



OPERATING MANUAL

Stepping Motor **αSTEP**

AR Series Motor



Table of contents

Introduction	1	Connection.....	7
Safety precautions	1	Inspection and maintenance	7
Precautions for use	2	Specifications.....	8
Preparation	3	General specifications	8
Installation	4	Regulations and standards	8

Introduction

Before use

Only qualified personnel of electrical and mechanical engineering should work with the product.
 Use the product correctly after thoroughly reading the section "Introduction". 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.

Related operating manuals

For operating manuals not included with the product, contact your nearest Oriental Motor sales office or download from Oriental Motor Website Download Page.

Operating manual name	Included or not included with product
AR Series OPERATING MANUAL Motor (this document)	Included
AR Series/ Motorized actuator equipped with AR Series USER MANUAL	Not included
APPENDIX UL Standards for AR Series	Included

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. Fully understand the meaning of each item before using the product.

Description of signs

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

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.

WARNING

General

- 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.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting, and troubleshooting the product. Failure to do so may result in fire, electric shock, injury, or damage to equipment.
- 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.
- Take measures to keep the moving part in position if the product is used in vertical operations such as elevating equipment. The motor loses holding torque when the power is shut off, allowing the moving parts to fall and possibly cause injury or damage to equipment.
- The brake mechanism of an electromagnetic brake motor is used for the purpose to hold the moving part and motor in position. Do not use it as a deceleration/safety brake. Doing so may result in injury or damage to the equipment.

Installation

- Install the motor in Class I equipment. Failure to do so may result in electric shock. (It is no need to ground when the driver power supply voltage is 24 VDC.)
- When installing the motor, install it inside an enclosure so that it is out of the direct reach of users. Be sure to ground if users can touch it. Failure to do so may result in electric shock. Failure to do so may result in electric shock.

Connection

- Connect the motor securely according to the motor connection method explained in the **USER MANUAL** or **OPERATING MANUAL Driver**. Failure to do so may result in fire or electric shock.
- Do not forcibly bend, pull, or pinch the cables. Doing so may result in fire or electric shock.

Repair, disassembly, and modification

- Do not disassemble or modify the motor. This may cause electric shock or injury. Refer all such internal inspections and repairs to the Oriental Motor sales office from which you purchased the product.

CAUTION

General

- Do not use the motor beyond its specifications. Doing so may result in electric shock, injury, or damage to equipment.
- Do not touch the motor during operation or immediately after stopping. The surface is hot and may cause a skin burn(s).

Transportation

- Do not carry the motor by holding the motor output shaft or motor cable. Doing so may cause injury.

Installation

- Provide a cover over the rotating parts (output shaft) of the motor. Failure to do so may result in injury.
- Do not leave anything around the motor that would obstruct ventilation. Doing so may result in damage to equipment.

Operation

- Do not touch the rotating parts (output shaft) of the motor during operation. Doing so may cause injury.
- Provide an emergency stop device or emergency stop circuit external to the equipment so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.
- The motor surface temperature may exceed 70 °C (158 °F), even under normal operating conditions. If the operator is allowed to approach the motor in operation, affix a warning label shown in the figure on a conspicuous position. Failure to do so may result in skin burn(s).
- For the power supply input to the electromagnetic brake, use a DC power supply with reinforced insulation on the primary side. Failure to do so may result in electric shock.



Warning label

Maintenance and inspection

- Do not touch the terminals while conducting the insulation resistance measurement or dielectric strength test. Doing so may cause electric shock.

Precautions for use

This chapter covers restrictions and requirements the user should consider when using the product.

- Always use the accessory cable to connect the motor and driver.**
- When conducting the insulation resistance measurement or the dielectric strength test, be sure to separate the connection between the motor and the driver.**

Conducting the insulation resistance measurement or dielectric strength test with the motor and driver connected may result in damage to the product.

• Double shaft motor

Do not apply load torque, radial load, or axial load to the output shaft on the opposite side of the motor output shaft.

- Do not apply a radial load and axial load in excess of the specified permissible limit.**

Operating the motor under an excessive radial load and axial load may damage the motor bearings (ball bearings). Be sure to operate the motor within the specified permissible limit of radial load and axial load. See page 5 for details.

- Use the motor in conditions where its surface temperature will not exceed 100 °C (212 °F).**

The motor does not have a function to protect from overheating. The motor surface temperature may exceed 100 °C (212 °F) under certain conditions (ambient temperature, operating speed, duty cycle, etc.). To prevent the motor bearings (ball bearings) from reaching its usable life quickly, use the motor in conditions where the surface temperature will not exceed 100 °C (212 °F).

Use the geared motor in a condition where the gear case temperature does not exceed 70 °C (158 °F), in order to prevent deterioration of grease and parts in the gear case.

If the motor is to be operated continuously, install the motor in a location where heat dissipation capacity equivalent to a level achieved with a heat sink [made of aluminum, 250×250×6 mm (9.84×9.84×0.24 in.)] is ensured.

• Holding torque at standstill

The motor holding torque is reduced by the current cutback function of the driver at motor standstill. When selecting a motor, check the holding torque at motor standstill in the specifications on the catalog.

- Do not use the electromagnetic brake for braking or as a safety brake.**

Do not use the electromagnetic brake as a means to decelerate and stop the motor. The brake hub of the electromagnetic brake will wear significantly and the braking force will drop. The electromagnetic brake is of power-off activated type. This means that although it helps maintain the position of the load in the event of power outage, etc., this brake cannot securely hold the load in place. Accordingly, do not use the electromagnetic brake as a safety brake. To use the electromagnetic brake to hold the load in place, do so after the motor has stopped.

• Preventing electrical noise

See [USER MANUAL](#) for measures with regard to noise.

• Peak torque of geared motor

Always operate the geared motor under a load not exceeding the peak torque. If the load exceeds the peak torque, the gear part will be damaged.

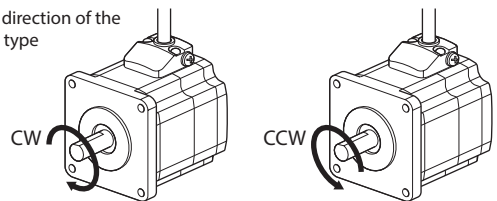
• Rotation direction of the gear output shaft

The relationship between the rotation direction of the motor shaft and that of the gear output shaft changes as follows, depending on the gear type and gear ratio.

Type of gear	Gear ratio	Rotation direction (relative to the motor rotation direction)
TH geared	3.6, 7.2, 10	Same direction
	20, 30	Opposite direction
FC geared, PL geared PS geared, PN geared	All gear ratios	Same direction
Harmonic geared	All gear ratios	Opposite direction

The rotation direction of the motor output shaft indicates as viewed from the output shaft side.

Rotation direction of the standard type



- Do not perform push-motion operation with geared motor.**

Doing so may result in damage to the motor or gear part.

• About grease of geared motor

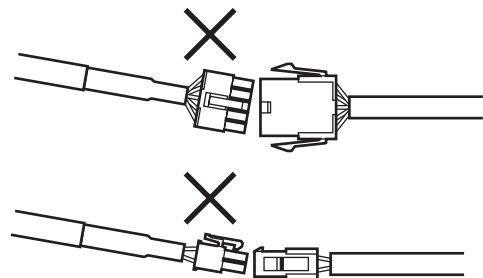
On rare occasions, a small amount of grease may ooze out from the geared motor. If there is concern over possible environmental damage resulting from the leakage of grease, check for grease stains during regular inspections. Alternatively, install an oil pan or other device to prevent leakage from causing further damage. Oil leakage may lead to problems in the customer's equipment or products.

■ Notes when the connection cable is used

Note the following points when an accessory cable is used.

• When inserting the connector

Hold the connector main body, and insert it in straight securely. Inserting the connector in a inclined state may result in damage to terminals or a connection failure.



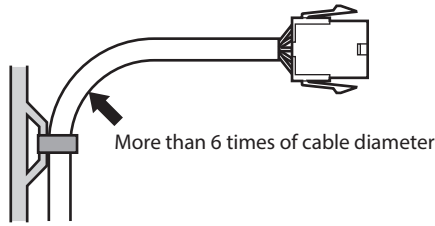
• When pulling out the connector

Pull out the connector in straight while releasing the lock part of the connector. Pulling out the connector with holding the cable (lead wire) may result in damage to the connector.

• Bending radius of cable

Use the cable in a state where the bending radius of the cable is more than six times of the cable diameter.

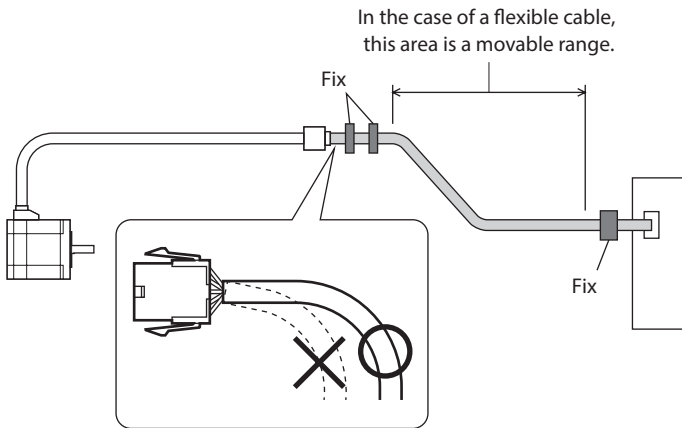
In the case of the lead wire type, use in a state where the bending radius is more than four times of the diameter of the lead wires.



• How to fix the cable

Fix the cable at the positions near the connector so as to apply no stress on the connector part.

Take measures so as to apply no stress on the connector by using wide clamps or by fixing at two places.



Preparation

■ Checking the product

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

- Motor1 unit
- Parallel key1 pc. *1
- Varistor.....1 pc. *2
- OPERATING MANUAL Motor.....1 copy (this document)
- APPENDIX UL Standards for **AR** Series.....1 copy *3

*1 Included with geared types. However, the parallel key does not come with the following geared type products.

TH geared: **ARM24-T, ARM46-T, ARM66-T**

PL geared: **ARM46-P**

PS geared: **ARM24-PS**

PN geared: **ARM24-N**

Harmonic geared: **ARM24-H**

*2 Included with the electromagnetic brake motor of DC power input type.

*3 Included with products conform to the UL Standards.

■ How to identify the product model

Verify the model number of the purchased unit against the number shown on the nameplate.

• Standard type

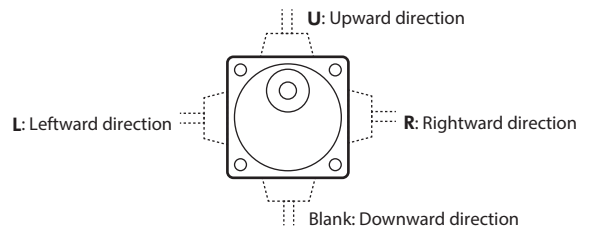
ARM 4 6 S A 0 K
 1 2 3 4 5 6 7

• Geared type (excluding FC geared type)

ARM 4 6 S A K - T 7.2 U
 1 2 3 4 5 7 8 9 10

1	Series name	ARM: AR Series motor
2	Motor frame size	1: 20 mm (0.79 in.) 2: 28 mm (1.10 in.) [30 mm (1.18 in.) for Harmonic geared type] 4: 42 mm (1.65 in.) 6: 60 mm (2.36 in.) 9: 85 mm (3.35 in.) [90 mm (3.54 in.) for geared types]
3	Motor length	
4	Motor identification	S: Without connector cover for cable Blank: With connector cover for cable
5	Motor type	A: Single shaft B: Double shaft M: With electromagnetic brake
6	Additional function	0: Round shaft without shaft flat Blank: Round shaft with shaft flat on one side
7	Motor power supply input	C: AC power input type K: DC power input type
8	Type of gear	T: TH geared P: PL geared PS: PS geared N: PN geared H: Harmonic geared Blank: Standard
9	Gear ratio	
10	Cable outlet direction * (TH geared type only)	U: Upward direction L: Leftward direction R: Rightward direction Blank: Downward direction

* The cable outlet direction represents the one as viewed from the output shaft side in a state of placing it upward.

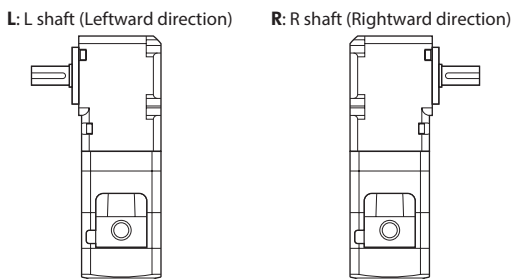


● FC geared type

ARM 6 6 A C - FC 7.2 L A
 1 2 3 4 5 6 7 8 9

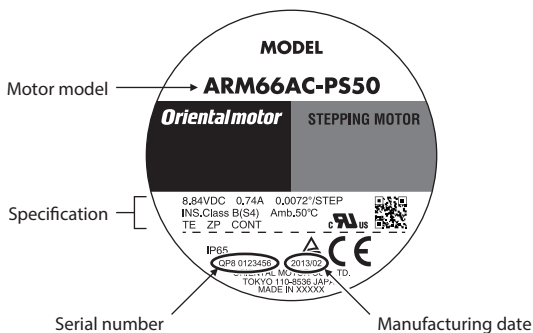
1	Series name	ARM: AR Series motor
2	Motor frame size	4: 42 mm (1.65 in.) 6: 60 mm (2.36 in.)
3	Motor length	
4	Motor type	A: Single shaft
5	Motor power supply input	C: AC power input type
6	Type of gear	FC: FC geared
7	Gear ratio	
8	Output shaft direction *	L: L shaft (Leftward direction) R: R shaft (Rightward direction)
9	Output shaft type	A: Solid shaft

* The direction of the gearhead output shaft represents that as the view from the motor cable outlet side.



■ Information about nameplate

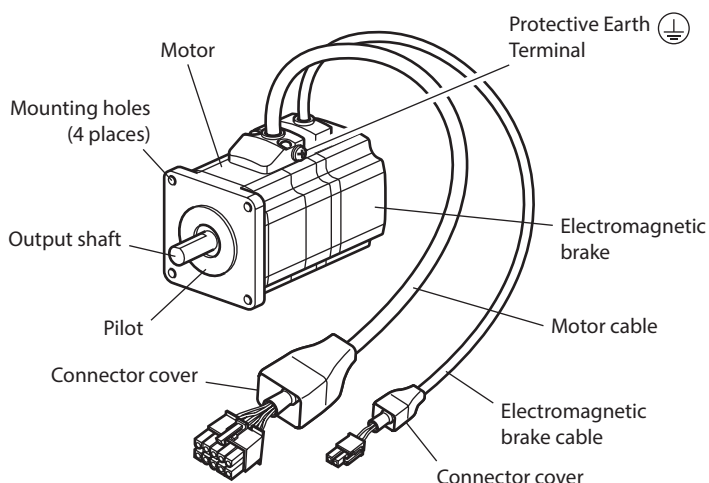
The figure shows an example.



The position describing the information may vary depending on the product.

■ Names of parts

This figure shows the **ARM66MC**.



Installation

● Location for installation

The motor 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 (provide vent holes)
- Operating ambient temperature -10 to +50 °C (+14 to +122 °F) (non-freezing)
Harmonic gear type: 0 to +40 °C (+32 to +104 °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 (rain, water droplets), oil (oil droplets), or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- 1,000 m (3,300 ft.) or lower above sea level

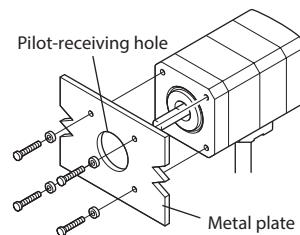
■ Installation direction

The motor can be installed in any direction.

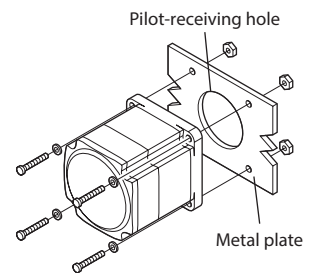
■ Installation method

To allow for heat dissipation and prevent vibration, install the motor on a metal surface of sufficient strength.

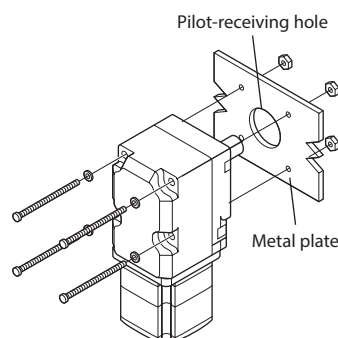
● Installation method A



● Installation method B



● Installation method B (FC geared type)



Nominal size, tightening torque, and installation method

Type	Motor frame size [mm (in.)]	Screw size	Tightening torque [N·m (oz-in)]	Effective depth of screw thread [mm (in.)]	Installation method
Standard	20 (0.79)	M2	0.25 (35)	2.5 (0.098)	A
	28 (1.10)	M2.5	0.5 (71)	2.5 (0.098)	
	42 (1.65)	M3	1 (142)	-	B
	60 (2.36)	M4	2 (280)		
	85 (3.35)	M6	3 (420)		
TH geared	28 (1.10)	M2.5	0.5 (71)	4 (0.157)	A
	42 (1.65)	M4	2 (280)	8 (0.315)	
	60 (2.36)		15 (0.591)		
FC geared	42 (1.65)	M4	2 (280)	-	B
	60 (2.36)	M5	2.5 (350)		
PL geared	28 (1.10)	M3	1 (142)	6 (0.24)	A
PS geared	42 (1.65)	M4	2 (280)	8 (0.315)	
PN geared	60 (2.36)	M5	2.5 (350)	10 (0.394)	
Harmonic geared *1	90 (3.54)	M8	4 (560)	15 (0.591)	
Harmonic geared *2	90 (3.54)	M8	4 (560)	-	B

*1 **ARM24**, **ARM46**, and **ARM66** only.

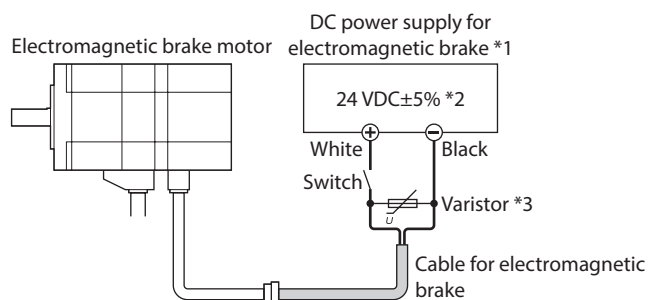
*2 **ARM98** only.

■ Installing a load

When installing a load to the motor, align the centers of the motor output shaft and load shaft. Be careful not to damage the output shaft or the bearings (ball bearings) when installing a coupling or pulley to the motor output shaft.

● Electromagnetic brake motor

To release the electromagnetic brake and install the load, a DC power supply is needed to power the electromagnetic brake. Use a cable for electromagnetic brake to connect a DC power supply of 24 VDC to the motor.



*1 The power supply current capacities are as follows.

ARM24, **ARM26**: 0.05 A or more

ARM46: 0.08 A or more

ARM66, **ARM69**, **ARM98**: 0.25 A or more

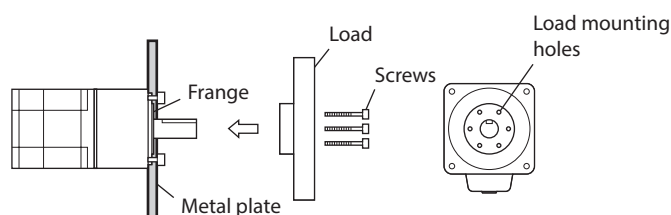
*2 If the distance between the motor and driver is extended to 20 m (65.6 ft.) to 30 m (98.4 ft.), use a power supply of 24 VDC ± 4%.

*3 Provide a varistor to protect the contact of the switch or to prevent electrical noise. It is included with the electromagnetic brake motor of DC power input type.

[Recommended varistor: Z15D121 (SEMITEC Corporation)].

● Installing on the flange surface (Harmonic geared type)

With a Harmonic geared type (excluding **ARM98**), a load can be installed directly to the gear using the load mounting holes provided on the flange surface.



Motor model	Screw size	Number of screw	Tightening torque [N·m (oz-in)]	Effective depth of screw thread [mm (in.)]
ARM24	M3	4	1.4 (198)	4 (0.157)
ARM46	M3	6	1.4 (198)	5 (0.2)
ARM66	M4	6	2.5 (350)	6 (0.24)



- When installing a load on the flange surface, the load cannot be mounted using the key slot in the output shaft.
- Design an appropriate installation layout so that the load will not contact the metal plate or screws used for installing the motor.

■ Permissible radial load, permissible axial load, and permissible moment load



- If the radial load or axial load exceeds the specified allowable value, repeated load applications may cause the bearing (ball bearings) or output shaft of the motor to undergo a fatigue failure.
- With a double shaft type, do not apply load torque, radial load, or axial load to the output shaft on the opposite side of the motor output shaft.



The permissible radial load and permissible axial load of the **PS** geared type and **PN** geared type represent the value that the service life of the gear part satisfies 20,000 hours when either of the radial load or axial load is applied to the gear output shaft.

● Permissible radial load, permissible axial load

● Standard type

Motor model	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
	Distance from the tip of motor output shaft [mm (in.)]					
	0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)	
ARM14 ARM15	12 (2.7)	15 (3.3)	-	-	-	3 (0.67)
ARM24 ARM26	25 (5.6)	34 (7.6)	52 (11.7)	-	-	5 (1.12)
ARM46	35 (7.8)	44 (9.9)	58 (13)	85 (19.1)	-	15 (3.3)
ARM66 ARM69	90 (20)	100 (22)	130 (29)	180 (40)	270 (60)	30 (6.7)
ARM98 ARM911	260 (58)	290 (65)	340 (76)	390 (87)	480 (108)	60 (13.5)

• TH geared type

Motor model	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
	Distance from the tip of motor output shaft [mm (in.)]					
	0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)	
ARM24	15 (3.3)	17 (3.8)	20 (4.5)	23 (5.1)	–	10 (2.2)
ARM46	10 (2.2)	14 (3.1)	20 (4.5)	30 (6.7)	–	15 (3.3)
ARM66	70 (15.7)	80 (18)	100 (22)	120 (27)	150 (33)	40 (9)
ARM98	220 (49)	250 (56)	300 (67)	350 (78)	400 (90)	100 (22)

• FC geared type

Motor model	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
	Distance from the tip of motor output shaft [mm (in.)]					
	0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)	
ARM46	180 (40)	200 (45)	220 (49)	250 (56)	–	100 (22)
ARM66	270 (60)	290 (65)	310 (69)	330 (74)	350 (78)	200 (45)

• PL geared type

Motor model	Gear ratio	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
		Distance from the tip of motor output shaft [mm (in.)]					
		0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)	
ARM46	5 7.2 10	73 (16.4)	84 (18.9)	100 (22)	123 (27)	–	50 (11.2)
	25 36 50	109 (24)	127 (28)	150 (33)	184 (41)	–	
	5	200 (45)	220 (49)	250 (56)	280 (63)	320 (72)	
7.2 10	250 (56)	270 (60)	300 (67)	340 (76)	390 (87)		
25 36 50	330 (74)	360 (81)	400 (90)	450 (101)	520 (117)		
ARM98	5 7.2 10	480 (108)	540 (121)	600 (135)	680 (153)	790 (177)	300 (67)
	25	850 (191)	940 (210)	1,050 (230)	1,190 (260)	1,380 (310)	
	36	930 (200)	1,030 (230)	1,150 (250)	1,310 (290)	1,520 (340)	
	50	1,050 (230)	1,160 (260)	1,300 (290)	1,480 (330)	1,710 (380)	

• PS geared type

Motor model	Gear ratio	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
		Distance from the tip of motor output shaft [mm (in.)]					
		0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)	
ARM24	5 7.2 10	45 (10.1)	60 (13.5)	80 (18)	100 (22)	–	40 (9)
	5	70 (15.7)	80 (18)	95 (21)	120 (27)	–	
	7.2	80 (18)	90 (20)	110 (24)	140 (31)	–	
ARM46	10	85 (19.1)	100 (22)	120 (27)	150 (33)	–	100 (22)
	25	120 (27)	140 (31)	170 (38)	210 (47)	–	
	36	130 (29)	160 (36)	190 (42)	240 (54)	–	
	50	150 (33)	170 (38)	210 (47)	260 (58)	–	
	5	170 (38)	200 (45)	230 (51)	270 (60)	320 (72)	
7.2	200 (45)	220 (49)	260 (58)	310 (69)	370 (83)		
10	220 (49)	250 (56)	290 (65)	350 (78)	410 (92)		
25	300 (67)	340 (76)	400 (90)	470 (105)	560 (126)		
36	340 (76)	380 (85)	450 (101)	530 (119)	630 (141)		
ARM98	50	380 (85)	430 (96)	500 (112)	600 (135)	700 (157)	600 (135)
	5	380 (85)	420 (94)	470 (105)	540 (121)	630 (141)	
	7.2	430 (96)	470 (105)	530 (119)	610 (137)	710 (159)	
	10	480 (108)	530 (119)	590 (132)	680 (153)	790 (177)	
	25	650 (146)	720 (162)	810 (182)	920 (200)	1,070 (240)	
	36	730 (164)	810 (182)	910 (200)	1,040 (230)	1,210 (270)	
	50	820 (184)	910 (200)	1,020 (220)	1,160 (260)	1,350 (300)	

• PN geared type

Motor model	Gear ratio	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
		Distance from the tip of motor output shaft [mm (in.)]					
		0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)	
ARM24	5 7.2 10	45 (10.1)	60 (13.5)	80 (18)	100 (22)	–	40 (9)
	5	80 (18)	95 (21)	120 (27)	160 (36)	–	
	7.2	90 (20)	110 (24)	130 (29)	180 (40)	–	
ARM46	10	100 (22)	120 (27)	150 (33)	200 (45)	–	100 (22)

Motor model	Gear ratio	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
		Distance from the tip of motor output shaft [mm (in.)]					
		0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)	
ARM66	5	240 (54)	260 (58)	280 (63)	300 (67)	330 (74)	200 (45)
	7.2	270 (60)	290 (65)	310 (69)	340 (76)	370 (83)	
	10	300 (67)	320 (72)	350 (78)	380 (85)	410 (92)	
	25	410 (92)	440 (99)	470 (105)	520 (117)	560 (126)	
	36	360 (81)	410 (92)	480 (108)	570 (128)	640 (144)	
	50	360 (81)	410 (92)	480 (108)	570 (128)	700 (157)	
ARM98	5	370 (83)	390 (87)	410 (92)	430 (96)	460 (103)	600 (135)
	7.2	410 (92)	440 (99)	460 (103)	490 (110)	520 (117)	
	10	460 (103)	490 (110)	520 (117)	550 (123)	580 (130)	
	25	630 (141)	660 (148)	700 (157)	740 (166)	790 (177)	
	36	710 (159)	750 (168)	790 (177)	840 (189)	900 (200)	
	50	790 (177)	840 (189)	890 (200)	940 (210)	1,000 (220)	

• Harmonic geared type

Motor model	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
	Distance from the tip of motor output shaft [mm (in.)]					
	0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)	
ARM24	100 (22)	135 (30)	175 (39)	250 (56)	–	140 (31)
ARM46	180 (40)	220 (49)	270 (60)	360 (81)	510 (114)	220 (49)
ARM66	320 (72)	370 (83)	440 (99)	550 (123)	720 (162)	450 (101)
ARM98	1,090 (240)	1,150 (250)	1,230 (270)	1,310 (290)	1,410 (310)	1,300 (290)

• Permissible moment load of the Harmonic geared type

Motor model	Gear ratio	Permissible moment load (N-m)
ARM24	All gear ratios	2.9
ARM46		5.6
ARM66		11.6

• Calculation of moment load

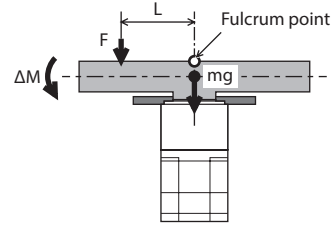
If an eccentric load is applied on the flange surface when installing an arm or a table, calculate the moment load using the formula next. The moment load should not exceed the permissible value.

How to read a code

• m: Mass of a load (kg)	• ΔF: Load applied on the output flange surface (N)
• g: Gravitational acceleration (m/s ²)	• Fs: Permissible axial load (N)
• F: External force (N)	• ΔM: Load moment (N-m)
• L: Overhang distance (m)	• M: Permissible moment load (N-m)
• a: Constant (m)	

Example 1; When an external force F(N) is applied on a position overhanging by L (m) from the center of the output flange in the horizontal direction

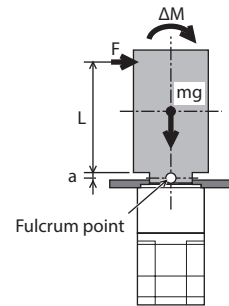
- Load moment
 $\Delta M = F \cdot L$
 $\Delta M \leq M$
- Axial load
 $\Delta F = F + m \cdot g$
 $\Delta F \leq F_s$



Example 2; When an external force F(N) is applied on a position overhanging by L (m) from the output flange mounting surface in the vertical direction

- Load moment
 $\Delta M = F \cdot (L + a)$
 $\Delta M \leq M$
- Axial load
 $\Delta F = m \cdot g$
 $\Delta F \leq F_s$

Motor model	Coefficient "a"
ARM24	0.0073
ARM46	0.009
ARM66	0.0114



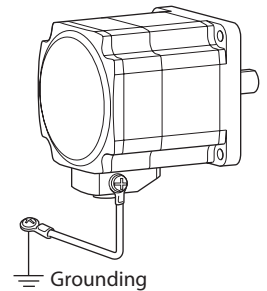
Connection

■ Connecting to the driver

Refer to OPERATING MANUAL Driver or USER MANUAL for the connection method. If connector covers are attached on cables, cover the connected connectors using them.

■ Grounding the motor

Be sure to ground the Protective Earth Terminal of the motor. (Not required when the driver's power supply specification is 24 VDC.)
 Screw size: M4
 Tightening torque: 1.2 N-m (170 oz-in)
 Use a grounding wire larger than AWG18 (0.75 mm²).
 Use a round terminal when grounding, and secure it with a mounting screw with a washer. Ground wires and crimp terminals are not included.



Inspection and maintenance

■ Inspection

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

• During inspection

- Are any of the screws having installed the motor loose?
- Check for any unusual noises in the motor bearings (ball bearings) or other moving parts.
- Are the motor output shaft and load shaft out of alignment?
- Are there any scratches, signs of stress or loose driver connections in the motor cable?

■ 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.

Specifications

Check on the Oriental Motor Website for the product specifications.

General specifications

Degree of protection	IP65 (Excluding the installation surface and connectors) IP20 (Double shaft type, models including "S" in the motor model *1)	
Operation environment	Ambient temperature	-10 to +50 °C (+14 to +122 °F) (non-freezing) Harmonic gear type: 0 to +40 °C (+32 to +104 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 1,000 m (3,300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water, or oil
Storage environment	Ambient temperature	-20 to +60 °C (-4 to +140 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 3,000 m (10,000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water, or oil
Shipping environment	Ambient temperature	-20 to +60 °C (-4 to +140 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 3,000 m (10,000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water, or oil
Insulation resistance	100 MΩ or more when 500 VDC megger is applied between the following places: • Case - Motor and sensor windings • Case - Electromagnetic brake windings	
Dielectric strength	Sufficient to withstand the following for 1 minute:	
	AC power input type	
	Case - Motor and sensor windings	1.5 kVAC 50/60 Hz
	Case - Electromagnetic brake windings	1.5 kVAC 50/60 Hz
DC power input type		
Case - Motor and sensor windings	1.0 kVAC 50/60 Hz *2	
Case - Electromagnetic brake windings	1.0 kVAC 50/60 Hz *3	

*1 Check the model number of the motor against the number shown on the nameplate or [USER MANUAL](#).

*2 0.5 kVAC for **ARM14**, **ARM15**, **ARM24**, and **ARM26**

*3 0.5 kVAC for **ARM24** and **ARM26**

Regulations and standards

■ UL Standards

Check the "APPENDIX UL Standards for AR Series" for recognition information about UL Standards.

■ CE Marking

Motors of the AR Series AC power input type are affixed the CE Marking under the Low Voltage Directive and EMC Directive.

● Low Voltage Directive

This product is certified by TÜV Rheinland under the EN 60034-1.

- This product cannot be used in IT power distribution systems.
- Install the product within the enclosure in order to avoid contact with hands.

- When a product can be touched with hands, be sure to ground. When installing the motor and driver, securely connect their Protective Earth Terminals.
- To protect against electric shock using an earth leakage breaker (RCD), connect a type B earth leakage breaker to the primary side of the driver.
- When using a circuit breaker (MCCB), use a unit conforming to the EN or IEC standard.
- Isolate the motor cable, power-supply cable, and other drive cables from the signal cables by means of double insulation.
- The temperature of the driver's heat sink may exceed 90 °C (194 °F) depending on the driving conditions. Accordingly, take heed of the following items:
 - Do not touch the driver.
 - Do not use the driver near flammable objects.
 - Always conduct a trial operation to check the driver temperature.

● Applicable Standards

- EN 60034-1
- EN 60034-5
- EN 60664-1

● Installation conditions

- To be incorporated in equipment
- Overvoltage category: II
- Pollution degree: 3 (2 for the double-shaft type and IP20 type)
- Protection against electric shock: Class I
- Be sure to ground the Protective Earth Terminal of the motor.

● EMC Directive

The AR Series motor conforms to the EMC Directive in a state where the motor is connected with the driver. For details, refer to the [OPERATING MANUAL Driver](#).

■ RoHS Directive

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

- Unauthorized reproduction or copying of all or part of this manual is prohibited.
- Oriental Motor shall not be liable whatsoever for any problems relating to industrial property rights arising from use of any information, circuit, equipment or device provided or referenced in this manual.
- Characteristics, specifications, and dimensions are subject to change without notice.
- While we make every effort to offer accurate information in the manual, we welcome your input. Should you find unclear descriptions, errors or omissions, please contact your nearest Oriental Motor sales office.
- **Orientalmotor** and **ALSTEP** are registered trademarks or trademarks of Oriental Motor Co., Ltd., in Japan and other countries.

© Copyright ORIENTAL MOTOR CO., LTD. 2015

Published in October 2018

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

ORIENTAL MOTOR U.S.A. CORP.
Technical Support Tel:(800)468-3982
8:30 A.M. to 5:00 P.M., P.S.T. (M-F)
7:30 A.M. to 5:00 P.M., C.S.T. (M-F)
www.orientalmotor.com

ORIENTAL MOTOR DO BRASIL LTDA.
Tel:+55-11-3266-6018
www.orientalmotor.com.br

ORIENTAL MOTOR (EUROPA) GmbH
Schiesstraße 44, 40549 Düsseldorf, Germany
Technical Support Tel:00 800/22 55 66 22
www.orientalmotor.de

ORIENTAL MOTOR (UK) LTD.
Tel:01256-347090
www.oriental-motor.co.uk

ORIENTAL MOTOR (FRANCE) SARL
Tel:01 47 86 97 50
www.orientalmotor.fr

ORIENTAL MOTOR ITALIA s.r.l.
Tel:02-93906346
www.orientalmotor.it

ORIENTAL MOTOR CO., LTD.
4-8-1 Higashiueno, Taito-ku, Tokyo 110-8536
Japan
Tel:03-6744-0361
www.orientalmotor.co.jp

ORIENTAL MOTOR ASIA PACIFIC PTE. LTD.
Singapore
Tel:1800-8420280
www.orientalmotor.com.sg

ORIENTAL MOTOR (MALAYSIA) SDN. BHD.
Tel:1800-806161
www.orientalmotor.com.my

ORIENTAL MOTOR (THAILAND) CO., LTD.
Tel:1800-888-881
www.orientalmotor.co.th

ORIENTAL MOTOR (INDIA) PVT. LTD.
Tel:+91-80-41125586
www.orientalmotor.co.in

TAIWAN ORIENTAL MOTOR CO., LTD.
Tel:0800-060708
www.orientalmotor.com.tw

SHANGHAI ORIENTAL MOTOR CO., LTD.
Tel:400-820-6516
www.orientalmotor.com.cn

INA ORIENTAL MOTOR CO., LTD.
Korea
Tel:080-777-2042
www.inaom.co.kr

ORIENTAL MOTOR CO., LTD.
Hong Kong Branch
Tel:+852-2427-9800