Chapter 1 Safety

1-1 Installation manual

◇ This manual indicates general guidelines and cautions to use the product safely. We assume no responsibility whatsoever for any damages or accidents resulting from improperly-used method.

◇ It is recommended to make note of our customer service contact number shown at the end of this manual for the loss of this manual.

1-2 Alert terms and descriptions

◇ Two levels of alert (i.e. warning or caution) reflect the degree of potential danger or accident.

◇ The urgency terms should be understood and strictly observed.

Alert Level	Descriptions
⚠***Warning***	Indicates an imminently hazardous situation, which if not properly dealt with, could result in death or serious injury.
⚠***Caution***	Indicates a potentially hazardous situation, which if not properly dealt with, could possibly result in minor or moderate injury or equipment damage.

◇ The classification words reflect the degree of importance, added in the procedure and the instruction.

Classification	Descriptions
! Annotation	Indicates damage occurrence to the product or loss of time or materials. Be sure to observe the instructions.
Memo	Supplement with the text and information preventing from improper operation.

◇ Caution and Annotation indicate a situation that may potentially result in serious accident. Understand the indication and strictly observe the instructions.

1-3 Instructions on safety

---------- ⚠***Warning*** ----------

① General

◆ Operators, who have understood this manual, should perform installation, operation, maintenance, and inspection to avoid injury.

◆ Operating manager and operators need to ensure that the product should be operated by staffs, who have understood the product and the manual to avoid injury.

◆ Industrial equipment manufacturers need to ensure that instructions concerning to operation, maintenance and inspection should be reflected in the manual for end-user of industrial equipment to avoid injury.

② Installation

◆ Be sure to stay out from under loads of the gear reducer during carriage and installation to avoid injury.

③ Operation

◆ Do not touch the rotor during operation to avoid injury.

④ Maintenance/inspection

◆ Do not touch the rotor during maintenance/inspection to avoid injury.

◆Ensure a steady implementation of spinning stop of driving equipment/driven equipment during maintenance/inspection.

---------- ⚠***Caution*** ----------

① General

◆ Be sure to peruse this manual before installation, operation, maintenance, and inspection to avoid injury or damage to the gear reducer.

◆ Be sure to follow the specifications of the gear reducer to avoid injury or damage to the gear reducer.

◆ Do not put fingers or objects into the orifice of the gear reducer or the gap between cover and chain or belt (if used) at joint part to avoid injury or damage to the gear reducer.

◆ To avoid injury, do not use the damaged gear reducer .

◆ Do not disassemble and re-assemble the gear reducer. This may cause injury. We are not responsible for a re-assembled gear reducer. Once disassembled, the reducer is out of warranty.

◆ To avoid injury, do not shock or vibrate the gear reducer strongly.

② Unpacking

◆ Confirm that the actual product is correct as ordered. Installation of improper gear reducer may cause injury or damage to the equipment.

③ Moving

◆ Take extra care for fall or tumble during movement of the gear reducer to avoid injury or damage to the gear reducer.

④ Installation

◆ Do not step onto the gear reducer or put heavy object to avoid injury or damage to the gear reducer.

◆ Be sure to fasten the bolts of the gear reducer tightly using our recommended torque. Fall or shift of position by loosen bolts may cause injury or damage to the industrial equipment.

◆ Take extra care for fall or tumble of the gear reducer during installation to avoid injury.

⑤ Running

◆ The gear reducer may have high temperature during running. Do not touch the gear reducer until the temperature drops enough to avoid burn.

◆ In case the gear reducer in abnormal condition, do not run the reducer until proper measure is taken to avoid injury or damage to the gear reducer.

◆ Do not use the gear reducer in the atmosphere of ignition or near combustible materials to avoid fire breaking.

⑥ Maintenance

◆ Turn off the power of the industrial equipment during grease change or maintenance to avoid injury and damage to the gear reducer.

◆ Replace the safety cover after grease change and maintenance (if safety cover is available) to avoid injury or damage to the gear reducer.

---------- ***! Annotation*** ----------

① General

◆ Store away from humidity or atmosphere of corrosion to avoid damage to the gear reducer by corrosion.

② Unpacking

◆ Unpack after confirming the top and bottom of the package to avoid damage to the gear reducer.

③ Installation

◆ Be sure to use proper lifting sling, which can support the weight of the gear reducer to avoid fall.

◆ Ensure that there is no object on the surface of installation to avoid deformation on the installation side. Normal accuracy of installation may not be obtained.

◆ Install in proper direction to avoid damage to the gear reducer.

④ Maintenance

◆ Please contact us for repair. Disassembling may cause unrecoverable condition.

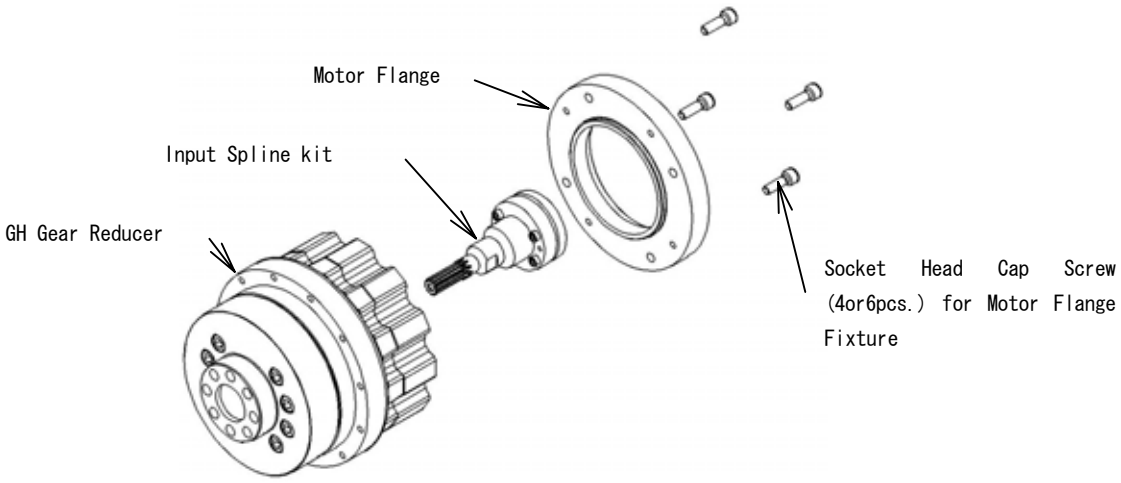
Chapter 2 Before Installation

2-1 Contents of the package

Following items are packed in the box.

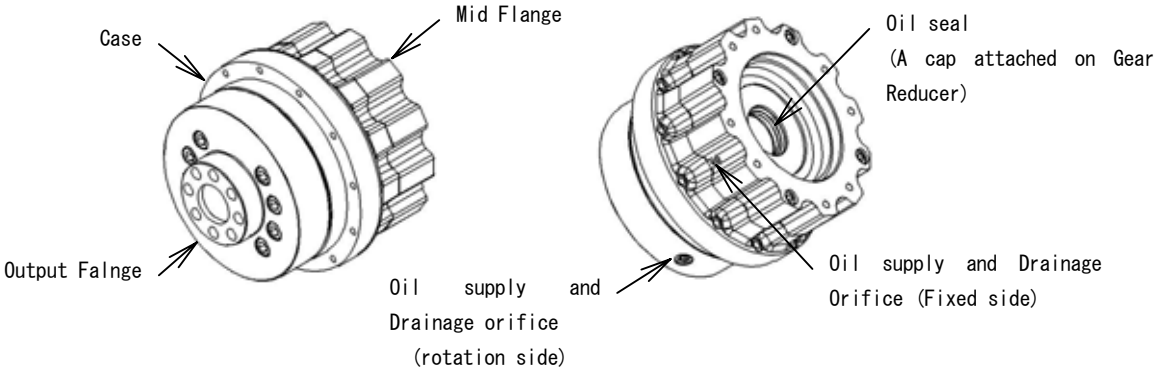
Confirm that the actual product is correct as ordered before installation.

The actual product may be different from the illustration below .



2-2 Parts name

The actual product may be different from the illustration below .



2-3 Cautions

① Servomotor

◆ Output torque

Set up the servomotor maximum output torque or usage maximum torque as follows:

Servomotor max. output torque (usage max. torque) × Ratio≦ Allowable torque of acceleration/deceleration of the gear reducer

◆ Output rotation frequency

Set up the maximum output rotation frequency or usage maximum rotation frequency of servomotor as follows:

Max. output rotation frequency for servomotor (usage max. rotation frequency) ÷ Ratio ≦ Allowable max. output rotation frequency

GH gear reducer rating table

Models	Ratio	Rated Torque	Acceleration/deceleration Allowable Torque	Momentary Max. Allowable Torque	Rated Output Rotation Frequency	Allowable Max. Output Rotation Frequency	
						Continuous Drive	Intermittent Drive
GH 7	11(461/41)	68.6 N-m (7 kgf-m)	205.8 N-m (21 kgf-m)	480.2 N-m (49 kgf-m)	50 rpm	150 rpm	270 rpm
	21						
	31(153/5)						
GH17	11	166.6 N-m (17 kgf-m)	499.8 N-m (51 kgf-m)	1166.2 N-m (119 kgf-m)	50 rpm	150 rpm	270 rpm
	21						
	31						
GH24	11	235.2 N-m (24 kgf-m)	705.6 N-m (72 kgf-m)	1646.4 N-m (168 kgf-m)	50 rpm	150 rpm	250 rpm
	21						
	31						
GH40	11(419/39)	392.0 N-m (40kgf-m)	176.0 N-m (120kgf-m)	2744.0 N-m (280kgf-m)	50 rpm	150 rpm	250 rpm
	21						
	31(723/23)						
GH100	21(20.375)	980.7 N-m (100kgf-m)	294.1 N-m (300kgf-m)	6864.9 N-m (700kgf-m)	50 rpm	65 rpm	135 rpm (※1)
	31(31.4)						

※ Momentary Max. Allowable Torque is allowable torque under emergency stop or external shock.

※1 At 4sec : RUN, 4sec : STOP, acceleration 980 N-m.

②Fastening bolt

Our recommended bolt and fastening torque should be used for gear reducer's installation. Disc spring washer for socket head cap screw is recommended to prevent from bolt's loosening and scratches on the surface.

Recommended Bolt

Socket Head Cap Screw: JIS B1176

Strength: JIS B 1051 12.9

Screw: JIS B 0205 6g or 2nd class

Bolt fastening torque and tightening force

Nominal	Fastening Torque	Tightening Force
M5×0.8	9.01±0.49 N-m (0.92±0.05 kgf-m)	9310 N (950 kgf)
M6×1.0	15.6±0.78 N-m (1.6±0.08 kgf-m)	13180 N (1345 kgf)
M8×1.25	37.2±1.86 N-m (3.8±0.19 kgf-m)	23960 N (2445 kgf)
M10×1.5	73.5±3.43 N-m (7.5±035 kgf-m)	38080 N (3886 kgf)
M12×1.75	128.4±6.37 N-m (13.1±0.65 kgf-m)	55100 (5622 kgf)
M16×2.0	318.5±15.9 N-m (32.5±1.62 kgf-m)	103410 N (10552 kgf)

Descriptions of fastening torque are for the material such as steel and cast iron.

Fastening torque and transmission torque should be considered for material such as aluminum.

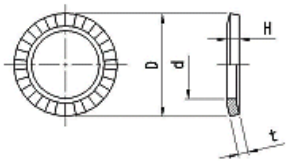
Disc spring washer for socket head cap screw

Name: Disc Spring Washer … Heiwa Hatsujyo Industry Co., Ltd.

Appellation: Disc SW-2H-Nominal

Material: S50CM to S65CM

Hardness: HRC 40 to 48



(Unit: mm)

Nominal	Diameters of Disc Spring Washer		t	H
	d	D		
5	5.25	8.5	0.6	0.85
6	6.4	10	1	1.25
8	8.4	13	1.2	1.55
10	10.6	16	1.5	1.9
12	12.6	18	1.8	2.2
16	16.9	24	2.3	2.8

③Liquid packing

Apply liquid packing on the circumference between middle flange and motor flange and between motor flange and motor.

Product name	Manufacturer	Description / usage
Three Bond 1211	Three Bond	• Solventless Silicon Type • Semi-dry liquid gasket
Helme Seal SS-60F	NIPPON Helmetex	• Solventless Elastic Sealant • Sealed for metal (flange) contact face • Equivalent to Three Bond 1211

✳ Do not use them when the flange is made by cupper or cupper alloy.

✳ Please consult when it is used in a special environment (deep alkali and high pressure steam etc).

④Lubrication

◆ Standard lubrication for GH gear reducer is grease lubrication.

◆ Gear reducer is filled with grease at shipping out from our plant.

◆ Standard grease exchange time is 20,000 running hours by deterioration of the grease, when the gear reducer is filled with proper amount of grease.

Set a term of grease exchange after checking the grease contamination and deterioration, in case of grease contamination or usage under improper ambient temperature (more than 40℃).

Designated grease brand and temperature limit

Brand	Moly White RE00
Manufacturer	Nabtesco Co., Ltd
Temperature Limit (Ambient temp.)	-10 to 40℃

◆ Two of orifices for grease filling and drainage for grease filling (exchange) are available on the gear reducer. Follow the procedure below and use one orifice as filling intake and the other as drainage outlet.

Refer to the specifications or Chapter 2 “2-2 Parts name” for the location of the orifices.

Step 1 Remove the socket head cap plug on the intake, and then place a grease nipple.

Step 2 Remove the socket head cap plug on drainage side and open.

Step 3 Fill the prescribed amount of designated grease with proper tools such as grease gun from the intake orifice, and when grease exchange, catch the drained grease from the outlet orifice. Prescribed amount of grease is the deducting input gear capacity out of the GH gear reducer grease volume in the right table.

Step 4 Replace the socket head cap plug, and then wipe out unnecessary grease.

Model	Quantity			
	Horizontal installation		Vertical installation	
	cc	g	cc	g
GH 7	130	113	120	104
GH17	295	257	285	248
GH24	300	261	300	261
GH40	775	674	595	518
GH100	1839	1600	-	-

* Vertical installation’s volume shows the grease amount of output faced down.

⚠***Caution***

◆ Handling grease
- Read instructions of grease carefully before using to avoid serious conditions.
- Use the protective goggle so that grease does not get into eyes, to avoid inflammation of eyes.
- Use latex gloves to avoid inflammation of skin.
- Do not eat. (Can cause diarrhea or vomiting)
- Refer to the Material Safety Data Sheet if there are unclear points.

◆ Emergency step
- If the grease got into eyes, rinse eyes with clean water for 15 minutes and submit to medical treatment.
- If touched the grease, wash with water and soap completely.
- If swallowed the grease, do not force to vomit, but submit to medical treatment immediately.

◆ Disposal of oil waste and container waste
- Proper disposal is obliged, as ordinance requires.
- Contact the grease distributor for appropriate assistance if there are unclear points.

◆ Storage
- Avoid exposure to air to protect from foreign particles and water.
- Avoid direct sun light, away from fire and heat source and store in a cool and dark place.

② Storage of the gear reducer

Do not store the gear reducer in the atmosphere as below to avoid rust, corrosion, deterioration of seals and so on.

- High temperature, high humidity or freezing place.
- Affected by weather and wind directly.
- Near chemicals such as organic solvent, acid, alkaline and so on or place affected by evaporating gas.
- Place where dew condensation may occur.

③ Disposal of the gear reducer

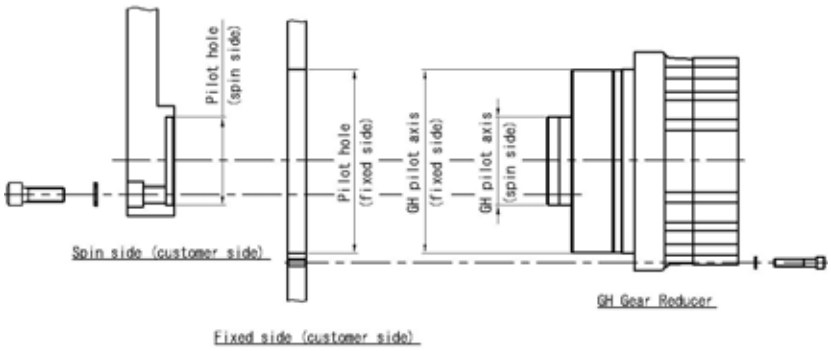
In case of disposal of the gear reducer, extract the grease inside completely and speak to general industrial equipment waste management service for the disposal.

Chapter 3 Installation Procedure

3-1 Installation of the gear reducer

Following points need to be checked before installation.

- ◆ Ensure that the pilot hole of the fixed side and the pilot center axis of the gear reducer case are fitted.
- ◆ Ensure that the joint hole (axis) of the spin side and the joint axis (hole) of the gear reducer output flange side are fitted.
- ◆ Use our recommended bolt and fastening torque mentioned in 2-3, ② for fixing bolt.



Bolt nominal diameter and quantity of each model

Model	Fixed Side		Spin Side	
	Nominal	Quantity	Nominal	Quantity
GH 7	M5	12	M10	6
GH17	M6	12	M12	8
GH24	M8	8	M12	8
GH40	M8	12	M12	12
GH100	M12	12	M16	8

⚠Caution

- Use either axis or hole for Gear Reducer output side joint.
- The fixing bolt in this section may receive momentary maximum allowable torque.
  Bolt specification and transmission torque should be considered if fixing bolt in a different condition from our recommendation is used.

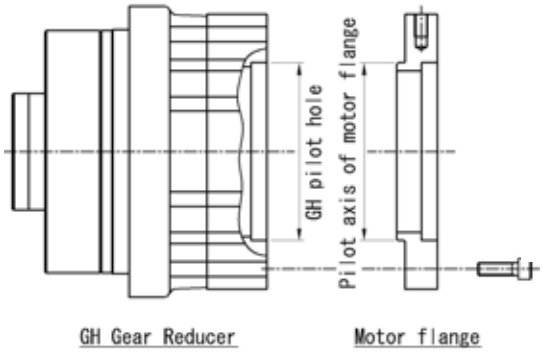
Memo

- Fixing bolts and disc spring washer are not attached to this product. They should be provided by customers.

3-2 Installation of the motor flange

Following points need to be checked before installation.

- ◆ Ensure that the joint hole of the Gear Reducer and the joint axis of the motor flange are fitted.
- ◆ Use our recommended bolt and fastening torque mentioned in 2-3, ②for fastening the bolt.



Socket Head Cap Screw for Motor Flange (attachment)

Model	Socket Head Cap Screw	Quantity
GH 7	M8×20	4
GH17	M8×25	4
GH24	M8×20	4 or 6
GH40	M12×20	4

⚠Caution

- Use either axis or hole for Gear Reducer output side joint.

Memo

Socket head cap screws for motor flange installation are attached.

3-3 Installation of the input gear

Structure or shape may vary depending on the motor axis for the input spline. Install the input spline according to the following procedure.

◆ Straight axis (without key)

Step 1 Mount ③wedge friction joint in order of inner ring and outer ring onto ①input spline.

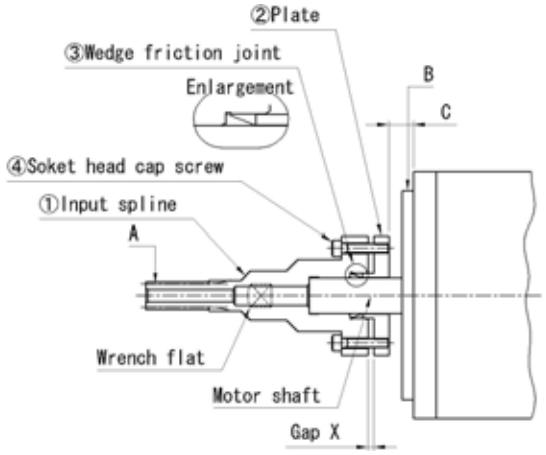
Step 2 Mount ②plate onto ①input spline and fasten ④socket head cap screw gently

Step 3 Push ①input spline hole bottom against the front edge of the motor axis completely. (Slide slightly at the time of mounting.)

Measure C to confirm ①input spline being mounted as regular size. Distance of C is described in the specification.

Step 4 Fasten ④socket head cap screw with recommended torque.

Confirm the gap X is uniform on the circumference after fastened.



Step 5 Confirm the axial run-out at the position of ①input spline point A. The axial run-out of ①input spline point A should be adjusted less than 70 μ m against motor joint B.

⚠Caution

- Transmission torque varies depending on the motor axis diameter for the wedge friction joint type. Due to this, the momentary maximum allowable torque or allowable torque acceleration/deceleration may not be obtained.
- Apply lubricant oil of the molybdenum group, which does not contain antifriction composition for installation of wedge friction joint.

◆ Straight axis (with key)･･･ Using the stud

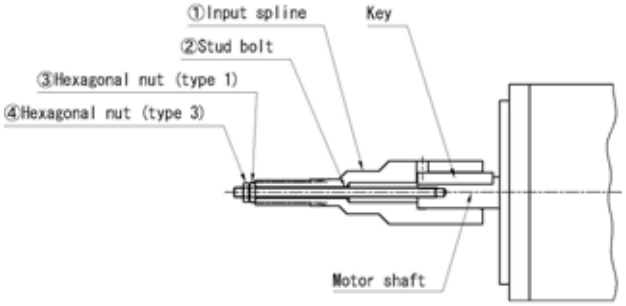
Step 1 Mount ②stud bolt onto the motor axis.

Step 2 Place the key onto the motor axis.

Step 3 Push ①input spline hole bottom against the motor axis front edge completely.

Step 4 Fasten ③hexagonal nut (type 1) into ②stud bolt.

Step 5 Fasten ④hexagonal nut (type 3) into ②stud bolt.



Memo

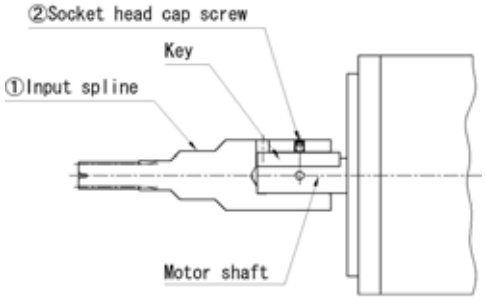
- It is recommended to use additional parts such as Loctite to prevent from loosening of ②stud bolt and ③ ④ hexagonal nuts.

◆ Straight axis (with key)･･･ Using the socket head cap screw

Step 1 Place the key onto the motor axis.

Step 2 Push ①input spline hole bottom against the motor axis front edge completely.

Step 3 Fasten ②socket head cap screw.



Memo

- It is recommended to use additional parts such as Loctite to prevent from loosening of ②socket head cap screw.

◆ 1/10 Taper axis

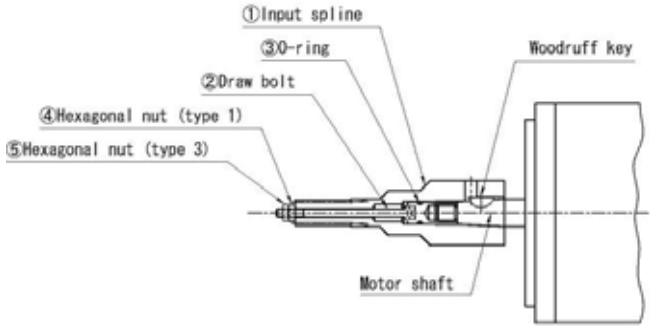
Step 1 Place ③O-ring onto ②draw bolt.

Step 2 Mount ②draw bolt onto the motor axis.

Step 3 Mount the Woodruff Key onto the motor axis.

Step 4 Mount ①input spline onto the front edge of motor axis.

Step 5 Fasten ④&⑤ Hexagonal nut into ②draw bolt.



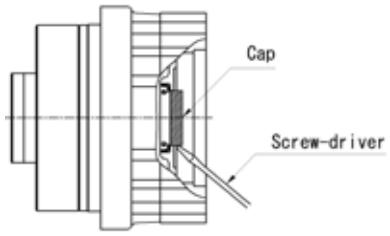
Memo

- It is recommended to use additional parts such as Loctite to prevent from loosening of ②draw bolt ④ &⑤Hexagonal nut.

3-4.Installation of the servomotor

Check the following points before installation of the motor flange.

◆ When the GH gear reducer is delivered at customer, the cap is attached on center hole for inserting input spline in order to prevent to leak the grease inside GH gear reducer. When the cap is removed by a screw-driver etc., please pay attention not to scratch GH gear reducer.



◆ When a servomotor with input spline is assembled onto GH gear reducer, the grease inside GH gear reducer may leak into motor-cavity.

Step1. Clean an attached input spline or an input spline of your supply.

Step2. Insert input spline into GH gear reducer.

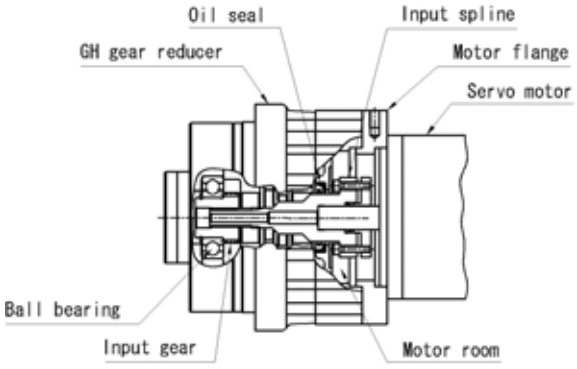
Step3. If the grease inside GH gear reducer leak into motor-room, remove input spline and wipe the leaked grease by using cloth etc.

Step4. Assemble input spline on servomotor as mentioned at 3-3.

Step 5 Assemble servmotor on GH gear reducer.

Pay attention not to make any scratch on oil seal.

Step 6. Fix the servomotor with the fixing bolts



⚠Caution

- Do not push the servomotor excessively when installing the input gear mounted servomotor. It can damage the deep groove bearing that is supporting the input gear.

！Annotation

- **The pressure inside of the gear reducer becomes higher after installation of the input spline mounted servomotor. If the gear reducer is run in this condition, it may cause grease leakage since the pressure inside of the gear reducer exceeds the allowable pressure of the oil seal.**

  After installation of the servomotor, open the orifices of oil supply and drainage and re-fasten to prevent from grease leakage.

Memo

- Fixing bolts in this section are not attached. They should be provided by customers.
- At customer site, designate the fastening torque of the fixing bolt, which needs to be changed depending on the material of flange for the servomotor.

Chapter 4 Others

4-1 Notices of GH SERIES application

◇ If the end-user of this product is military concerned or the product is used for manufacturing of weapons, it may be export-regulated product prescribed in “Foreign Exchange Act”. Prudent examination and necessary export procedure should be taken for export.

◇ If the product is used in the equipment such as Nuclear Power Equipment, Aerospace Equipment, Traffic Equipment, Medial Equipment, Safety Equipments and so on and breakdown or malfunction of this product may threaten human life directly or affect human body, necessary examination should be taken for each time. Please contact our distributor or branch office nearby.

◇ Although this product is manufactured under strict quality control, safety device should be equipped if the product is applied to the equipment which may cause serious loss to human life or equipment by breakdown of the product.

◇ If the product is used in particular atmosphere (clean room, foodstuff manufacturing and so on), please contact our distributor or branch office nearby beforehand.

4-2 Warranty

◇ We guarantee that there is no failure upon materials and manufacturing of the gear reducer.

◇ Warranty period is, whichever reaching earlier, one year after delivery or 2000 hours running after installation, when the product is used under rated running condition prescribed by our company and also under the correct installation and lubrication condition.

◇ Should failure upon materials or manufacturing is reported during the warranty period mentioned above, either repair of the product or supply of replacement is provided at our cost. However, man-hour needed for uninstalling/installing from/to running machine, transportation fee and tax/duties required for the re-delivery and additional expenses such as warehouse fees, etc. are all out of our responsibility.

◇ We assume no responsibility whatsoever for any expenses such as opportunity losses resulting from suspension of the machine, which is caused by malfunction of the product.

◇ The upper limit of the amount for compensation, if implemented, shall not exceed the sales price of the product.

4-3 Customer service

◇ Please contact the following customer service for requirements of service and assistance for the gear reducer.

◇ Please inform the type of machine and the serial number on the nameplate sealed on the product, when our service is required.

Nabtesco Corporation

Nabtesco Corporation, Tokyo Head Office
9-18, Kaigan 1-chome, Minato-ku, Tokyo 105-0022, Japan
TEL +81-3-3578-7461 FAX +81-3-3578-7471
E-mail P_information@nabtesco.com HomePage www.nabtesco.com

Nabtesco Coporation, Nagoya Sales Office
Nagoya Daini Saitama Building, 4-2-28 Meieki, Nakamura-ku, Nagoya 450-0002, Japan
TEL +81-52-582-2981 FAX +81-52-582-2987

Nabtesco Corporation, Tsu Plant
594-banchi, Ichimachida, Katada-cho, Tsu-shi, Mie-ken 514-8533, Japan
TEL +81-59-237-4602 FAX +81-59-237-4612

Nabtesco Motion Control Inc.
28850 Cabot Drive, Suite 300, Novi, Michigan 48377, USA
PHONE +1-248-553-3020 FAX +1-248-553-3070
E-mail info@nabtescomotion.com HomePage www.nabtescomotion.com

Nabtesco Precision Europe GmbH
Klosterstr.49, D-40211 Dusseldolf, Germany
PHONE +49-211-173790 FAX +49-211-364677
E-mail info@nabtesco-precision.de HomePage www.nabtesco-precision.de