RADICON POWERBUILD

Series M

Installation & Maintenance Manual

GEARED MOTORS · GEARBOXES · GEAR ASSEMBLIES · DRIVE SOLUTIONS

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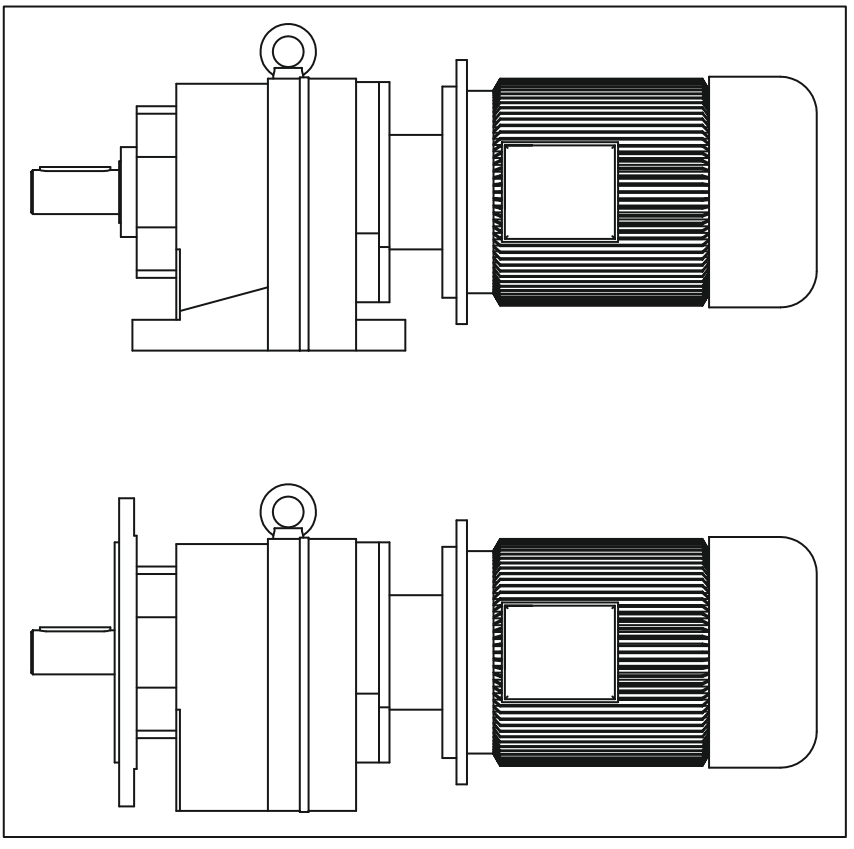


INSTALLATION & MAINTENANCE

SERIES M

POWER BUILD PVT LTD

Leaders in Power Transmission Solutions

IMPORTANT

Product Safety Information

General - The following information is important in ensuring safety. It must be brought to the attention of personnel involved in the selection of Power Build Pvt. Ltd. equipment, those responsible for the design of the machinery in which it is to be incorporated and those involved in its installation, use and maintenance.

Power Build Pvt. Ltd. is not liable for damage arising from non-compliance of the operating manual.

The operating manual is a part of the product.

- Always keep the operating manual ready to hand near the product as it contains important information.
- Pass on the operating manual if the product is supplied with main equipment / machine.

Power Build Pvt. Ltd. equipment will operate safely provided it is selected, installed, used and maintained properly. As with any power transmission equipment **proper precautions must** be taken as indicated in the following paragraphs, to ensure safety.

Potential Hazards - these are **not** necessarily listed in any order of severity as the degree of danger varies in individual circumstances.

Instructions on the protective measures to be taken by the user, including where appropriate, the personal protective equipment to be provided.

It is important therefore that the list is studied in its entirety:-

1) **Fire/Explosion**
   a) Oil mists and vapour are generated within gear units. It is therefore dangerous to use naked lights in the proximity of gearbox openings, due to the risk of fire or explosion.
   b) In the event of fire or serious overheating (over 300°C), certain materials (rubber, plastics, etc.) may decompose and produce fumes. Care should be taken to avoid exposure to the fumes, and the remains of burned or overheated plastic/rubber materials should be handled with rubber gloves.
2) **Guards -** Rotating shafts and couplings must be guarded to eliminate the possibility of physical contact or entanglement of clothing. It should be of rigid construction and firmly secured.
3) **Noise -** High speed gearboxes and gearbox driven machinery may produce noise levels which are damaging to the hearing with prolonged exposure. Ear defenders should be provided for personnel in these circumstances.
4) **Lifting -** Where provided (on larger units) only the lifting points or eyebolts must be used for lifting operations (see maintenance manual or general arrangement drawing for lifting point positions). Failure to use the lifting points provided may result in personal injury and/or damage to the product or surrounding equipment. Keep clear of raised equipment.
5) **Lubricants and Lubrication**
   a) Prolonged contact with lubricants can be detrimental to the skin. The manufacturer's instruction must be followed when handling lubricants.
   b) The lubrication status of the equipment must be checked before commissioning. Read and carry out all instructions on the lubricant plate and in the installation and maintenance literature. Take notice of all warning tags. Failure to do so could result in mechanical damage and in extreme cases risk of injury to personnel.
6) **Electrical Equipment -** Observe hazard warnings on electrical equipment and isolate power before working on the gearbox or associated equipment, in order to prevent the machinery being started.

7) Installation, Maintenance and Storage

a) In the event that equipment is to be held in storage, for a period exceeding 6 months, prior to installation or commissioning, Power Build Pvt. Ltd. must be consulted regarding special preservation requirements. Unless otherwise agreed, equipment must be stored in a building protected from extremes of temperature and humidity to prevent deterioration.

b) The rotating components (gears and shafts) must be turned a few revolutions once a month (to prevent bearings brinelling). External gearbox components may be supplied with reservative materials applied, in the form of a "waxed" tape overwrap or wax film preservative. Gloves should be worn when removing these materials. The former can be removed manually, the latter using white spirit as a solvent.

Preservatives applied to the internal parts of the gear units do not require removal prior to operation.

c) Installation must be performed in accordance with the manufacturer's instructions and be undertaken by suitably qualified personnel.

d) Before working on a gearbox or associated equipment, ensure that the load has been removed from the system to eliminate the possibility of any movement of the machinery and isolate power supply. Where necessary, provide mechanical means to ensure the machinery cannot move or rotate. Ensure removal of such devices after work is complete.

e) Ensure the proper maintenance of gearboxes in operation. Use only the correct tools and Power Build Pvt. Ltd. approved spare parts for repair and maintenance. Consult the Maintenance Manual before dismantling or performing maintenance work.

8) Hot Surfaces and Lubricants

a) During operation, gear units may become sufficiently hot to cause skin burns. Care must be taken to avoid accidental contact.

b) After extended running the lubricant in gear units and lubrication systems may reach temperatures sufficient to cause burns.

Allow equipment to cool before servicing or performing adjustments.

9) Selection and Design

a) Where gear units provide a backstop facility, ensure that back-up systems are provided if failure of the backstop device would endanger personnel or result in damage.

b) The driving and driven equipment must be correctly selected to ensure that the complete machinery installation will perform satisfactorily, avoiding system critical speeds, system torsional vibration, etc.

c) The equipment must not be operated in an environment or at speeds, powers, and torques or with external loads beyond those for which it was designed.

Unintended use includes:

- Overloading the gearbox or exceeding the limits that are defined in the technical data;
- Converting or modifying the gearbox;
- Using the gearbox for an application that it was not designed for.

d) As improvements in design are being made continually the contents of this catalogue are not to be regarded as binding in detail, and drawings and capacities are subject to alterations without notice.

10) Waste Disposal

Waste (Used oil, Rubber items, Packing material etc) should be disposed as per local rules of disposal.

The above guidance is based on the current state of knowledge and our best assessment of the potential hazards in the operation of the gear units.

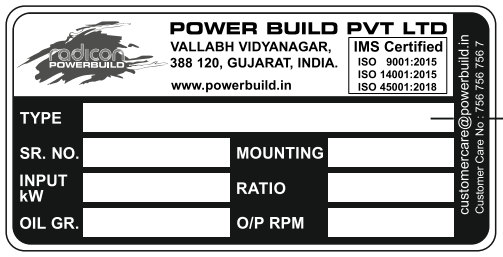
Any further information or clarification required may be obtained by contacting Power Build Pvt. Ltd.

CONTENTS

1 UNIT IDENTIFICATION

When requesting further information, or service support quote the following information from the nameplate:

- Unit Type
- Sr. Number



* See Appendix 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
*	M																			
Example	M	0	3	2	2	8	.	0	B	M	C	-	1	A	.	7	5	A	-	-

1 - Series M

Range [M]

2, 3 - Size of Unit

[01] Through [16]

4 - No of Reductions

[2] Through [5]

5 - Revision Version

[2] For Sizes 01 to 08, 16

[1] For Sizes 09 to 14

6, 7, 8 - Nominal Overall Ratio

eg [8.0] See Pages 102-112

9 - Unit Version

[B] - Base Mounted (Please refer Catalogue)
B5 (D) Flange Mounted

[E] - B14 (C) Flange Mounting

[V] - Base and B14 (C) Flange Mounting
(Non - Standard Special Orders Only)

10 - Type of Unit

[M] - Motorised with IEC standard motor

[G] - Unit to allow ftting of IEC motor (non customer motor)

[R] - Reducer unit

[S] - Reducer unit with fan kit

[W] - Reducer unit with backstop CCW rotation

[X] - Reducer unit with backstop CW rotation

[Y] - Reducer unit with fan and backstop CW rotation

[Z] - Reducer unit with fan and backstop CCW rotation

11 - Output Shaft

[C] - Standard See Page 8

12 - Motor Adaptor For Unit Types Column 10 Entries M, H, G.

See Pages 9 to 13

For All Other Types Enter [-]

13, 14 - Mounting Position

eg [2B] See Page 14

15, 16, 17 - Geared Motor Powers

Motor Power Required

eg [.75] See Page 21 - 80

For reducer and non standard motor types enter [---]

18 - No of Motor Poles

[-] No motor

	50 Hz		60 Hz	
4 Pole (Std) 1500 rpm	[A]	1800 rpm	[B]	
4 Pole (High) 1500 rpm	[K]	1800 rpm	[L]	
6 Pole (Std) 1000 rpm	[C]	1200 rpm	[D]	
6 Pole (High) 1000 rpm	[M]	1200 rpm	[N]	
2 Pole	3000 rpm	[E]	3600 rpm	[F]
8 Pole	750 rpm	[G]	900 rpm	[H]

[S] Dual speed or special motor

19 - Additional Motor Features

eg [-A] See Page 19

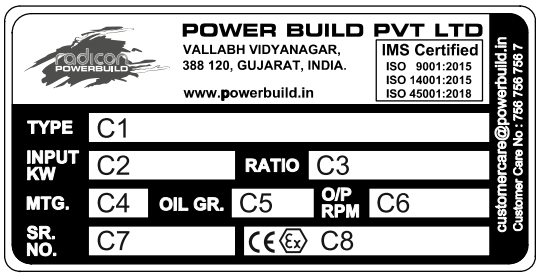
For Types Without Motor Enter [-]

20 - Additional Gearbox Features

Double Oil Seal, Motorised Backstop Etc

eg [-F] See Page 20

Unit Identification



Where …

C1 - Unit type
C2 - Input power of gearbox (kW)
C3 - Ratio of gearbox
C4 - Recommended mounting position of gearbox
C5 - Recommended Oil Grade of gearbox
C6 - Output speed (rpm) of gearbox
C7 - Serial number of gearbox.
C8 - Marking

Marking

These gear units are intended for use in industrial systems. The units are correctly installed in accordance with these instructions (gear units only) they comply with the ATEX Directive – 2014/34/EU.

Electric Motors, couplings or any other equipment fitted to the gear unit must be comply with ATEX Directive - 2014/34/EU. If the unit is supplied as a geared motor package, it is important to check the name plates of the gear unit and the motor (or any other equipment fitted) corresponds with the classification of the potentially explosive atmosphere in which the unit is to be installed. If the motor is earthed, electrical continuity is ensured by the adaptor between the motor and gearbox that is always of metallic material. It is the final responsibility of the installer to verify the electrical continuity between the engine and gearbox.

ATEX classification

Example			**II**	**2**	**G**	**Ex h**	**IIB**	**T3 or T 125°C**	**Ga**
Meaning	**Variant**	**ATEX classification**							
Classification	Conformity for European Directive	CE							
Classification	Explosion protection symbol	Ex							
Device Group	Above ground use		II						
Category	Zone 1, 21			2					
	Zone 2, 22			3					
Drive design	Explosive atmosphere caused by gas				G				
	Explosive atmosphere caused by dust				D				
Ignition protection	Constructional safety / liquid immersion					Ex h			
Explosion group :									
Area exposed to gases	High ignition power required						IIA		
	Medium ignition power required						IIB		
	Low ignition power required						IIC		
Area exposed to dust	Lint						IIIA		
	Non-conductive dust						IIIB		
	Conductive dust						IIIC		
Temperature class / temperature limits for the zones	450 C							T1	
	300 C							T2	
	200 C							T3	
	135 C							T4	
	100 C							T5	
	85 C							T6	
	e.g. Max. surface temperature 125 C.							T 125	
Equipment protection level	Very high protection level in gas								Ga
	High protection level in gas								Gb
	Normal protection level in gas								Gc
	Very high protection level in dust								Da
	High protection level in dust								Db
	Normal protection level dust								Dc

2 GENERAL INFORMATION

The following instructions will help you achieve a satisfactory installation of your Power Build Pvt Ltd. Series M unit, ensuring the best possible conditions for a long and trouble free operation.

All units are tested and checked prior to despatch, a great deal of care is taken in packing and shipping arrangements to ensure that the unit arrives at the customer in the approved condition.

3 FITTING OF COMPONENTS TO EITHER THE UNIT INPUT OR OUTPUT SHAFT

The input or output shaft extension diameter tolerance is to ISO tolerance k6 (for shaft diameter ≤ 50mm) and m6 (for shaft diameter > 50mm) and the fitted components should be to ISO tolerance M7 (for bore diameter ≤ 50mm) and K7 (for bore diameter > 50 mm).

- Items (such as gears, sprockets, couplings etc) should not be hammered onto these shafts since this would damage the shaft support bearings.
- The item should be pushed onto the shaft using a screw jack device fitted into the threaded hole provided in the end of the shaft.
- Items being fitted may be heated to 80/100°C to aid assembly further.

THREADED HOLE DETAILS

UNIT SIZE	INPUT SHAFT	OUTPUT SHAFT
M0122/M0132	M5 x 12 mm deep	M6 x 16 mm deep
M0222/M0232/M0322/M0332/ M0432/M0532/M0632	M5 x 12 mm deep	M10 x 22 mm deep
M0422	M6 x 16 mm deep	M10 x 22 mm deep
M0522	M6 x 16 mm deep	M12 x 28 mm deep
M0622/M0732	M6 x 16 mm deep	
M0722/M0832	M8 x 19 mm deep	M16 x 36 mm deep
M0822	M10 x 22 mm deep	
M0922	M12 x 28 mm deep	M20 x 42 mm deep
M0932	M10 x 22 mm deep	
M1022	M16 x 36 mm deep	
M1032	M12 x 28 mm deep	M20 x 42 mm deep
M1322/M1332	M20 x 42 mm deep	
M1422/M1432	M20 x 42 mm deep	M24 x 50 mm deep
M1622/M1632	M20 x 42 mm deep	

4 WEATHER PROTECTION OF UNIT

All Series M units are provided with protection against normal weather conditions. Where units are to operate in extreme conditions, or where they are to stand for long periods without running, eg during plant construction, we should be notified when ordering so that arrangements for adequate protection can be made.

5 INSTALLATION

5.1 MOTORISED AND REDUCERS (SIZES M 01, 02, 03, 04, 05, 06 & 07)

Motorised and Reducer types of sizes M 01, 02, 03, 04, 05, 06 & 07 are supplied ready filled with the appropriate amount of lubricant for the mounting position identified in the original order. (If the unit is to be mounted in a different position to that originally intended then the amount of lubricant in the unit will require amending

- See Appendix 2 of this document for the revised quantities
- See Appendix 1 for the methodology for doing this.

MOTORISED AND REDUCERS (SIZES M 08, 09, 10, 13, 14 & 16)

Motorised and Reducer types of sizes M 08, 09, 10, 13, 14 & 16 are shipped without oil for the customer to fill on site once installed. The different mounting positions are indicated in Appendix 2 with the appropriate oil fill quantities. The units have several oil fill and drain plugs to cater for all mounting positions. A list of approved lubricants is supplied in Appendix 2.

5.2 GEAR HEADS (ALL SIZES SERIES M)

If the unit has been supplied as a Gear Head type to allow fitting of the motor separately then refer to Appendix 1. For sizes M 01, 03, 04, 06 & 07 only, units satisfying condition ‘G’ (ref Appendix 1) will be supplied filled with oil, and units satisfying condition 'A' or 'M' (ref Appendix 1) will be supplied less oil.

5.3 FIXING TO CUSTOMER EQUIPMENT

Fixing the Gear Head flange facing or feet to the customer equipment use set screws to ISO grade 8.8 minimum.

Torque tighten to:-

Set Screw Size	Tightening Torque
M8	25 Nm
M10	50 Nm
M12	85 Nm
M16	200 Nm
M20	350 Nm
M24	610 Nm
M30	1220 Nm
M36	2150 Nm

5.4 MOTOR CONNECTIONS

TO MAINS

Connection of the electric motor to the mains supply should be made by a qualified person. The current rating of the motor will be identified on the motor plate, and correct sizing of the cables to electrical regulations is essential.

MOTOR TERMINAL CONNECTION

Circuit diagrams for the correct wiring of the motor terminal box are included as Appendix 3.

5.5 FOOT-MOUNTED UNITS

The following procedure is recommended for all foot mounted units.
Foot mounted units are supplied either as free standing units, or if required, mounted on a standard baseplate with a foot mounted motor correctly aligned and connected by a flexible coupling.

a) Clean shaft extensions and ventilator when fitted.

b) Secure unit, or baseplate if fitted to a rigid foundation using heavy duty bolts to ISO grade 8.8 minimum.

c) Ensure baseplate is not distorted
Note: Units not supplied on baseplates should if possible be mounted on the same bedplate as the prime mover.

d) Align unit (see Appendix 5)
Note: It is important to ensure when aligning unit on baseplate that all machined mounting points are supported over their full area.
If steel packings are used these should be placed either side of the foundation bolt as close as possible. During the final bolting ensure the unit or baseplate is not distorted this will cause strains in the gear case resulting in errors of alignment of shafts and gearing.

e) For units mounted on bedplates after alignment select any two diagonally opposite feet, drill ream and dowel in position.

f) Fit guards in accordance with the factory acts.

g) Check motor wiring for correct direction of rotation this is important when a holdback device is fitted.

h) Fill gear unit with oil (if not factory filled) as detailed in Section 6.

5.6 REPLACEMENT OF OIL SEALS

a) Clean and drain the unit.

b) Remove any equipment from the outputshaft such as couplings and remove the output key.

c) Remove the old seal

d) Smear oil seals with grease (see Appendix 4).

e) Fit replacement seal on a seal guide, slide it along the shaft and press the seal into the housings.

f) Fill with the correct amount of an approved lubricant, see Appendix 2.

DANGER

- The installation of the gearbox onto/into the customer machine must be made in such a way that no clearances may develop where dust can deposit which may come into contact with moving parts (risk of heat development).
- A change in mounting position may only be carried out after consultation with PBPL. The ATEX approval no longer applies when PBPL is not consulted !
- The gearboxes/geared motors must not be used in systems with cathodic protection!
- The gearboxes and motors must be included in the equipotential bonding of the system.
- Placing an installation above hot parts on which, for instance, leaking oil may ignite is not permissible. If required, install an oil collecting trough.

6 LUBRICATION AND MAINTENANCE

6.1 LUBRICATION

- Unit sizes M 01, 02, 03, 04, 05, 06 & 07 are factory filled with Mineral Oil.
- Unit sizes M 08, 09, 10, 13, 14 & 16 will be oil filled by client. (See Appendix 2)

6.2 PERIODIC INSPECTION

Check oil level every 3000 hours or 6 months whichever is sooner on sizes M 06, 07, 08, 09, 10, 13 14 and 16 and if necessary top up with the recommended grade of lubricant.

6.3 OIL CHANGES

Size 01 and 02, 03, 04 and 05 units are lubricated for life. On all other sizes regular oil changes are essential and the following factors should be used to determine the frequency at which these are carried out.

a. Oil temperature - unit operating under load.
b. Type of oil.
c. Environment - humidity, dust, etc.
d. Operating conditions - shock, loading, etc.

At elevated temperatures the effective life of the oil is very much reduced. This is most pronounced with oils containing fatty and E.P. additives. To prevent damage to the unit through lubricant breakdown the oil should be renewed as detailed in the following table:

UNIT OPERATING TEMPERATURE°C	RENEWAL PERIOD	
	MINERAL OIL	SYNTHETIC OIL
75 OR LESS	18000 HOURS OR 3 YEARS	26000 HOURS OR 3 YEARS
80	12500 HOURS OR 3 YEARS	26000 HOURS OR 3 YEARS
85	9000 HOURS OR 3 YEARS	22000 HOURS OR 3 YEARS
90	6000 HOURS OR 2 YEARS	15000 HOURS OR 3 YEARS
95	4500 HOURS OR 17 MONTHS	10500 HOURS OR 3 YEARS
100	3000 HOURS OR 12 MONTHS	7500 HOURS OR 2 1/2 YEARS
105	2200 HOURS OR 8 MONTHS	6000 HOURS OR 2 YEARS
110	1500 HOURS OR 6 MONTHS	4500 HOURS OR 18 MONTHS
NB:	**INITIAL FILL OF OIL SHOULD BE CHANGED IN A NEW GEAR UNIT AFTER 1000 HOURS OPERATION OR ONE YEAR OR HALF THE ABOVE LIFE WHICHEVER IS THE SOONEST**	

Note:

Figures quoted are for oil temperatures when the unit has attained normal running temperature when operating under load. These figures are based on normal running but where conditions are particularly severe it may be necessary to change the oil more frequently.
When changing lubricant, if same lubricant is not used then unit must be flushed out and filled only with one type of lubricant.

LUBRICATION CHANGE PERIOD

- Sizes 01, 02, 03, 04 and 05 are filled for life.
- All other sizes of Series M will require an oil change:
  - 10,000 hours for mineral oil
  - 20,000 hours for synthetic oil

TEMPERATURE LIMITATIONS

The standard lubricant is suitable for operation in ambient temperatures of 20° to 50°C, outside of this consult Table 1 or Application Engineers.

TABLE 1 OIL GRADES

LUBRICANT	AMBIENT TEMPERATURE RANGE		
	5°C to 20°C (type E) 30°C to 20°C (type H)	0°C to 35°C	20°C to 50°C
EP Mineral Oil (type E)	5E (VG 220)	6E (VG 320)	7E (VG 460)
Polyalphaolefn based Synthetic (type H)	5H (VG 220)	5H (VG 220)	6H (VG 320)

6.4 LUBRICANT QUANTITY

The quantity of lubricant required by size and mounting position is given in Table 1, Appendix 2. A diagram showing mounting position designations is also included in Appendix 2.

6.5 APPROVED LUBRICANTS

Table 2 Appendix 2 gives the lubricants approved for use in the gear unit.

6.6 GREASE LUBRICATION

Where re-greasing points are provided add 2 shots (6 grams) monthly of NLGI 2 grade grease.

Appendix 5 gives the grease approved for use in the unit.

6.7 CLEANING

With the drive stationary periodically clean any dirt or dust from the gear unit and the electric motor cooling fins and fan guard to aid cooling.

The breather plug should be check for blockage of hole and it is required to clean if required.

7 NOISE

The range of Series M product satisfies a noise (sound pressure level) of 85 dB(A) or less when measured at 1 metre from the unit surface.
Measurements taken in accordance with B.S.7676 Pt1 : 1993 (ISO 8579-1 : 1993).

Any further information or clarification required may be obtained by contacting branch offices which are mention on back page of this Installation & Maintenance manual.

ASSEMBLY OF MOTOR AND MOTOR ADAPTOR TO THE GEAR HEAD

Depending on motor frame size and type of flange facing (C or D flange) determines whether or not the motor adaptor is attached firstly to the motor or to the Gear Head.

Unit	M0122		M0132/M0232/ M0332/M0432/ M0532/M0632		M0222/M0322		M0422/M0522/ M0622		M0732		M0722/M0832	
Flange / Frame	C (B14)	D (B5)	C (B14)	D (B5)	C (B14)	D (B5)	C (B14)	D (B5)	C (B14)	D (B5)	C (B14)	D (B5)
63	N/A	G	N/A	G	N/A	G	N/A	G	N/A	N/A	N/A	N/A
71	M	G	M	G	M	G	N/A	G	N/A	N/A	N/A	N/A
80	M	G	M	G	M	G	M	G	M	G	M	G
90	M	G	M	G	M	G	M	G	M	G	M	G
100/112	M	N/A	N/A	N/A	M	N/A	M	G	N/A	G	M	G
132	N/A	N/A	N/A	N/A	N/A	N/A	N/A	G	N/A	N/A	N/A	G
160	N/A	N/A	N/A	N/A	N/A	N/A	N/A	G	N/A	N/A	N/A	G

	M0822/M0932	M0922/M1032	M1022	M1322/M1332	M1422/M1432	M1622/M1632
ALL MOTOR FRAME SIZES	G	G	G	G	G	G

M - Fix adaptor to motor then fix assembly to Gear Head
G - Fix adaptor to Gear Head first then fit motor
N/A - Not available

Note:

- For build condition 'A' and 'M' only, prior to fitting the motor adaptor, fill the gearcase with the correct amount of lubricant (Appendix 2). Apply liquid gasket material (Loctite 518) to the upturned face of the gearhead in a continuous bead. The gasket material should be outside any leak path and all screw holes should be ringed. (Health and Safety instructions with the material must be observed).

- When fitting the motor adaptor to the electric motor for build condition 'M', ensure that the copper washers supplied with the kit are fitted under the heads of the set screws fixing the adaptor to the motor, and that the threads of the set screws are coated with thread sealent.

APPENDIX 2
LUBRICATION

The standard lubricant is suitable for operation in ambient temperatures of 20° to 50°C, outside of this please consult Table 2 or Power Build Pvt Ltd.

1. **M01 to M07** are supplied factory filled with a quantity of EP mineral oil (Grade 7E) appropriate to the mounting position. If the gear unit is drained for any reason it must be re-filled with the correct grade and quantity of lubricant as shown in the table below.
2. **M08 to M16** are supplied without lubricant and must be filled via the ventilator position with the correct type (Mineral / Synthetic / Food) and grade of oil until oil escapes through the level plug hole – see table below for approximate lubricant quantity.
3. **Maintenance:**
   - **M01 to M07**, These units must be fully drained and re-filled with the correct quantity of lubricant.
   - **M08 to M16**, The Lubricant levels can be checked and maintained by filling through the fill / ventilator position until oil escapes through the level plug hole - See Mounting Positions and Lubricant Fill Levels on adjacent page.
4. M1 to M03 units, do not require a ventilator.
   M05 to M07 units, can be used without a ventilator except for mounting position 5 and 6.
   M08 to M16 unit only, fit the ventilator plug in the position appropriate to the mounting position.
5. Quintuple Reduction Units consist of a smaller Series M primary unit flange mounted on to the main Series M gear unit, both units should be checked for oil type and quantity.

TABLE 1 LUBRICANT QUANTITY (Liters) :

Oil quantities are approximate for M08 to M16, fill gearbox until oil escapes from level plug hole

Double reduction & final stage quadruple or quintuple reduction														
Size		M0122	M0222	M0322	M0422	M0522	M0622	M0722	M0822	M0922	M1022	M1322	M1422	M1622
Mounting Position	1	0.5	0.8	0.8	1.5	1.5	2.0	2.6	5.9	10.0	13.5	14.1	35.0	44.2
	2	0.8	1.2	1.2	1.8	1.8	2.0	2.9	7.7	12.3	20.7	20.0	48.8	69.5
	3	0.6	0.7	0.7	1.6	1.6	1.9	2.7	6.7	11.3	19.7	19.0	42.5	76.5
	4	0.8	1.2	1.2	1.8	1.8	1.7	3.0	7.7	14.8	22.8	24.4	54.0	88.5
	5	0.7	1.1	1.1	2.0	2.0	2.2	3.2	7.0	16.0	24.5	35.6	55.0	93.2
	6	1.0	1.4	1.4	2.6	2.6	2.8	4.7	9.4	18.0	28.2	29.0	62.0	112.3

Size		M0132	M0232	M0332	M0432	M0532	M0632	M0732	M0832	M0932	M1032	M1332	M1432	M1632
Mounting Position	1	0.6	0.8	0.8	1.6	1.6	2.1	2.7	4.3	8.6	15.3	17.8	32.3	53.5
	2	0.9	1.3	1.3	1.9	1.9	2.1	3.0	6.8	12.3	20.8	27.7	45.8	72.8
	3	0.7	0.7	0.7	1.7	1.7	2.0	2.8	7.5	13.8	19.8	26.9	47.3	78.8
	4	0.9	1.2	1.2	1.9	1.9	1.8	3.1	8.5	15.3	24.8	37.6	55.2	94.0
	5	0.7	1.1	1.1	2.1	2.1	2.3	3.3	9.5	23.0	36.0	48.0	59.5	132.0
	6	1.1	1.6	1.6	2.7	2.7	2.9	4.8	9.7	17.0	28.5	45.2	67.2	118.6

Primary stage quadruple reduction	(Quantities obtained from above double and triple sizes indicated)										
Size	M0342	M0442	M0542	M0642	M0742	M0842	M0942	M1042	M1342	M1442	M1642
Primary Unit size	M0122	M0322	M0322	M0322	M0322	M0522	M0522	M0722	M0722	M0722	M0922
Secondary Unit size	M0322	M0422	M0522	M0622	M0722	M0822	M0922	M1022	M1322	M1422	M1622

Primary stage quintuple reduction	(Quantities obtained from above double and triple sizes indicated)										
Size	M0352	M0452	M0552	M0652	M0752	M0852	M0952	M1052	M1352	M1452	M1652
Primary Unit size	M0132	M0332	M0332	M0332	M0332	M0532	M0532	M0732	M0732	M0732	M0932
Secondary Unit size	M0322	M0422	M0522	M0622	M0722	M0822	M0922	M1022	M1322	M1422	M1622

TABLE 2 RECOMMENDED LUBRICANTS

NUMBERS IN BRACKETS INDICATES RECOMMENDED MINIMUM OPERATING TEMPERATURE °C.

LUBRICANT SUPPLIER	LUBRICANT RANGE NAME	ISO VISCOSITY / GRADE NO.		
Type E - Mineral oils containing industrial EP additives		220 / 5E	320 / 6E	460 / 7E
		AMBIENT TEMPERATURE RANGE °C		
		-5 to 20	0 to 35	20 to 50
Batoyle Freedom Group	Remus	220 (-2)	320 (-2)	460 (-2)
Boxer Services incorporated with Millers Oils Limited	Indus	220 (-10)	320 (-10)	460 (-10)
BP Oil International Limited	Energol GR-XF	220 (-16)	320 (-13)	460 (-1)
	Energol GR-XP	220 (-15)	320 (-10)	460 (-7)
Caltex	Meropa	220 (-4)	320 (-4)	460 (-4)
	RPM Borate EP Lubricant	220 (-7)	320 (-4)	460 (-7)
Carl Bechem GmbH	Berugear GS BM	220 (-20)	320 (-13)	460 (-10)
	Staroil G	220 (-13)	320 (-13)	460 (-10)
Castrol International	Alpha Max	220 (-19)	320 (-13)	460 (-10)
	Alpha SP	220 (-16)	320 (-16)	460 (-1)
Chevron International Oil Company Ltd	Gear Compound EP (USA version)	220 (-16)	320 (-13)	460 (-10)
	Gear Compound EP (Eastern ver)	220 (-13)	320 (-13)	460 (-13)
	Ultra Gear	220 (-10)	320 (-7)	460 (-7)
Eko-Elda Abee	Eko Gearlub	220 (-13)	320 (-10)	460 (-1)
Engen Petroleum Limited	Gengear	220 (-15)	320 (-12)	460 (-3)
Esso	Spartan EP	220 (-16)	320 (-13)	460 (-7)
Esso/Exxon	Spartan EP	220 (-12)	320 (-12)	460 (-4)
Fuchs Lubricants	Powergear		P/Gear (-16)	M460 (-4)
	Renogear V	220EP (-13)	320EP (-4)	460EP (-4)
	Renogear WE	220 (-7)	320 (-4)	400 (-4)
	Renolin CLPF Super	6 (-13)	8 (-10)	10 (-10)
Klüber Lubrication	Klüberoil GEM1	220 (-5)	320 (-5)	460 (-5)
Kuwait Petroleum International	Q8 Goya	220 (-16)	320 (-13)	460 (-10)
Lubrication Engineers Inc	Almasol Vari-Purpose Gear	607 (-18)	605 (-13)	608 (-10)
Mobil Oil Company Limited	Mobil gear 600 Series	630 (-13)	632 (-13)	634 (-1)
	Mobil gear XMP	220 (-19)	320 (-13)	460 (-7)
Omega Manufacturing Division	Omega 690		85w/140 (-15)	
Optimol Ölwerke GmbH	Optigear BM	220 (-11)	320 (-10)	460 (-7)
	Optigear	220 (-18)	320 (-9)	460 (-7)
Pertamina (Indonesia)	Masri	220 (-4)	320 (-4)	460 (-4)
Petro-Canada	Ultima EP	220 (-22)	320 (-16)	460 (-10)
Rocol	Sapphire Hi-Torque	220 (-13)	320 (-13)	460 (-13)
Sasol Oil (Pty) Limited	Cobalt	220 (-4)	320 (-1)	460 (-4)
	Hemat	220 (-10)	320 (-7)	460 (-4)
Saudi Arabian Lubricating Oil Co.	Gear Lube EP	EP220 (-1)	EP320 (0)	EP460 (0)
Shell Oils	Omala S2G	220 (-4)	320 (-4)	460 (-4)
	Omala F	220 (-13)	320 (-10)	460 (-4)
Texaco Limited	Meropa	220 (-16)	320 (-16)	460 (-10)
	Meropa WM	220 (-19)	320 (-16)	460 (-11)
Total	Carter EP	220 (-7)	320 (-7)	460 (-4)
	Carter VP/CS	220 (-16)	320 (-13)	460 (-7)
Tribol GmbH	Molub-Alloy Gear Oil	90 (-18)	690 (-16)	140 (-13)
	Tribol 1100	220 (-20)	320 (-18)	460 (-16)
Hindustan Petroleum	HP PARTHAN EP	220 (-5)	320 (0)	460 (3)
Hindustan Petroleum	HP PARTHAN EP MA	220 (-6)	320 (-3)	460 (0)

		ISO VISCOSITY / GRADE NO.		
Type H - Polyalphaolefin base synthetic lubricants with EP additives		220 / 5H	320 / 6H	460 / 7H
		AMBIENT TEMPERATURE RANGE °C		
		-30 to 20	0 to 35	20 to 50
Batoyle Freedom Group	Titan	220 (-31)	320 (-28)	
Boxer Services incorporated with Millers Oils Limited	Silkgear	220 (-35)	320 (-35)	460 (-35)
BP Oil International Limited	Enersyn EPX		320 (-28)	
Caltex	Pinnacle EP	220 (-43)	320 (-43)	460 (-37)
Carl Bechem GmbH	Berusynth GP	220 (-38)	320 (-35)	460 (-32)
Castrol International	Alphasyn EP	220 (-37)	320 (-31)	460 (-31)
	Alphasyn T	220 (-31)	320 (-28)	460 (-28)
Chevron International Oil Company Ltd	Tegra	220 (-46)	320 (-33)	460 (-31)
Esso/Exxon	Spartan Synthetic EP	220 (-46)	320 (-43)	460 (-40)
Fuchs Lubricants (UK) Plc	Renogear SG	220 (-32)	320 (-30)	
	Renolin Unisyn CLP	220 (-37)	320 (-34)	460 (-28)
Klüber Lubrication	Klübersynth GEM 4	220 (-35)	320 (-35)	460 (-30)
Kuwait Petroleum International	Q8 EL Greco	220 (-22)	320 (-19)	460 (-16)
Lubrication Engineers Inc	Synolec Gear Lubricant	9920 (-40)		
Mobil Oil Company Limited	Mobilgear SHC	220 (-40)	320 (-37)	460 (-32)
	Mobilgear SHC XMP	220 (-40)	320 (-33)	460 (-31)
Optimol Ölwerke GmbH	Optigear Synthetic A	220 (-31)	320 (-31)	
Petro-Canada	Super Gear Fluid	220 (-43)	320 (-37)	460 (-37)
Shell Oils	Omala S4 GX	220 (-43)	320 (-40)	460 (-37)
Texaco Limited	Pinnacle EP	220 (-43)	320 (-43)	460 (-37)
	Pinnacle WM	220 (-43)	320 (-40)	
Total	Carter SP	220 (-34)	320 (-31)	460 (-28)
Tribol GmbH	Tribol 1510	220 (-36)	320 (-33)	460 (-28)
Hindustan Petroleum	HP PARTHAN SL	220 (-33)	320 (-30)	460 (-28)
Hindustan Petroleum	HP PARTHAN PG	220 (-30)	320 (-24)	460 (-22)

APPENDIX 2
MOUNTING POSITION

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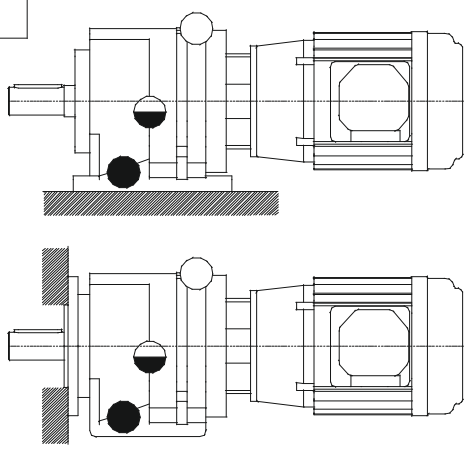

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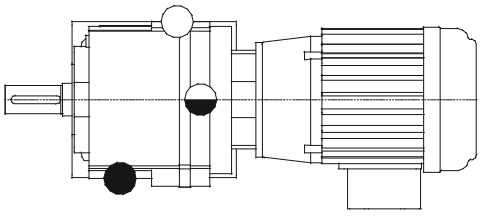

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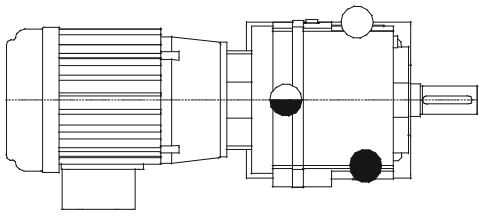

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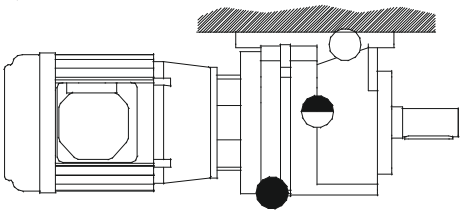

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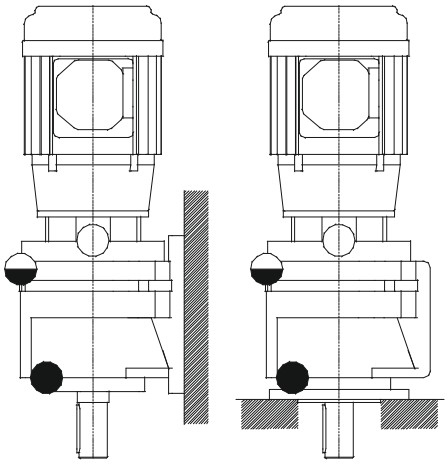

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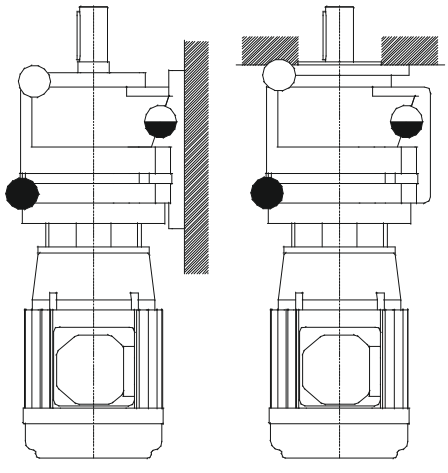


DRAIN POSITION

LEVEL POSITION

VENTILATOR POSITION

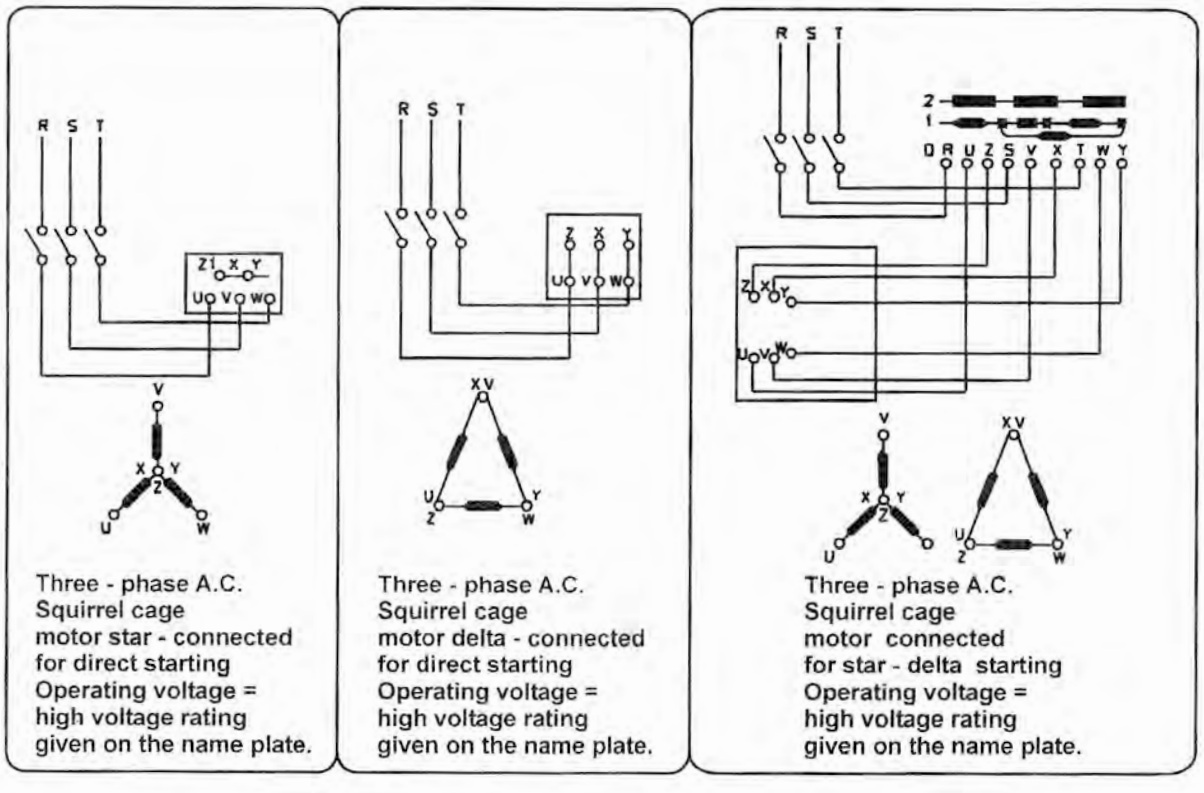
Connetion to Power System

All geared motors are factory-adjusted for maximum voltage if not stipulated otherwise. Make sure that the voltage on the installation site coincides with that indicated on the rating plate of the motor. The direction of rotation may be changed by interchanging two phases of the mains.

The geared motors are connected to the power supply system like any other three-phase A.C. Motors. There are no special instructions for Geared Motors beyond applicable for standard electric motors. The feed lines should be of sufficient diameter to avoid any notable drop of voltage upon starting the geared motors.

It is advisable to fit a protective motor switch with adjustable overload relays. This switch, which is adjusted to the motor rating, cuts out all three phases in case of overload or failure of one phase. The normal fuses can not give sufficient overload protection.

The connection diagram given below shows the usual types of connection of three phase A.C. Squirrel cage motors.



Geared Motors with pole and voltage changing system as well as motors for braking gears are provided with special connection diagrams which will be found on the inside of the terminal box of each motor.

STOP

- In frequency inverter operation, the motor must be provided with a corresponding ATEX approval.
- In frequency inverter operation in explosion group IIC, stray currents must be ruled out, since very low stray currents are already potentially explosive.

NOTE

- Please observe the operating instructions for the explosion-protected motor.

DANGER

- The electric installation has to be carried out by skilled personnel in compliance with electro-technical regulations and standards.

APPENDIX 4
APPROVED BEARING GREASES

SUPPLIER	LUBRICANT RANGE	ALLOWABLE OPERATING TEMPERATURE RANGE °C	
		ABOVE	TO
BP Oil International Limited	Energrease LS-EP	-30	130
Caltex	Multifak EP	0	120
Castrol International	LMX Grease	-40	150
	Spheerol AP	-30	110
	Spheerol EPL	-10	120
Fuchs Lubricants	Renolit EP	-25	100
Klüber Lubrication	Klüberlub BE 41-542	-20	140
Mobil Oil Company Limited	Mobilgrease XHP	-15	150
	Mobilith SHC	-20	180
Omega Manufacturing Division	Omega 85	-40	230
Optimol Ölwerke GmbH	Longtime PD	-45	140
Shell Oils	Albida RL	-20	150
	Alvania EP B	-20	120
	Nerita HV	-30	130
Texaco Limited	Multifak All Purpose EP	-30	140

Notes:

1) All the above greases are NLGI grade 2.

2) Refer to Power Build Pvt Ltd Application Engineers if the unit is operating in an ambient temperature outside the range of -30°C to 50°C.

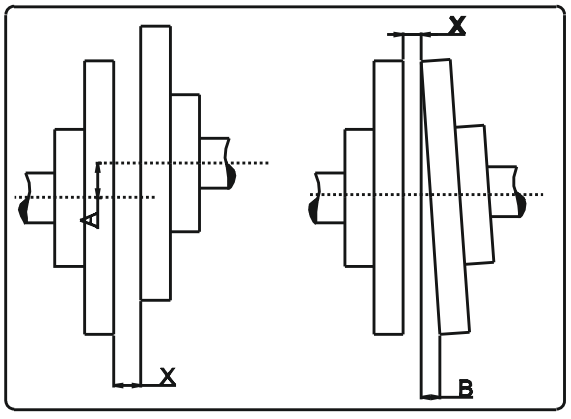
APPENDIX 5
CONNECTION WITH THE DRIVEN MACHINE

Connection with the Driven Machine

Since output shaft (low-speed shaft) and input shaft (high-speed shaft) are protected with rust preventive coating, remove it with thinner or a similar solvent.

1. Direct Connection

   (a) When the input shaft of the driven machine and the output shaft (low-speed shaft) of the geared motor/reducer are coupled directly, use a “flexible coupling” and make sure that both ends are in alignment. (Refer to Fig. 1.)



Allowance of Dimension A	0.05 mm
Allowance of Dimension B	0.04 mm
Dimension X	Specified by coupling maker

Fig. 1 Accuracy of alignment of direct coupling connection

2. When the machine is driven by V-belt, chain or gearing.

   Make arrangement to ensure that the shaft of driven machine and that of geared motor/reducer is positioned parallel. When the machine is driven by V-belt or chain, ensure that the center distance is not too long by setting the proper distance and belt and chain are stretched at right angle. When the machine is driven by gearing, geared motor/reducer should be installed setting up the accurate center distance and avoiding partial bearing of gears, and the output shaft is pushed downward.

   (a) Point of load application on the output shaft :

   When load (overhung load) is applied on the tip of the shaft, it may cause damage to the shaft. The gearing or chain sprocket wheel must be mounted such that the point of load application is as near as possible to the face of the unit to minimize overhung load.

   (b) Tension of chain:

   When using chain, it is necessary to give suitable slack to chain. If the tension of chain is too loose, excessive shock will be generated at starting or load fluctuations, which may damage both the geared motor/reducer and the driven machine. Generally, the recommended amount of slack is 2% of span distance. (Refer to Fig. 2.)

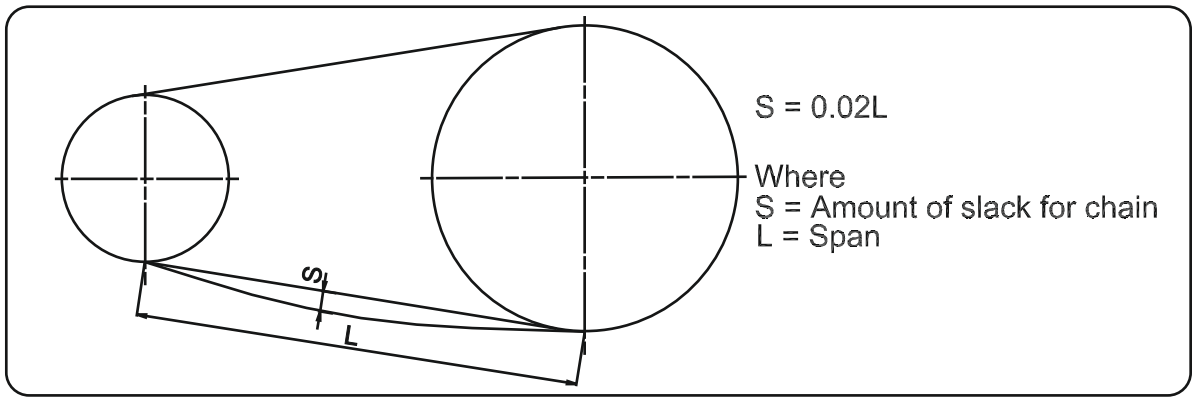


Fig. 2

(c) Layout of chain driving:

When using chain horizontally for connection with the drive and the driven machine, arrange shafts so as to give tension to the upper side of chain. Shaft arrangement of vertical transmission is not recommended, however, if necessary, the large wheel should be positioned at lower end.

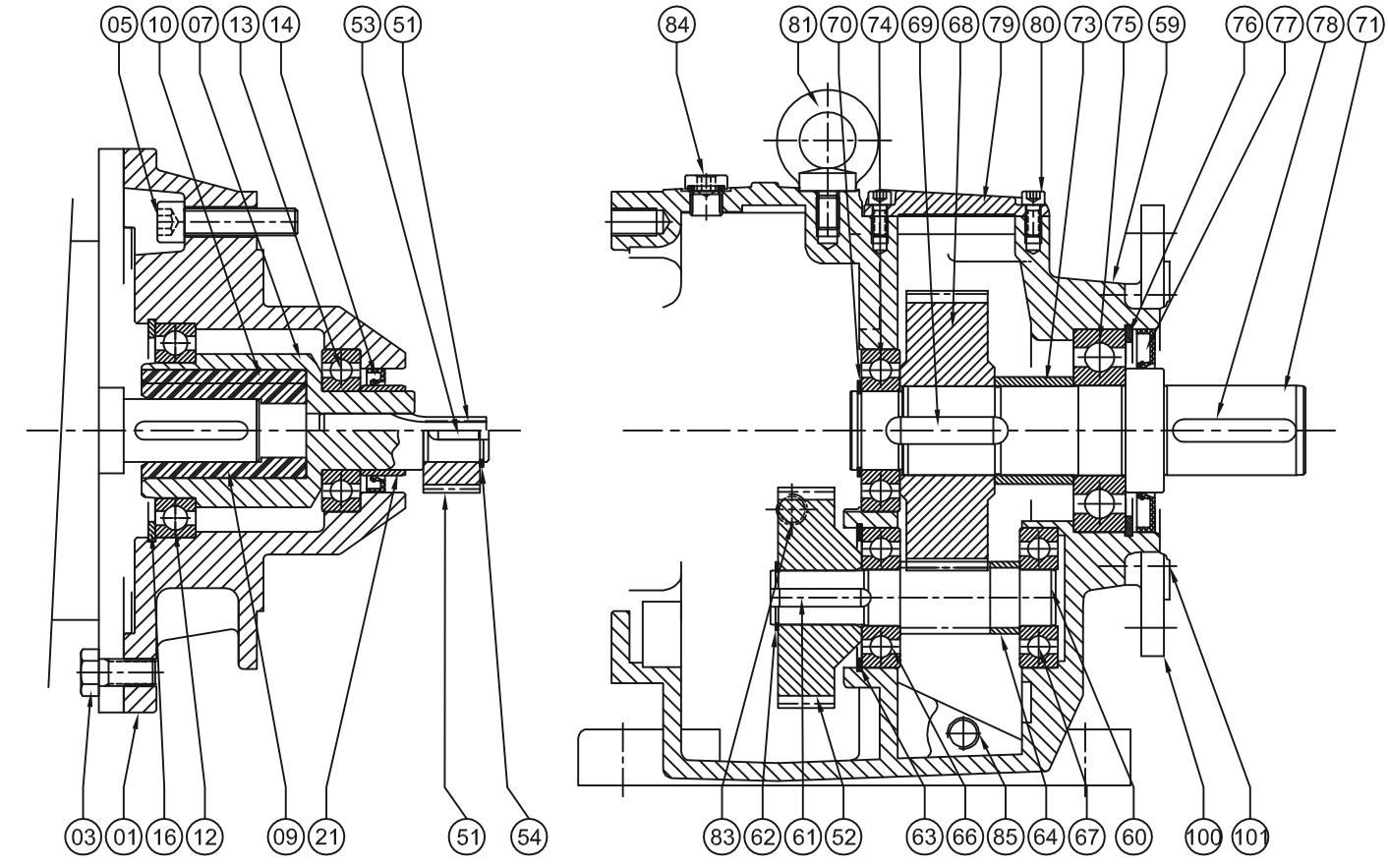
(d) When load (overhung load) is applied on the output shaft, please make sure that it is within the limit of allowable value. Allowable value of overhung load is shown in graph of catalogue.

3. Dimension of keyway

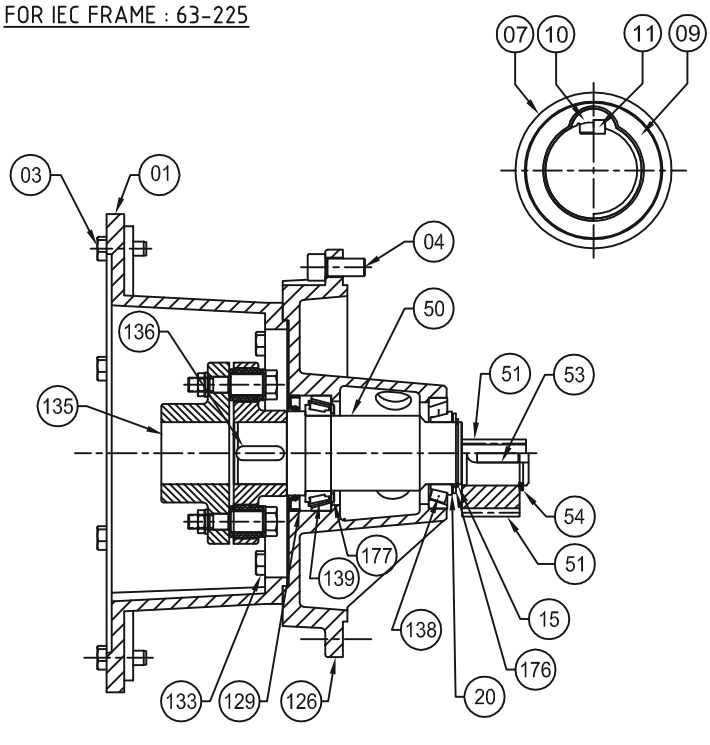
Dimension of the shaft end keyway is in accordance with DIN 6885.

Danger!

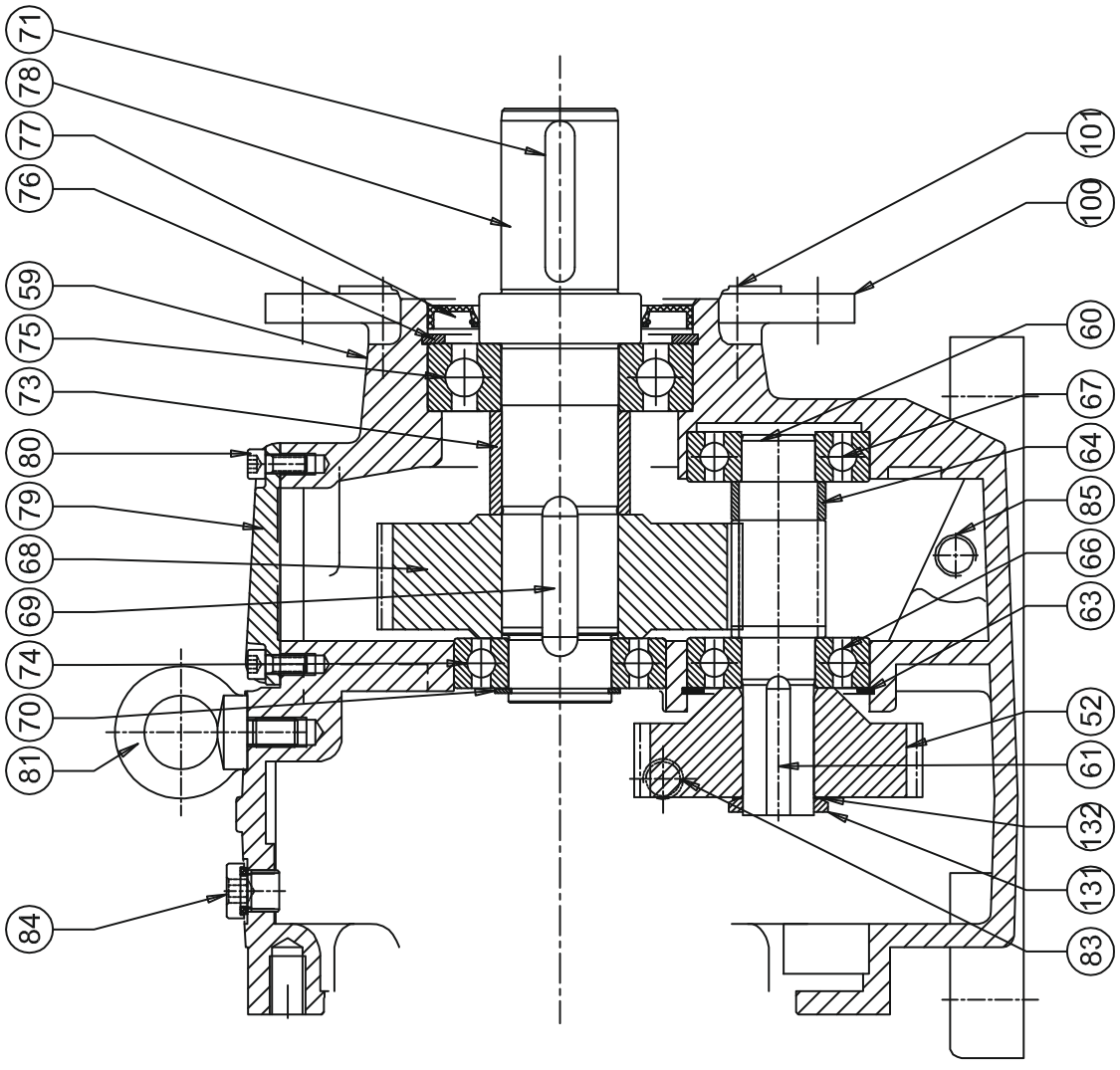
- The assembly of the single components tested by ATEX must be checked for new ignition danger.
- The belt device is equipped with a pre-tension device.
- In explosion group IIC, no belt drives are permissible in category 2!



FOR IEC FRAME : 63-225



FOR IEC FRAME : 250 & 280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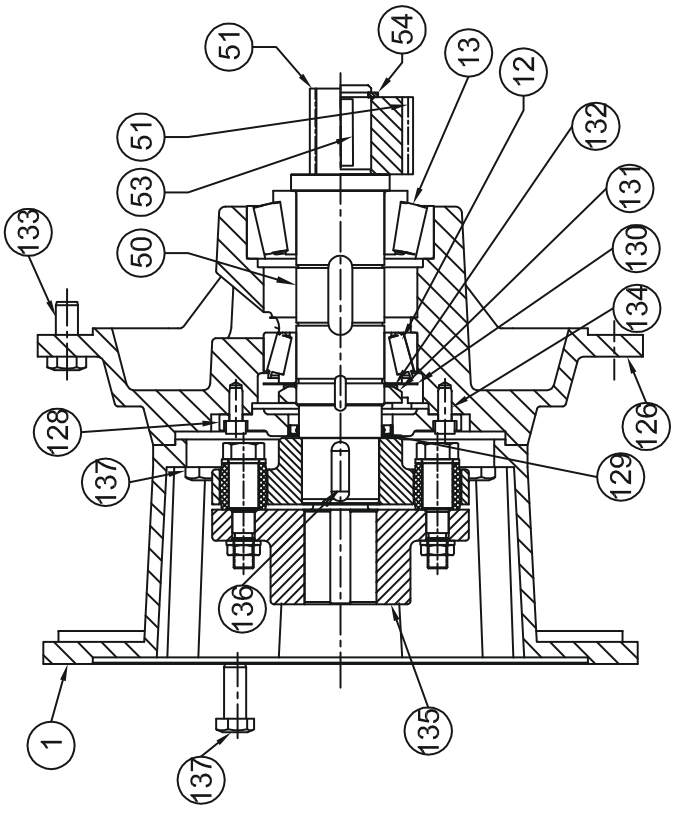
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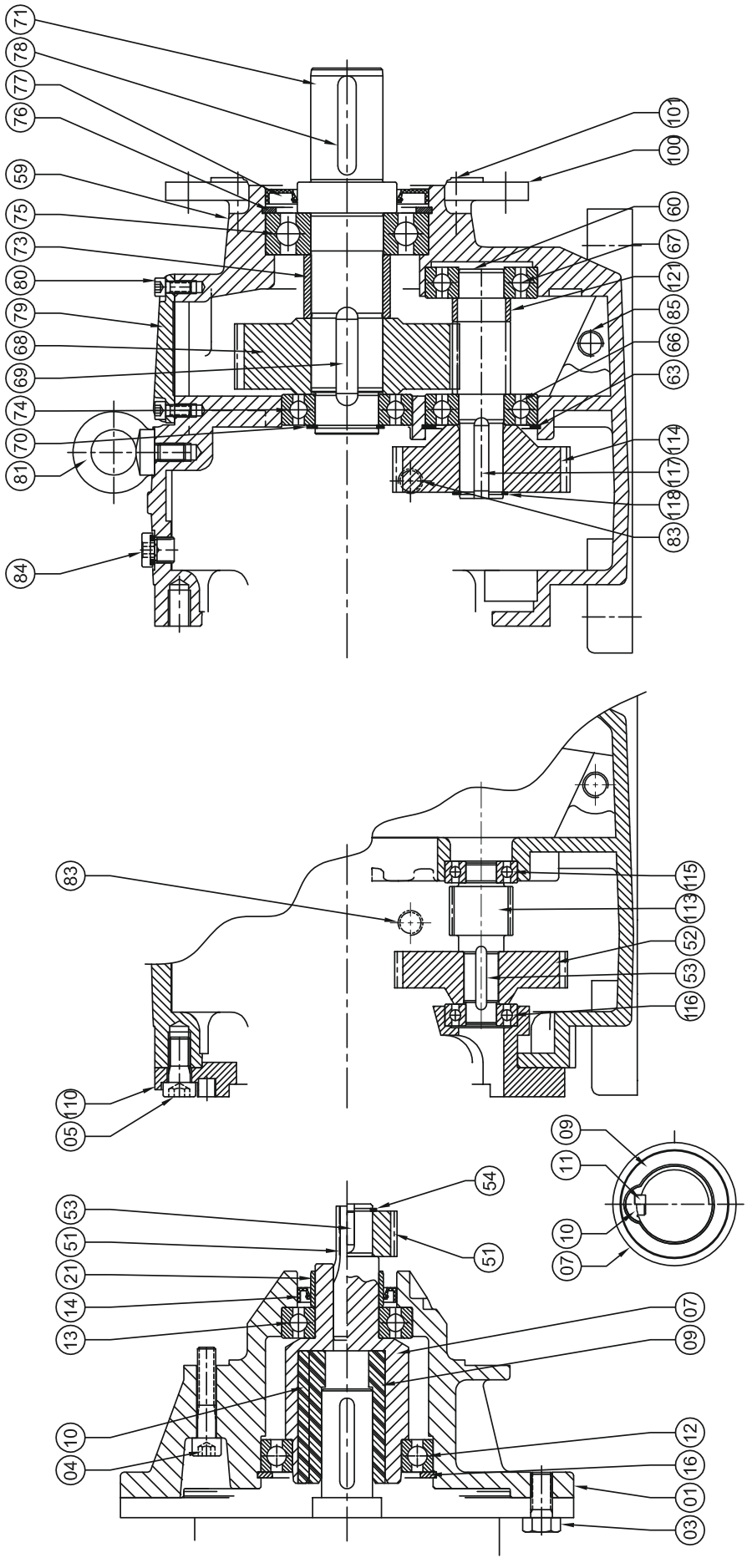
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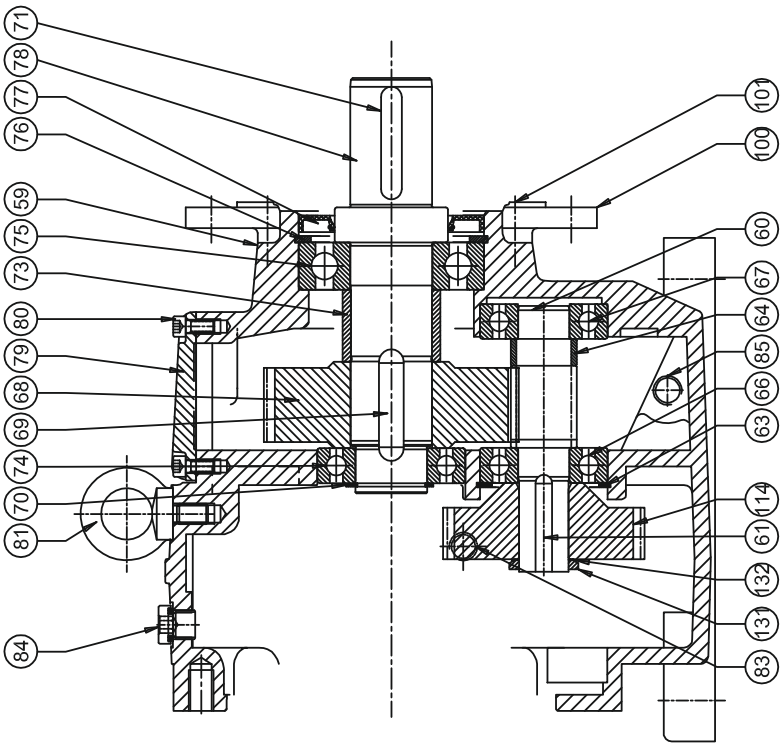

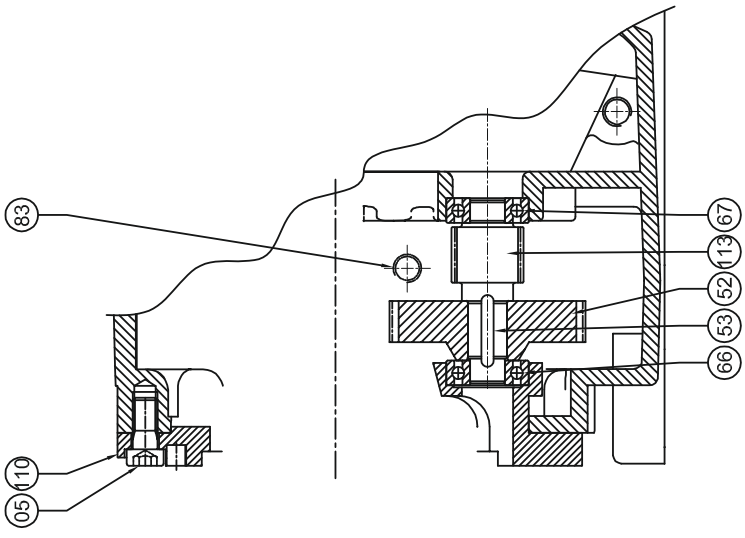

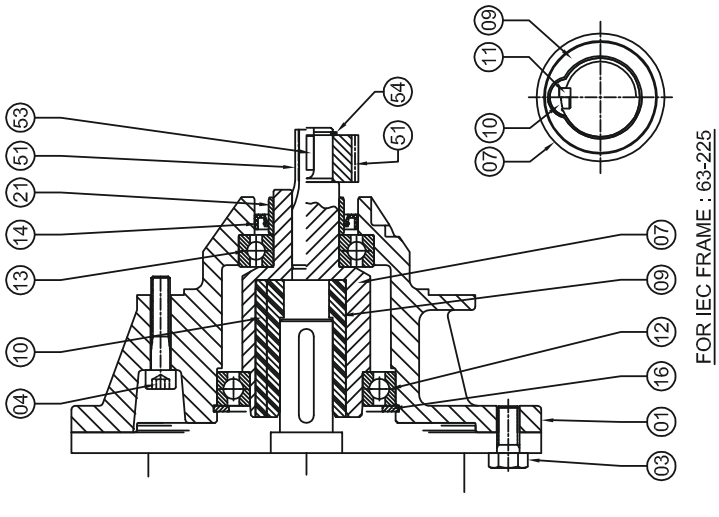

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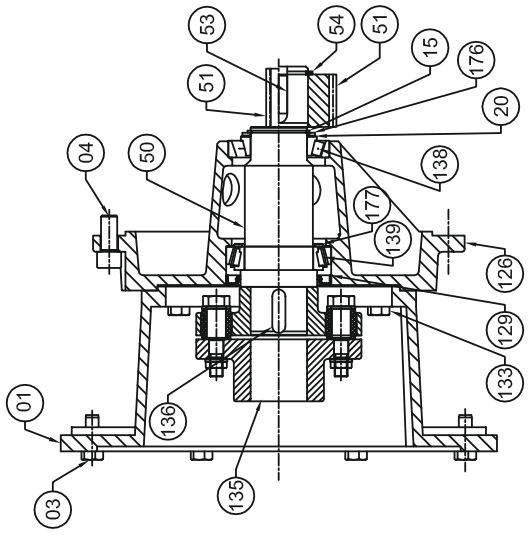

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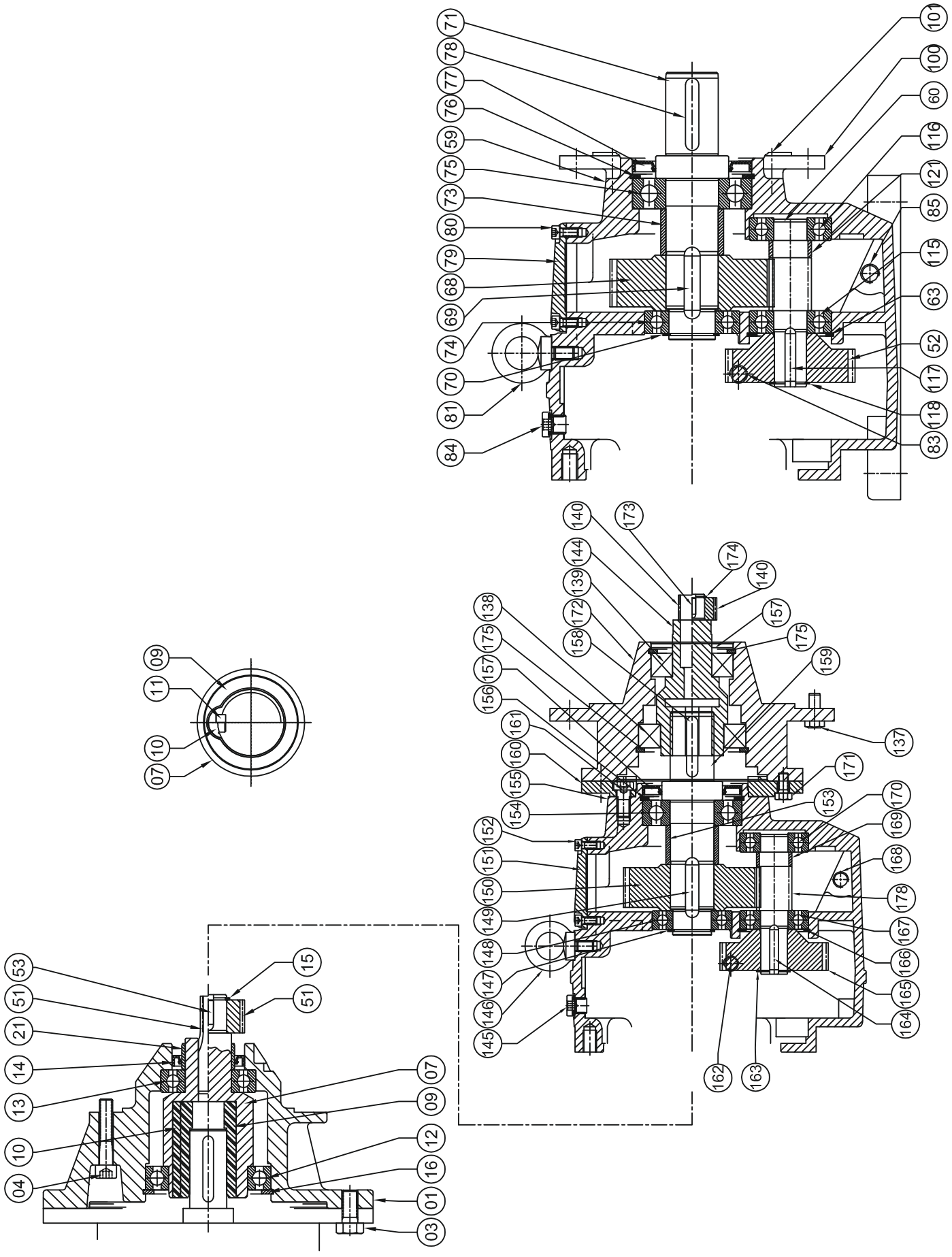
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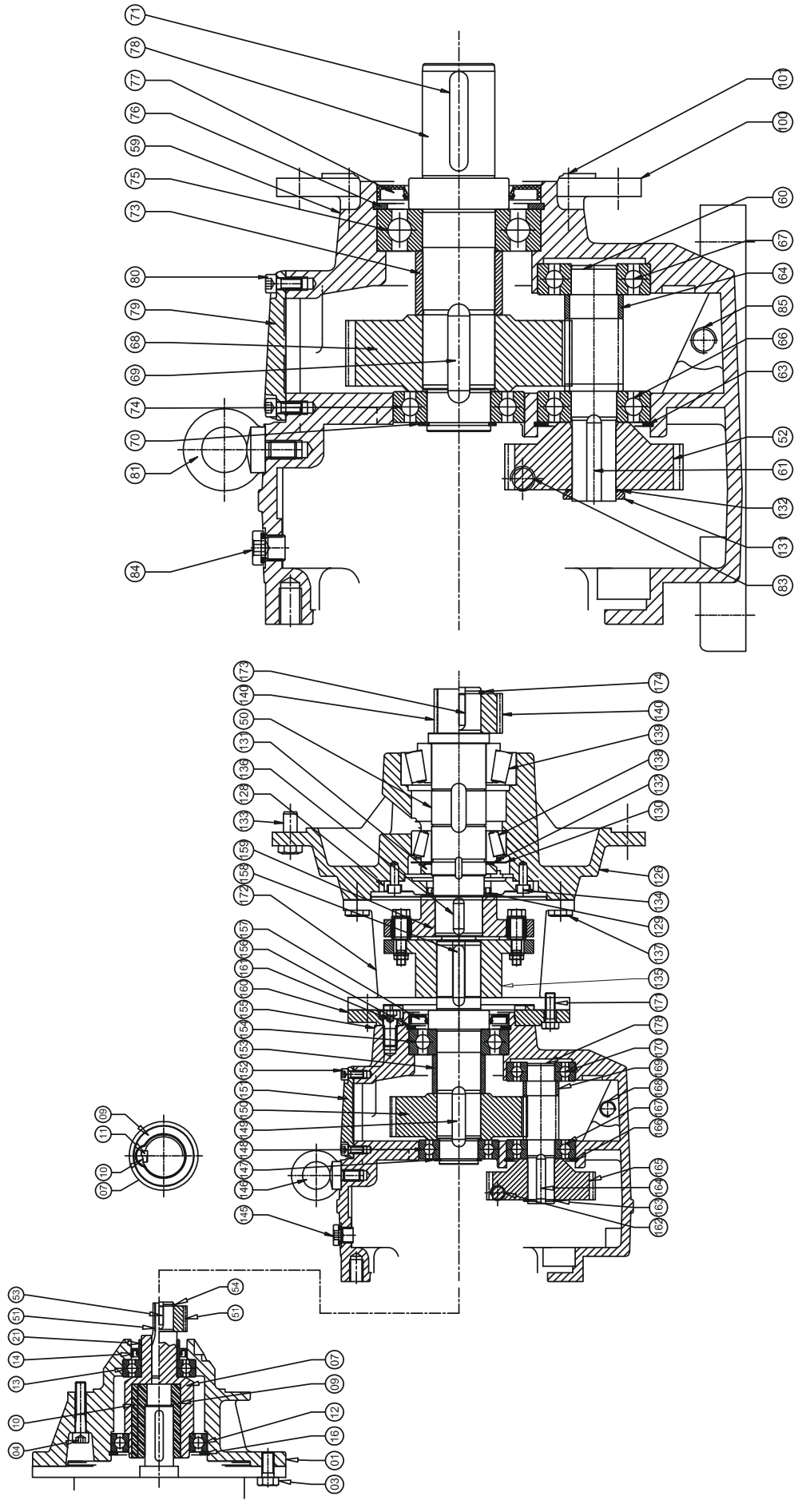
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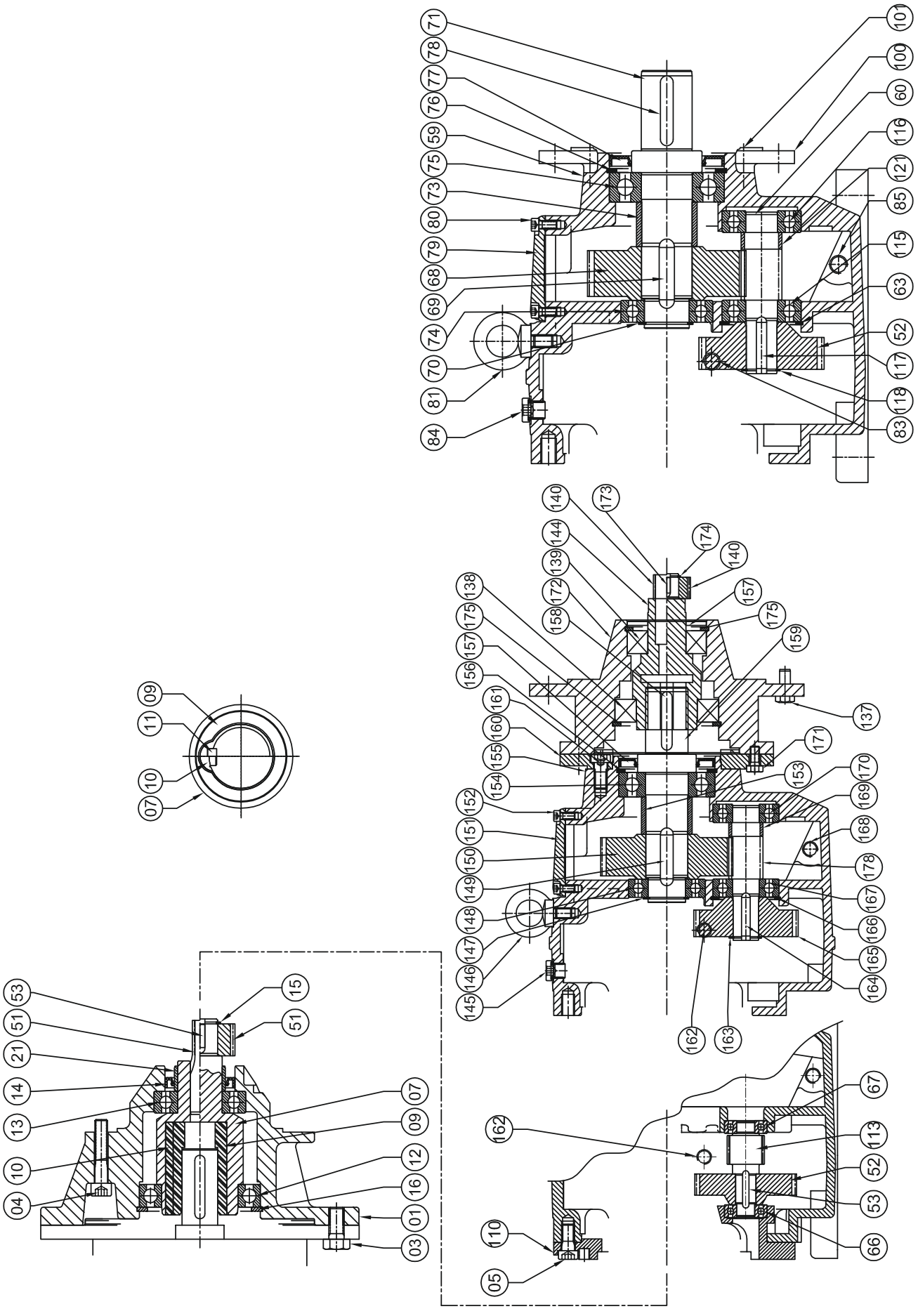
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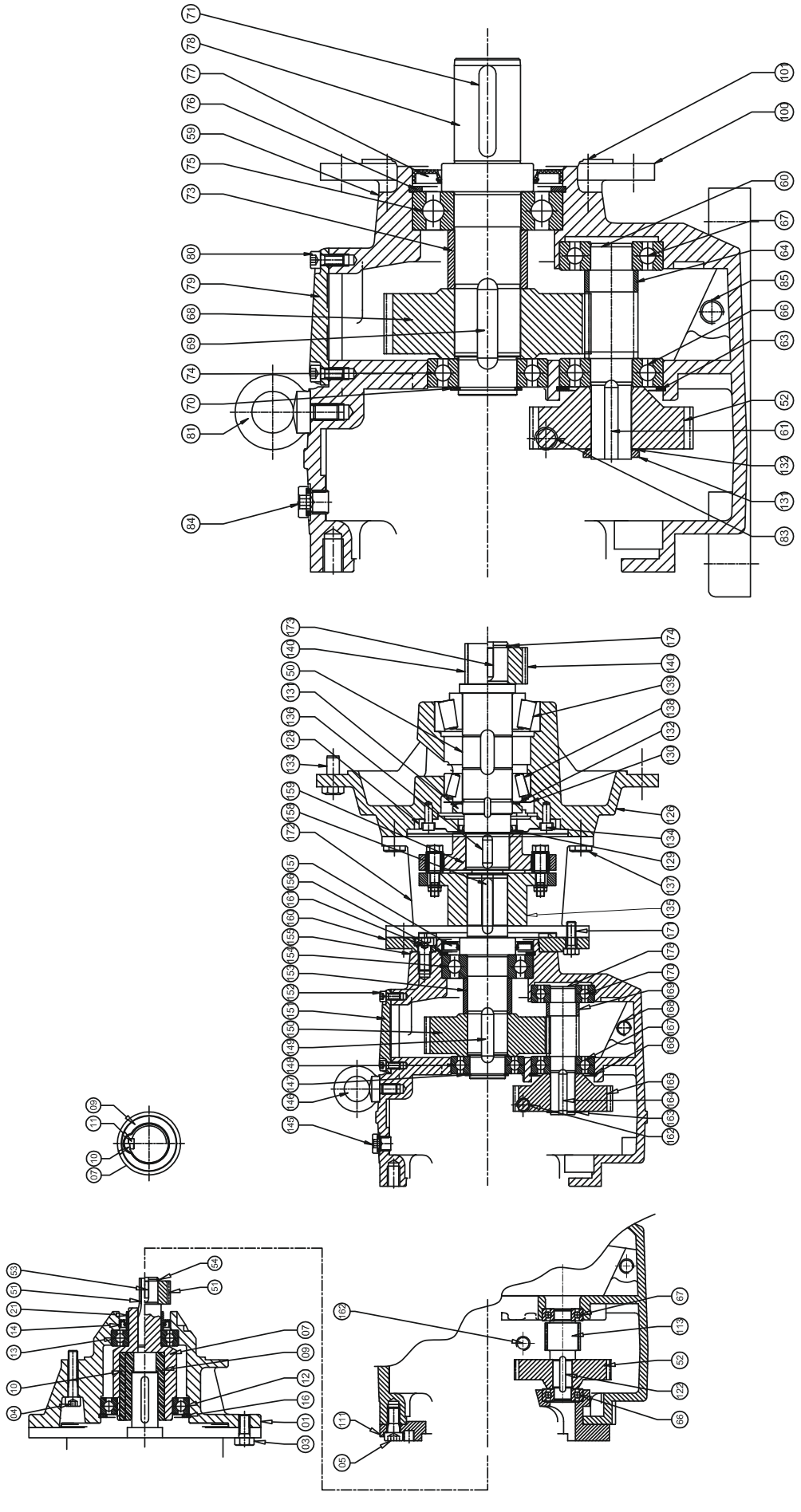
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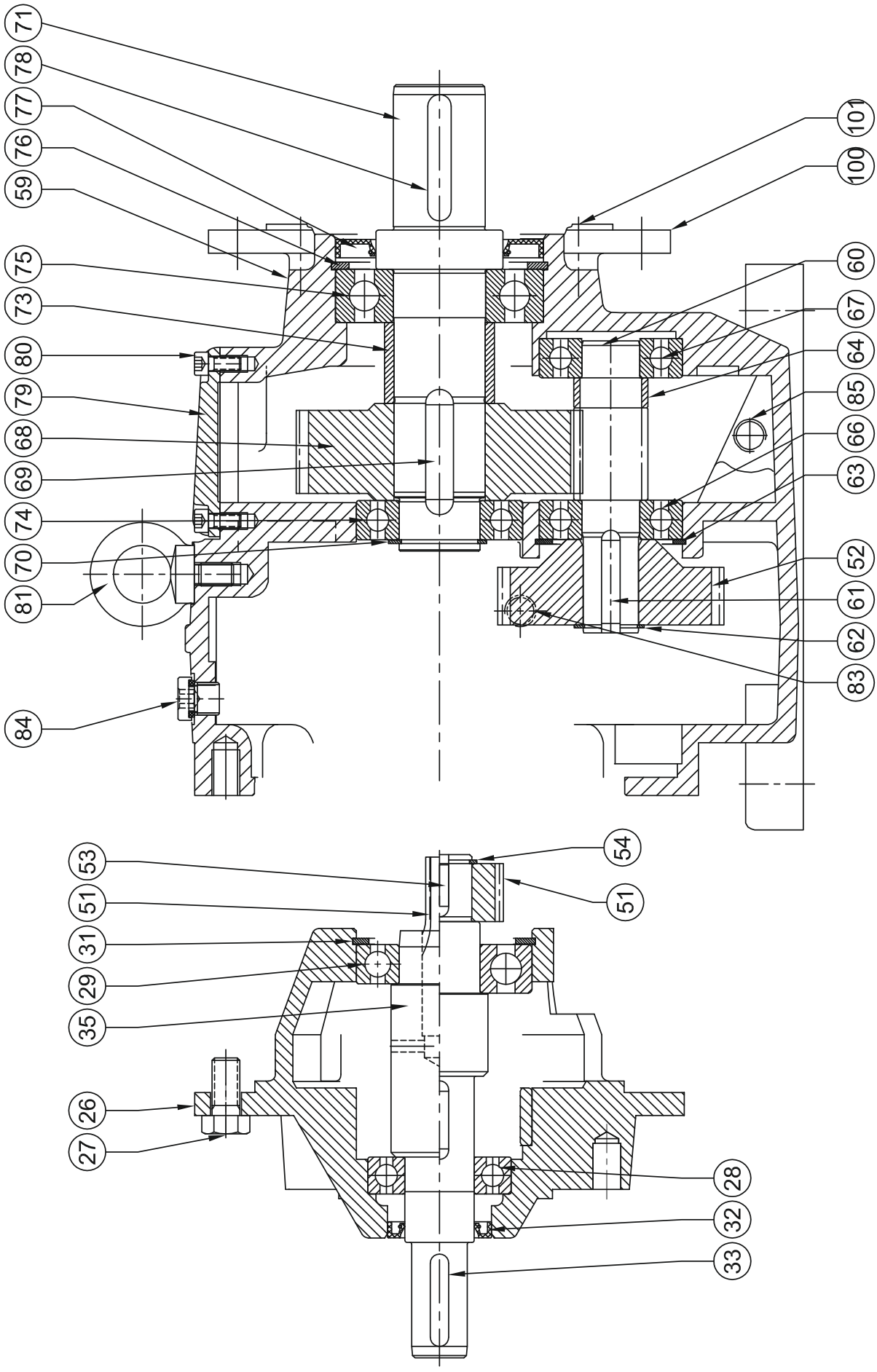
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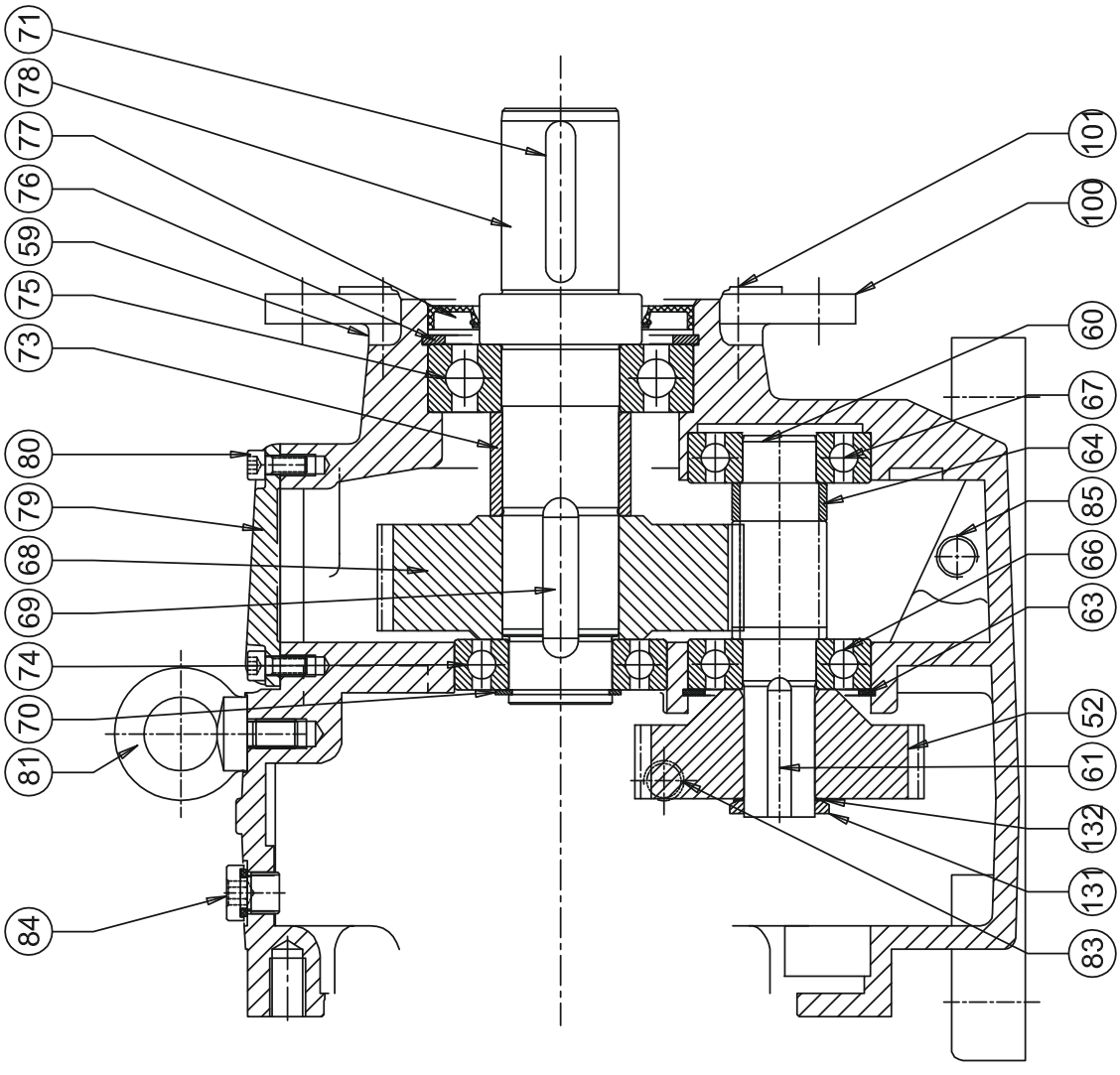
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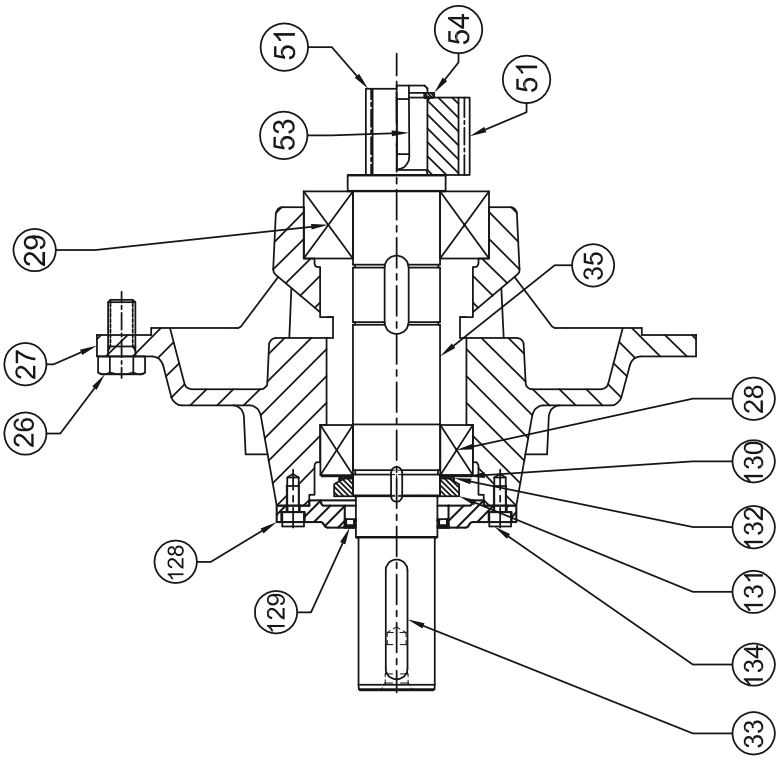
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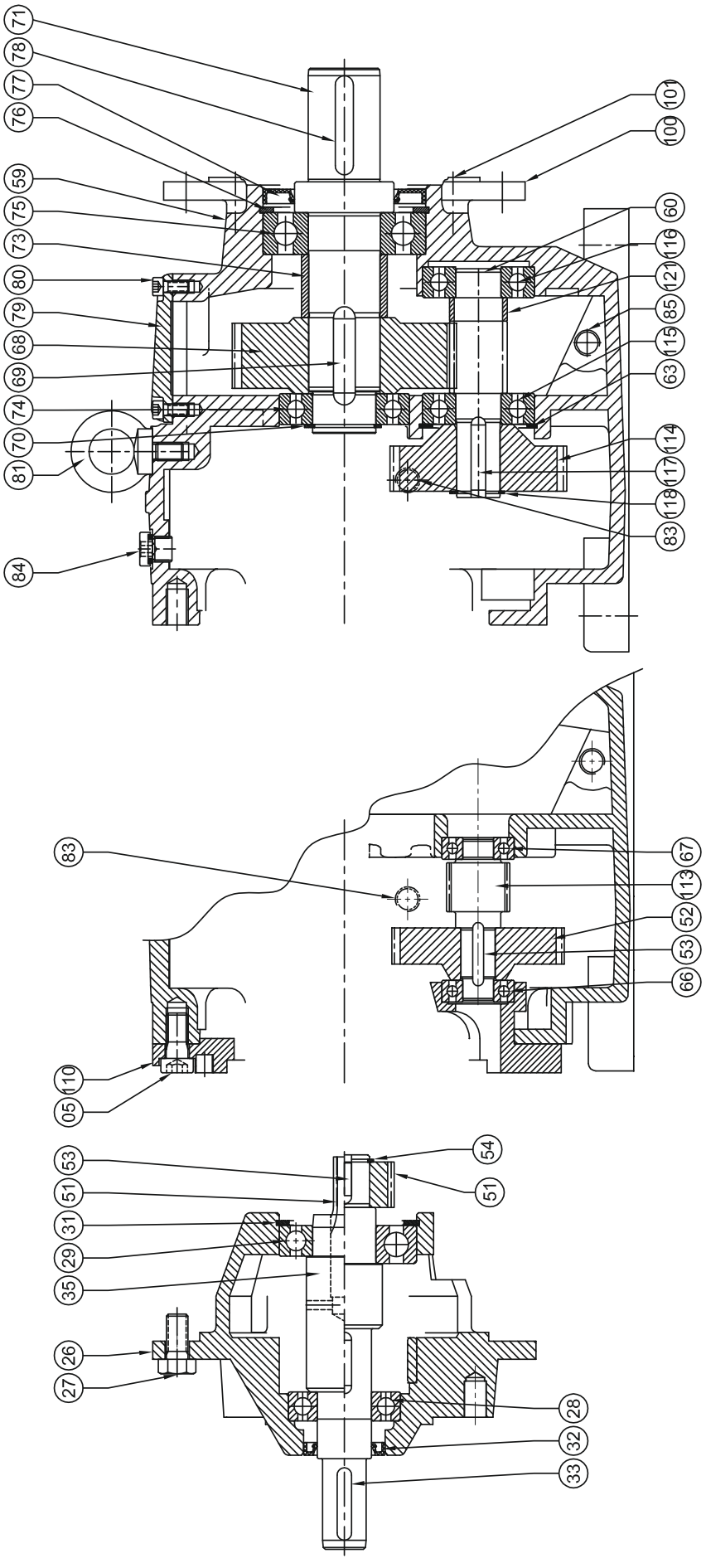
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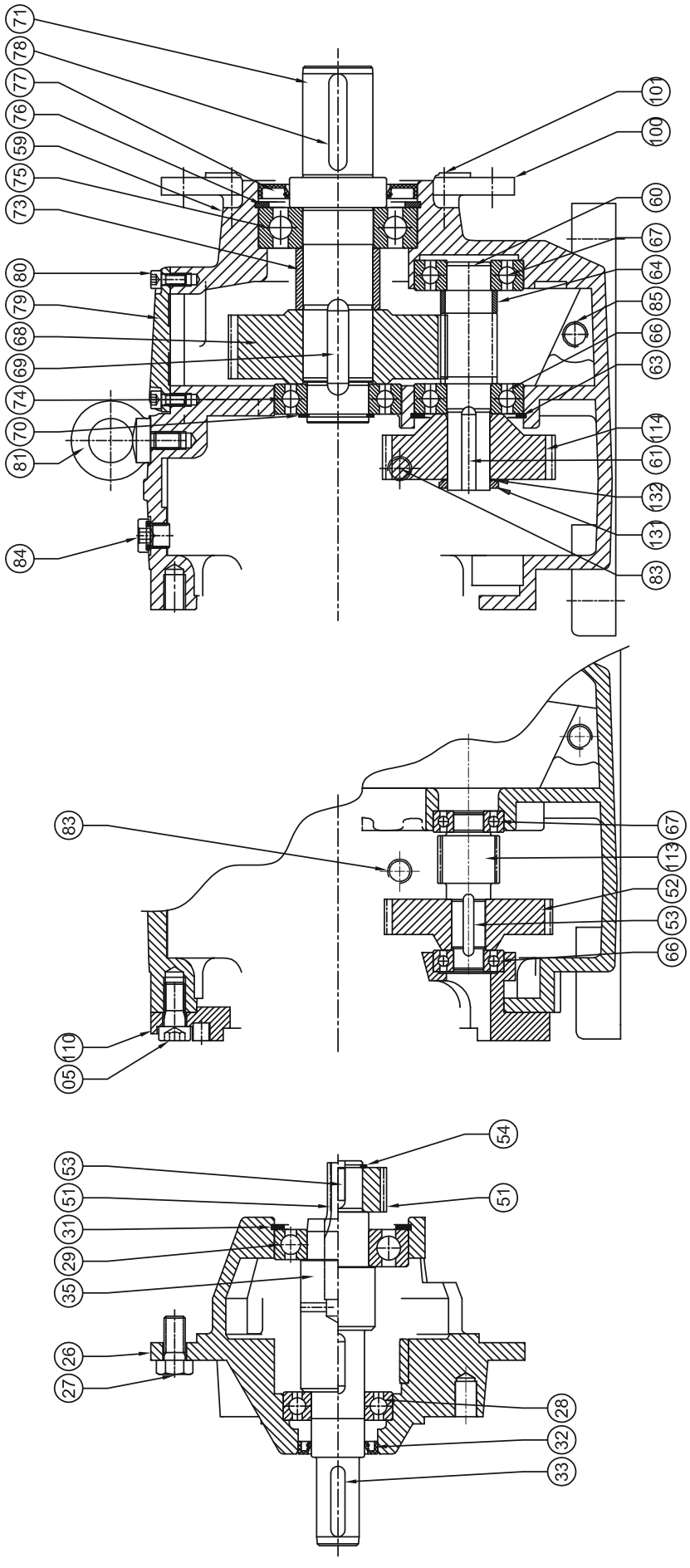
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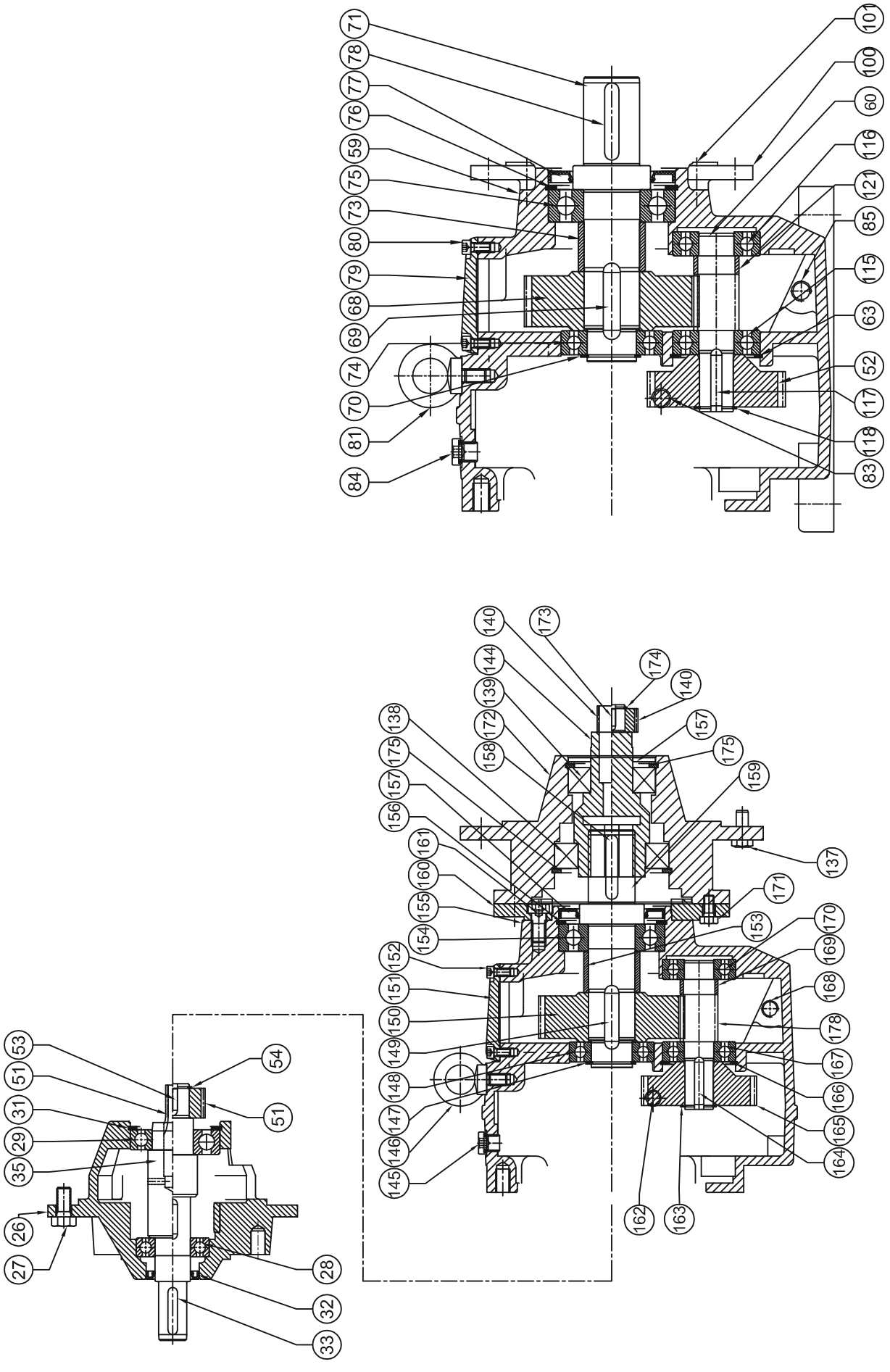
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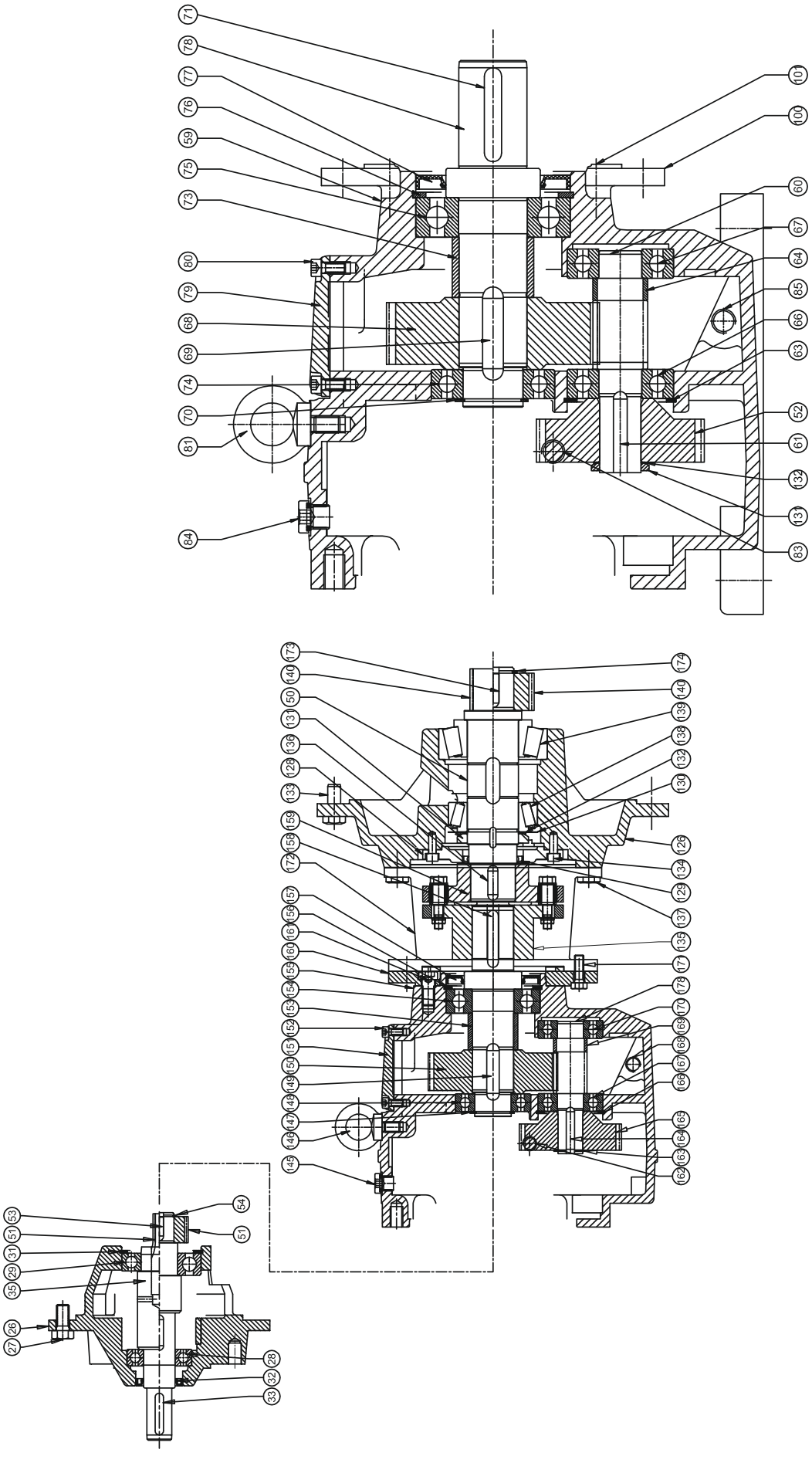
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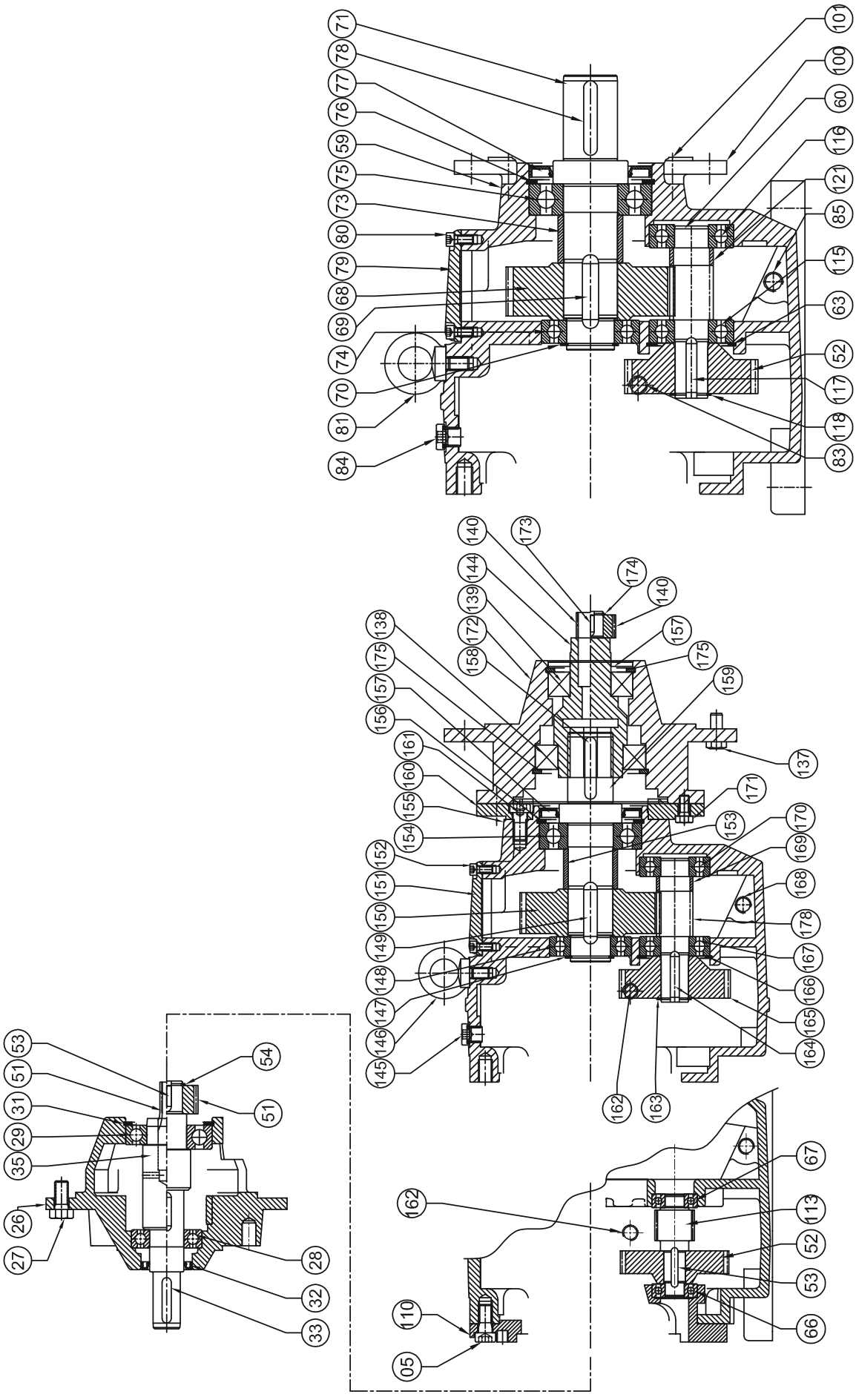
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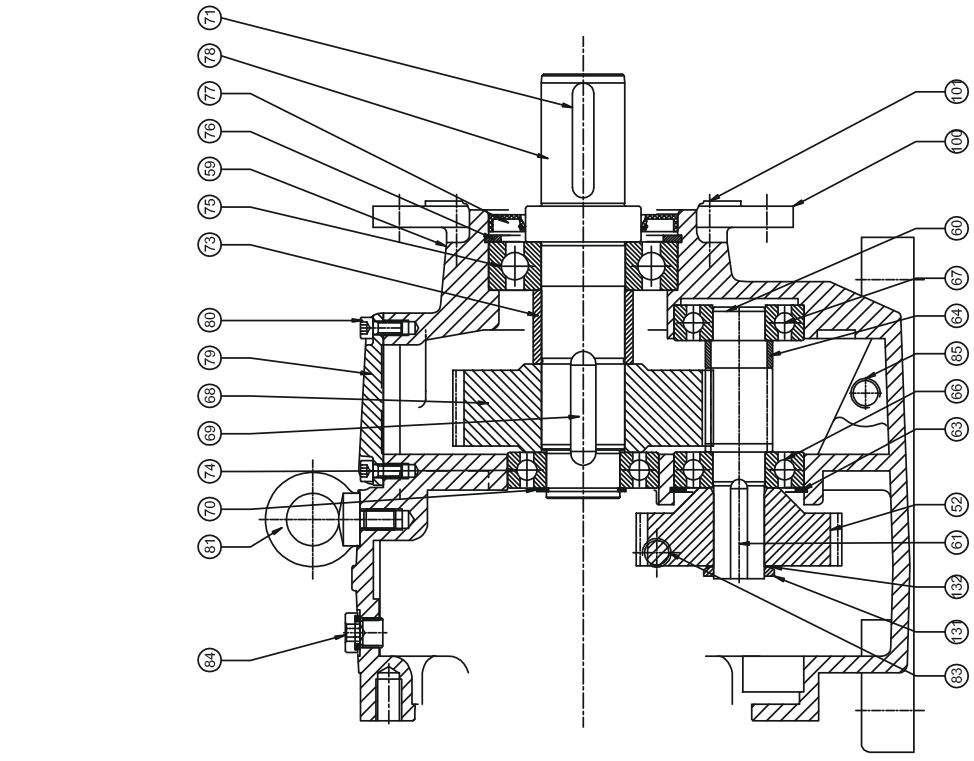
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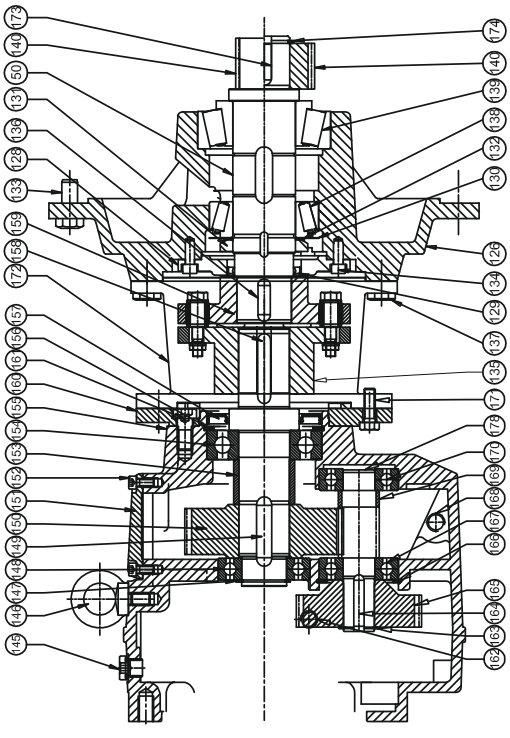
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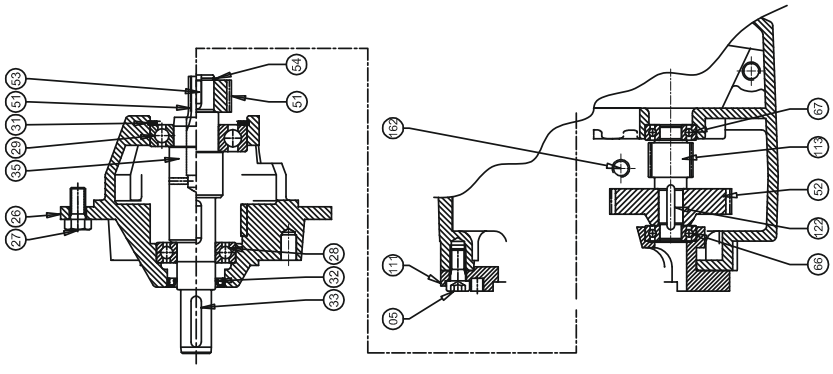
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1 Motor Adaptor	68 FG Wheel	120 Hexagon Socket Head Cap Screw
2 Flange (Adaptor)	69 Key (FG Wheel+O/p Shaft/Sleeve)	121 Distance Piece
3 Fastener (Adaptor+Motor)	70 External Criclip O/p End Bearing	122 Key (PG Kit Pinion+Primary wheel)
4 Fastener (Adaptor+Flange)	71 O/p Shaft (M,C,F,K)(Double Extended)	123-125 -
5 Fastener (Flange+Gear Case)	72 O/p Sleeve (C,F,K)	126 Motor Adaptor
6 Nut (In Triple Only)	73 Distance Piece (O/p Shaft/Sleeve)	127 External Circlip
7 Plug in Shaft	74 Bering O/p Shaft (Wheel End)	128 Oil Catcher
8 Coupling	75 Bering O/p Shaft (O/p End)	129 Oil Seal
9 Nylon Sleeve	76 Internal Circlip O/p End Bearing	130 Flinger
10 Nylon Key	77 O/p Oil Seal	131 Lock Nut
11 Key	78 Key (O/p Shaft End)	132 Tab Washer
12 Bearing (Motor Side)	79 Inspection Cover	133 Fasteners (Adaptor+Gear Case)
13 Bearing (Pinion Side)	80 Fastener Gear Case+Cover	134 Fasteners (Oil Catcher+Adaptor)
14 Oil Seal Input	81 Eye Bolt	135 Input Coupling
15 Circlip (Pinion Side)	82 Shim	136 Key
16 Circlip (Motor Side)	83 Oil Level Indicator	137 SCREW ISO 4017 GR8.8ZP
17 Nilos Ring	84 Vent Plug	138 Bearing (Coupling Side)
18 Grease Nipple	85 Drain Plug	139 Bearing (Pinion Side)
19 Support Washer	86 Bevel Pinion (K)	140 Pinion
20 Shims	87 Nilos Ring On FG Pinion (K)	141 Key
21 Wear Sleeve	88 Circlip For PG Wheel on Bevel Pinion	142 Circlip (Pinion Side)
22-25 -	89 Bearing On Bevel Pinion 1	143 Circlip (Motor Side)
26 Housing Input	90 Bearing On Bevel Pinion 2	144 Plug in Shaft
27 Fastener Housing+Gear Case	91 Bevel Wheel (K)	145 Vent Plug
28 Bearing (Motor Side)	92 Key (Bevel Wheel+FG Pinion)	146 Eye Bolt
29 Bearing (Pinion Side)	93 End Cover For Bevel Bore	147 External Criclip O/p End Bearing
30 Nilos Ring-32214JV	94 Internal Circlip For FG Pinion Bearing	148 Bering O/p Shaft (Wheel End)
31 Circlip	95 Backstop	149 Key (FG Wheel+O/p Shaft/Sleeve)
32 Oil Seal	96 Key For Backstop	150 FG Wheel
33 Key	97 External Circlip for Backstop	151 Inspection Cover
34 Support Washer	98 Nilos Ring 1 On O/p (K)	152 Fastener Gear Case+Cover
35 Input Shaft	99 Nilos Ring 2 On O/p (K)	153 Distance Piece (O/p Shaft/Sleeve)
36 Shim	100 O/p Flange (M)	154 Bering O/p Shaft (O/p End)
37 Grease Nipple	101 Flange Fastener (M)	155 Gear Case
38 Primary Pinion	102 Worm Wheel	156 Internal Circlip O/p End Bearing
39-50 -	103 Worm Shaft	157 O/p Oil Seal
51 Primary Pinion	104 Grease Nipple (C07-C10)	158 Key (O/p Shaft End)
52 Primary Wheel	105 Key (O/p Sleeve+O/p Shaft)	159 O/p Shaft (M,C,F,K)(Double Extended)
53 Key	106 Circlip (O/p Sleeve+O/p Shaft)	160 O/p Flange
54 Circlip	107 Washer (O/p Sleeve)	161 Fasteners (Gear Case+O/p Flange)
55 Lock Nut	108 Bolt (O/p Sleeve+O/p Shaft)	162 Oil Level Indicator
56 Lock Washer	109 -	163 Circlip For Triple Wheel on PG Pinion
57-58 -	110 Triple Housing	164 Key (PG Kit Pinion+Triple Wheel)
59 Gear Case	111 Triple Ring	165 Triple Wheel
60 Final Pinion	112 Copper Washer	166 Internal Circlip for Intermediate Bearing)
61 Key (PG Wheel+FG Pinion)	113 Triple Pinion	167 Bearing Input Side
62 Circlip for PG Wheel	114 Triple Wheel	168 Drain Plug
63 Internal Circlip for Intermediate Brg.)	115 Bearing Input Side	169 Distance Piece
64 Distance Piece FG Pinion	116 Bearing Pinion Side	170 Bearing Pinion Side
65 End cover for FG Pinion	117 Key (PG Kit Pinion+Triple Wheel)	171 Fasteners (Flange+Connecting Adaptor)
66 Bearing FG Pinion 1	118 Circlip For Triple Wheel on PG Pinion	172 Connecting Adaptor
67 Bearing FG Pinion 2	119 Circlip For Triple Bore	

Notes :

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