# Measuring and control stations

for air volume and pressure

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</table>
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:

A E R G O O B 0 6 0 0 0 4 0 0

See above
Width
Height

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 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® 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®” 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 todays 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®, high accuracy, averaging airflow measuring velocity sensor with 100% repeatability on site measurements.
- Suitable for use with pneumatic, analogue electronic or DDC transmitters/controllers.
Supply and extract air flow balancing

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 airflow 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.

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
Room pressure control for laboratory with fume-cupboard

Example: Room pressure control for laboratory with fume-cupboard

The “Air-Trac®” system

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.

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
**“Master-Slave” room pressure control**

The “Air-Trac®” system

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

- **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.

- **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
Circular air volume and pressure measuring and control terminals

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 ø4 mm external ø6 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, ø12 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

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 = AHSOOOD – 200R
Manufacturer: HC Barcol-Air

Installation Instructions:

The HC Barcol-Air VAV terminals shall be installed using at least two circular support brackets, with anti-vibration rubber under the terminal. Each of these bracket(installations clamps) 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).

Technical data
Type AEP ... B
AFQ ... B
AHQ ... D

HC Barcol-Air - 2012 / 2
Changes w/o notice or obligation.
Circular air volume and pressure measuring and control terminals

Model overview
Type AEP . . . B
AFQ . . . B
AHQ . . . D

Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>100</th>
<th>125</th>
<th>160</th>
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<td>294</td>
<td>279</td>
<td>254</td>
<td>239</td>
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</table>

Diameters 500 to 900 mm are available upon request.

All dimensions are in mm.

*** Installed length.
Circular air volume and pressure measuring and control terminals

Selection graph

Flow curves, airflow versus Δp

![Flow curves diagram](attachment:flow_curves.png)

<table>
<thead>
<tr>
<th>Model</th>
<th>100</th>
<th>125</th>
<th>160</th>
<th>180</th>
<th>200</th>
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<tr>
<td>Kv [l/s / 1Pa]</td>
<td>5.5</td>
<td>8.5</td>
<td>15.0</td>
<td>20.0</td>
<td>24.9</td>
<td>35.4</td>
<td>54.1</td>
<td>58.9</td>
<td>74.3</td>
<td>92.6</td>
<td>122.3</td>
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</table>

Interpolation not allowed.

Example
To be determined the airflow for a terminal size 160 with a pressure differential signal (Δp_{pc}) of 30 Pa.

There are two ways to determine the airflow:

**Method-1, with use of the selection graph.**
Reading off the flow, at Δp_{pc} = 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:

\[
V = Kv \sqrt{\Delta p_{pc}} = 15.0 \times \sqrt{30} = 82 \text{ l/s}
\]

Zeta values

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<th>Model</th>
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<td>Zeta</td>
<td>0.45</td>
<td>0.73</td>
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<td>0.46</td>
<td>0.55</td>
<td>0.561</td>
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</table>

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:

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

* Rho = Specific density (= 1.2 kg/m³ at 20°C and 50% rel. humidity)
Circular air volume and pressure measuring and control terminals

<table>
<thead>
<tr>
<th>Model</th>
<th>data referring to inlet spigot</th>
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<th>radiated sound single wall</th>
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<td>Lₚ in dB/Oct. (re 1pW)</td>
<td>Lₚ in dB/Oct. (re 1pW)</td>
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<tr>
<td></td>
<td>min. ∆Pₕ</td>
<td>125 Hz</td>
<td>250 Hz</td>
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<td>∆Pₕ</td>
<td>m/s</td>
<td>l/s</td>
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1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2. Lw 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. ∆ps 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>
<thead>
<tr>
<th>Type</th>
<th>AFQ(G)OOB</th>
<th>AHQ(G)OOB</th>
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</table>

<table>
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<th>125</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
<th>dB(A)</th>
<th>NC</th>
<th>NR</th>
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<td>10</td>
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<td>30</td>
<td>30</td>
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<td>15</td>
<td>15</td>
<td>20</td>
<td>20</td>
<td>25</td>
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<td>----</td>
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</table>
### Circular volume and pressure measuring and control terminals

**Type AFQ(G)OOB**

**AHQ(G)OOB**

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Discharge sound</th>
<th>Radiated sound single wall</th>
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<tr>
<td></td>
<td>$L_p$ in dB/Oct. (re 1pW)</td>
<td>$L_p$ values</td>
</tr>
<tr>
<td></td>
<td>125 Hz</td>
<td>250 Hz</td>
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<tr>
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<td>125</td>
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<tr>
<td>160</td>
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#### Table 1: Assumptions for additional attenuation

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<th>Hz</th>
<th>125</th>
<th>250</th>
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<th>1K</th>
<th>2K</th>
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<tbody>
<tr>
<td>Discharge (dB)</td>
<td>9</td>
<td>10</td>
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<td>30</td>
<td>39</td>
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</tr>
<tr>
<td>Radiated (dB)</td>
<td>2</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>22</td>
<td>20</td>
</tr>
</tbody>
</table>

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. $L_p$ values are including a room absorption of 0.1 dB/Oct.
6. $L_p$, NC, and NR index figures are sound pressure levels. Figures less than 20 are indicated by "--".
7. $\Delta p$ 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.
Rectangular air volume and pressure measuring and control terminals

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.

Technical information

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

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 ø4 mm external ø6 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, ø10 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.

Additional features for type AFS and AHS:
- Multi-leaf damper blade; full shut-off optional.
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 airflow 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 ∆p).
Max. radiated sound index < NC20 (@250Pa ∆p).

Ordering example : type – model – handing = AHSO00D – 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

<table>
<thead>
<tr>
<th>Height (H)</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
<th>400</th>
<th>450</th>
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</tbody>
</table>

All dimensions are in mm.

* * * Installed length
Rectangular air volume measuring and control terminals

Selection graph

<table>
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<tr>
<th>Height (H)</th>
<th>Width (W)</th>
<th>Kv value</th>
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<tr>
<td></td>
<td>600</td>
<td>100</td>
</tr>
</tbody>
</table>

Example

To be determined the airflow for a terminal size 450 x 450 with a pressure differential signal ($\Delta p_{ic}$) 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 $\Delta p_{ic} = 30$ Pa; the result is 870 l/s (or 3130 m$^3$/h)

Method-2, arithmetical determination.
The given Kv value (164) must be used in the following formula:

$$V = K v \sqrt{\Delta p_{ic}} = 164 \times \sqrt{30} = 898 \text{ l/s}$$

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:

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

* Rho = Specific density (= 1.2 kg/m$^3$ at 20°C and 50% rel. humidity)
### Sound data \( \Delta p = 125 \text{ Pa} \)

<table>
<thead>
<tr>
<th>Size (W x H)</th>
<th>min. ( \Delta p )</th>
<th>velocity</th>
<th>air volume</th>
<th>data refering to inlet spigot</th>
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</thead>
<tbody>
<tr>
<td>350 x 300 (DN 355)</td>
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<td>300 x 350 (DN 400)</td>
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<td></td>
</tr>
<tr>
<td>800 x 400 (DN 630)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>900 x 450 (DN 710)</td>
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</tbody>
</table>

**Table 2: Correction table for other unit sizes:**

<table>
<thead>
<tr>
<th>W x H</th>
<th>( \Delta L_{p_A} )</th>
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</thead>
<tbody>
<tr>
<td>(m(^2))</td>
<td>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</td>
</tr>
<tr>
<td>( \Delta L_{p_A} )</td>
<td>-7 -6 -5 -4 -3 -2 -1 -1 0 0 1 1 1 2</td>
</tr>
</tbody>
</table>

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2. \( L_{pA(0.2)} \) 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. \( L_{pA} \) 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. \( \Delta \)ps 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.

### Type AFS(G)OOB

---

**Table 1: Assumptions for additional attenuation**

<table>
<thead>
<tr>
<th>Hz</th>
<th>Discharge (dB)</th>
<th>Radiated (dB)</th>
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<tr>
<td>125</td>
<td>5 10 20</td>
<td>30 30 25</td>
</tr>
<tr>
<td>250</td>
<td>15 20</td>
<td>30 30 25</td>
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<tr>
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<td>30 30 25</td>
</tr>
<tr>
<td>4000</td>
<td>15 20</td>
<td>30 30 25</td>
</tr>
</tbody>
</table>
Sound data $\Delta p = 250$ Pa

<table>
<thead>
<tr>
<th>Size (W x H)</th>
<th>data referring to inlet spigot</th>
<th>min. $\Delta p_s$</th>
<th>sound volume</th>
<th>control terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 x 300 (DN 355)</td>
<td>2 420 899 1512 13</td>
<td>6 630 1334 2268 13</td>
<td>8 840 1779 3024 23</td>
<td>10 1050 2224 3780 35</td>
</tr>
<tr>
<td>350 x 350 (DN 400)</td>
<td>2 245 519 882 1 6 735 1556 2646 13</td>
<td>8 980 2075 3528 23</td>
<td>10 1225 2594 4410 35</td>
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</tr>
<tr>
<td>400 x 400 (DN 450)</td>
<td>2 320 678 1152 1 6 960 2033 3456 13</td>
<td>8 1280 2711 4608 23</td>
<td>10 1600 3388 5760 35</td>
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</tr>
<tr>
<td>500 x 400 (DN 500) (LpA(0.2))</td>
<td>2 400 847 1440 1 6 1200 2541 4320 13</td>
<td>8 1600 3388 5760 35</td>
<td>10 2000 4236 7200 35</td>
<td></td>
</tr>
<tr>
<td>600 x 400 (DN 560)</td>
<td>2 480 1016 1728 1 6 960 2033 3456 13</td>
<td>8 1280 2711 4608 23</td>
<td>10 1600 3388 5760 35</td>
<td></td>
</tr>
<tr>
<td>800 x 400 (DN 630)</td>
<td>2 640 1355 2304 1 6 1440 3049 5184 13</td>
<td>8 1920 4066 6912 23</td>
<td>10 2400 5082 8640 35</td>
<td></td>
</tr>
<tr>
<td>900 x 450 (DN 710)</td>
<td>2 810 1715 2916 1 6 1920 4066 6912 23</td>
<td>8 2560 5421 9216 23</td>
<td>10 3200 6776 11520 35</td>
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</tr>
</tbody>
</table>

1. Sound data is determined in a reverberation room at an independent sound laboratory, according to ISO 3741 and ISO 5135 standards.
2. $L_p$ 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. $L_p$ 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 2: Correction table for other unit sizes: $L_p = L_{pA(0.2)} + \Delta L_p$

<table>
<thead>
<tr>
<th>$W x H$</th>
<th>$W x H$</th>
<th>$W x H$</th>
<th>$W x H$</th>
<th>$W x H$</th>
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<td>m²</td>
<td>m²</td>
<td>m²</td>
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<tr>
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<td>0.04</td>
<td>0.05</td>
<td>0.06</td>
<td>0.07</td>
</tr>
<tr>
<td>0.08</td>
<td>0.10</td>
<td>0.12</td>
<td>0.14</td>
<td>0.16</td>
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<tr>
<td>0.18</td>
<td>0.20</td>
<td>0.25</td>
<td>0.30</td>
<td>0.40</td>
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<tr>
<td>0.50</td>
<td>0.60</td>
<td>0.70</td>
<td>0.80</td>
<td>0.90</td>
</tr>
</tbody>
</table>

$\Delta L_{pA}(\text{dB})$ -7 -6 -5 -4 -3 -2 -1 -0 0 1 1 2
TAKING THE NEXT STEP

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