Connection and Operation



1 Power Input Display

Color	Function	When Activated	
Green	Power Supply Indication	Lights when power is on	

2 Current Adjustment Potentiometers

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

4 Input/Output Signals

Indication	Input/ Output	Pin No.	Signal Name	Function		
CN2		1	Pulse Signal	Operation command pulse signal		
		2	(CW Pulse Signal)	(The motor will rotate in the CW direction when in 2-pulse input mode.)		
	Input	3	Rotation Direction Signal	Rotation direction signal		
		4	(CCW Pulse Signal)	(The motor will rotate in the CCW direction when in 2-pulse input mode.)		
		5	All Windings Off Signal	Turns off the output current to the motor so that the motor shaft can be rotated by external force		
		6	All Windings on Signal			
		7	Possiution Salast Signal	Switches to the resolution set in DATA1 and DATA2		
		8	nesolution Select Signal			
Outpu		9	Automatic Current Cutback	Disables the automatic surrent outback function		
	[10	Release Signal			
	Output	11	Excitation Timing Signal	This signal is output when the excitation sequence is in step "0."		
	υιιμαι	12	Excitation milling Signal			

5 Resolution Setting Switches

Indication	Switch Name	Function		
DATA1	Population Sotting Switch	Fach quitch can be get to the desired resolution from the 1C resolution levels		
DATA2	Resolution Setting Switch	Each switch can be set to the desired resolution from the 16 resolution revers.		

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DRL20, DRL28 •With the high-resolution motor, the resolution is one-half the values specified below.

R1			R2		
Resolution Setting Switch	Microsteps/	Resolution 1	Resolution Setting Switch	Microsteps/	Resolution 2
DATA1 DATA2	Step 1	mm (in.)	DATA1 DATA2	Step 2	mm (in.)
0	1	0.002 (0.000079)	0	×2.5	0.005 (0.00020)
1	2	0.001 (0.000039)	1	×1.25	0.0025 (0.000098)
2	2.5	0.0008 (0.000031)	2	1.6	0.00125 (0.000049)
3	4	0.0005 (0.00002)	3	2	0.001 (0.000039)
4	5	0.0004 (0.000016)	4	3.2	0.000625 (0.000025)
5	8	0.00025 (0.0000098)	5	4	0.0005 (0.000020)
6	10	0.0002 (0.0000079)	6	6.4	0.0003125 (0.000012)
7	20	0.0001 (0.0000039)	7	10	0.0002 (0.0000079)
8	25	0.00008 (0.0000031)	8	12.8	0.00015625 (0.0000062)
9	40	0.00005 (0.000002)	9	20	0.0001 (0.0000039)
A	50	0.00004 (0.0000016)	A	25.6	0.000078125 (0.0000031)
В	80	0.000025 (0.00000098)	В	40	0.00005 (0.0000020)
С	100	0.00002 (0.00000079)	С	50	0.00004 (0.0000016)
D	125	0.000016 (0.00000063)	D	51.2	0.0000390625 (0.0000015)
E	200	0.00001 (0.00000039)	E	100	0.00002 (0.00000079)
F	250	0.000008 (0.00000031)	F	102.4	0.00001953125 (0.00000077)

DRL42 •With the high-resolution motor, the resolution is one-half the values specified below.

R1			R2		
Resolution Setting Switch	Microsteps/	Resolution 1	Resolution Setting Switch	Microsteps/	Resolution 2
DATA1 DATA2	Step 1	mm (in.)	DATA1 DATA2	Step 2	mm (in.)
0	1	0.004 (0.00016)	0	×2.5	0.01 (0.00039)
1	2	0.002 (0.000079)	1	×1.25	0.005 (0.00020)
2	2.5	0.0016 (0.000063)	2	1.6	0.0025 (0.000098)
3	4	0.001 (0.000039)	3	2	0.002 (0.000079)
4	5	0.0008 (0.000031)	4	3.2	0.00125 (0.000049)
5	8	0.0005 (0.00002)	5	4	0.001 (0.000039)
6	10	0.0004 (0.000016)	6	6.4	0.000625 (0.000025)
7	20	0.0002 (0.0000079)	7	10	0.0004 (0.000016)
8	25	0.00016 (0.0000063)	8	12.8	0.0003125 (0.000012)
9	40	0.0001 (0.0000039)	9	20	0.0002 (0.0000079)
А	50	0.00008 (0.0000031)	Α	25.6	0.00015625 (0.0000062)
В	80	0.00005 (0.000002)	В	40	0.0001 (0.0000039)
С	100	0.00004 (0.0000016)	С	50	0.00008 (0.0000031)
D	125	0.000032 (0.0000013)	D	51.2	0.000078125 (0.0000031)
E	200	0.00002 (0.00000079)	E	100	0.00004 (0.0000016)
F	250	0.000016 (0.00000063)	F	102.4	0.0000390625 (0.0000015)

DRL60 • With the high-resolution motor, the resolution is one-half the values specified below.

R1			R2		
Resolution Setting Switch	Microsteps/	Resolution 1	Resolution Setting Switch	Microsteps/	Resolution 2
DATA1 DATA2	Step 1	mm (in.)	DATA1 DATA2	Step 2	mm (in.)
0	1	0.008 (0.00031)	0	×2.5	0.02 (0.00079)
1	2	0.004 (0.00016)	1	×1.25	0.01(0.00039)
2	2.5	0.0032 (0.00013)	2	1.6	0.005 (0.00020)
3	4	0.002 (0.000079)	3	2	0.004 (0.00016)
4	5	0.0016 (0.000063)	4	3.2	0.0025 (0.000098)
5	8	0.001 (0.000039)	5	4	0.002 (0.000079)
6	10	0.0008 (0.000031)	6	6.4	0.00125 (0.000049)
7	20	0.0004 (0.000016)	7	10	0.0008 (0.000031)
8	25	0.00032 (0.000013)	8	12.8	0.000625 (0.000025)
9	40	0.0002 (0.0000079)	9	20	0.0004 (0.000016)
A	50	0.00016 (0.0000063)	A	25.6	0.0003125 (0.000012)
В	80	0.0001 (0.0000039)	В	40	0.0002 (0.0000079)
С	100	0.00008 (0.0000031)	С	50	0.00016 (0.0000063)
D	125	0.000064 (0.0000025)	D	51.2	0.00015625 (0.0000062)
E	200	0.00004 (0.0000016)	E	100	0.00008 (0.0000031)
F	250	0.000032 (0.0000013)	F	102.4	0.000078125 (0.0000031)

Notes:

 $\hfill \ensuremath{\bullet}$ The resolutions are theoretical values.

 ${\ensuremath{\bullet}}$ The resolution is calculated by dividing the base resolution by the number of microstep.

• The numbers of microsteps that can be specified by the "Resolution Select" signal are limited to those selected in resolution 1 or resolution 2.

• Do not change the "Resolution Select" signal input or resolution select switch while the actuator is operating. It may cause malfunction.

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Connection Diagram



\bigcirc Input/Output Signal Connection

Keep the input signal V₀ between 5 VDC and 24 VDC.
 When V₀ is equal to 5 VDC, the external resistor R₁ is not necessary. When V₀ is above 5 VDC, connect R₁ to keep the current between 10 mA and 20 mA.

Example: When V₀ is 24 VDC R₁: 1.5 to 2.2 k Ω , 0.5 W or more

Keep the output signal voltage V₀ between 5 VDC and 24 VDC, current 10 mA or less. When V₀ is above 10 mA, connect R₂ to keep the current 10 mA or less.

◇Power Supply

Use a power supply that can supply sufficient input current. When power supply capacity is insufficient, a decrease in actuator output can cause the following malfunctions:

Actuator does not move properly at high-speed (insufficient thrust).
 Slow actuator startup and stopping

Connecting the Electromagnetic Brake to Power Supply

- Connect the red/white lead from the actuator to the +24 VDC terminal on the DC power supply and the black/white lead to the GND terminal. (The electromagnetic brake leads have polarity. The electromagnetic brake will not operate if the leads are connected in reverse polarity.)
- For the electromagnetic brake, use a power supply of 24 VDC±5%, 0.1 A or more for DRL42, or 24 VDC±5%, 0.3 A or more for DRL60.
- To connect the electromagnetic brake to the DC power supply, use a shielded cable of AWG24 or thicker and keep the wiring distance to a minimum. Be sure to use the supplied surge suppressor to protect switch contact and suppress noise.

◇Notes on Wiring

- Use twisted-pair wires of AWG24 to 22 and 2 m (6.6 ft.) or less in length for the signal lines.
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases. Technical reference → F-67
- Use wires of AWG22 for the power supply lines.
 When assembling the connector, use the hand-operated crimp tool or the crimped driver lead wire set (sold separately). The crimp tool is not provided with the package. It must be purchased separately.
- Signal lines should be kept at least 2 cm (0.79 in.) away from power lines (power supply lines and motor lines). Do not wire the signal lines with the power lines in the same duct or bundle them together.
- Extension of the motor leads should be within 10 m (32.8 ft.).
- If noise generated by the wiring and layout of motor cables and/or power cables causes a problem, try shielding the cables or insert ferrite cores.
- Incorrect connection of DC power input will lead to driver damage. Make sure that the polarity is correct before turning the power on.

Description of Input/Output Signals



Pulse (CW) and Rotation Direction (CCW) Input Signal

\Diamond Input Circuit and Sample Connection



Notes:

- Keep the input signal voltage V₀ between 5 VDC and 24 VDC.
- \bullet When V₀ is equal to 5 VDC, the external resistor R₁ is not necessary. When V₀ is above 5 VDC, connect R₁ to keep the current between 10 mA and 20 mA.

◇Pulse Waveform Characteristics



Pulse Duty: 50% and below

- \ast The shaded area indicates when the photocoupler diode is ON. The actuator moves when the photocoupler state changes from ON to OFF.
- \bullet The minimum interval time when changing rotation direction 10 μs is shown as a response time of circuit. This value varies greatly depending on the actuator type and load inertia.

◇Pulse Input Mode

• 1-Pulse Input Mode

The 1-pulse input mode uses "Pulse" and "Rotation Direction" signals. When the "Pulse" input is switched from ON to OFF while the "Rotation Direction" input is ON, the screw shaft moves one step forward. When the "Pulse" input is switched from ON to OFF while the "Rotation Direction" input is OFF, the screw shaft moves one step backward.



• 2-Pulse Input Mode

The 2-pulse input mode uses "CW" and "CCW" pulse signals. When the "CW" input is switched from ON to OFF, the screw shaft moves one step forward. When the "CCW" input is switched from ON to OFF, the screw shaft moves one step backward.



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

\bigcirc Input Circuit and Sample Connection



Note:

• Keep the input signal voltage V_0 between 5 VDC and 24 VDC. When V_0 is equal to 5 VDC, the external resistor R_1 is not necessary. When V_0 is above 5 VDC, connect R_1 to keep the current between 10 mA and 20 mA.

\bigcirc 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" input is turned "ON," the motor current turns off and the actuator loses its holding torque.
- When the "All Windings Off" input is turned "OFF," the motor current turns on and the actuator regains its holding torque.



Note:

When operating the actuator, this switch must be "OFF."

- \bigcirc 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" input is in the "photocoupler OFF" state, the resolution set by resolution setting switch DATA1 is selected. When the "Resolution Select" input is in the "photocoupler ON" state, the resolution set by resolution setting switch DATA2 is selected.
- Example: Changing the resolution from 0.0004 mm (0.000016 in.) (10 microsteps/step) to 0.004 mm (0.00016 in.)



◇Automatic Current Cutback Release (C.D.INH) Input Signal Pin No.(?), (10)

Turning the "Automatic Current Cutback Release" input "ON" will disable the automatic current cutback function when the actuator is at standstill. Turning the "Automatic Current Cutback Release" input "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 second after the pulse input is stopped, thus suppressing heat generation from the motor and driver.

Excitation Timing (TIM.) Output Signal

Output Circuit and Sample Connection



Note:

● Keep the output signal voltage V₀ between 5 VDC and 24 VDC, current 10 mA or less. When Vo is above 10 mA, connect the external resistor R2 as shown in the figure to keep the current 10 mA or less.

• This signal is used for precise home detection, etc.

The "Excitation Timing" output comes on every particular amount (see the chart below) of the screw shaft movement.

Model	Travel Amount of the Screw Shaft	
DRL20, DRL28P	0.02 mm (0.00079 in.)	
DRL42P	0.04 mm (0.0016 in.)	
DRL60P	0.08 mm (0.0031 in.)	
DRL28M	0.01 mm (0.00039 in.)	
DRL42M	0.02 mm (0.00079 in.)	
DRL60M	0.04 mm (0.0016 in.)	
Movement of the Screw Excitation Timing Ou	Shaft Forward Stop / Backward St tput OFF Travel Amount	top

Timing Chart





- *1 The minimum switching time to change rotation direction (1-pulse input mode), and switching time to change CW, CCW pulse (2-pulse input mode) 10 µs is shown as a response time of circuit. The actuator may need more time.
- *2 Depends on load inertia, load torque and starting frequency.
- *3 Never input a pulse signal immediately after switching the "All Windings Off" signal to the "photocoupler OFF" state. The actuator may not start.
- *4 Wait at least five seconds before turning on the power again.

*5 Only for electromagnetic brake type

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