Total Quality. Assured.

VAV TERMINAL UNIT

MADE IN VIETNAM
STARDUCT
ISO 9001-2015

STARDUCT

amca INTERNATIONAL

MEMBER

SINCE 2019

“ We sell superiority”

We have a long history of believing that hard working, professional manner and creativity are roots for oustanding products. We are selling not only national and international standard products but also our superiority.

The superiority of Star Asia Jsc., once again, is not only about high quality products but in reasonable price, innovative improvement and relationship with customers.

In order to bring benefits to all investors, contractors, applicators and end user, we have a great interest in maintaining close communication with prospects and customers to keep up with their needs and requirements in every particular project.

WHY CHOOSE STARDUCT ?

Right choice of product is a key for final effect. We give reasons and suggestions that help customer to make decision more easily and more sensibly.

Choosing product is not an easy job to M&E contractors and investors, especially when dealing with high-level technical products. Value of M&E maybe small in comparison with the entire value of a project but the role it plays is not small at all.

Knowing well this issue, Star Asia has been pondering much on how to improve quality, to shorten delivery time and to ease procedure, so that customers would be able to make final decision easily.

STARDUCT

Variety of products

Under Starduct brand is a large variety of product. In order to build up an good total quality system, it is neccessary to get uniform and compatible parts. Star Asia has been developing Starduct products as integral parts of one system so that customer can select products for their systems from one source. Starduct products include many sizes, types going together with compatibe fittings, fasteners, these help to increase reliability of entire system as well as to ease planning, purchasing, managing, maitaining, repairing and guaranteeing works.

Standards

On the direction of getting an world-class manufacturer, all Starduct products are developed based on highest standards of the industry. In fact, Starduct is one in small number domestic brands is highly appreciated by technical consultants, designers, big investors and is considered standardized brand in big project over the country.

Reliable quality

With modern production lines and facilities, strict control system, Starduct products have superior quality. Impotant point is, thanks to being design, tested, produced under high standards, quality of our products meet or surpass concerning national/international standards.
Starduct reliable quality is shown by long term guaranty with clear terms and conditions.

High effect

With a total system approach, Starduct is not in the price race. In the one hand, we try improving production to increase capacity, productivity, output for a lower cost. On the other hand, we consolidate our designing jobs, production process, quality control procedure... to ensure the total quality for the systems those applying Starduct product. We are receiving posive responses from most of our customers on the econo-technical effects brought by Starduct products.

Informativeness

Technical info. is the most important issue to architects, system designers and installation contractors. Starduct products always go with essetial neccessary information. These scientific and logical bases would help customers to consider and calculate the compliance of products before making the last decision. In addition, Star Asia is ready to give more details and relating technical information, so that applicators can keep peace in mind with their solutions.

Long term benefit

Beside the direct benefits from Starduct product and clear guaranty policy, our customers and partners can get additional advantages, that is supports and favours on price, consultancy, technique as well as collaboration in particular projects.
Caring about long term benefits is an topic that Star Asia trying to realize as much as possible because this concerning of our long term strategy. Thanks to this approach, Star Asia has successfully kept close relationship with partners in Vietnam and taken some optimistic paces to the global market.

VAV AND CAV SYSTEM

Brief description

CAV vs VAV HVAC Systems

Twenty to thirty years ago it was common practice to install a CAV (constant air volume) system in commercial buildings for ventilation and air-conditioning. These types of HVAC systems require high airflow rates and higher amounts of energy for heating and cooling. Thus, increasing utility costs. Therefore, the theory is, that you will achieve considerable energy savings by installing a VAV (variable air volume) system. However, the change is effective only if the entire system is adapted. So, let's compare CAV vs VAV HVAC systems.

CAV System

- A CAV unit operates the fan and compressor at full capacity until the temperature drops to a specified setting, then the compressor turns off. The on/off cycling is not efficient at keeping the space at a constant temperature.

- CAV systems are small and serve a single thermal zone. However, variations such as CAV with reheat, CAV multizone, and CAV primary-secondary systems have the ability to serve multiple zones and larger buildings.

- There are two types of CAV systems commonly used: the terminal reheat system and the mixed air system.

- The terminal reheat system cools the air in the air handling unit down within its zone of spaces. While it cools the air, it is inefficient and costly.

- The mixed air system has two air streams. One for the coldest and one for the hottest needed air temperature in the zone. The two air streams are strategically combined to offset the space's load. It works well to cool the air. However, it does not control humidity.

VAV Systems

- VAV Sytems were developed to meet the varying heating and cooling needs of different building zones. For example, a zone can be either a single room or a cluster of rooms all sharing the same heat gain, and heat loss characteristics.

- The system is efficient at dehumidifying the space.

- Also available in a multiple-zone system.
- The VAV (variable air volume) system is one of the most energy efficient ways for building air-handling system.

- Offers more precise temperature control as the fan speed varies depending on the temperature in the space. The compressor regulates the refrigerant flow to maintain a constant air temperature.

- The HVAC industry regards pressure independent VAV systems as the best HVAC system design available. This is a result of improvements in the terminal unit.

So, you might be wondering, what is the biggest difference between CVA vs VAV HVAC systems? Savings. You can save as much as 30 percent in energy costs with a VAV System. In addition, VAV systems are economical to install and to operate. If you have any questions about what type of system your building currently uses, or are interested in converting your old CAV system to a VAV system, contact STARDUCT. We can help you save money today!

STARDUCT VAV TERMINAL UNIT

General

Starduct VAV box is a high-tech product made by Star Asia, manufacturer of ancillary products for air-conditioning and air-ventiliation with almost 20 years of experience in Vietnam. Star Asia has high-technology facilities to fulfill the manufacture of products, with high quality sources of materials and accessories from industry-leading suppliers such as Belimo, Switzerland, for control systems; Nippon Steel, Japan, for ZAM plated steel; Bytronic, Switzerland, for CNC sheet metal processing technology and teams of engineering R&D, machinery and precision mechanical manufacturing with many years of experience. All of which work together to serve the purpose of delivering the highest quality product

The product, VAV (Variable Air Volume units), is manufactured at the Starduct Mechanical Factory and have participated in AHRI's certification program according to the AHRI standard 880(I-P) 2017 (Variable air volume terminals certification program).

Starduct VAV has been certified under the standard ISO7244 for rate of leakage from outer casing and blade. Certified under standard AS1217.2-1985 for noise and tested under ANSI/ASHREA 130-1996 of radiated and discharge sound power determination.

Materials

Case : 0.8 mm thickness by ZAM steel, 270g/m2 coating layer
Damper blade : Double layer 0.8mm thickness by ZAM steel, 270g/m2 coating layer with heat resistances silicone gasket.
Internal insulation : 25mm thickness acoustic foarm, black color.
Bearing : Brass
Shaft : Square steel bar 10*10mm
Differetial pressure sensor : Aluminum tube
Controler : Belimo

NIPPON STEEL

ZAM®

MATERIAL FOR THE 21st CENTURY

ZAM is hot-deep coating layer by Zinc, 6% Aluminumand 3% Magnesium alloy coated steel sheet

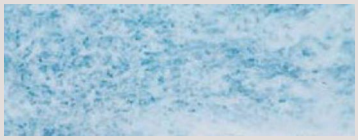
Excellent corrosion resistance

Base on the corrosion resistance, ZAM is higher than 10 to 20 times with hot-deep galvanized steel and 5 to 8 times with Zinc +5% aluminum coating layer (Compaired in salt spray test)

Corrosion resistane compaired on flat surfaces

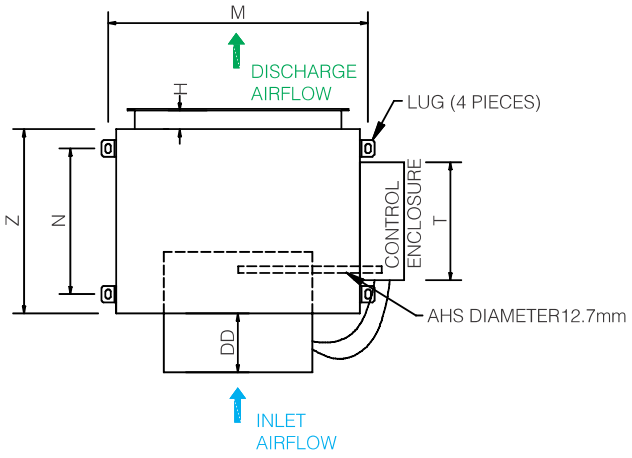
Hot-deep galvanized

ZAM™

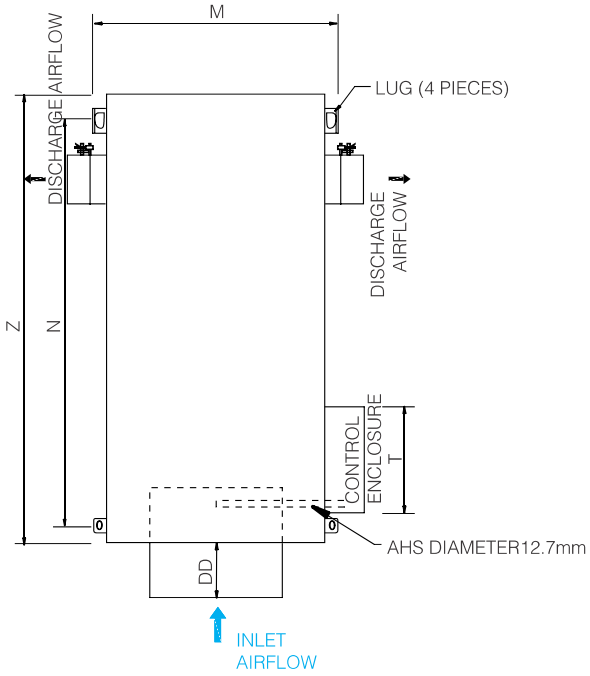


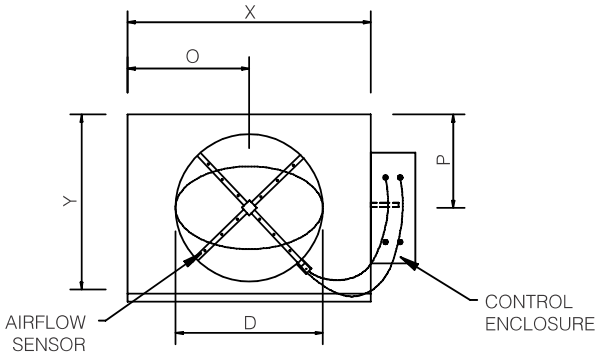
2500 hours salt spray test with both of samples 90/90g/m2

SVAV-S-T100 SINGLE DUCT TERMINAL UNIT(BASE)

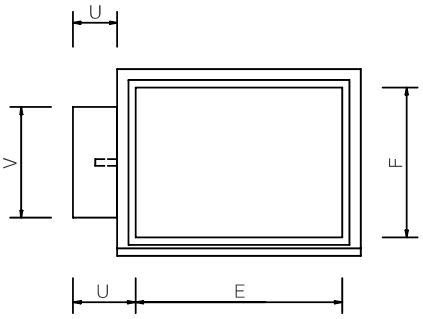


TOP VIEW





INLET VIEW



BOTTOM VIEW

DIMENSIONAL DETAILS

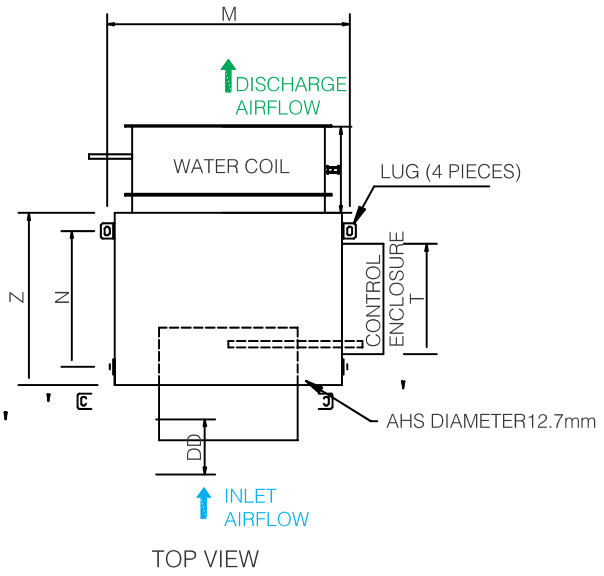
UNIT:mm

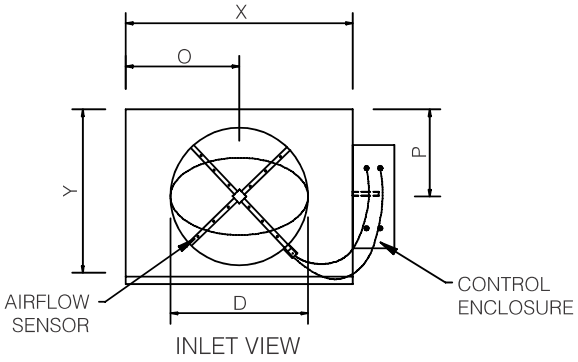
Type	Primary Airflow		DD	Box			Inlet	Discharge Outlet		O	P	Lug		H	Control Enclosure		
	Min (CMH)	Max (CMH)		X	Y	Z	D	E	F			M	N		T	U	V
SVAV-S-T100-05	102	612	160	270	280	400/910	125	220	230	135	140	310	327	45	460	120	250
SVAV-S-T100-06	153	880	160	270	280	400/910	150	220	230	135	140	310	327	45	460	120	250
SVAV-S-T100-07	204	1190	160	320	280	400/910	175	270	230	160	140	360	327	45	460	120	250
SVAV-S-T100-08	272	1560	160	320	280	400/910	200	270	230	160	140	360	327	45	460	120	250
SVAV-S-T100-09	374	1972	160	370	330	400/1200	225	320	280	185	165	410	327	45	460	120	250
SVAV-S-T100-10	425	2430	160	370	330	400/1200	250	320	280	185	165	410	327	45	460	120	250
SVAV-S-T100-12	612	3500	160	420	380	450/1200	300	370	330	210	190	460	377	45	460	120	250
SVAV-S-T100-14	816	4760	160	470	430	500/1500	350	420	380	235	215	510	427	45	460	120	250
SVAV-S-T100-16	1071	6232	160	520	480	500/1500	400	470	430	260	240	560	427	45	460	120	250

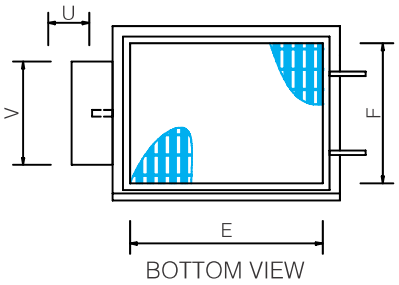
General notes:

- Internal insulation 25mm (1") 32 kg/m³ (2 lb) density coated to prevent air erosion.
- Galvanized steel housing.
- Mechanically seal-leak resistant construction.
- Rectangular discharge opening have drive and slip cleat duct connections as standard.
- Right hand control location standard, as shown above.
- Turbulent flow approaching the terminal will create additional noise, pressure drop and greater air flow variation. It is therefore recommended for optimum performance there should be a minimum of 4 duct diameters of straight inlet duct, same size as inlet, between the inlet and any transition, take off or fitting.

SVAV-S-T100 SINGLE DUCT TERMINAL UNIT(WATER COIL)







DIMENSIONAL DETAILS

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TERMINAL UNIT SELECTION DATA SHEET

Inlet Size	Air Flow		Basic Unit		With Atten		Min. △ ptbose Unit		Discharge NC Assembly △ ps, Across Unit			Discharge NC Assembly 914mm △ ps, Across Unit			Radiated NC Basic Assembly △ ps, Across Unit		
									0.5"W.G	1.5"W.G	3"W.G	0.5"W.G	1.5"W.G	3"W.G	0.5"W.G	1.5"W.G	3"W.G
in	CMH	CFM	*W.G	Pa	*W.G	Pa	*W.G	Pa	125Pa	375Pa	750Pa	125Pa	375Pa	750Pa	125Pa	375Pa	750Pa
05	102	60	0.01	2	0.01	2	0.06	15	–	–	–	–	–	–	–	–	–
	230	140	0.01	2	0.01	2	0.14	35	–	–	–	–	–	–	–	–	21
	425	250	0.01	2	0.01	2	0.25	62	–	–	24	–	–	–	20	24	27
	612	360	0.01	2	0.01	2	0.39	97	–	22	26	–	–	22	25	28	31
06	153	90	0.02	5	0.02	5	0.05	12	–	–	–	–	–	–	–	–	–
	381	225	0.05	11	0.05	11	0.12	30	–	–	21	–	–	–	–	–	21
	511	300	0.08	20	0.08	20	0.21	52	–	–	24	–	–	–	–	20	25
	637	375	0.13	31	0.13	31	0.33	82	–	21	27	–	–	22	–	23	27
	880	517	0.18	45	0.18	45	0.46	114	–	24	30	–	–	25	–	25	29
07	204	120	0.03	7	0.03	7	0.12	30	–	–	26	–	–	–	–	–	23
	561	330	0.05	12	0.05	12	0.20	50	–	23	29	–	–	21	–	22	26
	935	550	0.07	18	0.07	18	0.29	22	–	25	32	–	–	24	–	24	28
	1190	700	0.10	26	0.1	26	0.41	102	–	27	34	–	22	27	22	27	29
08	272	160	0.01	2	0.01	2	0.07	17	–	–	25	–	–	–	–	21	25
	849	500	0.01	2	0.01	2	0.10	25	–	20	28	–	–	–	–	23	28
	1018	600	0.01	2	0.01	2	0.15	37	–	23	30	–	–	22	–	26	30
	1188	700	0.01	2	0.01	2	0.20	50	–	24	32	–	–	24	20	27	32
	1560	920	0.01	2	0.01	2	0.25	62	–	25	32	–	–	24	22	29	33
09	374	220	0.01	2	0.01	2	0.06	15	–	22	31	–	–	22	–	–	25
	935	550	0.01	2	0.01	2	0.12	30	–	25	34	–	–	25	–	–	28
	1530	900	0.01	2	0.01	2	0.2	50	–	25	35	–	–	26	–	22	31
	1972	16	0.01	2	0.01	2	0.3	75	–	27	36	–	21	27	–	24	37
10	425	250	0.01	2	0.01	2	0.06	15	–	–	27	–	–	21	–	–	25
	1274	750	0.01	2	0.01	2	0.10	25	–	20	28/	–	–	22	–	–	27
	1612	950	0.01	2	0.01	2	0.15	37	–	22	30	–	–	24	–	22	29
	2430	1429	0.01	2	0.01	2	0.29	72	–	25	33	–	20	27	–	25	32
12	612	360	0.01	2	0.01	2	0.07	17	–	23	31	–	–	23	–	21	28
	2037	1200	0.01	2	0.01	2	0.11	27	–	25	32	–	–	26	–	23	30
	2548	1500	0.01	2	0.01	2	0.17	42	–	26	37	–	21	28	–	25	31
	3060	1800	0.01	2	0.01	2	0.24	60	–	27	35	–	23	30	–	26	363
	3500	2060	0.01	2	0.01	2	0.33	82	–	28	35	–	25	31	–	28	34
14	816	480	0.01	2	0.01	2	0.05	12	–	22	31	–	21	29	–	21	28
	2548	1500	0.01	2	0.01	2	0.10	25	–	25	34	–	23	31	–	26	32
	3398	2000	0.01	2	0.01	2	0.18	45	–	27	36	–	24	32	21	29	35
	4248	2500	0.01	2	0.01	2	0.27	67	–	29	38	–	25	34	24	32	37
	4760	2800	0.01	2	0.01	2	0.38	95	–	30	39	–	26	35	27	35	40
16	1071	630	0.01	2	0.01	2	0.06	15	–	22	30	–	20	28	–	23	30
	3398	2000	0.01	2	0.01	2	0.10	25	–	25	33	–	22	30	–	26	33
	4248	2500	0.01	2	0.01	2	0.16	40	–	27	35	–	24	32	22	30	35
	5097	3000	0.01	2	0.01	2	0.22	55	–	29	37	–	26	34	25	33	38
	5947	3500	0.01	2	0.01	2	0.30	75	–	31	40	–	27	35	28	36	41
	6232	3660	0.01	2	0.01	2	0.39	97	20	33	41	20	28	36	31	39	44

Rediated sound is based on a 16mm mineral fiber tile ceiling per ARI 855–998 typical cottenuation values. Discharged sound is based on enviornmetal effect, end reflection, flex duct effect, space effect, soumd Power, division and lined duct effect.

Total Deduction	Octave Band mid Frequency, Hz					
	125	250	500	1000	2000	4000
All size	18	19	20	26	31	36

Total Deduction	Octave Band mid Frequency, Hz					
	125	250	500	1000	2000	4000
<300CFM	24	28	39	53	59	40
300CFM–700CFM	27	29	40	51	53	39
>700CFM	29	30	41	51	52	39

1. Sound Power levels Lw dB re 10^{-12} watts
2. NC–Based on ARI 855–98
3. Dashes (–) indicate NC's less than 20
4. CFM–Cubic feet / minute
5. CMH–Cubic meter / hour
6. pa–Pressnre given in Pascals
7. "W.G.–inches of Water Gauge

TERMINAL UNIT DISCHARGE SOUND POWER LEVEL

Inlet Size	Air Flow		125Pa(0.5"WG)						250Pa(1.0"WG)						500Pa(2.0"WG)						750Pa(3.0"WG)					
			Octave Band						Octave Band						Octave Band						Octave Band					
in	CMH	CFM	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
05	102	60	48	44	40	38	37	32	51	47	47	43	44	39	54	51	52	49	50	46	56	53	55	51	53	51
	230	140	55	52	46	43	40	35	57	53	52	48	47	42	80	57	57	53	53	50	62	60	59	56	56	54
	425	250	59	57	50	46	42	37	61	58	55	57	49	45	64	62	62	56	55	52	66	64	63	59	59	56
	612	360	62	61	53	49	44	39	65	61	58	54	50	46	67	65	62	59	56	53	69	67	65	61	60	58
06	153	90	47	43	36	37	34	27	51	48	41	42	41	35	55	53	47	48	47	43	57	56	50	51	51	47
	381	225	52	48	41	41	37	30	55	53	47	46	44	38	59	58	52	52	50	45	62	61	56	55	54	50
	511	300	54	52	45	44	39	32	58	57	51	49	46	40	62	62	56	55	52	47	65	65	60	58	56	52
	637	375	57	55	48	46	41	33	61	60	54	52	47	41	65	65	59	57	54	49	67	68	63	61	57	53
	880	517	59	57	51	48	42	35	63	62	56	54	49	42	67	67	62	59	55	50	69	70	65	62	59	54
07	204	120	51	49	41	41	38	34	55	55	48	47	44	41	59	60	55	52	51	48	61	63	59	56	55	52
	561	330	54	53	45	44	40	36	58	58	52	49	46	43	60	64	58	55	53	50	64	67	63	59	57	54
	935	550	59	58	50	47	42	39	62	63	57	53	49	46	66	69	64	59	55	53	68	72	68	62	59	57
	1190	700	60	58	52	49	43	40	64	65	59	54	50	47	67	70	65	60	56	54	70	74	69	64	60	58
08	272	160	53	51	44	42	39	35	57	57	51	48	45	42	61	63	58	54	52	49	64	66	62	57	56	54
	849	500	55	53	46	44	40	36	59	59	53	50	47	43	63	65	60	56	53	51	66	68	64	59	57	55
	1018	600	57	54	48	46	41	37	61	61	55	51	47	44	65	67	62	57	54	52	67	70	66	61	58	56
	1188	700	58	56	50	47	42	38	62	62	57	53	48	45	66	68	64	59	55	53	69	72	68	62	59	57
	1560	920	60	57	51	48	42	39	64	63	58	54	49	46	68	69	65	60	55	53	70	73	70	63	59	58
09	374	220	56	52	45	44	40	37	60	59	54	51	48	45	64	67	62	58	56	53	57	71	67	62	60	57
	935	550	58	54	47	46	42	39	63	61	56	53	50	47	67	69	64	61	57	56	69	74	69	65	62	59
	1530	900	60	55	49	48	43	40	64	63	57	56	51	48	69	71	66	62	58	56	71	75	71	67	63	60
	1972	1160	62	56	50	49	44	41	66	64	58	57	51	49	70	72	67	64	59	57	73	76	72	68	64	61
10	475	250	55	51	48	47	44	40	59	57	55	52	51	48	63	64	61	57	57	55	66	67	65	59	61	59
	1274	750	57	53	50	49	45	41	61	59	57	54	52	49	66	66	63	59	58	56	68	70	67	65	65	61
	1612	950	59	55	52	51	46	42	63	61	58	56	53	50	68	68	65	61	59	57	70	71	69	64	63	62
	1954	1150	61	56	53	52	47	43	65	63	60	57	53	50	69	69	66	62	60	58	72	73	70	65	64	62
	2430	1429	62	57	54	54	47	44	66	64	61	58	54	51	71	70	67	63	60	58	73	74	71	66	64	63
12	612	360	56	55	52	48	44	40	61	62	58	54	51	47	66	68	64	60	57	53	69	72	68	64	61	57
	2037	1200	59	57	53	50	46	42	64	63	60	56	52	48	59	70	66	62	59	55	72	73	70	66	63	59
	2548	1500	61	57	55	51	47	43	67	64	61	57	54	50	72	71	68	64	61	57	75	74	71	67	65	60
	3060	1800	63	58	56	53	48	45	68	65	62	59	55	51	74	71	69	65	62	58	77	75	72	69	66	62
	3500	2060	65	59	57	54	50	46	70	65	63	60	56	52	75	72	70	66	63	59	78	76	73	70	67	63
14	816	480	55	53	48	46	42	38	62	60	54	53	49	45	68	67	60	59	56	51	72	72	63	63	59	55
	2548	1500	59	55	52	49	45	41	63	63	58	55	52	48	72	70	64	62	59	55	75	74	68	66	62	58
	3398	2000	62	57	56	50	48	43	68	65	62	57	54	50	74	72	68	64	61	57	78	76	71	68	65	61
	4248	2500	64	59	58	52	49	45	70	66	64	59	56	52	76	73	70	66	62	59	80	78	74	70	66	63
	4760	2800	65	60	60	53	51	47	71	67	66	60	57	53	78	75	72	67	64	60	82	78	76	71	68	64
16	1071	630	59	53	51	48	45	40	65	60	57	55	52	47	71	67	62	62	59	54	75	71	66	66	63	58
	3398	2000	62	56	55	50	47	42	68	63	60	57	54	49	75	70	66	64	61	56	78	74	69	68	65	60
	4248	2500	64	58	58	51	49	44	71	65	63	58	56	51	77	72	69	65	62	58	81	76	72	69	66	62
	5097	3000	66	59	60	53	50	46	73	66	66	60	57	53	79	73	71	67	64	59	83	77	75	71	68	64
	5948	3500	68	61	62	54	51	47	74	67	68	61	58	54	81	74	73	68	65	61	84	78	77	72	69	65
	6232	3660	70	62	64	55	52	48	76	69	69	62	59	55	82	75	75	59	66	62	86	79	78	73	70	66

1. Sound Power levels Lw dB re 10^{-12} watts
2. NC–Based on ARI 855–98
3. Dashes (–) indicate NC's less than 20
4. CFM–Cubic feet / minute
5. CMH–Cubic meter / hour
6. pa–Pressnre given in Pascals
7. "W.G.–inches of Water Gauge

TERMINAL UNIT DISCHARGE SOUND POWER LEVEL WITH 914MM

Inlet Size	Air Flow		125Pa(0.5"WG)						250Pa(1.0"WG)						500Pa(2.0"WG)						750Pa(3.0"WG)					
			Octave Band						Octave Band						Octave Band						Octave Band					
in	CMH	CFM	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
05	102	60	48	43	36	28	–	–	48	45	40	32	23	–	51	47	44	57	29	20	52	48	47	39	32	25
	230	140	54	51	41	33	21	–	56	53	46	38	27	–	57	55	50	42	33	24	58	56	53	45	36	28
	425	250	59	56	45	37	24	–	67	58	50	42	30	–	62	60	54	46	36	28	63	61	56	49	39	31
	612	360	62	60	48	40	26	–	63	62	52	44	32	21	65	64	57	49	38	28	66	65	59	52	41	32
06	153	90	47	40	37	28	–	–	50	45	42	33	25	–	53	49	47	38	31	23	55	52	50	41	35	27
	381	225	51	46	41	32	21	–	54	50	46	37	27	–	57	54	51	42	33	25	59	57	54	45	37	29
	511	300	54	49	44	35	22	–	57	54	49	40	29	–	60	58	54	45	35	27	62	61	57	48	39	31
	637	375	56	52	47	37	23	–	59	56	52	42	30	20	62	61	57	47	36	28	64	63	60	50	40	33
	880	517	58	54	49	39	25	–	61	59	54	44	31	22	64	63	59	49	37	29	66	66	62	52	41	34
07	204	120	48	44	37	31	20	–	52	48	43	36	27	25	55	53	50	41	33	32	57	56	54	44	37	37
	561	330	52	48	41	35	23	–	56	53	48	40	29	26	59	57	54	45	36	34	61	59	58	48	39	38
	935	550	58	54	47	40	26	21	61	59	53	46	33	28	64	63	60	51	39	35	66	65	63	54	43	39
	1190	700	60	56	49	42	27	21	63	61	55	48	34	29	66	65	62	53	40	36	58	68	65	56	44	40
08	272	160	52	47	41	35	26	–	55	52	48	41	32	25	59	56	54	46	38	32	61	59	58	49	42	36
	849	500	54	50	43	38	27	–	58	54	50	43	33	27	61	59	56	48	40	34	63	61	60	51	43	38
	1018	600	56	52	45	39	28	21	59	56	51	44	35	28	63	61	57	50	41	35	65	63	61	53	44	39
	1188	700	57	53	46	41	29	22	61	58	52	46	36	29	64	62	59	51	42	36	66	65	62	54	45	40
	1560	920	58	55	47	42	30	23	62	59	54	47	36	30	66	64	60	52	43	37	68	66	64	55	46	41
09	374	220	54	49	45	38	29	25	58	54	51	43	36	32	61	60	58	48	42	40	64	64	62	51	46	44
	935	550	57	51	47	41	31	27	60	57	53	46	38	34	64	63	60	51	44	41	66	66	64	54	48	46
	1530	900	59	53	48	44	33	28	62	59	55	49	39	36	66	64	62	54	46	43	68	88	66	57	49	47
	1972	1160	60	54	50	46	34	29	64	60	56	51	40	37	67	66	63	56	57	44	70	68	67	58	51	48
10	475	250	53	47	45	38	30	30	57	53	51	43	37	33	61	59	58	49	43	35	64	62	61	52	47	37
	1274	750	56	49	47	41	32	32	60	55	53	46	38	34	64	61	60	51	45	37	66	65	63	54	48	39
	1612	950	58	51	48	43	34	33	62	57	55	48	40	36	66	63	61	53	46	39	69	66	65	56	50	40
	1954	1150	59	53	49	44	35	34	65	59	56	49	41	37	68	64	62	54	47	40	70	68	66	58	51	41
	2430	1429	61	54	50	45	35	35	65	60	57	51	42	38	69	66	63	56	48	41	72	69	67	59	52	42
12	612	360	54	51	49	42	36	31	58	57	55	48	41	38	62	62	62	53	47	45	65	65	66	57	51	49
	2037	1200	57	53	51	44	37	33	61	59	57	50	43	40	66	64	64	55	49	47	68	68	68	59	53	51
	2548	1500	59	55	52	46	39	35	64	61	59	51	45	41	68	66	65	57	51	48	71	70	69	60	54	52
	3060	1800	61	57	53	47	40	36	65	62	60	53	46	43	70	68	67	58	52	50	72	71	70	62	55	54
	3500	2060	63	58	54	48	41	37	67	63	61	54	47	44	72	69	68	60	53	51	74	72	71	63	56	55
14	816	480	58	53	46	42	37	33	64	59	53	48	43	40	69	66	59	53	49	46	73	70	62	57	52	50
	2548	1500	61	54	50	45	40	36	66	61	56	50	46	42	72	68	62	56	52	49	75	72	66	59	53	53
	3398	2000	62	56	52	46	42	37	68	62	58	52	47	44	73	69	64	58	53	50	76	73	68	61	57	54
	4248	2500	63	57	54	48	43	39	69	63	60	53	49	45	74	70	66	59	56	52	77	74	70	62	58	56
	4760	2800	64	57	56	49	44	40	70	64	62	54	50	46	75	71	68	60	56	53	78	75	71	53	59	57
16	1071	630	58	52	49	45	41	34	63	59	55	51	47	42	69	66	60	56	53	49	73	70	64	60	57	53
	3398	2000	60	54	52	47	43	36	66	61	58	53	49	44	71	68	63	58	55	51	75	72	66	61	59	55
	4248	2500	62	56	54	48	44	38	67	62	60	54	50	45	73	69	65	60	56	52	77	73	68	63	60	57
	5097	3000	63	57	56	50	45	39	69	54	61	55	51	46	75	70	67	61	57	51	78	74	70	64	61	58
	5948	3500	64	58	57	51	46	40	70	65	63	56	32	47	76	71	68	62	58	55	79	75	71	65	62	59
	6232	3660	65	59	59	51	47	41	71	65	64	57	53	48	77	72	70	63	59	56	80	76	73	66	63	60

1. Sound Power levels Lw dB re 10^{-12} watts
2. NC–Based on ARI 855–98
3. Dashes (–) indicate NC's less than 20
4. CFM–Cubic feet / minute
5. CMH–Cubic meter / hour
6. pa–Pressnre given in Pascals
7. "W.G.–inches of Water Gauge

TERMINAL UNIT DISCHARGE SOUND POWER LEVEL WITH 1500MM

Inlet Size	Air Flow		125Pa(0.5"WG)						250Pa(1.0"WG)						500Pa(2.0"WG)						750Pa(3.0"WG)					
			Octave Band						Octave Band						Octave Band						Octave Band					
in	CMH	CFM	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
05	102	60	47	40	36	25	–	–	50	43	46	30	20	–	52	47	45	35	26	–	54	49	48	38	30	–
	230	140	52	45	41	30	–	–	55	49	45	35	23	–	58	53	50	40	29	–	59	55	53	43	33	–
	425	250	56	49	44	34	–	–	59	53	49	38	25	–	61	57	53	43	31	–	63	59	56	46	36	–
	612	360	59	52	46	36	21	–	61	56	51	41	27	–	64	60	56	46	33	–	65	62	56	49	36	–
06	153	90	47	39	34	24	–	–	50	43	40	29	–	–	53	47	45	35	26	–	54	50	48	38	30	–
	381	225	51	44	39	28	–	–	54	48	44	33	22	–	56	52	49	39	28	–	58	55	51	42	32	–
	511	300	53	47	42	31	–	–	56	52	47	36	23	–	59	56	52	41	29	–	61	58	55	45	33	–
	637	375	56	50	44	33	–	–	58	54	49	38	24	–	61	59	54	44	31	–	63	61	57	47	34	21
	880	517	57	52	46	35	–	–	60	57	51	40	25	–	63	61	56	45	31	–	65	63	59	48	35	22
07	204	120	49	42	37	28	–	–	52	47	43	31	–	–	56	51	48	37	26	21	58	54	51	43	30	26
	561	330	52	46	41	32	–	–	56	51	46	36	–	–	60	56	51	41	28	24	62	59	54	44	32	29
	935	550	57	52	46	37	–	–	61	57	51	41	23	20	65	62	56	46	30	28	67	64	59	49	36	33
	1190	700	60	54	47	38	–	–	63	59	53	43	24	22	67	64	56	48	31	30	59	67	61	52	36	34
08	272	160	52	45	40	32	–	–	55	50	46	37	25	–	59	55	52	42	32	25	61	58	56	45	36	27
	849	500	54	48	42	34	–	–	58	53	48	39	26	20	61	58	64	44	33	27	63	60	58	47	37	31
	1018	600	56	50	44	36	21	–	60	55	50	41	27	22	63	60	56	46	34	28	65	62	59	49	37	32
	1188	700	58	51	45	37	21	–	65	56	51	42	28	23	65	61	57	47	34	29	67	64	60	50	38	33
	1560	920	59	53	46	38	22	–	63	58	52	43	28	24	66	63	58	48	35	30	68	65	61	51	39	34
09	374	220	52	45	43	33	21	–	56	51	49	38	28	26	59	57	55	44	36	33	61	60	59	47	39	37
	935	550	55	48	45	36	22	20	59	54	51	42	29	28	63	60	58	47	36	36	65	63	61	50	40	39
	1530	900	58	51	47	39	23	22	61	56	53	44	30	29	65	62	59	49	37	36	67	65	63	52	41	41
	1972	1160	60	52	48	40	23	23	63	58	54	46	30	30	67	64	60	51	38	37	69	67	64	54	42	42
10	936	550	52	46	42	33	22	–	56	51	49	38	28	26	59	56	56	44	35	33	62	59	59	47	38	36
	1274	750	55	49	44	36	33	22	59	54	51	41	30	28	62	59	58	47	36	35	65	62	61	50	40	38
	1612	950	57	51	46	38	25	23	61	56	53	43	61	30	65	61	59	49	37	36	67	64	63	52	41	40
	1954	1150	59	52	47	40	25	24	63	57	54	45	32	31	67	63	60	50	38	37	69	66	64	53	42	41
	2430	1429	61	54	48	41	26	25	64	59	55	46	33	32	68	64	61	52	39	38	70	67	65	55	43	42
12	612	360	54	52	48	39	27	25	58	57	55	45	34	32	61	62	61	51	41	38	63	65	65	55	45	42
	2037	1200	57	54	50	41	29	27	61	59	57	47	36	34	65	64	63	53	43	40	67	67	67	57	47	44
	2548	1500	60	56	51	43	31	29	63	61	58	49	37	35	67	66	64	55	44	42	69	69	68	59	48	46
	3060	1800	62	58	52	44	32	30	65	63	59	50	39	37	69	68	66	56	45	43	71	71	69	60	50	47
	3500	2060	63	59	53	45	33	31	67	64	60	51	39	38	71	70	66	57	46	44	73	72	70	61	50	48
14	816	480	58	53	46	38	29	29	64	59	52	43	35	35	69	66	58	49	42	42	73	70	61	52	46	46
	2548	1500	61	54	49	41	32	31	66	61	55	46	38	38	72	68	61	52	45	44	75	72	65	55	48	48
	3398	2000	62	56	52	43	34	33	68	62	58	48	40	40	73	69	64	54	47	46	76	73	68	58	50	50
	4248	2500	63	57	54	44	35	35	69	63	60	50	42	41	74	70	66	56	48	48	77	74	70	59	52	52
	4760	2800	64	57	56	46	37	36	70	64	62	51	43	42	75	71	68	57	49	49	78	75	71	61	53	53
16	1071	630	58	52	49	41	34	29	63	59	55	47	40	36	69	66	1	54	47	43	73	70	64	57	51	48
	3398	2000	60	54	52	43	36	31	66	61	58	50	42	38	71	68	64	56	49	46	75	72	67	59	53	50
	4248	2500	62	56	54	45	37	33	67	62	60	51	44	40	73	69	66	57	51	48	77	73	69	61	55	52
	5097	3000	63	57	56	46	39	35	69	64	62	52	45	42	75	70	68	69	52	49	78	74	71	62	56	54
	5948	3500	64	58	57	48	40	36	70	65	63	54	46	43	76	71	69	60	53	51	79	75	73	53	56	77
	6232	3660	65	59	59	48	41	37	71	65	65	55	47	44	77	72	71	61	54	52	80	76	74	64	58	56

1. Sound Power levels Lw dB re 10^{-12} watts
2. NC–Based on ARI 855–98
3. Dashes (–) indicate NC's less than 20
4. CFM–Cubic feet / minute
5. CMH–Cubic meter / hour
6. pa–Pressnre given in Pascals
7. "W.G.–inches of Water Gauge

TERMINAL UNIT RADIATED SOUND POWER LEVEL

Inlet Size	Air Flow		125Pa(0.5"WG)						250Pa(1.0"WG)						500Pa(2.0"WG)						750Pa(3.0"WG)					
			Octave Band						Octave Band						Octave Band						Octave Band					
in	CMH	CFM	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
05	102	60	47	35	29	23	–	–	49	38	33	27	23	20	51	41	37	32	29	27	52	42	39	34	37	31
	230	140	54	41	34	28	22	–	56	44	38	32	28	24	58	47	42	37	34	31	59	49	44	30	37	35
	425	250	58	46	38	31	25	–	60	49	42	36	31	26	62	51	46	40	37	33	63	53	48	43	40	37
	612	360	62	49	41	34	28	21	64	52	45	38	33	28	66	55	48	43	39	35	67	56	51	45	42	39
06	153	90	47	35	31	25	20	–	50	39	35	29	26	22	53	43	38	34	32	28	55	45	40	37	36	32
	381	225	50	40	36	29	24	–	54	44	39	34	30	25	57	48	43	38	36	31	59	50	45	41	39	35
	511	300	53	43	39	32	26	20	56	47	43	27	32	26	60	51	46	41	38	33	62	53	49	44	42	36
	637	375	55	45	42	34	28	22	58	49	45	39	34	28	62	53	49	43	40	34	64	56	51	46	43	38
	880	517	57	48	44	36	29	23	60	51	47	41	35	29	64	55	51	45	42	35	65	58	53	48	45	39
07	204	120	50	37	31	28	22	–	52	43	37	32	26	20	54	47	42	36	30	26	56	50	46	38	33	29
	561	330	53	41	34	31	25	–	56	45	40	35	29	24	58	50	46	39	34	29	58	59	49	41	36	32
	935	550	58	45	38	35	30	23	60	50	44	39	34	28	62	55	50	43	38	33	64	58	53	45	41	36
	1190	700	62	47	40	37	32	24	62	52	46	42	36	29	64	58	51	46	41	34	65	80	55	47	42	37
08	272	160	53	41	34	29	25	24	57	46	40	35	31	32	60	51	46	40	37	40	62	54	49	43	41	44
	849	500	55	44	36	31	26	25	59	49	42	37	32	32	62	54	48	42	39	40	64	56	51	45	42	45
	1018	600	57	46	38	33	27	25	60	51	43	38	33	33	64	56	49	43	40	41	66	58	53	47	43	46
	1188	700	58	47	39	34	28	25	62	52	45	39	34	33	65	57	51	45	41	41	67	60	54	48	44	46
	1560	900	60	49	40	35	29	26	63	54	46	41	35	34	67	59	52	46	41	42	69	62	55	49	45	46
09	374	220	50	37	32	27	21	–	54	45	39	33	28	26	57	52	46	40	34	33	59	56	50	44	38	37
	935	550	52	40	34	30	24	20	56	47	41	36	32	27	59	55	49	43	36	34	61	59	53	46	40	38
	1530	900	50	42	36	32	25	21	57	49	43	38	32	28	61	57	50	45	38	35	63	61	55	48	42	39
	1972	1160	56	44	39	34	27	23	58	51	45	40	38	29	63	58	52	47	40	36	64	64	56	51	48	39
10	936	550	50	39	32	26	23	22	53	46	39	32	27	27	57	52	46	37	32	33	59	56	50	41	35	36
	1274	750	52	42	35	29	25	23	55	48	42	34	30	29	59	54	48	40	35	34	61	58	52	43	38	38
	1612	950	53	43	37	31	27	24	57	50	44	37	32	30	61	56	50	2	37	35	63	60	54	45	39	39
	1954	1150	55	45	39	33	29	25	58	51	45	38	33	31	62	57	52	44	38	36	64	61	56	47	41	40
	2430	1427	56	46	40	34	30	26	59	52	47	40	35	32	63	59	53	45	40	37	65	62	57	48	42	40
12	612	360	49	44	37	31	24	20	53	49	43	37	29	25	58	55	50	42	34	30	60	58	53	45	37	33
	2037	1200	52	45	39	34	27	22	56	51	45	40	32	27	61	57	52	45	37	32	63	60	55	48	40	35
	2548	1500	54	47	41	36	30	24	59	52	47	42	35	29	63	58	53	47	40	34	65	51	47	50	43	37
	3060	1800	56	48	42	38	32	26	61	53	48	43	37	31	65	59	54	49	42	36	67	62	58	52	45	39
	3500	2060	58	49	43	40	34	27	62	54	49	45	39	32	66	60	55	50	44	37	69	63	59	53	47	40
14	816	480	52	44	35	30	22	–	56	50	40	35	28	22	59	55	45	40	33	28	62	59	48	43	36	31
	2548	1500	56	47	41	34	28	22	60	53	46	40	33	28	64	59	51	45	38	33	66	62	56	48	41	36
	3398	2000	59	49	45	38	32	26	63	55	51	43	37	31	66	61	56	48	42	37	69	65	59	51	45	40
	4248	2500	61	51	49	40	35	29	65	57	54	56	40	34	69	63	59	51	45	40	71	66	62	54	48	43
	4760	2800	63	52	51	42	38	31	67	58	57	48	43	36	71	64	62	53	48	42	73	68	65	56	51	45
16	1071	630	54	46	39	34	29	25	58	52	44	39	34	30	61	57	48	44	39	35	64	60	51	47	31	37
	3398	2000	57	48	44	38	33	28	61	54	49	43	38	33	64	60	53	47	43	38	67	63	56	50	45	41
	4248	2500	59	50	48	41	37	31	63	56	53	45	41	36	67	61	57	50	46	41	69	65	60	53	48	44
	5097	3000	61	52	51	43	39	33	65	57	56	47	44	38	69	63	60	52	48	43	71	66	63	55	51	46
	5948	3500	63	53	54	45	41	35	57	59	58	49	46	40	70	64	63	54	50	45	73	68	66	57	53	48
	6232	3660	64	54	56	46	43	27	68	60	61	51	48	42	72	65	65	56	52	47	74	69	68	58	55	50

1. Sound Power levels Lw dB re 10^{-12} watts
2. NC–Based on ARI 855–98
3. Dashes (–) indicate NC's less than 20
4. CFM–Cubic feet / minute
5. CMH–Cubic meter / hour
6. pa–Pressnre given in Pascals
7. "W.G.–inches of Water Gauge

TERMINAL UNIT HEAT WATER COIL DATA (Kw)

Type	Rows	Coil	HD Loss	Airflow(CMH)					
		L/s	KPa	212	299	338	425	594	680
SVAV-S-T100-05 SVAV-S-T100-06	1	0.03	0.39	1.64	1.90	1.99	2.17	2.43	2.52
		0.06	1.46	1.82	2.17	2.29	2.52	2.90	3.05
		0.13	5.56	1.96	2.34	2.49	2.78	3.22	3.40
		0.19	12.22	1.99	2.40	2.58	2.87	3.34	3.55
		Through the Coil, △ ps		4.98	7.47	9.95	12.44	24.88	29.86
	2	0.06	0.36	2.72	3.28	3.52	3.93	4.54	4.78
		0.13	1.40	2.99	3.66	3.99	4.48	5.33	5.69
		0.25	5.35	3.14	3.93	4.25	4.86	5.86	6.30
		0.38	11.72	3.19	4.02	4.37	5.01	6.10	6.54
		Through the Coil, △ ps		9.95	17.42	19.91	29.86	52.26	64.70

Type	Rows	Coil	HD Loss	Airflow(CMH)					
		L/s	KPa	338	511	680	1019	1188	1361
SVAV-S-T100-07 SVAV-S-T100-08	1	0.03	0.51	2.29	2.67	2.93	3.28	3.43	3.55
		0.06	1.97	2.61	3.14	3.55	4.10	4.31	4.48
		0.13	7.47	2.84	3.46	3.96	4.69	4.95	5.22
		0.19	16.38	2.93	3.60	4.13	4.92	5.25	5.51
		Through the Coil, △ ps		4.98	9.95	17.42	37.33	47.28	59.72
	2	0.06	0.51	3.93	4.78	5.42	6.30	6.62	0.92
		0.13	1.91	4.40	5.54	6.42	7.74	8.62	8.70
		0.25	7.26	4.69	6.04	7.12	8.76	9.44	10.02
		0.38	15.90	4.81	6.21	7.39	9.17	9.94	10.58
		Through the Coil, △ ps		12.44	24.88	39.81	79.63	102.02	126.91

Type	Rows	Coil	HD Loss	Airflow(CMH)					
		L/s	KPa	511	850	1188	1530	1699	1868
SVAV-S-T100-09 SVAV-S-T100-10	1	0.06	0.33	3.49	4.28	4.78	5.16	5.30	5.45
		0.13	1.26	3.96	4.98	5.71	6.24	6.48	6.68
		0.25	4.81	4.25	5.45	6.33	7.03	7.33	7.59
		0.38	10.52	4.37	5.66	6.59	7.36	7.68	7.97
		Through the Coil, △ ps		4.98	14.93	24.88	37.33	47.28	54.74
	2	0.06	0.69	5.48	6.89	7.80	8.44	8.70	8.94
		0.13	2.63	6.33	8.32	9.73	10.81	11.25	11.66
		0.25	9.98	6.86	9.29	11.14	12.57	13.19	13.77
		0.38	21.82	7.06	9.70	1.89	13.31	14.01	14.65
		Through the Coil, △ ps		12.44	29.96	54.74	82.12	97.05	114.47

Type	Rows	Coil	HD Loss	Airflow(CMH)					
		L/s	KPa	680	1018	1300	2037	2379	2718
SVAV-S-T100-12	1	0.06	0.45	4.57	5.33	5.86	6.59	6.86	7.09
		0.13	1.67	5.25	6.30	7.06	8.18	8.62	9.00
		0.25	6.34	5.89	6.95	7.91	8.35	9.94	10.43
		0.38	13.84	5.86	7.21	8.24	9.85	10.46	11.02
		Through the Coil, △ ps		4.98	9.95	17.43	37.33	47.28	59.72
	2	0.06	0.93	6.95	8.26	9.14	10.32	10.73	11.08
		0.13	3.47	8.24	10.20	11.66	13.75	14.54	15.21
		0.25	13.06	9.06	11.55	13.48	16.44	17.58	18.58
		0.38	28.48	9.48	12.07	14.24	17.55	18.90	20.08
		Through the Coil, △ ps		12.44	24.88	39.81	79.63	102.02	126.91

TERMINAL UNIT HEAT WATER COIL DATA (Kw)

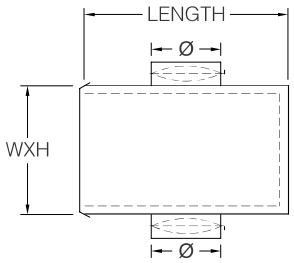
Type	Rows	Coil	HD Loss	Airflow(CMH)					
		L/s	KPa	1018	1090	2379	3080	3398	3736
SVAV-S-T100-14	1	0.06	0.60	6.30	7.47	8.24	8.76	8.97	9.14
		0.13	2.27	7.47	9.26	10.46	11.37	11.72	12.07
		0.25	8.58	8.24	10.46	12.10	13.36	13.89	14.36
		0.38	18.71	8.56	11.02	12.78	14.18	14.80	15.36
		Through the Coil, △ ps		4.98	14.93	24.88	37.33	47.28	54.74
	2	0.09	0.99	10.35	12.78	14.27	15.33	15.74	16.12
		0.19	3.80	12.25	15.94	18.49	20.40	21.19	21.89
		0.38	14.50	13.48	18.17	21.63	24.35	25.53	26.58
		0.57	31.83	13.95	19.08	22.95	26.02	27.37	28.60
		Through the Coil, △ ps		12.44	29.86	54.74	82.12	97.05	114.47

Type	Rows	Coil	HD Loss	Airflow(CMH)					
		L/s	KPa	1360	2037	2718	3398	4078	4755
SVAV-S-T100-16	1	0.06	0.69	7.50	8.53	9.20	9.70	10.11	10.40
		0.13	2.57	9.17	10.79	11.93	12.84	13.54	14.16
		0.25	9.71	10.29	12.40	13.98	15.27	16.29	17.20
		0.38	21.16	10.73	13.07	14.86	16.29	17.50	18.52
		Through the Coil, △ ps		7.47	14.93	22.40	34.84	47.28	58.72
	2	0.09	1.11	12.40	14.45	15.80	16.76	17.53	18.08
		0.19	4.18	15.15	18.49	20.93	22.77	24.27	25.50
		0.38	15.99	17.00	21.42	24.79	27.56	29.81	31.74
		0.57	35.12	17.73	22.60	26.44	29.57	32.24	34.55
		Through the Coil, △ ps		14.93	29.86	49.77	72.16	97.05	126.91

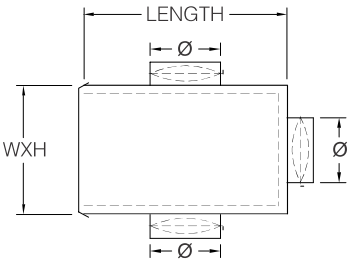
Correction Factors – Hot Water Coils									
		Entering water temperature, ℃							
		49	54	60	66	71	77	82	88
Entering Air Temp℃	10	0.54	0.62	0.71	0.79	0.87	0.96	1.04	1.12
	13	0.50	0.58	0.67	0.75	0.83	0.92	1.00	1.08
	16	0.47	0.55	0.63	0.71	0.79	0.88	0.96	1.04
	18	0.43	0.51	0.59	0.67	0.75	0.84	0.92	1.00

AIR TERMINALS WITH MULTIPLE OUTLET PLENUM ARRANGEMENT

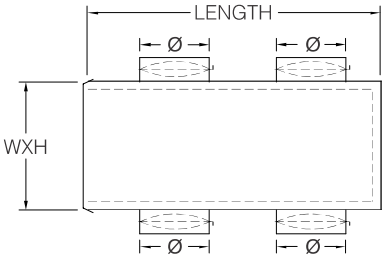
S-MOA-A,B,C,D,E,F



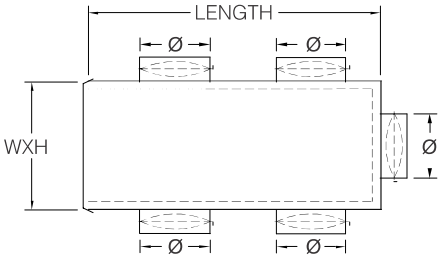
ARRANGEMENT–A



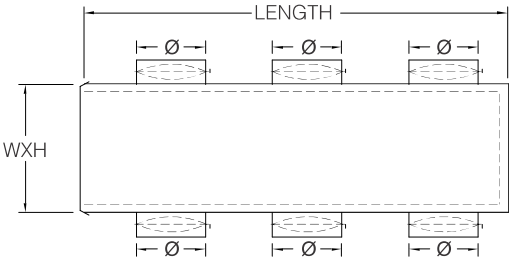
ARRANGEMENT–B



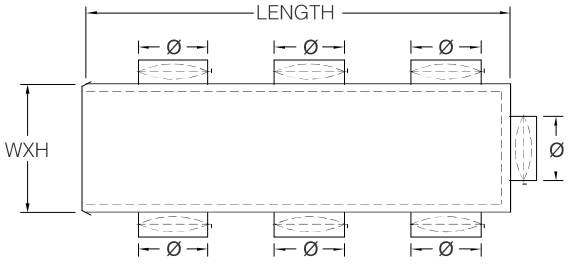
ARRANGEMENT–C



ARRANGEMENT–D



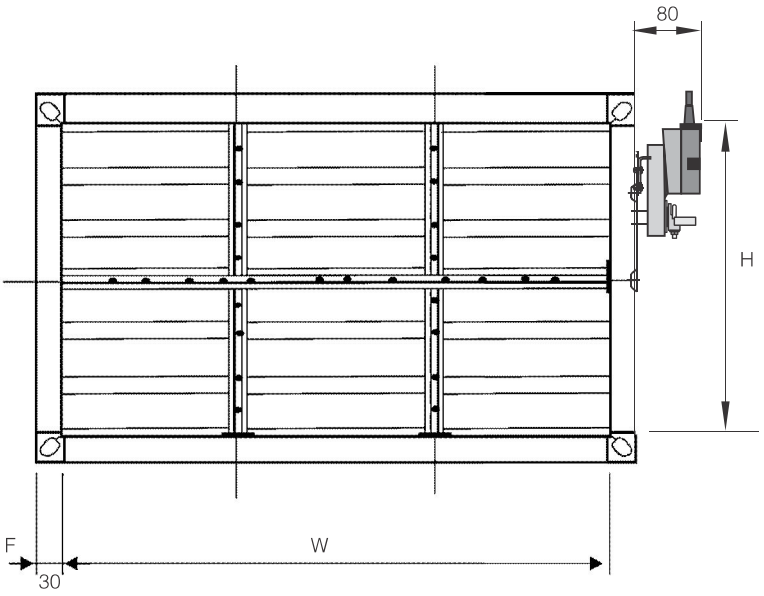
ARRANGEMENT–E



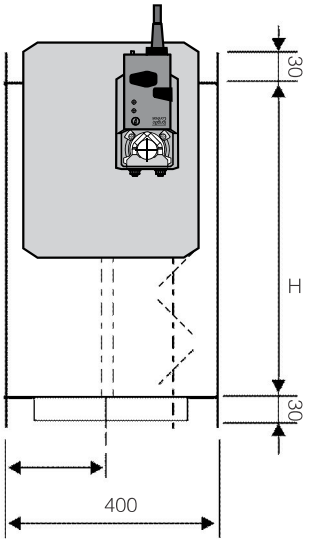
ARRANGEMENT–F

Note:
Multiple outlet plenums can be supplied in the upon arragement and the dimensions will be as per the customer's reqiurement.

SVAV-RS-T RETANGULAR SINGLE DUCT VAV AND CONTROL



FRONT VIEW



RIGHT VIEW

AIR VOLUME TABLE–1

V=2m/s

UNIT: mm

WIDTH (W)	HEIGHT(H)											
	200	250	300	350	400	450	500	600	700	800	900	1000
200	288											
250	360	450										
300	432	540	648									
350	504	630	756	882								
400	576	720	864	1008	1152							
450	648	810	972	1134	1296	1458						
500	720	900	1080	1260	1440	1620	1800					
550		990	1188	1386	1584	1782	1980					
600			1296	1512	1728	1944	2160	2592				
650			1404	1638	1872	2106	2340	2808				
700			1512	1764	2016	2268	2520	3024	3528			
800				2016	2304	2592	2880	3546	4032	4608		
900					2592	2916	3240	3888	4536	5184	5832	
1000					2880	3240	3600	4320	5040	5760	6480	7200

AIR VOLUME TABLE–2

V=4m/s UNIT: mm

WIDTH (W)	HEIGHT(H)											
	200	250	300	350	400	450	500	600	700	800	900	1000
200	576											
250	720	900										
300	864	1080	1296									
350	1080	1260	1512	1764								
400	1152	1440	1728	2016	2304							
450	1296	1620	1944	2268	2592	2916						
500	1440	180	2160	2520	2880	3240	3600					
550		1980	2376	2772	3168	3564	3960					
600			2592	3024	3456	3888	4320	5184				
650			2808	3276	3744	4212	4680	5616				
700			3024	3528	4032	4536	5040	6048	7056			
800				4032	4608	5184	5760	6912	8064	9216		
900					5184	5832	6480	7776	9072	10368	11664	
1000					5760	6480	7200	8640	10080	1150	12960	14400

AIR VOLUME TABLE–3

V=6m/s UNIT: mm

WIDTH (W)	HEIGHT(H)											
	200	250	300	350	400	450	500	600	700	800	900	1000
200	864											
250	1080	1350										
300	1296	1620	1944									
350	1512	1890	2268	2646								
400	1728	2160	2592	3024	4374							
450	1944	2430	2916	3402	3888	4374						
500	2160	2700	3240	3780	4320	4860	7776					
550		2970	3564	4158	4752	5346	5940					
600			3888	4536	5184	5832	6480	7776				
650			4212	4914	5616	6318	7560	8424				
700			4536	5292	6048	6804	7560	86409072	10574			
800				6048	6912	7776	8640	10368	12096	13824		
900					776	8748	9720	11664	13608	15552	17496	
1000					8640	9720	10800	12960	15120	17280	19440	21600

AIR VOLUME TABLE–4

V=8m/s UNIT: mm

WIDTH (W)	HEIGHT(H)											
	200	250	300	350	400	450	500	600	700	800	900	1000
200	1152											
250	1440	1800										
300	1728	540	648									
350	2016	2520	3024	3528								
400	2304	2880	3456	4032	4508							
450	2592	3240	3888	4536	5184	5832						
500	2880	3600	4320	5040	5760	6480	7200					
550		3960	4752	5544	6336	6968	7920					
600			5184	6048	6904	7776	8640	10368				
650			5616	6552	7488	8424	9360	11232				
700			6048	7056	8064	9072	10080	12096	14112			
800				8064	9216	10368	11520	13824	16128	18432		
900					10368	11664	12960	15552	18144	20736	23328	
1000					11520	12960	14400	17280	20160	23040	25920	28800

AIR VOLUME TABLE–5

V=10m/s UNIT: mm

WIDTH (W)	HEIGHT(H)											
	200	250	300	350	400	450	500	600	700	800	900	1000
200	1440											
250	1800	2250										
300	2160	2700	3240									
350	2520	3150	3780	4410								
400	2880	3600	4320	5040	5760							
450	3240	4050	4860	5670	6480	7290						
~~500~~	~~3600~~	~~4500~~	~~5400~~	~~6300~~	~~7200~~	8100	9000					
550		4950	5940	6930	7920	8710	9900					
600			6480	7560	8630	9720	10800	12960				
650			7020	8190	9360	10530	117000	14040				
700			7560	8820	10080	11340	12600	15120	17640			
800				10080	11520	12960	14400	17280	20160	23040		
900					12960	14580	16200	19440	22680	25920	29160	
1000					14400	16200	18000	21600	25200	28800	32400	36000

STARDUCT VAV CONTROLLER CONTROL MODE

A volumetric flow controller is used for pressure-independent volumetric flow regulation in ventilation and air-conditioning systems. It is used to keep the volumetric flow constant (CAV) within specified limits or to control it variably (VAV) as a func- tion of a command variable, for example a room temperature controller, DDC or bus system. For constant volumetric flows, the operating stages CLOSED / Vmin / Vmid / Vmax / OPEN are available in stage operation, controlled via relays or switches. The housing, measuring sensor, control flap, PI controller with pressure sensor and actuator form a closed control loop with feedback, allowing demand-dependent, energy-saving air-con- ditioning of the single rooms or areas of air-conditioning sys- tems. When suitable electrical controller types are used, room or duct pressure regulation can be achieved.

The first adjustment of the Vmin, Vmax and Vnenn operating volu- metric flows is done prior to delivery ex works in accordance with specific customer requirements, although Vmin and Vmax can be easily changed at any time with the controller already mounted by means of the handheld control device or the PC- Tool software.

When these values are set, the functions of all volumetric flow controllers are also checked. The operating point Vmax can be set in the range 20 (30)...100% of the nominal volumetric flow of the box, while the operating point Vmin is set in the range 0...100% relative to Vnenn (depending on the con- troller types). The maximum deviation of the volumetric flows is +/- 5%, relative to the nominal volumetric flow Vnenn, based on a calibration curve of 12 m/sec. At lower flow rates, the devia- tion in percent may increase.

For the calibration of the controllers, a curve with a flow rate of 12 m/ sec is available. For constant-volume volumetric flow controllers, the Vmin value will be set to the desired constant- volume value.
If the calibration curve must be changed on site, the controllers must either be recalibrated ex factory or the calibration curve must be changed on site by the customer service of Starduct

Belimo product types

VAV-Universal – maximum flexibility for increased requirements

Ventilation concepts according to DIN EN 15232 require modern, energy-efficient VAV control concepts and ensure operation as required from the fan to the room. Not as much as possible, but as much as necessary.
In addition to the proven VAV-Compact product range, which covers around 90 percent of VAV applications, the modern VAV-Universal product range is now available for special applications. Its modular design, consisting of a VRU controller with integrated high-quality Δp sensor technology, enables the optimum combination of controller and damper motorisation for all VAV, duct pressure and room-pressure applications.

VRU controller sensor unit

The VRU controller sensor unit was developed for use in building technology and is perfectly matched to the VST actuators that belong to the system. Two sensor variants are available: in addition to the well-established, dynamic D3 sensor, the new M1 membrane sensor is also available.
The system supports volumetric flow (VAV), duct pressure (STP) and room-pressure (RP) applications. The control via analogue, BACnet/Modbus, in hybrid mode or MP-Bus is preset with the corresponding tools by the OEM or on the system during system integration. NFC interface, service socket or a PP interface are available for easy tool connection.

VST actuator product range

The range of damper actuators with plug-and-play function includes rotary actuators, very fast running actuators and fail-safe rotary actuators. The actuator running time is detected by the VRU controller and used to optimise the control performance.

Tools for easy commissioning and parametrisation

With the Belimo Assistant App (Android, iOS), actual and setpoint values can be displayed graphically as trend data or parameters adjusted on the system via Bluetooth or NFC. The Belimo PC-Tool is available to system integrators and VAV manufacturers for the production of the VAV unit.

VAV-Compact L/N/SMV-D3-...

The system solution for volumetric flow systems to equip your VAV units for VAV or CAV applications. For analogue control or for direct integration into Modbus, BACnet, KNX or MP-Bus systems.
See www.belimo.eu

Product and function overview

	Function	Characteristic	VRU-D3-BAC	VRU-M1-BAC	VRU-M1R-BAC
Application	VAV/CAV	Volumetric flow	■	■	
	Measure volumetric flow	Volumetric flow	■	■	
	Position Control (Open-Loop)	Volumetric flow	■	■	
	Duct pressure control	Δp	■	■	
	Room-pressure control	Δp			■
	Room-pressure cascade control	Δp Room-pressure volumetric flow control	■ Flow	■ Flow	■ Δp
	Integration in DCV system	Requirement recording via damper position	■	■	■
Control	Modulating	min./max.	■	■	■
	Step mode	min./max.	■	■	■
	Local override – input z1	Motor stop/damper OPEN	■	■	■
	Local override – input z2	Damper CLOSED/max.	■	■	■
	Room-pressure mode +/–	Adjustable via Tool/Modbus/BACnet			
	Control (adjustable with Tool)	0…10 V/2…10 V/variable/bus	■	■	■
		Modbus RTU, incl. hybrid mode	■	■	■
		BACnet MS/TP, incl. hybrid mode	■	■	■
		MP-Bus	■	■	■[1]
	Feedback (Feedback U5)	0…10 V/2…10 V variable/bus	■	■	■
		Volumetric flow/Δp/position	■	■	Δp
Δp sensor	Measuring principle	D3 - flow (dynamic)	■		
		M1(R) - diaphragm (static)		■	■
	Measuring ranges	Application-dependent (VAV 0…500 Pa)	0…500 Pa	0…600 Pa	–75…75 Pa
	Field of application	Comfort zone	■	■	■
		Polluted air (compatibility test required)		■	■
Actuator	Ready-to-connect connection	Plug-and-play function	■	■	■
	L/N/SM24A-VST	5/10/20 Nm, 120 s, rotary actuator	■	■	■
	L/NMQ24A-VST	4 Nm, 2.4 s/8 Nm, 4 s, very fast running actuator	■	■	■
	NKQ24A-VST	6 Nm, 4 s, very fast running actuator, electrical fail-safe	■	■	■
	N/SF24A-VST LF24-VST	4/10/20 Nm, 120 s, mechanical fail-safe	■	■	■
Tools	Assistant App, NFC	NFC/Bluetooth	■	■	■
	PC-Tool	Default/OEM Manufacturing Tool	■	■	■

Note: VAV-Universal components incl. replacement units are only available from manufacturers of VAV units (OEM).
The components VRD. /VRP.../..-V/..-SRV-ST of the old VAV-Universal product range are not compatible with the VRU./...-VST.
Please contact your Belimo representative for further assistance.

[1] RPC room-pressure cascade controllers cannot be integrated into MP-Bus systems.

Terms

CAV	Constant Air Volume
VAV	Variable Air Volume
DCV	Demand Controlled Ventilation
BMT	Building management technology
DPC	Duct pressure controller
RP	Room-pressure controller
RPC	Room-pressure cascade
D3	Δp sensor, D3 – flow sensor (dynamic)
M1(R)	Δp sensor, M1(R) – diaphragm sensor (static)
VRU...	VAV-Universal controller, Δp sensor unit
...-VST	VAV-Universal actuator, suitable for the VRU... controller
VC	VAV-Compact product range, compact solution VAV controller and Δp sensor integrated in actuator
VU	VAV-Universal product range, modular solution, VAV controller with integrated Δp sensor and external actuator

cw	Clockwise	direction of rotation
ccw	Anticlockwise	direction of rotation
min.	Operating mode min.	according to the application V'_{min}, P'_{min}, min.
max.	Operating mode max.	according to the application V'_{max}, P'_{max}, max.
P'_{nom} [1]	Pressure application	Δp control nominal setting[1]
V'_{nom} [1]	VAV applications	volumetric flow nominal setting[1]
$\Delta p@V'_{nom}$ [1]	VAV applications	calibration unit VAV unit[1]

[1] OEM factory setting: fixed setting, values cannot be changed

MOD	Modbus interface
BAC	BACnet interface
MP	MP-Bus interface
NFC	Chip (Near Field Communication), interface for wireless tool connection

Volumetric flow control VAV/CAV

Brief description

- Variable volumetric flow control (VAV) — $V'_{min}...V'_{max}$
- Constant volumetric flow control (CAV) — Damper CLOSED/V'_{min}/V'_{max} / Damper OPEN

Principle diagram

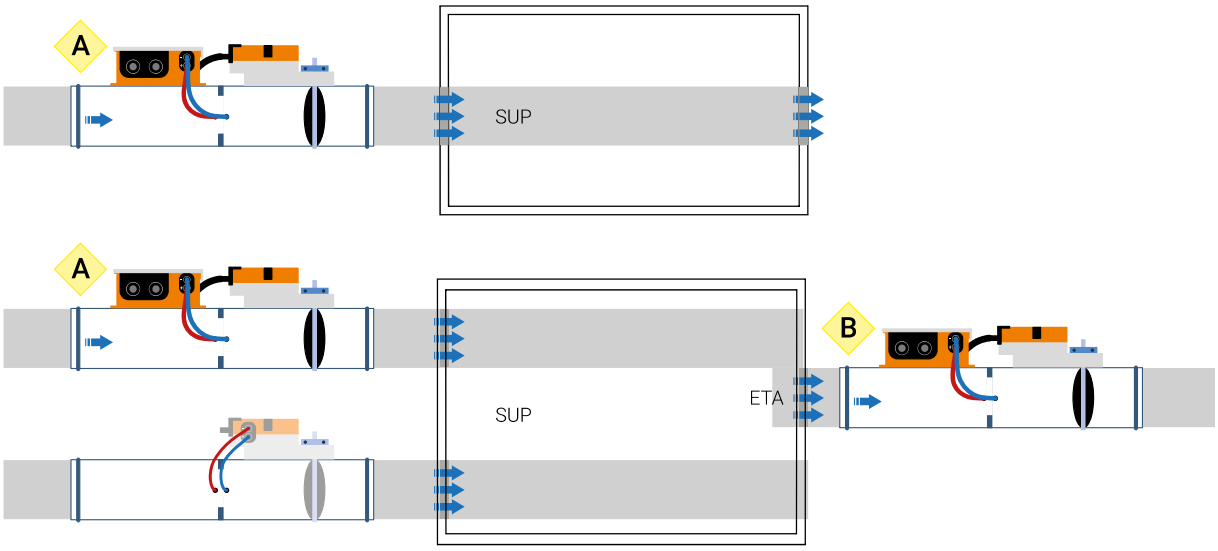


Illustration example

Ventilation system with constant [CAV] and variable air volume [VAV]

- Room and zone applications SUP unit or SUP and ETA unit, in comfort zone
- Extract air/extraction systems for polluted extract air, e.g. kitchen extract air

The VAV-Universal VRU-... control unit controls the volumetric flow specified by the room automation system, e.g. via a room temperature or air quality controller for the downstr am zone/room. Pressure fluctuations in the air duct system are detected and automatically corrected.

The following variants are available in combination with the actuator solutionoptimally suited to the application:

VRU-D3-BAC for comfort zone

VRU-M1-BAC for comfort zone and for polluted extract air

The damper position of the VAV unit is available for DCV applications via the selected bus system (Fan Optimiser function).

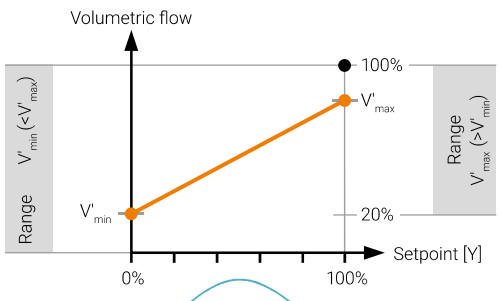
Control functions

- V'_{min} — Minimum air exchange rate, hygiene section, building protection (air humidity etc.)
- V'_{max} — Maximum air exchange rate, maximum cooling load, removal of emissions
- $V'_{min}...V'_{max}$ — Partial load operation - variable volume operation (VAV)
- Local override (z1/z2) — Motor stop, damper OPEN, V'_{max}, damper CLOSED
- Control — analogue 0...10 V/2...10 V, Modbus [1], BACnet[1], MP-Bus [1] Hybrid mode possible

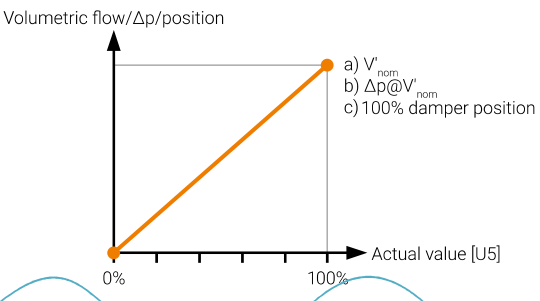
[1] Hybrid mode possible

Function diagram

VAV control: analogue/bus (setpoint)



Feedback U5/bus (actual value)



Device selection

Product type from Belimo	Function	Sensor/actuator characteristic	Field of application	SUP unit	ETA unit
VRU-D3-BAC	VAV/CAV controller	Δp sensor, integrated D3 flow sensor 0...500 Pa	Comfort	■	■
VRU-M1-BAC	VAV/CAV controller	Δp sensor, integrated M1 diaphragm sensor 0...600 Pa	Comfort Polluted air	■	■
L/N/SM24A-VST	Rotary actuator, default	5/10/20 Nm, 120 s	All ranges		
LF/NF/ SM24A-VST	Rotary actuator, mechanical fail-safe	4/10/20 Nm, 120 s, spring 20 s	All ranges		
LMQ24A-VST	Rotary actuator, very fast running	4 Nm, 2.4 s	All ranges		
NMQ24A-VST	Rotary actuator, very fast running	8 Nm, 4 s	All ranges		
NKQ24A-VST	Rotary actuator, very fast running, electrical fail-safe	6 Nm, 4 s	All ranges		

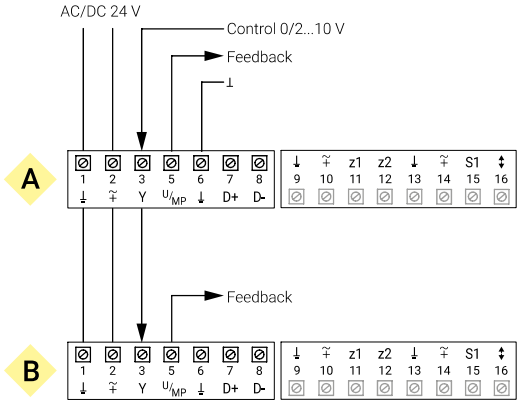
Option VAV-Compact

Product type from Belimo	Function	Sensor/actuator characteristic	Field of application	SUP unit	ETA unit
L/N/SMV-D3...	VAV-Compact controller (VAV/CAV)	Δp sensor, integrated D3 flow sensor 0...500 Pa Rotary actuator 5/10/20 Nm, integrated	Comfort	■	■

Diagram

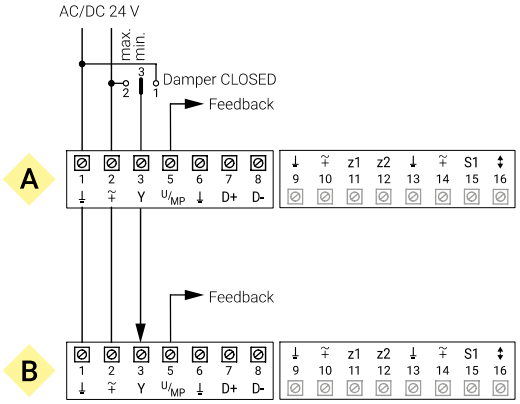
Analogue control [Mode 0...10/2...10 V]

– VAV mode: V'_{min}/V'_{max}

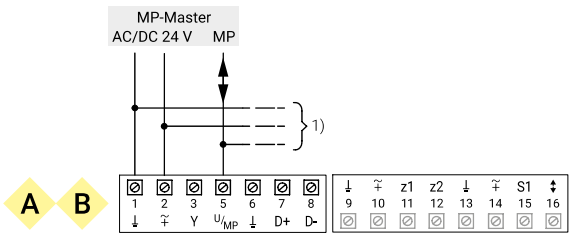


Analogue control [Mode 2...10 V]

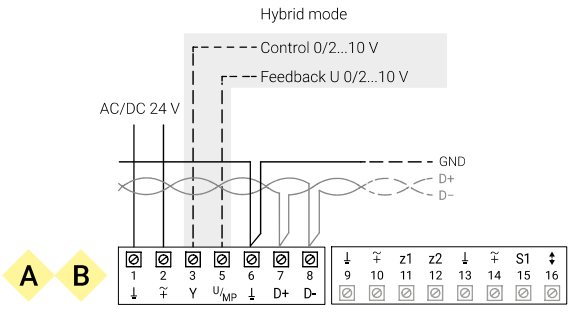
– CAV steps: damper CLOSED/V'_{min}/V'_{max}



MP-Bus



Mode RTU, BACnet MS/TP



[1] Other MP devices (total 8)

Safety requirements

Only authorised specialists may carry out installation. All applicable legal and government agency regulations must be complied with during use. Connection via an isolating transformer.

See VAV-Universal-VRU Product Information: www.belimo.eu

Explanations/notes

– Priority control p. 71
– Connection z1/z2 p. 61
– Sensor integration bus mode p. 61
– VRP-M replacement in existing MP-Bus system:
See separate instructions VAV-Universal-VRU in VRP-M compatibility mode (MP)

Volumetric flow measurement

Brief description

Volumetric flow measuring device (transmitter) for detecting or monitoring volumetric flow

Principle diagram

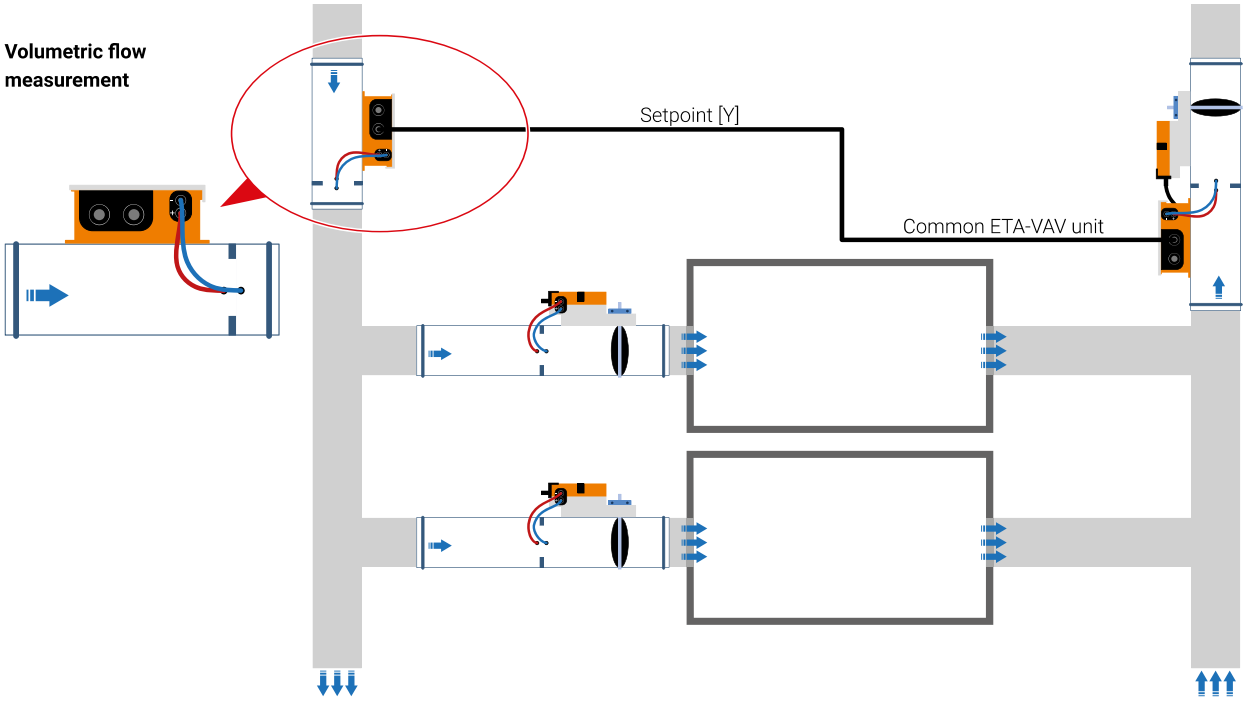
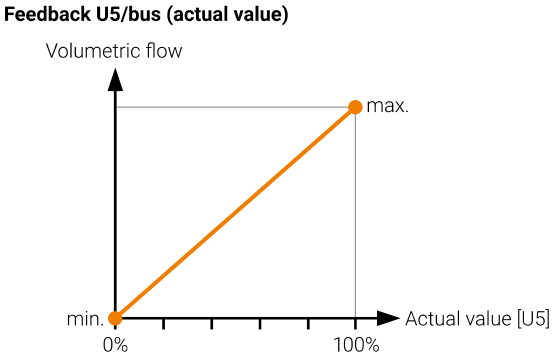


Illustration example

Volumetric flow measuring devices for detecting or monitoring volumetric flow

- In air handling units in comfort zones and for polluted fluid
- E.g. for recording the total supply air for the setpoint specification of a common extract air-side VAV unit
- Display function 0...100% V'_{nom}
- Analogue integration 0...10 V/2...10 V, Modbus, BACnet, MP-Bus

Function diagram



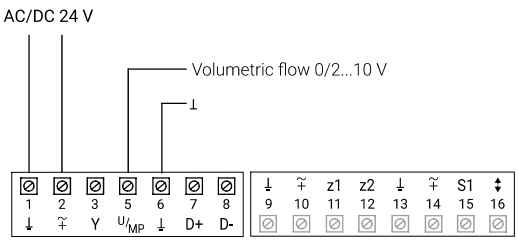
Device selection

Product type from Belimo	Function	Sensor/actuator characteristic	Field of application	SUP unit	ETA unit
VRU-D3-BAC	VAV/CAV controller	Δp sensor, integrated D3 flow sensor 0...500 Pa	Comfort	■	■
VRU-M1-BAC	VAV/CAV controller	Δp sensor, integrated M1 diaphragm sensor 0...600 Pa	Comfort Polluted air	■	■

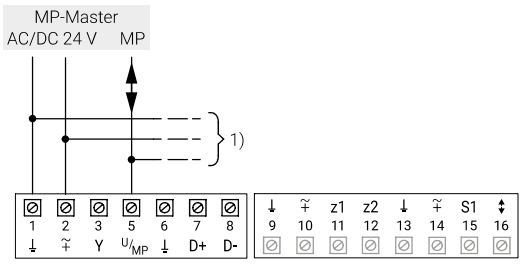
Diagram

Analogue operation [Mode 0...10/2...10 V]

Display V'$_{nom}$



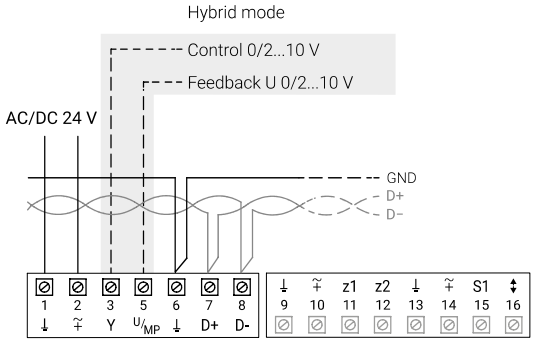
MP-Bus



[1] Other MP devices (total 8)

Mode RTU, BACnet MS/TP

Hybrid mode



Safety requirements

Only authorised specialists may carry out installation. All applicable legal and government agency regulations must be complied with during use. Connection via an isolating transformer.

See VAV-Universal-VRU Product Information: www.belimo.eu

Explanations/notes

- Priority control p. 71
- Connection z1/z2 p. 61
- Sensor integration bus mode p. 61
- VRP-M replacement in existing MP-Bus system: See separate instructions VAV-Universal-VRU in VRP-M compatibility mode (MP)

Parameter and tool overview for volumetric flow measurement

Parameter/function	Unit/value	Function/description/(area)	Application	Tool			Authorisation
			VAV/CAV	Assistant app	PC-Tool	ZTH EU	Expert/OEM
VAV unit – manufacturer parameters (OEM values – not variable)							
Application	Volumetric flow	Application setting	■	r	r	r	O
Designation	Text	Model designation measuring device (16 Z.)	■	r	r	–	O
V'$_{nom}$	m^3/h/l/s/cfm	Volumetric flow nominal value	■	r	r	r	O
NFC interface	ON/OFF	NFC Communication for app access	■	r	r	–	O
Parametrisation – Project specific settings							
Position	Text	System designation (64 Z./ZTH 16 Z.)	■	r/w	r/w	r	
Altitude compensation	ON/OFF	Switch function on/off	■	r/w	r/w	–	E
Altitude of installation	0 m	Compensated Δp and volumetric flow values to set the altitude of installation (above sea level)	■	r/w	r/w	–	E
Feedback type	Volumetric flow	Volume	■	r/w	r/w	–	E
Feedback U	2...10 V/0...10 V/adjustable	Setting U signal	■	r/w	r/w	–	E

Legend

r Tool: read
w Tool: write
– Tool: Does not support parameter
E Only visible in Expert Mode

Position Control (Open-Loop)

Brief description

VAV-Universal-VRU-... sensor/actuator in position control mode (Open-Loop, i.e. VAV control function inactive)

– Volumetric flow display 0...100% V'_{nom}
– Damper actuator, control 0...100% range of rotation

Principle diagram

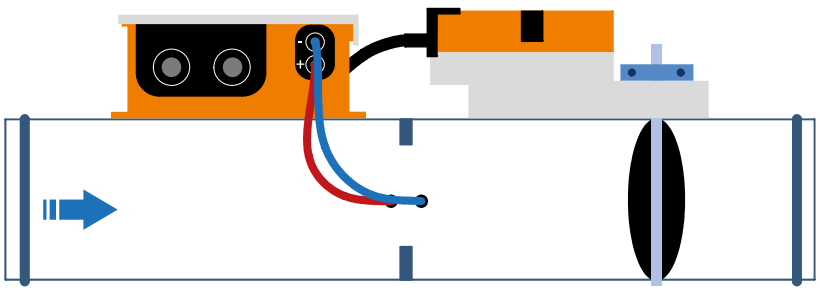


Illustration example

In this application, the VAV-Universal VRU-... functions solely as a sensor and actuator element. Position control mode: volumetric flow/pressure control inactive.

– VRU-D3-BAC for comfort zone
– VRU-M1-BAC for the comfort zone and polluted extract air

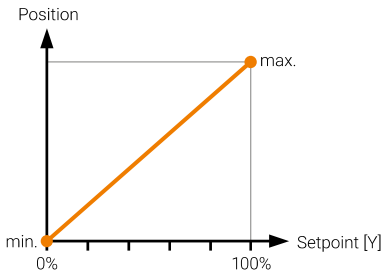
Position control function

– Volumetric flow display 0...100% V'_{nom}
– Damper actuator, control 0...100% range of rotation
– Local override (z1/z2) Motor stop, damper OPEN, damper CLOSED
– Control analogue 0...10 V/2...10 V, Modbus [1], BACnet [1], MP-Bus

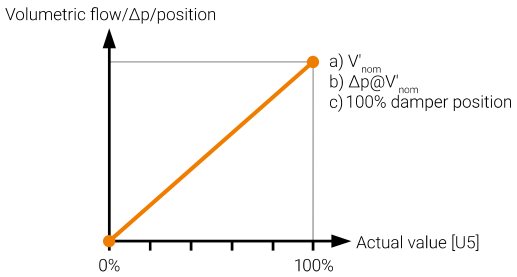
[1] Hybrid mode possible

Function diagram

Position control: analogue/bus (setpoint)



Feedback U5/bus (actual value)



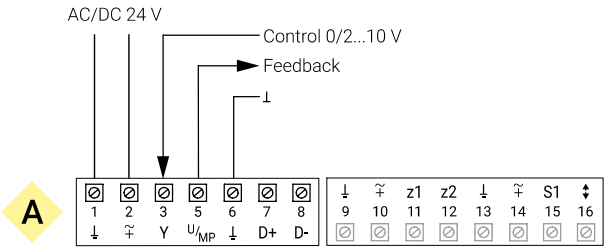
Device selection

Product type from Belimo	Function	Sensor/actuator characteristic	Field of application	SUP unit	ETA unit
VRU-D3-BAC	Position Control (Open-Loop)	Δp sensor, integrated D3 flow sensor 0...500 Pa	Comfort	▪	▪
VRU-M1-BAC	Position Control (Open-Loop)	Δp sensor, integrated M1 diaphragm sensor 0...600 Pa	Comfort Polluted air	▪	▪
L/N/SM24A-VST	Rotary actuator, default	5/10/20 Nm, 120 s	All ranges		
LF/NF/SF24A-VST	Rotary actuator, mechanical fail-safe	4/10/20 Nm, 120 s, spring 20 s	All ranges		
LMQ24A-VST	Rotary actuator, very fast running	4 Nm, 2.4 s	All ranges		
NMQ24A-VST	Rotary actuator, very fast running	8 Nm, 4 s	All ranges		
NKQ24A-VST	Rotary actuator, very fast running, electrical fail-safe	6 Nm, 4 s	All ranges		

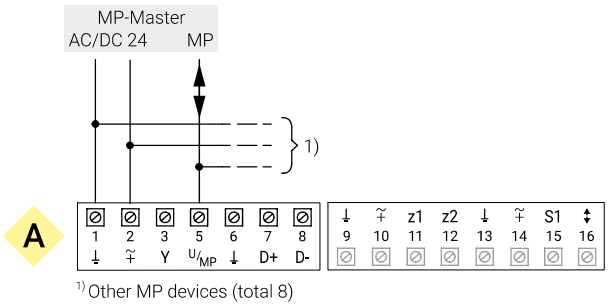
Diagram

Analogue control [Mode 0...10/2...10 V]

– Modulating control: 0...100% range of rotation



MP-Bus



1) Other MP devices (total 8)

Safety requirements

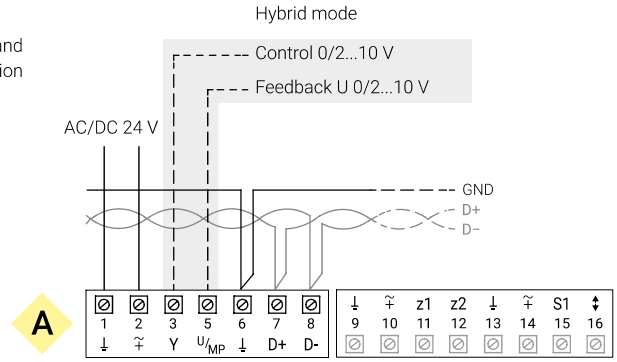
Only authorised specialists may carry out installation. All applicable legal and government agency regulations must be complied with during use. Connection via an isolating transformer.

See VAV-Universal-VRU Product Information: www.belimo.eu

Explanations/notes

– Priority control p. 71
– Connection z1/z2 p. 61
– Sensor integration bus mode p. 61
– VRP-M replacement in existing MP-Bus system: See separate instructions VAV-Universal-VRU in VRP-M compatibility mode (MP)

Mode RTU, BACnet MS/TP



Parameter and tool overview for volumetric flow control position control

Parameter/function	Unit/value	Function/description/(area)	Application	Tool			Authorisation
			VAV/CAV	Assistant app	PC-Tool	ZTH EU	Expert/OEM
VAV unit – manufacturer parameters (OEM values – not variable)							
Application	Volumetric flow	Application setting	■	r	r	r	O
Designation	Text	Model designation unit/damper (16 Z.)	■	r	r	–	O
V'_{nom}	m^3/h/l/s/cfm	Volumetric flow nominal value	■	r	r	r	O
$\Delta p@V'_{nom}$	Pa	Calibration VAV unit [38...500 Pa]	■	r	r	–	O
SN actuator	xxxxx-xxxxx-xxx-xxx	Actuator serial number	■	r	–	–	
Rotation direction	ccw/cw	Actuator direction of rotation setting	■	r/w	r/w	–	E
Range of rotation	Adapted/programmed	Actuator adapted/programmed 30...95°	■	r/w	r/w	–	E
Power-on behaviour	No action/synch./ adaptation	Actuator power-on behaviour	■	r/w	r/w	–	E
NFC interface	ON/OFF	NFC Communication for app access	■	r	r	–	O
Parametrisation – Project specific settings							
Position	Text	System designation (64 Z./ZTH 16 Z.)	■	r/w	r/w	r	
max.	%	Damper position 0...100%	■	r/w	r/w	r/w	
min.	%	Damper position 0...100%	■	r/w	r/w	r/w	
Altitude compensation	ON/OFF	Switch function on/off	■	r/w	r/w	–	E
Altitude of installation	0 m	Compensated Δp and volumetric flow values to set the altitude of installation (above sea level)	■	r/w	r/w	–	E
Control function	VAV/CAV	VAV control inactive (Open-Loop)	■	r/w	r/w	–	E
Setpoint	Analogue/bus	Analogue and hybrid mode/bus	■	r/w	r/w	–	E
Reference signal Y	2...10 V/0...10 V/adjustable	Setting for damper control	■	r/w	r/w	–	E
Feedback type	Volumetric flow/Δp/position	Volume/Δp/damper position	■	r/w	r/w	–	E
Feedback U	2...10 V/0...10 V/adjustable	Setting U signal	■	r/w	r/w	–	E

Legend r Tool: read w Tool: write – Tool: Does not support parameter E Only visible in Expert Mode

Duct pressure control STP

Brief description

Duct/line pressure control

– Variable operation (STP)	$P'_{min}...P'_{max}$
– Constant pressure control (STP)	P'_{min}/P'_{max} damper CLOSED/damper OPEN

Principle diagram

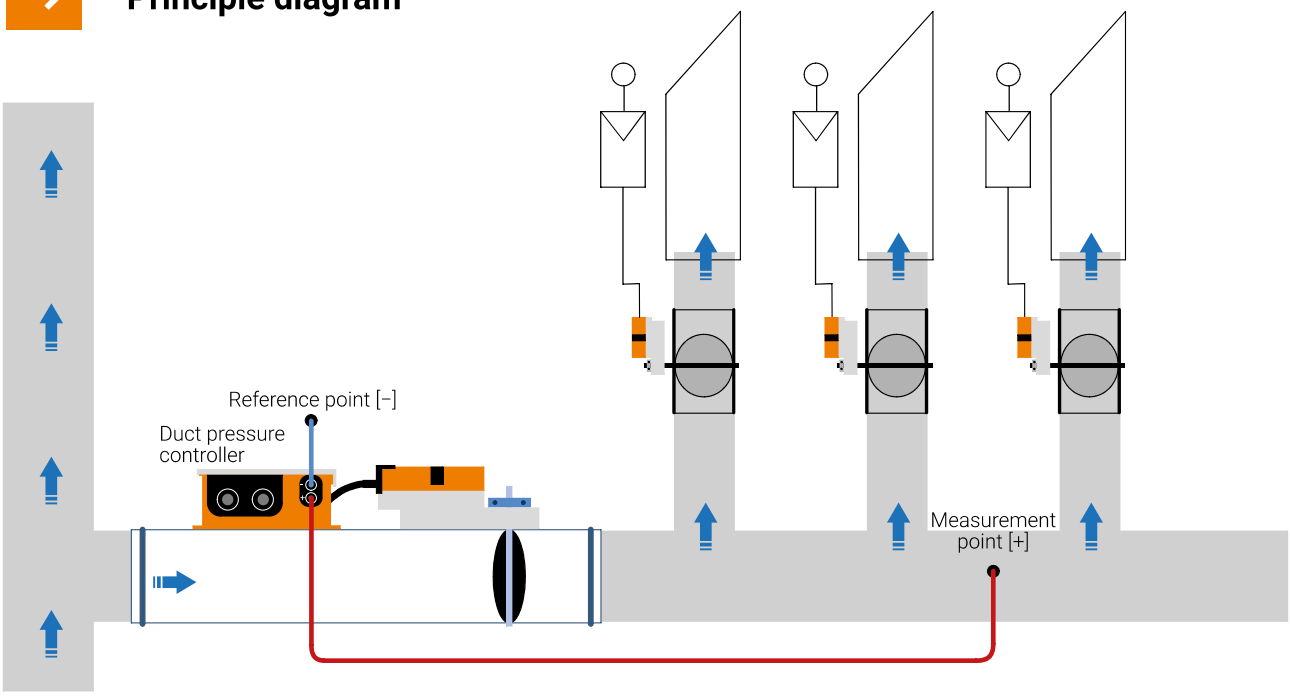


Illustration example

Duct and line pressure control in ventilation systems

– Storey line

– Pre-pressure, control e.g. for active cooling ceiling systems

The VAV-Universal VRU-... control unit controls the duct pressure required for the application. Pressure fluctuations in the air duct system are detected and automatically corrected.

The following variants are available in combination with the actuator solution optimally suited to the application:

– VRU-D3-BAC operating range 38...500 Pa

– VRU-M1-BAC operating range 38...600 Pa

The damper position is available for DCV applications via the selected bus system (Fan Optimiser function).

Control functions

– P'_{min}	Pressure level 1
– P'_{max}	Pressure level 2
– $P'_{min}...P'_{max}$	Variable operation (STP)
– Local override (z1/z2)	Motor stop, damper OPEN, P'_{max}, damper CLOSED
– Control	analogue 0...10 V/2...10 V, Modbus [1], BACnet [1], MP-Bus

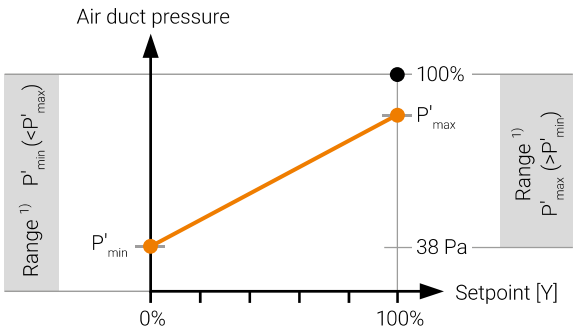
[1] Hybrid mode possible

Max. hose line for D3 sensor (VRU-D3-BAC)

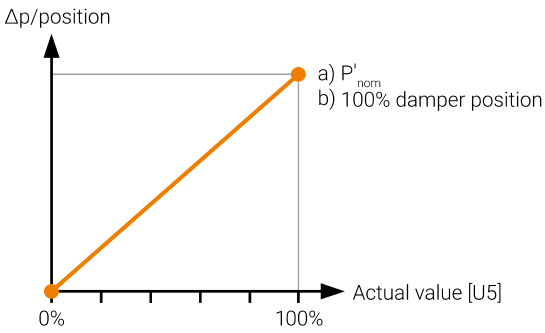
The pressure drop in the measurement signal cable generates a measuring error of maximum 2.5%. Use of the VRU-M1-BAC is recommended for applications with measurement signal cables >20 m.

Function diagram

Δp control: Y/bus (setpoint)



Feedback U5/bus (actual value)



1) Note: The control limit/nominal voltage range STP is under revision. (Release: 3rd quarter 2021)

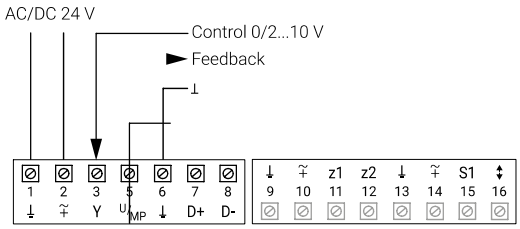
Device selection

Product type from Belimo	Function	Sensor/actuator characteristic	Field of application
VRU-D3-BAC	Duct pressure controller - lower control limit 38 Pa	Δp sensor, integrated D3 flow sensor 0...500 Pa	Comfort
VRU-M1-BAC	Duct pressure controller - lower control limit 38 Pa	Δp sensor, integrated M1 diaphragm sensor 0...600 Pa	Comfort Polluted air
L/N/SM24A-VST	Rotary actuator, default	5/10/20 Nm, 120 s	All ranges
LF/NF/SF24A-VST	Rotary actuator, mechanical fail-safe	4/10/20 Nm, 120 s, spring 20 s	All ranges

Diagram

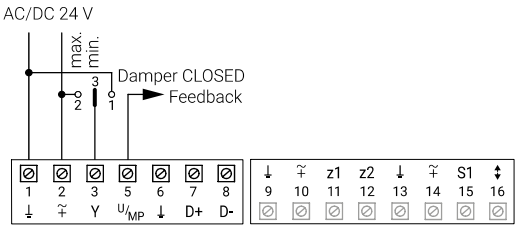
Analogue control [Mode 0...10/2...10 V]

– Modulating operation: P'min...P'max

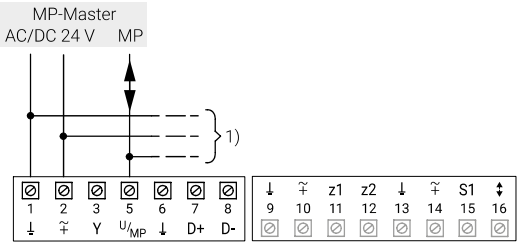


Analogue control [Mode 2...10 V]

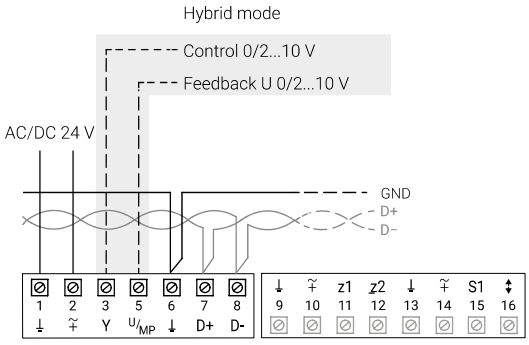
– Step mode: damper CLOSED/P'min/P'max



MP-Bus



Mode RTU, BACnet MS/TP



1) Other MP devices (total 8)

Safety requirements

Only authorised specialists may carry out installation. All applicable legal and government agency regulations must be complied with during use. Connection via an isolating transformer.

See VAV-Universal-VRU Product Information: www.belimo.eu

Explanations/notes

– Priority control	p. 71
– Connection z1/z2	p. 61
– Sensor integration bus mode	p. 61
– VRP-M replacement in existing MP-Bus system:	See separate instructions VAV-Universal-VRU in VRP-M compatibility mode (MP)

Room-pressure control RP

Brief description

Room-pressure control RP, suitable for rooms with non-critical leakage rates/ overflows

– Modulating P'_{min} ...P'_{max}/Motor stop
– Step mode P'_{min}/P'_{max}/damper CLOSED/damper OPEN/Motor stop

Principle diagram

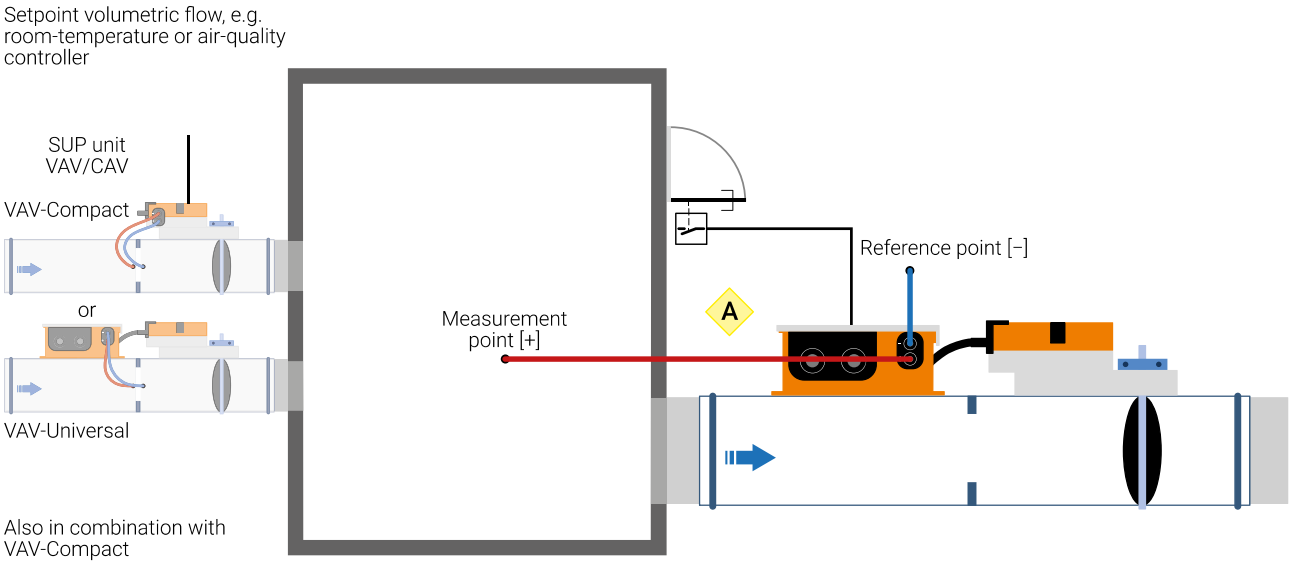


Illustration example

Ventilation systems – with non-critical leakage rates – for defined positive or negative room-pressure conditions:

– Leakage rate of >5...10% V'_{supply}
– Room tightness class according to VDI 2083-19; Class 0 and 1
– Room and zone applications, e.g. with odour nuisance in restaurants, smoking rooms
– Room applications with polluted extract air, e.g. extract air in commercial kitchens

The room-pressure controller–VRU-M1R-BAC Application[RP]–compares the pressure in the room relative to the reference value and controls the control damper to the adjusted room-pressure setpoint. With actuator solution optimally suited to the application.
The opposite VAV unit is responsible for the air exchange rate required for the room, e.g. external room temperature or air quality controller.

Requirements (applies to positive and negative room-pressure applications)

– VRU-M1R-BAC	Room-pressure application [RP] with sensor range −75...75 Pa
– Measurement room	Connect pressure line to the (+) of the VRU-M1R-BAC
– Reference room	Connect pressure line to (−) of the VRU-M1R-BAC

Room-pressure – Operation mode (positive/negative pressure)

If necessary, the room pressure can be switched from positive to negative pressure (pressure lines remain unchanged!):
For this purpose, the P'_{nom}/P'_{max}/P'_{min} are mirrored in the negative range.
Example: P'_{min} 10 Pa becomes −10 Pa.
The changeover takes place at:

– Analogue control/MP-Bus	Belimo Assistant App
– Modbus/BACnet	Belimo Assistant App or Command "Operating Mode"

– Control functions

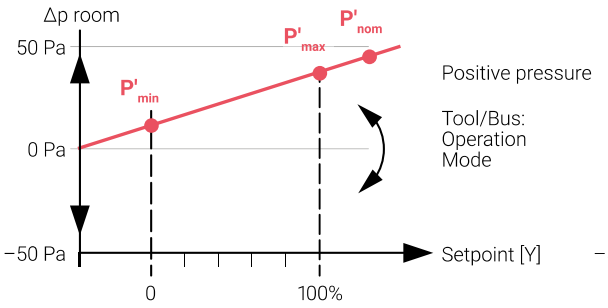
– P'_{min}	Room-pressure setpoint 1
P'_{max}	Room-pressure setpoint 2 (step mode or modulating control)
– Application area	SUP-side or ETA-side assembly arrangement
– Room-pressure mode	Positive/negative pressure

– Door monitoring – Motor stop
Actuator remains in current position when door is open (z2)
– "Operation Mode" positive/negative pressure
Changeover via "Operation Mode" bus or Assistant App, PC-Tool
– Local override (z1/z2)
Motor stop, damper OPEN, P'_{max}, damper CLOSED
– Control: analogue 0...10 V/2...10 V, Modbus [1], BACnet [1], MP-Bus

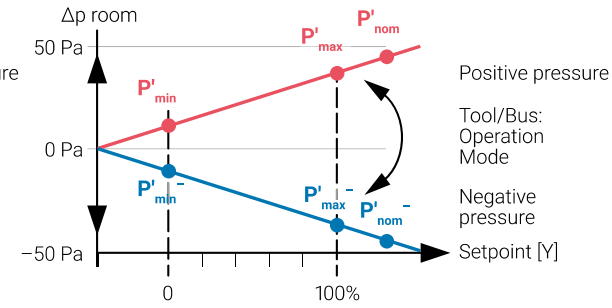
[1] Hybrid mode possible

Function diagram

Positive room pressure

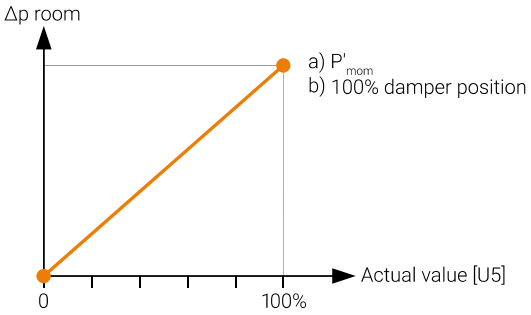


Changeover operation: positive/negative pressure



For operation in the negative-pressure range, P'_{nom}/P'_{max}/P'_{min} are mirrored in the negative range.
Example:
+ Positive pressure: P'_{min} 5 Pa/P'_{max} 10 Pa, becomes
− Negative pressure setting: P'_{min} −5 Pa/P'_{max} −10 Pa

Feedback U5/bus (actual value)

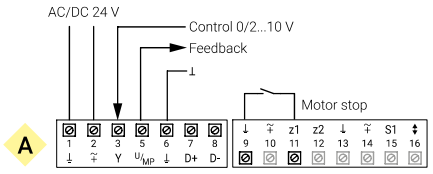


Device selection

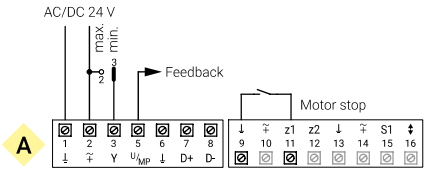
Product type from Belimo	Function	Sensor/actuator characteristic	Field of application	SUP	ETA
VRU-M1R-BAC	Room-pressure controller	Δp sensor, integrated M1 diaphragm sensor −75...75 Pa	Comfort, polluted air	■	■
L/N/SM24A-VST	Rotary actuator, default	5/10/20 Nm, 120 s	All ranges		
LF/NF/SF24A-VST	Rotary actuator, mechanical fail-safe	4/10/20 Nm, 120 s, spring 20 s	All ranges		
LMQ24A-VST	Rotary actuator, very fast running	4 Nm, 2.4 s	All ranges		
NMQ24A-VST	Rotary actuator, very fast running	8 Nm, 4 s	All ranges		
NKQ24A-VST	Rotary actuator, very fast running, electrial fail-safe	6 Nm, 4 s	All ranges		

Diagram

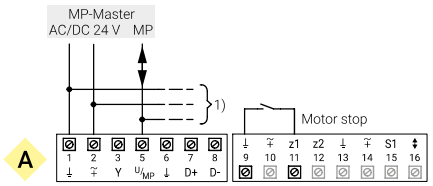
Analogue control [Mode 0...10/2...10 V]
– Modulating operation: P'_{min}...P'_{max}



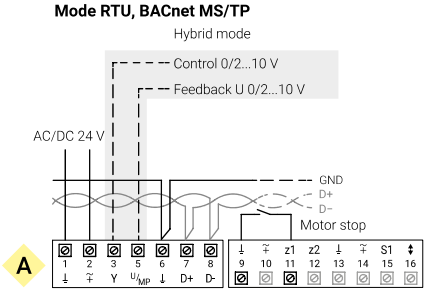
Analogue control [Mode 0...10/2...10 V]
– Step mode: P'_{min}/P'_{max}



MP-Bus



Mode RTU, BACnet MS/TP



1) Other MP devices (total 8)

Room-pressure – VAV unit with bypass control RP

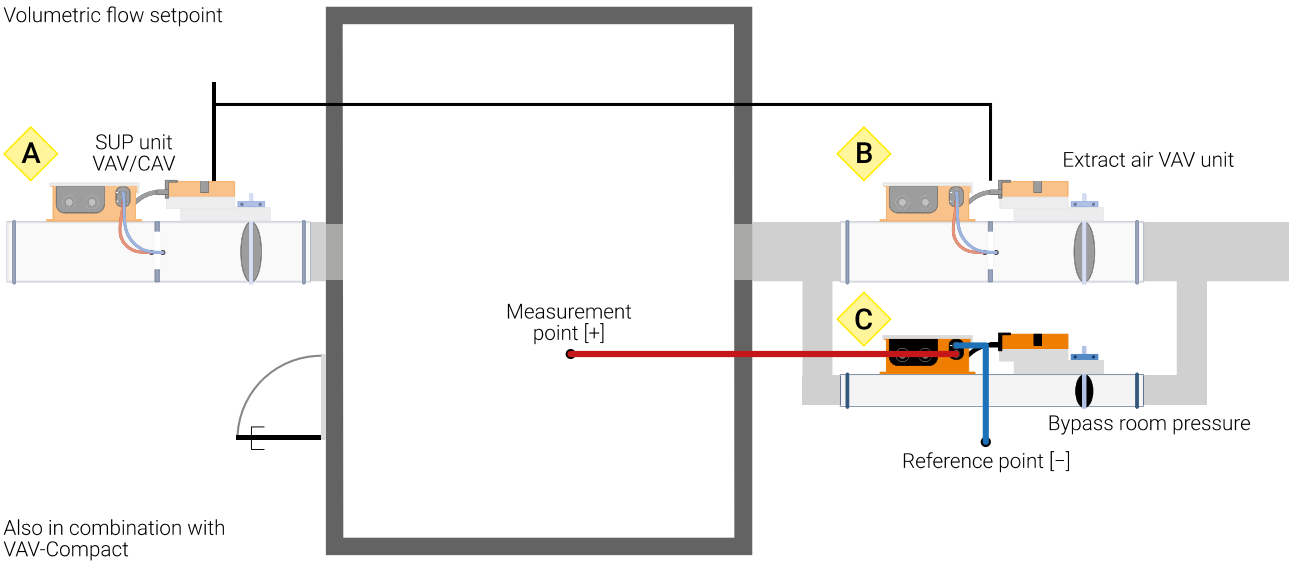
Brief description

Room-pressure volumetric flow bypass damper control for rooms with low leakage rate/overflow:

<A> <B> Volumetric flow VAV/CAV $V'_{min}...V'_{max}$
VRU-D3-BAC/VRU-M1-BAC [VAV]

<C> Room-pressure bypass damper $P'_{min}...P'_{max}$
VRU-M1R-BAC [RPC] −75...75 Pa

Principle diagram



Also in combination with VAV-Compact

Illustration example

Ventilation systems with defined positive or negative room pressure for rooms with low leakage rate/overflow.

- Leakage rate of <5% from V'_{supply}
- Room tightness class according to VDI 2083-19; Class 2 and 3
- Application examples for "sensitve room pressure applications"

The two VAV units <A> <B> are responsible for the air exchange rate required for the room, e.g. external room temperature or air quality controller. The room-pressure controller VRU-M1R-BAC <C> compares the pressure in the room with the defined reference value and then controls the bypass damper to the specified room-pressure setpoint.

Requirements (applies to positive and negative room-pressure applications)

– VRU-M1R-BAC	Room-pressure application [RP] with sensor range −75...75 Pa Extract-air-side-mounted or supply-air-side-mounted (setting parameters)
– Measurement room	Connect pressure line to the (+) of VRU-M1R-BAC
– Reference room	Connect pressure line to (−) of the VRU-M1R-BAC

Control setting, see Commissioning room/duct pressure applications page 73

Room-pressure – Operation mode (positive/negative pressure)
If necessary, the room pressure can be switched from positive to negative pressure (pressure lines remain unchanged!): for this purpose, $P'_{nom}/P'_{max}/P'_{min}$ are mirrored in the negative range.
Example: P'_{min}
The changeover takes place at:
– Analogue control/MP-Bus Belimo Assistant App
– Modbus/BACnet Belimo Assistant App or "Operating Mode" command

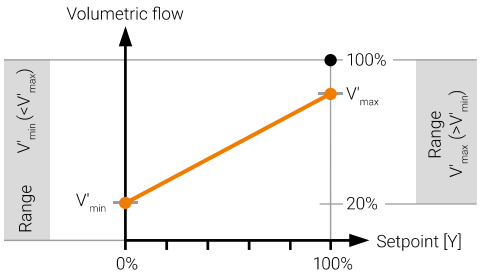
VAV control functions <A> <B>
– $V'_{min}...V'_{max}$ Air exchange rate, CAV step mode or VAV modulating control $V'_{min}...V'_{max}$

RP control functions <C>
– P'_{min} Room-pressure setpoint 1
– P'_{max} Room-pressure setpoint 2 (step mode or modulating control)
– Application area: SUP or ETA-side assembly arrangement
– Room-pressure mode Positive/negative pressure
– "Operation Mode" positive/negative pressure
Changeover via "Operation Mode" bus or Assistant App, PC-Tool
– Local override (z1/z2)
P'_{max}, damper CLOSED, damper OPEN, motor stop
– Control: analogue 0...10 V/2...10 V, Modbus [1], BACnet [1], MP-Bus

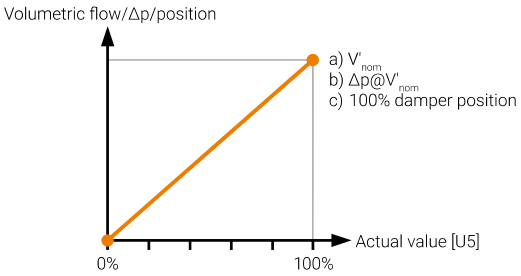
[1] Hybrid mode possible

Function diagram

VAV mode: analogue/bus (setpoint)

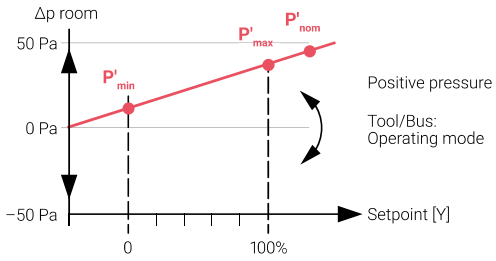


Feedback U5/bus (feedback)

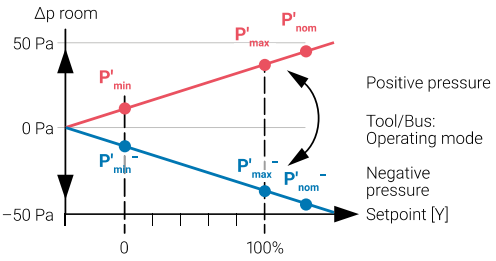


Function diagram

Positive pressure

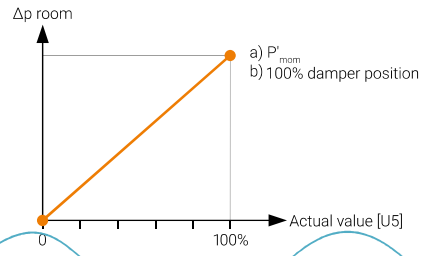


Changeover positive: overpressure/negative pressure



For operation in the negative-pressure range, $P'_{nom}/P'_{max}/P'_{min}$ are mirrored in the negative range.
Example:
+ Positive pressure setting:
P'_{min} 5 Pa/P'_{max} 10 Pa, becomes
− Negative pressure setting:
P'_{min} −5 Pa/P'_{max} −10 Pa

Feedback U5/bus (actual value)



Device selection <A> <B> VAV units

Room-pressure – Operation mode (positive/negative pressure)

Product type from Belimo	Function	Sensor/actuator characteristic	Field of application	SUP unit	ETA unit
VRU-D3-BAC	Volumetric flow controller [VAV] <A> <B>	Δp sensor, D3 flow 0…500 Pa	Comfort	■	■
VRU-M1-BAC	Volumetric flow controller [VAV] <A> <B>	Δp sensor, M1 diaphragm 0…600 Pa	Comfort Polluted air	■	■
L/N/SM24A-VST	Rotary actuator, default	5/10/20 Nm, 120 s	All ranges		

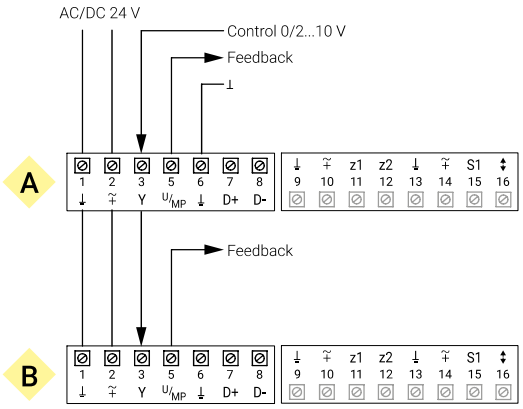
Device selection <C> bypass damper

Product type from Belimo	Function	Sensor/actuator characteristic	Field of application	SUP unit	ETA unit
VRU-M1R-BAC	Room-pressure controller [RP] <C>	Δp sensor, M1 diaphragm −75…75 Pa	Comfort Polluted air	■	■
L/N/SM24A-VST	Rotary actuator, default	5/10/20 Nm, 120 s	All ranges	■	■
LMQ24A-VST	Rotary actuator, very fast running	4 Nm, 2.4 s	All ranges		
NMQ24A-VST	Rotary actuator, very fast running	8 Nm, 4 s	All ranges		
NKQ24A-VST	Rotary actuator, very fast running electrical fail-safe	6 Nm, 4 s	All ranges		

Diagram

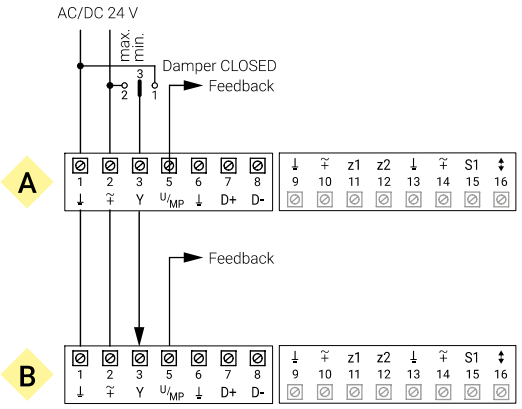
Analogue control [Mode 0...10/2...10 V]

– Modulating operation: P'_{min}...P'_{max}

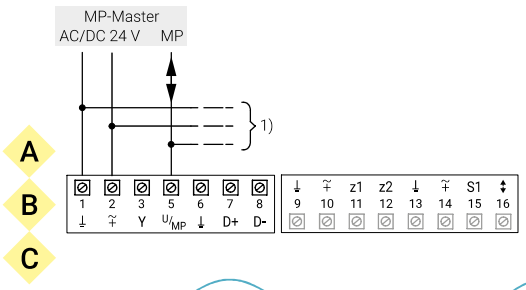


Analogue control [Mode 2...10 V]

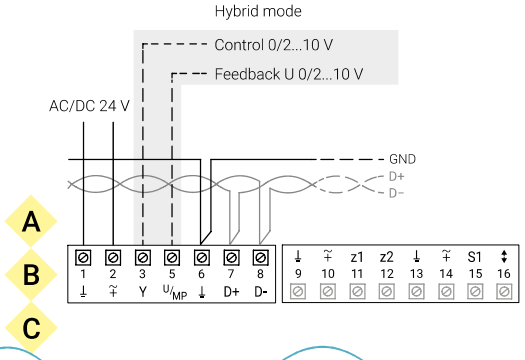
– Step mode: damper CLOSED/P'_{min}/P'_{max}



MP-Bus



Mode RTU, BACnet MS/TP



Connection

Brief description

VRU-...-BAC – Connection and basic functions

Principle diagram

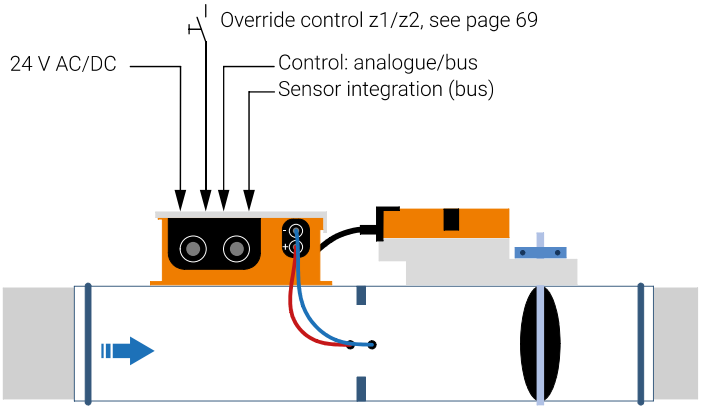
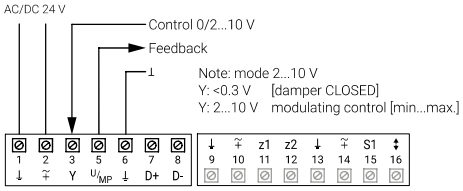


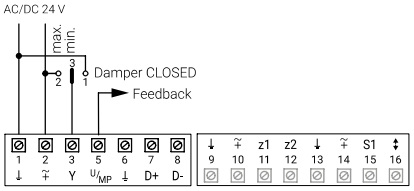
Illustration example

Diagram

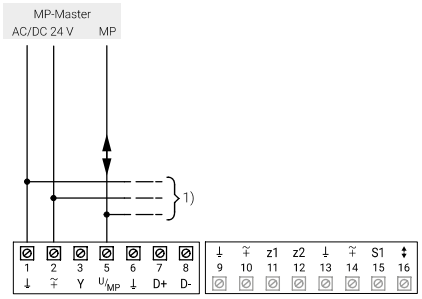
Analogue control [Mode 0...10/2...10 V]
– Modulating operation: min...max.



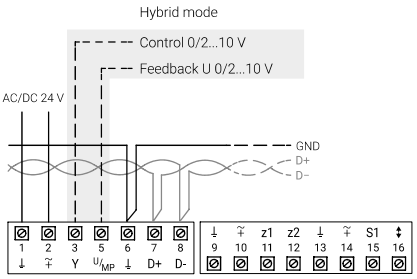
Analogue control [Mode 2...10 V]
– Step mode: damper CLOSED/min./max.



MP-Bus



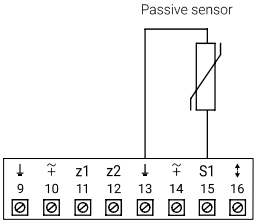
Mode RTU, BACnet MS/TP



[1] Other MP devices (total 8)
z1/z2 see page 69 for connection and priority control

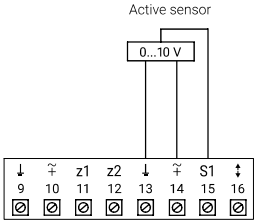
Sensor integration (Modbus, BACnet, MP-Bus)

Connection of passive sensors
e.g. Pt1000/Ni1000/...



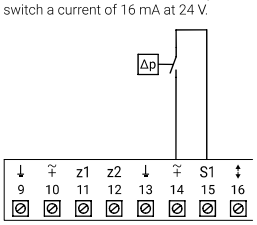
Connection of active sensors
e.g. 0...10 V @ 0...50°C

Possible voltage ranges: 0...32 V
(resolution 30 mV)



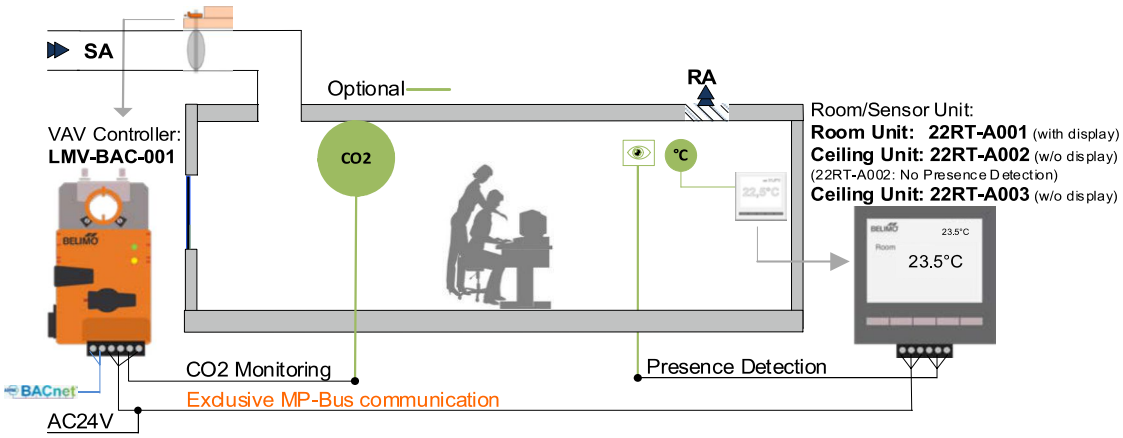
Connection of the switching contact
e.g. Δp monitor

Switching contacts: the switching contact must be able to accurately switch a current of 16 mA at 24 V.



Selection №: 2 - Single duct SUP / Cooling only	Application: No 2

The ZoneEase VAV system modulates the supply air damper of the VAV box for cooling based on room temperature setpoint. In order for it to work properly, the central air handling unit must provide cool primary air.



Operation Modes

Cooling mode
With selected application, The ZoneEase VAV system modulates the supply air damper of the VAV box for cooling.

Cooling mode is operating when the room temperature is above the basic room temperature setpoint plus half the hysteresis (default setting 0.5K).
Hysteresis is also called deadband (default setting 1°C).

Off mode
In Off mode, the ZoneEase system is providing only a minimum air volume flow into zone Vmin and all the controls, temperature and CO2 control, and the corresponding aggregates are turned off. The damper can be configured to the closed position This is used in case of energy saving or in case the room is not occupied e.g. holidays.

Active Mode
This Mode of the VAV system activates all the requisite control parts for the selected application. It is related to vice versa action of Off mode (see above).
Note: The active mode is used by all the applications.

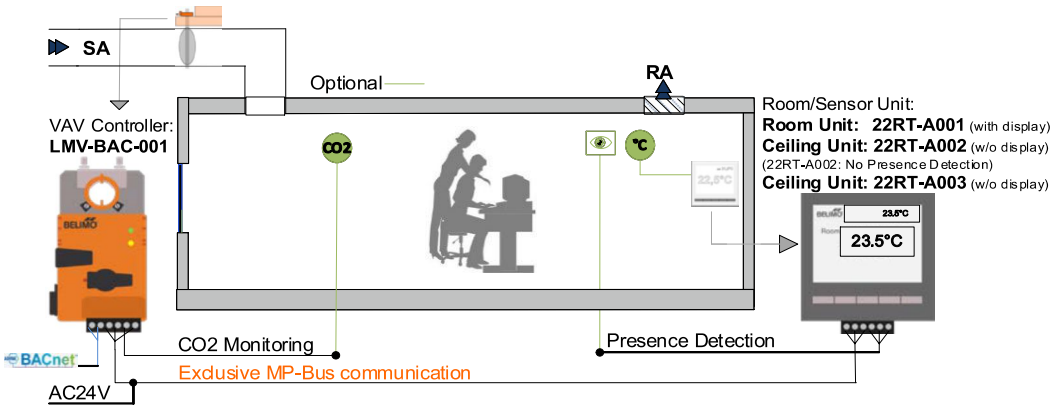
Economy mode
The ECO mode is an energy saving mode. In case the room is not occupied, e.g. night times or weekend, room setpoint [SP] will be overwritten with the cooling Eco temperature setpoint [ESP] in Economy mode.

Boost mode
The Boost mode is used to immediately cool down or heat up the room temperature to room temperature setpoint [SP] and providing a boost of Air. When this mode is activated, air volume flow will be adjusted to Vmax temporarily for 10mins (default setting) or until the temperature setpoint is reached.
This mode can be set by the room user or via the Building Management System by trigger or over a time schedule event. The boost mode is enabled when the following conditions are met:

- The room temperature is above the setpoint when there is a cooling demand that is active.
- The room temperature (based on the active mode temperature set point) is out of the dead band zone. As long as the room temperature is within the deadband zone, the boost mode can`t be enabled.

Selection №: 3 - Single duct SUP – Cooling/Heating only	Application: No 3

The ZoneEase VAV system modulates the supply air damper of the VAV box for cooling or heating based on room temperature setpoint. In order for it to work properly, the central air handling unit must provide cool or heated primary air.



Operation Modes

Cooling/Heating control mode
With selected Application "Heating/Cooling Only", heating mode is operating when the room temperature is lower than the basic cooling/heating setpoint minus half the hysteresis (default setting 0.5K) or cooling mode is operating vice versa if room temperature is above setpoint plus half the hysteresis. In addition the summer/winter mode needs to be activated (bit set to summer=0 cold air is available / winter=1 heated air is available) by Building Management System. This implies cool or heated air is provided by the air handling unit.
Hysteresis is also called deadband (default setting 1°C).

Off mode
In Off mode, the ZoneEase system is providing only a minimum air volume flow into zone Vmin and all the controls such as temperature control, are turned off. The damper can be configured to the closed position. This is used in case of energy saving or in case the room is not occupied e.g. holidays.

Active Mode
This Mode of the VAV system activates all the requisite control parts for the selected application. It is related to vice versa action of Off mode (see above).
Note: The active mode is used by all the applications.

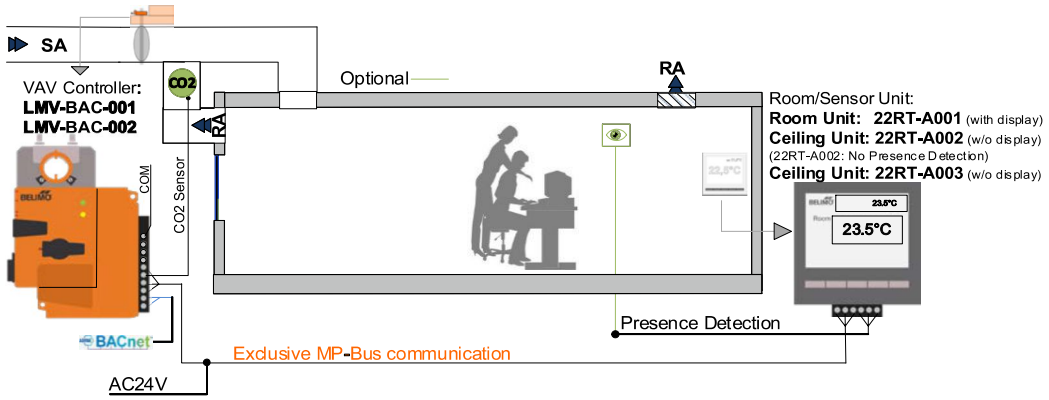
Economy mode
The ECO mode is an energy saving mode. In case the room is not occupied, e.g. night times or weekend, room setpoint [SP] will be overwritten with the cooling/heating Eco temperature setpoint [ESP/ESP] in Economy mode.

Boost mode
The Boost mode is used to immediately cool down or heat up the room temperature to room temperature setpoint [SP] and providing a boost of Air. When this mode is activated, air volume flow will be adjusted to Vmax temporarily for 10mins (default setting) or until the temperature setpoint, respectively P-Band of setpoint, is reached.
This mode can be set by the room user or via the Building Management System by trigger or over a time schedule event. The boost mode is enabled when the following conditions are met:

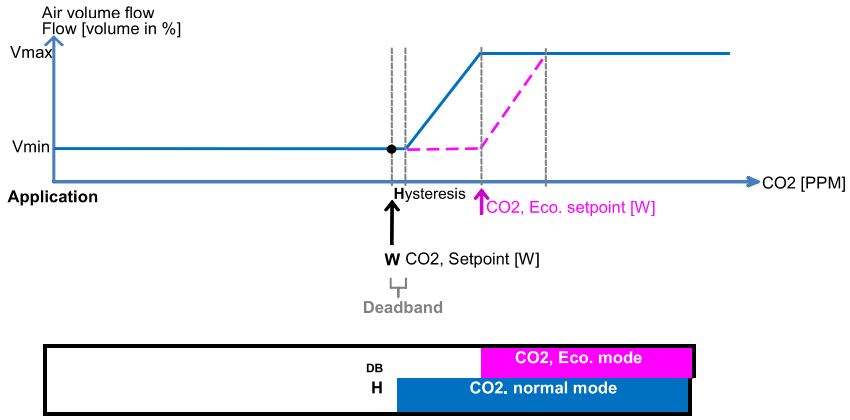
- The room temperature is above the setpoint when there is a cooling demand or below the SP when there is a heating demand that is active.
- The room temperature (based on the active mode temperature setpoint) is out of the dead band zone. As long as the room temperature is within the deadband zone, the boost mode can`t be enabled.

Selection №: 8 - VAV-Demand Control Ventilation by CO2	Application: No 8

The ZoneEase VAV system modulates the supply air damper of the VAV box for fresh air into the zone. Modulation is based on the CO2 concentration from the return air duct (RA) of air handling unit and the desirable indoor air quality (CO2 setpoint). CO2 setpoint and the current CO2 value are accessible at the Room Unit or Ceiling Sensor.



Sequences



Operation Modes

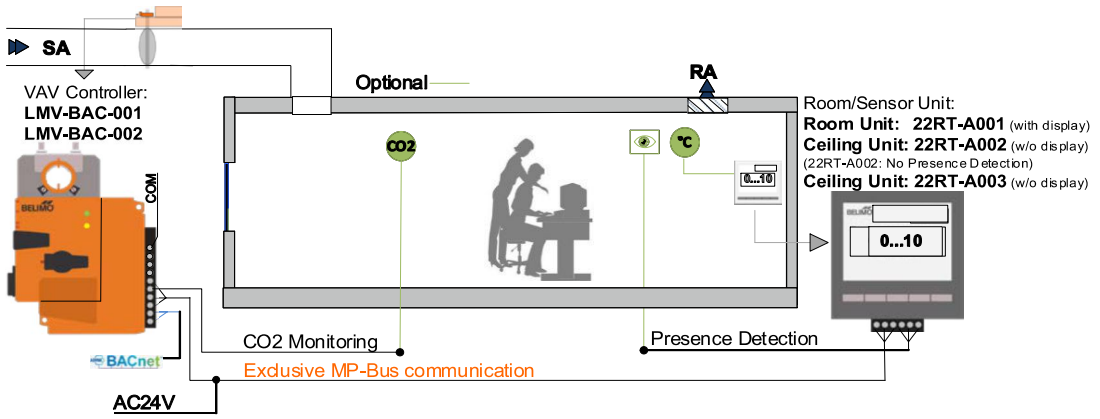
Demand Control Ventilation
With selected Application, the ZoneEase VAV system is operating in demand control ventilation depending from CO2 concentration from the return air duct (RA) of air handling unit and the desirable indoor air quality (CO2 setpoint).

Off mode
In Off mode, the ZoneEase system is providing only a minimum air volume flow into zone,Vmin and the, CO2 control, is turned off. The damper can be configured to the closed position. This is used in case of energy saving or in case the room is not occupied e.g. holidays.

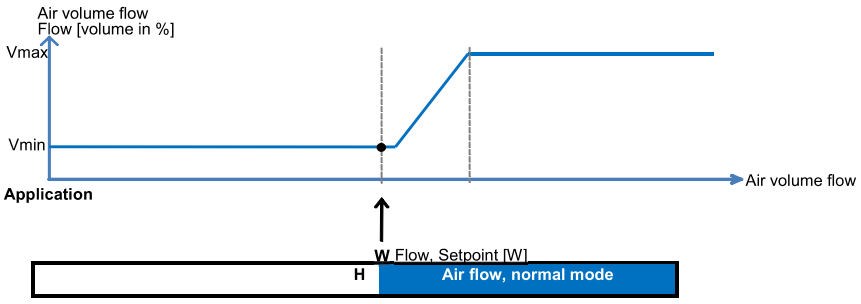
Active Mode
This Mode of the VAV system activates all the requisite control parts for the selected application. It is related to vice versa action of Off mode (see above).

Selection №: 9 - VAV-Flow Control	Application: No 9

The ZoneEase VAV system modulates the supply air damper of the VAV box based on the air volume flow setpoint. In order for it to work properly, the central air handling unit must provide primary air.



Sequences



Operation Modes

VAV-Flow Control (Variable Air Volume)
Selected application modulates the supply air damper of the VAV box based on the air volume flow setpoint. Range of setpoint 0…10 to be selected by room occupant at Room Unit, the setpoint contains stages from 0 to 10 which means Vmin to Vmax. In order for it to work properly, the central air handling unit must provide primary air.

Off mode
In Off mode, the ZoneEase system is providing only a minimum air volume flow into zone by adjustment of Vmin . The damper can be configured to the closed position. This is used in case of energy saving or in case the room is not occupied e.g. holidays.

Active Mode
This Mode of the VAV system activates all the requisite control parts for the selected application. It is related to vice versa action of Off mode (see above).

STARDUCT

SINCE 2004