

## Room Temperature Controller with LCD

## RDF30

for 4-pipe fan coil units

for compressors in DX type equipment with reversing valve

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**Outputs for on / off valve actuators**

**Outputs for 2-stage compressor with reversing valve**

**Outputs for a 3-speed fan**

**Control depending on the room or the return air temperature**

**Operating modes: Normal, Economy and Standby**

**Operating mode changeover input for remote control**

**Function for avoiding damage resulting from moisture**

**Selectable installation and control parameters**

**Display of room temperature or setpoint selectable**

**Minimum and maximum setpoint limitation**

**Operating voltage AC 230 V**

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### Use

Typical use:

- For control of the room temperature in individual rooms that are heated or cooled with 4-pipe fan coil units
- For the control of rooms that are cooled with DX type equipment and reversing valve
- For opening or closing a valve
- For switching a 3-speed fan

The controller acquires the room temperature via its integrated sensor or external room temperature sensor QAA32 or, if used, via an external return air temperature sensor QAH11.1 and maintains the setpoint by delivering 2-position valve control or compressor output commands.

The switching differential is 2 K in heating mode and 1 K in cooling mode (adjustable parameters).

**Fan operation**

The fan is switched to the selected speed via control output Q1, Q2 or Q3.

When function "Temperature-dependent fan control" is activated (can be selected with DIP switch no.1), the fan is switched on / off depending on the temperature, that is, together with the valve or compressor.

It is switched off when

- leaving the heating or cooling sequence, provided function "Temperature-dependent fan control " is activated
- manually changing to Standby "U", provided no setpoints (e.g. for frost protection) have been adjusted and are active
- activating an external operating mode changeover switch, provided plant conditions do not call for Economy mode
- turning off the controller's power supply

**Water-based fan coil application (heating mode)**

ON

When used in connection with 4-pipe fan coils, set DIP switch no. 4 to **ON**.

Used in conjunction with 2 valves, for heating and cooling operation.

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

1. the acquired room temperature lies by half the switching differential below the setpoint, and
2. the heating valve has been fully closed for more than 1 minute (parameter P20).

OFF

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

1. the acquired room temperature lies by half the switching differential above the setpoint, and
2. the heating valve has been fully open for more than 1 minute (parameter P19).

**Water-based fan coil application (cooling mode)**

ON

The cooling valve receives the **OPEN** command via control output Y21 when

1. the acquired room temperature lies by half the switching differential plus the dead zone1 (P12) above the setpoint ( $x \geq w + Xdz + \frac{1}{2} SDC$ ), and
2. the cooling valve has been closed for more than 1 minute (parameter P20).

OFF

The cooling valve receives the **CLOSE** command via control output Y21 when

1. the acquired room temperature lies by half the switching differential plus the dead zone1 (P12) below the setpoint ( $x < w + Xdz - \frac{1}{2} SDC$ )
2. the cooling valve has been open for more than 1 minute (parameter P19).

**Compressor-based 2-stage cooling application (1st stage)**

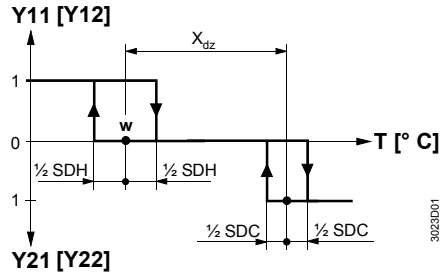
ON

When using 2-stage cooling, set DIP switch no. 4 to **OFF**.

Compressor **C1** receives the **ON** command via control output Y11 when

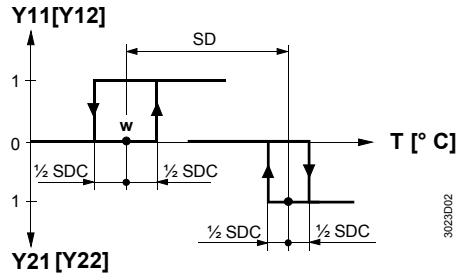
	<ol style="list-style-type: none"> <li>1. the acquired room temperature lies by half the switching differential above the set point, and</li> <li>2. compressor <b>C1</b> has been <b>OFF</b> for more than 1 minute (parameter P20).</li> </ol>
OFF	<p>Compressor <b>C1</b> receives the <b>OFF</b> command via control output Y11 when</p> <ol style="list-style-type: none"> <li>1. the acquired room temperature lies by half the switching differential below the set point, and</li> <li>2. compressor <b>C1</b> has been <b>ON</b> for more than 1 minute (parameter P19).</li> </ol>
<b>Compressor-based 2-stage cooling application (2nd stage)</b>	
ON	<p>Compressor <b>C2</b> receives the <b>ON</b> command via control output Y21 when</p> <ol style="list-style-type: none"> <li>1. the acquired room temperature lies by half the switching differential plus the setpoint differential (P18) above the setpoint (<math>x \geq w + SD + \frac{1}{2} SDC</math>), and</li> <li>2. compressor <b>C2</b> has been <b>OFF</b> for more than 1 minute (parameter P20).</li> </ol>
OFF	<p>Compressor <b>C2</b> receives the <b>OFF</b> command via control output Y21 when</p> <ol style="list-style-type: none"> <li>1. the acquired room temperature lies by half the switching differential plus the setpoint differential (P18) below the setpoint (<math>x &lt; w + SD - \frac{1}{2} SDC</math>)</li> <li>2. compressor <b>C2</b> has been <b>ON</b> for more than 1 minute (parameter P19).</li> </ol>
<b>Compressor-based application with reversing valve (heating mode)</b>	
ON	<p>When using heating and cooling DX with a reversing valve, set DIP switch no. 4 to <b>ON</b> and connect outputs Y11 and Y21 to control the compressor.</p> <p>Compressor <b>C1</b> receives the <b>ON</b> command via control output Y11 when</p> <ol style="list-style-type: none"> <li>1. the measured room temperature lies by half the switching differential below the setpoint, and</li> <li>2. compressor <b>C1</b> has been <b>OFF</b> for more than 1 minute (parameter P20).</li> </ol>
OFF	<p>Compressor <b>C1</b> receives the <b>OFF</b> command via control output Y11 when</p> <ol style="list-style-type: none"> <li>1. the acquired room temperature lies by half the switching differential above the set point, and</li> <li>2. compressor <b>C1</b> has been <b>ON</b> for more than 1 minute (parameter P19).</li> </ol>
<b>Compressor-based application with reversing valve (cooling mode)</b>	
ON	<p>Compressor <b>C1</b> receives the <b>ON</b> command via control output Y21 when</p> <ol style="list-style-type: none"> <li>1. the acquired room temperature lies by half the switching differential plus the dead zone (P12) above the setpoint (<math>x \geq w + Xdz + \frac{1}{2} SDC</math>), and</li> <li>2. compressor <b>C1</b> has been <b>OFF</b> for more than 1 minute (parameter P20).</li> </ol>
OFF	<p>Compressor <b>C1</b> receives the <b>OFF</b> command via control output Y21 when</p> <ol style="list-style-type: none"> <li>1. the acquired room temperature lies by half the switching differential plus the dead zone (P12) below the setpoint (<math>x &lt; w + Xdz - \frac{1}{2} SDC</math>)</li> <li>3. compressor <b>C1</b> has been <b>ON</b> for more than 1 minute (parameter P19).</li> </ol>

### Water-based fan coil heating and cooling mode



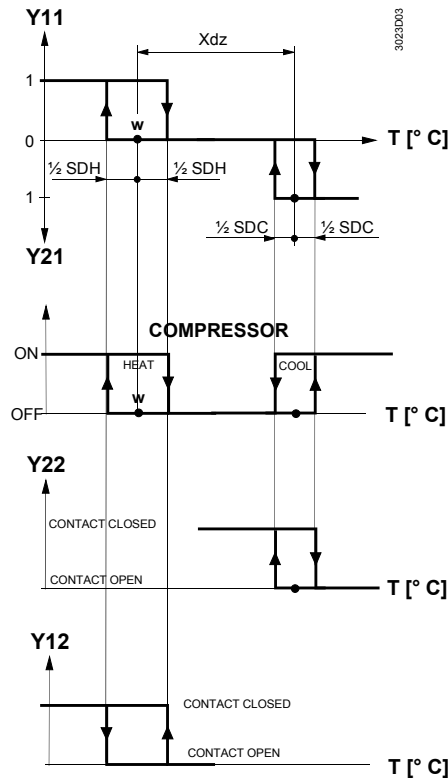
T	Room temperature
SDH	Switching differential "Heating"
SDC	Switching differential "Cooling"
Xdz	Dead zone
w	Room temperature setpoint
Y11	Manipulated variable "Heating valve"
Y12	Reverse of Y11
Y21	Manipulated variable "Cooling valve"
Y22	Reverse of Y21

### Compressor-based 2-stage cooling



T	Room temperature
SDC	Switching differential "Cooling"
SD	Setpoint differential
w	Room temperature setpoint
Y11	Manipulated variable "Compressor stage 1"
Y12	Reverse of Y11
Y21	Manipulated variable "Compressor stage 2"
Y22	Reverse of Y21

### Compressor-based 1-stage heating and 1-stage cooling with reversing valve



T	Room temperature
SDH	Switching differential "Heating"
SDC	Switching differential "Cooling"
Xdz	Dead zone
w	Room temperature setpoint
Y11	Manipulated variable "Compressor Heating stage"
Y12	Reversing valve output "Heating"
Y21	Manipulated variable "Compressor Cooling stage"
Y22	Reversing valve output "Cooling"

### Return air temperature (optional)

The RDF30 provides control either depending on the acquired room temperature or depending on the fan coil unit's return air temperature. Changeover is automatic if a QAH11.1 cable temperature sensor is connected.

## Operating modes

The following operating modes are available:

- Normal mode** Heating or cooling mode with automatic changeover and with manually selected fan speed III, II or I. In Normal mode, the controller maintains the adjusted setpoint in heating mode and, in cooling mode, a temperature level represented by the setpoint plus the dead zone.
- Economy mode** A changeover switch can be connected to status input D1-GND. When the switch closes (due to an open window, for instance), the operating mode will change from Normal to Economy. In this operating mode, the relevant setpoints of heating or cooling are maintained (control parameters P01 and P02). The operating action of the switch (NC or NO) can be selected.
- Standby** The relevant setpoints of heating and cooling are maintained when in Standby “⏻”, provided such setpoints have been adjusted (control parameters P03 and P04).
- Avoiding damage due to moisture(optional)** To avoid damage due to moisture in very warm and humid climatic zones resulting from lack of air circulation in energy saving mode (e.g. in hotel rooms during unoccupied periods), the fan can be kept running in Economy mode when activating parameter P17. In this case, the fan keeps running at the selected speed or at speed 1 if the operating mode selector is in Standby “⏻” .

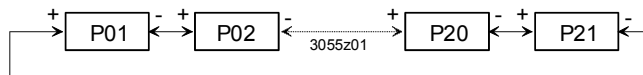
## Setting the control parameters

A number of control parameters can be set to optimize the control performance. These parameters can also be set during operation without opening the unit. In the event of a power failure, all control parameters set will be maintained.

### Settings

The parameters can be changed as follows:

1. Set the operating mode selector to 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 + and –.
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 Normal mode.

### Control parameters

Parameter	Meaning	Setting range	Factory setting
P01	Setpoint of heating in Economy mode (operating mode changeover contact activated)	OFF, 5...20 °C (in increments of 0.5 K)	16 °C
P02	Setpoint of cooling in Economy mode (operating mode changeover contact activated)	OFF, 21...35 °C (in increments of 0.5 K)	28 °C
P03	Setpoint of heating in Standby “⏻”	OFF, 5...20 °C (in increments of 0.5 K)	8 °C
P04	Setpoint of cooling in Standby “⏻”	OFF, 21...35 °C (in increments of 0.5 K)	OFF
P05	Minimum setpoint limitation in Normal mode	5...20 °C (in increments of 0.5 K)	5 °C

P06	Maximum setpoint limitation in Normal mode	21...35 °C (in increments of 0.5 K)	35 °C
P07	Heating / cooling changeover switching point cooling	(No setting and no display)	16 °C
P08	Heating / cooling changeover switching point heating	(No setting and no display)	28 °C
P09	Sensor calibration	-3...+3 °C (in increments of 0.5 K)	0 K
P10	P-band in heating mode or switching differential heating	0.5...+4 K (in increments of 0.5 K)	2 K
P11	P-band in cooling mode or switching differential cooling	0.5...+4 K (in increments of 0.5 K)	1 K
P12	Dead zone in Normal mode	0.5...5 K (in increments of 0.5 K)	2 K
P13	Active temperature sensor (no setting, display only)	1: Room temperature sensor active 2: Return air temperature sensor active	-
P14	Value of current room temperature reading (no setting, display only)	0...49 °C = current temperature value	-
P17	Fan control in Economy mode OFF: Fan is off in the dead zone / ON: Fan is on in the dead zone	ON: Running at the selected speed or at speed 1 if in Standby "⏻"	OFF
P18	Setpoint differential	0.5...5 K (in increments of 0.5 K)	2 K
P19	Minimum output on time (Y11, Y21)	1...20 minutes (in increments of 1 min.)	1 min.
P20	Minimum output off time (Y11, Y21)	1...20 minutes (in increments of 1 min.)	1 min.
P21	Fan overrun	0...300 seconds (in increments of 10 s)	0 s

## Ordering

When ordering, please give name and type reference.

The QAH11.1 temperature sensor (used as a return air temperature sensor) and zone valves are to be ordered as separate items.

## Equipment combinations

Type of unit	Type reference	Data Sheet
Cable temperature sensor	<b>QAH11.1</b>	1840
Room sensor	<b>QAA32</b>	1747
Electromotoric on/off valve and actuator	<b>MVI.../MXI...</b>	4867
Electromotoric on / off actuator	<b>SFA21...</b>	4863
Thermal actuator (for radiator valve)	<b>STA21...</b>	4893
Thermal actuator (for small valves 2.5 mm)	<b>STP21...</b>	4878
Zone valve actuator	<b>SUA...</b>	4830

## Mechanical design

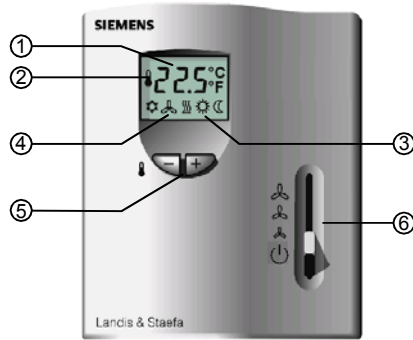
The unit consists of 2 parts:

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







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

The base carries the screw terminals. The DIP switches are located at the rear of the housing.

## 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  Normal mode  
 Economy mode
- 4  Cooling valve open  
 Fan on  
 Heating valve open
- 5 Buttons for adjusting the setpoints and the control parameters
- 6 Operating mode selector  
(Standby "U", heating or cooling mode with manual selection of the fan speed)

### Set of DIP switches

DIP switch no.	Meaning	Position ON (factory setting)	Position OFF
1	Fan control	Fan control is temperature-independent in Normal mode	Fan control in is temperature-dependent in all operating modes
2	Display of temperature or setpoint	Room (return air) temperature display	Setpoint display
3	Operating action of switch for external operating mode changeover	Changeover activated when switch is closed (N.O.)	Changeover activated when switch is open (N.C.)
4	Output sequence	Heating and cooling (4-pipe)	2-stage cooling

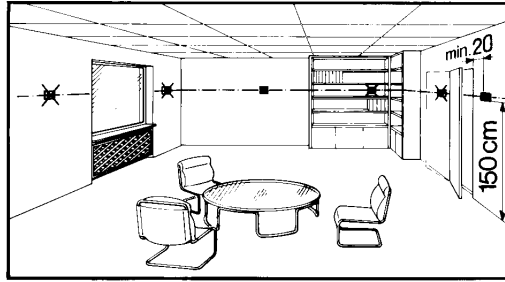
### Accessories

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

### Engineering notes

#### Mounting, installation and commissioning notes

Mounting location: On the wall or inside the fan coil unit. Not 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 connecting wires can be run to the controller from a recessed conduit box.



Check the settings of the DIP switches and change them, if required.

After applying power, the controller makes a reset during which the fan LCD segments flash, indicating that the reset has been correctly made. This takes about 3 seconds.

Then, the controller is ready to operate.



- The cables used must satisfy the insulation requirements with regard to mains potential



- Sensor input B1-M carries mains potential. If the sensor's cables must be extended, the cables used must be suited for mains voltage



The controller is supplied with Mounting Instructions.

### Calibrating the sensor

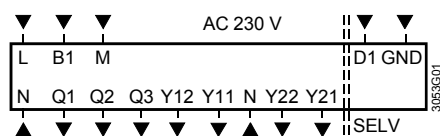
If the room temperature displayed by the controller is inconsistent with the room temperature effectively measured, the temperature sensor can be recalibrated. In that case, parameter P09 must be changed.

### Technical data

⚠ Power supply	Operating voltage	AC 230 V + 10/-15 %
	Frequency	50/60 Hz
	Power consumption	max. 6 VA
	Control outputs Q1, Q2, Q3-N	AC 230 V
	Rating	max. 5(3)A
	Control outputs Y11, Y21-N (NO) Y12, Y22-N (NC)	AC 230 V max. 5(3)A
	Return air temperature sensor – status input B1-M	QAH11.1, safety class II NTC resistor 3 kΩ at 25 °C
	Status input D1 and GND	
	Operating action selectable	normally open (NO) normally closed (NC)
	Contact sensing	SELV DC 6...15 V / 3...6 mA
Insulation against mains	4 kV, reinforced insulation	
Operational data	Perm. cable length with copper cable 1.5 mm <sup>2</sup> for connection to terminals B1, B2 and D1	80 m
	Setpoint setting range	5...35 °C
	Control deviation at 25 °C	max. ±0.5 K
	Switching differential in heating mode (adjustable)	2 K
	Switching differential in cooling mode (adjustable)	1 K
	Dead zone $X_{dz}$ in Normal mode (adjustable)	2 K
	Setpoint «Economy mode (C)», heating (adjustable)	16 °C
	Setpoint «Economy (C)», cooling (adjustable)	28 °C
	Setpoint «Standby (U)», heating (adjustable)	8 °C
	Setpoint «Standby (U)», cooling (adjustable)	OFF
Environmental conditions	Operation	to IEC 721-3-3
	Climatic conditions	class 3 K5
	Temperature	0...+50 °C
	Humidity	<95 % r.h.

Norms and standards	Transport	to IEC 721-3-2
	Climatic conditions	class 2 K3
	Temperature	-25...+70 °C
	Humidity	<95 % r.h.
	Mechanical conditions	class 2M2
	Storage	to IEC 721-3-1
	Climatic conditions	class 1K3
	Temperature	-25...+70 °C
	Humidity	<95 % r.h.
	 conformity to EMC directive Low voltage directive	89/336/EEC 73/23/EEC
 N474 <b>C-Tick</b> 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	EN 50 081-1
	Immunity	EN 50 082-1
	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 <sup>2</sup> or 1 x 2.5 mm <sup>2</sup>
Weight	0.23 kg	
Colour of housing front	white, NCS S 0502-G (RAL 9003)	

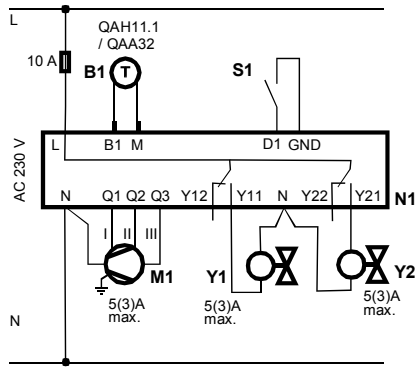
## Connection terminals



L, N	Operating voltage AC 230 V	Q1	Control output "Fan speed I" AC 230 V
B1	Status input «Return air temperature sensor or external room temperature sensor QAA32»	Q2	Control output "Fan speed II" AC 230 V
M	Measuring neutral «Return air temperature sensor or external room temperature sensor QAA32»	Q3	Control output "Fan speed III" AC 230 V
D1, GND	Status input for potential-free operating mode changeover switch (operating action can be selected)	Y11	Control output "Heating valve" AC 230 V (N.O. contact) or output for compressor (N.C. contact) or reversing valve output
		Y12	Control output "Heating" AC 230V (N.C. contact) or reversing valve output
		Y21	Control output "Cooling valve" AC 230 V (N.O. contact) or output for compressor (N.C. contact) or reversing valve output
		Y22	Control output "Cooling" AC 230V (N.C. contact) or reversing valve output

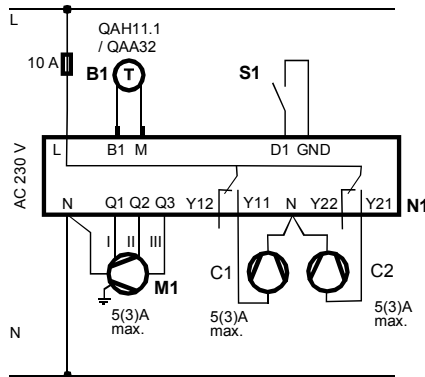
## Connection diagram

Application:  
4-pipe fan coil units



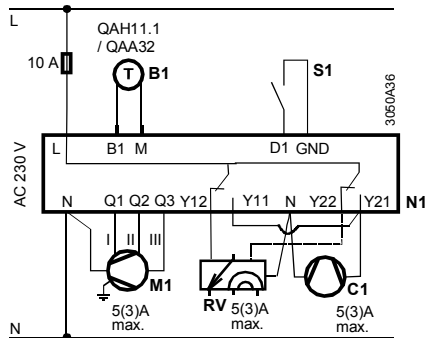
- B1 Return air temperature sensor (QAH11.1) or external room temperature sensor (QAA32)
- M1 3-speed fan
- N1 Room temperature controller RDF30
- S1 External operating mode changeover switch
- Y1 Zone valve for heating mode
- Y2 Zone valve for cooling mode

Application:  
2-stage cooling compressors in DX type equipment



- B1 Return air temperature sensor (QAH11.1) or external room temperature sensor (QAA32)
- M1 3-speed fan
- N1 Room temperature controller RDF30
- S1 External operating mode changeover switch
- C1 Compressor
- C2 Compressor

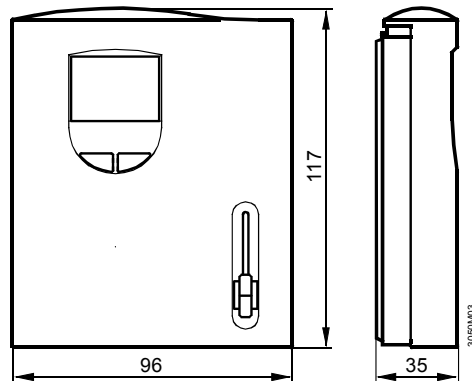
Application:  
Compressors in DX-type equipment with reversing valve



- B1 Return air temperature sensor (QAH11.1) or external room temperature sensor (QAA32)
- M1 3-speed fan
- N1 Room temperature controller RDF30
- S1 External operating mode changeover switch
- C1 Compressor
- RV Reversing valve

## Dimensions

### Controller



### Base

