

Table 11 - Bearing specifications by type of motor

NEMA		Ве	arings
Frames	Mounting	Front (D.E.)	Rear (O.D.E.)
	Open	drip proof motors	
B48 and C48		6 2 03 Z	6 2 0 2 Z
56 and A56	MS	6 2 03 Z	6 2 0 2 Z
B56 and C56	ALL FORMS	6 2 03 Z	6 2 0 2 Z
D56 and	<u>ь</u> Н	6 2 04 Z	6 2 0 2 Z /
F56H/G56H	AL	02042	6 2 03 Z
1 3011/03011	Totally onclo	sed fan cooled moto	
442 T	Totally Clicio		
143 T		6 2 05 ZZ	6 2 04 ZZ
145 T		6 2 05 ZZ	6 2 04 ZZ
182 T		6307 ZZ	6 2 06 ZZ
184 T		6307 ZZ	6 2 06 ZZ
W 182 T		6 2 06 ZZ	6 2 05 ZZ
W 184 T		6 2 06 ZZ	6 2 05 ZZ
21 3 T		6308 ZZ	6 2 07 ZZ
21 5 T		6308 ZZ	6 2 07 ZZ
W 21 3 T		6308 ZZ	6 2 07 ZZ
W 21 5 T		6308 ZZ	6 2 07 ZZ
2 54 T		6309-C3	6 2 09 Z-C3
2 56 T		6309-C3	6 2 09 Z-C3
W 2 54 T		6309-C3	6 2 09 Z-C3
W 2 56 T		6309-C3	6 2 09 Z-C3
2 84 T and TS		63 11 -C3	6 211 Z-C3
2 86 T and TS		63 11 -C3	6 211 Z-C3
324 T and TS		63 12 -C3	6 212 Z-C3
3 2 6 T and TS		63 12 -C3	6 212 Z-C3
364 T and TS		63 1 4-C3	63 1 4-C3
365 T and TS	MS	63 1 4-C3	63 1 4-C3
404 T	LL FORMS	NU 3 1 6-C3	63 1 4-C3
404 TS	<u>L</u>	63 1 4-C3	63 1 4-C3
405 T	AL	NU 316-C3	63 1 4-C3
405 TS		63 1 4-C3	64 1 4-C3
444 T		NU 3 1 9-C3	63 1 6-C3
444 TS		63 1 4-C3	63 1 4-C3
445 T		NU 3 1 9-C3	63 1 6-C3
445 TS		63 1 4-C3	63 1 4-C3
447 T		NU 3 1 9-C3	63 1 6-C3
447 TS		63 1 4-C3	63 1 4-C3
449 T		NU 3 22 -C3	63 1 9-C3
449 TS		63 1 4-C3	63 1 4-C3
504 T		NU 319-C3	63 1 6-C3
504 TS		63 1 4-C3	63 1 4-C3
505 T		NU 3 1 9-C3	63 1 6-C3
505 TS		63 1 4-C3	63 1 4-C3
5008 T		NU 3 22 -C3	63 1 9-C3
5008TS		63 1 4-C3	63 1 4-C3
586 T		NU 3 22 -C3	63 1 9-C3
586 TS		63 1 4-C3	63 1 4-C3
587 T		NU 3 22 -C3	63 1 9-C3
587 TS		63 1 4-C3	63 1 4-C3
Saw Arbor		Ве	arings
motor	Mounting		
frame		Front (D.E.)	Rear (O.D.E.)
80 S MS		6307 ZZ	6 2 07 ZZ
80 M MS	DO	6307 ZZ	6 2 07 ZZ
80 L MS	В3	6307 ZZ	6 2 07 ZZ
90 L MS		6308 ZZ	6 2 08 ZZ
30 2 1010		3000 22	320022

ODP Motors	Manustina	Bea	arings
Nema-T frames	Mounting	Front (D.E.)	Rear (O.D.E.)
E 1 43/5T		6 2 05 ZZ	6 2 04 ZZ
F 1 43/5T		6 2 05 ZZ	6 2 04 ZZ
1 8 2 T		6 2 06 ZZ	6 2 05 ZZ
1 84 T		6 2 0 2 ZZ	6 2 05 ZZ
21 3/5T		6 2 08 ZZ	6 2 06 ZZ
2 54 T		6309 Z-C3	6 2 09 Z-C3
2 56 T		6309 Z-C3	6 2 09 Z-C3
2 84 T		63 11 Z-C3	6 211 Z-C3
2 84 TS	≟	63 11 Z-C3	6 211 Z-C3
2 86 T	6	63 11 Z-C3	6 211 Z-C3
2 86 TS	ING	63 11 Z-C3	6 211 Z-C3
3 2 4 T	¥	63 12 Z-C3	6 212 Z-C3
3 2 4 TS	101	63 12 Z-C3	6 212 Z-C3
3 2 6 T		63 12 Z-C3	6 212 Z-C3
3 2 6 TS	HORIZONTAL MOUNTING ONLY	63 12 Z-C3	6 212 Z-C3
364 T	0ZII	63 1 4 C3	63 1 4 C3
364 TS	는 무	63 1 4 C3	63 1 4 C3
365 T		63 1 4 C3	63 1 4 C3
365 TS		63 1 4 C3	63 1 4 C3
404 T		NU 3 1 6 C3	63 1 4 C3
404 TS		63 1 4 C3	63 1 4 C3
405 T		NU 3 1 6 C3	63 1 4 C3
405 TS		63 1 4 C3	63 1 4 C3
444 T		NU 3 1 9 C3	63 1 6 C3
444 TS		63 1 4 C3	63 1 4 C3
445 T		NU 3 1 9 C3	63 1 6 C3
445 TS		63 1 4 C3	63 1 4 C3

IEC	May wating	Bea	arings
frame	Mounting	Front (D.E.)	Rear (O.D.E.)
	Totally enclo	sed fan cooled motor	S
63		6 2 0 1 ZZ	6 2 0 1 ZZ
7 1		6 2 03 ZZ	6 2 0 2 ZZ
80		6 2 04 ZZ	6 2 03 ZZ
90 S - L		6 2 05 ZZ	6 2 04 ZZ
1 00 L		6 2 06 ZZ	6 2 05 ZZ
112 M		6307 ZZ	6 2 06 ZZ
132 S - M		6308 ZZ	6 2 07 ZZ
160 M - L		6309-C3	6 2 09 Z-C3
180 M - L	B3	63 11 -C3	6 211 Z-C3
2 00 M - L		63 12 -C3	6 212 Z-C3
22 5 S/M		63 1 4-C3	63 1 4-C3
2 50 S/M		63 1 4-C3	63 1 4-C3
2 80 S/M		63 1 4-C3	63 1 4-C3
		63 1 6-C3	63 1 6-C3
3 1 5 S/M		63 1 4-C3	63 1 4-C3
		63 1 9-C3	63 1 6-C3
355 M/L		63 1 4-C3	63 1 4-C3
		NU 3 22 -C3	63 1 9-C3

FOR NEMA LOW VOLTAGE ELECTRIC MOTORS



Table 12 – Bearing lubrication intervals and amount of grease

				ı	BALL BE	ARINGS	- Series (62/63					
			Relu	brication	intervals ((running h	ours – ho	rizontal po	sition)				
	Пр	ole	IV p	ole	VI po	ole	VIII p	ole	Х	pole	XII	pole	Amount of grease
						Se	rie 6 2						
Bearing	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	(g)
6 2 09	1 8400	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	9
6 211	1 4 2 00	1 6500	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	11
6 212	121 00	1 4400	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	1 3
						Serie	63						
Bearing	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	(g)
6309	1 5700	1 8 1 00	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	1 3
63 11	11 500	1 3700	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	1 8
63 12	9800	11 900	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	21
63 1 4	3600	4500	9700	11 600	1 4 2 00	1 6400	1 7300	1 9700	1 9700	2 0000	2 0000	2 0000	2 7
63 1 6	-	-	8500	1 0400	12 800	1 4900	1 5900	1 8700	1 8700	2 0000	2 0000	2 0000	34
63 1 9	-	-	7000	9000	11 000	1 3000	1 4000	1 7400	1 7400	1 8600	1 8600	2 0000	45
63 22	-	-	5 1 00	7 2 00	9 2 00	10800	11 800	1 5 1 00	1 5 1 00	1 5500	1 5500	1 9300	60

Table 13 – Bearing lubrication intervals and amount of grease

	BALL BEARINGS - Series NU3												
	Relubrication intervals (running hours – horizontal position)												
	II pole IV pole VI pole VIII pole X pole XII po						pole	Amount of grease					
Bearing	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	(g)
NU 309	9800	1 3300	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	1 3
NU 3 11	6400	9 2 00	1 9 1 00	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	1 8
NU 3 12	5 1 00	7600	1 7 2 00	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	2 0000	21
NU 3 1 4	1 600	2 500	7 1 00	8900	11 000	1 3 1 00	1 5 1 00	1 6900	1 6900	1 9300	1 9300	2 0000	2 7
NU 3 1 6	-	-	6000	7600	9500	11 600	1 3800	1 5500	1 5500	1 7800	1 7800	2 0000	34
NU 3 1 9	-	-	4700	6000	7600	9800	122 00	1 3700	1 3700	1 5700	1 5700	2 0000	45
NU 3 22	-	-	3300	4400	5900	7800	1 0700	11 500	11 500	1 3400	1 3400	1 7300	60
NU 3 2 4	-	-	2 400	3500	5000	6600	1 0000	1 0 2 00	1 0 2 00	121 00	121 00	1 5000	7 2

Notes:

- The ZZ bearings from 6201 to 6307 do not require relubrication as its life time is about 20,000 hours.
- Tables 1 and 2 are intended for the lubrication period under bearing temperature of 70°C (for bearings up to 6312 and NU 312) and temperature of 85°C (for bearings 6314 and NU 314 and larger).
- For each **1**5°C of temperature rise, the relubrication period is reduced by half.
- The relubrication periods given above are for those cases applying Polyrex® EM grease.
- When motors are used on the vertical position, their relubrication interval is reduced by half if compared to horizontal position motors.

Compatibility of Polyrex® EM grease with other types of grease:

Containing polyurea thickener and mineral oil, the Polyrex® EM grease is compatible with other types of grease that contain:

- Lithium base or complex of lithium or polyurea and highly refined mineral oil.
- Inhibitor additive against corrosion, rust and anti-oxidant additive.

Notes:

- Although Polyrex® EM is compatible with types of grease given above, we do no recommended to mix it with any other greases.
- If you intend to use a type of grease different than those recommended above , first contact WEG.
- On applications (with high or low temperatures, speed variation, etc), the type of grease and relubrification interval are given on an additional nameplate attached to the motor.



4. Maintenance

A well-designed maintenance program for electric motors can be summed up as: periodical inspection of insulation levels, temperature rise, wear, bearing lubrication and the occasional checking of fan air flow.

Inspection cycles depend upon the type of motor and the conditions under which it operates.

4.1 Cleanliness

Motors should be kept clean, free of dust, debris and oil. Soft brushes or clean cotton rags should be used for cleaning. A jet of compressed air should be used to remove non-abrasive dust from the fan cover and any accumulated grime from the fan and cooling fins.

Oil or damp impregnated impurities can be removed with rags soaked in a suitable solvent.

Terminal boxes fitted to motors with IP55 protection should be cleaned; their terminals should be free of oxidation, in perfect mechanical condition, and all unused space dust-free.

Motors with IPW 55 protection are recommended for use under unfavourable ambient conditions.

4.2 Lubrication

Proper lubrication extends bearing life.

Lubrication Maintenance Includes:

- a) Attention to the overall state of the bearings;
- b) Cleaning and lubrication;
- c) Critical inspection of the bearings.

Motor noise should be measured at regular intervals of one to four months. A well-tuned ear is perfectly capable of distinguishing unusual noises, even with rudimentary tools such as a screw driver, etc., without recourse to sophisticated listening aids or stethescopes that are available on the market.

A uniform hum is a sign that a bearing is running perfectly. Bearing temperature control is also part of routine maintenance.

Constant temperature control is possible with the aid of external thermometers or by embedded thermal elements. WEG motors are normally equipped with grease lubricated ball or roller bearings.

Bearings should be lubricated to avoid metallic contact of the moving parts, and also for protection against corrosion and wear. Lubricant properties deteriorate in the course of time and mechanical operation: furthermore, all lubricants are subject to contamination under working conditions

For this reason lubricants must be renewed and any lubricant consumed needs replacing from time to time.

4.2.1 Periodical Lubrication

WEG motors are supplied with sufficient grease for a long running period. Lubrication intervals, the amount of grease and the type of bearing used in frames 140T to 580T are to be found in Tables 11, 12 and 13.

Lubrication intervals depend upon the size of the motor, speed, working conditions and the type of grease used.

4.2.2 Quality and Quantity of Grease

Correct lubrication is important!

Grease must be applied correctly and in sufficient quantity as both insufficient or excessive greasing are harmful.

Excessive greasing causes overheating brought about by the greater resistance encountered by the rotating parts and, in particular, by the compacting of the lubricant and its eventual loss of lubricating qualities.

This can cause seepage with the grease penetrating the motor and dripping on the coils.

GREASES FOR MOTOR BEARINGS

For operating temperatures from -30 to 170°C							
<u>Туре</u>	<u>Type</u> <u>Supplier</u>						
Polyrex® EM	Esso						

4.2.3 Lubricating Instructions

a) Frame 140T to 210T motors

Frame **1**40T to **21**0T size motors are not fitted with grease nipples. Lubrication is carried out during periodical overhauls when the motor is taken apart.

Cleaning and Lubrication of Bearings

With the motor dismantled and without extracting the bearings from the shaft, all existing grease should be removed and the bearings cleaned with Diesel oil, kerosene or other solvent, until thoroughly clean.

Refill the spaces between the balls or rollers and the bearing cages with grease immediately after washing. Never rotate bearings in their dry state after washing.

For inspection purposes apply a few drops of machine oil. During these operations maximum care and cleanliness is recommended to avoid the penetration of any impurities or dust that could harm the bearings. Clean all external parts prior to reassembly.

b) Frame 360T to 580T Motors

Motors above 360T frame size are fitted with regreasable bearing system.

The lubrication system from this frame size upwards was designed to allow the removal of all grease from the bearing races through a bleeder outlet which at the same time impedes the entry of dust or other contaminants harmful to the bearing.

This outlet also prevents injury to the bearings from the well-known problem of over-greasing.

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It is advisable to lubricate while the motor is running, to allow the renewal of grease in the bearing case.

Should this procedure not be possible because of rotating parts in the proximity of the nipple (pulleys, coupling sleeves, etc.) that are hazardous to the operator the following procedure should be followed: - Inject about half the estimated amount of grease and run the motor at full speed for approximately a minute; switch off the motor and inject the remaining grease.

The injection of all the grease with the motor at rest could cause penetration of a portion of the lubricant through the internal seal of the bearing case and hence into the motor.

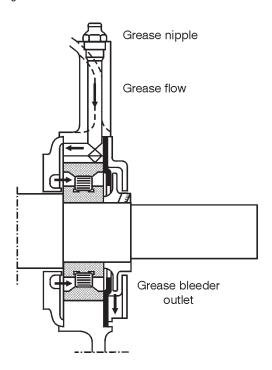


Figure 4.1 - Bearings and lubrication system

Nipples must be clean prior to introduction of grease to avoid entry of any alien bodies into the bearing.

For lubricating use only a manual grease gun.

Bearing Lubrication Steps

- Cleanse the area around the grease nipples with clean cotton fabric.
- With the motor running, add grease with a manual grease gun until the lubricant commences to be expelled from the bleeder outlet, or until the quantity of grease recommended in Tables 12 or 13 has been applied.
- 3. Allow the motor to run long enough to eject all excess grease.

4.2.4 Replacement of Bearings

The opening of a motor to replace a bearing should only be carried out by qualified personnel.

Damage to the core after the removal of the bearing cover can be avoided by filling the gap between the rotor and the stator with stiff paper of a proper thickness.



Providing suitable tooling is employed, disassembly of a bearing is not difficult.

The extractor grips should be applied to the sidewall of the inner ring to be stripped, or to an adjacent part.

To ensure perfect functioning and to prevent injury to the bearing parts, it is essential that the assembly be undertaken under conditions of complete cleanliness and by competent personnel.

New bearings should not be removed from their packages until the moment of assembly.

Prior to fitting a new bearing, ascertain that the shaft has no rough edges or signs of hammering.

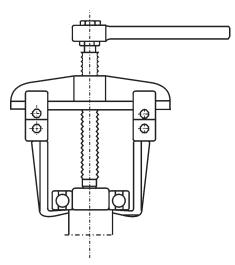


Figure 4.2 - A bearing extractor

During assembly bearings cannot be subjected to direct blows. The aid used to press or strike the bearing should be applied to the inner ring.

4.3 Air Gap Checking (Large Rating Open Motors)

Upon the completion of any work on the bearings check the gap measurement between the stator and the rotor using the appropriate gazes.

The gap variation at any two vertically opposite points must be less than 10% of the average gap measurement.

4.4 Explosion Proof Motor Repair Steps

4.4.1 Objective

as intended.

In view of the heavy liability associated with burning of motors of this type, this product has been designed and manufactured to high technical standards, under rigid controls. In addition, in many areas it is required that explosion proof motors ONLY be repaired by licensed personnel or in licensed facilities authorized to do this type of work. The following general procedures, safeguards, and guidelines must be followed in order to ensure repaired explosion proof motors operate

4.4.2 Repair Procedure and Precautions

Dismantle the damaged motor with appropriate tools without hammering and/or pitting machined surfaces such as enclosure joints, fastening



holes, and all joints in general.

The position of the fan cover should be suitably marked prior to removal so as to facilitate reassembly later on.

Examine the motor's general condition and, if necessary, disassemble all parts and clean them with kerosene. Under no circumstances should scrapers, emery papers or tools be used that could affect the dimensions of any part during cleaning.

Protect all machined parts against oxidation by applying a coating of vaseline or oil immediately after cleaning.

STRIPPING OF WINDINGS

This step requires great care to avoid knocking and/or denting of enclosure joints and, when removing the sealing compound from the terminal box, damage or cracking of the frame.

IMPREGNATION

Protect all frame threads by inserting corresponding bolts, and the joint between terminal box and frame, by coating it with a non-adhesive varnish (ISO 287 - ISOLASIL).

Protective varnish on machined parts should be removed soon after treating with impregnating varnish. This operation should be carried out manually without using tools.

ASSEMBLY

Inspect all parts for defects, such as cracks, joint incrustations, damaged threads and other potential problems.

Assemble using a rubber headed mallet and a bronze bushing after ascertaining that all parts are perfectly fitted.

Bolts should be positioned with corresponding spring washers and evenly tightened.

TESTING

Rotate the shaft by hand while examining for any drag problems on covers or fastening rings.

Carry out running tests as for standard motors.

MOUNTING THE TERMINAL BOX

Prior to fitting the terminal box all cable outlets on the frame should be sealed with a sealing compound (Ist layer) and an Epoxy resin (ISO 340) mixed with ground quartz (2nd layer) in the following proportions:

340A resin50 parts340B resin50 partsGround quartz100 parts

Drying time for this mixture is two hours during which the frame should not be handled and cable outlets should be upwards.

When dry, see that the outlets and areas around the cables are perfectly sealed.

Mount the terminal box and paint the motor.

4.4.3 Miscellaneous Recommendations

 Any damaged parts (cracks, pittings in machined surfaces, defective threads) must be replaced and under no circumstances should attempts be made to recover them.

- Upon reassembling explosion proof motors IPW55 the substitution of all seals is mandatory.
- Should any doubts arise, consult WEG.



5. Malfunctioning



Most malfunctions affecting the normal running of electric motors can be prevented by maintenance and the appropriate precautions.

While ventilation, cleanliness and careful maintenance are the main factors ensuring long motor life, a further essential factor is the prompt attention to any malfunctioning as signalled by vibrations, shaft knock, declining insulation resistance, smoke or fire, sparking or unusual slip ring or brush wear, sudden changes of bearing temperatures.

When failures of an electric or mechanical nature arise, the first step to be taken is to stop the motor and subsequent examination of all mechanical and electrical parts of the installation.

In the event of fire, the installation should be isolated from the mains supply, which is normally done by turning off the respective switches. In the event of fire within the motor itself, steps should be taken to restrain and suffocate it by covering the ventilation vents.

To extinguish a fire, dry chemical or ${\rm CO_2}$ extinguishers should be used - never water.

5.1 Standard Three-Phase Motor Failures

Owing to the widespread usage of asynchronous three-phase motors in industry which are more often repaired in the plant workshops, there follows a summary of possible failures and their probable causes, detection and repairs.

Motors are generally designed to Class B or F insulation and for ambient temperatures up to 40°C.

Most winding defects arise when temperature limits, due to current overload, are surpassed throughout the winding or even in only portions thereof. These defects are identified by the darkening or carbonizing of wire insulation.

5.1.1 Short Circuits Between Turns

A short circuit between turns can be a consequent of two coinciding insulation defects, or the result of defects arising simultaneously on two adjacent wires. As wires are randomly tested, even the best quality wires can have weak spots. Weak spots can, on occasion, tolerate a voltage surge of 30% at the time of testing for shorting between turns, and later fail due to humidity, dust or vibration.

Depending on the intensity of the short, a magnetic hum becomes audible.

In some cases, the three-phase current imbalance can be so insignificant that the motor protective device fails to react. A short circuit between turns, and phases to ground due to insulation failure is rare, and even so, it nearly always occurs during the early stages of operation.

5.1.2 Winding Failures

a) One burnt winding phase

This failure arises when a motor runs wired in delta and current fails in one main conductor.

Current rises from **2** to **2**.5 times in the remaining winding with a simultaneous marked fall in speed. If the motor stops, the current will increase from 3.5 to 4 times its rated value.

In most instances, this defect is due to the absence of a protective switch, or else the switch has been set too high.

b) Two burnt winding phases

This failure arises when current fails in one main conductor and the motor winding is star-connected. One of the winding phases remains currentless while the others absorb the full voltage and carry an excessive current.

The slip almost doubles.

c) Three burnt winding phases

Probable cause 1

Motor only protected by fuses; an overload on the motor will be the cause of the trouble.

Consequently, progressive carbonizing of the wires and insulation culminate in a short circuit between turns, or a short against the frame occurs.

A protective switch placed before the motor would easily solve this problem.

Probable cause 2

Motor incorrectly connected. For example: A motor with windings designed for 230/400V is connected through a star-delta switch to 400V connection.

The absorted current will be so high that the winding will burn out in a few seconds if the fuses or a wrongly set protective switch fail to react promptly.

Probable cause 3

The star-delta switch is not commutated and the motor continues to run for a time connected to the star under overload conditions.

As it only develops 1/3 of its torque, the motor cannot reach rated speed. The increased slip results in higher ohmic losses arising from the Joule effect. As the stator current, consistent with the load, may not exceed the rated value for the delta connection, the protective switch will not react

Consequent to increased winding and rotor losses the motor will overheat and the winding burn out.

Probable cause 4

Failures from this cause arise from thermal overload, due to too many starts under intermittent operation or to an overly long starting cycle. The perfect functioning of motor operating under these conditions is only assured when the following values are heeded:

- a) number of starts per hour;
- b) starting with or without load;
- c) mechanical brake or current inversion;
- d) acceleration of rotating masses connected to motor shaft;
- e) load torque vs. speed during acceleration and braking.

The continuous effort exerted by the rotor during intermittent starting brings about heavier losses which provoke overheating. Under certain circumstances with the motor idle there is a possibility that the stator winding is subjected to damage as a result of the





heating of the motor. In such a case, a slip ring motor is recommended as a large portion of the heat (due to rotor losses) is dissipated in the rheostat.

5.1.3 Rotor Failures

If a motor running under load conditions produces a noise of varying intensity and decreasing frequency while the load is increased, the reason, in most cases, will be an unsymmetrical rotor winding.

In squirrel-cage motors the cause will nearly always be a break in one or more of the rotor bars; simultaneously, periodical stator current fluctuations may be recorded. As a rule, this defect appears only in molded or die cast aluminum cages.

Failures due to spot heating in one or another of the bars in the rotor stack are identified by the blue coloration at the affected points.

Should there be failures in various contiguous bars, vibrations and shuddering can occur as if due to an unbalance, and are often interpreted as such. When the rotor stack acquires a blue or violet coloration, it is a sign of overloading.

This can be caused by overly high slip, by too many starts or overlong starting cycles. This failure can also arise from insufficient main voltage.

5.1.4 Bearing Failures

Bearing damage is a result of overloading brought about by an overly taut belt or axial impacts and stresses.

Underestimating the distance between the drive pulley and the driven pulley is a common occurrence.

The arc of contact of the belt on the drive pulley thus becomes inadmissibly small and thereby belt tension is insufficient for torque transmission.

In spite of this it is quite usual to increase belt tension in order to attain sufficient drive.

Admittably, this is feasible with the latest belt types reinforced by synthetic materials.

However, this practice fails to consider the load on the bearing and the result is bearing failure within a short time.

Additionally there is the possibility of the shaft being subjected to unacceptably high loads when the motor is fitted with a pulley that is too wide.

5.1.5 Shaft Fractures

Although bearings traditionally constitute the weaker part, and the shafts are designed with wide safety margins, it is not beyond the realm of possibility that a shaft may fracture by fatigue from bending stress brought about by excessive belt tension.

In most cases, fractures occur right behind the drive end bearing. As a consequence of alternating bending stress induced by a rotating shaft, fractures travel inwards from the outside of the shaft until the point of rupture is reached when resistance of the remaining shaft cross-section no longer suffices.

Avoid additional drilling the shaft (fastening screw holes) as such operations tend to cause stress concentration.

5.1.6 Unbalanced V-Belt Drives

The substitution of only one of a number of other parallel belts on a drive is frequently the cause of shaft fractures, as well as being malpractice.

Any used, and consequently stretched belts retained on the drive, especially those closest to the motor, while new and unstretched belts are placed on the same drive turning farther from the bearing, can augment shaft stress.

5.1.7 Damage Arising from Poorly Fitted Transmission Parts or Improper Motor Alignment

Damage to bearing and fracture in shafts often ensue from inadequate fitting of pulleys, couplings or pinions. There parts "knock" when rotating. The defect is recognized by the scratches that appear on the shaft or the eventual scalelike flaking of the shaft end.

Keyways with edges pitted by loosely fitted keys can also bring about shaft failures.

Poorly aligned couplings cause knocks and radial and axial shaking to shaft and bearings.

Within a short while these malpractices cause the deterioration of the bearings and the enlargement of the bearing cover bracket located on the drive end side.

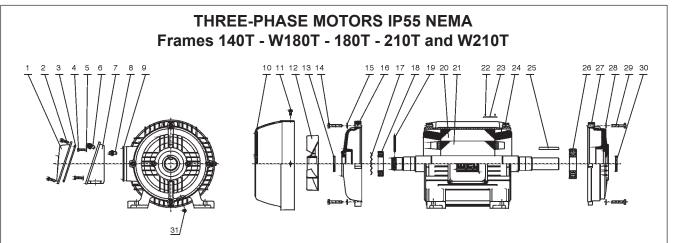
Shaft fracture can occur in more serious cases.



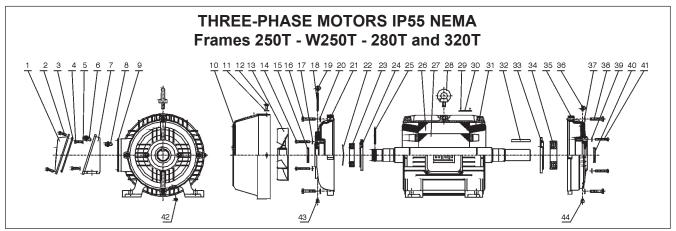
5.2 Troubleshooting chart

FAILURE	PROBABLE CAUSE	CORRECTIVE MEASURES				
Motor fails to start	No voltage supply Low voltage supply Wrong control connections Loose connection at some terminal lug Overload	 Check feed connections to control system and from this to motor. Check voltage supply and ascertain that voltage remains within 10% of the rated voltage shown on the motor nameplate. Compare connections with the wiring diagram on the motor nameplate. Tighten all connections. Try to start motor under no-load conditions. If it starts, there may be an overload condition or a blocking of the starting mechanism. Reduce load to rated load level and increase torque. 				
High noise level	Unbalance Distorted shaft Incorrect alignment Uneven air gap Dirt in the air gap Extraneous matter stuck between fan and motor casing Loose motor foundation Worn bearings	 Vibrations can be eliminated by balancing rotor. If load is coupled directly to motor shaft, the load can be unbalanced. Shaft key bent; check rotor balance and eccentricity. Check motor aligment with machine running. Check shaft for warping or bearing wear. Dismantle motor and remove dirt or dust with jet of dry air. Dismantle motor and clean. Remove trash or debris from motor vicinity. Tighten all foundation studs. If necessary, realign motor. Check lubrication. Replace bearing if noise is excessive and continuous. 				
Overheating of bearings	Excessive grease Excessive axial or radial strain on belt Deformed shaft Rough bearing surface Loose or poorly fitted motor end shields Lack of grease Hardened grease cause locking of balls Foreign material in grease	 Remove grease bleeder plug and run motor until excess grease is expelled. Reduce belt tension. Have shaft straightened and check rotor balance. Replace bearings before they damage shaft. Check end shields for close fit and tightness around circumference. Add grease to bearing. Replace bearings. Flush out housings and relubricate. 				
Intense bearing vibration	Unbalanced rotor Dirty or worn bearing Bearing rings too tight on shaft and/or bearing housing Extraneous solid particles in bearing	 Balance rotor statically and dynamically. If bearing rings are in perfect condition, clean and relubricate the bearing, otherwise, replace bearing. Before altering shaft or housing dimensions, it is advisable to ascertain that bearing dimensions correspond to manufacturer's specifications. Take bearing apart and clean. Reassemble only if rotating and support surfaces are unharmed. 				
Overheating of motor	Obstructed cooling system Overload Incorrect voltages and frequecies Frequent inversions Rotor dragging on stator Unbalanced electrical load (burnt fuse, incorrect control)	 Clean and dry motor; inspect air vents and windings periodically. Check application, measuring voltage and current under normal running conditions. Compare values on motor nameplate with those of mains supply. Also check voltage at motor terminals under full load. Exchange motor for another that meets needs. Check bearing wear and shaft curvature. Check for unbalanced voltages or operation under single-phase condition. 				

6. Spare Parts and Component Terminology

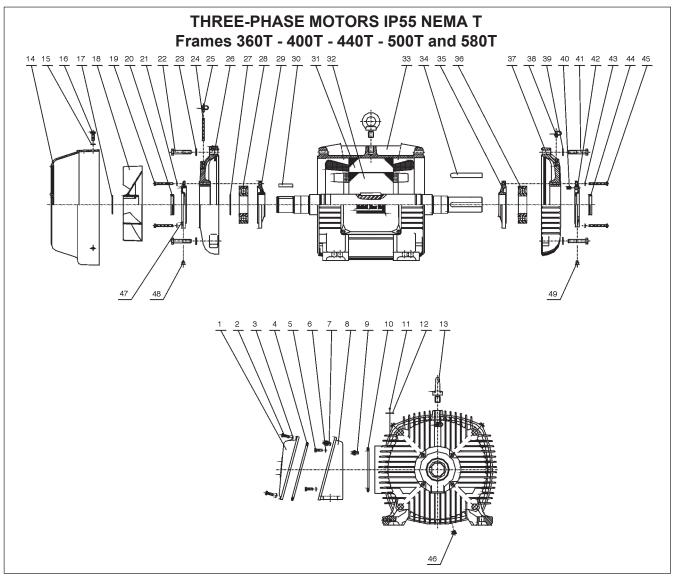


Part Nr.	Description	Part Nr.	Description	Part Nr.	Description
1	Terminal box cover	13	V'Ring	2 5	Shaft key
2	Terminal box cover fixing bolt	1 4	Non-drive end endshield fixing bolt	2 6	Drive end bearing
3	Terminal box cover gasket	1 5	Non-drive end endshield washer	2 7	Drive endshield
4	Terminal box fixing bolt	1 6	Non-drive endshield	2 8	Drive endshield washer
5	Terminal box fixing washer	1 7	Spring washer	2 9	Drive end endshield fixing bol
6	Terminal box grounding lug	18	Non-drive bearing	33	V'Ring
7	Terminal box	1 9	Fan fixing pin	31	Drain plug
8	Frame grounding lug	2 0	Wound stator		p9
9	Terminal box o'ring gasket	21	Rotor / shaft assembly		
1 0	Fan cover	22	Nameplate fixing rivet		
11	Fan cover fixing bolt	2 3	Nameplate		
12	Fan	24	Frame		



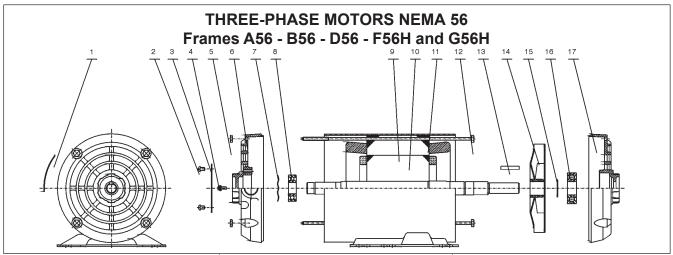
Part Nr.	Description	Part Nr.	Description	Part Nr.	Description
1	Terminal box cover	1 6	Non-drive end endshield fixing	30	Nameplate
2	Terminal box cover fixing bolt		bolt	3 1	Frame
3	Terminal box cover gasket	1 7	Non-drive end bearing cap washer	3 2	Shaft key
4	Terminal box fixing bolt	1 8	Non-drive end grease nipple	33	Drive end bearing cap
5	Terminal box fixing washer	1 9	Non-drive end grease nipple cover	34	Drive end bearing
6	Terminal box grounding lug	2 0	Non-drive end endshield washer	35	Drive andshield
7	Terminal box	21	Non-drive endshield	36	Drive end grease nipple cover
8	Frame grounding lug	22	Spring washer	37	Drive endshield washer
9	Terminal box o'ring gasket	2 3	Non-drive end bearing	38	Drive end endshield fixing bolt
1 0	Fan cover	2 4	Non-drive end bearing cap	39	Drive end bearing cap washer
11	Fan cover washer	2 5	Fan fixing pin	40	V'Ring
12	Fan cover fixing bolt	2 6	Wound stator	4 1	Drive end bearing cap fixing bolt
1 3	Fan	2 7	Rotor and shaft	4 2	Drain plug
1 4	Non-drive end bearing cap bolt	2 8	Eyebolt	43	Non-drive and grease relief
1 5	V'Ring	2 9	Nameplate fixing rivet	44	Drive end grease relief



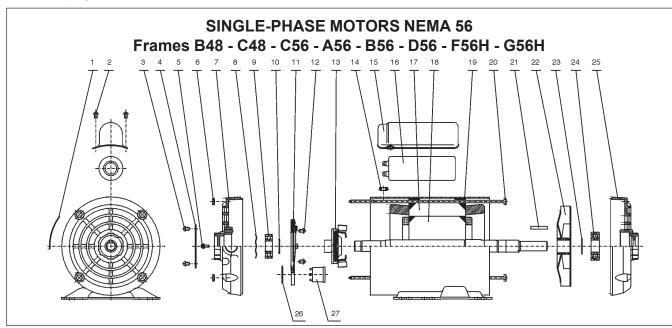


Part Nr.	Description	Part Nr.	Description	Part Nr.	Description
1	Terminal box cover	18	Fan •	34	Shaft key
2	Terminal box cover fixing bolt	1 9	Non-drive end bearing cap bolt	35	Internal drive end bearing cap
3	Terminal box cover washer	2 0	V'Ring	36	Drive end bearing
4	Terminal box cover gasket	21	Non-drive end bearing cap washer	37	Drive endshield
5	Terminal box fixing bolt	22	Non-drive end endshield fixing	38	Drive end grease nipple cover
6	Terminal box fixing washer		bolt	39	Drive endshield washer
7	Terminal box grounding lug	2 3	Non-drive end endshield washer	40	Pre-load spring
8	Terminal box	2 4	Non-drive end grease nipple	4 1	Drive end endshield fixing bolt
9	Frame grounding lug	2 5	Non-drive end grease nipple cover	4 2	External drive end bearing cap
1 0	Terminal box o'ring gasket	2 6	Non-drive enshield	43	Drive end bearing cap washer
11	Nameplate fixing rivet	2 7	Bearing cap	44	V'Ring
12	Nameplate	2 8	Non-drive bearing	45	Drive end bearing cap fixing bolt
1 3	Eyebolt	2 9	Internal non-drive end bearing cap	46	Drain plug
1 4	Fan cover	30	Fan fixing key	47	External non-drive end bearing
1 5	Fan cover washer	31	Wound stator		cap
1 6	Fan cover fixing bolt	3 2	Rotor / shaft assembly	48	Non drive end grease relief
1 7	Fan fixing ring	33	Frame	49	Non-drive end grease relief





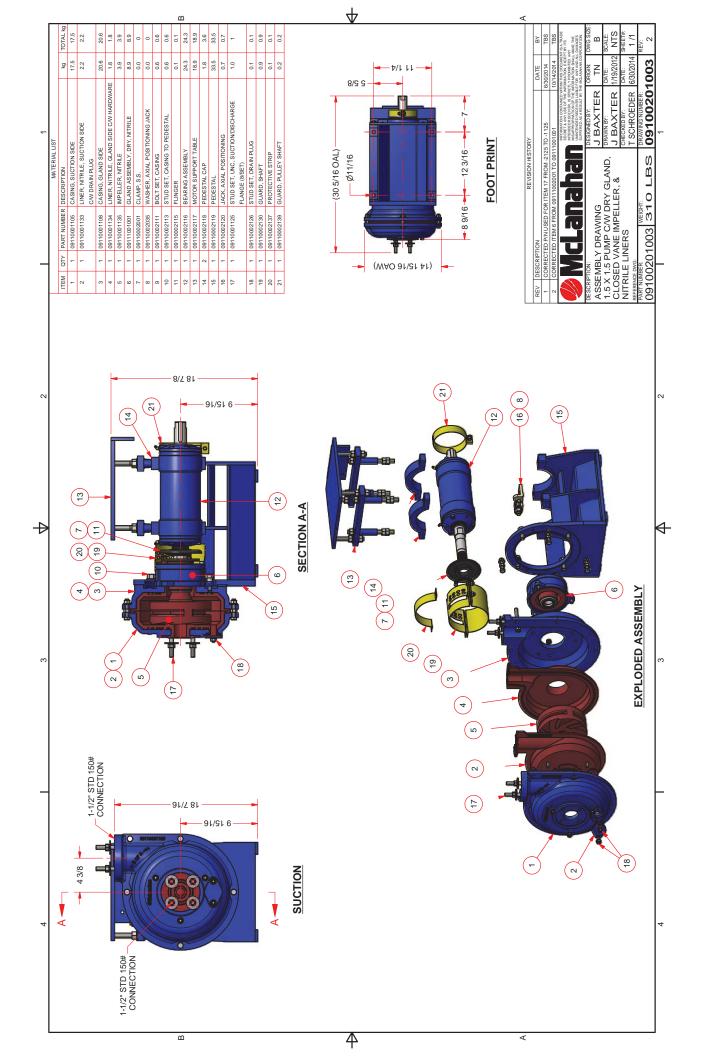
Part Nr.	Description	Part Nr.	Description	Part Nr.	Description
1	Sticker	8	Non-drive end bearing	1 4	Fan
2	Terminal box cover fixing bolt	9	Wound stator	1 5	Drive end bearing fastening
3	Terminal box cover	10	Rotor / shaft assembly		washer
4	Grounding lug	11	Frame	1 6	Drive end bearing
5	Through bolt fastening nut	12	Through bolt	17	Drive endshield
6	Non-drive endshield	1 3	Shaft key		
7	Spring washer				

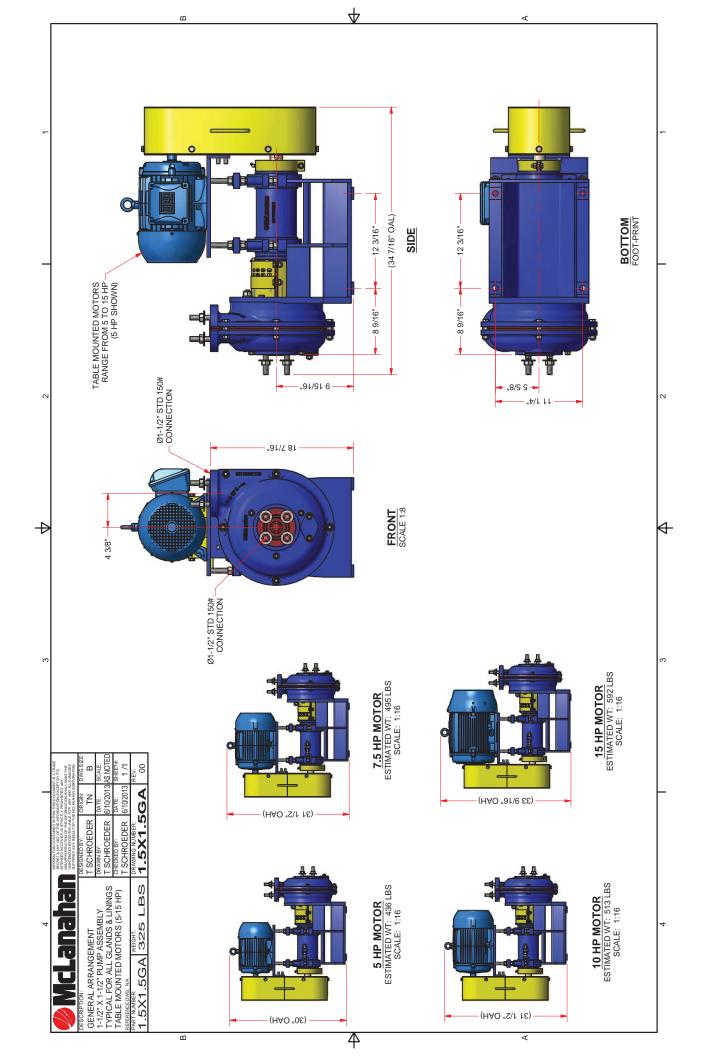


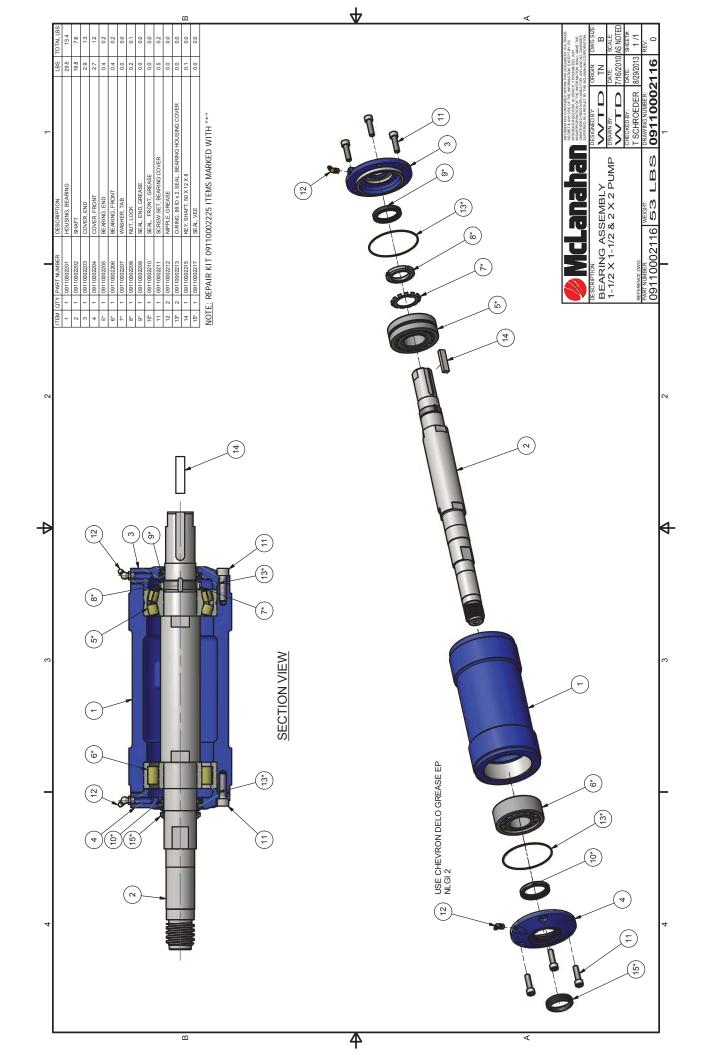
Part Nr.	Description	Part Nr.	Description	Part Nr.	Description
1	Sticker	12	Stationary switch fastening bolt	2 3	Drive end bearing fastening
2	Capacitor cover fixing bolt	13	Centrifugal switch		washer
3	Terminal box cover fixing bolt	1 4	Rubber ring for lead passing hole	2 4	Drive end bearing
4	Terminal box cover		to capacitor	2 5	Drive endshield
5	Grounding lug	1 5	Capacitor cover	2 6	Overload thermal protector fixing
6	Through bolt fastening nut	1 6	Capacitor		ring
7	Non-drive endshield	1 7	Wound stator	2 7	Overload thermal protector
8	Spring washer	1 8	Rotor / shaft assembly		•
9	Non-drive and bearing	1 9	Frame		
1 0	Non-drive and bearing fastening	2 0	Through bolt		
	washer	21	Shaft key		
11	Stationary switch	22	Fan		

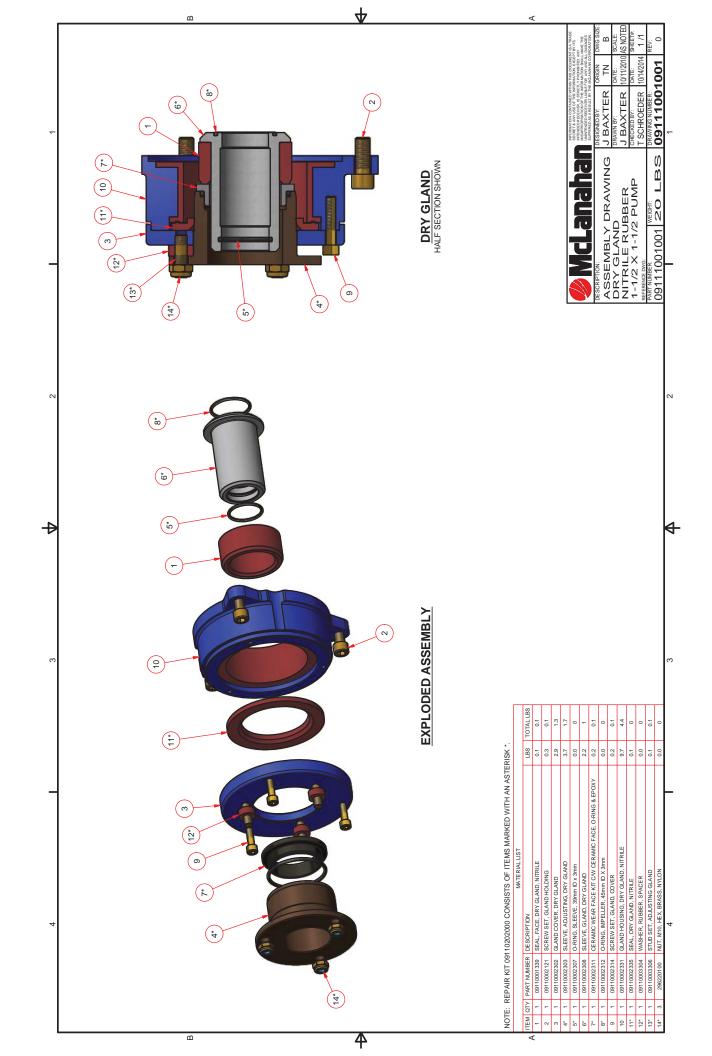
Note: For F56H and G56H frame motors: 1)

Part nr. 2 = 3 pieces; 2) Part nr. 15 and 16 = 2 pieces





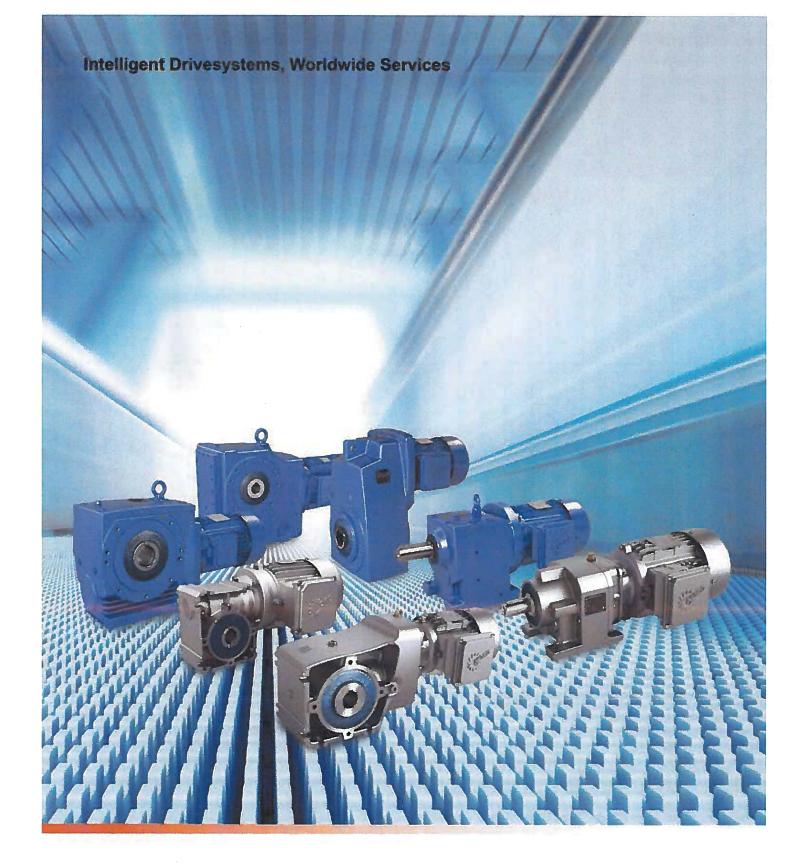






MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL AMARUQ WTP – NUNAVUT VEOLIA PROJECT: 5000 218 009

NORD CLINCHER SERIES, GEAR REDUCER



EN **B 1000**

Gear units

Operating and Assembly Instructions







General safety and operating instructions

1. General

Depending on its protection class, the device may have live, bare, moving or rotating parts or hot surfaces during operation,.

Unauthorised removal of covers, improper use, incorrect installation or operation causes a risk of serious personal injury or material damage.

All transport, installation, commissioning and maintenance work must be carried out by qualified specialist personnel (national accident prevention regulations must be observed).

Within the meaning of this basic safety information, qualified specialist personnel are persons who are familiar with the installation, assembly, commissioning and operation of the product and who have the training and experience to recognise and avoid any hazards and risks.

2. Correct use

NORD products may only be used according to the information in the catalogue and the associated technical documentation.

Compliance with the operating and installation instructions is a prerequisite for fault-free operation and for the fulfilment of any warranty claims. These operating and installation instructions must be read before working with the device!

These operating and installation instructions contain important information about **servicing**. They must therefore be kept **close to the device**.

All details regarding technical data and permissible conditions at the installation site must be complied with.

3. Transport, storage

Information regarding transport, storage and correct handling must be complied with.

4. Installation

The device must be protected against impermissible loads. In particular, during transport and handling, components must not be deformed or changed. Touching of electronic components and contacts must be avoided.

5. Electrical Connection

When working on live three-phase motors, the applicable national accident prevention regulations must be complied with (e.g. BGV A3, formerly VBG 4).

The electrical installation must be implemented according to the applicable regulations (e.g. cable cross-section, fuses, earth lead connections).

Information regarding EMC-compliant installation – such as shielding, earthing and installation of cables – can be found in the three-phase motor documentation. Compliance with the limiting values specified in the EMC regulations is the responsibility of the manufacturer of the system or machine.

6. Operation

Appropriate safety measures must be taken for applications where failure of the device may result in injury.

Where necessary, systems in which NORD devices are installed must be equipped with additional monitoring and protective equipment according to the applicable safety requirements, e.g. legislation concerning technical equipment, accident prevention regulations, etc.

All covers and guards must be kept closed during operation.

7. Maintenance and repairs

After the device has been disconnected from the power supply, live equipment components and power connections should not be touched immediately, because of possible charged capacitors.

Further information can be found in this documentation.

These safety instructions must be kept in a safe place!



Documentation

Name:

B 1000

Part No.:

6052802

Series:

Gear units and geared motors

Type series:

Gear unit

Helical gear unit

types:

NORDBLOC helical gear units Standard helical gear units Parallel shaft gear units

Bevel gear units

Helical worm gear units
MINIBLOC worm gear units
UNIVERSAL worm gear units

Version list

Title, Date	Order number	Comments	
B 1000, February 2013	6052802 / 0713	-	
B 1000, September 2014	6052802 / 3814	General corrections	
B 1000, April 2015	6052802 / 1915	New gear unit types SK 10382.1 + SK 11382.1	
B 1000, March 2016	6052802 / 0916	General corrections New bevel gear units SK 920072.1 + SK 930072.1	
B 1000, September 2016	6052802 / 3816	General corrections New SK 071.1 helical gear unit, SK 171.1, SK 371.1, SK 571.1, SK 771.1;	

Table 1: Version list B 1000

Copyright notice

As an integral component of the device described here, this document must be provided to all users in a suitable form.

Any editing or amendment or other utilisation of the document is prohibited.

Publisher

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1 Notes

1.1 General information

Read the Operating Manual carefully prior to performing any work on or putting the gear unit into operation. Strict compliance with the instructions in this Operating Manual is essential. This Operating Manual and all associated special documentation must be kept in the immediate vicinity of the gear unit

Getriebebau NORD accepts no liability for damage to persons, materials or assets as a result of the non-observance of this Operating Manual, operating errors or incorrect use. General wearing parts, e.g. radial seals are excluded from the warranty.

If additional components are attached to or installed on or in the gear unit (e.g. motor, cooling system, pressure sensor etc.) or components (e.g. cooling system) are supplied with the order, the operating instructions for these components must be observed.

If geared motors are used, compliance with the Motor Operating Manual is also necessary.

If you do not understand the contents of this Operating Manual or additional operating instructions, please consult Getriebebau NORD!

1.2 Safety and information symbols

1.2.1 Explanation of labels used

▲ DANGER	Indicates an immediate danger, which may result in death or serious injury.
▲ WARNING	Indicates a possibly dangerous situation, which may result in death or serious injury.
A CAUTION	Indicates a possibly dangerous situation, which may result in slight or minor injuries.
NOTICE	Indicates a possibly harmful situation, which may cause damage to the product or the environment.
i Note	Indicates hints for use and useful information.



1.3 Correct use

These gear units generate a rotational movement and are intended for use in commercial systems. The gear unit must only be used according to the information in the technical documentation from Getriebebau NORD.

Commissioning (start of proper operation) is prohibited until it has been established that the machine complies with the local laws and directives. The EMC Directive 2004/108/EC and the Machinery Directive 2006/42/EC in their currently valid scope of application must be complied with in particular.



DANGER!

Explosion hazard

Serious injury and material damage due to explosion are possible.

Use in explosion hazard areas is prohibited.



WARNING

Injury to persons

Appropriate safety measures must be taken for applications where failure of a gear unit or geared motor may result in injury.

Safeguard a wide area around the hazard zone.



WARNING

Material damage and personal injury

If the gear unit is not used as designed, this may cause damage to the gear unit or the premature failure of components. Personal injury as a result of this cannot be ruled out.

Strict compliance with the technical data on the type plate is essential. The documentation must be observed.

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1.4 Safety information

Observe all safety information, including that provided in the individual sections of this Operating Manual. All national and other regulations on safety and accident prevention must also be observed.

A

DANGER!

Severe personal injury

Serious physical and property damage may result from inappropriate installation, non-designated use, incorrect operation, non-compliance with safety information, unauthorised removal of housing components or safety covers and structural modifications to the gear unit.

- All work, e.g. transportation, storage, installation, electrical connection, commissioning, servicing, maintenance and repair must only be performed by qualified specialist personnel.
- · Observe the Operating Manual
- · Observe the safety information
- Observe the safety and accident prevention regulations.
- · Tighten the drive elements or secure the parallel key before switching on.
- · Do not make any structural modifications.
- · Do not remove any safety devices.
- · If necessary, wear hearing protection when working in the immediate vicinity of the gear unit.
- All rotating components must be provided with guards. In standard cases, covers are fitted by NORD. The
 covers must always be used if contact protection is not provided by other methods.

A

DANGER!

Injury to persons

The surfaces of gear units or geared motors may become hot during or shortly after operation. Danger of burns!

- Installation and maintenance work must only be performed when gear unit is at a standstill and has cooled down. The drive must be isolated and secured to prevent accidental start-up.
- · Wear protective gloves.
- Shield hot surfaces with contact guards.
- Do not store inflammable objects or substances in the immediate vicinity of the gear unit.



WARNING

Injury to persons

Serious injury and material damage due to improper transport are possible.

- · No additional loads may be attached.
- Transportation aids and lifting gear must have an adequate load-bearing capacity.
- · Pipes and hoses must be protected from damage.



CAUTION

Injury to persons

Danger of cuts from exterior edges of attachment adapters, flanges and covers.

Contact freezing with metallic components in case of low temperatures.

In addition to personal protective equipment, wear suitable protective gloves and suitable goggles during assembly, commissioning, inspection and maintenance, in order to prevent injuries.

It is recommended that repairs to NORD Products are carried out by the NORD Service department.

1.5 Other documents

Further information may be obtained from the following documents:

- Gear unit catalogues (G1000, G1012, G1014, G1035, G1050, G2000),
- · Operating and maintenance instructions for the electric motor,
- if applicable, the Operating Manuals for attached or supplied options

1.6 Disposal

Observe the current local regulations. In particular, lubricants must be collected and disposed of correctly.

Gear unit components	Material
Gear wheels, shafts, rolling bearings, parallel keys, locking rings,	Steel
Gear unit housing, housing components,	Grey cast iron
Light alloy gear unit housing, light alloy gear unit housing components,	Aluminium
Worm gears, bushes,	Bronze
Radial seals, sealing caps, rubber components,	Elastomers with steel
Coupling components	Plastic with steel
Flat seals	Asbestos-free sealing material
Gear oil	Additive mineral oil
Synthetic gear oil (type plate code: CLP PG)	Polyglycol-based lubricants
Cooling spiral, embedding material of the cooling spiral, screw fittings	Copper, epoxy, yellow brass

Table 2: Disposal of materials

B 1000 EN-3816



2 Description of gear unit

2.1 Type designations and gear unit types

Gear unit types / Type designations

Helical gear units

SK 11E, SK 21E, SK 31E, SK 41E, SK 51E (1-stage)

SK 02, SK 12, SK 22, SK 32, SK 42, SK 52, SK 62N (2-stage)

SK 03, SK 13, SK 23, SK 33N, SK 43, SK 53 (3-stage)

SK 62, SK 72, SK 82, SK 92, SK 102 (2-stage)

SK 63, SK 73, SK 83, SK 93, SK 103 (3-stage)

NORDBLOC helical gear units

SK 320, SK 172, SK 272, SK 372, SK 472, SK 572, SK 672, SK 772, SK 872, SK 972 (2-stage)

SK 273, SK 373, SK 473, SK 573, SK 673, SK 773, SK 873, SK 973 (3-stage)

SK 071.1, SK 371.1, SK 571.1, SK 771.1 (1-stage)

SK 072.1, SK 172.1, SK 372.1, SK 572.1, SK 672.1, SK 772.1, SK 872.1, SK 972.1 (2-stage)

SK 373.1, SK 573.1, SK 673.1, SK 773.1, SK 873.1, SK 973.1 (3-stage)

Standard helical gear units

SK 0, SK 01, SK 20, SK 25, SK 30, SK 33 (2-stage)

SK 10, SK 200, SK 250, SK 300, SK 330 (3-stage)

Parallel shaft gear unit

SK 0182NB, SK 0282NB, SK 1282, SK 2282, SK 3282, SK 4282, SK 5282, SK 6282, SK 7282, SK 8282,

SK 9282, SK 10282, SK 11282 (2-stage)

SK 1382NB, SK 2382, SK 3382, SK 4382, SK 5382, SK 6382, SK 7382, SK 8382, SK 9382, SK 10382,

SK 10382.1, SK 11382, SK 11382.1, SK 12382 (3-stage)

Bevel gear units

SK 92072, SK 92172, SK 92372, SK 92672, SK 92772;

SK 920072.1, SK 92072.1, SK 92172.1, SK 92372.1, SK 92672.1, SK 92772.1, SK 93072.1, SK 93172.1,

SK 930072.1, SK 93372.1, SK 93672.1, SK 93772.1 (2-stage)

SK 9012.1, SK 9016.1, SK 9022.1, SK 9032.1, SK 9042.1, SK 9052.1, SK 9062.1, SK 9072.1, SK 9082.1,

SK 9086.1, SK 9092.1, SK 9096.1 (3-stage)

SK 9013.1, SK 9017.1, SK 9023.1, SK 9033.1, SK 9043.1, SK 9053.1 (4-stage)

Helical worm gear units

SK 02040, SK 02050, SK 12063, SK 12080, SK 32100, SK 42125 (2-stage)

SK 13050, SK 13063, SK 13080, SK 33100, SK 43125 (3-stage)

MINIBLOC worm gear units

SK1 S32, SK1 S40, SK 1S50, SK 1S63, SK 1SU..., SK 1SM31, SK 1SM40, SK 1SM50, SK 1SM63 (1-stage)

SK 2S32NB, SK 2S40NB, SK 2S50NB, SK 2S63NB, SK 2SU..., SK 2SM40, SK 2SM50, SK 2SM63 (2-stage)

With free drive shaft

Viton radial seals

Pressure venting

Worm pre-stage

Worm pre-stage

Oil level tank

spiral

Oil expansion tank

Synthetic oil ISO VG 220

Casing cover with cooling

Modular contrate pre-stage

W

VI

OA

OT

SO1

CC

DR

H10

/31



Z

F

Х

X7

XF

AL

5

V

Gear unit types / Type designations

Output flange B14

Base and output flange B14

Base and output flange B5

Reinforced axial output

Reinforced output shaft

Reinforced drive shaft

(Standard helical gear units)

(Standard helical gear units)

Output flange B5

Foot mounting

bearings

UNIVERSAL worm gear units SK 1SI31, SK 1SI40, SK 1SI50, SK 1SI63, SK 1SI75, SK 1SIS31, ..., SK 1SIS75, SK 1SID31, ..., SK 1SID63, SK 1SMI31, ..., SK 1SMI75, SK 1SMID31, ..., SK 1SMID63, SK 1SIS-D31, ..., SK 1SIS-D63 (1-stage), SK 2SMID40, SK 2SMID50, SK 2SMID63, SK 2SID40, ..., SK 2SID63 (2-stage) **Versions / Options** Foot mounting with solid shaft D Torque support IEC Standard IEC motor Hollow shaft version Torque bracket mounting Α ĸ ٧ Solid shaft version S Shrink disc NEMA Standard NEMA motor Solid shaft both sides VS Reinforced shrink disc attachment 1

Hollow shaft with internal spline

Covering cap as contact guard

Reinforced rubber buffer

Fastening element

Covering cap IP66

Agitator version

Reinforced bearings

Drywell agitator version

Rubber huffer

Back stop

FΑ

G

VG

R

В

Н

H66

VL

VL2

VL3

Table 3: Type designations and gear unit types

Double gear units consist of two single gear units. They are to be treated as per the instructions in this Manual, i.e. as two individual gear units.

Type designation for double gear units: e.g. SK 73 /22 (consisting of single gear units SK 73 and SK 22)

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2.2 Type plate

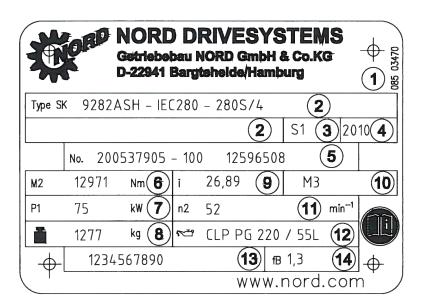


Fig. 1: Type plate (example) with explanation of the type plate fields

Explanation

- 1 Matrix or bar code
- 2 NORD gear unit type
- 3 Operating mode
- 4 Year of manufacture
- 5 Serial number
- 6 Rated torque of gear unit output shaft
- 7 Drive power
- 8 Weight according to ordered version
- 9 Overall gear unit ratio
- 10 Installation orientation
- 11 Rated speed of gear unit output shaft
- Lubricant type, viscosity and quantity
- Customer's part
 - number
- 14 Operating factor



3 Assembly instructions, storage, preparation, installation

Please observe all general safety instructions (please see chapter 1.4 "Safety information"), the safety information in the individual sections and the proper use (please see chapter 1.3 "Correct use")bestimmungsgemäße Verwendung</dg ref source inline>.

3.1 Transporting the gear unit



WARNING

Hazard due to heavy loads

Severe injuries and material damage due to falling or tipping heavy loads are possible.

- Standing under the gear unit during transport is extremely dangerous.
- · To prevent injury, the danger area must be generously cordoned off.
- Only transport using the eyebolts attached to the gear unit.
- · No additional loads may be attached.
- · If geared motors have an additional eyebolt attached to the motor, this must also be used.
- · The thread of the eyebolt must be fully screwed in.
- · Avoid pulling the eyebolts at an angle.

NOTICE

Gear unit damage

Damage to the gear unit due to improper use is possible.

- Prevent damage to the gear unit. Impacts to the free ends of the shafts may cause internal damage to the gear unit.
- Use adequately dimensioned and suitable means of transportation. Lifting tackle must be designed for the
 weight of the gear unit. The weight of the gear unit can be obtained from the dispatch documents.

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3.2 Storage

For short-term storage before commissioning, please observe the following:

Store in the installation position (please see chapter 6.1 "Configurations and maintenance") and secure the gear unit against falling,

- · Lightly oil bare metal housing surfaces and shafts
- · Store in a dry place.
- Temperature in the range from 5 °C to + 50 °C without large fluctuations,
- · Relative humidity less than 60 %,
- · No direct exposure to sunlight or UV light,
- No aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity,
- · No vibration or oscillation

3.3 Long-term storage



Injury to persons

Incorrect, or excessively long storage may result in malfunctions of the gear unit.

Perform an inspection of the gear unit prior to commissioning if the permissible storage time has been exceeded.

1 Information

Long-term storage

For storage or standstill periods in excess of 9 months, Getriebebau NORD recommends the long-term storage ontion

With the long-term storage option and the use of the measures listed below, storage for up to 2 years is possible. As the actual influences on the unit greatly depend on the local conditions, these times should only be regarded as guide values.



Conditions of the gear unit and storage area for long-term storage prior to commissioning:

- Store in the installation position (please see chapter 6.1 "Configurations and maintenance") and secure the gear unit against falling.
- Transportation damage to the external paint must be repaired. Check that a suitable rust inhibitor is applied to the flange bearing surfaces. If necessary apply a suitable rust inhibitor to the surfaces.
- Gear units with the long-term storage option are completely filled with lubricant or have VCI corrosion protection agent mixed with the gear oil (see adhesive label on the gear unit, or are not filled with oil, but rather with small quantities of VCI concentrate.
- The sealing band in the vent plug must not be removed during storage. The gear unit must remain sealed tight.
- Store in a dry place.
- · In tropical regions, the gear unit must be protected against damage by insects
- Temperature in the range from 5 °C to + 40 °C without large fluctuations,
- · Relative humidity less than 60 %,
- · No direct exposure to sunlight or UV light,
- No aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity,
- · No vibration or oscillation

Measures during storage or standstill periods

• If the relative humidity is <50 % the gear unit can be stored for up to 3 years.

Measures before commissioning

- If the storage or standstill period exceeds 2 years or the temperature during short-term storage has
 greatly deviated from the standard range, the lubricant in the gear unit must be replaced before
 commissioning.
- · If the gear unit is completely filled, the oil level must be reduced before commissioning.
- For gear units without oil filling, the oil level for the version must be filled before commissioning.
 The VCI concentrate may remain in the gear unit. Lubricant quantities and types must be filled according to the details on the type plate.

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3.4 Preparing for installation



CAUTION

Injury to persons

Transport damage may cause malfunctions of the gear unit, which may cause material damage or personal injury.

Please inspect the delivery for transport and packaging damage immediately on receipt. Report any damage to the carrier immediately. Gear units with transport damage must not be commissioned.

The drive unit must be inspected and may only be installed if no damage is apparent. In particular the radial seals and the sealing caps must be inspected for damage.

Pay attention to leaked lubricants, they may cause slips.

All bare metal surfaces and shafts of the gear unit are protected against corrosion with oil, grease or corrosion protection agents before shipping.

Thoroughly remove all oil, grease or corrosion protection agents and any dirt from the shafts and flange surfaces before assembly.

In applications where an incorrect rotational direction may result in damage or potential risk, the correct rotational direction of the output shaft is to be established by test running the drive when uncoupled and guaranteeing such for subsequent operation.

Gears with integrated return stops are marked with arrows on the drive/driven sides. The arrows point in the rotation direction of the gear unit. When connecting the motor and during motor control, it must be ensured that the gear unit can only operate in the direction of rotation. (For further explanations see catalogue G1000 and WN 0-000 40)

NOTICE

Gear unit damage

For gear units with an integrated back stop, switching the drive motor to the blocked direction of rotation, i.e. incorrect direction of rotation, may result in damage to the gear unit.

Take care that the direction of rotation is correct.

Ensure that no aggressive or corrosive substances are present in the area surrounding the installation site or are subsequently expected during operation, which attack metal, lubricants or elastomers. In case of doubt, please contact Getriebebau NORD and take the recommended action.

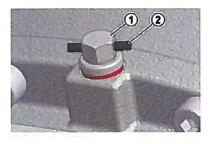
Oil expansion tanks (Option OA) must be fitted in accordance with works standard WN 0-530 04. For gear units with an M10x1 vent plug, works standard WN 0-52135 must be also be observed during installation.

Oil level tanks (Option OT) must be fitted in accordance with works standard WN 0-521 30.

If venting of the gear unit is provided, the vent or the pressure vent must be activated before commissioning. To activate, remove the transport securing device (sealing cord). Position of the vent plug (please see chapter 6.1 "Configurations and maintenance").



3 Assembly instructions, storage, preparation, installation





Explanation

- Standard vent plug
- Transport securing device

2

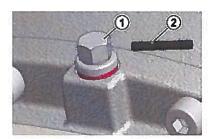
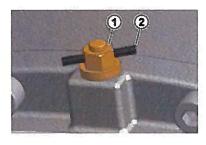


Figure 2: Activating the vent plug





Explanation

- 1 Vent screw
- 2 Transport securing device

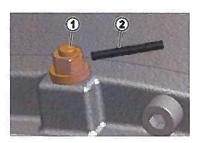
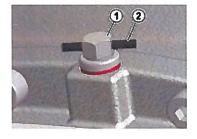


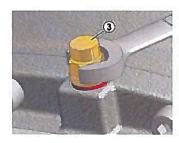
Figure 3: Activating the vent plug

Before commissioning, the vent plug must be replaced with the special pressure vent which is supplied as a loose part.

This is done by unscrewing the vent fitting and replacing it with the special pressure vent and seal (refer to Section 6.1 "Configurations and maintenance"). Double gear units consist of two single units and are equipped with 2 oil chambers and 2 pressure vents.







Standard vent plug

Explanation

2 Transport securing device

3 Special pressure vent screw

Figure 4: Removing the vent plug and fitting the special pressure vent

(please see chapter 6.5 "Torque values")

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3.5 Installing the gear unit



WARNING

Danger of burns

The surfaces of gear units or geared motors may become hot during or shortly after operation. Hot surfaces which can be touched directly must be protected with a contact guard.



WARNING

Danger to persons

If the foundation or the fastening of the gear unit is not adequately dimensioned, the gear unit may detach, fall down or rotate in an uncontrolled manner.

The foundation and the gear unit fastening must be appropriately designed for the weight and the torque. All bolts must be used to fasten the gear unit

NOTICE

Damage to the gear unit due to overheating

The gear unit may be damaged by overheating.

When installing, check that the cooling air from the motor fan can circulate around the geared motor and the gear unit without obstruction.

The eyebolts screwed into the gear units must be used during installation. No additional load may be attached to the gear unit.

If geared motors have an additional eyebolt attached to the motor, this must also be used. Avoid pulling the eyebolts at an angle. Observe the safety information (please see chapter 1.4 "Safety information").

The base and/or flange to which the gear unit is fitted should be vibration-free, torsionally strong and flat. The smoothness of the mating surface on the base or flange must be according to tolerance class K according to DIN ISO 2768-2. All contamination to the bolting surfaces of gear unit and base and/or flange must be thoroughly removed.

The gear housing must always be earthed. With geared motors, earthing via the motor connection must be ensured.

The gear unit must be precisely aligned with the drive shaft of the machine in order to prevent additional forces from being imposed on the gear unit due to distortion.

Welding of the gear unit is prohibited. The gear unit must not be used as the earth connection for welding work, as this may cause damage to the bearings and gear wheels.

The gear unit must be installed in the correct orientation(please see chapter 6.1 "Configurations and maintenance"). (UNIVERSAL SI and SM gear unit types do not depend on the configuration). Changes to the installation position after delivery require adjustment of the quantity of oil, and often other measures such as e.g. the installation of encapsulated roller bearings. Damage may result if the stated installation position is not observed.

All gear unit feet and/or all flange bolts on each side must be used. Bolts must have a minimum quality of 8.8. The bolts must be tightened to the correct torques (please see chapter 6.5 "Torque values"). Tension-free bolting must be ensured, particularly for gear units with a foot and flange.

The oil inspection screws, oil drain screws and the vent valves must be accessible.



3.6 Fitting hubs on the gear shafts

NOTICE

Gear unit damage

The gear unit may be damaged by axial forces.

Do not subject the gear unit to harmful axial forces when fitting the hubs. In particular, do not hit the hubs with a hammer.

Drive and driven elements, e.g. coupling and chain-wheel hubs must be mounted onto the drive and driven shaft of the gear unit using suitable pullers that will not apply damaging axial forces onto the gear unit.

Information

Installation

Use the end thread of the shafts for pulling. Fitting can be aided by coating the hub with lubricant or heating it up to approx. 100 °C beforehand.

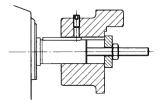


Figure 5: Example of a simple pulling device

A

DANGER

Severe personal injury

There is a danger of injury due to rapidly rotating drive and driven elements.

Drive and driven elements, such as belt drives, chain drives, shrink disks, fans and couplings must be fitted with contact protection.

Drive and driven elements may only subject the drive unit to the maximum radial forces F_R and axial forces F_A which are specified in the catalogue. Observe the correct tension, particularly on belts and chains.

Additional loads due to unbalanced hubs are not permitted.

The transverse force must be applied to the gear unit as closely as possible.

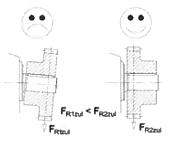


Figure 6: Correct assembly of drive elements



3.7 Fitting push-on gear units

NOTICE

Gear unit damage

The bearings, gear wheels, shafts and housing may be damaged by incorrect fitting.

- · Observe the assembly instructions.
- The push-on gear unit must be fitted onto the shaft using a suitable puller, which will not exert damaging axial forces on the gear unit. In particular, do not hit the gear unit with a hammer.

Assembly and subsequent dismantling is aided by applying an anti-corrosive lubricant to the shaft before fitting (e.g. NORD Anti-Corrosion Part No. 089 00099). Excess grease or anti-corrosion agent may escape after assembly and may drip off. Clean these points on the output shaft after a running-in time of approx. 24 hours. This escape of grease is not due to a leak in the gear unit.

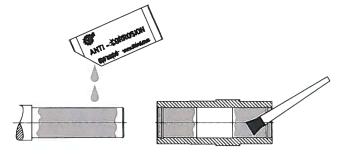


Figure 7: Applying lubricant to the shaft and the hub

Information

Fastening element

The gear unit can be fitted to shafts with and without a shoulder using the fastening element (Option B). Tighten the bolt of the fastening element to the correct torque (please see chapter 6.5 "Torque values"). For gear units with option H66, the factory-fitted closing cap must be removed before assembly.

For push-on gear units with option H66 and fastening element (Option B) the pressed-in closing cap must be pushed out before fitting the gear unit. The pressed-in closing cap may be destroyed during dismantling. As standard a second closing cap is supplied as a loose spare part. After fitting the gear unit, fit the new / new condition closing cap as described in Section 3.9 "Fitting the covers".





Figure 8: Removing the factory-fitted closing cap

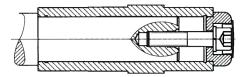


Figure 9: Gear unit mounted to shaft with a shoulder using the fastening element

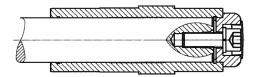


Figure 10: Gear unit mounted to shaft without a shoulder using the fastening element

A gear unit can be dismantled from a shaft with a shoulder using the following device, for example.

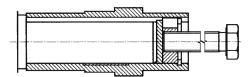


Figure 11: Dismantling using dismantling device

When assembling push-on gears with torque supports, the support must not be distorted. Tension-free mounting is aided by the rubber buffer (Option G or VG).



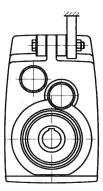


Figure 12: Mounting the rubber buffer (Option G or VG) on parallel shaft gear units

To fit the rubber buffer, tighten the screw fastening until there is no play between the contact surfaces when there is no load.

Then turn the fastening nut half a turn in order to pre-tension the rubber buffer (only applies for screw fastenings with adjusting threads). Greater pre-tension is not permissible



The gear unit may suddenly rotate around the shaft if the bolts are loosened.

Secure the screw fastening against loosening, e.g. with Loctite 242 or a second nut.

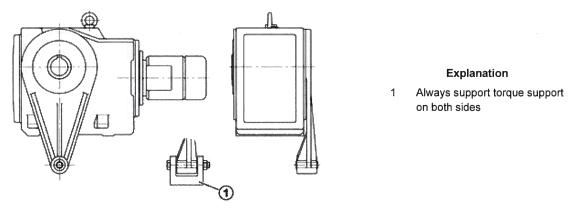


Fig. 13: Attaching the torque support on bevel gear and worm gear units

Tighten the fastenings of the torque support with the correct tightening torques (please see chapter 6.5 "Torque values") and secure against loosening (e.g. Loctite 242, Loxeal 54-03).

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3.8 Fitting shrink discs



Risk of injury

Risk of injury from incorrect mounting and dismantling of the shrink disc.

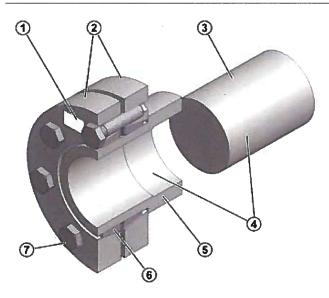
Observe the instructions.

NOTICE

Gear unit damage

If the tensioning bolts are tightened without the solid shaft inserted, the hollow shaft may be permanently deformed.

Do not tighten bolts if the solid shaft is not inserted!



Explanation

- Shrink disc, type, part no. and torque details for tensioning screws
- 2 Tensioning flanges
- 3 Solid shaft of machine
- 4 Shaft and hollow shaft bore FREE OF GREASE
- 5 Hollow shaft of gear unit
- 5 Double half-slotted inner ring
- 7 Tensioning screws DIN 931 (933) -10.9

Figure 14: Hollow shaft with shrink disc

The shrink discs are supplied by the manufacturer ready for fitting. They must not be dismantled prior to fitting.

The solid shaft of the machine runs free of grease in the hollow shaft of the gear unit.



Assembly sequence

- 1. Remove any transport securing devices.
- 2. Loosen but do not remove tightening bolt and tighten gently by hand until there is no play between the flanges and the inner ring.
- 3. Slide the shrink disc onto the hollow shaft until the outer clamping flange is flush with the hollow shaft. The shrink disc is easier to slide on if the bore of the inner ring is lightly greased.
- 4. Prior to mounting, grease the solid shaft only in the area which will later come into contact with the bronze bush in the hollow shaft of the gear unit. Do not grease the bronze bush, in order to prevent grease penetrating the area around the shrink connection.
- 5. The hollow shaft of the gear unit must be completely de-greased and completely free of grease.
- 6. In the area of the shrink connection the solid shaft of the machine must be degreased and **completely free** of grease.
- 7. Insert the solid shaft of the machine into the hollow shaft so as to completely fill the area around the shrink connection.
- 8. Position the clamping flange by gently tightening the bolts.
- 9. Tighten the tensioning bolts successively in a clockwise direction by several turns not crosswise with approx. ¼ rotation per turn. Tighten the bolts with a torque wrench to the torque indicated on the shrink disc.
- 10. When the tensioning bolts have been tightened, there must be an even gap between the clamping flanges. If this is not the case, the gear unit must be dismantled and the shrink disc connection checked for correct fit.

Dismantling sequence:

- 1. Loosen the tensioning bolts successively in a clockwise direction by several turns with approx. ¼ rotation per turn. Do not remove the bolts from their thread.
- 2. Loosen the clamping flanges from the cone of the inner ring.
- 3. Remove the gear unit from the solid shaft of the machine.

If a shrink disk has been in use for a long period or is dirty, it must be dismantled, cleaned and the conical surfaces coated with Molykote G Rapid Plus or a similar lubricant before it is refitted. The threads and head surfaces of the screws must be treated with grease without Molykote. Any damaged or corroded elements must be replaced.

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3.9 Fitting the covers

WARNING

Risk of injury

There is a danger of injury due to shrink discs and freely rotating shaft journals.

- · Use a cover (Option H and Option H66) as a guard.
- If this does not achieve sufficient protection against contact according to the required protection type, the machinery and plant constructor must ensure this by means of special attached components.

All fixing screws must be used and tightened to the correct torque (please see chapter 6.5 "Torque values"). For covers with Option H66, press in the new / new condition closing cap by tapping it lightly with a hammer.









Figure 15: Fitting the covers, Option SH, Option H, and Option H66

3.10 Fitting the covers

A

WARNING

Risk of injury

There is a danger of injury due to freely rotating shaft journals.

- · Use a cover cap as a guard
- If this does not achieve sufficient protection against contact according to the required protection type, the machinery and plant constructor must ensure this by means of special attached components.

Many versions of the universal worm gear unit are supplied with plastic cover caps as standard. These cover caps protect the shaft sealing ring against the entry of dust and other possible contamination. The cover caps can be removed by hand without the use of tools and pushed onto the A or B side.

The cover cap must be removed before installing the universal worm gear unit. After installation is complete, the cover cap must be pushed into the threaded holes on the output flange on the corresponding side. Care must be taken that the cover cap is removed and pushed on vertically, in order not to damage the expansion elements of the cover cap.







Fig. 16: Removal and fitting of the cover cap



3.11 Fitting a standard motor

The maximum permitted motor weights indicated in the table below must not be exceeded when attaching the motor to an IEC/NEMA adapter:

Maximum permitted motor weights														
IEC motor size	63	71	80	90	100	112	132	160	180	200	225	250	280	315
NEMA motor size		56C	143T	145T	182T	184T	210T	250T	280T	324T	326T	365T		
Max. motor weight [kg]	25	30	40	50	60	80	100	200	250	350	500	700	1000	1500



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WARNING

Risk of injury

Severe injuries may be caused by rapidly rotating parts when installing and servicing couplings.

Secure the drive unit against accidental switch-on.

Assembly procedure to attach a standard motor to the IEC adapter (Option IEC/NEMA adapter)

- Clean the motor shaft and flange surfaces of the motor and the IEC /NEMA adapter and check for damage. The mounting dimensions and tolerances of the motor must conform to DIN EN 50347/NEMA MG1 Part 4.
- 2. Push the coupling sleeve onto the motor shaft so that the motor parallel key engages into the groove in the sleeve on tightening.
- 3. Tighten the coupling sleeve on the motor shaft in accordance with the motor manufacturer's instructions until it touches the collar. With motor sizes 90, 160, 180 and 225, any spacer bushes must be positioned between the coupling sleeve and the collar. With standard helical gear units, dimension B between the coupling sleeve and the collar must be observed (see Figure 17). Certain NEMA adapters require adjustment of the coupling in accordance with the specifications indicated on the adhesive plate.
- 4. If the coupling half contains a threaded pin, the coupling must be secured axially on the shaft. The threaded pin must be coated prior to use with a securing lubricant e.g. Loctite 242, Loxeal 54-03 and tightened to the correct torque (please see chapter 6.5 "Torque values").

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- 5. Sealing of the flange surfaces of the motor and the IEC/NEMA adapter is recommended if the motor is installed outdoors or in a humid environment. Before the motor is installed, the flange surfaces must be completely coated with surface sealant Loctite 574 or Loxeal 58-14 so that the flange seals after mounting.
- 6. Mount the motor on the IEC/NEMA adapter. Do not forget to fit the gear rim or the splined sleeve provided (see illustration below).
- 7. Tighten the bolts of the IEC/NEMA adapter with the correct torque (please see chapter 6.5 "Torque values").

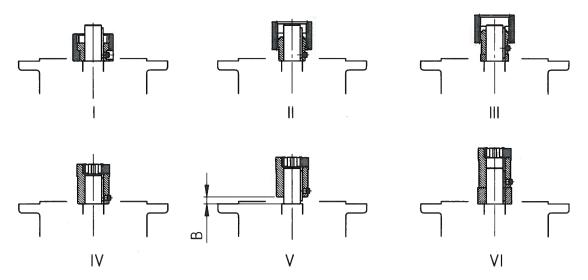


Figure 17: Fitting the coupling onto the motor shaft - various types of coupling

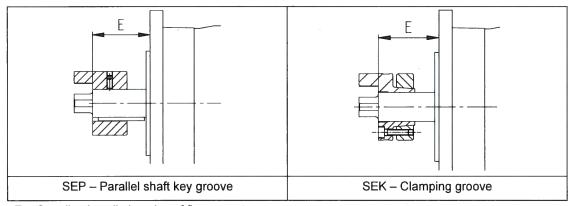
- I Curved tooth coupling
- II Curved tooth coupling, two-part
- III Curved tooth coupling, two-part with spacer bush
- IV Claw coupling, two-part
- V Claw coupling, two-part, observe dimension B:

Standard helical gear unit:						
S	SK 0, SK 01, SK 20, SK 25, SK 30, SK 33 (2-stage)					
S	SK 010, SK 200, SK 250, SK 300, SK 330 (3-stage)					
	IEC size 63	IEC size 71				
Dimension B (Fig. V)	B = 4.5 mm	B = 11.5 mm				

VI Claw coupling two-part with spacer bush



3.12 Installation of a servo motor (Option SEP / SEK)



E = Coupling installation size of flange system

Cylinder type	Coupling size*	Installation size E [mm]
SE. 100	GS 19	40
SE. 130	GS 24	50
SE. 165	GS 28	58
SE. 215	GS 28	80
OL. 210	GS 48	80
SE. 300	GS 48	82

^{*)} All coupling sizes are available as SEP or SEK versions, the ring gear has a hardness of (Shore) 98 Sh-A-GS, colour red

Table 4: Allocation of cylinder types to coupling sizes

To prevent damage to the coupling, the dimension E which is stated in Table 12 must be complied with!

Assembly sequence for the connection of a servo motor to the servo adapter (Option SEP / SEK)

Please refer to the coupling manufacturer's operating/installation instructions for the assembly of the two halves of the coupling.

30 B 1000 EN-3816



3.13 Fitting the cooling coil to the cooling system



Risk of injury

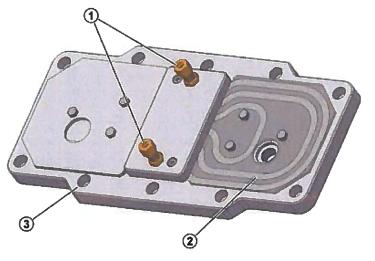
Possibility of injury due to pressure discharge.

Ensure that the pressure is released from the cooling circuit before carrying out any work on the gear unit.

The cooling coil is installed in the casing cover. Cutting ring screw threads according to DIN 2353 are located at the casing cover for the connection of a pipe with an external diameter of 10 mm.

Remove the closing cap from the screw neck prior to assembly to avoid any contamination of the cooling system. The screw necks should be connected with the coolant circuit, which must be provided by the operator. The flow direction of the coolant is irrelevant.

Make sure not to twist the screw necks during or after assembly as the cooling coil may be damaged. It must be ensured that no external forces act on the cooling coil.



Explanation

- Cutting ring screw threads
- 2 Cooling coil
- 3 Housing cover

Figure 18: Cooling cover



3.14 Installation of an oil expansion tank, Option OA

The expansion tank must be installed vertically with the hose connection facing downwards and the vent plug upwards. Please note the attached factory standard 0-530-04 for the installation.

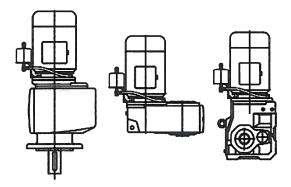


Figure 19: Installing the expansion tank

3.15 Subsequent paintwork

NOTICE

Damage to the device

For retrospective painting of the gear unit, the radial seals, rubber elements, pressure venting valves, hoses, type plates, adhesive labels and motor coupling components must not come into contact with paints, lacquers or solvents, as otherwise components may be damaged or made illegible.



4 Commissioning

4.1 Check the oil level

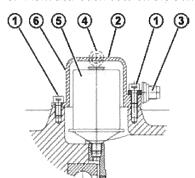
The oil level must be checked prior to commissioning (please see chapter 5.2 "Service and Maintenance Work").

4.2 Activating the automatic lubricant dispenser

Some gear unit types with standard motor (Option IEC/NEMA) have an automatic lubricant dispenser for the roller bearings. This dispenser must be activated prior to commissioning. The cartridge case cover of the adapter for attaching an IEC/NEMA standard motor has a red information sign for the activation of the lubricant dispenser. A grease escape opening which is closed with a G1/4 cap screw is located opposite to the lubricant dispenser. After activation of the lubricant dispenser, the cap screw can be removed and replaced with the grease collection container (Part No. 28301210) which is supplied separately with the delivery.

Activating the automatic lubricant dispenser:

- 1. Loosen and remove the cylindrical screws.
- 2. Remove the cartridge cover.
- Screw the activation screw into the lubricant dispenser until the lug breaks off at the defined fracture point
- 4. Re-fit the cartridge cover and fasten it with the cylindrical screw (please see chapter 6.5 "Torque values").
- 5. Mark activation date on the adhesive label indicating the month/year



Explanation

- 1 Cylindrical screw M8 x 16
- 2 Cartridge cover
- 3 Activation screw
- 4 Lug
- 5 Lubricant sensor
- 6 Position of adhesive label

Figure 20: Activating the automatic lubricant dispenser with standard motor mounting



Adhesive label:

Notice!

Screw in the activation screw until the lug breaks off before commissioning the gear unit.

Dispensing time: 12 Months

Month

Activation date Year

1 2 3 4 5 6 7 8 9 10 11 12

06 07 08 09 10

11 12 13 14 15

Figure 21: Adhesive label

4.3 Operation with lubricant cooling

Water cooling

NOTICE

Gear unit damage

The gear unit may be damaged by overheating.

The drive may only be commissioned after the cooling spiral has been connected to the cooling circuit, and the cooling circuit has been put into operation.

The coolant must have a similar thermal capacity as water (specific thermal capacity at 20°C c=4.18 kJ/kgK). Industrial water without any air bubbles or sediments is recommended as a coolant. The hardness of the water must be between 1 dH and 15 dH; the pH value must be between pH 7.4 and pH 9.5. No aggressive liquids may be added to the coolant!

The coolant pressure must not exceed 8 bar. The required quantity of coolant is 10 litres/minute, and the coolant inlet temperature must not exceed 40°C; we recommend 10°C.

We also recommend fitting a pressure reducer or similar at the coolant inlet to avoid damage due to excessive pressure.

If there is a danger of frost the operator should add a suitable anti-freeze solution to the cooling water.

The **temperature of the cooling water** and the **cooling water flow rate** must be supervised and ensured by the operator.

Air/Oil cooler

The version and all important data for the air/oil cooler can be obtained from Catalogue G1000, or contact the manufacturer of the cooling unit.



4.4 Running-in time for the worm gear unit

Information

Running-in time

In order to achieve maximum efficiency of the worm gear unit, the gear unit must be subjected to a running-in period of approx. 25 h - 48 h under maximum load.

There may be a reduction in efficiency before the running-in period is complete.

4.5 Checklist

Checklist					
Subject of check	Date checked:	Information see Section			
Is the vent plug activated or the pressure vent screwed in?		3.4			
Does the required configuration conform with the actual installation?		6.1			
Are the external gear shaft forces within permitted limits (chain tension)?		3.6			
Is the torque support correctly fitted?	,	3.7			
Are contact guards fitted to rotating components?		3.9			
Is the automatic lubricant dispenser activated?		4.2			
Is the cooling cover connected to the cooling circuit?		3.13			
		4.3			



5 Service and maintenance

WARNING

Danger of burns

The surfaces of gear units or geared motors may become hot during or shortly after operation.

- Installation and maintenance work must only be performed when gear unit is at a standstill and has cooled down. The drive must be isolated and secured to prevent accidental start-up.
- · Wear protective gloves.
- · Shield hot surfaces with contact guards.

5.1 Service and Maintenance Intervals

Service and Maintenance Intervals	Service and Maintenance Work	Information see Section
At least every six months	 Visual inspection Check for running noises Check the oil level Re-grease / remove excess grease (only applicable for free drive shaft / Option W and for agitator bearings / Option VL2 / VL3) Replace the automatic lubricator / remove excess grease (for operating times < 8 h / day): (A replacement interval of 1 year is permissible for the lubricant dispenser) (Only for IEC / NEMA standard motor mounting). Empty or replace the lubricant collection container with every second replacement of the lubricant dispenser. 	5.2
For operating temperatures up to 80 °C every 10000 operating hours, at least every 2 years	Change the oil (The interval is doubled if filled with synthetic products) Cleaning or replacing the vent plug Replace shaft sealing rings if worn	5.2
Every 20000 operating hours, at least every 4 years	Re-lubrication of the bearings in the gear unit	5.2
At least every 10 years	General overhaul	5.2



1 Information

Oil change intervals

The oil change intervals apply for normal operating conditions and operating temperatures up to 80 °C. The oil change intervals are reduced in the case of extreme conditions (operating temperatures higher than 80 °C, high humidity, aggressive environment and frequent fluctuations in the operating temperature).

5.2 Service and Maintenance Work



WARNING

Severe personal injury

Severe injury and material damage may be caused by incorrect servicing and maintenance work.

Servicing and maintenance work must only be performed by qualified specialist personnel. Wear the necessary protective clothing for servicing and maintenance work (e.g. industrial footwear, protective gloves, goggles, etc.)



WARNING

Severe personal injury

Risk of injury due to rapidly rotating and hot machine components.

Installation and maintenance work must only be performed when gear units are at a standstill and have cooled down. The drive must be isolated and secured to prevent accidental start-up.



WARNING

Severe personal injury

Particles or liquids thrown up during servicing and maintenance can cause injuries.

Observe the safety information when cleaning with compressed air or a pressure washer.



WARNING

Danger of burns

Danger of burns due to hot oil.

- · Allow the gear unit to cool down before carrying out maintenance or repair work.
- Wear protective gloves.

NOTICE

Leaks

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Take care that no dirt or water enters the shaft sealing rings or the vents when cleaning

Dirt or water in the shaft sealing rings may cause leaks

Visual inspection

The gear unit must be checked for leaks. In addition, the gear unit must be inspected for external damage and cracks in the hoses, hose connections and rubber buffers. Have the gear unit repaired in case of leaks, e.g. dripping gear oil or cooling water, damage or cracks. Please contact the NORD service department.



1 Information

Shaft sealing rings

Shaft sealing rings are rubbing seals and have sealing lips made from an elastomer material. These sealing lips are lubricated with a special grease at the factory. This reduces the wear due to their function and ensures a long service life. An oil film in the region of the rubbing sealing lip is therefore normal and is not due to leakage.(please see chapter 6.7 "Leaks and seals")

Check for running noises

If the gear unit produces unusual running noises and/or vibrations, this could indicate damage to the gear unit. In this case the gear should be shut down and a general overhaul carried out.

Check the oil level

Section 6.1 "Configurations and maintenance" describes the versions and the corresponding oil level screws. With double gear units, the oil level must be checked on both units. The pressure vent must be at the position marked in Section 6.1 "Configurations and maintenance"Bauformen und Wartung

The oil level does not need to be checked on gear units without oil level screw (please see chapter 6.1 "Configurations and maintenance").

Gear unit types that are not supplied full of oil must be filled before the oil level is checked.

Check the oil level with an oil temperature of between 20 °C to 40 °C.

- 1. The oil level may only be checked when the gear unit is at a standstill and has cooled down. The gear unit must be secured to prevent accidental switch-on.
- 2. The oil level screw corresponding to the version must be screwed out (please see chapter 6.1 "Configurations and maintenance").

Information

Checking the oil level

At the first oil level check a small amount of oil may escape, as the oil level may be below the lower edge of the oil level hole.

- Gear units with oil level screw: The correct oil level is at the lower edge of the oil level hole. If the
 oil level is too low, this must be corrected using the correct type of oil. An oil level glass is available
 instead of the oil level screw
- 4. Gear units with an oil level tank: The oil level must be checked in the oil level tank with the aid of the dipstick plug (thread G1 1/4). The oil level must be between the upper and lower marking when the dipstick is fully screwed in (see Figure 22). Top up the oil level with the relevant type of oil as necessary. These gearboxes may only be operated in the configuration stated in Section 6.1 "Configurations and maintenance".
- The oil level screw or the cap screw with dipstick and all other loosened screws must be correctly re-tightened.



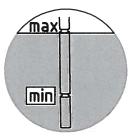


Figure 22: Checking the oil level with a dipstick

Re-greasing

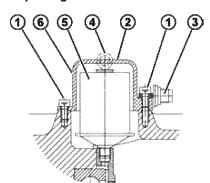
Some gear unit designs (free drive shaft, Option W, agitator designs VL2 and VL3) are equipped with a re-greasing device.

For agitator versions VL2 and VL3, the vent screw located opposite to the grease nipple must be unscrewed before re-greasing. Grease should be injected until a quantity of 20 - 25 g escapes from the vent hole. After this, the vent plug must be reinserted and tightened.

For Option W and some IEC adapters, the outer roller bearing must be re-greased with approx. 20 - 25 g of grease via the grease nipple provided. Remove any excess grease from the adapter.

Recommended grease: Petamo GHY 133N (please see chapter 6.2 "Lubricants") (Fa. Klüber Lubrication).

Replacing the automatic lubricant dispenser



Explanation

- Cylindrical screws M8 x 16
- 2 Cartridge cover
- 3 Activation screw
- 4 Lug
- 5 Lubricant sensor
- 6 Position of adhesive label

Figure 23: Replacing the automatic lubricant dispenser with standard motor mounting

The cartridge cover must be unscrewed. The lubrication dispenser is screwed out and replaced with a new component (Part No. 283 0100). Remove any excess grease from the adapter. Then activate (please see chapter 4.2 "Activating the automatic lubricant dispenser").



Empty or replace the grease collection container (Part No. 28301210) with every second replacement of the lubricant container. To empty the container, unscrew it from the screw fitting. The container has an internal piston, which can be pressed back with a rod with a maximum diameter of 10 mm. Collect the grease which is pressed out and dispose of it correctly. Due to the shape of the container, a residual quantity of grease remains in the container. After emptying and cleaning the container, it can be screwed back into the drain hole in the IEC adapter. Replace the container with a new one if it is damaged.

Change the oil

The figures in Section 6.1 "Configurations and maintenance" show the oil drain screw, the oil level screw and the pressure vent screw for various designs.

Procedure:

- 1. Place a catchment vessel under the oil drain screw or the oil drain cock.
- 2. Completely remove the oil level screw or screwed sealing plug with dipstick if an oil level tank is being used and unscrew oil drain screw.



WARNING

Danger of burns

Danger of burns due to hot oil.

- · Allow the gear unit to cool down before carrying out maintenance or repair work.
- Wear protective gloves.
- 3. Drain all the oil from the gear unit.
- 4. If the sealing ring of the oil drain screw or oil level screw is damaged in the thread, a new oil level screw must be used or the thread must be cleaned and coated with securing lubricant, e.g. Loctite 242, Loxeal 54-03 prior to insertion.
- 5. Screw the oil drain screw into the hole and tighten to the correct torque (please see chapter 6.5 "Torque values").
- 6. Using a suitable filling device, refill with oil of the same type through the oil level hole until oil emerges from the oil level hole. (The oil can also be filled through the pressure vent screw or a sealing plug located higher than the oil level). If an oil level tank is used, fill the oil through the upper inlet (thread G1¼) until the oil level is set as described in Section 5.2 "Service and Maintenance Work".
- 7. Wait at least 15 minutes, or at least 30 minutes if an oil level tank is used, and then check the oil level. Proceed as described in Section 5.2 "Service and Maintenance Work".

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1 Information

Oil level

The oil does not need to be changed on gear units without oil level screw (please see chapter 6.1 "Configurations and maintenance"). These gear units are lubricated for life.

Standard helical gear units have no oil level screw. Here, the oil is topped up through the pressure vent bolt using the quantities listed in the table in Section 6.4 "Helical gear unit".

Cleaning or replacing the vent plug

Unscrew the vent screw and thoroughly clean it (e.g. with compressed air) and fit the vent screw in the same place, If necessary, use a new vent screw with a new sealing ring.

Replace the shaft sealing ring

Once the shaft sealing ring has reached the end of its service life, the oil film in the region of the sealing lip increases and a measurable leakage with dripping oil occurs. **The shaft sealing ring must then be replaced.** The space between the sealing lip and the protective lip must be filled approximately 50 % with grease on fitting (recommended grease: PETAMO GHY 133N). Take care that after fitting, the new shaft sealing ring does not run in the old wear track.

Re-lubricating bearings

For bearings which are not oil-lubricated and whose holes are completely above the oil level, replace the roller bearing grease (recommended grease: PETAMO GHY 133N). Please contact the NORD service department.

General overhaul

For this, the gear unit must be completely dismantled. The following work must be carried out:

- Clean all gear unit components
- Examine all gear unit components for damage
- All damaged components must be replaced
- All roller bearings must be replaced
- Replace back stops if fitted
- Replace all seals, radial seals and Nilos rings
- Replace plastic and elastomer components of the motor coupling

The general overhaul must be carried out by qualified personnel in a specialist workshop with appropriate equipment in observance of national regulations and laws. We recommend that the general overhaul is carried out by the NORD Service department.



6 Appendix

6.1 Configurations and maintenance

Explanation of symbols for the following version illustrations:



1 Information

Gear unit - Lubrication

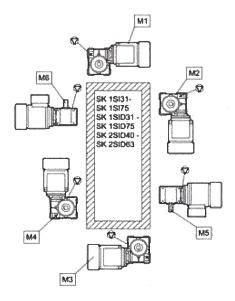
SK 320, SK 172, SK 272, SK 372 as well as SK 273 and SK 373, SK 01282 NB, SK 0282 NB, SK 1382 NB and UNIVERSAL / MINIBLOC gear units are lubricated for life. These gear units do not have an oil filler screw.

UNIVERSAL / MINIBLOC worm gear units

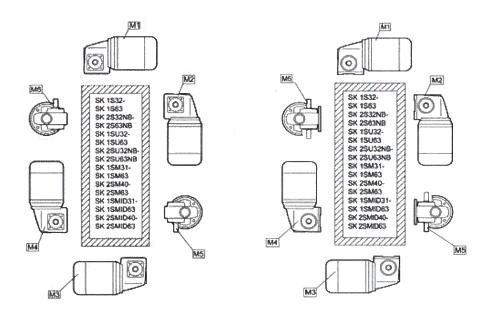
NORD UNIVERSAL / MINIBLOC worm gear units are suitable for all installation positions. They have an oil filler which is independent of the configuration.

As an option, types SI and SMI can be equipped with a vent screw. Gear units with vents must be installed in the stated position.

Types SI, SMI, S, SM and SU as 2-stage gear unit types and types SI, SMI as worm gear units for direct motor mounting have an oil filler which depends on the configuration and must be installed in the stated position.







Parallel shaft gear units with oil level tank

The following applies for SK 9282, SK 9382, SK 10282, SK 10382, SK 10382.1, SK 11282, SK 11382, SK 11382.1 and SK 12382 in the M4 configuration with oil level tank:

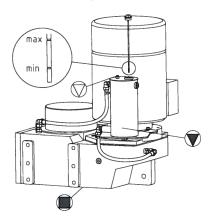


Figure 24: Oil level check with oil level tank



