Cooling Fans

Cooling Module

FM Series IP55/43

Cooling Module

FM Series

For details on this product please refer to our website, contact technical support or your nearest Oriental Motor sales office.
www.orientalmotor.com

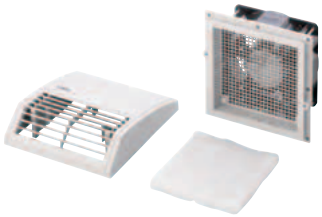
The **FM** Series offers modular products that combine a fan with peripherals. These modules help reduce equipment problems caused by ingress of dust or water, while saving installation and replacement costs.

RoHS

Features

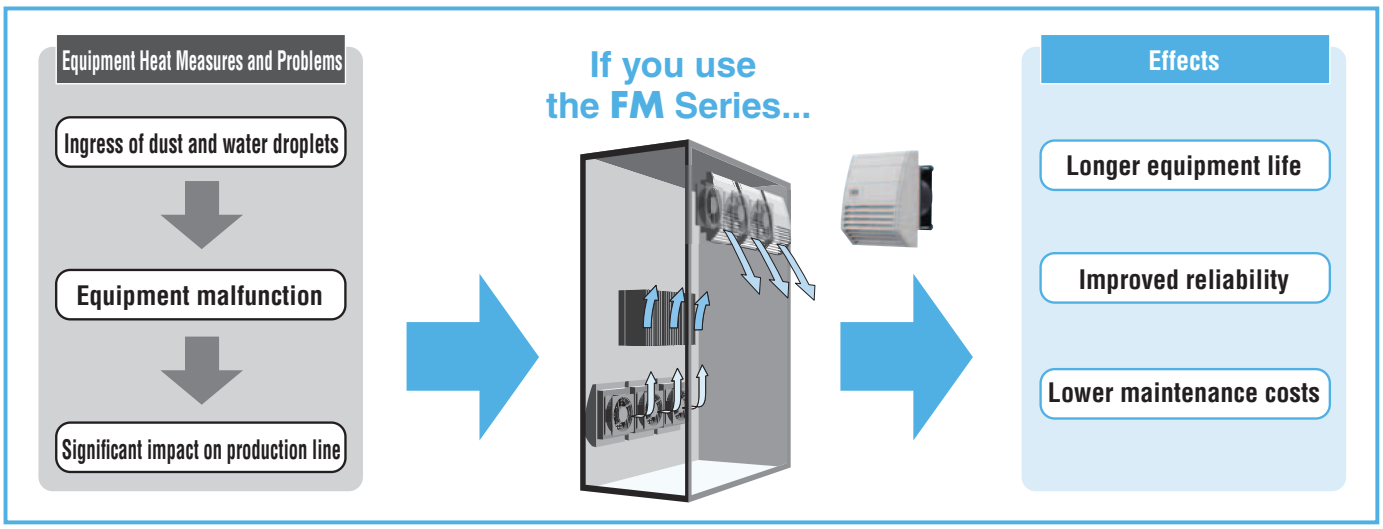
Preventing Ingress of Dust and Water Droplets

The integrated structure consisting of a fan, filter and cover makes it easy to prevent ingress of dust and water droplets into the enclosure.



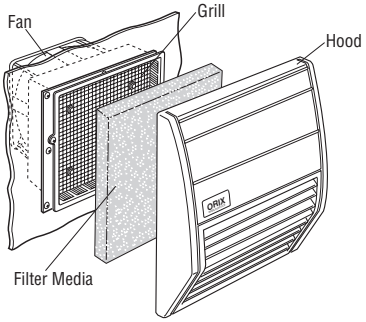
Improvement of Equipment Reliability

The entrance of dust or water droplets in the air brought in by cooling fans may cause problems.
The **FM** Series will protect your equipment from these factors, resulting in long life and high reliability.



Easy Installation and Maintenance

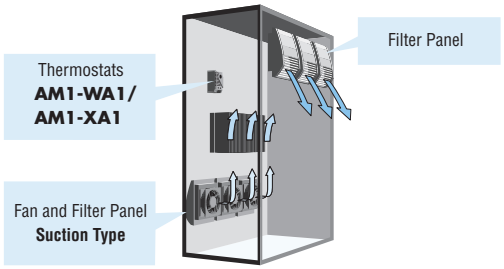
The module can be easily installed by tightening screws from outside filter media.
The filter can be replaced from outside the equipment, which makes maintenance easy.



Effective Cooling Using the FM Series

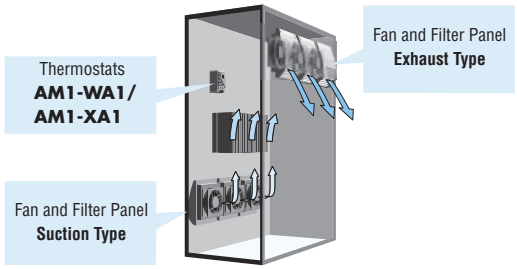
"Fan and filter panel" and "filter panel" are available for the **FM** Series.
By combining these panels as shown below, ingress of dust and water droplets into the enclosure can be prevented to achieve effective cooling.

1 Suction type "fan and filter panel" at the bottom, "filter panel" at the top



- Air is suctioned using the fans at the bottom and exhausted from the vent holes at the top.
- The pressure inside the enclosure is raised so that dust does not easily enter the enclosure through gaps other than the suction intake (such as through gaps at case joints and around cable holes).

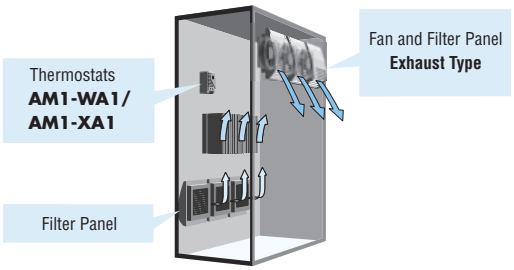
2 Suction type "fan and filter panel" at the bottom, exhaust type "fan and filter panel" at the top



- Air is suctioned using the fans at the bottom and exhausted from the fans at the top.
- This method is ideal for applications where components are densely mounted in the enclosure and the method in 1 does not provide effective cooling.

- **The methods in 1 and 2 are recommended in general, but the following method is also possible.**

"Filter panel" at the bottom, exhaust type "fan and filter panel" at the top



- The pressure inside the enclosure is lowered so that air does not easily leak out through gaps other than the exhaust outlets (such as through gaps at case joints and around cable holes).
  This method is suitable for applications where expelling of dust from inside the enclosure may affect the surrounding environment.

Fan and Filter Panel

A fan is equipped with a filter and cover.
The suction type and exhaust type are available.

Filter Panel

A filter is integrated with a cover.
Fan is not included.

Thermostats AM1-WA1/AM1-XA1 → Page F-113

A thermostat is ideal for temperature control in the enclosure.
More effective cooling is possible by combining the **FM** Series with a thermostat.

AM1-WA1 **AM1-XA1**

Types and Features

Both IP55 and IP43 models are available.

IP55/IP43

These models conform to the IP55 and IP43 under the IEC Standards.
These models are ideal for applications where ingress of dust, foreign objects, water droplets, etc. must be prevented to ensure a high degree of protection.

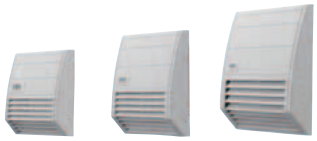
◇Fan and Filter Panel

- Hood size: Large [209 mm×226 mm (8.23 in.×8.90 in.)],
  Medium [157 mm×170 mm (6.18 in.×6.69 in.)],
  Small [129 mm×134 mm (5.08 in.×5.28 in.)]
- Installed fan: □119 mm − 38 mm (□4.69 in. − 1.50 in.) Thick
  AC Axial Flow Fan (Hood size: Large, Medium)
  □92 mm − 25 mm (□3.62 in. − 0.98 in.) Thick
  AC Axial Flow Fan (Hood size: Small)
- Air flow direction: Suction type, Exhaust type

◇Accessories

Plug cord for connection to power supply [1 m (3.3 ft.)], Mounting screws

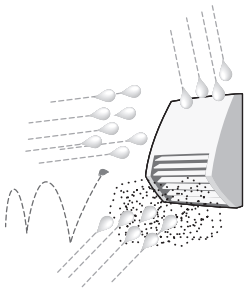
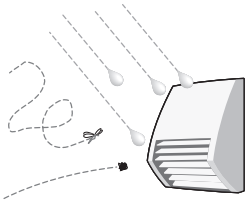
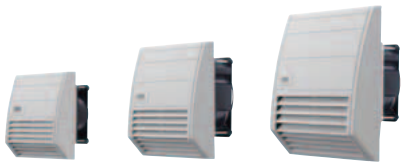
◇Filter Panels are Available in Same Size



Selecting from the FM Series

Select Based on Degree of Protection (IP)

Select an appropriate model according to the degree of protection required by your equipment as a whole or the environment in which the equipment is used.

Type (Degree of protection)	Explanation of Degree of Protection	Dust-Removal Ratio	External View	Air-Blowing Capacity
IP55	 The equipment is protected against ingress of dust and water jet (from all directions).*	95% (Air velocity 0.7 m/s)	 Hood type (material: resin)	Good
IP43	 The equipment is protected against ingress of wires (with a diameter of 1 mm or more) and sprayed water (coming from directions within a range of 60° relative to the vertical plane).*	48% (Air velocity 2.0 m/s)	 Hood type (material: resin)	Better

*In accordance with the test conditions specified in EN 60529.

● On products offering higher degrees of protection, the air flow – static pressure characteristics are lower due to the thickness and density of the filter media used. ➜ Page F-109

◇Degree of Protection

IP codes indicating the grade of dust-resistance and waterproofing are specified as follows under EN 60529.

[Example]

I P 4 3

Second Number
First Number

IP Code	Protection against Contact or Ingress of Human Body Parts and Solid Objects	
First Number	Protection Level	Test Condition
IP4X	Protected against ingress of wires etc.	Solid objects with a diameter of 1.0 mm or more do not enter.
IP5X	Protected against powdery dust	Powdery dust that may inhibit normal operation does not enter.

IP Code	Protection against Ingress of Water	
Second Number	Protection Level	Test Condition
IPX3	Protection against ingress of raindrops from directions within a range of 60° relative to the vertical plane	Sprayed water at a rate of 10 liter/min. for 10 minutes from directions within 60° from a height of 200 mm
IPX4	Protection against ingress of splashes from all directions	Sprayed water at a rate of 10 liter/min. for 10 minutes from all directions at a distance of 300 to 500 mm
IPX5	Protection against water jet from all directions	Sprayed water jet of 30 kPa at a rate of 12.5 liter/min. for 3 minutes from all directions at a distance of 3 m

●Select Based on Air Flow – Static Pressure Characteristics

The **FM** Series consists of models that offer varying air flow – static pressure characteristics according to the applicable degree of protection, installed fan, cover size and others.

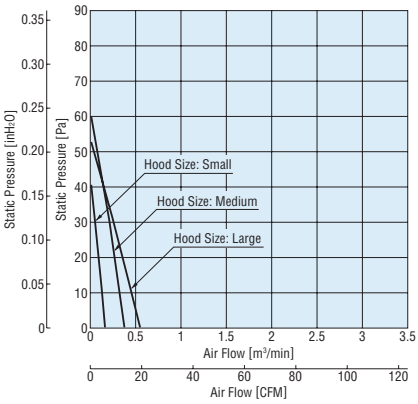
Select a model that best suits the degree of protection, cooling capacity, space efficiency and other conditions that suit your equipment.

● The following examples are based on representative characteristics.

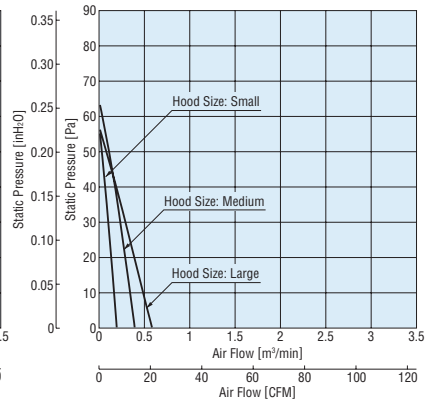
Example of Air Flow – Static Pressure Characteristics of IP55

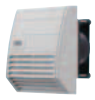
- IP55 models achieve the highest degree of protection among all **FM** Series fans. Accordingly, their air flow and static pressure are lower compared to IP43 models.
  Use of multiple fans is recommended if your application must conform to IP55 while demonstrating a certain level of air-blowing capacity at the same time.
- The characteristics vary depending on the hood size (large, medium or small) and installed fan [□119 mm − 38 mm (□4.69 in. − 1.50 in.) thick or □92 mm − 25 mm (□3.62 in. − 0.98 in.) thick].

◇50 Hz (Exhaust type)



◇60 Hz (Exhaust type)





Hood Size: Small
129 mm×134 mm (5.08 in.×5.28 in.)
Installed Fan:
□92 mm − 25 mm (□3.62 in. − 0.98 in.) Thick

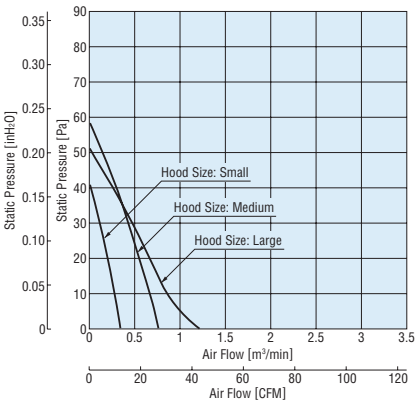
Hood Size: Medium
157 mm×170 mm (6.18 in.×6.69 in.)
Installed Fan:
□119 mm − 38 mm (□4.69 in. − 1.50 in.) Thick

Hood Size: Large
209 mm×226 mm (8.23 in.×8.90 in.)
Installed Fan:
□119 mm − 38 mm (□4.69 in. − 1.50 in.) Thick

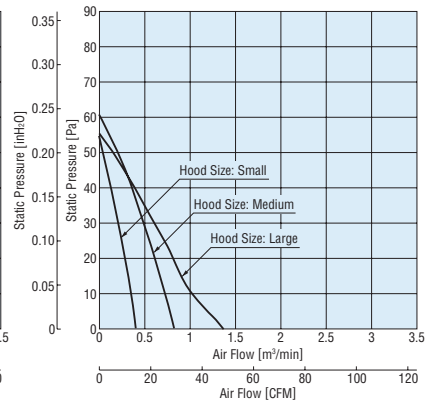
Example of Air Flow – Static Pressure Characteristics of IP43

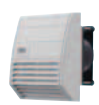
- IP43 models provide a higher air flow and static pressure compared to IP55.
- The characteristics vary depending on the hood size (large, medium or small) and installed fan [□119 mm − 38 mm (□4.69 in. − 1.50 in.) thick or □92 mm − 25 mm (□3.62 in. − 0.98 in.) thick].

◇50 Hz (Exhaust type)



◇60 Hz (Exhaust type)





Hood Size: Small
129 mm×134 mm (5.08 in.×5.28 in.)
Installed Fan:
□92 mm − 25 mm (□3.62 in. − 0.98 in.) Thick

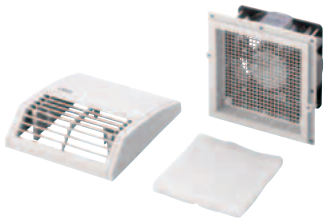
Hood Size: Medium
157 mm×170 mm (6.18 in.×6.69 in.)
Installed Fan:
□119 mm − 38 mm (□4.69 in. − 1.50 in.) Thick

Hood Size: Large
209 mm×226 mm (8.23 in.×8.90 in.)
Installed Fan:
□119 mm − 38 mm (□4.69 in. − 1.50 in.) Thick

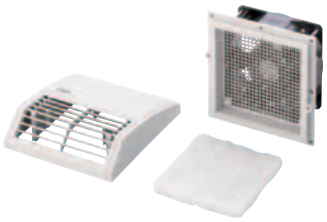
Internal Structure of the FM Series

The figure below illustrates the internal structure of the fan and filter panel.
The fan, filter, cover and all other parts come pre-assembled.

IP55/IP43

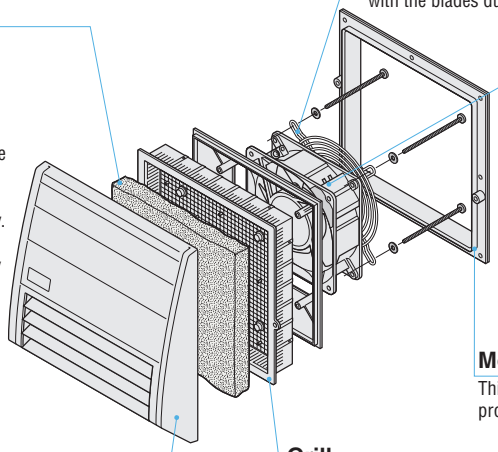


Exhaust Type



Suction Type

Filter Media
The filter media shuts out dust, water droplets and other objects in the air to maintain clean air inside the enclosure.
It is recommended that the filter media be checked periodically for clogging and replaced as necessary. Clogged filter media will cause the cooling capacity to drop.



Finger Guard
The finger guard protects fingers and other objects from coming in contact with the blades during operation.

Fan
The size of the fan is □119 mm – 38 mm (□4.69 in. – 1.50 in.) thick or □92 mm – 25 mm (□3.62 in. – 0.98 in.) thick.
The exhaust type and the suction type are available according to the required air flow direction.

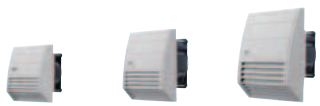
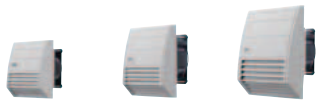
Mounting Frame
This frame is used to affix the product to the enclosure.

Hood
The hood prevents ingress of water droplets from above.
If the module is installed near a wall, the hood ensures that a air flow path is available at all times.

Grill
The grill holds the filter and is fixed to the mounting frame.

Lineup

Fan and Filter Panel

Type (Degree of protection)	Module Dimensions W×H [mm (in.)]	Shape (Material)	Dust-Removal Ratio	Air Flow Direction	Color	Installed Fan	Power Supply Voltage [VAC]
IP55	 129×134 (5.08×5.28) 157×170 (6.18×6.69) 209×226 (8.23×8.90)	Hood type (Resin)	95% (Air velocity 0.7 m/s)	Suction Exhaust	Light gray	□119 mm – 38 mm thick (□4.69 in. – 1.50 in. thick) □92 mm – 25 mm thick (□3.62 in. – 0.98 in. thick)	Single-Phase 115 Single-Phase 220/230
IP43	 129×134 (5.08×5.28) 157×170 (6.18×6.69) 209×226 (8.23×8.90)		48% (Air velocity 2.0 m/s)				

Filter Panel

Type (Degree of protection)	Module Dimensions W×H [mm (in.)]	Shape (Material)	Dust-Removal Ratio	Color
IP55	 129×134 (5.08×5.28) 157×170 (6.18×6.69) 209×226 (8.23×8.90)	Hood type (Resin)	95% (Air velocity 0.7 m/s)	Light gray
IP43	 129×134 (5.08×5.28) 157×170 (6.18×6.69) 209×226 (8.23×8.90)		48% (Air velocity 2.0 m/s)	

● The same filter medias supplied with products are available as accessories. Filter medias for IP55/IP43 → Page F-112

Product Number Code

Fan and Filter Panel

FM A 2 3 B I - 2 H 2 2 1

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

①	Series	**FM**: **FM** Series
②	Cooling Method	**A**: Fan and Filter Panel Exhaust Type **B**: Fan and Filter Panel Suction Type
③	Module Type	**2**: Hood Type
④	Panel Painted Color	**3**: Light Gray
⑤	Media Type	**B**: For IP43 **C**: For IP55
⑥	Additional Functions	**I** : IP55/IP43
⑦	Reference Number	
⑧	Module Dimensions (W×H×D [mm (in.)])	**H**: 209×226×136 (8.23×8.90×5.35) **J** : 157×170×98 (6.18×6.69×3.86) **K**: 129×134×80 (5.08×5.28×3.15)
⑨	Fan Speed	**1**: Standard Speed **2**: Middle Speed
⑩	Power Supply Voltage	**2**: Single-Phase 115 VAC **5**: Single-Phase 220/230 VAC
⑪	Number of Installed Fans	**1**: 1 fan

Filter Panel

FM Z 2 3 BI - D

① ② ③ ④ ⑤ ⑥

①	Series	**FM**: **FM** Series
②	Cooling Method	**Z**: Filter Panel
③	Module Type	**2**: Hood Type
④	Panel Painted Color	**3**: Light Gray
⑤	Media Type	**BI**: For IP43 **CI**: For IP55
⑥	Module Dimensions (W×H×D [mm (in.)])	**D**: 209×226×50 (8.23×8.90×1.97) **E** : 157×170×40 (6.18×6.69×1.57) **F** : 129×134×35 (5.08×5.28×1.38)

Product Line

IP55/Exhaust Type

Size	Power Supply Voltage VAC	Model
209 mm × 226 mm (8.23 in. × 8.90 in.) Installed Fan: □119 mm — 38 mm Thick (□4.69 in. — 1.50 in. thick)	Single-Phase 115	**FMA23CI-2H221**
	Single-Phase 220/230	**FMA23CI-2H251**
157 mm × 170 mm (6.18 in. × 6.69 in.) Installed Fan: □119 mm — 38 mm Thick (□4.69 in. — 1.50 in. thick)	Single-Phase 115	**FMA23CI-2J221**
	Single-Phase 220/230	**FMA23CI-2J251**
129 mm × 134 mm (5.08 in. × 5.28 in.) Installed Fan: □92 mm — 25 mm Thick (□3.62 in. — 0.98 in. thick)	Single-Phase 115	**FMA23CI-2K121**
	Single-Phase 220/230	**FMA23CI-2K151**

IP43/Exhaust Type

Size	Power Supply Voltage VAC	Model
209 mm × 226 mm (8.23 in. × 8.90 in.) Installed Fan: □119 mm — 38 mm Thick (□4.69 in. — 1.50 in. thick)	Single-Phase 115	**FMA23BI-2H221**
	Single-Phase 220/230	**FMA23BI-2H251**
157 mm × 170 mm (6.18 in. × 6.69 in.) Installed Fan: □119 mm — 38 mm Thick (□4.69 in. — 1.50 in. thick)	Single-Phase 115	**FMA23BI-2J221**
	Single-Phase 220/230	**FMA23BI-2J251**
129 mm × 134 mm (5.08 in. × 5.28 in.) Installed Fan: □92 mm — 25 mm Thick (□3.62 in. — 0.98 in. thick)	Single-Phase 115	**FMA23BI-2K121**
	Single-Phase 220/230	**FMA23BI-2K151**

IP55/Suction Type

Size	Power Supply Voltage VAC	Model
209 mm × 226 mm (8.23 in. × 8.90 in.) Installed Fan: □119 mm — 38 mm Thick (□4.69 in. — 1.50 in. thick)	Single-Phase 115	**FMB23CI-2H221**
	Single-Phase 220/230	**FMB23CI-2H251**
157 mm × 170 mm (6.18 in. × 6.69 in.) Installed Fan: □119 mm — 38 mm Thick (□4.69 in. — 1.50 in. thick)	Single-Phase 115	**FMB23CI-2J221**
	Single-Phase 220/230	**FMB23CI-2J251**
129 mm × 134 mm (5.08 in. × 5.28 in.) Installed Fan: □92 mm — 25 mm Thick (□3.62 in. — 0.98 in. thick)	Single-Phase 115	**FMB23CI-2K121**
	Single-Phase 220/230	**FMB23CI-2K151**

IP43/Suction Type

Size	Power Supply Voltage VAC	Model
209 mm × 226 mm (8.23 in. × 8.90 in.) Installed Fan: □119 mm — 38 mm Thick (□4.69 in. — 1.50 in. thick)	Single-Phase 115	**FMB23BI-2H221**
	Single-Phase 220/230	**FMB23BI-2H251**
157 mm × 170 mm (6.18 in. × 6.69 in.) Installed Fan: □119 mm — 38 mm Thick (□4.69 in. — 1.50 in. thick)	Single-Phase 115	**FMB23BI-2J221**
	Single-Phase 220/230	**FMB23BI-2J251**
129 mm × 134 mm (5.08 in. × 5.28 in.) Installed Fan: □92 mm — 25 mm Thick (□3.62 in. — 0.98 in. thick)	Single-Phase 115	**FMB23BI-2K121**
	Single-Phase 220/230	**FMB23BI-2K151**

For details (specifications, characteristics, dimensions and others) on these products please refer either to our website, contact technical support or your nearest Oriental Motor sales office.
www.orientalmotor.com

Filter Panel IP55/IP43 RoHS

Ingress of dust or water droplets into the enclosure and discharge dust from the enclosure can be prevented by installing a filter panel over the vent holes in the enclosure.

Product Line

IP55

Model	Size [mm (in.)]
FMZ23CI-D	209×226 (8.23×8.90)
FMZ23CI-E	157×170 (6.18×6.69)
FMZ23CI-F	129×134 (5.08×5.28)

IP43

Model	Size [mm (in.)]
FMZ23BI-D	209×226 (8.23×8.90)
FMZ23BI-E	157×170 (6.18×6.69)
FMZ23BI-F	129×134 (5.08×5.28)

The following items are included in each product.
Filter Panel, Mounting Screws, Operating Manual

Accessories

Replacement Filter Media

◇Filter Media for IP55

Model	Applicable Model		
FMXAC-D	**FM** Series	Dimensions 209 mm×226 mm (8.23 in.×8.90 in.)	IP55
FMXAC-E	**FM** Series	Dimensions 157 mm×170 mm (6.18 in.×6.69 in.)	IP55
FMXAC-F	**FM** Series	Dimensions 129 mm×134 mm (5.08 in.×5.28 in.)	IP55

◇Filter Media for IP43

Model	Applicable Model		
FMXAB-D	**FM** Series	Dimensions 209 mm×226 mm (8.23 in.×8.90 in.)	IP43
FMXAB-E	**FM** Series	Dimensions 157 mm×170 mm (6.18 in.×6.69 in.)	IP43
FMXAB-F	**FM** Series	Dimensions 129 mm×134 mm (5.08 in.×5.28 in.)	IP43

- These filter media apply to both fan and filter panel, and filter panel.
- These filter media are the same as those supplied with each product.
- Filter media is entering by five pieces.
- It is recommended that the filter media be checked periodically for clogging, as a clogged filter will cause the cooling capacity to drop.

Thermostats

A thermostat makes it possible for fans to operate only when cooling is necessary, thereby conserving energy.

RoHS

Thermostats **AM1-WA1/AM1-XA1**

Page → F-113