



TEM

**OPERATION AND
MAINTENANCE
MANUAL**

**“ELECTRIC GEARMOTORS
24-400 V AC FAMILY”**

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1 INTRODUCTION

This manual contains information for use and maintenance of alternate current gearmotors (hereinafter simply AC) with 24-400 V power supply, hereinafter referred to as "gearmotors". Information about the electric motor can be found in the manual "Operating and maintenance instructions" of the motor itself.

The content of this document reflects the requirements of Directives 768/2008/EC, 2014/30/EU, 2011/65/EU, 2012/19/EU and relevant legislation.

The manual is to be considered an integral part of the motor to which it is attached and must therefore be kept throughout the life of the machine (it is recommended to keep it in a dry and protected place).

The manufacturer reserves the right to make changes, without notice and without incurring any penalty, without prejudice to the main technical characteristics and safety; for any other information contact the nearest retailer.



WARNING USE THE GEAR MOTOR ONLY AFTER READING THIS MANUAL AND THE MANUAL OF THE ELECTRIC MOTOR

2 GENERAL WARNING



Before each operation, disconnect the equipment from the power grid. Has dangerous rotating parts, remove the protection only by motor disconnected from the network and with parts not in motion.



Attention the equipment can reach in the external surfaces in contact with the operator, high temperatures. Handle only with cold motor.



Attention the motor has sharp parts that can cause injuries. Use special protective gloves.

Attention the thin thickness of the plate bearing the electrical data can be sharp. Beware the keyless motor drive shaft has sharp edges



WARNING:

- The user is responsible for compliance with local safety, installation and use regulations.
- All transportation, installation, use, ordinary and extraordinary maintenance of the motor must be performed exclusively by specialised and competent operators.
- Operator means the person or persons responsible for installing, operating, adjusting, repairing and transporting the motor.

This manual contains the instructions that allow maintenance and regular use of the gearmotor avoiding inconveniences that could damage its proper functioning.

The gearmotor is a risk-bearing component mainly of electrical and mechanical origin, therefore, if used improperly, it can create hazardous conditions and cause harm to people, animals and things.

It is recommended to read carefully the instructions that follow before commissioning the gearmotor; each installation operation, commissioning, maintenance and protection of the gearmotor shall be carried out by qualified personnel in compliance with all applicable laws and technical standards and safety requirements for electrical equipment of machinery as stated by the European reference standard EN 60204-1.

Please note that this documentation complements and does not replace any legislation or technical regulations or safety requirements concerning the gearmotor; the following information provides only practical suggestions for the competent staff responsible for this task. All liability arising from improper use and failure to comply with the applicable safety directives concerning electrical equipment shall be waived.

Failure to comply with the warnings and/or any tampering of the gear motor, relieves TEM of any liability in the event of accidents and/or damage to property and persons.

Before starting the gear motor, the user must carefully read the contents of this manual.

The user must comply with the safety standards in force in their country and as provided in this manual.

3 SCOPE AND DESCRIPTION

Our gearmotors are mainly used in the field of industrial automation but can be used for all those uses where it is necessary to vary the speed and the direction of the organs to which they are connected.

All the gear motors mentioned below have been designed and constructed in accordance with the requirements of the standards:

EN 50419, EN 60034-1, EN 60034-2, EN 60034-4, EN 60034-5, EN 60034-6, EN 60034-7, EN 60034-8, EN 60034-9, EN 60034-14, EN 60034-16-1, EN 60034-18-1/22/31, EN 60276, EN 60423, EN 60529, EN 61986, CEI 2-19,
and Directives: 768/2008/EC, 2014/30/EU, 2011/65/EU and 2012/19/EU

4 ELECTRIC GEARMOTOR IDENTIFICATION

All motors shall be fitted with a plate in which the data necessary for their identification can be collected. The layout of these data is described below.

- | | |
|-----------------------------------|-------------------------------------|
| 1. Company name and address | 10. Serial number |
| 2. Designation of the series/type | 11. Month and year of construction |
| 3. Revolutions per minute | 12. Nominal current |
| 4. Nominal voltage | 13. Brake supply voltage |
| 5. Protection grade | 14. Encoder model |
| 6. Insulation class | 15. Resolver poles n. |
| 7. Nominal Torque | 16. CE mark |
| 8. Peak Torque | 17. Ban on dumping into urban waste |
| 9. Voltage constant | |

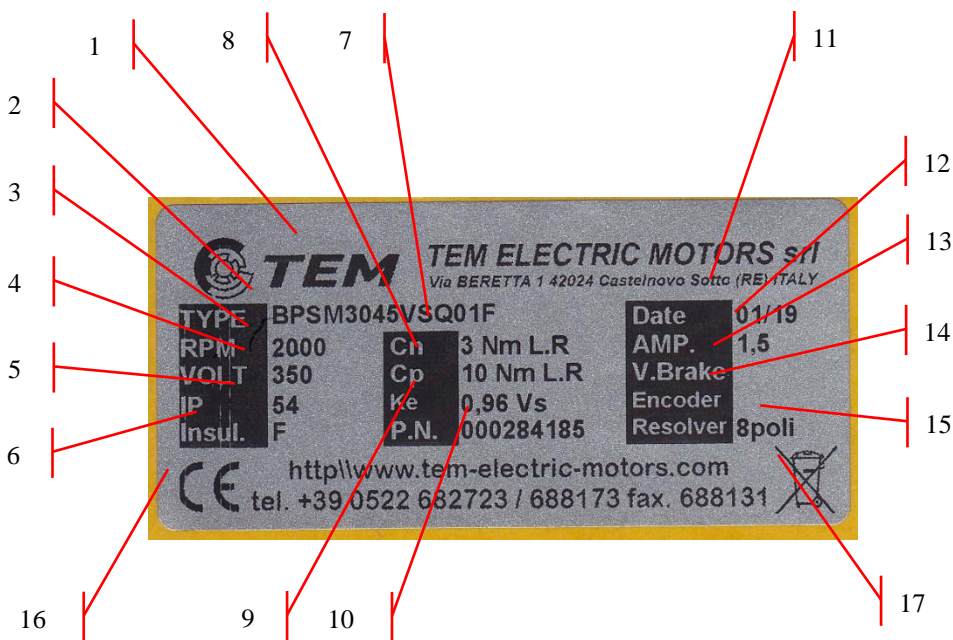


Fig. 1: Identification plate

5 A.C. GEARMOTORS DESCRIPTION

The gearmotors to which this manual refers are of alternate current type with power supply from 24 to 400V AC.

5.1 Technical data

The basic technical characteristics are given on the plate of the gearmotor, if the user is in the need to know other parameters not specified can request them from the retailer, consult them or download them from the website: www.tem-electric-motors.com or alternatively request to TEM directly the characterization card of the gearmotor of which it is in possession, to do this it is sufficient to provide or the full name of the article (see code on box TYPE of the motor plate) or the serial number (see serial number on box P.N of the motor plate).

Technical data when not otherwise specified are intended to refer to (tolerance 5%):

Ambient temperature 25 °C, Altitude max. 1000m a.s.l., Relative humidity max. 75% in absence of condensation.

6 PROHIBITED SCOPE

The AC gearmotors manufactured by us can reach a maximum protection level of IP 55 (only on specific request of the customer) making appropriate constructive changes, therefore their use is not allowed in those cases where greater protection is required for example:

- Hermetic protection against dust.
- Exposure to direct water jets with pressures exceeding 30 Kpa and flow rates exceeding 13.2 l/min.
- Partial or total immersion in water, oil, etc...

In the case of standard gear motors (protection IP 54) the limitations are extended as required by EN 60034-5.

Uses in oxygen-free and/or radioactive environments are also prohibited.

WARNING:



The gearmotor cannot be used in environments where explosion-proof characteristics are required.

Ensure that the environment in which it is to be installed is not subject to gaseous and poisonous fumes for the maintainer. The use of the gear motor is allowed to persons over 14 years of age.

ATTENTION USE THE GEAR MOTOR ONLY AFTER READING THIS MANUAL AND THE MANUAL OF THE ELECTRIC MOTOR.

7 ASSEMBLY, STORAGE, PREPARATION AND INSTALLATION

Comply with all safety and warning information contained in the individual chapters.

7.1 Transport of the gearbox



Danger of falling loads

- 1) • The eyebolts must be screwed completely.
- 2) • Do not pull diagonally from the gongers.

For transport use only the eyebolts screwed to the gearbox. In the case of gear motors, also use the possible eyebolt applied to the motor.

Transport the gearbox carefully. Backlashes at free shaft ends cause damage inside the gearbox.

7.2 Storage

For short storage periods before commissioning, observe the following:

- store in the correct mounting position ((see Chapter 7.1 "Mounting and maintenance positions")) and ensure the gearbox against falls,
- lightly oil the unpainted carcass surfaces and shafts,
- storing in dry environments,
- the ambient temperature shall not vary and shall be between - 5 °C and + 50 °C,
- the relative humidity of the air must be less than 60 %,
- do not expose directly to sunlight or ultraviolet light,
- no corrosive or aggressive substances must be present in the surrounding area (contaminated air, ozone, gases, solvents, acids, alkaline solutions, salts, radioactivity, etc.),
- do not subject to vibration or shock.

7.3 Long-term storage

In case of storage or closure of more than 9 months, TEM recommends the long-term storage option. With the measurements below, a storage of about 2 years is possible. As maximum storage times are hugely influenced by environment conditions, the indicated times should only be considered as reference values.

Gearbox status and place of storage for long-term storage before commissioning:

- Store in the mounting position and ensure gearbox against falls.
- Any damage to the paint layer due to transport shall be repaired. It shall be verified that adequate anti-rust has been applied to flange surfaces and shaft ends and, if necessary, that one suitable for such surfaces has been applied.
- The gearbox must be hermetically sealed.
- Store in dry environments.
- In tropical areas, it is necessary to protect the motor from insects.
- The ambient temperature shall not change and shall be between - 5 °C and + 40 °C,
- The relative humidity of the air must be less than 60 %.
- Do not expose directly to sunlight or ultraviolet light.

-
- No corrosive or aggressive substances must be present in the surrounding area (contaminated air, ozone, gases, solvents, acids, alkaline solutions, salts, radioactivity, etc...).
 - Do not subject to vibration or shock.

Measures to be taken during the storage or fallowing period

- If the relative humidity of the air is less than 50 %, the gearbox may be stored for up to 3 years.

Measures to be taken before commissioning

- Subject the gearbox to inspection before putting it into operation.
- If the storage or fallowing period extends beyond approximately 2 years or the temperature during short-term storage varies significantly from the reference range, it is necessary to replace the lubricant inside the gearbox before putting into operation.
- If the gearbox is fully oil-filled, the oil level must be reduced according to the mounting position before commissioning.
- If the gearbox is not full of oil, the oil level must be refilled according to the mounting position before commissioning. For the quantity and type of lubricant please refer to the information on the gearbox plate.

7.4 Pre-installation operations

Check the gearbox immediately upon delivery to verify that it has not suffered damage to transport and packaging. The operation must be checked and can only be mounted if no leakage is detected. In particular, check that the shaft rings and caps are not damaged. Immediately report the damage to the transport company. In case of transport damage, it may not be possible to start the gearbox.

Before transport, drivers are protected against corrosion by application to bare surfaces and oil/grease shafts or corrosion products.

Before mounting, completely remove the oil / grease or anti-corrosion products and any dirt incrustations from all shafts and flanged surfaces.

In cases where an incorrect direction of rotation may cause damage or danger, a no-load test operation of the group shall be performed to determine the correct direction of rotation of the output shaft, which shall then be maintained during operation.

For the connection of the motor and during the control of the motor, it is necessary to ensure that the gearbox can only turn in that direction of rotation, eg. checking the rotation field.

Ensure that no substances are present in the area surrounding the installation site, or are present during subsequent operation, which may exert an aggressive and corrosive action against metals, lubricants and elastomers.

If the gearbox has a vent, the vent or pressure vent must be activated before starting. For activation, remove the transport safety (drawstring).

7.5 Gearbox Installation



Damage from overheating of the gearbox:

In the case of gear motors, ensure that the motor cooling air reaches the gearbox unhindered.

For mounting, use ring eyebolts screwed to the reducer. No additional loads shall be attached to the gearbox.

In the case of gearmotors, use also any eyebolt applied to the motor. Avoid pulling diagonally from the eyebolts. Observe the safety signs.

The base or flange to which the gearbox is attached shall be resistant to oscillation, torsion and level. The flatness of the crankcase or flange coupling surfaces shall be achieved according to the tolerance class K of DIN ISO 2768-2. Care must be taken to remove any dirt on the coupling surfaces of the gearbox, crankcase or flange.

The gearbox carcass must always be grounded. In the case of gear motors, grounding shall be ensured by the connection of the motor.

The gearbox must be precisely aligned with the shaft of the machine to be operated to prevent additional forces from being induced in the gearbox due to defective tightening.

Welding work on the gearbox is not permitted. The gearbox should not be used as a earth point for welding operations, otherwise the bearings and gears could be damaged.

The reducer shall be installed in the correct position. Changing the mounting position after delivery requires a correction of the amount of oil and often other measurements, such as the mounting of encapsulated rolling bearings. Failure to respect the specified mounting position may cause damage.

Use all gearbox fixing feet on one side or all flange screws. Use at least 8.8 quality screws. The screws shall be tightened with the corresponding tightening torque. In particular, in the case of gearboxes with feet and flange, screw without excessively tightening.

Oil control and discharge screws and venting screws shall be accessible.

7.6 Mounting hubs on gearbox shafts



Damage to the gearbox caused by axial forces.

Do not induce harmful axial forces in the reducer. Do not tap the hub with a hammer

Mounting of motorcycle drive elements, such as coupling hubs and sprocket hubs on the inlet shaft and on the outlet shaft of the gearbox, shall be carried out with suitable shrink disks that do not induce harmful axial forces in the gearbox.

For shrinking use the front threading of the shafts. To facilitate assembly, apply the lubricant before the hub.

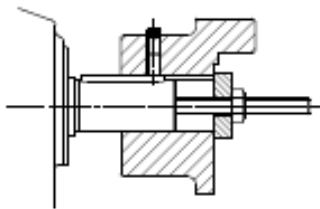


Fig. 2: Shrink disk

The output elements shall not transmit to the gearbox radial loads F_R and axial F_A exceeding the maximum permissible value. In particular, for belts and chains it is necessary to respect the correct tension.

No additional load due to unbalance of hubs is permitted.

Radial loads shall be applied as close as possible to the gearbox.

7.7 Mounting of plug-in gearboxes



If the reaction arm screw loosens, the gearbox can beat against the output shaft. Lock the screw connection to prevent loosening, for example with Loctite 242 or a second nut.



Damage to gearbox caused by axial forces.

In the event of improper assembly, bearings, gear wheels, shafts and carcasses could be damaged.

- Use suitable shrink disks.
- Don't beat on the gearbox with a hammer.

To simplify assembly and subsequent disassembly, apply an anti-corrosion lubricant to the shaft and hub before assembly. Excess grease or anti-corrosion may leak and drip after mounting. After a break-in of about 24 hours, thoroughly clean the points on the output shaft. The grease leak does not constitute a loss of the gearbox.

8 COMMISSIONING

8.1 Oil level control

Before commissioning it is necessary to check the oil level

9 INSPECTION AND MAINTENANCE

9.1 Inspection and maintenance intervals

MAINTENANCE INSPECTION INTERVAL	MAINTENANCE INSPECTION WORK
At least every 6 months	<ul style="list-style-type: none"> • Visual check • Noise control • Check oil level • Flexible tube visual inspection • Grease / remove excess grease.
At least every 3000 hours	<ul style="list-style-type: none"> • Replacement of gearbox sealing rings (see gearbox specific instructions)
With operating temperatures of up to 70°C per 10000 operating hours, at least every 2 years	<ul style="list-style-type: none"> • Oil change (the interval doubles in case of use of synthetic products) • Cleaning and possible replacement of the venting screw • Replacement of shaft rings
Every 20000 operating hours, at least every 4 years	<ul style="list-style-type: none"> • Perform secondary greasing of the bearings inside the gearbox
At least every 10 years	<ul style="list-style-type: none"> • General revision

Tab.1: Maintenance

Oil change intervals refer to normal operating conditions and operating temperatures up to 80°C. In extreme operating conditions (operating temperatures above 80°C, high atmospheric humidity, aggressive environment and frequent variations in operating temperature), oil change intervals shorten

9.2 Inspection and maintenance work

Visual check

Check that the gearbox does not leak. Also check that the gearbox has no external damage and there are no cracks on hoses, hose fittings and anti-vibration rubber pads. If any leakage occurs, such as oil or cooling water drips, damage or cracks, immediately repair the gearbox.

Shaft sealing rings are components that have a limited life and are subject to wear and aging. The service life of shaft rings depends on the most varied environment conditions. Temperature, light (especially UV light), ozone and other gases and fluids affect the ageing process of shaft rings. Some of these influences can alter the physico-chemical characteristics of shaft sealing rings and, depending on their intensity, considerably shorten their duration. Foreign matter (e.g. dust, mud, sand, metal particles) and overheating (excessive rotation rate or heat added from other sources) accelerate sealing lip wear. In the factory these elastomeric lips are lubricated with a special grease. This lubrication minimizes their inherent wear and tear and ensures a long service life. For this reason the presence of a veil of oil at the sealing lip is normal and should not be interpreted as a loss.

Noise control

If there are unusual noises and/or vibrations during the operation of the gearbox, this may indicate a failure of the gearbox itself. In this case it is necessary to stop the gearbox and perform a general overhaul.

Oil change

Procedure:

1. Place a collection vessel under the oil tap or drain cap.
2. Completely unscrew the oil level cap or, if the oil level tank is used, the cap with level rod and the drain cap.
3. Fully drain the oil from the gearbox.
4. If the oil drain cap or oil cap seal ring is damaged, use a new oil cap or clean the thread and, before screwing, apply a thread brake, such as Loctite 242, Loxal 54-03.
5. Screw the oil drain cap and tighten to the required tightening torque.
6. Pour the new oil of the same type through the oil level hole with a suitable filling device, until the oil starts to escape from the hole. (The oil can also be introduced through the vent hole or a threaded plug located above the oil level). If a tank is used, introduce the oil from the upper loading hole (thread G1¼) until the oil reaches the level described in Chapter 9.2 "Inspection and maintenance work".
7. Wait at least 15 minutes. If an oil level tank is used, the oil level shall be checked at least 30 minutes after filling.

Cleaning and possible replacement of the venting screw

Unscrew the vent cap, clean it thoroughly (for example with compressed air) and reassemble it in the same position. If necessary, use a vent screw with a new sealing ring.

Replacement of shaft ring gasket

Reaching the end of the useful life, the veil of oil at the sealing lip increases and slowly a measurable loss is formed with oil dripping. It is therefore necessary to replace the ring gasket. The area between the sealing lip and the protective lip should be filled with approximately 50 % grease during assembly (recommended grease type: PETAMO GHY 133N). After mounting, the new ring gasket shall not be in the trace of the previous gasket.

Re-lubrication of bearings

Completely replace the grease in rolling bearings that do not have oil lubrication and in the holes of the latter up to above the oil level (recommended grease type: PETAMO GHY 133N).

General review

For this operation it is necessary to completely disassemble the gearbox. Perform the following operations:

- clean all the components of the gearbox,
- check that all the components of the gearbox do not present any damage,
- replace all damaged components,
- replace all rolling bearings,
- replace the anti-meter devices, if any,
- replace all gaskets and seals,
- replace the plastic and elastomer parts of the motor coupling.

The general audit shall be carried out at a qualified workshop with appropriate equipment and by qualified personnel in accordance with national rules and regulations.

10 DISPOSAL

Gearbox components	Material
Gear wheels, shafts, rolling bearings, tabs, safety rings, ...	Steel
Reducer carcase, parts of carcase, ...	Grey cast iron
Light alloy gearbox carcase, light alloy carcase parts, ...	Aluminium
Helical wheels, bushings, ...	Bronze
Sealing rings for shafts, caps, rubber elements, ...	Elastomer and steel
Joints	Plastic and steel
Flat gaskets	Asbestos-free sealing material
Oil for gearbox	Mineral oil with additives
Oil for synthetic reducers (label: CLP PG)	Polyglycol-based synthetic oil

Tab.2: disposal

10.1 Compliance Electromagnetic Compatibility

All equipment described in this manual complies with EN61000-6-2 Electromagnetic Compatibility 2014/30/EU.

For further information on radio frequency disturbances, please contact our technical department; if additional filtering devices are required, TEM will be able to meet all your needs upon customer's request.

11 STANDARDS FOR ENVIRONMENT PROTECTION

At the end of the operating life the gear motor must not be thrown as common waste, but must be scrapped in a suitable container for the recycling of electrical and electronic material; this is evidenced by the symbol of the crossed out bin placed on the plate of the same motor.

Depending on its intrinsic characteristics, the materials that make up the engine could be recyclable, it is therefore recommended in case of demolition to differentiate the parts according to their nature and in any case to comply with the relevant local directives.

Waste recycling and other forms of electrical and electronic material management make an important contribution to environment protection. To obtain information on the nearest collection point it is advisable to contact the relevant bodies.



12 WARRANTY

12.1 Information on technical assistance

In case of motor problems, not traceable to the table "TROUBLESHOOTING" contact your nearest retailer.


12.2 Maintenance of minimum requirements

The manufacturer shall ensure that the minimum safety requirements are maintained for 10 (ten) years from the year of manufacture.

12.3 Limits to warranty

- The manufacturer guarantees the gearmotors described in this booklet, for 12 (twelve) months from the date reported on the engine plate and within that period undertakes to repair or replace the defective parts, provided that they have been used under the conditions shown on the plate.
- Parts subject to wear and tear are not covered by warranty.
- TEM will only cover the repair costs, any other costs (withdrawal, replacement, transport, etc.) including any damage to property and persons, and shall be borne by the customer, who for no reason shall be entitled to claim TEM itself.
- The warranty is not recognised in cases of poor maintenance, abnormal use of the motor and tampering thereof.
- Claims for damage incurred during transport can only be forwarded when the damage is ascertained and confirmed upon delivery of the goods.
- Any dispute is due to the territorial jurisdiction of the judicial authority of Reggio Emilia.
- In order to ensure the fastest possible repair, in the event of a warranty claim, send the defective product in free port together with the duly completed warranty certificate.

12.1 Certificate of warranty

	<p><i>CERTIFICATE OF WARRANTY</i> TEM ELECTRIC MOTORS srl</p>
Item:	
Series Number (P.N.) :	
Purchase date :	
Anomaly :	
Stamp and signature of the user :	

NB: Keep the warranty certificate carefully. Your loss extinguishes your warranty right.