

# OPTIMA-RES-A

## Residential VAV System Box

### Data Sheet



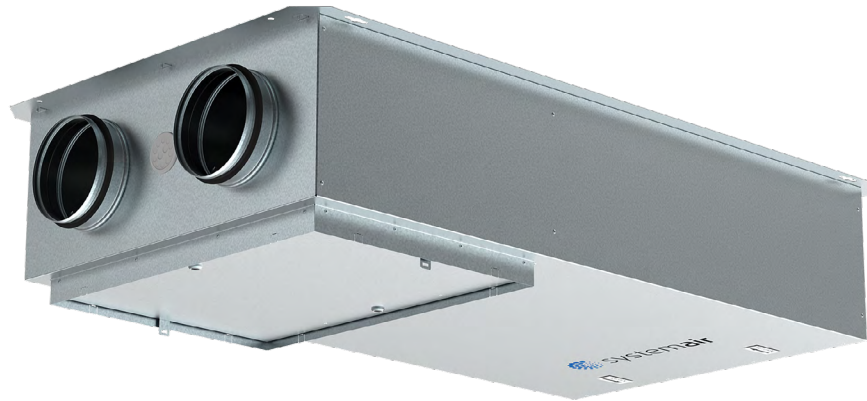
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## Description

OPTIMA-RES-A is a compact system of supply and extract VAV controllers intended for ventilation control of residential premises. The basic functionality is continuous supply and extract air flow volume control in master/slave operation mode. Additionally, it can be switched into override operation modes like open or close damper, or minimum or maximum air flow volume control.

### Highlights

- Complete VAV supply and extract master/slave solution
- AC 230 V power supply
- Electrical safety elements and connection terminals on board
- Noise attenuators included
- Fit for installation on surface or into gypsum walls or ceilings
- VAV controllers can be easily detached and mounted in other supply/extract configuration

### List of Accessories

Detailed information about accessories for OPTIMA-RES-A is available [↗](#) on page 5.

- RC-C3DOC: Room Controller
- MZ3-Touch: Ventilation Control Panel
- EC-Basic – CO<sub>2</sub> + Temperature Room Controller
- CO2RT: CO<sub>2</sub> Room Transmitter
- ZTH-EU: Service Tool for VAV Controllers

## Design

The system of OPTIMA-RES-A system is encased in a galvanised steel box. The system consists of:

- One supply and one extract variable OPTIMA-R air flow controller in a circular galvanised steel body
- Electric part with power supply and control circuitry
- Acoustic attenuation

The VAV controllers are mounted to the circular duct connections by sleeves, so the VAV controllers are easily removable. The system box is equipped with cable pass diaphragms for cables related to power supply, setpoint control signal, feed-back signal and override signal. These cables shall be connected by a service person on site. The corresponding terminals are available according to the wiring diagram.



# Controls

The residential VAV system is equipped with BLC4 type compact controllers in the master/slave connection. The controllers use analog input for the setpoint signal and analog output for the feedback signal. The type of the signals is DC 0 V ... 10 V. The VAV controllers are factory calibrated as standard to the air volume indicated in the table below or, upon request, they can be adjusted to site required settings of the  $V_{\min}/V_{\max}$  range. The air volumes can also be readjusted on site with the ZTH-EU hand held service tool. If specific air volumes for  $V_{\min}$  and  $V_{\max}$  would be required, they must be indicated in the ordering code or noted in the order for adequate calibration in the factory.

## Factory Settings

Size	$V_{\min}$ @ 2 m/s		$V_{\max}$ @ 9 m/s		$V_{\text{nom}}$ @ 11 m/s	
(mm)	(m <sup>3</sup> /h)	(l/s)	(m <sup>3</sup> /h)	(l/s)	(m <sup>3</sup> /h)	(l/s)
100	57	16	254	71	311	86
125	88	24	398	111	486	135
160	145	40	651	181	796	221

## Basic Functional Characteristics

Controller type: OPTIMA-RES-A-...BLC4

## Basic Parameters and Features

Flow volume adjustment setpoint signal:

Analog input DC 0 V ... 10 V. The Systemair MZ3-Touch room control device is primarily foreseen to be connected to the analog input. It can operate in automatic mode, continuously controlling the air flow volume dependent from temperature, VOC or CO<sub>2</sub> concentration. If switched to manual mode, the air flow setpoint can be adjusted manually in four discrete steps between the preset  $V_{\min}$  and  $V_{\max}$  of OPTIMA-RES-A.

Other control devices with 0 V ... 10 V control output can also be used, e.g. Systemair RC-C3DOC.

Controller parameters setup tools: Belimo ZTH-EU

Feedback signal (actual air flow volume): Analog output DC 0 V ... 10 V

Power supply (each VAV controller, secured by transformer on board):

AC 24 V/50 Hz	DC 24 V
4 VA	2 W

Power supply (whole system): AC 230 V/50 Hz

Protection class (closed system box): IP40

## Master/Slave Configuration

The VAV system is configured as master/slave. The supply air VAV controller (the master) reads the flow volume setpoint from an external source like e.g. a room controller or manual setpoint dial. The control range ( $V_{\min}$ ,  $V_{\max}$ ) of the master VAV controller can be adjusted at the factory or on site with the ZTH-EU configuration tool. The feedback signal from master VAV represents the actual measured air flow volume. This signal is connected to the extract air VAV controller (the slave) as the setpoint for the air flow volume. So the air flow volumes of supply and extract air are always equal with high reliability.

### Master (Supply Air) VAV Controller Setup

$V_{\min}$  adjustable between 0 and  $V_{\text{nom}}$

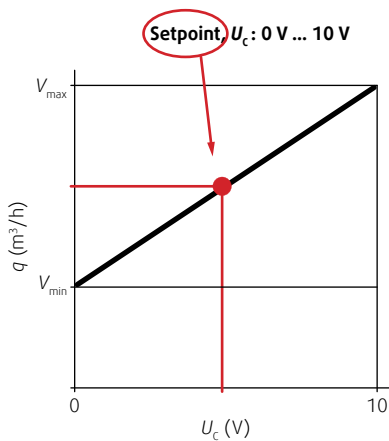
$V_{\max}$  adjustable between  $V_{\min}$  and  $V_{\text{nom}}$ . Lowest possible adjustment is 20% of  $V_{\text{nom}}$ .

### Slave (Extract Air) VAV Controller Setup

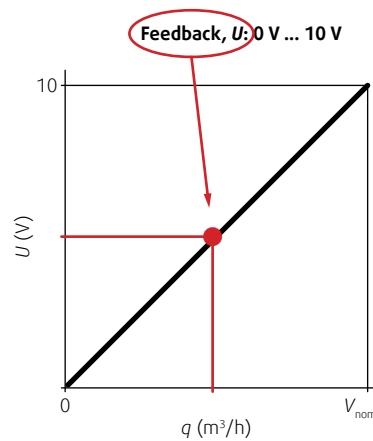
$V_{\min}$  adjusted to 0, shall not be changed.

$V_{\max}$  adjusted equal  $V_{\text{nom}}$ , shall not be changed.

### Setpoint/Feedback Signal and Air Flow Volume Calculation for VAV Controller



$$U_c (V) = \frac{q - V_{\min}}{V_{\max} - V_{\min}} \cdot 10$$



$$q = \frac{U (V)}{10} \cdot V_{\text{nom}}$$

$U_c$ : Air flow volume setpoint signal value (range DC 0 V ... 10 V)

$q$ : Air flow volume

$V_{\min}$ : Minimum adjusted air flow volume (lower limit of control range)

$V_{\max}$ : Maximum adjusted air flow volume (upper limit of control range)

$U$ : Measured air flow volume feedback signal value (range DC 0 ... 10 V)

$V_{\text{nom}}$ : Nominal air flow volume calibrated in factory – not adjustable.

# Dimensions

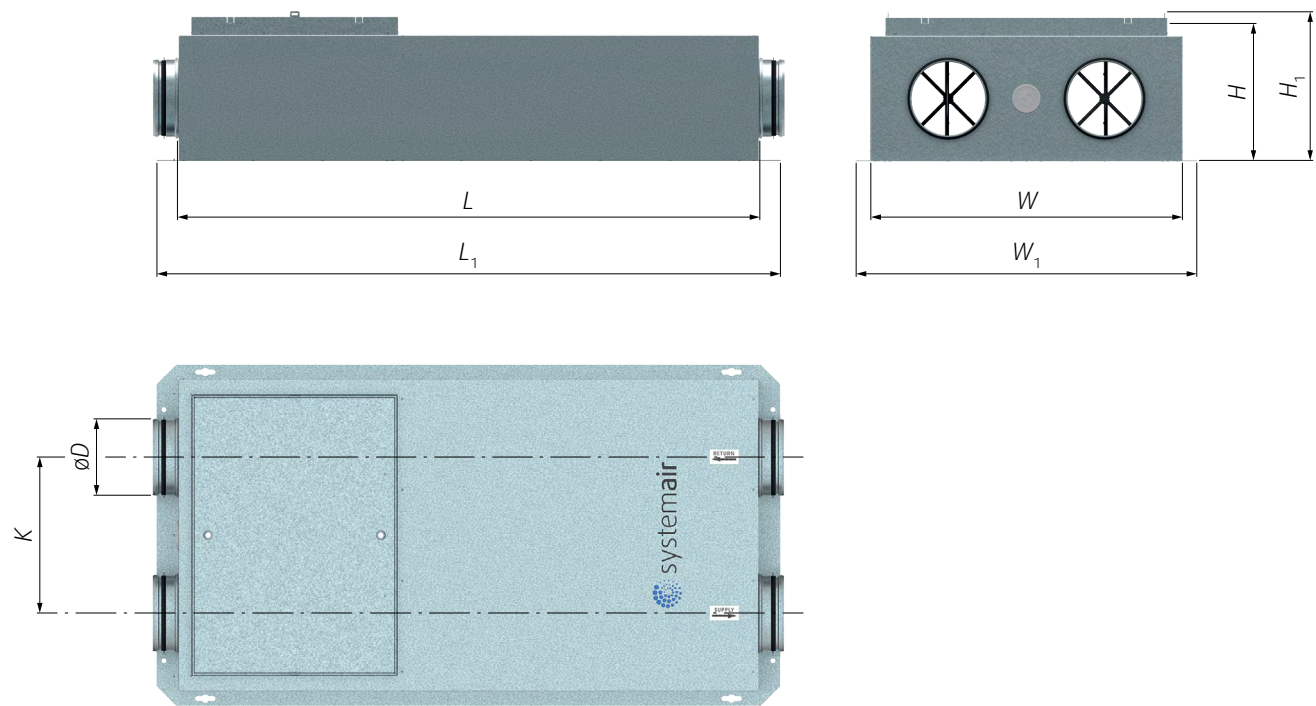
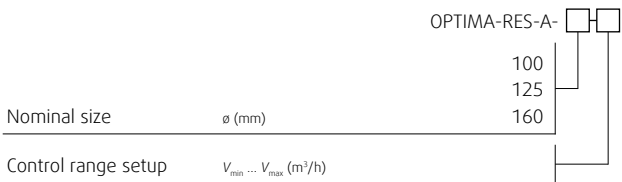


Fig. 1: Dimensions of the OPTIMA-RES-A

Tab. 1: Dimensions of the OPTIMA-RES-A

DN	$\varnothing D$	K	W	W <sub>1</sub>	H	H <sub>1</sub>	L	L <sub>1</sub>	m	v
(mm)									(kg)	(l)
100	98	250	495	555	200	225	1080	1170	25	147
125	123	280	550	610	235	260	1180	1270	29	202
160	157,5	320	640	700	282	306	1190	1280	35	275

# Ordering Code



## Example of the Ordering Code

OPTIMA-RES-A-125-130-310

Residential VAV control system of size 125, control range 130 m³/h ( $V_{min}$ ) up to 310 m³/h ( $V_{max}$ )

# Accessories

## RC-C3DOC

Room Controller



Art. No.: 27142

Complete pre-programmed room controller intended to control heating, cooling, CO<sub>2</sub> and other physical parameters in a zone control system.

## MZ3-Touch

Ventilation Control Panel



Art. No.: 92690

- Positioner and controller for comfort ventilation with a touch panel.
- Design according to Feller EDIZIOdue®.
- Manual operation with 4 steps.
- AUTO operation: The controller activates the ventilation based on controls curve.
- Automatic reset of the party air level.
- One DC 0 V ... 10 V controls output to control the ventilation system. One DC 0 V ... 10 V input to measure CO<sub>2</sub> or other sensors.

### EC-Basic – CO<sub>2</sub> + Temperature Room Controller



Art.No. 24808

- For simultaneous control of the room temperature and the CO<sub>2</sub> concentration (on-board sensors) based on priority of the value with the higher control difference.
- Pre-adjustable heating or cooling control loop.
- One DC 0 V ... 10 V VAV control output.

### CO<sub>2</sub>RT

CO<sub>2</sub> Room Transmitter



Art. No.: 13704, 14357

Room sensor for measuring carbon dioxide concentration in indoor environments.

### ZTH-EU

Service Tool for VAV Controllers



Art. No.: 27655

Configuration and setup tool for VAV controllers.



# Technical Parameters

## Discharged Sound Power Level

### Legend

$p_s$	Pa	Pressure drop
$q_v$	m <sup>3</sup> /h l/s	Air flow volume
$L_{WA}$	dB(A)	A-weighted total discharged sound power level
$L_w$	dB	Non-weighted total discharged sound power level

OPTIMA-RES-A-100											
Air Flow	$p_s$	$L_{WA}$	$L_w$	Non-Weighted Sound Power Level							
m <sup>3</sup> /h	Pa	dB	dB(A)	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
57 $V_{min}$ @ 2 m/s *	100	28	<b>42</b>	34	41	20	19	20	9	-8	2
	250	32	<b>42</b>	33	41	26	27	28	18	5	15
	500	37	<b>43</b>	33	41	30	33	35	26	15	25
	750	41	<b>45</b>	33	41	33	36	38	30	21	30
	1000	43	<b>46</b>	33	41	35	39	41	33	25	34
155	100	28	<b>34</b>	15	32	19	23	25	18	<5	10
	250	37	<b>40</b>	18	36	28	33	36	27	13	21
	500	45	<b>47</b>	20	39	34	40	43	34	21	30
	750	49	<b>51</b>	21	41	38	44	48	38	26	35
	1000	52	<b>54</b>	22	42	41	48	51	41	29	39
254 $V_{max}$ @ 9 m/s *	100	31	<b>34</b>	12	30	19	26	29	23	9	19
	250	42	<b>44</b>	18	38	30	37	40	32	18	28
	500	50	<b>52</b>	23	44	38	46	48	39	25	35
	750	55	<b>56</b>	26	48	43	51	53	43	29	39
	1000	58	<b>60</b>	28	50	47	54	56	46	32	42

NOTE:

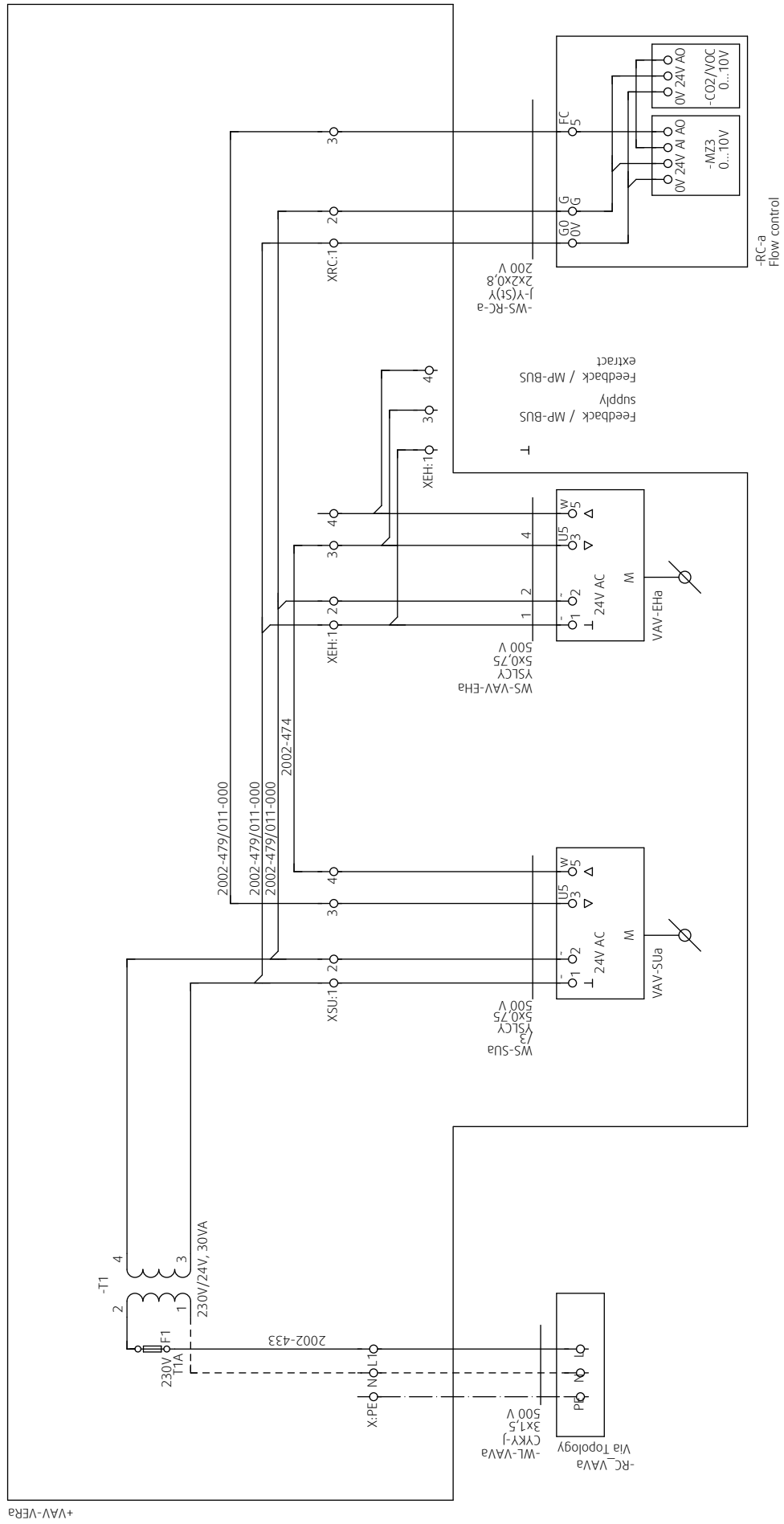
\* Standard factory air volume setting, if not indicated differently upon order.

The  $V_{min}$  can be adjusted from 0 m<sup>3</sup>/h to  $V_{max}$  value from from the table above.

The  $V_{max}$  can be adjusted from 20% to 100% of the  $V_{max}$  value from the table above.

OPTIMA-RES-A-125											
Air Flow	$p_s$	$L_{WA}$	$L_W$	Non-Weighted Sound Power Level							
m <sup>3</sup> /h	Pa	dB	dB(A)	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
88 $V_{min}$ @ 2 m/s *	100	27	<b>42</b>	34	41	20	21	19	9	-7	2
	250	32	<b>43</b>	36	42	26	29	27	19	5	15
	500	37	<b>45</b>	38	43	31	35	33	26	14	25
	750	41	<b>47</b>	39	43	34	38	37	31	20	31
	1000	43	<b>48</b>	40	44	36	41	39	34	24	35
243	100	26	<b>36</b>	18	35	20	22	23	14	<5	<5
	250	36	<b>41</b>	20	38	29	33	34	25	11	19
	500	44	<b>47</b>	22	40	36	41	42	34	20	29
	750	49	<b>51</b>	22	42	40	46	47	39	26	35
	1000	53	<b>54</b>	23	43	43	49	50	43	29	39
398 $V_{max}$ @ 9 m/s *	100	30	<b>38</b>	20	37	23	25	28	18	5	13
	250	41	<b>46</b>	24	43	33	37	39	29	16	24
	500	49	<b>53</b>	27	48	41	47	47	38	24	32
	750	55	<b>57</b>	29	50	46	52	52	43	28	37
	1000	58	<b>60</b>	30	52	49	56	56	46	32	41




OPTIMA-RES-A-160											
Air Flow	$p_s$	$L_{WA}$	$L_W$	Non-Weighted Sound Power Level							
m <sup>3</sup> /h	Pa	dB	dB(A)	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
145 $V_{min}$ @ 2 m/s *	100	31	<b>47</b>	40	46	24	25	22	11	-5	4
	250	37	<b>49</b>	39	48	31	33	32	23	8	18
	500	43	<b>51</b>	39	50	37	39	40	33	18	29
	750	47	<b>53</b>	39	51	40	43	44	38	24	35
	1000	50	<b>55</b>	38	52	42	46	48	42	28	39
398	100	30	<b>38</b>	25	36	22	25	27	18	<5	10
	250	40	<b>44</b>	26	42	31	36	37	29	15	23
	500	47	<b>51</b>	27	46	39	43	45	38	23	32
	750	52	<b>54</b>	27	49	43	48	50	42	28	38
	1000	55	<b>57</b>	28	51	46	51	53	46	32	42
651 $V_{max}$ @ 9 m/s *	100	35	<b>40</b>	26	38	24	29	33	24	11	19
	250	44	<b>49</b>	29	47	35	39	42	33	20	29
	500	51	<b>56</b>	33	53	43	47	49	41	27	36
	750	55	<b>60</b>	35	57	47	52	53	45	31	40
	1000	58	<b>63</b>	36	60	51	55	56	48	34	44



# Solutions for Room Controls with VAV Ventilation Systems

The variable air flow controlled ventilation as a part of demand oriented control of room climate can be integrated in different ways according to various user requirements. The basic part of the climate control is the various room controllers. Each of them fits a different control solution at a corresponding cost level.

## Room Control Solutions, Quick Overview

	Room Controller		
			
Parameters, Functions	RC-C3D0C	MZ3-Touch	EC-Basic – CO <sub>2</sub> + Temperature Room Controller
Number of control loops	3	1	2
Value assignment to control loop	Freely adjustable	Fixed	Fixed
Control loop sequence	Freely adjustable	-	Fixed (simultaneous)
Analog outputs (control setpoints)	Heating valve, Cooling valve, VAV	VAV	VAV
Internal sensors (analog values)	1 × Temperature	-	1 × Temperature, 1 × CO <sub>2</sub>
External sensor analog inputs	1 × Pt1000, 1 × DC 0 V ... 10 V	1 × DC 0 V ... 10 V	-
Binary inputs	2 (configurable)	-	-
Controlled values for VAV	Temp. Heat/Temp. Cool, CO <sub>2</sub> , VOC, Humidity, Others	CO <sub>2</sub> , VOC	Temp. Cool, CO <sub>2</sub>
Measurement range of controlled values	Adjustable for CO <sub>2</sub> , Fixed for others	Fixed	Fixed
VAV control normal operation 0(2) V ... 10 V = V <sub>min</sub> ... V <sub>max</sub>	Yes	Yes	Yes
VAV control manual override modes available	Open/Close/V <sub>min</sub> /V <sub>max</sub> (by BMS)	V <sub>min</sub> , 40%, 60%, 100% (120 min) of V <sub>max</sub>	-
Bus communication protocols/ Physical media	Modbus RTU, BACnet MSTP/RS485	-	-

## MZ3-Touch

### Ventilation Control Panel

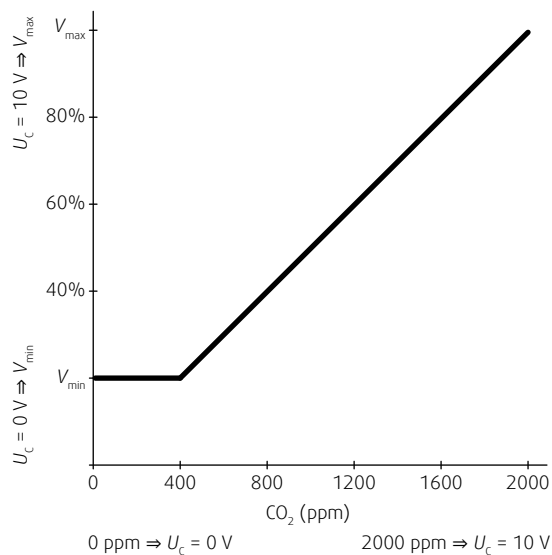


For VAV air flow control based on a single physical value like CO<sub>2</sub> or VOC concentration.

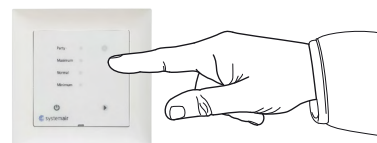
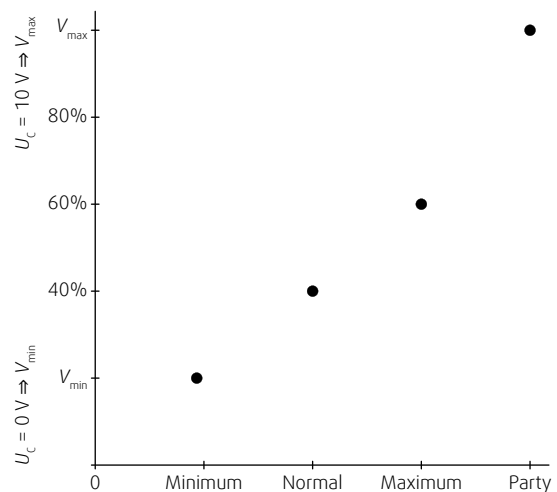
### Functions

The room controller can set the air flow volume on the VAV controller by the 0 V ... 10 V signal. The leading value for the control is the concentration of CO<sub>2</sub>, eventually VOC in the air. For the measurement of this value, a separate transmitter shall be used with a 0 V ... 10 V measurement signal. For CO<sub>2</sub>, it corresponds to 0 ppm ... 2000 ppm. This signal shall be connected to the analog input of the room controller. No setpoint or control parameter adjustments are possible. The operation modes can be adjusted on the room controller by touching the key on the cover plate.

In automatic mode, the CO<sub>2</sub> concentration influences the air flow setpoint for VAV.

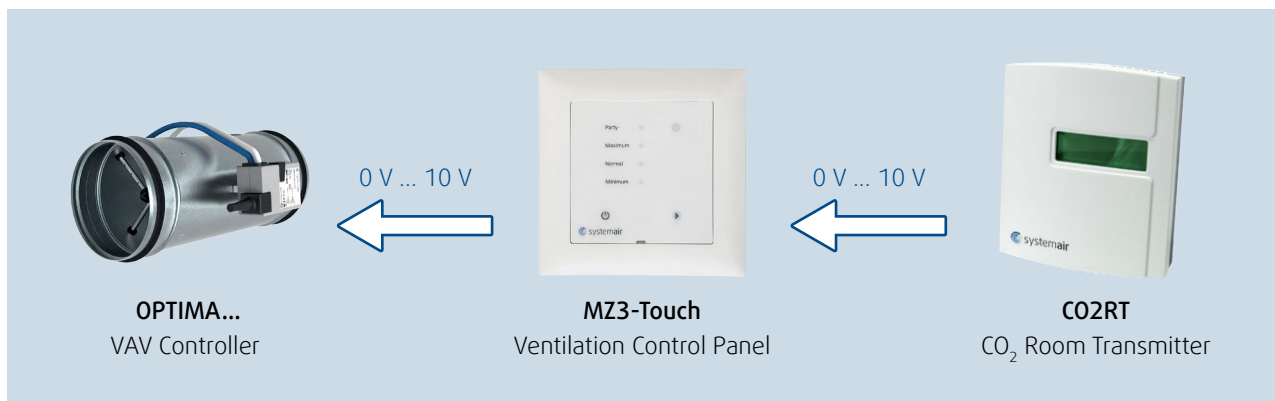


In manual mode, the chosen flow volume level influences the air flow set-point for VAV. The “party” position (V<sub>max</sub>) is temporary. After 120 minutes, the system changes the position to “Maximum” (60%).





## Topology



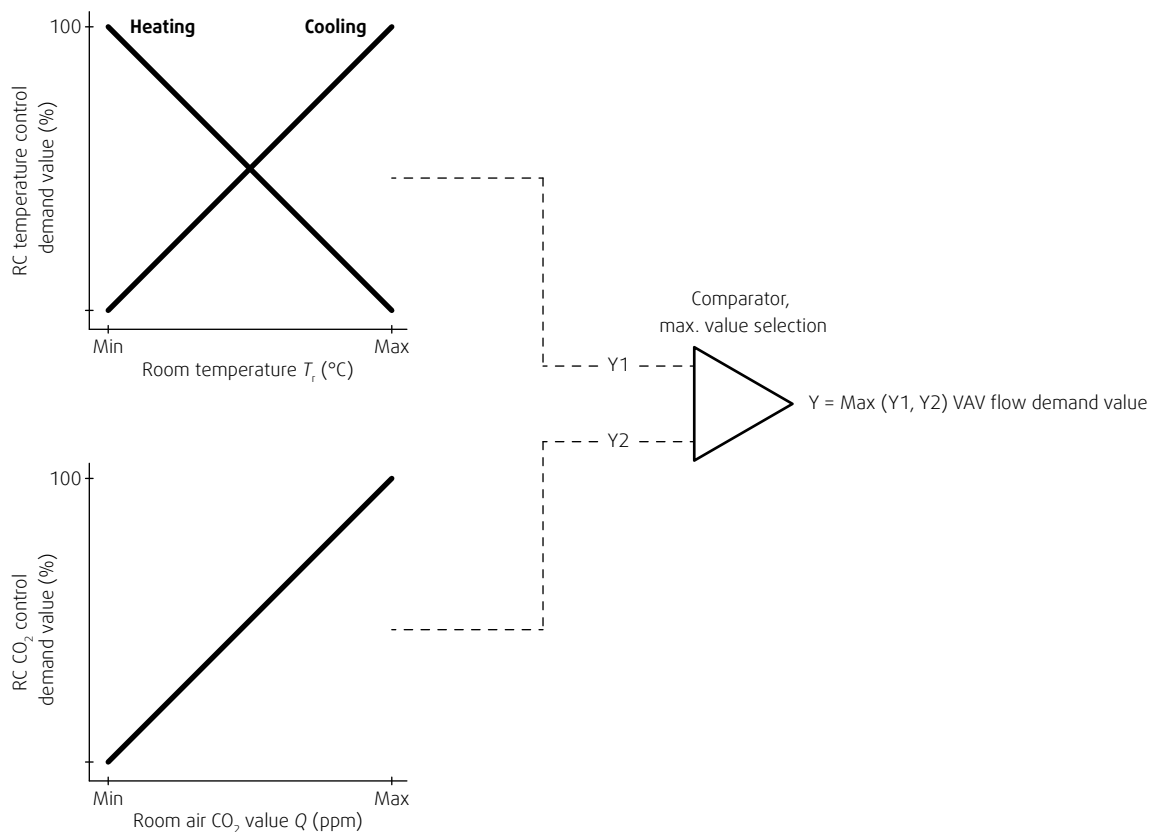
## EC-Basic – CO<sub>2</sub> + Temperature Room Controller



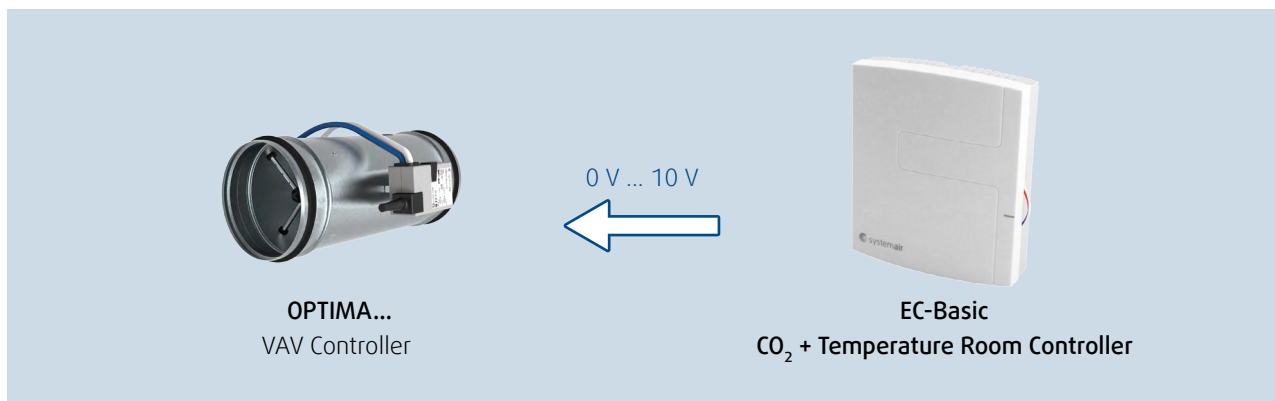
For VAV air flow control based on two physical values, temperature and CO<sub>2</sub> concentration simultaneously.

### Functions

The room controller can set the air flow volume on the VAV controller by the 0 V ... 10 V signal. The leading values for the control are the temperature (cooling mode or heating mode) and the concentration of CO<sub>2</sub> in the air. Both values are measured inside the room controller, no additional transmitters shall be connected. The temperature and the CO<sub>2</sub> level are measured and evaluated simultaneously. The one with the currently larger control difference is chosen as the actual control value for the VAV setpoint. The CO<sub>2</sub> control has no set-point or range to adjust. The temperature setpoint can be adjusted manually by a dial on the room controller. The cooling or the heating mode can be pre-adjusted by jumper switches.



## Topology



**RC-C3DOC**

## Room Controller



For VAV air flow control based on multiple physical values and control states in different configurable operation modes and sequences.

**Functions**

The room controller has the following main **control functions**:

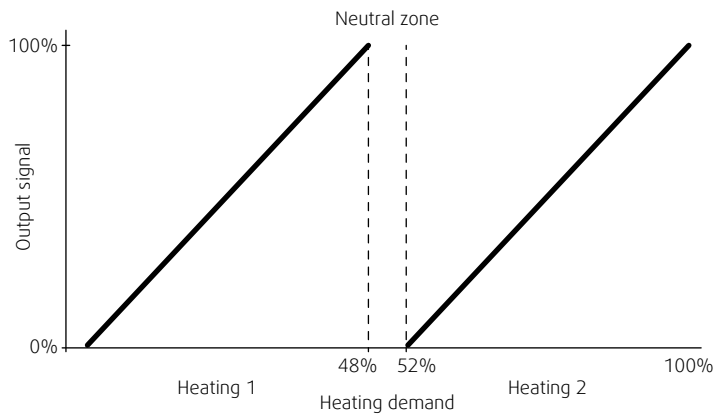
- Heating control, separate controls of the heating valve and VAV in heating mode
- Cooling control, separate controls of the cooling valve and VAV in cooling mode
- CO<sub>2</sub> (or VOC, or humidity or other values) control by VAV
- Dew point surveillance protection
- Frost protection
- Different operation modes switched according to room occupation state
- Energy conservation procedures in case of room control conditions disturbance (e.g. open window)

The following **measurement and detection capabilities** are included or can be connected to the RC:

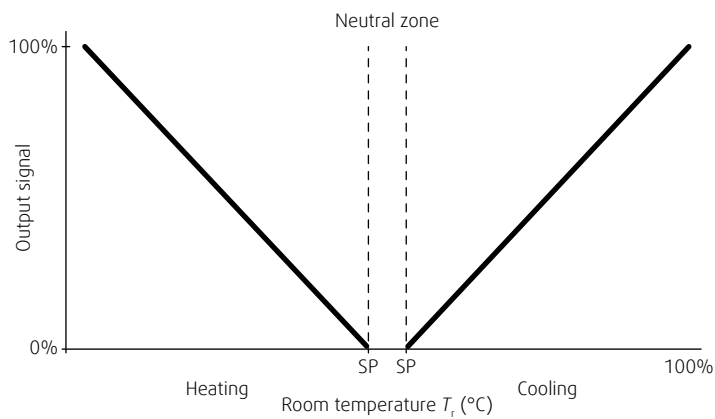
- Room temperature measurement on board
- External temperature measurement connectable via analog input
- External CO<sub>2</sub> (or other value) measurement connectable via analog input
- External change-over switch connectable via digital input
- External dew point detection connectable via digital input
- External presence/occupation detection connectable via digital input
- External window opening detection connectable via digital input

The following **control loop sequences** can be configured on the RC:

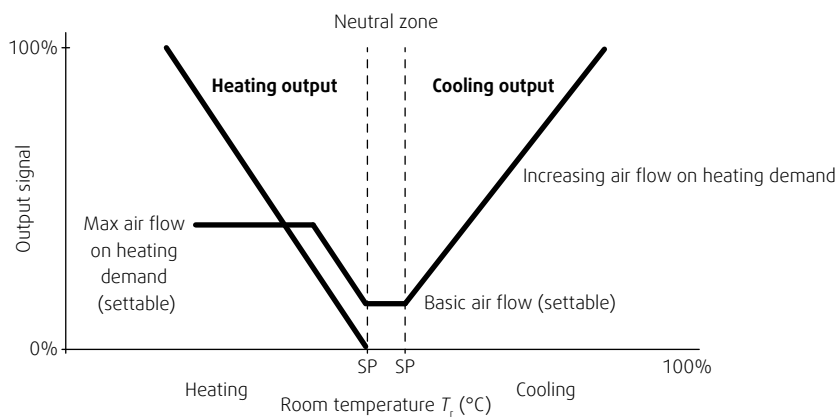
- **Heating/Heating**



- **Heating/Cooling**

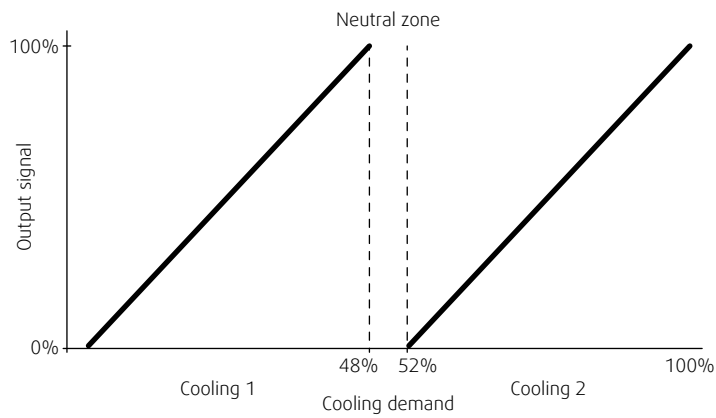


- **Heating/Cooling with VAV-control**

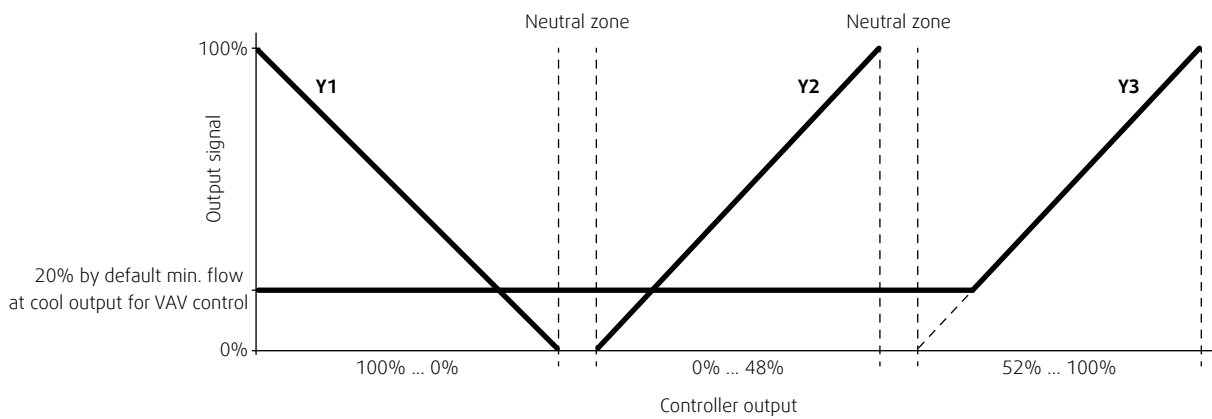




- Cooling/Cooling

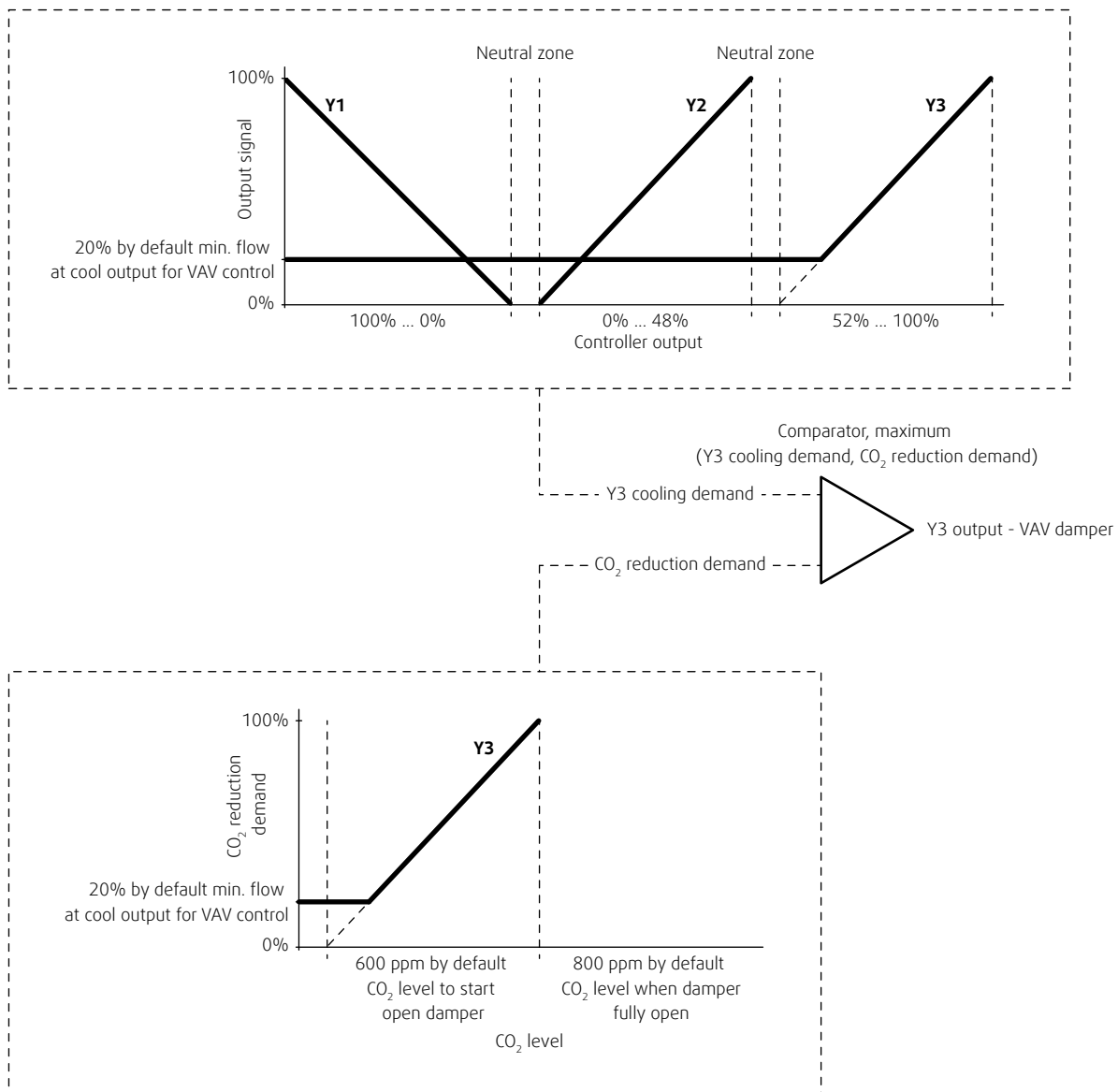


- Heating/Cooling/VAV

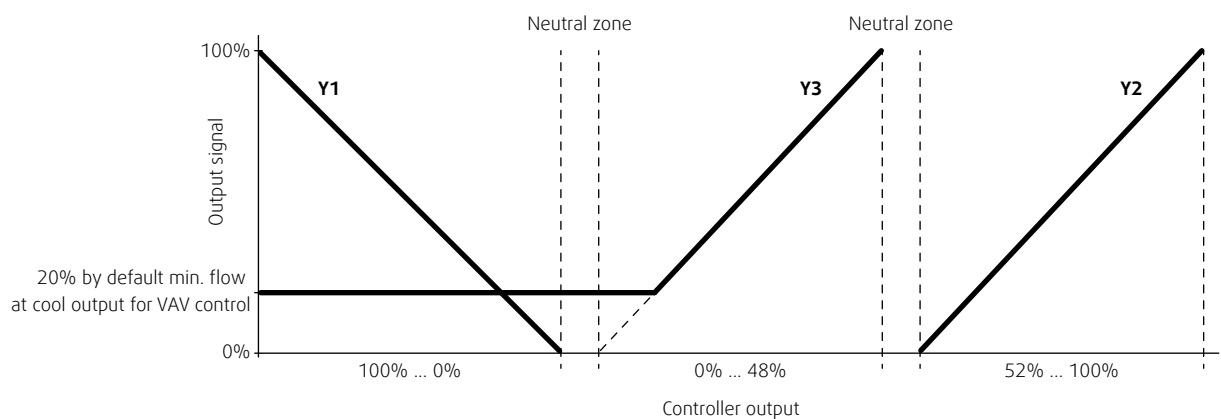


### • Heating/Cooling/VAV simultaneously with CO<sub>2</sub> control

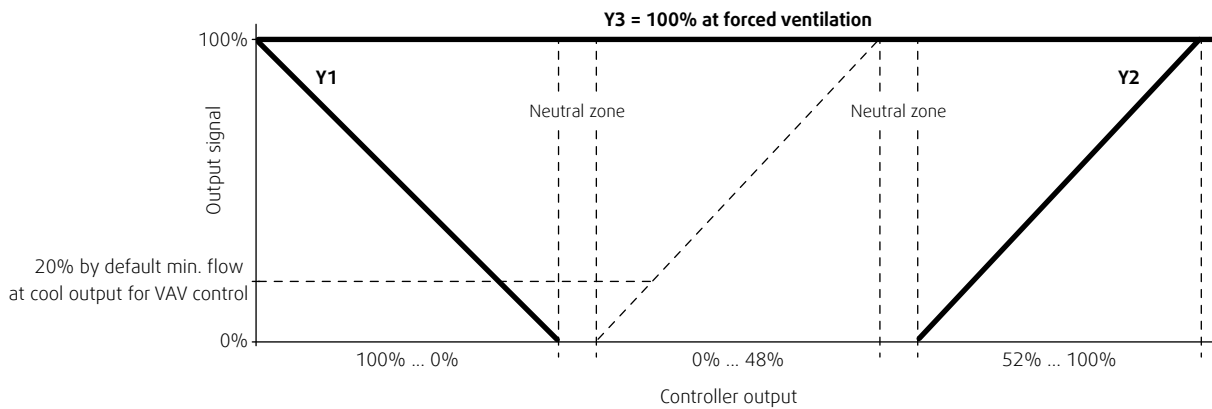
Value with higher control difference becomes control value.



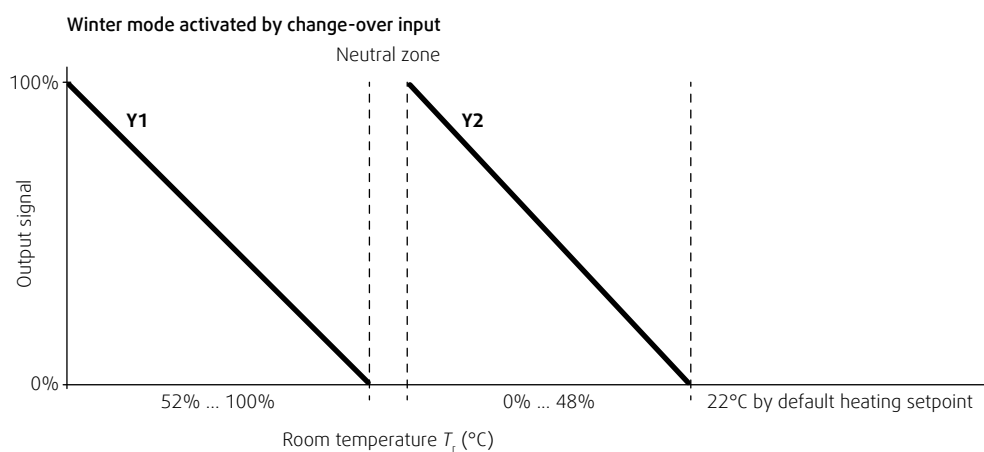
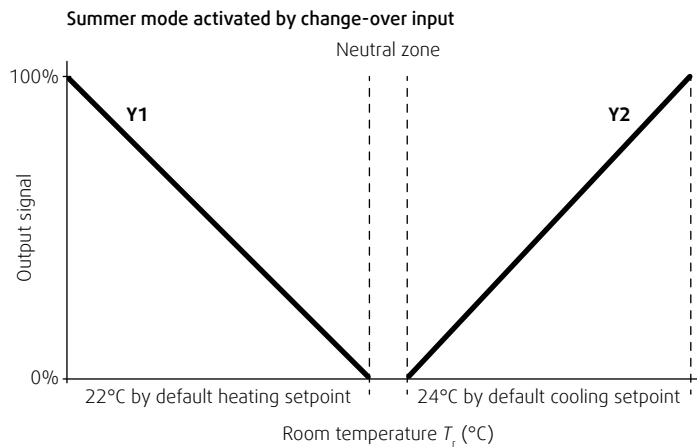
### • Heating/VAV/Cooling (reversed sequence)



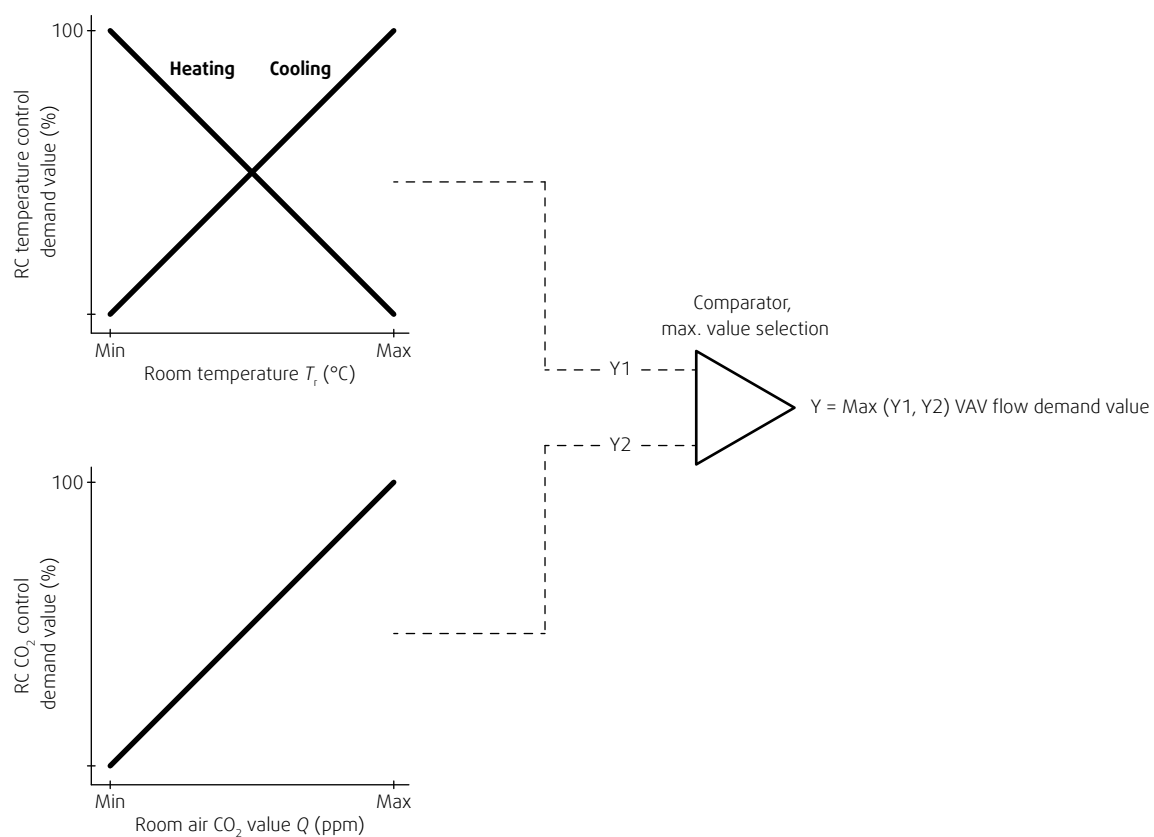
- Heating/Cooling with forced ventilation



- Heating/Cooling or Heating/Heating via change-over



- Full range change-over determined heating/cooling control by VAV combined with CO<sub>2</sub> control



## Adjustment and indication of parameters

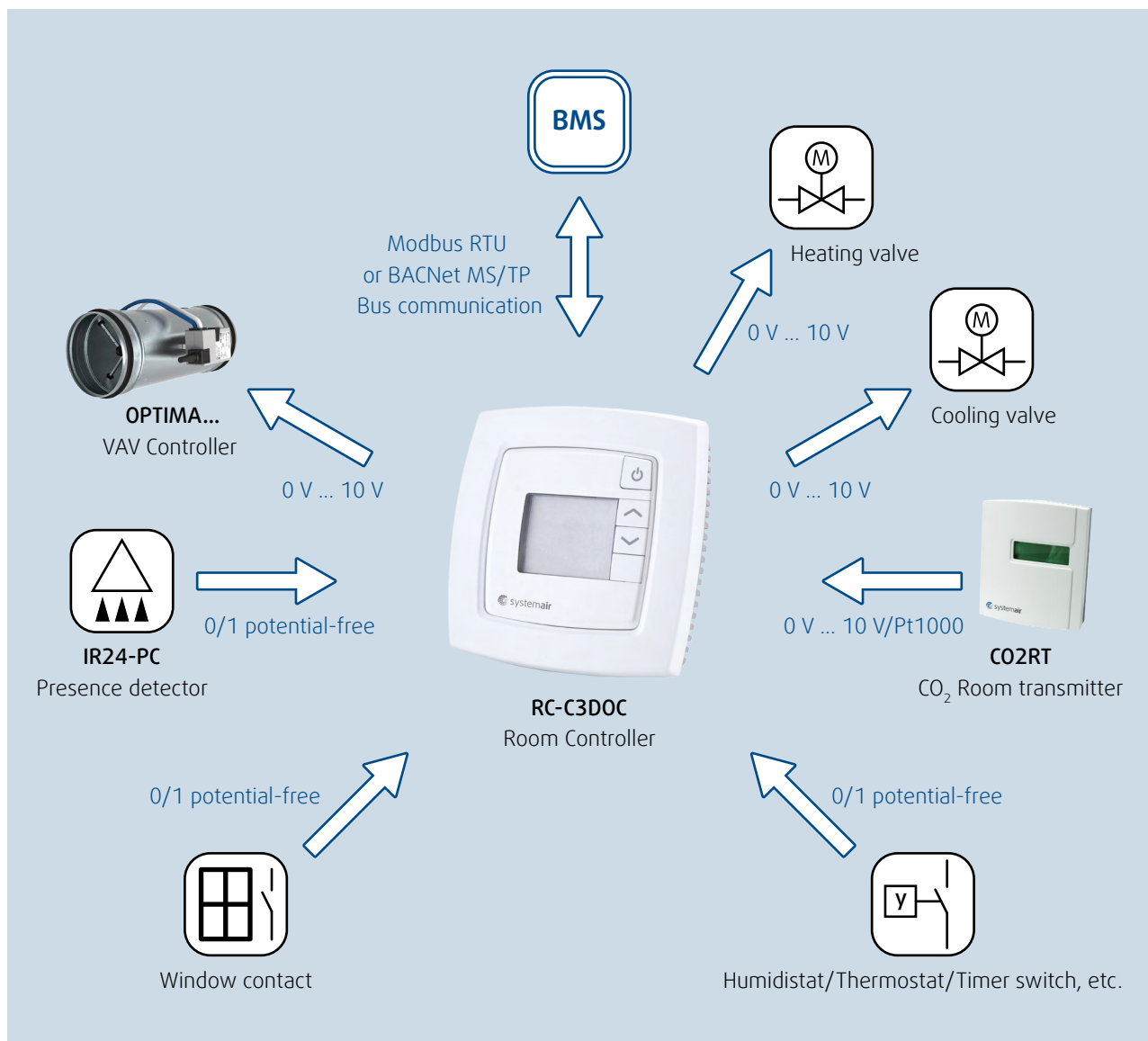
The operation parameters, procedures and limits can be adjusted with the help of pushbuttons and indicated by the LCD display on the room controller.

Adjustment and indication are also possible via PC with corresponding hardware and software.

## Communication

The room controller has an RS485 on-board communication serial port for which the Modbus RTU or BACNet MS/TP bus communication protocols can be turned on.

## Topology





# Installation, Maintenance & Operation

Information about installation, maintenance and operation is available in the document [🔗 "UserManual\\_OPTIMA-RES-A"](#).

OPTIMA-RES-A is mounted on the wall or ceiling and is connected to a spiro duct by a rubber gasket tight connection. The system box can be fixed to the wall or ceiling by screws through the holes in four mounting ears on the bottom plate. The electrical connection terminals and VAV controllers can be found under the cover of the system box. The cover can be removed by turning the two locks on the cover plate with a screw driver by 90°. To avoid falling out after unlock the cover plate is tight to the system box by chains. The cover plate in the closed position is sunken into the frame. This enables to attach a plaster board to the outer surface of the cover. So the inspection opening cover can be from the same material and flush with the surrounding wall or ceiling where the system box is installed. The plaster board for the cover must be foreseen with cut-outs to keep the cover locks accessible.

The power supply and signal cables can be pulled into the box through the diaphragm between the supply/extract air connections. The cables must be fixed inside the box on the fixing ridge by cable straps. This avoids excessive mechanical stress on the cables. The cables shall be connected to the spring terminals according to the wiring diagram. To protect the circuitry from overload or short circuit fault, there is a fuse terminal on the power supply.

Dry indoor conditions with an operation temperature range of -20°C to +70°C.

## Transport & Storage

Dry indoor conditions with a temperature range of -40°C to +50°C.

## Supplement

Any deviations from the technical specifications contained herein as well as the terms should be discussed with the manufacturer. We reserve the right to make any changes to the product without prior notice, provided that these changes do not affect the quality of the product and the required parameters.

Current information on all products is available at [🔗 design.systemair.com](#)

# Related Products

## OPTIMA-R

### VAV Controller

Air flow volume control units for standard air flow velocity range.

Product information is available within the [DataSheet\\_OPTIMA-R](#) technical documentation and on [Systemair DESIGN](#).



## OPTIMA-LV-R

### Low Velocity VAV Controller

Air flow volume control units for low to medium air flow velocity range.

Product information is available within the [DataSheet\\_OPTIMA-LV-R](#) technical documentation and on [Systemair DESIGN](#).

