Oriental motor

HP-1426-4

Compact linear actuator

DRL Series
Actuator

OPERATING MANUAL

Table of Contents

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.

Notes to the user

- This product must be handled by qualified personnel with expert knowledge of electrical and mechanical engineering. Before using the product, read "Safety precautions" carefully to ensure correct use.
- The product is designed and manufactured for use as an internal component for general industrial equipment. Do not use the product for any other purpose. Oriental Motor shall not be liable whatsoever for any damage arising from a failure to observe this warning.
- Should you require the inspection or repair of internal parts, contact the Oriental Motor office where you purchased the product.
- 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 the nearest office.
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Composition and contents of this operating manual

This manual describes the actuators used with the **DRL** series.
To operate a **DRL** series actuator, the actuator and driver must be set up first. Read the following operating manuals regarding the **DRL** series and follow the instructions.

- **DRL series actuator OPERATING MANUAL (this manual)**
  Explains the installation of the actuator and a load.
- **DRL series driver OPERATING MANUAL**
  Explains the installation, connection, I/O, setting and troubleshooting of the driver.

Before using this product

This section covers items you should know before using this **DRL** series actuator.

Introduction

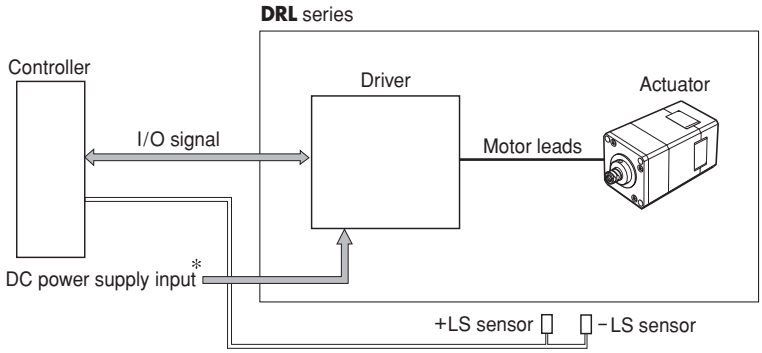
This section covers the main features and system configuration.

■ Main features

The compact linear actuator **DRL** series is a family of linear motion actuators adopting a new mechanism: a 5-phase stepping motor incorporating a ball screw.

■ System configuration

Operating the **DRL** series requires a controller equipped with a pulse output function.



* As for the voltage supply to the driver, use a DC power source with reinforced insulation on both the primary and secondary sides.

■ Hazardous substances

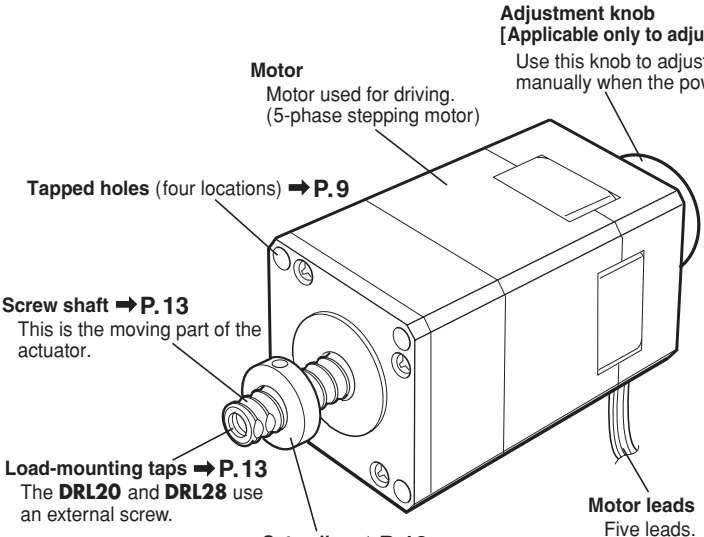
RoHS (Directive 2002/95/EC 27Jan.2003) compliant

Names and functions of parts

This section covers the names and functions of the actuator's respective parts.
See the reference page indicated for details on each part.

■ Standard type

Illustration shows the **DRL60P** standard type.



Adjustment knob
[Applicable only to adjustment knob type] ➡ **P. 17**
Use this knob to adjust the position manually when the power is off.

Motor
Motor used for driving.
(5-phase stepping motor)

Tapped holes (four locations) ➡ **P. 9**

Screw shaft ➡ **P. 13**
This is the moving part of the actuator.

Load-mounting taps ➡ **P. 13**
The **DRL20** and **DRL28** use an external screw.

Set collar ➡ **P. 13**
This prevents the screw shaft from retracting completely into the case.

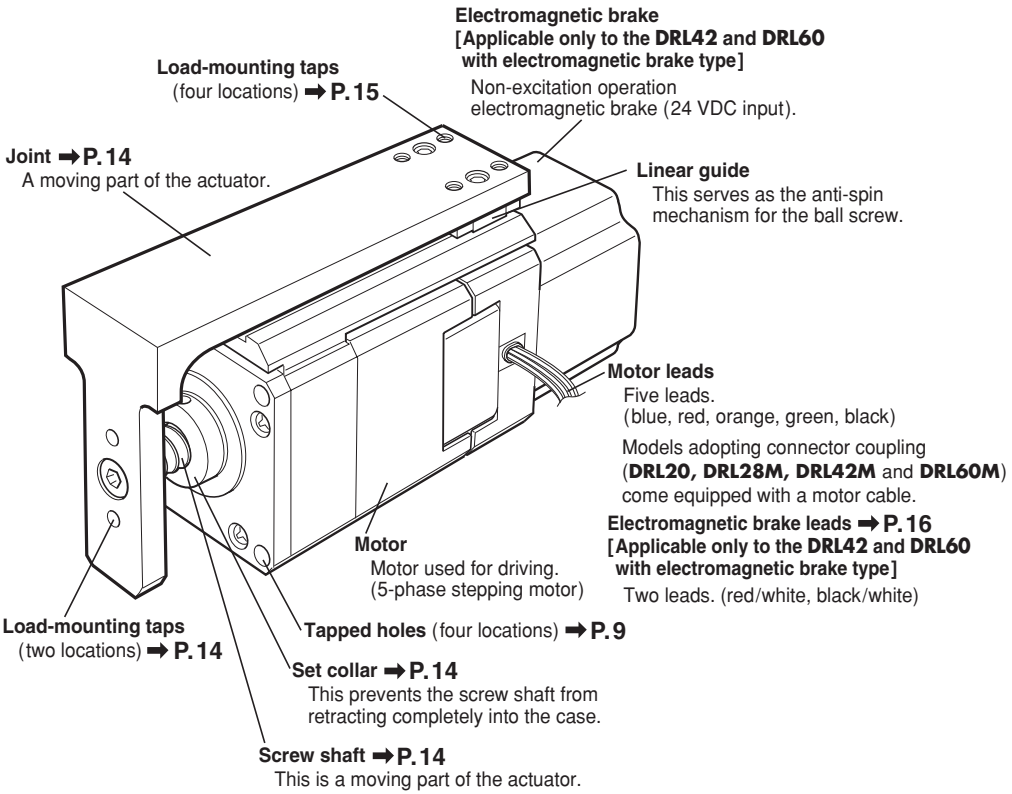
Motor leads
Five leads.
(blue, red, orange, green, black)

Models adopting connector coupling (**DRL20, DRL28M, DRL42M** and **DRL60M**) come equipped with a motor cable.

* The standard type is also available with an electromagnetic brake. (**DRL42** and **DRL60** only)

■ Guide type

Illustration shows the **DRL60P** Guide type.



Varistor
[Applicable only to the electromagnetic brake type] ➡ P.16

Be sure to connect the varistor when wiring the electromagnetic brake.

∗ The guide type is also available with an adjustment knob.

Safety precautions

This product is designed for incorporation into industrial equipment. Touching the product during operation may result in bodily injury or property damage, since the screw shaft is rotating and the surface of the actuator remains very hot.
To prevent bodily injury or damage to the product, be sure the product is handled and operated only by qualified personnel familiar with operations involving electronic equipment.

The precautions provided in this section are intended to ensure safe and correct use of the product, thereby preventing damage or injury to the user or other personnel. Fully understand the meaning of each item before using the product.

⚠ Warning

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

⚠ Caution

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

NOTE

The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.

⚠ Warning

General

- Do not use the product in an atmosphere containing explosive, flammable or corrosive gases, in a place exposed to water, or near flammable objects. Doing so may result in fire or injury.
- Provide a measure to retain the position of the moving parts of the equipment when the product is used in a vertical application. The actuator loses its holding capability when the power is cut off. Without an appropriate measure the moving parts will descend, resulting in injury or equipment damage.
- Do not use the actuator's built-in electromagnetic brake mechanism for stopping or for safety purposes. Using it for purposes other than holding the moving parts and actuator in position may cause injury or damage to equipment.

Installation

- Install the actuator in an enclosure in order to prevent injury.

Repair, disassembly and modification

- Do not repair, disassemble or modify the actuator. Doing so may result in injury.

⚠ Caution

General

- Do not use the actuator beyond its specifications. Doing so may result in injury or equipment damage.
- Do not touch the actuator during operation or immediately after stopping. The surface is hot and may cause a burn.

Transportation

- Do not hold the actuator by the motor leads. Doing so may result in injury.

Installation

- Do not place flammable objects near the actuator. Doing so may result in fire or burns.
- Do not place objects near the actuator that may prevent proper ventilation. Doing so may result in equipment damage.
- Provide a cover for the movable part of the actuator. Failure to do so may result in injury.

Disposal

- To dispose of the actuator, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.

Precautions for use

This section covers the limitations and points to note regarding use of the **DRL** series actuator.

■ Maximum thrust force

Always operate the actuator under a load not exceeding the maximum thrust force.
Operating the actuator under a load beyond the maximum thrust force or allowing the screw shaft to remain locked may cause damage to the motor's bearing (ball bearing).
When using the actuator in a lift application, operate it under a load not exceeding the maximum vertical load and without the application of an external force.

■ Maximum load moment

Always operate the actuator under a load moment within the permissible value.
Operating the actuator continuously in conditions under a load moment beyond the permissible value may result in a malfunction or shorter service life of the actuator.

■ Do not let the screw shaft hit the stroke end or load

Do not let the screw shaft hit the stroke end or equipment during operation, since such an impact may damage the actuator. Should the screw shaft hit the stroke end or load, retract the shaft at the recommended starting speed.

Model	Recommended starting speed [mm/s (in/sec)]
DRL20, DRL28	0.2 (0.01)
DRL42	0.4 (0.02)
DRL60	0.8 (0.03)

■ For a lift device, provide a measure to prevent the moving part from dropping

The actuator loses its holding brake force upon the occurrence of a power failure or when the A.W.OFF (all windings off) input is turned to "ON". When the actuator is used in a lift device such as an elevator, provide a measure to prevent the moving parts from dropping.

■ Actuator surface temperature

Use the actuator in conditions where its surface temperature will not exceed 90°C (194°F).
If the surface temperature of the actuator case exceeds 90°C (194°F) due to operating conditions (ambient temperature, operating speed, operating duty, etc.), a damaged motor coil or shorter service life of the bearing (ball bearing) may result.

■ Grease on screw shaft

Grease on the screw shaft may darken slightly within a short time after the start of operation. This is not a problem if there is no abnormal noise (i.e., from deflection or interference). Wipe off the dirty grease with a rag, and apply new grease.
If the grease on the screw shaft has darkened after the initial operation (one to three weeks), check the accuracy of installation.

■ Measure insulation resistance or conduct a dielectric-strength test on actuator alone

Measuring insulation resistance or conducting dielectric-strength test with the actuator and driver connected may damage your product.

■ Standard type actuator

● Provide an anti-spin mechanism for the screw shaft

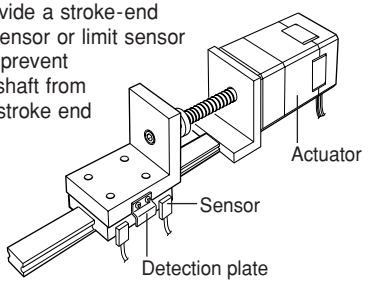
The standard type cannot be operated without an anti-spin mechanism for the screw shaft. Always provide an anti-spin mechanism externally to the product. In addition, make sure the load installed to the screw shaft is supported with a linear guide, etc.

● Installation accuracy

When using the standard type, always install it within the specified installation accuracy.
Low accuracy of installation may result in a malfunctioning actuator or shorter service life of the ball screw. ➡ Page **13**

● Stopping the screw shaft

When operating the standard type, always provide a stroke-end detection sensor or limit sensor in order to prevent the screw shaft from hitting the stroke end or load.



● When a carrier guide for load is provided

When a carrier guide for load is provided, always use the standard type. (Do not use the guide type.)

■ Guide type

The linear guide of the guide type is mainly used as the anti-spin mechanism.
Do not apply a load moment to the linear guide of the **DRL20** and **DRL28**.
The **DRL42** and **DRL60** can withstand a slight load moment using the load-mounting taps at the joint.

■ Electromagnetic brake

● Use the electromagnetic brake type for an application involving up/down travel.

For a lifter or other device in which the load moves up and down, use the electromagnetic brake type and provide an additional safety-brake mechanism to hold the load in position.
To hold the load in position, apply the electromagnetic brake only after the actuator has stopped. Repeated braking for such a purpose will wear the brake hub excessively, causing its holding ability to drop.

● Connecting an electromagnetic brake

The electromagnetic brake operates via the ON/OFF status of the DC power supply. When connecting the electromagnetic brake leads, observe the correct polarity. Be sure to connect the supplied varistor (non-polarized) to protect the switch contacts and prevent noise. ➡ Page **16**

■ Adjustment knob type

Use the adjustment knob to adjust the position manually when the power is off.
Do not touch the adjustment knob when the actuator is operating. To do so may cause an actuator malfunction or cause damage to the actuator.

Installation

This section covers the actuator's installation location and method, as well as the method for installing a load.

Location for installation

The actuator is designed and manufactured for use as a built-in component in industrial equipment.

Install it in a well-ventilated place satisfying the following conditions, where the product can be easily accessed for the purpose of inspection.

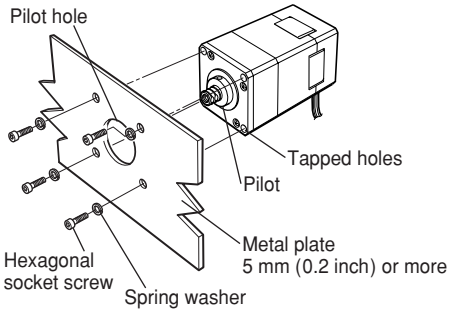
- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature
  - •Grounded ball screw, Rolled ball screw
    : 0 to +40°C (+32 to +104°F) [non-freezing]
  - •Corrosion-resistant ground ball screw
    : +5 to +40°C (+41 to +104°F)
- Operating ambient humidity 85% or less (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rains, water droplets), oil (oil droplets) or other liquids
- Area 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

Installing the actuator

Install the actuator to a rigid metal plate.
A mounting plate (model: **PADRL-**□□) is available as an option. See page 11 for details.

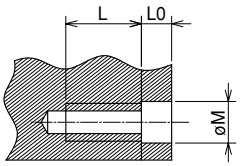
1. Insert the pilot located on the actuator's installation surface into the metal plate's countersunk hole or through-hole.

2. Securely tighten the four screws so as to leave no gaps between the actuator's installation surface and the metal plate.
Install the actuator to a metal plate [with a thickness of 5 mm (0.2 inch) or more] with a smooth surface providing excellent vibration resistance and thermal conductivity.



The above figure shows an installation example of the standard type.

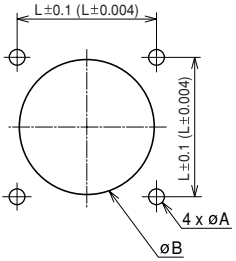
● Details of tapped hole



Model	Nominal diameter of bolt	Tightening torque [N·m (oz-in)]	Dimension of tapped hole [mm (inch)]		
			ø M	L0	L (Effective depth)
DRL20	M2	0.4 (56)	2.3 (0.09)	2 (0.08)	5 (0.2)
DRL28	M2.5	0.6 (85)	3 (0.12)	2 (0.08)	6 (0.24)
DRL42	M4	1.8 (250)	–	–	8 (0.31)
DRL60	M5	5.0 (710)	5.5 (0.22)	4 (0.16)	10 (0.39)

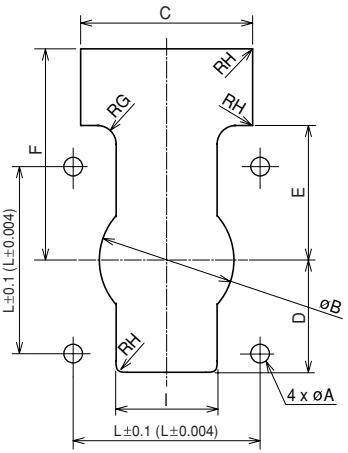
■ Plate cutout for mounting Unit=mm (inch)

● Standard type



	DRL20	DRL28	DRL42	DRL60
L	16 (0.63)	23 (0.906)	31 (1.22)	50 (1.969)
A	2.3 (0.09)	3 (0.12)	4.5 (0.18)	5.5 (0.22)
B	16 to 17 (0.63 to 0.67)	22 to 23 (0.87 to 0.91)	25 to 27 (0.98 to 1.06)	36 to 38 (1.42 to 1.5)

● Guide type



	DRL20	DRL28	DRL42	DRL60
L	16 (0.63)	23 (0.906)	31 (1.22)	50 (1.969)
A	2.3 (0.09)	3 (0.12)	4.5 (0.18)	5.5 (0.22)
B	16 to 17 (0.63 to 0.67)	22 to 23 (0.87 to 0.91)	25 to 27 (0.98 to 1.06)	36 to 38 (1.42 to 1.5)
C	20 (0.79) or more	26 (1.02) or more	34 (1.34) or more	50 (1.97) or more
D	11 (0.43) or more	15 (0.59) or more	22 (0.87) or more	31 (1.22) or more
E	10 (0.39)	15.5 to 17.5 (0.61 to 0.69)	25 to 26 (0.98 to 1.02)	32 to 34 (1.26 to 1.34)
F	28 (1.1) or more	30 (1.18) or more	42 (1.65) or more	58.5 (2.3) or more
G	3 to 5 (0.12 to 0.2)	3 to 5 (0.12 to 0.2)	4 to 6 (0.16 to 0.24)	5 to 8 (0.2 to 0.31)
H*	R2 (0.08) or less	R2 (0.08) or less	R2 (0.08) or less	R3 (0.12) or less
I	13 to 14 (0.51 to 0.55)	14 to 16 (0.55 to 0.63)	18 to 22 (0.71 to 0.87)	29 to 35 (1.14 to 1.38)

*C, F and I indicate the minimum dimensions, while E indicates the maximum dimension.

NOTE

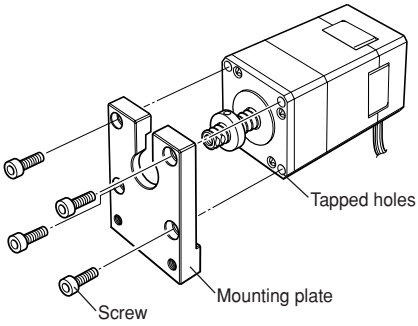
Do not remove the guide from the screw shaft. The installation accuracy of the screw shaft will decrease, resulting in a malfunctioning actuator or shorter service life of the actuator.

Installing the actuator using a mounting plate **PADRL-□□** (sold separately)

1. **Installing the actuator and mounting plate**
Install the mounting plate to the actuator by tightening the supplied screws (four pieces) into the tapped holes.

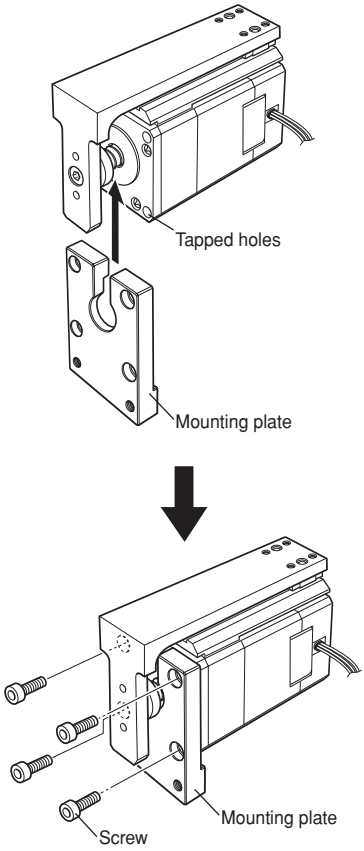
● **Standard type**

Illustration shows the **DRL60P** standard type.



● **Guide type**

Illustration shows the **DRL60P** Guide type.

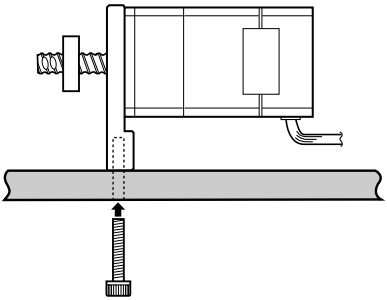


Model	Nominal diameter of bolt	Tightening torque [N·m (oz-in)]
DRL20	M2	0.4 (56)
DRL28	M2.5	0.6 (85)
DRL42	M4	1.8 (250)
DRL60	M5	5.0 (710)

2. Mounting to the equipment

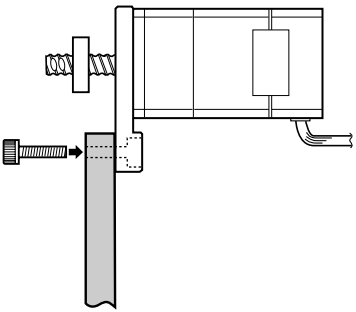
Mount the mounting plate to the equipment using two screws (not supplied).
Three methods are available.

● Type A



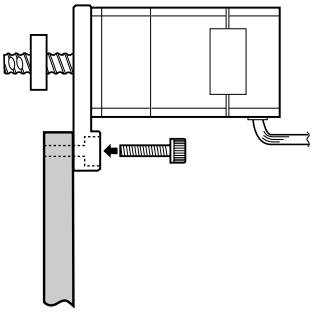
Model	Nominal diameter of bolt	Effective depth [mm (inch)]	Tightening torque [N·m (oz-in)]
DRL20	M3	6 (0.236)	1.0 (142)
DRL28	M3	8 (0.315)	1.0 (142)
DRL42	M5	10 (0.394)	5.0 (710)
DRL60	M6	10 (0.394)	5.0 (710)

● Type B



Model	Nominal diameter of bolt	Effective depth [mm (inch)]	Tightening torque [N·m (oz-in)]
DRL20	M4	5 (0.197)	1.8 (250)
DRL28	M4	5.5 (0.217)	1.8 (250)
DRL42	M6	7.5 (0.295)	5.0 (710)
DRL60	M8	16.5 (0.65)	5.0 (710)

● Type C



Model	Nominal diameter of bolt	Tightening torque [N·m (oz-in)]
DRL20, DRL28	M3	1.0 (142)
DRL42	M5	5.0 (710)
DRL60	M6	5.0 (710)

Installing a load

■ Standard type

The standard type cannot be operated without an anti-spin mechanism for the screw shaft. Always provide an anti-spin mechanism externally to the product. In addition, make sure the load installed to the screw shaft is supported with a linear guide, etc.

NOTE

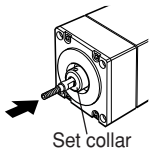
When transporting the equipment in which the actuator is installed, be sure to remove the load from the screw shaft.

● Installation method

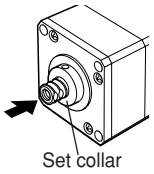
Install the load into the load mounting taps using a screw (or nut, in the case of the **DRL20** and **DRL28**). The screw, nut, and washer are not supplied with the product.

1. Retract the screw shaft until it stops at the set collar.

DRL20, **DRL28**

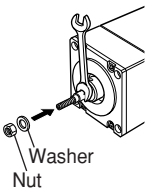


DRL42, **DRL60**

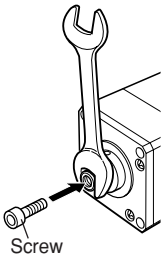


2. Holding the flat section of the screw shaft with a wrench, affix the load with a screw (or nut, in the case of the **DRL20** and **DRL28**).

DRL20, **DRL28**



DRL42, **DRL60**

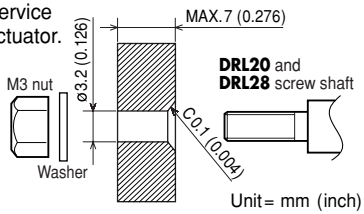


Model	Nominal diameter of screw/nut	Tightening torque* [N·m (oz-in)]
DRL20, DRL28	M3 nut	0.6 (85)
DRL42	M4 screw	1.8 (250)
DRL60	M8 screw	5.0 (710)

*Use of a thread locking adhesive is recommended.

NOTE

When installing a load to the **DRL20** and **DRL28** standard type, chamfer the load-mounting hole by a factor of 0.1 (0.004). Chamfering the end face of the screw shaft may result in a malfunctioning actuator or shorter service life of the actuator.



Unit = mm (inch)

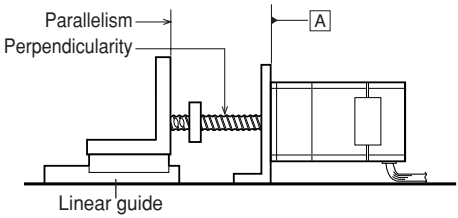
● Installation accuracy

When installing a load to the screw shaft of the standard type, ensure the installation accuracy specified below.

Similar accuracy is needed when using a mounting plate (sold separately).

Make sure the following mounting accuracy is provided using a dial test indicator or clearance gauge. Low accuracy of installation may result in a malfunctioning actuator or shorter service life of the actuator.

Standard type



Perpendicularity

DRL20:

⊥	ø0.02 (0.0008)	A

DRL28:

⊥	ø0.03 (0.0012)	A

DRL42, **DRL60**:

⊥	ø0.05 (0.002)	A

Parallelism

DRL20:

//	0.02 (0.0008)	A

DRL28:

//	0.03 (0.0012)	A

DRL42, **DRL60**:

//	0.05 (0.002)	A

Unit = mm (inch)

NOTE

If abnormal noise is heard from the actuator or the grease on the screw shaft has darkened after the initial operation (one to three weeks), check the accuracy of installation.

■ Guide type

NOTE

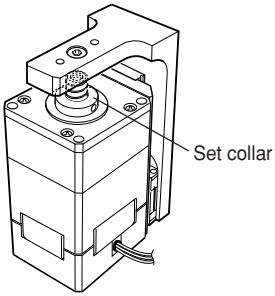
- Do not apply an overhung load to the joint of the guide type. Also, do not apply a load moment to the joint of the **DRL20** and **DRL28** guide type. Doing so may result in a malfunction or shorter service life of the actuator.
- When transporting the equipment in which the actuator is installed, be sure to remove the load from the screw shaft.

● Installation method

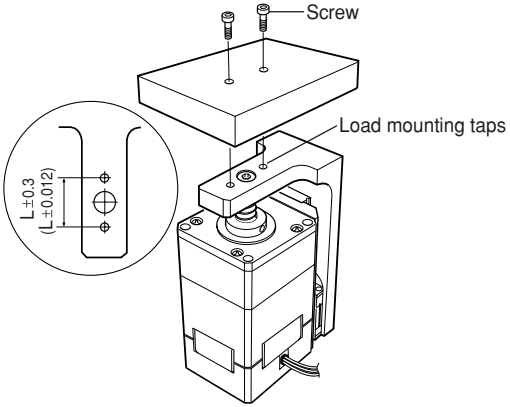
● When using load-mounting taps on the screw shaft side

Install the load using load-mounting taps at the joint and appropriate screws (not supplied with the product).

1. Retract the screw shaft until it stops at the set collar.



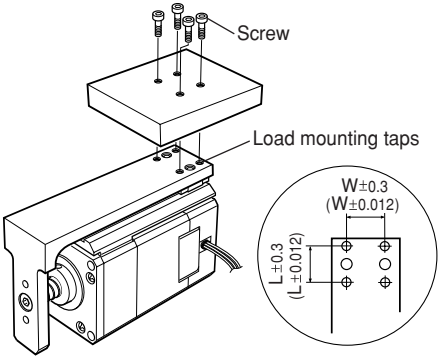
2. Affix the load with a screw.



Model	Nominal diameter of bolt	Tightening torque [N·m (oz-in)]	Effective depth [mm (inch)]	L [mm (inch)]
DRL20	M2	0.4 (56)	4 (0.157)	15 (0.591)
DRL28	M2.5	0.6 (85)	5 (0.197)	16 (0.63)
DRL42	M4	1.0 (142)	7.5 (0.295)	20 (0.787)
DRL60	M5	2.0 (280)	11.5 (0.453)	30 (1.181)

● **When using load-mounting taps on the linear-guide side**

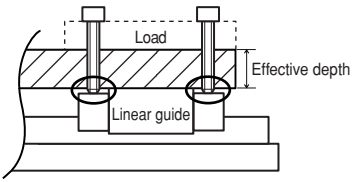
Install the load using load-mounting taps at the joint and appropriate screws (not supplied with the product).



Model	Nominal diameter of bolt	Tightening torque [N·m (oz-in)]	Effective depth [mm (inch)]	L [mm (inch)]	W [mm (inch)]
DRL20	M2	0.4 (56)	4 (0.157)	18 (0.709)	12 (0.472)
DRL28	M2.5	0.6 (85)	3.5 (0.138)	14 (0.551)	12 (0.472)
DRL42	M4	1.0 (142)	5.5 (0.217)	24 (0.945)	19 (0.748)
DRL60	M5	2.0 (280)	5.5 (0.217)	22 (0.866)	28 (1.102)

NOTE

When using the load mounting taps on the linear-guide side, use screws that do not exceed the effective depth of threads in the linear guide.
Use of long screws exceeding the effective depth may damage the linear guide.



Connection

Connecting the driver

See the operating manual for the driver.

Connecting the electromagnetic brake

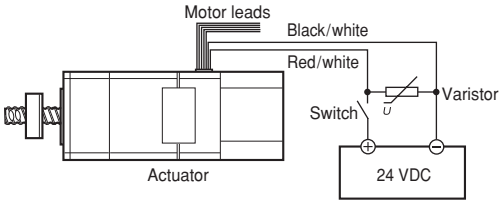
This section covers the connecting the electromagnetic brake. See the operating manual for the driver about connecting the driver.

■Connecting the electromagnetic brake

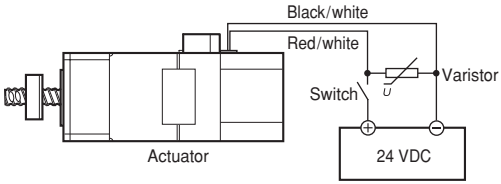
Connect the two lead wires [600 mm (24 inch)] from the actuator to the DC power supply.

1. Connect the red/white lead wire to the +24 V terminal of the DC power supply.
2. Connect the black/white lead wire to the GND terminal of the DC power supply.
3. Connect the varistor in parallel across the +24 V and GND terminals of the DC power supply.

●DRL42P, DRL60P



●DRL42M, DRL60M

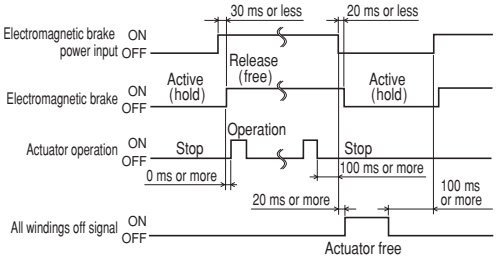


■Connecting power supply for the electromagnetic brake

The electromagnetic brake operates via the ON/OFF status of the DC power supply. For the electromagnetic brake, provide a power source of 24 VDC ±5%, 0.11 A or more if you are using the **DRL42**, or one of 24 VDC ±5%, 0.33 A or more in the case of the **DRL60**.

Use a shielded cable of AWG24 (0.2 mm^2) or more in diameter to connect the electromagnetic brake to the DC power supply, keeping the length as short as possible.

■Timing chart for the electromagnetic brake

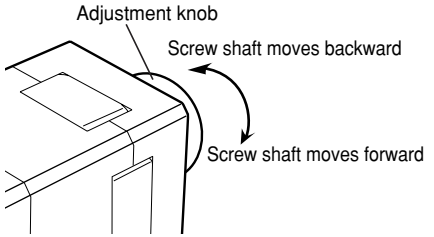


Operation

How to use the adjustment knob

(Applicable only to adjustment knob type)

Use this knob to adjust the position when the power is off by manually moving the screw shaft.
Turning the adjustment knob by one revolution moves the screw shaft by the length of the lead [**DRL20**, **DRL28**: 1 mm (0.039 inch), **DRL42**: 2 mm (0.079 inch), **DRL60**: 4 mm (0.157 inch)].
Adjust the position within the effective stroke range.



NOTE

Do not touch the adjustment knob when the actuator is operating. To do so may cause an actuator malfunction or cause damage to the actuator.

Operating speed at low temperature

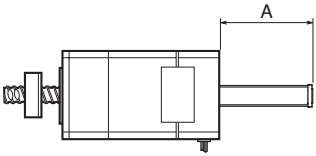
If the ambient temperature is 10°C (+50°F) or below, keep the maximum speed to the applicable value shown in the table.

Model	Ambient temperature	Maximum speed mm/s (in/sec)
DRL20	0 to +10°C (+32 to +50°F)	13 (0.51)
DRL28PA, DRL28PB		15 (0.59)
DRL42PA, DRL42PB		20 (0.79)
DRL60PA, DRL60PB		24 (0.94)
DRL28PBL	+5 to +10°C (+41 to +50°F)	15 (0.59)
DRL42PBL		20 (0.79)
DRL60PBL		24 (0.94)
DRL28MB	0 to +10°C (+32 to +50°F)	12 (0.47)
DRL42MB		15 (0.59)
DRL60MB		22 (0.87)
DRL28MBL	+5 to +10°C (+41 to +50°F)	12 (0.47)
DRL42MBL		15 (0.59)
DRL60MBL		22 (0.87)

Screw shaft projection

With actuators whose stroke is 60 mm (2.36 inch) or more, the long screw shaft projects from the end face of the actuator as shown in the figure. For these actuators, provide a sufficient space in the rear to prevent the screw shaft from contacting other parts, etc.

Model	Maximum projection length (A) mm (inch)
DRL28PA1-06G **DRL28PB1-06G**	28 (1.1)
DRL42PA2-10G **DRL42PB2-10G**	73 (2.9)
DRL60PA4-10G **DRL60PB4-10G**	64 (2.5)



Maintenance/Inspection

It is recommended that the following items be checked regularly after operation.
Should an abnormality be noted, discontinue any use and contact your nearest Oriental Motor office.

■ Inspection items

- Are there any loose actuator-mounting screws ?
- Is there any abnormal noise coming from the actuator motor, screw shaft, linear guide, etc. ?
- Is there any scratching or stress on the motor leads or loose connection between the leads and driver ?
- Is there any misalignment between the actuator's screw shaft and the load's shaft ?
- Is the grease on the actuator's screw shaft or linear guide darker ?

■ Changing grease

When the grease on the actuator's screw shaft or linear guide has become dirty, wipe off the dirty grease completely with a rag, and apply new grease.

● Grease check interval

- Once every week of operation
- Once every month

● Recommended grease

- **Grounded ball screw, Rolled ball screw**

Screw shaft: AFC Grease (THK CO., LTD.)
Linear guide: Multemp PS No. 2 (KYODO YUSHI CO., LTD.)

- **Corrosion-resistant ground ball screw**

Screw shaft: AFE Grease (THK CO., LTD.)
Linear guide: AFE Grease (THK CO., LTD.)

NOTE

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.

Options

■ Motor cable

Used for actuator connection by means of connector coupling.

Model	Cable length [m (ft.)]	Applicable product
LC5N10A	1 (3.3)	**DRL20, DRL28M**
LC5N10B	1 (3.3)	**DRL42M**
LC5N10C	1 (3.3)	**DRL60M**

■ Connector set (Molex)

A set of connector housings and contacts matching a connector-type actuators.
Each bag contains enough housings and contacts for connecting 30 actuators.

Model	Applicable actuator	Connector housings (30 pieces)	Contacts (180 pieces)	Applicable cable
CS5N30A	**DRL20 DRL28M**	51065-0500	50212-8100	AWG30 to 24 (0.05 to 0.2 mm^2) Outer diameter of sheathed cable: ø1.4 mm (ø0.06 in.) or less. Stripped length: 1.3 to 1.8 mm (0.05 to 0.07 in.)
CS5N30B	**DRL42M**	51103-0500	50351-8100	AWG28 to 22 (0.08 to 0.3 mm^2) Outer diameter of sheathed cable: ø1.15 to 1.8 mm (ø0.05 to 0.07 in.) Stripped length: 2.3 to 2.8 mm (0.09 to 0.11 in.)
CS5N30C	**DRL60M**	51144-0500	50539-8100	AWG24 to 18 (0.2 to 0.75 mm^2) Outer diameter of sheathed cable: ø1.4 to 3 mm (ø0.06 to 0.12 in.) Stripped length: 3 to 3.5 mm (0.12 to 0.14 in.)

■ Mounting plate

A dedicated mounting bracket used to install the actuator.

Model	Applicable product
PADRL-20	**DRL20**
PADRL-28	**DRL28**
PADRL-42	**DRL42**
PADRL-60	**DRL60**

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

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