Model BGA Operation Manual

NIPPON GEAR CO., LTD.

■Contents

1. Preface

1.1 About this Operation Manual

This manual is intended for persons in charge of operating and maintaining the subject device to use it properly. Before starting operation or maintenance, be sure to read through this operation manual.

To the device manufacturer: Be sure to hand over this operation manual to the maintenance manager at the end user.

1.2 Acceptance check

If the received product seems to be damaged during transportation or if you collate the received items with the delivery list and find some items missing, contact us and the transport company within 1 week after you receive the product.

1.3 Product warranty

(1) Warranty period

The product is to be warranted for 2 years from the shipment from our factory or 1 year from the start of operation at site, whichever is earlier.

(2) Warranty coverage

Our products are to be warranted for the period determined at the time of contract when they are used at the determined ratings under the determined operating conditions. Accordingly, warranty is not covered even within the warranty period when a problem occurs due to any of the causes listed below.

1) A failure caused due to the use of our product beyond the range of its specifications or selection conditions
2) A failure caused by a reason not involved with the structure of our product as well as a natural disaster including a fire, flood, typhoon, or earthquake
3) A failure caused due to modification or repair by a person other than our staff or a service dealer specified by us
4) A non-conformity caused due to deterioration with age (including natural discoloration of coating, plating, or the like, rusting, deterioration of grease, and oil separation)
5) A failure caused due to the failure of the user to perform preventive maintenance, inspection, or maintenance that is specified in the operation manual or the like
6) A failure caused due to an improper operation or handling
7) A sensory symptom (such as sound or vibration) that does not generally seem to affect the quality and performance

(3) Warranty information

Should a problem be found for which we are responsible during the warranty period, we will replace the product with a new one or pay for the repair of the product.

This warranty is valid only within Japan.

The warranty covers only the cost to repair or replace the delivered product, not including the following costs induced by a failure in the delivered product.

1) Extra costs including the man-hour cost for removing the product from the actual machine and mounting it to the machine, transportation cost required for redelivery, tax, and cost of the warehouse
2) Costs of the loss of non-operation, opportunity, and others that is caused due to a problem with the product

1.4 Safety precautions

This section describes important safety precautions on handing an actuator.

Before using an actuator, read these precautions to handle it properly.

Actuators should be handled only by trained professional operators.

(1) When receiving, transporting, and storing an actuator

⚠ Caution ・・・Prevent any accident due to dropping or the like.
●Before slinging or craning an actuator, check the weight. Avoid stepping under the hung actuator and pay enough attention to safety during work. ●If the cardboard box containing an actuator gets wet, the packaging strength may be reduced. For this reason, carefully store and handle the box containing an actuator. If these precautions are not observed, an injury accident may occur.

(2) When installing and testing an actuator

⚠ Caution ・・・Prevent any accident due to dropping or falling.
●Before slinging or craning an actuator, check the weight. Avoid stepping under the hung actuator and pay enough attention to safety during work. ●Before starting work, secure the safety of footing. Avoid work on unstable piping or the like. ●When removing and mounting covers, consider their weights and pay enough attention to safety during work. If these precautions are not observed, an injury accident may occur.

⚠ Caution ・・・Prevent any accident due to improper operations.
●Do not use any tool to handle the hand wheel. If this precaution is not observed, an injury accident may occur.

(3) Control of maintenance, maintenance checkup, and others

⚠ Caution ・・・Prevent any accident due to dropping or falling.
●Before slinging or craning an opening/closing machine, check the weight. Avoid stepping under the hung opening/closing machine and pay enough attention to safety during work. ●Before starting work, secure the safety of footing. Avoid work on unstable piping or the like. ●When removing and mounting covers, consider their weights and pay enough attention to safety during work. If these precautions are not observed, an injury accident may occur.

⚠ Caution ・・・Prevent any accident due to improper operations.
●Do not use any tool to handle the hand wheel. If this precaution is not observed, an injury accident may occur.

2. Overview

Model BGA is a bevel gear reducer. You can easily perform manual opening/closing by mounting it directly on a gate valve or globe valve subject to thrust load.

3. Model and Sizes

The model is called BGA, and is available in 7 sizes, types 04 to 4. Each size is available in the basic type, opening indicator-attached type (P), and position indicator- and limit switch-attached type (S). (BGA-4 is only basic type.)

It is also available in the orthogonal biaxial type, called by BGAW.

BGA-□: Basic type
BGA-□P: Position indicator -attached type
BGA-□S: Position indicator - and limit switch-attached type
BGAW-□: Orthogonal biaxial type

4. Specifications

Table 1 lists the specifications.

Table 1: Specifications of the BGA bevel gear reducer of each size

Item \ Type		BGA-04	BGA-00	BGA-0	BGA-1	BGA-2	BGA-3	BGA-4
Gear Ratio		2:1	2.5:1	3:1	4.11:1	6:1	9:1	10:1
Allowable thrust (N)		26,000	62,000	98,000	200,000	340,000	620,000	1200,000
Allowable torque (N・m)		110	340	740	1,500	2,900	5,900	12,000
Maximum stem diameter (mm)	Rising stem	φ40	φ46	φ55	φ62	φ85	φ115	φ130
	Non-rising stem	φ30	φ38	φ45	φ52	φ70	φ95	φ110

5. Structure and Adjustment

The structure and the adjustment method are as described below.

5.1 Main unit

The main unit structural drawing is shown in “8. Structural Drawings” on page 10.

Rotation of the manual handle is transmitted from straight bevel gear (A) ④ to drive sleeve ③ via the hammer blow-attached claw clutch of straight bevel gear (B) ⑤ to rotate stem nut ⑪, engaged with the involute spline and operates the valve stem.

5.2 Opening indicator

A structural drawing of the opening indicator is shown in 8. Structural Drawings on page 11.

With the rotational force of the manual handle, gear ②, fixed on the same shaft as that of straight bevel gear (A), rotates, which is decelerated with gear ⑤ via gears ③, ④, and ㉚ to ㊱. Via gears ④, ⑲, and ⑤ or ④, ⑳, and ⑤ depending on the rotation direction of the handle, shaft ⑪ is rotated to rotate needle ⑩.

If, by any chance, needle ⑩ rotates in a direction opposite to the one in the specifications, remove cover ⑮ first and then clamp plate ⑭, loosen the hexagon socket setscrews of gear ㉖, change the orientation of the gear, and fix it with the hexagon socket setscrews.

When reattaching the cover ⑮, apply liquid packing.

This structural drawing shows a 6-stage reduction gear set. A 7-stage one may be used if a larger reduction ratio is necessary.

5.3 Limit switch

The structure of the limit switch is shown in Figure 1, and the components are listed in Table 2.

The opening indicator-attached type (opening indicator being explained in Section 5.2) rotates needle shaft ① in this figure to rotate gear ③ (small), fixed on the needle shaft. It rotates gear ④ (large), engaged with gear ③ (small), to rotate each of cams ⑦ on the open and closed sides, which are fixed on the same shaft, and operates limit switch ⑩. To adjust limit switch ⑩, remove case lid ⑤, loosen hexagon socket setscrews ⑧, which fix cams ⑦, and turn the cams. After adjustment, tighten the hexagon socket setscrews to fix the cams.

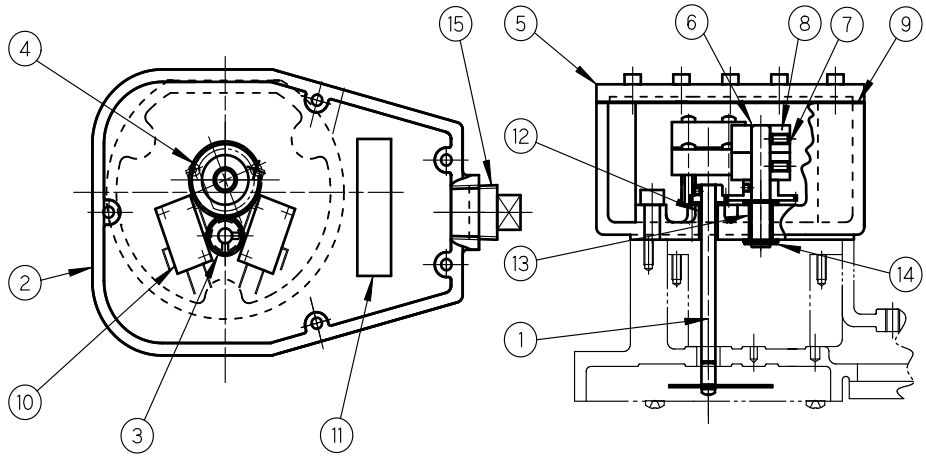


Figure 1: Structural drawing of the limit switch

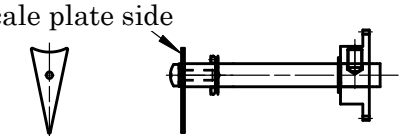
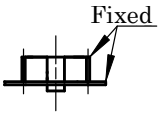
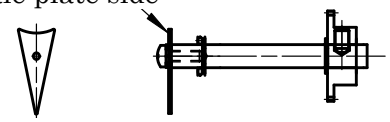
Table 2: Limit switch component table

Part number	Part name	Quantity
015	Square plug	1
014	E-shaped retaining ring	1
013	Brimmed DU bushing	1
012	Brimmed DU bushing	2
011	Relay terminal block	1
010	Limit switch	2
009	Gasket	1
008	Hexagon socket setscrew	1
007	Cam	1
006	Pillar for cam	1
005	Case lid	1
004	Gear (large)	1
003	Gear (small)	1
002	Case	2
001	Needle shaft	1

5.4 Fitting gear (A1) ⑦ according to the rotation direction of needle ⑨ of the opening indicator-attached type

5.4.1. Orientation of gear (A1) ⑦ according to the handle rotation direction

Table 3: Orientation of gear (A1) ⑦ according to the handle rotation direction

Item	Handle rotation direction	⑦ Gear (A1) orientation	⑨ Needle	Remarks
	Clockwise to open	Scale plate side  Red indicator needle	Right to open	The rotation direction of each gear is shown. In Figures 2 and 3, gears ⑥, ⑦, and ⑧ have the same number of teeth. In the gear set, the pinion gear is fixed.  Fixed
	Counter clockwise to open	Scale plate side  Red indicator needle	Right to open	

5.4.2. Gear rotation direction

(A 6-stage gear set is shown here. For a 7-stage one, the positions of ⑥ and ⑧ in Figures 2 and 3 are switched.)

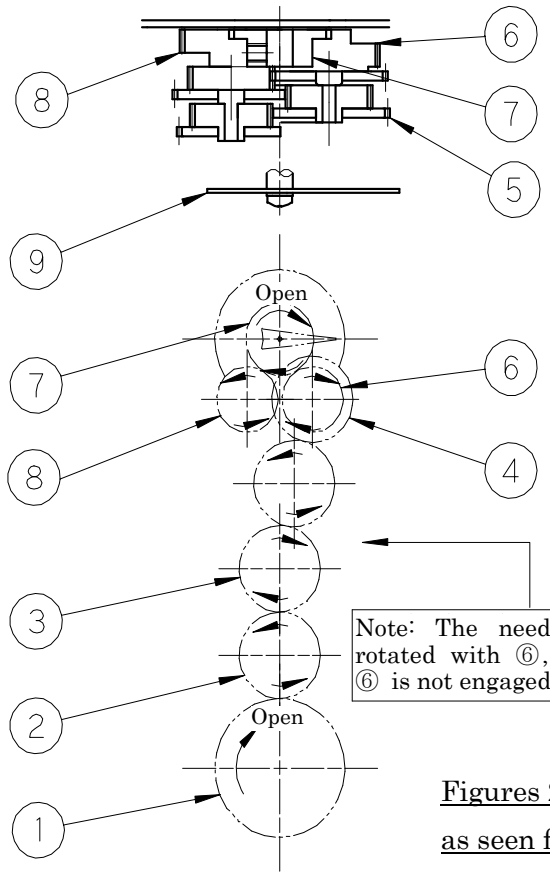
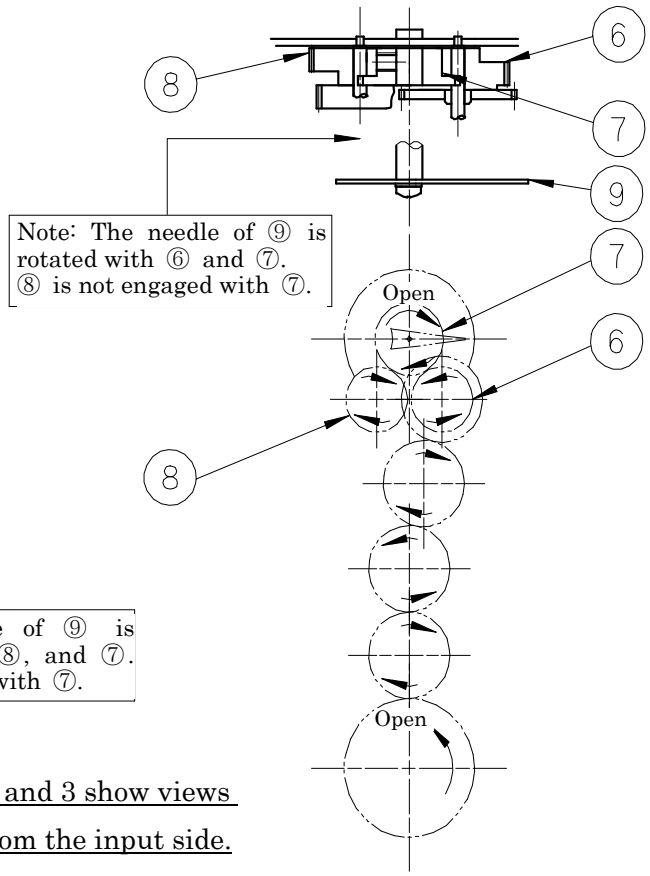


Figure 2: Structural drawing of a handle that is opened when rotated clockwise



Figures 2 and 3 show views as seen from the input side.

Figure 3: Structural drawing of a handle that is opened when rotated counterclockwise

6. Maintenance and Inspection

6.1 Grease

The grease is adjusted to an appropriate amount before shipment from the factory, so that you can operate this product without adjusting the amount.

The grease amount is as listed in Table 6.

To supply grease, use the lithium soap base grease of Shell Lubricants Japan K.K. (For BGA-4 only, use NGC-EP0 of NIPPECO LTD.)

When supplying grease, make sure that it is not contaminated with any dissimilar grease or foreign objects.

The operating temperature range of Alvania EP2 is -20°C to +110°C. Because of the structure of this product, however, the allowable temperature range is -20°C to +90°C. If you want to use this product at a lower or higher temperature, contact us. (Table 4)

Table 4: Grease type

Manufacturer	Brand	Soap base
Shell Lubricants Japan K.K.	Shell Alvania EP2	Lithium

6.2 Grease inspection and replacement procedures

6.2.1 Grease inspection

Inspect the grease at least once a year. (If this product is used frequently, increase the number of inspections.)

Remove the square plug and inspect the grease amount and the status of the grease near the gears. If the status of the grease is as listed in Table 5, take the appropriate one of the measures listed in the table.

Table 5: Grease status and measures

Grease status	Measure
The amount of grease is small.	Supply grease.
Syneresis has occurred causing soap content to adhere to the gears, etc.	Disassemble this product and replace the grease.
Contaminated with water and turned to milky white color.	Disassemble this product and replace the grease.
Contaminated with foreign objects.	Disassemble this product and replace the grease.

To retighten the removed plug, use seal tape (NITOFLON No. 95 or equivalent) and screw in the plug securely.

6.2.2 Grease replacement

If you use this product several times a day and no abnormality is found during grease inspection, you can continue to use this product without grease replacement. In this case, replace the grease during an overhaul, which is to be performed every 5 to 10 years.

If this product is used more frequently, disassemble this product every 2 years and replace the grease.

Do not remove the grease from Model GBA by, for example, washing with oil, without dissembling.

Table 6: Grease amount according to size

Unit size	Grease amount (kg)
BGA-04	0.13
BGA-00	0.5
BGA-0	0.65
BGA-1	1.5
BGA-2	3.0
BGA-3	7.2
BGA-4	10.0

7. Electric Parts Specifications

7.1 Opening indicator- and limit switch-attached type

Limit switch (single pole double throw) (Figure 4)

Model: V-156-1C25

Manufacturer: OMRON Corporation

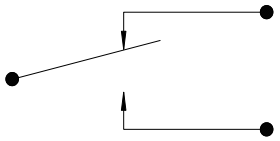


Figure 4: Circuit symbol of a single pole double throw limit switch

Table 7: Limit switch specifications

Item / Rating	Rated voltage (V)		Non-inductive load (A)				Inductive load (A)			
			Resistance load		Lumped load		Inductive load		Electromotor load	
			Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open
15 A	DC	8	15		4		10		6	
		30	10		4		10		4	
		125	0.6		0.1		0.6		0.1	
		250	0.3		0.05		0.3		0.05	
	AC	250	15		2		10		3	

(Notes) 1. The inductive load is when the power factor is 0.4 or greater (AC) and the rating is 7 ms or less (DC).

2. The lumped load is assumed to have 10 times the inrush current.

3. The electromotor load is assumed to have 6 times the inrush current.

8. Structural Drawings

8.1 Structural drawing of the basic type of Model BGA.

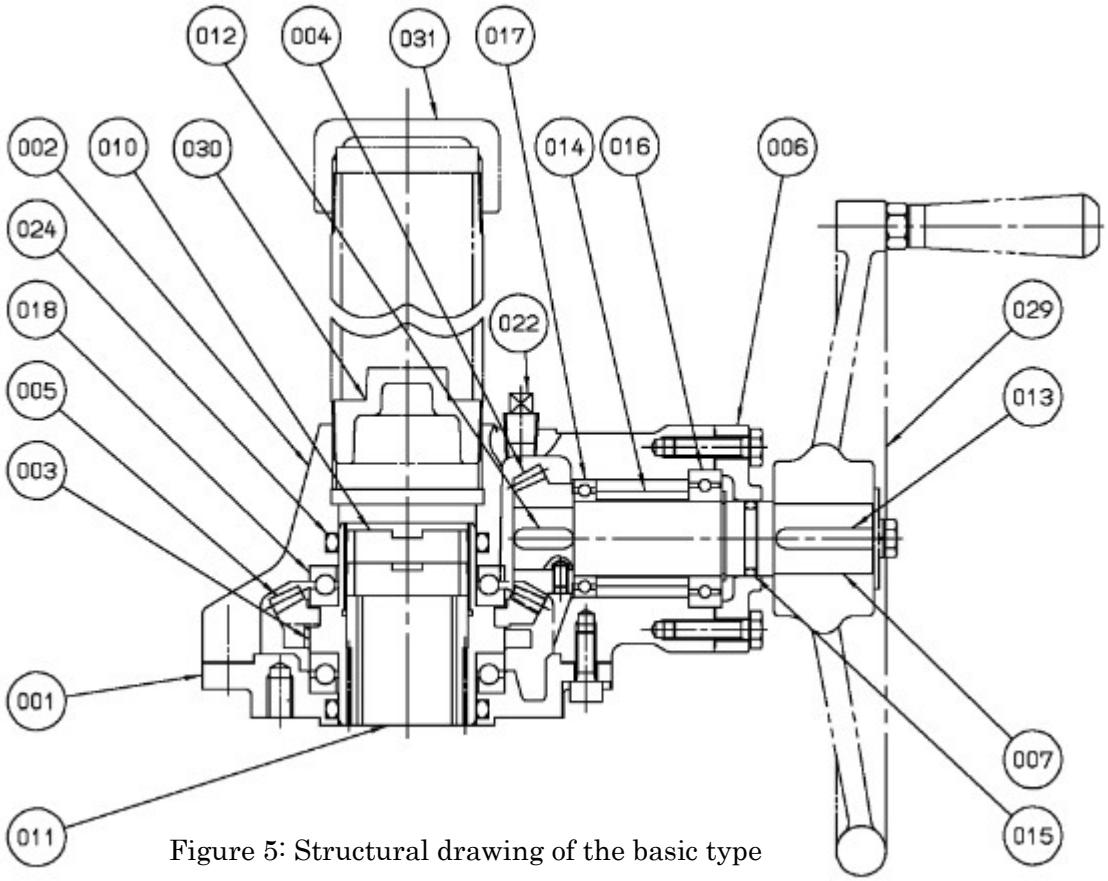


Figure 5: Structural drawing of the basic type of Model BGA

Table 8: List of components of the basic type of Model BGA

031	Stem cover	1	Option
030	Plug	1	Option
029	Handle	1	Option
024	O-ring	2	
022	Plug	1	
018	Single-direction thrust ball bearing	2	
017	Single row deep groove ball bearing	1	
016	Single row deep groove ball bearing	1	
015	O-ring	1	
014	Bearing collar	1	
013	Key	1	
012	Key	1	
011	Stem nut	1	
010	Lock nut	2	
007	Shaft	1	
006	Cap	1	
005	Straight bevel gear (B)	1	
004	Straight bevel gear (A)	1	
003	Drive sleeve	1	
002	Cover	1	
001	Base	1	
Part number	Part name	Quantity	Remarks

8.2 Structural drawing of the opening indicator of Model BGA

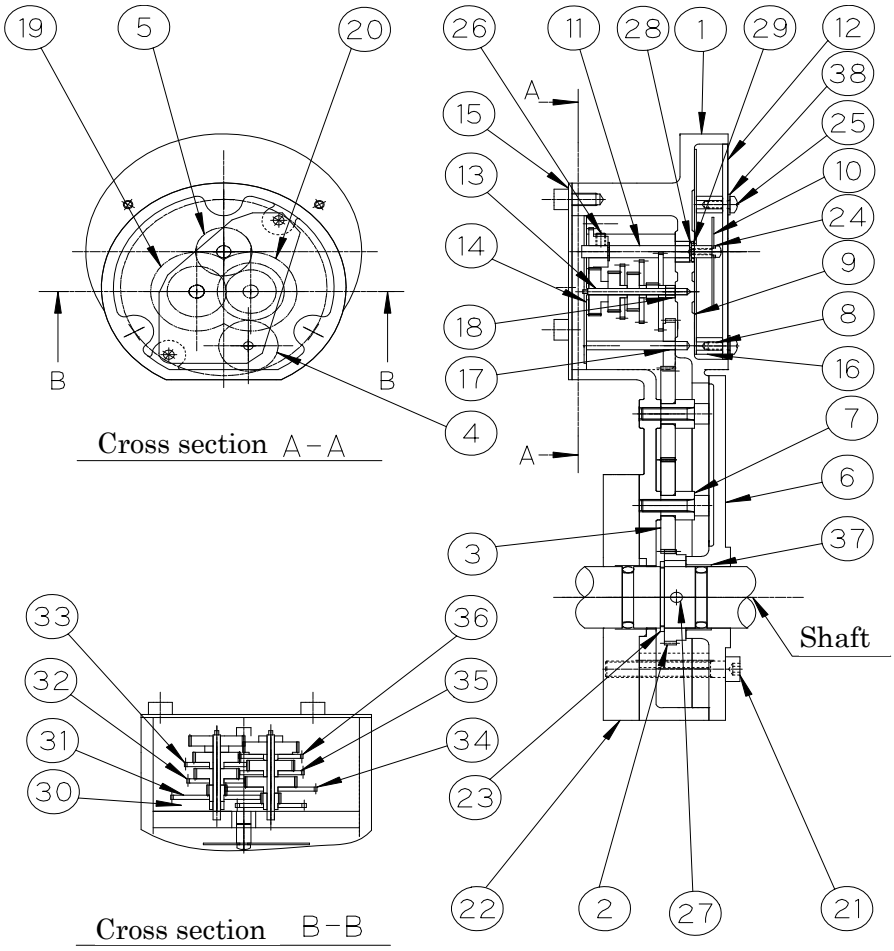


Figure 6: Structural drawing of the opening indicator of Model BGA

20	Gear (D4-2)	1					
19	Gear (B5-1)	1					
18	Gear collar	3		38	Flat washer	3	
17	Gear C shaft	1		37	Curl bearing	1	
16	Gear A shaft bushing	1		36	Gear (D4-1)	1	
15	Cover (2)	1		35	Gear (D3-1)	1	
14	Clamp plate	1		34	Gear (D2-1)	1	
13	Needle gear shaft	2		33	Gear (D2-1)	1	
12	Acrylic plate	1		32	Gear (B4-1)	1	
11	Gear A shaft	1		31	Gear (B3-1)	1	
10	Needle	1		30	Gear (B2-1)	1	
9	Opening plate	1		29	O-ring	1	
8	Stand	3		28	E-shaped retaining ring	1	
7	Fixed collar for gear (medium 2, 3)	2		27	Parallel pin	1	
6	Cover (1)	1		26	Hexagon socket setscrew	1	
5	Gear (A1)	1		25	Cross-recessed pan head machine screw	3	
4	Gear (C1)	1		24	Spring washer	1	
3	Gear (medium 2, 3)	2		23	Snap ring (for shaft)	1	
2	Gear (medium 1)	1		22	Spacer	1	
1	Opening indicator body	1		21	Hexagon socket head cap screw	6	
Part number	Part name	Quantity	Remarks	Part number	Part name	Quantity	Remarks

9. Environment

Painting: Heatproof temperature of 150 degrees

Lubricant: -20 to +110

Operating temperature range: -20°C to +90°C

Resin-related information

Position indicator acrylic resin:

Handle grip: -65°C to +135°C

10. Contact after Delivery

When contacting us about Model BGA, notify us of the following items, stamped on the nameplate:

- TYPE: Actuator model
- ORDER: Product number
- SERIAL: Serial number