(RoHS) RoHS Directive-Compliant

Compact Linear Actuators

DRL Series

In the compact linear actuator **DRL** Series, the drive mechanism adopts a 5-phase stepping motor with ball screw. This series achieves highly accurate positioning in a space saving design.

c(UL)us CE

●List of products conforming to safety standards (product name, applicable standards, file number, certification body) → Page H-12

■Features

●Compact Design and High Positioning Accuracy

The actuator size was reduced through unique ideas that a motor manufacturer can generate. Using the original technology of Oriental Motor, the compact and lightweight body houses the linear motion mechanism as well as the rotating parts of the stepping motor. The **DRL** Series helps to achieve a significant reduction in the size of your equipment and system.

●Lineup of Rolled Ball Screw Type and Ground Ball Screw Type

Rolled Ball Screw Type Repetitive Positioning Accuracy: ± 0.02 mm

Ground Ball Screw Type Repetitive Positioning Accuracy: ± 0.005 mm

● If you are interested in the ground ball screw type, please contact the nearest Oriental Motor sales office.

●Compact DC Input Board Driver Meeting the Space-Saving Needs

The compact, lightweight driver implements microstep drive.
A new IC allows the driver to provide various functions.
● Smooth Drive Function
● 1-Pulse/2-Pulse Input Mode Switching
● 25 Microstep Drive Resolution Settings are Available
● Power Input Indicator LED
● Photocoupler Input
● Connector with Safety Lock (by MOLEX)
● Conforms to Safety Standards

Mass: 40 g
25 mm
45 mm
65 mm
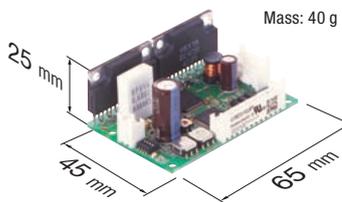
◇Compact Microstep Driver

The microstep drive system allows you to set high resolutions up to 1/250 of the basic resolution of the actuator. This function is effective in meeting your low vibration and low noise operation needs at low speeds. The high-performance driver is also compact and lightweight, achieving a reduction of approximately 45% in size compared with a conventional full-step type driver.

●Low Vibration with the Smooth Drive Function

The smooth drive function automatically implements microstep drive based on the same travel amount and speed used in the full step mode, without changing the pulse input settings. This function is particularly useful when the system is operated in the full step or half step mode.

●Comparison of Speed Fluctuation
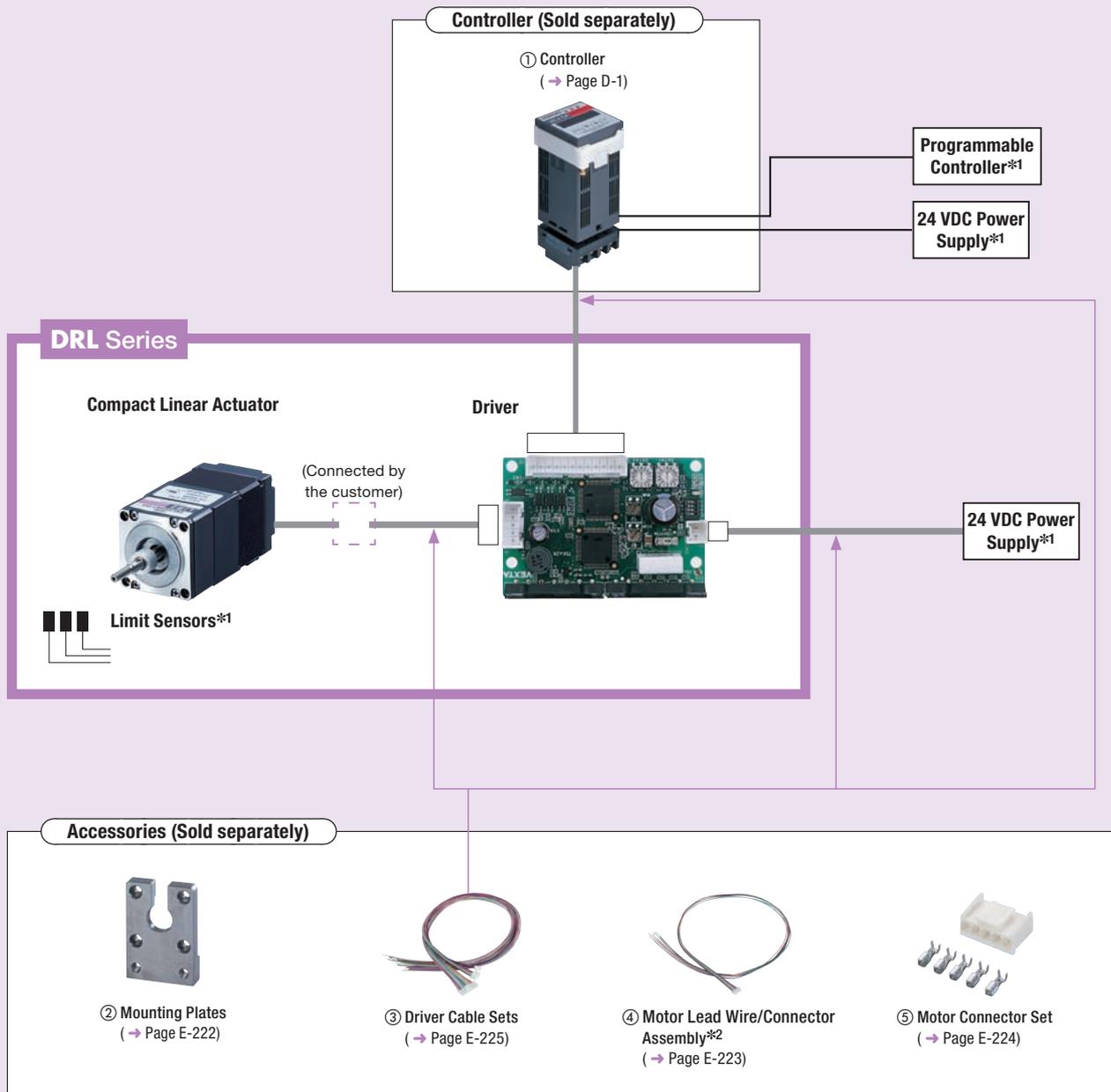**Smooth Drive Function: OFF**

500 STEP/R
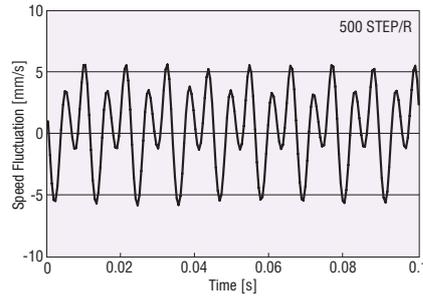
Smooth Drive Function: ON

500 STEP/R
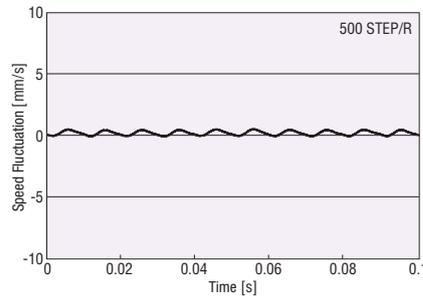
■ System Configuration

An example of a single-axis system configuration with the **SG8030J** controller is shown below.

∗1 Not supplied

Controller (Sold separately)

① Controller
(➜ Page D-1)

Programmable Controller∗1

24 VDC Power Supply∗1

DRL Series

Compact Linear Actuator

Driver

(Connected by the customer)

Limit Sensors∗1

24 VDC Power Supply∗1

Accessories (Sold separately)

② Mounting Plates
(➜ Page E-222)

③ Driver Cable Sets
(➜ Page E-225)

④ Motor Lead Wire/Connector Assembly∗2
(➜ Page E-223)

⑤ Motor Connector Set
(➜ Page E-224)

∗2 Lead wires with a connector assembly of 0.6 m are included with the **DRL20** motor and driver package.

Number	Name	Overview	Page
①	Controller	This controller gives commands needed to drive the actuator.	D-1
②	Mounting Plates	Dedicated mounting bracket used for installing the actuator.	E-222
③	Driver Cable Sets	Cables for connecting the driver and motor, DC power supply or programmable controller (0.6 m).	E-225
④	Motor Lead Wire/Connector Assembly	Lead wire with a connector crimped for connector-coupled actuators (0.6 m, 1 m).	E-223
⑤	Motor Connector Set	Set of connector housings and contacts for use with connector-coupled actuators (for 30 units).	E-224

● **System Configuration Example**

DRL Series		Sold Separately		
		Controller	Driver Cable Set (0.6 m)	Mounting Plate
DRL28PA1-03G	+	**SG8030J-U**	**LCS04SD5**	**PADRL-28**

● The system configuration shown above is an example. Other combinations are available.

E-205

Right side tab navigation:
Motorized Actuators
Introduction / Types
EZ limo ELS
EZ limo EZSII / Motorized Linear Slides
EZ limo EZSII Clean Room
Accessories & Installation
EZ limo ELC / Motorized Cylinders
EZ limo EZA
Accessories & Installation
DRS / DRL / Compact Linear Actuators
Accessories & Installation
DG / Hollow Rotary Actuators
Accessories & Installation

■Product Number Code

DRL 60 P A 4 - 05 M G

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①	Series Name	**DRL**: **DRL** Series
②	Frame Size	**20**: □20 mm **28**: □28 mm **42**: □42 mm **60**: □60 mm
③	Motor Type	**P**: Standard Motor
④	Drive System	**A**: Rolled Ball Screw Type **B**: Ground Ball Screw Type
⑤	Lead	**1**: 1 mm (□20 mm, 28 mm) **2**: 2 mm (□42 mm) **4**: 4 mm (□60 mm)
⑥	Type	Blank: Standard Type **G**: Guide Type
⑦	Stroke	**02**: 25 mm (□20 mm) **03**: 30 mm (□28 mm) **04**: 40 mm (□42 mm) **05**: 50 mm (□60 mm)
⑧	Additional Function	Blank: Without Additional Function **M**: With Electromagnetic Brake **N**: With Adjusting Knob
⑨	Driver Type	**G**: CRD Driver

■Product Line

Frame Size (mm)	Additional Function / Type	Without Additional Function Product Name	With Electromagnetic Brake Product Name	With Adjusting Knob Product Name
□20	Standard Type	**DRL20PB1-02G**	–	**DRL20PB1-02NG**
	Guide Type	**DRL20PB1G-02G**	–	**DRL20PB1G-02NG**
□28	Standard Type	**DRL28PA1-03G**	–	**DRL28PA1-03NG**
	Guide Type	**DRL28PA1G-03G**	–	**DRL28PA1G-03NG**
□42	Standard Type	**DRL42PA2-04G**	**DRL42PA2-04MG**	**DRL42PA2-04NG**
	Guide Type	**DRL42PA2G-04G**	**DRL42PA2G-04MG**	**DRL42PA2G-04NG**
□60	Standard Type	**DRL60PA4-05G**	**DRL60PA4-05MG**	**DRL60PA4-05NG**
	Guide Type	**DRL60PA4G-05G**	**DRL60PA4G-05MG**	**DRL60PA4G-05NG**

─ The following items are included in each product. ─

Actuator, Driver, Driver Connector, Motor Lead Wire/Connector Assembly[*1], Surge Suppressor[*2], Operating Manual
[*1] Only for **DRL20**
[*2] Electromagnetic brake type only

■Specifications

●Actuator
◇Standard Type (RoHS) c⊕us CE

Product Name	Without Additional Function	DRL20PB1-02G	DRL28PA1-03G	DRL42PA2-04G	DRL60PA4-05G
	With Adjusting Knob	DRL20PB1-02NG	DRL28PA1-03NG	DRL42PA2-04NG	DRL60PA4-05NG
	With Electromagnetic Brake	–	–	DRL42PA2-04MG	DRL60PA4-05MG
Maximum Vertical Transportable Mass[1] kg		1.5	3	10	30
Maximum Speed[2] mm/s		20	24	30	32
Maximum Acceleration m/s^2		0.2	0.2	0.4	0.26
Maximum Thrust Force[3] N		15	30	100	300
Maximum Holding Force	Power ON[4] N	15	30	100	300
	Power OFF N	0	0	0	0
	Electromagnetic Brake N	–	–	100	300
Repetitive Positioning Accuracy mm		±0.005	±0.02		
Lost Motion mm		0.05	0.1		
Resolution[5] mm		0.002	0.002	0.004	0.008
Lead mm		1	1	2	4
Stroke mm		25	30	40	50
Mass	Without Additional Function kg	0.08	0.18	0.6	1.3
	With Adjusting Knob kg	0.08	0.19	0.6	1.35
	With Electromagnetic Brake kg	–	–	0.8	1.7
Dimensions No.	Without Additional Function/With Adjusting Knob	1	2	3	5
	With Electromagnetic Brake	–	–	4	6

◇Guide Type (RoHS) c⊕us CE

Product Name	Without Additional Function	DRL20PB1G-02G	DRL28PA1G-03G	DRL42PA2G-04G	DRL60PA4G-05G
	With Adjusting Knob	DRL20PB1G-02NG	DRL28PA1G-03NG	DRL42PA2G-04NG	DRL60PA4G-05NG
	With Electromagnetic Brake	–	–	DRL42PA2G-04MG	DRL60PA4G-05MG
Maximum Horizontal Transportable Mass (Fig. A) kg		0.5	1	2	3
Maximum Vertical Transportable Mass (Fig. B)[1] kg		1	1.5	5	15
Maximum Speed[2] mm/s		20	24	30	32
Maximum Acceleration m/s^2		0.2	0.2	0.4	0.26
Maximum Thrust Force[3] N		15	30	100	300
Maximum Holding Force	Power ON[4] N	15	30	100	300
	Power OFF N	0	0	0	0
	Electromagnetic Brake N	–	–	100	300
Maximum Load Moment N·m		M_P: 0 M_Y: 0 M_R: 0	M_P: 0 M_Y: 0 M_R: 0	M_P: 0.5 M_Y: 0.25 M_R: 0.8	M_P: 0.6 M_Y: 0.35 M_R: 2.2
Repetitive Positioning Accuracy mm		①±0.005 ②±0.01	±0.02		
Lost Motion mm		0.05	0.1		
Resolution[5] mm		0.002	0.002	0.004	0.008
Lead mm		1	1	2	4
Stroke mm		25	30	40	50
Mass	Without Additional Function kg	0.14	0.25	0.8	1.8
	With Adjusting Knob kg	0.15	0.26	0.8	1.85
	With Electromagnetic Brake kg	–	–	1	2.2
Dimensions No.	Without Additional Function/With Adjusting Knob	7	8	9	11
	With Electromagnetic Brake	–	–	10	12

∗1 When the power is turned off, or when in an all windings off situation, the actuator loses its thrust force or holding force. As such, it can no longer keep the load in position or withstand an external force.
∗2 Use each actuator at or below the following maximum speed in an operating temperature range of 0 to +10˚C: **DRL20**: 13 mm/s, **DRL28**: 15 mm/s, **DRL42**: 20 mm/s, **DRL60**: 24 mm/s.
∗3 The maximum thrust force is measured during constant-speed operation in the horizontal direction with no load applied to the moving parts (screw shaft and joint). Thrust force varies with load mass and acceleration.
∗4 The maximum holding force at excitation is the value when the automatic current cutback function is ON (Standstill Current: 50% of the rated current).
∗5 Twenty-five resolutions can be set.

Note
●Use the actuator in conditions where its surface temperature will not exceed 90˚C. The repetitive positioning accuracy is measured at a constant temperature under a constant load.
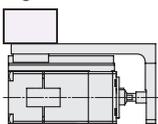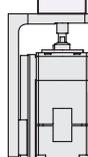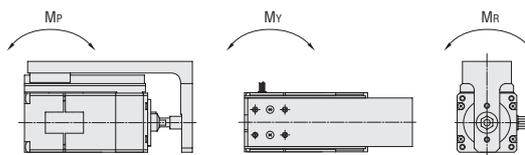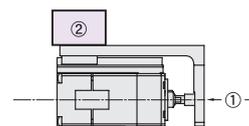**How to read specifications table** → Page E-189

●Maximum Transportable Mass   ●Load Moment   ●Repetitive Positioning Accuracy

Figure A   Figure B M_P M_Y M_R

① Repetitive positioning accuracy is measured at the tip of the guide. ② Repetitive positioning accuracy is measured on the linear guide.
If footnote ① or ② is not indicated, then the accuracy values are identical.

Introduction Types

EZ limo ELS

EZ limo EZSII Motorized Linear Slides

EZ limo EZSII Clean Room

Accessories & Installation

EZ limo ELC

EZ limo EZA Motorized Cylinders

Accessories & Installation

DRS Compact Linear Actuators

DRL Installation

Accessories & Installation

DG Hollow Rotary Actuators

Accessories & Installation

●Electromagnetic Brake

Type of Electromagnetic Brake	Power Off Activated Type
Power Supply Input Voltage/Current	**DRL42**: 24 VDC±5% 0.08 A **DRL60**: 24 VDC±5% 0.25 A
Brake Activation/Release Time	Activate Time: 20 ms Release Time: 30 ms
Time Rating	Continuous

●Driver

Driver Product Name		CRD5103P	CRD5107P	CRD5114P
Power Supply Input	Voltage	24 VDC±10%		
	Current	0.7 A	1.4 A	2.5 A
Input Signals	Input Mode	Photocoupler Input, Input Resistance 220 Ω, Input Current 7~20 mA, Photocoupler "ON": +4.5~5.25 V, Photocoupler "OFF": 0~1 V (Voltage between terminals)		
	CW Pulse Signal (Pulse signal)	CW (Forward) Direction Operation Command Pulse Signal (Operation command pulse signal when in 1-pulse input mode) Negative Logic Pulse Input Pulse Width 1 μs min., Pulse Rise and Fall Time 2 μs max., Pulse Duty 50% max. The screw shaft moves one step forward when the pulse input is switched from "ON" → "OFF." Maximum Input Pulse Frequency: 500 kHz (when the pulse duty is 50%)		
	CCW Pulse Signal (Traveling direction signal)	CCW (Backward) Direction Operation Command Pulse Signal (Traveling direction signal when in 1-pulse input mode - Photocoupler ON: CW, Photocoupler OFF: CCW) Negative Logic Pulse Input Pulse Width 1 μs min., Pulse Rise and Fall Time 2 μs max., Pulse Duty 50% max. The screw shaft moves one step backward when the pulse input is switched from "ON" → "OFF." Maximum Input Pulse Frequency: 500 kHz (when the pulse duty is 50%)		
	Resolution Select Signal	Resolution specified in DATA1 when photocoupler "OFF;" resolution specified in DATA2 when photocoupler "ON"		
	All Windings OFF Signal	When the signal is photocoupler "ON," the output current to the actuator is cut off. When the signal is photocoupler "OFF," the output current is supplied to the actuator.		
	Current Cutback Release Signal	When the signal is photocoupler "ON," the automatic current cutback function at actuator standstill is released. When the signal is photocoupler "OFF," the automatic current cutback function is activated after actuator stops (approximately 100 ms).		
Output Signal	Output Mode	Photocoupler and Open-Collector Output External Use Condition: 24 VDC 10 mA max.		
	Excitation Timing Signal	This signal is output when the excitation sequence is at STEP "0." (Photocoupler: ON) Resolution 1: Signal is output once every 10 pulses Resolution 10: Signal is output once every 100 pulses		
Functions		Automatic Current Cutback, Resolution Select, Pulse Input Mode Switch, Smooth Drive Function, All Windings Off, Excitation Timing		
Cooling Method		Natural Cooling Method		
Mass		0.04 kg		
Dimensions No.		⑬		

■ General Specifications

This is the value after rated operation under normal ambient temperature and humidity.

| Specifications		Actuator	Driver (24 VDC input)
Motor Insulation Class		Class B (130˚C) [Recognized as Class A (105˚C) under the UL and CSA Standards]	–
Insulation Resistance		The measured value is 100 MΩ min. when a 500 VDC megger is applied between the motor windings and the case.	–
Dielectric Strength		No abnormality is judged even with the following application between the motor windings and the case for 1 minute: · **DRL20**, **DRL28** 0.5 kVAC 50 Hz or 60 Hz · **DRL42** 1.0 kVAC 50 Hz or 60 Hz · **DRL60** 1.5 kVAC 50 Hz or 60 Hz	–
Operating Environment (In operation)	Ambient Temperature	0~+40˚C (non-freezing)	
	Ambient Humidity	85% max. (non-condensing)	
	Atmosphere	Use in an area without corrosive gases or dust. The product should not be exposed to water, oil or other liquids.	

Note
●Do not measure insulation resistance or perform the dielectric strength test while the actuator and driver are connected.
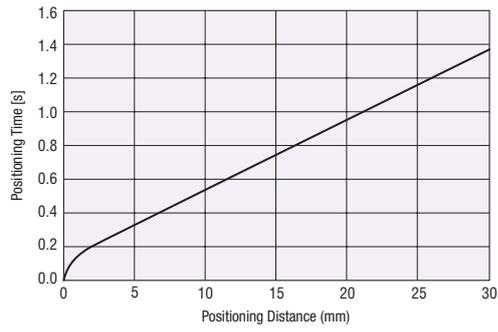
■Positioning Distance – Positioning Time (Reference)

The positioning time (reference) can be checked from the positioning distance. The graphs below show the characteristics when operated at maximum speed and maximum acceleration.
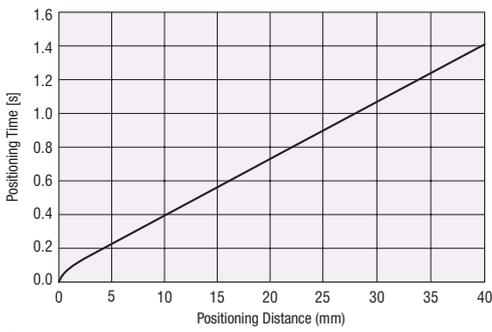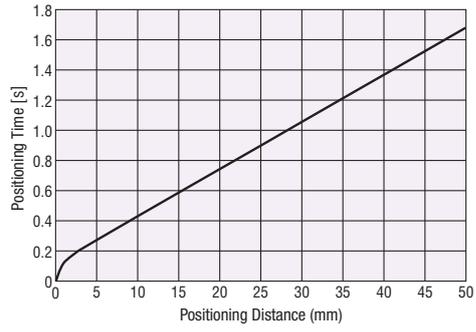
DRL20
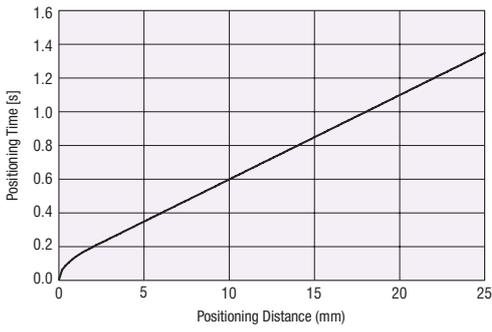
DRL28

DRL42

DRL60

● Use each actuator at the following starting speed:
DRL20, **DRL28**: 0.2 mm/s or less
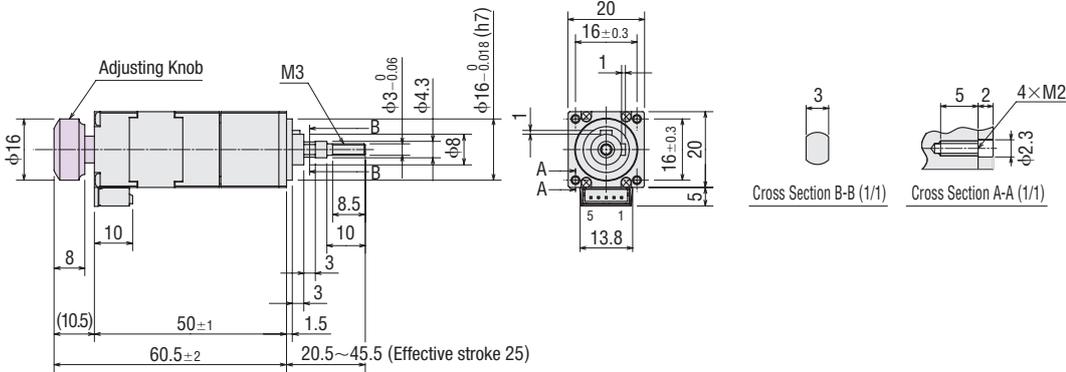**DRL42** : 0.4 mm/s or less
DRL60 : 0.8 mm/s or less

■Dimensions (Unit = mm)

●Actuator
◇Standard Type
1 □20 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL20PB1-02G	DRL20PB1-02	0.08	D520
DRL20PB1-02NG	DRL20PB1-02N	0.08	D521

Cross Section B-B (1/1) Cross Section A-A (1/1)

●The actuator comes with a motor lead wire/connector assembly (0.6 m).
　UL Style 3265, AWG24

2 □28 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL28PA1-03G	DRL28PA1-03	0.18	D468
DRL28PA1-03NG	DRL28PA1-03N	0.19	D503

Cross Section B-B (1/1) Cross Section A-A (1/1)

5 Motor Leads 600 mm
UL Style 3265, AWG26
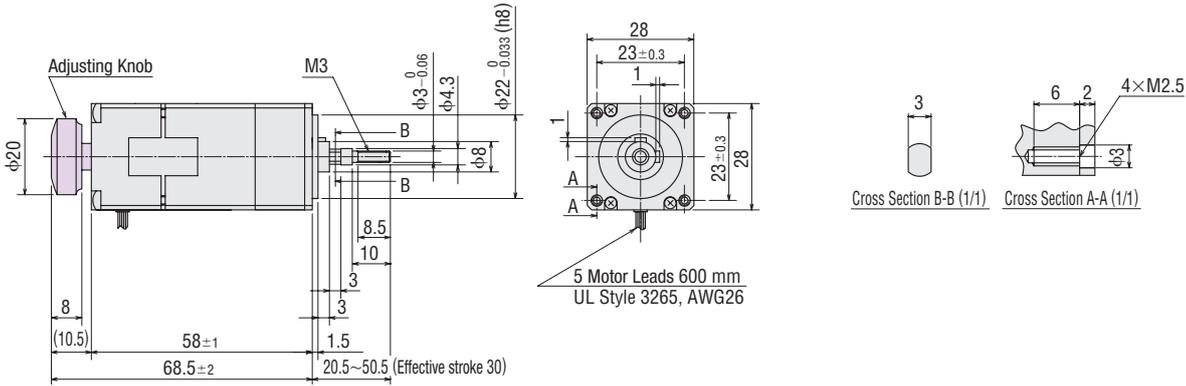
3 □42 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL42PA2-04G	DRL42PA2-04	0.6	D361
DRL42PA2-04NG	DRL42PA2-04N	0.6	D507

5 Motor Leads 600 mm
UL Style 3265, AWG26
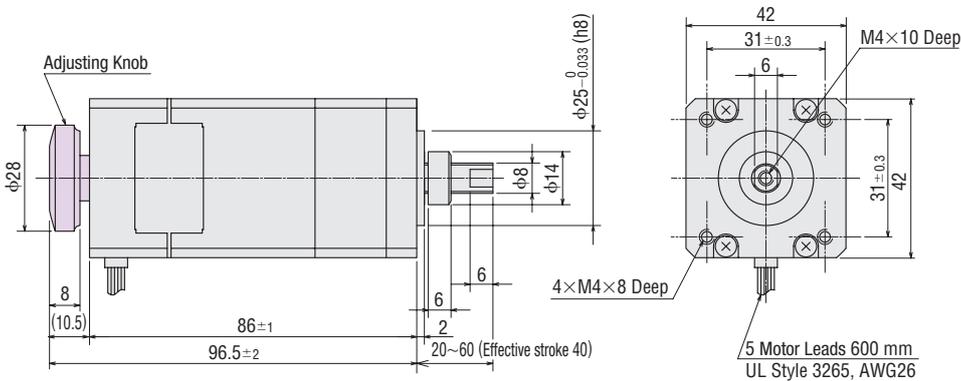
●The dimensions of 1, 2 and 3 apply to a configuration with an adjusting knob. For products without additional functions, the shaft and adjusting knob shown in ▢ areas should be ignored.

4 ☐42 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL42PA2-04MG	DRL42PA2-04M	0.8	D510

42
31±0.3
6
M4×10 Deep
$\phi 25^{0}_{-0.033}$ (h8)
$\phi 8$
$\phi 14$
31±0.3
42
4×M4×8 Deep
6
6
2
(33)
86±1
119±2
20~60 (Effective stroke 40)

2 Electromagnetic Brake Leads 600 mm
UL Style 1430, AWG22
5 Motor Leads 600 mm
UL Style 3265, AWG26
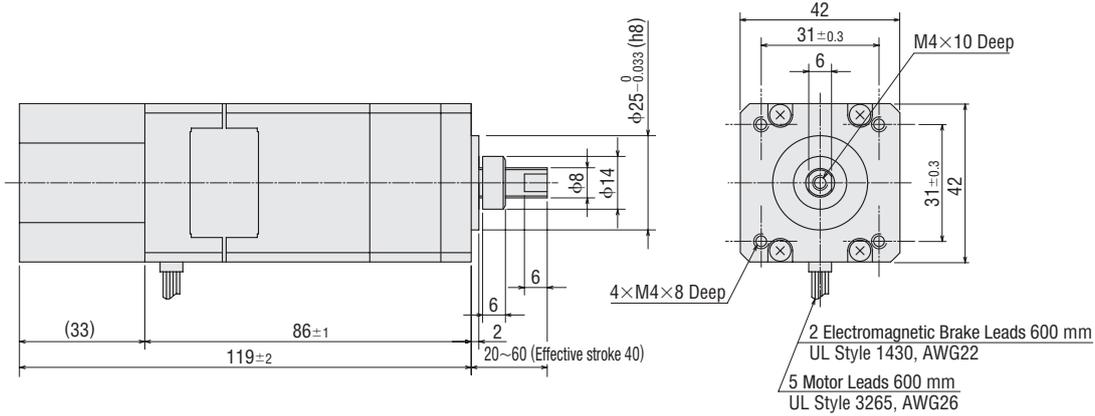
5 ☐60 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL60PA4-05G	DRL60PA4-05	1.3	D362
DRL60PA4-05NG	DRL60PA4-05N	1.35	D511

Adjusting Knob
$\phi 36$
60
50±0.3
12
M8×15 Deep
$\phi 14$
$\phi 26$
$\phi 36^{0}_{-0.039}$ (h8)
50±0.3
60
A
A
8
(10.5)
98±1
108.5±2
10
8
1.5
24.5~74.5 (Effective stroke 50)

5 Motor Leads 600 mm
UL Style 3266, AWG22

10
4
4×M5
$\phi 5.5$

Cross Section A-A (1/1)

● The dimensions of 5 apply to a configuration with an adjusting knob. For products without additional functions, the shaft and adjusting knob shown in ☐ areas should be ignored.
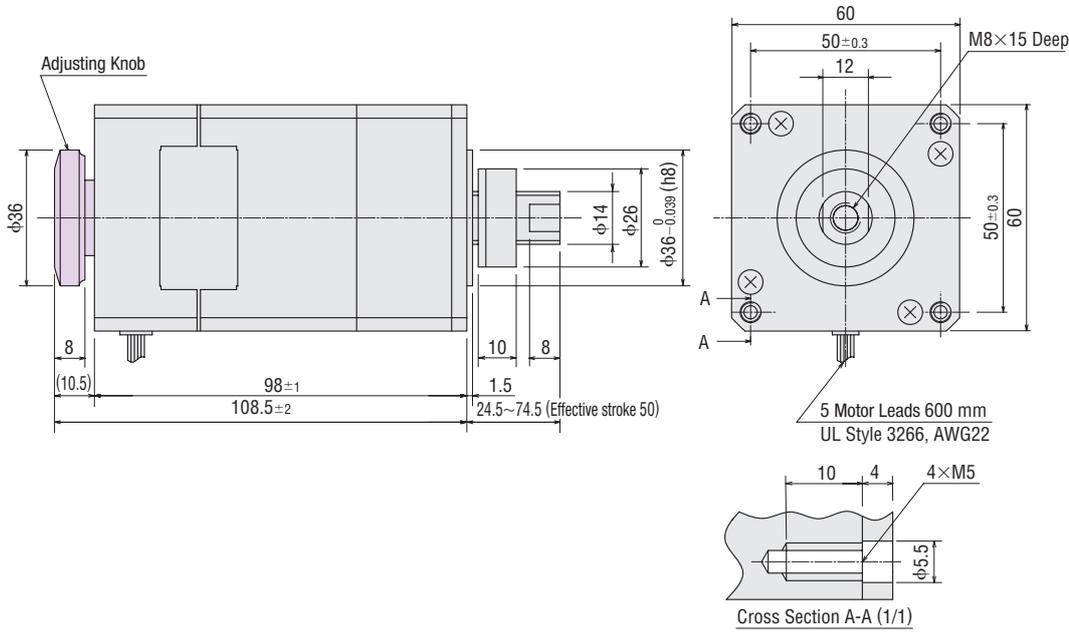
6 □60 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL60PA4-05MG	DRL60PA4-05M	1.7	D512

60
50±0.3
12
M8×15 Deep

φ14
φ26
φ36 0−0.039 (h8)

50±0.3
60

(40)　98±1
138±2

10　8
1.5
24.5~74.5 (Effective stroke 50)

A

A

2 Electromagnetic Brake Leads 600 mm
UL Style 1430, AWG22
5 Motor Leads 600 mm
UL Style 3266, AWG22

10　4　4×M5

φ5.5

Cross Section A-A (1/1)
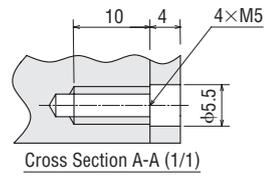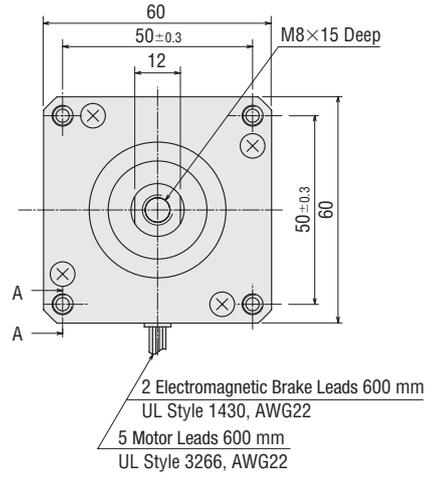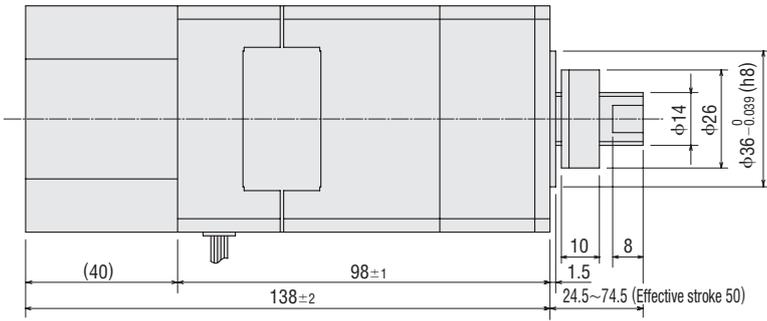
◇Guide Type

7 □20 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL20PB1G-02G	DRL20PB1G-02	0.14	D522
DRL20PB1G-02NG	DRL20PB1G-02N	0.15	D523

Cross Section A-A (1/1)

Adjusting Knob

2×M2×4 Deep

21～46 (Effective stroke 25)
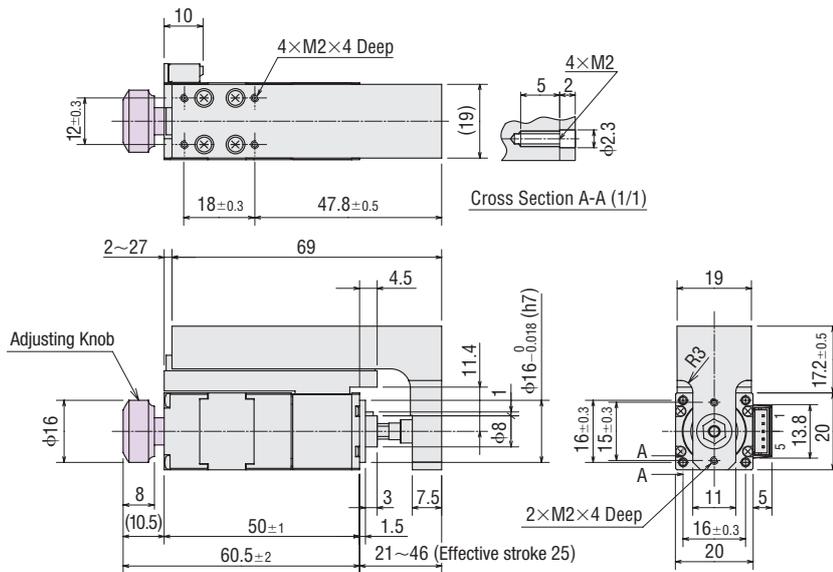
● The actuator comes with a motor lead wire/connector assembly (0.6 m).
UL Style 3265, AWG24

8 □28 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL28PA1G-03G	DRL28PA1G-03	0.25	D456
DRL28PA1G-03NG	DRL28PA1G-03N	0.26	D513

Cross Section A-A (1/1)

Adjusting Knob

2×M2.5

5 Motor Leads 600 mm
UL Style 3265, AWG26

21～51 (Effective stroke 30)
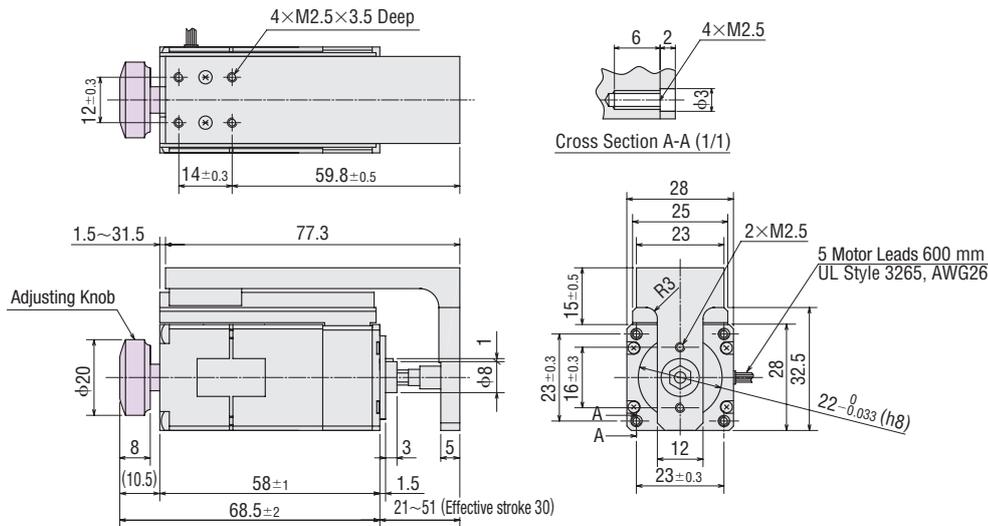
● The dimensions of 7 and 8 apply to a configuration with an adjusting knob. For products without additional functions, the shaft and adjusting knob shown in ▢ areas should be ignored.

**Dimensions E-210/Connection and Operation E-217/Combinations E-221**

E-213

⑨ □42 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL42PA2G-04G	DRL42PA2G-04	0.8	D364
DRL42PA2G-04NG	DRL42PA2G-04N	0.8	D514

⑩ □42 mm
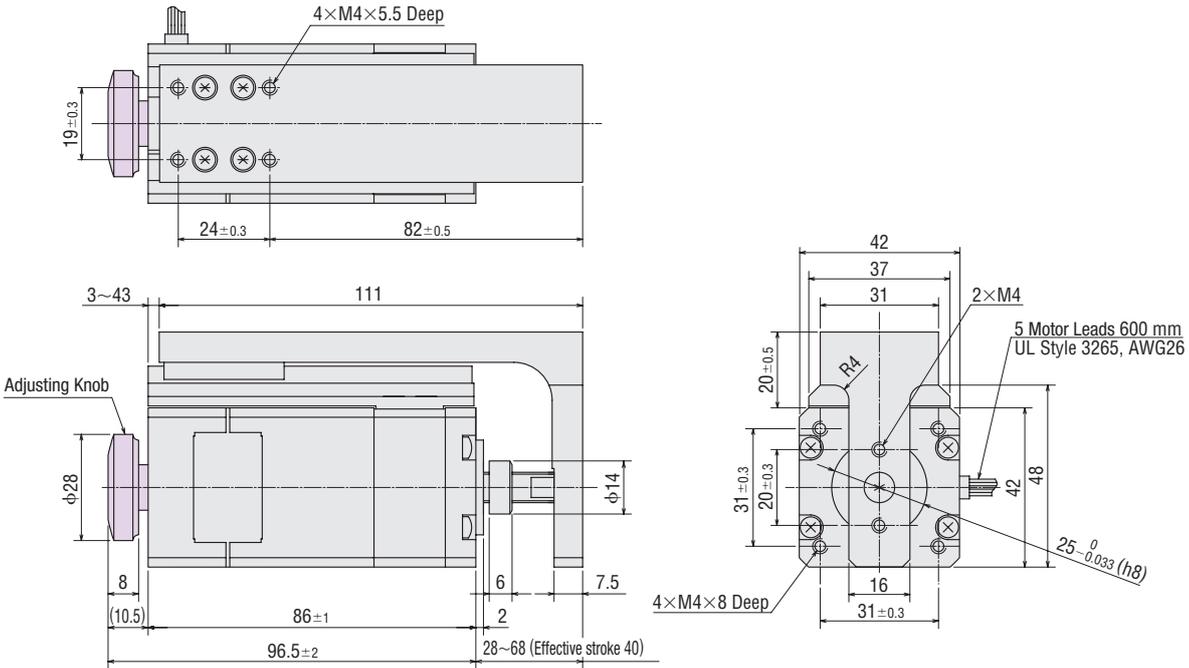
Product Name	Actuator Product Name	Mass kg	CAD
DRL42PA2G-04MG	DRL42PA2G-04M	1	D515

● The dimensions of ⑨ apply to a configuration with an adjusting knob. For products without additional functions, the shaft and adjusting knob shown in ▨ areas should be ignored.
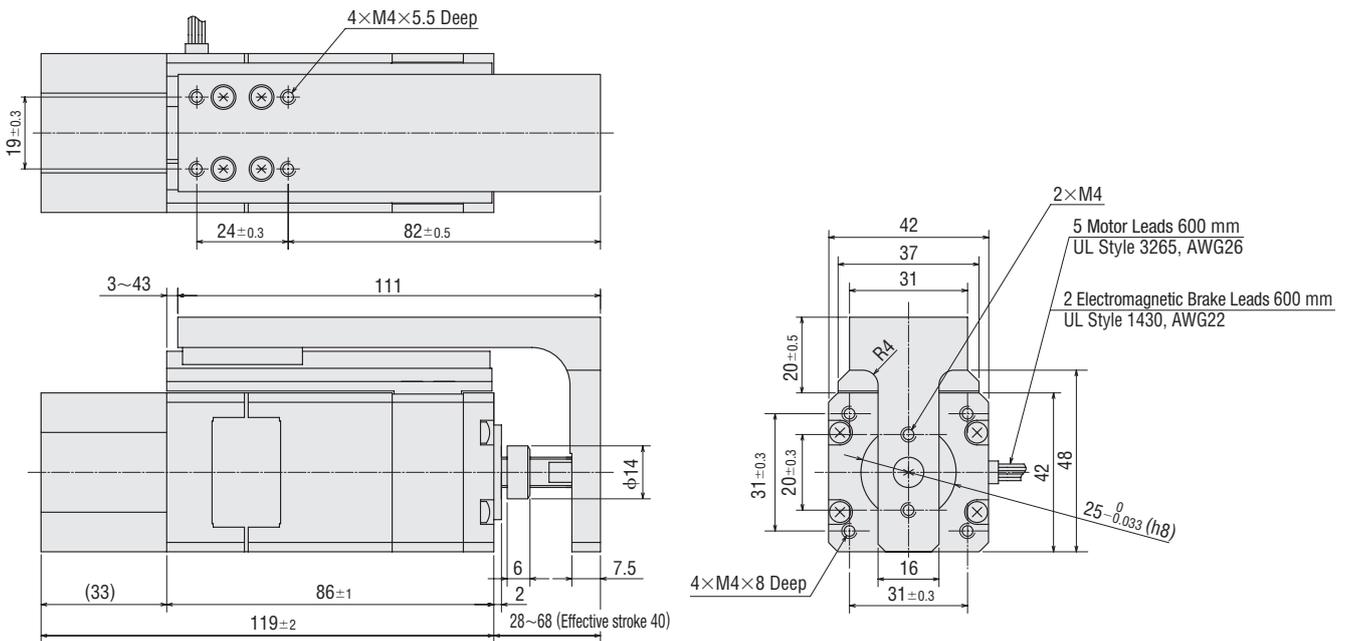
11 □60 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL60PA4G-05G	DRL60PA4G-05	1.8	D365
DRL60PA4G-05NG	DRL60PA4G-05N	1.85	D516

4×M5×5.5 Deep

28±0.3

22±0.3   104±0.5

10   4   4×M5

φ5.5

Cross Section A-A (1/1)

3～53   131

Adjusting Knob

φ36

8

(10.5)   98±1   10   11.5

108.5±2   1.5

36～86 (Effective stroke 50)

φ26

60
52
46

2×M5

5 Motor Leads 600 mm
UL Style 3266, AWG22

26.5±0.5

R5

50±0.3   30±0.3   60   66

A

A

27

50±0.3

36 -0.039 0 (h8)
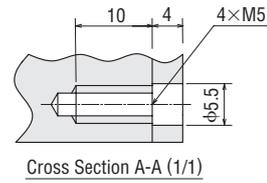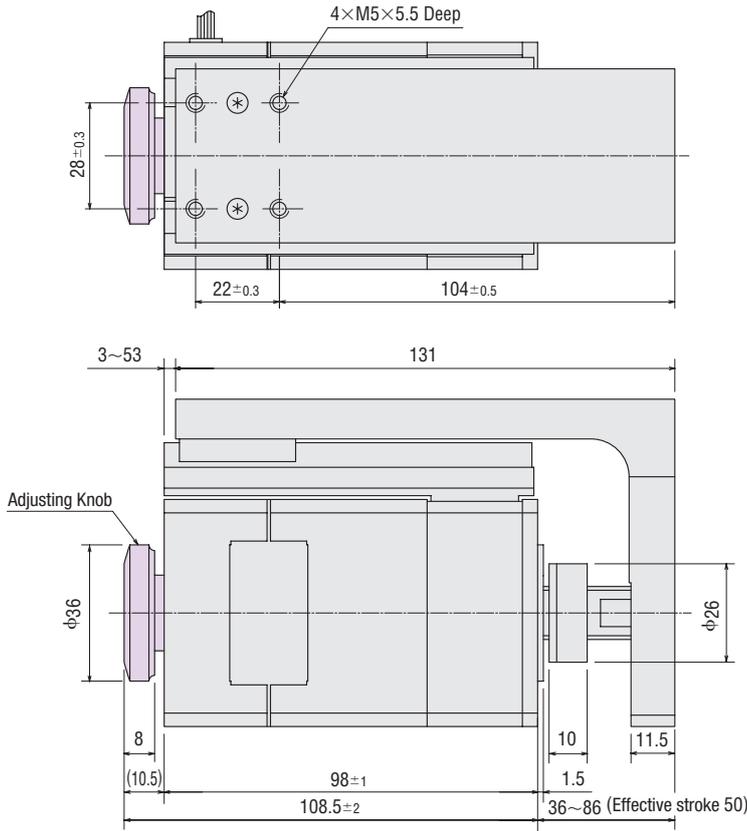
12 □60 mm

Product Name	Actuator Product Name	Mass kg	CAD
DRL60PA4G-05MG	DRL60PA4G-05M	2.2	D517

4×M5×5.5 Deep

28±0.3

22±0.3   104±0.5

10   4   4×M5

φ5.5

Cross Section A-A (1/1)

3～53   131

φ26

(40)   98±1   10   11.5

138±2   1.5

36～86 (Effective stroke 50)

60
52
46

2×M5

5 Motor Leads 600 mm
UL Style 3266, AWG22

2 Electromagnetic Brake Leads 600 mm
UL Style 1430, AWG22

26.5±0.5

R5

50±0.3   30±0.3   60   66

A

A

27

50±0.3

36 -0.039 0 (h8)

● The dimensions of 11 apply to a configuration with an adjusting knob. For products without additional functions, the shaft and adjusting knob shown in ▨ areas should be ignored.
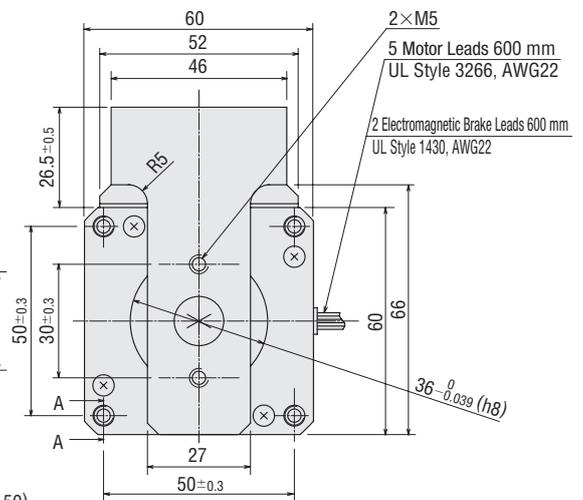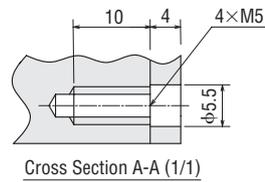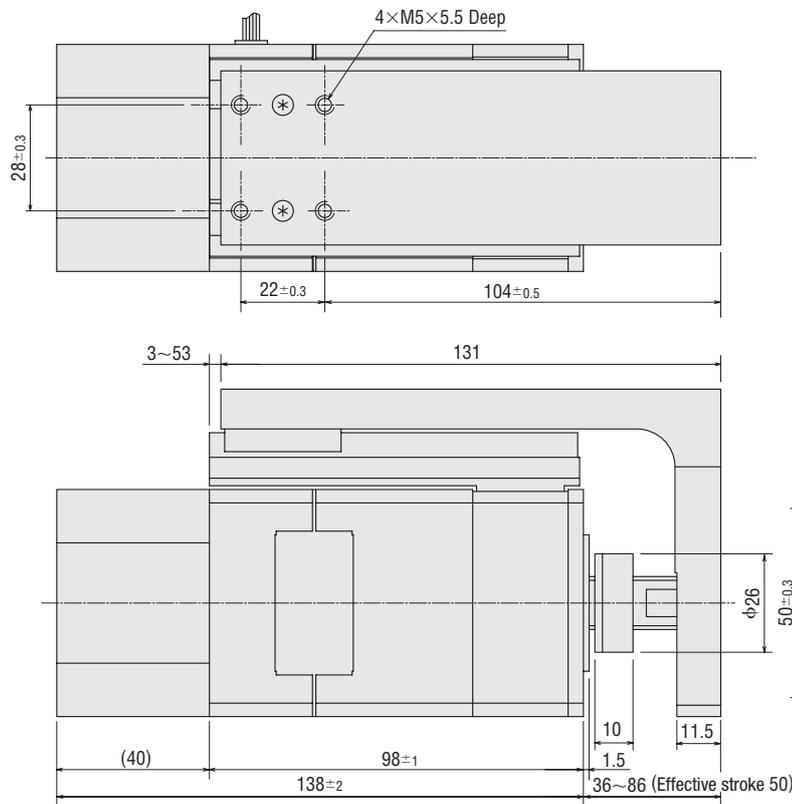
●Driver

13

Driver Product Name: CRD5103P, CRD5107P, CRD5114P

Mass: 0.04 kg

CAD B363

4×φ3.5 Thru
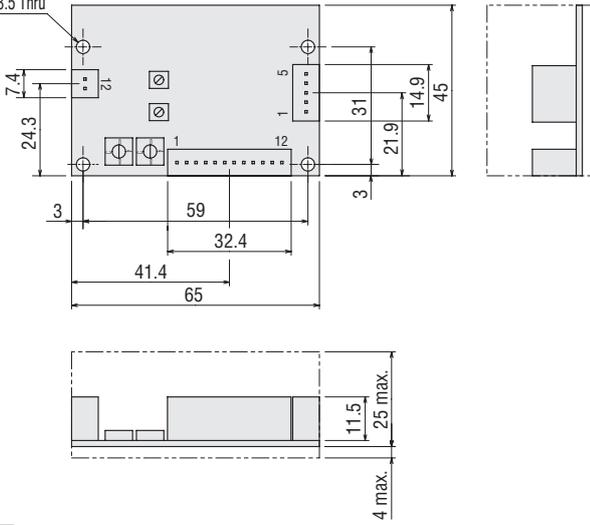
●Included (MOLEX)
Connector Housing
  51103-1200
  51103-0500
  51103-0200
Contact
  50351-8100

Note

●When assembling the connectors, use the hand crimp tool for contact [57295-5000 (MOLEX)]. Or, use the driver cable set consisting of cables already crimped with connectors (sold separately). The crimp tool is not included. Please provide separately.
Driver Cable Set ➡ Page E-225

Motorized Actuators

Introduction Types

EZ limo ELS

EZ limo EZSII / EZSII Motorized Linear Slides

EZ limo EZSII / EZSII Clean Room

Accessories & Installation

EZ limo ELC

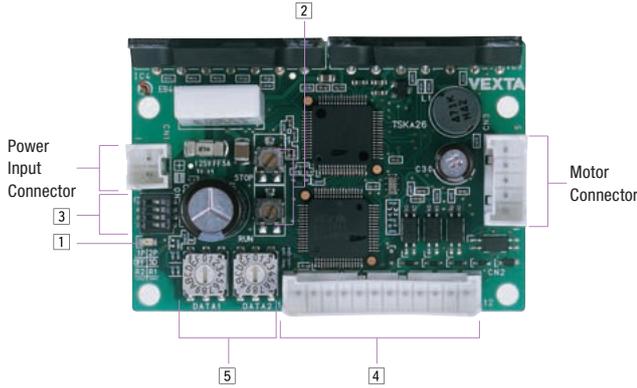EZ limo EZA Motorized Cylinders

Accessories & Installation

DRS Compact Linear Actuators

DRL Accessories & Installation

DG Hollow Rotary Actuators

Accessories & Installation

■Connection and Operation

●Names and Functions of Driver Parts

Power Input Connector

Motor Connector

1 Power Input Indicator

Color	Function	Lighting Condition
Green	Power Supply Indication	When power is applied

2 Current Adjustment Potentiometers

Indication	Potentiometer Name	Functions
RUN	Motor Operating Current Adjustment Potentiometer	For adjusting the operating current of the motor
STOP	Motor Standstill Current Adjustment Potentiometer	For adjusting the standstill current of the motor

3 Function Switches

Indication	Switch Name	Functions
1P/2P	Pulse Input Mode Switch	Switches between 1-pulse input mode and 2-pulse input mode
OFF/SD	Smooth Drive Function Switch	Switches the smooth drive function to enabled or disabled
R2/R1	Resolution Select Switch	Switches the base resolution between R1 and R2

4 I/O Signals

Indication	I/O	Pin No.	Signal Name	Functions
CN2	Input Signals	1	CW Pulse Signal (Pulse signal)	The motor will rotate in the CW (forward) direction. (Operation command pulse signal when in 1-pulse input mode)
		2		
		3	CCW Pulse Signal (Traveling direction signal)	The motor will rotate in the CCW (backward) direction. (Traveling direction signal in 1-pulse input mode) Photocoupler "OFF": CCW, Photocoupler "ON": CW
		4		
		5	All Windings Off Signal	This signal is used to turn off the output current to the motor to allow for position adjustment of the screw shaft using an external force.
		6		
		7	Resolution Select Signal	This signal is used to switch to the resolution set in DATA1 and DATA2
		8		
		9	Automatic Current Cutback Release Signal	This signal is used to disable the automatic current cutback function.
		10		
	Output Signal	11	Excitation Timing Signal	This signal is output when the excitation sequence is at STEP "0."
		12		

5 Resolution Setting Switches

Indication	Switch Name	Function
DATA1	Resolution Setting Switch	Each switch can be set to the desired resolution from the 16 resolution levels.
DATA2		

[DRL20, DRL28]

R1			R2		
Resolution Setting Switch DATA1, DATA2	Microsteps/ Step 1	Resolution 1 (mm)	Resolution Setting Switch DATA1, DATA2	Microsteps/ Step 2	Resolution 2 (mm)
0	1	0.002	0	×2.5	0.005
1	2	0.001	1	×1.25	0.0025
2	2.5	0.0008	2	1.6	0.00125
3	4	0.0005	3	2	0.001
4	5	0.0004	4	3.2	0.000625
5	8	0.00025	5	4	0.0005
6	10	0.0002	6	6.4	0.0003125
7	20	0.0001	7	10	0.0002
8	25	0.00008	8	12.8	0.00015625
9	40	0.00005	9	20	0.0001
A	50	0.00004	A	25.6	0.000078125
B	80	0.000025	B	40	0.00005
C	100	0.00002	C	50	0.00004
D	125	0.000016	D	51.2	0.0000390625
E	200	0.00001	E	100	0.00002
F	250	0.000008	F	102.4	0.00001953125

[DRL42]

R1			R2		
Resolution Setting Switch DATA1, DATA2	Microsteps/ Step 1	Resolution 1 (mm)	Resolution Setting Switch DATA1, DATA2	Microsteps/ Step 2	Resolution 2 (mm)
0	1	0.004	0	×2.5	0.01
1	2	0.002	1	×1.25	0.005
2	2.5	0.0016	2	1.6	0.0025
3	4	0.001	3	2	0.002
4	5	0.0008	4	3.2	0.00125
5	8	0.0005	5	4	0.001
6	10	0.0004	6	6.4	0.000625
7	20	0.0002	7	10	0.0004
8	25	0.00016	8	12.8	0.0003125
9	40	0.0001	9	20	0.0002
A	50	0.00008	A	25.6	0.00015625
B	80	0.00005	B	40	0.0001
C	100	0.00004	C	50	0.00008
D	125	0.000032	D	51.2	0.000078125
E	200	0.00002	E	100	0.00004
F	250	0.000016	F	102.4	0.0000390625

[DRL60]

R1			R2		
Resolution Setting Switch DATA1, DATA2	Microsteps/ Step 1	Resolution 1 (mm)	Resolution Setting Switch DATA1, DATA2	Microsteps/ Step 2	Resolution 2 (mm)
0	1	0.008	0	×2.5	0.02
1	2	0.004	1	×1.25	0.01
2	2.5	0.0032	2	1.6	0.005
3	4	0.002	3	2	0.004
4	5	0.0016	4	3.2	0.0025
5	8	0.001	5	4	0.002
6	10	0.0008	6	6.4	0.00125
7	20	0.0004	7	10	0.0008
8	25	0.00032	8	12.8	0.000625
9	40	0.0002	9	20	0.0004
A	50	0.00016	A	25.6	0.0003125
B	80	0.0001	B	40	0.0002
C	100	0.00008	C	50	0.00016
D	125	0.000064	D	51.2	0.00015625
E	200	0.00004	E	100	0.00008
F	250	0.000032	F	102.4	0.000078125

Notes

● The resolutions are theoretical values.
● The resolution is calculated by dividing the basic resolution by the number of microstep.
● Number of microsteps that can be specified by the "Resolution Select" signal (C/S) are limited to those selected in resolution 1 or resolution 2.
● Do not change the "Resolution Select" signal (C/S) input or resolution select switch while the actuator is operating.
This may cause a malfunction with the actuator.

●Connection Diagram

Customer's Controller — Driver
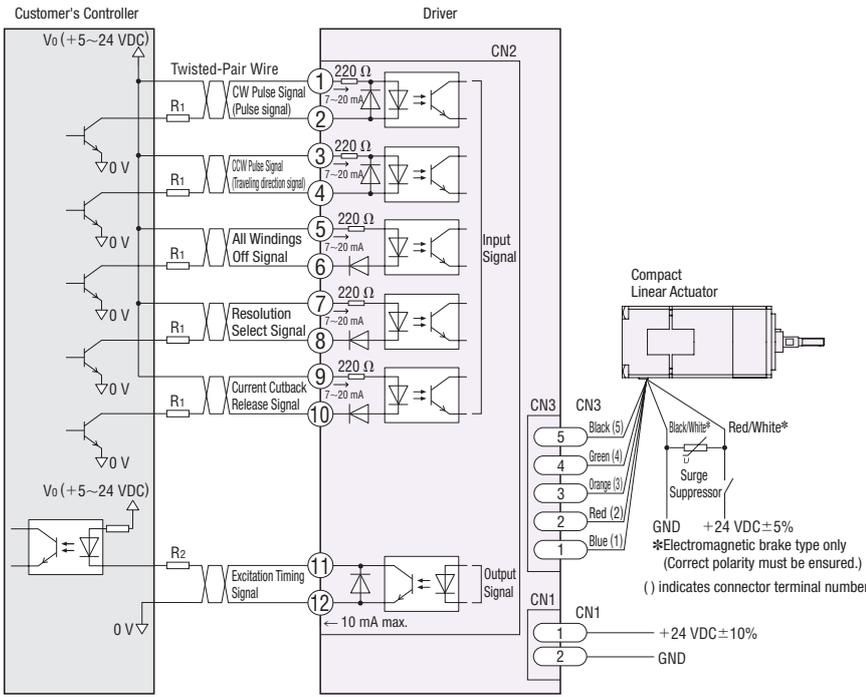
Notes on Wiring

◇I/O Signal Connection

●Input Signal
The external resistor is not needed when the voltage is 5 VDC. If voltage exceeding 5 VDC is applied, connect an external resistor R_1 so that the current becomes 7 to 20 mA.
Example: V_0 is 24 VDC, R_1: 1.5 to 2.2 kΩ 0.5 W or more

●Output Signal
Check the specifications of all devices to be connected and if the current will exceed 10 mA, connect an external resistor R_2.

●Use a twisted-pair wire of AWG24 to 22 (0.2 to 0.3 mm^2).

●Since the maximum transmissible frequency drops as the pulse line becomes longer, keep the wiring length as short as possible (within 2 m).

●Provide a minimum distance of 20 mm between the I/O signal lines and power lines (power supply lines, motor lines, etc.).

◇Power Connection

●Use wires of AWG22 (0.3 mm^2).

●Incorrect polarities of the DC power supply input will lead to driver damage. Make sure that the polarity is correct before turning power on.

◇Extension of Motor Cable

●Use a wire of AWG22 (0.3 mm^2) or thicker.

●Keep the distance between the actuator and driver to 10 m or less.

◇Connecting the Electromagnetic Brake

●Use a shielded cable of AWG24 (0.2 mm^2) or thicker.

●Use the following power supplies for electromagnetic brakes:
DRL42: 24 VDC±5% 0.1 A or more
DRL60: 24 VDC±5% 0.3 A or more

●Connect the red/white lead wire from the actuator to the +24 VDC terminal on the DC power supply and the black/white lead wire to the GND terminal on the DC power supply.

●Correct polarity (+ and −) must be ensured when connecting the electromagnetic brake lead wires to the DC power supply. If polarity is incorrect, the electromagnetic brake will not be released.

●Keep the wiring distance as short as possible to suppress noise.

●To protect the switch contacts and prevent noise, always connect a surge suppressor (included).

◇General

●A separate hand crimp tool is required to crimp the included connector and lead wire. The accessory driver cable set (sold separately) comes with all lead wires already crimped.

●If noise generated by the motor cable or power supply cable causes a problem with the specific wiring or layout, shield the cable or use ferrite cores.

Introduction
Types

EZ limo
ELS

EZ limo
EZS II

EZ limo
EZS II
Clean Room

Accessories
&
Installation

EZ limo
ELC

EZ limo
EZA

Accessories
&
Installation

DRS

DRL

Accessories
&
Installation

DG

Accessories
&
Installation

Motorized Linear Slides   Motorized Cylinders   Compact Linear Actuators   Hollow Rotary Actuators

● **Description of I/O Signals**

Indication of I/O Signal "ON" and "OFF"

Input (output) "ON" indicates that the current is sent into the photocoupler (transistor) inside the driver. Input (output) "OFF" indicates that the current is not sent into the photocoupler (transistor) inside the driver.

Photocoupler State   OFF ⌐ ON

CW (PLS) and CCW (DIR.) Pulse Input Signals

◇ **Input Circuit and Connection Example**
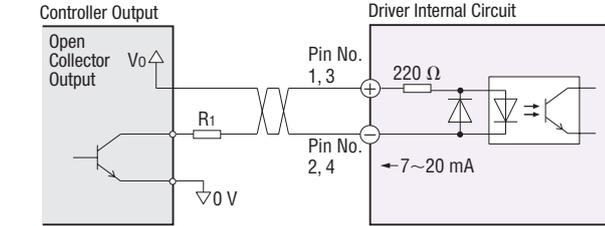
Notes
● Keep the input signal voltage between 5 VDC and 24 VDC.
● When the voltage is equal to 5 VDC, the external resistor R_1 shown in the figure is not necessary. When the voltage exceeds 5 VDC, connect the external resistor R_1 to keep the input current between 7 mA to 20 mA as shown on the figure.

◇ **Pulse Waveform**
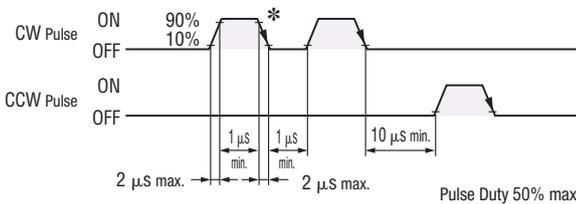
✱ The shaded area indicates when the photocoupler diode is ON. The actuator moves when the signal is switched from "photocoupler ON" to "OFF."
● The minimum interval time 10 μs when changing from CW to CCW is shown as a response time of the circuit. This value varies greatly depending on the actuator type and moment of load inertia.
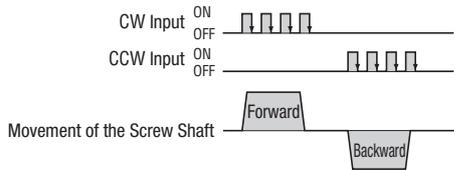
◇ **Pulse Input Modes**
• **2-Pulse Input Mode**
The 2-pulse input mode uses "CW" and "CCW" pulse signals. The screw shaft moves one step forward when the CW input is switched from "ON" → "OFF." The screw shaft moves one step backward when the CCW input is switched from "ON" → "OFF."
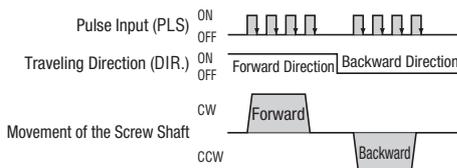
Note
● The initial setting is the 2-pulse input mode.

• **1-Pulse Input Mode**
The 1-pulse input mode uses "Pulse" (PLS) and "Traveling Direction" (DIR.) signals. When the PLS input is switched from "ON" → "OFF" while the DIR. input is ON, the screw shaft moves one step forward. When the PLS input is switched from "ON" → "OFF" while the DIR. input is "OFF", the screw shaft moves one step backward.

All Windings Off (A.W.OFF)/Resolution Select (C/S)/ Current Cutback Release (C.D.INH) Input Signals

◇ **Input Circuit and Connection Example**
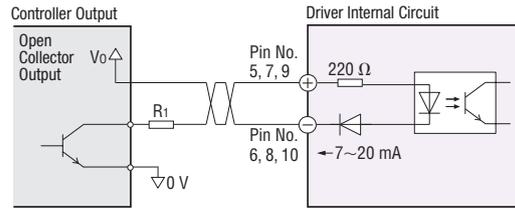
Notes
● Keep the input signal voltage between 5 VDC and 24 VDC.
● When the voltage is equal to 5 VDC, the external resistor R_1 shown in the figure is not necessary. When the voltage exceeds 5 VDC, connect the external resistor R_1 to keep the input current between 7 mA to 20 mA as shown on the figure.

◇ **All Windings Off (A.W.OFF) Input Signal   Pin No. ⑤, ⑥**
● This signal is used when moving the screw shaft for manual positioning.
● When the "All Windings Off" (A.W.OFF) input signal is turned "ON," the motor current turns off and the actuator loses its holding force.
● When the "All Windings Off" (A.W.OFF) input signal is turned "OFF," the motor current turns on and the actuator regains its holding force.
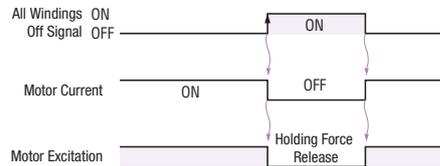

Note
● When operating the actuator, be sure to turn the signal to "OFF."

◇ **Resolution Select (C/S) Input Signal   Pin No. ⑦, ⑧**
● This signal is used to switch between two resolutions set by resolution setting switch (DATA1, DATA2). When the "Resolution Select" (C/S) input signal is turned "OFF," the resolution set by resolution setting switch DATA1 is selected. When the "Resolution Select" (C/S) input signal is turned "ON," the resolution set by resolution setting switch DATA2 is selected.

Example: Changing the resolution from 0.0004 mm (10 microsteps/ step) to 0.004 mm (1 microsteps/step) (**DRL42P**)
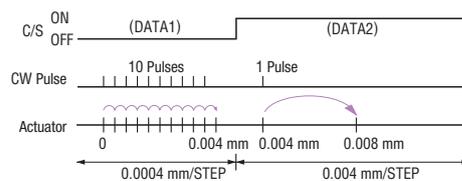
◇ **Automatic Current Cutback Release (C.D.INH) Input Signal Pin No. ⑨, ⑩**
● Turning the "Automatic Current Cutback Release" (C.D.INH) input signal "ON" will disable the automatic current cutback function when the actuator is at standstill. Turning the "Automatic Current Cutback Release" (C.D.INH) input signal "OFF" will enable the automatic current cutback function. When the automatic current cutback function is enabled, the output current to the motor will be automatically reduced within approximately 0.1 seconds after the pulse input is stopped, thus suppressing heat generation from the motor and driver.

Excitation Timing (TIMING) Output Signal

◇Output Circuit and Connection Example

Controller Input — V_0 — Driver Internal Circuit
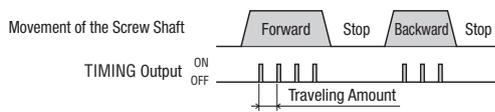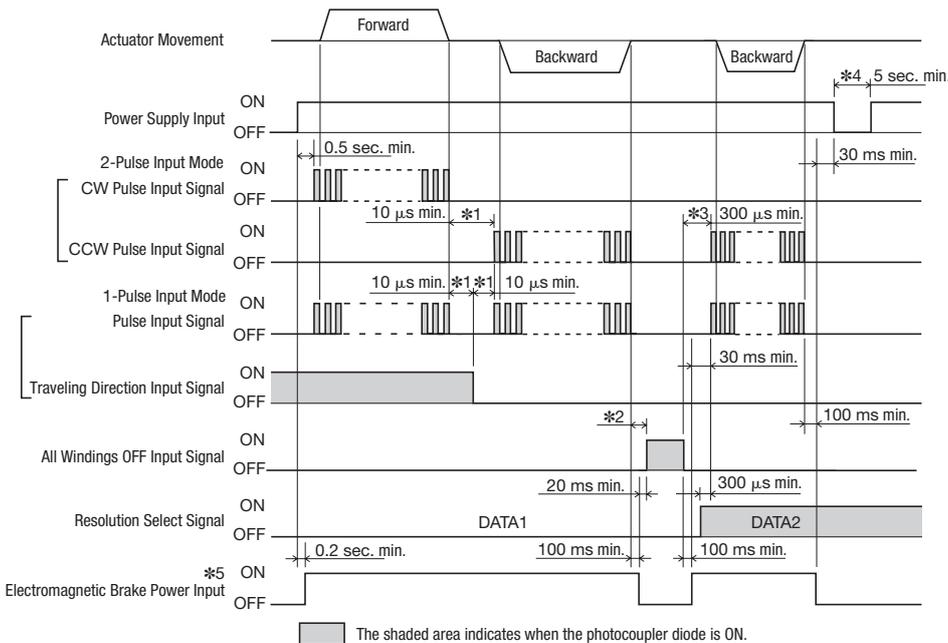
R_2 — Pin No.11 — Pin No.12 — ←10 mA max.

0 V
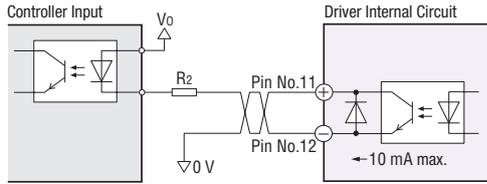
Note
● Keep the output signal voltage between 5 VDC and 24 VDC. The current value must be 10 mA or less. When the current value exceeds 10 mA, connect the external resistor R_2 as shown in the figure to keep the current 10 mA or less.

● This signal is used for precise home detection, etc.
The "Timing" output signal is turned "ON" every time the screw shaft travels by the following travel amount:

Product Name	Travel Amount of the Screw Shaft
DRL20, **DRL28**	0.02 mm
DRL42	0.04 mm
DRL60	0.08 mm

Movement of the Screw Shaft — Forward — Stop — Backward — Stop

TIMING Output — ON / OFF — Traveling Amount

●Timing Chart

Actuator Movement — Forward — Backward — Backward

Power Supply Input — ON / OFF — *4 5 sec. min.

2-Pulse Input Mode CW Pulse Input Signal — ON / OFF — 0.5 sec. min. — 30 ms min.

CCW Pulse Input Signal — ON / OFF — 10 μs min. *1 — *3 300 μs min.

1-Pulse Input Mode Pulse Input Signal — ON / OFF — 10 μs min. *1 *1 10 μs min.

Traveling Direction Input Signal — ON / OFF — 30 ms min.

All Windings OFF Input Signal — ON / OFF — *2 — 100 ms min.

Resolution Select Signal — ON / OFF — DATA1 — 20 ms min. — 300 μs min. — DATA2

*5 Electromagnetic Brake Power Input — ON / OFF — 0.2 sec. min. — 100 ms min. — 100 ms min.

The shaded area indicates when the photocoupler diode is ON.

*1 The switching time to change the CW or CCW pulse (2-pulse input mode), or switching time to change the traveling direction signal (1-pulse input mode) 10 μs or more, is shown as circuit response time. Set the time over which responding to the actuator is possible.
*2 Depends on load inertia, load torque and starting frequency.
*3 Do not input a pulse signal immediately after switching the "All Windings Off" input signal to "OFF." The actuator may not start.
*4 Wait at least five seconds before turning on the power again.
*5 Electromagnetic brake type only

■List of Actuator and Driver Combinations

Frame Size (mm)	Type	Additional Functions	Product Name	Actuator Product Name	Driver Product Name
□20	Standard Type	Without Additional Function	**DRL20PB1-02G**	DRL20PB1-02	CRD5103P
		With Adjusting Knob	**DRL20PB1-02NG**	DRL20PB1-02N	
	Guide Type	Without Additional Function	**DRL20PB1G-02G**	DRL20PB1G-02	
		With Adjusting Knob	**DRL20PB1G-02NG**	DRL20PB1G-02N	
□28	Standard Type	Without Additional Function	**DRL28PA1-03G**	DRL28PA1-03	CRD5107P
		With Adjusting Knob	**DRL28PA1-03NG**	DRL28PA1-03N	
	Guide Type	Without Additional Function	**DRL28PA1G-03G**	DRL28PA1G-03	
		With Adjusting Knob	**DRL28PA1G-03NG**	DRL28PA1G-03N	
□42	Standard Type	Without Additional Function	**DRL42PA2-04G**	DRL42PA2-04	
		With Electromagnetic Brake	**DRL42PA2-04MG**	DRL42PA2-04M	
		With Adjusting Knob	**DRL42PA2-04NG**	DRL42PA2-04N	
	Guide Type	Without Additional Function	**DRL42PA2G-04G**	DRL42PA2G-04	
		With Electromagnetic Brake	**DRL42PA2G-04MG**	DRL42PA2G-04M	
		With Adjusting Knob	**DRL42PA2G-04NG**	DRL42PA2G-04N	
□60	Standard Type	Without Additional Function	**DRL60PA4-05G**	DRL60PA4-05	CRD5114P
		With Electromagnetic Brake	**DRL60PA4-05MG**	DRL60PA4-05M	
		With Adjusting Knob	**DRL60PA4-05NG**	DRL60PA4-05N	
	Guide Type	Without Additional Function	**DRL60PA4G-05G**	DRL60PA4G-05	
		With Electromagnetic Brake	**DRL60PA4G-05MG**	DRL60PA4G-05M	
		With Adjusting Knob	**DRL60PA4G-05NG**	DRL60PA4G-05N	

Introduction Types

EZ limo ELS

EZ limo EZS II Motorized Linear Slides

EZ limo EZS II Clean Room

Accessories & Installation

EZ limo ELC Motorized Cylinders

EZ limo EZA

Accessories & Installation

DRS Compact Linear Actuators

DRL

Accessories & Installation

DG Hollow Rotary Actuators

Accessories & Installation