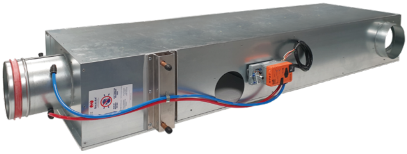

VVIS

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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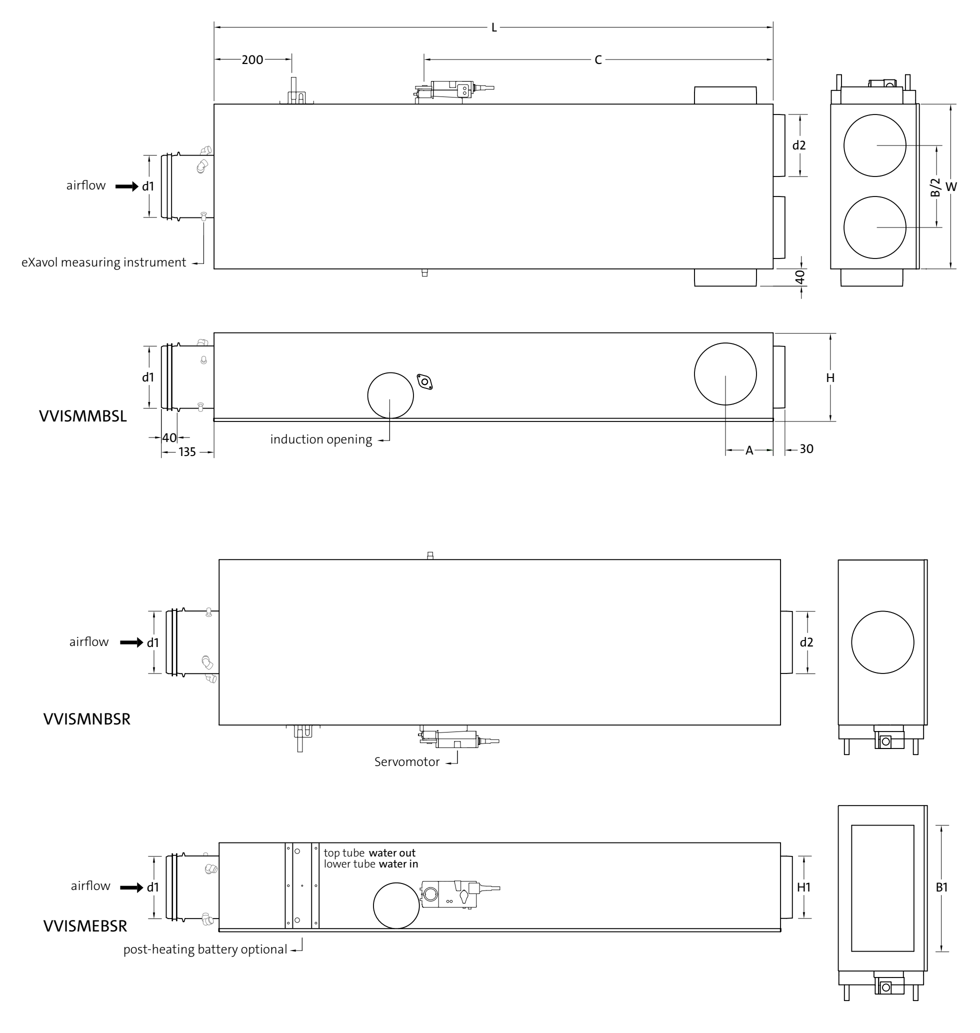
Dimensions



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

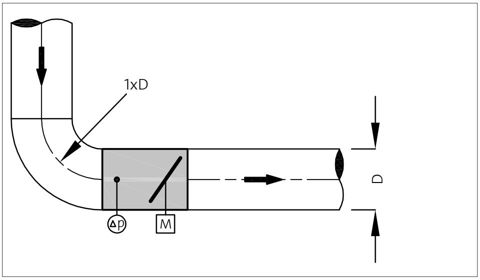
- The listed dimensions are in mm.

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 %.

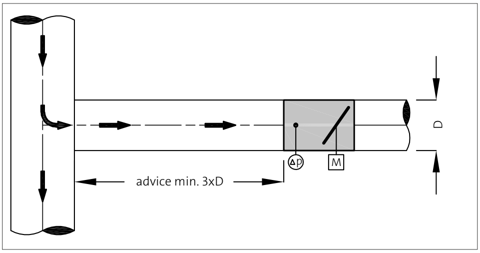
Bend

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



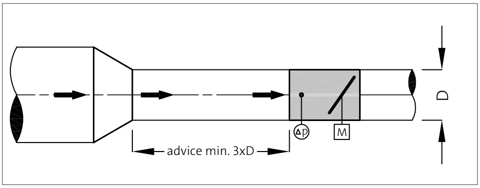
Main channel branch

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.



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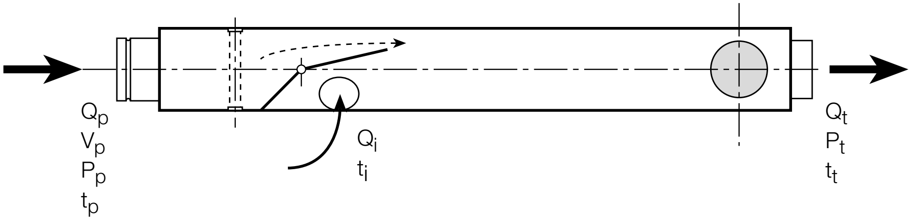
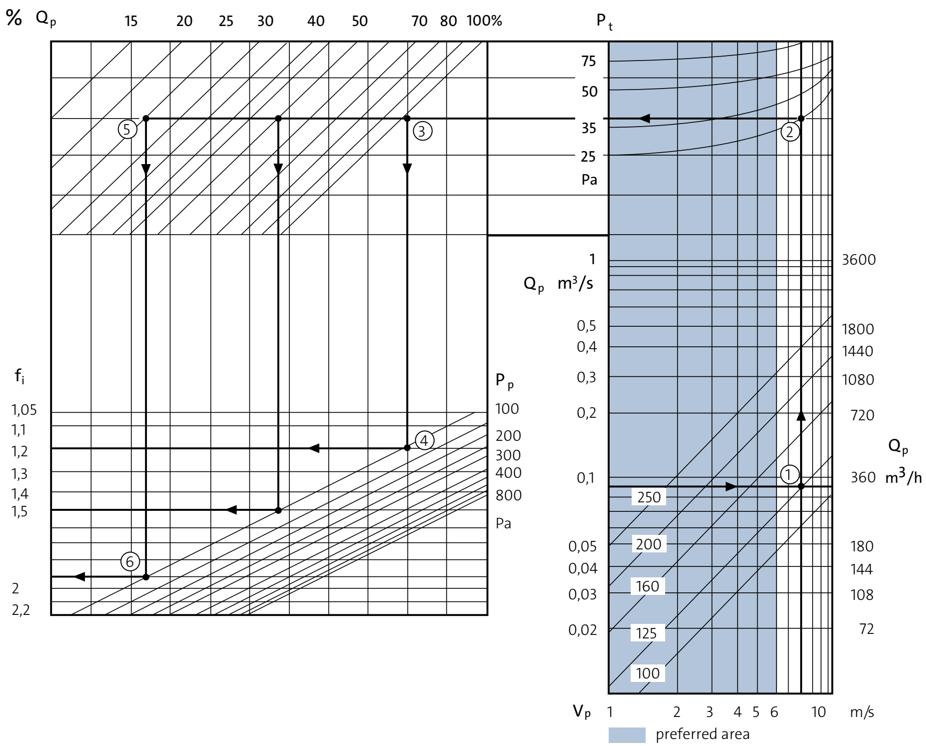
Selection graph air side, induction determination



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



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Selection example

Situation
Q_p = 0,09 m^3/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 = . . m^3/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 m^3/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.

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

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							

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							

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 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

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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
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 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.