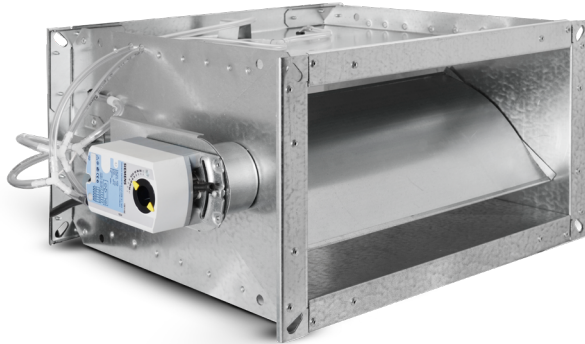


Rectangular VAV flow regulator **RAVAV-Q**



Description

The RAVAV-Q regulator is dedicated for forced ventilation systems and is an important component for installations with variable air flow.

The regulator casing is made of Z275 galvanized sheet. Optionally, it is possible to use the 1.4301 stainless steel to build the casing. Inside the casing profiled and insulated (mineral wool) damper blade (non-airtight). The actuator is installed on the control unit casing so as to allow for thermal insulation of the system. The regulator is also available in the version insulated housing with 50 mm of mineral wool enclosed in galvanised steel shield.

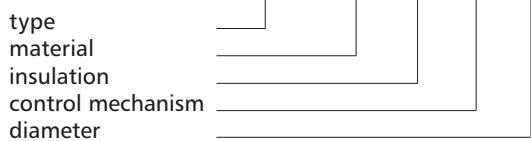
The measuring system based on aluminium impact pressure tubes and pressure relieve stub pipes ensures reliable measuring of the air flow.

Sensor, digital control unit and servomotor are integrated in one device. The servomotor adjusts the damper position, the control unit compares the current air flow rate with the set value and the sensor turns the differential pressure value into electric signal. It is possible to change standard controller to solution with fastrunning actuator, static pressure sensor, etc

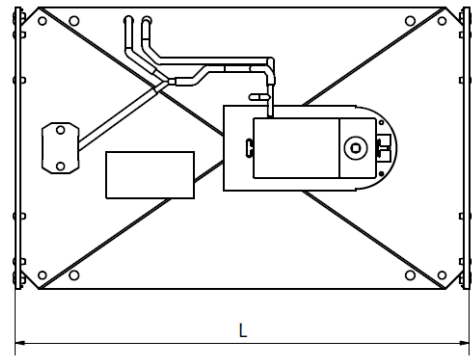
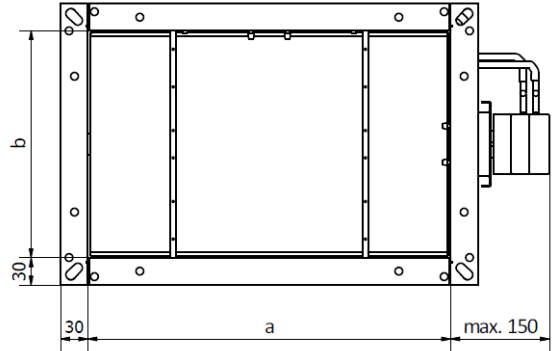
Version: 004/11/21/PG.

Marking example

Product code: **RAVAV-Q - aaa - bbb - ccc - ddd**



Dimensions



b [mm]	a [mm]									
	100	200	300	400	500	600	700	800	900	1000
100	400	400	400	400	400	400	400	400	400	400
200	-	400	400	400	400	400	400	400	400	400
300	-	-	500	500	500	500	500	500	500	500
400	-	-	-	500	500	500	500	500	500	500

Lenght L [mm] RAVAV-Q.

b [mm]	a [mm]									
	100	200	300	400	500	600	700	800	900	1000
100	2,6	3,3	4	4,6	5,3	7,3	8,1	9	9,8	10,6
200	-	4,1	4,8	5,6	6,4	8,7	9,6	10,5	11,5	12,4
300	-	-	6,6	7,6	8,6	11,6	12,8	14	15,2	16,4
400	-	-	-	8,7	9,8	13,1	14,4	15,7	17	18,3

Weights RAVAV-Q [kg].

Rectangular VAV flow regulator

RAVAV-Q

Ordering options

Material:

- RAVAV-Q-... - default: galvanised steel
 RAVAV-Q-K-... - 1.4301/304

Insulation:

- RAVAV-Q-... - default: not insulated
 RAVAV-Q-I-... - insulation with external shield, thickness: 30 mm
 RAVAV-Q-K-I-... - steel 1.4301/304, insulation with external shield, thickness 30 mm

Control mechanism:

- RAVAV-Q-... - Belimo servomotor, with communication MP-BUS 5Nm, standard operating time LMV-D3-MP (default)
 RAVAV-Q-MOD - Belimo servomotor, with communication MODBUS, 5Nm, standard operating time LMV-D3-MOD
 RAVAV-Q-KNX - Belimo servomotor, with communication KNX, 5Nm, standard operating time LMV-D3-KNX
 RAVAV-Q-G - Gruner servomotor, with communication PP-BUS, 5Nm 15...120s 227VM(Z)-024-05/(8E8)
 RAVAV-Q-SIM - Siemens servomotor, without communication protocol, 5Nm, 150s - GDB181.1E/3

Diameter:

Regulators are available in size range 100x100 – 1000x400 [mm]..

*Additional options:

- V_{min} - flow minimum [m³/h (range 0-100% V_{nom})
 V_{max} - flow maximum [m³/h (range 20-100% V_{nom})
 0-10 (or different) - control signal (default 2-10 V)

*Please specify non-standard settings, when placing an order.

Code example:

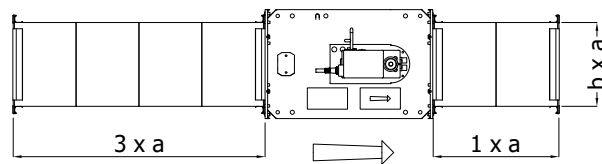
RAVAV-Q-K-I-KNX-400x200

The manufacturer reserves the right to make changes.

Characteristics

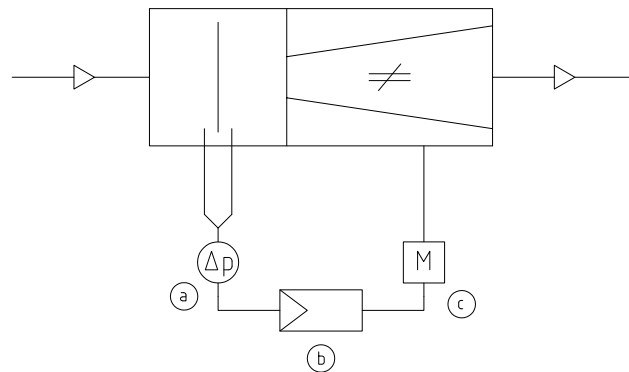
- High air flow measurement accuracy
- Casing tightness is class C as per EN-1751:2014-03
- Operating temperature range from 0 to 50 [°C],
- Differential pressure range measured before and after the regulator 50-1000Pa.
- Possibility to measure current air flow parameters using external micromanometers

Recommended minimum distances



Operating diagram

Sensor, control unit and servomotor are integrated in one device. The servomotor adjusts the damper position, the control unit compares the current air flow rate with the set value and the sensor turns the differential pressure value into electric signal.



a - sensor b - digital control c - servomotor

Rectangular VAV flow regulator

RAVAV-Q

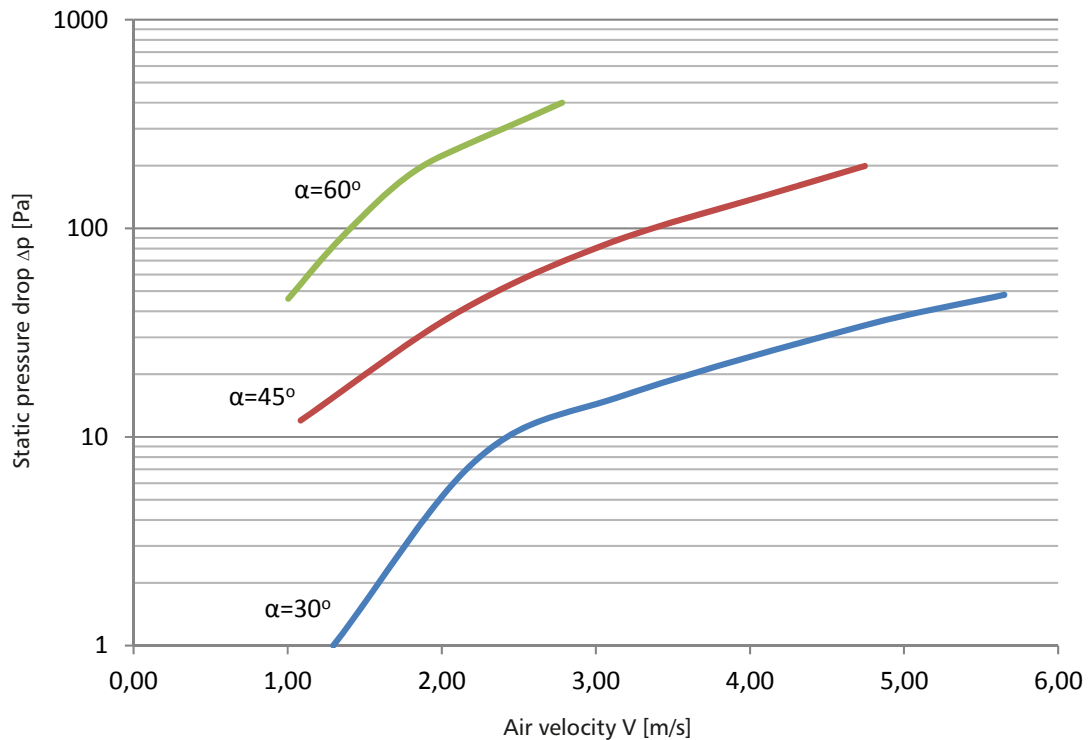
Air flow

Standard air flow rates RAVAV-Q (min: 2 [m/s], max: 12 [m/s]).

b	V	a										
		100	200	300	400	500	600	700	800	900	1000	
100	m ³ /h	min	72	144	216	288	360	432	504	576	648	720
		max	432	864	1296	1728	2160	2592	3024	3456	3888	4320
	l/s	min	20	40	60	80	100	120	140	160	180	200
		max	120	240	360	480	600	720	840	960	1080	1200
200	m ³ /h	min	-	288	432	576	720	864	1008	1152	1296	1440
		max	-	1728	2592	3456	4320	5184	6048	6912	7776	8640
	l/s	min	-	80	120	160	200	240	280	320	360	400
		max	-	480	720	960	1200	1440	1680	1920	2160	2400
300	m ³ /h	min	-	-	648	864	1080	1296	1512	1728	1944	2160
		max	-	-	3888	5184	6480	7776	9072	10368	11664	12960
	l/s	min	-	-	180	240	300	360	420	480	540	600
		max	-	-	1080	1440	1800	2160	2520	2880	3240	3600
400	m ³ /h	min	-	-	-	1152	1440	1728	2016	2304	2592	2880
		max	-	-	-	6912	8640	10368	12096	13824	15552	17280
	l/s	min	-	-	-	320	400	480	560	640	720	800
		max	-	-	-	1920	2400	2880	3360	3840	4320	4800

Pressure drops

The graph below shows the dependence of the pressure drop on the air flow



Rectangular VAV flow regulator

RAVAV-Q

Pressure drop and level of sound power emitted to the system for different damper settings

Δp	b	v	$L_{WA} [dB(A)]$									
			a									
[Pa]	[mm]	[m/s]	[mm]									
			100	200	300	400	500	600	700	800	900	1000
50	100	2	30	33	35	36	37	38	38	39	40	40
		4	39	42	43	45	46	46	47	48	48	49
		6	43	46	48	49	50	51	52	52	53	53
		8	47	50	52	53	54	55	55	56	56	57
		10	50	53	54	56	57	57	58	59	59	60
		12	52	55	57	58	59	60	61	61	62	62
	200	2	-	34	36	37	38	39	39	40	40	41
		4	-	43	45	46	47	48	48	49	49	50
		6	-	48	50	51	52	53	53	54	54	55
		8	-	51	53	54	55	56	57	57	58	58
		10	-	54	56	57	58	59	60	60	61	61
		12	-	57	59	60	61	62	63	63	64	64
	300	2	-	-	35	37	38	38	39	40	40	41
		4	-	-	45	46	47	48	49	49	50	50
		6	-	-	50	51	52	53	53	54	55	55
		8	-	-	53	55	56	56	57	58	58	59
		10	-	-	57	58	59	60	60	61	61	62
		12	-	-	60	61	62	63	63	64	64	65
	400	2	-	-	-	37	38	38	39	40	40	41
		4	-	-	-	46	51	48	48	49	50	50
		6	-	-	-	51	56	53	54	54	55	55
		8	-	-	-	55	59	57	58	58	59	59
		10	-	-	-	58	62	60	61	61	62	62
		12	-	-	-	61	64	63	64	64	65	65
100	100	2	36	39	41	42	43	44	45	45	46	46
		4	44	47	49	50	51	52	52	53	53	54
		6	49	52	54	55	56	57	58	58	59	59
		8	52	55	57	58	59	60	61	61	62	62
		10	55	58	59	61	62	62	63	64	64	65
		12	57	60	62	63	64	65	65	66	66	67
	200	2	-	40	42	43	44	45	46	46	47	47
		4	-	48	50	51	52	53	54	54	55	55
		6	-	54	56	57	58	59	59	60	60	61
		8	-	57	59	60	61	62	62	63	63	64
		10	-	59	61	62	63	64	65	65	66	66
		12	-	62	64	65	66	67	67	68	68	69
	300	2	-	-	43	44	45	46	46	47	48	48
		4	-	-	50	52	53	54	55	55	56	56
		6	-	-	56	57	58	59	60	60	61	61
		8	-	-	59	61	62	62	63	64	64	65
		10	-	-	62	63	64	65	66	66	67	67
		12	-	-	65	66	67	68	68	69	69	70
	400	2	-	-	-	43	44	45	46	46	47	47
		4	-	-	-	52	53	54	55	55	56	56
		6	-	-	-	58	59	59	60	61	61	62
		8	-	-	-	61	62	63	63	64	64	65
		10	-	-	-	63	64	65	66	66	67	67
		12	-	-	-	66	67	68	68	69	69	70

Rectangular VAV flow regulator

RAVAV-Q

Pressure drop and level of sound power emitted to the system for different damper settings

Δp	b	v	$L_{WA} [dB(A)]$									
			a									
			[mm]									
[Pa]	[mm]	[m/s]	100	200	300	400	500	600	700	800	900	1000
150	100	2	40	43	45	46	47	48	49	49	50	50
		4	47	50	52	53	54	55	56	56	57	57
		6	52	55	57	58	59	60	60	61	62	62
		8	56	59	60	62	63	63	64	65	65	66
		10	58	61	63	64	65	66	66	67	67	68
		12	60	63	65	66	67	68	68	69	69	70
	200	2	-	45	47	48	49	50	50	51	51	52
		4	-	52	54	55	56	57	57	58	58	59
		6	-	57	58	60	61	61	62	63	63	64
		8	-	60	62	63	64	65	66	67	67	67
		10	-	63	65	66	67	68	68	69	69	70
		12	-	65	67	68	69	70	70	71	71	72
	300	2	-	-	47	48	49	50	51	51	52	52
		4	-	-	54	55	56	57	57	58	59	59
		6	-	-	59	60	61	62	63	63	64	64
		8	-	-	63	65	66	66	67	68	68	69
		10	-	-	66	67	68	69	69	70	70	71
		12	-	-	68	69	70	71	71	72	72	73
	400	2	-	-	-	48	49	50	51	51	52	52
		4	-	-	-	56	56	57	58	59	59	59
		6	-	-	-	61	62	62	63	64	64	65
		8	-	-	-	65	66	66	67	68	68	69
		10	-	-	-	67	68	69	69	70	71	71
		12	-	-	-	69	70	71	72	72	73	73
200	100	2	44	47	48	50	51	52	52	53	53	54
		4	49	52	54	55	56	57	58	58	59	59
		6	54	57	59	60	61	62	63	63	64	64
		8	58	61	63	64	65	66	66	67	67	68
		10	60	63	65	66	67	68	69	69	70	70
		12	62	65	67	68	69	70	71	71	72	72
	200	2	-	48	50	51	52	53	54	54	55	55
		4	-	54	56	57	58	59	60	60	61	61
		6	-	59	61	62	63	64	64	65	65	66
		8	-	63	64	66	67	67	68	69	69	70
		10	-	65	67	68	69	70	71	71	72	72
		12	-	67	69	70	71	72	73	73	74	74
	300	2	-	-	50	51	52	53	54	54	55	55
		4	-	-	56	58	59	59	60	61	61	62
		6	-	-	62	63	64	65	65	66	66	67
		8	-	-	65	67	68	69	69	70	70	71
		10	-	-	68	69	70	71	72	72	73	73
		12	-	-	70	71	72	73	74	74	75	75
	400	2	-	-	-	52	53	54	54	55	55	56
		4	-	-	-	58	59	60	60	61	61	62
		6	-	-	-	63	64	65	65	66	66	67
		8	-	-	-	67	68	69	69	70	70	71
		10	-	-	-	70	71	71	72	73	73	74
		12	-	-	-	72	73	74	74	75	75	76

Rectangular VAV flow regulator

RAVAV-Q

Pressure drop and level of sound power emitted to the system for different damper settings

Δp	b	v	$L_{WA} [dB(A)]$									
			a									
			[mm]									
[Pa]	[mm]	[m/s]	100	200	300	400	500	600	700	800	900	1000
250	100	2	46	49	51	52	53	54	55	55	56	56
		4	51	54	56	57	58	59	60	60	61	61
		6	56	59	61	62	63	64	64	65	65	66
		8	59	62	64	65	66	67	68	68	69	69
		10	62	65	67	68	69	70	71	71	72	72
		12	64	67	69	70	71	72	73	73	74	74
	200	2	-	51	53	54	55	56	56	57	57	58
		4	-	56	58	59	60	61	61	62	63	63
		6	-	61	62	64	65	65	66	67	67	68
		8	-	64	66	67	68	69	70	70	71	71
		10	-	67	69	71	71	72	73	74	74	74
		12	-	69	71	72	73	74	75	75	76	76
	300	2	-	-	53	54	55	56	57	57	58	58
		4	-	-	58	60	61	61	62	63	63	64
		6	-	-	63	65	66	66	67	68	68	69
		8	-	-	67	68	69	70	71	71	72	72
		10	-	-	70	71	72	73	74	74	75	75
		12	-	-	72	73	74	75	76	76	77	77
	400	2	-	-	-	55	56	56	57	58	58	59
		4	-	-	-	60	61	62	62	63	63	64
		6	-	-	-	65	66	66	67	68	68	69
		8	-	-	-	69	70	70	71	72	72	73
		10	-	-	-	72	73	74	74	75	75	76
		12	-	-	-	74	75	76	76	77	77	78
500	100	2	55	58	60	61	62	63	64	64	65	65
		4	58	61	62	64	65	65	66	67	67	68
		6	61	64	66	67	68	69	70	70	71	71
		8	65	68	69	71	72	72	73	74	74	75
		10	67	70	72	73	74	75	76	76	77	77
		12	69	72	74	75	76	77	78	78	79	79
	200	2	-	60	62	63	64	65	66	66	67	67
		4	-	63	64	66	67	67	68	69	69	70
		6	-	66	68	69	70	71	72	72	73	73
		8	-	70	72	73	74	75	75	76	76	77
		10	-	72	74	75	76	77	78	78	79	79
		12	-	75	77	78	79	80	80	81	81	82
	300	2	-	-	63	64	0	66	67	67	68	68
		4	-	-	65	67	0	68	69	70	70	71
		6	-	-	69	70	0	72	73	73	74	74
		8	-	-	72	74	0	75	76	77	77	78
		10	-	-	75	76	0	78	79	79	80	80
		12	-	-	78	79	0	81	81	82	82	83
	400	2	-	-	-	64	65	66	67	67	68	68
		4	-	-	-	67	68	69	69	70	70	71
		6	-	-	-	71	72	73	73	74	74	75
		8	-	-	-	74	75	76	77	77	78	78
		10	-	-	-	77	78	79	80	80	81	81
		12	-	-	-	79	80	81	82	82	83	83

Rectangular VAV flow regulator

RAVAV-Q

Servomotor specification

RAVAV-Q airflow regulators can be supplied with:

1. The Belimo Compact control mechanism with standard running times, where the operating parameters are set at the stage of regulator calibration by the manufacturer.
2. The Gruner 227V / VM control mechanism, where the operating parameters are set at the stage of regulator calibration by the manufacturer. You can adjust the settings without additional tools after the regulator installation.
3. The Siemens GDB..1E series control mechanism, with standard running times, where the operating parameters are set at the stage of regulator calibration by the manufacturer.

Symbol	LMV-D3-MP
Nominal voltage	24 V AC, 50/60 Hz 24 V DC
Operating range	19,2 ... 28,8 V AC 21,6 ... 28,8 V DC
Power consumption	2 W
Resistance class	III (safe voltage - low)
Insulation class	IP54
Electromagnetic compatibility	CE acc. to 89/336/EEC
Ambient temperature	0 ... +50 °C
Ambient humidity	5 ... 95% relative humidity, no condensation (as per EN 60730-1)
Maintenance	maintenance-free
Standard control	
VAV mode with Y lead signal (terminal 3)	2 ... 10 V DC / (4 ... 20 mA with 500 Ω resistor), min input impedance 100 kΩ 0 ... 10 V DC / (0 ... 20 mA with 500 Ω resistor), min input impedance 100 kΩ possible settings 0 ... 10 V DC, min input impedance 100 kΩ
Operating mode for measuring signal U5 (terminal 5)	2 ... 10 V DC, maks. 0,5 mA 0 ... 10 V DC, maks. 0,5 mA adjustable: volumetric flow, damper position or differential pressure, max 0,5 mA
CAV operating modes	CLOSED / Vmin. / (Vsr. *) / Vmaks. / OPEN * (* onlu with 24 V AC power supply)
MP bus functions	
Bus address	MP1 ... 8 (standard operation: PP)
EIB-Konnex / MODBUS RTU / BACnet	with BELIMO UK24EIB / UK24MOD / UK24BAC, 1 do 8 Belimo MP devices (VAV regulator / damper or value servomotor)
DDC regulator	DDC regulator / PLC with integral MP bud interface, various manufacturers
Adjusting ventilator speed	with BELIMO COU24-A-MP regulator
Connecting the sensor	passive (PT1000, Ni1000, etc.) and active sensor with 0...10 V input signal, e.g. temperature, humidity sensor two-state signal (contact load capacity 16 mA / 24V) e.g. switches, presence sensors

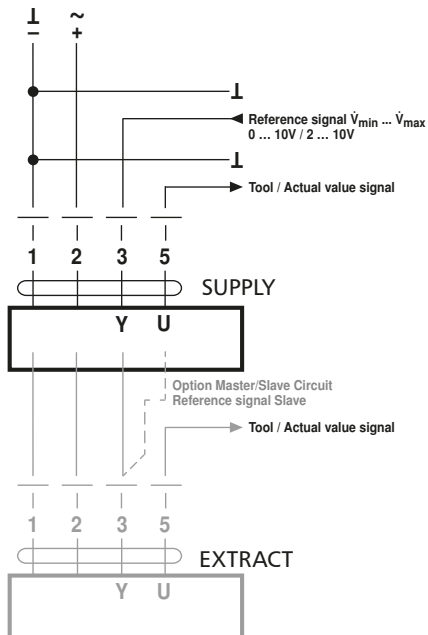
It is also possible to provide regulators with actuators integrated for KNX, MODBUS communication protocol.

Rectangular VAV flow regulator

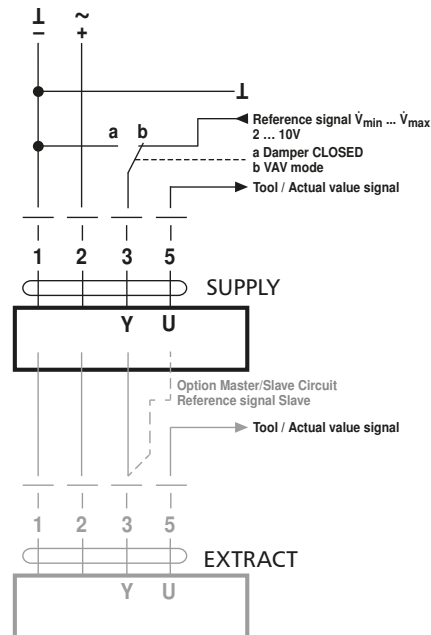
RAVAV-Q

Connections diagram Belimo servomotor

VAV – analogue reference signa:



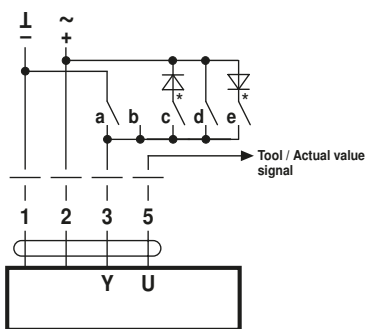
VAV – with shutt-off (closed), 2 ... 10V mode:



Damper CLOSED via 0 ... 10 V reference signal (Mode 2 ... 10 V)

Function	Standard: 0,1V	Shut-off level: 0,5 V
Damper CLOSED	< 0,1V	< 0,5V
V_{min}	> 0,1 ... 2V	> 0,5 ... 2V
$V_{min} ... V_{max}$	2 ... 10V	2 ... 10V

CAV - step mode CLOSED / V_{min} / V_{mid} / V_{max} / OPEN



CAV Function CLOSED – V_{min} – V_{max} – OPEN (standard)

	a	b	c	d	e
Signal	\perp		\sim	\sim	\sim
	-		+	+	+
Switching terminal 3	$\frac{\perp}{3}$	$\frac{\perp}{3}$	$\frac{\perp}{3}$	$\frac{\perp}{3}$	$\frac{\perp}{3}$
Mode 2 ... 10 V	CLOSED	V_{min}	CLOSED*	V_{max}	OPEN*
Mode 0 ... 10 V	V_{min}	V_{min}	CLOSED*	V_{max}	OPEN*

PC-Tool "CAV Function" setting:
2 ... 10 V, Shut-off level 0.1 V

PC-Tool "CAV Function" setting:
CLOSED – V_{min} – V_{max} . Shut-off level CLOSED: 0.1 V

CAV function CLOSED – V_{min} – V_{mid} – V_{max} – OPEN

	a	b	c	d	e
Signal	\perp		\sim	\sim	\sim
	-		+	+	+
Switching terminal 3	$\frac{\perp}{3}$	$\frac{\perp}{3}$	$\frac{\perp}{3}$	$\frac{\perp}{3}$	$\frac{\perp}{3}$
Mode 2 ... 10 V	CLOSED	V_{min}	V_{mid} *	V_{max}	OPEN*
Mode 0 ... 10 V	V_{min}	V_{min}	V_{mid} *	V_{max}	OPEN*

PC-Tool "CAV Function" setting:
CLOSED – V_{min} – V_{mid} – V_{max} (NMV-D2M compatible)

Note!

- Note that the contacts are mutually interlocking.
- DC supply: C and E are not available with DC 24 V

Rectangular VAV flow regulator

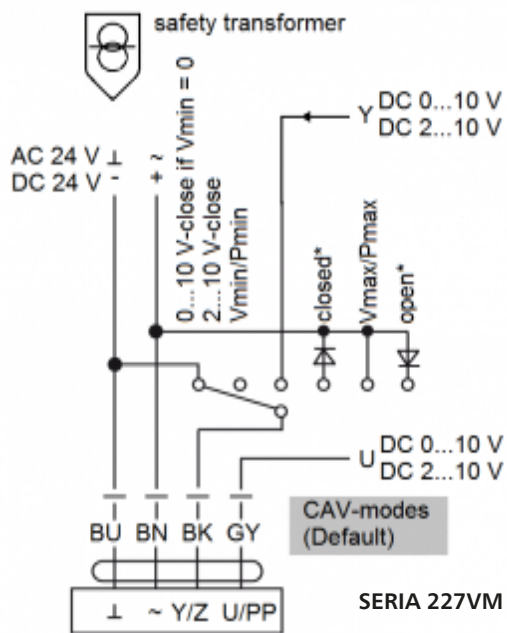
RAVAV-Q

Gruner servomotor specification

Symbol	227VM-024-05
Nominal voltage	24V AC/DC
Operating range	19 ... 29V AC/DC
Power consumption	2,5W (operation), 1,0 (standby)
Resistance class	III (safe voltage - low)
Casing insulation class	IP42
Electromagnetic compatibility	CE (2004/108/EG)
Ambient temperature	0 ... +50°C
Ambient humidity	5 ... 95% % relative humidity, no condensation (as per EN 60730-1)
Maintenance	maintenance-free

It is also possible to provide regulators with actuators integrated for MODBUS communication protocol.

Connection diagram



Rectangular VAV flow regulator

RAVAV-Q

Servomotor user manual



Front panel:

1. Disengagement button (self-restoring)
2. Value selection knob
3. Function selection knob
4. Display

The manual refers to the operation of RAVAV-G regulator servomotor (series 227VM)

The display shows values in accordance with selected function. Apart from digital values, the square symbols located by the display right edge indicate the active flow unit (m³/h or l/s) of selected diagnostic function.

A specific function is selected using the function selection knob (3), and values for specific functions are selected using the value selection knob (2).

If no function is selected, the display will show three horizontal dashes (- - -).

After setting a desired value, its saving is confirmed with double blink of the displayed symbols.

Function selection:

1.FLOW function

Current flow in m³/h or l/s is displayed. The displayed value is consistent with the value of measurement signal U (2-10 VDC or 0-10 VDC). By turning the value selection knob, it is possible to choose between flow units (m³/h or l/s).

2.Vmin function

It enables to set the required minimum flow for the external lead signal Y=0 V or Y=2 V. By turning the value selection knob, it is possible to set the required V_{min}.

3.Vmax function

It enables to set the required maximum flow for the external lead signal Y=10 V. By turning the value selection knob, it is possible to set the required V_{max}.

4.MODE function

It enables to set the rotation direction (clockwise or counterclockwise) and the input range (0-10 V or 2-10 VDC) for lead signal Y. The range of measurement signal U corresponds to lead signal Y.

- 0 - n - 0-10 V, clockwise (CW)
- 0 - i - 0-10 V, counterclockwise (CCW)
- 2 - n - 2-10 V, clockwise (CW)
- 2 - i - 2-10 V, counterclockwise (CCW)

5.DIAG function

It activates the diagnostic menu. The external lead signal Y is omitted, actions are performed in accordance with the function chosen using the value selection knob. Diagnostic functions are automatically deactivated after 10 hours. In the Diag mode, the display blinks, showing the current flow for 8 seconds and the selected function for 2 seconds.

- **oP** full opening of damper
- **cL** full closing of damper
- **Hi** forcing of V_{max}
- **Lo** forcing of V_{min}
- **on** test mode ON – servomotor remains in current position
- **oFF** test mode OFF – servomotor operates in line with the external lead signal Y (the signal is presented as 0 – 100 x 10⁻¹ V)

6.Vnom function

It enables to set the V_{nom} value (nominal flow) which corresponds to the differential pressure of 86 Pa measured at the metering system (or another value depending on the maximum speed of air flow through the regulator). The value is factory-set and adjusted by the regulator manufacturer during calibration.

Rectangular VAV flow regulator

RAVAV-Q

Simens servomotor specification

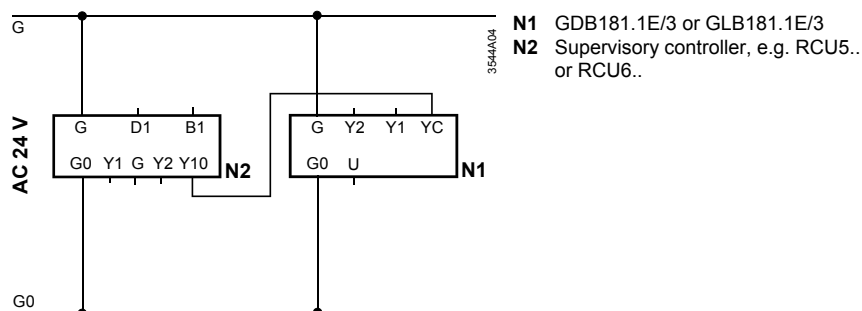
Symbol	GDB181.1E/3
Nominal voltage	24 V AC
Operating range	AC 24 V ±20 % / 50/60 Hz
Power consumption	2,5W (operation), 1,0 (standby)
Resistance class	III (safe voltage - low)
Casing insulation class	IP54
Electromagnetic compatibility	CE (2004/108/EG)
Ambient temperature	0 ... +50 °C
Ambient humidity	5 ... 95% % relative humidity, no condensation (as per EN 60730-1)
Maintenance	maintenance-free

It is also possible to provide regulators with actuators integrated for KNX, BACnet, MODBUS, RTU communication protocol.

Connection diagram

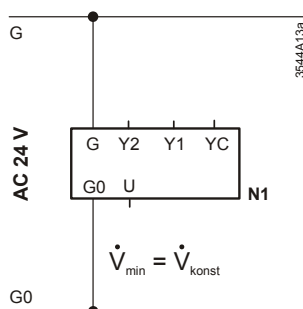
VAV

Supply / extract air control in operating mode "con"



CAV

Supply / extract air control in operating mode "con"



Complete shutoff in operating mode "con"

