Sumitomo Drive Technologies
Always on the Move

PARAMAX 9000

Getriebe und Getriebemotoren
Reducer & Drive Units

Betriebsanleitung
Operation Manual

Nr. 999345
06/2009

Table of Contents

1. General Notes

Please make sure you heed the safety notes in this documentation.

Electrical Hazards
Using the machine incorrectly may lead to bodily injury, serious injuries and/or life-threatening situations.

Hazard
Using the machine incorrectly may lead to bodily injury, serious injuries and/or life-threatening situations.

Dangerous Situation
Slight injury may result.

Harmful Situation
Damage to the drive or the environment could be caused.

Helpful Information

Disposal
Please obey the regulations in force.

Important Information on Explosion Protection

The Information applies to PARAMAX Gear Motors

The Information applies to PARAMAX Gearboxes

Spare Parts
Only use original spare parts. Any guarantee lapses should unauthorised spare parts be used.

2. Safety notes

Before working on the machine (assembling, operating, maintaining, inspecting etc.), please read these operating instructions through carefully so that you know exactly how to operate the PARAMAX and are aware of the safety rules to be applied and the warnings to be heeded. Keep these instructions near the machine so that you can refer to them at any time if necessary.

Transporting, assembling, lubricating, operating, maintaining and inspecting must only be done by trained technical experts otherwise there is the risk of injury or damaging the machine.
Never reach into moving parts and remove foreign bodies from them. This may cause injury or damage to the machine.
The gearbox unit must be put out of action and unplugged for maintenance and installation work.
The unit must only be used for the specified purpose otherwise there is the risk of injury or damage to the machine.

2.1 Safety notes for Operating Gearboxes or Gear Motors

A drive motor connected to the gearbox may only be operated after ensuring that the information on the rating plate matches the documentation supplied (drawings, parts lists etc.).
- The drive must not be damaged in any way.
- The lubricants provided must be suitable and if necessary prepared for the environmental conditions.

A motor connected to the gearbox may only be operated on the frequency inverter if the information on the gearbox rating plate is obeyed. The gearboxes are intended for commercial equipment and must only be used in accordance with the information in the technical documentation and the information on the rating plate. They comply with the standards and regulations in force and meet the requirements of Directive 94/9EG.

You will find more important information on this in Section 7.1.

3. Notes on Transporting and Inspection on Delivery

Never stand under a unit hanging from a crane or similar lifting device. There is the risk of severe or fatal injuries.

Unpack the unit so that it is the right side up otherwise there is the risk of injury.

Ensure that the gear motor or gearbox is not dropped.
Always use eye bolts or holes for hanging. Only prescribed slings of the correct size that can be hooked into the existing eyebolts or can be put round the flange connections must be used. The screwed in eyebolts are only designed for the weight of the drive. No additional loads must be suspended.

As a general rule: Do not use the centring holes on the shaft ends to lift the gearbox by the eyebolts etc. The bearings may be damaged.

After installing the PARAMAX gear motor or PARAMAX gearbox into the unit the whole machine must never be lifted on the suspension hooks or holes. This may cause injury or damage to the equipment or the lifting device.

Before lifting check the weight of the PARAMAX gear motor or the PARMAX gearbox using the information on/ in the packaging, the drawings supplied, the catalogue etc. Do not life any units whose weight exceeds the maximum load of the crane or the lifting device used. This may cause injury or damage to the equipment or the lifting device.

After Delivery it must be checked whether:

1. you have received what you ordered (see also descriptions on the rating plate).
   Should there be any doubt whether you have received what you ordered, please contact a representative, a dealer or a local service office.

2. Parts have been damaged during transport. Any transport damage must be reported to the carrier immediately. If it must be assumed that transport damage will restrict proper operation then the unit must not be started up.

3.1 PARAMAX gear motor and gearbox rating plates

PARAMAX Gearbox Rating Plate

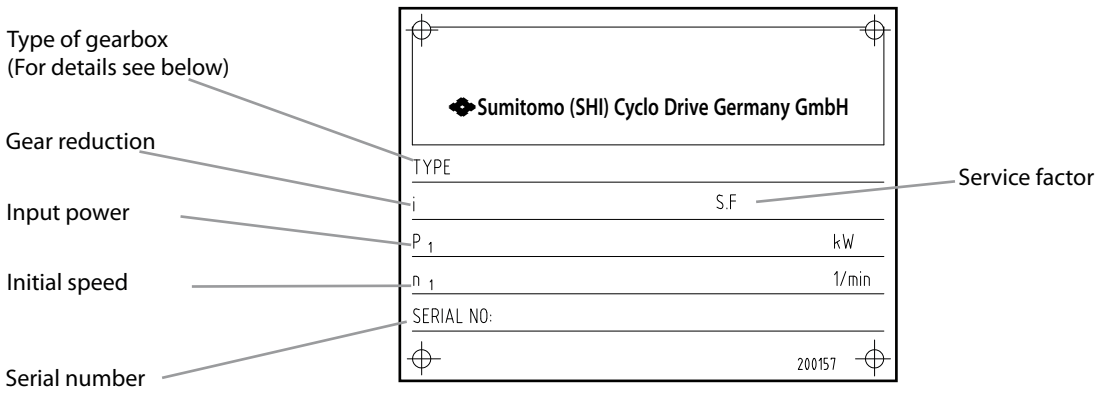


Fig. 1

PARAMAX Rating Plate with Sumitomo Standard IEC Motor

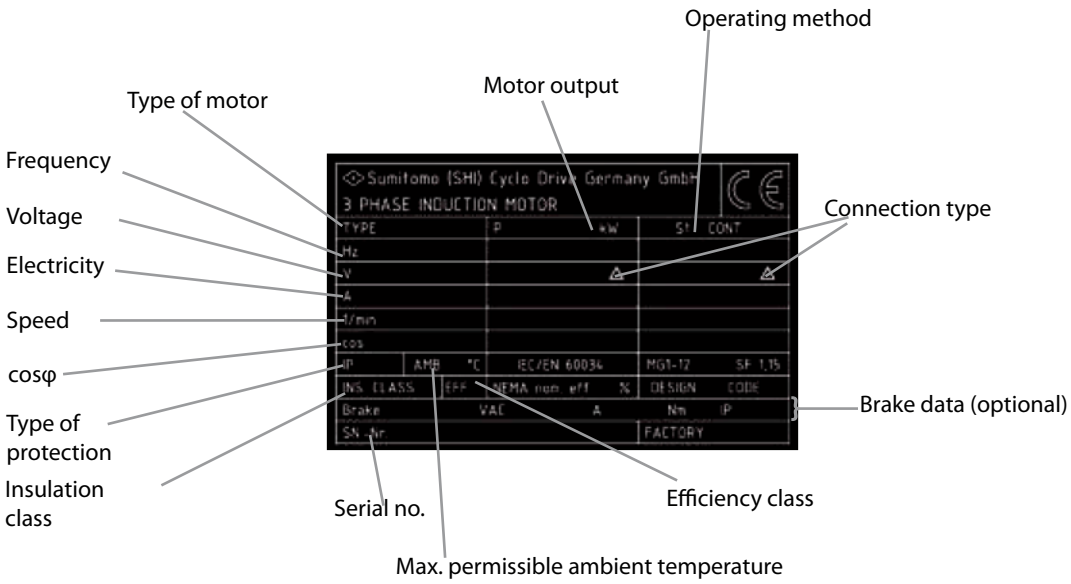


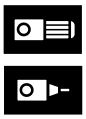
Fig. 2

Remarks:

The motor manufacturer's product description is considered an SHI for deliveries with other types of motor.

3.2 Nomenclature

The symbols are described here.
At the delivery inspection please check that you have received what you ordered.



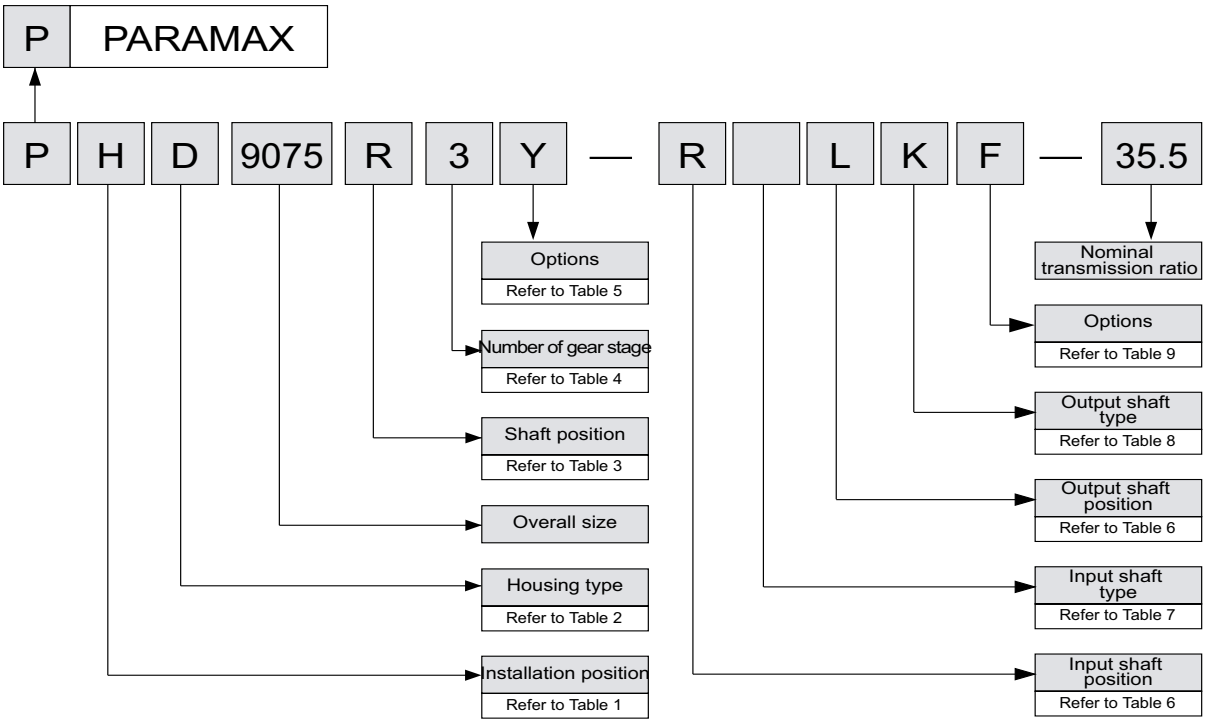


Table 1

Mounting method	
H	Horizontal
V	Vertical
W	Upright
R	Upright Flipped Over

Table 2

Housing type	
A	Mono-block housing
D	Split housing

Table 3

Shaft position	
P	Parallel shafts
R	Right-angle shafts

Table 4

Number of gear stages	
1	Single stage gear transmission
2	2 stage gear transmission
3	3 stage gear transmission
4	4 stage gear transmission

Table 5

Options	
Y	Inch shaft
A	Steel housing
YA	Steel fabricated housing + Inch shaft
F	Ductile iron housing
YF	Ductile iron housing + Inch shaft
W	Wall mount

Table 6

Position of input/output drive	
R	Right side viewed from input shaft
L	Left side viewed from input shaft
B	Both sides
D	Both sides (Gear arrangement reverse of B)

※ Projecting output shaft depends on position of bevel gear.

Table 7

Input shaft	
-	Solid shaft
M	Direct motor mounting
Y	Hollow input drive with flange (right angle shaft only)
J	Motor mounting with adapter

Table 8

Output shaft	
-	Solid shaft
K	Hollow output shaft feather key slot
T	Hollow output shaft shrink disc

Tab. 9

Accessories	
F	1 Radial fan (fitted on output side)
G	1 Radial fan (opposite output side)
B	Non-reversing device
FB	1 Radial fan + non-reversing device

4. Installing the PARAMAX gearbox/ gear motor

4.1 Tools Required

- Spanner set
- Torque wrench for fixing screws to feet/ flange housing, motor lamp, terminal couplings etc.
- Undoing device
- Compensating tools
- Corrosion protection (e.g. Mos2 paste, molycote, copper paste)

The corrosion protection used for transport and storage on the shaft ends or hollow shafts and on the centring seats must be removed before commissioning. The corrosion protection can be removed with an alkaline cleaner. Never use mechanical aids (abrasives etc.). The alkaline solvent must not come into contact with gaskets.

When using lubricants, solvents and corrosion protection products the protection guidelines for people and the environment as set out in the corresponding DIN 52 900 safety data sheets must be heeded.

4.2 Installation

The drive must be installed in such a way that inspection, maintenance and other work and any re-lubrication can be carried out easily.
The fixing bolts must only be tightened to the prescribed torque after a perfectly level, rigid, vibration-reducing base for the whole installation area has been carefully made and after the drive has been aligned. After approx. 4 weeks all fixing screws must be checked again to ensure they are tightened to the correct torque.
It is advisable to use DIN 10.9 fixing screws.

If the drive is loaded up to the maximum output drive torque or the max. shear force, not only must the feet be fixed with screws but also positive locking connections (e.g. cylindrical pins DIN 6325)must be provided.

Mos2 paste is recommended to prevent electrochemical corrosion between the gearbox and the driven machine as a result of contact between different metals e.g. cast iron and stainless steel.
Also earth the housing. Use earthing screws on the motor.

If the drive is varnished or partially re-varnished you must ensure that the ventilation valve and the shaft seal rings are masked carefully. After you have finished varnishing the adhesive strips must be removed.

Standard PARAMAX gearbox and gear motor units must not be used in an area where there is a risk of explosion (ATEX).
Under such conditions special explosion-proof gearboxes or gear motors must be used. Otherwise electric shocks, injuries, explosions or damage to the equipment may occur. (See also Section 14)

As the inverter itself is not explosion-proof, explosion-proof, inverter-driven motors must also only be installed in an area that is free from explosive gas mixtures or dust concentrations otherwise electric shocks, injuries, explosions or damage to the equipment or even bodily injury may occur.

PARAMAX gear motors or gearboxes must not be used for purposes other than those specified on the rating plate or in the manufacturer's documentation. This could lead to electric shocks, injuries or damage to the equipment.

No inflammable objects must be placed near the unit to avoid the risk of fire.

No objects that restrict ventilation must be put near the gear motor or the gearbox. Insufficient ventilation can cause excessive heat build-up that may result in burns or fire.

Do not tread on the gear motor or gearbox or hang on it because this could lead to injury.

Do not touch the shaft end of the gear motor or the gearbox, the internal gearing or the edges of the motor fan with bare hands because this could lead to injury.

If the unit is used to make foodstuffs where there is a risk of oil contamination, an oil tray or similar device must be installed to catch leaking oil in the event of the equipment breaking down or failing. Products can be contaminated by leaking oil.

4.3 Installation Angle

If the unit has been manufactured to be installed at an angle, the installation angle in the specifications must be observed exactly.

As far as possible do not remove the motor eyebolt. But if the eyebolt has to be removed insert a bolt into the thread hole or take other action to prevent water getting into the motor.

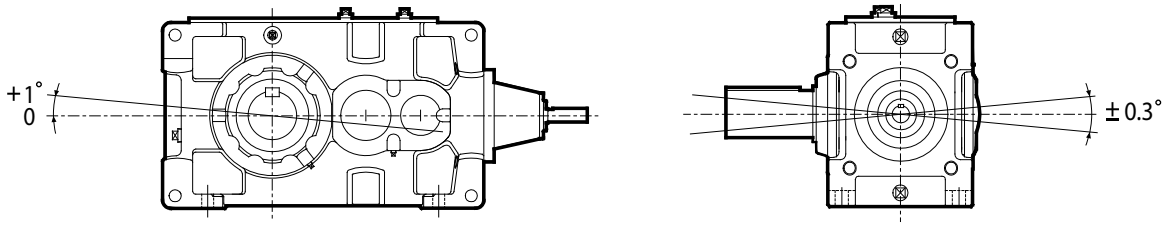


Fig. 3

4.4 Installing PARAMAX with Fan (parallel shaft)

CAUTION
Mind the edges of the feather key slot and other parts to avoid injury.
Keep accessories such as screws in the box so that they don't get lost.
Treat parts carefully to avoid damage. Protect from water and dust.

Fitting the Gearbox

1. Unscrew bolts 1) and 2) and then remove the fan guard 1). (Fig. 4).
2. Unscrew bolt 4) and then remove the fan guard 5) (Fig. 5) if the fixing bolt 9) can still not be inserted yet.
3. Unscrew bolt 6) and remove the fan wheel 7) (Fig. 6).
4. Fit the gearbox onto the mounting surface with the bolts (Fig. 7).
5. Push the fan wheel 7) onto the fan hub 8) and secure with bolts 6).
6. Fit fan hub 3) and 5) and secure with bolts 1), 2) and 3)(Figs. 3 and 4).

See Table 10 for bolt tightening torques.

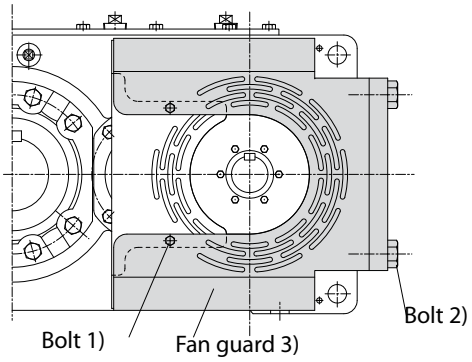


Fig. 4

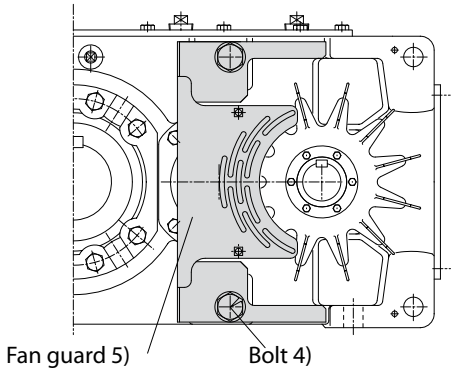


Fig. 5

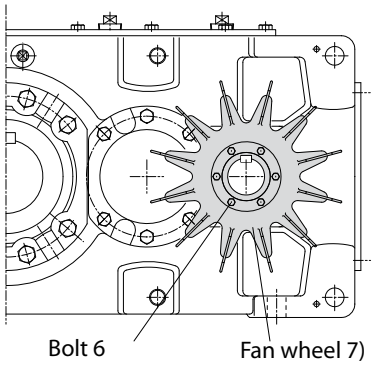


Fig. 6

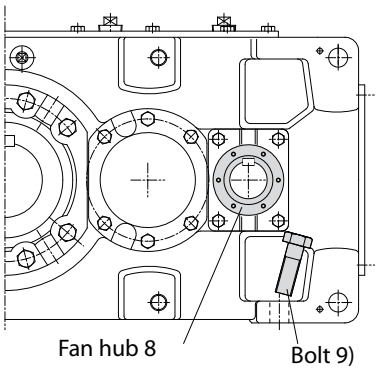


Fig. 7

Tab. 10 Bolt Tightening Torque Bolt tightening torque tolerance: + 10 %

bolt	Tightening torque Nm	
	Bolts 1), 2), 4)	Bolt 6)
M6	-	10.8
M8	11.3	-
M10	39.2	-
M12:	97.4	-

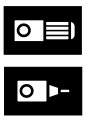
bolt	Tightening torque Nm	
	Bolts 1), 2), 4)	Bolt 6)
M20	190	-
M24	328	-
M30	652	-
1140	97.4	-

5. Operational area

Ambient Temperature: -10° to +40°

Operating at ambient temperatures below -10 °C and above +40 °C must be agreed with the manufacturer.
When using oil heating (ambient temperature <–10 °C) a voltage must be applied to this permanently.
An integral thermostat will control the oil heating if necessary.

Ambient Air Humidity: 85% max.



Height: 1000 m max.

Ambient Air: Free from corrosive and explosive gases and vapours. (Can be used in ATEX after consultation with the factory). (See Section 14)

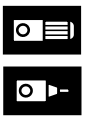
The surroundings should be dust-free and well ventilated.
Installation location: Inside, as dust-free as possible with no splash water.

Special configurations are required for installation under conditions other than those mentioned above.

6. Connecting to other Machines

Cover the rotating parts with suitable devices otherwise there is the risk of injury.

If the PARAMAX DRIVE is connected to a load you must ensure that the alignment deviation corresponds to the values specified in the maintenance instructions, the drawings, the catalogue etc. otherwise the system could be damaged because of the deviation.



Tighten the corresponding screws to the torque specified in the drawings and catalogues etc. otherwise the system may be damaged by loose parts.

If a belt is used to connect the unit to another machine, you must ensure that the belt tension and the belt pulley parallelity deviation are within the prescribed tolerances. If the unit is connected directly to another machine you must ensure that the prescribed accuracy deviation limits for this connection are adhered to otherwise the system may be damaged by any deviations.

If the PARAMAX DRIVE output shaft is to be moved with free rotation (i.e. without load), the feather key must be removed first otherwise there is the risk of injury.

Check the direction of rotation before you connect the PARAMAX DRIVE to another drive unit. An unexpected direction of rotation may lead to injury and damage to the system.

6.1 Fitting a connecting Part

When fitting a connecting part ensure that no impact forces or excessive pressure forces act on the shaft otherwise the bearing could be damaged.
The connection is made with a shrink fit or with the thread fitted to the end of the shaft (Fig. 8).

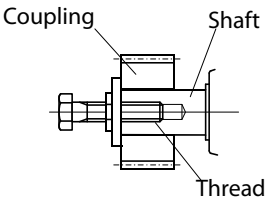


Fig. 8

Using the Mechanical Transmission Element

The dimensions shown in Fig. 9 (A, B and X) should be within the tolerances specified in Table 11.

Tab. 11

Tolerance for dimension A	0.05mm
Tolerance for dimension B	0.05mm
Dimension X	according to the connecting element manufacturer's specifications

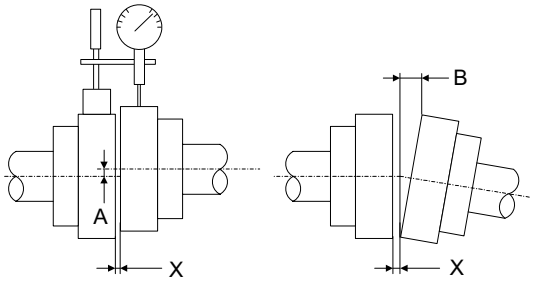


Fig. 9

Using the Chain, Sprocket wheel and Pinion

- The tensioned chain must be perpendicular to the PARAMAX DRIVE shaft.
- The sprocket wheel and pinion pitch circle must be more than three times the shaft diameter.
- The sprocket wheel and pinion must be fitted as tightly as possible onto the PARAMAX DRIVE so that the load contact point is as close as possible to the vertical centre line of the unit (Fig. 10).

Using a V-Belt

- If the belt is under too much tension this can lead to damage to the output shaft and bearings. Find out the right tension from the belt manufacturer's specifications.
- The parallel deviation of the two belt pulleys must be less than 20´ (Fig. 11).
- When using several V-belts only belt pulleys with the same circumference must be used.

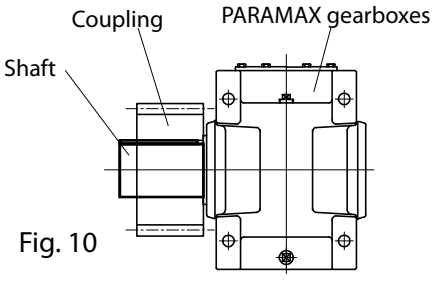


Fig. 10

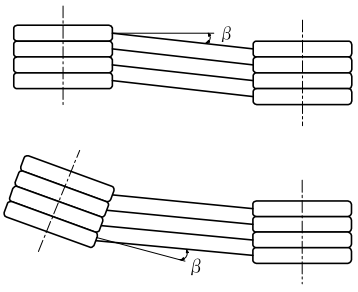


Fig. 11

6.2 Hollow Shaft

6.2.1 Assembling with Shrink Disc

The shrink disc is fitted with a shrinking mechanism without a feather key.

The bush (HB) is contracted onto the hollow shaft by the tensioning screws (ZS) as a result of which the shaft and the bush are connected for co-rotation (Fig. 12).

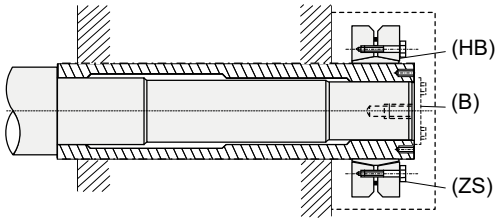


Fig. 12 Condition after assembly

Assembly Fig. 13

- Clean the contact surfaces (a) and (c) and remove grease residue.
- Lubricate the surface (c) with Molycote 321 or similar. Surface a, however, should be as clean as possible (no grease).
- Push the O-ring (b) onto the shaft (only for sizes 9090 - 9115)
- Fit the gearbox onto the shaft to be driven and screw the nut (e) on so that the surfaces (g) and (h) come into contact with each other.
- Fit the shrink disc (k) according to the measurement (LV). Tighten the tensioning screw (ZS) to the specified torque (TA) using a torque wrench.
  When tightening the tensioning screws you must ensure that the two spring washers are parallel to each other. Then check whether the shrink disc has been fitted properly and tighten the tensioning screws evenly clockwise (not crossed) with a suitable torque wrench. The two spring washers must remain parallel to each other while you are doing this. It is advisable to tighten the corresponding spring washers by 30 ° each.

Note 1: A pressure plate (B) must be fitted for vertical gearboxes to prevent the gearbox moving when the securing screw (ZS) is loosened (Fig. 11).

Note 2: Use DIN 10.9 or 12.9 screws as tensioning screws (ZS). If these must be replaced a screw in accordance with the manufacturer's specifications must be used.

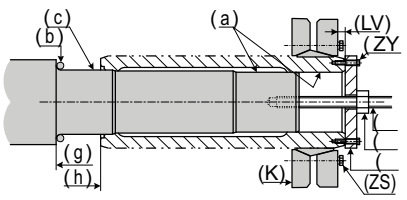


Fig. 13

6.2.1.1 Dismantling with shrink disc

Dismantling - Fig. 14

1. Undo the tensioning screw (ZS) and remove the shrink disc (k).
2. Fit the pressure plate (f) and the hexagonal screw (n). Using the screw (m) remove the gearbox from the shaft.
   Note: Parts (d), (e), (f), (ZY), (m) and (n) are not included in the standard L delivery schedule and must be ordered separately if necessary.

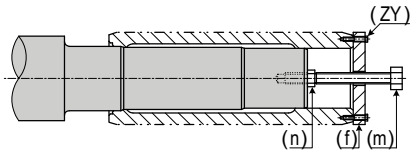


Fig. 14 Dismantling

6.2.2 Feather Key Connection

Size 9015 - 9055

The retaining ring (d) sits in the hollow shaft locating hole. This ring is the most important component for assembling, securing and dismantling the unit.

Fitting Instructions (Fig. 15)

1. Lubricate the shaft surface (3) with molybdenum disulphite grease.
2. Turn the nut (b) and push the gearbox onto the output shaft. To do this, use washers if necessary.

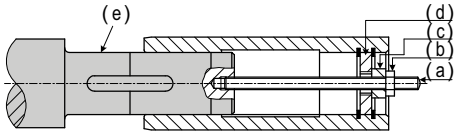


Fig. 15 Mounting

Securing (Fig. 16)

1. After fitting the gearbox onto the shaft tighten the screw (f). (The screw (f) is not included in the gearbox delivery schedule).
2. Protect the opening with the cover (g).

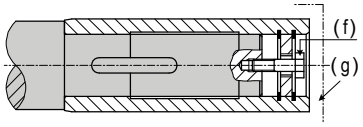


Fig. 16 Securing

Dismantling (Fig. 17)

1. Remove the ring (d), fit the bolt (n) and replace the ring (d). Attach bolt (J) to ring (d) and turn bolt (J) to disconnect the hollow shaft from the input shaft.
   See Table 13 for suitable bolt sizes.

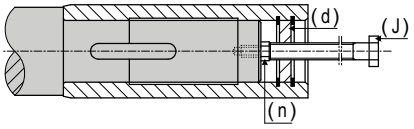


Fig. 17 Dismantling

Special Cases (Fig. 18)

1. If the shaft to be driven doesn't have a shoulder, its seating must be secured with a spacer ring (h) when assembling.
   (The spacer ring (h) is not included in the gearbox delivery schedule).

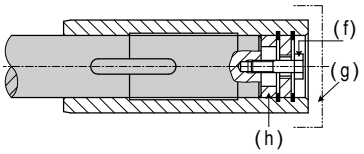


Fig. 18 Special cases (input shaft without shoulder)

6.2.2 Feather Key Connection
Size 9060 - 9085

The end of the hollow shaft is fitted with a pressure plate (d). The pressure plate is required for assembling, securing and dismantling the unit.

Fitting Instructions (Fig. 19)

1. Lubricate the shaft surface (3) with molybdenum disulphite grease.
2. Turn the nuts (b) and push the gearbox onto the output shaft. To do this, use washers if necessary.

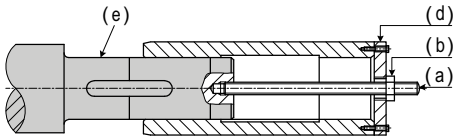


Fig. 19 Mounting

Securing (Fig. 20)

1. After fitting the gearbox onto the shaft tighten the screw (f). (The screw (f) is not included in the gearbox delivery schedule).
2. Protect the opening with the cover (g.

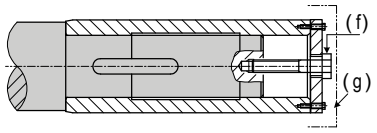


Fig. 30 Securing

Dismantling (Fig. 21)

1. Remove the pressure plate (d), fit the bolt (n) and replace the ring (d). Attach bolt (J) to ring (d) and turn bolt (J) to disconnect the hollow shaft from the input shaft.
   See Table 13 for suitable bolt sizes.

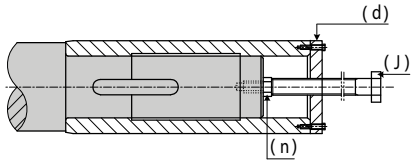


Fig. 21 Dismantling

Special Cases (Fig.22)

1. If the shaft to be driven (Fig. 11) doesn't have a shoulder, its seating must be secured with a spacer ring when assembling. (The spacer ring (h) is not included in the gearbox delivery schedule).

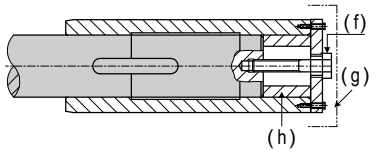


Fig. 22 Special cases (input shaft without shoulder)

6.2.3 Torque Support

(The torque support is not included in the standard delivery schedule).
The hollow shaft gearbox must be supported by a torque support to prevent it from being relocated by the reaction torque in a rotary movement. Fig. 23 shows the standard version of such a support. It should be designed in a suitable way and be stable enough to withstand the gearbox reaction forces and impacts.
Note 1: The number of retaining rings to be used depends on the size of the gearbox.
Note 2: Use a DIN quality 8.8 screw (T) and nut (M).
Note 3: Tighten the nut (M1) until there is no more play. However, do not tension the disc springs. Tighten the counter nut (M2) to the normal torque for the screw quality and tension with M1.

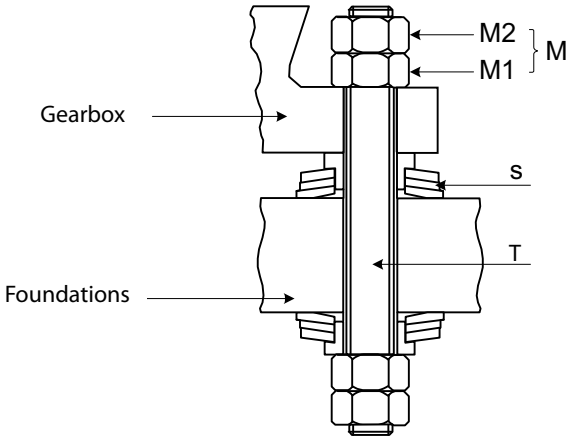


Fig. 23 Standard torque support

6.2.4 Hollow Shaft Dimensions (Shrink Disc Version)

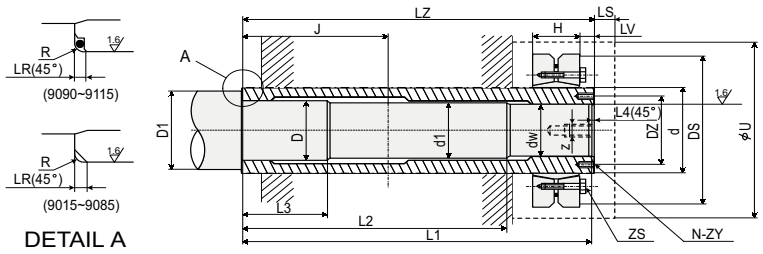


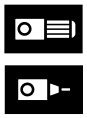
Fig. 24

Tab. 12 Hollow Shaft Dimensions

Dimension: mm

Größe	Shrink Disk				Locking Bolt		Hollow Shaft								Driven Shaft								
	MODEL	d	Ds	H	ZS	TA N · m	J	LZ	LR	LV	N-ZY	DZ	LS	U	dw	d1	D h7	D1 min	L1	L2	L3	L4	R	Z (Deep)
9015	TAS3091.4-080	80	145	38	M8	35	135	328	3	14	4 - M6	70	15	161	60h6	61	63	78	325	240	80	3	2.5	M20 (30)
9025	TAS3081. -090	90	155	39	M8	35	145	358	3	14	4 - M6	80	17	176	70h6	71	73	88	355	270	80	3	2.5	M20 (30)
9030	TAS3091.1-100	100	170	54	M10	59	160	393	3	14	4 - M6	90	20	209	80h6	81	83	98	390	295	90	3	2.5	M20 (30)
9035	TAS3093. -110	110	185	60	M10	70	160	403	3	14	4 - M6	97	20	244	85h6	86	88	103	390	295	90	3	2.5	M24 (35)
9040	TAS3081. -125	125	215	54	M10	70	180	448	3	20	4 - M8	110	17	244	95h6	96	98	113	445	335	110	3	2.5	M24 (35)
9045	TAS3093. -140	140	230	74	M12	120	180	463	3	20	4 - M10	124	17	277	105h6	106	108	123	460	355	110	3	2.5	M24 (35)
9050	TAS3093. -140	140	230	74	M12	120	200	503	3	22	4 - M10	124	17	284	105h6	106	108	123	500	380	110	3	2.5	M24 (35)
9055	TAS3091. -165	165	290	88	M16	250	205	528	3	27	4 - M12	146	17	314	120h6	121	123	138	525	385	120	3	2.5	M24 (35)
9060	TAS3091. -165	165	290	88	M16	250	230	583	4.5	27	4 - M12	146	12	322	125h6	126	128	143	580	435	130	3	3	M24 (35)
9065	TAS3091. -175	175	300	88	M16	250	235	594	4.5	26	4 - M12	157.5	21	349	140h6	141	143	158	589	450	130	5	3	M30 (45)
9070	TAS3081. -185	185	330	86	M16	290	260	644	4.5	26	4 - M12	167	21	371	145h6	146	148	163	640	475	160	5	3	M30 (45)
9075	TAS3081. -200	200	350	86	M16	290	265	651	4.5	26	4 - M12	177	21	379	155h6	156	158	173	646	475	160	5	3	M30 (45)
9080	TAS3081. -220	220	370	104	M16	290	285	714	4.5	26	4 - M12	195	21	401	170g6	171	173	188	709	520	190	5	3	M30 (45)
9085	TAS3081. -240	240	405	109	M20	570	285	714	4.5	27	4 - M12	210	21	456	180g6	181	183	198	709	520	190	5	3	M30 (45)
9090	TAS3081. -240	240	405	109	M20	570	350	844	6	27	6 - M12	215	21	451	190g6	191	193	212	840	635	200	5	4.5	M36 (55)
9095	TAS3081.1-260	260	440	120	M20	535	350	859	6	27	6 - M12	230	14	450	200g6	201	203	222	855	640	205	5	4.5	M36 (55)
9100	TAS3081.1-260	260	440	120	M20	535	390	934	6	27	6 - M12	235	21	491	210g6	211	213	234	930	705	215	5	4.5	M36 (55)
9105	TAS3081.1-280	280	460	134	M20	535	390	949	6	27	6 - M12	250	19	480	220g6	221	223	244	945	715	225	5	4.5	M36 (55)
9110	TAS3081.1-300	300	485	142	M20	535	420	1030	6	32	6 - M16	270	15	551	240g6	241	243	263	1025	770	245	5	4.5	M36 (55)
9115	TAS3091. -320	320	520	184	M20	490	420	1065	6	32	6 - M16	285	15	550	250g6	251	253	273	1060	785	245	5	4.5	M36 (55)

6.2.5 Hollow Shaft Dimensions (With Feather Key Slot)



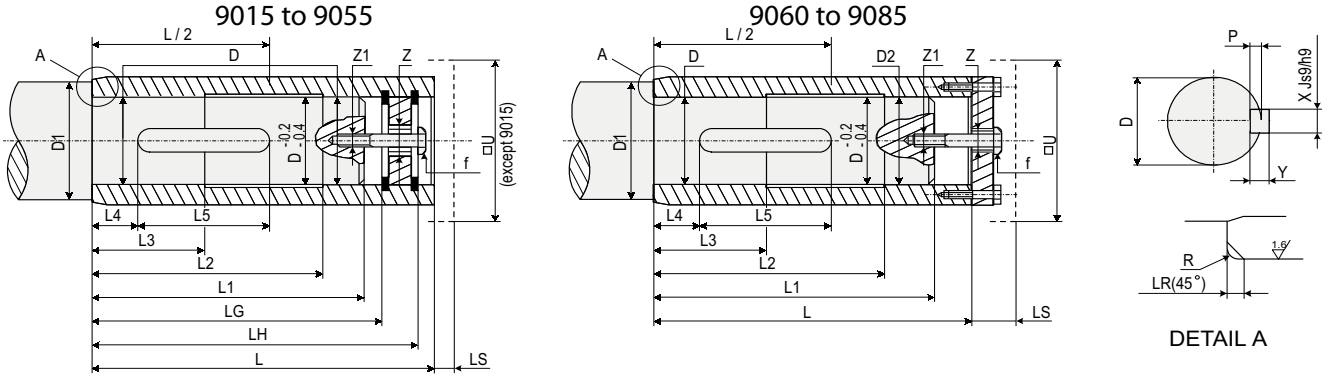


Fig. 25

Tab. 13 Hollow Shaft Dimensions (With Feather Key Slot)

Size	Hollow shaft				Safety cover		Shaft provided by the customer										Locking screw (f) Thread size Screw length	Locking distance ring (h) Outer diameter Width
	L	LG	LH	Z	LS	U	D	D1 min	L1	L2	L3	L4	L5	X	Y	Z	Z (Thread depth)	
9015	270	240	258	M24	8	161	55j6	70	235	200	70	30	115	16	10	6	M20(30)	M20/50	55/5
9025	300	265	286	M24	10	176	65j6	80	260	220	80	35	125	18	11	7	M20(30)	M20/50	65/5
9030	330	290	314	M24	10	230	75j6	90	285	240	90	35	145	22	14	9	M20(30)	M20/55	75/5
9035	330	290	315	M24	10	260	85j6	100	285	240	90	35	145	22	14	9	M20(30)	M20/55	85/5
9040	360	314	340	M30	10	260	90j6	105	310	260	100	40	180	25	14	9	M24(35)	M24760	90/4
9050	410	356	388	M30	10	300	105j6	120	310	300	110	45	220	28	16	10	M24(35)	M24/65	105/6
9055	410	356	388	M30	10	330	115j6	130	350	300	110	45	220	32	18	11	M24(35)	M24/65	115/6
9060	470	415	447	M30	10	340	125j6	140	410	345	125	50	260	32	18	11	M24(35)	M24/65	125/5
9070	530	470	504	M36	10	370	145j6	160	465	390	140	55	290	36	20	12	M30(45)	M30/70	145/5
9075	530	470	504	M36	10	400	150j6	165	465	390	140	55	290	40	22	13	M30(45)	M30/70	150/5
9080	570	510	544	M36	10	400	165j6	180	505	415	155	60	320	40	22	13	M30(45)	M30/70	165/5
9085	570	510	544	M36	10	450	175j6	190	505	415	155	60	320	40	22	13	M30(45)	M30/70	175/5

Note 1. The feather key and feather key slot comply with DIN6885 Page 1.
Note 2. The fixing bolt and distance ring are not included. Please supply if necessary
Note 3. Distance from centre of housing to shaft is L/2.

7. Electrical Installation

7.1 Safety Notes

Installation, connection and commissioning work as well as maintenance and repairs must only be carried out by qualified experts.
Before any work starts on the motor or the gear motor but particularly before covers are taken off active parts the motor must be disconnected as prescribed.
The 5 safety rules as set out in DIN VDE 0105 must be obeyed.
These electric motors comply with the standards and regulations in force and meet the requirements of the Low Voltage Directive 73/23/EWG.

The electrical connection of a standard Sumitomo 3 phase motor is described below.
Information on brake motors, servo motors, direct current motors and motors made by other manufacturers can be found if applicable in the relevant operating instructions.

Do not carry out any work on the unit if it is live. Be sure to turn off the power to prevent electric shocks.
Connect the unit to the mains cable according to the circuit diagram on the terminal block or the operating instructions otherwise there is the risk of electric shocks or fire.
Do not bend, pull or grasp the mains cable excessively otherwise there is the risk of electric shocks or fire.
Earth the earthing bolt otherwise there is the risk of electric shocks or fire.
When the motor and other electrical components are connected to the electricity the electrical codes and connection conditions provided by the factory must be obeyed otherwise there is the risk of burns, electric shocks, injuries and fire. The motor is not fitted with any protective device. However, overload protection must be fitted in accordance with the electrical regulations provided by the factory. It is advisable to install other protective devices (earth leakage breaker, etc.), in addition to an overload protector, in order to prevent burns, electric shocks, injury and fire.
Never touch the terminals when measuring the insulation resistance to prevent electric shocks.
If a star delta starter is used then only use one with an electromagnetic switch on the primary side (3 contact type) otherwise there is the risk of fire.
If a 400v inverter is used for the input drive a suppressor filter or reactor must be fitted on the side with the inverter or the insulation on the motor side must be increased otherwise there is the risk of fire or damage to the equipment caused by dielectric breakdown.

When using long cables the drop in voltage must be noted. Therefore cables with the appropriate diameter must be chosen so that this value does not exceed 2%.

7.2 Measuring the Insulation Resistance

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

Measure the insulation resistance before connecting. The insulation resistance(R) varies depending on the motor power, voltage, type of insulation, coil temperature, humidity, contamination, operating period, test electrification period etc. Normally the insulation resistance should not exceed the values in Table 14.

Tab. 14 - Insulation resistance

Motor voltage	Megohmmeter voltage	Insulation resistance (R)
Low voltage motor 600 V or less	500 V	1 M W or more
High voltage motor 300 V or more	1,000 V	1 M W or more

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

$$R = \frac{\text{Rated voltage (V)}}{\text{Rated output (kW)} + 1000} \quad \textbf{(M Ω)}$$

$$R = \frac{\text{Rated voltage (V)} + \text{Speed (rpm)}/3}{\text{Rated output (kW)} + 2000} \textbf{ + 0.5 (M Ω)}$$

A drop in insulation resistance can normally be attributed to poor insulation. In this case the power supply must not be switched on. Please contact a representative, a dealer or a local sales office.

7.3 Protection Co-Ordination

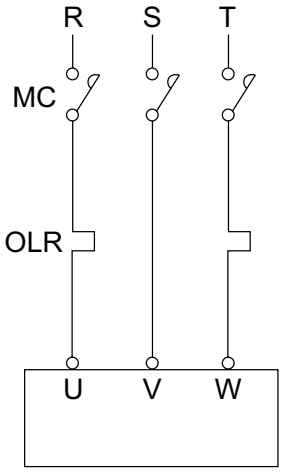
1. A circuit fuse must be used to protect against short circuits.

2. The operating current on the motor rating plate must not be exceeded. An appropriate overload protection device must be used.

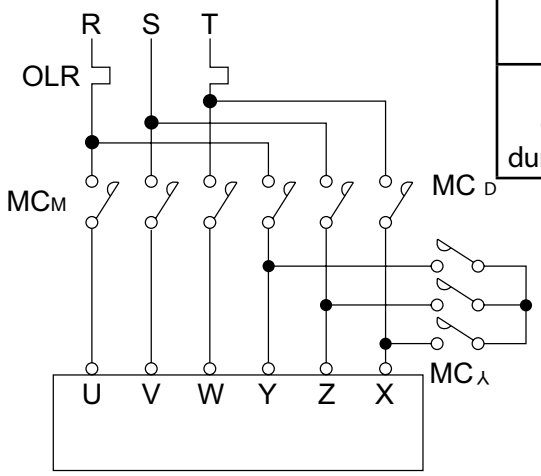
7.4 Motor Connection

Motor Connection and Standard Specifications for Terminal Codes

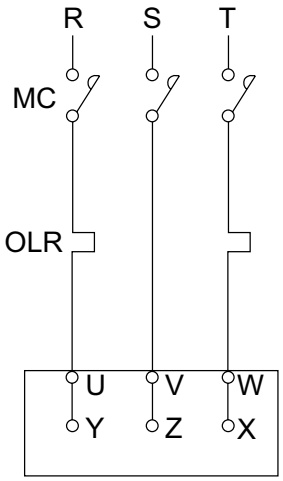
Star connection for start	MC m MC Δ MC λ	ON: OFF ON:
Delta connection during operation	MC m MC Δ MC λ	ON: OFF ON:



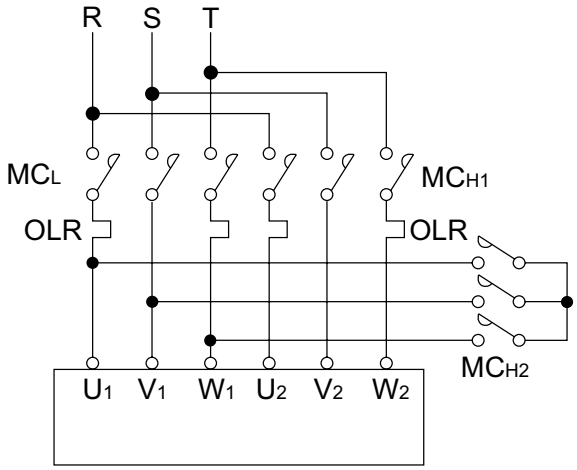
3 output cables



Star connection



Direct start with triangular switching



4/8 pin two stage speed (constant torque)

Fig. 26: Motor connection and terminal code (200/400V 50/60Hz, 220/440 60Hz

MC: Electromagnetic contact
OCR: Overload protective device

——— To be provided by the customer

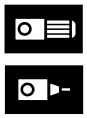
The following must be noted for Motors with External Fans:

Connect the fan motor to the mains.
With a single-phase fan motor the motor only turns in one direction.
If the fan motor is a three phase motor, it must be connected to the mains in such a way that it turns in the same direction as the arrow shown on the direction indicator plate.
If the fan turns in the other direction two of the three wires ‚U, V, W' must be switched. (The ventilation should go from the opposite load side to the load side.)

With externally cooled motors with thermostats (terminal code T1, T2) the thermostat must be connected to the power source. (The thermostat is a closed type)

Switch off the fan motor if the main motor is not used for a prolonged period.

8. Commissioning the Input Drive



During operation keep a safe distance from rotating parts (output drive shaft etc.) and do not touch them. Loose clothing may get caught leading to severe or fatal injuries.
If the power supply is cut switch the power switch to OFF. If the unit starts up again unexpectedly this may lead to electric shocks, injuries or damage to the equipment.

Do not operate the unit without the terminal block cover fitted. Replace this cover after completing maintenance work to prevent electric shocks.
Never open the terminal block cover if the explosion-proof motor is live because this could lead to explosions, combustion, electric shocks, injuries, fire or damage to the equipment.

Never put your finger or foreign objects in the gear motor or gearbox opening. This may lead to electric shocks, injuries, fire or damage to the equipment.

The gearbox gets extremely hot when running. This may cause burns.

Never undo the oil screw during operation because hot, splashing oil may cause burns.

Should abnormalities occur during operation turn the unit off immediately. Otherwise, electric shocks, injuries or fire could occur.

Never operate the unit with a higher rated voltage than specified because this may lead to injuries or damage to the equipment.

PARAMAX gearboxes are supplied without oil. All units must be filled with the required quantity of oil before first operation.

If the unit is installed, filled with oil and wired properly the following must be checked before first operation:
1. Are the electrical connections correct?
2. Is the unit connected to the drive machine properly?
3. Are the anchor bolts tightened correctly?
4. Is the direction of rotation correct?

After confirming these items without a load, gradually apply a load.
Then please observe the checklist in Table 15.

The Following must be Checked on first Operation and during the Running in Phase.

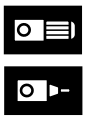
Can unusual noises or vibrations be detected?	1. Is the housing twisted because the installation support is uneven? 2. Is the lack of rigidity of the support causing excessive noise? 3. Is the centre of the shaft aligned with the drive machine? 4. Is the vibration of the input drive motor being transferred to the gear motor/ gearbox?
Is the surface of the PARAMAX gear motor or gearbox unusually hot?	1. Can a considerable increase or drop in voltage be noted? 2. Is the ambient temperature too high? 3. Does the actual current to the motor exceed the maximum value stated on the rating plate? 4. Is there enough oil in the unit?

Table 15

If abnormalities occur during operation the unit must be turned off immediately and a representative, dealer or local sales centre contacted.

9. Daily Inspection and Maintenance

Do not touch the unit if it is live. Always switch off the power supply first otherwise there is the risk of electric shocks.
Keep away from and do not touch rotating parts (output drive shaft etc.) during maintenance or inspection. Loose clothing may get caught leading to severe or fatal injuries.



Never dismantle or modify explosion-proof motors. This could lead to explosions, spontaneous combustion, electric shocks or damage to the equipment.
The electrical supply of an explosion-proof motor must comply with the electrical codes supplied by the factory, connection conditions and the explosion protection manual as well as the operating instructions. Otherwise there is the risk of electric shocks, injuries, explosions, fire or damage to the equipment.

Never put your finger or foreign objects in the gear motor or gearbox opening. This may lead to electric shocks, injuries, fire or damage to the equipment.
The gear motor or gearbox gets extremely hot when running. Touching the unit with bare hands may cause burns.

Never touch the terminals when measuring the insulation resistance to prevent electric shocks.

Never operate the unit without the guard for moving parts fitted. Loose clothing may get caught leading to severe or fatal injuries.

Any anomalies detected during operation must be identified and corrected immediately according to the instructions in this operating manual. Do not operate again until anomalies have been rectified.

Lubricants must be changed in accordance with the instructions in this operating manual. Always use the lubricant recommended by the manufacturer.

Lubricants must never be changed during operation or shortly afterwards. This could lead to a fire.

The motor bearings must be re-lubricated in accordance with the instructions in this operating manual. Avoid contact with rotating parts. This could cause injury.

Never operate damaged PARAMAX gear motors or gearboxes. This could lead to injury, fire or damage to the equipment.
We assume no liability for damage or injury caused by unauthorised changes to units carried out by the customer.

Lubricants from PARAMAX gear motors or gearboxes must be disposed of as industrial waste. Please obey the regulations in force.

When measuring the insulation resistance on explosion-proof motors you must ensure that there is no gas, fumes or other explosive substances around in order to avoid an explosion or spontaneous combustion.

9.1 Inspection intervals

Daily Inspections

Daily inspections as set out in Table 16 must be carried out in order to ensure that the unit is always working properly and in the best possible way.

Tab. 16

Rated current		Is the rated current less than the current shown on the rating plate?
Noise level		Have odd noises been heard? Have sudden changes in noises occurred?
Vibration		Has excessive vibration been noticed? Has the strength of vibration changed suddenly?
Surface temperature		Is the surface temperature unusually high (more than 90° C)?
		Has the surface temperature risen suddenly? The temperature rise during operation varies depending on the model. If the temperature difference between the motor surface and the surroundings reaches about 80°C and remains constant this is normal.
Oil level (with oil-lubricated models)	When idle	Does the oil level reach the top line of the sight glass?
	When idle	Is this oil level different from the oil level at rest?
	with trochoid pump	Is the oil signal or oil gauge working normally? If this is not so the machine must be stopped and the unit inspected. Too little oil means not enough lubrication of the gear reduction system, the risk of damaging the pump and wrecking the oil pipe.
Oil or lubricating grease leakage		Is oil or lubricating grease around the motor area or gearbox leaking onto shaft sealing rings or housing sealing surfaces?
Anchoring		Are the anchor bolts loose?
Chain and V-belt		Are the chain and V-belt loose?
Fan/ housing		Is it running properly? Can you clearly feel the airflow? Is the fan housing in perfect condition?

If anomalies are detected during the daily inspection these must be remedied as set out in Section 11, Troubleshooting. If the problem cannot be corrected, please contact a representative, a dealer or your local sales office.

Annual Inspections

Yearly inspection	
Gears	Examine the gears to check for damage
Inner case of gearbox	Check if contaminated with sludge or abrasives and clean if indicated by oil flush

Checking the Gearbox Gear Wheels:

- Drain the oil
- Undo the screws on the inspection cover
- Examine the teeth visually for pitting and wear
- When putting the inspection cover down make sure the sealing surfaces are clean
- Replace damaged gaskets
- Tighten the screws (8.8) with the correct torque
- Fill up with oil
- Check for leaks after starting the machine up

If damage is detected on the gear teeth that indicates that it will not be safe to operate the machine until the next maintenance interval, appropriate original spare parts must be obtained. **Gear Wheels must be Replaced in Sets.** It is advisable to replace the corresponding roller bearings and gaskets at the same time.

9.2 Lubrication Instructions

Please obey the lubrication instructions. Incorrect maintenance reduces the service life of the gearbox unit.

Tab. 17 Lubrication method (when operating at a standard input drive speed)

		Size	9015	9025	9030	9035	9040	9050	9055	9060	9070	9075	9080	9085
Right angle shaft	2-stage	Horizontal	Oil bath							Splash oil lubrication			*	*
		Vertical	Oil pump, shaft input drive											
		Upright	Oil bath + grease							Splash oil lubrication			*	*
	3-stage	Horizontal	-	-	Oil bath					Splash oil lubrication				
		Vertical	-	-	Oil pump, shaft input drive									
		Upright	-	-	Oil bath + grease					Splash oil lubrication				
	4-stage	Horizontal	-	-	-	-	Oil bath			Splash oil lubrication				
		Vertical	-	-	-	-	Oil pump, shaft input drive							
		Upright	-	-	-	-	Oil bath + grease			Splash oil lubrication				
Parallel shaft	2-stage	Horizontal	Oil bath							Splash oil lubrication				
		Vertical	Oil pump, shaft input drive											
		Upright	Oil bath							Splash oil lubrication				
	3-stage	Horizontal	Oil bath							Splash oil lubrication				
		Vertical	Oil pump, shaft input drive											
		Upright	?		Oil bath					Splash oil lubrication				
	4-stage	Horizontal	-	-	Oil bath					Splash oil lubrication				
		Vertical	-	-	Oil pump, shaft input drive									
		Upright	-	-	Oil bath					Splash oil lubrication				

		Size	9090	9095	9100	9105	9110	9115	9118	9121	9126	9128	9131	9136
Right angle shaft	2-stage	Horizontal	-	*	-	*	-	*	-	-	-	-	-	-
		Vertical	-	-	-	-	-	-	-	-	-	-	-	-
		Upright	-	-	-	-	-	-	-	-	-	-	-	-
	3-stage	Horizontal	Splash oil lubrication		*	*	*	*	*	*	*	*	*	*
		Vertical	Oil pump, shaft input drive			Electric pump			-	-	-	-	-	-
		Upright	-	-	-	-	-	-	-	-	-	-	-	-
	4-stage	Horizontal	Oil bath						Splash oil lubrication			*	*	*
		Vertical	Oil pump, shaft input drive						-	-	-	-	-	-
		Upright	-	-	-	-	-	-	-	-	-	-	-	-
Parallel shaft	2-stage	Horizontal	Splash oil lubrication		*	*	*	*	-	-	-	-	-	-
		Vertical	Electric pump						-	-	-	-	-	-
		Upright	-	-	-	-	-	-	-	-	-	-	-	-
	3-stage	Horizontal	Splash oil lubrication							-	-	-	-	-
		Vertical	Electric pump						-	-	-	-	-	-
		Upright	-	-	-	-	-	-	-	-	-	-	-	-
	4-stage	Horizontal	Splash oil lubrication											
		Vertical	Oil pump, shaft input drive				Electric pump		-	-	-	-	-	-
		Upright	-	-	-	-	-	-	-	-	-	-	-	-

*: In constant operating mode the splash lubrication system or the electric pump is used depending on the input drive frequency.

Tab. 18 - Standard input drive speeds

Configuration			Size	Input speed r/min
				750 / 1000 / 1500 / 1800
Right angle shaft	2 stage	Horizontal	9015 - 9075	
			9080 - 9085	
			9095	
			9105 - 9115	
		Vertical	9015 - 9075	
			9080 - 9085	
		Upright	9015 - 9075	
			9080 - 9085	
	3 stage	Horizontal	9030 - 9095	
			9100 - 9115	
		Vertical	9030 - 9095	
			9100 - 9115	
		Upright	9030 - 9085	
	4 stage	Horizontal	9040 - 9115	
		Vertical	9040 - 9115	
		Upright	9040 - 9085	
Parallel shaft	2 stage	Horizontal	9015 - 9095	
			9100 - 9105	
			9110 - 9115	
		Vertical	9015 - 9095	
			9100 - 9105	
			9110 - 9115	
		Upright	9015 - 9085	
	3 stage	Horizontal	9015 - 9115	
		Vertical	9015 - 9115	
		Upright	9015 - 9085	
	4 stage	Horizontal	9030 - 9115	
		Vertical	9030 - 9115	
		Upright	9030 - 9085	

Note:
1. The specified ranges except for the shaded areas show the standard input drive speeds.
2. Please contact a representative, a dealer or a local sales office if you have queries on speeds beyond the shaded areas.
3. Please contact a representative, a dealer or a local sales office if you have questions about standard input drive speeds for gearbox sizes 9118 - 9136.

If the unit has a motor pump, the motor for the pump must be started before starting the gear motor or the gearbox motor. As soon as the lubrication oil is circulating through the bearing the gear motor or the gearbox motor must be started otherwise the unit could be damaged.
Use a flow switch or a flow inspection glass to check that the oil is flowing. Should irregularities occur the gear motor or gearbox motor must be stopped immediately.

9.3 First Lubrication Filling, Topping up and Changing

Tab. 19. Initial oil filling, changing

	Oil change intervals	Operating conditions
Initial filling	Before commissioning	-------
1st oil change	Up to a maximum of 500 hours or 6 months	-------
2nd oil change	Every 2, 500 hours or 6 months	-------
	Every 5, 000 hours or annually *	When operating at an oil temperature of < 70°C
Further oil changes	Every 2, 500 hours or 6 months *	When operating at an oil temperature of > 70°C

* whichever occurs first.
Please contact the lubricant manufacturer if operating the unit in environments with corrosive gases or widely fluctuating ambient temperatures.

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www.sumitomodriveeurope.com Phone +49 (0) 8136 66 0
Cyclostraße 92
85229 Markt Indersdorf

Oil Quantity (L)

The quantities given in Tables 20 and 21 are an average guide. The oil level must be checked with a dipstick or a sight glass.

Tab. 20

Unit: Liter

Size	Horizontal type						Vertical type						Upright type					
	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	5	-	-	5	5	-	5	-	-	5	6	-	7	-	-	9	11	-
9025	7	-	-	7	8	-	7	-	-	7	8	-	11	-	-	13	15	-
9030	10	10	-	10	10	14	7	9	-	9	10	10	14	16	-	16	20	20
9035	12	12	-	12	13	17	9	12	-	12	14	14	19	21	-	22	25	25
9040	16	16	19	16	19	25	19	18	18	18	18	17	24	29	35	29	35	35
9045	18	18	21	18	21	28	23	22	22	22	22	21	30	36	43	36	43	43
9050	21	21	24	21	24	32	20	21	24	22	25	23	31	35	46	36	45	46
9055	28	28	29	28	29	40	26	30	34	31	35	33	45	46	59	47	59	59
9060	25	29	38	25	33	37	*	28	36	25	28	32	44	56	68	53	68	69
9065	29	33	43	29	38	42	*	35	45	32	35	40	56	65	85	67	85	86
9070	37	45	57	38	49	56	*	46	54	39	44	53	65	83	107	84	106	108
9075	46	52	67	47	59	67	*	59	68	49	56	67	87	100	122	100	120	122
9080	53	60	73	54	64	73	*	60	69	54	57	65	90	115	128	109	130	130
9085	67	75	90	68	80	90	*	80	94	71	79	89	126	144	174	137	176	175
9090	-	120	150	120	120	150	-	120	120	90	90	110	-	-	-	-	-	-
9095	100	155	180	140	155	180	-	145	155	120	120	140	-	-	-	-	-	-
9100	-	180	210	170	180	220	-	170	180	140	140	170	-	-	-	-	-	-
9105	150	220	255	205	225	260	-	210	220	175	175	210	-	-	-	-	-	-
9110	-	250	300	240	260	300	-	230	250	200	200	240	-	-	-	-	-	-
9115	200	310	360	290	325	365	-	290	315	255	255	295	-	-	-	-	-	-
9118	-	350	390	-	350	390	-	-	-	-	-	-	-	-	-	-	-	-
9121	-	460	540	-	470	530	-	-	-	-	-	-	-	-	-	-	-	-
9126	-	460	530	-	470	520	-	-	-	-	-	-	-	-	-	-	-	-
9128	-	350	460	-	390	450	-	-	-	-	-	-	-	-	-	-	-	-
9131	-	510	680	-	550	650	-	-	-	-	-	-	-	-	-	-	-	-
9136	-	500	660	-	540	640	-	-	-	-	-	-	-	-	-	-	-	-

*: Refer to table 21

Table 21 Right angle shaft 2 stage oil quantity in litres.

Size	Transmission ratio		Transmission ratio	
	6.3-9	10-18	8-11.2	12.5-22.4
9060	25	25	-	-
9065	-	-	32	32
9070	35	41	-	-
9075	-	-	47	54
9080	46	55	-	-
9085	-	-	58	68

Filling with Oil:

Pour the oil in through the filler neck on top of the main unit. The oil level must be checked with a dipstick or a sight glass (see Fig. 27).
When doing this the dipstick must be screwed into the lowest position otherwise the reading will not be accurate (see Fig. 28).

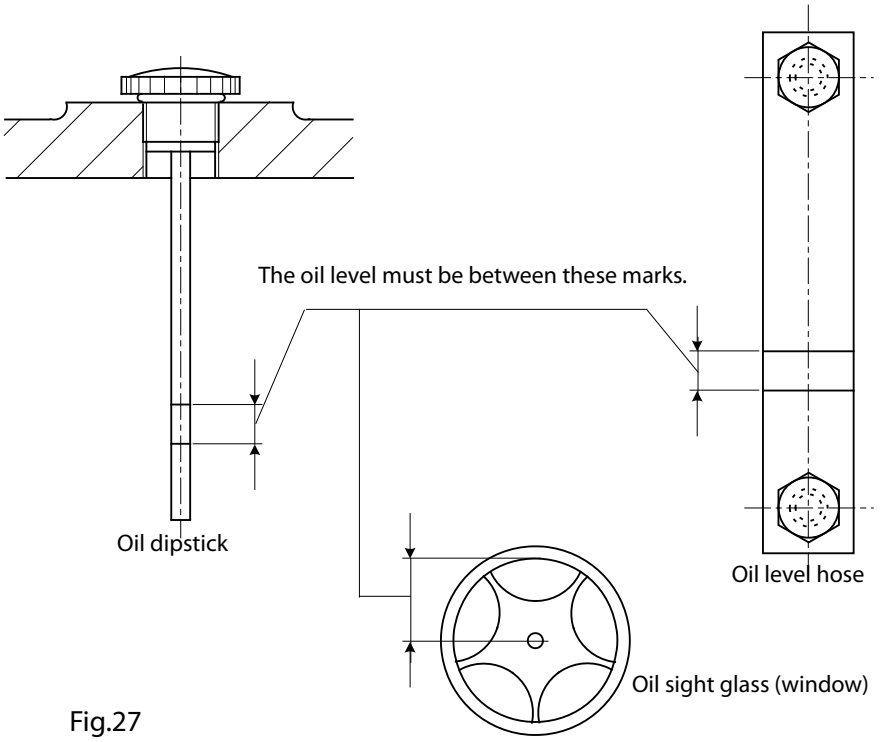


Fig.27

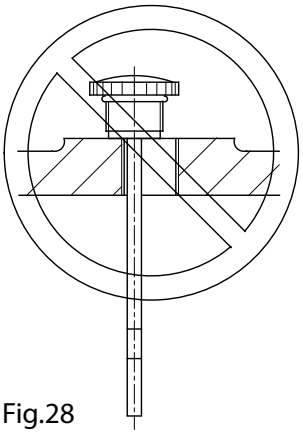


Fig.28

When topping up ensure that no loose nuts, bolts, gaskets, dust, water or other foreign objects fall into the unit.

If the oil level is below the minimum level adequate lubrication cannot be guaranteed.

If the oil level is above the maximum level the quality of the oil will deteriorate more quickly because of the high oil temperature.

Use the drain outlet underneath the unit to drain the oil. The oil should still be hot at this time. If the unit has a breathing filter, open it to make it easier to drain and top up the oil.

Lubricating and Changing Lubrication

Grease lubricated models are filled with grease at the factory and are supplied with grease nipples and grease drain screws.
Please use Table 17 on page 23 to check whether lubrication is necessary.
Remove the lubrication drain screw on the gearbox unit housing to fill or change the lubricant. Remove the lubricant drain plug, drain old lubricant and top up with a grease gun.
Top up with new lubricant until all the old lubricant has drained via the lubricant drain. Replace the plug. Top the gearbox up slowly during operation to ensure that the lubricant circulates properly. Please check as accurately as possible the number and position of the grease nipples (see Figs. 29 & 30).

Tab. 22 Lubricant change

Interval	Drive speed
Every 1,500 hours	up to 750 rpm
Every 1,000 hours	from 750 - 1,800 rpm

Tab. 22 Viscosity

Output shaft speed		Ambient temperature		
		-10°C to 15°C	0° to 30°	+10° to 50°
> 100	ISO* AGMA	VG68 2EP	VG150 4EP	VG220 5EP
< 100	ISO* AGMA	VG100 3EP	VG220 5EP	VG320 6EP

Tab. 23 Recommended lubricants

	Brand	BP	CASTROL			CHEVRON TEXACO		EXXON MOBIL		SHELL	TOTAL
Gear Oil	ISO VG68 AGMA 2EP	ENERGOL GR-XP-68	ALPHA SP68	OPTIGEAR BM68	TRIBOL 1100/68	GEAR COMPOUNDS EP68	MEROPA WM68	SPARTAN EP68	MOBIL-GEAR 626	OMALA 68	CARTER EP68
	ISO VG100 AGMA 3EP	ENERGOL GR-XP-100	ALPHA SP100	OPTIGEAR BM100	TRIBOL 1100/100	GEAR COMPOUNDS EP100	MEROPA WM100	SPARTAN EP100	MOBIL-GEAR 627	OMALA 100	CARTER EP100
	ISO VG150 AGMA 4EP	ENERGOL GR-XP-150	ALPHA SP150	OPTIGEAR BM150	TRIBOL 1100/150	GEAR COMPOUNDS EP150	MEROPA WM150	SPARTAN EP150	MOBIL-GEAR 629	OMALA 150	CARTER EP150
	ISO VG220 AGMA 5EP	ENERGOL GR-XP-220	ALPHA SP220	OPTIGEAR BM220	TRIBOL 1100/220	GEAR COMPOUNDS EP220	MEROPA WM220	SPARTAN EP220	MOBIL-GEAR 630	OMALA 220	CARTER EP220
	ISO VG320 AGMA 6EP	ENERGOL GR-XP-320	ALPHA SP320	OPTIGEAR BM320	TRIBOL 1100/320	GEAR COMPOUNDS EP320	MEROPA WM320	SPARTAN EP320	MOBIL-GEAR 632	OMALA 320	CARTER EP320
Bearing grease		ENER-GREASE LS EP2	SPHEEROL AP3	Olista Long-time 3EP	TRIBOL 3020/ 1000-2	DURALITH GREASE 68	MULTI-FAK EP2	BEACON EP2	MOBILUX EP2	ALVANIA EP2	MULTIS EP2

Position of Grease nipple and Drain screw

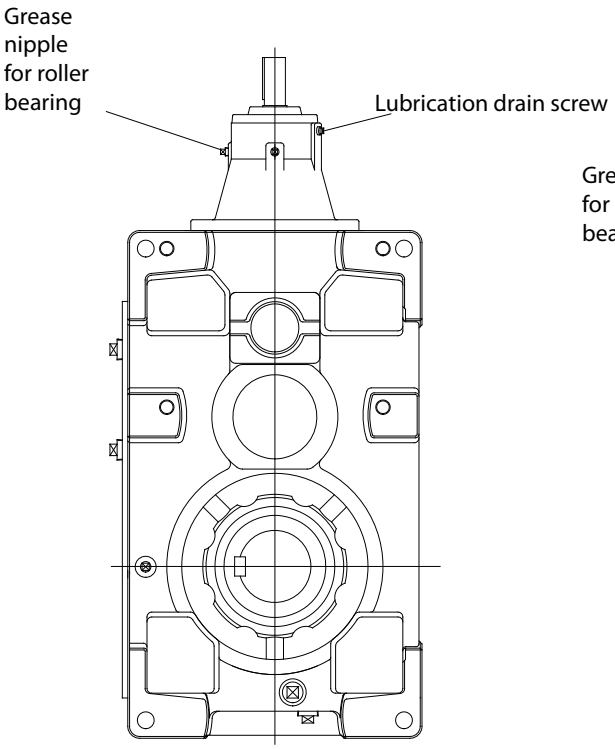


Fig. 29 Gearbox fitted upright

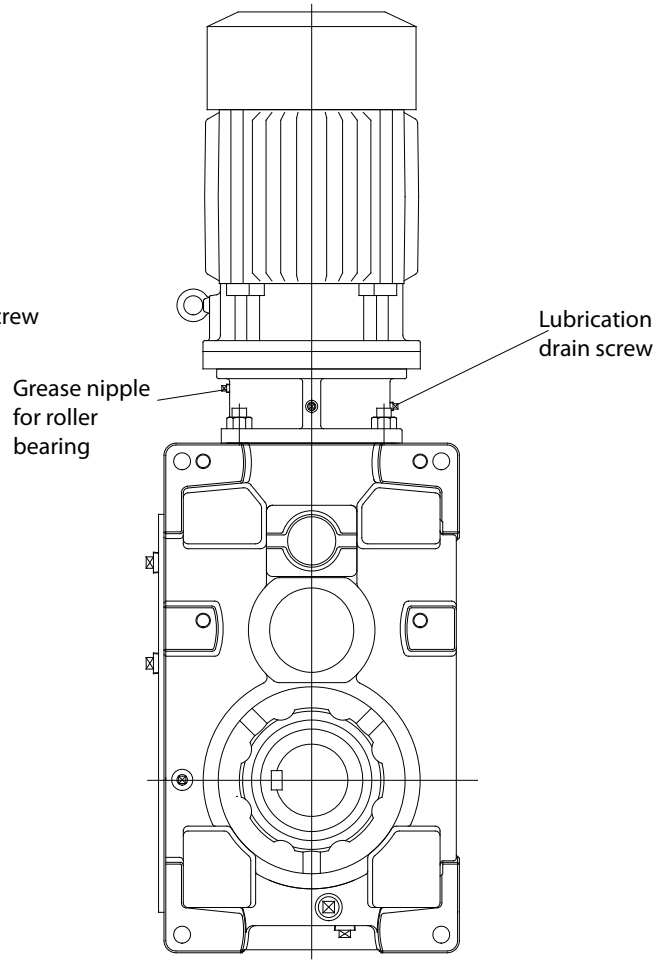
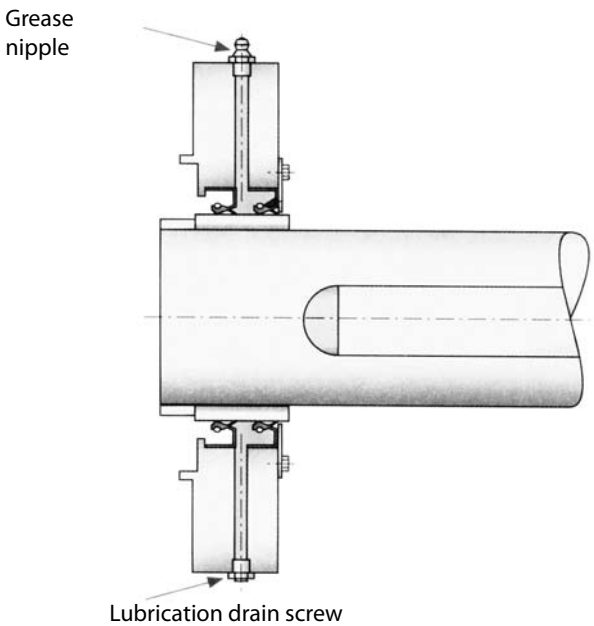


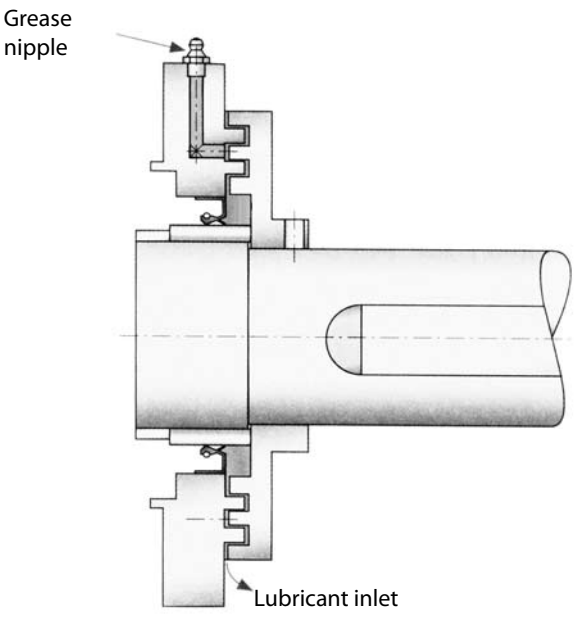
Fig. 30 Gear motor fitted upright

Should the gearbox be fitted with a taconite gasket the lubricant must also be replaced after the prescribed interval(Table 22).

Standard type



Labyrinth type



9.4 Maintenance of Motor Bearings

These maintenance instructions apply to Sumitomo motors.
The respective operating instructions apply if brake motors, servo motors, direct current motors or vector motors or motors from other manufacturers are used.
Bearing types and maintenance methods differ depending on the sizes. For this please note the rating plate and bearing type as in Tab. 24.

	Size of motor		
Type of bearing	A side	B side	Remarks
Sealed bearing	225 or smaller	250 or bigger	no fittings for lubrication
open bearing	250 or smaller		with grease nipple and lubricant drain screw

Tab. 24

Maintaining Sealed Bearings

As sealed bearings are filled in advance with high quality lubricant, they do not have to be topped up when commissioning. Under normal operating conditions we recommend replacing the bearings during dismantling or maintenance every three - five years for continuous running or after 20,000 operating hours.

Using CM Class Bearings

Using "MULTEMP SRL (Kyodo Yushi)"

Under extreme operating conditions, replace bearings at shorter intervals.
With externally cooled motors where the service life of the fan motor bearing is 15,000 - 20,000 hours we recommend replacing the fan every 15,000 hours.

Maintaining open Bearings

Re-lubrication intervals and amounts
Check the bearing number on the rating plate and top up the lubrication as shown in Table 25.

Tab. 25

Bearing No.	Dimension			Initial quantity (gram)	Top up quantity	Lubrication intervals (depending on frequency rpm)					
	Internal dia.	External dia.	Width			750r/min	900r/min	1000r/min	1200r/min	1500r/min	1800r/min
6314	70	150	35	200	40	8500	7000	6000	5000	3500	2500
6315	75	160	37	230	45	8500	6500	6000	4500	3500	2500
6316	80	170	39	260	50	8000	6500	5500	4500	3000	2500
6317	85	180	41	300	55	7500	6000	5000	4000	3000	2000
6318	90	190	43	350	60	7000	5500	5000	4000	2500	2000
6319	95	200	45	400	65	7000	5500	4500	3500	2500	1500
6320	100	215	47	450	70	6500	5000	4500	3500	2000	1500
6321	105	225	49	500	75	6000	5000	4000	3000	2000	1500
6322	110	240	50	550	80	6000	4500	4000	3000	2000	1000
6324	120	260	55	700	100	5500	4000	3500	2500	1500	1000
6412	60	150	35	200	40	8500	7000	6000	5000	3500	3000
6413	65	160	37	230	45	8000	6500	6000	4500	3500	2500
6414	70	180	42	300	55	8000	6500	5500	4500	3000	2500
NU314	70	150	35	120	40	4000	3500	3000	2500	1500	1000
NU315	75	160	37	150	45	4000	3000	3000	2000	1500	1000
NU316	80	170	39	200	50	4000	3000	2500	2000	1500	1000
NU317	85	180	41	250	55	3500	3000	2500	2000	1500	1000
NU318	90	190	43	300	60	3500	2500	2500	2000	1000	1000
NU319	95	200	45	350	65	3500	2500	2000	1500	1000	
NU320	100	215	47	400	70	3000	2500	2000	1500	1000	
NU321	105	225	49	450	75	3000	2500	2000	1500	1000	
NU322	110	240	50	500	80	3000	2000	2000	1500	1000	
NU324	120	260	55	650	100	2500	2000	1500	1000		

Initial Amount: Top up amount after dismantling and cleaning the bearing. Pour about 1/3 of the quantity directly into the bearing and the rest of it into the internal space.
Top Up Amount: The amount of grease that is poured into the bearing after each interval.
Even if the bearings are not to run continuously they must be re-lubricated at least every three years.
If the unit is not used for some time it must be lubricated again immediately **After it is Started Up** again.

Recommended Lubricants - Grease

Tab. 26

Ambient temperature °C	Open bearings	
	E, B type insulation	F type insulation
	Shell oil	
-10 to +50	ESSO UNIREX 2	DARINA GREASE 2

Do not use any Type of Lubricants other than those Listed in Table 26.

Topping up with grease (see Fig. 31 below and Figs. 29 and 30 on p. 27)
Drain the old lubricant through the drain screw and during operation top up via the grease nipple. (If you top up the lubricant when the machine is not operating this may lead to insufficient lubrication).
After topping up let the unit run for 10 minutes and then tighten the drain screw.

Do not use too much grease as this can lead to overheating and leaks.
Never top up with more than the specified amount or extend the lubrication intervals.
Please note: Before starting up fill up with grease and top up regularly. If the machine is not sufficiently lubricated this could cause excessive wear, increased noise and/or burning.

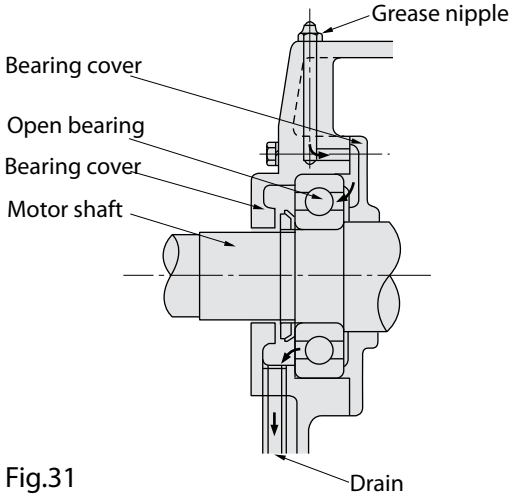


Fig.31

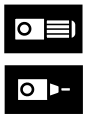
Parts Subject to Wear and Tear:
If the following parts are replaced after an operating time of 3 - 5 years the service life can be extended regardless of the operating condition:
Bearings, oil gaskets, nilos rings, adjustment rings, feather keys, spacer washers, gaskets, plugs, inspection glasses

Check shafts and gear wheels and replace if damaged.
For other parts replace depending on how worn they are.

10. Dismantling/Assembly

Repairs, dismantling and assembly must only be carried out by trained, technical experts otherwise there is the risk of damaging the machine.

Never get hold of the feather key slot or other parts with sharp edges: Danger of injury



Only dismantle the machine in dust-free, dry places.
Keep accessories like screws in a box so as not to lose them.
Handle parts carefully so as not to damage them.

10.1 Dismantling/Assembling Gearbox/Motor

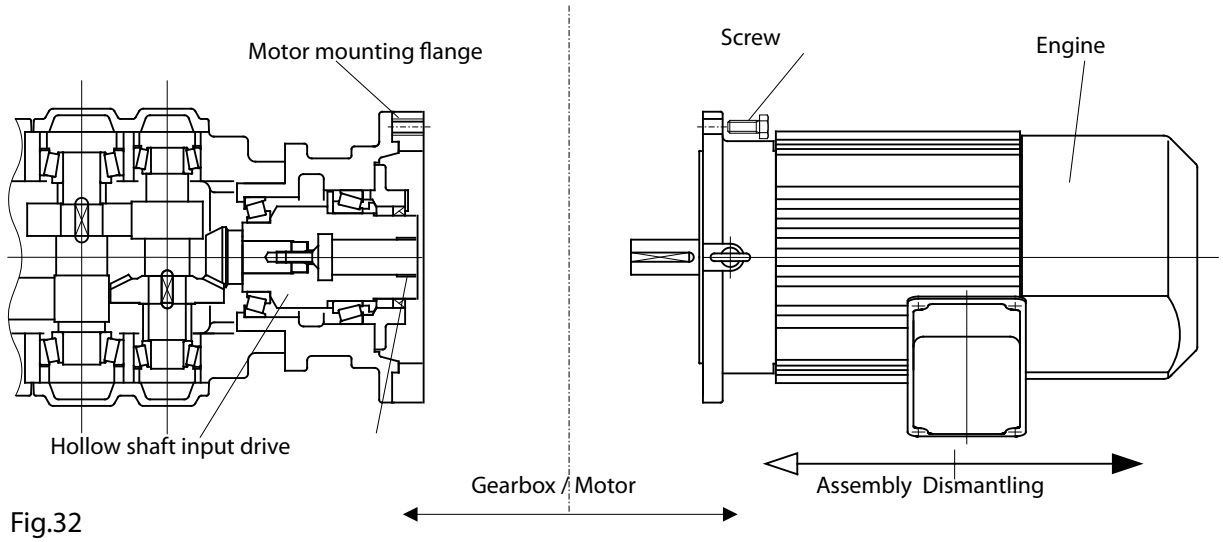


Fig.32

Dismantling
- Undo the anchor bolts.
- Move the motor slowly in the direction indicated and remove from the hollow shaft.
  Treat the parts carefully and avoid touching the edges of the key and the bush on the output shaft side and motor side in order not to harm the coating on the bush.

Assembly
· Fit a motor appropriate for the gearbox part. Push the motor slowly in the direction indicated.
· Align the feather key in the motor shaft with the feather key slot in the hollow shaft.
· Lubricate the motor shaft and insert it carefully into the hollow input drive shaft.
  Caution: Do not touch the coating on the feather key slot and the shaft end on the motor shaft on the bush and on the motor.
· Check to see that the motor is seated properly and tighten the fitting bolts in order to connect the motor and the flange firmly.

· When dismantling or assembling the motor make absolutely sure that you:
· Treat the bearings and coil carefully to prevent them being covered in dust or liquid.
· Spread some adhesive on the outside of the bearing in case it is run on overload as with major changes in load or strong vibrations. (Recommended adhesive: Loctite 242 or 271)
· Remove the old liquid seal and replace with a new one.
· Ensure that no irregularities occur by turning it by hand and attempting to operate it.

11. Troubleshooting

In the event of anomalies, appropriate action as set out in the operating instructions must be taken.
Do not operate the unit until the problem has been solved. If a repair is not possible, contact Sumitomo.

Malfunction			Possible cause	Correction
The motor runs without a load.			Power failure.	Contact the electricity supply company.
			Defective electric circuit.	Check the circuit.
			Fuse burnt out.	Replace the fuse.
			Safety clutch tripped.	Rectify malfunction and reset device.
			Load locking.	Check the load and safety device.
			Loose connection.	Adjust connection.
			Connection to stator coil cut off.	Contact authorised service agent.
			Bearing damage.	Contact authorised service agent.
			3-phase is functioning as single-phase.	Check the power supply with a voltmeter. Check the motor, coil in the transformer, contactor, fuse, etc. and repair or replace them.
Motor running without load	When load is applied	Switch gets hot	Insufficient switch capacity.	Replace switch with a specified one.
			Overload.	Reduce the load to the specified one.
		Fuse burnt out	Fuse overloaded.	Use appropriate fuse.
			Overload.	Reduce the load to the specified one.
		Motor overheated and running too slowly	Voltage drop.	Contact the electricity supply company.
			Overload.	Reduce the load to the specified one.
			Short-circuited motor stator coil.	Contact authorised service agent.
			The key is missing.	Install a key.
			The bearing is burnt out.	Contact authorised service agent.
			Fuse switch wrongly aligned	Check fuse switch.
	Motor runs in the wrong direction		Connection error.	Change the connection.
	Fuse burnt out		The outlet wire is short-circuited.	Contact authorised service agent.
			Loose connection between motor and starter.	Correct connection.
			Overload.	Reduce the load to the specified value.
Excessive temperature rise			Voltage drop or voltage rise.	Contact the electricity supply company
			Bearing burnt out.	Contact authorised service agent.
			The ambient temperature is high.	Improve the ventilation method.
			Damage due to overload applied to gears, bearings, etc.	Contact authorised service agent.
Oil leakage	Oil leaks from the input/output shaft sections.		Damaged oil seal.	Change the oil seal.
			Scratches or abrasions on the sealing lip.	Contact authorised service agent.
	Oil leaks from the abutting surface of the housing		Loose anchor bolt.	Tighten the fitting screws to their proper torque.
Odd noises Excessively strong vibrations			Gearbox, shaft or bearing damage	Contact an authorised service agent
			Housing distorted because of uneven support	Level support surface or use spacer blocks
			Resonance as a result of the support surface not being rigid enough	Make the support surface more rigid
			Not properly aligned with the connection machine	Align the centre of the shaft
			The connection machine transmits vibrations to the Paramax gearbox	Operate without the connection machine to check gearbox
Odd motor noise			Foreign bodies have got in	Remove foreign bodies
			Bearing damage	Replace bearing
Frequency inverter triggered	Cut off because of excessive current		Sudden acceleration/ braking	Increase acceleration/ braking time
			Sudden change in load	Reduce load
	Excessive earth current		Earthing on the output side	Remove earthing
	Direct current too high		Short circuit on the output side	Check cable, remedy malfunction
	Cut off because of excessive regenerative voltage		Sudden braking	Increase braking time, reduce braking frequency
	Thermo contact triggered		Overload	Reduce load to specified values

12. Sectional drawings

12.1 PARAMAX Gear Motor Sectional Drawing

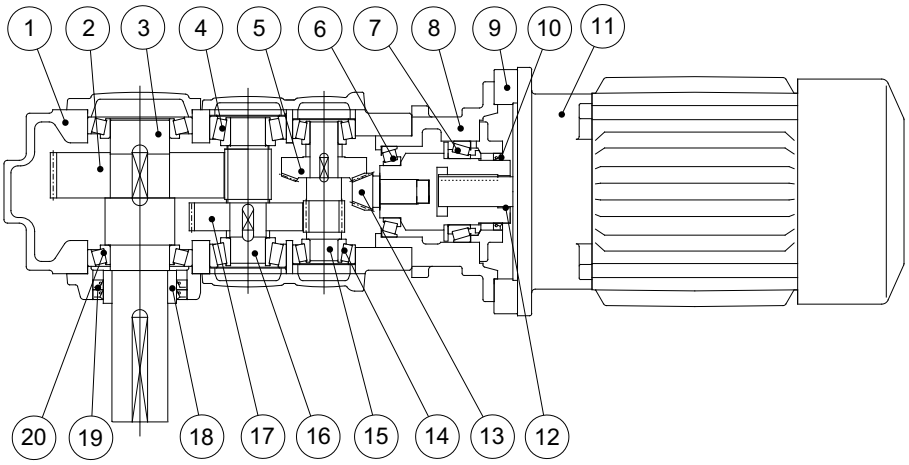


Fig. 33 Gear motor with right angle shaft configuration

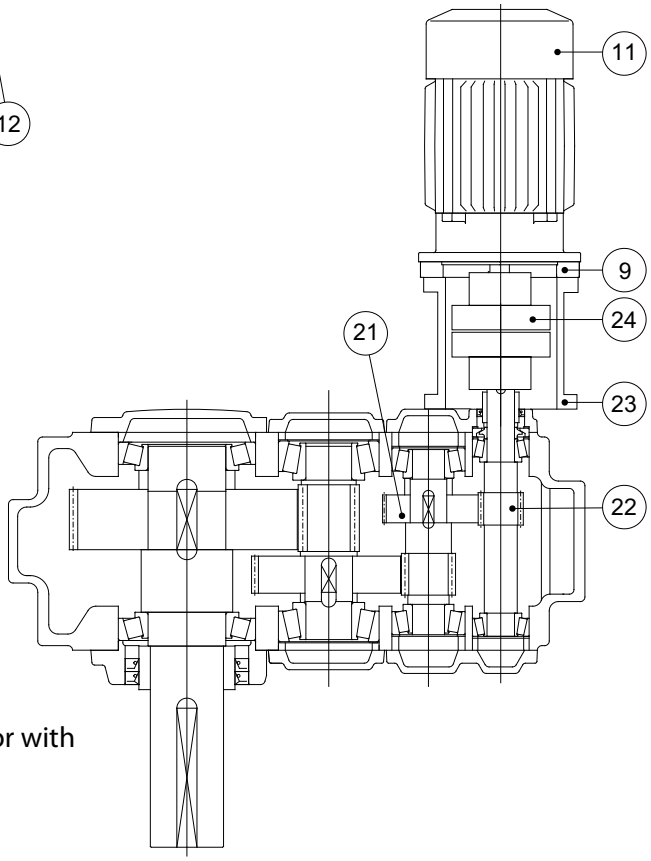


Fig. 34 Gear motor with parallel shafts

Part no.	Description	Part no.	Description	Part no.	Description
1	Housing	9	Motor mounting flange	17	Cog wheel
2	Cog wheel	10	Oil gasket	18	Adjusting ring
3	Drive shaft	11	Engine	19	Oil gasket
4	Tapered roller bearing	12	Bush	20	Tapered roller bearing
5	Bevel gear	13	Bevel pinion	21	Gear wheel
6	Tapered roller bearing	14	Tapered roller bearing	22	Pinion shaft
7	Tapered roller bearing	15	Pinion shaft	23	Motor adaptor
8	Bearing housing	16	Pinion shaft	24	Coupling

12.2 Gearbox Cross Sectional Drawings

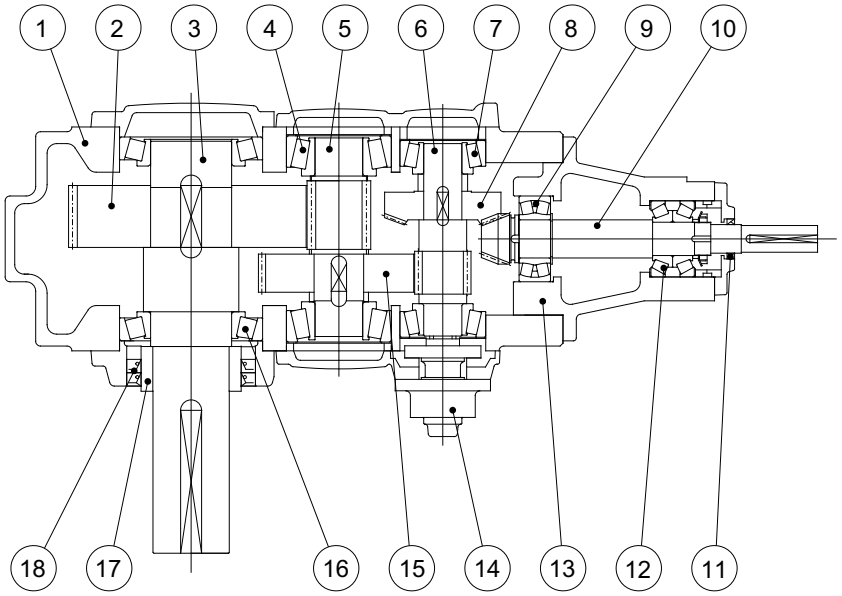


Fig. 35 Gearbox with right angle shaft configuration

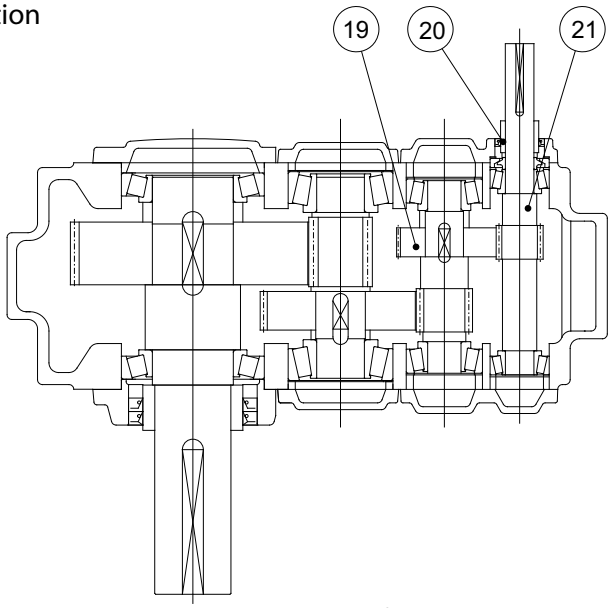


Fig. 36 Gearbox with parallel shafts

Part no.	Description	Part no.	Description	Part no.	Description
1	Housing	9	Self-aligning roller bearing	17	Adjusting ring
2	Cog wheel	10	Bevel pinion shaft	18	Oil gasket
3	Drive shaft	11	Oil gasket	19	Gear wheel
4	Tapered roller bearing	12	Tapered roller bearing	20	Adjusting ring
5	Pinion shaft	13	Bearing housing	21	Pinion shaft
6	Pinion shaft	14	Oil pump		
7	Tapered roller bearing	15	Cog wheel		
8	Bevel gear	16	Tapered roller bearing		

12.3 Motor Cross Sectional Drawings

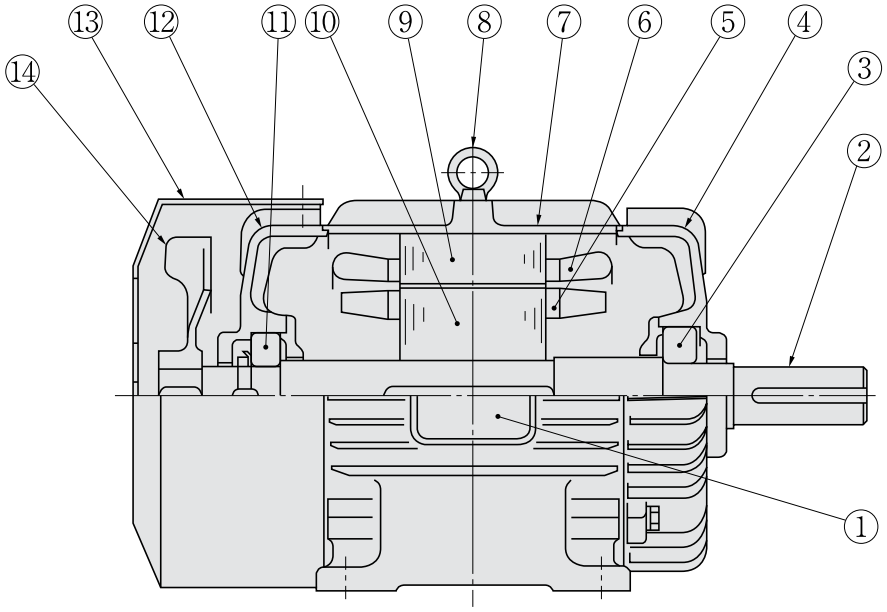


Fig. 37 Fully closed squirrel cage motor with fan

Part no.	Description	Part no.	Description
1	Terminal blocks	8	Eye bolt
2	Motor shaft	9	Stator core
3	Bearing on the A side	10	Rotor core
4	Bearing cover on the A side	11	Bearing on the B side
5	Short circuit ring	12	Bearing cover on the B side
6	Stator coil	13	Fan guard
7	Stator housing	14	Fan

13. Position of Oil Filler Neck and Drain Screw

Horizontal

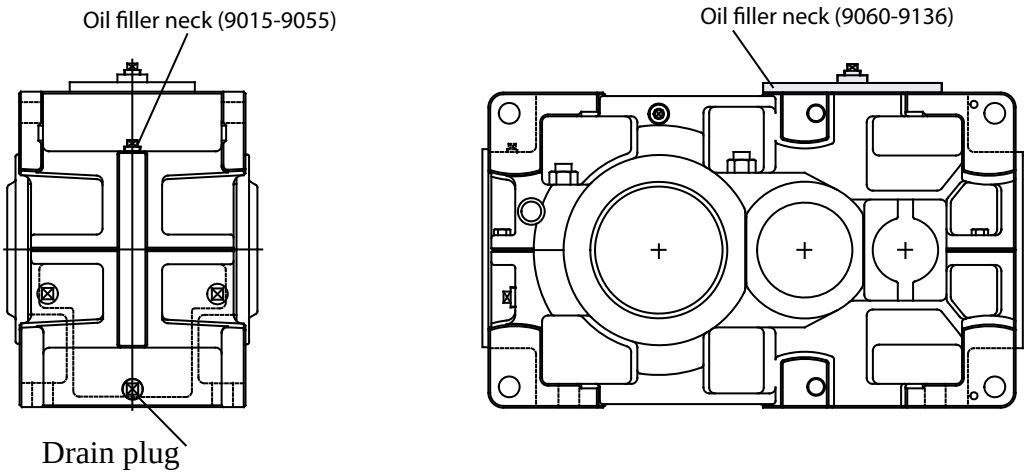


Fig. 38

Vertical

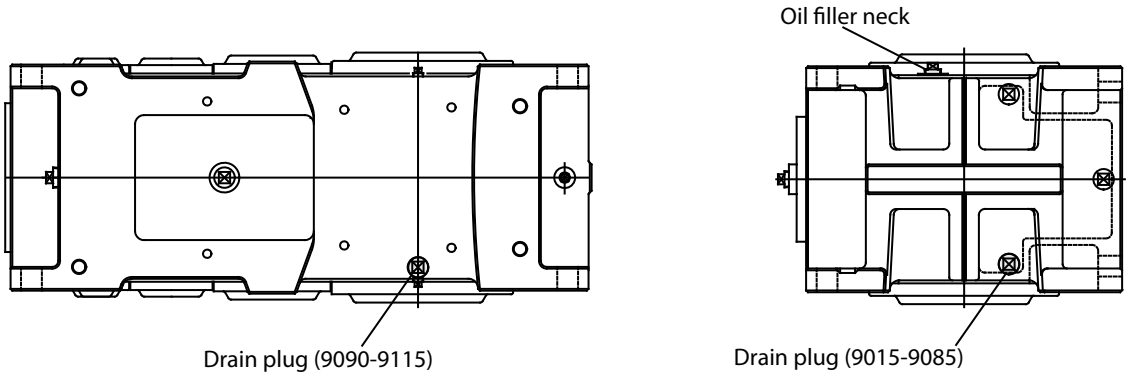


Fig. 39

Upright

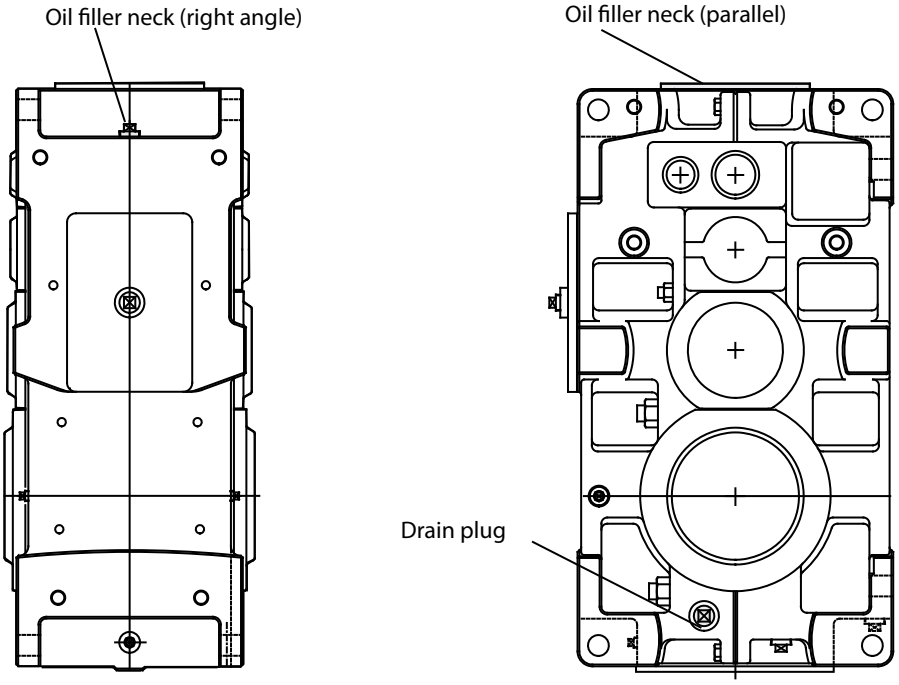


Fig. 40

14 Special Instructions for ATEX approved PARAMAX Gearboxes and Gear Motors

14.1 Safety Instructions for Use in an ATEX Area

Explosive gas mixtures or dust concentrations combined with hot, live, moving gearbox parts may lead to serious material and physical damage or even fatal injuries.
Standard PARAMAX gearboxes and gear motors must not be used in an area where there is a risk of explosion.
Under such conditions special explosion-proof gearboxes or gear motors must be used.
An ATEX certified gearbox or an ATEX certified gear motor must always have an ATEX label attached at the factory. The ATEX identification mark is found on the rating plate (see Section 3.1).
Installing, connecting, commissioning and maintenance and repair work on the gearbox/ gear motor and on additional electrical equipment must only be carried out by a qualified professional, taking account of:

- these instructions
- the warning and instruction plates on the gearbox/ gear motor
- any other development documents and connection diagrams relating to the drive
- the plant-specific conditions and requirements,
- the national and regional standards and regulations in force (explosion protection, safety, accident protection)
- dust deposits must be no thicker than 1mm and must be removed if necessary.
- The installation site at the customer's premises must not prevent the heat discharging from the gearbox as a result of convection and heat conduction.
- Overloaded operation is not permitted.
- Heat must not get into the gearbox from outside.
- The oil temperature must not exceed a max. of 85°C.
- The drive speed must not exceed a max. of 1800 r/min.
- All electrical and mechanical components fitted to the gearbox must have a separate ATEX certificate.

As the inverter itself is not explosion-proof, explosion-proof, inverter-driven motors must also only be installed in an area that is free from explosive gas mixtures or dust concentrations. Otherwise electric shocks, injuries, explosions or damage to the equipment may occur.

Electrical Installation of an Explosion-Proof Motor (ATEX)

The supply of an explosion-proof motor must comply with the electrical codes supplied by the factory, connection conditions and the explosion protection regulations as well as the operating instructions otherwise there is the risk of electric shocks, injuries, explosions, fire or damage to the equipment.

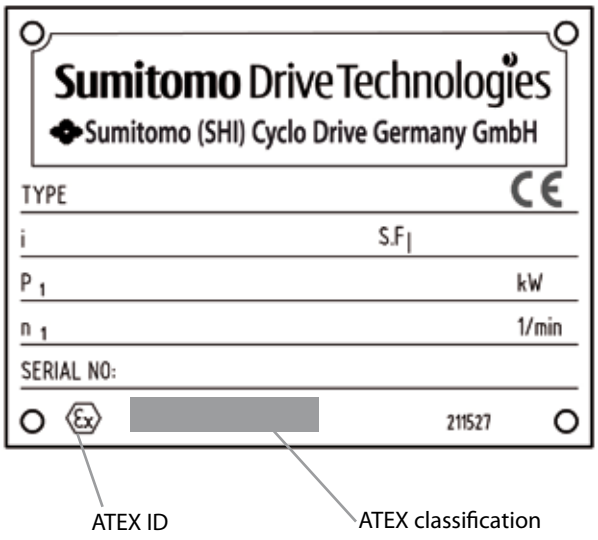
An overload protective device must be used for explosion-proof motors that switches the unit off after a specific time interval if the motor is blocked.

With the electrical connection the electrical markings provided by the factory, the electrical conditions and the explosion protection regulations must be obeyed otherwise there is the risk of burns, electric shocks, injuries and fire.
If an inverter is used for an explosion-proof motor one inverter must be used for each motor. Only use approved inverters.
When measuring the insulation resistance on an explosion-proof motor you must ensure that there is no gas, fumes or other explosive substances around in order to avoid an explosion or ignition.

14.2 Check list for ATEX approved Gearboxes and Gear Motors before Commissioning

- Does the information on the gearbox or gear motor rating plate correspond with the ATEX area of application required on site?
- Does the rating plate have the correct information?
- Is the drive undamaged (check for any transport or storage damage)?
- Is an unrestricted supply of cooling air guaranteed? Is any hot exhaust air being drawn in from other equipment? The cooling air must not exceed a temperature of 40°C.
- Are all inputs and outputs and all electrical parts ATEX approved and are they also labelled correctly?

PARAMAX rating plate with ATEX ID



The gearbox must be switched on without load when first commissioned. If it runs quietly and without any odd noises, the gearbox is attached to the driven machine.

Measure the surface temperature after about 3 hours. Check the maximum permissible difference between the surface temperature and the ambient temperature. Should this value be greater than that specified for the relevant type the equipment must be stopped immediately and Sumitomo must be contacted.
For applications in ATEX areas PARAMAX gearboxes are designed at the factory so that the oil temperature never exceeds 85°C under any circumstances. This must also be guaranteed by the operator in the relevant application.
The oil temperature in the equipment is always tested under full load.
Is the PT100 temperature device installed in ATEX gearboxes connected properly?
An isolation amplifier must be provided for sensors and passive components.
Here all the wiring must be done with light blue connection components.

14.3. Operating in an ATEX Explosion Area

It is particularly important to perform the inspection work specified in Section 9 and to adhere to the inspection intervals.

Any oil leaks must be rectified immediately.

In addition, with applications with a fan fitted on the gearbox side, this must be checked every day to ensure it is working properly.

If fans or the fan housing are damaged (corrosion, distortion, extraneous causes etc.) the gearbox unit must be stopped and repaired with original spare parts before being started up again.

The gearbox unit must be checked every day for visual damage and defects must be remedied immediately.
Gear wheels must undergo a visual check ½ yearly.

Labyrinth - and TACONITE gaskets and greased lubricated roller bearings must be re-lubricated every month.

Breathing filters and ventilation holes must be checked monthly and if necessary cleaned and overhauled again.

Caution: ATEX approval lapses if changes or conditions of use are not approved or not carried out by Sumitomo.

15. EC Machinery Directive

Reducers
Reducers are considered as "machinery components" and are not subject of the EC machinery directive 2006/42/EG.
The start of operation within the ambit of the EC machinery directive is forbidden, as long as it is not confirmed, that the machine, where the reducer is built in, complies with this directive.
From 2010 no manufacturers declaration, EC conformity declaration and declaration of incorporation will be issued.
Gearmotors
For gearmotors a conformity declaration according low voltage directive will be issued.

		machine directive 2006/42/EG	low voltage directive 73/23/EG	EMV 89/336/EG	ATEX 94/9/EG
reducer	CE mark	no	no	no	yes
	declaration of conformity	no	no	no	yes
	declaration of incorporation	no	no	no	no
gearmotor	CE mark	no	yes (motor)	no	yes (reducer)
	declaration of conformity	no	yes (motor)	no	yes (reducer)
	declaration of incorporation	no	no	no	no
inverter	CE mark	no	yes (inverter)	yes	no
	declaration of conformity	no	yes (inverter)	yse	no
	declaration of incorporation	no	no	no	no