CHAPTER-13
VOLUME CONTROL DAMPERS
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TECNALCO, an industry leader in quality air moving products, manufactures high quality aerofoil and ordinary type volume control dampers.

TECNALCO multi blade volume control dampers are used in heating, ventilating, air conditioning plants and applications, where they are not subjected to water spray, salt spray and other corrosive fumes.

TECNALCO standard low leakage control dampers are designed for economical and reliable air volume control.

Features:

Available in two different types of constructions
(1) Ordinary type and (2) Aerofoil type.

1. Ordinary type construction
   a. Parallel blade operation
   b. Opposed blade operation

2. Aerofoil type construction
   a. Parallel blade operation
   b. Opposed blade operation

All types and models of volume control dampers are made of galvanized sheet steel of thickness 1.2 mm / optional 1 mm / 1.5 mm / 2mm, according to the design conditions. As per SMACNA standards.

All joints are welded and sealed for air tight functioning which adds to maintain rigidity.

All welded points are protected by aluminium spray coating.

Both parallel and opposed blade dampers are furnished with concealed control linkage with a manually operated quadrant.

Exposed linkage, a shaft for pneumatic or electric motor operation are optionals.

Pre-punched holes, to the frame for installing the volume control damper to the duct, are optional.

### Standard types and models

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
<th>Operation</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCD</td>
<td>‘TO’</td>
<td>‘O’</td>
<td>VCD galvanized type opposed blade single skin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘P’</td>
<td>VCD galvanized type parallel blade</td>
</tr>
<tr>
<td></td>
<td>‘TNA’</td>
<td>‘O’</td>
<td>VCD aerofoil type opposed blade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘P’</td>
<td>VCD aerofoil type parallel blade</td>
</tr>
<tr>
<td></td>
<td>‘TA’</td>
<td>‘O’</td>
<td>VCD aerofoil type opposed blade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘P’</td>
<td>VCD aerofoil type parallel blade</td>
</tr>
<tr>
<td></td>
<td>‘TG’</td>
<td>‘O’</td>
<td>VCD gear wheel type opposed blade only</td>
</tr>
<tr>
<td></td>
<td>‘TR’</td>
<td>-</td>
<td>Round volume control damper; Blade → galvanized sheet steel</td>
</tr>
<tr>
<td></td>
<td>‘TR’-H</td>
<td>-</td>
<td>Round volume control damper; Blade → perforated sheet of mild steel</td>
</tr>
</tbody>
</table>
VOLUME CONTROL DAMPERS

VOLUME CONTROL DAMPERS SINGLE SKIN BLADE TYPE

VCD- TO’O
GI single skin blade opposite blade

Tecnalco model VCD-TO O is a Volume Control Damper of single skin type blade made up of GI material with opposed blade operation.

MATERIAL CONSTRUCTION

FRAME
1.2mm thickness galvanized steel sheet.

BLADES
1.2mm thickness galvanized steel sheet optional 1mm/1.5mm/2mm.

AXLES
1/2” galvanized round steel rod.

LINKAGE
Made of galvanized steel.

BUSH
Bronze bush optional brass bush.

QUADRANT
Plated steel with wing nut to lock the blades positions.
Marked to show the position of the blades.

VCD DEPTH
S&C type = 150mm, Box type = 156mm, Flange type = 130mm.
VIOLYME CONTROL DAMPERS

VCD- TOP
GI single skin blade parallel blade

![FLANGE TYPE](image1)
![BOX TYPE](image2)
![S&C TYPE](image3)

MATERIAL CONSTRUCTION

FRAME
1.2mm thickness galvanized steel sheet.

BLADES
1.2mm thickness galvanized steel sheet optional 1mm/1.5mm/2mm.

AXLES
1/2” galvanized round steel rod.

LINKAGE
Made of galvanized steel.

BUSH
Bronze bush optional brass bush.

QUADRANT
Plated steel with wing nut to lock the blades positions.
Marked to show the position of the blades.

VCD DEPTH
S&C type = 150mm, Box type = 156mm, Flange type = 130mm.
VOLUME CONTROL DAMPERS AEROFOIL BLADE TYPE

VCD- TA’O’

- TECNALCO high performance aerofoil control dampers are designed for quiet, efficient and reliable air volume control.
- The unique design of an aerofoil blade provides smooth air flow with reduced turbulence.
- Minimising the turbulence reduces noise and increases efficiency of air flow.
- The double walled construction inherent in an aerofoil blade also increases damper strength.
- Aerofoil type construction exhibits better performance characteristic over ordinary type construction.

TECNALCO model VCD-TA’O is a volume control damper of aerofoil type (double skin blade construction made of fixed aluminium aerofoil profiled blades) with opposed blade operation.

MATERIAL CONSTRUCTION

FRAME
1.2mm thickness galvanized steel sheet.

BLADES
Aerofoil 1mm double skin extruded aluminum profile made of galvanized steel sheet is optional.

AXLES
1/2” Square hollow extruded aluminum profile, optional 1/2” round / square galvanized steel rod.

LINKAGE
Made of galvanized steel.

BUSH
Nylon bush optional Bronze / brass bush.

QUADRANT
Plated steel with wing nut to lock the blades positions. Marked to show the position of the blades.

VCD DEPTH
S&C type = 150mm, Box type = 156mm, Flange type = 130mm.
TECNALCO model VCD-'TA'P is a volume control damper of aerofoil type (double skin blade construction made of fixed aluminium aerofoil profiled blades) with parallel blade operation.

**MATERIAL CONSTRUCTION**

**FRAME**
1.2mm thickness galvanized steel sheet.

**BLADES**
Aerofoil 1mm double skill extruded aluminum profile made of galvanized steel sheet is optional.

**AXLES**
\( \frac{1}{2} '' \) Square hollow extruded aluminium profile, optional \( \frac{1}{2} '' \) round / square galvanized steel rod.

**LINKAGE**
Made of galvanized steel.

**BUSH**
Nylon bush optional Bronze / brass bush.

**QUADRANT**
Plated steel with wing nut to lock the blades positions.
Marked to show the position of the blades.

**VCD DEPTH**
S&C type = 150mm, Box type = 156mm, Flange type = 130mm.
VOLUME CONTROL DAMPERS

 Parallel blade operation: → P

 Parallel blades offer rapid air response relative to blade movement but divert air flow to one side of the duct. Blade rotation is in the same direction and is best suited for on or off applications.

 Opposed blade operation: → O

 Opposed blades provide non-diverting air flow and reduced turbulence, which is important when the damper is used in front of fans or coils. Due to opposite blade rotation, opposed blade dampers also require lower opening torque.

NOTE: In increments of 50 mm are also available in standard sizes. Damper with L or W 1200 is provided with a centre partition. Standard finish is galvanized steel with weld points protected by aluminium spray coating.

VCD-‘TG’O

TECNALCO model VCD-‘TG’O is a volume control damper of aerofoil type with fixed aluminium aerofoil profiled blades. The blades are coupled with high quality PVC gear wheels to get smooth and rattle free opposed blade operation.

Standard Sizes

Models VCD-TO - O / TO - P  
TA - O / T - P / TG - O

 Any combination of L x W

<table>
<thead>
<tr>
<th>L (mm)</th>
<th>W (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>300</td>
<td>300</td>
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<tr>
<td>400</td>
<td>400</td>
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<tr>
<td>800</td>
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<tr>
<td>900</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td></td>
</tr>
</tbody>
</table>

MATERIAL CONSTRUCTION

FRAME
1.2mm thickness galvanized steel sheet.

BLADES
Aerofoil 1mm double skill extruded aluminum profile.

AXLES
1/2" Square hollow extruded aluminium profile.

LINKAGE
PVC Gear wheels.

BUSH
Nylon bush.

QUADRANT
Plated steel with wing nut to lock the blades positions. Marked to show the position of the blades.
TECNALCO model VCD-O-AM is an AMCA certified low leakage damper of aerofoil type (double skin extruded aluminium blade construction). It meets the leakage requirements of the International Energy Conservation Code by leaking less than 3 cfm/sq. ft. at 1” of static pressure and is AMCA certified as a Class 1A damper for sizes 24”x24”, 36”x36” and 12”x48”.

**STANDARD CONSTRUCTION**

FRAME  
1.2mm thickness galvanized steel sheet.

BLADES  
Aerofoil 1.0mm double skin extruded aluminum profile.

AXLES  
½” galvanized round steel rod.

JAMB SEALS  
Stainless steel jamb seals.

BUSH  
Bronze bush.

QUADRANT  
Plated steel with wing nut to lock the blades positions. Marked to show the position of the blades.

TECNALCO certifies that the VCD-O-AM shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and company with the requirements of the AMCA Certified Ratings Program. The AMCA International Certified Ratings Seal applies to Air Performance and Air Leakage.

*“Air Leakage is based on Operation between 0°C - 49°C (32°F - 120°F)”*

*“Tested for Air Leakage in accordance with ANSI/AMCA 500-D, Figure 5.5 Alternate.”*

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**VELOCITY VS. PRESSURE DROP**

<table>
<thead>
<tr>
<th>Size</th>
<th>Graph Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>12X12 INCH</td>
<td>Red</td>
</tr>
<tr>
<td>48X12 INCH</td>
<td>Pink</td>
</tr>
<tr>
<td>12X48 INCH</td>
<td>Blue</td>
</tr>
<tr>
<td>36X36 INCH</td>
<td>Green</td>
</tr>
<tr>
<td>24X24 INCH</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

*“Tested for Air Performance in accordance with ANSI/AMCA 500-D, Figure 5.5”*
**VOLUME CONTROL DAMPERS**

<table>
<thead>
<tr>
<th>Pressure / class</th>
<th>Leakage, L/S/m² (ft³/min/ft²)</th>
<th>Required Rating</th>
<th>Damper Size</th>
<th>1 IN.W.G</th>
<th>4 IN.W.G</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1&quot; (0.25 kPa)</td>
<td>4&quot; (1.0 kPa)</td>
<td></td>
<td>1A</td>
<td>2</td>
</tr>
<tr>
<td>1A</td>
<td>3 (15.2)</td>
<td>N/A</td>
<td>36&quot; x 36&quot;</td>
<td>1A</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>4 (20.3)</td>
<td>8 (40.6)</td>
<td>12&quot; x 48&quot;</td>
<td>1A</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>10 (50.8)</td>
<td>20 (102)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>40 (203)</td>
<td>80 (406)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Leakage testing conducted in accordance with AMCA Standard 500-D

*Torque applied holding damper closed 2.5 in. lbs./sq.ft. on opposed blade dampers.
TECNALCO models VCD-'TR'/‘TR’-H are round volume control dampers designed to access easily with circular ducts. In these models the controlling blade is made of galvanised sheet steel perforated sheet of mild steel respectively. The adjustable controlling blade is mounted on nylon bushes or bronze bushes with a manually operated quadrant.

VCD- TR
TECNALCO model VCD-'TR'/'TR'-H is a round volume control damper designed to access easily with circular ducts of any diameter. The controlling blade is made of galvanised sheet steel.

MATERIAL CONSTRUCTION

FRAME
0.9mm thickness galvanized steel sheet optional 1.2mm/1.5mm.

BLADES
0.9mm thickness galvanized steel sheet optional 1.2mm/1.5mm.

AXLES
1/2" Square hollow extruded aluminium profile optional round galvanized rad.

BUSH
Nylon bush optional bronze / brass bush.

QUADRANT
Plated steel with wing nut to lock the blades positions. Marked to show the position of the blades.
TECNALCO model VCD-TR H is a round volume control damper designed to access easily with circular ducts of any diameter. The controlling blade is made of perforated sheet of mild steel.

### Standard sizes
**Models VCD- TR / TR - H**

<table>
<thead>
<tr>
<th>L (mm)</th>
<th>W (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>400</td>
</tr>
<tr>
<td>150</td>
<td>450</td>
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<tr>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>250</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td></td>
</tr>
<tr>
<td>350</td>
<td></td>
</tr>
</tbody>
</table>

### MATERIAL CONSTRUCTION

**FRAME**
- 0.9mm thickness galvanized steel sheet optional 1.2mm/1.5mm.

**BLADES**
- 0.7mm thickness perforated galvanized steel sheet.

**AXLES**
- 1/2" Square hollow extruded aluminium profile optional round galvanized rad.

**BUSH**
- Nylon bush optional bronze / brass bush.

**QUADRANT**
- Plated steel with wing nut to lock the blades positions.
- Marked to show the position of the blades.
TECNALCO, MVCD and MR-VCD models are provided with electrically driven actuator. These are available in all the models. Different models of actuators are used based on the clients requirements.

LOW LEAKAGE VCD

TECNALCO, Low leakage VCD’s are provided with additional Jam Seals for reducing the leakage between the blades and the frames. These are available in all the models.

MATERIAL CONSTRUCTION

FRAME
1.2mm thickness galvanized steel sheet.

BLADES
Aerofoil 1mm double skill extruded aluminum profile made of galvanized steel sheet is optional.

AXLES
$\frac{1}{2}$ Square hollow extruded aluminum profile, optional $\frac{1}{2}$ round / square galvanized steel rod.

LINKAGE
Made of galvanized steel.

BUSH
Nylon bush optional Bronze / brass bush.

Note: Available for box type
VOLUME CONTROL DAMPERS

MATERIAL CONSTRUCTION

FRAME
1.2mm thickness galvanized steel sheet.

BLADES
Aerofoil 1mm double skill extruded aluminum profile made of galvanized steel sheet is optional.

AXLES
\( \frac{1}{2} \) round galvanized steel rod.

JAMB SEALS
Stainless steel jamb seals.

LINKAGE
Made of galvanized steel.

BUSH
Bronze optional brass bush.

QUADRANT
Plated steel with wing nut to lock the blades positions.
Marked to show the position of the blades.

VCD DEPTH
S&C type = 150mm, Box type = 156mm, Flange type = 130mm.

GI RING
Gi Circular ring made of galvanized sheet thickness 0.8mm with also available on optional.

Note:
* Gi Rings are available in SS and aluminum finish
* Up to 1.5mm thickness available
* Depth 150mm
VOLUME CONTROL DAMPERS CONSTRUCTIONAL DETAILS

Frame : Galvanised sheet steel = 1.2 mm / 1.5 mm thickness
Note: other thickness available on request.

Blades : Galvanised sheet steel = 1.0 mm / 1.2 mm thickness.
(or) Aluminium fixed profiled blades = 1.2 mm thickness (double skin type).
(or) Perforated sheet of mild steel = 0.7 mm thickness
Note: other thickness available on request.

Bearings : Oil impregnated bronze / nylon bushes

Shaft : Galvanised steel of TECNALCO make

Linkage : Steel or aluminium linkage

Operation : Galvanised steel manual quadrant with full open and full shut markings

Material construction details:

Ordinary type construction:
- Frames and blades are made of galvanised sheet steel in ordinary construction.
- Finish → Standard finish is galvanised sheet steel with weld points protected by aluminium spray coating.

Aerofoil type construction:
- Aerofoil type construction is of double skin blades made of aluminium fixed profile or galvanised sheet steel.
- Frame is made of galvanised sheet steel and blades are made of fixed aluminium aerofoil profiled blades (galvanised sheet steel is optional. Aerofoil blades are constructed by forming two sheets of galvanised sheet steel over a square shaft to give an aerofoil section, which minimizes the effects of turbulence and reduces pressure drop and noise).
- Finish → Standard finish is galvanised sheet steel with weld points protected by aluminium spray coating.

Round type construction:
- Frame is made of galvanised sheet steel of thickness 0.9mm / 1.0mm / 1.2mm.
- The controlling blade is made of galvanised sheet steel of thickness 1.0mm. (or) is made of perforated sheet of mild steel of thickness 0.9mm.
- The movement of the blade permits regulation from full open to full shut off conditions with galvanised sheet steel blade. And full open to 50% shut off with perforated sheet of mild steel.
- Finish → Standard finish is galvanised sheet steel with weld points protected by aluminium spray coating.
ENGINEERING AND PERFORMANCE DATA

Pressure drop
Pressure drop co-efficients and resistance factors of multileaf dampers are a function of airspeed and vary in relation to the system's total pressure available.

The pressure drop is indicated in the graphs for opposed blade dampers and for parallel blade dampers for blade openings of 1/4, 1/2, 3/4 and 4/4 open position.

The values indicated in the graphs can be used for air flow control in composed air handling units and for air flow control in ducting.

The indicated pressure drop value is under a condition that the system's total pressure permits the indicated air speed over the damper.

Indicated pressure drop is the difference in measured static pressure before and after the damper.

Leakage:
Maximum pressure drop when closed = 2000 Pa
At D Pt = 500 Pa m³/hr / met² and Veff. = 7.5 met / sec.

<table>
<thead>
<tr>
<th>VCD- TO Opp/parallel</th>
<th>VCD- TA Opp/parallel</th>
<th>VCD- TR Opposed</th>
<th>VCD- TG Opposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5%</td>
<td>3.9%</td>
<td>5.2%</td>
<td>3.1%</td>
</tr>
</tbody>
</table>
**Opposed blade dampers**

In function of aerodynamic load, the torque co-efficient required to operate the damper blades is indicated in opposite graphic.

The indicated torque ratings are required to overcome the friction of the seals on blade closure.

The indicated torque value is for the total damper with number of blades, as specified.

For selecting the actuator, a safety factor of 25% should be applied to the indicated Nm value.

**Parallel blade dampers**

The torque value for parallel blade dampers is generally higher than for opposite blade dampers of the same surface and composition.

The indicated torque value is for the total damper with number of blades as specified.

Indicated torque ratings are required to overcome the friction of the seals on blade closure.

Actuator selection will be made with a safety factor of 25% to the indicated values from graph opposite.

The torque values indicated in the graphs are for dampers closed. Anyhow, the blade angle resulting for the largest torque requirement is depending on the fan and distributing system.
VOLUME CONTROL DAMPERS

ENGINEERING AND PERFORMANCE DATA

Example:

With uniform duct flow
Blade angle $= \alpha ^\circ$ (0° → full open
90° → full shut)
$K$ = Pressure drop factor
$V_k$ = based on $L \times W$ in met/sec.

1. Finding the pressure drop
$L \times W = 1000 \times 930$ mm
$V = 10$ m3/sec.
$\alpha = 200$

$V_k = Duct \ velocity = 10 \times 0.93 = 10.75$ met/sec.
From graph - A $\rightarrow K = 1.5$
From graph - B $\rightarrow Pt = 105$ Pa

2. Finding the blade angle
$L \times W = 1000 \times 390$ mm
$L \times W = 1000 \times 930$ mm
$V = 10$ m3/sec.
$P_t = 250$Pa
$V_k = Duct \ velocity = 10 \times 0.93 = 10.75$ met/sec.
From graph - B $\rightarrow K = 3.5$
From graph - A $\rightarrow \alpha = 37^\circ$
Fixing Details:

Type 'S' fixing:
Screw type fixing

NOTE:
- Standard supply is Type ‘S’ fixing.
- Pre-punched holes to the frame or available on request.

Available finishes:
- Galvanized sheet steel finish frame (Mill finish)
- Epoxy primary coated finish.

Ordering Data:
Specify
1. TECNALCO type and model
2. Nominal size - L x W
3. Quantity
4. Type of fixing
5. Surface finish
6. Remarks

Example:

<table>
<thead>
<tr>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCD'TA'O</td>
<td>500 x 300</td>
<td>5 nos.</td>
<td>Type ‘S’ fixing with pre-punched holes</td>
<td>GI finish</td>
<td></td>
</tr>
</tbody>
</table>