



CYCLO[®] DRIVE

6000 Series

The Available Solution

SHI
Sumitomo Heavy Industries

Maintenance Manual

| Frame Size | |
|------------------|------------------|
| Single Reduction | Double Reduction |
| 6060 | 6060DA |
| ↓ | ↓ |
| 6275 | 6275DA |



<< Notes >>

- Cyclo gearmotors and reducers should be handled, installed, and maintained by trained technicians. Carefully read this maintenance manual before use.
- A copy of this maintenance manual should be sent to the actual user.
- This maintenance manual should be retained by the user for future reference.

POWER TRANSMISSION & CONTROLS GROUP
 **Sumitomo Heavy Industries, Ltd.**

SI unit

No.

CM2001E-1

Safety and Other Precautions


- Carefully read this maintenance manual and all accompanying documents before use (installation, operation, maintenance, inspection, etc.). Thoroughly understand the machine, information about safety, and all precautions for correct operation. Retain this manual for future reference.
- Pay close attention to the "DANGER" and "CAUTION" warnings regarding safety and proper use.



: Improper handling may result in physical damage, serious personal injury and/or death.



: Improper handling may result in physical damage and/or personal injury.

Matters described in  CAUTION may lead to serious danger depending on the situation. Be sure to observe important matters described herein.



DANGER

- Transport, installation, plumbing, wiring, operation, maintenance, and inspections should be performed by trained technicians; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- When using the equipment in conjunction with **an explosion proof motor**, a technician with electrical expertise should supervise the transport, installation, plumbing, wiring, operation, maintenance and inspection of the equipment so as to avoid a potentially hazardous, situation that may result in electrical shock, fire, explosion, personal injury and/or damage to the equipment.
- When the unit is to be used in a system for human transport, a secondary safety device should be installed to minimize chances of accidents resulting in personal injury, death, or damage to the equipment.
- When the unit is to be used for an elevator, install a safety device on the elevator side to prevent it from falling; otherwise, personal injury, death, or damage to the equipment may result.


How to Refer to the Maintenance Manual

•This maintenance manual is common for both Cyclo gearmotor and reducer. The symbols shown below appear in the upper right corner of each page to indicate the classification. Read the applicable pages. On **COMMON** pages, these symbols identify distinctions between gearmotors and reducers.

•Refer to the brake maintenance manual (Cat. No.MM0202E) for the handling of **gearmotors with a brake**.

| Specifications | Common specifications | Gearmotor | Reducer |
|----------------|-----------------------|--|---|
| Symbol | COMMON |  |  |

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1. Inspection Upon Delivery

⚠ CAUTION

- Unpack the unit after verifying that it is positioned right side up; otherwise, injury may result.
- Verify that the unit received is in fact the one you ordered. Installing the wrong unit may result in personal injury or equipment damage.
- Do not remove the rating plate.

Verify the items listed below upon receiving the Cyclo gearmotor or reducer. If a nonconformity or problem is found, contact our nearest agent, distributor, or sales office.

- (1) Does the information on the rating plate conform to what you ordered?
- (2) Was there any part broken during transport?
- (3) Are all bolts and nuts tightened firmly?

1-1) How to Refer to the Rating Plate

There are two types of rating plates, Type I and Type II. Some typical plates are shown below; refer to the proper one.

- When making an inquiry, advise us of 1 the type of gearmotor or reducer, 2 reduction ratio, and 3 serial No.

Gearmotor

(1) Rating Plate Type I : Gearmotor

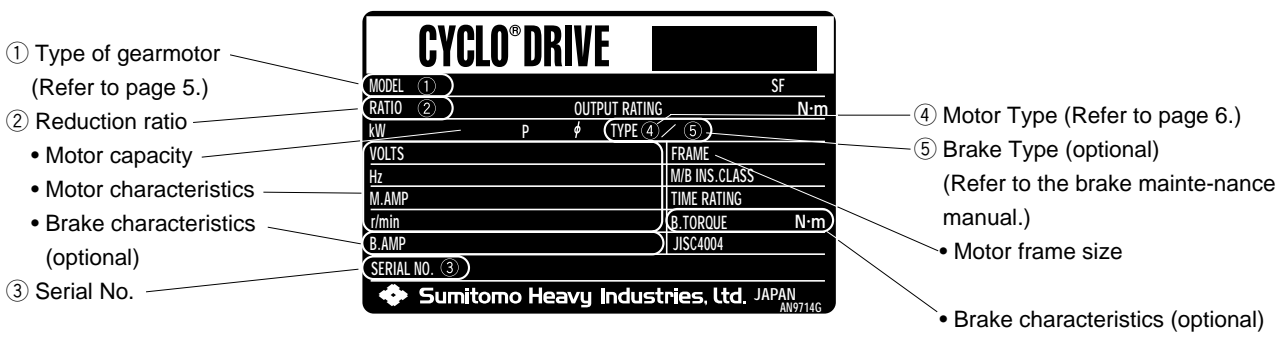


Fig.1 Gearmotor Rating Plate (Type I)

(2) Rating Plate Type II : Reducer with Motor

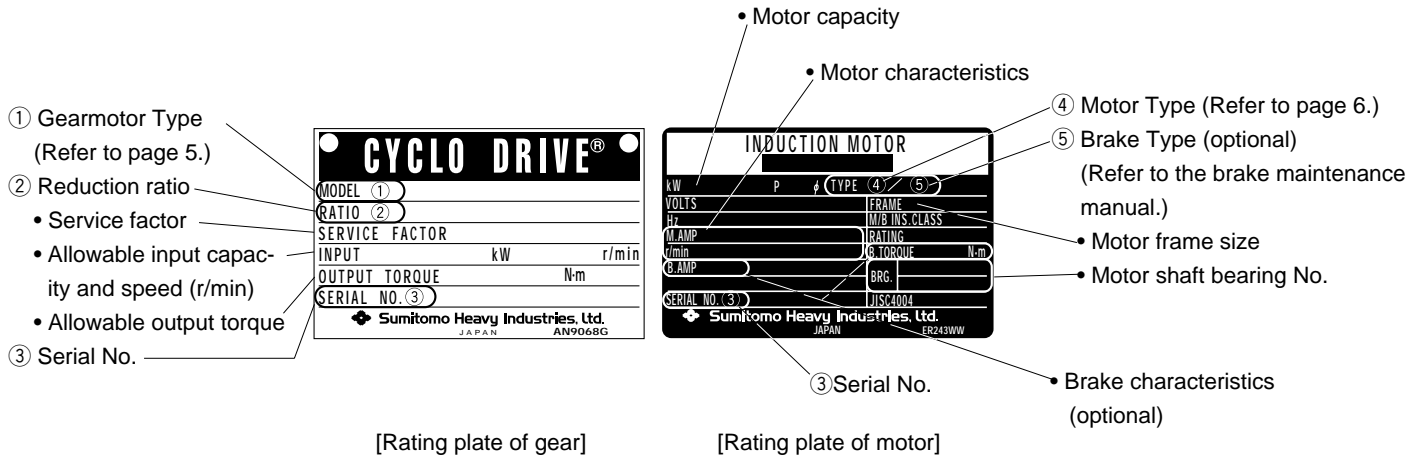


Fig.2 Rating Plates of Reducer with Motor (Type II)

Reducer



(1) Rating Plate Type I

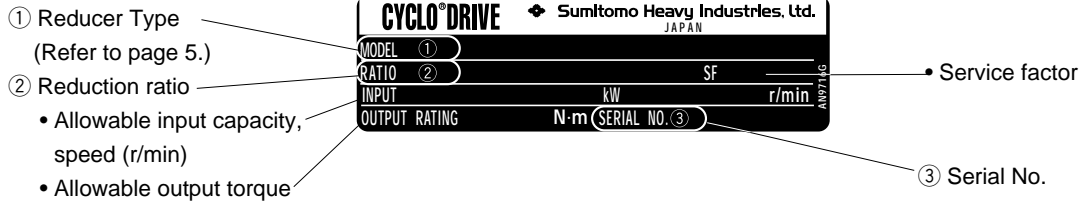


Fig.3 Rating Plate of Reducer (Type I)

(2) Rating Plate Type II

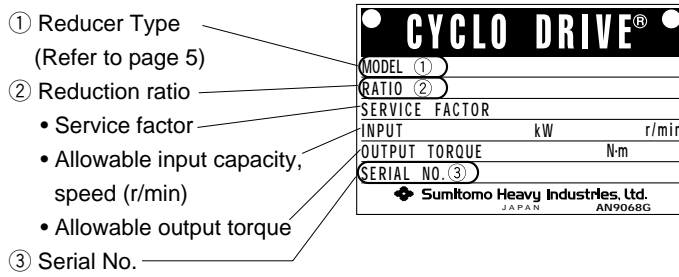


Fig.4 Rating Plate of Reducer (Type II)

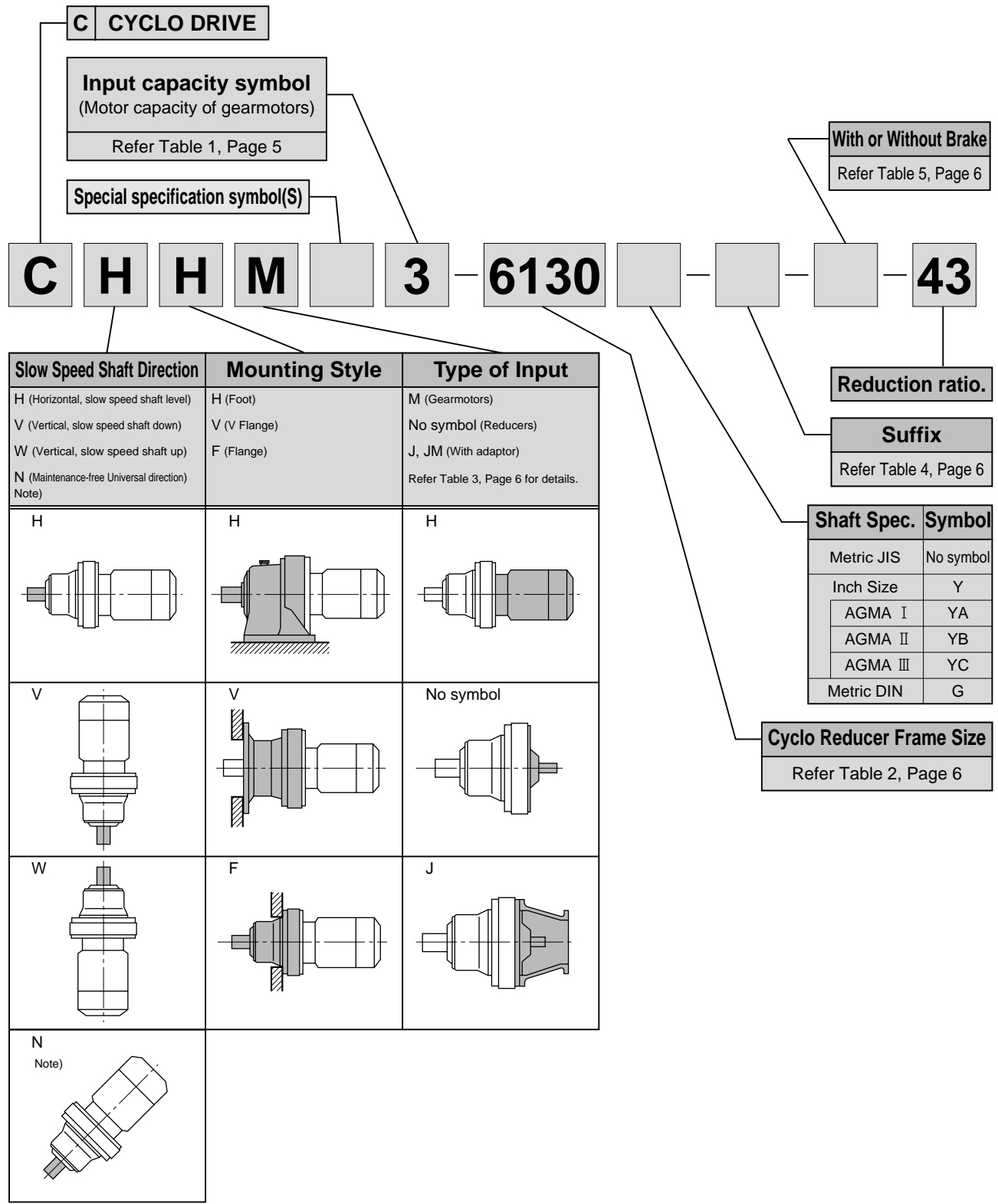
1-2) Lubrication Method **COMMON**

Refer to "8-2. Confirmation of Lubrication Method" on page 17 to confirm the lubrication method.

• **Oil-lubricated** models are shipped without oil. Units must be filled with the proper amount of recommended oil prior to start-up.

1-3) Nomenclature of Gearmotor or Reducer

Respective codes and cyclo nomenclature are shown below. Please verify that the type of gearmotor or reducer you received conforms to what you ordered.



Note: N-Universal Mounting Maintenance-free is for Frame Size up to 6125 (Single stage), 6125DB (Double stage).

Table1 Input Capacity Symbol (Motor capacity in case of gearmotors).

| | | | | | | | | | | | | |
|----|-----------------|----------|----------|-----------|----------|-----------|---------|----------|---------|---------|----------|----------|
| 4P | Capacity symbol | 01 | 02 | 03 | 05 | 08 | 1 | 1H | 2 | 3 | 4 | 5 |
| | kW (HP) | 0.1(1/8) | 0.2(1/4) | 0.25(1/3) | 0.4(1/2) | 0.55(3/4) | 0.75(1) | 1.1(1.5) | 1.5(2) | 2.2(3) | 3.0(4) | 3.7(5) |
| | Capacity symbol | 8 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 75 | 100 |
| | kW (HP) | 5.5(7.5) | 7.5(10) | 11(15) | 15(20) | 18.5(25) | 22(30) | 30(40) | 37(50) | 45(60) | 55(75) | 75(100) |
| 6P | Capacity symbol | 206 | 256 | 306 | 406 | 506 | 606 | 756 | 1006 | 1256 | 1506 | 1756 |
| | kW (HP) | 15(20) | 18.5(25) | 22(30) | 30(40) | 37(50) | 45(60) | 55(75) | 75(100) | 90(125) | 110(150) | 132(175) |

Table 2 Cyclo Reducer Frame Size.

| Single Reduction | Single Reduction | Double Reduction | (Output side+ Input side) | Double Reduction | (Output side+ Input side) | Double Reduction | (Output side+ Input side) |
|------------------|-------------------|------------------|---------------------------|------------------|---------------------------|------------------|---------------------------|
| 6060 | 614H | 6060DA | 6060+6060 | 6140DC | 6140+6105 | 6190DA | 6190+6125 |
| 6065 | 6160 | 6065DA | 6065+6065 | 6145DA | 6145+6075 | 6190DB | 6190+6135 |
| 6070 | 6165 | 6070DA | 6070+6065 | 6145DB | 6145+6095 | 6195DA | 6195+6125 |
| 6075 | 616H | 6075DA | 6075+6065 | 6145DC | 6145+6105 | 6195DB | 6195+6135 |
| 6080 | 6170 | 6090DA | 6090+6075 | 6160DA | 6160+6095 | 6205DA | 6205+6125 |
| 6085 | 6175 | 6095DA | 6095+6075 | 6160DB | 6160+6105 | 6205DB | 6205+6135 |
| 6090 | 6180 | 6100DA | 6100+6075 | 6160DC | 6160+6125 | 6215DA | 6215+6135 |
| 6095 | 6185 | 6105DA | 6105+6075 | 6165DA | 6165+6095 | 6215DB | 6215+6165 |
| 6100 | 6190 | 6120DA | 6120+6075 | 6165DB | 6165+6105 | 6225DA | 6225+6135 |
| 6105 | 6195 | 6120DB | 6120+6095 | 6165DC | 6165+6125 | 6225DB | 6225+6175 |
| 610H | 6205 | 6125DA | 6125+6075 | 6170DA | 6170+6095 | 6235DA | 6235+6165 |
| 6110 | 6215 | 6125DB | 6125+6095 | 6170DB | 6170+6105 | 6235DB | 6235+6185 |
| 6115 | 6225 | 6130DA | 6130+6075 | 6170DC | 6170+6125 | 6245DA | 6245+6165 |
| 6120 | 6235 | 6130DB | 6130+6095 | 6175DA | 6175+6095 | 6245DB | 6245+6185 |
| 6125 | 6245 | 6130DC | 6130+6105 | 6175DB | 6175+6105 | 6255DA | 6255+6175 |
| 612H | 6255 | 6135DA | 6135+6075 | 6175DC | 6175+6125 | 6255DB | 6255+6195 |
| 6130 | 6265 | 6135DB | 6135+6095 | 6180DA | 6180+6105 | 6265DA | 6265+6195 |
| 6135 | 6275 | 6135DC | 6135+6105 | 6180DB | 6180+6135 | 6275DA | 6275+6195 |
| 6140 | | 6140DA | 6140+6075 | 6185DA | 6185+6105 | | |
| 6145 | H type is option. | 6140DB | 6140+6095 | 6185DB | 6185+6135 | | |

Table3 Type of Motor Connection

| Type of Motor Connection | Without Motor | With Motor |
|--------------------------|---------------|------------|
| Integral Motor | | M |
| Free Shaft | - | |
| W/C-Face Adaptor | J | JM |
| W/Quill I/P Adaptor | X | XM |
| Beier | B | BM |
| With Clutch Brake | | CM |
| With Fluid Coupling | | RM |

Table 4 Suffix Designation

| Reducer Specification | Symbol | Motor Specification | Symbol |
|-------------------------------|--------|---------------------|--------|
| Torque Limiter | TL | AF Motor | AV |
| High Cap Brg. | R1 | Servo Motor | SV |
| High Cap. Brg. Ductile Casing | R2 | DC Motor | DV |
| Baseplate | BP | 3-phase Motor | Blank |
| HH Type Ceiling | H1 | Single-phase Motor | SG |
| Modification Left Wall | H2 | | |
| Modification Right Wall | H3 | | |

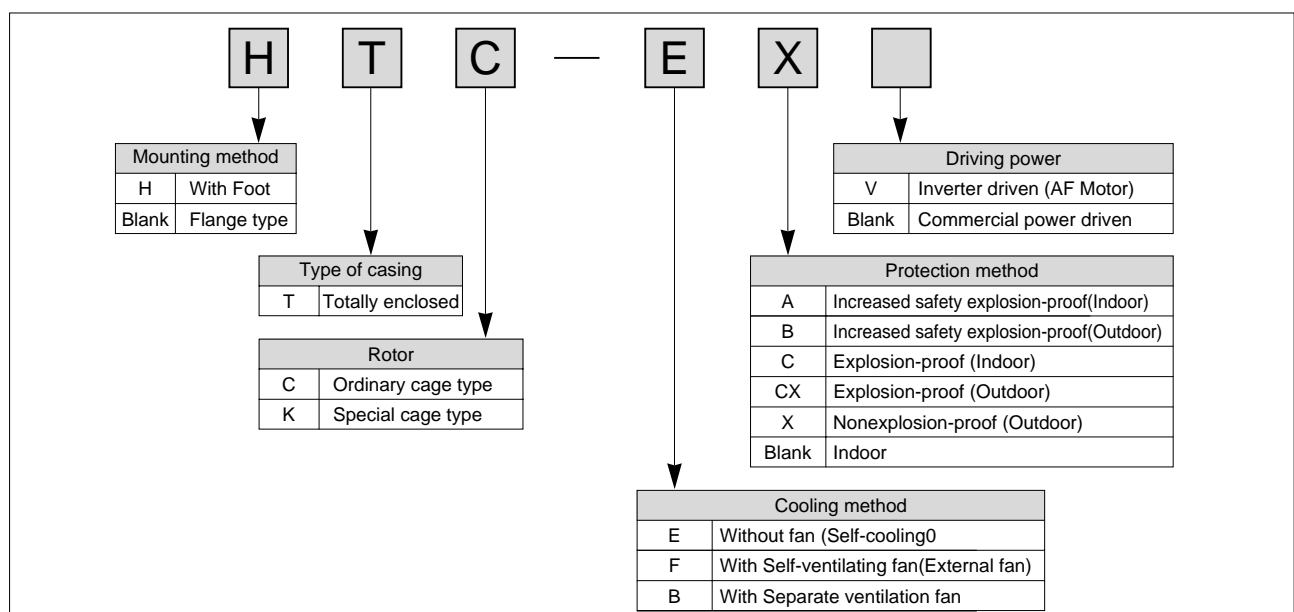
Table5 Brake (Integral Only)

| Brake | Symbol |
|-------|--------|
| NO | |
| YES | B |

1-4) Type of Motor

Respective codes and motor nomenclature are shown below. Please verify that the type of gearmotor you received conforms to what you ordered.

• For Cyclo **with a servo motor**, **DC motor** or **Vector motor**, refer to the respective motor maintenance manual.



2. Storage

When storing Cyclo gearmotors or reducers for any extended period of time, consider the following important points:

2-1) Storage Location

Store the unit in a clean, dry place indoors.

- Avoid storage outdoors or in places with humidity, dust, sudden temperature changes or corrosive gas.

2-2) Storage Period

- (1) Storage period should be less than the "Rust-Proofing period" listed below.
- (2) When the storage period exceeds the standard "rust-proofing period", special rust-proofing is necessary. Contact the factory for details.
- (3) Export models need export rust prevention. Contact the factory for details.
- (4) Standard rust-proofing specification:
 - ① Outside rust-proofing
Before shipment, rust-proofing treatment is administered. Check the effect of rust-proofing, whenever necessary it should be administered.
 - ② Fig Inside rust-proofing

| Lubrication | Grease lubricated models | Oil lubricated models |
|----------------------|--|-----------------------|
| Rust-proofing period | 1 Year | 6 Months (Note ; 1) |
| Storage condition | Generally to be stored inside the shop or warehouse, relatively free of humidity, dust, extreme temperature fluctuation, corrosive gas and similar atmosphere. | |

2-3) Use After Storage

- (1) Oil seals will deteriorate when exposed to high temperatures and UV rays. Inspect the oil seals before operation.
Replace the oil seals after long-term storage if there is any sign of deterioration.
- (2) After starting the Cyclo, Verify that there is no abnormal sound, vibration, or heat rise. If supplied as a brakemotor, check that the brake operates properly. If any anomaly is observed, contact our nearest agent, distributor, or sales office.

3. Transport

DANGER

- Do not stand directly under a unit suspended by a crane or other lifting mechanism; otherwise, injury or death may result.

CAUTION

- Exercise ample care so as not to drop the gearmotor or reducer. When a hanging bolt or hole is provided, be sure to use it. After mounting a Cyclo unit to the equipment, do not hoist the entire machine using the hanging bolt or hole; otherwise, personal injury or damage to the equipment and/or lifting device may result.
- Before hoisting, refer to the rating plate, crate, outline drawing, catalog, etc. for the weight of the Cyclo gearmotor or reducer. Never hoist a unit that exceeds the rating of the crane or other mechanism being used to lift it; otherwise, personal injury or damage to the equipment and/or lifting device may result.

4. Installation

⚠ DANGER

- Do not use a standard unit in an explosive atmosphere (which is likely to be filled with explosive gas or steam). Under such conditions, an explosion-proof motor should be used; otherwise, electric shock, personal injury, explosion fire, or damage to the equipment may result.
- Since the inverter itself is not explosion-proof, install an **inverter-driven, explosion-proof type motor** in a place free from explosive gas; otherwise, electric shock, personal injury, explosion fire, or damage to the equipment may result.

⚠ CAUTION

- Do not use the Cyclo gearmotor or reducer for purposes other than those shown on the rating plate or in the manufacturing specifications; otherwise, electric shock, personal injury, or damage to the equipment may result.
- Do not place flammable objects around the gearmotor; otherwise, fire may result.
- Do not place any object around the gearmotor or reducer that will hinder ventilation. Insufficient ventilation can cause excessive heat build-up that may result in burns or fire.
- Do not step on or hang from the gearmotor or reducer; otherwise injury may result.
- Do not touch the shaft end of the gearmotor or reducer, inside keyways, or the edge of the motor cooling fan with bare hands; otherwise, injury may result.
- When the unit is used in food processing applications vulnerable to oil contamination, install an oil pan or other such device to cope with oil leakage due to breakdown or failure; otherwise, oil leakage may damage products.

4-1) Installation Location

- Ambient temperature : -10°C to +40°C
- Ambient humidity : 85% max.
- Altitude : 1000m max.
- Ambient atmosphere : There should be no corrosive gas, explosive gas, or steam.

The location should be well ventilated without dust.

Installation location : Indoors, with minimum dust and no water splashing.

- Units made to special specifications are necessary for installation under conditions other than the above.
- Units made according to the outdoor, explosion-proof or other specifications can be used under the specified conditions without any problem.
- Install units where inspection, maintenance, and other such operations can be easily carried out.
- Install units on a sufficiently rigid base.

4-2) Installation Angle

Table6 Installation Angle

| | |
|-------------------------|---|
| Grease lubricated model | Free |
| Oil lubricated model | Low speed shaft Horizontal or Vertical (Refer to page 5. Contact us inclined installation.) |

When the unit is made according to your specification for inclined installation, do not install it at any angle other than the specified angle. (The shaft orientation of the standard **outdoor gearmotor** is horizontal. Contact us for other shaft orientations.)

- Do not remove the eyebolt on the motor. Should the eyebolt be removed, put a bolt into the threaded hole or take other water-proofing measures to prevent water from entering the motor through the threaded hole.

4-3) Severe Load Conditions

When vibration is strong and start-stop operation is frequent, it is recommended to use minimum strength class 8.8 foundation bolts as per JIS 1051.

5. Coupling with Other Machines

⚠ CAUTION

- Confirm the rotation direction before coupling the unit with the driven machine. Incorrect rotation direction may cause personal injury or damage to the equipment.
- When operating the gearmotor or reducer alone (uncoupled), remove the key that is temporarily attached to the output shaft; otherwise, injury may result.
- Cover the rotating parts; otherwise, injury may result.
- When coupling the gearmotor or reducer with a load, check that the centering, the belt tension and parallelism of the pulleys are within the specified limits. When the unit is directly coupled with another machine, check that the direct coupling accuracy is within the specified limits. When a belt is used for coupling the unit with another machine, check the belt tension. Correctly tighten bolts on the pulley and coupling before operation; otherwise, injury may result because of misalignment.

5-1) Confirming Rotation Direction

Gearmotor



Figure 5 shows the rotation direction of the output shaft when wires are connected as shown in Fig.10 on page 13.

Fig.5 Rotation Direction of Slow Speed Shaft (Gearmotor)

| When the motor wiring conforms to Fig. 10, the motor shaft turns clockwise viewed from the load side. At that time, the rotation direction of slow speed shaft is in the direction of the arrow shown below. | | |
|--|------------------|------------------|
| Gear construction | Single reduction | Double reduction |
| Rotation direction of slow speed shaft. (Viewed from load side) | | |

- For reverse rotation, change the positions of R and T of the motor wiring.

Reducer



Table 8 Rotation Direction of Slow Speed Shaft (Reducer)

| Gear construction | Single reduction | Double reduction |
|--|--|--|
| Rotation direction of slow speed shaft | As compared with high speed shaft, opposite direction. | As compared with high speed shaft, same direction. |

Table 7 Frame Sizes

| Frame size | |
|------------------|------------------------|
| Single reduction | Double reduction |
| 606□ | 606□DA |
| 607□ | 607□DA |
| 608□ | — |
| 609□ | 609□DA |
| 610□ | 610□DA |
| 611□ | — |
| 612□ | 612□DA, 612□DB |
| 613□ | 613□DA, 613□DB, 613□DC |
| 614□ | 614□DA, 614□DB, 614□DC |
| 616□ | 616□DA, 616□DB, 616□DC |
| 617□ | 617□DA, 617□DB, 617□DC |
| 618□ | 618□DA, 618□DB |
| 619 | 619□DA, 619□DB |
| 6205 | 6205DA, 6205DB |
| 6215 | 6215DA, 6215DB |
| 6225 | 6225DA, 6225DB |
| 6235 | 6235DA, 6235DB |
| 6245 | 6245DA, 6245DB |
| 6255 | 6255DA, 6255DB |
| 6265 | 6265DA |
| 6275 | 6275DA |

0, 5, or H is inserted in □.

5-2) Coupling Installation

- When installing a coupling, do not impact or apply excessive thrust load to the shaft ; otherwise, the bearing may be damaged or collar may be left.
- Thermal shrinking is the recommended installation method.

(1) When Using a Coupling

The accuracy of the dimensions (A, B, and X) shown in Fig.6 should be within the tolerance shown in Table 9.

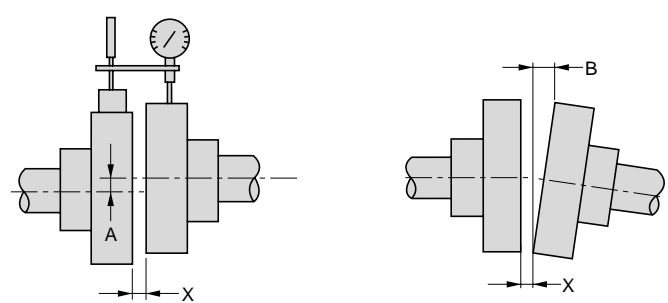


Fig. 6

Table 9 Centering Accuracy of Flexible Coupling

| | |
|-----------------------|---------------------------------------|
| Dimension A Tolerance | 0.1mm or manufacturer's specification |
| Dimension B Tolerance | 0.1mm or manufacturer's specification |
| X dimension | Manufacturer's specification |

(2) When Using a Chain Sprocket and Gear

- The chain tension angle should be perpendicular to the shaft.
- Refer to the chain catalog for the chain tension.
- Select sprockets and gears whose pitch diameter are three times the shaft diameter or greater.
- Install sprocket and gears so that their point of load application will be closer to the gearmotor or reducer side with respect to the length of the shaft. (Fig.7)

(3) When Using a V-belt

- Excessive V-belt tension will damage the shaft and bearing. Refer to the V-belt catalog for proper tension.
- The parallelism and eccentricity (β) between two pulleys should be within $20'$. (Fig.8)
- Use a matched set with the same circumferential length when more than one belt is to be installed.

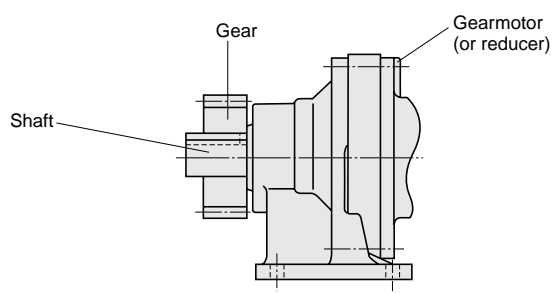


Fig. 7

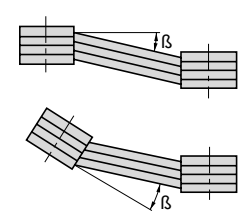


Fig. 8



6. Wiring

- Wiring for **SUMITOMO standard 3-phase motor** is shown below.
Refer to the respective instruction manual for **brakemotors**, **servomotors**, **DC motors** and **motors made by other companies** when they are used.

⚠ DANGER

- Do not handle the unit when cables are live. Be sure to turn off the power; otherwise, electric shock may result.
- Connect a power cable to the unit according to the diagram shown inside the terminal box or in the maintenance manual; otherwise, electric shock or fire may result.
- Do not forcibly curve, pull, or clamp the power cable and lead wires; otherwise, electric shock or fire may result.
- Correctly ground the grounding bolt; otherwise, electric shock may result.
- The lead-in condition of an **explosion-proof type motor** shall conform to the facility's electrical codes, extension regulations and explosion-proofing guide, as well as the maintenance manual; otherwise, electric shock, personal injury, explosion, fire or damage to the equipment may result.

⚠ CAUTION

- When wiring, follow the facility's electrical codes and extension regulations; otherwise, burning, electric shock, injury, or fire may result.
- The motor is not equipped with a protective device. However, it is compulsory to install an overload protector according to facility electrical codes. It is recommended to install other protective devices (earth leakage breaker, etc.), in addition to an overload protector, in order to prevent burning, electric shock, injury, and fire.
- Never touch the terminals when measuring insulation resistance; otherwise, electric shock may result.
- When using a star-delta starter**, select one with an electromagnetic switch on the primary side (3-contact type); otherwise, fire may result.
- When using a **400V-class inverter** to drive the motor, mount a suppresser filter or reactor on the inverter side, or provide reinforced insulation on the motor side; otherwise, dielectric breakdown may cause fire or damage to the equipment.
- When driving an explosion-proof type motor with an inverter**, use one inverter for one motor. Use the approved inverter for the motor.
- When measuring the insulation resistance of an **explosion-proof type motor**, confirm that there is no gas, steam, or other explosive substance in the vicinity, in order to prevent possible explosion or ignition.

- Long cables cause voltage to drop. Select cables with appropriate diameter so that the voltage drop will be less than 2%.
- After wiring **outdoor and explosion-proof type motors**, check that terminal box mounting bolts are not loose, and correctly attach the terminal box cover.

6-1) Attaching and Detaching the Terminal Cover (**0.1~04kW 3-phase motor**)

(1) Detaching

As shown in Fig.9, hold both sides of the terminal box and pull it towards you. The cover will detach.

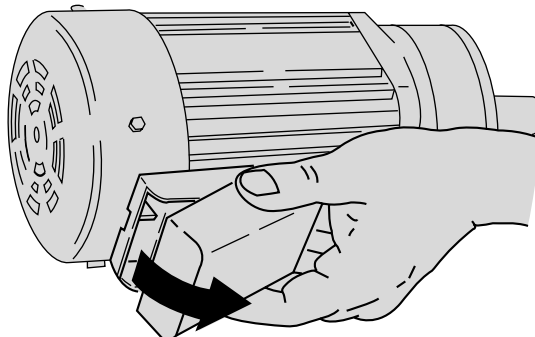


Fig. 9

(2) Attaching

Press the terminal box cover onto the terminal box case until it snaps into place.



6-2) Measuring Insulation Resistance

- When measuring the insulation resistance, disconnect the motor from the control panel. Check the motor separately.

Measure the insulation resistance before wiring. The insulation resistance (R) varies according to the motor output, voltage, type of insulation, coil temperature, humidity, dirt, period of operation, test electrification time, etc. Usually, the insulation resistance exceeds the values shown in Table 10.

Table 10 Insulation Resistance

| Motor voltage | Megohmmeter voltage | Insulation resistance (R) |
|-------------------------------------|---------------------|---------------------------|
| Low-voltage motor of 600V or less | 500V | 1M (Ω) or more |
| High-voltage motor of 3000V or more | 1000V | 5M (Ω) or more |

Reference : The following equations are shown in JEC-2100.

$$R \geq \frac{\text{Rated Voltage (V)}}{\text{Rated Output (kW)+1000}} \quad (\text{M}\Omega)$$

$$R \geq \frac{\text{Rated Voltage(V)+Speed(rpm)/3}}{\text{Rated Output(kW)+2000}} \quad +0.5(\text{M}\Omega)$$

A drop in insulation resistance may be attributed to poor insulation. In that case, do not turn on the power. Contact our nearest agent, distributor, or sales office.

6-3) Protection Coordination

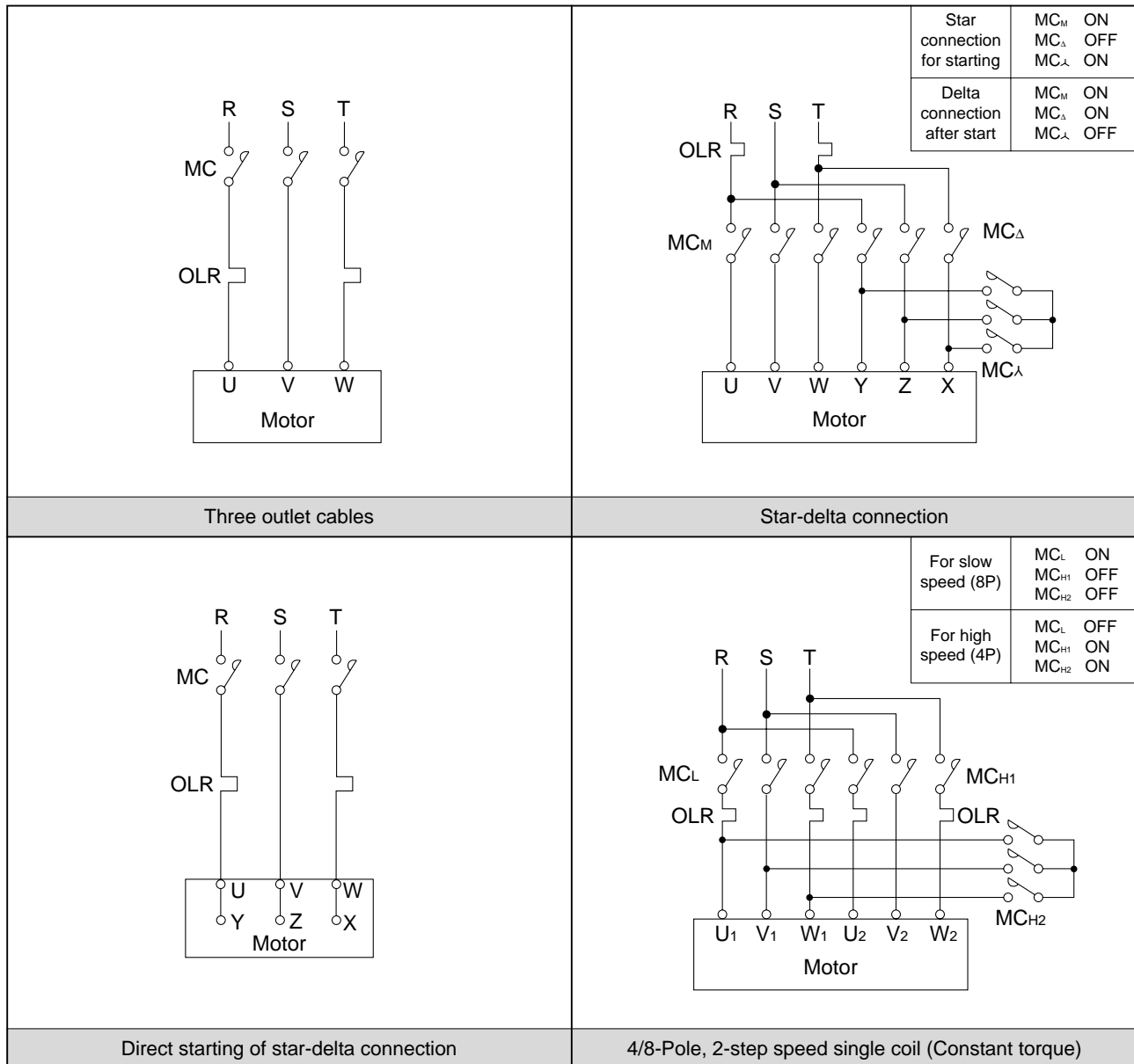
- (1) Use a molded case circuit breaker for protection against short circuit.
- (2) Use an overload protection device that protects the unit against a surge of electric current exceeding that shown on the rating plate.
- (3) For an **explosion-proof type motor**, use an overload protector that can protect the unit within the allowable binding hour by means of the locked rotor current shown on the rating plate.



6-4) Motor Connection

Fig.10 shows the motor connection and the standard specifications for terminal codes.

Fig. 10 Motor Connection and Terminal Code (200/400V 50/60Hz, 220/440V 60Hz)



MC : Electromagnetic contactor
 OLR : Overload protection device

These should be furnished by the customer.

• **Observe the following for a forced ventilation type :**

- Connect the forced ventilation fan motor with the power source.
- If the fan motor is a single phase motor, the motor rotates in only one direction.
- If the fan motor is a three phase motor, it must be connected to the power source in such a way that the fan turns in the same direction as the arrow shown on the direction indicator plate.
 If rotary direction of the fan is opposite, change two of the three wires (U, V, W) with each other. (The direction of ventilation should be from opposite load side to load side.)
- For a forced ventilation type with a thermostat (Terminal code T₁, T₂), connect the thermostat with the power source. (The thermostat is a normal closed type)
- Turn-off the forced ventilation motor if the main motor will not be operating for an extended period.

6-5) Trochoid Pump Connection

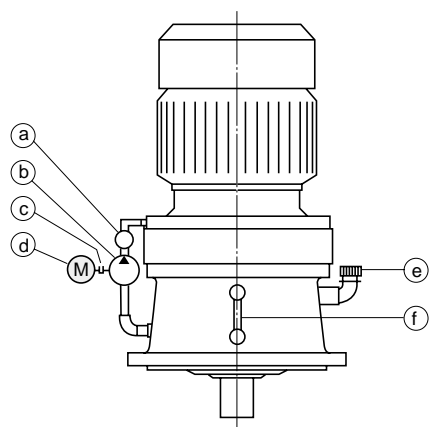
⚠ CAUTION

- Conduct priming shown in the maintenance manual, before the start up of the main motor, in case of forced oil lubrication by the trochoid pump; otherwise damage to the equipment may result.
For forced oil lubrication by trochoid pump, prime the pump, as shown in the maintenance manual, before starting the main motor; otherwise, the equipment may be damaged.

- (1) Because forced lubrication by the trochoid pump is necessary for vertical type 6275, 6275DA, a separate power source should be prepared for the pump. (Refer to Table 11 and Fig.11)
- (2) Refer to Fig.12 for the trochoid pump wiring.
- (3) Establish an electrical interlocking device between the trochoid pump motor and main motor that satisfies the following two functions; (Refer to Fig.12)
 - ① Start-up time-The main motor stops when the trochoid pump stops.
 - ② During operation-The main motor stops when the trochoid pump stops for some unknown reason.
- (4) To assure optimal lubrication conditions, the trochoid pump should be started-up at least 30 seconds before the start-up of the main motor. (priming)

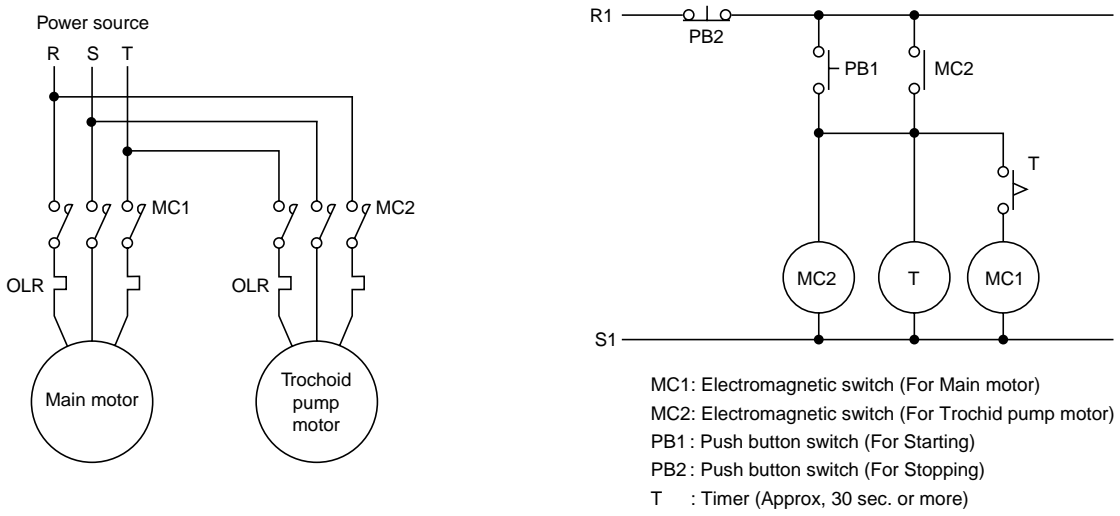
Table011 Trochoid Pump Specification

| Cyclo drive | | | Trochoid pump | | | | | | Note |
|-------------|------------|---------------------|---------------|------------|--------------------|---------------------|--------------------|---------------------|--|
| Type | Frame size | Reduction ratio | Pump type | Pump motor | 50Hz Zone | | 60Hz Zone | | |
| | | | | | Discharge (ℓ /min) | Max. pressure (MPa) | Discharge (ℓ /min) | Max. pressure (MPa) | |
| Vertical | 6275 | All reduction ratio | TOP-216HBVB | 0.75kW 4P | 24.0 | 0.78 | 28.8 | 0.49 | (1) Trochoid pump manufactured by Nippon Oil Pump Mfg. Ltd. is to be used as the standard pump. (2) A relief valve (Pressure set at 0.29MPa) is a standard attachment on the trochoid pump. |
| | 6275DA | All reduction ratio | TOP-204HBVB | 0.4kW 4P | 6.0 | 1.57 | 7.2 | 1.13 | |



| | |
|---|---------------------------|
| a | Pressure gauge |
| b | Trochoid pump |
| c | Coupling |
| d | Motor (For Trochoid pump) |
| e | Oil filler plug |
| f | Oil level gauge |

Fig. 11 Trochoid Pump Construction



- MC1: Electromagnetic switch (For Main motor)
- MC2: Electromagnetic switch (For Trochoid pump motor)
- PB1: Push button switch (For Starting)
- PB2: Push button switch (For Stopping)
- T : Timer (Approx, 30 sec. or more)

Fig. 12 Trochoid Pump Wiring Diagram

7. Operation

⚠ DANGER

- Do not approach or touch rotating parts (output shaft, etc.) during operation; loose clothing may become caught in these rotating parts and cause serious injury or death.
- When the power supply is interrupted, be sure to turn off the power switch. Unexpected resumption of power may cause electric shock, personal injury, or damage to the equipment.
- Do not operate the unit with the terminal box cover removed. Return the terminal box cover to the original position after maintenance, in order to prevent electric shock.
- Do not open the terminal box cover when power is supplied to an **explosion-proof type motor** ; otherwise, explosion, ignition, electric shock, personal injury, fire, or damage to the equipment may result.

⚠ CAUTION

- Do not put fingers or foreign objects into the opening of the gearmotor or reducer; otherwise electric shock, personal injury, fire, or damage to the equipment may result.
- The gearmotor or reducer becomes very hot during operation. Touching the unit may result in burns.
- Do not loosen the oil filler plug during operation; otherwise, hot, splashing lubricant may cause burns.
- If any abnormality occurs during operation, stop operation immediately; otherwise, electric shock, personal injury, or fire may result.
- Do not operate the unit in excess of the rating; otherwise, personal injury or damage to the equipment may result.

• **Oil-lubricated models** are shipped without oil. Units must be filled with the proper amount of recommended oil prior to start-up.

After the unit is installed, filled with oil and properly wired, check the following before operating:

- (1) Is the wiring correct ?
- (2) Is the unit properly coupled with the driven machine ?
- (3) Are foundation bolts tightened firmly ?
- (4) Is the direction of rotation as required.
- (5) Does the oil level in **the oil-lubricated model** reach the top line of the oil gauge when the unit is at rest ?

After confirming these items without a load, gradually apply a load.

Check the items shown in Table 12.

Table 12 Items to Check During Initial Start-up and Break-in Period

| | |
|--|---|
| Is abnormal sound or vibration generated ? | <ol style="list-style-type: none"> (1) Is the housing deformed because the installation surface is not flat ? (2) Is insufficient rigidity of the installation base generating excessive noise ? (3) Is the shaft center aligned with the driven machine ? (4) Is the vibration of the driven machine transmitted to the gearmotor or reducer ? |
| Is the surface temperature of the gearmotor or reducer abnormally high ? | <ol style="list-style-type: none"> (1) Is the voltage rise or drop substantial ? (2) Is the ambient temperature too high ? (3) Does the current flowing to the gearmotor exceed the rated current shown on the rating plate ? |

If any abnormality is found, stop operation and contact our nearest agent, distributor, or sales office.

8. Daily Inspection and Maintenance

DANGER

- Do not handle the unit when cables are live. Be sure to turn off the power; otherwise, electric shock may result.
- Do not approach or touch any rotating parts (output shaft, etc.) during maintenance or inspection of the unit; loose clothing may become caught in these rotating parts and cause serious injury or death.
- Customers shall not disassemble or modify **explosion-proof type motors** ; otherwise, explosion, ignition, electric shock, or damage to the equipment may result.
- The lead-in condition of an **explosion-proof type motor** shall conform to the facilities electrical codes, extension regulations, and explosion-proofing guide, as well as the maintenance manual ; otherwise, explosion, ignition, electric shock, or damage to the equipment may result.


CAUTION

- Do not put fingers or foreign objects into the opening of the gearmotor or reducer; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- The gearmotor or reducer becomes very hot during operation. Touching the unit with bare hands; may result in serious burns.
- Do not touch the terminal when measuring insulation resistance; otherwise, electric shock may result.
- Do not operate the unit without a safety cover in place to shield rotating parts; otherwise loose clothing may become caught in the unit and cause serious injury.
- Promptly identify and correct, according to instructions in this maintenance manual, any abnormalities observed during operation. Do not operate until abnormality is corrected.
- Change lubricant according to the maintenance manual instructions. Be sure to use factory recommended lubricant.
- Do not change lubricant during operation or immediately after stopping operation; otherwise, burns may result.
- Supply/discharge grease to/from the motor bearing according to the maintenance manual instructions. Avoid contact with rotating parts; otherwise, injury may result.
- Do not operate damaged gearmotors or reducers; otherwise, injury, fire, or damage to the equipment may result.
- We cannot assume any responsibility for damage or injury resulting from an unauthorized modification by a customer.
- Dispose of the gearmotor or reducer lubricant as general industrial waste.
- When measuring the insulation resistance of an **explosion-proof type motor** , confirm that there is no gas, steam, or other explosive substance around the unit in order to prevent explosion or ignition.

8-1) Daily Inspection

To ensure proper and continued optimum operation, use Table 13 to perform daily inspections.

Table 13 Daily Inspection

| Inspection item | | Details of inspection |
|--|---|--|
| Electric current |  | Is the current below the rated current shown on the rating plate ? |
| Noise | | Is there abnormal sound ? Is there sudden change in sound ? |
| Vibration | | Is there excessive vibration ? Does vibration change suddenly ? |
| Surface temperature | | Is the surface temperature abnormally high ? Does the surface temperature rise suddenly ? [The temperature rise during operation differs according to the models. When the difference between the temperature of the gear surface and the ambient temperature is approx. 60°C (for size 6060-6125 it is approx. 40°C), there will be no problem if there is no fluctuation. |
| Oil level (Oil-lubricated model) | At rest | Does the oil level reach the top line of the oil gauge ? |
| | In operation | When compared to the oil level at rest, is this level different ? |
| | When using the trochoid pump | Is the function of oil signal or flow gauge normal ? When the function is abnormal, stop the unit and inspect it ; otherwise inadequate oil will cause poor lubrication of reduction portion, broken pump and fill-up the oil pipe. |
| Oil or grease leakage | | Does oil or grease leak from the gear section ? |
| Foundation bolt | | Are foundation bolts loose ? |
| Chain and V-belt | | Are chain and V-belt loose ? |

When any abnormality is found during the daily inspection, take corrective measures listed in section 10, Troubleshooting (pages 28 and 29.) If the abnormality cannot be corrected, contact our nearest agent, distributor or sales office.

8-2) Confirmation of Lubrication Method

• Refer to the applicable items regarding maintenance. Improper maintenance may decrease unit life.

- (1) Refer to Table 14 to confirm the gear lubrication method for your unit.
- (2) Table 15 lists pages that can be referenced regarding lubrication maintenance.

Table 14 Lubrication Method for Respective Gear Types (For driving at standard input speed)

Contact us when the input speed is not standard.

| Single reduction | Frame size | 606□ | 607□ | 608□ | 609□ | 610□ | 611□ | 612□ | 613□ | 614□ | 616□ | 617□ | 618□ | 619□ | 6205 | 6215 | 6225 | 6235 | 6245 | 6255 | 6265 | 6275 | |
|------------------|-----------------|---------------------------------|--------|--------|--------|--------|--------|--------|--------|----------|--------|--------|--------|---------------------------------|--------|--------|--------|--------|--------|--------|------|------|--|
| | Horizontal | Grease | | | | | | | | Oil bath | | | | | | | | | | | | | |
| | Vertical | Grease | | | | | | | | Oil bath | | | | Plunger pump (Self-lubrication) | | | | | | | | | |
| Double reduction | Frame size | 606□DA | 607□DA | 609□DA | 610□DA | 612□DA | 612□DB | 613□DA | 613□DB | 613□DC | 614□DA | 614□DB | 614□DC | 616□DA | 616□DB | 617□DA | 617□DB | 618□DA | | | | | |
| | Horizontal | Grease | | | | | | | | Grease | | | | | | | | | | | | | |
| | Vertical | Grease | | | | | | | | Grease | | | | | | | | | | | | | |
| | Frame size | 616□DC | 617□DC | 618□DB | 619□DA | 619□DB | 6205DA | 6205DB | 6215DA | 6215DB | 6225DA | 6225DB | 6235DA | 6235DB | 6245DA | 6245DB | 6255DA | 6255DB | 6265DA | 4275DA | | | |
| | Horizontal | Oil bath | | | | | | | | | | | | | | | | | | | | | |
| Vertical | Reduction ratio | ~473 | ~481 | ~1015 | ~2065 | | | | ~1849 | | | | ~2537 | | | | | | | | | | |
| | | Plunger pump (Self-lubrication) | | | | | | | | | | | | | | | | | | | | | |
| | Reduction ratio | 559~ | 1003~ | 1247~ | 2537~ | | | | 2065~ | | | | 3045~ | | | | | | | | | | |
| | Grease | | | | | | | | | | | | | | | | | | | | | | |

■ Maintenance-free type

■ Forced lubrication by trochoid pump. Refer to "6-5 Trochoid Pump Connection" on page 14.

0, 5, or H is inserted in □.

Table 15 Maintenance Manual Pages that can be Referenced Regarding Lubrication Maintenance

| | Lubrication method | Supply of oil/grease before initial operation after purchase | Pages where maintenance method is shown | | | | | | |
|---------------------|--------------------|--|---|------------------------|--------------------|------------------------|-----------------------------|-------------|--------------------|
| | | | Oil/grease change period | Recommended oil/grease | Qty of oil/grease | Disposal of oil/grease | Parts | | |
| Gear | Oil | Oil bath | Necessary | 8-3) (1) P18 | 8-3) (2) P18 | 8-3) (3) P18 | 8-3) (4), (5) P19, 20 | 8-6) P24 | |
| | | Plunger pump lubrication | | | | | | | Self-lubrication |
| | | Trochoid pump lubrication | | | | | | | Forced lubrication |
| Gear | Grease | Maintenance-free | Unnecessary | 8-4) (1) P20 | 8-4) (2) P20 | 8-4) (3) P21 | 8-4) (4) P21 | | |
| | | Except for maintenance-free | | | | | | | Self-lubrication |
| Motor shaft bearing | Grease | — | Unnecessary | 8-5) (1) P22 | 8-5) (2) P23 | 8-5) (1) P22 | 8-5) (3) P23 | | |

8-3) Oil Supply and Change for **Oil-lubricated Gear**

(1) Oil Change Interval

Table 16 Oil Change Interval

| Change interval | Operation |
|---|--------------------------|
| 3000hrs operation or 6 months, whichever comes. | Checking lubrication oil |
| 10000hrs operation or 3 Years, first. | Changing lubrication oil |

Consult us when there are special ambient conditions, like Low or High temperature, and special specifications are required.

(2) Recommended Lubricants

Be sure to use a lubricant recommended by our company.

Table 17 Recommended Lubricants (Equivalent to SP type industrial high-Pressure gear oil or JIS K2219)

| Ambient temperature (°C) | Cosmo Oil | Nippon Oil Mitsubishi | Idemitsu Kosan | Japan Energy | Gulf Oil | Esso General | Mobil Oil | Shell Oil | Caltex Oil | BP Oil |
|--------------------------|-----------------------------|-----------------------|-------------------------------|-------------------------|-----------------------------------|-----------------------|---------------------------------------|--------------------|----------------------|---------------------------------------|
| -10 ~ 5 | Cosmo Gear SE 68 | Bonnock M 68 | Daphe Super Gear Oil 68 | JOMO Reductase 68 | EP Lubricant HD 68 | Spartan EP 68 | Mobil gear 626 (ISO VG 68) | Omala Oil 68 | | Energol GR-XP 68 |
| 0 ~ 35 | Cosmo Gear SE 100, 150 | Bonnock M 100, 150 | Daphe Super Gear Oil 100, 150 | JOMO Reductase 100, 150 | EP Lubricant HD 100 HD 150 | Spartan EP 100 EP 150 | Mobil gear 627, 629 (ISO VG 100, 150) | Omala Oil 100, 150 | Meropa 100, 150 | Energol GR-XP 100 GR-XP 150 |
| 30 ~ 50 | Cosmo Gear SE 220, 320, 460 | Bonnock M 220~460 | | JOMO Reductase 220~460 | EP Lubricant HD 220 HD 320 HD 460 | Spartan EP220~460 | Mobil gear 630, 634 (ISO VG 220~460) | Omala Oil 220~460 | Meropa 220, 320, 460 | Energol GR-XP 220 GR-XP 320 GR-XP 460 |

- ① During winter or at comparatively low temperatures, use a lubricant with low viscosity.
- ② Table 18 shows allowable viscosities. The viscosity you use should not exceed the standard range shown.

Table 18 Allowable Viscosities

| | | | |
|--------------------------|---|-----------------------------|---|
| Min. Allowable Viscosity | 15mm ² /S or more at operating oil temperature | | Viscosity that ensures oil film strength adequate for load transmission |
| Max. Allowable Viscosity | Oil-bath lubrication | 4300mm ² /S max. | Viscosity necessary for start-up of the Cyclo |
| | Oil-bath lubrication | 2200mm ² /S max. | Viscosity necessary for start-up of plunger pump and trochoid pump |

- ③ For smooth start-up, use oil with a pour point 5°C lower than the ambient temperature.
- ④ When operating conditions vary greatly, use oil with a high viscosity index that meets the requirements of ② and ③.
- ⑤ When the unit is operated in ambient temperatures either below or above the 0~40°C range, it may be necessary to either preheat or cool the lubricant and/or use special parts. Contact us for details.

(3) Oil Quantity

Table 19 shows approx. quantity of oil. Be sure to check the oil level through the oil gauge.

Table 19 Approx. Qty of Oil (ℓ)

| Single reduction | Frame size | 613□ | 614□ | 616□ | 617□ | 618□ | 619□ | 6205 | 6215 | 6225 | 6235 | 6245 | 6255 | 6265 | 6275 | | | | | |
|------------------|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Horizontal shaft | | 0.7 | 0.7 | 1.4 | 1.9 | 2.5 | 4.0 | 5.5 | 8.5 | 10 | 15 | 16 | 21 | 29 | 56 | | | | |
| Vertical shaft | | 1.1 | 1.1 | 1.0 | 1.9 | 2.0 | 2.7 | 5.7 | 7.5 | 10 | 12 | 15 | 42 | 51 | (60) | | | | | |
| Double reduction | Frame size | 616□DC | 617□DC | 618□DB | 619□DA | 619□DB | 6205DA | 6205DB | 6215DA | 6215DB | 6225DA | 6225DB | 6235DA | 6235DB | 6245DA | 6245DB | 6255DA | 6255DB | 6265DA | 6275DA |
| | Horizontal shaft | 1.5 | 2.4 | 3.5 | 5.8 | 6.0 | 6.0 | 6.0 | 10 | 10 | 11 | 11 | 17 | 17 | 18 | 18 | 23 | 23 | 32 | 60 |
| | Vertical shaft | 1.0 | 1.9 | 2.0 | 2.7 | 2.7 | 1.1 | 11 | 14 | 14 | 18 | 18 | 23 | 23 | 29 | 29 | 42 | 42 | 51 | (60) |

() with trochoid pump. 0, 5, or H is inserted in □.

(4) Oil Supply

- Be sure to fill with oil when the unit is not operating.
- When the viscosity of oil is high, it may take some time for the oil to settle. Be careful not to over-fill.
(If oil is filled above the upper line, the temperature will rise due to the churning heat of the oil or oil will leak into the motor through the slinger see Fig.13).

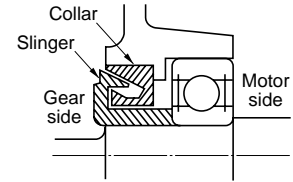


Fig. 13

Oil supply for Horizontal Type (Refer to Fig.14)

- The standard location of the oil gauge on a horizontal unit is on the right side (viewed from the slow speed shaft side). However, since the oil gauge may be placed on either side, select the side most convenient for observation.

- ① Remove the oil filler plug.
- ② Fill oil through oil filler port while checking oil level by the oil gauge.
- ③ Fill oil the upper line on the oil gauge.
- ④ Replace the oil filler plug.

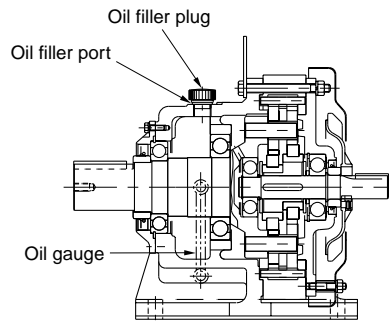
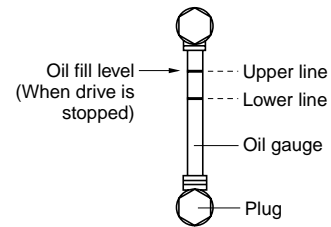


Fig. 14



Oil supply for Vertical Type (Refer to Fig.15)

- ① Remove the oil filler plug and, except for sizes 6255 and 6265, also remove the airvent.
- ② Fill oil through oil filler port while checking oil level by the oil gauge.
- ③ Fill oil the upper line on the oil gauge.
- ④ **Except for Sizes 6255 and 6265**, apply water proof sealing tape to threads of the air vent plug before re-installing.
- ⑤ Replace the oil filler plug.

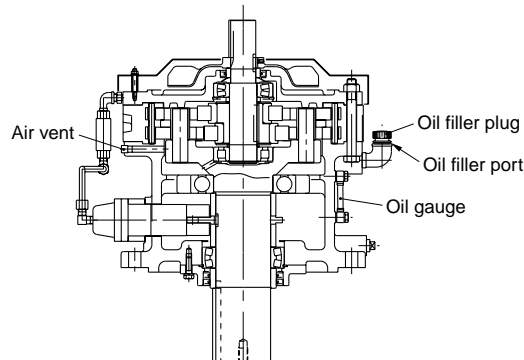
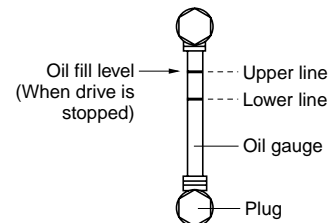


Fig. 15



(5) Oil Discharge

Remove the drain plug shown in Fig. 16 or the lower plug shown in Fig. 17 to discharge oil.

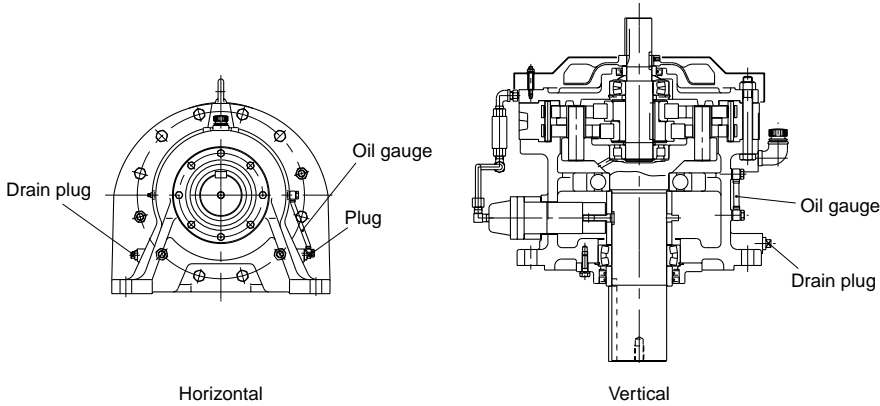


Fig. 16

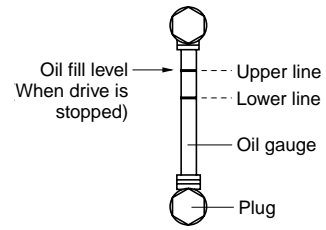


Fig. 17

(6) Long-term Stoppage

Table 20 Long-Term Stoppage

| | | |
|-----------------|-------------------|--|
| Stoppage Period | Approx. 1 month | Change the oil and operate the unit for several minutes before stopping the unit. |
| | More than 1 month | Flush the unit, fill with rust-preventive oil, and operate the unit without a load for several minutes before stopping the unit. |

• Before starting operation after long-term stoppage, always change the oil. This will ensure that the lubricant is free from deterioration that may have been caused by long-term stoppage.

8-4) Grease Replenishment and Change for Gear Portion

(1) Grease Replenishment/Change Interval

Table 21 Grease Supply/Change Intervals

| Model | Grease supply/change interval |
|---|--|
| Maintenance-free series (□ section in Table 14 on page 17) | Long-life grease (ALVANIA GREASE RA) is supplied with these models, so operation can continue for extended periods. However, disassembly to change the grease after 20,000 hr or 3 to 5 years operation will ensure longer service life. |
| Grease-lubricated models other than maintenance-free | Refer to Tables 22 and 23 for supply and change of grease. |

Table 22 Grease Replenishment Interval
(Excl. maintenance-free type)

| Hours of operation | Replenishment interval | Remarks |
|--------------------|------------------------|---|
| 10 hr max./day | 3~6 months | Reduce the supply interval when the operating conditions are severe or the frame size is large. |
| 10~24 hr/day | 500~1,000 hr | |

Table 23 Grease Change Interval
(Excl. maintenance-free type)

| Change interval | Remarks |
|------------------------------|---|
| Every 20,000 hr or 3~5 years | Reduce the supply interval when the operating conditions are severe or the frame size is large. |

(2) Recommended Grease

Table 24 Recommended Grease

| Ambient temperature (°C) | Model | | |
|--------------------------|--|------------------------------|--------------------|
| | i) Maintenance-free series (□ section in Table 14 on page 17) | ii) Other grease model | |
| | Showa Shell Sekiyu | Cosmo Oil | Showa Shell Sekiyu |
| -10~50 | ALVANIA GREASE RA | COSMO GREASE DYNAMAX SH No.2 | ALVANIA GREASE 2 |

• Do not use any grease other than those shown in Table 24.
 • Models ii) in Table 24 are filled with COSMO GREASE DYNAMAX SH No.2 before shipment from our factory.
 • The two kinds of grease for ii) in Table 24 may be mixed with each other.
 • When the ambient temperature continuously exceeds the range of 0~40°C, modifications are needed.

(3) Quantity of Grease

Table 25 shows the quantity of grease Required when grease needs to be changed. Approximately 1/3~1/2 of the volume for the reduction mechanism section is appropriate.

Table 25 Qty of Grease

| Single reduction | Frame size | 606□ | 607□ | 608□ | 609□ | 610□ | 611□ | 612□ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|-----|--|------|------|-----|-----|------|--|------|--|------|----|------|--|------|--|--|-----|--|--|----|--|--|-----|--|--|-----|--|--|
| | Reduction portion | Qty of grease (g) | | 25 | 25 | 65 | 90 | 140 | 200 | 330 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Slow speed shaft bearing portion | Qty of grease (g) | | 35 | 35 | 70 | 100 | 100 | 90 | 120 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Double reduction | Frame size | 606□DA | 607□DA | 609□DA | 610□DA | 612□DA | 612□DB | 613□DA | 613□DB | 613□DC | 614□DA | 614□DB | 614□DC | 616□DA | 616□DB | 616□DC | 617□DA | 617□DB | 617□DC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1st stage (I/P side) reduction portion | Qty of grease (g) | | | | | | 25 | | | 90 | | | 25 | | | 90 | | | 140 | | | 25 | | | 90 | | | 140 | | | 90 | | | 140 | | | 330 | | | 90 | | | 140 | | | 330 | | |
| | 2nd stage (O/P side) reduction portion | Qty of grease (g) | | 25 | | 90 | | 140 | | 330 | | 450 | | | | | | 750 | | | | | | 1000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2nd stage (O/P side) slow speed shaft bearing portion | Qty of grease (g) | | 35 | | 35 | | 100 | | 100 | | 120 | | 300 | | | | | | | | | | | | 500 | | | | | | | | | | | | | | | | | | | | | | | |
| | Frame size | 618□DA | 618□DB | 619□DA | 619□DB | 6205DA | 6205DB | 6215DA | 6215DB | 6225DA | 6225DB | 6235DA | 6235DB | 6245DA | 6245DB | 6255DA | 6255DB | 6265DA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1st stage (I/P side) reduction portion | Qty of grease (g) | | 140 | | 450 | | 330 | | 450 | | 330 | | 450 | | 750 | | 450 | | 1000 | | 750 | | 1100 | | 750 | | 1100 | | 1000 | | 1500 | | 1500 | | | | | | | | | | | | | | | | |
| 2nd stage (O/P side) reduction portion | Qty of grease (g) | | 1100 | | | | 1500 | | | | 1500 | | | | 2000 | | | | 2500 | | | | 4000 | | | | 4500 | | | | 6000 | | | | 8000 | | | | | | | | | | | | | | |
| 2nd stage (O/P side) slow speed shaft bearing portion | Qty of grease (g) | | 600 | | 700 | | 700 | | 800 | | 900 | | 1000 | | 1100 | | 1200 | | 1300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

- : Maintenance-free Series
- Space/volume ratio : Ratio of grease to the volume of space
- 0, 5, or H is inserted in □.

(4) Supply and Discharge of Grease

Procedure for supplying grease for **grease-lubricated models** (excl. maintenance-free type)

- ① Remove the grease discharge plug from the outside cover.
- ② Supply grease with a grease gun through the grease nipple in the inside cover section or motor connection cover.
- ③ Replace the grease discharge plug.

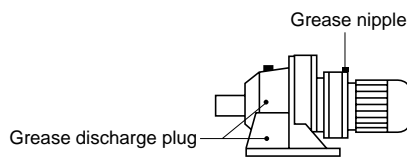


Fig. 18 Location of Grease Discharge Port

- Fill with grease during operation to ensure proper, uniform circulation.
- Fill with grease slowly.
- Grease supply exceeding the quantity shown in Table 25 will cause temperature rise from agitation heat or leakage of grease into the motor.
- Apply grease liberally to bearings (especially to eccentric bearings), pins, rollers, and toothed section of the cyclo discs. (Refer to 11. Construction Drawing on pages 30 and 31.)

Grease change for **grease-lubricated models and maintenance-free series** is something missing here?



8-5) Maintenance of Motor Bearing

The maintenance for **Sumitomo standard 3-phase motor** is shown below.

(Refer to the respective instruction manuals for the **brakemotor**, **servomotor**, **DC motor and Bearing type**; maintenance methods also differ according to motor size. Before maintenance, check the bearing type on the rating plate and Table 26)

Table 26 Bearing Type

| Bearing type | Motor frame size | | Note |
|----------------|--|-------------------|---------------------------------------|
| | Load side | Opposite side | |
| Shield bearing | Smaller than 160# | Smaller than 250# | No grease nipple |
| Open bearing | Bigger than 180# and frame size over than 6235 | --- | With grease nipple and discharge plug |

Maintenance of **shield bearing**

Refer to [8-6 Maintenance of Parts] (Page 24)

Grease replenishment for **open bearing**

(1) Grease Replenishment Intervals and Quantity

Check the bearing no, on the rating plate, refer to Table 27 and supply grease.

Table 27 Grease Replenishment Intervals and Quantity for Open Bearing

| Bearing No. | Dimension (mm) | | | Initial q'ty (g) | Replenished q'ty (g) | Grease replenishment intervals (Total times every motor speed (r/min)) | | | | | |
|-------------|----------------|------|----|------------------|----------------------|--|----------|-----------|-----------|-----------|-----------|
| | I. D | O. D | W | | | 750r/min | 900r/min | 1000r/min | 1200r/min | 1500r/min | 1800r/min |
| 6314 | 70 | 150 | 35 | 200 | 40 | 8500 | 7000 | 6000 | 5000 | 3500 | 2500 |
| 6315 | 75 | 160 | 37 | 230 | 45 | 8500 | 6500 | 6000 | 4500 | 3500 | 2500 |
| 6316 | 80 | 170 | 39 | 260 | 50 | 8000 | 6500 | 5500 | 4500 | 3000 | 2500 |
| 6317 | 85 | 180 | 41 | 300 | 55 | 7500 | 6000 | 5000 | 4000 | 3000 | 2000 |
| 6318 | 90 | 190 | 43 | 350 | 60 | 7000 | 5500 | 5000 | 4000 | 2500 | 2000 |
| 6319 | 95 | 200 | 45 | 400 | 65 | 7000 | 5500 | 4500 | 3500 | 2500 | 1500 |
| 6320 | 100 | 215 | 47 | 450 | 70 | 6500 | 5000 | 4500 | 3500 | 2000 | 1500 |
| 6321 | 105 | 225 | 49 | 500 | 75 | 6000 | 5000 | 4000 | 3000 | 2000 | 1500 |
| 6322 | 110 | 240 | 50 | 550 | 80 | 6000 | 4500 | 4000 | 3000 | 2000 | 1000 |
| 6324 | 120 | 260 | 55 | 700 | 100 | 5500 | 4000 | 3500 | 2500 | 1500 | 1000 |
| 6412 | 60 | 150 | 35 | 200 | 40 | 8500 | 7000 | 6000 | 5000 | 3500 | 3000 |
| 6413 | 65 | 160 | 37 | 230 | 45 | 8000 | 6500 | 6000 | 4500 | 3500 | 2500 |
| 6414 | 70 | 180 | 42 | 300 | 55 | 8000 | 6500 | 5500 | 4500 | 3000 | 2500 |
| NU314 | 70 | 150 | 35 | 120 | 40 | 4000 | 3500 | 3000 | 2500 | 1500 | 1000 |
| NU315 | 75 | 160 | 37 | 150 | 45 | 4000 | 3000 | 3000 | 2000 | 1500 | 1000 |
| NU316 | 80 | 170 | 39 | 200 | 50 | 4000 | 3000 | 2500 | 2000 | 1500 | 1000 |
| NU317 | 85 | 180 | 41 | 250 | 55 | 3500 | 3000 | 2500 | 2000 | 1500 | 1000 |
| NU318 | 90 | 190 | 43 | 300 | 60 | 3500 | 2500 | 2500 | 2000 | 1000 | 1000 |
| NU319 | 95 | 200 | 45 | 350 | 65 | 3500 | 2500 | 2000 | 1500 | 1000 | |
| NU320 | 100 | 215 | 47 | 400 | 70 | 3000 | 2500 | 2000 | 1500 | 1000 | |
| NU321 | 105 | 225 | 49 | 450 | 75 | 3000 | 2500 | 2000 | 1500 | 1000 | |
| NU322 | 110 | 240 | 50 | 500 | 80 | 3000 | 2000 | 2000 | 1500 | 1000 | |
| NU324 | 120 | 260 | 55 | 650 | 100 | 2500 | 2000 | 1500 | 1000 | | |

- "Initial q'ty" shows quantity of grease for disassembled and cleaned inside of the unit. Paint 1/3 of grease with the inner lace of bearing and replenish other with inside of the unit.
- "Replenished q'ty" shows quantity of grease for every replenishment.
- For intermittent operation, replenish grease every 3 years or less.
- For long-term stoppage replenish grease just after operating.



(2) Recommended Grease

Table 28 Recommended Grease

| Ambient temperature °C | Open bearing | |
|---------------------------|--------------------|-----------------|
| | E, B Insulation | F Insulation |
| | Showa Shell Sekiyu | |
| -10~40 | Alvania Grease 2 | Darina Grease 2 |

- Do not use any grease other than those shown in Table 28.

(3) Grease Supply and Discharge (Refer to Fig.19 and Fig.39, 40 on page 32)

- ① Remove the discharge plug, discharge old grease and add new grease while unit is operating.
(Grease replenishment at rest cause an insufficient grease change.)
- ② Replace the discharge plug after 10min operation.

- Excessive grease may cause temperature rise of bearing or leakage of grease.
- Exceeding the recommended amount of grease does not extend the replenishment interval.
- Don't neglect daily inspection; otherwise abnormal wear and noise from the motor, damage to the bearing may result.

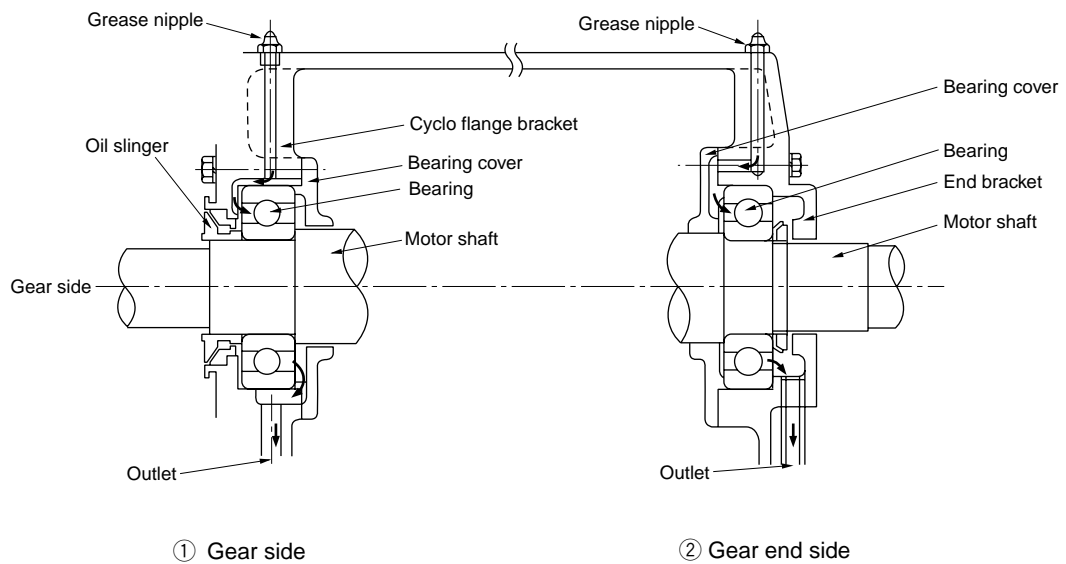


Fig. 19 Construction of Open Bearing in the Motor

8-6) Maintenance of Parts

We recommend overhauling the gearmotor or reducer after 20,000 hours or 4 to 5 years of operation to ensure longer service life; this is dependent on the operating conditions.

Contact our service office, if necessary. Although our technician should perform overhauls, the customer should identify and provide appropriate corrective action according to Table 29, if performing disassembly and inspection.

Table 29 Maintenance of Parts

| Parts | | Material | Correction | |
|--|--|------------------------------------|--|---|
| Gear portion | Cyclo disc | Bearing steel | • Replace if pitted or teeth are damaged. | |
| | Ring gear pin | ↑ | • Replace if part is damaged. | |
| | Slow speed shaft pin | ↑ | | |
| | Slow speed shaft roller | ↑ | | |
| | Bearing | ↑ | • Replace if part is damaged. | |
| | Oil seal | Nitril rubber | • Replace. • Apply grease (or oil) on the lip of the oil seal during assembly. • JIS D type (Spring loaded, rubber covered with dust lip) is recommended for dust-proof. | |
| | Oil level gauge | Oil-proof special vinyl (Standard) | Replace when discolored parts make it difficult to check oil level. | |
| | Oil signal | Polycarbonate (Transparent pipe) | Clean discolored parts with neutral cleanser. | |
| | Gasket | | Paper gasket for low (medium) surface pressure (manufactured by Three Bond Co., Ltd.) | • Replace. • Apply liquid gasket (Three Bond 1102 etc.) on both surfaces of paper gasket, during assembly. |
| Three Bond 1215 (Liquid gasket : manufactured by Three Bond Co., Ltd.) | | | • Apply liquid gasket on both surfaces of parts after flashing oil. | |
| Motor portion | Bearing | Open type | Bearing steel | • Replace. Grease is damaged. |
| | | Sealed type | ↑ | • Replace if part is damaged. |
| | Oil slinger collar (Only for motor of 6130-6165) | | Nitril rubber | • Replace. • Apply grease on the lip of the oil seal during assembly. |

- Since wear and tear on the oil seals, collar, oil level gauge, oil signal and gasket may result in oil leakage, handle all parts carefully during disassembly and assembly. Replace parts showing any signs of deterioration.
- Apply Three Bond 1215 to ⑥ gasket A, ⑭ gasket B and ⑰ gasket C in **frame size 6205~6265, 6205DA~6265DA, 6205DB~6255DB** (Refer Fig.28 on Page 30 and Fig.34 on Page 31)
- Items listed in the "Material" column of Table 29 are standard accessories. Consult us if the ambient is non-standard since some of them are different from standard one.
- Use CM class (distance) bearing for the motor bearing.
- Use grease (Kyodo Yushi : Multemp SRL) lubricated bearing for the sealed motor bearing.
- Use the roller bearing with a bronze retainer for the motor bearing.
- Change new V ring for antiloading side.
Grease up V ring rip when assembling.

9. Disassembly and Assembly

⚠ DANGER

- Customers shall not disassemble or modify **explosion-proof type motors**; otherwise, explosion, ignition, electric shock or damage to the equipment may result.

⚠ CAUTION

- Trained technicians should repair, disassemble and assemble gearmotors or reducers; otherwise, electric shock, personal injury, fire, or damage to the equipment may result.

- To avoid injury, take care when working around keyways and parts having sharp edges. Observe all safety precautions.
- Avoid disassembling gearmotors or reducers in dusty or humid locations.
- Keep screws and other small parts in a box to avoid losing them.
- Take care not to damage parts. Avoid contact with dust and water.
- After disassembly, clean and inspect all parts. Replace all damaged parts.

9-1) Disassembly of Gear Portion (Single reduction)

Discharge oil from the oil lubricated unit before the disassembly.
(Refer to [8-3 (5) Discharge of Oil] on Page 20)

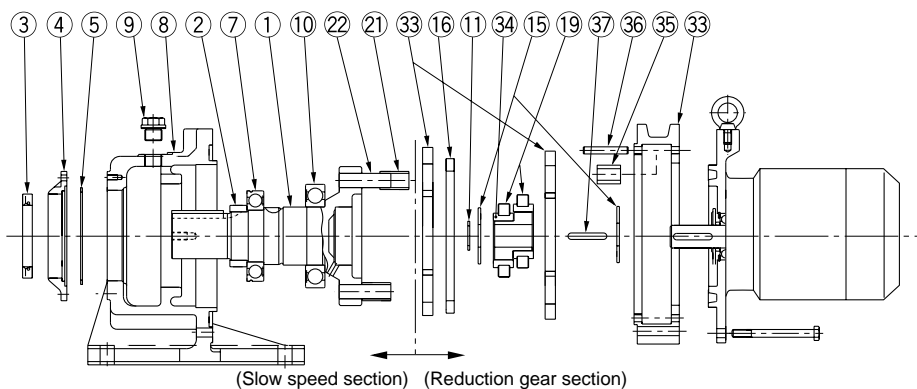


Fig. 20

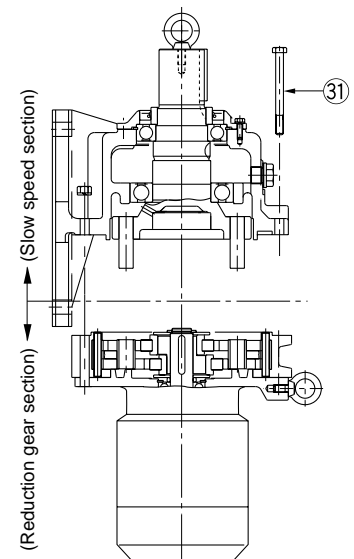


Fig. 21

Disassembly of main parts

Follow these steps to disassemble the unit: (Refer to Fig. 20, 21 and Fig. 27, 31 on Page 30)

- (1) Place the drive with the slow speed section up → Remove the bolts for ring gear housing 31 → Separate the slow speed section
- (2) Reduction gear section
Slow speed shaft roller 21 → Retaining ring 11 (**Larger than frame size 6120**) → High speed shaft bearing A 12 (**Reducer** and **smaller than frame size 6115 gearmotor**. Refer to Fig.28 on Page 30) → Spacer 15 → Cyclo disc A 33 → Spacer ring 16 (**Larger than frame size 6100**) → Eccentric 34 (With eccentric bearing 19) or eccentric bearing 56 (Refer to Fig.32 on Page 30) → Cyclo disc B 33 (Larger than frame size 6100) → Key 37 → Spacer 15 → Ring gear pin 36 → Ring gear roller 35
- (3) High speed section (Refer to Fig.28 on Page 30) ...High speed end shield 20 to high speed shaft 26 disassembly.
Fan cover 24 → Fan 23 (**Larger than frame size 6160**) → Retaining ring 30 (**Frame size 6060-6265**) or bearing plate (**Frame size 6275**) → High speed shaft 26 (With high speed shaft bearing B 29 and collar 27)
- (4) Slow speed section
Slow speed end cap 4 → Retaining ring 5 → Slow speed shaft 1 (With slow speed shaft bearing A 7, B 10 and collar 2)

9-2) Assembly of Gear Portion (single reduction)

Assembly procedures are the reverse of the disassembly procedures.

- (1) Since wear and tear on the oil seals, collars, gaskets, oil signal, etc. may lead to oil leakage, they should be replaced with new parts in accordance with the procedures described in Table 29 on Page 24.
- (2) When assembling balance weight (**Frame size 6060~6095**), the stamped face of the weight should be facing you.
- (3) Replacement of the eccentric bearing
 - One cyclo disc model (Frame size 606□*, 607□, 609□)**
 - Fit the bearing with the eccentric so that the unstamped sides are on the same level.
(**Frame size 606□, 607□, refer to Fig. 22**)
 - When assembling the eccentric to the shaft, the stamped side of one should be facing you.
 - One cyclo disc model (Frame size 608□)**
 - Fit cyclo disc at center of the bearing (Refer Fig. 24)
 - When assembling the eccentric to the shaft, the stamped side of one should be facing you.
 - Two cyclo disc model (Frame size 610□, 612□~616□)**
 - When assembling the eccentric to the shaft, the stamped side of one should be facing you.
 - Two cyclo disc model (Frame size 611□, 617□~6275)**
 - Fit the bearing to the eccentric assembly so that the stamps are facing outwards to each other. (Refer to Fig. 23)
- (4) **In frame sizes 6100~6275**, the two cyclo discs should be placed with the stamps on each disc facing you at an angle of 180 degrees opposite to each other. (Refer to Fig. 25)
- (5) In the vertical type with a plunger pump, the roller at the extended end of the pump should be assembled so that the roller is in contact with the cam ④ (Fig. 29 on Page 30) to enable it to rotate. At that time, the position should be fixed with the UP mark on the pump at the top side (**Frame size 6205 through 6265**) or a knock pin (**Frame size 6160 through 6195**).
- (6) After assembling, confirm that there is no abnormality and test-run the unit.

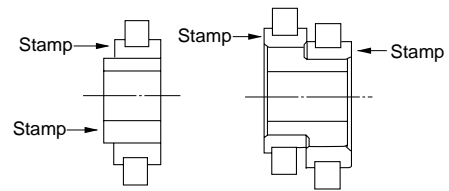


Fig. 22

Fig. 23



Fig. 24

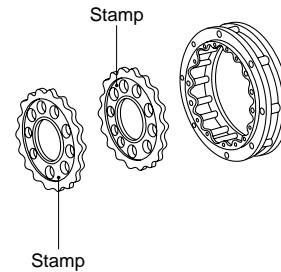


Fig. 25

*0, 5, or H is inserted in □.

9-3) Disassembly of Gear Portion (Double reduction)

- Discharge oil from the oil lubricated unit before the disassembly. {Refer to [8-3 (5) Discharge of oil] on Page 20}
- Disassembly procedures for double reduction are basically the same as those for single reduction.
Disassemble second stage first and then the first stage according to Fig. 26 and 27 on Page 27. {Refer to [Disassembly of gear portion (single reduction)] on Page 25}

9-4) Assembly of Gear Portion (Double reduction)

- Assembly procedures are the reverse of the disassembly procedures.

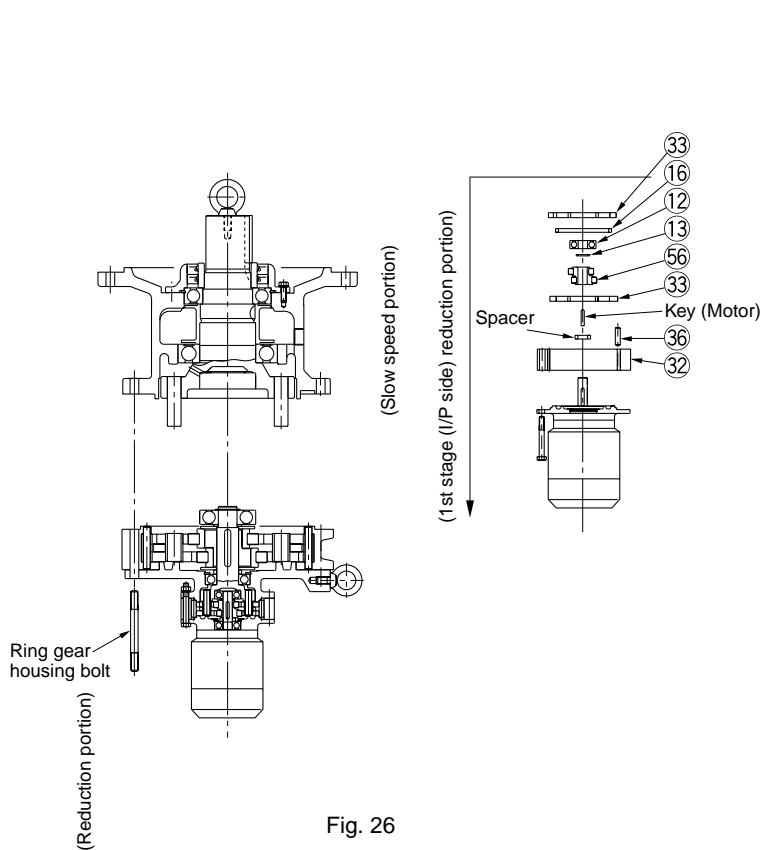


Fig. 26

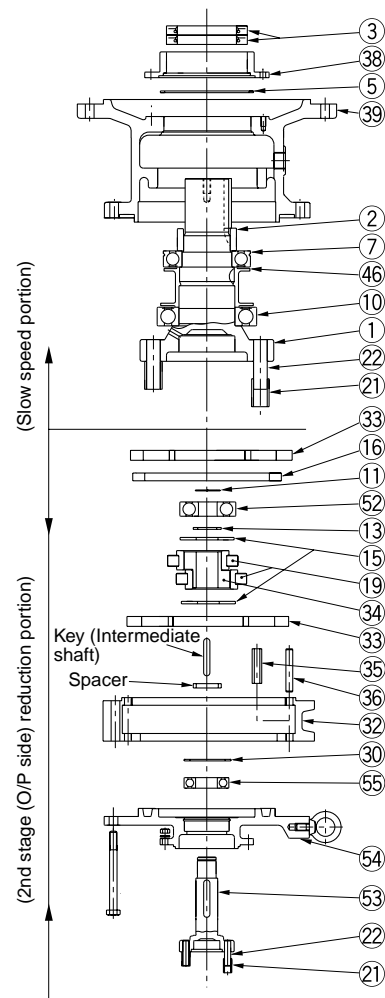


Fig. 27

9-5) Disassembly and Assembly of Motor

When disassembling and assembling motor, take care the following.

- (1) Avoid assembling or disassembling the stationary core and bearing in a dusty, humid or wet location.
- (2) When the unit is used under severe duty, such as fluctuating load or vibration, we recommend applying a small amount of loctite to the outer race of the bearing. (Recommended: Loctite 242 or 271)
- (3) Apply Three bond 1324D to inner race of the oil slinger collar of on the rotation side (P32, Fig.40, No.14) for **6130~6165** or, the bottom side of oil seal collar.
- (4) When assembling an outdoor motor, remove the old liquid gasket and re-apply.
- (5) After assembling, confirm that there is no abnormality and test-run the unit.

10. Troubleshooting

If a problem occurs with the gearmotor or reducer, refer to Table 30 below and take the appropriate corrective action as soon as possible. If the problem can not be eliminated, contact out nearest agent, dealer or sales office.

Table 30 Troubleshooting




| Problem | | Possible cause | Correction | |
|---|--|---|--|---|
|  | The motor will not operate under load. | Power failure | Contact the electric power company. | |
| | | Defective electric circuit | Check the circuit. | |
| | | Blown fuse | Replace the fuse. | |
| | | Protective device is engaged | Disengage protective device. | |
| | | Load locking | Check the load and safety device. | |
| | | Poor switch contact | Adjust the contact area. | |
| | | Disconnection of motor stator coil | Return the unit to factory for servicing. | |
| | | Bearing is broken | Replace the bearing. | |
| | | 3-phase is functioning as single-phase. | Check the power supply with a voltmeter. Check the motor, coil in the transformer, contact, fuse, etc. and repair or replace them. | |
| The motor runs without a load but the output shaft does not rotate. | | Damage due to overloading of gears | Return the unit to factory for servicing. | |
| The output shaft turns without a load | When a load is applied | The switch is heated. | Insufficient capacity of switch | Replace with specified switch. |
| | | | Overload | Decrease the load to the specified value. |
| | | Fuse tripping | Insufficient capacity of fuse | Replace with specified fuse. |
| | | | Overload | Decrease the load to the specified value. |
| | | The speed will not increase and the motor is overheating. | Voltage drop | Contact the electric power company. |
| | | | Overload | Decrease the load to the specified value. |
| | The motor stops. | Short-circuited motor stator coil | Return the unit to factory for servicing. | |
| | | The key is missing | Install a key. | |
| | | The bearing is burned. | Replace the bearing. | |
| | The motor runs in the reverse direction. | Poor adjustment of protective device | Adjust the protective device. | |
| | | Connection error | Change the connection. | |
| | | Fuse tripping | The outlet wire is short-circuited. | Return the unit to factory for servicing. |
| Excessive temperature rise | | Poor contact between motor and starter | Complete the connection. | |
| | | Overload | Decrease the load to the specified value. | |
| | | Voltage drop or rise | Contact the electric power company. | |
| | | The ambient temperature is high. | Improve the ventilation method. | |
| | | Damaged bearing | Replace the bearing. | |
| Oil leakage | Leakage of oil/grease into motor | Abnormal wear of Cyclo disc due to overloading | Replace the Cyclo disc. | |
| | | Damaged oil seal | Replace the oil seal. | |
| | | Loose bolts | Tighten bolts correctly. | |
| Abnormal sound Abnormal vibration | | Damaged oil seal | Return the unit to factory for servicing. | |
| | | Excessive oil/grease supply | Remove excess oil/grease. | |
| | | Entry of dust and foreign matter into bearings or damaged bearings. | Replace the bearing. | |
| | | Entry of foreign matter into Cyclo disc. | Remove the foreign matter and check the damage. | |
| | | Damaged Cyclo disc. | Replace the Cyclo disc. | |
| | | Distortion of housing because the installation surface is not flat | Make the installation base flat or make adjustment using shims. | |
| | | Resonance due to insufficient rigidity of installation base | Reinforce the installation base to increase rigidity. | |
| Nonalignment of shaft with driven machine | Align the shaft centers. | | | |
| Abnormal sound from motor  | | Transmission of vibration from the driven machine | Individually operate the gearmotor or reducer to check the source of the sound. | |
| | | Entry of foreign matter | Remove the foreign matter. | |
| | | Damaged bearings | Replace the bearing. | |

Table 30 Troubleshooting

| Problem | | Possible cause | Correction |
|--|--|-------------------------------------|--|
|  Inverter tripping | Shut-off due to overcurrent | Sudden acceleration/deceleration | Increase the acceleration/deceleration time. |
| | | Sudden change in load | Decrease the load. |
| | Grounding overcurrent | Grounding on the output side | Make correction to eliminate grounding. |
| | DC overcurrent | Short-circuiting on the output side | Make correction to eliminate short-circuiting. Check cables. |
| | Shut-off due to regenerative overvoltage | Sudden deceleration | Increase the deceleration time. Reduce the braking frequency. |
| | Thermal relay operation | Overloading | Decrease the load to the specified value. |

11. Construction Drawing

11-1) Construction of Gearmotor and Reducer

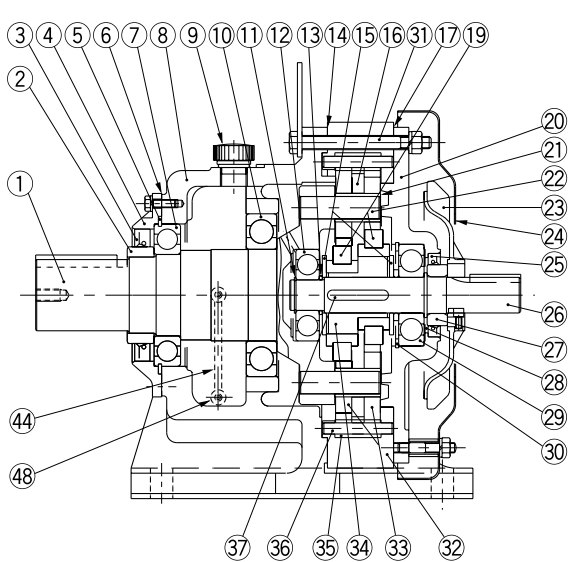


Fig. 28 Type CHH (Horizontal • Reducer)
Single Reduction (Example : Frame size 6175)

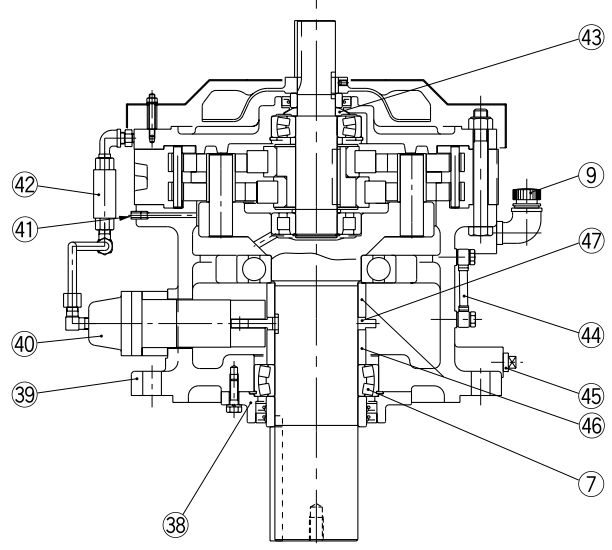


Fig. 29 Type CVV (Vertical • Reducer)
Single Reduction (Example : Frame size 6225)

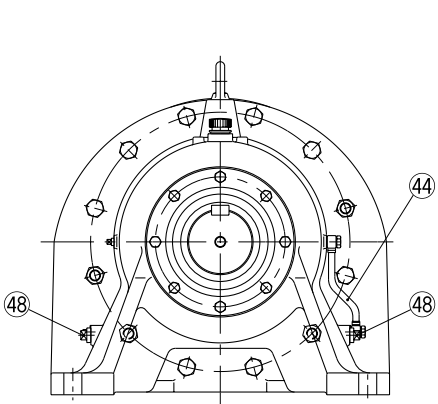


Fig. 30 Type CHHM (Horizontal • Gearmotor), Single Reduction (Example : Frame size 6225)

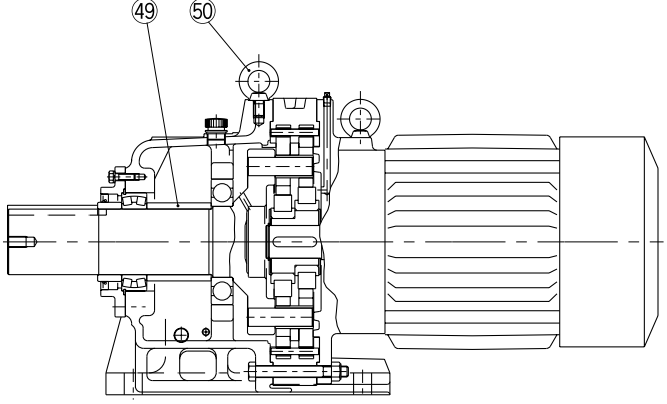


Fig. 31 Type CNHM (Horizontal • Gearmotor)
Single Reduction (Example : Frame size 6095)

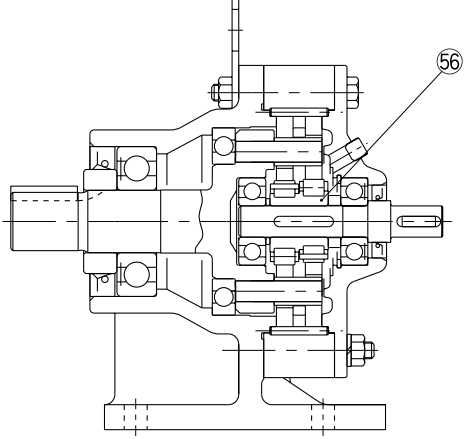


Fig. 32 Type CNH (Horizontal • Reducer)
Single Reduction (Example : Frame size 6105)

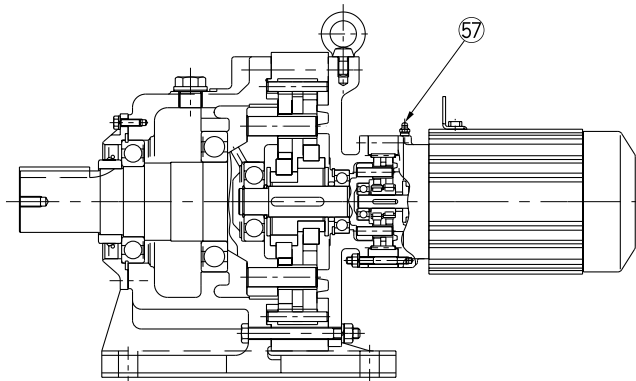


Fig. 33 Type CHHM (Horizontal • Gearmotor)
Double Reduction (Example : Frame size grease
lubricated 6185DB)

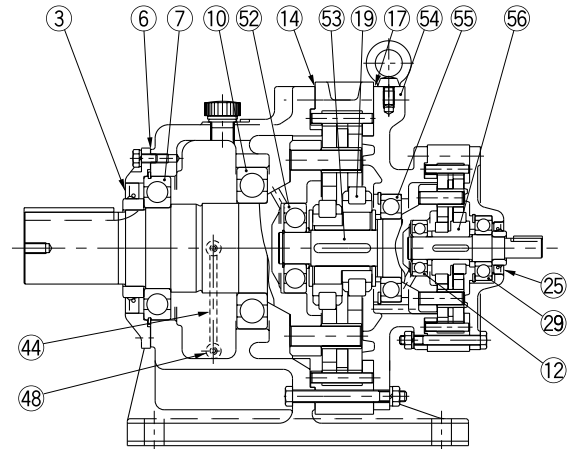


Fig. 34 Type CHH (Horizontal • Reducer)
Double Reduction (Example : Frame size 6185DB)

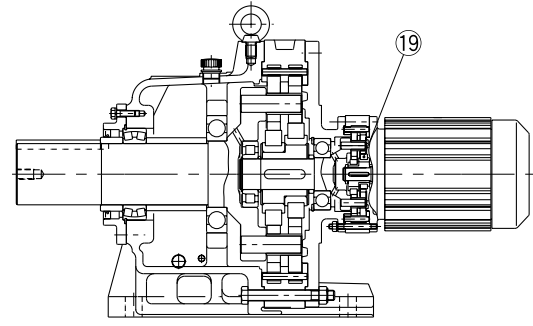


Fig. 35 Type CHHM (Horizontal • Gearmotor)
Double Reduction (Example : Frame size 6225DB)

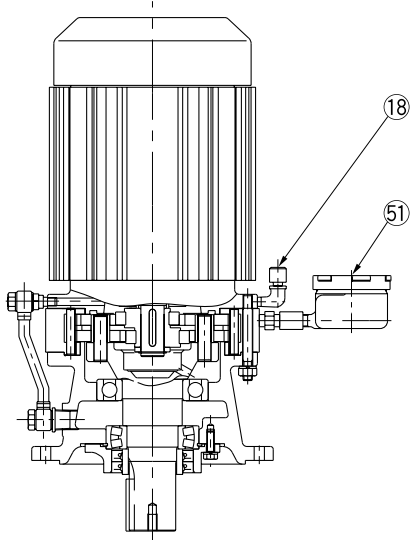


Fig. 36 Type CVVM (Vertical • Gearmotor)
Single Reduction
(Example : Frame size 6145)

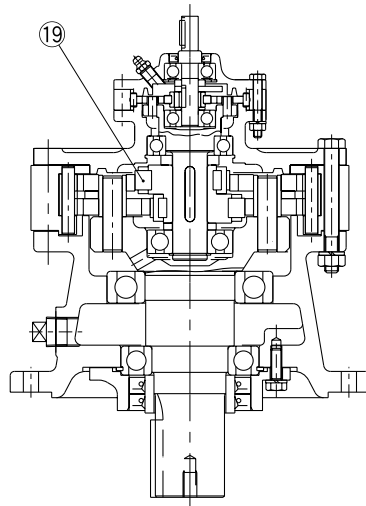


Fig. 37 Type CVV (Vertical • Reducer)
Double Reduction
(Example : Frame size 6135DA)

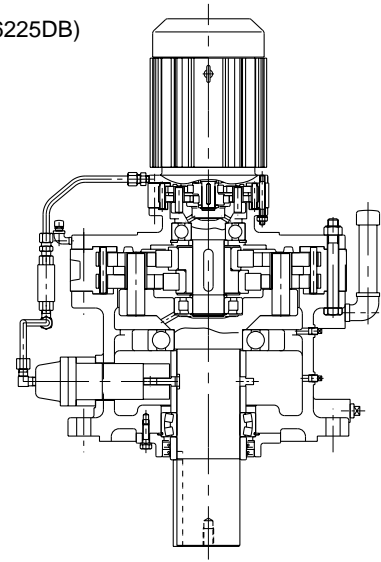


Fig. 38 Type CVVM (Vertical • Gearmotor)
Double Reduction
(Example : Frame size 6225DA)

Table 31 Principal Parts

| No. | Part Name | No. | Part Name | No. | Part Name | No. | Part Name | No. | Part Name |
|-----|-----------------------------|-----|--|-----|-----------------------------|-----|------------------|-----|-------------------------------|
| 1 | Slow speed shaft | 13 | Spacer | 25 | Oil seal | 37 | Key | 49 | Spacer |
| 2 | Collar (Slow speed shaft) | 14 | Gasket B | 26 | High speed shaft | 38 | Gland | 50 | Eye bolt |
| 3 | Oil seal | 15 | End plate | 27 | Collar (High speed shaft) | 39 | Flanged casing | 51 | Oil filler |
| 4 | Slow speed end cap | 16 | Spacer ring | 28 | Spacer | 40 | Plunger pump | 52 | Intermediate shaft, bearing A |
| 5 | Retaining ring | 17 | Gasket C | 29 | High speed shaft, bearing B | 41 | Air vent plug | 53 | Intermediate shaft |
| 6 | Gasket A | 18 | Air vent plug | 30 | Retaining ring | 42 | Oil signal | 54 | Intermediate cover |
| 7 | Slow speed shaft, bearing A | 19 | Bearing for eccentric (High speed shaft section) | 31 | Bolt for ring gear housing | 43 | Oil slinger | 55 | Intermediate shaft, bearing B |
| 8 | Horizontal casing | 20 | High speed end shield | 32 | Ring gear housing | 44 | Oil lever gauge | 56 | Eccentric bearing (Double) |
| 9 | Oil filler plug | 21 | Slow speed shaft roller | 33 | Cycloid disc | 45 | Plug (Oil drain) | 57 | Grease nipple |
| 10 | Slow speed shaft, bearing B | 22 | Slow speed shaft pin | 34 | Eccentric | 46 | Spacer | | |
| 11 | Retaining ring | 23 | Cooling fan | 35 | Ring gear roller | 47 | Cam | | |
| 12 | High speed shaft, bearing A | 24 | Fan cover | 36 | Ring gear pin | 48 | Plug (Oil drain) | | |

11-2) Construction Drawing of Motor (for direct coupling with Cyclo drive)

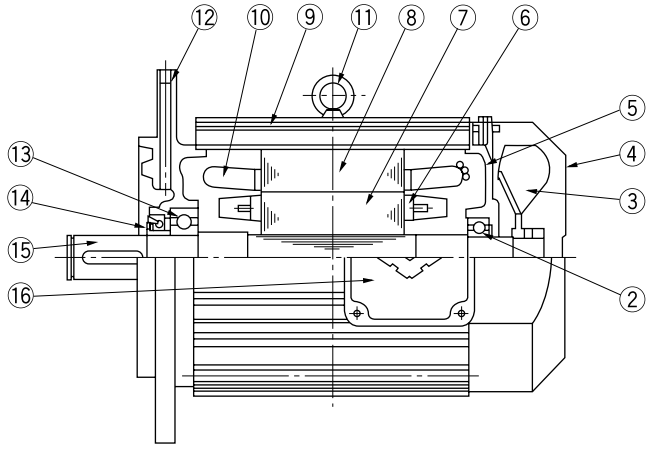


Fig. 39 Example of Construction of 80-112M Frame

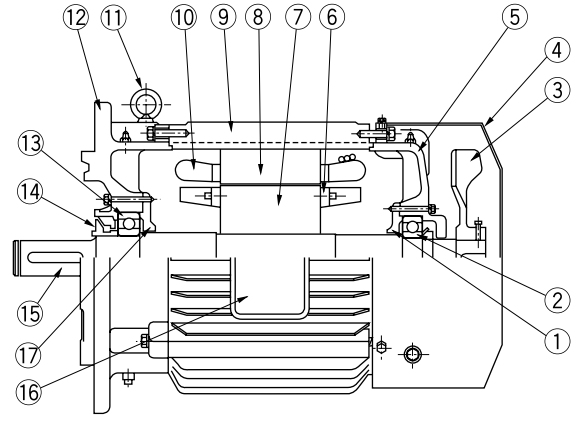


Fig. 40 Example of Construction of Frame Size 180 or Above

Table 32 Main Parts of Motor

| No. | Part Name | No. | Part Name | No. | Part Name |
|-----|------------------------------------|-----|----------------------|-----|------------------------|
| 1 | Bearing cover | 7 | Rotor core | 13 | Motor shaft bearing A |
| 2 | Motor shaft bearing B | 8 | Stationary core | 14 | Oil slinger (Oil seal) |
| 3 | Fan | 9 | Stator frame | 15 | Motor shaft |
| 4 | Fan cover | 10 | Stator windings | 16 | Conduit box |
| 5 | End bracket | 11 | Eyebolt | 17 | Bearing cover |
| 6 | Rotor conductor short circuit ring | 12 | Cyclo flange bracket | | |

12. List of Bearings and Oil Seals

12-1) Bearings

Refer to Tables 33~36 for the model of each bearings.

Table 33 Slow Speed Shaft Bearing

| Frame size | | Slow speed shaft | |
|------------------|------------------------|------------------|-----------|
| Single reduction | Double reduction | Bearing A | Bearing B |
| 606□ * | 606□DA | 6204Z | 6909 |
| 607□ | 607□DA | 6204Z | 6909 |
| 608□ | — | 6305Z | 6009 |
| 609□ | 609□DA | 6306Z | 16011 |
| 610□ | 610□DA | 6306Z | 16011 |
| 611□ | — | 6307Z | 6011 |
| 612□ | 612□DA, 612□DB | 6308Z | 6013 |
| 613□ | 613□DA, 613□DB, 613□DC | 6211NR | 6213 |
| 614□ | 614□DA, 614□DB, 614□DC | 22211EXNR | 6213 |
| 616□ | 616□DA, 616□DB, 616□DC | *3TM-6213NR | *6215 |
| 617□ | 617□DA, 617□DB, 617□DC | *6216NR | *6218 |
| 618□ | 618□DA, 618□DB | *6218NR | *6220 |
| 619□ | 619□DA, 619□DB | *6221NR | *6026 |
| 6205 | 6205DA, 6205DB | 22220BNRC2 | 6222C2 |
| 6215 | 6215DA, 6215DB | 23022BNRC2 | 6224C2 |
| 6225 | 6225DA, 6225DB | 23024BNRC2 | 6226C2 |
| 6235 | 6235DA, 6235DB | 23026BNRC2 | NUP228C2 |
| 6245 | 6245DA, 6245DB | 23028BNRC2 | NUP230C2 |
| 6255 | 6255DA, 6255DB | 23032BNRC2 | NUP234C2 |
| 6265 | 6265DA | 23034BNRC2 | NUP236C2 |
| 6275 | 6275DA | 23136BNXR | 6340 |

(Note) Refer to the following construction drawing for position of bearing

| | Single reduction | Double reduction | No. |
|----------------------------|------------------|------------------|-----|
| Slow speed shaft bearing A | Fig. 28 (P30) | Fig. 34 (P31) | ⑦ |
| Slow speed shaft bearing B | Fig. 28 (P30) | Fig. 34 (P31) | ⑩ |

In case of grease lubrication, *marked bearing should be changed for sealed bearing which No. is like the following NR (STD)→ZNR, NXR→ZNXR, None→Z.
 *0, 5, or H is inserted in □.

Table 34 High Speed Shaft Bearing, Motor Shaft Bearing

| Frame size | | High speed shaft | | | |
|------------------|--|----------------------------|----------------------------|--|------|
| Single reduction | Double reduction | High speed shaft bearing A | High speed shaft bearing B | Eccentric bearing | Q'ty |
| 606□ * | 606□DA, 607□DA | 6301 | 6301Z | 607YXX | 1 |
| 607□ | 609□DA, 610□DA, 612□DA, 613□DA, 614□DA | 6301 | 6301Z | 607YXX | 1 |
| 608□ | — | 6301SH | 6302Z | Refer to table 35 Eccentric bearing | 1 |
| 609□ | 612□DB, 613□DB, 614□DB, 616□DA, 617□DA | 6302RSH2 | 6302Z | | |
| 610□ | 613□DC, 614□DC, 616□DB, 617□DB, 618□DA | 6302RSH2 | 6302Z | | |
| 611□ | — | 6302RSH2 | 6302Z | | |
| 612□ | 616□DC, 617□DC, 619□DA, 6205DA | 6304 | 6305Z | | |
| 613□ | 618□DB, 619□DB, 6205DB, 6215DA, 6225DA | 6305 | 6306 | | |
| 614□ | — | 6305R | 6306 | | |
| 616□ | 6215DB, 6235DA, 6245DA | 6307R | 6308 | 2 | |
| 617□ | 6255DB, 6255DA | 6406 | 6407 | | |
| 618□ | 6235DB, 6245DB | 6407 | 6409 | 2 | |
| 619□ | 6255DB, 6265DA, 6275DA | 6408 | 6411 | 2 | |
| 6205 | — | NJ310EV7 | 21311V1 | 620GXX | 2 |
| 6215 | — | NJ311EV16 | 21311V1 | 621GXX | 2 |
| 6225 | — | NJ312EV11 | 21312V1 | 622GXX | 2 |
| 6235 | — | NJ313EV11 | 21314V1 | 623GXX | 2 |
| 6245 | — | NJ314EV7 | 21315V1 | 624GXX | 2 |
| 6255 | — | NJ316EV1 | 21318V1 | 625GXX | 2 |
| 6265 | — | NJ317EV1 | 21318V1 | 626GXX | 2 |
| 6275 | — | NJ417 | 22222BL1 | 627GXX | 2 |

*0, 5, or H is inserted in □.

(Note) Refer to the following construction drawing for position of bearing

| | Single reduction | Double reduction | No. |
|----------------------------|------------------|------------------|-----|
| High speed shaft bearing A | Fig. 28 (P30) | Fig. 34 (P31) | ⑫ |
| High speed shaft bearing B | Fig. 28 (P30) | Fig. 34 (P31) | ⑲ |
| Eccentric bearing | Fig. 28 (P30) | Fig. 35 (P31) | ⑲ |

Table 35 Eccentric Bearing

| High speed shaft, Motor speed shaft | Frame size | | | | | |
|--|-------------|-------------|------------------|----------------------------|----------------------------|----------------------------|
| | 6090, 6095 | 6100, 6105 | 6120, 6125 | 6130, 6135 | 6140, 6145 | 6160, 6165 |
| Intermediate shaft Reduction ratio | 609□DA * | 610□DA | 612□DA 612□DB | 613□DA 613□DB 613□DC | 614□DA 614□DB 614□DC | 616□DA 616□DB 616□DC |
| 6 | 60906YRX | 6100608YRX | 6120608YRX | 61406-11YSX | 61406-11YSX | 6160608YRX2 |
| 8 | 60908-15YSX | 6100608YRX | 6120608YRX | 61406-11YSX | 61406-11YSX | 6160608YRX2 |
| 11 | 60908-15YSX | 61011-15YRX | 6121115YSX | 61406-11YSX | 61406-11YSX | 61611-15YSX |
| 13 | 60908-15YSX | 61011-15YRX | 6121317YSX | 61413-17YSX | 61413-17YSX | 61611-15YSX |
| 15 | 60908-15YSX | 61011-15YRX | 6121115YSX | 61413-17YSX | 61413-17YSX | 61611-15YSX |
| 17 | 60917YSX | 61017YSX | 6121317YSX | 61413-17YSX | 61413-17YSX | 61617-25YSX |
| 21 | 60921YSX | 61021YRX | 61221YRX | 6142125YSX | 6142125YSX | 61617-25YSX |
| 25 | 6092529YSX | 6102529YRX | 6122529YSX | 6142125YSX | 6142125YSX | 61617-25YSX |
| 29 | 6092529YSX | 6102529YRX | 6122529YSX | 6142935YSX | 6142935YSX | 6162935YSX |
| 35 | 60935YSX | 61035YRX | 61235YRX | 6142935YSX | 6142935YSX | 6162935YSX |
| 43 | 60943YSX | 61043YSX | 61243YSX | 61443-59YSX | 61443-59YSX | 6164351YSX |
| 51 | 60951YRX | 61051YRX | 6125159YSX | 61443-59YSX | 61443-59YSX | 6164351YSX |
| 59 | 60959YSX | 61059YRX | 6125159YSX | 61443-59YSX | 61443-59YSX | 61659YSX |
| 71 | 60971YRX | 61071YRX | 6127187YSX | 6147187YSX | 6147187YSX | 61671YRX2 |
| 87 | 60987YSX | 61087YRX | 6127187YSX | 6147187YSX | 6147187YSX | 61687YSX |
| 119 | 609119YSX | 610119YSX | — | — | — | — |

*0, 5, or H is inserted in □.

(Note) Refer to the following construction drawing for position of bearing

| | |
|------------------|-----|
| Single reduction | No. |
| Fig. 32 (P30) | ⑤ |
| Double reduction | No. |
| Fig. 37 (P31) | ⑱ |

Table 36 Intermediate Shaft Bearing

| Frame size | Intermediate shaft | | | | Frame size | Intermediate shaft | | | |
|------------|--------------------|-----------|--|------|----------------|--------------------|-----------|-------------------|------|
| | Bearing A | Bearing B | Eccentric bearing | Q'ty | | Bearing A | Bearing B | Eccentric bearing | Q'ty |
| 606□DA* | 6301 | 6909 | 607YXX | 1 | 618□DA | 6407 | 6208 | 618YSX | 2 |
| 607□DA | 6301 | 6909 | 607YXX | 1 | 618□DB | 6407 | 6213 | 618YSX | 2 |
| 609□DA | 6302RSH2 | 6007 | Refer to table 35 Eccentric bearing | 1 | 619□DA | 6408 | 6210 | 619YSX | 2 |
| 610□DA | 6302RSH2 | 6007 | | | 619□DB | 6408 | 6213 | 619YSX | 2 |
| 612□DA | 6304 | 6007 | | | 6205DA | NJ310EV7 | 6210 | 620GXX | 2 |
| 612□DB | 6304 | 6205 | | | 6205DB | NJ310EV7 | 6310 | 620GXX | 2 |
| 613□DA | 6305 | 6007 | | | 6215DA, 6215DB | NJ311EV16 | 6311 | 621GXX | 2 |
| 613□DB | 6305 | 6206 | | | 6225DA, 6225DB | NJ312EV11 | 6313 | 622GXX | 2 |
| 613□DC | 6305 | 6206 | | | 6235DA, 6235DB | NJ313EV11 | 6314 | 623GXX | 2 |
| 614□DA | 6305 | 6007 | | | 6245DA | NJ314EV7 | 6315 | 624GXX | 2 |
| 614□DB | 6305 | 6206 | | | 6245DB | NJ314EV7 | 6316 | 624GXX | 2 |
| 614□DC | 6305 | 6206 | | | 6255DA, 6255DB | NJ316EV1 | 6318 | 625GXX | 2 |
| 616□DA | 6307R | 6207 | | | 6265DA | NJ317EV1 | 6320 | 626GXX | 2 |
| 616□DB | | | | | 6275DA | NJ417 | 22220RH | 627GXX | 2 |
| 616□DC | 6307R | 6208 | | | | | | | |
| 617□DA | 6406 | 6207 | | | 617YSX | | | | 2 |
| 617□DB | | | | | 617YSX | | | | 2 |
| 617□DC | 6406 | 6208 | | | 617YSX | | | | 2 |

*0, 5, or H is inserted in □.

(Note) Refer to the following construction drawing for position of bearing

| | Drawing No. | No. |
|------------------------------|---------------|-----|
| Intermediate shaft bearing A | Fig. 34 (P31) | 52 |
| Intermediate shaft bearing B | Fig. 34 (P31) | 55 |
| Eccentric bearing | Fig. 34 (P31) | 19 |

12-2) Oil Seals

Table 37 Oil Seal

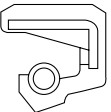
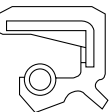
| Frame size | Slow speed shaft | | | | | High speed shaft | | |
|------------|------------------|-------------------------------|------------------|----------------|------|-------------------------------|------|--|
| | Type | Dimension mm (I.D.XO.D.XW) | Q'ty | | Type | Dimension mm (I.D.XO.D.XW) | Q'ty | |
| | | | Horizontal shaft | Vertical shaft | | | | |
| 606□* | D | 30 x 47 x 8 | 1 | 1 | S | 17 x 30 x 6 | 1 | |
| 607□ | D | 30 x 47 x 8 | 1 | 1 | S | 17 x 30 x 6 | 1 | |
| 608□ | D | 45 x 62 x 9 | 1 | 1 | S | 17 x 30 x 6 | 1 | |
| 609□ | D | 50 x 72 x 12 | 1 | 1 | S | 20 x 35 x 7 | 1 | |
| 610□ | D | 50 x 72 x 12 | 1 | 1 | S | 20 x 35 x 7 | 1 | |
| 611□ | D | 55 x 80 x 12 | 1 | 1 | S | 20 x 35 x 7 | 1 | |
| 612□ | D | 65 x 90 x 13 | 1 | 1 | D | 32 x 52 x 8 | 1 | |
| 613□ | D | 65 x 88 x 12 | 1 | 2 | D | 38 x 58 x 11 | 1 | |
| 614□ | D | 65 x 88 x 12 | 1 | 2 | D | 38 x 58 x 11 | 1 | |
| 616□ | D | 85 x 110 x 13 | 1 | 2 | D | 55 x 78 x 12 | 1 | |
| 617□ | D | 95 x 130 x 15 | 1 | 2 | D | 60 x 82 x 12 | 1 | |
| 618□ | D | 110 x 145 x 15 | 1 | 2 | D | 65 x 88 x 12 | 1 | |
| 619□ | D | 120 x 155 x 16 | 1 | 2 | S | 70 x 88 x 10 | 1 | |
| 6205 | D | 120 x 155 x 16 | 1 | 2 | S | 70 x 88 x 10 | 1 | |
| 6215 | D | 130 x 160 x 14 | 1 | 2 | S | 75 x 100 x 13 | 1 | |
| 6225 | D | 145 x 175 x 14 | 1 | 2 | S | 75 x 100 x 13 | 1 | |
| 6235 | D | 160 x 190 x 16 | 1 | 2 | S | 85 x 110 x 13 | 1 | |
| 6245 | D | 170 x 200 x 16 | 1 | 2 | S | 95 x 120 x 13 | 1 | |
| 6255 | D | 190 x 225 x 16 | 1 | 2 | S | 110 x 140 x 14 | 1 | |
| 6265 | D | 200 x 240 x 20 | 1 | 2 | S | 110 x 140 x 14 | 1 | |
| 6275 | D | 230 x 270 x 20 | 1 | 2 | S | 120 x 150 x 14 | 1 | |

*0, 5, or H is inserted in □.

(Note) Refer to the following construction drawing for position of bearing

| | Single reduction | Double reduction | No. |
|---------------------------|------------------|------------------|-----|
| Slow speed shaft oil seal | Fig. 2(P30) | Fig. 34 (P31) | 3 |
| High speed shaft oil seal | Fig. 2(P30) | Fig. 34 (P31) | 25 |

Table 38 Type and Shaft of Oil Seal

| Type | Shape | NOK | Koyo Chicago Rawhide |
|------|---|-----|----------------------|
| S | Circumferential rubber with spring (JIS S type)  | SC | MHS |
| D | Dust-proofing circumferential rubber with spring (JIS D type)  | TC | MHSA |

(JIS B2402-1976 Oil seal)

13. Warranty

The scope of our warranty for our products is limited to the range of our manufacture.

Warranty (period and contents)

| | |
|---------------------|--|
| Warranty Period | The warranty for new Cyclo, units shall be 24 months from date of shipment. |
| Warranty Condition | <p>In the event that any problem or damage to the Product arises during the "Warranty Period" from defects in the Product whenever the Product is properly installed and combined with the Buyer's equipment or machines, maintained as specified in the maintenance manual, and properly operated under the conditions described in the catalog or as otherwise agree upon in writing between the Seller and the Buyer or its customers; the Seller will provide, at its sole discretion, appropriate repair or replacement of the Product, without charge, at a designated facility, except as stipulated in the "Warranty Exclusions" described below.</p> <p>However, if the Product is installed or integrated into the Buyer's equipment or machines, the Seller shall not reimburse the cost of: removal or re-installation of the Product or other incidental costs related thereto, any lost opportunity, any profit loss or other incidental or consequential losses or damages incurred by the Buyer or its customers.</p> |
| Warranty Exclusions | <p>Notwithstanding the above warranty, the warranty as set forth herein shall not apply to any problem or damage to the Product that is caused by :</p> <ol style="list-style-type: none"> 1. installation, connection, combination or integration of the Product in or to the other equipment or machine that is rendered by any person or entity other than the Seller ; 2. insufficient maintenance or improper operation by the Buyer or its customers, such that the Product is not maintained in accordance with the maintenance manual provided or designated by the Seller ; 3. improper use or operation of the Product by the Buyer or its customers that is not informed to the Seller, including, without limitation, the Buyer's or its customers' operation of the Product not in conformity with the specifications, or use of lubricating oil in the Product that is not recommended by the Seller ; 4. any problem or damage to any equipment or machine to which the Product is installed, connected or combined, or on any specifications particular to the Buyer or its customers ; 5. any changes, modifications, improvements or alterations to the Product or those functions that are rendered on the Product by any person or entity other than the Seller ; 6. any parts in the Product that are supplied or designated by the Buyer or its customers ; 7. earthquake, fire, flood, sea-breeze, gas, thunder, acts of God or any other reasons beyond the control of the Seller ; 8. normal wear and tear, or deterioration of the Product's parts, such as bearings, oil-seals ; 9. any other troubles, problems or damage to the Product that are not attributable to the Seller. |

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