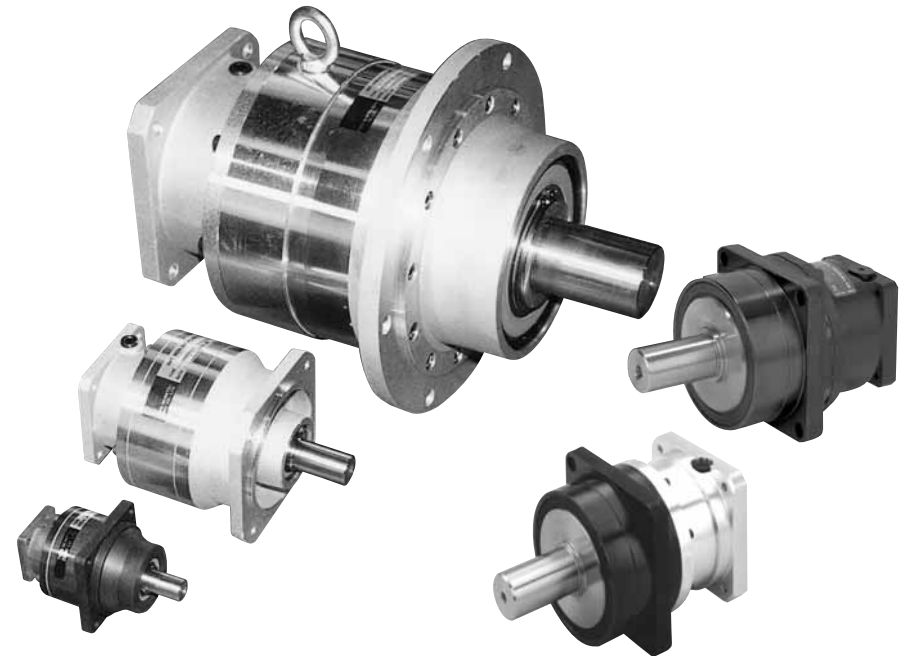


MC DRIVE IB Series

Speed Reducer for Servo Motors



 **Sumitomo Heavy Industries, Ltd.**

POWER TRANSMISSION & CONTROLS GROUP

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- Speed reducer should be handled, installed and maintained by trained technicians. Carefully read the maintenance manual before use.
- A copy of this maintenance manual should be sent to the actual user .
- This maintenance manual should be maintained by the user.

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. Maintain this manual for future reference.
- Pay particular 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.



- Transport, installation, plumbing, wiring, operation, maintenance, and inspections should be handled by properly trained technicians; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- When the unit is to be used in a system for transport of human beings, a secondary safety device should be installed to minimize chances of accidents resulting in 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.

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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. When a different unit is installed, injury or damage to the equipment may result.
- Do not remove the rating plate.

Upon delivery and receipt of the reducer check the following. If a nonconformity or problem is found, contact our nearest agent, distributor, or sales office.

- (1) Do the items 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

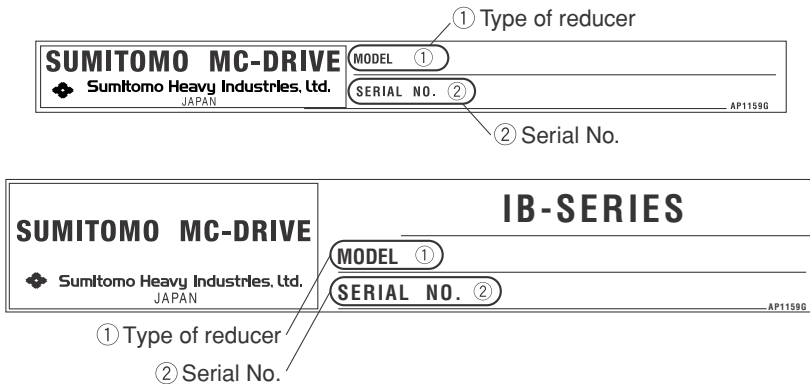


Fig.1 Rating Plate of Reducer

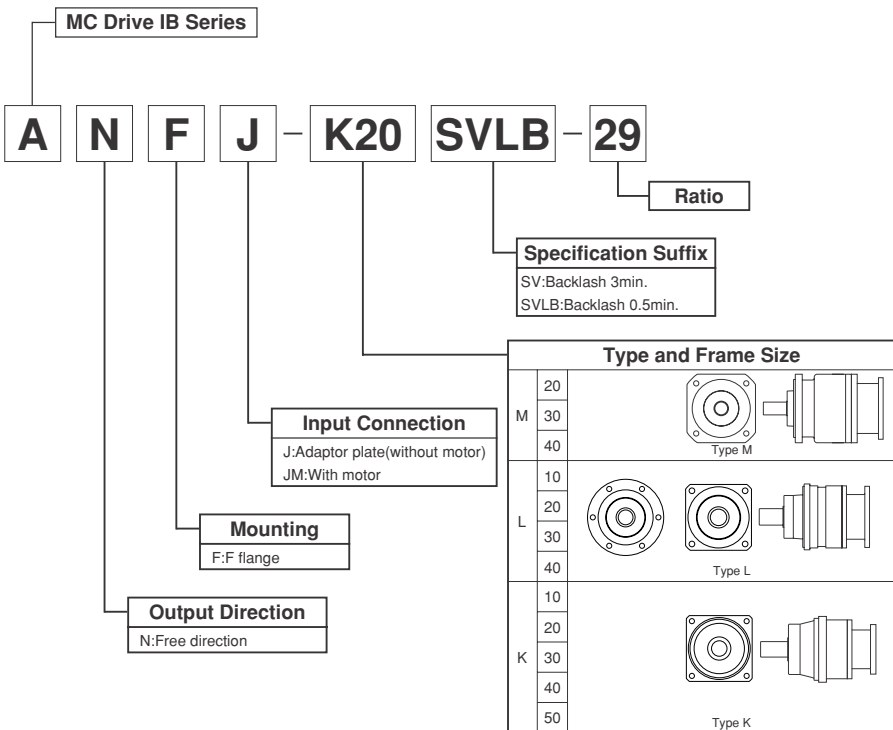
- When making an inquiry, advise us of ① the type of reducer and ② serial No.

1—2) Lubrication Method

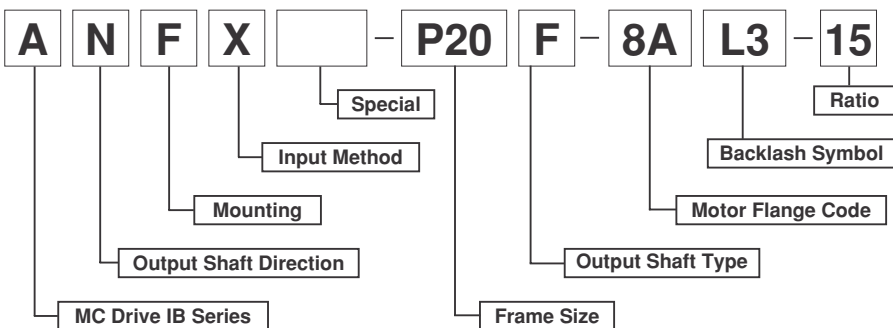
Since all MC drive IB series adopt grease lubrication, grease has been loaded on shipping from factory. Put units into operation as they are.

1—3) Nomenclature of Reducer

● Type M, L, K



● Type P, P1



Output Shaft Type	Symbol
Flange	F
Solid Shaft (without keyway)	N
Solid Shaft (with keyway)	W

Backlash	Symbol
15min or less	LD
10min or less	LC
3min	L3

2. Storage

When storing 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 change, or corrosive gas.

2—2) Storage Period

- (1) Storage period should be less than 1 year.
- (2) Export models need export rust prevention. Contact the factory for details.

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 reducer, 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 reducer. When a hanging bolt or hole is provided, be sure to use it. After mounting reducer 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 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



CAUTION

- Do not use the reducer for purpose other than those shown on the rating plate or in the manufacturing specification; otherwise, electric shock, injury, or damage to the equipment may result.
- Do not place any object that will hinder ventilation around the reducer; otherwise, the cooling effect is reduced, possibly leading to fire or burns due to excessive heat built-up.
- Do not step on or hang from the reducer; otherwise, injury may result.
- Do not touch the shaft end of the 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 failure or limited service life; otherwise, oil leakage may damage products.

4—1) Place of Installation

Ambient temperature: 0—40°C

There is possibility of malfunctioning startup depending on rotational speed and torque of the motor. When you use the motor at 0°C, please consult us.

Ambient humidity: 90% max. No condensation

Altitude: 1000m max.

Ambient atmosphere there should be no corrosive gas, explosive gas, or steam. The place should be well ventilated without dust.

Location of installation: 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 the units where inspection, maintenance, and other such operations can be carried out easily.
- Install the unit on a sufficiently rigid base.

5. Coupling with Other Machines



CAUTION

- Confirm the direction of rotation before coupling the unit with the driven machine. Difference in the direction of rotation may cause injury or damage to the equipment.
- When operating the 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 reducer with 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.

- (1) The standard output shaft of reducer is straight type. Recommend to use some kinds of coupling which are not generated backlash at the coupling part.
- (2) In case radial load is put on output shaft, do not exceed the value in the attached table, "Standard model table".
- (3) When output shaft is installed in coupling, do not force into it so that bearing may be damaged.

5—1) 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.
- When chain sprockets, gears or pullers are coupled with the reducer, please use within the range of the allowable radial axial load, or shaft and bearing may be damaged.

(1) When Using a Coupling

The accuracy of the dimensions (A, B and X) shown in Fig.2 should be within the tolerance shown in Table 1.

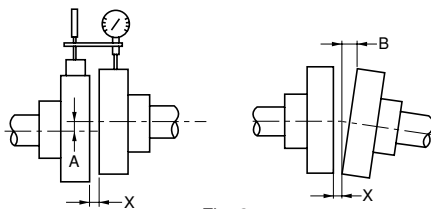


Fig. 2

Table 1 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 reducer side with respect to the length of the shaft. (Fig.3)

(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.4)
- Use a matchend set with the same circumferential length when more than one belt is to be installed.

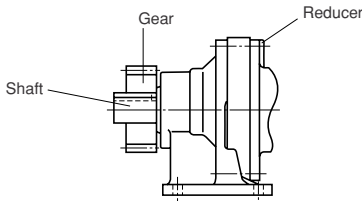


Fig. 3

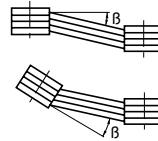


Fig. 4

6. Operation



DANGER

- Do not approach or touch rotating parts (output shaft, etc.) during operation; otherwise, loose clothing caught in these rotating parts may result in serious injury.



CAUTION

- Do not put fingers or foreign object into the opening of the reducer; otherwise, injury or damage to the equipment may result.
- The reducer will become very hot during operation. Do not touch or come in contact with the unit; otherwise, burns may result.
- If anomaly occurs during operation, stop operation immediately; otherwise, injury may result.
- Do not operate the unit in excess of the rating; otherwise, injury or damage to the equipment may result.

7. Daily Inspection and Maintenance



DANGER

- Do not approach or touch any rotating parts (output shaft, etc.) during maintenance or inspection of the unit; otherwise, loose clothing caught in these rotating parts may result in injury or death.



CAUTION

- Do not put fingers or foreign objects into the opening of the reducer; otherwise, injury or damage to the equipment may result.
- The reducer will become very hot during operation. Do not touch the unit with bare hands; otherwise, burns may result.
- Identify and provide appropriate corrective action in a timely fashion and according to this maintenance manual if any abnormal operating characteristics are observed. Do not operate the unit corrective action has been taken.
- Do not use damaged reducers; otherwise, injury or damage to the equipment may result.
- We can not assume any responsibility for damage or injury as a result of an unauthorized modification by a customer.
- Dispose of the reducer as general industrial waste.

7—1) Daily Inspection

To ensure proper and continued optimum operation, use table1 to perform daily inspections.

Table 2 Daily Inspection

Inspection item	Details of inspection
Noise	Is there abnormal sound? Is there sudden change in sound?
Vibration	Is there vibration abnormally large? Does vibration change suddenly?
Surface temperature	Is the surface temperature abnormally high? Does the surface temperature rise suddenly?
Foundation bolt	Are foundation bolts loose?
Grease leakage	Does grease leak from the gear section?

When some anomaly is found during the daily inspection, contact our nearest agent, distributor, or sales office.

8. Instructing Motor Installation

8—1) Type M·L

This is the construction anyone can connect with motor because the coupling is used at the shaft coupling part between reducer and motor.

Assemble them as the following instruction.

- (1) Put the reducer on the proper table so that the slow speed shaft is facing down.
- (2) Put hub(1), spacer, and hub(2) of the coupling which are equipped with the input shaft of the reducer in order, and push them until clicks of the hub are engaged enough.
- (3) Set the position manually so that clamping bolts of the hub(2) are fastened into the hole of the slow speed end cap.
- (4) Put the motor shaft into the center hole of the hub(2) and assemble perpendicularly cover and motor.
- (5) Fasten the motor with the slow speed end cap with motor installation bolt.
- (6) Fasten the coupling bolt with hexagon head from the setting hole in the side of the slow speed end cap referring the clamping torque in the table 3.

Table 3 Clamping Torque

Coupling type	Fastening bolt	Clamping torque
CCZ18	M3	1.67N·m
CCZ25	M4	3.92N·m
CCZ35	M5	7.35N·m
CCZ50	M8	19.6N·m
CCZ70	M10	33.3N·m
FF 10	M6	8.83N·m
FF 15	M8	21.6N·m

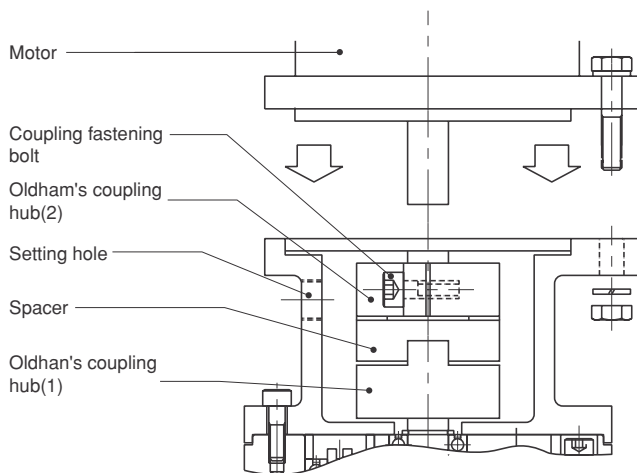


Fig. 5 Installation Drawing

8—2) Type K

Because the special coupling is used at the coupling part between reducer and motor, it is possible to install either straight shaft, shaft with key groove, or D-cut shaft. Install it as the following instruction.

- (1) Set the coupling unified with primary sun gear into motor shaft. Set the tip of sun gear from the motor flange side for size in the table 5. (In case the size is out of the designated range, reducer's life expectancy might be shortened.)
- (2) Fasten the coupling bolt with hexagon head by clamping torque in the table 4.
- (3) Put the reducer on the proper table so that the slow speed shaft is facing down.
- (4) In case motor with shield is used, apply packing in liquid to the flange side of the slow speed end cap because high speed shaft seal of the reducer is removed.
- (5) Put motor primary sun gear is installed into perpendicularly without damaging high speed end cap.
- (6) Rotating primary sun gear along with motor manually and putting it into motor, each cog meet well. Then, it is convenient to shorten power wire of motor.
- (7) Finally fasten flanges of motor and of slow speed end cap with bolt and nuts.

Table 4 Clamping Torque

Motor capacity	Fastening bolt	Clamping torque
50W	M3	1.67N·m
100W	M3	1.67N·m
200W	M4	3.92N·m
400W	M4	3.92N·m
750W	M5	7.35N·m

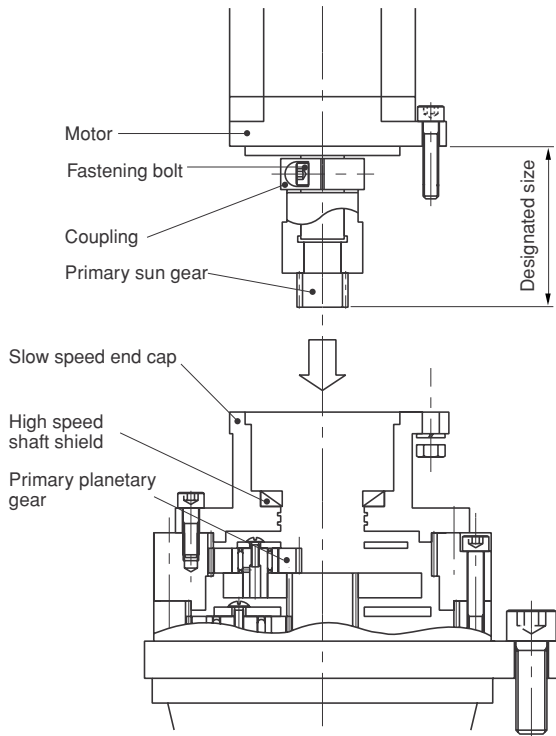


Fig. 6 Motor Installation Drawing

Table 5

Motor power W	Frame size	Reduction ratio	Designated size	Motor power W	Frame size	Reduction ratio	Designated size
50	K10	5	44±0.2	400	K20	5	52±0.2
		9	58±0.2		K30	9	72±0.2
		20	41±0.2		K40	20	51±0.2
		29	41±0.2			29	51±0.2
100	K10	5	44±0.2	750	K30	5	64±0.2
		9	58±0.2			9	89±0.2
	K20	20	43±0.2		K50	20	61±0.2
		29	43±0.2			29	61±0.2
200	K10	5	53±0.2				
	K20	9	66±0.2				
	K30	20	51±0.2				
		29	51±0.2				

8—3) Type P, P1

Either straight type, shaft with keyway, or D shaft may be attached to the motor shaft, because special coupling is used for shaft connection part of reducer and motor. Follow the process below from (1) through (7) for assembly. (Remove key while assembly for shaft with keyway.)

- (1) Place reducer on an appropriate worktable with output shaft on the bottom side.
- (2) Remove fitting of the setting hole (1 place) of the reducer unit (① in figure below).
- (3) Match the location by turning by hand to tighten tightening bolt of the coupling into setting hole of the reducer unit (② in figure below).
- (4) Insert motor shaft into the center hole of the coupling, press in vertically and fit the pilot part of the reducer unit and motor.
- (5) Tighten motor and reducer unit with motor attachment bolt (④ in figure below).
- (6) Tighten coupling tightening bolt through the setting hole of the side of the reducer unit using a torque wrench bolt (④ in figure below). Refer to Table 12 for necessary tightening torque.

Table 6

Fastening bolt	Clamping torque [N·m]	Coupling hole diameter [mm]
M3	1.67	ø6-ø8
M4	3.92	ø9-ø14
M5	7.35	ø16-ø19
M6	8.83	ø24-ø28
M8	21.6	ø32-ø38

- (7) Insert fitting (1 place) in the setting hole of the joint cover.

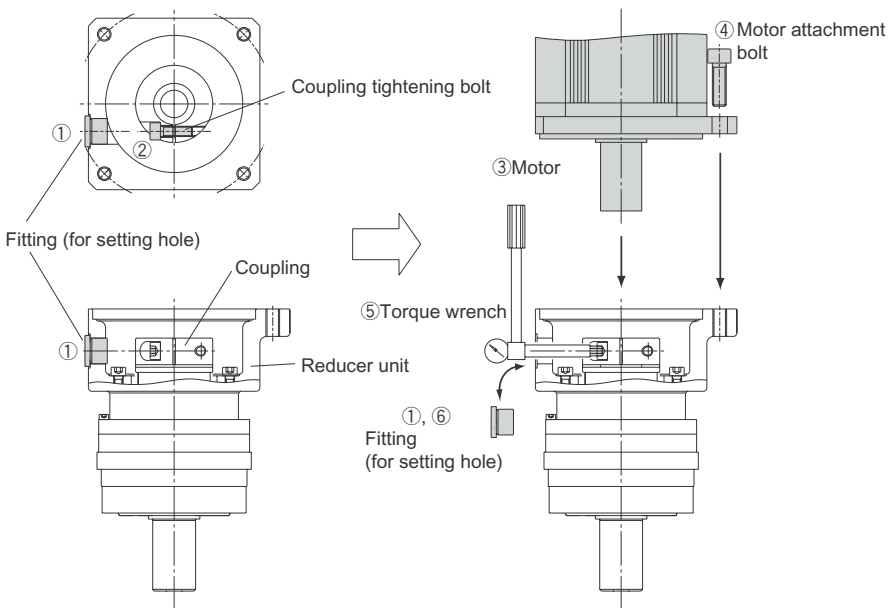


Fig. 7 Motor linstallation Drawing

9. Construction Drawing

9—1) Type M

As shown in Fig.8, this construction has two stages reduction structure with spur gear and two pairs of gear train for the clockwise and the counterclockwise directions are combined.

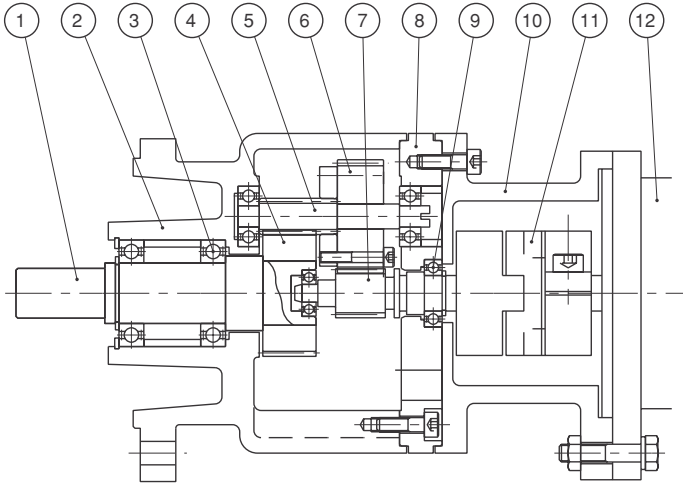


Fig. 8 Type M Construction Drawing

Part No.	Part name
1	Slow speed shaft
2	Case
3	Slow speed shaft bearing
4	Secondary gear
5	Secondary pinion
6	Primary gear
7	Primary pinion
8	Slow speed end cap
9	High speed shaft bearing
10	Adapter plate
11	Coupling
12	Motor

9—2) Type L

As shown in Fig.9, this is simple planetary gearing mechanism and has four gears at each stage. Two of them are for clockwise and the others for counterclockwise. This is the power transmitting mechanism.

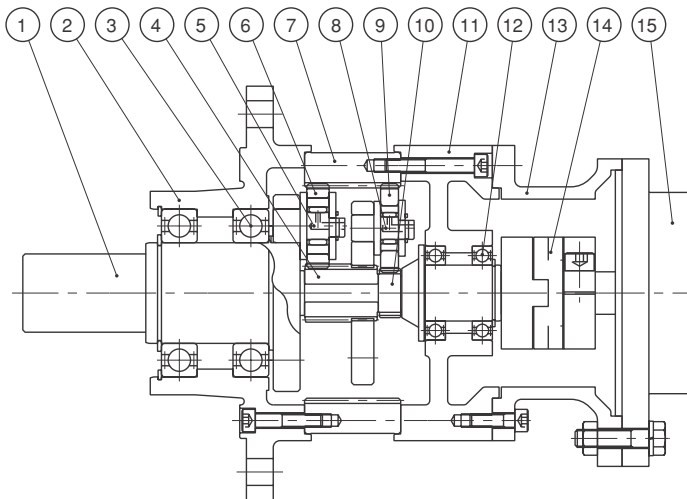


Fig.9 Type L Construction Drawing

Part No.	Part name
1	Slow speed shaft
2	Case
3	High speed shaft bearing
4	Secondary sun gear
5	Secondary planetary shaft
6	Secondary planetary gear
7	Inner gear
8	Primary planetary shaft
9	Primary planetary gear
10	Primary sun gear
11	Slow speed end cap
12	.High speed shaft bearing
13	Adapter plate
14	Coupling
15	Motor

9—3) Type K

As shown in Fig.10, this is simple planetary gearing mechanism and has four gears at each stage. Two of them are for clockwise and the others for counterclockwise. This is the power transmitting mechanism.

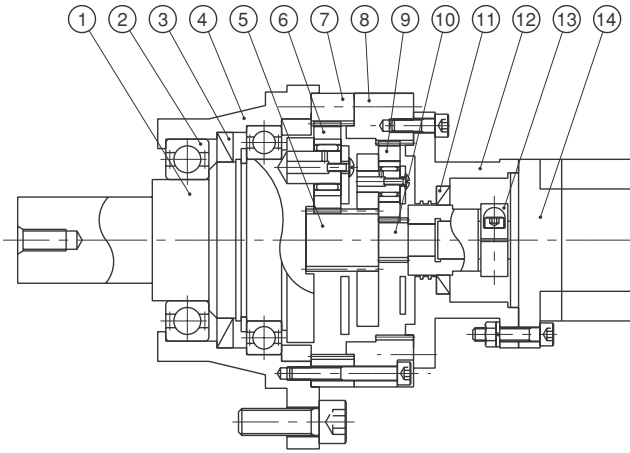


Fig. 10 Type K Construction Drawing

Part No.	Part name
1	Slow speed shaft
2	Slow speed shaft bearing
3	Slow speed shaft shield
4	Case
5	Secondary sun gear
6	Secondary planetary gear
7	Secondary inner gear
8	Primary inner gear
9	Primary planetary gear
10	Primary sun gear
11	High speed shaft shield
12	Slow speed end cap
13	Coupling
14	Motor

9—4) Type P

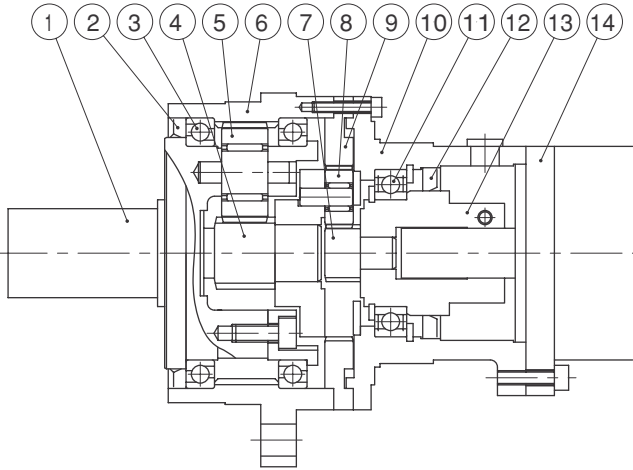


Fig. 11 Type P Construction Drawing

Part No.	Part name
1	Output shaft
2	Oil seal
3	Bearing
4	Sun gear
5	Planetary gear
6	Casing with internal gear
7	Sun gear
8	Planetary gear
9	Internal gear
10	Bracket
11	Bearing
12	Oil seal
13	Coupling
14	Motor

9—5) Type P1

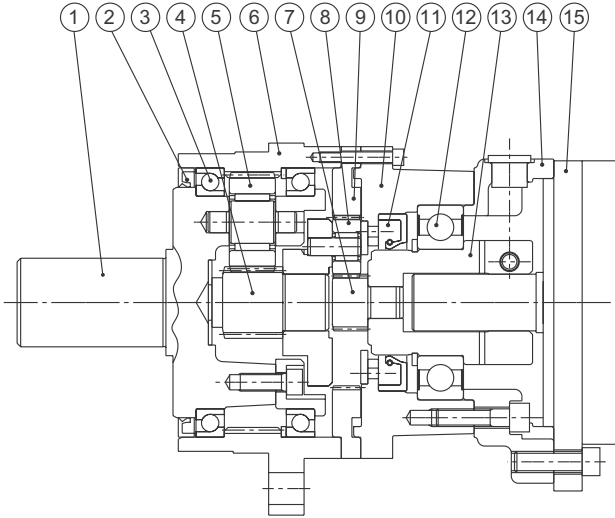


Fig. 12 Type P1 Construction Drawing

Part No.	Part name
1	Output Shaft
2	Oil Seal
3	Bearing of Output
4	Sun Gear of Output
5	Planetary Gear of Output
6	Casing with Internal Gear
7	Sun Gear of Input
8	Planetary Gear of Input
9	Internal Gear of Input
10	Joint Cover
11	Input Shaft Bearing
12	Oil Seal
13	Coupling
14	Adaptor Plate
15	Motor (Provided by Customers)

10. Backlash

Do not disassemble the unit because the backlash is adjusted by SHI's method. In case disassembly is needed, consult us.

11. 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 period for the Products shall be 18 months after the commencement of delivery or 18 months after the shipment of the Products from the seller's works or 12 months from the Products coming into operation, whichever comes first.
Warranty Condition	In case that any problems, troubles or damages on the Products arise due to the defects in the Products during the above "Warranty Period", although the Products are appropriately and properly installed in, connected or combined to the equipment or machines, or maintained in accordance with the maintenance manual and are properly operated under the conditions as described in the catalogue or otherwise as agreed upon in writing between the Seller and the Buyer or its customers, the Seller will Provide, at its sole discretion, appropriate repair or replacement on the Products free of charge, except as stipulated in the "Exception for Warranty" as described below. However, in the event that the Products is installed in, connected or combined to or integrated into the equipment or machines, the Seller shall not reimburse the costs for removal or re-installation of the Products or other incidental costs related thereto and any lost opportunity, loss of profit or any other incidental or consequential losses or damages incurred by the Buyer or its customers.
Exception for Warranty	Notwithstanding the above warranty, the warranty as set forth herein shall not be applied to the problems, troubles or damages on the Products which are caused by: <ol style="list-style-type: none"> 1. installations, connections, combinations or integration of the Products in or to the other equipment or machines, which are rendered by any person or entity other than the Seller, 2. the insufficient maintenance or improper operation by the Buyer or its customers, such that the Product is not appropriately maintained in accordance with the maintenance manual provided or designated by the Seller, 3. the improper use or operation of the Products by the Buyer or its customers which are not informed to the Seller, including, without limitation, the Buyer's or its customers' operation of the Products not in conformity with the specifications, or use of the lubrication oil in the Products which is not recommended by the Seller, 4. troubles, problems or damages on any equipment or machines in or to which the Products are installed, connected or combined or installed, or any specifications particular to the Buyer or its customers, or 5. any changes, modifications, improvements or alterations on the Products or those functions which are rendered on the Products by any person or entity other than the Seller, 6. any parts in the Products which 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. waste, exhaustion, normal tear or ware, or deterioration on the parts of the Products, such as bearing, oil-seal. 9. any other troubles, problems or damages on the Products which are not attributable to the Seller.

— note —