http://siemens.com/bt/download

Notes

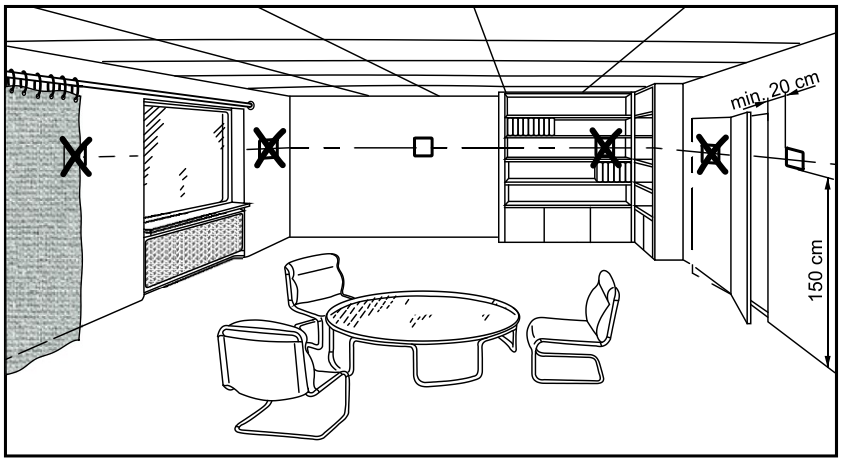
Security

⚠ CAUTION	
	**National safety regulations** Failure to comply with national safety regulations may result in personal injury and property damage. ● Observe national provisions and comply with the appropriate safety regulations.

Engineering

Device address	The device address is assigned to “1” (factory setting). If necessary, engineer/installer can change the address value using the parameter P81.
Baud rate	The Baud rate is selectable. Four options, 9600 bps, 19200 bps 38400 bps and 57600 bps, are available for the Modbus network (19200 bps is default).
Parity	Parity can be set to none, odd or even (even is default).

Mounting and installation



Mounting

- Mount the room thermostat on a recessed square conduit box with 60 mm fixing centers.
- Do not mount on a wall in niches or bookshelves, behind curtains, above or near heat sources, or exposed to direct solar radiation.
- Mount about 1.5 m above the floor.
- Mount the room thermostat in a clean, dry indoor place without direct airflow from a heating / cooling device, and not exposed to dripping or splash water.
- In case of limited space in the conduit box, use mounting bracket ARG70.3 to increase the headroom by 10 mm.

⚠ WARNING	
	**Device damage** Carefully read all wiring diagrams prior to installation to avoid damage to the device caused by incorrect wiring of high or low voltages.

Wiring

- See Mounting Instructions A6V12060783 enclosed with the thermostat.
- Comply with local regulations to wire, protect and earth the thermostat.
- ⚠ The device has no internal fuse for supply lines to fan and actuators. To avoid risk of fire and injury due to short-circuits, the AC 230 V mains supply line must have a circuit breaker with a rated current of no more than 10 A.
- ⚠ Properly size the cables to the thermostat, fan and valve actuators for AC 230 V mains voltage.
- ⚠ Use only valve actuators rated for AC 230 V.
- ⚠ Adapt the wiring cross section for power supply (L, N), and 230 V outputs (Yx-N) to the preceding overload protection elements (max 10 A) under all circumstances. Comply with local regulations under all circumstances.
- ⚠ Cables of SELV inputs S1 (X2)-M / B1 (X1)-M: use cables with min 230 V insulation, as the conduit box carries AC 230 V mains voltage.
- ⚠ Inputs S1 (X2)-M / B1 (X1)-M: several switches (e.g. summer/winter switch) may be connected in parallel. Consider overall maximum contact sensing current for switch rating.
- Selectable relay function: Follow the instructions in Basic documentation A6V12114068 to connect external equipment to the relay outputs.
- ⚠ Isolate the cables of Modbus communication input A+, B- and REF for 230 V.
- ⚠ Disconnect thermostat from power supply before removing from the mounting plate.
- ⚠ The device does not support hot-plug.

Operating mode

In Protection mode, press any button to activate the screen, then press the mode button to change to another operating mode.

Commissioning

Applications

The room thermostat is delivered with a fixed set of applications.

Select and activate the relevant application during commissioning using one of the following tools:

- Local DIP switch and HMI
- Modbus commissioning tools

Set the DIP switches before snapping the front panel onto the mounting plate, if you want to select an application via **DIP switches**.

All DIP switches need to be set to “OFF” ("remote configuration"), if you want to select an application via **commissioning tools**.

After power is applied, the thermostat resets and all LCD segments light up, indicating that resetting was correct. After the reset, which takes about 3 seconds, the thermostat is ready for commissioning by qualified HVAC staff.

Display “NONE”

If “NONE” is displayed on the LCD, the DIP switches are set to OFF-OFF-OFF for remote configuration, but the application has not yet been assigned to the device. The application can be set using commissioning tools via RS485 Modbus.

Note

When the application is changed, the thermostat reloads the factory settings for all control parameters, except baud rate (P82), parity (P83) and zone addresses (P81)!

Control parameters

The thermostat's control parameters can be set to ensure optimum performance of the entire system.

The parameters can be adjusted via

- Local HMI
- Modbus commissioning tools

Control sequence

The control sequence may need to be set via parameter P01 depending on the application. The factory setting for the 2-pipe application is “Cooling only”; and “Heating and cooling” for the 4-pipe application.

Compressor-based application

When the thermostat is used with a compressor, adjust the minimum output On-time (P48) and Off-time (P49) for Y1/Y2 to avoid damaging the compressor or shortening its life due to frequent switching.

Calibrate sensor

Recalibrate the temperature sensor if the room temperature displayed on the thermostat does not match the room temperature measured (after minimum 1 hour of operation). To do this, change P05.

Setpoint and range limitation

We recommend reviewing the setpoints and setpoint ranges (P08…P12) and changing them as needed to achieve maximum comfort and save energy.

Disposal

This symbol or any other national label indicate that the product, its packaging, and, where applicable, any batteries may not be disposed of as domestic waste. Delete all personal data and dispose of the item(s) at separate collection and recycling facilities in accordance with local and national legislation.
For additional details, refer to www.siemens.com/bt/disposal.

Open Source Software (OSS)

All open source software components used within the product (including their copyright holders and the license conditions) can be found from the website https://www.siemens.com/download?A6V11893104.

Warranty

Technical data on specific applications are valid only together with Siemens products listed under "Equipment combinations". Siemens rejects any and all warranties in the event that third-party products are used.

Technical data

Power supply	
Operating voltage	AC 230 V +10/-15 %
Frequency	50/60 Hz
Power consumption	9 VA

- **No internal fuse!**

External preliminary protection with max. C 10 A circuit breaker required in all cases.

Outputs	
DC fan control DC 0…10 V; Y50	SELV DC 0…10 V, max. 5 mA
Control output Y1-N / Y2-N (N.O.) Rating	 AC 230 V Max. 5(2) A

Multifunctional inputs	
S1 (X2)-M/B1 (X1)-M	
Temperature sensor input	
Type	NTC (3 kΩ at 25 °C)
Temperature range	0…49 °C
Cable length	Max. 80 m
Digital input	
Operating action	Selectable (NO/NC)
Contact sensing	SELV DC 0…3.3 V, max. 1 mA
Parallel connection of several thermostats for one switch	Max. 20 thermostats per switch
Insulation against mains voltage (SELV)	III (4 kV), reinforced insulation

Modbus	
Interface type	RS485 Modbus RTU Wire (ref.): 16 AWG, 1 pair, shielded serial line with 1.5 mm^2 and length < 1200 m
Bus current	Max. 50 mA
Bus topology: See Modbus manual (Modbus over serial line specification and implementation guide from http://www.modbus.org)	

Operational data		
Switching differential, adjustable		
Heating	(P30)	2 K (0.5…6 K)
Cooling	(P31)	1 K (0.5…6 K)
Setpoint setting and setpoint range		
Comfort	(P08)	21 °C (5…40 °C)
Economy	(P11-P12)	15 °C/30 °C (OFF, 5…40 °C)
Protection	(P65-P66)	8 °C/OFF (OFF, 5…40 °C)
Multifunctional input B1 (RDF660MB/MM only)		Selectable (0, 1, 2, 9)
Input default value	(P38)	9: H/C changeover (DI)
Multifunctional input S1 (RDF660MB/MM only)		Selectable (0, 3, 10, 11)
Input default value	(P40)	3: Window contact (DI)
Multifunctional inputs X1/X2 (RDF660MB only)		Selectable (0…11)
Input X1		3 (P38) Window contact (DI)
Input X2		1 (P40) External temperature sensor
Built-in room temperature sensor		
Measuring range		0…49 °C
Accuracy at 25 °C		< ±0.5 K
Temperature calibration range		±5 K
Settings and display resolution		
Setpoint		0.5 °C
Current temperature value displayed		0.5 °C

Environmental conditions	
Storage	IEC 60721-3-1
Climatic conditions	Class 1K3
Transport	IEC 60721-3-2
Climatic conditions	Class 2K3
Operation	IEC 60721-3-3
Climatic conditions	Class 3K5 [1)]

Standards and directives	
EU conformity (CE)	A5W00156993A[*]
RCM conformity	A5W00156996A[*]
Safety class	II as per EN 60730-1
Pollution class	Class 2
Degree of protection of housing	IP30 as per EN 60529
Housing flammability class according to UL94	V-0
Environmental compatibility	The product environmental declaration (A5W00139322A [*]) contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).

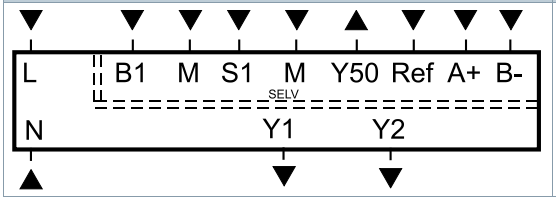
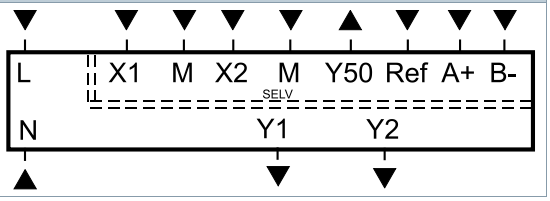
General	
Connection terminals	Solid wires or prepared stranded wires 1 x 0.4…1.5 mm^2
Housing front color	RAL 9003 white
Weight without/with packaging	148 g/241 g

[*)] The documents can be downloaded from http://siemens.com/bt/download.

[1)] No condensation is allowed.

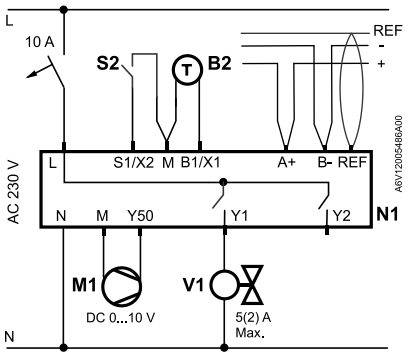
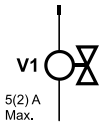
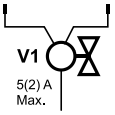
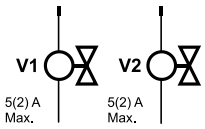
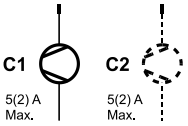
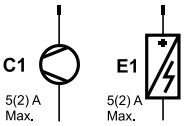
Diagrams

Connection terminals

RDF660MB/MM	RDF660MB
	

L, N	Operating voltage AC 230 V
Y50	DC 0...10 V fan output
M	Reference for DC fan
Y1, Y2	Control output “Valve” AC 230 V (N.O., for normally closed valves), output for compressor or output for electric heater
B1, S1 (RDF660MB/MM only)	Multifunctional input for temperature sensor (e.g. QAH11.1) or potential-free switch Factory setting: B1 = H/C changeover (DI) S1 = Window contact
X1, X2 (RDF660MB only)	Multifunctional input for temperature sensor (e.g. QAH11.1) or potential-free switch Factory setting: X1 = Window contact X2 = External temperature sensor
M	Measuring neutral for sensor and switch
REF	RS485 signal / common ground (differential common)
A +	RS485 Modbus connection
B –	RS485 Modbus connection

Connection diagrams

Application	
2-pipe, 2-position	
2-pipe, 3-position	
4-pipe	
1-stage compressor (heating and/or cooling)	
1-stage compressor with electric heater (RDF660MB only)	

N1 Room thermostat RDF660MB/MM, RDF660MB

C1, C2 1-stage compressor

V1 Valve actuator, 2- or 3-position

V1, V2 Valve actuator, 2-position

S2 Switch (keycard, window contact, presence detector, etc.)

B2 Temperature sensor (return air temperature, external room temperature, changeover sensor, etc.)

\+ RS485 Modbus connection

\- RS485 Modbus connection

REF RS485 signal/common ground (differential common)

M1 DC 0...10 V fan

E1 Electric heater (RDF660MB only)

Application examples

The thermostats support the following applications, that can be configured using the DIP switches inside the front panel of the unit or a Modbus commissioning tool.

Remote configuration

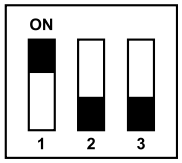
All DIP switches need to be set to **OFF** (factory setting) to select an application via commissioning tool.

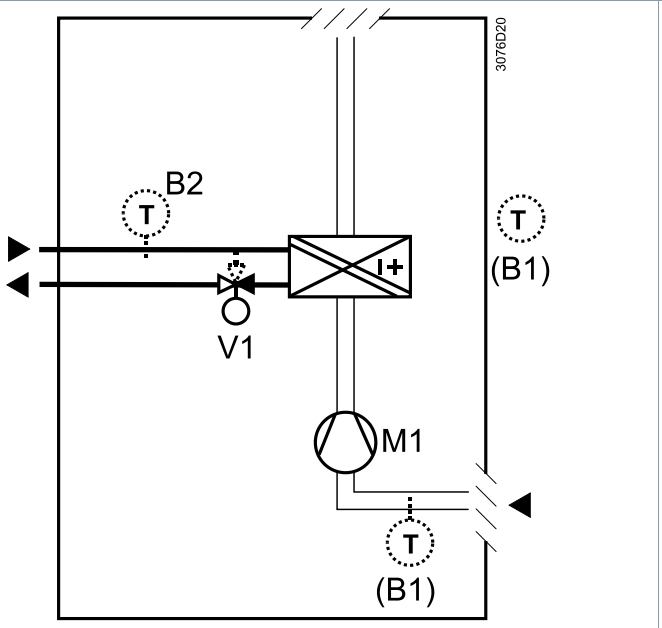
Remote configuration, via commissioning tool (factory setting)	DIP switches 

Applications for fan coil systems

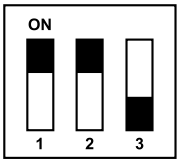
Application and output signal, DIP switches, diagram

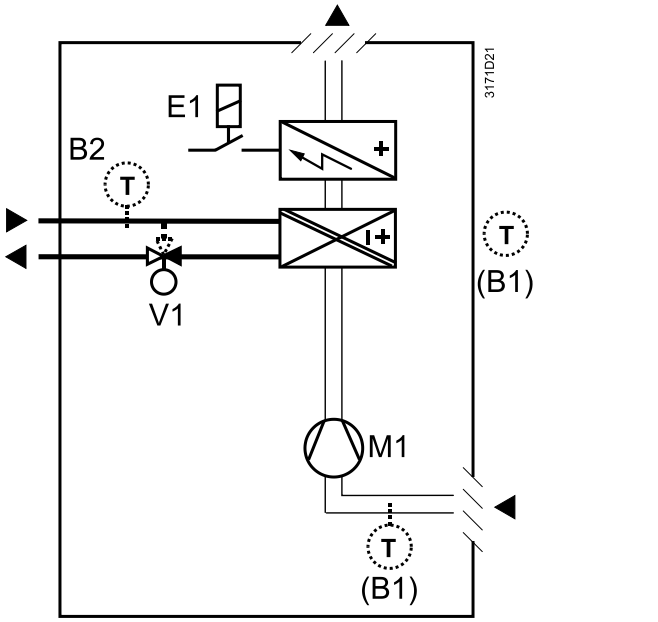
2-pipe fan coil unit On/Off (heating **or** cooling)



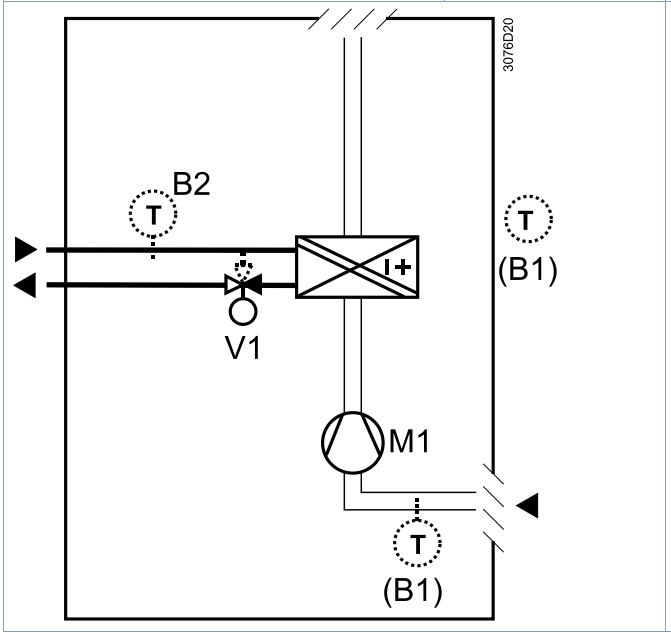


2-pipe fan coil unit with electric heater (heating **or** cooling) On/Off (RDF660MB only)

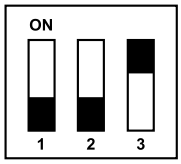


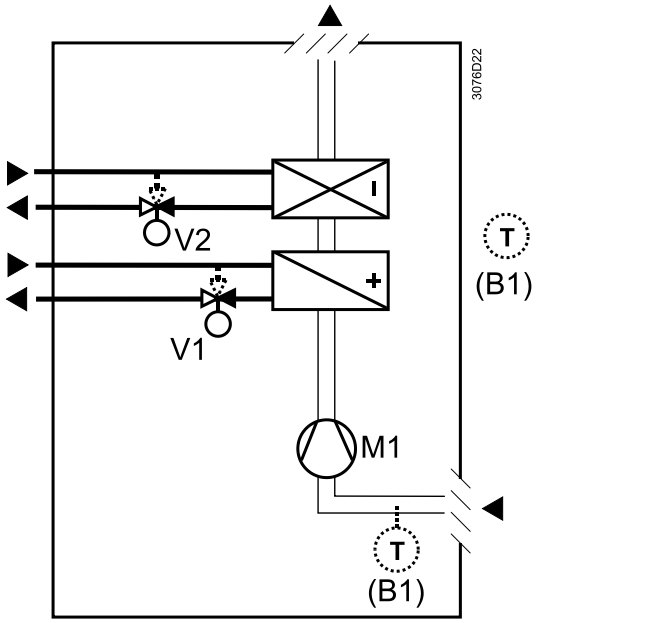


2-pipe fan coil unit modulating, 3-position (heating **or** cooling)



4-pipe fan coil unit On/Off (heating **and** cooling)





V1 Heating or heating/cooling valve actuator

V2 Cooling valve actuator

E1 Electric heater (RDF660MB only)

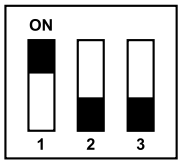
B1 Return air temperature sensor or external room temperature sensor (optional)

B2 Changeover sensor (optional)

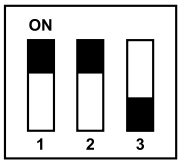
M1 ECM fan

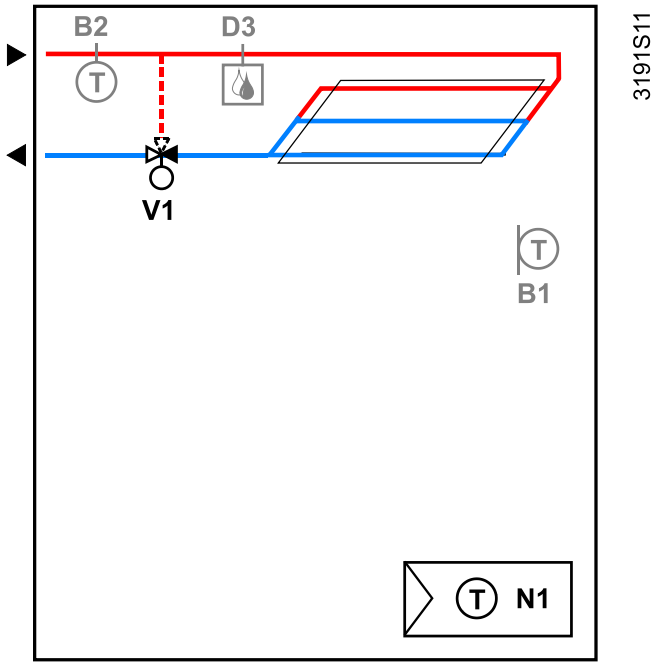
Application and output signal, DIP switches, diagram

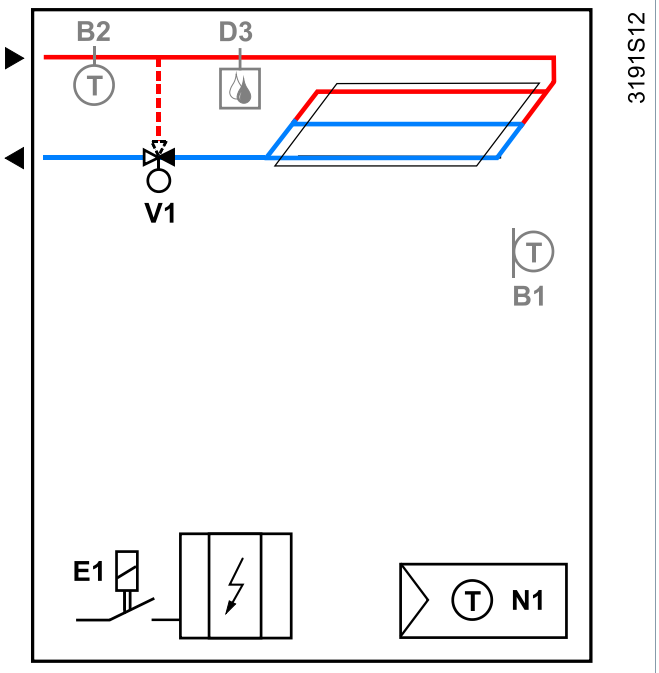
Chilled/heated ceiling On/Off
(heating **or** cooling)



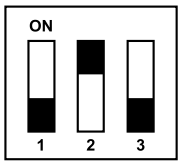
Chilled/heated ceiling with electric heater
(heating **or** cooling) On/Off
(RDF660MB only)



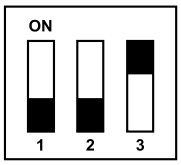


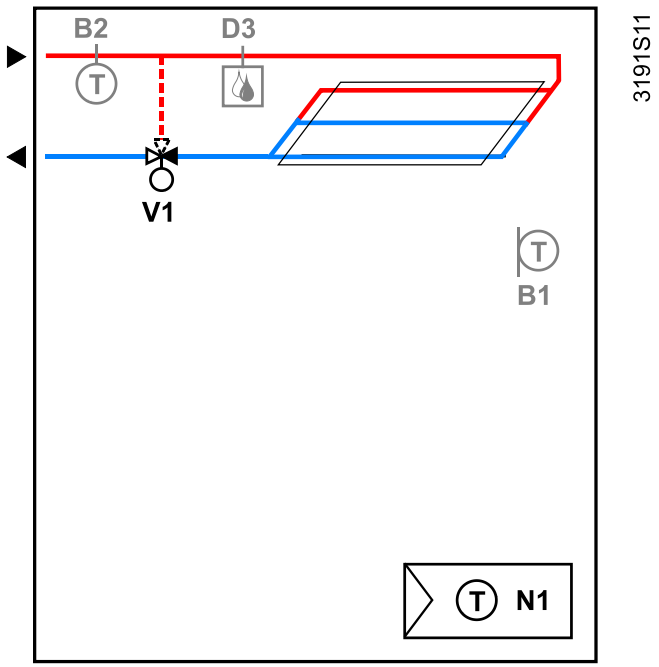


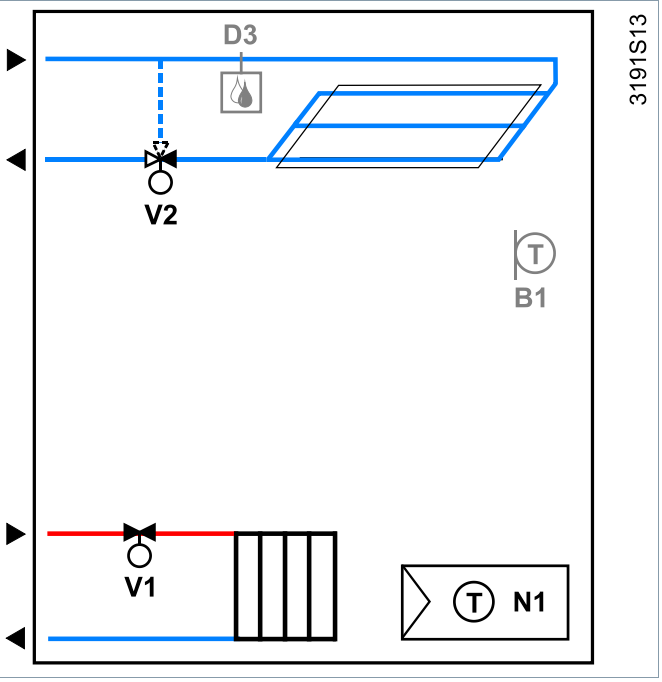
Chilled/heated ceiling
modulating, 3-position
(heating **or** cooling)



Chilled ceiling and radiator On/Off
(heating **and** cooling)

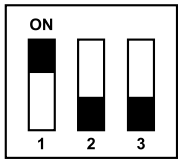
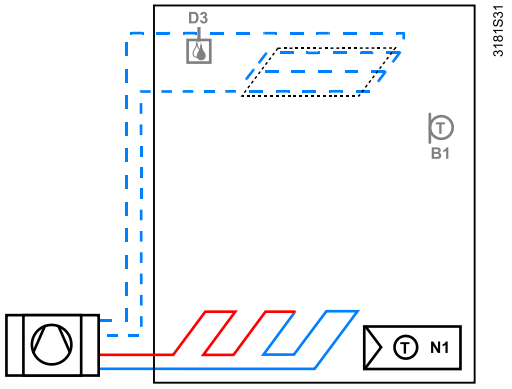
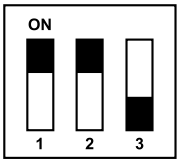
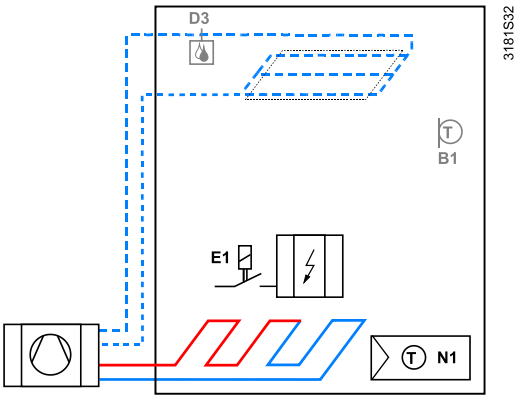
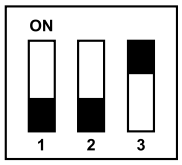
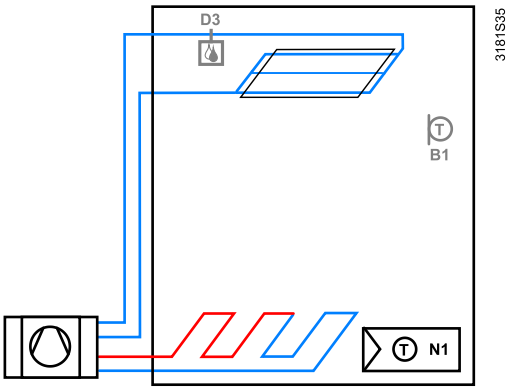






V1	Heating or heating/cooling valve actuator	B1	Return air temperature sensor or external room temperature sensor (optional)
V2	Cooling valve actuator	B2	Changeover sensor (optional)
E1	Electric heater (RDF660MB only)	D3	Dewpoint sensor

Application for heat pump systems

Application and output signal, DIP switches, diagram	
1-stage compressor On/Off (heating **or** cooling)	
	
1-stage compressor with electric heater (heating **or** cooling) On/Off (RDF660MB only)	
	
1-stage compressor On/Off (heating **and** cooling)	
	

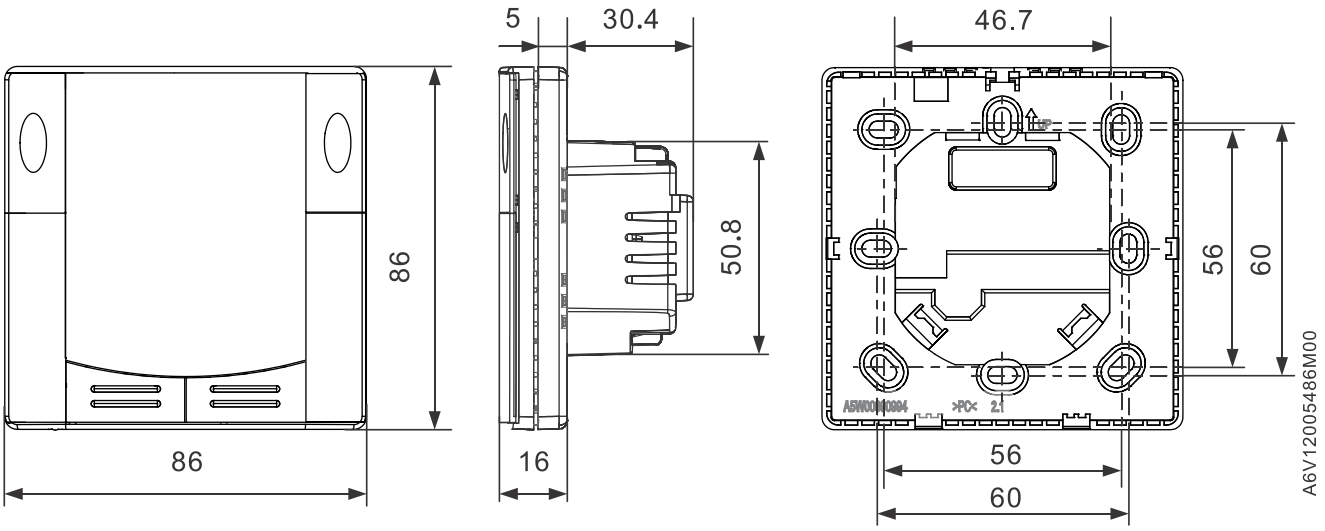
N1 Thermostat
Terminal Y1: Heating (H&C) or Heating/Cooling
Terminal Y2: Cooling (H&C)

B1 Return air temperature sensor or external room temperature sensor (optional)

E1 Electric heaters (RDF660MB only)

D3 Dewpoint sensor

Dimensions



Dimensions in mm

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