Oriental motor

HF-3027-12

OPERATING MANUAL

Varioflow Fans MRS16V type MRS18V2 type

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.

Introduction

■ Before using the fan

Only qualified personnel should work with the product.
Use the product correctly after thoroughly reading the section " Safety precautions." In addition, be sure to observe the contents described in warning, caution, and note in this manual.
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.

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.
⚠Caution	Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.
Note	The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.

⚠Warning

- 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. Handling by unqualified and uneducated personnel 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 for class I equipment. Be sure to ground the protective earth terminal when installing the fan. Failure to do so may result in electric shock.
- 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. Failure to do so may result in fire.
- Be sure to insulate the connection terminal of the variable resistor. Failure to do so may result in electric shock.
- The fan (circuit) is not provided with an overcurrent protective function. For connection with the power supply, install an overcurrent protection device (such as a circuit breaker). Failure to do so may result in fire.
- 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

- 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 burn.
- 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 burn.
- To prevent the risk of damage to equipment, leave nothing around the fan that would obstruct ventilation.
- Install an overload protection device and current leakage breaker. Failure to do so may result in fire.
- Do not touch the rotating parts (blades) when the fan is in operation. This may cause injury. The use of the optional fingerguard is recommended to ensure protection.
- 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, 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 burns.

Warning label

Preparation

■ 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.

- Fan ..... 1 piece
- Variable resistor (with adjustment knob and dial plate) ..... 1 set
- Power cable ..... 1 piece (**MRS16V** type only)
- Operating manual (this manual) .... 1 piece

■ Checking the model name

To verify that the unit you've purchased is the correct one, check the model number shown on the nameplate.
MRS16V-B, **MRS18V2-B**, **MRS18V2-D**

Installation

■ Location for installation

The fan is designed and manufactured for installation in equipment. 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
  −10 to +60 °C (+14 to +140 °F) (non-freezing)
- Operating ambient humidity 85% or less (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 holes on the mounting plate and fix the fan on the plate using screws (not supplied). The screw size is M5 and the tightening torque is 1.2 N·m (10.6 lb-in).

For air orientation and rotational direction, see the indications shown on the fan's side frame.

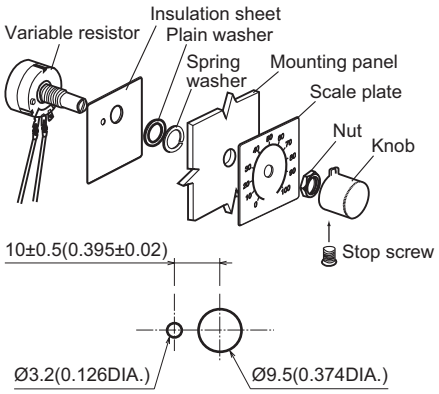
■ Installing the variable resistor

1. Install attachments (scale plate, insulation sheet, washer, etc.) to the variable resistor to tighten with a nut as shown in the figure below. Tightening torque: 0.45 N·m (3.9 lb-in) max.
2. Mount the knob and fix it in place with the stop screw M4. Tightening torque: 0.4 N·m (3.5 lb-in) max.

Note

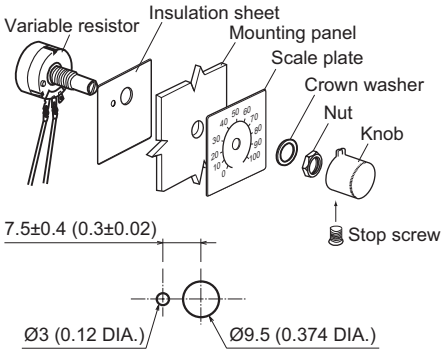
- Do not run a series of fans off a single variable resistor. Circuit damage may result.
- Be sure to install the insulation sheet. Failure to do so may result in electric shock.

● MRS16V-B



Panel cut-out drawing [Unit:mm(in.)]

● MRS18V2-B, MRS18V2-D



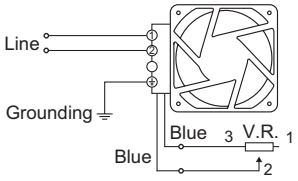
Panel cut-out drawing [Unit: mm (in.)]

Wiring

■ Wiring diagrams

● Using a variable resistor

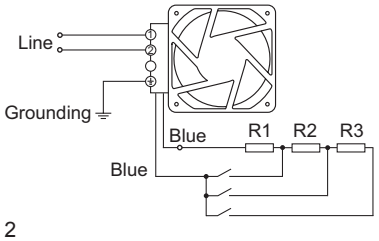
Connect the supplied variable resistor to the lead wires (blue color 2 pieces) coming out of the terminal box of the fan.
1 to 3 indicate terminal numbers for the variable resistor. Turn the knob right to increase air flow-static pressure.
Variable resistor: 200 kΩ 1/4 W with a linear resistance vs. angle curve



Blue: Lead wires for connecting variable resistor

● Using a fixed resistor

Fixed resistors that use relays or the like can also be switched.
R1+R2+R3=200 kΩ (max.) 1/4 W (min.)

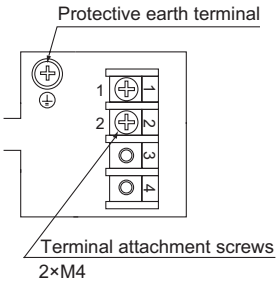
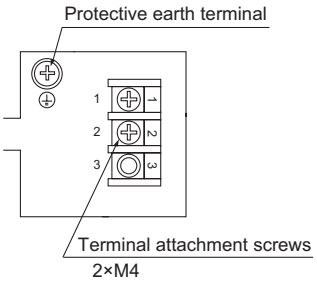


Blue: Lead wires for connecting variable resistor

Note

- Wire the lead wires for connecting variable resistor away from the lead wires for fan power supply and other power lines.
- Use a shielded cable or twisted-pair cable for the lead wires for connecting variable resistor, and wire them over the shortest possible distance.
- The lead wires (blue color 2 pieces) coming out of the terminal box of the fan are used for connecting the variable resistor. Do not connect a power supply.

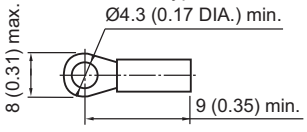
■ Inside the terminal box

MRS16V-B	MRS18V2-B, MRS18V2-D
	

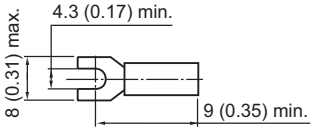
The tightening torque for the terminal attachment screw is 0.7 N·m (6.2 lb-in).

<Suitable crimp-style terminals> [Unit: mm (in.)]

- Round terminal type with insulation



- U-shaped terminal with insulation



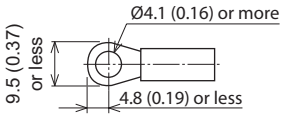
Applicable lead wire Power supply: AWG20 (0.5 mm²) or thicker

■ 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 mm²) or thicker

[Unit: mm (in.)]

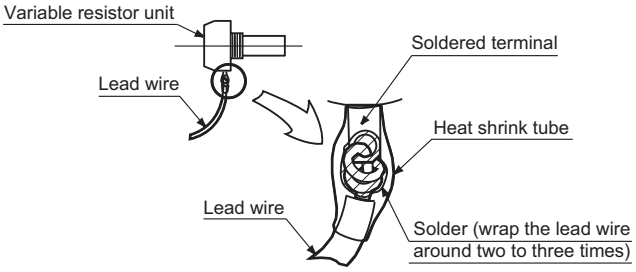


Note

Do not use screws other than the Protective Earth Terminal screws attached on the product.

■ Soldering the variable resistor terminals

1. Pass the lead wire through the terminal hole and wrap around two to three times.
2. Solder the lead wire to the terminal.
   Soldering condition: 235 °C (455 °F), less than 5 sec.
3. Cover the soldered area with a heat shrink tube.



Enlargement of Circular Area

Noise protection

■ External noise control (prevention of interference)

The product do not have filters against power line noise. When fans are used in noisy environments caused by high-output control and switching, the rotating speed of the fan will become unreliable. Use the commercial LC filters provided.

■ Preventing noise from being discharged externally from the power line

The product use triac for phase control, which can cause noise that affects other equipment. Use the commercial LC filters provided.

Installing and wiring in compliance with EMC Directive

This product has been designed and manufactured to be incorporated in equipment. The EMC Directive requires that your mechanical equipment in which the product is installed satisfies the applicable requirements. The installation/wiring methods of the fan explained here represent the basic methods that are effective in helping your mechanical equipment conform to the EMC Directive. The final level of conformance of your mechanical equipment to the EMC Directive will vary depending on the control system equipment used with the fan, configuration of electrical parts, wiring, layout, hazard level, and the like. It therefore must be verified through conducting EMC measures on your mechanical equipment.

Without effective measures to suppress the electromagnetic interference (EMI) caused by the product in the surrounding control system equipment or the electromagnetic spectrum (EMS) generated by the product, the function of your mechanical equipment may be seriously affected.
This product will conform to the EMC Directive if installed/wired using the methods specified below.

■ Connecting a mains filter

Install a mains filter which the customer provides, in the power line in order to prevent the noise generated within the fan from propagating outside via the AC input line. For mains filters, use the products as shown in the chart, or an equivalent.

Manufacturer	Model
SOSHIN ELECTRIC CO., LTD	NF2010A-UP
Schaffner EMC	FN2070-10-06

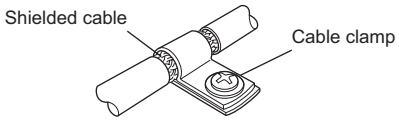
- Overvoltage category Ⅱ applies to mains filters.
- Install the mains filter as close to the driver as possible.
- Use cable clamps and other means to secure the input and output cables firmly to the surface of the enclosure.
- Connect the ground terminal of the mains filter to the grounding point, using as thick and short a wire as possible.
- Do not place the AC input cable parallel with the mains-filter output cable.
- Parallel placement will reduce mains filter effectiveness if the enclosure's internal noise is directly coupled to the power supply cable by means of stray capacitance.

■ How to ground

Cables used for grounding the fan, mains filter, and power supply cable (shielded cable) must be as thick and short distance as possible so that no potential difference is generated among the grounding points. Choose a large, thick and uniformly conductive surface for the grounding point.

■ Wiring the power supply cable

Use a shielded cable of AWG20 (0.5 mm^2) for the power supply cable, and keep it as short as possible.
Strip a part of the shielded cable and ground the stripped part using a metal cable clamp that contacts the stripped cable around its entire circumference, or use a drain wire to make the ground connection.
Connect both ends (mains filter side and power supply side) of the shielded cable to the grounding points so that no potential difference is generated between grounds.



■ Surge arrester

A surge arrester is effective for reduction of the surge voltage of the lightning surge generated between the AC power line and earth or between AC power lines. Connect the following surge arrester.

Manufacturer	Model
SOSHIN ELECTRIC CO., LTD	LT-C12G801WS

■ Ferrite core

Use the ferrite core for extending the cable. The ferrite core reduces the negative effects of external noise. Use ferrite core ZCAT3035-1330 (TDK Corporation) or its equivalent. Connect the ferrite cores as close as possible to the driver.

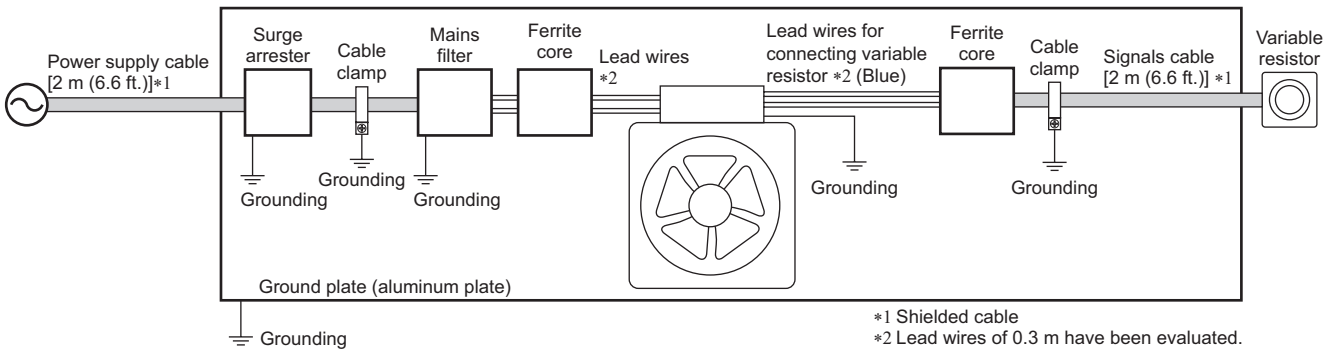
■ Wiring the I/O signals cable

Use a shielded cable of AWG22 (0.3 mm^2) for the I/O signals cable, and keep the wiring distance as short as possible [less than 2 m (6.6 ft.)].
Refer to "Wiring the power supply cable" for how to ground the shielded cable.

■ Notes about installation and wiring

- Connect the fan and other peripheral control equipment directly to the grounding point so as to prevent a potential difference from developing between grounds.
- When relays or electromagnetic switches are used together with the product, use mains filters or CR circuits to suppress surges generated by them.
- Keep cables as short as possible without coiling and bundling extra lengths.
- Wire the power lines such as the power cable away from the signal cables by providing a minimum clearance of 100 mm (3.94 in.) between them. If they must cross, do so at a right angle. Place the AC input cable and output cable of a mains filter separately from each other.

■ Example of installation and wiring



∗1 Shielded cable
∗2 Lead wires of 0.3 m have been evaluated.

■ Precautions about static electricity

Static electricity may cause the fan to malfunction or suffer damaged. Be sure to ground the product to prevent it from being damaged by static electricity.
Do not approach or touch the product while the power is on.

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 ℃ (248±9 °F)
Close (Power ON) ..... 77±15 ℃ (170±27 °F)

Inspection and maintenance

■ Inspection

It is recommended that periodic inspections be conducted for the items listed below after each operation of the fan. If an abnormal condition is noted, discontinue any use and contact your nearest office.

● During inspection

- Check if any of the fan mounting screws come loose.
- Check if the fan generates unusual noises.
- Check if the fan has unusual smells or appearance defects.

■ Warranty

Check on the Oriental Motor Website or General Catalog for the product warranty.

■ Disposal

Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.

Regulations and standards

■ UL Standards and CSA Standards

MRS18V2 types are recognized by UL under the UL/CSA standards.

Standards	Certification body
UL 507 CSA C22.2 No.113	UL

■ EU Directive

● CE Marking

MRS18V2 types are affixed the CE Marking under the Low Voltage Directive and EMC Directive.

- Low Voltage Directive

- This product is designed and manufactured to be incorporated in equipment.
- Install the product inside an enclosure in order to avoid contact with hands.
- Be sure to ground the Protective Earth Terminal of the fan.
- Isolate the power cables from the signal cables by means of double insulation.

Applicable standards

EN 60950-1

Installation conditions (For EN Standard)

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.

- EMC Directive

This product has received EMC compliance under the conditions specified in "Example of installation and wiring" on p.3.
The final level of conformance of your mechanical equipment to the EMC Directive will vary depending on the control system equipment used with the fan, configuration of electrical parts, wiring, layout, hazard level, and the like. It therefore must be verified through conducting EMC measures on your mechanical equipment.

Applicable Standards

EMI	EN 55011 EN 61000-6-4 EN 61000-3-2 EN 61000-3-3
EMS	EN 61000-6-2

Caution: This equipment is not intended for use in residential environments nor for use on a lowvoltage public network supplied in residential premises, and it may not provide adequate protection to radio reception interference in such environments.

■ RoHS Directive

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

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• Please contact your nearest Oriental Motor office for further information.

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