MARK AIR VALVES CV, VV & VVS

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CONCEPT
• MARK AIR VALVES represent a unique and radically different technical approach to the challenge of controlling ducted air volumes.

Mark Air valves provide accurate air volume control in all low or high pressure applications and maintain required air volume independent of system pressure variations. This is achieved by having a movable cone inside a round venturi shaped housing. The spring controlled cone readjusts to pressure variation before or after the valve. No external flow control device is required.

VALVE FEATURES
• Compact, lightweight permits flexibility in job applications and reduced installation costs, easily located for convenient access.
• Simplicity of design and rugged components assure consistent and maintenance free performance — Field proven.
• Factory calibrated, no costly field balancing. Future additions to system will not require rebalancing of original valves.
• External adjustment and graduated dial: no special tools or flow measuring devices required for volume change.
• Sturdy cylindrical aluminum housing for slip-in connection, fewer transitions.
• Corrosion resistant construction of aluminum and stainless steel.
• CV and VV — Selection of 5 sizes up to 1750 CFM per valve (H).
• VVS—Selection of 4 sizes up to 1500 CFM per valve (H).
• High, Medium and Low pressure ranges.

APPLICATION
• MARK AIR VALVES are used in supply or exhaust systems, for constant or variable volume, with or without reheat, in single or duel duct systems.
• CONSTANT VOLUME SYSTEMS: MA-CV MARK AIR VALVE
  Assures specified air flow regardless of pressure variations. Completely self contained.
• VARIABLE VOLUME SYSTEM: MA-VV MARK AIR VALVE.
  With pneumatic or electronic operator, offers true proportional control when connected to a zone thermostat. Maintains all thermostat settings regardless of pressure changes before or after the valve.
• SHUT-OFF VARIABLE VOLUME SYSTEM: MA-VVS MARK AIR VALVE
  With the addition of the shut-off feature, valves may be used where 100% closure is required, may be used in conjunction with a smoke detector for supply and exhaust systems, and for duel duct applications.

The VVS valve will provide accurate air volume control in all low or high pressure applications and maintain thermostatic settings independent of system pressure variations.

TYPICAL APPLICATIONS
1. Interior zones require cooling year round. Load variations caused mainly by shifting occupancy can be efficiently handled with MA-VV valves supplying multiple outlet boxes and light troffer diffusers.
2. Exterior zones can use MA-VV valves with reheat coils. Heating costs are reduced since thermostat controls the air valve and water valve in sequence. When room temperature is too low, MA-VV valve is throttled to minimum. Only if additional heating is required will the hot water valve open.
3. MA-CV valves can also be used to eliminate the critical balancing of primary air serving induction units. Specified air volume is maintained year round.
4. Several recent applications have taken advantage of the compact size of MARK AIR VALVES in using an all air system. The skin of the building is handled by MA-VV warm air valves supplying more or less heat at the window. Variable volume cool air is supplied year round at the ceiling by MA-VV valves. Both valves are controlled by a single thermostat so that as one closes the other opens.
5. Either low or high pressure constant volume MA-CV valves are recommended for use with absolute filters. As filter resistance increases, valve resistance decreases to maintain specified air volume. Typical applications are hospital operating rooms, laboratories and clean rooms.
6. Low pressure variable volume MA-VV valves are ideal for exhaust or return systems. As illustrated a selector switch, located at the fume hood, sets the valve for minimum or maximum volume. Can also be used to control hood air volume in multiple fume hood applications.
7. MARK AIR VALVES are ideal for retro-fit applications.
APPLICATIONS
Regardless of the type of system, the Mark Air valve assures specified air volume and minimizes balancing.

FIGURE 1

For further details and special applications contact Rosemex engineering.
OPERATION

MODEL MA-CV VALVE

AUTOMATICALLY MAINTAINS A CONSTANT AIR VOLUME CORRESPONDING TO A MANUALLY SET POSITION, INDEPENDENT OF PRESSURE CHANGES.

Air volume is kept constant at a specified flow by locking the control rod in reference to the calibration dial. The cone is free to move in response to fluctuations in pressure. An increase in pressure ahead or after the valve pushes the cone deeper into the venturi, increasing the resistance so as to maintain constant volume. With a decrease in pressure, the spring pushes the cone out of the throat, reducing the resistance. For an other air volume selection, the control rod is simply set to a new dial position.

MODEL MA-VV VALVE

AUTOMATICALLY MAINTAINS A CONSTANT AIR VOLUME, AT EACH THERMOSTATICALLY SET POSITION, INDEPENDENT OF PRESSURE CHANGES.

By mounting a pneumatic or electronic operator the control rod is positioned according to thermostat demand between factory set minimum, [for VVS valve minimum is shut-off], and maximum limits. For any thermostat demand, the cone is self adjusting (same as MA-CV valve) and maintains constant air volume regardless of pressure changes.
**SELECTION**

**FIGURE 4**

Determine system pressure after the fan and select valves according to capacity requirements in low, medium or high pressure columns. Low pressure valves are for systems where the ΔP across the valve is between 0.3' and 3.0' water gauge. Medium pressure valves are for system pressure between 0.6' and 3.0' water gauge. High pressure valves are for systems where the ΔP across the valve of 1.0' to 6.0' water gauge. In order to allow for flexibility in cases of future changes, avoid selecting valves at either their maximum or their minimum limits. Duct diameter should match valve size to eliminate transitions.

### TABLE 1

**MA-CV AND VV VOLUME RANGE**

<table>
<thead>
<tr>
<th>VALVE NO.</th>
<th>CFM MINIMUM / MAXIMUM</th>
<th>*DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOW</td>
<td>MED.</td>
</tr>
<tr>
<td></td>
<td>ΔP 0.3” - 3.0”</td>
<td>ΔP 0.6” - 3.0”</td>
</tr>
<tr>
<td>5</td>
<td>20 - 150</td>
<td>30 - 175</td>
</tr>
<tr>
<td>6</td>
<td>35 - 250</td>
<td>50 - 300</td>
</tr>
<tr>
<td>8</td>
<td>50 - 400</td>
<td>60 - 500</td>
</tr>
<tr>
<td>10</td>
<td>40 - 700</td>
<td>60 - 900</td>
</tr>
<tr>
<td>12</td>
<td>190 - 1200</td>
<td>200 - 1400</td>
</tr>
<tr>
<td>210</td>
<td>80 - 1400</td>
<td>120 - 1800</td>
</tr>
<tr>
<td>212</td>
<td>380 - 2400</td>
<td>400 - 2800</td>
</tr>
<tr>
<td>312</td>
<td>570 - 3600</td>
<td>600 - 4200</td>
</tr>
<tr>
<td>412</td>
<td>760 - 4800</td>
<td>800 - 5600</td>
</tr>
</tbody>
</table>

* Actual dimensions are per current drawings. Future changes may be shown on approval drawings only. See page 8 for recommended selection ranges.

### TABLE 2

**MA-VVS VOLUME RANGE**

<table>
<thead>
<tr>
<th>VALVE NO.</th>
<th>CFM MINIMUM / MAXIMUM</th>
<th>*DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOW</td>
<td>MED.</td>
</tr>
<tr>
<td></td>
<td>ΔP 0.4’’ - 3.0’’</td>
<td>ΔP 0.6’’ - 3.0’’</td>
</tr>
<tr>
<td>6</td>
<td>0 - 250</td>
<td>0 - 300</td>
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<td>8</td>
<td>0 - 400</td>
<td>0 - 500</td>
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<td>0 - 850</td>
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<td>0 - 2000</td>
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<tr>
<td>312</td>
<td>0 - 3000</td>
<td>0 - 3600</td>
</tr>
<tr>
<td>412</td>
<td>0 - 4000</td>
<td>0 - 4800</td>
</tr>
</tbody>
</table>

* Actual dimensions are per current drawings. Future changes may be shown on approval drawings only. See page 9 for recommended selection ranges.

**VVS SELECTION**

Determine system pressure after the fan and select valves according to capacity requirements. Low pressure valves are for systems where the static pressure drop across the valve can range between 0.4” and 3.0” water gauge. Medium pressure valves are for systems between 0.6” and 3.0” water gauge. High pressure valves are for systems where the static pressure is between 1.25” and 6.0” water gauge across the valve.
KEY CRITERIA RE SELECTION AND SIZING OF MARK AIR VALVES

SECTION 1: VALVE MODELS

Rosemex offers three kinds of air valve:

1. for constant volume systems (MA-CV).
2. for variable volume systems (MA-VV) where air volume rates range between a specified minimum and maximum.
3. for variable volume systems (MA-VVS shut-off) where air flow ranges from zero to a specified maximum.

All three models assure controlled air flow for either supply or exhaust systems.

MA-CV, CONSTANT VOLUME VALVES do not require pneumatic or electrical operators. They are manually set at the factory to a specified CFM and maintain that CFM independent of static pressure variations occurring ahead of or after the valve.

MA-VV, VARIABLE VOLUME VALVES require auxiliary pneumatic or electronic operators to reset air flow in response to signals from zone thermostats. However, for any constant signal, where a given thermostat is satisfied, the CFM remains constant independent of pressure variations caused by valve adjustments in other zones. This pressure independent feature assures system stability and longer operator life.

MA-VVS, VARIABLE VOLUME/SHUT-OFF VALVES are similar to MA-VV units except that they have a stepped housing permitting air flow shut-off. In the closed position there is a metal to metal contact between the cone and housing seat.

MA-VVS valves are not pressure independent below 30% of their maximum catalogued capacity, at which point they are controlled by the thermostat.

SECTION 2: CONTROL MODES

As mentioned, either electronic or pneumatic operators may be used to control Mark Air valves. However, electronic operators require a more complex linkage and mounting base and the valve units are thus slightly more expensive.

Both MA-VV and MA-VVS models are available for either normally closed (NC) or normally open (NO) applications. N.C. means a minimum or closed valve setting with a zero control signal to the pneumatic or electronic operator.

Conversely, N.O. requires the maximum or open position with a zero control signal. All MA-VV & MA-VVS models are shipped normally closed unless otherwise specified.

There is a small additional charge for N.O. pneumatic system applications because an additional reversing linkage must be provided. There is no additional charge for N.O. electronic operators since operation in either control mode is a matter of the wiring contacts used.

SECTION 3: SYSTEM STATIC PRESSURE

All Mark Air valves are designed to operate over a wide range of system static pressure variations. They will maintain a given air flow, whether manually set (CV models) or thermostatically set (VV & VVS models), independent of pressure variations ahead of or after the valve within a specific range as indicated in the following table.

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>∆SP ACROSS VALVE INCHES WATER GAUGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN.</td>
</tr>
<tr>
<td>LOW PRESSURE</td>
<td></td>
</tr>
<tr>
<td>0.3</td>
<td>MA-CV-L</td>
</tr>
<tr>
<td>0.4</td>
<td>MA-VVS-L</td>
</tr>
<tr>
<td>MEDIUM PRESSURE</td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td>MA-CV-M</td>
</tr>
<tr>
<td>HIGH PRESSURE</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>MA-CV-H</td>
</tr>
<tr>
<td>1.25</td>
<td>MA-VVS-H</td>
</tr>
</tbody>
</table>

A specified air flow, which corresponds to a particular dial setting, (a calibration label is affixed to each valve) is achieved when the static pressure drop across the valve reaches the minimum required for the valve model selected. With the dial setting fixed, this same CFM will be maintained at all higher static pressure differentials up to the maximum indicated.

The principal advantages of low pressure units are:

1. require less fan hp
2. less acoustic treatment
3. lighter gauge ductwork

The advantages of high pressure units are:

1. generally valves are one size smaller for the same CFM capacity as low pressure valves,
2. smaller supply ducts and/or
3. a more extensive duct system per air handling unit

An intermediate pressure range of MA-valves is also available, covering a ∆SP from 0.6 to 3.0 inches. Valves in this range are designated by the suffix letter M, as MA-CV-10M, MA-VV-12M or MA-VVS-8M. These may be used in conjunction with low pressure units if higher CFM capacities are required nearer the fan where a ∆SP of 0.6 or higher is available.

SECTION 4: CFM RANGE

MA-CV and MA-VV models are available in five standard sizes identified by their nominal diameters of 5", 6", 8", 10" and 12". All sizes except the 5" are also available as MA-VVS models.

The CFM range of a particular valve size depends upon the pressure range selected. For example, a MA-CV-10L has a maximum capacity of 700 CFM; the maximum for a MA-CV-10M (the same size valve, but medium pressure) is 900 CFM and for a MA-CV-10H (again the same size valve, but high pressure) is 1200 CFM.

Occasionally, a project may have a CFM requirement greater than the capacity of our largest standard valve. For such applications, Rosemex furnishes an arrangement of two or more valves. These modular units are available for size 10 and 12 valves. Modular MA-VV valves require one operator per two valves, thus a MA-VV-212 will need one operator, a MA-VV-312 will need two as will a MA-VV-412. However, 10" and 12" MA-VS modular units must have an operator for each valve.

In addition to the larger space requirements, high CFMs incur a penalty in terms of noise generation. Two valves generate twice the sound power of a single valve. This means adding 3 db to the catalogued sound power data for every doubling of valve modules.

In selecting MA-VV valves, consideration must be given, not only to the maximum CFM needed but also, to the minimum CFM. For example, suppose a maximum of 260 CFM is required for a low pressure variable volume application.
From our catalogued capacity ranges either a No. 8, 10 or 12 valve could be chosen. However, with the No. 12, the minimum CFM possible is 150 or 58% of the maximum. Choosing a No. 8 valve would permit a variation down to 50 CFM or about 19% of the maximum.

SECTION 5: CONTROL SENSITIVITY
In regard to VAV systems there is another reason to avoid over-sizing, which has to do with the thermostatic control of the valve. In order to vary the CFM the thermostat sends a proportional control signal to the valve operator e.g.: with a minimum signal, the valve is at minimum and with a maximum signal, the valve is at maximum. When the CFM variation is small (such as in the case of the No. 12 valve varying from 250 to 300 CFM), then, the operator stroke must be severely limited. Instead of a broad control range, the thermostat becomes essentially an on-off switch and would be over sensitive causing the valve to continually cycle, reducing the operator life span.

The minimum CFM setting should be as low as possible and never higher than 50% of the maximum specified.

SECTION 6: CAPACITY SAFETY MARGIN
One of the attractive features of the Mark Air Valve is its broad capacity range. In many cases, it will be possible to size a unit at approximately 75% of its maximum rating. This is an optimum selection since it permits increases to meet possible future higher load demands without requiring a new valve.

SECTION 7: ACOUSTIC CONSIDERATIONS
With regard to the above selection criteria, two sizes may be about equal in advantages or disadvantages for a certain specified CFM range. For example, consider a low pressure VAV application with a particular zone requiring a minimum of 350 and a maximum of 700 CFM. 700 CFM is the limit of a No. 10 valve, so any future increases with the same valve would not be possible, however it is smaller than a 12, slightly less expensive and the probability of future change is remote. A No. 12 valve would assure ample safety margin to increase capacity and there may be plenty of ceiling space. In other words, all things being about equal, which size do you select?

A few such cases may be decided by evaluating the acoustic performance of each size. For example, the ducted sound at 2” ASP in a typical installation would be NC 27 for the No. 10 and NC 25 for a No. 12 in the same installation. If there was an NC 30 requirement, it might be safer to choose the No. 12 valve. We say “might” since it is also necessary to consider radiated sound if the valve is located over the occupied space. With an acoustically poor lay-in type ceiling, the NC resulting from the radiated sound of a No. 10 valve would be 25 and would be 21 for a No. 12 valve over the same ceiling. For an average acoustic lay-in ceiling (STC 35-39) there would not be a radiated noise problem with either size.

SECTION 8: SPECIAL APPLICATIONS

Because of its compact size relative to capacity, the Mark Air valve is ideally suited for a variety of special applications.

Custom cabinets may be fitted with valves to regulate air flow at exterior zones or they may be added to fume hoods, either as a constant volume balancing device or with variable volume control, for either or both hood supply and exhaust.

Problems of limited space, especially common in renovation work, are minimized by the use of Mark Air valves. The conversion of existing constant volume systems to variable volume may require no more than removing a section of duct and replacing it with a valve.

Although valves are designed for horizontal installation they may be specified for vertical duct applications. In such cases, air flow direction (up or down) must be indicated to assure proper calibration i.e., will air pressure work against the gravitational force of the cone assembly or will it work in the same direction as the gravitational force. CFM range for vertical installations will vary from the catalogue depending on valve size and air flow direction.

The following is a list of commonly specified options:
1. MA-VV or VVS valve complete with pneumatic or electronic operator.
2. MA-CV, MA-VV or MA-VVS valves with acoustically treated multiple outlet boxes.
3. MA-CV, MA-VV or MA-VVS valves with flanged housings (1” flanges on either or both ends of valve).
4. MA-CV or MA-VV valves with electric or hot water duct coils.
5. Stainless steel valves (for horizontal installations only).
6. Polyester or other spray coatings (for horizontal installations only).

SECTION 9: SELECTION CHARTS

Chart I is for selecting MA-CV and VV valves and Chart II is for MA-VVS valves.

The CFM capacity range of each valve size is indicated by a horizontal bar. The left-hand limit of each horizontal bar designates the minimum possible CFM and the right-hand limit, the maximum.

The selection of a particular size valve should be determined by the maximum CFM required. Each bar is divided into areas that qualify any size selection relative to a maximum CFM setting.

In the case of MA-VV valves the minimum may be selected at the left hand limit or at any CFM below 50% of the maximum setting. The shaded areas qualifying size selection refer to the maximum setting only. For example, assume a low pressure, variable volume application (MA-VVL) where a maximum of 520 and a minimum of 130 CFM are required, then a no. 10 valve would be an ideal selection.

The following steps will assure optimum valve sizing.
1. Determine type valve required and refer to Chart I (MA-CV and MA-VV) or Chart II (MA-VVS).
2. Choose the pressure range requirement (Low, Medium or High).
3. Descend along the vertical line, corresponding to the maximum CFM required, until the appropriate pressure range group of horizontal bars is reached.

The intersection of the vertical CFM line with a horizontal bar, where the point of intersection is nearest the unshaded portion of the bar and furthest from the solid portion of the bar identifies that bar as the best size selection.
SELECTION CHART I FOR CONSTANT AND VARIABLE VOLUME VALVES — MA-CV, MA-VV

AIR VOLUME RATE — CFM

LOW PRESSURE
0.3” TO 3.0” ΔSP

MEDIUM PRESSURE
0.6” TO 3.0” ΔSP

HIGH PRESSURE
1.0” TO 6.0” ΔSP

SELECTION OF MAXIMUM CFM

IDEAL

POOR
SELECTION CHART II FOR VARIABLE VOLUME SHUT-OFF VALVES – MA-VVS

AIR VOLUME RATE – CFM

LOW PRESSURE 0.4" TO 3.0" ΔSP

MEDIUM PRESSURE 0.6" TO 3.0" ΔSP

HIGH PRESSURE 1.25" TO 6.0" ΔSP
The information contained herein is intended to improve estimates of room sound levels resulting from Mark Air valves and typical duct system arrangements. It should also serve as a guide for determining the most efficient and economical acoustic treatment to achieve a desired sound level. Data is provided for types MA-CV, MA-VV and MA-VVS valves covering all pressure ranges.

Naturally, the sound level values given do not include extraneous noise sources; such as adjoining mechanical rooms, pipe chases, outside traffic, etc. Nor has sound generation by diffusers been considered, since sound levels vary with diffuser types and sizes, and should be determined in accordance with the manufacturer’s literature. Further, it has not been possible to evaluate the directivity of sound propagation because this too varies with diffuser geometry.

It is important to note that the sound level values shown are based on sound pressure levels for a valve and a specific duct system as tested in our laboratory in accordance with ASHRAE Standard 36-72. Variations in duct sizing and arrangement will result in different system characteristics and influence sound transmission properties. Reference can be made to Mark Air valve data to obtain the sound power values of the valve alone and to these, appropriate correction factors may be applied.

The sound propogated at the Mark Air valve is directly related to:
1. The air volume/air (CFM) through the valve
2. The pressure drop (ΔSP) across the valve
3. The size of the valve
4. The geometry of the valve, i.e., whether it is a model VV or VVS

For a given valve, the higher the CFM and/or ΔSP the higher the sound level. This is true for all types of duct constructions causing air stream flow losses. These losses are transformed into increased turbulence and sound energy. Typically, this sound is broad band and is generated over a frequency range between 125 and 4000 Hz.

For convenience of application, generated noise data has been given in two forms:
1. “ducted sound”; i.e., the noise at the air valve outlet which is, channelled with the air into a room and
2. “radiated sound”; i.e., the noise that radiates from the valve housing and duct elements and passes through the suspended ceiling into a room.

Ducted noise must be attenuated by the elements downstream of the valve and the acoustic treatment required depends upon the particular system design and the specified acceptable sound level for a given space.

In most valve installations, radiated noise is attenuated by the ceiling plenum, by the suspended ceiling and by room absorption.

Valves should be located as remote as practical from terminal diffusers to provide as much attenuating length as possible after the valve. Where there is a choice, valves should be located over non critical areas, e.g., corridors, storage facilities, etc., in order to minimize the addition of radiated noise to the occupied space. Valves may be located at take-offs from main or branch ducts. Take-offs should be standard high pressure design to minimize excessive pressure losses.

Concerning radiated sound, our catalogues give only the sound power data for noise radiating directly from the valve housing. Our laboratory tests meticulously avoided contaminating noise from duct work immediately before and after the valve by insulating and wrapping these elements with lead sheeting.

Naturally, this treatment will not be found on the job. Consideration then must be given to the noise generated by the valve which may be radiated, not only from the housing, but from duct elements immediately before and after the valve. Flexible duct, even the typical acoustic flexible duct, is very poor in preventing the transmission of radiated sound; i.e., the sound escaping through the duct walls as opposed to the sound directed downstream or upstream within the duct. For this reason, flexible connections directly to the valve should be avoided where static pressures are over 1” WG and flexible take-offs to diffusers should be?after sufficient acoustic treatment and as far downstream from the valve as practical.
Distribution duct acoustically treated for specified length before take-offs to diffusers.

Acoustically lined distribution duct “T” arrangement, L = Specified length.

Silencer with untreated distribution duct, either straight or as per “T” arrangement shown.
**DUCTED SOUND MA-CV AND VV**

**DUCTED SOUND POWER LEVELS**
The NC values can be calculated by referring to the tables in Chapter 35 of the 1973 ASHRAE SYSTEM HANDBOOK.

### TABLE 3
**DUCTED PWL RE 10⁻¹² WATT**

<table>
<thead>
<tr>
<th>VALVE NO.</th>
<th>CFM</th>
<th>ΔP 0.3” OCTAVE PWL</th>
<th>ΔP 1.0” OCTAVE PWL</th>
<th>ΔP 2.0” OCTAVE PWL</th>
<th>ΔP 3.0” OCTAVE PWL</th>
<th>ΔP 4.0” OCTAVE PWL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>45 44 44 44 31 24</td>
<td>55 53 52 53 42 37</td>
<td>57 55 56 57 49 45</td>
<td>58 56 59 60 53 49</td>
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**NOTES:**
- ΔP — Static pressure drop across valve
- OCTAVE — Center band frequencies as per USA1 S1-6-1967
- PWL — Valve sound power level re10⁻¹² watt
### RADIATED PWL RE 10⁻¹² WATT

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**NOTES:**
- **ΔP** — Static pressure drop across valve
- **OCTAVE** — Center band frequencies as per USA1 S1-6-1967
- **PWL** — Valve sound power level re10⁻¹² watt
# Sound Power Levels

## Table 5

### Ducted Sound VVS

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<th>VALVE NO.</th>
<th>CFM</th>
<th>0.4&quot; ΔP OCTAVE PWL</th>
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<th>2.0&quot; ΔP OCTAVE PWL</th>
<th>3.0&quot; ΔP OCTAVE PWL</th>
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### Notes:
- ΔP — Static pressure drop across valve in inches of water
- OCTAVE — Center band frequencies as per USA1 S1-6-1967
- PWL — Valve sound power level re10^-12 watt

## Table 6

### Radiated Sound VVS

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<tr>
<th>VALVE NO.</th>
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### Notes:
- ΔP — Static pressure drop across valve in inches of water
- OCTAVE — Center band frequencies as per USA1 S1-6-1967
- PWL — Valve sound power level re10^-12 watt
DUCTED AND RADIATED NC LEVELS

DISCHARGE AND RADIATED NC LEVELS

The following tables, one for each of the Mark Air valve sizes, give NC values for different valve and duct arrangements as illustrated on page 11. The columns headed with a “D” are anticipated NC levels resulting from the valve noise ducted into the occupied space. It does not include noise which may be generated by the diffuser. The columns headed with an “R” give the NC levels resulting from radiated sound and include sound radiating from both the valve and the duct elements in the immediate vicinity of the valve.

The final NC level estimate for a given zone is the logarithmic sum of the ducted and radiated NC values for the valve systems serving the occupied space. (See table 16 on page 20 for adding NC levels).

**TABLE 7**
MA-CV AND MA-VV – CONSTANT AND VARIABLE VOLUME VALVES

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* MOB-M: A multiple outlet box in 22 ga. galvanized steel lined with 1/2” thick, 1 1/2 lb density fibreglass. Dimensions are as per MOB Data Sheet. Data based on flexible duct take-offs equal to AL-U-FLEX type S (single ply aluminum).

† MOB-F: A multiple outlet box constructed of 1” solid fibreglass duct board covered with aluminum foil. Dimensions are as per MOB Data Sheet. Data based on flexible duct take-offs equal to AL-U-FLEX type S (single ply aluminum).
### TABLE 8
**MA-CV AND MA-VV – CONSTANT AND VARIABLE VOLUME VALVES**

<table>
<thead>
<tr>
<th>VALVE NO. 6</th>
<th>MOB-M</th>
<th>MOB-F</th>
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<th>SILENCER</th>
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| 250 CFM     |       |       | D | R | D | R | D | R | D | R | D | R | D | R |
| 0.3         | <10   | <10   | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| 1.0         | 17    | <10   | 15  | 10  | 16  | <10 | 14  | <10 | 11  | <10 | 11  | <10 | 11  | <10 |
| 2.0         | 24    | 15    | 21  | 16  | 22  | 14  | 20  | 14  | 17  | 14  | 17  | 14  | 17  | 14  |
| 3.0         | 26    | 17    | 24  | 18  | 25  | 17  | 22  | 16  | 20  | 16  | 20  | 16  | 20  | 16  |

| 300 CFM     |       |       | D | R | D | R | D | R | D | R | D | R | D | R |
| 0.3         | <10   | <10   | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| 1.0         | 19    | 10    | 16  | 11  | 17  | <10 | 15  | <10 | 13  | <10 | 13  | <10 | 13  | <10 |
| 2.0         | 25    | 16    | 22  | 17  | 24  | 15  | 21  | 15  | 19  | 15  | 19  | 15  | 19  | 15  |
| 3.0         | 29    | 20    | 26  | 21  | 27  | 19  | 25  | 19  | 22  | 19  | 22  | 19  | 22  | 19  |

| 400 CFM     |       |       | D | R | D | R | D | R | D | R | D | R | D | R |
| 0.3         | <10   | <10   | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| 1.0         | 21    | 12    | 19  | 13  | 20  | 11  | 17  | 11  | 15  | 11  | 15  | 11  | 15  | 11  |
| 2.0         | 29    | 20    | 26  | 21  | 27  | 19  | 25  | 19  | 22  | 19  | 22  | 19  | 22  | 19  |
| 3.0         | 32    | 23    | 30  | 24  | 31  | 22  | 29  | 22  | 26  | 22  | 26  | 22  | 26  | 22  |

### TABLE 9
**MA-CV AND MA-VV – CONSTANT AND VARIABLE VOLUME VALVES**

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| 400 CFM     |       |       | D | R | D | R | D | R | D | R | D | R | D | R |
| 0.3         | <10   | <10   | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| 1.0         | 19    | 13    | 16  | 14  | 17  | 12  | 15  | 12  | 12  | 12  | 12  | 12  | 12  | 12  |
| 2.0         | 24    | 18    | 21  | 19  | 22  | 17  | 20  | 17  | 17  | 17  | 17  | 17  | 17  | 17  |
| 3.0         | 26    | 21    | 24  | 22  | 25  | 20  | 22  | 20  | 20  | 20  | 20  | 20  | 20  | 20  |

| 550 CFM     |       |       | D | R | D | R | D | R | D | R | D | R | D | R |
| 0.3         | <10   | <10   | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| 1.0         | 20    | 15    | 17  | 16  | 19  | 14  | 16  | 14  | 14  | 14  | 14  | 14  | 14  | 14  |
| 2.0         | 26    | 21    | 24  | 22  | 25  | 20  | 22  | 20  | 20  | 20  | 20  | 20  | 20  | 20  |
| 3.0         | 30    | 25    | 27  | 26  | 29  | 24  | 26  | 24  | 24  | 24  | 24  | 24  | 24  | 24  |

| 700 CFM     |       |       | D | R | D | R | D | R | D | R | D | R | D | R |
| 0.3         | <10   | <10   | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| 1.0         | 21    | 16    | 19  | 17  | 20  | 15  | 17  | 15  | 15  | 15  | 15  | 15  | 15  | 15  |
| 2.0         | 29    | 23    | 26  | 24  | 27  | 22  | 25  | 22  | 22  | 22  | 22  | 22  | 22  | 22  |
| 3.0         | 34    | 28    | 31  | 29  | 32  | 27  | 30  | 27  | 27  | 27  | 27  | 27  | 27  | 27  |
### TABLE 10
**MA-CV AND MA-VV – CONSTANT AND VARIABLE VOLUME VALVES**

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### TABLE 11
**MA-CV AND MA-VV – CONSTANT AND VARIABLE VOLUME VALVES**

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### TABLE 12

**MA-VVS — VARIABLE VOLUME / SHUT-OFF VALVES**

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### TABLE 13

**MA-VVS — VARIABLE VOLUME / SHUT-OFF VALVES**

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**TABLE 14**

**MA-VVS — VARIABLE VOLUME / SHUT-OFF VALVES**

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**TABLE 15**

**MA-VVS — VARIABLE VOLUME / SHUT-OFF VALVES**

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<td>R</td>
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<td>31</td>
<td>28</td>
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<td></td>
<td>1.25</td>
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<td>25</td>
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<td></td>
<td>2.0</td>
<td>34</td>
<td>31</td>
<td>31</td>
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<tr>
<td></td>
<td>3.0</td>
<td>37</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

VALVE NO. 10: MOB-M MOB-F
SILENCER: Duct Lining

VALVE NO. 12: MOB-M MOB-F
SILENCER: Duct Lining
**DEFINITIONS**

1. **VALVE**
Data provided is based on laboratory tests of Mark Air valves in each of the sizes indicated, and covers models MA-CV, MA-VV and MA-VVS for all pressure ranges.

2. **CFM**
Air volume rates in cubic feet per minute are given for each size valve to cover all pressure ranges. NC values for other air flows may be interpolated with sufficient accuracy.

3. **∆SP**
The static pressure drop across the valve in inches water gauge, i.e. the static pressure immediately ahead of the valve less the static pressure immediately after the valve.

4. **MOB — M**
A multiple outlet box in 22 ga. galvanized steel lined with 1/2” thick, 1 1/2 lb density fibreglass.
Dimensions are as per MOB Data Sheet. Data based on flexible duct take-offs equal to AL-U-FLEX type S (single ply aluminum).

5. **MOB — F**
A multiple outlet box constructed of 1” solid fibreglass duct board covered with aluminum foil.
Dimensions are as per MOB Data Sheet. Data based on flexible duct take-offs equal to AL-U-FLEX type S (single ply aluminum).

6. **LINED DUCT**
A sheet metal distribution duct lined on all sides with 1” thick, 1 1/2 lb density fibreglass for a length as indicated in the tables. Data for sizes 5, 6 and 8 are based on inside duct dimensions where the height equals the valve diameter and the width is sized for an air velocity not exceeding 800 feet per minute.
Ducts for sizes 10 and 12 also have a height equal to the valve diameter but the width is sized for a duct friction loss not exceeding 0.25 inches WG per 100 ft.

7. **SILENCER**
A rectangular commercial attenuating module of specified length with a minimum height equal to the valve diameter and a width sized for a static pressure drop not exceeding 0.15 inches WG. Perforated sheet metal protects the acoustic attenuating media and forms a single, straight through air passage with an aerodynamic entrance and exit.

8. **NC LEVEL**
The Noise Criteria curve tangent to the highest point on the sound pressure level curve at any of the center frequencies in octave bands 2 through 7.
Both ducted and radiated sound pressure levels include a 10 db room attenuation factor plus applicable deductions for end terminal loss. See table 19 for NC corrections when using other room attenuation factors.
No deductions have been taken for sound power division, in other words, all diffusers fed by a given valve are assumed to be in the same occupied space. See table 17 for NC reduction due to power divisions.
NC values for radiated noise are based on an average lay-in type ceiling with an STC 35-40 rating. See table 18 for NC corrections when using ceilings with different STC ratings.

---

**TABLE 16**

<table>
<thead>
<tr>
<th>ADDING NC VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIFFERENCE BETWEEN TWO NC VALVES TO BE COMBINED</td>
</tr>
<tr>
<td>CORRECTIONS TO BE ADDED TO HIGHEST VALUE</td>
</tr>
</tbody>
</table>

**TABLE 17**

<table>
<thead>
<tr>
<th>NC REDUCTION FOR POWER DIVISION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFM DIVISION</td>
</tr>
<tr>
<td>NC CORRECTION</td>
</tr>
</tbody>
</table>

**TABLE 18**

<table>
<thead>
<tr>
<th>RADIATED NC CORRECTIONS FOR LAY-IN CEILINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STC RATING</td>
</tr>
<tr>
<td>NC CORRECTION</td>
</tr>
</tbody>
</table>

**TABLE 19**

<table>
<thead>
<tr>
<th>NC CORRECTIONS AS PER ROOM ATTENUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROOM FACTOR</td>
</tr>
<tr>
<td>NC CORRECTION</td>
</tr>
</tbody>
</table>
**LINEAR OUTPUT MODULE (LOM)**

**DESCRIPTIONS**
A factory installed mecanism, connected to the valve shaft, provides potentiometer resistance values for every actuator position. Eight valve positions are precisely factory calibrated and corresponding CFM values are registered in the LOM using an IBM compatible computer. The LOM calculates and produces a linear output 0-10 V DC signal proportional to all CFM values between the specified minimum and maximum. The LOM output signal can be used by the room pressure control system for precise and stable regulation.

**APPLICATIONS**
- Room static pressure control in laboratories, hospitals, clean rooms...
- Fresh air or exhaust air control.
- Stable variable volume control.
- Constant CFM Hepa filter

**GRAPH EXAMPLE FOR MAVV-10L**

**MARK H.FAB.INC.**

**MARK AIR VALVE ASSEMBLY**

**MARY AIR VALVE ASSEMBLY**

**PNEUMATIC ACTUATOR**

**POTENTIOMETER MOUNTING KIT.**
SPECIFICATION GUIDE

- The air volume (cfm) will be regulated using variable air volume units with linear characteristics.
- Inlet and outlet connections will be circular and of similar dimensions.
  The aluminium valve housing will incorporate a complete venturi containing an aluminium aerodynamic moving cone.
  The cone rod will be made of stainless steel.
- In order to prevent dust accumulation and bacterial development, interior acoustic insulation will not be permitted.
  Sound power levels will be as shown in tables 3 @ 7 measured in a semi-reverberant room in accordance with ASHREA standard 36-72. (see Rosemex Mark Air Valve catalog)
- The controlled air volume will be **mechanically independent of static pressure variation at all actuator positions**.
  Following a pressure variation, cfm correction will be achieved through the spring-loaded moving cone within one second.
  To increase **actuator life** and **speed of response**, the pressure variation corrective action (new cone position) will be independent of the actuator.
  External air speed sensors are not acceptable.
- The air volume will be proportional to the valve cone position and have near-linear characteristics.
- The mechanical valve dial will permit direct reading of air volume at all time.
  Specified **minimum cfm** and **maximum cfm** will be factory calibrated. Future modifications will not require special calibrating tools and will be easily completed on job site.
- The valve actuator will be supplied and installed by Rosemex at the factory.
  - Electronic actuator.
  - Pneumatic actuator.
- The **Air Valve** will be manufactured by Rosemex, models MACV, MAVV or MAVVS.

MARK AIR VALVE MODEL

- MACV
- MAVV
- MAVVS

OPTIONS

- Reverse-acting linkage for normally-open valve.
- Thermal/acoustic insulation with aluminum sheet metal protective jacket.
  Improves attenuation of radiated sound through valve walls.
- Flanged housing for quick installation and ease of removal.
- Teflon shaft bushings (2).
- Protective coatings for added resistance to acid and alkalized fumes.
  - Eisenheiss.
  - Heresite phenolic.
- Stainless steel connecting rod and inside bracket.
- Stainless steel casing and cone (horizontal mounting only).
- Electric, hydronic or steam booster heating coil.
- Noise attenuating in-line units (silencer).
- Microprocessor linearisation output module (LOM).
  - Valve CFM directly proportional to 0-10 VDC linear output control signal.
- Housing stainless steel screws.

CV AND VV ORDERING INSTRUCTIONS

**VALVE IDENTIFICATION**

MARK AIR VALVES should be ordered as per the following combination of letters and numerals.

Example: MA-VV-6-H-150-300

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA</td>
<td>MARK AIR VALVE</td>
</tr>
<tr>
<td>VV</td>
<td>Variable volume</td>
</tr>
<tr>
<td>CV</td>
<td>Variable volume (for constant volume)</td>
</tr>
<tr>
<td>6</td>
<td>Valve size (Diameter, 5-6-8-10 or 12)</td>
</tr>
<tr>
<td>H</td>
<td>High pressure</td>
</tr>
<tr>
<td>L</td>
<td>Low pressure</td>
</tr>
<tr>
<td>M</td>
<td>Medium pressure</td>
</tr>
</tbody>
</table>

**ORDERING INSTRUCTIONS**

MARK AIR VALVES should be ordered as per the following identification:

Example: MA-VV-6-H-300

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA</td>
<td>MARK AIR VALVE</td>
</tr>
<tr>
<td>VVS</td>
<td>Variable volume shut-off unit</td>
</tr>
<tr>
<td>6</td>
<td>Valve no. (Diameter, 6-8-10 or 12)</td>
</tr>
<tr>
<td>H</td>
<td>High pressure</td>
</tr>
<tr>
<td>L</td>
<td>Low pressure</td>
</tr>
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<td>M</td>
<td>Medium pressure</td>
</tr>
</tbody>
</table>

**MARK AIR VALVE MODEL**

- MACV
- MAVV
- MAVVS

ROSEMUX INC. reserves the right to change specifications without notice.