OpenAir™

VAV static – Modular Air Volume Controller ASV181.1E/3

- **Controller for plants with variable or constant airflow**
- **Consisting of static differential pressure sensor and configurable digital air volume controller**
- **Operating voltage AC 24 V**
- **For connection to an OpenAir™ family 3-position air damper actuator**
- **Prewired with 1x 0.9 m and 1x0.3 m connecting cables**

Note

Please refer to the Technical Basics in document P3544en for a detailed description as well as information on safety, engineering notes, mounting and commissioning

Use

Used primarily to control a variable or constant volumetric airflows.

The controller is used for:

- Supply air control
- Extract air control
- Supply/extract air cascade control with
  - ratio control 1 : 1
  - ratio control (over-/underpressure)
  - differential control (over-/underpressure)

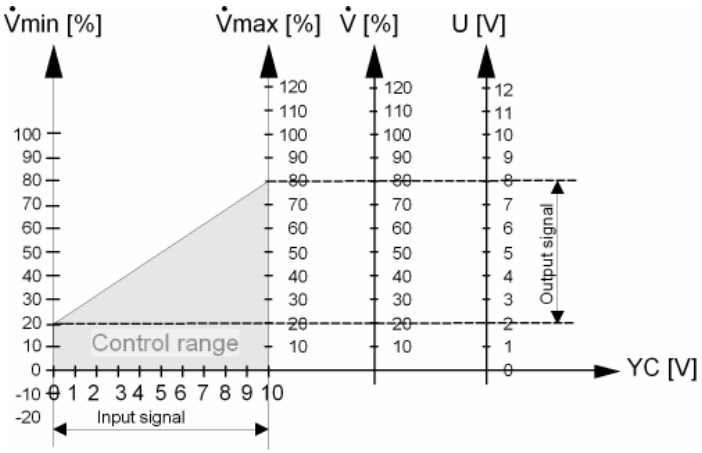
Parameter settings in DC 0…10 V «con» mode

The following parameters must be set or checked:

Parameter	Setting	Meaning	Siemens default setting
Type	**con**	DC 0...10 V mode	**con**
Vn	**1.00 ... 2.55**	Characteristic for nominal volumetric airflow to be set by manufacturer (OEM)	**1.00**
Vmax	**20...120 %**	Maximum volumetric airflow	**100 %**
Vmin	**-20...100 %**	Minimum volumetric airflow	**0 %**
Dir	**L** or **r**	Opening direction of air damper	**r** (opening direction clockwise)

Variable Air Volume (VAV) control

«VAV static» operates in VAV mode provided a DC 0...10 V signal is fed to input YC. The setpoint signal controls operating range $\dot{V}_{min}$ ... $\dot{V}_{max}$.



Forced control in VAV mode

Using the Y1 and Y2 control signals, the damper of the air volume controller can be driven either to the fully open or fully closed position.

Signal	VAV application (type = «con»)			
U	Volumetric airflow output DC 0…10 V			
YC	DC 0…10 V			
Y1	Open	G0	G0	Open
Y2	Open	Open	G0	G0
Action	VAV control with DC 0…10 V setpoint compensation	Dir «**r**» clockwise rotation Dir «**L**» counterclockwise rotation **"Damper fully open"**	VAV control with DC 0…10 V setpoint compensation	Dir «**r**» counterclockwise rotation Dir «**L**» clockwise rotation **"Damper fully closed"**

Constant Air Volume (CAV) control

«VAV static» operates in CAV mode if input YC is **open.**
$\dot{V}_{min}$ or $\dot{V}_{max}$ control can be accomplished with control signals Y1 and Y2.

Forced control in CAV mode

If inputs Y1 and Y2 are appropriately wired, different states can be reached according to the following table:

Signal	CAV applications (type = «con»)			
U	Volumetric airflow output DC 0…10 V			
YC	offen			
Y1	Open	G0	G0	Open
Y2	Open	Open	G0	G0
Action	**Vmin control**	Dir «**r**» clockwise rotation Dir «**L**» counterclockwise rotation **"Damper fully open"**	**Vmax control**	Dir «**r**» counterclockwise rotation Dir «**L**» clockwise rotation **"Damper fully closed"**

Note

CAV mode is also possible when preselecting a constant setpoint via input YC.

3-position «3P» mode

To use «VAV static» as a differential pressure sensor with a 3-position actuator, the operating mode parameter must be set to «3P».

In 3-position «3P» mode, the following parameters must be set or checked:

Parameter settings in 3-position «3P» mode

Parameter	Setting	Meaning	Siemens default setting
Typ	**3P**	3-position mode	**con**
Vn	**1.00 ... 2.55**	Correction factor for nominal volumetric airflow to be set by (OEM)	**1.00**
Dir	**L** or **r**	Opening direction of air damper	**r** (opening direction clockwise)

In 3-position «3P» mode, $\dot{V}_{min}$ and $\dot{V}_{max}$ are of no importance since volumetric flow control in this operating mode is ensured by the higher level room controller (typically cascade of room temperature and volumetric flow). In this operating mode, volumetric flow control of «VAV static» is deactivated.

The air damper's direction of rotation is determined by the connection of signal inputs Y1 (core 6, violet) and Y2 (core 7, orange).

Signal	Differential pressure sensor with 3-position actuator (type = «3P»)			
U	Volumetric airflow output DC 0…10 V			
YC	n.a.			
Y1	Open	G0	G0	Open
Y2	Open	Open	G0	G0
Action	Damper maintains its position	Damper opens Dir «**r**» or «**L**» to be set by manufacturer (OEM)	Damper closes Dir «**r**» or «**L**» to be set by manufacturer (OEM)	Damper closes Dir «**r**» or «**L**» to be set by manufacturer (OEM)

Ordering by manufacturer (OEM)

Notes to the operating modes

The documentation provided by the manufacturer of the air volume controller (OEM) normally contains detailed ordering information on «VAV static».

The manufacturer of the air volume controller (OEM) normally configures and fully adjusts «VAV static» in the factory. This considerably facilitates commissioning on site. Should changes to the configuration or adjustments become necessary, they can be made on site with the AST10 setting unit.

The manufacturers always adjusts $\dot{V}_n$ (nominal volumetric airflow).

3-position «3P» mode

When **«3P»** is configured, the supply and extract air volume controllers are connected to separate 3-position outputs and DC 0…10 V inputs of the relevant DDC individual room controller (e.g. RXC31.1).

DC 0…10 V «con» mode

When **«con»** is configured, a differentiation is made as to how «VAV static» are wired in relation to the relevant controller:

In the case of **parallel control,** the controller controls all «VAV static» in a starlike (parallel) manner. This means that the DC 0…10 V output signal is the reference variable for all «VAV static». The manufacturer of the air volume controller adjusts the minimum and maximum volumetric airflow limit values $\dot{V}_{min}$ and $\dot{V}_{max}$ individually on each controller.

Parallel control is in particular suitable to design large rooms with several air volume controllers.

With **master-slave control,** the DC 0…10 V output signal of the controller is fed to the supply air volume controller (master controller) as the reference variable. The extract air volume controllers (slave controllers) receive the master controller's actual value signal of the volumetric airflow as the reference variable (setpoint).

Minimum and maximum limitation of the volumetric airflow

«3P» mode

The limitation to $\dot{V}_{min}$ or $\dot{V}_{max}$ is made on the relevant controller. This means that the manufacturer of the air volume controller does not set these limit values on the «VAV static». The factory settings made by Siemens are 0 % and 100 % and will not be changed.

DC 0…10 V «con» mode

Here, a differentiation is made between 2 cases, which must be considered when ordering the air volume controller with the OEM:

- The OEM sets the limit values ($\dot{V}_{min}$ and $\dot{V}_{max}$) on the «VAV static»
- The limit values ($\dot{V}_{min}$ and $\dot{V}_{max}$) are set on the relevant room temperature controller, provided the controller used offers this facility

Equipment combinations

Unit	Type	Data sheet
Room temperature controller	**RCU5...**	3045
	RCU6...	3046
	RDU5…	3065
Individual room controller	**RX…**	38xx
Standard controller	**RLU2…**	3101
	RMU7…	3144
Setting unit	**AST10**	5851
Service Tool	**AST21**	5852

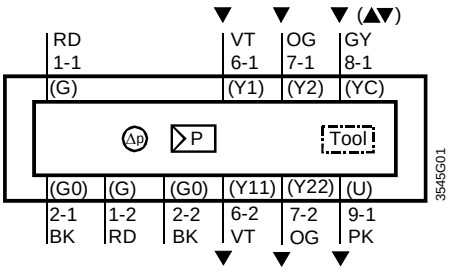
Technical data

⚠ **Power supply AC24 V** (SELV/PELV) G (core 1 «red») and G0 (core 2 «black»)	Operating voltage / Frequency	AC 24 V ±20 % / 50/60 Hz
	Power consumption (without connected actuator)	6 VA / 3.5 W
Signal inputs Volumetric airflow reference signal or communication signal YC (core 8 «grey») Positioning signals Y1 (core 6 «violet») and Y2 (core 7 «orange»)	Input voltage	DC 0…10 V
	Max. perm. input voltage	DC 35 V limited to DC 11 V
	Complete shutoff in VAV range, at $\dot{V}_{min} \leq 0$ %	DC −1.5...−0.2 V
	Contact sensing	
	Contact open	DC 30 V contact voltage
	Contact closed	DC 0 V, 8 mA contact current
Signal outputs Volumetric airflow measuring signal U (core 9 «pink»)	Output voltage	DC 0…10 V limited to DC 12.8 V
	Max. output current	DC ±1 mA
3-position output signal [1] Y11 (core 6-2 violet), Y22 (core 7-2 orange)	Output voltage	AC 0/24 V
	Max. current load	500 mA
	Max. cable length between ASV181.1E/3 and OpenAir™ actuator	3 m
Actuator supply [2] G (core 1-2 red) G0 (core 2-2 black)	Operating voltage	AC 24 V ±20 %
	Frequency	50/60 Hz
Service tool socket	Terminal strip	2 x 3-pole, 2.54 mm spacing
Connecting cable 1	Cable length	0.9 m
	Number of lines and cross-sectional area of core	6 x 0.75 mm²
Connecting cable 2	Cable length	0.3 m
	Number of lines and cross-sectional area of core	4 x 0.34 mm²
Degree of protection and safety class	Degree of protection to EN 60 529	IP 54
	Safety class to EN 60 730	III
Environmental conditions	Operation / Transport	IEC 721-3-3 / IEC 721-3-2
	Temperature	0...50 °C / −25...+70 °C
	Humidity (noncondensing)	< 95 % r.F. / < 95 % r.F.
Norms and standards	Product safety	
	Automatic electrical controls for household and similar use	EN 60 730-2-14 (mode of action type 1)
	Electromagnetic compatibility(EMC)	
	Immunity	IEC 61 000-6-2
	Emissions	IEC 61 000-6-3
CE -Conformity	EMC directive	89/336/EWG
	Low-voltage directive	73/23/EWG
C-Tick - Conformity	Australian EMC Framework	Radio communication act 1992
	Radio Interference Emmission Standard	AS/NZS 3548
Dimensions	W x H x D	68 x 135 x 45 mm
Weight	excl. packaging	0.28 kg
Air volume controller	3-position controller with hysteresis	
	Max. volumetric airflow $\dot{V}_{max}$, adjustable	20...120 %
Differential pressure sensor	Min. volumetric airflow $\dot{V}_{min}$, adjustable	−20...+100 %
	Nominal volumetric airflow adjustment $\dot{V}_n$	1.00...2.55
	Measuring range	0…400 Pa
	Range of use	4…300 Pa
	Accuracy across range of use	
	at 25 °C, 990 mbar, $\dot{V}_n$ = 1 and optional mounting location	±2.5 %
	Time constant	1 s
	Max. perm. operating pressure	3000 Pa
	Max. perm. overload on one side	3000 Pa

1) The triacs can be destroyed if there is a short circuit or false wiring at 3-position outputs Y11, Y22.
2) The outputs G and G0 are not short-circuit-proof.

The «VAV static» - modular air volume controller is supplied with ready wired connecting cables. The devices connected to it must use the same G0.

Internal diagram



Legend

Connection cable 1 (color-coded and labeled):

Wire labelling	Colour of core	Terminal code	Meaning
1	red (RD)	G	System potential AC 24 V
2	black (BK)	G0	System neutral AC 24 V
6	violet (VT)	Y1	Positioning signal "Actuator's direction of rotation" (G0 switched), dependent on the setting of direction
7	orange (OG)	Y2	Positioning signal "Actuator's direction of rotation" (G0 switched), dependent on the setting of direction
8	gray (GY)	YC [1)]	Volumetric airflow reference signal DC 0 ... 10 V (setpoint) or communication signal with **AST10** or **AST21** connected.
9	pink (PK)	U	Volumetric airflow measuring signal DC 0 ... 10 V (actual value)

Connection cable 2 (color-coded and labeled):

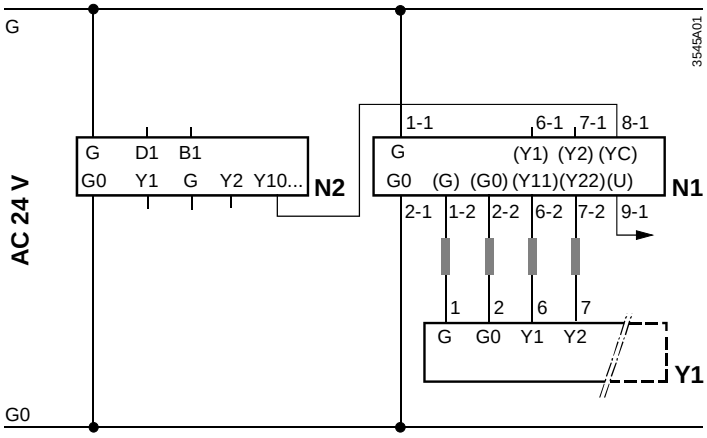
Wire labelling	Colour of core	Terminal code	Meaning
1	red (RD)	G	System potential AC 24 V
2	black (BK)	G0	System neutral AC 24 V
6	violet (VT)	Y11	Positioning signal "Actuator's direction of rotation" (G0 switched), dependent on the setting of direction
7	orange (OG)	Y22	Positioning signal "Actuator's direction of rotation" (G0 switched), dependent on the setting of direction

Tool = Service tool connecting socket (6-pole)

[1)] To ensure the functions at YC, only one cable may be connected at the time, either the cable for the volumetric airflow reference signal DC 0...10 V (setpoint) or the cable for the communication signal!

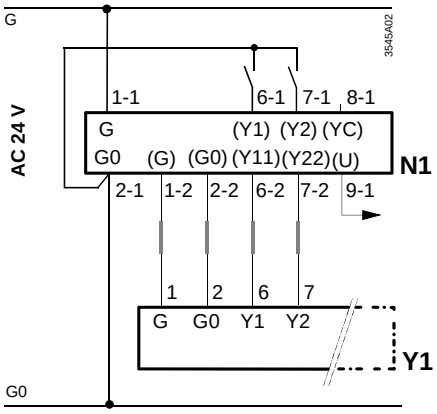
Connection diagrams

VAV
Supply-/extract air control operating mode «con»

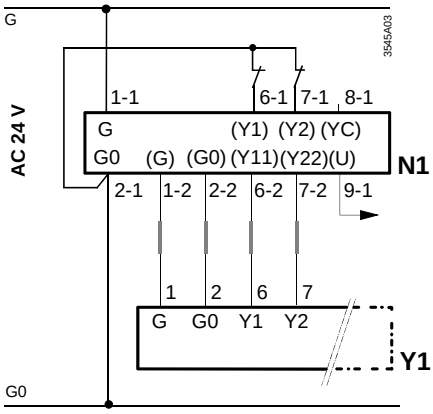


CAV
Supply-/extract air control operating mode «con»

$\dot{V}_{min} = \dot{V}_{const.}$

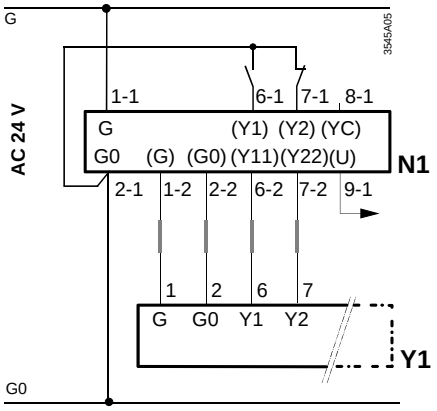


$\dot{V}_{max} = \dot{V}_{const.}$

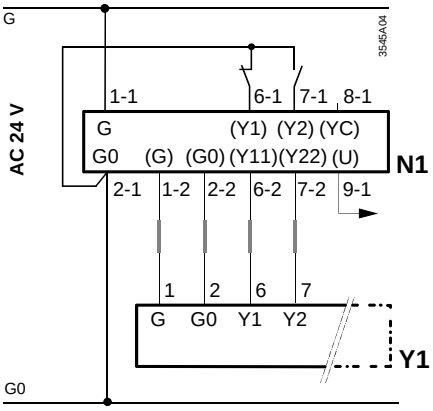


Modulating control $\dot{V}_{max}$ and $\dot{V}_{min}$ and complete shutoff and fully open operating mode «con»

Complete shutoff



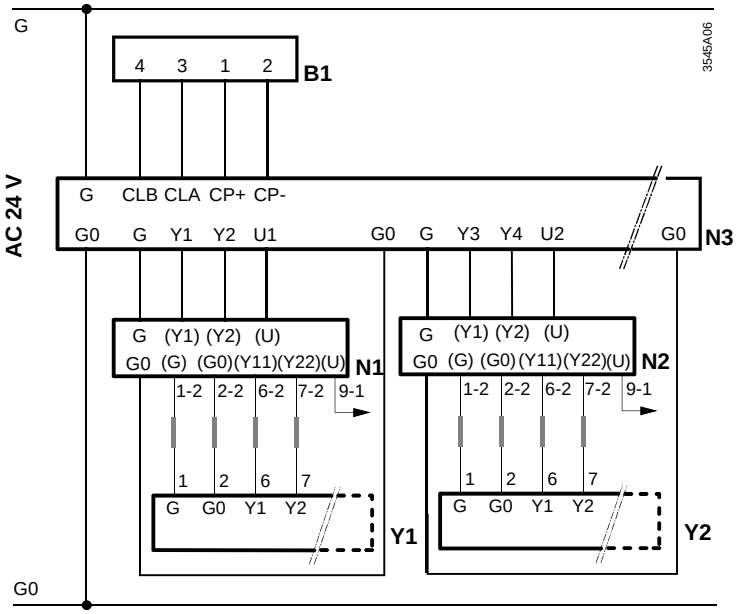
Fully open



Legend for operating mode «con»

N1 ASV181.1E/3
N2 Leading controller
Y1 OpenAir™ 3 - position actuator

Supply-/extract air control operating mode «3P»



Legend to operating mode «3P»

N1 **ASV181.1E/3** –supply air–
N2 **ASV181.1E/3** –Extract air–
Y1 OpenAir™ 3 - position actuator
Y2 OpenAir™ 3 - position actuator
N3 Room temperature controller DESIGO™ **RXC31.1**
B1 DESIGO™-room unit, e. g. **QAX32.1**

⚠

- The operating voltage fed to terminals G and G0 must comply with the requirements for SELV or PELV
- Use safety isolating transformers with double insulation conforming to EN 61558; they must be suited for 100 % on time

Dimensions (All dimensions in mm)