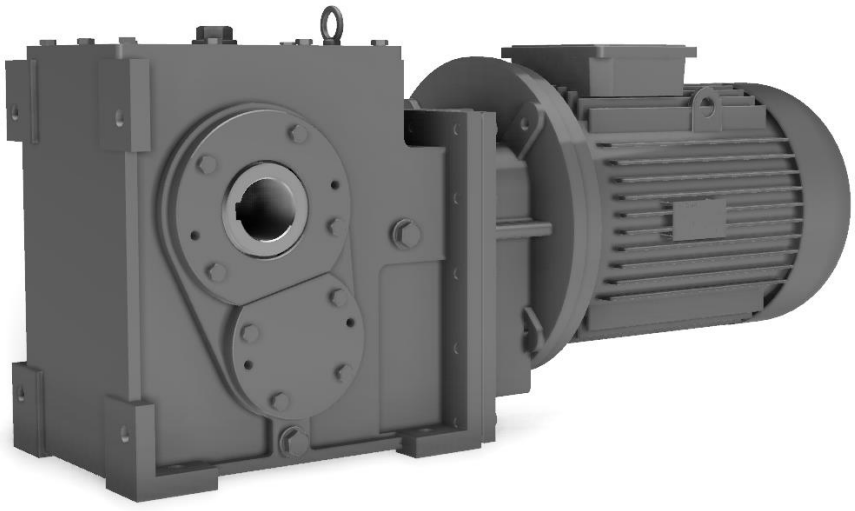
DZ SERIES

GEARBOX

OPERATING MANUAL



INDEX

1. How to Use This Manual

1.1 General Information

This operating manual should be kept in close proximity to the area where the gearbox operates and should be reachable at all times. Before starting-up the gearbox, please read this manual carefully and follow the instructions strictly. Failure to follow instructions may result in voiding your warranty.

For motorgears, please also follow the operating instructions of the motor manufacturer.

1.2 Safety and Information Symbols

Please pay attention to the safety and information symbols below.

Danger ! - Can cause severe or fatal injuries

Warning ! - Can damage the gearbox or environment

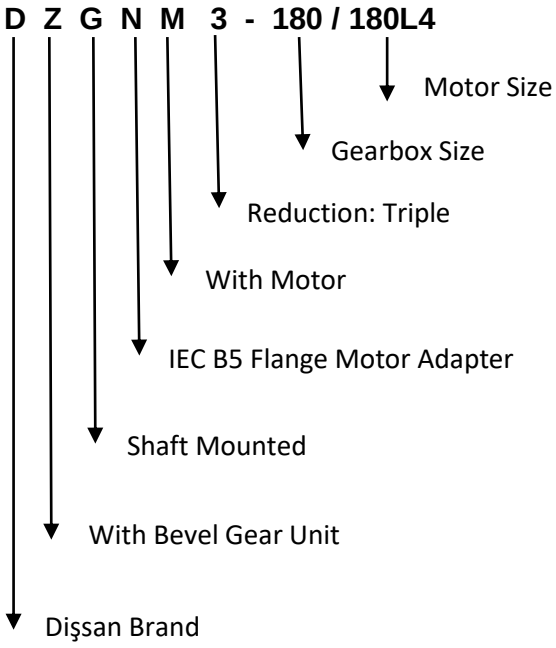
Note ! - Important Information

2. Gearbox Type Definitions

2.1 Type Definitions

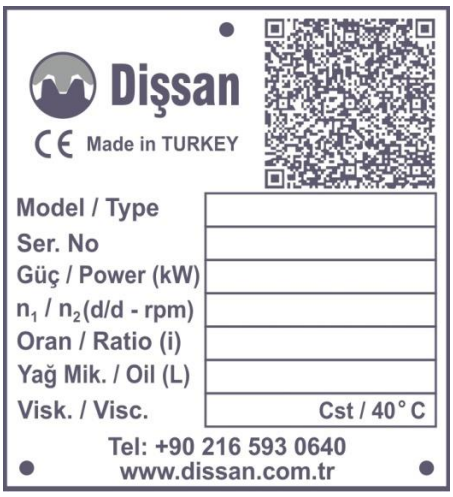
DZGN	Helical spur gear and bevel gear units, shaft mounted, with IEC B5 motor adapter, without motor
DZDN	Helical spur gear and bevel gear units, solid output shaft, with IEC B5 motor adapter, without motor
DZGNM	Helical spur gear and bevel gear units, shaft mounted, with IEC B5 motor adapter, with motor
DZDNM	Helical spur gear and bevel gear units, solid output shaft, with IEC B5 motor adapter, with motor
DZGM	Helical spur gear and bevel gear units, shaft mounted, with motor
DZDM	Helical spur gear and bevel gear units, solid output shaft, with motor
DZGT	Helical spur gear and bevel gear units, shaft mounted, solid input shaft, without motor
DZDT	Helical spur gear and bevel gear units, solid output shaft, solid input shaft, without motor

2.2 Type Definition Example



2.3 Nameplate Definitions

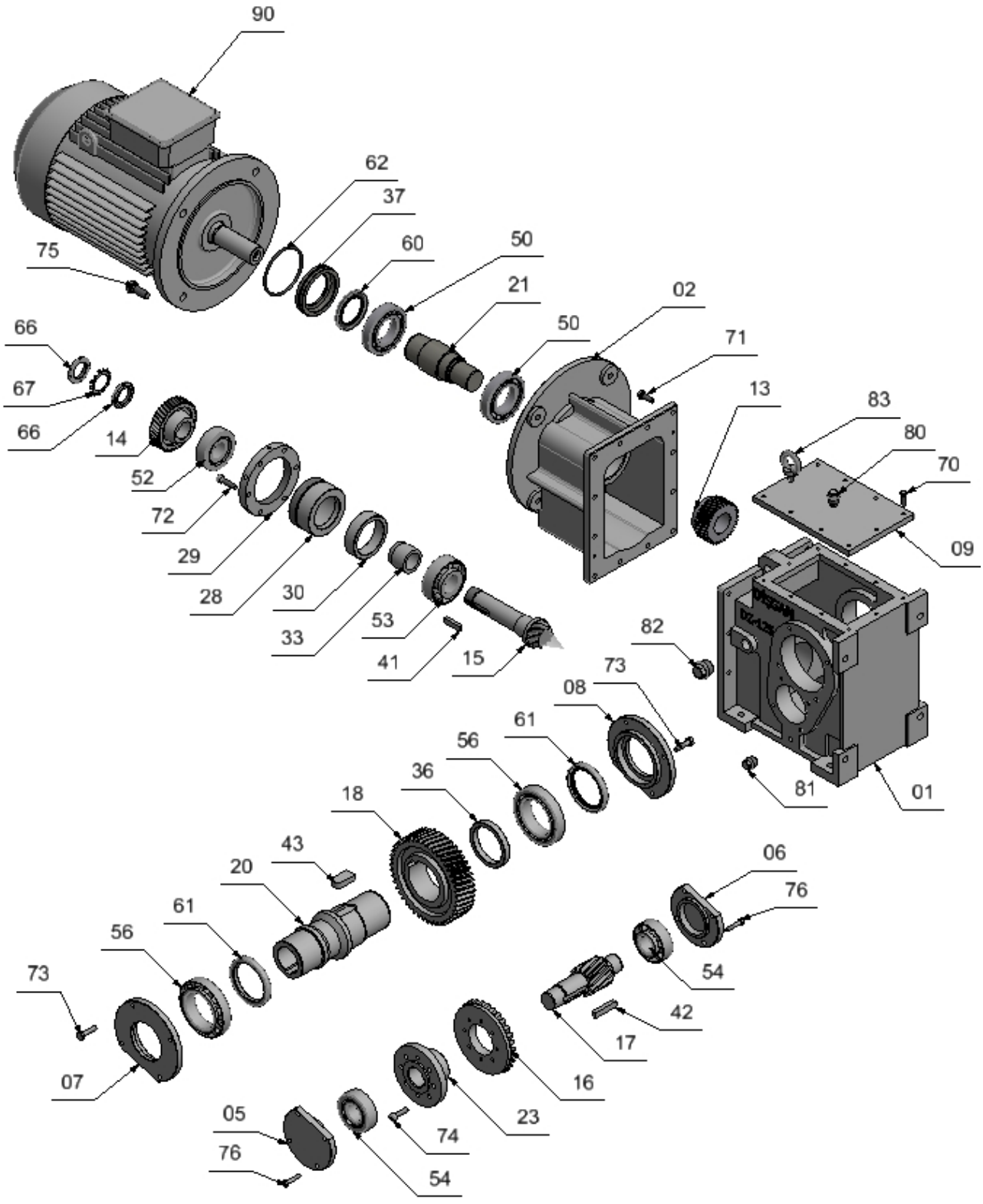
The nameplate identifies the type of product and its features. Therefore, nameplates must not be removed, should be kept intact and legible. Please state the serial number on the nameplate when ordering spare parts for the gearbox.



Type	: Gearbox Type and Size
Ser.No	: Serial Number
Power (kW)	: Motor Power
n_1/n_2 (rpm)	: Input and Output Speeds
Ratio (i)	: Reduction Ratio (n_1: n_2)
Oil (L)	: Oil Amount
Visc	: Oil Viscosity

3. Part Lists

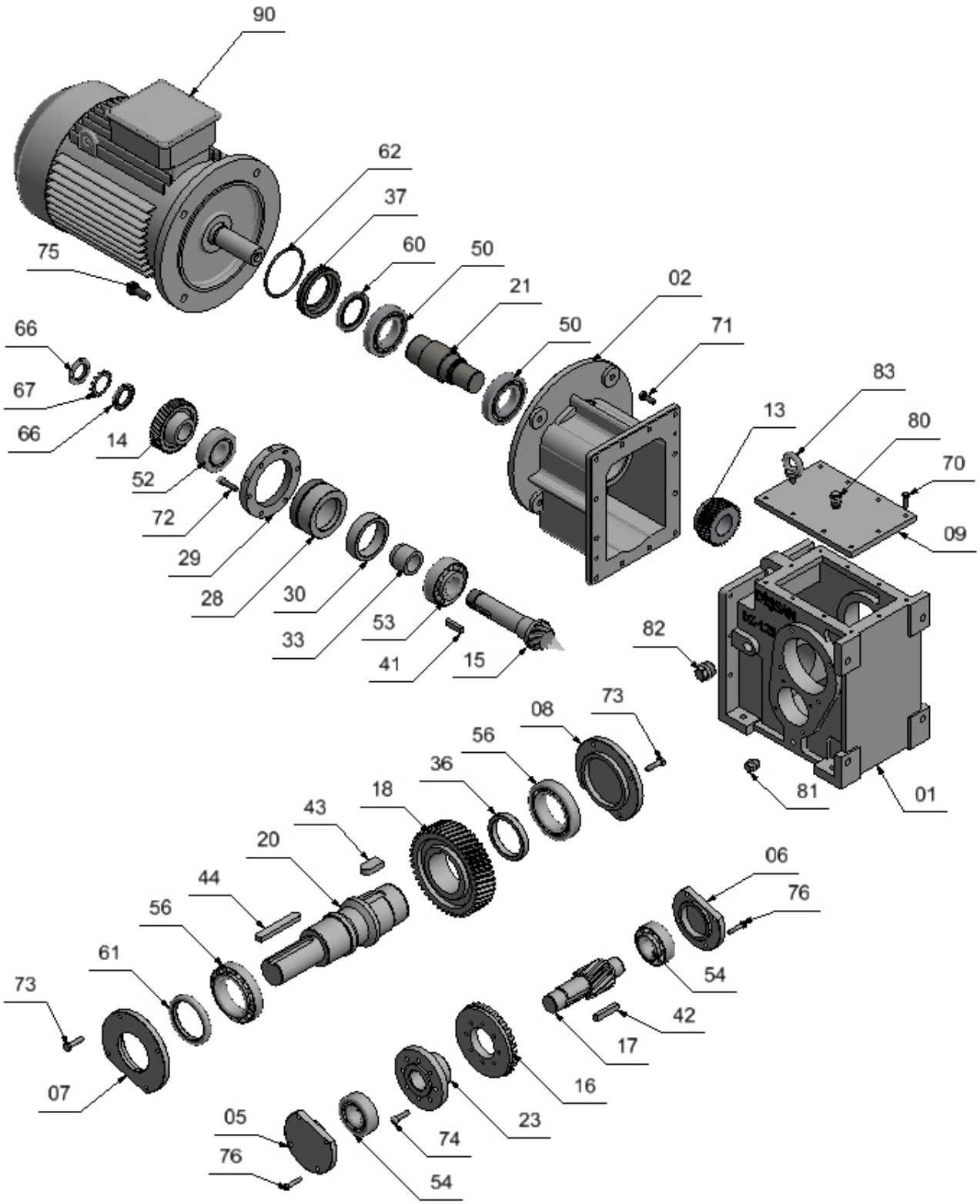
3.1 DZGNM Model



DZGNM Part List

Part No	Quantity	Part Definition
01	1	Housing
02	1	Front-stage Housing
05	1	Cover
06	1	Cover
07	1	Cover
08	1	Cover
09	1	Upper Cover
13	1	I.Stage Pinion Gear
14	1	I.Stage Gear
15	1	II.Stage Bevel Pinion Gear
16	1	II.Stage Gear
17	1	III.Stage Pinion Gear
18	1	III.Stage Gear
20	1	Output Shaft
21	1	Input Shaft
23	1	Gear Hub
28	1	Bearing Bed
29	1	Setting Ring
30	1	Ring
33	1	Ring
36	1	Ring
37	1	Oil Seal Ring
41	1	Key
42	1	Key
43	1	Key
50	2	Bearing
52	1	Bearing
53	1	Bearing
54	2	Bearing
56	2	Bearing
60	1	Oil Seal
61	2	Oil Seal
62	1	O-Ring
66	2	Shaft Nut
67	1	Safety Washer
70	10	Hexagon Head Bolt
71	12	Hexagon Head Bolt
72	6	Imbus Cıvata
73	8	Hexagon Head Bolt
74	8	Countersunk Head Bolt
75	4	Hexagon Head Bolt
76	8	Hexagon Head Bolt
80	1	Oil Filling and Breathing Plug
81	2	Oil Drain Plug
82	1	Oil Level Plug
83	1	Eye Bolt
90	1	Electric Motor

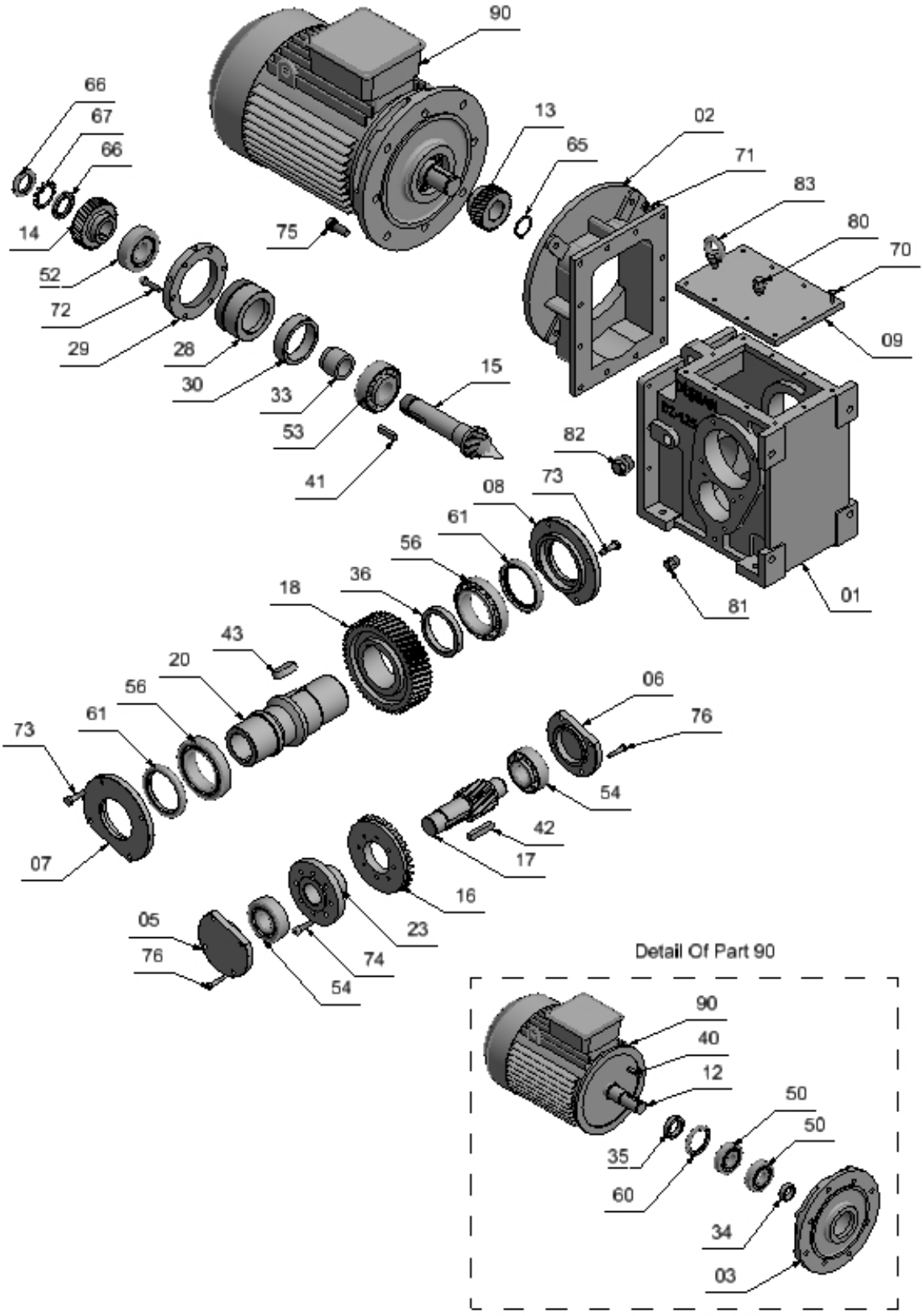
3.2 DZDNM Model



DZDNM Part List

Part No	Quantity	Part Definition
01	1	Housing
02	1	Front-stage Housing
05	1	Cover
06	1	Cover
07	1	Cover
08	1	Cover
09	1	Upper Cover
13	1	I.Stage Pinion Gear
14	1	I.Stage Gear
15	1	II.Stage Bevel Pinion Gear
16	1	II.Stage Gear
17	1	III.Stage Pinion Gear
18	1	III.Stage Gear
20	1	Output Shaft
21	1	Input Shaft
23	1	Gear Hub
28	1	Bearing Bed
29	1	Setting Ring
30	1	Ring
33	1	Ring
36	1	Ring
37	1	Oil Seal Ring
41, 42	2	Key
43, 44	2	Key
50	2	Bearing
52	1	Bearing
53	1	Bearing
54	2	Bearing
56	2	Bearing
60	1	Oil Seal
61	1	Oil Seal
62	1	O-Ring
66	2	Shaft Nut
67	1	Safety Washer
70	10	Hexagon Head Bolt
71	12	Hexagon Head Bolt
72	6	Imbus Cıvata
73	8	Hexagon Head Bolt
74	8	Countersunk Head Bolt
75	4	Hexagon Head Bolt
76	8	Hexagon Head Bolt
80	1	Oil Filling and Breathing Plug
81	2	Oil Drain Plug
82	1	Oil Level Plug
83	1	Eye Bolt
90	1	Electric Motor

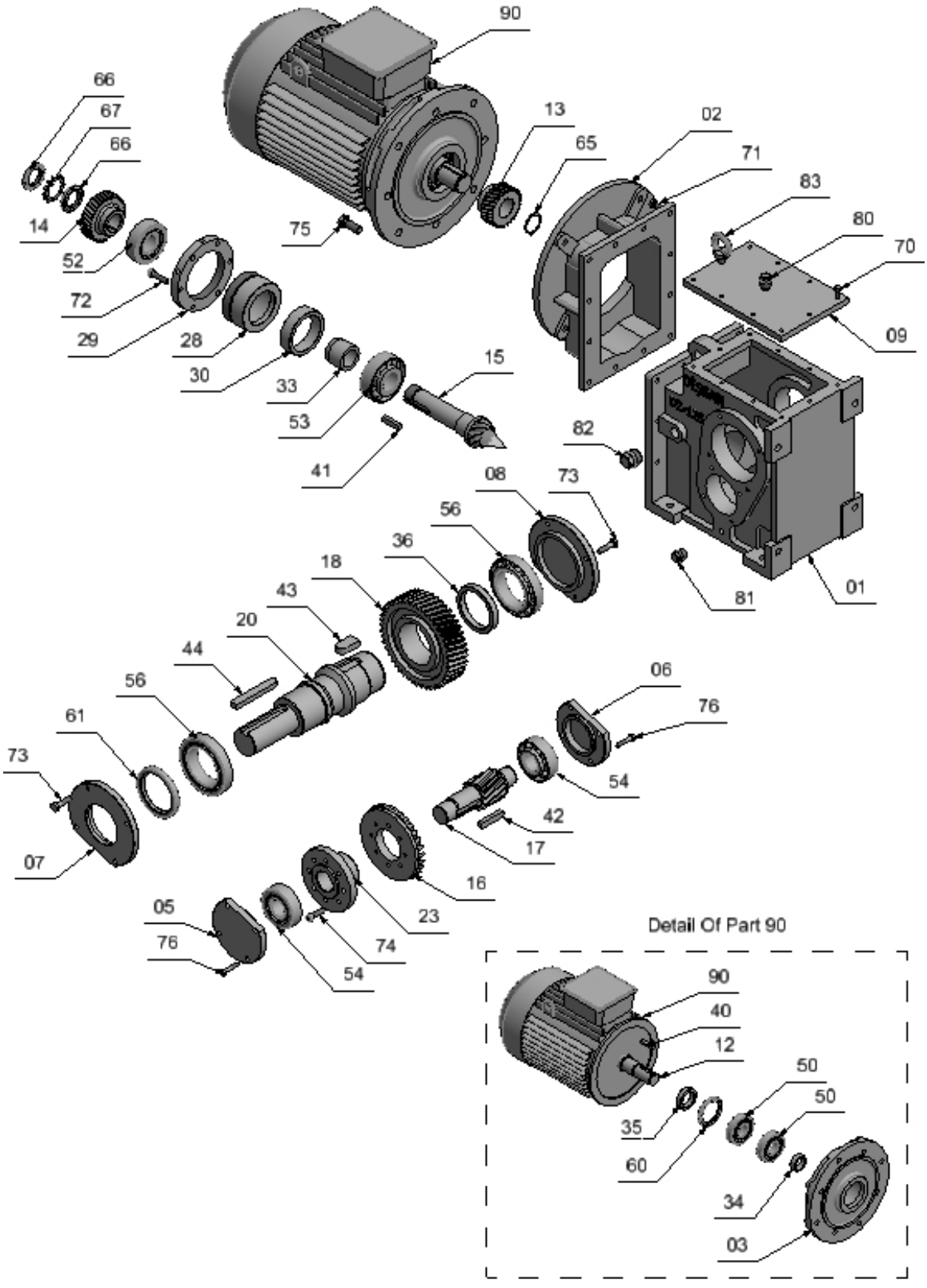
3.3 DZGM Model



DZGM Part List

Part No	Quantity	Part Definition
01	1	Housing
02	1	Front-stage Housing
03	1	Motor Flange
05	1	Cover
06	1	Cover
07	1	Cover
08	1	Cover
09	1	Upper Cover
12	1	Motor Shaft
13	1	I.Stage Pinion Gear
14	1	I.Stage Gear
15	1	II.Stage Bevel Pinion Gear
16	1	II.Stage Gear
17	1	III.Stage Pinion Gear
18	1	III.Stage Gear
20	1	Output Shaft
23	1	Gear Hub
28	1	Bearing Bed
29	1	Setting Ring
30, 33	2	Ring
34, 35	2	Ring
36	1	Ring
40, 41	2	Key
42, 43	2	Key
50	2	Bearing
52	1	Bearing
53	1	Bearing
54	2	Bearing
56	2	Bearing
60	1	Oil Seal
61	2	Oil Seal
65	1	Circlip
66	2	Shaft Nut
67	1	Safety Washer
70	10	Hexagon Head Bolt
71	12	Hexagon Head Bolt
72	6	Countersunk Head Bolt
73	8	Hexagon Head Bolt
74	8	Countersunk Head Bolt
75	4	Hexagon Head Bolt
76	8	Hexagon Head Bolt
80	1	Oil Filling and Breathing Plug
81	2	Oil Drain Plug
82	1	Oil Level Plug
83	1	Eye Bolt
90	1	Electric Motor

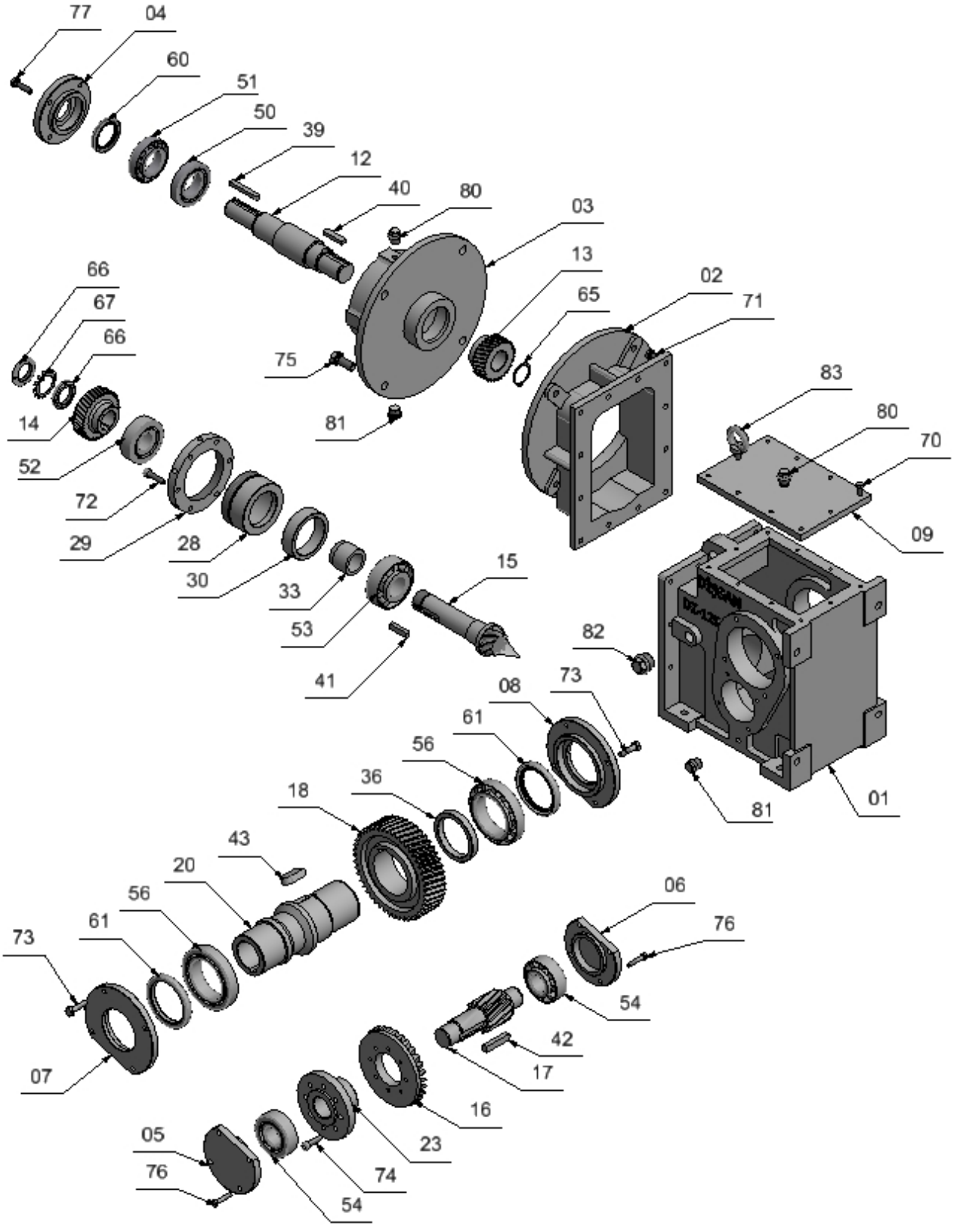
3.4 DZDM Model



DZDM Part List

Part No	Quantity	Part Definition
01	1	Housing
02	1	Front-stage Housing
03	1	Motor Flange
05	1	Cover
06	1	Cover
07	1	Cover
08	1	Cover
09	1	Upper Cover
12	1	Motor Shaft
13	1	I.Stage Pinion Gear
14	1	I.Stage Gear
15	1	II.Stage Bevel Pinion Gear
16	1	II.Stage Gear
17	1	III.Stage Pinion Gear
18	1	III.Stage Gear
20	1	Output Shaft
23	1	Gear Hub
28	1	Bearing Bed
29	1	Setting Ring
30, 33	2	Ring
34, 35	2	Ring
36	1	Ring
40, 41	2	Key
42, 43, 44	3	Key
50	2	Bearing
52	1	Bearing
53	1	Bearing
54	2	Bearing
56	2	Bearing
60	1	Oil Seal
61	1	Oil Seal
65	1	Circlip
66	2	Shaft Nut
67	1	Safety Washer
70	10	Hexagon Head Bolt
71	12	Hexagon Head Bolt
72	6	Countersunk Head Bolt
73	8	Hexagon Head Bolt
74	8	Countersunk Head Bolt
75	4	Hexagon Head Bolt
76	8	Hexagon Head Bolt
80	1	Oil Filling and Breathing Plug
81	2	Oil Drain Plug
82	1	Oil Level Plug
83	1	Eye Bolt
90	1	Electric Motor

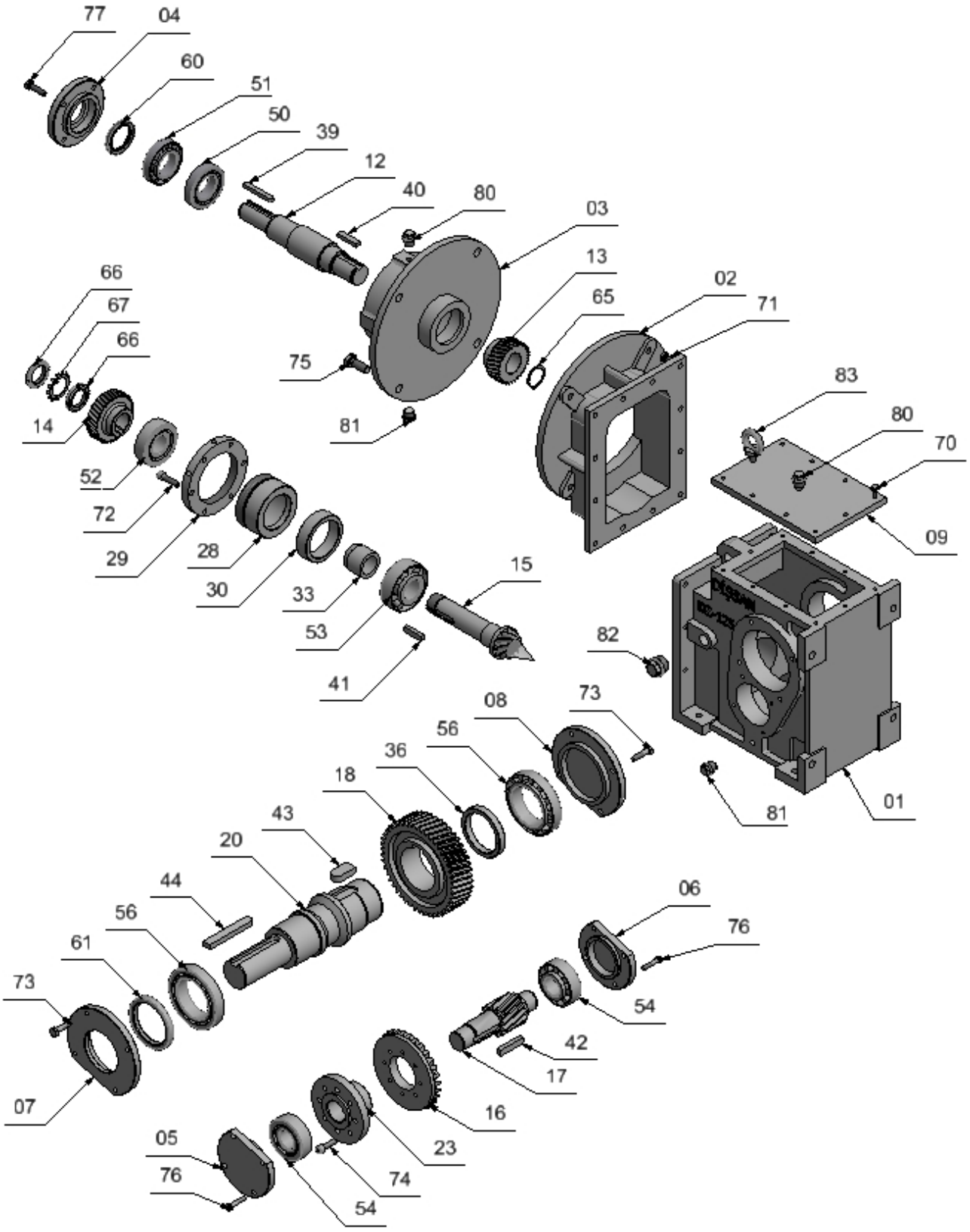
3.5 DZGT Model



DZGT Part List

Part No	Quantity	Part Definition
01	1	Housing
02	1	Front-stage Housing
03	1	Input Flange
04	1	Cover
05	1	Cover
06	1	Cover
07	1	Cover
08	1	Cover
09	1	Upper Cover
12	1	Input Shaft
13	1	I.Stage Pinion Gear
14	1	I.Stage Gear
15	1	II.Stage Bevel Pinion Gear
16	1	II.Stage Gear
17	1	III.Stage Pinion Gear
18	1	III.Stage Gear
20	1	Output Shaft
23	1	Gear Hub
28	1	Bearing Bed
29	1	Setting Ring
30, 33, 36	3	Ring
39, 40, 41	3	Key
42, 43	2	Key
50	1	Bearing
51	1	Bearing
52	1	Bearing
53	1	Bearing
54	2	Bearing
56	2	Bearing
60	1	Oil Seal
61	2	Oil Seal
65	1	Circlip
66	2	Shaft Nut
67	1	Safety Washer
70	10	Hexagon Head Bolt
71	12	Hexagon Head Bolt
72	6	Countersunk Head Bolt
73	8	Hexagon Head Bolt
74	8	Countersunk Head Bolt
75	4	Hexagon Head Bolt
76	8	Hexagon Head Bolt
77	4	Hexagon Head Bolt
80	2	Oil Filling and Breathing Plug
81	3	Oil Drain Plug
82	1	Oil Level Plug
83	1	Eye Bolt

3.6 DZDT Model



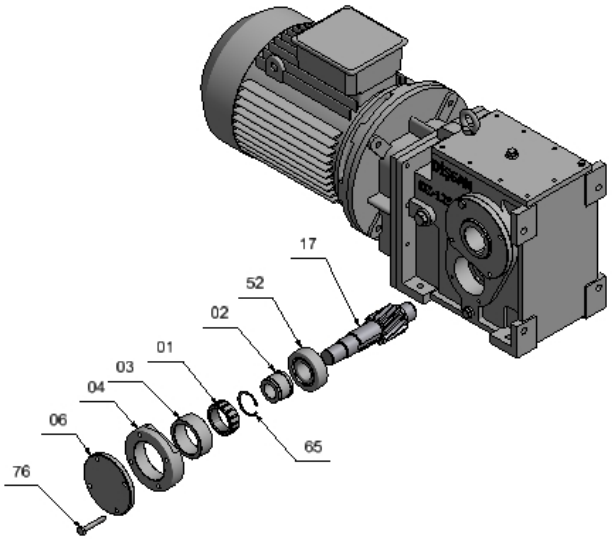
DZDT Part List

Part No	Quantity	Part Definition
01	1	Housing
02	1	Front-stage Housing
03	1	Input Flange
04	1	Cover
05	1	Cover
06	1	Cover
07	1	Cover
08	1	Cover
09	1	Upper Cover
12	1	Input Shaft
13	1	I.Stage Pinion Gear
14	1	I.Stage Gear
15	1	II.Stage Bevel Pinion Gear
16	1	II.Stage Gear
17	1	III.Stage Pinion Gear
18	1	III.Stage Gear
20	1	Output Shaft
23	1	Gear Hub
28	1	Bearing Bed
29	1	Setting Ring
30, 33, 36	3	Ring
39, 40, 41	3	Key
42, 43, 44	3	Key
50	1	Bearing
51	1	Bearing
52	1	Bearing
53	1	Bearing
54	1	Bearing
56	1	Bearing
60	1	Oil Seal
61	1	Oil Seal
65	1	Circlip
66	2	Shaft Nut
67	1	Safety Washer
70	10	Hexagon Head Bolt
71	12	Hexagon Head Bolt
72	6	Countersunk Head Bolt
73	8	Hexagon Head Bolt
74	8	Countersunk Head Bolt
75	4	Hexagon Head Bolt
76	8	Hexagon Head Bolt
77	4	Hexagon Head Bolt
80	2	Oil Filling and Breathing Plug
81	3	Oil Drain Plug
82	1	Oil Level Plug
83	1	Eye Bolt

Optional Accessories

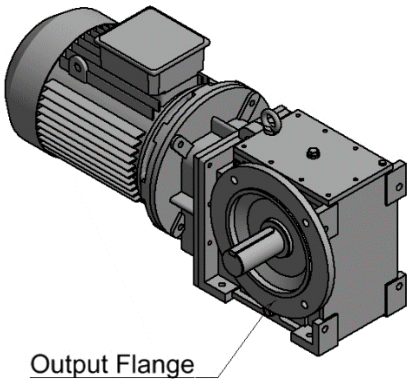
- Back Stop
- Output Flange
- Electromagnetic Motor Brake
- Torque Arm

Back Stop

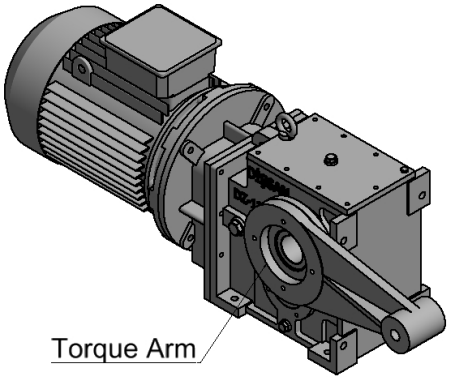


Part No	Qty	Part Definition
01	1	Back-stop
02	1	Back-stop Inner Ring
03	1	Back-stop Outer Ring
04	1	Outer Ring
06	1	Back-stop Cover
17	1	III. Stage Pinion Gear
52	1	Taper Roller Bearing
65	1	Circlip
76	4	Hexagon Head Bolt

Output Flange



Torque Arm



4. Safety Instructions

The following safety instructions are important to prevent loss of life, injuries and property damage. The operators must ensure that the basic safety rules are read and adhered to.

Incorrect installation, improper use of the product, failure to follow safety warnings, removal of the protective covers of the gearbox can cause serious injuries and property damage.

All work involved in the transportation, connection, commissioning and maintenance of any Dişsan product must be carried out by qualified and responsible technicians that have read the instructions in this manual.

Before starting up the gearbox, objects around the product that may cause injury must be removed. The propeller that is connected to the input shaft of the gearbox can cause injuries. Keep enough distance from the propeller to avoid accidental contact.

If the gearbox is damaged, do not install the product without consulting Dişsan.

Gearboxes are designed for use in industrial machines and applications. The gearbox should only be used within permitted ranges indicated in the catalogue and nameplate of the product. Using the gearbox outside the permitted ranges would result in voiding the warranty.

The gearboxes comply with the requirements of the directive 2006/42/EC. The machines and machine parts that will be connected to the gearboxes should also comply with 2006/42/EC standards.

Standard gearboxes are suitable for operation in ambient temperatures between -5° C and +40° C. If the ambient temperature is outside this range, you should consult Dişsan for necessary measures before ordering.

Touching hot surfaces may cause burns. If the temperature of the gearbox rises above 60° C during operation, do not touch the gearbox housing without appropriate safety equipment such as gloves to prevent burning.

Oils can be harmful to health and environment. Intensive contact with oil can lead to skin irritations. Avoid intensive contact with oil and clean skin thoroughly after contacting. The used oil should be disposed according to local regulations.

The transportation, installation, mounting, de-mounting and maintenance of the gearbox should be performed only when the system is turned off. All necessary precautions should be taken to prevent accidental operation of the gearbox.

5. Transportation and Storage

5.1 Transportation

When accepting the delivery of the gearbox, check that the product is complete and undamaged. If damage is detected, you should immediately inform the shipping company and Dişsan. The damaged gearbox should not be operated unless approval is taken from Dişsan that the damage has no effect on the operation.

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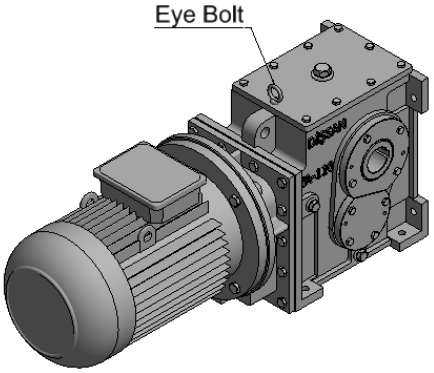
Ensure that adequate safety measures are taken to protect operators from injury during transportation. The operators should not stay under the lifting equipment and the gearbox during transportation. Standing under the gearbox can lead to death.

When lifting up the gearbox use the eyebolts. Tighten the eyebolts before using. The eyebolts are suitable to handle only the gearbox weight. Do not attach additional loads.

Always use sufficiently rated handling and lifting equipment. The equipment should be appropriate to handle the gearbox weight.

The gearbox should be handled and landed to the ground at low speed. If the gearbox falls or crashes to the ground, the gearbox could be damaged. If the input or output shafts of the gearbox get a knock, this can damage the shafts and gears inside the gearbox.



5.2 Storage

The hollow shafts and solid shaft ends of the gearboxes are covered with anti-corrosion grease before delivery. If the gearbox is stored with packaging, the anti-corrosion grease will be effective for two years. If the gearbox will be stored longer than two years, the grease should be reapplied.

If the gearboxes will be stored between nine months and three years, long-term storage instructions should be followed.

- Gearboxes should be stored with packaging.
- Avoid direct exposure to sun, rain and snow. Store in a location free from humidity, shock and vibration.
- The packaging should be checked regularly.
- Reapply the anti-corrosion grease to shafts after two years.

6. Installation

6.1 Before Starting Installation

Make sure that the gearbox is not damaged during transportation or storage. If the gearbox is damaged, do not install the gearbox without consulting Dişsan.

For motor gears, also check the operating instructions of the motor manufacturer.

The installation must be carried out by qualified and responsible technicians who have read the instructions in this manual.

Make sure that you have all the equipment necessary for installation; set of wrenches, torque wrench, shims, spacing rings, lubricant, bolt fixing compound etc.

Before starting installation, make sure that the shafts and all connections surfaces are free of oil and dust. The anti-corrosion grease that was applied for protection should be removed with an appropriate solvent. **The solvent should not touch the seals and painting of the housing.**

For connecting the gearbox, use bolts with quality class 8.8 or higher.

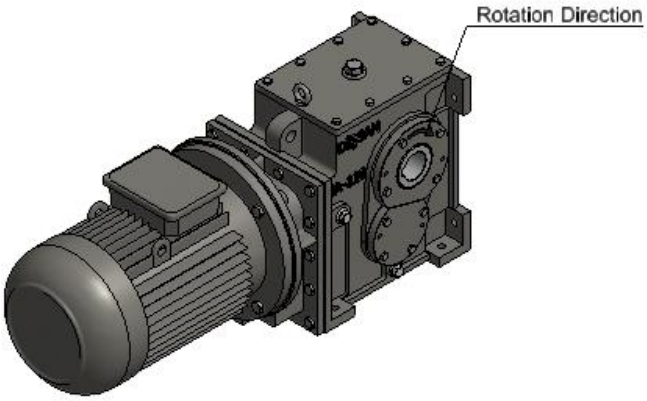
The gearboxes should only be mounted using the foot connection points indicated by Dişsan.

If you would like to paint the gearbox, make sure that no paint or thinner touches the shaft seals, plastic parts, breather plugs, pipes and nameplates. Otherwise, these parts might get damaged and the nameplate might get illegible.

Gearboxes with backstop operate only in one direction which is specified in the order. If the motor rotates in the locked direction, this may damage the backstop and the motor. Make sure that the motor rotates in correct direction.

To check the direction of the motor, start/stop the motor. If the motor rotates in opposite direction, change the direction by switching the poles.

The rotation direction that was specified at order is marked on the gearbox with an arrow as shown below.



6.2 Shaft Tolerances

Model	Hollow Shaft Diameter (mm)	Hollow Shaft Tolerance (F7)	Output Shaft Diameter (mm)	Output Shaft Tolerance (50mm and below k6) (above 50mm m6)
DZ - 100	40	+0,050 +0,025	40	+0,018 +0,002
DZ - 110	50	+0,050 +0,025	50	+0,018 +0,002
DZ - 125	60	+0,060 +0,030	60	+0,030 +0,011
DZ - 140	70	+0,060 +0,030	70	+0,030 +0,011
DZ - 160	80	+0,060 +0,030	80	+0,030 +0,011
DZ - 180	90	+0,071 +0,036	90	+0,035 +0,013
DZ - 200	110	+0,071 +0,036	110	+0,035 +0,013

6.3 Electrical Connections

The electrical connection of the motor must be carried out by qualified electrical technicians.

Please make sure that proper ground connections are done for the gearbox and the motor.

Please check that system voltage is in line with the voltage stated on the etiquette of the motor. Wrong voltage may damage the motor.

Please make sure that the electrical connections of the motor are done according to the electrical connection scheme on the terminal box of the motor.

The gearboxes are assembled with the oil level indicator, oil fill and breather plug and oil drain plug installed in their proper locations according to the specified mounting position. If the gearboxes will be operated in a different mounting position, the gearbox could be damaged.
If the gearboxes will be operated in a different mounting position, please consult Dişsan. Changing the monting position may require to change the oil level in the gearbox. Please see Page 30 for the required oil levels according to different mounting positions.

6.4 Mounting Positions

The mounting position should be specified at the order. The gearboxes are assembled with the oil level indicator, oil fill and breather plug and oil drain plug installed in their proper locations according to the specified mounting position. If the gearboxes will be operated in a different mounting position, the gearbox could be damaged.

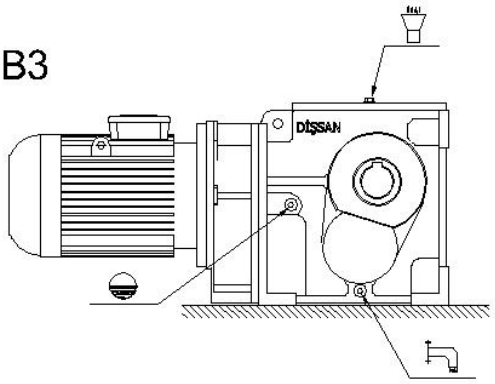
If the gearboxes will be operated in a different mounting position, please consult Dişsan. Changing the monting position may require to change the oil level in the gearbox. Please see Page 30 for the required oil levels according to different mounting positions.

The breather filter is supplied with the gearbox. However, it is not attached to prevent damage during transportation. **Before installation, take out the blind plug and put the breather filter in its place!** The required place to put the breather filter according to specified mounting position is shown on the gearbox with an etiquette.

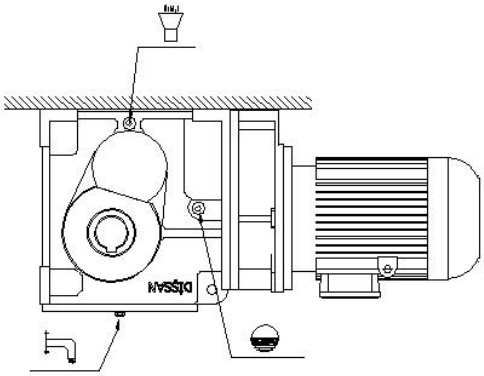
For some mounting position, its is required to use a breather pipe as well. In this case, the breather pipe is also supplied seperately with the gearbox. When attaching the breather pipe, please wrap teflon around the teeth of the pipe end to ensure oil sealing.
Oil level indicator, breather filter and oil drain plug should be reachable at all times for regular controls and maintenance activities.

Mounting Positions Chart

B3



B8



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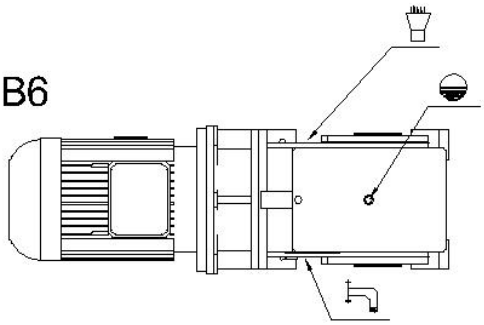
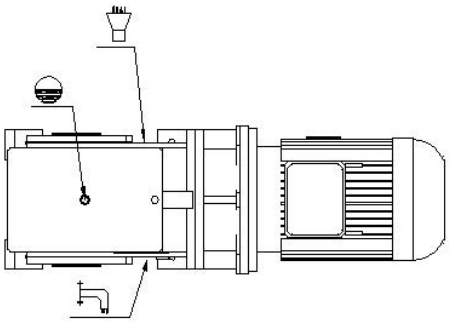
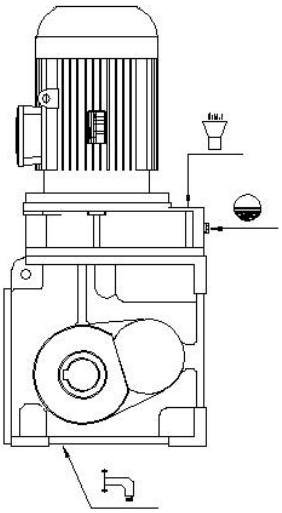


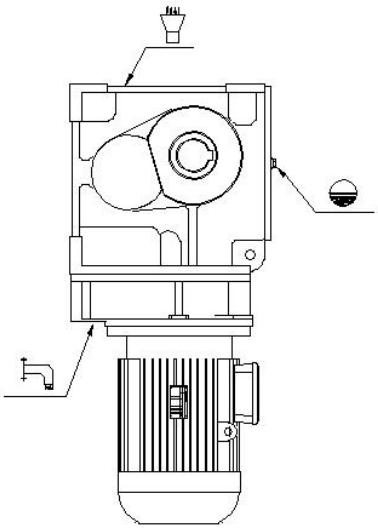
B7



V5



V6



SYMBOLS :

Oil Fill and Breathing Plug

Oil Level Plug

Oil Discharge Plug

6.5 Checking the Oil Level

Check if the oil level is suitable for the mounting position as described below.

- After placing a container under the oil level plug, remove the plug carefully. If the oil level is adequate, there should be small amount of oil leakage.
- If there is no leakage, fill in more oil as described below:
  - Obtain one of the proper oil types recommended in the oil chart in this manual (Page 30)
  - Remove the breather filter and fill in oil through a cone filler, while the oil level plug is open.
  - When oil starts to come out from the opening, affix the plug again.
  - Continue to fill in a small amount of oil, until the oil level reaches approximately the midpoint of the oil level plug.
  - Put on the breather filter back to its place.

When mounting the coupling to the gearbox shaft, we recommend to heat the coupling up to 80° C. **Do NOT hammer or mechanically force the coupling to the shaft!**

6.6 Mounting the Shaft

The hollow output shafts of the shaft mounted DZ model gearboxes are machined with F7 tolerance. The tolerance of the drum shaft should be machined with max. m6 tolerance. The gap between the gearbox hollow shaft diameter and the drum shaft diameter should be 0,03 – 0,05 mm to enable an easy mounting.

When mounting the gearbox to the drum shaft, do not apply force to the gearbox housing.You can put a piece of wood on the hollow shaft and fit the gearbox by hammering the wood.

Solid shaft DZ model gearboxes can be mounted to the driven machines with elastic couplings, chain gears or spur gears. Gearbox solid shaft is machined with m6 tolerance. The hole the gearbox shaft will pass through should be machined with H7 tolerance. The hole can be heaten up to 80° C to ease the mounting.

DZ model gearboxes with solid input shaft can be mounted to the motor with belt pulley or coupling. The coupling hole should be machined with H7 tolerance.

When mounting the coupling to the gearbox shaft, we recommend to heat the coupling up to 80° C. **Do NOT hammer or mechanically force the coupling to the shaft!**

6.7 Connection Bolts and Tightening Torques

Connection Bolts:

Gearbox Size	Foot Connection Bolts	Motor Connection Bolts					
		IEC - 90	IEC - 100	IEC - 112	IEC - 132		
DZ - 100	M12 X 40 (4 pieces)	M10 X 40 (4 pieces)	M12 X 40 (4 pieces)	M12 X 40 (4 pieces)	M12 X 40 (4 pieces)		

		IEC - 100	IEC - 112	IEC - 132	IEC - 160		
DZ - 110	M12 X 40 (4 pieces)	M12 X 40 (4 pieces)	M12 X 40 (4 pieces)	M12 X 40 (4 pieces)	M16 X 50 (4 pieces)		

		IEC - 100	IEC - 112	IEC - 132	IEC - 160	IEC - 180	
DZ - 125	M14 X 50 (4 pieces)	M12 X 40 (4 pieces)	M12 X 40 (4 pieces)	M12 X 40 (4 pieces)	M16 X 50 (4 pieces)	M16 X 50 (4 pieces)	

		IEC - 100	IEC - 112	IEC - 132	IEC - 160	IEC - 180	
DZ - 140	M16 X 50 (4 pieces)	M12 X 40 (4 pieces)	M12 X 40 (4 pieces)	M12 X 40 (4 pieces)	M16 X 50 (4 pieces)	M16 X 50 (4 pieces)	

		IEC - 112	IEC - 132	IEC - 160	IEC - 180	IEC - 200	
DZ - 160	M20 X 60 (4 pieces)	M12 X 40 (4 pieces)	M12 X 40 (4 pieces)	M16 X 50 (4 pieces)	M16 X 50 (4 pieces)	M16 X 50 (4 pieces)	

		IEC - 132	IEC - 160	IEC - 180	IEC - 200	IEC - 225	
DZ - 180	M20 X 60 (4 pieces)	M12 X 40 (4 pieces)	M16 X 50 (4 pieces)	M16 X 50 (4 pieces)	M16 X 50 (4 pieces)	M16 X 50 (8 pieces)	
		IEC - 132	IEC - 160	IEC - 180	IEC - 200	IEC - 225	IEC - 250
DZ - 200	M24 X 60 (4 pieces)	M12 X 40 (4 pieces)	M16 X 50 (4 pieces)	M16 X 50 (4 pieces)	M16 X 50 (4 pieces)	M16 X 50 (8 pieces)	M16 X 50 (8 pieces)

Not: The motor connections of DZGM & DZDM model gearboxes are done accomplished in Dişsan factory. DZGT/DZDT model gearboxes do not have motor connection bolts.

Tightening Torques:

Bolt / Nut	Tightening Torque - Nm (Class 8.8)
M10	30
M12	58
M16	140

6.8 Mounting the IEC Motor with B5 Flange to the Gearbox

DZGNM and DZDNM model gearboxes are supplied with IEC motors with B5 flange. The motor connections are done in Dişsan factory.

DZGN and DZDN model gearboxes are supplied without motor. The user can procure any IEC motor with B5 flange and connect to the gearbox.

Please follow below instructions to connect the motor to the gearbox:

- ❖ Make sure the motor shaft and flange surfaces are clean. Remove burrs if any. Check if there is any damage.
- ❖ Check the adapter through which the motor shaft will go. There should be no damage on the adapter hole and flange surfaces.
- ❖ Put the motor through the motor adapter flange and tighten the bolts.

In case of DZGM and DZDM model, the motor is connected to the gearbox in Dişsan factory. If any motor change is necessary, the gearbox should be sent to Dişsan factory.

6.9 Starting Operation

Before starting operation make sure that the oil level is sufficient according to the mounting position (see 6.4).

At initial operation, if there is excessive noise or vibration, stop the system and check possible reasons indicated below:

- Check the frame connections
- Check if the bolts are properly tightened.
- Check the motor current.

If the problem persists after fixing above points, consult Dişsan.

7. Maintenance and Inspections

Below maintenance instructions must be followed to ensure efficient and long-life operation of the gearbox.

7.1 Preparing for the Maintenance and Inspections

Before starting any maintenance work, disconnect the gearbox from power supply and take necessary precautions to prevent un-intentional re-start. Inform all responsible parties and operators about the maintenance.

Hot gearbox surfaces and hot oil may cause burns. Let the gearbox cool down before starting your work.

- ❖ Remove the oil level plug and oil drain plug carefully.
- ❖ Prevent foreign bodies entering the gearbox during maintenance work.
- ❖ Do not clean the gearbox with high pressure cleaning equipment.

7.2 Maintenance and Inspection Periods

Item for Maintenance & Inspection	Period
Oil level check	Daily
Oil quality check	Every 3,000 hours of operation (at least every six months)
Visual inspection of the seals for oil leakage from breather plug, covers and housing.	Daily
Oil change*	First oil change: after 1000 hours of operation Following oil changes: For mineral oils; every 5,000 hours of operation (at least every year) For synthetic oils; every 15,000 hours of operation (at least every three years)
Bearing noise check	Every 3,000 hours of operation (at least every six months)
Bearing Grease Change	Every 25,000 hours of operation (at least every five years)
Replace oil seal	Every 25,000 hours of operation (at least every five years)

* For normal working conditions, +70° C oil temperature is taken as reference. Oil change intervals depend on the oil temperature in operation.

7.3 Checking the Oil Level

- After placing a container under the oil level plug, remove the plug carefully. If the oil level is adequate, there should be small amount of oil leakage.
- If there is no leakage, fill in more oil as described below:
  - Obtain one of the proper oil types recommended in the oil chart in this manual (Page 30)
  - Remove the breather filter and fill in oil through a cone filler, while the oil level plug is open.
  - When oil starts to come out from the opening, affix the plug again.
  - Continue to fill in a small amount of oil, until the oil level reaches approximately the midpoint of the oil level plug.
  - Put on the breather filter back to its place.

7.4 Checking Oil Quality

- Open the oil drain plug carefully and let some amount of oil pour out.
- Visually check if there is extreme contamination.

7.5 Changing the Oil

Hot oil may cause burns. Let the gearbox and oil cool down before starting your work.
Avoid intensive contact with oil and clean skin thoroughly after contacting.

- Place a container under the oil drain plug.
- Remove the oil drain plug, breather filter and oil level plug.
- Drain the oil fully.
- Put the oil drain plug back to its place.
- Obtain one of the proper oil types recommended in the oil chart in this manual (Page 30).
- Fill in fresh oil through the opening after the removal of the breather filter, with the help of a cone filler.
- When oil starts to come out from the oil level plug, affix the plug again.
- Continue to fill in a small amount of oil, until the oil level reaches approximately the midpoint of the oil level plug.
- Put on the breather filter back to its place.

8. Lubrication

8.1 Oil Types

Gear Oils

Only CLP-type lubricants conforming to DIN 51 517-3 standards can be used in Dişsan gearboxes. The lubricant must contain additives that provide corrosion protection, oxidation resistance and wear prevention.

Poly-Alpha-Olefin (PAO) Based Synthetic Gear Oils

PAO-based synthetic gear oils have very high viscosity indices. A very low pour point means they can be used effectively in cold climates where mineral lubricants cannot be deployed, while a high oxidation resistance means they are also viable for use in tropical climates unlike mineral lubricants. They can be used in gearboxes with helical spur gears or helical bevel gears. These are recommended for all gearboxes whether vertical or horizontal, pressure-lubricated or oil bath-lubricated. These lubricants are also recommended for slide and ball bearing mechanisms.

Contrary to PAG-based synthetic lubricants, PAO-based synthetic lubricants may be mixed with mineral lubricants. They are compatible with all paints, oil gaskets and seals used in gearboxes. Gearboxes that have been filled with mineral oils before may be drained and refilled with PAO-based oils without any cleaning necessary. Viscosity grade must be selected based on gearbox type and ambient conditions. The viscosity grade is indicated on the plate affixed to the gearbox.

The minimum requirements of the PAO-based synthetic gear oil to be used are indicated in the table below.

Properties	Standards
Viscosity Index	ASTM D 2270
Pour Point, °C	ASTM D 97
Flash Point, °C	ASTM D 92

Rust Protection	ASTM D 665
FZG Friction Wear	ISO 14635-1 A/8.3/90
4 Ball EP Test, kgf	ASTM D 2783

Mineral Gear Oils

These are high-quality paraffinic lubricants that contain extreme pressure additives as well as additives to protect against rust, corrosion, wear, foaming and oxidation. They may be used in gearboxes with helical spur gears or helical bevel gears that work under extreme pressure and loads. These are recommended for all gearboxes whether vertical or horizontal, pressure-lubricated or bath-lubricated, as well as for slide and ball-bearing mechanisms.

The minimum requirements of the mineral oil to be used are indicated in the table below.

Properties	Standards
Viscosity Index	ASTM D 2270
Pour Point, °C	ASTM D 97
Flash Point, °C	ASTM D 92
Rust Protection	ASTM D 665
FZG Friction Wear	ISO 14635-1 A/8.3/90
4 Ball EP Test, kgf	ASTM D 2783

Oil Temperatures

PAO-based synthetic gear oils have a wider operating temperature range and higher viscosity index values than mineral oils.

Operating temperature range of mineral oils: -10°C and +70°C (burst: +90°C)
Operating temperature range of PAO-based synthetic oils: -20°C and +90°C (burst: +110°C)

Oil Life Guideline

The cleanliness of the oil affects the reliability of the operation and the life of the oil and the gearbox. Therefore you must ensure that the oil in the gearbox is clean. If there are any doubts about gear oil cleanliness, conduct an oil analysis and decide whether the oil must be replaced depending on its results.

The initial oil change should take place after 1000 hours of operation.

- PAO-based synthetic gear oil change interval: 3 years or 15,000 hours of operation
- Mineral gear oil change interval: 1 year or 5,000 hours of operation

Note: The above values assume an average oil temperature of 70°C. Actual oil lives may be shorter or longer. As a general rule, oil life decreases by half for every additional 10°C of operating temperature above 70°C.

All Dişsan gearboxes are factory-filled with Mobil-branded gear oils. Dişsan recommends draining the factory-filled oil after the first 1000 hours of operation, and refilling with Mobil SHC Gear series

lubricants with viscosity values as indicated on the plates affixed to the gearbox. Changing between oil brands is not recommended as different brand oils may not be compatible. If changing the brand is unavoidable, the gearbox must be thoroughly flushed. Dişsan shall accept no liability for incompatibility between oil brands.

8.4 Recommended Oils

PAO Based Synthetic Gear Oil Chart

Oil Name /Type	Mounting Position	Viscosity Class	Brand
Mobil SHC Gear 150	Vertical	ISO VG 150	Mobil
Mobil SHC Gear 220	Vertical & Horizontal	ISO VG 220	
Mobil SHC 629	Vertical	ISO VG 150	Mobil
Mobil SHC 630	Vertical & Horizontal	ISO VG 220	
Omala S4 GX 150	Vertical	ISO VG 150	Shell
Omala S4 GX 220	Vertical & Horizontal	ISO VG 220	
Alphasyn T 150	Vertical	ISO VG 150	Castrol
Alphasyn T 220	Vertical & Horizontal	ISO VG 220	
Enersyn EP – XF 150	Vertical	ISO VG 150	bp
Enersyn EP – XF 220	Vertical & Horizontal	ISO VG 220	

Mineral Gear Oil Chart

Oil Name /Type	Mounting Position	Viscosity Class	Brand
Mobilgear 600 XP 150	Vertical	ISO VG 150	Mobil
Mobilgear 600 XP 220	Vertical & Horizontal	ISO VG 220	
Omala S2 G 150	Vertical	ISO VG 150	Shell
Omala S2 G 220	Vertical & Horizontal	ISO VG 220	
Alpha SP 150	Vertical	ISO VG 150	Castrol
Alpha SP 220	Vertical & Horizontal	ISO VG 220	
Energol GR- XP 150	Vertical	ISO VG 150	bp
Energol GR- XP 220	Vertical & Horizontal	ISO VG 220	

8.3 Oil Fill Quantities According to Mounting Position

	Oil Quantity (Liters)			
Model	**B3 / B8**	**B6 / B7**	**V5**	**V6**
DZ - 100	6	6,5	9,0	6
DZ - 110	8,5	9,5	13	8,5
DZ - 125	12	13,5	18	12
DZ - 140	16	18	24	16
DZ - 160	22	24	33	22
DZ - 180	30	33	45	30
DZ - 200	40	44	60	40

* The oil fill amounts in above table are approximate values. Gearbox should be filled with oil up to the midpoint of the oil level plug.

9. Troubleshooting Guide

All operations must be carried out by qualified and responsible technicians who have read the instructions in this manual. During warranty period, Dişsan should be informed before any operation on the gearbox. Any operation conducted without priorly consulting Dişsan will void the warranty of the gearbox. Only oil changes can be carried out without informing Dişsan.

If any malfunction is detected, system must be stopped and should not be restarted before the problem is eliminated.

Malfunction	Possible Causes	Remedies
Gearbox gets extremely hot (Ambient temperature is below 40°C) Running temperature of the gearbox varies according to the transmitted power and speed. Max. allowed running temperature is up to 70°C.	If the source of the heat is the motor, it can be due to motor connection failure. If the source of the heat is the gearbox, it can be due to inadequate oil type usage and oil level. Bearings may be too tight.	An authorized electrical technician should check the motor connections. Check the oil level and if the oil used is suitable (Page 30). Check the oil quantity according to mounting position. (Page 30) Send the gearbox to Dişsan
Gearbox gets extremely hot (Ambient temperature is above 40°C)		Standard gearboxes are suitable for operation in ambient temperatures up to +40°C. If the ambient temperature is outside this range, you should consult Dişsan for necessary measures.
Unusual noise comes from the gearbox	- Bearings may be damaged due to insufficient oil. - The gears may be broken or damaged. Foreign particles may be in the oil.	- Check oil level. If the problem persists after correcting the oil level, send the gearbox to Dişsan. - Send the gearbox to Dişsan. Change the oil. If problem persists, send the gearbox to Dişsan.
Oil leakage – from seals	Seals may be damaged.	If within warranty period, send to Dişsan. If warranty period is over, change the damaged seals.

Oil leakage – from breather filter	Check if the breather plug/filer is at the proper location according to mounting position. Oil level might be too much. Oil may be expanded due to extreme heat.	If not correct, change the location of the breather plug/filter. Check and correct the oil level. (Page 30) If extreme heat persists, send the gearbox to Dişsan.
Oil leakage – from oil drain or oil level plugs	The plugs may not be tight enough. Plugs may be crushed and damaged.	Tighten the plugs. If oil leakage persists, change the damaged plugs and wrap with teflon and tighten.
Oil leakage – from housing	Housing may be broken or cracked.	Send the gearbox to Dişsan.
Oil leakage – From covers	Cover bolts may be loose. Sealing liquid may be damaged.	Check and tighten the bolts. If within warranty period, send to Dişsan. If warranty period is over, disassemble the cover, clean and put new sealing liquid. Assemble the cover and tighten the bolts.
Motor is running but the gearbox shaft is not turning	The key may be slipped or gears may be damaged. There is mechanical disconnection.	Send the gearbox to Dişsan.

Instructions for Changing the Oil Seals:

- Place a suitable container under the oil drain plug of the gearbox housing.
- Unscrew the oil drain plug and allow the oil to drain into the container.
- After the oil is fully drained, remove the cover of the oil seal.
- While taking out the seal avoid any damage to metal surfaces.
- Check if there is any damage on the metal surfaces of the cover where the seal is placed. If there is no damage, you may continue the process. If there is damage, change the cover with a new one.
- After taking out the seal, clean up the area. Make sure there is no dust or silicon residuals left on the metal surfaces.
- Check the new seal to ensure it has no damage.
- Place the new seal with the help of a ring with the same size as the seal. Hammer the four corners of the ring to put the seal in its place thoroughly.
- If you cannot find a suitable ring, you can use a metal stick to help you place the seal. Be careful not to damage the seal.
- Put the cover back in place. Avoid any damage to the seal spring. While placing the cover, apply grease oil to the gearbox shaft to ease the process

- Refill the gearbox with the same oil or with fresh oil up to the level suitable according to the mounting position. Make sure to use correct oil type as indicated on the gearbox nameplate or the oil chart in this manual (Page 30).

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