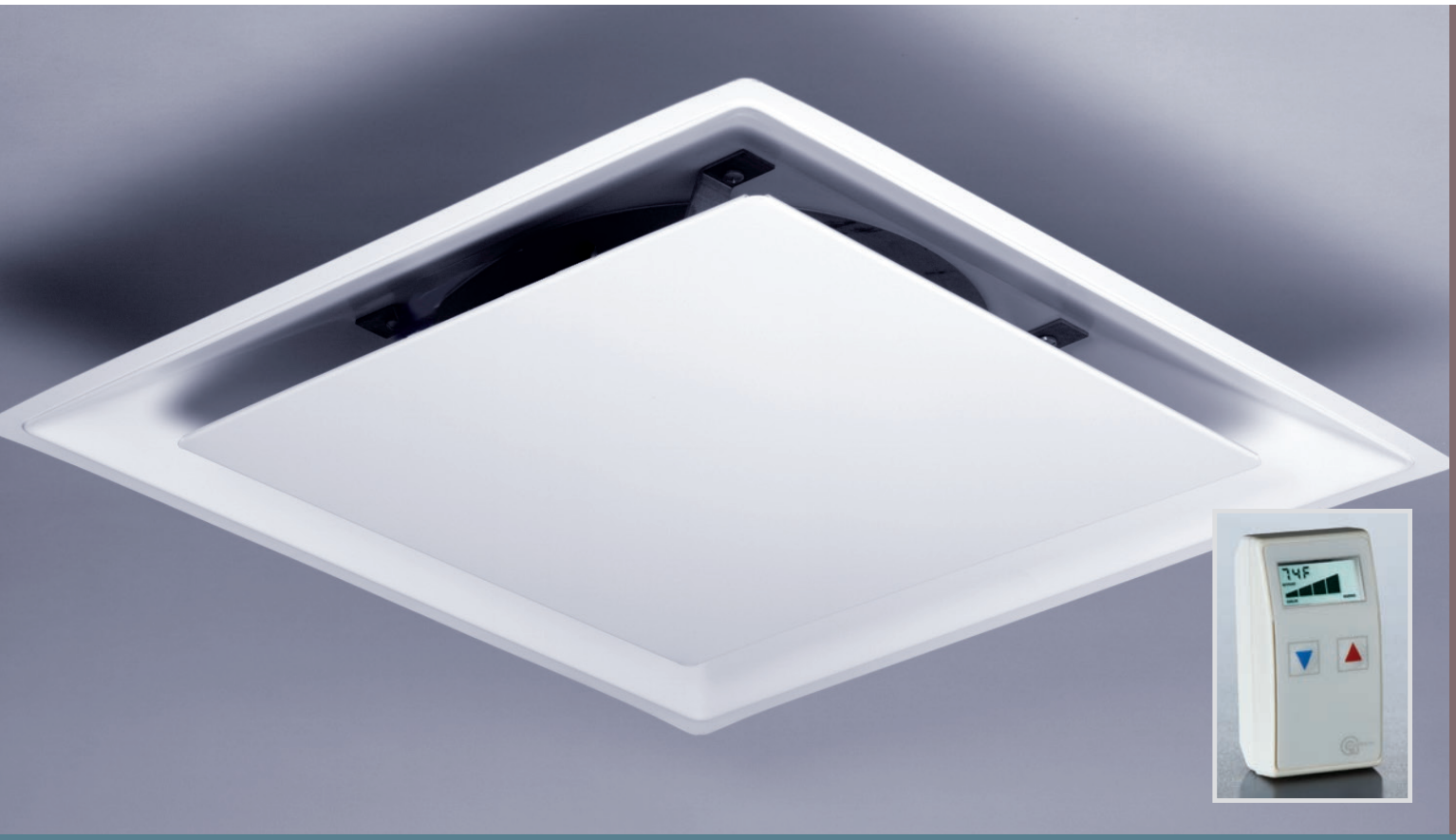
MB Therma-Fuser™

Standalone Motorized Disc VAV Diffuser

Therma-Fuser™ Systems

Models:	**MB-M**	Master with sensor and controller
	MB-S	Slave with controller to follow master
	MB-D	Drone with controller for 3rd party control



MB: Product Overview

FORM 122.101 REV 1407

BENEFITS AT A GLANCE.

INDIVIDUAL COMFORT OVER A WIDE RANGE OF CONTROL

Every Therma-Fuser™ diffuser is a VAV zone of temperature control providing pleasing comfort in both heating and cooling. A wide range of control with comfort set points adjustable from 55-95˚F/13-35˚C. The electric motor delivers a consistent response for control of room temperature, and when required, a quick response to commands. The Wall Adjuster provides easy access for unit configuration and for the occupant to adjust comfort set points

ROBUST DESIGN WITH LONG LIFE MOTOR

The need for any maintenance or repair is minimized through the robust design and a brushless DC stepper motor specifically selected for a long life. The electric motor directly drives a threaded shaft connected with a linkage to the dampers eliminating the need for a failure prone gear box. The control algorithm reduces the motor run time to a minimum reducing energy use and extending the motor life. And, should maintenance be required, the unique design allows for easy access to the motor from the room without removal of the diffuser from the ceiling.

ONLY THERMA-FUSER™ VAV OFFERS THESE BENEFITS

- Quiet – no motor noise
- Separate temperature set points for VAV heating and VAV cooling.
- Superior air distribution - more entrainment, even temperature distribution, higher ADPI* and better room air change effectiveness.
- Lowest energy VAV terminal-green VAV.
- Low to no maintenance - 2 year warranty.
- Easily adapts to office changes.

*ADPI (Air Diffusion Performance Index)

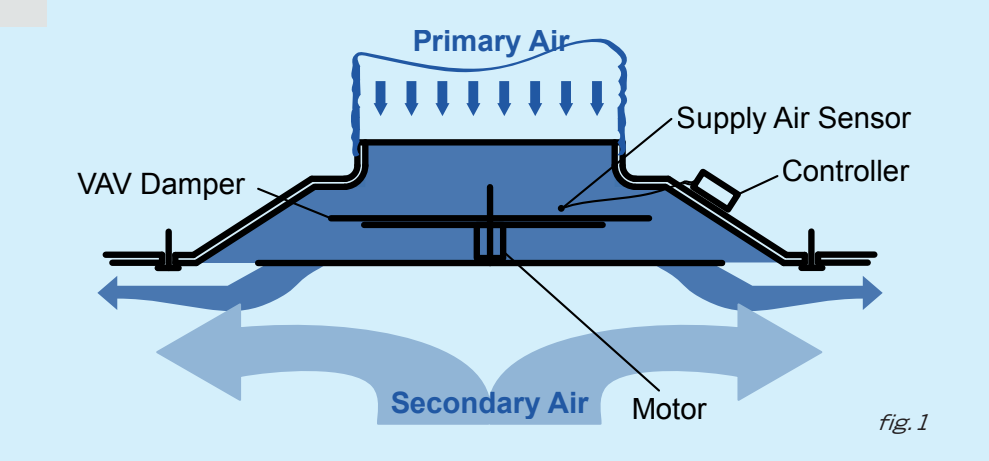


fig. 1

HOW IT WORKS

Model MB Therma-Fuser diffusers are nominal 24"/600mm square ceiling diffusers with built in DDC controller, and VAV damper. A round disc damper opens and closes to meter air flow (hot or cold) into the room in response to room temperature. The damper is modulated by a brushless DC stepper motor. The electric motor, rigorously tested to provide many years of reliable service, directly drives a threaded shaft connected with a linkage to the disc damper.

The controller uses an 'expert system' control similar to having an "expert" sitting there making the adjustments. Unlike PID control, 'expert system' control does not require field tuning. Every 10 seconds it determines if the damper should be adjusted and the amount of any adjustment based on temperature relationships and the rate of change of damper position.

MASTER DIFFUSER

MB-M master diffusers contain a duct temperature sensor and DDC controller for standalone operation with the Wall Adjuster.

ROOM AIR SENSING

To monitor average room temperature, a sensor in the Wall Adjuster (Fig. 2) is used similar to a traditional thermostat. The Wall Adjuster should not be located on an outside wall or where it could be exposed to direct sunlight at any time during the day. It should be located away from the diffuser, yet exposed to general airflow from the space.

A properly applied MB-M will hold the room average within 1.5˚F/0.9˚C of the temperature selected.

COOLING AND HEATING MODES

In the cooling mode, the MB-M damper opens on a rise in room temperature. In the heating mode the operation is reversed with the MB-M damper blades closing on a rise in room temperature. Determination of cooling/heating mode is made automatically by comparing supply air temperature to room temperature and set point. The MB-M is in the heating mode if the supply air temperature is warmer than both the room temperature and set point. The MB-M is in the cooling mode if the supply air temperature is cooler than either the room temperature or set point.

ADJUSTING SET POINTS

The room temperature set point is easily adjusted by pressing the up and down arrows on the Wall Adjuster (see Fig. 2). Adjustment is limited to that set using the set point offset (see Configuration).

BUILDING AUTOMATION INTERFACE

The MB-M has a 0-10VDC analog input for set point adjustment by a building automation system. The damper can also be forced open or closed through this interface.

CONFIGURATION

The MB-M diffuser comes factory configured and ready to operate once power is connected. If required, there are six parameters that can be accessed through the menu button on the bottom of the Wall Adjuster:

1. Temperature correction (sensor calibration)
2. Minimum damper position %
3. Maximum damper position %
4. Heating set point
5. Cooling set point
6. Set point offset (limits the range of set point adjustment)

In addition, there are dip switches on the back of Wall Adjuster to adjust the display of the Adjuster between warmer/cooler, numeric and ˚F/˚C.

OPEN FOR BALANCING

When both the up and down arrow buttons on the Wall Adjuster are pressed for a couple seconds the MB-M enters a balancing mode and opens to 100% damper position. When either arrow button is pressed the balancing mode is released and the MB-M will close and then re-open to control the temperature of the room.

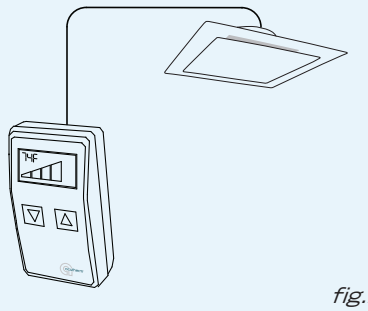
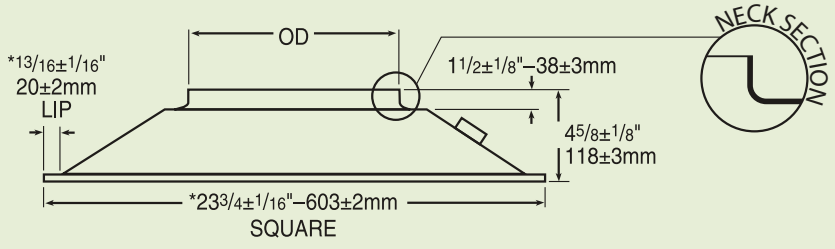


fig. 2

DIMENSIONS

Inlet Designation	OD	
	Inches ± 1/16	mm ± 3
6"	5 15/16	150
8"	7 15/16	200
10"	9 15/16	250
12"	11 15/16	300



*595±2mm Square with 16±2mm lip available —specify 595mm square.

SLAVE DIFFUSER

MB-S slave diffusers contain only the DDC controller allowing the diffuser to mimic the master diffuser, opening and closing with the MB-M

DRONE DIFFUSER

MB-D drone diffusers contain only the DDC controller and use an analog 0-10VDC input to position the damper with a direct 0-100% relationship. With this input, controls by others may be used to control the MB-D diffuser.

SUPPLY POWER

Each MB diffuser requires 24VAC +3/-1 power supplied. Max power draw is 15VA when the motor is running, but when the motor is idle, the power draw drops to <1VA.

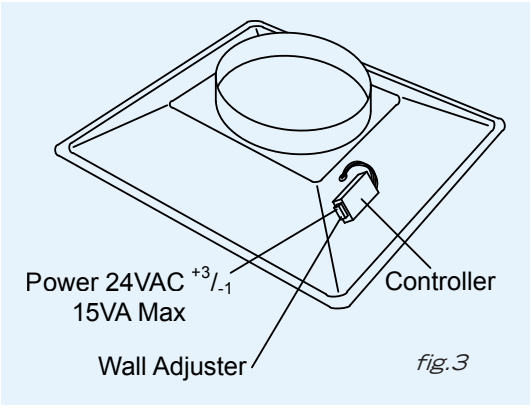


fig.3

SYSTEM DESIGN

The best control for heating/cooling units supplying air to VAV terminals is a discharge thermostat which maintains a constant supply air temperature. With DX equipment these are a high and low limit. Use a room thermostat for changeover between heating and cooling modes. For hybrid systems (part VAV and part constant volume) control the heating/cooling supply unit with a thermostat in one of the rooms with a constant volume diffuser, preferably the space with the greatest load. For both VAV and hybrid systems, the fan should run continuously. The constant discharge velocity of Therma-Fuser diffusers at varying air flow provides good room circulation which reduces stratification. Keeping heating supply air temperatures as low as possible will further reduce room air stratification to a negligible level.

Static pressure at the inlet of the Therma-Fuser diffuser should be between 0.05"wg/12Pa and 0.25"wg/62Pa, at full and partial air flows. Static pressure below 0.05"wg/12Pa will result in low air flow and less induction. Above 0.25"wg/62Pa, Therma-Fuser diffusers operate well but excessive noise may result. Use minimum flow settings where tight shut off is not needed.
Size Therma-Fuser™ VAV diffusers for low static pressure drops - between 0.05"wg/12Pa and 0.25"wg/62Pa maximum to limit noise. Size the diffusers as large as possible, especially at the end of the duct run, for the lowest possible pressure drop at design air flow. Size the ducts for a maximum pressure drop of the difference between the pressure drops over the first and the last diffusers.
If the system turns down more than 30%, static pressure should be controlled. Included in the options for static pressure control are fan speed control and modulating bypass dampers. Modulating zone dampers are recommended where several zones share a higher pressure duct or riser.
Manual balancing dampers should be used at the takeoff for each diffuser. Manual balancing dampers may not be required with ducts designed to Acutherm specifications.
Acutherm has "how to" system design brochures for almost every ducted air system. For specific recommendations refer to the brochure for your system.

GUIDE SPECIFICATION

(Suitable for Section 23 36 16 Variable-Air-Volume Units of the CSI Master Format).
2.2 Standalone motorized VAV diffusers
A. Standalone motorized variable air volume diffusers shall be Therma-Fuser™ model MB manufactured by Acutherm, Hayward CA.
B. Standalone motorized VAV diffusers shall be a complete VAV terminal with supply air sensor, "expert system" controller, motor and disc damper contained in a nominal 24in/600mm square diffuser.
C. They shall be actuated by a brushless DC stepper motor with a direct linkage to the damper shipped in the open position for balancing should the diffuser not yet be connected to power.
D. All VAV diffusers shall provide easy access to the motor from the room without removal of the diffuser should maintenance be required.
E. The expert controller shall have the ability to change control response as the space changes. P, PI, PD and PID control shall not be acceptable.
F. The housing shall have an offset ridge on each of the four edges to provide better air flow in lay-in installations.
G. The manufacturer shall warrant that all VAV diffusers shall be free from defects in materials and workmanship for a period of two years from date of shipment.
H. All VAV diffusers shall have a solid (no holes or slots), hinged appearance panel that can be unlatched and folded down to hang allowing hands to be free for adjusting temperature set points. Instructions for the VAV diffuser shall be on the inside of the appearance panel.
I. Supply air to the VAV diffuser shall be constant temperature (may be reset to another constant temperature). Supply air shall be limited to no lower than 50°F/10°C on cooling and as low as possible not to exceed 120°F/49°C on heating.

For the guide specification in a word format and for specifications for the MB-S Slave and MB-D Drone types, please visit www.acutherm.com, click on:

➲Documents
➲2x2
➲MB
➲Specifications.

PERFORMANCE GUIDE in I-P UNITS

Nomimal Inlet Diameter in	Inlet Static Pressure in wg	Maximum Flow cfm	Maximum Flow		25% Maximum Flow	
			Throw* - Feet @ v_t=50/100	†NC	Throw* - Feet @ v_t=50/100	†NC
6	.05	100	3/2	<15	2/<1	<15
	.10	140	4/3	17	2/2	<15
	•.11	147	4/3	18	2/2	<15
	.15	175	5/4	24	3/2	<15
	.20	210	6/5	27	4/3	<15
	.25	230	7/6	30	4/3	20
8	.05	160	5/3	<15	3/2	<15
	.10	225	7/5	18	3/2	<15
	•.12	245	7/5	21	3/2	<15
	.15	275	8/6	25	4/3	<15
	.20	320	9/7	30	4/3	19
	.25	350	9/7	34	5/3	24
10	.05	260	6/4	<15	3/2	<15
	.10	370	8/5	25	5/3	<15
	•.12	402	8/6	27	5/3	<15
	.15	450	9/7	31	5/4	<15
	.20	520	10/8	35	6/4	21
	.25	580	11/9	39	6/5	25
12	.05	340	8/6	<15	6/3	<15
	.10	500	10/8	24	6/4	<15
	•.14	580	11/9	29	7/5	18
	.15	600	11/9	30	7/5	19
	.20	690	12/10	36	7/5	25
	.25	780	13/11	39	8/6	29

- • Denotes 750 fpm / 3.81 m/s inlet velocity.
- * Throw data is for air 20°F/11°C lower than room temperature. Throws for isothermal air are 40 to 50% greater.
- † NC based on L_w(10^{-12} watts reference) -10db
- Tested in accordance with ANSI/ASHRAE 70, ANSI S12.31, ARI 890, ISO 5219 and ISO 3741.
- Ratings independently verified by Inchcape Testing Services, ETL Testing Laboratories.

PERFORMANCE GUIDE in SI (METRIC) UNITS

Inlet Designation	Nominal Inlet Dia. mm	Inlet Static Pressure Pa	Maximum Flow		Maximum Flow Throw (m)*@v_t =			25% Maximum Flow Throw (m)*@v_t =		
			L/s	m^3/h	.25 m/s	.50 m/s	†NC	.25 m/s	.50 m/s	†NC
6	150	10	43	157	0.9	0.6	<15	0.6	< 0.3	<15
		20	59	211	1.1	0.8	16	0.6	0.5	<15
		• 30	73	262	1.3	1.0	20	0.7	0.6	<15
		40	86	310	1.6	1.3	25	1.0	0.7	<15
		50	99	358	1.8	1.5	27	1.2	0.9	<15
		60	107	385	2.1	1.8	29	1.2	0.9	19
8	200	10	69	250	1.4	0.8	<15	0.9	0.6	<15
		20	94	339	1.9	1.3	17	0.9	0.6	<15
		• 30	116	417	2.3	1.7	21	1.0	0.7	<15
		40	134	484	2.5	1.9	26	1.2	0.9	16
		50	151	545	2.8	2.2	30	1.2	0.9	19
		60	163	586	2.8	2.2	33	1.5	0.9	23
10	250	10	112	405	1.6	1.2	<15	0.8	0.6	<15
		20	154	556	2.2	1.4	21	1.3	0.8	<15
		• 30	190	685	2.6	1.8	27	1.5	1.1	<15
		40	219	791	2.8	2.2	32	1.6	1.2	16
		50	246	886	3.1	2.5	35	1.8	1.2	21
		60	269	968	3.3	2.7	38	1.8	1.5	24
12	300	10	146	525	2.3	1.7	<15	1.8	0.9	<15
		20	206	743	2.8	2.2	20	1.8	1.1	<15
		30	255	920	3.2	2.6	26	2.0	1.4	17
		• 40	292	1053	3.4	2.8	31	2.1	1.5	20
		50	326	1176	3.7	3.1	36	2.1	1.5	25
		60	360	1299	3.9	3.3	38	2.4	1.8	28

(All SI / Metric ratings are soft conversion from I-P ratings)

- • Denotes 750 fpm / 3.81 m/s inlet velocity.
- * Throw data is for air 20°F/11°C lower than room temperature. Throws for isothermal air are 40 to 50% greater.
- † NC based on $L_w(10^{-12}$ watts reference) -10db
- Tested in accordance with ANSI/ASHRAE 70, ANSI S12.31, ARI 890, ISO 5219 and ISO 3741.
- Ratings independently verified by Inchcape Testing Services, ETL Testing Laboratories.

MB Therma-Fuser™ Standalone Motorized Disc Diffuser

TWO YEAR WARRANTY

Acutherm warrants that its Model MB diffuser, exclusive of any options and accessories (whether factory or field installed) shall be free from defective 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 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 CONSEQUENTIONAL 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 replacement 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) Type	(3) Size
MB		

Product
1. Model: **MB** – Motorized Disc Therma-Fuser diffuser
2. Type: **M** master, **S** slave, and **D** drone
3. Size: nominal **6, 8, 10, or 12** inch inlet

Options

(1) Remote Adjust	(2) Insulation	(3) Security Hanger	(4) Sheared Housing
ADJ-M			

Options
1. Remote Adjust: **ADJ-M** Motorized Wall Adjuster
2. Insulation: **I** for attic/plenum side insulation
3. Security Hanger: **H** two hangers on opposite corners
4. Sheared Housing: **595** for 600mm metric grid ceilings, **T1** for $23^{3}/_{16}$" and **T2** for $22^{3}/_{4}$"

Accessories

(1) Ceiling Frame

Accessories
1. Ceiling Frame: **TFHD** for hard ceiling, **TF4DB** for 4" drop box, **TF1DB** for $^{17}/_{16}$" drop box, **TFSP** for spline, **TFT1** for tegular $^{9}/_{16}$" T-bar, **TFT2** for tegular 1" T-bar, and **TFAL** for air lifter (no ceiling) diffuser

AVAILABLE ONLINE
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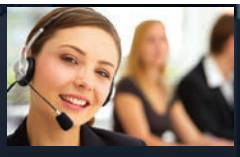

EMAIL SUPPORT
Send us your questions and we'll get you the answers you need.
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