

# **WTY1 (SWTY1) SERIES**

## **GEARLESS PERMANENT SYNCHRONOUS TRACTION MACHINE OPERATION MANUAL**

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**⚠ In case of any damage to the machines and wounds to people, before installation, application and maintenance, one should read this manual carefully.**

**⚠ The installation, application and maintenance should accord with the manual strictly.**

**⚠ When rotating this series of traction machines by other motors, the traction machines will be working at generator condition, and the terminals will produce high voltage, so one should protect from getting an electric shock, and the peripheral equipments should be protected from that high voltage.**

**⚠ Strictly prohibit from shorting circuit when the machine is at high speed, because at this time the terminals produce high voltage but the circuit with low impedance, which will generate high current and then high torque, the whole structure of the machine and peripheral equipments may be damaged by this torque, and even cause people injured. No liability can be assumed for any damage caused by shorting circuit when the machine is at high speed.**

**⚠ Strictly prohibit from unqualified people's operation. Only qualified personnel are allowed to perform any installation, operation and maintenance work.**

**⚠ The power of the traction machine must be from a driver with closed control type. Direct connection to the motor may destroy it.**

**⚠ Brakes must be inspected at regular intervals, please refer to appendix I.**

**⚠ Hand winding device is for emergency rescue only, It is not allowed for elevator commissioning.**

**⚠ Please regularly check whether there is oil on brake wheel. If so, please promptly wipe off to prevent brake torque reduction caused by oil.**

**⚠ Do not overfill the grease otherwise might cause oil leak.**

## ***1. Product description***

This series of traction machines are mainly consisted of permanent synchronous traction machine, brake system, traction sheave. Its principle is that the driver supplies 3 phase varied voltage and frequency power for the machine according to the feedback of encoder, then inside of the motor will generate rotary magnetic field, which will drive the permanent rotor rotating with synchronous speed. Through the friction between the traction sheave and ropes the car of the elevator can be up and down.

This series of traction machine's each designed performance and production are all accord with the regulation. The performance of every machine was under strictly test before sending out, that means the quality and performance of the machine can accord with standard.

## ***2. Application***

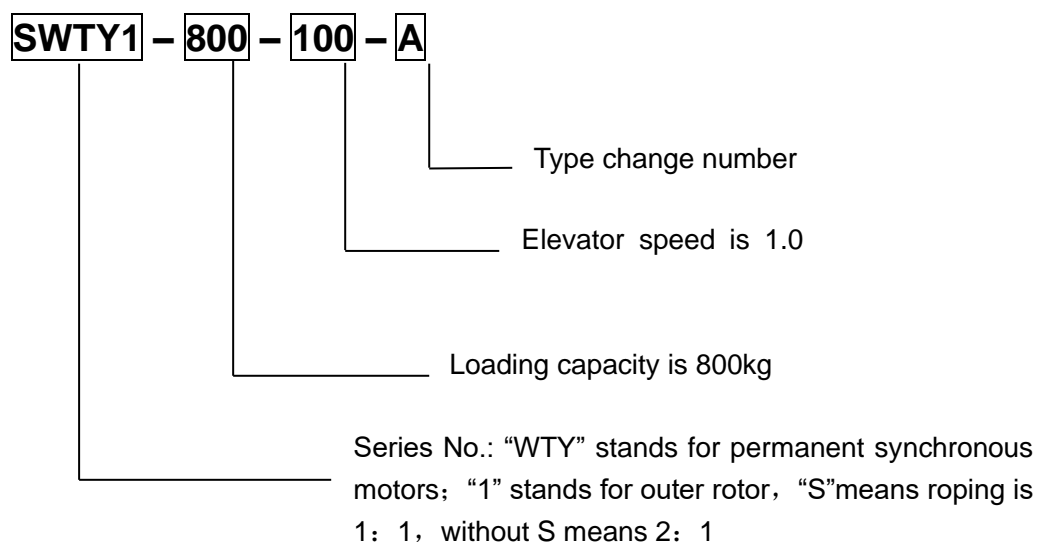
This series of traction machine can be applied as a driver for upright hoisting of any kinds of passenger elevators, medical elevators and goods elevators.

### 3. Working Conditions and Environment

- Altitude should be less than 1000m, over 1000m need correction according IEC60034-1.
- Temperature in the machine room should between 5 and 40 degrees centigrade.
- The deviation between power supply and rated power should be less than  $\pm 7\%$ .
- Air should contain no corrosive and flammable gas.
- The comparative humidity should be less than 90%, monthly average lowest temperature should not exceed 25 degrees centigrade.
- Lubricant is not needed on the surfaces of traction sheave and ropes.

### 4. Machine type code

The code of traction machine is composed of 4 parts, the meaning of each parts is as follows:



### 5. Transport and Installation

#### 5.1 Open the housing and Transport

In the process of opening housing, check the nameplate parameters and machine type; make sure it is the right type for using. Check the packing list first to make sure if all the components are ready after opening the housing and if the machine is damaged or not. If any damage has been occurred during transport, make a notice of claim to the forwarder or tell our company directly. Store the motors only in closed, dry, dust-free, well-ventilated. Make sure rope hook clasps the ring on the machine before suspending; keep steady and no crash during suspending. The eyebolts are designed for the specified machine weight. Suspension of additional loads is not permitted.

#### 5.2 Installation

Before installation one should use 500V Mega-ohm meter to test the winding's insulation resistance to the ground, the resistance should not less than 1MΩ, otherwise one should dry the machine first. The installation of the machine should accord with the arrangement of machine room, during installation one should not disassemble any parts of the machine arbitrary. If needed, the installation should carry out by professional personnel; and keep clean of the machine room.

Note: because the rotor contains permanent magnets, beside the traction machine no scrap iron can appear, in case of going into the machine.

### 5.3 Electrical Connection

Main Electrical parts are consisted of motor, sensors. Among them the terminals of motor and sensors are all in the terminal box. The terminals' connection is show in box.

### 5.4 Pulse voltage insulation structure

5.4.1 without energy feedback and non-AFE energy feedback, the insulation structure pluse voltage grade: Phase is IVIC C, Ground is IVIC B.

5.4.2 AFE energy feedback, the Max permissible peak-to-peak voltage is as follows:

- Allowable value of phase to pahse= $2 \times \text{DC bus voltage} \times \text{Overshoot factor}$
- Allowable value of phase to ground= $0.75 \times 2 \times \text{DC bus voltage} \times \text{Overshoot factor}$

|                       | Phase to phase | Phase to ground |
|-----------------------|----------------|-----------------|
| Overshoot factor (OF) | 2              | 1.5             |

### 5.5 Main Circuit of Driver and Output Connections

The power of the traction machine is supplied by driver, and the U、V、W terminals should be connected with the ouput terminals of driver. If the machine can not rotate, change any two terminals between U、V、W. The shield of driver and the traction machine should have good earthing.

### 5.6 Inspection and Preparations Before Operation

Before operation, one should inspect the following items:

- 1) check if the electrical connection is right or not.
- 2) affirm there is no short circuit of exposed parts and no short circuit to ground.
- 3) affirm the connection of terminals, inserting connections and bolts are firm enough.

### 5.7 Connections of Brake

Connect over excitation rectifier with magnet according to connection diagram, and then one can give over excitation rectifier electrical power.

**⚠ Note: wrong connection, open circuit and short circuit may lead to damage of over excitation rectifier.**

### 5.8 Brake adjustments (Refer to appendix 1 for details)

The brake system had adjusted before leaving factory. So it does not need to adjust when at fixing site. If really needed, one can adjust the compressing length of springs using spanner, if increase the length, the brake torque will decrease, contrarily the brake torque will increase. One also can adjust the gap between brake tile and brake sheave through adjust screw on brake arms.

**⚠ Note: during adjustment one cannot let the two end bolts between**

lever and brake died, if they died may lead to the elevator out of control or even crashed.

## 6. Handwheel device instructions

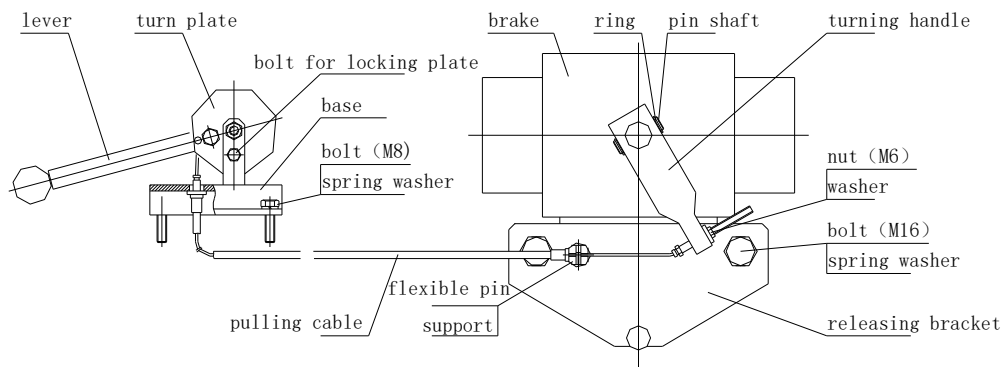
The elevator can be lifted through handwheel devices to save passengers if the power is off or other faults happen. There should be two qualified people to do hand wheeling. First of all, make sure the power is off, after that, let the gears on handwheel connect with the gears on traction machine, then one person open the brake, the other one hand wheeling the machine to the level and open the gate to let passengers out.

**⚠ Note: before handling, make sure the power is off. The two persons who operate the machine should cooperate closely, in case of damages to people.**

### Installation and Application of Long-distance Releasing Device

The long-distance releasing device has been adjusted before leaving factory. Customers usually do not need to adjust; the following steps can help you to install the device by yourself.

The picture might have some difference with machine because of product improvement just for your reference.



### 6.1 Installation

- 6.1.1 Spread the steel cable.
- 6.1.2 Remove the former rope guard (the same outline as releasing bracket), and install the releasing bracket, adjust the distance between releasing bracket and outer diameter of traction sheave (about 5mm), screw down bolt(M16) and the spring washer.
- 6.1.3 Remove the turning handle of the brake and leave two rings for later use, put the turning handle inside the hole of the brake, then using pin shaft to fasten, and the two ends using rings to lock up.
- 6.1.4 According to the above drawing, put the steel cable inside the support of the bracket, and put flexible pin into one small round through hole, to stop the steel cable from slip off the support.
- 6.1.5 Put the pulling cable through the lever, enclose with washer, screw nut (M6), and frap the steel cable.

6.1.6 Fix bolt (M8) and spring washer.

**⚠️Note: There should be some space leaving for curvature of pulling cable on fixing base**

## **6.2 application**

6.2.1 Remove bolt for locking plate.

6.2.2 Pull the lever upward, the lever rotates and the brake acts then the traction sheave can be rotated.

6.2.3 After releasing operation, lock the turn plate with bolt for locking plate in case of suddenness releasing.

- i. If releasing results is not as expected, adjust nut (M6) little by little to get releasing function.

## **6.3 Notes**

6.3.1 When fixing the long-distance releasing device, make sure the pulling cable arranged reasonably and glidingly, with no twist and knot or other situations affect torque transporting. If there need curve the cable, curved radius less than 400mm is advised.

6.3.2 The user should leave enough space for avoiding the curved radius too small when fixing the releasing base. The curved radius of pulling cable in this place should be less than 200mm; otherwise the release will be hard or even can not release and the cable broken.

6.3.3 The early fasten force of pulling cable cannot be too high, which can release but won't affect brake torque is ok. If it is too high, this may reduce the brake torque even makes the brake out of work.

6.3.4 The fixing style of releasing devices of 1000kg, 2.5m/s and above are a little difference, but the same instructions.

## **7. Maintenance**

7.1 The 800kg, 2:1 and above traction sheave end adopt open bearing, this need the customers do maintenance work periodically.

7.2 The bearing of traction sheave end was injected grease, when doing maintenance work; customers should inject the same kind of grease.

7.3 Customer can inject grease through grease zerk and protect the injection hole from dust inside the cup. Grease should be refilled according to machine label show. Please do not overfill the grease otherwise might cause oil leak. The back bearing is double sealed bearing, which does not need to maintain.

7.4 The sealed bearings do not need to maintain (No lubrication label on front and rear ends).

## **8. Notes**

- ⚠️** Keep the machine room clean and dry.
- ⚠️** Keep the traction machine clean.
- ⚠️** Affirm the brake system is reliable and fray or not.
- ⚠️** The brake should disassembly and maintenance work each year.

- ⚠ Checked and clean oil or debris on the brake wheel and brake shoe surface in time when maintenance.

## Appendix 1 brake installation instructions

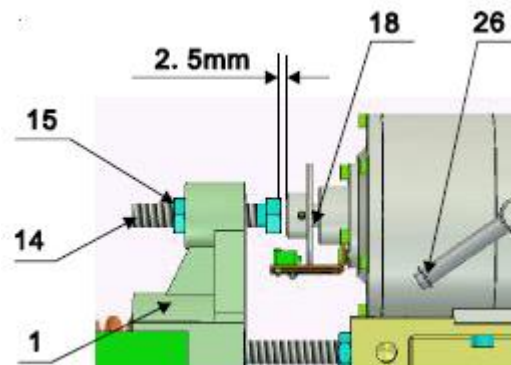
(Different types have some differences, if changed without notice is allowed)

### I Important Notice

- ⚠ In the event to adjust two sides of brake at the same time, the elevator should be unloaded and to be lifted to the upper end, then put the counterweight on the buffer to prevent from slipping accident.
- ⚠ Before the counterweight of elevator is not stable on the buffer, if want to adjust the brake torque and release gap, right and left side shall be done respectively. Before adjust one side, stress the brake spring (12) of this side tightly so that to reach enough brake-torque, then adjust.
- ⚠ Before normal operation or experiment with power, reset the handle and remove the handle lever for threaded joint (the handle lever for clip-spring joint is lighter that don't need to be removed).

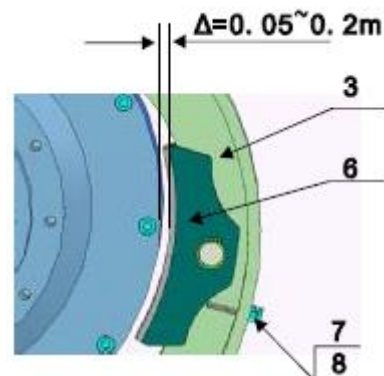
### II Adjustment for Releasing the Brake and Noise

1. Adjustment for magnet release stroke when power off, push the magnet moving mandrill (18) in right figure inward until it can't move. Screw the release bolt (14) so that the gap between release bolt (14) and magnet moving mandrill (18) is around 2.5mm (tested by gauge). The dimension of gap is reserved for null stroke for brake. The magnet design stroke is 5mm. Effective stroke of magnet equals design stroke subtracts reserved null stroke.



2. Adjustment for release gap

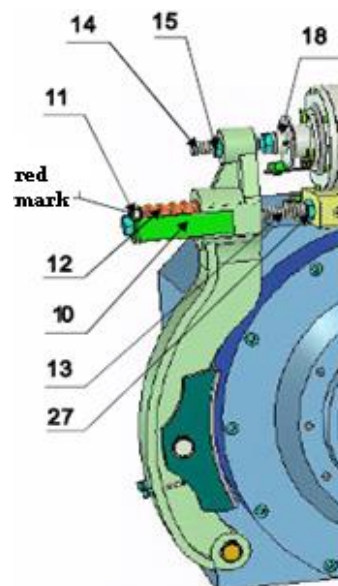
When release gap can be measured directly, power on to release the brake or by hand. Use the gauge to measure the gap between friction pad (6) and brake pulley. The gap should be 0.05 0.2 mm. The value could be as small as possible as long as no friction between friction pad (6) and brake pulley. If the gap is too big, the noise of locking brake will increase. If the gap is too small, there would be friction between friction pad and brake pulley, screw the release bolt (14) along the brake arm into magnet moving mandrill (18); Otherwise, loose release bolt (14) outwards. It





should not exceed 30 for each adjustment until there is no friction between friction pad (6) and brake pulley fitly. Lock the nut (15) under Power-on-release condition when the gaps of both sides are identical.

3. Adjustment for brake shoes after the brake shoes contact with the brake pulley completely, adjust the bolt (7) and let it contact with brake shoes (3) slightly. Test the gap between brake Shoes and brake pulley when power-on -release or manual-release. The gap should be even on upper and lower. At last lock the nut (8).



### **III Adjustment for Brake Torque and Lock-brake Synchronization**

#### 1. Adjustment for brake torque

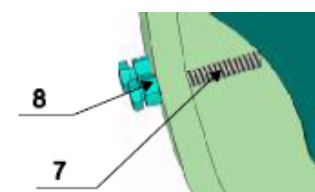
Loose the nut (15), turn out the bolt (14) and loose the nut (8). When the brake shoes contact with the brake pulley completely, adjust the bolt (7) until it contacts the brake shoes slightly, and the bolt (14) can't stress the magnet moving mandrill (18) tightly. According to the corresponding table between springs compressed length and brake torque on the brake arm, screw brake lever (13) inwards or screw the nut on the brake lever to compress the spring and get required brake torque. Or use the torque test device to measure torque (use torque wrench according to the brake torque required by tractor). Here, the spring lengths of both side of brake should be equivalent. After finish adjustment for brake torque, mark all the contact positions on torque ruler (10), brake lever (13) and spring base (11).

#### 2. Adjustment for lock-brake synchronization

Observe the lock-brake synchronization on both brake arms: when locking brake with enough brake Torque, if two sides are not synchronal, increase the spring stress on slow side and decrease the spring stress on fast side until reaching synchronization. After finish, check the brake torque and lock all fasteners, and then do the brake-torque test or elevator static-load test. If the test is not eligible, re-adjust the synchronization.

#### 3. Adjustment for brake speed

For the brake with over-excitation rectifier, when the brake torque meets the requirements, if there is back-car phenomenon and the problem can't be solved by adjusting frequency converter, the lock-brake selecting wire between terminal 3 and 4 of excitation rectifier can be removed that will fast the lock-brake speed and increase the noise. (Remark: there are two kinds of brake speed:



Slow locking speed is with little noise when terminal 3 and 4 of excitation rectifier are short. Whereas fast locking time is with much noise. )

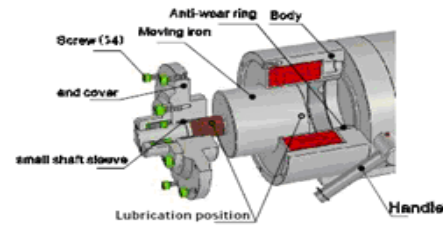
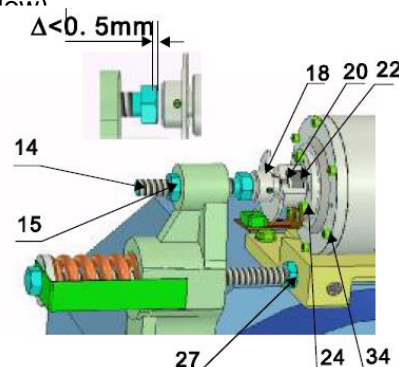
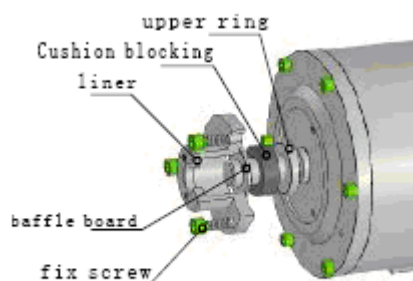


Figure 18

### IV Troubleshooting

1. If the magnet is overheating, (1)  
Check if the coil is short between turns. If yes, replace magnet. (2)Check if relative contactor burns out. If yes, manage it in time.
2. The green light (operation indicating light) is on when lock controller works normally. If over current occurs due to magnet is short between turns, break down or short, the controller red light is on (problem indicating light). The controller will cut down the power automatically and lock the brake automatically. The controller will get back to work automatically after solving the short problem. If the problem is due to short between turns, please replace the magnet.
3. Check the brake regularly when the power is on; observe whether the magnet moving mandrill can operate smoothly and whether there is some clog phenomenon. At least remove brake coil and check 1 year a time. If yes, check and maintain (loose the release bolt (14), remove shaft cap, screw down the screw (34) and then open the magnet end cover). During remove, clean the friction pairs of moving iron core and magnet motive mandrill. Smear some carbon molybdenum for lubrication and then assembly. (See figure at left).
4. Check the brake one time at least per year. The method is as same as item 3.
5. Check the brake lock time and whether the brake spring is loose or broken termly. If the spring is loose, compress it to the required length. If the spring is broken, replace it. After check and maintain, lock the nut (27) and mark with paint.
6. Replace cushion blocking when the magnet is used more than 1 million times or the noise increases, change the cushion blocking. The method is: remove the screw, take out the liner and the rubber pad of baffle (the upper ring is still on the shaft) and then replace the cushion blocking. (See figure below)



7. Termly check the gap between friction pad (6) and brake pulley. If there is friction on pulley, loose the lock nut (15), turn the release bolt (14) inwards by a certain degree. The gap should be 0.05~0.2mm, if the gap is too big, the noise of locking brake will increase. Screw the bolt (14) outwards 30 degrees orderly until the gap is small and

there is no friction. After adjustment, lock the nut (15) and mark with red paint.

8. Termly check the gap  $\Delta$  between the lock bolt (14) and magnet moving mandrill (18).after lock the brake when switch off, push the magnet moving mandrill inwards until reach the innerest place of magnet. Use the gauge to measure the gap, which is not allowed less than 3mm, replace it in time.
9. If  $A=0$  the brake shoe must be replaced.
10. If the magnet can't release after power on, check if the spring is too tight, and if the contactor of relative brake circuit in the control panel is paste, burn or virtual connection. If yes, handle it in time.
11. When the magnet noise is larger adjust the gap between brake pulley and friction pad until minimal and no friction. For the magnet that more than one year after being used or after checked, if the gap has already adjust to minimal value, the noise can't meet the requirements, loose the screw (24) and replace cushion blocking (22).

**Note: do not loose screw (20)!**

