SIEMENS

Room thermostats with KNX communications RDG100KN, RDG160KN, RDG165KN

Basic Documentation

Edition: 7.0

CE1P3191en
2018-07-03

Building Technologies

Content

1. About this document

1.1 Revision history

Edition	Date	Changes	Section	Pages
7.0	2018-07-03	RDG160KN SW version ≥ V2.04, Index J • Master / Slave function in KNX S-Mode • 4-pipe application with PICV and 6-port ball valve • Communication interface with 5 mA KNX bus load • Flow limitation in heating mode for PICV combi valve • Fix dead links • Update the graphic of flow limitation function • Update graphic of PICV with 6-port ball valve • Add 6-port ball valve, flow limitation and master/slave into Index	Various Various 3.5, 3.6.6.1, 3.6.9.2 6.2 Index	
6.0	2017-03-30	• Reduce file size by compressing some big images' size	Various	
5.0	2016-07-26	• Add 6-port ball valve and PICV valve applications for RDG160KN • Remove all separations on wiring diagrams	Various 6.3	
4.0	2015-06-16	• New features for new product RDG165KN: humidity control, relay functions, swap functions, fan in the 2nd stage, presence detector and window contact	Various	
3.2	March 2014	• 2-position → On/Off (only partially) • Update Equipment Combination • Protection via circuit breaker • Add eu.bac certification • Update section Standards and Directives • Update C-tick	Various 2.4 4.1, 6.2, 8 8 8 8	
3.2	Sept 2013	• DC 0…10 V actuators • Various corrections	2.4 Various	
3.1	March 2013	• Various corrections	Various	
3.0	January 2013	• Amendments for RDG160KN • Various corrections	Various	
2.0	June 2011	• Amendments for new Software V1.20 • Various corrections	Various	
1.0	07 Jun 2010	First edition		

1.2 Reference documents

Subject	Ref	Doc No.	Description
Room thermostats with KNX communications, RDG1..KN	[1]	CE1N3191	Data Sheet
	[2]	CE1B3191	Operating Instructions
	[3]	CE1M3191	Mounting Instructions RDG100KN
	[18]	CE1M3191.1	Mounting Instructions RDG16..KN
	[19]	CE1M3191.2	Parameter List RDG165KN
KNX Manual	[4]	Handbook for Home and Building Control – Basic Principles (http://www.knx.org/knx-en/training/books-documentation/knx-association-books/index.php)	
Synco and KNX (see www.siemens.com/synco)	[5]	CE1N3127	KNX bus, Data Sheet
	[6]	CE1P3127	Communication via the KNX bus for Synco 700, 900 and RXB/RXL, Basic Documentation
	[7]	XLS template in HIT	Planning and commissioning protocol, communication Synco 700
	[8]	CE1N3122	RMB795B central control unit, Data Sheet
	[20]	CE1P3122	RMB795B central control unit, Basic Documentation

Subject	Ref	Doc No.	Description
	[21]	CE1P3113	RMZ792-B bus operator unit, Basic Documentation
	[9]	CE1Y3110	KNX S-Mode data points
	[10]	--	Product data for ETS
	[11]	CE1J3110	ETS product data compatibility list
	[12]	0-92168en	Synco Application Manual
Desigo engineering documents	[13]	CM1Y9775	Desigo RXB integration – S-Mode
	[14]	CM1Y9776	Desigo RXB/RXL integration – Individual Addressing
	[15]	CM1Y9777	Third-party integration
	[16]	CM1Y9778	Synco integration
	[17]	CM1Y9779	Working with ETS
Web server OZW772	[22]	CE1C5701	Commissioning Instructions

1.3 Before you start

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1.4 Target audience, prerequisites

This document assumes that users of the RDG1..KN room thermostats are familiar with the ETS and/or Synco ACS tools and can use them.

It is also assumed that these users are aware of the specific conditions associated with KNX.

In most countries, specific KNX know-how is conveyed through training centers certified by the KNX Association (see www.knx.org/).

For reference documentation, see 1.2.

1.5 Glossary

The inputs, outputs and parameters of an application can be influenced in various ways. These are identified by the following symbols in this document:

ETS

Parameters identified by this symbol are set using ETS.


ACS

Parameters identified by this symbol are set using ACS.

Note!

Setting RDG.. KNX parameters is only supported by the following tool versions:
– ETS4 or higher versions
– ACS version 5.11 (for RDG1..0KN) and version 8.32 or higher (for RDG165KN)

Inputs and outputs identified by this symbol communicate with other KNX devices. They are called communication objects (CO).

The communication objects of the RDG1..KN works partly in S-Mode, partly in LTE-Mode, and partly in both. These objects are described accordingly.

A list of the parameters is shown in 3.14.

2. Summary

2.1 Types

Product no.	Stock no.	Features							
		Operating voltage	Number of control outputs				Fan		Humidity	Backlit LCD
			On/Off	PWM	3-pos.	DC	3-speed	DC		
RDG100KN	S55770-T163	AC 230 V	3 [1]	2 [1]	2 [1]		✓			✓
RDG160KN	S55770-T297	AC 24 V	2 [2]			2 [2]		✓		✓
						2	✓[3]			
RDG165KN	S55770-T347	AC 24 V	2 [2]			2 [2]		✓	✓	✓
						2	✓[3]		✓ [4]	

[1] Selectable: On/Off, PWM or 3-position (triac outputs)

[2] On/Off or DC control signal

[3] 3-speed fan selectable only via DC control outputs

[4] Release contact dehumidifier via external DC – On/Off converter

2.2 Functions

Use

Fan coil units via On/Off or modulating/DC control outputs:
- 2-pipe system
- 2-pipe system with electric heater
- 2-pipe system and radiator/floor heating
- 4-pipe system
- 4-pipe system with electric heater (RDG100KN)
- 2-stage heating or cooling system
- 4-pipe system with combi valve (PICV) and a 6-port ball valve as changeover (RDG160KN SW version ≥ V2.04, Index J)

Chilled/heated ceilings (or radiators) via On/Off or modulating/DC control outputs:
- Chilled/heated ceiling
- Chilled/heated ceiling with electric heater
- Chilled/heated ceiling and radiator/floor heating
- Chilled ceiling and radiator/floor heating
- Chilled/heated ceiling, 2-stage cooling or heating
- Chilled/heated ceiling with 6-port ball valve (RDG160KN version ≥ V1.14)
- Chilled/heated ceiling with PICV valve and a 6-port ball valve as changeover (RDG160KN version ≥ V1.14)

Compressor applications via On/Off control outputs (RDG16..KN):
- Heating or cooling, compressors in DX-type equipment
- Heating or cooling, compressors in DX-type equipment with electric heater
- Heating and cooling, compressors in DX-type equipment
- 2-stage heating or cooling, compressors in DX-type equipment

The room thermostats are delivered with a fixed set of applications.
The relevant application is selected and activated during commissioning using one of the following tools:
- Synco ACS
- ETS
- Local DIP switch and HMI

Features
- Operating modes: Comfort, Economy and Protection
- Automatic or manual heating/cooling changeover

- Backlit display

RDG100KN:
- On/Off, PWM or 3-position control outputs (triacs)
- Control output for 3-speed or 1-speed fan
- AC 230 V operating voltage

RDG16..KN:
- DC 0...10 V or On/Off control outputs for actuators
- DC 0...10 V or relay outputs for fan (ECM, 1-speed or 3-speed)
- AC 24 V operating voltage

RDG165KN:
- Built-in humidity sensor and humidity control

Functions

- Room temperature control via built-in temperature sensor or external room temperature/return air temperature sensor
- Minimum/maximum humidity control by shifting temperature setpoint and releasing contact for dehumidifier/humidifier (RDG165KN)
- Changeover between heating and cooling mode (automatic via local sensor or bus, or manually)
- Selection of applications via DIP switches or commissioning tool (ACS, ETS)
- Parameters download with commissioning tool (ACS, ETS)
- Selection of operating modes via operating mode button
- Temporary Comfort mode extension
- 1-speed, 3-speed or DC 0...10 V fan control (automatically or manually)
- Display of current room temperature or setpoint in °C or °F
- Minimum and maximum limitation of room temperature setpoint
- Button lock (automatically or manually)
- 3 multifunctional inputs, selectable for:
  - Operating mode switchover contact (keycard, window contact, etc.)
  - Window contact switches operating mode to Protection (RDG16..KN)
  - Presence detector switches operating mode to Comfort (RDG16..KN)
  - Sensor for automatic heating/cooling changeover
  - External room temperature or return air temperature sensor
  - Dewpoint sensor
  - Electric heater enable
  - Fault input
  - Monitor input for temperature sensor or switch state
  - Supply air temperature sensor (RDG16..KN)
- Advanced fan control function, e.g. fan kick, fan start delay, selectable fan operation (enable, disable or depending on heating/cooling mode)
- Purge function together with 2-port valve
- Reminder to clean fan filters (P62)
- Floor heating temperature limitation
- Minimum and maximum supply air temperature limitation (RDG16..KN)
- Interworking with AQR and QMX sensor for room humidity and room temperature measurement (RDG165KN)
- Interworking with QMX room operator units for room humidity, room temperature and operating commands for fan, operating mode and setpoints (RDG165KN)
- Swap function for 2-pipe and 2-stage application by switching the 1st stage heating to the 2nd stage cooling (RDG165KN)
- Enabling fan output only in the 2nd stage (RDG165KN)
- Control 6-port ball valve for chilled and heated ceiling, DC 0…10V, DC 2…10 V and inverted signals DC 10…0V, DC 10…2 V (RDG160KN)

- Control 6-port ball valve as changeover (on/off – open/close signal) and combi valve (PICV) DC 0…10V for
  - Chilled and heated ceiling application (RDG160KN)
  - Fan coil application (RDG160KN SW version ≥ 2.04)
- Control of 6-port ball valve via KNX S-Mode objects (RDG160KN)
- Flow limitation function for combi valve (PICV) in heating mode (RDG160KN SW version ≥ 2.04)
- Selectable relay functions (RDG16..KN):
  - Switching off external equipment during Protection mode
  - Switching on external equipment (e.g. pump) during heating/cooling mode
  - Output status heating/cooling sequence
  - Dehumidification/humidification control output (RDG165KN)
- Reloading factory settings for commissioning and control parameters
- KNX bus (terminals CE+ and CE-) for communication with Synco or KNX compatible devices
- Display of outside temperature or time of day via KNX bus
- Time scheduling and central control of setpoints via KNX bus
- Control of Economy setpoints via KNX bus (RDG16..KN)
- Energy supply optimization via energy demand signal with a Synco RMB795B central control unit

2.3 Integration via KNX bus

The RDG.. room thermostats can be integrated as follows:

- Integration into Synco 700 system via LTE-Mode (easy engineering)
- Integration into Synco living via group addressing (ETS)
- Integration into Desigo via group addressing (ETS) or individual addressing
- Integration into third-party systems via group addressing (ETS)

The following KNX functions are available:

- Central time program and setpoints, e.g. when using the RMB795B central control unit
- Outside temperature or time of day via bus displayed on thermostat
- Remote operation and monitoring, e.g. using the RMZ792-B bus operator unit
- Remote operation and monitoring with web browser using the OZW772 web server
- Maximum energy efficiency due to exchange of relevant energy information, e.g. with Synco 700 controllers (e.g. heating demand, cooling demand)
- Alarming, e.g. external fault contact, condensation, clean filter, etc.
- Monitoring input for temperature sensor or switch

Engineering and commissioning can be done by using…

– local DIP switches/HMI
– Synco ACS
– ETS

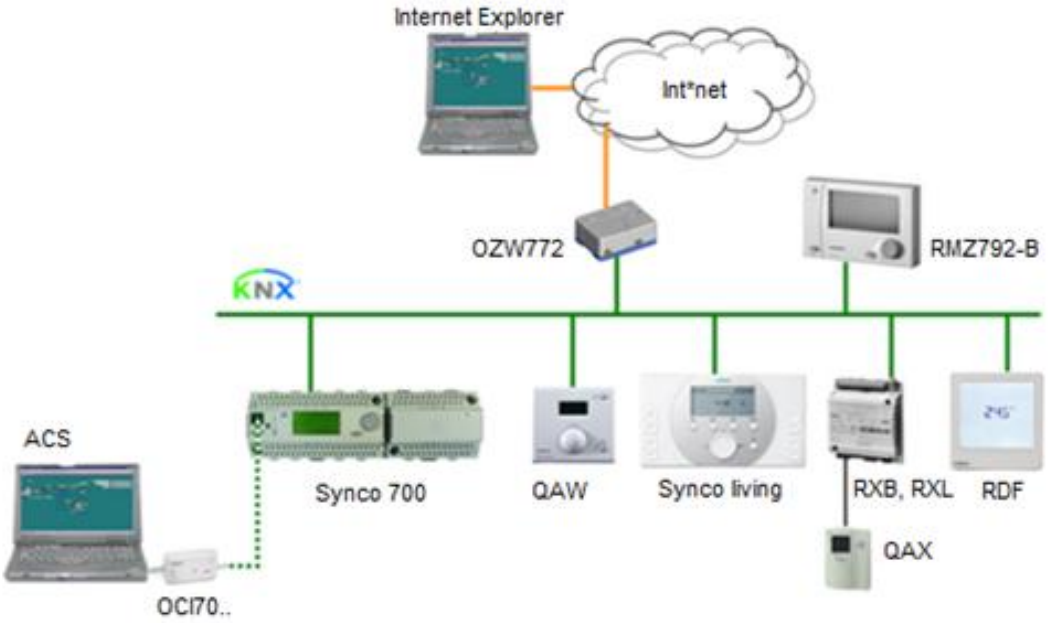
Synco 700

The RDG.. room thermostats are especially tailored for integration into the Synco 700 system and operate together in LTE-Mode. This extends the field of use of Synco for individual room control in conjunction with fan coil units, VAV, chilled ceilings and radiators.

Synco living

The S-Mode extension of the QAX9x3 central apartment unit enables the communicating room thermostats to be integrated into Synco living systems. Using the S-Mode data points of the central apartment unit, additional room information can be exchanged with the room thermostat via KNX TP1 (RF function is not available on the room thermostats). The ETS engineering tool is required for integration.

Synco topology



Legend:		
	Synco 700	Building automation and control system (BACS)
	Synco living	Room automation and control system
	RDG.., RDF.., RDU..	Room thermostats
	OZW772	Web server
	RMZ792-B	Bus operator unit
	QAW..	Room unit
	ACS790	Engineering and Service tool
	OCI700, OCI702	Interface for ACS
	RXB, RXL	Room controllers
	QAX	Room unit for RXB/RXL room controllers

Desigo and third-party systems

The RDG.. KNX thermostats can be integrated into the Siemens building automation and control systems (BACS) Desigo/Apogee or into third-party systems. Either S-Mode (group addressing) or individual addressing can be used for integration.

2.4 Equipment combinations

	Description	Product no.	Data Sheet*)
	Cable temperature or changeover sensor, cable length 2.5 m NTC (3 kΩ at 25 °C) 	**QAH11.1**	1840
	Room temperature sensor NTC (3 kΩ at 25 °C) 	**QAA32**	1747
	Condensation monitor 	**QXA21**	A6V107 41072
	Flush-mount KNX room sensor (Base and front module) 	**AQR2570N.. AQR2532NNW AQR2533NNW AQR2535NNW**	1411
	Wall-mounted KNX sensors 	**QMX3.P30 QMX3.P70**	1602
On/Off actuators	Electromotoric On/Off actuator 	**SFA21..**	4863
	Electromotoric On/Off actuator 	**SFP21..**	4865
	Electromotoric On/Off valve and actuator (only available in AP, UAE, SA and IN) 	**MVI../MXI..**	A6V1125 1892
	Zone valve actuator (only available in AP, UAE, SA and IN) 	**SUA..**	4832
On/Off and PWM actuators [1)]	Thermal actuator (for radiator valves) AC 230 V, NO 	**STA23..** [1)]	4884
	Thermal actuator (for radiator valves) AC 24 V, NO 	**STA73..** [1)]	4884
	Thermal actuator AC 230 V (for small valves 2.5 mm), NC 	**STP23..** [1)]	4884
	Thermal actuator AC 24 V (for small valves 2.5 mm), NC 	**STP73..** [1)]	4884
3-position actuators	Electrical actuator, 3-position (for radiator valves) 	**SSA31..**	4893
	Electrical actuator, 3-position (for 2- and 3-port valves/V…P45) 	**SSC31**	4895
	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 small valve 5 mm) 	**SSD31..**	4861
	Electrical actuator, 3-position (for valves 5.5 mm) 	**SAS31..**	4581
	Rotary actuators for ball valves 3-position 	**GDB331.9E**	4657

DC 0…10 V actuators

Electrical actuator, DC 0...10 V (for radiator and PICV 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) 	**SAS61..**	4581
Electrothermal actuator, AC 24 V, NC, DC 0…10 V, 1 m 	**STA63**	4884
Electrothermal actuator, AC 24 V, NO, DC 0…10 V, 1 m 	**STP63**	4884
Rotary actuators for ball valves AC 24 V, DC 0…10 V 	**GDB161.9E**	4657
Rotary actuators for ball valves KNX S-Mode 	**GDB111.9E/KN**	A6V10725318

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

[1] With PWM control, it is not possible to ensure exact parallel running of 2 or more thermal actuators. If several fan coil systems are controlled by the same thermostat, preference should be given to motorized actuators with On/Off or 3-position control

Note For more information about parallel operation and the maximum number of actuators that can be used, refer to the Data Sheets of the selected type of actuator and the following list:

Maximum number of actuators in parallel on the RDG100KN:
- 6 SS..31.. actuators (3-position)
- 4 ST..23.. if used with On/Off control signal
- 10 SFA.., SUA.., MVI.., MXI.. On/Off actuators
- Parallel operation of SAS31 is not available

Maximum number of actuators in parallel on the RDG16..KN:
- 10 SS..61.. actuators (DC)
- 10 ST..23/63/73.. actuators (DC or On/Off)
- 10 SFA.., SUA.., MVI.., MXI.. On/Off actuators
- 10 SAS61.. actuators (DC)
- 10 GDB161.9E

2.5 Accessories

Description	Product/stock no.	Data Sheet
KNX power supply 160 mA (Siemens BT LV)	**5WG1 125-1AB02**	--
KNX power supply 320 mA (Siemens BT LV)	**5WG1 125-1AB12**	--
KNX power supply 640 mA (Siemens BT LV)	**5WG1 125-1AB22**	--

3. Functions

3.1 Temperature control

General note: Parameters

Setting of the control parameters (P01, etc., mentioned throughout the document) is described in 3.14.

Temperature control

The thermostat acquires the room temperature via built-in sensor, external room temperature sensor (QAA32), external return air temperature sensor (QAH11.1) or via KNX (RDG165KN, via S-Mode or LTE-Mode), and maintains the setpoint by delivering actuator control commands to heating and/or cooling equipment. The following control outputs are available:

- On/Off control (2-position)
- Modulating PI/P control with PWM output
- Modulating PI/P control with 3-position control output
- Modulating PI/P control with DC 0...10 V control output

The switching differential or proportional band is 2 K for heating mode and 1 K for cooling mode (P30 and P31).
The integral action time for modulating PI control is adjustable via P35 (factory setting: 5 minutes on RDG100KN/45 minutes on RDG16..KN).

Display

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

KNX
Room temperature

The acquired room temperature (internal or external sensor) is available as information on the bus.
The RDG165KN can also acquire the room temperature via KNX.

/

- With automatic changeover or continuous heating/cooling, symbols / indicate that the system currently heats or cools (heating or cooling output is activated)
- With manual changeover (P01 = 2), symbols / indicate that the system currently operates in heating or cooling mode. Thus, the symbols are displayed even when the thermostat operates in the neutral zone. Symbols / indicate that the system is currently heating or cooling (the heating or cooling output is activated)

Concurrent display of °C and °F

Concurrent display of the current room temperature setpoint or current room temperature in °C and °F is available (P07 = 1).

KNX
Outside temperature via bus

The outside temperature displays on the thermostat (P07 = 2). This temperature value has only informational character.
In LTE-Mode, the outside temperature can only be received on outside temperature zone 31.
In S-Mode, the corresponding communication object must be bound to a KNX sensor device.

KNX
Time of day via bus

Time of day via bus displays on the thermostat (P07 = 3 or 4). The display format is either in 12- or 24-hour format.
The information can be received from a Synco controller with time master functionality or any other KNX device if the corresponding communication object is bound.

Note

When an application program is downloaded to the Synco devices via ETS, the correct group addresses must also be downloaded in order to display the time of day on the thermostat (see Synco Knowledge Base - KB771).

3.2 Operating modes

The thermostat's operating mode can be influenced in different ways (see below). Specific heating and cooling setpoints are assigned to each operating mode.

Room operating mode: State

The thermostat sends the current room operating mode via bus.

The following operating modes are available:

Auto

In Auto mode, the operating mode is commanded via bus.
Auto is replaced by Comfort when no time schedule via bus is present.

Comfort

In Comfort mode, the thermostat maintains the Comfort setpoint. This setpoint can be defined via P8, P9 and P10. It can be locally adjusted via the rotary knob or via bus.
In Comfort mode, the fan can be set to automatic or manual fan speed: Low, medium or high.

Presence detector (RDG16..KN)

The thermostat switches to Comfort mode when the presence detector (local or via KNX) is active (room is occupied). *)

Economy

The setpoints (more energy savings than in Comfort mode) can be defined via P11 and P12.
The thermostat switches to Economy mode when...
- the operating mode button is pressed (only possible if P02 is set to 2),
- Economy is sent via bus,
- an operating mode switchover contact on RDG100KN (e.g. keycard contact presence detector, window contact) is active,
  "Window state" is sent to RDG100KN via bus, e.g. from a KNX switch or a KNX presence detector (P02 is irrelevant). *)

Room operating mode: Window state (RDG100KN)

Protection

In Protection mode, the system is...
- protected against frost (factory setting: 8 °C, configurable via P65)
- protected against overheating (factory setting: OFF, configurable via P66)

No other operating mode can be selected locally if Protection mode is commanded from time schedule via bus (e.g. from a central control unit RMB795B). and are displayed.

Room operating mode: Window state (RDG16..KN)

The thermostat switches to Protection mode when...
- the operating mode button is pressed
- Protection is sent via bus
- the window contact on RDG16..KN is active (open window)
- "Window state" is sent to the RDG16..KN via bus, e.g. from a KNX switch *)

Note

*) For details regarding the operating mode switchover contact (RDG1..0KN), window contact (RDG16..KN) and presence detector (RDG16..KN), see 3.2.1.

3.2.1 Different ways to influence the operating mode

Source for change of operating mode

ACS

Different interventions can influence the operating mode.
The source of the actual room operating mode state can be monitored using the "Cause" diagnostic data point in the ACS tool, operator unit RMZ792-B or web server OZW772.

Source	Description	Value of data point "Cause"
Local operation via left button	• Operating mode is not Auto • No time schedule via bus	Room operating mode selector (preselection)
	• Temporary Comfort extension is active	Timer function
	• Operating mode switchover contact (RDG100KN)	Room operating mode contact
	• Window contact (RDG16..KN)	Window switch
	• Presence detector (RDG16..KN)	Presence detector
Bus command KNX Room op. mode	• "Window state" sent via bus (RDG100KN)	Room operating mode contact
	• "Window state" sent via bus (RDG16..KN)	Window switch
	• "Presence detector" sent via bus (RDG16..KN)	Presence detector
	• Time schedule available via bus → local operating mode is set to Auto • Time schedule sends Protection mode via bus → operating mode cannot be changed locally	Time switch

Priority of operating mode interventions

The following table shows the priorities of different interventions.
A lower number means a higher priority.

Priority	Description	Remark
①	Commissioning	In parameter setting mode, you can always command an operating mode independent of all other settings or intervention via bus and local input.
②	Protection mode via bus from time schedule	Protection mode, sent by a time schedule, cannot be overridden by the user nor by an operating mode switchover contact.
③	Operating mode switchover contact (RDG100KN)	If the contact is closed, the operating mode changes to Economy. This overrides the operating mode on the thermostat.
③	Window contact (RDG16..KN)	If the contact is closed, the operating mode changes to Protection. This overrides the operating mode on the thermostat.
③	"Window state" via bus	"Window state" sent via bus has the same effect as the local operating mode switchover contact (RDG100KN) or local window contact (RDG16..KN). **Note:** Only one input source must be used, either local input X1/X2/D1or KNX bus.
④	Presence detector (RDG16..KN)	If the contact is closed (room occupied), the operating mode changes to Comfort. This overrides the operating mode on the thermostat. Open the contact (room unoccupied) will set the thermostat back to the previous operating mode.
④	Presence detector via bus (RDG16..KN)	"Presence detector" sent via bus has the same effect as the local presence detector. **Note:** Only one input source must be used, either local input X1/X2/D1or KNX bus.
④	Operating mode button	The user can switch the operating mode using the operating mode button.
④	Operating mode via bus	The operating mode can be changed via bus.

Priority	Description	Remark
④	Temporary extended Comfort mode via operating mode button	The operating mode can be temporarily set from Economy to Comfort by pressing the operating mode button, if... – Economy was sent via bus – extended Comfort period >0 (P68) **Note:** The last option selected is always used, either locally or using bus.
④	Time schedule via bus	The operating mode sent via bus can be overridden by all other interventions. Exception: Protection mode has priority 2. **Note:** If the time schedule switches from Comfort to Economy, but the presence detector is still active (room occupied), the thermostat continues to work in Comfort mode for the period of occupancy.

Auto mode with time schedule via bus

If a time schedule via bus is present, e.g. from central control unit, then the Auto mode is active. The thermostat automatically changes between Comfort and Economy according to the time schedule via bus.
The display shows the Auto mode symbol along with the symbol for the actual room operating mode (Comfort or Economy).
By pressing the operating mode button, you can change to another operating mode.
Automatic fan is the default fan speed in Auto mode.

Behavior when bus sends new operating mode

Each time the time schedule sends a new operating mode (switching event), the operating mode of the thermostat is set back to Auto mode. This ensures that the room temperature is maintained according to the time schedule.

Precomfort via bus

If the time schedule sends Precomfort mode, then this mode is transformed either to Economy (factory setting) or Comfort (selectable via P88).

Behavior when bus sends Protection

No intervention is possible neither by the user nor by an operating mode switch-over contact, if Protection mode is set by the time schedule. OFF flashes on the display when the user presses a button.

Availability of Economy mode

The operating mode can be selected locally via the operating mode button.
The behavior of the operating mode button (user profile) can be defined via P02, factory setting is P02 = 1.

P02	Without time schedule	With time schedule via bus	Description
1	→	→	• Switching manually between **2** modes, Economy is not available (factory setting) • Suited for hotel guest rooms or commercial buildings • If a time schedule via bus is available, then the Comfort mode can be temporarily extended (see below)
2	→ →	→ → →	• Switching manually between **3** modes • Suited for homes and rooms where manual switching to Economy mode is desired

Operating mode switchover contact (RDG100KN)

The thermostat is forced to Economy mode when …

- a window is open
- a presence detector signals "no one present"
- the keycard of a hotel room is withdrawn, etc.

The contact can be connected to digital input D1 or multifunctional input X1, X2. Set P38, P40 or P42 to 3. P02 is not relevant. User operations are ineffective and **OFF** displays if the operating mode switchover contact is active.

Window contact (RDG16..KN)

The thermostat is forced into Protection mode when the window is open. The contact can be connected to multifunctional input X1, X2 or digital input D1. Set P38, P40 or P42 to 3. User operations are ineffective and **OFF** displays if the window contact is active.

Room operating mode: Window state

The function operating mode switchover (window contact) is also available via the KNX signal "Window state", e.g. from a KNX switch or a KNX presence detector.

Notes

- Only one input source must be used, either local input X1/X2/D1or KNX bus. User operations are ineffective and OFF displays if the operating mode switchover (window contact) is active, or if "Window state" is sent via bus.
- When RDG160KN is set as slave, the window state (as Transmit) is sent to the master and the operating mode of all slaves will be changed accordingly, as long as at least one window contact is open

Presence detector (RDG16..KN)

The operating mode can be changed to Comfort or Economy mode based on the room occupancy (room occupied or unoccupied, via presence detector or keycard).

Time schedule via bus	Presence detector behavior
Comfort mode	• Whenever the presence detector is activated or deactivated, the operating mode remains in Comfort
Economy mode	• Whenever the presence detector is activated, the operating mode goes to Comfort • Whenever the presence detector is deactivated, the operating mode goes to Economy (with auto mode)
Protection mode	• Presence detector has no influence on the operating mode
Not available	• Whenever the presence detector is activated, the operating mode goes to Comfort • Whenever the presence detector is deactivated, the operating mode goes to Economy

Notes

- When the time-switch changes to Economy but the presence detector is still active, the operating mode remains in Comfort mode until the presence detector becomes inactive
- The contact (e.g. a card reader) can be connected to multifunctional input X1, X2 or digital input D1 (set P38, P40 or P42 to 10) or the occupancy is sent via bus from a KNX presence detector (only one input source must be used, either local input X1/X2/D1 or KNX bus)

Temporary timer to extend Comfort mode

Comfort mode can be temporarily extended (e.g. working after business hours or on weekends) when the thermostat is in Economy mode.

1. Press the operating mode button to switch the operating mode back to Comfort for the period preset (P68).
2. Press the operating mode button again to stop the timer.

The following conditions must be fulfilled:

- The operating mode switchover contact is closed (connected to input X1, X2, D1; P38, P40, P42 set to 3 or a KNX switch, KNX presence detector, etc. via bus)
  or
  mode selection via operating mode button is set to "Protection-Auto" (P02 = 1) and the time schedule via bus is Economy
- P68 (extend Comfort period) is greater than 0

During the temporary Comfort mode extension, the symbol displays.

When P68 (extend Comfort period) equals 0, extended Comfort cannot be activated; pressing the left button will switch the thermostat to Protection.
If the operating mode switchover contact is active, press the left button and **OFF** will display (blinking).

Timer to extend presence/absence (RDG1..0KN)

The actual room operating mode can be forced temporarily into Comfort or Economy/Protection mode. The time period is adjusted via the rotary knob:

- Extend presence: Set the thermostat to Comfort mode for the selected time period
- Extend absence: Set the thermostat to Economy/Protection mode for the selected time period

To activate the function, press and hold the left button 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; the symbol appears
- Extend absence: 0:00…–9:30 in steps of 30 minutes; the symbol or appears

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

Function if no time schedule is received via bus

User profile for operating mode (selected via P02)	**Operating mode when activating function**	**Function**	**Operating mode during function**	**Operating mode at the end of function**
P02 = 1: ☼ ⌂	Comfort	Extension	Comfort	Protection
	Comfort	Absence	Protection	Comfort
P02 = 2: ☼ ☾ ⌂	Comfort or Economy	Extension	Comfort	Economy
	Comfort or Economy	Absence	Economy	Comfort

Note Extension/absence functions not available in protection mode.

Function with time schedule via bus

User profile for operating mode (selected via P02)	**Operating mode when activating function**	**Function**	**Operating mode during function**	**Operating mode at the end of function**
P02 = 1: Auto ☼ ⌂	Auto or Comfort	Extension	Comfort	Auto
	Auto or Comfort	Absence	Protection	Auto
P02 = 2 → Auto ☼ ☾ ⌂	Auto, Comfort or Economy	Extension	Comfort	Auto
	Auto, Comfort or Economy	Absence	Economy	Auto

Note Extension/absence function is not available in Protection mode.

3.2.2 Communication examples

The following examples show 3 typical applications for a central time schedule in conjunction with local control of the room operating mode.
The room operating mode in rooms 1…3 of a building is determined by the time schedule. Window contacts are fitted in all rooms.

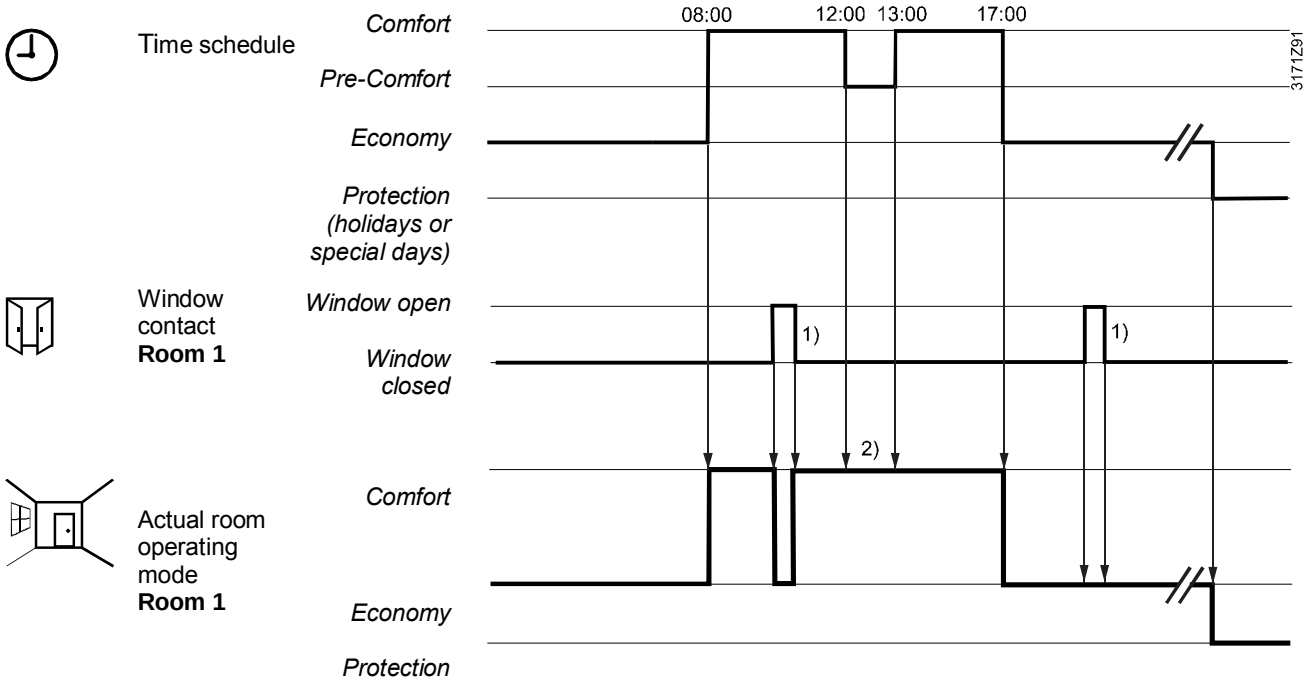
The following conditions are specified:

The rooms are used and controlled by the time schedule as follows:
– Night setback from 17:00 to 08:00 (Economy)
– Lunch break from 12:00 to 13:00 (Precomfort)

The substitution (P88) for Precomfort via bus is set on the thermostats as follows:
– Room 1: Comfort (1)
– Room 2: Economy (0)

Example 1 (RDG100KN) **Operating mode switchover**

In **room 1,** the window is opened briefly, once in the morning and once in the late afternoon (1). Only the opening in the morning has a direct impact on the actual room operating mode.
During lunch break (2), the time schedule changes to Precomfort. The mode remains in Comfort as set by parameter "Transformation Precomfort" (P88 = 1).

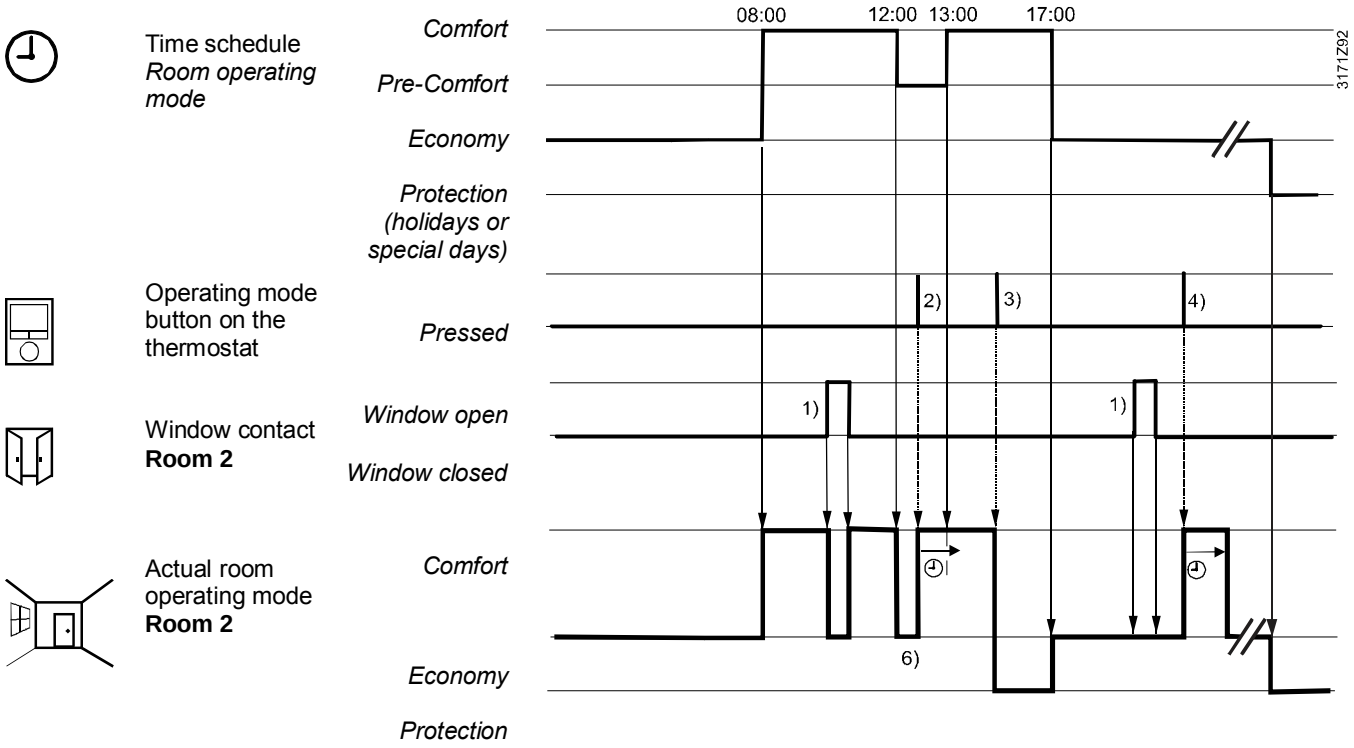


Example 2 (RDG100KN) **Interaction of user operation (operating mode button) and central time schedule**

In **room 2,** the window is opened briefly, once in the morning and once in the late afternoon (1).
Only the opening in the morning has a direct impact on the actual room operating mode.

With the operating mode button, the operating mode can be changed between OFF and Auto or to temporary Comfort extension.

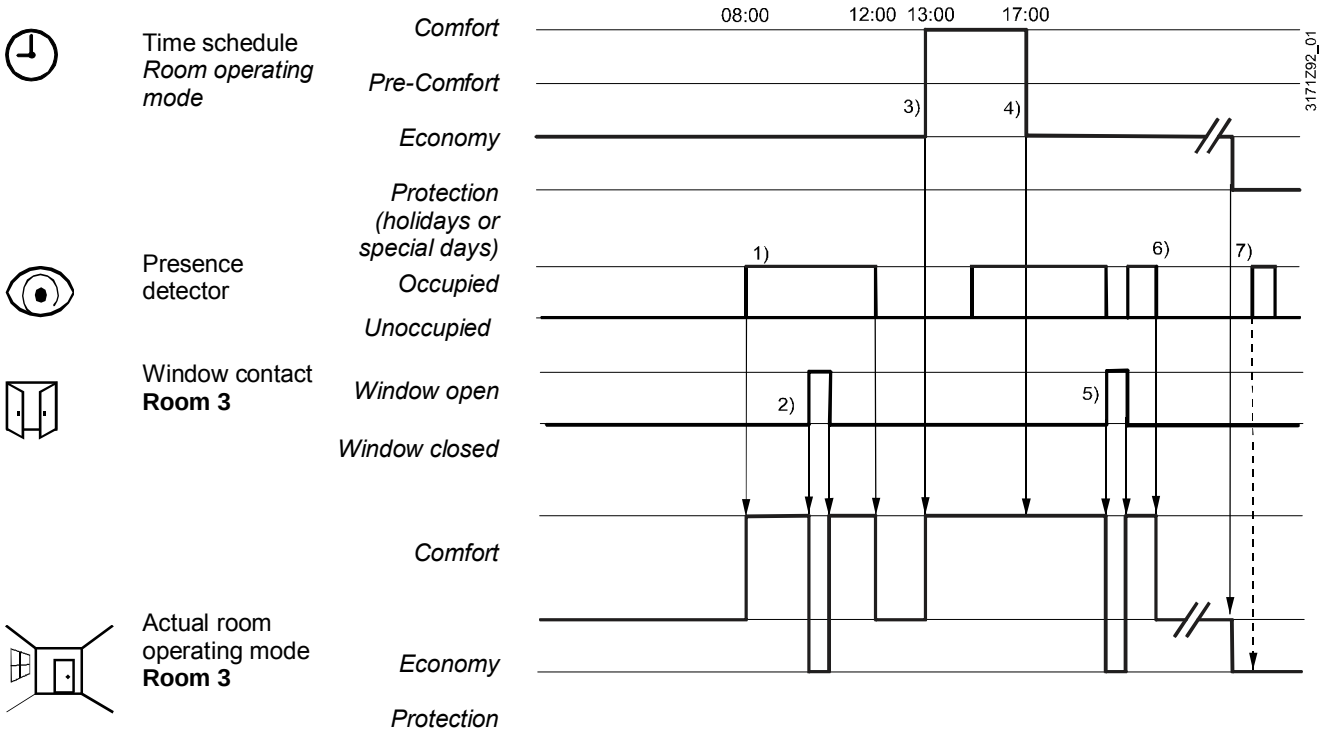
- During lunch break, the time schedule changes to Precomfort. The mode of the thermostat changes to Economy as set by parameter "Transformation Precomfort" (P88 = 0) (6)
- During lunch break, the user changes the operating mode to Comfort (temporary Comfort extension) by pressing the operating mode button (2)
- At 13:00, the timer is reset due to mode change by the central time schedule
- In the afternoon, the user switches off the thermostat by pressing the operating mode button (3). At 17:00 the user setting is reset to Economy by the time schedule
- At 19:30, the user again extends the Comfort mode (4)



Example 3 (RDG16..KN) **Application for "Window Contact", "Presence Detector" and “Central time schedule”**

In **room 3**, the time schedule set available between 13:00 and 17:00.

- In the morning, as soon as the presence is detected, the operating mode switches to Comfort (1)
- The users open the window for a short time and the operating mode switches to Protection (2)
- In the afternoon, the central time schedule sets the Comfort mode from 13:00 to 17:00 (3)
- After 17:00, the room is still occupied and the operating mode remains in Comfort (occupancy via presence detector) (4)
- The users open the window and exit the room for a short time. The operating mode switches to Protection as long as the window is open (5)
- As soon as the room is unoccupied, the thermostat switches to Economy (6)
- After this time period, the occupancy detected by presence detector has no effect, and the central time schedule sets the thermostat to Protection (7)



3.3 Room temperature setpoints

3.3.1 Description

Comfort mode

The factory setting for the Comfort basic setpoint is 21 °C and can be changed in the thermostat's EEPROM via P08 or via bus with communication object "Comfort basic setpoint". The last option selected is always used.

The Comfort setpoint can be adjusted via the rotary knob, or via bus from a remote device like a touchpanel, operating unit, etc. The last option selected is always used.

Temporary setpoint

When the "Temporary setpoint" function is enabled via P69, the Comfort setpoint is set back to the Comfort basic setpoint stored in P08 when the operating mode changes.

Note

This setback is only executed when the change of the operating mode was commanded by pressing the mode button or via bus, not by the window contact (digital input or bus) .

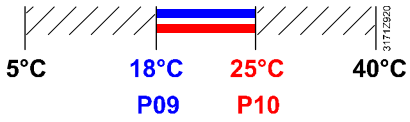
Setpoint limitation

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

P09 < P10
(comfort concept)

- If the minimum limit P09 is set lower than the maximum limit P10, both heating and cooling are adjustable between these two limits
- The user adjusts the desired setpoint and the thermostat controls the room temperature accordingly
- For 4-pipe applications, the selected comfort setpoint is in the middle of the dead zone (P33). The unit stops to energize the heating/cooling outputs as soon as the room temperature reaches the dead zone

Example



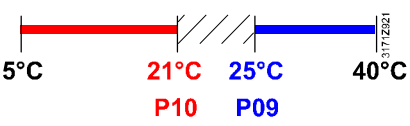
Cooling setpoint adjustable: 18…25 °C
Heating setpoint adjustable: 18…25 °C

P09 ≥ P10
(energy saving concept)

- If the minimum limit P09 is set higher than the limit P10, then
  - the setting range of cooling setpoint is from P09…40 °C in place of 5…40 °C
  - the setting range of heating setpoint is from 5…P10 °C in place of 5…40 °C

  This allows the user to limit the maximum heating setpoint and the minimum cooling setpoint.
- For 4-pipe applications:
  - The thermostat runs with the setpoint of the active sequence:
    In heating mode, the heating setpoint is active and adjustable via rotary knob.
    In cooling mode, the cooling setpoint is active and adjustable via rotary knob
  - Switching from the heating setpoint to the cooling setpoint and vice-versa occurs when the room temperature reaches the adjusted limitation (P09 or P10) of the **inactive** sequence. For example, the thermostat is in heating sequence and operates using the heating setpoint. When the room temperature reaches P09, the thermostat switches to cooling mode and operates using the cooling setpoint, as long as the room temperature does not drop below P10

Example



Cooling setpoint adjustable: 25…40 °C
Heating setpoint adjustable: 5…21 °C

Economy mode ☾ Use P11 and P12 to adjust the Economy mode setpoints.
The heating setpoint is 15 °C (factory setting), and the cooling setpoint is 30 °C.

Protection mode Use P65 and P66 to adjust the Protection mode setpoints.
The heating setpoint is 8 °C (frost protection, factory setting) and OFF for cooling.

Caution ⚠ If a setpoint (Economy or Protection) is set to OFF, the thermostat does not control the room temperature in the corresponding mode (heating or cooling). In other words, there is no protective heating or cooling function and thus risk of frost in heating mode or risk of overtemperature in cooling mode!

The Economy setpoints (P11, P12) are accessible at the Service level; the Protection setpoints (P65, P66) are accessible at the Expert level.

3.3.2 Setting and adjusting setpoints

Room temperature setpoints can be…
– set during commissioning
– adjusted during runtime

KNX

Comfort basic setpoint
Comfort setpoint
Economy heating setpoint [4]
Economy cooling setpoint [4]

The source can be one of the followings:
– The local HMI
– A tool
– A central control unit

The thermostat stores the setpoints in…
– EEPROM in the form of parameters
– The runtime memory

The table below shows the interrelations:

Setpoint setting			**Stored in the EEPROM of thermostat**
Commissioning **– HMI** **– Tool download**	**Input LTE-Mode**	**Input S-Mode**	
Comfort basic setpoint dead zone Comfort [1]	Setpoints Heating Setpoints Cooling	Comfort basic setpoint	P08 Comfort basic setpoint P33 Dead zone Comfort [1]
Setpoint Economy Heating Setpoint Economy Cooling	Setpoints Heating Setpoints Cooling	Setpoints Heating Setpoints Cooling	P11 Economy Heating P12 Economy Cooling
Setpoint Protection Heating Setpoint Protection Cooling			P65 Protection Heating P66 Protection Cooling

Current runtime setpoints in thermostat	**Setpoint adjustment**			**New current runtime setpoints in thermostat**
	Input LTE-Mode [2]	**Input S-Mode** [3]	**Local operation** [3]	
Comfort setpoint	Setpoint shift H Setpoint shift C	Comfort setpoint	Rotary knob	Comfort setpoint
Economy Heating Economy Cooling	Setpoint shift H Setpoint shift C			Economy Heating Economy Cooling
Protection Heating Protection Cooling				Protection Heating Protection Cooling

Actual room operating mode → **Current setpoint** (used by the thermostat for temperature control)

[1] Only required for heating and cooling applications (see 3.6.12)

[2] LTE-Mode: **Shift is added** to the local shift

[3] S-Mode: **The last option selected is always used**, either S-Mode input or local operation

[4] To display the S-Mode objects of the Economy heating and cooling setpoint (P11/P12), set the control parameter “Room temperature: Economy setpoints” to **as group object** in ETS tool

KNX

Current setpoint

The current setpoint (used by the thermostat for temperature control) is available on the bus for use in the central control unit.

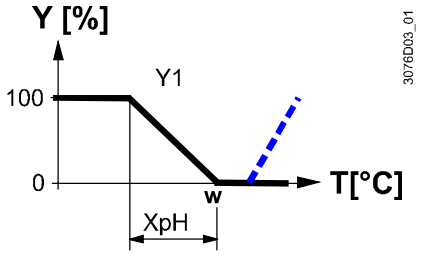
Clarification concerning current setpoint in Comfort mode

The Comfort setpoint **w** (e.g. customer setting on the display) and the current setpoint **w2** (used by the thermostat for temperature control, but not on the display) is handled differently depending on the selected application and setting.

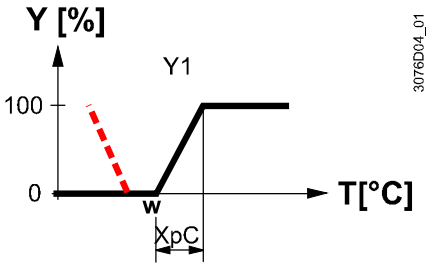
2-pipe or
4-pipe with P09>P10

Both the Comfort setpoint **w** and current setpoint **w2** have the same values.

Heating mode



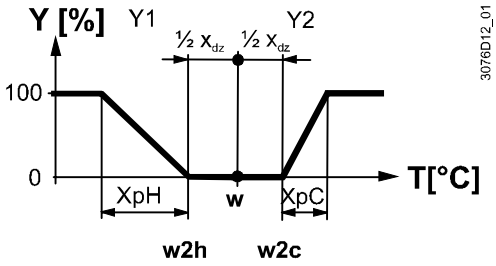
Cooling mode



4-pipe with P09<P10

The Comfort setpoint **w** (value selectable via e.g. rotary knob) is in the middle of the dead zone (P33). The current setpoints **w2..** (used by the thermostat for temperature control) are at the boundaries of the dead zone.

w2h = Comfort setpoint (w) – ½ dead zone (Xdz)
w2c = Comfort setpoint (w) + ½ dead zone (Xdz)



General notes

- The supported communication objects are different in LTE-Mode and S-Mode
- Changes via the local HMI or tools have the same priority (the last option is always used)
- Setting the Comfort basic setpoint will reset the runtime Comfort setpoint

Notes on setpoint adjustment (LTE-Mode with Synco only)

- Central setpoint shift is used for summer/winter compensation in particular
- Setpoint shift does not affect the setpoints stored in P08, P11, P12 and P33
- Local shift and central shift are added together
- Applies only to Comfort and Economy setpoints; Protection setpoints are not shifted centrally
- The current setpoint heating and cooling is limited by the Protection setpoint. If the Protection setpoint is OFF, then both the minimum 5 °C and maximum 40 °C are used
- The current setpoints for cooling and heating of the same operating mode have a minimum distance of 0.5 K
- The result of local and central shift, together with the room operating mode, is used by the thermostat for temperature control (current setpoint)

Setpoint priority
Setpoint master (RMB)

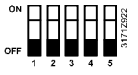
- The room thermostat always adopts the setpoints received from the controller RMB795B. Thus the setpoints locally adjusted on the thermostats are overridden by the setpoints from the room group (e.g. every 15 minutes)
  - RDG16..KN: On RMB SW Version >= 2.0, the circumstances under which the controller sends out the setpoints can be defined. Refer to CE1P3122 [20] for "Setpoint priority" and "Setpoint Master" functions
  - RDG100KN: The local setpoints are always overridden

3.4 Applications overview

The thermostats support the following applications, which can be configured using the DIP switches at the rear of the unit or a commissioning tool.

Remote configuration

Set DIP switches 1...3 to OFF (remote configuration, factory setting) to select an application via commissioning tool.

Remote configuration via commissioning tool (factory setting) • Synco ACS • ETS	DIP switches 

For the applications (basic applications) provide by the tools, see 3.4.1.
For universal applications (chilled ceiling, etc.) and compressor applications, see 3.4.2, 3.4.3, 3.6.9 and 3.6.10.

Notes

RDG100KN

- Use P46/P47 to change the control output from On/Off (factory setting) to PWM
- Use DIP switches 4 and 5 to change the control output from On/Off to 3-position

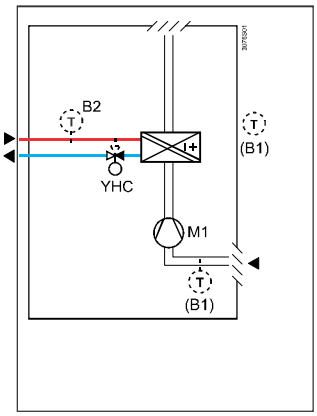
RDG16..KN

- Use P46/P47 to change the valve actuator output from DC (factory setting) to On/Off
- Use DIP switch 4 to change the fan output from DC (factory setting) to 3-speed

3.4.1 Applications for fan coil systems

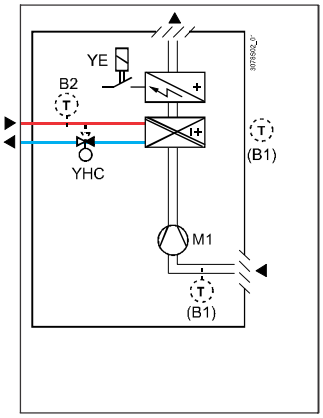
Applications, DIP setting, control outputs

- 2-pipe fan coil unit



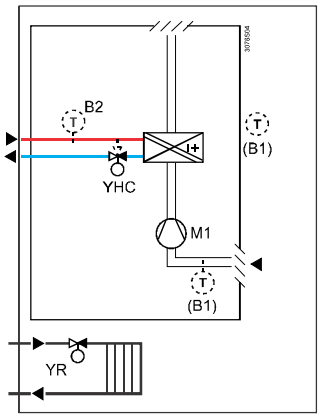
Using RDG100KN, RDG16..KN

- 2-pipe fan coil unit and electric heater



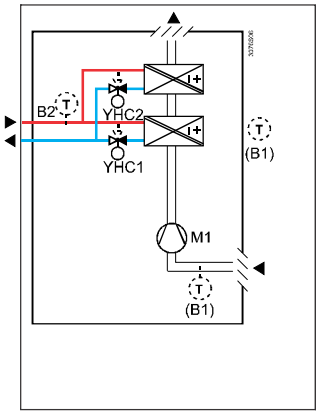
Using RDG100KN, RDG16..KN

- 2-pipe fan coil unit and radiator/floor heating



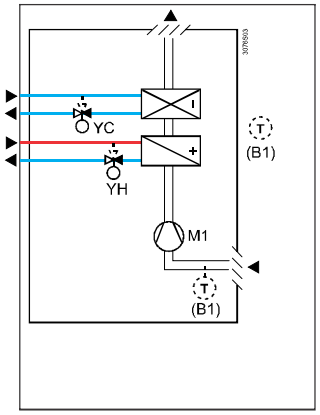
Using RDG100KN, RDG16..KN

- 2-pipe/2-stage fan coil unit



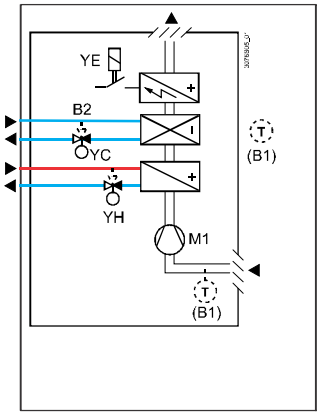
Using RDG100KN, RDG16..KN

- 4-pipe fan coil unit



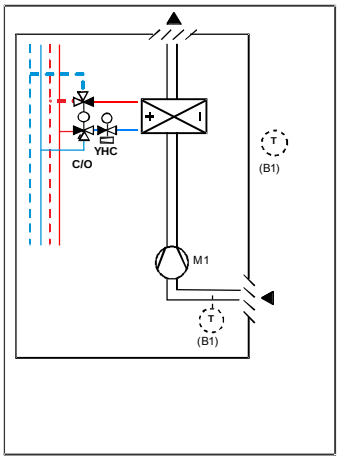
Using RDG100KN, RDG16..KN

- 4-pipe fan coil unit and electric heater



Using RDG100KN

- 4-pipe fan coil unit with PICV and 6-port ball valve as change over



Using RDG160KN (version ≥ V2.04)

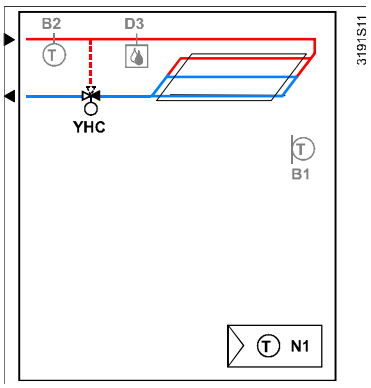
YHC.. Heating/cooling valve actuator
YH Heating valve actuator
YC Cooling valve actuator
YE Electric heater
M1 1-speed or 3-speed fan
B1 Return air temperature sensor or external room temperature sensor (optional)
B2 Changeover sensor (optional)

Product no.	Control outputs	Fan
RDG100KN	On/Off, PWM, 3-position	3-speed, 1-speed
RDG16..KN	DC 0...10 V	3-speed, 1-speed, DC 0...10 V
	On/Off	DC 0...10 V

3.4.2 Applications for universal systems

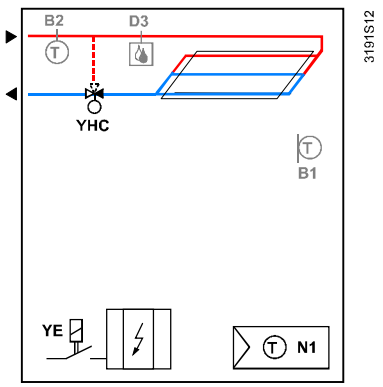
Applications, DIP setting, control outputs

- Chilled/heated ceiling



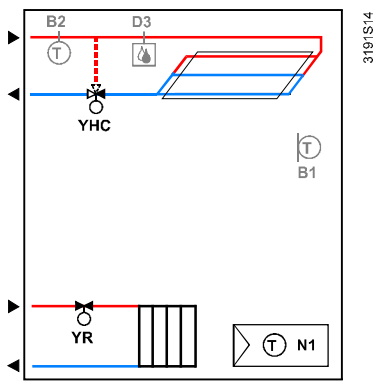
Using RDG100KN, RDG16..KN

- Chilled/heated ceiling and electric heater



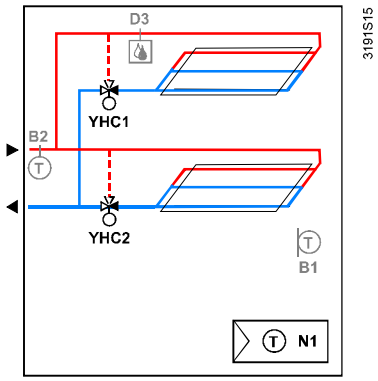
Using RDG100KN, RDG16..KN

- Chilled/heated ceiling and radiator/ floor heating



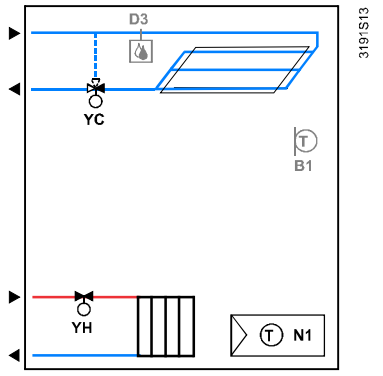
Using RDG100KN, RDG16..KN

- 2-stage chilled/ heated ceiling



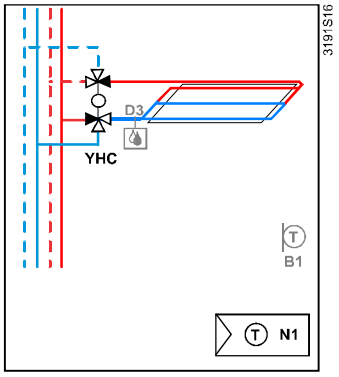
Using RDG100KN, RDG16..KN

- Chilled ceiling and radiator



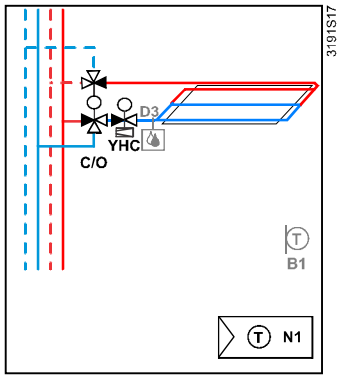
Using RDG100KN, RDG16..KN

Chilled and heated ceiling control with 6-port ball valve



Using RDG160KN (version ≥ V1.14)

Chilled and heated ceiling control with PICV and 6-port ball valve as changeover



Using RDG160KN (version ≥ V1.14)

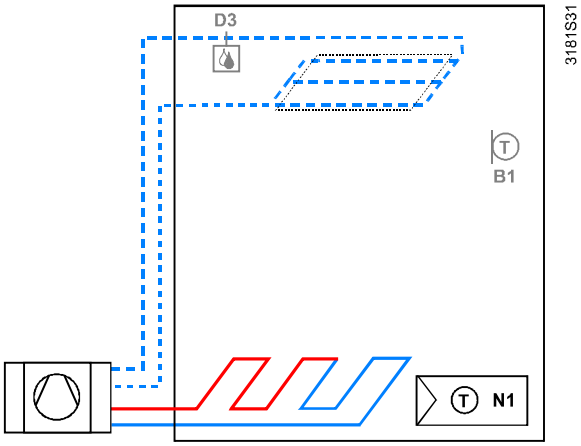
YHC..	Heating/cooling valve actuator
YH	Heating valve actuator
YC	Cooling valve actuator
YE	Electric heater
D3	Dewpoint sensor
M1	1-speed or 3-speed fan
B1	Return air temperature sensor or external room temperature sensor (optional)
B2	Changeover sensor (optional)

Product no.	Control outputs
RDG100KN	On/Off, PWM, 3-position
RDG16..KN	On/Off, DC 0...10 V

3.4.3 Applications for heat pump systems (RDG16..KN)

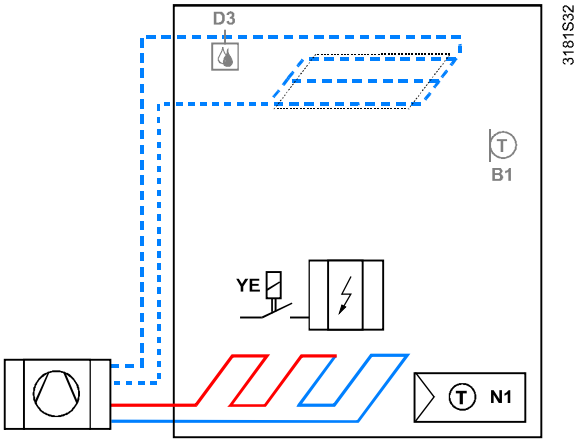
Applications, DIP setting, control outputs

- Heated or cooled with compressors



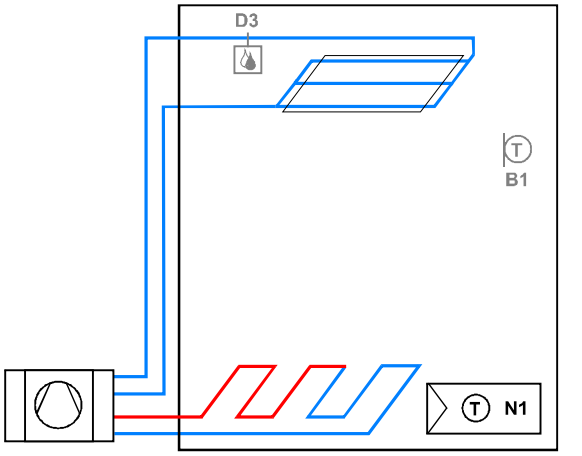
Using RDG16..KN

- Heated or cooled with compressors with electric heater



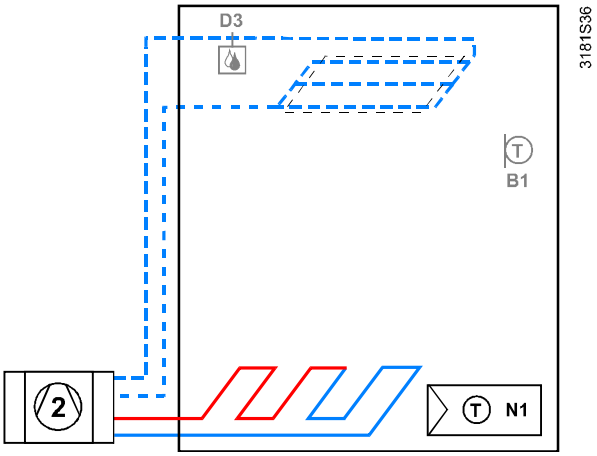
Using RDG16..KN

- Heated and cooled with compressors



Using RDG16..KN

- 2-stage heated or cooled with compressors



Using RDG16..KN

N1 Thermostat
Output Y10/Q1: Heating or heating/cooling
Output Y20/Q2: Cooling only (heating/cooling)

YE Electric heater

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

D3 Dewpoint sensor

Product no.	Control outputs	Fan
RDG16..KN	On/Off, DC 0...10 V	Disabled, DC 0...10 V

3.5 Additional functions

Function overview	RDG100KN	RDG160KN	RDG165KN
Heating/cooling changeover via bus	✓	✓	✓
Automatic heating/cooling changeover via changeover sensor			
Changeover switch			
Manual heating/cooling changeover			
External/return air temperature sensor			
Purge function			
Avoid damage from moisture			
Avoid cold air in heating mode			
Minimum output On/Off time			
Floor heating/cooling			
Floor temperature limitation function			
Dewpoint monitoring			
Fault state			
Button lock			
Supply air temperature limitation	X		
Qx relay switching function	X		
Swap outputs for 2-pipe and 2-stage applications	X	X	
Humidity control	X	X	
Master/slave KNX S-Mode	X	✓	X
Flow limitation in heating	X		X

Heating/cooling changeover via bus

The heating/cooling changeover information can be received via bus. This is only possible if the control sequence is set to automatic heating/cooling changeover (P01 = 3) and no local input (X1, X2, D1) is assigned with this function.

KNX

Heating/cooling changeover

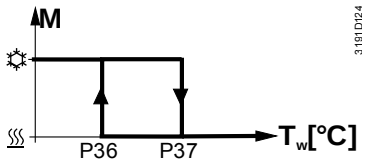
In the absence of the required information (e.g. due to problems with data communication, power failure, etc.), the thermostat operates in the last valid room operating mode (heating or cooling).

Automatic heating/cooling changeover via changeover sensor

If a cable temperature sensor (QAH11.1 + ARG86.3) is connected to X1/X2, and P38/P40 is set to 2, the water temperature acquired by the changeover sensor is used to change over from heating to cooling mode, or vice versa.

- When the water temperature is above 28 °C (adjustable via P37), the thermostat changes over to heating mode. It stays in heating mode until the temperature falls below 16 °C (adjustable via P36)
- When the water temperature is below 16 °C (P36), the thermostat changes over to cooling mode. It stays in cooling mode until the temperature rises above 28 °C (P37)
- If the water temperature is between the 2 changeover points immediately after power-up (inside the hysteresis), the thermostat starts in the previous mode

The water temperature is acquired at 30-second intervals and the operating state is updated accordingly.



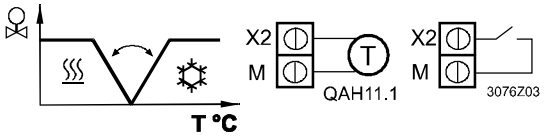
M Operating mode
T_w Water temperature
Cooling mode
Heating mode

Note

- RDG1..0KN: The setting range is 10...25 °C for P36 and 27…40 °C for P37
- RDG165KN: The setting range of P36 and P37 is 5…40 °C, and the maximum value of P36 is limited by P37 with a minimal interval of 2 °C

Changeover switch

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 or X1 or D1 (switch only) based on the commissioning of the inputs (P38, P40, P42).
See also 3.9.

Note

By using an external switch as changeover, the operating action (via P39, P41 or P43) cannot be changed.
The assignment is fixed: Contact open → heating mode
Contact closed → cooling mode

Manual heating/cooling changeover

- Manual heating/cooling changeover means selection via changeover button on the thermostat by repeatedly pushing the button until the required mode is displayed (automatic changeover is done via bus or via an external sensor/switch connected to X1, X2, or D1)
- If manual heating/cooling changeover is commissioned (P01 = 2), then heating/cooling mode cannot be changed via bus/changeover sensor/switch; it will remain in the last mode that was selected locally via button

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 3.9.

Purge function

The changeover sensor ensures changeover from heating to cooling mode based on the acquired water temperature. We recommend activating the Purge function (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.

Avoid damage from moisture

In very warm and humid climates, the fan runs periodically or continuously at a low fan speed (e.g. in empty apartments or shops) in Economy mode by setting P61, in order to avoid damage from moisture due to lack of air circulation. Refer to "Fan kick" function in 3.8.

Avoid cold air in heating mode

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

Minimum output On/Off time

Limit the On/Off switching cycle to protect the HVAC equipment, e.g. the compressor and reduce wear and tear. The minimum output on time and off time for the On/Off control output can be adjusted from 1 to 20 minutes via P48 and P49. The factory setting is 1 minute.
Readjusting the setpoint or heating/cooling mode changeover immediately results in calculation of the output state; the outputs may not hold the minimum 1-minute On/Off time.
If P48 or P49 is set to greater than 1 minute, the minimum On/Off time for the control output is maintained as set, even if the setpoint or changeover mode is readjusted.

Floor heating/ Floor cooling

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

Floor temperature limitation function

The floor temperature should be limited for two 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 (P51), the heating valve is fully closed until the floor temperature drops to a level 2 K below the parameterized limit. The factory setting of P51 is OFF (disabled).
Input X1 or X2 must be commissioned accordingly (P38 or P40 = 1).
See 3.9.

Recommended values for P51:

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

The table below outlines the relationship between parameter, temperature source and temperature display:

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 impact on			
Application	**Output Y1**	**Output Y2**	**Output Y3**	**Heating (P01 = 0/2/3)**	**Cooling (P01 = 1/2/3)**	**Heat. and cool. (P01 = 4)**	**Remark**
2-pipe	H/C valve			Y1	N/A		
2-pipe and electric heater	H/C valve	Electric heater		Y2	Y2 *)		Only electric heater
2-pipe and radiator	H/C valve	Radiator		Y2	Y2		Only radiator
4-pipe	Heating valve	Cooling valve		Y1	N/A	Y1	
4-pipe and electric heater	Heating valve	Cooling valve	Electric heater	Y3	N/A	Y3	Only electric heater
2-stage	1st H/C	2nd H/C		Y1, Y2	N/A		

*) If P13 = ON → electric heater in cooling mode

Note Either floor temperature sensor or external room temperature sensor can be used.

Supply air temperature limitation (RDG16..KN)

This function increases the comfort in the room by keeping the supply air temperature of the fan coil unit between the selected minimum and maximum temperature limits.
If the supply air temperature exceeds a limit, the thermostat reduces the corresponding valve position until the supply air temperature is back in the limits.

In case the air flow is too low (especially with DC 0...10 V fans), this prevents cold air from dumping into the room/warm air from bubbling straight up instead of circulating.

To enable this function, the multifunctional input, to which the supply air sensor is connected, needs to be set to "Supply air sensor" (e.g. P38 = 9). Then the parameters for the limits are displayed (P63: minimum supply air temperature, P64: maximum supply air temperature).

Note

- This function is only active in Comfort mode and can only be used with DC 0...10 V actuators
- This function is unavailable on applications with electric heater

Dewpoint monitoring

Dewpoint monitoring is essential to prevent condensation on the chilled ceiling (cooling with fan disabled, 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.
If the fan function is enabled (P52 ≠ 0), the fan continues to work as long as the Dewpoint function is active.

Note: when condensation is detected with
P01=5, the 6-port control ball valve will be close (5V)
P01=6, the combi-valve (PICV) will be closed and the 6-port ball valve will not change position

KNX

Fault state
Fault information

The condensation symbol displays during temporary override and the fault "Condensation in room" is sent via bus.

The input must be commissioned accordingly (P38, P40 and P42).

See 3.9.

Button lock

If the "Button lock" function is enabled by P14, lock or unlock them by pressing the right button for 3 seconds.
If "Auto lock" is configured, the thermostat automatically locks the buttons 10 seconds after the last adjustment.

Swap outputs for 2-pipe and 2-stage applications
(RDG165KN only)

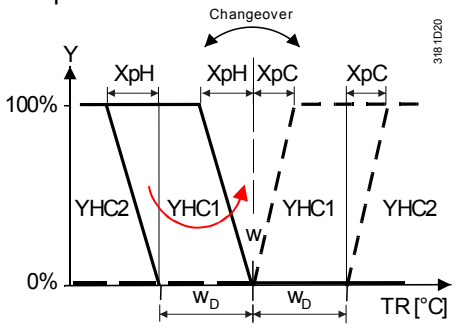
For 2-pipe and 2-stage applications with different equipment, e.g. fan coil units and radiant heating/cooling panels, it is possible to invert the sequence of the equipment to optimize energy use, when the thermostat changes the sequence from heating to cooling (P01 = 2 or 3).

Under factory settings, the 1st stage in heating (YHC1) is also the 1st stage in cooling.

The swap function optimizes the use of heating/cooling energy in mixed systems. For example, when the fan coil units are combined with radiant heating/cooling panels, it is more appropriate to start heating with the panels (1st stage heating, YHC1) and start cooling using the fan coil unit (1st stage cooling, YHC2).

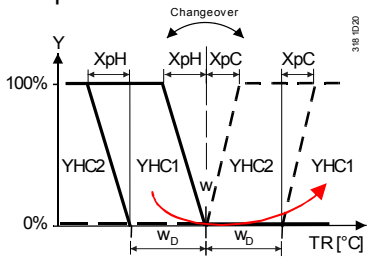
Enable the swap function by setting P47 (YHC2 output signal, 1st stage in cooling) to 3 (On/Off) or 4 (DC), depending on the requested control signal.

Swap function disabled



P46 (YHC1) and P47 (YHC2) are set to 1 (On/Off) or 2 (DC)

Swap function enabled



P46 is set to 1 (On/Off) or 2 (DC)
P47 is set to 3 (On/Off) or 4 (DC)

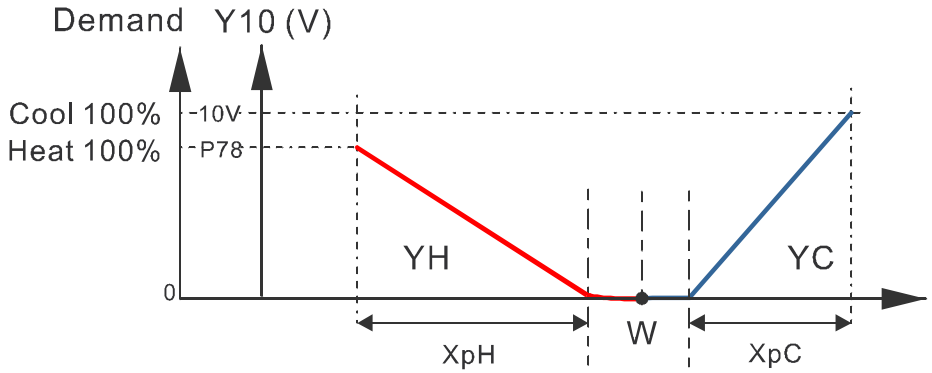
Notes

- For 2-pipe/2-stage applications, see 3.6.8
- If the equipment requests fan operation only in the 2nd stage (heating and/or cooling), see 3.8 to set up the fan function (fan in the 2nd stage)
- For application examples, see 6.3.3

Flow limitation function for combi valve (PICV)
(RDG160KN SW ≥V2.04)

Set different limits to the flow in both sequences, heating and cooling to balance heating and cooling systems and avoid hydraulic problems caused by the different flow rates.
Cooling typically requires a higher flow rate than heating, and the combi valve (PICV) is mechanically and manually set to the cooling flow limit.
However, when the system operates in heating mode, set another flow limitation.
The new limit to the DC 0...10 V signal (new 100% heating demand) can now be set with the parameter P78.

The function can be enabled on all combined heating/cooling applications with DC 0...10 V output for universal and fan coil unit applications.



T[°C] Room temperature
Y10 DC 0…10 V signal
W Room temperature setpoint
YH Control command "Valve" (heating)
YC Control command "Valve" (cooling)

The function can be enabled for the following heating/cooling applications with DC 0...10 V output. P78 is not visible on other applications.

Fan coil type	Universal type
• 2 pipe • 2 pipe with electrical heater • 2 pipe with radiator • 4 pipe • 4-pipe with PICV and 6- port ball valve as changeover	• Chilled/heated ceiling with changeover • Chilled/heated ceiling and electric heater • Chilled/heated ceiling and radiator • H/C ceiling with PICV and 6- port ball valve as changeover

3.5.1 Qx relay switching functions (RDG16..KN)

The following functions are only available on the RDG16..KN and allow the control of external equipment connected to the Q1, Q2 and Q3 relay outputs:

Function description	P7x =	RDG16..KN
• Switching off external equipment when the thermostat is in Protection mode	1	✓
• Switching on external equipment during…		
- heating/cooling demand	2	✓
- heating demand	3	✓
- cooling demand	4	✓
• Energizing the contact when…		
- the heating sequence is active	5	✓
- the cooling sequence is active	6	✓
• Humidity control:		
- Output to control dehumidifier	7	✓
- Output to control humidifier	8	✓

Notes

- These functions are only available on DC fan control (DIP4 = OFF or P53 = 3) or when the fan function is disabled (P52 = 0)
- Do not use these functions in combination with On/Off valve control (P46/P47 = 1) to ensure temperature control accuracy. If these functions are required, the total maximum current on the relay outputs (Q1+Q2+Q3) must not exceed 2 A

The relay output function can be enabled and tested as follows:

Relay output function on…	Enable function via Expert level parameter	Test function via diagnostic parameter
Q1	P72	d08
Q2	P73	d09
Q3	P74	d10

Switching off external equipment in Protection mode

The external equipment (e.g. fan coil unit) can be switched off via relay output for energy savings when the thermostat is in Protection mode and no temperature control is requested.

Set the related output parameter to 1 to enable the function.
Relay contact is open when the thermostat is in Protection mode.

Note:
The relay contact will not switch on when the room temperature is below the frost protection setpoint.

Examples

For application examples, see 6.3.2.

Energizing the contact during heating/cooling demand

During heating or cooling demand, the relay contact can be energized to control external equipment, e.g. to run the pump for a water system (fan coil unit) or a compressor.

To reduce wear and tear on HVAC equipment, the minimum output On/Off time of the Qx relay output can be adjusted (1…20 minutes) via P48 and P49. The factory setting is 1 minute.

To enable the function, set the related output parameter:
- To energize the output during heating/cooling demand, set the parameter to 2
- To energize the output during heating demand, set the parameter to 3
- To energize the output during cooling demand, set the parameter to 4

Examples For application examples, see 6.3.2.

Notes
- During heating demand, the relay contact remains OFF only with electric heater or radiator (output signal on Y20 > 0 V).
- If the purge function (P50) is active (1…5 minutes every 2 hours), the relay contact turns ON to run the external equipment, e.g. a water pump

Output heating/cooling sequence

This function switches the relay output on or off depending on the sequence, either heating or cooling. The output can be used for the release of a heat pump compressor, a reversing valve or 6-port ball valve as changeover.

To enable the function, set the related output parameter:
- To close the contact when the thermostat is in heating mode (even in the dead zone), set the parameter to 5
- To close the contact when the thermostat is in cooling mode (even in the dead zone), set the parameter to 6

Special case for RDG160KN (SW version ≥ V1.14)
P01=6 Chilled/heated ceiling with PICV and 6-port control ball valve as changeover.

When the RDG160KN is set with P01=6 (Chilled/heated ceiling with PICV and 6-port control ball valve as changeover), relay Q1 is automatically set as 5 (close in heating mode) and Q2 is automatically set as 6 (close in cooling mode).

This provides the possibility to control the 6-port ball valve as changeover with a 3-position signal (and a 3-position actuator).
The relay setting cannot be change when P01=6
For detailed information, see 3.6.9.2.

Examples For application examples, see 6.3.2.

To reduce wear and tear on HVAC equipment, the minimum output On/Off time of the Qx relay output can be adjusted (1…20 minutes) via P48 and P49. The factory setting is 1 minute.

Humidity control

Depending on the humidity in the room and the humidity setpoint, the humidity control function switches the relay outputs to control the external equipment, e.g. dehumidifier/humidifier. See 3.5.2.

To enable the function, set the related output parameter:
- To control the dehumidifier, set the parameter to 7
- To control the humidifier, set the parameter to 8

To reduce wear and tear on the HVAC equipment, the minimum output On/Off time of the Qx relay output can be adjusted (1…20 minutes) via P48 and P49. The factory setting is 1 minute.

Note When the operating mode is changed from Comfort to Economy or Protection, the relay contact remains energized until the end of the minimum on time set via P48.

3.5.2 Humidity control (RDG165KN only)

Humidity control limits the humidity in the room according to the selected setpoint (minimum/maximum) by shifting the temperature setpoint, or by enabling outputs to release the external equipment as needed, e.g. the dehumidifier or humidifier.

Humidity control is active in Comfort mode when P75 is set to 3 (factory setting). The function can be disabled by setting P75 to 0.

Humidity function is disabled in Economy or Protection mode.

The humidity level in the room is acquired by the built-in sensor. The thermostat can receive the relative humidity via the bus if a valid humidity value is available and selected on KNX (S-Mode or LTE-Mode).

KNX

Room humidity

The priorities are set as follows:

1. S-Mode
   - By selecting parameter “Room relative humidity” in the ETS to **Receive**, the thermostat can display the relative humidity measured by an external sensor on the bus.
   - If the parameter is set to **Transmit** (factory setting), the thermostat can display the humidity value measured by the built-in sensor and the value is sent to the bus.
2. LTE-Mode
   The thermostat displays the relative humidity value on the bus if the external KNX sensor is in the same geographic zone apartment and room (A.R.1) as the thermostat.
3. In other cases, the thermostat displays the humidity value measured by the built-in sensor.

Note To display room humidity (%) on the thermostat, P07 needs to be set to 5 (factory setting).

Setpoint (P21, P22)

The maximum humidity setpoint (%) is selectable via P21 (setpoint humidity high) and can be adjusted via parameters in Service level or via the bus.
Setting P21 to OFF disables maximum humidity control.

KNX

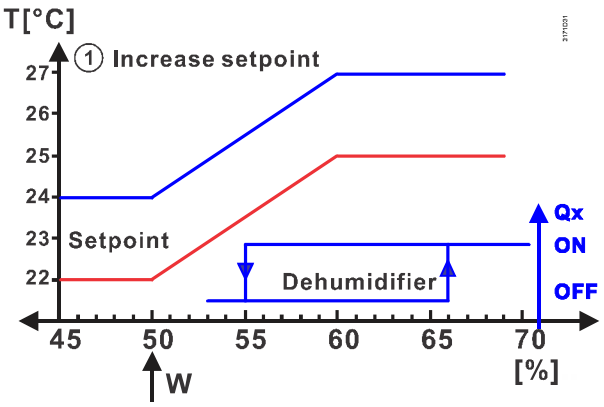
Setpoint high
Setpoint low

The minimum humidity setpoint (%) is selectable via P22 (setpoint humidity low) and can be adjusted via parameters in Service level or via bus.
Setting P22 to OFF (default setting) disables minimum humidity control. The setting range is limited by P21.

S-Mode objects for the humidity setpoint are available when the parameter "Humidity setpoints" is set to **as group object** in ETS.

Dehumidification

When the relative humidity exceeds the maximum setpoint, the thermostat makes a proportional shift of the temperature setpoint until P76 (max. shift temp setpoint) is reached. If this control is not enough to reduce the humidity, an external dehumidifier can be switched on via relay outputs or KNX, when the related relay function is selected (P72, P73 or P74 is set to7).



Note The maximum temperature shift setpoint value is reached at setpoint humidity high (P21) +10%. The contact for the dehumidifier is released at setpoint humidity + 15%.

KNX

Dehumidification

Applications with a DC fan:

- Enable the function to control the external dehumidifier directly via relay output by setting P72 (output Q1), P73 (output Q2) or P74 (output Q3) to 7.
  When the output is energized, the S-Mode object dehumidification sends the information "ON" to the bus
- The selected relay output is switched on if relative humidity exceeds the maximum setpoint +15%
- For applications with On/Off valves on Q1 or Q2 or both, the output Q3 (P74 = 7) is used to control the external dehumidifier
- The relay contact remains closed or open for the minimum On/Off time defined by P48 or P49

Applications with a 3-speed fan:

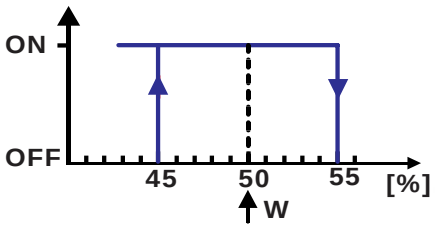
- The external dehumidifier is controlled via external DC – On/Off converter connected to analog output Y50. The output signal is DC 10 V if dehumidification control is requested
- The output Y50 remains On for a minimum time of 30 seconds (not selectable)
- This function is available without specific settings (P72, P73 and P74 are not displayed)

Note The current of the external DC – On/Off converter should not exceed the maximum output current of the Y50 (max. 5 mA). We recommend using the converter from Titan (single relay control (IO/1RM) at 3 mA input current).

Humidification

The function controls the minimum relative humidity in the room and it is available only for applications with DC fan or no fan.

The external humidifier connected to the relay output is enabled as soon as the humidity falls below setpoint humidity low (P22).



KNX
Humidification

To enable the relay function, set P72 (output Q1), P73 (output Q2) or P74 (output Q3) to 8. The humidification S-Mode object sends ON to the bus as soon as the output is energized.

KNX
HumDehumMode

When the humidity falls below the minimum setpoint or exceeds the maximum setpoint, the symbol is displayed and the S-Mode object HumDehumMode sends the corresponding state on the bus.

Max. shift temperature setpoint (P76)

When the humidity reaches setpoint humidity high (P21), the thermostat shifts the temperature setpoint to reduce the relative humidity in the room.

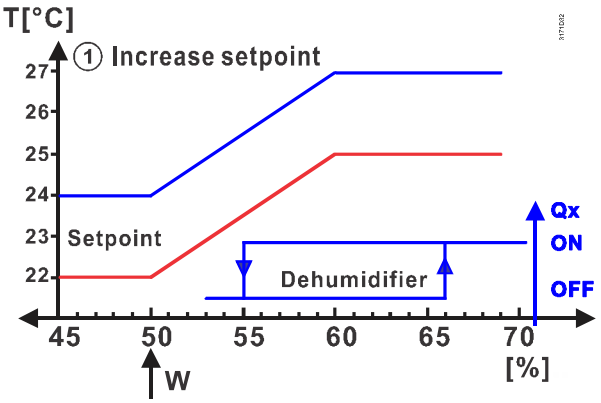
The maximum shifting temperature setpoint can be set via P76 in Expert level with a setting range of -3…3 K, depending on the connected equipment. The factory setting is 3 K.

The maximum shifting temperature setpoint value is reached at setpoint humidity high (P21) +10%.

P76 > 0 K

The positive values of P76 (0.5…3.0 K) are used for heating and cooling systems, or a heating system in a humid cold environment.

For heating and cooling systems, both temperature setpoints (heating and cooling) are shifted in parallel (i.e. dead zone remains unchanged).

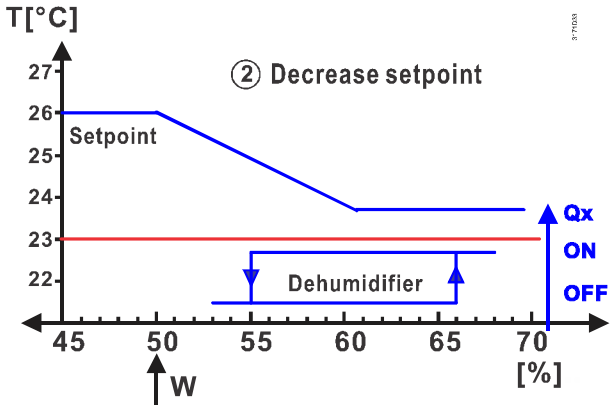


Note

For systems with heating and cooling applications, the value of the dead zone (P33) must be bigger than the maximum shifting temperature setpoint (P76), in order to avoid changeover between heating and cooling sequences in case of fast humidity changes in the room.

P76 < 0 K

For applications with powerful cooling water systems (temperature of cold surfaces is lower than the dewpoint temperature of the humid air), dehumidification can be reached by reducing the room temperature, because the vapor in the air condensates on the surface of the cooling system. In this case, set P76 to a negative value (-0.5…-3.0 K).



Note

This setting is typically used for cooling applications with fan coil units or split units. When the thermostat is in cooling mode or in the dead zone, the temperature setpoint cooling is shifted only when P76 is less than 0 K. The temperature setpoint heating, if available, remains unchanged. The thermostat guarantees a minimum dead zone between both setpoints.

P76 = 0 K

When P76 is set to 0 K, the temperature setpoint heating and/or cooling are not shifted. Dehumidification can be achieved by releasing the relay contact for the dehumidifier. The release contact is switched on 5% over the maximum humidity setpoint and switched off 5% below the setpoint.

Calibration humidity (P23)

The relative humidity measured by the built-in sensor is also displayed if P07 is set to 5. The sensor can be calibrated (+/-10%) via P23.

Note

For application examples with humidity control, see6.3.1.

3.5.3 Master / slave in KNX S-Mode

Available only on RDG160KN SW version ≥ V2.04 only.

The master and slave function prevents wasting energy when several thermostats are installed in the same room (e.g. open spaces).

The master thermostat typically sets the setpoint and operating mode and provides this information to the slaves. The slaves control the local outputs based on the master's data, their own acquired temperatures and own control algorithms.
The master also defines the active sequence, either heating or cooling, for the slave. The information is transmitted from the master via the KNX object [48] "Effective application mode" to the slaves on the KNX object [31] application mode.

Window contacts can be wired directly to the adjacent thermostat (short wiring = lower cost) on applications with windows contacts. The new extended window contact function sends window states of the slaves to the master. The master then sets the slave to Protection as long as at least one window is open.
The new extended function further reduces energy and investment costs.

User case A:

- The user changes the operating mode and comfort setpoint on the master thermostat. The data is transmitted to the slaves.
- The user can modify the setpoint on slaves, if the button lock function (via parameter P14) is not enabled. The master and slaves take over the new setpoint.
- The operating mode can be changed on an individual slave, but has no impact on the other thermostats.

S-Mode binding:

	S-Mode objects master		S-Mode objects slave	
Setpoint:	[23]	Room temperature: Comfort setpoint	[23]	Room temperature: Comfort setpoint
Operation mode:	[16] (out)	Room operating mode: State	[7] (in)	Room operating mode: Preselection
Application mode:	[48] (out)	Effective application mode	[31] (in)	Application mode
Window status	[20] (in)	Room operating mode: Window state	[20] (out)	Room operating mode: Window state

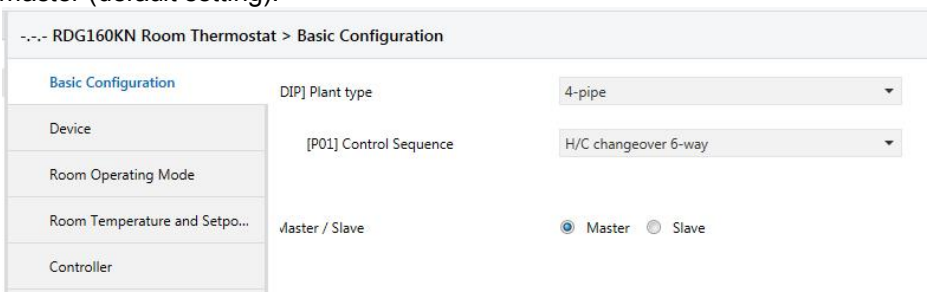
User case B:

- The user changes the reference operating mode and comfort setpoint on all thermostats (master and slave). The data is transmitted and updated on all thermostats.

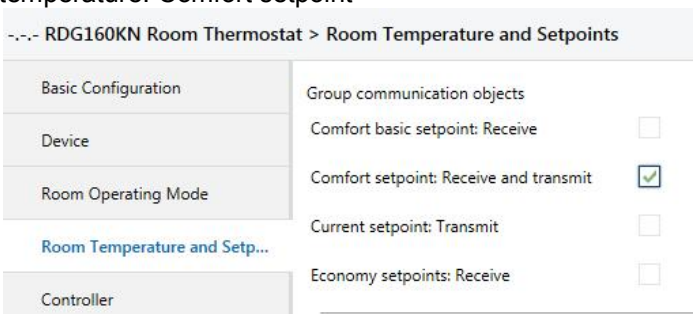
	S-Mode objects master		S-Mode objects slave	
Setpoint:	[23]	Room temperature: Comfort setpoint	[23]	Room temperature: Comfort setpoint
Operation mode:	[7] (out)	Room operating mode: Preselection	[7] (in)	Room operating mode: Preselection
Application mode:	[48] (out)	Effective application mode	[31] (in)	Application mode
Window status	[20] (in)	Room operating mode: Window state	[20] (out)	Room operating mode: Window state

Setting master / slave

The master and slave function must be selected on RDG160KN via ETS.
(SW version ≥ 2.04).
Object "*[48] Effective application mode"* is visible, if the thermostat operates as the master (default setting).



Comfort setpoint: Receive and transmit must be selected to use object [23] Room temperature: Comfort setpoint



Window state of slaves

When setting the thermostat to slave, the KNX object [20] “Room operating mode: Window state” automatically sets to “**Transmit**”. Binding the object from the slaves with the “Window state” of the master (available as **Receive** object), allows the master to collect all window states and control the operating mode of all bound thermostats.

- The master switches the operating mode to Protection if one or more windows are open.
- Master switches back to previous operating mode only after all window contacts are closed.

Note

A heartbeat function communicates between the KNX objects [20] “Room operating mode: Window state” of the slaves and master.
The function ensures that information exchange on window states is synchronized and correct between master and slaves. See 3.11.5.

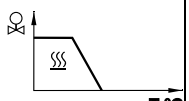
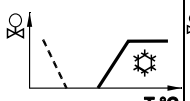
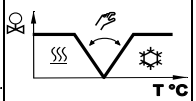
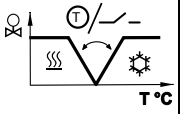
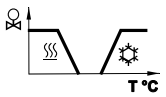
3.6 Control sequences

3.6.1 Sequences overview (setting via P01)

The main control sequence (i.e. the water coil sequence of the fan coil unit) can be set via **P01**.

The following sequences can be activated in the thermostats (with or without auxiliary heating).

The available sequences depend on the application (selected via DIP switches, see 3.4).

Parameter	**P01 = 0**	**P01 = 1**	**P01 = 2**	**P01 = 3**	**P01 = 4**	**P01=5** [3]	**P01=6** [3]
Sequence							
Available for basic application[1] **:** ↓	Heating	Cooling ↘ = heating sequence for electric heater/radiator	Manually select heating or cooling sequence (using HMI)	Automatic heating/cooling changeover via external water temperature sensor or remote switch	Heating and cooling sequence, i.e. 4-pipe		
2-pipe, 2-pipe and electric heater 2-pipe and radiator	✓	✓	✓	✓			
4-pipe 4-pipe and electric heater			✓ [2]	✓ [2]	✓		
2-stage heating or cooling	✓	✓	✓	✓			
6-port ball valve for C/H ceiling						✓	
PICV valve and a 6-port ball valve as changeover for C/H ceiling or fan coil							✓

[1] For chilled/heated ceiling and radiator applications, see 3.6.9;

[2] For manual and automatic changeover with 4-pipe applications, see 3.6.6:
- 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 3.6.6.

[3] For RDG160KN (SW version ≥ V1.14)

For the relationship between setpoints and sequences, see 3.6.12.

3.6.2 Application mode

KNX

Application mode

The behavior of the thermostat can be influenced by a building automation and control system (BACS) via bus using the command "Application mode".
Cooling and/or heating activity can be enabled or disabled using this signal.
Application mode is supported in LTE-Mode and S-Mode.
The RDG.. KNX thermostats support the following commands:

#	Application mode	Description	Control sequence enabled
0	Auto	Thermostat automatically changes between heating and cooling.	Heating and/or cooling
1	Heat	Thermostat is only allowed to heat	Heating only
2	Morning warm-up	If "Morning warm-up" is received, the room is heated up as fast as possible (if necessary). The thermostat allows only heating.	Heating only
3	Cool	Thermostat is only allowed to provide cooling.	Cooling only
4	Night purge	Not supported by fan coil applications.	N/A (= Auto)
5	Pre-cool	If "Pre-cool" is received, the room is cooled down as fast as possible (if necessary). The thermostat allows only cooling.	Cooling only
6	Off	Thermostat does not control outputs, i.e. all outputs go to off or 0%.	Neither heating nor cooling
8	Emergency heat	The thermostat heats as much as possible. The thermostat allows only heating.	Heating only
9	Fan only	All control outputs are set to 0% and only the fan is set to high speed. Function is terminated by any operation on the thermostat.	Run fan at high speed

With all other commands, the thermostat behaves as if it was in Auto mode, i.e. heating or cooling by demand.

ACS

The heating and cooling state of the thermostat can be monitored with the ACS tool (diagnostic value "Control sequence"). The last active mode is displayed when the thermostat is in the dead zone or temperature control is disabled.

Heating or cooling

With a 2-pipe application, the control sequence state is determined by the application mode (see 3.6.2) and by the state of the heating/cooling changeover signal (via local sensor or bus), or fixed according to the selected control sequence (P01 = heating (0)/cooling (1)).

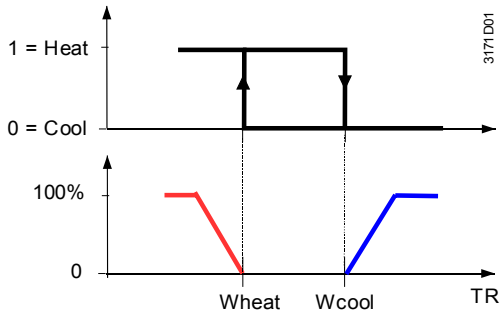
Application mode (via bus)	State changeover/continuous heating or cooling	Control sequence state (ACS diagnostic value)
Auto (0)	Heating	Heating
	Cooling	Cooling
Heat (1), (2), (8)	Heating	Heating
	Cooling	**Heating**
Cool (3), (5)	Heating	**Cooling**
	Cooling	Cooling
Night purge (4), Fan only (9)	Heating	Heating
	Cooling	Cooling

Heating and cooling

With a 4-pipe, 2-pipe with electric heater, and 2-pipe with radiator application, the control sequence state is based on the application mode and heating/cooling demand.

Application mode (via bus)	Heating/cooling demand	Control sequence state (ACS diagnostic value)
Auto (0)	Heating	Heating
	No demand	Heating/cooling depending on last active sequence
	Cooling	Cooling
Heat (1), (2), (8)	Heating	Heating
	No demand	**Heating**
	Cooling	**Heating**
Cool (3), (5)	Heating	**Cooling**
	No demand	**Cooling**
	Cooling	Cooling
Night purge (4), Fan only (9)	No temperature control active	Heating/cooling based on last active sequence

The value of the control output as a function of the room temperature is illustrated in the following diagram for a heating and cooling system:



Wheat = current heating setpoint
Wcool = current cooling setpoint
TR = room temperature

Heating or cooling with the master / slave function (RDG160KN SW≥ V2.04)

The KNX object [48] “Effective application mode” on the master thermostat can be bound to the KNX object [31] application mode of the slaves to control the sequence, either heating or cooling, of all thermostats.

3.6.3 2-pipe fan coil unit

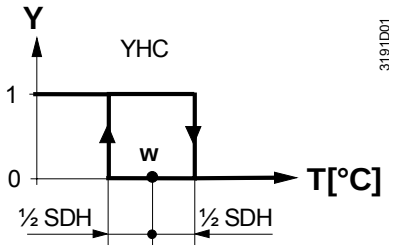
On 2-pipe applications, the thermostat controls a valve in heating/cooling mode with changeover (automatically or manually), heating only, or cooling only (factory setting, P01 = 1).

On/Off control

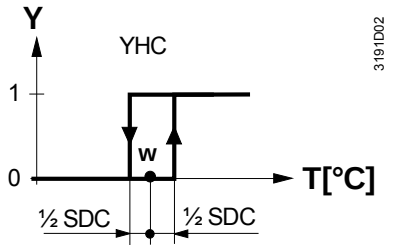
Control sequence On/Off control output

The diagrams below show the control sequence for On/Off control.

Heating mode



Cooling mode



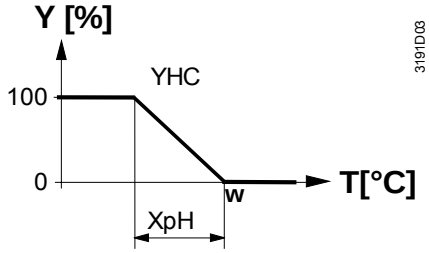
T[°C] Room temperature
w Room temperature setpoint
YHC Control command "Valve"
SDH Switching differential "Heating" (P30)
SDC Switching differential "Cooling" (P31)

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

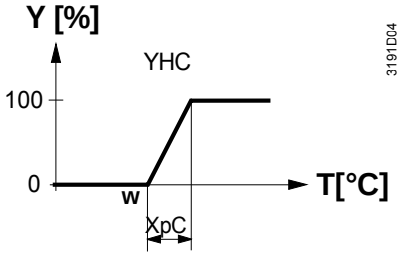
Control sequence modulating output

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

Heating mode



Cooling mode



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

Note The diagrams only show the PI thermostat's proportional part.

Setting sequence and control outputs

See 3.4, 3.6.1, and 3.7.

Note Parameter P78 (RDG160KN SW version ≥ 2.04) sets the heating flow limitation when using a PICV. See 3.5.

3.6.4 2-pipe fan coil unit with electric heater

Heating or cooling with auxiliary heater

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

Electric heating, active in cooling mode

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

Note "Setpoint for electric heater" is limited by parameter "Maximum setpoint for Comfort mode" (P10).

Electric heating in heating mode

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

Electric heating and manual changeover (RDG1..0KN)

The electric 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 electric heater"

Remote enabling/disabling of the electric heater is possible via input X1, X2 or D1 for tariff regulations, energy savings, etc.
Input X1, X2, or D1 must be commissioned accordingly (P38, P40 and P42). See 3.9.

KNX

Enable electric heater

The electric heater can also be enabled/disabled via bus.

Note Do not assign the function to a local input X1, X2 or D1 if "Enable electric heater" input is used via bus.

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

On/Off electric heater with DC fan on RDG16..KN

- With a DC 0...10 V (ECM) fan, it is possible to select On/Off control for the electric heater by setting P47 = 1. The electric heater must be connected to output Q2
- The electric heater starts with a delay of 15 seconds, to ensure the fan delivers sufficient air flow to dissipate the heat (also valid for application with DC control of the electric heater)
- To avoid overheating of the electric heater, the thermostat guarantee at least fan speed II (middle value between Vmin (P56) – Vmax (P55)) when the electric heater needs to be energized (RDG165KN)

Adaptive temperature compensation for electric heater

When an electric heater is connected directly to output Q2, the current causes the relay contact to heat up. This falsifies the reading of the internal temperature sensor. The thermostat compensates the temperature if the rated power of the electric heating is entered at P45.
Factory setting P45: 0.0 kW, setting range: 0.0…1.2 kW.

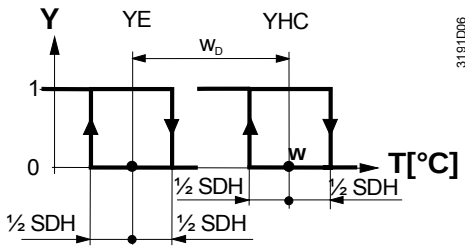
On/Off control

Control sequence On/Off output

The diagrams below show the control sequence for On/Off control.

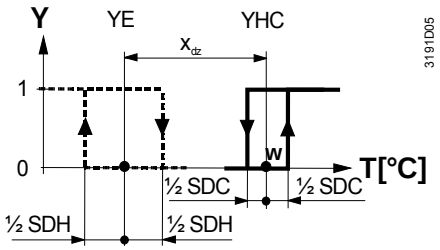
Heating mode

(automatic changeover = heating or heating only)



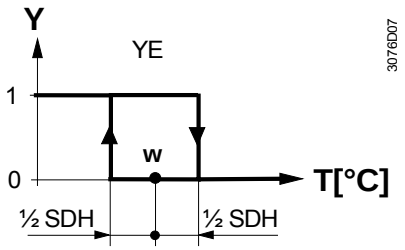
Cooling mode

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



Heating mode with manual changeover (P01 = 2) on RDG1..0KN

(manual changeover = heating)



T[°C]	Room temperature
W	Room temperature setpoint
YHC	Control command "Valve"
YE	Control command "Electric heater"
SDH	Switching differential "Heating" (P30)
SDC	Switching differential "Cooling" (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

Note RDG165KN with manual changeover works in the same way as automatic changeover, with 2-stage heating.

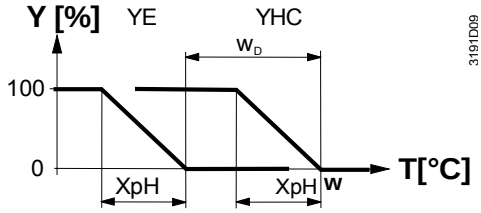
Modulating control: 3-position, PWM or DC 0…10 V

Control sequence modulating control output

The diagrams below show the control sequence for modulating control.

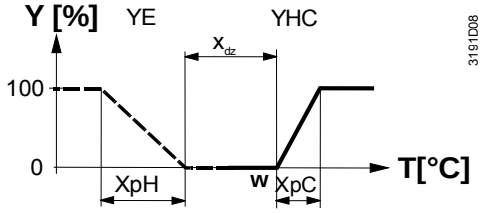
Heating mode

(automatic changeover = heating or heating only)



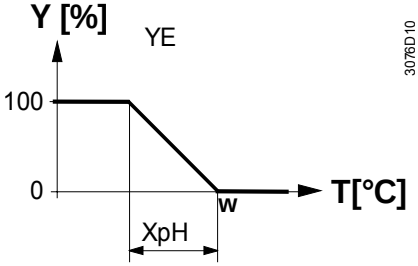
Cooling mode

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



Heating mode with manual changeover (P01 = 2) on RDG1..0KN

(manual changeover = heating)



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

Notes

- The diagrams only show the PI thermostat's proportional part
- RDG165KN with manual changeover works in the same way as automatic changeover, with 2-stage heating

Setting sequence and control outputs

See 3.4, 3.6.1, and 3.7.

Note Parameter P78 (RDG160KN SW version ≥ 2.04) sets the heating flow limitation when using a PICV. See 3.5.

3.6.5 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 heating 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).

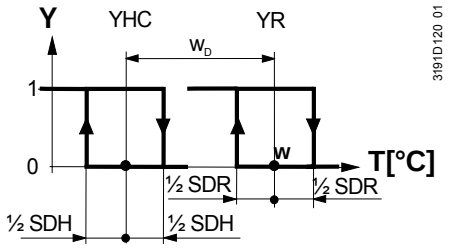
Floor heating

The radiator sequence can also be used for floor heating.
The "Floor heating limitation" function is described on page 34.

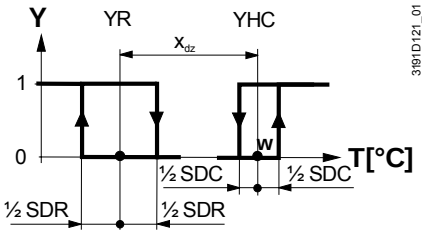
On/Off control

The diagrams below show the control sequence for On/Off control.

Heating mode



Cooling mode



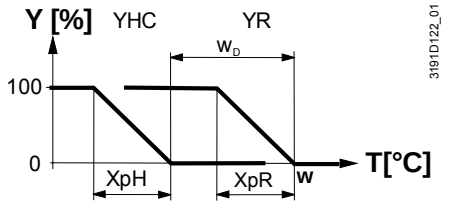
T[°C]	Room temperature
W	Room temperature setpoint
YHC	Control command "Valve" or "Compressor"
YR	Control command "Radiator"

SDH	Switching differential "Heating" (P30)
SDC	Switching differential "Cooling" (P31)
SDR	Switching differential "Radiator" (P32)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

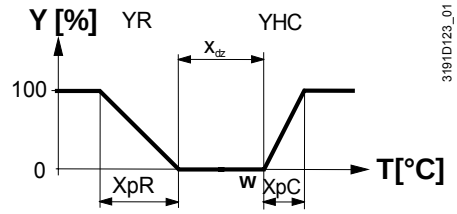
Modulating control: 3-position, PWM or DC 0...10 V

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

Heating mode



Cooling mode



T[°C]	Room temperature
W	Room temperature setpoint
YHC	Control command "Valve"
YR	Control command "Radiator"

XpH	Proportional band "Heating" (P30)
XpC	Proportional band "Cooling" (P31)
XpR	Proportional band "Radiator" (P32)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

Note The diagr ams only show the PI thermostat's proportional part.

Setting sequence and control outputs

See 3.4, 3.6.1, and 3.7.

Note Parameter P78 (RDG160KN SW version ≥ 2.04) sets the heating flow limitation when using a PICV. See 3.5.

3.6.6 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.

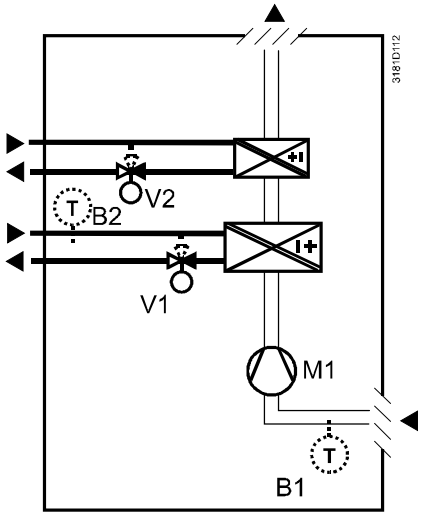
4-pipe application with manual changeover

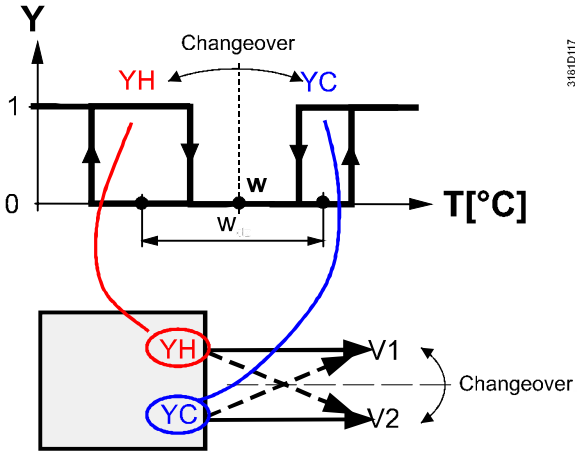
The heating or cooling output can be released via operating mode button if P01 is set to Manual (P01 = 2).

"Main and secondary" application (RDG100KN, 4-pipe with changeover)

If P01 is set to changeover (P01 = 3), the heating and cooling output is swapped as per the input state of the changeover sensor/switch/bus input (see automatic heating and cooling changeover sensor in 3.5). This mode is used for the so-called "Main and secondary" application. This is a 4-pipe fan coil unit system with different capacities in the two coils. The water circuit is changed to optimize the energy exchange based 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

V1	Large coil	YH	Control command "Valve"
V2	Small coil	(heating)	
M1	1-speed or 3-speed fan	YC	Control command "Valve"
B1	Return air temperature sensor or	(cooling)	
external	room temperature sensor (optional)	T[°C]	Room temperature
		B2	Changeover sensor (optional)

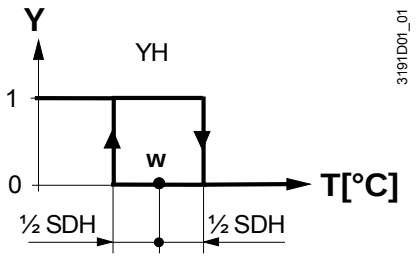
Notes

- The parameter for the heating and cooling changeover sensor (B2 in the above diagram) must be set to 2 (X1 or X2, P38 or P40)
- The thermostat assumes winter operation when B2 > P37 (factory setting 28 °C)
- The thermostat assumes summer operation when B2 < P36 (factory setting 16 °C)

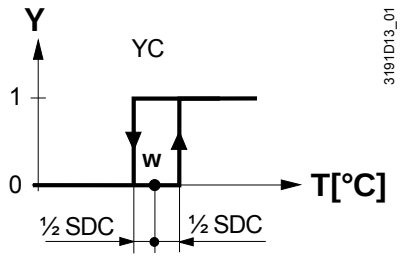
On/Off control

The diagrams below show the control sequence for On/Off control.

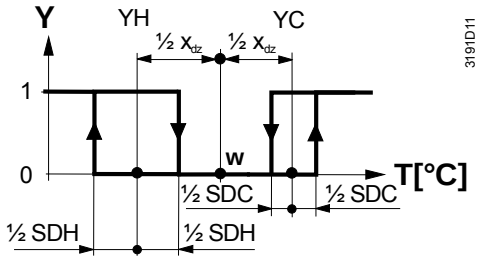
Heating mode with manual selection (P01 = 2) or for P09 >= P10 in heating sequence



Cooling mode with manual selection (P01 = 2) or for P09 >= P10 in cooling sequence



Heating and cooling mode (P01 = 04)

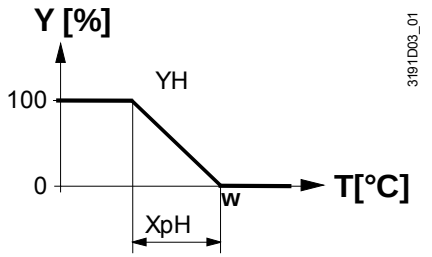


T[°C]	Room temperature
w	Room temperature setpoint
YH	Control command "Valve" (heating)
YC	Control command "Valve" (cooling)
SDH	Switching differential "Heating" (P30)
SDC	Switching differential "Cooling" (P31)
X_{dz}	Dead zone (P33)

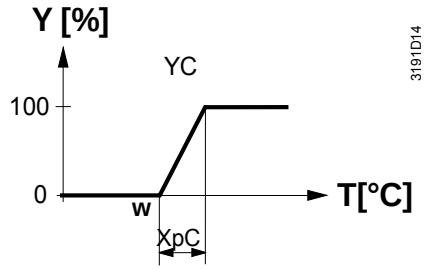
Modulating control: 3-position, PWM, or DC 0...10 V

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

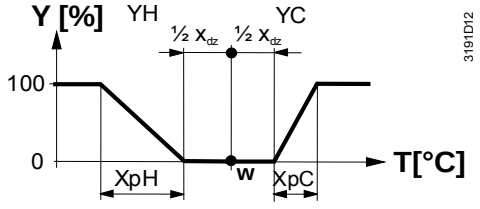
Heating mode with manual selection (P01 = 2) or for P09 >= P10 in heating sequence



Cooling mode with manual selection (P01 = 2) or for P09 >= P10 in cooling sequence



Heating and cooling mode (P01 = 04)



T[°C]	Room temperature
w	Room temperature setpoint
YH	Control command "Valve" (heating)
YC	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 thermostat's proportional part.

Setting sequence and control outputs

See 3.4, 3.6.1, and 3.7.

3.6.6.1 4-pipe application with PICV and 6-port control ball valve as changeover

On a 4-pipe fan coil application with DC fan control, the RDG160KN (SW version ≥ V2.04) controls a combi valve (PICV) in combination with a 6-port ball valve as changeover.

Note: Set DIP# 4 to “off” (4-pipe system) and parameter P01=6.
For details on the principle, see 3.6.9.2.

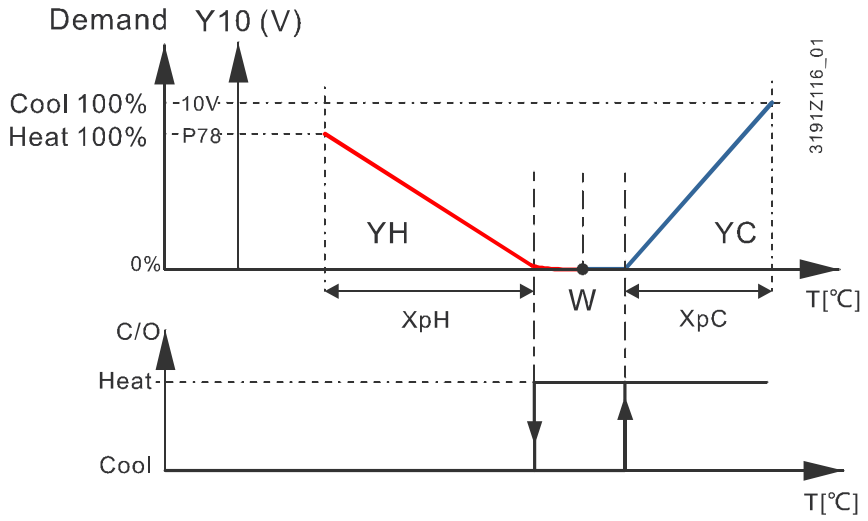
Principle

This application is used on 4-pipe systems with one heat exchanger and differential pressure controller (using a PICV).

The changeover signal DC 0…10 V controls the flow rate on the combi valve (PICV), while the 6-port ball valve, connected to the relay outputs, is used as the changeover to switch the sequence between heating and cooling. The changeover signal can be set as a 3-wired (3-position actuator, default setting) or 2-wired (with 2-position actuator and spring return).

Enable the flow limitation function (for PICV) via parameter P78 to balance heating and cooling systems and avoid hydraulic problems caused by the different flow rates. (see 3.5).

The fan can only be set on DC Y50 output on this application.
Set fan operation (P52) to enable (disable by default).



T[℃]	Room temperature
Y10	DC 0…10 V signal
W	Room temperature setpoint
YH	Control command "Valve" (heating)
YC	Control command "Valve" (cooling)
P78	Flow limitation function for heating only (SW version ≥ V2.04)

See 3.6.9.2 for detailed information on how the thermostat limits the mix of the heating and cooling medium as well as on control outputs.

The connection diagram for application P01=6 with PICV and 6-port ball valve as changeover is available in 6.2.

3.6.7 4-pipe fan coil unit with electric heater (RDG100KN)

Heating and cooling with auxiliary heater

On 4-pipe applications with electric 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 electric heater. Heating and cooling is factory-set (P01 = 4).

Electric heating in heating mode

The electric heater is used as an additional heat source when the heating energy controlled by the valve is insufficient.
The electric heater receives an ON command when the temperature is below "setpoint" minus "1/2 "dead zone" minus "setpoint differential" (= setpoint for electric heater).

Digital input "Enable electric heater"

Remote enabling/disabling of the electric heater is possible via input X1, X2, or D1 for tariff regulations, energy saving, etc.
Input X1, X2, or D1 must be commissioned accordingly (P38, P40 and P42). See 3.9.

KNX

Enable electric heater

The electric heater can also be enabled/disabled via bus.

Do not assign the function to a local input X1, X2 or D1 if the bus input is used.

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

4-pipe application with manual changeover

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

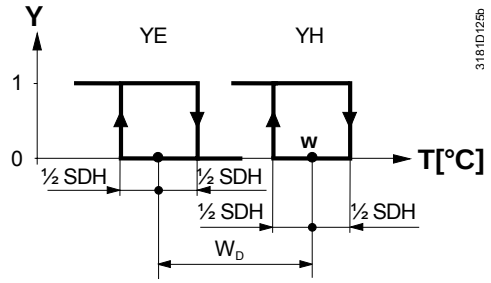
"Main and secondary" application

See 3.6.6.

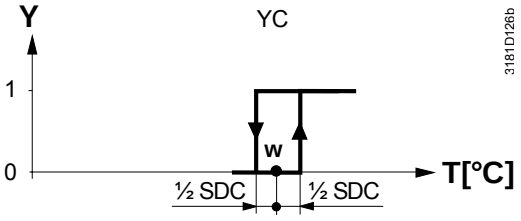
On/Off control

The diagrams below show the control sequence for On/Off control.

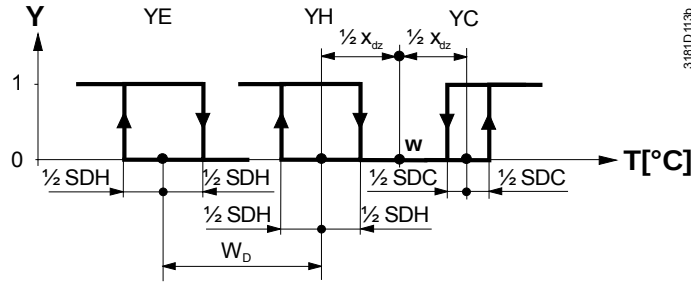
Heating mode with **manual** selection (P01 = 2)



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



Heating and cooling mode (P01 = 4)

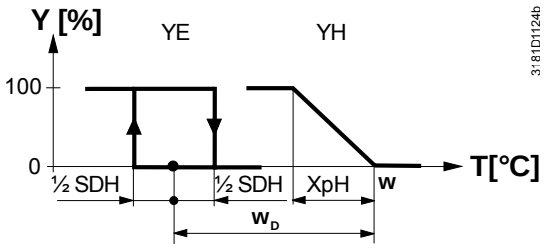


T[°C]	Room temperature
w	Room temperature setpoint
YE	Control command "El heater"
YH	Control command "Valve" (heating)
YC	Control command "Valve" (cooling)
SDH	Switching differential "Heating" (P30)
SDC	Switching differential "Cooling" (P31)
X_{dz}	Dead zone (P33)
w_D	Setpoint differential (P34)

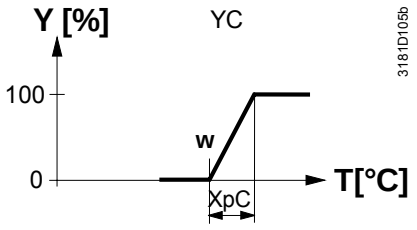
Modulating control: 3-position or PWM

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

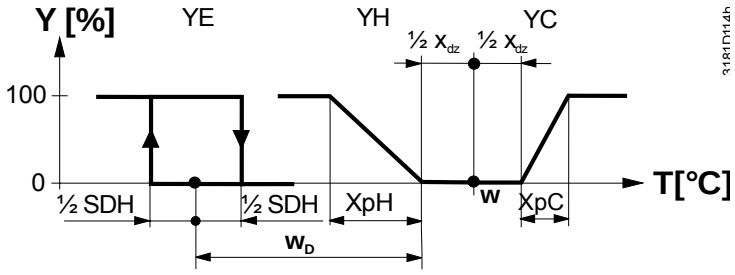
Heating mode with manual selection (P01 = 2)



Cooling mode with manual selection P01 = 2)



Heating and cooling mode (P01 = 4)



T[°C]	Room temperature
w	Room temperature setpoint
YE	Control command "El heater" (only On/Off)
YH	Control command "Valve" (heating) (On/Offor PWM, not 3-position)
YC	Control command "Valve" (cooling) (On/Off, PWM or 3-position)
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 thermostat's proportional part.

Setting sequence and control outputs

See 3.4, 3.6.1, and 3.7.

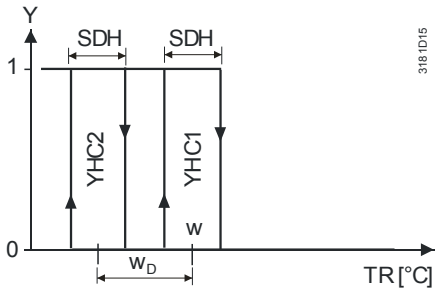
Notes

- YH can only be On/Off or PWM
- YC can be On/Off, PWM or 3-position
- YE can only be On/Off

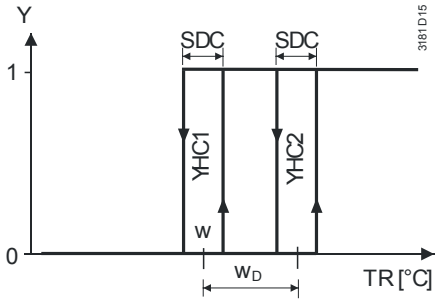
3.6.8 2-pipe/2-stage heating or cooling

2-stage heating or cooling	On 2-stage applications, the thermostat controls 2 valves or 2-stage compressors in heating or cooling mode or changeover (automatically or manually). "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".
Swap function	With the swap function enabled, the 1st stage in heating (YHC1) switches to the 2nd stage in cooling. This function optimizes the use of heating/cooling energy in systems with different equipment. For example, fan coil units combined with radiant heating/cooling panels or floor heating/cooling. See 3.5 to enable the function via P47.
Fan in the 2nd stage	Depending on the equipment, fan control can be started in the 2nd stage (in the 1st stage the fan remains OFF), either in the heating or cooling sequence. Set P52 to 4 or 5 according to the description in 3.8.
On/Off control	The diagrams below show the control sequence for On/Off control.

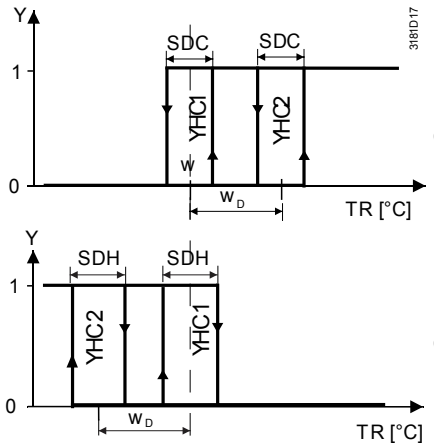
Heating mode (P01 = 0)



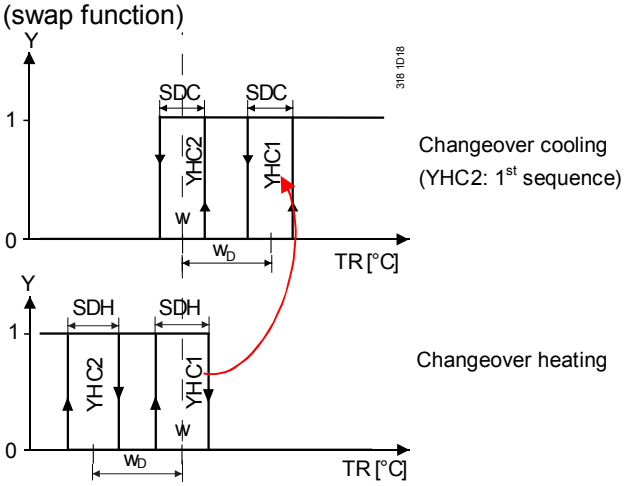
Cooling mode (P01 = 1)



Changeover (P01 = 2 or P01 = 3, P47 = 1)



Changeover (P01 = 2 or P01 = 3, P47 = 3) (swap function)

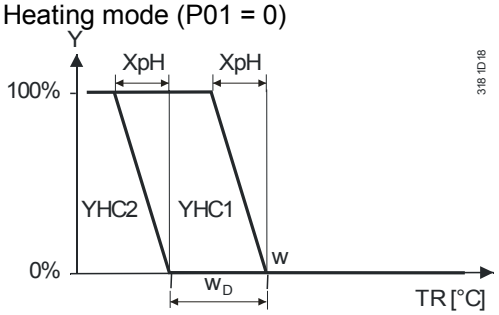


T[°C]	Room temperature
w	Room temperature setpoint
YHC1	Control command "Stage 1"
YHC2	Control command "Stage 2"
SDH	Switching differential "Heating" (P30)
SDC	Switching differential "Cooling" (P31)
w_D	Setpoint differential (P34)

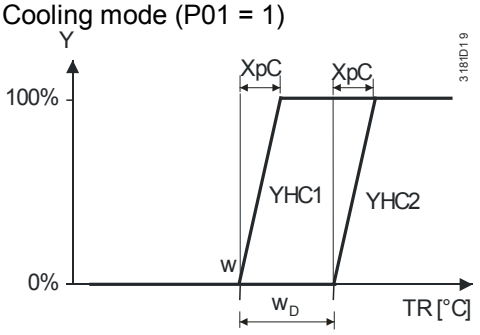
Modulating control: 3-position, PWM or DC 0...10 V

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

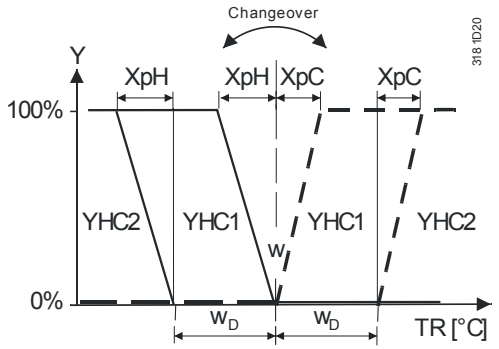
Heating mode (P01 = 0)



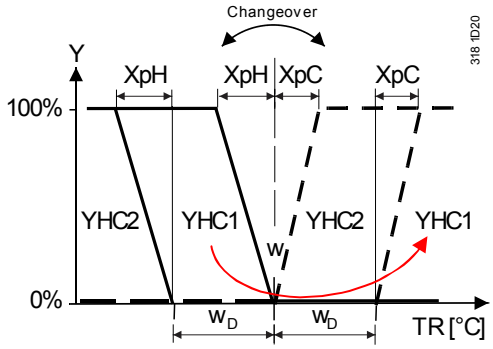
Cooling mode (P01 = 1)



Changeover (P01 = 2 or P01 = 3, P47 = 2)



Changeover (P01 = 2 or P01 = 3, P47 = 4) (swap function)



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)
w_D	Setpoint differential (P34)

Note The diagrams only show the PI thermostat's proportional part.

Setting sequence and control outputs

See 3.4, 3.6.1, and 3.7.

Note For applications with different signals, on/off (1st stage) and DC (2nd stage), small switching differential SDH / SDC (P30, P31) is suggested to start 1st sequence as soon as heating / cooling demand is requested.

Note Set the heating flow limitation function with parameter P78 (RDG160KN SW version ≥ 1.18) when using a PICV on this application. See 3.5.

3.6.9 Chilled/heated ceiling and radiator applications

For chilled/heated ceiling and radiator applications

- Set the corresponding basic application according to 3.4.
- Disable the fan (P52)

The following applications are available:

Application for chilled/heated ceiling, radiator	Set basic application	Section	Sequences
Chilled/heated ceiling with changeover	2-pipe	0	H (\ ) C (/)
Chilled/heated ceiling and electric heater (cooling only: disable electric heater via P13)	2-pipe and electric heater	3.6.4	El H + H (↯\ \ ) El H + C (↯\ /) C (/)
Chilled/heated ceiling and radiator	2-pipe and radiator	3.6.5	H + rad (\ r\ ) Rad + C (r\ /)
Chilled ceiling and radiator	4-pipe	3.6.6	H + C (\ /)
Chilled/heated ceiling, 2-stage	2-stage heating or cooling	3.6.8	H + H (\ \ ) C + C (/ /)

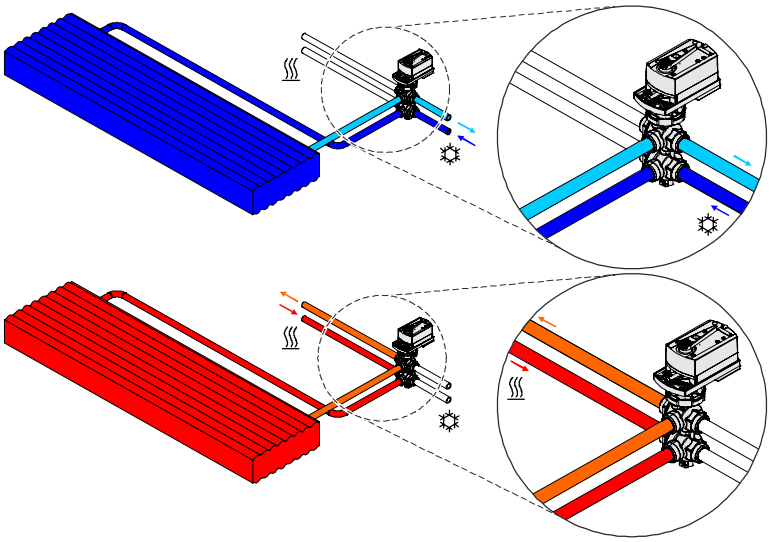
3.6.9.1 Chilled/heated ceiling with 6-port control ball valve (RDG160KN)

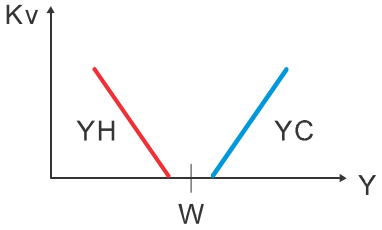
The RDG160KN (SW version ≥ V1.14) is able to control a 6-port control ball valve for a chilled and heated ceiling application.

This application is only available when the thermostats are set as 4-pipe application and P01=5 (see 3.4.2).

Principle

Only one signal DC 0…10V (Y10 output) is used to control the 6-port control ball valve for cooling and heating.





Hydraulic and control diagram of the 6-port control ball valve loop

W	Room temperature setpoint
YH	Control command "Valve" (heating)
YC	Control command "Valve" (cooling)
Kv	Flow through the valve

Default Integral action time TN is fix to 45 seconds.

Control output configuration

When the thermostat is set with P01= 5; only the Y10 output can be used to control the 6-port control ball valve.
Output voltage range of Y10 can be configured via P46. For details, see chapter 3.7.11.

P46 = 3	6-way valve (DC 0…10 V control signal)
P46 = 4	6-way valve (DC 2… 10 V control signal)
P46 = 5	Inverse signal, 6-way valve (DC 10… 0 V control signal)
P46 = 6	Inverse signal, 6-way valve (DC 10… 2 V control signal)

* Inversing the signal might cause hydraulic balancing issues

Fan control

When the thermostat is set with P01=5, the fan control will be set as **disable** and cannot be changed.
The parameter P52 (Fan control) is set to 0 and cannot be change

3.6.9.2 Chilled/heated ceiling with Pressure Independent Combi Valve and a 6-port ball valve as changeover (RDG160KN)

The RDG160KN (SW version ≥ V1.14) is able to control a Pressure Independent Combi Valve (PICV) for a chilled and heated ceiling application in combination with a 6-port ball valve as changeover.

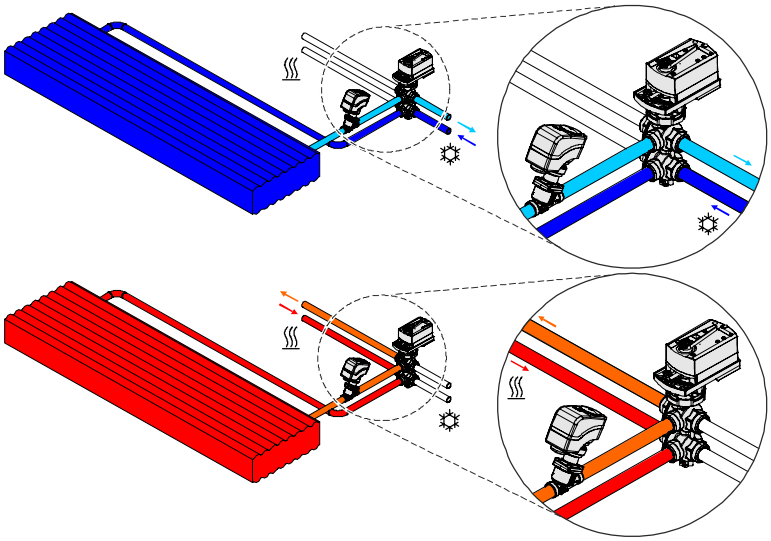
This application is only available when the thermostat is set with a 4-pipe application and P01= 6 (see 3.4.2).

Note: Set DIP# 4 to “off”

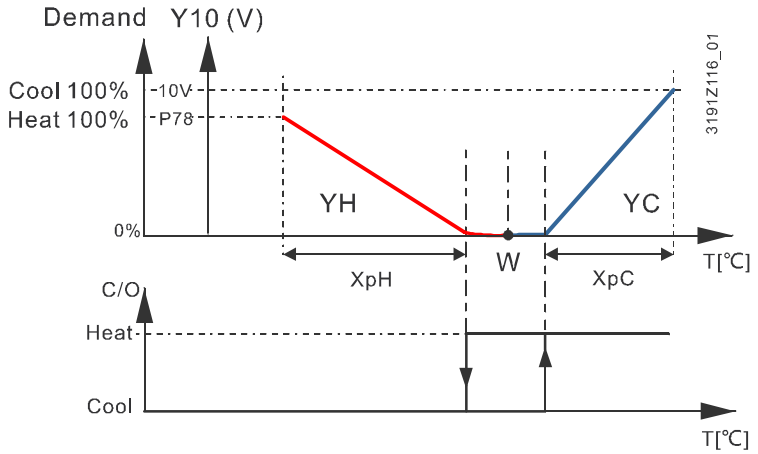
Principle

This application is used for chilled and heated ceiling (4-pipes) with one heat exchanger and differential pressure controller (done with the PICV).
The control sequences (heating and cooling) are managed by one DC 0…10 V signal (Y10) meant to be used with a pressure independent combi valve (PICV).

A 6-port ball valve must be used as changeover. The changeover signal can be set as a 3-wired (3-position actuator, default setting) or 2-wired (with 2-position actuator and spring return).



Enable the flow limitation function (for PICV) via parameter P78 to balance heating and cooling systems and avoid hydraulic problems caused by the different flow rates (see 3.5).



T[°C]	Room temperature
Y10	DC 0…10 V signal
W	Room temperature setpoint
YH	Control command "Valve" (heating)
YC	Control command "Valve" (cooling)
P78	Flow limitation function for heating only (SW version ≥ V2.04)

In order to limit the medium mix (heating and cooling medium), the changeover signal and the control signal (DC 0…10 V) work in sequence.
When control sequences change, the thermostat closes the pressure independent combi valve (PICV) and releases the corresponding relay to operate the 6-port control ball valve.
A delay of 120 seconds is needed before the pressure independent combi valve (PICV) can be operated by the thermostat.

When the relay to ensure the 6-port control ball valve is on the right H/C position, the control signal for the PICV valve is released.

Control output

PICV control:
When the thermostat is set with P01= 6, only the Y10 output can be used to control the control of the pressure independent combi valve (PICV).

6-port ball valve as changeover
When the thermostat is set with P01= 6;

- The relay Q1 is energized when “Heating sequence active” (P72= 5, fixed, cannot be changed)
- The relay Q2 is energized when “Cooling sequence active” (P73= 6, fixed, cannot be changed)

Wiring diagram of the application P01=6 H/C; ceiling with PICV and 6-port ball valve as changeover is available chapter 6.2

3.6.10 Compressor applications (RDG16..KN)

For compressor applications,

- Set the corresponding basic application as per 3.4.
- Disable the fan (P52) or set the type of fan speed (P53)
- Select the type of control outputs (On/Off or DC 0...10 V, P46, P47)

The following applications are available:

Application for compressors in DX-type equipment	Set basic application	Section	Sequences
1-stage compressor	2-pipe	0	H (\ ) C (/)
1-stage compressor with reversing valve	2-pipe	0 0 6.3.2	H + C
1-stage compressor and electric heater (cooling only: disable electric heater via P13)	2-pipe and electric heater	3.6.4	El. H + H (↯\ \ ) El. H + C (↯\ /) C (/)
1-stage compressor for heating and cooling	4-pipe	3.6.6	H + C (\ /)
2-stage compressor	2-stage heating or cooling	3.6.8	H + H (\ \ ) C + C (/ /)

Notes

- Minimum On/Off time: P48/P49 (only with On/Off control outputs)
- Fan operation: P52 (0 = disabled, 1 = enabled)
- Fan speed: P53 (1 = 1-speed, 2 = 3-speed, 3 = DC 0...10 V)
- Control outputs On/Off: P46 = 1 (V1) P47 = 1 (V2) (ECM/DC fan only)
  Control outputs DC 0...10 V: P46 = 2 (V1) P47 = 2 (V2)

3.6.11 Applications with external AQR sensor or QMX room operator unit (RDG165KN)

The equipment combination is for use in commercial buildings, offices, schools, museums, shops, etc.

	AQR/QMX sensor	
Advantages of equipment combination	**LTE-Mode**	**S-Mode**
a) Sensor can be installed in the optimal place for temperature and humidity measurement	✓	✓
b) Unauthorized personal cannot change settings on sensors installed in the room	✓	✓
c) The HVAC equipment and measurement point (T, r.h.) are far apart (e.g. in large spaces). Installing the thermostat near the equipment and the sensor on the measurement point reduces wiring costs and increases control accuracy	✓	✓
d) Several RDG.. room thermostats can operate with one room temperature and/or humidity value (in large spaces)	X	✓
e) AQR/QMX sensor is more appropriate for interior design	✓	✓

With sensor AQR25.. or QMX3..0

Sensor AQR25..., QMX3.P30 or QMX3.P70 delivers relative humidity and room temperature values to the RDG165KN.

The RDG165KN and the sensors use LTE-Mode (KNX) communication. To exchange information (humidity or room temperature), both units must have the same geographic zone apartment and room (A.R.1, where "A" is the value of P82 and "R" is the value of P83 of the RDG165KN).
This equipment combination works on a 1-to-1 basis. Values cannot be provided from the sensor to several RDG165KN room thermostats.

For applications in S-Mode, set the objects for humidity and room temperature of the RDG165KN to **Receive** in ETS. The thermostat then works with the values acquired by the sensor. Default setting **Transmit** indicates that the RDG165KN provides the local room temperature and relative humidity over the bus. One sensor can deliver data to several thermostats.

3.6.12 Setpoints and sequences

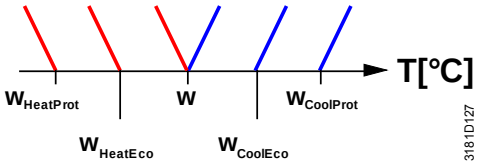
2-pipe and 2-stage applications

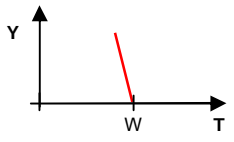
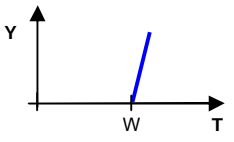
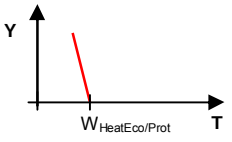
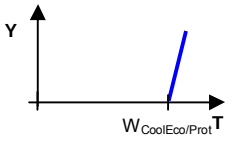
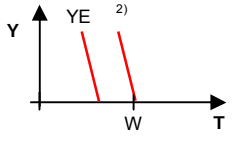
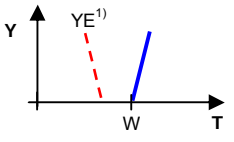
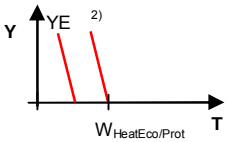
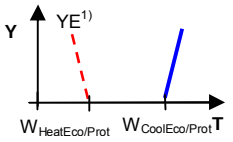
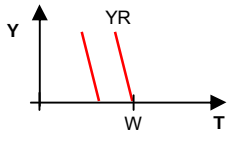
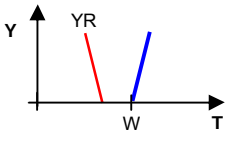
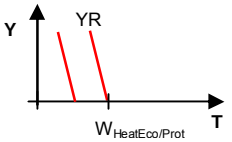
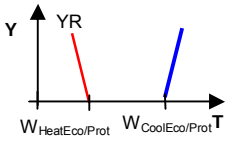
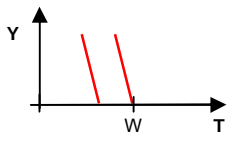
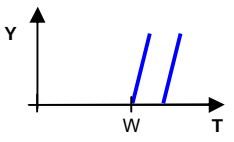
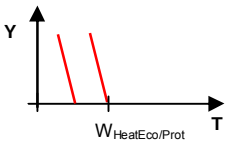
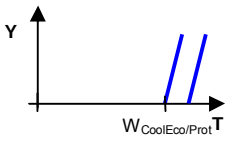
On changeover applications, the Comfort setpoints for heating and cooling sequence are the same (w).

On 2-pipe applications with electric 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 Economy and Protection mode are below the Comfort setpoints (for heating) and above the Comfort setpoints (for cooling).
They can be set via P11, P12 (Economy mode) and P65, P66 (Protection mode).



Application	Comfort mode		Economy/Protection mode	
	Heating	Cooling	Heating	Cooling
2-pipe				
2-pipe and electric heater				
2-pipe and radiator				
2-stage heating or cooling				

[1] If P13 = ON

[2] Only for RDG1..0KN: In case of manual changeover (P01 = 2), the first heating sequence is disabled to prevent heating (electric heater) and cooling (coil) at the same time

W = setpoint in Comfort mode

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

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

YR = radiator sequence

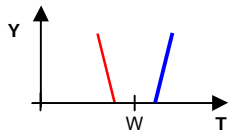
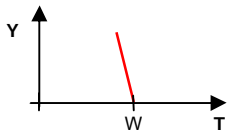
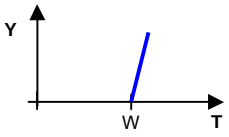
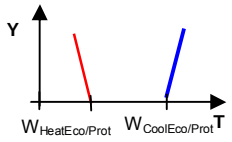
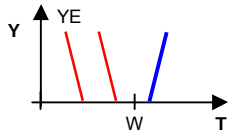
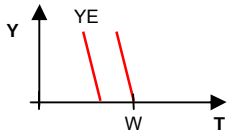
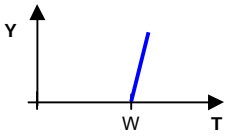
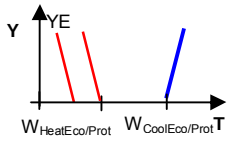
YE = electric heater sequence

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 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			Economy/Protection mode
	Heating and cooling P09 < P10	Heating only [1] or heating and cooling P09 < P10	Cooling only [1] or heating and cooling P09 >= P10	Heating and/or cooling
4-pipe				
4-pipe and electric heater				

[1] Manual changeover, P01 = 2

W = setpoint in Comfort mode

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

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

YE = electric heater sequence

3.7 Control outputs

3.7.1 Overview

Overview of control outputs

Different control output signals are available and are defined during commissioning (see below).

Control output / Product no.	On/Off	PWM	3-position	DC 0…10 V
RDG100KN	Y1, Y2, Y3 (3 x NO)	Y1, Y3, (2 x PWM)	Y1/Y2, Y3/Y4 (2 x ▲ / ▼)	---
RDG16..KN	Q1, Q2, (2 x NO)	---	---	Y10, Y20

Control output / Product no.	DC 0…10 V	DC 2…10 V	DC 10…0 V	DC 10…2 V
RDG160KN for 6-port control ball valve application P01=5	Y10	Y10	Y10	Y10

On/Off control signal (2-position)

The valve receives the ON command via control output Y1 (Q1 on RDG16..KN) or Y3 (Q2 on RDG16..KN) when…

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

The valve receives the OFF command when…

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

Electric heater control signal (On/Off)

The electric heater receives an ON command via the auxiliary heating control output (Y…, see Mounting Instructions [3][18]) when…

1. the acquired room temperature is below the "Setpoint for electric heater",
2. the electric heater has been switched off for at least 1 minute.

The OFF command for the electric heater is output when…

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

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

Note On RDG16..KN the electric heater can be controlled via the On/Off control output (Q2) by setting P47 to 1. For adaptive temperature compensation: see 3.6.4.

3-position control signal (RDG100KN only)

Heating: Output Y1 provides the OPEN command, and Y2 the CLOSE command to the 3-position actuator. Cooling: Same with Y3 and Y4.
The factory setting for the actuator's running time is 150 seconds. It can be

adjusted via P44 (Y1 and Y2) or P45 (Y3 and Y4).
The parameters are only displayed 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 (RDG100KN only)

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

The actuator running time is 150 seconds (factory setting). It can be adjusted via P44 (Y1) or P45 (Y3). These parameters are only displayed if On/Off is selected via DIP switches 4 and 5 and if PWM is selected via P46 and P47.

Note For a more accurate control temperature with PWM signals, the **integral action time (P35) must be set to 0** (Proportional control).

PWM for thermal valve actuators

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

Notes

- Never apply PWM to a motorized actuator
- It is impossible to ensure exact parallel running of 2 or more thermal valve actuators. Motorized actuators with On/Off or 3-position control take precedence if several fan coil systems are controlled by the same room thermostat.

PWM for electric heaters

For electric 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.

Note For PWM, the **integral action time (P35) must be set to 0**.

DC 0...10 V control

This function is available with RDG16..KN only.

DC 0...10 V for valve actuators

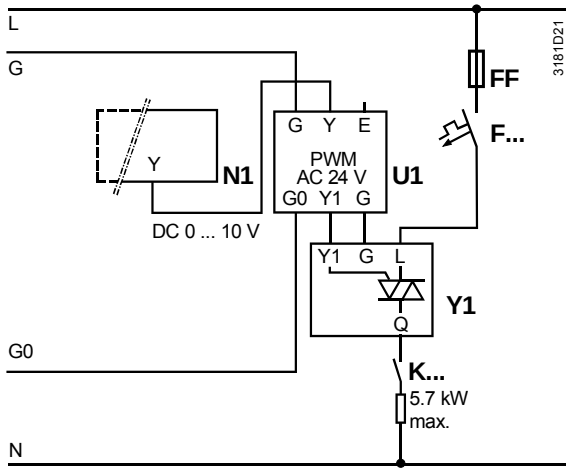
The demand calculated by PI control from the current room temperature and setpoint is provided via Y10 and Y20 to the valve actuator as a continuous DC 0...10 V signal.

Note Parameter P78 (RDG160KN SW version ≥ 2.04) sets the heating flow limitation when PICV is installed in heating and cooling systems at output Y10. See 3.5.

DC 0...10 V for electric 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 electric heater with pulsed current

Note On RDG16..KN the electric heater can be controlled via the On/Off control output (Q2) by setting P47 to 1. For adaptive temperature compensation, see 3.6.4.



N1	RDG16..KN
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

DC 0...10 V
DC 2…10 V
for 6-port control ball valve (RDG160KN only)

The RDG160KN (SW version ≥ V1.14) is able to control a 6-port control ball valve that provides heating and cooling within one DC 0…10 V or DC 2…10 V signal. With those 2 signals, it is possible to control Siemens valves as well as other manufacturer DC 2…10 V valves.

The RDG160KN can also provide for the same application, an inverse signal DC 10…0 V or DC 10…2 V signal in case of inversed hydraulic connection on the valve.
The selection of the signal can be set with P46.

	Description	Explanations
P46 = 3	6-way valve (DC 0…10 V control signal)	Suitable for Siemens and competitors' 6-port control valve and actuators with DC 0…10 V signal
P46 = 4	6-way valve (DC 2…10 V control signal)	Suitable for competitors' 6-port control valve and actuators with DC 2…10 V signal (for example Belimo)
P46 = 5	inverse signal, 6-way valve (DC 10… 0 V control signal)	Useful in case of inversed hydraulic connection on the 6-port control ball valve with Siemens or competitors' DC 0…10 V actuator*
P46 = 6	inverse signal, 6-way valve (DC 10… 2 V control signal)	Useful in case of inversed hydraulic connection on the 6-port control ball valve with competitors' DC 2…10 V actuator (for example Belimo)*

* Inversing the signal might cause hydraulic balancing issues

3.7.2 Control output configuration (setting via DIP switches 4/5 or tool, and P46/P47)

Overview

Control outputs			
On/Off	**Mod.**	**Mod.**	**Mod.**

	(2-position)		PWM	3-pos.	DC 0…10 V
Applications with 3-speed/1-speed fan					
2-pipe	✓		✓	✓	✓
2-pipe and electric heater	✓		✓	✓	✓
2-pipe and radiator/floor heating	✓		✓	✓	✓
4-pipe	✓		✓	✓	✓
4-pipe and electric heater	✓		✓	(✓) *)	
2-stage, cooling or heating	✓		✓	✓	✓

Applications with DC 0…10 V (ECM) fan					
2-pipe		✓			✓
2-pipe and electric heater		✓			✓
2-pipe and radiator/floor heating		✓			✓
4-pipe		✓			✓
2-stage, cooling or heating		✓			✓

Applications with DC 0…10 V 6-port valve **)					
H/C ceiling					✓
Available with product no.➔	RDG100KN	RDG16..KN	RDG100KN	RDG100KN	RDG16..KN

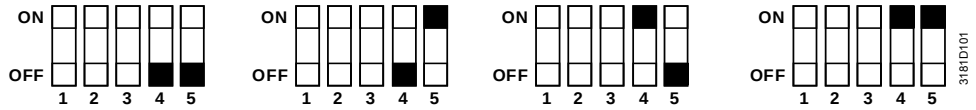
*) Only available for one actuator

**) RDG160KN with SW version ≥ V1.14

RDG100KN

The type of the control outputs (2- or 3-position) is set via DIP switches 4 and 5.

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



Y1/Y2 =	On/Off	On/Off	3-position	3-position
Y3/Y4 =	On/Off	3-position	On/Off	3-position

Notes

- If On/Off is selected, the factory setting is On/Off. To select PWM (pulse width modulation), set P46 and/or P47 to 2
- 4-pipe with electric heater: As the electric heater requires 1 of 4 outputs, only the cooling valve actuator can be 3-position
- For commissioning via tool, all DIP switches have to be set to OFF. Control outputs need to be set via tools in this case

For details on connecting peripheral devices and setting of the DIP switches, refer to the Mounting Instructions M3191 [3].

RDG16..KN

Applications with DC 0...10 V (ECM) fan control (Y50) or without fan:
The type of valve actuator control outputs can be changed from DC 0...10 V (factory setting) to On/Off.

To select On/Off valve actuator control, set P46 and/or P47 to 1.

- Cooling: DC 0...10 V Y10 (P46 = 2, default), On/Off on Q1 (P46 = 1)
- Heating: DC 0...10 V Y20 (P47 = 2, default), On/Off on Q2 (P47 = 1)

When the RDG160KN (SW version ≥ V1.14) is set for a chilled and heated ceiling with a 6-port ball valve (P01=5 or P01=6), the control output is Y10 and cannot be changed.

Notes

- For 2-pipe and 2-stage application, P47 can be set to 3 or 4 to enable the swap function. See 3.5
- For applications with 3-speed fan, only DC 0...10 V control outputs Y10 and Y20 are available
- Fan type can be selected via P53 or DIP switch 4, see 3.8
- On/Off valve actuator control on applications without fan function – sequence of settings:
  - Set DIP switch 4 to OFF and P53 to 3
  - Disable the fan function by setting P52 to 0
  - Set the valve actuators to On/Off by setting P46 and/or P47 to 1
- For commissioning via tools, set all DIP switches to OFF. The control outputs need to be set via tools in this case

3.8 Fan control

Overview fan outputs

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

Control output / Product no.	On/Off 1-/3-speed fan	Modulating fan DC 0…10 V	Control type selected via
RDG100KN	Q1,Q2,Q3 (3)		P53
RDG160KN	Q1,Q2,Q3 (3) [1)]	Y50 (1) [1)]	P53, DIP 4
RDG165KN	Q1,Q2,Q3 (3) [1)]	Y50 (1) [1)]	P53, DIP 4

( ) Number of outputs

[1)] Selectable via P53 or DIP switch 4 on RDG16..KN

The fan operates in automatic mode or at the selected speed with manual mode. In automatic mode, the fan speed is based 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 I (min. fan speed) as per the setting of P15 (RDG16..KN: fan stage in dead zone) and P60 (fan kick).

Factory setting for "Fan in the dead zone":

- RDG100KN: Fan speed I : (P60 = 0)
- RDG16..KN: Fan speed OFF: (P15 = 0, P60 = OFF)

Only one fan output at one time is on, either Q1, Q2 or Q3.

Selection fan output on RDG16..KN

The type of fan output (DC 0...10 V, 3-speed or 1-speed) can be set via DIP switch 4, local HMI (P53) or tool (ACS, ETS).

If application is set via DIP switches and DIP 4 is set to OFF:

- DC 0...10 V fan (ECM) on Y50 is selected
- P53 = 3 (ECM fan) cannot be modified
- 3-speed/1-speed fan output is not available

If application is set via DIP switches and DIP 4 is set to ON:

- 3-speed fan on Q1, Q2, Q3 is selected, P53 = 2
- 1-speed fan (on Q1) can be selected via HMI (P53 = 1) or via tools (ACS or ETS)
- DC 0...10 V (ECM) fan output is not available
- 3-speed fan output is enabled only if the application has also been selected via DIP switches

If all DIP switches are OFF (commissioning via tool ACS or ETS):

- Application and type of fan must be set and downloaded via tools
- If ECM fan has been set, the type of fan output cannot be modified via HMI
- If 3-speed or 1-speed is selected, P53 can be modified locally to 2 (3-speed) or 1 (1-speed)

KNX

Fan command value
Enable fan command value

The fan speed and mode can be changed via bus.

For this purpose, the fan command value needs to be enabled.

KNX

Fan operation
Fan stage I-II-III
Fan output

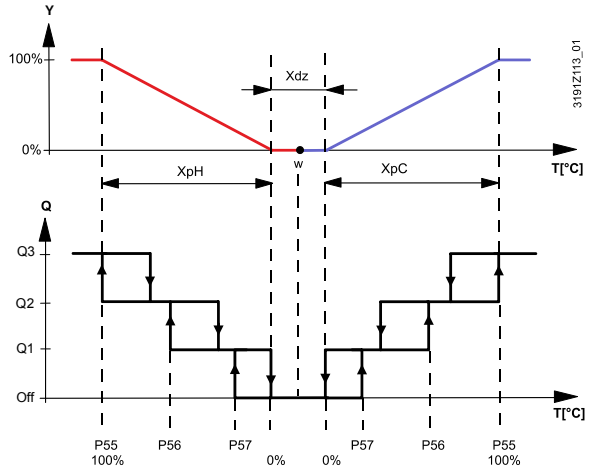
The fan speed and mode can be monitored via bus.

3-speed fan control with modulating heating/cooling control (PWM, 3-pos or DC 0...10 V)

The individual switching points for ON of each fan stage can be adjusted via control 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.

Heating/cooling

1- or 3-speed fan



w	Room temperature setpoint
Q	Fan speed
Y_H	Control demand "Heating"
Y_C	Control demand "Cooling"
XpH	Proportional band "Heating" (P30)
XpC	Proportional band "Cooling" (P31)
X_{dz}	Dead zone (P33)
	Fan speed switching point high (P55)
	Fan speed switching point med (P56)
	Fan speed switching point low (P57)

Note The diagram only shows the PI control's proportional part.

3-speed/ECM fan control with On/Off heating/cooling control

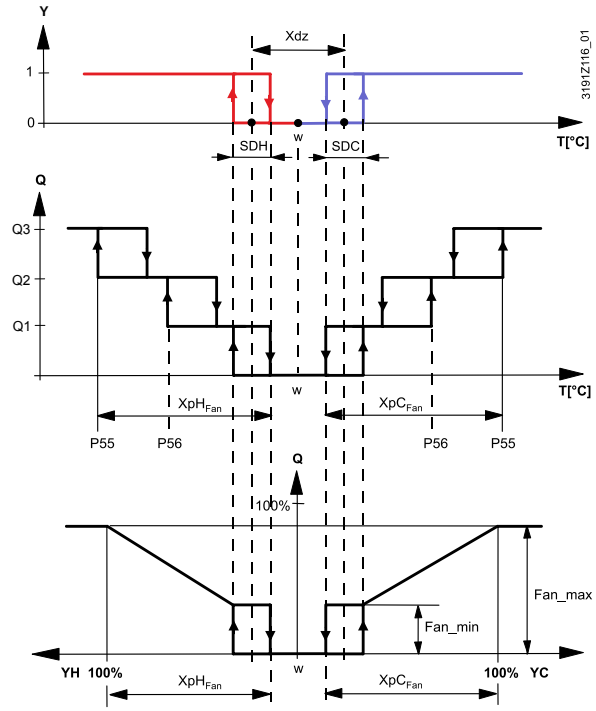
On applications with On/Off control:

1) The switching point for low fan speed is synchronized to the heating/cooling output. P57 (switching point fan speed low) 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.

Heating/cooling

1- or 3-speed fan

ECM fan



T [°C]	Room temperature
w	Room temperature setpoint
Q	Fan speed
Y	Control command "Valve"
SDH	Switching differential "Heating" (P30)
SDC	Switching differential "Cooling" (P31)
Xdz	Dead zone (P33)
XpH_{Fan}	Switching range for fan "Heating" (Table)
XpC_{Fan}	Switching range for fan "Cooling" (Table)
	Fan 3-speed switching point high (P55)
	Fan 3-speed switching point med (P56)
Fan_max	Max. ECM fan speed (P55)
Fan_min	Min. ECM fan speed (P56)

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

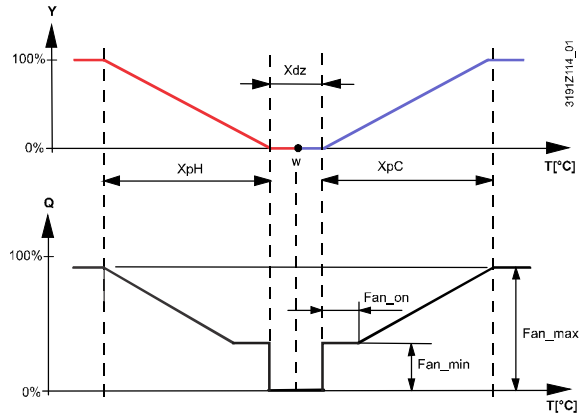
1-speed/3-speed fan

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

Control sequence for DC 0...10 V fan (ECM) and DC 0...10 V valves (RDG16..KN)

When DC 0...10 V fan and DC 0...10 V valve output control are selected, the fan switching points can be set via the following parameters:

– P55: ECM fan max. output
– P56: ECM fan min. output
– P57: Switching point fan

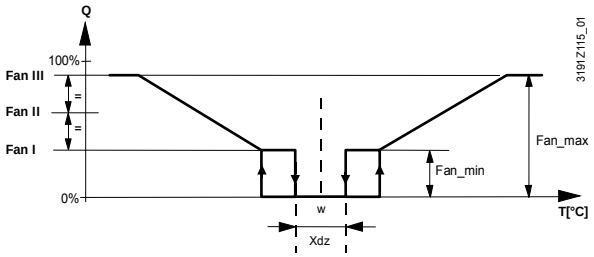


w	Room temperature setpoint
Q	Fan speed
Y_H	Control demand "Heating"
Y_C	Control demand "Cooling"
XpH	Proportional band "Heating" (P30)
XpC	Proportional band "Cooling" (P31)
X_{dz}	Dead zone (P33)
Fan_max	Max. fan speed (P55)
Fan_min	Min. fan speed (P56)
Fan_on	Fan switch-on point (P57)

Note The diagram only shows the PI control's proportional part.

Manual operation DC 0...10 V fan

Fan speed I = min. fan speed
Fan speed II = half-way between min. fan speed and max. fan speed
Fan speed III = max. fan speed



Note: Manual fan settings do not influence control signals "Heating" and "Cooling".

Note When heating with the electric heater only, manual fan speed I is unavailable to guarantee the necessary minimum air flow for the electric heater and to avoid overheating of the system.

2 sequences heating/cooling (RDG1..0KN)

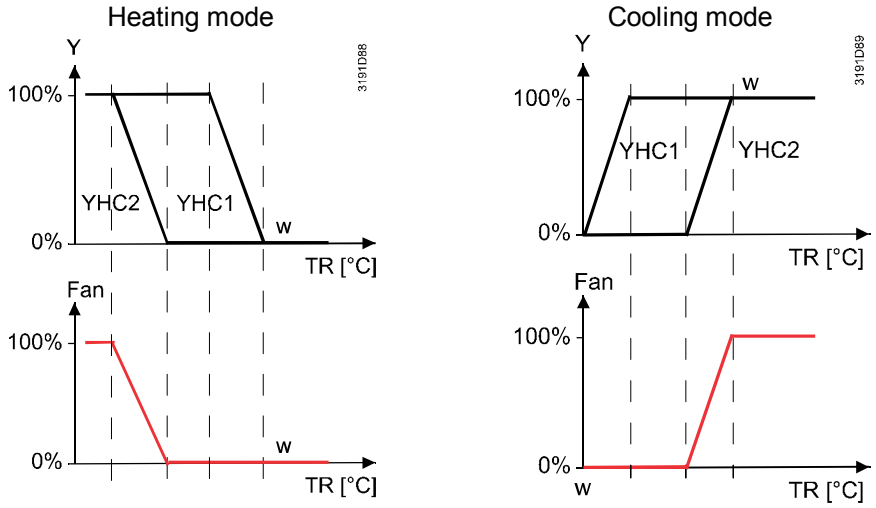
For heating or cooling with 2 sequences (e.g. heating with a heating coil and an electric heater, or 2-stage cooling), the fan is always synchronized with the 1st stage.

Fan in the 2nd stage (RDG165KN)

For 2-pipe and 2-stage applications, based on the equipment, the fan may have to run in the 2-stage only (in the 1st stage the fan remains OFF), either in the heating or cooling sequence.

Example 1 The fan runs only in the 2nd stage in the heating and cooling sequence (2-pipe and 2-stage application).

Set both P46 and P47 to 1 or 2 (based on the requested control signal), and set P52 to 4 (fan in the 2nd stage).



Notes

- The output for the 1st stage (YHC1) in heating mode is also the 1st stage in cooling mode
- This function is available for DC/3-speed/1-speed fans

Example 2

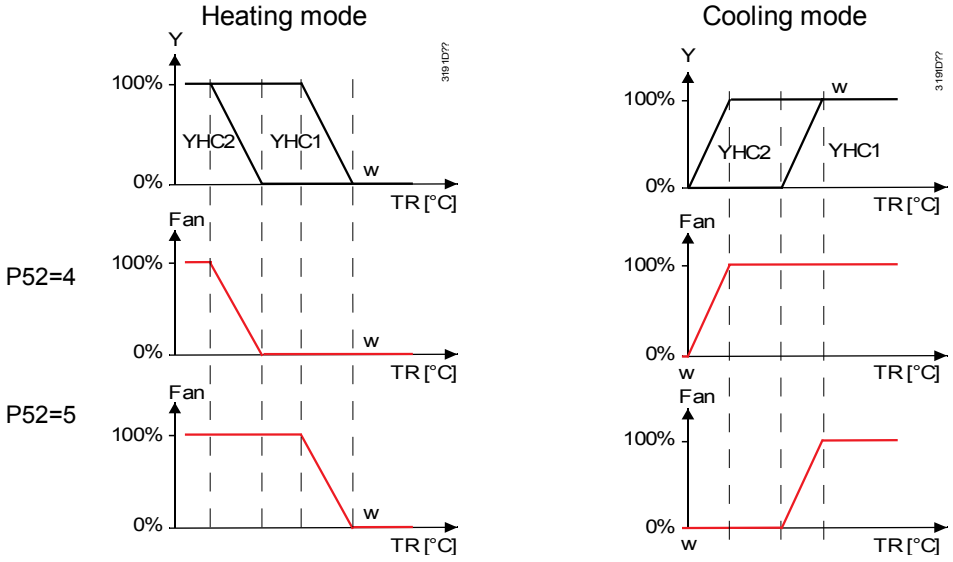
We recommend enabling the swap function on applications with fan coil system and floor heating/cooling systems. In this application, the fan runs during cooling demand (fan coil unit and floor cooling) and only in the 2nd heating stage (with the fan coil unit).

Set P47 to 3 or 4, depending on the selected control signal (swap function), and set P52 to 4 (fan in the 2nd stage).

Example 3

The fan runs during heating demand and only in the 2nd cooling stage, e.g. for applications with fan coil system and radiant heating/cooling panels.

This setting is available only when P52 is set to 5, and the swap function is selected (P47 is set to 3 or 4).



Notes

- The output for the 1st stage in heating mode is the 2nd stage in cooling mode
- This function is available for DC/3-speed/1-speed fans

Examples, other combinations

The following table shows for the 2-pipe / 2-stage applications the relation between the fan behavior (switching range fan XpH_{Fan}/XpC_{Fan} according to look-up table or proportional band XpH/XpC) depending on the selected output signals and on the synchronization of the fan with the first or second sequence.

Combination	1st stage signal	2nd stage signal	Fan Type	Fan Synchro	Fan behavior
1	On/off	On/off	DC	1st sequence	XpH_{Fan}/XpC_{Fan}, P-control
2	DC	DC	DC	1st sequence	XpH/XpC, P/PI control
3	On/off	On/off	DC	2nd sequence	XpH_{Fan}/XpC_{Fan}, P-control
4	DC	DC	DC	2nd sequence	XpH/XpC, P/PI control
5	On/off	DC	DC	1st sequence	XpH_{Fan}/XpC_{Fan}, P-control
6	On/off	DC	DC	2nd sequence	XpH/XpC, P/PI control
7	DC	On/off	DC	1st sequence	XpH/XpC, P/PI control
8	DC	On/off	DC	2nd sequence	XpH_{Fan}/XpC_{Fan}, P-control
9	DC	DC	3-speed	1st sequence	XpH/XpC, P/PI control
10	DC	DC	3-speed	2nd sequence	XpH/XpC, P/PI control

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 disabled via P52.
When the fan operation is disabled, the fan symbol on the display disappears and pressing the fan button has no impact.
This function allows you to use the thermostat on universal applications such as chilled/heated ceilings and radiator, etc. (see 3.6.9).

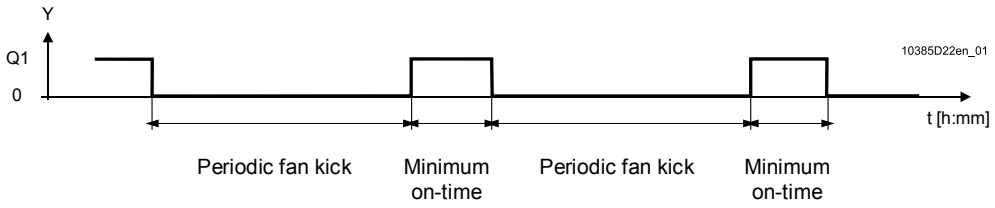
Fan minimum on- time

In automatic mode, a dwelling time of 2 minutes (factory setting) is active. The fan maintains each speed for at least 2 minutes before changing to the next speed.
The minimum on-time can be adjusted from 1…6 minutes via P59.

Fan kick (P60, P61)

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 a 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 P60, and for Economy mode via P61.

Notes

- Fan kick value 0 means the fan runs continuously in the dead zone
- Fan kick value 1 and higher: Value in minutes
- Fan kick value OFF means the fan does not run in the dead zone

Fan operation in dead zone P15 (RDG16..KN)

The fan speed in the dead zone (in Comfort mode) can be set via P15 (Service level) according to customer preference.

The following options are available:

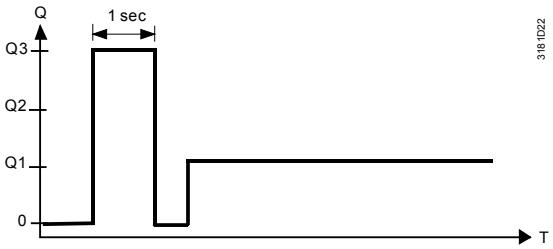
- Fan does not run in the dead zone (P15 = 0)
- Fan runs at low speed in heating and cooling mode (P15 = 1)
- Fan runs at low speed in Cooling mode only (P15 = 2)

The functions "Fan in dead zone" (P15) and "Fan kick" (P60) are combined as follows:

- P60 = 0 Fan runs continuously in the dead zone, P15 has no influence
- P60 = OFF Fan operation in dead zone according to P15

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 P58).



Fan overrun for electric heater

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

⚠ Fan failure

In case of fan failure, the thermostat cannot protect the electric heater against overtemperature. For this reason, the electric 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 change/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 function is set via P62 (default = OFF (0)).

KNX

Fault information

The "Clean filter reminder" is reset when the operating mode is manually set to Protection and back.

Fan in Auto mode

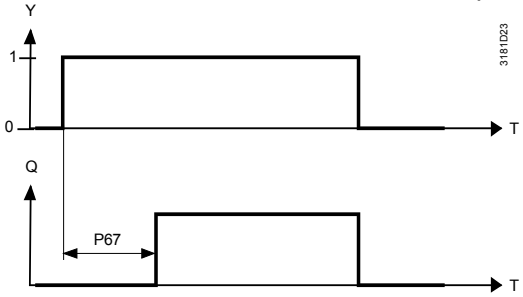
In Auto mode Auto, the default fan mode is automatic. The fan mode can be changed to Manual by pressing the FAN button. The fan returns to the automatic default mode after each switchover from Comfort to Economy mode, and vice versa.

Fan start delay

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

Note

RDG100KN SW version <= 1.24:
Function available for On/Off control outputs only.



Fan operation with combi valve PICV and a 6-port ball valve as changeover

Fan control is set to disable by default, if the thermostat is set with P01=6. It can, however, be enabled via parameter P52 for applications with fan coils using the combi valve PICV to control the flow rate and the 6-port ball valve as changeover. In this case, the fan can only be set on DC fan at output Y50.

P52	1 = Disabled	0 = Disabled 1 = Enabled 2 = Heating only 3 = Cooling only

3.9 Multifunctional input, digital input

The thermostat has 2 multifunctional inputs X1 and X2 and a digital input D1.

An NTC type sensor 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 P38 + P39 for X1, P40 + P41 for X2, and P42 + P43 for D1.

The current temperature or state of the inputs X1/X2 and D1 is available on bus for monitoring purposes.

The parameters can be set to the following values:

#	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 P51.	AI	--
2 Heating/ cooling changeover	Heating/cooling changeover	Sensor input for "Automatic heating/cooling changeover" function. A switch can also be connected rather than a sensor. Important: Switch closed means always cooling, (this cannot be changed). See also 3.5. Heating/cooling changeover is also possible via bus. In this case, the function must not be assigned to any local input X1, X2, D1. See also 3.5. Diagnostic value **0** ˚**C** is displayed for closed contact/**100** ˚**C** for open contact, if a switch is connected.	AI/DI	DI
3 Window state	Operating mode switchover (RDG100KN)	Digital input to switch over the operating mode to Economy. If the operating mode switchover contact is active, user operations are ineffective and **OFF** is displayed. Operating mode switchover is also possible via bus. In this case, do not assign the function to any local input X1, X2 or D1. See also 3.2.	DI	DI
3 Window state	Window contact (RDG16..KN)	Digital input to switch over the operating mode to Protection. If the window contact is active, user operations are ineffective and **OFF** is displayed. Window contact is also possible via bus. In this case, do not assign the function to any local input X1, X2 or D1. See also 3.2.	DI	DI
4	Dewpoint monitor	Digital input for a dewpoint sensor to detect condensation. Cooling is stopped if condensation occurs.	DI	DI

#	Function of input	Description	Type X1/X2	Type DI
5	Enable electric heater	Digital input to enable/disable the electric heater via remote control. Enable electric heater is also possible via bus. In this case, **do not** assign the function to any local input X1, X2, D1. See also 3.6.	DI	DI
6	Fault	Digital input to signal an external fault (example: dirty air filter). If the input is active, **ALx** is displayed and a fault is sent on the bus. See also 3.11.8. (Alarm x, with x = 1 for X1, x = 2 for X2, x = 3 for D1). **Note**: Fault displays have no impact on the thermostat's operation. They merely represent a visual signal.	DI	DI
7	Monitor input (digital)	Digital input to monitor the state of an external switch via bus	DI	DI
8	Monitor input (temperature)	Sensor input to monitor the state of an external sensor (e.g. QAH11.1) via bus.	AI	--
9	Supply air temperature limitation (RDG16..KN only)	Sensor input to acquire the supply air temperature. The thermostat controls the room temperature via the built-in sensor. The control output (DC 0...10 V) is reduced if the supply air temperature falls below the min. limit or exceeds the max. limit (P63, P64).	AI	--
10	Presence detector (RDG16..KN only)	Presence detector input switches the operating mode to Comfort when the room is occupied and switches back to Economy when the room is unoccupied. Presence detector is also possible via bus. In this case, do not assign the function to any local input X1, X2 or D1. See also 3.2.1.	DI	DI

KNX Enable electric heater

KNX Fault information

KNX D1, X1, X2 (Digital)

KNX X1, X2 (Temp.)

KNX X1, X2 (Temp.)

KNX Presence detector

- Control action can be changed from normally open (NO) and normally closed (NC) via 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 fault (6) or monitor input (7,8)
- X1 is factory-set to "External sensor" (1), X2 to "Not used" (0), and D1 to "Operating mode switchover" (3)

For more detailed information, see3.4.

Notes

- For inputs X1, X2, or D1, one physical switch can be used for up to 20 thermostats (parallel connection)
  Caution! DO NOT mix X1/X2 (mains potential on RDG100KN) and D1.
- For sensors on inputs X1, X2, or D1, the maximum cable length is 80 m

3.10 Handling faults

Temperature out of range

If the room temperature exceeds or falls below 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 as soon as the temperature is within the measuring range.

Fault "Er1" on display

If the built-in sensor fails and no external sensor is connected, fault message **Er1** displays on the thermostat. Replace the thermostat if you want the room temperature to be measured.

For fault status messages on the bus, see 3.11.8.

3.11 KNX communications

The RDG KNX thermostats support communications as per the KNX specification.

S-Mode	Standard mode; engineering via group addresses.
LTE-Mode	Logical Tag Extended mode, for easy engineering, is used in conjunction with Synco.

3.11.1 S-Mode

This mode corresponds to KNX communications.
Connections are established via ETS by assigning communication objects to group addresses.

3.11.2 LTE-Mode

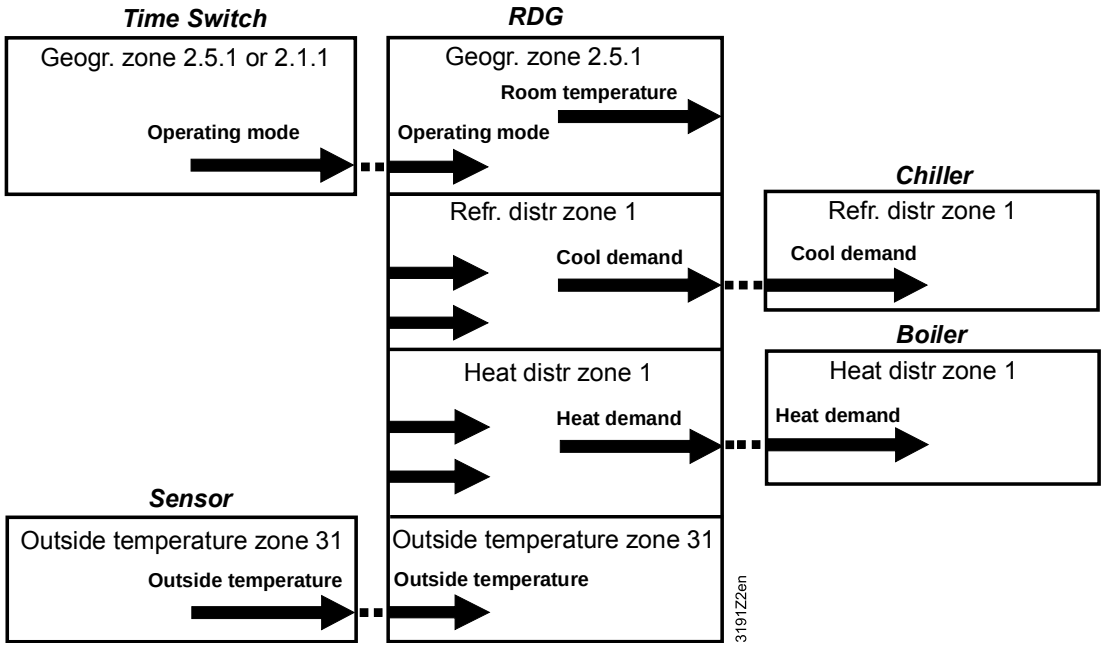
LTE-Mode was specifically designed to simplify engineering. Unlike with S-Mode, individual connections (group addresses) need not be created in the tool. The devices autonomously establish connections.

Definitions

The following circumstances are predefined:

- Every device or subdevice is located within a zone
- Every data point (input or output) is assigned to a zone
- Every data point (input or output) has a precisely defined "name"

Whenever an output and an input with the same "name" are located in the same zone, a connection is established automatically, as shown in the following diagram.



Engineering and commissioning

- For a detailed description of KNX (topology, bus supply, function and setting of LTE zones, filter tables, etc.), see "Communication via the KNX bus for Synco 700, 900 and RXB/RXL, Basic Documentation" [6]
- LTE-Mode data points and settings are described in the Synco Application Manual [12]
- To engineer and commission a specific system, use the Synco700 planning and commissioning protocol (XLS table in HIT, [7])

3.11.3 Zone addressing in LTE-Mode (in conjunction with Synco)

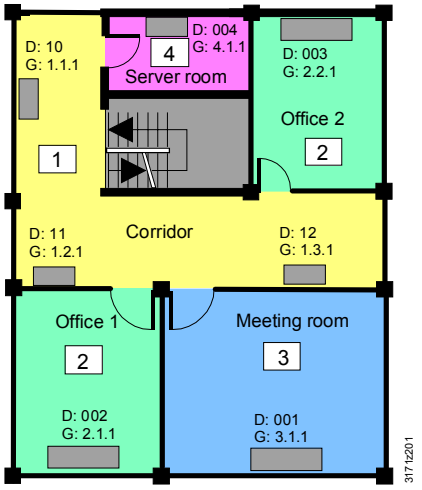
Zone addresses must be allocated where RDG.. KNX room thermostats are used in LTE-Mode (e.g. in conjunction with Synco).
The following zone addresses must be defined together with the Synco devices at the planning stage based on application.

Short description	Factory setting	Parameter
Geographical zone (apartment)	--- (out of service)	P82
Geographical zone (room)	1	P83
Heat distr zone heating coil	1	P84
Refr distr zone cooling coil	1	P85
Heat distr zone heating surface	2	P86

Note "Subzone" of "Geographical zone" is fixed at 1 (not adjustable).

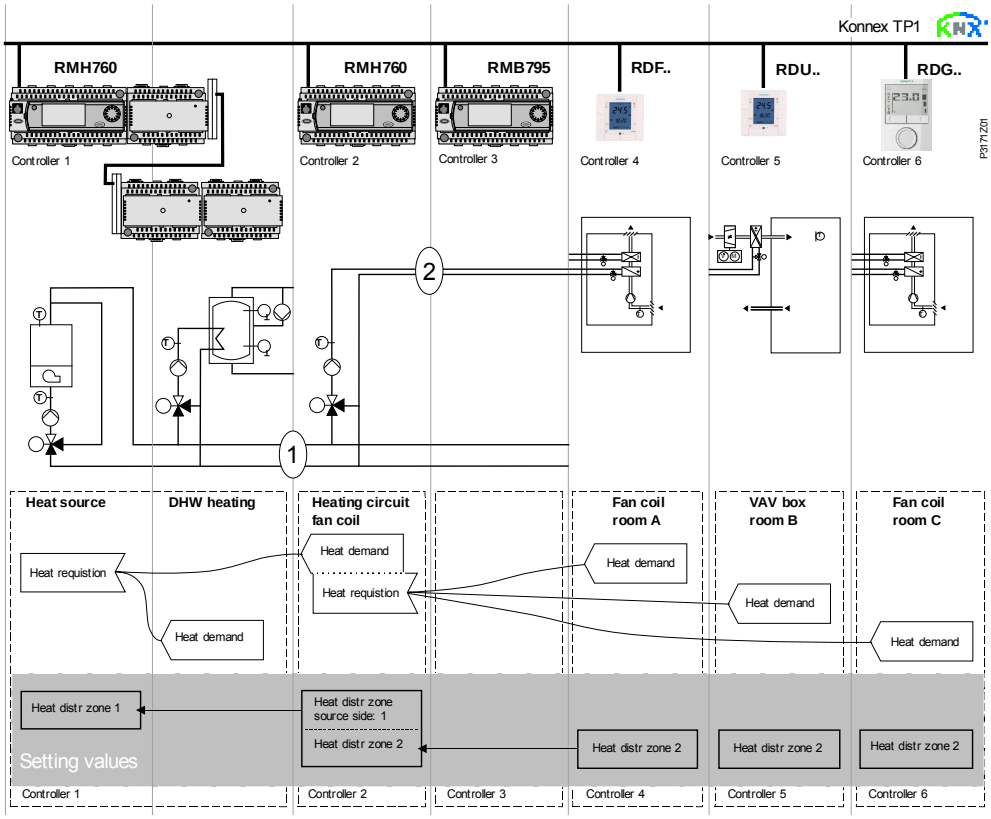
The device sends and receives LTE communication signals only if the zone address is valid (not OSV = not out of service).

The zones are defined as follows:

Geographical zone (space zone) (Apartment . Room . Subzone) Apartment = ---, 1...126 Room = ---, 1...63 *Subzone = fix 1*	Zone where an RDG.. KNX room thermostat is physically located. Other room-specific devices may also be located in this zone. Information exchanged in this zone is related specifically to the device like operating mode, setpoints, room temperature, etc. The designations "Apartment", "Room" and "Subzone" are not necessarily literal. For example, Apartment can be used to refer to a group of rooms, floor or section of a building. "Room", however, really does refer to a room. Subzone is not used for HVAC devices. It is more relevant to other disciplines, such as lighting. Subzone is fixed at "1" and not displayed. The time switch information is expected from the same zone where the thermostat is located (Residential). If no time switch information is received from the same zone, the thermostat uses the information received from the same apartment but with room "1" A.1.1 (Office). **Example:** **Commercial building** In a commercial building, the time switch information is sent by the RMB975 central control unit. The zones are divided into so called "Room groups" (e.g. 1...4), where each "Room group" can have an individual schedule. A room thermostat in the same "Room group" must have the same Apartment Address. Legend: D = device address (P81) G = geographical zone (P82, P83) (Apartment.Room.Subzone) 
Heat distribution zone heating coil Zone = ---, 1...31	Information related specifically to the hot water system in heating coils is exchanged within this zone. The zone also includes a Synco device to process the information (e.g. RMH7xx or RMU7xx with changeover).
Heat distribution zone heating surface (radiator) Zone = ---, 1...31	Information related specifically to the hot water system of a radiator is exchanged within this zone (e.g. heating demand). This zone also includes a Synco device to process the information (e.g. RMH7xx or RMB795B).
Refrigeration distribution zone cooling coil Zone = ---, 1...31	Information related specifically to the chilled water system is exchanged within this zone (e.g. cooling demand). This zone also includes a Synco device to process the information (e.g. RMU7xx).
Outside temperature zone *Zone*	Outside temperature received in outside temperature zone 31 can be displayed on the room thermostat when commissioned accordingly (P07 = 2).

3.11.4 Example of heating and cooling demand zone

The building is equipped with Synco controls on the generation side and RDF../RDU../RDG.. room thermostats on the room side.



Explanation relating to the illustration

In the case of a typical application, the individual RDF../RDG.. room thermostats send their heat demand to the primary controller (in the above example to the RMH760).

(1) and (2) designate the numbers of the distribution zone.

Notes

- This type of application can also be applied to refrigeration distribution zones
- If no 2-pipe fan coil unit is used, heat and refrigeration demand signals are sent simultaneously to the primary plant

3.11.5 Send heartbeat and receive timeout

In a KNX network, S-Mode and LTE-Mode communication objects can be exchanged between individual devices. The "Receive timeout "defines the period of time within which all the communication objects requested from a device is received at least once. If a communication object is not received within this period, a predefined value is used.

Similarly, the "Send heartbeat" defines the period of time within which all the communication objects requested must be transmitted at least once.

LTE-Mode/S-Mode

Fixed times are specified as follows:

– Receive timeout: 31 minutes
– Send heartbeat: 15 minutes

Object [KNX obj. Nr.]	I/O	Minutes	Default value
Room operating mode: Time switch [12]	Receive	31	Comfort
Room operating mode: Preselection [7] [1)]	Receive	31	Auto
Application mode [31]	Receive	31	Auto
Room operating mode Window state [20] [2)]	Transmit	15	Close

[1)] For RDG100KN, RDG160KN, RDG165KN, RDG400KN and RDG405KN
[2)] Only available in S-Mode for RDG160KN (SW version ≥ V2.04) when set as slave

Reducing the bus load

Individual zones can also be disabled (out of service) via control parameter if they are not being used. In disabled zones, the LTE signal no longer sends periodically and therefore reduces bus load.

3.11.6 Startup

Startup response

The application is restarted after every reset, so that all the connected motorized valve actuators are synchronized (see 3.7).

Startup delay

After a reset, it takes up to 5 minutes for all the connected room thermostats to restart. This is designed to avoid overloading the mains power supply when restarting. At the same time, it reduces the load on the KNX network, as not all thermostats transmit data at the same time. The delay ($T_{WaitDevice}$) is determined by the thermostat's device address. The device starts to send after the delay.

3.11.7 Heating and cooling demand

Heating output primary
Heating output secondary
Cooling output primary
Cooling output secondary

In conjunction with Synco, the heating and/or cooling demand from each room is transmitted to the BACS to provide the required heating or cooling energy.

An example for LTE-Mode is described in 3.11.4.

In S-Mode, the current state signals of the control outputs are available.

3.11.8 Fault function on KNX

A fault is sent on the bus in the event of a fault occur (e.g. digital fault input, Dewpoint, communication configuration, etc.).

An RDG.. room thermostat monitors the bus and sends its fault when the fault has the highest alarm priority. This ensures that the management station does not miss any alarms.
The alarm with the highest priority is displayed first and sent over the bus if alarms occur at the same time.

Fault transmission is different in LTE-Mode and S-Mode:

S-Mode	LTE-Mode
Fault state	Alarm info (error code + internal information)
Fault information (internal information)	Alarm text (default text can be edited with ACS tool)

The table below shows the error code and default alarm texts.

		Thermostat	Fault information on bus		
Priorities	**Fault**	**Display**	**Error code**	**Default fault text**	**Text adjustable [1)]**
-	No fault	---	0	No fault	✓
1	Bus power supply [2)]	BUS BUSF	5000	No bus power supply	---
2	Device address error	Addr	6001	>1 id device address	---
3	Condensation		4930	Condensation in the room	✓
4	External fault input X1	AL1	9001	Fault input 1	✓
5	External fault input X2	AL2	9002	Fault input 2	✓
6	External fault input D1	AL3	9003	Fault input 3	✓
7	Clean filter reminder	FIL	3911	Dirty filter	✓

[1)] Default alarm texts are stored in the thermostat's non-volatile memory and can be adjusted using the ACS commissioning tool

[2)] This error is not sent over the bus (because there is no bus, not enough bus power supply, bus is overloaded or bus signal is distorted)

Priority of alarms

- Priority order is #1…7
- External faults #4…6: If faults are active, the display shows **AL1, AL2, AL3**, alternating. Only the fault with the highest priority is sent over the bus

Fault transmission

A supervisor alarm system may command the thermostat to stop sending faults to the bus via the communication object "Fault transmission" (disable/enable).
This has no impact on the local display of faults.

After a timeout of 48 hours, the sending of faults is automatically enabled again.

3.12 Communication objects (S-Mode)

3.12.1 Overview

Page	Object no. and name		Thermostat RDG..		Object no. and name	Page
14	1 System time	→				
14	3 Time of day	→				
				→	21 Room temperature	
14	44 Outside temperature	→		↔	21 Room temperature [4]	14
				→	16 Room operating mode: State [1]	15
16	12 Room operating mode: Time switch [1]	→		→	24 Room temperature: Current setpoint	26
16	7 Room operating mode: Preselection [1]	↔				
15, 18, 79	20 Room operating mode: Window state [5]	→ ↔		→	33 Fan operation (0 = Auto/1 = Manual)	73
18	45 Room operating mode: Presence detector [3]	→		→	35 Fan output	73
26	22 Room temperature: Comfort basic setpoint	→		→	36 Fan stage I	73
26	23 Room temperature: Comfort setpoint	↔		→	37 Fan stage II	73
26	46 Room temperature: Economy heating setpoint [3]	→		→	38 Fan stage III	73
26	47 Room temperature: Economy cooling setpoint [3]	→				
47	31 Application mode	→				
				→	25 Heating output primary [2]	86
73	32 Enable fan command value	→		→	26 Heating output secondary [2]	86
73	34 Fan command value	→		→	27 Cooling output primary [2]	86
				→	28 Cooling output secondary [2]	86
50, 80	29 Enable electric heater	→				
				→	43 D1	80
32, 79	30 Heating/cooling changeover	→		→	39/41 X1 (temperature/digital)	80
				→	40/42 X2 (temperature/digital)	80
87	6 Fault transmission	→		→	5 Fault state	35, 87
				→	4 Fault information	35, 78, 80, 87
40	48 Room humidity [%r.h.] [4]	↔		→	49 Dehumidification [4]	41
				→	48 Effective application mode [6]	
40	52 Setpoint high [4]	→		→	50 Humidification [4]	42
40	53 Setpoint low [4]	→		→	51 HumDehumMode [4]	42

→ Input communication object

→ Output communication object

↔ Input and output communication object

[1] 8-bit and 1-bit object available, selectable via parameter in ETS

[2] Availability depending on selected application/function

[3] Only on RDG16...KN

[4] Only on RDG165KN

[5] As input / output object only on RDG160KN (SW version ≥ V2.04)

[6] Only on RDG160KN (SW version ≥ V2.04)

3.12.2 Description of communication objects

Obj	Object name	Function	Type/length	Flags
1	**System time**	Time and date	19.001 8 Byte	CWU
System time for display on the room thermostat. See P07 (3 or 4)				
3	**Time of day**	Time and date	10.001 3 Byte	CWU
Another object for receiving the time of day for display on the room thermostat. See P07 (3 or 4)				
4	**Fault information**	Alarm Info	219.001 6 Byte	CT
Common alarm output. If an alarm occurs, the alarm number is transmitted				
5	**Fault state**	Faulty/ normal	1.005 1 bit	CT
Common alarm output. If an alarm occurs, the alarm flag is set				
6	**Fault transmission**	Enable/ disable	1.003 1 bit	CWU
A supervisor alarm system can disable the broadcasting of alarms by the devices. This has no impact on the local display of alarms. After a timeout of 48 hours, the sending of faults is automatically enabled again.				
7	**Room operating mode: Preselection**	Auto Comfort PreComf. Economy Protection	20.102 1 Byte	CWTU
Controls the room operating mode selection of the thermostat via bus. The command can also be submitted as four 1-bit communication objects (8...11). The last interaction wins – either from local operating mode button or via bus. **Note**: The thermostat will transform Precomfort either into Economy or Comfort (selectable via P88).				
8 9 10 11	**Operating mode: Preselection** **Auto** **Comf** **Eco** **Prot**	Trigger	1.017 1 bit	CW
Switch room operating mode to either Auto, Comfort, Economy or Protection. The last interaction wins – either from the local operating mode button or via bus.				
12	**Room operating mode: Time switch**	Comfort Economy PreComf. Protection	20.102 1 Byte	CWU
This information is provided by a central time switch or a supervisor and defines the actual HVAC operating mode. The command can also be submitted via three 1-bit communication objects (13...15). Protection has the highest priority and cannot be overridden. **Note**: The thermostat will transform Precomfort either into Economy or Comfort (selectable P88).				
13 14 15	**Time switch** **Comfort** **Economy** **Protection**	Trigger	1.017 1 bit	CW
Switch the HVAC mode to either Comfort, Economy or Protection mode.				
16	**Room operating mode: State**	Comfort Economy Protection	20.102 1 Byte	CRT
Actual room operating mode used by the thermostat (considering time switch, user selection, window contact, etc.) This state information is available via one 8-bit enumeration or three 1-bit communication objects (17...19). **Note**: The thermostat does not support Precomfort.				
17 18 19	**Room operating mode:** **State Comfort** **State Economy** **State Protection**	ON OFF	1.002 1 bit	CT
Corresponding communication object sends "True"				
20	**Window state (RDG100KN)**	Open Closed	1.019 1 bit	CWU
The thermostat is set to Economy mode if value "1" (open) is received. It switches back to the previous mode when the value is "0" (closed). "Window state" is sent e.g. by a KNX switch or a KNX presence detector. It has the same effect as the local operating mode switchover contact X1, X2, D1 (P38, P40, P42). *Only one input source must be used, either local input X1/X2/D1 or KNX bus.*				
21	**Room temperature (RDG1..0KN)**	Temp. value	9.001 2 Byte	CRT
The value of the room temperature measured via built-in or external sensor is available via this communication object.				
22	**Room temperature: Comfort basic setpoint**	Temp. value	9.001 2 Byte	CWU
If function "Temporary setpoint" is enabled via P69, then after an operating mode change, the setpoint adjustments made by the user and via communication object 23 are dismissed and the thermostat is reset to the Comfort basic setpoint. **Note**: Setpoints that have been changed via the local HMI may be overwritten during a system startup from a central master controller, e.g.RMB795B. *The Comfort basic setpoint is stored in EEPROM (see 3.3.2). → The service life of the EEPROM depends on the number of write cycles. Never write this communication object cyclically!*				
23	**Room temperature: Comfort setpoint**	Temp. value	9.001 2 Byte	CWTU
Communication object used to shift the setpoint used by the thermostat (see 3.3.2). Same priority as local setpoint shift on the thermostat. The last selected option is always used. **Note**: The Comfort basic setpoint (object 22) will not be changed.				
24	**Current setpoint**	Temp. value	9.001 2 Byte	CRT
Current setpoint, including shift, compensation, etc., used by the thermostat for temperature control.				
25	**Heating output primary**	0…100 %	5.001 8 bit	CRT
Indicates the position of the heating actuator of first stage. E.g. 2-pipe with electric heater application: Output of heating coil.				
26	**Heating output secondary**	0…100%	5.001 8 bit	CRT
Indicates the position of the heating actuator of the second stage. E.g. 2-pipe with electric heater application: Output of the electric heater.				

Obj	Object name	Function	Type/length	Flags
27	**Cooling output primary**	0…100%	5.001 8 bit	CRT
Indicates the position of the cooling actuator of the first stage. E.g. 2-pipe with electric heater application: Output of the cooling coil.				
28	**Cooling output secondary**	0…100%	5.001 8 bit	CRT
Indicates the position of the cooling actuator of the second stage. E.g. 2-stage changeover application: Output of the second cooling stage.				
29	**Enable electric heating**	Enable/ disable	1.003 1 bit	CWU
An electric heater can be disabled with this communication object (e.g. to meet tariff regulations). The same function is also available via local multifunctional input X1/X2/D1 (P38, P40, P42). *Only one input source must be used, either local input X1/X2/D1or KNX bus.*				
30	**Heating/cooling changeover**	Heat/Cool	1.100 1 bit	CWU
Changeover information transmitted via bus. Default: Current mode before power down. The same function is also available via local multifunctional input X1/X2/D1 (P38, P40, P42). *Only one input source must be used, either local input X1/X2/D1or KNX bus..*				
31	**Application mode**	HVAC control mode	20.105 8 bit	CWU

0	Auto (default)	Heating and/or cooling
1	Heat	Heating only
2	Morning warmup*	Heating only
3	Cool	Cooling only
5	Precool*	Cooling only
6	OFF	Neither heating nor cooling
8	Emergency heat*	Heating only
9	Fan only	Fan runs at high speed

** Function handled like Heat (1) or Cool (3)*

32	**Enable fan command value**	Enable Disable	1.003 1 bit	CWU
Set fan mode to Auto (disable) or Manual (enable) by a KNX control unit. If Manual, the value received on **Fan command value** (34) will be used to command the fan speed. Default: Enable The last interaction wins – either from the local fan mode button or via bus.				
33	**Fan operation**	Auto Manual	1.001 1 bit	CRT
Indicates the status of the fan mode: Auto (0) or Manual (1).				
34	**Fan command value**	0…100%	5.001 8 bit	CWU

The fan can be set to a specified speed by a KNX control unit when manual fan operation is enabled.

Speed	Fan command value (physical KNX value)
1	1...33% (1…85)
2	34…67% (86...170)
3	68…100% (171…255)

Fan speed "0" is not supported by the thermostat and the fan speed will remain unchanged.

35	**Fan output**	0…100%	5.001 8 bit	CRT

Indicates the current fan speed as a value 0...100%

Speed	Fan output (physical KNX value)
OFF	0% (0)
1	33% (84)
2	66% (186)
3	100% (255)

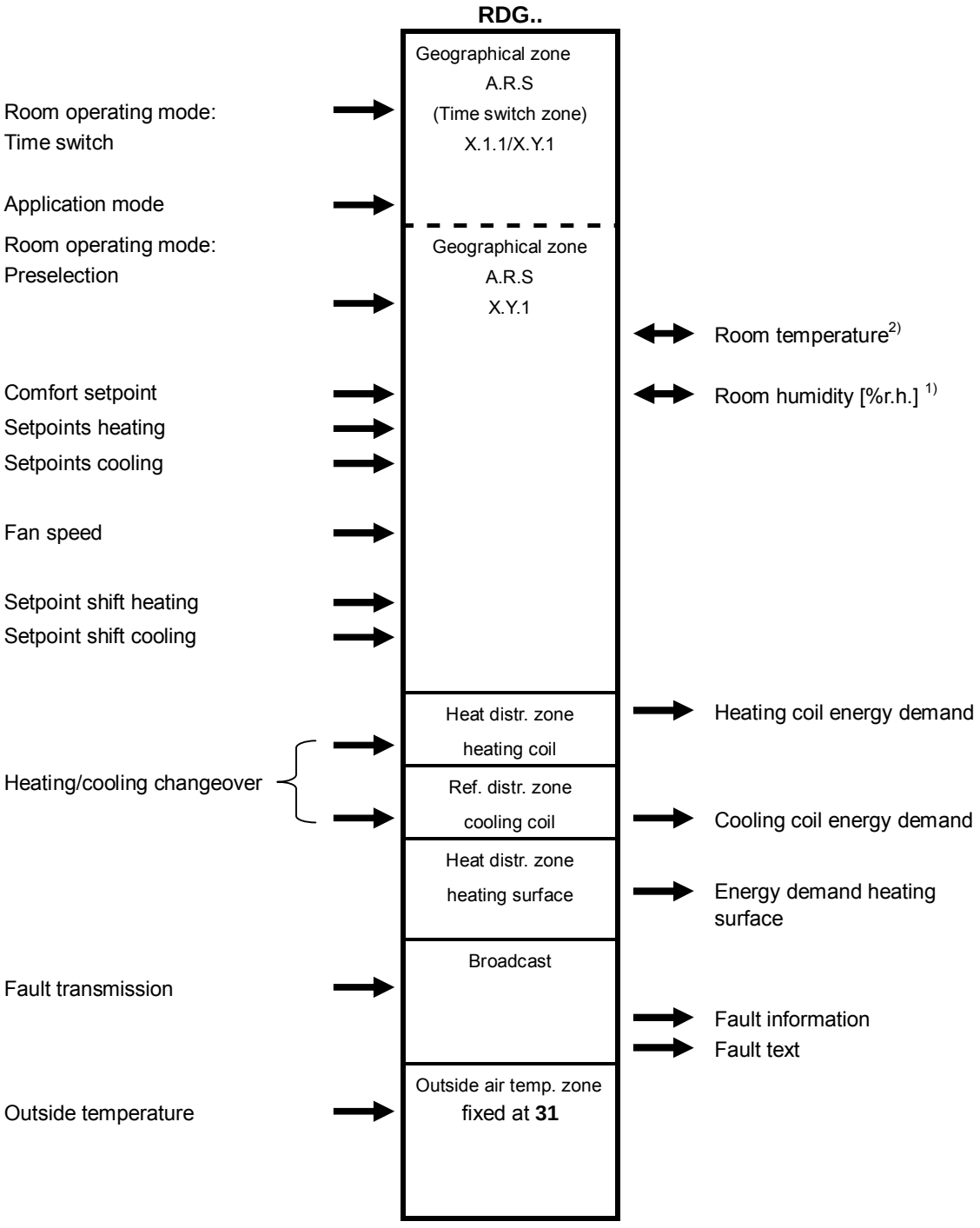
Obj	Object name	Function	Type/length	Flags
36 37 38	**Fan speed I** **Fan speed III** **Fan speed III**	ON OFF	1.001 1 bit	CRT
Indicate the state of the relay outputs				
39 40	**X1: Temperature** **X2: Temperature**	Temp. value	9.001 2 Byte	CRT
Indicate the values of the temperature sensors connected to the local inputs X1/X2				
41 42 43	**X1: Digital** **X2: Digital** **D1: Digital**	ON OFF	1.001 1 bit	CRT
Indicate the status of the digital inputs (adjusted by P39/P41/P43) including considering of operating action				
44	**Outside temperature**	Temp. value	9.001 2 Byte	CWU
The outside temperature measured by a KNX sensor can be displayed on the thermostat, if P07 "Additional user information" is set = 2 (outside temperature).				

Obj	Object name	Function	Type/length	Flags

Note: The following objects are available on RDG16..KN only.

20	**Window state (RDG16..KN)**	Open Closed	1.019 1 bit	CRT CWU
The RDG16..KN is set to Protection if value "1" (open) is received and switches back to the previous mode for value "0" (closed). The "Window state" is sent (e.g. by a KNX switch and has the same effect as local window contact X1, X2 (P38, P40). *Only **one** input source required either a local input X1/X2 or KNX bus.* RDG160KN (SW version ≥ V2.04) When RDG operates as slave, the window state object is set to "**Transmit**" and the local window state is sent on the bus. When RDG works as master, the window state object is set to "**Receive**" and collects all window states from the slaves. It switches back to the previous mode for value "0" (closed) once all states are "0" (closed).				
21	**Room temperature**	Temp. value	9.001 2 Byte	CRT
The value of the room temperature measured via built-in or external sensor is available on bus when this communication object is set to **Transmit**. (RDG165KN) By setting the object to **Receive**, the thermostat receives and works with the room temperature from an external sensor.				
45	**Precence detector**	Unoccupied Occupied	1.019 1 bit	CWU
Standard presence: The thermostat is set to Comfort mode if value "1" (occupied) is received. It switches back to Economy when the value is "0" (unoccupied). "Presence detector" is sent via KNX. It has the same effect as the local presence detector function on X1, X2 (parameter P38, P40). *Only one input source must be used, either local input X1/X2 or KNX bus.*				
46	**Room temperature: Economy heating setpoint (P11)**	Temp. value	9.001 2 Byte	CWU
Communication object to adjust the Economy heating setpoint used by the thermostat (see 3.3.2). It directly changes the value of the local parameter "Economy setpoint" P11. S-Mode object needs to be enabled by setting **Room temp.: Economy setpoints** to **as group object** in ETS. The Economy setpoint is stored in EEPROM. The service life of the EEPROM depends on the number of write cycles. Never write this communication object cyclically.				
47	**Room temperature: Economy cooling setpoint (P12)**	Temp. value	9.001 2 Byte	CWU
Communication object to adjust the Economy cooling setpoint used by the thermostat (see 3.3.2). It directly changes the value of the local parameter "Economy setpoint" P12. S-Mode object needs to be enabled by setting **Room temp.: Economy setpoints** to **as group object** in ETS. The Economy setpoint is stored in EEPROM. The service life of the EEPROM depends on the number of write cycles. Never write this communication object cyclically.				
48	**Room humidity [%r.h.]**	I/O	9.007 2 Byte	
The value of the room humidity measured via built-in sensor is available on bus when this communication object is set to **Transmit**. By setting the object to **Receive**, the thermostat receives and works with the humidity from an external sensor.				
48	**Effective application mode**	HVAC application mode	20.105 8 bit	CRT CWU
RDG160KN (SW version ≥ V2.04) The master thermostat sends the application mode, either heating or cooling, on the bus. This can be used to control the slaves via object [31] application mode.				
49	**Dehumidification**	O	1.001 1 bit	CRT
Indicates the position of the dehumidification relay output, when the function is enabled by selection "relay function P7x" = 7.				
50	**Humidification**	O	1.001 1 bit	CRT
Indicates the position of the humidification relay output, when the function is enabled by selection "relay function P7x" = 8.				
51	**DPT_HumDehum Mode**	O	20.115	CT
Indicates the mode of the humidity control function: 0 = inactive 1 = humidification; rel. humidity lower than setpoint low P22 2 = dehumidification; rel. humidity higher than setpoint high P21 3 … 255 = not used				
52	**Setpoint humidity high (P21)**	I	9.007 2 Byte	CWU
Communication object to adjust the humidity setpoint high used by the thermostat. It changes the value of P21. S-Mode object must be enabled by setting "Humidity setpoints" to "as group object" in ETS. The humidity setpoint max is stored in EEPROM. The service life of the EEPROM depends on the number of write cycles. Never write this communication object cyclically.				
53	**Setpoint humidity low (P22)**	I	9.007 2 Byte	CWU
Communication object to adjust the humidity setpoint low used by the thermostat. It changes the value of P22. S-Mode object must be enabled by setting **Humidity setpoints** to **as group object** in ETS. The humidity setpoint min is stored in EEPROM. The service life of the EEPROM depends on the number of write cycles. Never write this communication object cyclically.				

3.13 Communication objects (LTE-Mode)



[1] Only on RDG165KN

[2] Only output communication object available for RDG160KN and RDG100KN

3.14 Control parameters

A number of control parameters can be readjusted to optimize control performance. This can be done on the thermostat via HMI or via commissioning/operating tool. 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, including communications, 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 be adjusted any time.
The parameters at the Expert level need careful configuration because they impact the thermostat's control performance and functionality.

3.14.1 Parameter setting via local HMI

Enter only Service level

1. Hold down both the left and right buttons simultaneously for 4 seconds. Release them, and hold the right button again within 2 seconds until **P01** displays.
   Continue with step 2.

Enter Expert level with Diagnostics and test

1. Hold down both the left and right buttons simultaneously for 4 seconds. Release them, and hold the left button again within 2 seconds until the temperature disappears.
   Turn the rotary knob counterclockwise minimum ½ rotation. **Pxx** displays.
   Continue with step 2.

Adjust parameters

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

Reset parameters

The factory setting for the control parameters can be reloaded via P71, by changing the value to ON. Confirm the change by pressing the right button. Then **8888** displays during reloading.

3.14.2 Parameter setting/download via tool

The control parameters can be adjusted via bus either by parameter download during commissioning or during normal operation with a tool like ACS.

ACS

With the ACS tool, the parameters can be changed…

– during commissioning via parameter download (all parameters)
– during operations via Popcard (most of the parameters)

OZW772 Web server, RMZ792-B bus operator unit

Most parameters can be changed during operations using the OZW772 web server or the RMZ792-B bus operator unit.

ETS

ETS is an engineering tool and can be used for the full commissioning of the RDG.. KNX room thermostats. Device address, application, and control parameters can be defined and downloaded via ETS.

Notes

- Setting RDG.. KNX parameters is only supported by ETS4 or higher/ACS version 5.11 (for RDG1..0KN), version 8.32 or higher (for RDG165KN) and version V10.02.080 or higher (for RDG160KN with SW version ≥ V1.14)
- The RDG.. KNX room thermostats (without ETS parameter download) require version ETS4 or higher/ACS version 5.11 (for RDG1..0KN), version 8.32 or higher (for RDG165KN) and version V10.02.080 or higher (for RDG160KN with SW version ≥ V1.14)

Connecting a KNX tool

Connecting a KNX commissioning/operating tool to the RDG1..KN is described in 4.2.

3.14.3 Parameters of the Service level

Parameter	Name Service level	Factory setting	Range	RDG100KN	RDG160KN	RDG165KN	Dependencies
P01	Control sequence RDG100KN (range 0…4) RDG160KN (range 0…6) RDG165KN (range 0…4)	2-pipe: 1 = Cooling only 4-pipe: 4 = Heating and cooling	0 = Heating only 1 = Cooling only 2 = H/C changeover manual 3 = H/C changeover auto 4 = Heating and cooling 5 = H/C ceiling with 6-port control ball valve 6 = H/C ceiling + FCU with PICV and 6-port ball valve as changeover	✓	✓	✓	
P02	Operation via room op selector	1	1 = Auto – Protection 2 = Auto - Comfort - Economy - Protection	✓	✓	✓	
P03	Operation via fan op selector	0	0 = Auto - Manual 1 = Manual 2 = Auto - Manual - Protection	✓	✓	✓	P52
P04	Unit	0	0 = °C 1 = °F	✓	✓	✓	
P05	Measured value correction	0 K	– 3...3 K	✓	✓	✓	
P06	Standard display	0	0 = Room temperature 1 = Setpoint	✓	✓	✓	
P07	Additional display information RDG1..0KN (range 0…4) RDG165KN (range 0...5)	0 (RDG1..0KN) 5 (RDG165KN)	0 = --- (No display) 1 = °C and °F 2 = Outside temperature (via bus) 3 = Time of day (12 h) (via bus) 4 = Time of day (24 h) (via bus) 5 = Rel. humidity (%)	✓	✓	✓	
P08	Comfort basic setpoint	21 °C	5...40 °C	✓	✓	✓	
P09	Comfort setpoint minimum	5 °C	5...40 °C	✓	✓	✓	
P10	Comfort setpoint maximum	35 °C	5...40 °C	✓	✓	✓	
P11	Economy heating setpoint	15 °C	OFF, 5 ... WCoolEco; WCoolEco = 40 °C max	✓	✓	✓	
P12	Economy cooling setpoint	30 °C	OFF, WHeatEco...40 °C; WHeatEco = 5 °C min	✓	✓	✓	
P13	Electric heater when cooling	ON	ON: Enabled OFF: Disabled	✓	✓	✓	Appl[1)]
P14	Button lock	0	0 = Unlocked 1 = Auto lock 2 = Manual lock	✓	✓	✓	
P15	Fan stage in dead zone (Comfort)	0	0 = Disabled 1 = Low speed (Heat and Cool) 2 = Low speed (Cooling only)	x	✓	✓	
P21	Setpoint humidity high	50	OFF, 20…90%	x	x	✓	P75
P22	Setpoint humidity low	OFF	OFF, 20…90%	x	x	✓	P75
P23	Calibration humidity	0	-10...0…10%	x	x	✓	P75

[1)] Appl. = applications

Note Parameter display depends on selected application and function.

3.14.4 Parameters of the Expert level with diagnostics and test

Parameter	Name Expert level	Factory setting	Range	RDG100KN	RDG160KN	RDG165KN	Dependencies
P30	Heat P-band Xp/switching diff	2 K	0.5 … 6 K	✓	✓	✓	
P31	Cool P-band Xp/switching diff	1 K	0.5 … 6 K	✓	✓	✓	
P32	Radiator P-band Xp/swi diff	2 K	0.5 … 6 K	✓	✓	✓	Appl[1)]
P33	Dead zone Comfort mode	2 K	0.5 … 5 K	✓	✓	✓	Appl[1)]
P34	Setpoint differential	2 K	0.5 … 5 K	✓	✓	✓	Appl[1)]
P35	Integral action time Tn, RDG100KN RDG16..KN	5 min 45 min	0…10 min 0...120 min	✓ x	x ✓	x ✓	P46, P47 P46, P47
P36	H/C ch'over swi point cooling RDG1..0KN RDG165KN	16 °C	 10…25 °C 5 °C…P37	✓	✓	 ✓	P38, P40
P37	H/C ch'over swi point heating RDG1..0KN RDG165KN	28 °C	 27…40 °C P36…40 °C	✓	✓	 ✓	P38, P40
P38	Input X1 RDG100KN (range 0..3 [ECO]..8) RDG16..KN (range 0..3 [PROT]..10) [3)]	1 = Ext. sensor	0 = --- (no function) 1 = Room temp ext. sensor/return air temp (AI) 2 = H/C changeover (AI/DI) 3 = Operating mode contact [ECO], window contact [PROT] (DI) 4 = Dewpoint sensor (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI) 7 = Monitor input (Digital) 8 = Monitor input (Temp) 9 = Supply air sensor 10 = Presence detector (DI)	✓	✓	✓	
P39	Normal position input X1	0 (NO)	0 = Normally open/Open 1 = Normally closed/Close	✓	✓	✓	P38
P40	Input X2 RDG100KN (range 0..3 [ECO]..8) RDG16..KN (range 0..3 [PROT]..10) [3)]	0 = No function	0 = --- (no function) 1 = Room temp ext. sensor/return air temp (AI) 2 = H/C changeover (AI/DI) 3 = Operating mode contact [ECO], window contact [PROT] (DI) 4 = Dewpoint sensor (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI) 7 = Monitor input (Digital) 8 = Monitor input (Temp) 9 = Supply air sensor (AI) 10 = Presence detector (DI)	✓	✓	✓	
P41	Normal position input X2	0 (NO)	0 = Normally open/open 1 = Normally closed/closed	✓	✓	✓	P40
P42	Input D1 RDG100KN (range 0..3 [ECO]..7) RDG16..KN (range 0..3 [PROT]..10) [3)]	3 = Operating mode contact (RDG100KN) Window contact (RDG16..KN)	0 = --- (no function) 2 = H/C changeover (DI) 3 = Operating mode contact [ECO], window contact [PROT] (DI) 4 = Dewpoint sensor (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI) 7 = Monitor input (Digital) 10 = Presence detector (DI)	✓	✓	✓	
P43	Normal position input D1	0 (NO)	0 = Normally open/open 1 = Normally closed/closed	✓	✓	✓	P42
P44	Actuator running time Y1/Y2	150 s	20…300 s	✓	x	x	P46
P45	Actuator running time Y3/Y4	150 s	20…300 s	✓	x	x	P47
P45	Power of electric heater on Q2 (for adaptive temperature compensation)	0 kW	0.0 ….. 1.2 kW	x	✓	✓	

Parameter	Name Expert level	Factory setting	Range	RDG100KN	RDG160KN	RDG165KN	Dependencies
P46	Output Y1/Y2	1 = On/Off	0 = 3-position 1 = On/Off 2 = PWM	✓	x	x	Appl[1)]
P46	Outputs Y10 (DC) or Q1 (2-pos) RDG160KN (range 1…6) RDG165KN (range 1…2)	2 = DC 0...10 V	1 = On/Off 2 = DC 0...10 V 3 = 6-port valve (DC 0… 10 V) 4 = 6-port valve (DC 2… 10 V) 5 = Inverse signal, 6-port valve (DC 10… 0 V) 6 = Inverse signal 6-port valve (DC 10… 2 V)	x	✓	✓	Appl[1)]
P47	Output Y3/Y4	1 = On/Off	0 = 3-position 1 = On/Off 2 = PWM	✓	x	x	Appl[1)]
P47	Outputs Y20 (DC) or Q2 (2.pos) RDG160KN (range 1…2) RDG165KN (range 1…4) [2)]	2 = DC 0...10 V	1 = On/Off 2 = DC 0...10 V 3 = On/Off (Q2 = 1st stage cooling) 4 = DC (Y20 = 1st stage cooling)	x	✓	✓	Appl[1)]
P48	On time minimum 2-pos output	1 min.	1...20 min	✓	✓	✓	P46
P49	Off time minimum 2-pos output	1 min.	1...20 min	✓	✓	✓	P47
P50	Purge time	OFF	OFF: Not active 1…5 min: Active with selected duration	✓	✓	✓	P38, P40
P51	Flow temp limit floor heating	OFF	OFF, 10...50 °C	✓	✓	✓	P38, P40
P52	Fan control RDG1..0KN (range 0…3) RDG165KN (range 0…5)	1 = Enabled	0 = Disabled 1 = Enabled 2 = Heating only 3 = Cooling only 4 = (P47 = 1, 2) 2nd stage (H + C) (P47 = 3, 4) Cool + 2nd stage heating 5 = (P47 = 3, 4) Heat + 2nd stage cooling	✓	✓	✓	P47
P53	Fan speeds RDG100KN	2 = 3-speed	1 = 1-speed 2 = 3-speed	✓	x	x	P52
P53	Fan speeds RDG16..KN	3 = DC 0...10 V	1 = 1-speed fan 2 = 3-speed fan 3 = DC 0...10 V (ECM fan)	x	✓	✓	P52
P54	Fan overrun time	60 s	0...360 s	✓	✓	✓	P52, Appl[1)]
P55	Fan speed switching point high	100%	80...100%	✓	✓	✓	P52, P53, DIP
	ECM fan max. output	ECM: 80%	ECM: fan min…100%	x	✓	✓	P52, P53, DIP
P56	Fan speed switching point med	65%	30…75%	✓	✓	✓	P52, P53, DIP
	ECM fan min. output	ECM: 30%	ECM: 1%...fan max.	x	✓	✓	P52, P53, DIP
P57	Fan speed switching point low	10%	1...15%	✓	✓	✓	P52, P53, DIP
	ECM: Switching point fan	ECM: 10%	ECM: 1...100%	x	✓	✓	P52, P53, DIP
P58	Fan start kick	ON	ON: Enabled OFF: Disabled	✓	✓	✓	P52
P59	On time minimum fan	2 min	1...6 min	✓	✓	✓	P52
P60	Periodic fan kick Comfort RDG100KN RDG16..KN	0 OFF	0…89 min, OFF	✓	✓	✓	P52
P61	Periodic fan kick Eco	OFF	0…359 min, OFF	✓	✓	✓	P52

Parameter	Name Expert level	Factory setting	Range	RDG100KN	RDG160KN	RDG165KN	Dependencies
P62	Service filter	OFF	OFF, 100…9900 h	✓	✓	✓	P52
P63	Minimum supply air temperature	OFF	OFF, 0…P64 °C	x	✓	✓	P38, P40
P64	Maximum supply air temperature	OFF	OFF, P63…50 °C	x	✓	✓	P38, P40
P65	Protection heating setpoint	8 °C	OFF, 5…WCoolProt; WCoolProt = 40 °C max	✓	✓	✓	
P66	Protection cooling setpoint	OFF	OFF, WHeatProt… 40; WHeatProt = 5 °C min	✓	✓	✓	
P67	Fan start delay RDG100KN RDG16..KN	0 s	0...180 s 0...360 s	✓	✓	✓	P52, P46, P47
P68	Temporary Comfort mode	0 (= OFF)	0...360 min	✓	✓	✓	P02
P69	Temporary Comfort setpoint	OFF	OFF = Disabled ON = Enabled	✓	✓	✓	
P71	Restore factory setting	OFF	OFF = Disabled ON = Reload start "8888" is displayed for 3 s during reload process	✓	✓	✓	
P72	Output Q1 function RDG160KN (range 0..6) [4] RDG165KN (range 0..8)	0	0 = No function 1 = Switch OFF in Protection 2 = Switch ON in H/C demand 3 = Switch ON in H demand 4 = Switch ON in C demand 5 = Heating sequence active 6 = Cooling sequence active 7 = External dehumidifier control 8 = External humidifier control	x	✓	✓	P01; P46; P53
P73	Output Q2 function RDG160KN (range 0..6) [4] RDG165KN (range 0..8)	0	0 = No function 1= Switch OFF in Protection 2= Switch ON in H/C demand 3= Switch ON in H demand 4= Switch ON in C demand 5 = Heating sequence active 6 = Cooling sequence active 7 = External dehumidifier control 8 = External humidifier control	x	✓	✓	P01; P47; P53
P74	Output Q3 function RDG160KN (range 0..6) [4] RDG165KN (range 0..8)	0	0 = No function 1 = Switch OFF in Protection 2 = Switch ON in H/C demand 3 = Switch ON in H demand 4 = Switch ON in C demand 5 = Heating sequence active 6 = Cooling sequence active 7 = Dehumidification control 8 = Humidification control	x	✓	✓	P53
P75	Control strategy	3	0 = Temperature (T) 3 = Temp., humidity (T+r.h.)	x	x	✓	
P76	Max shift temp setpoint (dehumid.)	3 K	- 3...3 K	x	x	✓	
P78	Flow limitation in heating mode for PICV (Y10 only) [5]	10V	0…10V	x	✓	x	

[1] Appl. = applications
[2] Only for 2-pipe and 2-stage applications
[3] For RDG160KN SW version ≥ V1.14 range: 0..3 [ECO]..9
[4] For SW version < V1.14 range: 0..1 (only for P74, not available for P72, P73)
[5] For SW version ≥ V2.04

Notes

- P45: To compensate for heat dissipation of the eletric heater relay in RDG16..KN
- P46/P47: Setting to On/Off or 3-position is configured via DIP switches 4 and 5

Parameter	Name Communications	Factory setting	Range	Dependencies
P81	Device address [3]	255	1…255	
P82	Geographical zone (apartment) [4]	---	---, 1...126	
P83	Geographical zone (room) [3]	1	---, 1...63	
P84	Heat distr zone heating coil	---	---, 1...31	Appl[1], P01
P85	Refrig distr zone cooling coil	---	---, 1...31	Appl[1], P01
P86	Heat distr zone heating surface	---	---, 1...31	Appl[1]
P88	Transformation Precomfort	0	0 = Economy 1 = Comfort	

[1] Appl. = applications

[3] Physical address = Area.Line.DeviceAddress. Factory setting of Area = 0, Line = 2.
Can be changed by special management service, e.g. from line coupler or via ACS commissioning tool.

[4] Type = geographical zone A.R.S. In RDG sub zone = fixed value 1

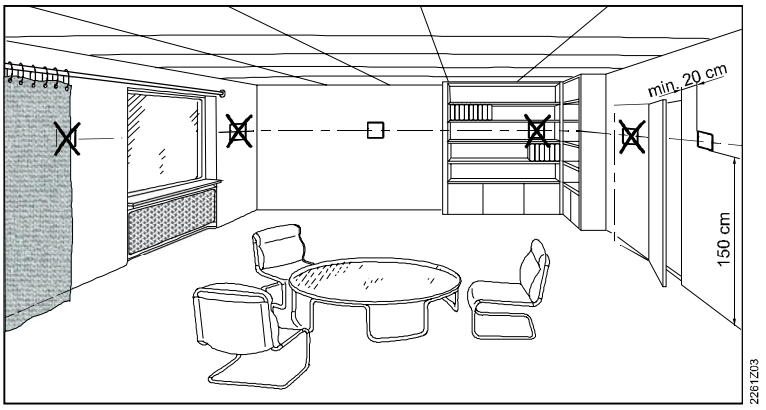
Parameter	Name Diagnostics and test	Range	Dependencies
d01	Application number	0 = (No application) 1 = 2-pipe 2 = 2-pipe with electric heater 3 = 2-pipe with radiator 4 = 4-pipe 5 = 2-stage heating or cooling 6 = 4-pipe with electric heater	
d02	X1 state	"---" = Function not selected 0 = Not activated (for DI) 1 = Activated (DI) 0…49 °C = Current temp. value (for AI) 00 = H/C Input shorted 100 = H/C Input open	
d03	X2 state	"---" = Function not selected 0 = Not activated (for DI) 1 = Activated (DI) 0…49 °C = Current temp. value (for AI) 00 = H/C Input shorted 100 = H/C Input open	
d04	D1 state	"---" = Function not selected 0 = Not activated (for DI) 1 = Activated (DI) 00 = H/C Input shorted 100 = H/C Input open	
d05	Test mode for checking the Y1/Y2 actuator's running direction [5]	"---" = No signal on outputs Y1 and Y2 OPE = Output Y1 forced opening CLO = Output Y2 forced closing	P46
d06	Test mode for checking the Y3/Y4 actuator's running direction [5]	"---" = No signal on outputs Y3 and Y4 OPE = Output Y3 forced opening CLO = Output Y4 forced closing	P47
d07	Software version	**Ux.xx** is displayed	
d08	Test mode for checking the Q1 output (P72 function) (RDG165KN)	"---" = no signal at output Q1 OPE = output Q1 forced opening CLO = output Q1 forced closing	P72, App[1]
d09	Test mode for checking the Q2 output (P73 function) (RDG165KN)	"---" = no signal at output Q2 OPE = output Q2 forced opening CLO = output Q2 forced closing	P73, App[1]
d10	Test mode for checking the Q3 output (P74 function) (RDG16…KN)	"---" = no signal at output Q3 OPE = output Q3 forced opening CLO = output Q3 forced closing	P74, App[1]

[5] This parameter can only be quit when the setting is back at "---". Press the left button to escape

4. Handling

4.1 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 it about 1.5 m above the floor.



Mounting

- Mount the room thermostat in a clean, dry indoor place without direct airflow from a heating/cooling device, and not exposed to dripping or splash water.

Wiring

See Mounting Instructions M3191 [3] or M3191.1 [18] or M3191.2 [19] enclosed with the thermostat.

- Comply with local regulations to wire, protect and earth the thermostat.

Warning!
No internal line protection for supply lines to external consumers (Q1, Q2, Q3, Yx or Yxx)!
Risk of fire and injury due to short-circuits!

- Adapt the line diameters as per local regulations to the rated value of the installed overcurrent protection device
- The AC 230 V mains supply line must have an external circuit breaker with a rated current of no more than 10 A
- Properly size the cables to the thermostat, fan and valve actuators for AC 230 V mains voltage
- Use only valve actuators rated for AC 230 V
- Inputs X1-M, X2-M or D1-GND: Several switches (e.g. summer/winter switch) may be connected in parallel. Consider overall maximum contact sensing current for switch rating
- Inputs X1-M and X2-M carry mains potential (RDG100KN only). Sensor cables must be suited for AC 230 V mains voltage
- Selectable relay function (RDG16..KN): See 3.14.4
- Isolate the cables of input D1-GND and KNX communication input CE+/CE- for AC 230 V if the conduit box carries AC 230 V mains voltage
- Disconnect from power supply before removing from the mounting plate
- If a KNX bus power supply is connected to the line with communicating thermostats and Synco controller, the internal KNX power supply of the Synco controllers must be switched off

4.2 Commissioning

Applications

The room thermostats are delivered with a fixed set of applications.

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

– Local DIP switch and HMI
– Synco ACS
– ETS

DIP switches

Set the DIP switches before snapping the thermostat to the mounting plate, if you want to select an application via DIP switches.

All DIP switches need to be set to OFF (remote configuration), if you want to select an application via commissioning tool.

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

NO APPL

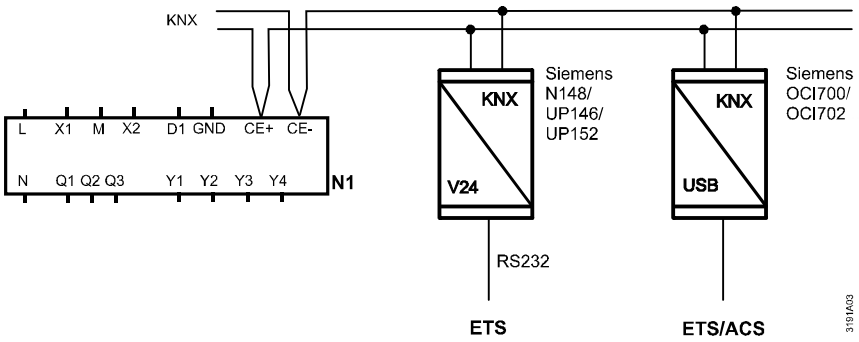
If all DIP switches are OFF, **NO APPL** displays, indicating that the application must be commissioned via a tool.

Note

Each time the application is changed, the thermostat reloads the factory setting for all control parameters, except for KNX device and zone addresses!

Connecting tools

Connect the Synco ACS or ETS tools to the KNX bus cable at any point for commissioning:



ACS and ETS require an interface:

– RS232 KNX interface (e.g. Siemens N148/UP146/UP152)
– OCI700, OCI702 USB-KNX interface

Note

An external KNX bus power supply is required if an RDG1..KN is connected directly to a tool (ACS or ETS) via KNX interface.

Control parameters

The thermostat's control parameters can be set to ensure optimum performance of the entire system (see 3.14).
The parameters can be adjusted using
– Local HMI
– Synco ACS
– ETS

Control sequence

- Set the control sequence via P01 depending on the application. The factory setting is as follows:

Application	Factory setting P01
2-pipe and chilled/heated ceiling, and 2-stage	1 = cooling only
4-pipe, chilled ceiling and radiator	4 = heating and cooling

Calibrate sensor

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

Setpoint and range limitation

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

Programming mode

The programming mode helps identify the thermostat in the KNX network during commissioning.
Press the left and right buttons simultaneously for 6 seconds to activate programming mode, which is indicated on the display with **PrOg**.
Programming mode remains active until thermostat identification is complete.

Assign KNX device address

Assign device address (P81) via HMI, ACS or ETS.

With device address set to 255, the communication is deactivated (no exchange of process data).

Assign KNX group addresses

Use ETS to assign the KNX group addresses of the thermostat's communication objects.

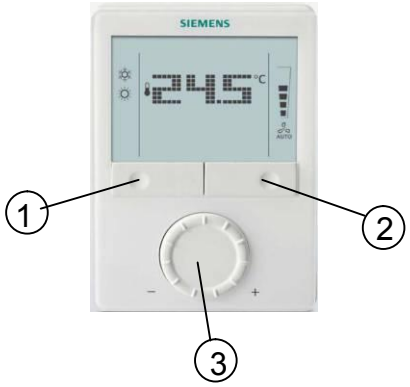
KNX serial number

Each device has a unique KNX serial number at the rear. An additional sticker with the same KNX serial number is enclosed in the packaging box. This sticker is intended for installers for documentation purposes.

4.3 Operation

See also Operating Instructions B3191 [2] enclosed with the thermostat.

Layout

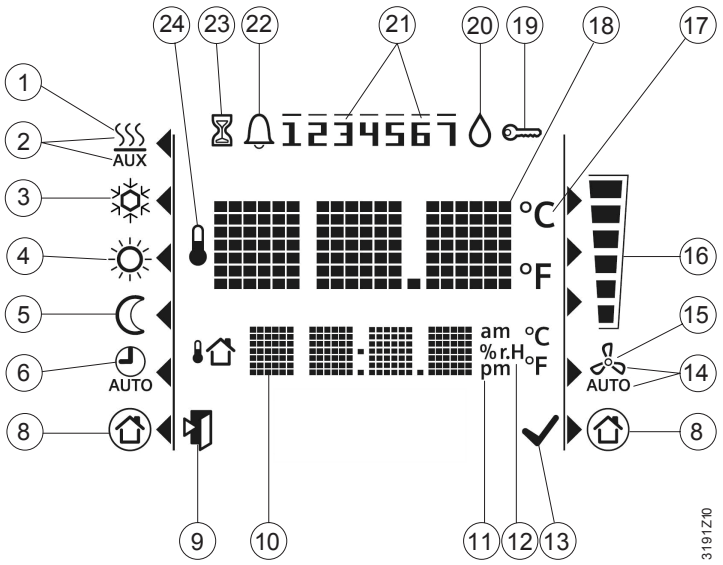


1. Operating mode button/Esc
2. Fan mode button/Ok
3. Rotary knob to adjust setpoints and parameters

Button operation

User action	Effect, description
Normal operation	Actual operating mode and state are indicated by symbols.
Press any button (thermostat in normal operation)	Enter operating mode selection; backlit LCD turns on, all possible mode symbols turn on, indicator element (arrow) will appear on the current mode/state.
Press left button	Change operating mode (indicator element (arrow) changes to the next mode symbol. 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 turns off.
Press left button (P01 = 2)	Toggle between heating and cooling.
Press left button while "Operating mode" via bus is Economy or while operating mode switchover contact is activated	Activate "Extend Comfort mode" (for details, see page 19).
Keep left button pressed and turn rotary knob clockwise/counter-clockwise	Activate timer "Extend presence"/"Extend absence" and set the time (for details, see page 19).
Press right button >3 seconds	Activate/deactivate button lock.
Press right button for fan coil unit	Change fan mode.
Press right button if P52 = 0 (fan disabled, e.g. in chilled ceiling applications)	Set thermostat to Protection mode.
Turn rotary knob	Adjust the room temperature Comfort setpoint.
Hold down both the left and right buttons simultaneously for 4 seconds. Release them, and hold the right button again within 2 seconds until **P01** displays	Enter parameter setting mode "Service level".
Press left and right button for 4 seconds, release, press left button for 2 seconds until the temperature disappears, then turn rotary knob counterclockwise min. ½ revolution	Enter parameter setting mode "Expert level", diagnostics and test.
Press left and right button simultaneously for 6 seconds	Enter (KNX) programming mode.

Display



#	Symbol	Description	#	Symbol	Description
1		Heating mode	15		Manual fan
2	AUX	Heating mode, electric heater active	16		Fan speed: Fan speed I
3		Cooling mode			Fan speed: Fan speed II
4		Comfort mode			Fan speed: Fan speed III
5		Economy mode	17	°C °F	Degrees Celsius Degrees Fahrenheit
6	AUTO	Auto mode according to schedule (via bus)	18		Digits for room temperature and setpoint display
8		Protection mode	19		Button lock
9		Escape	20		Condensation in room (Dewpoint sensor active) or humidity control active
10		Additional user information, like outside temperature or time of day from KNX bus, or relative humidity (RDG165KN only). Selectable via parameters	21	1234567	Weekday 1…7 from KNX bus 1 = Monday/7 = Sunday
11	am pm	Morning: 12-hour format Afternoon: 12-hour format	22		Fault
12	%r.H	Relative humidity (RDG165KN only)	23		"Temporary timer" function; displays when operating mode is temporarily extended (extended presence or absence)
13		Confirmation of parameters	24		Indicates that room temperature is displayed
14	AUTO	Automatic fan			

4.4 Remote operation

The RDG.. room thermostats can be operated from a remote location using an OZW772 web server, an RMZ792-B bus operating unit or the ACS tool.

4.5 Disposal

The devices are considered electronics devices for disposal in terms of European Directive 2012/19/EU and may not be disposed of as domestic waste.

- Dispose of the device via the channels provided for this purpose
- Comply with all local and currently applicable laws and regulations

5. Supported KNX tools

5.1 ETS

ETS

ETS is an engineering tool and is used to fully commission the RDG.. KNX room thermostats.

ETS can implement the following functions:

– Define and download the physical address
– Define and download the application (plant type, control sequence)
– Set up and download the thermostat's control parameters
– Set up and download group addresses

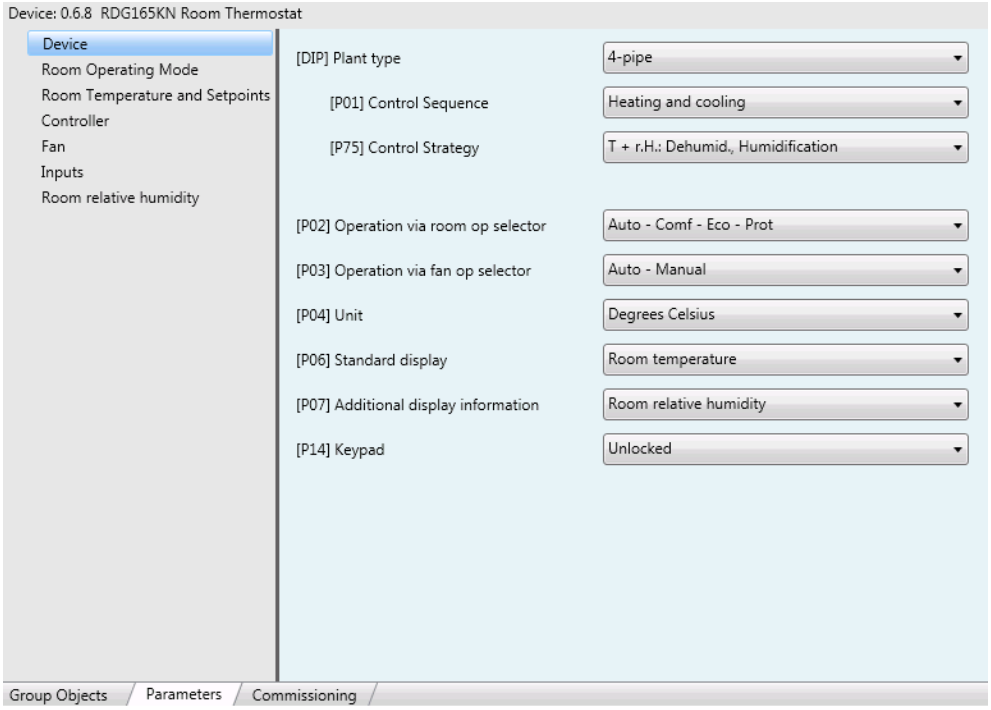
This document does not describe how to operate ETS and how to set up a device. Refer to the KNX Manual [4] for more details.

Note!

Setting RDG.. KNX parameters is only supported by ETS.
ETS can be updated online.

5.1.1 Parameter settings in ETS

1. Open the project in ETS and select a device.
2. Click **Parameters** tab, and adjust the control parameters as follows:



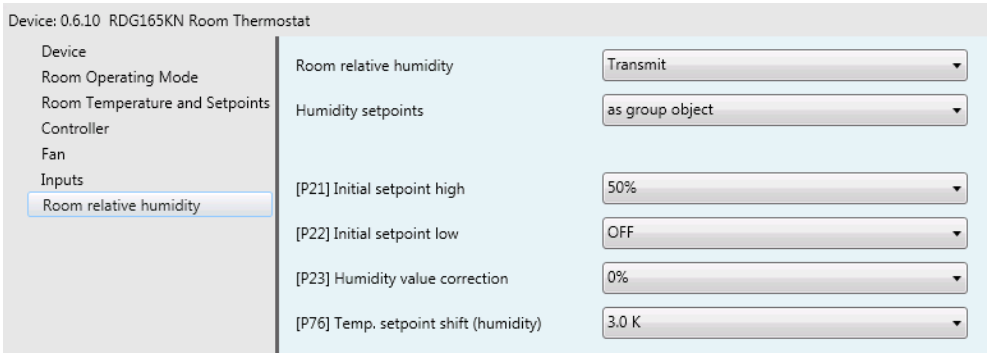
3. The **Plant type** (application), **Control Sequence** and other control parameters ([Pxx] description) can be downloaded.
   For more details on control parameters, see 3.14.

Notes

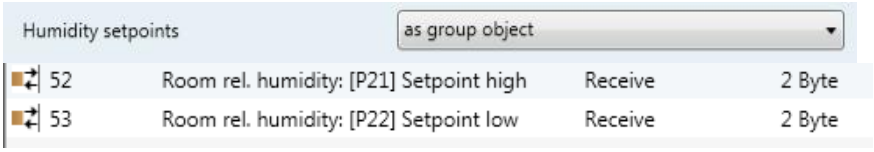
- ETS 4 or higher version is used to assign the communication objects to group addresses (S-Mode)
- ETS 4 or higher version is used to download the application and parameters
- The humidity parameters are only available in RDG165KN

Humidity parameters

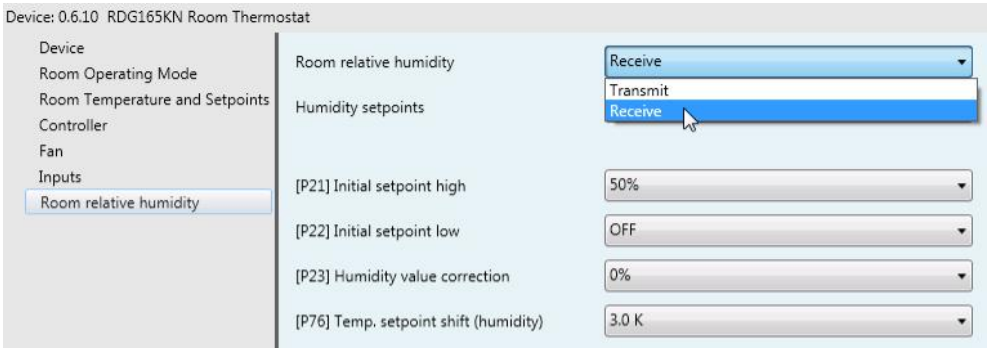
1. Click **Room relative humidity** in the left pane and the humidity parameters will display.
2. Adjust the parameters as required. See 3.14 for more details of control parameters.



3. Select **as group object** in the drop-down list of **Humidity setpoints**, and then the S-Mode humidity setpoint displays in the **Group Objects** tab as follows:

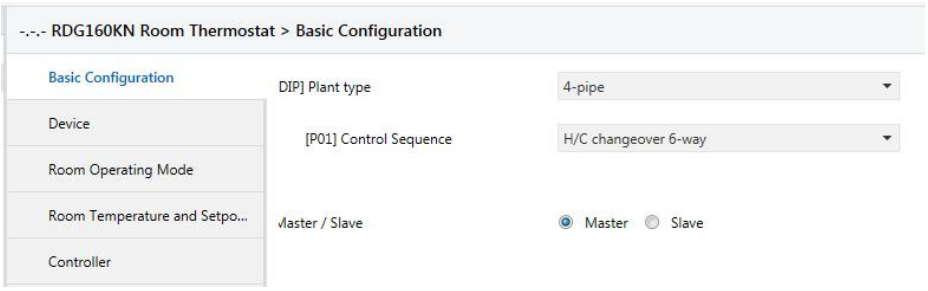


4. Select **Receive** in the drop-down list of **Room relative humidity**. The thermostat then receives the room's relative humidity from an external sensor.

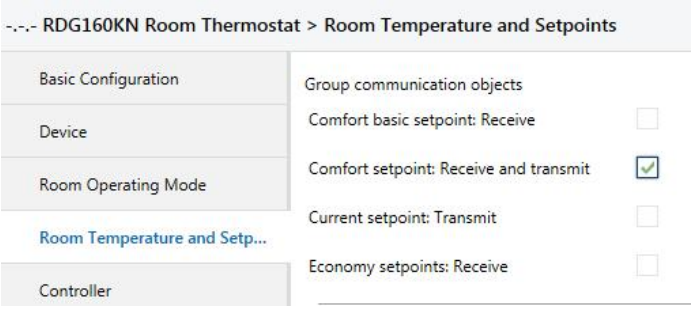


Setting master / slave
RDG160KN SW ≥ 2.04

Select master and slave function via ETS on RDG160KN.



Comfort setpoint: Select Receive and transmit need to use object [23] Room temperature: Comfort setpoint



5.2 ACS tool

ACS

The ACS tool commissions the RDG.. KNX room thermostats (physical address, application, parameters). They can be operated or monitored via bus during normal operation.

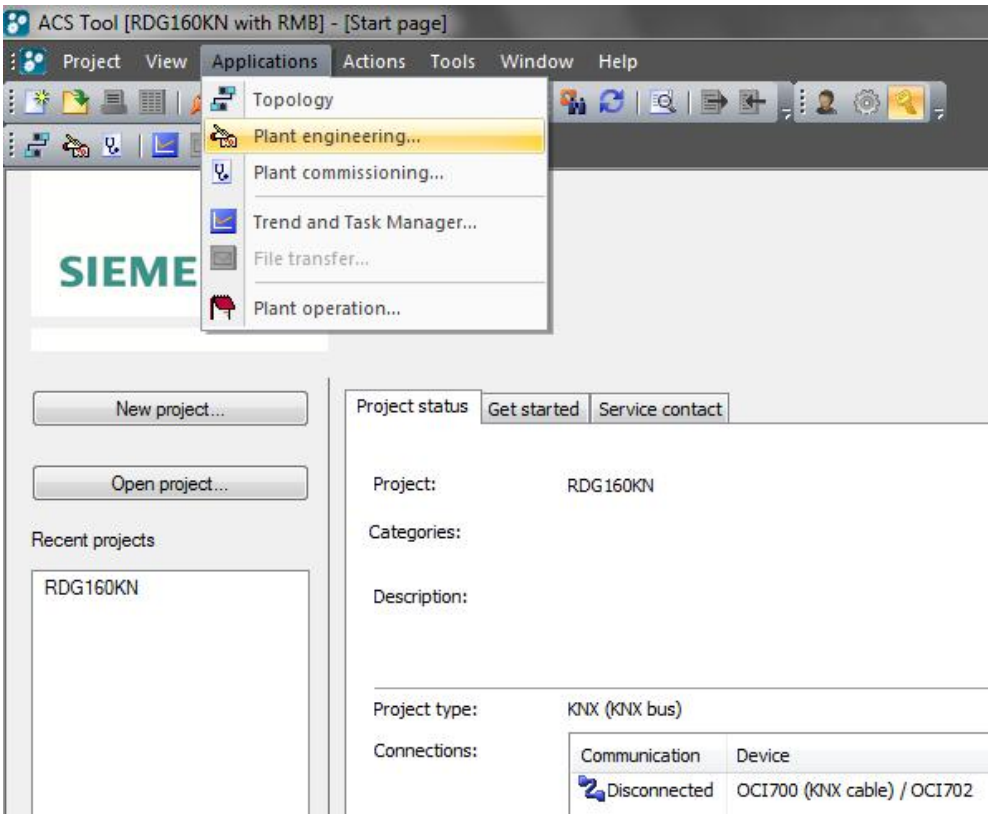
This section does not describe how the physical address is defined and only provides a brief overview of ACS' main functionality.
For more information, refer to the ACS online help.

Note!

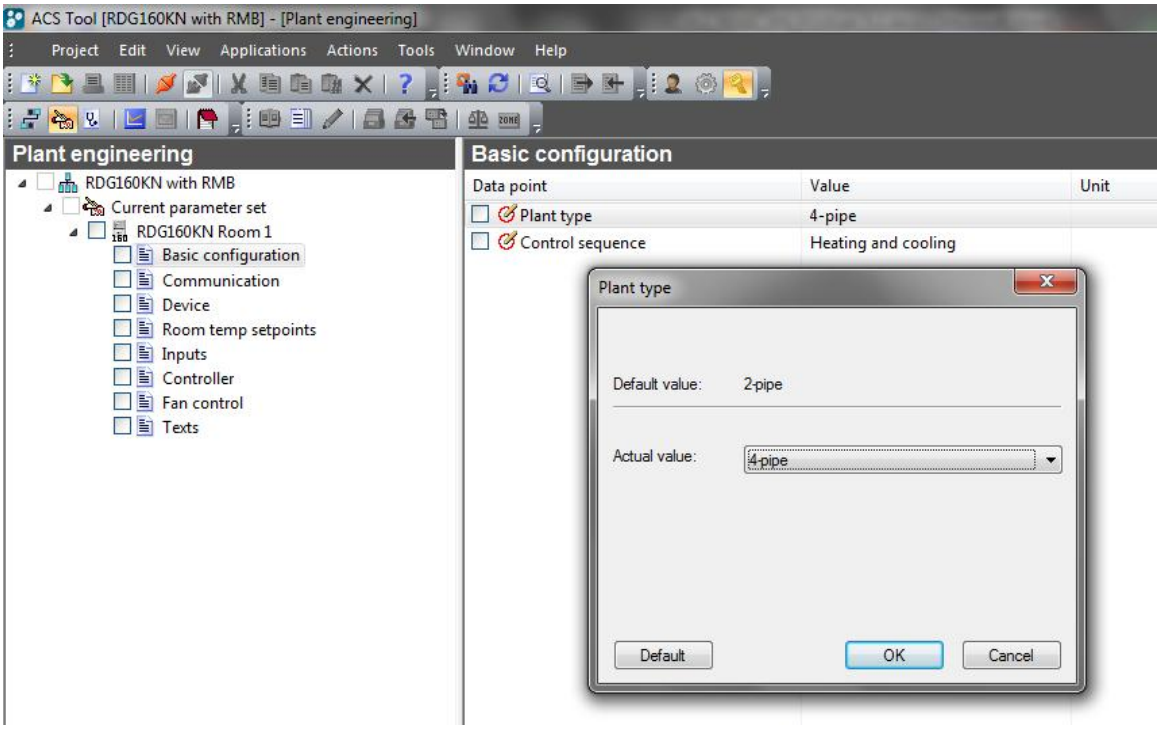
Setting RDG.. KNX parameters is only supported by ACS version 5.11 or higher.

5.2.1 Parameter setting in ACS

In the ACS program, select **Plant** → **Open** to open the plant.
To start the parameter settings, select **Applications** → **Plant engineering**.



The application and control parameters can be adjusted and downloaded.
Column **Line no.** contains the parameter number as displayed in the parameter table. See 3.14.



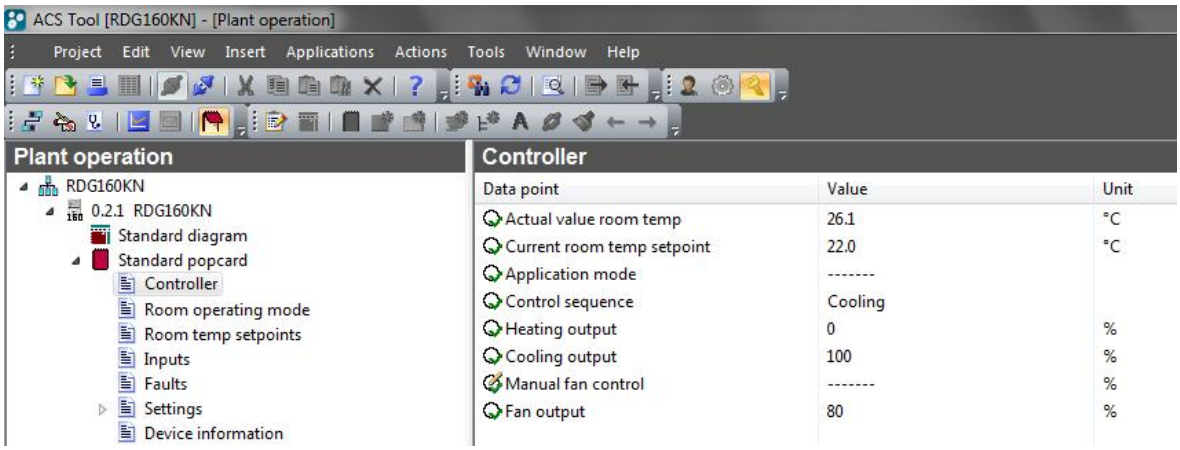
Note!

Some parameters have a different range in ACS than on the room thermostats. The thermostat does not accept changes that are outside its range. This can be observed online by the fact that a changed value jumps back to the original value. Use the ranges described in the parameter tables in 3.14.

5.2.2 Operation and monitoring with ACS

ACS

In the ACS program, select **Plant → Open** to open the plant.
To start monitoring and operation, select **Applications → Plant operation**.



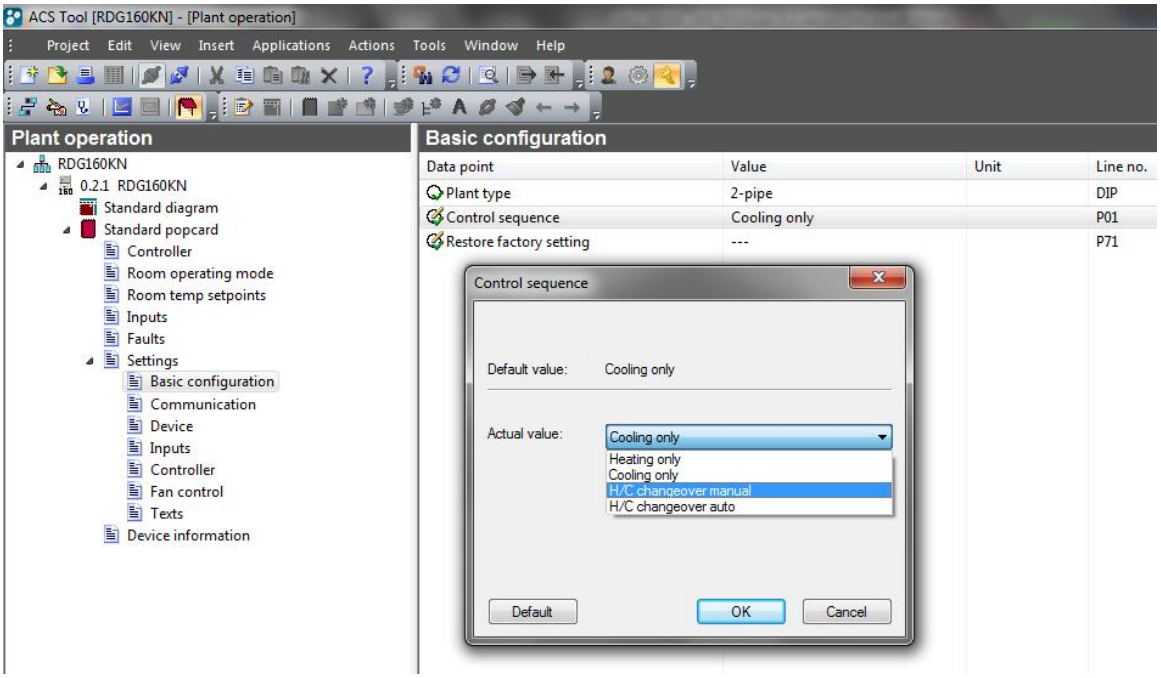
Parameter settings in ACS

The ACS tool supports parameter settings even during normal operation.

To change a control parameter, double click the parameter under **Standard popcard** to make the settings.

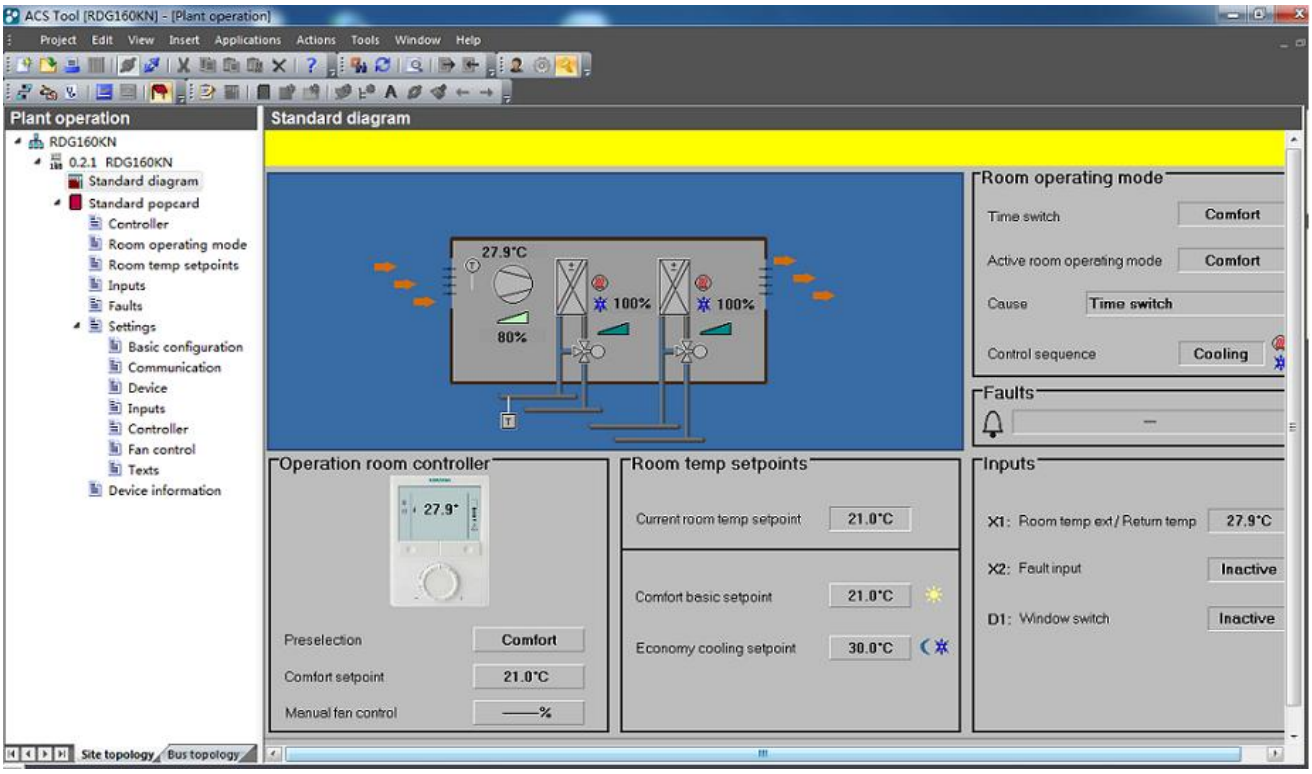
Notes

- Make sure you have logged on with sufficient access right.
- Only control parameters can be changed, no application!

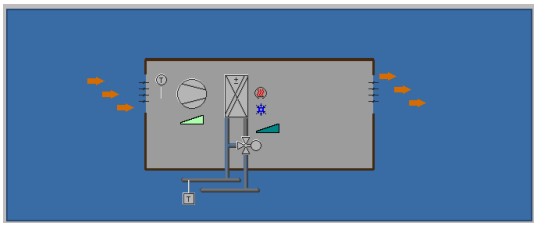
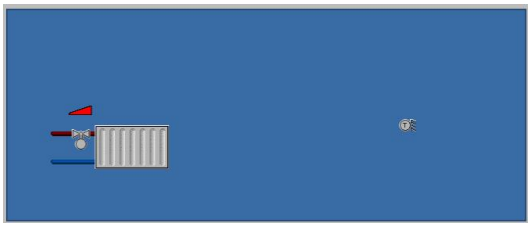
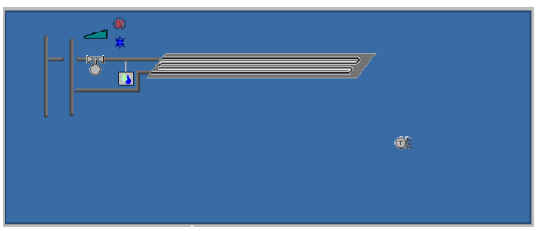
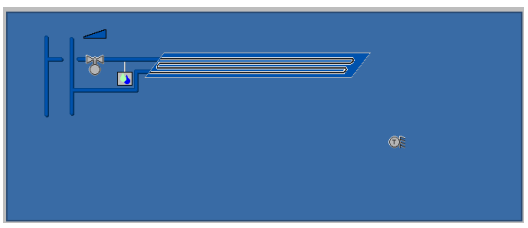


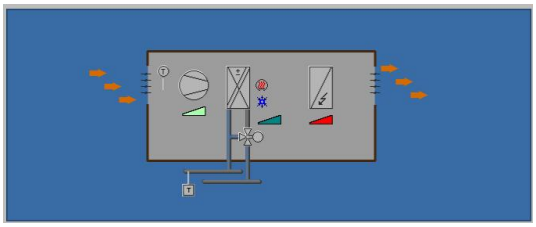
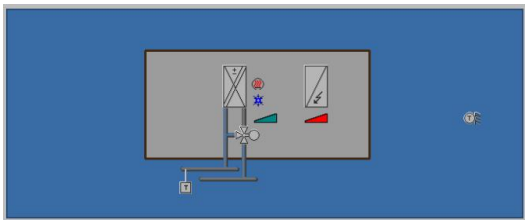
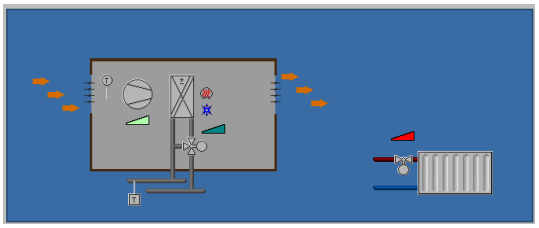
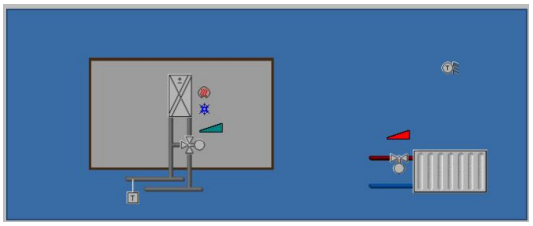
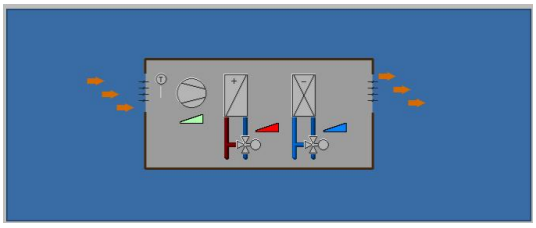
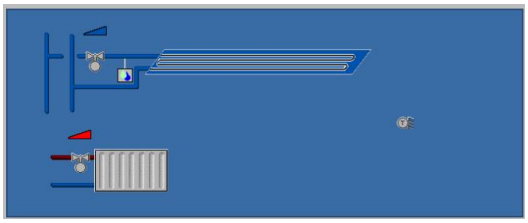
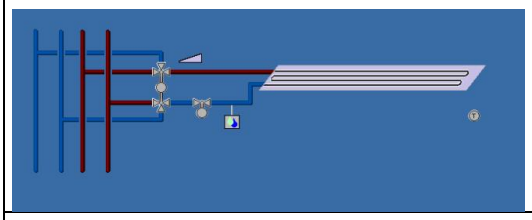
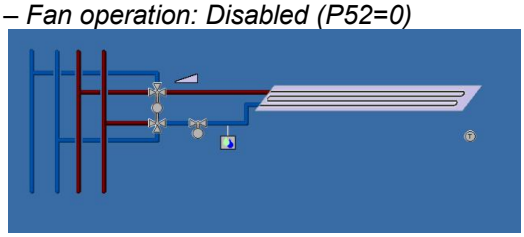
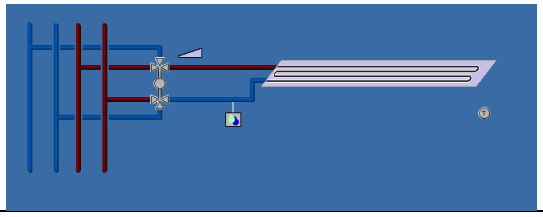
Plant diagram in ACS

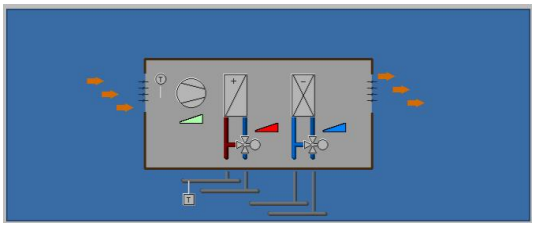
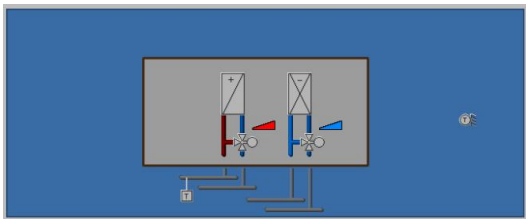
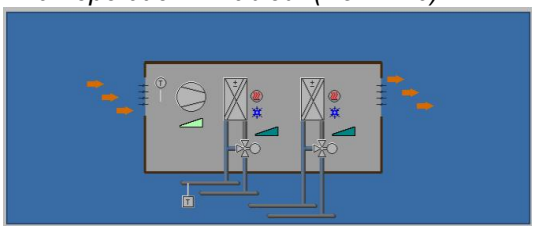
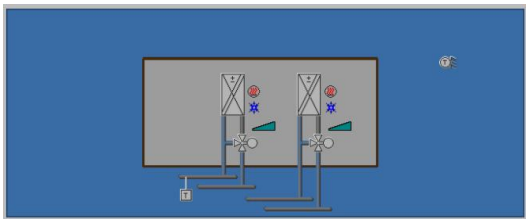
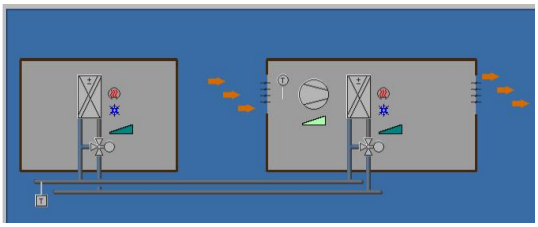
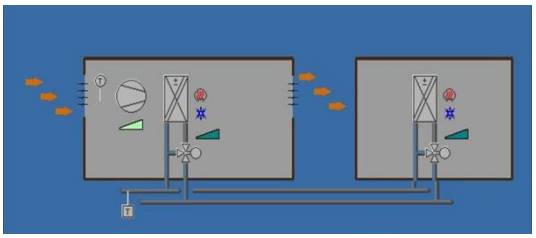
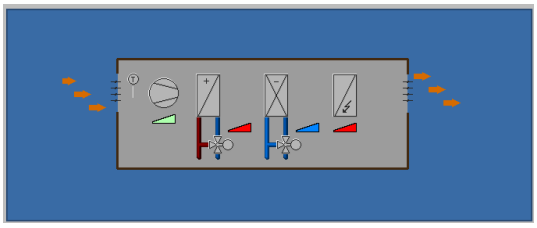
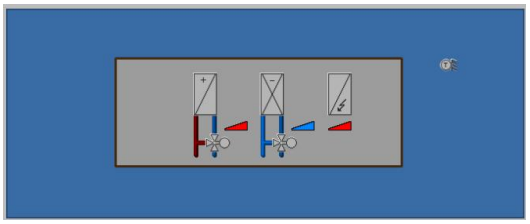
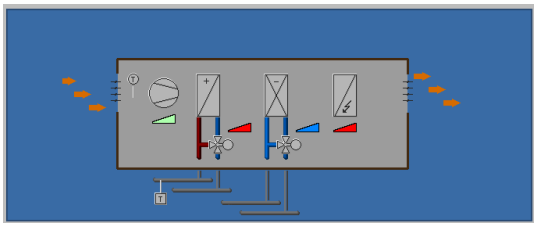
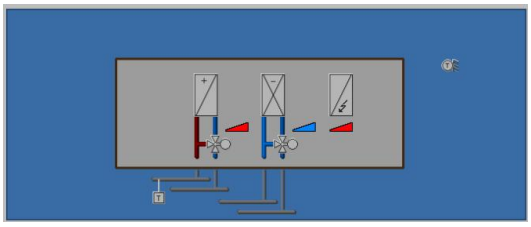
The ACS tool offers plant diagrams for easy monitoring and operation of the thermostat.
To start this application, select **Applications → Plant operation → Standard diagram**.



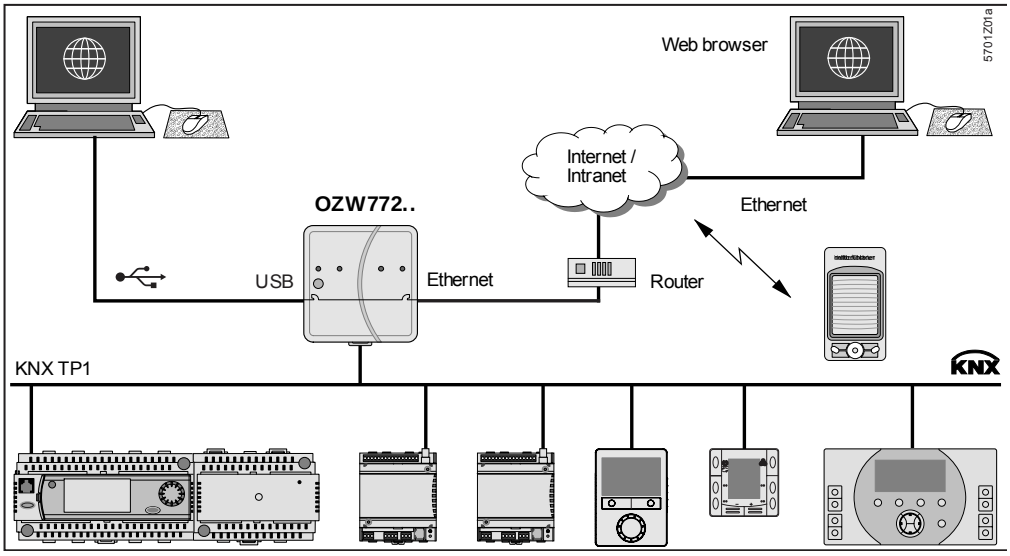
The ACS tool provides standard plant diagrams for RDG.. KNX room thermostats, depending on the following configurations:

Plant type	**Application** *Configuration*	**Application** *Configuration*
2-pipe	**2-pipe fan coil unit** *– Control sequence: No impact (P01 = any)* *– Fan operation: Enabled (P52 <> 0)* 	**Radiator** *– Control sequence: Heating only (P01 = 0)* *– Fan operation: Disabled (P52 = 0)* 
	Chilled/heated ceiling *– Control sequence: Changeover* *– Fan operation: Disabled (P52 = 0)* 	**Chilled ceiling** *– Control sequence: Cooling only* *– Fan operation: Disabled (P52 = 0)* 

Plant type	Application *Configuration*	Application *Configuration*
2-pipe and electric heater	**2-pipe fan coil unit with electric heater** *– Control sequence: No impact (P01 = any)* *– Fan operation: Enabled (P52 <> 0)* 	**Single stage with electric heater** *– Control sequence: No impact (P01 = any)* *– Fan operation: Disabled (P52 = 0)* 
2-pipe and radiator	**2-pipe fan coil unit with radiator** *– Control sequence: No impact (P01 = any)* *– Fan operation: Enabled (P52 <> 0)* 	**Single stage with radiator** *– Control sequence: No impact (P01 = any)* *– Fan operation: Disabled (P52 = 0)* 
4-pipe	**4-pipe fan coil unit** *– Control sequence: Not auto c/o (P01 <> 3)* *– Fan operation: Enabled (P52 <> 0)* 	**Chilled ceiling with radiator** *– Control sequence: No impact (P01 = any)* *– Fan operation: Disabled (P52 = 0)* 
	4-pipe fan coil unit with PICV and 6-port control ball valve as changeover *– Control sequence: P01 = 6* *– Fan operation: Must be enabled (P52 <> 0)* 	**H/C ceiling with PICV and 6-port control ball valve as changeover** *– Control sequence: P01 = 6* *– Fan operation: Disabled (P52=0)* 
	/C ceiling with 6-port control ball valve *– Control sequence: P01 = 5* *– Fan operation: Disabled (P52 = 0)* 	

Plant type	Application *Configuration*	Application *Configuration*
	Fan coil unit main/secondary *– Control sequence: Auto c/o (P01 = 3)* *– Fan operation: Enabled (P52 <> 0)* 	**Main/secondary** *– Control sequence: Auto c/o (P01 = 3)* *– Fan operation: Disabled (P52 = 0)* 
2-stage heating or cooling	**2-stage fan coil unit** *– Control sequence: No impact (P01 = any)* *– Fan operation: Enabled (P52 <> 0)* 	**2-stage** *– Control sequence: No impact (P01 = any)* *– Fan operation: Disabled (P52 = 0)* 
	2-stage fan coil unit *– Control sequence: No impact (P01 = any)* *– Fan operation: 2nd stage (P52 = 4)* 	**2-stage** *– Control sequence: No impact (P01 = any)* *– Fan operation: 2nd stage (P52 = 5)* 
4-pipe with electric heater	**4-pipe fan coil unit with electric heater** *– Control sequence: Not auto c/o (P01 <> 3)* *– Fan operation: Enabled (P52 <> 0)* 	**1 stage Heat and Cool with electric heater** *– Control sequence: No impact (P01 <> 3)* *– Fan operation: Disabled (P52 = 0)* 
	Fan coil unit main/secondary with electric heater *– Control sequence: Auto c/o (P01 = 3)* *– Fan operation: Enabled (P52 <> 0)* 	**Main/secondary with electric heater** *– Control sequence: Auto c/o (P01 = 3)* *– Fan operation: Disabled (P52 = 0)* 

5.2.3 Operation and monitoring with OZW772



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HomeControl app for plant control

The OZW772 web server enables users to operate a Synco HVAC system from a remote location – via a PC or from a smart phone using the HomeControl app.
A start page display the most important data points. A combination of menu/path navigation enables users to access all data points quickly and straightforwardly.
The entire installation can be visualized in the form of plant diagrams. Alarm and state messages can be forwarded to different message receivers, such as e-mail, SMS, etc.

For details, see Commissioning Instructions CE1C5701 [22].

5.2.4 Operation and monitoring with RMZ792

The RMZ792 is a communicating operator unit designed for operating Synco™ 700 and RDG.. KNX devices in a KNX network.
The operator unit is suited both for fixed installation and mobile use (e.g. for use by the service engineer).
Do not operate third-party devices.

For details, see Basic Documentation CE1P3113 [21].

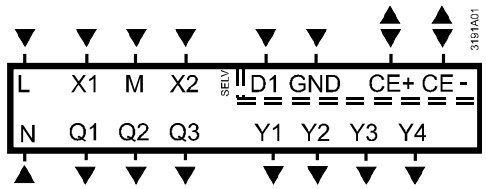
Note The application cannot be displayed in the form of text, instead a number is used: (Parameter **Plant type** on menu **Basic setting)**:

0 = no application
1 = 2-pipe
2 = 2-pipe and electric heater
3 = 2-pipe and radiator
4 = 4-pipe
5 = 2-stage
6 = 4-pipe and electric heater

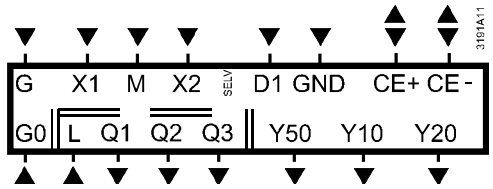
6. Connection

6.1 Connection terminals

RDG100KN



RDG16..KN

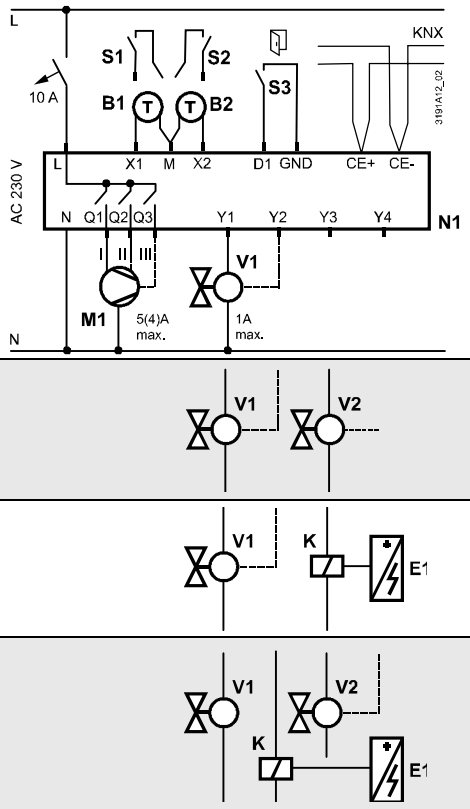


L, N	Operating voltage AC 230 V	(RDG100KN)
G, G0	Operating voltage AC 24 V	(RDG16..KN)
L	Feed for relays AC 24...230 V	(RDG16..KN)
X1, X2	Multifunctional input for temperature sensor (e.g. QAH11.1) or potential-free switch Factory setting: – X1 = external temperature sensor – X2 = no function (function can be selected via P38/P40).	
M	Measuring neutral for sensors and switches	
D1, GND	Multifunctional input for potential-free switch Factory setting: Operating mode switchover contact (function can be selected via P42)	
Q1	Control output fan speed I AC 230 V	
Q2	Control output fan speed II AC 230 V	
Q3	Control output fan speed III AC 230 V	
Q1...Q3	Also for special functions AC 24...230 V	(RDG16..KN)
Y1…Y4	Control outputs "Valve" AC 230 V (N/O triac, for normally closed valves), output for electric heater via external relay	(RDG100KN)
Y10, Y20	Control outputs "Valve" DC 0...10 V	(RDG16..KN)
Y50	Control output "Fan" DC 0...10 V	(RDG16..KN)
CE+	KNX data +	
CE-	KNX data –	

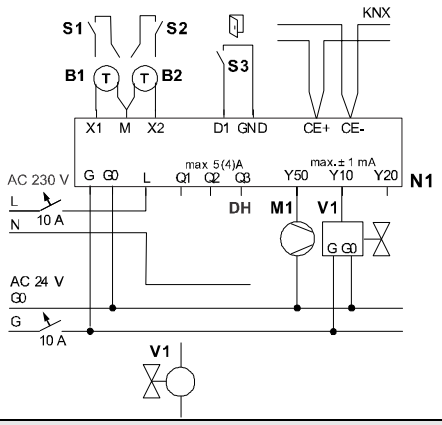
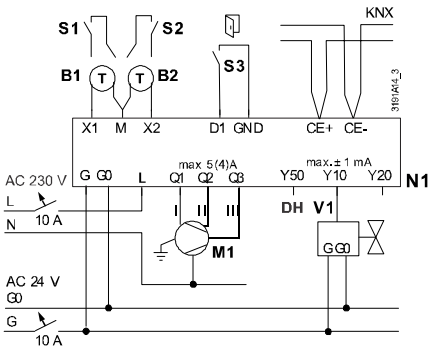
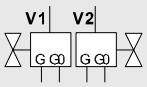
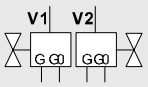
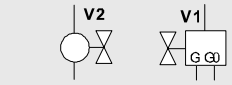
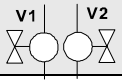
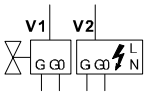
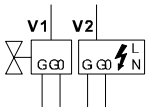
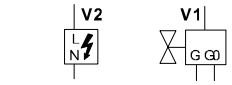
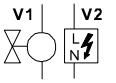
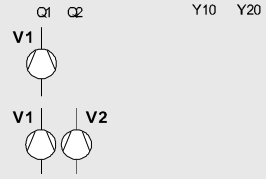
6.2 Connection diagrams

RDG100KN

Application	V1	V2
• 2-pipe	YHC	
• 2-pipe and radiator	YHC	YR
• 4-pipe	YH	YC
• 2-stage	YHC1	YHC2
• 2-pipe and electric heater	YHC	YE
• 4-pipe and electric heater	YH	YC
	YE	



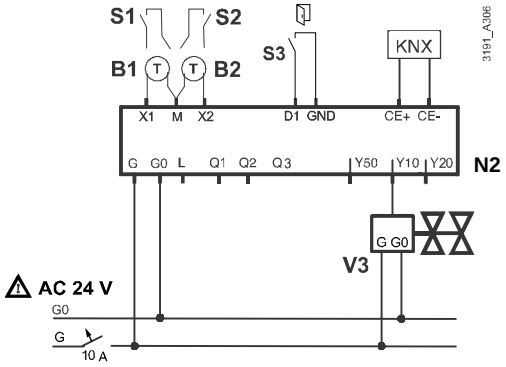
N1	Room thermostat RDG100KN	M1	1-speed or 3-speed fan
S1, S2	Switch (keycard, window contact, presence detector, etc.)	V1, V2	Valve actuators: On/Off or PWM, 3-position, heating, cooling, radiator, heating/cooling, 1st or 2nd stage
S3	Switch at SELV input (keycard, window contact)	K	Relay
B1, B2	Temperature sensor (return air temperature, external room temperature, changeover sensor, etc.)	YH	Heating valve actuator
		YC	Cooling valve actuator
		YHC	Heating/cooling valve actuator
CE+	KNX data +	YHC1/YHC2	1st/2nd stage
CE–	KNX data –	YR	Radiator valve actuator
		YE	Electric heater

RDG16..KN			DC 0...10 V fan	1-speed/3-speed fan
Application	**V1** ⬇	**V2** ⬇		
• 2-pipe	YHC			
• 2-pipe and radiator	YHC	YR		
• 4-pipe	YH	YC		
• 2-stage	YHC1	YHC2		
Control outputs:				
	2 x DC			
	1 x DC 1 x On/Off			
	2 x On/Off			
• 2-pipe and electric heater	YHC	YE		
Control outputs:				
	2 x DC			
	1 x DC 1 x On/Off			
	2 x On/Off			
• Compressor 1-stage	C1			
• Compressor 2-stage	C1	C2		

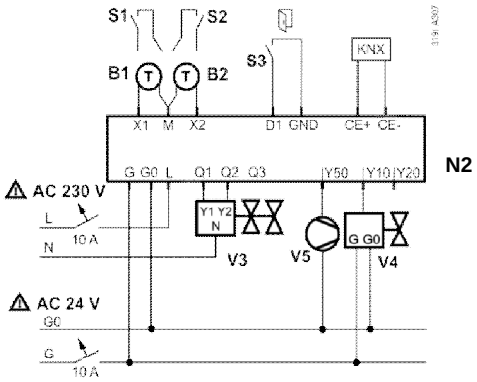
N1	Room thermostat RDG16..KN	YE	Electric heater
S1...S3	Switch (keycard, window contact, presence detector, etc.)	M1	1-speed or 3-speed fan, DC 0...10 V fan
		V1, V2	Valve actuators: On/Off or DC 0...10 V, heating, cooling, radiator, heating/cooling, 1st or 2nd stage
B1, B2	Temperature sensor (return air temperature, external room temperature, changeover sensor, etc.)	YH	Heating valve actuator
		YC	Cooling valve actuator
CE+	KNX data +	YHC	Heating/cooling valve actuator
CE–	KNX data –	YR	Radiator valve actuator
DH	De-Humidifier RDG165KN only Q3=On/Off, Y50=0…10V, see 6.3.1	YHC1/YHC2	1st/2nd stage
		C1/C2	Compressor 1st/2nd stage

Application
(RDG160KN only)

6-port ball valve



PICV with 6-port ball valve as change over



N2	Room thermostat RDG160KN	V3	6-way modulating control actuator (as DC output) 6-way 3-position control actuator (as H/C changeover control)
S1...S3	Switch (keycard, window contact, presence detector, etc.)	V4	PICV control valve
B1, B2	Temperature sensor (return air temperature, external room temperature, changeover sensor, etc.)	V5	Fan (optional)
		CE+	KNX data +
		CE–	KNX data –

6.3 Application examples (RDG165KN)

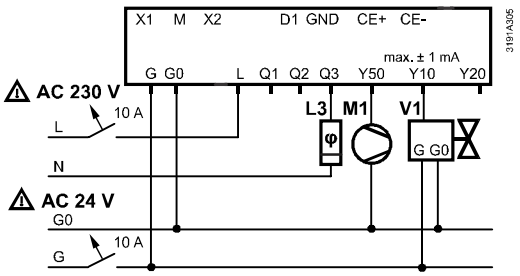
6.3.1 Humidity control (RDG165KN)

Note: In the following examples, P76 is configured based on the connected type of equipment. See details in 3.5.2.

Example 1: Dehumidifier, DC fan and valve

2-pipe fan coil application for dehumidification, with temperature setpoint shifting and dehumidifier contact, DC fan and DC valve:

Commissioning		Outputs used	
• Fan	P53 = 3 (or DIP4 = OFF)	• M1	DC fan
• Control strategy	P75 = 3 (factory setting)	• V1	DC valve
• Setpoint high	P21 = 50% (factory setting)	• L3*)	Dehumidifier
• Temp. shift	P76 = 3 K (factory setting)		
• Valve	P46 = 2 (factory setting)	*) Release contact	
• Relay function	P74 = 7 (dehumidifier)		

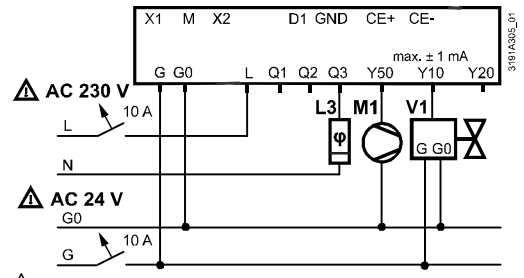


⚠ See 8 for min. and max. ratings

Example 2:
Dehumidifier,
DC fan + valve,
No shifting setpoint

2-pipe fan coil application for dehumidification, with DC fan and DC valve (without temperature setpoint shifting):

Commissioning		Outputs used	
• Fan	P53 = 3 (or DIP4 = OFF)	• M1	DC fan
• Control strategy	P75 = 3 (factory setting)	• V1	DC valve
• Setpoint high	P21 = 50 % (factory setting	• L3*)	Dehumidifier
• Temp. shift	P76 = 0		
• Valve	P46 = 2 (factory setting)	*) Release contact	
• Relay function	P74 = 7 (dehumidifier)		

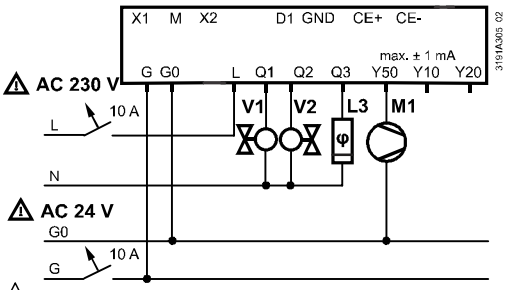


⚠ See 8 for min. and max. ratings

Example 3:
Dehum./DC fan,
On/Off valves

4-pipe fan coil application for dehumidification, with temperature setpoint shifting, dehumidifier contact, DC fan and On/Off valves:

Commissioning		Outputs used	
• Fan	P53 = 3 (or DIP4 = OFF)	• M1	DC fan
• Control strategy	P75 = 3 (factory setting)	• V1, V2	On/Off valves
• Setpoint high	P21 = 50% (factory setting)	• L3*)	Dehumidifier
• Temp. shift	P76 = 3 K (factory setting)		
• Valves	P46/47 = 1	*) Release contact	
• Relay function	P74 = 7 (dehumidifier)		

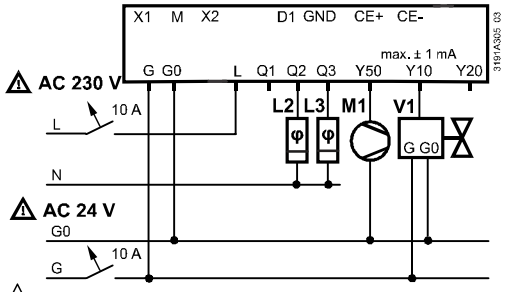


⚠ See 8 for min. and max. ratings.

Example 4: Dehumidifier + humidifier/DC fan

2-pipe fan coil application for dehumidification, with temperature setpoint shifting, dehumidifier contact, DC fan and DC valve, humidification is controlled by release contact:

Commissioning		Outputs used	
• Fan	P53 = 3 (or DIP4 = OFF)	• M1	DC fan
• Control strategy	P75 = 3 (factory setting)	• V1	DC valve
• Setpoint high	P21 = 50% (factory setting)	• L2*)	Humidifier
• Setpoint low	P22 = OFF (factory setting)	• L3*)	Dehumidifier
• Temp. shift	P76 = 3 K (factory setting)		
• Valve	P46 = 2 (factory setting)	*) Release contact	
• Relay function	P74 = 7 (Q3) (dehum.)		
• Relay function	P73 = 8 (Q2) (hum.)		

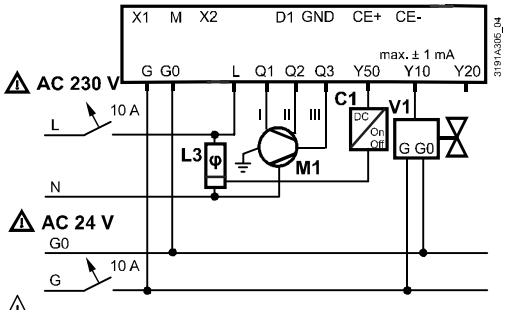


⚠ See 8 for min. and max. ratings

Example 5: Dehum./3-speed fan

2-pipe fan coil application for dehumidification, with temperature setpoint shifting, dehumidifier contact (via external converter) and 3-speed fan:

Commissioning		Outputs used	
• Fan	P53 = 2 (or DIP4 = ON)	• M1	3-speed fan
• Control strategy	P75 = 3 (factory setting)	• V1	DC valve
• Setpoint high	P21 = 50% (factory setting)	• C1	DC - On/Off converter
• Temp. shift	P76 = 3 K (factory setting)	• L3*)	Dehumidifier
• Valve	P46 = 2 (factory setting)	*) Release contact	



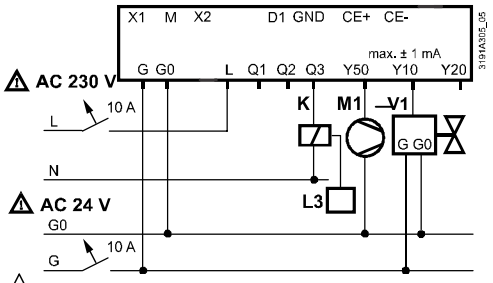
⚠ See 8 for min. and max. ratings

6.3.2 Relay functions (RDG165KN)

Example 1: Switching off the fan coil unit

2-pipe fan coil application, fan coil unit off during Protection mode.

Commissioning		Outputs used	
• Fan	P53 = 3 (or DIP4 = OFF)	• M1	DC fan
• Valve	P46 = 2 (factory setting)	• V1	DC valve
• Relay function	P74 = 1 (Protection mode)	• L3*)	Fan coil
		• K	Relay
		*) Release contact	

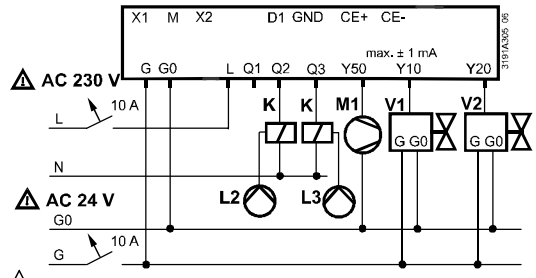


⚠ See 8 for min. and max. ratings

Example 2: Switching on pumps

4-pipe fan coil application, pumps on during heating and cooling demand.

Commissioning		Outputs used	
• Fan	P53 = 3 (or DIP4 = OFF)	• M1	DC fan
• Valves	P46/P47 = 2 (factory setting)	• V1, V2	DC valves
• Relay function	P73 = 3 (heating pump)	• L2*)	Heating pump
• Relay function	P74 = 4 (cooling pump)	• L3*)	Cooling pump
		• K	Relay
		*) Release contact	

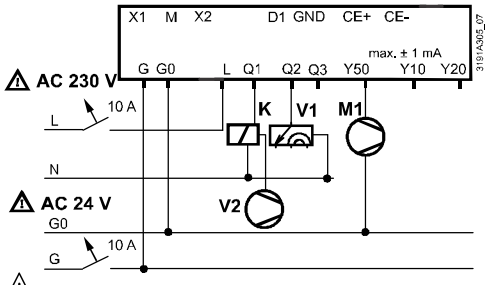


⚠ See 8 for min. and max. ratings

Example 3: Compressor and reversing valve

Compressor application, with reversing valve (heating/cooling) and DC fan:

Commissioning		Outputs used	
• Application	4-pipe	• M1	DC fan
• Control output	P46 = 1 (On/Off)	• V1*)	Reversing valve
• Fan	P53 = 3 (or DIP4 = OFF)	• V2*)	Compressor
• Relay function	Heating/cooling	• K	Relay
- ON in demand: P72 = 2		*) Release contact	
- Energized mode: Heating P73 = 5			
- Energized mode: Cooling P73 = 6			



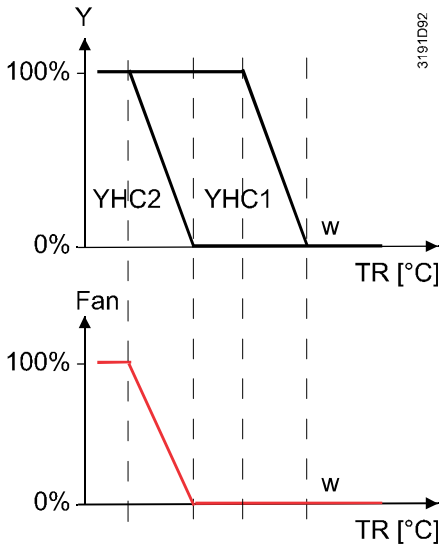
⚠ See 8 for min. and max. ratings

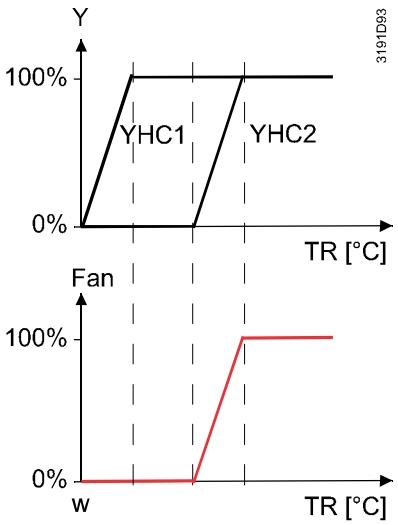
6.3.3 Swap function and/or fan in the 2nd stage (RDG165KN)

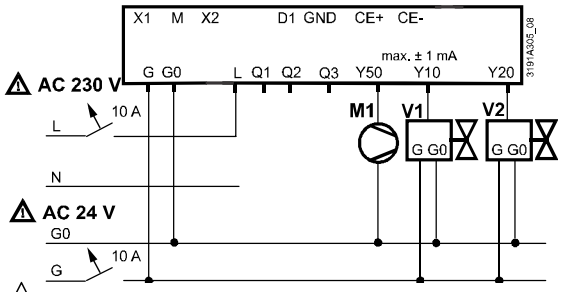
Example 1:
Fan in the 2nd stage

2-pipe fan coil application for floor heating/cooling (2-stage heating/cooling), fan runs only in the 2nd stage:

Commissioning		Outputs used	
• Fan	P52 = 4 (2nd stage)	• M1	DC fan
• Valve	P46 = 2 (floor)	• V1	DC valve floor
• Valve	P47 = 2 (fan coil unit)	• V2	DC valve fan coil units







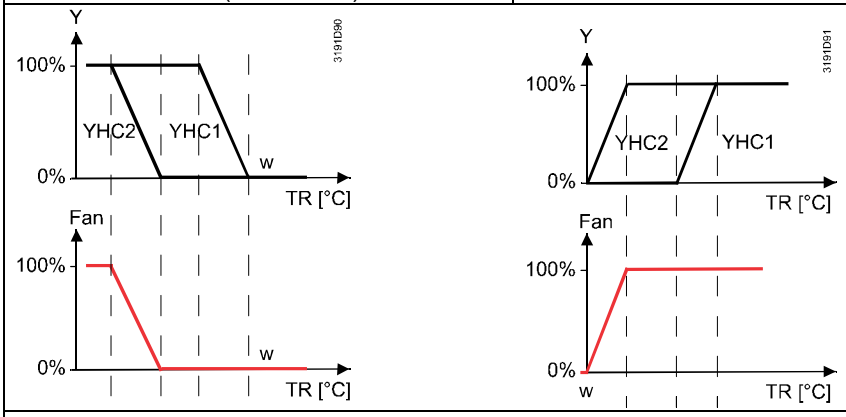
⚠ See 8 for min. and max. ratings

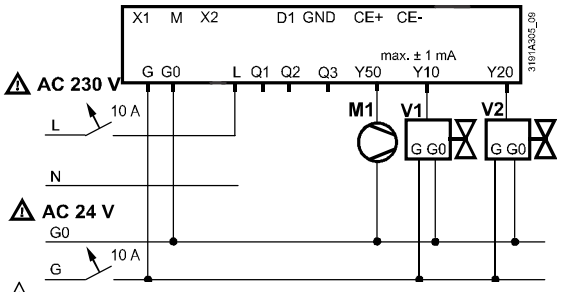
Example 2:
Swap and fan in the 2nd stage

2-pipe and 2-stage application with radiant heating/cooling panels, the fan only operates with the fan coil unit:

- Heating sequence: 1st panel and 2nd fan coil unit
- Cooling sequence: 1st fan coil unit and 2nd panel

Commissioning		Outputs used	
• Fan	P52 = 4 (2nd stage)	• M1	DC fan (2nd stage)
• Valve	P46 = 2 (panel)	• V1	DC valve panel
• Valve	P47 = 4 (fan coil unit)	• V2	DC valve fan coil unit



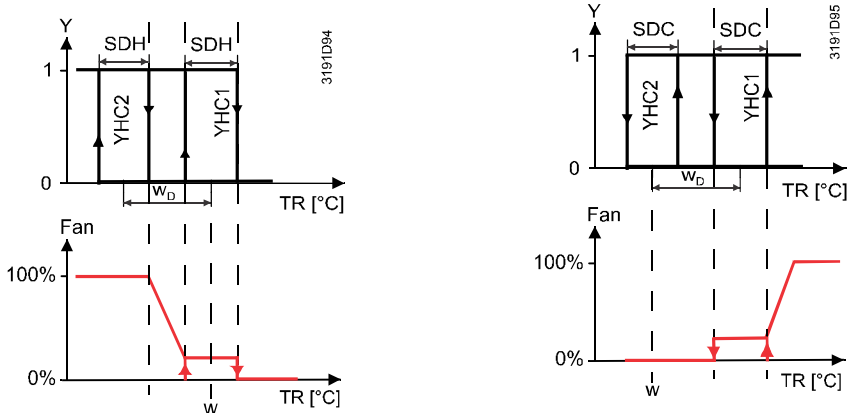


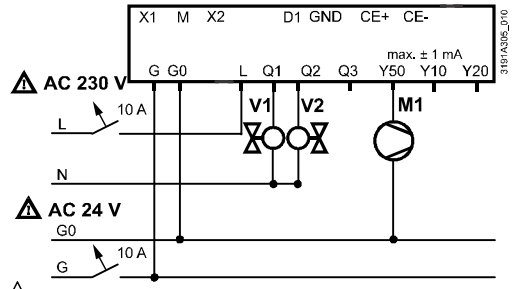
⚠ See 8 for min. and max. ratings

Example 3:
Swap and fan in the 2nd stage

2-pipe fan coil and 2-stage application with different types of equipment (On/Off control outputs), the fan only operates if output V1 is energized.

Commissioning		Outputs used	
• Fan	P52 = 5 (2nd stage)	• M1	DC fan (2nd stage)
• Valve	P46 = 1 (equipment 1)	• V1	On/Off valve (equipment 1)
• Valve	P47 = 3 (equipment 2)	• V2	On/Off valve (equipment 2)





⚠ See 8 for min. and max. ratings

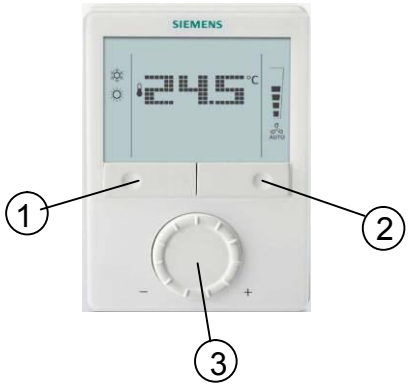
7. Mechanical design

7.1 General

The room thermostat consists of two parts:

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

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

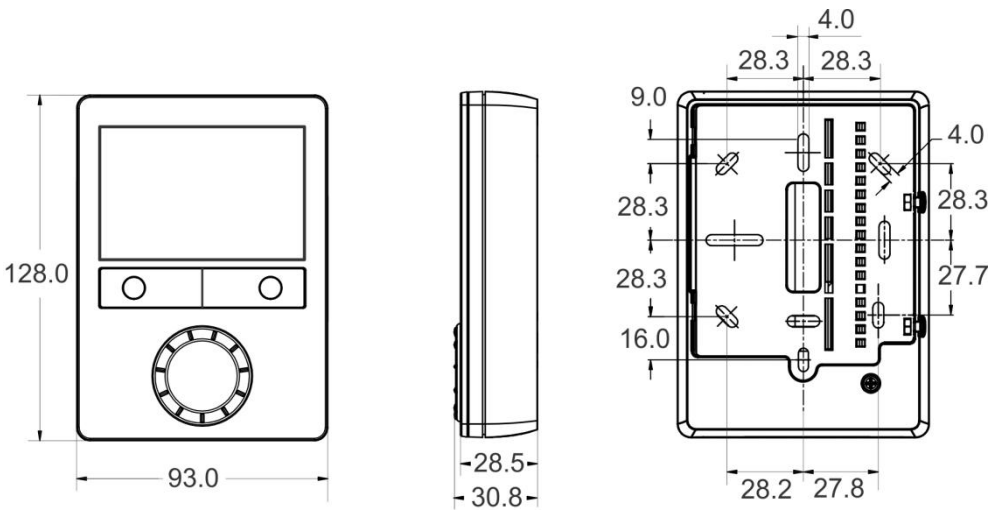


1. Operating mode button/Esc
2. Fan mode button/OK
3. Rotary knob to adjust setpoints and parameters

For operation, see 4.3.

7.2 Dimensions

Dimensions in mm



8. Technical data

RDG100KN

⚠ Power supply	Rated voltage	AC 230 V
	Frequency	50/60 Hz
	Power consumption	Max. 8 VA/1 W
	No internal fuse!	
	External preliminary protection with max. C 10 A circuit breaker required in all cases.	
Outputs	Fan control Q1, Q2, Q3 – N	AC 230 V
	Rating min, max resistive (inductive)	5 mA...5(4) A
	No internal fuse!	
	External preliminary protection with max. C 10 A circuit breaker in the supply line required under all circumstances.	
STOP Note!	**Do NOT connect fans in parallel!**	
	Connect one fan directly, for additional fans, one relay for each speed.	
	Control outputs	Solid state (triacs)
	Y1, Y2, Y3, Y4-N	AC 230 V, 8 mA...1 A
	Power limitation	3 A fast microfuse, cannot be exchanged
Inputs	Multifunctional inputs	
	X1-M/X2-M	
	Temperature sensor input	
	Type	QAH11.1 (NTC)
	Temperature range	0...49 °C
	Cable length	Max. 80 m
	Digital input	
	Operating action	Selectable (NO/NC)
	Contact sensing	DC 0…5 V, max. 5 mA
	Parallel connection of several thermostats for one switch	Max. 20 thermostats per switch. **Do not mix with D1!**
	Insulation against mains	N/A, mains potential ⚠
	D1-GND	
	Operating action	Selectable (NO/NC)
	Contact sensing	SELV DC 6…15 V, 3…6 mA
	Parallel connection of several thermostats for one switch	Max. 20 thermostats per switch. **Do not mix with X1/X2!**
	Insulation against mains	3.75 kV, reinforced insulation
	Function of inputs	Selectable
	External temperature sensor, heating/cooling changeover sensor, operating mode switchover contact, dewpoint monitor contact, enable electric heater contact, fault contact, monitoring input	X1: P38 X2: P40 D1: P42

RDG16..KN

⚠ Power supply	Rated voltage	AC 24 V
	DC 24 V: Make sure to connect G to + and G0 to -	DC 24 V
	Frequency	50/60 Hz
	Power consumption	Max. 2 VA/2 W
	No internal fuse! External preliminary protection with max. C 10 A circuit breaker required in all cases.	
Outputs	Q1/Q2/Q3/L-N (relay)	AC 24...230 V
	Use for 3-speed fan control	
	Rating min, max resistive (inductive)	5 mA...5(4) A
STOP Note!	**Do NOT connect fans in parallel!** Connect one fan directly, for additional fans, one relay for each speed.	
	Use for actuator control (Q1, Q2)	
	Q1 - rating min, max resistive/inductive	5 mA...1 A
	Q2 - rating min, max resistive/inductive	5 mA...5(4) A
	Max total load current Q1+Q2(+Q3)	5 A
	Use for external equipment (Q1, Q2, Q3)	
	Rating min, max resistive/inductive Qx	5 mA...1 A
	Max total load current Q1+Q2+Q3	2 A
	No internal fuse! External preliminary protection with max. C 10 A circuit breaker in the supply line required under all circumstances.	
	ECM fan control Y50-G0	SELV DC 0...10 V, Max. ±5 mA
	Actuator control Y10-G0/Y20-G0 (G)	SELV DC 0...10 V, Max. ±1 mA
Inputs	Multifunctional inputs	SELV
	X1-M/X2-M	
	Temperature sensor input	
	Type	QAH11.1 (NTC)
	Temperature range	0...49 °C
	Cable length	Max. 80 m
	Digital input	|
	Operating action	Selectable (NO/NC)
	Contact sensing	DC 0…5 V, max. 5 mA
	Parallel connection of several thermostats for one switch	Max. 20 thermostats per switch
	D1-GND	
	Operating action	Selectable (NO/NC)
	Contact sensing	DC 6…15 V, 3…6 mA
	Parallel connection of several thermostats for one switch	Max. 20 thermostats per switch
	Function of inputs	Selectable
	External room temperature sensor, heating/cooling changeover sensor, operating mode switchover contact, Dewpoint monitor contact, enable electric heater contact, fault contact, monitoring input, supply air temperature, presence function	X1: P38 X2: P40 D1: P42

RDG100KN, RDG16..KN

KNX bus	Interface type	KNX, TP1-64 (electrically isolated)
	Bus current (RDG160KN ≥ Index J RDG165KN ≥ Index F) RDG100KN ≥ Index J) Older versions	5 mA 20 mA
	Bus topology: See KNX Manual [4]	
Operational data	Switching differential (adjustable)	
	Heating mode (P30)	2 K (0.5…6 K)
	Cooling mode (P31)	1 K (0.5…6 K)
	Setpoint setting and setpoint range	
	☼ Comfort mode (P08)	21 °C (5…40 °C)
	☾ Economy mode (P11-P12)	15 °C/30 °C (OFF, 5…40 °C)
	⌂ Protection mode (P65-P66)	8 °C/OFF (OFF, 5…40 °C)
	Multifunctional inputs X1/X2/D1	Selectable (0...8)
	Input X1 default value (P38)	1 (ext. temperature sensor, room or return air)
	Input X2 default value (P40)	0 (no function)
	Input D1 default value (P42)	3 (operating mode switchover)
	Built-in room temperature sensor	
	Measuring range	0…49 °C
	Accuracy at 25 °C (after calibration via P05)	< ± 0.5 K
	Temperature calibration range	± 3.0 K
	Built-in humidity sensor (RDG165KN)	
	Measuring range	10…90 %
	Accuracy (after calibration via P23)	< 5%
	Humidity calibration range	± 10%
	Settings and display resolution	
	Setpoints	0.5 °C
	Current temperature value displayed	0.5 °C
Environmental conditions	Operation	IEC 60721-3-3
	Climatic conditions	Class 3K5
	Temperature	0…50 °C
	Humidity	<95% r.h.
	Transport	IEC 60721-3-2
	Climatic conditions	Class 2K3
	Temperature	−25…65 °C
	Humidity	<95% r.h.
	Mechanical conditions	Class 2M2
	Storage	IEC 60721-3-1
	Climatic conditions	Class 1K3
	Temperature	−25…65 °C
	Humidity	<95% r.h.
Standards and directives	EU conformity (CE)	CE1T3191xx*) (RDG100KN) CE1T3191xx01*) (RDG16..KN)
	Electronic control type	2.B (micro-disconnection on operation)
	RCM conformity (Emission)	AS/NZS 61000-6-3
	Safety class	II as per EN60730
	Pollution class	Normal
	Degree of protection of housing	IP30 as per EN60529

Environmental Compatibility	The product environmental declaration CE1E3181*) and CE1E3191*) contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).		
Eco design and labelling diretives	Based on EU Regulation 813/2013 (Eco design directive) and 811/2013 (Labelling directive) concerning space heaters, combination heaters, the following classes apply:		
	RDG100KN		
	- Application with On/Off operation of a heater	Class I	value 1%
	- PWM (TPI) room thermostat, for use with On/Off output heaters	Class IV	value 2%
	RDG16..KN		
	- Application with On/Off operation of a heater	Class I	value 1%
	- Modulating room thermostat, for use with modulating heaters	Class V	value 3%
eu.bac 	Meets the requirements for eu.bac certification See product list at: http://www.eubaccert.eu/licences-by-criteria.asp		
	RDG160KN (license 213356)	Energy Efficiency Label	Control accuracy [K]
	Fancoil unit systems (2 pipes, 2 wires) (motorized actuator DC, variable fan speed)	AA	Heating 0.1 Cooling 0.1
	Fancoil unit systems (4 pipes) (thermal actuator, On/Off, variable fan speed)	A	Heating 0.4 Cooling 0.4
General	Connection terminals	Solid wires or stranded wires with ferrules 1 x 0.4…2.5 mm^2 or 2 x 0.4…1.5 mm^2	
Caution ⚠	Minimal wiring cross-section on L, N, Q1, Q2, Q3, Y1, Y2, Y3, Y4	Min. 1.5 mm^2	
	Housing front color	RAL 9003 white	
	Weight without/with packaging RDG100KN	0.270 kg/0.380 kg	
	Weight without/with packaging RDG16..KN	0.240 kg/0.320 kg	

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

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