SOLID AIR®
INTERNATIONAL

Chapter 5
Volume units

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Technique variable volume units 3

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Technique variable volume systems

General
A central air-handling system in a building may produce the need for subsequent control in a particular room or area. The difference in load between the various rooms or their orientation or internal load may be such that unwanted temperature differences occur. Users also like to have the freedom to determine the temperature of the room. Some users feel more comfortable with a higher temperature, whilst others need lower temperatures to perform to the best of their ability. Being able to change the amount of fresh air is also important to air quality.

Variable volume plays an important role in achieving cost savings in producing and transporting fresh air. By measuring and controlling the air quality, it is possible to achieve a good indoor climate whilst minimising air-change costs. It is common to use combinations of control options.

Subsequent control can be achieved in various ways. We distinguish three basic groups of subsequent control:
a) Supply-air temperature control
b) Supply-air volume control.
c) Air-quality control

Group a includes the constant volume post-heating systems. Groups b and c include the standard variable-volume systems (VAV systems) and the variable-volume induction systems (VAV-I systems).
Variable-volume systems have the upper hand from the point of view of energy savings.

Basic principles
The basic variable-volume system is air-side control of the room temperature. In principle, a VAV unit consists of a motor-controlled control damper fitted in the supply duct before the supply diffuser, which controls the amount of supply air with a control signal from the room. In other words, the air volume is adjusted to the temperature difference that exists in respect of the setting point of the room-temperature controller.

Theoretically, this means you can heat or cool with a VAV system. If you change from heating to cooling, the action of the controller needs to be inverted. In the heating situation, less cold air is used with a rising room temperature, whilst in the cooling situation more air is supplied.

If the room temperature ends below the setpoint on the room thermostat, despite minimising the air supply, the supplied air can be raised to a higher temperature with a hot-water after-heater. This control of hot water can be controlled by the room thermostat.

Separating both functions is a good and simple solution. Heating with a basic heating that keeps the rooms at a normal temperature irrespective of the air system, controlled by room or facade on the basis of the outside temperature. The air system provides the ventilation and the cooling of the rooms with the higher load, and controls the room temperature by controlling it by room or by zone. For example, indoor meeting rooms.

Let's consider the summer situation first. With high outdoor temperatures, the cooling load of the room will consist of:
1. Incoming sunshine
2. Transmission
3. Lighting
4. People
5. Heat produced by equipment

These loads are partly permanent, partly variable.
The variables are the incoming sunshine and the outside temperature. The other values have more or less set links, but do depend on the level of occupancy.

If there is one or more persons in the room, the lights will be on and/or equipment, such as screens. That is the basic load that determines the minimum air volume. If the lighting can be controlled in the room, the heat from the lighting is also a variable. The maximum amount of air is determined by the sum of all the factors.

The winter situation does not differ that much from the summer situation. Other than that the transmission share in the summer brings heat from the outside to the inside, but in winter it is the other way around. That heat loss is compensated with heating. You create a facade with a "0" transmission value as it were. In summer or winter, in the room itself there is either a need for more or less cooling. It would seem counterintuitive and not terribly energy aware to heat and cool at the same time. However, remember that the heating elements on the facade do not only supply convection heat, but also serve to compensate the radiation of the relatively cold glass surface.

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In modern, well-insulated buildings, radiators are often no longer necessary. Water-side subsequent controls are used as air post-heaters, climate-control ceilings, induction convectors or concrete core activation or underfloor heating.

Behaviour of the diffusers

Variable volume also means a changing amount of air on the diffusers. Some types of diffuser provide better options than others. The choice of VAV unit is also relevant.

A variable-volume induction system provides for an extremely wide control range and every type of diffuser is suitable. The maximum capacity of a diffuser is determined by the permissible noise levels. With a standard unit, the minimum capacity is determined by the selection details of the diffuser and the temperature difference between the supply temperature and the room temperature.

Ceiling diffusers are generally more suitable than wall diffusers. The selection details of all Solid Air diffusers are based on a supply temperature with a maximum temperature difference of 10 K compared to the room temperature. The lowest air volume in the tables for a diffuser type and model size is therefore the minimum permissible air volume.

If the capacity is below this lowest table value, the Coanda effect will lose out to gravity and the heavier colder air will no longer stick but drop down. However, if the temperature difference is less than 10 K, a horizontal outflow will still be achieved below the minimum value. With a fixed air-supply temperature for a summer and a winter scenario, the relative temperature difference in winter will automatically be smaller than in summer, as the room temperature in winter is generally set lower than in summer.

Example:

Supply temperature	16 °C
Room temperature summer	25 °C
Room temperature winter	21 °C

That makes the temperature difference 9 K for summer and 5 K for winter. By using a sliding control on the supply temperature, it is possible to influence the differences for summer and winter.

The outflow speed of a diffuser determines the occurrence of the Coanda effect. In general, you can say that ceiling diffusers have a greater control range than wall diffusers. Practice has demonstrated that for normal sound requirements, perforated ceiling outlets permit control from 100 to 40-50 %, depending on the model size. For variable-volume induction systems (VAVI), there is more freedom in the choice of diffusers. Controlling down the primary volume is accompanied by increasing the induced air volume, causing the temperature to the diffuser to rise.

The total air volume to the room remains virtually constant and the temperature difference with the room temperature becomes smaller. It is only with an extreme control down, that the total volume will reduce. In fact, the control range that can be achieved with VAVI is from 100 % to 0 %. In practice, 20 % is the most common lowest value, as it is not favourable to close off the ventilation of a room completely.

With a smaller air supply volume over a diffuser, the throw will reduce. The throw is defined as follows: Throw is the distance from the diffuser where the air speed in the horizontal flow does not exceed 0.25 m/s.

In the selection method that is applied by Solid Air, the tables take account of a “normal” ceiling height that is between 2.6 and 3.4 m. The vertical part of the airflow is not taken into account, as the speed in the down area increases rather than decreases on cooling. At the end of throw given in the tables, the air does not stand still. We can conclude that with partial use of a VAV system, the airflow always reaches further than the stated throw, albeit at lower speeds. A reasonable air change of the room is maintained.

It is only when the capacity over the diffuser becomes so small that the weight of the cool flow means the sticking effect no longer occurs, that there will no longer be any air distribution. At that point, the air drops from the diffusers as it were.

Variable volume systems

Introduction

Besides the traditional constant-volume system for ventilation and cooling, there are also a number of energy-saving variable-volume systems:
- Variable volume VARITRONIC.
- Variable volume induction INDUTRONIC.

The VAV systems belong to the group of high-pressure and medium-pressure systems, and consequently they require little in the way of construction volume and do not occupy precious floor surface, as the entire system is built into a suspended ceiling. Just 0.3 m of clearance in thesuspended ceilings, and in many cases much less, is all the space that is required. Space that was already included in the construction volume for the aesthetic finish of "the ceiling", as it includes the required light fittings, hides the required pipes and ducts for electrical systems, sanitary facilities and communication systems, such as telephones and computers. The following overview discusses the main principles of two standard solutions, which belong to the "All Air systems" that make optimum use of "free cooling" and where the operation of the cooling machine is limited to the periods the outdoor temperature exceeds 16 °C to 17 °C.

VAV system; Varitronic
Type VVO, fitted with Belimo control equipment

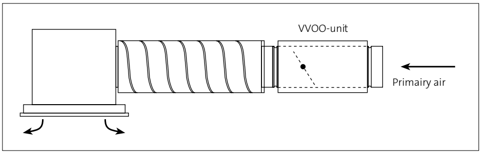
The purpose of the system is to maintain the required room temperature with respect to the cooling situations, and to ensure air quality with minimum ventilation needs. On the basis of the room temperature, and irrespective of the inlet pressure, the exact air volume is supplied that is required to cover the cooling load. However, to guarantee minimum ventilation, the unit does not control further down than a preset minimum. With a correct diffuser choice and positioning, a ratio between minimum and maximum air volume of approximately 1:3 can be achieved, which represents a control range of 100 - 35 %.

The room is preferably heated with a central-heating system along the facade. To prevent simultaneous cooling and heating, a sequential thermostat can be used. When there is a heat demand, the air system returns to the minimum air volume. With this individually set and automated control, it is possible to achieve a low-energy system. The inlet pressure of the unit may be minimal at around 100 to 150 Pa, which reduces the ventilator capacity and, as a result of the simultaneous factor, the central duct system and the ventilator can become smaller. The simple and maintenance-free subsequent control equipment, and the resistance to dirt, reduce maintenance to a minimum.

With a required sound-pressure level of 30 - 35 dB(A) in the room, it is generally necessary to use a separate attenuator. The separation of cooling and heating means the relevant elements can be put in their optimum position:
Heating: on the facade and below the windows to compensate the cold-air drop and cold radiation immediately.
Cooling: with supply diffusers on the facade side in the ceiling, to ensure the cooling air is introduced where the heat is produced.

Another favourable aspect of this separation is that part of the equipment is placed in the ceiling plenum and consequently does not occupy any floor space.

Summary of the Solid Air variable-volume system:
- Control range 100-35 %.
- Simple control equipment, maintenance-free.
- Not sensitive to dirt.
- Low internal resistance.
- Individual subsequent control.
- Low energy.
- Air-quality control option.



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VAV induction system; Indutronic
Type VVIM, fitted with Belimo control equipment

This is an improved version of the variable-volume system. Here too, the air supply volume to the room is adjusted to the load. This system is characterised by adding room air to the primary airflow before it reaches the diffusers. This has a stabilising effect on the air volume to the room and on the supply temperature from the units.

The air speed in the occupied zone is also determined by the supply diffusers and has to comply with the “comfort standards”. With a 100% load, a correctly selected diffuser will manage perfectly. However, at low air speeds, there is a danger of unwanted air movement as the airflow releases from the ceiling and penetrates the occupied zone at too high a speed. Correspondingly, the refreshment rate becomes insufficient as the air does not reach far enough. This limits controlling down in a normal variable-volume system.

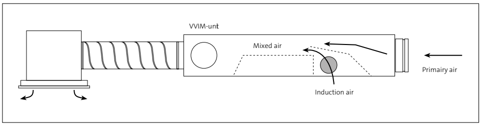
The Solid Air induction VAV unit prevents this type of problem. This units maintains a virtually constant air volume to the room with a decreasing amount of supplied primary air, by taking in room air through the induction opening. As variable-volume units maintain the ventilator pressure more or less constant and at an acceptable noise level, it is possible to calculate the induction effect properly in advance. This is associated with the pressure drop that is achieved over the damper blade, but not with the vane position; the induction effect can be maintained as constant.

This means an inlet pressure of just 100 Pa is sufficient, and additional noise provisions are not required for a required sound-pressure level of 30 - 35 dB(A) in the room. To determine the ventilator pressure, it is not necessary to take the pressure losses behind the induction unit into account, as they are overcome by the pressure recovery in the unit and are already included in the inlet pressure. As the unit always induces air, the air temperature to the diffusers will be higher than the primary temperature. Under a maximum load, ± 20 % air will be added from the room. As the supply temperature may be 12 K lower than the room temperature, the outflow air temperature may differ 10 °K from the room temperature. A situation, where the diffuser will still operate properly. Although this does not change the cooling capacity, the volume reduces by 20%, which means the duct system and the transport ventilator may be smaller.

With a decreasing primary air volume, the supply diffusers are supplied with a more “constant” air volume with an increasing temperature than in a normal variable-volume system. The diffusers continue to control the air movement in the occupied zone, but the average speed will reduce, as the thermal forces are smaller. In a variable-volume induction system this increases the comfort with a decreasing load. In view of the fact that the system runs on part load for a relatively high number of hours per year, this has a strong impact on the comfort experience of the users of the room.

Summary of the Solid Air VAV induction system:

- Smaller central system, with savings of up to 20 %.
- Not sensitive to dirt.
- Extremely low resistance.
- Control range of 100-10 % with increasing comfort.
- Low sound-pressure level.
- Low installation costs, due to integrated control, attenuator and manifold.
- Simple control equipment, maintenance-free.



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Variable-volume system, comments on design

VAV system VVO and VVI type:

Usually, an inlet pressure of 75-100 Pa is sufficient for the variable-volume units. When post-heaters are used, an extra 50 Pa should be taken into account.

Limit the difference in inlet pressure between the first and the last units in the duct system. This can cause differences in sound production of the units that are too great. It is recommended to keep the pressure drop over the duct system below 100 Pa with 100 % air supply.

The ventilator is controlled on the basis of the duct pressure. Therefore, position the pressure transducer deep into the duct system.

Pay extra attention to critical acoustic situations, such as low noise levels (< 25 dB(A)), hard rooms, light walls, no suspended ceilings, etc. In case of doubt, consult an acoustics adviser.

Preferably fit a control-technical link between the variable-volume system (cooling) and the heating, so that they do not work against each other.

Set the system in such a way that with 100% yield of the air-handling unit, the last units at the end of the duct system still operate and have an inlet pressure of 75-100 Pa. Take the corresponding pressure value of the pressure transducer as the setpoint.

Variable-volume units are insensitive to the fitting position. However, the disruption of the flow due to bends and branches must be taken into account. Two to three times the diameter as a straight flow before the unit is recommended. The duct dimension corresponds to the connection sizes of the unit.

VAV-Induction system type VVI, diffuser selection

As induction units also induce air under a maximum load, we recommend the diffusers are selected at approximately 1.2 times the primary air volume.

Design the secondary duct system, including diffuser, at maximum 25 Pa pressure loss.

Comment

For more information regarding the control equipment, please consult our technical experts.

VVOS

Variable-volume unit
Round
Single-walled and double-walled
LUKA D/ATC 2

Available types
V V O S M - -

- **V** volume unit
- **V** variable volume
- **O** round version
- **S** Safe version
- **M** eXavol measuring instrument

- **Version**
  - **O** single-walled
  - **D** double-walled

- **Belimo control equipment**
  - **S** compact MP (standard)
  - **T** compact MOD (also suitable for BACnet MS/TP)
  - **K** compact KNX
  - **V** universal VRU (if fast running motor is desired)

For more specific information about the aforementioned Belimo control equipment please refer to the annex VAV actuators.

SA-Select
Check SA-Select to create extended order codes and selection details online. **NB!** At this moment, SA-Select is only available in Dutch. But it is possible to create extended order codes and selection details online.

Use
The variable-volume unit type VVOS is suitable for room-temperature control and air-quality control in low, mid and high-pressure systems. The units are suitable for supply air and discharge air.

Characteristics
- Nominal volume range up to 26 t/m 4464 m^3/h.
- Minimum air velocity 1 m/s.
- High control accuracy.
- Available in seven model sizes.
- Independent of inlet pressure.
- Extremely low internal resistance.
- Diagonally integrated measuring instrument.
- Airtightness class LUKA D/ ATC 2.
- Damper blade seal: airtight class 4 in accordance with EN 1751.

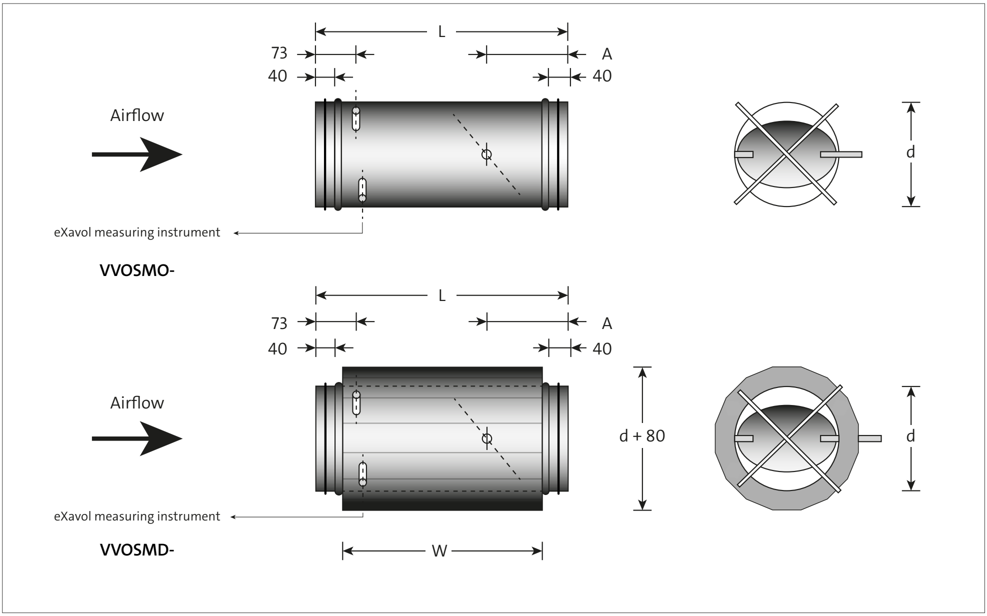
Finish

Housing and damper blade:	sendzimir galvanised steel sheet
Round connection:	in accordance with EN 1506 and EN 13180

Control equipment
Solid Air has Belimo as its own brand for combining variable volume controls with intelligent servo motors. Our variable volume control comes factory calibrated with a control accuracy of approximately 3 %. For more specific information about adjusting your VAV system, please refer to the appendix Commissioning variable volume system.

If required, other makes can be used. This would be subject to other prices than those included in this catalogue. Information is available on request.

Dimensions



Available dimensions

model	A	B	L	d	weight single-walled	weight double-walled
100	85	245	350	99	1.8	2.0
125	95	245	350	124	1.8	2.0
160	95	245	350	159	2.3	2.5
200	112	295	400	199	2.8	3.0
250	136	295	400	249	2.8	3.0
315	170	395	500	314	4.3	4.5
400	215	495	600	399	4.8	5.0

Note

- The listed dimensions are in mm, the listed weights are (including Belimo compact controller) in kg.
- Take account of attenuation in case of a high pressure loss. We recommend placing a silencer behind the volume control. Click here for technical documentation.
- Factory setting of damper blade direction:
  CCW: open
  CW: closed

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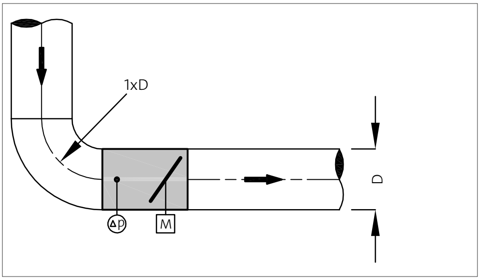
Fitting

Variable-volume unit type VVOS are insensitive to the mounting position and are particularly accurate. The disruption of the flow due to bends and/or canal branches must be taken into account. Disruption of the ideal flow can lead to reduced control accuracy to approx. 15 %.

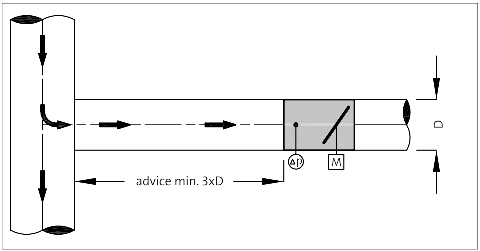
Bend

Placing a VAV controller immediately after a 1xD bend often has no significant impact on control accuracy.



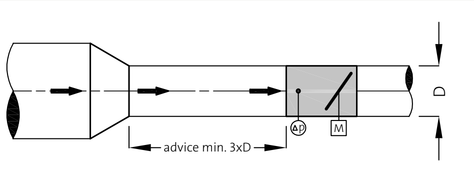
Main channel branch

When branching off the main channel, the advice is to use at least 3 x D straight flow.



Conduct for the unit

When using conducts in the connecting channel, the advice is to maintain at least 3xD straight flow for the volume unit in the size of the volume unit.



Selection details

model	volume flow in m³/h at air velocity									
	1 m/s	2 m/s	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s (Qv nom)
100	26	53	79	106	132	158	185	211	238	264
125	42	84	126	168	211	253	295	337	379	421
160	69	138	207	276	346	415	484	553	622	691
200	109	218	328	437	546	655	764	874	983	1092
250	172	344	515	687	859	1031	1203	1374	1546	1718
315	275	549	824	1099	1374	1648	1923	2198	2472	2747
400	446	893	1339	1786	2232	2678	3125	3571	4018	4464

The preferred area for maximum volum flow.

We recommend a minimum volume flow according to a channel speed of 1 m/s (take into account reduced control accuracy at even lower air velocities).

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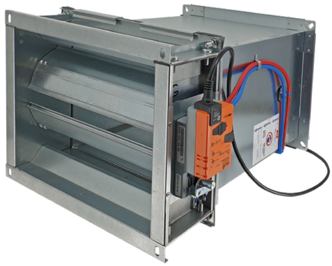

VRV

Variable-volume unit
Rectangular
Single-walled and double-walled
LUKA D/ATC 2

Available types
V R V - S - -

- **V** volume control
- **R** rectangular version
- **V** variable volume

- **Seal**
  - **R** with rubber seal on damper blades
  - **L** airtightness class 4 in accordance with EN1751

- **S** SDV measuring instrument

- **Version**
  - **O** single-walled
  - **D** double-walled

- **Belimo control equipment:**
  - **S** compact MP (standard)
  - **T** compact MOD (also suitable for BACnet MS/TP)
  - **K** compact KNX
  - **V** universal VRU (if fast running motor is desired)

For more specific information about the above-mentioned Belimo control equipment, please refer to the annex VAV actuators.

SA-Select
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Use
The rectangular variable-volume unit type VRV is suitable as an air-volume unit in low and medium-pressure systems, in supply and return systems.
The unit can be fitted with an electronic control system with a factory set minimum and maximum air volume, and works independently of inlet pressure. The unit can also be supplied as a constant-volume unit.
These units can be used in balance controls. Please consult our technical experts.

Characteristics
- Nominal volume range up to 86400 m³/h.
- Independent of inlet pressure
- High control accuracy
- Low flow noise.
- Airtightness class LUKA /ATC 2.

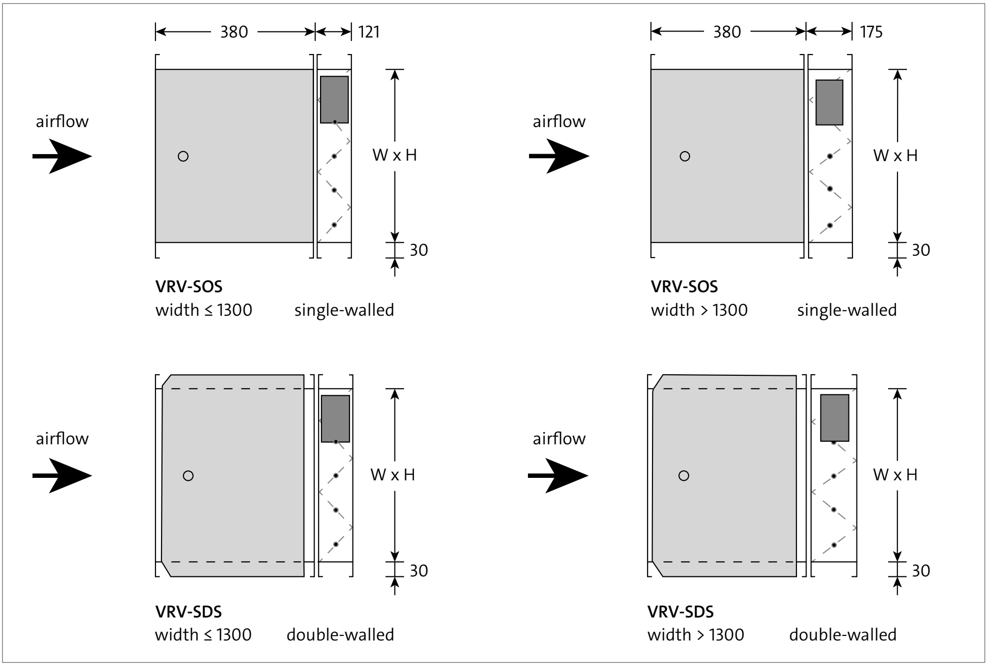
Finish

Housing and damper blades:	sendzimir galvanised steel sheet
Drive:	aluminium gears
Bearings:	polyamide

Control equipment
Solid Air uses Belimo as its house brand for combining variable-volume units with intelligent servomotors. For more specific information about adjusting your VAV system, please refer to the appendix Commissioning variable volume system.

If required, other makes can be used. This would be subject to other prices than those included in this catalogue. Information is available on request.

Dimensions



Available dimensions

- Every duct size to 2000 x 1200 mm (W x H).

Note

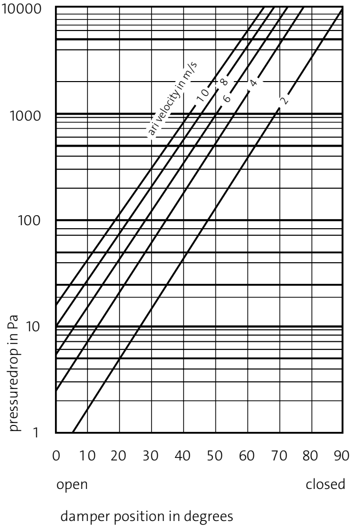
- The listed dimensions are in mm.
- Take account of attenuation in case of a high pressure loss.
- VRV version with airtight damper section to 1200 mm with 121 mm profile, larger with 175 profile.
- Dimensions that exceed 1200 x 1200 mm have an airtightness class LUKA C/ATC 3.
- Factory setting of damper blade direction:
  CCW: open
  CW: closed

Fitting

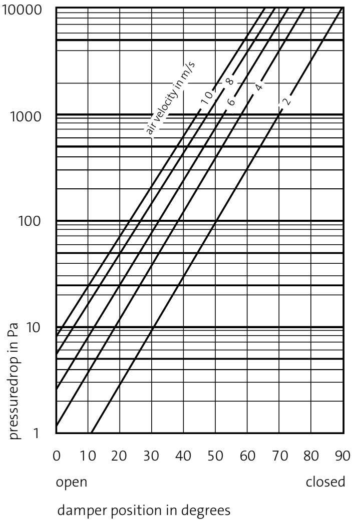
Variable-volume units type VRV are insensitive to the fitting position. However, the disruption of the flow due to bends and branches must be taken into account. Two to three times the straight flow of the diameter before the unit is recommended. The duct dimension corresponds to the connection size of the unit.

Selection details

W ≤ 1200 mm



W > 1200 mm



Minimum air volume at 2 m/s (m³/h)

H	W												
	200	**300**	**400**	**500**	**600**	**700**	**800**	**1000**	**1200**	**1400**	**1600**	**1800**	**2000**
200	288	432	576	720	864	1008	1152	1440	1728	2016	2304	2592	2880
300	432	648	864	1080	1296	1512	1728	2160	2592	3024	3456	3888	4320
400	576	864	1152	1440	1728	2016	2304	2880	3456	4032	4608	5184	5760
500	720	1080	1440	1800	2160	2520	2880	3600	4320	5040	5760	6480	7200
600	864	1296	1728	2160	2592	3024	3456	4320	5184	6048	6912	7776	8640
700	1008	1512	2016	2520	3024	3528	4032	5040	6048	7056	8064	9072	10080
800	1152	1728	2304	2880	3456	4032	4608	5760	6912	8064	9216	10368	11520
900	1296	1944	2592	3240	3888	4536	5184	6480	7776	9072	10368	11664	12960
1000	1440	2160	2880	3600	4320	5040	5760	7200	8640	10080	11520	12960	14400
1100	1584	2376	3168	3960	4752	5544	6336	7920	9504	11088	12672	14256	15840
1200	1728	2592	3456	4320	5184	6048	6912	8640	10368	12096	13824	15552	17280

Maximum air volume at 10 m/s (m³/h)

H	W												
	200	**300**	**400**	**500**	**600**	**700**	**800**	**1000**	**1200**	**1400**	**1600**	**1800**	**2000**
200	1440	2160	2880	3600	4320	5040	5760	7200	8640	10080	11520	12960	14400
300	2160	3240	4320	5400	6480	7560	8640	10800	12960	15120	17280	19440	21600
400	2880	4320	5760	7200	8640	10080	11520	14400	17280	20160	23040	25920	28800
500	3600	5400	7200	9000	10800	12600	14400	18000	21600	25200	28800	32400	36000
600	4320	6480	8640	10800	12960	15120	17280	21600	25920	30240	34560	38880	43200
700	5040	7560	10080	12600	15120	17640	20160	25200	30240	35280	40320	45360	50400
800	5760	8640	11520	14400	17280	20160	23040	28800	34560	40320	46080	51840	57600
900	6480	9720	12960	16200	19440	22680	25920	32400	38880	45360	51840	5.320	64800
1000	7200	10800	14400	18000	21600	25200	28800	36000	43200	50400	57600	64800	72000
1100	7920	11880	15840	19800	23760	27720	31680	39600	47520	55440	63360	71280	79200
1200	8640	12960	17280	21600	25920	30240	34560	43200	51840	60480	69120	77760	86400

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Air noise VRV: w x h = 1000 x 1000 mm

100 Pa Pressure loss

v	Lw in dB/octave band								Lwa
m/s	63	125	250	500	1k	2k	4k	8k	dB(A)
2	57	57	59	61	62	61	56	46	67
4	65	63	62	61	60	57	53	47	65
6	70	67	65	64	63	62	59	54	68
8	73	70	68	67	66	65	62	58	72
10	83	81	79	77	74	70	64	56	79

200 Pa Pressure loss

v	Lw in dB/octave band								Lwa
m/s	63	125	250	500	1k	2k	4k	8k	dB(A)
2	63	64	66	68	69	67	62	53	73
4	72	70	69	68	66	64	60	54	71
6	76	74	72	71	70	68	65	60	75
8	80	77	75	73	73	71	69	65	78
10	83	79	77	75	74	73	71	68	80

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400 Pa Pressure loss

v	Lw in dB/octave band								Lwa
m/s	63	125	250	500	1k	2k	4k	8k	dB(A)
2	70	70	72	74	75	74	69	60	80
4	77	75	75	77	79	80	79	74	86
6	83	80	79	78	77	75	72	67	82
8	87	83	81	80	79	78	75	71	85
10	90	86	83	82	81	80	78	74	87

Radiation noise VRV: w x h = 1000 x 1000 mm

100 Pa Drukverlies

v	Lw in dB/octave band								Lwa
m/s	63	125	250	500	1k	2k	4k	8k	dB(A)
2	54	53	51	50	46	40	30	15	51
4	62	59	54	50	44	36	27	16	51
6	67	63	57	53	47	41	33	23	55
8	70	66	60	56	50	44	36	27	58
10	80	77	71	66	58	49	38	25	68

200 Pa Pressure loss

v	Lw in dB/octave band								Lwa
m/s	63	125	250	500	1k	2k	4k	8k	dB(A)
2	60	60	58	57	53	46	36	22	58
4	69	66	61	57	50	43	34	23	58
6	73	70	64	60	54	47	39	29	62
8	77	73	67	62	57	50	43	34	64
10	80	75	69	64	58	52	45	37	66

400 Pa Pressure loss

v	Lw in dB/octave band								Lwa
m/s	63	125	250	500	1k	2k	4k	8k	dB(A)
2	67	66	64	63	59	53	43	29	64
4	74	71	67	66	63	59	53	43	68
6	80	76	71	67	61	54	46	36	68
8	84	79	73	69	63	57	49	40	71
10	87	82	75	71	65	59	52	43	73

Noise data

- The radiation noise of the double-walled version is approximately 5 dB than the above table values.

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Correction table alternative dimensions

Air noise

H	W												
	200	300	400	500	600	700	800	1000	1200	1400	1600	1800	2000
200	-14	-12	-11	-10	-9	-9	-8	-7	-6	-6	-5	-4	-4
300	-12	-10	-9	-8	-7	-7	-6	-5	-4	-4	-3	-3	-2
400	-11	-9	-8	-7	-6	-6	-5	-4	-3	-3	-2	-1	-1
500	-10	-8	-7	-6	-5	-5	-4	-3	-2	-2	-1	0	0
600	-9	-7	-6	-5	-4	-4	-3	-2	-1	-1	0	0	1
700	-9	-7	-6	-5	-4	-3	-3	-2	-1	0	0	1	1
800	-8	-6	-5	-4	-3	-3	-2	-1	0	0	1	2	2
1000	-7	-5	-4	-3	-2	-2	-1	0	1	1	2	3	3
1200	-6	-4	-3	-2	-1	-1	0	1	2	2	3	3	4

Radiation noise

H	W												
	200	300	400	500	600	700	800	1000	1200	1400	1600	1800	2000
200	-7	-6	-5	-5	-4	-3	-3	-2	-2	-1	0	0	0
300	-6	-5	-5	-4	-3	-3	-3	-2	-1	-1	0	0	1
400	-5	-5	-4	-3	-3	-3	-2	-2	-1	0	0	0	1
500	-5	-4	-3	-3	-3	-2	-2	-1	-1	0	0	1	1
600	-4	-3	-3	-3	-2	-2	-2	-1	0	0	0	1	1
700	-3	-3	-3	-2	-2	-2	-1	-1	0	0	1	1	1
800	-3	-3	-2	-2	-2	-1	-1	0	0	0	1	1	1
1000	-2	-2	-2	-1	-1	-1	0	0	0	1	1	1	2
1200	-2	-1	-1	-1	0	0	0	0	1	1	1	2	2

Selection example

Situation

Air volume	3900 m^3/h.
Duct size	600 x 300 mm.
Max. pressure difference over the unit	approx. 200 Pa.

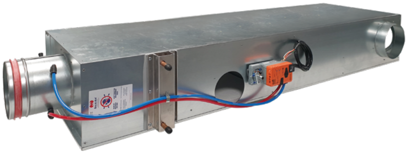
Solution

Calculate supply speed	v = ca. 6 m/s.
Read L_W af in table	
• Air noise (200 Pa)	L_{wa} = 75 dB(A).
• Radiation noise (200 Pa)	L_{wa} = 62 dB(A).

Read the correction values in the correction table and correct the previously calculated L_{wa} value:

• Air noise	75 - 7 = 68 dB(A).
• Radiation noise	62 - 3 = 59 dB(A).

The octave-band data need to be corrected in the same way.



VVIS

Variable-volume unit
Inducing
Attenuating
Luka D/ATC 2

Available types
V V I S M - - - -

- **V** volume unit
- **V** variable volume
- **I** induction
- **S** safe (primary connection only)
- **M** eXavol measuring instrument

- **Secondary connection**
  - **E** rectangular
  - **M** 4 x round
  - **N** 1 x round

- **Accessories**
  - **O** not applicable
  - **B** warm-water post-heating battery

- **Belimo control equipment**
  - **S** compact MP (standard)
  - **T** compact MOD (also suitable for BACnet MS/TP)
  - **K** compact KNX
  - **V** universal VRU (if fast-running motor is desired)

- **Finish**
  - **R** servo motor and post-heating battery right (standard)
  - **L** servo motor and post-heating battery left

For more specific information about the above-mentioned Belimo control equipment, please refer to the appendix VAV actuators.

Use
The variable-volume unit type VVIS is suitable for room-temperature control and air-quality control. The induction effect ensures a stable outflow pattern between the minimum and maximum air volume. The unit is used in rooms that are fully climatised with air.

Characteristics
- Nominal volume between 26 to 1,718 m^3/h.
- Available in five model sizes.
- Extremely low internal resistance.
- Pressure independent.
- Control damper can close fully.
- Diagonally integrated measuring instrument.
- Great control accuracy.
- Extremely low radiation and air-noise level.
- Airtightness class housing LUKA D/ATC 2.

Finish
Housing: sendzimir galvanised steel sheet
Internal acoustic and thermal insulation.
Round connection: in accordance with EN 1506 and EN 13180

Post-heating battery can be removed for inspection and maintenance.

Pipes:	copper
Vanes:	aluminium, double-waved
Max. operating pressure:	10.5 bar
Max. temp.:	90 °C
Test pressure:	25 bar
Connection:	external 12 mm

Control equipment
Solid Air has Belimo as its own brand for combining variable volume units with intelligent servo motors. Our variable volume control comes factory calibrated with a control accuracy of approximately 3 %. For more specific information about adjusting your VAV system, please refer to the appendix Commissioning variable volume system.

If desired, other products can be used. Different prices apply than those stated in this catalogue. Information on request.

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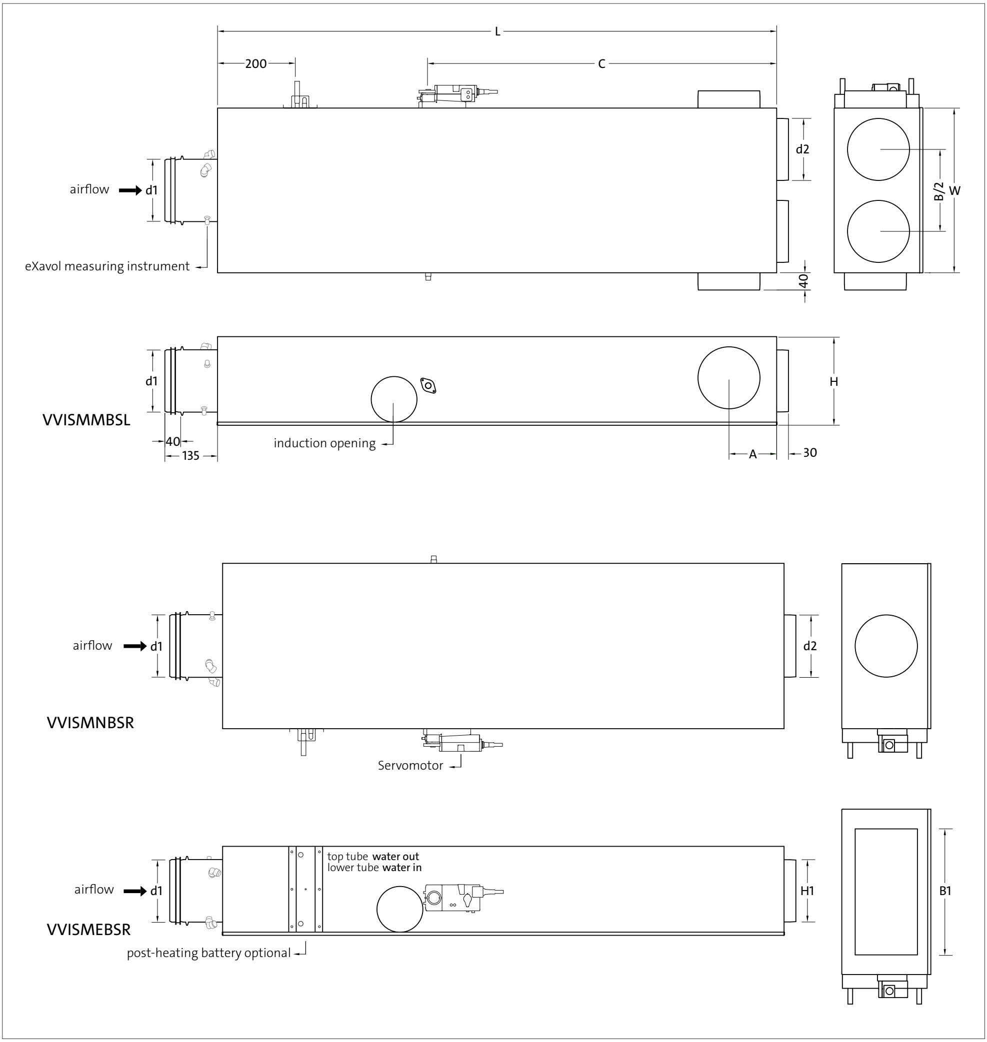
Dimensions



Available dimensions

model	d1	d2	L with post-heating battery	L without post-heating battery	W	H	A	B1	H1	C
100	99	124	1210	1150	350	200	104	298	123	735
125	124	124	1210	1150	350	200	104	298	123	735
160	159	159	1425	1365	420	225	122	368	158	888
200	199	199	1630	1570	500	275	142	448	198	1030
250	249	249	1930	1870	600	325	167	548	248	1281

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Selection details

model	volume flow in m³/h at air velocity									
	1 m/s	2 m/s	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s (Qv nom)
100	26	53	79	106	132	158	185	211	238	264
125	42	84	126	168	211	253	295	337	379	421
160	69	138	207	276	346	415	484	553	622	691
200	109	218	328	437	546	655	764	874	983	1092
250	172	344	515	687	859	1.031	1203	1374	1546	1718

The preferred area for maximum volum flow.

We recommend a minimum volume flow according to a channel speed of 1 m/s (take into account reduced control accuracy at even lower air velocities).

Comment

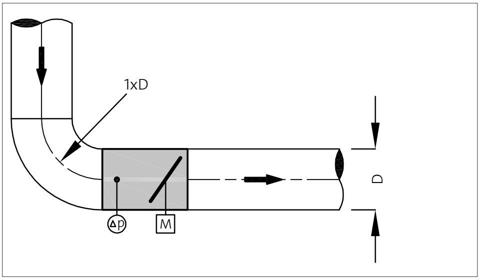
• The listed dimensions are in mm.

Fitting

Variable-volume units type VVOS are insensitive to the fitting position. However, the disruption of the flow due to bends and branches must be taken into account. Disruption of the ideal flow can lead to reduced control accuracy of up to approx. 15 %.

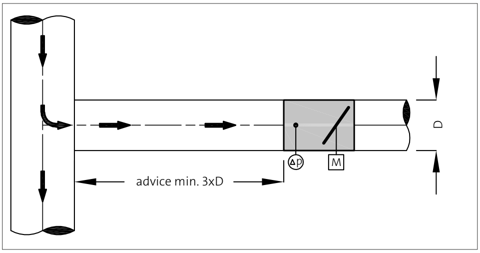
Bend

Placing a VAV controller immediately after a 1xD bend often has no significant impact on control accuracy.



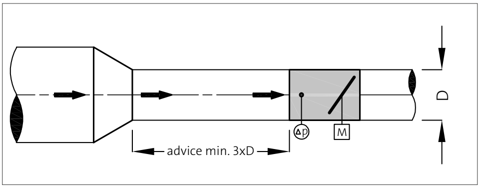
Main channel branch

When branching off the main channel, the advice is to use at least 3 x D straight flow.

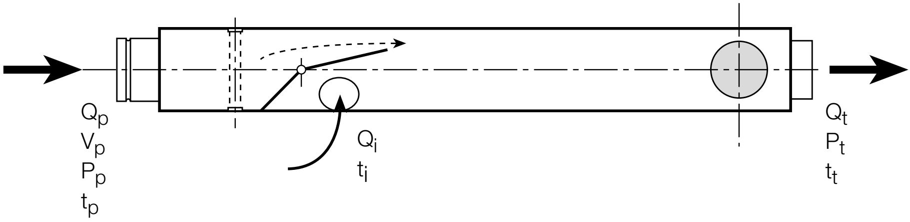


Conduct for the unit

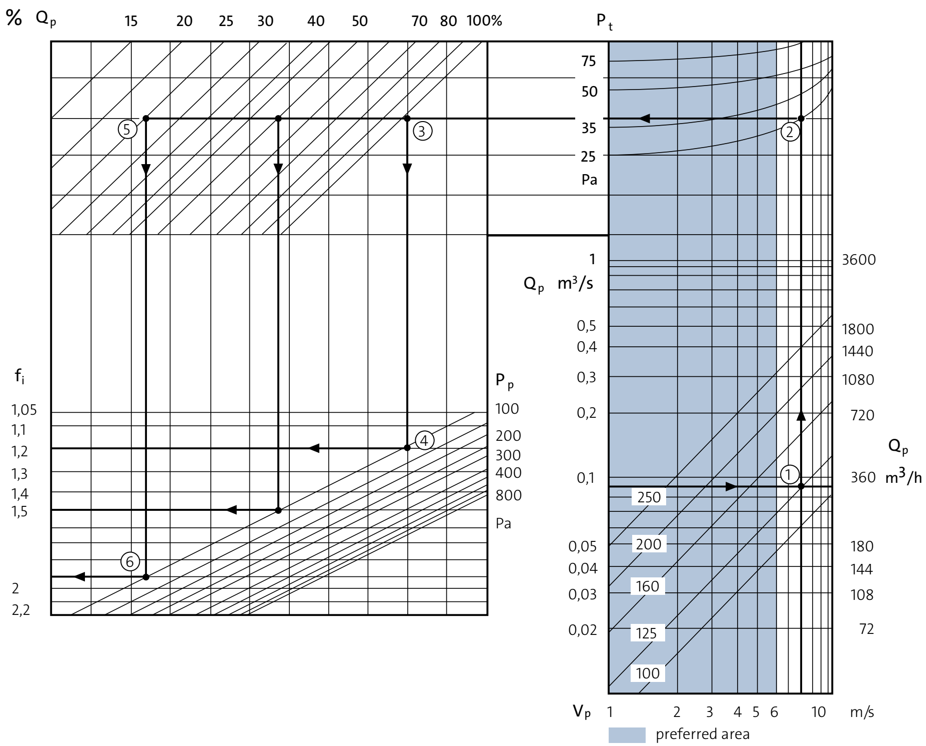
When using conducts in the connecting channel, the advice is to maintain at least 3xD straight flow for the volume unit in the size of the volume unit.



Selection graph air side, induction determination



Q_p = incoming air volume in m³/s (m³/h)
V_p = speed in primary connection in m/s
P_p = inlet pressure in Pa
t_p = entry temperature in °C
Q_i = induction air volume (Q_t - Q_p)
t_i = induction air temperature in °C
f_i = induction factor
Q_t = total air volume (Q_p x f_i)
P_t = counterpressure duct + diffuser in Pa



Selection example

Situation

Q_p = 0,09 m³/s (maximum)
P_p = 100 Pa
P_t = 25 Pa
t_p = 16 °C
t_i = 24 °C (room temperature) summer minimum 25 %

Required

model size
V_p = . . m/s
Q_t = . . m³/s
t_t = . . C with maximum and minimum capacity

Solution

Determine model size within the preferred range.
Model size 125 with V_p = 7,8 m/s.

Determine fi for 100 % capacity and 100 Pa inlet pressure.
f_i = 1.2

Determine Qt for maximum capacity for the purpose of choosing the diffuser
Q_t = 1,2 x 0,09 = 0,108 m³/s

Determine tt for maximum capacity
$\Delta t_t = \Delta t_p : f_i$

$= 8 : 1.2 = 6.6$ °C

$t_t = t_i - \Delta t_t$

$= 24 - 6.6 = 17.4$ °C

Determine f_i for 25 % capacity and 100 Pa inlet pressure summer situation.
f_i = 1.9

Determine Qt for minimum capacity summer situation.

$$Q_t = \frac{1.9 \times 0.09 \times 25}{100} = 0.043 \text{ m}^3/\text{s}$$

Determine tt for minimum capacity summer situation.

$\Delta t_t = \Delta t_p : t_i$

$= 8 : 1.9 = 4.2$ °C

$t_t = t_i - \Delta t_t$

$= 24 - 4.2 = 19.8$ °C

For the sake of simplicity, it has been assumed that the inlet pressure remains the same for the minimum capacity. The actual values of Q_t and t_t will be more favourable due to a higher inlet pressure.

Selection data heating capacity

air volume		model 100 & 125							ΔP air in Pa
		water l/h							
m^3/s	m^3/h	50	60	80	100	125	150	200	
0.015	54	10.9	11.1	11.4	11.6	11.8	12.0		-
0.020	72	13.5	13.9	14.5	14.8	15.0	15.2	15.4	1
0.025	90	16.0	16.5	17.3	17.7	18.0	18.2	18.6	1
0.030	108	18.2	18.9	19.9	20.5	20.9	21.2	21.6	2
0.040	144	22.0	23.1	24.4	25.4	26.0	26.5	27.1	3
0.050	180	25.0	26.5	28.4	29.5	30.5	31.2	32.1	5
0.060	216	27.5	29.1	31.6	33.1	34.4	35.3	36.5	7
0.080	288	30.5	33.1	36.7	38.9	40.8	42.1	43.8	12
0.100	360	32.0	35.3	39.9	42.9	45.5	47.2	49.6	19
0.125	450		36.3	42.1	46.1	49.4	51.9	55.1	29
0.150	540			43.1	47.8	52.1	55.1	59.0	42
0.200	720				48.3	54.0	58.1	63.5	74
		0.65	0.94	1.67	2.61	4.07	5.87	10.4	
		ΔP water in kPa							

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air volume		model 160							ΔP air in Pa
		water l/h							
m^3/s	m^3/h	50	60	80	100	125	150	200	
0.020	72	13.9	14.5	15.0	15.4	15.8	16.0	16.2	-
0.025	90	16.5	17.1	18.0	18.4	19.0	19.2	19.6	1
0.030	108	19.0	19.7	20.9	21.4	22.0	22.4	22.7	1
0.040	144	23.3	24.4	25.9	26.9	27.6	28.2	29.0	1
0.050	180	26.9	28.4	30.5	31.8	32.9	33.7	34.6	2
0.060	216	29.9	31.8	34.4	36.1	37.6	38.5	39.7	3
0.080	288	34.4	37.2	41.0	43.4	45.1	47.0	48.9	5
0.100	360	37.2	40.8	45.9	48.3	52.1	54.0	56.6	8
0.125	450	39.1	43.6	50.2	54.5	58.3	60.9	64.5	13
0.150	540	39.3	44.9	52.8	58.3	63.0	66.4	70.9	19
0.200	720	-	-	54.5	61.9	68.4	73.3	79.7	33
0.250	900	-	-	-	62.2	70.3	76.5	84.6	52
		0.73	1.05	1.87	2.92	4.56	6.57	11.7	
		ΔP water in kPa							

air volume		model 200							ΔP air in Pa
		water l/h							
m^3/s	m^3/h	100	125	150	200	250	300	400	
0.030	108	25.7	26.4	28.9	27.5	28.0	28.4	28.7	-
0.040	144	32.1	33.3	34.0	35.0	35.7	36.0	36.7	1
0.050	180	38.0	39.6	40.6	41.9	42.8	43.4	44.1	1
0.060	216	43.4	45.3	46.6	48.5	49.5	50.4	51.2	2
0.080	288	52.4	55.4	57.5	60.2	61.9	62.9	64.4	3
0.100	360	59.8	63.7	66.6	70.3	72.5	74.2	76.2	4
0.125	450	66.8	72.2	75.9	81.0	84.2	86.4	89.2	7
0.150	540	71.7	78.4	83.3	89.7	94.0	96.7	100.4	10
0.200	720	77.2	86.5	93.5	102.8	108.8	113.1	118.6	17
0.250	900	78.3	89.9	98.7	110.9	119.0	124.6	132.0	27
0.300	1080		90.2	100.7	115.4	125.4	132.5	141.8	39
0.400	1440				117.5	130.6	140.3	153.5	70
		0.55	0.86	1.23	2.19	3.43	4.94	8.78	
		ΔP water in kPa							

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air volume		model 250							ΔP air in Pa
		water l/h							
m³/s	m³/h	100	125	150	200	250	300	400	
0.050	**180**	93.2	40.9	42.3	43.8	44.8	45.5	46.3	**-**
0.060	**216**	45.0	47.2	48.7	50.7	52.1	52.9	53.9	**1**
0.080	**288**	55.1	58.5	60.7	63.7	65.6	66.8	68.5	**1**
0.100	**360**	36.7	68.1	71.3	75.4	77.9	79.6	81.8	**2**
0.125	**450**	72.7	78.6	82.6	88.2	91.6	94.1	97.2	**3**
0.150	**540**	79.6	87.0	92.3	99.4	103.9	107.0	111.0	**4**
0.200	**720**	89.1	99.5	107.0	117.5	124.1	128.8	134.7	**8**
0.250	**900**	93.8	107.0	116.9	130.5	139.4	145.7	154.0	**12**
0.300	**1080**	95.0	110.9	128.9	139.8	150.9	158.9	169.0	**17**
0.400	**1440**			126.6	149.2	164.8	175.8	191.0	**31**
0.500	**1800**				150.8	170.7	184.2	204.5	**48**
0.600	**2160**						187.6	211.3	**69**
		0.63	0.98	1.42	2.52	3.94	5.67	10.1	
		ΔP water in kPa							

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Heating data

- The heat output is given in Watt per °C temperature difference between water and air-entry temperature.
  Q = table value x (t_w - t_l)
  = total transmitted output in Watt.
  t_w = water-entry temperature
  t_l = air-entry temperature
- The values included in the tables should be used as the minimum water volume.
- It is permitted to interpolate the interim values.
- It is customary to calculate the output for the maximum air volume, taking account of the fact that lower air volumes generate less heat output.

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Radiation noise VVIS

model 100																
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.031	111	4	100	30	31	29	23	20	14	11	200	37	38	36	30	27	21	18
0.047	170	6	100	33	34	32	26	23	17	14	200	39	40	38	32	29	23	20
0.063	227	8	100	36	37	35	29	26	20	16	200	41	42	40	34	31	25	22
0.079	284	10	100	38	39	37	31	28	22	19	200	43	44	42	36	33	27	24
0.031	111	4	400	44	45	43	37	34	28	25	800	51	52	50	41	41	35	32
0.047	170	6	400	46	47	45	39	36	30	27	800	53	54	52	46	43	37	34
0.063	227	8	400	48	49	47	41	38	32	29	800	55	56	54	48	45	39	35
0.079	284	10	400	49	50	48	42	39	33	30	800	56	57	55	49	46	40	37

model 125																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.049	176	4	100	32	33	31	25	22	16	13	200	39	40	38	32	29	23	20
0.074	266	6	100	35	36	34	28	25	19	16	200	41	42	40	34	31	25	22
0.098	353	8	100	38	39	37	31	28	22	18	200	43	44	42	36	33	27	24
0.123	443	10	100	40	41	39	33	30	24	21	200	45	46	44	38	35	29	26
0.049	176	4	400	46	47	45	39	36	30	27	800	53	54	52	46	43	37	34
0.074	266	6	400	48	49	47	41	38	32	29	800	55	56	54	48	45	39	36
0.098	353	8	400	50	51	49	43	40	34	30	800	57	58	56	50	47	41	37
0.123	443	10	400	51	52	50	44	41	35	32	800	58	59	57	51	48	42	39

model 160																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.080	288	4	100	35	36	34	28	25	19	15	200	41	42	40	34	31	25	22
0.121	436	6	100	37	38	36	30	27	21	18	200	43	44	42	36	33	27	24
0.161	580	8	100	40	41	39	33	30	24	21	200	45	46	44	38	35	29	26
0.201	724	10	100	42	43	41	35	32	26	23	200	47	48	46	40	37	31	28
0.080	288	4	400	48	49	47	41	38	32	29	800	55	56	54	48	45	39	36
0.121	436	6	400	50	51	49	43	40	34	31	800	57	58	56	50	47	41	38
0.161	580	8	400	52	53	51	45	42	36	33	800	59	60	58	52	49	43	40
0.201	724	10	400	53	54	52	46	43	37	34	800	60	61	59	53	50	44	41

model 200																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.126	454	4	100	49	41	38	31	28	23	23	200	46	45	45	38	35	30	26
0.188	677	6	100	51	43	41	34	31	26	26	200	48	47	47	40	37	32	28
0.251	904	8	100	54	50	44	37	34	29	30	200	56	52	49	42	39	34	32
0.314	1130	10	100	58	54	46	39	36	31	34	200	59	57	51	44	41	36	36
0.126	454	4	400	50	52	52	45	42	37	33	800	57	59	59	52	49	44	40
0.188	677	6	400	52	54	54	47	44	39	35	800	59	61	61	54	51	46	42
0.251	904	8	400	56	55	52	49	46	41	35	800	61	63	63	56	53	48	43
0.314	1130	10	400	60	60	55	50	47	42	39	800	63	64	64	57	54	49	44

model 250																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.196	706	4	100	50	42	40	33	30	25	25	200	46	46	43	40	37	32	26
0.296	1062	6	100	52	44	43	36	33	28	27	200	48	28	44	42	39	34	28
0.393	1415	8	100	54	50	46	39	36	31	30	200	55	53	48	44	41	36	32
0.491	1768	10	100	55	54	48	41	38	33	33	200	58	58	51	46	43	38	36
0.196	706	4	400	50	53	51	47	44	39	33	800	59	61	61	54	51	46	42
0.295	1062	6	400	51	54	52	49	46	41	34	800	61	63	63	56	53	48	44
0.393	1415	8	400	57	57	53	51	48	43	37	800	63	65	65	58	55	50	45
0.491	1768	10	400	61	60	55	52	49	44	39	800	64	66	66	59	56	51	46

Air noise VVIS

model 100																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m³/s	m³/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.031	**111**	**4**	**100**	29	27	24	19	9	5	9	**200**	36	34	31	26	16	12	14
0.047	**170**	**6**	**100**	32	30	27	22	12	8	10	**200**	38	36	33	28	18	14	16
0.063	**227**	**8**	**100**	35	33	30	25	15	11	13	**200**	40	38	35	30	20	16	18
0.079	**284**	**10**	**100**	37	35	32	27	17	13	15	**200**	42	40	37	32	22	18	20
0.031	**111**	**4**	**400**	43	41	38	33	23	19	21	**800**	50	48	45	40	30	26	28
0.047	**170**	**6**	**400**	45	43	40	35	25	21	23	**800**	52	50	47	42	32	28	30
0.063	**227**	**8**	**400**	47	45	42	37	27	23	25	**800**	54	52	49	44	34	30	32
0.079	**284**	**10**	**400**	48	46	43	38	28	24	26	**800**	55	53	50	45	35	31	33

model 125																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m³/s	m³/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.049	**176**	**4**	**100**	31	29	26	21	11	7	9	**200**	38	36	33	28	18	14	16
0.074	**266**	**6**	**100**	34	32	29	24	14	10	12	**200**	40	38	35	30	20	16	18
0.098	**353**	**8**	**100**	37	35	32	27	17	13	15	**200**	42	40	37	32	22	18	20
0.123	**443**	**10**	**100**	39	37	34	29	19	15	17	**200**	44	42	39	34	24	20	22
0.049	**176**	**4**	**400**	45	43	40	35	25	21	23	**800**	52	50	47	42	32	28	30
0.074	**266**	**6**	**400**	47	45	42	37	27	23	25	**800**	54	52	49	44	34	30	32
0.098	**353**	**8**	**400**	49	47	44	39	29	25	27	**800**	56	54	51	46	36	32	33
0.123	**443**	**10**	**400**	50	48	45	40	30	26	28	**800**	57	55	52	47	37	33	35

model 160																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m³/s	m³/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.080	**288**	**4**	**100**	34	32	29	24	14	10	11	**200**	40	38	35	30	20	16	18
0.121	**436**	**6**	**100**	36	34	31	26	16	12	14	**200**	42	40	37	32	22	18	20
0.161	**580**	**8**	**100**	39	37	34	29	19	15	17	**200**	44	42	39	34	24	20	22
0.201	**724**	**10**	**100**	41	39	36	31	21	17	19	**200**	46	44	41	36	26	22	24
0.080	**288**	**4**	**400**	47	45	42	37	27	23	25	**800**	54	52	49	44	34	30	32
0.121	**436**	**6**	**400**	49	47	44	39	29	25	27	**800**	56	54	51	46	36	32	34
0.161	**580**	**8**	**400**	51	49	46	41	31	27	29	**800**	58	56	53	48	38	34	36
0.201	**724**	**10**	**400**	52	50	47	42	32	28	30	**800**	59	57	54	49	39	35	37

model 200																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m³/s	m³/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.126	**454**	**4**	**100**	43	36	30	25	15	11	17	**200**	47	42	36	32	22	18	22
0.188	**677**	**6**	**100**	46	39	33	28	18	14	20	**200**	49	44	37	34	24	20	24
0.251	**904**	**8**	**100**	51	45	38	31	21	17	26	**200**	54	49	41	36	26	22	29
0.314	**1130**	**10**	**100**	56	49	43	33	23	19	30	**200**	58	53	46	38	28	24	33
0.126	**454**	**4**	**400**	53	50	44	39	29	25	29	**800**	56	54	51	46	36	32	34
0.188	**677**	**6**	**400**	55	52	46	41	31	27	31	**800**	58	56	53	48	38	34	36
0.251	**904**	**8**	**400**	60	56	49	43	33	29	36	**800**	60	58	55	50	40	36	38
0.314	**1130**	**10**	**400**	62	58	52	44	34	30	38	**800**	61	59	56	51	41	37	40

model 250																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m³/s	m³/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.196	**706**	**4**	**100**	45	38	32	27	17	13	19	**200**	49	44	39	34	24	20	24
0.296	**1062**	**6**	**100**	47	40	36	30	20	16	21	**200**	51	46	41	36	26	22	26
0.393	**1415**	**8**	**100**	53	46	40	33	23	19	27	**200**	57	51	45	38	28	24	32
0.491	**1768**	**10**	**100**	55	49	43	35	25	21	30	**200**	59	53	48	40	30	26	34
0.196	**706**	**4**	**400**	54	50	46	41	31	27	30	**800**	58	56	53	48	38	34	36
0.295	**1062**	**6**	**400**	56	52	47	43	33	29	32	**800**	60	58	55	50	40	36	38
0.393	**1415**	**8**	**400**	62	57	52	45	35	31	37	**800**	62	60	57	52	42	38	40
0.491	**1768**	**10**	**400**	64	60	55	46	36	32	40	**800**	63	61	58	53	43	39	41

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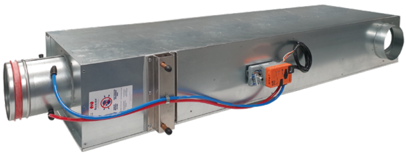
Noise data

- The sound power is given in dB with a reference value of 10- 12 Watt.
- The dB(A) values are given for air noise with attenuation of a ceiling diffuser with a plenum box. The radiation noise has been calculated with attenuation of the ceiling plenum and an insulation value of a suspended ceiling. See the correction table for the relevant calculation value.
- The assumed space attenuation is 10 dB. If the actual value is lower, the dB(A) values have to be corrected.
- **NB:** the Lw values are measured with a duct ending in the clearance (including end reflection). In criticalacoustic situations, such as low noise levels (<25dB(A)), hard room, light walls, please consult an acoustics adviser.

Correction table

octave bands	125	250	500	1k	2k	4k
radiation noise	2	5	10	15	15	15

The above are the calculation values that are assumed on calculating the tables on the previous pages.



VVRS

Variable-volume unit
Non-inducting
Attenuating
Luka D/ATC 2

Available types
V V R S M - - - -

V volume unit
V variable volume
R non-inducing
S safe (primary connection only)
M eXavol measuring instrument

- **Secondary connection**
  - **E** rectangular
  - **M** 4 x round
  - **N** 1 x round

- **Accessories**
  - **O** not applicable
  - **B** warm-water post-heating battery

- **Belimo control equipment**
  - **S** compact MP (standard)
  - **T** compact MOD (also suitable for BACnet MS/TP)
  - **K** compact KNX
  - **V** universal VRU (if fast-running motor is desired)

- **Finish**
  - **R** servo motor and post-heating battery right (standard)
  - **L** servo motor and post-heating battery left

For more specific information about the above-mentioned Belimo control equipment, please refer to the appendix VAV actuators.

Use
The variable-volume unit type VVRS is suitable for room-temperature control and air-quality control. The unit is suitable for cooling and heating, and is fitted with an attenuator.

Characteristics
- Nominal volume between 26 to 1.718 m^3/h.
- Available in five model sizes.
- Extremely low internal resistance.
- Pressure independent.
- Control damper can close fully.
- Diagonally integrated measuring instrument.
- Great control accuracy.
- Extremely low radiation and air-noise level.
- Airtightness class housing LUKA D/ATC 2.

Finish
Housing: sendzimir galvanised steel sheet
Internal acoustic and thermal insulation.
Round connection: in accordance with EN 1506 and EN 13180

Post-heating battery can be removed for inspection and maintenance.
Pipes: copper
Vanes: aluminium, double-waved
Max. operating pressure: 10.5 bar
Max. temp.: 90 °C
Test pressure: 25 bar
Connection: external 12 mm

Control equipment
Solid Air has Belimo as its own brand for combining variable volume units with intelligent servo motors. Our variable volume control comes factory calibrated with a control accuracy of approximately 3 %.For more specific information about adjusting your VAV system, please refer to the appendix Commissioning variable volume system.

If desired, other products can be used. Different prices apply than those stated in this catalogue. Information on request.

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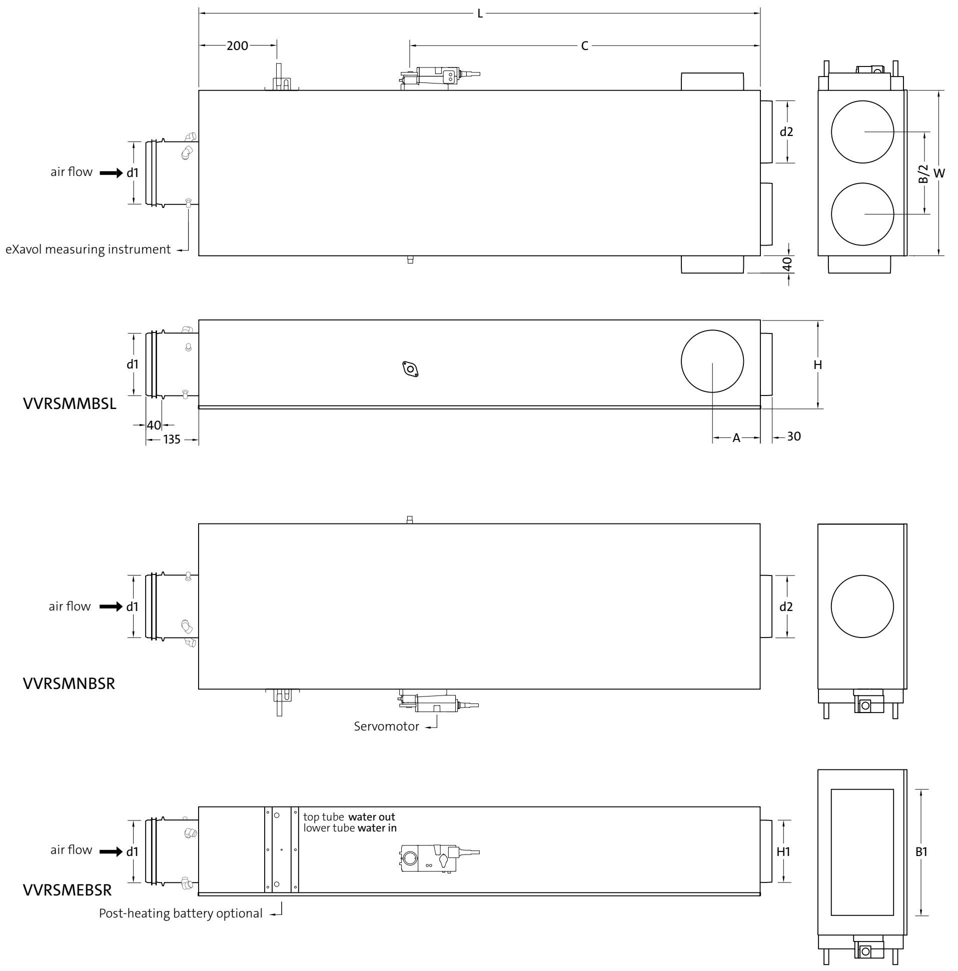
Dimensions



Available dimensions

model	d1	d2	L with post-heating battery	L without post-heating battery	W	H	A	B1	H1	C
100	99	124	1210	1150	350	200	104	298	123	735
125	124	124	1210	1150	350	200	104	298	123	735
160	159	159	1425	1365	420	225	122	368	158	888
200	199	199	1630	1570	500	275	142	448	198	1030
250	249	249	1930	1870	600	325	167	548	248	1281

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Selection details

model	volume flow in m^3/h at air velocity									
	1 m/s	2 m/s	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s (Qv nom)
100	26	53	79	106	132	158	185	211	238	264
125	42	84	126	168	211	253	295	337	379	421
160	69	138	207	276	346	415	484	553	622	691
200	109	218	328	437	546	655	764	874	983	1092
250	172	344	515	687	859	1031	1203	1374	1546	1718

The preferred area for maximum volum flow.

We recommend a minimum volume flow according to a channel speed of 1 m/s (take into account reduced control accuracy at even lower air velocities).

Comment

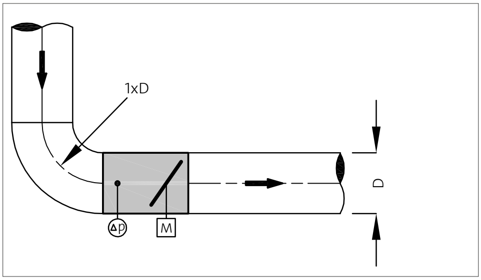
• The listed dimensions are in mm.

Fitting

Variable-volume units type VVRS are insensitive to the fitting position. However, the disruption of the flow due to bends and branches must be taken into account. Disruption of the ideal flow can lead to reduced control accuracy of up to approx. 15 %.

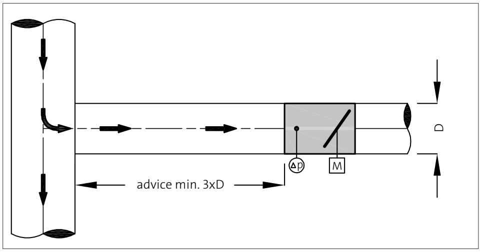
Bend

Placing a VAV controller immediately after a 1xD bend often has no significant impact on control accuracy.



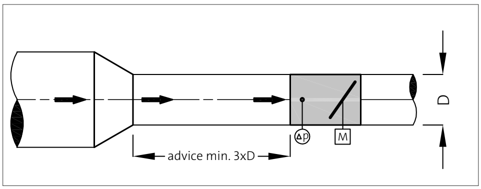
Main channel branch

When branching off the main channel, the advice is to use at least 3 x D straight flow.



Conduct for the unit

When using conducts in the connecting channel, the advice is to maintain at least 3xD straight flow for the volume unit in the size of the volume unit.



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Selection data heating capacity

air volume		model 100 & 125 water l/h							ΔP air in Pa
m³/s	m³/h	50	60	80	100	125	150	200	
0.015	54	10.9	11.1	11.4	11.6	11.8	12.0		-
0.020	72	13.5	13.9	14.5	14.8	15.0	15.2	15.4	1
0.025	90	16.0	16.5	17.3	17.7	18.0	18.2	18.6	1
0.030	108	18.2	18.9	19.9	20.5	20.9	21.2	21.6	2
0.040	144	22.0	23.1	24.4	25.4	26.0	26.5	27.1	3
0.050	180	25.0	26.5	28.4	29.5	30.5	31.2	32.1	5
0.060	216	27.5	29.1	31.6	33.1	34.4	35.3	36.5	7
0.080	288	30.5	33.1	36.7	38.9	40.8	42.1	43.8	12
0.100	360	32.0	35.3	39.9	42.9	45.5	47.2	49.6	19
0.125	450		36.3	42.1	46.1	49.4	51.9	55.1	29
0.150	540			43.1	47.8	52.1	55.1	59.0	42
0.200	720				48.3	54.0	58.1	63.5	74
		0.65	0.94	1.67	2.61	4.07	5.87	10.4	
		ΔP water in kPa							

air volume		model 160 water l/h							ΔP air in Pa
m³/s	m³/h	50	60	80	100	125	150	200	
0.020	72	13.9	14.5	15.0	15.4	15.8	16.0	16.2	-
0.025	90	16.5	17.1	18.0	18.4	19.0	19.2	19.6	1
0.030	108	19.0	19.7	20.9	21.4	22.0	22.4	22.7	1
0.040	144	23.3	24.4	25.9	26.9	27.6	28.2	29.0	1
0.050	180	26.9	28.4	30.5	31.8	32.9	33.7	34.6	2
0.060	216	29.9	31.8	34.4	36.1	37.6	38.5	39.7	3
0.080	288	34.4	37.2	41.0	43.4	45.1	47.0	48.9	5
0.100	360	37.2	40.8	45.9	48.3	52.1	54.0	56.6	8
0.125	450	39.1	43.6	50.2	54.5	58.3	60.9	64.5	13
0.150	540	39.3	44.9	52.8	58.3	63.0	66.4	70.9	19
0.200	720	-	-	54.5	61.9	68.4	73.3	79.7	33
0.250	900	-	-	-	62.2	70.3	76.5	84.6	52
		0.73	1.05	1.87	2.92	4.56	6.57	11.7	
		ΔP water in kPa							

air volume		model 200 water l/h							ΔP air in Pa
m³/s	m³/h	100	125	150	200	250	300	400	
0.030	108	25.7	26.4	28.9	27.5	28.0	28.4	28.7	-
0.040	144	32.1	33.3	34.0	35.0	35.7	36.0	36.7	1
0.050	180	38.0	39.6	40.6	41.9	42.8	43.4	44.1	1
0.060	216	43.4	45.3	46.6	48.5	49.5	50.4	51.2	2
0.080	288	52.4	55.4	57.5	60.2	61.9	62.9	64.4	3
0.100	360	59.8	63.7	66.6	70.3	72.5	74.2	76.2	4
0.125	450	66.8	72.2	75.9	81.0	84.2	86.4	89.2	7
0.150	540	71.7	78.4	83.3	89.7	94.0	96.7	100.4	10
0.200	720	77.2	86.5	93.5	102.8	108.8	113.1	118.6	17
0.250	900	78.3	89.9	98.7	110.9	119.0	124.6	132.0	27
0.300	1080		90.2	100.7	115.4	125.4	132.5	141.8	39
0.400	1440				117.5	130.6	140.3	153.5	70
		0.55	0.86	1.23	2.19	3.43	4.94	8.78	
		ΔP water in kPa							

air volume		model 250							ΔP air in Pa
		water l/h							
m^3/s	m^3/h	100	125	150	200	250	300	400	
0.050	**180**	93.2	40.9	42.3	43.8	44.8	45.5	46.3	**-**
0.060	**216**	45.0	47.2	48.7	50.7	52.1	52.9	53.9	**1**
0.080	**288**	55.1	58.5	60.7	63.7	65.6	66.8	68.5	**1**
0.100	**360**	36.7	68.1	71.3	75.4	77.9	79.6	81.8	**2**
0.125	**450**	72.7	78.6	82.6	88.2	91.6	94.1	97.2	**3**
0.150	**540**	79.6	87.0	92.3	99.4	103.9	107.0	111.0	**4**
0.200	**720**	89.1	99.5	107.0	117.5	124.1	128.8	134.7	**8**
0.250	**900**	93.8	107.0	116.9	130.5	139.4	145.7	154.0	**12**
0.300	**1080**	95.0	110.9	128.9	139.8	150.9	158.9	169.0	**17**
0.400	**1440**			126.6	149.2	164.8	175.8	191.0	**31**
0.500	**1800**				150.8	170.7	184.2	204.5	**48**
0.600	**2160**						187.6	211.3	**69**
		0.63	0.98	1.42	2.52	3.94	5.67	10.1	
		ΔP water in kPa							

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Heating data

- The heat output is given in Watt per °C temperature difference between water and air-entry temperature.
  Q = table value x (t_w - t_l)
  = total transmitted output in Watt.
  t_w = water-entry temperature
  t_l = air-entry temperature
- The values included in the tables should be used as the minimum water volume.
- It is permitted to interpolate the interim values.
- It is customary to calculate the output for the maximum air volume, taking account of the fact that lower air volumes generate less heat output.

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Radiation noise VVRS

model 100																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.031	111	4	100	30	31	29	23	20	14	11	200	37	38	36	30	27	21	18
0.047	170	6	100	33	34	32	26	23	17	14	200	39	40	38	32	29	23	20
0.063	227	8	100	36	37	35	29	26	20	16	200	41	42	40	34	31	25	22
0.079	284	10	100	38	39	37	31	28	22	19	200	43	44	42	36	33	27	24
0.031	111	4	400	44	45	43	37	34	28	25	800	51	52	50	41	41	35	32
0.047	170	6	400	46	47	45	39	36	30	27	800	53	54	52	46	43	37	34
0.063	227	8	400	48	49	47	41	38	32	29	800	55	56	54	48	45	39	35
0.079	284	10	400	49	50	48	42	39	33	30	800	56	57	55	49	46	40	37

model 125																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.049	176	4	100	32	33	31	25	22	16	13	200	39	40	38	32	29	23	20
0.074	266	6	100	35	36	34	28	25	19	16	200	41	42	40	34	31	25	22
0.098	353	8	100	38	39	37	31	28	22	18	200	43	44	42	36	33	27	24
0.123	443	10	100	40	41	39	33	30	24	21	200	45	46	44	38	35	29	26
0.049	176	4	400	46	47	45	39	36	30	27	800	53	54	52	46	43	37	34
0.074	266	6	400	48	49	47	41	38	32	29	800	55	56	54	48	45	39	36
0.098	353	8	400	50	51	49	43	40	34	30	800	57	58	56	50	47	41	37
0.123	443	10	400	51	52	50	44	41	35	32	800	58	59	57	51	48	42	39

model 160																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.080	288	4	100	35	36	34	28	25	19	15	200	41	42	40	34	31	25	22
0.121	436	6	100	37	38	36	30	27	21	18	200	43	44	42	36	33	27	24
0.161	580	8	100	40	41	39	33	30	24	21	200	45	46	44	38	35	29	26
0.201	724	10	100	42	43	41	35	32	26	23	200	47	48	46	40	37	31	28
0.080	288	4	400	48	49	47	41	38	32	29	800	55	56	54	48	45	39	36
0.121	436	6	400	50	51	49	43	40	34	31	800	57	58	56	50	47	41	38
0.161	580	8	400	52	53	51	45	42	36	33	800	59	60	58	52	49	43	40
0.201	724	10	400	53	54	52	46	43	37	34	800	60	61	59	53	50	44	41

model 200																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.126	454	4	100	49	41	38	31	28	23	23	200	46	45	45	38	35	30	26
0.188	677	6	100	51	43	41	34	31	26	26	200	48	47	47	40	37	32	28
0.251	904	8	100	54	50	44	37	34	29	30	200	56	52	49	42	39	34	32
0.314	1130	10	100	58	54	46	39	36	31	34	200	59	57	51	44	41	36	36
0.126	454	4	400	50	52	52	45	42	37	33	800	57	59	59	52	49	44	40
0.188	677	6	400	52	54	54	47	44	39	35	800	59	61	61	54	51	46	42
0.251	904	8	400	56	55	52	49	46	41	35	800	61	63	63	56	53	48	43
0.314	1130	10	400	60	60	55	50	47	42	39	800	63	64	64	57	54	49	44

model 250																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.196	706	4	100	50	42	40	33	30	25	25	200	46	46	43	40	37	32	26
0.296	1062	6	100	52	44	43	36	33	28	27	200	48	28	44	42	39	34	28
0.393	1415	8	100	54	50	46	39	36	31	30	200	55	53	48	44	41	36	32
0.491	1768	10	100	55	54	48	41	38	33	33	200	58	58	51	46	43	38	36
0.196	706	4	400	50	53	51	47	44	39	33	800	59	61	61	54	51	46	42
0.295	1062	6	400	51	54	52	49	46	41	34	800	61	63	63	56	53	48	44
0.393	1415	8	400	57	57	53	51	48	43	37	800	63	65	65	58	55	50	45
0.491	1768	10	400	61	60	55	52	49	44	39	800	64	66	66	59	56	51	46

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Air noise VVRS

model 100																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.031	**111**	**4**	**100**	29	27	24	19	9	5	9	**200**	36	34	31	26	16	12	14
0.047	**170**	**6**	**100**	32	30	27	22	12	8	10	**200**	38	36	33	28	18	14	16
0.063	**227**	**8**	**100**	35	33	30	25	15	11	13	**200**	40	38	35	30	20	16	18
0.079	**284**	**10**	**100**	37	35	32	27	17	13	15	**200**	42	40	37	32	22	18	20
0.031	**111**	**4**	**400**	43	41	38	33	23	19	21	**800**	50	48	45	40	30	26	28
0.047	**170**	**6**	**400**	45	43	40	35	25	21	23	**800**	52	50	47	42	32	28	30
0.063	**227**	**8**	**400**	47	45	42	37	27	23	25	**800**	54	52	49	44	34	30	32
0.079	**284**	**10**	**400**	48	46	43	38	28	24	26	**800**	55	53	50	45	35	31	33

model 125																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.049	**176**	**4**	**100**	31	29	26	21	11	7	9	**200**	38	36	33	28	18	14	16
0.074	**266**	**6**	**100**	34	32	29	24	14	10	12	**200**	40	38	35	30	20	16	18
0.098	**353**	**8**	**100**	37	35	32	27	17	13	15	**200**	42	40	37	32	22	18	20
0.123	**443**	**10**	**100**	39	37	34	29	19	15	17	**200**	44	42	39	34	24	20	22
0.049	**176**	**4**	**400**	45	43	40	35	25	21	23	**800**	52	50	47	42	32	28	30
0.074	**266**	**6**	**400**	47	45	42	37	27	23	25	**800**	54	52	49	44	34	30	32
0.098	**353**	**8**	**400**	49	47	44	39	29	25	27	**800**	56	54	51	46	36	32	33
0.123	**443**	**10**	**400**	50	48	45	40	30	26	28	**800**	57	55	52	47	37	33	35

model 160																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.080	**288**	**4**	**100**	34	32	29	24	14	10	11	**200**	40	38	35	30	20	16	18
0.121	**436**	**6**	**100**	36	34	31	26	16	12	14	**200**	42	40	37	32	22	18	20
0.161	**580**	**8**	**100**	39	37	34	29	19	15	17	**200**	44	42	39	34	24	20	22
0.201	**724**	**10**	**100**	41	39	36	31	21	17	19	**200**	46	44	41	36	26	22	24
0.080	**288**	**4**	**400**	47	45	42	37	27	23	25	**800**	54	52	49	44	34	30	32
0.121	**436**	**6**	**400**	49	47	44	39	29	25	27	**800**	56	54	51	46	36	32	34
0.161	**580**	**8**	**400**	51	49	46	41	31	27	29	**800**	58	56	53	48	38	34	36
0.201	**724**	**10**	**400**	52	50	47	42	32	28	30	**800**	59	57	54	49	39	35	37

model 200																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.126	**454**	**4**	**100**	43	36	30	25	15	11	17	**200**	47	42	36	32	22	18	22
0.188	**677**	**6**	**100**	46	39	33	28	18	14	20	**200**	49	44	37	34	24	20	24
0.251	**904**	**8**	**100**	51	45	38	31	21	17	26	**200**	54	49	41	36	26	22	29
0.314	**1130**	**10**	**100**	56	49	43	33	23	19	30	**200**	58	53	46	38	28	24	33
0.126	**454**	**4**	**400**	53	50	44	39	29	25	29	**800**	56	54	51	46	36	32	34
0.188	**677**	**6**	**400**	55	52	46	41	31	27	31	**800**	58	56	53	48	38	34	36
0.251	**904**	**8**	**400**	60	56	49	43	33	29	36	**800**	60	58	55	50	40	36	38
0.314	**1130**	**10**	**400**	62	58	52	44	34	30	38	**800**	61	59	56	51	41	37	40

model 250																		
Q	V		P	L_w in dB/octave band						L_p	P	L_w in dB/octave band						L_p
m^3/s	m^3/h	m/s	Pa	125	250	500	1K	2K	4K	dB(A)	Pa	125	250	500	1K	2K	4K	dB(A)
0.196	**706**	**4**	**100**	45	38	32	27	17	13	19	**200**	49	44	39	34	24	20	24
0.296	**1062**	**6**	**100**	47	40	36	30	20	16	21	**200**	51	46	41	36	26	22	26
0.393	**1415**	**8**	**100**	53	46	40	33	23	19	27	**200**	57	51	45	38	28	24	32
0.491	**1768**	**10**	**100**	55	49	43	35	25	21	30	**200**	59	53	48	40	30	26	34
0.196	**706**	**4**	**400**	54	50	46	41	31	27	30	**800**	58	56	53	48	38	34	36
0.295	**1062**	**6**	**400**	56	52	47	43	33	29	32	**800**	60	58	55	50	40	36	38
0.393	**1415**	**8**	**400**	62	57	52	45	35	31	37	**800**	62	60	57	52	42	38	40
0.491	**1768**	**10**	**400**	64	60	55	46	36	32	40	**800**	63	61	58	53	43	39	41

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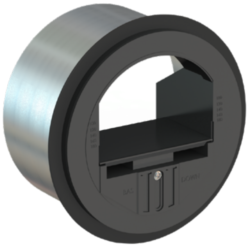
Noise data

- The sound power is given in dB with a reference value of 10- 12 Watt.
- The dB(A) values are given for air noise with attenuation of a ceiling diffuser with a plenum box. The radiation noise has been calculated with attenuation of the ceiling plenum and an insulation value of a suspended ceiling. See the correction table for the relevant calculation value.
- The assumed space attenuation is 10 dB. If the actual value is lower, the dB(A) values have to be corrected.
- **NB:** the L_W values are measured with a duct ending in the clearance (including end reflection). In criticalacoustic situations, such as low noise levels (<25dB(A)), hard room, light walls, please consult an acoustics adviser.

Correction table

octave band	125	250	500	1k	2k	4k
radiation noise	2	5	10	15	15	15

The above are the calculation values that are assumed on calculating the tables on the following pages.



VCIR

Constant-volume units
Mechanical control
Adjustable volume flow

Available types
V C I R O R

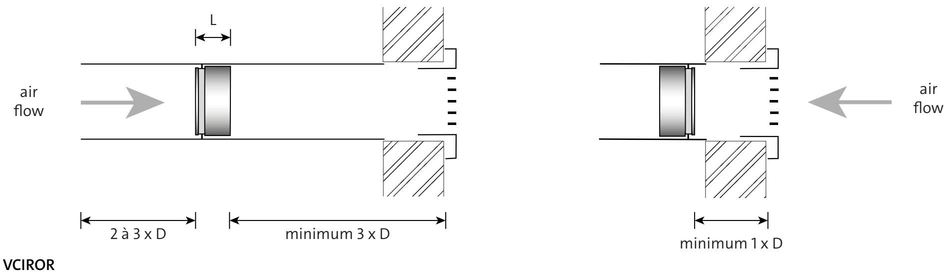
- **V** volume unit
- **C** constant volume
- **I** adjustable
- **R** round version
- **O** none
- **R** rubber seal

Use
The mechanical constant-volume unit type VCIR serves to keep a constant set volume flow, independent of inlet pressure and without an external energy supply. The unit compensates a change to the inlet pressure in the preferred range with an accuracy of approximately 10 %. For selections outside the preferred range, the deviations may be greater. The units are suitable for supply air and discharge air.

Characteristics
- Volume range up 15-700 3/h
- Pressure range of 50-250 Pa.
- Flame-retardant plastic: fire class M1.
- Can be fitted in a round duct, fixed with rubber seal.
- Maximum operating temperature: 60 °C.

Finish
Housing and damper blade:	flame-retardant plastic
Spring mechanism:	stainless steel
Connection:	rubber seal

Dimensions



Available dimensions

model	L	d
80	55	79
100	70	99
125	86	124
160	91	159
200	91	199
250	120	249

Note

• The listed dimensions are in mm.

Fitting

Constant-volume units type VCIR can be fitted horizontally or vertically. In case of horizontal fitting, the text "BAS" should be horizontal, or at the bottom in other words. The flow direction is marked on the unit. We advise to have a straight supply to the unit over a length of twice to three times the diameter.
For supply diffusers, we recommend at least three times the diameter in a straight flow between the unit and the diffuser. For return diffusers, we recommend once the diameter as the minimum distance between the diffuser and the unit. The internal housing can be removed. Mark the outside of the air duct to determine the position of the unit.

Authority

To guarantee the accuracy of the unit, the pressure drop over the damper blade should at least equal the pressure drop of the section with fittings behind it.

General

The VCIR cannot be put in a closed position.

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Selection details

Available versions

model	setting range	step
	m^3/h	m^3/h
80	15-50	2,5
100	15-50	2,5
100	50-100	5
125	15-50	2,5
125	50-100	5
125	100-180	5
160	50-100	5
160	100-180	5
160	180-300	5
200	100-180	5
200	180-300	5
200	300-500	10
250	180-300	5
250	300-500	10
250	500-700	25

Sound power in dB(A)

m^3/h	L_w dB (A)			
	50 Pa	100 Pa	150 Pa	200 Pa
15	25	29	32	35
30	26	31	35	38
45	27	33	36	39
50	32	37	39	42
60	32	37	39	42
75	32	37	40	42
90	32	38	41	44
100	33	39	42	45
120	30	37	39	42
150	33	37	41	45
180	34	40	44	47
210	34	40	42	44
240	35	41	44	47
270	37	43	45	49
300	33	37	42	45
350	35	40	44	47
400	37	42	45	50
450	38	44	46	51
500	39	46	48	53

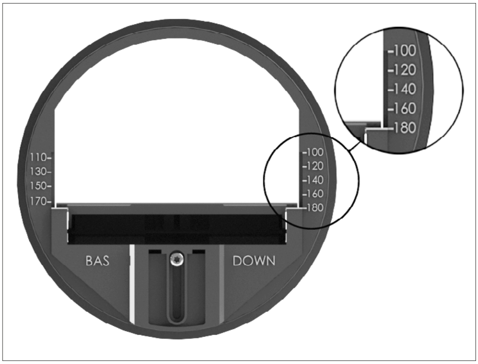
is preferred range

General

- The standard setting for the air volume is the maximum value of the setting range.
- Under Lw, the selection tables give the sound-power level in dB(A) with the given pressure loss (in Pa) over the unit.
- **NB:** the Lw values are measured with a duct ending in the clearance including end reflection. For high noise requirements (< 25 dB(A)), hard rooms, light walls, please consult an acoustic adviser.
- **NB:** the available pressure drop over the unit should be at least 50 Pa.

Setting

Setting with a torx 10 wrench.



Order and options codes

VCIROR model 200 suitable for air volumes of 100 to 180 m³/h.

model	setting range Vmin.-Vmax.
200	100 - 180

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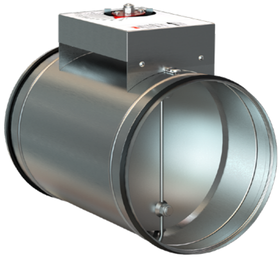

VCMH

Constant-volume units
Mechanical control
Single-walled and double-walled
LUKA C/ATC 3

Available types
V C M H - -

V volume unit
C constant volume
M mechanical control
H round version, adjustable

- Adjustable
O manual
M motor (see price list)

- Connection
R single-walled (safe version)
A double-walled (safe version)

Use
The mechanical constant-volume unit type VCMH serves to keep a constant adjustable volume flow, independent of any inlet pressure and without an external energy supply. The unit has a scale in m3/h and can be set easily from the outside. The unit compensates a change to the inlet pressure in the preferred range with an accuracy of approximately 5 to 10 %. In smaller models and/or with lower air volumes, the inaccuracy may increase. The units are suitable for supply air and discharge air.

Characteristics
- Volume range up to 3000 m^3/h
- Pressure range of 50-1000 Pa.
- Available in seven model sizes.
- Low internal resistance.
- Insensitive to dirt.
- Can be fitted in any position.
- Can be adjusted across the entire volume range.
- Airtightness class LUKA C/ATC 3.
- Indoor temperature range: -20 to +70 °C, short time 90 °C.

Finish

Housing:	sendzimir galvanised steel sheet
Blade spindle:	stainless steel mounting in special no-maintenance bearings

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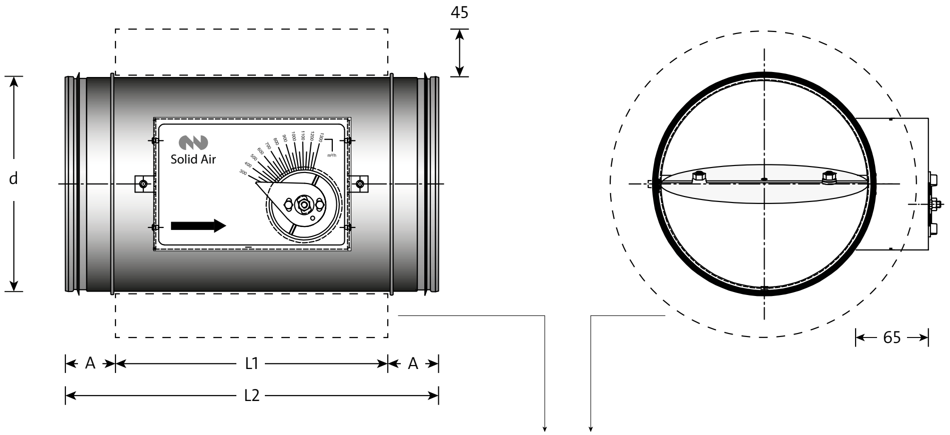
Dimensions



VCMHOR

Double-walled version
VCMH-A

Available dimensions

model	A	L1	L2	d	weight single-walled	weight double-walled	drive (optional)	weight drive
80	40	249	329	79	1.19	1.92		
100	40	249	329	99	1.33	2.21		
125	40	249	329	124	1.53	2.6		
160	40	249	329	159	1.78	3.11	LM24A or LM230A	0.66
200	40	249	329	199	2.22	4.06		
250	60	286	406	249	3.14	5.59		
315	60	336	456	314	5.19	8.79		

Comment
- The listed dimensions are in mm, weights (excluding optional Belimo drive) in kg.

Fitting
Constant-volume units type VCMH are insensitive to the fitting position. However, the disruption of the flow due to bends and branches must be taken into account. Three times the diameter in a straight flow before the unit is recommended and twice the diameter after the unit. The duct dimension corresponds to the connection size of the unit.

Authority
To guarantee the accuracy of the unit, the pressure drop over the damper blade should at least equal the pressure drop of the section with fittings behind it.

General
The VCMH cannot be put in a closed position.

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Selection details

model	air volume				pressure drop over the damper																				
					50 Pa							100 Pa							250 Pa						
					Lw in dB/octave band						Lp	Lw in dB/octave band						Lp	Lw in dB/octave band						Lp
	m^3/s	m^3/h	Pmin	m/s	63	125	250	500	1k	2k	dB(A)	63	125	250	500	1k	2k	dB(A)	63	125	250	500	1k	2k	dB(A)
80	0.014	**50**	50	2.8	40	38	31	32	32	31	12	46	42	36	37	37	36	17	47	43	38	38	39	40	18
	0.022	**80**	50	4.4	43	39	35	34	36	35	14	48	45	41	38	39	38	20	48	46	44	43	44	45	22
	0.031	**110**	50	6.1	42	38	36	36	38	36	14	48	43	40	40	41	40	19	49	48	47	45	47	47	24
	0.042	**150**	50	8.3	43	41	39	41	39	39	17	48	47	45	44	45	44	23	51	51	49	49	49	49	27
	0.056	**200**	70	11.1	-	-	-	-	-	-	-	51	50	49	49	47	46	26	54	54	55	53	52	52	31
100	0.019	**70**	50	2.5	25	29	22	23	23	24	-	36	40	33	33	34	35	13	46	42	37	38	39	40	17
	0.036	**130**	50	4.6	41	38	34	32	35	34	13	45	44	39	39	38	37	18	50	49	44	46	46	46	24
	0.053	**190**	50	6.7	45	41	38	38	40	38	17	46	46	43	41	41	41	21	51	50	48	48	47	49	26
	0.069	**250**	50	8.8	45	44	42	43	41	43	20	50	49	48	47	48	46	25	53	54	53	52	51	50	30
	0.083	**300**	70	10.6	-	-	-	-	-	-	-	52	54	51	51	50	48	29	57	58	55	55	55	55	33
125	0.033	**120**	50	2.7	43	41	34	33	35	33	15	48	44	38	38	41	39	19	51	50	43	43	45	46	24
	0.056	**200**	50	4.5	45	42	37	37	39	36	17	48	46	41	40	41	40	21	55	51	48	48	50	49	27
	0.078	**280**	50	6.3	47	44	39	41	40	39	19	50	49	46	45	46	45	24	54	54	50	51	51	53	29
	0.100	**360**	50	8.1	48	44	42	43	42	41	20	52	51	49	48	47	47	27	56	57	56	55	54	54	33
	0.139	**500**	70	11.3	-	-	-	-	-	-	-	55	55	53	54	51	50	31	59	60	59	59	58	60	36
160	0.042	**150**	50	2.1	46	43	36	35	37	35	17	50	47	40	41	43	41	21	53	52	46	45	46	48	26
	0.083	**300**	50	4.1	47	43	39	39	39	38	18	52	49	45	44	44	43	24	54	52	49	49	49	51	27
	0.125	**450**	50	6.2	46	44	41	41	43	40	19	54	51	46	47	49	46	26	58	58	53	55	54	55	33
	0.167	**600**	50	8.3	48	46	44	45	44	43	22	54	53	51	51	50	50	28	59	58	57	58	56	57	34
	0.222	**800**	70	11.1	-	-	-	-	-	-	-	56	56	55	57	54	52	33	61	64	63	63	60	60	40
200	0.069	**250**	50	2.2	45	42	36	36	38	36	17	50	46	40	42	43	40	21	55	53	48	49	50	50	28
	0.125	**450**	50	4.0	45	42	38	38	39	37	17	51	48	44	43	45	44	23	56	54	50	51	51	52	29
	0.194	**700**	50	6.2	45	43	40	42	40	39	19	51	49	46	48	48	46	25	58	57	55	55	55	56	33
	0.250	**900**	50	8.0	49	47	45	46	44	44	23	54	52	52	52	51	50	29	58	59	58	58	56	57	35
	0.333	**1200**	80	10.6	-	-	-	-	-	-	-	55	54	53	54	52	50	30	61	64	61	63	60	60	39
250	0.111	**400**	50	2.3	48	43	37	38	39	37	18	52	48	42	44	43	44	23	55	52	48	47	49	50	27
	0.194	**700**	50	4.0	47	44	41	38	39	38	19	53	51	46	45	46	45	26	59	56	51	51	52	53	31
	0.306	**1100**	50	6.2	48	45	44	42	42	42	21	53	51	48	49	48	47	27	59	57	54	56	54	55	33
	0.389	**1400**	50	7.9	48	46	44	44	43	42	22	55	54	52	53	51	49	30	58	60	59	57	56	58	36
	0.556	**2000**	90	11.3	-	-	-	-	-	-	-	57	56	55	57	55	53	33	63	65	62	64	62	61	40
315	0.167	**600**	50	2.1	44	42	35	35	36	35	16	52	50	42	43	44	43	24	56	53	50	48	51	52	28
	0.306	**1100**	50	3.9	47	44	41	39	39	39	19	55	52	47	47	47	46	27	60	56	53	53	53	54	32
	0.472	**1700**	50	6.1	48	45	43	42	42	41	21	54	53	51	49	50	48	28	59	58	56	56	55	56	34
	0.611	**2200**	50	7.8	50	49	46	46	46	44	24	56	55	52	52	52	50	30	60	61	60	59	59	59	37
	0.833	**3000**	90	10.7	-	-	-	-	-	-	-	61	60	58	59	56	55	36	63	64	64	63	63	62	41

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Noise details

- Minimum static pressure loss over the unit P_{min} in Pa.
- The sound power is given in dB with a reference value of 10^{-12} Watt.
- The sound-pressure values L_p are given in dB(A) and apply to air noise with an attenuator and a ceiling diffuser with a plenum box. See the octave-band correction table for the relevant calculation values.
- Under L_w and L_p, the above selection tables give the air-noise values. For radiation noise, these need to be corrected in accordance with the radiation-noise table.
- The assumed space attenuation is 10 dB. If the actual value is lower, the dB(A) values have to be corrected.
- NB: the Lw values are measured with a duct ending in the clearance (including end reflection).
- For high noise requirements (< 25 dB(A)), hard rooms, light walls, please consult an acoustic adviser.
- It is permitted to interpolate the interim values.
- **NB:** the available pressure drop over the unit should be at least 50 Pa.

Correction table

Radiation noise

model	80	100	125	160	200	250	315
VCMH-O/R single-walled	-18	-17	-17	-15	-14	-13	-12
VCMH-D/A double-walled	-36	-35	-35	-33	-32	-31	-30

Octave-band correction

octave bands	63	125	250	500	1k	2k
air noise	0	5	10	20	30	30

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VCMR

Constant-volume units
Mechanical control
Single-walled and double-walled
LUKA C/ATC 3

Available types

V C M R - -

V volume unit
C constant volume
M mechanical control
R rectangular version, adjustable

- **Adjustable**
O manual
M motor (see price list)

- **Version**
O single-walled
D double-walled

Use

The mechanical constant-volume unit VCMR serves to keep a constant adjustable volume flow, independent of any inlet pressure and without an external energy supply. The unit has a scale in m3/h and can be set easily from the outside. The unit fully compensates a change to the inlet pressure with an accuracy of approximately 5 to 15 %. In smaller models and/or with lower air volumes, the inaccuracy may increase. The units are suitable for supply air and discharge air.

Characteristics

- Volume range up to 6480 m^3/h
- Pressure range of 50-1000 Pa.
- Available in seventeen model sizes.
- Low internal resistance.
- Insensitive to dirt.
- Can be fitted in any position.
- Can be adjusted across the entire volume range.
- Airtightness class LUKA C/ ATC 3.
- Indoor temperature range: -20 to +70 °C, short time 90 °C.

Finish

Housing:	sendzimir galvanised steel sheet
Blade spindle:	stainless steel mounting in special no-maintenance bearings

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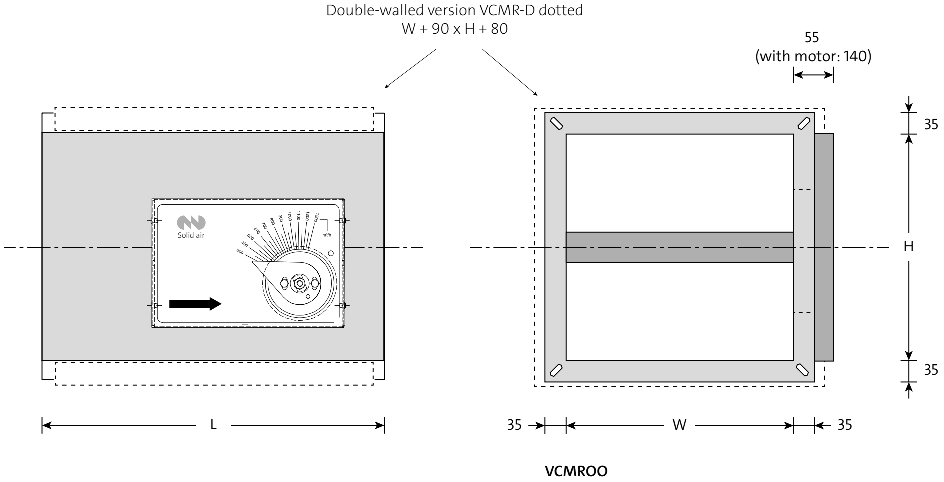
Dimensions



Length for available dimensions

W x H	L	weight single-walled	weight double-walled	drive (optional)	weight drive
200 x 100	300	3.4	4.9	LM24A or LM230A	0.66
200 x 150	325	4	6.1	LM24A or LM230A	0.66
200 x 200	425	5.4	8.3	NM24A or NM230A	0.8
300 x 100	300	4.2	6.1	LM24A or LM230A	0.66
300 x 150	325	4.8	7.4	LM24A or LM230A	0.66
300 x 200	350	5.8	8.7	NM24A or NM230A	0.8
300 x 250	450	7.6	11.5	NM24A or NM230A	0.8
300 x 300	500	9	13.5	SM24A or SM230A	1.3
400 x 200	375	7	10.7	LM24A or LM230A	0.66
400 x 250	450	8.8	13.4	NM24A or NM230A	0.8
400 x 300	500	10.2	13.5	SM24A or SM230A	1.3
500 x 200	375	8.2	12.4	LM24A or LM230A	0.66
500 x 250	400	9.4	14	NM24A or NM230A	0.8
500 x 300	500	11.6	17.6	SM24A or SM230A	1.3
600 x 200	350	9	13.4	NM24A or NM230A	0.8
600 x 250	500	12.2	18.7	SM24A or SM230A	1.3
600 x 300	500	13	19.7	SM24A or SM230A	1.3

Comment

- The listed dimensions are in mm, weights (excluding optional Belimo drive) in kg. Weight of the optional drive in kg is specified separately.

Fitting

Variable-volume units type VCMR are insensitive to the fitting position. However, the disruption of the flow due to bends and branches must be taken into account. Four times the height before the unit in a straight flow is recommended and twice the height after the unit. The duct dimension corresponds to the connection size of the unit.

Authority

To guarantee the accuracy of the unit, the pressure drop over the damper blade should at least equal the pressure drop of the section with fittings behind it.

General

The VCMR cannot be put in a closed position.

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Selection details

	air volume				pressure drop over the damper blade																				
					50 Pa							100 Pa							250 Pa						
					L_w in dB/octave band						L_p	L_w in dB/octave band						L_p	L_w in dB/octave band						L_p
W x H	m³/s	m³/h	P_{min}	m/s	63	125	250	500	1k	2k	dB(A)	63	125	250	500	1k	2k	dB(A)	63	125	250	500	1k	2k	dB(A)
200 x 100	0.056	**200**	50	2.8	49	44	39	35	34	32	19	52	49	46	41	40	38	23	56	55	54	49	47	46	30
	0.080	**288**	50	4.0	58	51	44	38	37	36	26	60	56	51	45	43	42	30	62	62	59	53	51	50	35
	0.120	**432**	50	6.0	65	57	47	39	38	40	32	66	61	54	47	45	46	35	67	67	63	57	53	53	40
	0.160	**576**	75	8.0	-	-	-	-	-	-	-	71	65	57	48	46	48	39	71	71	66	59	55	55	44
	0.200	**720**	100	10.0	-	-	-	-	-	-	-	74	68	59	49	47	49	42	73	74	69	61	57	56	46
200 x 150 en 300 x 100	0.069	**250**	50	2.3	46	42	38	35	34	30	16	50	48	45	41	40	37	22	55	54	53	48	47	46	29
	0.120	**432**	50	4.0	58	51	44	38	37	36	26	60	56	51	45	43	43	30	63	62	59	54	51	50	36
	0.180	**648**	50	6.0	65	56	47	38	37	39	32	66	61	54	47	45	46	35	67	67	63	57	53	53	40
	0.240	**864**	75	8.0	-	-	-	-	-	-	-	71	65	57	48	46	48	39	71	71	66	59	55	55	44
	0.300	**1080**	100	10.0	-	-	-	-	-	-	-	74	68	59	49	47	49	42	73	74	69	61	57	56	46
200 x 200	0.097	**350**	50	2.4	47	43	39	36	34	31	17	52	49	46	42	41	39	23	57	56	55	50	49	48	30
	0.160	**576**	50	4.0	58	51	44	38	37	36	26	61	57	52	46	44	43	31	64	63	60	55	52	51	37
	0.240	**864**	50	6.0	65	56	47	38	37	39	32	67	62	55	47	45	46	36	68	68	64	58	54	54	41
	0.320	**1152**	75	8.0	-	-	-	-	-	-	-	71	66	57	49	47	48	40	72	72	67	60	56	56	45
	0.400	**1440**	100	10.0	-	-	-	-	-	-	-	74	68	59	49	47	49	42	74	74	69	62	57	57	47
300 x 150	0.097	**350**	50	2.2	45	42	38	35	34	30	16	50	48	45	42	41	38	22	56	55	54	50	49	48	30
	0.180	**648**	50	4.0	58	51	44	38	37	36	26	61	57	52	46	44	43	31	64	64	61	55	53	52	37
	0.270	**972**	50	6.0	65	56	47	38	37	39	32	67	62	55	47	45	46	36	69	69	65	58	55	54	42
	0.360	**1296**	75	8.0	-	-	-	-	-	-	-	71	66	57	49	47	48	40	72	72	68	61	57	56	45
	0.450	**1620**	100	10.0	-	-	-	-	-	-	-	74	68	59	49	47	49	42	74	75	70	62	58	57	47
300 x 200	0.139	**500**	50	2.3	47	43	39	36	35	31	18	52	49	47	43	42	39	24	58	57	56	51	50	49	31
	0.240	**864**	50	4.0	59	52	45	38	37	37	26	61	57	52	46	44	44	31	65	64	61	56	53	52	38
	0.360	**1296**	50	6.0	65	57	47	39	38	40	32	67	62	55	48	46	47	36	69	69	65	59	55	55	42
	0.480	**1728**	75	8.0	-	-	-	-	-	-	-	71	66	57	49	47	48	40	72	72	68	61	57	56	45
	0.600	**2160**	100	10.0	-	-	-	-	-	-	-	74	68	59	49	47	49	42	74	75	70	62	58	57	47
300 x 250	0.167	**600**	50	2.2	47	43	40	37	36	32	18	52	49	47	43	42	39	24	58	57	56	52	51	50	32
	0.300	**1080**	50	4.0	59	52	45	38	37	37	26	61	57	52	46	44	44	31	65	65	62	56	54	53	38
	0.450	**1620**	50	6.0	65	57	47	39	38	40	32	67	62	55	48	46	47	36	70	70	66	59	56	55	43
	0.600	**2160**	75	8.0	-	-	-	-	-	-	-	71	66	57	49	47	48	40	73	73	68	61	57	57	46
	0.750	**2700**	100	10.0	-	-	-	-	-	-	-	73	67	57	48	45	48	40	73	74	69	61	57	56	46
400 x 200	0.194	**700**	50	2.4	49	45	41	37	36	33	19	54	51	48	44	43	40	25	60	59	57	53	52	50	33
	0.320	**1152**	50	4.0	59	52	45	39	38	37	27	62	58	53	47	45	44	32	66	65	62	57	54	53	39
	0.480	**1728**	50	6.0	66	57	48	39	38	40	33	68	63	56	48	46	47	37	70	70	66	60	56	56	43
	0.640	**2304**	75	8.0	-	-	-	-	-	-	-	72	66	58	49	47	49	40	73	73	69	62	58	57	46
	0.800	**2880**	100	10.0	-	-	-	-	-	-	-	73	67	58	48	46	48	41	74	74	69	62	57	57	47
300 x 300	0.208	**750**	50	2.3	48	44	40	37	36	32	19	53	50	48	44	43	40	25	59	58	57	53	51	50	33
	0.360	**1296**	50	4.0	59	52	45	39	38	37	27	62	58	53	47	45	44	32	66	65	62	57	54	53	39
	0.540	**1944**	50	6.0	66	57	48	39	38	40	33	68	63	56	48	46	47	37	70	70	66	60	56	56	43
	0.720	**2592**	75	8.0	-	-	-	-	-	-	-	72	66	58	49	47	49	40	73	73	69	62	58	57	46
	0.900	**3240**	100	10.0	-	-	-	-	-	-	-	75	69	59	50	47	50	42	75	76	71	63	59	58	48
400 x 250	0.222	**800**	50	2.2	48	44	41	38	37	33	19	53	50	48	44	43	40	25	60	59	58	53	52	51	33
	0.400	**1440**	50	4.0	60	53	46	39	38	38	27	62	58	53	47	45	45	32	67	66	63	58	55	54	40
	0.600	**2160**	50	6.0	66	57	48	39	38	40	33	68	63	56	48	46	47	37	71	71	67	60	57	56	44
	0.800	**2880**	75	8.0	-	-	-	-	-	-	-	72	66	58	49	47	49	40	74	74	69	62	58	58	47
	1.000	**3600**	100	10.0	-	-	-	-	-	-	-	75	69	59	50	47	50	42	76	76	71	64	59	59	49
500 x 200	0.243	**875**	50	2.4	50	45	41	38	37	33	20	54	51	48	45	43	41	26	61	60	58	54	53	51	34
	0.400	**1440**	50	4.0	60	53	46	39	38	38	27	62	58	53	47	45	45	32	67	66	63	58	55	54	40
	0.600	**2160**	50	6.0	66	57	48	39	38	40	33	68	63	56	48	46	47	37	71	71	67	60	57	56	44
	0.800	**2880**	75	8.0	-	-	-	-	-	-	-	72	66	58	49	47	49	40	74	74	69	62	58	58	47
	1.000	**3600**	100	10.0	-	-	-	-	-	-	-	75	69	59	50	47	50	42	76	76	71	64	59	59	49
400 x 300	0.278	**1000**	50	2.3	48	44	40	37	36	32	18	53	50	48	44	43	40	25	60	59	58	53	52	51	33
	0.480	**1728**	50	4.0	60	53	46	39	38	38	27	63	59	54	48	46	45	33	67	67	64	58	56	55	40
	0.720	**2592**	50	6.0	65	57	47	39	38	40	32	68	63	56	48	46	47	37	71	71	67	60	57	56	44
	0.960	**3456**	75	8.0	-	-	-	-	-	-	-	72	66	58	49	47	49	40	74	74	69	62	58	58	47
	1.200	**4320**	100	10.0	-	-	-	-	-	-	-	75	69	59	50	47	50	42	76	76	71	64	59	59	49
600 x 200	0.313	**1125**	50	2.6	50	46	41	37	36	33	20	55	52	49	45	43	41	26	61	60	59	54	53	52	35
	0.480	**1728**	50	4.0	60	53	46	39	38	38	27	63	59	54	48	46	45	33	67	67	64	58	56	55	40
	0.720	**2592**	50	6.0	65	57	47	39	38	40	32	68	63	56	48	46	47	37	71	71	67	60	57	56	44
	0.960	**3456**	75	8.0	-	-	-	-	-	-	-	72	66	58	49	47	49	40	74	74	69	62	58	58	47
	1.200	**4320**	100	10.0	-	-	-	-	-	-	-	75	69	59	50	47	50	42	76	76	71	64	59	59	49

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Air noise VCMR

	air volume				pressure drop over the damper blade																				
					50 Pa							100 Pa							250 Pa						
					L_w in dB/octave band						L_p	L_w in dB/octave band						L_p	L_w in dB/octave band						L_p
W x H	m^3/s	m^3/h	P_{min}	m/s	63	125	250	500	1k	2k	dB(A)	63	125	250	500	1k	2k	dB(A)	63	125	250	500	1k	2k	dB(A)
500 x 250	0.278	1000	50	2.2	48	44	41	38	37	33	19	54	51	48	45	44	41	25	60	59	58	54	53	52	34
	0.500	1800	50	4.0	60	53	46	39	38	38	27	63	59	54	48	46	45	33	67	67	64	58	56	55	40
	0.750	2700	50	6.0	66	57	48	39	38	40	33	68	63	56	49	47	48	37	71	71	67	61	57	57	44
	1.000	3600	75	8.0	-	-	-	-	-	-	-	72	67	58	50	48	49	41	74	74	70	63	59	58	47
	1.250	4500	100	10.0	-	-	-	-	-	-	-	75	69	59	50	47	50	42	76	76	71	64	59	59	49
500 x 300	0.333	1200	50	2.2	48	44	41	38	37	33	19	54	51	49	45	44	41	26	61	60	59	54	53	52	34
	0.600	2160	50	4.0	60	53	46	39	38	38	27	63	59	54	48	46	46	33	68	67	64	59	56	55	41
	0.900	3240	50	6.0	66	57	48	39	38	40	33	69	64	57	49	47	48	38	72	72	68	61	58	57	45
	1.200	4320	75	8.0	-	-	-	-	-	-	-	72	67	58	50	48	49	41	74	74	70	63	59	58	47
	1.500	5400	100	10.0	-	-	-	-	-	-	-	75	69	60	50	48	50	43	76	77	72	64	60	59	49
600 x 250	0.389	1400	50	2.6	51	46	42	38	37	34	20	56	53	50	46	45	42	27	62	61	60	55	54	53	36
	0.600	2160	50	4.0	60	53	46	39	38	38	27	63	59	54	48	46	46	33	68	67	64	59	56	55	41
	0.900	3240	50	6.0	66	57	48	39	38	40	33	69	64	57	49	47	48	38	72	72	68	61	58	57	45
	1.200	4320	75	8.0	-	-	-	-	-	-	-	72	67	58	50	48	49	41	74	74	70	63	59	58	47
	1.500	5400	100	10.0	-	-	-	-	-	-	-	75	69	60	50	48	50	43	76	77	72	64	60	59	49
600 x 300	0.444	1600	50	2.5	51	46	42	39	38	34	21	56	53	50	47	45	43	28	63	62	61	56	55	54	37
	0.720	2592	50	4.0	60	53	46	40	39	38	28	64	60	55	49	47	46	34	69	68	65	60	57	56	42
	1.080	3888	50	6.0	66	57	48	39	38	40	33	69	64	57	49	47	48	38	72	72	68	62	58	58	45
	1.440	5184	75	8.0	-	-	-	-	-	-	-	73	67	59	50	48	50	41	75	75	71	64	60	59	48
	1.800	6480	100	10.0	-	-	-	-	-	-	-	75	69	60	50	48	50	43	77	77	72	65	60	60	50

Radiation noise VCMR

	air volume				pressure drop over the damper blade																				
					50 Pa							100 Pa							250 Pa						
					L_w in dB/octave band						L_p	L_w in dB/octave band						L_p	L_w in dB/octave band						L_p
W x H	m^3/s	m^3/h	P_{min}	m/s	63	125	250	500	1k	2k	dB(A)	63	125	250	500	1k	2k	dB(A)	63	125	250	500	1k	2k	dB(A)
200 x 100	0.056	200	50	2.8	41	40	32	29	24	23	16	45	44	37	34	29	29	21	50	49	43	39	35	36	26
	0.080	288	50	4.0	46	44	35	32	29	27	20	49	49	41	37	33	32	25	54	54	48	43	39	39	30
	0.120	432	50	6.0	50	48	38	35	32	31	24	53	53	44	40	37	36	29	57	59	52	46	42	41	35
	0.160	576	75	8.0	-	-	-	-	-	-	-	56	56	47	42	39	38	31	60	62	55	49	45	43	38
	0.200	720	100	10.0	-	-	-	-	-	-	-	58	59	49	44	41	39	34	62	65	57	50	46	44	40
200 x 150 en 300 x 100	0.069	250	50	2.3	39	38	31	28	23	21	14	43	43	36	33	28	28	19	49	48	43	39	35	36	25
	0.120	432	50	4.0	46	44	35	32	29	27	20	50	49	42	38	34	33	25	55	56	49	44	40	40	32
	0.180	648	50	6.0	50	48	38	35	32	31	24	54	54	45	41	37	36	29	59	60	53	48	44	43	36
	0.240	864	75	8.0	-	-	-	-	-	-	-	57	57	47	43	40	38	32	61	64	56	50	46	44	39
	0.300	1080	100	10.0	-	-	-	-	-	-	-	59	59	49	45	42	40	34	63	66	58	52	48	46	41
200 x 200	0.097	350	50	2.4	39	38	31	28	23	22	15	44	43	37	33	28	28	20	50	49	43	39	35	36	26
	0.160	576	50	4.0	46	44	35	32	29	27	20	50	49	42	38	34	33	25	55	56	49	44	40	40	32
	0.240	864	50	6.0	50	49	39	36	33	31	24	54	54	45	41	38	37	30	59	61	54	48	44	43	37
	0.320	1152	75	8.0	-	-	-	-	-	-	-	57	57	48	43	40	39	32	62	64	57	51	47	45	40
	0.400	1440	100	10.0	-	-	-	-	-	-	-	59	60	50	45	42	40	35	64	67	59	52	48	46	42
300 x 150	0.097	350	50	2.2	38	37	30	27	22	21	14	43	42	36	32	28	27	19	49	48	43	39	35	36	25
	0.180	648	50	4.0	46	44	35	32	29	27	20	50	49	42	38	34	33	25	56	56	50	45	41	41	32
	0.270	972	50	6.0	50	49	39	36	33	31	24	54	54	45	41	38	37	30	60	61	54	49	45	44	37
	0.360	1296	75	8.0	-	-	-	-	-	-	-	57	57	48	43	40	39	32	62	65	57	51	47	45	40
	0.450	1620	100	10.0	-	-	-	-	-	-	-	59	60	50	45	42	40	35	64	67	59	53	49	47	42
300 x 200	0.139	500	50	2.3	40	39	32	29	24	22	15	44	44	37	34	29	29	20	51	50	44	41	36	37	27
	0.240	864	50	4.0	47	45	36	33	30	28	21	51	50	43	39	35	34	26	57	57	51	46	42	42	33
	0.360	1296	50	6.0	51	50	40	37	34	32	25	55	55	46	42	39	38	31	61	62	55	50	46	45	38
	0.480	1728	75	8.0	-	-	-	-	-	-	-	58	58	49	44	41	40	33	63	66	58	52	48	46	41
	0.600	2160	100	10.0	-	-	-	-	-	-	-	60	61	51	46	43	41	36	65	68	60	54	50	48	43
300 x 250	0.167	600	50	2.2	39	38	31	28	23	22	15	44	43	37	34	29	29	20	50	50	44	40	36	37	27
	0.300	1080	50	4.0	47	45	36	33	30	28	21	51	51	43	39	35	34	27	57	58	51	46	42	42	34
	0.450	1620	50	6.0	51	50	40	37	34	32	25	56	56	47	43	39	38	31	61	63	56	50	46	45	39
	0.600	2160	75	8.0	-	-	-	-	-	-	-	59	59	49	45	42	40	34	64	66	59	53	49	47	42
	0.750	2700	100	10.0	-	-	-	-	-	-	-	61	61	51	47	44	42	36	66	69	61	54	50	48	44

2025_02_v2

Radiation noise VCMR

	air volume				pressure drop over the damper blade																				
					50 Pa							100 Pa							250 Pa						
					Lw in dB/octave band						Lp	Lw in dB/octave band						Lp	Lw in dB/octave band						Lp
W x H	m³/s	m³/h	P_{min}	m/s	63	125	250	500	1k	2k	dB(A)	63	125	250	500	1k	2k	dB(A)	63	125	250	500	1k	2k	dB(A)
400 x 200	0,194	700	50	2,4	40	39	32	29	24	23	16	45	44	38	34	29	29	21	52	51	45	41	37	38	28
	0,320	1152	50	4,0	47	45	36	33	30	28	21	51	50	43	39	35	34	26	57	58	51	46	42	42	34
	0,480	1728	50	6,0	51	50	40	37	34	32	25	55	55	46	42	39	38	31	61	63	56	50	46	45	39
	0,640	2304	75	8,0	-	-	-	-	-	-	-	59	59	49	45	42	40	34	64	67	59	53	49	47	42
	0,800	2880	100	10,0	-	-	-	-	-	-	-	61	61	51	47	44	42	36	66	69	61	55	51	49	44
300 x 300	0,208	750	50	2,3	39	39	31	28	23	22	15	44	44	37	34	29	29	20	51	50	45	41	37	38	27
	0,360	1296	50	4,0	46	45	36	33	29	28	20	51	50	43	39	35	34	26	57	58	51	46	42	42	34
	0,540	1944	50	6,0	51	49	39	36	33	32	25	55	55	46	42	39	38	31	61	63	56	50	46	45	39
	0,720	2592	75	8,0	-	-	-	-	-	-	-	59	59	49	45	42	40	34	64	67	59	53	49	47	42
	0,900	3240	100	10,0	-	-	-	-	-	-	-	61	62	52	47	44	42	37	67	70	62	55	51	49	45
400 x 250	0,222	800	50	2,2	39	38	31	28	23	22	15	44	43	37	34	29	29	20	51	50	45	41	37	38	27
	0,400	1440	50	4,0	47	45	36	33	30	28	21	51	51	43	39	35	34	27	58	58	52	47	43	43	34
	0,600	2160	50	6,0	51	50	40	37	34	32	25	56	56	47	43	39	38	31	62	63	56	51	47	46	39
	0,800	2880	75	8,0	-	-	-	-	-	-	-	59	59	50	45	42	41	34	65	67	60	54	50	48	43
	1,000	3600	100	10,0	-	-	-	-	-	-	-	61	62	52	47	44	42	37	67	70	62	55	51	49	45
500 x 200	0,243	875	50	2,4	40	39	32	29	24	22	15	45	44	38	34	30	29	21	52	51	45	41	37	38	28
	0,400	1440	50	4,0	47	45	36	33	30	28	21	51	51	43	39	35	34	27	58	58	52	47	43	43	34
	0,600	2160	50	6,0	51	50	40	37	34	32	25	56	56	47	43	39	38	31	62	63	56	51	47	46	39
	0,800	2880	75	8,0	-	-	-	-	-	-	-	59	59	50	45	42	41	34	65	67	60	54	50	48	43
	1,000	3600	100	10,0	-	-	-	-	-	-	-	61	62	52	47	44	42	37	67	70	62	55	51	49	45
400 x 300	0,278	1000	50	2,3	40	39	32	29	24	22	15	45	44	38	34	30	29	21	52	51	45	42	37	38	28
	0,480	1728	50	4,0	47	46	37	34	30	29	21	52	51	44	40	36	35	27	58	59	52	47	43	43	35
	0,720	2592	50	6,0	52	50	40	37	34	33	26	56	56	47	43	40	39	32	62	64	57	51	47	46	40
	0,960	3456	75	8,0	-	-	-	-	-	-	-	60	60	50	46	43	41	35	65	68	60	54	50	48	43
	1,200	4320	100	10,0	-	-	-	-	-	-	-	62	62	52	48	45	43	37	67	70	62	56	52	50	45
600 x 200	0,313	1125	50	2,6	41	40	33	30	25	24	16	46	46	39	35	31	30	22	53	52	47	43	38	39	29
	0,480	1728	50	4,0	47	46	37	34	30	29	21	52	51	44	40	36	35	27	58	59	52	47	43	43	35
	0,720	2592	50	6,0	52	50	40	37	34	33	26	56	56	47	43	40	39	32	62	64	57	51	47	46	40
	0,960	3456	75	8,0	-	-	-	-	-	-	-	60	60	50	46	43	41	35	65	68	60	54	50	48	43
	1,200	4320	100	10,0	-	-	-	-	-	-	-	62	62	52	48	45	43	37	67	70	62	56	52	50	45
500 x 250	0,278	1000	50	2,2	40	39	32	29	23	22	15	45	44	37	34	29	29	20	51	51	45	41	37	38	28
	0,500	1800	50	4,0	47	46	37	34	30	29	21	52	51	44	40	36	35	27	58	59	52	47	43	43	35
	0,750	2700	50	6,0	52	50	40	37	34	33	26	56	56	47	43	40	39	32	62	64	57	51	47	46	40
	1,000	3600	75	8,0	-	-	-	-	-	-	-	60	60	50	46	43	41	35	65	68	60	54	50	48	43
	1,250	4500	100	10,0	-	-	-	-	-	-	-	62	62	52	48	45	43	37	67	70	62	56	52	50	45
600 x 250	0,389	1400	50	2,6	41	40	33	30	25	23	16	47	46	39	36	31	31	22	53	53	47	43	39	40	30
	0,600	2160	50	4,0	47	46	37	34	30	29	21	52	52	44	40	36	35	28	59	59	53	48	44	44	35
	0,900	3240	50	6,0	52	50	40	37	34	33	26	57	57	48	44	40	39	32	63	64	57	52	48	47	40
	1,200	4320	75	8,0	-	-	-	-	-	-	-	60	60	51	46	43	42	35	66	68	61	55	51	49	44
	1,500	5400	100	10,0	-	-	-	-	-	-	-	62	63	53	48	45	43	38	68	71	63	56	52	50	46
500 x 300	0,333	1200	50	2,2	40	39	32	29	23	22	15	45	44	38	35	30	30	21	52	51	46	42	38	39	28
	0,600	2160	50	4,0	47	46	37	34	30	29	21	52	52	44	40	36	35	28	59	59	53	48	44	44	35
	0,900	3240	50	6,0	52	50	40	37	34	33	26	57	57	48	44	40	39	32	63	64	57	52	48	47	40
	1,200	4320	75	8,0	-	-	-	-	-	-	-	60	60	51	46	43	42	35	66	68	61	55	51	49	44
	1,500	5400	100	10,0	-	-	-	-	-	-	-	62	63	53	48	45	43	38	68	71	63	56	52	50	46
600 x 300	0,444	1600	50	2,5	41	40	33	30	25	23	16	47	46	39	36	31	31	22	54	53	47	44	39	40	30
	0,720	2592	50	4,0	47	46	37	34	30	29	21	52	52	44	40	36	35	28	59	60	53	48	44	44	36
	1,080	3888	50	6,0	52	50	40	37	34	33	26	57	57	48	44	40	39	32	63	65	58	52	48	47	41
	1,440	5184	75	8,0	-	-	-	-	-	-	-	60	60	51	46	43	42	35	66	69	61	55	51	49	44
	1,800	6480	100	10,0	-	-	-	-	-	-	-	63	63	53	49	46	44	38	69	72	64	57	53	51	47

Correction table

Air noise 4k and 8k compared to 2k

m/s	50 Pa		100 Pa		250 Pa	
	4k	8k	4k	8k	4k	8k
2	-10	-17	-7	-14	-3	-8
4	-8	-17	-6	-14	-3	-9
6	-6	-17	-5	-14	-3	-10
8	-	-	-4	-14	-3	-10
10	-	-	-4	-14	-3	-10

Radiation noise 4k and 8k compared to 2k

m/s	50 Pa		100 Pa		250 Pa	
	4k	8k	4k	8k	4k	8k
2	-13	-20	-10	-16	-6	-11
4	-9	-19	-8	-16	-5	-11
6	-7	-18	-6	-15	-5	-11
8	-	-	-5	-15	-4	-11
10	-	-	-4	-14	-4	-12

5

Noise data

- Minimum static pressure loss over the unit P_{min} in Pa. The sound-power capacity L_W is given in dB with a reference value of 10^{-12} watt.
- The sound-pressure values L_p are given in dB(A). The values are given for air noise with an attenuator and a ceiling diffuser with a plenum box. The radiation noise has been calculated with attenuation of the ceiling plenum and an insulation value of a suspended ceiling. See the correction table for the relevant calculation values.
- The assumed space attenuation is 10 dB. If the actual value is lower, the dB(A) values have to be corrected.
- The radiation noise of the double-walled version is approximately
  5 dB lower than the above table values.
- **NB:** the L_W values are measured with a duct ending in the clearance (including end reflection).
- For high noise requirements (< 25 dB(A)), hard rooms, light walls, please consult an acoustic adviser.
- It is permitted to interpolate the interim values.
- **NB:** the available pressure drop over the unit should be at least 50 Pa.

Correction table ceiling attenuation

octave bands	63	125	250	500	1k	2k	4k	8k
air noise	0	5	10	20	30	30	25	20
radiation noise	0	2	5	10	15	15	15	15

2025_02_v2

AOOO

Measuring instrument
Round

Available types
A O O O M O -

- **A** accessory
- **O** not applicable
- **O** round version
- **O** not applicable
- **M** eXavol measuring instrument, diagonally integrated
- **O** not applicable

- **Measuring instrument**
  - **V** VRU-D3-BAC (supplied separately)
  - **O** not applicable

Use
The diagonally integrated measuring instrument type AOOOMO is suitable for measuring air volumes in round ducts. The measuring cross type eXavol can be connected to an electronic, dynamic pressure transducer.

Optionally, we can also supply a set Belimo pressure transducer type VRU-D3-BAC with corresponding air ducts (length 1.5 m). The regulator and associated ducts are supplied separately for placement in the vicinity of the measuring instrument. Electronic wiring not included.

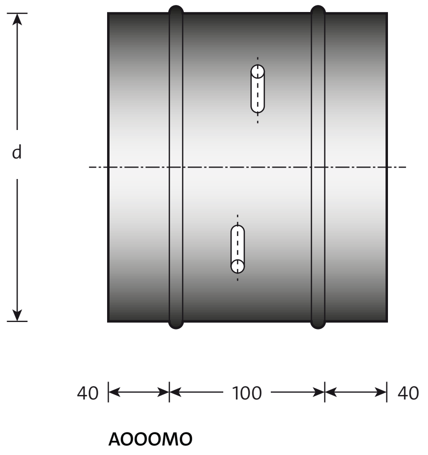
Characteristics
- Nominal volume range up to 4.525 m^3/h.
- Available in seven model sizes.
- Extremely low internal resistance.
- High signal.
- Measures the average air speed over the entire duct diameter.
- Round version.

Finish

Housing:	sendzimir galvanised steel sheet
Round connection:	in accordance with EN1506 and EN13180
Measuring tubes:	aluminium

2025_06_v4

Dimensions



Available dimensions

model	d
100	99
125	124
160	159
200	199
250	249
315	314
400	399

Note

• The listed dimensions are in mm.

Fitting

Air-volume measuring instruments type AOOOMO are insensitive to the fitting position. However, the disruption of the flow due to bends and branches must be taken into account. Two to three times the diameter in a straight flow before the unit is recommended. The duct dimension corresponds to the connection size of the measuring instrument.

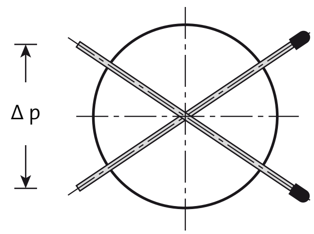
"C " factor

Formula: $Q = C \times \sqrt{p}$

Q = air volume in m^3/h
C = factor
p = Δp over measuring instrument

model	C	Pa
100	21.1	156.5
125	34.9	145.5
160	57.5	144.4
200	92.7	138.8
250	144.7	141.0
315	240.9	130.0
400	404.1	122.0

Pa values are given for a 10 m/s supply speed.



2025_06_v4

VRVO

Measuring instrument
Rectangular
Single-walled and double-walled
LUKA D/ATC 2

Available types

V R V O S - -

- **V** volume unit
- **R** rectangular version
- **V** variable-volume measuring instrument
- **O** none
- **S** SDV measuring instrument

- **Version**
  - **O** single-walled
  - **D** double-walled

- **Measuring instrument**
  - **V** VRU-D3-BAC
  - **O** none

Use

The measuring station type VRVO is suitable for measuring air volumes in rectangular ducts. The measuring instrument type VRVO can be connected to an electronic, dynamic pressure transducer.

Characteristics

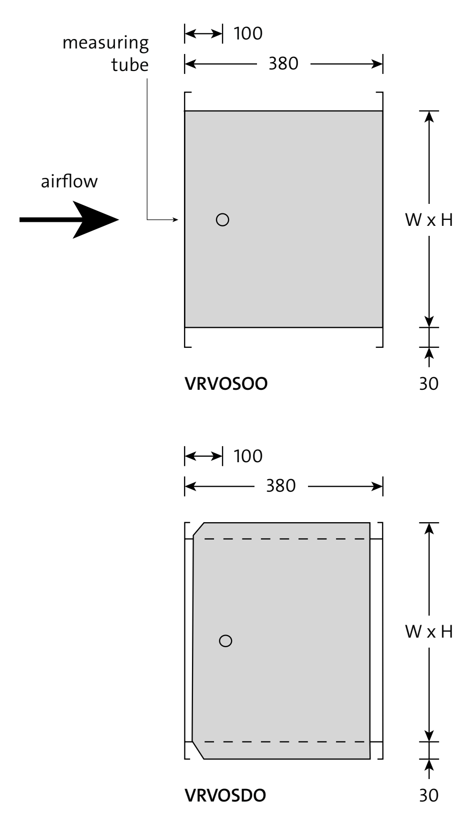
- Wide variety of model sizes available.
- Low resistance.
- Low flow noise.
- Airtightness class LUKA D/ ATC 2.

Finish

Housing:	sendzimir galvanised steel sheet
Measuring tube:	aluminium

2024_08_v3

Dimensions



Note

- The listed dimensions are in mm.
- Dimensions that exceed 1200 x 1200 mm have an airtightness class LUKA C/ATC 3.

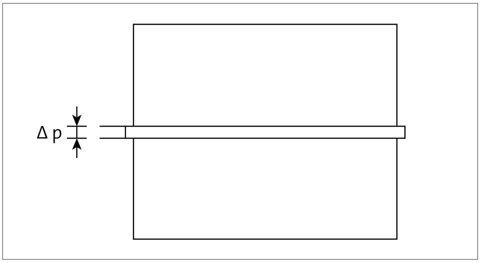
Fitting

Air-volume measuring instruments type VRVO are insensitive to the fitting position. However, disruption of the flow due to bends and branches must be taken into account. Two to three times the diameter as a straight flow before the unit is recommended. The duct dimension corresponds to the connection size of the measuring instrument.

Air-volume formula

$Q = A \times (dP_{\text{measuring tube}}/1.5)^{0.5} \times 3600$

Q = air volume in m^3/h
A = duct surface in m^2
$dP_{\text{measuring tube}}$ = pressure difference over connection points of the measuring tube in Pa



2024_08_v3

KIVT

Damper section
Louvre damper
LUKA C/ATC 3

Available types

K - V T - -

K damper section

- **Seal**
  - **I** standard
  - **R** rubber seal on damper blades
  - **L** airtight class 4 in accordance with EN 1751*

V square or rectangular

T intermediate mounting flanges

- **Housing length**
  - **E** 121 mm (W ≤ 1300 mm)
  - **F** 175 mm (W > 1300 mm)

- **Version**
  - **G** suitable for servomotor operation
  - **H** with manual fixing device

*KLVTE to max 1200 mm wide.
KL VTF to max 1600 mm wide.

Use

The louvre dampers type KIVT, KRVT and KLVT are suitable for being incorporated as control or closing damper in air-handling units or air-duct systems. The dampers are available in a choice of manual or servomotor operation.

Characteristics

- Two widths of vanes are available.
- Low resistance in open position.
- Low flow noise.
- Airtightness class LUKA C/ATC 3.

Finish

Housing:	sendzimir galvanised steel sheet
Drive:	aluminium gears
Bearings:	polyamide

Control equipment

Solid Air has Belimo as its own brand for combining louvre damper and actuators. For more specific information about the actuators, please refer to the appendix actuators.

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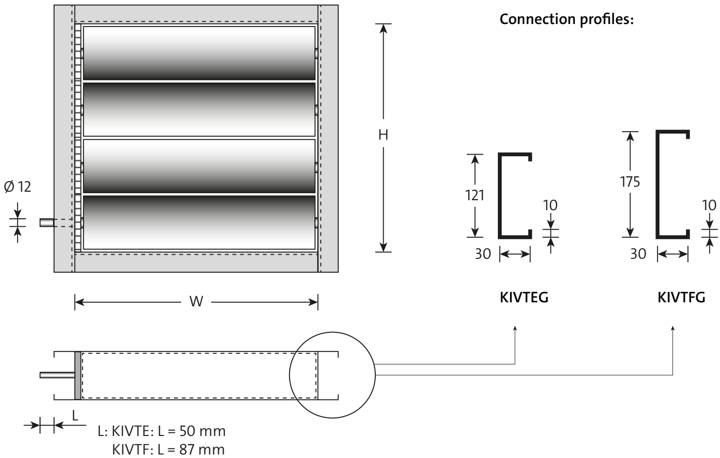
5

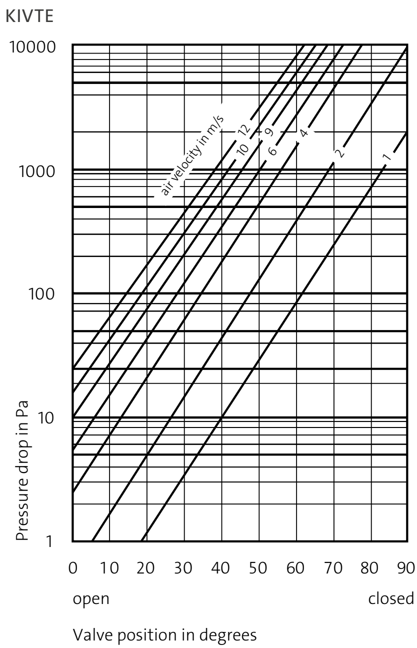
Dimensions

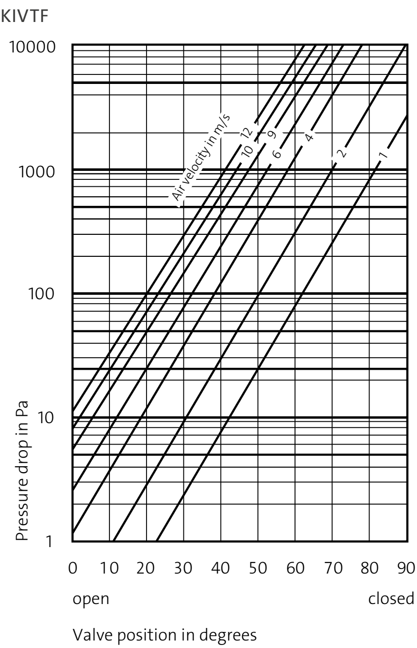


Note

• The listed dimensions are in mm.

Selection details





2024_08_v3

Available dimensions

KIVTE

H	W											
	200	300	400	500	600	700	800	900	1000	1100	1200	1300
200	■	■	■	■	■	■	■	■	■	■	■	■
300	■	■	■	■	■	■	■	■	■	■	■	■
400	■	■	■	■	■	■	■	■	■	■	■	■
500	■	■	■	■	■	■	■	■	■	■	■	■
600	■	■	■	■	■	■	■	■	■	■	■	■
700	■	■	■	■	■	■	■	■	■	■	■	■
800	■	■	■	■	■	■	■	■	■	■	■	■
900	■	■	■	■	■	■	■	■	■	■	■	■
1000	■	■	■	■	■	■	■	■	■	■	■	■
1100	■	■	■	■	■	■	■	■	■	■	■	■
1200	■	■	■	■	■	■	■	■	■	■	■	■

Width of 200 to 1300 mm, in increments of 50 mm.
Height of 200 to 1200 mm, in increments of 50 mm.

KIVTF

H	W								
	300	500	700	900	1200	1400	1600	1800	2000
345						■	■	■	■
510						■	■	■	■
675						■	■	■	■
840						■	■	■	■
1005						■	■	■	■
1170						■	■	■	■
1335	■	■	■	■	■	■	■	■	■
1500	■	■	■	■	■	■	■	■	■
1665	■	■	■	■	■	■	■	■	■
1830	■	■	■	■	■	■	■	■	■
1995	■	■	■	■	■	■	■	■	■

Width of 300 to 2000 mm, in increments of 50 mm.
Height of 345 to 1995 mm, in increments of 165 mm.

SRH/SRS

Control damper
Round
Rubber seal
LUKA C/ATC 3

Available types

S R -

S control damper - safe
R round

- Operation
H manual
HA manual operation, rubber seal on damper blade
SA suitable for motor operation, rubber seal on damper blade

Use

The SRH control damper is suitable for fitting in a duct system as a control or shut-off damper. The damper can be set over 90°. The damper position can be fixed with a screw. The damper can be insulated to a thickness of 50 mm without any problem.

The SRSA type is suitable for fitting a servomotor.

The SRHA/SRSA type is fitted with a rubber seal on the damper blade.

Characteristics

- Low resistance in open position.
- Low flow noise.
- Airtightness class SRH, SRHA and SRSA LUKA C/ATC 3.
- Airtightness class on the damper blade SRHA en SRSA:
  model 80 up to 300 class 3
  model 315 up to 630 class 4

Finish

Control damper: galvanised sheet steel
Post-treatment: none

Control equipment

Solid Air has Belimo as its own brand for combining louvre damper and actuators. For more specific information about the actuators, please refer to the appendix actuators.

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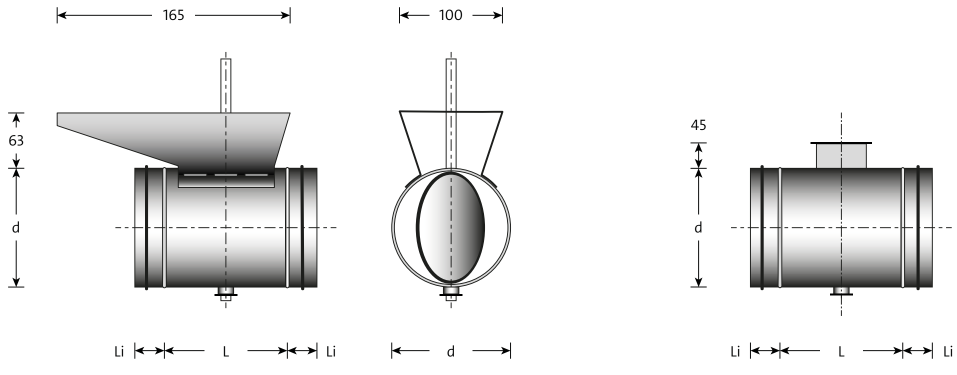
Dimensions



Available dimensions and weights

SRH - SRHA (manual operation)

model	d	L	Li	weight kg
80	79	88	35	0.40
100	99	88	35	0.45
125	124	88	35	0.56
150	149	88	35	0.68
160	159	88	35	0.70
180	179	88	35	0.84
200	199	88	35	0.90
224	223	88	45	1.04
250	249	88	45	1.05
280	279	88	45	1.40
300	299	88	45	1.60
315	314	88	45	1.70
355	354	88	55	1.80
400	399	88	55	2.90
450	449	128	55	4.00
500	499	128	55	4.90
560*	559	128	55	5.30
630*	629	128	55	6.30

SRSA (suitable for servomotor)

model	d	L	Li	weight kg
100	99	88	35	0.68
125	124	88	35	0.79
150	149	88	35	0.91
160	159	88	35	0.93
180	179	88	35	1.07
200	199	88	35	1.13
224	223	88	45	1.27
250	249	88	45	1.28
280	279	88	45	1.63
300	299	88	45	1.83
315	314	88	45	1.93
355	354	88	55	2.03
400	399	88	55	3.13
450	449	128	55	4.23
500	499	128	55	5.13
560	559	128	55	5.13

*Model 560 and 630 not available in type SRHA.

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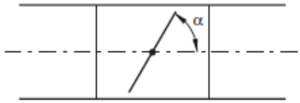
SRH noise details

Set the angle α:

α = 0° = damper open, α = 90° = damper closed

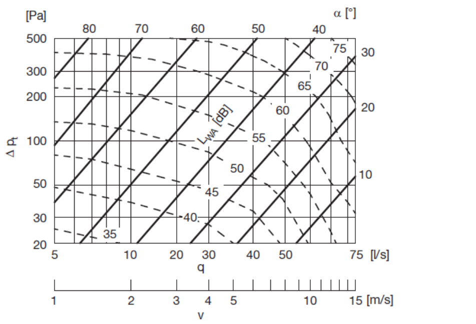


Technical details

Pressure loss with data over the noise pollution for dimensions:

- The solid curves show the pressure loss, Δp_t, via the control damper as a function of the flow speed q and setting angle.
- The dotted lines represent the A-weighted sound power, L_{wa} in dB on the duct.

Ø80



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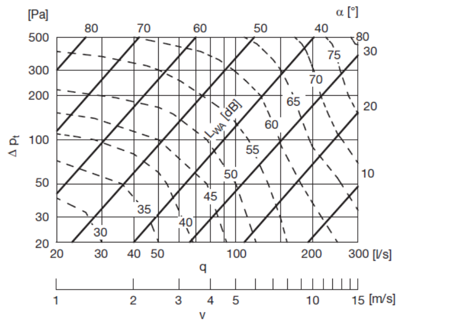
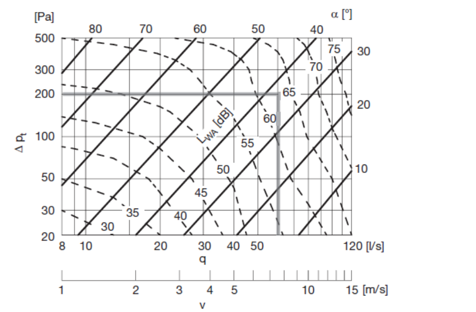


Ø100



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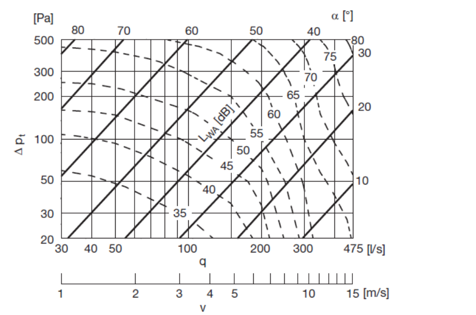

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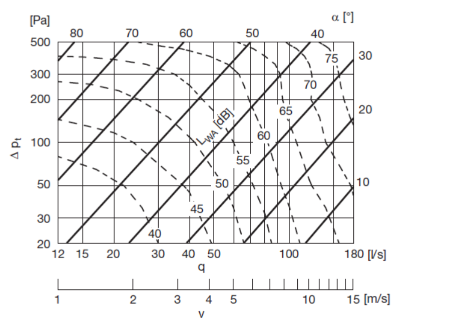

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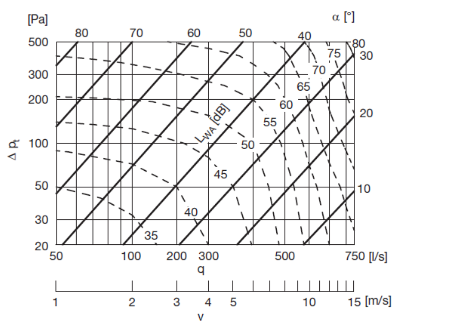

5

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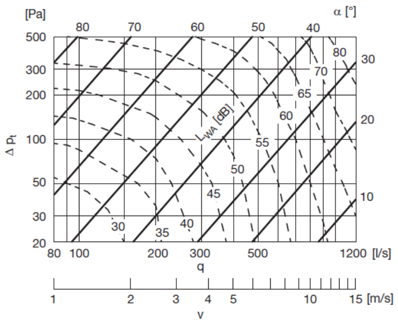
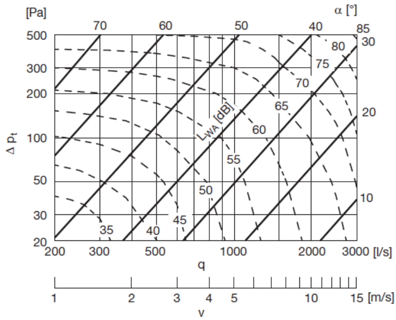
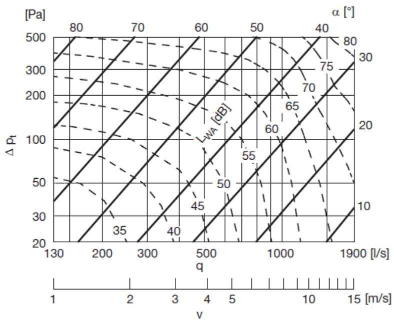
Ø315



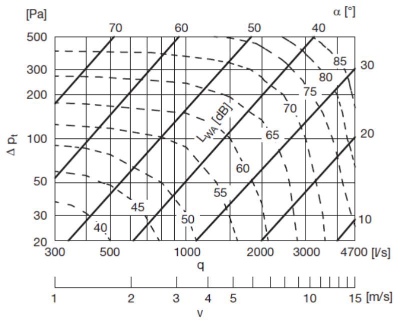
Ø500



Ø400



Ø630



Actuators

Control dampers

Use
The product group Volume units includes operations that are focused on the use of the volume units or the control dampers.

Characteristics
- Open/close or modulating 0 (2) - 10 Volt.
- Power supply 24 or 230 Volt.
- Modbus, BACnet or KNX available on request.
- 5, 10 or 20 Nm.

Versions of control dampers
All modulating versions (SR) are not self-adaptive.

torque	function	24 Volt DC/AC	230 Volt DC/AC
5 Nm (1 m^2)	Open/closed	LM24A	LM230A
	Open/closed + auxiliary switch	LM24A-S	LM230A-S
	Modulating	LM24A-SR	LM230A-SR
10 Nm (2 m^2)	Open/closed	NM24A	NM230A
	Open/closed + auxiliary switch	NM24A-S	NM230A-S
	Modulating	NM24A-SR	NM230A-SR
20 Nm (4 m^2)	Open/closed	SM24A	SM230A
	Open/closed + auxiliary switch	SM24A-S	SM230A-S
	Modulating	SM24A-SR	SM230A-SR

Fitting
Other makes and/or accessories can be fitted on request. Control damper actuators can also be supplied individually.

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VAV actuators

Variabel-volume units

Use
Our variable volume units are fitted with Belimo control equipment as standard ex works. You can choose a compact controller (cost-effective solution) or a universal control set (more flexibility). With a compact controller, the pressure sensor and regulator are integrated into the drive and form one compact whole. The compact controller is available in different bus communicative versions such as *-MOD (which can also be set for BACnet), *-KNX or *-MP.

With a universal control set, you choose a pressure sensor/controller in one housing and a separate drive. A dynamic or static pressure sensor can be chosen for, for example, clean or contaminated air. You can choose a standard drive, fast-running drive or operationally safe drive. In addition to the volume flow control, the universal pressure sensor/regulator can also be used for volume flow measurement, no drive is selected.

In addition to the volume flow solutions, the universal control set can also be used for static channel pressure control or room pressure control. Ask our sales department about the possibilities.

The variable volume units are always operated by a VAV actuator that is calibrated and set for the desired application ex works.

Characteristics
- Actuators for variable-volume units are only available with a 24 Volt supply.
- Suitable for analogue control and readout by means of 0(2)-10 Volt control/feedback signal.
- Modbus, BACnet, KNX and MP-bus bus communicative versions are available for integration into building management systems.
- Some versions can also be used of a hybrid function in which the control takes place analogue and the reading via the communication bus.

Fitting
VAV actuators are assembled, calibrated and adjusted from the factory. Installation of other products and/or accessories on request.

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VAV actuator compact

Belimo compact (pressure transducer/regulator and actuator in one housing)

function	article code	moment	runnig time 90 gr.	sensor	power supply	bus type	near field communication (NFC)	factory installed as standard					
								application	mode	turn-direction open *2	set-point	control	readout
volume-flow control	LMV-D3-MP-SD	5 Nm (1 m^2)	120 sec.	D3 dynamic 0-500 Pa	24 Volt AC/DC	MP	Yes	Volume-flow control	0-10 Volt	Counter Clock Wise (CCW)	Analog	0-10 Volt	0-10 Volt
	NMV-D3-MP-SD	10 Nm (2 m^2)											
	LMV-D3-MOD	5 Nm (1 m^2)				MOD BACnet MP	No		2-10 Volt *1		BUS	BUS	BUS
	NMV-D3-MOD	10 Nm (2 m^2)											
	LMV-D3-KNX	5 Nm (1 m^2)				KNX			2-10 Volt *1				
	NMV-D3-KNX	10 Nm (2 m^2)											

1 Bus communicative compact controllers (-MOD and *-KNX) are delivered ex works standard for control via the communication bus (setpoint source is set to BUS). There is digital control instead of analogue control. Nevertheless, these controllers have a mode setting that is set to 2-10V by default. This is necessary for applications where clamp 3 may be used as an analog input for sensor input.

*2 For volume controls type VVI or VVR in Left version, the 'direction of rotation open' is set to CW.

VAV actuator universal

Belimo universal (pressure transducer/regulator and separate actuator)

function	article code	sensor	power supply	bustype	near field communi-cation (NFC)	standaard af fabriek					
						application	mode	turn-direction open *2	set-point	control	readout
volume flow control	VRU-D3-BAC	D3 dynamic 0-500 Pa	24 Volt AC/DC	MOD BACnet MP	Yes	Volume-flow control	0-10 Volt	Counter Clock Wise (CCW)	Analog	0-10 Volt	0-10 Volt
volume flow control polluted air *3	VRU-M1-BAC	M1 static 0-600 Pa									

*3 **Note:** Validate the chosen volume unit is based on materials used that come into contact with polluted air.

Actuators

function	artikelcode	moment	looptijd 90 gr.	voeding
slow running	LM24A-VST	5 Nm (1 m²)	120 sec.	Plug in ready (via VRU)
	NM24A-VST	10 Nm (2 m²)		
	SM24A-VST	20 Nm (4 m²)		
fast running	LMQ24A-VST	4 Nm (0,8 m²)	2,4 sec.	
	NMQ24A-VST	8 Nm (1,6 m²)	4 sec.	
	SMQ-24A-VST	16 Nm (3,2 m²)	7 sec.	
operational safety	LF24-VST	4 Nm (0,8 m²)	120 sec. (Spring < 20 sec.)	
	NF24A-VST	10 Nm (2 m²)		
	SF24A-VST	20 Nm (4 m²)		
safety fast-running	NKQ24A-VST	6 Nm (1,2 m²)	4 sec. (Capacity < 4 sec.)	

Pressure transducer for measuring instrument

function	article code	sensor	power supply	bustype	near field communication (NFC)	factory installed as standard		
						application	mode	readout
volume flow measurement	VRU-D3-BAC	D3 dynamic 0-500 Pa	24 Volt AC/DC	MOD BACnet MP	Yes	Volume flow measurement	0-10 Volt	0-10 Volt
volume flow measurement polluted air *4	VRU-M1-BAC	M1 static 0 - 600 Pa						

*4 **Note:** Validate the chosen measuring instrument on the basis of materials used that come into contact with the polluted air.

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Room sensors,-control units, -controls

Individual room control CO_2/RV/temperature/ventilation

Use

Solid Air supplies a complete range of room sensors, control units and controllers suitable for CO_2 and/ or temperature control. In addition to the units with integrated CO_2 sensor, the Belimo room controllers (thermostats) type CR24 are also available for individual use. Differential room control based on temperature. For more general information on the possibilities of the In various products, we refer you to the document Solid Air room sensors, control units and controllers.

Characteristics

- Air-quality sensors and thermostats with several functionalities.
- Direct control of the VAV system.
- Stand-alone controls or can be incorporated into building-management systems.

Fitting

In accordance with supplied instructions.

Note

- Please consult our technical experts about extra possibilities and options.

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Belimo room sensors/control units for CO_2/temperature control via GBS *1

<table>
<tr><th>version</th><th>product code</th><th>colors LED green yellow red</th><th>tempera-ture + Rel. moisture/ dew point + CO_2</th><th>number of analog outputs + Standard outputs</th><th>MOD bus and BACNet</th><th>MP-BUS</th><th>NFC</th><th>commis-ioning with Belimo Assistant App via NFC</th><th>setpoint statement desired value for GBS. *2</th><th>power supply</th></tr>
<tr><td>
white cover against unwanted adjustments</td><td>22RTM-19-1</td><td rowspan="5">Yes</td><td rowspan="5">Yes</td><td rowspan="5">3, lineair 0-10V</td><td>No</td><td rowspan="5">Yes</td><td rowspan="5">Yes</td><td rowspan="5">Yes</td><td rowspan="3">Temperature</td><td rowspan="5">24V AC/DC</td></tr>
<tr><td rowspan="2">
white cover with virtual display via Belimo Display App</td><td>P-22RTM-1900A-1</td><td>No</td></tr>
<tr><td>P-22RTM-1U00A-2</td><td>Yes</td></tr>
<tr><td rowspan="2">
white cover with E-Paper like Display touch screen</td><td>P-22RTM-1900D-1</td><td>No</td><td rowspan="2">Temperature and ventilatie</td></tr>
<tr><td>P-22RTM-1U00D-2</td><td>Yes</td></tr>
</table>

*1: Belimo sensors are intended to take temperature, relative humidity and CO_2 measurements and feed them back to the control panel control system. The control of field devices such as VAV units or reheaters must be achieved by a control system. With the above Belimo units, the lower and upper limit can be specified for the 0-10V feedback of the CO_2 signal.As a result, this Belimo Sensor can be used as a stand-alone CO_2 sensor for control of an LMV-D3-MP (VAV unit).

*2 **Please note:** this is not a controller but only a setpoint for feedback to GBS for the desired value.

Belimo room sensors/controllers for 'stand alone' temperature control

thermostats	function/version	analogue output
CR24-B1	cooling only	0(2) -10V
CR24-B2	cooling and heating	cooling: 0(2)-10V heating: 3 point
CR24-B3	cooling and heating	cooling: 0(2)-10V heating: 3 point or 0-10V

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Atal room sensors/controllers for 'stand alone' CO_2/temperature control

<table>
<tr><th>version</th><th>colors LED green yellow red</th><th>tempera-ture</th><th>rel. moisture /Dew-point</th><th>CO_2</th><th>number of analog outputs + Standard output</th><th>analog output temperature</th><th>analoge output \ CO_2</th><th>direct PID-control of VAV air valve with one analog output based on CO_2 and temperature setpoint.</th><th>MOD bus and BACNet</th><th>power supply</th></tr>
<tr><td>
AT-VLC-ND-A2-RS
white cover whithout display</td><td rowspan="2">Yes, switch-able</td><td rowspan="3">Yes</td><td rowspan="3">No</td><td rowspan="2">Yes, 0-2000 ppm</td><td rowspan="3">2, lineair 0-10V</td><td rowspan="3">PID with setpoint for stand-alone control of heat exchanger (see figure 1) or linear for feedback to GBS.</td><td rowspan="3">PID with setpoint for stand-alone control (see figure 1) or linear for feedback GBS</td><td rowspan="2">No</td><td rowspan="3">Modbus RTU RS485</td><td rowspan="3">24V AC/DC</td></tr>
<tr><td>
AT-VLC-A2-RS-VAV
white cover with display and control buttons</td></tr>
<tr><td>
AT-VLX-A2-RS-VAV
white cover with green, orange, red colored display based on CO_2 and control buttons</td><td>No LED, but photo-chromatic display</td><td>Yes, 0-5000 ppm</td><td>Yes, summer/ winter temperature switching (air heating/cooling) via a modbus command is required. See figure 2 below.</td></tr>
</table>

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