

## OPERATING MANUAL

### AC Axial Flow Fans

### MRS Series MRW18 type



#### Introduction

##### ■ Before use

Only qualified and educated personnel should work with the product. Use the product correctly after thoroughly reading the section "Safety precautions." The product described in this manual has been designed and manufactured to be incorporated in general industrial equipment. Do not use for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

#### Standard · CE Marking

##### ■ UL Standard, CSA Standard

The product is recognized by UL and certified by CSA.

| Standards        | Certification body |
|------------------|--------------------|
| UL 507           | UL                 |
| CSA C22.2 No.113 | UL, CSA            |

##### ■ EU Directive

##### CE Marking

The CE mark is affixed to the standard type based on Low Voltage Directive. (The CE mark is affixed to **MRS25** based on Low Voltage Directive and ErP Directive.)

The CE mark is affixed to the alarm type based on Low Voltage Directive and EMC Directive. (The CE mark is affixed to **MRS25** based on Low Voltage Directive, EMC Directive and ErP Directive.)

##### • Low Voltage Directive

| Standards  | Certification body |
|------------|--------------------|
| EN 60950-1 | VDE                |

\* The certificate of the **MRW18** types by VDE is valid only for the fan assembly itself. The capacitor is not included in the certificate. However, both the fan assembly and capacitor combined have been tested against and have passed EN 60950-1 Annex B.8.

The **MRS25** and **MRS20-□B**, **MRS18-□B**, **MRS16-□B** are not certified by VDE.

##### • EMC Directive (Only alarm type)

Standards: EN 61000-6-2, EN 61000-6-4

##### Installation conditions (For EN Standards)

Overvoltage category II, Pollution degree 2, Class I equipment

When connecting to a power supply of overvoltage category III, supply power via the insulation transformer.

##### • ErP Directive

##### Regulations

COMMISSION REGULATION (EU) No 327/2011

##### Product Information

|                                 |        |
|---------------------------------|--------|
| Measurement category            | A      |
| Efficiency category             | Static |
| Variable speed drive integrated | No     |
| Specific ratio                  | 1      |

|                              | MRS25-B, -B□ |              | MRS25-D, -D□ |              |
|------------------------------|--------------|--------------|--------------|--------------|
|                              | Actual       | Request 2015 | Actual       | Request 2015 |
| Overall efficiency [%]       | 33.3         | 28.1         | 28.4         | 28.3         |
| Efficiency grade [N]         | 44.9         | 40           | 40.1         | 40           |
| Power input [W]              | 132          | -            | 143          | -            |
| Air flow [m <sup>3</sup> /h] | 995          |              | 984          |              |
| Static pressure [Pa]         | 164          |              | 150          |              |
| Speed [r/min]                | 3195         |              | 3158         |              |

Thank you for purchasing an Oriental Motor product. This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

|                              | MRS25-T, -T□ |              |
|------------------------------|--------------|--------------|
|                              | Actual       | Request 2015 |
| Overall efficiency [%]       | 37.7         | 28.0         |
| Efficiency grade [N]         | 49.7         | 40           |
| Power input [W]              | 125          | -            |
| Air flow [m <sup>3</sup> /h] | 1007         |              |
| Static pressure [Pa]         | 164          |              |
| Speed [r/min]                | 3245         |              |

##### ■ RoHS Directive

The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).

##### ■ Republic of Korea, Radio Waves Act

##### Only alarm type except for MRS14-TTM

KC Mark is affixed to this product under the Radio Waves Act, the republic of Korea.



#### Safety precautions

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product. Use the product only after carefully reading and fully understanding these instructions.

#### ⚠ Warning

Handling the product without observing the instructions that accompany a "Warning" symbol may result in serious injury or death.

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Doing so may result in fire, electric shock or injury.
- Only qualified and educated personnel should be allowed to perform installation, connection, operation and inspection/troubleshooting of the product. Failure to do so may result in fire, electric shock or injury.
- Do not transport, install the product, perform connections or inspections when the power is on. Always turn the power off before carrying out these operations. Failure to do so may result in electric shock.
- Turn off the power in the event the overheat protection device (thermal protector) is triggered. Failure to do so may result in injury or damage to equipment, since the fan will start abruptly when the overheat protection device (thermal protector) is automatically reset.
- The fan is Class I equipment. Install the fan so as to avoid contact with hands, or ground it to prevent the risk of electric shock.  
*Lüfter zur Verwendung in Geräten der Schutzklasse I. Das Erdungskabel wird an dem als Erde gekennzeichneten Pol Anschlusskasten angeklemt.*
- Install the fan in an enclosure in order to prevent electric shock or injury.
- Keep the input-power voltage within the specified range to avoid fire and electric shock.
- Connect the cables securely according to the wiring diagram in order to prevent fire and electric shock.
- Do not forcibly bend, pull or pinch the cable. Doing so may fire and electric shock.
- Turn off the power in the event of a power failure, or the fan will suddenly start when the power is restored and may cause injury or damage to equipment.
- Do not disassemble or modify the fan. This may cause electric shock or injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

## ⚠ Caution

Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.

- Do not use the fan beyond its specifications, or electric shock, injury or damage to equipment may result.
  - Keep your fingers and objects out of the openings in the fan. This may cause injury.
  - Do not touch the motor during operation or immediately after stopping. The surface is hot and may cause a skin burn(s).
  - Do not hold the rotating parts (blades) of the fan or lead wire. This may cause injury.
  - Keep the area around the fan free of combustible materials in order to prevent fire or a skin burn(s).
  - To prevent the risk of damage to equipment, leave nothing around the fan that would obstruct ventilation.
  - Do not touch the rotating parts (blades) when the fan is in operation. This may cause injury. The use of the optional finger guard is recommended to ensure protection.
- Wegen der Verletzungsgefahr dürfen die Lüfterflügel bei Ventilatorbetrieb nicht berührt werden. Der Gebrauch des als Sonderzubehör erhältlichen Fingerschutzes ist empfehlenswert, um erhöhte Sicherheit zu gewährleisten.*
- When an abnormality is noted, stop the operation immediately, or fire, electric shock or injury may occur.
  - The motor's surface temperature may exceed 70 °C (158 °F), even under normal operating conditions. If a fan is accessible during operation, post the warning label shown in the figure in a conspicuous position to prevent the risk of skin burn(s).
  - Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.



Warning label

## Precautions for use

### ■ When using the fan with an inverter

- When using the fan in combination with an inverter, use it by setting below 60 Hz of the inverter frequency.
- The inverter which input voltage exceeds 240 VAC cannot be used. The insulation of the fan winding may deteriorate, causing damage to the fan.
- Number of fan poles: 2 poles
- A resonance phenomenon may occur depending on the setting frequency. If the resonance phenomenon occurred, use the product with avoiding the resonance points.

**Note** If the setting frequency is lowered when an inverter is connected to the alarm type fan, the fan speed may slow down, causing an alarm to generate.  
Note that the low-speed alarm function cannot be used since the alarm signal is continued to output if the fan speed remains at a speed to generate the alarm.

## Preparation

### ■ Checking the model name

To verify that the unit you've purchased is the correct one, check the model number shown on the nameplate.

#### • Standard type

MRS25-B, MRS25-D, MRS25-T, MRS20-BUL, MRS20-DUL, MRS20-E, MRS20-TUL, MRS18-BUL, MRS18-DUL, MRS18-E, MRS18-TUL, MRS16-BUL, MRS16-DUL, MRS16-E, MRS16-TUL, MRS14-TUL

#### • Low-speed alarm, electronic alarm type

MRS25-BM, MRS25-DM, MRS25-TM, MRS20-BM, MRS20-DM, MRS20-EM, MRS20-TM, MRS18-BTM, MRS18-DTM, MRS18-ETM, MRS18-TTM, MRS16-BTM, MRS16-DTM, MRS16-ETM, MRS16-TTM, MRS14-TTM

#### • Low-speed alarm, contact alarm type

(Normal operation: Contact ON)

MRS25-BB, MRS25-DB, MRS25-TB, MRS20-BB, MRS20-DB, MRS20-EB, MRS20-TB, MRS18-BB, MRS18-DB, MRS18-EB, MRS18-TB, MRS16-BB, MRS16-DB, MRS16-EB, MRS16-TB

#### • Low-speed alarm, contact alarm type

(Normal operation: Contact OFF)

MRS16-BTA, MRS16-DTA, MRS16-TTA  
MRW18-BTA, MRW18-DTA, MRW18-TTA

## ■ Checking the product

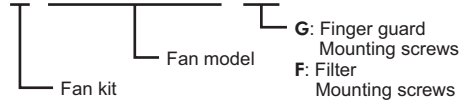
Verify that the items listed below are included. Report any missing or damaged items to the branch or sales office from which you purchased the product.

|  | Single-phase | Three-phase |
|--|--------------|-------------|
| • Fan: 1 piece                           | ○            | ○           |
| • Capacitor: 1 piece                     | ○ *          | —           |
| • Capacitor cap: 1 piece                 | ○ *          | —           |
| • OPERATING MANUAL: 1 copy (this manual) | ○            | ○           |

\* A capacitor and capacitor cap are not provided with the MRS18 and MRS16 standard type.

How to identify the fan kit model

### T- MRS16BUL - G



**Note** Do not conduct insulation-resistance measurement or dielectric voltage-withstand testing between the primary circuit (coil) and secondary circuit (alarm circuit). Doing so may damage the alarm circuit.

## Installation

### ■ Location for installation

Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors
- Operating ambient temperature -30 to +60 °C (-22 to +140 °F) (non-freezing)
  - MRS14-TTM: -20 to +60 °C (-4 to +140 °F)
  - MRW18 type: -10 to +50 °C (+14 to +122 °F)
- Operating ambient humidity 85% maximum (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rains, water droplets), oil (oil droplets) or other liquids
- Area not subject to continuous vibration or excessive shocks
- Area free of radioactive materials, magnetic fields or vacuum
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)

When using near a switching circuit or high-frequency power supply, the induced current may flow inside the fan due to electromagnetic noise (conductive noise, radiative noise). If the induced current flows, the electric corrosion is caused in the bearings of the fan. As a result, it may generate the noise or shorten the service life of the products. Use the fan in the environment that the electromagnetic noise does not cause.

### ■ How to install the fan

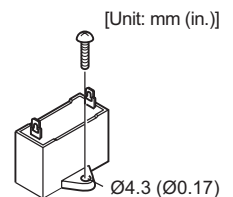
Install the fan onto an appropriate flat metal plate having excellent vibration resistance and heat conductivity. Drill mounting holes in equipment used, and secure the fan using screws (not supplied). For air orientation and rotational direction, see the indications shown on the fan's side frame.

| Model                          | Screw size | Tightening torque    |
|--------------------------------|------------|----------------------|
| MRS14                          | M4         | 0.6 N·m (5.3 lb-in)  |
| Other MRS series<br>MRW18 type | M5         | 1.2 N·m (10.6 lb-in) |

### ■ Mounting the capacitor

Check the capacity of the supplied capacitor against the capacity shown on the fan's nameplate in order to verify that you have the correct capacitor. Secure the capacitor in place using the M4 screws (not supplied).

(case of 2-terminal type)



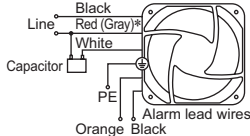
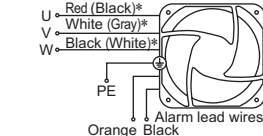
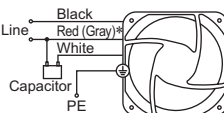
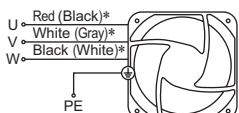
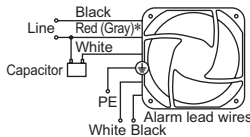
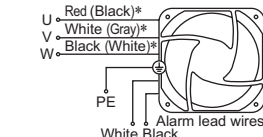
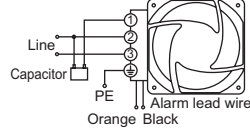
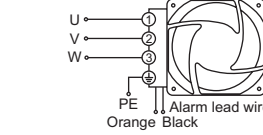
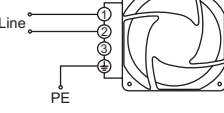
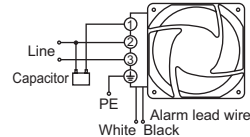
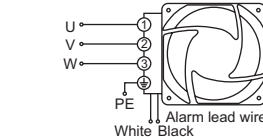
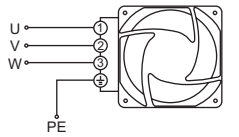
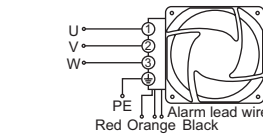
**Note** The tightening torque of the capacitor's mounting screws should be 1 N·m (8.85 lb-in) or more in order to prevent the legs from being damaged.

# Wiring

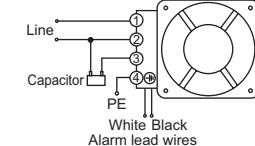
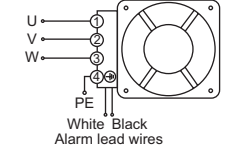
## ■ Wiring diagrams

### ● MRS series

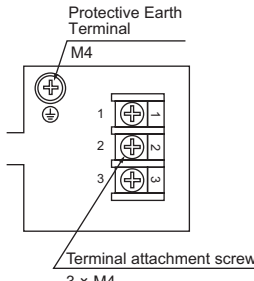
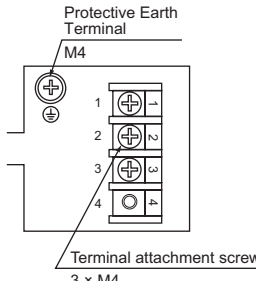
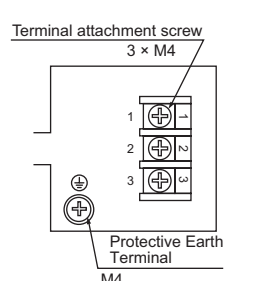
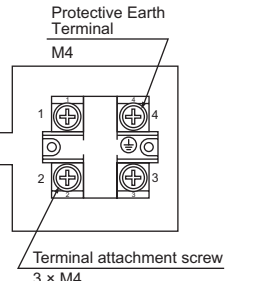
\* For **MRS25**, the colors of lead wires are black, red and white and those of **MRS20** are black, gray and white.

|                              | Single-phase models with alarm type  | Three-phase models with alarm type   | Single-phase models standard type  | Three-phase models standard type   |
|------------------------------|--|--|--|--|
| <b>MRS25</b><br><b>MRS20</b> | Electronic type alarm<br> | Electronic type alarm<br>   |  |   |
| <b>MRS25</b><br><b>MRS20</b> | Contact type alarm<br>    | Contact type alarm<br>      |  |  |
| <b>MRS18</b><br><b>MRS16</b> | Electronic type alarm<br> | Electronic type alarm<br>   |  |  |
| <b>MRS18</b><br><b>MRS16</b> | Contact type alarm<br>   | Contact type alarm<br>     |  |  |
| <b>MRS14</b>                 |  | Electronic type alarm<br> |  |  |

### ● MRW18 type

| Single-phase models with alarm type   | Three-phase models with alarm type  |
|---|---|
| Contact type alarm<br> | Contact type alarm<br> |

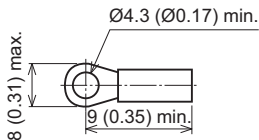
## ■ Inside the terminal box

| <b>MRS18</b>  | <b>MRS16</b>  | <b>MRS14</b>   | <b>MRW18</b>  |
|---|---|--|---|
|  |  |  |  |

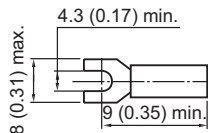
\* The tightening torque for the terminal attachment screw is 0.7 N·m (6.2 lb-in).

<Suitable crimp-style terminals>

- Round terminal type with insulation



- U-shaped terminal with insulation



[Unit: mm (in.)]

### ■ Connecting Protective Earth Terminal

Ground the fan using the Protective Earth Terminal (⊕).

Applicable crimp terminal:

Insulated round crimp terminal

Terminal screw size: M4

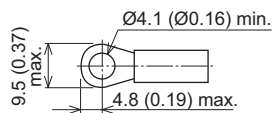
Tightening torque:

1.0 to 1.3 N·m (8.8 to 11.5 lb-in)

Applicable lead wire:

AWG18 (0.75 mm<sup>2</sup>) or thicker

[Unit: mm (in.)]

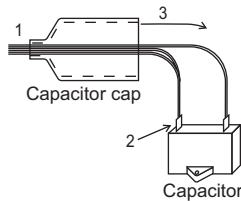


**Note** Be sure to use the screw for grounding attached on the product.

### ■ Mounting the capacitor cap

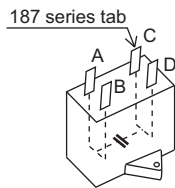
Use the capacitor cap provided for insulation of the capacitor terminal connections.

1. Pass the lead wires through the capacitor cap as shown in figure.
2. Connect the lead wires to the terminals or use terminal ends.
3. Cap the capacitor with the capacitor cap.



### ■ Capacitor connection

The capacitor internal wiring is as follows: Capacitor terminals are internally electrically connected in twos; A-B and C-D for easy connection. For easy to install terminals use 187 series FASTON Terminals (TE Connectivity). For lead wire connection, use one lead wire for each individual terminal.



## Alarm function

The alarm signal is output when the fan's rotation speed falls below 1800±300 r/min.

### ■ Low-speed alarm, electronic alarm type

Maximum voltage V out max. = 30 VDC

Leakage current I = 250 μA max.

Maximum current I out max. = 15 mA

Output saturated voltage V out (sat) = 0.4 V max.

Output mode: Open collector output

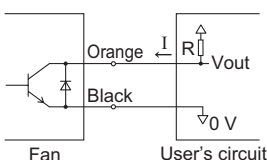
Output condition:

Normal operation: L level (Internal transistor ON)

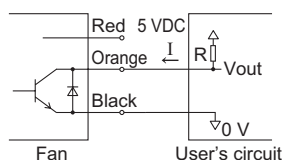
Alarm output: H level (Internal transistor OFF)

Connection of the alarm

Except for the **MRS14-TTM**



**MRS14-TTM**



### ■ Low-speed alarm, contact alarm type

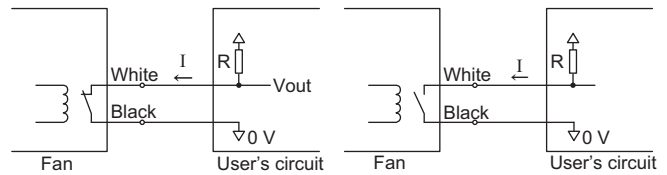
Output rating:

Resistance load 10 VA max. (100 V max. and 0.5 A max.)

Connection of the alarm

Normal operation : Contact OFF

Normal operation : Contact ON



**Note** Except for the **MRS14-TTM**, the alarm circuits do not have a delay function. Avoiding detection, when starting the fan, for example, requires an external delay function. Set the delay time to 10 seconds min.

## Overheat protection

The fan uses a thermal protector for overheat protection. Once the temperature reaches a specified level, the internal thermal protector that has an automatic-return feature is triggered to stop the fan operation. Be sure to turn off the power when checking the thermal protector.

Operating temperature of thermal protectors

Open (Power OFF) 120±5 °C (248±9 °F)

Close (Power ON) 77±15 °C (170±27 °F)

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