

USE AND MAINTENANCE MANUAL

GEARLESS

GLS PRODUCT RANGE



GLS Series

GLS20

GLS26

GLS34

GLS40

GLS48

Gearless permanent magnet synchronous motor

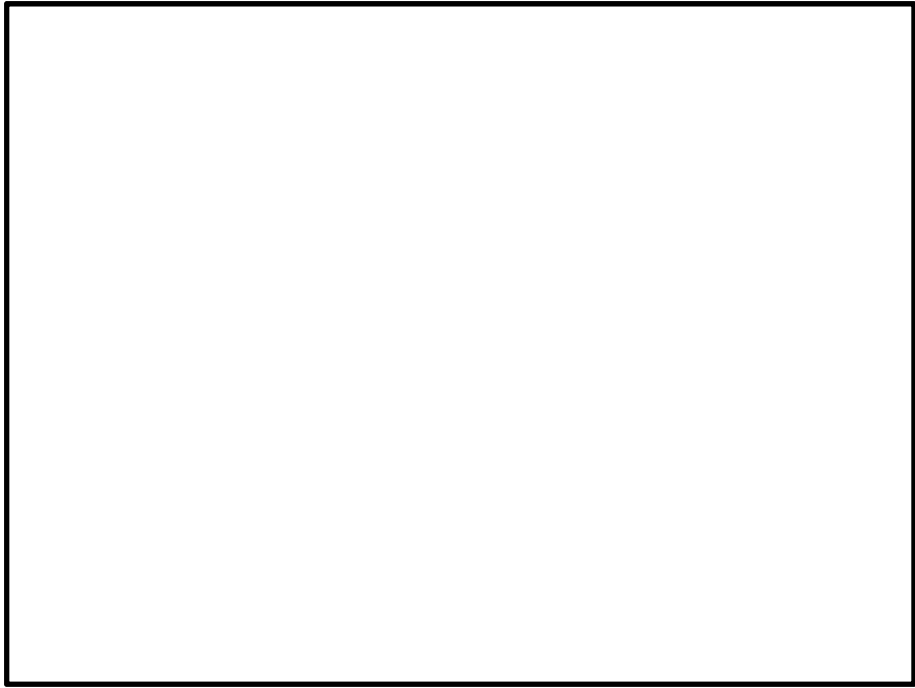
Operating instructions

Store for future use!

GEM-GLS-v010323

(subject to change without prior notice)





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1 General information

Comprehension and compliance with the following instructions is mandatory to ensure the functionality and safety of the product. If the following instructions especially about but not limited for general safety, transport, storage, mounting, operating conditions, start-up, maintenance, repair, cleaning and disposal / recycling are not observed, the product may not operate safely and may cause a hazard to the life and risks for users and third parties.

Deviations from the following requirements may therefore lead both to the loss of the statutory material defect liability rights and to the liability of the buyer for the product that has become unsafe due to the deviation from the specifications.

1.1 Contents of the operating instructions

These operating instructions help you to work safely on and with the elevator machines GEM series GLSxx. They contain safety instructions that must be complied with as well as information that is required for failure-free operation of the elevator machine.

The operating instructions must be stored in the vicinity of the elevator machine. It must be ensured that all persons who have to perform activities on the elevator machine can consult the operating instructions at any time.

Keep the operating instructions for continued use. They must be passed-on to all successive owners, users and final customers.

1.2 For whom are intended

The operating instructions address persons entrusted with planning, installation, commissioning and maintenance and servicing and who have the corresponding qualifications and skills for their job.

1.3 Exclusion of liability

GEM General Elevator Machines S.r.l. is not liable for any damage due to misuse, incorrect use, improper use or as a consequence of unauthorized repairs or modifications.

1.4 Warranty

Unless otherwise agreed upon in the sales contract, this warranty is governed by the following clauses:

1.4.1 - the warranty on our products is valid for a period of THREE years from the date shown on the shipping papers. During the warranty period, GEM will replace without charge any component that has been recognized as defective;

1.4.2 – a component can be declared defective only if the relevant defects have been recognized by GEM;

1.4.3 – components that are to be repaired or replaced under warranty must be sent with all shipping and duty fees pre-paid;

1.4.4 – requests for service calls must be made by the customer in writing. The customer must pay for labour, room and board, and travel costs;

1.4.5 – **this warranty will automatically become null and void should any of the following circumstances occur:**

1.4.5.1 - the component for which warranty service has been requested has tampered with;

1.4.5.2 - the machine has been used in any application which was not previously authorized by or agreed upon with GEM in writing;

1.4.5.3 - the machine has been used in a way that does not conform to the specifications for which it has been built, as indicated in the technical manual and in this Operation and Maintenance Manual;

1.4.5.4 – the identification plates are missing or it is impossible to identify the machine;

1.4.6 – the following components, which are subjects to normal wear or natural degradation, are not included in this warranty: brake pads, roller bearings, electrical windings, magnets;

1.4.7 – this warranty does not include compensation for shipping fees or down time;

1.4.8 - **warranty claim procedure:**

1.4.8.1 – all warranty claims must be communicated to GEM, e-mail in advance, followed by official letter or fax duly stamped and signed, within 8 days from the day that the relevant problem occurs;

1.4.8.2 – GEM will confirm in writing (with e-mail in advance) the eventual acceptance of proposed repairs to be executed by the customer and covered by the warranty, or the company will send its own technical personnel;

1.4.8.3 – any defective material replaced by the customer must remain at our disposal for 30 days

so that the necessary verification can be performed, or the material must be shipped to GEM when the company so requests in writing;

- 1.4.8.4 – absolutely no claims will be accepted for warranty repairs that were not previously authorized in writing by GEM;
- 1.4.8.5 – in any case, a complete photographic report of the executed repair operation must be supplied to GEM. The purpose of this study is not only to record the repair procedure but also to enable GEM to correct the problem and improve the quality and reliability of the machines;
- 1.4.8.6 – GEM reserves the right to ask back defective materials in order to check the cause of the problem. If defective materials don't reach GEM factory within 30 days from request the new parts will be invoiced to the customer.

2 Safety instructions

2.1 General

The GEM GLSxx elevator machine is not a ready-to-use product and may only be operated after having been installed in machines or plants and its safety, depending on the application, has been ensured by protective grids, barriers, constructive devices or other adequate measures (see EN ISO 13857)!

Installation, connection to the power supply and commissioning may only be performed by qualified service personnel! The relevant regulations (both European and National) must be observed!

Installers, manufacturers and operators of system parts or entire systems are responsible for the correct and safe mounting and a reliable operation.

2.2 Intended use

The GLSxx is a permanent-magnet, gearless elevator machine, designed as an internal rotor motor for elevator with and without a machine room. The elevator machine is not designed for any use other than those listed here – this is considered improper use.







Applications other than the intended use of this elevator machine are not permitted without approval by GEM General Elevator Machines S.r.l..

Reading these operating instructions and complying with all instructions - especially the safety instructions - is considered part of intended use. It also includes carrying out all the inspection work at the prescribed intervals.

Not the manufacturer, rather the operator of the GEM GLSxx is liable for any personal harm or material damage arising from non-intended use!

2.3 Pictograms

Safety instructions are highlighted with warning triangles and are depicted according to the degree of hazard as follows.

	<p>Danger! General hazardous area. Death or severe injury or significant property damage can occur if the corresponding precautions are not taken!</p>
	<p>Warning! Risk of moderate or minor injury if the corresponding precautions are not taken!</p>
	<p>Caution! Material damage is possible if the corresponding precautions are not taken.</p>
	<p>Danger! Danger by dangerous, electric voltage! Death or severe injury can occur if the corresponding precautions are not taken!</p>
	<p>Information Important additional information and advice for user.</p>
	<p>Warning! Danger by hot surface! Slight bodily harm is possible if the corresponding precautions are not taken!</p>

2.4 Product safety

The elevator machine conforms to the state of the art at the time of delivery and is fundamentally considered to be reliable. The elevator machine and accessories may only be installed and operated in perfect condition and in compliance with the operating instructions. Exceeding the limits stated in the chapter "Technical Data" can lead to a defect in the elevator machine.

2.5 Requirements placed on the personnel / due diligence

Persons entrusted with the planning, installation, commissioning and maintenance and servicing in connection with the elevator machine must have the corresponding qualifications and skills for these jobs. Based on their training, knowledge and experience as well as knowledge of the relevant standards, they must be able to judge the work transferred to them and be able to recognize possible hazards.

In addition, they must be knowledgeable about the safety regulations, EU directives, rules for the prevention of accidents and the corresponding national as well as regional and in-house regulations. Personnel undergoing training, instruction, or on apprenticeship may only work on the elevator machine under the supervision of an experienced person. This also applies to personnel in general training.

Comply with the legal minimum age.

2.6 General safety instructions



Danger!

Rotation of the drive shaft induces a voltage, which is applied to the connection terminals.



Danger!

The elevator machine has attachment points: screwed-on eye bolts. The attachment points are designed exclusively for transporting the elevator machine including brake and traction sheave. Do not lift other loads such as bolted on components, ropes lying on top, etc. with the attachment points. Adequately sized lifting device must be used. Make sure nobody is in the area of path of transport of the machine (danger zone).



Warning!

Depending on the operating conditions, the elevator machine can have high surface temperatures of $> 80^{\circ}\text{C}$.

Risk of burns!

If the installation situation does not provide sufficient personal protection, then this must be provided by the customer in the form of additional measures.

If work has to be carried out on the machine at normal operating temperature, suitable gloves must be worn.



Warning!

Warning of hand injuries!



Risk of injury from reaching into the rope guard.

Do not carry out any activities during operation.

Only perform maintenance work on the drive when stopped.

The elevator machine is only to be operated within the ranges specified on the plate of the machine!

Use the elevator machine only in the authorised fashion and only for the tasks and flow media specified in the order!

If the elevator machine is not energized, no electric torque is available. Releasing the brakes can cause uncontrolled acceleration of the elevator.

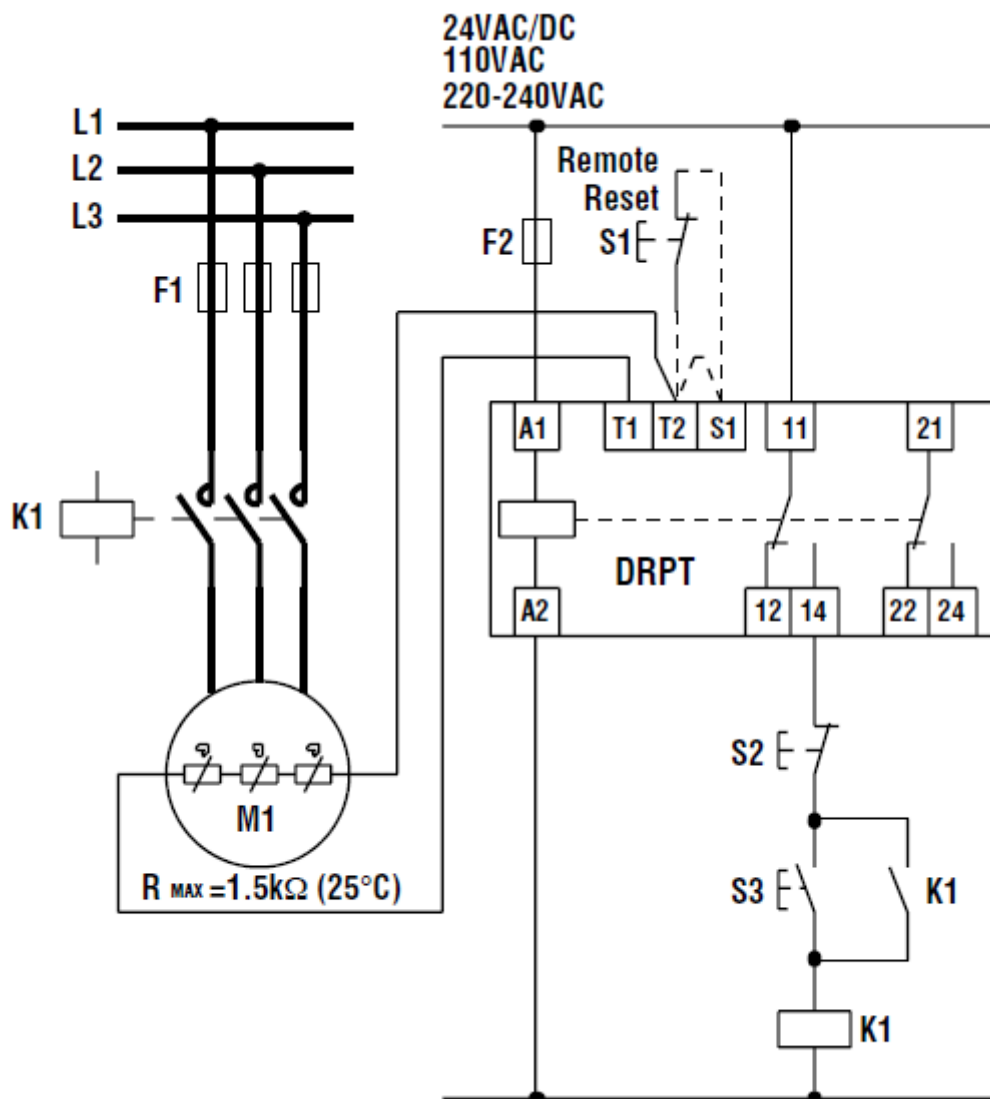
We recommend short-circuiting the windings of the de-energized elevator machine to generate a brake torque dependent on the speed.

In the event of a short-circuit, a short-circuit current of at least the level of the rated current is flowing.

The windings may not be short-circuited when the elevator machine is energized.

Safety features, for example the brake release monitoring, may not be dismantled, circumvented or made inoperative!

Thermistors installed in the winding act as protection against excess temperatures in the elevator machine and must be evaluated. When the thermistors are activated, the energy supply to the elevator machine must be switched off (Safety chain). Thermistors must be monitored by a proper thermistor protection relay (max tension in the measure circuit is $\leq 2.5\text{Vdc}$). Typical wiring diagram is as follows:



WARNING: A VOLTAGE >2.5Vdc WILL DESTROY THE THERMISTORS!!

2.7 Operator's obligation of diligence

The elevator machine has been designed and built after consideration of a risk analysis and after careful selection of the harmonised standards to be complied with as well as other technical specifications. It therefore complies with the state of the art and guarantees maximum safety during operation. However, this safety can only be achieved in practical operation when all the necessary measures are taken. The machine operator therefore has a duty of care to ensure that these measures are planned and to supervise their execution.

In particular, the operator must ensure that

- the elevator machine is used as intended (see chapter "Product overview")
- the installation is operated in a flawless, functional condition and the safety devices are periodically checked for their properly functioning condition
- the required personal safety gear is available to and used by the operating, maintenance and repair personnel
- the operating instructions are available at the location where the elevator machine is being used, are complete and are in readable condition
- sufficiently qualified and authorized personnel operate, maintain and repair the elevator machine
- these personnel receive regular instruction in all relevant industrial safety and environmental protection issues and are familiar with the operating instructions and the safety instructions they contain
- all safety and warning notices attached to the elevator machine are never removed and remain legible

2.8 Employment of external personnel

Maintenance and service work are frequently carried out by external employees who often do not recognize the specific situations and the thus resulting dangers.

These persons must be comprehensively informed about the hazards in their area of activity.

You must monitor their working methods in order to intervene in good time if necessary.

3 Product overview

3.1 Operational area

The GEM GLSxx is designed as a gearless elevator machine for traction sheave rope elevators. Owing to its very compact design, the GLSxx is suitable also for machine-roomless elevators.

The type-tested brake can be used as a:

- Brake mechanism acting on the drive shaft as part of the ascending car overspeed protection means

- Brake element acting on the drive shaft as part of the protection against unintended car movement

The GEM GLSxx machine require a low ambient humidity and temperature between -5°C-+40°C (if necessary, external auxiliary fans can be included for forced ventilation). Do not use the machine in an explosive environment.

Nominal conditions of the machine up to 1000m above sea level. For higher altitudes, the reduction in motor torque should be taken into consideration.

3.2 Identification plate

The identification for the GLSxx include all the relevant data necessary for the identification and for the installation of the machine.

The identification plate is located on the top front of the machine.

GEM <small>GENERAL ELEVATOR MACHINES</small>	Serial N.: 123456		MADE IN ITALY	
	Type: GLS40	T.S.: Ø240	Rop.: 2:1	CE
Speed: 1,0m/s		D.L.: 800Kg		
Brake: EVO-02		207Vdc	2x0,41A //	2x85W //
Motor 3~:	Type: M921	Power: 5,8kW	16 Poles	
YEAR:2019	Rat.torque: 350Nm	Rat.rpm: 159rpm		
Voltage: 350Vac	Current: 18,6A	Freq.: 21,2Hz		
Res.(U,V): 3,0 Ohm	Ind.(U,V): 44mH	cos ø: 0,90		
Thermal protector: 3 x PTC 120°C (max 2,5Vdc!!!)				
Insulation class: F		Protection class: IP21		
ED (S3): 40%	S/h: 180	Amb.T.: -5°C ÷ +40°C		
Encoder: Heidenhain ECN 1313 - 2048 - EnDat01				
Total Weight: 150Kg		Fan type:12038,230V 1~,50/60Hz,0.13A		
<small>GEM-General Elevator Machines S.r.l.-V.le Caproni, 18-38068 Rovereto (TN)-Italy Tel. 0039-0464-240033 - Fax. 0039-0464-240034 - email: info@gem-ita.com</small>				

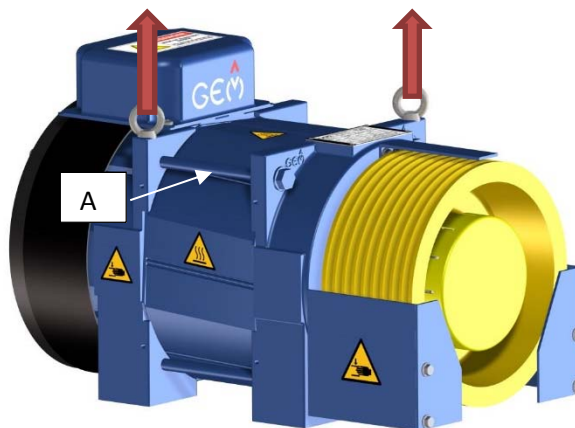
Example identification plate GLSxx



Position of identification plate on GLSxx

3.3 Transport

- GEM GLSxx elevator machine are packed by the manufacturer for the types of transport and storage agreed upon.



Position of attachment points



Transport the elevator machine either in the original packing (pallet or cage) using a proper forklift or at the attachment points using a suitable lifting gear in such a way that the load on each eyelet must be almost vertical (packaging must be removed in this case). **DO NOT** tighten the threaded eyelets by tools (they must be tightened by hand only).

Make sure nobody is in the area of path of transport/lifting of the winch (danger zone).

When lifting the machine always use a safety belt around screws "A" but **NEVER** lift through these screws, the safety belt **MUST** be UNLOADED and placed there only for safety redundancy.

Transport elevator machine without any additional load and taking the centre of gravity into account!

The threads in the shaft ends are not to suit eyebolts to transport the elevator machine. Avoid excessive vibration and shocks.

Extreme heat or cold (transport temperature less than -20 °C or plus +60 °C) must be avoided!

Check packing and elevator machine for possible damage and report the forwarding agency about any damages caused by transport. Shipping damages are not covered by our guarantee!

3.4 Storage

Store the elevator machine in the original packaging in a dry area protected from the weather or protect it from dirt and weather until final mounting.

Extreme heat or cold must be avoided! (storage temperature -10 °C to +50 °C) High humidity which can lead to condensation must be avoided.

Avoid aggressive conditions (for example salt spray)!

Avoid excessive storage times (we recommend max. one year) and check bearing for correct function before installing the motor. (Release the brakes and move the rotor by hand. Take care if the bearing makes untypical noises)

3.5 Disposal / recycling



Disposal must be carried out professionally and environmentally friendly in accordance with the legal stipulations. Most of the materials the machine is build of are completely recyclable (i.e. cast iron, steel, copper wires, ...). Check it with your local authorized firms for disposal.

4 Mechanical installation

4.1 General mounting advises

Mounting, electrical connection and commissioning works are only to be performed by trained service personnel. Adhere to all machinery-related requirements and specifications supplied by the system manufacturer or machine builder.

CAUTION!

Caution!

When working at or in the elevator, the elevator machine and especially the brakes have to be covered and protected against dust and chips.

Do not install distorted.

Do not apply any force (levering, bending). Above all, do not expose the rotor to any heavy mechanical shocks.

Before starting installation, the elevator machine must be checked for transport damage, especially the cables have to be checked.

No welding must be carried out on the elevator machine. The elevator machine must not be used as a ground point for welding. Magnets and bearings could be destroyed.

The cooling-airflow around the elevator machine must not be obstructed.

We recommend keep at least 130 mm space between the brake and the wall (axial direction) to make access to the encoder possible.

The brake design with manual hand release must be freely accessible since the levers for brake release are moved laterally (see chapter "Start-up / manual emergency evacuation")!

4.2 Fastening the elevator machine

On the bottom side of the machine are 4 threads.

The elevator machine has to be fixed with 4 screws M16 - 8.8 at the mounting bedplate.

Tightening torque M16 - 8.8: 190 Nm.

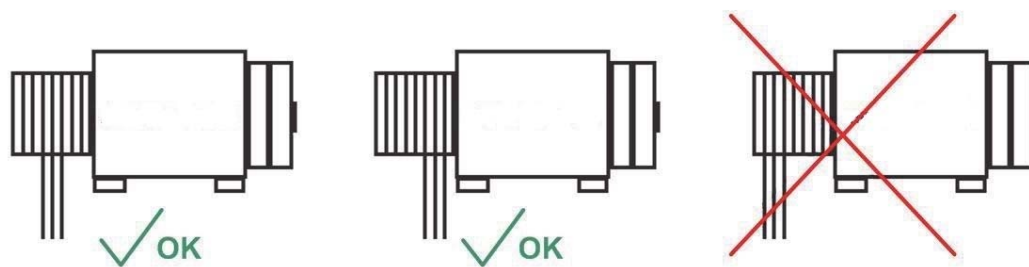
Screw-in depth at least 1.5 times of screw size (minimum 24 mm, **maximum 30 mm**).

Fasten the screws crosswise in at least two steps to the required tightening torque. The permissible unevenness for the mounting surface is 0.1 mm.

The mounting surface has to be rigid and robust enough to withstand the forces.

For the vibration decoupling of the elevator system, damping elements should be used.

4.3 Fitting the ropes



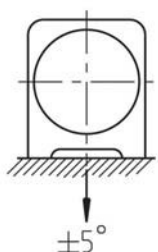
Fitting the ropes

If the traction sheave should offer more grooves than the actual number of ropes, the ropes must be applied on the sheave either centred or towards the motor side.

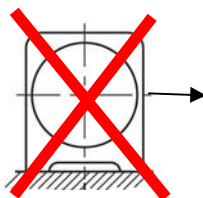
4.4 Rope pull



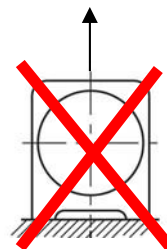
The rope pull must only be in the vertical direction to the motor foot. The rope force direction resulting from rope pull must be observed.



Resulting rope force



No lateral ropes force



No upward ropes force

4.5 Fastening rope guard



Warning!
Warning of hand injuries!



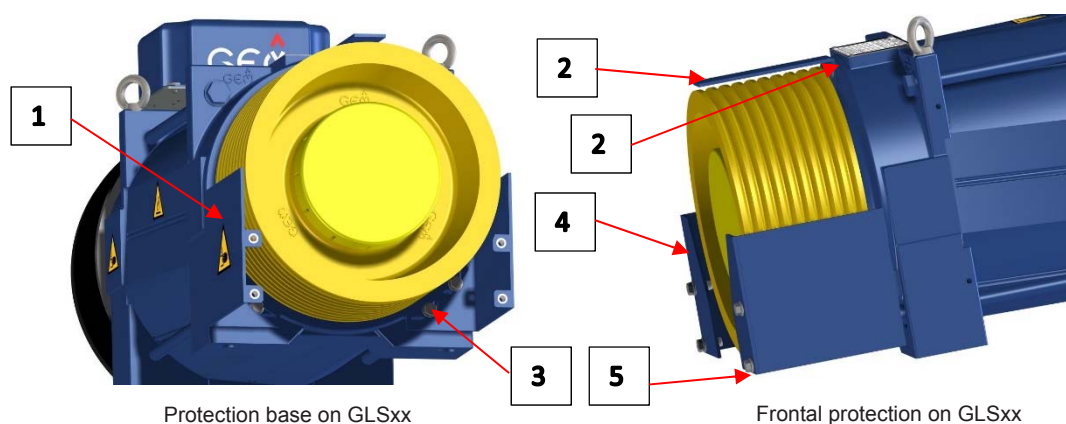
Risk of injury from reaching into the rope guard.
Do not carry out any activities during operation.
Only perform maintenance work on the drive when stopped.



Rope guard GEM GLSxx

The elevator machine is on the right and left fitted with rope protections (1). A rope retainer (2) is optionally available. Set the rope protections to a distance of 2 - 3 mm from the ropes.

4.5.1 Rope protections attachment on GEM GLSxx
Adjustability on both sides $\pm 5^\circ$. Normal wrap angles $175^\circ - 185^\circ$.



The protection base (1) is attached to the machine housing with two auto-locking hexagon head screws M6 x 14 – cl.8.8 (3) in each side. Those screws remain attached to the housing when removing or adapting the protection base.

The slotted hole in the protection base (1) enables the required distance to the ropes to be set (easier using a long tube key Ch10), tightening torque M6 - 8.8: 10 Nm

The frontal protections (4) are attached with two auto-locking hexagon head screws M6 x 14 – cl.8.8 (5) in each side. Those screws remain attached to the protection base when removing or adapting the frontal protection. Tightening torque M6 - 8.8: 10 Nm

The optional rope retainer (2) is attached with two auto-locking hexagon head screws M6 x 14 – cl.8.8 (6). Those screws remain attached to the housing when removing or adapting the rope retainer.

The elongated slots in the rope retainer (2) enable the required distance to the ropes to be set. Tightening torque M6 - 8.8: 10 Nm

5 Electrical installation

5.1 Safety precautions

Work on electric components may only be carried out by trained electricians or by persons instructed in electricity under the supervision of an electrician in accordance with electrical engineering regulations.

Electrical equipment must be checked regularly: loose connections are to be re-tightened and damaged cables must be replaced immediately.

Always keep switch cabinets and all electrical supply facilities locked. Access is only allowed for authorized persons using a key or special tool.

Never clean electrical equipment with water or similar liquids.

5.2 EMC directive



Compliance with the EMC directive 2014/30/UE only applies to this product if frequency inverters are used and are installed in line with the associated operating instructions and are EMC-compatible. If this product is improperly integrated into a system or is combined and operated with non-EMC compatible components, the manufacturer or operator of the complete system is solely responsible for compliance with the EMC directive 2014/30/UE. In detail, connecting devices that are EMC rules compliant doesn't mean necessarily that the whole system will be EMC compliant.

5.3 Motor

CAUTION!

The motor cable for the elevator machine is available as an option.

The elevator machine cannot be connected to the supply line without a frequency inverter in between. Connecting the machine directly to the supply line can destroy the motor.

5.3.1 Cable cross section

The cable cross-section must be specified dependent on the motor current and the ambient conditions (e.g. temperature, wiring method) in accordance with IEC 204-1.

5.3.2 Type of cable

Always use **shielded** cables for the motor connections! Both rigid and flexible lines can be installed. The use of wire-end sleeves is recommended for flexible lines.

Rated voltage U_0 / U : 450 / 750 V AC

5.3.3 Cable length

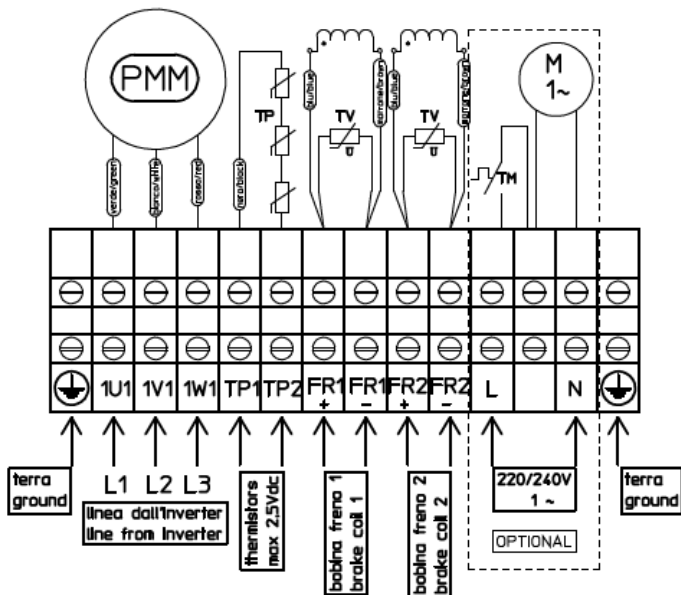
The maximum cable length is 25 m. With a motor line > 25 m compliance with EN 12015 (Electromagnetic Compatibility - Interference emissions) and EN 12016 (Electromagnetic Compatibility - Interference immunity) can no longer be guaranteed.

5.3.4 Connection

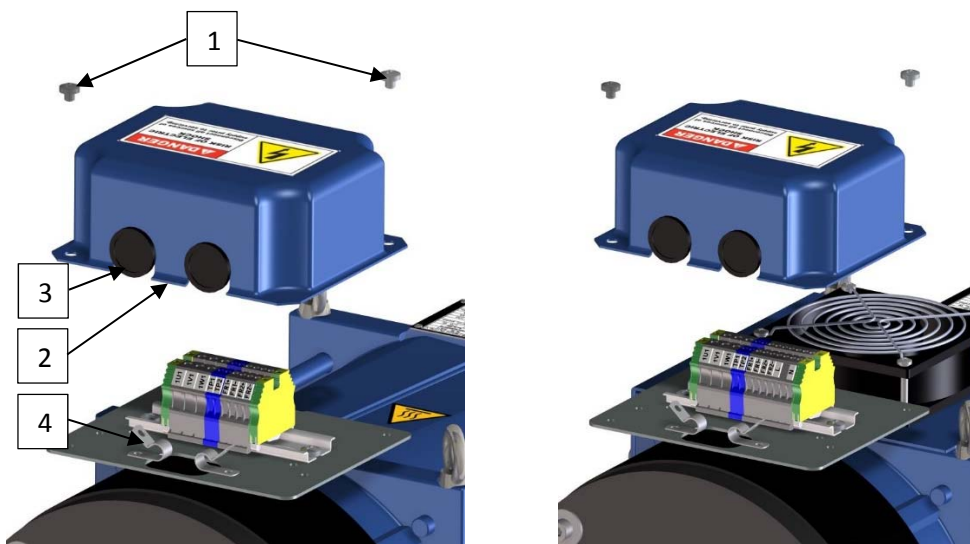


Danger!

The motor cable must be connected to the correct phase of the frequency inverter and the elevator machine: U -> U / V -> V / W -> W (or L1 -> U / L2 -> V / L3 -> W or R -> U / S -> V / T -> W). If the actual direction of travel does not correspond to the selected direction, the turning direction of the elevator machine must be changed in the frequency inverter configuration. If the motor cable is not connected to the correct phase, control of the elevator machine is not possible. It can result in jerky movements or uncontrolled acceleration of the elevator machine.



5.3.5 Connection requirements



Connection Standard

Connection with forced ventilation

Standard connection requirements

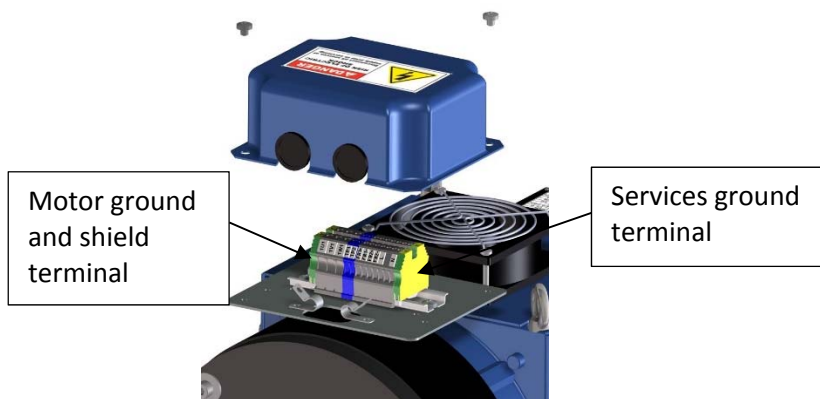
1. Loosen both recessed cheese head screws M6 (1)
2. The cover plate (2) can now be removed
3. Connect the GLSxx according to the connection diagram (**attached under the cover plate**)
4. Cables must be passed through the rubber rings (3) and clamped with the cable clamps (4)
5. Ground and shield of motor cable must be plugged in the yellow/green terminal
6. U,V,W sequence must be respected
7. Connect PTC (see below)
8. Connect brake and brake micro's
9. Remount the cover plate (2)
10. Tighten the M6 screws (1)

Connection requirements with optional forced ventilation

1. Loosen both recessed cheese head screws M6 (1)
2. The cover plate (2) can now be removed
3. Connect the GLSxx according to the connection diagram (**attached under the cover plate**)
4. Cables must be passed through the rubber rings (3) and clamped with the cable clamps (4)
5. Ground and shield of motor cable must be plugged in the yellow/green terminal
6. U,V,W sequence must be respected
7. Connect PTC (see below)
8. Connect brake and brake micro's
9. Connect the fan supply line (220÷240V monophas 50/60Hz) to the L and N terminals
10. Remount the cover plate (2)
11. Tighten the M6 screws (1)

5.3.6 Protective ground connection

Two terminals are dedicated to ground protective connection: one is for the motor ground cable and for the motor cable shield and the other one is for services. A good ground connection is mandatory!

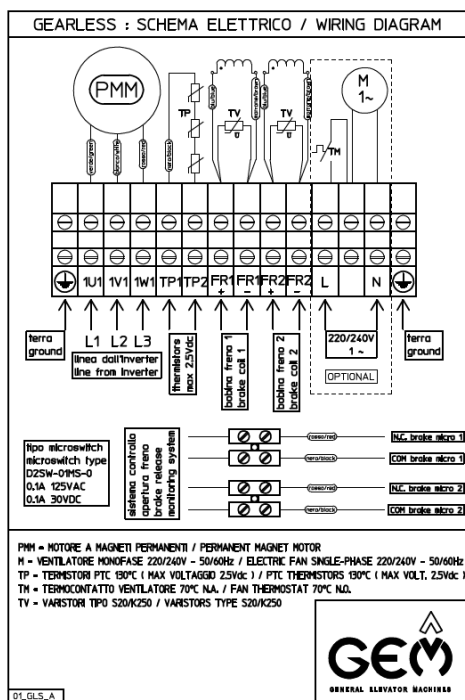


Protective ground connection

5.3.7 Temperature monitoring

- The PTC thermistor motor protection must be connected.
- Only connect to monitor inputs approved for PTC thermistors.
- Maximum permissible test voltage for PTC thermistors 2.5 V DC.

5.3.8 Connection diagram



The electrical connection diagram is attached under the cover plate.

5.4 Absolute encoder



Caution!

Never touch the connection contacts on the position absolute encoder or on the cable! The electronics can be destroyed by static electricity.

You must discharge your own body before touching. This can be done, for example, by touching a conductive, earthed object (e.g. bare metal switch cabinet parts) immediately before.

Operation of the elevator machine without an absolute encoder is not permissible.



Note:

Removal of the absolute encoder is only possible from the rear. Due to the extremely low failure rate of the absolute encoder, this does not represent a problem. Nevertheless a suitable free space must be maintained behind the machine in order to permit free access for maintenance. **Never joint together the encoder cable and the motor cable or pass together through the same pipe. The encoder shield cable must be connected to a steel plate in the cabinet.**

5.4.1 Lead

Encoder Type	ECN1313
Cable length	5 m
Cable design	Shielded cable
Extension in 5 m steps	optional
Maximum cable length	25 m

5.4.2 Contact assignment

5.4.2.1 Absolute encoder ECN1313

Electrical connection

ECN 1313 wires color assignment - GEM green cable

	Power supply					Incremental signals ¹⁾				Serial data transfer			
Colors													
Wiring	Up	Sensor Up	0V	Sensor 0V	Internal shield	A+	A-	B+	B-	DATA	DATA	CLOCK	CLOCK
	Brown	Red	White	Blue	/	Pink/ Grey	Red/ Blue	Black	Violet	Gray	Pink	Green	Yellow

Cable shield connected to housing; Up = Power supply voltage; T = Temperature
 Sensor: The sensor line is connected in the encoder with the corresponding power line.
 Vacant pins or wires must not be used.

¹⁾ Only with ordering designations EnDat 01 and EnDat 02

5.4.3 Offset

The absolute encoder offset is set to 0 in factory. Because different inverters can have different behavior, before running the machine it is advisable anyway to perform a “poletuning” procedure in order to get the encoder offset. This procedure has to be performed more times checking that the encoder offset angle doesn’t differ more than $\pm 10^\circ$ each attempt. If replicability is not achieved check that:

- The encoder cable is not damaged or with loosen cables
- The encoder is correctly fixed (expanding flange or central screw)
- Parameters entered in the inverter are correct according to the encoder data sheet and the encoder card is correctly installed in the inverter

For details of the procedure, refer to the frequency inverter operating instructions. If for any reason the encoder should be dismantled and re-mounted, the “poletuning” procedure MUST be absolutely performed before running the machine.

5.5 Brake

- GLS20 Brake type EVO-01, 2 x 200 Nm
- GLS26 Brake type EVO-01, 2 x 250 Nm
- GLS34 Brake type EVO-02, 2 x 350 Nm
- GLS40 Brake type EVO-02, 2 x 450 Nm
- GLS48 Brake type EVO-01, 2 x 500 Nm

- Also refer to the operating instructions for the brake.

5.5.1 Application

- The brakes are intended for static applications as holding brakes. Dynamic braking must be restricted to emergency and inspection braking. No wear occurs on a holding brake. This means that the brake is maintenance free, and only the air gap has to be checked as described in the "Maintenance and repair - Inspection intervals - Checking the air gap" chapter.

5.5.2 Mechanical releasing

Mechanical release of the brakes is possible by using the manual hand release system available as an option. Two different types of levers are available for manual hand release of the brake: long levers for local manual hand release; short levers for remote hand release by mean of a Bowden cable and a remote lever.

Both type are easily retrofittable on existing brakes.

5.5.3 Release monitoring

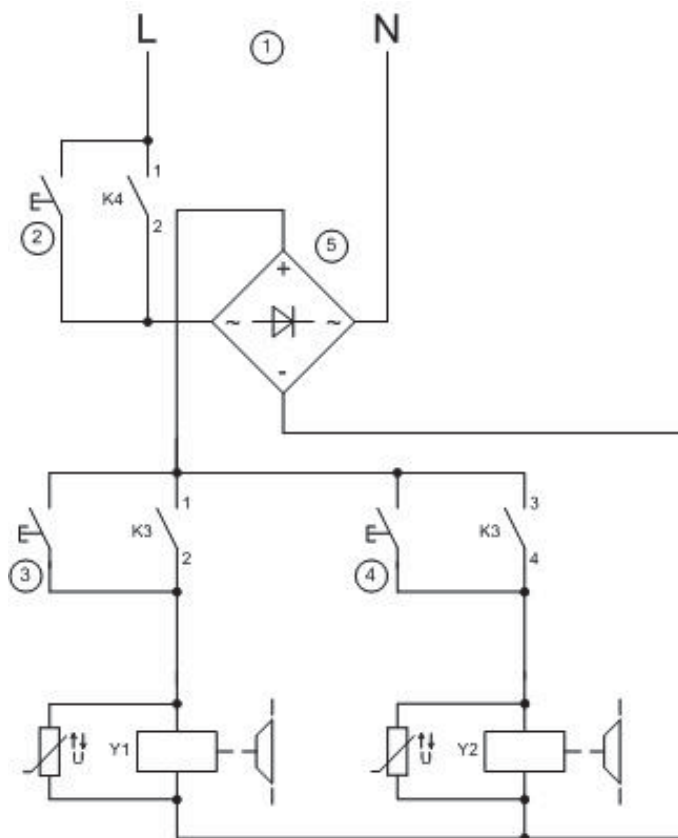
- The brake release monitoring serves as monitoring for redundancy and the operation status of the brakes.
- Release monitoring for the brakes is carried out by a couple of microswitches. For technical data, see chapter "Appendix - Technical data - Microswitch".

5.5.4 Brake control

5.5.4.1 Electromechanical contactors

To reduce noises during brake disconnection the brakes should be switched to the alternating current side (K4), while normal operation. The brakes are switched-off slower and thus quieter through the rectifier.

To ensure instantaneous brake engagement in emergencies, during inspection runs and return runs, a second contactor (K3), which disconnects the brake on the direct current side, should be used. This contactor is to be switched depending on the safety circuit.



Simplified diagram for brake control

- 1 Voltage supply
- 2 Button circuit test
- 3/4 "Open brake" button
- 5 Rectifier
- K3 Brake contactor, activated by safety circuit
- K4 Brake contactor, activated by control or frequency inverter

5.5.5 Connection

- The brake has two independent coils that can be powered through the FR1+,FR1-,FR2+,FR2-terminals
- The brake must be supplied with 207Vdc (no overexcitation is required) and the connection of the two coils must be in parallel
- The brake has two independent (electrically and mechanically) braking devices
- Each braking system has its own brake release monitoring microswitch (usually supplied in NC configuration; see connection diagram)

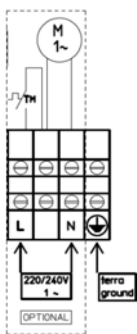
5.6 Forced cooling

GLSxx forced ventilation (optional): the forced ventilation is optional and can be added afterwards. Forced ventilation is suggested only in case of intense lift traffic (offices, hospitals,...), high lift room temperatures, high cabin travel (>50m).

5.6.1 Technical data

Voltage	220 - 240	[V]
Frequency	50 / 60	[Hz]
Power	20 / 19	[W]
Current	0.13 / 0.11	[A]

5.6.2 Connection diagram



TM Thermal contact N.O. 70°C

6 Start-up

6.1 Operating conditions

The elevator machine must be installed in a not free accessible machine room or a closed hoist-way.

Be aware of the protection class specified on the name plate.

Do not operate the elevator machine in an explosive atmosphere.

6.2 First Start-up

Before first-time start-up, check the following:

Installation and electrical connection have been properly completed.

Safety devices are installed.

All leftover installation materials and other foreign materials have been removed.

The protective ground is connected.

Motor protection correctly connected and operative.

Cable entries closed.

Mounting, installation position and accessories are o.k.

Connection data corresponds to the data on the name plate.

6.3 Tests

Tests on elevator systems can be performed by the assembly company or a certification authority or organisation. This involves discovering of failure-critical and hazardous conditions. The relevant operator is responsible for safety. The descriptions below are intended as recommendations for the technical procedure and do not deal in sufficient depth with safety engineering aspects of the relevant system. Therefore, priority is given to the safety engineering specifications of the assembly company or operator. Only trained specialist personnel may carry out tests.

6.3.1 Run the machine without load

Before installing the ropes on the traction sheave check that the motor run freely in both sense of rotation with a current absorbtion of less than 0,5A. In case a greater value of current is measured verify that the inverter input parameters are correct and that the brake opens correctly.

6.3.2 Half load test with current measurement.

The test for the 50 % weight compensation should preferably be carried out as follows:

The motor current is to be measured in both travel directions with a half load.

GEM

The measured currents should correspond as closely as possible.

The difference between the measured currents should not show a variation of more than 10 %.

Half load test with release of the brake only

The shorting circuit, if installed, should be disabled for the duration of the half load test.

With a half load and the brake released, the car may not move.

After the half load test, the shorting circuit is to be reactivated.

6.3.3 Testing the brake in accordance with EN 81-20:2014

When testing the brakes, the short-circuit wiring has to be deactivated to only test the effect of the brake.

It is recommended to perform the tests when the car position is about in the middle of the shaft.

1. Overload

The test shall be carried out whilst the car is descending at rated speed with 125 % of the rated load and interrupting the supply to the motor and the brake.

2. Failure of one brake circuit:

The test shall be carried out whilst the car is descending at rated speed with rated load.

To simulate failure of a brake circuit, it must be possible to keep the brake circuits open mechanically independently of one another even when opening the safety circuit.

This condition may not be permanent and must therefore be created using buttons or similar.

At the same time, the safety circuit should be opened when using this function.

For this test, the elevator must be observed.

If no discernible delay occurs, the brake circuit held open is to be closed immediately. The system should be stopped and the brake tested.

If the circuit is designed in accordance with the principle circuit diagram:

At the nominal speed, press one of the buttons and hold it down until the elevator has stopped.

Repeat the test with the other button to test the second brake circuit.

3. Testing the microswitches

The release monitoring for the brakes must be evaluated.

Before every trip, the change in the state of both brake circuits must be monitored separately.

Switching must thus be tested individually, according to the function as an NC contact. If there is a missing or incorrect signal, the elevator cabin may not leave the stopping point.

6.4 Pull out of safety gear

If the car loaded with the nominal load enters the trap due to a malfunction or during the certification inspection, it is possible that the trap device is seated rather firmly. In such a case, it is entirely possible that the elevator machine torque is no longer sufficient to pull the car out of the trap.

With gearless elevator machines in the shaft, the elevator machine is usually not accessible. A handwheel is unnecessary in such a layout.

With gearless elevator machines in machine rooms, a handwheel does not make any sense because there is no gear reduction. That is because due to the low moment arm of force, only slight force can be applied. A handwheel could even present a hazard, as even with only a slight imbalance in the installation, it is no longer possible to stop the elevator with the handwheel.

For both cases involving gearless elevator machines:

If the elevator machine torque or the driving capability is not sufficient, a block and tackle or similar should be used.

It is advisable to have a suitable block and tackle on hand for the certification inspection.

Note

Note that an overload in the car leads to an increase in the motor torque. 25 % overload results in 150 % of the required motor torque! As regulated elevator machines are normally designed for a maximum torque of ca. 170 - 200 % rated torque, only slight reserves are available during such special cases.

6.5 Emergency evacuation



Attention!

The measures for emergency evacuation described below may only be performed by instructed persons for maintenance of the elevator or qualified personnel of elevator companies.

6.5.1 Emergency evacuation by release of the brakes

In case of power failure or failure of the recovery control, emergency rescue is only possible by releasing the brakes. The brake can be released by an electrical emergency power supply or, if available, by a manual hand release.

When the brakes are released manually, the elevator moves in the direction of the greater weight. If there is a balance between the cabin and the counterweight, the cabin must be made heavier by suitable means.

To reduce the acceleration of the elevator, we recommend short-circuiting the motor windings for the evacuation. The short-circuit is generated by the motor contactors or an electronic circuit. This is always effective even in the event of a power failure.

The short-circuit generates a speed-dependent braking torque. The maximum braking torque is achieved at lower speeds.

Depending on the system type and weight ratios, it is possible that due to the short-circuit generated braking torque is not sufficient to limit the lift speed. So the speed must be monitored closely during evacuation and evacuation interrupted if necessary.

Releasing of the brake can be ended when a floor is reached. Now the elevator door can be opened with a triangular key.

The elevator manufacturer's safety instructions have priority!

6.5.2 Releasing of the brake with the lever for hand release

Mechanical brake hand release system is available optionally. The hand release system can be fitted later. Two different type of brake hand levers can be installed: levers for Bowden cable (short) and levers for direct hand manoeuvre (long).



Levers for Bowden cable



Levers for direct hand manoeuvre

For instructions about installation of those levers see "Installation Manual for EVO brakes"



Danger!

The hand release of the brake must be performed by trained personnel only and always with the cabin position **in sight**.

6.5.3 Releasing the brake with electric emergency power supply (UPS)

By means of an uninterruptible power supply (UPS) the brake can be opened electrically. For this purpose, for example, the existing dual circuit testing buttons can be used.

See "Brake control principle circuit diagram" in the Brake - Brake control chapter.

6.5.4 Automatic emergency evacuation

The automatic emergency evacuation lift power system (ELPS) is described in the operation instructions of the system itself.

7 Faults and remedy

Fault	Causes	Adjustment
Noises on elevator machine	Bearing defective	Contact customer service
	Interference on encoder signals	Check correct shield to ground connection for the encoder cable
	Encoder not locked	Fix the encoder position
	Wrong setting at the frequency inverter	Check setting at the frequency inverter
	Absolute encoder defective	Change absolute encoder
Excessive temperature / Temperature protection trips	Surface of the elevator machine is covered	Remove cover from drive or mount with more distance to the elevator machine.
	Ambient temperature higher than 40 °C	Enhance ventilation
	Wrong setting at the frequency inverter	Check setting at the frequency inverter
Elevator machine does not start	Motor phases connected incorrect	Check motor connection
	VVVF defective	Check VVVF
	Brake does not release	See brake faults
	Overloading	Check if the lift is correctly balanced
Elevator machine does not turn when the brake is released	Brake rotor sticks after a long storage time on the armature disk	Release the brake mechanically or remove it and loosen the brake rotor carefully from the armature plate.
Brake switching noises	Brake is switched on the DC-side	Modify the control to AC switching for normal operation. Fit an additional protective circuit.
	Air gap of brake too big	Replace the brake rotor (Special tool required! Contact the customer service of GEM S.r.l.).
Brake does not release	Power supply too low. The voltage at the brake is too low.	Check supply, if necessary increase cable cross-section (and transformer)
	Brake control wrong / defective	Check brake control
	Brake coil defective	Replace brake (special tool required. Contact customer service of GEM S.r.l.)
	Brake worn out	Replace the brake rotor (Special tool required! Contact the customer service of GEM S.r.l.).
Brake release monitoring does not switch	Microswitch defective	Replace microswitch (see "Installation Manual for EVO Brakes")
	Contacts dirty	Operate microswitch with a higher contact current, at least 10 mA or replace microswitch

8 Service and maintenance

8.1 General notes on maintenance

Observe the safety-at-work regulations! Service and maintenance can only be performed by trained personnel.

Disassembling the elevator machine can only be done with special devices!

Caution, strong magnetic force!

Never use a high-pressure cleaner (for example steam jet cleaner) for cleaning the elevator machine!

Take note of abnormal operating noise.

The bearings have a lifetime lubrication. There is no possibility to relubricate. Maintenance is not necessary for the bearings.

To check the brake wear or to check the traction sheave, the following instructions have to be referred: "Installation Manual for EVO Brakes".

It is not possible to adjust the brake. The brake cannot be readjusted. Replace the brake rotor when

the maximum air gap has been reached.

The brake wear has to be checked with the brake closed, therefore:

Make sure that all moving parts have stopped, secure them mechanically if required!

Make sure that the elevator can not be moved from any other person than the one who does the check!

8.2 Inspection intervals

	During installation or after the first 3 months	every year
Distance of the rope guard	x	x
Check vibration isolation The thickness of the vibration isolation must be the same on the right and left.	x	x
Checking the air gap of the brake	x	x
Visual inspection of the mounting screws on the hous- ing, brakes and traction sheave. The locking compound must be free of damage.	x	x
Check the traction sheave if worn out		x

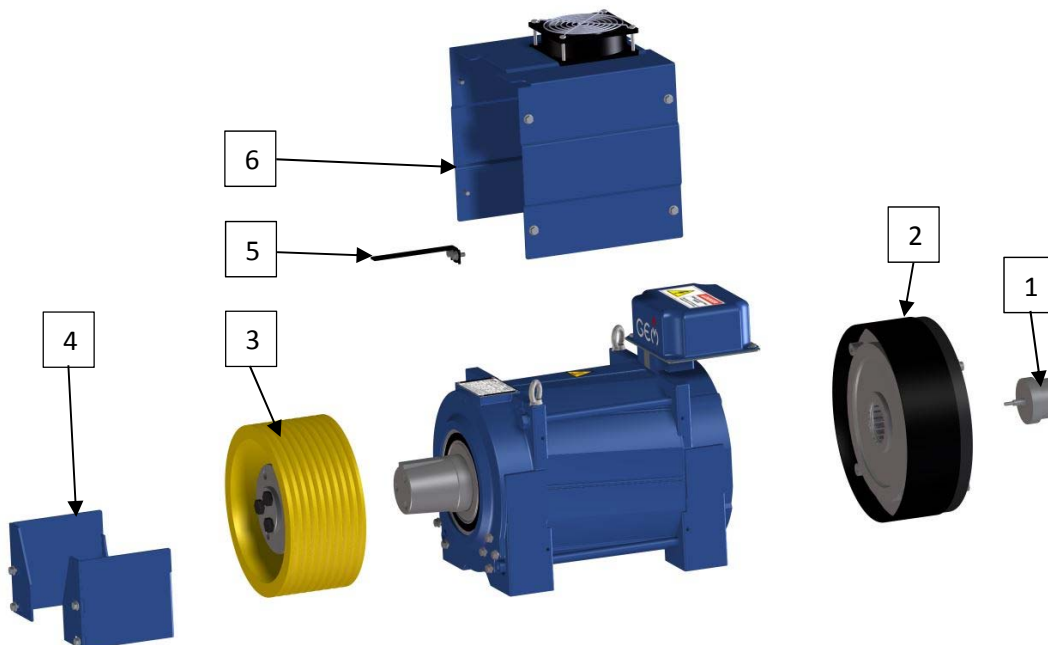
8.2.1 Checking the air gap

Follow the relevant instructions in "Installation Manual for EVO Brakes"

8.3 Spare parts and retrofit parts

Spare parts and accessories not supplied by GEM S.r.l. can't be installed on GEM machines. Will assume no liability or guarantee for damages caused by spare parts that are not approved by GEM.

Available parts for motor version GLSxx



Available spare parts:

1. Absolute encoder
2. Complete brake
 - 2.1 Brake rotor with O-rings
 - 2.2 Micro switch for brake
 - 2.3 Protection rubber cover
3. Traction sheave
4. Rope guard
5. Rope retainer
6. Forced ventilation

Spare parts are supplied with replacement instructions.



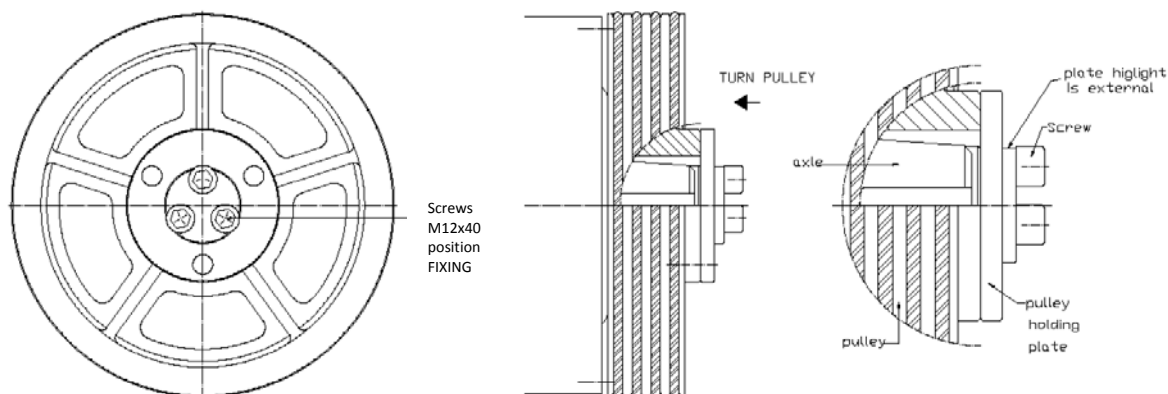
Warning!

The drawbars of the elevator machine must not be released under any circumstances.

9 Mounting-Dismounting the traction sheave

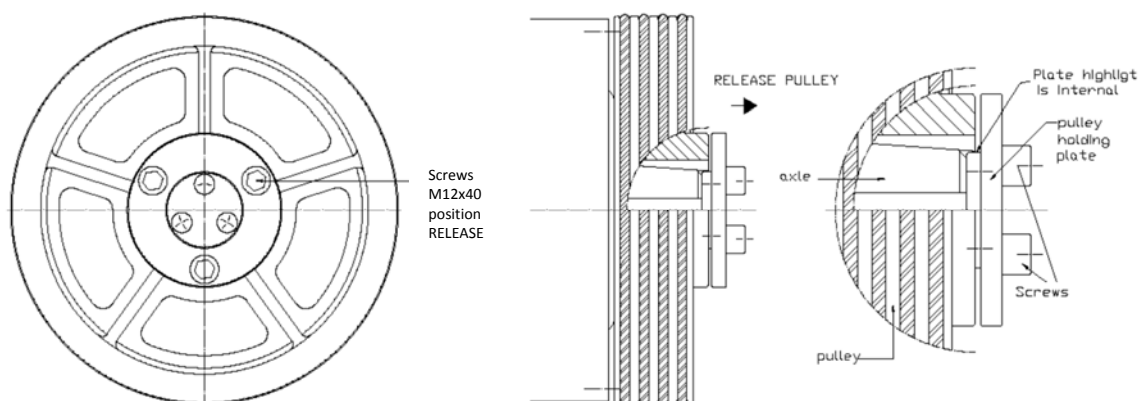
9.1 Mounting the traction sheave

- Clean carefully with solvent the internal conic housing and the feather key housing in the traction sheave and the conic end of the shaft and its feather key.
- Install the traction sheave onto the shaft end centering the feather key with its housing.
- Mount the steel washer with the smaller diameter towards the external side and fix with the three hexagon screws M12x40 (torque 85Nm) with their grower elastic rings. Proceed tightening in turn almost twice.



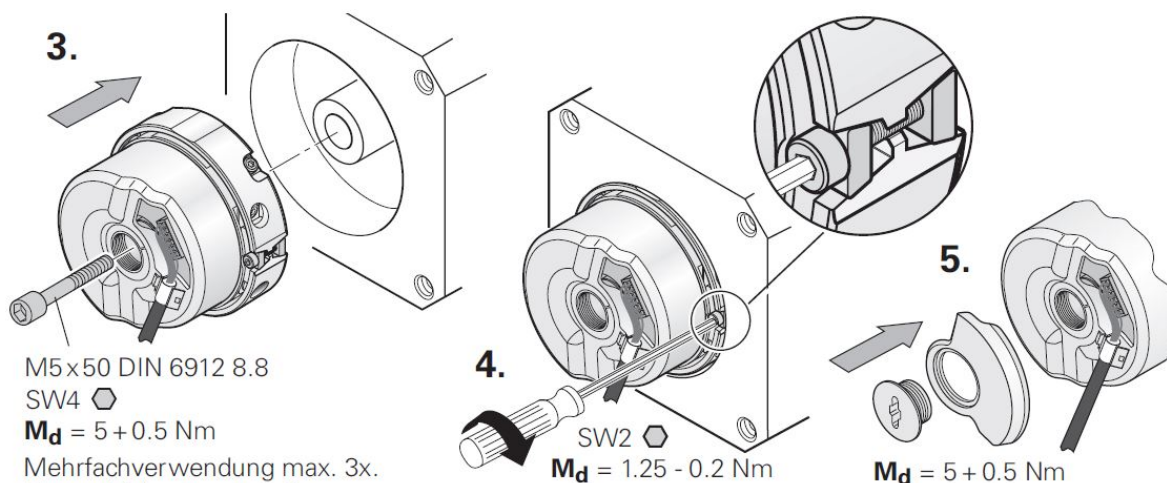
9.2 Dismounting the traction sheave

- Loosen and remove the three fixing screws (remove the plastic protection before if present)
- Remove the steel washer and turn 180° now with the smaller diameter towards the internal side
- **IMPORTANT: secure the traction sheave before dismounting it so it cannot drop away!!**
- Install the three screws in the outer diameter holes and tighten them in turn till the traction shave is free.



10 Mounting-Dismounting the encoder

10.1 Original Heidenhain instructions



Demontage in umgekehrter Reihenfolge
Disassembly in reverse order
Demontage dans l'ordre inverse
Smontaggio in sequenza inversa
Desmontaje en orden contrario

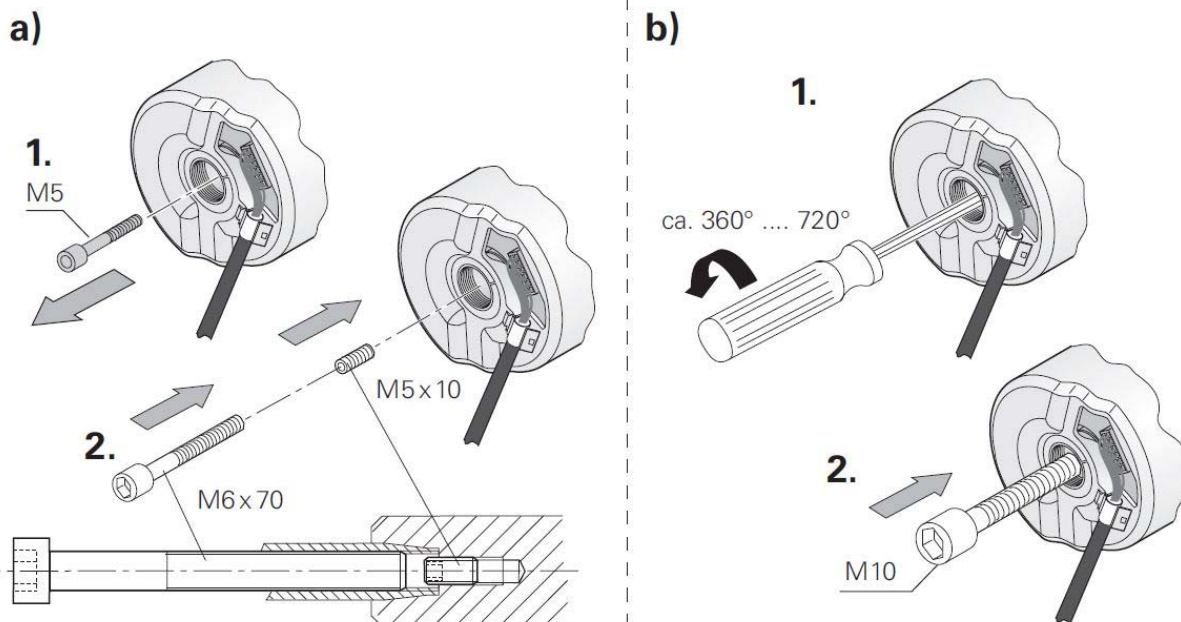
Zwei Möglichkeiten zum Abdrücken während der Demontage des Drehgebers

Two ways of pressing the encoder out during dismounting

Deux possibilités de démontage du capteur rotatif

Les deux possibilités pour extraire pendant le démontage du codeur

Dos posibilidades de aflojar durante el desmontaje del encoder



11 Main Data

10.1 Technical data (typical applications)

Motor type		GLS20	GLS26	GLS26	GLS34	GLS40	GLS48
Suspension		2:1	2:1	2:1	2:1	2:1	2:1
Typical payload*	[kg]	450		630		1000	
Rated torque	[Nm]	140	200	200	270	355	425
permissible radial load	[kg]	3100		3100		3100	
Speed	[m/s]	1.0		1.0		1.0	
Total weight	[kg]	115	130	125	140	150	165
Traction sheave							
- Diameter	[mm]	200	240	200	240	200	240
- Width	[mm]	114	114	114	114	114	114
- Rope diameter	[mm]	6.5		6.5		6.5	
- Standard number of grooves		5		6		9	
- Standard groove distance	[mm]	12		12		12	

Table shows typical data, other values possible.
Other rope diameters and groove distances are possible.

11.1.1 Protection rating

Component	Protection rating
Motor	IP 21
Absolute encoder	IP 40
Brake (electrical)	IP 54
Brake (mechanical with protection)	IP 21
Complete machine	IP 21

11.1.2 Ambient conditions

The user must ensure that the specified ambient conditions are observed.		
Ambient temperature for operation	[°C]	-5°C ÷ +40°C
Humidity	[%]	Maximum 95% / condensation not permitted
Installation height	[m above sea level]	Within 0÷1000m Above 1000m specify in request of offer phase.

11.1.3 Brake

		EVO-01	EVO-02
Brake type			
Brake torque	[Nm]	2x250 max	2x500 max
Operating voltage	[V DC]	207	207
Rated output power	[W]	2x62	2x85
Electrical protection rating		IP 54	IP 54
Mechanical protection rating		IP 21	IP 21

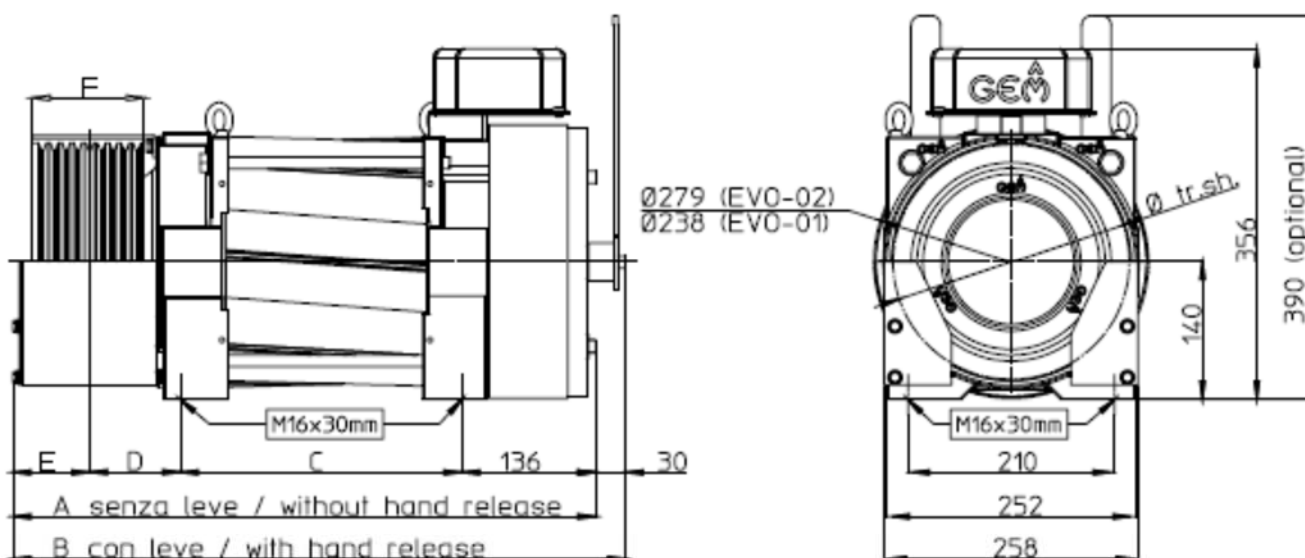
11.1.3.1 Micro switch

Maximum current	[A / V DC]	0.1A
Maximum voltage	[V DC]	30VDC

For any further detail about brake see the "**INSTALLATION MANUAL FOR EVO BRAKES**".

11.2 Dimension sheet

Dimension sheet GLSxx



MODELLO
MODEL

DATI PULEGGIA
TRACTION SHEAVE DATA

DIMENSIONI GENERALI (MM)
OVERALL DIMENSIONS (MM)

	Ø	F	A	B	C	D	E
GLS20	200	114	490	520	184	92	78
	240	114	490	520	184	92	78
	320	109	490	520	184	91	79
GLS26	200	114	524	554	218	92	78
	240	114	524	554	218	92	78
	320	109	524	554	218	91	79
GLS34	200	114	558	588	252	92	78
	240	114	558	588	252	92	78
	320	109	558	588	252	91	79
GLS40	200	114	592	622	286	92	78
	240	114	592	622	286	92	78
	320	109	592	622	286	91	79
GLS48	200	114	626	656	320	92	78
	240	114	626	656	320	92	78
	320	109	626	656	320	91	79



EC/EU declaration of conformity

- Translation -
(english)
DC-GEM-GLS-02_ENG

Manufacturer: GEM General Elevator Machines S.r.l
Viale Caproni, 18 – Rovereto (TN)
Italia

The manufacturer take the full responsibility for issuing this EC/EU declaration of conformity.

Product description: Series GLSxx - Gearless lift and elevator machine.

Models: GLS20 GLS26 GLS34 GLS40 GLS48

The above mentioned products of this declaration fulfill all the relevant requirements of the following European Directives:

Machinery Directive 2006/42/EC
Lift Directive 2014/33/UE
EMC Directive 2014/30/UE

The following harmonized standards have been complied:

EN ISO 12100:2010	Safety of machine tools - General principles for design – Risk assessment and risk reduction
CEI-EN 60034-1:2011	Rotating electrical machines — Parte 1: Rating and performance
EN 81-20:2020	Safety rules for the construction and installation of elevators – Lifts for the transport of persons and goods - Part 20: Passenger and goods passenger lifts
EN 60204-1:2018	Safety of machinery — Electrical equipment of machines — Part 1: General requirements

For the evaluation of the products concerning electromagnetic compatibility the following standards have been complied:

EN 12015:2020	Electromagnetic compatibility — Product family standard for elevators, escalators and moving walks— Emission
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This declaration refers exclusively to the products as they are placed on the market; any added component and/or operations made in a second time by the final user are excluded.

Rovereto, 01/03/2023
L'Amministratore
Flavio Parisi

GEM

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