

8. MAINTENANCE

The purpose of the maintenance is to extend the useful life of the equipment. The non-compliance with one of these previous items can cause unexpected machine failures.

If motors with cylindrical roller or angular contact bearings are to be transported during the maintenance procedures, the shaft locking device must always be fitted. All HGF motors, regardless of the bearing type, must always be transported with the shaft locking device fitted.

All repairs, disassembly and assembly related services must be carried out only by qualified and well-trained personnel by using proper tools and techniques. Make sure that the machine has stopped and it is disconnected from the power supply, including the accessory devices (space heater, brake, etc.), before any servicing is undertaken.

The company does not assume any responsibility or liability for repair services or maintenance operations executed by non-authorized Service Centers or by non qualified service personnel. The company shall have no obligation or liability whatsoever to the buyer for any indirect, special, consequential or incidental loss or damage caused or arising from the company's proven negligence

8.1. GENERAL INSPECTION

The inspection intervals depend on the motor type, application and installation conditions. Proceed as follows during inspection:

- Visually inspect the motor and coupling. Check if abnormal noises, vibrations, excessive heating, wear signs, misalignment or damaged parts are noticed. Replace the damaged parts as required;
- Measure the insulation resistance according to the item 5.4;
- Clean the motor enclosure. Remove oil spills and dust accumulation from the motor frame surface to ensure a better heat transfer to the surrounding ambient;
- Check cooling fan condition and clean the air inlet & outlet openings to ensure a free air flow over the motor;
- Investigate the actual condition of the seals and replace them, if required;
- Drain the condensed water from inside the motor. After draining, reinstall the drain plugs to ensure the degree of protection as indicated on the motor nameplate. The motor must always be positioned so the drain hole is at the lowest position (see item 6);
- Check the connections of the power supply cables, ensuring the correct clearance distance between live and grounded parts, as specified in Table 6.3;
- Check if the tightening torque of the bolted connections and mounting bolts meets the tightening torque specified in Table 8.7;
- Check the status of the cable passages, the cable gland seals and the seals inside the terminal box and replace them, if required;
- Check the bearing operating conditions. Check for the presence of any abnormal noise, vibration or other abnormal operating conditions, like motor temperature rise. Check the oil level, the lube oil condition and compare the workings hours with the informed life time;
- Record and file all changes performed on the motor.



Do not reuse damaged or worn parts. Damaged or worn parts must be replaced by parts supplied by the manufacturer and must be installed as if they were the original parts.

8.2. LUBRICATION

Proper lubrication plays a vital role in the motor performance. Only use the grease or oil types, amounts and lubrication intervals recommended for the bearings. This information is available on the motor nameplate and the lubrication procedures must be carried out according to the type of lubricant (oil or grease).

When the motor is fitted with thermal protection devices for bearing temperature control, consider the operating temperature limits shown in Table 6.4.

The maximum operating temperature of motors used in special applications may differ from those shown in Table 6.4. The grease and oil disposal should be made in compliance with applicable laws in each country.



Please contact WEG when motors are to be installed in special environments or used for special applications.

8.2.1. Grease lubricated rolling bearings

MGS: Indicate what applies



Excess grease causes bearing overheating, resulting in bearing failure.

The lubrication intervals specified in Table 8.1, Table 8.2, Table 8.3 and Table 8.4 consider an absolute temperature on the bearing of 70 °C (up to frame size IEC 200 / NEMA 324/6) and 85 °C (for frame size IEC 225 / NEMA 364/5 and above), the motor running at rated speed, a motor mounted in horizontal position and greased with Mobil Polyrex EM grease. Any variation of the parameters listed above must be evaluated.

Table 8.1 - Lubrication intervals for ball bearings

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)							
					ODP (Open Drip Proof)		W21 TEFC (Totally Enclosed Fan Cooled)		W22 TEFC (Totally Enclosed Fan Cooled)			
IEC	NEMA					50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	
90	143/5	2	6205	4	-	-	20000	20000	25000	25000		
		4										
		6										
		8										
100	-	2	6206	5	-	-	20000	20000	25000	25000		
		4										
		6										
		8										
112	182/4	2	6207/ 6307	9	-	-	20000	20000	25000	25000		
		4										
		6										
		8										
132	213/5	2	6308	11	-	-	20000	18400	25000	23200		
		4					20000	20000	25000	25000		
		6										
		8										
160	254/6	2	6309	13	20000	20000	18100	15700	22000	20000		
		4					20000	20000	25000	25000		
		6										
		8										
180	284/6	2	6311	18	20000	20000	13700	11500	17000	14000		
		4					20000	20000	25000	25000		
		6										
		8										
200	324/6	2	6312	21	20000	20000	11900	9800	15000	12000		
		4					20000	20000	25000	25000		
		6										
		8										
225 250 280 315 355	364/5 404/5 444/5 445/7	2	6314	27	18000	14400	4500	3600	5000	4000		
		4					20000	20000	11600	9700	14000	12000
		6							16400	14200	20000	17000
		8							19700	17300	24000	20000
	4	6316	34	14000	*Upon request	3500	*Upon request	4000	*Upon request			
	6					20000	20000	10400	8500	13000	10000	
	8							14900	12800	18000	16000	
	2							18700	15900	20000	20000	
	2	6319	45	9600	*Upon request	2400	*Upon request	3000	*Upon request			
	4					20000	20000	9000	7000	11000	8000	
	6							13000	11000	16000	13000	
	8							17400	14000	20000	17000	
	4	6322	60	20000	20000	7200	5100	9000	6000			
	6					10800	9200	13000	11000			
	8					15100	11800	19000	14000			

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Table 8.2 - Lubrication intervals for cylindrical roller bearings

Frame		Poles	Bearing designation	Amount of grease (g)	LUBRICATION INTERVALS (hours)							
					ODP (Open Drip Proof)		W21 TEFC (Totally Enclosed Fan Cooled)		W22 TEFC (Totally Enclosed Fan Cooled)			
IEC	NEMA				50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz		
160	254/6	2	NU309	13	20000	20000	19600	13300	9800	16000	12000	
		4					20000	20000	20000	20000	25000	25000
		6										
		8										
180	284/6	2	NU311	18	18400	12800	9200	6400	11000	8000		
		4			20000	20000	20000	19100	25000	25000		
		6						20000				
		8										
200	324/6	2	NU312	21	15200	10200	7600	5100	9000	6000		
		4			20000	20000	20000	17200	25000	21000		
		6						20000				
		8										
225 250 280 315 355	364/5 404/5 444/5	4	NU314	27	17800	14200	8900	7100	11000	9000		
		6			20000	20000	13100	11000	16000	13000		
		8					16900	15100	20000	19000		
	445/7 447/9 L447/9	4	NU316	34	15200	12000	7600	6000	9000	7000		
		6			20000	19000	11600	9500	14000	12000		
		8				20000	15500	13800	19000	17000		
	504/5 5008 5010/11	4	NU319	45	12000	9400	6000	4700	7000	5000		
		6			19600	15200	9800	7600	12000	9000		
		8			20000	20000	13700	12200	17000	15000		
	586/7 588/9	4	NU322	60	8800	6600	4400	3300	5000	4000		
		6			15600	11800	7800	5900	9000	7000		
		8			20000	20000	11500	10700	14000	13000		

Table 8.3 - Lubrication intervals for ball bearings - HGF line

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)	
IEC	NEMA				50 Hz	60 Hz
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	2	6314	27	3100	2100
		4 - 8	6320	50	4500	4500
			6316	34	4500	4500
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T	2	6314	27	3100	2100
		4 - 8	6322	60	4500	4500
			6319	45	4500	4500
400L/A/B and 400 C/D/E	6806/7/8T and 6809/10/11T	2	6315	30	2700	1800
		4 - 8	6324	72	4500	4500
			6319	45	4500	4500
450	7006/10	2	6220	31	2500	1400
		4	6328	93	4500	3300
			6322	60	4500	4500
		6 - 8	6328	93	4500	4500
			6322	60	4500	4500
500	8006/10	4	6330	104	4200	2800
			6324	72	4500	4500
		6 - 8	6330	104	4500	4500
			6324	72	4500	4500
			6324	72	4500	4500
500	8006/10	4	6330	104	4200	2800
			6324	72	4500	4500
		6 - 8	6330	104	4500	4500
			6324	72	4500	4500
560	8806/10	4 - 8	*Upon request			
630	9606/10	4 - 8				

Table 8.4 - Lubrication intervals for cylindrical roller bearings - HGF line

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)	
IEC	NEMA				50 Hz	60 Hz
315L/A/B and 315C/D/E	5006/7/8 and 5009/10/11	4	NU320	50	4300	2900
		6 - 8			4500	4500
355L/A/B and 355C/D/E	5807/8/9 and 5810/11/12	4	NU322	60	3500	2200
		6 - 8			4500	4500
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11	4	NU324	72	2900	1800
		6 - 8			4500	4500
450	7006/10	4	NU328	93	2000	1400
		6			4500	3200
		8			4500	4500
500	8006/10	4	NU330	104	1700	1000
		6			4100	2900
		8			4500	4500
560	8806/10	4	NU228 + 6228	75	2600	1600
		6 - 8		106	4500	4500
630	9606/10	4	NU232 + 6232	92	1800	1000
		6		120	4300	3100
		8		140	4500	4500

For each increment of 15 °C above the bearing temperature, the relubrication intervals given in the Table must be halved. The relubrication interval of motors designed by the manufacturer for mounting in horizontal position, but installed in vertical position (with WEG authorization), must be halved.

For special applications, such as: high and low temperatures, aggressive environments, driven by frequency inverter (VFD - frequency inverter), etc., please contact WEG about the required amount of grease and the relubrication intervals.

8.2.1.1. Motor without grease fitting

Motors without grease fittings must be lubricated in accordance with the existing Maintenance Plan. Motor disassembly must be carried out as specified in Item 8.3. If motors are fitted with shielded bearings (for example, ZZ, DDU, 2RS, VV), these bearings must be replaced at the end of the grease service life.

8.2.1.2. Motor with grease fitting

To lubricate the bearings with the motor stopped, proceed as follows:

- Before lubricating, clean the grease nipple and immediate vicinity thoroughly;
- Lift grease inlet protection;
- Remove the grease outlet plug;
- Pump in approximately half of the total grease indicated on the motor nameplate and run the motor for about 1 (one) minute at rated speed;
- Switch-off the motor and pump in the remaining grease;
- Lower again the grease inlet protection and reinstall the grease outlet protection.

To grease the motor while running, proceed as follows:

- Before lubricating, clean the grease nipple and immediate vicinity thoroughly;
- Pump the total grease indicated on the motor nameplate;
- Lower again the grease inlet protection.



For lubrication, use only manual grease gun.

If Motors are provided with a spring device for grease removal, the grease excess must be removed by pulling the rod and cleaning the spring until the spring does not remove more grease.

8.2.1.3. Compatibility of the Mobil Polyrex EM grease with other greases

The Mobil Polyrex EM grease has a polyurea thickener and a mineral oil thus being compatible with greases that contain:

- Lithium based thickener, lithium-based complex thickener, polyurea thickener and refined mineral oil;
- The used grease must have in its formulation corrosion and oxidation inhibitors.

In general terms, greases with the same type of soap are compatible to each other. However, depending on the proportion of the mixture there may be incompatibility. In such a case, it is not recommended to mix different types of greases without contacting the supplier or WEG beforehand.

8.2.2. Oil lubricated bearings

To change the oil of oil lubricated motor proceed as follows:

- Switch-off the motor;
- Remove threaded oil drain plug;
- Open the valve and drain the oil;
- Close the drain vale again;
- Reinstall the threaded oil drain plug;
- Fill-up with the type and amount of oil as specified on the nameplate;
- Check oil level. The oil level is OK when the lubricant can be viewed approximately in the center of the sight glass;
- Reinstall oil inlet plug;
- Check for oil leaks and ensure that all not used threaded plugs are closed with plugs.

The bearing lubricating oil must be replaced as specified on the nameplate or whenever changes in the oil properties are noticed. The oil viscosity and pH must be checked periodically. The oil level must be checked every day and must be kept in the center of the sight glass.

Please contact WEG, when oils with different viscosities should be used.

Note:

The HGF vertical mounted motors with high axial thrust are supplied with grease lubricated DE-bearings and with oil lubricated NDE-bearings. The DE-bearings must be lubricated according to recommendations in item 8.2.1. Table 8.5 specifies the oil type and the amount of oil required for this motor lubrication.

Table 8.5 - Oil properties for HGF vertical mounted motors with high axial thrust

Mounting - high axial thrust	Frame		Poles	Bearing designation	Oil (liters)	Interval (h)	Lubricant	Lubricant specification
	IEC	NEMA						
	315L/A/B e 315C/D/E	5006/7/8T e 5009/10/11T	4 - 8	29320	20	8000	Renolin DTA 40 / SHC 629	ISO VG150 mineral oil with antifoam and antioxidant additives
	355L/A/B e 355C/D/E	5807/8/9T e 5810/11/12T	4 - 8	29320	26			
	400L/A/B e 400C/D/E	6806/7/8T e 6809/10/11T	4 - 8	29320	37			
	450	7006/10	4 - 8	29320	45			

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8.2.3. Oil mist lubricated bearings

Check the service conditions of the seals and if replacement is required use only original components. Clean the seal components before assembly (bearing caps, end shields, etc.).

Apply joint sealant between the bearing caps and end shields. The joint sealant must be compatible with the used lubricating oil. Connect the oil lubricant tubes (oil inlet and oil outlet tubes and motor drain tube), as shown in Figure 6.12.

8.2.4. Sleeve bearings

The lubricating oil of sleeve bearings must be changed at the intervals specified in Table 8.6. To replace the oil, proceed as follows:

- NDE-bearing: remove the protection plate from the fan cover;
- Drain the oil through the drain hole located at the bottom of the bearing (see Figure 8.1);
- Close the oil drain hole;
- Remove the oil inlet plug;
- Fill the sleeve bearing with the specified oil and with the amount of oil specified in;
- Check the oil level and ensure it is kept close to the center of the sight glass;
- Install the oil inlet plug;
- Check for oil leaks.



Figure 8.1 - Sleeve bearing

Table 8.6 - Oil properties for sleeve bearings

Frame		Poles	Bearing designation	Oil (liters)	Interval (h)	Lubricant	Lubricant specification
IEC	NEMA						
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	2	9-80	2.8	8000	Renolin DTA 10	ISO VG32 mineral oil with antifoam and antioxidant additives
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T						
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11T						
450	7006/10						
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	4 - 8	9-90	2.8	8000	Renolin DTA 15	ISO VG46 mineral oil with antifoam and antioxidant additives
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T		9-100				
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11T		11-110	4.7			
450	7006/10		11-125				
500	8006/10						

The lubricating oil must be replaced as specified on the nameplate or whenever changes on the oil properties are noticed. The oil viscosity and pH must be checked periodically. The oil level must be checked every day and kept in the center of the sight glass.

Please contact WEG, when oils with different viscosities are to be used.

8.3. MOTOR ASSEMBLY AND DISASSEMBLY



All repair services on motors should be always performed by qualified personnel and in accordance with the applicable laws and regulations in each country. Always use proper tools and devices for motor disassembly and assembly.



Disassembly and assembly services can be carried out only after the motor has been disconnected from the power supply and is completely stopped.

Dangerous voltages may be present at the motor terminals inside the terminal box since capacitors can retain electrical charge for long periods of time even when they are not connected directly to a power source or when space heaters are connected to the motor or when the motor windings are used as space heaters. Dangerous voltages may be present at the motor terminals when they are driven by frequency inverter even when they are completely stopped.

Record the installation conditions such as terminal connection diagram, alignment / leveling conditions before starting the disassembly procedures. These records should be considered for later assembly.

Disassemble the motor carefully without causing scratches on machined surfaces or damaging the threads.

Assemble the motor on a flat surface ensuring a good support base. Footless motors must be fixed/locked on the base to prevent accidents.

Handle the motor carefully to not damage the insulated components such as windings, insulated rolling bearings, power cables etc..

Seal elements, such as joint seals and bearing seals should always be replaced when wear or damage is noticed.

Motors with degree of protection higher than IP55 are supplied with joint and screw seal Loctite 5923 (Henkel) Clean the components and apply a new coat of Loctite 5923 on the surfaces before assembly.

8.3.1. Terminal box

Proceed as follows to remove the terminal box cover and to disconnect/connect the power supply cables and the cables of the accessory devices:

- Ensure that during the screw removal the terminal box cover does not damage the components installed inside the terminal box;
- If the terminal box cover is fitted with lifting eyebolt, lift the terminal box cover always by its lift eyebolt;
- If motors are supplied with terminal blocks, ensure the correct tightening torque on the motor terminals as specified in Table 8.7;
- Ensure that the cables do not contact sharp edges;
- Ensure that the original IP degree of protection is not changed and is maintained as indicate on the motor nameplate. The power supply cables and the control cables must always be fitted with components (cable glands, conduits) that meet the applicable standards and regulations of each country;
- Ensure that the pressure relief device is in perfect operating condition, if provided. The seals in the terminal box must be in perfect condition for reuse and must be reinstalled correctly to ensure the specified degree of protection;
- Ensure the correct tightening torque for the securing bolts of the terminal box cover as specified in Table 8.7.

Table 8.7 - Tightening torque for the securing bolts [Nm]

Screw type and seal	M4	M5	M6	M8	M10	M12	M16	M20
Hex bolt/hex socket bolt (without seal)	-	4 to 7	7 to 12	16 to 30	30 to 50	55 to 85	120 to 180	230 to 360
Combined slotted screw (without seal)	-	3 to 5	5 to 10	10 to 18	-	-	-	-
Hex bolt/hex socket bolt (with seal with metallic stop/cord)	-	-	-	13 to 20	25 to 37	40 to 55	50 to 65	-
Combined slotted screw (with flat seal and/or mettalic stop/cord)	-	3 to 5	4 to 8	8 to 15	-	-	-	-
Hex bolt/hex socket bolt (with flat seal)	-	-	-	8 to 15	18 to 30	25 to 40	35 to 50	-
Terminal blocks	1 to 1,5	1,5 to 4	3 to 6,5	6 to 9	10 to 18	15,5 to 30	30 to 50	-
Grounding terminals	-	3 to 5	5 to 10	10 to 18	30 to 50	55 to 85	120 to 180	-

8.4. DRYING THE STATOR WINDING INSULATION

Dismantle the motor completely. Remove the end shields, the rotor with the shaft, the fan cover, the fan and the terminal box before the wound stator with the frame is transferred to the oven for the drying process. Place the wound stator in the oven heated to max. 120 °C for two hours. For larger motors a longer drying time may be required. After the drying process has been concluded, allow the stator to cool to room temperature. Measure the insulation resistance again as described in item 5.4. Repeat the stator drying process if the required insulation resistance does not meet the values specified in Table 5.3. If the insulation resistance does not improve despite several drying processes, evaluate the causes of the insulation resistance drop carefully and an eventual replacement of the motor winding may be required. If in doubt contact WEG.



To prevent electrical shock, discharge the motor terminals immediately before, and after each measurement. If the motor is equipped with capacitors, these must be discharged before beginning any repair.



8.5. SPARE PARTS

When ordering spare parts, always provide complete motor designation, indicating the motor type, the code number and the serial number, which are stated on the motor nameplate.

Spare parts must always be purchased from WEG authorized Service Centers. The use of non-original spare parts can cause motor failure, performance drop and void the product warranty.

The spare parts must be stored in a clean, dry and properly ventilated room, with relative air humidity not exceeding 60%, with ambient temperature between 5 °C and 40 °C, free of dust, vibrations, gases, corrosive smokes and at constant temperature. The spare parts must be stored in their normal mounting position without placing other components onto them.

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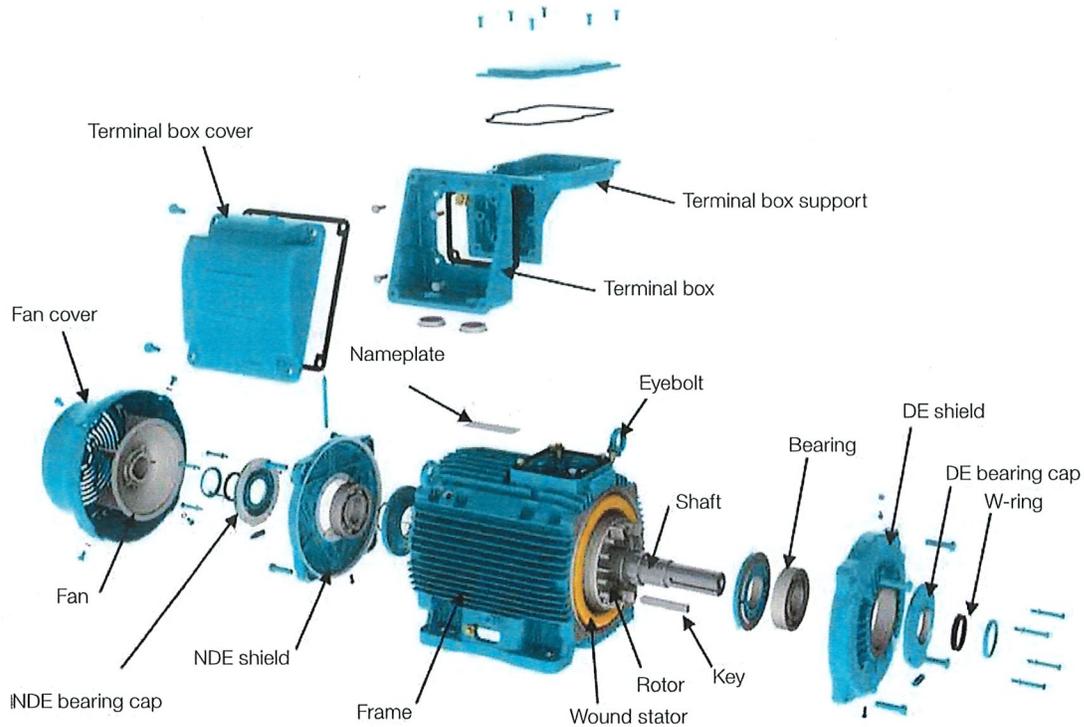


Figure 8.2 - Exploded view of the components of a W22 motor