Motorized Actuators

Hollow Rotary Actuators
Hollow Rotary Actuators

DG Series

A hollow rotary actuator featuring a hollow table that allows large-inertia discs or arms to be installed directly. The actuator uses an step motor adopting closed loop control. High accuracy positioning can be performed while keeping the user-friendly features of a stepping motor intact.

Features

Accurate Positioning

The gear-reduction mechanism employs precision gears along with a proprietary adjustment mechanism that eliminates backlash. The repetitive positioning accuracy from a single direction is \( \pm 15 \text{ sec.} \), while lost motion in a positioning operation from two directions is 2 arc minutes. These characteristics make the DG Series an ideal choice for applications in which accurate positioning is a must.

Product 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
- 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.

- **Large-Diameter, Hollow Output Table Makes Possible Simple Wiring and Piping**
  The diameter of the driven gear has been increased with the use of a single-stage reduction gear mechanism, resulting in a hollow hole through-hole of sufficiently large diameter with respect to frame size. This helps reduce the complexity of wiring and piping, thus simplifying your equipment design.

- **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.

<table>
<thead>
<tr>
<th>Frame Size [mm (in.)]</th>
<th>Permissible Thrust Load [N (lb.)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>DG60 60 (2.36)</td>
<td>100 (22)</td>
</tr>
<tr>
<td>DG85 85 (3.35)</td>
<td>500 (112)</td>
</tr>
<tr>
<td>DG130 130 (5.12)</td>
<td>2000 (450)</td>
</tr>
<tr>
<td>DG200 200 (7.87)</td>
<td>4000 (900)</td>
</tr>
</tbody>
</table>

- **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.

<table>
<thead>
<tr>
<th>Frame Size [mm (in.)]</th>
<th>Diameter of Hollow Section [mm (in.)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>DG60 60 (2.36)</td>
<td>28 (1.1)</td>
</tr>
<tr>
<td>DG85 85 (3.35)</td>
<td>33 (1.3)</td>
</tr>
<tr>
<td>DG130 130 (5.12)</td>
<td>62 (2.44)</td>
</tr>
<tr>
<td>DG200 200 (7.87)</td>
<td>100 (3.94)</td>
</tr>
</tbody>
</table>

- **RoHS-Compliant**
  The DG Series conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.
  Details of RoHS Directive ➔ Page G-38
Type and Structure

- **DG60**
  - Permissible Torque: 0.9 N\(\cdot\)m (7.9 lb-in)
  - Permissible Thrust Load: 100 N (22 lb.)
  - Permissible Moment Load: 2 N\(\cdot\)m (17.7 lb-in)

- **DG85, DG130, DG200**
  - Permissible Torque: 50 N\(\cdot\)m (440 lb-in)
  - Permissible Thrust Load: 4000 N (900 lb.)
  - Permissible Moment Load: 100 N\(\cdot\)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
# How to Read Specifications

<table>
<thead>
<tr>
<th>Actuator</th>
<th>Frame Size mm (in.)</th>
<th>DG85R-ASAA</th>
<th>DG130R-ASAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Phase</td>
<td>Single Shaft</td>
<td>85 (3.35)</td>
<td>130 (5.12)</td>
</tr>
<tr>
<td>100-115 VAC</td>
<td>Double Shaft</td>
<td>DG85R-ASBA</td>
<td>DG130R-ASBA</td>
</tr>
<tr>
<td>Single-Phase</td>
<td>Single Shaft</td>
<td>–</td>
<td>DG130R-ASAC</td>
</tr>
<tr>
<td>200-230 VAC</td>
<td>Double Shaft</td>
<td>–</td>
<td>DG130R-ASBC</td>
</tr>
<tr>
<td>Three-Phase</td>
<td>Single Shaft</td>
<td>–</td>
<td>DG130R-ASAS</td>
</tr>
<tr>
<td>200-230 VAC</td>
<td>Double Shaft</td>
<td>–</td>
<td>DG130R-ASBS</td>
</tr>
</tbody>
</table>

## Specifications

### ε - Type of Output Table Supporting Bearing

- **Motor Type**
  - Type of Output Table Supporting Bearing
  - Cross-Roller Bearing
- **Permissible Torque**
  - N·m (lb-in) 2.8 (24) 12 (106)
- **Maximum Holding Torque**
  - N·m (lb-in) 1.5 (15.9) 12 (106)
- **Inertial Moment**
  - kg·m² (oz·in²) 2534×10⁻⁶ (139) 15874×10⁻⁶ (870)
- **Permissible Speed**
  - r/min 200
- **Gear Ratio**
  - 18:1
- **Resolution**
  - 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 [5000] × 1) 180 000 P/R (Resolution Setting: 0.002˚/step [10 000] × 1)
- **Angular Transmission Error**
  - arc minute (degrees) 4 (0.067˚) 3 (0.05˚)
- **Permissible Moment Load**
  - N·m (lb-in) 0.015 (0.0006) 0.015 (0.0006)
  - kg·m² (oz·in²) 0.030 (0.0012) 0.030 (0.0012)
- **Runout of Output Table Surface**
  - mm (in.) 1 (0.040) 0.01 (0.0015)
- **Runout of Output Table Inner (Outer) Diameter**
  - mm (in.) 0.015 (0.0006) 0.015 (0.0006)
- **Parallelism of Output Table**
  - mm (in.) 0.030 (0.0012) 0.030 (0.0012)
- **Degree of Protection**
  - IP40 (IP20 for motor connector)
- **Mass**
  - kg (lb.) 1.2 (2.6) 2.6 (5.7)

1. **Type of Output Table Supporting Bearing**
   - The type of the bearing used for the output table.
2. **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.
3. **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.
4. **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.
5. **Permissible Speed**
   - The output table speed that can be tolerated by the mechanical strength of the reduction mechanism.
6. **Resolution**
   - The number of pulses needed to rotate the output table by one rotation.
7. **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.
8. **Lost Motion**
   - The difference in stopped angles achieved when the output table is positioned to the same position in the forward and reverse directions.
9. **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.
10. **Permissible Thrust Load**
    - The permissible value of thrust load applied to the output table in the axial direction.
11. **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.
12. **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.
13. **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.
14. **Parallelism of Output Table**
    - An inclination of the mounting surface of the output table compared with the actuator mounting surface on the equipment side.
15. **Degree of Protection**
    - IEC 60529 and EN 60034-5 (IEC 60034-5) classify the dust-resistance and waterproofing into grades.
## System Configuration

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

![Diagram of system configuration]

### Accessories and Peripheral Equipment (Sold separately)

<table>
<thead>
<tr>
<th>No.</th>
<th>Product Name</th>
<th>Overview</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Controller</td>
<td>This controller gives commands needed to drive the actuator.</td>
<td>C-269</td>
</tr>
<tr>
<td>②</td>
<td>Home-Sensor Set</td>
<td>Set of sensor, shielding plate, sensor mounting bracket and cable with connector [2 m (6.6 ft.)].</td>
<td>D-185</td>
</tr>
<tr>
<td>③</td>
<td>Extension Cables</td>
<td>General-purpose cable for connecting the driver and controller [1 m, 2 m (3.3 ft., 6.6 ft.)].</td>
<td>D-188</td>
</tr>
<tr>
<td>④</td>
<td>DIN Rail Mounting Plate</td>
<td>Set of terminal block and cable for connecting the host controller and EMP Series controller [1 m (3.3 ft.)].</td>
<td>D-190</td>
</tr>
<tr>
<td>⑤</td>
<td>Driver Cables</td>
<td>Cable for extending the wiring distance between the actuator and driver (1 to 20 m (3.3 to 65.6 ft.)).</td>
<td>D-189</td>
</tr>
<tr>
<td>⑥</td>
<td>Connector -- Terminal Block Conversion Unit</td>
<td>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.)].</td>
<td>D-191</td>
</tr>
</tbody>
</table>

### Example of System Configuration

(Sold separately)

<table>
<thead>
<tr>
<th>DG Series</th>
<th>Controller</th>
<th>Extension Cable</th>
<th>Home-Sensor Set</th>
<th>DIN Rail Mounting Plate</th>
<th>Driver Cables EMP Series Dedicated Type</th>
<th>Connector -- Terminal Block Conversion Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DG130R-ASAA</td>
<td>EMP401-1</td>
<td>CC03AIP</td>
<td>PADG-S8</td>
<td>PAPD01</td>
<td>CC01EMP4</td>
<td>CC50T1</td>
</tr>
</tbody>
</table>

The system configuration shown above is an example. Other combinations are available.
### Product Number Code

**DG 130 R - AS A A**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>❀ Series ❀</td>
<td>DG: DG Series</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>❀ Frame Size ❀</td>
<td>60: 60 mm (2.36 in.)</td>
<td>85: 85 mm (3.35 in.)</td>
<td>130: 130 mm (5.12 in.)</td>
<td>200: 200 mm (7.87 in.)</td>
<td></td>
</tr>
<tr>
<td>❀ Type of Output Table Supporting Bearing ❀</td>
<td>Blank: Deep-Groove Ball Bearing</td>
<td>R: Cross-Roller Bearing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>❀ Motor Type ❀</td>
<td>AS: ANSTEP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>❀ Motor Shaft ❀</td>
<td>A: Single Shaft</td>
<td>B: Double Shaft</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

**Actuator (RoHS)**

<table>
<thead>
<tr>
<th>Model</th>
<th>24 VDC</th>
<th>Single-Phase 100-115 VAC</th>
<th>Single-Phase 200-230 VAC</th>
<th>Three-Phase 200-230 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DG60-ASAK</td>
<td>DG60-ASBK</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DG85R-ASAA</td>
<td>DG85R-ASBA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DG130R-ASAA</td>
<td>DG130R-ASAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DG130R-ASBA</td>
<td>DG130R-ASBC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DG200R-ASAA</td>
<td>DG200R-ASAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DG200R-ASBA</td>
<td>DG200R-ASBC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Motor Type**

- **AS**: ANSTEP
- **A**: Single Shaft
- **B**: Double Shaft

**Type of Output Table Supporting Bearing**

- Deep-Groove Ball Bearing
- Cross-Roller Bearing

**Permissible Torque**

- Nm (lb-in): 0.9 (7.9) / 2.8 (24) / 12 (106) / 50 (440)
- Nm (lb-in): 0.45 (3.9) / 1.8 (15.9) / 12 (106) / 36 (310)

**Inertial Moment J**

- kg·m² (oz·in²): 4324 × 10⁻⁷ (24) / 2534 × 10⁻⁶ (139) / 15874 × 10⁻⁶ (870) / 108160 × 10⁻⁶ (5900)

**Permissible Speed**

- r/min: 200 / 110

**Gear Ratio**

- 18 : 1

**Resolution**

- 9000 P/R (Resolution Setting: 0.04°/step [500] × 11) / 18 000 P/R (Resolution Setting: 0.02°/step [1000] × 10)
- 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: ±13 (±0.04°)

**Runout of Output Table Surface**

- mm (in.): 0.030 (0.0012) / 0.015 (0.0006)

**Runout of Output Table Imer (Outer) Diameter**

- mm (in.): 0.030 (0.0012) / 0.15 (0.0006) / 0.30 (0.0012)

**Parallelism of Output Table**

- mm (in.): 0.050 (0.002) / 0.02 (0.0008) / 0.05 (0.0002)

**Effect of Protection**

- IP64 (IP20 for motor connector)

**Mass**

- kg (lb.): 0.5 (1.1) / 1.2 (2.6) / 2.6 (5.7) / 9.5 (20.9)

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1. The back shaft of the motor in the double shaft type is intended for installing a slit disc. Do not apply load torque, overhung load or thrust load to the back shaft of the motor.
2. You can set one of four resolutions using the resolution select switch or resolution select signal. The factory driver settings are [1000] × 11 and 18 000 P/R (0.02°/step)
● Speed – Torque Characteristics

**DG60-ASAK/DG60-ASBK**

![Graph of Torque vs. Speed for DG60-ASAK/DG60-ASBK](image)

**DG130R-ASA/DG130R-ASB**

![Graph of Torque vs. Speed for DG130R-ASA/DG130R-ASB](image)

**DG200R-ASA/DG200R-ASB**

![Graph of Torque vs. Speed for DG200R-ASA/DG200R-ASB](image)

● Load Inertia – Positioning Time (Reference value)

**DG60-ASAK/DG60-ASBK**

![Graph of Positioning Time vs. Load Inertia for DG60-ASAK/DG60-ASBK](image)

**DG130R-ASA/DG130R-ASB**

![Graph of Positioning Time vs. Load Inertia for DG130R-ASA/DG130R-ASB](image)

**DG200R-ASA/DG200R-ASB**

![Graph of Positioning Time vs. Load Inertia for DG200R-ASA/DG200R-ASB](image)

Enter the power supply voltage (A, C or S) in the box within the model name.

The load inertia refers to the inertia of the customer’s work.

Enter the power supply voltage (A, C or S) in the box within the model name.
Table Precision (at no load)  Unit = mm (in.)

**DG60**

- Runout of output table surface
- Runout of output table inner diameter (hollow diameter)
- Parallelism of output table (against the mounting surface)

**DG85, DG130, DG200**

- Runout of output table surface
- Runout of output table inner and outer diameter
- 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.

- **DG60-ASAK/DG60-ASBK**
  - L = 100 mm (3.94 in.)
  - L = 75 mm (2.95 in.)
  - L = 50 mm (1.97 in.)

- **DG85R-ASAA/DG85R-ASBA**
  - L = 200 mm (7.87 in.)
  - L = 150 mm (5.91 in.)
  - L = 100 mm (3.94 in.)

- **DG130R-ASA/DG130R-ASB**
  - L = 400 mm (15.75 in.)
  - L = 300 mm (11.81 in.)
  - L = 200 mm (7.87 in.)

- **DG200R-ASA/DG200R-ASB**
  - L = 600 mm (23.62 in.)
  - L = 400 mm (15.75 in.)
  - L = 300 mm (11.81 in.)
  - L = 200 mm (7.87 in.)

Enter the power supply voltage (A, C or S) in the box (□) within the model name.
### Driver

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>24 VDC ± 10%</td>
<td>Single-Phase 100-115 VAC</td>
<td>Single-Phase 200-230 VAC</td>
<td>Three-Phase 200-230 VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>1.0 A</td>
<td>3.3 A</td>
<td>5 A</td>
<td>6.5 A</td>
<td>3 A</td>
<td>4.5 A</td>
<td>1.5 A</td>
<td>2.4 A</td>
</tr>
</tbody>
</table>

#### Maximum Input Pulse Frequency

- 250 kHz (when the pulse duty is 50%)  
  
#### Power Source

- **Voltage**: 24 VDC ± 10%
- **Frequency**: 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

#### Driver Model


#### Input Signals

- **Driver Model**: Photocoupler input, input resistance: 220 Ω, input current: 7–20 mA
- **Pulse Signal (CW Pulse Signal)**: Operation command pulse signal (CW direction operation command pulse signal when in 2-pulse input mode)  
  - Pulse width: 1 μs minimum, Pulse rise/fall: 2 μs maximum (negative logic pulse input)
- **Rotation Direction Signal (CCW Pulse Signal)**: Rotation direction signal Photocoupler ON: CCW, Photocoupler OFF: CW  
  - Pulse width: 1 μs minimum, Pulse rise/fall: 2 μs maximum (negative logic pulse input)
- **Alarm Clear Signal**: 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 Signal**: 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 Signal**: 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 Signals

- **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)

#### Protective Functions

- 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

### 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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Motor</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation Class</td>
<td>Class B (130°C (266°F))</td>
<td>Recognized as Class A 105°C (221°F) by UL/CSA Standards</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>100 MΩ or more when 500 VDC megger is applied between the following places: - Case – Motor and sensor windings</td>
<td>100 MΩ or more when 500 VDC megger is applied between the following places: - Heat sink – Power input terminal [ASD13B-A, ASD24A-A, ASD30E-A, ASD12A-C, ASD20A-C, ASD12A-S, ASD20A-S] - Case – Power input terminal - Signal I/O terminal – Power input terminal</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>Sufficient to withstand the following for 1 minute: [DGM60-ASAK, DGM60-ASBK] - Case – Motor and sensor windings 0.5 kVAC 50 Hz or 60 Hz</td>
<td>Sufficient to withstand the following for 1 minute: - Heat sink – Power input terminal 0.5 kVAC 50 Hz or 60 Hz [ASD13B-A, ASD24A-A, ASD30E-A, ASD12A-C, ASD20A-C, ASD12A-S, ASD20A-S] - Case – Power input terminal 1.5 kVAC 50 Hz or 60 Hz - Signal I/O terminal – Power input terminal 2.3 kVAC (3.0 kVAC for 200-230 VAC input) 50 Hz or 60 Hz</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>0~+50°C (+32~+122°F) (non-freezing) 0~+40°C (+32~+104°F) (non-freezing) when accessory home-sensor set is attached</td>
<td>[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)</td>
</tr>
<tr>
<td>Ambient Humidity</td>
<td>85% or less (non-condensing)</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- Do not measure insulation resistance or perform the dielectric strength test while the actuator and driver are connected.
**Dimensions**  Unit = mm (in.)

### Linear and Rotary Actuators

#### Motor Cable

<table>
<thead>
<tr>
<th>Model</th>
<th>Actuator Model</th>
<th>Mass kg (lb.)</th>
<th>DXF</th>
</tr>
</thead>
<tbody>
<tr>
<td>DG60-ASAK</td>
<td>DG60-ASAK</td>
<td>0.5 (1.1)</td>
<td>D469</td>
</tr>
<tr>
<td>DG60-ASBK</td>
<td>DG60-ASBK</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- These dimensions are for the double shaft models. For the single shaft models, ignore the purple (   ) 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.

---

**Motor Leads**

- 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.

---

- 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.
Enter the power supply voltage (A, C or S) in the box [ ] within the model name.

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.

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

ASD10A-K
Mass: 0.25 kg (0.55 lb.)

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)

Mass: 0.8 kg (1.76 lb.)

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

![Diagram of DG60](image)

DG60

Motor Connector

Power Input Connector

![Diagram of DG85, DG130, DG200](image)

DG85, DG130, DG200

Motor Connector

Not Used

Power Input Terminals

Protective Earth Terminal

Signal Monitor Display

LED Indicators

<table>
<thead>
<tr>
<th>Indication</th>
<th>Color</th>
<th>Function</th>
<th>When Activated</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATION</td>
<td>Green</td>
<td>Power Supply Indication</td>
<td>Lights when power is on.</td>
</tr>
<tr>
<td>ALARM</td>
<td>Red</td>
<td>Alarm indication</td>
<td>Blinks when protective functions are activated.</td>
</tr>
</tbody>
</table>

Alarm

<table>
<thead>
<tr>
<th>Blink Count</th>
<th>Function</th>
<th>When Activated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overheat*</td>
<td>The temperature of the heat sink inside the driver has reached approximately 85˚C (185˚F).</td>
</tr>
<tr>
<td>2</td>
<td>Overload</td>
<td>The motor has been operated continuously over 5 seconds under a load exceeding the maximum torque.</td>
</tr>
<tr>
<td>3</td>
<td>Overvoltage</td>
<td>The primary inverter voltage of the driver has exceeded the allowable level.</td>
</tr>
<tr>
<td>4</td>
<td>Speed Error</td>
<td>The actuator cannot accurately follow at the indicated pulse speed.</td>
</tr>
<tr>
<td>5</td>
<td>Overcurrent*</td>
<td>An excessive current has flowed through the inverter power element inside the driver.</td>
</tr>
<tr>
<td>6</td>
<td>Overspeed</td>
<td>The output table speed has exceeded 270 r/min.</td>
</tr>
<tr>
<td>7</td>
<td>EEPROM Data Error</td>
<td>A motor control parameter has been damaged.</td>
</tr>
<tr>
<td>8</td>
<td>Sensor Error</td>
<td>The power has been turned on without the motor cable connected to the driver.</td>
</tr>
</tbody>
</table>

Lights (No blinking)

System Error: The driver has fatal error.

*DG60 does not have “Overheat protection” and “Overcurrent protection” functions.

Function Switches

<table>
<thead>
<tr>
<th>Indication</th>
<th>Switch Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000/500</td>
<td>Resolution Select Switch</td>
<td>This function is for selecting the actuator resolution. The resolution of the output table is 18 times of indications.</td>
</tr>
<tr>
<td>1/1/10</td>
<td>1P/2P Pulse Input Mode Switch</td>
<td>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.</td>
</tr>
</tbody>
</table>

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 \([\times 10]\), it cannot control the resolution selected by input terminal. It is always \([\times 10]\).
### Input/Output Signals (36 pins)

#### DG60

<table>
<thead>
<tr>
<th>Indication</th>
<th>Input/Output</th>
<th>Pin No.</th>
<th>Signal</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>External power input</td>
<td>2</td>
<td>GND</td>
<td>Power supply for signal control</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Vcc = 24 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>DIR. (CCW)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>DIR. (CCW)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>PLS (CW)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>PLS (CW)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>13</td>
<td>BSG1</td>
<td>Quadrature BSG output</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>GND</td>
<td>Open-collector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>ASG1</td>
<td>Quadrature ASG output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>GND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>21</td>
<td>ACL</td>
<td>Alarm clear</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>ACL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>TIM.1</td>
<td>Timing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>TIM.1</td>
<td>Timing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>ALARM</td>
<td>Alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>ALARM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>END</td>
<td>Positioning completion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>END</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>×10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>×10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>C.OFF</td>
<td>All windings off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>C.OFF</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*For more details, refer to the description of input/output signals.

#### DG85, DG130, DG200

<table>
<thead>
<tr>
<th>Indication</th>
<th>Input/Output</th>
<th>Pin No.</th>
<th>Signal</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>External power input</td>
<td>1</td>
<td>Vcc = 5 V</td>
<td>Power supply for signal control</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Vcc = 24 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>DIR. (CCW)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>DIR. (CCW)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>PLS (CW)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>PLS (CW)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>13</td>
<td>BSG1</td>
<td>Quadrature BSG output</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>GND</td>
<td>Open-collector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>ASG1</td>
<td>Quadrature ASG output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>GND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>17</td>
<td>BSG2</td>
<td>Quadrature BSG output</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>BSG2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>ASG2</td>
<td>Quadrature ASG output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>ASG2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>21</td>
<td>ACL</td>
<td>Alarm clear</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>ACL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>TIM.1</td>
<td>Timing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>TIM.1</td>
<td>Timing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>ALARM</td>
<td>Alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>ALARM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>TIM.2</td>
<td>Timing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>TIM.2</td>
<td>Timing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>END</td>
<td>Positioning completion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>END</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>×10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>×10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>C.OFF</td>
<td>All windings off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>C.OFF</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*For more details, refer to the description of input/output signals.

### Connection Diagram

**DG60**

[Connection Diagram Image]

- **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 from exceeding 20 mA 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 (R1) 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 R2.
  * Check the connection on page D-182 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. Technical reference → Page F-67
  - 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 D-188
  - The range of wire for the power connector (CN1) is AWG24 to 18. Use wires of AWG20 or thicker for the power supply lines.
  - Provide a minimum distance of 300 mm (1 ft.) between the control I/O signal lines and power lines (AC lines, motor lines and other large-current circuits).
  Do not run the control I/O signal lines in the same ducts as power lines or bundle them with 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).
**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) 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_

**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. Technical reference → Page F-67
- 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 D-188
- Use the following cable for the power 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
- Provide a minimum distance of 300 mm (1 ft.) between the control I/O signal lines and power lines (AC lines, motor lines and other large-current circuits.) Do not run the control I/O signal lines in the same ducts as power lines or bundle them with 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**

- If the “Timing” signal output or “Quadrature” signal output is used, a 5VDC or 24VDC power supply is required. Connect the power supply for “Timing” signal output or “Quadrature” signal output either 5 VDC or 24 VDC. Do not input 5 VDC and 24 VDC at the same time. Description of input/output signals → Page D-182

**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.

**Common to DG60, DG85, DG130 and DG200**

**Pulse (PLS) and Rotation Direction (DIR.) Input Signal**

**Input Circuit and Sample Connection**

- **Driver Controller**
  - 16 mA
  - Open-Collector Output
  - When Using 5 VDC
  - 5 mA
  - 4.7 kΩ
  - Open-Collector Output
  - When Using 24 VDC

**All Windings Off (C.OFF) Input Signal**

- **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**

**Pulse Waveform Characteristics**

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

**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).

**Resolution Select (×10) Input Signal**

- **Pin No. 3, 4**
- 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.

**Alarm Clear (ACL) Input Signal**

- **Pin No. 3, 4**
- 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 external resistor is not needed when V0 is 5 VDC. When the voltage exceeds 5 VDC, connect the external resistor R1 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.

**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.

**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

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 msec after the pulse input stops.

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

Alarms (ALARM) Output Signal

Circuits for use with 30 VDC, 15 mA maximum. When the “Alarm” signal is output, the driver’s LED indicator (ALARM) blinks, and the actuator stops (non-excitation state). Except for DG60

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.

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

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 pulse resolution is the same as the motor resolution at the time of power-on.

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 msec (max.) time lag between real motor motion and the output signals.

Pulse Waveform Characteristics

ASG1

BSG1

(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**

- 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.

◇ 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.

**Pulse Waveform Characteristics**

 ASN1 (ASN2)  
 BSG1 (BSG2)

(Clockwise rotation of motor)

◇ Quadrature (ASG1/BSG1, ASG2/BSG2) Output Signal

Pin No. ◇ 23, ◇ 24

A counter or similar device can be connected to monitor the position of the output table. The pulse resolution is the same as the motor resolution at the time of power-on.  

[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 motor has stopped. There is 1 msec (max.) time lag between real motor motion and the output signals.

**List of Actuator and Driver Combinations**

Model names for actuator and driver combinations are shown below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Actuator Model</th>
<th>Driver Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>DG60-ASAK</td>
<td>DGM60-ASAK</td>
<td>ASD10A-K</td>
</tr>
<tr>
<td>DG60-ASBK</td>
<td>DGM60-ASBK</td>
<td>ASD10A-K</td>
</tr>
<tr>
<td>DG85R-ASAA</td>
<td>DGM85R-ASAA</td>
<td>ASD13B-A</td>
</tr>
<tr>
<td>DG85R-ASBA</td>
<td>DGM85R-ASBA</td>
<td>ASD13B-A</td>
</tr>
<tr>
<td>DG130R-ASAA</td>
<td>DGM130R-ASAA</td>
<td>ASD24A-A</td>
</tr>
<tr>
<td>DG130R-ASBA</td>
<td>DGM130R-ASBA</td>
<td>ASD24A-A</td>
</tr>
<tr>
<td>DG130R-ASAC</td>
<td>DGM130R-ASAC</td>
<td>ASD12A-C</td>
</tr>
<tr>
<td>DG130R-ASBC</td>
<td>DGM130R-ASAC</td>
<td>ASD12A-C</td>
</tr>
<tr>
<td>DG130R-ASAS</td>
<td>DGM130R-ASAC</td>
<td>ASD12A-S</td>
</tr>
<tr>
<td>DG130R-ASBS</td>
<td>DGM130R-ASBC</td>
<td>ASD12A-S</td>
</tr>
<tr>
<td>DG200R-ASAA</td>
<td>DGM200R-ASAA</td>
<td>ASD30E-A</td>
</tr>
<tr>
<td>DG200R-ASBA</td>
<td>DGM200R-ASBA</td>
<td>ASD30E-A</td>
</tr>
<tr>
<td>DG200R-ASAC</td>
<td>DGM200R-ASAC</td>
<td>ASD20A-C</td>
</tr>
<tr>
<td>DG200R-ASBC</td>
<td>DGM200R-ASBC</td>
<td>ASD20A-C</td>
</tr>
<tr>
<td>DG200R-ASAS</td>
<td>DGM200R-ASAC</td>
<td>ASD20A-S</td>
</tr>
<tr>
<td>DG200R-ASBS</td>
<td>DGM200R-ASBC</td>
<td>ASD20A-S</td>
</tr>
</tbody>
</table>

**List of Actuator and Driver Combinations**
Hollow Rotary Actuators

Accessories (Sold separately)

Home-Sensor Set (RoHS)

A home-sensor set, which consists of a photomicro sensor, connector with 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Sensor Output</th>
<th>Applicable Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>PADG-SA</td>
<td>NPN</td>
<td>DG60-ASAK/DG60-ASBK</td>
</tr>
<tr>
<td>PADG-SAY</td>
<td>PNP</td>
<td></td>
</tr>
<tr>
<td>PADG-SBY</td>
<td>PNP</td>
<td></td>
</tr>
</tbody>
</table>

Enter the power supply voltage (A, C or S) in the box (□) within the model name.

Sensor Specifications

NPN Type

<table>
<thead>
<tr>
<th>Model</th>
<th>Power Supply</th>
<th>Current Consumption</th>
<th>Control Output</th>
<th>Indicator LED</th>
<th>Sensor Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PADG-SA</td>
<td>5–24 VDC ±10%, ripple (P-P) 10% or less</td>
<td>35 mA or less</td>
<td>NPN open-collector output, 5–24 VDC 100 mA or less</td>
<td>Detection display (red)</td>
<td>Normally open/normally closed (selectable, depending on connection)</td>
</tr>
<tr>
<td>PADG-SB</td>
<td>5–24 VDC ±10%, ripple (P-P) 10% or less</td>
<td>30 mA or less</td>
<td>NPN open-collector output, 5–24 VDC 50 mA or less</td>
<td>Detection display (red)</td>
<td>Normally open/normally closed (selectable, depending on connection)</td>
</tr>
</tbody>
</table>

PNP Type

<table>
<thead>
<tr>
<th>Model</th>
<th>Power Supply</th>
<th>Current Consumption</th>
<th>Control Output</th>
<th>Indicator LED</th>
<th>Sensor Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PADG-SAY</td>
<td>5–24 VDC ±10%, ripple (P-P) 10% or less</td>
<td>30 mA or less</td>
<td>PNP open-collector output, 5–24 VDC 50 mA or less</td>
<td>Detection display (red)</td>
<td>Normally open/normally closed (selectable, depending on connection)</td>
</tr>
<tr>
<td>PADG-SBY</td>
<td>5–24 VDC ±10%, ripple (P-P) 10% or less</td>
<td>35 mA or less</td>
<td>PNP open-collector output, 5–24 VDC 100 mA or less</td>
<td>Detection display (red)</td>
<td>Normally open/normally closed (selectable, depending on connection)</td>
</tr>
</tbody>
</table>

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 back shaft of the motor, the user must provide a separate sensor, mounting bracket and other necessary parts.

When Extending the Sensor Cable

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 (in.)

<table>
<thead>
<tr>
<th>DG60-ASAK/DG60-ASBK</th>
</tr>
</thead>
<tbody>
<tr>
<td>76 (2.99)</td>
</tr>
<tr>
<td>31 (1.22)</td>
</tr>
<tr>
<td>10 (0.39)</td>
</tr>
<tr>
<td>10.9 (0.43)</td>
</tr>
<tr>
<td>Connector with Cable: 2000 mm (78.74 in.)</td>
</tr>
<tr>
<td>28.6 (1.13)</td>
</tr>
<tr>
<td>2.4 (0.09)</td>
</tr>
<tr>
<td>6.4 (0.25)</td>
</tr>
<tr>
<td>26 (1.02)</td>
</tr>
<tr>
<td>28 (1.10)</td>
</tr>
<tr>
<td>2000 mm (78.74 in.)</td>
</tr>
</tbody>
</table>

When mounting holes are provided at the table center

When mounting holes are provided a distance from the table center

Machining Dimension Drawing for Installation of Shielding Plate
Enter the power supply voltage (A, C or S) 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.
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.

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

- **Extension Cables**
  These extension cables are used to extend the wiring distance between the actuator and driver.

  **Product Line**
  
<table>
<thead>
<tr>
<th>Model</th>
<th>Length: L m (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC01AIP</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>CC02AIP</td>
<td>2 (6.6)</td>
</tr>
<tr>
<td>CC03AIP</td>
<td>3 (9.8)</td>
</tr>
<tr>
<td>CC05AIP</td>
<td>5 (16.4)</td>
</tr>
<tr>
<td>CC07AIP</td>
<td>7 (23)</td>
</tr>
<tr>
<td>CC10AIP</td>
<td>10 (32.8)</td>
</tr>
<tr>
<td>CC15AIP</td>
<td>15 (49.2)</td>
</tr>
<tr>
<td>CC20AIP</td>
<td>20 (65.6)</td>
</tr>
</tbody>
</table>

- **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**
  
<table>
<thead>
<tr>
<th>Model</th>
<th>Length: L m (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC01SAR</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>CC02SAR</td>
<td>2 (6.6)</td>
</tr>
<tr>
<td>CC03SAR</td>
<td>3 (9.8)</td>
</tr>
<tr>
<td>CC05SAR</td>
<td>5 (16.4)</td>
</tr>
<tr>
<td>CC07SAR</td>
<td>7 (23)</td>
</tr>
<tr>
<td>CC10SAR</td>
<td>10 (32.8)</td>
</tr>
</tbody>
</table>

- **Flexible Extension Cables (continued)**
  
  Only for DG85, DG130, and DG200

- **Dimensions**
  
  Unit = mm (in.)

  ![Diagram](image)

- **Notes on Use of a Flexible Extension Cable**
  
  ① Do not allow the cable to bend at the cable connector.

  ![Diagram](image)

  ② Keep the bending radius to 60 mm (2.36 in.) or more.

  ![Diagram](image)

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

  ![Diagram](image)
## Driver Cables (RoHS)

### EMP Series Dedicated Type
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.

<table>
<thead>
<tr>
<th>Model</th>
<th>Length: L m (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC01EMP4</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>CC02EMP4</td>
<td>2 (6.6)</td>
</tr>
</tbody>
</table>

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

### Dimensions
- **Unit = mm (in.)**

### 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.

<table>
<thead>
<tr>
<th>Model</th>
<th>Length: L m (ft.)</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC36D1-1</td>
<td>1 (3.3)</td>
<td>Control input pin: 36 pins</td>
</tr>
<tr>
<td>CC36D2-1</td>
<td>2 (6.6)</td>
<td></td>
</tr>
</tbody>
</table>

### Dimensions
- **Unit = mm (in.)**
- Conductor: AWG28

---

**Controller Side**

- L (39 (1.54))
- 7 (0.28)

**Driver Side**

- L (39 (1.54))
- 12.7 (0.5)

**Sensor Side**

- 12.7 (0.5)
- 90 (3.54)

**Driver Side**

- L (39 (1.54))
- 12.7 (0.5)
- 7 (0.28)

**Controller Side**

- L (39 (1.54))
- 12.7 (0.5)
- 90 (3.54)
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.)

Product Line

<table>
<thead>
<tr>
<th>Model</th>
<th>Length (m)</th>
<th>Connector/Applicable Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC36T1</td>
<td>1 (3.3)</td>
<td>Control input pin: 36 pins</td>
</tr>
<tr>
<td>CC50T1</td>
<td>1</td>
<td>For EMP Series</td>
</tr>
</tbody>
</table>

Dimensions  
Unit = mm (in.)

CC36T1

- 2 × ø 4.5 (ø 0.177) Mounting Holes
- 2 × ø 8 (ø 0.315) Counterbore × 3.5 (0.14) Deep

Terminal Block Pin Configuration

<table>
<thead>
<tr>
<th>39 (1.54)</th>
<th>8 (0.31)</th>
<th>39 (1.54)</th>
<th>12.7 (0.50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal screw size: M3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tightening torque: 1.2 N·m (170 oz-in)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable minimum lead wire: AWG22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CC50T1

- 2 × ø 4.5 (ø 0.177) Mounting Holes
- 2 × ø 8 (ø 0.315) Counterbore × 3.5 (0.14) Deep

Terminal Block Pin Configuration

<table>
<thead>
<tr>
<th>39 (1.54)</th>
<th>8 (0.31)</th>
<th>39 (1.54)</th>
<th>12.7 (0.50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal screw size: M3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tightening torque: 1.2 N·m (170 oz-in)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable minimum lead wire: AWG22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Applicable Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>PADP01</td>
<td>DG85</td>
</tr>
<tr>
<td></td>
<td>DG130</td>
</tr>
<tr>
<td></td>
<td>DG200</td>
</tr>
</tbody>
</table>

### Dimensions

- **Unit** = mm (in.)
- Mass: 20 g (0.71 oz.)
- Screws (3 pieces, included)
  - M3P0.5 Length 8 mm (0.31 in.)

![DIN Rail Mounting Plate Diagram]
**Hollow Rotary Actuators**

**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.

**Mounting Screws** (Not supplied)

**Spring Washers** (Not supplied)

**Mounting Plate (iron or aluminum)**

- **DG60**: 5 mm (0.2 in.) or more
- **DG85**: 8 mm (0.31 in.) or more
- **DG130**: 10 mm (0.39 in.) or more
- **DG200**: 15 mm (0.59 in.) or more

**Positioning Pins** (Not supplied)

**Positioning Pin Holes**

Refer to the table below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Pin Hole Diameter (mm)</th>
<th>Pin Hole Depth (mm)</th>
<th>Number of Pin Holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DG85</td>
<td>φ 6.012 (0.2386)</td>
<td>10.5 (0.41)</td>
<td>2</td>
</tr>
<tr>
<td>DG130</td>
<td>φ 8.015 (0.3150)</td>
<td>8 (0.31) (Blind hole)</td>
<td>2 [One of those is 8 mm × 10 mm (0.31 in. × 0.39 in.) hole]</td>
</tr>
<tr>
<td>DG200</td>
<td>φ 8.015 (0.3150)</td>
<td>8 mm (0.31 in.)</td>
<td></td>
</tr>
</tbody>
</table>

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 [φ 6.030 (0.2382)]. 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 ~ 50°C (32 ~ 122°F) (non-freezing)
  0 ~ 40°C (32 ~ 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 liquids
- 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.

- **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:**
- 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.

**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°C to +40°C (+32°F to +104°F) (non-freezing)
- 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 liquids
- 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.
- 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 (fillings, pins, pieces of wire, etc.) do not enter the drivers.