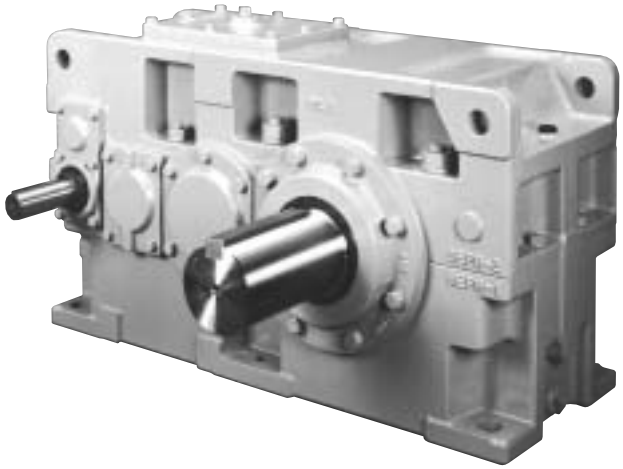
Sumitomo Drive Technologies

Always on the Move

PARAMAX® 8000 Series

Reducer & Drive Units



- PARAMAX DRIVE should be handled, installed, and maintained by trained technicians. Carefully read the maintenance manual before use.
- Oil is removed from PARAMAX DRIVE before shipment. Supply oil according to the maintenance manual before operation.
- A copy of this maintenance manual should be sent to the actual user of PARAMAX DRIVE.
- This maintenance manual should be maintained by the user.

Maintenance Manual | GM0501E-3

(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.

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

CAUTION : 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, operation, maintenance, and inspections should be handled by properly trained technicians ; otherwise, injury or damage to the machine 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 system.
- When the unit is to be used for an elevator, install a safety device on the elevator side to prevent it from falling, otherwise, serious injury, death, or damage to the elevator may result.
- Do not disassemble PARAMAX DRIVE during operation. Even if it is at rest, do not disassemble any parts other than the dip stick, oil inlet/outlet, and inspection cover when the input/output shafts of the PARAMAX DRIVE is connected to a motor or other mating machines; otherwise falling or operation out of control due to disengagement of gears, as well as death, injury, or damage to the machine may result.

CAUTION

- The unit should be operated only within its design and performance specifications ; othrewise, injury or damage to a system may occur.
- Keep hands and all foreign objects from the internal moving parts of the unit ; otherwise, injury or damage to a system may occur.
- Damaged units should be taken off - line and not put back in operation until properly repaired.
- Any modifications or alterations of any kind, to the unit, will void the warranty and all subsequent claims.
- Do not remove the rating plate.

- Oil has been removed from PARAMAX DRIVE before shipment from our factory. Supply oil before use.

CONTENTS

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 ordered. When a different product is installed, injury or damage to the system may result.

Upon delivery of the PARAMAX DRIVE check the following :

(1) The descriptions on the rating plate conform to your order.
(2) There were no parts damaged during transport.
(3) All bolts and nuts are firmly tightened.

If there is any doubt that the unit delivered does not conform to the one ordered, contact the nearest agent, distributor or service office.

1 — 1) How to check the rating plate

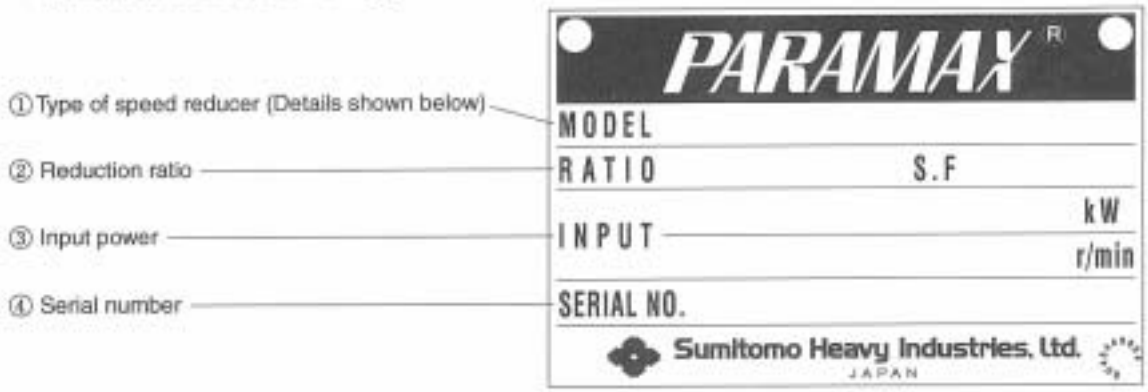
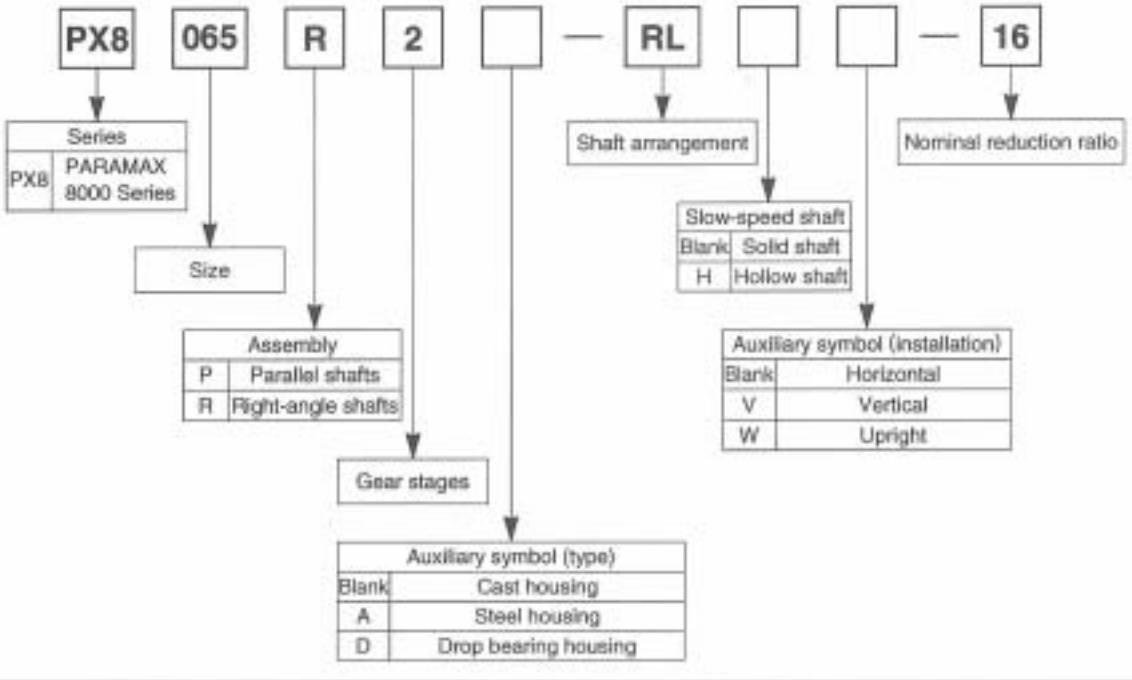


Fig. 1 Rating plate of reducer

· Have the ①MODEL ②RATIO ④SERIAL No. information ready when making inquiries.

1 — 2) Types of reducers

Symbols denote the followng. Check that the type of reducer conforms to your order.



2. Storage

When storing PARAMAX DRIVE for any extended periods of time before use, consider the following important points.

2 — 1) Temporary storage

(1) Store PARAMAX DRIVE in a clean, dry, covered storage area.

- **Do not store PARAMAX DRIVE outdoors or in a wet location.**

2 — 2) Long-term storage

(1) The oil seal will deteriorate when exposed to high temperatures and UV rays. Inspect and replace the oil seal after long-term storage if there are any signs of damage or cracking.

(2) After starting PARAMAX DRIVE, check that it is free from abnormal sound, vibration, or heat build-up. (If any kind of anomaly is observed) contact the nearest agent, dealer, or service office immediately.

(3) Every 2 — 3 months after shipment, operate PARAMAX DRIVE with the recommended lubricant for 5 — 10 minutes. If this is not possible, or when PARAMAX DRIVE is to be stored for more than 6 months, fill the unit with the proper amount of vapor phase inhibitor (JIS NP20 or its equivalent) according to the inhibitor manufacturers recommendations.

3. Transport

⚠ CAUTION

- Exercise ample care not to drop PARAMAX DRIVE during transport. When a hanging bolt or hole is provided, be sure to use it. After mounting PARAMAX DRIVE on a system, however, do not hoist the entire system using the hanging bolt or hole. Before hoisting, check the weight with the rating plate, crate, outline drawing, catalog, etc. Never hoist a PARAMAX DRIVE that exceeds the rating of the crane or other mechanism being used to lift it ; otherwise, injury or damage to the unit and/or lifting device may occur.

4. Installation

⚠ DANGER

- Never stand directly under a unit suspended by a crane or other lifting mechanism ; otherwise personal injury or death may result.

⚠ CAUTION

- Do not place any objects that will hinder ventilation around PARAMAX DRIVE ; otherwise, cooling effect is reduced, and may lead to a possible fire hazard due to excessive heat build-up.
- Do not step on or hang from PARAMAX DRIVE ; otherwise, injury may result.
- Do not touch the key way at the shaft end or on the inside of PARAMAX DRIVE ; otherwise, injury may result.
- When PARAMAX DRIVE 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) Location of installation

Ambient temperature : -10 to +40°C
Ambient humidity : 85% max.
Ambient atmosphere : There shall be no corrosive gas, explosive gas, or steam.
The installation space shall be well ventilated, and free from dust.
Location of installation : Indoors

- **Special specifications are necessary when installation conditions are other than those mentioned here. In such cases contact the nearest agent, dealer or service office.**
- **When a product is made according to special specifications for outdoor use or use in explosive environments, the product can be safely operated under those specified conditions without problem.**

4 — 2) Installation angle

- **Install PARAMAX DRIVE on a sufficiently rigid base.**
- **Use installation bolts corresponding to JIS strength class 10.9 or its equivalent.**

5. Coupling with other machines

⚠ CAUTION

- Instal appropriate guard devices around rotating parts ; otherwise, injury may result.
- When coupling PARAMAX DRIVE with a load, confirm that the alignment error is within the specified limits shown in the maintenance manual, drawings, catalog, etc. ; otherwise, damage to the system may result, due to misalignment.
- Correctly tighten respective bolts to the specified torque shown in the drawing, catalog, etc. ; otherwise ; scattering fragments may damage the system.
- When a belt is used for coupling the unit with another machine, check that the belt tension and the parallelism of the pulley 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 ; otherwise, the system may be damaged, due to misalignment.
- Remove the key temporarily attached to the output shaft of PARAMAX DRIVE when the shaft is free-rotating (i. e. not loaded) ; otherwise, injury may result.
- Confirm the direction of rotation before coupling PARAMAX DRIVE with its driven machine. Difference in the direction of rotation may cause injury or damage to the system.

5 — 1) Installation coupler

- When attaching a coupler, be careful not to apply impact force or excessive thrust to the shaft ; otherwise, the bearing may be damaged.
- Shrink fit or shaft-end thread is recommended for mounting (Fig. 2)

(1) Use of coupling
The dimensions (A, B, and X) illustrated in Fig. 3 shall be within the tolerance shown in Table 1.

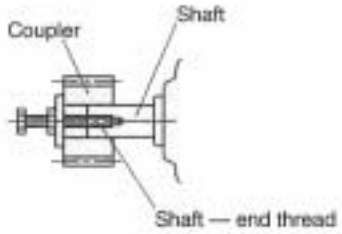


Fig. 2

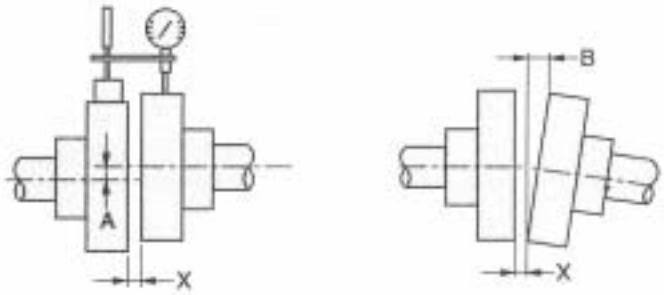


Fig. 3

Table 1 Aligning tolerance for coupling

Tolerance for A dimension	0.05mm
Tolerance for B dimension	0.05mm
X dimension	Specified by coupling manufacturer

(2) Use of chain, sprocket, and gear

- The chain tension angle shall be perpendicular to the shaft of PARAMAX DRIVE.
- The pitch circle of the sprocket and gear shall be more than three times the shaft diameter.
- Locate the sprocket and gear as close to PARAMAX DRIVE as possible so that the point of application of the load will be closer to the PARAMAX DRIVE'S vertical centerline. (Fig. 4)

(3) Use of V belt

- Excessive V belt tension will damage the output shaft and bearing. The amount must be specified by V belt manufacturer.
- Eccentricity of parallelism between two pulleys shall be less than 20'. (Fig. 5)
- Use a matched set with identical circumferential length when more than one V belt is used.

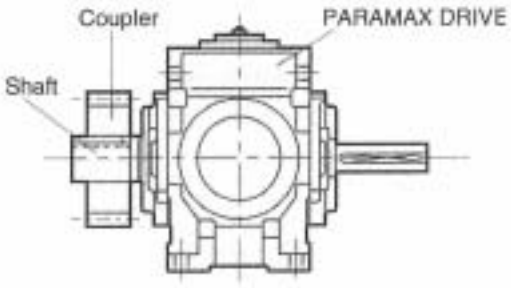


Fig. 4

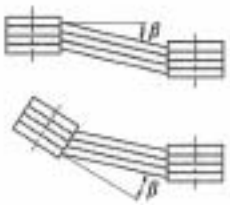


Fig. 5

5 — 2) Hollow shaft

5 — 2 — 1) Shrink disc type

The shrink disc has a keyless shrink fit mechanism which shrinks hub (HB) mechanically through the tightening locking bolt (ZS), and holds shaft and hub as one fixture. (Fig. 6)

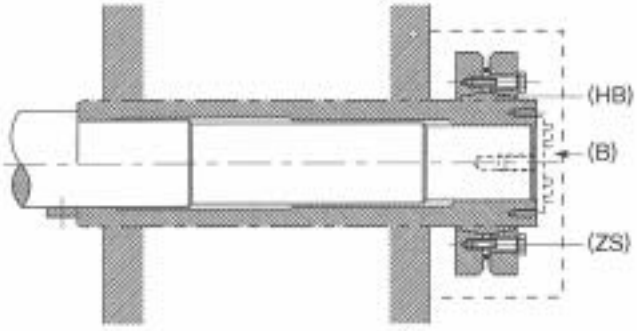


Fig. 6 Full mounted position

Mounting procedure (Fig. 7)

(1) Clean and degrease contact surfaces (a) and (c).
(2) Smear surface (c) with "Molykote 321" or its equivalent. However, keep surface (a) as clean as possible (no grease).
(3) Slide O-ring (b) onto the shaft.
(4) Mount the reducer on the driven shaft and screw nut (e) until faces(g) and (h) make contact.
(5) Set the shrink disc (k) at dimensions (LV). Tighten locking bolt (ZS) at specified torque (TA) (using a torque wrench). Make sure that both plates are parallel when tightening bolts. After confirming that the shrink disc is set correctly, tighten the bolts with a wrench of appropriate length. Uniformly, tighten bolts clockwise (not diagonally) while keeping both plates parallel. It is recommended to tighten respective bolts by 30° each time.

Note 1. In case of a vertical type unit, mount a thrust washer (B) to prevent the reducer from moving when locking nut (ZS) is loosened. (Fig. 6)

Note 2. A high-tension bolt (JIS strength 10.9 or 12.9) is used as a locking bolt (ZS). When replacing it, use one specified by the manufacturer.

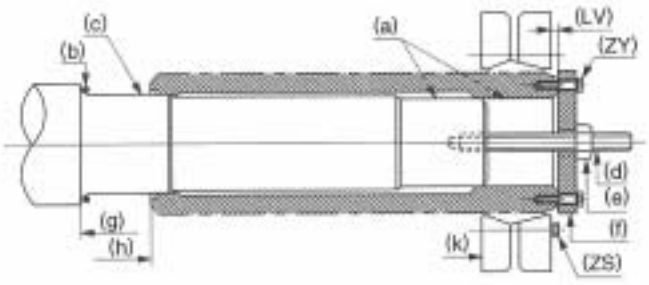


Fig. 7 Mounting

Removal procedure (Fig. 8)

(1) Loosen locking bolt (ZS) and remove shrink disc (k).

(2) Set thrust washer (f) and hexagon head bolt (n). Remove the reducer from the driven shaft using bolt (m).

Note : Parts (d), (e), (f), (ZY), (m), and (n), are optional. Order these as required.

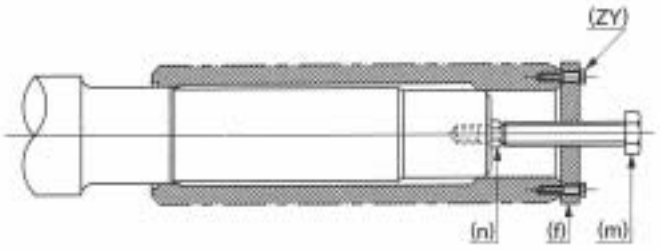


Fig. 8 Removal

5 — 2 — 2) Key way connection

The hollow shaft bore is provided with retaining ring (d). Ring (d) is the essential component for mounting, securing, and removing the unit.

Mounting procedure (Fig. 9)

(1) Slide O-ring (i) over the driven shaft.

(2) Smear surface of shaft (e) with molybdenum disulfide grease.

(3) Turn nut (b) and slide the reducer over the driven shaft. Use ring (c) as necessary.

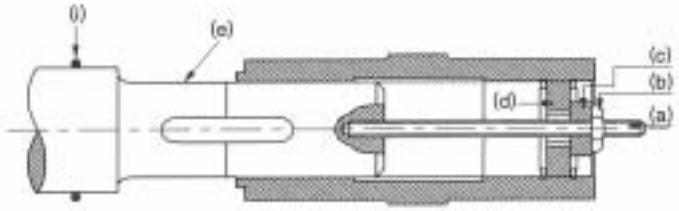


Fig. 9 Mounting

Securing (Fig. 10)

(1) After mounting the reducer on the driven shaft, fix bolt (f). (Bolt (f) is not supplied with the unit.)

(2) The bore should be protected by cover (g).

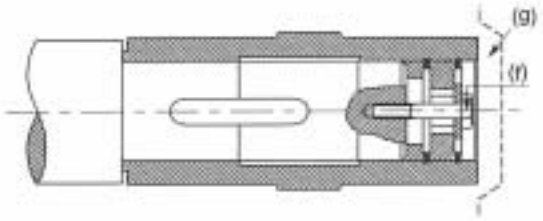


Fig. 10 Securing

Special cases (Fig. 11)

(1) If the driven shaft has no shoulder (Fig. 11) when mounting, provide a distance ring (h) for fixing in place. (Distance ring (h) is not supplied with the unit.)

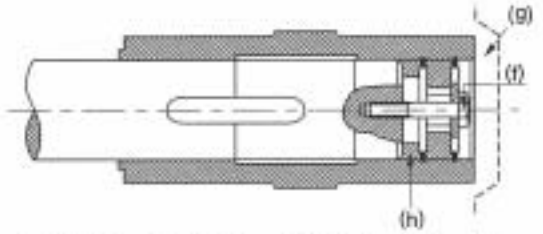


Fig. 11 Securing (Driven shaft without shoulder)

Removal procedure (Fig. 12)

(1) Remove ring (d), mount bolt (n), and reset ring (d). Attach bolt (J) to ring (d), and turn bolt (J) to disconnect the hollow shaft from the driven shaft.

Note 1 : Parts (a), (b), (c), (n), and (J) are optional. Order these as required.

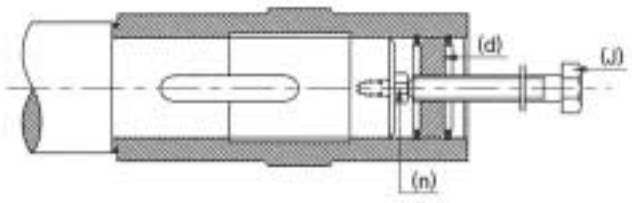


Fig. 12 Removal

5 — 2 — 3) Torque arm

(The torque arm is optional.)

The hollow shaft reducer is fixed by the torque arm to prevent the reducer from revolving by an opposite reaction force. Fig. 13 shows the construction of a standard torque arm. Select a torque arm support with proper construction and strength, taking into consideration the reaction force of the reducer and the impact load.

Note 1. The number of disc springs (s) differs according to the size of the reducer.

Note 2. Use bolt (T) and nut (M) classified as JIS strength class 8.8.

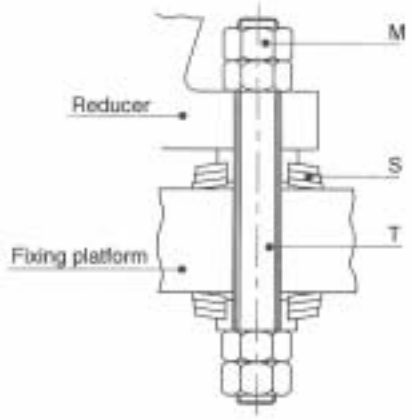


Fig. 13 Standard torque arm

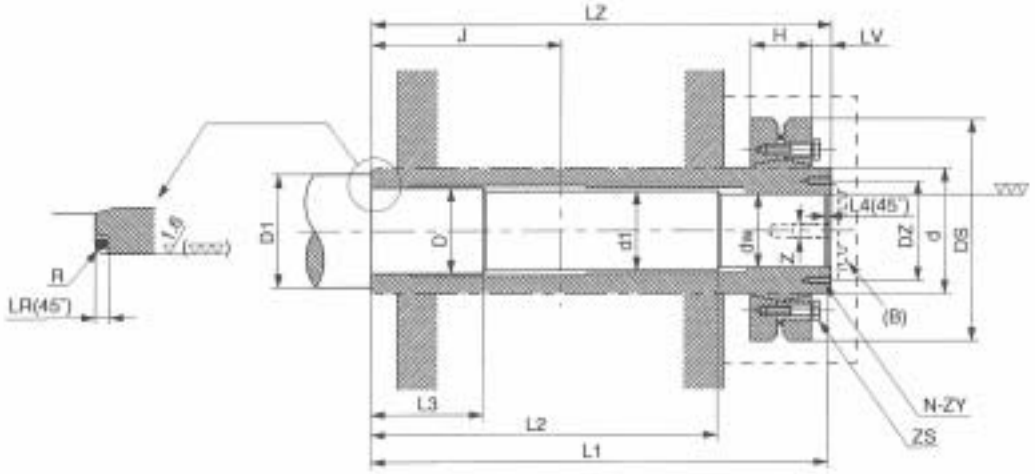


Fig. 14 Hollow shaft dimensions (shrink disc type)

Table 2 Hollow shaft dimensions

Size	Shrink disc				Tightening bolt		Hollow shaft						Driven shaft								
	MODEL Note 1	d	Ds	H	ZS	TA kgf·m	J	LZ	LR	LV	N-ZY	DZ	dw	d1	D h7	D1 min	L1	L2	L3	L4	R	Z (Thread depth)
8015	TAS3091.4-080	80	145	38	M8	35	135	328	3	14	4-M6	70	60 h6	61	63	79	325	240	80	3	2.5	M20 (30)
8020, 8025	TAS3081. -090	90	155	39	M8	35	145	358	3	14	4-M6	80	70 h6	71	73	89	355	270	80	3	2.5	M20 (30)
8030, 8035	TAS3091.1-100	100	170	54	M10	59	160	393	3	14	4-M6	90	80 h6	81	83	98	390	295	90	3	2.5	M20 (30)
8040, 8045	TAS3081. -125	125	215	54	M10	70	180	448	3	20	4-M8	110	95 h6	96	98	111	445	335	110	3	2.5	M24 (35)
8050, 8055	TAS3093. -140	140	230	74	M12	120	200	503	3	22	4-M10	124	105 h6	106	108	127	500	380	110	3	2.5	M24 (35)
8060, 8065	TAS3091. -165	165	290	88	M16	250	230	583	3	27	4-M12	146	125 h6	126	128	147	580	435	130	3	2.5	M24 (35)
8070, 8075	TAS3081. -185	185	330	86	M16	290	260	644	5.5	26	4-M12	167	145 h6	146	148	174	640	475	160	5	2.5	M30 (45)
8080, 8085	TAS3081. -220	220	370	104	M16	290	285	714	5.5	26	4-M12	195	170 g6	171	173	197	710	520	190	5	4.5	M30 (45)
8090	TAS3081. -240	240	405	109	M20	570	350	844	6	27	6-M12	215	190 g6	191	193	212	840	635	200	5	4.5	M36 (55)
8095	TAS3081.1-260	260	440	120	M20	535	350	859	6	27	6-M12	230	200 g6	201	203	222	855	640	205	5	4.5	M36 (55)
8100	TAS3081.1-260	260	440	120	M20	535	390	934	6	27	6-M12	235	210 g6	211	213	234	930	705	215	5	4.5	M36 (55)
8105	TAS3081.1-280	280	460	134	M20	535	390	949	6	27	6-M12	250	220 g6	221	223	244	945	715	225	5	4.5	M36 (55)
8110	TAS3081.1-300	300	485	142	M20	535	420	1030	6	32	6-M16	270	240 g6	241	243	263	1025	770	245	5	4.5	M36 (55)
8115	TAS3091. -320	320	520	184	M20	490	420	1065	6	32	6-M16	285	250 g6	251	253	273	1060	785	245	5	4.5	M36 (55)

Note 1. Shrink disc (made by SCHÄFER) type code.

Note 2. Mount a thrust washer (B) on a vertical reducer to prevent the reducer from moving when locking bolt (ZS) is tightened.

6. Lubrication

6 — 1) Shipping condition

- **PARAMAX DRIVE units are shipped without oil. Supply oil before operation.**

6 — 2) Splash lubrication

In standard cases, splash lubrication is applied to horizontal PARAMAX DRIVE when the high-speed shaft speed is 750 – 1800 rpm.

6 — 3) Forced lubrication

⚠ CAUTION

- For a system in which a lubricant motor pump is provided separately, switch on the pump motor prior to switching on the reducer motor. This will enable praper lubrication of the bearings prior to start – up. Failure to do so may damage the unit.

Use a flow switch and/or sight to verify that lubricant is circulating, and for emergency motor stop if necessary.

6 — 4) Selection of lubricant

Refer to Table 3-1 to select appropriate viscosity.
Table 3-2 shows recommended lubricants.
The brand name may be changed. If so, make sure that the new brand-name product is interchangeable with the old brand-name product.

Table 3-1 Lubricant viscosity

Number of slow-speed shaft revolutions	Ambient temperature			
		-10°C — +15°C	0°C — 30°C	+10°C — +50°C
100rpm or more	ISO* AGMA	VG68 2EP	VG150 4EP	VG220 5EP
100rpm or less	ISO* AGMA	VG100 3EP	VG220 5EP	VG320 6EP

*ISO : Kinetic viscosity (cSt) at 40°C

Table 3-2 Recommended lubricants

	Brand	ARAL	BP	CASTROL	CHEVRON	ELF	ESSO	FINA	GULF	MOBIL	SHELL	SUNOCO	TEXACO	TOTAL	WINTER -SHALL
Gear oil	ISO VG 68 AGMA 2EP	DEGOL BG68	ENERGOL GR-XP-68	ALPHA SP68	NL GEAR COM-POUND 68	REDUC-TELF SP68	SPARTAN EP68	GIRAN 68	EP LUBRI-CANT HD68	MOBIL-GEAR 626	OMALA 68	SUNEP 1050 ISO68	MEROPA 68	CARTER EP68	WIOLAN IT68
	ISO VG 100 AGMA 3EP	DEGOL BG100	ENERGOL GR-XP-100	ALPHA SP100	NL GEAR COM-POUND 100	REDUC-TELF SP100	SPARTAN EP100	GIRAN 100	EP LUBRI-CANT HD100	MOBIL-GEAR 627	OMALA 100	SUNEP 1055 ISO100	MEROPA 100	CARTER EP100	WIOLAN IT100
	ISO VG 150 AGMA 4EP	DEGOL BG150	ENERGOL GR-XP-150	ALPHA SP150	NL GEAR COM-POUND 150	REDUC-TELF SP150	SPARTAN EP150	GIRAN 150	EP LUBRI-CANT HD150	MOBIL-GEAR 629	OMALA 150	SUNEP 1060 ISO150	MEROPA 150	CARTER EP150	WIOLAN IT150
	ISO VG 220 AGMA 5EP	DEGOL BG220	ENERGOL GR-XP-220	ALPHA SP220	NL GEAR COM-POUND 220	REDUC-TELF SP220	SPARTAN EP220	GIRAN 220	EP LUBRI-CANT HD220	MOBIL-GEAR 630	OMALA 220	SUNEP 1070 ISO220	MEROPA 220	CARTER EP220	WIOLAN IT220
	ISO VG 320 AGMA 6EP	DEGOL BG320	ENERGOL GR-XP-320	ALPHA SP320	NL GEAR COM-POUND 320	REDUC-TELF SP320	SPARTAN EP320	GIRAN 320	EP LUBRI-CANT HD320	MOBIL-GEAR 632	OMALA 320	SUNEP 1090 ISO320	MEROPA 320	CARTER EP320N	WIOLAN IT320
Bearing grease		ARALUB HL3	ENER-GREASE LS EP2	SPHEEROL AP3	DURA-LITH GREASE EP2	EPEXA 2	BEACON EP2	MARSON EPL3	GULF-CROWN EP2	MOBIL-PLEX 48	ALVANIA EP2	MULTI DUTY EP2	MUL-TIFAK EP2	MULTIS EP2	WIOLUB LFK2

6 — 5) Oil quantity

An estimated quantity of oil for standard specifications is shown in item 12. "Oil quantity." The oil quantity shown in the catalog is not exact. Use a dipstick or visible oil gauge to check the oil level.

6 — 6) Oil supply

Supply oil through the filling port atop the main unit. Check the oil level with a dipstick or visual oil gauge. (Fig. 15)
Screw the dipstick to its deepest position to check the oil level ; otherwise, the measured oil level will not be correct. (Fig. 16)

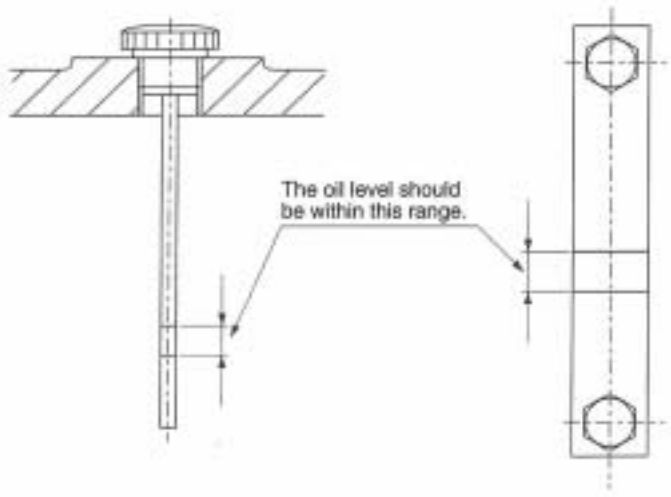


Fig. 15

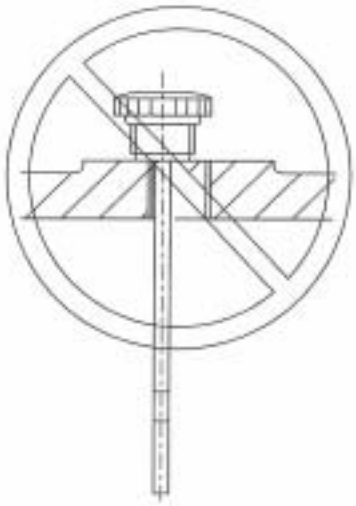


Fig. 16

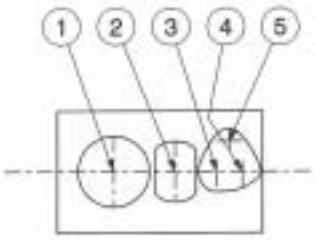
Care should be maintained during the oil — filling process to ensure that loose nutes, bolts, washers, dust, water and other such foreign material do not enter the unit.
In case the oil level is lower than the range, the lubrication can not be done enough.
In case the oil level is higher than the range, deterioration of the oil is accelerated due to oil temperature rising.

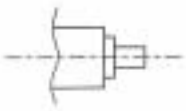
6 — 7) Greasing

(1) Since some bearings are grease lubricated, the location and number of grease nipples should be confirmed in advance.
(2) The bearings are packed with grease at the time of shipment. Supply grease according to the input speed — every 1500 hours when the revolution is 750 rpm, and every 1000 hours when the revolution is 750 — 1800 rpm.
(3) Table 4 shows replenishment quantity of grease. Do not supply grease too much.

Table 4 Replenishment quantity of grease (g / one time)

Size / Port	8015	8020 8025	8030 8035	8040 8045	8050 8055	8060 8065	8070 8075	8080 8085	8090	8095	8100	8105	8110	8115
①	30	30	40	50	70	100	150	150	200	200	200	200	200	200
②	10	10	30	30	50	50	70	70	100	100	150	150	200	200
③	10	10	10	20	20	30	40	50	70	70	70	70	100	100
④	10	10	20	20	20	30	40	40	50	50	50	50	50	50
⑤			10	10	10	10	20	20	30	30	30	30	30	30
⑥	20	20	20	40	40	60	100	100		150		150		200
⑦			20	20	30	40	40	60	100	100	100	100	100	100
⑧				20	20	20	30	40	60	60	60	60	60	60





Right - angle - shaft

2 - stage	3 - stage	4 - stage
⑥	⑦	⑧

6 — 8) Waste oil

Remove the drain plug under the main unit to drain waste oil while it is still warm. (i. e. Soon after operation of the unit has ceased. But not immediately after.)

7. Operation

DANGER

- Never approach or touch any rotating parts (shaft, etc.) during operation, loose clothing caught in these rotating parts may result in severe injury and/or death.

CAUTION

- The reducer will get very hot during operation. Do not touch or come in contact in any way with the reducer ; otherwise, you may suffer burns.
- If the reducer is operating in an abnormal way, stop the unit immediatery ; otherwise, injury may result.
- Do not operate the reducer in a manner that exceeds its rating criteria ; otherwise, injury or damage to the system may result.
- Do not remove any covers or open the reducer during operation ; otherwise, splashing lubricant may cause burns.
- Do not loosen the oil filler plug during operation ; otherwise, splashing lubricant may cause burns.
- When reversing the direction of rotation, first bring the unit to a complete stop, then commence reverse rotation ; otherwise, the system may be damaged.

After installation, check the following points prior to operation.
(1) Is the reducer correctly coupled with the mating machine ?
(2) Are foundation bolts firmly tightened ?
(3) Does the direction of rotation conform to the one specified and designed for ?
After confirming the above, allow for a no-load break-in period. Then gradually apply the design load.
At this time, confirm the following :

Table 5

Items to be checked during break-in period/possible causes.	
Abnormal sound and vibration	(1) The housing is deformed because the installation surface is irregular. (2) Resonance is occurring due to the lack of rigidity of the installation base. (3) The shaft center is not properly aligned with the mating machine. (4) The vibration of the mating machine is transmitted to the reducer.
The surface temperature of the reducer is abnormally high.	(1) The motor current has exceeded the rated current shown in the rating plate. (2) The voltage rise and drop of the motor is too large. (3) The ambient temperature at which the reducer is operating in is too high. (4) The oil is not at its specified level (too low or too high).

When an anomaly is found, stop operation, and contact the nearest agent, dealer, or service office.

8. Daily inspection and maintenance

DANGER

- Never approach or touch any rotating parts (shaft, etc.) when maintaining or inspecting the reducer during operation.
  Loose clothing cought in these rotating parts may result in severe injury and/or death.
- Be sure to stop both the driving and driven machines before checking any tooth surfaces, otherwise, you may be caught in the gear engaging section, resulting in severe injury and/or death.
- Do not operate any units without all (safety) covers in place. Failure to do so may cause injury and/or death.

CAUTION

- The surface of the reducer will get hot, do not touch the reducer ; otherwise, a burn may result.
- Do not change the oil during operation or soon after operation has ceased ; otherwise, the hot oil may cause burns.
- Do not remove any covers or open the reducer during operation ; otherwise, splashing hot lubricant may cause burn.
- Change lubricant according to the maintenance manual, and use only those recommended lubricants ; otherwise, the system may be damaged.

● Overhaul the machine 3 — 5 years after initial operation, depending on the operating condition. Replace the following parts to extend the service life.

Renewal parts

- ◆ Bearing, oil seal, nilosring, collar, key, shim, packing, retaining ring, and visible gauge.
- ◆ When forced lubrication is adopted
  - All piping parts including pump (directly coupled with shaft).
  - The adapter shaft is included for a pump directly coupled with the shaft.
  - Special equipment (flow switch, cooler, etc.) as necessary.
- ◆ Shafts and gears when damage is found.
- ◆ Other parts (incl. special applications) as necessary.

The PARAMAX DRIVE should be returned to our plant for overhaul, in principle. Advise us of the machine No. of the speed reducer to overhaul, serial No., type, number of speed reducers, and period.

8 — 1) Daily inspection

To ensure proper and contined optimum operation, use the table below to perform daily inspections of the unit.

Table 6

Inspection item	Details of inspection
Noise	Is there abnormal sound or sudden change in the noise characteristics during operation ?
Vibration	Is there sudden change in the vibration of the reducer excessive vibration ?
Surface temperature	Is the temperature of the surface of the reducer abnormally high (more than 90°C) ? Or is it rising rapidly ? (The temperature rise during operation differs according to the type of reducers. A surface temperature of approx. 80°C will not cause any adverse effects as long as it doesn't rise significantly above this level.)
Oil level	Is the oil level decreasing ? (Check the oil level with a dipstick or visible oil gauge when the reducer is not operating)
Oil leakage	Is oil leaking from the oil seal, etc. ?
Foundation bolt	Have any bolts come loose ?
Chain and belt	Have any transumission belts or chains come loose ?

When any abnormality is found during daily inspection, take appropriate corrective measures based on "9. Troubleshooting (P. 12)"
If normal operation is still not possible, contact the nearest agent, distributor, or service office.

8 — 2) Change of lubricant

(1) Change oil 500 hours or 6 months whichever comes first after initial start-up. The second oil change should be after 2,500 hours or 6 months, whichever comes first.
(2) In case of the oil temperature is below 70°C, a 50000 hour or 1 year (whichever comes first) change interval is recommended.
(3) In case of the oil temperature is above 70°C, a 2500 hour or 1 year (whichever comes first) change interval is recommended.
(4) Deterioration of the oil will be accelerated when the ambient temperature changes rapidly or the ambient atmosphere contains corrosive gases. In these situations consult with the lubricant manufacturer.

8 — 3) Water cooler unit (special specifications)

(1) Periodically check and clean the cooler of the water cooler unit. The inspection and cleaning period depends on the state of contamination of lube oil or the quality of cooling water. Be sure to conduct periodical inspection every 3 — 6 months.
The quality of cooling water should conform to JRA9001 (cooling water quality standard for refrigerating air conditioner). Standard values are shown in the table below for reference.
(2) Remove the hood on the water U-turn side to check the state of contamination. Remove oil from the drain plug of the cooler to check the state of contamination on the oil side.
(3) Be sure to check the corrosion-proof zinc bar. Change it if it is reduced by half. The bar may be changed in 3 — 6 months depending on the water quality.
(4) When stopping operation in a place where cooling water is frozen in winter, be sure to drain cooling water every day.

pH	(25°C)	6.5 — 8.0	Sulfate ion	(PPM)	200 or less
Electric conductivity	(25°C μs / cm)	800 or less	Total ion	(PPM)	1.0 or less
M alkalinity	(PPM)	100 or less	Ammonium ion	(PPM)	1.0 or less
Total hardness	(PPM)	200 or less	Sulfur ion	(PPM)	Not detected
Chlorine ion	(PPM)	200 or less	Silica	(PPM)	50 or less

(PPM = mg / liter)

(The Japan refrigeration and air conditioning industry association)

9. Troubleshooting

⚠ CAUTION

- Identify and provide appropriate corrective action in a timely fashion for any abnormal operation characteristics according as the maintenance manual. Do not operate the unit until corrective action has been taken.

When any abnomality occurs in the reducer, refer to the following table and take appropriate measures as soon as possible.

Table 7

Details of trouble		Cause	Correction
The input shaft rotates, but the output shaft will not.		Damage due to overloaded gears or shafts	Repair at a specialized workshop
The output shaft turns when there is no load.	But it seizes up when a load is applied.	The key is out of position	Place the key in position
		Scorched bearing	Repair at a specialized workshop
		Poor adjustment of protective device	Adjust the protective device
	Reverse rotation is possible.	Incorrect wiring for the motor	Change the connection
Excessive temperature rise		Overload	Reduce the load to the specified value
		The ambient temperature it too high	Improve the ventilation method
		Damage due to overload applied to gears, bearings, etc.	Repair at a specialized workshop
Oil leakage	Oil leaks from the input / output shaft sections.	Damaged oil seal	Change the oil seal
		Scratches or abrasion of the lip contact section	Repair at a specialized workshop
	Oil leaks from the joint surface of the housing.	Loose tightening bolt	Tighten the tightening bolts to their proper torque
Abnormal sound. Excessively high vibration.		Damaged gears, shafts, or bearings	Repair at a specialized workshop
		Deformation of the housing due to uneven installation surface	Flatten the installation surface or use liners for adjustment
		Resonance due to insufficient rigidity of installation base	Reinforce the installation base to improve the rigidity
		Incorrect alignment with the mating machine	Align the shaft center
		Transmission of the mating machine's vibration to the reducer	Independently operate the reducer to check the source of abnormal sound

10. Disassembly / reassembly and disposal

10 — 1) Disassembly and reassembly

⚠ CAUTION

- Repair, disassembly, and reassembly should be handled by properly trained technicians ; otherwise, the system may be damaged.

10 — 2) Disposal

⚠ CAUTION

- Dispose the reducer and lubricant as general industrial waste.

11. Construction drawing

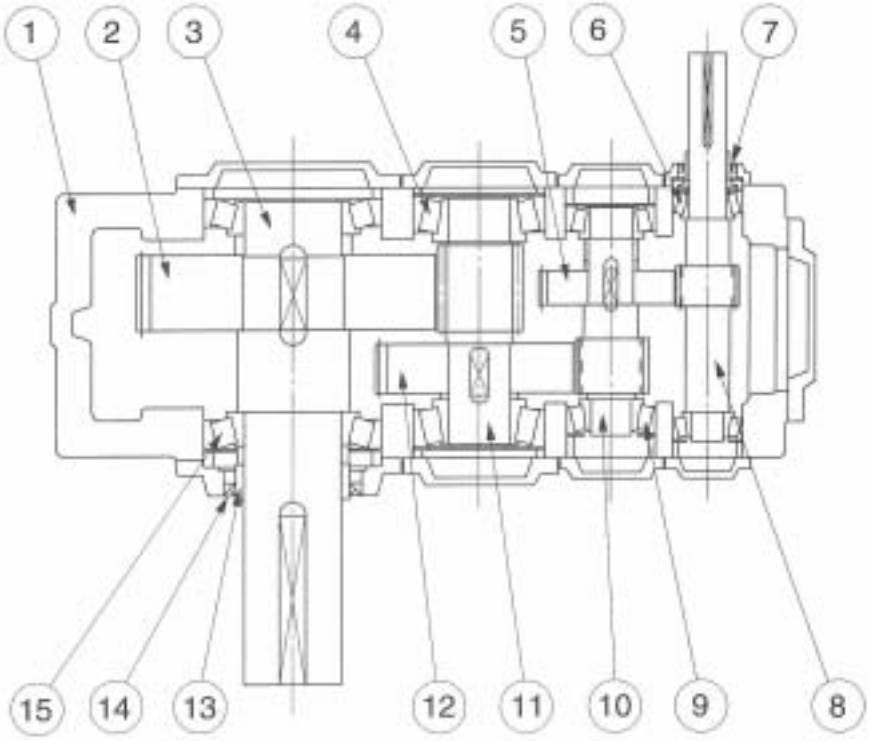


Fig. 17 Solid parallel shaft horizontal type 3 - stage unit

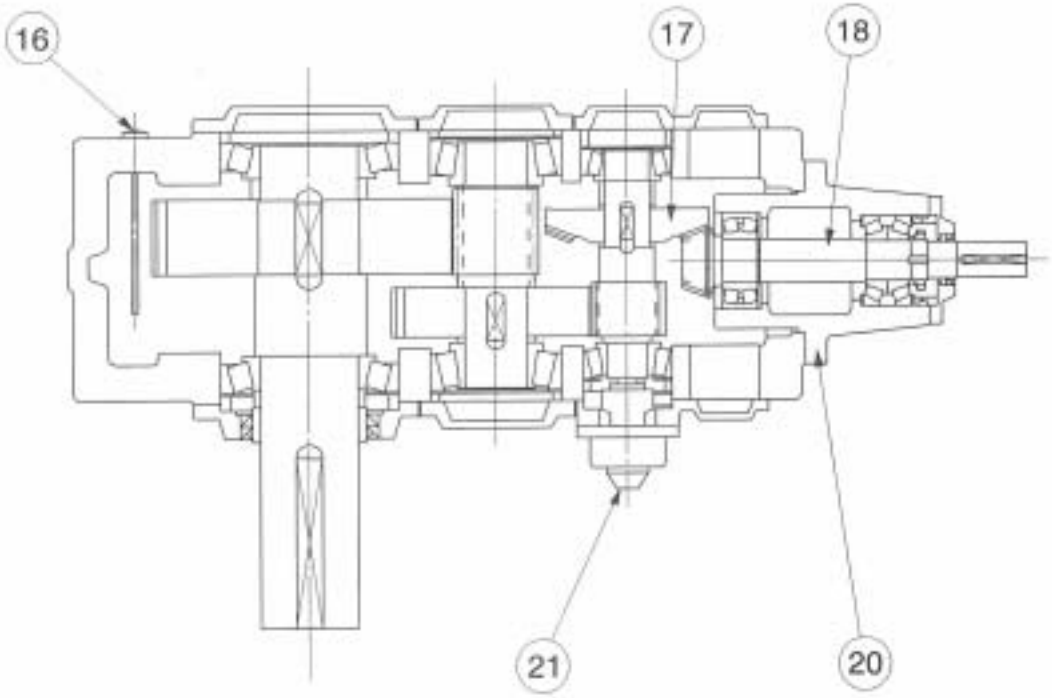


Fig. 18 Solid right - angle shaft vertical type 3 - stage unit

Ref. No.	Part name	Ref. No.	Part name	Ref. No.	Part name
1	Housing	8	Helical pinion shaft	15	Taper roller bearing
2	Helical gear	9	Taper roller bearing	16	Dipstick
3	Slow speed shaft	10	Helical pinion shaft	17	Bevel gear
4	Taper roller bearing	11	Helical pinion shaft	18	Bevel pinion gear
5	Helical gear	12	Helical gear	19	
6	Taper roller bearing	13	Collar	20	Bearing housing
7	Oil seal	14	Oil seal	21	Oil pump

12. Oil quantity

Table 8 (Unit : ℓ)

Size	Horizontal type						Vertical type					
	Parallel shaft			Right - angle shaft			Parallel shaft			Right - angle shaft		
	2 - stage	3 - stage	4 - stage	2 - stage	3 - stage	4 - stage	2 - stage	3 - stage	4 - stage	2 - stage	3 - stage	4 - stage
8015	5	6	—	5	—	—	4	4	—	3	—	—
8020, 8025	8	8	—	7	—	—	6	6	—	4	—	—
8030, 8035	11	12	13	9	11	—	9	9	9	5	9	—
8040, 8045	16	17	19	12	16	19	13	13	12	7	14	15
8050, 8055	24	26	29	20	25	30	18	18	19	11	20	23
8060, 8065	37	42	44	28	40	46	28	28	31	17	31	35
8070, 8075	55	60	65	42	57	67	44	44	52	23	53	53
8080, 8085	79	86	93	61	83	97	62	61	68	28	69	72
8090	120	120	150	—	120	150	90	90	110	—	120	120
8095	140	155	180	100	155	180	120	120	140	—	145	155
8100	170	180	220	—	180	210	140	140	170	—	170	180
8105	205	225	260	150	220	255	175	175	210	—	210	220
8110	240	260	300	—	250	300	200	200	240	—	230	250
8115	290	325	365	200	310	360	255	255	295	—	290	315
8118	—	350	390	—	350	390	—	—	—	—	—	—
8121	—	470	530	—	460	540	—	—	—	—	—	—
8126	—	470	520	—	460	530	—	—	—	—	—	—
✻ 8128	—	390	450	—	350	460	—	—	—	—	—	—
✻ 8131	—	550	650	—	510	680	—	—	—	—	—	—
✻ 8136	—	540	640	—	500	660	—	—	—	—	—	—

✻ Steel housing

13. Oil seal dimensions

1. For slow speed shaft

Table 9 I. D. × O. D. × Width (Unit : mm)

Size	Solid shaft	Hollow shaft
8015	70 × 90 × 12	80 × 100 × 12
8020, 8025	80 × 100 × 12	90 × 110 × 13
8030, 8035	90 × 110 × 13	105 × 130 × 13
8040, 8045	115 × 140 × 12	130 × 160 × 14
8050, 8055	130 × 160 × 14	140 × 170 × 14
8060, 8065	130 × 160 × 14	170 × 200 × 16
8070, 8075	150 × 180 × 14	190 × 220 × 15
8080, 8085	170 × 200 × 16	220 × 250 × 16
8090	210 × 240 × 15	240 × 270 × 15
8095	210 × 240 × 15	260 × 300 × 20
8100	220 × 250 × 16	260 × 300 × 20
8105	240 × 270 × 15	280 × 320 × 20
8110	240 × 270 × 15	300 × 360 × 25
8115	265 × 290 × 16	320 × 360 × 20
8118	280 × 320 × 20	—
8121	300 × 360 × 25	—
8126	320 × 360 × 20	—
8128	360 × 400 × 20	—
8131	360 × 400 × 20	—
8136	400 × 460 × 28	—

2. For high speed shaft

Table 10

I. D. × O. D. × Width (Unit : mm)

Size	Parallel shaft			Right - angle shaft		
	2 - stage	3 - stage	4 - stage	2 - stage	3 - stage	4 - stage
8015	40 × 52 × 8	35 × 47 × 7	———	40 × 52 × 8	———	———
8020, 8025	45 × 62 × 9	40 × 52 × 8	———	45 × 62 × 9	———	———
8030, 8035	50 × 65 × 9	40 × 52 × 8	35 × 47 × 7	50 × 65 × 9	30 × 42 × 8	———
8040, 8045	60 × 80 × 12	45 × 62 × 9	40 × 52 × 8	50 × 65 × 9	35 × 47 × 7	30 × 42 × 8
8050, 8055	70 × 90 × 12	50 × 65 × 9	40 × 52 × 8	55 × 72 × 9	40 × 52 × 8	30 × 42 × 8
8060, 8065	80 × 100 × 12	60 × 80 × 12	45 × 62 × 9	65 × 85 × 13	50 × 65 × 9	35 × 47 × 7
8070, 8075	80 × 100 × 12	70 × 90 × 12	50 × 65 × 9	70 × 90 × 12	55 × 72 × 9	40 × 52 × 8
8080, 8085	90 × 110 × 13	80 × 100 × 12	55 × 72 × 9	80 × 100 × 12	65 × 85 × 13	50 × 65 × 9
8090	100 × 120 × 12	70 × 90 × 12	55 × 72 × 9	———	70 × 90 × 12	55 × 72 × 9
8095	100 × 120 × 12	70 × 90 × 12	55 × 72 × 9	100 × 120 × 12	70 × 90 × 12	55 × 72 × 9
8100	110 × 130 × 13	80 × 100 × 12	65 × 85 × 13	———	80 × 100 × 12	65 × 85 × 13
8105	110 × 130 × 13	80 × 100 × 12	65 × 85 × 13	105 × 130 × 13	80 × 100 × 12	65 × 85 × 13
8110	125 × 150 × 13	90 × 110 × 13	65 × 85 × 13	———	90 × 110 × 13	65 × 85 × 13
8115	125 × 150 × 13	90 × 110 × 13	65 × 85 × 13	125 × 150 × 13	90 × 110 × 13	65 × 85 × 13
8118	———	90 × 110 × 13	65 × 85 × 13	———	90 × 110 × 13	65 × 85 × 13
8121, 8126	———	110 × 130 × 13	70 × 90 × 12	———	100 × 120 × 12 ※130 × 160 × 14	70 × 90 × 12
8128	———	110 × 140 × 14	80 × 100 × 12	———	105 × 130 × 13	80 × 100 × 12
8131, 8136	———	150 × 180 × 14	80 × 100 × 12	———	125 × 150 × 13	90 × 110 × 13

JIS B 2402 type D (spring - loaded, rubber outer periphery), made of nitride rubber

※ 8121, 8126 i = 31.5

14. Bearings

Table 11 2 - stage unit bearing

STD : Standard bearing
HD : Heavy duty

	Size	High - speed shaft		Intermediate shaft		Slow - speed shaft				
							Solid shaft		Hollow shaft	
		Motor side	Opposite side	Pinion side	Gear side		Shaft - out side	Opposite to shaft - out side	Shaft - out side	Opposite to shaft - out side
2 - stage parallel shaft	8015	33206	33206	33207	33207		32212	32212	*1 SL182916	*1 SL182916
	8020, 8025	33207	33207	33209	33209		33214	33214	*1 SL182918	*1 SL182918
	8030, 8035	33208	33208	32310	32310		33216	33216	*1 SL182922	*1 SL182922
	8040, 8045	33210	33210	32312	32312	STD	30219	30219	*1 SL182926	*1 SL182926
						HD	22219	22219		
	8050, 8055	33211	33211	32314	32314	STD	30222	30222	*1 SL182928	*1 SL182928
						HD	23222	23222		
	8060, 8065	33213	33213	32316	32316	STD	30226	30226	*1 SL182934	*1 SL182934
						HD	22226	22226		
	8070, 8075	33216	33216	32319	32319	STD	30230	30230	*1 SL182938	*1 SL182938
						HD	22230	22230		
	8080, 8085	33218	33218	32321	32321	STD	23134	23134	*1 SL182944	*1 SL182944
						HD	24134	24134		
	8090	2 × 30221	22318	22324	22324	STD	23136	23136	*1 SL182948	*1 SL182948
						HD	24136	24136		
	8095	2 × 30221	22318	22324	22324	STD	23138	23138	*1 SL182952	*1 SL182952
						HD	24138	24138		
	8100	2 × 30224	22320	22328	22328	STD	23140	23140	*1 SL182952	*1 SL182952
						HD	24140	24140		
	8105	2 × 30224	22320	22328	22328	STD	23144	23144	*1 SL182956	*1 SL182956
						HD	24144	24144		
	8110	2 × 32032X	22322	22330	22330	STD	23144	23144	*1 SL182960	*1 SL182960
						HD	24144	24144		
	8115	2 × 32032X	22322	22330	22330	STD	23148	23148	*1 SL182964	*1 SL182964
						HD	24148	24148		
2 - stage right - angle shaft	8015	*2 2 × 30307D	22308	32307	*2 32307C		32212	32212	*1 SL182916	*1 SL182916
	8020, 8025	*2 2 × 30308D	22309	32309	*2 32309C		33214	33214	*1 SL182918	*1 SL182918
	8030, 8035	*2 2 × 30309D	22310	32310	*2 32310C		33216	33216	*1 SL182922	*1 SL182922
	8040, 8045	*2 2 × 30311D	22312	32312	*2 32312C	STD	30219	30219	*1 SL182926	*1 SL182926
						HD	22219	22219		
	8050, 8055	*2 2 × 30312D	22313	32314	*2 32314C	STD	30222	30222	*1 SL182928	*1 SL182928
						HD	23222	23222		
	8060, 8065	*2 2 × 30314D	22316	32316	*2 32316C	STD	30226	30226	*1 SL182934	*1 SL182934
						HD	22226	22226		
	8070, 8075	*2 2 × 30316D	22317	22320	22320	STD	30230	30230	*1 SL182938	*1 SL182938
						HD	22230	22230		
	8080, 8085	*2 2 × 30318D	22319	22322	22322	STD	23134	23134	*1 SL182944	*1 SL182944
						HD	24134	24134		
	8090	———	———	———	———	STD	23136	23136	*1 SL182948	*1 SL182948
						HD	24136	24136		
	8095	*2 2 × 30319D	22322	22324	22324	STD	23138	23138	*1 SL182952	*1 SL182952
						HD	24138	24138		
	8100	———	———	———	———	STD	23140	23140	*1 SL182952	*1 SL182952
						HD	24140	24140		
	8105	2 × 32222	22328	22328	22328	STD	23144	23144	*1 SL182956	*1 SL182956
						HD	24144	24144		
	8110	———	———	———	———	STD	23144	23144	*1 SL182960	*1 SL182960
						HD	24144	24144		
	8115	2 × 32226	22328	22330	22330	STD	23148	23148	*1 SL182964	*1 SL182964
						HD	24148	24148		

*1 : INA Full complement cylindrical roller bearing (C3 bearing internal clearance)
*2 : NTN D - type and C - type taper roller bearing

Table 12 3 - stage unit bearing

STD : Standard bearing
HD : Heavy duty

	Size	High - speed shaft		Intermediate shaft		Intermediate shaft		Slow- speed shaft				
								Solid shaft			Hollow shaft	
		Motor side	Opposite side	Pinion side	Gear side				Shaft - out side	Opposite to shaft - out side	Shaft - out side	Opposite to shaft - out side
3 - stage parallel shaft	8015	33205	33205	33206	33206	33207	33207		32212	32212	*1 SL182916	*1 SL182916
	8020, 8025	33206	33206	33207	33207	33209	33209		33214	33214	*1 SL182918	*1 SL182918
	8030, 8035	33206	33206	32307	32307	32310	32310		33216	33216	*1 SL182922	*1 SL182922
	8040, 8045	33207	33207	32308	32308	32312	32312	STD	30219	30219	*1 SL182926	*1 SL182926
								HD	22219	22219		
	8050, 8055	33208	33208	32309	32309	32314	32314	STD	30222	30222	*1 SL182928	*1 SL182928
								HD	23222	23222		
	8060, 8065	33210	33210	32311	32311	32316	32316	STD	30226	30226	*1 SL182934	*1 SL182934
								HD	22226	22226		
	8070, 8075	33211	33211	32313	32313	32319	32319	STD	30230	30230	*1 SL182938	*1 SL182938
								HD	22230	22230		
	8080, 8085	33213	33213	32315	32315	32321	32321	STD	23134	23134	*1 SL182944	*1 SL182944
								HD	24134	24134		
	8090	32314	32314	22318	22318	22324	22324	STD	23136	23136	*1 SL182948	*1 SL182948
								HD	24136	24136		
	8095	32314	32314	22318	22318	22324	22324	STD	23138	23138	*1 SL182952	*1 SL182952
								HD	24138	24138		
	8100	32316	32316	22320	22320	22328	22328	STD	23140	23140	*1 SL182952	*1 SL182952
								HD	24140	24140		
	8105	32316	32316	22320	22320	22328	22328	STD	23144	23144	*1 SL182956	*1 SL182956
								HD	24144	24144		
	8110	32316	32316	22322	22322	22330	22330	STD	23144	23144	*1 SL182960	*1 SL182960
								HD	24144	24144		
	8115	32316	32316	22322	22322	22330	22330	STD	23148	23148	*1 SL182964	*1 SL182964
								HD	24148	24148		
	8118	32316	32316	22322	22322	22334	22334	STD	23152	23152	*1 SL182972	*1 SL182972
	8121	24124	24124	22326	22326	22340	22340	STD	24060	24060	*1 SL182980	*1 SL182980
	8126	24124	24124	22326	22326	22340	22340	STD	24060	24060	*1 SL182980	*1 SL182980
	8128	23224	23224	22328	22328	22344	22344	STD	24064	24064	*1 SL182984	*1 SL182984
	8131	24130	24130	22334	22334	22348	22348	STD	24072	24072	*1 SL182992	*1 SL182992
	8136	24130	24130	22334	22334	22348	22348	STD	24072	24072	*1 SL182992	*1 SL182992
3 - stage right - angle shaft	8015	———	———	———	———	———	———		———	———	———	———
	8020, 8025	———	———	———	———	———	———		———	———	———	———
	8030, 8035	*2 2 × 30307D	22308	32307	32307	32310	32310		33216	33216	*1 SL182922	*1 SL182922
	8040, 8045	*2 2 × 30308D	22309	32308	32308	32312	32312	STD	30219	30219	*1 SL182926	*1 SL182926
								HD	22219	22219		
	8050, 8055	*2 2 × 30309D	22310	32309	32309	32314	32314	STD	30222	30222	*1 SL182928	*1 SL182928
								HD	23222	23222		
	8060, 8065	*2 2 × 30311D	22312	32311	32311	32316	32316	STD	30226	30226	*1 SL182934	*1 SL182934
								HD	22226	22226		
	8070, 8075	*2 2 × 30312D	22313	32313	32313	32319	32319	STD	30230	30230	*1 SL182938	*1 SL182938
								HD	22230	22230		
	8080, 8085	*2 2 × 30314D	22315	32315	32315	32321	32321	STD	23134	23134	*1 SL182944	*1 SL182944
								HD	24134	24134		
	8090	*2 2 × 30316D	22316	22318	22318	22324	22324	STD	23136	23136	*1 SL182948	*1 SL182948
								HD	24136	24136		
	8095	*2 2 × 30315D	22316	22318	22318	22324	22324	STD	23138	23138	*1 SL182952	*1 SL182952
								HD	24138	24138		
	8100	*2 2 × 30317D	22318	22320	22320	22328	22328	STD	23140	23140	*1 SL182952	*1 SL182952
								HD	24140	24140		
	8105	*2 2 × 30317D	22318	22320	22320	22328	22328	STD	23144	23144	*1 SL182956	*1 SL182956
								HD	24144	24144		
	8110	*2 2 × 30319D	22320	22322	22322	22330	22330	STD	23144	23144	*1 SL182960	*1 SL182960
								HD	24144	24144		
	8115	*2 2 × 30319D	22320	22322	22322	22330	22330	STD	23148	23148	*1 SL182964	*1 SL182964
								HD	24148	24148		
	8118	*2 2 × 30319D	22320	22322	22322	22334	22334	STD	23152	23152	*1 SL182972	*1 SL182972
	8121	i≦31.5 2 × 31324X	22326	22326	22326	22340	22340	STD	24060	24060	*1 SL182980	*1 SL182980
		*2 i≦35.5 2 × 30319D	22322									
	8126	i≦31.5 2 × 31324X	22326	22326	22326	22340	22340	STD	24060	24060	*1 SL182980	*1 SL182980
		*2 i≦35.5 2 × 30319D	22322									
	8128	2 × 31322X	22328	22328	22328	22344	22344	STD	24064	24064	*1 SL182984	*1 SL182984
	8131	2 × 31326X	22328	22334	22334	22348	22348	STD	24072	24072	*1 SL182992	*1 SL182992
	8136	2 × 31326X	22328	22334	22334	22348	22348	STD	24072	24072	*1 SL182992	*1 SL182992

*1 : INA Full complement cylindrical roller bearing (C3 bearing internal clearance)
*2 : NTN D - type tapere roller bearing

Table 13 4 - stage unit bearing

STD : Standard bearing
HD : Heavy duty

	Size	High - speed shaft		Intermediate shaft		Intermediate shaft		Intermediate shaft		Slow - speed shaft				
											Solid shaft		Hollow shaft	
		Motor side	Opposite side	Pinion side	Gear side						Shaft - out side	Opposite to shaft - out side	Shaft - out side	Opposite to shaft - out side
4 - stage parallel shaft	8015	——	——	——	——	——	——	——	——		——	——	——	——
	8020, 8025	——	——	——	——	——	——	——	——		——	——	——	——
	8030, 8035	33205	33205	33206	33206	32307	32307	32310	32310		33216	33216	*1 SL182922	*1 SL182922
	8040, 8045	33206	33206	33207	33207	32308	32308	32312	32312	STD	30219	30219	*1 SL182926	*1 SL182926
										HD	22219	22219		
	8050, 8055	33206	33206	32307	32307	32309	32309	32314	32314	STD	30222	30222	*1 SL182928	*1 SL182928
										HD	23222	23222		
	8060, 8065	33207	33207	32308	32308	32311	32311	32316	32316	STD	30226	30226	*1 SL182934	*1 SL182934
										HD	22226	22226		
	8070, 8075	32308	32308	32309	32309	32313	32313	32319	32319	STD	30230	30230	*1 SL182938	*1 SL182938
										HD	22230	22230		
	8080, 8085	32309	32309	32311	32311	32315	32315	32321	32321	STD	23134	23134	*1 SL182944	*1 SL182944
										HD	24134	24134		
	8090	32212	32212	32314	32314	22318	22318	22324	22324	STD	23136	23136	*1 SL182948	*1 SL182948
										HD	24136	24136		
	8095	32212	32212	32314	32314	22318	22318	22324	22324	STD	23138	23138	*1 SL182952	*1 SL182952
										HD	24138	24138		
	8100	33214	33214	32316	32316	22320	22320	22328	22328	STD	23140	23140	*1 SL182952	*1 SL182952
										HD	24140	24140		
	8105	33214	33214	32316	32316	22320	22320	22328	22328	STD	23144	23144	*1 SL182956	*1 SL182956
										HD	24144	24144		
	8110	33214	33214	32316	32316	22322	22322	22330	22330	STD	23144	23144	*1 SL182960	*1 SL182960
										HD	24144	24144		
	8115	33214	33214	32316	32316	22322	22322	22330	22330	STD	23148	23148	*1 SL182964	*1 SL182964
										HD	24148	24148		
	8118	33214	22314	32316	32316	22322	22322	22334	22334	STD	23152	23152	*1 SL182972	*1 SL182972
	8121	22314	22314	22319	22319	22326	22326	22340	22340	STD	24060	24060	*1 SL182980	*1 SL182980
	8126	22314	22314	22319	22319	22326	22326	22340	22340	STD	24060	24060	*1 SL182980	*1 SL182980
	8128	22316	22316	22320	22320	22328	22328	22344	22344	STD	24064	24064	*1 SL182984	*1 SL182984
	8131	22317	22317	22322	22322	22334	22334	22348	22348	STD	24072	24072	*1 SL182992	*1 SL182992
	8136	22317	22317	22322	22322	22334	22334	22348	22348	STD	24072	24072	*1 SL182992	*1 SL182992
4 - stage right - angle shaft	8015	——	——	——	——	——	——	——	——		——	——	——	——
	8020, 8025	——	——	——	——	——	——	——	——		——	——	——	——
	8030, 8035	——	——	——	——	——	——	——	——		——	——	——	——
	8040, 8045	*2 2 × 30307D	22308	33207	33207	32308	32308	32312	32312	STD	30219	30219	*1 SL182926	*1 SL182926
										HD	22219	22219		
	8050, 8055	*2 2 × 30307D	22308	32307	32307	32309	32309	32314	32314	STD	30222	30222	*1 SL182928	*1 SL182928
										HD	23222	23222		
	8060, 8065	*2 2 × 30306D	22309	32308	32308	32311	32311	32316	32316	STD	30226	30226	*1 SL182934	*1 SL182934
										HD	22226	22226		
	8070, 8075	*2 2 × 30309D	22310	32309	32309	32313	32313	32319	32319	STD	30230	30230	*1 SL182938	*1 SL182938
										HD	22230	22230		
	8080, 8085	*2 2 × 30311D	22312	32311	32311	32315	32315	32321	32321	STD	23134	23134	*1 SL182944	*1 SL182944
										HD	24134	24134		
	8090	*2 2 × 30312D	22313	32314	32314	22318	22318	22324	22324	STD	23136	23136	*1 SL182948	*1 SL182948
										HD	24136	24136		
	8095	*2 2 × 30312D	22313	32314	32314	22318	22318	22324	22324	STD	23138	23138	*1 SL182952	*1 SL182952
										HD	24138	24138		
	8100	*2 2 × 30314D	22315	32316	32316	22320	22320	22328	22328	STD	23140	23140	*1 SL182952	*1 SL182952
										HD	24140	24140		
	8105	*2 2 × 30314D	22315	32316	32316	22320	22320	22328	22328	STD	23144	23144	*1 SL182956	*1 SL182956
										HD	24144	24144		
	8110	*2 2 × 30314D	22315	32316	32316	22322	22322	22330	22330	STD	23144	23144	*1 SL182960	*1 SL182960
										HD	24144	24144		
	8115	*2 2 × 30314D	22315	32316	32316	22322	22322	22330	22330	STD	23148	23148	*1 SL182964	*1 SL182964
										HD	24148	24148		
	8118	*2 2 × 30314D	22315	32316	32316	22322	22322	22334	22334	STD	23152	23152	*1 SL182972	*1 SL182972
	8121	*2 2 × 30315D	22316	22319	22319	22326	22326	22340	22340	STD	24060	24060	*1 SL182980	*1 SL182980
	8126	*2 2 × 30315D	22316	22319	22319	22326	22326	22340	22340	STD	24060	24060	*1 SL182980	*1 SL182980
	8128	*2 2 × 30317D	22318	22320	22320	22328	22328	22344	22344	STD	24064	24064	*1 SL182984	*1 SL182984
	8131	*2 2 × 30316D	22320	22322	22322	22334	22334	22348	22348	STD	24072	24072	*1 SL182992	*1 SL182992
	8136	*2 2 × 30316D	22320	22322	22322	22334	22334	22348	22348	STD	24072	24072	*1 SL182992	*1 SL182992

*1 : INA Full complement cylindrical roller bearing (C3 bearing internal clearance)
*2 : NTN D - type tapere roller bearing

15. Locations of oil filler and drain plug

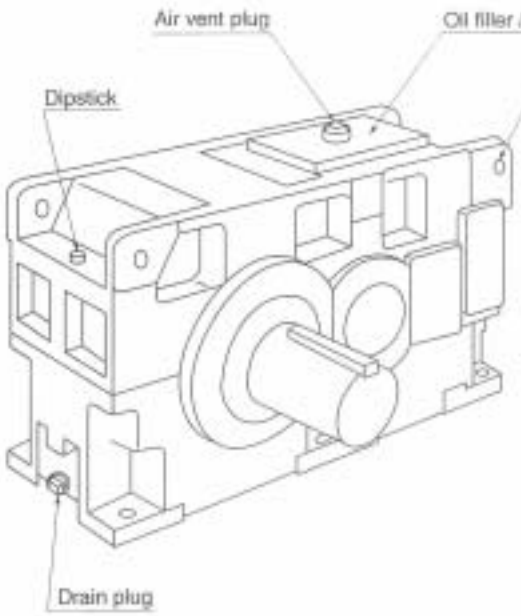


Fig. 19 Horizontal

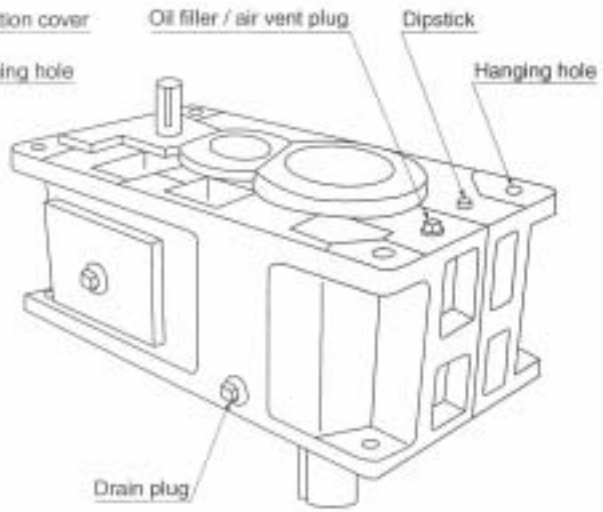


Fig. 20 Vertical

16. 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, whether 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: 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.

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