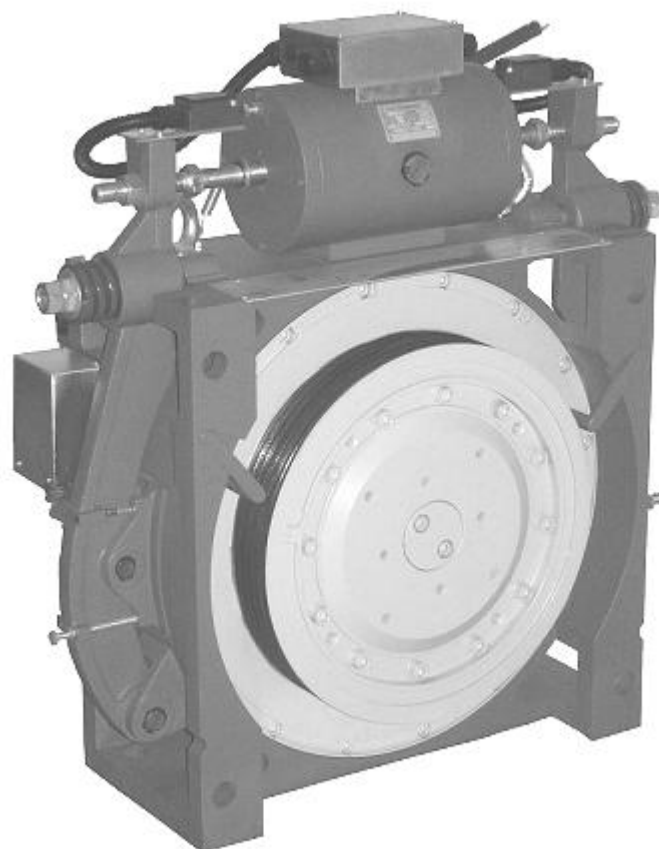




Operation and Maintenance Manual

WWTY Series Synchronous Permanent-Magnet Type Gearless Traction Machine



NINGBO XINDA ELEVATOR ACCESSORIES FACTORY

Version: Ae01

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1 Precautions for use of the Machine

Thank you very much for purchasing our products. In order to ensure that the elevator can run with high safety, reliability and quality, the elevator operators should be trained and become familiar with the installation, commissioning and operation of this product, and know elevator construction very well. This product should be installed, tested, accepted, used and maintained according to this manual and GB7588-2003 "Safety Rules for the Manufacturing and Installation of Electric Lifts"(egvEN81-1:1998"Safety rules for the construction and installation of electric lifts") as well. The manufacturer will not take any responsibility for any personal injury or equipment damage caused due to improper handling or violating above-mentioned manual and safety rules during the installation, commissioning, acceptance, use and maintenance of the product. To guarantee correct installation and operation of the motor, please read this manual carefully at first.

1.1 Symbol meaning

In this manual, three symbols as per the dangerous degree are used to remind the users to pay great necessary attention to it.



Adequate safety measures must be taken. Or otherwise there will possibly be significant personal injury (even death) or serious equipment damages.



It is necessary to take adequate preventive actions, or otherwise personal injury (but not death) or equipment damages may be caused. However, serious personal injury (even death) or serious equipment damages may also be caused when external conditions have changed but preventive actions are not changed accordingly.



Prompt for relative knowledge.

1.2 Basic safety requirements

- Gearless traction machine must be installed in a lockable room, so that only specially-trained persons can have access to it.
- Operators must operate the machine strictly according to the manual and GB7588-2003 (egvEN81-1:1998) rules. Or otherwise dangers and damages will be caused.
- After completion of the installation, check whether the motor and brake can function normally according to the requirements.
- The motor must not be connected directly with 3-phase power supply, but should be powered by inverter which is designed to drive the synchronous permanent-magnet type motor.
- The magnet coils of the motor and brake are heating elements, and any objects must not be placed on the coils to prevent poor dissipation.
- Hand release of brake can only be actuated in case of emergency and must not be operated under normal conditions, unless otherwise specified in this manual.
- High voltage is generated during motor rotation, and even if the power supply of inverter is disconnected, therefore touching the motor connection terminals is prohibited.
- During high-speed rotation of the motor, it is prohibited to apply brake by directly short-circuiting the terminals. But in case of emergency, terminal short-circuiting is allowed at zero-speed startup in order to move the car up and down slowly for the purpose of rescuing.

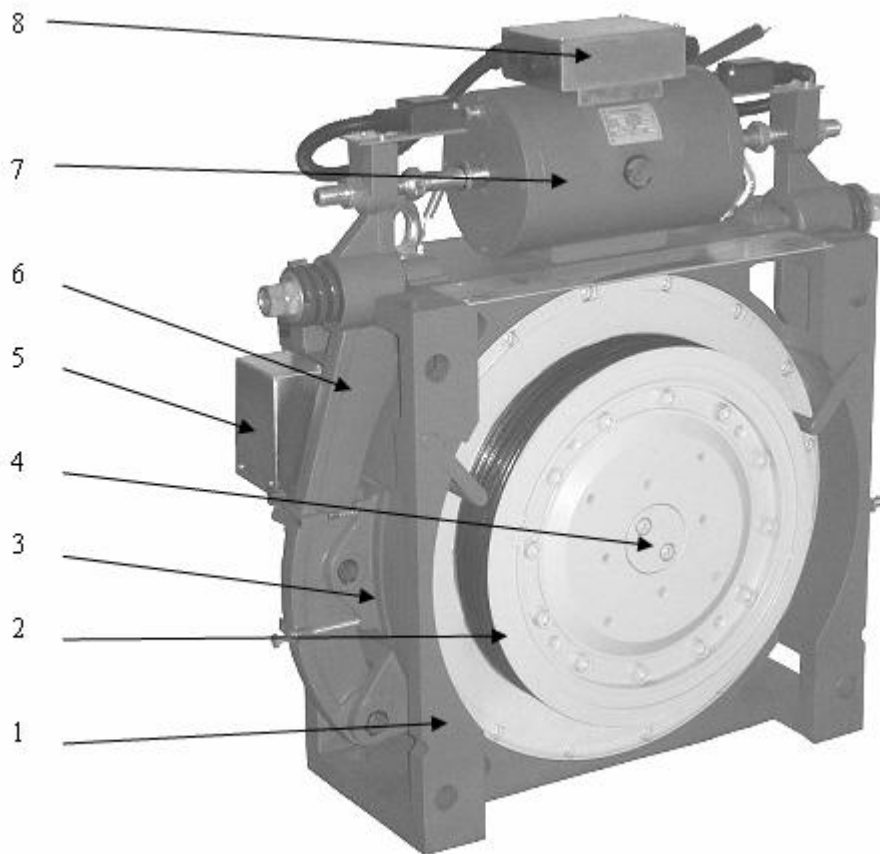
2 Product Descriptions

2.1 Product construction

WWTY series permanent-magnetic synchronous gearless traction machine (hereafter called traction machine) is more suitable for machine-room-less and adopts the low-speed,

high-torque permanent-magnetic synchronous 3-phase motor which provides direct way of drive. Therefore the product has the advantages of low power consumption, low noise, free of pollution and little requirement of maintenance. Its main construction characteristics are:

- The traction sheave is together with the brake wheel and both are fixed by the bolts.
- The traction sheave side adopts double-row self-aligning roller bearing.
- The machine base adopts flat frame construction and is suitable for machine-room-less installation with various installation ways from three sides. The traction way can be arranged as upward pull and downward pull.
- The adopted permanent magnet is fixed on the rotor frame by high-strength adhesive and dovetail wedge (viz. brake wheel) in order to ensure that during the operation course, it will not demagnetize or peel off even if the rotating torque exceeds 2.5 times of the rated torque.
- The brake system consists of two sets of brake arm, brake shoe, electromagnet and brake releasing micro-switch.
- Two installation ways are applicable for the encoder.



Picture 1 Construction Sketch of the Traction Machine

Table 1

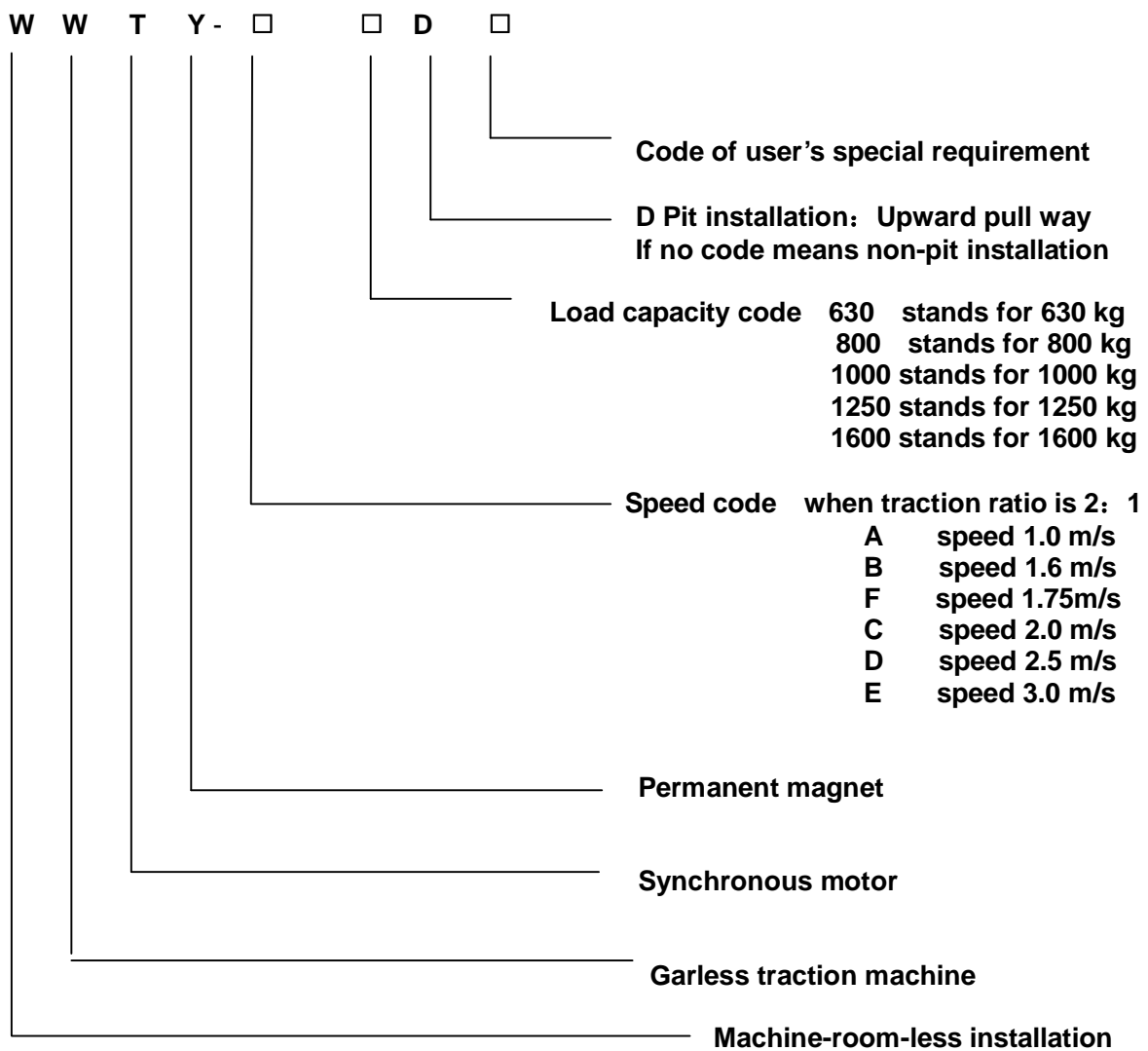
Ref	Description	Ref	Description
1	Machine base	5	Machine connection box
2	Traction sheave	6	Brake arm
3	Brake shoe	7	Electromagnet
4	Main bearing (plus cover)	8	Electromagnet connection box



- ◆ The traction ratio of the entire series synchronous permanent-magnet gearless traction machine is 2:1. If the user has special requirements, he can check with the manufacturer and part specification can make 1:1.

- ◆ There are two ways of encoder installation. One is suitable for the encoder with small volute bearing (for example 1300 series of the Germany Heidenhain Company). Plug the encoder into the volute holes on the main bearing of the traction machine and fix it on the main bearing with bolts and fix the outside case by internal expanding on the encoder base. The second way is suitable for the encoder with big bearing holes. Set the encoder on the main bearing of the traction machine and fix the outside case by reed with bolts on the machine base through key connection (for example the OIH100 series of Tamagawa Company).
- ◆ Our company's standard encoder is ERN487 mode manufactured by Germany Heidenhain Company.
- ◆ (Compare ERN487 with ERN1387, their electric performance is the same. But the protection grade of ERN487 is IP64, which is higher than that of ERN1387 IP40. Additionally, ERN487 increases 6 ~ 10m signal cables specially configured by Heidenhain Company.)

2.2 Product designation method



2.3 Main technical parameters of the product

2.3.1 Traction technical parameters of the machine

- Work system: S5, Continuance percentage 40%, and 240 operations/h.
- Traction ratio: 2:1
- Wrap angle of traction rope around traction sheave is 180°.
- Refer to the attached Table 1, the diameter and quantity of the traction rope is 2xR. See the attached Picture1 for the dimension of the rope groove
- Max. permissible axle load: 8000kg.
- Max. permissible travel height: 120m (compensation chain may not be used if traveling

- height is below 30m).
- 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
- Insulation Class: class F
- Protection Class: IP20
- Standard-configuration encoder (ERN487-2048) protection class: IP64.
- Cooling form : IC00.
- The asynchronous torque multiple: 2.2 times
- Max. torque multiple: 2.5 times
- The heat inspector for the motor winding: PTC120°C
- Voltage and frequency of the inverter: 3-phase, 400V, 50~60Hz

2.3.3 Technical parameters of the brake

- Excitation current: see Table 3 in Section 4.3.2
- Braking torque: see Table 7 in Section 6.2.2
- Excitation Voltage: DC190±28V (AC220±33V)
- Holding voltage: DC95±14V
- Working air gap: 0.05~0.10mm (factory setting or after readjustment)
- Max. working air gap: 0.25mm
- Work continual rate: 50%

2.4 Environmental conditions for operation

- Not exceed 1000m.
- Environmental temperature -5°C~40°C.
- Under the temperature of 20°C, the max. relative humidity is lower than 90%. No condition of dew condensate.
- Ventilation should be good enough to ensure that adequate heat can be dissipated through convection and radiation waves.

2.5 Contents of the product package

- One WWTY series traction machine complies with customer's order.
- Accessories: one encoder connecting cable (for the standard configuration ERN487-2048 encoder, the cable has been integrated with the encoder), one set of remote brake release device.
- One copy of user's manual for traction machine and one copy of user's manual for encoder.
- Parts optional by customers: diversion sheave (deflection sheave), etc. as per the order contract.



◆ User's special requirements should be specified in the appendix attached to the contract when the contract is made.

◆ Diameters of the diversion sheave we provided include 320, 400, 440, 520, 640mm.

◆ In order to avoid increasing the manufacturer's cost and affecting delivery time, users should make selection within the specified scope of supply.

3 Handling and Storage of Product

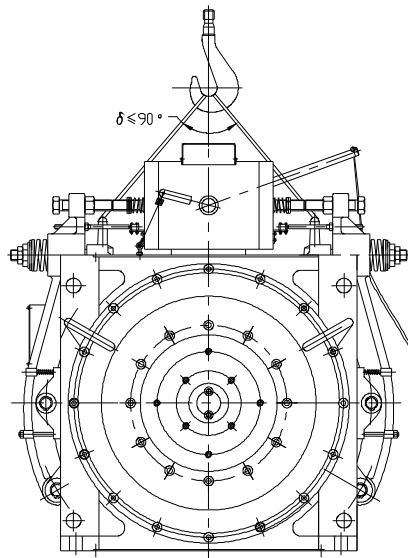
3.1 Storage



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

3.2 Lifting

Before leave the factory, the machine has been strictly tested. When the goods arrived, check the goods by visual to see if they are intact. If the damage is caused by the transportation department, shall claim from them at once; even if urgently needed, do not install and operate the damaged machine. Handling and lifting the product as per the Picture 2.



Picture 2 Product Lifting Sketch



- The eyebolt is only used for lifting the traction machine; any other weights must not be added.

4 Installation

4.1 Preparations prior to the machine 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 the M20 bolt (feet installation) or M24 bolt (side installation) of 12.9 grade intensity or M20 nut (feet installation) or M24 nut (side installation) of 12.9 grade intensity. The spanner tightening torque is 530N.m (M20 bolt or nut) or 915N.m (M24 bolt or nut).
- The traction machine should be with antiskid device for the lifting steel rope during the course of lifting. The gap between the machine and the steel rope should be not more than 2mm during the installation.

4.2 Preparations prior to electrical connections



- The electric 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 0.5MΩ. If the value is lower than 0.5MΩ, the coil should be heated and dried. Mains-frequency power can be used to heat it and its voltage value should be 5% lower than the rated voltage value of the motor and 30% lower than the rated voltage of the brake. Observe the heating state momentarily. The outside case surface temperature should not exceed 80°C.
- The permanent electric connection should ensure reliable connection no looseness.
- No external materials, dust and humidity air will be allowed to enter into the connection box. Therefore, strict inspection should be done before connections and the cable connector should be locked after connections. Notice should be paid to after the connections to ensure the cable entrance after the cable enters into the connection box is sealed well.



Operate strictly subject to the following 5 safe rules to avoid personal injury or machinery damage.

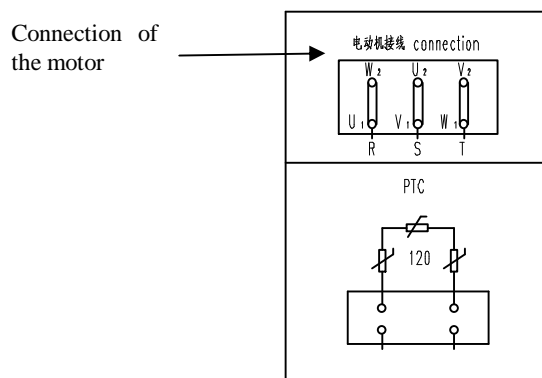
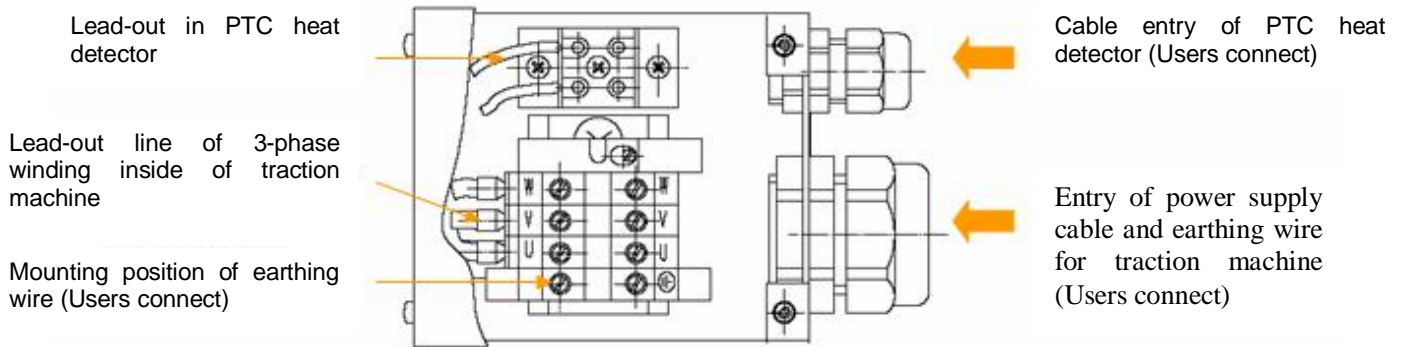
- Switch off power source.
- Any devices that can activate the machine by causal touches should be closed or locked.
- Make sure that the power source has been separated with safe devices.
- The circuit that can bring high voltage (higher than 1000V) should adopt dependable grounding or short circuit.
- Neighboring operating components should adopt safety devices or protective cover to shelter from each other.



- ◆ The cable connector for the machine is waterproof and in accordance with requirements of EMC.
- ◆ Max. allowable voltage growth rate for motor terminals is 1.3kV/μs, and max. voltage is 1.3KV. If above-mentioned values are possibly exceed, 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 insulating criterion for the motor is 700V, which is also the maximum DC bus voltage that the 400V frequency converter can reach instantaneously.

4.3 Electrical connection

4.3.1 Connection of the terminal box of the traction machine



Picture 3 Connection Diagram of Connection Box for Traction Machine



- In order to ensure that the motor magnet will not be demagnetized permanently due to overheat, causing damage or performance deterioration to the motor, it is necessary to connect the PTC detectors with corresponding control circuits, so that they can switch off the power supply in the possible shortest time in case of overheat occurrence.
- Max. operating voltage of PTC heat detectors should not exceed 25V.
- Max. allowable operating temperature of the permanent magnet is 150°C, but irreversible loss of magnetic performance will occur at this temperature, which will have adverse effect on the operation performance of the motor. In order to improve its reliability, acting temperature of PTC detectors is set to 120°C.
- Steady and correct 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 converter) from causing any electromagnetic radiation and interference to the surrounding environment and protect the signal transmission cables (cables connecting the encoder with the frequency converter) from the electromagnetic radiation and interference), the main cables should be as short as possible and should be the shielded 3-core cables. The both ends of metal sheath on the shielded cable should not exceed 5A/mm², and its line voltage drop should not exceed 0.2V.



- ◆ 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 it will be actuated at 120°C. When external voltage of 2.5V is applied, corresponding resistance values at different temperatures are shown in Table 2.

Table 2 Temperature and Resistance Corresponding Table of PTC Detector

Resistance of 3 PTC heat detecting elements connected with each other in series (Ω)	≤ 300	≤ 1650	≥ 3990	≥ 12000
Corresponding temperature in the winding ($^{\circ}\text{C}$)	25	115	125	≥ 135

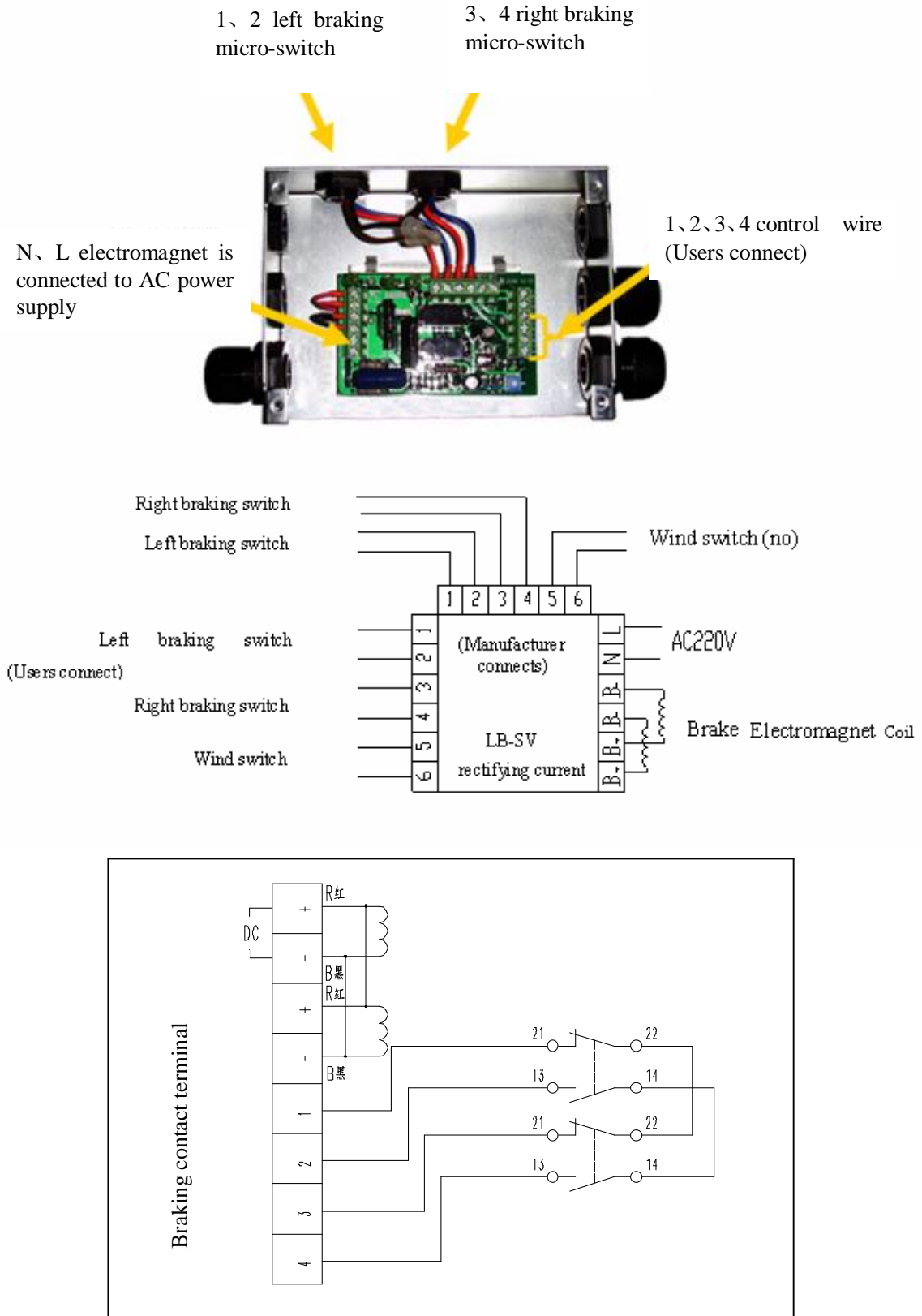
4.3.2 Connection of the brake electromagnet connection box



- The electromagnetic coil in the brake electromagnet should be connected with DC voltage. When the brake is required to release, quick response excitation voltage of DC190~200 V should be electrified at first for about 1~2s, and then after the brake released, the quick response excitation voltage is converted into holding voltage about of DC95~100V until the power supply is switched off and the brake is applied. The power disconnection switch should be mounted at the AC side.
- For the electrical connection of the brake, it is necessary to use 2-core cable with its cross-section $\geq 0.75\text{mm}^2$ and its dielectric voltage $\geq 500\text{V}$.
- The terminals for the brake electromagnetic coil and 2 micro-switches should be housed in the connection box on the enclosure of the brake electromagnet. Ensure that no moisture, dust and other things are left in the box.
- If the thyristor rectified power supply (optional parts) is installed in the connection box of the brake, with automatic conversion of its quick response excitation to holding voltage. Before use, users only need to connect AC220V power to the N and L terminal boxes on the PCB board. The power supply disconnection switch should be mounted at the AC side.
- The 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 switch contacts are in open state, and when the electromagnetic coil of the brake is energized (the brake is released), the two groups switch contacts of the braking micro-switch are in closed state.
- Table 3 shows the current values of brake magnet coils when the quick response excitation voltage is DC190V or AC220V (when the holding voltage is DC110V, the current values are halved).
- The breaking capacity of the braking micro-switch should not exceed AC250V, and its current should not exceed 0.5A.

Table 3

Traction machine type	WWTY-X-400~800	WWTY-X-1000	WWTY-X-1250	WWTY-X-1600
Electromagnet type	DZS165S	DZS165M	DZS165M	DZS165L
Current (A) for AC200V	2.4	2.7	2.7	3



Picture 4 Connection diagram of the electromagnet connection box and its principle sketch

4.3.3 Encoder connection



- WWTY series traction machines may be provided with a wide range of optional encoders so that can select different inverters. On ordering, users should select

corresponding encoder according to the used frequency converter, or select the frequency converter according to the used encoder. If users feel difficult to determine it, they should consult the manufacturer of the frequency converter.

- We list the frequency converters suitable to the encoders described in the following sections. But that does not mean that only these converters can be used and should be deemed final confirmation of the adaptability. Users should ask the suppliers of the frequency converters to confirm the encoders before final decision.



- 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.

4.3.3.1 ERN487-2048 Encoder



- ◆ ERN487-2048 encoder is an increment encoder manufactured by Heidenhain in Germany, and its output signal is A+, A-, B+, B-, R+, R-, C+, C-, D+, D-.
- ◆ A+, A-, B+, B- of ERN487-2048 encoder are 2048 sin/cos signals each per revolution, its C+, C-, D+, D- is one sin/cos signal per revolution, R+ and R- are zero calibration signals. Refer to related Heidenhain manuals for details.
- ◆ The connector which connects ERN487-2048 encoder and frequency converter is 3-line 15-pin D model connector.
- ◆ ERN487-2048 encoder is suitable to the DSV5445/5444 series manufactured by German DIETZ Company, F4-FLIFT series of KEB, and ARTDrive1 frequency converter of SIEL Company in Italy.
- ◆ ERN487-2048 encoder is our standard configuration, and is provided with extension cable by the manufacturer.

4.3.3.2 ERN1321-4096 or ERN1321-8192 Encoder



- ◆ ERN1321-4096 or ERN1321-8192 is increment encoder manufactured by Heidenhain Company in Germany.
- ◆ The output signals A+, A-, B+, B- of ERN1321-4096 are each 4096 square wave pulses per revolution, and its R+ and R- are zero calibration signals.
- ◆ The output signals A+, A-, B+, B- of ERN1321-8192 are each 8192 square wave pulses per revolution, and its R+ and R- are zero calibration signals.
- ◆ It is applicable to VS-676GL5-IP series frequency converters of Japanese YASKAWA Company.
- ◆ An extending 8-core shielded cable is provided with the encoder when it is delivered. The relationship between core color of the extension cable and corresponding terminals of VS-676GL5-IP is shown in Table 4.

Table4 Relationship between ERN1321-4096 or ERN1321-8192 Encoder and Corresponding Terminals of VS-676GL5-IP

Encoder End		Frequency Converter End	
Signal Marking	Core Color	Signal Marking	Color
0	Black	0	Black
+5V	Red	+5	Red
A+	Blue	A (1)	Blue
A-	Light blue	A [^] (1 [^])	White/Blue
B+	Yellow	B (2)	Yellow
B-	White	B [^] (2 [^])	White/ Yellow
R+	Green	Z	Green
R-	Grey	Z [^]	White/Green

4.3.3.3 OIH100-8192C/T-L3-5V Encoder



- ◆ OIH100-8192C/T-L3-5V Encoder is the increment encoder manufactured by TAMAGAWA Company in Japan.
- ◆ The output signals A+, A-, B+, B- of OIH100-8192 encoder are each 8192 square wave pulses per revolution, and its R+ and R- are zero calibration signals.
- ◆ It is matched with VS-676GL5-IP series frequency converters of YASKAWA Company in Japan.
- ◆ An extending 8-core shielded cable is provided with the encoder when it is delivered.

4.3.3.4 ECN1313EnDat (ECN413) Encoder



- ◆ ECN1313EnDat is absolute shaft encoder manufactured by Heidenhain Company in Germany. Besides with 6~10m original signal cable, the others are the same as ECN1313 encoder.
- ◆ Output signals A+, A-, B+, B- of ECN1313EnDat are 2048 sin/cos signals per revolution, \overline{DATA} , \overline{CLOCK} , \overline{CLOCK} signals are Gray codes, simultaneous bi-directional connection in series. Please refer to related manuals of Heidenhain Company for details.
- ◆ Suitable to FRN-VG7S-4UD series of **FUJI ELECTRIC** Company in Japan (via OPC-VG7-SPG (EP4287A) serial PG adapter card) and UNIDRIVE ES series of CT Company in Britain.
- ◆ When it is used for UNIDRIVE ES series, the extending shielded cable has a 15-pin D mode connector. When used for FRU-VG7S-4UD series, the relationship between its core colors and signals is shown in Table 5.

Table5 Relationship between Core Colors and Signals when ECN1313EnDat Encoder is used for FRU-VG7S-4UDseries

signal	\overline{DATA}	A +	\overline{OV} Sensor	B+	\overline{CLOCK}	$\overline{5V}$ Sensor	CLOCK	B-	$\overline{5V}$ UP	\overline{OV} UN	A-	DATA
Core color	Pink	Green	White	Light blue	Yellow	Blue	Purple	Dark grey	Red	Black	Orange	Light grey

4.3.3.5 OIH100-8192P32-L6-5V Encoder



- OIH100-8192P32-L6-5V Encoder is the increment encoder manufactured by TAMAGAWA Company in Japan.
- There is 120° electric angle difference between output signals U, V and W of OIH100-8192P32-L6-5V, and has 12 square waves per revolution (suitable to the motor with 12 pairs of poles), and signals A and B are square waves differing by 90° from each other, and has 10000 square waves per revolution. Z is calibration signal.
- Suitable to **FRN-VG7S-4UD** Frequency converter, the relationship between the core colors of its extension cable and signals is shown in Table 6 as follows.

Table 6 Relationship between Core Color and Signals when OIH100-8192P32-L6-5V encoder is used forFRN-VG7S-4UD frequency converter

signal	A	\overline{A}	B	\overline{B}	Z	\overline{Z}	U	\overline{U}	V	\overline{V}	W	\overline{W}	DC 5V	Gnd 0V
Core color	blue	blue/white	brown	brown/white	yellow	orange	Grey	light blue	purple	green	white	pink	red	black

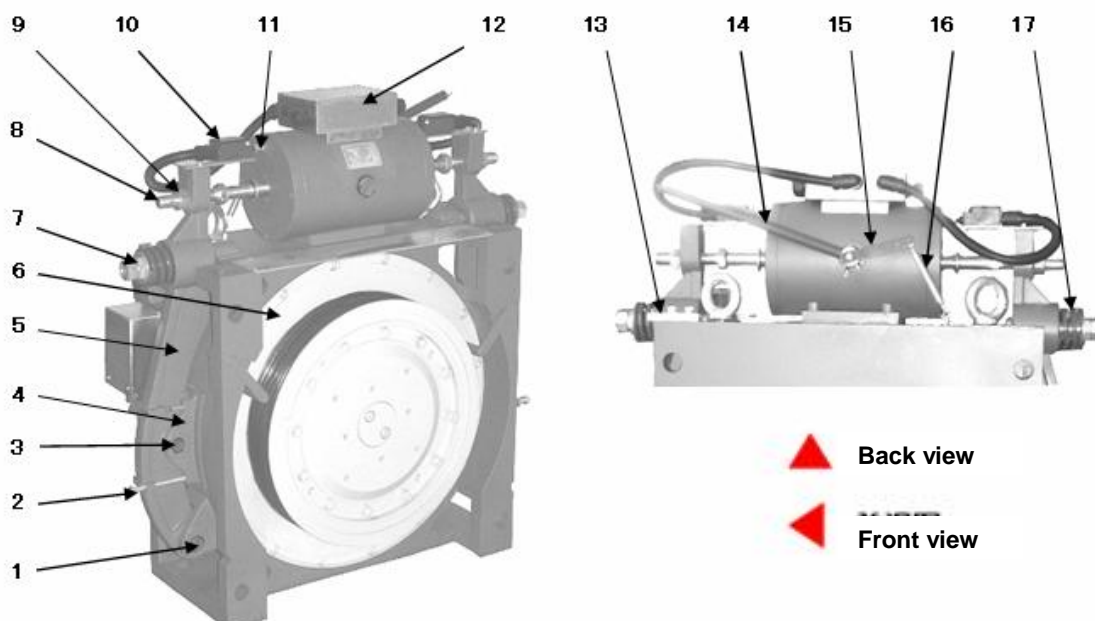
5 Commissioning of Traction Machine



- 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 of the frequency converter and rich experience in its commissioning and operating.
- 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 loads. In this case, the motor and frequency converter should be learning the machine. 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 learning is completed correctly. After confirmation, suspend the car and counterweights. During commissioning, the 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.
- 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 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 by 10~15%.
- If there is any problem about 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



Picture 5 Brake Construction Diagram

Table 7

Ref	Description	Ref	Description
1	Brake arm pivot	10	Brake micro-switch
2	Brake shoe mandril	11	Adjustment lever for brake switch
3	Brake shoe pin	12	Electromagnet connection box
4	Brake shoe	13	Steel rope frame for remote brake release
5	Brake arm	14	Brake release lever
6	Brake wheel	15	Reset lever for remote brake release
7	Adjustment nut for brake spring	16	Reset tension spring
8	Brake retaining bolt	17	Brake spring
9	Brake retaining nut		

Brake: When the elevator is leveling, de-energized or inspection of failure, the electromagnet is under de-energized state. The brake arm operates downwards with the function of the brake spring to drive the brake shoe to brake the wheel rim and stop the traction sheave.

Normal release: When the traction sheave prepares to rotate or is rotating, the electromagnet coil is energized and the electromagnet mandril operates outwards with the function of the electromagnetic force and overcomes the pressure force of the brake spring and push the brake arm outwards to make the brake shoe release the brake wheel rim.

Hand releasing: At the state of installation or inspection, traction machine can be released by pressing the releasing levers downwards, (users have the remote brake release device can turn the handgrip of brake release) which can overcome the pressure force of the brake spring to make the brake arm push outwards and fulfill the purpose of hand releasing.



- The function of the brake 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. Since it adopts safety switch for the brake micro-switch that when the users need, the brake mechanism can be functioned as one part of the up travel car over-speed protection components.



- ◆ Brake mechanism consists of two groups of separate operation mechanisms and If one group of operation mechanism is damaged, the other group is still in effect to ensure the car can decelerate or stop.
- ◆ In the normal operation (the motor is rotating), the brake is in the condition of brake releasing that only when the motor stops rotating; the brake is in the condition of braking. When in the condition of failure, the electromagnet coil is deenergization and under the function of the pressure spring, big brake torque is produced to decelerate the car till stop.
- ◆ In order to be convenient for hand releasing of the brake that the manufacturer provides a set of remote brake releasing device as accessory. This device can be installed at any place where users think is convenient. But the bending radius of its steel rope should exceed 0.6m, or otherwise the resistance torque will be too big so that it is difficult for operation and it will easily damage the device.

6.2 Commissioning of brake mechanism

6.2.1 Adjustment of air gap between brake shoe and brake wheel rim



- The braking mechanism of the brake has been adjusted well before the traction machine is delivered. Users can decide to or not to make additional adjustment based on the field specific condition.
- Put the empty car at the bottom level, hand release, the empty car will up travel slowly at this time and adjust as per Section 6.2.3. After one side is adjusted well and then adjust another side.
- The size of air gap has direct effect on the noises produced in brake contracting, vibration amplitude and the reliability of releasing the contracting brake. Therefore,

the air gap should be adjusted carefully in time. When the air gap is bigger than 0.2mm or the noise level produced in brake contracting increased obviously, it is necessary to do adjustment

6.2.2 Adjustment of braking torque

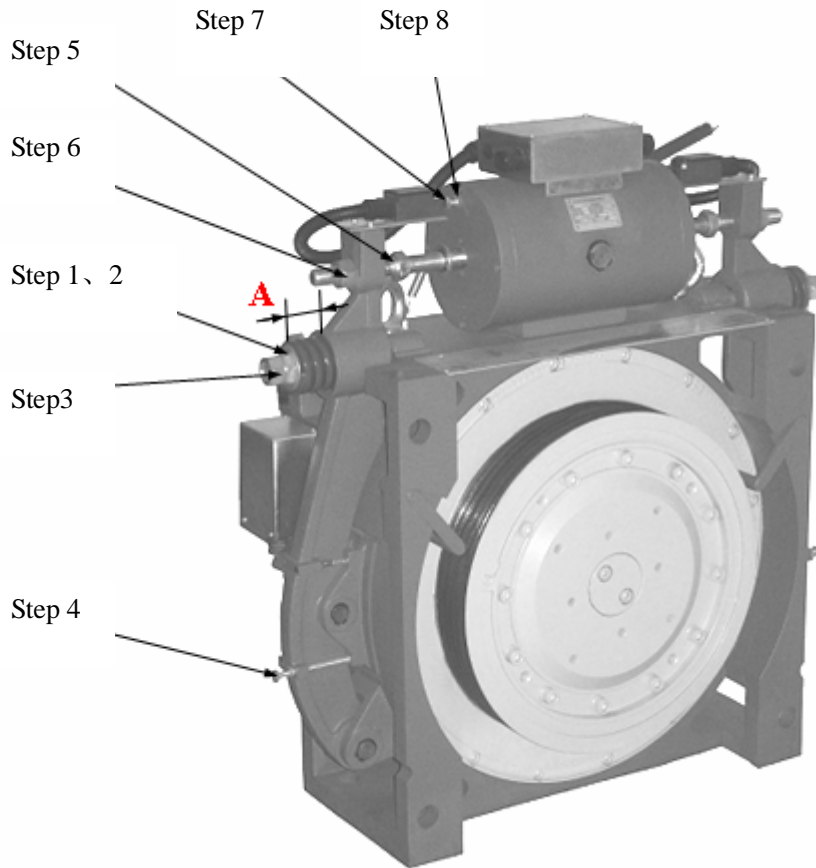


- The braking torque of the brake is set to rated torque of about 2×0.75 before the traction machine is delivered. Generally users do not need to make any adjustment. If necessary, it is possible to make micro adjustment. When replace the brake shoe with new one, adjust the brake torque according to Section 6.2.3.
- If the braking torque is set to a very low value, it cannot meet the demand for braking, but a very high braking torque will possibly lead to impossible releasing of the contracting brake especially when the voltage fluctuates or at high operating temperature. Meanwhile, too high braking torque will produce a very high deceleration when emergent braking is applied, which does not meet the requirements of GB7588
- Users can make proper adjustment for the quality of the car, counterweight and the deceleration requirements during braking according to their need.
- See the Table 8 for the brake torque set by the manufacturer as well as the max. permissible brake torque (at this time, the air gap between the brake shoe and the brake wheel rim is 0.25mm).

Table 8

Traction machine load capacity (kg)	400	630	800	1000	1250	1600
Single brake spring compression B dimension (mm)	4.5	6	8	10	12	16
The single braking torque of the brake for B dimension (N.m)	215	335	425	538	670	855
Single spring compression dimension under the max. braking torque (mm)	7	11.5	14	17	20	26
The max. single permissible braking torque for brake (N.m)	350	550	690	875	1130	1400

6.2.3 Adjustment of the brake shoe



Picture 6 Flow chart for brake shoe adjustment

- Step 1:** Tighten the adjustment nut of the spring braking but not compress the braking spring and when the spring is at the critical point of being about to be compressed, note down the dimension A labeled in the picture.
- Step 2:** Go on tightening the adjustment nut and refer to the dimension B in the Table 8 for the tightening depth.
- Step 3:** Tighten the retaining nut.
- Step 4:** Tighten the mandril of the brake shoe to make the brake shoe integrate closely with the brake wheel rim and then tighten the nut on the mandril.
- Step 5:** Adjust the brake retaining bolt to make it press closely on the mandril of the electromagnet. The best position for the retaining bolt is: when the traction machine operates with the speed lower than the inspection speed and the electromagnet mandril push away the brake arm, the air gap between the brake shoe and the brake wheel rim should be well-proportioned and as small as possible(0.05~0.10mm are appropriate) so that no friction will be produced between the brake shoe and the brake wheel or only tiny friction at several points(it can be distinguished according to the friction voice).
- Step 6:** Tighten the brake retaining nut.
- Step 7:** Adjust the regulative lever of the braking switch, and when electrify the electromagnet, the regulative lever will trigger the braking micro-switch operates effectually.
- Step 8:** Tighten the fixing nut of the braking switch regulative lever.

7 Operation of Manual Emergent Rescue



- As no hand winding device is available, emergent rescue can be executed by

providing emergent power supply or adopting short circuiting for the three terminals of the motor. When three terminals of the motor are short circuited, the brake is released manually and the potential energy is utilized to drive the motor rotator, the motor is generating electricity, and the generated resistance torque can ensure the car ascend or descend for achieving the purpose of emergent rescue.

- For making use of potential energy for the purpose of emergent rescue, the three lead-in terminals of the motor can be short circuited only if the motor stops rotation or its speed is below 5% of its rated speed. Such short circuiting must be accomplished with contactor, and it is ensured during the short circuiting that the three lead-in terminals are disconnected with the output end of frequency inverter.
- The method “short circuiting of motor’s lead-in terminals” must not replace the brake during normal operation, and it is only an alternative for emergent rescue.



- Before short circuiting the connection terminal of the motor, all of the power supply should be switched off.

8 Protections and Maintenance of the Product

8.1 Routine inspection and maintenance of the product



- After the product was put into operation, it should be made routine inspection, certain protection and maintenance to make the gearless traction machine operate normally. See Table 9 for the routine inspection contents and the relative maintenance method.

Table 9 Routine inspection contents and relative maintenance method

Check parts	Check cycle	Check contents	Maintenance method
External surface	Six months	Is it clean?	Clean the dust from the machine surface(never wash it with water)
Extruding fasteners	Six months	Is it loose?	Tighten the loose fasteners.
All electrical connections	Six months	Have the terminals come loose? Are the cables damaged?	Tighten the loose terminals and replace the damaged cable.
Bearing noise	Six months	Listen to check if there are any unpitched sounds except harmonic sound?	Every year, change and refill the traction end wheel bearing with the 3 No. white special type grease 250g. Replace bearing if it is very serious.
Encoder	Six months	Has the fixing of the shaft and shell come loose?	Tighten it again.
Traction wheel	Six months	Be wearing seriously (the space between the traction rope and the groove bottom is < 0.5mm)?	Replace traction wheel.
Brake	One month	Is the brake torque not big enough? Are there any black carbonized things on the brake wheel rim? Has the thickness of the brake block been less than 3mm?	Maintain as per the item 8.2
Anti-slip device for steel rope	Six months	Does it become loose? Dose the space between the anti-slip lever and the steel rope is >2.5mm or <1.5mm?	Re-adjust and tighten
Brake arm pivot and Brake shoe pin	Six month		Refill the lubricating oil

8.2 Inspection and Maintenance of Brake

8.2.1 Clean the carbonized things on the surface of the brake shoe and brake wheel rim



- After long time running of the gearless traction machine, the friction lining surface will be carbonized and has some black carbonized things left on the surfaces of the friction lining and the brake wheel rim because of long time friction of the friction lining and the brake wheel rim on the brake shoe, which will affect the traction machine to reduce its brake torque. If there is any phenomenon like above, the surface of the brake block and brake wheel rim must be cleaned and maintained.
- Before cleaning the carbonized parts, the elevator must be stopped in order to avoid any accidents.

8.2.2 Replacement of the brake shoe

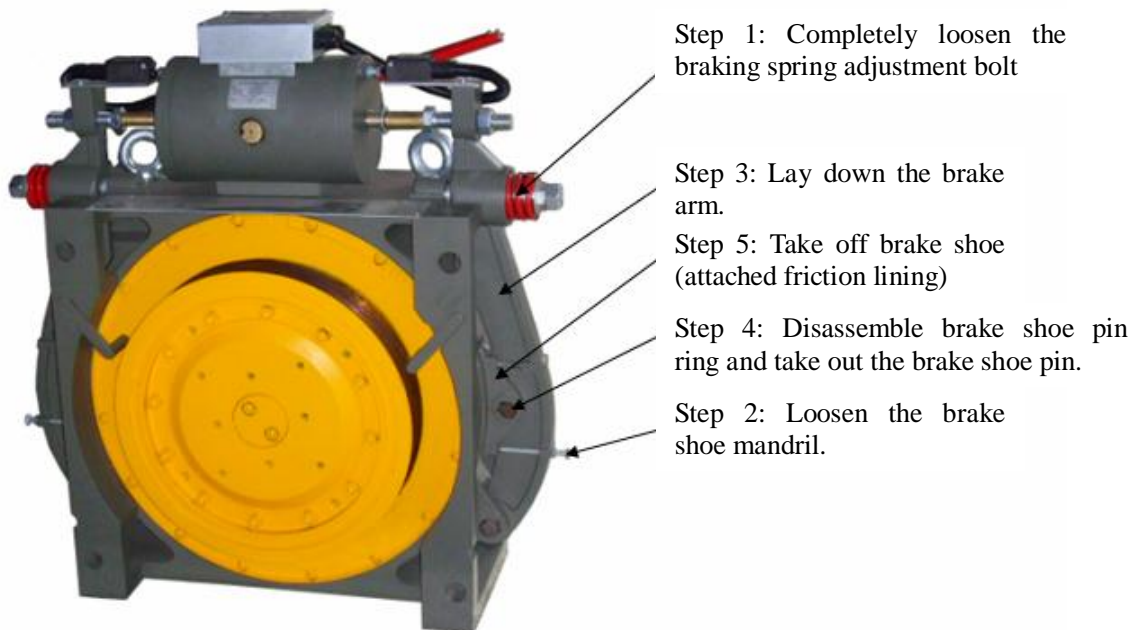


- The thickness of the friction lining at the first installation is 6mm. When the friction lining is damaged or if its thickness is less than 3mm that the brake shoe can not brake the wheel rim tightly, it must be replaced with a new brake shoe to ensure safety operation of the elevator.



- Before replacing the brake shoe, the traction machine must be stopped operating.

8.2.2.1 Disassemble the worn brake shoe



Picture 7 Flow chart of disassembling the worn brake shoe

8.2.2.2 Assemble the new brake shoe



Step 4: As per Section 6.2.3 install and adjust the braking adjustment bolt and braking spring.

Step 3: Raise the brake arm and return to the state of before disassembling.

Step 1: Install the new brake shoe (including friction lining).

Step 2: Penetrate the brake shoe pin and install the ring of the brake shoe pin.

Picture 8 Flow chart of assembling the new brake shoe

8.2.2.3 The common faults of the brake mechanism and solutions

Table 10 common faults of the brake mechanism and solutions

Phenomena	Possible Causes	Solutions
Insufficient brake torque	<ol style="list-style-type: none"> 1 Insufficient spring pressure 2 Oil, grease or dirty things exist on the brake wheel rim 3 Brake shoe is excessively worn 	<ol style="list-style-type: none"> 1 Increase spring pressure to proper value 2 Remove the grease or dirt 3 Replace brake shoe
Brake cannot be released or cannot hold after it is released	<ol style="list-style-type: none"> 1 No power is supplied to brake magnet coil 2 The air gap is too big or too small 3 The excitation voltage is too low 4 The holding voltage is too low 5 Electromagnet plunger is seized. 6 Excessive heating 7 Excessive spring pressure 	<ol style="list-style-type: none"> 1 Check the wire connection and DC output end of thyristor rectifier circuit. If there is no DC output, replace the PCB. 2 Check the air gap and adjust it 3 Check if the excitation voltage is < 165VDC 4 Check if the holding voltage is < 81V DC 5 Eliminate the causes 6 Check if the voltage is too high (if the holding voltage is > 110V DC) 7 Reduce spring pressure to a proper value
Delay in brake release	<ol style="list-style-type: none"> 1 Air gap is too large 2 Excitation voltage is too low 	<ol style="list-style-type: none"> 1 Check air gap and adjust it 2 Check if the excitation voltage is < 162V DC
Brake cannot be applied or delays in applying the brake	<ol style="list-style-type: none"> 1 After turning off the switch, high residual voltage exists on the coil 2 Magnet plunger is seized 3 Insufficient spring pressure 4 Friction lining is excessively worn 	<ol style="list-style-type: none"> 1 Check residual voltage on the coil 2 Eliminate the causes 3 Increase spring pressure to proper value 4 Replace brake shoe
Too loud noise is produced when	Air gap is too big	Check the air gap and adjust it

brake is released or applied		
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9 Spare parts list

Table 11 Spare Parts list

Ref	Parts Description	Remarks
1	Traction sheave	According to the load capacity and traction ability.
2	Encoder end bearing	Deep-groove ball bearing NSK-6313-VVCM or NTN-6313LLBCM.
3	Traction wheel end bearing	Double-row roller bearing 23122-2CS5/VT143 by SKF.
4	Encoder	ERN487-2048 manufactured by Heidenhain, or other encoders specified by customers
5	Controllable rectifier CKZB(optional parts)	Input 220V AC, output excitation 190V DC/3A holding 95V DC/1.5A.
6	Brake shoe pad	Non-asbestos type material with high friction coefficient
7	Braking micro-switch	TS236-11Z-M16 manufactured by Schmersal Company.

10 Quality warranty



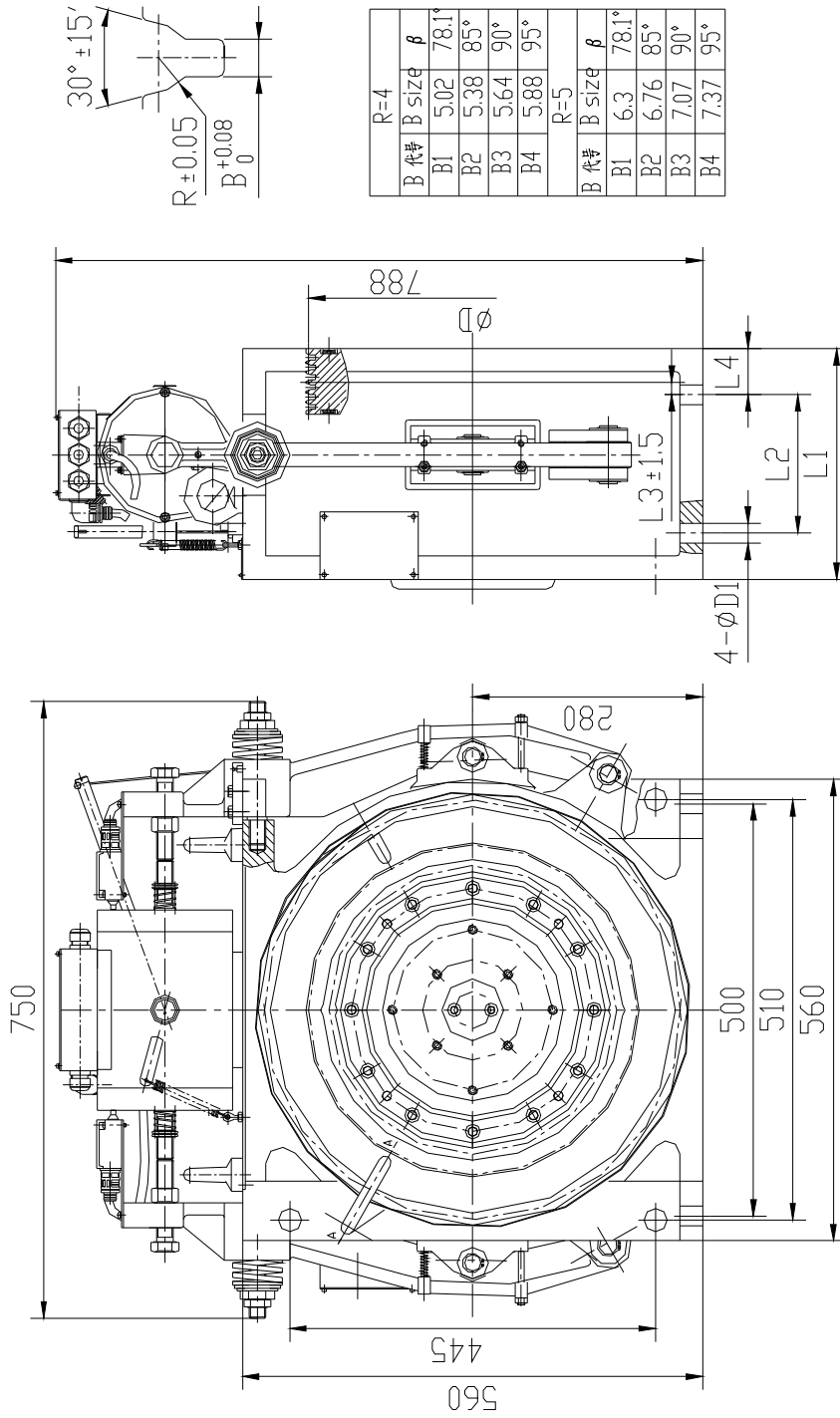
- The manufacturer shall provide maintenance and repair free of charge if this product has any quality problems caused due to the design or manufacture of the manufacturer within two years from the date of its shipment from the manufacturer or within one year and a half from the date of its being put into operation. The manufacturer will provide lifelong maintenance service at proper cost for the damages arising after two years or caused due to other factors rather than the faults of the manufacturer within the warranty period.

11 note

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

Attach:

The mechanical and electrical parameters and overall installation dimensions of the traction machine



400~1000kg: D1=24; 1250~1600kg: D1=28;

Attached Picture 1 Overall installation dimensions of the traction machine

Attached Table 1 Overall installation dimensions of the traction machine and mechanical and electrical parameters

ID No.	Type	L1	L2	L3	L4	Speed (m/s)	Load (kg)	Frequency (Hz)	Rev r/min	Power (kW)	Current (A)	Voltage (V)	BMF (V)	Ropes	Torque (N·m)	Weight (kg)	Max.Brake Torque (N·m)	GD ² (kg·m ²)
3101001	WWTY-L-400	200	88	33	56	0.63	400	16	60	1.8	4.8	320	250	3×Φ8	271	340	703	2.95
3101002	WWTY-A-400	200	88	33	56	1	400	26	96	2.7	7.2	320	260	3×Φ8	278		703	2.95
3101003	WWTY-B-400	200	88	33	56	1.6	400	41	153	4.5	11.2	320	260	3×Φ8	281		703	2.95
3101004	WWTY-L-630	228	116	27	56	0.63	630	16	60	2.8	7.2	320	250	4×Φ8	432	370	1095	3.52
3101005	WWTY-A-630	228	116	27	56	1	630	26	96	4.4	11	320	260	4×Φ8	438		1095	3.52
3101006	WWTY-B-630	228	116	27	56	1.6	630	41	153	7	16.8	320	260	4×Φ8	438		1095	3.52
3101007	WWTY-L-800	253	141	21	56	0.63	800	16	60	3.4	8.8	320	250	5×Φ8	541	400	1375	3.91
3101008	WWTY-A-800	253	141	21	56	1	800	26	96	5.5	13.2	320	260	5×Φ8	547		1375	3.91
3101009	WWTY-B-800	253	141	21	56	1.6	800	41	153	8.8	21.5	320	260	5×Φ8	549		1375	3.91
3101010	WWTY-F-800	253	141	21	56	1.75	800	44	168	9.6	23.7	320	260	5×Φ8	546		1375	3.91
3101011	WWTY-C-800	253	141	21	56	2	800	51	191	11	26	320	260	5×Φ8	550		1375	3.91
3101012	WWTY-L-1000	280	168	15	56	0.63	1000	16	60	4.4	11.2	320	250	6×Φ8	700	430	1750	4.41
3101013	WWTY-A-1000	280	168	15	56	1	1000	26	96	7	16.8	320	260	6×Φ8	696		1750	4.41
3101014	WWTY-B-1000	280	168	15	56	1.6	1000	41	153	11.2	26	320	260	6×Φ8	699		1750	4.41
3101015	WWTY-F-1000	280	168	15	56	1.75	1000	44	168	12.3	29.2	320	260	6×Φ8	699		1750	4.41
3101016	WWTY-C-1000	280	168	15	56	2	1000	51	191	14	32.5	320	260	6×Φ8	700		1750	4.41
3101017	WWTY-D-1000	280	168	15	56	2.5	1000	64	239	17.5	40.2	320	260	6×Φ8	699	1750	4.41	
3101018	WWTY-L-1250	316	188	15	64	0.63	1250	16	59	5.5	12.9	320	250	6×Φ10	890	460	2260	5.21
3101019	WWTY-A-1250	316	188	15	64	1	1250	25	93	8.8	20.6	320	260	6×Φ10	904		2260	5.21
3101020	WWTY-B-1250	316	188	15	64	1.6	1250	40	149	14	31.1	320	260	6×Φ10	897		2260	5.21
3101021	WWTY-F-1250	316	188	15	64	1.75	1250	44	163	15.4	34.4	320	260	6×Φ10	902		2260	5.21

ID No.	Type	L1	L2	L3	L4	Speed (m/s)	Load (kg)	Frequency (Hz)	Rev r/min	Power (kW)	Current (A)	Voltage (V)	BMF (V)	Ropes	Torque (N·m)	Weight (kg)	Max.Brake Torque (N·m)	GD ² (kg·m ²)
3101022	WWTY-C-1250	316	188	15	64	2	1250	50	187	17.7	40.3	320	260	6×Φ10	904	490	2260	5.21
3101023	WWTY-D-1250	316	188	15	64	2.5	1250	62	233	22	50.3	320	260	6×Φ10	904		2260	5.21
3101024	WWTY-L-1600	350	222	8	64	0.63	1600	16	59	6.9	16.6	320	250	7×Φ10	1117	490	2810	5.85
3101025	WWTY-A-1600	350	222	8	64	1	1600	25	93	10.9	26.8	320	260	7×Φ10	1119		2810	5.85
3101026	WWTY-B-1600	350	222	8	64	1.6	1600	40	149	17.7	39.5	320	260	7×Φ10	1122		2810	5.85
3101027	WWTY-F-1600	350	222	8	64	1.75	1600	44	163	19.1	43.7	320	260	7×Φ10	1119		2810	5.85
3101028	WWTY-C-1600	350	222	8	64	2	1600	50	186	21.9	51.4	320	260	7×Φ10	1118		2810	5.85
3101029	WWTY-D-1600	350	222	8	64	2.5	1600	62	233	27.4	64.3	320	260	7×Φ10	1123		2810	5.85

- BMF is the motor line voltage measured at rated rotate speed and no load.
- The traction rope quantity is n+1.
- The voltage is the output voltage of vector converter when the motor is at rated working point.
- The noise level is the average Meter-A weighted sound pressure measured at 1 meter away from rectangular enveloping surface when the gearless traction machine is at no load.

WWTY Series Synchronous Permanent-Magnet Gearless Type Traction Machine

- Add: DongWu Town, NingBo City, Zhejiang Province, China
- P.C: 315113
- TEL: +86-0574-88336262 +86-0574-88336012
- FAX: +86-0574-88336161 +86-0574-88489056
- <http://www.nbx.com>
- E-mail: overseas_center@xinda-group.com
nbxinda@mail.nbptt.zj.cn