

Compact Motorized Cylinder

DR Series Wide table type

OPERATING MANUAL Actuator

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Thank you for purchasing an Oriental Motor product.

This 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.

1 Introduction

1-1 Before use

Only qualified personnel of electrical and mechanical engineering should work with the product.

Use the product correctly after thoroughly reading the section "2 Safety precautions" on p.3. 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.

1-2 Overview of the product

The compact motorized cylinder **DR** Series (hereinafter described as cylinder) is an actuator of a linear motion mechanism that a stepping motor is integrated with a ball screw. The ***αSTEP*** **AZ** Series is adopted for the motor.

1-3 Related operating manuals

For operating manuals, download from Oriental Motor Website Download Page or contact your nearest Oriental Motor sales office.

- **DR** Series OPERATING MANUAL Actuator (this document)
- **AZ** Series/Motorized actuator equipped with **AZ** Series OPERATING MANUAL Function Edition
- Motorized actuator Compact Motorized Cylinder Function Setting Edition *

* Be sure to read the operating manual "Function Setting Edition" which is exclusively for compact motorized cylinders.

Refer to the operating manual of the driver for contents not described in these manuals.




2 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.



You must not operate the cylinder (operate the equipment for the specified purpose) if the machine in which the cylinder is installed does not satisfy the related safety standards. The factory safety manager or safety personnel in charge of the applicable machine must ensure that the machine is operated only by qualified personnel who are familiar with the operation of electronic equipment, and thereby prevent injury or damage to the equipment.

The term "qualified personnel" refers to persons who have received the necessary training or education and have pertinent experience; who are familiar with the relevant standards, regulations, accident-prevention rules and inspection conditions; who are authorized by the factory safety manager to engage in the necessary activities; and who have the ability to discern and prevent potential dangers.

Description of signs

 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 the safe use of the product.

Description of graphic symbols

	Indicates "prohibited" actions that must not be performed.
	Indicates "compulsory" actions that must be performed.

WARNING






- Do not use the cylinder 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 or injury.
- Do not transport, install, connect or inspect the cylinder while the power is supplied. Doing so may result in electric shock.
- Do not forcibly bend, pull or pinch the cable. Doing so may result in fire.
- Do not disassemble or modify the cylinder. Doing so may result in injury or damage to equipment.
- Never use the cylinder in a medical device used in connection with the maintenance or management of human life or health, or in a transportation system whose purpose is to move or carry people.
- Be sure to provide a safety cage conforming to EN ISO 13857 to prevent persons from entering the moving range of the cylinder while power is supplied to the cylinder. Turn off the main power to the driver before performing adjustment or inspection in which the moving part is moved manually. Failure to do so may result in injury.
- Do not hit the ball screw with the mechanical stopper in operations other than push-motion operation. Doing so may result in injury or damage to equipment.



- Assign qualified personnel to the task of installing, wiring, operating/controlling, inspecting and troubleshooting the cylinder. Failure to do so may result in fire, injury or damage to equipment.
- When setting the data, do so outside the safety cage. Failure to do so may result in injury.
- Take measures to keep the moving part in position if the cylinder is used in vertical operations such as elevating equipment. Failure to do so may result in injury or damage to equipment.
- When an alarm is generated in the driver (any of the driver's protective functions is triggered), take measures to hold the moving part in a specific position since the cylinder stops and loses its holding torque. Failure to do so may result in injury or damage to equipment.
- Install the cylinder inside an enclosure. Failure to do so may result in 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.
- After replacing the driver, set the resolution, traveling direction or other parameters before operating the cylinder. If the cylinder is operated without setting parameters, the ball screw may move to unexpected directions or run at unexpected speeds, causing injury or damage to equipment.

CAUTION

	<ul style="list-style-type: none">• Do not use the cylinder beyond its specifications. Doing so may result in injury or damage to equipment.• Keep your fingers and objects out of the openings in the cylinder. Failure to do so may result in fire or injury.• Do not touch the cylinder during operation or immediately after stopping. Doing so may result in a skin burn(s).• Do not carry the cylinder by holding the moving part or cable. Doing so may cause injury.• Keep the area around the cylinder free of combustible materials. Failure to do so may result in fire or a skin burn(s).• Do not leave anything around the cylinder that would obstruct ventilation. Doing so may result in damage to equipment.• Do not touch the moving part during operation. Doing so may result in injury.• Do not touch the terminals while conducting the insulation resistance measurement or dielectric strength test. Doing so may result in electric shock.• While the cylinder is operated, do not make the cable contact with the moving part. Doing so may result in disconnection in the cable, leading to damage.
	<ul style="list-style-type: none">• Use the cylinder and driver only in the specified combination. Failure to do so may result in fire.• Wear a helmet, safety shoes, gloves or other protective gear when transporting or installing the cylinder. 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 cylinder in operation, affix a warning label shown in the figure on a conspicuous position. Failure to do so may result in a skin burn(s).  <p>Warning label</p>

3 Precautions for use

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

■ General

- **Be sure to use our cable to connect the cylinder and driver.**

Check on the Oriental Motor Website for the model name of cables.

- **Do not detach the table or loosen the screws.**

If the table is detached or the screws secured the table is loosened, the installation accuracy of the ball screw is deteriorated, resulting in malfunction or shorter service life of the cylinder. Also, the home position set in the encoder (ABZO sensor) at the time of shipment may be deviated, and this may cause unexpected movements, leading to damage to equipment.

- **Do not install a guide for load transportation additionally on the customer side.**

Misalignment of guides may cause damage to equipment.

- **When conducting the insulation resistance measurement or the dielectric strength test, be sure to separate the connection between the cylinder and the driver.**

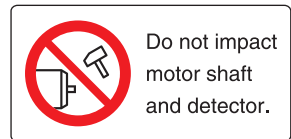
Conducting the insulation resistance measurement or dielectric strength test with the cylinder and driver connected may result in damage to the product.

- **Do not make an impact on the cylinder.**

Do not drop the cylinder. Also, do not hit or strike the cylinder. Making an impact on the cylinder may cause the positioning accuracy to decrease, the motor to damage, or the lifetime to reduce.

- **Make sure not to hit or apply a strong impact on the encoder (ABZO sensor).**

- Making a strong impact on an encoder (ABZO sensor) may cause the motor malfunction or damage to the encoder (ABZO sensor).
- When transporting the cylinder or installing a load, handle the cylinder carefully not to make a strong impact on the moving part.
- The warning label shown in the figure is indicated on the motor.



Warning label

- **Meshing noise of mechanical sensor**

A gear type mechanical sensor is built into the encoder (ABZO sensor). Although the meshing noise of gears may generate, it is not malfunction.

- **Do not move the encoder (ABZO sensor) toward a strong magnetic field.**

A magnetic sensor is built into the encoder (ABZO sensor). If the cylinder is installed close to equipment which generates a strong magnetic field, the encoder (ABZO sensor) may break or malfunction. Make sure the environment at transportation and storage as well as the installation location in use. Keep the magnetic flux density on the surface of the encoder (ABZO sensor) so as not to exceed the values in the table.

Model	Magnetic flux density	
	When transporting and storing	When operating
DR28	5 mT	2 mT *

* When the magnetic flux density is exceeding 1 mT and 2 mT or less, use in an environment where the operating ambient temperature is exceeding 20 °C (68 °F) and 40 °C (104 °F) or less.

■ Temperature

- **Use the cylinder in a condition where the motor surface temperature does not exceed 80 °C (176 °F).**

The motor surface temperature may exceed 80 °C (176 °F) under certain conditions (ambient temperature, operating speed, duty cycle, etc.). In order to protect the encoder (ABZO sensor), use the motor in a condition where the motor surface temperature does not exceed 80 °C (176 °F).

If the encoder (ABZO sensor) temperature reaches the upper limit, the motor overheat protection alarm will generate.

- **Operate the cylinder in the range of the operating ambient temperature.**

If the cylinder is used outside of the operating ambient temperature, it may not operate properly.

■ Operation

- **Keep 20 m (65.6 ft.) or less for the wiring distance between the cylinder and driver.**

To extend more than 20 m (65.6 ft.) may cause the thrust to reduce.

- **Holding torque at standstill**

The holding force at standstill for the cylinder is a value when the current cutback function (stop current 50%) is enabled. Note the holding force is reduced in the current cutback state. In addition, turning off the power supply causes the holding force of the cylinder to lose. Make sure a load does not fall.

- **Do not perform push-motion operation at the speed exceeding the maximum push speed or the maximum push-motion return-to-home speed.**

The mechanical impact may cause damage to the cylinder. If the ball screw was pressed at high speed, take measures by referring to "8 Troubleshooting" on p.23.

- **Do not perform push-motion operation with the cylinder of ball screw lead 1 mm.**

The TLC output may be turned ON before push-motion operation is complete. (Push-motion return-to-home operation can be performed.)

■ Inspection

- **Grease**

Grease on the ball screw or linear guide may darken during the initial operation (one to three weeks). Refer to p.20, and wipe off the dirty grease to apply new grease.

■ Notes when the connection cable is used

Note the following points when our cable is used.

- **When inserting the connector**

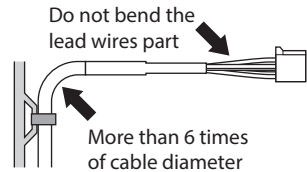
Hold the connector main body, and insert it in straight securely. Inserting the connector in an inclined state may result in damage to terminals or a connection failure.

- **When unplugging the connector**

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

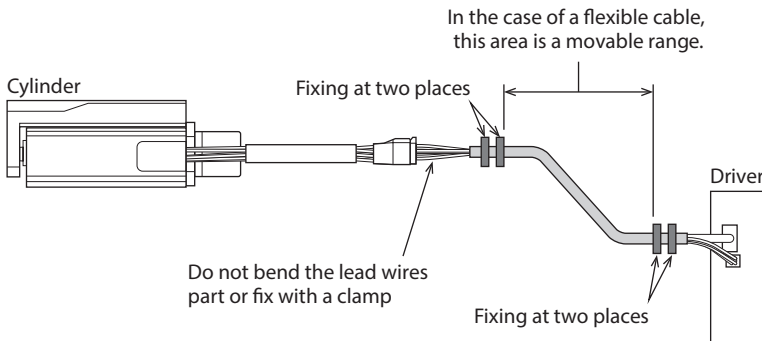
- **Bending radius of cable**

Use the cable in a state where the bending radius of the cable is more than six times of the cable diameter. Do not bend the lead wires part or fix it with a clamp. Doing so may cause damage to the connector.



- **How to fix the cable**

Fix the cable near the connectors at two places as shown in the figure or fix it with a wide clamp to take measures to prevent stress from being applied to the connectors.



4 Preparation

4-1 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.

- Compact motorized cylinder 1 unit
- Instructions and Precautions for Safe Use..... 1 copy

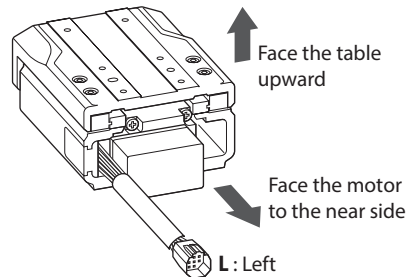
4-2 How to identify the product model

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

DR **28** **W** **2.5** **BC** **03** - **AZ** **A** **K** **L**
 1 2 3 4 5 6 7 8 9 10

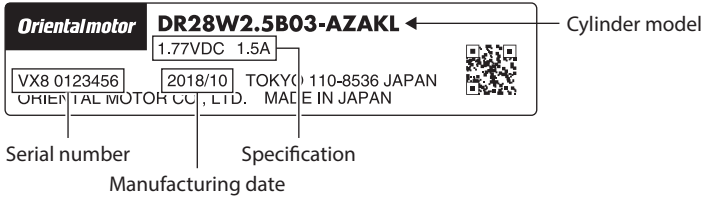
1	Series	DR: DR Series
2	Frame size of the equipped motor	28: 28 mm
3	Type	W: Wide table type
4	Ball screw lead	1: 1 mm 2.5: 2.5 mm
5	Ball screw type	B: Precision ball screw BC: Precision ball screw with cover
6	Stroke	03: 30 mm
7	Equipped motor	AZ: AZ Series
8	Additional function	A: None
9	Motor power supply type	K: DC power supply input
10	Cable outlet direction *	L: Left (Outlet position: Left side of motor)

* The cable outlet direction represents the direction when the table is faced upward and the motor is placed on the near side.



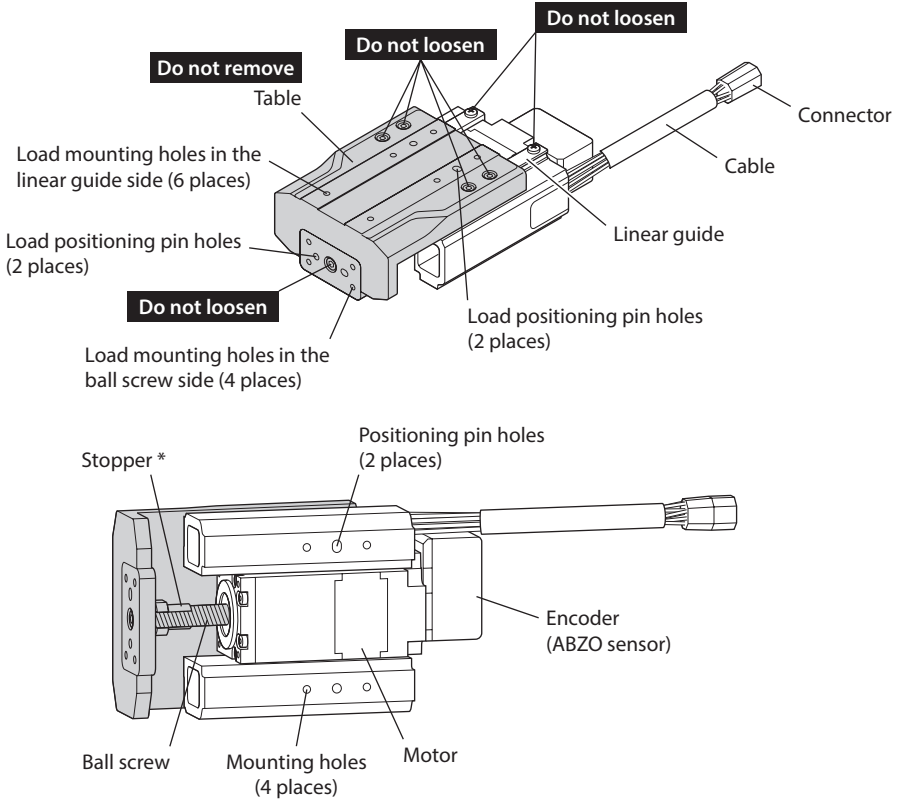
4-3 Information about nameplate

The figure shows an example.



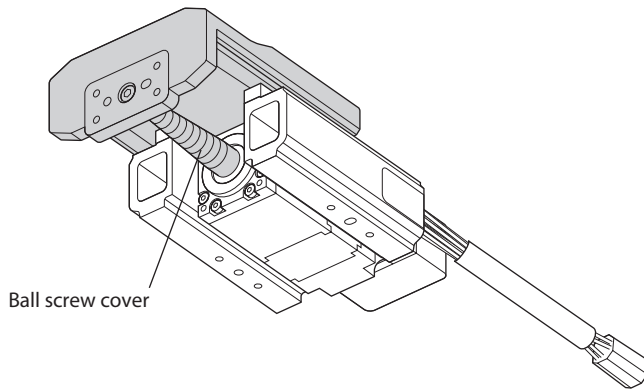
4-4 Names of parts

The area indicated in gray color represents a moving part.



* This prevents the ball screw from retracting completely into the motor.

■ With ball screw cover



4-5 Driver for possible combinations

Use the **DR** Series in combination with the **AZ** Series DC power input type driver.

5 Installation

5-1 Location for installation

The cylinder is designed and manufactured to be incorporated 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: 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
- Up to 1,000 m (3,300 ft.) above sea level

■ If the cylinder is installed in an environment where a magnetic field is generated

A magnetic sensor is built into the encoder (ABZO sensor). If the cylinder is installed close to equipment which generates a strong magnetic field, the encoder (ABZO sensor) may break or malfunction. Keep the magnetic flux density on the surface of the encoder (ABZO sensor) so as not to exceed the values in the table.

Model	Magnetic flux density
DR28	2 mT *

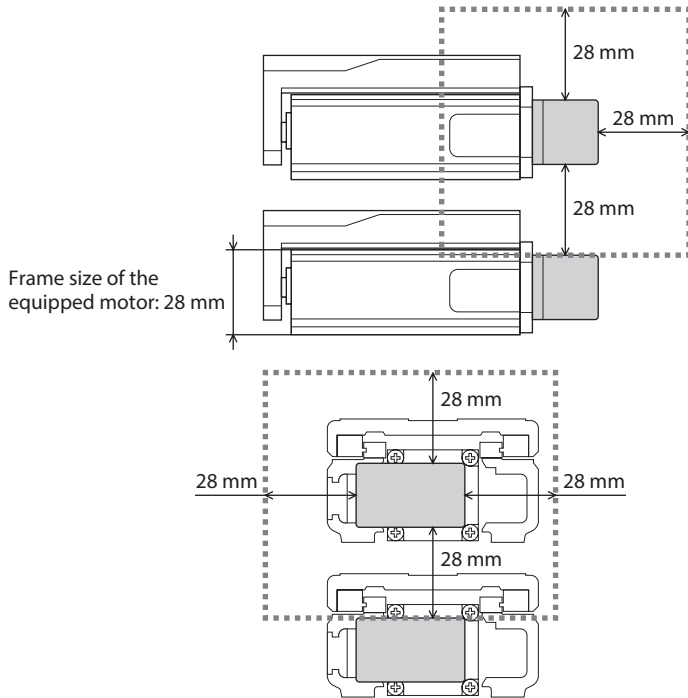
* When the magnetic flux density is exceeding 1 mT and 2 mT or less, use in an environment where the operating ambient temperature is exceeding 20 °C (68 °F) and 40 °C (104 °F) or less.



Do not install the cylinder close to equipment which generates a strong magnetic field.

■ Spaces required for installation

The encoder (ABZO sensor) is easily affected by a magnetic field. Therefore, when cylinders are installed side by side, ensure the distances from the encoder (ABZO sensor) in horizontal and vertical directions as shown in the figure.



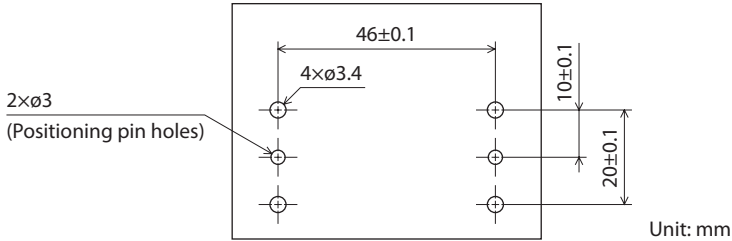
5-2 Design for mounting plate

The cylinder can be installed in any direction.

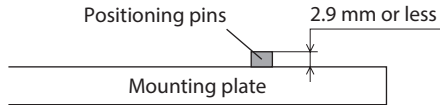
Install the cylinder onto an appropriate flat mounting plate [thickness approximately 5 mm (0.2 in.) or more] having excellent vibration resistance and heat conductivity. If a high accuracy is required, design the thickness of the plate in consideration of installation conditions such as load condition, rigidity, vibration, and others.

Values of the tightening torque are recommended. Tighten with an appropriate torque according to the design conditions of the mounting plate and load.

The following shows the recommended design dimensions of a mounting plate required when the cylinder is installed.



Note When the positioning pins are installed on the mounting plate, the height of the positioning pins should be 2.9 mm or less from the upper surface of the mounting plate. Exceeding 2.9 mm may cause the cylinder to break, leading to injury or mechanical damage.

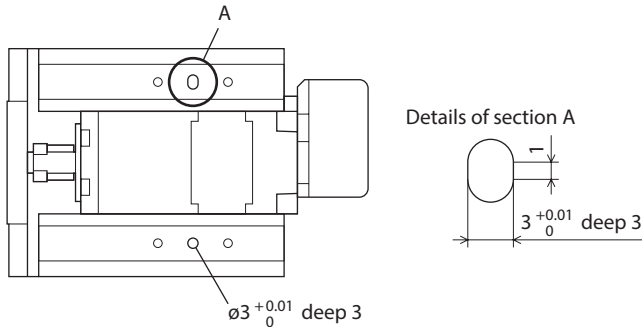


● Specification of mounting holes

Model	Nominal size	Tightening torque	Effective depth of screw thread
DR28	M3	1 N·m (142 oz-in)	5 mm

● Specification of positioning pin holes (Unit: mm)

Recommended size of positioning pin: $\phi 3 \begin{smallmatrix} 0 \\ -0.01 \end{smallmatrix}$



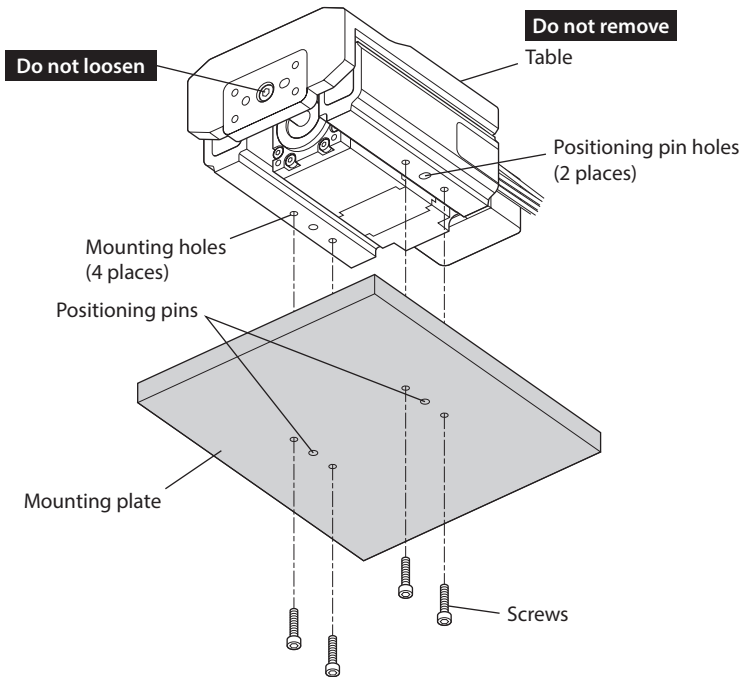
5-3 Installation method

1. Install the positioning pins on the mounting plate.

Note Be sure to install the positioning pins on the mounting plate. Pressing the positioning pins into the cylinder may cause damage.

memo When a squareness is required with respect to the traveling direction of the table, adjust the table so that it is perpendicular to the traveling direction using only the round positioning pin hole.

2. Install the cylinder while the positioning pins are inserted into the positioning pin holes of the cylinder, and secure the mounting holes with screws (not included).



Note Do not detach the table or loosen the screws of the table. Doing so may deteriorate the installation accuracy of the ball screw, resulting in malfunction or shorter service life of the cylinder. Also, the home position set in the encoder (ABZO sensor) at the time of shipment may be deviated, and this may cause unexpected movements, leading to damage to equipment.

5-4 Installing a load

There are two load mounting surfaces, which are provided on the linear guide side and the ball screw side.

■ Note when installing a load

Although the wide table type cylinder can receive a load moment, use it less than the specifications. Operating the cylinder under an excessive load moment may cause malfunction or shorter service life of the cylinder. Check the specifications of the products on p.24.

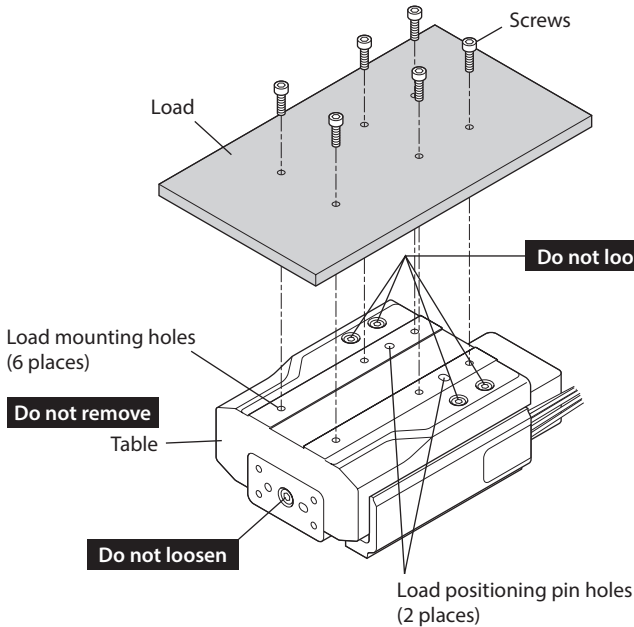
■ When using load mounting holes in the linear guide side

● Specification of load mounting holes

Model	Nominal size	Tightening torque	Effective depth of screw thread
DR28	M3	1 N·m (142 oz-in)	5 mm

● Installation method

Secure the load with screws (not included).



Note

- Do not detach the table or loosen the screws of the table. Doing so may deteriorate the installation accuracy of the ball screw, resulting in malfunction or shorter service life of the cylinder. Also, the home position set in the encoder (ABZO sensor) at the time of shipment may be deviated, and this may cause unexpected movements, leading to damage to equipment.
- The flatness of the mounting surface on a load side should be 0.01 mm or less. Poor flatness may cause the table to deform, resulting in malfunction or damage to product.

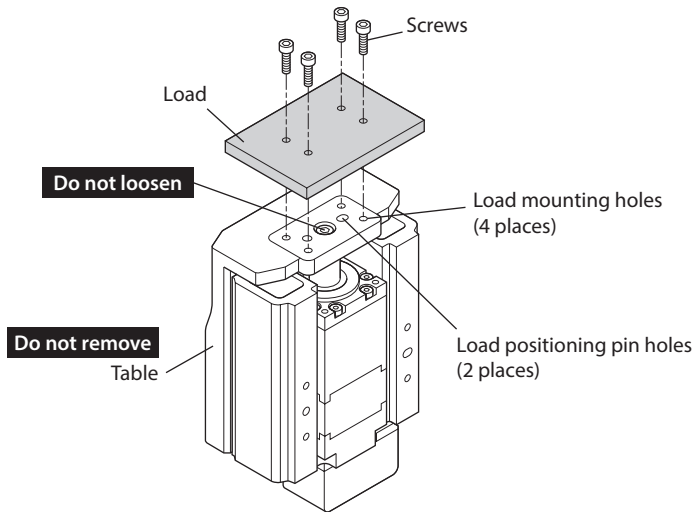
■ When using load mounting holes in the ball screw side

● Specification of load mounting holes

Model	Nominal size	Tightening torque	Effective depth of screw thread
DR28	M3	1 N·m (142 oz-in)	5.5 mm

● Installation method

1. Retract the ball screw until the table stops.
2. Secure the load with screws (not included).

**Note**

Do not detach the table or loosen the screws of the table. Doing so may deteriorate the installation accuracy of the ball screw, resulting in malfunction or shorter service life of the cylinder. Also, the home position set in the encoder (ABZO sensor) at the time of shipment may be deviated, and this may cause unexpected movements, leading to damage to equipment.

■ Load positioning pin holes

Two types of load-positioning pin holes, which are an elongated hole and a round hole, are provided on the table. If installation repeatability is required when installing a load, use the load-positioning pin holes.

Note Be sure to secure the positioning pins to the load side. Pressing the positioning pins into the table may cause the cylinder break.

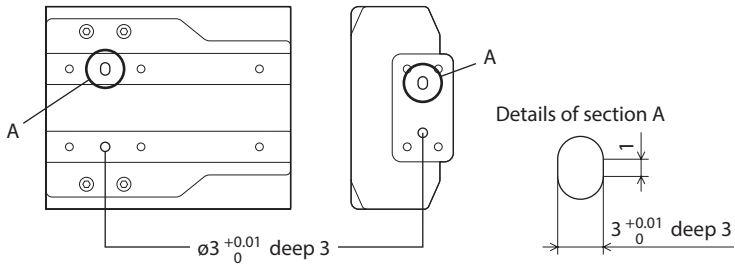
memo When a squareness is required with respect to the table, adjust a load so that it is perpendicular to the table using only the round positioning pin hole.

Specification of load positioning pin holes [Unit: mm]

Recommended size of positioning pin: $\phi 3 \begin{smallmatrix} 0 \\ -0.01 \end{smallmatrix}$

• Linear guide side

• Ball screw side



6 Connection

Refer to the operating manual of the driver for how to connect with the driver and the wiring distance between the cylinder and driver.

7 Inspection and maintenance

7-1 Maintenance item and timing

If the cylinder is operated eight hours a day, perform maintenance according to the applicable period specified in the table. Reduce maintenance intervals accordingly if the operating rate is high such as continuous operation for twenty-four hours.

Maintenance timing	External inspection	External cleaning	Internal inspection
When operated for the first time	○	○	—
A week after initial operation	○	○	○
Every a month thereafter	○	○	○

■ External inspection

Check the items specified in table.

Item	Inspection item	Remedial action
Cylinder	<ul style="list-style-type: none">• Check if any of the screws having installed the cylinder comes loose.• Check if any of the screws having installed a load comes loose.	Tighten the screws securely.
Cable, connector	<ul style="list-style-type: none">• Check if a damage or stress is applied on the cable.• Check if the connection part between the cylinder and driver comes loose.	<ul style="list-style-type: none">• Replace the cable.• Disconnect and reconnect the connector.
Operation	Check if an unusual noise or vibration is generated from a bearing part.	Check the installation of the load and operation speed.

■ External cleaning

Clean the exterior surface of the cylinder whenever necessary.

- Wipe off any dirt and stains using a soft cloth.
- Do not apply compressed air. Dust may enter from a space, resulting in malfunction.
- To remove stubborn stains, wipe the area using a soft cloth moistened with neutral detergent.
- Do not use petroleum solvents, since they will damage the coated surface.

■ Internal inspection

Visually check the items specified in table. Even if the grease has turned brown, lubrication condition is deemed appropriate if the running surface still appears glossy. Refer to "7-2 Applying grease" for how to apply grease.

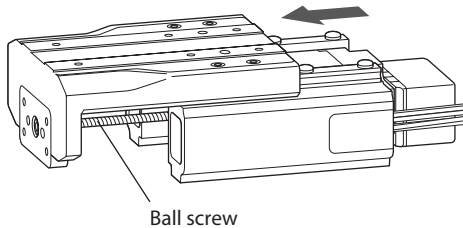
Item	Inspection item	Remedial action
Ball screw	Check if any of foreign objects such as dust is adhered.	Remove the foreign matter.
	Check if the grease has lost its gloss or has been consumed.	Clean the ball screw with a soft cloth and apply grease.
Linear guide	Check if any of foreign objects such as dust is adhered.	Remove the foreign matter.
	Check if the grease has lost its gloss or has been consumed.	Clean the linear guide with a soft cloth and apply grease.

7-2 Applying grease

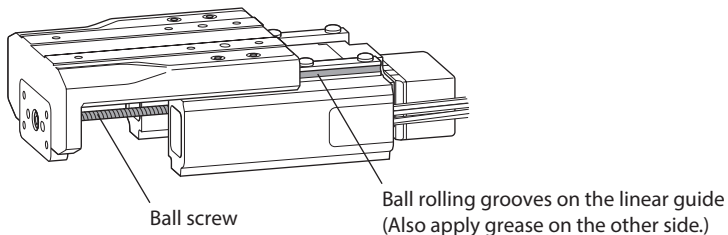


Wear protective goggles when applying grease. Pay attention to safety and handle the grease carefully by following the instructions provided with that product. If grease gets into the eyes or comes in contact with the skin, immediately flush the area thoroughly with water.

1. Turn the ball screw by hand to draw from the motor.



2. Wipe off the old grease and any dirt completely with a soft cloth, and apply new grease to the lubrication places shown in the figure.
Grease to be used : AFC grease (THK CO., LTD.)



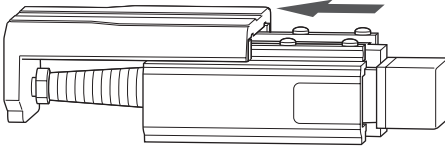
■ For cylinder with ball screw cover

Apply grease to the cylinder with ball screw cover according to the following procedures.

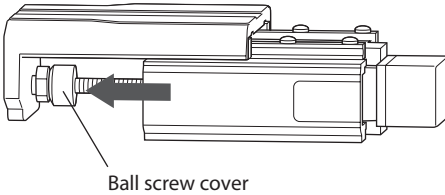


Do not touch the ball screw cover with bare hands. Doing so may cut fingers or the like by the ball screw cover.

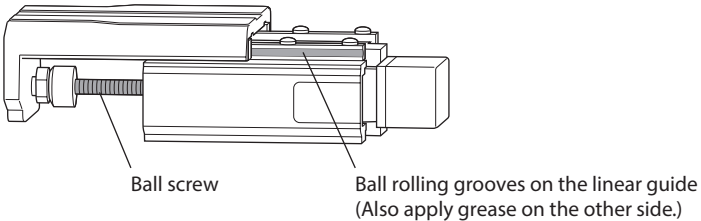
1. Turn the ball screw by hand to draw from the motor.



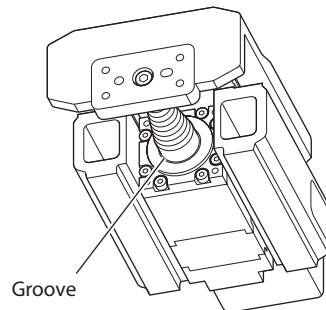
2. Draw the ball screw cover to the end of the ball screw.



3. Wipe off the old grease and any dirt completely with a soft cloth, and apply new grease to the lubrication places shown in the figure.
Grease to be used : AFC grease (THK CO., LTD.)



4. Return the ball screw cover, and check that it can be fit in the groove.



7-3 Warranty

Check on the Oriental Motor Website for the product warranty.

7-4 Disposal

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

8 Troubleshooting

During cylinder operation, the cylinder may fail to function properly due to an improper setting or wiring. When the cylinder cannot be operated properly, refer to the contents provided in this section and take an appropriate action. If the problem persists, contact your nearest Oriental Motor sales office.

Phenomenon	Possible cause	Remedial action
The ball screw does not move with being jammed.	The ball screw was stopped by hitting a hard object in a condition where the speed or load condition was exceeded the specification value.	Return the ball screw at the recommended starting speed shown in the table next. After that, check the following items. <ul style="list-style-type: none"> • Is the screw for mounting a load come loose? • Are the ball screw and the load damaged? • Are the positions of the stopper and the home position displaced? • Is the mounting accuracy changed?
The ball screw does not operate at the command speed.	The thrust of the cylinder is not enough against a load.	Review the load.
Malfunction of cylinder.	A load moment exceeding the specification value is applied.	Use the cylinder with a load moment of the specification value or smaller.
The thrust of the cylinder has lowered.	The wiring distance is exceeded the specification value.	Set the distance between the cylinder and driver within 20 m (65.6 ft.).
	The viscosity of the grease was changed.	Refer to "9-2 General specifications" on p.25, and check the operating ambient temperature.

Recommended starting speed

Model	Lead	Recommended starting speed
DR28	1 mm	0.2 mm/s
	2.5 mm	0.5 mm/s

9 Specifications

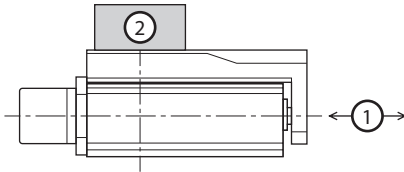
9-1 Product specifications

Cylinder model		DR28W1B03-AZAKL DR28W1BC03-AZAKL	DR28W2.5B03-AZAKL DR28W2.5BC03-AZAKL
Ball screw lead [mm]		1	2.5
Ball screw type		Precision	Precision
Repetitive positioning accuracy [mm]	① Tip position	±0.003	±0.003
	② Upper side	±0.005	±0.005
Lost motion [mm]		0.03 or less	0.03 or less
Minimum travel amount [mm]		0.001	0.001
Permissible moment [N·m] *1	Static permissible moment	M _P : 0.6 M _V : 0.5 M _R : 16.2	M _P : 0.6 M _V : 0.5 M _R : 16.2
	Dynamic permissible moment		
Transportable mass [kg]	Horizontal	4	4
	Vertical	4	2
Thrust [N]		40	20
Push force [N]		—	50
Holding force [N]		40	20
Stroke [mm]		30	30
Maximum speed [mm/s] *2		40	100
Maximum acceleration [m/s ²]		0.2	0.5

*1 Ensure a load is below the value of the thrust.

*2 The maximum speed may decrease depending on the ambient temperature or the connection cable length.

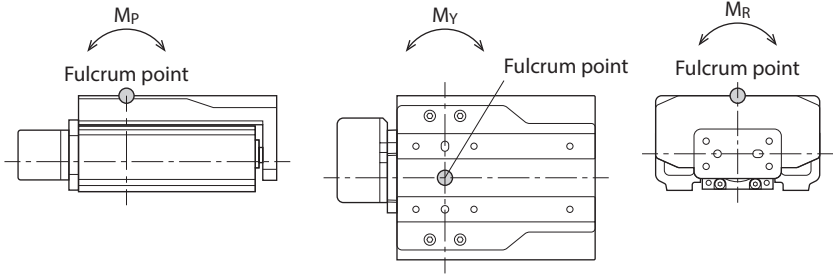
● Repetitive positioning accuracy



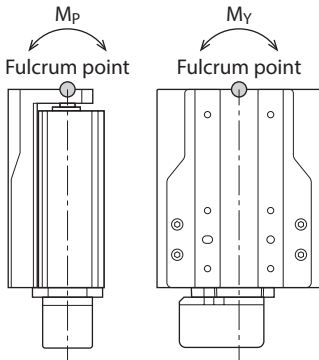
① is the repetitive positioning accuracy of the tip position of the table.

② is the repetitive positioning accuracy of the upper side (on the linear guide).

● Permissible moment (Horizontal direction)

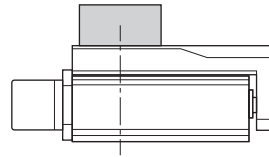


● Permissible moment (Vertical direction)

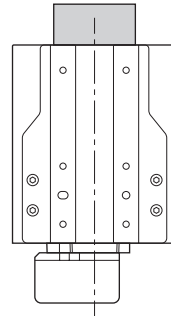


● Transportable mass

• Horizontal direction



• Vertical direction



9-2 General specifications

Operating environment	Ambient temperature	0 to +40 °C [+32 to +104 °F] (non-freezing)
	Ambient humidity	85% or less (non-condensing)
	Altitude	Up to 1,000 m (3,300 ft.) above sea level
Storage environment, Shipping environment	Ambient temperature	-20 to +60 °C [-4 to +140 °F] (non-freezing)
	Ambient humidity	85% or less (non-condensing)
	Altitude	Up to 3,000 m (10,000 ft.) above sea level
Noise level		70 dB (A) or less

10 Regulations and standards

10-1 CE Marking/UKCA Marking

■ EU EMC Directive/UK EMC Regulation

The driver combining with the actuator is affixed the marks under the EMC. For details about applicable standards and others, check with the operating manual of the driver.

10-2 EU RoHS Directive/UK RoHS Regulation

This product does not contain the substances exceeding the restriction values.

10-3 Machinery Directive

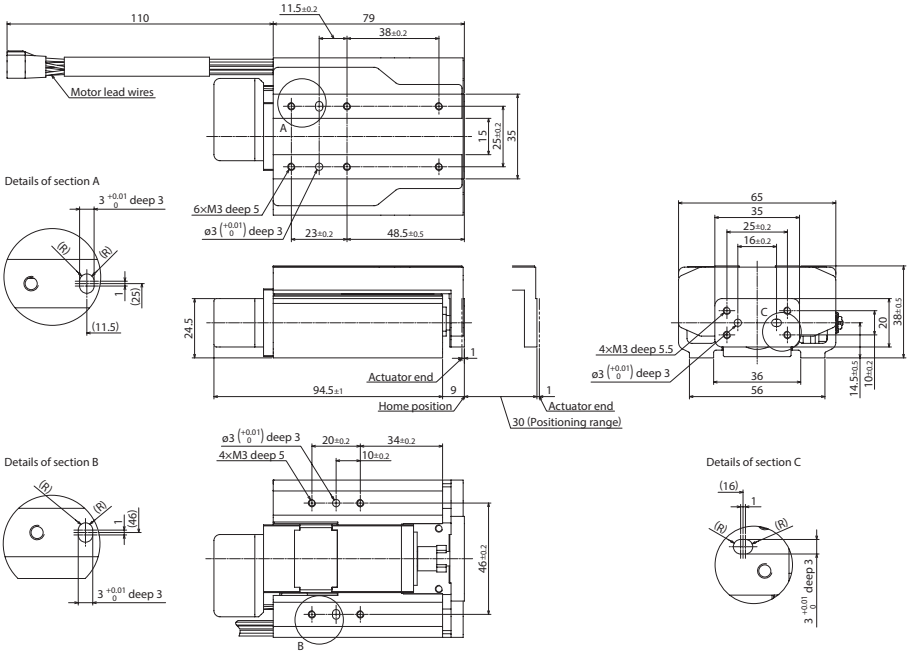
The cylinder and driver have been designed and manufactured to be incorporated in general industrial equipment, and a Declaration of Incorporation of Partly Completed Machinery is issued with them according to the Machinery Directive.

Applicable Standards: EN ISO 12100

11 Dimension

Model	Mass [kg (lb.)]
DR28W1B03-AZAKL DR28W1BC03-AZAKL DR28W2.5B03-AZAKL DR28W2.5BC03-AZAKL	0.46 (1.01)

Unit: mm



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