

Connecting to Machinery (cont.), Operation

Hollow Shaft (cont.)

Torque Arm (optional)

The hollow shaft reducer is fixed by the torque arm to prevent the reducer from revolving by an opposite reaction force. Fig. 22 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.

Notes: a. The number of disc springs (s) differs according to the size of the reducer.

b. Use bolt (t) and nut (M) classified as JIS/ISO/ASTM strength class 8.8.

c. Adjust Nut (M1) to remove any clearance in the assembly.

Spacer/washer (s) should be able to spin by hand. If not, readjust/loosen M1 nut. Lock in position using locking nut (M2).

d. Over tightening of the spring washers or incorrect torque arm assembly will create additional stresses and can lead to premature failure.

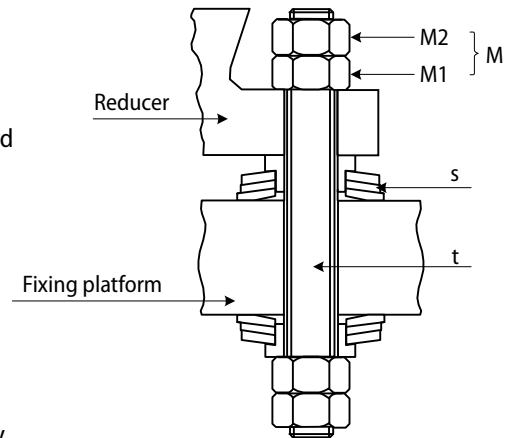


Fig. 22 Standard Torque Arm

Operation

⚠ DANGER

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

⚠ CAUTION

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

• **Paramax® reducers are shipped without oil. Units must be filled with the proper amount of recommended oil prior to start-up.**

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

- (1) the wiring is correct
- (2) the unit is properly coupled with the driven machine
- (3) the foundation bolts are tightened securely
- (4) the direction of rotation is correct.

After confirming these items, conduct a trial run with a light load. Begin full operation after confirming that there is no abnormal sound, vibration and/or temperature rise. Check all items listed in Table 14.

Operation (cont.), Lubrication

Table 14. Initial Start-up and Break-in Period Checklist

Is the reducer generating an abnormal sound or vibration?	<p>(1) Is the housing deformed because the installation surface is not level?</p> <p>(2) Is insufficient rigidity of the installation base generating excessive noise?</p> <p>(3) Is the shaft center aligned with the driven machine?</p> <p>(4) Is vibration from the driven machine transmitted to the reducer?</p>
Is the surface temperature of the Paramax® reducer abnormally high?	<p>(1) Is the the voltage rise or drop substantial?</p> <p>(2) Is the ambient temperature too high?</p> <p>(3) Does the current flowing to the motor exceed the rated current shown on the rating plate?</p> <p>(4) Is the oil at the specified level?</p>

If any abnormality is observed, stop operation and contact your nearest Sumitomo agent, distributor or sales office.

Lubrication

Lubrication Method

- Follow all applicable maintenance specifications. Reducer service life may decrease without proper maintenance.

- (1) Refer to Table 15 for the gear lubrication method for your reducer.
- (2) Refer to Table 16 for the pages in this manual that cover lubrication maintenance.
- (3) Refer to Table 11 on page 5 for standard input speed.

Table 15. Lubrication Method (For standard input speed. Contact Sumitomo if input speed is not standard.)

		Size	9015	9025	9030	9035	9040	9045	9050	9055	9060	9065	9070	9075	9080	9085			
Right angle shaft	2-stage	Horizontal	Oil bath								Oil splash				*	*			
		Vertical	Shaft driven oil pump																
		Upright	Oil bath + grease								Oil splash				*	*			
	3-stage	Horizontal	-	-	Oil bath								Oil splash						
		Vertical	-	-	Shaft driven oil pump														
		Upright	-	-	Oil bath + grease								Oil splash						
		4-stage	Horizontal	-	-	-	-	Oil bath								Oil splash			
			Vertical	-	-	-	-	Shaft driven oil pump											
			Upright	-	-	-	-	Oil bath + grease								Oil splash			
Parallel shaft	2-stage	Horizontal	Oil bath								Oil splash								
		Vertical	Shaft driven oil pump																
		Upright	Oil bath								Oil splash								
	3-stage	Horizontal	Oil bath								Oil splash								
		Vertical	Shaft driven oil pump																
		Upright	Oil bath								Oil splash								
	4-stage	Horizontal	-	-	Oil bath								Oil splash						
		Vertical	-	-	Shaft driven oil pump														
		Upright	-	-	Oil bath								Oil splash						

		Size	9090	9095	9100	9105	9110	9115	9118	9121	9126	9128	9131	9136			
Right angle shaft	2-stage	Horizontal	-	*	-	*	-	*	-	-	-	-	-	-			
		Vertical	-	-	-	-	-	-	-	-	-	-	-	-			
		Upright	-	-	-	-	-	-	-	-	-	-	-	-			
	3-stage	Horizontal	Oil splash			*	*	*	*	*	*	*	*	*			
		Vertical	Shaft driven oil pump			Electric pump											
		Upright	-	-	-	-	-	-	-	-	-	-	-	-			
	4-stage	Horizontal	Oil bath								Oil splash				*	*	*
		Vertical	Shaft driven oil pump														
		Upright	-	-	-	-	-	-	-	-	-	-	-	-			
2-stage		Horizontal	Oil splash			*	*	*	*	-	-	-	-	-			
		Vertical	Electric pump														
		Upright	-	-	-	-	-	-	-	-	-	-	-	-			
3-stage	Horizontal	Oil splash								-				-	-		
	Vertical	Electric pump															
	Upright	-	-	-	-	-	-	-	-	-	-	-	-				
4-stage	Horizontal	Oil splash															
	Vertical	Shaft driven oil pump					Electric pump					-	-	-	-		
	Upright	-	-	-	-	-	-	-	-	-	-	-	-				

* In the case of continuous operation, oil splash or electric pump lubrication is determined by input frequency.

Lubrication (cont.)

Lubrication Method (cont.)

Table 16. Lubrication Maintenance Page Numbers

	Lubrication method	Supply of oil/grease before initial operation after purchase	Page Number				
			Oil/grease change period	Recommended oil / grease	Q'ty of oil/ grease	Disposal of oil/ grease	Parts
Gear	Oil bath	Self-lubrication	Necessary (Unnecessary for grease)	P. 15	P. 15	P. 16	P. 26
	Oil bath + grease						
	Oil splash lubrication						
	Shaft driven pump lubrication						
	Electric pump lubrication	Forced lubrication					

⚠ CAUTION

- For equipment with a motorized oil pump, run the pump before starting the drive unit or reducer. Start the motor for the reducer after lubricating oil has circulated through the bearing; otherwise, the equipment may be damaged.
- For equipment with a circulating oil system (motorized or mechanical), the oil level will need to be adjusted from the initial fill as oil fills the lubrication lines. We recommend comparing the static condition oil level with the operating level, and adding the difference to the static level.
Refer to the addendum in this manual for specific lubrication system maintenance.

- Install a flow switch or flow sight to check the circulation of the lubricating oil. Stop the motor of drive unit or reducer if any abnormality occurs.

Lubrication Maintenance

Maximum Oil Change Interval

Table 17. Maximum Oil Change Interval

	Interval		Usage Conditions
Oil Feeding	At Purchasing		_____
Oil Change	1st Time	After 500 hrs or six months of operation, whichever comes first.	_____
	2nd Time	After 2500 hrs or six months of operation, whichever comes first.	_____
	3rd Time or Later	Every 2500 hrs or six months, whichever comes first.	When case oil temperature is 158° F (70° C) or higher
		Every 5000 hrs or one year, whichever comes first.	When case oil temperature is lower than 158° F (70° C)

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

Table 18. Grease Interval

Interval	Input speed
Every 1500hrs	750 rpm or slower
Every 1000hrs	750 to 1800 rpm

- The grease lubricated models are packed with grease prior to shipment and grease nipples and grease relief plugs are attached. Please check the number of grease nipple and their positions carefully.
- Please check Table 15 for models that require grease lubrication.
- Please see Fig. 23 and 24 (page 15) for grease nipple and grease relief plug positions.
- For units with grease lubricated bearings:
 - Remove grease relief plug
 - Slowly** pump grease into grease nipple **while shafts are rotating**. Sumitomo recommends using a manual, hand grease gun; use extreme caution when using a pneumatic grease gun.
 - Stop filling with grease and replace the relief plug when grease begins to purge.

Lubrication (cont.)

Lubrication Maintenance (cont.)

Lubricant Selection

- Refer to Table 19 to select the appropriate oil viscosity.
- Refer to Table 20 for recommended lubricants.
- The list of recommended lubricants is not a complete list. The lubricant recommendations are intended to help guide the customer in making a proper lubricant selection and are provided as a customer service benefit to our customers. Contact the lubricant supplier for current oil brands and available quantities.
- **Synthetics** can be considered as long as they are compatible with the various gearbox materials such as plain and alloy steels, bronze, copper, cast iron, acrylic plastic, NBR or FKM seals, denatured alkylde resin (internal Primer Paint), mineral oil with EP additives (test oil residue).
- Proper lubricant selection and maintenance practice is the responsibility of the customer.
- When ambient temperature spans beyond the range for a single viscosity grade oil shown below, it is recommended that the oil be selected for the **maximum** ambient temperature **and** an immersion oil heater be equipped to maintain the minimum temperature for that viscosity oil. If an immersion oil heater is not equipped, **seasonal oil changes will be required** to meet viscosity requirements.

Table 19. Oil Viscosity

Output speed	Ambient temperature			
		14° F (-10° C) to 59° F (15° C)	32° F (0° C) to 86° F (30° C)	50° F (10° C) to 122° F (50° C)
100 rpm or more	ISO* AGMA	VG68 2EP	VG150 4EP	VG220 5EP
100 rpm or less	ISO* AGMA	VG100 3EP	VG220 5EP	VG320 6EP

Table 20. Recommended Lubricants

Gear Oil	Brand	BP	CASTROL		CHEVRON/TEXACO/CALTEX		EXXON MOBIL		SHELL	TOTAL
	ISO VG68 AGMA 2EP	ENERGOL GR-XP-68	ALPHA SP68	OPTIGEAR BM68	TRIBOL 1100/68	MEROPA or *MEROPA XL ISO 68	-	SPARTAN EP68	MOBILGEAR 600 XP68	OMALA S2 G 68
ISO VG100 AGMA 3EP	ENERGOL GR-XP-100	ALPHA SP100	OPTIGEAR BM100	TRIBOL 1100/100	MEROPA ISO 100	-	SPARTAN EP100	MOBILGEAR 600 XP100	OMALA S2 G 100	CARTER EP100
ISO VG150 AGMA 4EP	ENERGOL GR-XP-150	ALPHA SP150	OPTIGEAR BM150	TRIBOL 1100/150	MEROPA or *MEROPA XL ISO 150	*MEROPA ELITE SYN XM ISO 150	SPARTAN EP150	MOBILGEAR 600 XP150	OMALA S2 G 150	CARTER EP150
ISO VG220 AGMA 5EP	ENERGOL GR-XP-220	ALPHA SP220	OPTIGEAR BM220	TRIBOL 1100/220	MEROPA or *MEROPA XL ISO 220	*MEROPA ELITE SYN XM ISO 220	SPARTAN EP220	MOBILGEAR 600 XP220	OMALA S2 G 220	CARTER EP220
ISO VG320 AGMA 6EP	ENERGOL GR-XP-320	ALPHA SP320	OPTIGEAR BM320	TRIBOL 1100/320	MEROPA or *MEROPA XL ISO 320	*MEROPA ELITE SYN XM ISO 320	SPARTAN EP320	MOBILGEAR 600 XP320	OMALA S2 G 320	CARTER EP320
Bearing Grease	ENERGREASE LS EP2	SPHEEROL AP3	OLISTA LONGTIME 3EP	TRIBOL 3020/1000-2	MULTIFAK EP2	-	BEACON EP2	MOBILUX EP2	GADUS S2 V220 2	MULTIS EP2

*Depicts extreme micro-pitting protection with excellent performance results in the FVA 54/7 Load and Endurance Stages

Oil Quantity

Estimated quantities of oil for standard specifications are listed in Table 21 Oil Quantity. The oil quantity shown in the catalog is not exact. Use a dipstick or visible oil gauge to check the oil level.

Oil Replenishment

- Supply oil through the inlet on the top of the main unit. Check the oil level with a dipstick or oil sight gauge (Fig. 23).
- Screw the dipstick to its deepest position to check the oil level; otherwise, the measured oil level will be incorrect (Fig. 24).
- Check oil level when lubricant is close to the lubricant operating temperature - in order to obtain accurate oil level readings. Large oil sumps will have considerable difference between cold and warm oil levels.
- When filling the unit for the first time or after 1 or more week of inoperation, fill or check the lubricant level to the bottom mark on the level gauge. Operate unit at a light load, for approximately 5 minutes, shut down equipment and check and readjust oil level if required.
- If unit is supplied with a lubrication system, it is important, to check the oil level before the lubricant has had time to drain.

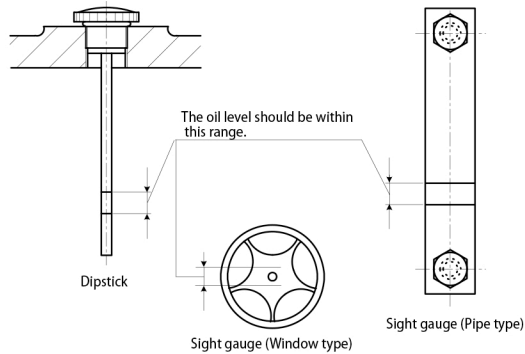


Fig. 24

Lubrication (cont.)

Lubrication Maintenance (cont.)

Oil Replenishment (cont.)

During the oil replenishment process, ensure that loose nuts, bolts washers dust, water and other foreign materials do not enter the reducer. The reducer will not be sufficiently lubricated if the oil level is below the recommended range. However, if the oil level is above the recommended range, the oil temperature will rise and cause the oil to deteriorate (See Fig. 23).

When draining oil from the reducer, remove the drain plug located under the unit and allow the oil to drain while it is still warm. Removing the breather will make draining or replenishing oil easier.

Replenishing Grease

- (1) Remove the grease relief plug from the gear housing.
- (2) To ensure even distribution, slowly add new grease through the grease fitting while the reducer is running. Continue adding grease until it begins to come out of the port.
- (3) Replace grease relief plug

Typical Grease Fitting and Discharge Plug Locations

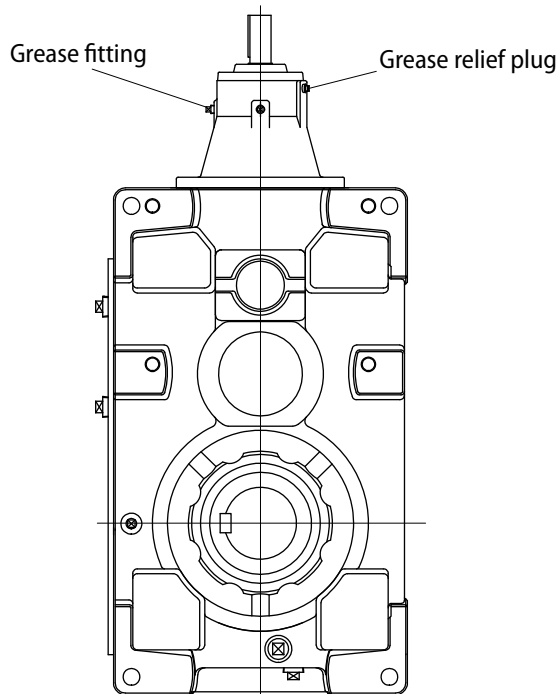


Fig. 25 Reducer Upright Mount

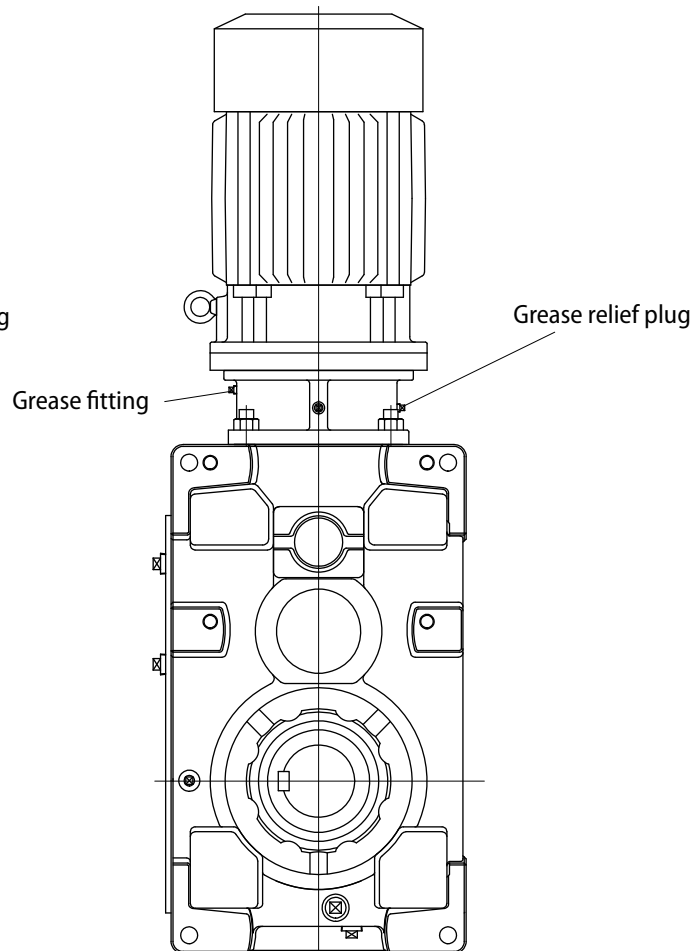


Fig. 26 Drive Unit Upright Mount

Lubrication (cont.)

Oil Quantity

Table 21. Oil Quantity

Units: gallons (liters)

Size	Horizontal						Vertical						Upright					
	Right Angle Shaft			Parallel Shaft			Right Angle Shaft			Parallel Shaft			Right Angle Shaft			Parallel 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	2 stage	3 stage	4 stage	2 stage	3 stage	4 stage
9015	1.3 (5)	—	—	1.3 (5)	1.3 (5)	—	1.3 (5)	—	—	1.3 (5)	1.6 (6)	—	1.9 (7)	—	—	2.4 (9)	2.9 (11)	—
9025	1.9 (7)	—	—	1.9 (7)	2.1 (8)	—	1.9 (7)	—	—	1.9 (7)	2.1 (8)	—	2.9 (11)	—	—	3.4 (13)	4.0 (15)	—
9030	2.6 (10)	2.6 (10)	—	2.6 (10)	2.6 (10)	3.7 (14)	1.9 (7)	2.4 (9)	—	2.4 (9)	2.6 (10)	2.6 (10)	3.7 (14)	4.2 (16)	—	4.2 (16)	5.3 (20)	5.3 (20)
9035	3.2 (12)	3.2 (12)	—	3.2 (12)	3.4 (13)	4.5 (17)	2.4 (9)	3.2 (12)	—	3.2 (12)	3.7 (14)	3.7 (14)	5.0 (19)	5.6 (21)	—	5.8 (22)	6.6 (25)	6.6 (25)
9040	4.2 (16)	4.2 (16)	5.0 (19)	4.2 (16)	5.0 (19)	6.6 (25)	5.0 (19)	4.8 (18)	4.8 (18)	4.8 (18)	4.8 (18)	4.5 (17)	6.3 (24)	7.7 (29)	9.3 (35)	7.7 (29)	9.3 (35)	9.3 (35)
9045	4.8 (18)	4.8 (18)	5.6 (21)	4.8 (18)	5.6 (21)	7.4 (28)	6.1 (23)	5.8 (22)	5.8 (22)	5.8 (22)	5.8 (22)	5.6 (21)	7.9 (30)	9.5 (36)	11 (43)	9.5 (36)	11 (43)	11 (43)
9050	5.6 (21)	5.6 (21)	6.3 (24)	5.6 (21)	6.3 (24)	8.5 (32)	5.3 (20)	5.6 (21)	6.3 (24)	5.8 (22)	6.6 (25)	6.1 (23)	8.2 (31)	9.3 (35)	12 (46)	9.5 (36)	12 (45)	12 (46)
9055	7.4 (28)	7.4 (28)	7.7 (29)	7.4 (28)	7.7 (29)	11 (40)	6.9 (26)	7.9 (30)	9.0 (34)	8.2 (31)	9.3 (35)	8.7 (33)	12 (45)	12 (46)	16 (59)	12 (47)	16 (59)	16 (59)
9060	6.6 (25)	7.7 (29)	10 (38)	6.6 (25)	8.7 (33)	9.8 (37)	*	7.4 (28)	9.5 (36)	6.6 (25)	7.4 (28)	8.5 (32)	12 (44)	15 (56)	18 (68)	14 (53)	18 (68)	18 (69)
9065	7.7 (29)	8.7 (33)	11 (43)	7.7 (29)	10 (38)	11 (42)	*	9.3 (35)	12 (45)	8.5 (32)	9.3 (35)	11 (40)	15 (56)	17 (65)	22 (85)	18 (67)	22 (85)	23 (86)
9070	9.8 (37)	12 (45)	15 (57)	10 (38)	13 (49)	15 (56)	*	12 (46)	14 (54)	10 (39)	12 (44)	14 (53)	17 (65)	22 (83)	28 (107)	22 (84)	28 (106)	29 (108)
9075	12 (46)	14 (52)	18 (67)	12 (47)	16 (59)	18 (67)	*	16 (59)	18 (68)	13 (49)	15 (56)	18 (67)	23 (87)	26 (100)	32 (122)	26 (100)	32 (120)	32 (122)
9080	14 (53)	16 (60)	19 (73)	14 (54)	17 (64)	19 (73)	*	16 (60)	18 (69)	14 (54)	15 (57)	17 (65)	24 (90)	30 (115)	34 (128)	29 (109)	34 (130)	34 (130)
9085	17 (67)	20 (75)	24 (90)	18 (68)	21 (80)	24 (90)	*	21 (80)	25 (94)	19 (71)	21 (79)	24 (89)	33 (126)	38 (144)	46 (174)	36 (137)	46 (176)	46 (175)
9090	—	32 (120)	40 (150)	32 (120)	32 (120)	40 (150)	—	32 (120)	32 (120)	24 (90)	24 (90)	29 (110)	—	—	—	—	—	—
9095	26 (100)	41 (155)	48 (180)	37 (140)	41 (155)	48 (180)	—	38 (145)	41 (155)	32 (120)	32 (120)	37 (140)	—	—	—	—	—	—
9100	—	48 (180)	55 (210)	45 (170)	48 (180)	58 (220)	—	45 (170)	48 (180)	37 (140)	37 (140)	45 (170)	—	—	—	—	—	—
9105	40 (150)	58 (220)	67 (255)	54 (205)	59 (225)	69 (260)	—	55 (210)	58 (220)	46 (175)	46 (175)	55 (210)	—	—	—	—	—	—
9110	—	66 (250)	79 (300)	63 (240)	69 (260)	79 (300)	—	61 (230)	66 (250)	53 (200)	53 (200)	63 (240)	—	—	—	—	—	—
9115	53 (200)	82 (310)	95 (360)	77 (290)	86 (325)	96 (365)	—	77 (290)	83 (315)	67 (255)	67 (255)	78 (295)	—	—	—	—	—	—
9118	—	92 (350)	103 (390)	—	92 (350)	103 (390)	—	—	—	—	—	—	—	—	—	—	—	—
9121	—	122 (460)	143 (540)	—	124 (470)	140 (530)	—	—	—	—	—	—	—	—	—	—	—	—
9126	—	122 (460)	140 (530)	—	124 (470)	137 (520)	—	—	—	—	—	—	—	—	—	—	—	—
9128	—	92 (350)	122 (460)	—	103 (390)	119 (450)	—	—	—	—	—	—	—	—	—	—	—	—
9131	—	135 (510)	180 (680)	—	145 (550)	172 (650)	—	—	—	—	—	—	—	—	—	—	—	—
9136	—	132 (500)	174 (660)	—	143 (540)	169 (640)	—	—	—	—	—	—	—	—	—	—	—	—

* : Refer to Table 22.

Lubrication (cont.)

Oil Quantity (cont.)

Table 22. Oil Quantity – Right Angle Shaft, Two-stage, Units: gallons (liters)

Size	Ratio		Ratio	
	6.3 – 9	10 – 18	8 – 11.2	12.5 – 22.4
9060	6.6 (25)	6.6 (25)	–	–
9065	–	–	8.5 (32)	8.5 (32)
9070	9.3 (35)	11 (41)	–	–
9075	–	–	12 (47)	14 (54)
9080	12 (46)	15 (55)	–	–
9085	–	–	15 (58)	18 (68)

Oil Fill and Drain Plug Locations

Fig. 27 Horizontal

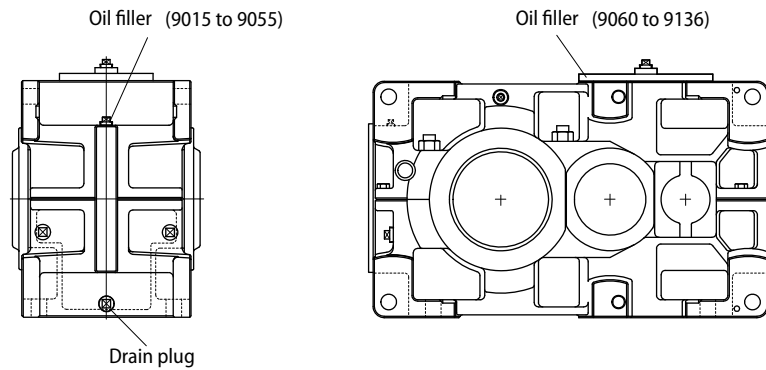


Fig. 28 Vertical

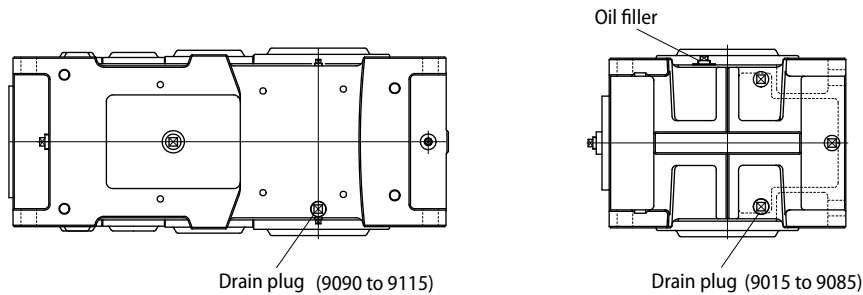
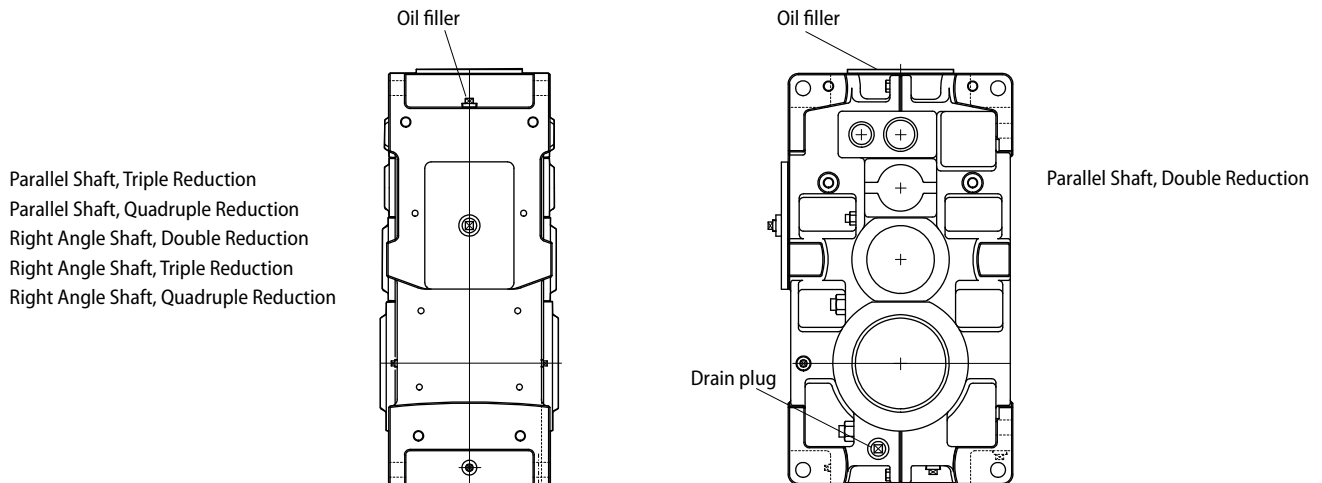


Fig. 29 Upright



Daily Inspection

⚠ DANGER

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

⚠ CAUTION

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

To ensure proper and continued optimum operation, use Table 23 to perform daily inspections. If any abnormality is found during the daily inspection, follow the corrective procedures listed in the **Troubleshooting** section (Page 26). If the abnormality cannot be corrected, contact the nearest Sumitomo agent, distributor or sales office.

Table 23. Daily Inspection Checklist

Inspection Item		Details
Electric Current		Is the current below the rated current shown on the rating plate?
Noise		Are there abnormal sounds coming from the reducer? Is there a sudden change in sound?
Vibration		Is there excessive vibration? Does vibration change suddenly?
Surface Temperature		Is the surface temperature abnormally high (higher than 194° F (90°C))? Does the surface temperature rise suddenly ? <i>The temperature rise during operation differs according to the model. The difference between the temperature of the gear surface and the ambient temperature may be as high as 176° F (80° C), as long as the temperature is not fluctuating.</i>
Oil Level (Oil-lubricated model)	At Rest	Does the oil level reach the top line of the oil gauge?
	In Operation	When compared to the oil level at rest, is this level different?
	When Using a Trochoid Pump	Is the oil signal or flow gauge functioning normally? <i>If functioning abnormally, stop the unit and inspect it; otherwise, inadequate oil will cause poor lubrication of reduction portion, broken pump and fill-up the oil pipe.</i>
Oil or Grease Leakage		Does oil or grease leak from the gear section?
Foundation Bolt		Are foundation bolts loose?
Chain and V-Belt		Are chain and V-belt loose?