Oriental motor

HL-14063-2

Compact Linear Actuators

DRL Ⅱ Series Actuator

OPERATING MANUAL

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.

Table of contents

1 Introduction

■ Before using the product

Only qualified personnel should work with the product. Use the product correctly after thoroughly reading the “2 Safety precautions” on p.7.
The product described in this manual has been designed and manufactured for use in general industrial machinery, and must not be used for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ Composition and contents of this operating manual

This is an operating manual of the actuator for the **DRL**Ⅱ Series.
Before operating the actuator, it is necessary to set up the actuator and driver.
Operating manuals enclosed with the product vary depending on the type of the driver.
Read the following operating manuals and follow the instructions.

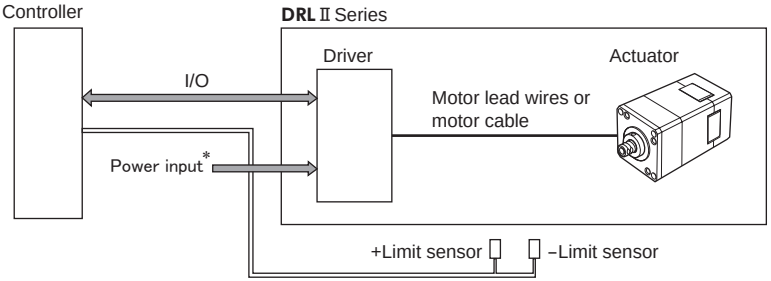
Title of operating manual		Description	How to obtain the operating manual
Pulse input type	Built-in controller type		
DRLⅡ Series Actuator OPERATING MANUAL(this document)		This manual explains the installation of the actuator and a load.	Supplied with the product
DRLⅡ Series Pulse input Type Driver OPERATING MANUAL	**DRL**Ⅱ Series FLEX Built-in Controller OPERATING MANUAL	This manual explains the installation, connection, I/O, Safty precaution of the product.	Supplied with the product
CRK Series Pulse input Type OPERATING MANUAL	**CRK** Series FLEX Built-in Controller USER MANUAL	This manual explains the function, installation/connection method, operating method and others of the driver.	This manual does not come with the product. Contact your nearest Oriental Motor sales office.

■ Overview of the product

The compact linear actuators DRLII Series is a package product consisting of an actuator and driver for achieving linear motion, which actuator mechanism adopts a 5-phase stepping motor integrated with a ball screw.

■ System configuration

Controllers with pulse output functions are needed to operate the **DRL**Ⅱ Series.



* When using the DC power input driver, use a DC power supply with reinforced insulation on its primary and secondary sides.

■ Hazardous substances

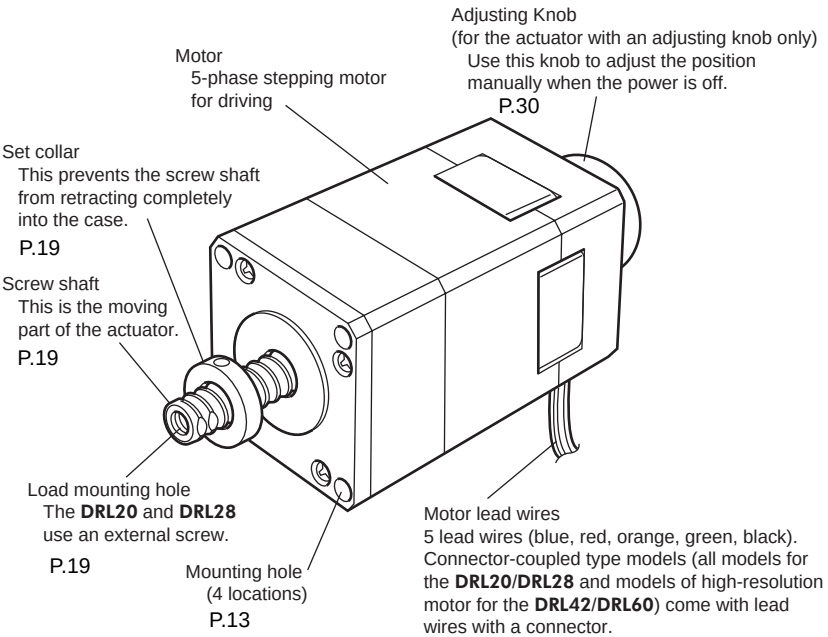
The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).

■ 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

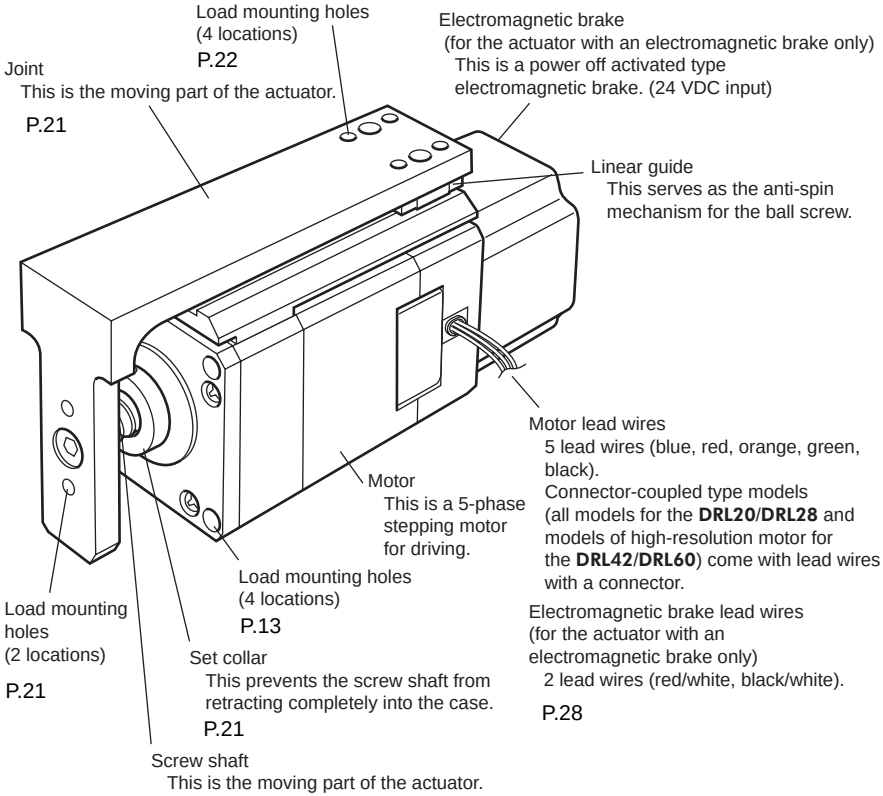
The following figure shows the standard type of the **DRL60**.



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

- Guide type

The following figure shows the standard type of the **DRL60G**.



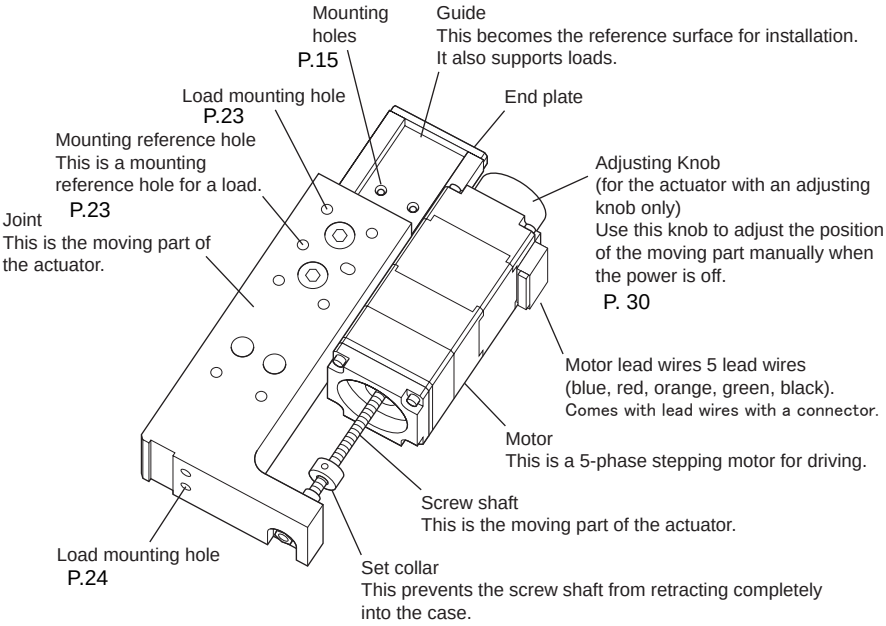
∗ The guide type with an adjusting knob is also available.

Surge suppressor

Be sure to connect the surge suppressor when wiring the electromagnetic brake.
Refer to p.28 for details.

- Table type

The following figure shows the **DRL28V** type.



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.

⚠**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 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.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire, injury or damage to equipment.
- When the actuator is used for vertical drive such as elevating equipment etc., provide a safety brake mechanism in addition to using an electromagnetic brake type actuator to hold the load position. The actuator loses its holding torque when the power is shut off, allowing the moving part to fall and possibly cause injury or damage to equipment.
- Do not use the brake mechanism of the electromagnetic brake type actuator to reduce speed or as a safety brake. Use the electromagnetic brake to hold the moving part or actuator in position. Failure to do so may result in injury or damage to equipment.

Installation

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

Connection

- Do not forcibly bend, pull or pinch the connection cable. Doing so may result in fire.

Repair, disassembly and modification

- Do not disassemble or modify the actuator. This may cause injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

⚠Caution

General

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

Transportation

- Do not carry the actuator by holding the moving part (screw shaft), motor lead wire or motor cable of the actuator. Doing so may cause 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 over the moving parts of the actuator to prevent injury.

Operation

- Do not touch the moving part (screw shaft) of the actuator while operating. Doing so may cause injury.
- The actuator's surface temperature may exceed 70 °C (158 °F), even under normal operating conditions. If an actuator is accessible during operation, post a warning label shown in the figure in a conspicuous position to prevent the risk of skin burn(s).

Warning label

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.

3 Precautions for use

This section covers limitations and requirements the user should consider when using the **DRL**Ⅱ 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 transportable mass 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 stop the moving part (screw shaft) by hitting the stroke end or load
  Do not stop the moving part (screw shaft) by hitting the stroke end or equipment when operating. The mechanical impact may cause damage to the actuator. If the moving part (screw shaft) hits the stroke end or equipment, remove the load and return the moving part (screw shaft) at the recommended starting speed.

Model	Recommended starting speed [mm/s (in/sec)]
DRL20, **DRL28**	0.2 (0.007)
DRL42 [Lead 2 mm (0.079 in.)]	0.4 (0.015)
DRL42 [Lead 8 mm (0.315 in.)]	1.6 (0.062)
DRL60	0.8 (0.031)

- Do not move the position of the set collar.
  The set collar is used to prevent the screw shaft from retracting completely into the case. Moving the position of the set collar may cause damage to the screw shaft, resulting in actuator malfunction or damage.

- Take measures to keep the moving part in position if the product is used in vertical drive such as elevating equipment.
  The actuator loses its holding force upon the occurrence of a power failure or when the A.W.OFF (all windings off) input is turned ON. Take measures to keep the moving part in position if the product is used in vertical drive such as elevating equipment.

- 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.
  When grease on the screw shaft has darkened after the initial operation (one to three weeks), the installation accuracy may be decreased. Refer to p.25 and check the installation accuracy of the screw shaft. When grease was darkened, refer to p.32 and apply new grease.

- Conduct the insulation resistance measurement or withstand voltage test separately on the actuator and the driver.
  Conducting the insulation resistance measurement or withstand voltage test with the actuator and driver connected may result in injury or damage to the product.

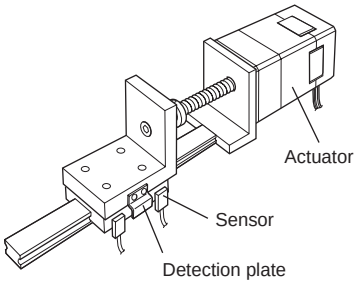
- Standard type actuator

  Provide an anti-spin mechanism for the screw shaft
  The standard type actuators 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.

  Load to the screw shaft
  Applying a load moment to the screw shaft may cause deterioration of the screw shaft. Support a load with a linear guide etc. and install the load in the specified installation accuracy so that a load moment does not apply to the screw shaft. Refer to p.25 for the installation accuracy.

  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. Refer to p.25 for the installation accuracy.

  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 or table type actuator.)

- Guide type actuator
  The guide type actuator can withstand a load moment using the load mounting holes in the joint. Do not apply a load moment in excess of the specification value.

- Electromagnetic brake

  Use an electromagnetic brake type actuator in vertical drive such as elevating equipment

  For vertical drive such as elevating equipment etc., provide a safety brake mechanism in addition to using an electromagnetic brake type actuator to hold the load position. When using the electromagnetic brake to hold the load position, operate it after the actuator operation has stopped. If decelerating and stopping of the actuator is repeated using the electromagnetic brake, the brake hub of the electromagnetic brake will wear significantly and the braking force will drop.

  Connecting an electromagnetic brake

  The electromagnetic brake operates via the ON/OFF status of the DC power supply. When connecting the electromagnetic brake lead wires, observe the correct polarity. Be sure to connect the supplied surge suppressor (non-polar) to protect the contact of the switch or to prevent electrical noise.

- Adjusting knob type

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

4 Installation

This section covers the location and method of installing the actuator, and attaching the load.

4.1 Location for installation

The actuator is designed and manufactured for installation in equipment.
Install the actuator 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)
  Table type: +5 to +40 °C (+41 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

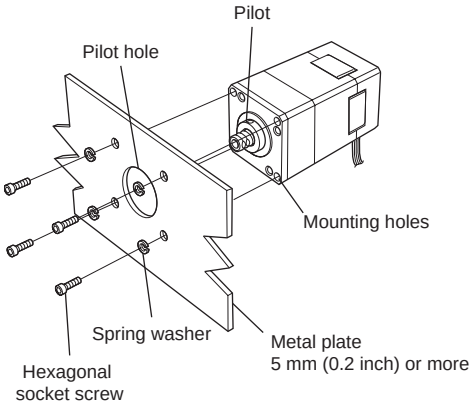
4.2 Installation method

■ Standard type, guide type

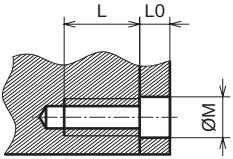
Install the actuator to a metal plate [with a thickness of 5 mm (0.2 inch) or more] with a smooth surface providing excellent vibration resistance and thermal conductivity.
A accessory mounting plate (model: **PADRL-□□**) is available (sold separately).
Refer to "8 Accessories (sold separately)" on p.33.

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.
   The following figure is an installation example of the standard type.



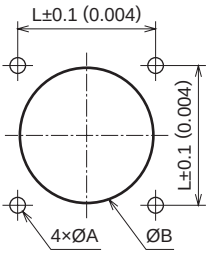
Details of mounting hole (tapped hole)



Model	Screw size	Tightening torque [N·m (oz-in)]	Dimension of mounting hole (tapped hole) [mm (in.)]		
			M	L0	L (Effective depth)
DRL20(G)	M2	0.4 (57)	2.3 (0.09)	2 (0.08)	5 (0.2)
DRL28(G)	M2.5	0.6 (85)	3 (0.12)	2 (0.08)	6 (0.24)
DRL42(G)	M4	1.8 (260)	–	–	8 (0.31)
DRL60(G)	M5	5.0 (710)	5.5 (0.22)	4 (0.16)	10 (0.39)

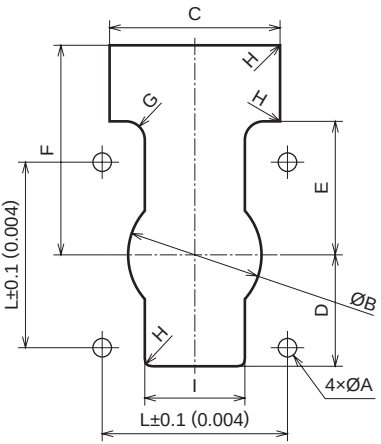
■ Plate cutout for mounting [Unit = mm (inch)]

Standard type



Model	L	A	B
DRL20	16 (0.630)	2.3 (0.09)	16～17 (0.63～0.67)
DRL28	23 (0.906)	3 (0.12)	22～23 (0.87～0.91)
DRL42	31 (1.221)	4.5 (0.18)	25～27 (0.98～1.06)
DRL60	50 (1.970)	5.5 (0.22)	36～38 (1.42～1.50)

Guide type



Model	L	A	B
DRL20G	16 (0.630)	2.3 (0.09)	16～17 (0.63～0.67)
DRL28G	23 (0.906)	3 (0.12)	22～23 (0.87～0.91)
DRL42G	31 (1.221)	4.5 (0.18)	25～27 (0.98～1.06)
DRL60G	50 (1.970)	5.5 (0.22)	36～38 (1.42～1.50)

Model	C	D	E	F	G	H*	I
DRL20G	20 (0.79) or more	11 (0.44) or more	10 (0.39)	28 (1.11) or more	R3～5 (R0.12～0.2)	R2 (R0.078) or less	13～14 (0.51～0.55)
DRL28G	26 (1.03) or more	15 (0.60) or more	15.5～17.5 (0.61～0.69)	30 (1.19) or more	R3～5 (R0.12～0.2)	R2 (R0.078) or less	14～16 (0.55～0.63)
DRL42G	34 (1.34) or more	22 (0.87) or more	25～26 (0.98～1.02)	42 (1.66) or more	R4～6 (R0.16～0.24)	R2 (R0.078) or less	18～22 (0.71～0.87)
DRL60G	50 (1.97) or more	31 (1.23) or more	32～34 (1.26～1.34)	58.5 (2.30) or more	R5～8 (R0.2～0.32)	R3 (R0.118) or less	29～35 (1.14～1.38)

* 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.

■ Table type

Install the actuator using the mounting holes provided on the guide. Install the actuator onto an appropriate flat mounting plate [thickness of 5 mm (0.2 in.) or more] having excellent vibration resistance and heat conductivity. If the mounting reference is needed, use the side surface of the guide as the mounting reference surface.

Note The actuator is installed while moving the guide table. Be aware that if the motor lead wire is short-circuited, a holding torque may be generated, making the guide table feel heavy and hard to move.

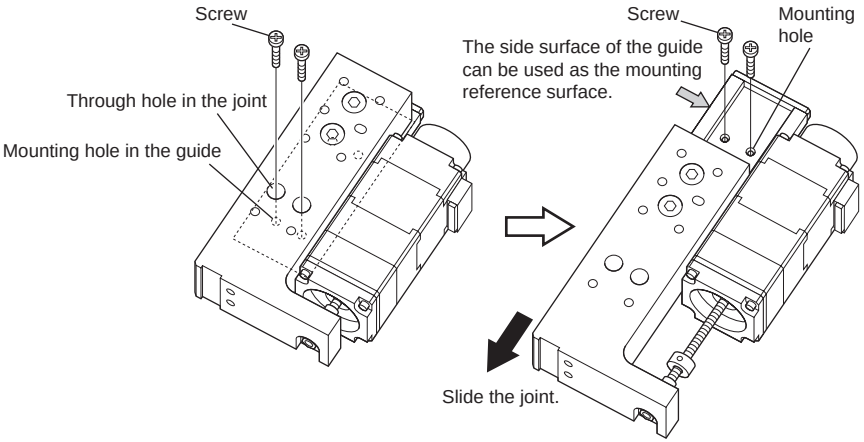
1. Manually push the guide table (turn the adjusting knob if the actuator has the adjusting knob), and align the guide table's through holes with the mounting holes provided on the guide.

2. Temporarily tighten screws (not supplied) into the mounting holes.
   Recommended screw: Cross-recessed round head screw
   Recommended screw size: M2.5

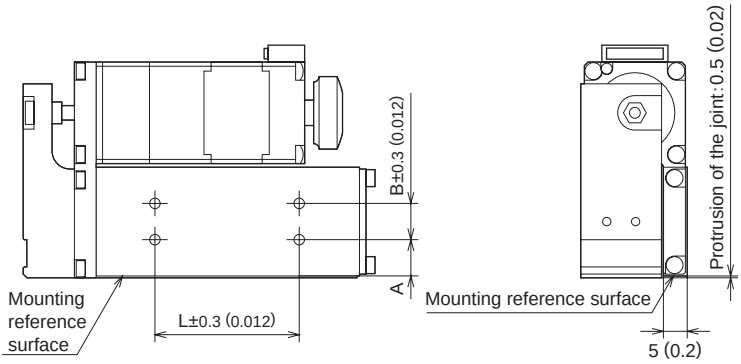
Note
- The effective screw depth on the mounting surface must be 5 mm (0.2 in.) or more, and be sure to use screws with sufficient length.
- If a screw falls off when the guide table's through holes and the mounting holes are not aligned properly, it may fall into the gap of the guide. Be sure to align the guide table's through holes with the mounting holes.

3. Move the guide table forward until the other mounting hole becomes visible, and then tighten screws (not supplied) into the mounting holes.

4. Move the guide table backward, and then securely tighten the screws that have been temporarily tightened.
   Secure the screws so that there is no gap between the guide table and the mounting surface.
   Tightening torque: 0.4 N·m (57 oz-in)



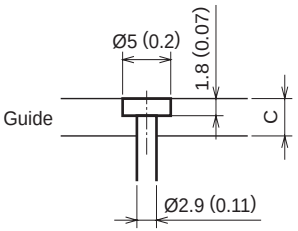
- Reference drawing for mounting [Unit: mm (in.)]



Model	L	A	B
DRL20V	35 (1.378)	8 (0.315)	9 (0.354)
DRL28V	40 (1.575)	10 (0.394)	10 (0.394)

Note Never remove the guide table from the screw shaft. Doing so may deteriorate the mounting accuracy of the screw shaft, resulting in a malfunction or shorter service life of the actuator. If the guide table is disengaged, please contact our Customer Service Center.

- Details of mounting hole [Unit: mm (in.)]



Model	Screw size	Tightening torque [N·m (oz-in)]	C [mm (in.)]
DRL20V	M2.5	0.4 (57)	3.5 (0.14)
DRL28V			3.0 (0.12)

Note When installing the actuator, use screws having a thread height of less than 1.8 mm (0.071 in.). If the height exceeds 1.8 mm (0.071 in.), screws cannot be fitted in the mounting holes in the guide, resulting in damage to the guide.

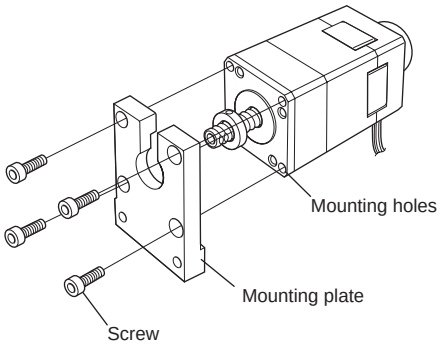
4.3 Installing the actuator using a mounting plate (sold separately)

The mounting plate is an accessory (sold separately). Refer to "8 Accessories (sold separately)" on p.33.

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

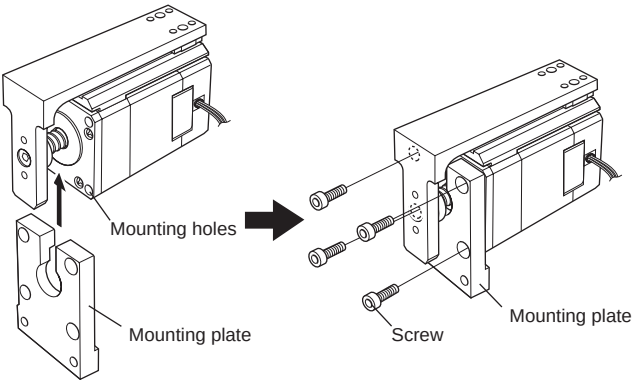
Standard type

The following figure shows the standard type of the **DRL60**.



Guide type

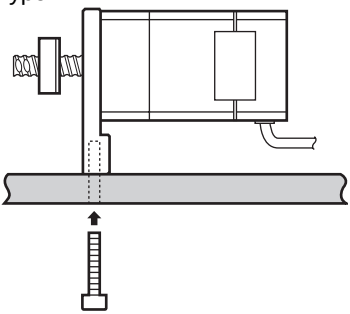
The following figure shows the guide type of the **DRL60G**.



Model	Screw size	Tightening torque [N·m (oz-in)]
DRL20G	M2	0.4 (57)
DRL28G	M2.5	0.6 (85)
DRL42G	M4	1.8 (260)
DRL60G	M5	5.0 (710)

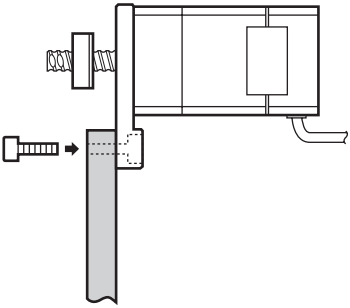
2. Mount the mounting plate to the equipment using two screws (not supplied).
Three methods are available.

Type A



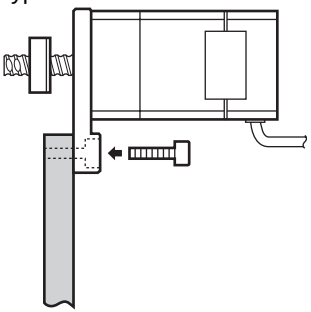
Model	Screw size	Effective depth [mm (in.)]	Tightening torque [N·m (oz-in)]
DRL20(G)	M3	6 (0.23)	1.0 (142)
DRL28(G)	M3	8 (0.31)	1.0 (142)
DRL42(G)	M5	10 (0.39)	5.0 (710)
DRL60(G)	M6	10 (0.39)	5.0 (710)

Type B



Model	Screw size	Effective depth [mm (in.)]	Tightening torque [N·m (oz-in)]
DRL20(G)	M4	5 (0.19)	1.8 (260)
DRL28(G)	M4	5.5 (0.21)	1.8 (260)
DRL42(G)	M6	7.5 (0.29)	5.0 (710)
DRL60(G)	M8	16.5 (0.64)	5.0 (710)

Type C



Model	Screw size	Tightening torque [N·m (oz-in)]
DRL20(G) **DRL28(G)**	M3	1.0 (142)
DRL42(G)	M5	5.0 (710)
DRL60(G)	M6	5.0 (710)

4.4 Installing a load

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

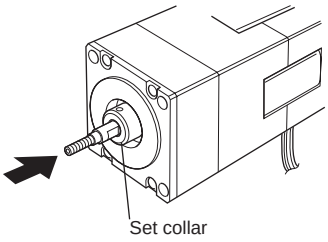
■ Standard type

The standard type actuator cannot be operated without an anti-spin mechanism for the screw shaft. Refer to p.25 and be sure to 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.

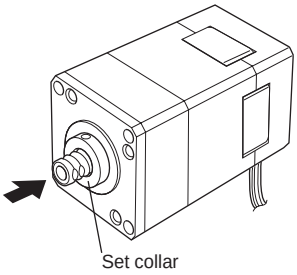
- Installation method
  - Install a load to the load mounting hole using a screw (or nut, in the case of the **DRL20** and **DRL28**). The screw, nut, and washer are not supplied with the product.
  - Use of a thread locking adhesive is recommended.

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

DRL20, DRL28

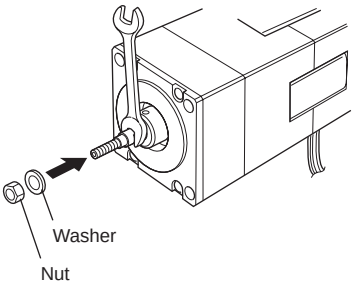


DRL42, DRL60

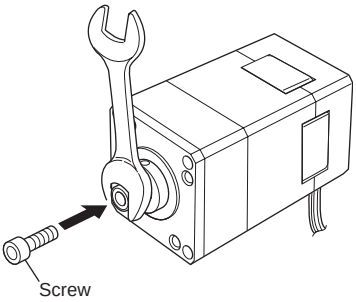


2. Holding the flat section of the screw shaft with a wrench, secure the load with a screw (or nut, in the case of the **DRL20** and **DRL28**).

DRL20, DRL28

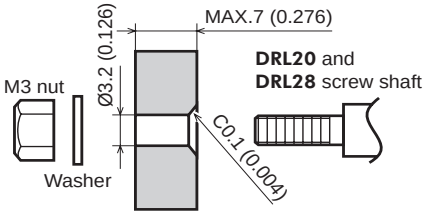


DRL42, DRL60



Model	Screw or nut size	Tightening torque [N·m (oz-in)]
DRL20, DRL28	M3 nut	0.6 (85)
DRL42	M4 screw	1.8 (260)
DRL60	M8 screw	5.0 (710)

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

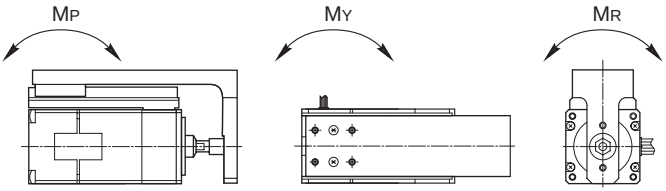


■ Guide type

Note Do not apply a load moment beyond the value of the following table to the joint. Doing so may result in malfunction or shorter service life of the actuator.

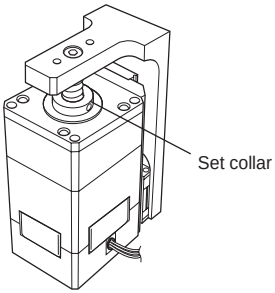
- Maximum load moment [unit: N·m (oz-in)]

Model	MP	MY	MR
DRL20G	0.1 (14)	0.05 (7)	0.15 (21)
DRL28G	0.13 (18)	0.07 (10)	0.3 (42)
DRL42G	0.5 (71)	0.25 (35)	0.8 (113)
DRL60G	0.6 (85)	0.35 (49)	2.2 (310)

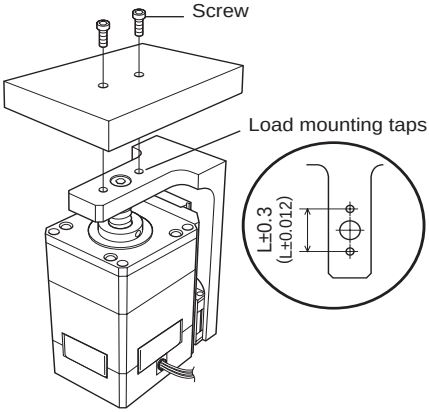


- When using load mounting holes in the screw shaft side of the joint
  Install a load to the load mounting holes in the joint using screws (not supplied with the product).

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



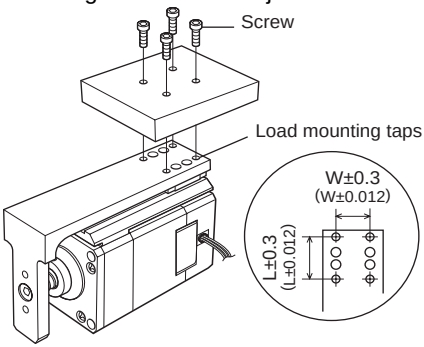
2. Secure the load with a screw.



Model	Screw size	Tightening torque [N·m (oz-in)]	Effective depth [mm (in.)]	L [mm (in.)]
DRL20G	M2	0.4 (57)	4 (0.16)	15 (0.591)
DRL28G	M2.5	0.6 (85)	5 (0.2)	16 (0.630)
DRL42G	M4	1.0 (142)	7.5 (0.3)	20 (0.787)
DRL60G	M5	2.0 (280)	11.5 (0.45)	30 (1.181)

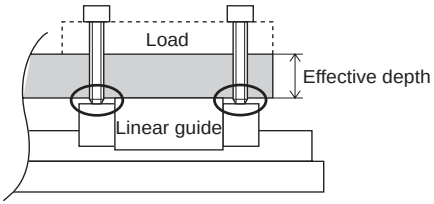
- When using load mounting holes in the linear guide side of the joint

Install a load to the load mounting holes in the joint using screws (not supplied with the product).



Model	Screw size	Tightening torque [N·m (oz-in)]	Effective depth [mm (in.)]	L [mm (in.)]	W [mm (in.)]
DRL20G	M2	0.4 (57)	4 (0.16)	18 (0.709)	12 (0.472)
DRL28G	M2.5	0.6 (85)	3.5 (0.14)	18 (0.709)	12 (0.472)
DRL42G	M4	1.0 (142)	5.5 (0.22)	24 (0.945)	19 (0.748)
DRL60G	M5	2.0 (280)	5.5 (0.22)	22 (0.866)	28 (1.102)

Note When using the load mounting holes in 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.



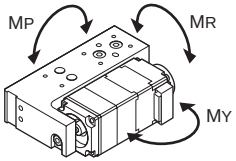
■ Table type

Install a load to the load mounting holes in the joint using screws (not supplied with the product). Load mounting holes are located in three places: the screw shaft side, the joint upper surface and the joint side surface. Use these holes in accordance with your purpose.

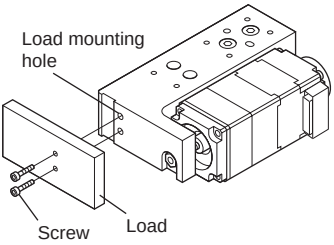
Note Do not apply a load moment beyond the value of the following table to the joint. Doing so may result in malfunction or shorter service life of the actuator.

- Maximum load moment [unit: N·m (oz-in)]

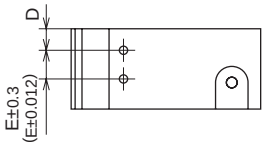
Model	MP	MY	MR
DRL20V	0.4 (56)	0.4 (56)	0.8 (113)
DRL28V	0.7 (99)	0.7 (99)	1.5 (210)



- When installing a load to the load mounting holes in the screw shaft side

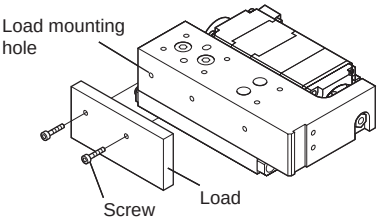


• Dimension of the load mounting hole

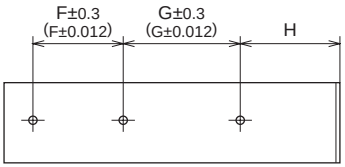


Model	Screw size	Tightening torque [N·m (oz-in)]	Effective depth [mm (in.)]	D [mm (in.)]	E [mm (in.)]
DRL20V	M3	1.0 (142)	6 (0.24)	3.5 (0.14)	7 (0.276)
DRL28V				7.2 (0.28)	8 (0.315)

- When installing a load to the load mounting holes in the joint side surface

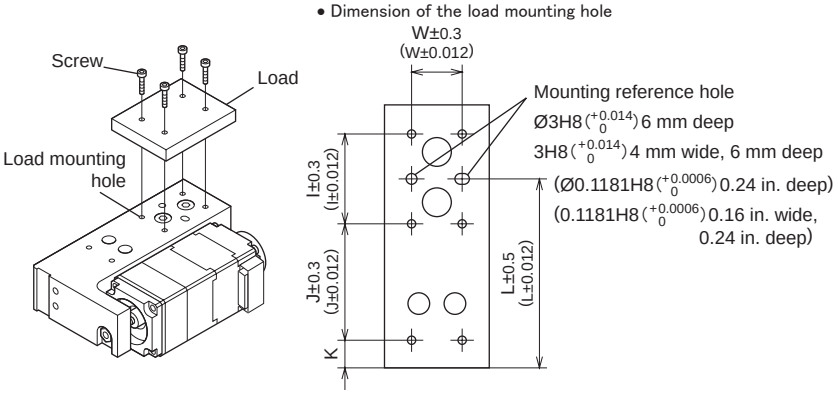


• Dimension of the load mounting hole



Model	Screw size	Tightening torque [N·m (oz-in)]	Effective depth [mm (in.)]	F [mm (in.)]	G [mm (in.)]	H [mm (in.)]
DRL20V	M3	1.0 (142)	6 (0.24)	20 (0.787)	39.5 (1.555)	17.9 (0.70)
DRL28V				25 (0.984)	31.9 (1.256)	27.5 (1.08)

- When installing a load to the load mounting holes in the joint upper surface
  Load mounting reference holes are located in the joint upper surface. When reproducibility is required for mounting loads, use these mounting reference holes.

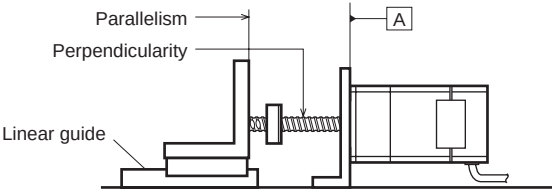


Model	Screw size	Tightening torque [N·m (oz-in)]	Effective depth [mm (in.)]	I [mm (in.)]	J [mm (in.)]	K [mm (in.)]	L [mm (in.)]	W [mm (in.)]
DRL20V	M3	1.0 (142)	6 (0.24)	20 (0.787)	39.5 (1.555)	17.9 (0.70)	67.4 (2.65)	10 (0.394)
DRL28V				25 (0.984)	31.9 (1.256)	27.5 (1.08)	71.9 (2.83)	14 (0.551)

■ Installation accuracy

When installing a load to the screw shaft of the standard type actuator, be sure to provide an anti-spin mechanism with the installation accuracy specified below. Similar accuracy is needed when using an accessory mounting plate (sold separately). (The guide type actuator is assembled with the installation accuracy specified below at the time of shipment.)

Be sure to check the installation accuracy using a lever type dial test indicator or feeler gauge etc. Low installation accuracy may result in malfunction or shorter service life of the actuator.



Model	Squareness	Parallelism
DRL20	⊥ Ø0.02 (Ø0.0007) A	// 0.02 (0.0007) A
DRL28	⊥ Ø0.03 (Ø0.0011) A	// 0.03 (0.0011) A
DRL42, **DRL60**	⊥ Ø0.05 (Ø0.0019) A	// 0.05 (0.0019) A

Note

When noise from an actuator has generated or grease on the screw shaft has darkened after the initial operation (one to three weeks), the installation accuracy may be decreased. Check the installation accuracy of the screw shaft. When grease was darkened, refer to p.32 and apply new grease.

4.5 Installing the home position sensor for the table type

■ Details of home sensor set

The following parts are used in the accessory home sensor set **PADRL-S□** (sold separately).

- Photomicrosensor ..... 1 pc.: PM- U24 (SUNX limited)
- Sensor plate ..... 1 pc.
- Shielding plate ..... 1 pc.
- M2 screw with washer ..... 2 pcs.: for mounting the sensor
- M2 screw ..... 2 pcs.: for mounting the shielding plate
- Hexagonal socket head screw ..... 2 pcs.: for mounting the sensor plate (**DRL20V**: M2, **DRL28V**: M2.5)

Note

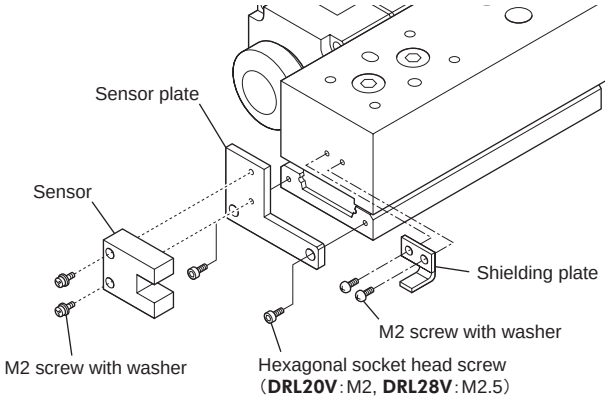
- The photomicrosensor is designed for use within equipment and therefore has no special means of protection against disturbances from external sources of light. If the actuator is to be used under an incandescent lamp or in conditions that are subject to disturbances from external light, provide the means to prevent such interference.
- Use the sensors after confirming that there is no looseness, play or other abnormality due to vibration, impact, etc.
- To prevent malfunctioning due to the adhesion of dust on the sensors, clean and/or replace the sensors regularly.

■ Installation of the sensor

1. Remove the end plate from the guide, and using hexagonal socket head screws (**DRL20V**: M2, **DRL28V**: M2.5) mount the sensor plate instead.
   Tightening torque: 0.4 N·m (57 oz-in)

2. Mount the shielding plate to the screw holes in the rear area of the guide table using M2 screws.
   Tightening torque: 0.2 N·m (28 oz-in)

3. Mount the photomicrosensor to the sensor plate using M2 screws with washer.
   Tightening torque: 0.1 N·m (14 oz-in)

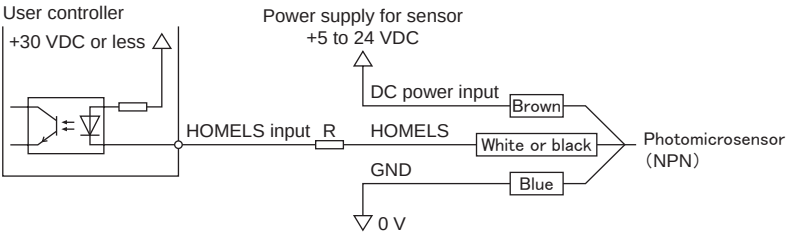


Note

- Do not install the home sensor set while the power is supplied. To do so may result in injury or equipment damage.
- Be sure to install the sensor and shielding plate in the direction shown in the figure. Installing them in the wrong direction may disable sensor detection or cause the shielding plate to contact the sensor and result in sensor damage.
- When installing the sensor plate and shielding plate to the actuator, be sure to use the supplied screws.

■ Sensor wire connection

The power supply must be 5 to 24 VDC, the current must be 50 mA or less. If the current exceeds 50 mA, connect an external resistor R.
Output operation can be selected from either ON when light is shielded or ON when light is induced. Use either one of them as appropriate.



- Output operation turns ON when light is shielded: Connect white lead wire.
- Output operation turns ON when light is induced: Connect black lead wire.
- Be sure to insulate the unconnected lead wire.

Note

- Place the sensor wires as far apart as possibble from the power cables such as the motor and power supply cables. If they have to cross, cross them at a right angle.
- Use a common GND for the sensor and driver. Any difference in GND potential will result in a sensor malfunction.

5 Connection

This section covers the connection method for the driver or electromagnetic brake.

5.1 Connecting the driver

Refer to the operating manual for the **DRL**Ⅱ Series driver.
See p.2 for operating manuals in details.

5.2 Connecting the electromagnetic brake

■ Connecting power supply for the electromagnetic brake

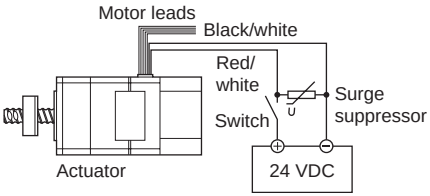
The electromagnetic brake operates via the ON/OFF status of the DC power supply. For the electromagnetic brake, provide a power source of 24 VDC ± 5%, 0.08 A or more if you are using the **DRL42**, or one of 24 VDC ± 5%, 0.25 A or more in the case of the **DRL60**. Use a shielded cable of AWG24 (0.2 mm^2) or more in diameter to connect the electromagnetic brake to the DC power supply, keeping the length as short as possible.

■ Connecting method

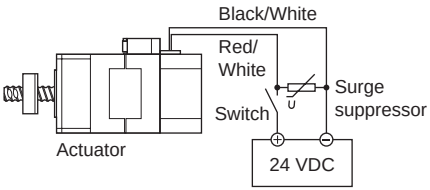
Connect the two lead wires [600 mm (24 inch)] from the actuator to the DC power supply.

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 surge suppressor in parallel across the +24 V and GND terminals of the DC power supply.

- Lead wire type actuator



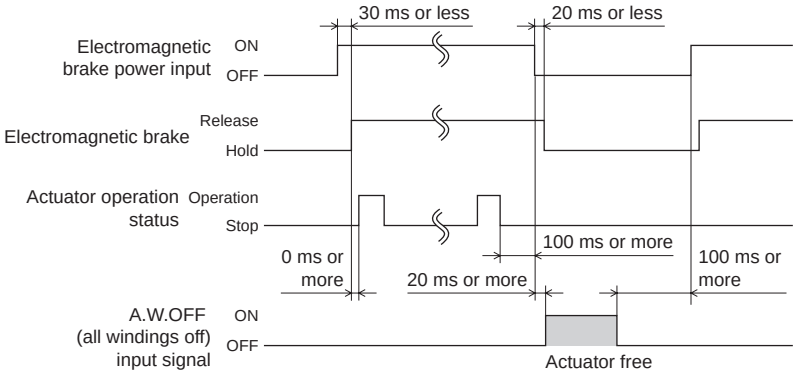
- Connector-coupled type actuator



Note

- Do not apply the voltage beyond its specifications. Doing so may increase the temperature rise in the electromagnetic brake, resulting in damage to the actuator. Conversely, insufficient voltage may prevent the brake from releasing.
- Be sure to connect the surge suppressor to protect the contact of the switch or to prevent electrical noise.
- Connect the lead wires of the electromagnetic brake in the correct polarities since they have polarities. Connecting the lead wires in reverse polarity will not properly operate the electromagnetic brake.
- Provide separate power supplies for the I/O signals and the electromagnetic brake.

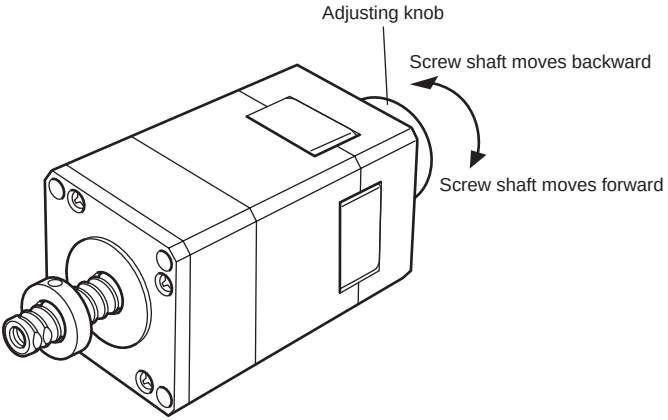
- Timing chart for the electromagnetic brake



6 Operation

6.1 How to use the adjusting knob (adjusting knob type only)

Use when adjusting the position of the screw shaft. Turn off the power supply and move the screw shaft by turning the adjusting knob manually. Turning the adjusting knob by one revolution moves the screw shaft by the length of the lead. Adjust the position within the effective stroke range.



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

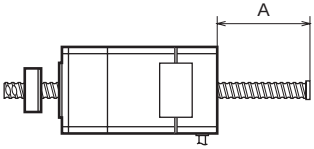
6.2 Operating speed at low temperature

If the ambient temperature is the value of ( ) parentheses shown in the following table, keep the maximum speed to the applicable value in the table.

	Standard motor		High-resolution motor	
	Standard type Guide type	Table type	Standard type Guide type	Table type
DRL20	13 mm/s (0～+10℃) 0.51 in/s (+32～+50 °F)	13 mm/s (+5～+15℃) 0.51 in/s (+41～+59 °F)	–	–
DRL28	15 mm/s (0～+10℃) 0.59 in/s (+32～+50 °F)	10 mm/s (+5～+15℃) 0.39 in/s (+41～+59 °F)	12 mm/s (0～+10℃) 0.47 in/s (+32～+50 °F)	–
	24 mm/s (+10～+15℃) 0.94 in/s (+50～+59 °F)	24 mm/s (+15～+20℃) 0.94 in/s (+59～+68°F)		
DRL42 [Lead 2 mm (0.079 in.)]	20 mm/s (0～+10℃) 0.78 in/s (+32～+50 °F)	–	15 mm/s (0～+10℃) 0.59 in/s (+32～+50 °F)	–
DRL42 [Lead 8 mm (0.315 in.)]	80 mm/s (0～+10℃) 3.1 in/s (+32～+50 °F)	–	–	–
DRL60	32 mm/s (0～+15℃) 1.25 in/s (+32～+59 °F)	–	22 mm/s (0～+10℃) 0.86 in/s (+32～+50 °F)	–

6.3 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 (in.)]
DRL28-06 [stroke 60 mm (2.36 in.)]	28 (1.11)
DRL42-10 [stroke 100 mm (3.93 in.)]	73 (2.88)
DRL60-10 [stroke 100 mm (3.93 in.)]	64 (2.52)

7 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.?
- Are there any scratches, signs of stress or loose driver connections in the motor lead wires or motor cable?
- Is there any misalignment between the actuator screw shaft and the load shaft?
- Is grease on the actuator screw shaft or linear guide darken?

■ Maintenance of grease

When the grease on the actuator 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

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

  Table type
  Screw shaft: AFE-CA Grease (THK CO., LTD.)
  Linear guide: AFE-CA 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.

8 Accessories (sold separately)

■ Connector lead wires

These lead wires can be used to connect the connector-coupled type actuator to the driver.

Model	Length [m (ft.)]	Applicable product
LC5N10A	1 (3.3)	**DRL20, DRL28**
LC5N10B	1 (3.3)	**DRL42**
LC5N10C	1 (3.3)	**DRL60**

■ Connector set (molex)

These are sets of connector housing and contacts for the connector-coupled type actuators. Each package contains housings and contacts for 30 units.

Model	Applicable product	Connector housings	Contacts	Applicable lead wire
CS5N30A	**DRL20 DRL28**	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	**DRL42**	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	**DRL60**	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.)

The lead wire of AWG24 to 22 (0.2 to 0.3 mm^2) is applicable for the motor connector (CN3).

■ Mounting plate

These dedicated mounting brackets can be used to install the actuator.

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

■ Home sensor set (for the table type actuator)

These are sensor sets for the return to home operation (NPN output type).

Model	Applicable product
PADRL-S20	**DRL20**
PADRL-S28	**DRL28**

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