

**→ Usage Instructions**

**In order to ensure the safe, reliable and quality operation of the electric lift, elevator staffs must read the instructions carefully and follow the relevant provisions of this manual, as well as comply with GB7588-2003 《Safety rules for the construction and installation of electric lifts》 (egvEN81-1:1998 《Safety rules for the construction and installation of electric lifts》) before installing, debugging and using this product. The manufacturer doesn't take any responsibility for any personal or equipment accident caused by any improper handling or violation of the abovementioned provisions during the process of installation, debugging, usage, maintenance and repairing.**

**→Warning:**

**①Installation and later maintenance of the traction sheave must be done by professionally trained personnel. Please contact our company if any disassembly or assembly is needed. Any unauthorized disassembly or assembly of the permanent-magnet synchronized traction sheave may cause damage to the machine and personal injury.**

**② The traction sheave must run with power supplied by frequency converter. Do not energize it directly.**

- ③ After the traction sheave is under the condition of power outage and band-type brake, the three phase power line terminal must be short-circuited.
- ④ The traction sheave is generating when it rotates passively. Higher voltage will be produced at the terminals of the motor at that time. Avoid electric shock or damage of the external device.
- ⑤ The connecting steel rope of the remote operation brake loosening device must be laid out smoothly. Do not twist, twine or fold it.
- ⑥ Oil and other impurities should be avoided between the brake-shoe and the brake wheel lest insufficient brake torque is caused.
- ⑦ Before and after opening the package, guarantee that the traction sheave should not be caught in the rain nor settled in a damp environment.
- ⑧ The electromagnetic coils of the motor and the brake are heating parts. Any other stuff that will have an impact on their heat dissipation is not allowed to be covered over them.
- ⑨ When the motor is rotating at a high speed, braking by direct short-circuit of the power line terminals is forbidden. But short-circuit of the power line terminals under the condition of zero speed start in emergency is allowed, for it will realize emergency rescue by making the car move up or down slowly.

→ Tips:

- ① The traction sheave's encoder connecting line must be put in a different slot

to the one for its three phase power line. Closely parallel routing of the lines is forbidden strictly while the slot material must be metal conductive material.

② There must be 4 shock pads for the traction sheave, among which the one with a red mark is for the side of the traction wheel.

③ If there is any noise or vibration during the operation of the traction sheave, please take the following measures.

I Confirm whether the noise or vibration comes from the traction sheave itself.

II Slight vibration of the lift can also be caused by the traction sheave's uneven frame or insufficient stiffness .

III Make sure if the traction sheave's frequency converter is well grounded and the encoder's signal line is well shielded.

IV See to it that the technical parameters of the traction sheave that needs inputting frequency converter are correct. The technical parameters of the traction sheave are on the nameplate or certificate of merchandise.

V Adjust the PI parameter of the frequency converter's speed loop and current loop, or adjust its carrier frequency (usually 8K~12KHz).

VI If you cannot solve the problem after carrying out the aforementioned measures, please contact the manufacturer of the frequency converter for help.

## 1. Product descriptions

WYJ103-05 gearless synchronous traction machine consists of PM synchronous motor, traction sheave, brakes device and encoder etc.

### **Motor:**

It is an inner-rotor three-phase synchronous motor. The stator winding is insulated up to F class. And thermistor with positive temperature coefficient is embedded internally for temperature inspection in consideration of the control characteristics. Bearing located at front end is self-aligning roller bearing and back end is Column roller bearing. There is speed/position measuring system at the back end of shaft. There is feedback system at end of rear bearing to monitor speed and position and standard configuration is Heidenhain ERN1387 encoder and Nemicon SBH-8192-5MD encoder.

### **Brake device:**

These devices are brakes that generate stall force by spring. It has exciting windings. When the windings are excited by the overexcitation rectifier, electromagnetic force will counteract the spring's force to release the brake. Overexcitation rectifier changes from full-wave to half-wave after a fixed period to keep the brake open. Brake will resume automatically after power-off. This traction machine has not its own overexcitation rectifier mentioned above. Customer ought to set it in the lift control system by themselves.

Microswitches are used to monitor the braking state. When the brakes are open, the "NO" contacts are disconnected.

Braking force can be adjusted by adjust the four M20 nuts besides the brakes to change the length of springs.

### **Traction sheave:**

Six M14 bolt holes are provided on the front side of traction sheave permitting a mechanical return motion device to be fitted in case of an emergency.

## **2. Working condition and motor data**

The following ambient conditions must be ensured on site:

**Altitude:** Max. 1,000 m (Lower load when the altitude is higher than 1,000 m )

**Ambient temperature:** 5~40°C

**Ambient air does not contain corrosive and flammable gases.**

**Max. relative humidity:**  $\leq 90\%$  while the average lowest temperature of that month is no more than 25°C

**Motor insulation grade:** F

**Motor pole:** As per data sheet

**Protection level:** IP42

**Cooling-down method:** IC00

The permissible rate of voltage change is less than  $\pm 7\%$  of rated voltage

## **3. Inspection before usage and Installation**

### **3.1 Inspection before using the traction sheave**

● Check the completion of the package and whether there is a sign of getting damp when opening the case. If the components of the traction sheave have got rusted because of moisture, derusting treatment will be a must;

● Check the data on the nameplate and confirm whether the traction sheave model meets the need of usage;

● Check whether the traction sheave's structure parts have been damaged, its fasteners have been lose or felt down and its brake system is flexible.

● Use a 500v megohmmeter to measure the insulation resistance of both motor windings and electromagnet field coil and make sure the value is no lower than 0.5 hegohm, or drying treatment will be needed.

### 3.2 Installation of the traction sheave

Installation of the traction sheave must be conducted strictly in compliance with the drawings offered by the factory to ensure the lift's traction condition meets the design requirements. The traction sheave must be hoisted for installation as a whole and disassembly and installation is absolutely forbidden.

Please check the allowance load of base before installation, and the level of installation should not more than 0.1mm. Using 4 pcs M24 bolts which with mechanical strength degree 12.9 to fix traction machine on base, and tighten torque of bolt is 880N.m. Please unload winding gear on traction sheave before installing steel, then unload shield. After installing steel rope, then install shield (the distance between steel rope and shield should less than 3mm), and finally to in seam winding gear (the tighten torque of 6 M14×35 is 180N.m).

## 4. Electrical connection

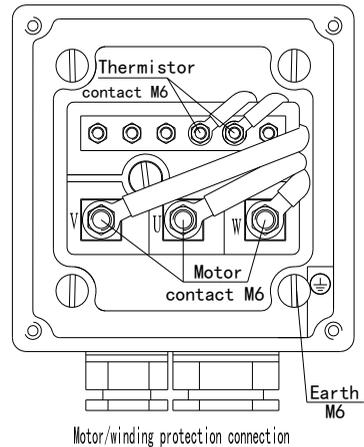
Have the electrical connection done by a qualified electrician. The connection of each contact must be firm and the nuts must be screwed tightly.

The terminal box for motor windings and thermistor is located on machine side, while the one for brakes and microswitches is on the top of the machine.

### 4.1 Motor windings/Thermistor connection:

Terminal box of motor winding and thermistor is shown in the drawing:

① Three M6 bolts connect with U, V, W output of inverter. Sometimes, the order of three phases should be changed when the inverter starts its self-learning on the first time. Thus, the connection of motor and converter needn't set exactly according to phase. Shielded cable should be used as power cable to connect the motor and converter. And its shielded layer should be earthed reliably and detached with encoder cable.



② Two M3 bolts connect with thermistor, which acts as motor winding's temperature sensor. They have no polarity. When the temperature of windings is up to 145°C, their resistance will be more than 1650Ω and the safety system will start then.

③ The M6 bolts at the right-bottom corner of the terminal box works as earthed

bolt at the same time. The motor must be earthed reliably when used.

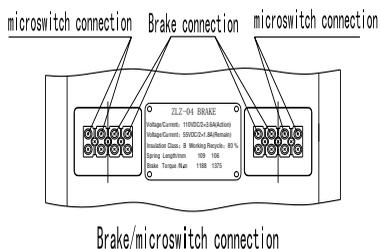
④The maximum allowable voltage rise rate on the terminals inside the junction box of the main engine is  $1.3\text{kV}/\mu\text{s}$ , and the highest voltage is  $1.3\text{kV}$ . if the above mentioned values are surpassed, a filter or external series reactor will be used. The filter or external series reactor will prolong the motor's service life but will lower its maximum torque by  $3\sim 5\%$ .

⑤To prevent the main cable (the output cable of the frequency convertor) from disturbing the surrounding space with electromagnetic radiation, and the signal transmission cable (the junction cable between the encoder and the frequency convertor) from being disturbed by electromagnetic radiation, the main cable, a three-core cable with shield, should be as short as possible. The two ends of the metal sheath shielding the cable must be twisted and earthed at the same time. The current density of the main cable should not be higher than  $7\text{A}/\text{mm}^2$  and its line drop no higher than  $0.3\text{V}$ .

## 4.2 Brake/microswitch connection

The terminal box for brake/microswitch is shown in the drawing.

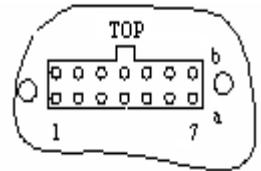
Those two sets of M3 terminals at the edge of the terminal board belong to microswitches



working for monitoring the brakes' switching state. The contacts of the microswitches are designed as NO contacts and have current carrying capacity AC220V/100mA. That set of M5 terminals in the middle of the terminal board belongs to brakes. When they carry rated current, the brake will be opened. With normal temperature, parallel connecting resistance of two brakes' excitation windings is  $51.5\Omega$ . We recommend the bridge rectifier that adapts to AC220V circuit and has rated current 10A as brakes' power supply. Brake use overexcitation to start-up at DC220V(DC110V) and hold at DC110V(DC55V). Terminals on the terminal board connect with brake windings directly. Traction machine itself has no transform device for overexcitation voltage. User has to add it into the lift control system with additional design.

### 4.3 Speed/Position measuring system connection

This system is located at the back end of shaft. The standard configuration is Heiden hain ERN1387 sine-cosine photoelectril encoder and nemicon SBH-8192-5MD encoder. It is connected via a 14-pole signal plug connector. The function of each pole of those plugs is shown in the following table:



6b	2a	3b	5a	4b	4a	7b	1a	2b	6a
A		B		R		C		D	
+	-	+	-	+	-	+	-	+	-
1b		7a		5b		3a			
Up +5V		+5 V sensor		0 V		0 V sensor			

Please refer to the instruction of encoder for the details of those functions. That

encoder instruction is supplied as one of the necessary documents together with the traction machine. Be careful to the plugs and cables. Don't use caustic flux. Cables for signal should have shielded layer that must be earthed reliably. And signal cable must be detached with power output cable of converter. Ensure the firmness of plugs and signal cables, correction of connection between plugs and the converter, safety of the earth wire and encoder shell. Otherwise, traction machine will eventually not work well.

We recommend the use of an appropriate cable set to connect the measuring system to the converter system. Cable sets can be supplied as accessories.

Signal cable should be fixed on the motor frame after plugged into encoder. Don't have the plugs and weld bear the weight of cable.

The encoder is matched to the associated converter. Do not change the adjustment as this may make it impossible to use the motor.

We can also provide other speed/position encoder on request.

## **4.4 Earthing**

For safety reasons, it is very important that the motor be properly and carefully earthed!

When using shielded power cables, make sure the cable shield metal contacts the motor frame over a large area. This is achieved e.g. by special cable glands provided for shield contact.

## **5. Operation and maintenance**

### **5.1 Max. car deceleration permitted**

Relationship between max car deceleration permitted and rope angles is shown in the following table. Please note it when adjust the elevator!

Capacity kg	Speed m/s	Proportion of ropes	Cass mass (P) kg	Rope angle	Max. deceleration m/s <sup>2</sup>
1350	1.00	2:1	1620~2160	180 °	1.18
	1.75	2:1	1620~2160	180 °	0.98
	2.5	2:1	1620~2160	180 °	0.90
1600	1.00	2:1	1920~2560	180 °	1.20
	1.75	2:1	1920~2560	180 °	1.02
	2.0	2:1	1920~2560	180 °	0.98
	2.5	2:1	1920~2560	180 °	0.90

Note: If the weight of lift is out of the range, i.e.  $P = (1.2 \sim 1.6)$  rated weight  $Q$ , please contact NingBo ShenLing Elevator Accessories Co., LTD.

## 5.2 Initial operation

Motor must cooperate with inverter. The converter needs self-learning before initial operation to make sure the related position of rotor magnet and stator winding centricity. Self-learning must be processed with null load.

Finish the connections according to this instruction and ensure make no mistake, and then turn on power. Traction machine run with null load (with no steel rope). Start self-learning according to the process presented in inverter operation instruction. If fail at first time, please change the phase order according to the inverter instruction and start again. If it continues to fail, please check the electrical connection, especially the encoder wires. After successful self-learning, run the system. If the traction

machine works abnormally, the problem is usually related to open circuit in the encoder. Please check and resolve carefully. After successful regulation, adjust the converter speed command to run the motor for 5min on obverse and reverse direction with speed 0.2m/s (about 20r/min) to even the grease of bearing and check the matching of the system.

With KEB F4/F5 converter, position information will be saved after successful self-learning. Even if the traction sheave is driven to turn any angle without power (e.g. return motion), if only the converter or encoder hasn't been changed, the traction machine can work well without more self-learning after power-on.

### **5.3 Normal maintenance**

The operator is responsible for the proper installation of the motor with regard to the safety requirements as well as for its inspection and maintenance as specified in the applicable regulations.

Maintenance is normally limited to the following:

- Check the traction sheave.
- Regrease the self-aligning roller bearing regularly.
- Inspect and service the emergency twin brake.
- Clean the motor surface.
- Check the tightening torque ( 160N m ) of the 12×M14×60-10.9 connecting bolts between the traction sheave and the brake hub.
- Check the tightening torque ( 880N m ) of the four M24 bolts who fasten the motor on the frame.

The lift operator is responsible for regular checks of the brake safety components and the traction sheave, and must include these components in his visual inspection

schedules.

## 5.4 Lubricating instructions

Please add grease every two years, or according to the needs of use. Please add 60 grams each time, we recommend using Shell Jiadu S3 T150J2 Bearing Grease. A conventional grease gun can be used for regreasing, using the oil cup. The oil cup is “parked” on the left foot of the machine (viewed facing the traction sheave). The lubricating point is arranged on the rotor side. It is closed with a screwed sealing plug to M10×1. Unscrew the plug and change the nipple when needed, and put them back after regreasing is finished.

## 5.5 Adjustment and maintenance of twin shoe brake

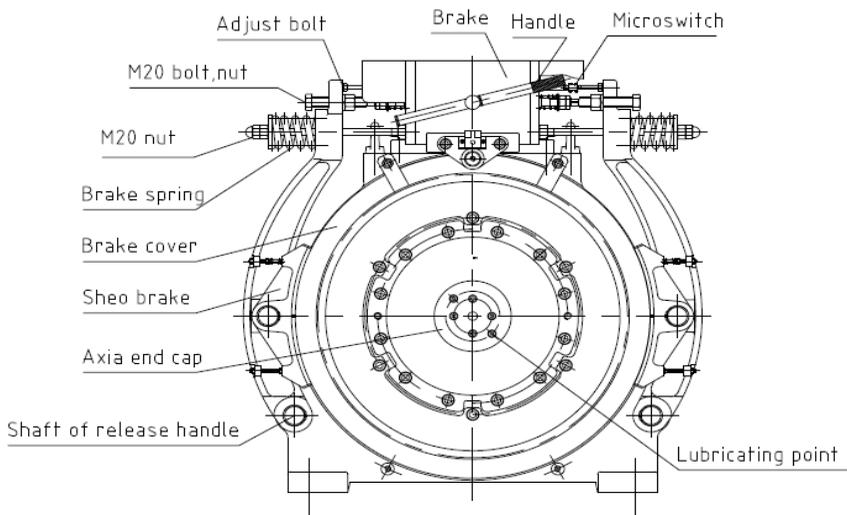
### 5.5.1 Adjusting the braking moment

Adjust the two M20 nuts on the both sides of the brake to change the braking moment. Keep the force of those two compressive springs same during this process. The relationship between spring length and braking moment is shown in the following table:

1350kg	Spring Length (mm)	114	112	110	108	106
	Moment (N.m)	2*1065	2*1200	2*1335	2*1470	2*1605
1600kg	Spring Length (mm)	112	110	108	106	104
	Moment (N.m)	2*1200	2*1335	2*1470	2*1605	2*1740

Braking moment has been adjusted before leaving factory. User must adjust the spring length to change the braking moment according to relative regulation when

debugging the elevator to keep the braking condition of the machine!



## 5.5.2 Adjusting the microswitches

Unscrew the M8 bolts besides the microswitches shelf. When the brakes haven't been electrified, set the resistance between the terminals of microswitches to be 0. Electrify the brakes and make them open (don't brake), and then measure the resistance. The value should be infinite (open circuit). Adjust the shelf position and screw M8 bolts to fix it. Keep the state of switches be connected and break when brake and brake open.

### 5.5.3 Adjusting the friction gap

If brakes cannot let the rotor run freely when power-on, M20 bolts and nuts can be adjusted for it when power-off, which can change the friction gap and brake noise. Screw the bolts, nuts, etc. after adjustment.

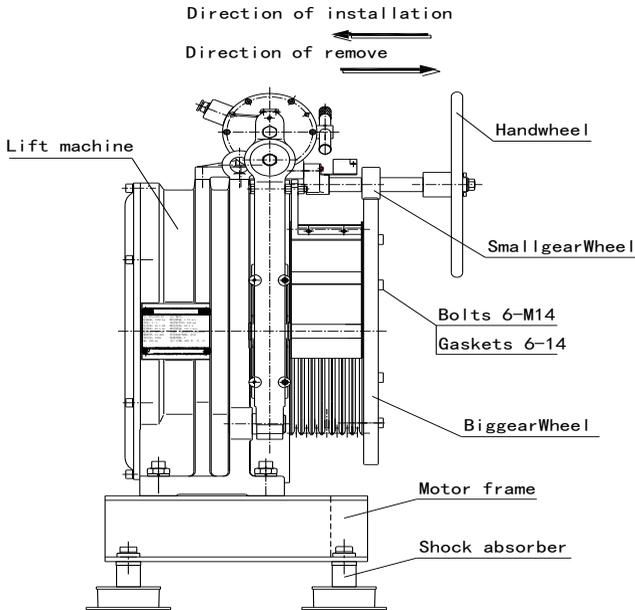
If brakes cannot let the wheel hub run freely when power-on, M20 bolts and nuts can be adjusted when power-off to change the electromagnetic air gap inside the brake so that the friction gap between brake-shoe and brake hub and noise created when opening or closing the brake will be adjusted. The gap between brake-shoe and brake hub should be as small as possible (but it cannot hinder the brake hub from rotating freely nor create friction noise), and the gap should be 0.1~0.3mm in width. After adjusting the friction gap, lock the locking screws and nuts behind the locking brake-shoe as well as the M20 nuts and spring washer.

## Trouble shooting for braking system:

Fault	Possible cause	Remedy
Braking system does not release	<ul style="list-style-type: none"> <li>① Brake gap too small</li> <li>② Braking system not energized</li> <li>③ Voltage applied at excitation winding too low</li> <li>④ Overexcitation rectifier defective</li> <li>⑤ Lack of electromagnetic force</li> </ul>	<ul style="list-style-type: none"> <li>① Check and adjust the length of spring and M20 bolts and nuts</li> <li>② Check electrical connection</li> <li>③ Check voltage supply to brakes</li> <li>④ Replace rectifier</li> <li>⑤ Check the voltage of contacts, check the resistance of armature, replace the armature</li> </ul>
Braking system releases delay	<ul style="list-style-type: none"> <li>① Too large friction on plunger</li> <li>② Voltage applied at excitation winding too low</li> <li>③ Air gap is too big</li> </ul>	<ul style="list-style-type: none"> <li>① Check the friction of plunger or rotate it</li> <li>② Check supply voltage to coil</li> <li>③ Check and adjust air gap</li> </ul>
Braking system brake delay	<ul style="list-style-type: none"> <li>① Brake shoe mechanically blocked</li> </ul>	<ul style="list-style-type: none"> <li>① Remove mechanical blocking or rotate the plunger</li> </ul>
opening/closing of both sides of band-type brake does not synchronize	<ul style="list-style-type: none"> <li>① Compressive forces of both sides of the brake spring are different</li> <li>② The brake opening distances on both sides of the brake are different</li> </ul>	<ul style="list-style-type: none"> <li>① Respectively fine-tune the amount of compression of both sides of the brake spring (try to equal pressure on both sides if there is enough brake force)</li> <li>② Respectively adjust brake opening distances on both sides of the brake</li> </ul>
The brake is seriously heating	The voltage applied to the brake is too high (no higher than 10% of the brake's rated voltage)	Readjust the voltage applied to the brake
band-type brake noise is too loud	The gap between brake-shoes is too big because the abrasion of the friction plate surface or improper adjustment	Narrow the friction gap by adjusting the M20 bolts outwards

## 5.6 Return motion device

A mechanical return motion device can be fitted at the operator's own responsibility if the lift needs to be moved manually in case of a power-off or breakdown. The use of this device is shown in the following drawing:



When fitting the device, all of the electrical supply must be disconnected! Fix the big gear wheel of the device at the traction sheave with six M14 bolts and spring gaskets (Note: please screw the bolts tightly). Then push the sheath connected with small gear wheel on the handwheel aiming at the hole on the return motion device frame. Note to mesh the big and small gear wheel with each other correctly.

**NOTE:** At least two personnels are necessary for the return operation. One releases the brakes and the other turn the handwheel round to rotate the traction sheave to move the lift. Don't release the brakes when lift is stopped.

After finish above operation, pull out the handwheel. Big gear wheel can be kept

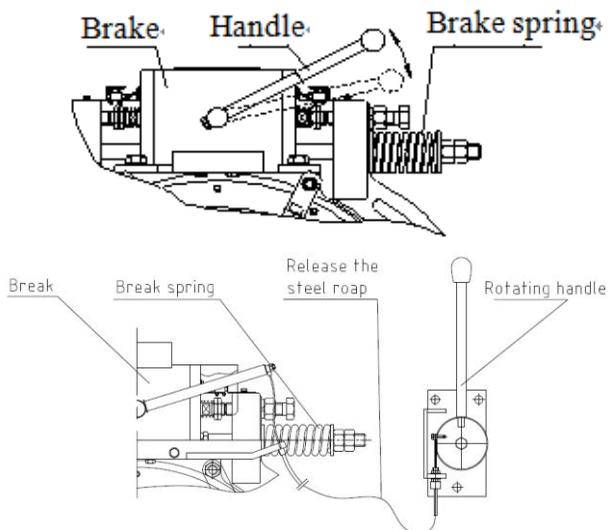
assembled with tightly fixed bolts and gaskets on it.

NOTE: Big gear wheel must be fixed firmly when assembled to prevent from being flexible and falling off, which will result in dangers.

## 5.7 Replacement of the traction sheave

When removing the old traction sheave, secure it against falling down. Two M14 threaded holes for forcing screws are provided in the traction sheave to facilitate disassembly.

When fitting the new traction sheave, be sure to use a tightening torque of 160Nm to tighten the 12 connecting bolts (M14x60-10.9).



When installing and using the barring gear, the rotating handle can also be used to close the brake.

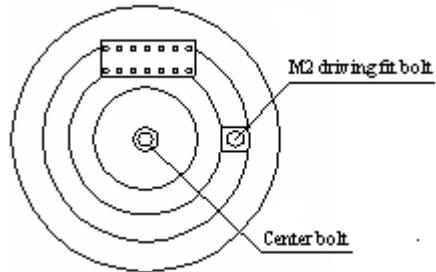
## 5.8 The replacement of traction sheave

When dismantling the old traction sheave, protecting measures must be taken in advance to avoid any injury. There are two M14 bolt holes in the traction sheave and bolts (M14×80 bolts are suggested) can be screwed to push the traction sheave out.

Fasten the traction sheave with 12 M14×60 bolts by exerting torque of 180N·m on them.

## 5.9 Replacement of speed/position measuring system

To replace the encoder, please follow the instruction to unscrew the M2 driving fit bolts on the caulking ring with hexagon ring spanner. Push the encoder shell with hand lightly to make sure the caulking ring is really open and



then remove the center bolts with the spanner. Then screw M6×70 hexagon ring bolts into that holes to push out the encoder.

For installation, first screw the center trip bolts tightly. Then set the M2 bolts on the caulking ring and ensure the ring is tied tightly.

Please refer to the encoder instruction for the tightening torque of each bolts.

Please remove and install other parts of encoder as few as possible.

After the replacement, unload the carrying rope and make the encoder self-learning again with no load.

## 6 Common troubleshooting

### **6.1 Brake fault**

See the common brake faults in this manual for details.

### **6.2 Traction sheave vibration noise**

See the tips on usage in this manual for details.

### **6.3 The traction sheave is overheating.**

① The loss of magnetic pole position will lead to an increase in current. Encoder connection must be checked to prevent disturbance. Self-learning will begin after the encoder is retightened. If the encoder is damaged, replace it with another one;

② The overheating environment;

③ The motor is overloaded and the cause must be checked.

### **6.4 Traction sheave runaway**

① The magnetic pole position is lost. Encoder connection must be checked to prevent disturbance. Self-learning will begin after the encoder is retightened. If the encoder is damaged, replace it with another one;

② Something has gone wrong with control matching.

### **6.5 Traction sheave unusual abrasion**

① The traction sheave doesn't go with the steel rope;

② Traction condition hasn't been rationally designed and specific pressure is not high enough.

① The tension of the steel rope is not equal.

## 7. Accessory

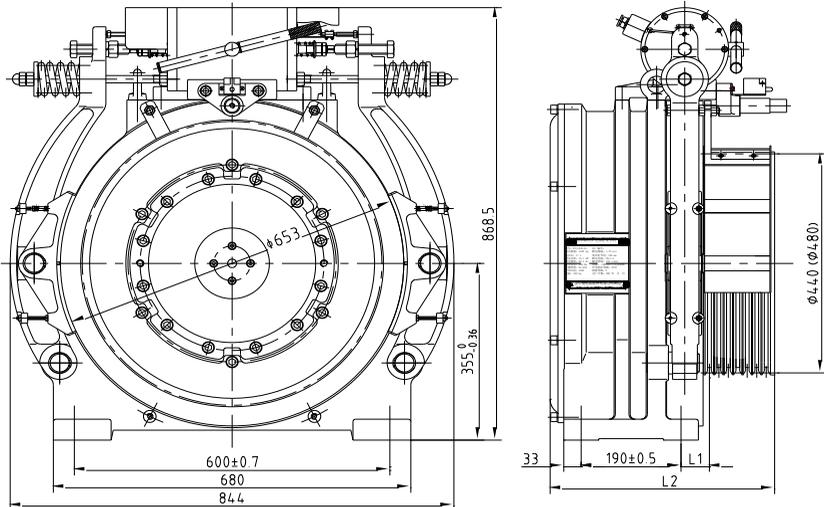
The following table shows accessories for order:

Num.	Accessory Name	Symbol
1	Traction sheave*	NS103005C033-01、NS103005C042-01
2	Traction sheave*	NS103005C034-01、NS103005C043-01
3	Column roller bearing	NJ312ET
4	Bearing blade spring	NS103004D017-01
5	Self-aligning roller bearing	23028CDE4、24028CE4
6	Wire board	NS103004C025G01
7	Measure system	ERN1387
8	The complete set of brakes	NS103005D009G01
9	Friction brake	NS103005D010-01
10	Armature (left and right)	NS103005C025G01

Note : The draft number of traction machine of load 1350kg,speed 2.5m/s is NS103005C034-01; The draft number of traction machine of load 1350kg,speed 1.0m/s and 1.75m/s is NS103005C033-01; The draft number of traction machine of load 1600kg,speed 2.5m/s is NS103005C043-01;The draft number of traction machine of load 1600kg ,speed 1.0m/s and 1.75m/s is NS103005C042-01;The self-aligning roller bearing of traction machine of load 1600kg,speed 2.5m/s is NSK 24028CE4.

## 8. Outline size and technical data

### 8.1 Outline size and mass



Rated load (kg)	1350	1600
L1 (mm)	54	55
L2 (mm)	427	430

Note: The traction sheave diameter of load 1350kg,1600kg,speed 2.5m/s traction machine is 480 mm; The traction sheave diameter of load 1350kg,1600kg,speed 1.0m/s ,1.75m/s traction machine is 440 mm。

## 8.2 Basic technical data

Load kg	Speed m/s	Height m	Torque N m	Force kN	Rotate speed rpm	Power kW	Current A
1350	1.0	50	950	76	86.8	8.6	16.7
	1.75	80	950	76	151.9	15.1	29.3
	2.5	120	1100	76	198.9	22.9	44.8
1600	1.0	50	1100	76	86.8	9.9	19
	1.75	80	1100	76	151.9	18.3	33
	2.5	120	1300	76	198.9	27.2	46

Note: The reference value of balance coefficient is 0.45 in calculation.



# WYJ103-05 Instruction Manual for Gearless Traction Machine



**宁波申菱机电科技股份有限公司**  
**NBSL M&E TECHNOLOGY CO., LTD.**

# Contents

Usage Instructions.....	1
Warning.....	1
Tips.....	3
1 Product descriptions .....	5
2 Working condition and motor data sheet.....	6
3 Inspection before usage and Installation.....	7
3.1 Inspection before usage.....	7
3.2 Installation.....	7
4 Machine connection .....	8
4.1 Motor/Winding protection connection .....	8
4.2 Brake/microswitch connection .....	10
4.3 Speed/Position measuring system connection .....	10
4.4 Earthing .....	12
5 Operation and maintenance .....	12
5.1 Permissible max. deceleration of lift .....	12
5.2 Initial operation .....	13
5.3 Routine maintenance .....	13
5.4 Lubricating instructions .....	14
5.5 Adjustment and maintenance of brake .....	14
5.5.1 Adjusting the braking moment .....	15
5.5.2 Adjusting the microswitches.....	16
5.5.3 Adjusting the friction clearance.....	16
5.6 Return motion device .....	18
5.7 Replacement of the traction sheave .....	19
5.8 Replace of machine sheave.....	20
5.9 Replacement of speed/position measuring system .....	20
6 Common troubleshooting.....	21
7 Accessory .....	22
8 Outline size and technical data .....	23

Address: SHENGANG ROAD#3633, SONGJIANG DISTRICT, SHANGHAI, 201611, CHINA

Postcode: 201611

Service: 4001120201

Fax: 86-021-37011824 转 7017

Website: <http://www.nbsl.com>

Customer Service Email: [service@nbsl.com](mailto:service@nbsl.com)