

## VAV and CAV terminals “Air-Trac®” systems

# VAV and CAV terminals “Air-Trac®” systems

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**Composition type designation:**

**N - B - O - N - E - O - B**

**N** Position 1: **Product group**

N = air volume control terminals

**B** Position 2: **Function**

A = single wall, circular volume control terminal  
B = double wall, circular volume control terminal  
1 = non standard, specify separately

**O** Position 3: **Controls (manufacturer)**

O = without controls  
For controls, contact our sales staff

**Q** Position 4: **Outlet**

A = rectangular outlet  
B = circular outlet  
C = 4 circular outlets ('Octopus')  
G = rectangular outlet and provision for integral hot water reheat coil  
J = 4 circular outlets and provision for integral hot water reheat coil  
N = rectangular outlet and provision for integral electric reheat coil  
Q = 4 circular outlets and provision for integral electric reheat coil  
1 = non standard, specify separately

**E** Position 5: **Reheat coil**

O = without reheat coil  
A = 1-row hot water reheat coil  
B = 2-row hot water reheat coil  
D = 4-row hot water reheat coil  
E = 1-stage 230VAC/1-phase electric reheat coil  
F = 2-stage 230VAC/1-phase electric reheat coil  
G = 3-stage 230VAC/1-phase electric reheat coil  
H = 1-stage 400VAC/3-phase electric reheat coil  
J = 2-stage 400VAC/3-phase electric reheat coil  
1 = non standard, specify separately

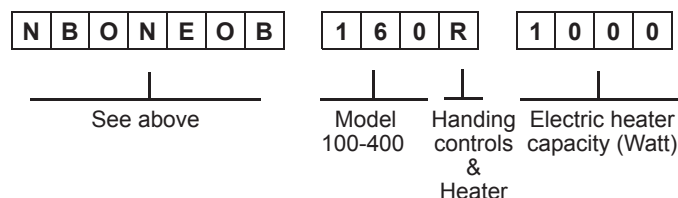
**O** Position 6: **Controls (type & function)**

O = without controls  
For controls, contact our sales staff

**B** Position 7: **Sensor**

O = not applicable  
B = Flo-Cross®, 2 x 12 point averaging and signal amplifying air flow sensor (standard)  
1 = non standard, specify separately

**Ordering example:**



**Ordering codes "Specials"**

N..1... - 3010 = 4 balancing dampers in 'Octopus' outlet  
N..1... - 3006 = 'Octopus' with 6 outlets instead of 4  
N..1... - 3016 = 'Octopus' with 6 outlets incl. balancing dampers  
N..1... - FL = Flange connection 30 mm for rectangular outlet

**Ordering information:**

*Standard terminals:*

- quantity of terminals
- complete 7 digit code
- terminal size or model
- air volume setting ( $V_{max}$ ,  $V_{min}$  etc)
- control handing (standard right side)
- if applicable, electric reheat coil capacity
- supply or return air

*Non standard terminals:*

- for non standard terminals a full description and/or drawing are requested

# Circular VAV and CAV air volume control terminals

*Technical data*  
*Single wall (NA.....)*  
*Double wall (NB.....)*



## Application

Types NA and NB are circular pressure-independent VAV and CAV air volume control terminals. The terminals are designed particularly for systems with space and installation restrictions and for the accurate measurement and control of air volumes courtesy of the patented airflow sensor type Flo-Cross®.

In CAV application, the terminals maintain the required constant airflow independent to the inlet static pressure.

In VAV application, the terminals control the air volume to the room, depending on the cooling load required thus saving energy consumption in both cooling and heating applications.

Alternatively VAV terminals are ideal to be used for CO<sub>2</sub> control. Dependent of the indoor air quality, always the correct amount of fresh air will be supplied to the room. Of course the primary air handling system need to be suitable for this.

The VAV or CAV terminals can be used either for supply or return air applications in new or refurbishment projects. The terminals do have a single wall (NA) or double wall (NB) construction and can be delivered with a distribution plenum and a built-in hot water or electric reheat coil.

### Features:

- Pressure independent control functions.
- Volume control range 100% down to 10%.
- Low pressure loss over the terminal.
- Single or double wall construction.
- Factory fitted distribution plenum with built-in hot water or electric reheat coil.
- Oval shaped damper blade for linear control characteristics.
- Low leakage damper, less than 2% of V<sub>nom</sub> at 750 Pa.
- Low noise production.
- Suitable for all control functions (VAV, CAV, shut-off, etc.) to maximise system energy savings.
- Flo-Cross® 2 x 12 points averaging and signal amplifying airflow sensor, better than 2,5% accuracy even with irregular duct approach.
- Maintenance free.

## Technical information

### Casing:

Single or double wall, air-tight construction made of galvanized sheet steel (non spiral), casing leakage rate to Class II VDI 3803 or DIN 24 194 part 2. Duct-sleeve connections at the in- and outlet are suitable for DIN 24 145 or DIN 24 146 connections. In case of double wall construction 25 mm insulation material is used, completely enclosed by the double wall construction.

### Insulation:

The terminal is supplied with 25 mm thermal and acoustical insulation (30 kg/m<sup>3</sup>) complying to: NFPA90A and 90B surface burning characteristics, BS476 part 6 and 7 fire propagation, UL 181 class 0 surface spread of flame and UL 94 HF1 flammability.

### Damper:

Damper blade: made of steel, sandwich construction of twin blade and neoprene gasket with low leakage according to DIN 1946, part 4. Damper shaft: aluminium, ø12 mm with self lubricating Nylon bearings.

### Flo-Cross®:

Extruded aluminium construction with nylon core + feet.

### Distribution plenum:

Made of galvanized sheet steel with 13 mm internal isolation. Plenum with standard rectangular or multiple (4 x circular) outlet construction. Optional single, double, triple or six circular outlets are possible. Outlet spigots are made of flame retardant polymer and optionally can be provided with volume control dampers made of galvanized sheet steel.

### Reheat coil:

Choice of 1-, 2- or 4-row hot water reheat coil or electric reheat coil (230VAC/1-phase or 400VAC/3-phase).

More detailed technical information can be found in the separate NO documentation.

### Controls:

Suitable for use with pneumatic, analogue electronic or DDC controllers. Controls can be factory fitted, wired and calibrated. Controls enclosure (galvanized sheet steel) can be provided optionally.

## Delivery format

### Delivery format:

- The VAV or CAV terminal will be supplied as a single mounting assembly. Optional ordered distribution plenum, reheat coil and/or controls are factory fitted, wired and calibrated. The on site delivered terminal can directly be installed and commissioned.
- Controls location and hot water or electric connections are as a standard fitted on the right hand side of the terminal when looking in the direction of the airflow.
- On request, the terminal can be delivered with connections on the left hand side.
- When terminals are ordered with controls, these will be factory fitted, wired and calibrated upon request.
- For terminals ordered with 'free-issue' third party controls, wiring diagrams and mounting instructions must be provided.

# Circular VAV and CAV air volume control terminals

*Technical data*  
Single wall (NA.....)  
Double wall (NB.....)



## Specify as:

### Example:

Supply and install, variable air volume terminals, double-wall construction with distribution plenum with 4 circular outlets, constructed from galvanized sheet steel. The casing leakage rate shall be classified according to class II, VDI 3803/DIN 24 194 and the duct-sleeve connections shall be suitable for DIN 24 145 or DIN 24 146 respectively. The VAV terminals shall have a low leakage, sandwich construction and oval shaped damper blade with neoprene gasket and an aluminium damper shaft with self lubricating Nylon bearings.

A centre averaging airflow sensor with at least 2 x 12 test points and amplified signal, type Flo-Cross® shall control the airflow with an accuracy better than 2.5 %. The terminals shall be supplied with 1-row hot water reheat coil.

The controller shall be I/A Series, DDC controller:  
LonMark® compatible, type MNL-V2RVx or  
BACnet® compatible, type MNB-V2.

Controls must be factory fitted, wired and calibrated according to the following requirements:

Maximum air volume 250 l/s  
Minimum air volume 60 l/s  
Minimum air volume 120 l/s (in case of reheat)  
Terminal size 200 mm  
Max. pressure loss 38 Pa  
Max. discharge sound index < NC30 (@250Pa Δp)  
Max. radiated sound index < NC30 (@250Pa Δp)

Ordering example: type – model – handing  
= NBOJA0B – 200R

Manufacturer: HC Barcol-Air

## Installation Instructions:

The HC Barcol-Air VAV terminals shall be installed using at least two support brackets (DIN-rail or L-profile), with anti-vibration rubber under the terminal. Each of these brackets shall be fixed with two threaded rods to the ceiling slab above.

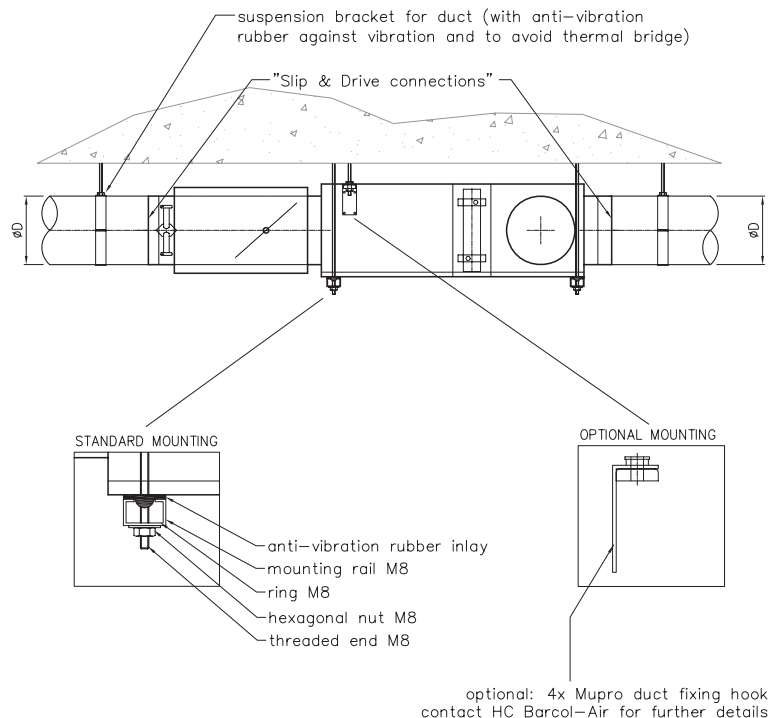
### This installation method:

- 1 Shall prevent the body of the VAV terminal from high mechanical tension, which could damage the construction and performance of the terminal.
- 2 Shall prevent torsion on the VAV terminals, which could cause malfunction of the damper blades.
- 3 Provides some flexibility to the final location of the VAV terminals.
- 4 Use at least 1x diameter straight duct length before the VAV inlet.

- 5 Additional manual volume control dampers (VCD's) before the inlet are not required / recommended!!
- 6 All connections shall be thermally isolated.
7. Pressure sensing tubes of Flo-Cross® airflow sensor shall not be "kinked" or otherwise obstructed by the external duct insulation.

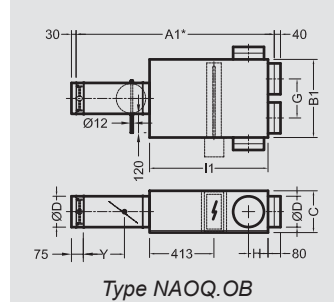
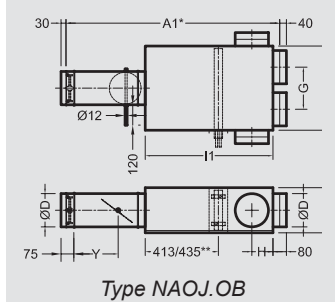
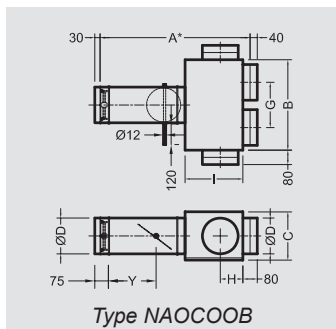
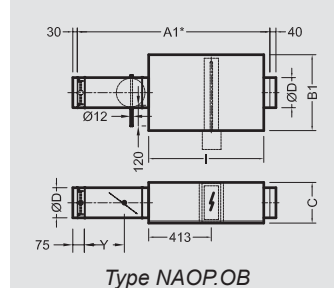
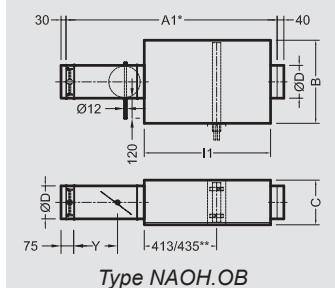
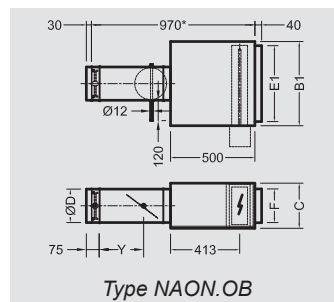
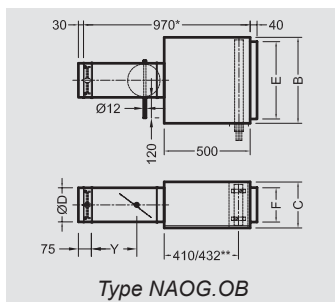
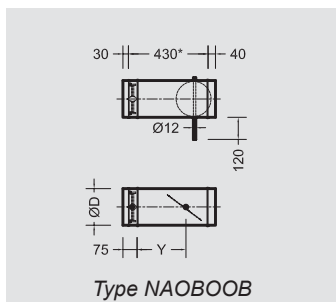
Installation of circular VAV terminals can be done in a similar way, with the only assumption that two circular support brackets with anti-vibration rubber (installation clamps) instead of DIN-rail or L-profile shall be used. To prevent the VAV terminal from rotation, we recommend to use a complete clamp (support + top bracket), so that the terminal is 'clammed' in between.

Optional 4 x Mupro fixing hooks can be used (see drawing).



# Circular VAV and CAV air volume control terminals

## Model overview Single wall - type NA.....



### Dimensions NA terminals

Model	100	125	160	200	250	315	355	400
A*	780	780	780	830	880	930	990	1030
A1*	1230	1230	1230	1280	1330	1380	1440	1480
B	330	330	400	500	600	740	820	910
B1	330	330	400	400	600	600	600	600
C	228	228	248	268	318	408	408	458
ØD	98	123	158	198	248	313	353	398
E	275	275	350	450	550	690	770	850
E1	275	275	350	350	550	550	550	550
F	170	170	175	200	250	330	330	380
G	180	180	215	255	305	370	410	455
H	125	125	125	125	175	200	250	250
I	270	270	270	320	370	420	520	520
I1	720	720	720	770	820	870	970	970
Y	310	310	310	300	285	260	245	235

Other dimensions are available upon request.

All dimensions in mm.

\* = Installed length.

\*\* = Size varies with a 1-/2-row or 4-row hot water reheat coil.

### Kv values

Model	100	125	160	200	250	315	355	400
Kv (l/s / Pa)	5,5	8,5	15,0	24,9	35,4	58,9	74,3	92,6

Flow = Kv x √ΔPfc

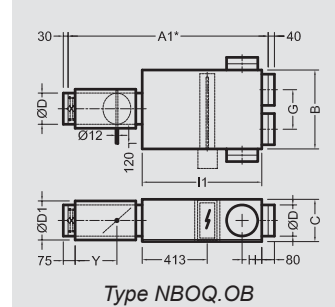
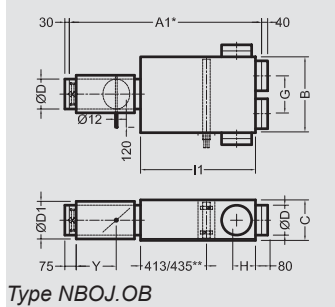
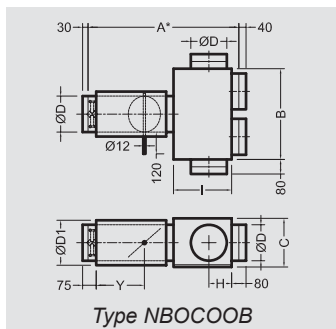
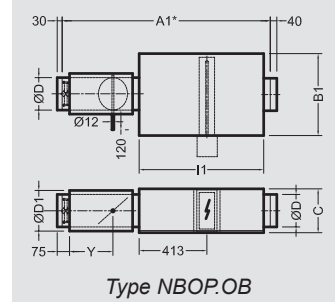
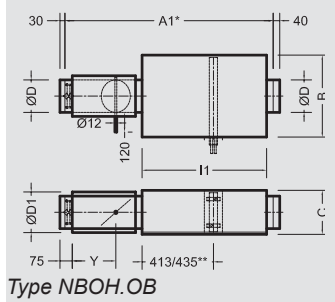
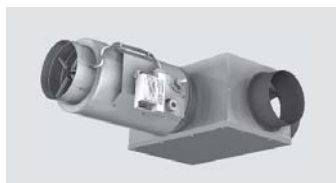
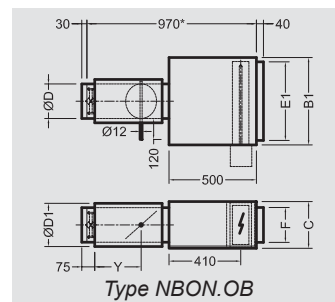
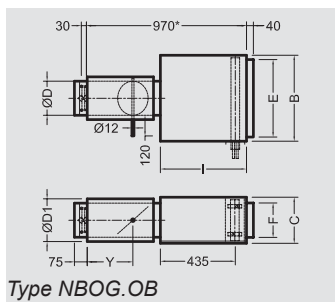
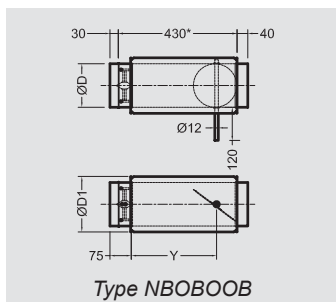
ΔPfc = Flo-Cross® signal

If ΔPfc = 30 Pa and VAV size = 160

Flow = 15,0 x √30 = 82 l/s

# Circular VAV and CAV air volume control terminals

# Model overview Double wall - type NB.....



### Dimensions NB terminals

Model	100	125	160	200	250	315	355	400
A*	780	780	780	830	880	930	990	1030
A1**	1230	1230	1230	1280	1330	1380	1440	1480
B	330	330	400	500	600	740	820	910
B1	330	330	400	400	600	600	600	600
C	228	228	248	268	318	408	408	458
ØD	98	123	158	198	248	313	353	398
ØD1	150	180	200	250	300	355	400	450
E	275	275	350	450	550	690	770	850
E1	275	275	350	350	550	550	550	550
F	170	170	175	200	250	330	330	380
G	180	180	215	255	305	370	410	455
H	125	125	125	125	175	200	250	250
I	270	270	270	320	370	420	520	520
I1	720	720	720	770	820	870	970	970
Y	310	310	310	300	285	260	245	235

Other dimensions are available upon request.

### Kv values

Model	100	125	160	200	250	315	355	400
Kv (l/s / Pa)	5,5	8,5	15,0	24,9	35,4	58,9	74,3	92,6

All dimensions in mm.

\* = Installed length.

\*\* = Size varies with a 1-2-row or 4-row hot water reheat coil.

$$\text{Flow} = K_v \times \sqrt{\Delta P_{fc}}$$

$\Delta P_{fc}$  = Flo-Cross® signal

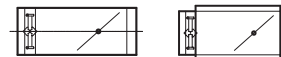
If  $\Delta P_{fc} = 30 \text{ Pa}$  and VAV size = 160

$$\text{Flow} = 15,0 \times \sqrt{30} = 82 \text{ l/s}$$



# Circular VAV and CAV air volume control terminals

Type **NAOBOOB**  
**NBOBOOB**



## Sound data $\Delta p = 125 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 125 \text{ Pa}$																											
						discharge sound						radiated sound single wall						radiated sound double wall															
	velocity		air volume			L <sub>w</sub> in dB/Oct. (re 1pW)						Lp values			L <sub>w</sub> in dB/Oct. (re 1pW)						Lp values			L <sub>w</sub> in dB/Oct. (re 1pW)						Lp values			
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	
	m/s	l/s	CFM	m <sup>3</sup> /h		Pa	dB									dB									dB								
100	2	15	31	53	2	43	44	40	38	34	22	--	--	--	19	-	19	20	23	21	--	--	--	-	-	-	-	-	-	--	--	--	
	4	29	62	106	8	49	50	46	44	40	29	24	--	20	26	23	26	27	30	28	--	--	--	22	-	-	-	-	-	--	--	--	
	6	44	94	160	17	53	54	51	48	44	34	28	22	24	30	27	30	31	34	32	--	--	--	26	20	-	-	-	18	--	--	--	
	8	59	125	213	30	57	58	54	52	49	39	31	26	28	33	30	33	34	37	35	--	--	--	29	23	19	19	19	21	--	--	--	
	10	74	156	266	47	59	61	58	55	52	43	34	29	31	35	32	35	36	39	37	--	--	--	32	26	22	21	21	23	--	--	--	
125	2	23	49	84	2	40	43	40	39	34	25	--	--	--	28	24	25	22	23	17	--	--	--	-	-	-	-	-	--	--	--		
	4	47	99	168	7	47	49	46	45	40	31	23	--	--	35	31	32	29	30	24	--	--	--	23	18	-	-	-	-	--	--	--	
	6	70	149	253	16	52	54	51	49	44	36	27	21	24	39	35	36	33	34	28	--	--	--	27	22	19	18	-	19	--	--	--	
	8	94	198	337	28	56	58	55	53	48	40	31	25	28	42	38	38	35	37	31	21	--	--	--	30	25	22	21	20	22	--	--	--
	10	117	248	421	44	59	61	58	56	51	44	34	29	31	44	40	41	38	39	33	23	--	--	--	33	28	25	23	22	24	--	--	--
160	2	39	82	139	2	39	41	40	38	37	32	--	--	--	28	24	25	22	23	18	--	--	--	18	-	-	-	-	-	--	--	--	
	4	78	164	279	7	47	48	46	44	41	36	22	--	--	35	31	32	29	30	25	--	--	--	25	20	19	-	-	-	--	--	--	
	6	116	246	418	15	52	52	50	49	44	39	26	--	22	39	35	36	33	34	29	--	--	--	29	24	23	20	18	20	--	--	--	
	8	155	328	558	26	56	56	54	52	48	42	30	24	26	42	38	38	35	37	31	21	--	--	--	32	27	26	23	21	23	--	--	--
	10	194	410	697	41	60	60	58	56	51	45	34	28	30	44	40	41	38	39	34	23	--	--	--	34	29	28	25	23	25	--	--	--
200	2	61	129	219	2	39	34	37	34	30	23	--	--	--	29	24	24	23	23	18	--	--	--	19	-	-	-	-	-	--	--	--	
	4	122	258	439	6	48	44	46	42	37	31	20	--	--	36	31	31	29	30	25	--	--	--	26	22	21	18	-	-	--	--	--	
	6	183	387	658	14	54	51	52	47	42	36	26	--	20	40	35	35	33	34	29	--	--	--	30	26	25	22	20	21	--	--	--	
	8	244	516	878	25	58	55	56	51	46	40	31	23	25	43	38	38	36	37	31	21	--	--	--	33	29	28	25	22	24	--	--	--
	10	305	645	1097	39	61	59	60	54	50	43	34	27	30	45	40	40	38	39	34	23	--	--	--	35	31	30	27	25	26	--	--	--
250	2	96	203	345	1	41	43	42	39	34	30	--	--	--	29	24	24	23	23	18	--	--	--	19	-	-	-	-	-	--	--	--	
	4	192	406	690	6	50	51	50	45	40	35	25	--	20	36	31	31	29	30	25	--	--	--	26	21	21	18	-	-	--	--	--	
	6	288	609	1035	13	56	56	55	50	44	39	30	23	26	40	35	35	33	34	29	--	--	--	30	25	25	22	20	21	--	--	--	
	8	383	812	1380	23	60	60	59	53	47	43	34	28	30	43	38	38	36	37	31	21	--	--	--	33	28	28	25	23	24	--	--	--
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315	2	153	324	550	1	42	45	41	41	38	33	--	--	--	30	24	24	23	23	19	--	--	--	21	18	18	-	-	-	--	--	--	
	4	306	648	1101	5	52	52	48	47	43	38	26	--	21	37	31	31	30	30	26	--	--	--	28	25	25	22	18	19	--	--	--	
	6	459	971	1651	12	58	57	54	52	48	42	31	24	27	41	35	35	34	34	30	--	--	--	32	29	29	26	22	23	--	--	--	
	8	612	1295	2202	22	63	61	58	56	52	46	35	29	31	44	38	38	36	37	32	21	--	--	--	35	32	32	29	25	26	--	--	--
	10	764	1619	2752	34	67	64	62	59	55	50	39	34	35	46	40	40	39	39	35	23	--	--	--	38	34	34	31	27	28	--	--	--
355	2	195	412	701	1	42	52	45	45	40	38	24	--	21	30	24	24	23	23	19	--	--	--	22	19	19	-	-	-	--	--	--	
	4	389	824	1401	5	53	56	51	50	43	42	29	24	26	37	31	31	30	30	26	--	--	--	29	26	26	23	18	20	--	--	--	
	6	584	1236	2102	12	59	60	56	54	46	45	33	28	30	41	35	35	34	34	30	--	--	--	33	30	30	27	23	24	--	--	--	
	8	779	1649	2803	21	64	63	60	57	50	48	37	32	33	44	38	38	37	37	33	21	--	--	--	36	33	33	30	25	27	--	--	--
	10	973	2061	3503	33	68	66	64	61	53	52	41	36	37	46	40	40	39	39	35	24	--	--	--	38	35	35	32	28	29	--	--	--
400	2	248	524	891	1	43	54	46	46	42	36	26	21	24	30	24	24	23	23	19	--	--	--	22	19	19	-	-	-	--	--	--	
	4	495	1049	1783	5	54	58	52	51	45	40	31	26	28	37	31	31	30	30	26	--	--	--	29	26	26	24	19	20	--	--	--	
	6	743	1573	2674	11	60	62	57	55	48	43	35	30	32	41	35	35	34	34	30	--	--	--	33	30	30	28	23	24	--	--	--	
	8	990	2097	3565	20	65	65	61	58	52	46	39	34	36	44	38	37	37	37	33	21	--	--	--	36	33	33	31	26	27	--	--	--
	10	1238	2621	4456	32	69	68	65	62	55	50	42	37	39	46	40	40	39	39	35	23	--	--	--	39	36	36	33	28	29	--	--	--

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2. L<sub>w</sub> in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
3. The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
4. The radiated sound pressure levels are determined

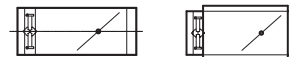
- with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
5. Lp values are including a room absorption of 10 dB/Oct.
6. dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

# Circular VAV and CAV air volume control terminals

Type **NAOBOOB**  
**NBOBOOB**



## Sound data $\Delta p = 250 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 250 \text{ Pa}$																											
						discharge sound						radiated sound single wall						radiated sound double wall															
	air volume					L <sub>w</sub> in dB/Oct. (re 1pW)						Lp values			L <sub>w</sub> in dB/Oct. (re 1pW)						Lp values			L <sub>w</sub> in dB/Oct. (re 1pW)						Lp values			
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	
velocity	air volume			Pa	dB									dB									dB										
m/s	l/s	CFM	m <sup>3</sup> /h																														
100	2	15	31	53	2	45	48	45	43	40	29	21	--	--	26	23	26	27	30	28	--	--	--	21	-	-	-	-	-	--	--	--	
	4	29	62	106	8	51	53	51	48	45	35	27	20	23	33	30	33	34	37	35	--	--	--	28	22	18	-	-	18	--	--	--	
	6	44	94	160	17	55	57	54	52	49	40	31	25	27	37	34	37	38	41	39	21	--	--	32	26	22	20	20	22	--	--	--	
	8	59	125	213	30	58	60	57	55	53	44	34	28	31	40	37	40	41	44	42	24	--	22	35	29	25	23	23	25	--	--	--	
	10	74	156	266	47	60	63	60	57	56	47	36	32	33	42	39	42	43	46	44	26	22	24	38	32	28	25	25	27	--	--	--	
125	2	23	49	84	2	43	47	46	43	40	33	20	--	--	35	31	31	28	30	24	--	--	--	22	17	-	-	-	--	--	--		
	4	47	99	168	7	50	53	51	49	45	38	26	20	23	41	38	38	35	37	31	20	--	--	29	24	21	18	-	19	--	--	--	
	6	70	149	253	16	54	57	55	53	48	41	30	25	27	45	42	42	39	41	35	24	--	--	33	28	25	22	21	23	--	--	--	
	8	94	198	337	28	58	60	58	56	51	45	34	29	31	48	45	45	42	44	38	27	--	22	36	31	28	25	24	26	--	--	--	
	10	117	248	421	44	61	63	61	58	54	48	37	32	34	50	47	47	44	46	40	29	22	24	39	34	31	27	26	28	--	--	--	
160	2	39	82	139	2	42	47	46	44	43	40	20	--	--	35	31	31	28	30	24	--	--	--	24	19	18	-	-	-	--	--	--	
	4	78	164	279	7	50	53	52	50	47	43	26	20	23	41	38	38	35	37	31	20	--	--	31	26	25	20	18	20	--	--	--	
	6	116	246	418	15	55	57	55	54	50	46	31	24	27	45	42	42	39	41	35	24	--	--	35	30	29	24	22	24	--	--	--	
	8	155	328	558	26	59	60	59	57	53	48	34	28	30	48	45	45	42	44	38	27	--	22	38	33	32	27	25	27	--	--	--	
	10	194	410	697	41	62	63	61	59	55	50	37	32	33	50	47	47	44	46	40	29	22	24	40	35	34	29	27	29	--	--	--	
200	2	61	129	219	2	43	38	41	39	36	30	--	--	--	36	31	31	29	30	24	--	--	--	25	21	20	-	-	-	--	--	--	
	4	122	258	439	6	52	49	50	47	43	37	24	--	--	43	38	38	36	37	31	21	--	--	32	28	27	22	19	21	--	--	--	
	6	183	387	658	14	57	55	56	51	47	42	30	22	24	47	42	42	40	41	35	25	--	--	36	32	31	26	23	25	--	--	--	
	8	244	516	878	25	61	59	60	55	51	45	34	27	29	50	45	45	43	44	38	28	--	22	39	35	34	29	26	28	--	--	--	
	10	305	645	1097	39	64	63	63	58	54	48	38	31	33	52	47	47	45	46	40	30	22	24	41	37	36	31	29	30	--	--	--	
250	2	96	203	345	1	44	47	46	44	41	37	21	--	--	36	31	31	29	30	24	--	--	--	25	20	20	-	-	-	--	--	--	
	4	192	406	690	6	53	55	54	50	46	42	29	23	25	43	38	38	36	37	31	21	--	--	32	27	27	22	20	21	--	--	--	
	6	288	609	1035	13	59	60	59	54	50	46	34	28	31	47	42	42	40	41	35	25	--	--	36	31	31	26	24	25	--	--	--	
	8	383	812	1380	23	63	64	62	57	53	48	38	33	35	50	45	45	43	44	38	28	--	22	39	34	34	29	27	28	--	--	--	
	10	479	1015	1725	36	66	67	65	60	55	51	41	36	38	52	47	47	45	46	40	30	22	24	41	37	37	31	29	30	--	--	--	
315	2	153	324	550	1	45	50	45	46	45	40	23	--	20	37	31	31	29	30	25	--	--	--	27	24	24	19	-	-	--	--	--	
	4	306	648	1101	5	54	56	52	52	50	44	30	24	26	43	37	38	36	36	32	21	--	--	34	31	31	26	22	23	--	--	--	
	6	459	971	1651	12	60	60	57	56	53	48	34	28	31	47	41	42	40	40	36	25	--	--	38	35	35	30	26	27	--	--	--	
	8	612	1295	2202	22	65	64	61	59	56	51	38	33	34	50	44	44	43	43	39	27	--	21	41	38	38	33	29	30	--	--	--	
	10	764	1619	2752	34	69	67	64	62	59	54	41	36	37	52	46	47	45	45	41	30	21	23	44	40	40	35	31	32	22	--	--	
355	2	195	412	701	1	45	57	50	51	47	47	29	24	27	37	31	31	30	30	26	--	--	--	28	25	25	20	-	-	--	--	--	
	4	389	824	1401	5	55	61	56	55	50	49	33	29	31	44	38	38	37	37	33	21	--	--	35	32	32	27	22	24	--	--	--	
	6	584	1236	2102	12	61	64	60	58	52	51	37	32	34	48	42	42	41	41	37	25	--	--	39	36	36	31	26	28	--	--	--	
	8	779	1649	2803	21	66	66	63	61	55	54	40	35	37	50	45	45	44	44	40	28	--	22	42	39	39	34	29	31	20	--	--	--
	10	973	2061	3503	33	70	69	66	64	57	56	43	38	39	53	47	47	46	46	42	30	22	24	44	41	41	36	32	33	23	--	--	--
400	2	248	524	891	1	46	59	51	52	49	45	31	27	29	37	31	30	30	30	26	--	--	--	28	25	25	21	-	17	--	--	--	
	4	495	1049	1783	5	56	63	57	56	52	47	35	31	33	44	37	37	37	36	33	21	--	--	35	32	32	28	23	24	--	--	--	
	6	743	1573	2674	11	62	66	61	59	54	49	39	35	36	48	41	41	41	40	37	25	--	--	39	36	36	32	27	28	--	--	--	
	8	990	2097	3565	20	67	68	64	62	57	52	42	38	39	50	44	44	43	43	39	27	--	21	42	39	39	35	30	31	21	--	--	--
	10	1238	2621	4456	32	71	71	67	65	59	54	45	41	42	53	46	46	46	45	42	30	21	23	45	42	42	37	32	33	23	--	--	--

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2. L<sub>w</sub> in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
3. The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
4. The radiated sound pressure levels are determined

- with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
5. Lp values are including a room absorption of 10 dB/Oct.
6. dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. For non standard applications and/or selections, please contact our technical staff.

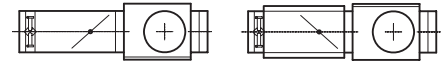
Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20



# Circular VAV and CAV air volume control terminals

Type **NAOCO**  
**NBOCO**



## Sound data $\Delta p = 250 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 250 \text{ Pa}$																													
						discharge sound								radiated sound single wall								radiated sound double wall													
	air volume					L <sub>w</sub> in dB/Oct. (re 1pW)				Lp values			L <sub>w</sub> in dB/Oct. (re 1pW)				Lp values			L <sub>w</sub> in dB/Oct. (re 1pW)				Lp values											
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR			
velocity	air volume			Pa	dB								dB								dB														
m/s	l/s	CFM	m <sup>3</sup> /h	dB								dB								dB															
100	2	15	31	53	2	36	36	27	23	18	-	-	-	26	23	26	27	30	28	-	-	-	21	-	-	-	-	-	-	-	-	-	-	-	-
	4	29	62	106	10	42	41	33	28	23	-	-	-	33	30	33	34	37	35	-	-	-	28	22	18	-	-	18	-	-	-	-	-	-	
	6	44	94	160	22	46	45	36	32	27	-	-	-	37	34	37	38	41	39	21	-	-	32	26	22	20	20	22	-	-	-	-	-	-	
	8	59	125	213	38	49	48	39	35	31	20	22	-	-	40	37	40	41	44	42	24	-	22	35	29	25	23	23	25	-	-	-	-	-	-
	10	74	156	266	60	51	51	42	37	34	23	25	-	-	42	39	42	43	46	44	26	22	24	38	32	28	25	25	27	-	-	-	-	-	-
125	2	23	49	84	2	34	35	28	23	18	-	-	-	35	31	31	28	30	24	-	-	-	22	17	-	-	-	-	-	-	-	-	-	-	
	4	47	99	168	7	41	41	33	29	23	-	-	-	41	38	38	35	37	31	-	-	-	29	24	21	18	-	19	-	-	-	-	-	-	
	6	70	149	253	17	45	45	37	33	26	17	-	-	45	42	42	39	41	35	24	-	-	33	28	25	22	21	23	-	-	-	-	-	-	
	8	94	198	337	30	49	48	40	36	29	21	22	-	-	48	45	45	42	44	38	27	-	22	36	31	28	25	24	26	-	-	-	-	-	-
	10	117	248	421	46	52	51	43	38	32	24	25	-	-	50	47	47	44	46	40	29	22	24	39	34	31	27	26	28	-	-	-	-	-	-
160	2	39	82	139	2	33	35	28	24	21	-	-	-	35	31	31	28	30	24	-	-	-	24	19	18	-	-	-	-	-	-	-	-	-	
	4	78	164	279	6	41	41	34	30	25	19	-	-	41	38	38	35	37	31	-	-	-	31	26	25	20	18	20	-	-	-	-	-	-	
	6	116	246	418	14	46	45	37	34	28	22	-	-	45	42	42	39	41	35	24	-	-	35	30	29	24	22	24	-	-	-	-	-	-	
	8	155	328	558	26	50	48	41	37	31	24	22	-	-	48	45	45	42	44	38	27	-	22	38	33	32	27	25	27	-	-	-	-	-	-
	10	194	410	697	40	53	51	43	39	33	26	25	-	-	51	47	47	44	46	40	29	22	24	40	35	34	29	27	29	-	-	-	-	-	-
200	2	61	129	219	1	34	26	23	19	-	-	-	-	36	31	31	29	30	24	-	-	-	25	21	20	-	-	-	-	-	-	-	-	-	
	4	122	258	439	6	43	37	32	27	21	-	-	-	43	38	38	36	37	31	21	-	-	32	28	27	22	19	21	-	-	-	-	-	-	
	6	183	387	658	13	48	43	38	31	25	18	-	-	47	42	42	40	41	35	25	-	-	36	32	31	26	23	25	-	-	-	-	-	-	
	8	244	516	878	23	52	47	42	35	29	21	23	-	-	50	45	45	43	44	38	28	-	22	39	35	34	29	26	28	-	-	-	-	-	-
	10	305	645	1097	36	55	51	45	38	32	24	27	-	-	52	47	47	45	46	40	30	22	24	41	37	36	31	29	30	-	-	-	-	-	-
250	2	96	203	345	1	35	35	28	24	19	-	-	-	36	31	31	29	30	24	-	-	-	25	20	20	-	-	-	-	-	-	-	-	-	
	4	192	406	690	5	44	43	36	30	24	18	-	-	43	38	38	36	37	31	21	-	-	32	27	27	22	20	21	-	-	-	-	-	-	
	6	288	609	1035	11	50	48	41	34	28	22	22	-	-	47	42	42	40	41	35	25	-	-	36	31	31	26	24	25	-	-	-	-	-	-
	8	383	812	1380	19	54	52	44	37	31	24	26	-	-	50	45	45	43	44	38	28	-	22	39	34	34	29	27	28	-	-	-	-	-	-
	10	479	1015	1725	30	57	55	47	40	33	27	29	22	25	52	47	47	45	46	40	30	22	24	41	37	37	31	29	30	-	-	-	-	-	-
315	2	153	324	550	1	39	42	27	26	23	-	-	-	37	31	31	29	30	25	-	-	-	27	24	24	19	-	-	-	-	-	-	-	-	
	4	306	648	1101	5	48	48	34	32	28	20	22	-	-	43	37	38	36	36	32	21	-	-	34	31	31	26	22	23	-	-	-	-	-	-
	6	459	971	1651	11	54	52	39	36	31	24	27	-	-	47	41	42	40	40	36	25	-	-	38	35	35	30	26	27	-	-	-	-	-	-
	8	612	1295	2202	19	59	56	43	39	34	27	31	23	26	50	44	44	43	43	39	27	-	21	41	38	38	33	29	30	-	-	-	-	-	-
	10	764	1619	2752	29	63	59	46	42	37	30	34	28	29	52	46	47	45	45	41	30	21	23	44	40	40	35	31	32	22	-	-	-	-	-
355	2	195	412	701	1	39	49	32	31	25	23	21	-	-	37	31	31	30	30	26	-	-	-	28	25	20	-	-	-	-	-	-	-	-	
	4	389	824	1401	4	49	53	38	35	28	25	25	20	23	44	38	38	37	37	33	21	-	-	35	32	32	27	22	24	-	-	-	-	-	-
	6	584	1236	2102	10	55	56	42	38	30	27	29	23	26	48	42	42	41	41	37	25	-	-	39	36	36	31	26	28	-	-	-	-	-	-
	8	779	1649	2803	18	60	58	45	41	33	30	32	26	28	50	45	45	44	44	40	28	-	22	42	39	39	34	29	31	20	-	-	-	-	-
	10	973	2061	3503	28	64	61	48	44	35	32	35	30	31	53	47	47	46	46	42	30	22	24	44	41	41	36	32	33	23	-	-	-	-	-
400	2	248	524	891	1	40	51	33	32	27	21	23	-	-	37	31	30	30	30	26	-	-	-	28	25	25	21	-	17	-	-	-	-	-	
	4	495	1049	1783	4	50	55	39	36	30	23	27	22	25	44	37	37	37	36	33	21	-	-	35	32	32	28	23	24	-	-	-	-	-	-
	6	743	1573	2674	9	56	58	43	39	32	25	31	25	28	48	41	41	41	40	37	25	-	-	39	36	36	32	27	28	-	-	-	-	-	-
	8	990	2097	3565	17	61	60	46	42	35	28	34	28	31	50	44	44	43	43	39	27	-	21	42	39	39	35	30	31	21	-	-	-	-	-
	10	1238	2621	4456	26	65	63	49	45	37	30	37	31	33	53	46	46	46	45	42	30	21	23	45	42	42	37	32	33	23	-	-	-	-	-

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2. L<sub>w</sub> in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "-".
3. The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
4. The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
5. Lp values are including a room absorption of 10 dB/Oct.

6. dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "-".
7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Insertion Loss

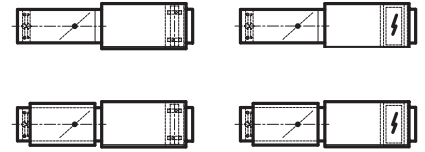
Model	125	250	500	1k	2k	4k	Hz
100	9	10	11	13	15	15	dB
125	8	9	10	12	14	14	dB
160	8	9	10	12	14	14	dB
200	7	8	9	11	13	13	dB
250	7	8	9	11	13	13	dB
315	7	8	9	11	13	13	dB
355	7	8	9	11	13	13	dB
400	7	8	9	11	13	13	dB





# Circular VAV and CAV air volume control terminals

Type *NAOG.OB NAON.OB*  
*NBOG.OB NBON.OB*



## Sound data $\Delta p = 250 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 250 \text{ Pa}$																											
						discharge sound						radiated sound single wall						radiated sound double wall															
	velocity		air volume			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values			
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB									dB									dB										
100	2	15	31	53	3	40	41	34	31	28	-	--	--	--	26	23	26	27	30	28	--	--	--	21	-	-	-	-	-	--	--	--	
	4	29	62	106	11	46	46	39	36	33	21	20	--	--	33	30	33	34	37	35	--	--	--	28	22	18	-	-	18	--	--	--	
	6	44	94	160	24	50	50	42	39	37	25	23	--	--	37	34	37	38	41	39	21	--	--	32	26	22	20	20	22	--	--	--	
	8	59	125	213	43	52	53	45	42	40	29	26	--	22	40	37	40	41	44	42	24	--	22	35	29	25	23	23	25	--	--	--	
	10	74	156	266	67	54	55	47	44	43	32	28	22	25	42	39	42	43	46	44	26	22	24	38	32	28	25	25	27	--	--	--	
125	2	23	49	84	3	38	40	34	32	28	19	--	--	--	35	31	31	28	30	24	--	--	--	22	17	-	-	-	--	--	--		
	4	47	99	168	10	45	46	39	37	33	24	--	--	--	41	38	38	35	37	31	20	--	--	29	24	21	18	-	19	--	--	--	
	6	70	149	253	23	49	50	43	40	36	27	23	--	--	45	42	42	39	41	35	24	--	--	33	28	25	22	21	23	--	--	--	
	8	94	198	337	40	52	53	46	43	39	30	26	--	22	48	45	45	42	44	38	27	--	22	36	31	28	25	24	26	--	--	--	
	10	117	248	421	63	55	55	48	45	41	33	29	23	25	50	47	47	44	46	40	29	22	24	39	34	31	27	26	28	--	--	--	
160	2	39	82	139	2	38	40	34	32	32	26	--	--	--	35	31	31	28	30	24	--	--	--	24	19	18	-	-	-	--	--	--	
	4	78	164	279	9	45	46	40	38	35	29	--	--	--	41	38	38	35	37	31	20	--	--	31	26	25	20	18	20	--	--	--	
	6	116	246	418	21	50	49	43	41	38	31	23	--	--	45	42	42	39	41	35	24	--	--	35	30	29	24	22	24	--	--	--	
	8	155	328	558	38	53	52	46	44	40	33	26	--	22	48	45	45	42	44	38	27	--	22	38	33	32	27	25	27	--	--	--	
	10	194	410	697	59	56	55	48	46	42	35	29	22	25	50	47	47	44	46	40	29	22	24	40	35	34	29	27	29	--	--	--	
200	2	61	129	219	2	39	32	29	27	24	-	--	--	--	36	31	31	29	30	24	--	--	--	25	21	20	-	-	-	--	--	--	
	4	122	258	439	9	47	41	38	35	31	23	--	--	--	43	38	38	36	37	31	21	--	--	32	28	27	22	19	21	--	--	--	
	6	183	387	658	21	52	47	43	39	35	27	23	--	--	47	42	42	40	41	35	25	--	--	36	32	31	26	23	25	--	--	--	
	8	244	516	878	38	55	51	47	42	38	30	27	--	21	50	45	45	43	44	38	28	--	22	39	35	34	29	26	28	--	--	--	
	10	305	645	1097	59	58	54	50	44	41	33	30	22	24	52	47	47	45	46	40	30	22	24	41	37	36	31	29	30	--	--	--	
250	2	96	203	345	2	40	41	34	32	29	23	--	--	--	36	31	31	29	30	24	--	--	--	25	20	20	-	-	-	--	--	--	
	4	192	406	690	9	48	48	42	38	34	28	--	--	--	43	38	38	36	37	31	21	--	--	32	27	27	22	20	21	--	--	--	
	6	288	609	1035	21	53	53	46	42	37	31	27	20	23	47	42	42	40	41	35	25	--	--	36	31	31	26	24	25	--	--	--	
	8	383	812	1380	38	57	56	49	45	40	34	30	23	26	50	45	45	43	44	38	28	--	22	39	34	34	29	27	28	--	--	--	
	10	479	1015	1725	59	60	59	52	47	42	36	33	27	29	52	47	47	45	46	40	30	22	24	41	37	37	31	29	30	--	--	--	
315	2	153	324	550	2	43	47	34	35	33	26	20	--	--	37	31	31	29	30	25	--	--	--	27	24	24	19	-	-	--	--	--	
	4	306	648	1101	9	52	53	40	40	37	30	26	20	23	43	37	38	36	36	32	21	--	--	34	31	31	26	22	23	--	--	--	
	6	459	971	1651	21	58	57	45	43	40	33	31	24	27	47	41	42	40	40	36	25	--	--	38	35	35	30	26	27	--	--	--	
	8	612	1295	2202	38	62	60	48	46	43	36	34	28	30	50	44	44	43	43	39	27	--	21	41	38	38	33	29	30	--	--	--	
	10	764	1619	2752	59	66	63	51	49	46	39	37	32	33	52	46	47	45	45	41	30	21	23	44	40	40	35	31	32	22	--	--	
355	2	195	412	701	2	43	54	38	39	35	33	26	21	24	37	31	31	30	30	26	--	--	--	28	25	25	20	-	-	--	--	--	
	4	389	824	1401	9	53	58	44	43	38	35	30	25	28	44	38	38	37	37	33	21	--	--	35	32	32	27	22	24	--	--	--	
	6	584	1236	2102	21	59	60	48	46	40	37	33	28	31	48	42	42	41	41	37	25	--	--	39	36	36	31	26	28	--	--	--	
	8	779	1649	2803	38	63	63	51	48	42	39	36	31	33	50	45	45	44	44	40	28	--	22	42	39	39	34	29	31	20	--	--	--
	10	973	2061	3503	59	67	65	53	51	44	41	39	34	35	53	47	47	46	46	42	30	22	24	44	41	41	36	32	33	23	--	--	--
400	2	248	524	891	2	44	56	39	40	37	31	28	24	26	37	31	30	30	30	26	--	--	--	28	25	25	21	-	17	--	--	--	
	4	495	1049	1783	9	54	60	45	44	40	33	32	28	30	44	37	37	37	36	33	21	--	--	35	32	32	28	23	24	--	--	--	
	6	743	1573	2674	21	60	62	49	47	42	35	35	31	33	48	41	41	41	40	37	25	--	--	39	36	36	32	27	28	--	--	--	
	8	990	2097	3565	38	64	65	52	49	44	37	38	33	35	50	44	44	43	43	39	27	--	21	42	39	39	35	30	31	21	--	--	--
	10	1238	2621	4456	59	68	67	54	52	46	39	41	36	37	53	46	46	46	45	42	30	21	23	45	42	42	37	32	33	23	--	--	--

- Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
- $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
- The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
- The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
- Lp values are including a room absorption of 10 dB/Oct.

- dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
- $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
- For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Insertion Loss

Model	125	250	500	1k	2k	4k	Hz
100	3	4	6	11	10	12	dB
125	3	4	6	11	10	12	dB
160	2	6	10	10	10	11	dB
200	2	5	10	10	10	11	dB
250	2	5	10	11	10	10	dB
315	1	4	9	10	10	10	dB
355	1	4	9	10	10	10	dB
400	1	3	8	10	10	10	dB







<b>Description</b>	<b>Page</b>
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# Rectangular VAV and CAV air volume control terminals

Type designation  
Single wall (NK.....)  
Double wall (NL.....)

## Composition type designation:

**N - L - O - D - O - O - B**

### **N** Position 1: **Product group**

N = air volume control terminals

### **K** Position 2: **Function**

O = not applicable  
K = single wall, rectangular VAV terminal, flanged type  
L = double wall, rectangular VAV terminal, flanged type  
1 = non standard, specify separately

### **O** Position 3: **Controls (manufacturer)**

O = without controls  
For controls, contact our sales staff

### **D** Position 4: **Outlet and sound attenuator**

O = not applicable  
A = rectangular outlet  
D = rectangular outlet with sound attenuator  
N = rectangular outlet with plenum for electric reheat coil  
R = rectangular outlet with sound attenuator and with plenum for electric reheat coil  
1 = non standard, specify separately

### **O** Position 5: **Reheat coil**

O = without reheat coil  
E = 1-stage 230VAC/1-phase electric reheat coil  
F = 2-stage 230VAC/1-phase electric reheat coil  
G = 3-stage 230VAC/1-phase electric reheat coil  
H = 1-stage 400VAC/3-phase electric reheat coil  
J = 2-stage 400VAC/3-phase electric reheat coil  
1 = non standard, specify separately

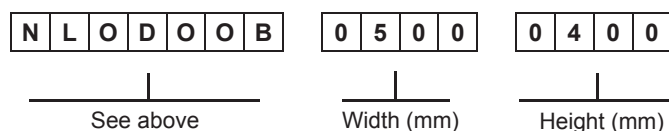
### **O** Position 6: **Controls (type & function)**

O = without controls  
R = return/extract application  
For controls, contact our sales staff

### **B** Position 7: **Sensor**

O = not applicable  
B = Flo-Cross®, 2 x 12 point averaging and signal amplifying air flow sensor (standard)  
1 = non standard, specify separately

### Ordering example:



### Ordering information:

#### Standard terminals:

- quantity of terminals
- complete 7 digit code
- terminal size or model
- air volume setting ( $V_{max}$ ,  $V_{min}$  etc)
- control handing (standard right side)
- if applicable, electric reheat coil capacity

#### Non standard terminals:

- for non standard terminals a full description and/or drawing are requested

# Rectangular VAV and CAV air volume control terminals

*Technical data*  
Single wall (NK.....)  
Double wall (NL.....)



## Application

Types NK and NL are rectangular pressure-independent VAV and CAV air volume control terminals.

The terminals are designed particularly for systems with larger air volumes and duct sizes and for the accurate measurement and control of air volumes courtesy of the patented airflow sensor type Flo-Cross®.

In CAV application, the terminals maintain the required constant airflow independent to the inlet static pressure.

In VAV application, the terminals control the air volume to the room, depending on the cooling load required thus saving energy consumption in both cooling and heating applications.

Alternatively VAV terminals are ideal to be used for CO<sub>2</sub> control. Dependent of the indoor air quality, always the correct amount of fresh air will be supplied to the room. Of course the primary air handling system need to be suitable for this.

The VAV or CAV terminals can be used either for supply or return air applications in new or refurbishment projects.

The terminals do have a single wall (type NK) or double wall (type NL) construction and can optionally be supplied with an additional sound attenuator and a plenum with built-in electric reheat coil.

### Features:

- Pressure independent control functions.
- Compact design.
- Volume control range 100% down to 10%.
- Low pressure loss over the terminal.
- Single or double wall construction.
- Factory fitted additional attenuator and/or plenum with built-in electric reheat coil.
- Multi-leaf damper blade; full shut-off optional.
- Low noise production.
- Suitable for large air volumes.
- Suitable for all control functions (VAV, CAV, shut-off, etc.) to maximise system energy savings.
- Flo-Cross® 2 x 12 points averaging and signal amplifying airflow sensor, better than 2,5% accuracy even with irregular duct approach.
- Maintenance free.

## Technical information

### Casing:

Single or double wall, air-tight construction made of galvanized sheet steel; casing leakage rate to Class II VDI 3803 / DIN 24 194. 30 mm flange connections at the in- and outlet. In case of double wall construction 25 mm insulation material is used, completely enclosed by the double wall construction.

### Insulation:

The terminal is supplied with 25 mm thermal and acoustical insulation (30 kg/m<sup>3</sup>) complying to: NFPA90A and 90B surface burning characteristics, BS476 part 6 and 7 fire propagation, UL 181 class 0 surface spread of flame and UL 94 HF1 flamability.

### Damper:

Damper blades: aluminium, aerofoil 50 mm opposed blade construction with external linkage.

Blades are optional provided with neoprene gasket for full shut-off function.

Damper shaft: steel, ø10 mm rotating in self lubricating Nylon bearings.

### Flo-Cross®:

Extruded aluminium construction with nylon core + feet.

### Sound attenuator:

Constructed from galvanized sheet steel, internal acoustic insulation tested to Class 'O' fire regulation, erosion proof up to 30 m/s. Special version insulation for hospital application on request.

### Reheat coil:

Choice of electric reheat coil 230VAC/1-phase or 400VAC/3-phase.

Coils are fitted in plenum made of galvanized sheet steel with 13 mm internal isolation, the fireflex S305 (30 kg/m<sup>3</sup>). More detailed technical information can be found in the separate NO documentation.

### Controls:

Suitable for use with pneumatic, analogue electronic or DDC controllers. Controls can be factory fitted, wired and calibrated. Controls enclosure (galvanized sheet steel) can be provided optionally.

## Delivery format

### Delivery format:

- The VAV or CAV terminal will be supplied as a single mounting assembly. Optional ordered distribution plenum, reheat coil and/or controls are factory fitted, wired and calibrated. The on site delivered terminal is ready to be installed and commissioned.
- Controls location and hot water or electric connections are as a standard fitted on the right hand side of the terminal when looking in the direction of the airflow.
- On request, the terminal can be delivered with connections on the left hand side.
- When terminals are ordered with controls, these will be factory fitted, wired and calibrated upon request.
- When terminals are ordered with 'free-issue' controls by others, wiring diagrams and mounting instructions must be provided.

# Rectangular VAV and CAV air volume control terminals

*Technical data*  
Single wall (NK.....)  
Double wall (NL.....)



## Specify as:

### Example:

Supply and install, variable air volume terminals, double-wall construction with sound attenuator with rectangular outlet, constructed from galvanized sheet steel. The casing leakage rate shall be classified according to class II, VDI 3803/DIN 24 194 and the duct-sleeve connections shall be 30 mm flange type. The VAV terminals shall have a multi-leaf opposed blade damper with steel damper shaft rotating in self lubricating Nylon bearings. A centre averaging airflow sensor with at least 2 x 12 test points and amplified signal air flow sensor, type Flo-Cross® shall control the airflow with an accuracy not less than 2.5 %. The VAV terminal shall be supplied with an additional sound attenuator made of galvanized sheet steel and internal isolation according to class '0' fire regulation.

The controller shall be I/A Series DDC controller:  
LON® compatible, type MNL-V2RVx  
or  
BACnet® compatible type MNB-V2.

Controls must be factory fitted, wired and calibrated according to the following requirements.

Maximum air volume 1280 l/s  
Minimum air volume 512 l/s  
Terminal size 400 x 400 mm  
Max. pressure loss 38 Pa  
Max. discharge sound index < NC35  
(@250Pa Δp)  
Max. radiated sound index < NC35  
(@250Pa Δp)

Ordering example: type – width – height+ =  
NL0DOOB – 0400 - 0400

Manufacturer: HC Barcol-Air

## Installation Instructions:

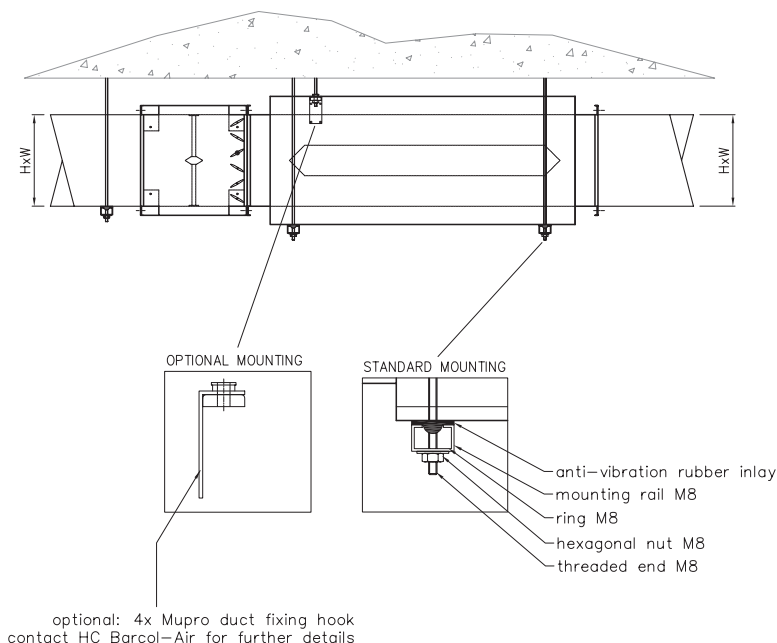
The HC Barcol-Air VAV terminals shall be installed using at least two support brackets (DIN-rail or L-profile), with anti-vibration rubber under the terminal. Each of these brackets shall be fixed with two threaded rods to the ceiling slab above.

This installation method:

- 1 Shall prevent the body of the VAV terminal from high mechanical tension, which could damage the construction and performance of the terminal.
- 2 Shall prevent torsion on the VAV terminals, which could cause malfunction of the damper blades.
- 3 Provides some flexibility to the final location of the VAV terminals.
- 4 Use at least 1x diagonal straight duct length before the VAV inlet.

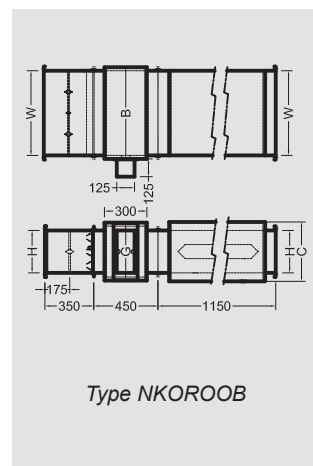
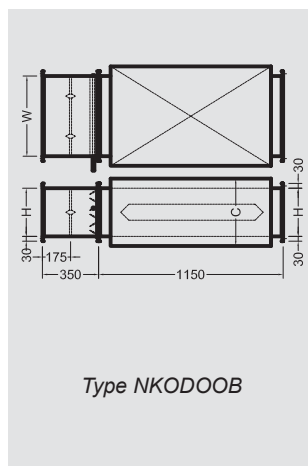
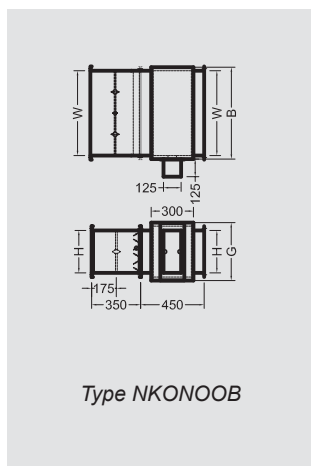
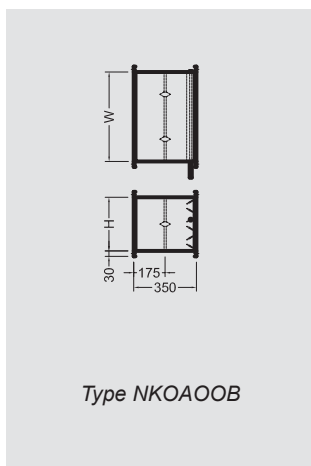
- 5 Additional manual volume control dampers (VCD's) before the inlet are not required / recommended!!
6. All connections shall be thermally isolated.
7. Pressure sensing tubes of Flo-Cross® airflow sensor shall not be "kinked" or otherwise obstructed by the external duct insulation.

Optional 4 x Mupro fixing hooks can be used (see drawing).



# Rectangular VAV and CAV air volume control terminals

## Model overview Single wall - type NK.....



### Dimensions NK/NL

height C	G	H	B width W	250	300	350	400	450	500	550	600	650	700	750
				200	250	300	350	400	450	500	600	700	750	800
300	250	200		•	•	•	•	•	•	•	•	•	•	•
370	300	250			•	•	•	•	•	•	•	•	•	•
450	350	300				•	•	•	•	•	•	•	•	•
520	400	350					•	•	•	•	•	•	•	•
600	450	400						•	•	•	•	•	•	•
735	500	450							•	•	•	•	•	•
765	550	500								•	•	•	•	•
850	650	600									•	•	•	•

All dimensions in mm.  
Other dimensions are available upon request.

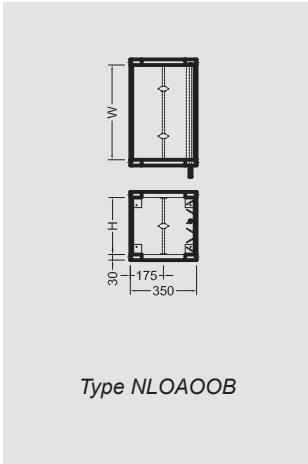
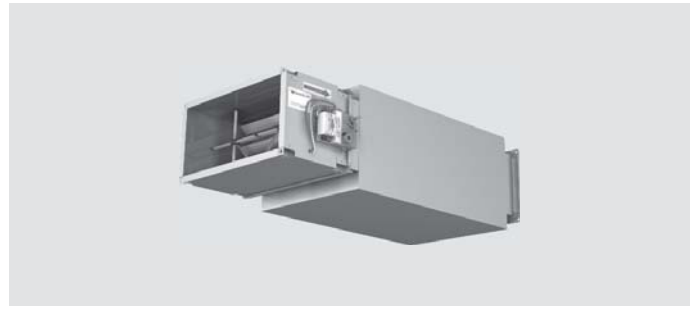
### Kv values

Height (H)	Width (W)												
	200	250	300	350	400	450	500	600	700	750	800	900	1000
150	25	31	36	43	51	54	61	72					
200	34	44	51	60	68	78	88	103	122	132	137		
250		49	60	72	88	100	98	121	156	146	158	181	195
300			72	85	99	113	121	143	171	185	198	215	243
350				97	113	129	143	171	195	211	227	256	288
400					126	144	162	198	227	245	251	287	324
450						164	185	226	259	279	287	329	371
500							208	241	291	314	324	371	417
600								287	342	369	397	454	510

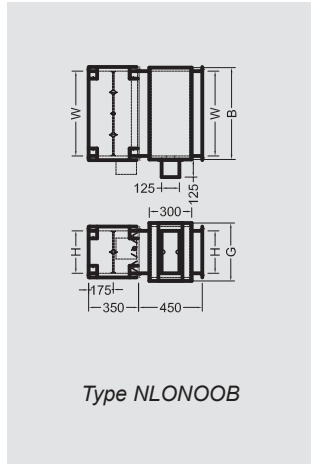
Flow = Kv x √ΔPfc  
 ΔPfc = Flo-Cross® signal  
 If ΔPfc = 30 Pa and VAV size = 500 x 350  
 Flow = 143 x √30 = 783 l/s

# Rectangular VAV and CAV air volume control terminals

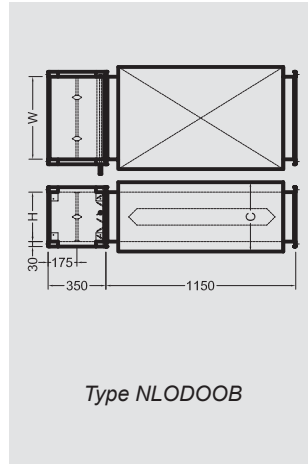
## Model overview Double wall - type NL.....



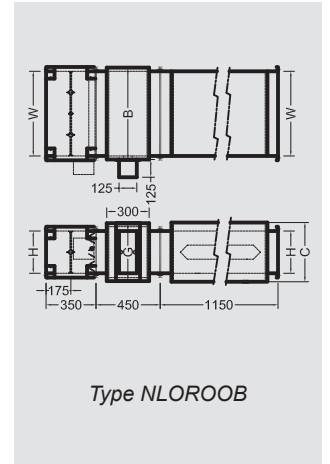
Type NLOAOOB



Type NLONOOB



Type NLODOOB



Type NLOROOB

For dimensions and Kv values see page 20.

# Rectangular VAV and CAV air volume control terminals

Type NK0A00B  
NLOA00B



## Sound data $\Delta p = 125 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 125 \text{ Pa}$																										
						discharge sound						radiated sound single wall						radiated sound double wall														
	air volume					$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
velocity	air volume			dB																												
m/s	l/s	CFM	m <sup>3</sup> /h	Pa																												
350 x 300 (DN 355)	2	210	445	756	1	47	48	43	27	30	22	21	--	--	33	32	26	-	-	-	--	--	--	29	28	22	-	-	-	--	--	--
	4	420	889	1512	6	57	60	56	45	44	37	33	28	30	43	44	39	31	28	29	23	--	--	39	40	35	27	24	23	--	--	--
	6	630	1334	2268	13	59	62	58	49	48	41	35	31	33	45	46	41	35	32	33	25	--	21	41	42	37	31	28	27	21	--	--
	8	840	1779	3024	23	58	61	55	47	47	41	33	29	31	44	45	38	33	31	33	23	--	--	40	41	34	29	27	27	--	--	--
	10	1050	2224	3780	35	60	60	54	47	49	42	34	29	31	46	44	37	33	33	34	23	--	--	42	40	33	29	29	28	--	--	--
350 x 350 (DN 400)	2	245	519	882	1	48	48	43	28	30	23	22	--	--	34	32	26	-	-	-	--	--	--	30	28	22	-	-	-	--	--	--
	4	490	1038	1764	6	58	61	57	46	45	38	34	29	31	44	45	40	32	29	30	23	--	--	40	41	36	28	25	24	--	--	--
	6	735	1556	2646	13	60	63	59	49	48	42	36	31	33	46	47	42	35	32	34	25	--	21	42	43	38	31	28	28	21	--	--
	8	980	2075	3528	23	58	61	56	48	47	41	34	30	32	44	45	39	34	31	33	24	--	--	40	41	35	30	27	27	--	--	--
	10	1225	2594	4410	35	61	61	55	48	50	43	34	29	31	47	45	38	34	34	35	24	--	--	43	41	34	30	30	29	20	--	--
400 x 400 (DN 450)	2	320	678	1152	1	49	50	44	29	31	24	23	--	--	35	34	27	-	-	-	--	--	--	31	30	23	-	-	-	--	--	--
	4	640	1355	2304	6	59	62	58	47	46	39	35	30	32	45	46	41	33	30	31	25	--	20	41	42	37	29	26	25	21	--	--
	6	960	2033	3456	13	61	64	60	51	50	43	37	33	35	47	48	43	37	34	35	27	--	23	43	44	39	33	30	29	23	--	--
	8	1280	2711	4608	23	60	63	57	49	49	43	35	31	33	46	47	40	35	33	35	25	--	21	42	43	36	31	29	29	21	--	--
	10	1600	3388	5760	35	62	62	56	49	51	44	36	31	33	48	46	39	35	35	36	25	--	21	44	42	35	31	31	30	21	--	--
500 x 400 (DN 500) ( $L_{pA(0,2)}$ )	2	400	847	1440	1	49	50	45	30	32	25	23	--	--	35	34	28	-	-	-	--	--	--	31	30	24	-	-	-	--	--	--
	4	800	1694	2880	6	59	62	59	48	47	40	35	30	32	45	46	42	34	31	32	25	--	20	41	42	38	30	27	26	21	--	--
	6	1200	2541	4320	13	61	64	60	52	50	44	37	33	35	47	48	43	38	34	36	27	--	23	43	44	39	34	30	30	23	--	--
	8	1600	3388	5760	23	60	63	57	50	50	44	35	31	33	46	47	40	36	34	36	25	--	21	42	43	36	32	30	30	21	--	--
	10	2000	4235	7200	35	62	62	57	50	52	45	36	31	33	48	46	40	36	36	37	25	--	21	44	42	36	32	32	31	21	--	--
600 x 400 (DN 560)	2	480	1016	1728	1	49	50	45	31	33	26	23	--	--	35	34	28	-	-	-	--	--	--	31	30	24	-	-	-	--	--	--
	4	960	2033	3456	6	59	62	59	49	48	41	35	30	32	45	46	42	35	32	33	25	--	20	41	42	38	31	28	27	21	--	--
	6	1440	3049	5184	13	61	64	60	52	51	45	37	33	35	47	48	43	38	35	37	27	--	23	43	44	39	34	31	31	23	--	--
	8	1920	4066	6912	23	60	63	58	51	50	44	35	31	33	46	47	41	37	34	36	25	--	21	42	43	37	33	30	30	21	--	--
	10	2400	5082	8640	35	62	62	57	51	53	46	36	31	33	48	46	40	37	37	38	26	--	21	44	42	36	33	33	32	21	--	--
800 x 400 (DN 630)	2	640	1355	2304	1	49	50	46	32	34	27	23	--	--	35	34	29	18	18	19	--	--	--	31	30	25	-	-	-	--	--	--
	4	1280	2711	4608	6	59	62	59	50	49	42	35	30	32	45	46	42	36	33	34	25	--	20	41	42	38	32	29	28	21	--	--
	6	1920	4066	6912	13	61	64	61	54	53	46	37	33	35	47	48	44	40	37	38	27	--	23	43	44	40	36	33	32	23	--	--
	8	2560	5421	9216	23	60	63	58	52	52	46	35	31	33	46	47	41	38	36	38	25	--	21	42	43	37	34	32	32	21	--	--
	10	3200	6776	11520	35	62	62	57	52	54	47	36	31	33	48	46	40	38	38	39	26	--	21	44	42	36	34	34	33	22	--	--
900 x 450 (DN 710)	2	810	1715	2916	1	49	50	46	33	35	28	23	--	--	35	34	29	19	19	20	--	--	--	31	30	25	-	-	-	--	--	--
	4	1620	3431	5832	6	59	62	60	51	50	43	35	30	32	45	46	43	37	34	35	25	--	20	41	42	39	33	30	29	21	--	--
	6	2430	5146	8748	13	61	64	61	55	54	47	37	33	35	47	48	44	41	38	39	27	--	23	43	44	40	37	34	33	23	--	--
	8	3240	6861	11664	23	60	63	59	53	53	47	35	31	33	46	47	42	39	37	39	26	--	21	42	43	38	35	33	33	22	--	--
	10	4050	8576	14580	35	62	62	58	53	55	48	36	31	33	48	46	41	39	39	40	26	--	21	44	42	37	35	35	34	22	--	--

- Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
- $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "-".
- The discharge sound pressure levels are determined with the assumptions as referred to in table 1 for downstream ductwork including a diffuser with insulated plenum box.
- The radiated sound pressure levels are determined with the assumptions as referred to in table 1 for

- ceiling plenum and suspended ceiling absorption.
- $L_p$  values are including a room absorption of 10 dB/Oct.
- dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "-".
- $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
- Sound data indicated by "X" are not provided as minimum required static pressure drop is more than the given pressure drop.
- For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1000	2000	4000
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Correction table for other unit sizes:  $L_{pA}' = L_{pA(0,2)} + \Delta L_{pA}$

$W \times H$ (m <sup>2</sup> )	0,03	0,04	0,05	0,06	0,07	0,08	0,10	0,12	0,14	0,16	0,18	0,20	0,25	0,30	0,40	0,50	0,60
$\Delta L_{pA}$ (dB)	-7	-6	-5	-4	-4	-3	-2	-1	-1	-1	0	0	0	1	1	1	2

# Rectangular VAV and CAV air volume control terminals

Type NK0A00B  
NLOA00B



## Sound data $\Delta p = 250 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 250 \text{ Pa}$																										
						discharge sound									radiated sound single wall									radiated sound double wall								
	air volume					$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
velocity	air volume			dB																												
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB																											
350 x 300 (DN 355)	2	210	445	756	1	49	50	46	31	32	25	24	--	--	35	34	29	-	-	-	--	--	--	31	30	25	-	-	-	--	--	--
	4	420	889	1512	6	59	62	59	49	47	39	35	31	33	45	46	42	35	31	31	25	--	21	41	42	38	31	27	25	21	--	--
	6	630	1334	2268	13	66	70	68	60	56	49	43	40	41	52	54	51	46	40	41	33	27	29	48	50	47	42	36	35	29	23	25
	8	840	1779	3024	23	67	71	69	62	58	51	44	41	42	53	55	52	48	42	43	34	28	31	49	51	48	44	38	37	30	24	26
	10	1050	2224	3780	35	66	70	67	61	58	51	43	40	41	52	54	50	47	42	43	33	27	29	48	50	46	43	38	37	29	22	25
350 x 350 (DN 400)	2	245	519	882	1	50	51	47	32	33	25	24	--	21	36	35	30	18	17	17	--	--	--	32	31	26	-	-	-	--	--	--
	4	490	1038	1764	6	60	63	60	49	48	40	36	32	33	46	47	43	35	32	32	26	--	22	42	43	39	31	28	26	22	--	--
	6	735	1556	2646	13	67	71	69	61	57	50	44	41	42	53	55	52	47	41	42	34	28	30	49	51	48	43	37	36	30	23	26
	8	980	2075	3528	23	68	72	70	63	59	52	45	42	43	54	56	53	49	43	44	35	29	31	50	52	49	45	39	38	31	25	27
	10	1225	2594	4410	35	67	71	68	61	58	52	44	41	42	53	55	51	47	42	44	34	28	30	49	51	47	43	38	38	30	23	26
400 x 400 (DN 450)	2	320	678	1152	1	51	52	48	33	34	26	25	--	22	37	36	31	19	18	18	--	--	--	33	32	27	-	-	-	--	--	--
	4	640	1355	2304	6	61	64	61	50	49	41	37	33	35	47	48	44	36	33	33	27	--	23	43	44	40	32	29	27	23	--	--
	6	960	2033	3456	13	68	72	70	62	58	51	45	42	43	54	56	53	48	42	43	35	29	31	50	52	49	44	38	37	31	25	27
	8	1280	2711	4608	23	69	73	71	64	60	53	46	44	44	55	57	54	50	44	45	36	31	33	51	53	50	46	40	39	32	26	28
	10	1600	3388	5760	35	68	72	69	63	59	53	45	42	43	54	56	52	49	43	45	35	29	31	50	52	48	45	39	39	31	25	27
500 x 400 (DN 500) ( $L_{pA(0,2)}$ )	2	400	847	1440	1	51	52	48	34	35	27	25	--	22	37	36	31	20	19	19	--	--	--	33	32	27	-	-	-	--	--	--
	4	800	1694	2880	6	61	64	61	51	50	42	37	33	35	47	48	44	37	34	34	27	--	23	43	44	40	33	30	28	23	--	--
	6	1200	2541	4320	13	68	72	71	63	59	52	45	42	43	54	56	54	49	43	44	36	29	31	50	52	50	45	39	38	31	25	27
	8	1600	3388	5760	23	69	73	71	65	61	54	46	44	44	55	57	54	51	45	46	36	31	33	51	53	50	47	41	40	32	26	28
	10	2000	4235	7200	35	68	72	69	64	60	54	45	42	43	54	56	52	50	44	46	35	29	31	50	52	48	46	40	40	31	25	27
600 x 400 (DN 560)	2	480	1016	1728	1	51	52	49	35	36	28	25	--	22	37	36	32	21	20	20	--	--	--	33	32	28	-	-	-	--	--	--
	4	960	2033	3456	6	61	64	62	52	50	43	37	33	35	47	48	45	38	34	35	27	--	23	43	44	41	34	30	29	23	--	--
	6	1440	3049	5184	13	68	72	71	64	60	53	45	42	43	54	56	54	50	44	45	36	29	31	50	52	50	46	40	39	32	25	27
	8	1920	4066	6912	23	69	73	71	66	62	55	46	44	44	55	57	54	52	46	47	37	31	33	51	53	50	48	42	41	33	26	28
	10	2400	5082	8640	35	68	72	69	64	61	55	45	42	43	54	56	52	50	45	47	35	29	31	50	52	48	46	41	41	31	25	27
800 x 400 (DN 630)	2	640	1355	2304	1	51	52	49	36	37	29	26	--	22	37	36	32	22	21	21	--	--	--	33	32	28	18	17	-	--	--	--
	4	1280	2711	4608	6	61	64	62	53	52	44	37	33	35	47	48	45	39	36	36	28	--	23	43	44	41	35	32	30	23	--	--
	6	1920	4066	6912	13	68	72	71	65	61	54	45	42	43	54	56	54	51	45	46	36	29	31	50	52	50	47	41	40	32	25	27
	8	2560	5421	9216	23	69	73	72	67	63	56	46	44	44	55	57	55	53	47	48	37	31	33	51	53	51	49	43	42	33	26	28
	10	3200	6776	11520	35	68	72	70	66	62	56	45	42	43	54	56	53	52	46	48	36	29	31	50	52	49	48	42	42	32	25	27
900 x 450 (DN 710)	2	810	1715	2916	1	51	52	49	37	38	30	26	--	22	37	36	32	23	22	22	--	--	--	33	32	28	19	18	-	--	--	--
	4	1620	3431	5832	6	61	64	63	54	53	45	37	33	35	47	48	46	40	37	37	28	--	23	43	44	42	36	33	31	24	--	--
	6	2430	5146	8748	13	68	72	72	66	62	55	45	42	43	54	56	55	52	46	47	36	29	31	50	52	51	48	42	41	32	25	27
	8	3240	6861	11664	23	69	73	72	68	64	57	46	44	44	55	57	55	54	48	49	37	31	33	51	53	51	50	44	43	33	26	28
	10	4050	8576	14580	35	68	72	70	67	64	57	45	42	43	54	56	53	53	48	49	36	29	31	50	52	49	49	44	43	32	25	27

- Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
- $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
- The discharge sound pressure levels are determined with the assumptions as referred to in table 1 for downstream ductwork including a diffuser with insulated plenum box.
- The radiated sound pressure levels are determined with the assumptions as referred to in table 1 for

- ceiling plenum and suspended ceiling absorption.
- $L_p$  values are including a room absorption of 10 dB/Oct.
- $dB(A)$ ,  $NC$  and  $NR$  index figures are sound pressure levels. Figures less than 20 are indicated by "--".
- $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
- Sound data indicated by "X" are not provided as minimum required static pressure drop is more than the given pressure drop.
- For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1000	2000	4000
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Correction table for other unit sizes:  $L_{pA}' = L_{pA(0,2)} + \Delta L_{pA}$

$W \times H$ (m <sup>2</sup> )	0,03	0,04	0,05	0,06	0,07	0,08	0,10	0,12	0,14	0,16	0,18	0,20	0,25	0,30	0,40	0,50	0,60
$\Delta L_{pA}$ (dB)	-7	-6	-5	-4	-4	-3	-2	-1	-1	-1	0	0	0	1	1	1	2







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# Circular CAV air volume control terminals with system powered mechanical regulator

Type designation  
(NR . . . . .)

## Composition type designation:

**N - R - O - B - O - V - O**

### **N** Position 1: **Product group**

O = not applicable

### **R** Position 2: **Function**

O = not applicable  
R = circular CAV terminals with system powered mechanical regulator  
1 = non standard, specify separately

### **O** Position 3: **Control**

O = system powered, regulator (standard)  
1 = non standard, specify separately

### **B** Position 4: **Outlet**

O = not applicable  
B = circular outlet  
C = 4 circular outlets ('Octopus')  
G = rectangular outlet and provision for integral hot water reheat coil  
J = 4 circular outlets and provision for integral hot water reheat coil  
N = rectangular outlet and provision for integral electric reheat coil  
Q = 4 circular outlets and provision for integral electric reheat coil  
1 = non standard, specify separately

### **O** Position 5: **Reheat coil**

O = without reheat coil  
A = 1-row hot water reheat coil  
B = 2-row hot water reheat coil  
D = 4-row hot water reheat coil  
E = 1-stage 230VAC/1-phase electric reheat coil  
F = 2-stage 230VAC/1-phase electric reheat coil  
G = 3-stage 230VAC/1-phase electric reheat coil  
H = 1-stage 400VAC/3-phase electric reheat coil  
J = 2-stage 400VAC/3-phase electric reheat coil  
1 = non standard, specify separately

### **V** Position 6: **Controls (type & function)**

O = not applicable  
V = factory set with provision for on-site adjustment across the full volume scale  
1 = non standard, specify separately

### **O** Position 7: **Sensor**

O = system powered regulator (standard)  
1 = non standard, specify separately

### Ordering example:

N	R	O	B	O	V	O	0	2	0	0	Q	6	5	0
See above							Model				Air volume (m <sup>3</sup> /h)			

### Ordering codes "Specials"

N..1... - 3010 = 4 balancing dampers in 'Octopus' outlet  
N..1... - 3006 = 'Octopus' with 6 outlets instead of 4  
N..1... - 3016 = 'Octopus' with 6 outlets incl. balancing dampers  
N..1... - FL = Flange connection 30 mm for rectangular outlet

### Ordering information:

#### Standard terminals:

- quantity of terminals
- complete 7 digit code
- terminal size or model
- air volume setting ( $V_{max}$ ,  $V_{min}$  etc)
- control handing (standard right side)
- if applicable, electric reheat coil capacity
- supply or return air

#### Non standard terminals:

- for non standard terminals a full description and/or drawing are requested



### Application

NR series circular, constant volume terminals with system powered mechanical regulator are designed to keep a constant air flow, independent of the inlet static pressure without the use of a DDC CAV/VAV controller/actuator. These terminals save commissioning time on site and are suitable either for supply or return air in new or refurbishment projects.

#### Features:

- Pressure independent from 40 – 1000 Pa.
- Compact design.
- Low pressure loss over the terminal.
- Control accuracy  $\pm 10\%$  (in the recommended flow range).
- Temperature insensitive ( $-15^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$ ).
- Can be mounted in any position.
- Factory set, saves commissioning time on site.
- Provision for on-site adjustment across the full volume scale.
- Maintenance free.
- Factory fitted distribution plenum with built-in hot water or electric reheat coil.
- Low noise production.

### Technical information

#### Casing:

Terminal casing made of galvanized sheet steel (non spiral) with sleeve connection with rubber gasket. Casing leakage rate to Class II VDI 3803 or DIN 24 194. Duct-sleeve connections at the in- and outlet are suitable for DIN 24 145 or DIN 24 146 connections. In case of double wall construction 25 mm insulation material is used completely enclosed by the double wall construction.

#### Damper:

Damper blade: aluminium.  
Damper shaft: stainless steel with self lubricating Nylon bearings.

#### Distribution plenum:

Made of galvanized sheet steel with 13 mm internal isolation ( $30\text{ kg/m}^3$ ).  
Plenum with standard rectangular or multiple outlet (4 x circular) outlet construction.  
Optional single, double, triple or six circular outlets possible.  
Outlet spigots are made of flame retardant polymer and optionally can be provided with volume control dampers made of galvanized sheet steel.

#### Reheat coil:

Choice of 1-, 2- or 4-row hot water reheat coil or electric reheat coil (230VAC/1-phase or 400VAC/3-phase).  
More detailed technical information can be found in the separate NO documentation.

#### Controls:

- The factory setpoint is indicated on the terminal.

### Delivery format

#### Delivery format:

- When ordering, the required air volume must be indicated.

# Circular CAV air volume control terminals with system powered mechanical regulator

Technical data  
Type NR . . . . .



## Specify as:

### Example:

Supply and install, circular, pressure independent constant air volume terminals with system powered mechanical regulator; control accuracy  $\pm 10\%$  of  $V_{max}$ . The construction shall be galvanized sheet steel with a casing leakage rate classified according to class II, VDI 3803/ DIN 24 194.

The CAV terminals shall have an aluminium damper blade with stainless steel shaft rotating in self lubricating Nylon bearings.

Air volume 161 l/s  
Terminal size 200 mm  
Max. pressure loss 60 Pa  
Max. discharge sound index < NC35 (@250Pa  $\Delta p$ )  
Max. radiated sound index < NC28 (@250Pa  $\Delta p$ )

HC Barcol-Air control type "V", factory set with provision for on-site adjustment across the full volume scale.  
(HC Barcol-Air type NROBOVO).

Ordering example : type – model – airflow (m<sup>3</sup>/h) =  
NROBOVO - 0200 - Q580 (= 161 l/s)

Manufacturer: HC Barcol-Air

## Installation Instructions:

The HC Barcol-Air CAV terminals shall be installed using at least two support brackets (DIN-rail or L-profile), with anti-vibration rubber under the terminal. Each of these brackets shall be fixed with two threaded rods to the ceiling slab above.

This installation method:

- 1 Shall prevent the body of the CAV terminal from high mechanical tension, which could damage the construction and performance of the terminal.
- 2 Shall prevent torsion on the CAV terminals, which could cause malfunction of the damper blades.
- 3 Provides some flexibility to the final location of the CAV terminals.
- 4 Use at least 1x diagonal straight duct length before the CAV inlet.

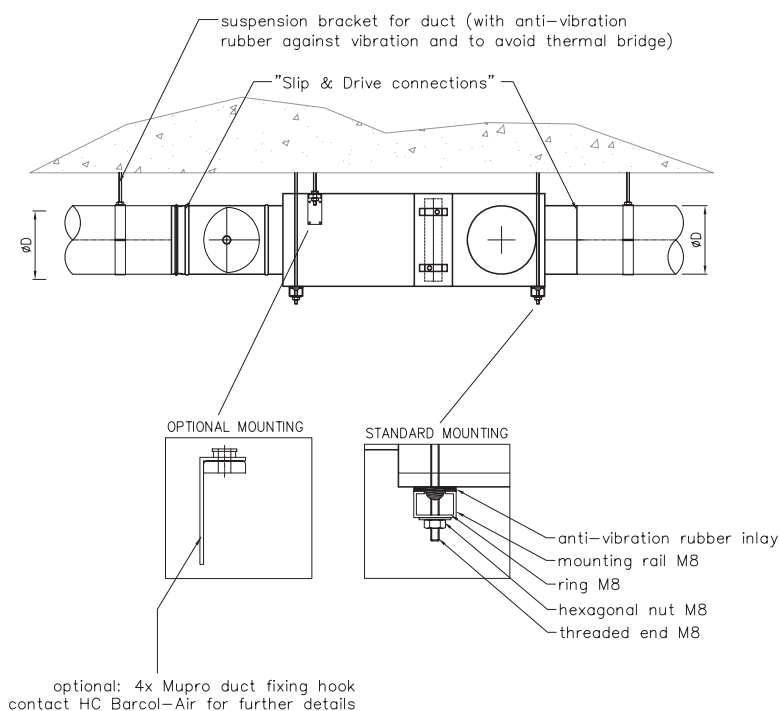
- 5 Additional manual volume control dampers (VCD's) before the inlet are not required / recommended!!
6. All connections shall be thermally isolated.

Installation of circular CAV terminals can be done in a similar way, with the only assumption that two circular support brackets with anti-vibration rubber (installation clamps) instead of DIN-rail or L-profile shall be used. To prevent the VAV terminal from rotation, we recommend to use a complete clamp (support + top bracket), so that the terminal is 'clammed' in between.

Optional 4 x Mupro fixing hooks can be used (see drawing).

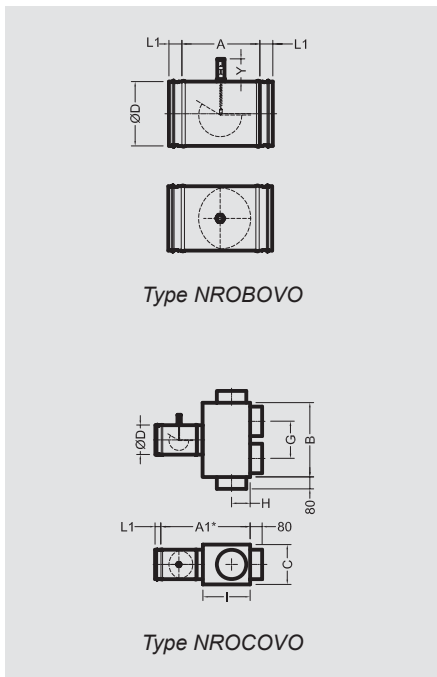
## Recommended air volume

Model Ø	m <sup>3</sup> /h		
	min	-	max
80	40	-	125
100	70	-	220
125	100	-	280
140	150	-	400
160	180	-	500
200	250	-	900
250	500	-	1500
315	800	-	2800
400	1000	-	4000



# Circular CAV air volume control terminals with system powered mechanical regulator

## Model overview (NR.....)



### Dimensions NR

Model	100	125	160	200	250	315	400
A	170	170	240	240	240	220	295
A1	520	520	590	640	690	720	895
A2	970	970	1040	1090	1140	1170	1345
A3	710	710	780	780	780	760	835
B	330	330	400	500	600	740	910
B1	330	330	400	400	600	600	600
C	228	228	248	268	318	408	458
ØD	98	123	158	198	248	313	398
E	275	275	350	450	550	690	850
E1	275	275	350	350	550	550	550
F	170	170	175	200	250	330	380
G	180	180	215	255	305	370	455
H	125	125	125	125	175	200	250
I	270	270	270	320	370	420	520
I1	720	720	720	770	820	870	970
I2	500	500	500	500	500	500	500
L1	40	40	40	40	40	60	60
Y	70	70	70	70	70	110	110

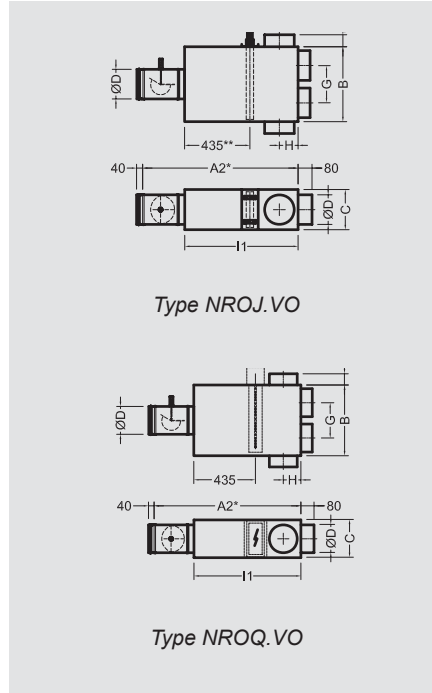
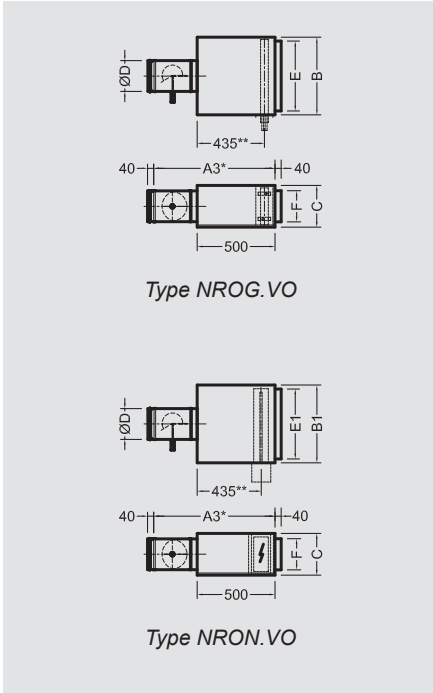
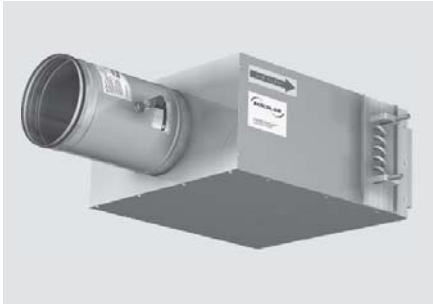
All dimensions in mm.

\* = Installed length.

\*\* = Size varies with a 1-/2-row or 4-row hot water reheat coil.

**Circular CAV air volume control terminals  
with system powered mechanical regulator**

*Model overview  
(NR.....)*



For dimensions see page 30.





**Sound data  $\Delta p = 125 \text{ Pa}$**

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 125 \text{ Pa}$																	
						discharge sound						radiated sound single wall											
	air volume					$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB									dB									
80	2.4	11	24	40	41	40	37	36	35	36	30	--	--	--	20	-	-	-	18	-	--	--	--
	4.0	19	39	67	47	48	44	42	40	40	33	--	--	--	28	20	18	21	22	-	--	--	--
	6.0	28	59	100	69	52	48	46	44	44	38	24	--	--	32	24	22	26	26	21	--	--	--
	7.5	35	74	125	98	54	50	48	47	47	41	26	--	20	34	26	25	28	29	24	--	--	--
100	2.6	19	41	70	41	44	41	38	37	35	30	--	--	--	26	17	-	19	18	-	--	--	--
	4.0	29	62	106	47	49	45	43	42	40	35	20	--	--	30	22	20	24	23	18	--	--	--
	6.0	44	94	160	70	53	49	47	46	45	40	25	--	--	34	26	24	29	28	23	--	--	--
	8.3	61	129	220	100	55	52	49	49	48	43	27	--	21	36	28	26	31	30	26	--	--	--
125	2.4	28	59	100	41	44	42	39	38	38	32	--	--	--	24	21	20	22	23	19	--	--	--
	4.0	47	99	168	47	51	47	44	42	41	35	23	--	--	31	26	25	26	26	22	--	--	--
	6.0	70	149	253	70	55	52	48	46	46	40	27	--	21	35	31	29	30	31	27	--	--	--
	6.7	78	165	280	81	56	53	49	47	47	41	28	--	22	36	32	30	31	32	28	--	--	--
140	2.8	42	88	150	42	48	44	41	38	37	32	--	--	--	30	27	28	27	25	19	--	--	--
	4.0	58	124	210	47	51	48	45	42	42	36	23	--	--	33	30	32	31	29	23	--	--	--
	6.0	89	188	320	70	56	52	50	47	47	41	27	--	22	38	35	36	36	34	28	--	--	--
	7.5	111	235	400	100	58	55	52	49	49	44	30	22	24	40	37	39	38	37	31	21	--	--
160	2.6	50	106	180	41	46	44	40	37	37	30	--	--	--	29	29	28	27	26	19	--	--	--
	4.0	78	164	279	47	51	49	45	43	42	35	23	--	--	34	34	33	33	31	24	--	--	--
	6.0	116	246	418	70	55	53	49	47	47	40	28	--	23	38	38	38	37	36	29	20	--	--
	7.2	139	294	500	92	57	55	51	49	49	43	29	22	25	40	40	40	39	38	32	22	--	--
200	2.3	69	147	250	41	46	43	41	41	40	34	--	--	--	29	30	30	32	29	24	--	--	--
	4.0	122	258	439	47	52	49	46	44	43	37	24	--	--	35	36	35	35	32	27	--	--	--
	6.0	183	387	658	70	56	53	50	49	48	42	28	21	23	39	40	39	40	37	32	22	--	--
	8.2	250	529	900	117	60	56	54	53	52	46	32	24	26	43	43	43	44	41	36	25	--	--
250	2.9	139	294	500	42	50	47	44	41	40	33	22	--	--	31	34	33	27	30	23	--	--	--
	4.0	192	406	690	47	53	51	48	45	44	37	26	--	20	35	38	37	31	34	27	--	--	--
	6.0	288	609	1035	70	58	55	52	50	49	42	30	22	25	39	42	42	36	39	32	23	--	--
	8.7	417	882	1500	132	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
315	2.9	222	471	800	41	51	48	44	41	40	33	23	--	--	34	32	29	29	28	24	--	--	--
	4.0	306	648	1101	47	55	52	48	45	44	37	26	--	21	37	36	33	33	32	28	--	--	--
	6.0	459	971	1651	70	59	56	52	50	49	43	31	23	26	41	40	38	37	37	33	21	--	--
	10.2	778	1647	2800	184	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
400	2.2	278	588	1000	43	50	47	45	44	43	36	22	--	--	35	32	31	32	33	27	--	--	--
	4.0	495	1049	1783	47	56	52	48	47	46	39	27	--	21	41	37	34	35	36	30	--	--	--
	6.0	743	1573	2674	70	60	56	53	52	51	44	32	25	27	45	42	39	40	41	35	24	--	--
	9.0	1111	2353	4000	141	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2.  $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
3. The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
4. The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.

5. Lp values are including a room absorption of 10 dB/Oct.
6. dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. Sound data indicated by "X" are not provided as minimum required static pressure drop is more than the given pressure drop.
9. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20



**Sound data  $\Delta p = 250 \text{ Pa}$**

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 250 \text{ Pa}$																	
						discharge sound						radiated sound single wall											
	air volume					$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB						dB												
80	2.4	11	24	40	41	47	44	43	42	43	37	--	--	--	26	20	19	23	25	20	--	--	--
	4.0	19	39	67	47	55	51	48	46	46	40	26	--	21	34	27	25	28	28	23	--	--	--
	6.0	28	59	100	69	59	55	52	51	51	45	30	23	25	38	31	29	32	33	28	--	--	--
	7.5	35	74	125	98	61	57	55	53	53	47	33	26	28	41	33	31	35	35	30	--	--	--
100	2.6	19	41	70	41	48	47	45	45	45	40	21	--	--	30	23	22	28	27	23	--	--	--
	4.0	29	62	106	47	55	52	49	48	47	41	27	--	21	37	28	26	31	30	25	--	--	--
	6.0	44	94	160	70	59	56	54	53	52	46	31	24	26	41	33	31	35	34	30	--	--	--
	8.3	61	129	220	100	61	58	56	55	54	49	34	27	28	43	35	33	38	37	33	--	--	--
125	2.4	28	59	100	41	50	48	45	44	45	39	23	--	--	31	27	26	28	29	26	--	--	--
	4.0	47	99	168	47	57	54	50	48	48	41	29	22	24	38	33	31	32	32	28	--	--	--
	6.0	70	149	253	70	62	58	55	53	53	46	33	27	28	42	37	36	37	37	33	20	--	--
	6.7	78	165	280	81	63	59	56	54	54	47	34	28	29	43	38	37	38	38	34	21	--	--
140	2.8	42	88	150	42	53	50	49	47	47	42	25	--	--	35	33	35	36	35	29	--	--	--
	4.0	58	124	210	47	58	54	52	49	48	42	30	22	24	40	37	38	38	36	29	20	--	--
	6.0	89	188	320	70	62	59	56	53	53	48	34	28	29	44	41	43	42	41	35	25	--	--
	7.5	111	235	400	100	64	61	59	56	56	50	36	30	32	46	44	45	45	43	37	27	--	21
160	2.6	50	106	180	41	52	51	48	47	47	41	25	--	--	34	36	36	37	36	30	--	--	--
	4.0	78	164	279	47	58	55	51	49	49	42	30	22	25	40	41	40	39	38	31	22	--	--
	6.0	116	246	418	70	62	60	56	54	54	47	34	27	30	44	45	44	44	43	36	27	--	21
	7.2	139	294	500	92	64	61	58	56	56	49	36	30	32	46	47	46	46	45	38	29	20	23
200	2.3	69	147	250	41	52	50	48	47	46	41	25	--	--	35	37	37	38	36	30	--	--	--
	4.0	122	258	439	47	59	55	52	51	50	44	31	23	25	42	42	41	42	39	33	24	--	--
	6.0	183	387	658	70	63	60	57	56	54	49	35	29	30	46	47	46	47	44	38	28	--	22
	8.2	250	529	900	117	66	63	60	59	58	53	38	33	34	49	50	49	50	48	42	32	23	26
250	2.9	139	294	500	42	56	54	52	51	50	44	29	21	24	37	41	42	36	40	34	23	--	--
	4.0	192	406	690	47	60	57	54	52	50	43	32	25	27	41	44	44	37	40	33	25	--	--
	6.0	288	609	1035	70	64	62	59	57	55	48	37	30	32	46	49	48	42	45	38	30	22	24
	8.7	417	882	1500	132	68	66	63	61	60	53	40	35	36	50	53	53	47	50	43	34	26	28
315	2.9	222	471	800	41	57	56	53	51	51	44	30	23	26	40	40	38	39	38	35	22	--	--
	4.0	306	648	1101	47	61	58	54	52	51	44	33	26	28	44	42	40	39	39	34	23	--	--
	6.0	459	971	1651	70	65	63	59	57	56	49	38	32	33	48	47	44	44	44	40	28	--	22
	10.2	778	1647	2800	184	71	69	65	63	62	56	43	39	39	53	53	50	50	50	46	34	26	28
400	2.2	278	588	1000	43	57	54	51	50	50	43	29	21	23	42	39	37	38	39	34	21	--	--
	4.0	495	1049	1783	47	62	58	55	54	53	46	34	28	29	47	44	41	42	42	37	26	--	20
	6.0	743	1573	2674	70	67	63	60	58	58	51	38	33	34	52	48	46	46	47	42	30	23	25
	9.0	1111	2353	4000	141	71	67	64	63	63	56	43	39	39	56	53	50	51	52	47	35	28	30

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2.  $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
3. The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
4. The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.

5. Lp values are including a room absorption of 10 dB/Oct.
6. dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. Sound data indicated by "X" are not provided as minimum required static pressure drop is more than the given pressure drop.
9. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20



**Sound data  $\Delta p = 125$  Pa**

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 125$ Pa																	
						discharge sound						radiated sound single wall											
	velocity		air volume			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB						dB												
80	2.4	11	24	40	41	40	37	36	35	36	30	--	--	--	20	-	-	-	18	-	--	--	--
	4.0	19	39	67	47	48	44	42	40	40	33	--	--	--	28	20	18	21	22	-	--	--	--
	6.0	28	59	100	69	52	48	46	44	44	38	24	--	--	32	24	22	26	26	21	--	--	--
	7.5	35	74	125	98	54	50	48	47	47	41	26	--	20	34	26	25	28	29	24	--	--	--
100	2.6	19	41	70	41	44	41	38	37	35	30	--	--	--	26	17	-	19	18	-	--	--	--
	4.0	29	62	106	47	49	45	43	42	40	35	20	--	--	30	22	20	24	23	18	--	--	--
	6.0	44	94	160	70	53	49	47	46	45	40	25	--	--	34	26	24	29	28	23	--	--	--
	8.3	61	129	220	100	55	52	49	49	48	43	27	--	21	36	28	26	31	30	26	--	--	--
125	2.4	28	59	100	41	44	42	39	38	38	32	--	--	--	24	21	20	22	23	19	--	--	--
	4.0	47	99	168	47	51	47	44	42	41	35	23	--	--	31	26	25	26	26	22	--	--	--
	6.0	70	149	253	70	55	52	48	46	46	40	27	--	21	35	31	29	30	31	27	--	--	--
	6.7	78	165	280	81	56	53	49	47	47	41	28	--	22	36	32	30	31	32	28	--	--	--
140	2.8	42	88	150	42	48	44	41	38	37	32	--	--	--	30	27	28	27	25	19	--	--	--
	4.0	58	124	210	47	51	48	45	42	42	36	23	--	--	33	30	32	31	29	23	--	--	--
	6.0	89	188	320	70	56	52	50	47	47	41	27	--	22	38	35	36	36	34	28	--	--	--
	7.5	111	235	400	100	58	55	52	49	49	44	30	22	24	40	37	39	38	37	31	21	--	--
160	2.6	50	106	180	41	46	44	40	37	37	30	--	--	--	29	29	28	27	26	19	--	--	--
	4.0	78	164	279	47	51	49	45	43	42	35	23	--	--	34	34	33	33	31	24	--	--	--
	6.0	116	246	418	70	55	53	49	47	47	40	28	--	23	38	38	38	37	36	29	20	--	--
	7.2	139	294	500	92	57	55	51	49	49	43	29	22	25	40	40	40	39	38	32	22	--	--
200	2.3	69	147	250	41	46	43	41	41	40	34	--	--	--	29	30	30	32	29	24	--	--	--
	4.0	122	258	439	47	52	49	46	44	43	37	24	--	--	35	36	35	35	32	27	--	--	--
	6.0	183	387	658	70	56	53	50	49	48	42	28	21	23	39	40	39	40	37	32	22	--	--
	8.2	250	529	900	117	60	56	54	53	52	46	32	24	26	43	43	43	44	41	36	25	--	--
250	2.9	139	294	500	42	50	47	44	41	40	33	22	--	--	31	34	33	27	30	23	--	--	--
	4.0	192	406	690	47	53	51	48	45	44	37	26	--	20	35	38	37	31	34	27	--	--	--
	6.0	288	609	1035	70	58	55	52	50	49	42	30	22	25	39	42	42	36	39	32	23	--	--
	8.7	417	882	1500	132	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
315	2.9	222	471	800	42	51	48	44	41	40	33	23	--	--	34	32	29	29	28	24	--	--	--
	4.0	306	648	1101	47	55	52	48	45	44	37	26	--	21	37	36	33	33	32	28	--	--	--
	6.0	459	971	1651	70	59	56	52	50	49	43	31	23	26	41	40	38	37	37	33	21	--	--
	10.2	778	1647	2800	184	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
400	2.2	278	588	1000	41	50	47	45	44	43	36	22	--	--	35	32	31	32	33	27	--	--	--
	4.0	495	1049	1783	47	56	52	48	47	46	39	27	--	21	41	37	34	35	36	30	--	--	--
	6.0	743	1573	2674	70	60	56	53	52	51	44	32	25	27	45	42	39	40	41	35	24	--	--
	9.0	1111	2353	4000	141	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2.  $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
3. The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
4. The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
5. Lp values are including a room absorption of 10 dB/Oct.
6. dB(A), NC and NR index figures are sound pressure

7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. Sound data indicated by "X" are not provided as minimum required static pressure drop is more than the given pressure drop.
9. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Insertion Loss

Model	125	250	500	1k	2k	4k	Hz
100	9	10	11	13	15	15	dB
125	8	9	10	12	14	14	dB
160	8	9	10	12	14	14	dB
200	7	8	9	11	13	13	dB
250	7	8	9	11	13	13	dB
315	7	8	9	11	13	13	dB
355	7	8	9	11	13	13	dB
400	7	8	9	11	13	13	dB



## Sound data $\Delta p = 250 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 250 \text{ Pa}$																													
						discharge sound						Lp values			radiated sound single wall						Lp values														
	velocity		air volume			$L_w$ in dB/Oct. (re 1pW)						dB(A)			NC			NR			$L_w$ in dB/Oct. (re 1pW)						dB(A)			NC			NR		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB												dB																		
80	2.4	11	24	40	41	47	44	43	42	43	37	--	--	--	26	20	19	23	25	20	--	--	--	26	20	19	23	25	20	--	--	--			
	4.0	19	39	67	47	55	51	48	46	46	40	26	--	21	34	27	25	28	28	23	--	--	--	34	27	25	28	28	23	--	--	--			
	6.0	28	59	100	69	59	55	52	51	51	45	30	23	25	38	31	29	32	33	28	--	--	--	38	31	29	32	33	28	--	--	--			
	7.5	35	74	125	98	61	57	55	53	53	47	33	26	28	41	33	31	35	35	30	--	--	--	41	33	31	35	35	30	--	--	--			
100	2.6	19	41	70	41	48	47	45	45	45	40	21	--	--	30	23	22	28	27	23	--	--	--	30	23	22	28	27	23	--	--	--			
	4.0	29	62	106	47	55	52	49	48	47	41	27	--	21	37	28	26	31	30	25	--	--	--	37	28	26	31	30	25	--	--	--			
	6.0	44	94	160	70	59	56	54	53	52	46	31	24	26	41	33	31	35	34	30	--	--	--	41	33	31	35	34	30	--	--	--			
	8.3	61	129	220	100	61	58	56	55	54	49	34	27	28	43	35	33	38	37	33	--	--	--	43	35	33	38	37	33	--	--	--			
125	2.4	28	59	100	41	50	48	45	44	45	39	23	--	--	31	27	26	28	29	26	--	--	--	31	27	26	28	29	26	--	--	--			
	4.0	47	99	168	47	57	54	50	48	48	41	29	22	24	38	33	31	32	32	28	--	--	--	38	33	31	32	32	28	--	--	--			
	6.0	70	149	253	70	62	58	55	53	53	46	33	27	28	42	37	36	37	37	33	20	--	--	42	37	36	37	37	33	20	--	--			
	6.7	78	165	280	81	63	59	56	54	54	47	34	28	29	43	38	37	38	38	34	21	--	--	43	38	37	38	38	34	21	--	--			
140	2.8	42	88	150	42	53	50	49	47	47	42	25	--	--	35	33	35	36	35	29	--	--	--	35	33	35	36	35	29	--	--	--			
	4.0	58	124	210	47	58	54	52	49	48	42	30	22	24	40	37	38	38	36	29	20	--	--	40	37	38	38	36	29	20	--	--			
	6.0	89	188	320	70	62	59	56	53	53	48	34	28	29	44	41	43	42	41	35	25	--	--	44	41	43	42	41	35	25	--	--			
	7.5	111	235	400	100	64	61	59	56	56	50	36	30	32	46	44	45	45	43	37	27	--	--	46	44	45	45	43	37	27	--	21			
160	2.6	50	106	180	41	52	51	48	47	47	41	25	--	--	34	36	36	37	36	30	--	--	--	34	36	36	37	36	30	--	--	--			
	4.0	78	164	279	47	58	55	51	49	49	42	30	22	25	40	41	40	39	38	31	22	--	--	40	41	40	39	38	31	22	--	--			
	6.0	116	246	418	70	62	60	56	54	54	47	34	27	30	44	45	44	44	43	36	27	--	--	44	45	44	44	43	36	27	--	21			
	7.2	139	294	500	92	64	61	58	56	56	49	36	30	32	46	47	46	46	45	38	29	20	--	--	46	47	46	46	45	38	29	20	23		
200	2.3	69	147	250	41	52	50	48	47	46	41	25	--	--	35	37	37	38	36	30	--	--	--	35	37	37	38	36	30	--	--	--			
	4.0	122	258	439	47	59	55	52	51	50	44	31	23	25	42	42	41	42	39	33	24	--	--	42	42	41	42	39	33	24	--	--			
	6.0	183	387	658	70	63	60	57	56	54	49	35	29	30	46	47	46	47	44	38	28	--	--	46	47	46	47	44	38	28	--	22			
	8.2	250	529	900	117	66	63	60	59	58	53	38	33	34	49	50	49	50	48	42	32	23	--	--	49	50	49	50	48	42	32	23	26		
250	2.9	139	294	500	42	56	54	52	51	50	44	29	21	24	37	41	42	36	40	34	23	--	--	37	41	42	36	40	34	23	--	--			
	4.0	192	406	690	47	60	57	54	52	50	43	32	25	27	41	44	44	37	40	33	25	--	--	41	44	44	37	40	33	25	--	--			
	6.0	288	609	1035	70	64	62	59	57	55	48	37	30	32	46	49	48	42	45	38	30	22	--	--	46	49	48	42	45	38	30	22	24		
	8.7	417	882	1500	132	68	66	63	61	60	53	40	35	36	50	53	53	47	50	43	34	26	--	--	50	53	53	47	50	43	34	26	28		
315	2.9	222	471	800	42	57	56	53	51	51	44	30	23	26	40	40	38	39	38	35	22	--	--	40	40	38	39	38	35	22	--	--			
	4.0	306	648	1101	47	61	58	54	52	51	44	33	26	28	44	42	40	39	39	34	23	--	--	44	42	40	39	39	34	23	--	--			
	6.0	459	971	1651	70	65	63	59	57	56	49	38	32	33	48	47	44	44	44	40	28	--	--	48	47	44	44	44	40	28	--	22			
	10.2	778	1647	2800	184	71	69	65	63	62	56	43	39	39	53	53	50	50	50	46	34	26	--	--	53	53	50	50	50	46	34	26	28		
400	2.2	278	588	1000	41	57	54	51	50	50	43	29	21	23	42	39	37	38	39	34	21	--	--	42	39	37	38	39	34	21	--	--			
	4.0	495	1049	1783	47	62	58	55	54	53	46	34	28	29	47	44	41	42	42	37	26	--	--	47	44	41	42	42	37	26	--	20			
	6.0	743	1573	2674	70	67	63	60	58	58	51	38	33	34	52	48	46	46	47	42	30	23	--	--	52	48	46	46	47	42	30	23	25		
	9.0	1111	2353	4000	141	71	67	64	63	63	56	43	39	39	56	53	50	51	52	47	35	28	--	--	56	53	50	51	52	47	35	28	30		

- Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
- $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
- The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
- The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
- Lp values are including a room absorption of 10 dB/Oct.
- dB(A), NC and NR index figures are sound pressure

- $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
- Sound data indicated by "X" are not provided as minimum required static pressure drop is more than the given pressure drop.
- For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Insertion Loss

Model	125	250	500	1k	2k	4k	Hz
100	9	10	11	13	15	15	dB
125	8	9	10	12	14	14	dB
160	8	9	10	12	14	14	dB
200	7	8	9	11	13	13	dB
250	7	8	9	11	13	13	dB
315	7	8	9	11	13	13	dB
355	7	8	9	11	13	13	dB
400	7	8	9	11	13	13	dB

# Circular CAV air volume control terminals with system powered mechanical regulator

Type NROG . VO  
NRON . VO



## Sound data $\Delta p = 125 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 125 \text{ Pa}$																	
						discharge sound						radiated sound single wall											
	velocity		air volume			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB									dB									
80	2.4	11	24	40	42	35	30	24	23	24	-	--	--	--	20	-	-	-	18	-	--	--	--
	4.0	19	39	67	51	43	36	29	27	27	19	--	--	--	28	20	18	21	22	-	--	--	--
	6.0	28	59	100	77	46	40	33	31	31	23	--	--	--	32	24	22	26	26	21	--	--	--
	7.5	35	74	125	110	48	42	35	33	33	25	--	--	--	34	26	25	28	29	24	--	--	--
100	2.6	19	41	70	42	39	33	26	25	23	-	--	--	--	26	17	-	19	18	-	--	--	--
	4.0	29	62	106	50	43	38	30	29	28	20	--	--	--	30	22	20	24	23	18	--	--	--
	6.0	44	94	160	77	47	41	34	33	32	25	--	--	--	34	26	24	29	28	23	--	--	--
	8.3	61	129	220	110	48	43	36	35	34	27	--	--	--	36	28	26	31	30	26	--	--	--
125	2.4	28	59	100	42	38	34	27	25	26	18	--	--	--	24	21	20	22	23	19	--	--	--
	4.0	47	99	168	50	45	40	31	29	29	20	--	--	--	31	26	25	26	26	22	--	--	--
	6.0	70	149	253	77	49	44	35	33	33	25	--	--	--	35	31	29	30	31	27	--	--	--
	6.7	78	165	280	90	50	45	36	34	34	26	21	--	--	36	32	30	31	32	28	--	--	--
140	2.8	42	88	150	43	42	37	29	26	25	17	--	--	--	30	27	28	27	25	19	--	--	--
	4.0	58	124	210	50	46	40	32	29	29	21	--	--	--	33	30	32	31	29	23	--	--	--
	6.0	89	188	320	78	50	44	37	34	34	26	20	--	--	38	35	36	36	34	28	--	--	--
	7.5	111	235	400	113	51	46	39	36	36	28	22	--	--	40	37	39	38	37	31	21	--	--
160	2.6	50	106	180	43	41	36	27	25	24	-	--	--	--	29	29	28	27	26	19	--	--	--
	4.0	78	164	279	51	46	41	32	30	30	21	--	--	--	34	34	33	33	31	24	--	--	--
	6.0	116	246	418	78	49	45	36	34	34	25	20	--	--	38	38	38	37	36	29	20	--	--
	7.2	139	294	500	104	51	46	38	36	36	27	22	--	--	40	40	40	39	38	32	22	--	--
200	2.3	69	147	250	42	40	36	29	28	27	20	--	--	--	29	30	30	32	29	24	--	--	--
	4.0	122	258	439	51	47	41	33	32	30	22	--	--	--	35	36	35	35	32	27	--	--	--
	6.0	183	387	658	78	50	45	37	36	35	27	21	--	--	39	40	39	40	37	32	22	--	--
	8.2	250	529	900	133	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
250	2.9	139	294	500	44	45	40	32	29	27	18	--	--	--	31	34	33	27	30	23	--	--	--
	4.0	192	406	690	51	48	43	35	33	31	22	--	--	--	35	38	37	31	34	27	--	--	--
	6.0	288	609	1035	78	52	47	39	37	36	27	23	--	--	39	42	42	36	39	32	23	--	--
	8.7	417	882	1500	150	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
315	2.9	222	471	800	44	49	45	31	29	28	19	--	--	--	34	32	29	29	28	24	--	--	--
	4.0	306	648	1101	51	52	48	35	33	32	23	23	--	--	37	36	33	33	32	28	--	--	--
	6.0	459	971	1651	79	56	52	39	37	36	28	27	--	22	41	40	38	37	37	33	21	--	--
	10.2	778	1647	2800	210	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
400	2.2	278	588	1000	42	48	44	32	31	31	22	21	--	--	35	32	31	32	33	27	--	--	--
	4.0	495	1049	1783	51	53	48	36	34	34	24	24	--	--	41	37	34	35	36	30	--	--	--
	6.0	743	1573	2674	79	57	52	40	39	38	29	28	21	23	45	42	39	40	41	35	24	--	--
	9.0	1111	2353	4000	161	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

- Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
- $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "-".
- The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
- The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
- Lp values are including a room absorption of 10 dB/Oct.
- dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
- $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
- Sound data indicated by "X" are not provided as minimum required static pressure drop is more than the given pressure drop.
- For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Insertion Loss

Model	125	250	500	1k	2k	4k	Hz
100	13	17	23	26	28	30	dB
125	12	15	22	25	27	29	dB
160	12	15	22	25	27	29	dB
200	11	15	21	24	26	28	dB
250	11	15	21	24	26	28	dB
315	8	11	21	24	26	26	dB
355	8	11	21	24	26	26	dB
400	8	11	21	24	26	26	dB

# Circular CAV air volume control terminals with system powered mechanical regulator

Type NROG . VO  
NRON . VO



## Sound data $\Delta p = 250 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 250 \text{ Pa}$																	
						discharge sound						radiated sound single wall											
	velocity		air volume			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB						dB												
80	2.4	11	24	40	42	42	37	31	30	31	23	--	--	--	26	20	19	23	25	20	--	--	--
	4.0	19	39	67	51	50	43	36	34	34	26	20	--	--	34	27	25	28	28	23	--	--	--
	6.0	28	59	100	77	53	47	40	38	38	30	24	--	--	38	31	29	32	33	28	--	--	--
	7.5	35	74	125	110	55	49	42	40	40	32	26	--	21	41	33	31	35	35	30	--	--	--
100	2.6	19	41	70	42	44	40	33	33	33	26	--	--	--	30	23	22	28	27	23	--	--	--
	4.0	29	62	106	50	50	45	37	36	35	27	21	--	--	37	28	26	31	30	25	--	--	--
	6.0	44	94	160	77	54	48	41	40	39	32	24	--	--	41	33	31	35	34	30	--	--	--
	8.3	61	129	220	110	55	50	43	42	41	34	26	--	21	43	35	33	38	37	33	--	--	--
125	2.4	28	59	100	42	45	41	34	33	33	25	--	--	--	31	27	26	28	29	26	--	--	--
	4.0	47	99	168	50	52	47	38	36	36	27	23	--	--	38	33	31	32	32	28	--	--	--
	6.0	70	149	253	77	56	51	42	40	40	32	27	--	22	42	37	36	37	37	33	20	--	--
	6.7	78	165	280	90	57	52	43	41	41	33	28	21	23	43	38	37	38	38	34	21	--	--
140	2.8	42	88	150	43	48	43	37	35	35	28	--	--	--	35	33	35	36	35	29	--	--	--
	4.0	58	124	210	50	53	47	39	36	36	28	23	--	--	40	37	38	38	36	29	20	--	--
	6.0	89	188	320	78	57	51	44	41	41	33	27	21	23	44	41	43	42	41	35	25	--	--
	7.5	111	235	400	113	58	53	46	43	43	35	29	23	25	46	44	45	45	43	37	27	--	21
160	2.6	50	106	180	43	47	44	36	35	35	27	--	--	--	34	36	36	37	36	30	--	--	--
	4.0	78	164	279	51	53	48	39	37	37	28	24	--	--	40	41	40	39	38	31	22	--	--
	6.0	116	246	418	78	56	52	43	41	41	32	27	20	22	44	45	44	44	43	36	27	--	21
	7.2	139	294	500	104	58	54	45	43	43	34	29	22	24	46	47	46	46	45	38	29	20	23
200	2.3	69	147	250	42	47	43	36	35	35	27	--	--	--	35	37	37	38	36	30	--	--	--
	4.0	122	258	439	51	54	48	40	39	37	30	24	--	--	42	42	41	42	39	33	24	--	--
	6.0	183	387	658	78	57	52	44	43	42	34	28	22	24	46	47	46	47	44	38	28	--	22
	8.2	250	529	900	133	60	55	47	46	45	38	31	25	27	49	50	49	50	48	42	32	23	26
250	2.9	139	294	500	44	51	47	40	39	38	30	22	--	--	37	41	42	36	40	34	23	--	--
	4.0	192	406	690	51	55	50	42	40	38	29	26	--	20	41	44	44	37	40	33	25	--	--
	6.0	288	609	1035	78	59	54	46	44	43	34	30	23	25	46	49	48	42	45	38	30	22	24
	8.7	417	882	1500	150	62	57	50	48	46	38	33	27	29	50	53	53	47	50	43	34	26	28
315	2.9	222	471	800	44	56	53	41	39	39	30	27	--	22	40	40	38	39	38	35	22	--	--
	4.0	306	648	1101	51	59	55	42	40	39	30	30	24	25	44	42	40	39	39	34	23	--	--
	6.0	459	971	1651	79	63	59	46	44	43	35	34	28	30	48	47	44	44	44	40	28	--	22
	10.2	778	1647	2800	210	67	64	51	49	49	40	39	34	35	53	53	50	50	50	46	34	26	28
400	2.2	278	588	1000	42	55	51	39	38	38	29	26	--	21	42	39	37	38	39	34	21	--	--
	4.0	495	1049	1783	51	60	55	43	41	41	31	31	25	27	47	44	41	42	42	37	26	--	20
	6.0	743	1573	2674	79	64	59	47	46	45	36	35	30	31	52	48	46	46	47	42	30	23	25
	9.0	1111	2353	4000	161	68	63	51	50	50	41	39	34	35	56	53	50	51	52	47	35	28	30

- Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
- $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
- The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
- The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
- Lp values are including a room absorption of 10 dB/Oct.
- dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
- $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
- Sound data indicated by "X" are not provided as minimum required static pressure drop is more than the given pressure drop.
- For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Insertion Loss

Model	125	250	500	1k	2k	4k	Hz
100	13	17	23	26	28	30	dB
125	12	15	22	25	27	29	dB
160	12	15	22	25	27	29	dB
200	11	15	21	24	26	28	dB
250	11	15	21	24	26	28	dB
315	8	11	21	24	26	26	dB
355	8	11	21	24	26	26	dB
400	8	11	21	24	26	26	dB



# Circular CAV air volume control terminals with system powered mechanical regulator

Type NROJ . VO  
NROQ . VO



## Sound data $\Delta p = 125 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 125 \text{ Pa}$																														
						discharge sound						radiated sound single wall																								
	velocity		air volume			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values															
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR													
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB									dB																						
80	2.4	11	24	40	42	29	23	-	-	-	-	-	-	-	20	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	4.0	19	39	67	51	37	29	21	17	-	-	-	-	-	28	20	18	21	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	6.0	28	59	100	77	40	33	25	21	19	-	-	-	-	32	24	22	26	26	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	7.5	35	74	125	110	42	35	27	23	21	-	-	-	-	34	26	25	28	29	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
100	2.6	19	41	70	42	33	26	18	-	-	-	-	-	-	26	17	-	19	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	4.0	29	62	106	50	37	31	22	19	-	-	-	-	-	30	22	20	24	23	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6.0	44	94	160	77	41	34	26	23	20	-	-	-	-	34	26	24	29	28	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	8.3	61	129	220	110	42	36	28	25	22	-	-	-	-	36	28	26	31	30	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
125	2.4	28	59	100	42	32	27	19	-	-	-	-	-	-	24	21	20	22	23	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4.0	47	99	168	50	39	33	23	19	-	-	-	-	-	31	26	25	26	26	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.0	70	149	253	77	43	37	27	23	21	-	-	-	-	35	31	29	30	31	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.7	78	165	280	90	44	38	28	24	22	-	-	-	-	36	32	30	31	32	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
140	2.8	42	88	150	43	36	30	21	-	-	-	-	-	-	30	27	28	27	25	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.0	58	124	210	50	40	33	24	19	-	-	-	-	-	33	30	32	31	29	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.0	89	188	320	78	44	37	29	24	22	-	-	-	-	38	35	36	36	34	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.5	111	235	400	113	45	39	31	26	24	-	-	-	-	40	37	39	38	37	31	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
160	2.6	50	106	180	43	35	29	19	-	-	-	-	-	-	29	29	28	27	26	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.0	78	164	279	51	40	34	24	20	18	-	-	-	-	34	34	33	33	31	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.0	116	246	418	78	43	38	28	24	22	-	-	-	-	38	38	38	37	36	29	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.2	139	294	500	104	45	39	30	26	24	-	-	-	-	40	40	40	39	38	32	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	2.3	69	147	250	42	34	29	21	18	-	-	-	-	-	29	30	30	32	29	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.0	122	258	439	51	41	34	25	22	18	-	-	-	-	35	36	35	35	32	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.0	183	387	658	78	44	38	29	26	23	-	-	-	-	39	40	39	40	37	32	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.2	250	529	900	133	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
250	2.9	139	294	500	44	39	33	24	19	-	-	-	-	-	31	34	33	27	30	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.0	192	406	690	51	42	36	27	23	19	-	-	-	-	35	38	37	31	34	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.0	288	609	1035	78	46	40	31	27	24	-	-	-	-	39	42	42	36	39	32	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.7	417	882	1500	150	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
315	2.9	222	471	800	44	43	38	23	19	-	-	-	-	-	34	32	29	29	28	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.0	306	648	1101	51	46	41	27	23	20	-	-	-	-	37	36	33	33	32	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.0	459	971	1651	79	50	45	31	27	24	-	-	-	-	41	40	38	37	37	33	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.2	778	1647	2800	210	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
400	2.2	278	588	1000	42	42	37	24	21	19	-	-	-	-	35	32	31	32	33	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.0	495	1049	1783	51	47	41	28	24	22	-	-	-	-	41	37	34	35	36	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.0	743	1573	2674	79	51	45	32	29	26	17	22	-	-	45	42	39	40	41	35	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.0	1111	2353	4000	161	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2.  $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "-".
3. The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
4. The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
5. Lp values are including a room absorption of 10 dB/Oct.
6. dB(A), NC and NR index figures are sound pressure

7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. Sound data indicated by "X" are not provided as minimum required static pressure drop is more than the given pressure drop.
9. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
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Model	125	250	500	1k	2k	4k	Hz
100	13	17	23	26	28	30	dB
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200	11	15	21	24	26	28	dB
250	11	15	21	24	26	28	dB
315	8	11	21	24	26	26	dB
355	8	11	21	24	26	26	dB
400	8	11	21	24	26	26	dB

# Circular CAV air volume control terminals with system powered mechanical regulator

Type NROJ . VO  
NROQ . VO



## Sound data $\Delta p = 250 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 250 \text{ Pa}$																	
						discharge sound						radiated sound single wall											
	velocity		air volume			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB						dB												
80	2.4	11	24	40	42	36	30	23	20	19	-	-	-	-	26	20	19	23	25	20	-	-	-
	4.0	19	39	67	51	44	36	28	24	22	-	-	-	-	34	27	25	28	28	23	-	-	-
	6.0	28	59	100	77	47	40	32	28	26	18	-	-	-	38	31	29	32	33	28	-	-	-
	7.5	35	74	125	110	49	42	34	30	28	20	-	-	-	41	33	31	35	35	30	-	-	-
100	2.6	19	41	70	42	38	33	25	23	21	-	-	-	-	30	23	22	28	27	23	-	-	-
	4.0	29	62	106	50	44	38	29	26	23	-	-	-	-	37	28	26	31	30	25	-	-	-
	6.0	44	94	160	77	48	41	33	30	27	20	-	-	-	41	33	31	35	34	30	-	-	-
	8.3	61	129	220	110	49	43	35	32	29	22	-	-	-	43	35	33	38	37	33	-	-	-
125	2.4	28	59	100	42	39	34	26	23	21	-	-	-	-	31	27	26	28	29	26	-	-	-
	4.0	47	99	168	50	46	40	30	26	24	-	-	-	-	38	33	31	32	32	28	-	-	-
	6.0	70	149	253	77	50	44	34	30	28	20	20	-	-	42	37	36	37	37	33	20	-	-
	6.7	78	165	280	90	51	45	35	31	29	21	21	-	-	43	38	37	38	38	34	21	-	-
140	2.8	42	88	150	43	42	36	29	25	23	-	-	-	-	35	33	35	36	35	29	-	-	-
	4.0	58	124	210	50	47	40	31	26	24	-	-	-	-	40	37	38	38	36	29	20	-	-
	6.0	89	188	320	78	51	44	36	31	29	21	21	-	-	44	41	43	42	41	35	25	-	-
	7.5	111	235	400	113	52	46	38	33	31	23	23	-	-	46	44	45	45	43	37	27	-	21
160	2.6	50	106	180	43	41	37	28	25	23	-	-	-	-	34	36	36	37	36	30	-	-	-
	4.0	78	164	279	51	47	41	31	27	25	-	-	-	-	40	41	40	39	38	31	22	-	-
	6.0	116	246	418	78	50	45	35	31	29	20	21	-	-	44	45	44	44	43	36	27	-	21
	7.2	139	294	500	104	52	47	37	33	31	22	23	-	-	46	47	46	46	45	38	29	20	23
200	2.3	69	147	250	42	41	36	28	25	23	-	-	-	-	35	37	37	38	36	30	-	-	-
	4.0	122	258	439	51	48	41	32	29	25	18	-	-	-	42	42	41	42	39	33	24	-	-
	6.0	183	387	658	78	51	45	36	33	30	22	22	-	-	46	47	46	47	44	38	28	-	22
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	4.0	192	406	690	51	49	43	34	30	26	17	-	-	-	41	44	44	37	40	33	25	-	-
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	4.0	306	648	1101	51	53	48	34	30	27	18	24	-	-	44	42	40	39	39	34	23	-	-
	6.0	459	971	1651	79	57	52	38	34	31	23	28	21	23	48	47	44	44	44	40	28	-	22
	10.2	778	1647	2800	210	61	57	43	39	37	28	32	27	28	53	53	50	50	50	46	34	26	28
400	2.2	278	588	1000	42	49	44	31	28	26	17	-	-	-	42	39	37	38	39	34	21	-	-
	4.0	495	1049	1783	51	54	48	35	31	29	19	25	-	-	47	44	41	42	42	37	26	-	20
	6.0	743	1573	2674	79	58	52	39	36	33	24	29	22	24	52	48	46	46	47	42	30	23	25
	9.0	1111	2353	4000	161	62	56	43	40	38	29	32	27	28	56	53	50	51	52	47	35	28	30

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
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# Rectangular CAV and VAV air volume control terminals with integral sound attenuator

Type designation  
(NS . . . . .)

## Composition type designation:

**N - S - O - R - E - O - B**

### **N** Position 1: **Product group**

N = air volume control terminals

### **B** Position 2: **Function**

O = not applicable  
S = rectangular VAV or CAV terminal with integral sound attenuator  
1 = non standard, specify separately

### **O** Position 3: **Controls (manufacturer)**

O = without controls  
For controls, contact our sales staff

### **Q** Position 4: **Outlet**

O = not applicable  
D = rectangular outlet and integral sound attenuation  
E = circular outlet and integral sound attenuation  
F = 4 circular outlets and integral sound attenuation  
K = rectangular outlet, integral sound attenuation and provision for integral hot water reheat coil  
L = circular outlet, integral sound attenuation and provision for integral hot water reheat coil  
M = 4 circular outlets, integral sound attenuation and provision for integral hot water reheat coil  
R = rectangular outlet, integral sound attenuation and provision for integral electric reheat coil  
S = circular outlet, integral sound attenuation and provision for integral electric reheat coil  
T = 4 circular outlets with integral sound attenuation and provision for integral electric reheat coil  
1 = non standard, specify separately

### **E** Position 5: **Reheat coil**

O = without reheat  
A = 1-row hot water reheat coil  
B = 2-row hot water reheat coil  
D = 4-row hot water reheat coil  
E = 1-stage 230VAC/1-phase electric reheat coil  
F = 2-stage 230VAC/1-phase electric reheat coil  
G = 3-stage 230VAC/1-phase electric reheat coil  
H = 1-stage 400VAC/3-phase electric reheat coil  
J = 2-stage 400VAC/3-phase electric reheat coil  
1 = non standard, specify separately

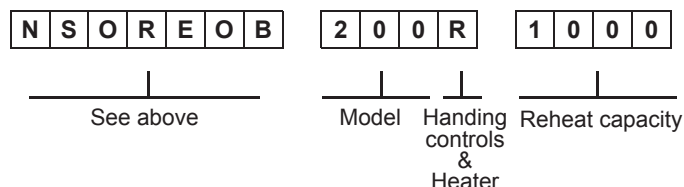
### **O** Position 6: **Controls (type & function)**

O = without controls  
R = return/extract application  
For controls, contact our sales staff

### **B** Position 7: **Sensor**

O = not applicable  
B = Flo-Cross®, 2 x 12 point averaging and signal amplifying air flow sensor (standard)  
1 = non standard, specify separately

### Ordering example:



### Ordering codes "Specials"

N..1... - 3010 = 4 balancing dampers in 'Octopus' outlet  
N..1... - 3006 = 'Octopus' with 6 outlets instead of 4  
N..1... - 3016 = 'Octopus' with 6 outlets incl. balancing dampers  
N..1... - FL = Flange connection 30 mm for rectangular outlet

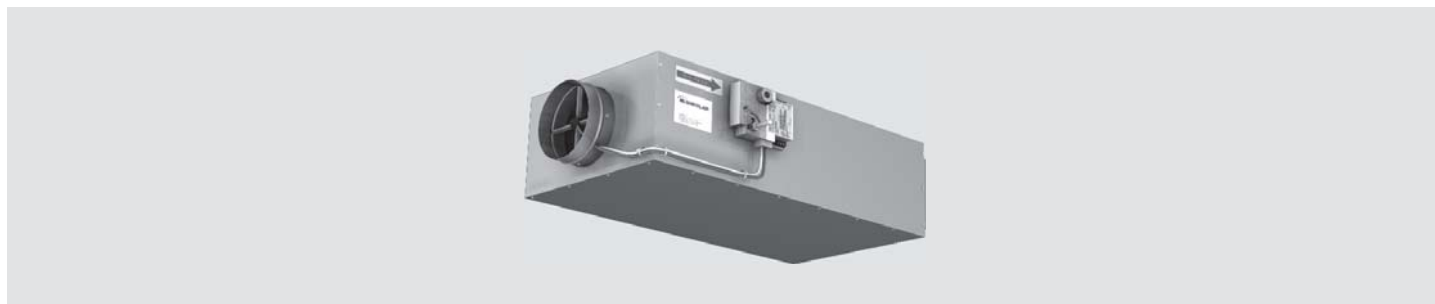
### Ordering information:

#### Standard terminals:

- quantity of terminals
- complete 7 digit code
- terminal size or model
- air volume setting ( $V_{max}$ ,  $V_{min}$  etc)
- control handing (standard right side)
- if applicable, electric reheat coil capacity

#### Non standard terminals:

- for non standard terminals a full description and/or drawing are requested



### Application

Type NS rectangular pressure-independent VAV and CAV air volume control terminals are designed particularly for systems with low noise criteria and for the accurate measurement and control of air volumes courtesy of the patented airflow sensor type Flo-Cross®.

In CAV application, the terminals maintain the required constant airflow independent to the inlet static pressure.

In VAV application, the terminals control the air volume to the room, depending on the cooling load required thus saving energy consumption in both cooling and heating applications.

Alternatively VAV terminals are ideal to be used for CO<sub>2</sub> control. Dependent of the indoor air quality, always the correct amount of fresh air will be supplied to the room. Of course the primary air handling system need to be suitable for this.

The VAV or CAV terminals can be used either for supply or return air applications in new or refurbishment projects. The terminals can optionally be supplied with a distribution plenum and a built-in hot water or electric reheat coil.

#### Features:

- Pressure independent control functions.
- Compact design; one-piece construction.
- Volume control range 100% down to 10%
- Low pressure loss over the terminal.
- Factory fitted in-built distribution plenum with built-in hot water or electric reheat coil.
- Low leakage damper, less than 2% of V<sub>nom</sub> at 750 Pa.
- Very low noise production.
- Suitable for all control functions (VAV, CAV, shut-off, etc.) to maximise system energy savings.
- Flo-Cross® 2 x 12 points averaging and signal amplifying airflow sensor, better than 2,5% accuracy even with irregular duct approach.
- Maintenance free.

### Technical information

#### Casing:

Air-tight construction made of galvanized sheet steel; casing leakage rate to Class II VDI 3803 / DIN 24 194. Duct-sleeve connections at the in- and outlet are suitable for DIN 24 145 or DIN 24 146 connections.

#### Insulation:

The terminal is supplied with 25 mm thermal and acoustical insulation (30 kg/m<sup>3</sup>) complying to: NFPA90A and 90B surface burning characteristics, BS476 part 6 and 7 fire propagation, UL 181 class 0 surface spread of flame and UL 94 HF1 flammability. Special version insulation for hospital application on request.

#### Damper:

Damper blade: made of steel with neoprene gasket (low leakage).  
Damper shaft: aluminium, ø12 mm with self lubricating Nylon bearings.

#### Flo-Cross®:

Extruded aluminium construction with nylon core + feet.

#### Distribution plenum:

Made of galvanized sheet steel with 13 mm internal isolation.  
'Octopus' plenum with standard multiple outlet (4 x circular) outlet construction.  
Optional single, double, triple or six circular outlets possible.  
Outlet spigots are made of flame retardant polymer and optionally can be provided with volume control dampers made of galvanized sheet steel.

#### Reheat coil:

Choice of 1-, 2- or 4-row hot water reheat coil or electric reheat coil (230VAC/1-phase or 400VAC/3-phase).  
More detailed technical information can be found in the separate NO documentation.

#### Controls:

Suitable for use with pneumatic, analogue electronic or DDC controllers. Controls can be factory fitted, wired and calibrated. Controls enclosure (galvanized sheet steel) can be provided optionally.

### Delivery format

#### Delivery format:

- The VAV or CAV terminal will be supplied as a single mounting assembly. Optional ordered distribution plenum, reheat coil and/or controls are factory fitted, wired and calibrated. The on site delivered terminal is ready to be installed and commissioned.
- Controls location and hot water or electric connections are as a standard fitted on the right hand side of the terminal when looking in the direction of the airflow.
- On request, the terminal can be delivered with connections on the left hand side.
- When terminals are ordered with controls, these will be factory fitted, wired and calibrated upon request.
- When terminals are ordered with 'free-issue' controls by others, wiring diagrams and mounting instructions must be provided.

# Rectangular CAV and VAV air volume control terminals with integral sound attenuator

Technical data  
Type NS . . . .



## Specify as:

### Example:

Supply and install, variable air volume terminals with integral sound attenuator and distribution plenum with 4 circular outlets, constructed from galvanized sheet steel. The casing leakage rate shall be classified according to class II, VDI 3803/DIN 24 194 and the duct-sleeve connections shall be suitable for DIN 24 145 or DIN 24 146 respectively. The VAV terminals shall have a low leakage damper blade with neoprene gasket and an aluminium damper shaft with self lubricating Nylon bearings. A centre averaging airflow sensor with at least 2 x 12 test points and amplified signal air flow sensor, type Flo-Cross® shall control the airflow with an accuracy not less than 2.5 %. The terminals shall be supplied with 1-row hot water reheat coil.

The controller shall be I/A Series, DDC controller:  
LonMark® compatible, type MNL-V2RVx  
or  
BACnet® compatible typ MNB-V2.

Controls must be factory fitted, wired and calibrated according to the following requirements.

Maximum air volume 250 l/s  
Minimum air volume 60 l/s  
Minimum air volume 120 l/s (in case of reheat)  
Terminal size 200 mm  
Max. pressure loss 38 Pa  
Max. discharge sound index < NC20  
(@250Pa Δ p)  
Max. radiated sound index < NC20  
(@250Pa Δ p)

Ordering example: type – model – handing =  
NSOMA0B – 200R

Manufacturer: HC Barcol-Air

## Installation Instructions:

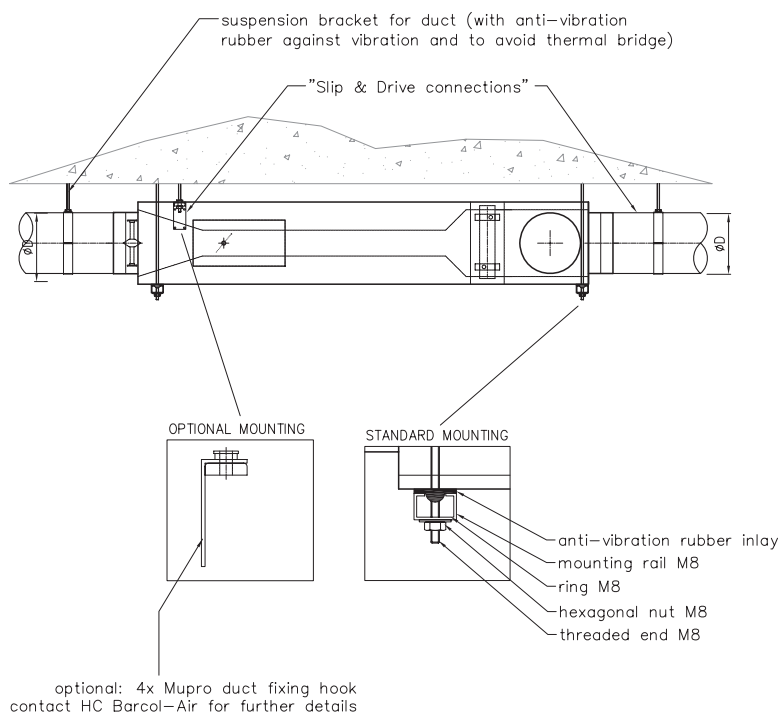
The HC Barcol-Air VAV terminals shall be installed using at least two support brackets (DIN-rail or L-profile), with anti-vibration rubber under the terminal. Each of these brackets shall be fixed with two threaded rods to the ceiling slab above.

This installation method:

- 1 Shall prevent the body of the VAV terminal from high mechanical tension, which could damage the construction and performance of the terminal.
- 2 Shall prevent torsion on the VAV terminals, which could cause malfunction of the damper blades.
- 3 Provides some flexibility to the final location of the VAV terminals.
- 4 Use at least 1x diagonal straight duct length before the VAV inlet.

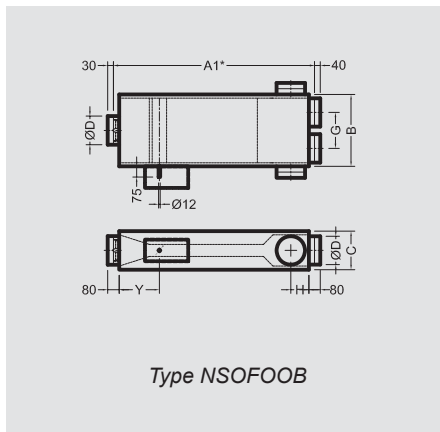
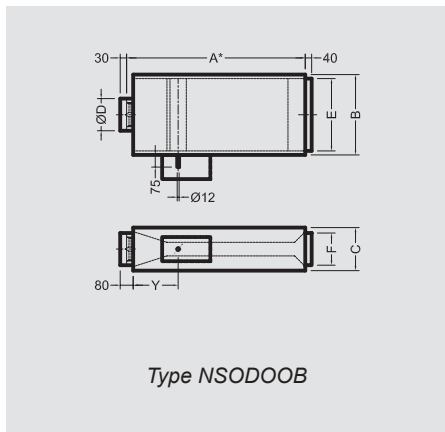
- 5 Additional manual volume control dampers (VCD's) before the inlet are not required / recommended!!
6. All connections shall be thermally isolated.
7. Pressure sensing tubes of Flo-Cross® airflow sensor shall not be "kinked" or otherwise obstructed by the external duct insulation.

Optional 4 x Mupro fixing hooks can be used (see drawing).



# Rectangular CAV and VAV air volume control terminals with integral sound attenuator

Model overview  
(NS.....)



## Dimensions NS

Model	100	125	160	200	250	315	355	400
A*	1110	1110	1110	1110	1110	1310	1310	1410
A1*	1360	1360	1360	1360	1460	1710	1710	1910
A2*	1260	1260	1260	1260	1260	1410	1410	1510
A3*	1510	1510	1510	1510	1610	1810	1810	2010
B	330	330	400	500	600	740	820	910
C	228	228	248	268	318	408	408	458
ØD	98	123	158	198	248	313	353	398
E	275	275	350	450	550	690	770	850
F	170	170	175	200	250	330	330	380
G	180	180	215	255	305	370	410	455
H	125	125	125	125	175	200	225	250
X**	330	330	330	330	430	480	530	580
X1**	352	352	352	352	452	502	552	602
Y	268	268	268	268	333	430	430	460

Other dimensions are available upon request.

All dimensions in mm.

\* = Installed length.

\*\* = Size varies with a 1-/2-row or 4-row hot water reheat coil.

## Kv values

Model	100	125	160	200	250	315	355	400
Kv (l/s / Pa)	5,5	8,5	15,0	24,9	35,4	58,9	74,3	92,6

Flow = Kv x  $\sqrt{\Delta P_{fc}}$

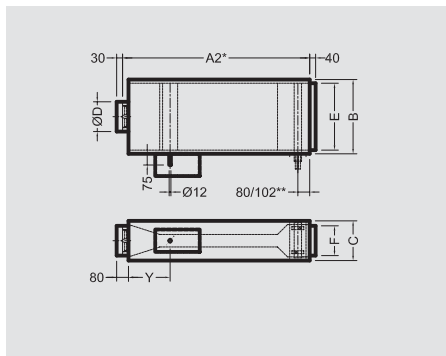
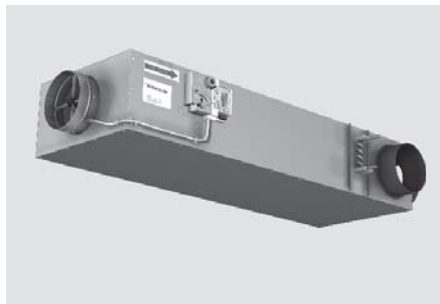
$\Delta P_{fc}$  = Flo-Cross® signal

If  $\Delta P_{fc}$  = 30 Pa and VAV size = 160

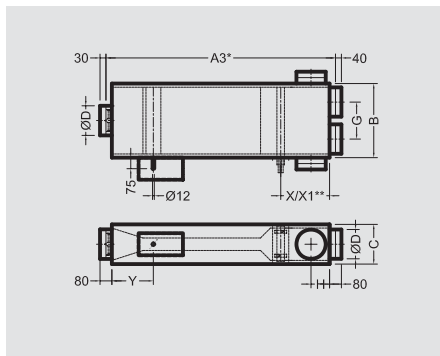
Flow = 15,0 x  $\sqrt{30}$  = 82 l/s

# Rectangular CAV and VAV air volume control terminals with integral sound attenuator

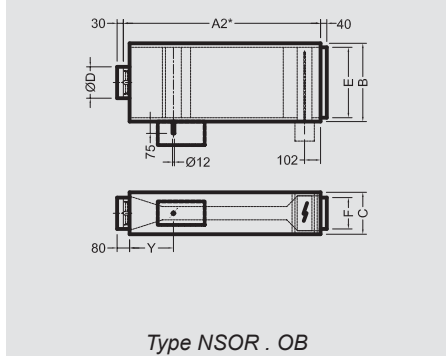
Model overview  
(NS.....)



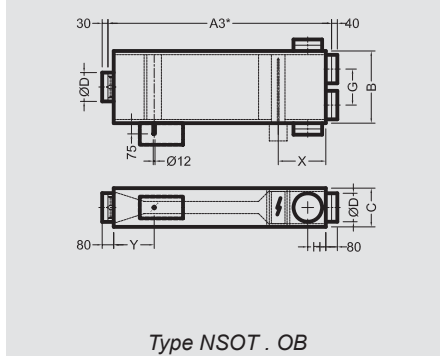
Type NSOK . OB



Type NSOM . OB



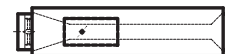
Type NSOR . OB



Type NSOT . OB

For dimensions see page 44.

# Retangular CAV and VAV air volume control terminals *Type NSODOOB* with integral sound attenuator



## Sound data $\Delta p = 125 \text{ Pa}$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 125 \text{ Pa}$																	
						discharge sound									radiated sound								
	velocity		air volume			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB						dB												
100	2	15	31	53	0	22	18	-	-	-	-	--	--	--	-	19	-	-	-	-	--	--	--
	4	29	62	106	1	29	28	-	-	-	-	--	--	--	22	23	-	-	18	-	--	--	--
	6	44	94	160	2	33	33	20	17	-	-	--	--	--	26	26	17	18	20	-	--	--	--
	8	59	125	213	4	35	37	24	20	-	-	--	--	--	28	28	19	20	21	-	--	--	--
	10	74	156	266	6	37	40	26	22	-	-	--	--	--	30	29	21	22	22	-	--	--	--
125	2	23	49	84	1	29	25	-	-	-	-	--	--	--	24	18	-	-	-	-	--	--	--
	4	47	99	168	2	36	35	22	-	-	-	--	--	--	29	23	21	-	-	-	--	--	--
	6	70	149	253	5	40	40	27	19	-	-	--	--	--	31	25	24	-	-	-	--	--	--
	8	94	198	337	8	42	44	31	22	-	-	--	--	--	33	27	26	18	17	-	--	--	--
	10	117	248	421	13	44	47	34	24	-	-	--	--	--	34	28	27	20	18	-	--	--	--
160	2	39	82	139	0	35	31	-	-	-	-	--	--	--	30	20	-	-	-	-	--	--	--
	4	78	164	279	2	39	38	24	-	-	-	--	--	--	37	30	19	-	-	-	--	--	--
	6	116	246	418	3	42	41	31	18	-	-	--	--	--	41	35	25	-	-	-	--	--	--
	8	155	328	558	6	43	44	36	23	-	-	--	--	--	44	40	30	21	-	-	--	--	--
	10	194	410	697	10	44	46	39	26	-	-	--	--	--	46	43	34	26	21	-	22	--	--
200	2	61	129	219	0	36	30	-	-	-	-	--	--	--	31	20	-	-	-	-	--	--	--
	4	122	258	439	2	41	37	24	-	18	20	--	--	--	38	30	-	-	-	-	--	--	--
	6	183	387	658	4	43	41	31	22	21	23	--	--	--	43	36	20	-	-	-	--	--	--
	8	244	516	878	8	44	43	35	27	23	24	--	--	--	46	40	25	20	-	-	20	--	--
	10	305	645	1097	12	45	45	39	31	25	26	--	--	--	48	44	28	25	21	-	23	--	--
250	2	96	203	345	1	31	21	-	-	-	-	--	--	--	26	18	-	-	-	-	--	--	--
	4	192	406	690	5	39	33	17	-	-	-	--	--	--	34	26	-	-	-	-	--	--	--
	6	288	609	1035	10	43	39	27	20	20	20	--	--	--	38	31	20	-	-	-	--	--	--
	8	383	812	1380	18	46	43	34	29	27	26	--	--	--	41	34	25	-	17	-	--	--	--
	10	479	1015	1725	28	48	47	39	35	33	30	20	--	--	44	37	28	20	20	-	--	--	--
315	2	153	324	550	1	-	-	-	-	-	-	--	--	--	22	19	-	-	-	-	--	--	--
	4	306	648	1101	4	32	31	18	-	-	18	--	--	--	34	29	17	-	-	-	--	--	--
	6	459	971	1651	8	42	40	30	25	26	25	--	--	--	42	34	25	-	-	-	--	--	--
	8	612	1295	2202	15	48	46	37	34	33	30	21	--	--	47	38	30	19	20	-	21	--	--
	10	764	1619	2752	23	54	51	43	41	38	33	26	--	21	51	42	34	24	23	-	24	--	--
355	2	195	412	701	1	-	18	-	-	-	-	--	--	--	23	19	-	-	-	-	--	--	--
	4	389	824	1401	5	33	34	24	-	-	-	--	--	--	36	29	-	-	-	-	--	--	--
	6	584	1236	2102	12	43	43	36	27	27	24	--	--	--	43	35	24	-	-	-	--	--	--
	8	779	1649	2803	22	50	49	44	37	34	29	23	--	--	48	39	29	19	19	-	22	--	--
	10	973	2061	3503	34	55	54	50	43	40	32	28	21	24	52	42	34	23	22	-	25	--	21
400	2	248	524	891	1	-	18	-	-	-	-	--	--	--	23	19	-	-	-	-	--	--	--
	4	495	1049	1783	4	33	34	26	18	19	-	--	--	--	36	28	-	-	-	-	--	--	--
	6	743	1573	2674	8	43	43	37	31	29	22	--	--	--	43	34	20	-	-	-	--	--	--
	8	990	2097	3565	15	50	49	45	40	37	27	23	--	--	49	38	26	-	-	-	22	--	--
	10	1238	2621	4456	23	55	54	51	47	42	30	28	21	24	53	42	30	20	18	-	26	--	22

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2.  $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
3. The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.
4. The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
5. Lp values are including a room absorption of 10 dB/Oct.

6. dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Insertion Loss

Model	125	250	500	1k	2k	4k	Hz
100	8	11	20	27	28	22	dB
125	7	10	19	26	27	21	dB
160	6	9	18	24	25	19	dB
200	5	10	16	22	23	20	dB
250	6	13	19	26	22	15	dB
315	6	12	19	25	21	17	dB
355	6	12	19	25	21	17	dB
400	5	11	15	19	19	14	dB

















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# Induction VAV

## air volume control terminals

Type designation  
(NV . . . . .)

### Composition type designation:

**N - V - O - N - F - O - B**

#### **N** Position 1: **Product group**

N = air volume control terminals

#### **V** Position 2: **Function**

- O = not applicable
- V = VAV Induction terminal
- W = VAV Induction terminal with controlled induction
- 1 = non standard, specify separately

#### **O** Position 3: **Controls (manufacturer)**

- O = without controls
- For controls, contact our sales staff

#### **N** Position 4: **Outlet**

- O = not applicable
- A = rectangular outlet
- C = 4 circular outlets 'Octopus'
- G = rectangular outlet and provision for integral hot water reheat coil
- J = 4 circular outlets and provision for integral hot water reheat coil
- N = rectangular outlet and provision for integral electric reheat coil
- Q = 4 circular outlets and provision for integral electric reheat coil
- 1 = non standard, specify separately

#### **F** Position 5: **Reheat coil**

- O = without reheat coil
- A = 1-row hot water reheat coil
- B = 2-row hot water reheat coil
- D = 4-row hot water reheat coil
- E = 1-stage 230VAC/1-phase electric reheat coil
- F = 2-stage 230VAC/1-phase electric reheat coil
- G = 3-stage 230VAC/1-phase electric reheat coil
- H = 1-stage 400VAC/3-phase electric reheat coil
- J = 2-stage 400VAC/3-phase electric reheat coil
- 1 = non standard, specify separately

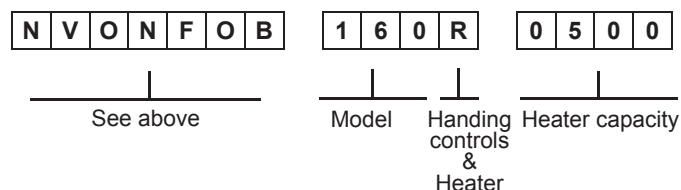
#### **O** Position 6: **Controls (type & function)**

- O = without controls
- For controls, contact our sales staff

#### **B** Position 7: **Sensor**

- O = not applicable
- B = Flo-Cross®, 2 x 12 point averaging and signal amplifying air flow sensor (standard)
- 1 = non standard, specify separately

#### Ordering example:



#### Ordering codes "Specials"

- N..1... - 3010 = 4 balancing dampers in 'Octopus' outlet
- N..1... - 3006 = 'Octopus' with 6 outlets instead of 4
- N..1... - 3016 = 'Octopus' with 6 outlets incl. balancing dampers
- N..1... - FL = Flange connection 30 mm for rectangular outlet

#### Ordering information:

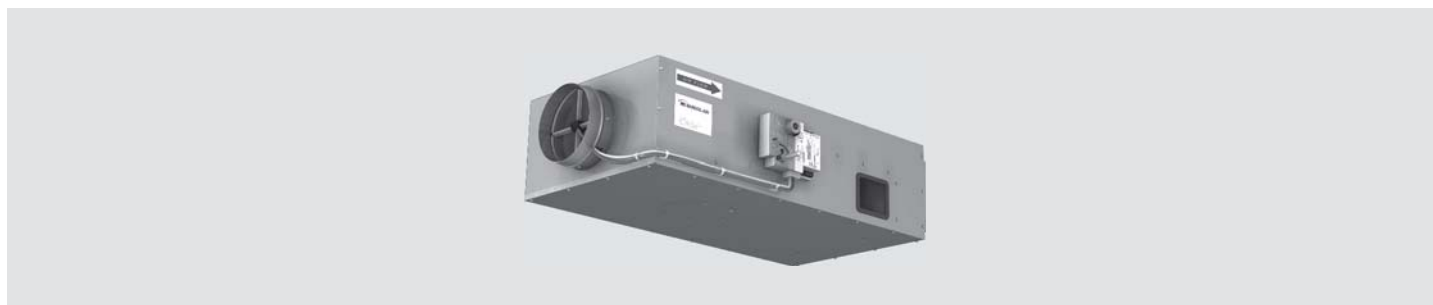
##### Standard terminals:

- quantity of terminals
- complete 7 digit code
- terminal size or model
- air volume setting ( $V_{max}$ ,  $V_{min}$  etc)
- control handing (standard right side)
- if applicable, electric reheat coil capacity

##### Non standard terminals:

- for non standard terminals a full description and/or drawing are requested





### Application

Type NV rectangular pressure-independent VAV air volume control terminals are designed particularly for systems with high variations in heat load. The terminals induce room air and mix it with conditioned primary air, maintaining a nearly constant air volume to the room thus providing sufficient air movement necessary to maintain occupant comfort even in extreme load variations. This specific characteristic means that cold air 'dumping' will not occur and that extremely low primary air temperatures can be used, without producing excessive differences between the supply and the room air temperature. The primary air is controlled by the patented airflow sensor type Flo-Cross®. The Induction VAV terminals can be used for supply air applications in new or refurbishment projects. The terminals can optionally be supplied with a distribution plenum and a built-in hot water or electric reheat coil.

Alternatively VAV terminals are ideal to be used for CO<sub>2</sub> control. Dependent of the indoor air quality, always the correct amount of fresh air will be supplied to the room. Of course the primary air handling system need to be suitable for this.

#### Features:

- Pressure independent control functions.
- Compact design; one-piece construction.
- Volume control range 100% down to 10% without the requirement of special VAV diffusers or assisting fans.
- Suitable for low temperature primary air systems.
- Factory fitted in-built distribution plenum with built-in hot water or electric reheat coil.
- Low leakage damper less than 2% of V<sub>nom</sub> at 750 Pa.
- Low noise production.
- Suitable for all control functions (VAV, CAV, shut off, etc.) to maximise system energy savings.
- Flo-Cross® 2 x 12 points averaging and signal amplifying airflow sensor, better than 2,5% accuracy even with irregular duct approach.
- Maintenance free.

### Technical information

#### Casing:

Air-tight construction made of galvanized sheet steel; casing leakage rate to Class II VDI 3803 / DIN 24 194. Duct-sleeve connections at the in- and outlet are suitable for DIN 24 145 or DIN 24 146 connections. The terminal has a circular inlet, two induction openings, rectangular outlet and an inspection opening at the bottom.

In case of multiple outlets, a perforated equalising grid in the multiple outlet section is fitted and balancing dampers can be provided on request.

#### Insulation:

The terminal is supplied with 25 mm thermal and acoustical insulation (30 kg/m<sup>3</sup>) complying to: NFPA90A and 90B surface burning characteristics, BS476 part 6 and 7 fire propagation, UL 181 class 0 surface spread of flame and UL 94 HF1 flamability.

#### Damper:

Specially constructed 'jet-tronic' damper for induction effect made of galvanized sheet steel and low leakage. Damper shaft: aluminium, ø12 mm with self lubricating Nylon bearings. Optional: additional damper in induction port for induction ratio control (type NW.....).

#### Flo-Cross®:

Extruded aluminium construction with nylon core + feet.

#### Distribution plenum:

Made of galvanized sheet steel with 13 mm internal isolation. 'Octopus' plenum has standard multiple outlet (4 x circular) outlet construction. Optional single, double, triple or six circular outlets possible. Outlet spigots are made of flame retardant polymer and optionally can be provided with volume control dampers made of galvanized sheet steel.

#### Reheat coil:

Choice of 1-, 2- or 4-row hot water reheat coil or electric reheat coil (230VAC/1-phase or 400VAC/3-phase).

More detailed technical information can be found in the separate NO documentation.

#### Controls:

Suitable for use with pneumatic, analogue electronic or DDC controllers. Controls can be factory fitted, wired and calibrated. Controls enclosure (galvanized sheet steel) can be provided optionally.

### Delivery format

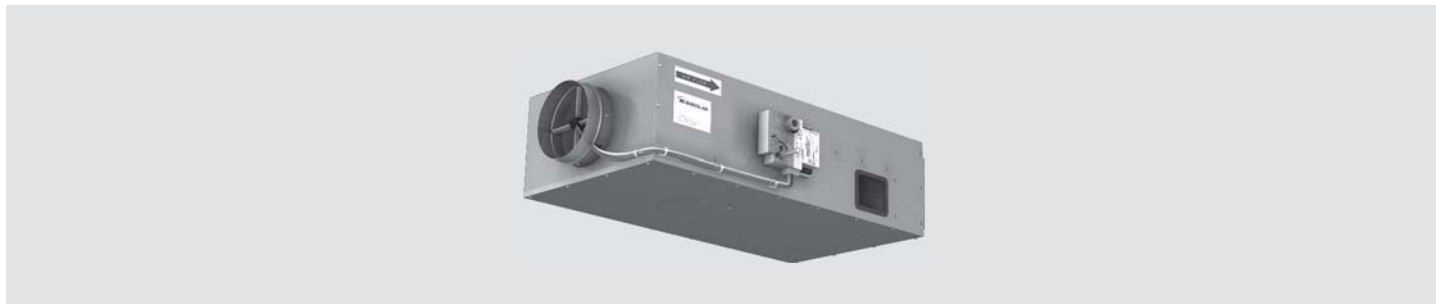
#### Delivery format:

- The VAV terminal will be supplied as a single mounting assembly. Optional ordered distribution plenum, reheat coil and/or controls are factory fitted, wired and calibrated. The on site delivered terminal is ready to be installed and commissioned.
- Controls location and hot water or electric connections are as a standard fitted on the right hand side of the terminal when looking in the direction of the airflow.
- On request, the terminal can be delivered with connections on the left hand side.
- When terminals are ordered with controls, these will be factory fitted, wired and calibrated upon request.
- When terminals are ordered with 'free-issue' controls by others, wiring diagrams and mounting instructions must be provided.

# Induction VAV

## air volume control terminals

Technical data  
Type NV . . . .



### Specify as:

*Example:*

Supply and install, induction variable air volume terminals with distribution plenum with 4 circular outlets, constructed from galvanized sheet steel. The terminal shall have duct-sleeve connections and shall be suitable for DIN 24 145 or DIN 24 146 respectively. The VAV terminals shall have a special 'jet-tronic' low leakage damper blade and an aluminium damper shaft with self lubricating Nylon bearings.

A centre averaging airflow sensor with at least 2 x 12 test points and amplified signal air flow sensor, type Flo-Cross® shall control the airflow with an accuracy not less than 2.5 %. The terminals shall be supplied with 1-row hot water reheat coil.

The controller shall be I/A Series, DDC controller :

LonMark® compatible, type MNL-V2RVx or  
BACnet® compatible type MNB-V2.

Controls must be factory fitted, wired and calibrated according to the following requirements.

Maximum air volume 250 l/s  
Minimum air volume 60 l/s  
Minimum air volume 120 l/s (in case of reheat)  
Terminal size 200 mm  
Max. discharge sound index < NC25 (@250Pa Δp)  
Max. radiated sound index < NC25 (@250Pa Δp)

Ordering example: type – model – handing =  
NVOJAOB – 200R

Manufacturer: HC Barcol-Air

### Installation Instructions:

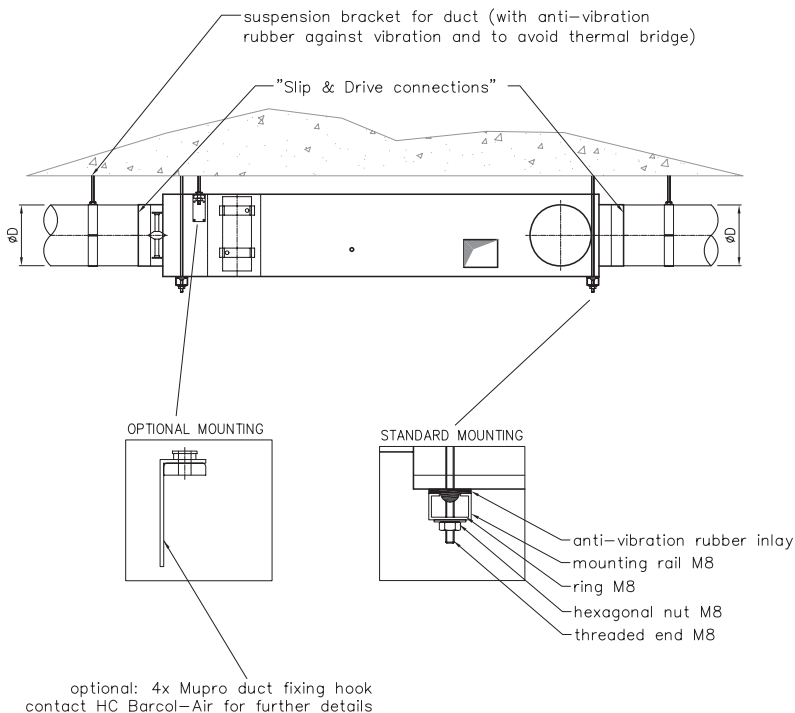
The HC Barcol-Air Induction VAV terminals shall be installed using at least two support brackets (DIN-rail or L-profile), with anti-vibration rubber under the terminal. Each of these brackets shall be fixed with two threaded rods to the ceiling slab above.

This installation method:

- 1 Shall prevent the body of the Induction VAV terminal from high mechanical tension, which could damage the construction and performance of the terminal.
- 2 Shall prevent torsion on the Induction VAV terminals, which could cause malfunction of the damper blades.
- 3 Provides some flexibility to the final location of the Induction VAV terminals.
- 4 Use at least 1x diagonal straight duct length before the Induction VAV inlet.

- 5 Additional manual volume control dampers (VCD's) before the inlet are not required / recommended!!
6. All connections shall be thermally isolated.
7. Pressure sensing tubes of Flo-Cross® airflow sensor shall not be "kinked" or otherwise obstructed by the external duct insulation.

Optional 4 x Mupro fixing hooks can be used (see drawing).

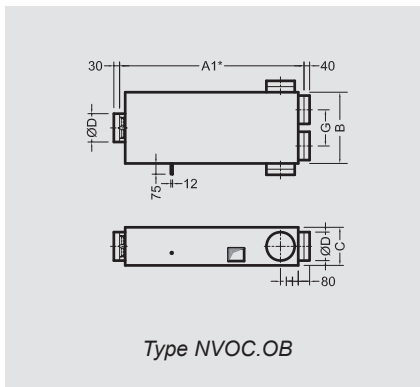
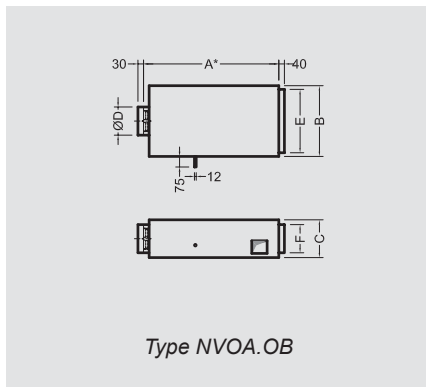


# Induction VAV

## air volume control terminals

# Model overview

## (NV.....)



### Dimensions NV

Model	100	125	160	200	250	315	355	400
A*	990	990	990	990	990	1540	1540	1540
A1*	1300	1300	1300	1300	1400	-	-	-
A2*	1240	1240	1240	1240	1240	1790	1790	1790
A3*	1550	1550	1550	1550	1750	-	-	-
B	330	330	400	500	600	740	820	910
C	228	228	248	268	318	408	408	458
ØD	98	123	158	198	248	313	353	398
E	275	275	350	450	550	690	770	850
F	170	170	175	200	250	330	330	380
G	180	180	215	255	305	-	-	-
H	125	125	125	125	175	-	-	-

Other dimensions are available upon request.  
Size 250 is maximum size for terminals with multiple outlet section.

All dimensions in mm.  
\* = Installed length.  
\*\* = Size varies with a 1-/2-row or 4-row hot water reheat coil.

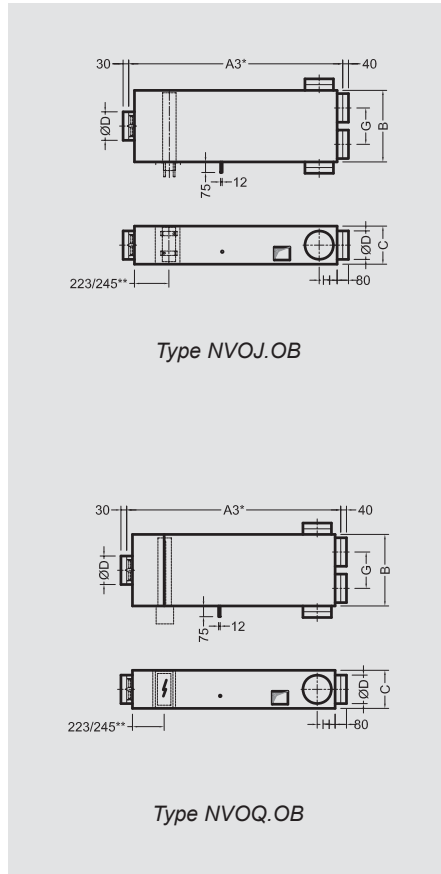
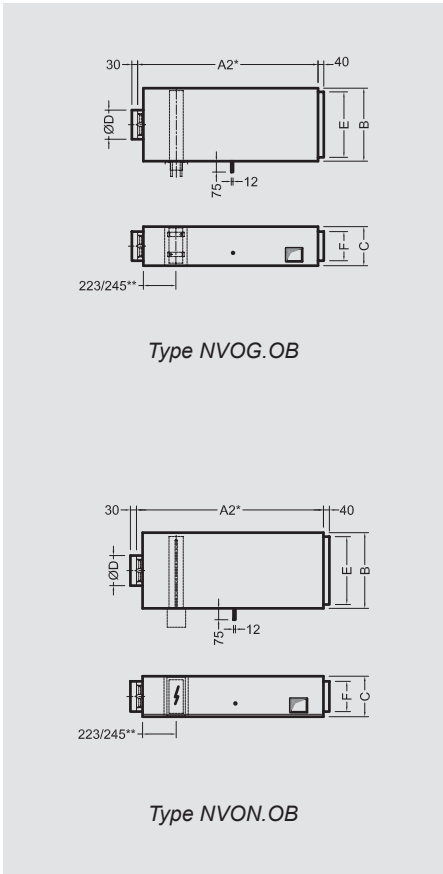
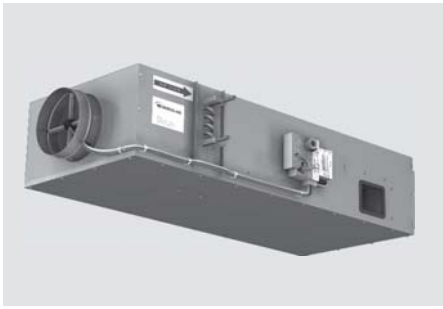
### Kv values

Model	100	125	160	200	250	315	355	400
Kv (l/s / Pa)	5,5	8,5	15,0	24,9	35,4	58,9	74,3	92,6

Flow = Kv x  $\sqrt{\Delta P_{fc}}$   
 $\Delta P_{fc}$  = Flo-Cross® signal  
If  $\Delta P_{fc}$  = 30 Pa and VAV size = 160  
Flow = 15,0 x  $\sqrt{30}$  = 82 l/s

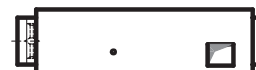
# Induction VAV air volume control terminals

## Model overview (NV.....)



For dimensions see page 58.





### Sound data $\Delta p = 250 \text{ Pa}$

Model	data referring to inlet spigot				$\Delta p = 250 \text{ Pa}$																												
					discharge sound							radiated sound																					
	velocity	air volume			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values													
					125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR											
m/s	l/s	CFM	m <sup>3</sup> /h	dB									dB																				
100	2	15	31	53	18	28	25	20	20	-	--	--	--	28	29	20	18	-	-	--	--	--	29	26	24	20	-	-	--	--	--		
	4	29	62	106	28	36	33	28	27	20	--	--	--	34	35	26	24	20	-	-	--	--	--	34	26	24	20	-	-	--	--	--	
	6	44	94	160	33	41	38	33	32	24	--	--	--	37	38	31	29	24	-	-	--	--	--	37	31	29	24	-	-	--	--	--	
	8	59	125	213	38	44	41	36	35	27	--	--	--	40	41	34	32	27	20	-	-	--	--	--	40	34	32	27	20	-	-	--	--
	10	74	156	266	41	46	44	39	37	29	--	--	--	42	43	36	35	30	23	-	-	--	--	--	42	36	35	30	23	-	-	--	--
125	2	23	49	84	24	32	29	24	24	-	--	--	--	31	32	23	20	-	-	--	--	--	31	23	20	-	-	--	--	--	--		
	4	47	99	168	34	40	37	32	31	23	--	--	--	37	38	29	26	22	-	-	--	--	--	37	29	26	22	-	-	--	--	--	
	6	70	149	253	39	44	41	37	35	27	--	--	--	40	41	33	31	26	19	-	-	--	--	--	40	33	31	26	19	-	-	--	--
	8	94	198	337	43	48	45	40	38	30	20	--	--	43	44	37	34	29	22	-	-	--	--	--	43	37	34	29	22	-	-	--	--
	10	117	248	421	46	50	47	43	40	32	23	--	--	45	46	39	37	32	25	-	-	--	--	21	45	39	37	32	25	-	-	--	21
160	2	39	82	139	32	36	32	28	27	20	--	--	--	34	30	26	22	18	-	-	--	--	--	34	26	22	18	-	-	--	--	--	
	4	78	164	279	41	44	40	36	34	27	--	--	--	40	36	33	29	25	17	-	-	--	--	--	40	33	29	25	17	-	-	--	--
	6	116	246	418	46	49	45	41	38	31	22	--	--	43	39	37	33	29	21	-	-	--	--	--	43	37	33	29	21	-	-	--	--
	8	155	328	558	50	52	48	44	41	34	25	--	--	46	42	40	36	32	24	-	-	--	--	--	46	40	36	32	24	-	-	--	--
	10	194	410	697	52	55	51	47	43	36	28	--	--	48	44	43	39	34	27	-	-	--	--	--	48	43	39	34	27	-	-	--	--
200	2	61	129	219	36	39	33	30	28	20	--	--	--	43	38	32	24	20	-	-	--	--	--	43	32	24	20	-	-	--	--	--	
	4	122	258	439	44	47	41	38	35	27	--	--	--	49	44	38	31	26	19	-	-	--	--	--	49	38	31	26	19	-	-	--	--
	6	183	387	658	49	52	46	42	39	31	25	--	--	52	47	43	35	30	23	-	-	--	--	22	52	43	35	30	23	-	-	--	22
	8	244	516	878	53	55	49	46	42	34	28	23	--	55	50	46	38	34	26	-	-	--	--	25	55	46	38	34	26	-	-	--	25
	10	305	645	1097	55	58	51	48	44	36	31	26	--	57	52	48	41	36	29	-	-	--	--	27	57	48	41	36	29	-	-	--	27
250	2	96	203	345	41	42	35	31	29	20	--	--	--	46	41	35	26	22	-	-	--	--	--	46	35	26	22	-	-	--	--	--	
	4	192	406	690	48	50	43	39	36	27	23	--	--	52	47	41	33	28	21	-	-	--	--	21	52	41	33	28	21	-	-	--	21
	6	288	609	1035	52	55	48	44	41	31	28	22	--	55	50	45	37	32	25	-	-	--	--	25	55	45	37	32	25	-	-	--	25
	8	383	812	1380	56	58	51	47	43	34	31	26	--	58	53	49	40	36	28	-	-	--	--	28	58	49	40	36	28	-	-	--	28
	10	479	1015	1725	58	61	54	50	46	37	33	29	--	60	55	51	43	38	31	-	-	--	--	30	60	51	43	38	31	-	-	--	30
315	2	153	324	550	46	46	38	33	31	21	--	--	--	49	44	38	28	24	-	-	--	--	--	49	38	28	24	-	-	--	--	--	
	4	306	648	1101	52	54	46	41	38	28	27	21	--	55	50	44	35	30	23	-	-	--	--	24	55	44	35	30	23	-	-	--	24
	6	459	971	1651	56	58	51	46	42	32	31	26	--	58	53	48	39	34	27	-	-	--	--	28	58	48	39	34	27	-	-	--	28
	8	612	1295	2202	58	62	54	49	45	35	34	30	--	61	56	52	42	38	30	-	-	--	--	31	61	52	42	38	30	-	-	--	31
	10	764	1619	2752	61	64	56	52	47	37	37	33	--	63	58	54	45	40	33	-	-	--	--	33	63	54	45	40	33	-	-	--	33
355	2	195	412	701	48	48	39	34	31	21	21	--	--	51	46	39	29	25	18	-	-	--	--	20	51	39	29	25	18	-	-	--	20
	4	389	824	1401	54	56	47	42	38	28	28	23	--	56	51	46	36	32	24	-	-	--	--	26	56	46	36	32	24	-	-	--	26
	6	584	1236	2102	58	60	52	47	43	32	33	28	--	60	55	50	40	36	28	-	-	--	--	30	60	50	40	36	28	-	-	--	30
	8	779	1649	2803	60	64	55	50	45	35	36	32	--	62	57	53	43	39	31	-	-	--	--	33	62	53	43	39	31	-	-	--	33
	10	973	2061	3503	62	66	58	53	48	37	38	35	--	65	60	56	46	41	34	-	-	--	--	35	65	56	46	41	34	-	-	--	35
400	2	248	524	891	51	50	41	35	32	21	24	--	--	52	47	41	30	26	19	-	-	--	--	22	52	41	30	26	19	-	-	--	22
	4	495	1049	1783	56	58	49	43	39	28	30	25	--	58	53	47	37	33	25	-	-	--	--	28	58	47	37	33	25	-	-	--	28
	6	743	1573	2674	59	62	54	48	43	32	35	31	--	61	56	51	41	37	29	-	-	--	--	31	61	51	41	37	29	-	-	--	31
	8	990	2097	3565	61	66	57	51	46	35	38	35	--	64	59	55	44	40	32	-	-	--	--	34	64	55	44	40	32	-	-	--	34
	10	1238	2621	4456	63	68	60	54	48	38	40	38	--	66	61	57	47	42	35	-	-	--	--	37	66	57	47	42	35	-	-	--	37

- Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
- $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
- The discharge sound pressure levels are determined with the assumptions as referred to in table 1 for downstream ductwork including a diffuser with insulated plenum box.
- The radiated sound pressure levels are determined with the assumptions as referred to in table 1 for ceiling plenum and suspended ceiling absorption.
- Lp values are including a room absorption of 10 dB/Oct.
- dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
- $\Delta p$ s is static pressure drop across VAV air volume control terminal with damper fully open.
- For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Insertion Loss

Model	125	250	500	1k	2k	4k	Hz
100	7	11	16	22	23	22	dB
125	5	10	14	21	22	20	dB
160	4	7	11	15	16	15	dB
200	4	6	9	13	14	13	dB
250	3	6	8	12	13	12	dB
315	3	5	8	11	12	12	dB
355	3	4	7	10	11	12	dB
400	3	4	6	10	11	12	dB











**Sound data  $\Delta p = 250 \text{ Pa}$**

Model	data referring to inlet spigot				$\Delta p = 250 \text{ Pa}$																																		
					discharge sound							radiated sound																											
	velocity	air volume			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values																			
					125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR																	
m/s	l/s	CFM	m <sup>3</sup> /h	dB						dB																													
100	2	15	31	53	18	28	25	20	20	-	-	-	28	29	20	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	4	29	62	106	28	36	33	28	27	20	-	-	-	34	35	26	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	6	44	94	160	33	41	38	33	32	24	-	-	-	37	38	31	29	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	8	59	125	213	38	44	41	36	35	27	-	-	-	40	41	34	32	27	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10	74	156	266	41	46	44	39	37	29	-	-	-	42	43	36	35	30	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
125	2	23	49	84	24	32	29	24	24	-	-	-	31	32	23	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	4	47	99	168	34	40	37	32	31	23	-	-	-	37	38	29	26	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6	70	149	253	39	44	41	37	35	27	-	-	-	40	41	33	31	26	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	8	94	198	337	43	48	45	40	38	30	20	-	-	43	44	37	34	29	22	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10	117	248	421	46	50	47	43	40	32	23	-	-	45	46	39	37	32	25	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
160	2	39	82	139	32	36	32	28	27	20	-	-	-	34	30	26	22	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4	78	164	279	41	44	40	36	34	27	-	-	-	40	36	33	29	25	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6	116	246	418	46	49	45	41	38	31	22	-	-	43	39	37	33	29	21	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	8	155	328	558	50	52	48	44	41	34	25	-	-	46	42	40	36	32	24	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10	194	410	697	52	55	51	47	43	36	28	-	-	48	44	43	39	34	27	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
200	2	61	129	219	36	39	33	30	28	20	-	-	-	43	38	32	24	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4	122	258	439	44	47	41	38	35	27	-	-	-	49	44	38	31	26	19	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6	183	387	658	49	52	46	42	39	31	25	-	-	52	47	43	35	30	23	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	8	244	516	878	53	55	49	46	42	34	28	-	-	55	50	46	38	34	26	30	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10	305	645	1097	55	58	51	48	44	36	31	-	-	57	52	48	41	36	29	33	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
250	2	96	203	345	41	42	35	31	29	20	-	-	-	46	41	35	26	22	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	4	192	406	690	48	50	43	39	36	27	23	-	-	52	47	41	33	28	21	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6	288	609	1035	52	55	48	44	41	31	28	-	-	55	50	45	37	32	25	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	8	383	812	1380	56	58	51	47	43	34	31	-	-	58	53	49	40	36	28	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10	479	1015	1725	58	61	54	50	46	37	33	-	-	60	55	51	43	38	31	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
315	2	153	324	550	46	46	38	33	31	21	-	-	-	49	44	38	28	24	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	4	306	648	1101	52	54	46	41	38	28	27	-	-	55	50	44	35	30	23	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6	459	971	1651	56	58	51	46	42	32	31	-	-	58	53	48	39	34	27	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	8	612	1295	2202	58	62	54	49	45	35	34	-	-	61	56	52	42	38	30	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10	764	1619	2752	61	64	56	52	47	37	37	-	-	63	58	54	45	40	33	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
355	2	195	412	701	48	48	39	34	31	21	21	-	-	51	46	39	29	25	18	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	4	389	824	1401	54	56	47	42	38	28	28	-	-	56	51	46	36	32	24	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6	584	1236	2102	58	60	52	47	43	32	33	-	-	60	55	50	40	36	28	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	8	779	1649	2803	60	64	55	50	45	35	36	-	-	62	57	53	43	39	31	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10	973	2061	3503	62	66	58	53	48	37	38	-	-	65	60	56	46	41	34	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
400	2	248	524	891	51	50	41	35	32	21	24	-	-	52	47	41	30	26	19	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	4	495	1049	1783	56	58	49	43	39	28	30	-	-	58	53	47	37	33	25	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	6	743	1573	2674	59	62	54	48	43	32	35	-	-	61	56	51	41	37	29	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	8	990	2097	3565	61	66	57	51	46	35	38	-	-	64	59	55	44	40	32	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	10	1238	2621	4456	63	68	60	54	48	38	40	-	-	66	61	57	47	42	35	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2.  $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
3. The discharge sound pressure levels are determined with the assumptions as referred to in table 1 for downstream ductwork including a diffuser with insulated plenum box.
4. The radiated sound pressure levels are determined with the assumptions as referred to in table 1 for ceiling plenum and suspended ceiling absorption.
5. Lp values are including a room absorption of 10 dB/Oct.
6. dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Insertion Loss

Model	125	250	500	1k	2k	4k	Hz
100</							





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# Slide in reheat coil

Type designation  
(NO . . . . .)

## Composition type designation:

**N - O - O - O - E - O - O**

**N** Position 1: **Product group**

N = air volume control terminals

**O** Position 2: **Function**

. = For code, use specified CAV / VAV type designation

**O** Position 3: **Controls (manufacturer)**

O = without controls  
For controls, contact our sales staff

**O** Position 4: **Distribution plenum**

. = For code, use specified CAV / VAV type designation

**E** Position 5: **Reheat coil**

A = 1-row hot water reheat coil  
B = 2-row hot water reheat coil  
D = 4-row hot water reheat coil  
E = 1-stage 230VAC/1-phase electric reheat coil  
F = 2-stage 230VAC/1-phase electric reheat coil  
G = 3-stage 230VAC/1-phase electric reheat coil  
H = 1-stage 400VAC/3-phase electric reheat coil  
J = 2-stage 400VAC/3-phase electric reheat coil  
1 = non standard, specify separately

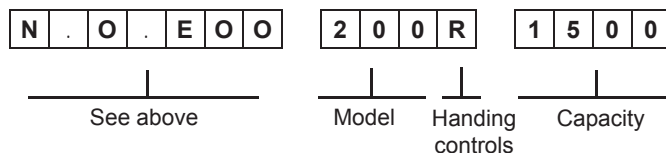
**O** Position 6: **Controls (type & function)**

O = without controls  
For controls, contact our sales staff

**O** Position 7: **Sensor**

O = not applicable

### Ordering example:



The slide in electric and hot-water reheat coils are applicable for all HC Barcol-Air CAV / VAV air terminals.

**Ordering information:**

*Standard terminals:*

- quantity of terminals
- complete 7 digit code
- terminal size or model
- air volume setting ( $V_{max}$ ,  $V_{min}$  etc)
- control handing (standard right side)
- if applicable, electric reheat coil capacity
- supply or return air

*Non standard terminals:*

- for non standard terminals a full description and/or drawing are requested



# Hot water reheat coil

## Technical data

Type N . . . A . . (1-row)  
 N . . . B . . (2-row)  
 N . . . D . . (3-row)



### Application

Types NOOOA00, NOOOB00 and NOOOD00 hot water reheat coils are suitable for incorporation in the HC Barcol-Air VAV and CAV terminals. The dimensions of these "slide in" reheat coils are adapted to the dimensions and the airflow range of the corresponding VAV or CAV terminal size.

### Technical information

#### Features:

- Factory fitted into the corresponding VAV or CAV terminal which saves valuable mounting time at site.
- High heat exchange efficiency.
- Available in 1-, 2- or 4-row design.
- Low air side pressure drop.

#### Construction:

- Copper tubes with aluminium fins.
- Test pressure 30 bar.
- Max. operating pressure (PN) 12,5 bar.
- Copper tube connections 12 or 15 mm.
- Suitable for all standard controls such as; 2- or 3-Way valves with Thermal-, 3-point or 0-10 VDC actuators.

#### Delivery format:

- The reheat coils are factory fitted into the corresponding CAV or VAV terminal.
- The connections are located, as standard, on the right hand side of the terminal when looking in the direction of air flow, unless otherwise requested.
- Coil connections are closed and protected with plastic caps.

### Specify as:

The reheat coils are specified with the corresponding VAV or CAV terminals.

### Selection example:

#### Given:

1. Reheat coil size : 160
2. Air flow :  $V = 0.097 \text{ m}^3/\text{s}$
3. Primary(entering) air temp. :  $EAT = 15^\circ\text{C}$
4. Hot water entering temp. :  $EWT = 65^\circ\text{C}$
5. Required capacity :  $P = 1400 \text{ W}$

#### Requested:

1. Capacity factor :  $W/^\circ\text{C}$
2. Water flow :  $Q_w \text{ (l/h)}$
3. Water side pressure drop :  $\Delta P_w \text{ (kPa)}$
4. Water side temp.difference :  $\Delta T_w \text{ (}^\circ\text{C)}$
5. Water leaving temperature :  $LWT \text{ (}^\circ\text{C)}$
6. Air side temp. difference :  $\Delta T_A \text{ (}^\circ\text{C)}$
7. Air leaving temperature :  $LAT \text{ (}^\circ\text{C)}$

#### Calculation:

1. Capacity factor (see tabel Pn)  
 $C = EWT - EAT = 65 - 15 = 50^\circ\text{C}$   
 $W/C = 1400 / 50 = 28 \text{ W}$

#### 2. Water flow ( $Q_w$ )

The required capacity can be achieved by a 1-row coil.

100 l/h results in 26.4 W

175 l/h results in 30 W

By interpolation the final water quantity can be calculated:

$$Q_w = 100 + (30 - 26.4) \times \frac{(175 - 100)}{(30 - 26.4)} = 133.3 \text{ l/h}$$

#### 3. Water-side pressure drop $\Delta P_w$

At 100 l/h  $\Delta P_w = 1.46 \text{ kPa}$ , the pressure drop is related to the water flow to the 1.8th:

$$\Delta P_w = \left( \frac{133.3}{100} \right)^{1.8} \times 1.46 = 2.3 \text{ kPa}$$

#### 4. Water side temperature difference ( $\Delta T_w$ )

$$\Delta T_w = \frac{w}{Q_w \times 1.16} = \frac{1400}{133.3 \times 1.16} = 9^\circ\text{C}$$

#### 5. Hot water leaving temperature (LWT)

$$LWT = EWT - \Delta T_w = 65 - 9 = 56^\circ\text{C}.$$

#### 6. Air side temperature difference ( $\Delta T_A$ )

$$\Delta T_A = \frac{P}{V \times 1200} = \frac{1400}{0.097 \times 1200} = 12^\circ\text{C}$$

#### 7. Air leaving temperature LAT

$$LAT = EAT + \Delta T_A = 15 + 12 = 27^\circ\text{C}$$

# Hot water reheat coil

## Model overview

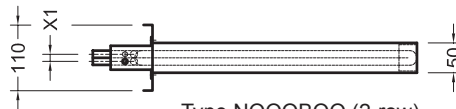
Type N . . . A . . (1-row)

N . . . B . . (2-row)

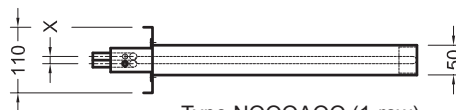
N . . . D . . (3-row)



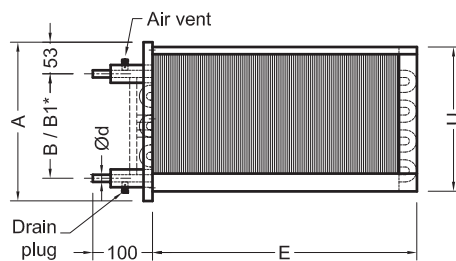
Type NOOODOO (4-row)



Type NOOOBOO (2-row)



Type NOOOAOO (1-row)



### Dimensions

Model	100	125	160	200	250	315	400
A	226	226	246	266	311	406	456
B	125	125	125	175	175	275	375
B1*	137.5	137.5	137.5	137.5	187.5	287.5	375
Ød	12	12	12	12	15	15	15
E	320	320	390	490	590	730	900
U	202	202	222	242	287	382	432
X	0	0	0	12	15	15	15
X1	12	12	12	12	15	15	15

Other dimensions are available upon request.

### Notes:

1. All dimensions are in mm.

2. Size B1 applicable for 2-row and 4-row version.

# Hot water reheat coil

Type N...A.. (1-row)

N...B.. (2-row)

N...D.. (3-row)

Selection; capacity factor (Pn), water flow (Qw) and pressure drop ( $\Delta P$ )

8.7 - 466.5 W/1°CΔT

Model	Air velocity at inlet m/s	Air volume			1-row (NOOOAOO) heating capacity in W/1°CΔT (ΔT = EWT - EAT)				2-row (NOOOBOO) heating capacity in W/1°CΔT (ΔT = EWT - EAT)				4-row (NOOODOO) heating capacity in W/1°CΔT (ΔT = EWT - EAT)				
		l/s	CFM	m³/h	Qw in l/h	50	75	100	150	75	150	250	300	75	150	250	300
100	2	15	32	54													
	3	22	46	79													
	4	29	61	104													
	5	37	78	133													
	6	44	93	158													
						Qw in l/h	50	75	100	150	75	150	250	300	75	150	300
					ΔPw in kPa	0.4	0.8	1.3	2.7	0.3	1.0	2.4	3.3	0.8	2.6	6.3	8.6
125	2	23	49	83													
	3	35	74	126													
	4	47	99	169													
	5	58	123	209													
	6	70	148	252													
						Qw in l/h	50	75	100	175	75	150	250	350	75	150	300
					ΔP in kPa	0.4	0.8	1.3	3.6	0.3	1.0	2.4	4.4	0.8	2.6	8.6	11.3
160	2	39	82	140													
	3	58	123	209													
	4	77	163	277													
	5	97	205	349													
	6	116	246	418													
						Qw in l/h	50	75	100	175	75	150	250	350	75	150	300
					ΔPw in kPa	0.4	0.9	1.5	3.9	0.3	1.1	2.7	4.8	0.8	2.8	9.6	12.6
200	2	62	131	223													
	3	91	193	328													
	4	122	258	439													
	5	152	322	547													
	6	183	388	659													
						Qw in l/h	50	100	150	200	75	200	300	400	75	200	300
					ΔPw in kPa	0.1	0.3	0.6	1.0	0.5	2.7	5.4	9.0	1.3	7.1	14.4	23.9
250	2	95	201	342													
	3	144	305	518													
	4	192	406	691													
	5	239	506	860													
	6	287	608	1033													
						Qw in l/h	75	125	175	225	150	250	350	450	150	250	350
					ΔPw in kPa	0.2	0.5	0.9	1.4	1.8	4.4	8.0	12.4	4.8	11.8	21.3	33.1
315	2	153	324	551													
	3	229	485	824													
	4	306	648	1102													
	5	382	809	1375													
	6	459	972	1652													
						Qw in l/h	100	200	300	400	175	300	450	650	175	300	450
					ΔPw in kPa	0.6	2.1	4.2	7.0	0.6	1.7	3.4	6.4	1.7	4.5	9.1	17.3
355	2	195	413	702													
	3	292	618	1051													
	4	389	824	1400													
	5	487	1031	1753													
	6	584	1237	2102													
						Qw in l/h	150	250	350	450	200	350	550	700	200	350	550
					ΔPw in kPa	0.3	0.6	1.2	1.8	1.2	3.1	6.8	10.4	3.1	8.4	18.5	28.3
400	2	248	525	893													
	3	371	786	1336													
	4	495	1048	1782													
	5	619	1311	2228													
	6	743	1574	2675													
						Qw in l/h	100	200	300	400	175	300	450	650	175	300	450
					ΔPw in kPa	0.6	2.1	4.2	7.0	0.6	1.7	3.4	6.4	1.7	4.5	9.1	17.3

1. The selection above is to calculate the heating capacity per 1 degree temperature difference between entering water temperature (EWT) and entering air temperature (EAT).

2. To calculate water pressure drop ( $\Delta P_w$ ) and leaving water temperature (LWT) see selection on page 70.

3. 4-Row coils can not be exchanged by 1- or 2-row coils.

# Electric reheat coil

## Technical data

Type N...E... / N...H...  
N...F... / N...J...  
N...G...



### Application

Types N...E..., N...F., N...G., N...H. and N...J.. electrical heating coils are suitable for incorporation in the HC Barcol-Air VAV and CAV terminals. The dimensions of these "slide in" reheat coils are adapted to the dimensions and the airflow range of the corresponding VAV or CAV terminal size.

### Technical information

#### Features:

- Factory fitted into the corresponding VAV or CAV terminal which saves valuable mounting time at site.
- Low air-side pressure loss.
- Available in 1 to 3 stage control type.
- 230VAC/1-phase or 400VAC/3-phase.

#### Construction:

- Heater element: stainless steel, CrNi (1.4541) 8 mm diameter.
- thermal 'cut-out': bimetal disc thermostat, auto reset (55°C) (optional manual reset 70°C).
- Controls enclosure: galvanized sheet steel.

### Delivery format

#### Delivery format:

- The reheat coils are factory fitted into the corresponding CAV or VAV terminal.
- The connections are located, as standard, on the right hand side of the terminal when looking in the direction of air flow, unless otherwise requested.
- Standard supplied with 12A relays, suitable for control signal of 24VAC, optional solid state relays or thyristor controls are available.

### Specify as:

#### Given:

Reheat coil size 200

Air flow:  $V = 0.122 \text{ m}^3/\text{s}$

Primary (entering) air temperature:

EAT = 15°C

Required supply (leaving) air temperature

LAT = 35°C

#### Requested:

*The capacity of the electric reheat coil?*

#### Calculation:

The required coil capacity can also be calculated using the formula:

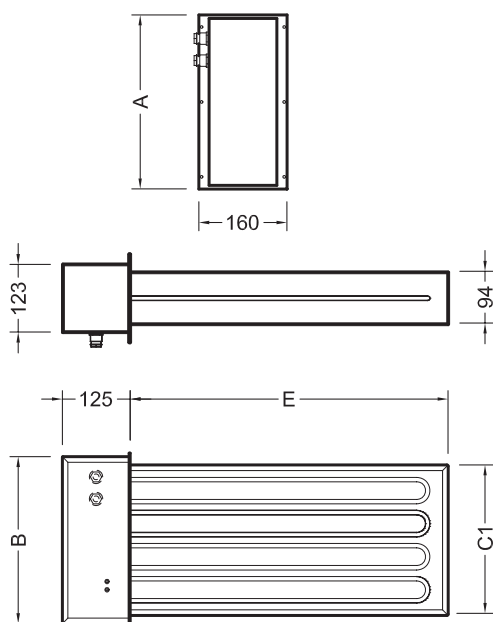
$$P = 1200 \times V \times \Delta T$$

$$P = 1200 \times 0.122 \times 20 = 2928 \text{ W}$$

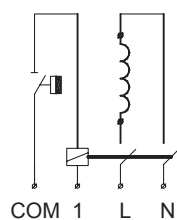
# Electric reheat coil

## Model overview

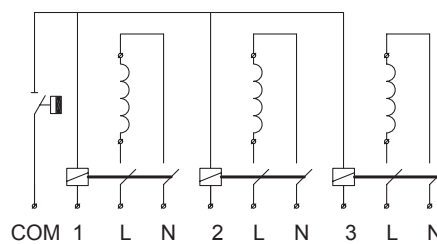
Type *N...E... / N...H...*  
*N...F... / N...J...*  
*N...G...*



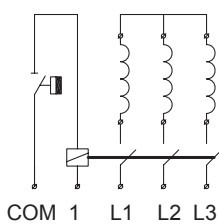
Type NOOO . OO



Wiring diagram, 1-stage, 230VAC/1-phase



Wiring diagram, 3-stage, 230VAC/1-phase



Wiring diagram, 1-stage, 400VAC/3-phase

### Legend:

= clixon

= relais

= coil

COM = common

L 1/2/3 = load

N = neutral

### Dimensions

Model	100	125	160	200	250	315	355	400
A	226	226	246	266	316	406	406	456
B	203	203	203	203	303	303	303	303
C1	183	183	203	223	273	363	363	413
E	307	307	377	477	577	717	797	887

All dimensions are in mm.

# Electric reheat coil

Type *N...E... / N...H...  
N...F... / N...J...  
N...G*

## Selection

53 - 4456 m<sup>3</sup>/h ; 0.5 - 9 KW

Model	Air velocity at inlet	Air volume		temperature increase due to electric reheat coil									
				1phase/230 VAC (maximum 12 A)						3phase/400 VAC (star)			
				0.5 KW	1 KW	1.5 KW	2 KW	2.5 KW	3 KW	4,5 KW	6 KW	9 KW	
m/s	l/s	CFM	m <sup>3</sup> /h	Δ T °C	Δ T °C	Δ T °C	Δ T °C	Δ T °C	Δ T °C	Δ T °C	Δ T °C	Δ T °C	
100	2	15	31	53	28								
	4	29	62	106	14	28							
	6	44	94	160	9	19	28						
	8	59	125	213	7	14	21	28					
	10	74	156	266	6	11	17	22					
125	2	23	49	84	18								
	4	47	99	168	9	18	27						
	6	70	149	253	6	12	18	24					
	8	94	198	337	4	9	13	18					
	10	117	248	421	4	7	11	14					
160	2	39	82	139	11	21	32						
	4	78	164	279	5	11	16	21	27				
	6	116	246	418	4	7	11	14	18	21			
	8	155	328	558	3	5	8	11	13	16			
	10	194	410	697		4	6	9	11	13			
200	2	61	129	219		14	20	27					
	4	122	258	439		7	10	14	17	20			
	6	183	387	658		5	7	9	11	14			
	8	244	516	878		3	5	7	9	10			
	10	305	645	1097		3	4	5	7	8			
250	2	96	203	345			13	17	22	26			
	4	192	406	690			6	9	11	13	19		
	6	288	609	1035			4	6	7	9	13		
	8	383	812	1380			3	4	5	6	10		
	10	479	1015	1725			3	3	4	5	8		
315	2	153	324	550				11	14	16	24		
	4	306	648	1101				5	7	8	12	16	24
	6	459	971	1651				4	5	5	8	11	16
	8	612	1295	2202				3	3	4	6	8	12
	10	764	1619	2752					3	3	5	7	10
355	2	195	412	701				9	11	13	19	26	
	4	389	824	1401				4	5	6	10	13	19
	6	584	1236	2102				3	4	4	6	9	13
	8	779	1649	2803					3	3	5	6	10
	10	973	2061	3503						3	4	5	8
400	2	248	524	891				7	8	10	15	20	30
	4	495	1049	1783				3	4	5	8	10	15
	6	743	1573	2674					3	3	5	7	10
	8	990	2097	3565							4	5	8
	10	1238	2621	4456							3	4	6

1. The maximum recommended supply air temperature is 35°C.  
At this temperature room height, supply air velocity, diffuser type and location has to be taken into account.

2. To calculate the capacity of an electric reheat coil, see selection example on page 73.

3. See price list for standard configurations and capacities.

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# Measuring and control stations for air volume and pressure

Type designation  
(A . . . . .)

## Composition type designation:

**A - E - R - G - O - O - B**

### **A** Position 1: **Product group**

A = accessories

### **E** Position 2: **Function**

- O = not applicable
- E = air volume measuring station
- F = air volume measuring and control station
- H = air volume measuring and pressure control station
- 1 = non standard, specify separately

### **R** Position 3: **Controls (manufacturer)**

- O = not applicable
- P = circular air volume measuring station
- Q = circular measuring and control station
- R = rectangular air volume measuring station
- S = rectangular measuring and control station
- 1 = non standard. specify separately

### **G** Position 4: **Outlet**

- O = not applicable
- G = air straightener
- 1 = non standard, specify separately

### **E** Position 5: **Controls (manufacturer)**

- O = without controls
- For controls, contact our sales staff

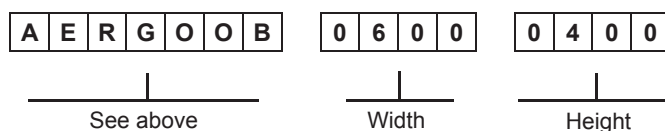
### **O** Position 6: **Controls (type & function)**

- O = without controls
- For controls, contact our sales staff

### **B** Position 7: **Sensor**

- O = not applicable
- B = Flo-Cross® 2 x 12 point averaging and signal amplifying air flow sensor (standard)
- D = Flo-Cross® and static pressure sensor
- L = fully shut-off version
- 1 = non standard, specify separately

### Ordering example:



### Ordering information:

#### Standard terminals:

- quantity of terminals
- complete 7 digit code
- terminal size or model
- air volume setting ( $V_{max}$ ,  $V_{min}$  etc)
- control handing (standard right side)
- installed length (type AEPOOOB)
- supply or return air

#### Non standard terminals:

- for non standard terminals a full description and/or drawing are requested

# Measuring and control stations for air volume and pressure

## The "Air-Trac<sup>®</sup>" system

### Measuring and control stations

The basic functions of airflow control such as: constant air volume, static pressure, supply/return balancing etc. are very simple and straightforward in theory. The practical application of these functions, however, is very difficult due to the small magnitudes of the measuring signals (velocity pressure in most cases).

Most airflow control applications involve 4 stages of control process:

- Sensing the airflow based on a pressure differential signal (velocity pressure produced by an in-duct airflow sensor).
- Transducing and amplifying that signal into a format used by the controller (analogue, pneumatic, DDC, etc.).
- Converting the signal into a proper control relationship by use of a square root extractor to make the control signal linear to air volume.
- Analyzing that control signal and if necessary adjust(reset) the airflow.

The overall accuracy of the control system (loop) is totally dependent on the intrinsic accuracy of each of these components and a small error in the first step will be amplified by the second and so on.

Because a controller can control no better than the signal it receives, HC Barcol-Air developed the Flo-Cross<sup>®</sup> airflow sensor, which provides a highly accurate test signal, averaged over at least 24 test points and amplified by at least 2,5 times (the velocity pressure). This sensor has a proven accuracy of 2,5% even with irregular duct approach.

This accurate signal can be read manually through a pressure-gauge or can be relayed to any building management system to be used to control such functions as: energy management, balancing supply and return air volumes, monitoring and controlling minimum fresh air volumes, tenancy billing by floor or by zone, to provide a reliable accurate reference point for airflow commissioning in VAV systems, etc. The HC Barcol-Air measuring and control station system consist of 3 different standard devices:

- Type AE..... for air flow measuring.
- Type AF..... for air flow measuring and air flow control.
- Type AH..... for air flow measuring and system pressure control.

#### Application example:

The design of your air system is now finished. All duct sizing, air flows and pressure drops have been calculated and the duct work drawings are (almost) finalised.

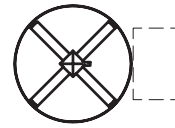
The design is usually based on several safety factors and mean standards of operation. This means that the system may well consume more energy or produce more noise than necessary when installed. Now is the time to look at the plans and introduce a method to ensure that the system can be fully optimised during commissioning at site. By installing HC Barcol-Air measuring and control stations you can confidently control the system at site to the most energy efficient operating levels.

### The "Air-Trac<sup>®</sup>" system

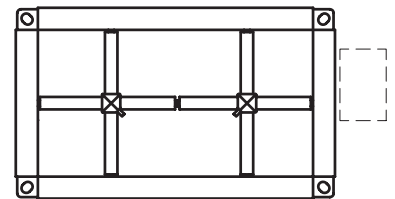
Constant volume systems can be optimised by one time commissioning of manual operated dampers. However, today from an energy point of view, constant volume systems are no longer used in air conditioned buildings. Variable Air Volume or Induction VAV systems in combination with modern Building Management Systems comply with today's energy saving requirements. In order to maximise energy savings under all load conditions it is necessary to monitor and control air flow and pressure during operation. Unfortunately nobody can afford having commissioning engineers working in the building 24 hours a day throughout the buildings life.

### Summary

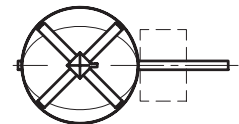
- Complies with today's energy saving requirements. Continuous monitoring and controlling airflow and system pressure to minimise energy consumption 24 hours a day throughout the buildings life.
- Flo-Cross<sup>®</sup>, high accuracy, averaging airflow measuring velocity sensor with 100% repeatability on site measurements.
- Suitable for use with pneumatic, analogue electronic or DDC transmitters/controllers.



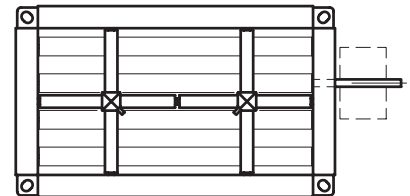
Circular airflow measuring station  
Type AEP....



Rectangular airflow measuring station  
Type AER....

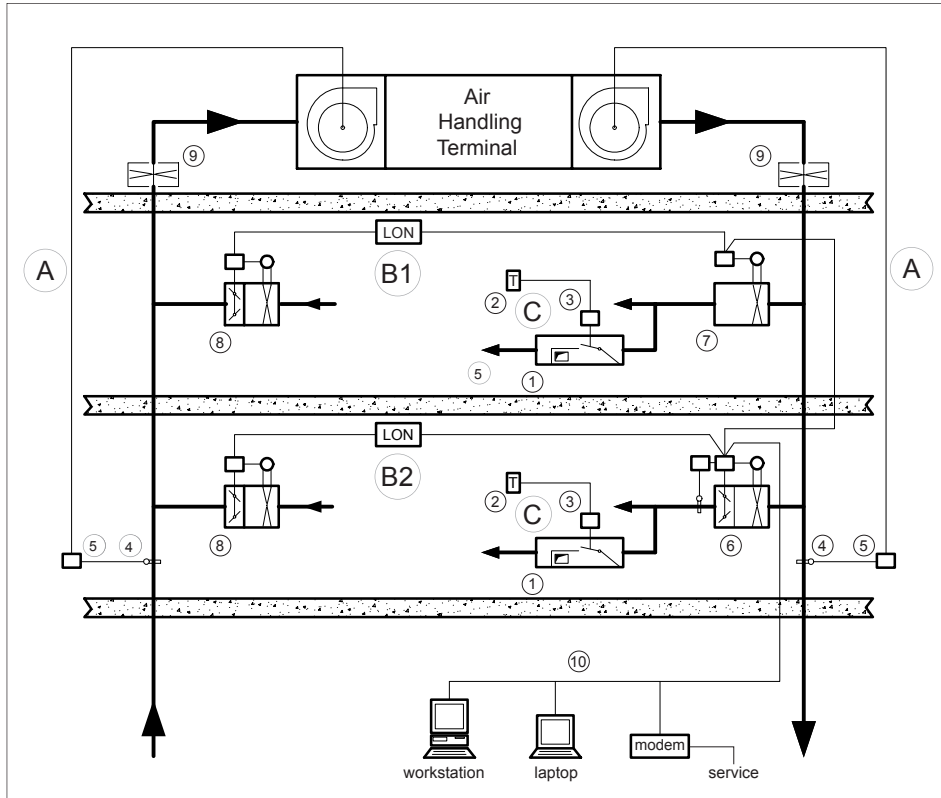


Circular airflow measuring and  
airflow control station  
Type AFQ....



Rectangular airflow measuring  
and airflow control station  
Type AFS...

## Example: VAV system with "Air-Trac®" control



1. VAV terminal
2. Room thermostat
3. VAV controller
4. Duct static pressure sensor
5. Fan speed controller (VFD)
6. Air flow measuring and pressure control station
7. Air flow measuring station
8. Air flow measuring and control station
9. Air flow measuring station
10. Building Management System (BMS)

### Reference list:

1. Air flow measuring station  
 rectangular: Type AER  
 circular: Type AEP
2. Air flow measuring and control station  
 rectangular: Type AFS  
 circular: Type AFQ
3. Air flow measuring and system pressure control station  
 rectangular: Type AHS  
 circular: Type AHQ
4. Variable Air Volume terminal with or without induction  
 without induction:  
 rectangular: Type NK, NL or NS  
 circular: Type NA or NB  
 with induction:  
 rectangular: Type NV
5. Speed controller (BMS) for air handling terminal with inputs for  
 - System pressure  
 - Air volume

### Control description

This type of control is used to prevent air flowing from one room to another. The reason for this can be that the air in one of the rooms is polluted or too hot or too cold.

The pressure in both rooms can be controlled by a difference between supply and return air. Positive (over) pressure is created when the supply air volume is more than the return or exhaust air volume. Negative (under) pressure is created more air is exhausted than supplied.

The "Air-Trac®" system combines these loops to give maximum energy savings under all load conditions.

#### A. Speed control of central AHU:

The supply fan is controlled to keep the required pressure in the riser(s) to a minimum value but still allowing the system to maintain the design room conditions.

The extract fan can be controlled by equalising supply and extract air flows to give the required under / over pressure in the building.

#### B. "Air-Trac®", supply and return air balancing, with or without pressure control

##### B1. without pressure control:

The supply airflow is constantly measured and the extract air flow is matched or controlled to give the required under/over pressure per floor or zone.

##### B2. with pressure control:

The supply duct pressure is controlled to the minimum value that still allows the VAV terminals in this zone to maintain the design room conditions.

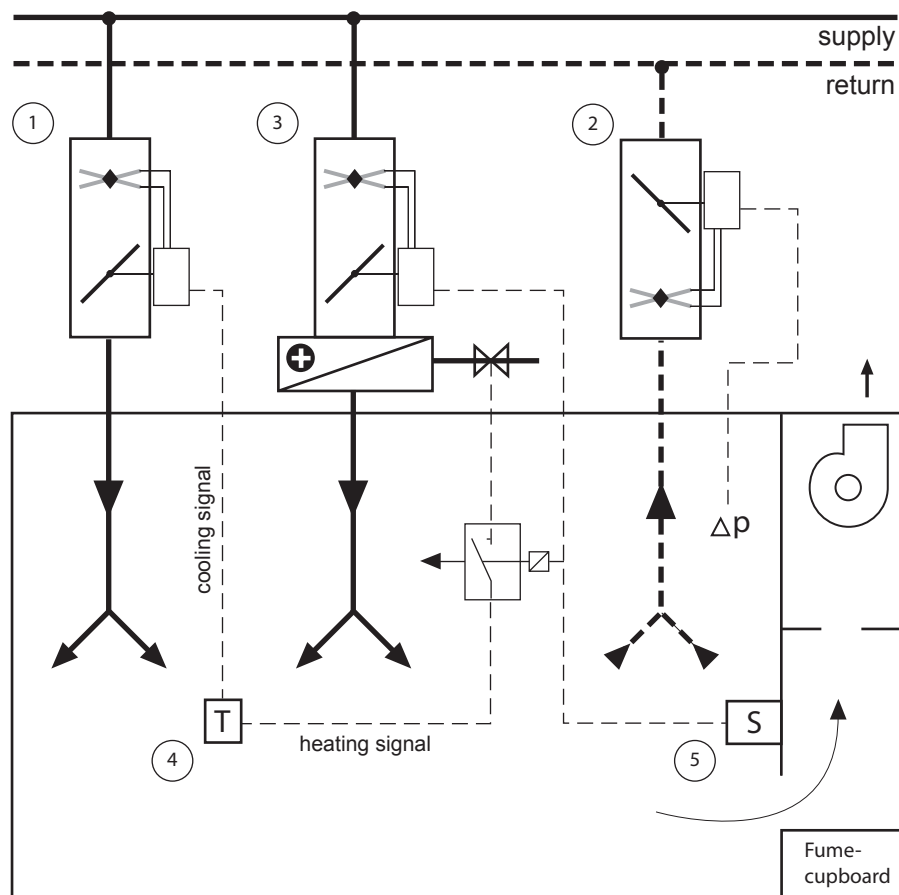
##### C. Room temperature control:

A VAV terminal controls the air volume to the room, depending on the cooling or heating load required thus saving energy consumption.

# Room pressure control for laboratory with fume-cupboard

The "Air-Trac®" system

## Example: Room pressure control for laboratory with fume-cupboard



### Reference list:

1. VAV terminal for room temperature control:
  - rectangular: Type NK, NL or NS
  - circular: Type NA or NB
2. Pressure control station with airflow measuring sensor:
  - rectangular: Type AHS
  - circular: Type AHQ
3. VAV terminal with integral reheat coil for room temperature control:
  - rectangular: Type NK, NL or NS
  - circular: Type NA or NB
4. Room thermostat or room temperature sensor
5. Fan speed switch for fume-cupboard

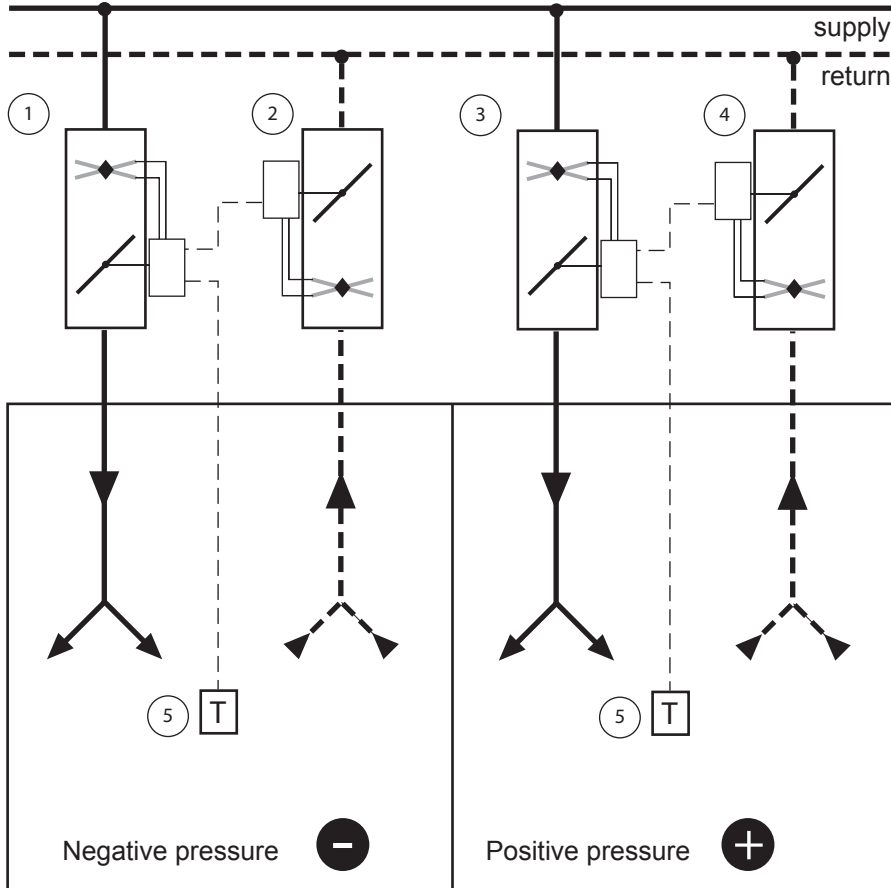
### Control description

Under normal conditions (fume-cupboard switched off), the room temperature is controlled by the VAV controller (1) and room pressure is kept at the required value with pressure control station (2).

When the fume-cupboard is switched on, the supply air must be raised or exhaust air must be lowered, in order to keep the room pressure at the required value. When the airflow, extracted by the fume-cupboard, is too high to be compensated by the pressure controller (2) an additional VAV terminal (3) is necessary to compensate the high extract air volume.

To prevent under cooling the room/laboratory with the high (primary) supply air volume the additional VAV controller can be equipped with a reheat coil.

## Example: “Master-Slave” room pressure control



### Reference list:

1. Supply air VAV terminal (master) for room temperature control  
 rectangular: Type NK or NL  
 circular: Type NA or NB
2. Return air VAV terminal (slave) for room (under) pressure control  
 rectangular: Type NK or NL  
 circular: Type NA or NB
3. Supply air VAV terminal (master) for room temperature control  
 rectangular: Type NK or NL  
 circular: Type NA or NB
4. Return air VAV terminal (slave) for room (over) pressure control  
 rectangular: Type NK or NL  
 circular: Type NA or NB
5. Room thermostat or room temperature sensor

### Control description

This type of control is used to prevent air flowing from one room to another. The reason for this can be that the air in one of the rooms is polluted or too hot or too cold.

The pressure in both rooms can be controlled by a difference between supply and return air. Positive (over) pressure is created when the supply air volume is more than the return or exhaust air volume. Negative (under) pressure is created when more air is exhausted than supplied.

# Circular air volume and pressure measuring and control terminals

## Technical data

Type AEP...B

AFQ...B

AHQ...D



## Application

The type AEP...B circular airflow measuring station is designed for the accurate measurement of airflow in air duct systems courtesy of the patented airflow sensor type Flo-Cross®. This accurate signal can be read manually through a pressure-gauge or can be relayed to any Building Management System to be used to control such functions as: energy management, balancing supply and return air volumes, monitoring and controlling minimum fresh air volumes, tenancy billing by floor or by zone, to provide a reliable accurate reference point for airflow commissioning in VAV systems, etc.

The type AFQ...B circular airflow measuring and airflow control station not only measures (like type AEP...B), it also controls the airflow in air duct systems. These stations are designed to be used for optimum floor/zone balancing purposes by controlling return airflow in accordance to a measured supply airflow.

The type AHQ...D circular airflow measuring and pressure control station is designed to control the supply duct pressure per zone, to a minimum value that still allows the VAV terminals in this zone to function efficiently, reducing operating cost and noise level.

### Features for type AEP, AFQ and AHQ:

- Flo-Cross®, high accuracy, centre-averaging airflow sensor.
- Static measuring device with 100% repeatability on-site measurements.
- Amplified signal, at least 2,5 times, to improve reading accuracy at low air velocity.
- The large number of test points (at least 24) ensures a true average measurement signal.
- Better than 2,5% accuracy even with irregular duct approach.
- Required minimum straight ductwork approach of 1x diameter only.
- Compact design.
- Suitable for large air volumes.
- Low pressure loss over the terminal.
- Low noise production.
- Maintenance free.

## Technical information

### Casing:

Single wall, air-tight construction made of galvanized sheet steel (non spiral); casing leakage rate to Class II VDI 3803 / DIN 24 194. Duct-sleeve connections at the in- and outlet are suitable for DIN 24 145 or DIN 24 146 connections.

### Flo-Cross®:

- Extruded aluminium construction with nylon core + feet.
- Twin test tubes: polyurethane flexible tubes, internal  $\varnothing 4$  mm external  $\varnothing 6$  mm, red high pressure, yellow low pressure.

### Damper (applicable for control stations type AFQ and AHQ):

- Damper blade: made of steel, sandwich construction of twin blade and neoprene gasket (low leakage).
- Damper shaft: aluminium,  $\varnothing 12$  mm with self lubricating Nylon bearings.

### Static pressure sensor (applicable for control station type AHQ):

- Aluminium construction complete with mounting bracket, to be fitted by others in the duct system.

### Controls:

Suitable for use with pneumatic, analogue electronic or DDC controllers. Controls can be factory fitted, wired and calibrated. Controls enclosure (galvanized sheet steel) can be provided optionally.

## Delivery format

### Delivery format:

- Controls location are as a standard fitted on the right hand side of the terminal when looking in the direction of the airflow.
- On request, the terminal can be delivered with connections on the left hand side.
- When terminals are ordered with controls, these will be factory fitted, wired and calibrated upon request.
- When terminals are ordered with 'free-issue' controls by others, wiring diagrams and mounting instructions must be provided.

# Circular air volume and pressure measuring and control terminals

## Technical data

Type AEP . . . B  
 AFQ . . . B  
 AHQ . . . D



### Specify as:

#### Example:

Supply and install circular airflow measuring and pressure control stations constructed from galvanized sheet steel. The casing leakage rate shall be classified according to class II, VDI 3803/DIN 24 194 and the duct-sleeve connections shall be suitable for DIN 24 145 or DIN 24 146 respectively.

The measuring and control station shall have low leakage, sandwich construction and oval shaped damper blade with neoprene gasket and an aluminium damper shaft with self lubricating Nylon bearings.

A centre averaging airflow sensor with at least 2 x 12 test points and amplified signal air flow sensor, type Flo-Cross® shall control the airflow with an accuracy not less than 2.5 %.

The controller shall be I/A Series, DDC controller:

LonMark® compatible, type MNL-V2RVx

or

BACnet® compatible, type MNB-V2 (1 for airflow measuring and 1 for pressure control).

Controls must be factory fitted, wired and calibrated according to the following requirements.

Minimum air volume 60 l/s.

Maximum air volume 250 l/s

Static pressure setting 100 Pa.

Terminal size 200 mm.

Max. pressure loss 38 Pa.

Max. discharge sound index < NC20 (@250Pa Δp).

Max. radiated sound index < NC20 (@250Pa Δp).

Ordering example :

type – model – handing =  
 AHS000D – 200R

Manufacturer: HC Barcol-Air

### Installation Instructions:

The HC Barcol-Air VAV terminals shall be installed using at least two support brackets (DIN-rail or L-profile), with anti-vibration rubber under the terminal. Each of these brackets shall be fixed with two threaded rods to the ceiling slab above.

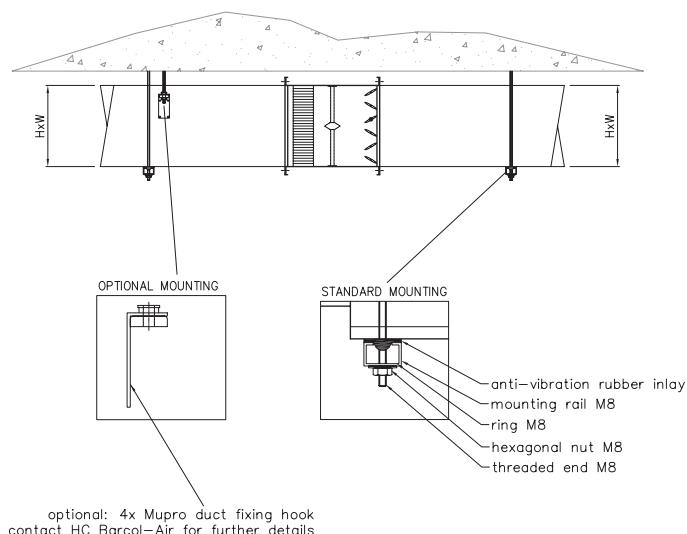
This installation method:

- 1 Shall prevent the body of the VAV terminal from high mechanical tension, which could damage the construction and performance of the terminal.
- 2 Shall prevent torsion on the VAV terminals, which could cause malfunction of the damper blades.
- 3 Provides some flexibility to the final location of the VAV terminals.
- 4 Use at least 1x diagonal straight duct length before the VAV inlet.

- 5 Additional manual volume control dampers (VDC's) before the inlet are not required / recommended!!
6. All connections shall be thermally isolated.
7. Pressure sensing tubes of Flo-Cross® airflow sensor shall not be "kinked" or otherwise obstructed by the external duct insulation.

Installation of circular VAV terminals can be done in a similar way, with the only assumption that two circular support brackets with anti-vibration rubber (installation clamps) instead of DIN-rail or L-profile shall be used. To prevent the VAV terminal from rotation, we recommend to use a complete clamp (support + top bracket), so that the terminal is 'clammed' in between.

Optional 4 x Mupro fixing hooks can be used (see drawing).

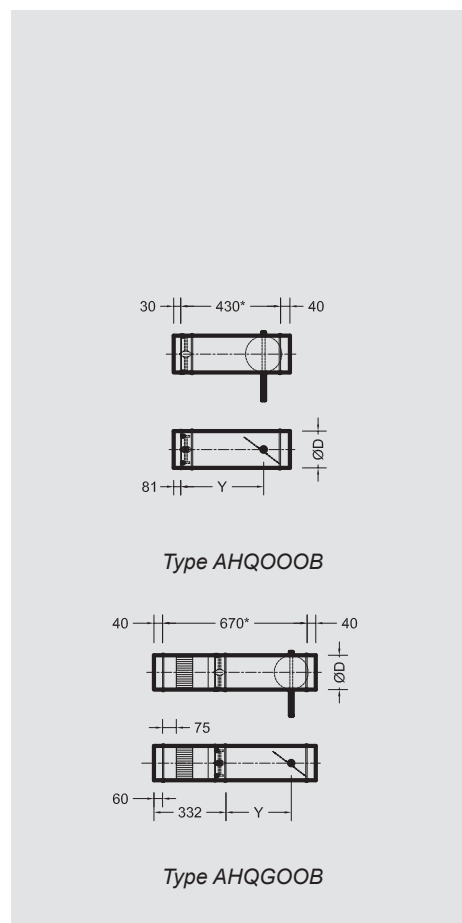
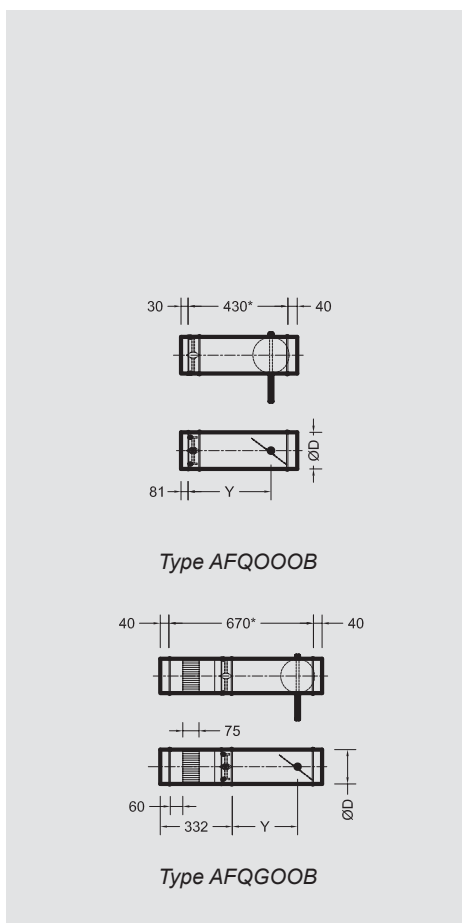
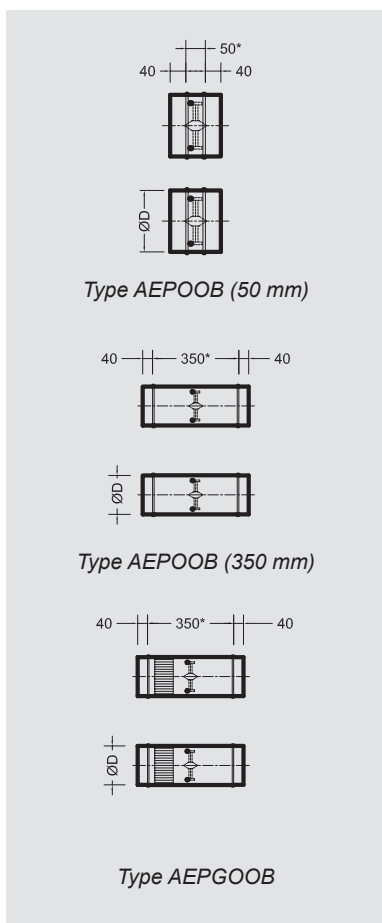
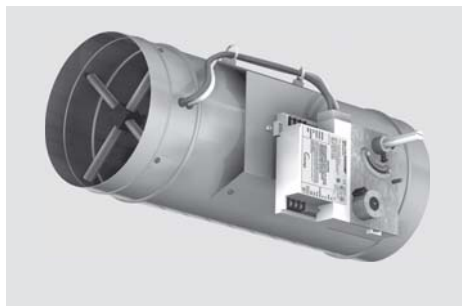




# Circular air volume and pressure measuring and control terminals

## Model overview

Type AEP... B  
 AFQ... B  
 AHQ... D



### Dimensions

Model	100	125	160	200	250	315	355	400
ØD	98	123	158	198	248	313	353	398
Y	304	304	304	294	279	254	239	229

All dimensions are in mm.

\*\*\* Installed length.

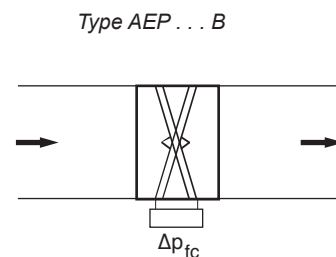
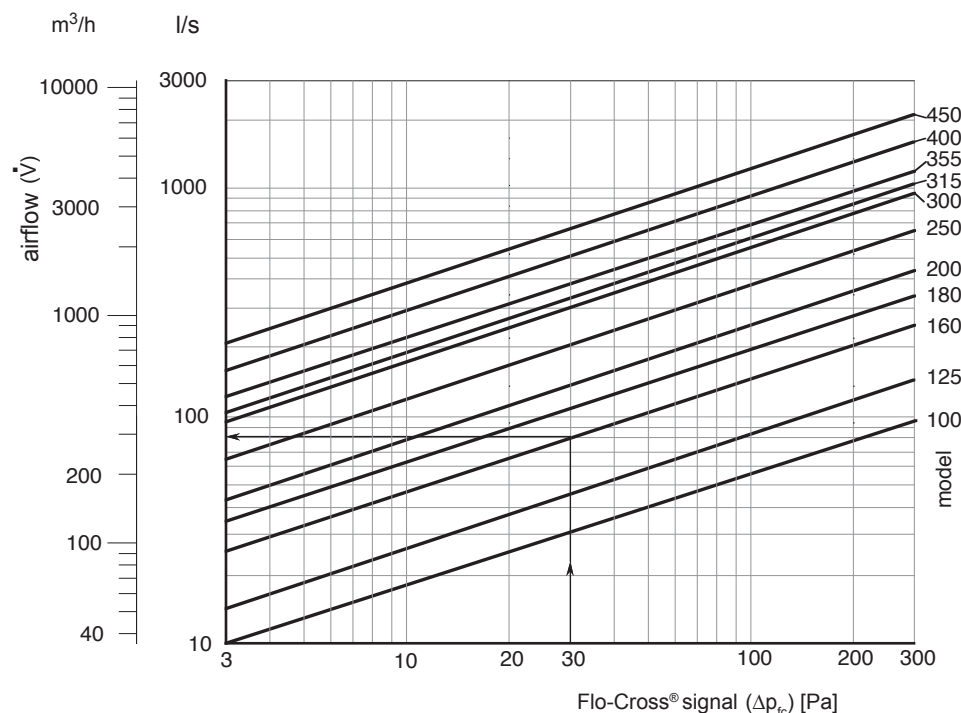
Diameters 500 to 900 mm are available upon request.

# Circular air volume and pressure measuring and control terminals

Type AEP . . . B  
AFQ . . . B  
AHQ . . . D

## Selection graph

### Flow curves, airflow versus $\Delta p$



### Kv values

Model	100	125	160	180	200	250	300	315	355	400	450
Kv [l/s / 1Pa]	5.5	8.5	15.0	20.0	24.9	35.4	54.1	58.9	74.3	92.6	122.3

Interpolation not allowed.

### Example

To be determined the airflow for a terminal size 160 with a pressure differential signal ( $\Delta p_{fc}$ ) of 30 Pa. There are two ways to determine the airflow:

#### Method-1, with use of the selection graph.

Reading off the flow, at  $\Delta p_{fc} = 30$  Pa and terminal size = 160, the result is 82 l/s

#### Method-2, arithmetical determination.

The given Kv value (15.0) must be used in the following formula:

$$V = Kv \sqrt{\Delta p_{fc}} = 15.0 \times \sqrt{30} = 82 \text{ l/s}$$

### Zeta values

Model	100	125	160	180	200	250	300	315	355	400	450
Zeta	0.45	0.73	0.46	0.39	0.38	0.49	0.46	0.46	0.55	0.561	0.61

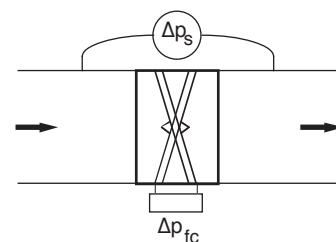
### Example

To be determined the static pressure loss for an terminal size 160 and a velocity of 8 m/s.

The given Zeta value (0.46) must be used in the following formula:

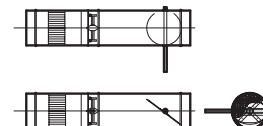
$$p_s = \text{Zeta} \times 0.5 \times \text{Rho}^* \times v^2 = 0.46 \times 0.5 \times 1.2 \times 8^2 = 18 \text{ Pa}$$

\* Rho = Specific density ( $\approx 1.2 \text{ kg/m}^3$  at 20°C and 50% rel. humidity)



# Circular air volume and pressure measuring and control terminals

Type AFQ(G)OOB  
AHQ(G)OOB



Sound data  $\Delta p = 125$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 125$ Pa																	
						discharge sound						radiated sound single wall											
	air volume					L <sub>w</sub> in dB/Oct. (re 1pW)						L <sub>p</sub> values			L <sub>w</sub> in dB/Oct. (re 1pW)						L <sub>p</sub> values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB						dB												
100	2	15	31	53	2	43	44	40	38	34	22	--	--	--	19	-	19	20	23	21	--	--	--
	4	29	62	106	8	49	50	46	44	40	29	24	--	20	26	23	26	27	30	28	--	--	--
	6	44	94	160	17	53	54	51	48	44	34	28	22	24	30	27	30	31	34	32	--	--	--
	8	59	125	213	30	57	58	54	52	49	39	31	26	28	33	30	33	34	37	35	--	--	--
	10	74	156	266	47	59	61	58	55	52	43	34	29	31	35	32	35	36	39	37	--	--	--
125	2	23	49	84	2	40	43	40	39	34	25	--	--	--	28	24	25	22	23	17	--	--	--
	4	47	99	168	7	47	49	46	45	40	31	23	--	--	35	31	32	29	30	24	--	--	--
	6	70	149	253	16	52	54	51	49	44	36	27	21	24	39	35	36	33	34	28	--	--	--
	8	94	198	337	28	56	58	55	53	48	40	31	25	28	42	38	38	35	37	31	21	--	--
	10	117	248	421	44	59	61	58	56	51	44	34	29	31	44	40	41	38	39	33	23	--	--
160	2	39	82	139	2	39	41	40	38	37	32	--	--	--	28	24	25	22	23	18	--	--	--
	4	78	164	279	7	47	48	46	44	41	36	22	--	--	35	31	32	29	30	25	--	--	--
	6	116	246	418	15	52	52	50	49	44	39	26	--	22	39	35	36	33	34	29	--	--	--
	8	155	328	558	26	56	56	54	52	48	42	30	24	26	42	38	38	35	37	31	21	--	--
	10	194	410	697	41	60	60	58	56	51	45	34	28	30	44	40	41	38	39	34	23	--	--
200	2	61	129	219	2	39	34	37	34	30	23	--	--	--	29	24	24	23	23	18	--	--	--
	4	122	258	439	6	48	44	46	42	37	31	20	--	--	36	31	31	29	30	25	--	--	--
	6	183	387	658	14	54	51	52	47	42	36	26	--	20	40	35	35	33	34	29	--	--	--
	8	244	516	878	25	58	55	56	51	46	40	31	23	25	43	38	38	36	37	31	21	--	--
	10	305	645	1097	39	61	59	60	54	50	43	34	27	30	45	40	40	38	39	34	23	--	--
250	2	96	203	345	1	41	43	42	39	34	30	--	--	--	29	24	24	23	23	18	--	--	--
	4	192	406	690	6	50	51	50	45	40	35	25	--	20	36	31	31	29	30	25	--	--	--
	6	288	609	1035	13	56	56	55	50	44	39	30	23	26	40	35	35	33	34	29	--	--	--
	8	383	812	1380	23	60	60	59	53	47	43	34	28	30	43	38	38	36	37	31	21	--	--
	10	479	1015	1725	36	63	63	62	56	50	45	37	32	34	45	40	40	38	39	34	23	--	--
315	2	153	324	550	1	42	45	41	41	38	33	--	--	--	30	24	24	23	23	19	--	--	--
	4	306	648	1101	5	52	52	48	47	43	38	26	--	21	37	31	31	30	30	26	--	--	--
	6	459	971	1651	12	58	57	54	52	48	42	31	24	27	41	35	35	34	34	30	--	--	--
	8	612	1295	2202	22	63	61	58	56	52	46	35	29	31	44	38	38	36	37	32	21	--	--
	10	764	1619	2752	34	67	64	62	59	55	50	39	34	35	46	40	40	39	39	35	23	--	--
355	2	195	412	701	1	42	52	45	45	40	38	24	--	21	30	24	24	23	23	19	--	--	--
	4	389	824	1401	5	53	56	51	50	43	42	29	24	26	37	31	31	30	30	26	--	--	--
	6	584	1236	2102	12	59	60	56	54	46	45	33	28	30	41	35	35	34	34	30	--	--	--
	8	779	1649	2803	21	64	63	60	57	50	48	37	32	33	44	38	38	37	37	33	21	--	--
	10	973	2061	3503	33	68	66	64	61	53	52	41	36	37	46	40	40	39	39	35	24	--	--
400	2	248	524	891	1	43	54	46	46	42	36	26	21	24	30	24	24	23	23	19	--	--	--
	4	495	1049	1783	5	54	58	52	51	45	40	31	26	28	37	31	31	30	30	26	--	--	--
	6	743	1573	2674	11	60	62	57	55	48	43	35	30	32	41	35	35	34	34	30	--	--	--
	8	990	2097	3565	20	65	65	61	58	52	46	39	34	36	44	38	37	37	37	33	21	--	--
	10	1238	2621	4456	32	69	68	65	62	55	50	42	37	39	46	40	40	39	39	35	23	--	--

- Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
- L<sub>w</sub> in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
- The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.

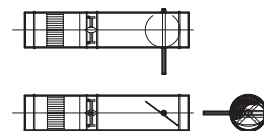
- The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
- L<sub>p</sub> values are including a room absorption of 10 dB/Oct.
- dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
- $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
- For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

# Circular volume and pressure measuring and control terminals

Type AFQ(G)OOB  
AHQ(G)OOB



Sound data  $\Delta p = 250$

Model	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 250$ Pa																		
						discharge sound						radiated sound single wall												
	air volume					L <sub>w</sub> in dB/Oct. (re 1pW)						L <sub>p</sub> values			L <sub>w</sub> in dB/Oct. (re 1pW)						L <sub>p</sub> values			
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	
m/s	l/s	CFM	m <sup>3</sup> /h	Pa						dB						dB								
100	2	15	31	53	2	45	48	45	43	40	29	21	--	--	26	23	26	27	30	28	--	--	--	
	4	29	62	106	8	51	53	51	48	45	35	27	20	23	33	30	33	34	37	35	--	--	--	
	6	44	94	160	17	55	57	54	52	49	40	31	25	27	37	34	37	38	41	39	21	--	--	
	8	59	125	213	30	58	60	57	55	53	44	34	28	31	40	37	40	41	44	42	24	--	22	
	10	74	156	266	47	60	63	60	57	56	47	36	32	33	42	39	42	43	46	44	26	22	24	
125	2	23	49	84	2	43	47	46	43	40	33	20	--	--	35	31	31	28	30	24	--	--	--	
	4	47	99	168	7	50	53	51	49	45	38	26	20	23	41	38	38	35	37	31	20	--	--	
	6	70	149	253	16	54	57	55	53	48	41	30	25	27	45	42	42	39	41	35	24	--	--	
	8	94	198	337	28	58	60	58	56	51	45	34	29	31	48	45	45	42	44	38	27	--	22	
	10	117	248	421	44	61	63	61	58	54	48	37	32	34	50	47	47	44	46	40	29	22	24	
160	2	39	82	139	2	42	47	46	44	43	40	20	--	--	35	31	31	28	30	24	--	--	--	
	4	78	164	279	7	50	53	52	50	47	43	26	20	23	41	38	38	35	37	31	20	--	--	
	6	116	246	418	15	55	57	55	54	50	46	31	24	27	45	42	42	39	41	35	24	--	--	
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	10	194	410	697	41	62	63	61	59	55	50	37	32	33	50	47	47	44	46	40	29	22	24	
200	2	61	129	219	2	43	38	41	39	36	30	--	--	--	36	31	31	29	30	24	--	--	--	
	4	122	258	439	6	52	49	50	47	43	37	24	--	--	43	38	38	36	37	31	21	--	--	
	6	183	387	658	14	57	55	56	51	47	42	30	22	24	47	42	42	40	41	35	25	--	--	
	8	244	516	878	25	61	59	60	55	51	45	34	27	29	50	45	45	43	44	38	28	--	22	
	10	305	645	1097	39	64	63	63	58	54	48	38	31	33	52	47	47	45	46	40	30	22	24	
250	2	96	203	345	1	44	47	46	44	41	37	21	--	--	36	31	31	29	30	24	--	--	--	
	4	192	406	690	6	53	55	54	50	46	42	29	23	25	43	38	38	36	37	31	21	--	--	
	6	288	609	1035	13	59	60	59	54	50	46	34	28	31	47	42	42	40	41	35	25	--	--	
	8	383	812	1380	23	63	64	62	57	53	48	38	33	35	50	45	45	43	44	38	28	--	22	
	10	479	1015	1725	36	66	67	65	60	55	51	41	36	38	52	47	47	45	46	40	30	22	24	
315	2	153	324	550	1	45	50	45	46	45	40	23	--	20	37	31	31	29	30	25	--	--	--	
	4	306	648	1101	5	54	56	52	52	50	44	30	24	26	43	37	38	36	36	32	21	--	--	
	6	459	971	1651	12	60	60	57	56	53	48	34	28	31	47	41	42	40	40	36	25	--	--	
	8	612	1295	2202	22	65	64	61	59	56	51	38	33	34	50	44	44	43	43	39	27	--	21	
	10	764	1619	2752	34	69	67	64	62	59	54	41	36	37	52	46	47	45	45	41	30	21	23	
355	2	195	412	701	1	45	57	50	51	47	47	29	24	27	37	31	31	30	30	26	--	--	--	
	4	389	824	1401	5	55	61	56	55	50	49	33	29	31	44	38	38	37	37	33	21	--	--	
	6	584	1236	2102	12	61	64	60	58	52	51	37	32	34	48	42	42	41	41	37	25	--	--	
	8	779	1649	2803	21	66	66	63	61	55	54	40	35	37	50	45	45	44	44	40	28	--	22	
	10	973	2061	3503	33	70	69	66	64	57	56	43	38	39	53	47	47	46	46	42	30	22	24	
400	2	248	524	891	1	46	59	51	52	49	45	31	27	29	37	31	30	30	30	26	--	--	--	
	4	495	1049	1783	5	56	63	57	56	52	47	35	31	33	44	37	37	37	36	33	21	--	--	
	6	743	1573	2674	11	62	66	61	59	54	49	39	35	36	48	41	41	41	40	37	25	--	--	
	8	990	2097	3565	20	67	68	64	62	57	52	42	38	39	50	44	44	43	43	39	27	--	21	
	10	1238	2621	4456	32	71	71	67	65	59	54	45	41	42	53	46	46	46	45	42	30	21	23	

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2. L<sub>w</sub> in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
3. The discharge sound pressure levels are determined with the assumptions as mentioned in table 1 for downstream ductwork including a diffuser with insulated plenum box.

4. The radiated sound pressure levels are determined with the assumptions as mentioned in table 1 for ceiling plenum and suspended ceiling absorption.
5. L<sub>p</sub> values are including a room absorption of 10 dB/Oct.
6. dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1K	2K	4K
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

# Rectangular air volume and pressure measuring and control terminals

## Technical data

Type AER . . . B

AFS . . . B

AHS . . . D



## Application

The type AER...B rectangular airflow measuring station is designed for the accurate measurement of airflow in air duct systems courtesy of the patented airflow sensor type Flo-Cross®. This accurate signal can be read manually through a pressure-gauge or can be relayed to any building management system to be used to control such functions as: energy management, balancing supply and return air volumes, monitoring and controlling minimum fresh air volumes, tenancy billing by floor or by zone, to provide a reliable accurate reference point for airflow commissioning in VAV systems, etc.

The type AFS...B rectangular airflow measuring and airflow control station not only measures (like type AER...B), it also controls the airflow in air duct systems. These stations are designed to be used for optimum floor/zone balancing purposes by controlling return airflow in accordance to a measured supply airflow.

The type AHS...D rectangular airflow measuring and pressure control station is designed to control the supply duct pressure per zone, to a minimum value that still allows the VAV terminals in this zone to function efficiently, reducing operating cost and noise level.

### Features for type AER, AFS and AHS:

- Flo-Cross®, high accuracy, centre-averaging airflow sensor.
- Static measuring device with 100% repeatability on-site measurements.
- Amplified signal, at least 2,5 times, to improve reading accuracy at low air velocity.
- The large number of test points (at least 24) and their positioning according to the "Tchebycheff rule" ensures a true average measurement signal.
- Better than 2,5% accuracy even with irregular duct approach.
- Required minimum straight ductwork approach of 1x diameter only.
- Compact design.
- Suitable for large air volumes.
- Low pressure loss over the terminal.
- Low noise production.
- Maintenance free.

### Additional features for type AFS and AHS:

- Multi-leaf damper blade; full shut-off optional.

## Technical information

### Casing:

- Single wall, air-tight construction made of galvanized sheet steel; casing leakage rate to Class II VDI 3803 / DIN 24 194.
- 30 mm flange connections at the in- and outlet.
- With turbulent oncoming airflow an air straightener type A..G... is recommended (free area 98%, aluminium construction).

### Flo-Cross®:

- Extruded aluminium construction with nylon core + feet.
- Twin test tubes: polyurethane flexible tubes, internal  $\varnothing 4$  mm external  $\varnothing 6$  mm, red high pressure, yellow low pressure.

### Damper (applicable for control stations type AFS and AHS):

- Damper blades: aluminium, aerofoil 50 mm opposed blade construction with external linkage.
- Blades can be provided with neoprene gasket (optional) for full shut-off function.
- Damper shaft: steel,  $\varnothing 10$  mm rotating in self lubricating Nylon bearings.

### Static pressure sensor (applicable for control station type AHS):

- Aluminium construction complete with mounting bracket, to be fitted by others in the duct system.

### Controls:

Suitable for use with pneumatic, analogue electronic or DDC controllers. Controls can be factory fitted, wired and calibrated. Controls enclosure (galvanized sheet steel) can be provided optionally.

## Delivery format

### Delivery format:

- Controls location are as a standard fitted on the right hand side of the terminal when looking in the direction of the airflow.
- On request, the terminal can be delivered with connections on the left hand side.
- When terminals are ordered with controls, these will be factory fitted, wired and calibrated upon request.
- When terminals are ordered with 'free-issue' controls by others, wiring diagrams and mounting instructions must be provided.

# Rectangular air volume and pressure measuring and control terminals

*Technical data*  
 Type AER... B  
 AFS... B  
 AHS... D



## Specify as:

### Example:

Supply and install rectangular airflow measuring and pressure control stations constructed from galvanized sheet steel. The casing leakage rate shall be classified according to class II, VDI 3803/DIN 24 194 and the inlet and outlet shall be provided with 30 mm flange connections. The measuring and control station shall have a multi-leaf opposed blade damper with steel damper shaft rotating in self lubricating Nylon bearings. A centre averaging airflow sensor with at least 2 x 12 test points and amplified signal air flow sensor, type Flo-Cross® shall control the airflow with an accuracy not less than 2.5%.

The controller shall be I/A Series, DDC controller:  
 LonMark® compatible, type MNL-V2RVx  
 or  
 BACnet® compatible, type MNB-V2 (1 for airflow measuring and 1 for pressure control).

Controls must be factory fitted, wired and calibrated according to the following requirements.

Maximum air volume 1280 l/s.  
 Minimum air volume 512 l/s.  
 Static pressure setting 100 Pa.  
 Terminal size 400 x 400 mm.  
 Max. pressure loss 38 Pa.  
 Max. discharge sound index < NC20 (@250Pa Δp).  
 Max. radiated sound index < NC20 (@250Pa Δp).

Ordering example : type – model – handing =  
 AHS000D – 0400 - 0400

Manufacturer: HC Barcol-Air

## Installation Instructions:

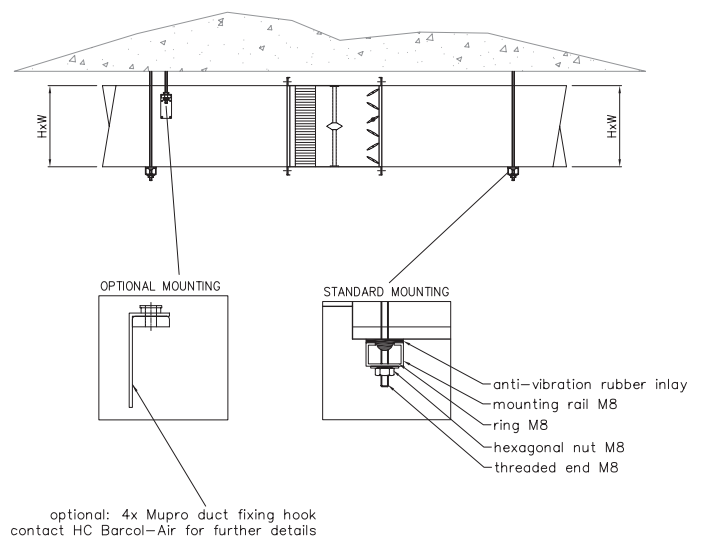
The HC Barcol-Air “Air-Trac®” terminals shall be installed using at least two support brackets (DIN-rail or L-profile), with anti-vibration rubber under the terminal. Each of these brackets shall be fixed with two threaded rods to the ceiling slab above.

This installation method:

- 1 Shall prevent the body of the “Air-Trac®” terminal from high mechanical tension, which could damage the construction and performance of the terminal.
- 2 Shall prevent torsion on the “Air-Trac®” terminals, which could cause malfunction of the damper blades.
- 3 Provides some flexibility to the final location of the “Air-Trac®” terminals.

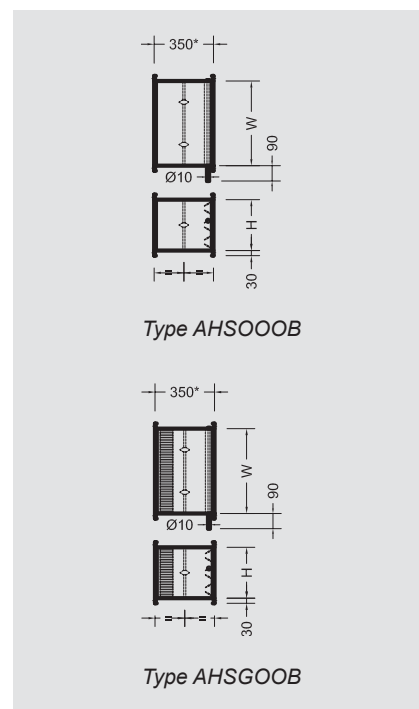
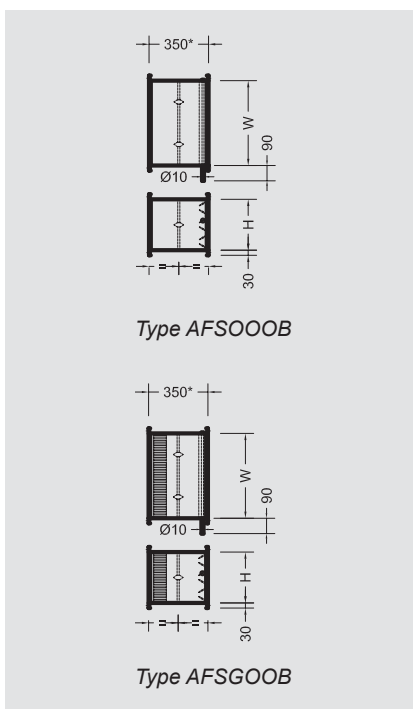
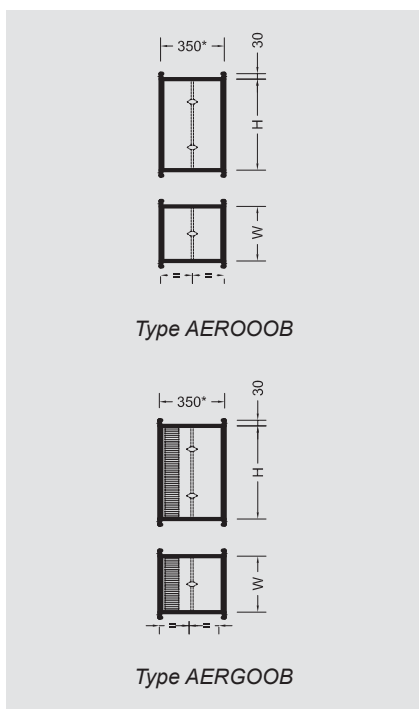
- 4 Use at least 1x diagonal straight duct length before the “Air-Trac®” inlet.
- 5 Additional manual volume control dampers (VDC’s) before the inlet are not required / recommended!!
6. All connections shall be thermally isolated.
7. Pressure sensing tubes of Flo-Cross® airflow sensor shall not be “kinked” or otherwise obstructed by the external duct insulation.

Optional 4 x Mupro fixing hooks can be used (see drawing).



# Rectangular air volume and pressure measuring and control terminals

Model overview  
 Type AER... B  
 AFS... B  
 AHS... D



## Dimensions

Height (H)	Width (W)											
	200	250	300	350	400	450	500	550	600	700	750	800
150	•	•	•	•	•	•	•	•	•	•	•	•
200	•	•	•	•	•	•	•	•	•	•	•	•
250		•	•	•	•	•	•	•	•	•	•	•
300			•	•	•	•	•	•	•	•	•	•
350				•	•	•	•	•	•	•	•	•
400					•	•	•	•	•	•	•	•
450						•	•	•	•	•	•	•
500							•	•	•	•	•	•
550								•	•	•	•	•
600									•	•	•	•

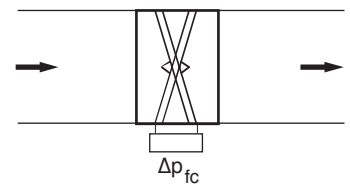
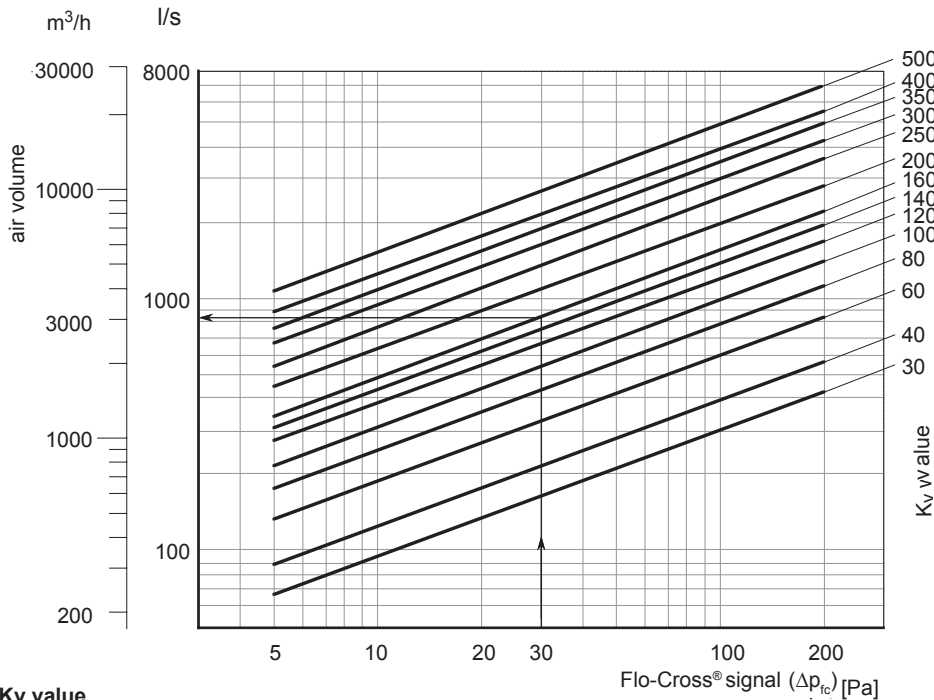
All dimensions are in mm.  
 \*\*\* Installed length



# Rectangular air volume measuring and control terminals

Type AER... B  
AFS... B  
AHS... D

## Selection graph



## Kv value

Height (H)	Width (W)												
	200	250	300	350	400	450	500	600	700	750	800	900	1000
150	25	31	36	43	51	54	61	72					
200	34	44	51	60	68	78	88	103	122	132	137		
250		49	60	72	88	100	98	121	156	146	158	181	195
300			72	85	99	113	121	143	171	185	198	215	243
350				97	113	129	143	171	195	211	227	256	288
400					126	144	162	198	227	245	251	287	324
450						164	185	226	259	279	287	329	371
500							208	241	291	314	324	371	417
600								287	342	369	397	454	510

Other dimensions available upon request (interpolation not allowed)

## Example

To be determined the airflow for a terminal size 450 x 450 with a pressure differential signal (Δp<sub>fc</sub>) of 30 Pa. There are two ways to determine the airflow:

### Method-1, with use of the Kv and the selection graph.

The Kv value from the table above is 164, reading off the flow, at Δp<sub>fc</sub> = 30 Pa; the result is 870 l/s (or 3130 m<sup>3</sup>/h)

### Method-2, arithmetical determination.

The given Kv value (164) must be used in the following formula:

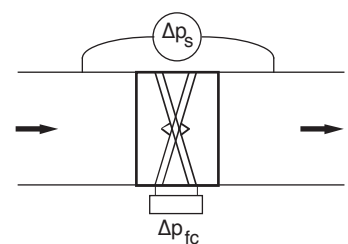
$$V = K_v \sqrt{\Delta p_{fc}} = 164 \times \sqrt{30} = 898 \text{ l/s}$$

## Zeta values

To be determined the static pressure loss for a rectangular airflow measuring station at a velocity of 8 m/s. The average Zeta value of these airflow stations is approximately 0,40. The given Zeta value must be used in the following formula:

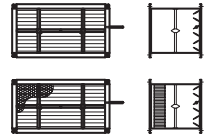
$$p_s = \text{Zeta} \times 0.5 \times \text{Rho} \times v^2 = 0.40 \times 0.5 \times 1.2 \times 8^2 = 13 \text{ Pa}$$

\* Rho = Specific density (≈ 1.2 kg/m<sup>3</sup> at 20°C and 50% rel. humidity)



# Rectangular air volume and pressure measuring and control terminals

Type AFS(G)OOB  
AHS(G)OOB



## Sound data $\Delta p = 125 \text{ Pa}$

Size (W x H)	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 125 \text{ Pa}$																	
						discharge sound						radiated sound single wall											
	velocity	air volume				$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
						dB									dB								
m/s	l/s	CFM	m <sup>3</sup> /h	Pa																			
350 x 300 (DN 355)	2	210	445	756	1	47	48	43	27	30	22	21	--	--	33	32	26	-	-	-	--	--	--
	4	420	889	1512	6	57	60	56	45	44	37	33	28	30	43	44	39	31	28	29	23	--	--
	6	630	1334	2268	13	59	62	58	49	48	41	35	31	33	45	46	41	35	32	33	25	--	21
	8	840	1779	3024	23	58	61	55	47	47	41	33	29	31	44	45	38	33	31	33	23	--	--
	10	1050	2224	3780	35	60	60	54	47	49	42	34	29	31	46	44	37	33	33	34	23	--	--
350 x 350 (DN 400)	2	245	519	882	1	48	48	43	28	30	23	22	--	--	34	32	26	-	-	-	--	--	--
	4	490	1038	1764	6	58	61	57	46	45	38	34	29	31	44	45	40	32	29	30	23	--	--
	6	735	1556	2646	13	60	63	59	49	48	42	36	31	33	46	47	42	35	32	34	25	--	21
	8	980	2075	3528	23	58	61	56	48	47	41	34	30	32	44	45	39	34	31	33	24	--	--
	10	1225	2594	4410	35	61	61	55	48	50	43	34	29	31	47	45	38	34	34	35	24	--	--
400 x 400 (DN 450)	2	320	678	1152	1	49	50	44	29	31	24	23	--	--	35	34	27	-	-	-	--	--	--
	4	640	1355	2304	6	59	62	58	47	46	39	35	30	32	45	46	41	33	30	31	25	--	20
	6	960	2033	3456	13	61	64	60	51	50	43	37	33	35	47	48	43	37	34	35	27	--	23
	8	1280	2711	4608	23	60	63	57	49	49	43	35	31	33	46	47	40	35	33	35	25	--	21
	10	1600	3388	5760	35	62	62	56	49	51	44	36	31	33	48	46	39	35	35	36	25	--	21
500 x 400 (DN 500) ( $L_{pA(0,2)}$ )	2	400	847	1440	1	49	50	45	30	32	25	23	--	--	35	34	28	-	-	-	--	--	--
	4	800	1694	2880	6	59	62	59	48	47	40	35	30	32	45	46	42	34	31	32	25	--	20
	6	1200	2541	4320	13	61	64	60	52	50	44	37	33	35	47	48	43	38	34	36	27	--	23
	8	1600	3388	5760	23	60	63	57	50	50	44	35	31	33	46	47	40	36	34	36	25	--	21
	10	2000	4235	7200	35	62	62	57	50	52	45	36	31	33	48	46	40	36	36	37	25	--	21
600 x 400 (DN 560)	2	480	1016	1728	1	49	50	45	31	33	26	23	--	--	35	34	28	-	17	17	--	--	--
	4	960	2033	3456	6	59	62	59	49	48	41	35	30	32	45	46	42	35	32	33	25	--	20
	6	1440	3049	5184	13	61	64	60	52	51	45	37	33	35	47	48	43	38	35	37	27	--	23
	8	1920	4066	6912	23	60	63	58	51	50	44	35	31	33	46	47	41	37	34	36	25	--	21
	10	2400	5082	8640	35	62	62	57	51	53	46	36	31	33	48	46	40	37	37	38	26	--	21
800 x 400 (DN 630)	2	640	1355	2304	1	49	50	46	32	34	27	23	--	--	35	34	29	18	18	19	--	--	--
	4	1280	2711	4608	6	59	62	59	50	49	42	35	30	32	45	46	42	36	33	34	25	--	20
	6	1920	4066	6912	13	61	64	61	54	53	46	37	33	35	47	48	44	40	37	38	27	--	23
	8	2560	5421	9216	23	60	63	58	52	52	46	35	31	33	46	47	41	38	36	38	25	--	21
	10	3200	6776	11520	35	62	62	57	52	54	47	36	31	33	48	46	40	38	38	39	26	--	21
900 x 450 (DN 710)	2	810	1715	2916	1	49	50	46	33	35	28	23	--	--	35	34	29	19	19	20	--	--	--
	4	1620	3431	5832	6	59	62	60	51	50	43	35	30	32	45	46	43	37	34	35	25	--	20
	6	2430	5146	8748	13	61	64	61	55	54	47	37	33	35	47	48	44	41	38	39	27	--	23
	8	3240	6861	11664	23	60	63	59	53	53	47	35	31	33	46	47	42	39	37	39	26	--	21
	10	4050	8576	14580	35	62	62	58	53	55	48	36	31	33	48	46	41	39	39	40	26	--	21

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2.  $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
3. The discharge sound pressure levels are determined with the assumptions as referred to in table 1 for downstream ductwork including a diffuser with insulated plenum box.

4. The radiated sound pressure levels are determined with the assumptions as referred to in table 1 for ceiling plenum and suspended ceiling absorption.
5. Lp values are including a room absorption of 10 dB/Oct.
6. dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

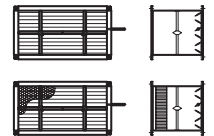
Hz	125	250	500	1000	2000	4000
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Correction table for other unit sizes:  $L_{pA}' = L_{pA(0,2)} + \Delta L_{pA}$

WxH (m <sup>2</sup> )	0,03	0,04	0,05	0,06	0,07	0,08	0,10	0,12	0,14	0,16	0,18	0,20	0,25	0,30	0,40	0,50	0,60
$\Delta L_{pA}$ (dB)	-7	-6	-5	-4	-4	-3	-2	-1	-1	-1	0	0	0	1	1	1	2

# Rectangular air volume and pressure measuring and control terminals

Type AFS(G)OOB  
AHS(G)OOB



## Sound data $\Delta p = 250$ Pa

Size (W x H)	data referring to inlet spigot				min. $\Delta p_s$	$\Delta p = 250$ Pa																	
						discharge sound						radiated sound single wall											
	velocity		air volume			$L_w$ in dB/Oct. (re 1pW)						Lp values			$L_w$ in dB/Oct. (re 1pW)						Lp values		
						125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	dB(A)	NC	NR
m/s	l/s	CFM	m <sup>3</sup> /h	Pa	dB									dB									
350 x 300 (DN 355)	2	210	445	756	1	49	50	46	31	32	25	24	--	--	35	34	29	-	-	-	--	--	--
	4	420	889	1512	6	59	62	59	49	47	39	35	31	33	45	46	42	35	31	31	25	--	21
	6	630	1334	2268	13	66	70	68	60	56	49	43	40	41	52	54	51	46	40	41	33	27	29
	8	840	1779	3024	23	67	71	69	62	58	51	44	41	42	53	55	52	48	42	43	34	28	31
	10	1050	2224	3780	35	66	70	67	61	58	51	43	40	41	52	54	50	47	42	43	33	27	29
350 x 350 (DN 400)	2	245	519	882	1	50	51	47	32	33	25	24	--	21	36	35	30	18	17	17	--	--	--
	4	490	1038	1764	6	60	63	60	49	48	40	36	32	33	46	47	43	35	32	32	26	--	22
	6	735	1556	2646	13	67	71	69	61	57	50	44	41	42	53	55	52	47	41	42	34	28	30
	8	980	2075	3528	23	68	72	70	63	59	52	45	42	43	54	56	53	49	43	44	35	29	31
	10	1225	2594	4410	35	67	71	68	61	58	52	44	41	42	53	55	51	47	42	44	34	28	30
400 x 400 (DN 450)	2	320	678	1152	1	51	52	48	33	34	26	25	--	22	37	36	31	19	18	18	--	--	--
	4	640	1355	2304	6	61	64	61	50	49	41	37	33	35	47	48	44	36	33	33	27	--	23
	6	960	2033	3456	13	68	72	70	62	58	51	45	42	43	54	56	53	48	42	43	35	29	31
	8	1280	2711	4608	23	69	73	71	64	60	53	46	44	44	55	57	54	50	44	45	36	31	33
	10	1600	3388	5760	35	68	72	69	63	59	53	45	42	43	54	56	52	49	43	45	35	29	31
500 x 400 (DN 500) ( $L_{pA(0,2)}$ )	2	400	847	1440	1	51	52	48	34	35	27	25	--	22	37	36	31	20	19	19	--	--	--
	4	800	1694	2880	6	61	64	61	51	50	42	37	33	35	47	48	44	37	34	34	27	--	23
	6	1200	2541	4320	13	68	72	71	63	59	52	45	42	43	54	56	54	49	43	44	36	29	31
	8	1600	3388	5760	23	69	73	71	65	61	54	46	44	44	55	57	54	51	45	46	36	31	33
	10	2000	4235	7200	35	68	72	69	64	60	54	45	42	43	54	56	52	50	44	46	35	29	31
600 x 400 (DN 560)	2	480	1016	1728	1	51	52	49	35	36	28	25	--	22	37	36	32	21	20	20	--	--	--
	4	960	2033	3456	6	61	64	62	52	50	43	37	33	35	47	48	45	38	34	35	27	--	23
	6	1440	3049	5184	13	68	72	71	64	60	53	45	42	43	54	56	54	50	44	45	36	29	31
	8	1920	4066	6912	23	69	73	71	66	62	55	46	44	44	55	57	54	52	46	47	37	31	33
	10	2400	5082	8640	35	68	72	69	64	61	55	45	42	43	54	56	52	50	45	47	35	29	31
800 x 400 (DN 630)	2	640	1355	2304	1	51	52	49	36	37	29	26	--	22	37	36	32	22	21	21	--	--	--
	4	1280	2711	4608	6	61	64	62	53	52	44	37	33	35	47	48	45	39	36	36	28	--	23
	6	1920	4066	6912	13	68	72	71	65	61	54	45	42	43	54	56	54	51	45	46	36	29	31
	8	2560	5421	9216	23	69	73	72	67	63	56	46	44	44	55	57	55	53	47	48	37	31	33
	10	3200	6776	11520	35	68	72	70	66	62	56	45	42	43	54	56	53	52	46	48	36	29	31
900 x 450 (DN 710)	2	810	1715	2916	1	51	52	49	37	38	30	26	--	22	37	36	32	23	22	22	--	--	--
	4	1620	3431	5832	6	61	64	63	54	53	45	37	33	35	47	48	46	40	37	37	28	--	23
	6	2430	5146	8748	13	68	72	72	66	62	55	45	42	43	54	56	55	52	46	47	36	29	31
	8	3240	6861	11664	23	69	73	72	68	64	57	46	44	44	55	57	55	54	48	49	37	31	33
	10	4050	8576	14580	35	68	72	70	67	64	57	45	42	43	54	56	53	53	48	49	36	29	31

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2.  $L_w$  in dB/Oct. (re 1pW) are sound power levels for discharge sound and case radiated sound. Figures less than 17 dB are indicated by "--".
3. The discharge sound pressure levels are determined with the assumptions as referred to in table 1 for downstream ductwork including a diffuser with insulated plenum box.

4. The radiated sound pressure levels are determined with the assumptions as referred to in table 1 for ceiling plenum and suspended ceiling absorption.
5. Lp values are including a room absorption of 10 dB/Oct.
6. dB(A), NC and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
7.  $\Delta p_s$  is static pressure drop across VAV air volume control terminal with damper fully open.
8. For non standard applications and/or selections, please contact our technical staff.

Table 1: Assumptions for additional attenuation

Hz	125	250	500	1000	2000	4000
Discharge (dB)	5	10	20	30	30	25
Radiated (dB)	2	5	10	15	15	20

Table 2: Correction table for other unit sizes:  $L_{pA}' = L_{pA(0,2)} + \Delta L_{pA}$

WxH (m <sup>2</sup> )	0,03	0,04	0,05	0,06	0,07	0,08	0,10	0,12	0,14	0,16	0,18	0,20	0,25	0,30	0,40	0,50	0,60
$\Delta L_{pA}$ (dB)	-7	-6	-5	-4	-4	-3	-2	-1	-1	-1	0	0	0	1	1	1	2



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