Oriental motor

NEW PRODUCTS

RoHS RoHS-Compliant

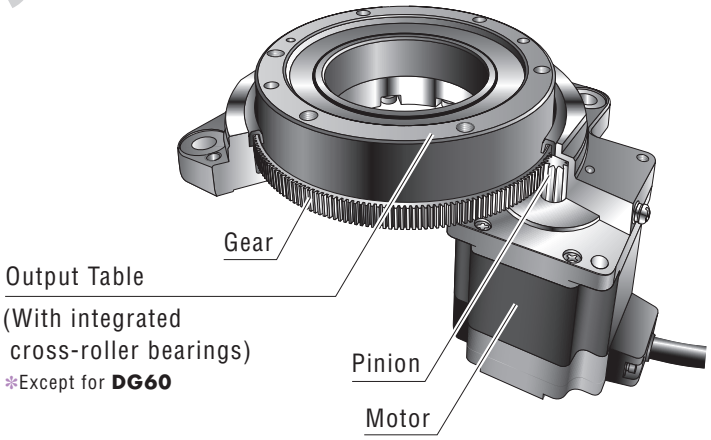
Hollow Rotary Actuators

DG Series

The **DG** Series is a rotary actuator featuring a hollow output table that allows large-inertia discs and arms to be installed directly. The range of applications has widened with the addition of models with a frame size of 200 mm (7.87 in.) and permissible torque of 50 N·m (440 lb-in).

DG series

DG Series actuators feature a compact, hollow output table that allows large-inertia discs and arms to be installed directly.



High Output, High Rigidity

The hollow output table is integrated with a high rigidity cross-roller bearing*.
This structure improves permissible thrust load and moment load while maintaining high torque.
*Except for **DG60**

High Accuracy Positioning without Backlash

- Repetitive positioning accuracy: ±15 sec
- Lost Motion: 2 min

Lineup

DG60
- ☐Permissible Torque: **0.9 N·m (7.9 lb-in)**
- ☐Frame Size: **60 mm (2.36 in.)**

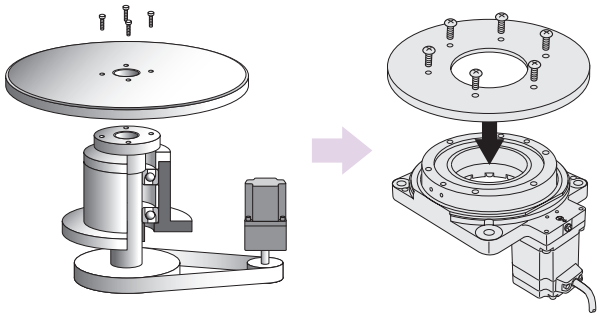
DG85
- ☐Permissible Torque: **2.8 N·m (24 lb-in)**
- ☐Frame Size: **85 mm (3.35 in.)**

DG130
- ☐Permissible Torque: **12 N·m (106 lb-in)**
- ☐Frame Size: **130 mm (5.12 in.)**

DG200 NEW
- ☐Permissible Torque: **50 N·m (440 lb-in)**
- ☐Frame Size: **200 mm (7.87 in.)**

Less Hassle with Direct Coupling

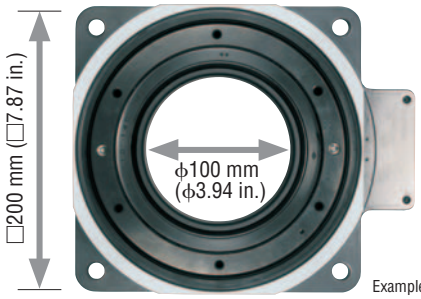
Equipment tables and arms can be installed directly on the output table. This saves you the hassle and cost of designing an installation mechanism, arranging necessary parts, adjusting the belt tension, etc., when mechanical parts such as belt and pulley are used for installation.



	Frame Size [mm (in.)]	Permissible Thrust Load [N (lb.)]
DG60	60 (2.36)	100 (22)
DG85	85 (3.35)	500 (112)
DG130	130 (5.12)	2000 (450)
NEW **DG200**	200 (7.87)	4000 (900)

Large-Diameter, Hollow Output Table Makes Possible Simple Wiring and Piping

A Hollow hole (through hole) of sufficiently large diameter helps reduce the complexity of wiring and piping, thus further simplifying your equipment design.



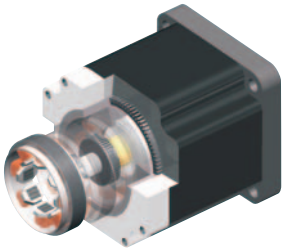
Example: **DG200**

	Frame Size [mm (in.)]	Diameter of Hollow Section [mm (in.)]
DG60	60 (2.36)	28 (1.1)
DG85	85 (3.35)	33 (1.3)
DG130	130 (5.12)	62 (2.44)
NEW **DG200**	200 (7.87)	100 (3.94)

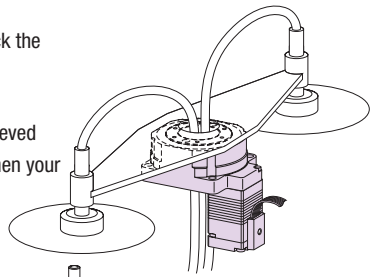
Supporting Sudden Load Fluctuation and Rapid Acceleration

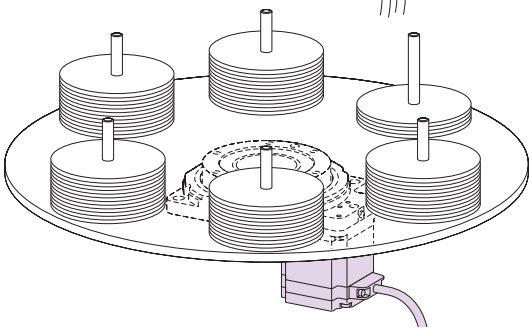
Adopting a closed loop α_{STEP} stepping motor designed to maintain synchronism, the **DG** Series actuator eliminates the need for tuning to prevent hunting upon sudden load fluctuation or rapid acceleration.

A built-in rotor position detection sensor constantly monitors the motor speed and position. If synchronism is about to be lost, closed-loop control is implemented immediately. With the **DG** Series, you can also enjoy greater reliability because the positioning completion signal and position detection function can be used to check the actuator condition.



Stable operation can be achieved without adjustment, even when your equipment is subject to load fluctuation.

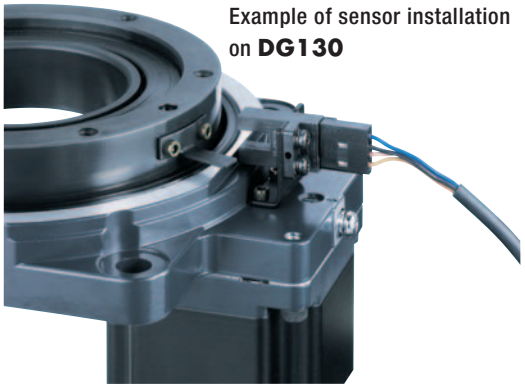




Home-Sensor Set is Available as an Accessory

The sensor set comes with all the parts required for the return to home operation, meaning you will spend less time designing, fabricating and procuring parts relating to sensor installation.

Example of sensor installation on **DG130**



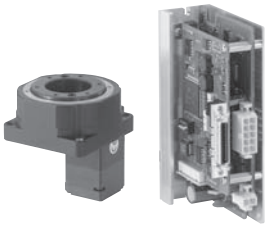
RoHS-Compliant

The **DG** Series conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

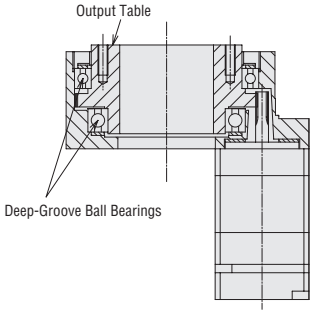
RoHS (Restriction of Hazardous Substances) Directive:
Directive on restriction of the use of certain hazardous substances in electrical and electronic equipment (2002/95/EC).
The RoHS Directive prohibits the use of six chemical substances in electrical and electronic products sold in the EU member states. The six controlled substances are: lead, hexavalent chromium, cadmium, mercury and two specific brominated flame-retardants (PBB and PBDE).

Type and Structure

DG60

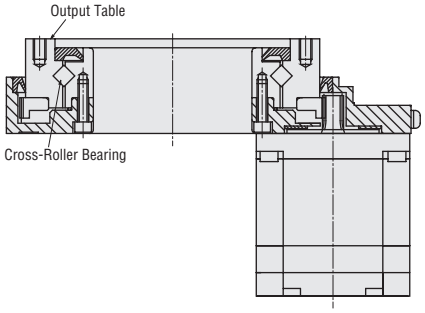


- Permissible Torque: 0.9 N·m (7.9 lb-in)
- Permissible Thrust Load: 100 N (22 lb.)
- Permissible Moment Load: 2 N·m (17.7 lb-in.)



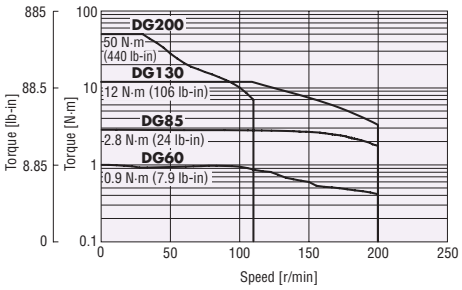
DG85, DG130, DG200

- Permissible Torque: 50 N·m (440 lb-in)
- Permissible Thrust Load: 4000 N (900 lb.)
- Permissible Moment Load: 100 N·m (880 lb-in)
  (The above value is for **DG200**.)



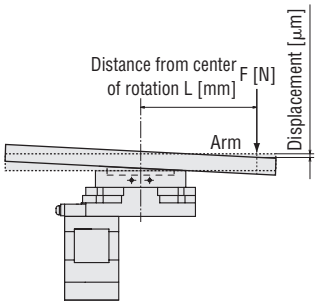
Permissible Torque

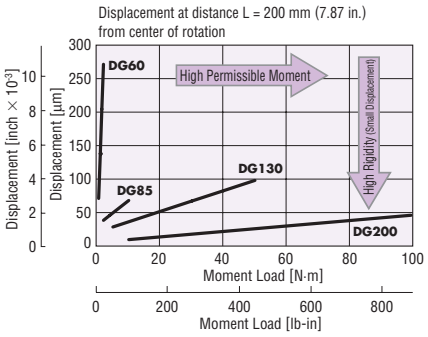
The hollow rotary actuators with larger permissible torque deliver stable, high speed positioning of larger inertial loads. Select the model that best suits your application.



Rigidity

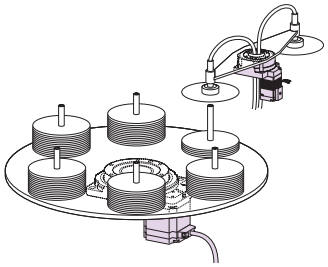
The output table uses deep-groove ball bearings (two pieces) for the 60 mm (2.36 in.) frame size type, and a cross-roller bearing for the 85 mm (3.35 in.), 130 mm (5.12 in.) and 200 mm (7.87 in.) frame size types. As the frame size increases, the permissible moment load also increases but the displacement caused by the moment load decreases.



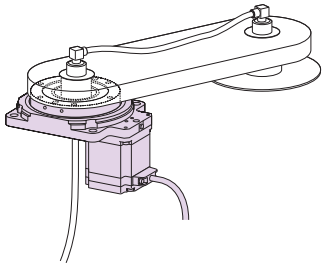


Applications

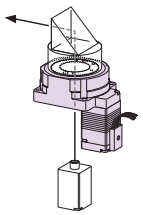
- Applications subject to changing load inertia



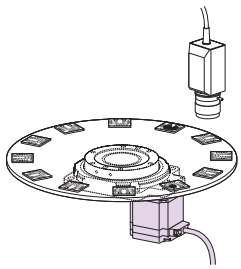
- Applications where a moment load is applied



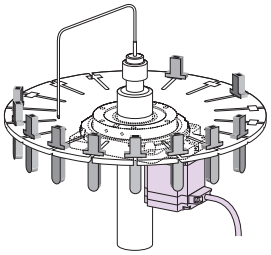
- Optical applications using the hollow hole



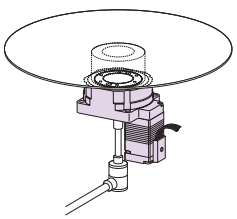
- High accuracy positioning applications



- High accuracy positioning applications using the hollow hole

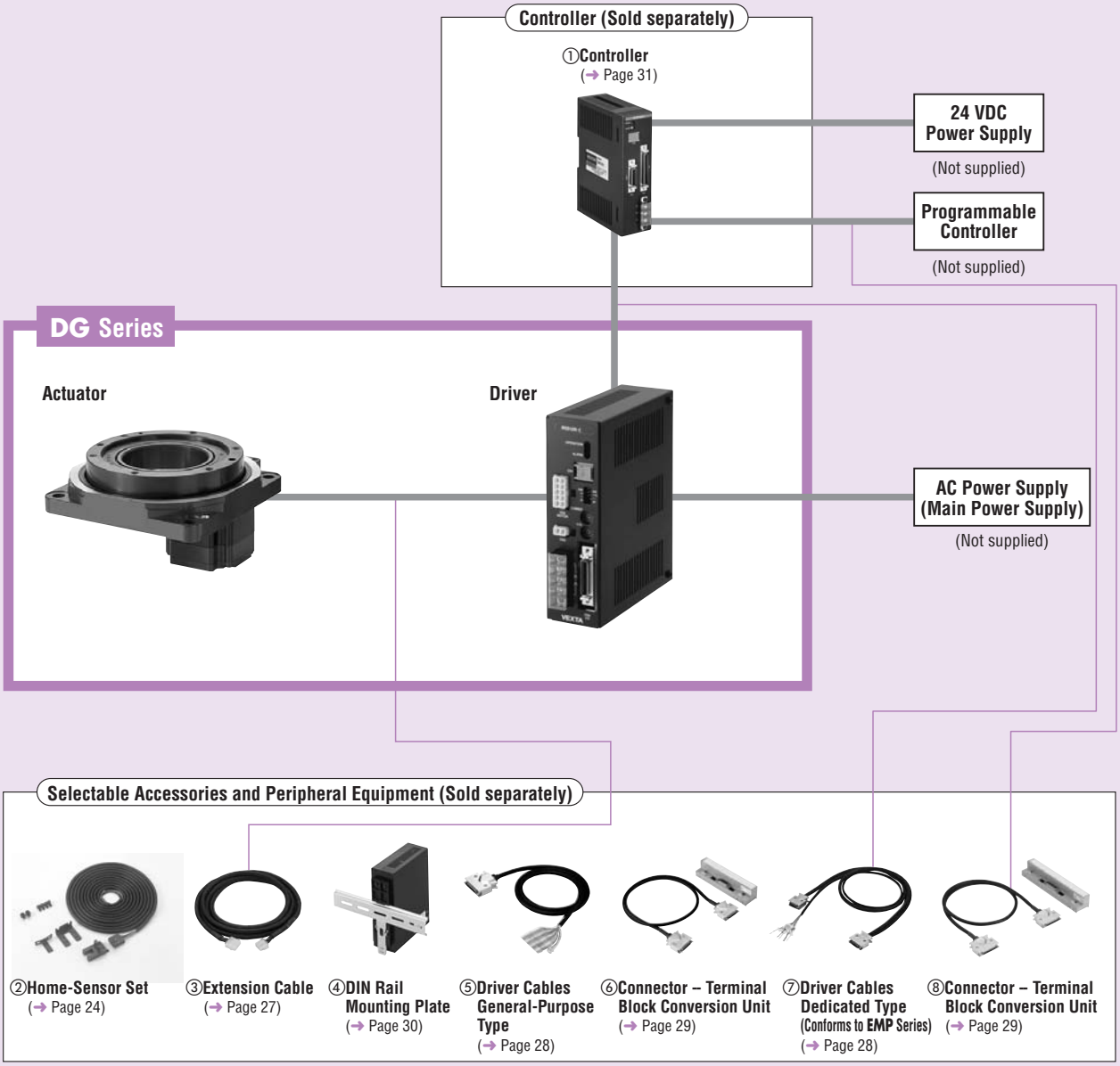


- Air absorption applications using the hollow hole



System Configuration

An example of a single-axis system configuration with the **EMP400** Series controller.



No.	Product Name	Overview	Page
①	Controller	This controller gives commands needed to drive the actuator.	31
②	Home-Sensor Set	Set of sensor, shield plate, sensor mounting bracket and cable with connector (2 m [6.6 ft.]).	24
③	Extension Cables	Cable for extending the wiring distance between the actuator and driver (1 to 20 m [3.3 to 65.6 ft.]).	27
	Flexible Extension Cables	Cable offering excellent flexibility, used to extend the wiring distance between the actuator and driver (1 to 10 m [3.3 to 32.8 ft.]).	
④	DIN Rail Mounting Plate	Use this plate when installing the driver to a DIN rail.	30
⑤	Driver Cables General-Purpose Type	General-purpose cable for connecting the driver and controller (1 m [3.3 ft.], 2 m [6.6 ft.]).	28
⑥	Connector – Terminal Block Conversion Unit	Set of terminal block and cable for connecting the driver and controller (1 m [3.3 ft.]).	29
⑦	Driver Cables Dedicated Type (Conforms to **EMP** Series)	Cable with connector for connecting the driver and controller **EMP** Series (1 m [3.3 ft.], 2 m [6.6 ft.]).	28
⑧	Connector – Terminal Block Conversion Unit	Set of terminal block and cable for connecting the host controller and controller **EMP** Series (1 m [3.3 ft.]).	29

●**Example of System Configuration**

(Body)		(Sold separately)					
DG Series	+	Controller	Extension Cable (3 m [9.8 ft.])	Home-Sensor Set	DIN Rail Mounting Plate	Driver Cables Dedicated Type (1 m [3.3 ft.])	Connector – Terminal Block Conversion Unit (1 m [3.3 ft.])
DG130R-ASAA		EMP401-1	CC03AIP	PADG-SB	PADP01	CC01EMP4	CC50T1

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

Product Number Code

DG 130 R - AS A A

① ② ③ ④ ⑤ ⑥

①	Series **DG**: **DG** Series
②	Frame Size **60**: 60 mm (2.36 in.) **85**: 85 mm (3.35 in.) **130**: 130 mm (5.12 in.) **200**: 200 mm (7.87 in.)
③	Type of Output Table Supporting Bearing Blank: Deep-Groove Ball Bearing **R**: Cross-Roller Bearing
④	Motor Type **AS**: α_{STEP}
⑤	Motor Shaft **A**: Single Shaft **B**: Double Shaft
⑥	Power Supply Voltage **A**: Single-Phase 100-115 VAC **C**: Single-Phase 200-230 VAC **S**: Three-Phase 200-230 VAC **K**: 24 VDC

Product Line

◇DC Input

24 VDC
Model
DG60-ASAK
DG60-ASBK

◇AC Input

Single-Phase 100-115 VAC	Single-Phase 200-230 VAC	Three-Phase 200-230 VAC
Model	Model	Model
DG85R-ASAA	–	–
DG85R-ASBA	–	–
DG130R-ASAA	**DG130R-ASAC**	**DG130R-ASAS**
DG130R-ASBA	**DG130R-ASBC**	**DG130R-ASBS**
DG200R-ASAA	**DG200R-ASAC**	**DG200R-ASAS**
DG200R-ASBA	**DG200R-ASBC**	**DG200R-ASBS**

The following items are included in each product.

Actuator, Driver, Connector for Input/Output Signal, Power Connector※1, Mounting Bracket for Driver (with screws)※2, Operating Manual

※1 Only for **DG60** ※2 Only for **DG85**, **DG130** and **DG200**

Safety Standards and CE Marking

●DG60

Product	Model	Applicable Standards	Certification Body	Standards File No.	CE Marking
Motor	ASM34AK-D, ASM34BK-D	UL 60950 CSA C22.2 No.60950	UL	E208200	EMC Directives
Driver	ASD10A-K	UL 508C CSA C22.2 No.14	UL	E171462	
		UL 1950 CSA C22.2 No.950		E208200	

●DG85, DG130, DG200

Product	Model	Applicable Standards	Certification Body	Standards File No.	CE Marking
Motor	ASM46AA-D, ASM46BA-D ASM66AA-D, ASM66BA-D ASM66AC-D, ASM66BC-D ASM911AA-D, ASM911BA-D ASM911AC-D, ASM911BC-D	UL 1004, UL 2111, CSA C22.2 No.100※1 CSA C22.2 No.77※1	UL	E64199	Low Voltage Directives EMC Directives※4
		EN 60950-1 EN 60034-1 EN 60034-5 IEC 60664-1	Conformed Product		
Driver	ASD13B-A, ASD24A-A ASD30E-A, ASD12A-C ASD20A-C, ASD12A-S ASD20A-S	UL 508C※2 CSA C22.2 No14	UL	E171462	
		EN 60950-1※3 EN 50178	Conformed Product		

※1 Except for **DG85**

※2 Recognized by UL in accordance with UL 508C at Maximum Surrounding Air Temperature 50˚C (122˚F).

※3 Only pulse input drivers comply with EN 60950-1.

※4 The EMC value changes according to the wiring and layout. Therefore, the final EMC level must be checked with the actuator and driver incorporated in the user's equipment. For installation conditions, refer to operating manual.

Specifications

Actuator RoHS

c UL us CE ●The **DG85** is certified under CSA only for the driver.

Model	Frame Size	mm (in.)	60 (2.36)	85 (3.35)	130 (5.12)	200 (7.87)
	24 VDC	Single Shaft	**DG60-ASAK**	–	–	–
		Double Shaft※1	**DG60-ASBK**	–	–	–
	Single-Phase 100-115 VAC	Single Shaft	–	**DG85R-ASAA**	**DG130R-ASAA**	**DG200R-ASAA**
		Double Shaft※1	–	**DG85R-ASBA**	**DG130R-ASBA**	**DG200R-ASBA**
	Single-Phase 200-230 VAC	Single Shaft	–	–	**DG130R-ASAC**	**DG200R-ASAC**
		Double Shaft※1	–	–	**DG130R-ASBC**	**DG200R-ASBC**
	Three-Phase 200-230 VAC	Single Shaft	–	–	**DG130R-ASAS**	**DG200R-ASAS**
		Double Shaft※1	–	–	**DG130R-ASBS**	**DG200R-ASBS**
Motor Type			αSTEP			
Type of Output Table Supporting Bearing			Deep-Groove Ball Bearing	Cross-Roller Bearing		
Permissible Torque※2		N·m (lb-in)	0.9 (7.9)	2.8 (24)	12 (106)	50 (440)
Maximum Holding Torque※3		N·m (lb-in)	0.45 (3.9)	1.8 (15.9)	12 (106)	36 (310)
Inertial Moment※4		J: kg·m^2 (oz-in^2)	4324×10^{-7} (24)	2534×10^{-6} (139)	15874×10^{-6} (870)	108160×10^{-6} (5900)
Permissible Speed		r/min	200			110
Gear Ratio			1 : 18			
Resolution※5			9000 P/R (Resolution Setting: 0.04°/step [500] [×1]) 18 000 P/R (Resolution Setting: 0.02°/step [1000] [×1]) 90 000 P/R (Resolution Setting: 0.004°/step [500] [×10]) 180 000 P/R (Resolution Setting: 0.002°/step [1000] [×10])			
Repetitive Positioning Accuracy		sec	±15 (±0.004°)			
Lost Motion		min	2 (0.033°)			
Angular Transmission Error		min	4 (0.067°)		3 (0.05°)	2 (0.033°)
Permissible Thrust Load		N (lb.)	100 (22)	500 (112)	2000 (450)	4000 (900)
Permissible Moment Load		N·m (lb-in)	2 (17.7)	10 (88)	50 (440)	100 (880)
Runout of Output Table Surface		mm (in.)	0.030 (0.0012)	0.015 (0.0006)		
Runout of Output Table Inner (Outer) Diameter		mm (in.)	0.030 (0.0012)	0.015 (0.0006)		0.030 (0.0012)
Parallelism of Output Table		mm (in.)	0.050 (0.002)	0.030 (0.0012)		0.050 (0.002)
Degree of Protection			IP40 (IP20 for motor connector)			
Mass of Actuator Unit		kg (lb.)	0.5 (1.1)	1.2 (2.6)	2.6 (5.7)	9.5 (20.9)

※1 The back shaft of the motor in the double shaft type is intended for installing a slit plate. Do not apply load torque, overhung load or thrust load to the back shaft of the motor.
※2 Permissible torque refers to the mechanical-strength limit of the gear-reduction mechanism. Be sure to keep the torque, including acceleration torque, within the permissible limit.
※3 Maximum holding torque represents the holding torque of the output table when the actuator is at a standstill.
※4 Inertial moment is calculated through conversion at the output table of the motor rotor's inertial moment and the inertial moment in the reduction mechanism.
※5 You can set one of four resolutions using the driver-resolution select switch or driver-resolution select signal. The factory driver settings are [1000] [×1] and 18 000 P/R (0.02°/step).

How to Read Specifications

●Type of Output Table Supporting Bearing
The type of the bearing used for the output table.

●Permissible Torque
The limit of mechanical strength of the reduction mechanism. Make sure the applied torque, including the acceleration torque and load fluctuation, does not exceed the permissible torque.

●Maximum Holding Torque
The maximum holding torque that can be exerted by the hollow rotary actuator when the actuator is at standstill with power supplied (the driver's output current is set to maximum: F) and by actuating the current cutback function.

●Inertial Moment
The total sum of the rotor inertial moment of the motor and the inertial moment of the reduction mechanism, converted to a moment on the output table.

●Permissible Speed
The output table speed that can be tolerated by the mechanical strength of the reduction mechanism.

●Resolution
The number of pulses needed to rotate the output table by one rotation.

●Repetitive Positioning Accuracy
A value indicating the degree of error that generates when positioning is performed repeatedly to the same position in the same direction.

●Lost Motion
The difference in stopped angles achieved when the output table is positioned to the same position in the forward and reverse directions.

●Angular Transmission Error
The difference between the theoretical rotation angle of the output table as calculated from the input pulse number, and the actual rotation angle.

●Permissible Thrust Load
The permissible value of thrust load applied to the output table in the axial direction.

●Permissible Moment Load
When a load is applied to a position away from the center of the output table, the output table receives a tilting force. The permissible moment load refers to the permissible value of moment load calculated by multiplying the offset distance from the center by the applied load.

●Runout of Output Table Surface
The maximum value of runout of the mounting surface of the output table when the output table is rotated under no load.

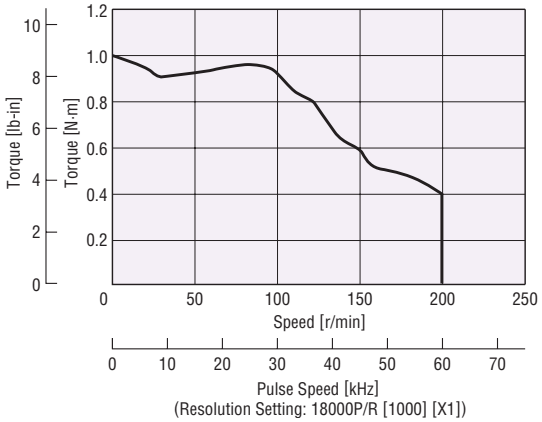
●Runout of Output Table Inner (Outer) Diameter
The maximum value of runout of the inner diameter or outer diameter of the table when the output table is rotated under no load.

●Parallelism of Output Table
An inclination of the mounting surface of the output table compared with the actuator mounting surface on the equipment side.

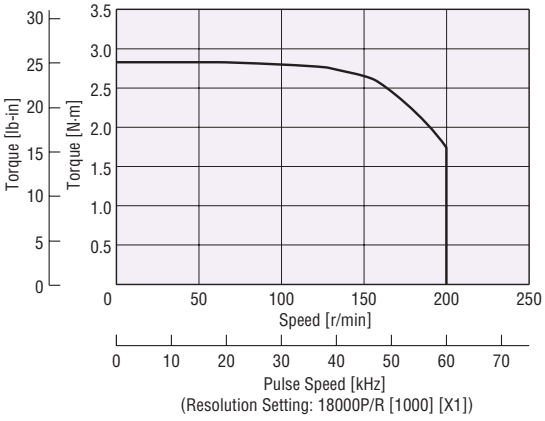
●Degree of Protection
IEC 60529 and EN 60034-5 (IEC 60034-5) classify the dust-resistance and waterproofing into grades.

●Speed – Torque Characteristics

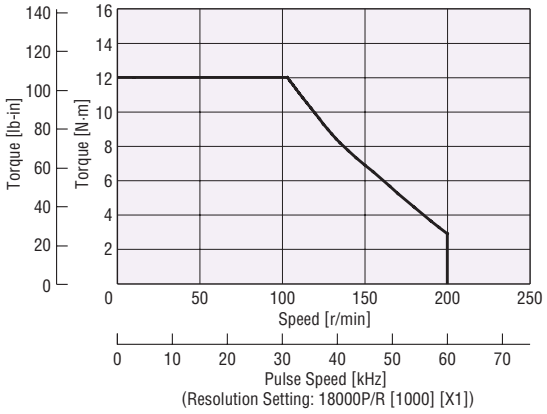
DG60-ASAK/DG60-ASBK



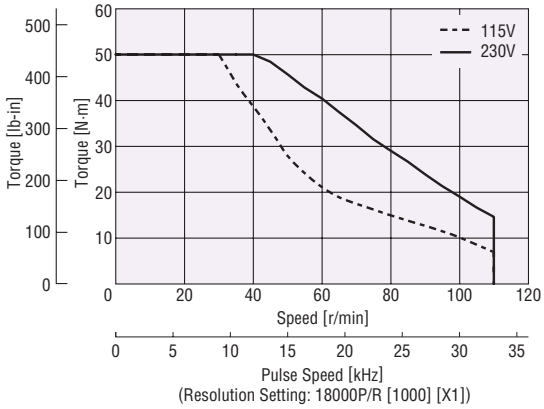
DG85R-ASAA/DG85R-ASBA



DG130R-ASA□/DG130R-ASB□



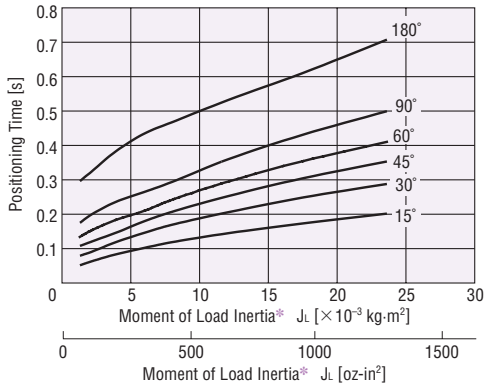
DG200R-ASA□/DG200R-ASB□



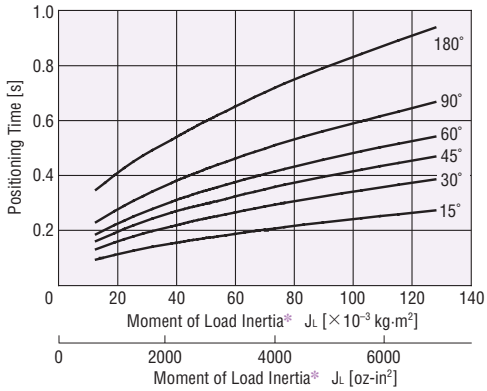
●Enter **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC) in the box (□) within the model name.

●Load Inertia – Positioning Time (Reference value)

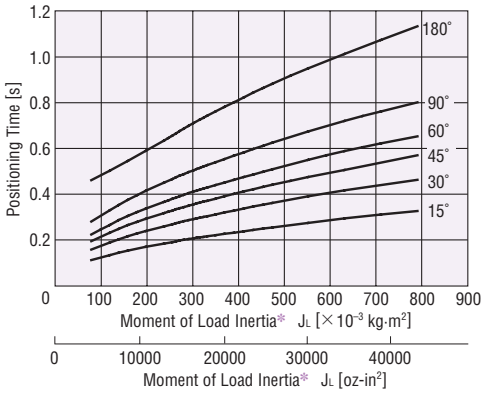
DG60-ASAK/DG60-ASBK



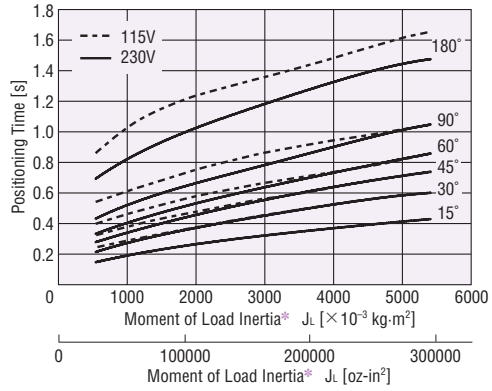
DG85R-ASAA/DG85R-ASBA



DG130R-ASA□/DG130R-ASB□



DG200R-ASA□/DG200R-ASB□

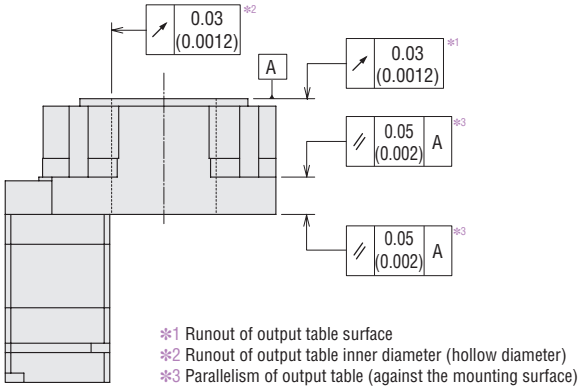


*The load inertia refers to the inertia of the customer's work.

●Enter **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC) in the box (□) within the model name.

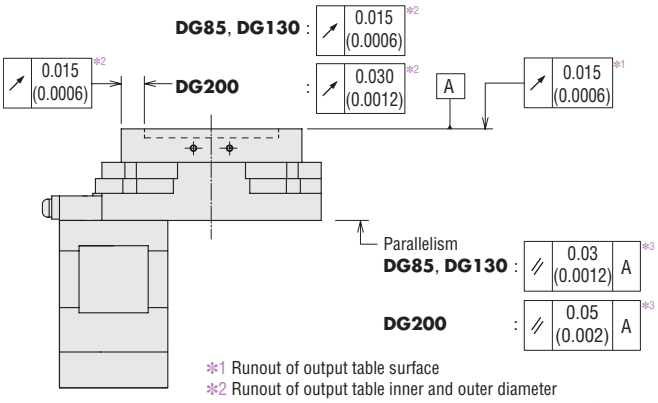
●Table Precision (at no load)

DG60



※1 Runout of output table surface
※2 Runout of output table inner diameter (hollow diameter)
※3 Parallelism of output table (against the mounting surface)

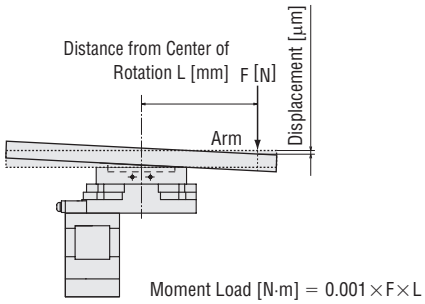
DG85, DG130, DG200



※1 Runout of output table surface
※2 Runout of output table inner and outer diameter
※3 Parallelism of output table (against the mounting surface)

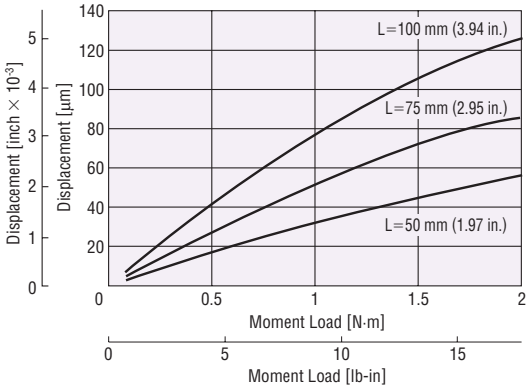
●Displacement by Moment Load (Reference value)

The output table will be displaced when it receives the moment load.
The graph plots the table displacement that occurs at distance L from the rotation center of the output table when a given load is applied in the negative direction.
The displacement becomes approximately twofold when the moment load is applied in both the positive and negative directions.

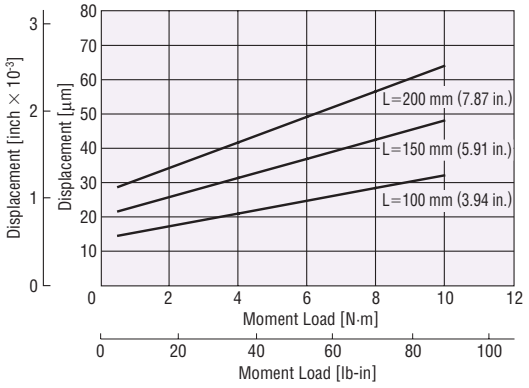


Moment Load [N·m] = 0.001×F×L

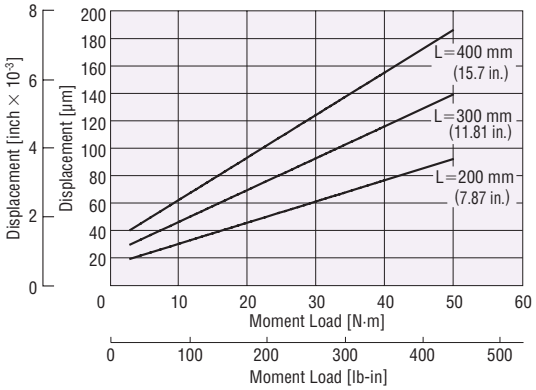
DG60-ASAK/DG60-ASBK



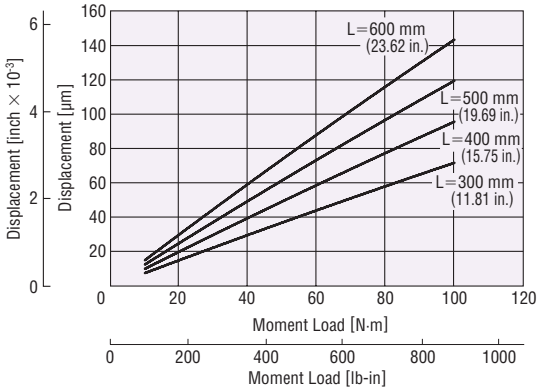
DG85R-ASAA/DG85R-ASBA



DG130R-ASA□/DG130R-ASB□



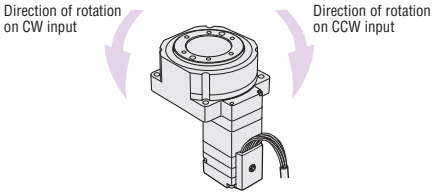
DG200R-ASA□/DG200R-ASB□



● Enter **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC) in the box (□) within the model name.

●Driver

Driver Model		ASD10A-K	ASD13B-A	ASD24A-A	ASD30E-A	ASD12A-C	ASD20A-C	ASD12A-S	ASD20A-S
Power Source	Voltage	24 VDC±10%	Single-Phase 100-115 VAC $^{+10\%}_{-15\%}$			Single-Phase 200-230 VAC $^{+10\%}_{-15\%}$		Three-Phase 200-230 VAC $^{+10\%}_{-15\%}$	
	Frequency	—	50/60 Hz			50/60 Hz		50/60 Hz	
	Current	1.0 A	3.3 A	5 A	6.5 A	3 A	4.5 A	1.5 A	2.4 A
Maximum Input Pulse Frequency		250 kHz (at 50% duty cycle)							
Input Signal	Input Mode	Photocoupler input, Input resistance 220 Ω, Input current 7～20 mA							
	CW Pulse (Pulse)	CW direction operation command pulse signal (Operation command pulse signal in 1-pulse input mode) Pulse width: 1 μs minimum, Pulse rise/fall time: 2 μs maximum (negative logic pulse input)							
	CCW Pulse (Rotation Direction)	CCW direction operation command pulse signal (Rotation direction signal in 1-pulse input mode) Pulse width: 1 μs minimum, Pulse rise/fall time: 2 μs maximum (negative logic pulse input)							
	Alarm Clear	This signal is used when a protective function has been activated, for canceling the alarm without turning off the power to the driver.							
	All Windings Off	When in the "photocoupler ON" state, the current to the motor is cut off and the output table can be rotated manually. When in the "photocoupler OFF" state, the current is supplied to the motor.							
	Resolution Select	When in the "photocoupler ON" state, the resolution is 10 times of the initial resolution setting. When in the "photocoupler OFF" state, the initial resolution setting is selected. This function is effective when the resolution select switch is set to 9000 P/R or 18 000 P/R.							
Output Signal	Output Mode	Photocoupler, Open-collector output, External use condition: 30 VDC maximum, 15 mA maximum [Positioning completion, Alarm, Timing (only for ASD10A-K)] Transistor, Open-collector output, External use condition: 30 VDC maximum, 15 mA maximum [Quadrature A·B phase, Timing (except ASD10A-K)] Line driver output, equivalent to 26C31 [Timing, Quadrature A·B phase] (except ASD10A-K)							
	Timing	The signal is output every time the output table rotates 0.4°. (Photocoupler: ON) A precise "Timing" signal cannot be obtained when the speed of the pulse input frequency is over 500 Hz.							
	Alarm	The signal is output when one of the driver's protective functions has been activated. (Photocoupler: OFF) When the "Alarm" signal is output, the alarm indicator (red LED) blinks, and the actuator stops (non-excitation state).							
	Positioning Completion	The signal is output when positioning is completed. (Photocoupler: ON) This signal is output when the table position is less than ±0.1° from the commanded position during operation with a pulse input frequency of 500 Hz or less.							
	Quadrature A·B Phase	This signal is output at the resolution set when the driver's power was turned on. The phase difference between A and B is 90° electrical. There is a 1 ms (max.) time lag between real actuator motion and the output signals. These signals are only for position verification when the actuator stopped.							
Protective Function		Overheat, Overload, Overvoltage, Speed error, Overcurrent, Overspeed, EEPROM data error, Sensor error, System error (ASD10A-K does not have overheat and overcurrent protections.)							
Degree of Protection		IP00	IP10						
Indicator (LED)		Operation indicator: Green LED, Alarm indicator: Red LED							
Cooling Method		Natural Ventilation							
Mass	kg (lb.)	0.25 (0.55)	0.8 (1.76)						



Note:

● The rotation directions of the driver input signals (CW and CCW) are opposite the actual rotation directions of the output table.
When the CW signal is input, the output table will rotate in the counterclockwise direction. When the CCW signal is input, the output table will rotate in the clockwise direction.

General Specifications

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

Item	Motor	Driver
Insulation Class	Class B [130˚C (266˚F)] [Recognized as class A (105˚C [221˚F]) by UL and CSA standards]	–
Insulation Resistance	100 MΩ or more when 500 VDC megger is applied between the following places: · Case – Motor and sensor windings	100 MΩ or more when 500 VDC megger is applied between the following places: [ASD10A-K] · Heat sink – Power supply input terminal [ASD13B-A, ASD24A-A, ASD30E-A, ASD12A-C, ASD20A-C, ASD12A-S, ASD20A-S] · Case – Power supply input terminal · Signal I/O terminal – Power supply input terminal
Dielectric Strength	Sufficient to withstand the following for 1 minute: [DGM60-ASAK, DGM60-ASBK] · Case – Motor and sensor windings 0.5 kV 50 Hz or 60 Hz [DGM85R-ASAA, DGM85R-ASBA] · Case – Motor and sensor windings 1 kV 50 Hz or 60 Hz [DGM130R-ASAA, DGM130R-ASBA, DGM130R-ASAC, DGM130R-ASBC, DGM200R-ASAA, DGM200R-ASBA, DGM200R-ASAC, DGM200R-ASBC] · Case – Motor and sensor windings 1.5 kV 50 Hz or 60 Hz	Sufficient to withstand the following for 1 minute: [ASD10A-K] · Heat sink – Power supply input terminal 0.5 kV 50 Hz or 60 Hz [ASD13B-A, ASD24A-A, ASD30E-A, ASD12A-C, ASD20A-C, ASD12A-S, ASD20A-S] · Case – Power supply input terminal 1.5 kV 50 Hz or 60 Hz · Signal I/O terminal – Power supply input terminal 2.3 kV (3.0 kV for 200-230 VAC input) 50 Hz or 60 Hz
Ambient Temperature	0～+50˚C (+32～122˚F) (non-freezing) 0～+40˚C (+32～104˚F) (non-freezing) when accessory home-sensor set is attached	[ASD13B-A, ASD24A-A, ASD30E-A, ASD12A-C, ASD20A-C, ASD12A-S, ASD20A-S] 0～+50˚C (+32～122˚F) (non-freezing) [ASD10A-K] 0～+40˚C (+32～104˚F) (non-freezing)
Ambient Humidity	85% or less (non-condensing)	

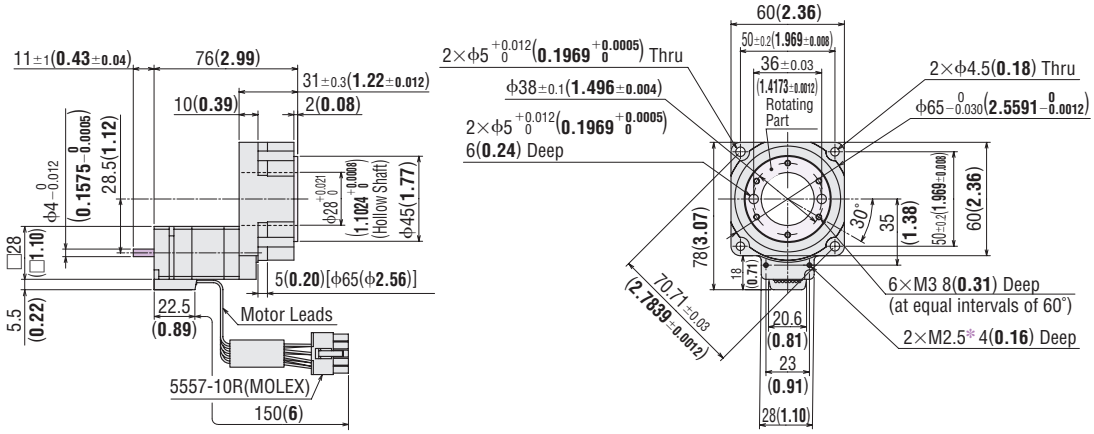
Note:

● Do not measure insulation resistance or perform the dielectric strength test while the actuator and driver are connected.

Dimensions Unit = mm (inch)

Actuator

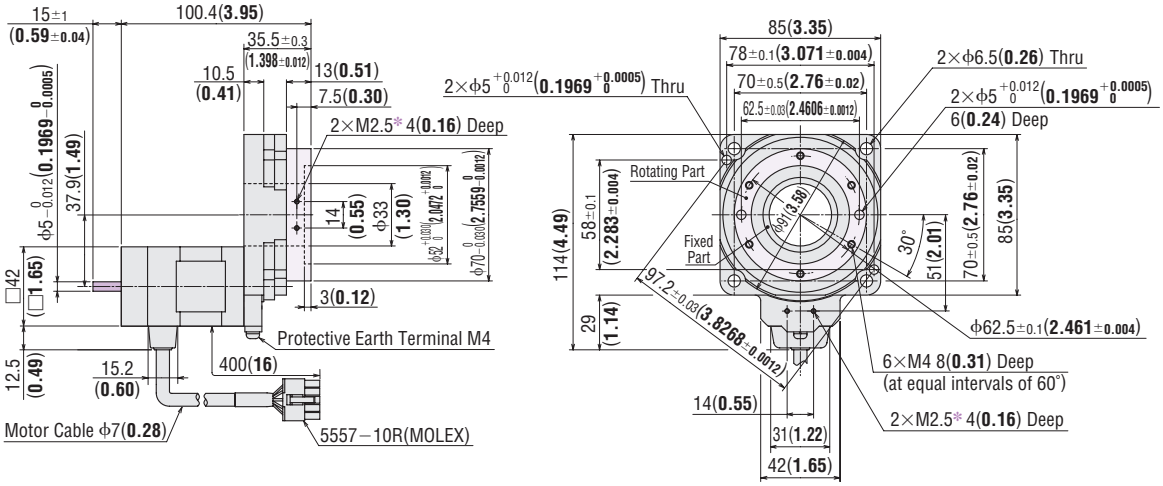
Model	Actuator Model	Mass kg (lb.)	CAD
DG60-ASAK	DGM60-ASAK	0.5 (1.1)	D469
DG60-ASBK	DGM60-ASBK		



● These dimensions are for double shaft models.
For single shaft models, ignore the colored ( ) areas.

*Use M2.5 screw holes when installing the home-sensor set (sold separately).
Do not use these holes for any purpose other than to install the home sensor.

Model	Actuator Model	Mass kg (lb.)	CAD
DG85R-ASAA	DGM85R-ASAA	1.2 (2.6)	D518
DG85R-ASBA	DGM85R-ASBA		

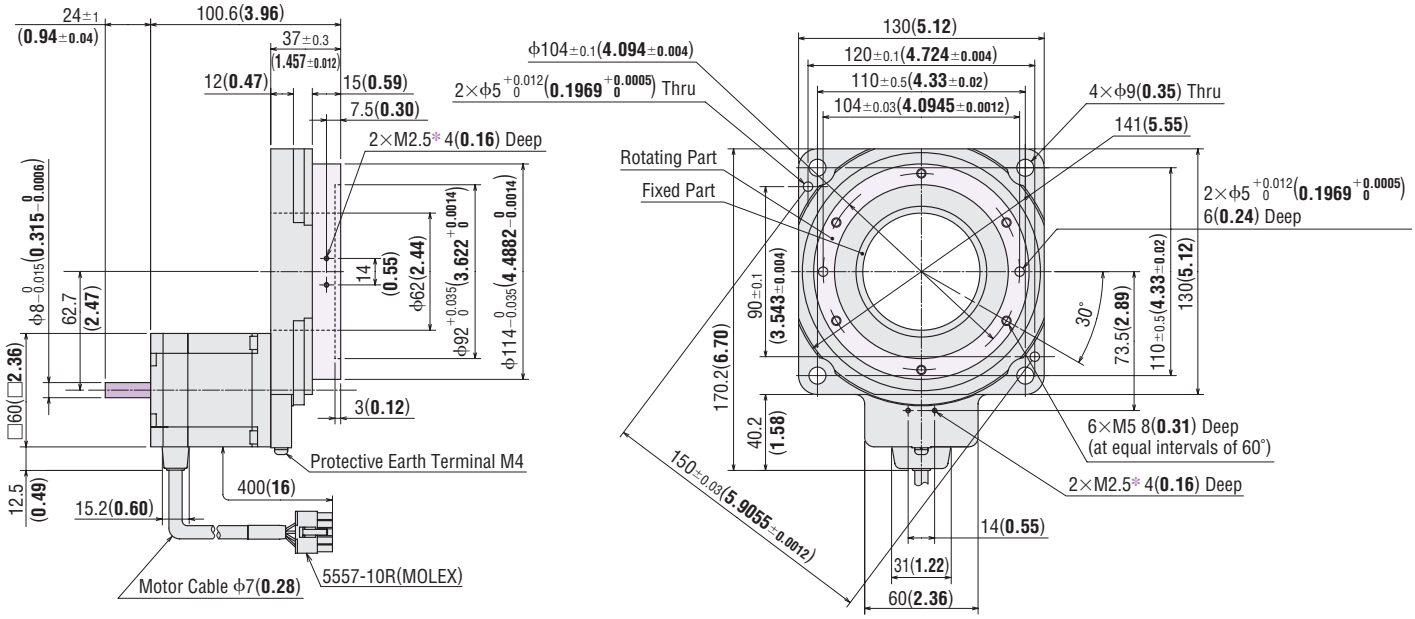


● These dimensions are for double shaft models.
For single shaft models, ignore the colored ( ) areas.

*Use M2.5 screw holes when installing the home-sensor set (sold separately).
Do not use these holes for any purpose other than to install the home sensor.

Model	Actuator Model	Mass kg (lb.)	CAD
DG130R-ASA□	DGM130R-ASA□	2.6 (5.7)	D519
DG130R-ASB□	DGM130R-ASB□		

● Enter **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC) in the box (□) within the model name.

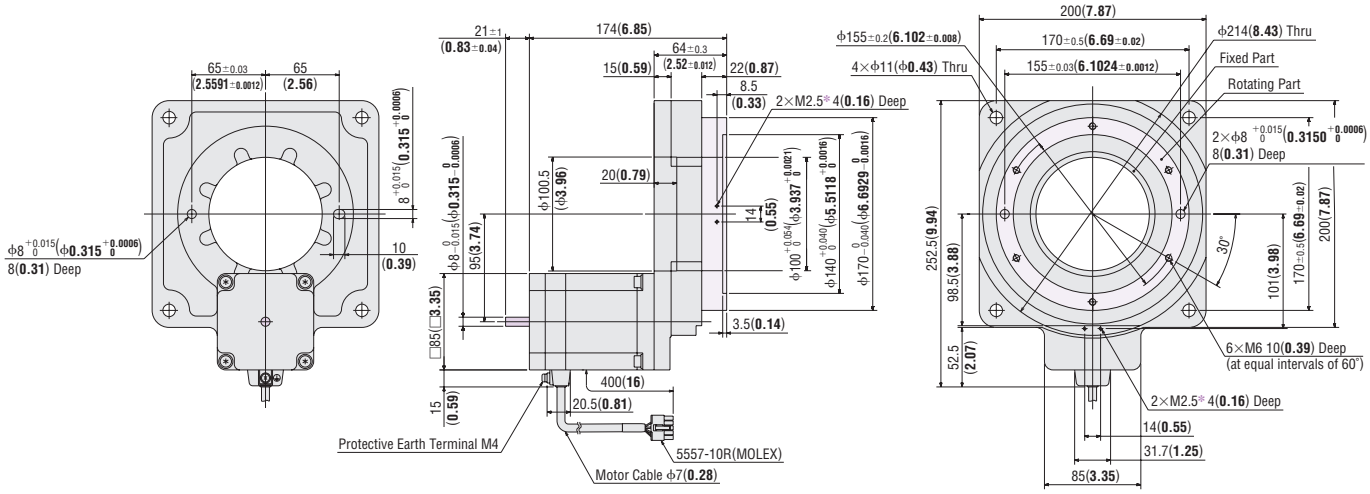


● These dimensions are for double shaft models.
For single shaft models, ignore the colored ( ) areas.

✻ Use M2.5 screw holes when installing the home-sensor set (sold separately).
Do not use these holes for any purpose other than to install the home sensor.

Model	Actuator Model	Mass kg (lb.)	CAD
DG200R-ASA□	DGM200R-ASA□	9.5 (20.9)	D1057
DG200R-ASB□	DGM200R-ASB□		

● Enter **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC) in the box (□) within the model name.

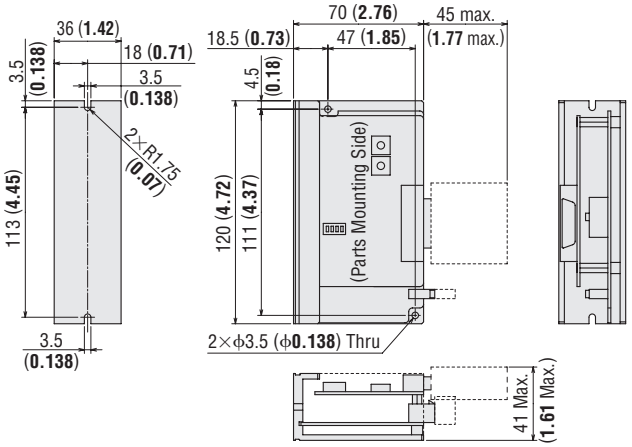


● These dimensions are for double shaft models.
For single shaft models, ignore the colored ( ) areas.

✻ Use M2.5 screw holes when installing the home-sensor set (sold separately).
Do not use these holes for any purpose other than to install the home sensor.

●Driver

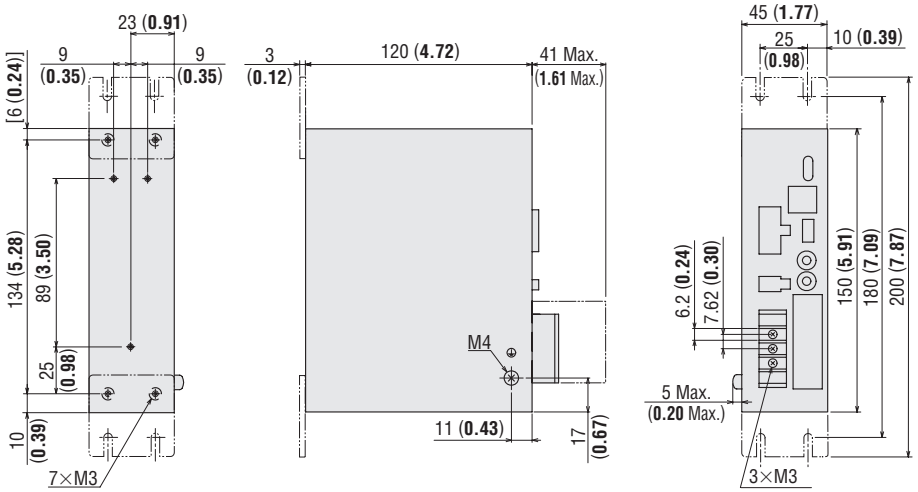
Driver Model: ASD10A-K
Mass: 0.25 kg (0.55 lb.) CAD B198



●Control I/O Connector (Included)
Cover assembly: 54331-1361 (MOLEX)
Connector: 54306-3619 (MOLEX)

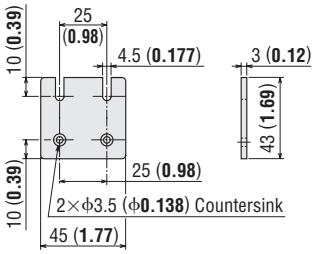
●Power Supply Connector (Included)
Connector: 5557-02R (MOLEX)
Connector crimp terminal: 5556TL (MOLEX)

Driver Model: ASD13B-A, ASD24A-A, ASD30E-A, ASD12A-C, ASD20A-C, ASD12A-S, ASD20A-S
Mass: 0.8 kg (1.76 lb.) CAD B197



●Control I/O Connector (Included)
Cover assembly: 54331-1361 (MOLEX)
Connector: 54306-3619 (MOLEX)

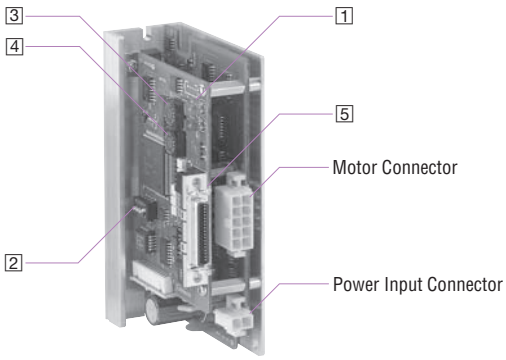
●Mounting Bracket
(2 pieces, included)



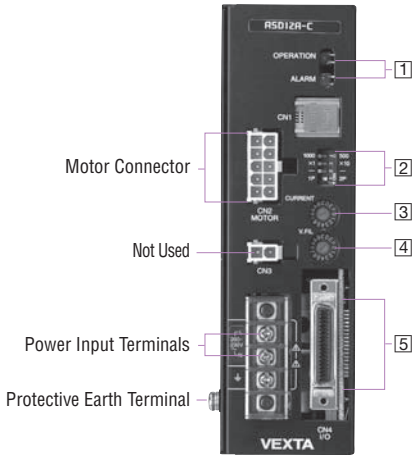
■Connection and Operation

●Names and Functions of Driver Parts

DG60



DG85, DG130, DG200



1 Signal Monitor Display

◇LED Indicator

Indication	Color	Function	When Activated
OPERATION	Green	Power supply indication	Lights when power is on.
ALARM	Red	Alarm indication	Blinks when protective functions are activated.

◇Alarm

Blink Count	Function	When Activated
1	Overheat*	The temperature of the heat sink inside the driver has reached approximately 85˚C (185˚F).
2	Overload	The motor has been operated continuously over 5 seconds under a load exceeding the maximum torque.
3	Overvoltage	The primary inverter voltage of the driver has exceeded the allowable level.
4	Speed error	The actuator cannot accurately follow at the indicated pulse speed.
5	Overcurrent*	An excessive current has flowed through the inverter power element inside the driver.
6	Overspeed	The output table speed has exceeded 270 r/min.
7	EEPROM data error	A motor control parameter has been damaged.
8	Sensor error	The power has been turned on without the motor cable connected to the driver.
Lights (No blinking)	System error	The driver has fatal error.

*__DG60__ does not have "Overheat protection" and "Overcurrent protection" functions.

2 Function Switch

Indication	Switch Name	Function
1000/500 ×1/×10	Resolution select switch	This function is for selecting the actuator resolution. The resolution of output table is 18 times of indications. "500" "×1" →9000 P/R (0.04˚/step) "1000" "×1" →18 000 P/R (0.02˚/step) [factory setting] "500" "×10" →90 000 P/R (0.004˚/step) "1000" "×10" →180 000 P/R (0.002˚/step)
1P/2P	Pulse input mode switch	The settings of this switch are compatible with the following two pulse input modes: "1P" for the 1-pulse input mode, "2P" for the 2-pulse input mode [factory setting].

Notes:

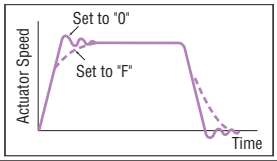
- Always turn the power OFF before switching resolution or pulse input, and turn it ON again after you have made the change.
- If the "Resolution Select" switch is set to "×10," it cannot control the resolution selected by input terminal. It is always "×10."

3 Current Adjustment Switch

Indication	Switch Name	Function
CURRENT	Current adjustment switch	The motor running current can be lowered to suppress temperature rise in the motor and driver, or lower operating current in order to allow a margin for motor torque (a maximum of 16 settings).

4 Velocity Filter Adjustment Switch

Indication	Switch Name	Function
V.FIL	Velocity filter adjustment switch	This switch is used to make adjustments when a smooth start-stop or smooth motion as low speed is required (a maximum of 16 settings).



5 Input/Output Signal (36 pins)

◇DG60

Indication	Input/Output	Pin No.	Signal	Signal Name
CN3	External power input	2	GND	Power supply for signal control
		3	Vcc+24 V	
	Input signal	9	CCW (DIR.)	CCW pulse (Rotation direction)*
		10	$\overline{\text{CCW (DIR.)}}$	
		11	CW (PLS)	CW pulse (Pulse)*
		12	$\overline{\text{CW (PLS)}}$	
	Output signal	13	BSG1	B-phase pulse output (Open-collector)
		14	GND	
		15	ASG1	A-phase pulse output (Open-collector)
		16	GND	
	Input signal	21	ACL	Alarm clear
		22	$\overline{\text{ACL}}$	
	Output signal	23	TIM.1	Timing (Open-collector)
		24	$\overline{\text{TIM.1}}$	
		25	ALARM	Alarm
		26	$\overline{\text{ALARM}}$	
		29	END	Positioning completion
		30	$\overline{\text{END}}$	
	Input signal	31	×10	Resolution select
		32	$\overline{\times 10}$	
		33	C.OFF	All windings off
		34	$\overline{\text{C.OFF}}$	

- For more details, refer to the description of input/output signals.
- * The factory setting is the 2-pulse input mode. Refer to ( ) when set to 1-pulse input mode.

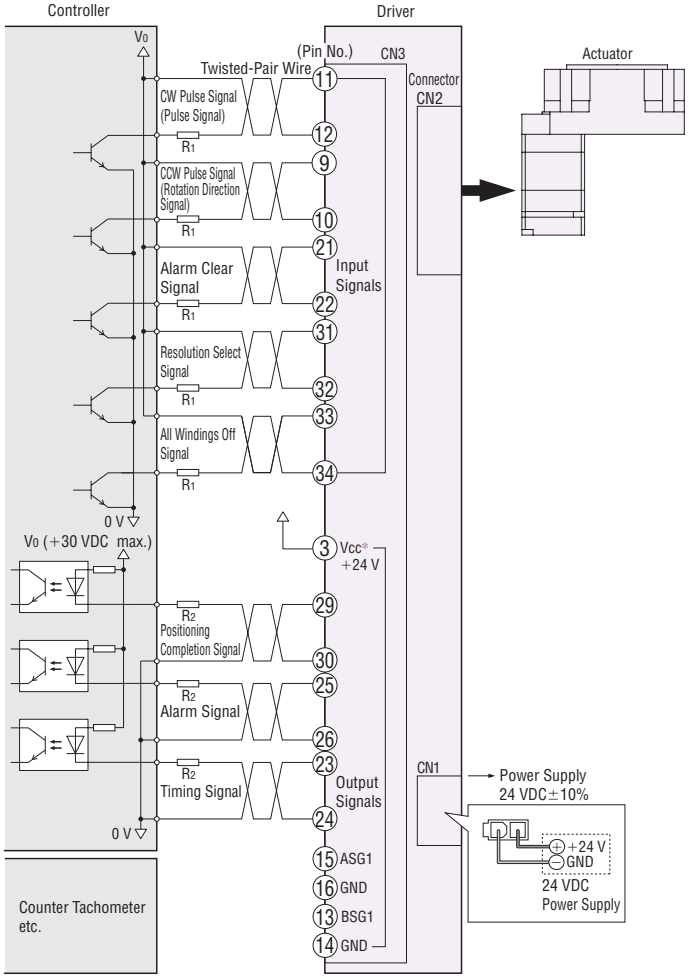
◇DG85, DG130, DG200

Indication	Input/Output	Pin No.	Signal	Signal Name
CN4	External power input	1	Vcc+5 V	Power supply for signal control
		2	GND	
		3	Vcc+24 V	
	Input signal	9	CCW (DIR.)	CCW pulse (Rotation direction)*
		10	$\overline{\text{CCW (DIR.)}}$	
		11	CW (PLS)	CW pulse (Pulse)*
		12	$\overline{\text{CW (PLS)}}$	
	Output signal	13	BSG1	B-phase pulse output (Open-collector)
		14	GND	
		15	ASG1	A-phase pulse output (Open-collector)
		16	GND	
		17	BSG2	B-phase pulse output (Line driver)
		18	$\overline{\text{BSG2}}$	
		19	ASG2	A-phase pulse output (Line driver)
		20	$\overline{\text{ASG2}}$	
	Input signal	21	ACL	Alarm clear
		22	$\overline{\text{ACL}}$	
	Output signal	23	TIM.1	Timing (Open-collector)
		24	GND	
		25	ALARM	Alarm
		26	$\overline{\text{ALARM}}$	
		27	TIM.2	Timing (Line driver)
		28	$\overline{\text{TIM.2}}$	
		29	END	Positioning completion
		30	$\overline{\text{END}}$	
	Input signal	31	×10	Resolution select
		32	$\overline{\times 10}$	
		33	C.OFF	All windings off
		34	$\overline{\text{C.OFF}}$	

- For more details, refer to the description of input/output signals.
- * The factory setting is the 2-pulse input mode. Refer to ( ) when set to 1-pulse input mode.

●Connection Diagrams

◇DG60



◇Input Signal Connection

- Signals can be connected directly when 5 VDC is supplied. If the signals are used at a voltage exceeding 5 VDC, be sure to provide an external resistor to prevent the current exceeding 20 mA from flowing. Internal components will be damaged if a voltage exceeding 5 VDC is supplied directly without using an external resistor.
  Example: If the voltage is 24 VDC, connect a resistor (R_1) of 1.5 to 2.2 kΩ and 0.5 W or more.

◇Output Signal Connection

- Use output signals at 30 VDC or less and 15 mA or less. If these specifications are exceeded, the internal components may be damaged. Check the specification of the connected equipment. If the current exceeds 15 mA, connect an external resistor R_2.
- * Check the connection on page 18 when using a 24 VDC power supply for control signals.

◇Power Supply

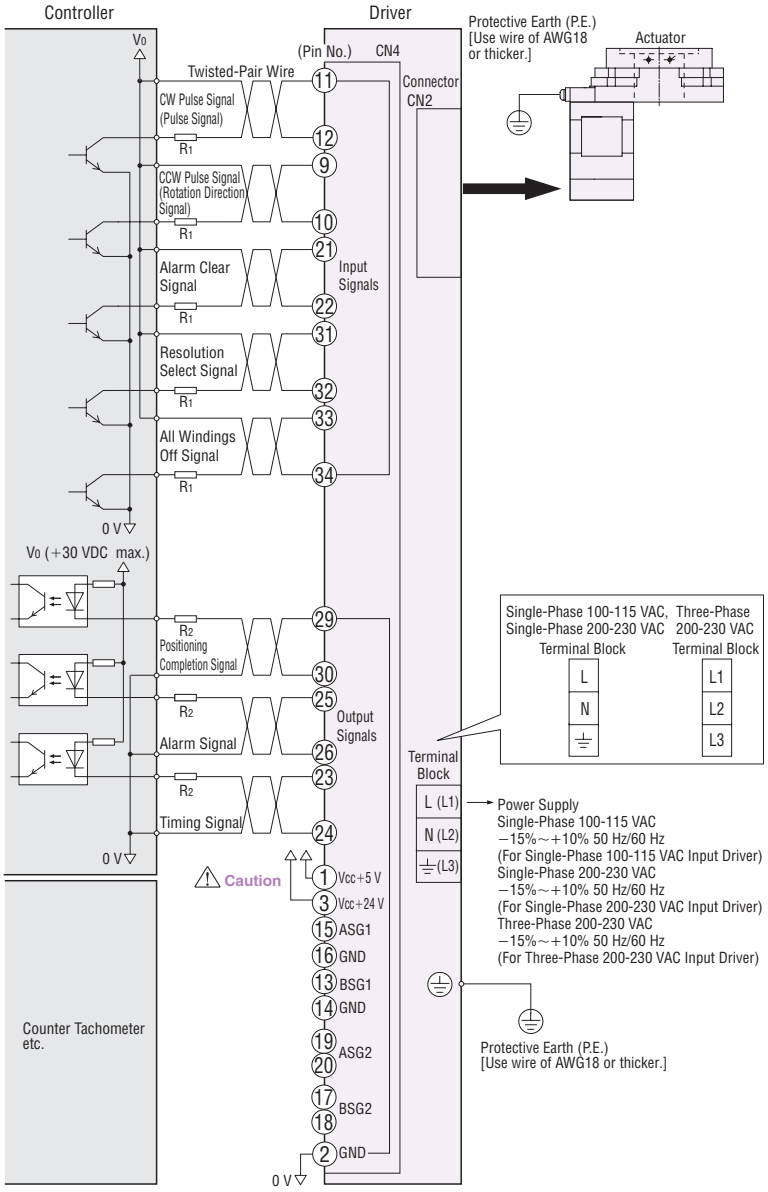
Use an input power voltage of 24 VDC. Use a power supply that can supply sufficient input current. When power supply capacity is insufficient, a decrease in motor output can cause the following malfunction:

- Actuator does not operate properly (insufficient torque).

◇Notes on Wiring

- Use multi-core, twisted-pair shielded wires of AWG28 or thicker for the control I/O signal lines (CN3), and keep wiring as short as possible (within 2 m [6.6 ft.]).
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
- When it is necessary to extend the wiring distance between the actuator and driver, the accessory extension cable or flexible extension cable must be used.
  Accessories ➜ Page 27
- The range of wire for the power connector (CN1) is AWG24 to 18. Use wires of AWG20 or thicker for the power supply lines.
- Keep the control I/O signal lines at least 300 mm [1 ft.] away from power lines (e.g. lines carrying large current, such as AC lines and motor lines). Also, do not run these lines through the same ducts or pipes as power lines.
- The customer must furnish the cables for power supply lines and control I/O signal lines.
- Use included connector for connection of power supply connector.
- To install the pins, be sure to use the specified crimping tool made by MOLEX 57026-5000 (for UL 1007) or 57027-5000 (for UL 1015).

◇DG85, DG130, DG200



◇Input Signal Connection

- Signals can be connected directly when 5 VDC is supplied. If the signals are used at a voltage exceeding 5 VDC, be sure to provide an external resistor to prevent the current exceeding 20 mA from flowing. Internal components will be damaged if a voltage exceeding 5 VDC is supplied directly without using an external resistor.
  Example: If the voltage is 24 VDC, connect a resistor (R_1) of 1.5 to 2.2 kΩ and 0.5 W or more.

◇Output Signal Connection

- Use output signals at 30 VDC or less and 15 mA or less. If these specifications are exceeded, the internal components may be damaged. Check the specification of the connected equipment. If the current exceeds 15 mA, connect an external resistor R_2.

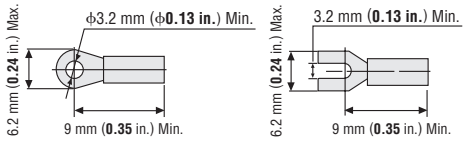
◇Notes on Wiring

- Use multi-core, twisted-pair shielded wires of AWG28 or thicker for the control I/O signal line (CN4), and keep wiring as short as possible (within 2 m [6.6 ft.]).
- Note that as the length of the pulse signal line increases, the maximum transmission frequency decreases.
- When it is necessary to extend the wiring distance between the actuator and driver, the accessory extension cable or flexible extension cable must be used. **Accessories** ➜ Page 27
- Use the following cable for the power supply line:
  Single-phase 100-115 VAC, Single-phase 200-230 VAC: 3-core cable of AWG18 or thicker.
  Three-phase 200-230 VAC: 4-core cable of AWG18 or thicker.
- Keep the control I/O signal line at least 300 mm [1 ft.] away from power lines (e.g. lines carrying large current, such as AC lines and motor lines). Also, do not run these lines through the same ducts or pipes as power lines.
- To ground the driver, lead the ground conductor from the protective earth terminal (M4) and connect the ground conductor to provide a common ground point.

⚠ Caution

- When the "Timing" signal output or "Pulse" signal output is used, 5 VDC or 24 VDC power supply is necessary. Power supply for "Timing" signal output or "Pulse" signal output should be connected to either 5 VDC or 24 VDC. Do not input 5 VDC and 24 VDC at the same time.
  Description of input/output signals ➜ Page 18

◇Recommended Crimp Terminals



- Crimp terminals are not provided with the products. They must be purchased separately.

●Description of Input/Output Signals

Indication of Input/Output Signal "ON""OFF"

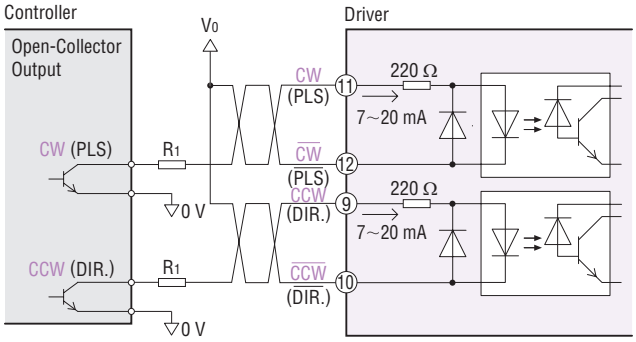
Input (output) "ON" indicates that the current is sent into the photocoupler (transistor) inside the driver. Input (output) "OFF" indicates that the current is not sent into the photocoupler (transistor) inside the driver.
The input/output remains "OFF" if nothing is connected.

Photocoupler OFF ON

Common to DG60, DG85, DG130 and DG200

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

◇Input Circuit and Sample Connection

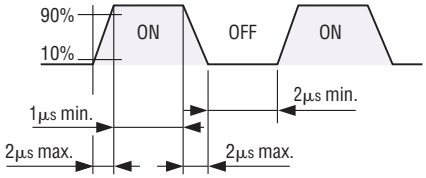


● The colored characters indicate signals under the 2-pulse input mode, while the black characters indicate signals under the 1-pulse input mode.

Note:

● The external resistor is not needed when V_0 is 5 VDC. When the voltage exceeds 5 VDC, connect the external resistor R_1 to keep input current at 20 mA or less. When 5 VDC or more is applied without the external resistor, the internal components may get damaged.

◇Pulse Waveform Characteristics



● For pulse signals, use input pulse waveforms like those shown in the figure above.

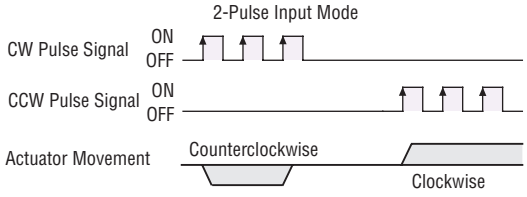
◇Pulse Input Mode

•2-Pulse Input Mode

The 2-pulse input mode uses "CW" and "CCW" pulses. When "CW" pulses are input, the actuator's output table rotates counterclockwise; when "CCW" pulses are input, the table rotates clockwise.

Note:

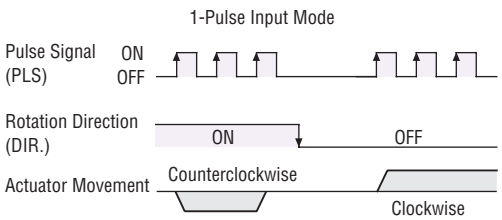
● The factory setting is 2-pulse input mode.



•1-Pulse Input Mode

The 1-pulse input mode uses "Pulse" (PLS) and "Rotation Direction" (DIR.) signals. CW rotation is selected by inputting DIR. signal at high level (with the input photocoupler OFF), CCW rotation by inputting at low level (with input photocoupler ON).

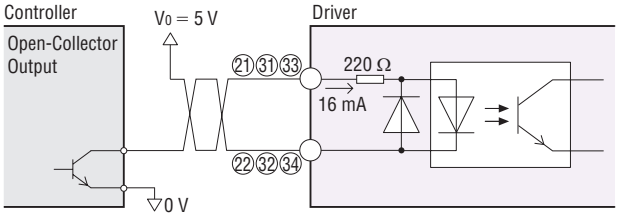
Rotation Direction Signals Photocoupler "OFF": Clockwise
Photocoupler "ON": Counterclockwise



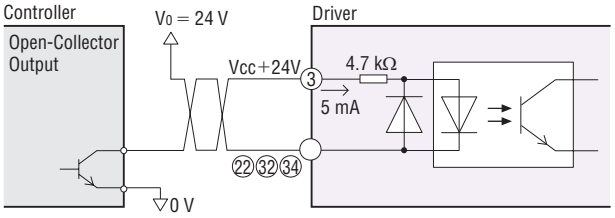
All Windings Off (C.OFF) Input Signal
Resolution Select (×10) Input Signal
Alarm Clear (ACL) Input Signal

◇Input Circuit and Sample Connection

•When Using 5 VDC



•When Using 24 VDC

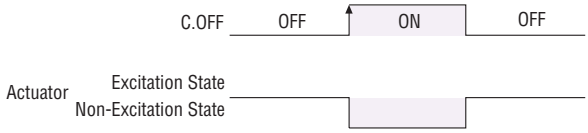


● Use pin No. 3 for the power input terminal.

◇All Windings Off (C.OFF) Input Signal

Pin No.㉝, ㉞

This controller power supply offers a choice of either 5 VDC or 24 VDC. Inputting the "All Windings Off" (C.OFF) signal puts the actuator in a non-excitation (free) state. It is used when turning the output table externally or when positioning manually. This signal clears the deviation counter.



◇Resolution Select (×10) Input Signal

Pin No.㉛, ㉜

This controller power supply offers a choice of either 5 VDC or 24 VDC. Inputting this signal when 18 000 P/R or 9000 P/R is selected as resolution via the function switch will increase the resolution ten times to 180 000 P/R or 90 000 P/R.

Note:

● While the resolution select switch is set to 180 000 P/R or 90 000 P/R, input of this signal will not change the resolution.

◇Alarm Clear (ACL) Input Signal

Pin No.㉑, ㉒

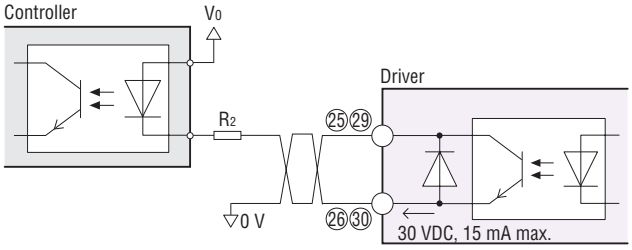
This controller power supply offers a choice of either 5 VDC or 24 VDC. This signal is used for canceling the alarm without turning off power to the driver when a protective function has been activated.

Note:

● The following alarm cannot be cleared. To cancel the alarm, first resolve the cause and check for safety, and then turn power on again.
・Overcurrent ・EEPROM data error ・System error

Positioning Completion (END) Output Signal
Alarm (ALARM) Output Signal

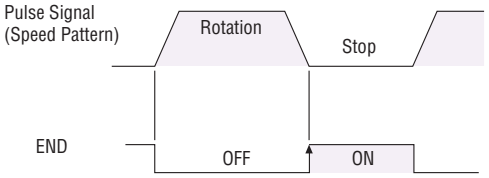
◇Output Circuit and Sample Connection



◇Positioning Completion (END) Output Signal

Pin No.㉙, ㉚

Circuits for use with 30 VDC, 15 mA maximum.
This signal is output at the photocoupler ON state when positioning is completed. This signal is output when the table position is less than ±0.1˚ from the command position, approximately 2 ms after the pulse input stops.

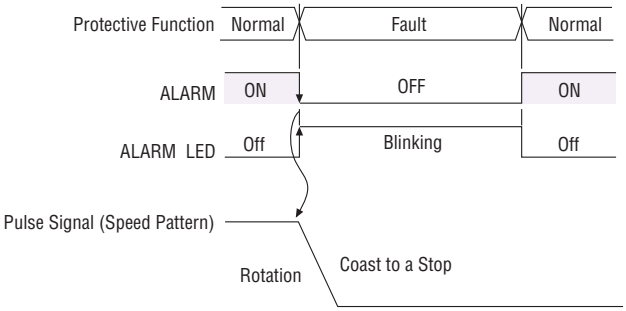


Note:
- The END signal blinks during operation with a pulse input frequency of 500 Hz or less.

◇Alarm (ALARM) Output Signal

Pin No.㉕, ㉖

Circuits for use with 30 VDC, 15 mA maximum. The photocoupler turns OFF when one of the driver's protective functions has been activated. When an abnormality such as an overload or overcurrent is detected, the "Alarm" signal will be output, the driver's LED indicator (ALARM) blinks, and the actuator stops (non-excitation state).
To cancel the alarm, first resolve the cause and check for safety, and then input an "Alarm Clear" (ACL) signal or reset power. Once power has been turned off, wait at least 10 seconds (5 seconds for **DG60**) before turning it on again.

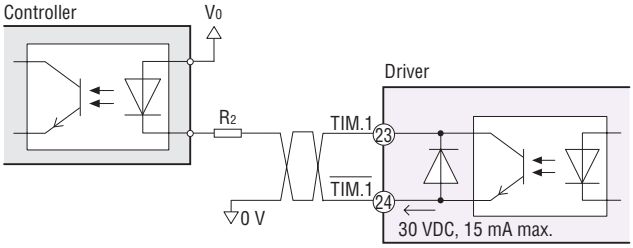


Notes:
- The "Alarm" output uses positive logic (normally closed), all other outputs use negative logic (normally open).
- The ALARM indicator lights (not blinks) when system error protective function has been activated.

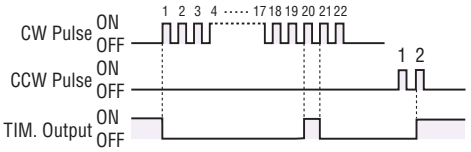
DG60

Timing (TIM.1) Output Signal

◇Output Circuit and Sample Connection



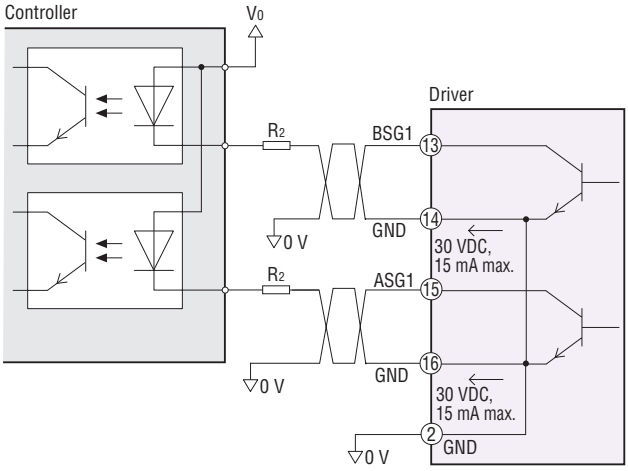
Circuits for use with 30 VDC, 15 mA maximum.
When the "Timing" signal is output, the transistor turns ON. This signal is used to detect the home position with greater precision. The number of pulses of this signal is 900 pulses per one table rotation.



Note:
- A precise "Timing" signal output cannot be obtained when the speed of the pulse input frequency is over 500 Hz.

Quadrature (ASG1/BSG1) Output Signal

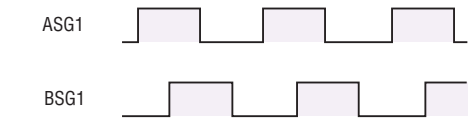
◇Output Circuit and Sample Connection



Circuits for use with 30 VDC, 15 mA maximum. A counter or similar device can be connected to monitor the position of the output table. The same pulse numbers as the setting resolution are output for each motor rotation.
[Example: Resolution select switch (18 000 P/R) → Output pulse number for each table rotation (18 000)]
The phase difference between A and B is 90˚ in electrical angle.

Notes:
- The pulse output accuracy of the motor is, regardless of resolution, within ±0.36˚ (repetition accuracy: within ±0.09˚).
- This signal is only for position verification when the motor has stopped. There is 1 ms (max.) time lag between real motor motion and the output signals.

◇Pulse Waveform Characteristics



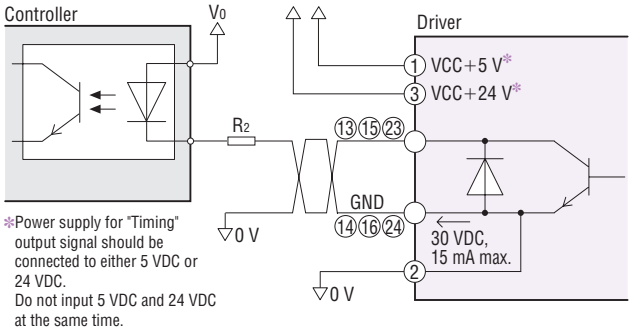
(Clockwise Rotation of Motor)

DG85, DG130, DG200

Timing (TIM.1, TIM.2) Output Signal
Quadrature (ASG1/BSG1, ASG2/BSG2) Output Signal

◇Output Circuit and Sample Connection

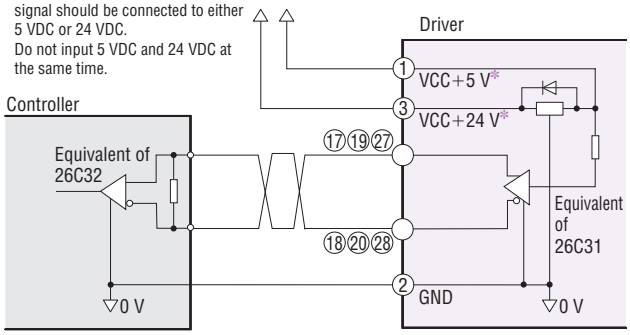
Open-Collector Output



*Power supply for "Timing" output signal should be connected to either 5 VDC or 24 VDC.
Do not input 5 VDC and 24 VDC at the same time.

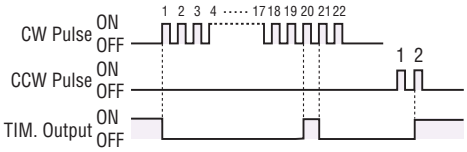
Circuits for use with 30 VDC, 15 mA maximum.

Line Driver Output



◇Timing (TIM.1, TIM.2) Output Signal
Pin No.㉓, ㉔, ㉗, ㉘

When the "Timing" signal is output, the transistor turns ON (For the line driver output which is TIM.2, the output signal is ON). This signal is used to detect the home position with greater precision. The number of pulses of this signal is 900 pulses per one table rotation.



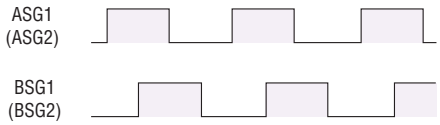
Notes:
- A precise "Timing" signal output cannot be obtained when the speed of the pulse input frequency is over 500 Hz.
- When the "Timing" signal output is used, 5 VDC or 24 VDC power supply is necessary.

◇Quadrature (ASG1/BSG1, ASG2/BSG2) Output Signal
Pin No.⑬~⑳

A counter or similar device can be connected to monitor the position of the output table. The same pulse numbers as the setting resolution are output for each motor rotation.
[Example: Resolution select switch (18 000 P/R) → Output pulse number for each table rotation (18 000)]
The phase difference between A and B is 90° in electrical angle.

Notes:
- The pulse output accuracy of the motor is, regardless of resolution, within ±0.36° (repetition accuracy: within ±0.09°).
- When the pulse output is used, 5 VDC or 24 VDC power supply is necessary. This signal is only for position verification when the actuator has stopped. There is 1 ms (max.) time lag between real actuator motion and the output signals.

◇Pulse Waveform Characteristics



(Clockwise Rotation of Motor)

List of Actuator and Driver Combinations

Model names for actuator and driver combinations are shown below.

Model	Actuator Model	Driver Model
DG60-ASAK	DGM60-ASAK	ASD10A-K
DG60-ASBK	DGM60-ASBK	ASD10A-K
DG85R-ASAA	DGM85R-ASAA	ASD13B-A
DG85R-ASBA	DGM85R-ASBA	ASD13B-A
DG130R-ASAA	DGM130R-ASAA	ASD24A-A
DG130R-ASBA	DGM130R-ASBA	ASD24A-A
DG130R-ASAC	DGM130R-ASAC	ASD12A-C
DG130R-ASBC	DGM130R-ASBC	ASD12A-C
DG130R-ASAS	DGM130R-ASAC	ASD12A-S
DG130R-ASBS	DGM130R-ASBC	ASD12A-S
DG200R-ASAA	DGM200R-ASAA	ASD30E-A
DG200R-ASBA	DGM200R-ASBA	ASD30E-A
DG200R-ASAC	DGM200R-ASAC	ASD20A-C
DG200R-ASBC	DGM200R-ASBC	ASD20A-C
DG200R-ASAS	DGM200R-ASAC	ASD20A-S
DG200R-ASBS	DGM200R-ASBC	ASD20A-S

Selection Calculations

Calculations are needed to select an appropriate product that meets the specifications required for your equipment. This section describes the selection calculations for the **DG** Series.

Calculate the Required Torque

① Calculate the inertia (load inertia) of the work.
Use less than 30 times the actuator inertia as a reference for the inertia of the work.

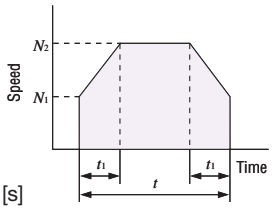
② Determine the positioning angle.

③ If there is no friction torque, check the positioning time from the load inertia – positioning time graph for the **DG** Series. Refer to page 8 for the load inertia – positioning time graph.

④ Determine the positioning time and acceleration/deceleration time.
However, make sure that:
Positioning time ≥ shortest positioning time identified from the load inertia – positioning time graph
Acceleration/deceleration time $t_1 \times 2 \leq$ positioning time

⑤ Determine the starting speed N_1, and calculate the operating speed N_2 using the following formula. Set N_1 to a low speed [0 to several r/min] but be careful not to increase it more than necessary.

$$N_2\,[\text{r/min}] = \frac{\theta - 6N_1t_1}{6\,(t - t_1)}$$



N_2 : Operating speed [r/min]
θ : Positioning angle [deg]
N_1 : Starting speed [r/min]
t : Positioning time [s]
t_1 : Acceleration (deceleration) time [s]

If you cannot achieve $N_1 \leq N_2 \leq 200$ [r/min] with the above formula, return to ④ and review the conditions.

⑥ Calculate the acceleration torque using the following formula.

$$\text{Acceleration torque } T_a\,[\text{N·m}] = (J_1 + J_L) \times \frac{\pi}{30} \times \frac{(N_2 - N_1)}{t_1}$$

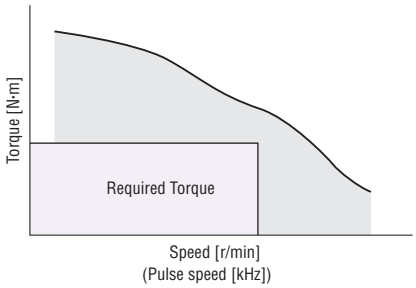
J_1 : Inertia of actuator [kg·m^2]
J_L : Total inertia [kg·m^2]
N_2 : Operating speed [r/min]
N_1 : Starting speed [r/min]
t_1 : Acceleration (deceleration) time [s]

⑦ Calculate the required torque. The required torque is equal to the load torque due to friction resistance plus the acceleration torque due to inertia, multiplied by the safety factor.

$$\text{Required torque } T = (\text{Load torque [N·m]} + \text{Acceleration torque [N·m]}) \times \text{Safety factor}$$
$$= (T_L + T_a) \times S$$

Set the safety factor S to at least 1.5.

⑧ Check whether the required torque T falls within the speed – torque characteristics. If the required torque does not fall within the range, return to ④ to change the conditions, and recalculate the value.



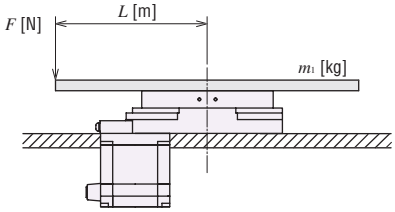
Use the following formula to convert the speed into a pulse speed.

$$f\,[\text{Hz}] = \frac{6N}{\theta s}$$

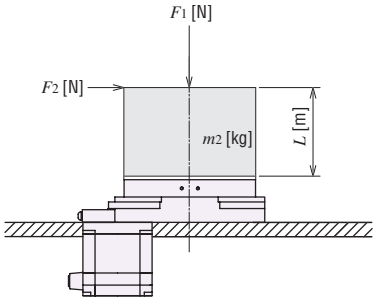
f : Pulse speed [Hz]
N : Speed [r/min]
θ_s : Output table step angle [deg/step]

Calculate the Thrust Load and Moment Load

If the output table is subject to a load as indicated in the following diagram, use the formula below to calculate the thrust load and moment load, and check that the values are within the specified values.



Thrust load [N] $Fs = F + m_1 \times g$
Moment load [N·m] $M = F \times L$
g: Gravitational acceleration 9.807 [m/s^2]



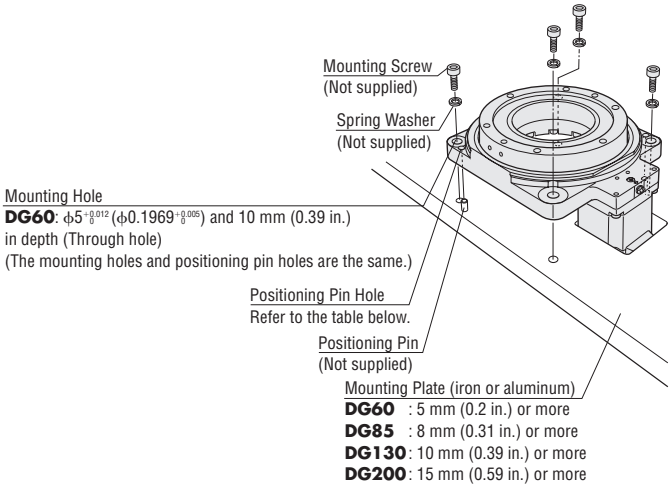
Thrust load [N] $Fs = F_1 + m_2 \times g$
Moment load [N·m] $M = F_2 \times (L + a)$

Model	a
DG60	0.01
DG85	0.02
DG130	0.03
DG200	0.04

Installation

Actuator Installation

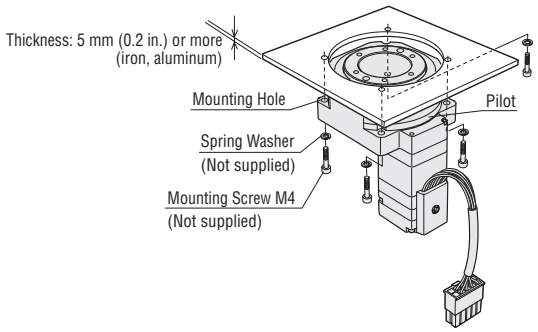
Install the actuator onto the mounting plate from the direction shown in the figure. Two positioning pin holes are provided in the mounting surface of the actuator. (With the actuator with a frame size of 60 mm (2.36 in.), the mounting holes and positioning pin holes are the same.) Use these holes to determine the position of the actuator on your equipment. Be sure to firmly attach the positioning pins in the mounting plate.
Provide relief holes in the mounting plate to prevent contact with the motor.



Positioning Pin Hole

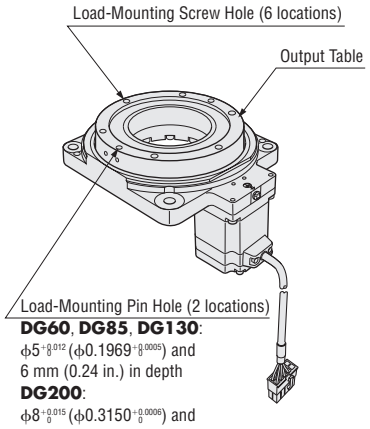
Model	Pin Hole Diameter mm (inch)	Pin Hole Depth mm (inch)	Number of Pin Hole
DG85	$\phi 5^{+0.012}_{0}$ ($\phi 0.1969^{+0.0005}_{0}$)	10.5 (0.41) (Through hole)	2
DG130		12 (0.47) (Through hole)	
DG200	$\phi 8^{+0.015}_{0}$ ($\phi 0.3150^{+0.0006}_{0}$)	8 (0.31) (Blind hole)	2 (One hole is a slot.)

The actuator with a frame size of 60 mm (2.36 in.) can be installed from the direction shown in the figure using a pilot [$\phi 65^{0}_{-0.030}$ ($\phi 2.5591^{0}_{-0.0012}$)]. However, installation from this direction is not possible when the accessory home-sensor set is used.



Attaching the Load to the Output Table

Attach the load using the load-mounting screw holes (six locations) provided in the output table.
Two load-mounting pin holes are provided in the output table. Use these holes and positioning pins to determine the position of the load. Be sure to firmly attach the positioning pins in the load.



Installation Conditions

Install the actuator in a location that meets the following conditions, or the product may be damaged.

- Indoors (This product is designed and manufactured to be installed within another device.)
- Ambient temperature: 0 to +50°C (+32 to +122°F) (non-freezing)
  0 to +40°C (+32 to +104°F) (non-freezing)
  when home-sensor set is attached
- Ambient humidity: 85% or less (non-condensing)
- Not exposed to explosive, flammable or corrosive gases
- Not exposed to direct sunlight
- Not exposed to dust
- Not exposed to water, oil or other liquid
- A place where heat can escape easily
- Not exposed to continuous vibration or excessive impact

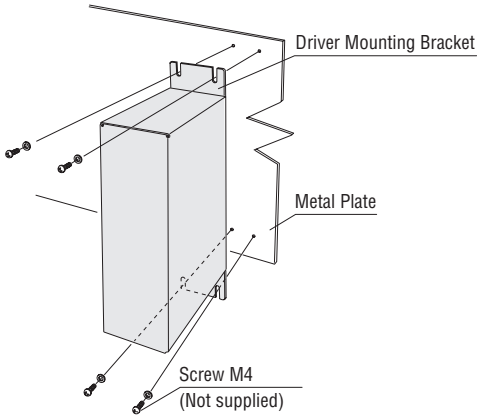
■Driver Installation

●Installation Direction and Method

AC Input Type

◇Installing Using Driver Mounting Bracket

1. Install the driver mounting brackets over the mounting holes at the back of the driver, using screws included.
2. Using the mounting holes in the driver mounting brackets and four screws, install the driver by making sure no gaps remain along the metal plate.

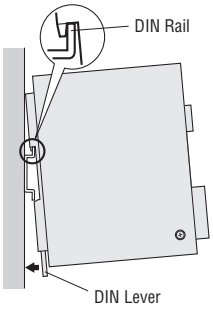


Notes:

- Firmly install on a metal plate that has good heat conductivity, such as iron or aluminum of 2 mm (0.08 in.) or more in thickness.
- To directly install the driver without using the screws included, pay particular attention to the length of the screws used for the mounting holes.

◇Installing to a DIN Rail

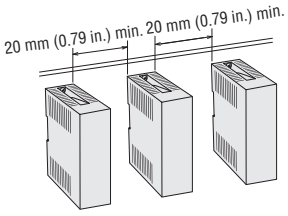
Pull the DIN lever down, engage the upper hooks of the DIN rail mounting plate over the DIN rail, and push the DIN lever until it locks in place.



Notes:

- Use a DIN rail with a rail width of 35 mm (1.38 in.). Also, use an end plate for affixing the driver.
- The DIN rail and end plate are not supplied with the driver. Those items must be provided by the customer.

◇Installation Clearances

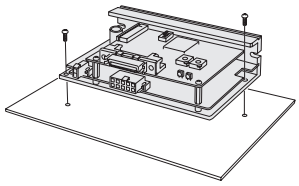


When two or more drivers are connected, the ambient temperature will increase due to rise in the temperature of each driver. Provide a minimum clearance of 20 mm (0.79 in.) between the two adjacent drivers and a minimum clearance of 25 mm (0.98 in.) between each driver and other equipment or structure in all directions. If the ambient temperature exceeds 50°C (122°F), provide forced cooling via a fan.

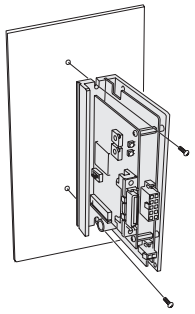
DC Input Type

Considering heat radiation, mount the driver as follows:

Installation in the Horizontal Direction
·Using Mounting Holes on Circuit Board



Installation in the Vertical Direction
·Using Mounting Holes at the Back



◇Installation Clearances

There must be a minimum clearance of 25 mm (0.98 in.) and 50 mm (1.97 in.) in the horizontal and vertical directions respectively, between the driver and enclosure or other equipment. When installing two or more drivers in parallel, provide a minimum clearance of 20 mm (0.79 in.) and 50 mm (1.97 in.) in the horizontal and vertical directions respectively, between adjacent drivers.

●Installation Conditions

Install the driver in a location that meets the following conditions, or the product may be damaged.

- Indoors (This product is designed and manufactured to be installed within another device.)
- Ambient temperature: 0 to +40°C (+32 to +104°F) (non-freezing)
  DG60
  : 0 to +50°C (+32 to +122°F) (non-freezing)
  DG85
  DG130
  DG200
- Ambient humidity: 85% or less (non-condensing)
- Not exposed to explosive, flammable or corrosive gases
- Not exposed to direct sunlight
- Not exposed to dust
- Not exposed to water, oil or other liquid
- A place where heat can escape easily
- Not exposed to continuous vibration or excessive impact

Notes:

- When installing the driver in an enclosed space such as a control box, or somewhere close to a heat-radiating object, vent holes should be used to prevent the driver from overheating.
- Do not install the driver in a location where a source of vibration will cause the driver to vibrate.
- In situations where drivers are located close to a large noise source such as high frequency welding machines or large electromagnetic switches, take steps to prevent noise interference, either by inserting noise filters or connecting the driver to a separate circuit.
- Take care that pieces of conductive material (filings, pins, pieces of wire, etc.) do not enter the drivers.

Accessories (Sold separately)

■Home-Sensor Set RoHS

A home-sensor set, which consists of a photomicro sensor, connector with robot cable, sensor mounting bracket, shielding plate and mounting screws, is provided to facilitate easy return to home operation.
All parts needed for return to home operation are included in the set, so you will spend less time designing, fabricating or procuring parts in connection with sensor installation. Installation is very easy, so you can start using the sensor right away.

●Product Line

Model	Sensor Output	Applicable Product
PADG-SA	NPN	**DG60-ASAK/DG60-ASBK**
PADG-SAY	PNP	
PADG-SB	NPN	**DG85R-ASAA/DG85R-ASBA** **DG130R-ASA□/DG130R-ASB□** **DG200R-ASA□/DG200R-ASB□**
PADG-SBY	PNP	

● Enter **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC) in the box (□) within the model name.

Model: **PADG-SB**

●Sensor Specifications

◇NPN Type

Model	**DG60**: EE-SX672A (OMRON) **DG85**, **DG130**, **DG200**: EE-SX673A (OMRON)
Power Supply	5～24 VDC±10%, ripple (P-P) 10% or less
Current Consumption	35 mA or less
Control Output	NPN open-collector output, 5～24 VDC 100 mA or less Residual voltage 0.8 V or less (at load current of 100 mA)
Indicator LED	Detection display (red)
Sensor Logic	Normally open/normally closed (switchable, depending on connection)

◇PNP Type

Model	**DG60**: EE-SX672R (OMRON) **DG85**, **DG130**, **DG200**: EE-SX673R (OMRON)
Power Supply	5～24 VDC±10%, ripple (P-P) 10% or less
Current Consumption	30 mA or less
Control Output	PNP open-collector output, 5～24 VDC 50 mA or less Residual voltage 1.3 V or less (at load current of 50 mA)
Indicator LED	Detection display (red)
Sensor Logic	Normally open/normally closed (switchable, depending on connection)

●Installing the Home-Sensor Set

Be aware of the following points when installing the accessory home-sensor set:

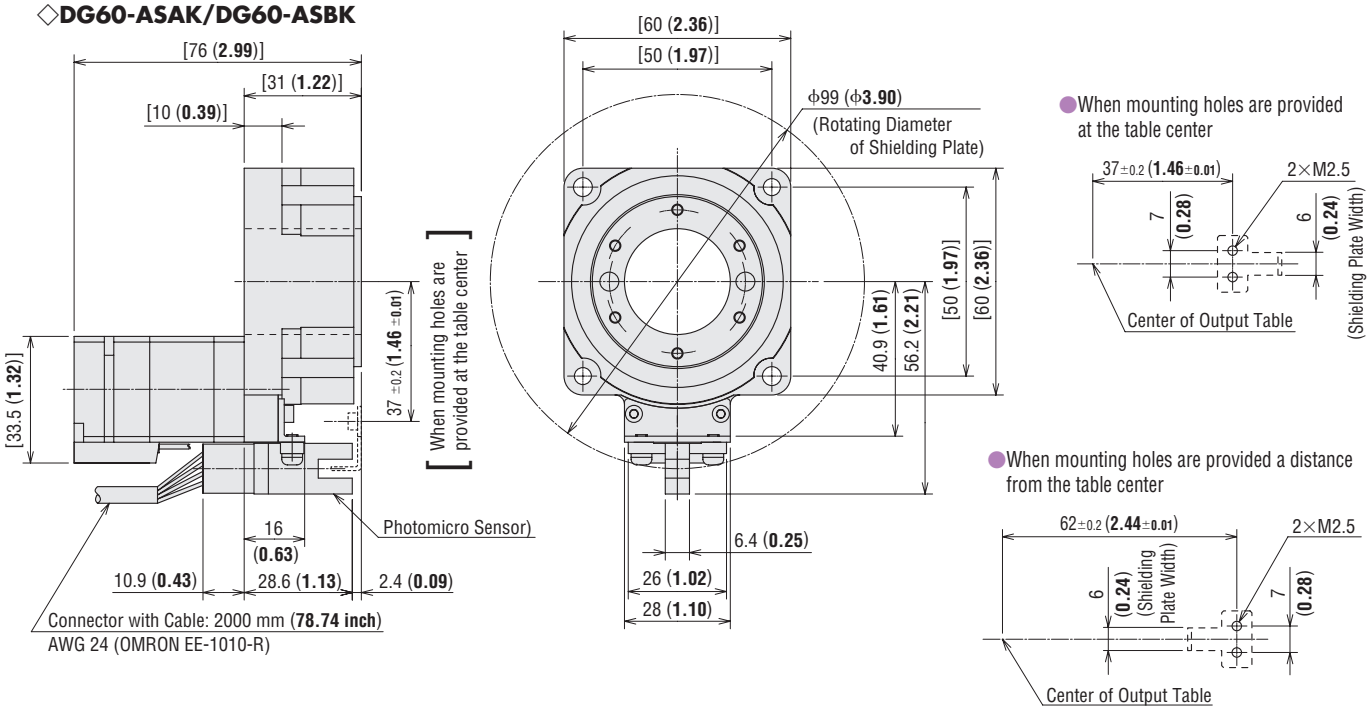
- Set the operating conditions so that the operating temperature stays at 40˚C (104˚F) or less and the surface temperature of the actuator motor stays at 90˚C (194˚F) or less.
- When performing return to home operation using the counter-output shaft of the motor, the user must provide a separate sensor, mounting bracket and other necessary parts.

●When Extending the Sensor Line

Use shielded cable when extending the sensor line more than 2 m (6.6 ft.).
The shielded cable must be grounded.

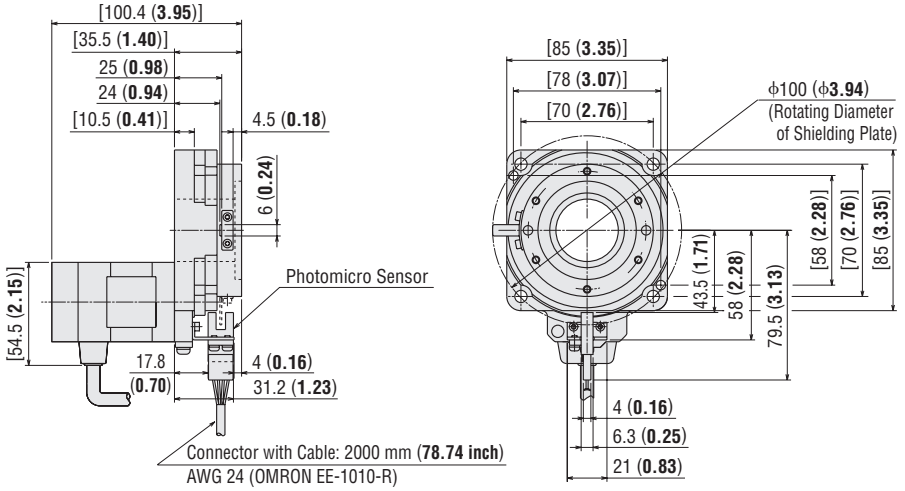
●Dimensions of Sensor Installation Unit = mm (inch)

◇DG60-ASAK/DG60-ASBK

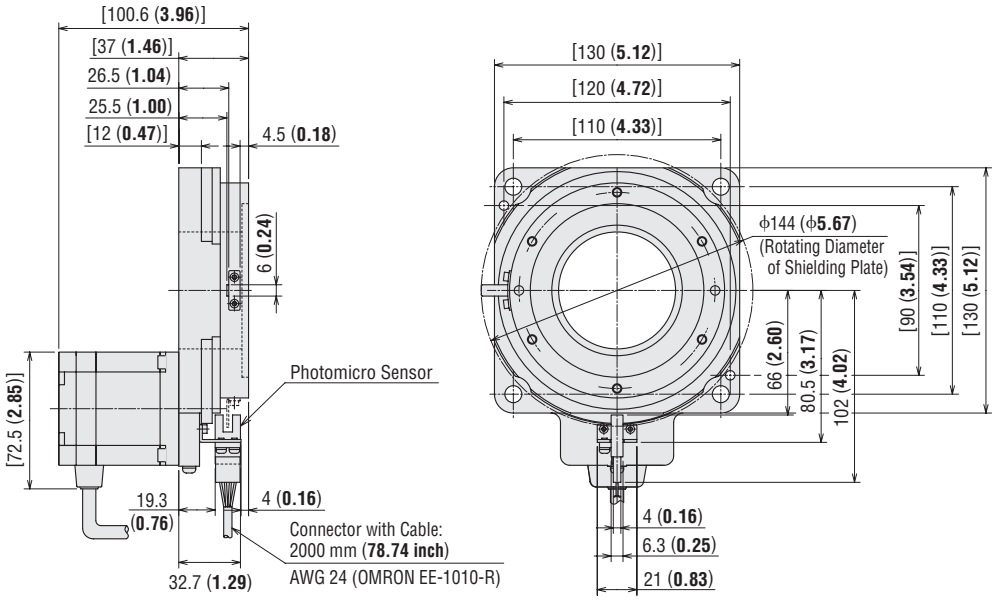


[Machining Dimension Drawing for Installation of Shielding Plate]

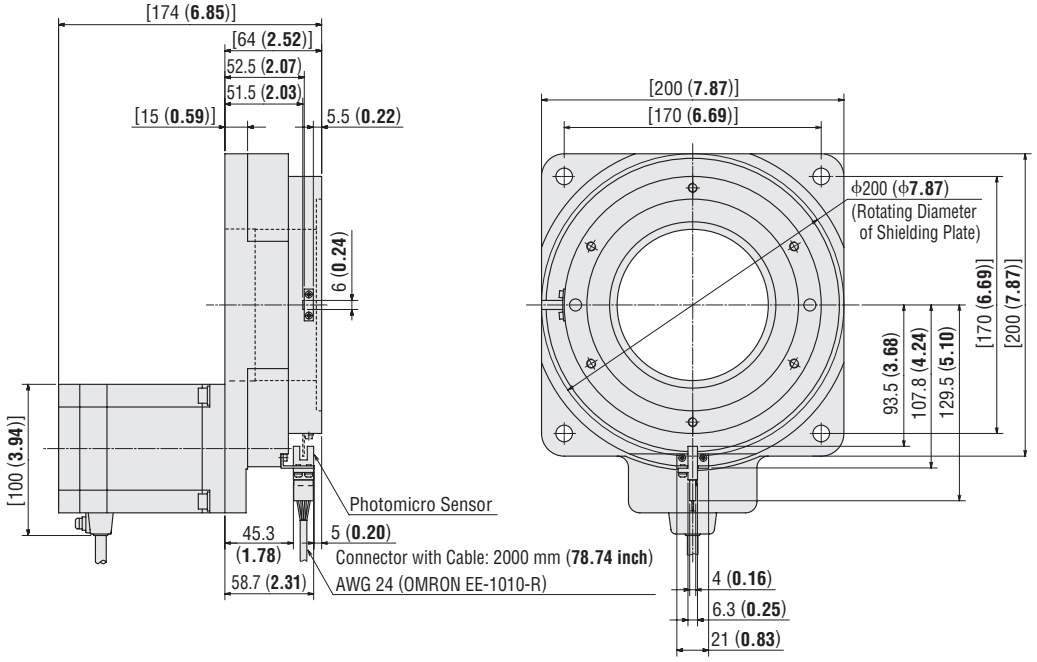
◇DG85R-ASAA/DG85R-ASBA



◇DG130R-ASA□/DG130R-ASB□



◇DG200R-ASA□/DG200R-ASB□



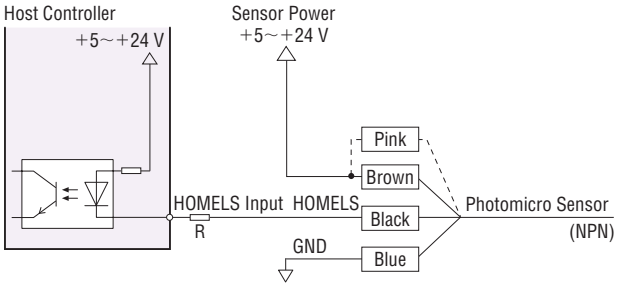
● Enter **A** (Single-Phase 100-115 VAC), **C** (Single-Phase 200-230 VAC) or **S** (Three-Phase 200-230 VAC) in the box (□) within the model name.

●Wiring the Sensor

◇NPN Type

Power supply voltage and current must be 5 to 24 VDC, 100 mA or below, respectively.
If the current exceeds 100 mA, connect an external resistor R.
GND for sensor power supply and customer's controller power supply should be common.

Pulse Input Package

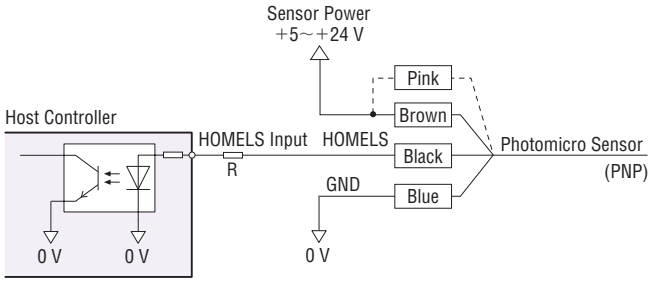


- - - Connect the pink lead to the brown lead when the sensor logic is N.C. (normally closed).
The pink lead is not connected when the sensor logic is N.O. (normally open).

◇PNP Type

Power supply voltage and current must be 5 to 24 VDC, 50 mA or below, respectively.
If the current exceeds 50 mA, connect an external resistor R.

Pulse Input Package



- - - Connect the pink lead to the brown lead when the sensor logic is N.C. (normally closed).
The pink lead is not connected when the sensor logic is N.O. (normally open).

■Motor Cables RoHS

●Extension Cables

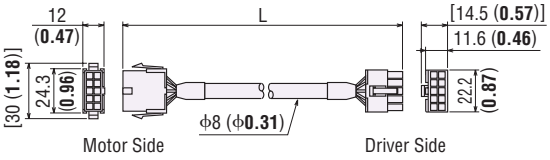
These extension cables are used to extend the wiring distance between the actuator and driver.

◇Product Line

Model	Length L m (ft.)
CC01AIP	1 (3.3)
CC02AIP	2 (6.6)
CC03AIP	3 (9.8)
CC05AIP	5 (16.4)
CC07AIP	7 (23)
CC10AIP	10 (32.8)
CC15AIP*	15 (49.2)
CC20AIP*	20 (65.6)

*Only for **DG85**, **DG130** and **DG200**

◇Dimensions Unit = mm (inch)



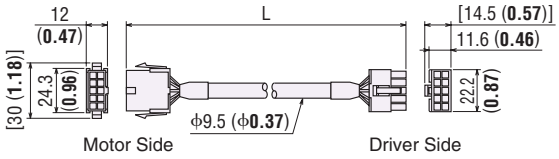
●Flexible Extension Cables

We recommend these flexible cables when the actuator is installed on a moving section and the cable is bent and flexed.

◇Product Line

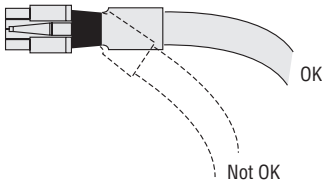
Model	Length L m (ft.)
CC01SAR	1 (3.3)
CC02SAR	2 (6.6)
CC03SAR	3 (9.8)
CC05SAR	5 (16.4)
CC07SAR	7 (23)
CC10SAR	10 (32.8)

◇Dimensions Unit = mm (inch)

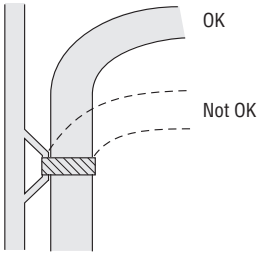


◇Notes on Use of a Flexible Extension Cable

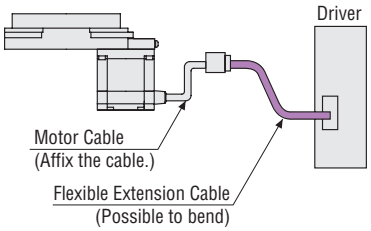
① Do not allow the cable to bend at the cable connector.



② Keep the bending radius to 60 mm or more.



③ The motor cable is not a flexible cable. If the motor cable is to be bent, bend it at the flexible extension cable.



Driver Cables RoHS

Dedicated Type (Conforms to **EMP** Series)

One end of the cable is a half-pitch connector that snaps into the driver for the **DG** Series. The other end of the cable is equipped with the connector for the **EMP** Series controller.

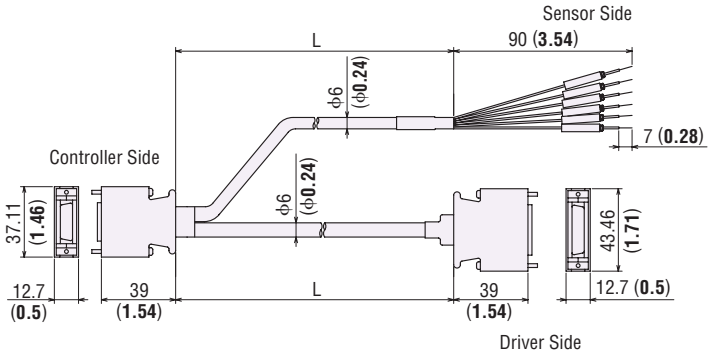
◇Product Line

Model	Length L m (ft.)
CC01EMP4	1 (3.3)
CC02EMP4	2 (6.6)

Note:

- The alarm clear function is not available on the **EMP400** Series.

◇Dimensions Unit = mm (inch)



General-Purpose Type

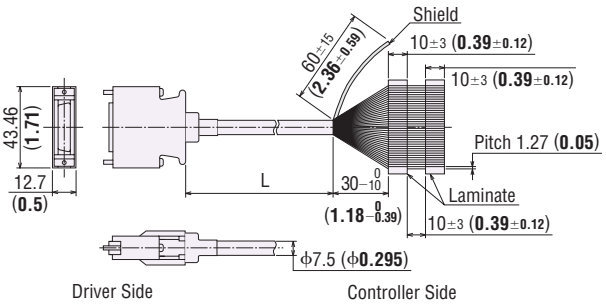
This is a shielded cable equipped with, at one end of the cable, the half-pitch connector that snaps into the driver for the **DG** Series.

◇Product Line

Model	Length L m (ft.)	Connector
CC36D1-1	1 (3.3)	Control input pin: 36 pins
CC36D2-1	2 (6.6)	

◇Dimensions Unit = mm (inch)

Conductor: AWG28



Connector – Terminal Block Conversion Unit RoHS

A conversion unit that connects a driver to a host controller using a terminal block.
- With a signal name plate for easy, one-glance identification of driver signal names.
- DIN-rail mountable
- Cable length: 1 m (3.3 ft.)

CC36T1 CC50T1

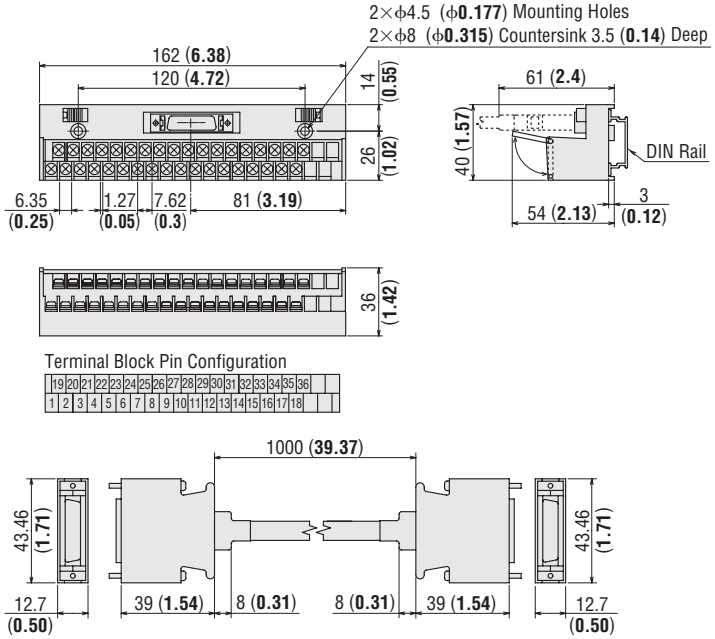
Product Line

Model	Length m (ft.)	Connector/Applicable Product
CC36T1	1 (3.3)	Control input pin: 36 pins
CC50T1		For **EMP** Series

Dimensions Unit = mm (inch)

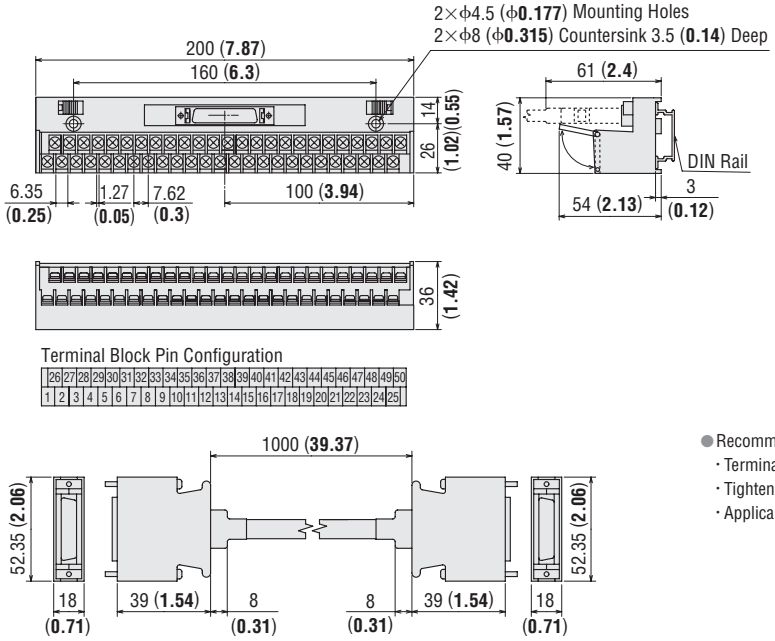
CC36T1

CAD B438

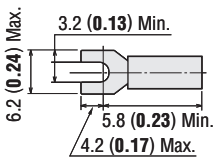


CC50T1

CAD B439



- Recommended Crimp Terminals
  - Terminal screw size: M3
  - Tightening torque: 1.2 N·m (170 oz-in)
  - Applicable minimum lead wire: AWG22

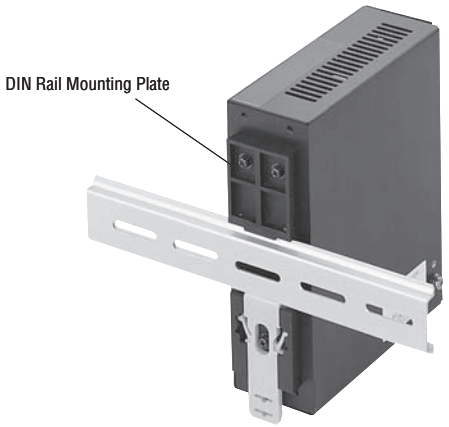


DIN Rail Mounting Plate RoHS

This mounting plate is convenient for installing the drivers of **DG85**, **DG130** and **DG200** on DIN rails with ease. The plate enables a simple, one-touch attachment/detachment to/from the DIN rail.

Product Line

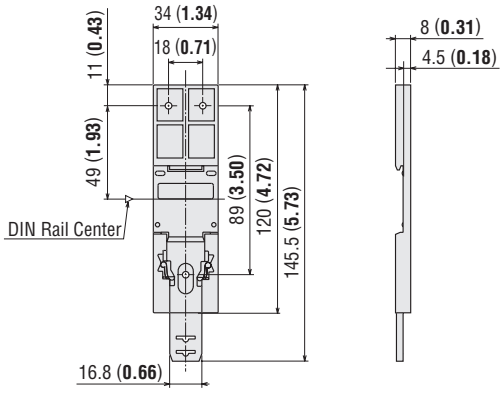
Model	Applicable Product
PADP01	**DG85** **DG130** **DG200**



Dimensions Unit = mm (inch)

Mass: 20 g (0.71 oz.)

- Screws (Included)
  M3 Length 8 mm (0.31 in.) ··· 3 pieces



Controllers RoHS

Controller for Stepping Motor
SG8030J


DIN Rail Mounting Model


Recessed Mounting Model

■Features

All operations including data setting can easily be performed using the four touch pads on the top panel. In addition, the number of signal lines is reduced to a minimum for easy connection.

- ●Jerk limiting control function to suppress motor drive vibrations
- ●Sequential-step positioning operation/external signal operation possible
- ●Maximum oscillation frequency: 200 kHz
- ●1-pulse output/2-pulse output mode select possible
- ●Four operating programs can be input.

■Product Line

Type	Model
DIN Rail Mounting Model	**SG8030J-D**
Recessed Mounting Model	**SG8030J-U**

Stored Program Controller
EMP400 Series


Single Axis


Dual Axis


Operator Interface Unit
(Sold separately)

■Features

In addition to the superior oscillation function reflecting Oriental Motor's wealth of expertise in motor design and manufacturing, the **EMP400** Series also provides the I/O control function and the sequence function that allow for programming of a series of operations.

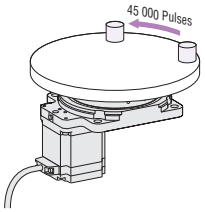
- ●32 different sequence programs can be input.
- ●Various operation patterns
- ●Teaching function
  When an operator interface unit **OP300** (accessory) is used, you can adjust the travel amount via teaching or monitor the current position.
- ●No special software is necessary.

■Product Line

Model	Number of Axes	Connector
EMP401-1	Single axis	Without connectors
EMP401-2		With connectors
EMP402-1	Dual axis	Without connectors
EMP402-2		With connectors

■Sample Program

Positioning operation



●Operator Interface Unit **OP300**

[1]VS1 500 ;Starting speed 500 Hz
[2]V1 1000 ;Operating speed 1000 Hz
[3]T1 20.0 ;Acceleration/deceleration rate 20.0 ms/kHz
[4]D1 +45 000 ;Travel amount 45 000 pulses in the clockwise direction
[5]INC1 ;Execute relative positioning operation

This product is manufactured at a plant certified with the international standards **ISO 9001** (for quality assurance) and **ISO 14001** (for systems of environmental management).

Specifications are subject to change without notice.

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