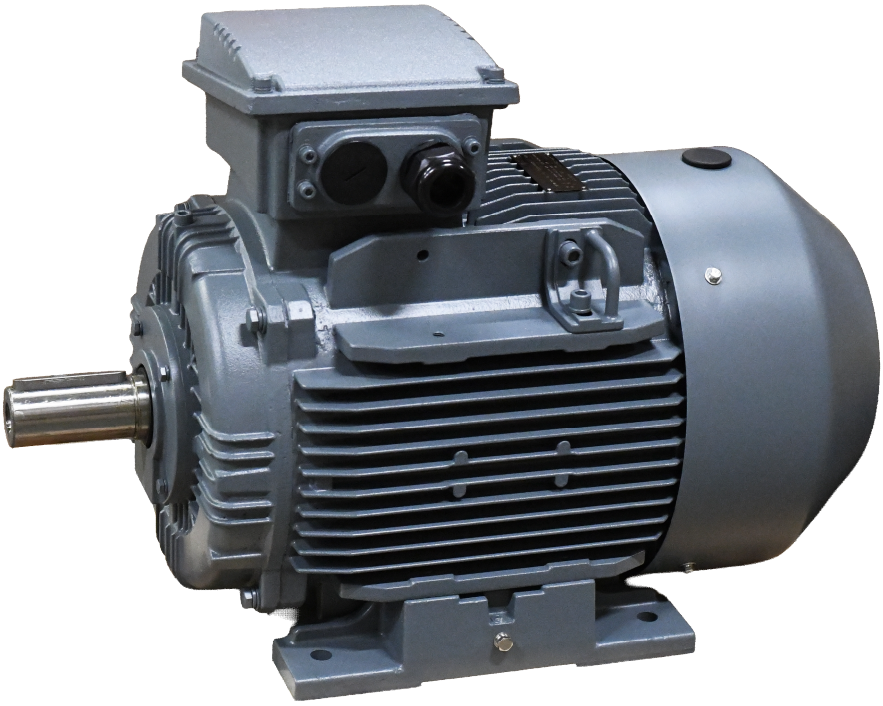
Operation and Maintenance Manual for IEC Three-Phase Motors

Series OMT 1-4 and OMT 1 MM [Multi-Mount]



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1. General Information

This operating and maintenance manual applies to three-phase asynchronous motors in the low to medium power range. All motors comply with the applicable IEC standards, in particular the IEC 60034 series, and meet the requirements regarding mounting arrangements, degrees of protection and cooling methods.

The motors are of cooling type IC411, totally enclosed and externally cooled, and are supplied in cast iron or aluminum housings. They are equipped with factory-lubricated ball or roller bearings. As standard, the motors are designed for ambient temperatures from –20 °C to +40 °C and for installation at altitudes up to 1000 m above sea level. According to IEC 60034-1 the maximum ambient temperature is 40°C. However, our OMT1 and OMT2 motors have a higher thermal reserve. Therefore, these motors can be used at ambient temperatures up to 47°C.

Deviations or special designs are indicated on the motor nameplate or in supplementary manufacturer documentation

Applicable Standards:

- IEC 60034-1 — Rating and Performance
- IEC 60034-2-1 — Determination of Losses and Efficiency
- IEC 60034-5 — Degrees of Protection (IP Code)
- IEC 60034-6 — Cooling Methods (IC Code)
- IEC 60034-7 — Mounting Arrangements (IM Code)
- IEC 60034-8 —Terminal Markings and Direction of Rotation
- IEC 60034-9 — Noise Limits
- IEC 60034-12 — Starting Performance
- IEC 60034-14 — Mechanical Vibration
- IEC 60034-18 — Insulation Systems
- IEC 60034-30-1 — Efficiency Classes (IE-codes)
- IEC 60204-1 — Safety of Machinery – Electrical

The motors are designed to be low-maintenance; however, regular inspections and basic maintenance actions are required to ensure safe and reliable operation. The maintenance instructions described in this manual apply to intended use within the specified environmental and operating conditions

1.1 Safety During Maintenance

Maintenance work may only be carried out by qualified electrical personnel. Before starting any work, disconnect the motor from the power supply, secure it against reconnection (lockout/tagout), and verify the absence of voltage. Be aware of hot surfaces and rotating parts and wear appropriate personal protective equipment (PPE). In hazardous areas, work must be carried out strictly in accordance with the zone classification and equipment category

1.2 Maintenance

- Condition-based: Visual, acoustic, temperature and vibration inspections with trend monitoring.
- Preventive: Relubrication, cleaning of cooling air paths, retightening of terminals.
- Corrective: Measures in case of limit value exceedance (insulation resistance, vibration, temperature).

2. Inspection on Delivery

Upon receipt, the motor must be carefully inspected for any damage or loss that may have occurred during transport. Any transport damage must be documented with photographs and reported to the supplier immediately.

The motor shaft must rotate smoothly and evenly by hand. In addition, compare the data on the nameplate with the power supply data and the requirements of the intended application to ensure compatibility. The serial number and nameplate data should be documented, as the condition on delivery serves as a reference for future inspections

3. Mounting and Installation

3.1 Lifting Equipment

The eye bolts supplied with the motor are intended exclusively for lifting the motor weight. Eye bolts must not be removed, as this may impair the degree of protection (IP rating).

Exception: For cable entry on the non-drive end (NDE), the eye bolt may be removed provided it is replaced with a sealing bolt of equivalent thread length to maintain sealing integrity.

3.2 Foundation and Mounting

The motor must be mounted on a stable, clean and level foundation. Use suitable foundation bolts and washers. Motors designed for horizontal mounting must not be installed on surfaces inclined more than 15° without consulting the supplier in advance.

3.3 Alignment and Drainage

Foot- and flange-mounted motors must be installed so that the drainage holes point downward. Remove any condensate before commissioning. After the initial operating period, mounting bolts must be checked and retightened if necessary. Alignment should also be checked regularly, particularly in case of vibrations or abnormal noise. Drainage holes must be kept clear.

3.4 Ventilation and Ambient Conditions

The motors are self-cooled. Free air circulation to the cooling fan must be ensured at all times to prevent overheating. This is especially important when installed in confined spaces or with restricted air supply.

The following minimum distances to adjacent walls apply (depending on IEC frame size):

4

IEC-Size	distances to adjacent walls
80-100	40mm
112-160	50mm
180-225	90mm
250-315	150mm
355	175mm
400	300mm

tab. 1: Mounting clearances to the nearest wall

The ambient temperature must not exceed 40 °C. For higher temperatures, consultation with the supplier is required. Cooling fins and air passages must be inspected regularly for contamination and kept clean.

4. Coupling

4.1 Direct Coupling

Motor and driven machine must be aligned accurately to avoid mechanical stress on the shaft. Poor alignment can cause excessive noise and vibration and may result in damage. The use of rigid couplings is not recommended. Couplings, belts and pulleys must be inspected regularly for secure fit, alignment and visible wear.

4.2 Indirect Coupling

4.2.1 Flat- or V-Belt Drive

Mount the motor on adjustable rails to allow belt tension adjustment. The belt pulley must be mounted firmly against the shaft shoulder. The pulley centerline must coincide with the shaft centerline. Use correctly dimensioned belts with the appropriate profile and in sufficient number to avoid slip or excessive tension.

Both pulleys must be aligned accurately so that their centers lie in one plane. For multi-belt drives, belts must be matched sets. Incorrect pulley dimensions or excessive belt tension may damage bearings or cause shaft failure. When in doubt, consult the supplier.

4.2.2 Gearbox Drive

The motor is mounted to the gearbox according to IEC mounting arrangements B14 (flange) or B5 (full flange). Seating surfaces must be flat, clean and free from stress. The centering spigot must provide a slip fit and ensure concentric alignment.

After centering, the motor is fixed via the spigot and securely bolted. Bolts must be tightened crosswise using the specified torque. If a flexible coupling is used, axial, radial and angular misalignment must remain within the coupling manufacturer's limits. Gear mesh and similar adjustments are to be carried out on the gearbox in accordance with the gearbox manufacturer's instructions.

4.2.3 Shaft Couplings, Pulleys and Gears

Before installation, remove corrosion protection from the shaft extension and coupling components. All coupling elements must be dynamically balanced, fit precisely on the shaft and have a correctly machined keyway. The rotor is balanced with a half key. Dimensions and tolerances are specified in the motor dimension drawings.

Extreme care must be taken during installation. Do not modify the shaft by filing or grinding. Couplings or pulleys should be heated to approx. 110 °C above ambient temperature for mounting. Only suitable pullers may be used for removal.

5. Electrical Connection

5.1.1 General Information

At delivery, the motor rotates clockwise when viewed from the drive end, provided phases L1, L2 and L3 are connected to terminals U1, V1 and W1. Rotation direction can be reversed by swapping any two phases. The connection diagram is located inside the terminal box cover.

If the motor is approved for one direction of rotation only, this is marked by an arrow on the fan cover. Connection cables and earthing must comply with IEC/VDE regulations. Line protection devices protect cables against short circuits but do not protect the motor windings against overload.

The use of a motor protection device with overload relay and phase-failure detection is recommended. All OMEC motors are equipped as standard with PTC thermistors in the windings. For thermal winding protection, these must be connected to an appropriate evaluation unit. PTCs must not be used for load switching.

5.2 Connection Methods

The terminal box contains six terminals: U1, V1, W1 and U2, V2, W2. The windings are connected in delta (Δ) or star (Y) using terminal links. The nameplate usually specifies two voltages (e.g. 230/400 V at 50 Hz).

- If the supply voltage corresponds to the lower value, use delta connection (Δ).
- If it corresponds to the higher value, use star connection (Y).

Example 230/400 V (50 Hz):

- 230 V line-to-line → delta (Δ)
- 400 V line-to-line → star (Y)

Star–delta starting is only permissible if the supply voltage corresponds to the delta voltage on the nameplate (e.g. 400/690 V motor on a 400 V supply).

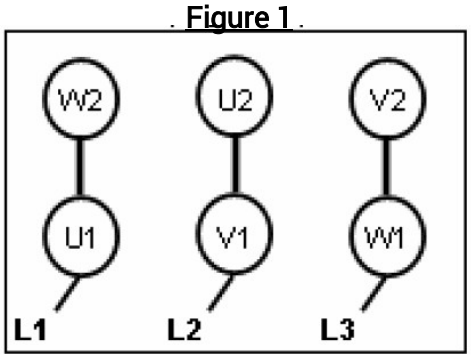
Pole-changing motors must be connected according to the supplied wiring diagram (Dahlander or separate windings, depending on design).

Practical Guidelines (Recommended)

Use the terminal designations **U1, V1, W1 / U2, V2, W2** consistently and avoid deviations unless explicitly specified by the manufacturer. Before commissioning, verify the phase sequence (clockwise rotating field when viewed from the drive end).
PTC thermistors must only be connected to suitable evaluation devices; they are not intended for load control. For motor protection, a combined concept must be used, consisting of line protection (short-circuit protection), overload protection with phase-failure detection, and temperature monitoring (PTC/PT100).
Electrical connections inside the terminal box should be checked regularly to ensure that all terminals remain properly tightened.

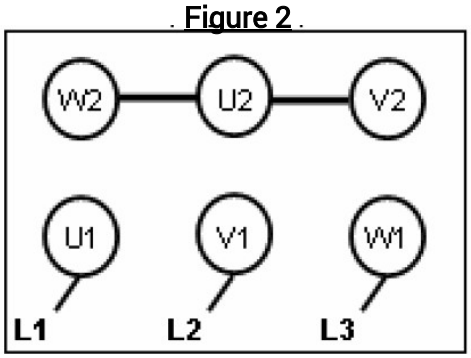
6. Connection diagram

. Figure 1 .



Δ-Delta-Connection

. Figure 2 .



Y-Star-Connection

Pic. 2: Connection diagram

6.1 Tightening Torques for Terminal Nuts

Brass terminal screws must be tightened according to the specified torque values depending on nominal diameter.

Nominal Diameter	Material	Tightening torques in Nm	Tolerance (+/- Nm)
M3	H62	0,5	0,05
M4	H62	1,2	0,12
M5	H62	2,5	0,2
M6	H62	4,2	0,5
M7	H62	10	1
M8	H62	20,3	2
M9	H62	35,5	3
M10	H62	56,8	5
M11	H62	88	8
M12	H62	122	10
M13	H62	206	20
M14	H62	237	23
M15	H62	300	30
M16	H62	440	40
M17	H62	600	60
M18	H62	816	80
M19	H62	1047	100

tab.2: Bolt tightening torques

7. Commissioning

Before commissioning, ensure the motor is de-energized, secured against reconnection and checked for absence of voltage.

7.1 Insulation Resistance Test

The insulation resistance of the windings must be measured, particularly after long storage. The value must be at least 10 MΩ at a 1000 V insulation test. Lower values require drying of the motor. Measurement values should be documented for future comparison.

7.2 Inspection of Connections and Protective Devices

All electrical connections must be checked for secure fit. Thermal protection devices must be set to the rated current.

7.3 No-Load Functional Test

Start the motor without load to verify the direction of rotation.

7.4 Load Test and Operating Conditions

Subsequently, perform a load test with gradual loading. The motor must run smoothly and without abnormal vibration. Operation is only permitted within the following limits: voltage ±5%, frequency ±2%.

8. Dust and Contamination

The points described in this section must be checked regularly as part of normal motor maintenance. The external surfaces, especially cooling fins and air channels, must be kept as clean as possible. Contamination can impair airflow and heat dissipation, leading to overheating.

Dust should be removed using a dry cloth or soft brush. Compressed air may only be used at low pressure. Aggressive cleaning agents or high-pressure cleaners are not permitted unless explicitly allowed by the IP rating

8.1 Moisture

Motors that are operated only infrequently should be started periodically to prevent moisture accumulation in the windings. This does not apply to motors equipped with standstill heaters.

8.2 Wear and Vibration

To avoid excessive wear and vibration, belt or chain tension must not be set too high. For directly coupled machines, alignment must be verified carefully. Mounting bolts and base frames must be securely tightened.

8.3 Lubrication

OMEC motor bearings are factory-filled with high-quality lithium-based grease. Motors in frame sizes 56 to 250 are equipped with sealed 2RZ-C3 bearings and are greased for life. Motors with relubrication devices are fitted with grease nipples and drain plugs. Relubrication must be carried out with the motor running and the drain plug removed to prevent overfilling.

8.4 Replacement of Ball/Roller Bearings

Bearings must be removed using suitable tools to avoid damage to the shaft. The bearing seat must be cleaned and inspected. New bearings should be heated to approx. 80 °C using an induction heater and mounted quickly. For roller bearings, heat only the inner ring. For open bearings, the maximum heating temperature is 110 °C.

Only the inner ring should be supported during installation. Never apply force to the outer ring of a ball bearing. Bearings must not be forced onto the shaft when cold.

9. Bearing Type

Framesize	Poles	Bearing type			Grease quantity			Regrease interval	
		Standard	MM Regreaseable	NU Bearing	Standard	MM Regreaseable	NU Bearing	63-- type Bearing	NU Bearing
	[ ]	[ ]	[ ]	[ ]	[g]	[g]	[g]	[h]	[h]
56	2-4-6-8	6201 2RZ							
63	2-4-6-8	6201 2RZ							
71	2-4-6-8	6202 2RZ							
80	2-4-6-8	6204 C3 2RZ							
90	2-4-6-8	6205 C3 2RZ							
100	2-4-6-8	6206 C3 2RZ							
112	2-4-6-8	6306 C3 2RZ							
132	2	6308 C3 2RZ	6308 C3			12		2000	
132	4-6-8	6308 C3 2RZ	6308 C3			12		4000	
160	2	6309 C3 2RZ	6309 C3			15		2000	
160	4-6-8	6309 C3 2RZ	6309 C3			15		4000	
180	2	6311 C3 2RZ	6311 C3			20		2000	
180	4-6-8	6311 C3 2RZ	6311 C3	NU 311		20	20	4000	4000
200	2	6312 C3 2RZ	6312 C3	NU 312		22	22	2000	2000
200	4-6-8	6312 C3 2RZ	6312 C3	NU 312		22	22	4000	4000
225	2	6313 C3 2RZ	6313 C3	NU 313		24	24	2000	2000
225	4-6-8	6313 C3 2RZ	6313 C3	NU 313		24	24	4000	4000
250	2	6314 C3 2RZ	6314 C3	NU 314		26	26	2000	2000
250	4-6-8	6314 C3 2RZ	6314 C3	NU 314		26	26	4000	4000
280	2	6314 C3	6314 C3	NU 314	26	26	26	2000	2000
280	4-6-8	6317 C3	6317 C3	NU 317	38	38	38	4000	4000
315	2	6317 C3		NU 317	38		38	2000	2000
315	4-6-8	6319 C3		NU 319	45		45	4000	4000
355	2	6317 C3		NU 317	38		38	2000	2000
355	4-6-8	6322 C3		NU 322	45		60	4000	2000
400	4-6-8	6326 C3		NU 326	85		80	4000	1750
450	4-6-8	6328 C3		NU 328	95		95	3750	1440
500	4-6-8	6330 C3		NU 330	110		105	3310	1180

Tab. 3: Bearing type, grease quantities and lubrication intervals

10. Lubrication Intervals

The term **lubrication interval** refers to the number of operating hours after which the bearing grease must be renewed. Electric motors are used in a wide variety of applications and are required to operate reliably under diverse conditions, such as dust, moisture, vibration, extreme temperatures, chemically aggressive environments or maritime atmospheres.

The service life of the lubrication depends mainly on time, speed and bearing size. Due to the large number of influencing factors, it is not possible to specify exact values for all operating conditions. Nevertheless, guideline values are necessary to provide the user with orientation. Lubrication condition and bearing condition are key factors influencing motor service life and must be considered as part of regular maintenance.

10.1 Guideline Values Under Normal Operating Conditions

With sealed bearings of types 2RS and ZZ, the grease quality ensures a service life of approximately 20,000 operating hours for two-pole motors and about 40,000 operating hours for multi-pole motors under normal operating conditions. These values apply at rated load and rated speed.

10.2 Motors with Relubrication Devices

Motors equipped with relubrication devices require relubrication in accordance with the information on the nameplate. Relubrication is carried out **with the motor running**, via the grease nipples, using the specified quantity of grease.

During relubrication, the grease drain plug must be removed and reinstalled afterwards to allow excess grease to escape and to prevent overfilling of the bearing.

Important Notes:

When replacing bearings, the free space may only be filled to approximately **two-thirds** with grease. Completely filling the bearing cavity leads to increased bearing temperature and accelerated wear.

Chemically aggressive environments, extreme humidity, heavy vibration, or very high or low temperatures are **not considered normal operating conditions** and require an adjustment of lubrication intervals.

- Lubrication intervals and grease quantities are specified on the separate nameplate.
- Relubrication must be performed with the motor running, via the grease nipples, using the specified grease quantity.

11. Storage Conditions

Motors must be stored under defined conditions to ensure their functionality and service life.
The storage area shall be dry, clean, and free from vibrations. The permissible ambient temperature range is between –20 °C and +40 °C.
In addition, it must be ensured that the environment is free from corrosive or chemically aggressive vapors.

11.1 Rotation During Storage (Preventing False Brinelling)

For motors from frame size 180 and above, the shaft must be rotated manually at least once every six months. This measure prevents bearing damage that may occur due to prolonged standstill.

If vibrations at the storage location cannot be completely avoided, the shaft must be mechanically secured.

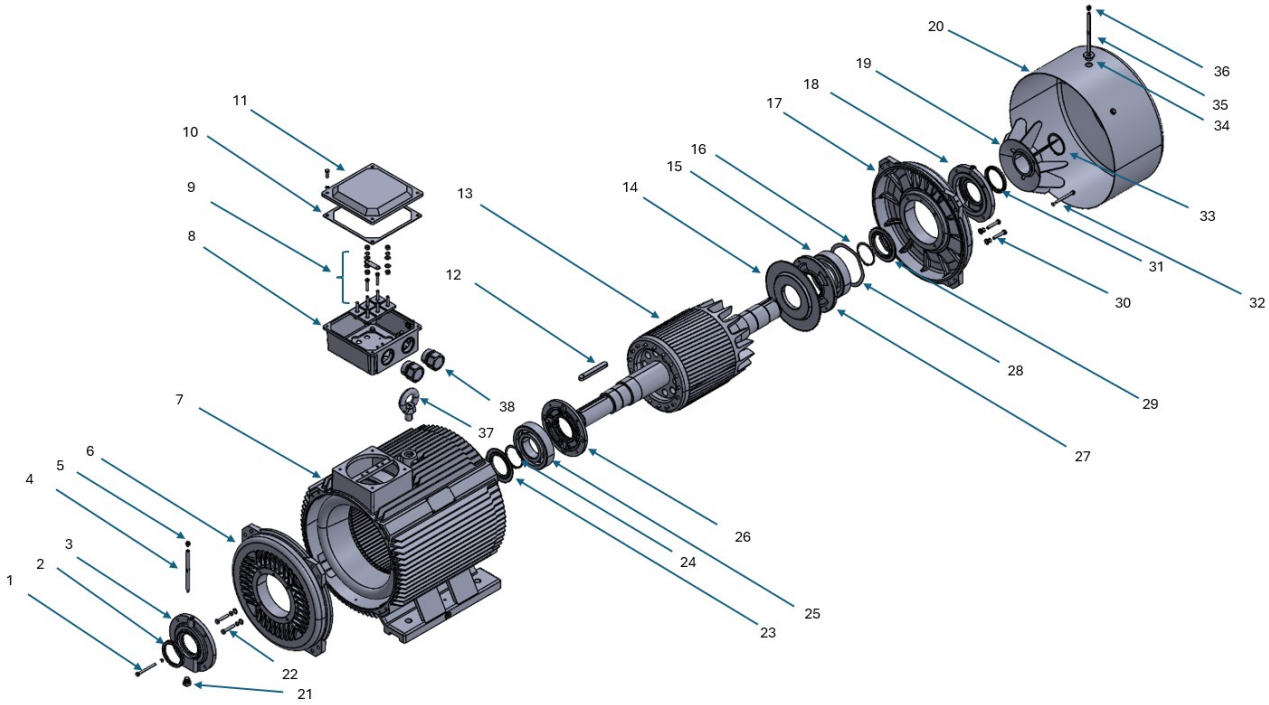
11.2 Motors with Rolling Bearings

Motors equipped with rolling bearings are supplied from the factory with a **shaft locking device**. This locking device must remain installed for the entire duration of the storage period in order to prevent damage to the bearings.

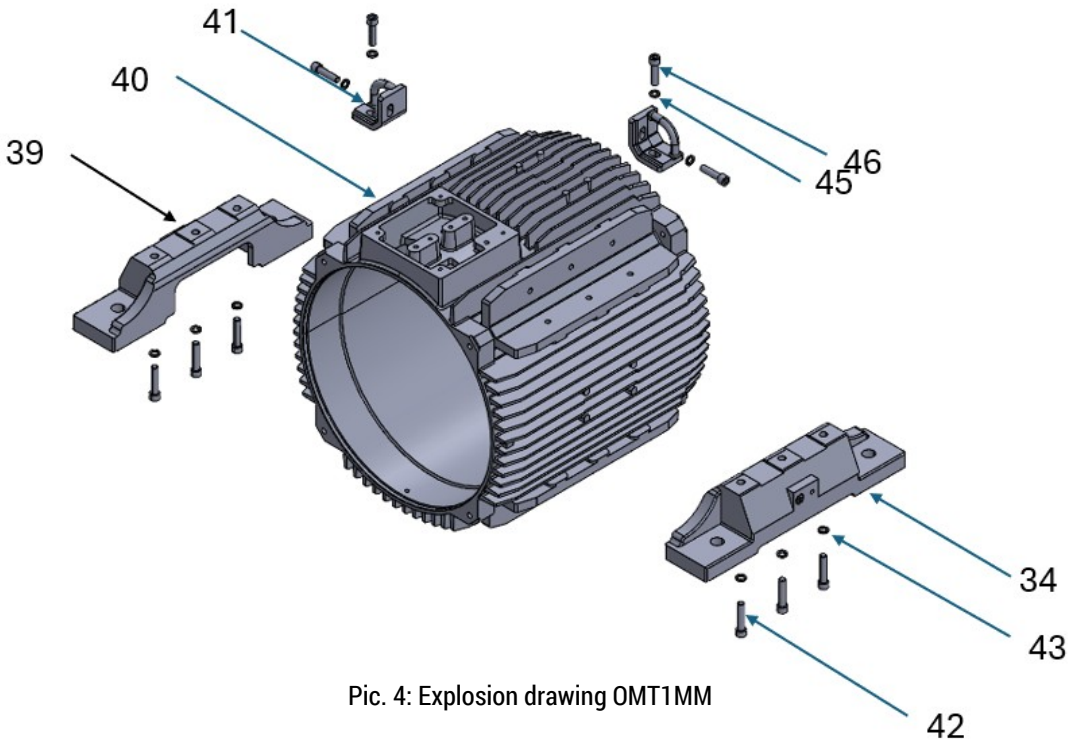
12. Spare parts list and exploded view drawing

General OMT1 / 3 / 4			
Squirrel-cage induction motor			
1	Bearing cover bolt (DE)	20	Fan Cover
2	DE V-ring	21	Grease relief plug
3	Outer bearing cover (DE)	22	Bearing cover bolt (DE)
4	Grease pipe (DE)	23	Bearing cover
5	Grease niple (DE)	24	Circlip
6	B5-B14 or DE-shield	25	Bearing (DE)
7	Stator Frame	26	Inner bearing cover(DE)
8	Terminal box housing	27	Distance ring
9	Terminal board complete	28	Pre load spring
10	Terminal box lid seal	29	Circlip
11	Terminal box cover	30	Bearing cover bolt (NDE)
12	Key	31	V-ring
13	Rotor	32	Bolt
14	Rotor Deflector	33	Circlip
15	Bearing (NDE)	34	Grease pipe rubber
16	Circlip	35	Grease pipe (NDE)
17	NDE-Shild	36	Grease niple (NDE)
18	Outer bearing cover (NDE)	37	Lifting eye
19	Fan	38	Cable gland
Multimount [MM]			
39	MM left feet	43	MM feet bolt washer
40	MM stator frame	44	MM right feet
41	MM lifting lug	45	MM lifting lug bolt washer
42	MM feet bolt	46	MM lifting lug bolt

Tab. 4: Sparepart list



Pic. 3: Explosion drawing OMT 1 / 3 / 4



Pic. 4: Explosion drawing OMT1MM