Thank you for purchasing the Minebea 24DCM brushless DC motor unit. This is an instructional guide designed to ensure safe handling and use of the motor. Please read this guide carefully before using this product to ensure that it is used safely.

Please retain this User’s Guide for future reference.

● Please be sure to give this User’s Guide to the end user.
### Table of Contents

1. Introduction ................................................................................................................. 3  
   1.1 Before Using This Product ..................................................................................... 3  
   1.2 Product Overview ................................................................................................... 3  
   1.3 Hazardous Substances ............................................................................................ 3  
2. Safety Precautions ....................................................................................................... 4  
3. Important Handling Information .................................................................................. 7  
4. Unpacking ................................................................................................................... 8  
5. Installation ................................................................................................................... 9  
   5.1 Where to Install ...................................................................................................... 9  
   5.2 How to Install ......................................................................................................... 9  
   5.3 Applying a Load ....................................................................................................10  
   5.4 Driver Installation .................................................................................................11  
6. Connection ..................................................................................................................12  
   6.1 Setting the Driver ..................................................................................................12  
   6.2 Connecting the Motor and Driver ..........................................................................16  
   6.3 Connecting the Power Supply ...............................................................................16  
   6.4 Connecting Input Signal Cable ..............................................................................17  
   6.5 Driver Input Circuit and Wiring Diagrams ............................................................18  
7. Operation ....................................................................................................................19  
   7.1 Input Signals .........................................................................................................19  
   7.2 Protection Functions ..............................................................................................20  
   7.3 Rotational Direction of the Motor Output Shaft ....................................................21  
   7.4 Setting Motor Speed ..............................................................................................21  
8. Maintenance and Inspection .......................................................................................22  
9. Troubleshooting ..........................................................................................................23  
10. Warranty ...................................................................................................................24  
11. Service Data...............................................................................................................25
1. Introduction

1.1 Before Using This Product
This product is designed to be installed in general industrial equipment. Do not use this product for any purpose other than its intended use. Use a direct current power supply with reinforced insulation between the primary and secondary circuits. The manufacturer shall not be held liable for the compensation of any damage caused as a result of neglecting this warning. The performance, specifications, or appearance of this product described in the accompanying User’s Guide are subject to change without prior notice.

1.2 Product Overview
The 24DCM series is a brushless DC motor unit comprised of a compact, high-power brushless DC motor with an inner rotor construction and an unenclosed 24 VDC driver (PCB mounted). It employs a round shaft for optimum operation in high-speed applications.

1.3 Hazardous Substances
2. Safety Precautions

Read this User’s Guide carefully before handling the motor, installing it in a device or operating it in order to ensure correct usage. Make sure that you have fully familiarized yourself with all the information about the motor, including safety information and precautions before using the motor. The following warnings and cautions are provided in order to ensure safe and correct usage of this product as well as to prevent injury or physical damage to you and others.

![WARNING] This symbol indicates important information that, if ignored, could possibly result in death or serious injury.

![CAUTION] This symbol indicates important information that, if ignored, could possibly result in personal injury or property damage.

Some of the safety information that follows the CAUTION symbol may, if ignored, result in serious hazards depending on the situation. All safety instructions provided under both symbols are very important and must be followed.

### WARNING

- **General**
  - Do not use the product in potentially explosive, flammable, corrosive or wet environments to prevent fire or personal injury.
  - Assign qualified personnel to perform all tasks of installing, wiring, operating/controlling, inspecting and troubleshooting related to this product. Failure to do so may result in fire or injury.
  - Whenever a problem triggers the driver’s protection function, correct the problem. Continuing to operate the driver without correcting the problem may result in motor malfunction, leading to personal injury or equipment damage.
  - To avoid injury, do not disassemble or alter the motor or driver.

- **Installation**
  - Install the motor and driver inside the equipment housing.

- **Connection**
  - The driver is designed for a DC power supply. To prevent fire, be sure to connect the driver using correct polarity.
  - To prevent fire, use the driver within the rated input voltage range.
  - To prevent fire, follow the wiring diagram when connecting the motor and driver.
  - To prevent fire, do not forcefully bend, pull or pinch the cables.
  - To prevent electric shock, when connecting the driver use a direct current power supply with reinforced insulation between the primary and secondary circuits.
| Operation | • In the event of a power failure, cut off the driver’s power supply. Failure to turn off the power may result in the motor suddenly starting up when the power comes back on, possibly causing personal injury or damage to equipment.  
• **Do not use the product for lifting and lowering devices.** Movable components may fall, resulting in personal injury or damage to equipment. |

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
</table>
| General | • To avoid injury or damage to equipment, do not use the motor and driver beyond their specification values.  
• Do not touch the motor and driver while in operation or immediately after operation has ceased. The surface of the motor and driver is hot and may cause burn injuries. |

| Transport | • The motor could drop if carried by the output shaft or cable. To avoid injury, do not carry the motor by the output shaft or cable. |

| Installation | • Do not place any flammable material near the motor and driver to avoid fire or burn injuries.  
• Do not place any material around the motor and driver that might block ventilation to avoid causing damage to your equipment.  
• Cover the output shaft while the motor is in operation to avoid injury. |
| **Operation** | • To prevent injury, install an external emergency stop device or circuit breaker that will ensure safe operation of your equipment in the event of equipment failure or malfunction.  
• In the event of malfunction, stop operation immediately and turn off the driver’s power supply to prevent fire, electric shock, or injury.  
• To avoid injury, do not touch the spinning component (output shaft) while the motor is in operation.  
• Shut off all driver input signals before turning on the driver’s power supply to prevent injury or damage to equipment due to sudden start of motor operations.  
• To prevent injury, turn off the driver’s power supply before manually operating the motor output shaft.  
• To prevent injury or damage to equipment, do not use the power supply’s on/off switch to start or stop operation of the motor. Use the START/STOP and RUN/BRAKE switches.  
• The motor’s surface temperature may exceed 80°C even under normal operating conditions. If there is a chance that anyone can come into contact with the motor during operation, attach a warning label, as shown below, to the motor so that it is clearly visible in order to prevent the risk of burn injuries.  
  
  Warning label |
| **Disposal** | • To dispose of the motor and driver, disassemble them into parts and components as best as possible and dispose of the individual parts/components as industrial waste. |
3. Important Handling Information

This section contains important handling and regulatory information for the 24DCM series motors.

● **Use the driver power supply correctly.**
  Using the wrong polarity when connecting the DC power supply or using an AC power supply will damage the driver.

● **Do not exceed the input voltage range.**
  The power supply’s input voltage range must be 24 VDC ±10%. Do not use a power supply with excessive voltage or high ripple voltage.
  When using anything other than a commercially produced DC power supply unit consisting of a transformer, diodes and condenser, make sure that the power supply waveform is flat in addition to testing the power supply in order to avoid failure.

● **Do not use the motor for load lowering operations.**
  The 24DCM series motors are not intended for use in operations where the motor output shaft is turned from the load side (i.e. load lowering operation). In such operations, motor speed cannot be controlled, and the motor’s protection function may be activated to automatically stop the motor from running, causing the load to drop.

● **Take noise cancellation measures.**
  The driver controls the motor via pulse-width modulation (PWM). PWM noise may affect other devices installed in its vicinity. When installing a sensor or microcomputer near the driver power supply, take appropriate noise cancellation measures.

● **Take fail-safe measures.**
  While the driver has a built-in protection circuit, it can operate only when it’s clear of faults. Install a fuse on the lead wire connected with the power supply to reduce the risk of failure.

● **Conduct separate insulation resistance and dielectric strength tests for the motor and driver.**
  To avoid damage to the product, do not conduct insulation resistance and dielectric strength tests while the motor is connected to the driver.
4. Unpacking

Upon receiving the product, check the following.

* If anything is missing or damaged, contact the distributor you purchased the product from.

● Verify that the product is the one you ordered.
  (Check the brushless DC motor and driver product numbers against those listed on your purchase order.)

● Make sure that all components included in the package are in tact and check for any missing items.
  • Brushless DC motor
  • Driver
  • Driver power cable
  • Driver input/output signal cable
  • User’s Guide (this booklet)

● Check for any defects, dents or damage occurring during shipping.
5. Installation

This section contains information about where and how to install the motor and driver as well as how to apply a load. Follow all instructions to ensure correct installation.

5.1 Where to Install

The motor and driver are designed and manufactured for use as internal equipment components. Install it in a well-ventilated and easily accessible location that meets the following conditions.

- Not exposed to direct sunlight
- Not exposed to continuous vibration and/or excessive impact
- Inside the housing (with a ventilation opening) of equipment installed in an indoor location
- Operating ambient temperatures of -20°C to +60°C (non-condensing)
- Maximum operating ambient humidity of 90% (non-condensing)
- Not exposed to flammable or corrosive gas or liquid
- Not exposed to excessive amounts of dust, salt, iron particles, and/or greasy fumes
- Not exposed to moisture (rain and water droplets), oil (oil droplets), and/or other liquids
- Not exposed to strong magnetic or electrolytic forces
- Environment free of radioactive materials, magnetic fields, and vacuum conditions

Install the motor on a flat mounting plate with superior vibration resistance and high heat conductivity.

5.2 How to Install

Install the motor on a mounting plate in order to keep the motor case temperature under 90°C.

1) Drill holes on the mounting plate for installation.

2) Mount the motor onto the plate using four bolts (not provided) driven through the holes as shown below. Make sure that there is no gap between the motor and the mounting plate.

Reference data on tightening torque when using a typical steel mounting plate

<table>
<thead>
<tr>
<th>Nominal thread type</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>M4</td>
<td>1.8 N·m</td>
</tr>
</tbody>
</table>
5.3 Applying a Load

When applying a load to the motor, align the motor output shaft and the load shaft.

**IMPORTANT**
- When coupling the motor with a load, make sure the pulleys are centered as well as parallel. Make sure that the load is securely attached to the output shaft.
- Do not damage the motor output shaft and bearing when applying a load to avoid damaging the shaft bearing.
- To avoid damage to the motor, do not alter or machine the motor output shaft.

● How to Apply a Load

- **Using a coupling**
  Horizontally align the centerline of the motor output shaft with the centerline of the load shaft.

- **Using a belt**
  Place the motor output shaft parallel to the load shaft and perpendicular to the line connecting the centers of both pulleys. Using the motor in a belt-driven system or other system where pressure is applied to the shaft bearing may shorten its life.

- **Using a gear**
  Adjust the motor output shaft so that it is parallel to the gear shaft and the output shaft meshes with the gear teeth.

● Permissible Overhung Load and Permissible Thrust Load

Make sure that the overhung load and thrust load on the motor input shaft do not exceed the maximum values shown in the table below.

**IMPORTANT**
- Overhung loads and thrust loads that exceed the permitted values may cause fatigue failure due to repeated load on the motor shaft bearing and output shaft.

<table>
<thead>
<tr>
<th>Product</th>
<th>Permissible overhung load [N]</th>
<th>Permissible thrust load [N]</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mm from shaft end</td>
<td>10 mm from shaft end</td>
<td></td>
</tr>
<tr>
<td>24DCM-371</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>24DCM-372</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Minimize the thrust load. If a thrust load must be applied, do not let it exceed one half the motor’s dead weight.
5.4 Driver Installation

● Direction of Installation
When installing the driver inside the equipment housing, use the four installation bolt holes on the driver to install it either in a vertical or horizontal direction.

● How to Install
Install the driver on a flat metallic plate with superior resistance to vibration and heat conduction.

Using the driver installation bolt holes, secure the driver to the metallic plate with four bolts (M3, not provided).

There must be a clearance of at least 30 mm and 50 mm in the horizontal and vertical directions, respectively, between the driver and enclosure or other equipment.

**IMPORTANT**

- Do not place any equipment generating significant heat or noise around the driver
- Keep the temperature around the driver under 50°C.

● Power Source
The 24DCM-37X series products are designed for DC power supply input specifications. Use a direct current power supply (e.g. switching power source).

● Grounding
The wire used to ground the motor and driver should be as thick and short as possible to minimize the potential difference generated.

**How to ground the motor**

**How to ground the driver**

Terminal

Metallic plate
6. Connection

This section describes how to connect the motor and driver, power supply, external control devices as well as the input/output signals and provides wiring diagrams.

6.1 Setting the Driver

Use the configuration switch (P-SW1) to change the settings for the motor connected to the driver (MDS-01AL002-01) as well as for soft starting, and switching between internal and external speed potentiometers. When the soft start feature is enabled or when the internal speed potentiometer is selected, the settings must be changed via the controls VR1 and VR2.

[Driver setting switches and controls]
6.1.1 Setting the Motor

The driver (MDS-01AL002-01) settings must be changed depending on the type of motor used (24DCM-371 or 24DCM-372).

The switch (P-SW1) setting for each type of motor is as shown below.

<table>
<thead>
<tr>
<th>P-SW1 Switch No.</th>
<th>24DCM-371 (50W)</th>
<th>24DCM-372 (100W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>3</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

[24DCM-371 (50W) setting]

![24DCM-371 (50W) setting diagram](image)

[24DCM-372 (100W) setting]

![24DCM-372 (100W) setting diagram](image)
6.1.2 Setting the Speed Potentiometer

The driver (MDS-01AL002-01) operating speed can be set either by an external or internal (built-in) speed potentiometer (VR2). Switching between the internal and external speed potentiometers can be done via the switch (P-SW1) setting. The switch (P-SW1) setting for internal and external speed potentiometers is as shown below.

<table>
<thead>
<tr>
<th>P-SW1 Switch No.</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

When the switch (P-SW1) for internal and external speed potentiometers is set to the ON position, the direction of acceleration or deceleration will be as shown in Figure [Internal speed potentiometer controller VR2].

For more information about acceleration and deceleration, see section 7.4 which describes how to adjust the speed setting.

[When the internal speed potentiometer is selected]

[Internal speed potentiometer controller VR2]
6.1.3 Soft Start Setting

The driver (MDS-01AL002-01) soft start feature can be either enabled or disabled via the configuration switch (P-SW1).

The soft start duration can be changed via the VR1 controllers when the soft start feature is enabled.

<table>
<thead>
<tr>
<th>P-SW1 Switch No.</th>
<th>Soft Start “Enabled”</th>
<th>Soft Start “Disabled”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

**IMPORTANT**

The soft start duration is adjusted by delaying the application of voltage used to set the speed with the use of a 10 kΩ internal variable resistor and a 100 μF charge circuit.

The soft start duration can be set to within an approximate range of 0.5 to 4.5 seconds. In actual usage, the duration is subject to the operating temperature and environment. Thorough testing of your system should be performed prior to actual use.

[When soft start is enabled]

[Soft start controller VR1]

Direction of increased delay
6.2 Connecting the Motor and Driver

Insert the 3-pin connector on the motor cable into the driver motor connector (CN2). Insert the 5-pin connector on the sensor signal into the driver motor connector (CN3).

**IMPORTANT**

- Do not insert or pull out the connector while the power is on.
- Firmly insert the connector into position. An incomplete connection of the connector may cause operation failure, or damage the motor and/or driver.
- Do not push or pull the cable. Handle only the plastic connector. Do not apply force in any direction other than that in which the connector is inserted or pulled out. The improper application of force may damage the connector and driver.

6.3 Connecting the Power Supply

The input power supply voltage is 24 VDC ±10%.

Insert the power supply cable connector into the driver power supply connector (CN1).

**IMPORTANT**

- Sufficient care should be taken to ensure correct power supply polarity. Connections with incorrect polarity may result in damage to the driver.
- Do not route the driver power supply cable via the same conduit used for other power supply lines or motor cables.
- When turning on the power supply again or pulling out the motor cable connector, do so ten seconds or more after power supply has been turned off.
6.4 Connecting Input Signal Cable

- Connecting to the Driver

Insert the input signal cable connector into the driver’s input/output signal cable (CN4) connector.

- The connection diagram shows how to set the driver speed via an external resistor. See 6.1.2 for setting the speed via an internal speed potentiometer.

**IMPORTANT**

- The input/output signal cable must be located 200 mm or more away from inductive loads such as electromagnetic relays and must cross power supply and motor cables, not lie parallel to them.
- If you are not using all the cables from the terminals provided on the non-connector side of the input/output signal cable, insulate the unused cables to prevent them from coming into contact with other devices.
6.5 Driver Input Circuit and Wiring Diagrams

The driver’s signal input is connected to the photocoupler input.

When connecting to an external control device, connect via the open collector output and switch.

■ External control device output is an open-collector output

![](image1)

■ External control device output is a switch

![](image2)
7. Operation

7.1 Input Signals

Do not start or stop the motor by turning the power supply on and off. Use the START/STOP and RUN/BRAKE switch instead. Failure to do so may cause injury or damage to equipment.

**IMPORTANT**

- The input signals (START/STOP, RUN/BRAKE, CW/CCW) must be set to the ON position for at least 100 milliseconds. Failure to do so may cause the motor to malfunction.
  *When the soft start feature is enabled, set the time interval according to your system configuration.
- Do not operate (switch ON or OFF) the START/STOP input, RUN/BRAKE input, and CW/CCW input simultaneously. Once any of the inputs have been switched ON or OFF, wait at least 100 milliseconds before switching another input ON or OFF.
- The motor temperature rises more quickly when friction load and inertial load are higher and when the frequency of starting, braking and running is greater. The temperature of the motor case and the driver heat radiation plate must be kept below 90°C.

**START/STOP Switch and RUN/BRAKE Switch**

To switch the motor from running to stop or visa versa, use the START/STOP switch and RUN/BRAKE switch. Follow the operations shown in the table below.

<table>
<thead>
<tr>
<th>Signal level</th>
<th>START/STOP</th>
<th>RUN/BRAKE</th>
<th>Motor operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, OFF</td>
<td>ON, OFF</td>
<td>OFF</td>
<td>Quick stop (braking)*1</td>
</tr>
<tr>
<td>ON, ON</td>
<td>ON</td>
<td>ON</td>
<td>Stop*2</td>
</tr>
<tr>
<td>OFF, OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>Quick stop (braking)*1</td>
</tr>
<tr>
<td>OFF, ON</td>
<td>OFF</td>
<td>ON</td>
<td>Run*3</td>
</tr>
</tbody>
</table>

*1 The motor is set to braking mode (braking to a stop).
*2 The motor output shaft coasts to a stop.
*3 The motor runs at the speed set by the internal or the external speed controlling device (external potentiometer)
*4 The ON/OFF status is as shown in this diagram.

**IMPORTANT**

- The BRAKE overrides the stop function when the signal to stop the motor (ON) and the signal to brake (OFF) are entered simultaneously, causing the motor to brake to a stop.
- When the BRAKE signal is turned off while the motor is running, the motor will brake to stop. The time it takes to brake depends on the conditions under which the motor is used as well as the load inertia, load characteristics and other parameters set on your system.
● START/STOP Switch
When the ON/OFF switch is set to the OFF position, the motor starts up.
When the ON/OFF switch is set to the ON position, the motor stops.
When the motor is stopped, the motor output shaft coasts to a stop.
The time it takes to start and/or brake depends on the conditions under which the motor is
used as well as the load inertia, load characteristics and other parameters set on your system.

● RUN/BRAKE Switch
When the RUN/BRAKE switch is set to the ON position, the motor runs.
When the RUN/BRAKE switch is set to the OFF position, the motor brakes to an immediate
stop.

IMPORTANT
• When the motor is stopped, the motor output shaft coasts to a stop.

● CW/CCW Switch
When the CW/CCW switch is set to the ON position, the motor turns clockwise (when viewed
from the motor output shaft side).
When it is set to the OFF position, the motor turns counterclockwise (when viewed from the
motor output shaft side).

7.2 Protection Functions
The product features the following protection functions.

<table>
<thead>
<tr>
<th>Protection function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor overload protection</td>
<td>Ensures that the electric current will not exceed about 150% of the rated input value.</td>
</tr>
<tr>
<td>Motor lock protection</td>
<td>Stops the motor in the event the electric current reaches about 150% of the rated input value and the motor has stopped running for about 10 seconds. The power must be turned on again in order to restart the motor.</td>
</tr>
<tr>
<td>Overcurrent protection</td>
<td>Ensures that an electric current exceeding about 150% of the rated input current will not be supplied.</td>
</tr>
<tr>
<td>Radiator heat protection</td>
<td>Stops the motor when the temperature of the driver radiator reaches the preset temperature. Once the temperature falls below the preset temperature, the radiator will resume operation. It will continually turn on and off until the cause of overheating is eliminated.</td>
</tr>
</tbody>
</table>
7.3 Rotational Direction of the Motor Output Shaft

The rotational direction of the motor output shaft is defined as clockwise (CW) or counterclockwise (CCW) as viewed from the motor output shaft.

CCW (counterclockwise)

CW (clockwise)

7.4 Setting Motor Speed

Set the operating speed of the motor using either the internal or external speed potentiometer. The motor speed range is between 200 and 3000 min⁻¹ for the motor alone.

An external potentiometer must be 10K Ω, 1/4 W or higher.
8. Maintenance and Inspection

It is recommended that the motor be checked for the following on a regular basis. If any abnormality is found, stop using the motor and contact your local distributor.

Areas to be inspected

・ Check for any abnormal noise in the motor bearing section (ball bearing).
・ Check for any damage or stress on the motor cable as well as any loose connection with the driver.
・ Check for any misalignment between the motor output shaft and the load shaft.
・ Check for any dust on the driver.

IMPORTANT

When testing insulation resistance and dielectric strength, conduct separate tests for the motor and the driver.
## 9. Troubleshooting

While the motor is running, the motor and driver may not operate correctly due to a speed setting error or connection error. In the event the motor fails to operate normally, refer to the following table for possible solutions. If the problem still cannot be corrected, contact your local distributor.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor does not run.</td>
<td>The START/STOP switch is not set to the OFF position and the RUN/BRAKE switch is not set to the ON position.</td>
<td>Check to see if the START/STOP switch is set to the OFF position and if the RUN/BRAKE switch is set to the ON position.</td>
</tr>
<tr>
<td></td>
<td>The internal or external potentiometer is not set.</td>
<td>Set the internal or external potentiometer, whichever is being used, to the desired speed.</td>
</tr>
<tr>
<td></td>
<td>The internal or external potentiometer is not properly connected.</td>
<td>Check the connection to the internal or external potentiometer, whichever is being used.</td>
</tr>
<tr>
<td></td>
<td>Protection function is activated.</td>
<td>Shut off the DC power source and then turn it back on after about 30 seconds.</td>
</tr>
<tr>
<td>Motor stops running.</td>
<td>Protection function is activated.</td>
<td>Shut off the DC power source and then turn it back on after about 30 seconds.</td>
</tr>
<tr>
<td>Motor turns opposite to the direction specified.</td>
<td>The CW/CCW switch is set to the wrong position, or the connection is open.</td>
<td>The motor output shaft turns clockwise when the CW/CCW switch is set to the ON position. It turns counterclockwise when the CW/CCW switch is set to the OFF position.</td>
</tr>
<tr>
<td>Motor operation is unstable.</td>
<td>The motor output shaft is not aligned with the load shaft.</td>
<td>Check the alignment of the motor output shaft and the load shaft.</td>
</tr>
<tr>
<td></td>
<td>The motor is affected by noise.</td>
<td>Check the operation using only the motor, drive and external control devices that are necessary for operation. If noise is detected, increase the distance from the source of the noise, rearrange the wiring, replace the signal cables with shield wires, or install a ferrite core.</td>
</tr>
<tr>
<td>Excessive vibration</td>
<td>The motor output shaft is not aligned with the load shaft.</td>
<td>Check the alignment of the motor output shaft and the load shaft.</td>
</tr>
<tr>
<td></td>
<td>The motor is affected by noise.</td>
<td>Check the operation using only the motor, drive and external control devices that are necessary for operation. If noise is detected, increase the distance from the source of the noise, rearrange the wiring, replace the signal cables with shield wires, or install a ferrite core.</td>
</tr>
</tbody>
</table>
10. Warranty

This product is guaranteed to be free from defects in material and workmanship under normal and intended use for a period of one year from the shipping date.

The warranty does not cover the following:

1) Defects or damage that are deemed to have resulted from the negligence of the user,
2) Products used under the conditions or in environments that exceed the limits specified by the manufacturer,
3) Defects or damage caused by any product other than this product,
4) Products that have been altered by the user, and
5) Defects or damage resulting from fire, natural disaster, or other force majeure events.

Minebea is not liable for complaints from end users.
11. Service Data

(Motor Characteristics)

【24DCM-371  50 Watt】

【24DCM-372  100 Watt】
Motor Diagrams

【24DCM-371  50 Watt】

【24DCM-372  100 Watt】
**Motor Connector**

Signal line pin  
(Connector : XHP-5 JST)

<table>
<thead>
<tr>
<th>Harness</th>
<th>Pin No.</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange/Red</td>
<td>1</td>
<td>HV</td>
</tr>
<tr>
<td>Orange/Blue</td>
<td>2</td>
<td>HU</td>
</tr>
<tr>
<td>Gray/Red</td>
<td>3</td>
<td>GND</td>
</tr>
<tr>
<td>Gray/Blue</td>
<td>4</td>
<td>+6V</td>
</tr>
<tr>
<td>White/Red</td>
<td>5</td>
<td>HW</td>
</tr>
</tbody>
</table>

Power line pin  
(Connector : VHR-3N JST)

<table>
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<tr>
<th>Harness</th>
<th>Pin No.</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>1</td>
<td>W</td>
</tr>
<tr>
<td>White</td>
<td>2</td>
<td>V</td>
</tr>
<tr>
<td>Red</td>
<td>3</td>
<td>U</td>
</tr>
</tbody>
</table>

Connection Wiring Diagram

Beamex ER-470  
AWG20 Red

Beamex ER-470  
AWG20 Black

Beamex ER-470  
AWG20 White
INQUIRY FORM

(Use this form when making an inquiry.)

<table>
<thead>
<tr>
<th>Date purchased</th>
<th>Model</th>
</tr>
</thead>
<tbody>
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</table>

Distributor

Phone

◆ Notes ◆

Distributed and manufactured by
Minebea Co., Ltd. Special Device Business Unit
4-18-18 Omori-nishi, Ota-ku, Tokyo 143-8543
Phone: 81-3-5753-6752 (Sales Promotion Dept.)
URL: http://www.minebea.co.jp