Cooling Fans

Cooling Module

FM Series IP55/43

RoHS RoHS-Compliant
Cooling Module
FM Series

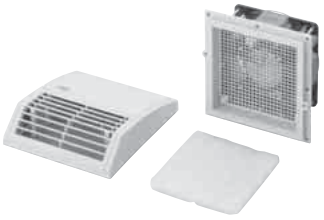
●Additional Information●
Technical reference ➜ Page F-1

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

Features

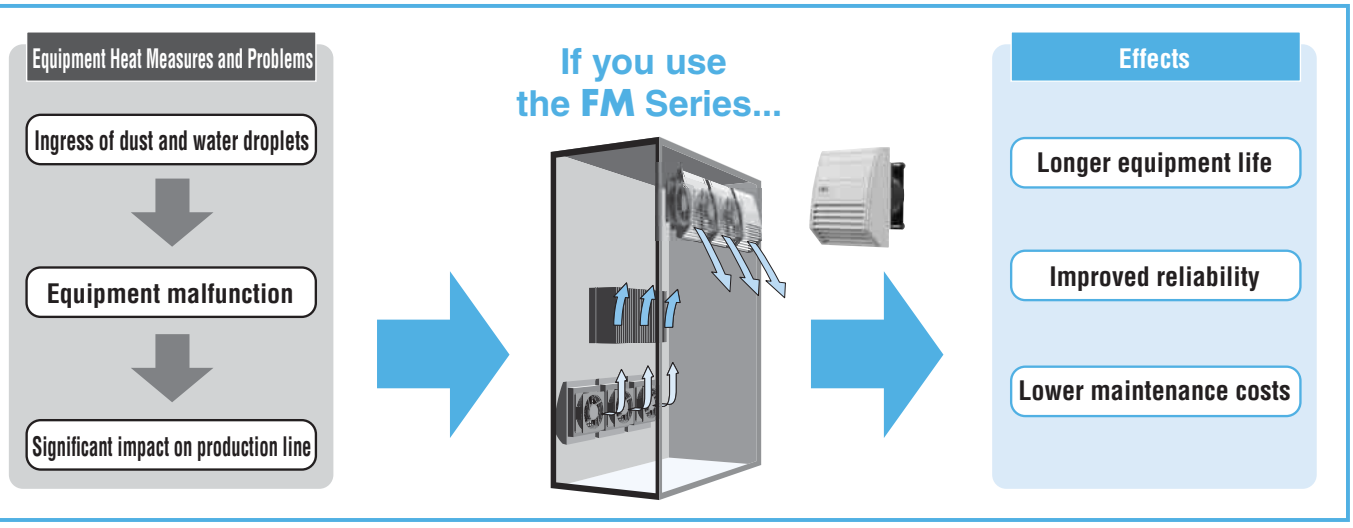
●Preventing Ingress of Dust and Water Droplets

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



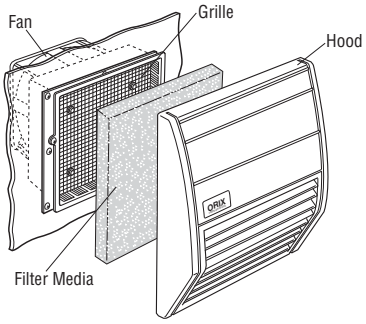
●Improvement of Equipment Reliability

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 a long life and high reliability.



●Easy Installation and Maintenance

The module can be easily installed only tightening screws from outside filter media.
The filter can be replaced from outside the equipment, and maintenance is also easy.



●RoHS RoHS-Compliant

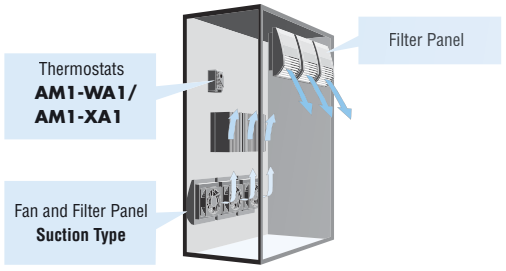
The **FM** Series conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

●Details of RoHS Directive ➜ Page G-38

Effective Cooling Using the **FM** Series

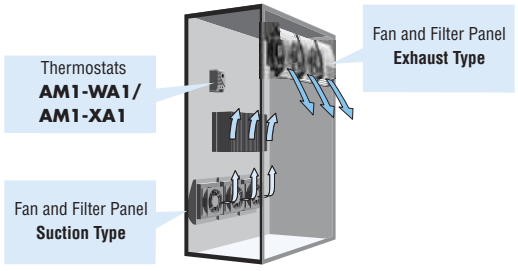
"Fan and filter panel" and "filter panel" are available for the **FM** Series.
By combining these panels as shown below, ingress of dust and water droplets into the enclosure can be prevented to achieve effective cooling.

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).

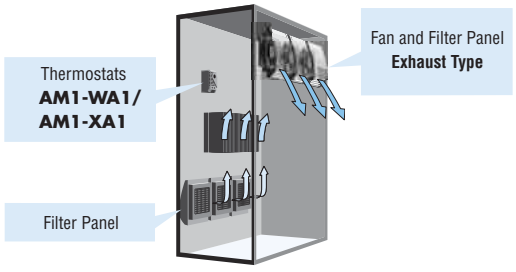
2 Suction type "fan and filter panel" at the bottom, exhaust type "fan and filter panel" at the top



- 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.

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

RoHS
Filter Panel
A filter is integrated with a cover.
Fan is not included.

RoHS
Thermostats AM1-WA1/AM1-XA1 → Page E-133
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: □119mm − 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

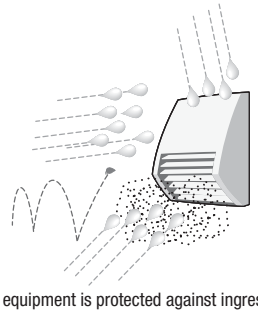
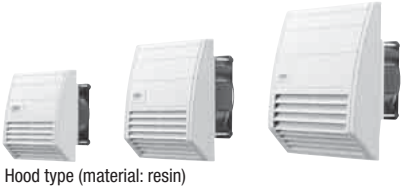
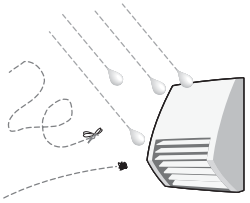
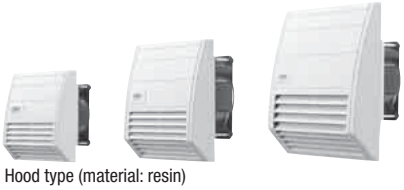
Plug cord for connection to power supply [1 m (3.3 ft.)], Mounting screws

◇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	Page
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	E-34
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	E-38

*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 E-29

◇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.

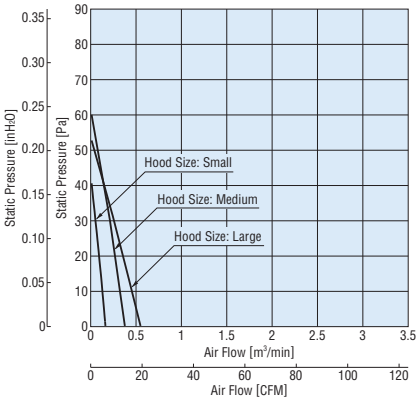
Select a model that best suits the degree of protection, cooling capacity, space efficiency and other conditions that suits your equipment.

● The following examples are based on representative characteristics. For the characteristics of each product, refer to pages E-34 to E-42.

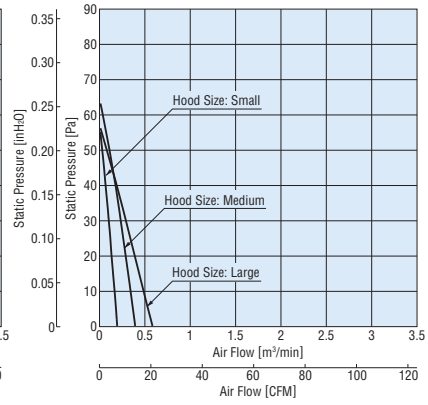
Example of Air Flow – Static Pressure Characteristics of IP55

- 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

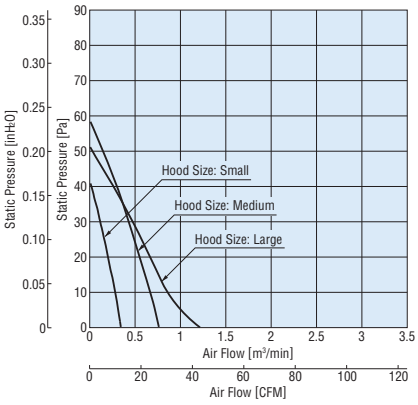
Hood Size: Medium
157 mm×170 mm (6.18 in.×6.69 in.)
Installed Fan:
□119 mm − 38 mm (□4.69 in. − 1.50 in.) Thick

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

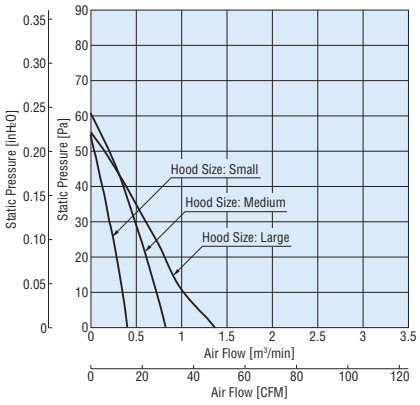
Example of Air Flow – Static Pressure Characteristics of IP43

- 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

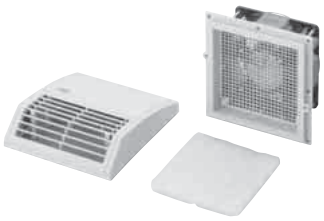
Hood Size: Medium
157 mm×170 mm (6.18 in.×6.69 in.)
Installed Fan:
□119 mm − 38 mm (□4.69 in. − 1.50 in.) Thick

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

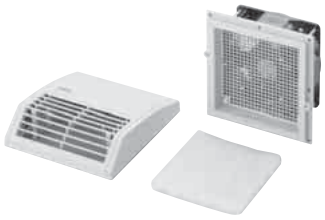
Internal Structure of the FM Series

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

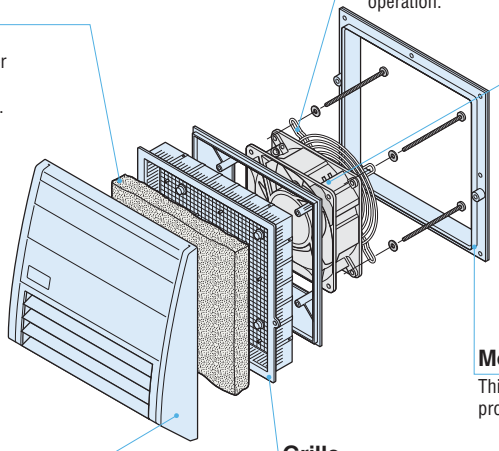
IP55/IP43



Exhaust Type



Suction Type



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

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.

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.

Grille
The grille holds the filter, and is fixed to the mounting frame.

Standards and CE Marking of Installed Fan

Installed Fan	Applicable Standards	Certification Body	Standards File No.	Marking
□119 mm × 38 mm thick (□4.69 in. × 1.50 in. thick) □92 mm × 25 mm thick (□3.62 in. × 0.98 in. thick)	UL 507	UL	E58377	CE Low Voltage Directive (PS E) products other than special electrical appliances and materials
	CSA C22.2 No.113	CSA	LR62524	
	EN 60950-1	VDE	5870	
	S Mark	JET	0018-91002-001	
			0018-91002-002	
			0018-91002-003	
	Electrical Appliance and Material Safety Law (Japan)	–		

General Specifications

Item	Specifications
Insulation Resistance	100 MΩ or more when 500 VDC megger is applied between the windings and the frame after continuous operation under normal ambient temperature and humidity.
Dielectric Strength	Sufficient to withstand 1.5 kVAC at 50 Hz applied between the windings and the frame for 1 minute after continuous operation under normal ambient temperature and humidity.
Temperature Rise	30°C (54°F) or less measured by the thermometer method after the temperature of the case has stabilized under normal operation at the rated voltage and frequency.
Operating Voltage Range	±10% of input voltage
Insulation Class	UL, CSA: Class A [105°C (221°F)], Class E [120°C (248°F)]
Overheat Protection	Impedance Protected
Ambient Temperature	−10～+60°C (+14 ～+140°F)
Ambient Humidity	85% or less (non-condensing)
Materials	Fan Frame: Die cast aluminum Blades: Polycarbonate (Flammability grade: V-0) Enclosure Hood: Polycarbonate (Flammability grade: V-0) Grille: ABS (Flammability grade: V-0) Mounting frame: ABS (Flammability grade: V-0)

Dust-Removal Ratio of Filter Media

Type	Dust-Removal Ratio η [%]	Air Velocity V [m/s]
IP55 Filter Media	95	0.7
IP43 Filter Media	48	2.0

How to Measure Dust-Removal Ratio

Various methods to measure dust-removal ratio are specified by Japanese Industrial Standard.
The table below summarizes the standards specifying measurement of dust-removal ratio as well as measuring equipment used.

Related Standards	Supplement
JIS B 9908 Ventilation Air Filter Measurement Method: Type 3 Weighing Method	Type 3 For measurement of coarse dust particles Other methods include type 1 for measuring very fine dust particles and type 2 for measuring fine dust particles. Mass method Measure the mass of trapped dust with respect to the mass of supplied dust and calculate the trapping efficiency based on the mass ratio. $\eta = (1 - \frac{Wp}{Wf}) \times 100\%$ η : Dust-removal ratio [%] Wf : Mass of supplied dust [g] Wp : Mass of dust collected in filter [g] Other methods include the counting method for measuring very fine dust particles and the colorimetry method for measuring fine dust particles.
JIS Z 8901 Test Dust Test Powder: Type 15	Type 15 represents mixed powder produced by mixing type 8 powder, type 12 powder and cotton linter at specified ratios.

Type	Type 8 (Loamy earth of the Kanto district)	Type 12 (Carbon black)	Cotton linter
Percentage	72 [%]	23 [%]	5 [%]
Composition	ϕ6.6～8.6 [μm]	ϕ0.03～0.20 [μm]	ϕ1.5 [μm] length 1 [mm] (0.04 [in.]) max.

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)

Lineup

Fan and Filter Panel

Type (Degree of protection)	Module Dimensions W×H [mm (in.)]	Shape (Material)	Dust-Removal Ratio	Air Flow Direction	Alarm Function	Color	Installed Fan	Power Supply Voltage [VAC]	Page
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	E-34
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)						E-38

Filter Panel

Type (Degree of protection)	Module Dimensions W×H [mm (in.)]	Shape (Material)	Dust-Removal Ratio	Color	Page
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	E-43
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)		E-43

● The same filter medias supplied with products are available as accessories.
Filter medias for IP55/IP43 ➜ Page E-43

FM Series IP55

□119 mm – 38 mm Thick
(□4.69 in. – 1.50 in. Thick) Fan Installed

□92 mm – 25 mm Thick
(□3.62 in. – 0.98 in. Thick) Fan Installed

Exhaust Type

Fan and Filter Panel

Ambient Temperature: −10～+60°C (+14～+140°F)
Operating Voltage Range: ±10%
Dust-Removal Ratio of Filter Media: 95%
(Details of dust-removal ratio ➜ Page E-31)
Materials
Enclosure
Hood: Polycarbonate (Flammability grade: V-0)
Grille: ABS (Flammability grade: V-0)
Mounting Frame: ABS (Flammability grade: V-0)
Installed Fan
Fan Frame: Die Cast Aluminum
Blades: Polycarbonate (Flammability grade V-0)
Installed Fan
Overheat Protection: Impedance Protected
Bearings: Ball Bearings

Specifications RoHS

Model	Diagram Number	Size	Input Voltage	Frequency	Input	Current	Speed	Max. Air Flow		Max. Static Pressure		Noise Level
			VAC	Hz	W	A	r/min	m³/min	CFM	Pa	inH₂O	dB (A)
FMA23CI-2H221	①	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	50	15.2	0.19	2300	0.55	19.4	53	0.213	38
				60	14.0	0.18	2500	0.61	21.5	56	0.225	40
FMA23CI-2H251			Single-Phase 220	50	14.0	0.11	2300	0.55	19.4	51	0.205	38
			Single-Phase 230	50	16.7	0.11	2400	0.55	19.4	53	0.213	38
				60	14.0	0.11	2500	0.61	21.5	56	0.225	40
FMA23CI-2J221	②	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	50	15.2	0.19	2300	0.37	13.1	60	0.241	39
				60	14.0	0.18	2500	0.41	14.5	63	0.253	40
FMA23CI-2J251			Single-Phase 220	50	14.0	0.11	2300	0.37	13.1	59	0.237	38
			Single-Phase 230	50	16.7	0.11	2400	0.37	13.1	60	0.241	39
				60	14.0	0.11	2500	0.41	14.5	63	0.253	40
FMA23CI-2K121	③	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	50	11.2	0.13	2600	0.16	5.65	41	0.165	37
				60	9.4	0.12	3000	0.20	7.06	55	0.221	41
FMA23CI-2K151			Single-Phase 220	50	10.2	0.07	2600	0.16	5.65	41	0.165	37
			Single-Phase 230	50	12.2	0.09	2600	0.16	5.65	41	0.165	37
				60	9.4	0.07	3000	0.20	7.06	55	0.221	41

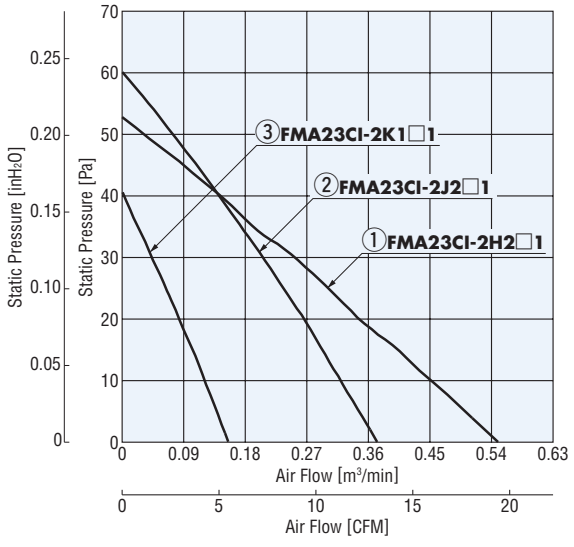
- How to read specifications ➜ Page E-19
- Details of RoHS Directive ➜ Page G-38
- The maximum air flow, maximum static pressure and noise level are representative values.
- Assemble the filter media to the hood. If you assemble it to the grill, the air flow may decrease.
- Internal structure of the **FM** Series ➜ Page E-30

The following items are included in each product.
Cooling Module, Plug Cord, Mounting Screws, Operating Manual

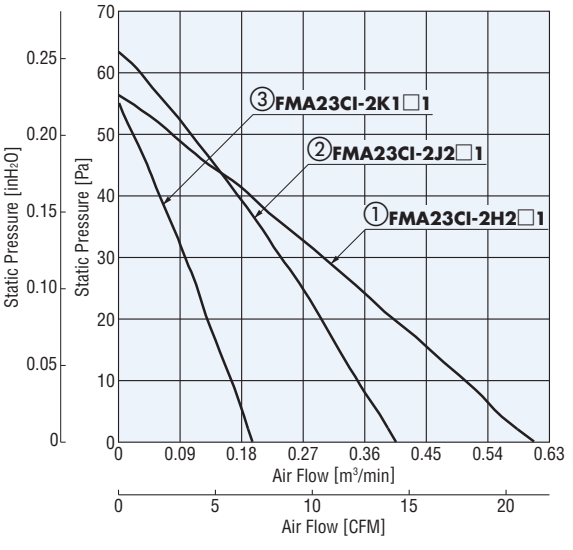
Air Flow – Static Pressure Characteristics

- How to read air flow – static pressure characteristics ➜ Page E-20

◇50 Hz



◇60 Hz



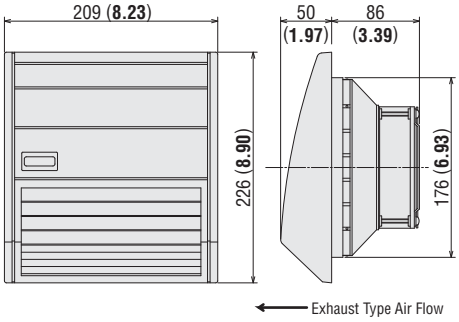
Features E-26 / General Specifications E-31

Dimensions Unit = mm (in.)

①FMA23CI-2H2□1

Mass: 1.2 kg (2.6 lb.)

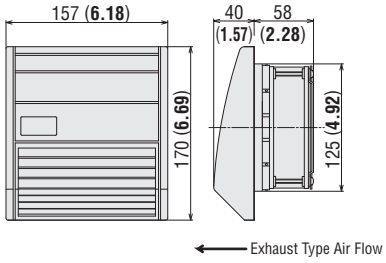
DXF E098



②FMA23CI-2J2□1

Mass: 0.9 kg (2.0 lb.)

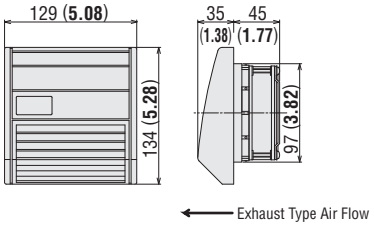
DXF E099



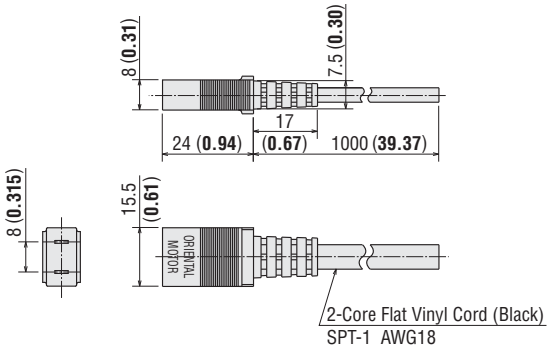
③FMA23CI-2K1□1

Mass: 0.5 kg (1.1 lb.)

DXF E100



Plug Cord for Connection to Power Supply (Included)



Refer to page E-42 for the panel cut-out and connection diagram, and page E-43 for the filter panel.

FM Series IP55

□119 mm – 38 mm Thick
(□4.69 in. – 1.50 in. Thick) Fan Installed

□92 mm – 25 mm Thick
(□3.62 in. – 0.98 in. Thick) Fan Installed

Suction Type

Fan and Filter Panel

Ambient Temperature: −10～+60°C (+14～+140°F)
Operating Voltage Range: ±10%
Dust-Removal Ratio of Filter Media: 95%
(Details of dust-removal ratio ➜ Page E-31)
Materials
Enclosure
Hood: Polycarbonate (Flammability grade: V-0)
Grille: ABS (Flammability grade: V-0)
Mounting Frame: ABS (Flammability grade: V-0)
Installed Fan
Fan Frame: Die Cast Aluminum
Blades: Polycarbonate (Flammability grade V-0)
Installed Fan
Overheat Protection: Impedance Protected
Bearings: Ball Bearings

Specifications RoHS

Model	Diagram Number	Size	Input Voltage	Frequency	Input	Current	Speed	Max. Air Flow		Max. Static Pressure		Noise Level
			VAC	Hz	W	A	r/min	m³/min	CFM	Pa	inH₂O	dB (A)
FMB23CI-2H221	①	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	50	15.2	0.19	2300	0.47	16.6	37	0.149	38
				60	14.0	0.18	2500	0.52	18.4	41	0.165	40
FMB23CI-2H251			Single-Phase 220	50	14.0	0.11	2300	0.44	15.5	34	0.136	38
			Single-Phase 230	50	16.7	0.11	2400	0.47	16.6	37	0.149	38
				60	14.0	0.11	2500	0.52	18.4	41	0.165	40
FMB23CI-2J221	②	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	50	15.2	0.19	2300	0.32	11.3	45	0.181	40
				60	14.0	0.18	2500	0.34	12.0	47	0.189	41
FMB23CI-2J251			Single-Phase 220	50	14.0	0.11	2300	0.30	10.6	42	0.169	40
			Single-Phase 230	50	16.7	0.11	2400	0.32	11.3	45	0.181	40
				60	14.0	0.11	2500	0.34	12.0	47	0.189	41
FMB23CI-2K121	③	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	50	11.2	0.13	2600	0.14	4.94	31	0.124	37
				60	9.4	0.12	3000	0.17	6.00	42	0.169	41
FMB23CI-2K151			Single-Phase 220	50	10.2	0.07	2600	0.14	4.94	28	0.112	37
			Single-Phase 230	50	12.2	0.09	2600	0.14	4.94	31	0.124	37
				60	9.4	0.07	3000	0.17	6.00	42	0.169	41

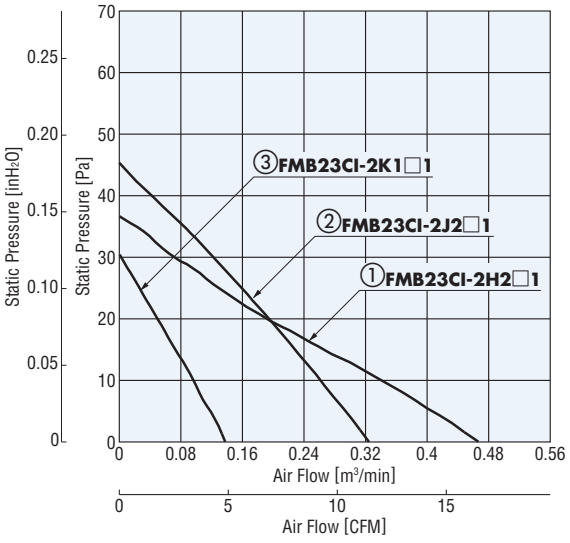
- How to read specifications ➜ Page E-19
- Details of RoHS Directive ➜ Page G-38
- The maximum air flow, maximum static pressure and noise level are representative values.
- Assemble the filter media to the hood. If you assemble it to the grill, the air flow may decrease.
- Internal structure of the **FM** Series ➜ Page E-30

The following items are included in each product.
Cooling Module, Plug Cord, Mounting Screws, Operating Manual

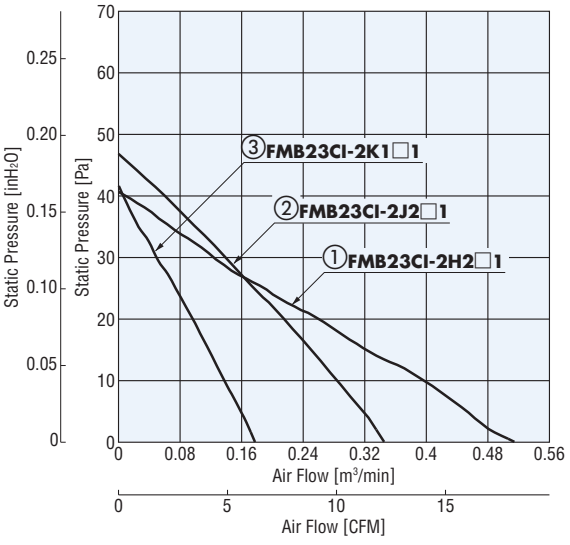
Air Flow – Static Pressure Characteristics

- How to read air flow – static pressure characteristics ➜ Page E-20

◇50 Hz



◇60 Hz



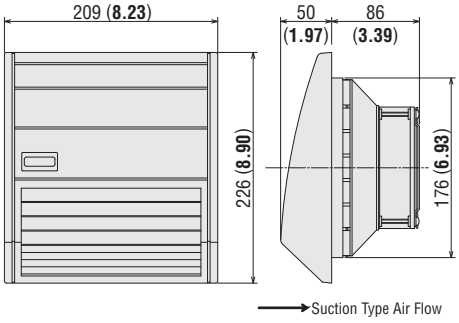
Features E-26 / General Specifications E-31

Dimensions Unit = mm (in.)

①FMB23CI-2H2□1

Mass: 1.1 kg (2.4 lb.)

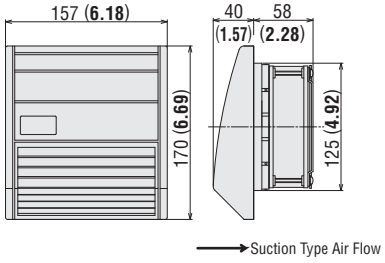
DXF E101



②FMB23CI-2J2□1

Mass: 0.9 kg (2.0 lb.)

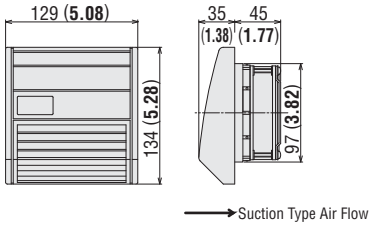
DXF E102



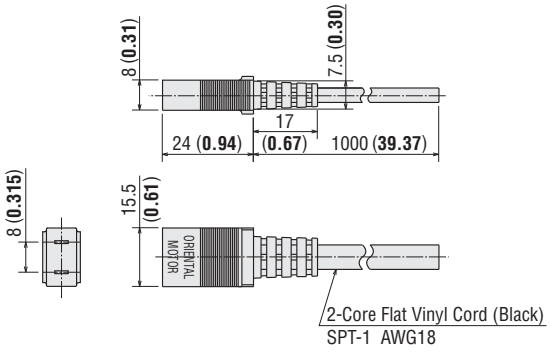
③FMB23CI-2K1□1

Mass: 0.5 kg (1.1 lb.)

DXF E103



Plug Cord for Connection to Power Supply (Included)



Refer to page E-42 for the panel cut-out and connection diagram, and page E-43 for the filter panel.

FM Series IP43

□119 mm – 38 mm Thick
(□4.69 in. – 1.50 in. Thick) Fan Installed

□92 mm – 25 mm Thick
(□3.62 in. – 0.98 in. Thick) Fan Installed

Exhaust Type

Fan and Filter Panel

Ambient Temperature: −10～+60°C (+14～+140°F)
Operating Voltage Range: ±10%
Dust-Removal Ratio of Filter Media: 48%
(Details of dust-removal ratio ➜ Page E-31)
Materials
Enclosure
Hood: Polycarbonate (Flammability grade: V-0)
Grille: ABS (Flammability grade: V-0)
Mounting Frame: ABS (Flammability grade: V-0)
Installed Fan
Fan Frame: Die Cast Aluminum
Blades: Polycarbonate (Flammability grade V-0)
Installed Fan
Overheat Protection: Impedance Protected
Bearings: Ball Bearings

Specifications RoHS

Model	Diagram Number	Size	Input Voltage	Frequency	Input	Current	Speed	Max. Air Flow		Max. Static Pressure		Noise Level
			VAC	Hz	W	A	r/min	m³/min	CFM	Pa	inH₂O	dB (A)
FMA23BI-2H221	①	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	50	15.2	0.19	2300	1.21	42.7	51	0.205	40
				60	14.0	0.18	2500	1.37	48.4	56	0.225	41
FMA23BI-2H251			Single-Phase 220	50	14.0	0.11	2300	1.18	41.7	49	0.197	40
			Single-Phase 230	50	16.7	0.11	2400	1.21	42.7	51	0.205	40
				60	14.0	0.11	2500	1.37	48.4	56	0.225	41
FMA23BI-2J221	②	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	50	15.2	0.19	2300	0.76	26.8	58	0.233	38
				60	14.0	0.18	2500	0.83	29.3	61	0.245	41
FMA23BI-2J251			Single-Phase 220	50	14.0	0.11	2300	0.75	26.5	56	0.225	37
			Single-Phase 230	50	16.7	0.11	2400	0.76	26.8	58	0.233	38
				60	14.0	0.11	2500	0.83	29.3	61	0.245	41
FMA23BI-2K121	③	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	50	11.2	0.13	2600	0.34	12.0	41	0.165	36
				60	9.4	0.12	3000	0.41	14.5	55	0.221	40
FMA23BI-2K151			Single-Phase 220	50	10.2	0.07	2600	0.33	11.6	40	0.161	36
			Single-Phase 230	50	12.2	0.09	2600	0.34	12.0	41	0.165	36
				60	9.4	0.07	3000	0.41	14.5	55	0.221	40

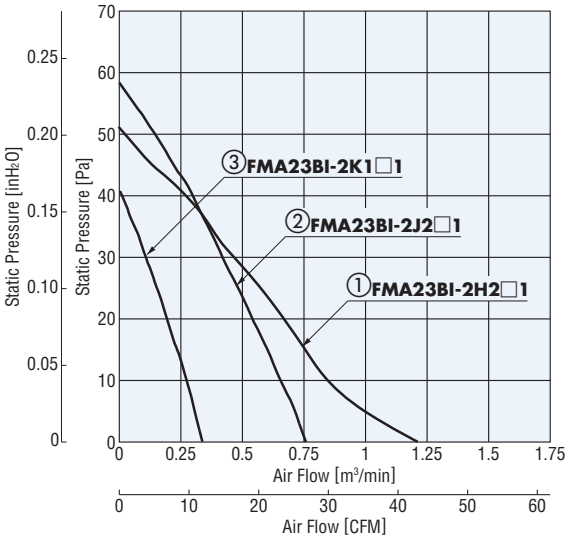
- How to read specifications ➜ Page E-19
- Details of RoHS Directive ➜ Page G-38
- The maximum air flow, maximum static pressure and noise level are representative values.
- Assemble the filter media to the hood. If you assemble it to the grill, the air flow may decrease.
- Internal structure of the **FM** Series ➜ Page E-30

The following items are included in each product.
Cooling Module, Plug Cord [1 m (3.3 ft.)],
Mounting Screws, Operating Manual

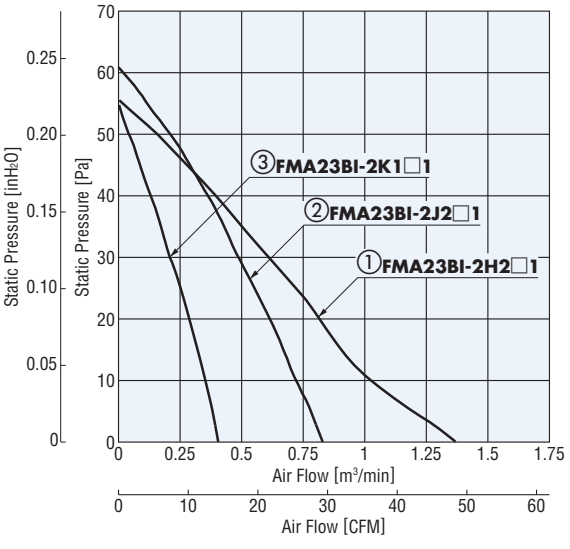
Air Flow – Static Pressure Characteristics

- How to read air flow – static pressure characteristics ➜ Page E-20

◇50 Hz



◇60 Hz

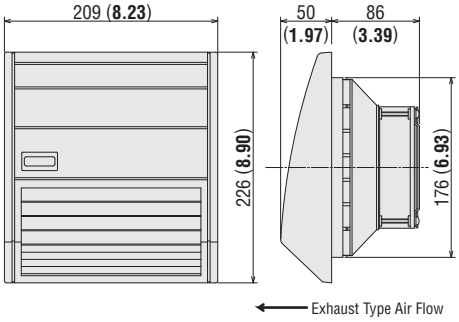


Dimensions Unit = mm (in.)

①FMA23BI-2H2□1

Mass: 1.1 kg (2.4 lb.)

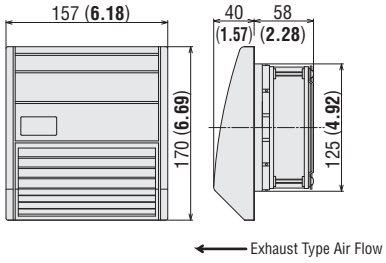
DXF E098



②FMA23BI-2J2□1

Mass: 0.9 kg (2.0 lb.)

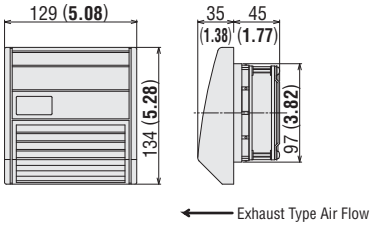
DXF E099



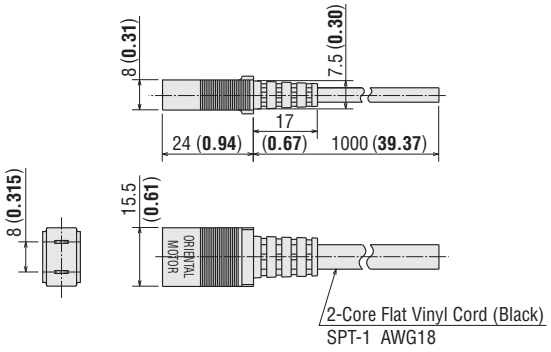
③FMA23BI-2K1□1

Mass: 0.5 kg (1.1 lb.)

DXF E100



Plug Cord for Connection to Power Supply (Included)



Refer to page E-42 for the panel cut-out and connection diagram, and page E-43 for the filter panel.

FM Series IP43

□119 mm – 38 mm Thick
(□4.69 in. – 1.50 in. Thick) Fan Installed

□92 mm – 25 mm Thick
(□3.62 in. – 0.98 in. Thick) Fan Installed

Suction Type

Fan and Filter Panel

Ambient Temperature: −10～+60°C (+14～+140 °F)
Operating Voltage Range: ±10%
Dust-Removal Ratio of Filter Media: 48%
(Details of dust-removal ratio ➜ Page E-31)
Materials
Enclosure
Hood: Polycarbonate (Flammability grade: V-0)
Grille: ABS (Flammability grade: V-0)
Mounting Frame: ABS (Flammability grade: V-0)
Installed Fan
Fan Frame: Die Cast Aluminum
Blades: Polycarbonate (Flammability grade V-0)
Installed Fan
Overheat Protection: Impedance Protected
Bearings: Ball Bearings

Specifications RoHS

Model	Diagram Number	Size	Input Voltage	Frequency	Input	Current	Speed	Max. Air Flow		Max. Static Pressure		Noise Level
			VAC	Hz	W	A	r/min	m³/min	CFM	Pa	inH₂O	dB (A)
FMB23BI-2H221	①	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	50	15.2	0.19	2300	1.08	38.1	41	0.165	40
				60	14.0	0.18	2500	1.25	44.1	46	0.185	41
FMB23BI-2H251			Single-Phase 220	50	14.0	0.11	2300	1.08	38.1	40	0.161	40
			Single-Phase 230	50	16.7	0.11	2400	1.08	38.1	41	0.165	40
				60	14.0	0.11	2500	1.25	44.1	46	0.185	41
FMB23BI-2J221	②	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	50	15.2	0.19	2300	0.71	25.1	43	0.173	38
				60	14.0	0.18	2500	0.80	28.2	45	0.181	40
FMB23BI-2J251			Single-Phase 220	50	14.0	0.11	2300	0.70	24.7	42	0.169	38
			Single-Phase 230	50	16.7	0.11	2400	0.71	25.1	43	0.173	38
				60	14.0	0.11	2500	0.80	28.2	45	0.181	40
FMB23BI-2K121	③	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	50	11.2	0.13	2600	0.40	14.1	33	0.132	37
				60	9.4	0.12	3000	0.49	17.3	44	0.177	41
FMB23BI-2K151			Single-Phase 220	50	10.2	0.07	2600	0.40	14.1	33	0.132	36
			Single-Phase 230	50	12.2	0.09	2600	0.40	14.1	33	0.132	37
				60	9.4	0.07	3000	0.49	17.3	44	0.177	41

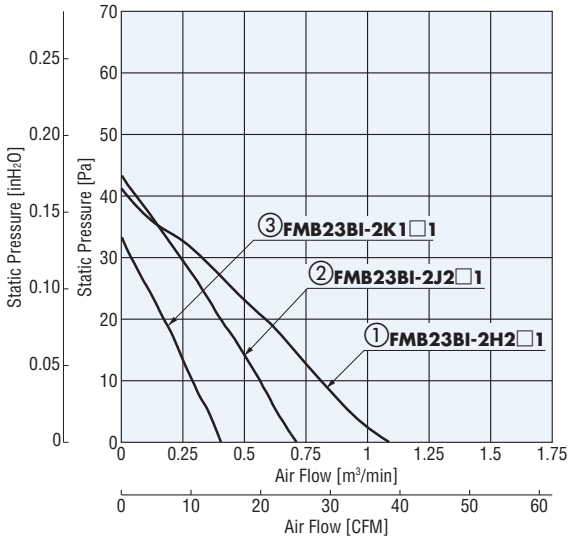
- How to read specifications ➜ Page E-19
- Details of RoHS Directive ➜ Page G-38
- The maximum air flow, maximum static pressure and noise level are representative values.
- Assemble the filter media to the hood. If you assemble it to the grill, the air flow may decrease.
- Internal structure of the **FM** Series ➜ Page E-30

The following items are included in each product.
Cooling Module, Plug Cord [1 m (3.3 ft.)],
Mounting Screws, Operating Manual

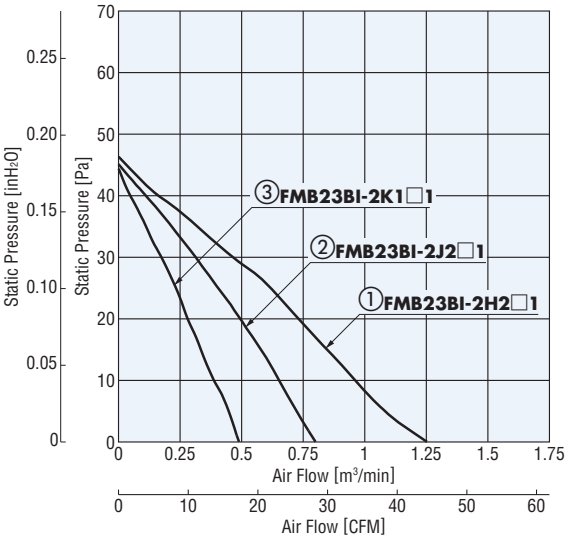
Air Flow – Static Pressure Characteristics

- How to read air flow – static pressure characteristics ➜ Page E-20

◇50 Hz



◇60 Hz



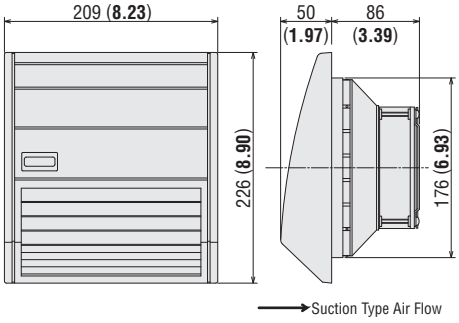
Features E-26 / General Specifications E-31

Dimensions Unit = mm (in.)

①FMB23BI-2H2□1

Mass: 1.1 kg (2.4 lb.)

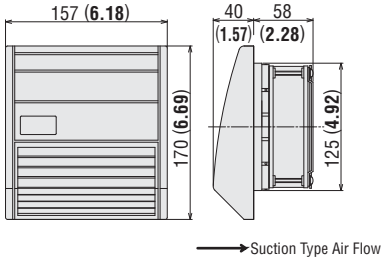
DXF E101



②FMB23BI-2J2□1

Mass: 0.9 kg (2.0 lb.)

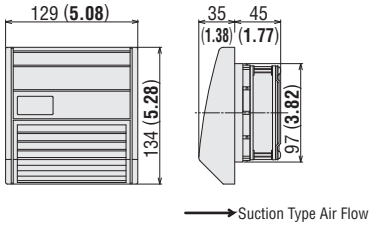
DXF E102



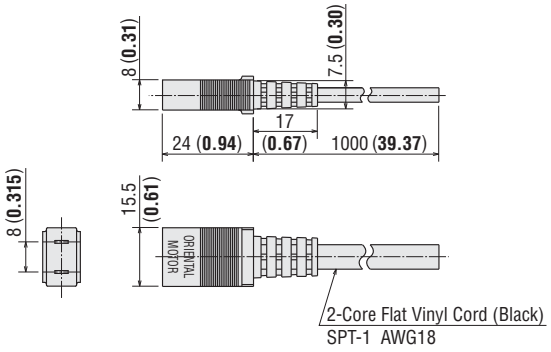
③FMB23BI-2K1□1

Mass: 0.5 kg (1.1 lb.)

DXF E103



Plug Cord for Connection to Power Supply (Included)



Refer to page E-42 for the panel cut-out and connection diagram, and page E-43 for the filter panel.

Panel Cut-Out Unit = mm (in.) These panel cut-outs apply to both fan and filter panel, and filter panel.

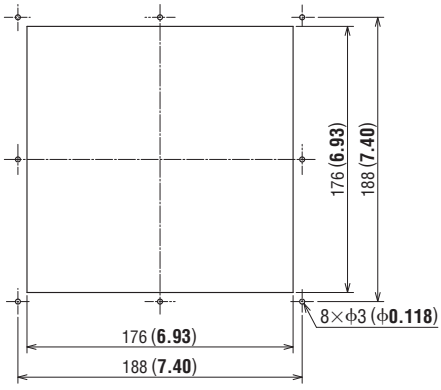
●Dimensions 209 mm×226 mm (8.23 in.×8.90 in.)

◇Fan and Filter Panel

IP55: **FMA23CI-2H2□1** (Exhaust type)
IP55: **FMB23CI-2H2□1** (Suction type)
IP43: **FMA23BI-2H2□1** (Exhaust type)
IP43: **FMB23BI-2H2□1** (Suction type)

◇Filter Panel

IP55: **FMZ23CI-D**
IP43: **FMZ23BI-D**



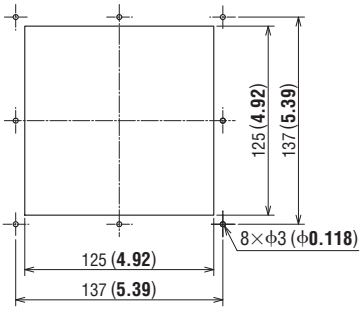
●Dimensions 157 mm×170mm (6.18 in.×6.69 in.)

◇Fan and Filter Panel

IP55: **FMA23CI-2J2□1** (Exhaust type)
IP55: **FMB23CI-2J2□1** (Suction type)
IP43: **FMA23BI-2J2□1** (Exhaust type)
IP43: **FMB23BI-2J2□1** (Suction type)

◇Filter Panel

IP55: **FMZ23CI-E**
IP43: **FMZ23BI-E**



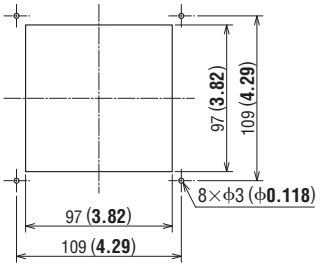
●Dimensions 129 mm×134 mm (5.08 in.×5.28 in.)

◇Fan and Filter Panel

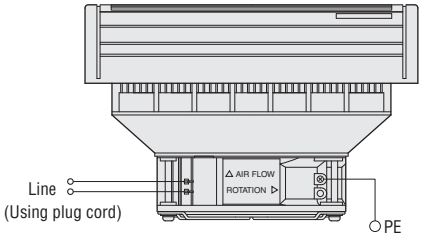
IP55: **FMA23CI-2K1□1** (Exhaust type)
IP55: **FMB23CI-2K1□1** (Suction type)
IP43: **FMA23BI-2K1□1** (Exhaust type)
IP43: **FMB23BI-2K1□1** (Suction type)

◇Filter Panel

IP55: **FMZ23CI-F**
IP43: **FMZ23BI-F**



Connection Diagram The connection diagram applies to all IP55/IP43 models of **FM** Series.



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)

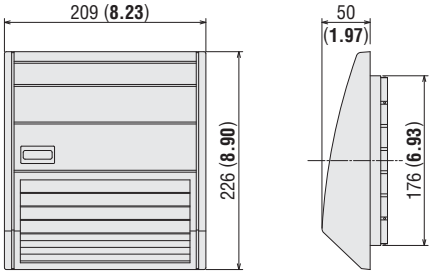
IP43

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)

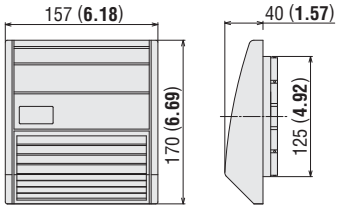
The following items are included in each product.
Filter Panel, Mounting Screws, Operating Manual

Dimensions Unit = mm (in.)

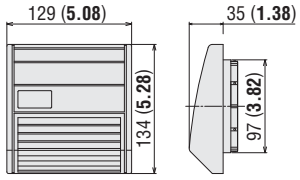
FMZ23□I-D
Mass: 0.5 kg (1.1 lb.)
DXF E104



FMZ23□I-E
Mass: 0.3 kg (0.66 lb.)
DXF E105



FMZ23□I-F
Mass: 0.2 kg (0.44 lb.)
DXF E106



- Dimensions of panel cut-out are also same as those of fan and filter panels.

Accessories

Replacement Filter Media

◇Filter Media for IP55 RoHS

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 RoHS

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, because a clogged filter media 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**
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