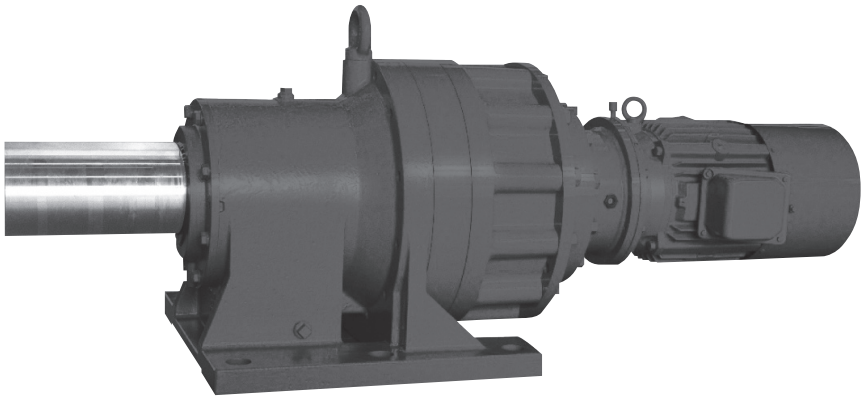
Sumitomo Drive Technologies

COMPOWER®

Planetary Gear Drive
DP1000 Series



《**CAUTION**》

- These Products should be handled, installed and maintained by trained technicians. Carefully read the maintenance manual before use.
- Oil is removed from these products before shipment. Supply oil according to the maintenance manual before operation.
- This maintenance manual should be sent to the actual user.
- This maintenance manual should be kept by the user for future reference.

Sumitomo Heavy Industries Gearbox Co., Ltd. Maintenance Manual No.PM1001E-2

- 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. After reading, retain this manual for future reference.
- Pay close attention to the "DANGER" and "CAUTION" warnings regarding safety and proper use.

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

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

Matters described in ⚠ CAUSION 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 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 protecting device for human safety should be installed to prevent accidents resulting in personal injury, death, or damage to the equipment due to running out of control or falling.
- When the unit is to be used for an elevator or lifter, install a safety protecting device on the elevator side to prevent falling; otherwise, personal injury, death, or damage to the equipment may result.
- Do not disassemble the product while operating. And do not disassemble the parts except the oil-level stick, drain port and inspection cover while the input/output shaft or the motor connecting to the machine, however it is not operating ; otherwise, personal injury, death or damage to the equipment due to falling or running out of control originating from coming off gear engagement may result.

⚠ CAUTION

Please install loss prevention device such as oil pan to the machine which is vulnerable to oil especially (machine for food processing and machine for clean room, and so on) in case oil or grease leaks; otherwise, the product may fail because of oil leakage.

Introduction: Reading the Maintenance Manual, Table of Contents

This maintenance manual is for COMPOWER DP1000 Series. See the maintenance manual of Motor (No.MM1001E) for handling the motor-brake of Drive Unit.

The symbols shown below appear in the upper right or left corner of each page to indicate the classification.
Please read the applicable pages. On Common pages, symbols identify distinctions between specific specifications.

Specifications	All specifications are common	Drive Unit	Reducer
Mark	Common		

Contents

⚠ 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 nameplate.

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

[1] Does the information on the nameplate conform to what you ordered?

[2] Was any part broken during transport?

[3] Are all bolts and nuts tightened firmly?

1-1 Reading the Nameplates

Representative examples of nameplates are shown below.

Please observe them by type.

When consulting us, provide [1]reducer or drive-unit nomenclature, [2]reduction ratio, and [3]Serial number.

(1) For reducer or drive-unit

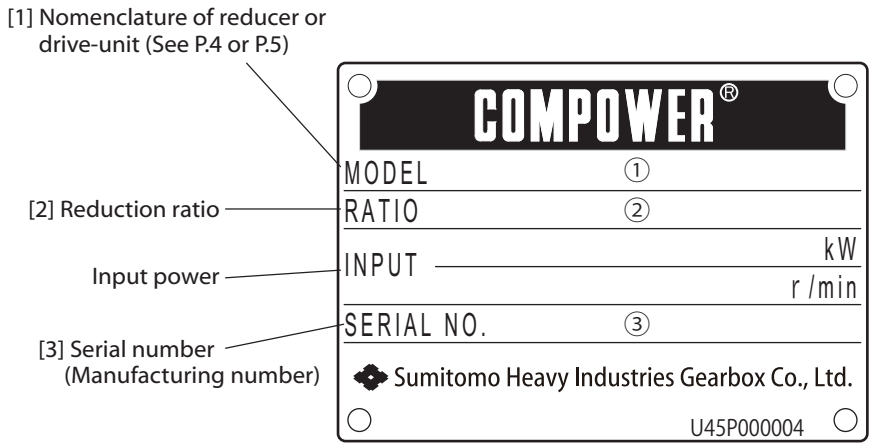


Fig1-1 Nameplate of gear part

(2) For drive-unit

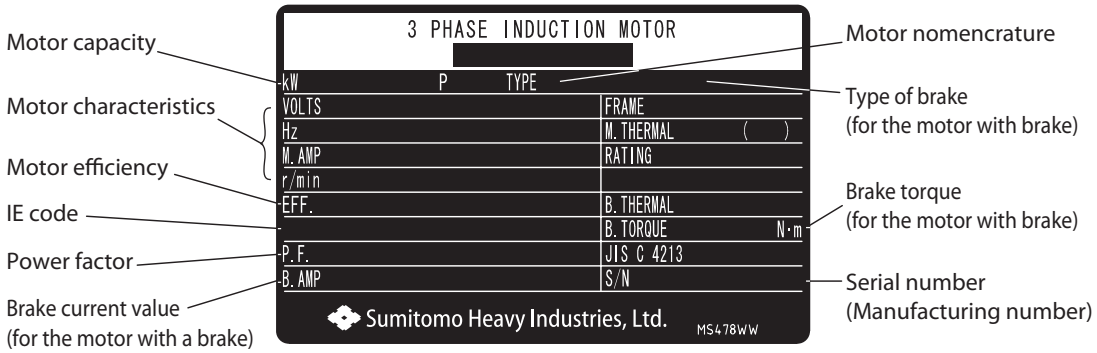
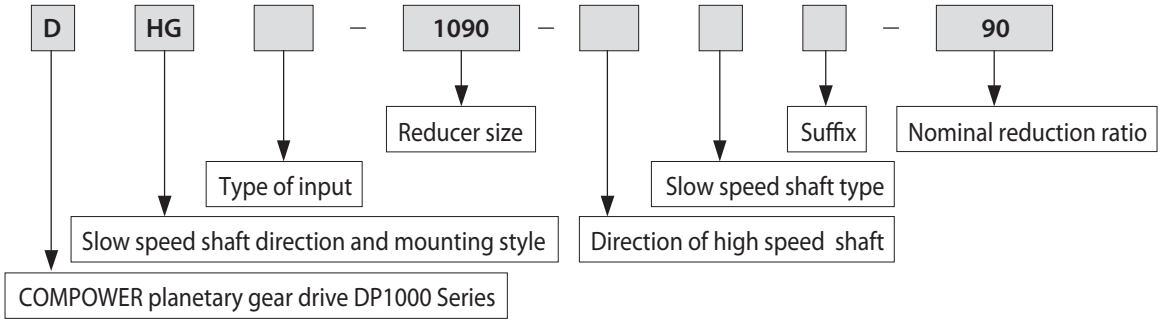


Fig1-2 Nameplate of motor

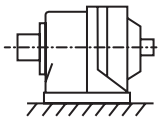
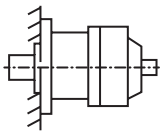
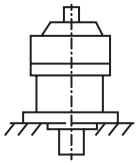
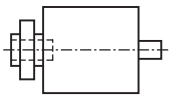
1-2 Nomenclature

Symbol meanings are shown below. Please confirm that the nomenclature matches the order. In the case of special model, there may not be nomenclature in the following.

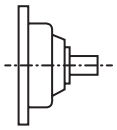
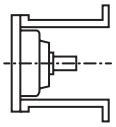
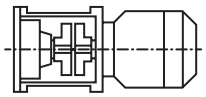
(1) Nomenclature of Reducer



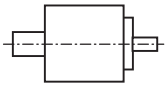
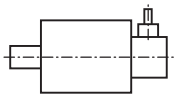
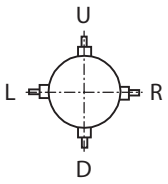
Slow speed shaft direction and mounting style

Horizontal and Foot mount	Horizontal and Flange mount	Vertical and Flange mount	Horizontal and Shaft mount
			

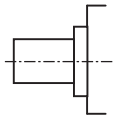
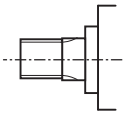
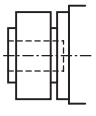
Type of input

Blank free solid shaft	J With motor adapter	JM With motor adapter and motor
		

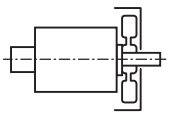
Direction of high speed shaft

Blank In-line	G Rightangle	L/R/U/D Direction of rightangle
	 	

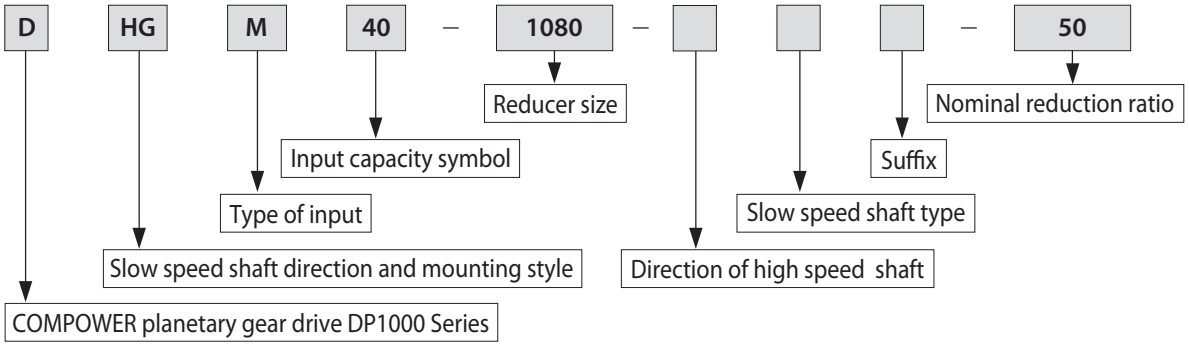
Slow speed shaft type

Blank Solid shaft with key	P Spline shaft	T Hollow shaft with Shrink disc
		

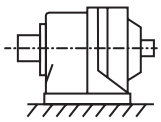
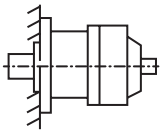
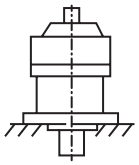
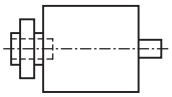
Suffix

Blank Standard type	F With cooling fan	R Radial base mount
–		

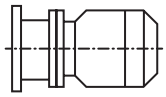
(2) Nomenclature of Drive-unit



Slow speed shaft direction and mounting style

Horizontal and Foot mount	Horizontal and Flange mount	Vertical and Flange mount	Horizontal and Shaft mount
			

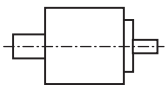
Type of input

Motor directly connected


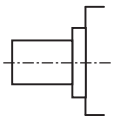
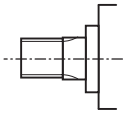
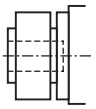
Input capacity symbol

Symbol	kW (HP)	Symbol	kW (HP)	Symbol	kW (HP)
02	0.2 (1/4)	5	3.7 (5)	30	22 (30)
05	0.4 (1/2)	8	5.5 (7.5)	40	30 (40)
1	0.75 (1)	10	7.5 (1.0)	50	37 (50)
2	1.5 (2)	15	11 (15)	60	45 (60)
3	2.2 (3)	20	15 (20)	75	55 (75)
4	3.0 (4)	25	18.5 (25)		

Direction of high speed shaft

Blank In-line


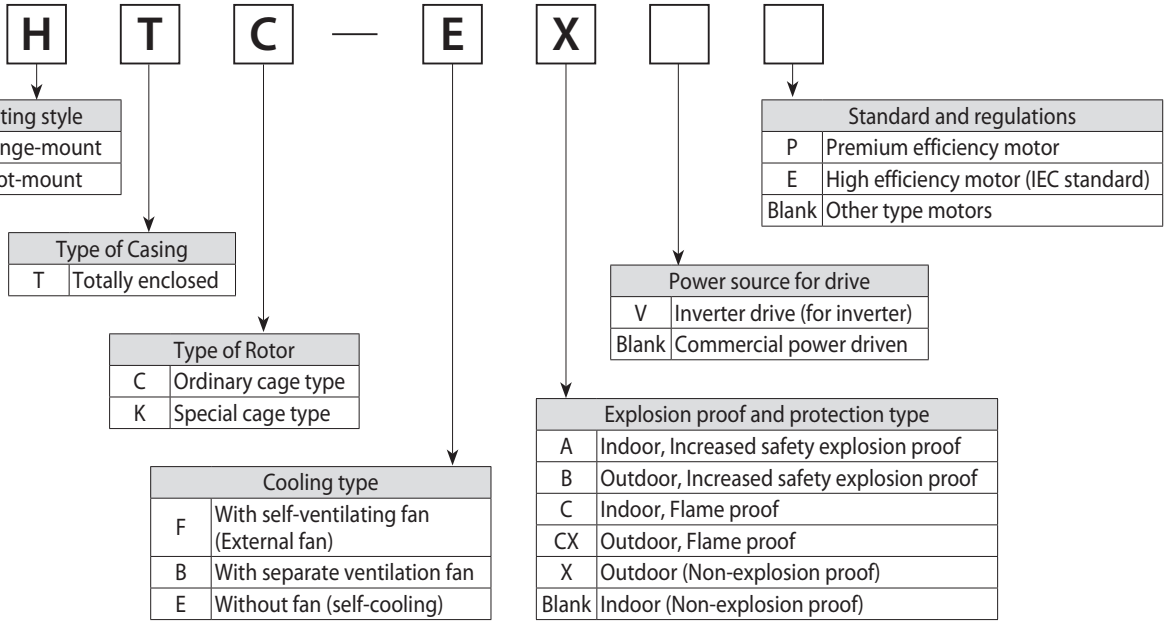
Slow speed shaft type

Blank Solid shaft with key	P Spline shaft	T Hollow shaft with Shrink disc
		

Suffix

Blank Standard type
–

(3) Nomenclature of motor



Common 2. Storage

If this product is not for immediate use, note the following points when storing it.

2-1 Storage Location

Store the product indoors in a clean, dry location.

Do not store outdoors. Store in a location that is free of moisture, dust, extreme temperature changes, corrosive gases, etc.

2-2 Storage Time

- The storage time should be within the rust prevention time shown below.
- If the storage time exceeds the rust prevention time shown below, adherence to special rust prevention specifications is required.
  Please consult with us.
- If for export, adherence to export rust prevention specifications is required. Please consult with us.
- Standard rust prevention specifications

  External rust prevention — Rust prevention oil is applied when shipping from the factory. Check rust conditions every six months after shipment. Reapply the rust prevention process, if necessary.

2-3 Using after Storage

- Oil seals are affected by temperature, ultraviolet light and other ambient conditions and can easily degrade. After long storage periods, inspect before operation, and replace any degraded seals with new seals.
- At startup, check that there are no unusual noises, vibrations, temperature rises, or other symptoms. For models with brakes, check that brakes work properly.

If any abnormalities are found, immediately contact the nearest authorized service station.

Common 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 unit.
  When a hanging bolt or hole is provided, be sure to use it. After mounting a unit to a machine, 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 unit. 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.
- Always drain oil lubricated models before mounting, moving, and transporting.
  Moving with lubricating oil in the machine may cause oil to escape from the air vent, etc.

⚠ CAUTION

- Do not use the products for purposes other than those shown on the nameplate 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, machines for clean room and so on, 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.
- Always drain oil lubricated models before mounting, moving, and transporting. Moving with lubricating oil in the machine may cause oil to escape from the air vent, etc.

4-1 Installation Location

Ambient temperature:	−10 to +40°C
Ambient humidity:	Maximum 85%
Altitude:	Maximum 1,000 m
Atmosphere:	No corrosive or volatile gases, no steam Dust-free, well-ventilated area.
Installation location:	Indoor type: Indoors (area with minimal dust, no contact with water)
Outdoor type:	Indoors or outdoors (area with little contact with rain water)
Vibration:	Maximum 1G

- Mounting in conditions other than the above requires adherence to optional specifications. Please consult with us.
- Drives built to specifications, such as hazardous duty, can be used in the specified mounting environments. However, concerning the connector to the machine used, implement measures based on the mounting environment.
- Mount in a location that enables easy operation, such as inspection and maintenance.
- Mount on a sufficiently rigid base.

4-2 Mounting angle

Mount the product on the horizontal base. (In the case of mounting with any angle, consult us.)
And for products manufactured with specified mounting angle, only use the specified mounting angle.

4-3 Mounting method

- Mount the product surely on the base with enough stiffness to use the steel bolts at least class 10.9 (JIS B 1051) strength.
- Construct knock pins on the product in the case of operating with heavy vibration and shock.
- In the case of the reducer-unit with motor mounted the base, however their shaft are centered enough before sipping, they may have gap between each shafts of motor and reducer while transportation or due to the condition of concrete base. Center each shafts of motor and reducer again at installation of the unit.
- Rust proof oil is applied on the face of high/slow speed shaft, key and mounting face. Remove it before installation, but do not use special solvent or sandpaper.

⚠ 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 product alone (uncoupled), remove the key that is temporarily attached to the low speed shaft; otherwise the key could fly off, and injury may result.
- Cover rotating parts; otherwise, injury may result.
- When coupling the product 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, there is a risk of injury due to scattering the broken pieces or of damage to the products.

5-1 Mounting Connected Equipment

- When mounting connected equipment, do not apply impact or excessive axial load to the shaft. The bearing could be damaged, or the collar could come off.
- Shrinkage fit is recommend.

(1) When using a coupling

The alignment accuracy (A, B, X) in figure 5-2 should be no greater than that shown in Table 5-1.

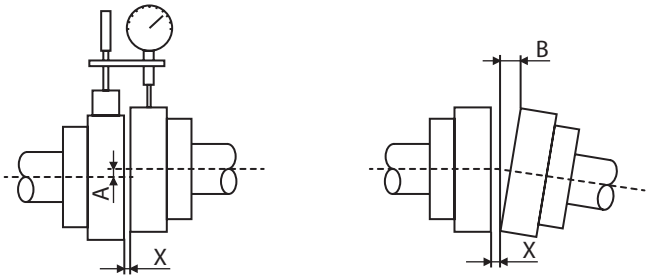


Fig. 5-2

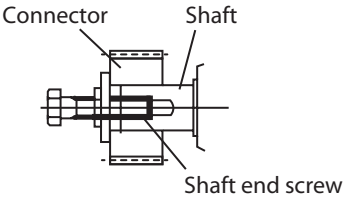


Fig. 5-1

Table 5-1 Alignment Precision for Flexible Coupling

Allowable tolerance A	0.05mm
Allowable tolerance B	0.05mm
X	manufacturer-specified X value

(2) When using chains, sprockets, or gears

- When using a chain, attach so that the chain tension angle is perpendicular to the shaft.
- Refer to the chain catalog or other reference for chain tension.
- The pitch circle diameter of the sprocket and gear shall be three times or more of the shaft diameter.
- The working load point of the sprocket or gear should go from the center of the shaft to this product. (See figure 5-3)

(3) When using a V-belt

- Over-tightening the V-belt will damage the shaft and bearing. - Refer to the V-belt catalog or other reference for V-belt tension.
- The parallelism, eccentricity β of the two pulleys should be within 20′. (See figure 5-4)
- When using multiple V-belts, use a matched set having the same circumferential length.

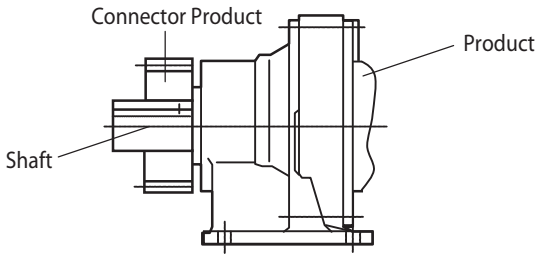


Fig. 5-3

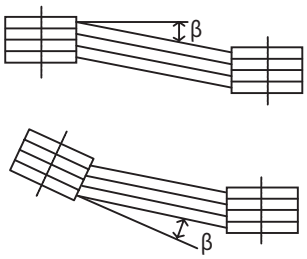


Fig. 5-4

5-2 Hollow shaft type

■ Remarks for mounting and removal of shrink disk

New shrink disk can be mounted as it is since proper grease has been applied before shipment. When mounting used shrink disk, disassemble and clean it first. Smear sliding cone, locking bolt, and contact area of locking bolt with molybdenum disulfide like MolycoteBR2 and MolyLG grease. Prior test of tightening locking bolt is recommended.

⚠ CAUTION

Clean oil content on the hole of boss and its contacting shaft sufficiently. Do not use solvent; corrosion by the solvent may occur. Locking bolt shall be tightened when the shaft is fully inserted in the boss.

It is recommended to smear the surface of boss and hole of sliding cone with grease before mounting shrink disk.

Mounting procedure

[1] If shrink disk can be easily lifted, mount it as assembly, If it is very heavy and crane cannot be used, disassemble first and assemble it on the hub.

[2] Make sure that outer ring and inner ring are parallel when tightening bolts.(A short handle wrench is suitable.)

[3] After confirming that the shrink disk is set correctly, tighten the bolts with a wrench of appropriate length. Uniformly and orderly, tighten bolts clockwise (not diagonally) while keeping outer ring and inner ring parallel. it is recommended to tighten respective bolts by 30 degree each time.

[4] All locking bolts shall be tightened with a torque wrench in accordance with the torque strength shown in the table 2.

[5] Finally, confirm gain that outer ring and inner ring are parallel.

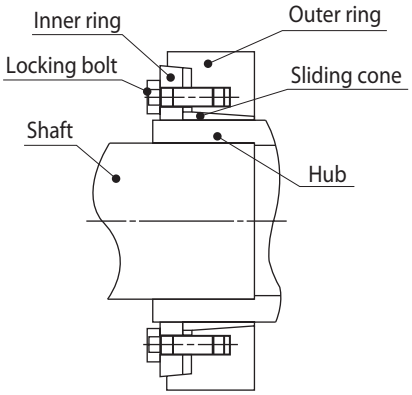


Fig. 5-5

Removal procedure

Steps of removal procedure shall be done in a reverse order of mounting procedure. Keep reducer or shrink disk from falling off shaft during the process. Carefully loosen locking bolts for keeping outer ring from inclining on the sliding cone.

⚠ CAUTION

Do not remove locking bolts unless you confirm that outer ring and inner ring are parallel; otherwise, injury by a sudden release of outer ring or inner ring from sliding cone.

Table 5-2 Standard torque of locking bolt for shrink disk.

Bolt (strength class 10.9)	M4	M5	M6	M8	M10	M12	M16	M20	M24	M27
Tightening torque N·m	2	4	12	30	59	100	250	490	840	1250

6. Wiring

This manual shows wiring for motors with Japanese standard specifications. Please consult with us for motors with overseas.

⚠ 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 bend, 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 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 protection 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 When using a star-delta starter select one with an electromagnetic switch on the primary side (3-contact point type); otherwise, fire may result.
- Voltage PWM inverters that use IGBT generate high-voltage surges at the motor terminals, which may degrade the insulation on the motor windings. In particular, if for example using a 400V class with long cables, a surge in excess of 1300V could be generated. Because of the the following measures are required.
  - Install an LCR filter or and AC reactor between the inverter and the motor
  - Enhance motor winding insulation
- For units When using a motor with brake , do not turn on connection power to the brake coil when the motor is stopped. Otherwise coil burnout fire, may result. Also, mistaken wiring could damage the rectifier.
- When a explosion proof motor is driven by an inverter , use one inverter for one motor. Use the approved inverter for the motor.
- When measuring the insulation resistance of a explosion proof motor , confirm that there is no gas or explosive vapor inthe vicinity, in order to prevent possible explosion or ignition.
- If ambient temperature exceeds 60°C , place the rectifier in a location where the temperature is 60°C or less. In this case, always protect the entire rectifier with a cover. However, standard ambient temperature conditions for units with and without brakes is −10 to 40°C . (Manufacture to special specification is required for operation in an environment where ambient temperature exceeds 40°C .)
- Long cables cause large voltage drops. Select cables with appropriate diameter so that the voltage drop will no greater than 2%.
- After wiring outdoor types and explosion proof types , check that terminal box mounting bolts are not loose, and correctly attach the terminal box cover.

6-1 Measuring Insulation Resistance

When measuring insulation resistance, always disconnect the control board and measure the motor alone.

Measure insulation resistance before wiring. Insulation resistance (R) is changed by a number of factors, including motor output, voltage, type of insulation, winding temperature, moisture, degree of fouling, time used, and amount of time test voltage is applied.
However, normally, it must be above the values in Table 6-1.

Table 6-1 Values for Insulation Resistance

Motor voltage	Megaohmmeter voltage	Insulation resistance (R)
Low-voltage electric motors of no more than 600V	500V	Minimum 1 MΩ

Reference: JEC -2100 contains the following equation.

$$R \geqq \frac{\text{Rated Voltage (V)}}{\text{Rated output power (kW)} + 1{,}000} \quad (\text{M}\Omega)$$

$$R \geqq \frac{\text{Rated Voltage (V)} + (\text{RPM}/3)}{\text{Rated output power (kW)} + 2{,}000} + 0.5 \ (\text{M}\Omega)$$

Low insulation resistance is a sign that there is an insulation failure. Do not apply power. Consult an accredited service station.

6-2 Coordination of System Protection

- Use a wiring breaker for short circuit proofing.
- Use an overload protection device designed to handle currents that exceed the rated current on the nameplate.
- For Increased safety, explosion proof motor , use an overload protection device capable of protecting the locked rotor current on the nameplate within the allowable locking time.

6-3 Connecting the Power Cable

Connect the power cable and motor lead wire by clasping in a pressure connection terminal as shown in figure 6-2.

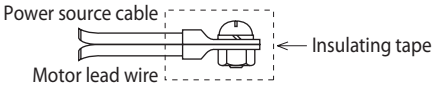
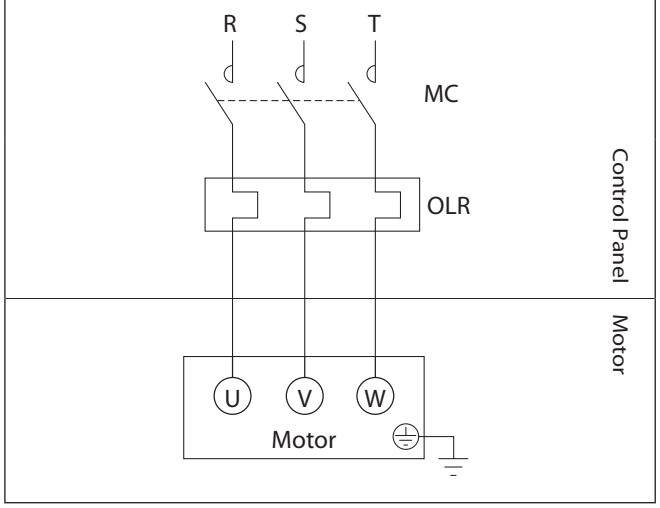


Fig. 6-1

shows motor wiring and standard specification for terminals and lead wires that are indicated by symbols.

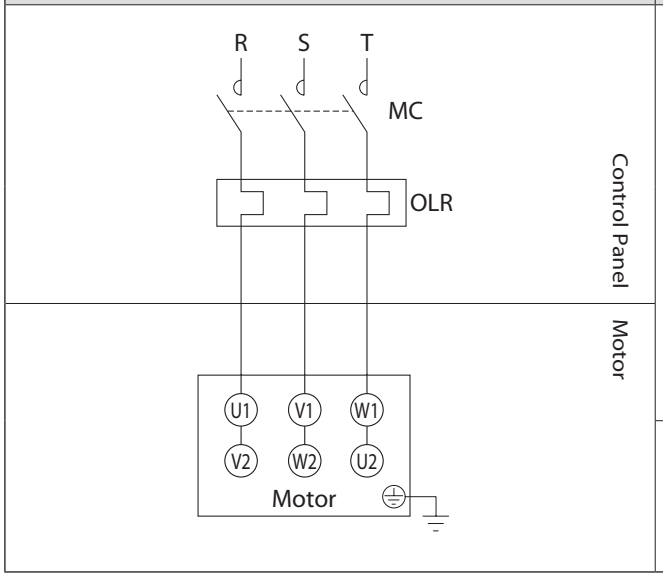
■ Without brake 3-phase power source

3 lead wires



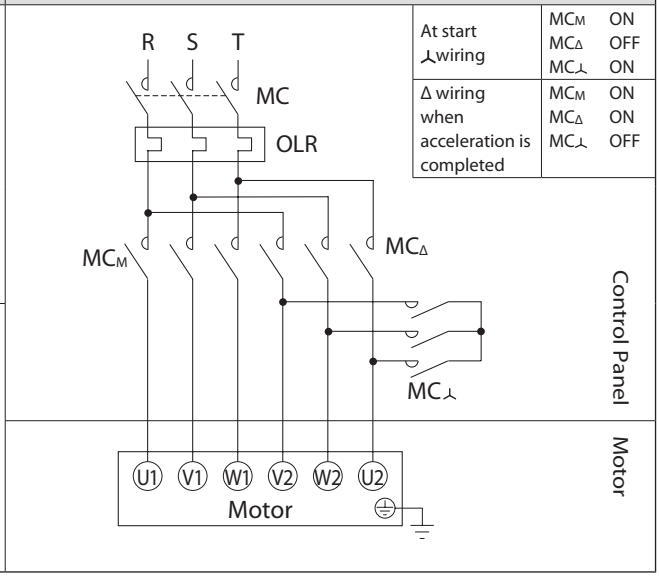
6 lead wires

Direct on-line starting



人 – Δ Starting

At start 人wiring	MC_M	ON
	MC_Δ	OFF
	$MC_人$	ON
Δ wiring when acceleration is completed	MC_M	ON
	MC_Δ	ON
	$MC_人$	OFF

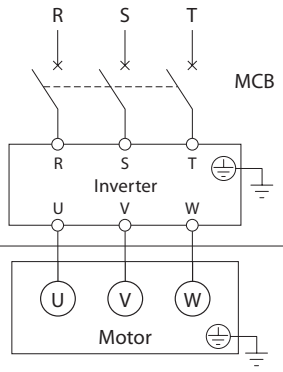
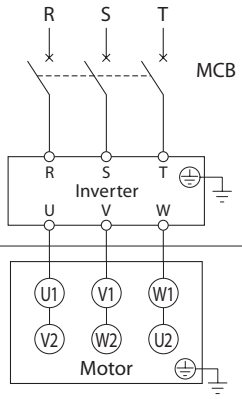


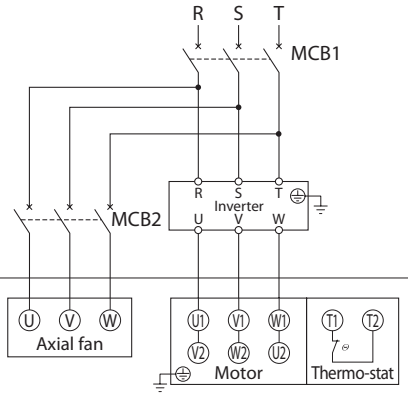
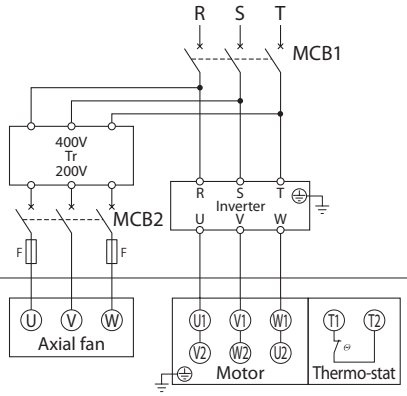
MC: Electromagnetic contactor
OLR: Overload protection device or electronic thermal relay

Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.

■ Without brake, Inverter drive

3 Lead Wires	6 Lead Wires
	

11 Lead Wires	
AF Motor for Inverter With Axial Fan	
Indoor 200V Class Outdoor 200V Class, 400V Class	Indoor 400V Class
	

MCB: Breaker for wiring
Tr: Transformer capacity 250–600VA, Secondary voltage 200–220V
F: Fuse 3–5A
— Customer to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.
- When using inverter for 400V class 3-phase motor / high-efficiency 3-phase motor, the motor must be insulated.

In the case of **With axial fan (totally enclosed, ventilated types)**

- Also connect a power source to the axial fan.
- For an indoor 400V class, the axial fan power source voltage will be 200V class. For the motor with special specifications, specifications may differ from the above. Check the manufacturing specifications.
- Connect the fan so that it rotates in the same direction as that shown on the nameplate for direction of rotation.
  (Normally, the air from the fan will blow in a direction from the anti-load side to the load side.)
- When the motor is shut down for a long period, also shut down the axial fan motor.
- Wire the mounted thermostat.
- Thermostat specification: Terminal symbols: T1, T2 and P1, P2 — Operating function: Normal close (b contact point)
  Operating temperature: 135°C (for thermal class 155 (F)) — Maximum current: DC 24V, 18A; AC 230V, 13A

⚠ DANGER

Do not approach or touch rotating parts (low speed shaft, etc.) during operation; otherwise loose clothing may became caught in these rotating parts and cause serious injury or death.

⚠ CAUTION

- Do not put fingers or foreign objects into the opening of the product; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- The product becomes very hot during operation. Touching the unit may result in burns.
- Do not loosen the oil filler plug, or do not open the cover for maintenance during operation; otherwise, hot, splashing lubricant may cause burns.
- In the case of drive opposite rotation, do stop the product at once before staring; damage to the equipment may result.
- 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 load rating; otherwise, personal injury, or damage to the equipment may result.

- These products are shipped with oil removed. Before operating, they must be supplied the recommended lubricating oil.
- The type of long-term rustproof, rustproof for export or lubrication-oil enclosure are shipped to be sealed up by the plug on the port for air-vent plug.
  Before the product mounting, do change the plug to the air-vent plug attached.
- The special piping type is shipped with attaching pipes due to be afraid to be damaged at the shipping.
  After the product mounting, do lay a pipe to it.

After installation and wiring are completed, check the following items before operating.

- Is the wiring correct?
- Is the unit properly coupled with the driven machine?
- Are mounting bolts tightened firmly?
- Is the direction of rotation as required?
- Does the oil level in an oil-lubricated model reach the top red line of the oil gauge when the unit is at rest?

After confirming these items, operate without a load and gradually apply a load. Check the items shown in Table 7-1.

Table 7-1 Items to Check During Operation

Is abnormal sound or vibration generated?	• Is the housing deformed because the installation surface is not flat? • Is insufficient rigidity of the installation base generating resonance? • Is the shaft center aligned with the driven machine? • Is the vibration of the driven machine transmitted to the gearmotor or reducer?
Is the surface temperature abnormally high?	• Is the voltage rise or drop substantial? • Is the ambient temperature too high? • Does the current flowing to the gearmotor exceed the rated current shown on the nameplate?

If any abnormalities are found, immediately stop operation and contact the nearest authorized service station.

⚠ DANGER

Do not approach or touch any rotating parts (output shaft, etc.) during run-time maintenance or inspection of the unit; loose clothing may become caught in these rotating parts and cause serious injury or death.

⚠ 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.
- Promptly identify and correct, according to instructions in this maintenance manual, any abnormalities observed during operation. Do not operate until the cause for the abnormality is understood, and the 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.
- 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, as it is outside the scope of the warranty.
- Dispose of gearmotor or reducer lubricant as general industrial waste.

8-1 Daily Inspection

Make certain to carry out daily inspections in accordance with Table 8-1. Neglecting inspections is a source of trouble.

Table 8-1 Daily inspection

Inspection item		Inspection detail
Noise		Are there unusual noises, or are there extreme changes in the noises?
Vibration		Is there abnormally large vibration? Are there extreme changes?
Surface temperature		Is surface temperature unusually high? Has there been a sudden rise? (Temperature rises during operation will differ according to model and type. However the gear unit surface temperature should be approximately 85°C, In this case, there is no particular problem if fluctuation is slight.)
Oil level		Is the oil level lower? (Check with oil check stick or oil gauge during operation is stopping.)
lubricant condition	force-feed lubrication	Are the oil signal and flow gauge working properly? Their no working properly is a sign of improper reducer lubrication, due to factors including insufficient oil, pump damage and plugged pipes. Immediately stop the machine and inspect.
Oil, grease leaks		Are oil or grease leaking from the gear unit? Are the oil seal sliding surfaces corroded?
Mounting bolts		Are the mounting bolts loose?
Chain, V-belt		Are the chain or V-belt loose?

If any abnormality is discovered during the daily inspection, take measures in accordance with “10. Troubleshooting” (P21-22).
If these actions do not remedy the issue, immediately contact the nearest authorized service station.

8-2 Confirmation of Lubrication Method

Standard lubrication method

- All model of The lubrication method are oil bath type.
- In the case of vertical mount type, it may have a part of grease lubrication on the bearing part of the upper shaft.
- Check the manufacture sheet or outline drawing about the detail of specification.

⚠ CAUTION

For equipment with moor oil pump, run the pump prior to operation of the product. Start motor of the product after lubricating oil has circulated through the bearing; otherwise, damage to the equipment may occur.

Provide flow switch or flow sight to check the circulation of the lubricating oil. Stop the motor of reducer or drive unit when abnormality occurs.

8-3 Oil Supply and Oil Change for part of gears

(1) Oil change interval

Table 8-2 Oil change interval

	Interval		Using conditions
Oil feeding	At purchasing		–
Oil Change	Ist time	Whichever comes first, after 500 hours or 6 months of operation	–
	2nd time	Whichever comes first, after 2,500 hours or 6 months of operation	–
	3rd time or later	Whichever comes first, every 5,000 hours or every year	When oil temperature is lower than 70°C
		Whichever comes first, every 2,500 hours or every half a year	When oil temperature is 70°C or higher

Please consult lubrication supplier when ambient temperature changes dramatically or atmosphere contains corrosive gas.

(2) Grease filling interval

Table 8-3 Grease filling interval

Filling interval	Input speed
Every 1,500 hours	750r/min or slower
Every 1,000 hours	Over 750 to 1,800r/min

- The grease lubrication types are shipped with filled grease. After their arrival, do check pieces of their grease-nipple and their fix points.
- Check whether grease lubrication type or not, and the fix points of grease-nipple, by the specifications or outline-drawing.

(3) Recommended lubricants

Only following lubricants in table8-4 shall be applied for lubrication.

Table 8-4 Recommended lubricants

Ambient temperature		ISO AGMA	BP	CASTROL			CHEVRON TEXACO		EXXON MOBIL		SHELL	TOTAL
									Mobil	ESSO		
Gear oil	-10°C~ +25°C	VG150 4EP	ENERGOL GR-XP-150	ALPHA SP150	OPTIGEAR BM150	TRIBOL 1100/150	GEAR COMPOUNDS EP150	MEROPA WM150	Mobil GEAR 629	SPARTAN EP150	Shell Omala S2 G 150	CARTER EP150
	10°C~ 40°C	VG220 5EP	ENERGOL GR-XP-220	ALPHA SP220	OPTIGEAR BM220	TRIBOL 1100/220	GEAR COMPOUNDS EP220	MEROPA WM220	Mobil GEAR 630	SPARTAN EP220	Shell Omala S2 G 220	CARTER EP220
	30°C~ 50°C	VG320 6EP	ENERGOL GR-XP-320	ALPHA SP320	OPTIGEAR BM320	TRIBOL 1100/320	GEAR COMPOUNDS EP320	MEROPA WM320	Mobil GEAR 632	SPARTAN EP320	Shell Omala S2 G 320	CARTER EP320
Bearing grease			ENER-GREASE LS EP2	SPHEEROL AP3	Olista Long-time 3EP	TRIBOL 3020/1000-2	DURALITH GREASE 68	MULTI-FAK EP2	Mobil UX EP2	BEACON EP2	ALVANIA EP2	MULTIS EP2

(4) Oil fill quantity

An estimated quantity of oil for standard specifications is shown Oil quantity table on page 24. (As to oil quantity for special specifications, refer to specifications sheet and outline drawing.) The oil quantity shown in the catalog, etc., is not exact quantity. Use a dipstick or visible oil gauge to check the oil level when filling.

(5) Oil supply and draining

Supply oil through the oil inlet on top of the main unit. Check the oil level with a dipstick or visible oil gauge. (Fig.8-1)
Screw the dipstick to its deepest position to check the oil level; otherwise, the measured oil level may be wrong. (Fig.8-2)

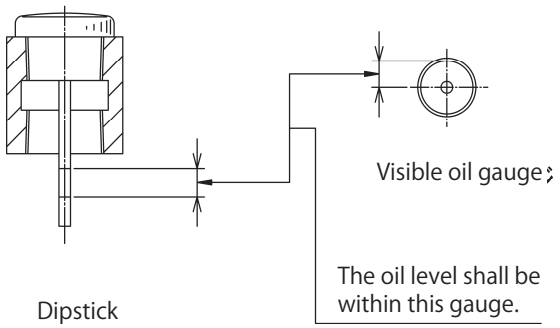


Fig. 8-1

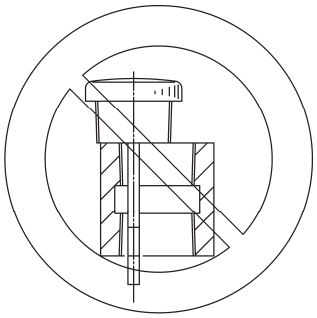


Fig. 8-2

Make sure during the oil-filling process that any foreign materials, dust, and water will not enter the unit. If the oil level is less than the range, the unit will not be lubricated well, and if higher, deterioration of the oil is accelerated due to oil temperature rise.
Please remove drain plug located under the unit for oil draining when lubricating oil is still warm. Removing the air vent makes draining and supplying oil easier.

(6) Grease supply and draining

① Confirm the position of grease fitting and relief fitting by specifications sheet and outline drawing.
② Supply of grease by grease gun from grease fitting. Amount of grease is shown in outline drawing.
No need to supply grease until grease is drained from relief fitting.
③ To supply grease smoothly, supply grease during operation. Speed of grease supply shall be slow.
Note: During the first operation, there is possibility that grease (which was supplied before shipment) will be drained from the relief fitting. In that case, please wipe up such grease.

8-4 Parts Maintenance

To extend operational life, replace the following parts every 3 to 5 years.

COMPOWER Planetary Gear Drive shall be basically returned to the factory to exchange the parts.
Please inform the serial number, model name, quantity, operation period, and so on.
COMPOWER Planetary Gear Drive shall be returned to the factory or authorized shop for repairing/maintenance with disassembly.
Please inform the service center of the serial number, model name, number of unit and operation period.

Replacement parts
- Bearing, oil seal, seal sleeve, and oil gauge.
- Check and replace shafts and gears if there is any damage.
- On a case-by-case basis for other parts including special applications.

9. Disassembly / Reassembly

⚠ CAUTION

- Disassembly and reassembly shall be handled by proper technicians; otherwise, personal injury or damage to the equipment may occur.
- If any abnormal condition occurs,immediately contact the nearest authorized service station.

- Make sure not to be injured by keyway or other sharp edges of parts.
- Disassemble the unit at a clean and dry location.
- Keep accessory parts like screws in the box to prevent loss.
- Carefully handle all parts to prevent damage. Keep them from water and dust.

9-1 Disassembly / reassembly of gear and motor [CONSTRUCTION 1]

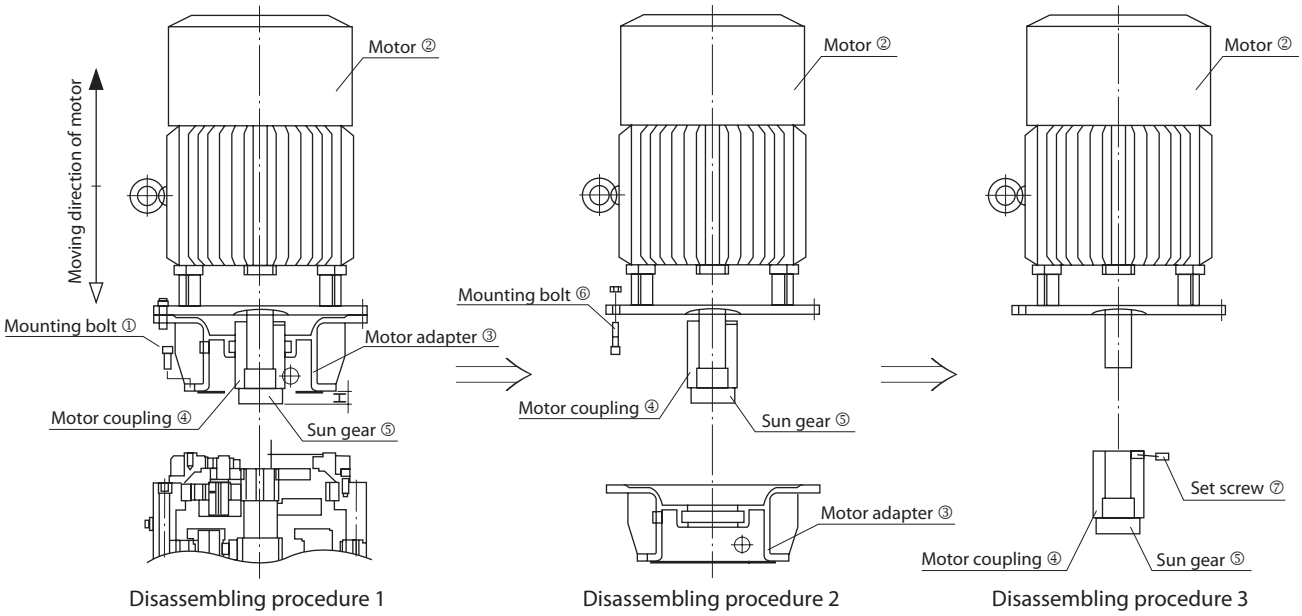


Fig. 9-1 Disassembling procedure of Construction 1

Disassembling procedure 1

(1) Verify that the drive unit is the right model for Construction1 according to table 9-2 "Selection Table" on page 20.
(2) Set the drive unit stably on rigid base with the motor upper side.
(3) Remove mounting bolt ①.
(4) Move motor ②, motor adapter ③, motor coupling ④, and sun gear ⑤ integrally towards →, and disassemble.

Disassembling procedure 2

(1) Remove mounting bolt ⑥.
(2) Remove motor ②, motor coupling ④, and sun gear ⑤ integrally from motor adapter ③.

Disassembling procedure 3

(3) Remove set screw ⑦ and demount motor coupling ④ and sun gear ⑤ integrally from motor shaft.

9-2 Disassembly / reassembly of gear and motor [CONSTRUCTION 2]

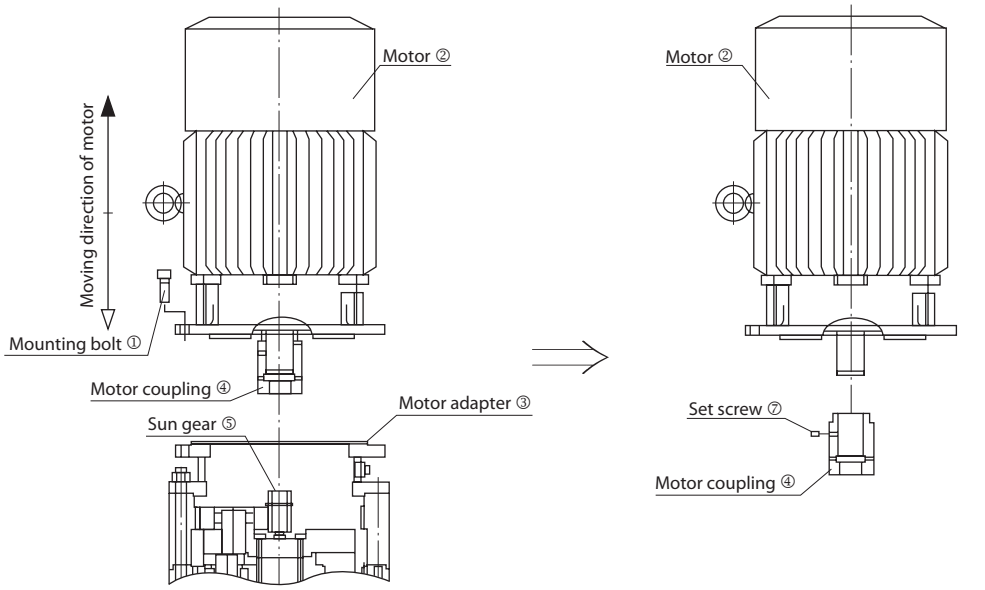


Fig. 9-2 Disassembling procedure of Construction 2

Disassembling procedure 1

(1) Verify that the drive unit is the right model for Construction2 according to table 9-2 "Selection Table" on page 20.
(2) Set the drive unit stably on rigid base with the motor upper side.
(3) Remove mounting bolt ①.
(4) Move motor ②, motor coupling ④ integrally towards →, and disassemble.

Disassembling procedure 2

(1) Remove set screw ⑦ and demount motor coupling ④ integrally from motor shaft.

9-3 Reassembling procedure

Steps of reassembling procedure shall be done in a reverse order of disassembling procedure carefully with followings.
(1) Keep gear part from dirt and dust, and reassemble each part to be fully cleaned with wash oil.
(2) Assemble oil seals with attention to the direction of lip after applying grease to lip part.
(3) For Construction1, adjust the position of sun gear within 0.5-1.5mm for A-B.
(4) Remove old liquid packing attached to the contact area and apply new one. Assemble completely by sliding slowly towards →.
(5) All bolts shall be tightened by a torque wrench in accordance with the standard torque shown in the table 9-1, standard torque of bolts.

Table. 9-1 Standard torque of bolts Unit: N·m

Strength	Bolt size									
	M6	M8	M10	M12	M14	M16	M18	M20	M24	M30
4.6	3.3~4.1	8.1~9.9	16.5~20.2	28.5~34.8	45.5~55.6	70.5~86.2	95.4~117	137~167	236~289	480~586
10.9	12.8~14.2	31.0~34.8	61.3~69.0	107~120	170~191	265~298	365~411	518~583	896~1010	1370~1540

Table 9-2 Selection Table : Drive Unit

Reduction ratio	Size of Reducer																										
	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1185	1190	1195	1200	1205	1210	1215	1220	
5	●	●	●	●	●	●	●																				5
9	●	●	●	●	●	●	●																				9
16	●	●	●	●	●	●	●	●	●	○	○	○	○	○													16
18				●	●	●	●	●	●	○	○	○	○	○													18
20				●	●	●	●	●	●	○	○	○	○	○													20
22.4	●	●	●	●	●	●	●	●	●	○	○	○	○	○													22.4
25						●	●	●	●	○	○	○	○	○													25
28						●	●	●	●	○	○	○	○	○													28
31.5	●	●	●	●	●	●	●	●	●	○	○	○	○	○													31.5
35.5				●	●	●	●	●	●	○	○	○	○	○													35.5
40	●	●	●	●	●	●	●	●	●	○	○	○	○	○													40
45						●	●	●	●	○	○	○	○	○													45
50	●	●	●	●	●	●	●	●	●																		50
56					●	●	●	●	●																		56
63					●	●	●	●	●																		63
71	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	○											71
80					●	●	●	●	●	●	●	●	●	○	○	○	○	○		○	○					○	80
90	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○					90
100					●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	100
112					●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	112
125	●	●	●	●	●	●	●	●	●	●	●	●	●	○.	○	○	○	○	○	○	○	○	○	○	○	○	125
140					●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	140
160					●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	160
180	●	●	●	●	●	●	●	●	●	●.	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	180
200					●	●	●	●	●		●	●	●	○	○	○	○	○	○	○		○	○	○	○	○	200
224	●	●	●	●	●	●	●	●	●									○		○				○	○	○	224
250						●		●		●	●	●	●														250
280										●	●	●	●														280
315	●	●	●	●	●	●	●	●	●	●	●	●	●														315
355								●	●	●	●	●	●		●	●	●					○					355
400	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		○	○	○	○	○	○	○	400
450								●	●	●	●	●	●	●	●	●	●	●		○	○	○	○	○	○	○	450
500								●	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	500
560	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	560
630								●	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	630
710								●	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	710
800	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	800
900								●	●	●	●	●	●	●	●	●	●	●	●	○		○		○	○	○	900
1000								●	●	●	●	●	●	●	●	●	●	●	●.	○	○						1000
1120	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●		○	○		○	○		○	1120
1250								●	●																		1250
1400	●	●	●	●	●	●	●	●	●																		1400
	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1185	1190	1195	1200	1205	1210	1215	1220	

● Applicable range of Construction 1

○ Applicable range of Construction 2

Blank : Not covered by DP1000-Series

⚠ CAUTION

Identify and provide appropriate corrective actions for any abnormality according to the maintenance manual. Do not operate the unit until corrective action has been taken.

When any abnormality happens on reducer or drive unit, take appropriate measures immediately referring to the following table. If they are not repairable, contact our nearest agency, distributor, or sales office.

Table 10-1 Troubleshooting

Problem			Cause	Correction
The motor will not operate under no load			Power failure	Contact the electric power company.
			Defective electric circuit	Check the circuit.
			Blown fuse	Replace the fuse.
			Protective device is engaged	Fix the problem and recover.
			Load locking	Check the load and safety device.
			Poor switch contact	Adjust the contact unit.
			Motor stator coil disconnect	Confer with authorized service station.
			Bearing damage	Confer with authorized service station.
			3-phase is functioning as single-phase	Check the power supply with a voltmeter. Check the motor, transformer coil, contactor, fuse, etc. and repair or replace them.
The motor rotates without a load but the slow speed shaft does not rotate			Damage to gear unit due to overloading of gears, etc.	Confer with authorized service station.
The slow speed shaft turns without a load	When a load is applied	The switch overheats	Insufficient switch capacity	Replace with specified switch.
			Overload	Decrease the load to the specified value.
		Fuse tripping	Insufficient fuse capacity	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.
			Short-circuited motor stator coil	Confer with authorized service station.
		It stops	The key is not inserted	Insert key.
			Bearing burnout	Confer with authorized service station.
			Poor adjustment of protection device	Adjust the protection device.
	The motor runs in the reverse direction		Wiring error	Change the connection.
	Fuse tripping		The lead wire is short circuited.	Confer with authorized service station.
			Poor contact between motor and starter	Make good connection.
Excessive temperature rise			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	Confer with authorized service station.
			Abnormal wear of gears and bearings due to overload, etc.	Confer with authorized service station.
Oil leakage	Blot or drip of a small amount of oil at seal section of input speed or output speed shaft		Grease applied to the oil seal seeps out at first	Wipe off around the oil seal, and observe.
	Leakage of oil from input speed or output speed shaft section		Damaged oil seal or maybe damaged shaft (or collar)	Confer with authorized service station.
	Leakage of oil/grease from the contact surfaces of ring gear housing and casing, etc.		Loose fastener bolts	Tighten fastener bolts correctly.
	Leakage of oil into motor		Damage to oil seals, or slinger collar	Confer with authorized service station.
			Excessive oil supply	Remove oil.

Table 10-2 Troubleshooting

Problem		Cause	Correction
Abnormal sound Excessive vibration		Dust and foreign matter in bearings, or damaged bearings	Confer with authorized service station.
		Reducer parts grinding on foreign matter	Confer with authorized service station.
		Reducer parts are damaged	Confer with authorized service station.
		Warping of housing because the installation surface is not flat	Make the installation base flat or make adjustment using liners, etc.
		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.
		Transmission of vibration from the driven machine	Individually operate the products to check the source of the sound.
Abnormal motor sounds		Foreign objects have entered	Confer with authorized service station.
		Bearing damage	Confer with authorized service station.
Tripping Inverter	Overcurrent shut-off	Sudden speed changes	Increase the time for speed changes.
		Extreme load fluctuation	Decrease load fluctuation.
	Overcurrent due to ground fault	Ground fault on out side	Take measures to prevent ground fault.
	Direct current overcurrent	Short on output side	Take measures to prevent short. Inspect wiring.
	Regenerative overvoltage shut-off	Sudden speed reduction	Increase the time for speed reduction. Decrease brake frequency.
	Thermal operation	Overload	Decrease the load to the specified value.

11-1 Construction of Reducer

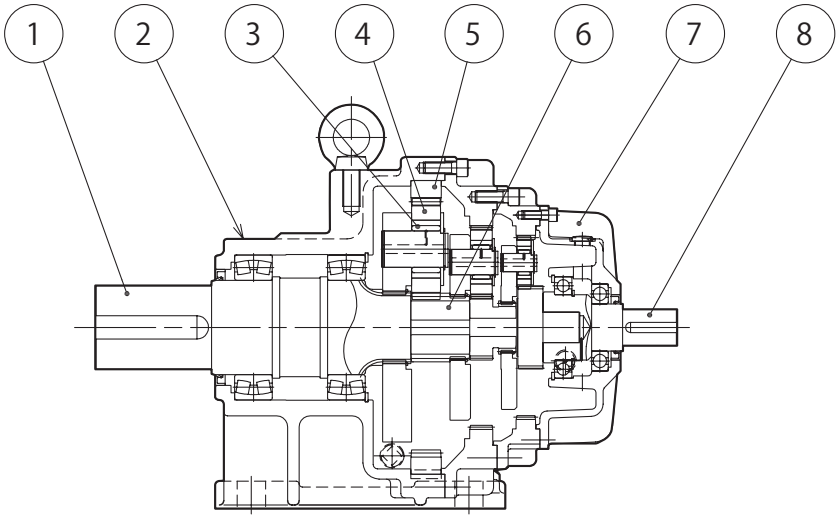


Fig.11-1 DHG Type (Foot mount tye)

No.	Part Name	No.	Part Name
1	Low-Speed Shaft	5	Internal Gear
2	Housing	6	Sun Gear
3	Bearing	7	High-Speed side Cover
4	Planetary Gear	8	High-Speed Shaft

11-2 Construction of Drive Unit

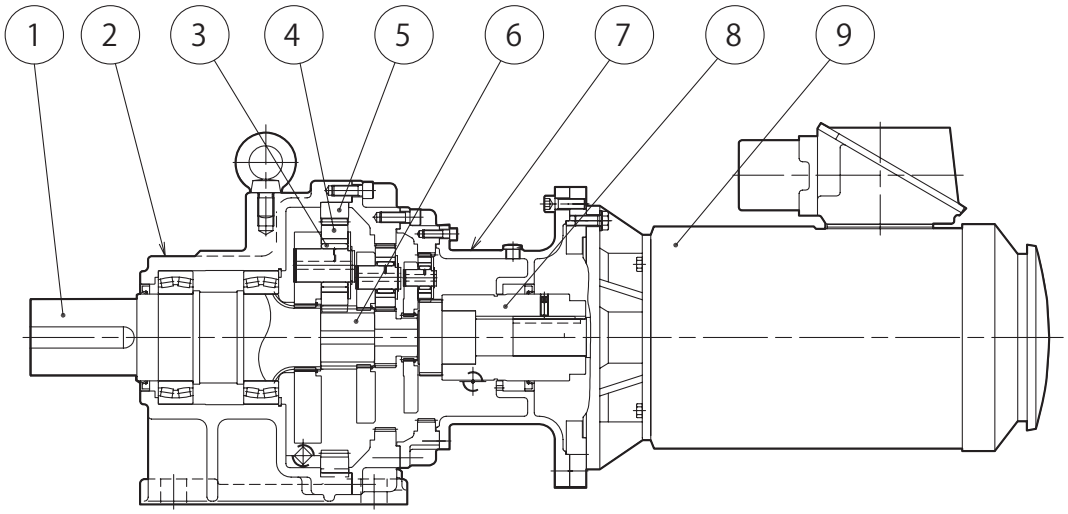


Fig.11-2 DHGM Type (Foot mount tye)

No.	Part Name	No.	Part Name
1	Low-Speed Shaft	6	Sun Gear
2	Housing	7	Motor Adapter
3	Bearing	8	Motor Coupling
4	Planetary Gear	9	Motor
5	Internal Gear		

The oil quantity shown below is not exact quantity. Use a dipstick or visible oil gauge to check the oil level when filling.
(As to oil quantity for special specifications, refer to specifications sheet and outline drawing.)

Table 12-1 Oil quantity for Reducer

Unit: Liter

Size	Reducer							
	DHG Type				DHF Type			
	Nominal Reduction Ratio				Nominal Reduction Ratio			
	5 · 9	16~45	50~224	250~1400	5 · 9	16~45	50~224	250~1400
1010	0.3	0.4	0.4	0.4	0.3	0.4	0.4	0.4
1020	0.4	0.4	0.5	0.5	0.4	0.4	0.5	0.5
1030	0.5	0.6	0.6	0.7	0.5	0.6	0.6	0.7
1040	0.7	0.8	0.8	0.9	0.7	0.8	0.8	0.9
1050	0.9	1.1	1.3	1.4	0.9	1.1	1.3	1.4
1060	2.0	2.2	2.5	2.7	2.0	2.2	2.5	2.7
1070	3.5	3.8	4.5	4.9	3.5	3.8	4.5	4.9
1080	-	4.8	5.7	6.8	-	4.8	5.7	6.8
1090	-	5.9	7.0	8.0	-	5.9	7.0	8.0
1100	-	11	12	13	-	8.3	9.0	10.5
1110	-	14	13	14	-	10	9.5	11
1120	-	20	16	17	-	15	11	12.5
1130	-	21	22	23	-	15	16	15.5
1140	-	33	34	34.5	-	22	15	16
1150	-	-	-	-	-	-	18	17
1160	-	-	-	-	-	-	22	20.5
1170	-	-	-	-	-	-	25	24
1180	-	-	-	-	-	-	28	26
1185	-	-	-	-	-	-	35	31
1190	-	-	-	-	-	-	40	36
1195	-	-	-	-	-	-	46	43
1200	-	-	-	-	-	-	52	47
1205	-	-	-	-	-	-	58	53
1210	-	-	-	-	-	-	63	57
1215	-	-	-	-	-	-	70	66
1220	-	-	-	-	-	-	77	70

Table 12-2 Oil quantity for Drive Unit

Unit: Liter

Size	Drive Unit											
	DHGM Type				DHFM Type				DVFM Type			
	Nominal Reduction Ratio				Nominal Reduction Ratio				Nominal Reduction Ratio			
	5 · 9	16~45	50~224	250~1400	5 · 9	16~45	50~224	250~1400	5 · 9	16~45	50~224	250~1400
1010	0.3	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.6	0.9	1.1
1020	0.4	0.4	0.5	0.5	0.4	0.4	0.5	0.5	0.6	0.7	1.0	1.2
1030	0.5	0.6	0.6	0.7	0.5	0.6	0.6	0.7	0.7	1.0	1.2	1.4
1040	0.7	0.8	0.8	0.9	0.7	0.8	0.8	0.9	1.1	1.4	1.7	1.9
1050	0.9	1.1	1.3	1.4	0.9	1.1	1.3	1.4	2.2	2.6	2.9	3.1
1060	2.0	2.2	2.5	2.7	2.0	2.2	2.5	2.7	4.1	4.8	5.2	5.4
1070	3.5	3.8	4.5	4.9	3.5	3.8	4.5	4.9	5.2	6.7	7.2	7.5
1080	-	4.8	5.7	6.8	-	4.8	5.7	6.8	-	8.3	9.0	9.5
1090	-	5.9	7.0	8.0	-	5.9	7.0	8.0	-	9.0	9.9	10.5
1100	-	11	12	12	-	8.3	9.0	9.3	-	15	16	17
1110	-	14	13.5	14	-	10	9.5	9.7	-	18	20	20
1120	-	20	-	16.5	-	15	-	11.5	-	28	-	31
1130	-	21	-	22.5	-	15	-	16.2	-	28	-	33
1140	-	-	-	35	-	-	-	17	-	-	-	34
1150	-	-	-	-	-	-	-	-	-	-	-	-
1160	-	-	-	-	-	-	-	-	-	-	-	-

The scope of our product warranty is limited to our manufacturing range.
Warranty (period and contents)

Warranty Period	The product warranty period is 18 months after delivery, 18 months after shipment of the product from the seller, or 12 months from product commissioning, whichever is first.
Warranty Conditions	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 on 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. However, if the product is installed or integrated into the Buyer's equipment or machines, the seller does not reimburse the following costs: removal or reinstallation of the product or other incidental costs related thereto, any lost opportunity, any profit loss or other incidental or consequential losses or damage incurred by the buyer or its customers.
Warranty Exclusions	Notwithstanding the above warranty, the warranty as set forth herein does not apply to any problem or damage to the product caused by: 1. Installation, connection, combination or integration of the product with or into 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 without informing the Seller, including, without limitation, the buyer's or its customers' operation of the product not in conformity with the specifications and use of lubricating oil that is not recommended by the seller; 4. Any problem or damage to any equipment or machine into or with 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 and oil seals; and 9. Any other problems with or damage to the product that are not attributable to the seller.

Worldwide Locations

U.S.A

Sumitomo Machinery Corporation of America (SMA)
4200 Holland Blvd. Chesapeake, VA 23323, U.S.A.
TEL (1)757-485-3355 FAX (1)757-485-7490

Canada

SM Cyclo of Canada, Ltd. (SMC)
1453 Cornwall Road, Oakville, Canada ON L6J 7T5
TEL (1)905-469-1050 FAX (1)905-469-1055

Mexico

SM Cyclo de Mexico, S.A. de C.V. (SMME)
Av. Desarrollo 541, Col. Finsa, Guadalupe,
Nuevo León, México, CP67132
TEL (52)81-8144-5130 FAX (52)81-8144-5130

Brazil

Sumitomo Industrias Pesadas do Brasil Ltda. (SHIB)
Rodovia do Acucar (SP-075) Km 26
Itu, Sao Paulo, Brasil
TEL (55)11-4886-1000 FAX (55)11-4886-1000

Chile

SM-Cyclo de Chile Ltda. (SMCH)
Camino Lo Echevers 550, Bodegas 5 y 6,
Quilicura, Región Metropolitana, Chile
TEL (56)2-892-7000 FAX (56)2-892-7001

Argentina

SM-Cyclo de Argentina S.A. (SMAR)
Ing Delpini 2230, B1615KGB Grand Bourg,
Malvinas Argentinas, Buenos Aires, Argentina
TEL (54)3327-45-4095 FAX (54)3327-45-4099

Guatemala

SM Cyclo de Guatemala Ensambladora, Ltda. (SMGT)
Parque Industrial Unisur, 0 Calle B 19-50 Zona 3,
Bodega D-1 Delta Bárcenas en Villa Nueva, Guatemala
TEL (502)6648-0500 FAX (502)6631-9171

Colombia

SM Cyclo Colombia, S.A.S. (SMCO)
Parque Industrial Celta, Km 7.0 Autopista Medellín,
Costado Occidental, Funza, Cundinamarca, Colombia
TEL (57)1-300-0673

Peru

SM Cyclo de Perú, S.A.C (SMPE)
Jr. Monte Rosa 255, Oficina 702, Lima,
Santiago de Surco, Perú
TEL (51)1-713-0342 FAX (51)1-715-0223

Germany

Sumitomo (SHI) Cyclo Drive Germany GmbH (SCG)
Cyclostraße 92, 85229 Markt Indersdorf, Germany
TEL (49)8136-66-0 FAX (49)8136-5771

Austria

Sumitomo (SHI) Cyclo Drive Germany GmbH (SCG)
SCG Branch Austria Office
Gruentalerstraße 30A, 4020 Linz, Austria
TEL (43)732-330958 FAX (43)732-331978

Belgium

Hansen Industrial Transmissions NV (HIT)
Leonardo da Vincilaan 1, Edegem, Belgium
TEL (32)34-50-12-11 FAX (32)34-50-12-20

France

SM-Cyclo France SAS (SMFR)
8 Avenue Christian Doppler, 77700 Serris, France
TEL (33)164171717 FAX (33)164171718

Italy

SM-Cyclo Italy Srl (SMIT)
Via dell' Artigianato 23, 20010 Cornaredo (MI), Italy
TEL (39)293-481101 FAX (39)293-481103

Spain

Sociedad Industrial de Transmisiones S.A. (SIT)
Ubarburu Pasealekua, 67, San Sebastián, Guipúzcoa,
Spain
TEL (34)943-457-200 FAX (34)902-431-278

United Kingdom

SM-Cyclo UK Ltd. (SMUK)
Unit 29, Bergen Way, Sutton Fields Industrial Estate,
Kingston upon Hull, HU7 0YQ, East Yorkshire,
United Kingdom
TEL (44)1482-790340 FAX (44)1482-790321

Turkey

SM Cyclo Turkey Güç Aktarım Sis. Tic. Ltd. Sti. (SMTR)
Barbaros Mh. Çiğdem Sk. Ağaoğlu, Office Mrk. No:1 Kat:4
D.18 Ataşehir, İstanbul, Turkey
TEL (90)216-250-6069 FAX (90)216-250-5556

India

Sumi-Cyclo Drive India Private Limited (SDI)

Gat No. 186, Raisoni Industrial Park, Alandi Markal Road,
Fulgaon-Pune, Maharashtra, India
TEL (91)96-0774-5353

China

Sumitomo (SHI) Cyclo Drive Shanghai, Ltd. (SCS)
11F, SMEG Plaza, No. 1386 Hongqiao Road,
Changning District, Shanghai, China 200336
TEL (86)21-3462-7877 FAX (86)21-3462-7922

Hong Kong

SM-Cyclo of Hong Kong Co., Ltd. (SMHK)
Room 19, 28th Floor, Metropole Square, No.2 On
Yiu Street, Shatin, New Territories, Hong Kong
TEL (852)2460-1881 FAX (852)2460-1882

Korea

Sumitomo (SHI) Cyclo Drive Korea, Ltd. (SCK)
Room #913, Royal Bldg, Saemunan-ro 5 gil 19,
Jongro-gu, Seoul, Korea 03173
TEL (82)2-730-0151 FAX (82)2-730-0156

Taiwan

Tatung SM-Cyclo Co., Ltd. (TSC)
22 Chungshan N. Road 3rd., Sec. Taipei, Taiwan 104,
R.O.C.
TEL (886)2-2595-7275 FAX (886)2-2595-5594

Singapore

Sumitomo (SHI) Cyclo Drive Asia Pacific Pte. Ltd. (SCA)
15 Kwong Min Road, Singapore 628718
TEL (65)6591-7800 FAX (65)6863-4238

Philippines

Sumitomo (SHI) Cyclo Drive Asia Pacific Pte. Ltd.
Philippines Branch Office （SMPH)
C4 & C5 Buildings Granville Industrial Complex, Carmona,
Cavite 4116, Philippines
TEL (63)2-584-4921 FAX (63)2-584-4922

Vietnam

SM-Cyclo (Vietnam) Co., Ltd. (SMVN)
Factory 2B, Lot K1-2-5, Road No. 2-3-5A,
Le Minh Xuan Industrial Park, Binh Chanh Dist.,
HCMC, Vietnam
TEL (84)8-3766-3709 FAX (84)8-3766-3710

Malaysia

SM-Cyclo (Malaysia) Sdn. Bhd. (SMMA)
No.7C, Jalan Anggerik Mokara 31/56, Kota Kemuning,
Seksyen 31, 40460 Shah Alam, Selangor Darul Ehsan,
Malaysia
TEL (60)3-5121-0455 FAX (60)3-5121-0578

Indonesia

PT. SM-Cyclo Indonesia (SMID)
Jalan Sungkai Blok F 25 No. 09 K, Delta Silicon Ⅲ,
Lippo Cikarang, Bekasi 17530, Indonesia
TEL (62)21-2961-2100 FAX (62)21-2961-2211

Thailand

SM-Cyclo (Thailand) Co., Ltd. (SMTH)
195 Empire Tower, Unit 2103-4, 21st Floor, South
Sathorn Road, Yannawa, Sathorn, Bangkok 10120,
Thailand
TEL (66)2670-0998 FAX (66)2670-0999

Australia

Sumitomo (SHI) Hansen Australia Pty. Ltd. (SHAU)
181 Power St, Glendenning, NSW 2761, Australia
TEL (61)2-9208-3000 FAX (61)2-9208-3050

Japan

Sumitomo Heavy Industries, Ltd. (SHI)
ThinkPark Tower, 1-1 Osaki 2-chome, Shinagawa-ku,
Tokyo 141-6025, Japan
TEL (81)3-6737-2511 FAX (81)3-6866-5160

Sumitomo Heavy Industries Gearbox Co., Ltd.
Headquarter 16-1, Wakihama 4-chome, Kaizuka-shi, Osaka 597-8555, Japan

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