



Cooling Fans



Introduction E-2	Introduction
Cooling Module..... E-25	FM Series IP55/IP43 E-26	Cooling Module FM
Axial Flow Fans..... E-45	AC Input MRS Series E-54	AC Input MRS
	AC Input Variable Flow MRS Series E-68	AC Input Variable Flow MRS
	AC Input MU Series E-70	AC Input MU
	DC Input Long-Life MDE Series E-78	DC Input Long-Life MDE
	DC Input MDS Series/ MD Series E-80	DC Input MDS/MD
Centrifugal Blowers E-99	AC Input MB Series E-102	AC Input MB
	DC Input MBD Series E-114	DC Input MBD
Cross Flow Fans E-121	AC Input MF Series E-124	AC Input MF
	DC Input MFD Series E-128	DC Input MFD
Thermostats E-133	Thermostats
Accessories E-137	Accessories
Installation E-155	Installation

Overview of Cooling Fans

Today's comfortable life and society is supported by advanced control systems, which may present many heat sources.

To operate these devices 24 hours a day, 365 days a year, the devices require appropriate heat designs and heat measures.

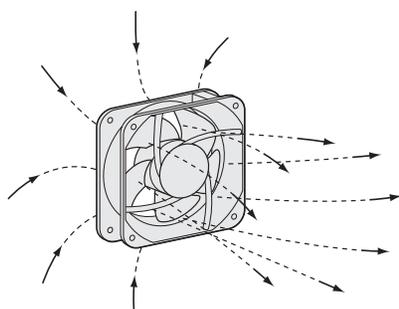
Oriental Motor offers a wide range of heat measure products centered on cooling fans to meet these requirements.

About a Cooling Fan

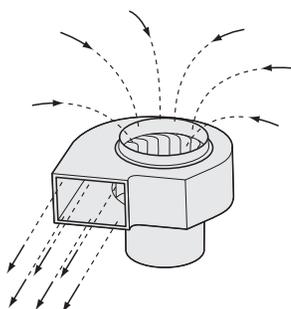
One method of cooling heat sources and enclosures is air cooling, which utilizes the air around us.

One device that can use this air is a cooling fan, which uses the power of a motor to spin a propeller or impeller to blow air.

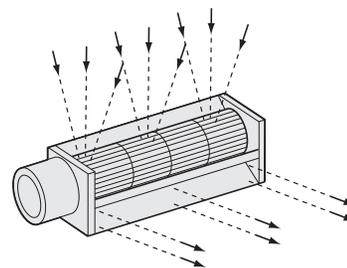
Oriental Motor provides three types of fans: axial flow fans, centrifugal blowers and cross flow fans, using different air-blowing systems.



Axial Flow Fans



Centrifugal Blowers

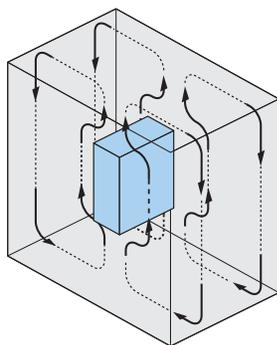


Cross Flow Fans

Highly Reliable Equipment Design Using Cooling Fans

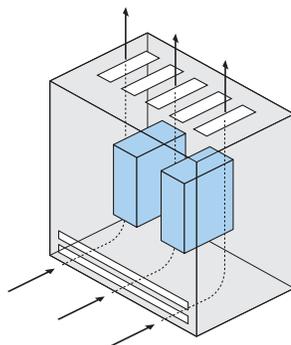
Even if the temperature of a heat source rises, cooling is not required if the temperature will not affect the heat source itself or peripheral equipment. However, if there is a danger that the heat will cause damage, some kind of cooling is required. There are two methods of cooling heat sources; natural air cooling and forced cooling. When forced cooling is required, cooling fans perform the appropriate ventilation and air-blowing. By using a cooling fan, the temperature of a heat source and its surroundings can be decreased, which enables extended equipment life, and more reliable equipment design.

Natural Air Cooling of Closed Enclosure



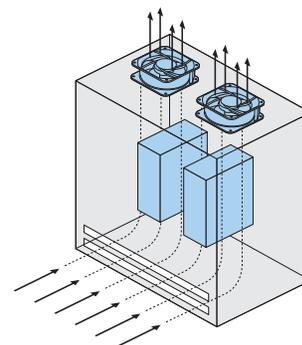
When there is no heat source, or the temperature of the heat source is low and does not affect peripheral equipment

Natural Air Cooling of Open Enclosure



When keeping enclosure temperature constant using natural air cooling, by opening air holes such as vents in the enclosure to create air flow

Forced Cooling of Open Enclosure



When the temperature of the heat source is high, or when the heat density in the enclosure is high and the temperature of the enclosure becomes extremely high

Cooling System Design Using Cooling Fans that Consider the Surrounding Environment

In order to achieve highly reliable heat design, it is necessary to design the cooling system from a comprehensive perspective that considers the surrounding environment. To support these heat designs, Oriental Motor offers a wide range of heat measure products, from cooling fans to accessories such as finger guards and filters.

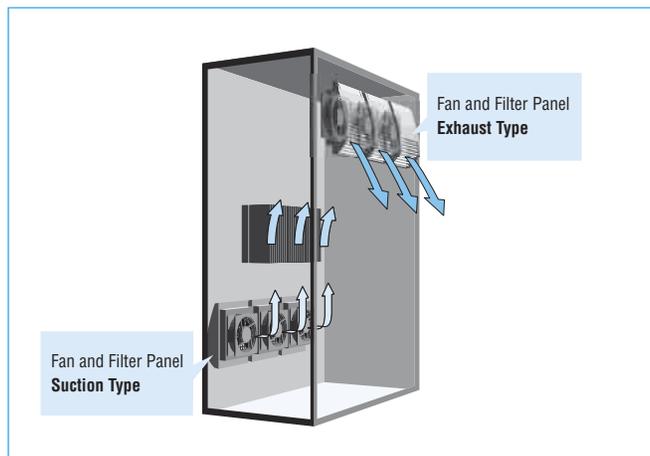
Cooling System Design that Considers the Surrounding Environment

There are various installation environments for equipment that uses cooling fans.

In factories that perform processes such as cutting, polishing or welding, dust is mixed in with the air. If equipment with cooling fans is used in such an environment, dust and powdery dust may enter the inside of the equipment and become attached to the devices inside the equipment, which may cause malfunction, deterioration or break down of the equipment.

Also, equipment installed in environments where food machinery is washed may break down due to the ingress of water droplets. To ensure high reliability in such environments, cooling system design is needed to consider the surrounding environment.

(Refer to recommendation ③ on page E-16 for details.)



Cooling System Design that Considers Detection of Cooling Problems and Prompt Maintenance

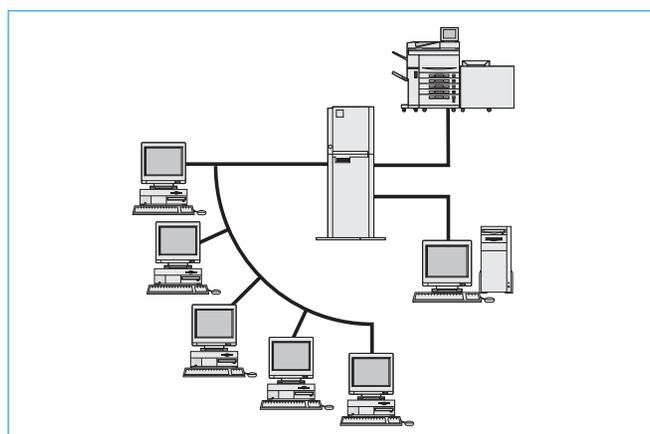
The mainframes and terminals and peripheral equipments of today's advanced control systems are connected via networks.

Operating these devices without disruption requires air cooling using cooling fans selected based on appropriate heat design.

However, the stop of cooling fans can cause a system failure, and periodic maintenance is required.

To ensure high reliability in such applications, cooling system design is needed to consider maintenance.

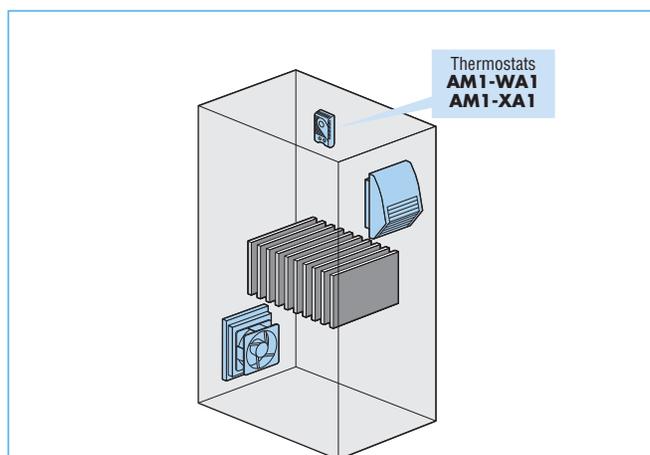
(Refer to recommendation ② on page E-15 for details.)



Cooling System Design that Considers Energy-Saving and Noise Reduction

Ambient temperature changes constantly in the place which equipment is installed. Thermostats make it possible for fans to operate only when cooling is necessary. By running the fans only as needed, energy can be conserved and noise can be reduced. In this environment, cooling system design with thermostats is needed.

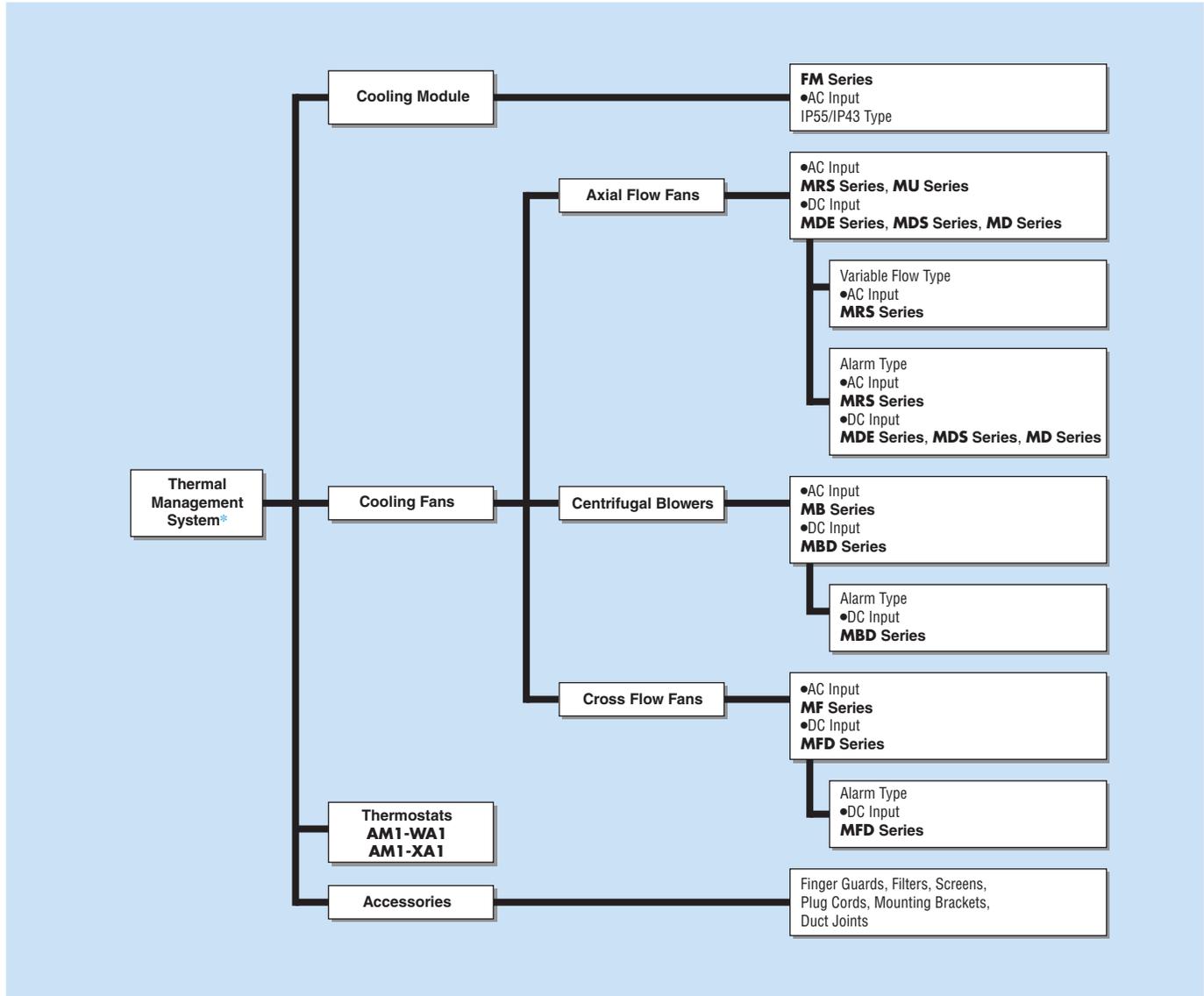
(Refer to recommendation ④ on page E-17 for details.)



System of Cooling Fans

Oriental Motor provides cooling fans for a wide range of applications.

- Fan products such as axial flow fans, centrifugal blowers and cross flow fans
- Cooling module integrated with fan and filter
- Thermostats combined with fans or cooling module to perform temperature control
- Accessories that make fans even easier to use



*Thermal Management System

We can enjoy a comfortable life at home and work today, thanks to advanced control systems. However, the devices that function as the core of such systems present many heat sources.

To operate these devices 24 hours a day, 365 days a year, the devices require appropriate heat designs and heat measures.

Oriental Motor can recommend the ideal products for you by examining your needs from the viewpoint of the Thermal Management System.

Examples of Thermal Management System products are found on page E-13.

Types of Cooling Fans

Cooling Module

FM Series Page E-25

The **FM** Series offers modular products integrated with fan, finger guard and filter.

These modules help reduce equipment problems caused by ingress of dust or water, while saving installation and replacement costs.



AC Axial Flow Fans

MRS Series Page E-54

The **MRS** Series is a large axial fan with large air flow, high static pressure and high efficiency in frame sizes from □250 mm (□9.84 in.) to □140 mm (□5.51 in.).



AC Axial Flow Fans

MU Series Page E-70

The **MU** Series is a compact AC axial flow fan in frame sizes from □119 mm (□4.69 in.) to □80 mm (□3.15 in.).



DC Long-Life Fans

MDE Series Page E-78

The **MDE** Series long-life fans have a 100 000 hour life expectancy.



DC Axial Flow Fans

MDS Series, MD Series Page E-80

The **MDS** Series and **MD** Series are compact axial flow fans adopting high performance brushless DC motors.



Centrifugal Blowers

MB Series, MBD Series Page E-99

Centrifugal blowers are optimal for spot cooling and for air flow through a duct, which provide directional air flow by maximizing static pressure.



Cross Flow Fans

MF Series, MFD Series Page E-121

The cross flow fans deliver a wide, uniform air flow.



Peripheral Products for Fans

Thermostats

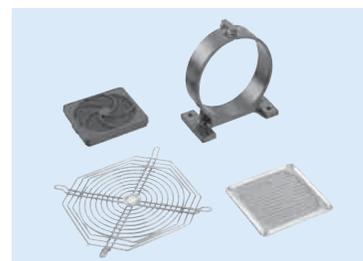
AM1-WA1/AM1-XA1 Page E-133

Thermostats combined with fan make it possible for fans to operate only when cooling is necessary.



Accessories Page E-137

Finger guards, filters, screens, plug cords, mounting brackets and duct joints are available for use with each fan.



Product Line of Cooling Fans

We offer a wide range of fans in varying frame sizes and voltage specifications. Fans offering additional functions such as alarm type are also available.

Cooling Module FM Series

Fan and Filter Panel

◇ Suction Type

Degree of Protection	External View	Shape/Material	Dust-Removal Ratio	Module Dimensions [mm (in.)]	209×226 (8.23×8.90)	157×170 (6.18×6.69)	129×134 (5.08×5.28)
				Fan Thickness	38 mm Thick (1.50 in. Thick)	38 mm Thick (1.50 in. Thick)	25 mm Thick (0.98 in. Thick)
				Fan Type	MU1238	MU1238	MU925
				Number of Installed Fans	1	1	1
IP55 → E-36~E-37	 (Color: Light gray)	Hood type, resin	95%	Single-Phase 115 VAC	●	●	●
				Single-Phase 220/230 VAC	●	●	●
IP43 → E-40~E-41		Hood type, resin	48%	Single-Phase 115 VAC	●	●	●
				Single-Phase 220/230 VAC	●	●	●

◇ Exhaust Type

Degree of Protection	External View	Shape/Material	Dust-Removal Ratio	Module Dimensions [mm (in.)]	209×226 (8.23×8.90)	157×170 (6.18×6.69)	129×134 (5.08×5.28)
				Fan Thickness	38 mm Thick (1.50 in. Thick)	38 mm Thick (1.50 in. Thick)	25 mm Thick (0.98 in. Thick)
				Fan Type	MU1238	MU1238	MU925
				Number of Installed Fans	1	1	1
IP55 → E-34~E-35	 (Color: Light gray)	Hood type, resin	95%	Single-Phase 115 VAC	●	●	●
				Single-Phase 220/230 VAC	●	●	●
IP43 → E-38~E-39		Hood type, resin	48%	Single-Phase 115 VAC	●	●	●
				Single-Phase 220/230 VAC	●	●	●

● Filter Panel

Degree of Protection	External View	Shape/Material	Dust-Removal Ratio	Module Dimensions [mm (in.)]	209×226 (8.23×8.90)	157×170 (6.18×6.69)	129×134 (5.08×5.28)
IP55	Same as fan type (Color: Light gray)	Hood type, resin	95%		●	●	●
IP43		Hood type, resin	48%		●	●	●

Axial Flow Fans

●: Standard Type ■: Alarm Type ◆: Pulse Sensor Type

Series	Power Supply Voltage	Frame Size [mm (in.)]											
		□250 (□9.84)	□200 (□7.87)	□180 (□7.09)	φ172 (φ6.77)	□160 (□6.30)	□140 (□5.51)	□119 (□4.69)	□92 (□3.62)	□80 (□3.15)	□62 (□2.44)	□52 (□2.05)	□42 (□1.65)
AC Axial Flow Fans MRS Series → Pages E-54~E-67	Single-Phase 100/110/115 VAC	●■	●■	●■		●■							
	Single-Phase 200/220/230 VAC	●■	●■*	●■*		●■*							
	Three-Phase 200/220/230 VAC	●■	●■	●■		●■	●■						
AC Axial Flow Fans MRS Series Variable Flow Type → Pages E-68~E-69	Single Phase 100/115 VAC			●									
	Single Phase 200/230 VAC			●									
AC Axial Flow Fans MU Series → Pages E-70~E-77	Single-Phase 115 VAC							●	●	●			
	Single-Phase 220/230 VAC							●	●	●			
DC Long-Life Fans MDE Series → Pages E-78~E-79	12 VDC							■					
	24 VDC							■					
DC Axial Flow Fans MDS Series, MD Series → Pages E-80~E-97	5 VDC											●	●
	12 VDC							●■	●■◆	●■◆	●■◆	●■	●■
	24 VDC					●◆◆		●■◆	●■◆	●■◆	●■◆	●■	●■
	48 VDC					●■◆		●■◆	●■◆	●■◆	●■◆	●■	●■

* The product for single-phase 220 VAC is not available.

Centrifugal Blowers

●: Standard Type ■: Alarm Type ◆: Pulse Sensor Type

Series	Power Supply Voltage	Impeller Diameter [mm (in.)]					
		φ160 (φ6.30)	φ120 (φ4.72)	φ100 (φ3.94)	φ80 (φ3.15)	φ60 (φ2.36)	φ50 (φ1.97)
AC Centrifugal Blowers MB Series → Pages E-102~E-113	Single-Phase 100/110/115 VAC	●	●	●	●	●	●
	Single-Phase 200/220/230 VAC	●	●	●	●	●	●
	Three-Phase 200/220/230 VAC	●*	●		●		
DC Centrifugal Blowers MBD Series → Pages E-114~E-119	24 VDC		●	●■◆	●■◆		
	48 VDC			●◆	●◆		

* The product for three-phase 220 VAC is not available.

Cross Flow Fans

●: Standard Type ■: Alarm Type ◆: Pulse Sensor Type

Series	Power Supply Voltage	Impeller Length [mm (in.)]	
		300 (11.81)	150 (5.91)
AC Cross Flow Fans MF Series → Pages E-124~E-127	Single-Phase 100/110/115 VAC	●	●
	Single-Phase 200/220/230 VAC	●	●
DC Cross Flow Fans MFD Series → Pages E-128~E-131	24 VDC	●■	●■
	48 VDC	●◆	●◆

Selection Guide ①

The features of cooling fans differ according to their air-blowing system.

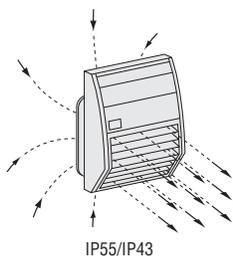
In this selection guide, we explain selection according to the type of air-blowing system, with example applications.

Refer to selection guide ② for selection according to maximum air flow and maximum static pressure, and selection guide ③ for selection according to additional functions.

Cooling Module (→ Page E-25)

Both IP55 and IP43 models are available.

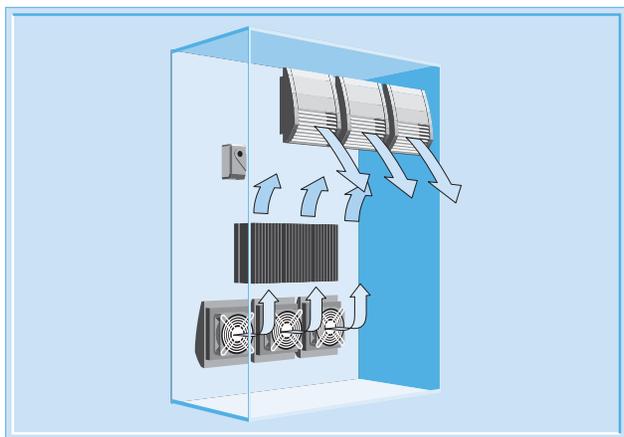
Various types are available, including a suction type and exhaust type.



IP55/IP43

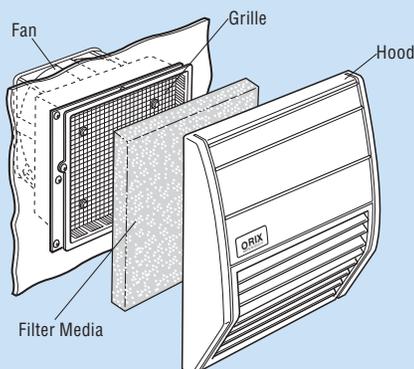
● Ventilation and Cooling Inside Control Box

Suitable for ventilation and cooling inside a control box installed in an environment where powdery dust is mixed in with the air. Improves the reliability of the entire control box.



● Easy Installation and Easy Maintenance

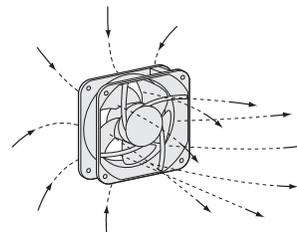
The module can be easily installed from the outside. The filter can be replaced from outside the equipment, and maintenance is also easy.



Axial Flow Fans (→ Page E-45)

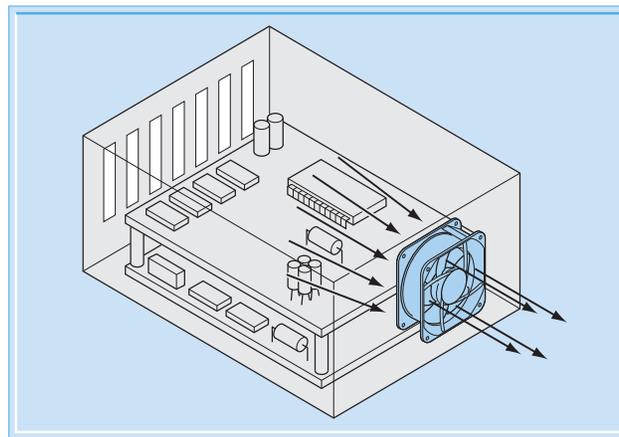
A large air flow is feature of axial flow fans.

Various types are available, including large size and small size.



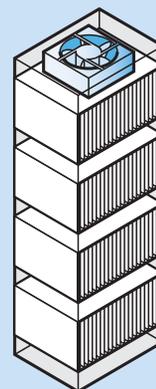
● Device Ventilation and Cooling

The large air flow of axial flow fans is suitable for ventilation and cooling inside electronic device.



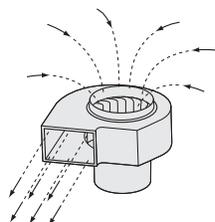
● Cooling Densely Mounted Devices

Enables energy-saving and less wiring compared to using multiple small fans.



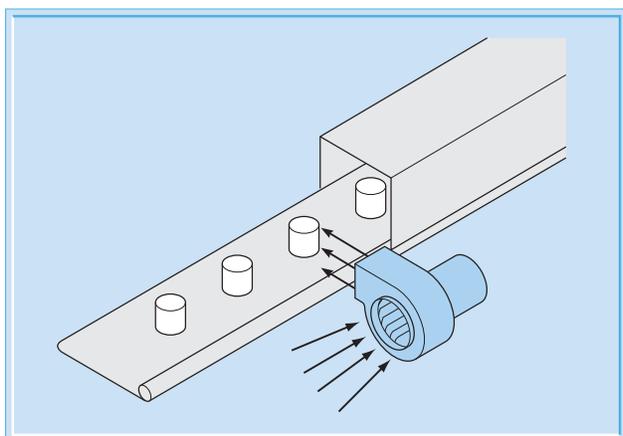
Centrifugal Blowers (→ Page E-99)

A large static pressure and concentrated air flow are features of centrifugal blowers.



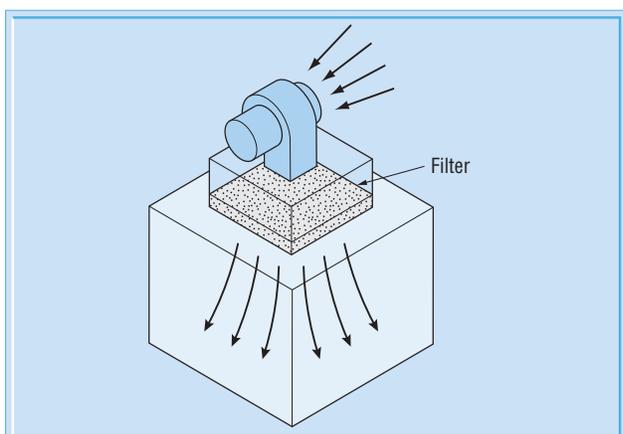
● Air-Blow Cooling or Drying

Centrifugal blowers offering high static pressures are suitable for the air-blow cooling of work pieces following heat treatment.



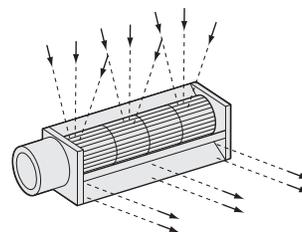
● Cooling with High Static Pressure

The high static pressure of centrifugal blowers makes them suitable for cooling used together with thick filters that are subject to significant pressure losses.



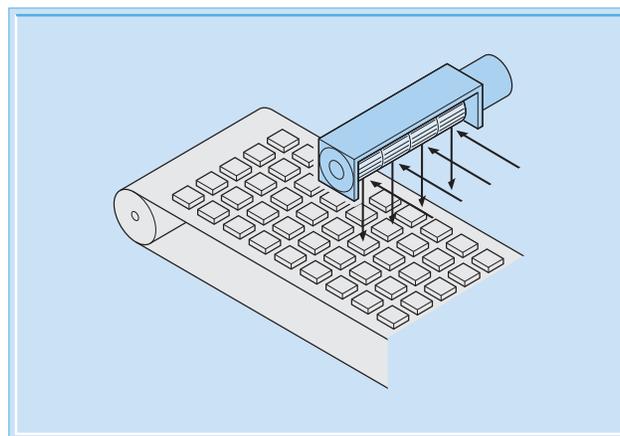
Cross Flow Fans (→ Page E-121)

A wide, uniform air flow is a feature of cross flow fans.



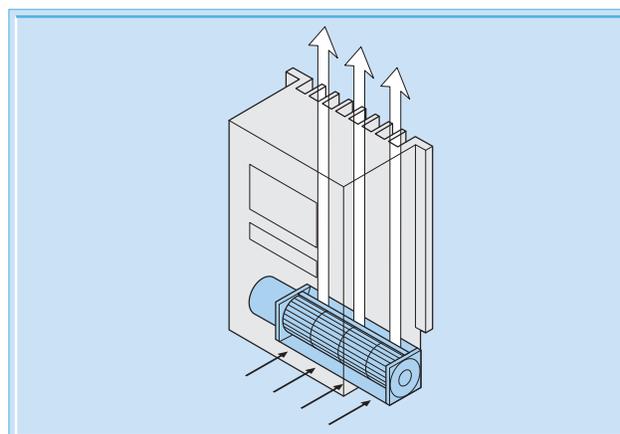
● Uniform Cooling or Drying

Cross flow fans are suitable for the air-blow cooling of wide areas.



● Cooling of Long and Thin Space

Suitable for air-blow cooling of long and thin spaces, such as where electronic devices are installed.



Selection Guide ②

To achieve objective work, the cooling fan needs to be selected in consideration of required performance as well as features of air flow.

The maximum air flow and maximum static pressure vary depending on the series and size of cooling fans. Select the cooling fan offering the characteristics that best suit the specifications of your equipment.

Maximum Air flow

The following tables indicate the maximum air flow for each type and series. Please use them as a guide when selecting cooling fans.

AC Axial Flow Fans

Max. Air Flow [m ³ /min (CFM)] For 50/60 Hz	Frame Size [mm (in.)]	Thickness [mm (in.)]	Type	Page
21.2/24 (742/848)	□250 (□9.84)	120 (4.72)	MRS25	E-54
13.2/15.5 (466/547)	□200 (□7.87)	90 (3.54)	MRS20	E-56
11.0/12.8 (388/452)	□180 (□7.09)	90 (3.54)	MRS18	E-58
6.2/7.3 (219/258)	□160 (□6.30)	62 (2.44)	MRS16	E-62
4.5/4.6 (159/162)	□140 (□5.51)	47 (1.85)	MRS14	E-66
2.7/3.0 (95.3/106)	□119 (□4.69)	38 (1.50)	MU1238	E-70
1.6/1.9 (56.5/67.1)	□119 (□4.69)	25 (0.98)	MU1225	E-72
0.95/1.10 (33.5/38.8)	□92 (□3.62)	25 (0.98)	MU925	E-74
0.45/0.55 (15.9/19.4)	□80 (□3.15)	25 (0.98)	MU825	E-76

DC Axial Flow Fans

Max. Air Flow [m ³ /min (CFM)]	Frame Size [mm (in.)]	Thickness [mm (in.)]	Type	Page
6 (212)	φ172 (φ6.77)	51 (2.01)	MDS1751	E-80
5.8 (205)	□140 (□5.51)	51 (2.01)	MDS1451	E-82
2.7 (95.3)	□119 (□4.69)	25.4 (1.00)	MDE1225	E-78
		25.4 (1.00)	MDS1225	E-84
2.5 (88.3)		25.4 (1.00)	MD1225	E-86
1.3 (45.9)	□92 (□3.62)	25.4 (1.00)	MD925	E-88
1 (35.3)	□80 (□3.15)	25.4 (1.00)	MD825	E-90
0.5 (17.7)	□62 (□2.44)	25.4 (1.00)	MD625	E-92
0.27 (9.53)	□52 (□2.05)	10 (0.39)	MDS510	E-94
0.18 (6.35)	□42 (□1.65)	10 (0.39)	MDS410	E-96

Centrifugal Blowers

Max. Air Flow [m ³ /min (CFM)] For 50/60 Hz	Impeller Diameter [mm (in.)]	Power Supply	Type	Page
8.0/9.0 (282/318)	φ160 (φ6.30)	AC Input	MB1665	E-102
4.4/5.1 (155/180)	φ120 (φ4.72)		MB1255	E-104
2.3/2.6 (81.2/91.8)	φ100 (φ3.94)		MB1040	E-106
1.6/1.8 (56.5/63.5)	φ80 (φ3.15)		MB840	E-108
0.44/0.36 (15.5/12.7)	φ60 (φ2.36)		MB630	E-110
0.21/0.24 (7.41/8.47)	φ50 (φ1.97)		MB520	E-112
3 (106)	φ120 (φ4.72)	DC Input	MBD12	E-114
1.95 (68.8)	φ100 (φ3.94)		MBD10	E-116
1.45 (51.2)	φ80 (φ3.15)		MBD8	E-118

Cross Flow Fans

Max. Air Flow [m ³ /min (CFM)] For 50/60 Hz	Impeller Length [mm (in.)]	Power Supply	Type	Page
6.0/6.2 (212/219)	300 (11.81)	AC Input	MF930	E-124
3.4/3.7 (120/131)	150 (5.91)		MF915	E-126
5.2 (184)	300 (11.81)	DC Input	MFD930	E-128
3 (106)	150 (5.91)		MFD915	E-130

Maximum Static Pressure

The following tables indicate the maximum static pressure for each series. Please use them as a guide when selecting cooling fans.

AC Axial Flow Fans

Max. Static Pressure [Pa (inH ₂ O)] For 50/60 Hz	Frame Size [mm (in.)]	Thickness [mm (in.)]	Type	Page
290/320 (1.16/1.28)	□250 (□9.84)	120 (4.72)	MRS25	E-54
221/186 (0.886/0.746)	□200 (□7.87)	90 (3.54)	MRS20	E-56
196/245 (0.786/0.982)	□180 (□7.09)	90 (3.54)	MRS18	E-58
127/157 (0.509/0.63)	□160 (□6.30)	62 (2.44)	MRS16	E-62
92/81 (0.369/0.325)	□140 (□5.51)	47 (1.85)	MRS14	E-66
81/81 (0.325/0.325)	□119 (□4.69)	38 (1.50)	MU1238	E-70
49/44 (0.196/0.176)	□119 (□4.69)	25 (0.98)	MU1225	E-72
44/59 (0.176/0.237)	□92 (□3.62)	25 (0.98)	MU925	E-74
34/49 (0.137/0.196)	□80 (□3.15)	25 (0.98)	MU825	E-76

DC Axial Flow Fans

Max. Static Pressure [Pa (inH ₂ O)]	Frame Size [mm (in.)]	Thickness [mm (in.)]	Type	Page
137 (0.549)	φ172 (φ6.77)	51 (2.01)	MDS1751	E-80
130 (0.521)	□140 (□5.51)	51 (2.01)	MDS1451	E-82
86 (0.345)	□42 (□1.65)	10 (0.39)	MDS410	E-96
70 (0.281)	□119 (□4.69)	25.4 (1.00)	MDE1225	E-78
		25.4 (1.00)	MDS1225	E-84
54 (0.217)	□52 (□2.05)	10 (0.39)	MDS510	E-94
		25.4 (1.00)	MD925	E-88
49 (0.196)	□80 (□3.15)	25.4 (1.00)	MD825	E-90
		25.4 (1.00)	MD625	E-92
43 (0.172)	□119 (□4.69)	25.4 (1.00)	MD1225	E-86

Centrifugal Blowers

Max. Static Pressure [Pa (inH ₂ O)] For 50/60 Hz	Impeller Diameter [mm (in.)]	Power Supply	Type	Page
490/686 (1.96/2.75)	φ160 (φ6.30)	AC Input	MB1665	E-102
309/441 (1.24/1.77)	φ120 (φ4.72)		MB1255	E-104
206/284 (0.826/1.14)	φ100 (φ3.94)		MB1040	E-106
152/221 (0.610/0.886)	φ80 (φ3.15)		MB840	E-108
53/76 (0.213/0.305)	φ60 (φ2.36)		MB630	E-110
37/53 (0.149/0.213)	φ50 (φ1.97)		MB520	E-112
372 (1.49)	φ120 (φ4.72)	DC Input	MBD12	E-114
294 (1.18)	φ100 (φ3.94)		MBD10	E-116
196 (0.786)	φ80 (φ3.15)		MBD8	E-118

Cross Flow Fans

Max. Static Pressure [Pa (inH ₂ O)] For 50/60 Hz	Impeller Length [mm (in.)]	Power Supply	Type	Page
74/103 (0.297/0.414)	300 (11.81)	AC Input	MF930	E-124
88/127 (0.353/0.509)	150 (5.91)		MF915	E-126
83 (0.333)	300 (11.81)	DC Input	MFD930	E-128
98 (0.393)	150 (5.91)		MFD915	E-130

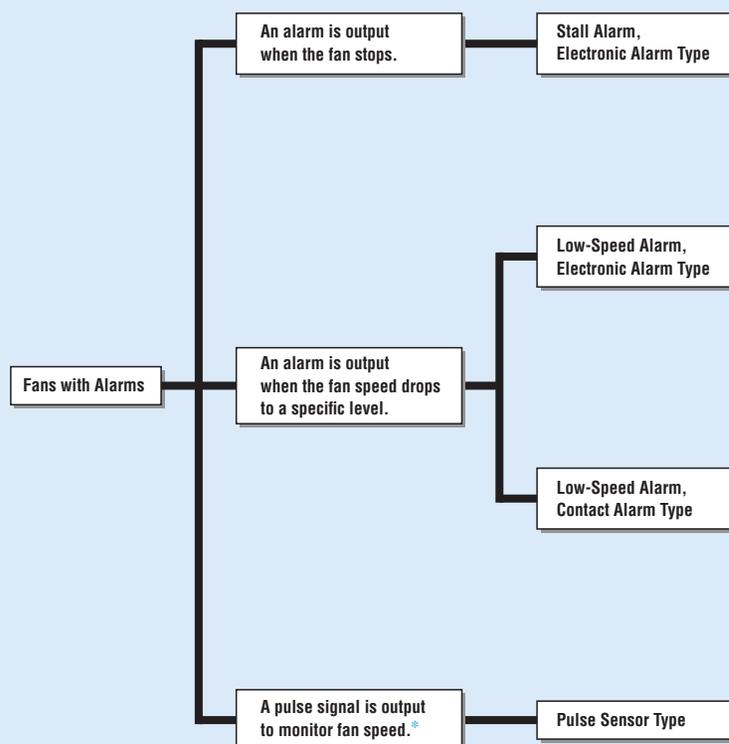
Selection Guide ③

In addition to air-blowing characteristics and performance, a fan can also be selected based on its additional functions, such as the alarm function.

Fans with Alarms

Fans with alarms indicate that its air-blowing capability has dropped due to an abnormality in the power supply or air channel, the entry of foreign objects, or other factors.

Alarms enhance the reliability of your equipment.



*Two pulses are output per revolution of the fan. Fan speed is monitored as the host controller, etc., reads the output pulses. This function helps you set a desired output speed for alarm activation.

Type	Size [mm (in.)]	Model	Page
DC Axial Flow Fans	□140 (□5.51)	MDS1451	E-82
	□119 (□4.69)	MDE1225	E-78
	□92 (□3.62)	MD925	E-88
	□80 (□3.15)	MD825	E-90
	□62 (□2.44)	MD625	E-92
	□52 (□2.05)	MDS510	E-94
	□42 (□1.65)	MDS410	E-96

Type	Size [mm (in.)]	Model	Page
AC Axial Flow Fans	□250 (□9.84)	MRS25	E-54
	□200 (□7.87)	MRS20	E-56
	□180 (□7.09)	MRS18	E-58
	□160 (□6.30)	MRS16	E-62
	□140 (□5.51)	MRS14	E-66
DC Axial Flow Fans	□119 (□4.69)	MDS1225	E-84

Type	Size [mm (in.)]	Model	Page
AC Axial Flow Fans	□250 (□9.84)	MRS25	E-54
	□160 (□6.30)	MRS16	E-62
DC Axial Flow Fans	φ172 (φ6.77)	MDS1751	E-80
DC Centrifugal Blowers	φ100 (φ3.94)	MBD10	E-116
	φ80 (φ3.15)	MBD8	E-118
DC Cross Flow Fans	300 (11.81)	MFD930	E-128
	150 (5.91)	MFD915	E-130

Type	Size [mm (in.)]	Model	Page
DC Axial Flow Fans	φ172 (φ6.77)	MDS1751	E-80
	□140 (□5.51)	MDS1451	E-82
	□92 (□3.62)	MD925	E-88
	□80 (□3.15)	MD825	E-90
	□62 (□2.44)	MD625	E-92
DC Centrifugal Blowers	φ100 (φ3.94)	MBD10	E-116
	φ80 (φ3.15)	MBD8	E-118
DC Cross Flow Fans	300 (11.81)	MFD930	E-128
	150 (5.91)	MFD915	E-130

●Refer to page E-21 for details on alarm specifications of each product.

Variable Flow Fans

An internal power control device allows adjustment of airflow to match the cooling requirements.

Variable Flow Fans	AC Axial Flow Fans	Size [mm (in.)]	Model	Page
		□180 (□7.09)	MR518V2-B, MR518V2-D	E-68

Recommendation of a Thermal Management System

You can improve the reliability of your equipment and reduce its overall cost by combining fans and peripheral products.

Oriental Motor can recommend the optimal product combinations and their effective use in order to meet specific requests.

We would be happy to assist you in the design of your equipment.

Customer Needs	Recommendation ①	Recommendation ②	Recommendation ③	Recommendation ④	Recommendation ⑤	Recommended Products
	Densely Mounted Device	Alarm Output	Cooling Module	Temperature control	Fan Kit	
Want to reduce noise	◎			◎		MRS Series, Thermostat
Want to use the equipment for a longer period		◎	◎	◎		MRS Series, MDE Series, FM Series, Thermostat
Want to lower maintenance costs		◎	◎	◎		MRS Series, MDS Series, MD Series, MDE Series, MBD Series, MFD Series, FM Series, Thermostat
Want to achieve a densely mounted device	◎					MRS Series, MDE Series
Want to detect cooling problems		◎				MDE Series, MDS Series, MD Series, MRS Series, MBD Series, MFD Series
Want to reduce power consumption	◎			◎		MRS Series, Thermostat
Want to reduce weight	◎					MRS Series
Want to simplify the ordering process					◎	MRS Series, MDE Series, MDS Series, MD Series, MB Series, MBD Series, MU Series

Recommendation ① Recommendation for the effective air cooling of equipment configured in a densely mounted device → Page E-14

We recommend high static pressure fans wherever components are densely packed in enclosures, such as 19" racks and large pieces of equipment.

Recommendation ② Recommendation for reliability improvement of equipment using fans with alarms → Page E-15

We can offer ideas to achieve lower maintenance costs and improve the reliability of your equipment by using fans with alarms.

Recommendation ③ Recommendation for ecological use of equipment using a cooling module → Page E-16

In environments where there is a danger of damage to equipment due to dust, insects, water, etc., we recommend the cooling module **FM** Series to protect the equipment and perform air cooling.

Recommendation ④ Recommendation for temperature control in the equipment using a thermostat → Page E-17

We can offer ideas to achieve proper temperature control in the enclosure as well as an overall cost reduction through the combined use of thermostat (**AM1-WA1**, **AM1-XA1**) and various AC fans.

Recommendation ⑤ Recommendation for fan kit → Page E-18

We can offer ideas to simplify the ordering process and prevent shortages of accessories by using fan kit that combine fan units, finger guards and mounting screws.

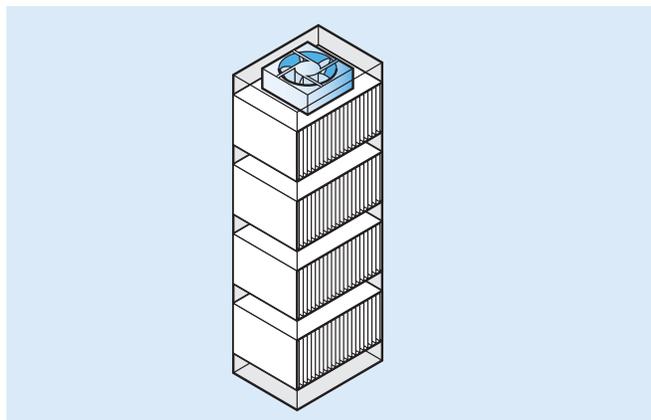
-Thermal Management System-

① Recommendation for the Effective Air Cooling of Equipment Configured in a Densely Mounted Device

We recommend large, high static pressure fans offering the following advantages for 19" racks and other equipment where components are densely mounted in enclosures.

■ Points of Recommendation

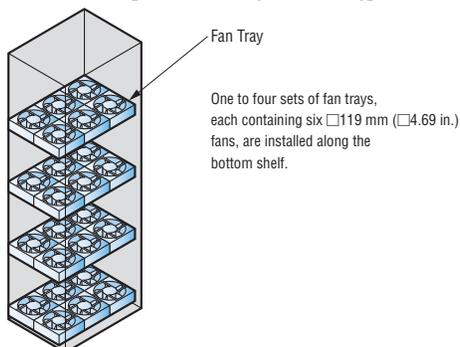
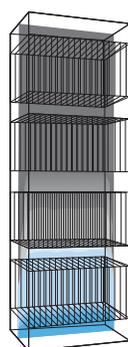
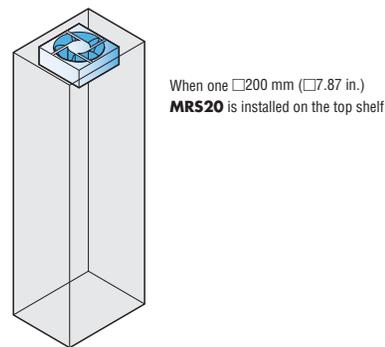
- Lower equipment noise
- Densely mounted device
- Lower power consumption
- Reduced weight and wiring cost



■ Comparison of Temperature Distributions

Generally, the air cooling of equipment with densely mounted device is achieved with multiple small fans placed in parallel. However, the same cooling effect can be achieved with one large fan offering high static pressure. The temperature distributions of both configurations are shown below.

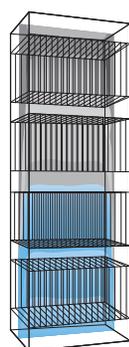
● When Multiple Small Fans [□119 mm (□4.69 in.)] are Used

● When One **MRS20** is Used

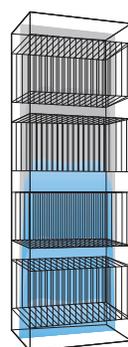
● When one fan tray is installed



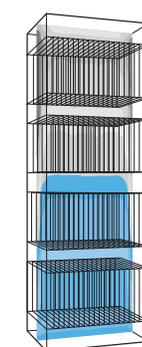
● When two fan trays are installed



● When three fan trays are installed



● When four fan trays are installed



● The same cooling effect as when four fan trays are installed can be achieved.

■ High-temperature range
■ Low-temperature range

As shown, one large fan offering high static pressure can achieve the same cooling effect as when four fan trays are installed (i.e. 24 small fans). The use of a single fan also results in simpler wiring, lower noise, less power consumption and reduced equipment weight compared with the use of multiple small fans. The time spent on maintenance will also be cut, and you will reduce the overall cost.

■ Applicable Products

● **MRS Series** (Page E-54)

Frame Size: □250 mm~□140 mm (□9.84 in.~□5.51 in.)

Maximum Air Flow: 21~4.5 m³/min (741~159 CFM)

Maximum Static Pressure: 290~92 Pa (1.164~0.369 inH₂O)

Noise Level: 58~48 dB



-Thermal Management System-

② Recommendation for Reliability Improvement of Equipment Using Fans with Alarms

Fans with an alarm enable you to detect cooling problems in devices that use fans. This enables prompt maintenance, and keeps the overall equipment in a state of high reliability.

Points of Recommendation

- Detection of cooling problems
- Improved reliability in equipment design

Types of Fans with Alarms

● Stall Alarm, Electronic Alarm Type

An alarm is output when the fan stops while operating.

Type	Frame Size	
DC Axial Flow Fans → Page E-78	□140 mm (□5.51 in.) (MDS1451)	
	□119 mm (□4.69 in.) (MDE1225)	
	□92 mm (□3.62 in.) (MD925)	
	□80 mm (□3.15 in.) (MD825)	
	□62 mm (□2.44 in.) (MD625)	
	□52 mm (□2.05 in.) (MDS510)	
	□42 mm (□1.65 in.) (MDS410)	

● Low-Speed Alarm, Electronic Alarm Type

An alarm is output when the fan speed drops to a specific level. Output mode is electronic output.

Type	Frame Size	
AC Axial Flow Fans → Page E-54	□250 mm (□9.84 in.) (MRS25)	
	□200 mm (□7.87 in.) (MRS20)	
	□180 mm (□7.09 in.) (MRS18)	
	□160 mm (□6.30 in.) (MRS16)	
	□140 mm (□5.51 in.) (MRS14)	
□119 mm (□4.69 in.) (MDS1225)		
DC Axial Flow Fans → Page E-84	□119 mm (□4.69 in.) (MDS1225)	

● Low-Speed Alarm, Contact Alarm Type

An alarm is output when the fan speed drops to a specific level. Output mode is contact output.

Type	Frame Size	
AC Axial Flow Fans → Page E-54	□250 mm (□9.84 in.) (MRS25)	
	□160 mm (□6.30 in.) (MRS16)	
DC Axial Flow Fans → Page E-80	φ172 mm (φ6.77 in.) (MDS1751)	
DC Centrifugal Blowers → Page E-116	Impeller diameter φ100 mm (φ3.94 in.) (MBD10)	
	Impeller diameter φ80 mm (φ3.15 in.) (MBD8)	
DC Cross Flow Fans → Page E-128	Impeller length 300 mm (11.81 in.) (MFD930)	
	Impeller length 150 mm (5.91 in.) (MFD915)	

● Pulse Sensor Type

Two pulses are output per revolution of the fan. Fan speed is monitored as the host controller, etc., reads the output pulses. This function helps you set a desired output speed for alarm activation.

Type	Frame Size	
DC Axial Flow Fans → Page E-80	φ172 mm (φ6.77 in.) (MDS1751)	
	□140 mm (□5.51 in.) (MDS1451)	
	□92 mm (□3.62 in.) (MD925)	
	□80 mm (□3.15 in.) (MD825)	
	□62 mm (□2.44 in.) (MD625)	
DC Centrifugal Blowers → Page E-116	Impeller diameter φ100 mm (φ3.94 in.) (MBD10)	
	Impeller diameter φ80 mm (φ3.15 in.) (MBD8)	
DC Cross Flow Fans → Page E-128	Impeller length 300 mm (11.81 in.) (MFD930)	
	Impeller length 150 mm (5.91 in.) (MFD915)	

-Thermal Management System-

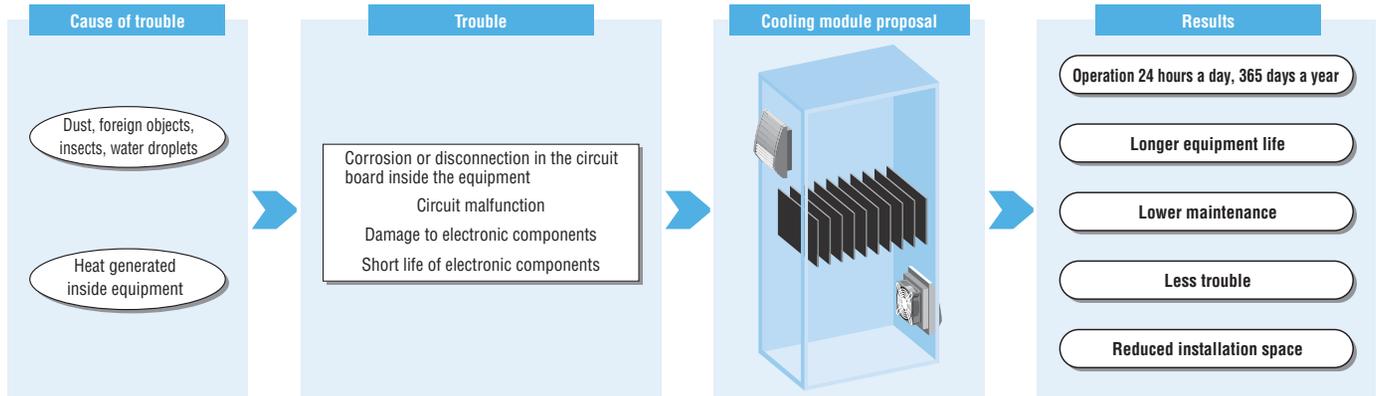
③ Recommendation for Ecological Use of Equipment Using the Cooling Module FM Series

In environments where there is a danger of damage to equipment due to dust, insects, water, etc., we recommend the cooling module **FM** Series.

■ Points of Recommendation

- Longer overall equipment life
- Simplified equipment design
- Lower maintenance costs

The cooling module **FM** Series enable longer life and improved reliability for the overall equipment. They also contribute to energy-saving and the environment.



■ Applicable Products

Cooling Module **FM** Series IP55/IP43 (Page E-34)

Resin hood type, IP55/IP43

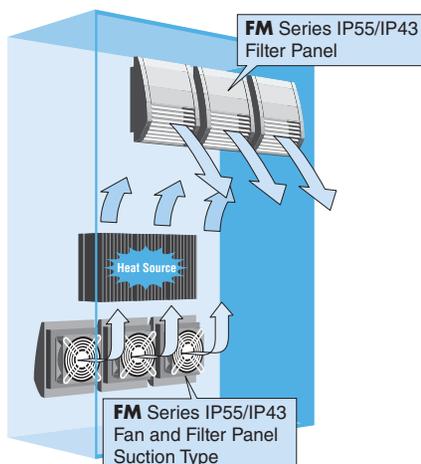
Protects the inside of equipment from powdery dust and water droplets.

• Module dimensions: 209 mm×226 mm~129 mm×134 mm (8.23 in.×8.90 in.~5.08 in.×5.28 in.)



■ Example of installation of FM Series

"Fan and filter panels" that include a fan and a filter, and "filter panels" that include a filter, are available. Both exhaust type and suction type "fan and filter panels" are available, for a wide variety of applications.



-Thermal Management System-

④ Recommendation for Temperature Control in the Equipment Using a Thermostat

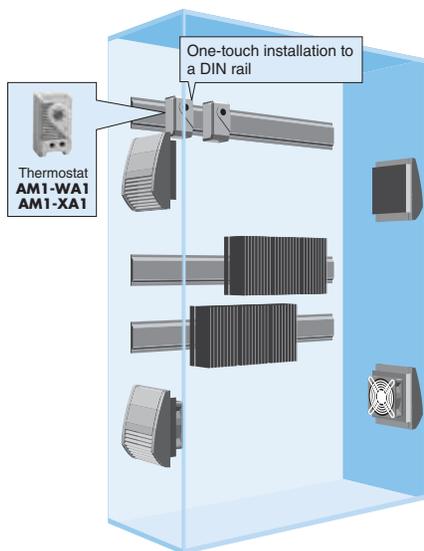
We can offer ideas to achieve proper temperature control in the enclosure as well as an overall cost reduction through the combined use of a thermostat (AM1-WA1, AM1-XA1) and various AC fans.

Points of Recommendation

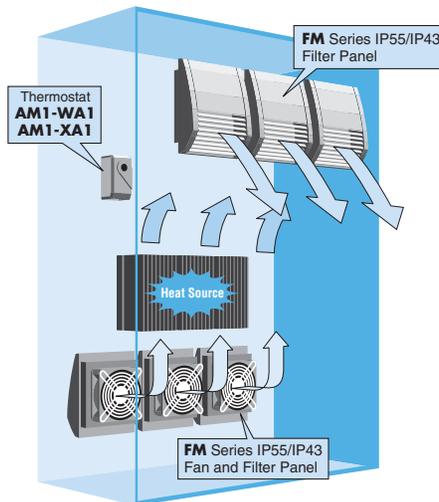
- Lower equipment noise
- Longer overall equipment life
- Lower power consumption
- Lower maintenance costs

Application Example of Thermostats

When the inside of the equipment is heated and reaches the thermostat's set temperature, the fans will start automatically. Once the inside of the equipment has cooled to a sufficient level, the fans will stop automatically.

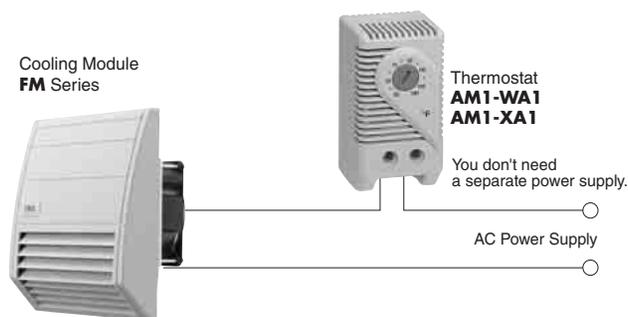


- Multiple cooling modules (FM Series) can be controlled.



- We have various other ideas to improve the effectiveness of your equipment. Refer to page E-133 for details.

Connection Example



Thermostats AM1-WA1/AM1-XA1 (Page E-133)



Features of Thermostats (AM1-WA1/AM1-XA1)

- Effective for energy-saving
- Lower equipment noise
- Easy setting
- No need for a separate power supply
- Conforms to DIN rail
- Conforms to safety standards
- Compact size: 33 mm (W)×60 mm (H)×35 mm (D)
[1.30 in. (W)×2.36 in. (H)×1.38 in. (D)]

-Thermal Management System-

⑤ Recommendation for Fan Kit

Various accessories will help you improve the safety and utility of fans.

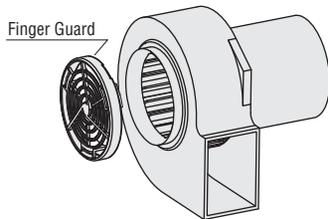
We recommend a fan kit, which combines the fan and necessary accessories.

■ Configuration of Fan Kit

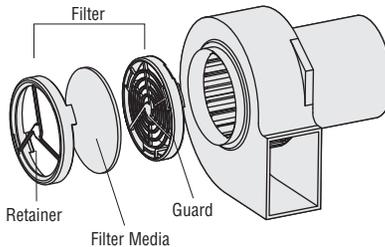
● Centrifugal Blowers **MB Series**

We offer the following accessories:

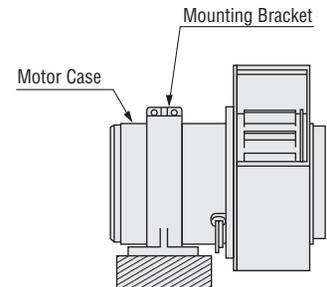
● Finger Guards (Page E-145)



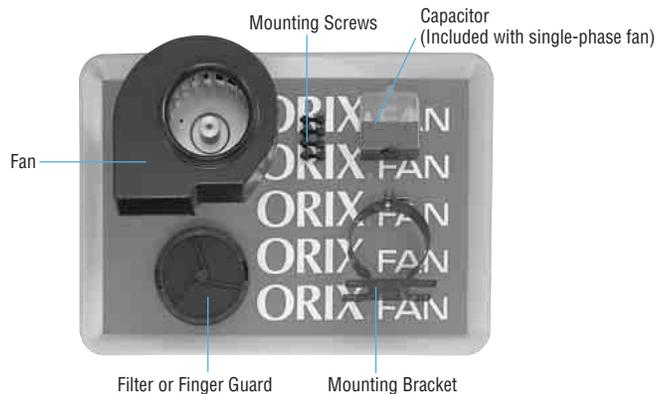
● Filters (Page E-147)



● Mounting Brackets (Page E-152)



These accessories and mounting screws are supplied with the fan.

◇ **MB Series Fan Kit**

- Centrifugal blower **MB1255-B** and accessories
MB1255-B fan, finger guard **FGB12**, mounting bracket **PAS6A**

- **MB1255-B** fan kit
T-MB1255-B-GA

Mounting screws are provided in addition to finger guards and mounting brackets.
All necessary items are ordered at the same time, so you can start using the fan immediately after delivery.

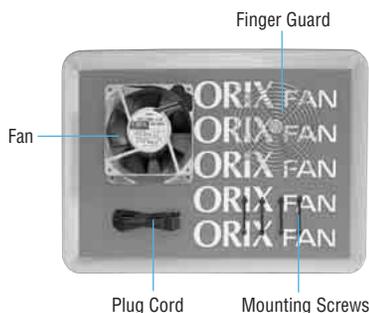
- Please specify **T-MB1255-B-FA** for use with filter **FLB12**.

■ Types of Fan Kits

● AC Axial Flow Fans

MRS Series fan kit* (Page E-138)

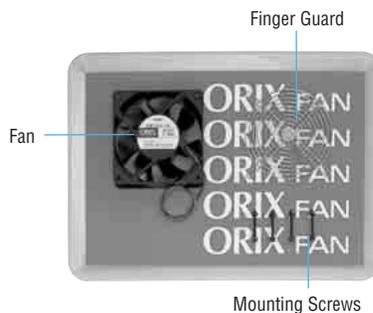
MU Series fan kit* (Page E-140)



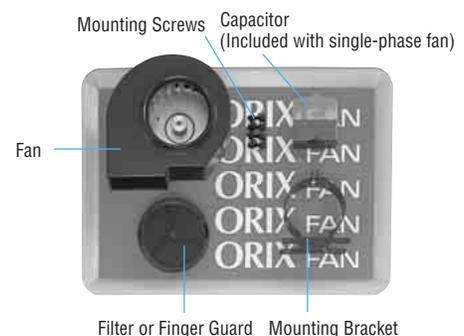
● DC Axial Flow Fans

MDE, **MDS** and **MD** Series fan kit

(Page E-141)

● AC Centrifugal Blowers,
DC Centrifugal Blowers

MB and **MBD** Series fan kit (Page E-143)



*Filter is included with some products of **MRS** Series fan kit.

*A plug cord is not supplied with the fan kit for the **MRS** Series and **MU825** type.

How to Read Specifications

MRS Series (Example)

□ 200 mm – 90 mm Thick (□ 7.87 in. – 3.54 in. Thick)

Specifications

Model		① Voltage	② Frequency	③ Current	④ Input	⑤ Speed	⑥ Max. Air Flow		⑦ Max. Static Pressure		⑧ Noise Level	⑨ Capacitor
⑩ Low-Speed Alarm, Electronic Alarm Type (Alarm specifications: ②)	Standard Type	VAC	Hz	A	W	r/min	m ³ /min	CFM	Pa	inH ₂ O	dB (A)	μF
MRS20-BM	MRS20-BUL	Single-Phase 100	50	0.8	75	2850	13.2	466	221	0.886	56	6.0
		Single-Phase 100	60	1.0	95	3350	15.5	547	186	0.746	60	
		Single-Phase 110	60	1.0	95	3400	15.5	547	255	1.02	61	
		Single-Phase 115	60	1.0	95	3400	15.5	547	265	1.06	61	
MRS20-DM	MRS20-DUL	Single-Phase 200	50	0.4	75	2850	13.2	466	221	0.886	56	6.0
		Single-Phase 200	60	0.5	95	3350	15.5	547	186	0.746	60	
		Single-Phase 230	60	0.5	95	3400	15.5	547	265	1.06	61	
MRS20-TM	MRS20-TUL	Three-Phase 200	50	0.4	75	2850	13.2	466	221	0.886	56	-
		Three-Phase 200	60	0.4	95	3350	15.5	547	265	1.06	60	
		Three-Phase 220	60	0.4	95	3400	15.5	547	265	1.06	61	
		Three-Phase 230	60	0.4	95	3400	15.5	547	265	1.06	61	

- ① Voltage: Power supply voltage needed to operate the fans. Varies with the type of fan, single-phase 100 VAC, 110 VAC, 115 VAC, single-phase 200 VAC, 220 VAC, 230 VAC and three-phase 200 VAC, 220 VAC, 230 VAC for AC power supply, and 5 VDC, 12 VDC, 24 VDC, 48 VDC for DC power supply.
- ② Frequency: For AC fans, speed varies depending on the frequency
- ③ Current: The current when the fan is at rated speed
- ④ Input Power: The input power when the fan is at rated speed
- ⑤ Speed: The fan's rated speed
- ⑥ Max. Air Flow: Maximum air flow that the fan can produce at rated speed*1
- ⑦ Max. Static Pressure: Maximum static pressure that the fan can produce at rated speed*2
- *1, 2 Values for maximum air flow and maximum static pressure are measured by the double chamber method.
- ⑧ Noise Level: Noise level when the fan is at rated speed*3
- *3 Noise level is measured in the A-weighted sound pressure level, at a distance of 1 m (3.3 ft.) from the intake side of fan.
- ⑨ Capacitor: Capacity required to operate single-phase 100 VAC, 110 VAC, 115 VAC and single-phase 200 VAC, 220 VAC, 230 VAC fans (Capacitor is included or built-in for products.)
- ⑩ Alarm Specifications: Indicate the type of fan with alarm.
Types of fan alarms include: stall alarm (electronic alarm type), low-speed alarm (contact alarm type, electronic alarm type), pulse sensor type.
There are ten alarm specifications. (These are described by the numbers in () in the specifications tables.)
These numbers correspond to the numbers in the "specifications for fans with alarms" (Pages E-21~E-23). Refer to these pages for details.

Overheat Protection

Built-in thermal protector

If the fan overheats and the internal temperature of windings reaches the specified temperature, the thermal protector (automatic return type) is activated and the fan is stopped. Be sure to turn the fan off before inspecting.

Impedance protected

These products are impedance protected to prevent the windings from burning.

Built-in overheat protection circuit

Overheat protection circuit is installed to prevent the windings from burning.

Fan Operation

Do not touch the fan blades when the fan is in operation. Use a finger guard (accessory) for protection.

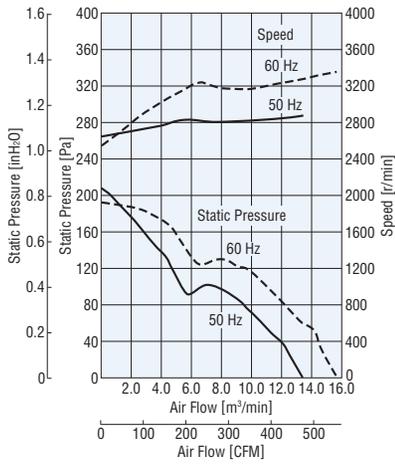
(A convenient fan kit is also available. → Page E-138)

Air Flow – Static Pressure Characteristics

The air flow – static pressure characteristics diagram indicates the static pressure value for a given air flow, with air flow on the horizontal axis, and static pressure on the vertical axis.

In the diagram below, an air flow of 13.2 m³/min (466 CFM) (at 50 Hz) corresponds to a condition with no pressure loss [static pressure 0 Pa (0 CFM)], which is the air flow value the fan can produce (maximum air flow).

Also, a static pressure of 221 Pa (0.886 inH₂O) (at 50 Hz) is the maximum static pressure the fan can produce.



● For details, refer to page F-69 in technical reference.

Specifications for Fans with Alarms

The alarm specifications vary depending on the type of alarm and fan.

Check the alarm specifications according to the alarm and fan type you use.

Specifications can also be referred to by the alarm specifications number shown on the specifications for each product.

Stall Alarm, Electronic Alarm Type

An alarm is output when the fan stops while operating.

Alarm Specifications Number ①	<ul style="list-style-type: none"> Models ◇ MDE Series: MDE1225-□L ◇ MDS/MD Series: MDS1451-□LH, MDS1451-□L, MD925A-□LH, MD925A-□L, MD825B-□LH, MD825B-□L, MD625B-□LH, MD625B-□L, MDS510-□LH, MDS510-□L, MDS410-□LH, MDS410-□L 	<ul style="list-style-type: none"> Example of Alarm Circuit Connection 								
	<ul style="list-style-type: none"> Alarm Specifications <table border="1"> <tr> <td>Alarm Activation Speed</td> <td>When locked</td> </tr> <tr> <td>Output Mode</td> <td>Open-collector output</td> </tr> <tr> <td>Output Condition</td> <td>Operation: L level (Internal transistor ON) When locked: H level (Internal transistor OFF)</td> </tr> <tr> <td>Maximum Rating</td> <td>Maximum applied voltage: 30 VDC max. Maximum current: 5 mA max.</td> </tr> <tr> <td>Delay Function</td> <td>Not built-in: External delay circuit is required to prevent alarm detection when starting the fan. The delay time should be at least 1 second.</td> </tr> </table>		Alarm Activation Speed	When locked	Output Mode	Open-collector output	Output Condition	Operation: L level (Internal transistor ON) When locked: H level (Internal transistor OFF)	Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 5 mA max.
Alarm Activation Speed	When locked									
Output Mode	Open-collector output									
Output Condition	Operation: L level (Internal transistor ON) When locked: H level (Internal transistor OFF)									
Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 5 mA max.									
Delay Function	Not built-in: External delay circuit is required to prevent alarm detection when starting the fan. The delay time should be at least 1 second.									

Low-Speed Alarm, Electronic Alarm Type

An alarm is output when the fan speed drops to a specific level. Output mode is electronic output.

Alarm Specifications Number ②	<ul style="list-style-type: none"> Models ◇ MRS Series: MRS25-□M, MRS20-□M, MRS18-□MH, MRS18-□TM, MRS16-□TM 	<ul style="list-style-type: none"> Example of Alarm Circuit Connection 								
	<ul style="list-style-type: none"> Alarm Specifications <table border="1"> <tr> <td>Alarm Activation Speed</td> <td>1800 ± 300 r/min</td> </tr> <tr> <td>Output Mode</td> <td>Open-collector output</td> </tr> <tr> <td>Output Condition</td> <td>Normal operation: L level (Internal transistor ON) Alarm output: H level (Internal transistor OFF)</td> </tr> <tr> <td>Maximum Rating</td> <td>Maximum applied voltage: 30 VDC max. Maximum current: 15 mA max.</td> </tr> <tr> <td>Delay Function</td> <td>Not built-in: External delay circuit is required to prevent alarm detection when starting the fan. The delay time should be at least 10 seconds.</td> </tr> </table>		Alarm Activation Speed	1800 ± 300 r/min	Output Mode	Open-collector output	Output Condition	Normal operation: L level (Internal transistor ON) Alarm output: H level (Internal transistor OFF)	Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 15 mA max.
Alarm Activation Speed	1800 ± 300 r/min									
Output Mode	Open-collector output									
Output Condition	Normal operation: L level (Internal transistor ON) Alarm output: H level (Internal transistor OFF)									
Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 15 mA max.									
Delay Function	Not built-in: External delay circuit is required to prevent alarm detection when starting the fan. The delay time should be at least 10 seconds.									

Alarm Specifications Number ③	<ul style="list-style-type: none"> Models ◇ MRS Series: MRS14-TTM 	<ul style="list-style-type: none"> Example of Alarm Circuit Connection 										
	<ul style="list-style-type: none"> Alarm Specifications <table border="1"> <tr> <td>Alarm Activation Speed</td> <td>1800 ± 300 r/min</td> </tr> <tr> <td>Output Mode</td> <td>Open-collector output</td> </tr> <tr> <td>Output Condition</td> <td>Normal operation: L level (Internal transistor ON) Alarm output: H level (Internal transistor OFF)</td> </tr> <tr> <td>Maximum Rating</td> <td>Maximum applied voltage: 30 VDC max. Maximum current: 15 mA max.</td> </tr> <tr> <td>Power Supply for Driving Alarm Circuit</td> <td>5 VDC ± 5%</td> </tr> <tr> <td>Delay Function</td> <td>Built-in starting delay time: 25 sec. max. (The alarm function starts monitoring within 25 seconds after the power is turned on.)</td> </tr> </table>		Alarm Activation Speed	1800 ± 300 r/min	Output Mode	Open-collector output	Output Condition	Normal operation: L level (Internal transistor ON) Alarm output: H level (Internal transistor OFF)	Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 15 mA max.	Power Supply for Driving Alarm Circuit	5 VDC ± 5%
Alarm Activation Speed	1800 ± 300 r/min											
Output Mode	Open-collector output											
Output Condition	Normal operation: L level (Internal transistor ON) Alarm output: H level (Internal transistor OFF)											
Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 15 mA max.											
Power Supply for Driving Alarm Circuit	5 VDC ± 5%											
Delay Function	Built-in starting delay time: 25 sec. max. (The alarm function starts monitoring within 25 seconds after the power is turned on.)											

Alarm Specifications Number ④	<ul style="list-style-type: none"> Models ◇ MDS Series: MDS1225-□MH, MDS1225-□M 	<ul style="list-style-type: none"> Example of Alarm Circuit Connection 								
	<ul style="list-style-type: none"> Alarm Specifications <table border="1"> <tr> <td>Alarm Activation Speed</td> <td>2100 ± 400 r/min</td> </tr> <tr> <td>Output Mode</td> <td>Open-collector output</td> </tr> <tr> <td>Output Condition</td> <td>Normal operation: L level (Internal transistor ON) Alarm output: H level (Internal transistor OFF)</td> </tr> <tr> <td>Maximum Rating</td> <td>Maximum applied voltage: 30 VDC max. Maximum current: 15 mA max.</td> </tr> <tr> <td>Delay Function</td> <td>Built-in starting delay time: 10 sec. max. (The alarm function starts monitoring within 10 seconds after the power is turned on.)</td> </tr> </table>		Alarm Activation Speed	2100 ± 400 r/min	Output Mode	Open-collector output	Output Condition	Normal operation: L level (Internal transistor ON) Alarm output: H level (Internal transistor OFF)	Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 15 mA max.
Alarm Activation Speed	2100 ± 400 r/min									
Output Mode	Open-collector output									
Output Condition	Normal operation: L level (Internal transistor ON) Alarm output: H level (Internal transistor OFF)									
Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 15 mA max.									
Delay Function	Built-in starting delay time: 10 sec. max. (The alarm function starts monitoring within 10 seconds after the power is turned on.)									

Low-Speed Alarm, Contact Alarm Type

An alarm is output when the fan speed drops to a specific level. Output mode is contact output.

Alarm Specifications Number	● Models ◇ MRS Series: MRS25-□B	● Example of Alarm Circuit Connection
	● Alarm Specifications	
5	Alarm Activation Speed	1800±300 r/min
	Output Mode	Relay output
	Output Condition	Normal operation: Contact ON Alarm output: Contact OFF
	Maximum Rating	Contact capacity Resistive load: max.10 VA (max. 100 V/max. 0.5 A)
	Delay Function	Not built-in: External delay circuit is required to prevent alarm detection when starting the fan. The delay time should be at least 10 seconds.

Alarm Specifications Number	● Models ◇ MRS Series: MRS16-□TA	● Example of Alarm Circuit Connection
	● Alarm Specifications	
6	Alarm Activation Speed	1800±300 r/min
	Output Mode	Relay output
	Output Condition	Normal operation: Contact OFF Alarm output: Contact ON
	Maximum Rating	Contact capacity Resistive load: max.10 VA (max. 100 V/max. 0.5 A)
	Delay Function	Not built-in: External delay circuit is required to prevent alarm detection when starting the fan. The delay time should be at least 10 seconds.

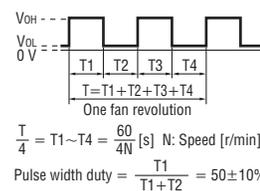
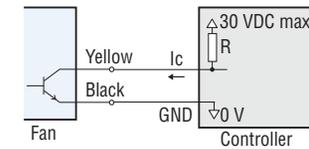
Alarm Specifications Number	● Models ◇ MBD Series: MBD10-24A, MBD8-24A ◇ MFD Series: MFD930-24A, MFD930B-24A, MFD915-24A, MFD915B-24A	● Example of Alarm Circuit Connection
	● Alarm Specifications	
7	Alarm Activation Speed	MBD Series, MFD915-24A, MFD915B-24A: 1500±400 r/min MFD930-24A, MFD930B-24A: 1300±400 r/min
	Output Mode	Relay output
	Output Condition	Normal operation: Contact ON Alarm output: Contact OFF
	Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 30 mA max.
	Delay Function	Built-in starting delay time: 10 sec. max. (The alarm function starts monitoring within 10 seconds after the power is turned on.)

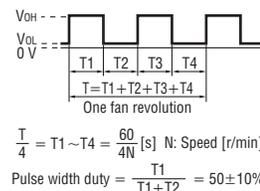
Alarm Specifications Number	● Models ◇ MDS Series: MDS1751-24BH, MDS1751-24B	● Example of Alarm Circuit Connection
	● Alarm Specifications	
8	Alarm Activation Speed	1800±400 r/min
	Output Mode	Relay output
	Output Condition	Normal operation: Contact ON Alarm output: Contact OFF
	Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 30 mA max.
	Delay Function	Built-in starting delay time: 10 sec. max. (The alarm function starts monitoring within 10 seconds after the power is turned on.)

Alarm Specifications Number	◇ MDS1751-24B	
	◇ MDS1751-24B	

Pulse Sensor Type

Two pulses are output per revolution of the fan. Fan speed is monitored as the host controller, etc., reads the output pulses. This function helps you set a desired output speed for alarm activation.

Alarm Specifications Number	<ul style="list-style-type: none"> Models ◇ MDS/MD Series: MDS1751-24SH, MDS1751-24S, MD925A-□SH, MD925A-□S, MD825B-□SH, MD825B-□S, MD625B-□SH, MD625B-□S ◇ MBD Series: MBD10-□S, MBD8-□S ◇ MFD Series: MFD930-48S, MFD930B-48S, MFD915-48S, MFD915B-48S 	
9	<ul style="list-style-type: none"> Alarm Specifications 	
	Output Pulse	Two pulses per fan revolution
	Output Mode	Open-collector output
	Output Condition	<ul style="list-style-type: none"> Normal Operation  <ul style="list-style-type: none"> When Locked  <p> $\frac{T}{4} = T1 \sim T4 = \frac{60}{4N} \text{ [s]} \quad N: \text{Speed [r/min]}$ $\text{Pulse width duty} = \frac{T1}{T1+T2} = 50 \pm 10\%$ </p>
Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current I_c : MD925A-□SH, MD925A-□S, MD825B-□SH, MD825B-□S, MD625B-□SH, MD625B-□S: 5 mA max. MDS1751-24SH, MDS1751-24S, MBD Series, MFD Series: 10 mA max.	
<ul style="list-style-type: none"> Example of Alarm Circuit Connection 		

Alarm Specifications Number	<ul style="list-style-type: none"> Models ◇ MDS Series: MDS1451-□SH, MDS1451-□S 	
10	<ul style="list-style-type: none"> Alarm Specifications 	
	Output Pulse	Two pulses per fan revolution
	Output Mode	Open-collector output
	Output Condition	<ul style="list-style-type: none"> Normal Operation  <ul style="list-style-type: none"> When Locked  <p> $\frac{T}{4} = T1 \sim T4 = \frac{60}{4N} \text{ [s]} \quad N: \text{Speed [r/min]}$ $\text{Pulse width duty} = \frac{T1}{T1+T2} = 50 \pm 10\%$ </p>
Maximum Rating	Maximum applied voltage: 30 VDC max. Maximum current: 5 mA max.	
<ul style="list-style-type: none"> Example of Alarm Circuit Connection 