SIEMENS

RDG1…

RDG100T

Room thermostats with display, for fan coil units

RDG100, RDG100T, RDG110, RDG140, RDG160

Basic Documentation

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1 About this document

1.1 Revision history

Edition	Date	Changes	Section	Pages
1.1	**June 2009**	**Several small corrections**	**All**	
1.0	May 2009	First edition		

1.2 Reference documents

Ref.	Document title	Type of document	Document no.
[1]	Wall-mounted room thermostats with LCD	Data Sheet	CE1N3181en
[2]	RDG1…	Operating Instructions	CE1B3181.1en
[3]	RDG100T	Operating Instructions	CE1B3181.2en
[4]	RDG100, RDG100T	Mounting Instructions	CE1M3181.1en
[5]	RDG110	Mounting Instructions	CE1M3181.2en
[6]	RDG140, RDG160	Mounting Instructions	CE1M3181.3en

1.3 Before you start

1.3.1 Copyright

1.3.2 Quality assurance

This document was prepared with great care.

- The contents of this document is checked at regular intervals
- Any corrections necessary are included in subsequent versions
- Documents are automatically amended as a consequence of modifications and corrections to the products described

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2 Summary

2.1 Brief description

Applications

- 2-pipe fan coil units, 2-pipe with electrical heater, 2-pipe with radiator / floor heating
- 4-pipe fan coil units, 4-pipe with electrical heater
- 2-stage heating or cooling application
- Compressors in dx type equipment
- Universal heating and/or cooling

Features, all types

- 2 multifunctional inputs and 1 digital input for keycard contact, external sensor, etc.
- Operating modes: Comfort, Energy Saving and Protection
- Automatic or manual heating / cooling changeover
- Adjustable commissioning and control parameters
- Minimum and maximum setpoint limitation
- Backlit LCD

RDG100, RDG100T features

- AC 230 V operating voltage, on/off, PWM or 3-position control outputs (triac)
- Output for 3-speed or 1-speed fan

RDG110 features

- AC 230 V operating voltage, on/off control outputs (relay)
- Output for 3-speed or 1-speed fan

RDG140 features

- AC 24 V operating voltage, DC 0…10 V control outputs
- Output for 3-speed or 1-speed fan

RDG160 features

- AC 24 V operating voltage, DC 0…10 V control outputs
- Output DC 0…10 V for fan control

Additional RDG100T features

- Infrared remote control receiver
- Auto Timer mode with 8 programmable timers

Functions

- Maintenance of room temperature via built-in temperature sensor or external room temperature / return air temperature sensor
- Automatic or manual changeover between heating and cooling mode
- Selection of applications via DIP switches
- Selection of operating mode via the operating mode button on the thermostat
- 1-speed, 3-speed or DC…10 V fan control (automatic or manual)
- Display of current room temperature or setpoint in °C and/or °F
- Minimum and maximum setpoint limitation
- Button lock (automatic or manual)
- 1 digital input, freely selectable for:
  - Operating mode switchover contact (keycard)
  - Automatic heating / cooling changeover contact
  - Electrical heater enable
  - Dewpoint sensor
  - Fault input
- 2 multifunctional inputs, freely selectable for:
  - Operating mode switchover contact (keycard)
  - Automatic heating / cooling changeover sensor
  - External room temperature or return air temperature
  - Dewpoint sensor
  - Electrical heater enable
  - Fault input

- Advanced fan control function, i.e. 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
- Reloading factory settings for commissioning and control parameters
- 7-day time program: 8 programmable timers to switch over between Comfort and Energy Saving mode (RDG100T)
- Infrared remote control (RDG100T)

2.2 Types and features

Product no.	Features								
	Operating voltage	Number of control outputs				Time program	Backlit LCD	Infrared receiver [1]	ECM Fan [2]
		ON/OFF	PWM	3-pos	DC 0..10 V				
RDG100	AC 230 V	**3** [3]	**2** [3]	**2** [3]			✓		
RDG100T	AC 230 V	**3** [3]	**2** [3]	**2** [3]		✓	✓	✓	
RDG110	AC 230 V	**2** [4]					✓		
RDG140	AC 24 V				**2**		✓		
RDG160	AC 24 V				**2**		✓		✓

1) Infrared remote control must be ordered as a separate item

2) ECM fan output DC 0…10 V

3) ON/OFF, PWM or 3-position (triac outputs)

4) Relay output (SPDT)

2.3 Equipment combinations

	Description	Product no.	Data Sheet
	Infrared remote control 	**IRA211**	3059
	Cable temperature sensor 	**QAH11.1**	1840
	Room temperature sensor 	**QAA32**	1747
	Condensation detector / extension module 	**QXA2000 / AQX2000**	1542
2-position actuators	Electromotoric ON/OFF valve and actuator (only available in AP, UAE, SA and IN) 	**MVI…/MXI…**	4867
	Electromotoric ON/OFF actuator 	**SFA21...**	4863
	Thermal actuator (for radiator valves) 	**STA21...**	4877
	Thermal actuator (for small valves 2.5 mm) 	**STP21...**	4878
	Zone valve actuators (only available in AP, UAE, SA and IN) 	**SUA…**	4832
3-position actuators	Electrical actuator, 3-position (for radiator valves) 	**SSA31...**	4893
	Electrical actuator, 3-position (for small valves 2.5 mm) 	**SSP31…**	4864
	Electrical actuator, 3-position (for small valves 5.5 mm) 	**SSB31...**	4891
	Electrical actuator, 3-position (for CombiValves VPI45) 	**SSD31...**	4861
	Electromotoric actuator, 3-position (for valves 5.5 mm) 	**SQS35…**	4573
DC 0…10 V actuators	Electrical actuator, DC 0...10 V (for radiator valves) 	**SSA61...**	4893
	Electrical actuator, DC 0...10 V (for 2- and 3-port valves / V…P45) 	**SSC61…**	4895
	Electrical actuator, DC 0...10 V (for small valves 2.5 mm) 	**SSP61…**	4864
	Electrical actuator, DC 0...10 V (for small valves 5.5 mm) 	**SSB61...**	4891
	Electrical actuator, DC 0...10 V (for CombiValves VPI45) 	**SSD61...**	4861
	Electromotoric actuator, DC 0...10 V (for valves 5.5 mm) 	**SQS65…**	4573
	Thermal actuator, DC 0...10 V (for small valves and radiator valves) 	**STS61**	4880

2.4 Accessories

Description	Product no.	Data Sheet
Changeover mounting kit (50 pcs / package)	ARG86.3	1840
Adapter plate 120 x 120 mm for 4“ x 4“ conduit boxes	ARG70	
Adapter plate 112 x 130 mm for surface wiring	ARG70.2	

2.5 Ordering

When ordering, please indicate product no. and description:
E.g. **RDG100 room thermostat**

Order the **IRA211** infrared remote control separately.

Order valve actuators separately.

3 Use

The RDG1… room thermostats are designed for use with the following types of system:

Fan coil units via ON/OFF or modulating control outputs:
- 2-pipe system
- 2-pipe system with electrical heater
- 2-pipe system and radiator / floor heating
- 4-pipe system
- 4-pipe system with electrical heater
- 2-stage heating or cooling system

Chilled / heated ceilings (or radiators) via ON/OFF or modulating control outputs:
- Chilled / heated ceiling
- Chilled / heated ceiling with electrical heater
- Chilled / heated ceiling and radiator / floor heating
- Chilled / heated ceiling, 2-stage cooling or heating

Heat pumps with dx type equipment:
- 1-stage compressor for heating or cooling
- 1-stage compressor for heating or cooling with electrical heater
- 1-stage compressor for heating or cooling and radiator / floor heating
- 1-stage compressor for heating and cooling with reversing valve
- 2-stage compressor for heating or cooling

4 Functions

4.1 Temperature control

General note

Setting of the control parameters (P01, etc., mentioned throughout the document) is described in section 4.15.

The thermostat acquires the room temperature via built-in sensor, external room temperature sensor (QAA32), or external return air temperature sensor (QAH11.1), and maintains the setpoint by delivering actuator control commands to heating and/or cooling equipment. The following control outputs are available depending on the thermostat type:

- 2-position control on **RDG100, RDG100T, RDG110**
- Modulating PI / P control with 3-position control output on **RDG100, RDG100T,**
- Modulating PI / P control with PWM output on **RDG100, RDG100T**
- Modulating PI / P control with DC 0…10 V control output on **RDG140, RDG160**

The switching differential or proportional band is 2 K for heating mode and 1 K for cooling mode (adjustable via parameters P30 and P31).
The integral action time for modulating PI control is 5 minutes (adjustable via parameter P35).

Display

The display shows the acquired room temperature or the Comfort setpoint, selectable via parameter P06. The factory setting displays the current room temperature. Use parameter P04 to display the room temperature or setpoint in °F rather than °C as needed.

/

If the thermostat is used in a system with manual heating / cooling changeover (P01 = 2), the heating and cooling symbols on the display show the fan coil or terminal unit's status. Thus, the symbols are displayed even when the thermostat operates in the neutral zone. For all other cases, the heating and cooling symbols are displayed when the heating or cooling output is activated.

Concurrent display of °C and °F

Concurrent display of the current temperature or setpoint in °C and °F (parameter P07) is possible on the thermostats without 7-day time program.

4.2 Operating modes

Select the thermostat's operating mode via the operating mode button on the unit or operating mode input (e.g. keycard occupancy sensor), when X1, X2, or D1 is set to 3 (P38, P40, P42). A corresponding setpoint is used to maintain the room temperature at the desired level depending on the active operating mode. The following operating modes are available:

Comfort mode ☼ In Comfort mode, the thermostat maintains the room temperature setpoint which can be adjusted via the **rotary knob**. The fan can be set to automatic or manual fan speed: Low, medium or high.

Energy Saving mode ☾ Energy Saving mode helps save energy. Select it by pressing the operating mode button if parameter P02 is set accordingly, or if the external operating mode switchover contact is active (e.g. window contact).

Note If the external operating mode switchover contact is active, user operations are ineffective and OFF is displayed. Control will then be according to Energy Saving setpoints (P11 and P12).

Protection mode ⌂ In Protection mode, the system is
- protected against frost (factory setting **8 °C**, can be disabled or changed via P65)
- protected against overheating (factory setting **OFF**, can be enabled or changed via P66)

Auto Timer mode (with RDG100T only) AUTO In Auto Timer mode AUTO, the thermostat automatically changes from Comfort to Energy Saving mode according to the 8 preprogrammed timers.
The display shows the Auto Timer mode symbol AUTO along with the symbol for the current operating mode (Comfort ☼ or Energy Saving ☾).
Automatic is the default fan speed in Auto Timer mode.

Operating mode button The behavior of the operating mode button can be selected via parameter P02:

#	Without time program	With time program (RDG100T only)	Remark
1	⌂→☼	⌂→AUTO→☼	Factory setting
2	⌂→☼→☾	⌂→AUTO→☼→☾	

4.3 Room temperature setpoints

Comfort mode ☼

The setpoint in Comfort mode can be adjusted via the **rotary knob**.

Setpoint limitation

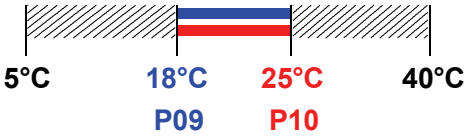
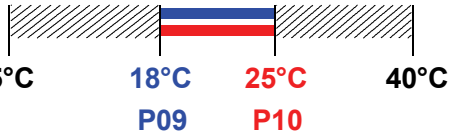
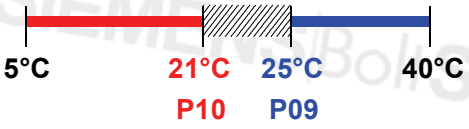
For energy saving purposes, the setpoint setting range can be limited to minimum (P09) and maximum (P10).

P09 < P10

- If the minimum limit **P09 is set lower** than the maximum limit P10, both heating and cooling are adjustable between these 2 limits

P09 ≥ P10

- For heating **or** cooling applications (e.g. 2-stage):
  – The setting range in cooling mode is from **P09…40 °C** in place of 5…40 °C
  – The setting range in heating mode is from **5…P10 °C** in place of 5…40 °C
- For heating **and** cooling applications (e.g. 4-pipe):
  – **P09** is the setpoint for cooling and **P10** the setpoint for heating
  – The setpoint can no longer be adjusted via the rotary knob

Examples	2-pipe heating OR cooling	4-pipe heating AND cooling
P09 < P10	 Cooling setpoint adjustable 18…25 °C Heating setpoint adjustable 18…25 °C	 Cooling setpoint adjustable 18…25 °C Heating setpoint adjustable 18…25 °C
P09 ≥ P10	 Cooling setpoint adjustable 25…40 °C Heating setpoint adjustable 5…21 °C	Cooling fixed = 25 °C (P09) Heating fixed = 21 °C (P10)

Temporary setpoint

If the “Temporary setpoint function” is enabled via parameter P69, the setpoint adjusted via the rotary knob is set back to the Comfort basic setpoint when the operating mode changes.

The factory setting for the Comfort basic setpoint is **21 °C** and can be changed via parameter P08.

Energy Saving mode ☾

Use control parameters P11 and P12 to adjust the Energy Saving mode setpoints. The heating setpoint is factory-set to **15 °C**, and the cooling setpoint to **30 °C**.

Protection mode

Use control parameters P65 and P66 to adjust the Protection mode setpoints. The heating setpoint is factory-set to **8 °C** (frost protection) and to **OFF** for cooling.

Caution ⚠

If a setpoint is set to OFF (P65, P66), the thermostat does not maintain the setpoint in the corresponding mode (heating or cooling).
This means no protective heating or cooling function and thus risk of frost in the heating mode or risk of overtemperature in cooling mode!

4.4 Setpoints and sequences

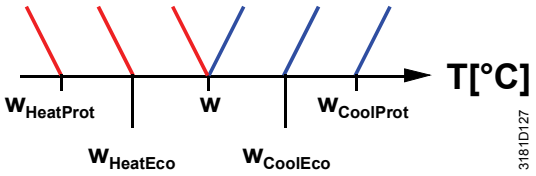
4.4.1 2-pipe and 2-stage applications

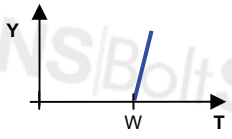
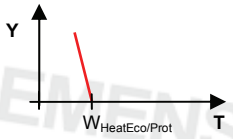
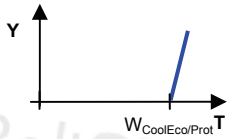
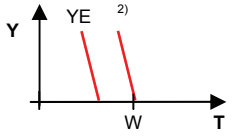
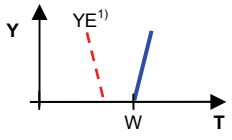
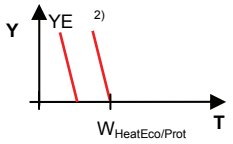
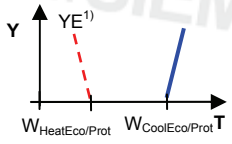
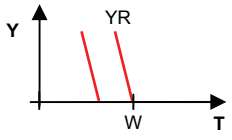
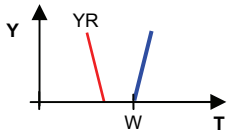
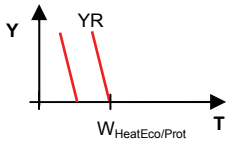
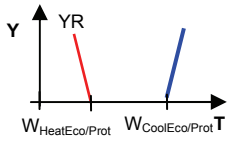
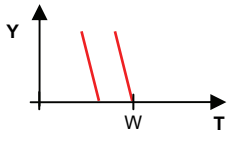
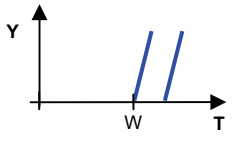
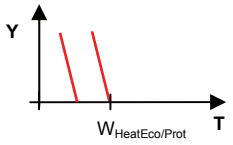
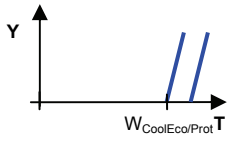
On changeover applications, the Comfort setpoints for heating and cooling sequence are the same (w).

On 2-pipe applications with electrical heater, the Comfort setpoint is either at the first heating sequence (in heating mode) or at the cooling sequence (in cooling mode).

On 2-pipe applications with radiator, the Comfort setpoint is either at the radiator sequence (in heating mode) or at the cooling sequence (in cooling mode).

The setpoints for Energy Saving and Protection mode are below the Comfort setpoints (heating) and above the Comfort setpoints (cooling).
They can be set via parameters P11, P12 (Energy Saving mode) and P65, P66 (Protection mode).



Application	Comfort mode		Energy Saving / Protection mode	
	Heating mode	Cooling mode	Heating mode	Cooling mode
2-pipe				
2-pipe & el. heater				
2-pipe & radiator				
2-stage heating or cooling				

1) If P13 = ON

2) In case of manual changeover (P01=2), the first heating sequence is disabled to prevent heating (el. heater) and cooling (coil) at he same time

W = setpoint in Comfort mode

$W_{HeatEco/Prot}$ = setpoint heating in Energy Saving or Protection mode

$W_{CoolEco/Prot}$ = setpoint cooling in Energy Saving or Protection mode

YR = radiator sequence

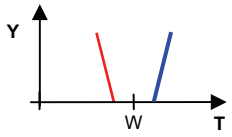
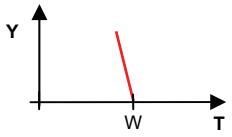
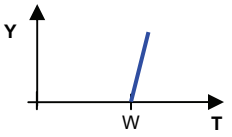
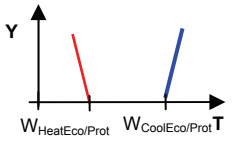
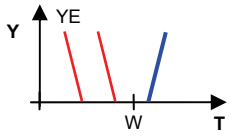
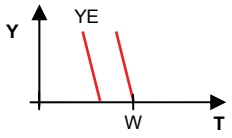
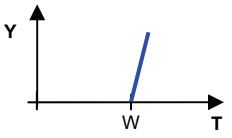
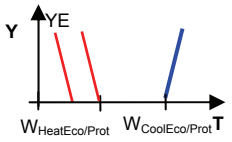
YE = electrical heater sequence

4.4.2 4-pipe applications

On 4-pipe applications, the Comfort setpoint (w) is in the middle of the dead zone, between the heating and cooling sequence.

The dead zone can be adjusted via parameter P33.

If manual changeover is selected, then either the cooling sequence or the heating sequence is released. In this case, the Comfort setpoint is at the selected heating or cooling sequence.

Application	Comfort mode			Energy Saving / Protection mode
	Heating and Cooling	Heating mode[1)]	Cooling mode[1)]	Heating and/or cooling
4-pipe				
4-pipe & el. heater				

1) Manual changeover, P01=2

W = setpoint in Comfort mode

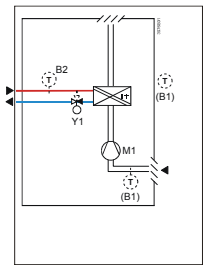
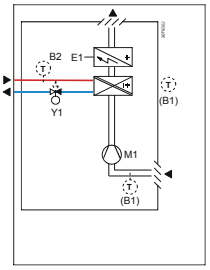
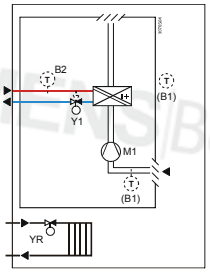
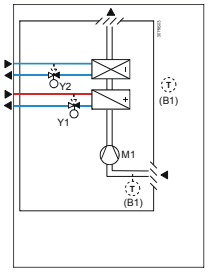
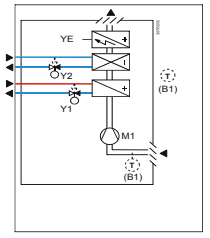
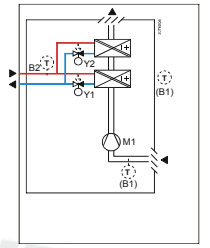
$W_{HeatEco/Prot}$ = heating setpoint for Energy Saving or Protection mode

$W_{CoolEco/Prot}$ = cooling setpoint for Energy Saving or Protection mode

YE = electrical heater sequence

4.5 Applications overview

The thermostats support the following applications, which can be **configured via DIP switches** at the rear of the unit. Depending on the type of thermostat, on/off or modulating control outputs are available.

Application (set via DIP switches 1…3)		**DIP switch**	**Control output** (set via DIP swi. 4 and 5)	**Product no.**
Heating or cooling • 2-pipe fan coil unit • Chilled / heated ceiling • 1-stage compressor [1)]			ON/OFF, PWM, 3-position	RDG100..
			ON/OFF (SPDT)	RDG110
			DC 0…10 V	RDG140
			DC 0…10 V [2)]	RDG160
Heating or cooling with auxiliary heater • 2-pipe fan coil unit with el. heater • Chilled / heated ceiling and el. heater • 1-stage compressor and el. heater [1)]			ON/OFF, PWM, 3-position	RDG100..
			ON/OFF (SPDT)	RDG110
			DC 0…10 V **Note**: Modulating el. heater	RDG140
			DC 0…10 V [2)] **Note**: Modulating el. heater	RDG160
Heating or cooling and radiator / floor heating • 2-pipe fan coil unit and radiator • Chilled / heated ceiling and radiator			ON/OFF, PWM, 3-position	RDG100..
			ON/OFF (SPDT)	RDG110
			DC 0…10 V	RDG140
			DC 0…10 V [2)]	RDG160
Heating and cooling • 4-pipe fan coil unit • Chilled ceiling and radiator • 1-stage compressor [1)] • 1-stage compressor with reversing valve			ON/OFF, PWM, 3-position	RDG100..
			ON/OFF (SPDT)	RDG110
			DC 0…10 V	RDG140
			DC 0…10 V [2)]	RDG160
Heating and cooling with auxiliary heater • 4-pipe fan coil unit with el. heater			ON/OFF, PWM, 3-position	RDG100
2-stage heating or cooling • 2-stage fan coil unit • 2-stage chilled / heated ceiling • 2-stage compressor [1)]			ON/OFF, PWM, 3-position	RDG100..
			ON/OFF (SPDT)	RDG110
			DC 0…10 V	RDG140
			DC 0 … 10 V [2)]	RDG160

1) Heat pump application covered by RDG110
(SPDT = relay with NO and NC contact)
2) With ECM fan control DC 0…10 V

Key	Y1	Heating or heating/cooling valve actuator	M1	1-speed or 3-speed fan
	Y2	Cooling valve actuator	B1	Return air temperature sensor or external room temperature sensor (optional)
	E1	Electrical heater	B2	Changeover sensor (optional)

Note The diagrams above only show the water-based fan coil applications, but not the compressor

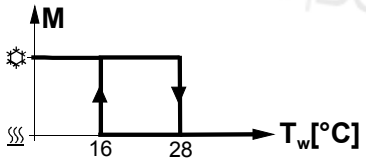
Universal applications

The RDG1xx.. can also be used on universal applications, e.g. fan coil-based cooling and floor heating, or chilled ceiling and electrical heater, etc.
For more detailed information, refer to subsection 4.7.9 ff.

4.6 Additional features

Automatic heating / cooling changeover

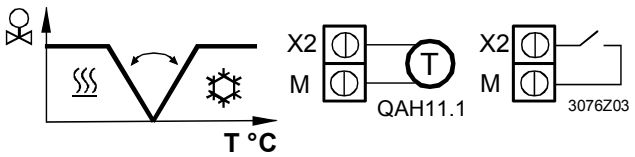
The water temperature acquired by the changeover sensor (QAH11.1 + ARG86.3) is used to change over from heating to cooling mode, or vice versa. When the water temperature is above 28 °C (parameter P37), the thermostat changes over to heating mode, and to cooling mode when below 16 °C (parameter P36).
If the water temperature is between the 2 changeover points immediately after power-up, the thermostat starts in heating mode.
The water temperature is acquired at 30-second intervals and the operating state is updated accordingly.



M Operating mode
T_w Water temperature
Cooling mode
Heating mode

Remote heating / cooling changeover

The QAH11.1 cable temperature sensor for automatic heating / cooling changeover can be replaced by an external switch for manual, remote changeover:



Contact open → heating mode
Contact closed → cooling mode

The sensor or switch can be connected to input terminal X2 (factory setting) or X1 or D1 (switch only), depending on the commissioning of the inputs (P38, P40, P42). See also section 4.10 “Multifunctional input”.

External / return air temperature sensor

The thermostat acquires the room temperature via built-in sensor, external room temperature sensor (QAA32), or external return air temperature sensor (QAH11.1) connected to multifunctional input X1 or X2.
Inputs X1 or X2 must be commissioned accordingly. See section 4.10 “Multi-functional input”.

Purge function

The changeover sensor ensures changeover from heating to cooling mode based on the acquired water temperature. We recommend activating the purge function (parameter P50) with 2-port valves. This function ensures correct acquisition of the medium temperature even if the 2-port valve is closed for an extended period of time. The valve is then opened for 1 to 5 minutes (adjustable) at 2-hour intervals during off hours.

Caution ⚠ The purge function (parameter P50) must be disabled if the thermostat is used in compressor-based applications.

Avoid damage from moisture

In very warm and humid climates, the fan can be run periodically or continuously at a low fan speed (e.g. in empty apartments or shops) in Energy Saving mode by setting parameter P61, in order to avoid damage from moisture due to lack of air circulation. See also section 4.9 “Fan control”, under “Fan kick function”.

Minimum output on-time / off-time

Limit the on/off switching cycle to protect the compressor and reduce wear and tear. The minimum output on-time and off-time for 2-position control output can be adjusted from 1 to 20 minutes via parameters P48 and P49.
The factory setting is 1 minute.
Readjusting the setpoint or heating / cooling mode changeover immediately results in calculation of the output status; output Y11/Y21 may not hold the minimum 1-minute on/off time.
If parameter P48 or P49 is set to above 1 minute, the minimum on/off time for the control output is maintained as set, even if the setpoint or changeover mode is readjusted.
This function is only available for on/off control with RDG100, RDG100T and RDG110.

Floor heating / Floor cooling

All heating sequences can also be used for floor heating.
You can use fan coil heating / cooling sequences for floor heating or cooling by disabling the fan via parameter P52.

Floor temperature limitation function

The temperature should be limited for 2 reasons: comfort and protection of the floor.

The floor temperature sensor, connected to multifunctional input X1 or X2, acquires the floor temperature. If the temperature exceeds the parameterized limit (parameter P51), the heating valve is fully closed until the floor temperature drops to a level 2 K below the parameterized limit.
This function is factory-set to OFF (disabled).
Input X1 or X2 must be commissioned accordingly (P38 or P40 = 1).
See section 4.10 “Multifunctional input”.

Recommended values for P51:

Living rooms:
Up to 26 °C for long-term presence, up to 28 °C for short-time presence.
Bath rooms:
Up to 28 °C for long-term presence, up to 30 °C for short-time presence.

The table below shows the relation between parameter, temperature source and temperature display:

Parameter P51	External temp. sensor available	Source for display of room temperature	Output control according to	Floor temp. limit function
OFF	No	Built-in sensor	Built-in sensor	Not active
OFF	Yes	External temp. sensor	External temp. sensor	Not active
10...50˚C	No	Built-in sensor	Built-in sensor	Not active
10…50˚C	Yes	Built-in sensor	Built-in sensor + limit by external sensor	Active

The floor temperature limitation function influences the outputs listed in the table below:

				Floor temp. limit function has influence on			
Application	Output Y1	Output Y2	Output Y3	Heat. mode (P01=0/2/3)	Cool. mode (P01=1/2/3)	Heat. & cool. mode (P01=4)	Remark
2-pipe	H/C valve			Y1	N/A		
2-pipe & el heater	H/C valve	El. heater		Y2	Y2 *)		Only el. heater
2-pipe & radiator	H/C valve	Radiator		Y2	Y2		Only radiator
4-pipe	Heating valve	Cooling valve		Y1	N/A	Y1	
4-pipe & el heater	Heating valve	Cooling valve	El. heater	Y3	N/A	Y3	Only el. heater
2-stage	1st H/C	2nd H/C		Y1, Y2	N/A		

*) If P13 = ON --> el. heater in cooling mode

Dewpoint monitoring

Dewpoint monitoring is essential to prevent condensation on the chilled ceiling (cooling with fan disabled, parameter P52). It helps avoid associated damage to the building.
A dewpoint sensor with a potential-free contact is connected to multifunctional input X1, X2 or D1. If there is condensation, the cooling valve is fully closed until no more condensation is detected, and the cooling output is disabled temporarily.
The condensation symbol is displayed during temporary override.
The input must be commissioned accordingly (P38, P40, P42).
See section 4.10 “Multifunctional input”.

Button lock

If the button lock function is enabled by parameter P14, the buttons will be locked or unlocked by pressing the right button for 3 seconds.
If “Auto lock” is configured, the thermostat will automatically lock the buttons 10 seconds after the last adjustment.

Operating mode switchover contact (window contact)

The thermostat can be forced into Energy Saving mode (e.g. when a window is opened). The window contact can be connected to digital input D1 (or multi-functional input X1, X2). Set parameter P42 (P38, P40) to 3.

Extended Comfort mode *(operating mode switchover contact closed)*

The left button switches the operating mode from Energy Saving to Comfort for the period preset in P68, if the following conditions are fulfilled:

- The operating mode switchover contact is closed (connected to input X1, X2, D1, parameter P38, P40, P42 set to 3)
- Parameter P68 (extend Comfort period) is greater than 0

During the temporary Comfort mode extension, sandglass symbol appears.

If parameter P68 (extend Comfort period) = 0, extended Comfort cannot be activated; pressing the left button will show “OFF” (blinking 3 times).

Temporary timer for extension of presence / absence

The current operating mode can be forced temporarily into Comfort or Energy Saving / Protection mode. The time period is adjusted via the rotary knob:

- Extend presence: Set the device to Comfort mode for the selected time period
- Extend absence: Set the device to Energy Saving / Protection mode for the selected time period

To activate the function, keep the left button pressed and, within 3 seconds, turn the rotary knob …

- clockwise for extended presence
- counterclockwise for extended absence

The rotary knob adjusts the time period:

- Extend presence: 0.00…+9:30 in steps of 30 minutes; symbol ☼ appears
- Extend absence: 0.00…–9:30 in steps of 30 minutes; symbol ☾ or ⌂ appears

During the extended presence / absence period, sandglass symbol ⧗ appears.

Function without time program

User operating mode selection	Operating mode when activating function	Function	Operating mode during function	Operating mode at the end of function
⌂→☼	Comfort	Extension	Comfort	Protection
⌂→☼ ≋→⌂→☼☼	Comfort	Absence	Protection	Comfort
	Protection	Not available	-	-
⌂→☼→☾	Comfort	Extension	Comfort	E-Saving
	Comfort	Absence	E-Saving	Comfort
	E-Saving	Extension	Comfort	E-Saving
	E-Saving	Absence	E-Saving	Comfort
	Protection	Not available	-	-

Function with time program (RDG100T)

User operating mode selection	Operating mode when activating function	Function	Operating mode during function	Operating mode at the end of function
⌂→ 🕘 AUTO→☼	Auto	Extension	Comfort	Auto
⌂→ 🕘 AUTO ≋→☼≋	Auto	Absence	Protection	Auto
→⌂→ 🕘 AUTO ☼→☼☼	Comfort	Extension	Comfort	Auto
	Comfort	Absence	Prot	Auto
	Protection	Not available	-	-
⌂→ 🕘 AUTO→☼→☾	E-Saving	Extension	Comfort	Auto
⌂→ (🕘 AUTO)	E-Saving	Absence	E-Saving	Auto
	Protection	Not available	-	-

4.7 Control sequences

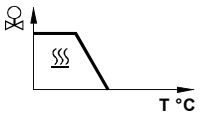
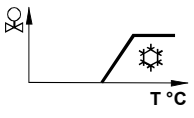
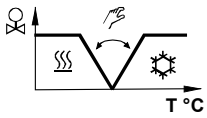
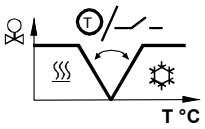
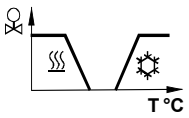
4.7.1 Sequences overview (setting via parameter P01)

The sequence can be set via **parameter P01**.

The thermostats can be used in systems featuring:

- Heating only (P01 = 0)
- Cooling only (P01 = 1)
- Manual heating / cooling changeover (P01 = 2)
- Automatic heating / cooling changeover (P01 = 3)
- Heating and cooling mode (e.g. 4-pipe system) (P01 = 4)

The available modes depend on the application (selected via DIP switch, see section 4.5).

Parameter	**P01 = 0**	**P01 = 1**	**P01 = 2**	**P01 = 3**	**P01 = 4**
Sequence					
Mode	Heating mode	Cooling mode	Manually select heating or cooling mode	Automatic heating/cooling changeover via external water temperature sensor or remote switch	Heating and cooling mode, i.e. 4-pipe
Available for basic application [1] : ⬇					
2-pipe, 2-pipe & el. heater 2-pipe & radiator	✓	✓	✓	✓	
4-pipe 4-pipe & el. heater			✓ [2]	✓ [2]	✓
2-stage heating or cooling	✓	✓	✓	✓	

Notes 1) Chilled / heated ceiling and radiator applications: see section 4.7.9; Compressor applications: see section 4.7.10.

2) Manual and automatic changeover for 4-pipe applications, see section 4.7.6:
   – 4-pipe **manual** changeover (P01 = 2) means activating either cooling or heating outputs
   – 4-pipe **automatic** changeover (P01 = 3) means swapping the control outputs according to a heating / cooling sensor or remote switch (main and secondary application), see section 4.7.6

4.7.2 Control outputs configuration (setting via DIP switches 4 / 5 and parameters P46 / P47)

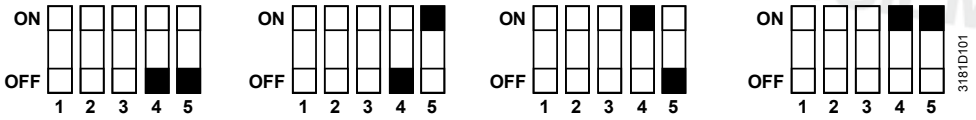
Control outputs / Application ↓	ON / OFF (2-position)		Modulating PWM (2-position)	Modulating 3-position	Modulating DC 0…10 V	
2-pipe	✓	✓	✓	✓	✓	✓
2-pipe and electrical heater	✓	✓	✓	✓	✓	✓
2-pipe and radiator / floor heating	✓	✓	✓	✓	✓	✓
4-pipe	✓	✓	✓	✓	✓	✓
4-pipe and electrical heater	✓		✓	(✓) *		
2 stage, cooling or heating	✓	✓	✓	✓	✓	✓
Available with type ➔	RDG100 RDG100T	RDG110	RDG100 RDG100T	RDG100 RDG100T	RDG140	RDG160

* (only possible for 1 actuator)

With RDG100 and RDG100T, the function of the control outputs (2-position or 3-position) is set via DIP switches 4 and 5 .

With RDG140 and RDG160, DIP switches 4 and 5 can be used to invert the DC 0…10 V signal to 10…0 V.

The patterns of DIP switches 4 and 5 are as follows:



RDG100, RDG100T	Y1 / Y2 =	2-position	2-position	3-position	3-position
	Y3 / Y4 =	2-position	3-position	2-position	3-position
RDG140, RDG160	Y10 =	DC 0…10 V	DC 0 … 10 V	DC 10 … 0 V inv.	10 … 0 V inv.
	Y20 =	DC 0…10 V	DC 10 … 0 V inv.	DC 0 … 10 V	10 … 0 V inv.

Note **RDG100, RDG100T:**

If 2-position is selected, the factory setting is on/off. If you want PWM (pulse width modulation), set parameters P46 and / or P47 to 2 = PWM.

RDG110: Only on/off available.

For details concerning connection of peripheral devices and setting of the DIP switches, refer to the Mounting Instructions:

– [4] M3181.1 (RDG100, RDG100T)
– [5] M3181.2 (RDG110)
– [6] M3181.3 (RDG140, RDG160)

4.7.3 2-pipe fan coil unit

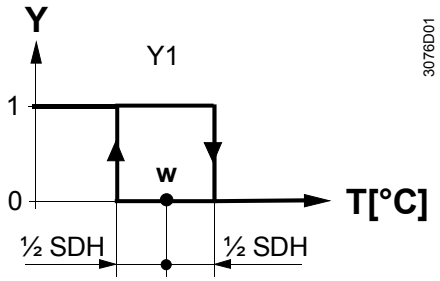
On 2-pipe applications, the thermostat controls a valve in heating / cooling mode with changeover (automatic or manual), heating only, or cooling only. Cooling only is factory set (P01 = 1).

ON/OFF control

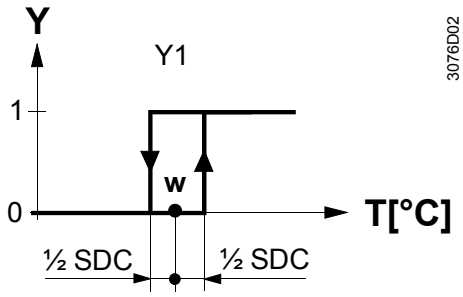
Control sequence on/off output

The diagrams below shows the control sequence for 2-position control.

Heating mode



Cooling mode



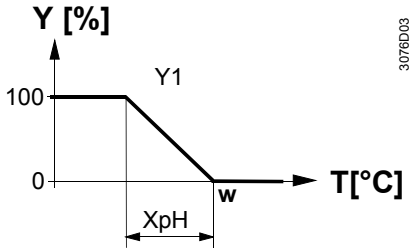
T[°C]	Room temperature	SDH	Switching differential “Heating” (P30)
w	Room temperature setpoint	SDC	Switching differential “Cooling” (P31)
Y1	Control command “Valve” or “Compressor”		

Modulating control: 3-position, PWM or DC 0…10 V

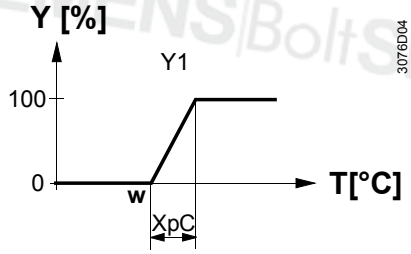
Control sequence modulating output

The diagrams below show the control sequence for modulating PI control.

Heating mode



Cooling mode



T[°C]	Room temperature	XpH	Proportional band “Heating” (P30)
w	Room temperature setpoint	XpC	Proportional band “Cooling” (P31)
Y1	Control command “Valve”		

Note The diagrams only show the PI controller’s proportional part.

Setting the sequence and the control outputs

Refer to sections 4.5 ("Applications"), 4.7.1 ("Sequences") and 4.7.2 ("Outputs").

4.7.4 2-pipe fan coil unit with electrical heater

Heating or cooling with auxiliary heater

On 2-pipe applications with electrical heater, the thermostat controls a valve in heating / cooling mode with changeover, heating only, or cooling only plus an auxiliary electrical heater.
Cooling only is factory set (P01=1) with enabled electrical heater (P13).

Electrical heating, active in cooling mode

In cooling mode, the valve receives an **OPEN** command if the acquired temperature is above the setpoint.
The electrical heater receives an **ON** command if the acquired room temperature drops below “setpoint” minus “dead zone” (= setpoint for electrical heater) while the electrical heater is enabled (parameter P13 = on).

Note: “Setpoint for electrical heater” is limited by parameter “Maximum setpoint for Comfort mode” (P10).

Electrical heating in heating mode

In heating mode, the valve receives an **OPEN** command if the acquired temperature is below the setpoint. The electrical heater is used as an additional heating source when the heating energy controlled by the valve is insufficient.
The electrical heater receives an **ON** command, if the temperature is below “setpoint” minus “setpoint differential” (= setpoint for electrical heater).

Electrical heating and manual changeover

The electrical heater is active in heating mode only and the control output for the valve is permanently disabled when manual changeover is selected (P01=2).

Digital input “Enable electrical heater”

Remote enabling / disabling of the electrical heater is possible via input X1, X2 or D1 for tariff regulations, energy savings, etc.
Input X1, X2, or D1 must be commissioned accordingly (parameters P38, P40, P42). See section 4.10 “Multifunctional input”.

Caution ⚠ An electrical heater must always be protected by a safety thermostat!

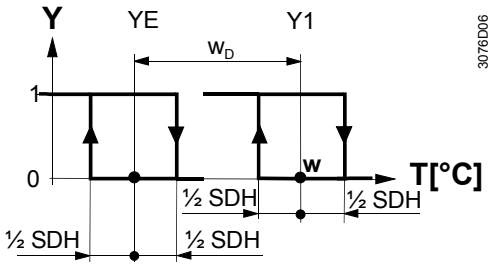
ON/OFF control

Control sequence on/off output

The diagrams below show the control sequence for 2-position.

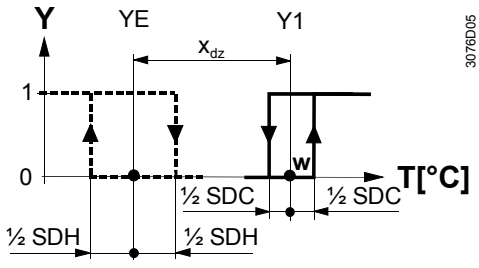
Heating mode

(automatic changeover = heating or heating only)



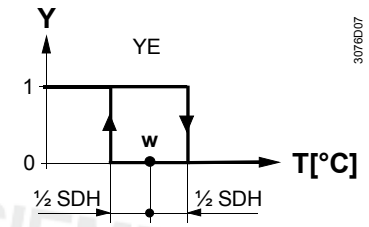
Cooling mode

(man. / auto. changeover = cooling or cooling only)



Heating mode with manual changeover (P01=2)

(manual changeover = heating)



T[°C]	Room temperature
W	Room temperature setpoint
Y1	Control command “Valve” or “Compressor”
YE	Control command “Electrical heater”
SDH	Switching differential “Heating” (P30)
SDC	Switching differential “Cooling” (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

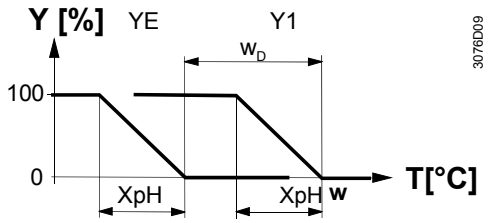
Modulating control 3-position, PWM or DC 0…10 V

Control sequence modulating output

The diagrams below show the control sequence for modulating control.

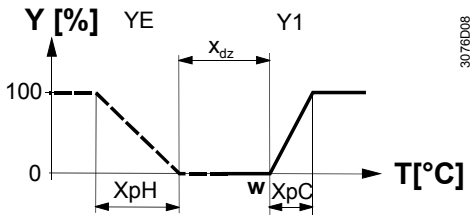
Heating mode

(automatic changeover = heating or heating only)



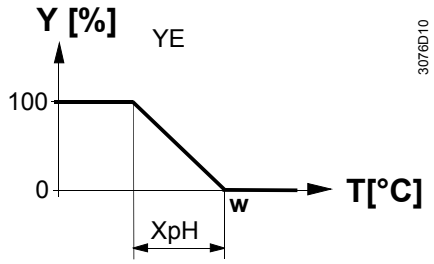
Cooling mode

(man. /auto. changeover = cooling or cooling only)



Heating mode with manual changeover (P01=2)

(manual changeover = heating)



T[°C]	Room temperature
W	Room temperature setpoint
Y1	Control command “Valve”
YE	Control command “Electrical heater”
XpH	Proportional band “Heating” (P30)
XpC	Proportional band “Cooling” (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

Note The diagrams only show the PI controller’s proportional part.

Setting the sequence and the control outputs

Refer to sections 4.5 ("Applications"), 4.7.1 ("Sequences") and 4.7.2 ("Outputs").

4.7.5 2-pipe fan coil unit with radiator or floor heating

Heating or cooling with radiator or floor heating

On 2-pipe applications with radiator, the thermostat controls a valve in heating / cooling mode with changeover, heating only, or cooling only plus a radiator valve. Cooling only is factory-set (P01=1).

Radiator, active in cooling mode

In cooling mode, the valve receives an **OPEN** command if the acquired temperature is above the setpoint.
The radiator receives an **ON** command if the acquired room temperature drops below “setpoint” minus “dead zone” (= “setpoint for radiator”).

Radiator in heating mode

In heating mode, the radiator receives an **OPEN** command if the acquired temperature is below the setpoint. The fan coil unit is used as an additional heat source when the heat energy controlled by the radiator is insufficient.
The fan coil unit receives an **ON** command if the temperature is below “setpoint” minus “setpoint differential” (= setpoint for fan coil unit).

Floor heating

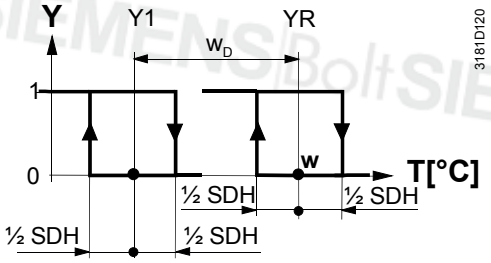
The radiator sequence can also be used for floor heating.
The "Floor heating limitation function" is described on page 17.

ON/OFF control

The diagrams below show the control sequence for 2-position control.

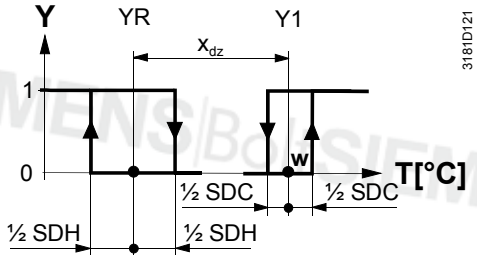
Heating mode

(automatic changeover = heating or heating only)



Cooling mode

(man. /auto. changeover = cooling or cooling only)



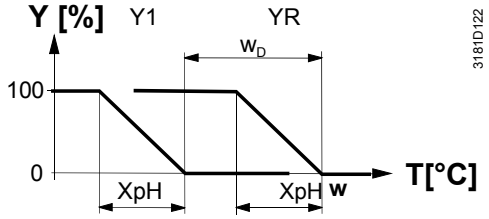
T[°C]	Room temperature	SDH	Switching differential “Heating” (P30)
W	Room temperature setpoint	SDC	Switching differential “Cooling” (P31)
Y1	Control command “Valve” or “Compressor”	X_{dz}	Dead zone (P33)
YR	Control command “Radiator”	w_D	Setpoint differential (P34)

Modulating control: 3-position, PWM or DC 0…10 V

The diagrams below show the control sequence for modulating PI control.

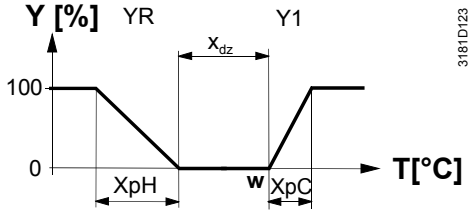
Heating mode

(automatic changeover = heating or heating only)



Cooling mode

(man. / auto. changeover = cooling or cooling only)



T[°C]	Room temperature	XpH	Proportional band “Heating” (P30)
W	Room temperature setpoint	XpC	Proportional band “Cooling” (P31)
Y1	Control command “Valve”	X_{dz}	Dead zone (P33)
YR	Control command “Radiator”	w_D	Setpoint differential (P34)

Note The diagrams only show the PI controller’s proportional part.

Setting the sequence and the control outputs

Refer to sections 4.5 ("Applications"), 4.7.1 ("Sequences") and 4.7.2 ("Outputs").

4.7.6 4-pipe fan coil unit

Heating and cooling

On 4-pipe applications, the thermostat controls 2 valves in heating and cooling mode, heating / cooling mode by manual selection, or heating and cooling mode with changeover. Heating and cooling mode (P01=4) is factory-set.

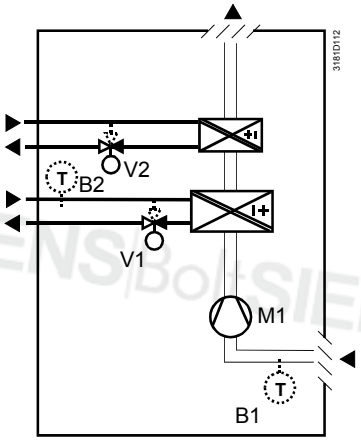
4-pipe application with manual changeover

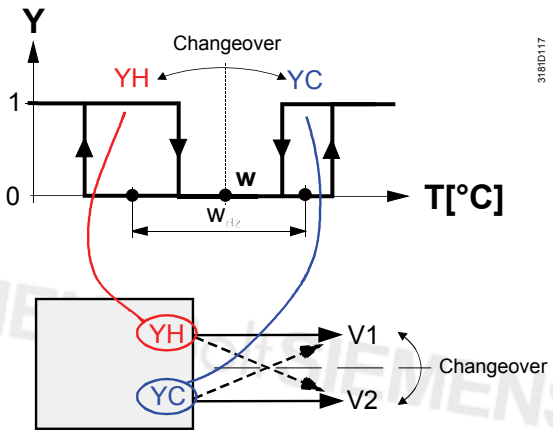
The heating or cooling output can be released via operating mode button if parameter P01 is set to manual (P01=2).

"Main and secondary" application (4-pipe with changeover)

If parameter P01 is set to changeover (P01=3), the heating and cooling output is swapped according to the changeover sensor input status (see automatic heating and cooling changeover sensor, section 4.6). This mode is used for the so-called "Main and secondary" application. This is a 4-pipe fan coil unit system with different capacity of the 2 coils. The water circuit is changed to optimize the energy exchange depending on the season (summer/winter):

– Winter: Large coil (V1) for heating, small coil (V2) for cooling
– Summer: Large coil (V1) for cooling, small coil (V2) for heating





Note:
This example shows on/off control;
for modulating control, connect the appropriate output terminals.

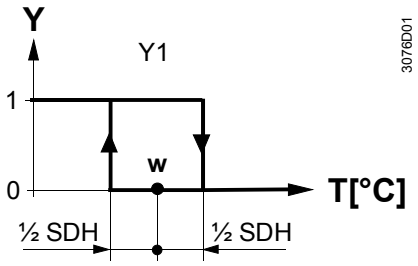
Notes

- The factory setting for the heating and cooling changeover sensor (B2 in the above diagram) is input X2 (P40 = 2)
- The thermostat assumes winter operation when B2 > P37 (factory setting 28 °C)
- The thermostat assumes summer operation when B2 < P36 (factory setting 16 °C)

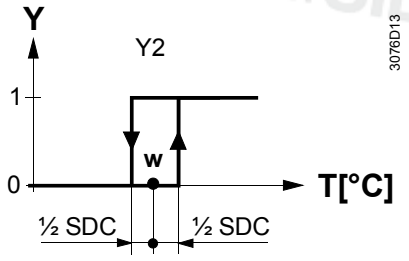
ON/OFF control

The diagrams below show the control sequence for 2-position control.

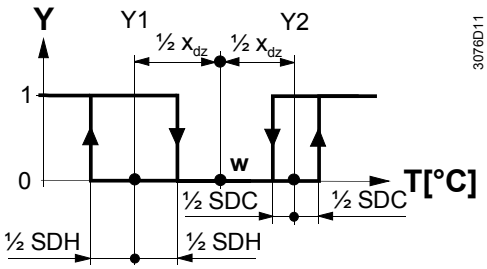
Heating mode with manual selection (P01=2)



Cooling mode with manual selection (P01=2)



Heating and cooling mode (P01=04)

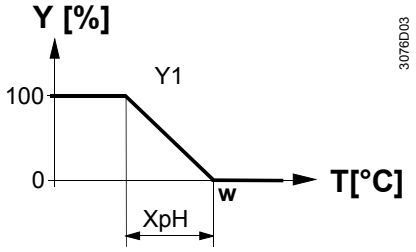


T[°C]	Room temperature
w	Room temperature setpoint
Y1	Control command “Valve” or “Comp.” (H)
Y2	Control command “Valve” or “Comp.” (C)
SDH	Switching differential “Heating” (P30)
SDC	Switching differential “Cooling” (P31)
X_{dz}	Dead zone (P33)

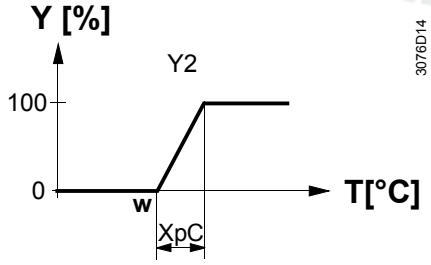
Modulating control: 3-position, PWM or DC 0…10 V

The diagrams below show the control sequence of modulating PI control.

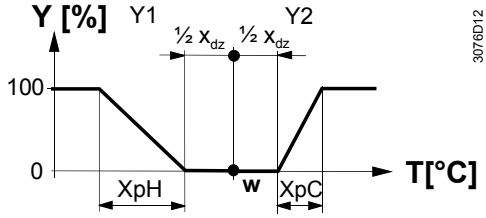
Heating mode with manual selection (P01=2)



Cooling mode with manual selection (P01=2)



Heating and cooling mode (P01=04)



T[°C]	Room temperature
w	Room temperature setpoint
Y1	Control command “Valve” heating
Y2	Control command “Valve” cooling
XpH	Proportional band “Heating” (P30)
XpC	Proportional band “Cooling” (P31)
X_{dz}	Dead zone (P33)

Note The diagrams only show the PI controller’s proportional part.

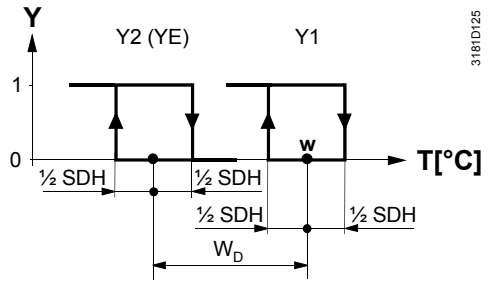
Setting the sequence and the control outputs

Refer to sections 4.5 ("Applications"), 4.7.1 ("Sequences") and 4.7.2 ("Outputs").

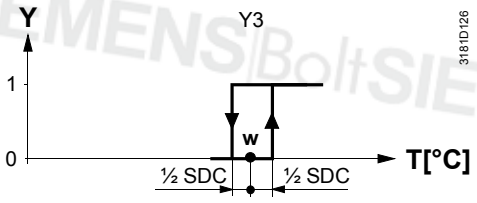
4.7.7 4-pipe fan coil unit with electrical heater

Heating and cooling with auxiliary heater	On 4-pipe applications with electrical heater, the thermostat controls 2 valves in heating and cooling mode by manual selection, heating and cooling mode with automatic changeover, heating only, or cooling only plus an auxiliary electrical heater. Heating and cooling is factory-set (P01=4).
Electrical heating in heating mode	The electrical heater is used as an additional heat source when the heating energy controlled by the valve is insufficient. The electrical heater receives an **ON** command when the temperature is below “setpoint” minus “1/2 "dead zone" minus "setpoint differential" (= "setpoint for electrical heater").
Digital input “Enable electrical heater”	Remote enabling / disabling of the electrical heater is possible via input X1, X2, or D1 for tariff regulations, energy saving, etc. Input X1, X2, or D1 must be commissioned accordingly (parameters P38, P40, P42). See section 4.10 “Multifunctional input”.
Caution ⚠	An electrical heater must always be protected by a safety thermostat!
4-pipe application with manual changeover	The heating or cooling output can be released via operating mode button if parameter P01 is set to manual (P01=2).
“Main and secondary” application	See section 4.7.6.
ON/OFF control	The diagrams below show the control sequence for 2-position control.

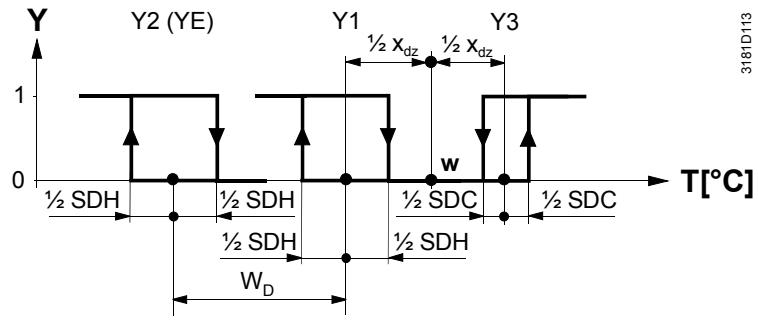
Heating mode with **manual** selection (P01=2)



Cooling mode with **manual** selection P01=2)



Heating and cooling mode (P01=4)

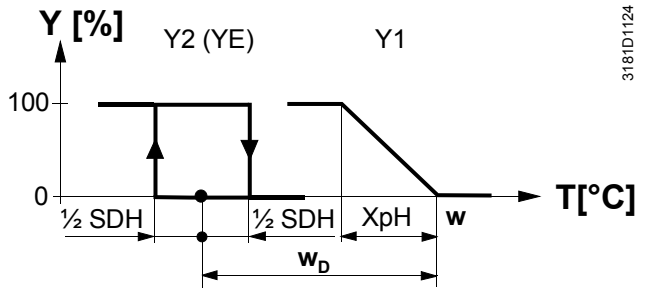


T[°C]	Room temperature
w	Room temperature setpoint
Y2	Control command “El. heater"
Y1	Control command “Valve” or “Comp.” (H)
Y3	Control command “Valve” or “Comp.” (C)
SDH	Switching differential “Heating” (P30)
SDC	Switching differential “Cooling” (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

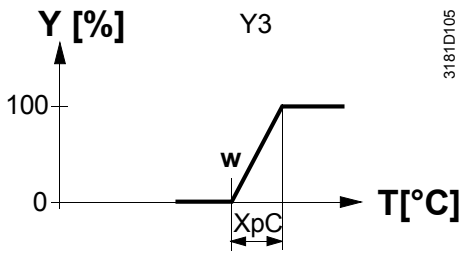
Modulating control: 3-position or PWM

The diagrams below show the control sequence of modulating PI control.

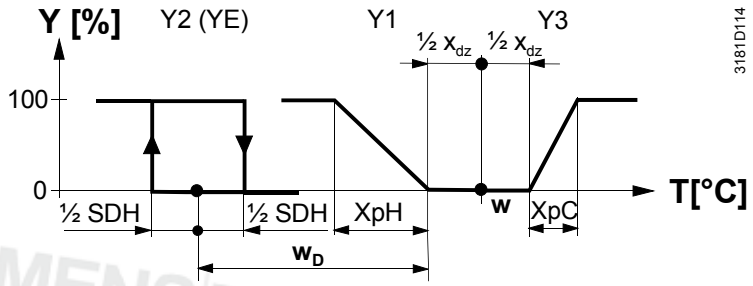
Heating mode with manual selection (P01=2)



Cooling mode with manual selection P01=2)



Heating and cooling mode (P01=4)



T[°C]	Room temperature
w	Room temperature setpoint
Y2	Control. command “El. heater" ***(only on/off)***
Y1	Control command “Valve” or “Comp.” (H) ***(only PWM, not 3-position)***
Y3	Control command “Valve” or “Comp.” (C)
XpH	Proportional band “Heating” (P30)
XpC	Proportional band “Cooling” (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

Note The diagrams only show the PI controller’s proportional part.

Setting the sequence and the control outputs

Refer to sections 4.5 ("Applications"), 4.7.1 ("Sequences") and 4.7.2 ("Outputs").

Notes
- Y1 can only be on/off or PWM
- Y2 can only be on/off
- Y3 can be on/off, PWM or 3-position

4.7.8 2-stage heating or cooling

2-stage heating or cooling

On 2-stage applications, the thermostat controls 2 valves or compressors in heating or cooling mode or changeover (automatic or manual).
“Cooling only" is factory-set (P01=1).

Heating mode

In heating mode, the 1st stage is activated if the acquired temperature is below the setpoint.
The 2nd stage is activated if the acquired room temperature drops below “setpoint” minus “setpoint differential”.

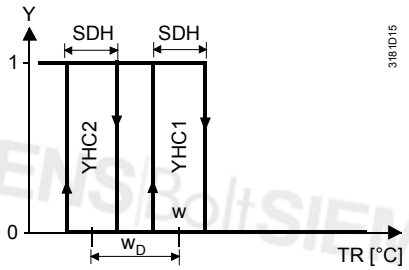
Cooling mode

In cooling mode, the 1st stage is activated if the acquired temperature is above the setpoint.
The 2nd stage is activated if the acquired room temperature rises above “setpoint” plus “setpoint differential”.

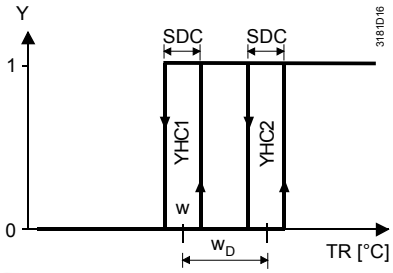
ON/OFF control

The diagrams below show the control sequence for 2-position control.

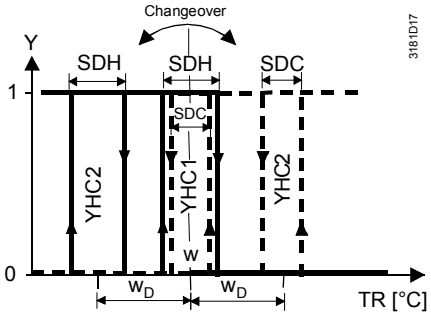
Heating mode (P01=0)



Cooling mode P01=1)



Changeover (P01=2 or P01= 3)

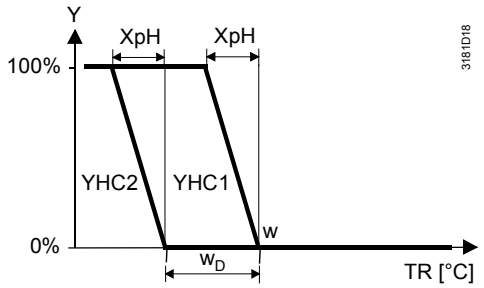


T[°C] Room temperature
w Room temperature setpoint
YHC1 Control command “Stage 1"
YHC2 Control command “Stage 2”
SDH Switching differential “Heating” (P30)
SDC Switching differential “Cooling” (P31)
X_{dz} Dead zone (P33)
w_D Setpoint differential (P34)

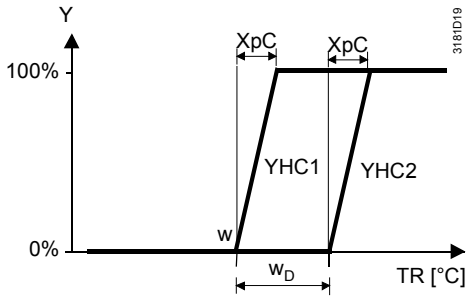
Modulating control: 3-position, PWM or DC 0…10 V

The diagrams below show the control sequence of modulating PI control.

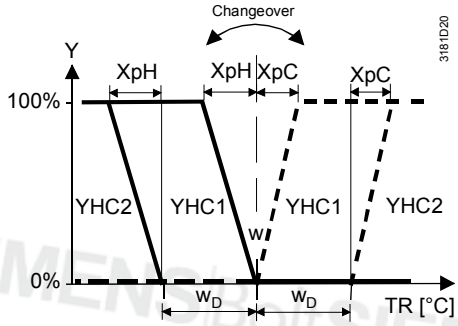
Heating mode (P01=0)



Cooling mode P01=1)



Changeover (P01=2 or P01= 3)



T[°C] Room temperature
w Room temperature setpoint
YHC1 Control command “Stage 1"
YHC2 Control command “Stage 2”
XpH Proportional band “Heating” (P30)
XpC Proportional band “Cooling” (P31)
X_{dz} Dead zone (P33)
w_D Setpoint differential (P34)

Note The diagrams only show the PI controller’s proportional part.

Setting the sequence and the control outputs

Refer to sections 4.5 ("Applications"), 4.7.1 ("Sequences") and 4.7.2 ("Outputs").

4.7.9 Chilled / heated ceiling and radiator applications

For chilled / heated ceiling and radiator,

- set the corresponding basic application
- disable the fan (P52)

The following applications are available:

Application for chilled / heated ceiling, radiator	Set basic application	See section	Sequences
Chilled / heated ceiling with changeover	2-pipe	4.7.3	H (\ ) C (/)
Chilled / heated ceiling & el. heater (cooling only: disable el. heater via P13)	2-pipe & electrical heater	4.7.4	El. H + H (⏚\ \ ) El. H + C (⏚\ /) C (/)
Chilled / heated ceiling & radiator	2-pipe & radiator	4.7.5	H + rad (\ r\ ) Rad + C (r\ /)
Chilled ceiling and radiator	4-pipe	4.7.6	H + C (\ /)
Cooling or heating 2-stage	2-stage heating or cooling	4.7.8	H + H (\ \ ) C + C (/ /)

4.7.10 Compressor applications (general)

For compressor applications,

- set the corresponding basic application
- disable the fan (P52) or set the fan speed (P53)

The following applications are available:

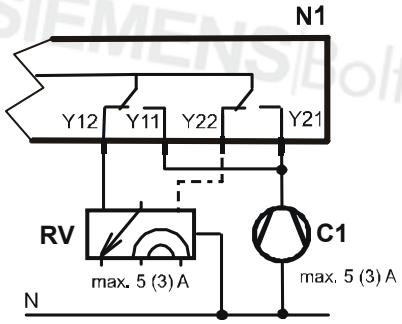
Application for chilled / heated ceiling, radiator	Set basic application	See section	Sequences
1-stage compressor	2-pipe	4.7.3	H (\ ) C (/)
1-stage compressor & el. heater *(cooling only: disable el. heater via P13)*	2-pipe & electrical heater	4.7.4	El. H + H (⏚\ \ ) El. H + C (⏚\ /) C (/)
1-stage compressor for heating and cooling	4-pipe	4.7.6	H + C (\ /)
1-stage compressor with reversing valve (for details, see below)	4-pipe	4.7.6	H + C (\ /)
2-stage compressor	2-stage heating or cooling	4.7.8	H + H (\ \ ) C + C (/ /)

Notes
- Minimum on/off time: P48 / P49
- Fan operation: P52 (0 = disabled, 1 = enabled)
- Fan speed: P53 (1 = 1-speed, 2 = 3-speed)

4.7.11 1-stage heating or cooling with reversing valve

On this application, the thermostat controls a compressor in heating or cooling mode with changeover (automatic or manual). Cooling only is factory-set (P01=1).

- Set basic application "4-pipe" (see section 4.7.6)
- Connect compressor and reversing valve as follows:



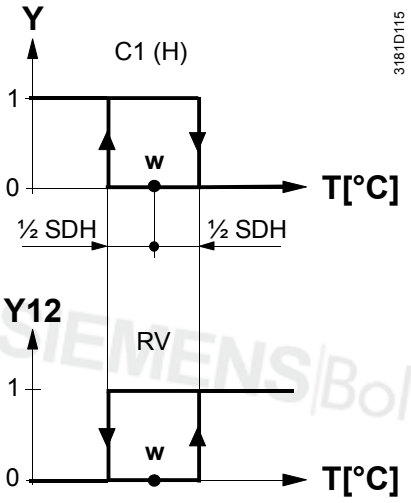
Hardware

This application is available with RDG110 only.

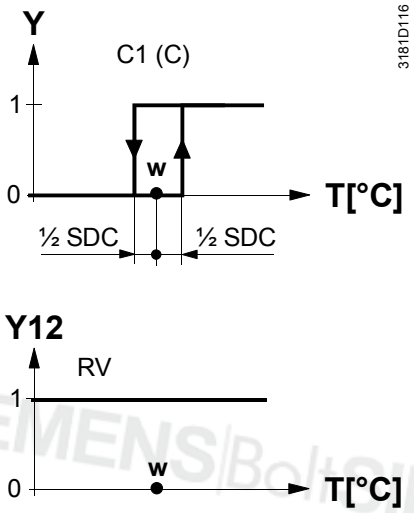
ON/OFF control

The diagrams below show the control sequences for 2-position control.

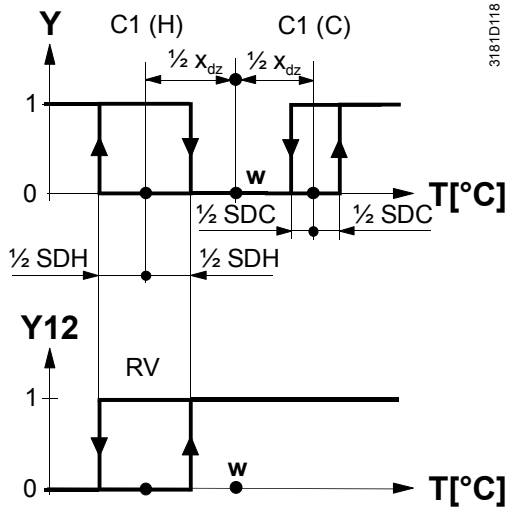
Heating mode with manual selection (P01 = 2)



Cooling mode with manual selection (P01 = 2)



Heating and cooling mode (P01=04)



T[°C]	Room temperature
w	Room temperature setpoint
Y11	Control command “Compressor” (H)
Y21	Control command “Compressor” (C)
Y12	Control command “Reversing valve” (heating = ON)
SDH	Switching differential “Heating” (P30)
SDC	Switching differential “Cooling” (P31)
X_{dz}	Dead zone (P33)

4.8 Control outputs

Overview of control outputs

Different control output signals are available depending on the thermostat type, the position of DIP switches 4 and 5, and parameters P46 and P47 (see section 4.7.2).

Control output / Product no.	2-position	2-position PWM	3-position	DC 0…10 V
RDG100, RDG100T	Y1, Y2, Y3 (3 x N.O.)	Y1, Y3, (2 x PWM)	Y1/Y2, Y3/Y4 (2 x ▲ / ▼)	
RDG110	Y11/Y12, Y21/Y22 (2 x SPDT)			
RDG140				Y10, Y20 (2 x DC 0…10 V)
RDG160				Y10, Y20 (2 x DC 0…10 V)

ON/OFF control signal (2-position)

The valve or compressor receives the **OPEN/ON** command via control output Y1 or Y3 (RDG110: Y11, Y21) when

1. the acquired room temperature is below the setpoint (heating mode) or above the setpoint (cooling mode).
2. the control outputs have been inactive for more than the “Minimum output off-time” (factory setting 1 minute, adjustable via parameter P48).

OFF command when

1. the acquired room temperature is above the setpoint (heating mode) or below the setpoint (cooling mode).
2. the valve has been active for more than the “Minimum output on-time” (factory setting 1 minute, adjustable via parameter P49).

Electrical heater control signal (2-position)

The electrical heater receives an **ON** command via the auxiliary heating control output (Y…, see Mounting Instructions) when

1. the acquired room temperature is below “setpoint for electrical heater”
2. the electrical heater has been switched off for at least 1 minute

The **OFF** command for the electrical heater is output when

1. the acquired room temperature is above the setpoint (electrical heater)
2. the electrical heater has been switched on for at least 1 minute

Caution ⚠ A safety thermostat (to prevent overtemperatures) must be provided externally.

3-position control signal

This function is available with RDG100 and RDG100T only.

Heating: Output Y1 provides the **OPEN** command, and Y2 the **CLOSE** command to the 3-position actuator. Cooling: Idem with Y3 and Y4.
The factory setting for the actuator's running time is 150 seconds. It can be adjusted via parameters P44 (Y1 and Y2) or P45 (Y3 and Y4).
The parameters are only visible if 3-position is selected via DIP switches 4 and 5.

Synchronization

1. When the thermostat is powered up, a closing command for the actuator running time + 150% is provided to ensure that the actuator fully closes and synchronizes to the control algorithm.

2. When the thermostat calculates the positions "fully close" or "fully open", the actuator's running time is extended + 150% to ensure the right actuator position is synchronized to the control algorithm.
3. After the actuator reaches the position calculated by the thermostat, a waiting time of 30 seconds is applied to stabilize the outputs.

PWM control

This function is available with RDG100 and RDG100T only.

The demand calculated by PI control from the current room temperature and set-point is provided via Y1 and Y3 to the valve actuator as a PWM signal (pulse width modulation) for thermal actuators. The output is activated for a period proportional to the heating / cooling demand and then switched off for the rest of the PWM interval.

The interval is 150 seconds (factory setting). It can be adjusted via parameters P44 (Y1) or P45 (Y3). These parameters are only visible if 2-position is selected via DIP switches 4 and 5 and if PWM is selected via P46 and P47.

PWM for thermal valve actuators

For thermal valve actuators, set the running time to 240 seconds.

Note!

- Never apply PWM to an electromotoric actuator
- It is not possible to ensure exact parallel running of 2 or more thermal valve actuator. If several fan coil units are driven by the same thermostat, preference should be given to electromotoric actuators

PWM for electrical heaters

For electrical heaters, set the running time to 90 seconds.
To avoid burn-off of mechanical contacts by frequent switching, use a current valve in place of a relay or contactor.

DC 0...10 V control

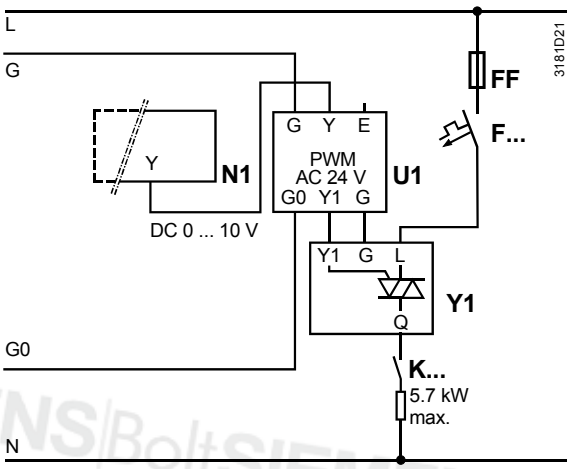
This function is available with RDG140 and RDG160 only.

DC 0...10 V for valve actuators

The demand calculated by PI control from the current room temperature and setpoint is provided via Y10 and Y20 to the valve actuator as a continuous DC 0...10 V signal.

DC 0...10 V for electrical heaters

- The demand calculated by PI control from the current room temperature and setpoint is provided via Y20 as a continuous DC 0...10 V signal.
- The signal converter (SEM61.4) converts the DC 0...10 V signal to AC 24 V PDM pulses for the current valve.
- The current valve (SEA45.1) supplies the electrical heater with AC 50…660 V pulsed current.



N1	RDG140, RDG160
U1	Signal converter SEM61.4 (see Data Sheet N5102)
Y1	Current valve SEA45.1 (see Data Sheet N4937)
K…	Safety loop (e.g. safety thermostat and high-temperature cutout)
FF	Very fast-acting fuse
F…	Overcurrent trip

4.9 Fan control

Overview of fan outputs

Different fan output signals are available depending on the thermostat type:

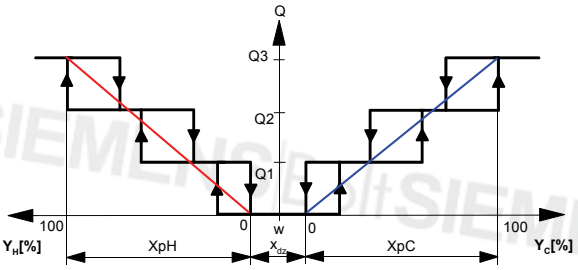
Control output / Product no.	On/off 1- / 3-speed fan	Modulating fan DC 0…10 V
RDG100, RDG100T	Q1,Q2,Q3 (3)	
RDG110	Q1,Q2,Q3 (3)	
RDG140	Q1,Q2,Q3 (3)	
RDG160		Y50 (1)

( ) Number of outputs

The fan operates in automatic mode or at the selected speed with manual mode. In automatic mode, the fan speed depends on the setpoint and the current room temperature. When the room temperature reaches the setpoint, the control valve closes and the fan switches off or stays at fan speed 1 (parameter P60; factory setting: 0 = fan speed 1 in dead zone).

3-speed fan control with modulating heating / cooling control

The individual switching points for **ON** of each fan stage can be adjusted via control parameters P55…P57. The fan speed switch off point is 20% below the switch on point. The diagrams below show fan speed control for modulating PI control.



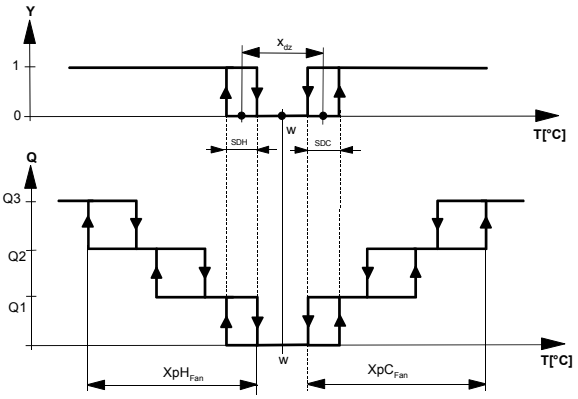
w	Room temperature setpoint
Q	Fan speed
Y_H	Control demand “Heating”
Y_C	Control demand “Cooling”
XpH	Proportional band “Heating”
XpC	Proportional band “Cooling”
X_{dz}	Dead zone

Note: The diagram only shows the PI controller’s proportional part.

3-speed fan control with on/off heating / cooling control

On applications with 2-position control:

1) The switching point for low fan speed (Q1) is synchronized to the heating / cooling output. Parameter “Switching point fan speed low” P57 is not relevant.
2) The maximum switching range of the fan (XpH_{Fan} / XpC_{Fan}) is defined by the switching differential (SDH/SDC) via a look-up table.



T[°C]	Room temperature
w	Room temperature setpoint
Q	Fan speed
Y	Control command “Valve”
SDH	Switching differential “Heating”
SDC	Switching differential “Cooling”
X_{dz}	Dead zone
XpH_{Fan}	Switching range for fan “Heating”
XpC_{Fan}	Switching range for fan “Cooling”

Look-up table with on/off control

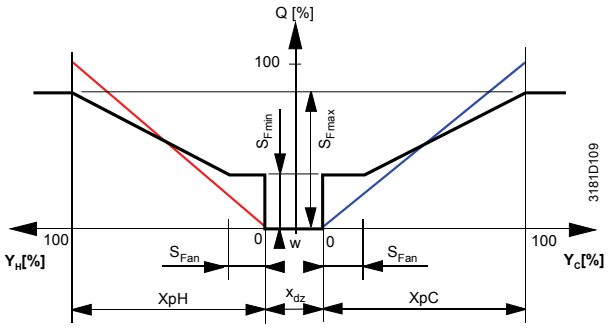
SDH/SDC [K]	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	>4.5
XpH_{Fan}/XpC_{Fan} [K]	2	3	4	5	6	7	8	9	10

1-speed / 3-speed fan

The thermostat can control a 1-speed or 3-speed fan (selected via control parameter P53). A 1-speed fan is connected to terminal Q1, a 3-speed fan to terminals Q1, Q2 and Q3.

Control sequence for modulating fan (ECM fan)

RDG160 has a DC 0…10 V output for electronically commutated (ECM) fan motors. The switching points can be set via parameter P55…P57.

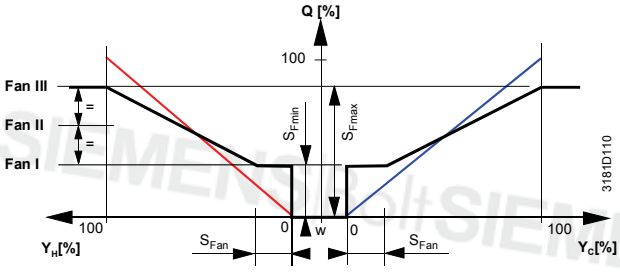


w	Room temperature setpoint
Q	Fan speed
Y_H	Control demand “Heating”
Y_C	Control demand “Cooling”
XpH	Proportional band “Heating”
XpC	Proportional band “Cooling”
X_{dz}	Dead zone
S_{Fan}	Switching point fan (P57)
S_{Fmin}	ECM fan min. output (P56)
S_{Fmax}	ECM fan max. output (P55)

Note: The diagram only shows the PI controller’s proportional part.

Manual operation (ECM fan)

Fan speed 1 = S_{Fmin}
Fan speed 2 = half-way between S_{Fmin} and S_{Fmax}
Fan speed 3 = S_{Fmax}



Note: The control signals "Heating" and "Cooling" are not influenced by the manual setting of fan speeds.

Fan operation as per heating / cooling mode, or disabled

Fan operation can be limited to be active with cooling only or heating only, or even be totally disabled via control parameter “Fan operation” P52.
When fan operation is disabled, the fan symbol on the display disappears and pressing the fan button has no influence.
This function allows you to use the thermostat on universal applications such as chilled / heated ceilings and radiator, etc. (see sections 4.7.9 ff).

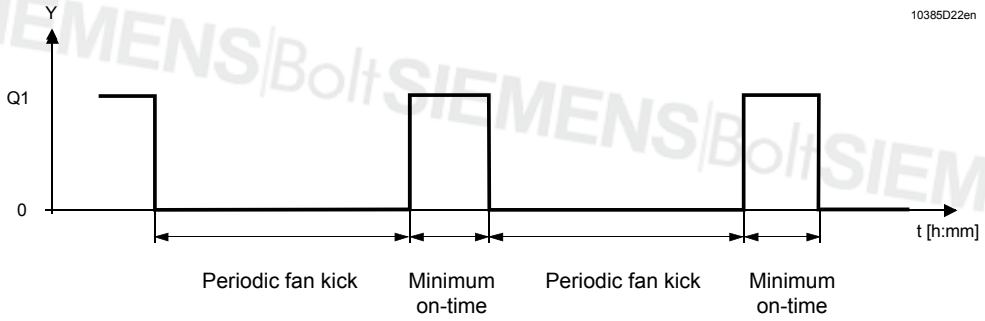
Fan minimum on- time

In automatic mode, a dwelling time of 2 minutes (factory setting) is active. The fan maintains each speed for at least 2 minutes before it changes to the next speed. This minimum on-time can be adjusted from 1…5 minutes via parameter P59.

Fan operation in dead zone (fan kick)

In automatic fan mode and with the room temperature in the dead zone, the control valve is normally closed and the fan disabled. With the fan kick function, the fan can be released from time to time at low speed for minimum on-time (see above) even if the valve is closed.

This function can be used to avoid damage from moisture due to a lack of air circulation, or to allow a return air temperature sensor to acquire the correct room temperature.

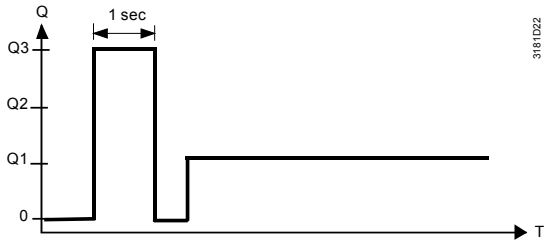


The periodic fan kick time can be selected individually for Comfort mode via parameter P60, and for Energy Saving mode via parameter P61.

Note: Fan kick value “0” means the fan runs continuously in the dead zone.
Fan kick value “OFF” means the fan does not run in the dead zone.

Fan start

When the fan starts from standstill, it starts at speed 3 for 1 second to ensure safe fan motor start by overcoming inertia and friction (selected via parameter P58).



Fan overrun for electrical heater

When the electrical heater is switched off, the fan overruns for 60 seconds (parameter P54) to avoid overtemperature of the electrical heater or prevent the thermal cutout from responding.

⚠ Fan failure

In case of fan failure, the thermostat cannot protect the electrical heater against overtemperature. That is why the electrical heater must feature a separate safety device (thermal cutout).

Clean fan filter reminder

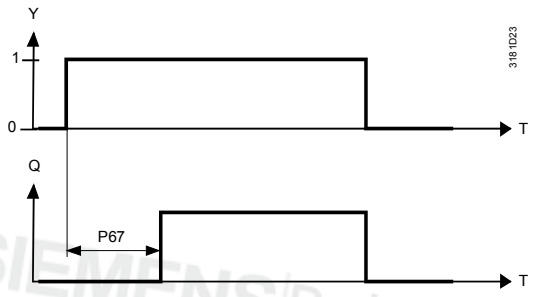
The clean fan filter reminder function counts the fan operating hours and displays message “FIL” 🔔 to remind the user to clean the fan filter as soon as the threshold is reached. This does not impact the thermostat's operation, which continues to run normally.
The clean filter reminder is reset when the operating mode is manually set to Protection and back.

Fan in Auto Timer mode
(RDG100T only)

In Auto Timer mode, the default fan mode is automatic. The fan mode can be changed to manual by pushing the “FAN” button. The fan returns to the automatic default mode after each switchover from Comfort to Energy Saving mode and vice versa.

Fan start delay
(2-position control only)

To let the heating / cooling coil reach its temperature, the fan start can be delayed by a time period set via parameter P67.



4.10 Multifunctional input, digital input

The thermostat has 2 multifunctional inputs X1 and X2 and a digital input D1.
A sensor type NTC like the QAH11.1 (AI, analog input) or a switch (DI, digital input) can be connected to the input terminals. The functionality of the inputs can be configured via parameters P38 for X1, P40 for X2, and P42 for D1.

#	*Function of input*	*Description*	*Type X1/X2*	*Type DI*
0	Not used	No function.	--	--
1	External / return air temperature	Sensor input for external room temperature sensor or return air temperature sensor to acquire the current room temperature, or floor heating temperature sensor to limit the heating output. *Note:* The room temperature is acquired by the built-in sensor if the floor temperature limitation function is enabled via parameter P51.	AI	
2	Heating / cooling changeover	Sensor input for automatic heating / cooling changeover function. A switch can also be connected rather than a sensor (switch closed = cooling, see section 4.6).	AI/(DI)	DI
3	Operating mode switchover	Digital input to switch over the operating mode to Energy Saving. If the operating mode switchover contact is active, user operations are ineffective and “OFF” is displayed.	DI	DI
4	Dewpoint monitor	Digital input for a dewpoint sensor to detect condensation. Cooling is stopped if condensation occurs.	DI	DI
5	Enable electrical heater	Digital input to enable / disable the electrical heater via remote control.	DI	DI
6	Fault	Digital input to signal an external fault (example: dirty air filter). If the input is active, “ALx” is displayed (Alarm x, with x = 1 for X1, x = 2 for X2, x = 3 for D1). *Note*: Fault displays do not influence the thermostat's operation. They merely represent a visual signal.	DI	DI

Operational action can be changed between normally open (NO) and normally closed (NC) via parameter P39, P41 (or P43 if it is a digital input).
Each input X1, X2 or D1 must be configured with a different function (1…5).
Exception: 1, 2 or 3 inputs can be configured as alarm inputs (6).

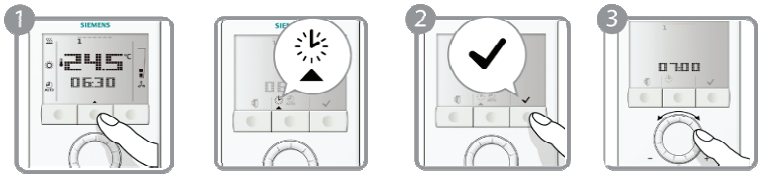
X1 is factory-set to “External sensor” (1), X2 to “Heating / cooling changeover” (2), and D1 to operating mode changeover (3).

For more detailed information, refer to section 4.5 “Applications”.

4.11 Auto timer (RDG100T only)

The thermostat provides an Auto Timer mode with 8 programmable timers. Each timer can be assigned to one or several days. In this mode, the thermostat automatically changes over between Comfort and Energy Saving mode according to the preprogrammed timers.

Setting the time of day and the weekday

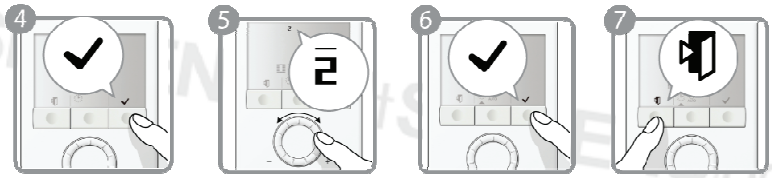


1. Press the program mode button to enter the programming mode menu.
2. Press button ✔ (OK) to enter the setting mode for the time of day. The time digits start blinking.
3. Turn the rotary knob clock- or counterclockwise to set the time of day.

12-hour and 24-hour format

If the current time of day is in 24-hour format and you wish to change it to 12-hour format, turn the knob clockwise passed 23:59 or counterclockwise passed 00:00.

If the current time of day is in 12-hour format and you wish to change it to 24-hour format, turn the knob clockwise passed 12:00 pm or counterclockwise passed 12:00 am.



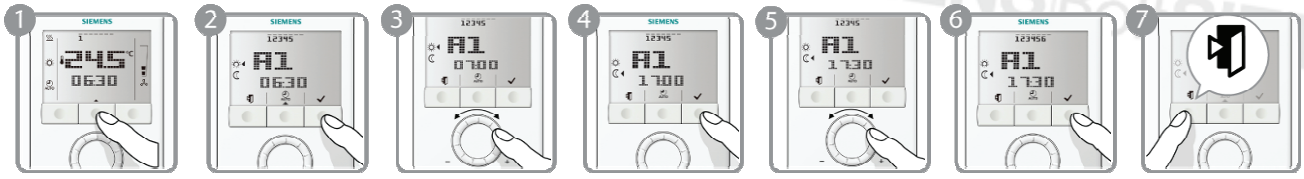
4. Confirm the time of day by pressing the right button ✔ The weekday indicator starts blinking.
5. Turn the rotary knob clock- or counterclockwise to set the current weekday.
6. Confirm the current weekday by pressing button ✔ (OK).
7. Press the program mode button (Esc) to leave the program mode.

Power failure

After a power failure, the time of day will blink to indicate power was lost. However the auto timer will continue to run with the time before the power loss occurred. Enter the setting mode to adjust the time of day if needed.

Setting the timers

The RDG100T provides 8 programmable timers A1 … A8. Each timer has a Comfort mode start and end time that can be applied to one or several weekdays. To set an auto timer, proceed as follows:



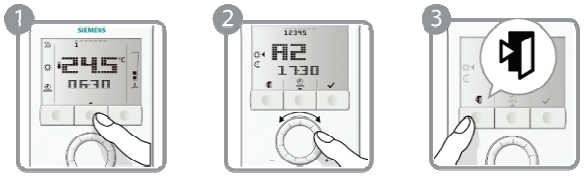
1. Press the program mode button twice to select “Auto timer setting” on the “Programming mode” menu.
2. Turn the rotary knob to the desired timer A1…A8 that you wish to adjust and press button ✓ (OK).
3. Turn the rotary knob to adjust the Comfort mode start time and confirm by pressing button ✓ (OK).
4. Turn the rotary knob to adjust the Comfort mode end time or Energy Saving start time respectively and confirm by pressing button ✓ (OK)
5. Weekday 1 , ✓ and ⇦ blink. Press button ✓ (OK) to select or button ⇦ (Esc) to deselect each day and advance to the next day.
6. After the 7th day is adjusted, all selected weekdays blink.
   Confirm setting for actual timer by pressing button ✓ (OK) and advance to the next timer. To adjust the next timer, repeat step 3…6 or press button ⇦ (Esc) to leave the setting mode.

Note

To save your adjustments, remember to press button ✓ (OK) in step 6 above before pressing button ⇦ (Esc) to leave the programmable timer setting mode.

View the programmable settings

You can view the 8 timers in sequence:



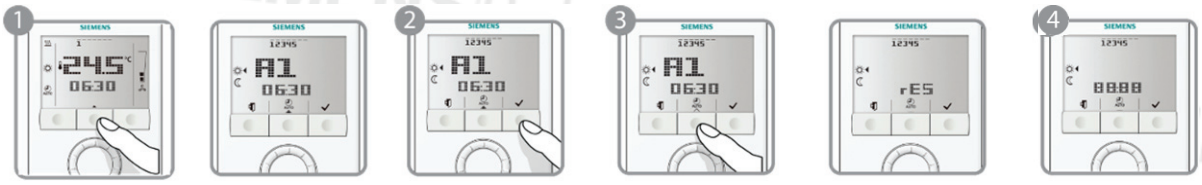
1. Press the program mode button twice to select the “Auto timer setting” in programming mode.
2. Turn the rotary knob to review the 8 auto timers.
3. Press button ⇦ (Esc) to return to normal operation.

Default timer settings

Timers A1…A4 have the following default settings (residential use):

Days	Time when thermostat is in Comfort mode	
Mon(1)- Fri(5)	06:30 – 08:30 (A1)	17:30 – 22:30 (A2)
Sat (6)	08:00-23:00 (A3)	
Sun (7)	08:00-22:30(A4)	
	• The thermostat is in Energy Saving mode ☾ during the remaining time • Timers A5…A8 are free with no default settings	

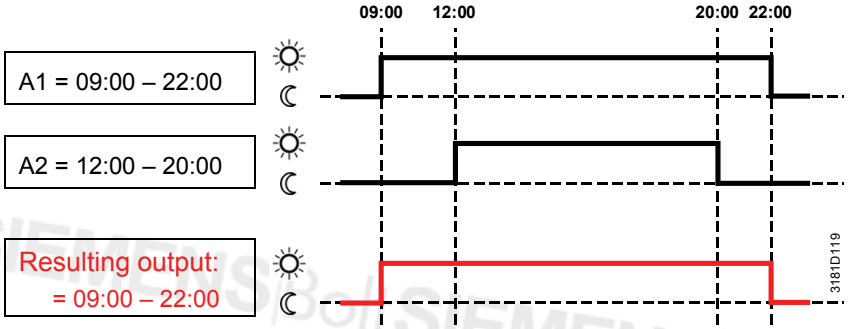
Reloading the default timer settings



1. Press the program mode button twice to select the “Auto timer setting” in programming mode.
2. Press button ✓ (OK) to enter the timer setting mode.
3. Press the program mode button for at least 3 seconds.
   “rES” will be displayed.
4. Press button ✓ (OK) to confirm reloading of the default timer settings or button (Esc) to leave without change.
   The display will show “8888” during the reloading process.

Overlapping of timer sequences

When several timer sequences overlap, the resulting output is the OR combination of the Comfort mode time of all timers.



4.12 Handling faults

Temperature out of range

When the room temperature is outside the measuring range, i.e. above 49 °C or below 0 °C, the limiting temperatures blink, e.g. “0 °C” or “49 °C”.
In addition, the heating output is activated if the current setpoint is not set to “OFF”, the thermostat is in heating mode and the temperature is below 0 °C.
For all other cases, no output is activated.

The thermostat resumes Comfort mode after the temperature returns to within the measuring range.

4.13 Infrared remote control

Use the IRA211 infrared remote control to operate a thermostat with built-in infrared receiver. The following operations can be carried out remotely:

- Select Protection, Comfort or Auto Timer mode
- Adjust setpoint in Comfort mode
- Select fan mode “Automatic” or “Manual”

A buzzer in the thermostat indicates remote control command reception.
Infrared remote control can be disabled via parameter P70.

4.14 DIP switches

Use the DIP switches at the rear of the thermostat to commission the thermostat's basic application prior to snapping it to the base.

– The application is set via DIP switches 1…3
– The function of the control outputs (2-position or 3-position) is set via DIP switches 4 and 5 for RDG 100 and RDG100T.
  For RDG140 and RDG160 (DC 0…10 V), DIP switches 4 and 5 serve to invert the DC 0…10 V signal

For details concerning connection of peripheral devices and setting of the DIP switches, refer to the Mounting Instructions:

– [4] M3181.1 (RDG100, RDG100T)
– [5] M3181.2 (RDG110)
– [6] M3181.3 (RDG140, RDG160)

Note During startup, the thermostat reloads the control parameter factory settings after each change of DIP switch setting.

4.15 Control parameters

A number of control parameters can be readjusted to optimize control performance. These parameters can also be set during operation without opening the unit. In the event of a power failure, all control parameter settings are retained.

The control parameters are assigned to 2 levels:
- “Service level”, and
- “Expert level” with "Diagnostics and test"

The “Service level” contains a small set of parameters to set up the thermostat for the HVAC system and to adjust the user interface. These parameters can usually be adjusted any time.
Change parameters at the “Expert level” carefully, as they impact control performance and functionality of the thermostat.

Parameter setting

Change the parameters as follows:

Enter only “Service level”

1. Press left and right button simultaneously for >3 seconds, release them, then press the right button for >3 seconds.
   The display shows “P01”.
   Continue with step 2.

Enter “Expert level” and "Diagnostics and test"

1. Press left button and right button simultaneously for >3 seconds, release them, press the left button for >3 seconds, then turn the rotary knob counterclockwise min. ½ rotation.
   The display shows “Pxx”.
   Continue with step 2.

Adjusting parameters

2. Select the required parameter by turning the rotary knob.
3. Press button ✔ (OK); the current value of the selected parameter starts blinking and can be changed by turning the rotary knob.
4. Press button ✔ (OK) to confirm the adjusted value or press button (Esc) to cancel the change.
5. If you wish to adjust additional parameters, repeat steps 2…4.
6. Press button (Esc) to leave the parameter setting mode.

Resetting parameters

The factory setting for the control parameters can be reloaded via parameter P71, by changing the value to “ON”. Confirm by pressing the right button.
The display shows “8888” during reloading.

4.15.1 Parameters of the "Service level"

Parameter	Name	Factory setting	Range		RDG100	RDG100T	RDG110	RDG140	RDG160
	Service level								
P01	Control sequence	With 2-pipe / 2-stage: 1 = cooling only With 4-pipe: 4 = H/C	0 = heating only 1 = cooling only 2 = H/C changeover manually 3 = H/C changeover automatically 4 = heating or cooling		✓	✓	✓	✓	✓
P02	Operating mode profile (operating mode button)	1	1 = (Auto) - Comfort - Protection 2 = (Auto) - Comfort - E-saving - Prot		✓	✓	✓	✓	✓
P03	Fan mode selection	0	0 = Auto - Manual 1 = Manual 2 = Auto - Manual - Prot		✓	✓	✓	✓	✓
P04	Selection of °C or °F	0 (°C)	0 = degrees Celsius (°C) 1 = degrees Fahrenheit (°F)		✓	✓	✓	✓	✓
P05	Sensor calibration (internally, externally)	0 K	– 3...3 K		✓	✓	✓	✓	✓
P06	Standard temperature display	0	0 = room temperature 1 = setpoint		✓	✓	✓	✓	✓
P07	Display info line (2nd line of LCD)	0	0 = --- (no display) 1 = °C and °F		0..1	✕	0..1	0..1	0..1
P08	Comfort setpoint	21 °C	5...40 °C		✓	✓	✓	✓	✓
P09	Min. setpoint for Comfort mode	5 °C	5...40 °C		✓	✓	✓	✓	✓
P10	Max. setpoint for Comfort mode	35 °C	5...40 °C		✓	✓	✓	✓	✓
P11	Energy Saving heating setpoint	15 °C	OFF, 5 ... WcoolE-saving; (WcoolE-saving = 40 °C max.)		✓	✓	✓	✓	✓
P12	Energy Saving cooling setpoint	30 °C	OFF, WHeatE-saving ... 40 °C; (WHeatE-saving = 5 °C min.)		✓	✓	✓	✓	✓
P13	Electrical heater in cooling mode	ON	ON: Enabled OFF: Disabled		✓	✓	✓	✓	✓
P14	Button lock function	0	0 = unlocked 1 = auto locked 2 = manual locked		✓	✓	✓	✓	✓

✓ Parameter available

✕ Parameter not available

Note Parameter display depends on selected application and function

4.15.2 Parameters of the "Expert level with diagnostics and test"

Parameter	Name	Factory setting	Range		RDG100	RDG100T	RDG110	RDG140	RDG160
	Expert level								
P30	P-band / switching differential in heating mode	2 K	0.5…6 K		✓	✓	✓	✓	✓
P31	P-band / switching differential in cooling mode	1 K	0.5…6 K		✓	✓	✓	✓	✓
P32	P-band / switching differential for radiator	2 K	0.5…6 K		✓	✓	✓	✓	✓
P33	Dead zone in Comfort mode	2 K	0.5…5 K		✓	✓	✓	✓	✓
P34	Setpoint differential (w_D)	2 K	0.5…5 K		✓	✓	✓	✓	✓
P35	Integral action time	5 min	0…10 min		✓	✓	✕	✓	✓
P36	Heating / cooling changeover cooling (X1/X2)	16 °C	10…25 °C		✓	✓	✓	✓	✓
P37	Heating / cooling changeover heating (X1/X2)	28 °C	27…40 °C		✓	✓	✓	✓	✓
P38	Functionality of X1	1 = external sensor	0 = --- (no function) 1 = room temp ext / ret air temp (AI) 2 = H/C changeover (AI/DI) 3 = operating mode contact [DI] 4 = dewpoint sensor (DI) 5 = enable electrical heater (DI) 6 = fault input (DI)		✓ 0..6	✓ 0..6	✓ 0..6	✓ 0..6	✓ 0..6
P39	Operating action of X1 if digital input	0 (NO)	0 = normally open / open 1 = normally closed / closed		✓	✓	✓	✓	✓
P40	Functionality of X2	2 = H/C changeover	0 = --- (no function) 1 = room temp ext / ret air temp (AI) 2 = H/C changeover (AI/DI) 3 = operating mode contact [DI] 4 = dewpoint sensor. (DI) 5 = enable electrical heater (DI) 6 = fault input (DI)		✓ 0..6	✓ 0..6	✓ 0..6	✓ 0..6	✓ 0..6
P41	Operating action of X2 if digital input	0 (NO)	0 = normally open / open 1 = normally closed / closed		✓	✓	✓	✓	✓
P42	Functionality of D1	3 = operating mode changeover	0 = --- (no function) 2 = H/C changeover (DI) 3 = operating mode contact [DI] 4 = dewpoint sensor (DI) 5 = enable electrical heater (DI) 6 = fault input (DI)		✓ 0..6	✓ 0..6	✓ 0..6	✓ 0..6	✓ 0..6
P43	Operating action of D1 if digital input	0 (NO)	0 = normally open / open 1 = normally closed / closed		✓	✓	✓	✓	✓
P44	Running time of Y1/Y2 output (only with modulating PI control)	150 s	20…300 s		✓	✓	✕	✕	✕
P45	Running time of Y3/Y4 output (only with modulating PI control)	150 s	20…300 s		✓	✓	✕	✕	✕
P46	Output Y1/Y2 (if not parameterized as 3-pos.)	ON/OFF (1)	1 = 2-position 2 = PWM		✓	✓	✕	✕	✕
P47	Output Y3/Y4 (if not parameterized as 3-pos.)	ON/OFF (1)	1 = 2-position 2 = PWM		✓	✓	✕	✕	✕
P48	Min. output on time 2-position control output	1 min.	1...20 min.		✓	✓	✓	✕	✕
P49	Min. output off time 2-position control output	1 min.	1...20 min.		✓	✓	✓	✕	✕
P50	Purging function (only when changeover with local sensor is selected)	OFF	OFF: Not active 1…5 min: Active with selected duration		✓	✓	✓	✓	✓
P51	Floor heating limit temperature	OFF	OFF, 10...50 °C		✓	✓	✓	✓	✓

✓ Parameter available

✕ Parameter not available

Note P46, P47: Setting to 2-position or 3-position is made with DIP switches 4 and 5.

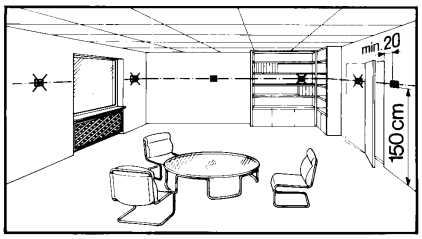
P52	Fan operation	1	0 = disabled 1 = enabled 2 = heating only 3 = cooling only	✓	✓	✓	✓	✓
P53	Fan speed	3-speed	1 = 1-speed 2 = 3-speed	✓	✓	✓	✓	✕
P54	Fan overrun time (only when electrical heater is used)	60 s	0...360 s	✓	✓	✓	✓	✓
P55	Switching point fan speed high	100%	80..100%	✓	✓	✓	✓	✕
	ECM fan max. output	ECM: 80%	ECM: fan min…100%	✕	✕	✕	✕	✓
P56	Switching point fan speed medium	65%	30...75%	✓	✓	✓	✓	✕
	ECM fan min. output	ECM: 30%	ECM: 0%...fan max.	✕	✕	✕	✕	✓
P57	Switching point fan speed low	10%	1...15%	✓	✓	✓	✓	✕
	ECM: Switching point fan	ECM:10%	ECM: 0..100%	✕	✕	✕	✕	✓
P58	Fan start booster	ON	ON: Enabled OFF: Disabled	✓	✓	✓	✓	✕
P59	Fan min. on time	2 min.	1...6 min	✓	✓	✓	✓	✓
P60	Fan kick interval in Comfort mode (time until next kick)	0	0…89 min, OFF (90 min.)	✓	✓	✓	✓	✓
P61	Fan kick interval in E-saving mode (time until next kick)	OFF	0…359 min, OFF (360 min.)	✓	✓	✓	✓	✓
P62	Clean filter reminder running time	Off (0)	OFF, 100…9900 hours	✓	✓	✓	✓	✓
P65	Protection heating setpoint	8 °C	OFF, 5…W Cool Prot; (W Cool Prot = 40 °C max.)	✓	✓	✓	✓	✓
P66	Protection cooling setpoint	OFF	OFF, W Heat Prot…40; (W Heat Prot = 5 °C min.)	✓	✓	✓	✓	✓
P67	Fan start delay in 2P control	0 s	0...180 s	✓	✓	✓	✕	✕
P68	Extension Comfort period	OFF	OFF; 15...360 min	✓	✓	✓	✓	✓
P69	Temporary setpoint Comfort mode (see also Comfort setpoint P08)	OFF	OFF = disabled ON = enabled	✓	✓	✓	✓	✓
P70	Infrared receiver	ON	OFF = disabled ON = enabled	✕	✓	✕	✕	✕
P71	Reload factory settings	OFF	OFF = disabled ON = reload start	✓	✓	✓	✓	✓
Parameter	**Name**	**Factory setting**	**Range**	**RDG100**	**RDG100T**	**RDG110**	**RDG140**	**RDG160**
	Diagnostics and test							
d01	Application type	Diagnostics	0 = (no application) 1 = 2-pipe 2 = 2-pipe with electrical heater 3 = 2-pipe with radiator 4 = 4-pipe 5 = 2 stage heating or cooling 6 = 4-pipe with electrical heater	✓	✓	✓	✓	✓
d02	X1 status	Diagnostics	0 = not activated (for DI) 1 = activated (DI) 0…49 °C = cur temp value (for AI) 00 = H/C input closed 100 = H/C input open	✓	✓	✓	✓	✓
d03	X2 status	Diagnostics	0 = not activated (for DI) 1 = activated (DI) 0…49 °C = cur temp value (for AI) 00 = H/C input closed 100 = H/C input open	✓	✓	✓	✓	✓
d04	D1 status	Diagnostics	0 = not activated (for DI) 1 = activated (DI) 00 = H/C input closed 100 = H/C input open	✓	✓	✓	✓	✓
d05	Test mode for checking actuator direction Y1/Y2 (press left button to escape)	---	"---" = no signal at outputs Y1 and Y2 OPE = output Y1 forced opening CLO = output Y2 forced closing	✓	✓	✕	✕	✕
d06	Test mode for checking actuator direction Y3/Y4 (press left button to escape)	---	"---" = no signal at outputs Y3 and Y4 OPE = output Y3 forced opening CLO = output Y4 forced closing	✓	✓	✕	✕	✕

✓ Parameter available

✕ Parameter not available

5 Handling

5.1 Mounting and installation



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.

Mounting

⚠

- The room thermostat must be mounted in a clean, dry indoor place and must not be exposed to drip or splash water

Wiring

See Mounting Instructions (M3181) enclosed with the thermostat.

⚠
⚠

- Comply with local regulations to wire, fuse and earth the thermostat
- Size correctly the cables to the thermostat, fan and valve actuators for AC 230 V mains voltage

⚠

- Use only valve actuators rated for AC 230 V on RDG100… / RDG110

⚠

- The power supply line must have an external fuse or circuit breaker with a rated current of no more than 10 A

⚠

- Isolate the cables of inputs X1-M / X2-M and D1-GND if the conduit box carries AC 230 V mains voltage
- On the RDG100.. and RDG110, inputs X1-M and X2-M carry mains potential. If the sensor's cables are extended, they must be suited for mains voltage
- Inputs X1-M, X2-M or D1-GND of different units (e.g. summer / winter switch) may be connected in parallel with an external switch. Consider overall maximum contact sensing current for switch rating
- Disconnect power supply before removing the thermostat from the mounting plate!

Commissioning

Select the application and the type of control output via the DIP switches before fitting the thermostat to the mounting plate.
After power is applied, the thermostat carries out a reset during which all LCD segments blink, indicating that the reset was correct. After the reset, which takes about 3 seconds, the thermostat is ready for commissioning by qualified HVAC staff.
The control parameters of the thermostat can be set to ensure optimum performance of the entire system (see section 4.15, control parameters).

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 in connection with a compressor, the minimum output on-time (parameter P48) and off-time (parameter P49) for Y11/Y21 must be adjusted to avoid damage to the compressor and shortening its life

Calibrate sensor

- Recalibrate the temperature sensor if the room temperature displayed on the thermostat does not match the room temperature measured. To do this, change parameter P05

Setpoint and setpoint setting range limitation

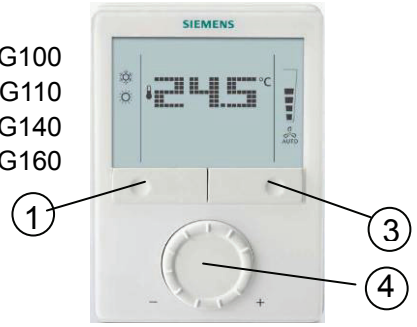
- We recommend to review the setpoints and setpoint setting ranges (parameters P08…P12) and change them as needed to achieve maximum comfort and save energy

5.2 Operation

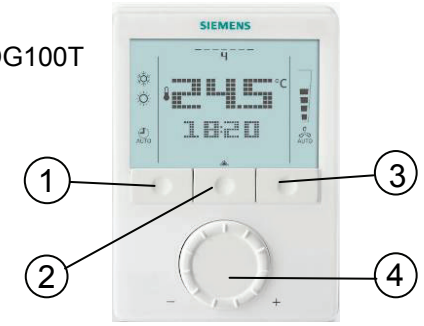
See also Operating Instructions B3181 enclosed with the thermostat.

Layout

RDG100
RDG110
RDG140
RDG160



RDG100T



1 Operating mode button / Esc
2 Button to enter the time and to set the timers
3 Fan mode button / OK
4 Rotary knob for setpoint and parameter adjustment

Button operation

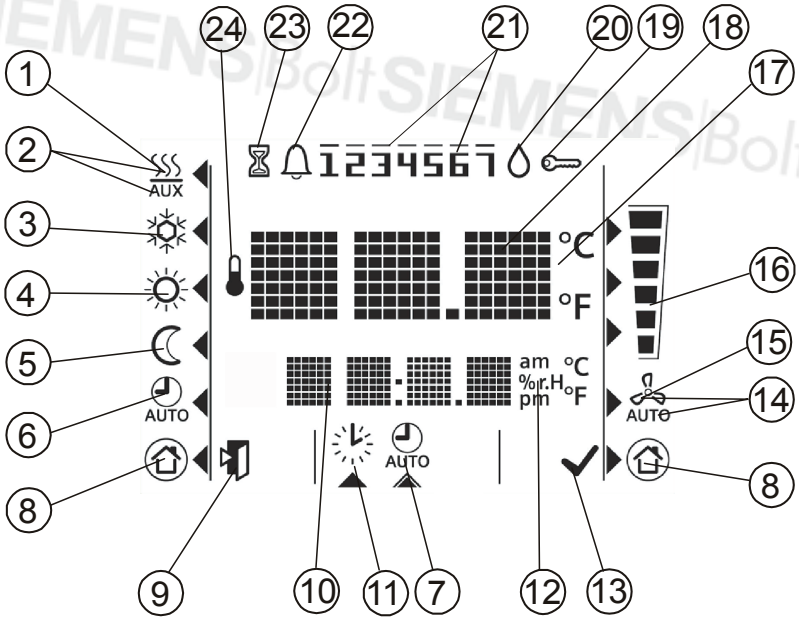
- When the thermostat is in normal operation, the actual operating mode and status are indicated by symbols
- When a button is pressed, the thermostat goes into mode selection. The backlit LCD will turn on, all possible mode selection options (symbols) will turn on, indicator element (arrow) will appear on the current mode/status
- When the button is pressed again, the indicator element will change to the next mode symbol and so on.
- After the last press and a timeout of 3 seconds, the newly selected mode is confirmed, the other elements disappear
- After a timeout of 20 seconds, the LCD backlight will turn off

User action	Effect, description
Press left button	Go into Operating mode selection
Press left button >3 seconds	Set thermostat to Protection mode
Keep left button depressed and turn rotary knob clockwise	Activate temporary timer "Extend presence" and set the time (for details, see page 18)
Keep left button depressed and turn rotary knob counterclockwise	Activate temporary timer "Extend absence" and set the time (for details, see page 18)
Press left button while "Operating mode switchover" is activated	Activate "Extend Comfort mode" (for details, see page 18)
Press right button >3 seconds	Activate / deactivate button lock
Press right button for fan coil unit	Change fan mode
Press right button for chilled ceiling (P52=0)	Set thermostat to Protection mode
Turn rotary knob	Adjust the room temperature setpoint
Press left and right button >3 seconds, release, then press right button >3 seconds	Go to parameter setting mode Service level”
Press left and right button for 3 seconds, release, press left button for 3 seconds, then turn rotary knob counterclockwise min. ½ rotation	Go to parameter setting mode Expert level, diagnostics and test

Only onRDG100T:

Press center button	Go to timer settings

LCD



#	Symbol	Description	#	Symbol	Description
1		Heating mode	14	AUTO	Automatic fan
2	AUX	Electrical heater active	15		Manual fan
3		Cooling mode	16		Fan speed: Fan speed 1
4		Comfort mode			Fan speed: Fan speed 2
5		Energy Saving mode			Fan speed: Fan speed 3
6	AUTO	Auto Timer mode	17	°C °F	Degrees Celsius Degrees Fahrenheit
7		View and set auto timer program			
8		Protection	18		Digits for room temperature and setpoint display
9		Escape	19		Button lock
10		Digits for time of day, room temperature, setpoint, etc.	20		Condensation in room (dewpoint sensor active)
11		Setting the time of day and the weekday	21	1234567	Weekday 1…7: 1 = Monday / 7 = Sunday
12	am pm	Morning: 12-hour format Afternoon: 12-hour format	22		Fault
			23		Temporary timer function (visible when operating mode is temporarily extended due to extended presence or absence)
13		Confirmation of parameters	24		Indicates that room temperature is displayed

5.3 Disposal

The device is classified as waste electronic equipment in terms of the European Directive 2002/96/EC (WEEE) and should not be disposed of as unsorted municipal waste.

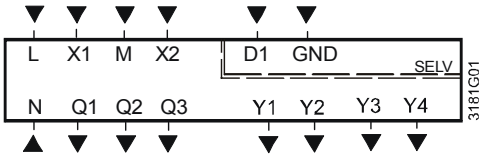
The relevant national legal rules must be adhered to.
Regarding disposal, use the systems setup for collecting electronic waste.

Observe all local and applicable laws.

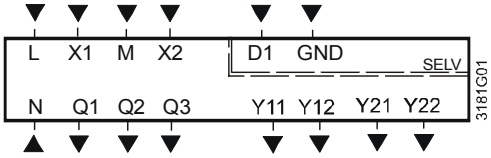
6 Engineering

6.1 Connection terminals

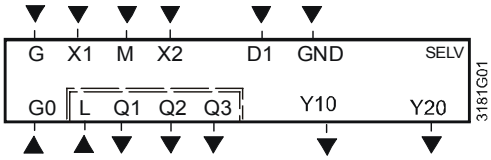
RDG100,
RDG100T



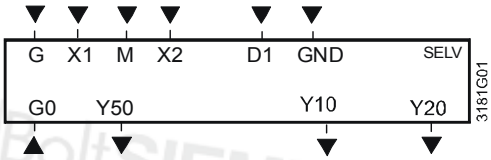
RDG110



RDG140



RDG160



L, N Operating voltage AC 230 V
G, G0 Operating voltage AC 24 V

X1, X2 Multifunctional input for temperature sensor (e.g. QAH11.1) or potential-free switch
Factory setting :
- X1 = external room temperature sensor
- X2 = sensor or switch for heating / cooling changeover

Change of setting: Parameters P38, P40

M Measuring neutral for sensor and switch

D1, GND Multifunctional input for potential-free switch.
Factory setting: Operating mode switchover contact
Change of setting: Parameter P42

Q1 Control output fan speed “low” AC 230 V
Q2 Control output fan speed “medium” AC 230 V
Q3 Control output fan speed “high” AC 230 V
Y50 Control output fan speed DC 0 … 10 V

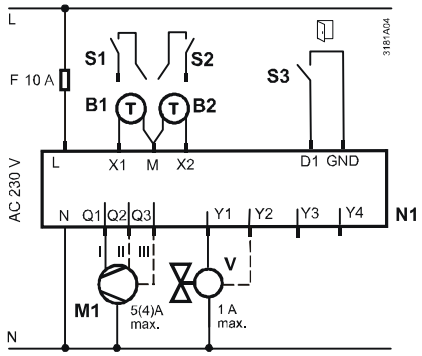
Y1…Y4 Control output “Valve” AC 230 V (NO, for normally closed valves), output for electrical heater via external relay
Y11, Y21 Control output “Valve” AC 230 V (NO, for normally closed valves), output for compressor or electrical heater
Y12, Y22 Control output “Valve” AC 230 V (NC, for normally open valves)
Y10, Y20 Control output for DC 0…10 V actuator

6.2 Connection diagrams

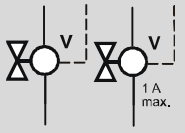
Note For details concerning connection of peripheral devices and setting of the DIP switches, please refer to the Mounting Instructions:
– M3181.1 (RDG100, RDG100T)
– M3181.2 (RDG110)
– M3181.3 (RDG140, RDG160)

RDG100…

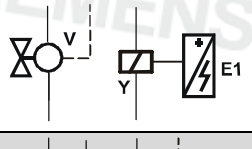
1- or 3-speed fan



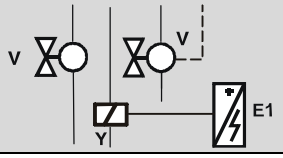
- 2-pipe



- 2-pipe & radiator
- 4-pipe
- 2-stage



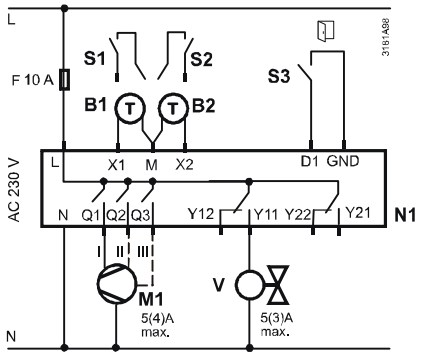
- 2-pipe & el. heater



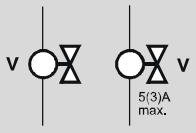
- 4-pipe & el. heater

RDG110

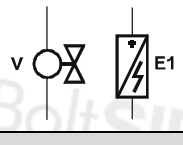
1- or 3-speed fan



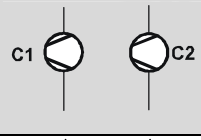
- 2-pipe



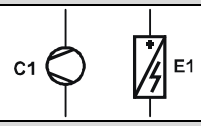
- 2-pipe & radiator
- 4-pipe
- 2-stage



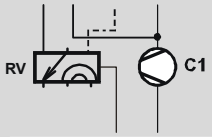
- 2-pipe & el. heater



- 1 and 2-stage compressor



- Compressor & el. heater



- Compressor & reversing valve

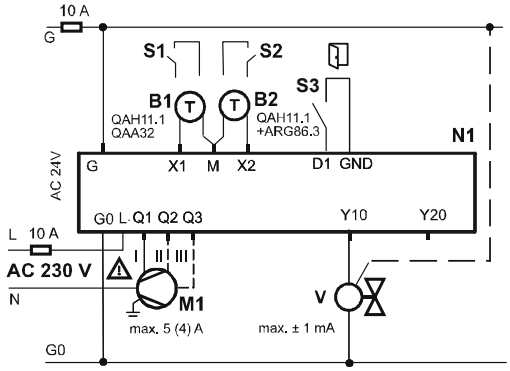
N1 Room thermostat RDG1…
M1 1- or 3-speed fan
V Valve actuators:
ON/OFF or PWM, 3-position, heating, cooling, radiator, heating / cooling, 1st or 2nd stage
E1 Electrical heater
C1, C2 Compressor

S1, S2 Switch (keycard, window contact, etc.)
S3 Switch at SELV input (keycard, window contact)
B1, B2 Temperature sensor (return air temperature, external room temperature, changeover sensor, floor temperature limit, etc.)
RV Reversing valve
Q Relay outputs
Y1...Y4 Triac outputs
Y11…Y22 Relay outputs

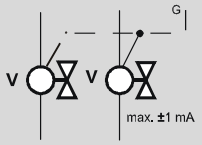
RDG140

1- or 3-speed fan

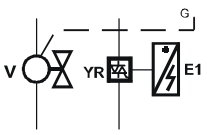
- 2-pipe



- 2-pipe & radiator
- 4-pipe
- 2-stage



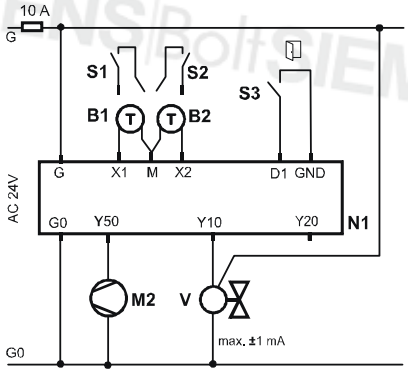
- 2-pipe & el. heater



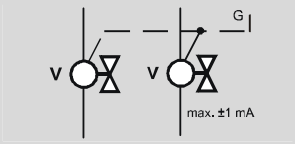
RDG160

EMC fan DC 0…10 V

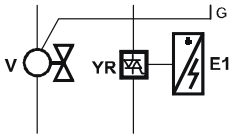
- 2-pipe



- 2-pipe & radiator
- 4-pipe
- 2-stage



- 2-pipe & el. heater



N1 Room thermostat RDG1…
M1 1- or 3-speed fan
M2 EMC fan DC 0…10 V
V Valve actuators DC 0…10 V:
Heating, cooling, radiator heating / cooling, 1st or 2nd stage
E1 Electrical heater
YR DC 0…10 V controlled converter / current valve

S1, S2 Switch (keycard, window contact, etc.)
S3 Switch at SELV input (keycard, window contact)
B1, B2 Temperature sensor (return air temperature, external room temperature, changeover sensor, floor temperature limit, etc.)
Q Relay outputs
Y DC 0…10 V outputs

7 Mechanical design

7.1 General

The room thermostat consists of 2 sections:

- Plastic housing which accommodates the electronics, the operating elements and the temperature sensor
- Mounting plate with the screw terminals

The housing engages in the mounting plate and is secured with 2 screws on the left side.

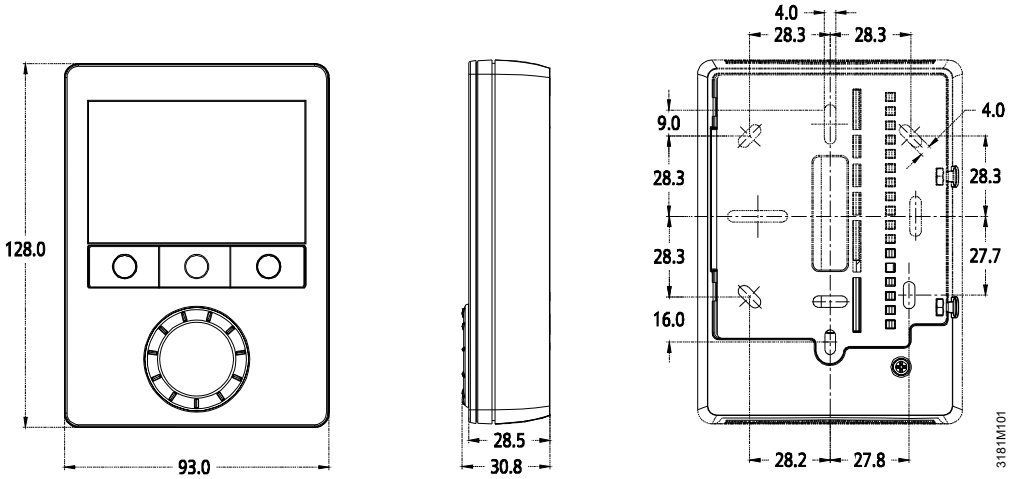
RDG100
RDG110
RDG140
RDG160

RDG100T

For operation, refer to section 5.2.

7.2 Dimensions

Dimensions in mm



8 Technical data

	RDG100, RDG100T, RDG110	RDG140, RDG160
⚠ Power supply		
Operating voltage	AC 230 V +10/-15%	SELV AC 24 V ±20%
Frequency	50/60 Hz	50/60 Hz
Power consumption	Max. 18 VA	Max. 2 VA
Outputs		
Fan control rating		
Q1, Q2, Q3-N	AC 230 V, max. 5(4) A	AC 230 V, max. 5(4) A (RDG140)
Y50 – G0		SELV DC 0…10 V, max. ± 1mA (RDG160)
Control outputs		
Y1, Y2, Y3, Y4-N	AC 230 V, max. 1 A (RDG100, RDG100T)	
Y11-N / /Y21-N (N.O.)	AC 230 V, max. 5(3) A (RDG110)	
Y10-G0 / Y20-G0		SELV DC 0…10 V
Resolution		39 mV
Current		Max. ±1 mA

		All types
Inputs		
Multifunctional inputs, digital input		
X1-M/X2-M		
Temperature sensor input		
Type		QAH11.1 (NTC)
Digital input		
Operating action		Selectable (NO/NC)
Contact sensing		DC 0…5 V, max. 5 mA
Insulation against mains		N/A, mains potential ⚠
D1-GND		
Operating action		Selectable (NO/NC)
Contact sensing		SELV DC 6…15 V, 3…6 mA
Insulation against mains		3.75 kV, reinforced insulation
Function input		Selectable
External temperature sensor, changeover sensor, operating mode switchover contact, dewpoint monitor contact, enable electrical heater contact, fault contact		
Switching differential, adjustable		
Heating mode	(P30)	2 K (0.5…6 K)
Cooling mode	(P31)	1 K (0.5…6 K)
Setpoint setting and setting range		
☼ Comfort mode	(P08)	21°C (5…40 °C)
☾ Energy Saving mode	(P11-P12)	15 °C/30 °C (OFF, 5…40 °C)
⌂ Protection	(P65-P66)	8 °C/OFF (OFF, 5…40 °C)
Multifunctional inputs X1 / X2, digital input D1		Selectable
Input X1		Ext. temperature sensor (P38 = 1)
Input X2		Changeover sensor (P40 = 2)
Input D1		Operating mode switchover (P42 = 3)

	Built-in room temperature sensor	
	Measuring range	0…49 °C
	Accuracy at 25 °C	< ± 0.5 K
	Temperature calibration range	± 3.0 K
	Settings and display resolution	
	Setpoints	0.5 °C
	Current temperature value displayed	0.5 °C
Environmental conditions	Operation	As per IEC 721-3-3
	Climatic conditions	Class 3K5
	Temperature	0…50 °C
	Humidity	<95% r.h.
	Transport	As per IEC 721-3-2
	Climatic conditions	Class 2K3
	Temperature	−25…60 °C
	Humidity	<95% r.h.
	Mechanical conditions	Class 2M2
	Storage	As per IEC 721-3-1
	Climatic conditions	Class 1K3
	Temperature	−25…60 °C
	Humidity	<95% r.h.
Standards	CE conformity	
	EMC directive	2004/108/EC
	Low-voltage directive	2006/95/EC
	N474 **C-tick** conformity to EMC emission standard	AS/NSZ 4251.1:1999
	RoHS 2002/95/EC Reduction of hazardous substances	2002/95/EC
	Product standards	
	Automatic electrical controls for household and similar use	As per EN 60730–1
	Special requirements for temperature-dependent controls	As per EN 60730–2-9
	Electronic control type	2.B (micro-disconnection on operation)
	Electromagnetic compatibility	
	Emissions	As per IEC/EN 61000-6-3
	Immunity	As per IEC/EN 61000-6-2
	Safety class	
	RDG100… / RDG110, RDG140	II as per EN 60730
	RDG160	III as per EN 60730
	Pollution class	Normal
	Degree of protection of housing	IP30 as per EN 60529
General	Connection terminals	Solid wires or prepared stranded wires 1 x 0.4…2.5 mm^2 or 2 x 0.4…1.5 mm^2
	Housing front color	RAL 9003 white
	Weight RDG100… / RDG110 / RDG140	0.30 kg
	RDG160	0.25 kg

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Siemens Switzerland Ltd
Building Technologies Division
International Headquarters
Gubelstrasse 22
CH-6301 Zug
Tel. +41 41-724 24 24
Fax +41 41-724 35 22
www.buildingtechnologies.siemens.com