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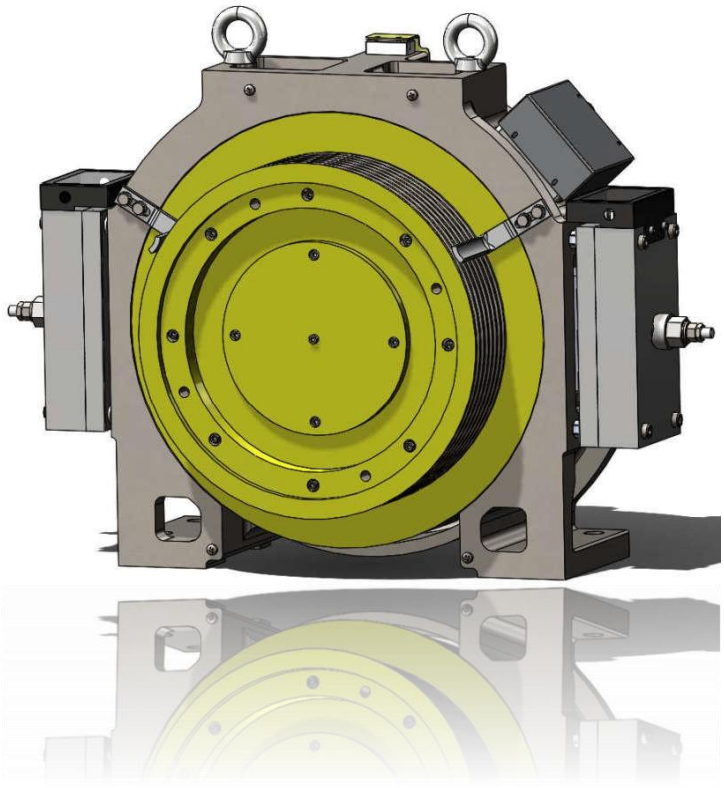


User and Maintenance Manual

VLD-50C Gearless Elevator Machine

1. Precautions for Use of the Machine

Thank you very much for purchasing our products. To ensure the elevator operates with high safety, reliability, and quality, elevator operators must be trained by experts, knowledgeable about the product's installation, commissioning, and use, and have a thorough understanding of the elevator structure. This product must be installed, tested, accepted, and used in accordance with this manual and the GB/T7588-2020 “Safety Rules for the Production and Installation of Electric Elevators” (EGV ISO 8100-2:2019: Part 2: Design Rules, Calculations, Inspections, and Tests for Elevator Components). The manufacturer cannot be held responsible for any personal injury or equipment damage that may occur due to improper use or violation of the above guidelines and safety rules during the installation, commissioning, acceptance, use, and maintenance of the product. To ensure the correct installation and operation of the motor, please read this manual carefully first.

1.1 Explanation of Symbols Used

In this guide, four symbols are used according to the level of danger to remind users that they must pay close attention to this:

Adequate safety precautions must be taken. Otherwise, serious personal injury (even death) or serious equipment damage may occur.

Sufficient preventive measures must be taken, otherwise personal injury (not death) or equipment damage may occur. However, when external conditions change and preventive measures are not adjusted accordingly, serious personal injury (even death) or serious equipment damage may also occur.

Pay more attention to inspection and operation, otherwise personal injury or equipment damage may occur.

Request for relative information.

1.2 Basic Safety Requirements

The gearless elevator machine must be installed in a lockable room accessible only to specially trained personnel.

- The product complies with GB7588-2003 standard and its Amendment 1, GB/T24478-2009, EN81-20:2014, and EN81-50:2014.
- The operator must strictly comply with this manual and the provisions of GB7588-2003, otherwise danger and damage may occur.
- After installation is complete, check that the motor and brake are functioning normally according to requirements.
- The motor should not be connected directly to a three-phase power source, but should be operated by a frequency converter designed to run synchronous motors.
- The magnet coils of the motor and brake are heating elements, and no object should be placed on the coils that could prevent heat distribution.
- The manual brake release and manual engagement device may only be used in emergency situations and is strictly prohibited for use during normal operation unless otherwise specified in this manual.
- High voltage occurs during motor rotation, and touching the motor connection terminals is prohibited even if the inverter's power supply is disconnected.
- It is prohibited to apply the brakes by directly short-circuiting the terminals while the motor is rotating at high speed. However, in emergency situations, short-circuiting the terminals is permitted during zero-speed operation to slowly move the cabin up and down for emergency rescue purposes.

2. About the Product

2.1 Product Structure

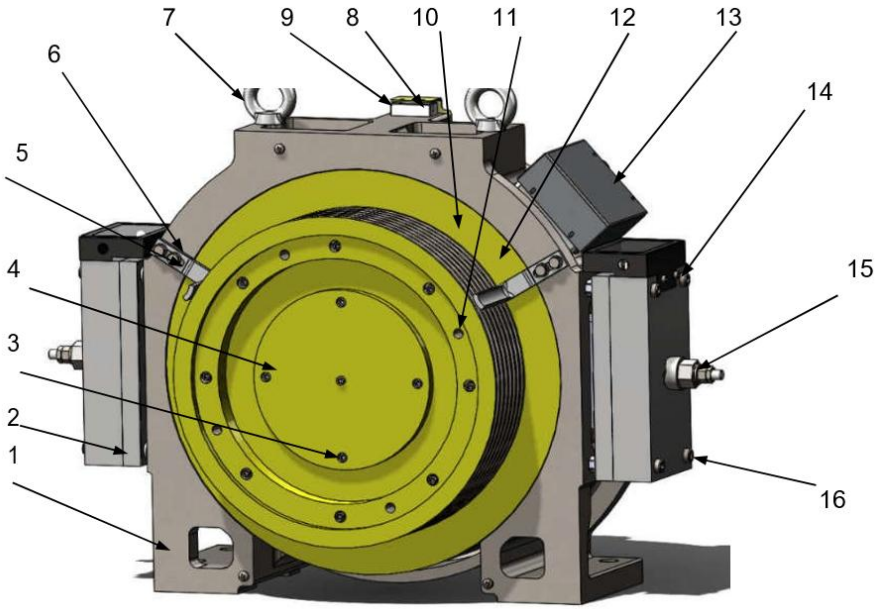
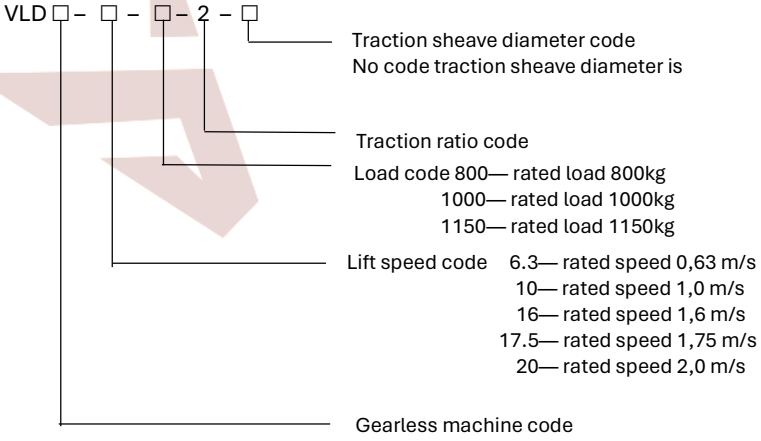


Figure 1 Gearless Elevator Machine

1	Machine Frame	7	Eyebolt	13	motor connection box
2	Brake	8	Cover of Hand Winding Hole	14	Adjusting Threaded Sleeve for Brake Gap
3	Oil Drain Bolt of the Bed	9	Hand Winding Detection Switch	15	Brake Release Nut
4	oil cup for bearing grease adding	10	Traction Sheave	16	Brake Gap Lock Screw
5	Anti-off rod for wire rope	11	Fixing Screw of Traction Sheave		
6	Fixing screw of anti-off rod	12	Rotor Bracket (Brake Wheel Integrated)		

- There are two ways to install the encoder. One is suitable for encoders with small taper shafts (such as the 1300 series of Germany Heidenhain). Insert the encoder into the taper hole of the main shaft of the traction machine and fix it with the main shaft with bolts. The outer case is fixed with the encoder seat by internal expansion method. The second type is suitable for encoders with large shaft holes. Insert it into the main shaft of the traction machine, connected by keys, and the outer case is fixed on the encoder seat by the reed and screws.
- Our company's standard encoder is ERN1387 mode manufactured by Germany Heidenhain Company. Please consult our company for the installation method of different encoders.

2.2 Product Designation Method



2.3 Main Technical Parameters of The Product

2.3.1 Traction Technical Parameters of The Machine

- Duty: S5, load 40%, start times 180/h
- Traction ratio: 2:1
- The wrap angle of traction rope around traction sheave: calculated according to GB7588 or EN81 Appendix M.
- Traction wire rope diameter: Φ10, see attached table 2 and 4 for the number of traction wire rope.
- Max. permissible shaft load: see attached table 2 and 4.
- Max allowable lifting height: 80m for single wrap.
- Balance factor: 0.5

▪ If the operating conditions provided by users do not comply with aforesaid requirements, consult the manufacturer before contracts are signed.

2.3.2 Technical Parameters of Drive Motor for The Traction Machine

- Type: 3 phase permanent-magnet synchronous motor.
- Poles: 32 poles
- Insulation class: F
- Protection class: IP41
- Cooling form: IC00
- Max. torque multiple: 1.8 times
- Motor winding thermal detector: PTC120℃
- Voltage and frequency of the inverter：3 相，400V，50～60Hz

2.3.3 Technical Parameters of The Brake

- Excitation current：2 x 1.35A。
- Max braking torque：2.5 x 760 N.m。
- Excitation voltage：DC180/90V (or as per user's requirements)
- Working air gap：0.10～0.25mm（factory setting or after readjustment）
- Max working air gap：0.3mm
- Work sustained rate：60%, action times 240/h

2.3.4 Environmental Conditions For Operation

- Not exceed 1000m；
- Ambient temperature: -5℃～40℃。
- At the temperature of 20℃, the max. relative humidity does not exceed 90%. No condition of dew condensate.
- Ventilation should be good enough to ensure that adequate heat can be dissipated through convection and radiation.

2.3.5 Contents of Product Package

- VLD-50C series machine which is consistent with customer's order
- Accessories: one encoder connecting cable, hand wheel 1 piece, brake releasing handle 2 pieces
- One copy of user's manual for traction machine and one copy of user's manual for encoder.
- Optional parts: deflection pulley and etc. according to the order contract.
  - User's special requirements should be specified in the appendix attached to the contract when the contract is signed.
  - The diameters of the deflection pulley provided by our company are 400 and 520.
  - In order to avoid increasing the manufacturer's cost and affecting delivery time, it will be better if users can make selection within the specified scope of supply.

3. Handling and Storage of Product

3.1 Storage

- The traction machine should be stored in an enclosed place which is dry, dustless, well ventilated and without apparent vibration.
- If the machine has been stored for more than 3 months, it should be operated on two opposite directions for more than 10 minutes at the speed which is low than 20% of the rated rotating speed to distribute the lubricating grease evenly in the bearing in order to avoid the bearing being rusted.

3.2 Lifting

- Lifting is only allowed in the lifting holes shown in Figure 2, and lifting in other parts is prohibited
- The lifting hole is only for lifting machine, no additional heavy objects are allowed.

Picture 2 Product lifting sketch

4. Installation

4.1 Preparations Prior to The Mechanical Installation

- When the boxes are opened, check the goods by visual to see if they are intact. If there is damage, and even if it is urgently needed, do not install and operate the damaged machine.
- Before installation of the machine, calculate permissible load of the base and foundation to see if they are satisfied.
- The base and foundation must be firm and hard enough to ensure the machine can be operated under all permissible load range.
- The planeness of the ground where the machine will be installed should not exceed 0.2mm.
- The machine must be installed in a closed room where relative safety protection measures can be observed. If the machine needs to be installed in a pit, the pit should be waterproof because if the machine is soaked in water, it may cause destructive damage.
- The feet of the traction machine should be fixed with M20 bolt of 12.9 grade intensity (feet installation) and corresponding nut. The tightening torque of the spanner is 960N.m.
- The traction machine is equipped with anti-off device for steel ropes. The gap between the machine and the steel rope should be no more than 2mm during the installation.

4.2 Preparations Prior to Electrical Connection

- The electrical connection should be connected by qualified electrician after the machine is installed.
- Switch off all circuits (including attached or auxiliary ones) before conducting any connection operations, especially before opening the connection box.
- Before putting into operation, insulation resistance of the motor and brake magnet should be tested with 500V megohm meter. Its value should be bigger than 5MΩ. If the value is lower than 5MΩ, the coil should be heated and dried. Working frequency power can be used to heat it, and its voltage value added should be 5% lower than the rated voltage value of the motor and 30% lower than the excitation voltage value of the brake. Observe the heating state momentarily. The outside case surface temperature should not exceed 80℃.
- The permanent electric connection should ensure reliable connection no looseness.

- No external materials, dust and humidity air are allowed to enter into the connection box. Therefore, strict inspection should be done before connections and lock the cable connector after connections. After connection, ensure that the cable entry is sealed after the cable enters the connection box.

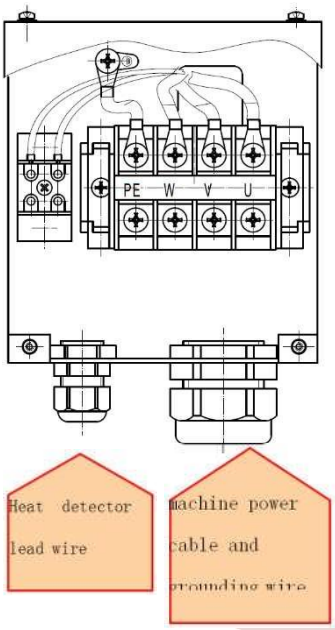
Strictly operate in accordance with the following 5 safety rules to avoid personal injury or death and machine damage.

- Switch off power source.
- Any devices that can activate the machine by causal touches should be closed or locked.
- Make sure that the power source has been separated with safe devices。
- The circuit that can bring high voltage (higher than 1000V) should adopt reliable grounding or short circuit.
- Adjacent moving parts should be separated by safety devices or protective covers.

- Max. allowable voltage ascending rate for terminals which are in the terminal box is 1.3kV/μs, and max value of voltage is 1.3KV. If above-mentioned values are possibly exceeded, a filter should be installed or an external reactor should be connected in series. The filter or reactor will substantially increase the insulation life of the motor, but also will reduce the max. rotating torque of the motor by 3~5%.
- The insulation criterion of the motor is designed according to 700V, this voltage is also the highest possible DC bus voltage value that a 400V inverter can reach instantly.

4.3 Electrical Connection

4.3.1 Connection of the terminal box of the traction machine



Picture 3 Wiring diagram of the machine connection box

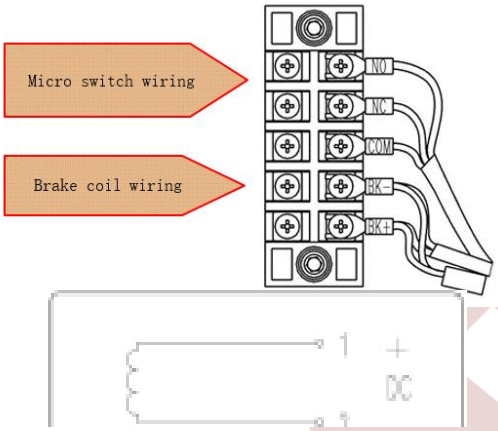
- In order to ensure that the motor will not be permanently demagnetized due to overheating, resulting in motor damage or performance deterioration, the PTC thermal detection element must be connected to the corresponding control circuit. Once it is overheated, it should ensure that the power supply can be cut off in the shortest possible time.
- Max. operating voltage of PTC heat detectors should not exceed 25V.
- Max. allowable operating temperature of the permanent magnet is 150 ℃ , but irreversible loss of magnetic performance will occur at this temperature, which will affect the operation performance of the motor. In order to improve its reliability, the PTC detector is set to 120℃.
- The reliable earthing must be provided for the motor in order to ensure its safe operation.
- In order to prevent the main cables (output cables of the inverter) from causing any electromagnetic radiation interference to the surrounding environment, the signal transmission cables (cables connecting the encoder and the inverter) and the main cables should be as short as possible and should be the shielded 3-core cables. The both ends of metal sheath of the shielded cable should be twisted and then grounded at the same time. The current density of the main cable should not exceed 5A/mm2, and its line voltage drop should not exceed 0.5V.
- 3-phase windings in the motor have been connected in “Y” connection and three lead-out lines are provided.
- In the adjacent 3-phase winding of the motor, there is 3 PTC heat detecting elements connected with each other in series, and its action temperature is 120 ℃ . When external voltage of 2.5V is applied, corresponding resistance values at different temperatures are shown in Table 1.
- The neutral wire and ground wire of the power distribution system should be grounded simultaneously and independently.

Resistance of 3 PTC heat detecting elements connected with each other in series (Ω)	≤300	≤1650	≥3990	≥12000
Temperature in the corresponding winding (℃)	25	115	125	≥135

Table 1 Correspondence table of detection temperature and resistance of PTC thermal detector

4.3.2 Connection of The Brake Electromagnet

- For the connection of the brake, it is necessary to use 2-core cable with its cross-section ≥0.75mm2 and its insulation withstanding voltage≥500V.
- If the supply voltage of the brake is AC, a rectifier board (optional part) should be installed inside of the connection box of brake. The conversion of the opening voltage and keeping voltage is done automatically. When users use it, it just needs to connect AC220V to the N and L terminals on the PCB board, and the power-off switch should be set on AC side.
- The connection terminal of braking micro-switch should be connected in normally-open state, namely when the brake is in braking state (the electromagnetic coil is de-energized), the two groups of switch contacts are in open state, and when the electromagnetic coil of the brake is energized (the brake is released), the two groups of switch contacts of the micro-switch are in closed state.
- For the interrupting capacity of micro-switch V4N, the voltage is 250VAC, current is 3A.



Picture 4 Connection sketch of brake

4.3.3 Encoder Connection

- Before the encoder is connected or disconnected with the frequency converter, power supplied to the frequency converter must be turned off in order to avoid any damages to the inverter and encoder.
- In order to facilitate users to choose different inverters, a variety of encoders are provided for selection. When ordering, the user should determine the encoder according to the selected frequency converter, or select the frequency converter according to the encoder. When the user is difficult to determine, please consult the inverter manufacturer.
- The standard length of the signal cable of encoder is 6m. It also can be provided as per users' requirements, but the max length cannot exceed 10m.
- To prevent the encoder signal from being interfered, the encoder signal wire and power cable should be wired separately

5. Commissioning of Traction Machine

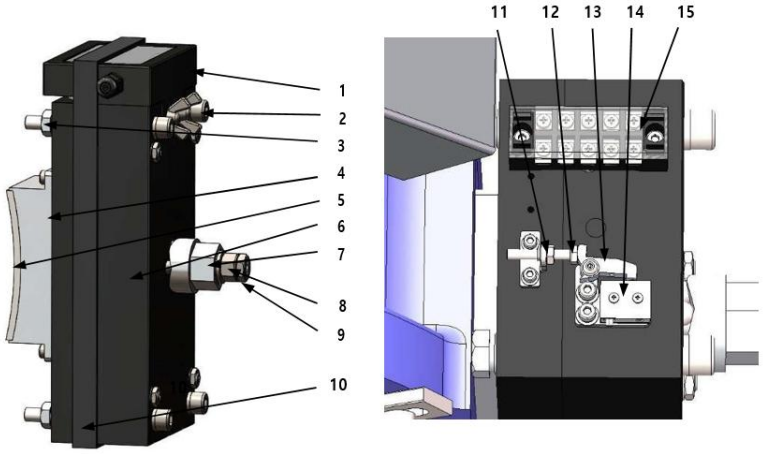
- Commissioning of traction machine is actually to ensure optimum adaptation between frequency converter and traction machine. Therefore, it is necessary to have a good understanding and abundant experiences to the frequency converter in commissioning and use.
- After installation and electrical connections of the traction machine are finished, check carefully whether the fixing and electrical connection of the machine is reliable and correct.
- After checking and no errors are found, before suspending the car and counterweights, enter related parameters of the machine into the frequency converter, and enable the frequency converter to supply power to the motor at no load. In this case, the motor and frequency converter should be in self-learning status. The frequency converter reads out related parameters of the motor and relative position values of magnetic fields of the stator and rotor of the motor.
- After self-learning, supply power in non-load state to check whether the self-learning is completed correctly. After confirmation, suspend the car and counterweights. During commissioning, the self-learning had better be carried out three or four times. Check if the nonconformance of magnetic-field position readings of the stator and rotor is very slight.
- As different users select the frequency converter from different suppliers and types, the actual operation and commissioning should be conducted strictly according to the operation manuals supplied by the frequency converter manufacturer. If there are any problems during the commissioning, please contact the frequency converter manufacturer in time.

- As the brake wheel rim is coated with anti-rusting paint upon delivery, and in order to reduce the braking noise, there is slight gap between the brake shoe and brake wheel rim. During the first self-learning, friction exists and the state is not real no-load state. Therefore, after first learning, run the machine at no load for 3 min or longer before a second learning can be started. Or otherwise, the current on loads will be increased.
- If there is any problem during the commissioning, users shall consult the frequency converter suppliers at first and get support from them.

6. Commissioning of Brake Mechanism

6.1 Description of Brake Mechanism

1.



1	Brake protection cover	6	Iron core	11	Lock nut of No 12
2	Brake gap lock screw	7	Brake release nut	12	Trigger bolt of braking micro-switch
3	adjusting threaded sleeve of braking gap	8	Adjusting nut of brake releasing gap	13	Control part of braking micro-switch
4	Armature assembly (brake shoe)	9	Lock nut of brake releasing gap	14	Braking micro-switch
5	Brake pad	10	Dust-proof ring	15	Terminal block

Picture 5 Schematic diagram of brake structure

Braking: When the elevator is leveling, de-energized or in inspection of failure, the electromagnet is under de-energized state, the electromagnet armature moves under the action of the brake spring to drive the brake pad to hold the brake hub, and the friction between the brake pad and the brake hub makes the traction sheave brake.

Normal release： Release the brake before elevator runs. At this time, the electromagnet coil is energized, the electromagnet push rod moves outward under the action of electromagnetic force and overcomes the pressing force of the brake spring to push the brake arm outwards, and it makes the brake pads loosen the brake hub of the traction sheave.

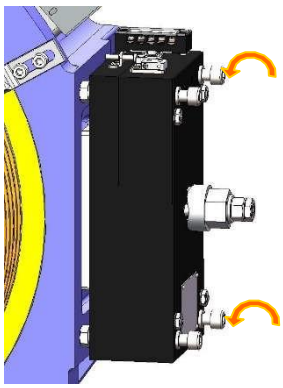
Manual brake release： Put the brake release handle (accessory of the traction machine) on the brake release nut, and turn the two brake release handles at the same time. The armature assembly of the electromagnet overcomes the pressing force of the brake spring and acts to make the brake pads release the brake hub.

- The function of the braking micro-switch is to determinate that if the brake is under releasing state or braking state. The terminal of the switch should be connected to the control circuit of the motor. As it is safety switch, when the users need, the brake mechanism can be functioned as one part of the ascending car overspeed protection components
- The brake mechanism is composed of two groups of independent action mechanisms, each of which is composed of an electromagnet iron core assembly, an electromagnet armature, a brake pad and a brake hub. If one group of action mechanism is damaged, the other group can still function effectively to ensure the safety of elevator operation
- Normal release is suitable for normal power supply and standby power supply.
- Manual brake release is only applicable to traction machines equipped with manual brake release mechanism. If the customer has this requirement, please confirm with the manufacturer when ordering.

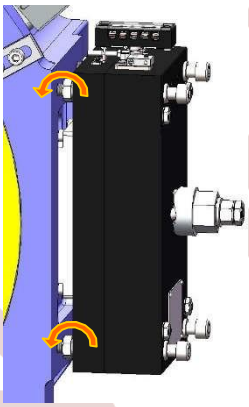
6.2 Commissioning of Brake Mechanism

6.2.1 Adjustment of Brake Gap Between Brake Shoe and Brake Wheel Rim

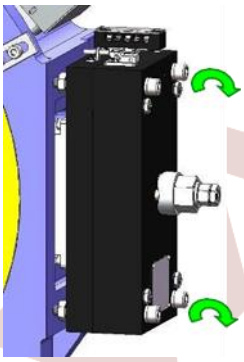
- The brake mechanism of the traction machine has been adjusted before delivery, and the user can decide whether to adjust it according to the specific situation on site.
- Place the empty car on the middle floor, and the elevator should run under the inspection state, and adjust according to the following steps. After adjusting one side, then adjust the other side.
- The size of the brake gap directly affects the noise and vibration of the brake and the reliability of the brake opening. It should be adjusted carefully and timely. It should be adjusted when the gap is greater than 0.2mm or the noise increases significantly during braking.



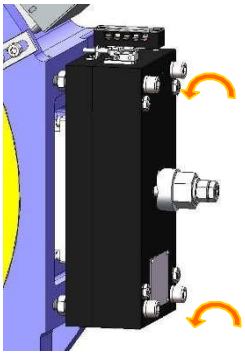
Step 1: Loosen the 4 pieces of "brake gap lock screw" (screw it out about 3~5mm, do not screw it out completely, otherwise the brake will drop out).



Step 2: Loosen 4 pieces of "brake gap adjustment threaded sleeve" (screw it out about 2~ 4mm).



Step 3: Fully tighten the 4 pieces of "brake gap lock screw", so that the friction plate is completely pressed on the brake hub.



Step 4: Loosen the 4 pieces of "brake gap lock screw counterclockwise for about 18°. Note that the 4 screws must be screwed at the same angle

Step 5: Tighten the 4 pieces of "brake gap adjustment threaded sleeve" completely. At this time, the gap between the brake pad and the brake hub is not more than 0.12mm. It can be measured with a feeler gauge.

Step 6: Release the brake at no more than the inspection speed to make the car run slowly, and carefully listen to check whether there is friction between the brake pads and the brake hub (should be no friction or only a slight friction at a few points). At the same time, listen to check whether the brake releasing and braking sound is too loud. Adjust according to the following phenomenon, until there is no friction sound and the brake releasing and braking noise at this time is within an acceptable level.

Phenomenon	Cause	Treatment method
Exist friction sound	Brake gap is too small	Follow step 4 to unscrew a small angle counterclockwise, and then follow step 5.
No friction sound, but releasing and braking sound is too big	Braking gap is too big	Loosen the 4 pieces of "brake gap lock screw" counterclockwise to a small angle, and then fully tighten the 4 pieces of "brake gap adjusting threaded sleeve".

6.2.2 Braking Torque

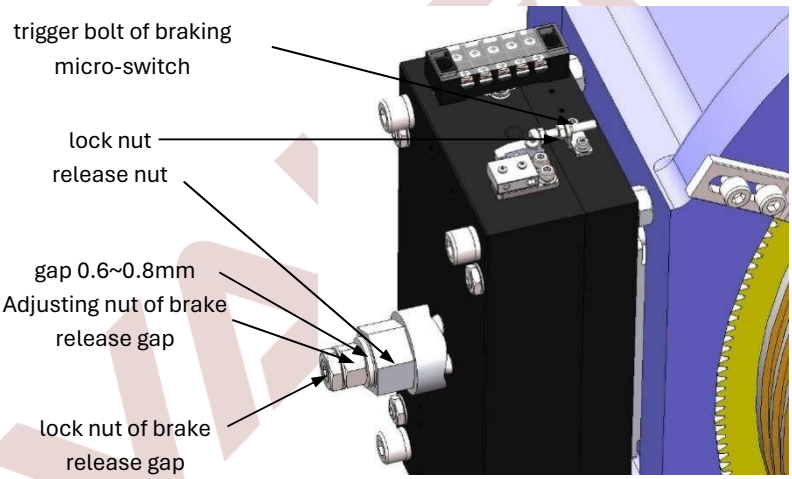
- Before delivery, the brake has been adjusted to a braking torque of approximately 2×1.25 times of the rated torque. Users do not need to readjust.
- Before delivery, the braking torque set by the manufacturer (at this time, the max brake gap between the brake pad and the brake hub is 0.2mm) as shown in Table 2.

Traction machine series	VLD-50C
Electromagnet model	DB5
Braking torque of single brake (N.m)	950

Table 2

6.2.3 Adjustment of Brake Release Nut

After the brake gap is adjusted, the brake nut needs to be adjusted. In the power-off state, first tighten the adjustment nut of brake release gap shown in Figure 6 (but do not compress the brake gap), and then rotate it about 100 degrees in the reverse direction, leaving a gap of 0.6 to 0.8mm, and then tighten the lock nut of brake release gap (this gap must be kept, otherwise the brake will lose its function when the friction plate wears more than 0.5mm, and the elevator will slip)



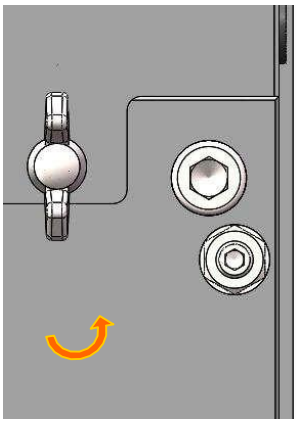
Picture 6 Schematic diagram of the structure of the brake release nut and the braking micro switch

6.2.4 Adjustment of Brake Release Gap Detection Switch

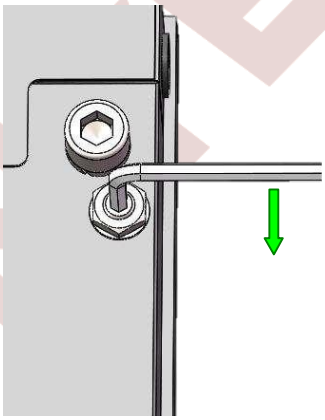
After the 6.2.3 adjustment is completed, the trigger stroke of the braking micro switch needs to be adjusted. Remove the brake protection cover (No 1) shown in Picture 5, and when the single brake is in the state of pull in (power on), first adjust the trigger bolt of the braking micro switch shown in Picture 6, and the micro switch is in closed state measured by a multimeter, and the brake is released (power off), the micro switch is in off state, and then tighten the lock nut.Fren Balatasının Ayarlanması

- Before the machine leaving factory, the brake cushion pad has been adjusted. Generally, there is no need to re-adjust, and the user is not recommended to adjust by himself.
- In the case of confirming that the brake gap is suitable, if the noise is not up to the standard when the brake is activated, a small cushion pad can be used to reduce the noise. However, the adjustment range should not be too large, otherwise it may cause the risk of the brake not pull in and the machine running with the braking. At the same time, it should be ensured that after the adjustment of the cushion pad, the pull-in and holding voltage of the brake electromagnet still meet the requirements in GB/T24478.

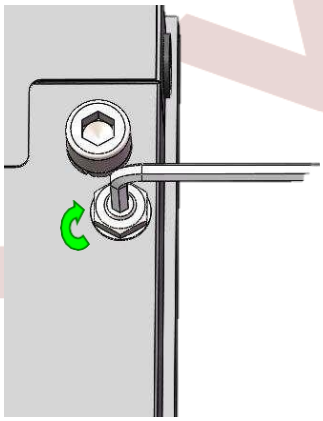
According to the position of the noise emitted by the brake when the power is turned on and off, the cushion at this position can be adjusted slightly. The adjustment steps are as follows:



Step 1: Use a wrench counterclockwise to loosen the lock nut.



Step 2: Use an Allen key to tighten the M8 screw clockwise by 10°~20°, turn the brake on and off to judge the noise; if the noise is not up to standard, turn the screw again to a certain angle. The total angle of the screw turned must not exceed 90°, otherwise it may cause the risk of the brake not pull in and the machine running with the braking.

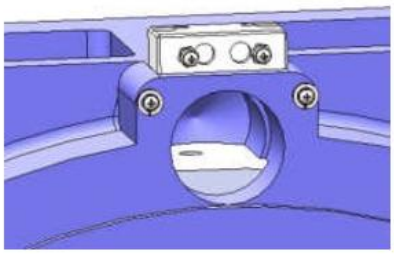


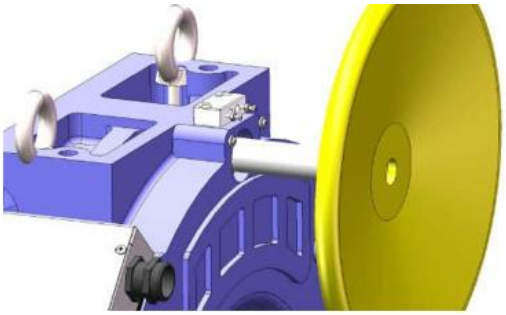
Step 3: After adjusting the cushion pad to make the noise reach the standard, fix the M8 screw with an Allen wrench, and lock the nut with a wrench.

You can also adjust other cushion pads at the same time according to the above steps, but you should pay special attention to step 2 to strictly control the adjustment range.

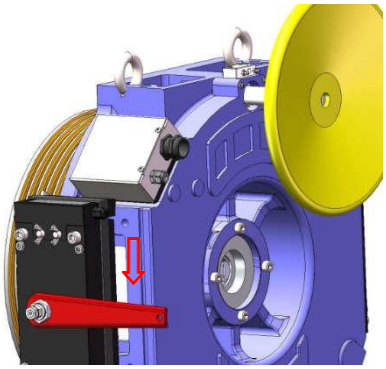
7. Operation of Manual Emergency Rescue

7.1 Operation of Hand Winding

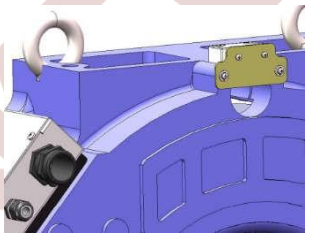




Step 1: Unscrew the screws on the cover plate of the hand winding hole, take out the pin of the micro switch with the cover plate, disconnect the micro switch, cut off the main circuit, and at the same time the hand winding hole is fully exposed.



Step 2: Insert the shaft of the hand wheel into the hole for hand wheel, and insert it to the end (gear shaft shoulder positioning), so that the pinion of the hand wheel is completely meshed with the gear on the brake hub.



Step 3: Press down on the brake release handles on both sides to make the traction machine in the manual brake release state, grasp the wheel rim of the hand and turn in the desired direction to lift the car to the nearest landing and open the door to release people.

Step 4: After the emergency rescue is completed, pull out the hand wheel, screw on the hand winding hole cover plate and screws which are removed in step 1, reset the hand winding micro switch, put brake release handle and hand wheel to the original place.

- In order to prevent damage to the gear when using the brake wheel gear to test the torque, do not test the braking torque of the two brakes at the same time, and can be tested individually..

7.2 Short-Circuit The Terminal For Rescue Operation

- Short-circuit the three terminals of the motor, manually release the brake, the traction machine is in the power generation state, the internal potential energy of the elevator system will drive the motor rotor to rotate slowly, and the generated electromagnetic resistance torque can ensure the lift car move up and down slowly to achieve the purpose of emergency rescue.
- The emergent rescue can be done by using the potential energy. Only when the motor has stopped running or it runs at a speed below 5% of its rated speed, then can short circuit the 3 lead-in terminals of the motor. The short circuit must be implemented by contactor, and make sure that the 3 lead-in terminals and output end of inverter are in the statues of open circuit.
- The method of short-circuiting the motor lead-in terminal shall not replace the brake during normal operation. It is only an alternative emergency rescue method.
- Before short-circuiting the motor terminals, cut off all power sources.

8. Protection and Maintenance of the Product

8.1 Routine Inspection and Maintenance of The Product

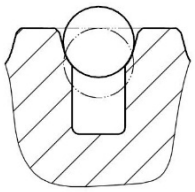
- After the product is put into operation, it should be made routine inspection, certain protection and maintenance to make the gearless traction machine operate normally. See Table 3 for the routine inspection contents and the relative maintenance method.

Part	Check cycle	Check contents	Maintenance method
External surface	6 months	It is clean?	Clean the dust from the machine surface (never wash it with water)
Exposed fasteners	6 months	It is loose?	Tighten the loose fasteners
Electrical connections	6 months	The terminals are loose? The cables are damaged?	Tighten the loose terminals and replace the damaged cable.
Bearing noise	6 months	The bearing sound is harmonious and free of noise during operation by listening?	Replace the bearing in severe cases.
Encoder	6 months	The fixing of shaft and housing are loose?	Re-tighten.
Traction sheave	6 months	It is severely worn (The upper end face of the traction rope is flush with the edge of the traction wheel, as shown in Figure 8)	If the wear is serious, replace the traction sheave according to the content of article 8.2.
Brake	6 months	Is the brake torque big enough? Is the brake pad thickness less than 3mm? Is the sound excessive?	Maintain according to article 8.3.1
Anti-off device for wire rope	6 months	It is loose? The distance between anti-off rod and wire rope is >2.5mm or ＜1.5mm?	Re-adjust and re-tighten.

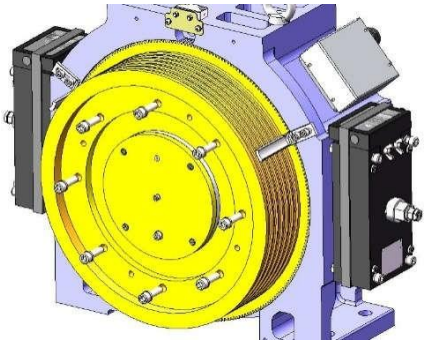
Table 3

8.2 Traction Sheave Replacement

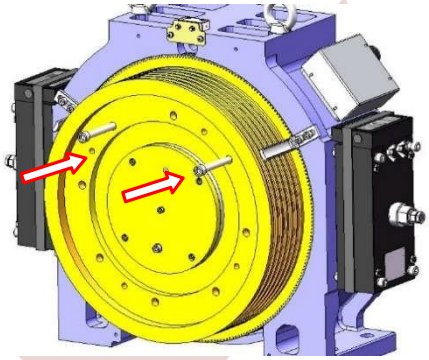
When the users find that the upper end face of the steel wire rope is flush with the outer edge of the traction wheel(see picture 8), the traction sheave should be replaced according to the following steps:



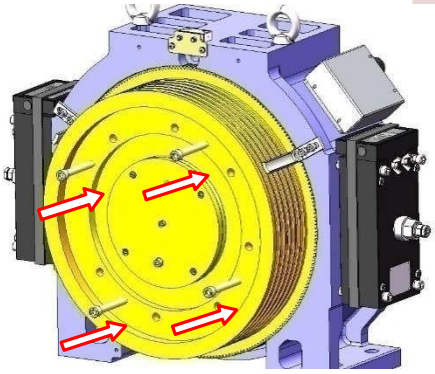
Picture 8 Schematic diagram of traction wheel worn



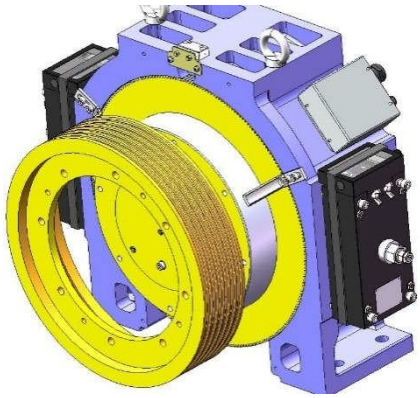
Step 1: Dismount the 8 pieces of screws which are for fixing the traction sheave.



Step 2: To ensure the safety, tighten 2 pieces of M12 bolts (it also can be bolt and stud bolt, and the shortest length should be 100) to the rotor bracket along the through hole which are removed from step 1, the tightening depth is 15~20mm.



Step 3: Tighten 4 pieces of M12 bolts (or bolt, all of them are called ejector bolts, the shortest length is 90) to the 4×M12 bolts hole which are reserved on the traction sheave by diagonal sequence alternately, then eject the old traction sheave.



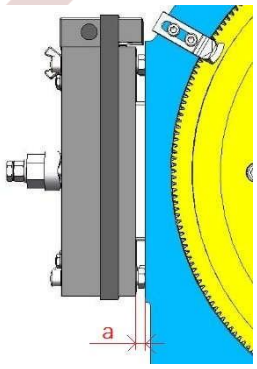
Step 4: Install the new traction sheave to the rotor (it is better to heat the traction sheave to about 100℃), then tighten 8 pieces of M12 bolts which are removed from step 1.

8.3 Inspection and Maintenance of Brake

- After long time running of the gearless traction machine, the brake pad surface will be carbonized and has some black carbonized things left on the surfaces of the brake pad and the brake wheel rim because of long time friction between the brake pad and the brake wheel rim, which will affect the traction machine to reduce its brake torque. If there is any phenomenon like above, the surface of the brake pad and brake wheel rim must be cleaned and maintained in time.
- After the gearless traction machine runs for a long time, if the thickness of the brake pad is below 3mm, the brake pad (the armature assembly) should be replaced to ensure the enough braking torque.
- If the traction machine is not used for more than 6 months and stored in a humid environment, check whether the inside of the brake is rusted before using it. If it is rusted, replace the relevant parts.

8.3.1 Brake Disassembly Inspection and Maintenance Method

In the case of brake power-off, measure the distance a between the brake armature and the end face of the machine base with a caliper (see Figure 9). If a<8mm, it indicates that the thickness of the brake pad has been reduced to less than 3mm and needs to be replaced in a time. Replace according to 8.3.2.



Step 1: make sure that the power supply of one group of the brakes is open circuit.

Step 2: Completely loosen the brake gap screws of the other group of brakes and then completely remove this group of brakes.

Step 3: Remove the No. 7, No. 8, and No. 9 shown in Picture 5. At this time, the iron core and armature assembly of the brake can be separated laterally.

Step 4: Clean the carbide on the surfaces of the brake hub andbrake pad.

Step 5: If the thickness of the brake pad is less than 3mm, replace the armature assembly with a new one.

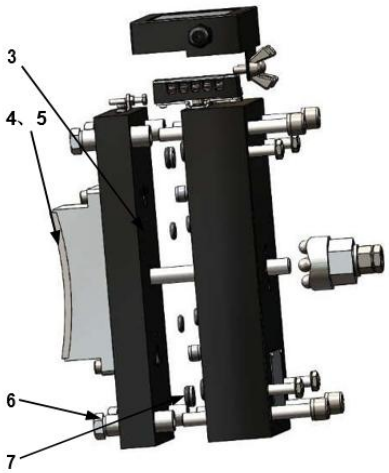
Step 6: Check the wear on the 4 guide sleeves in thearmature assembly, if there is obvious wear, replace it.

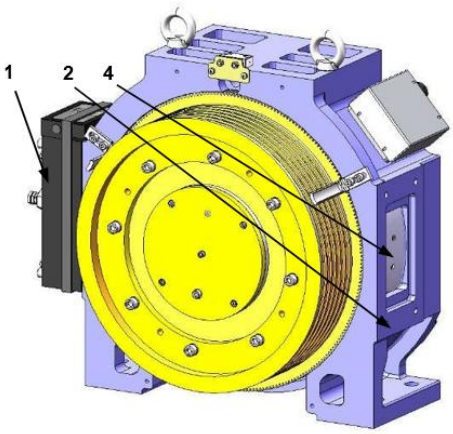
Step 7: Check the wear of the 8 buffer O-rings, and replace them if they are obviously damaged.

Step 8: Reinstall the brake, pay attention that the brake spring cannot be missing, and adjust the gap of the brake according to Article 6.2.1 of this manual.

Step 9: Perform maintenance on the other group of brakes according to above steps 1 to 8.

Step 10: Perform comprehensive commissioning Xaccording to the steps in articles 6.2.2 to 6.2.4 of this manual.





8.3.2 Inspection and Maintenance of The Buffer O-ring of The Brake

In the daily inspection and maintenance of the tractor, the sound of the brake operation should be checked. If the sound is excessive or abnormal, check the brake clearance first. If the brake clearance is normal or after adjusting the brake clearance, the sound of the brake operation is still large, the buffer should be adjusted according to this article. If it is not possible to improve the sound during operation by adjusting the cushion, it indicates that the cushion has been worn excessively, and the brake should be disassembled and inspected in time according to 8.3.1 in this article, and all the internal cushion should be replaced.

8.3.3 Brake Replacement

When the brake leaves the factory separately, the loose gap adjustment nut is generally locked, there is no gap between the armature and the core or the gap is very small, so it is necessary to adjust the brake gap and hold the brake micro-switch after replacing the new brake. The brake can be replaced by the following steps:

Step 1: Remove the brake which needs to be replaced as the requirements and Steps 1 and 2 in 8.3.2.

Step 2: Check the friction plate surface of the new brake and brake wheel surface. If there are attachments, clean them up.

Step 3: Properly screw the 4 brake gap adjusting screw sleeves of the new brake into the iron core (less than 10mm beyond the armature part), install the new brake on the traction machine, tighten the 4 locking screws, so that the brake pad completely presses the brake wheel.

Step 4: Wire the new brake as described in 4.3.2. If the exit cable of the brake is connected to the junction box on the main engine, connect the cable according to the wiring diagram on the junction box cover, and secure the hose protecting the cable.

Step 5: Loosen the brake clearance adjustment nut, and then adjust the brake clearance according to the requirements and steps in 6.2.1.

Step 6: Adjust the brake loose nut as described in 6.2.3.

Step 7: Adjust the gap detection switch according to 6.2.4.

Step 8: Adjust the brake cushion as per 6.2.5. If both sets of brakes need to be replaced, the cushioning of both sets of brakes can be adjusted simultaneously at the end.

Step 9: Replace another brake as described above.

8.3.4 Common Faults and Troubleshooting of Brake Mechanism

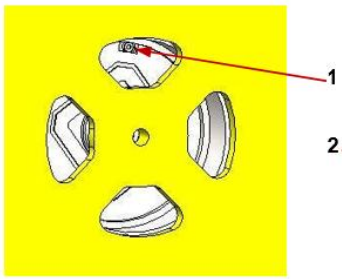
Phenomena	Causes	Solutions
Insufficient braking torque	1. Grease or dirt on the brake hub. 2. Excessive wear of brake pad.	1. Clean it. 2. Replace the armature assembly.
Brake cannot release or cannot hold after it is released	1. No power supplied to brake magnet coil. 2. Brake gap is too large or too small. 3. Voltage is too low. 4. Brake armature assembly is seized. 5. Excessive heating of electromagnet.	1. Check the wire connection 2. Check and adjust the air gap. 3. Check whether the excitation voltage is ＜80% rated voltage whether the hold voltage is＜ 40% rated voltage 4. Eliminate the causes. 5. Check if the DC voltage is too high.
Delay in brake release	1. Braking gap is too big. 2. Voltage is too low.	1. Check and adjust this air gap. 2. Check whether the voltage is ＜80V DC.
Brake cannot brake or delay in braking	1. After turning off the switch, high residual voltage exists on the coil. 2. Electromagnet armature assembly is seized. 3. Braking pad is excessively worn.	1. Check residual voltage on the coil. 2. Eliminate the causes. 3. Replace the brake armature assembly.
Excessive noise when braking and releasing	Braking gap is too big.	Check and adjust the brake gap.

8.4 Installation and Disassembly of Encoder

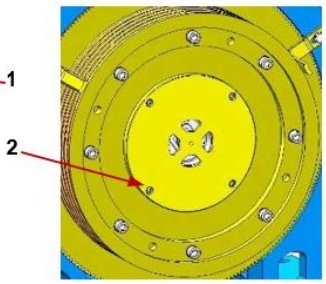
There are two installation positions for the encoder, one is the rear, that is, the encoder is installed on the side of the base of the traction machine, and the encoder can be directly observed from the rear of the traction machine. The other is the front, that is, the encoder is installed on the side of the traction wheel.

Rear-mounted encoder disassembly is relatively simple, different models of encoder disassembly slightly different, but the overall is respectively fixed or loosen the encoder housing and shaft, the specific encoder instructions can be seen.

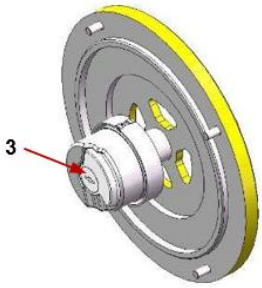
The pre-mounted encoder can be disassembled as follows.



Step 1: Push a wrench through the hole in the front end cover to loosen the encoder housing.



Step 2: Loosen the four screws securing the front cover.



Step 3: Remove the front cover, carefully and slowly, to avoid pulling the encoder cable. Open the encoder cover, unscrew the encoder shaft, and remove the encoder.

When installing the encoder, you can follow the above steps in reverse order.

- The front mounted encoder housing is fixed inside the tractor and the rotating shaft is fixed on the front cover. When disassembling the encoder, the encoder housing should be loosened first, and the front cover should not be removed directly, otherwise the encoder will be damaged.

9. Spare Parts List

No	Parts	Descriptions
1	Traction sheave	The traction sheave groove is severely worn and needs to be replaced.
2	Bearing at traction sheave	23022
3	Encoder	0822AADC1/0822SAF001/0822SAF002 of Tamagawa or other encoders specified by customers.
4	Braking pad	Non-asbestos type material with high friction coefficient.
5	Braking micro-switch	V4NS OR SS-5
6	Brake buffer O-ring	Damaged or deformed.

10. Quality Warranty

- For the quality problems caused by the design or manufacturing, the manufacturer shall provide maintenance and repair free of charge within 18 months from the date of Bill of Lading. The manufacturer will provide lifelong maintenance service at proper cost for the damages arising after 18 months or caused due to other factors rather than the faults of the manufacturer within the warranty period.

This manual may be subject to revision or the product may be subject to change without notice. Please contact the manufacturer!