

PIM™

Pressure Independence Module



BENEFITS AT A GLANCE.

EASY TO INSTALL PACKAGE

The Acutherm PIM™ is designed for ease of installation. Actuator, controls and transducer, along with all internal electrical and pressure connections, are factory assembled in a compact package. It is supplied with or without a damper tested to AMCA standards. All that is required of the installer is to:

- Install damper in duct.
- Connect electrical power.
- Install static pressure fitting in duct and run tubing to the PIM.

IDEAL FOR ACUTHERM MODULAR VAV SYSTEMS

The PIM allows Therma-Fuser™ VAV diffusers to operate quietly at both full flow and turndown conditions by providing pressure independence either as a bypass damper or zone damper. The damper modulates to maintain a static pressure at a point in the supply air duct set within the Therma-Fuser diffuser working range. Set point is adjustable from .05" to .5"wg / 12 to 124Pa.

RELIABLE STATIC PRESSURE CONTROL

The transducer is a differential pressure transducer with CMOS sensing technology internally linearized and temperature compensated for fast, reliable and repeatable response. All controls are trouble free solid state. Two single synchronous motors provide clockwise and counterclockwise rotation without detrimental temperature rise. A high-torque gear train reduces output shaft speed to .05 rpm to avoid hunting.

HOW IT WORKS

The built-in transducer is connected with $\frac{3}{8}$ " / 10mm tubing by others to a static pressure fitting located in the duct at the point of control. The pressure transducer measures differential pressure from the duct to a port open to atmosphere and converts that to a voltage output indicating static pressure. For static pressure above set point, zone dampers are rotated closed and bypass dampers rotated open. The opposite happens when the static pressure is below set point— one operating clockwise and the other counterclockwise.

INSTALLATION

Pre Installation Check

Check to see that the PIM is connected correctly for the application. PIMs with factory installed dampers are factory configured for the application. IF FOR ANY REASON THE PIM DIRECTION IS WRONG, SWITCH DIP SWITCH 2 (see fig. 1).

Installation Instructions

1) Install damper in duct as you would a conventional damper. Usual methods are to install when fabricating the duct, cut an opening on the side of an existing duct to slide the damper in, or use a slip, flange or spiral mate connection. Do not interfere with operation of damper blade(s) and check the length of screws and insulation. When installing in a transition from medium pressure to low pressure duct, seal between the damper frame and the duct as you would for any medium pressure ducting. If PIM is supplied loose from damper,

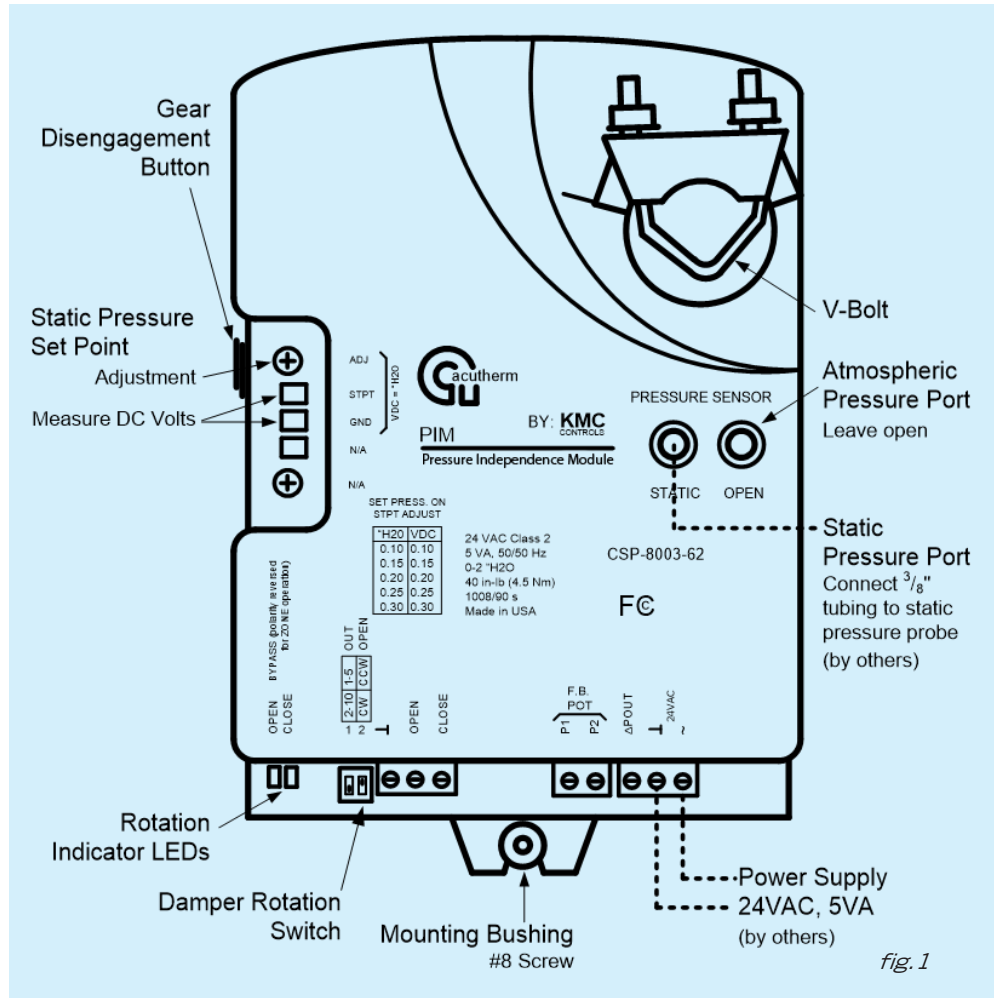
- a) Connect to damper shaft ($\frac{1}{2}$ in / 12.7mm dia. nominal) by placing the PIM over the shaft and tightening the two nuts on the V-bolt, and
- b) Anchor the PIM from turning with a screw through the mounting bushing in the slot of the mounting tab. The bushing can move allowing for damper shaft eccentricity. DO NOT SCREW THE PIM TO THE DAMPER OR DUCT as this will cause the PIM to stall. PIMs supplied with dampers may also have a factory installed bracket.

2) Locate the static pressure probe in duct $\frac{2}{3}$ to $\frac{3}{4}$ of the distance between the first and the last takeoff and after at least 6 diameters of straight run.

3) Drill a $\frac{3}{8}$ " / 9.6mm hole in the duct.

4) Install the static pressure probe (shipped with the PIM) pointing into the air flow and fasten in place using two sheet metal screws.

5) Remove any rubber protection plugs from transducer and fittings.



6) Run $\frac{3}{8}$ " / 10mm ($\frac{1}{4}$ " / 6.3mm ID) (plenum rated, classified for flame and smoke only, NFPA 90A recommended) pneumatic tubing (supplied by others) from the static pressure probe fitting to the 'STATIC' fitting on the PIM (see fig. 1). Leave the 'OPEN' fitting open to atmosphere. (If the PIM is in a fan inlet plenum, then run tubing from 'OPEN' fitting to an outside location.)

7) Connect 24VAC 60Hz or 50Hz to terminals labeled '24VAC'. Power required is 5VA (see fig. 1). 120VAC/1Ø/50-60 Hz units are supplied with a transformer. Use wire nuts to connect 120VAC to the transformer primary leads. (240VAC transformer also available.)

Operation Check

Remove the pneumatic tubing from the fitting. Zone dampers should open and bypass dampers should close. If rotation is in the wrong direction, switch dip switch 2 OPEN (see fig. 1).

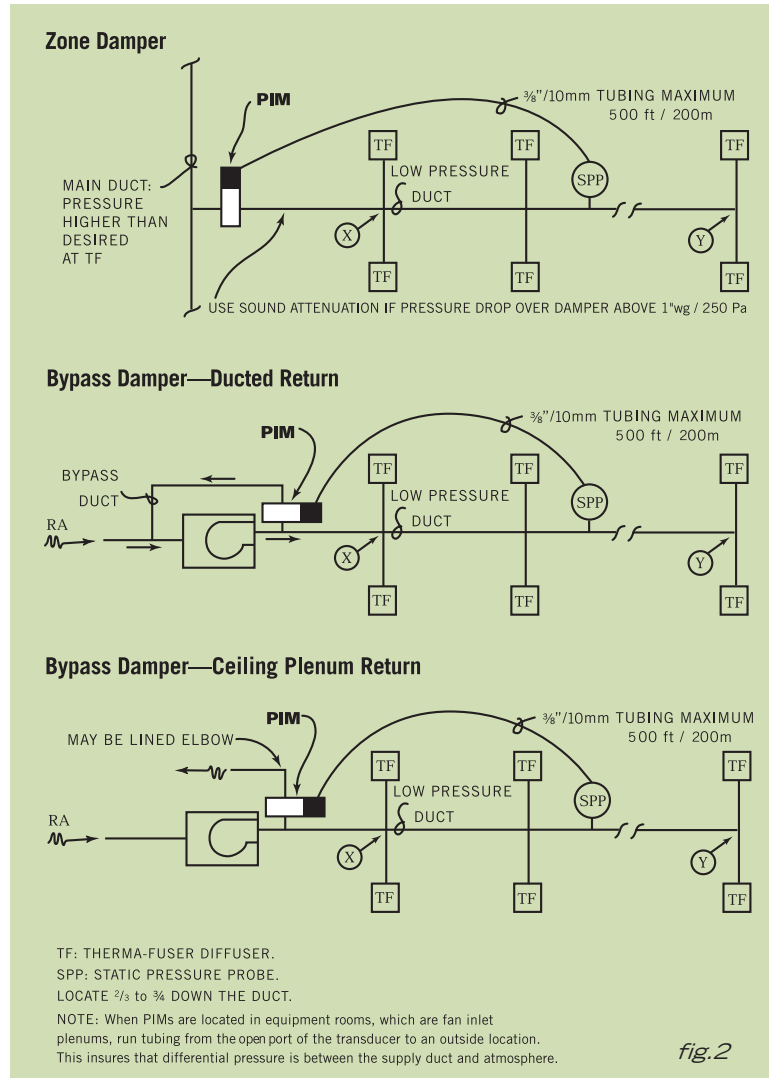
Adjusting Static Pressure

- 1) Determine the static pressure set point preferably using the Balancing Procedure in PIM IOM Form 071.201.
- 2) Measure the voltage across pads labeled STPT and GND and adjust the Phillips head screw labeled ADJ (see fig. 1) to obtain the desired static pressure per the chart below.

Static Pressure in. wg./Pa	DC Voltage across pads STPT and GND
0.05 / 12.5	0.05
0.10 / 24.9	0.10
0.15 / 37.3	0.15
0.20 / 49.8	0.20
0.25 / 62.2	0.25
0.30 / 74.7	0.30

SPECIFICATION

- A. Static pressure control stations shall be Pressure Independence Modules (PIM) manufactured by Acutherm, Hayward, CA.
- B. They shall consist of a control module mounted on a damper tested to AMCA standards.
- C. Control module shall be field adjustable for static pressures from .05"wg to .50"wg / 12 to 124Pa. The control module shall consist of actuator, controls and pressure transducer fully assembled and packaged for easy installation by connecting the tubing from the static pressure fitting and the input voltage. Voltage shall be 24VAC/1Ø/50-60Hz. Optionally an energy limiting transformer rated at 20VA may be factory installed in all 120VAC control modules. Maximum current draw shall be 15VA.
- D. The actuator shall have two synchronous motors that can turn the damper shaft clockwise or counterclockwise with a gear design and slip clutch capable of withstanding a stall condition at either end of the damper rotation with no detrimental temperature rise. The actuator shall mount directly on a ½ in / 12.7mm diameter damper shaft.
- E. The controls shall be electronic solid state and fully contained within the control module. Field adjustment of static pressure set point shall be by turning a Phillips head adjusting screw. Static pressure setting shall be made by correlating voltage readings with tabulated static pressure.
- F. Pressure transducer shall measure pressure differential between atmosphere and the tubing from the static pressure fitting.
- G. The control module shall be field converted from direct acting to bypass by adjusting a switch.
- H. 120V modules shall be in a NEMA 1 enclosure.
- I. A static pressure fitting shall be included for mounting in the downstream duct. Tubing between static fitting and control module is by others.
- J. Manufacturer shall provide a two-year warranty.
- K. Balancing and static pressure set points shall be by the Acutherm balancing procedure. (see Form 071.201).



SYSTEM DESIGN

Zone Damper

Static pressure control is achieved by dampering air flow to low pressure ductwork. A typical example is a large system in which supply main ducts operate at pressures higher than desired for quiet Therma-Fuser diffuser operation, about .25"wg / 62Pa. In variable air volume systems, fan capacity control should be considered for energy reduction. Also, some fans may have a pressure capability that could damage ductwork if totally closed off.

Bypass Damper

Static pressure control is achieved by bypassing air from the supply duct to the return. Typical applications include:

- (1) Uncontrolled fan capacity or
- (2) A fan that has controls that do not reduce capacity to the minimum flow of the Therma-Fuser diffuser. Bypass dampers should be sized to handle an air volume equal to the total turndown of the Therma-Fuser diffusers.

Example 1: 12 Therma-Fuser model TB-C-10. Design airflow 450 cfm / 212 l/s each. Turndown to tight shut off. Size the bypass damper for 5400 cfm/2544 l/s.

Example 2: 5 Therma-Fuser model TF-HC-8. Design airflow 275 cfm / 130 l/s each. Minimum flow stops set at 20% of design airflow. Size the bypass damper for 1100 cfm / 520 l/s.

Duct Design

If the Therma-Fuser diffusers are to deliver nominal capacity at .15"wg / 37Pa in the Therma-Fuser neck, and if a maximum of .25"wg / 62 Pa is to be held for quiet operation, the duct between points X and Y (see fig. 2) should be sized for maximum pressure drop of .1"wg / 25 Pa. In an existing system, if the pressure drop between X and Y exceeds .1"wg / 25 Pa., consider additional dampering, relief or a parallel duct. If Therma-Fuser diffuser design is below nominal, say .05"wg / 12Pa in the Therma-Fuser neck, the duct between X and Y can be sized for a maximum pressure drop of .2"wg / 50Pa.

PIM DIMENSIONS:

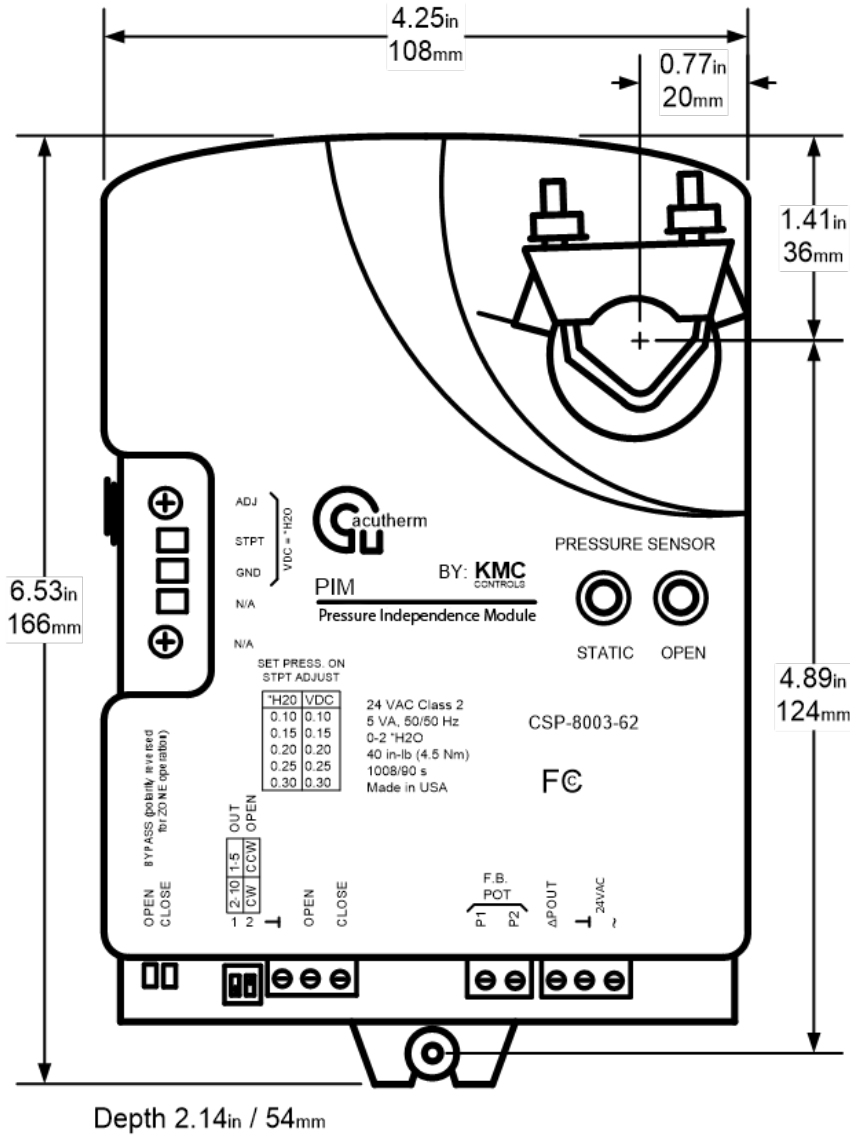


fig.3

Damper Selection Guidelines

Zone dampers should be sized for 100% of the air volume. Bypass dampers are also sized for 100% of the supply air volume unless the Therma-Fuser diffusers are equipped with minimum flow stops. Then the bypass should be sized for an air volume equal to the total turndown of the Therma-Fuser diffusers. Good judgment must be used when selecting and applying dampers to avoid excessive sound transmitted through the duct or radiated into the space. The latter is of more concern if the damper is above an occupied space rather than in an equipment room. Generally, dampers applied at pressure drops of less than 1"wg / 250Pa will have acceptable sound levels.

Extra caution should be taken when bypassing from a duct into a ceiling

plenum. These installations are best either in or over a mechanical room. Sound attenuation should be considered where dampers bypass into the ceiling plenum over an occupied space.

This can be a commercially available sound attenuator or four to five equivalent lengths of lined duct and an elbow for discharge away from the occupied space (usually up).

It is not necessary to be concerned that excessive leakage of a closed bypass damper will require an oversized system fan. VAV systems rarely operate at design conditions which is the only situation where the bypass damper is closed. Furthermore, leakage from a damper is so low that blade and jamb seals are not necessary.

Square/Rectangular Damper

Selection

AMCA Standard 500 provides only for testing of damper airflow and leakage and, as a result, most manufacturers of AMCA tested control dampers do not publish sound data. Generally, dampers selected below 1000fpm / 5.1m/s face velocity and applied at pressure drops of less than 1"wg / 250Pa will have acceptable sound levels.

QUICK SELECTION Square / Rectangular Dampers		
*Damper size	Max CFM at 1000 fpm	Max l/s at 5.1 m/s
12x12	1000	472
18x16	2000	943
24x16	3000	1415
30x24	5000	2358
36x30	7500	3538
48x30	10000	4717

*Square/rectangular dampers are available in a wide variety of sizes in addition to those shown.

Round Damper Selection

Round dampers are tested to standard ARI 880 and complete test data is available in a separate publication. Generally, dampers selected below 2000fpm / 10.2m/s face velocity and applied at pressure drops of less than 1"wg / 250Pa will have acceptable sound levels.

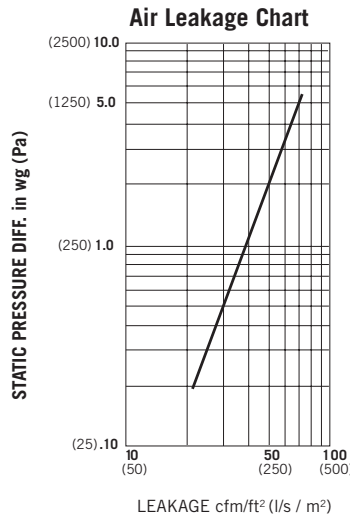
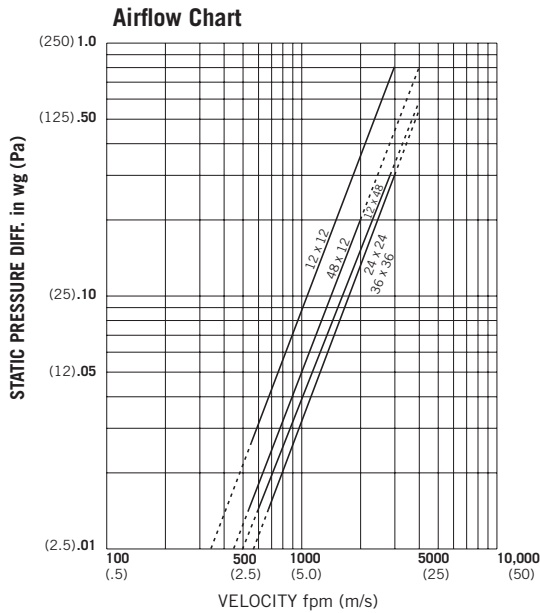
QUICK SELECTION Round Dampers		
Size designation	Max CFM at 2000 fpm	Max l/s at 10.2 m/s
6	393	185
8	698	329
10	1090	514
12	1570	741
14	2137	1008
16	2791	1317

Damper Not Supplied by Acutherm

Damper size must be limited to the 40in-lbs torque of the PIM. Where damper torque requirements are not available use:

Type Damper	Maximum Damper Size
Opposed blade—no seals	13ft ² / 1.21m ²
Opposed blade with jamb and blade seals	6.5ft ² / 0.60m ²

SQUARE / RECTANGULAR DAMPERS TYPICAL PERFORMANCE DATA AND DIMENSIONS



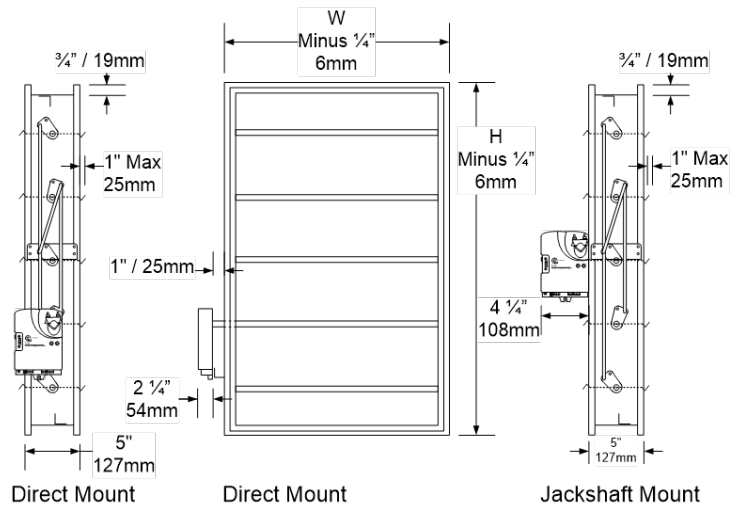
LEAKAGE IN CFM PER SQUARE FOOT

Standard opposed blade without seals. Holding torque applied with 4-inch pounds per square foot of damper area. (Test size 24" x 24") This performance information is derived from testing in accordance with AMCA Standard 500; with test set up per figure 5.5 and measurement apparatus set up per figure 6.5 of this AMCA standard.

VELOCITY IN FEET PER MINUTE (CFM / SQ.FT.)

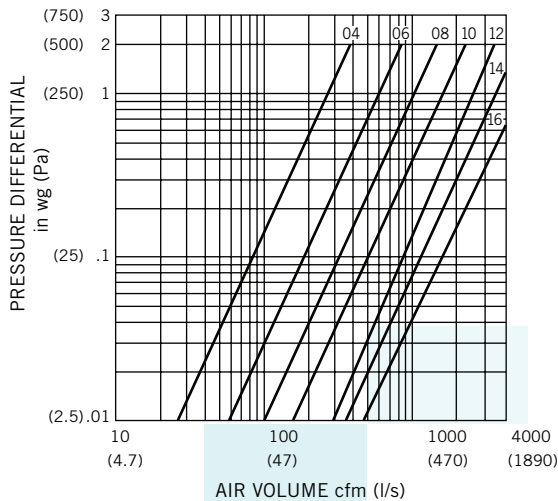
Airflow with damper 90° (Full) open. This performance information is derived from testing in accordance with AMCA Standard 500; with test set up per figure 5.3 and measurement apparatus set up per figure 6.5 of this AMCA standard.

Dimensions



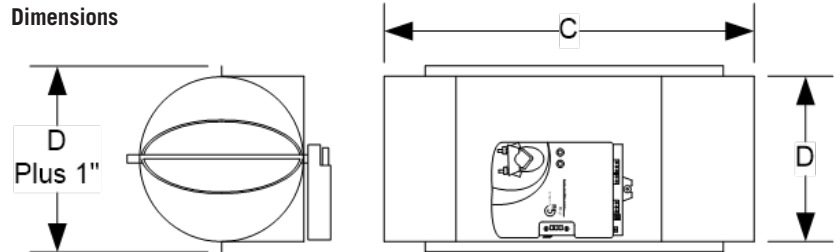
Sizes are specified width by height. Sizes begin at 6 x 6 and go up to 48 x 36. Contact factory for more options.

ROUND DAMPERS TYPICAL PERFORMANCE DATA AND DIMENSIONS



Complete ARI 880 test data is available.

Dimensions



Size designation	D* Outside Diameter in. / mm	C Length in. / mm
6	5 7/8 / 159	18 / 457
8	7 1/8 / 200	18 / 457
10	9 7/8 / 251	20 / 508
12	11 7/8 / 302	20 / 508
14	13 7/8 / 352	22 / 559
16	15 7/8 / 403	22 / 559

*Add 2in / 51mm to outside diameter when insulated. Insulation comes as standard.



PIM™ Pressure Independence Module

TWO YEAR WARRANTY

Acutherm warrants that its Pressure Independence Module, exclusive of any options and accessories (whether factory or field installed) shall be free from defects in material or workmanship for a period of two (2) years from the date of shipment and agrees to repair or replace, at its option, any parts that fail during said two (2) year period due to any such defects which would not have occurred had reasonable care been taken, provided that such parts have been inspected by Acutherm and found defective and provided the units have been given normal and proper usage and all parts and controls remain unaltered. Acutherm makes NO WARRANTY OF MERCHANTABILITY OF PRODUCTS OR OF THEIR FITNESS FOR ANY PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY WHICH EXTENDS BEYOND THE LIMITED WARRANTY ABOVE. ACUTHERM'S LIABILITY FOR ANY AND ALL LOSSES AND DAMAGES RESULTING FROM DEFECTS SHALL IN NO EVENT EXCEED THE COST OF REPAIR OR REPLACEMENT OF PARTS FOUND DEFECTIVE UPON EXAMINATION BY ACUTHERM. IN NO EVENT SHALL ACUTHERM BE LIABLE FOR INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR DAMAGES FOR INJURY TO PERSONS OR PROPERTY. Acutherm shall not be responsible for freight to or from its plant in connection with the inspection, repair or replacements of parts under the terms of this limited warranty nor for cost of removal or installation.

ACUTHERM PRODUCT GUIDE



Square VAV Diffusers

Round VAV Diffusers

Linear VAV Diffusers

Accessories

Pressure Control

Temperature Control

PRODUCT INFORMATION DESCRIPTION

Use the following model number nomenclature to order Therma-Fuser diffusers, options and accessories.

Product

(1) Model	(2) Use	(3) Voltage
PIM	<input type="text"/>	<input type="text"/>

Product
 1. Model: **PIM** Pressure Independence Module
 2. Damper Use: Z Zone Damper, B Bypass Damper,
 3. Voltage: **24** 24VAC/1Ø/50-60Hz, **120** 120VAC/1Ø/50-60Hz or **240** 240VAC/1Ø/50-60Hz

Options for Square/Rectangular

(1) Damper	(2) Width	(3) Height
S	<input type="text"/>	<input type="text"/>

Options Square/Rectangular
 1. Damper Type: **S** Square/Rectangle
 2. Width of damper (in.)
 3. Height of damper (in.)

Options for Round

(1) Damper	(2) Size	(3) Flow	(4) Wall	(5) Adpt. In
R	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
(6) Adpt. Out	(7) Atten.	(8) Multi Out		
<input type="text"/>	<input type="text"/>	<input type="text"/>		

Options Round
 1. Damper Type: **R** Round
 2. Size (Nominal Diameter): **6, 8, 10, 12, 14, or 16**in.
 3. Inlet Flow Cross: **FC**
 4. Double Wall Construction: **DW**
 5. Square to Round Inlet: **RSI**
 6. Round to Square Outlet: **RSO**
 7. Sound Attenuator: **AA12** 12" long, **AA24** 24" long, **AA48** 48" long
 8. Multiple Outlet Plenum: **MOP3** 3 outlets, **MOP4** 4 outlets

AVAILABLE ONLINE

Access digital brochures, CAD files, performance data and more!

www.acutherm.com

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EMAIL SUPPORT

Send us your questions and we'll get you the answers you need.

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