SIEMENS

3057

Preliminary Release

RDF110
RDF110/IR

RDF110.2
RDF110.2/IR

Room Temperature Controllers with LCD RDF110…

for 2-pipe fan coil units

for compressors in DX-type equipment

Output for an on / off valve actuator or an one stage compressor
3-speed fan control: Automatic and manual
Adjustable commissioning and control parameters
Display of room temperature or setpoint selectable
Minimum and maximum setpoint limitation
Operating voltage AC 230 V

Additional in RDF110
Automatic heating / cooling changeover
Operating modes: Normal operation, Energy saving and Standby
Input for a heating / cooling changeover or return air temperature sensor
Potential–free input for operating mode changeover (key-card contact etc.)
Function for avoiding damage resulting from moisture

***Additional in* RDF110.2**
Manual heating / cooling changeover
Operating modes: Normal operation, Standby

Optional
Infrared remote control (RDF110/IR, RDF110.2/IR)

Use

For controlling of the room temperature in individual rooms and zones which are:

- heated or cooled with 2-pipe fan coil unit
- cooled with single compressor in DX-type equipment

The controller controls:

- a 3 speed fan
- either a valve actuator for a 2-pipe application
- or a one stage compressor in DX-type equipment

Suitable for use in systems with

- automatic heating / cooling changeover (RDF110)
- continuous heating or cooling mode (RDF110)
- manual heating / cooling changeover (RDF110.2)

Functions

- Changeover between heating and cooling mode is either automatically driven by a changeover cable sensor QAH11.1 or manually.
- Maintaining of room temperature either with built-in temperature sensor or external room- / return air temperature sensor (only with RDF110)
- Selection of operation mode with an external changeover switch (only with RDF110) or with the operation mode button on the controller.
- Control of 3 fan speed automatic or manual
- Output for one 2 position (ON/OFF) valve actuator or a one stage compressor
- Optional with infrared remote control functionality (only with RDF110…/IR)

Controller

Temperature control

The controller acquires the room temperature via its built-in sensor and maintains the setpoint by delivering 2-position valve control commands or compressor output. With the RDF110 an external room temperature sensor (QAA32) or an external return air temperature sensor (QAH11.1) can be used instead.
The switching differential is 2 K in heating mode and 1 K in cooling mode (adjustable by parameter P08 and P09).

Display

On the display is shown the acquired room- / return air temperature or the setpoint of the actual corresponding operating mode. This can be selected by parameter P18. Factory setting is displaying of the current room temperature.
The heating and cooling symbols on the display show what the status of the fan coil is. This means, the symbols are also shown in the neutral zone.
If desired the display of temperature and setpoint can also be done in °F instead of °C, by changing of parameter P17.

Operating modes

The following operating modes are available:

Normal operation mode

In Normal operation mode the controller maintains the setpoint which can be adjusted over the buttons. The fan can be set to automatic fan speed or manual fan speed: low, medium or high.

Tip!

The adjustable setpoint range can be limited by a minimum (P05) and maximum (P06) limit. This action helps to prevent energy wasting and finally saves cost.

Energy saving mode (only with the RDF110)

When the external operating mode changeover is activated, the controller changes in the Energy saving mode. In this operating mode, the relevant setpoints of heating or cooling are maintained. These setpoints can be adjusted by control parameters P01 and P02. The default fan speed in energy saving is automatic fan.

Standby

When the controller is in Standby mode ⏻ the relevant setpoints of heating or cooling are maintained. These setpoints can be adjusted by control parameters P03 and P04. Factory setting of both setpoints is “OFF”, this means the controller will not be activated in standby.

Avoiding damage due to moisture (only with the RDF110)

To avoid damage due to moisture in very warm and humid climatic zones resulting from lack of air circulation in Energy saving mode, the fan can be kept running all the time (e.g. in hotel rooms during unoccupied periods), when setting parameter P20 “ON in dead zone”. In this case, the fan keeps always running at minimum fan speed 1.

Control sequences

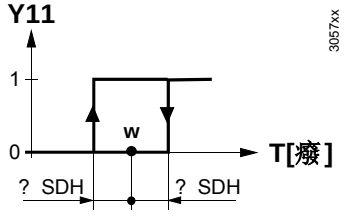
Water based Fan coil application

Use in conjunction with one valve, either for heating/cooling with changeover, heating only or cooling only operation.

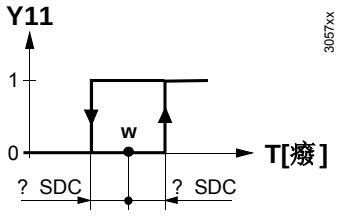
Compressor based application

Use in conjunction with a one-stage compressor for cooling only or heating only operation

Heating mode



Cooling mode



T[°C]	Room temperature	SDH	Switching differential “Heating”
W	Room temperature setpoint	SDC	Switching differential “Cooling”
Y11	Control output “valve” or “compressor”		

ON

The valve or compressor receives the **OPEN** command via control output Y11 when

1. the acquired room temperature lies by half the switching differential below the setpoint (heating mode) or above the setpoint (cooling mode), and
2. the control output Y11 was not energized for more than “minmum output off-time”; (factory setting 1 minute, adjustable by parameter P16)

OFF

The valve or compressor receives the **CLOSE** command via control output Y11 when

1. the acquired room temperature lies by half the switching differential above the setpoint (heating mode) or below the setpoint (cooling mode), and
2. the control output Y11 was energized for more than “minmum output on-time”; (factory setting 1 minute, adjustable by parameter P15)

Note: Control output Y12 delivers a control command which is inverted to the control command at output Y11 and which can be used for normally open valves.

Heating / cooling operation

With the RDF110, the changeover between cooling and heating is done either automatically by a heating / cooling changeover sensor or a remote changeover switch. If

the controller is commissioned *cooling only* or *heating only,* no changeover is possible. (Parameter P22, factory setting *cooling only*).

With the RDF110.2, when pressing the heating / cooling changeover button, the controller changes from heating to cooling or vice versa.

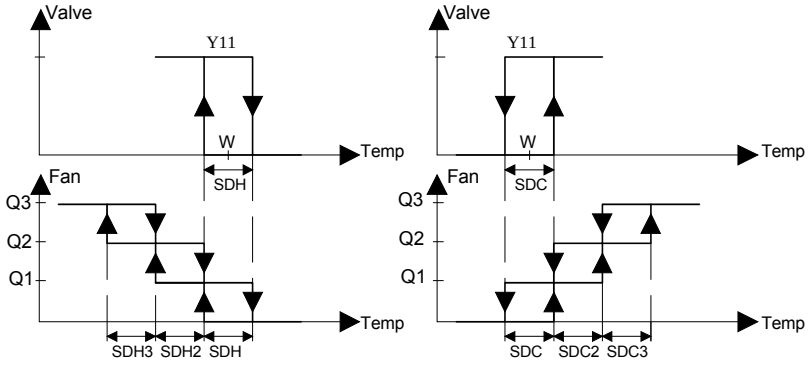
Minimum output on-time / off-time Y11

The minimum output on-time and off-time of Y11 can be adjusted from 1…10 minutes by parameter P15 and P16. Factory setting is 1 minute. In this case any adjustment on the setpoint or heating / cooling mode changeover will be taken immediately for computing the output status and output Y11 may not hold the minimum on/off-time of 1 minute.
If parameter P15 or P16 higher than 1 minute the minimum on/off-time of Y11 will be held as set, even the setpoint or changeover mode is adjusted.

Fan operation

The fan operates either in automatic mode or at the selected speed when using manual mode. In automatic mode, the fan speed depends on the setpoint and the current room temperature. When the room temperature has reached the setpoint, the control valve will close and the fan switches off: Temperature-dependent fan control. See below diagram. The individual switching differential of the fan stages can be adjusted by control parameter P08 – P13.

Heating mode *Cooling mode*



Ventilation always on

If desired, the fan control can be set to temperature independent which means the ventilation is always on, even in dead zone at least in fan speed 1. This can be selected individually for Normal operation mode with parameter P21 and for Energy saving mode with parameter P20. See also “Avoiding damage due to moisture”.

Dwell time

In automatic mode a dwell time of 2 minutes (factory setting) is active. The fan remains at one speed for at least two minutes before it is switched to the next. This dwell time can be adjusted from 1 minute to 5 minutes by parameter P14.

Fan start

Whenever the fan starts from zero, then it starts with fan speed 3 for 1 second in order to guarantee a safe fan motor start (to overcome inertia and friction)

External sensor input B1-M

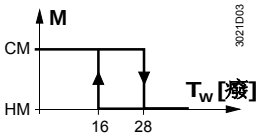
With the RDF110, on the same terminal B1-M a return air-/external room temperature sensor or an automatic heating / cooling changeover sensor can be connected. The function of this sensor input is dedicated by parameter P22.

⚠ The sensor input B1-M is not galvanically separated from the AC 230 V mains. Therefore only cable sensor and wiring with sufficient insulation must be used.

Automatic heating / cooling changeover

When P22 is set to “Automatic H/C changeover” the sensor input acts as an automatic heating / cooling changeover. The water temperature acquired by the changeover sensor (QAH11.1 + ARG86.3) is used to switch from heating to cooling mode, or vice versa. When the water temperature lies above 28 °C (adjustable parameter P24), the controller switches to heating mode, below 16 °C (adjustable parameter P23) it switches to cooling mode. If, immediately after switching on, the water temperature lies between the 2 changeover points, the controller will start in heating mode. The water temperature is acquired at 30 second intervals and the operating state updated.

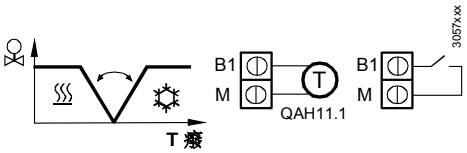
Automatic H/C changeover



M	Operating mode	CM	Cooling mode
T_w	Water temperature	HM	Heating mode

Remote heating / cooling changeover

The cable temperature sensor QAH11.1 for the automatic heating / cooling changeover can be replaced by an external switch (suited for mains voltage) for manual remote changeover:



switch open → heating mode

switch closed → cooling mode

With parameter (diagnostic value) P99 the automatic heating / cooling changeover status can be checked.

External room- or return air temperature sensor

When the parameter P22 is set to “Cooling only” or “Heating only”, the sensor input B1-M can be used to connect an external room temperature (QAA32) or a return air temperature sensor (QAH11.1). The changeover is automatic if a sensor is detected on the sensor input. With parameter (diagnostic value) P98 the sensor status can be checked.

Summary B1-M and P22

Following table summarizes the relation between parameter P22, external sensor B1-M and variables which the controller takes for maintaining the temperature:

Parameter P22	*Variables: the controller….*	*No sensor at B1-M*	*QAH11.1/QAA32 at B1-M*
Heating only	is in H/C mode	Heating	Heating
	controls according	Internal sensor	Sensor on B1
Cooling only	is in H/C mode	Cooling	Cooling
	controls according	Internal sensor	Sensor on B1
Automatic H/C changeover	is in H/C mode	Heating	depending on temperature from sensor B1-M
	controls according	Internal sensor	Internal sensor

External operating mode changeover D1-GND

With the RDF110, a potential-free operating mode changeover switch (window switch, key card contact etc.) can be connected to status input D1-GND. No additional power supply is required for detecting the position of the external switch.

When the switch closes due to an open window or unoccupied hotel room for instance, the operating mode will change to Energy saving. During this external operating mode changeover neither setpoint nor control parameter nor fan mode can be changed.

The operating action of the switch (N.C. or N.O.) can be selected by parameter P19.

Infrared remote control

The RDF110/IR and RDF110.2/IR have an infrared receiver. Together with the infrared remote control IRA210, the following operations can be done from remote:

- Setting of operating mode: Standby / Normal operation
- Adjusting of setpoint in Normal operation
- Selecting of fan mode: automatic or manual fan speed

With parameter P25 the infrared remote control functionality can be disabled.

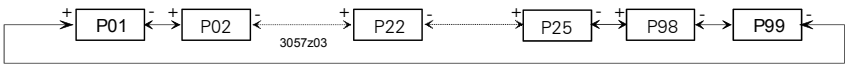
Control parameters

With the RDF110 and RDF110.2 a number of control parameters can be adjusted to optimize the control performance. These parameters can also be set during operation without opening the unit. In the event of power failure, all control parameter settings will be maintained.

Parameter setting

The parameters can be changed as follows:

1. Set the controller in standby ⏻
2. Press buttons ⊕ and ⊖ simultaneously for 3 seconds. Release them and, within 2 seconds, press button ⊕ again for 3 seconds. Then, the display will show “P01“.
3. Select the required parameter by repeatedly pressing buttons ⊕ and ⊖:



4. By pressing buttons ⊕ and ⊖ simultaneously, the current value of the selected parameter appears, which can be changed by repeatedly pressing buttons ⊕ or ⊖.
5. By pressing buttons ⊕ and ⊖ simultaneously again or 5 seconds after the last press of a button, the last parameter will be displayed again.
6. If you wish to display and change additional parameters, repeat steps 3 through 5.
7. 10 seconds after the last display or setting, all changes will be stored and the controller returns to operating mode standby.

Note: For RDF110.2 irrelevant parameters are not available and can not be displayed.

Parameter reset

The factory setting of the control parameter can be reloaded as follow:

1. Set the controller in standby ⏻
2. Press buttons ⊕ and ⊖ simultaneously for 3 seconds. Release them and, within 2 seconds press operating mode selector button 🌀/⏻ 2 times.

Then, the display will show “888“ during the reloading process

Control parameters of the RDF110 and RDF110.2

Para-meter	Meaning	Setting range	Factory setting
P01	Setpoint of heating in energy saving mode ($Wheat_{Eco}$)	OFF, 5 °C…$Wcool_{Eco}$	16 °C[1)]
P02	Setpoint of cooling in energy saving mode ($Wcool_{Eco}$)	OFF, $Wheat_{Eco}$…40 °C	28 °C[1)]
P03	Setpoint of heating in standby ⏻ ($Wheat_{Stb}$)	OFF, 5 °C…$Wcool_{Stb}$	OFF
P04	Setpoint of cooling in standby ⏻ ($Wcool_{Stb}$)	OFF, $Wheat_{Stb}$ …40 °C	OFF
P05	Minimum setpoint limitation in normal operation ($Wmin_{Comf}$)	5 °C…$Wmax_{Comf}$	5 °C
P06	Maximum setpoint limitation in normal operation ($Wmax_{Comf}$)	$Wmin_{Comf}$…40 °C	35 °C
P07	Sensor calibration	-3…+3 K	0 K
P08	Switching differential heating mode SDH	0.5…+4K	2 K
P09	Switching differential cooling mode SDC	0.5…+4K	1 K
P10	Switching differential fan speed 2 in heating operation mode SDH2	0.5…+4K	1 K
P11	Switching differential fan speed 2 in cooling operation mode SDC2	0.5…+4K	1 K
P12	Switching differential fan speed 3 in heating operation mode SDH3	0.5…+4K	1 K
P13	Switching differential fan speed 3 in cooling operation mode SDC3	0.5…+4K	1 K
P14	Dwelling time of auto fan speeds	1…5 Minutes	2 Min.
P15	Minimum output on-time (Y11)	1…10 Minutes	1 Min.
P16	Minimum output off-time (Y11)	1…10 Minutes	1 Min.
P17	Selection for °C or °F	°C or °F	°C
P18	Display of temperature or setpoint	OFF: setpoint ON: Room (or return air) temperature	ON
P19	Operating action of remote changeover input	0: Normally open (N.O) 1: Normally closed (N.C.)	0[1)]
P20	Fan control in energy saving mode	OFF in dead zone ON in dead zone	OFF[1)]
P21	Fan control in normal operation	OFF in dead zone ON in dead zone	OFF
P22	Heating / cooling mode	0: Heating only 1: Cooling only 2: Automatic H/C change-over	1: Cool-ing only[1)]
P23	Heating / cooling changeover switching point cooling	10…25 °C	16 °C[1)]
P24	Heating / cooling changeover switching point heating	27…40 °C	28 °C[1)]
P25	Infrared receiver (only with RDF.../IR)	0: Disabled 1: Enabled	1
P98	Active temperature sensor	0: Internal sensor 1: External sensor	Diagnos-tic value[1)]
P99	Value of current heating / cooling changeover temperature reading and indication of current mode	100 = input open → ♨ mode 0…49 °C = cur. temp. value 00 = input bridged → ☼mode OFF= not commissioned as automatic H/C changeover	Diagnos-tic value[1)]

1) Not available with RDF110.2

Type summary

Type reference	Features
RDF110	With input for automatic heat /cool changeover- or return air temperature sensor With input for operating mode changeover
RDF110.2	With manual heating / cooling changeover Without input for sensor Without input for operating mode changeover
RDF110/IR	Same as RDF110 additional with infrared remote functionality
RDF110.2/IR	Same as RDF110.2 additional with infrared remote functionality

Equipment combinations

Type of unit	Type reference	Data Sheet
Infrared remote control	**IRA210**	-
Cable temperature sensor	**QAH11.1**	1840
Room sensor	**QAA32**	1747
Changeover mounting kit	**ARG86.3**	1840
Electromotoric on/off valve and actuator	**MVI…/MXI…**	4867
Electromotoric on/off actuator	**SFA21...**	4863
Thermal actuator (for radiator valve)	**STA21...**	4893
Thermal actuator (for small valves 2.5 mm)	**STP21...**	4878
Zone valve actuators	**SUA…**	4830

Accessories

Description	**Type reference**
Adapter plate 120 x 120 mm for 4“ x 4“ conduit boxes	ARG70
Adapter plate 96 x 120 mm for 2“ x 4“ conduit boxes	ARG70.1
Adapter plate for surface wiring 112 x 130 mm	ARG70.2

Ordering

When ordering, please give name and type reference:
e.g. **Room temperature controller RDF110**

The infrared remote control **IRA210** is to be ordered as separate item

The **QAH11.1** can be used as return air temperature or automatic heating / cooling changeover sensor. In case it is used as changeover sensor the changeover sensor mounting kit **ARG86.3** is to be ordered as separate item.

Valve actuators are to be ordered as separate items

Mechanical design

The controller consists of 2 parts:

- Plastic housing which accommodates the electronics, the operating elements and the built-in room temperature sensor
- Mounting base

The housing engages in the mounting base and snaps on.

The base carries the screw terminals.

Setting and operating elements

Legend

1 Display of the room temperature, setpoints or control parameters

2 Symbol used when displaying the current room temperature

3 Operating mode
Normal mode
Energy saving mode

4 Standby / fan mode status
Standby mode
AUTO Auto fan active
fan speed low, medium, high

5 in cooling mode
in heating mode

6 Buttons for adjusting the setpoints and the control parameters

7 Button for changing fan operating and Standby

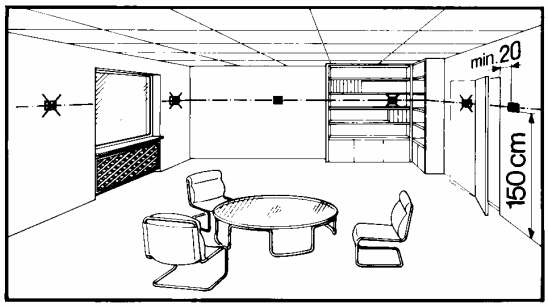
8 Manual heating / cooling changeover; only with the RDF110.2

9 Infrared receiver only with RDF110…/IR

Notes

Mounting and installation

The room controller can be mounted on a wall or inside the fan coil unit. The mounting location on a wall should not be in niches or bookshelves, not behind curtains, above or near heat sources and not exposed to direct solar radiation. Mounting height is about 1.5 m above the floor.



The controller can be fitted on a recessed conduit box.

When using an automatic heating / cooling changeover sensor then before fitting the sensor, thermal conductive paste must be applied to the location on the pipe where the sensor is placed.

Wiring

Refer also to the controller enclosed mounting instruction B3057.

⚠ • Wiring, fuse and earthing must be installed in the compliance with the local regulation. It must be made certain that safety extra low voltage lines (SELV circuit) are clearly separated from AC230 V mains voltage cable.

⚠ • The cables to the controller, external sensor, fan and valves carry AC 230 V and must be appropriate dimensioned.

⚠ • Only sensors and valves rated for AC 230 V may be used.

⚠ • The 230 V mains power supply line must have an external fuse or circuit breaker with a rated current of not more than 10 A

⚠ • Maximum 10 changeover contact inputs B2-M can be connected in parallel if an external switch is used instead of a changeover sensor. The switch must be rated for AC 230 V. The cable length may not exceed 80m overall.

• Maximum 10 operating mode changeover contact inputs D1-GND can be connected in parallel. The cable length may not exceed 80m overall.

Commissioning

After applying power, the controller makes a reset during which all LCD segments flash, indicating that the reset has been correctly made. This takes about 3 seconds. Then the controller is ready for commissioning by a qualified HVAC staff. The control parameter of the controller can be set to get an optimum on performance of the whole system. Refer also “Setting the control parameters”.

Heating / cooling mode

- Only with the RDF110; depending on application, the heating / cooling mode needs to be set by parameter P22. Factory setting is “Cooling only”. When using the function automatic heating / cooling changeover then P22 has to be set to “Automatic H/C changeover”.
  Note: when P22 is set to “Automatic H/C changeover” the built-in sensor is used for measuring the room temperature.

Compressor based application ⚠

- If the controller is used in conjunction with a compressor the minimum output on-time (parameter P15) and off-time (parameter P16) of Y11 needs to be adjusted in order not to harm the life time of the compressor.

Calibrating the sensor

- If the room temperature displayed by the controller is inconsistent with the room temperature effectively measured, the temperature sensor can be recalibrated. In that case, parameter P07 must be changed

Setpoint and range limitation

- For comfort and energy saving reasons it’s suggested to review the setpoints and setpoint ranges (parameter P01…P06) and if necessary to change accordingly.

Diagnostic value

- Only with the RDF110; parameter P98 and P99 are diagnostic value and help by checking or failure analyze of the system. With P98 the active temperature sensor, with P99 the status of the automatic heating / cooling changeover sensor is shown.

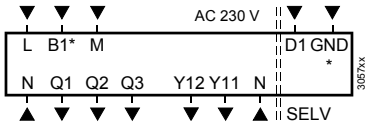
Technical data

⚠ Power supply	Operating voltage	AC 230 V +10/-15 %
	Frequency	50/60 Hz
	Power consumption	max. 8 VA
Outputs	Fan control Q1, Q2, Q3-N	AC 230 V
	Rating	max. 4(2)A
	Control output Y11-N (N.O.) / Y12-N (N.C.)	AC 230 V
	Rating	max. 4(2)A
Inputs	Changeover- or external room temperature sensor B2-M	
	Temperature sensor	QAH11.1, safety class II
⚠	Voltage against earth	AC 230 V
	Cable length max.	80m (min. 1.5 mm^2)
	Status input D1 and GND	
	Contact sensing	SELV DC 6…15 V / 3…6 mA
	Insulation against mains	4 kV, reinforced insulation
	Operating action	selectable (N.O. / N.C.)
	Cable length max.	80m (min. 1.5 mm^2)
	Infrared receiver (only with RDF110…/IR)	
	Transmission distance	≤ 7.5 m
	Directivity angle	≤ ±45°
Operational data	Switching differential, adjustable from 0.5..4K	
	heating mode (factory setting)	2 K
	cooling mode (factory setting)	1 K
	Setpoint setting range	
	☼ Normal operation	5...40 °C
	☾ Energy saving (only with RDF110)	OFF, 5...40 °C
	⏻ Standby	OFF, 5...40 °C
	Factory setting of setpoints	
	☼ Normal operation	20 °C
	☾ Energy saving in heating / cooling mode	16 °C / 28 °C
	⏻ Standby (heating and cooling mode)	OFF
	Built-in room temperature sensor	
	Measuring range	0…49 °C
	Accuracy at 25 °C	< ± 0.5 K
	Temperature calibration range	± 3.0 K
	Resolution of settings and display	
	Setpoints	0.5 °C
	Current temperature value displayed	0.5 °C
Environmental conditions	Operation	to IEC 721-3-3
	Climatic conditions	class 3K5
	Temperature	0...+50 °C
	Humidity	<95 % r.h.
	Transport	to IEC 721-3-2
	Climatic conditions	class 2K3
	Temperature	−25...+60 °C
	Humidity	<95 % r.h.
	Mechanical conditions	class 2M2
	Storage	to IEC 721-3-1
	Climatic conditions	class 1K3
	Temperature	−25...+60 °C
	Humidity	<95 % r.h.
Norms and standards	CE conformity to	
	EMC directive	89/336/EEC
	Low voltage directive	73/23/EEC and 93/68/EEC
	C-Tick conformity to	
	EMC emission standard	AS/NSZ 4251.1:1994

General

Product standards	
Automatic electrical controls for household and similar use	EN 60 730 – 1
Special requirements on temperature-dependent controls	EN 60 730 – 2 - 9
Electromagnetic compatibility	
Emissions	IEC/EN 61 000-6-3
Immunity	IEC/EN 61 000-6-1
Devices of safety class	II to EN 60 730
Pollution class	normal
Degree of protection of housing	IP 30 to EN 60 529
Connection terminals	solid wires or prepared stranded wires 2 x 0.4-1.5 mm^2 or 1 x 2.5 mm^2
Weight	0.28 kg
Color of housing front	white, NCS S 0502-G (RAL 9003)

Connection terminals



L, N Operating voltage AC 230 V
B1***** Changeover (QAH11.1+ ARG86.3) or external room temperature sensor (QAH11.1 / QAA32)
M Measuring neutral for sensor

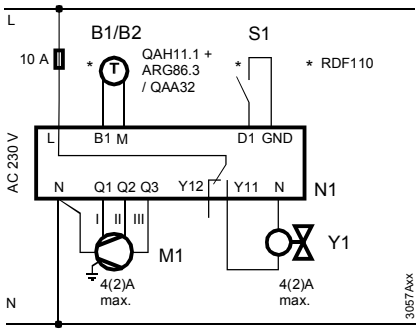
D1, GND***** Status input for potential-free operating mode changeover switch
Q1 Control output “Fan speed 1 AC 230 V
Q2 Control output “Fan speed 2 AC 230 V
Q3 Control output “Fan speed 3 AC 230 V
Y11 Control output “Valve” AC 230 V (N.O., for normally closed valves) or output for compressor
Y12 Control output “Valve” AC 230 V (N.C., for normally open valves)

*** Only with RDF110 or RDF110/IR**

Connection diagram

Application:

2-pipe fan coil units



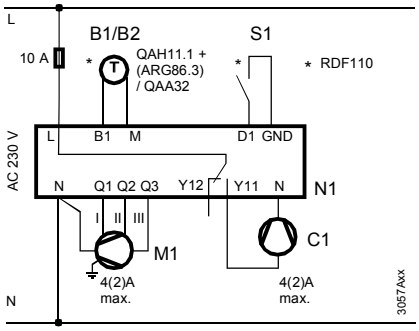
B1***** Return air temperature sensor (QAH11.1) or external room temperature sensor (QAA32)
B2***** Changeover sensor (temperature sensor QAH11.1 + changeover mounting kit ARG86.3)
M1 3-speed fan
N1 Room temperature controller RDF110..
S1***** External operating mode changeover switch
Y1 Zone valve

*** Only with RDF110 or RDF110/IR**

Application:

Compressor

in DX-type equipment



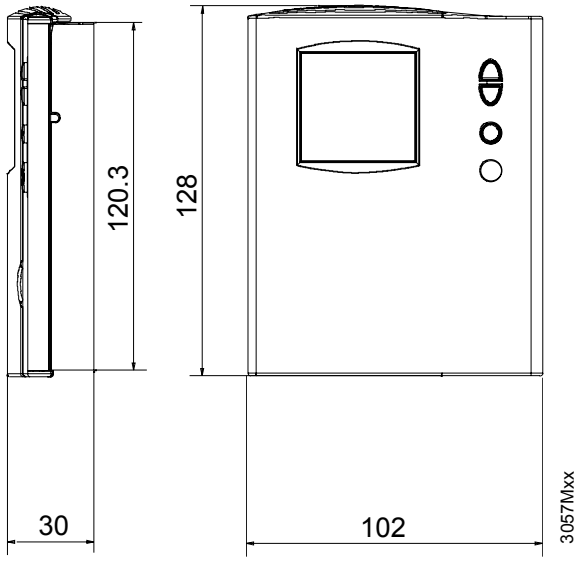
B1***** Return air temperature sensor (QAH11.1) or external room temperature sensor (QAA32)
B2***** Changeover sensor (temperature sensor QAH11.1 + changeover mounting kit ARG86.3)
M1 3-speed fan
N1 Room temperature controller RDF110..
S1***** External operating mode changeover switch
C1 Compressor

*** Only with RDF110 or RDF110/IR**

Note: For compressor application RDF110 or RDF110/IR is recommended

Dimensions

Controller



Mounting base