



# Precision Reduction Gear **RV**<sup>TM</sup>

## High Precision Gearhead

### **RD2 Series**

### Operation Manual

<Applicable Model Code>

RDS-006E, RDR-006E	RDS-010C, RDR-010C, RDP-010C
RDS-020E, RDR-020E, RDP-020E	RDS-027C, RDR-027C, RDP-027C
RDS-040E, RDR-040E, RDP-040E	RDS-050C, RDR-050C, RDP-050C
RDS-080E, RDR-080E, RDP-080E	RDS-100C, RDR-100C, RDP-100C
RDS-160E, RDR-160E, RDP-160E	RDS-200C, RDR-200C, RDP-200C
RDS-320E, RDR-320E, RDP-320E	RDS-320C, RDR-320C, RDP-320C

For the applicable model codes, refer to “Model” indicated on the shipping label of the product.

This manual must be thoroughly read and understood before using the product.  
Be sure to deliver this operation manual to the system manager and the person in charge of the operation.  
Keep this manual in the specified location so that it can be immediately referred to whenever necessary.

**Nabtesco**  
Nabtesco Corporation

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**Contact Information**

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# Important Information

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## 1. Intended use of this product

This product was designed and manufactured as a reduction gear that decelerates the rotation of the motor and transmits the rotational torque. Do not use this product for other purposes.



- Do not modify the reduction gear or use it outside its specified range. Failure to do so could cause injury or damage to the reduction gear.
  - The specifications indicated in the product catalog are based on Nabtesco evaluation methods. This product should only be used after confirming that it is appropriate for the operating conditions of your system. Failure to do so could cause injury or damage to the reduction gear.
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## 2. Rules to ensure safe use of this product

It is impossible for Nabtesco Corporation (referred to as “Nabtesco” hereafter) to foresee any potential hazards related to this product and hazards caused by human errors or peripheral devices.

There are also various points that must be observed and operations that are prohibited in relation to the use of this product, but it is also impossible to note all of them in this manual.

For this reason, it is necessary to take appropriate safety measures when operating this product, in addition to the points noted in this manual.

The particularly important information for safe handling of this product is noted below. This information applies to all workers involved, including the manager and supervisor of this product.

The “procedures” referred to in this manual indicate all the acts performed on this product during transportation, installation, operation, and maintenance/inspection.

### **Be sure to read this manual.**

Before using this product, thoroughly read this manual and understand all the content of this manual. Also, observe the safety precautions described in this manual.

### **Conditions for workers**

- The worker must have a fundamental knowledge of this product
- The worker must be aware of the potential hazards of this product and have adequate knowledge to avoid hazardous situations
- The worker must be able to take appropriate measures to avoid hazardous situations

**Observe the relevant laws, regulations, ordinances, and bylaws.**

Observe the relevant laws, regulations, ordinances, and bylaws enacted by the related countries and local governments.

**Prevention of accidents**

- To prevent accidents, do not perform any procedures not noted in this manual. Also, do not use this product for any purposes other than those noted at the beginning of this manual.
- If any abnormalities are found, take appropriate measures immediately to prevent any accidents, serious injury, or damage.
- Everyone, including workers and supervisors, must voluntarily take measures to ensure safety and well-being, as this can prevent accidents.

**3. Sharing of hazard information with users**

When selling or transferring this product embedded in a device, etc., hand this manual to the person who actually uses or manages the device (the person/group in charge). Or, add the necessary information concerning handling and maintenance procedures for preventing the accidents and failures described in this manual to the contents of the operation manual of the device.

**4. Product disposal**

When disposing of this product, drain the lubricant completely and handle it according to the ordinances of the local government and entrust the disposal to an industrial waste disposal specialist.

**5. Other important notes**

It is strictly prohibited to reverse-engineer the internal parts of this product.

# About This Manual

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## 1. Users of this manual

This manual is intended for native speakers of English. If this product is operated by non-native speakers of English, the customer is responsible for conducting safety training and giving operation instructions to those workers.

## 2. Copyrights

The copyright for this manual belongs to Nabtesco Corporation. Unauthorized reprinting, reproduction, copying, or translation of this manual in whole or in part is strictly prohibited.

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## Warranty

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1. In the case where Nabtesco confirms that a defect of the Product was caused due to Nabtesco's design or manufacture within the Warranty Period of the Product, Nabtesco shall repair or replace such defective Product at its cost. The Warranty Period shall be from the delivery of the Product by Nabtesco or its distributor to you ("Customer") until the end of one (1) year thereafter, or the end of two thousand (2,000) hours from the initial operation of Customer's equipment incorporating the Product at end user's production line, whichever comes earlier.
  
2. Unless otherwise expressly agreed between the parties in writing, the warranty obligations for the Product shall be limited to the repair or replacement set forth herein. **OTHER THAN AS PROVIDED HEREIN, THERE ARE NO WARRANTIES ON THE PRODUCT, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**
  
3. The warranty obligation under Section 1 above shall not apply if:
  - a) the defect was caused due to the use of the Product deviated from the Specifications or the working conditions provided by Nabtesco;
  - b) the defect was caused due to exposure to foreign substances or contamination (dirt, sand, etc.)
  - c) lubricant or spare part other than the ones recommended by Nabtesco was used in the Product;
  - d) the Product was used in an unusual environment (such as high temperature, high humidity, a lot of dust, corrosive/volatile/inflammable gas, pressurized/depressurized air, under water/liquid or others except for those expressly stated in the Specifications);
  - e) the Product was disassembled, re-assembled, repaired or modified by anyone other than Nabtesco;
  - f) the defect was caused due to the equipment into which the Product was installed;
  - g) the defect was caused due to an accident such as fire, earthquake, lightning, flood or others;  
or
  - h) the defect was due to any cause other than the design or manufacturing of the Product.
  
4. The warranty period for the repaired/replaced Product/part under Section 1 above shall be the rest of the initial Warranty Period of the defective Product subjected to such repair/replace.

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# Glossary

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## Rated service life

The lifetime resulting from the operation with the rated torque and the rated output speed is referred to as the “rated service life”.

## Allowable acceleration/deceleration torque

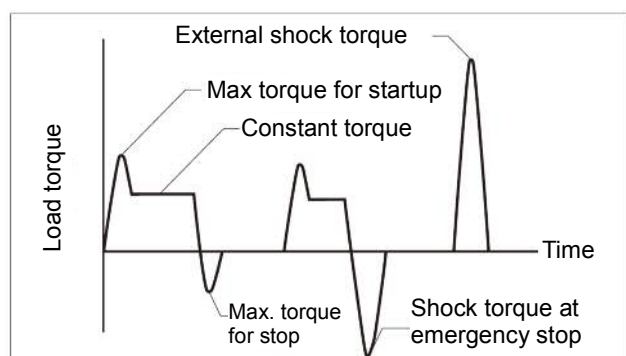
When the machine starts or stops, the load torque to be applied to the reduction gear is larger than the constant-speed load torque due to the effect of the inertia torque of the rotating part. In such a situation, the allowable torque during acceleration/deceleration is referred to as “allowable acceleration/deceleration torque”.

Note: Be careful that the load torque, which is applied at startup and stop, does not exceed the allowable acceleration/deceleration torque.

## Momentary maximum allowable torque

A large torque may be applied to the reduction gear due to execution of emergency stop or by an external shock. In such a situation, the allowable value of the momentary applied torque is referred to as “momentary maximum allowable torque”.

Note: Be careful that the momentary excessive torque does not exceed the momentary maximum allowable torque.



## Allowable output speed

The allowable value for the reduction gear’s output speed during operation without a load is referred to as the “allowable output speed”.

Note: The reduction gear temperature may exceed 60°C even when the speed is under the allowable speed depending on the operation conditions (duty, load, ambient temperature, etc.). In such a case, use the reduction gear at the speed so that the gear surface temperature is 60°C or lower.

## Allowable moment and maximum thrust load

The external load moment or thrust load may be applied to the reduction gear during normal operation. The allowable values at this time are referred to as “allowable moment” and “maximum thrust load” respectively.

Note 1: The above specification values are noted in the catalog or separately provided specification sheet.

Note 2: The “reduction gear” indicated in this manual refers to the “RD2 series high precision gearhead” of the product.



## Chapter 1 About Safety

The safety precautions noted in this chapter should be used as guidelines to prevent injury of workers who perform transportation, installation, operation, and maintenance of this product, as well as damage to the product.






### 1.1. About warnings

This manual alerts workers to hazardous situations and precautions related to this product in the following manner:

1. Safety regulations are described in Chapter 1 “About safety” in this manual
2. Warning statements are noted in this manual

### 1.2. Type and indication of warning

Warnings for potential hazards during operation are given according to the following four categories in this manual. If you fail to observe these warning statements, it could result in lethal injury or serious damage and malfunction of the product.

 <b>DANGER</b>	Indicates a hazardous situation that, if not avoided, is highly likely to result in death or serious injury.
 <b>WARNING</b>	Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury.
 <b>Note</b>	Indicates a potentially hazardous situation that, if not avoided, could result in physical damage.
 <b>Important</b>	Provides important information for correct use of this product, as well as supplemental explanation for the main body of the text or other information that helps to prevent erroneous operation.

### 1.3. General precautions

This section describes general precautions for safe use of this product. For precautions concerning transportation, installation, operation, maintenance, and inspection, be sure to confirm the contents of the relevant chapter.

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**! WARNING**

- Do not modify or disassemble the reduction gear in a manner not described in this manual. Failure to do so could cause injury or damage to the reduction gear.
  - Transportation, installation, operation, maintenance, and inspection of the reduction gear must be performed by personnel who fully understand this manual. The person in charge of the operation and manager of the reduction gear must not allow anyone without an understanding of the contents of this manual to operate it. Failure to do so could cause injury or damage to the reduction gear.
  - Do not put your fingers or any object into the opening of the reduction gear. If a belt or chain is used for connection of the drive sections, do not put your fingers or any object into the clearance of the protective cover, etc., as it could cause injury.
  - If any abnormalities or damage to the reduction gear are found, stop the operation immediately. Incorrect motion could cause injury.
- 

**! CAUTION**

- The reduction gear could become extremely hot during operation. After stopping the operation, never touch the reduction gear until it is completely cooled. Touching the reduction gear could cause burns.
  - Handle the lubricant according to the instructions given in this manual. Failure to do so could impair your health.
- 

**Note**

- Return the tools and other necessary items to the specified location after use. If a tool, bolt, nut, or other foreign object is trapped in the system, it could cause damage to the reduction gear.
  - Avoid excessive impact or vibration of the reduction gear. Failure to do so could cause damage to the reduction gear.
-

## Chapter 2 Product Overview

This chapter describes an overview of this product.

### 2.1. Name of each section

This section provides an explanation of the name of each section.

- If the shape of the actual section differs from the illustration below, refer to the catalog, separately provided “Outer dimensions” drawings and specification sheet.

#### ◆ Solid series

<Straight input type> RDS-□□□E

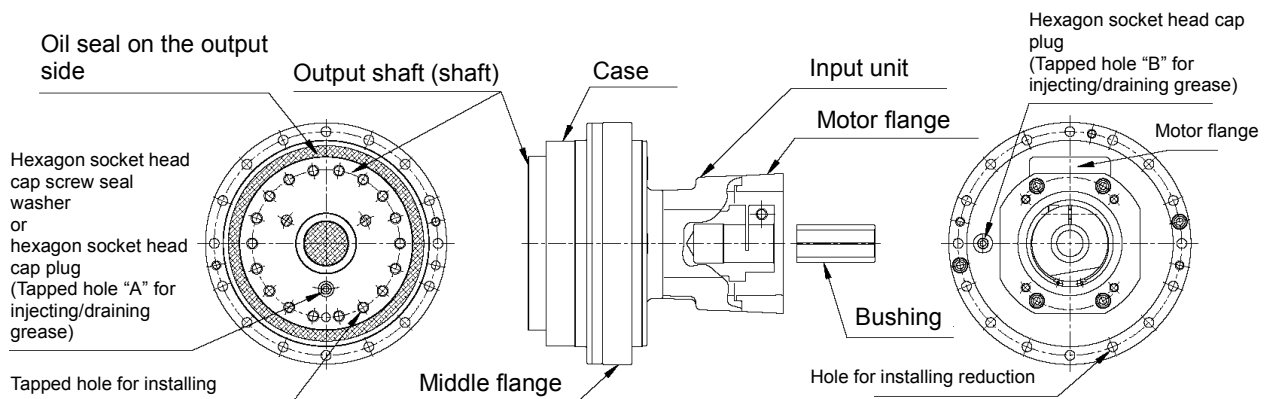


Fig. 2-1

<Right angle input type> RDR-□□□E

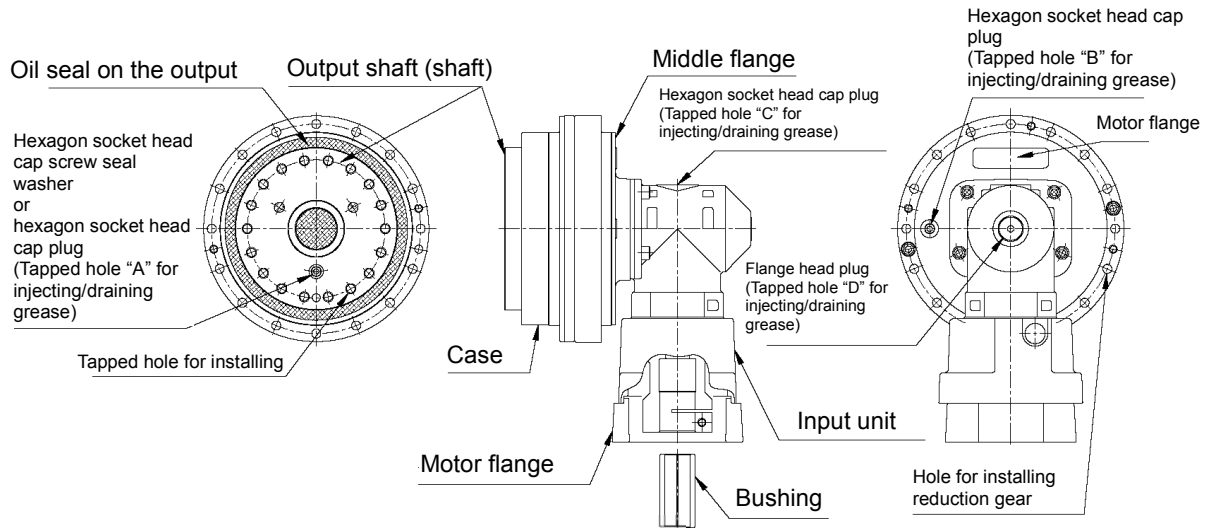


Fig. 2-2

<Pulley input type> RDP-□□□E

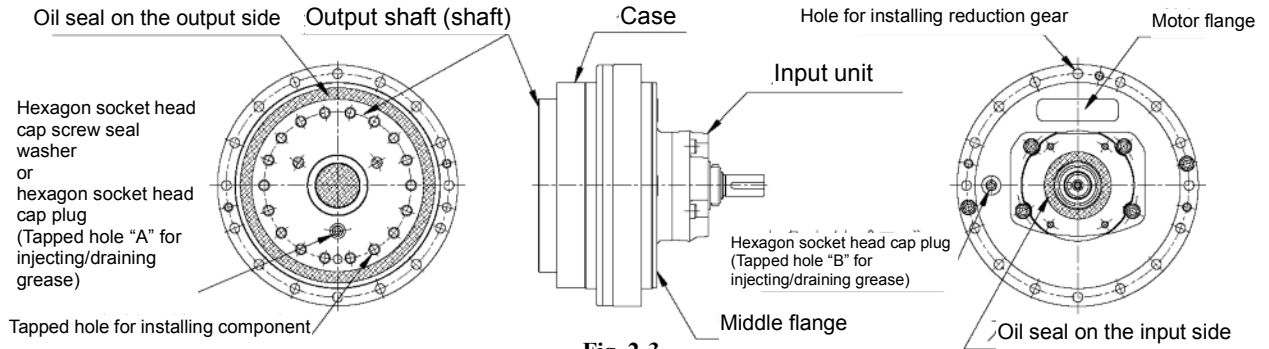


Fig. 2-3

◆ Hollow shaft series

<Straight input type> RDS-□□□C

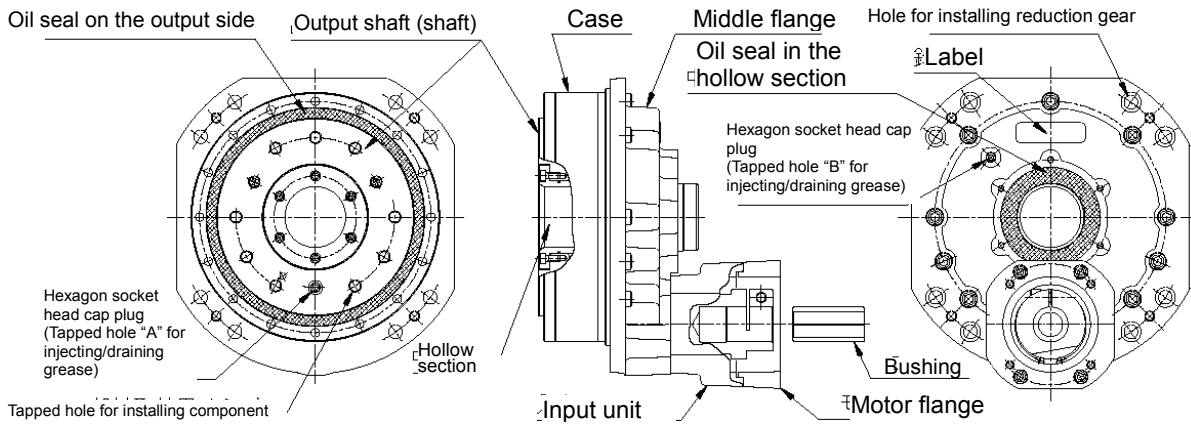


Fig. 2-4

<Right angle input type> RDR-□□□C

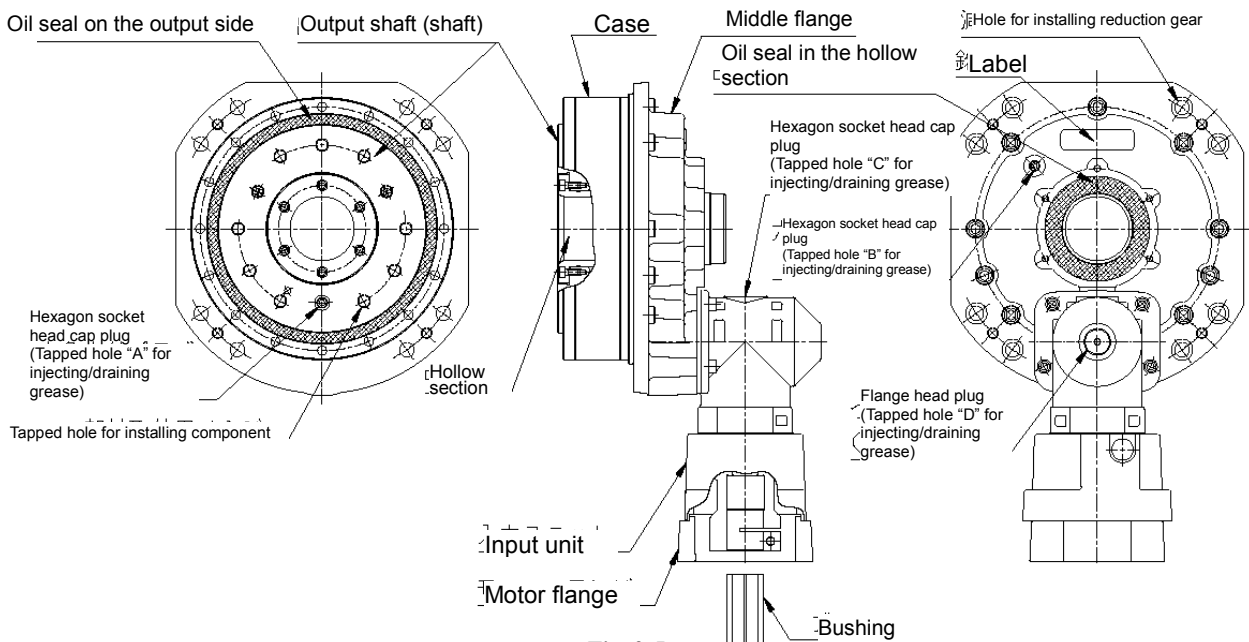
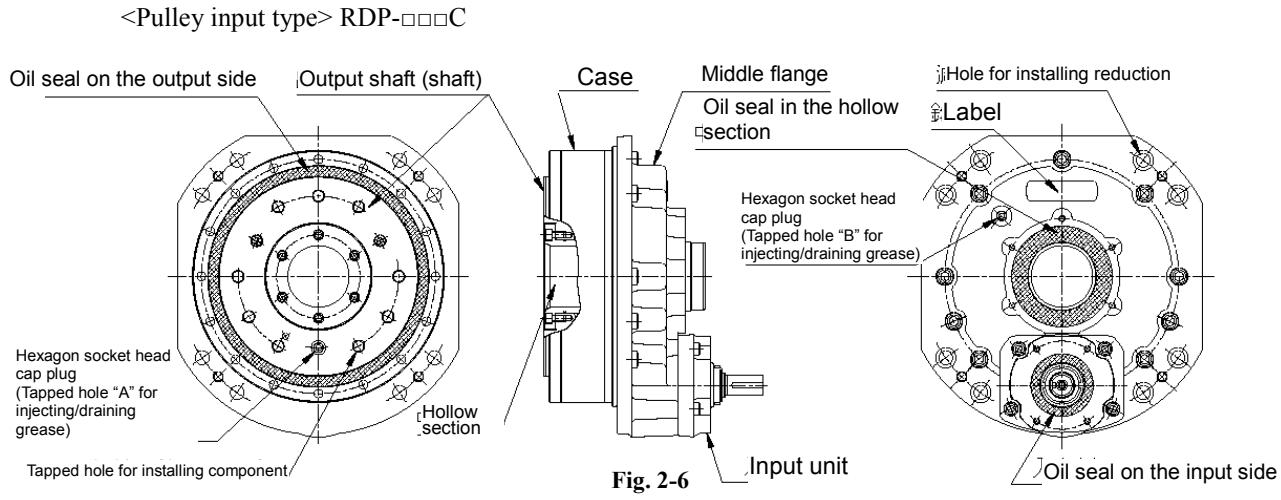


Fig. 2-5



**Important**

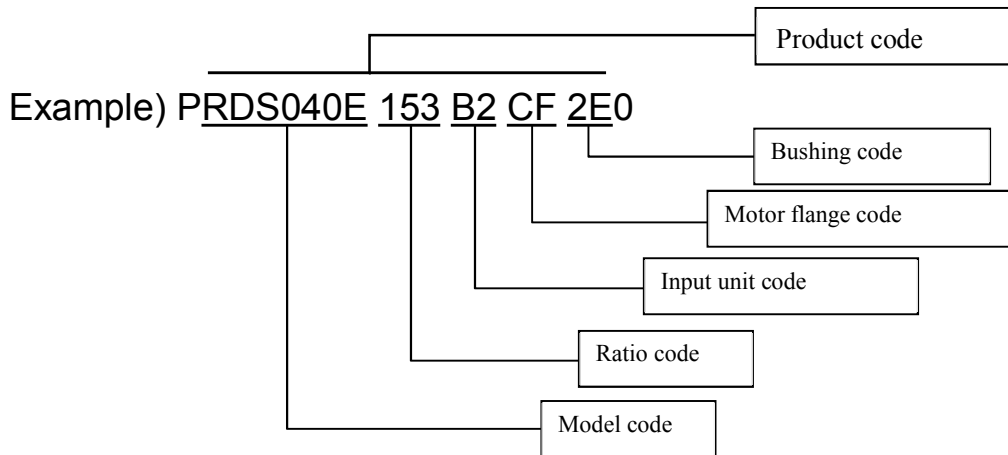
The shape of the reduction gear may differ from the illustration depending on the ordered specifications.

## 2.2. Parts codes of catalog products

The parts codes are assigned as follows for the RD2 series catalog products.

For detailed specifications of those products not included in the catalog, refer to the separately provided “Outer dimensions” drawings and specification sheet. If anything is unclear, contact our service department.

<Parts codes of catalog products>



The parts code of catalog products has “R” at the beginning of the product code.

Any other code indicates product not included in the catalog.

For the part number, check “Part number” located on the shipping label of the product (Fig. 4-3).

Note: The last digit of the parts code, within the range from 0 to 9 (“0” in the above parts code) indicates the revision code.

Note that this number may not be “0”.

## 2.3. Lubricant

The specified lubricant is filled before shipping.

- When replacing the lubricant, be sure to use the Nabtesco-specified lubricant. For purchase of the lubricant, contact our service representative.
- Do not mix it with other lubricants.

**Table 2-1**

Brand specified by Nabtesco	VIGOGREASE RE0*
Operating temperature range (ambient temperature)	-10 to 40°C

\* VIGOGREASE is registered trademark of Nabtesco Corporation.

### Note

- In order to take advantage of the performance of this product, use the Nabtesco-specified lubricant. Using other types of lubricant could cause deterioration of performance and premature damage.
- Mixing with other lubricants could cause deterioration of performance, generation of abnormal noise, and premature damage.

## Chapter 3 Transportation and Storage of Product

This chapter describes the transportation and storage of this product.

### 3.1. Transportation

- For the catalog products described in “2.2. Parts codes of catalog products”, refer to the weights of the reduction gears listed in Table 3-1 and transport the product in an appropriate way.
- For detailed specifications of those products not included in the catalog, refer to the weights indicated in the separately provided “Outer dimensions” drawings and specification sheet.
- If the reduction gear needs to be lifted after unpacking, also refer to “4.4 Lifting of this product”.
- Do not stack the packing boxes containing this product too high.
- Avoid excessive impact or vibration to the reduction gear.

Table 3-1

Product code	Weight (kg)	Product code	Weight (kg)	Product code	Weight (kg)
RDS-006E-□□□-B0	5.7	RDS-200C-□□□-B4	95.5	RDR-050C-□□□-C2	32.9
RDS-006E-□□□-B1	6.8	RDS-200C-□□□-B5	98.4	RDR-050C-□□□-C3	35.6
RDS-020E-□□□-B0	8.4	RDS-320C-□□□-B4	141.4	RDR-100C-□□□-C2	40.9
RDS-020E-□□□-B1	9.5	RDS-320C-□□□-B5	144.3	RDR-100C-□□□-C3	43.7
RDS-040E-□□□-B2	17.5	RDR-006E-□□□-C0	7.2	RDR-200C-□□□-C4	117.9
RDS-040E-□□□-B3	20.0	RDR-006E-□□□-C1	8.2	RDR-200C-□□□-C5	120.4
RDS-080E-□□□-B2	23.8	RDR-020E-□□□-C0	9.9	RDR-320C-□□□-C4	163.6
RDS-080E-□□□-B3	26.3	RDR-020E-□□□-C1	10.9	RDR-320C-□□□-C5	166.1
RDS-160E-□□□-B4	43.4	RDR-040E-□□□-C2	20.5	RDP-020E-081-A0	8.3
RDS-160E-□□□-B5	46.3	RDR-040E-□□□-C3	23.2	RDP-040E-057-A3	16.4
RDS-320E-□□□-B4	68.9	RDR-080E-□□□-C2	26.8	RDP-080E-081-A4	22.8
RDS-320E-□□□-B5	71.8	RDR-080E-□□□-C3	29.6	RDP-160E-066-A6	41.9
RDS-010C-□□□-B0	10.4	RDR-160E-□□□-C4	65.6	RDP-320E-081-A7	67.3
RDS-010C-□□□-B1	11.5	RDR-160E-□□□-C5	68.1	RDP-010C-108-A1	10.3
RDS-027C-□□□-B0	16.5	RDR-320E-□□□-C4	91.2	RDP-027C-100-A2	16.4
RDS-027C-□□□-B1	17.6	RDR-320E-□□□-C5	93.7	RDP-050C-109-A3	28.8
RDS-050C-□□□-B2	29.9	RDR-010C-□□□-C0	11.9	RDP-100C-101-A5	36.9
RDS-050C-□□□-B3	32.3	RDR-010C-□□□-C1	13.0	RDP-200C-106-A8	93.8
RDS-100C-□□□-B2	37.9	RDR-027C-□□□-C0	18.0	RDP-320C-157-A9	139.7
RDS-100C-□□□-B3	40.4	RDR-027C-□□□-C1	19.0		



- If the packing boxes containing the reduction gear are stacked too high during transportation, they may collapse and fall down, causing injury or damage to the reduction gear.

#### Note

- Applying excessive impact or vibration to the reduction gear could cause damage to the reduction gear.

#### Important

- The weight shown in Table 3-1 indicates the weight of the reduction gear only. The weight of the packing box, motor flange, bushing, and accessories is not included.
- The actual weight of the reduction gear may slightly differ from that listed in Table 3-1, depending on the specifications.

### 3.2. Storage

To avoid rust, corrosion, or deterioration of the sealing material, etc., and collapse of stored packing boxes, store the product in the following location.

- Location where the ambient temperature is between  $-10^{\circ}\text{C}$  to  $40^{\circ}\text{C}$ .
- Location where the humidity is less than 85% and no condensation occurs
- Location that is not directly affected by wind and rain
- Location that is free from combustible/volatile/corrosive gas or dust.
- Stable location that is free from any danger of collapse
- Location with little vibration



- 
- When storing the reduction gears, do not stack too many packing boxes. They may collapse and fall down, causing injury or damage to the reduction gear.
- 

#### Note

- 
- Store the reduction gear under the same conditions as those before unpacking. If it is left upside down, it could cause damage to the reduction gear.
  - Although the reduction gear is coated with rust prevention oil before shipping, it is not designed for long-term storage. If it is stored for a long period, check the condition of the reduction gear periodically and perform rust prevention treatment as necessary. If rust occurs, it could cause the leakage of lubricant or premature damage to the reduction gear.
  - If the reduction gear is used or operated after it has not been used for a long period of time, confirm that it is free from rust or corrosion and that the sealing material is free from deformation or cracks beforehand. If the reduction gear is used without checking these points, it could cause the leakage of lubricant or premature damage to the reduction gear.
-



## Chapter 4 Preparations for Installation

This chapter describes the preparation for installing this product.

Before designing the equipment, take care regarding the following precautions.

- When the reduction gear is used for human transportation equipment, install an effective safety unit as a fail-safe mechanism, in case of an unexpected failure in the reduction gear.
- When the reduction gear is used for elevating equipment, install an effective safety unit for preventing falls caused by idle running as a fail-safe mechanism, in case of an unexpected failure in the reduction gear.
- Install an oil receiver, etc., to prevent damage in case of lubricant leakage due to a failure or lifetime expiration.
- As this product may have residual rust prevention agent coated on it before shipping, wipe it off as necessary.



- When the reduction gear is used for human transportation equipment, install an effective safety unit as a fail-safe mechanism, in case of an unexpected failure in the reduction gear. If you fail to install it, it could cause injury in case the equipment goes out of control or falls off.
- When the reduction gear is used for elevating equipment, install an effective safety unit for preventing falls caused by idle running as a fail-safe mechanism, in case of an unexpected failure in the reduction gear. If you fail to install it, it could cause injury in case the elevating unit falls off.

### 4.1. Installation environment

Use this product under the following environment:

- Location where the ambient temperature is between -10°C to 40°C.
- Location where the humidity is less than 85% and no condensation occurs
- Location where the altitude is less than 1,000 m
- Well-ventilated location

Do not install the reduction gear at the following locations.

- Location where a lot of dust is collected
- Outdoors that can be directly affected by wind and rain
- Location near the environment that contains combustible/explosive/corrosive gases and flammable materials
- Location where the magnetic fields or vibration occur

#### Important

- If the required installation environment cannot be established/met, contact us in advance.
- When using this product under special conditions (clean room, equipment for food, medical equipment, concentrated alkali, high-pressure steam, etc.), contact our service representative in advance.

## 4.2. Preparation of required components

- The following components and materials are required for installing this product. Check the components/materials and prepare them at each customer's site.
- If the shape of the actual section differs from the illustration below, refer to the separately provided "Outer dimensions" drawings and specification sheet.
- Prepare the case installation component and shaft installation component which have either been designed and manufactured based on the catalog or separately provided "Outer dimensions" drawings and specification sheet.

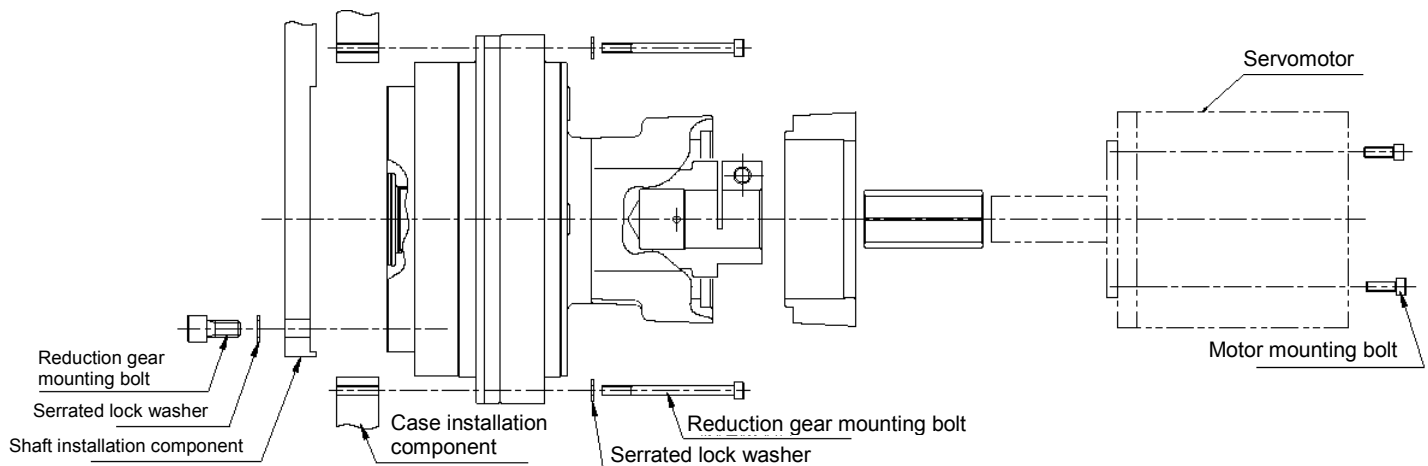


Fig. 4-1

### Important

- The actual components may differ from the required components shown in the above illustration, depending on the customer's equipment.

### 4.2.1. Installation components

The customer is required to prepare the following components used for incorporating the reduction gear into the customer's equipment.

#### ● Case installation component

- Prepare the case installation component for the reduction gear.

### ⚠ CAUTION

- Confirm that the design of the prepared case installation component conforms to the size and quantity of the bolts shown in Table 4-1 in "4.2.2 Reduction gear mounting bolts".
- When preparing the case installation component, take extra care not to cover the tapped holes for injecting/draining grease. If the tapped holes are covered, it will be difficult to replace the lubricant.

### ● Shaft installation component

- Prepare the shaft installation component for the output shaft of the reduction gear.



- Confirm that the design of the prepared shaft installation component conforms to the size and quantity of the bolts shown in Table 4-2 in “4.2.2 Reduction gear mounting bolts”.
- When preparing the shaft installation component, take extra care not to cover the tapped holes for injecting/draining grease. If the tapped holes are covered, it will be difficult to replace the lubricant.

### 4.2.2. Reduction gear mounting bolts

- For the catalog products described in “2.2. Parts codes of catalog products”, refer to the size and quantity of the bolts listed in Table 4-1 and Table 4-2.
- For the products not included in the catalog, prepare bolts according to the size and quantity of the case installation bolts and shaft installation bolts as indicated in the separately provided “Outer dimensions” drawings and specification sheet.
- Select the appropriate bolt length based on the mounting dimensions of the components prepared by the customer and the reduction gear.
- Prepare the following bolts recommended by Nabtesco:

Hexagon socket head cap screw	JIS B 1176: 2006
Strength class	JIS B 1051: 2000 12.9
Thread	JIS B 0209: 2001 6 g

For case installation components

Table 4-1

Model code	Nominal size × pitch (mm)	Required Qty.	
		Straight input type and pulley input type	Right angle input type
RD□-006E	M5 × 0.8	8	7
RD□-020E	M6 × 1.0	18	15
RD□-040E	M8 × 1.25	16	13
RD□-080E	M8 × 1.25	16	13
RD□-160E	M12 × 1.75	16	13
RD□-320E	M12 × 1.75	20	17
RD□-010C	M6 × 1.0	8	8
RD□-027C	M8 × 1.25	8	8
RD□-050C	M10 × 1.5	8	8
RD□-100C	M12 × 1.75	8	8
RD□-200C	M16 × 2.0	8	8
RD□-320C	M16 × 2.0	12	12

For shaft installation components

Table 4-2

Model code	Nominal size × pitch (mm)	Required Qty.
RD□-006E	M8 × 1.25	6
RD□-020E	M10 × 1.5	6
RD□-040E	M10 × 1.5	10
RD□-080E	M10 × 1.5	18
RD□-160E	M10 × 1.5	20
RD□-320E	M12 × 1.75	24
RD□-010C	M8 × 1.25	6
RD□-027C	M8 × 1.25	8
RD□-050C	M10 × 1.5	9
RD□-100C	M12 × 1.75	9
RD□-200C	M16 × 2.0	9
RD□-320C	M16 × 2.0	15

### Important

- Note that the number of bolts for the case installation component is different depending on the input type.

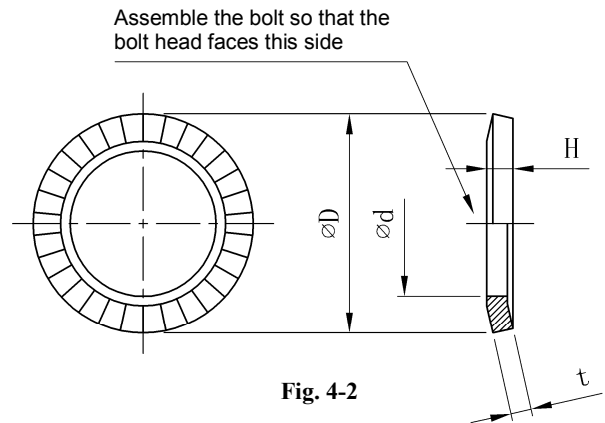
### 4.2.3. Serrated lock washer for hexagon socket head cap screw

Prepare the following serrated lock washer for hexagon socket head cap screw recommended by Nabtesco:

Name:	Belleville spring washer (made by Heiwa Hatsujyo Industry Co., Ltd.)
Corporation symbol:	CDW-H, CDW-L (Only for M5)
Material:	S50C to S70C
Hardness:	HR40 to 48

**Table 4-3** (Unit: mm)

Nominal size	ID and OD of Belleville spring washer		t	H
	$\phi d$	$\phi D$		
5	5.25	8.5	0.6	0.85
6	6.4	10	1.0	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
14	14.6	21	2.0	2.5
16	16.9	24	2.3	2.8



**Fig. 4-2**

#### Important

- When using any equivalent washer, select it with special care given to its outside diameter ( $\phi D$ ).

### 4.2.4. Liquid sealant

If the reduction gear and motor flange are removed, liquid sealant must be used to seal the installation surface of the reduction gear and motor flange when they are re-assembled. Prepare one of the following liquid sealants recommended by Nabtesco:

**Table 4-4**

Name	Manufacturer	Characteristics and applications
ThreeBond 1211	ThreeBond	<ul style="list-style-type: none"> <li>• Silicone-based, solventless type</li> <li>• Semi-dry gasket</li> </ul>
HermeSeal SS-60F	Nihon Hermetics Co.	<ul style="list-style-type: none"> <li>• One-part, non-solvent elastic sealant</li> <li>• Metal contact surface (flange surface) seal</li> <li>• Any product basically equivalent to ThreeBond 1211</li> </ul>
Loctite 515	Henkel	<ul style="list-style-type: none"> <li>• Anaerobic flange sealant</li> <li>• Metal contact surface (flange surface) seal</li> </ul>

#### Note

- Do not use the above liquid sealants if the component of the customer's device is made of copper or copper alloy.

### 4.3. Unpacking

Check the following points when unpacking.

- Before using this product, check the contents of the packing box and confirm that all the ordered items are included.
- Check the top and bottom direction of the packing box and unpack it.

---

**CAUTION**

- When transporting the reduction gear, take extra care so that it will not fall down or topple over. It could cause injury to the workers or damage to the reduction gear.
  - Before using this product, check the contents of the packing box and confirm that all the ordered items are included.  
If an incorrect part is installed, it could cause injury to the workers or damage to the device in which the incorrect part is assembled and the reduction gear.
- 

**Note**

- If it is left upside down, it could cause damage to the reduction gear. (Refer to Fig. 4-3 for the direction.)
- 

**Important**

- The reduction gear is coated with rust prevention oil before shipping. Therefore, if it is used as it is, the rust prevention oil could ooze from the bolt hole or flange mating face during operation. In addition, the rust prevention oil makes the reduction gear slippery. Wipe it off as necessary before use.
-

### 4.3.1. Checking the contents

- Check the shipping label to confirm that it matches the product you have ordered.
- Confirm that the contents of the packing box match the items in the illustration below when unpacking.

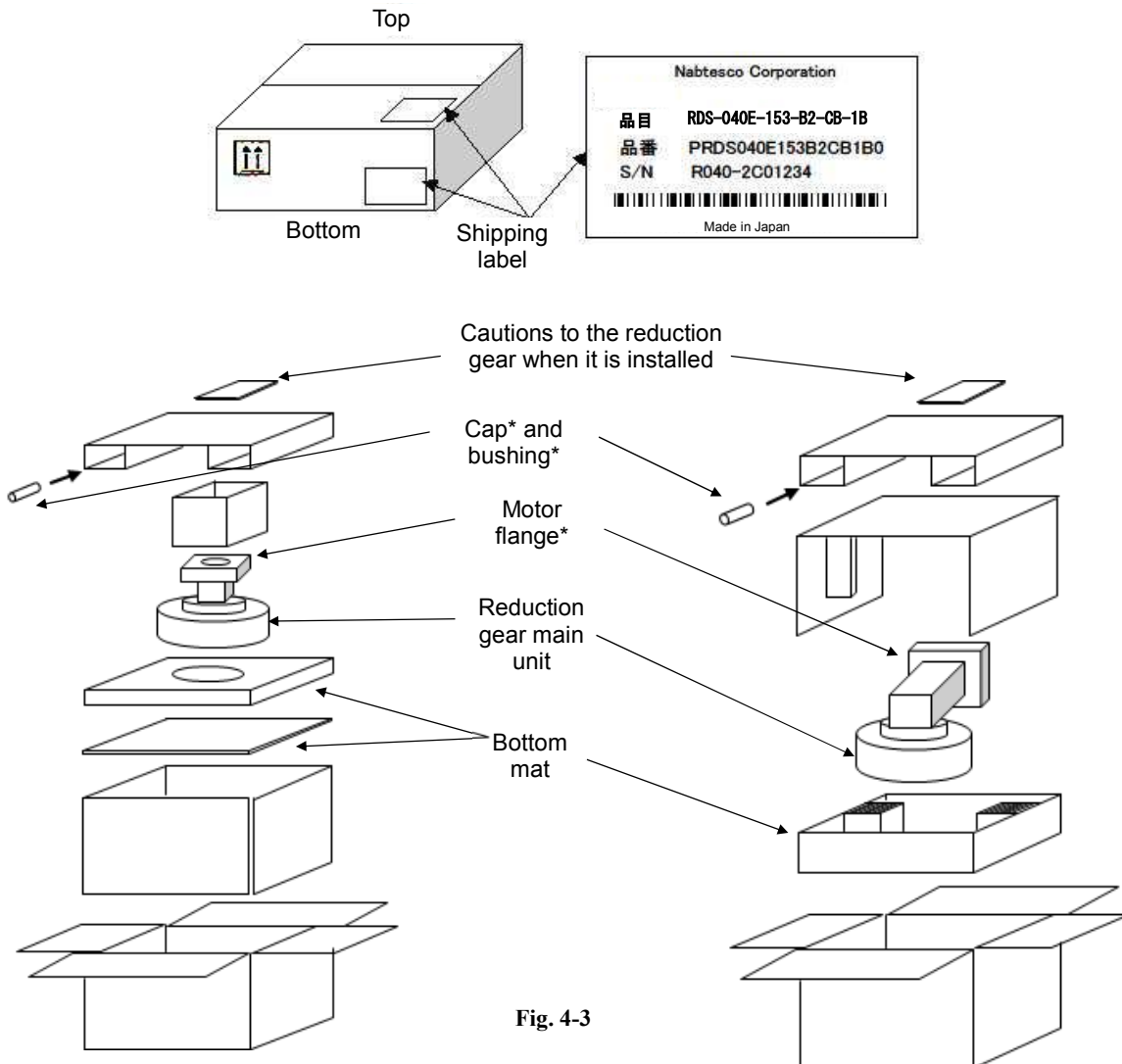


Fig. 4-3

#### Important

- When inquiring about this product, the model, parts name, and S/N (serial number) indicated on the shipping label are needed. Write them down when unpacking and keep them for cases in which they are needed. (The model and serial number indicated on the label may be used.)
- Depending on the product, the motor flange, cap, and bushing (\*) may not be assembled or included in the packing box.
- For the pulley type, the motor flange, cap, and bushing are not provided with the product.

### 4.3.2. Label indication

A label is attached to the main unit of this product.

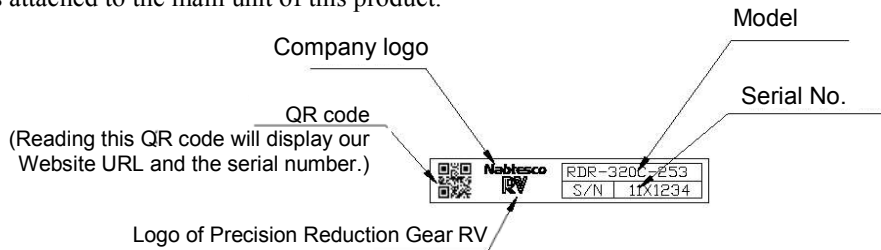


Fig. 4-4

### 4.4. Lifting of this product

- For details on the position and shape of the handling bolts, refer to the catalog or the separately provided “Outer dimensions” drawings and specification sheet.
- For the handling bolt size and weight of the catalog products described in “2.2. Parts codes of catalog products”, refer to Table 4-5 and Table 4-6.
- For the handling bolt size and weight of those products not included in the catalog, refer to the separately provided “Outer dimensions” drawings and specification sheet.
- Do not enter the area under the reduction gear when lifting the reduction gear.
- When lifting the reduction gear, be sure to use a lifter that can withstand the weight of the reduction gear.

#### Handling bolt size/Solid series

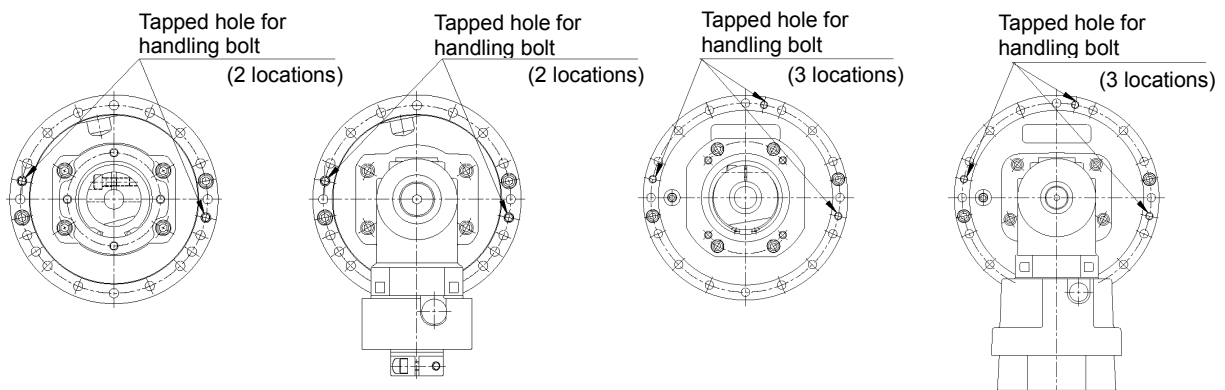
Table 4-5

Model code	Handling bolt Nominal size × pitch (mm)	Qty.	Weight (kg)		
			Straight*1	Right angle*1	Pulley
RD□-006E	M5 × 0.8	2	6 to 17	7 to 18	-
RD□-020E	M6 × 1.0	2	8 to 19	10 to 22	8
RD□-040E	M8 × 1.25	3	18 to 29	21 to 32	16
RD□-080E	M8 × 1.25	3	24 to 36	27 to 39	23
RD□-160E	M10 × 1.5	2	43 to 60	66 to 82	42
RD□-320E	M12 × 1.75	2	69 to 86	91 to 107	67

\*1: The weight varies depending on the coupling inner diameter of the input unit and the motor flange type.

<For RD -006E, 020E, 160E, and 320E>

<For RD -040E and 080E>



For the straight input type and pulley input type

For the right angle input type

For the straight input type and pulley input type

For the right angle input type

Fig. 4-5

## Handling bolt size/Hollow shaft series

Table 4-6

Model code	Handling bolt Nominal size × pitch (mm)	Qty.	Weight (kg)		
			Straight*1	Right angle*1	Pulley
RD□-010C	-	-	10 to 22	12 to 23	10
RD□-027C	M6 × 1.0	4	17 to 28	18 to 30	16
RD□-050C	M8 × 1.25	4	30 to 42	33 to 45	29
RD□-100C	M10 × 1.5	4	38 to 50	41 to 53	37
RD□-200C	M12 × 1.75	4	96 to 112	118 to 134	94
RD□-320C	M12 × 1.75	4	141 to 158	164 to 180	140

\*1: The weight varies depending on the coupling inner diameter of the input unit and the motor flange type.

<For RD□-027C, 050C, 100C, 200C, and 320C>

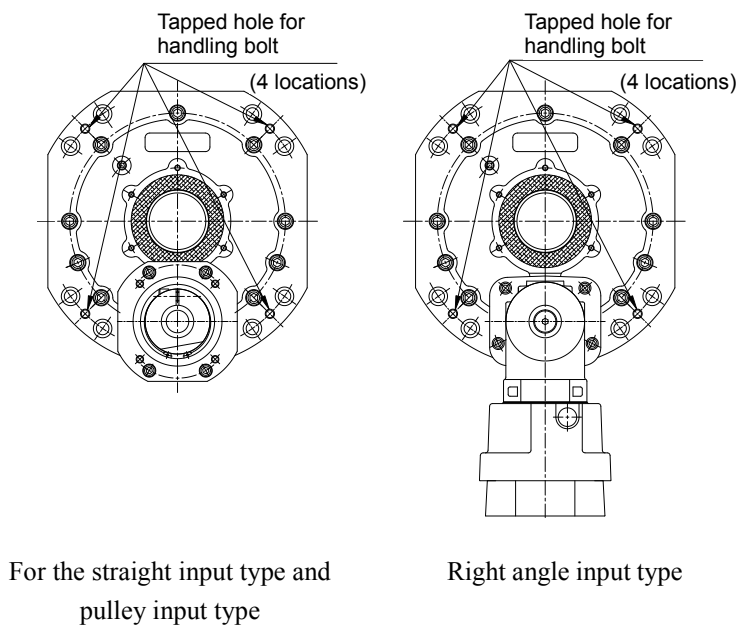


Fig. 4-6

**! WARNING**

- Do not enter the area under the reduction gear when lifting the reduction gear. If the reduction gear falls down, it could cause injury.
- When lifting the reduction gear, be sure to use a lifter that can withstand the weight of the reduction gear. Otherwise, the lifter will be damaged, and the reduction gear could fall down and topple over, which may result in injury.

**! CAUTION**

- Be sure that no load is applied to the hollow section when lifting. The reduction gear could be damaged and the components could fall down, which may cause injury to the workers. In addition, the oil seals for the hollow section may be deformed, which could eventually cause leakage of the lubricant.



## Chapter 5 Installation

This chapter describes the installation of this product.

Before installation, take care regarding the following precautions.

- Do not stand on top of the reduction gear or put anything on it.
- Be sure to install the reduction gear with the correct orientation.

### Note

- Standing on top of the reduction gear or putting something on it could cause damage to the reduction gear.
- Installing the reduction gear with an incorrect orientation could cause damage to the customer's device and the reduction gear.
- As the hollow section at the center of the reduction unit of the hollow shaft series is not designed to allow a load, do not use the reduction gear in a way that applies a load to the hollow section. The oil seals for the hollow section may be deformed, which could eventually cause leakage of the lubricant. (Refer to Fig. 2-4, 2-5, and 2-6.)

### 5.1. Bolt tightening torque

- Use the Nabtesco-recommended bolts for installing the reduction gear and tighten them with the specified tightening torque.
- Use the serrated lock washer for hexagon socket head cap screw to prevent the bolt from loosening and protect the bolt seat surface from flaws.

(Reference: “4.2.2 Reduction gear mounting bolts” and “4.2.3 Serrated lock washer for hexagon socket head cap screw”)

### Important

If aluminum or stainless-steel is used for the bolt, limit the tightening torque. When tightening the bolt with the limited torque, confirm that there is no strength problem by taking the transmission torque and load moment into due consideration.

The following are the bolt tightening torques specified by Nabtesco. Be sure to check when tightening the bolts.

#### 5.1.1. When incorporating the reduction gear into customer's equipment

Table 5-1

Nominal size × pitch (mm)	Tightening torque* (Nm)	Tightening force (N)
M5 × 0.8	9.01 ± 0.49	9,310
M6 × 1.0	15.6 ± 0.78	13,180
M8 × 1.25	37.2 ± 1.86	23,960
M10 × 1.5	73.5 ± 3.43	38,080
M12 × 1.75	129 ± 6.37	55,100
M14 × 2.0	205 ± 10.2	75,860
M16 × 2.0	319 ± 15.9	103,410

\*The tightening torque values listed are for steel or cast iron material.

### 5.1.2. When installing the motor flange onto the input unit

Table 5-2

Nominal size × pitch (mm)	M6 × 1.0	M8 × 1.25	M12 × 1.75
Tightening torque (Nm)	12.1 ± 0.61	29.4 ± 1.47	102 ± 5.10

### 5.1.3. When tightening the clamping bolt of the coupling

Table 5-3

Model code	Input type	Input unit code	Nominal size × pitch (mm)	Tightening torque (Nm)
RD□006E, RD□020E RD□010C, RD□027C	Straight	B0 (ID ø14)	M6 × 1.0	15.6 ± 0.78
		B1 (ID ø24)		
	Right angle	C0 (ID ø14)		
		C1 (ID ø24)		
RD□040E, RD□080E RD□050C, RD□100C	Straight	B2 (ID ø24)	M10 × 1.5	73.5 ± 3.43
		B3 (ID ø35)		
	Right angle	C2 (ID ø24)	M8 × 1.25	37.2 ± 1.86
		C3 (ID ø35)	M12 × 1.75	129 ± 6.37
RD□160E, RD□320E RD□200C, RD□320C	Straight	B4 (ID ø28)	M10 × 1.5	73.5 ± 3.43
		B5 (ID ø42)	M12 × 1.75	129 ± 6.37
		C4 (ID ø28)	M10 × 1.5	73.5 ± 3.43
	Right angle	C5 (ID ø42)	M12 × 1.75	129 ± 6.37
			M10 × 1.5	73.5 ± 3.43

Note: Clamping bolt (Refer to Fig. 5-7.)

## 5.2. Installation work

### Important

- The installation procedure may differ from the contents of this manual, depending on the shape of the components designed by the customer.

### 5.2.1. Installing the reduction gear

The following describes the installation of the reduction gear.

- The reduction gear is coated with rust prevention oil before shipping. Wipe off the rust prevention oil as necessary during installation. In particular, do not fail to wipe off the rust prevention oil from the mounting surface.

- When you order the motor flange mounting type, the product may be delivered with a motor flange already mounted. In such a case, it may not be possible to install the product in the customer's equipment as it is, depending on the installation method and tools to be used (Fig. 5-1). Check the condition of your equipment and install the product in the correct procedure.

**When tools interfere with the motor flange**

**When the case installation component interferes with the motor flange**

**Note: When using the mounting surface on the input unit side for the solid series**

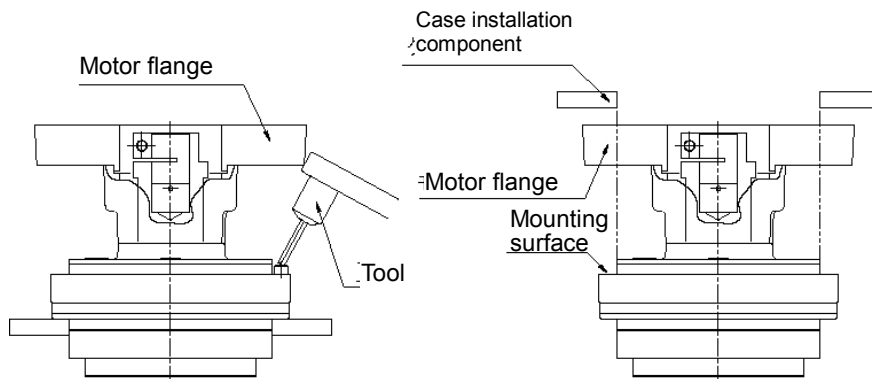
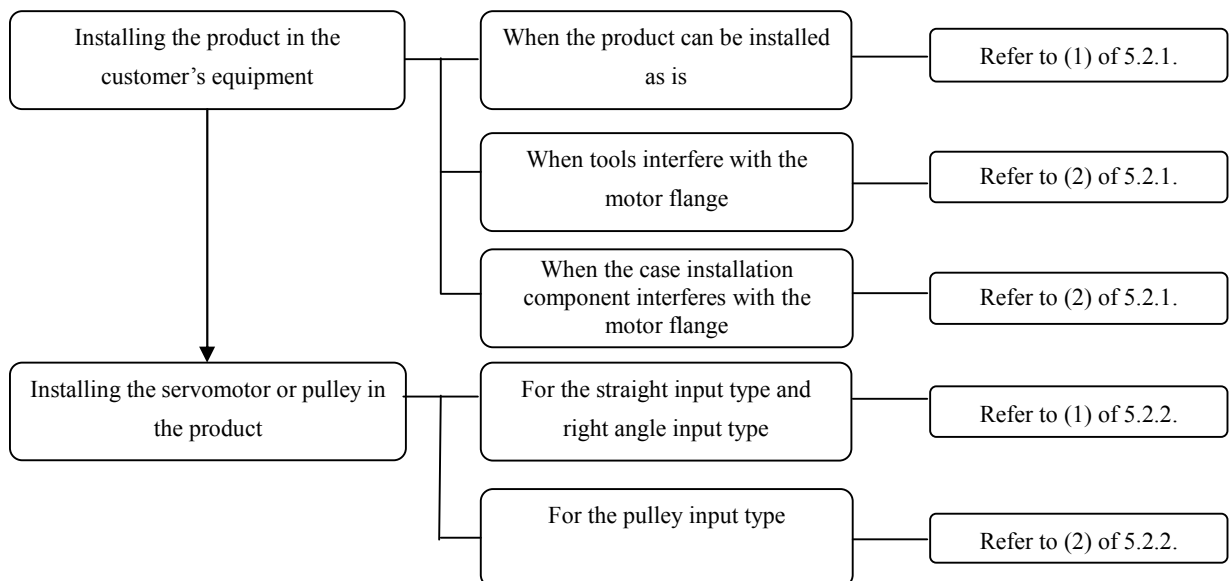


Fig. 5-1



**(1) When the product can be installed as is**

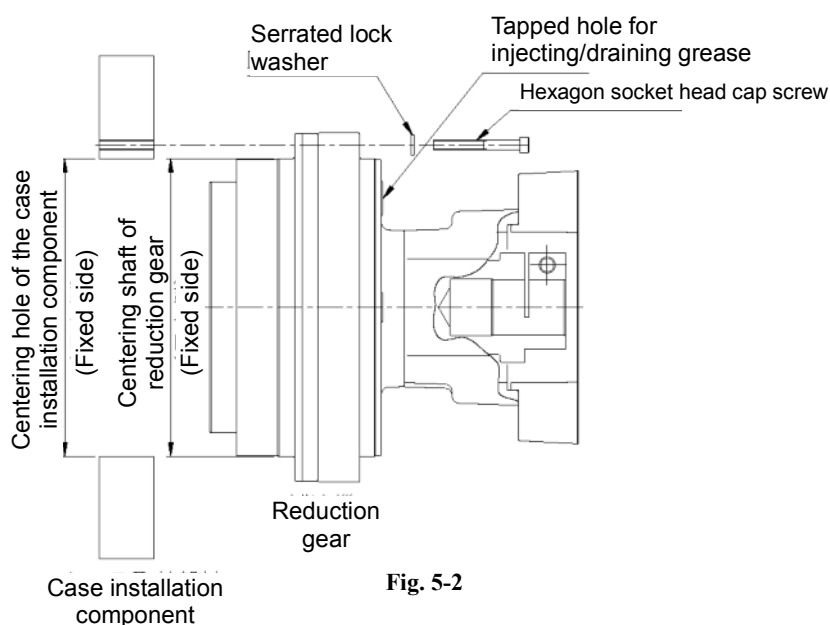
Perform steps 1 to 4 by taking care regarding the following precautions.

- Step 1**
- Align the mounting holes of the reduction gear with the positions of the tapped holes for the case installation component, and then attach the reduction gear to the specified position.
  - When the reduction gear is to be installed in the horizontal shaft position, install the reduction gear so that the tapped hole for injecting/draining grease is located at the top.
  - Confirm that the centering shaft of the reduction gear is correctly fitted into the centering hole of the case installation component.
  - Check that there is no foreign matter adhering to the mounting surface.

**Note**

- If there is foreign matter adhering to the mounting surface, the mounting surface of the reduction gear may be deformed, which could cause deterioration of performance, such as abnormal noise and torque irregularity and durability.

- Step 2**
- Insert the hexagon socket head cap screw into the Belleville spring washer for the hexagon socket head cap screw.  
(Reference: Fig. 4-2 in “4.2.3. Serrated lock washer for hexagon socket head cap screw”)
- Step 3**
- Tighten the hexagon socket head cap screws equally with the specified bolt tightening torque.  
(Reference: Table 5-1 in “5.1.1. Bolt tightening torque”)

**Fig. 5-2****CAUTION**

- If the hexagon socket head cap screw is not tightened with the specified torque, the reduction gear does not deliver the designed performance. In addition, it could cause injury and damage to the customer's device and the reduction gear.

- Step 4**
- Attach the shaft installation component to the reduction gear.
  - Confirm that the centering shaft of the reduction gear is correctly fitted into the centering hole of the shaft installation component.
  - Check that there is no foreign matter adhering to the mounting surface.
  - Using the reduction gear mounting bolt and serrated lock washer for hexagon socket head cap screw, fix the shaft installation component to the reduction gear. (Reference: Fig. 4-2 in “4.2.3. Serrated lock washer for hexagon socket head cap screw”)
  - Be sure to tighten the hexagon socket head cap screws with the specified tightening torque. (Reference: Table 5-1 in “5.1.1 Bolt tightening torque”)

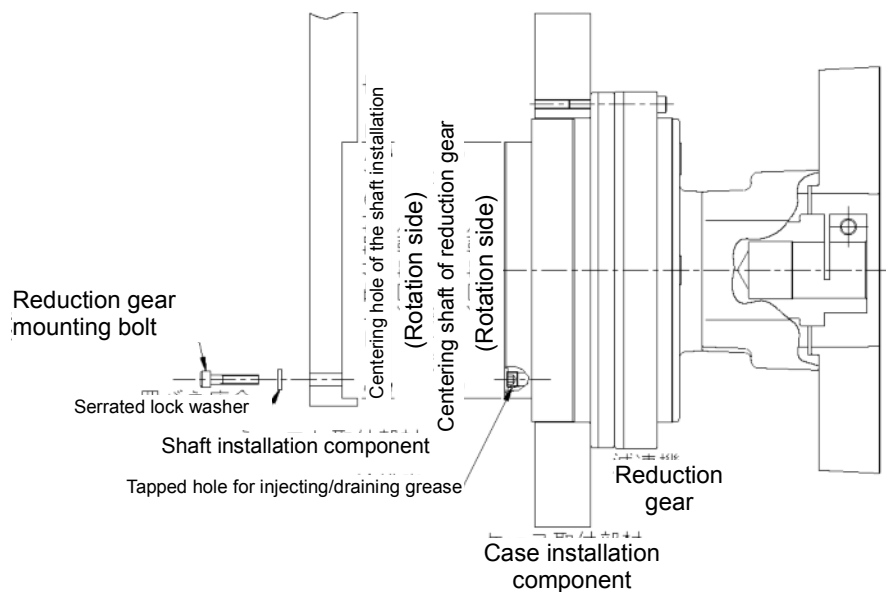


Fig. 5-3

### CAUTION

- If the hexagon socket head cap screws are not tightened with the specified torque, the reduction gear does not deliver the designed performance. In addition, it could cause injury and damage to the customer's device and the reduction gear.

### Note

- If there is foreign matter adhering to the mounting surface, the mounting surface of the reduction gear may be deformed, which could cause deterioration of performance, such as abnormal noise and torque irregularity and durability.
- When installing the shaft installation component, take extra care not to cover the tapped holes for injecting/draining grease. If the tapped holes are capped, it will be difficult to replace the lubricant.

**(2) When the product cannot be installed with the motor flange already mounted**

Perform steps 1 to 5 by taking care regarding the following precautions.

- Step 1**
- Loosen the four hexagon socket head cap screws securing the motor flange, remove the motor flange from the reduction gear, and then remove the liquid sealant.
  - As the hexagon socket head cap screws will be reused when assembling, store them in a safe place.

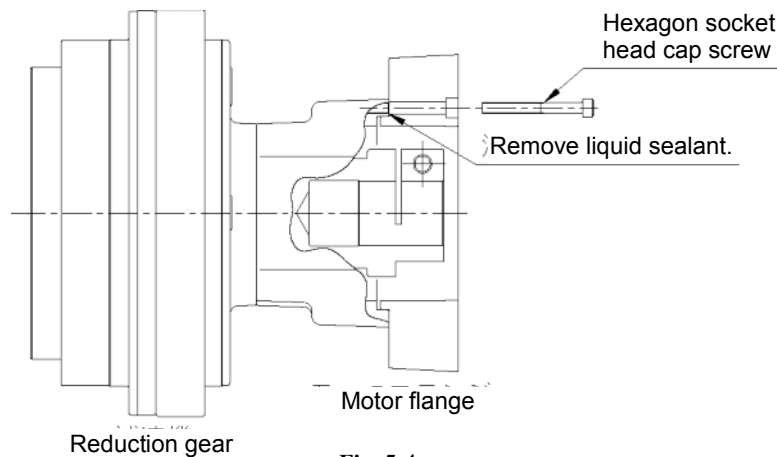


Fig. 5-4

**Note**

- A liquid sealant is applied to the area between the motor flange and reduction gear main unit (input unit).  
Due to the effect of the liquid sealant, it may not be possible to remove the motor flange easily only by removing the screws. In such a case, make a cut in the bonded surface using a cutter knife, etc., while taking care not to scratch the coating. Then, lightly tap the motor flange using a tool such as a plastic hammer, and then remove the motor flange from the reduction gear main unit. Applying excessive load could damage the reduction gear or motor flange.

- Step 2**
- With the motor flange removed, incorporate the reduction gear into the customer's equipment according to steps 1 to 3 in "(1) When the product can be installed as is".

- Step 3**
- Wipe off the grease adhering to the mounting surface of the motor flange and the reduction gear, and then apply a liquid sealant onto this surface. (Reference: Table 4-4 in "4.2.4. Liquid sealant")

- Take extra care so that the liquid sealant will not leak into the reduction gear.
- Take extra care so that the liquid sealant will not leak into the mounting bolt section.
- For the detailed coating procedure, follow the instructions given by the manufacturer of the sealant to be used.

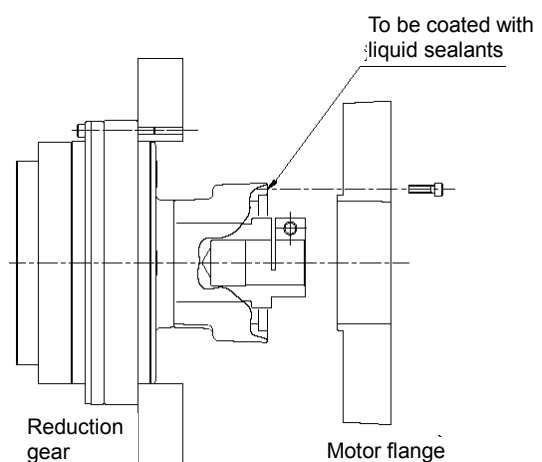


Fig. 5-5

**Note**

- If the leaking liquid sealant is mixed into the reduction gear, it could cause deterioration of performance, such as abnormal noise, vibration, and torque irregularity. Also, if the liquid sealant adheres to the lip of the oil seal, it could cause leakage of the lubricant.
- If it leaks into the mounting bolt section, it could deteriorate the bolt tightening force, and eventually result in deterioration of the transmission torque.

- Step 4**
- Align the mating part of the motor flange with that of the reduction gear. Then, closely attach the motor flange to the reduction gear while adjusting the position of the motor flange fixing hole.
  - Confirm that the centering shaft of the motor flange is correctly fitted into the centering hole of the reduction gear.
  - Check that there is no foreign matter adhering to the mounting surface.
  - Make sure that the matching surface of the motor flange and the matching surface of the reduction gear are in close contact. If either of them is tilting or there is a gap, remove the motor flange and perform step 4 again.
  - Using the hexagon socket head cap screws, fix the motor flange and reduction gear.
  - Use the stored hexagon socket head cap screws, which have been removed in step 1.
  - Be sure to tighten the hexagon socket head cap screws with the specified tightening torque.  
(Reference: Table 5-2 in “5.1.2 Bolt tightening torque”)

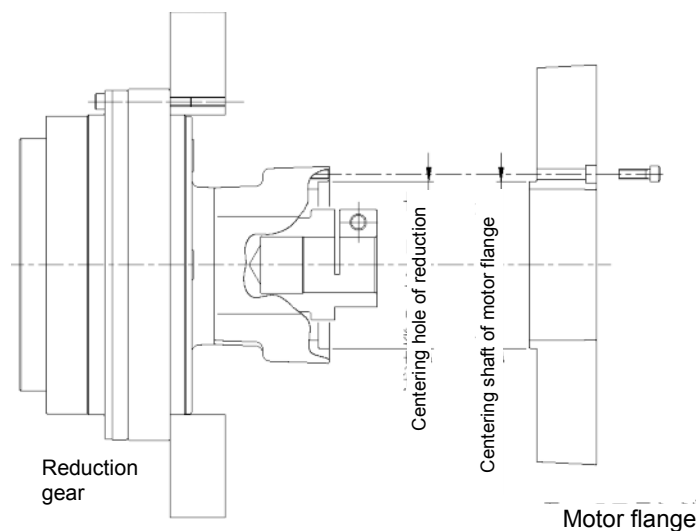


Fig. 5-6

**CAUTION**

- If the hexagon socket head cap screw is not tightened with the specified torque, the reduction gear does not deliver the designed performance. In addition, it could cause injury and damage to the customer's device and the reduction gear.

### Note

- If there is foreign matter adhering to the mounting surface, the mounting surface of the reduction gear may be deformed, which could cause deterioration of performance, such as abnormal noise and torque irregularity and durability.

- Step 5** • Incorporate the reduction gear into the customer's equipment according to step 4 in "(1) When the product can be installed as is".

## 5.2.2. Installing the servomotor, pulley, and reduction gear

This section describes the procedures for installing the servomotor and reduction gear (input side) for the straight and right angle input units and installing the pulley and reduction gear (input side) for the pulley input unit, and the installation direction for the hollow shaft series.

### (1) For the straight input type and right angle input type

Perform steps 1 to 7 by taking care regarding the following precautions.

- Step 1**
- Wipe the outside of the servomotor shaft and the clamping surface inside the coupling with a clean cloth.  
(Check that the clamping bolt is not tightened.)
  - When using a bushing, wipe the inside and outside of the bushing using a clean cloth.
  - Before installation, check that there are no scratches on the inside of the coupling, bushing, and motor shaft that could interfere with installation.
  - Make sure that there is no foreign material or oil on the outside of the servomotor shaft, the clamping surface of the coupling, or the inside and outside of the bushing.
- Step 2**
- Align the clamping bolt of the coupling with the motor flange hole.
  - When inserting the bushing, align the slit of the bushing and the slit of the coupling. (See Fig. 5-7 for the positional relationship between the bushing and coupling.)
  - When using the bushing with a V groove on the circumference, orient the V groove toward the reduction gear side and then insert the bushing.

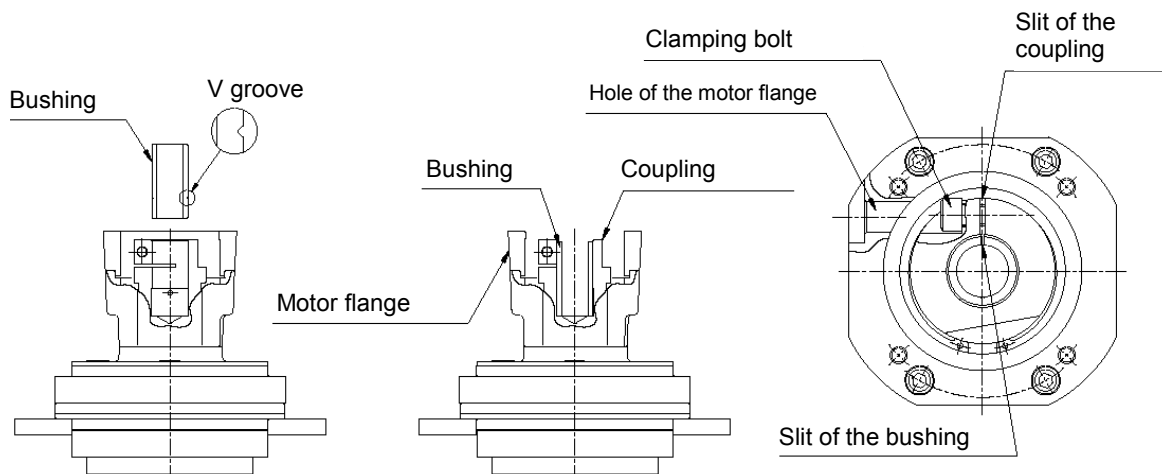


Fig. 5-7



**Important**

- If the slits of the bushing and coupling are not aligned, proper tightening force cannot be achieved.
- When using the bushing with a V groove on the circumference, orient the V groove toward the reduction gear side. If the direction is not correct, proper tightening force cannot be achieved.

- Step 3**
- If necessary, wipe off the grease adhering to the mounting surface of the motor flange and the servomotor, and then apply a liquid sealant onto this surface.

(Reference: Table 4-4 in “4.2.4 Liquid sealant”)

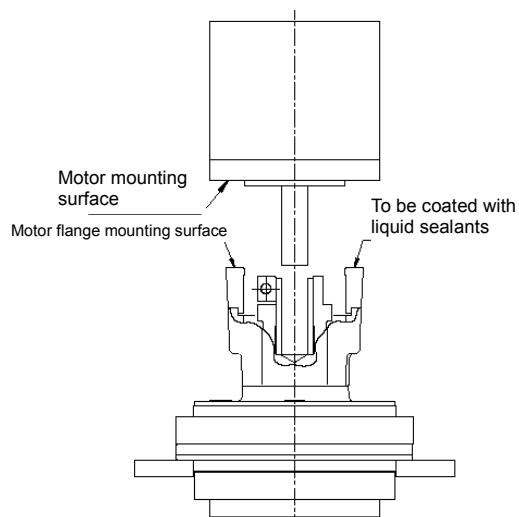


Fig. 5-8

- Step 4**
- Align the motor shaft with the inside of the coupling or the bushing and insert the servomotor in a straight line. Confirm that the mating part of the motor is aligned with the mating part of the motor flange when inserting the servomotor.
  - If the motor shaft has a keyway, set the motor so that the keyway of the motor shaft is positioned on the opposite side of the slit of the coupling (see Fig. 5-9) and then insert the motor.

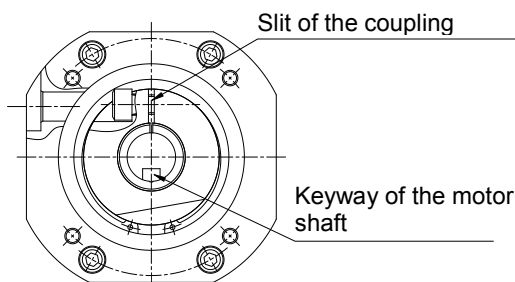


Fig. 5-9

**Important**

- If the keyway of the servomotor and the slit of the coupling are not positioned as specified in this manual, proper tightening force cannot be achieved.

- Step 5**
- Make sure that the mounting surfaces of the servomotor and motor flange are in close contact. If either of the surfaces is tilting or there is a gap, remove the servomotor and repeat Step 4.
  - Fix the servomotor to the motor flange with bolts.
  - Tighten the bolts with the tightening torque specified by the servomotor manufacturer.
  - Confirm that the centering shaft of the servomotor is correctly fitted into the centering hole of the motor flange.
  - Check that there is no foreign matter adhering to the mounting surface.
  - Do not forcibly press down on the motor.

**Note**

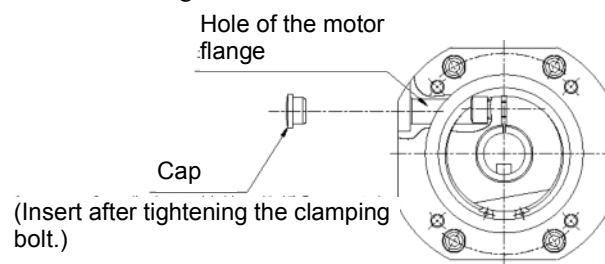
- If there is foreign matter adhering to the mounting surface, appropriate installation accuracy cannot be obtained. It could cause deterioration of performance, such as abnormal noise and vibration, and also lead to premature damage of the motor.
- Forcibly pressing to insert the servomotor could cause damage to the servomotor or reduction gear.

- Step 6**
- Using the bolt provided at the time of shipping, tighten the clamping bolt of the coupling with the specified bolt tightening torque. (Reference: Table 5-3 in “5.1.3. Tightening torque”)

**Note**

- After step 5 is completed, perform step 6. If the sequence is wrong, the servomotor or the reduction gear could be damaged.

- Step 7** Insert the cap into the hole of the motor flange.



**Fig. 5-10**

## (2) For the pulley input type

Install the pulley using the keyway on the input shaft of the reduction gear and the tap hole on the tip.

### Note

- Design the pulley so that the moment load applied to the tip of the input shaft is less than the allowable moment. If a moment load that is more than the allowable moment is applied to the input shaft of the reduction gear, it could cause damage to the reduction gear or customer's equipment.

Note: See our catalog for the calculation methods of the moment load.

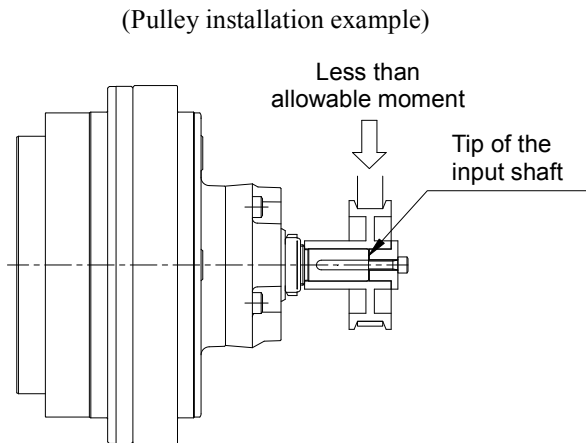


Fig. 5-11

## Allowable moment load

Table 5-4

Model code	Ratio code	Rated moment (Nm)	Allowable moment (Nm)
RDP-020E	081	38	38
RDP-040E	057	78	122
RDP-080E	081		133
RDP-160E	066	158	295
RDP-320E	081		417
RDP-010C	108	38	38
RDP-027C	100		40
RDP-050C	109	78	90
RDP-100C	101		134
RDP-200C	106	158	230
RDP-320C	157		215

## (3) For the hollow shaft series

When using the hollow shaft series described in “2.1 Name of each section” with the shaft facing up and with a vertical shaft installed (Fig. 5-12), contact our service representative individually. Note: The solid series can be installed as shown in Fig. 5-12.

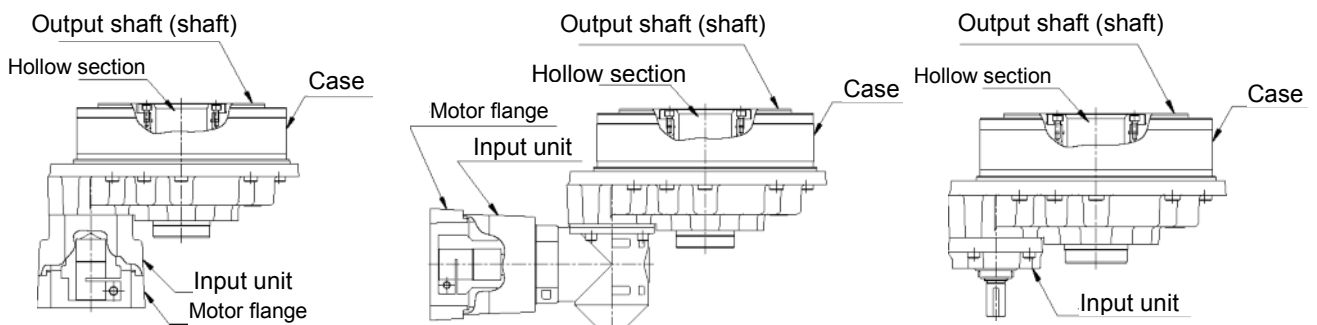


Fig. 5-12

## Chapter 6 Operation

This chapter describes the operation of the product.

### 6.1. Checking before operation

After installing this product in the customer's device, check the following points before starting operation.

- Components are fixed with each other correctly.
- The mounting bolts are tightened securely.
- The rotation section rotates in the desired direction.

### 6.2. Running-in operation

We recommend that the running-in operation is performed.

#### Important

- Abnormal noise or torque irregularity may occur during operation, depending on the characteristics of the lubricant. There is no problem with the quality when the symptom disappears after the running-in operation is performed for 30 minutes or more (until the surface temperature of the reduction gear body reaches around 50°C).
- During the running-in operation, check the items in Table 7-1.

### 6.3. Precautions for operation

Once the pre-operation checks and running-in operation are completed, operate the device safely by observing the following precautions.

#### WARNING

- Keep away from the rotation section during operation of the device or until it is completely stopped. Otherwise, you could be caught by the rotation section, which will result in serious injury.
- If any abnormalities, such as abnormal noise or excessive vibration are found, stop the operation immediately. Do not start the operation before the cause of the error is identified and corrective measures are taken. Incorrect motion could cause injury.

#### CAUTION

- The reduction gear could become extremely hot during operation. After stopping the operation, never touch the reduction gear until it is completely cooled. Touching the reduction gear could cause burns.
- Do not operate the reduction gear under a condition that exceeds the allowable acceleration/deceleration torque, allowable moment, and allowable output speed. It could cause injury to the workers or damage to the reduction gear.

#### Note

- Operate the reduction gear while the surface temperature is below 60°C. Failure to do so could cause premature damage. When the reduction gear is used with the surface temperature within 40 to 60°C, refer to "7.4.1 Replacement period of lubricant".

## ● Output speed

Set the maximum output speed and maximum operating speed for the servomotor as follows.

Servomotor maximum output speed (maximum operating speed) / Actual reduction ratio  $\leq$  Reduction gear maximum allowable output speed

### Solid series

Table 6-1

Model code	Actual reduction ratio	Rated output speed (rpm)	Maximum allowable output speed		
			Straight input (rpm)	Right angle input (rpm)	Pulley input (rpm)
RD□-006E	31	30	100	100	-
	43		81	81	-
	53.5		65	65	-
	79		44	44	-
	103		34	34	-
RD□-020E	41	15	75	75	-
	57		61	61	-
	81		43	43	43
	105		33	33	-
	121		29	29	-
	161		22	22	-
RD□-040E	41	15	70	70	-
	57		53	53	53
	81		37	37	-
	105		29	29	-
	121		25	25	-
	153		20	20	-
RD□-080E	41	15	70	70	-
	57		53	53	-
	81		37	37	37
	101		30	30	-
	121		25	25	-
	153		20	20	-
RD□-160E	66	15	30	30	30
	81		25	25	-
	101		20	20	-
	121		17	17	-
	145		14	14	-
	171		12	12	-
RD□-320E	66	15	30	30	-
	81		25	25	25
	101		20	20	-
	121		17	17	-
	141		14	14	-
	185		11	11	-

Note: The allowable speed may be limited by heat depending on the operating rate.

## Hollow shaft series

Table 6-2

Model code	Actual reduction ratio	Rated Output Speed (rpm)	Maximum allowable output speed		
			Straight Input (rpm)	Right angle input (rpm)	Pulley input (rpm)
RD□-010C	81	15	43	43	-
	108		32	32	32
	153		23	23	-
	189		19	19	-
	243		14	14	-
RD□-027C	99.82	15	35	35	35
	141.68		25	25	-
	184		19	19	-
	233.45		15	15	-
RD□-050C	109	15	28	28	28
	152.6		20	20	-
	196.2		15	15	-
	239.8		13	13	-
RD□-100C	100.5	15	30	30	30
	150		20	20	-
	210		14	14	-
	258		12	12	-
RD□-200C	105.83	15	19	19	19
	155.96		13	13	-
	206.09		10	10	-
	245.08		8	8	-
RD□-320C	115	15	17	17	-
	157		13	13	13
	207		10	10	-
	253		8	8	-

Note: The allowable speed may be limited by heat depending on the operating rate.

## Chapter 7 Maintenance and Inspection

This chapter describes how to perform maintenance and inspection.

### 7.1. Precautions on maintenance



- Keep away from the rotation section during maintenance/inspection of the device currently in operation. Otherwise, you could be caught by the rotation section, which will result in serious injury.
- If any abnormalities, such as abnormal noise or excessive vibration are found, stop the operation immediately. Do not start the operation before the cause of the error is identified and corrective measures are taken. Incorrect motion could cause injury.



- The reduction gear could become extremely hot during operation. After stopping the operation, never touch the reduction gear until it is completely cooled. Touching the reduction gear could cause burns.

When performing maintenance, observe the following precautions and ensure safety.

- Wear appropriate clothing and protective gear, including the protective goggles, gloves, and safety shoes.
- Organize the surrounding area and ensure safety to prevent secondary accidents.
- To maintain the condition in which the device is completely stopped, turn OFF the power to the customer's device and take extra care so that the power will not be turned ON by accident.

### 7.2. Daily inspection

Check the following items every day before starting the operation.

**Table 7-1**

Inspection item	Description
Noise	Check for abnormal noise or sudden change of noise.
Vibration	Check for excessive vibration or any sudden change.*
Surface temperature	Check for an excessively hot surface of the reduction gear (normally below 60°C) or any sudden change.
Bolts	Check for looseness of each mounting bolt.
Leakage of lubricant	Check for leakage of lubricant from the mating face or oil seal section in the vicinity of the reduction gear.

\* Check for vibration remotely in a distance from the rotation section such as connection components.



- If it is necessary to access the device for inspection while the device is in operation, cover the rotation section. Otherwise, you could be caught by the rotation section, which will result in serious injury.

### 7.3. Precautions when handling the lubricant

This section describes the precautions when handling lubricants.



- Before handling the lubricant, read the precautions described on the container of the lubricant and use it correctly. Improper use could impair your health.
- Wear protective goggles to protect your eyes from the lubricant. If it gets into your eyes, it could cause inflammation.
- Wear rubber gloves to protect your skin from the lubricant. If it touches your skin, it could cause inflammation.
- Do not eat or put the lubricant into your mouth. If it gets into your mouth, it could cause diarrhea or vomiting.

#### Important

- If anything is unclear, refer to the Safety Data Sheet. If it is not available, contact our service representative.

#### Emergency remedy

- If the lubricant gets into your eyes, rinse your eyes with clean water for 15 minutes and consult a physician.
- If the lubricant contacts the skin, wipe it off completely and thoroughly rinse the affected area with water and soap.
- If the lubricant is inhaled, move to a fresh air location and cover your body with a blanket to keep yourself warm and calm. Then, consult a physician.
- If the lubricant is swallowed, do not force yourself to vomit and consult a physician.

#### Disposal of waste grease and container

- It is required by law to dispose of the grease and container in the specified manner. Dispose of the grease and container appropriately according to the law.
- If anything is unclear, check the disposal precautions described in the Safety Data Sheet or contact our service representative.


#### Storage

- To prevent particles and moisture from being mixed into the container, seal it tightly.
- Keep it away from the direct sunlight, fire, and heat sources, and store it in a cool and dark place.



## 7.4. Lubricant replacement

### 7.4.1. Lubricant replacement time

When this product is operated filled with an appropriate amount of lubricant, the standard lubricant replacement time due to lubricant degradation is 20,000 hours. However, when operation involves a reduction gear surface temperature above 40°C (the  area in the right diagram), the state of the lubricant should be checked in advance and the grease replaced earlier as necessary. For the lubricants specified by Nabtesco, refer to “2.3. Lubricant”.

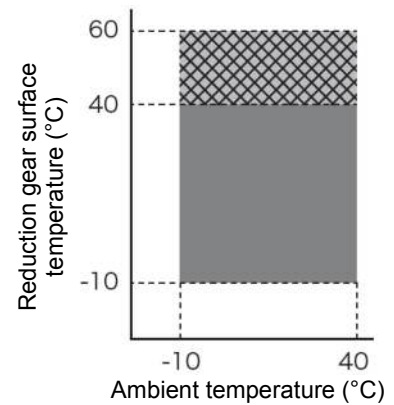


Fig. 7-1

### 7.4.2. Preparation

- Lubricant  
Prepare as much VIGOGREASE RE0 as needed according to the model and number of units. (Reference: Table 7-2 and Table 7-3 in “Amount of specified lubricant”)
- Seal tape
- Tightening tool  
Prepare a tightening tool based on Table 7-4.

#### Amount of specified lubricant/Solid series

Table 7-2

Model code	Weight (g)			
	Straight input type	Right angle input type		Pulley input type
		Main unit section	Right angle input section	
RD□-006E	141	167	23	-
RD□-020E	219	229	23	243
RD□-040E	358	390	51	371
RD□-080E	492	498	51	507
RD□-160E	1042	1188	581	1113
RD□-320E	1770	1961	581	1859

#### Amount of specified lubricant/Hollow shaft series

Table 7-3

Model code	Weight (g)			
	Straight input type	Right angle input type		Pulley input type
		Main unit section	Right angle input section	
RD□-010C	262	288	23	263
RD□-027C	443	469	23	446
RD□-050C	726	760	51	743
RD□-100C	938	968	51	950
RD□-200C	2294	2432	581	2359
RD□-320C	4563	4705	581	4647

### Plug size and tightening torque

Table 7-4

Frame number	Tapped hole "A" for injecting/draining grease	Tapped hole "B" for injecting/draining grease	Tapped hole "C" for injecting/draining grease	Tapped hole "D" for injecting/draining grease
006E	Hexagon socket head cap screw M6 seal washer tightening torque 12.1±0.61 (Nm)	Hexagon socket head cap plug GM-1/8 Tightening torque 12.3±2.45 (Nm)	Hexagon socket head cap plug GM-1/8 Tightening torque 8.0±1.0 (Nm)	Hexagon socket flange head screw plug GFO-M14 Tightening torque 39.2±1.96 (Nm)
020E				
010C				
027C				
040E				
080E	Hexagon socket head cap plug GM-1/8 Tightening torque 12.3±2.45 (Nm)		Hexagon socket head cap plug GM-1/8 Tightening torque 12.3±2.45 (Nm)	Hexagon socket flange head screw plug GFO-M18 Tightening torque 78.4±3.92 (Nm)
050C				
100C				
160E				
320E				
200C				
320C				

#### 7.4.3. Lubricant replacement procedure

This section describes how to replace lubricants.

The replacement procedure is different for the straight and pulley input type and the right angle input type.

Replace the lubricant correctly according to the following procedure.

- When handling the lubricant, be sure to wear protective goggles and rubber gloves.



- When replacing the lubricant, turn OFF the power source (e.g., power supply) and execute lock-out/tag-out so that the power will not be turned ON by accident. Otherwise, you could be caught by the rotation section, which will result in injury.



- If the lubricant gets in your eyes or touches your skin, it could cause inflammation.
- When the safety cover near the reduction gear has been removed for replacement/maintenance of lubricant, be sure to return them to their original positions after the procedure.

#### Note

- If the lubricant is overfilled, there is a possibility of high internal pressure and that an oil seal could fall off, the lip could be reversed, or lubricant could leak. If the lubricant is insufficient, a lubrication failure could occur and the reduction gear could be damaged.
- If the lubricant is not filled sufficiently, it could lead to premature damage of the reduction gear.

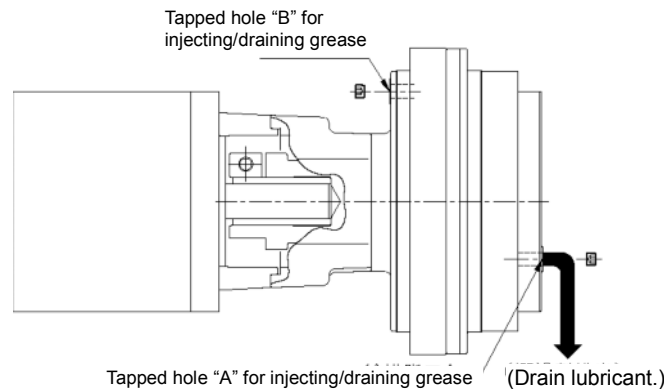
- **For the straight and pulley input type**

Perform steps 1 to 12 by taking care regarding the following precautions.

- Step 1**
- Rotate and position the output shaft of the reduction gear so that the tapped holes for injecting/draining grease are located diagonally.  
(Do not approach the device and reduction gear when power is being supplied to rotate and position the output shaft. Perform step 2 first when rotating the output shaft without using the power.)
- Step 2**
- Turn OFF the power to the device and confirm that the device is completely stopped.
- Step 3**
- Remove the hexagon socket head cap plugs and other parts for the tapped holes for injecting/draining grease, and drain the lubricant from the lower tapped hole for injecting/draining grease.  
Check the amount of drained lubricant by catching it with a container, etc., in order to control the same amount of lubricant to be drained and filled.  
Always drain the lubricant while the reduction gear is cool.

**CAUTION**

- If a tapped hole for injecting/draining grease is unplugged while the reduction gear is still hot, high-temperature lubricant sprays out, which could cause burns.



**Fig. 7-2**

- Step 4**
- Attach a grease nipple, etc. to the lower tapped hole for injecting/draining grease and then attach the injector.
- Step 5**
- Using the injector or the like, fill the lubricant through the lower tapped hole for injecting/draining grease on the supply side.
  - When filling the lubricant, be sure to remove the plug for the tapped hole “B” for injecting/draining grease on the drain side.
  - When pneumatic pressure is used for filling the lubricant, set the pressure below 0.03 MPa.

**Note**

- If you fail to remove the plug for tapped hole for injecting/draining grease on the drain side, the internal pressure increases. As a result, oil seals could fall off or the oil seal lip could be reversed.
- If the internal pressure of the reduction gear increases, oil seals could fall off or lubricant could leak.

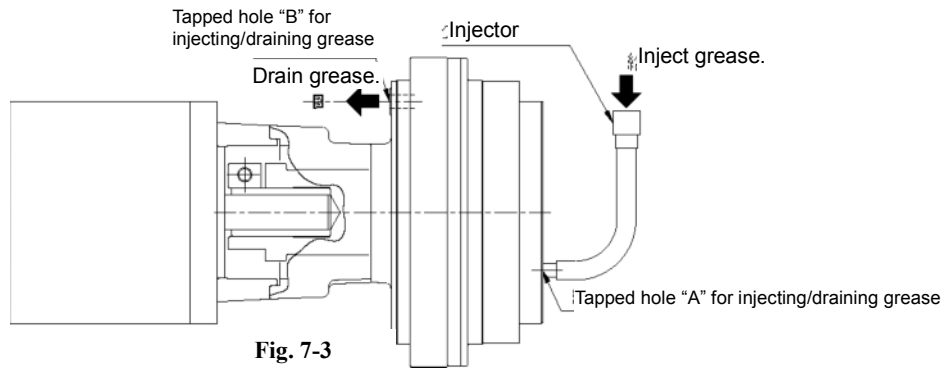


Fig. 7-3

- Step 6** • Inject the lubricant until it overflows from the upper tapped hole for injecting/draining grease on the drain side.
- Step 7** • Remove the injector from the grease nipple and plug the tapped holes “A” and “B” for injecting/draining grease on both the greasing and drain sides.
- Step 8** • Rotate the output shaft of the reduction gear by 1 or 2 turns.

### WARNING

- Do not use the motor to rotate the output shaft of the reduction gear for safety, if possible. If the motor is used by necessity, run the motor at a low speed and never touch the rotation section. Otherwise, you could be caught by the rotation section, which will result in serious injury.

- Step 9** • Repeat steps 5 to 8 if the amount of injected lubricant does not reach the amount of drained lubricant.
- Step 10** • It is recommended that the inside of the reduction gear is flushed so that the lubricant can be replaced more efficiently.
- When flushing the inside of the reduction gear, remove the injector from the tapped hole “A” on the supply side, and attach a hexagon socket head cap plug to the tapped hole “A” on the drain side. (Reference: Table 7-4 “Plug size and tightening torque”)
  - Calculate the output shaft conversion and set the servomotor rotation speed so that the output shaft rotation speed is 5 to 10 rpm. Then, rotate the motor for about one minute.
  - Perform steps 1 to 9 again.

### Important

- Set the rotation speed based on the output shaft conversion by taking the customer’s operation conditions into account.

- Step 11** • Attach the hexagon socket head cap plugs and other parts removed in step 3 above to the tapped holes “A” and “B” for injecting/draining grease with the specified tightening torque. (Reference: Table 7-4 “Plug size and tightening torque”)  
Replace with new seal tape.
- If the customer’s component is flush with the tapped holes “A” and “B” for injecting/draining grease, tighten it so that the plugs will not protrude from the edge surface.
- Step 12** • Wipe off the lubricant adhering to the surrounding completely.

### ● For the right angle input type

Perform steps 1 to 9 by taking care regarding the following precautions.

- The reduction gear main unit is separated from the right angle input unit internally. Fill the lubricant into the reduction gear main unit using the tapped holes “A” and “B” for injecting/draining grease and into the right angle input unit using the tapped holes “C” and “D” for injecting/draining grease.

**Step 1** • Rotate and position the output shaft of the reduction gear so that the tapped holes “A” and “B” for injecting/draining grease are located diagonally.  
(When rotating the output shaft using electric power, do not approach the equipment and reduction gear. When rotating the output shaft without using electric power, perform step 2 first.)

**Step 2** • Turn OFF the power to the device and confirm that the device is completely stopped.

**Step 3** • Remove both of the hexagon socket head cap plugs and other parts from the tapped holes for injecting/draining grease, and drain the lubricant from the lower tapped hole for injecting/draining grease.

- Check the amount of drained lubricant by catching it with a container, etc., in order to control the same amount of lubricant to be drained and filled.
- Always drain the lubricant while the reduction gear is cool.

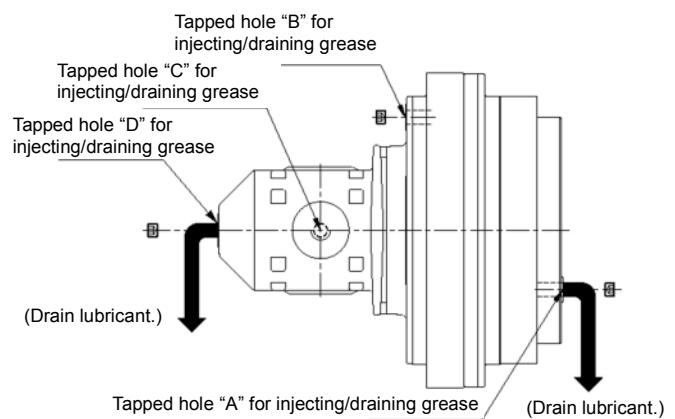


Fig. 7-4



- If a tapped hole for injecting/draining grease is unplugged while the reduction gear is still hot, high-temperature lubricant sprays out, which could cause burns.

**Step 4** • Attach grease nipples, etc. and injectors to the tapped hole “A” or “B” that is located at the lower side, and to the tapped holes “C” or “D” that is located at the lower side.

**Step 5** • For the straight input type and pulley input type, refer to steps 5 to 11 and fill the reduction gear main unit with new lubricant.

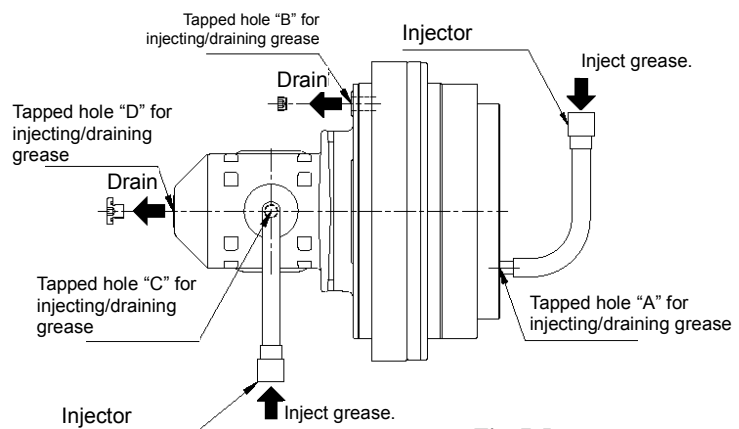


Fig. 7-5

- Step 6**
- Attach the plugs and parts removed in step 3 above to the tapped holes for injecting/draining grease “A” and “B” with the specified tightening torque.  
(Reference: Table 7-4 “Plug size and tightening torque”)  
Replace with new seal tape.
  - If the customer’s component is flush with the tapped holes for injecting/draining grease, tighten it so that the plugs will not protrude from the edge surface.
- Step 7**
- Refer to steps 5 to 11 of “For the straight input type and pulley input type” and fill the right angle input unit with new lubricant.
- Step 8**
- Attach the plugs and parts removed in step 3 above to the tapped holes for injecting/draining grease “C” and “D” with the specified tightening torque. (Reference: Table 7-4 “Plug size and tightening torque”) Replace with new seal tape.
  - If the customer’s component is flush with the tapped holes for injecting/draining grease, tighten it so that the plugs will not protrude from the edge surface.
- Step 9**
- Wipe off the lubricant adhering to the surrounding completely.

## 7.5. Troubleshooting checksheet

Check the following items in the case of trouble like abnormal noise, vibration, or malfunctions. When it is not possible to resolve an abnormality even after verifying the corresponding checkpoint, obtain a “Reduction Gear Investigation Request Sheet” from our Website, fill in the necessary information, and contact us via the agent where you bought the device.

<http://precision.nabtesco.com/documents/request.html>

### ● The trouble started immediately after installation of the reduction gear

Check column	Item
	Make sure the equipment’s drive section (the motor side or the reduction gear output surface side) is not interfering with another component.
	Make sure the equipment is not under a greater than expected load (torque, moment load, thrust load).
	Make sure the required number of bolts are tightened uniformly with the specified tightening torque.
	Make sure the reduction gear, motor, or your company’s components are not installed at a slant.
	Make sure the specified amount of Nabtesco-specified lubricant has been added.
	Make sure there are no problems with the motor’s parameter settings.
	Make sure there are no components resonating in unity.
	Make sure the motor is appropriately installed on the input unit.
	Make sure the flange and other components are designed and manufactured with the correct tolerances.

### ● The trouble started during operation

Check column	Item
	Make sure the equipment has not been in operation longer than the calculated service life.
	Make sure the surface temperature of the reduction gear is not higher than normal during operation.
	Make sure the operation conditions have not been changed.
	Make sure there are no loose or missing bolts.
	Make sure the equipment is not under a greater than expected load (torque, moment load, thrust load).
	Make sure the equipment’s drive section is not interfering with another component.
	Make sure an oil leak is not causing a drop in the amount of lubricant.
	Make sure there are no external contaminants in the gear, such as moisture or metal powder.
	Make sure no lubricant other than that specified is being used.

When the reduction gear is embedded in the customer’s equipment, create your own troubleshooting checksheet based on the above checkpoints.

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## Contact Information

For any inquiries and requests for services related to this product, contact our service representative using the following contact information.

In such a case, please inform us of the model, parts code, and S/N (serial number) indicated on the shipping label for the packing box.



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