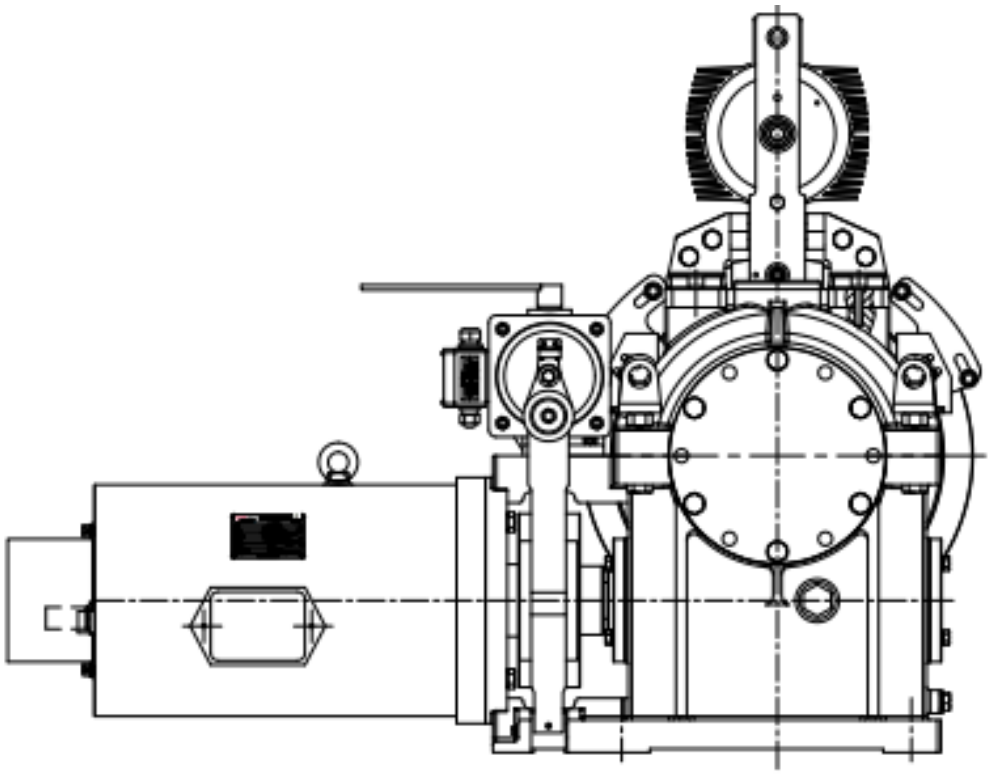
TGD0

Geared Machine

Complete Operation and Service Manual



SUZHOU TORIN DRIVE EQUIPMENT CO., LTD.

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IMPORTANT LIMITED LIABILITY AND WARRANTY NOTICE - PLEASE READ: REVISED AND EFFECTIVE SEPTEMBER 1, 2014

- **Express Limited Warranty - What is Covered:**

Effective September 1, 2014, Torin Drive International, LLC ("TDI") expressly warrants that the machines it sells to you will be free from defects in material and workmanship for a period of 12 months from the date of delivery. This express limited warranty is in lieu of all other warranties or conditions, express or implied (statutory or otherwise), verbal or written.

- **Express Limited Warranty - What is Not Covered:**

This express limited warranty does not cover defects, failures, or conditions in the machines sold to you by TDI that are due to normal wear and tear; abuse; misuse; misapplication; improper installation; improper modification/adjustment/repair; inadequate maintenance; failure to follow the machine's use and safety instructions; or any other contributing factors unrelated to the machine's material and workmanship.

- **All Implied Warranties Disclaimed to the Fullest Extent Allowed by Applicable Law:**

TDI's express limited warranty is in lieu of all other warranties or conditions, express or implied (statutory or otherwise), verbal or written. To the fullest extent allowed by applicable law, TDI EXPLICITLY DISCLAIMS ALL IMPLIED WARRANTIES OR CONDITIONS, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AND THE IMPLIED WARRANTY OF MERCHANTABILITY.

- **TDI Disclaims All Consequential Damages Relating to Its Express Limited Warranty:**

With the exception of the express limited warranty described above, to the fullest extent allowed by applicable law, TDI disclaims, and shall not be liable for direct, indirect, proximate, incidental, economic, and/or consequential damages relating in any way to the installation, use, maintenance, and operation of the machines it sells to you. Specifically, TDI shall not be liable for property damage; loss of profits; labor costs; downtime; legal costs; or any other damages measurable in money that arise from or relate in any way to the installation, use, maintenance, and operation of the machines it sells to you. This disclaimer and exclusion of consequential damages shall apply even if the express warranty fails of its essential purpose.

TDI's liability shall be limited to the terms of this express limited warranty. TDI's Limitation of Liability also applies to any pre-sale consulting with you (including any preliminary technical data consultations or reports); any post-sale consulting with you; and any effort by TDI to repair the machines it sells to you pursuant to this express limited warranty. With the exception of the express limited warranty described above, you assume all risks associated with the machines that TDI sells to you. The implied warranty disclaimer and the liability disclaimer above are made to the fullest extent allowed by applicable law. In the event that some provision(s) of the above implied warranty disclaimer and/or the liability disclaimer are not permitted under applicable law, then all other provisions shall remain in full force and effect to the fullest extent permitted under applicable law.

- **No Other Express or Implied Warranty Applies:**

The express limited warranty described above is the sole and exclusive warranty, express or implied (statutory or otherwise), for the machines that TDI sells to you. No employee, agent, or representative of TDI is authorized to alter, modify, expand, or reduce the terms of TDI's express limited warranty or to make any other warranty on behalf of TDI.

- **Express Limited Warranty - How to Redeem:**

To obtain the benefit of TDI's express limited warranty, please contact Warranty Claim Department, TDI International, 7598 A E Beaty Drive, Suite 102, Bartlett, TN 38133 as soon as possible after a defect in the machine's material or workmanship has been discovered. Please note: you must contact TDI concerning a machine covered by this express limited warranty before you attempt any repair work. Any unauthorized disassembly, repair, or reassembling performed by you will void TDI's responsibilities under this express limited warranty.

- **Express Limited Warranty - What TDI Will Do:**

Machines that are covered by this express limited warranty will be repaired or replaced, at TDI's option, during the warranty period. TDI will cover the expenses relating to the repair or replacement of its machines under this express limited warranty. However, TDI shall not be liable for direct, indirect, proximate, incidental, economic, and/or consequential damages relating in any way to efforts by TDI to repair or replace the machines it sells to you pursuant to this express limited warranty. Specifically, TDI shall not be liable for property damage; loss of profits; labor costs; downtime; legal costs; or any other damages measurable in money that arise from or relate in any way to TDI's efforts to repair or replace the machines it sells to you pursuant to this express limited warranty. If, after two (2) attempts at repair or replacement during the warranty period, the machine defect in material or workmanship persists, then you may elect to receive a refund of your original purchase price for the machine.

(Revised Full/PDF Doc Version of Express Limited Warranty)

1.0 Application

1.1 Overview

The TGD0 Machine is a geared machine designed for elevators. Its worm and gear configuration allows speeds up to 350 fpm (maximum), and an elevator capacity of up to 1760 lbs. 1:1, and 3520 lbs. 2:1 maximum.

The TGD0 machine used a drum brake with dual brake solenoids. The qualified elevator personnel can adjust the length of the spring to control the brake torque.

1.2 Codes and Standards

These machines are designed to comply with ASME A17.1-2005 code. The motors are designed with insulation class F minimum and have been approved and labeled by CSA.

1.3 Environmental Specifications

Operating ambient temperature: 0℃ to 50℃

Storage temperature: 0℃ to 60℃

Humidity: relative humidity of 10% to 95% non-condensing

Altitude: Up to 1000m above sea level without de-rating

1.4 Machine Specifications

Induction motors: 460V / 60Hz / 4(6)-poles / 3-phase

Brake coils: 110VDC/1.1A;110VDC/2.75A

Maximum full load mass: 9900 lbs.

Demountable bronze gear

Sheave diameter: 20.9 inches

Up to 5 x 0.5 in. Ropes

Designed for 180 starts per hour at 40% elevator duty cycle and 1:1 roping

Incremental encoder: 2048 pulse per revolution

Estimated weight: 1700lbs

Optional LEFT HAND (-L) or RIGHT HAND (-R)

Lubricating oil: 7.3L (1.9 Gal) Recommended oil is Shell Omala 460 or equivalent elevator gear oil

Normal Brake Model:	DZE-9E
Pick/Hold Voltage:	110/67 VDC
Pick/Hold Current:	1.1/0.67 A
Resistance:	55 Ohms

Emergency brake model:	DZE-20E
Pick/Hold Voltage:	110/60 VDC
Pick/Hold Current:	2.75/1.5 A
Resistance:	40 Ohms

Detailed Machine Specifications

Model Number		TGD0-1715-DV-R	TGD0-1715-DV-L	TGD0-1720-DV-R	TGD0-1720-DV-L	TGD0-1735-DV-R	TGD0-1735-DV-L
Motor Power	Hp	10	10	12	12	20	20
Elevator Capacity	lbs	1760	1760	1760	1760	1760	1760
Elevator Speed	fpm	150	150	200	200	350	350
Sheave Diameter	inches	20.9	20.9	20.9	20.9	20.9	20.9
Gear Ratio		41:1	41:1	41:1	41:1	47:2	47:2
Motor Use Speed	Rpm	1126	1126	1501	1501	1506	1506
Motor Voltage	VAC	460/208~230	460/208~230	460/208~230	460/208~230	460/208~230	460/208~230
Motor Rate Current	A	13.5/29~26.5	13.5/29~26.5	14.5/32~29	14.5/32~29	24/51.5~47	24/51.5~47
Cwt	%	40	40	40	40	40	40

Table 1 Machine Duty Table

2.0 Machine Component Overview

2.1 Machine Assembly

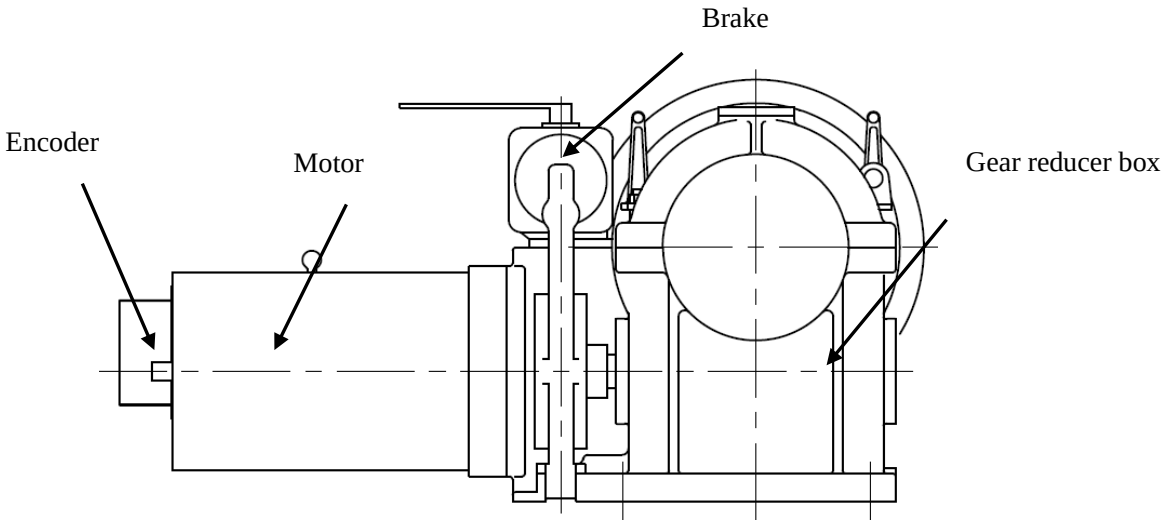


Figure 1 TGD0 Machine Assembly

2.2 Normal Brake Assembly

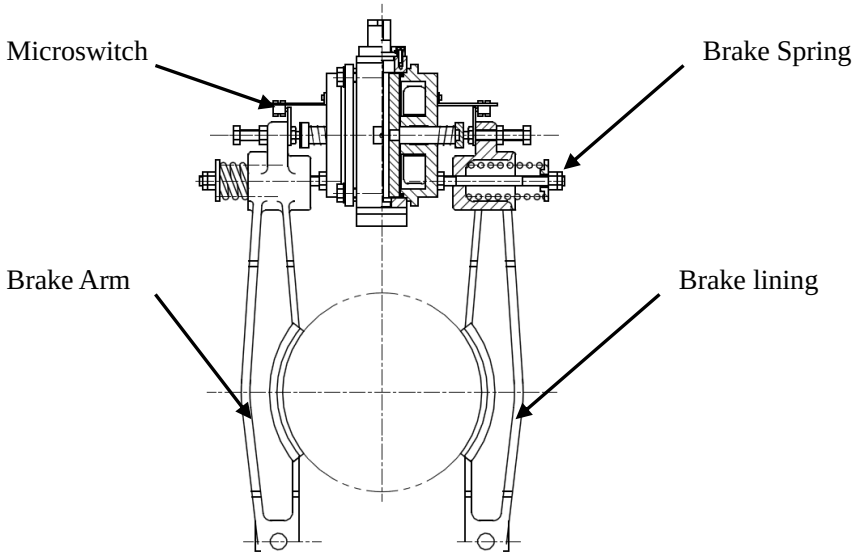


Figure 2 Normal Brake Assembly

2.3 Emergency Brake Assembly

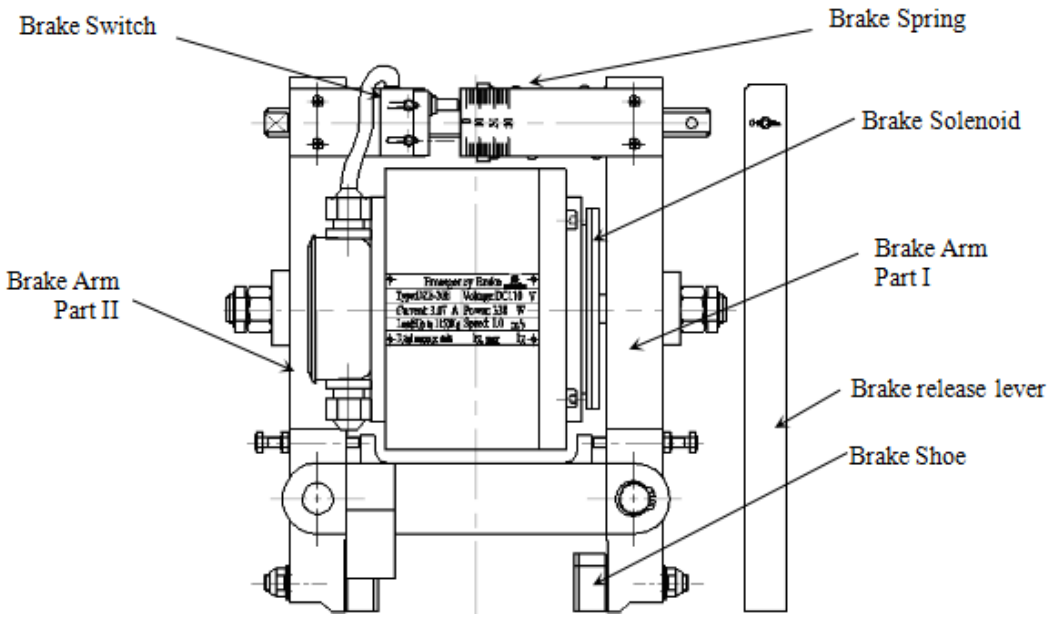


Figure 3 Emergency Brake Assembly

3.0 Safety Precautions

Important! Read this page BEFORE any work is performed on Elevator Equipment.

The procedures contained in this manual are intended for the use of qualified elevator personnel. In the interest of your personal safety and the safety of others, do NOT attempt ANY procedure that you are NOT qualified to perform. Always follow your company and OSHA required safety procedures and policies when performing ANY tasks.

All procedures must be done in accordance with the applicable rules in the latest edition of the National Electrical Code; the latest edition of ASME A17.1; and any governing local codes.

3.1 Terms in This Manual

CAUTION statements identify conditions that could result in damage to the equipment or other property if improper procedures are followed.

WARNING statements identify conditions that could result in personal injury if improper procedures are followed.

3.2 General Safety

Specific warnings and cautions are found where they apply, and DO NOT appear in this summary.

3.3 Electrical Safety

All wiring must be in accordance with the National Electrical Code, and must be consistent with all state and local codes.

3.4 Electrical Hazards

Electric shocks can cause personal injury or loss of life. Circuit breakers, switches and fuses may **NOT** disconnect all power to the equipment. Always refer to the wiring diagrams. Whether the AC supply is grounded or not, high voltage will be present at many points.

3.5 Mainline Disconnect

Unless otherwise suggested, always turn OFF, Lock and Tag out the mainline disconnect to remove power from the equipment.

3.6 Test Equipment Safety

Always refer to manufacturers' instruction book for proper test equipment operation and adjustments.

Buzzer type continuity testers can damage electronic components. Connection of devices such as voltmeters on certain low level analog circuits may degrade electronic system performance. Always use a voltmeter with a minimum impedance of 1M Ohm/Volt. A digital voltmeter is recommended.

3.7 When Power Is On

Dangerous voltages exist at several points in some products. To avoid personal injury, do **NOT** touch exposed electrical connections or components while power is **ON**.

3.8 Product Specific Warnings

The TGD1 Machine MUST be balanced during hoisting. See Hoisting Methods in the Installation section for proper lifting procedures.

Hang the elevator car before working on the machine. Failure to do so may result in severe injury and equipment damage.

4.0 Arrival of the Equipment

4.1 Receiving

Upon arrival of the machine, make a visual check for any external damage immediately upon their arrival on site. If any damage is found that occurred during transit, make a notice of claim in the presence of the forwarder. If necessary, do not put these machines into operation.

4.2 Storage

During storage in a warehouse or on the elevator job site, precautions should be taken to protect the machine from dust, dirt, moisture, and extreme temperatures.

4.3 Hoisting

TGD1 machines can be lifted by using a combination of hooks, chains & slings designed to safely carry the weight of the machine. See Figure 4.

Note: Tighten all eye bolts before hoisting machine, motor or gear box, and always use properly rated hoisting equipment with certified rigging personal on-site. Inspect all equipment/tools being used before every task.

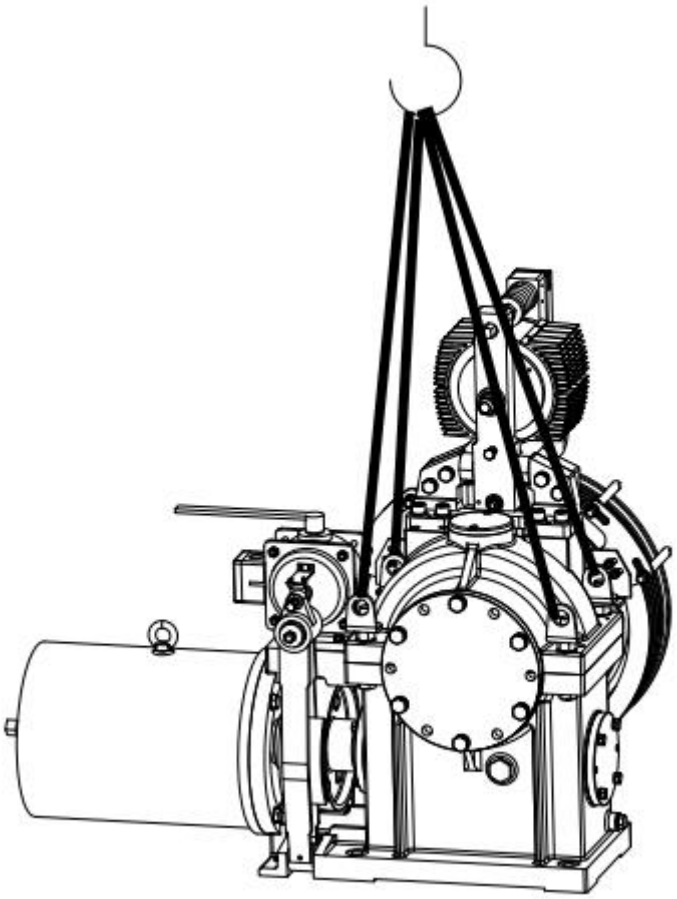


Figure 4 TGD0 Machine Recommended Hoisting Methods

5.0 Installation

5.1 Motor Connection

Use the job wiring diagrams with the motor configuration information to connect the motor to the controller.

Inverter drive output reactor: it is strongly recommended that a reactor to be installed between the inverter and motor to filter out high transient peak voltages that may damage the motor windings.

CAUTION! Before operating the machine, refer to the appropriate Product Manual and verify that the drive parameters for the job are set correctly.

Motor Connection

Connect the motor cable (U, V, W, and grounding) to three phase AC reactor then to frequency inverter output terminal, and check the short-circuiting between the windings and the ground before connection.

Note: Connections P1 and P2 are motor thermal overload connections if needed.

5.2 Brake Connection

The power terminal of brake is BK+ (positive pole), BK-(negative pole).

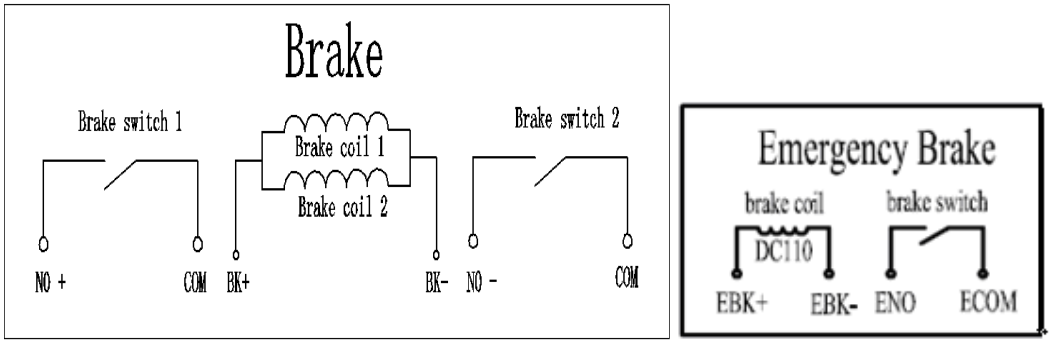


Figure 5 Normal & Emergency Brake Wiring

There are two micro switches installed in the normal brake and one micro switch installed in the emergency brake, which are used to feed back the action of the brake. User can connect it according to your control system requests.

5.3 Absolute Encoder Connection

These machines are supplied with BEI HS35 Incremental Optical Encoder. The incremental resolution is 2048 pulses per revolution. The operating personnel can connect the encoder to the inverter using special shielded-twisted-pares cable by following the figure below for proper encoder signals: A and /A, B and /B, +V and GND (+V and GND is the encoder power supply that can be from 5VDC to 28VDC).

Figure 6 Encoder Terminal Block

6.0 Maintenance

Only qualified personnel are allowed to perform any maintenance work.

6.1 Brake Stroke Check

Please pay attention to the value of brake stroke during the course of routine maintenance.

If the brake stroke is too short, the power of the solenoid cannot push the brake arm to obtain the enough gap, which will result in a disabled brake. Generally, the brake stroke has been adjusted in the factory and does not need to be adjusted in the field.

Suggest check cycle

- 3 months after initial installation
- 6 months after initial installation
- Annually for the remaining life of the product

Benchmark Criteria

The gap which is the bottom of the **Normal Brake Shoe** and the **drum** should 0.1~0.5mm (0.004”-0.02”).

The gap which is at the bottom of the **Emergency Brake Shoe** and the **sheave** should be 0.05~0.1mm (0.002”~0.004”).

6.2 Brake Lining Wear Check

If the brake lining wears too much, the brake will be disabled.

Suggest check cycle

Annually after initial install

Benchmark Criteria

New **Normal** brake lining thickness is 8mm.

The brake lining wear must be <2mm (0.079”). Use steel rule to measure the thickness of the brake shoe, the thickness “A” must be >6mm (0.236”). Otherwise replace the brake lining or replace the whole brake assembly. See Figure 7.

New **Emergency** brake lining thickness is 2mm.

The Emergency brake lining wear must be <2mm (0.079”). Use steel ruler to measure the thickness of the brake shoe, the thickness must be >20mm (0.79”). Otherwise replace the brake shoe. See Figure 8.

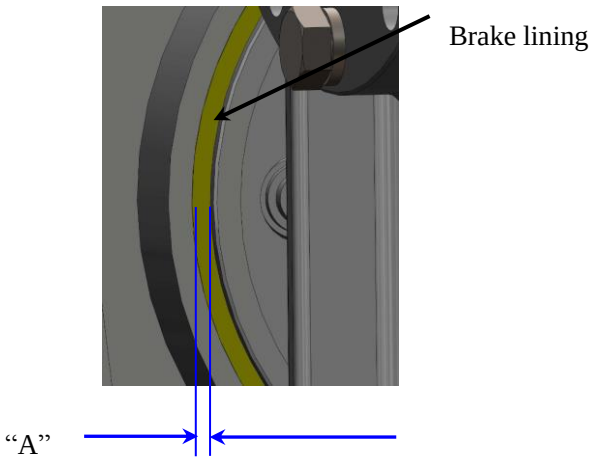


Figure 7 Normal brake lining
(Initial thickness is 8mm)

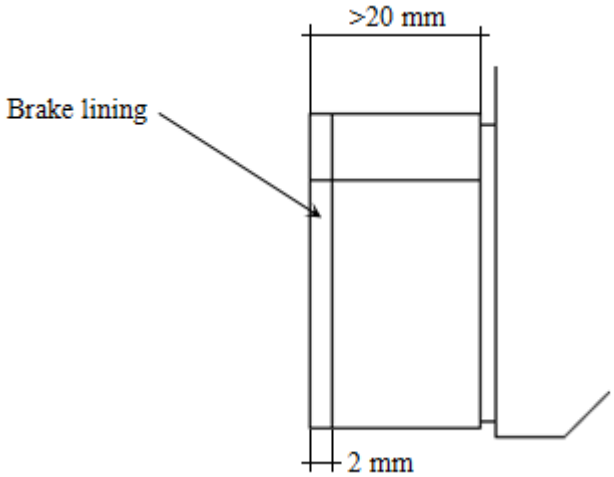


Figure 8 Emergency brake lining

6.3 Lubrication Check & Oil Change

The oil type we recommend is Shell Omala 460 or Kunlun 34# or equivalent elevator gear oil.

CAUTION! **Whether the geared oil needs to be changed depends on the cleanliness and age. Check the oil color, smell and cleanliness and confirm whether oil needs to be changed. If oil is black or smells foul, it should be changed. Use filter paper to check hot oil and watch for metal shavings to confirm whether oil needs changing. The oil volume of the TGD1 machine is 7.3L (1.9 Gal). The oil level should be at scale mark (red dot). If it's too little, the lubrication will be not enough and if it's too much, the oil can leak out. If the machine is stored for more than 1 year, the oil should be changed before use.**

Suggest check cycle

Using conventional mineral oil, the first time oil change should be done after the new machine runs **400 hours.**

After that, depending on the machine running condition, change conventional oil each 2000-3000 hours (at most 12-18 months).

Note: Do not use synthetic oil!

For oil change it is not necessary to hang the car and remove the ropes.

Required Tools & Materials:

Open end Wrench: 16mm & 22mm

Funnel & Oil pan

Oil change procedure

1. Remove elevator from service and verify the elevator is under your control.
2. Take off top cover with 16mm wrench for air flow.
3. Place funnel and oil pan right next to the oil drain.
4. Remove oil plug, drain the old oil away.
5. When the oil has ceased running out of the geared box, hand tighten oil plug to make sure you're not cross-threading it, tighten the rest of the way with your 22mm wrench.
6. Pour in 7.3L (1.9 Gal) conventional oil into the gear box top cover.
7. Run the car floor to floor for 10 minutes and check the machine running situation. Also check the gear box for any signs of heat or smoke, while verifying the proper disbursement of oil over the ring gear.

7.0 Adjustments

WARNING! Generally, the brake torque has been adjusted in the factory and does not need to be re-adjusted any more.

Proper brake operations with regard to loading MUST be verified before anyone is allowed to ride on the platform.

7.1 Brake Torque Adjustment

Preparation

1. Verify that any required Compensation Chains or Rope Assemblies have been installed.
2. On construction jobs, verify that hoistway barricades are in place to prevent unauthorized access.

7.1.1 Normal Brake Torque Adjustment

Required Tools & Materials:

Open end wrench: 18mm (2 pieces)

Torque wrench

12 point 22 mm socket

Adjust Procedure Steps

1. Remove the elevator from service.
2. Remove the encoder cover from the motor shaft. With a 12 point, 22mm socket and torque wrench on the end of the motor shaft, measure the torque, making sure that the emergency brake is open. See Figure 9. The torque should match the value in Table 3. For information regarding how to remove the encoder cover, see Section 8.1.1 Encoder Removal.

Table 3 Normal Brake Torque

Motor Power	A
12Hp	≥100Nm (74 ft-lb)
20Hp	≥160Nm (118 ft-lb)

3. Go to the Step 4 if the torque is out of the range. Otherwise the brake torque is good.
4. Loosen the Spring Adjustment Locknut by open end wrench (18mm), and then adjust the Spring Adjustment Nut slowly to ensure the torque is in range. See Figure 10.

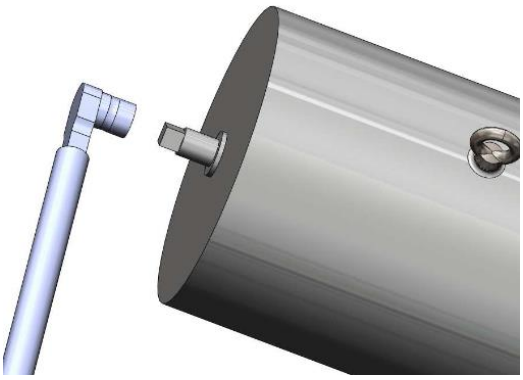


Figure 9 Normal Brake Torque Adjustment

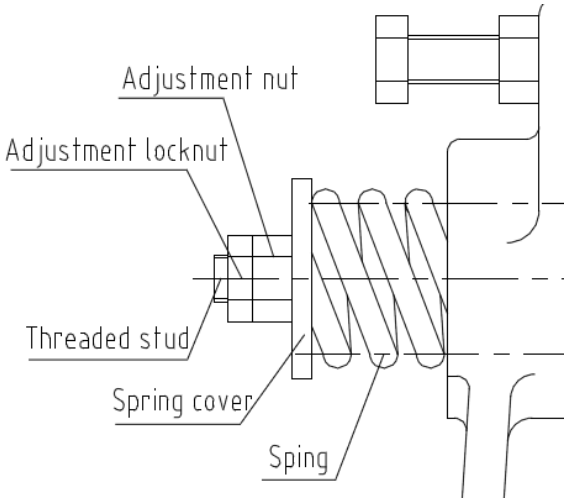


Figure 10 Normal Brake Torque Adjustment

5. If the torque is too small, tighten the nut clockwise to increase it. If the torque is too much, loose the nut counter-clockwise to reduce it. Retighten the Adjustment locknut.
6. Reconfirm that the value of torque is good.

7.1.2 Emergency Brake Torque Adjustment

Required Tools & Materials:

Open end wrench: 30mm (2 piece）

Torque wrench

12 point 22mm socket

Hex wrench: 6mm

Adjustment Procedure Steps

1. Check the length of the spring's decrement, which is showed on the surveyor's rod. The surveyor's rod should show 15-17 mm, otherwise the length must be readjusted. See "A" in Figure 11.

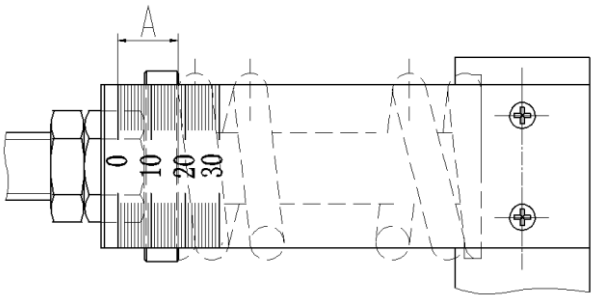


Figure 11 Emergency Brake Spring Length Decrement

2. Park the counterweight on the buffers & remove the elevator from service.
3. Loosen the Spring Adjustment Thin Locknut by 30mm open end wrench, then adjust the Spring Adjustment nut slowly to ensure the decrement length is in range. See Figure 12.

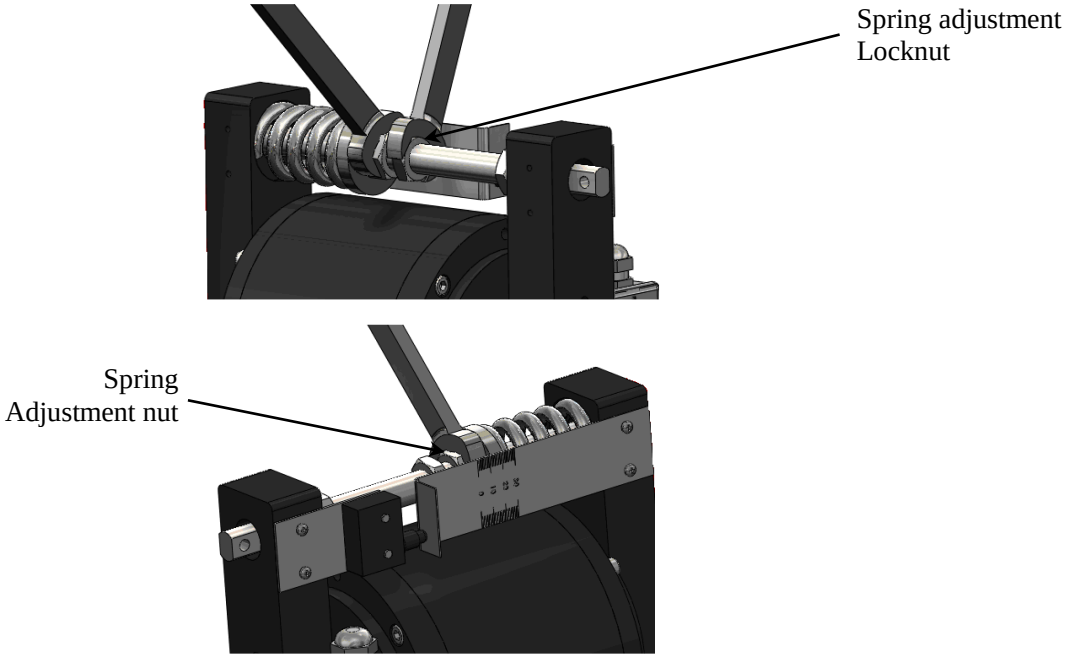


Figure 12 Emergency Brake Spring Adjustment

4. If the "A" dimension is too big, loosen the spring adjustment washer counter clockwise to reduce it. If the "A" dimension is too small, tighten the spring adjustment washer clockwise to increase the dimension.
5. Re-measure and confirm that the dimension is correct and then tighten spring adjustment thin locknut.
6. Also measure the brake torque by torque wrench. First of all, remove the encoder cover from the motor shaft, put a 12 point socket: 22mm into the motor shaft, install the torque wrench on the bolt to measure the torque, make sure that the normal brake is open and that the torque on torque wrench matches the following value [B]. See Table 4 and Figure 13. For information regarding how to remove the encoder cover, see Section 8.1.1 Encoder Removal.

Table 3 Emergency Brake Torque

Rated Load	Speed	B
1760lbs	0.76m/s (150 FPM)	≥95Nm (70 ft-lb)
1760lbs	1.02m/s (200 FPM)	≥95Nm (70 ft-lb)
1760lbs	1.78m/s (350 FPM)	≥145Nm (107 ft-lb)

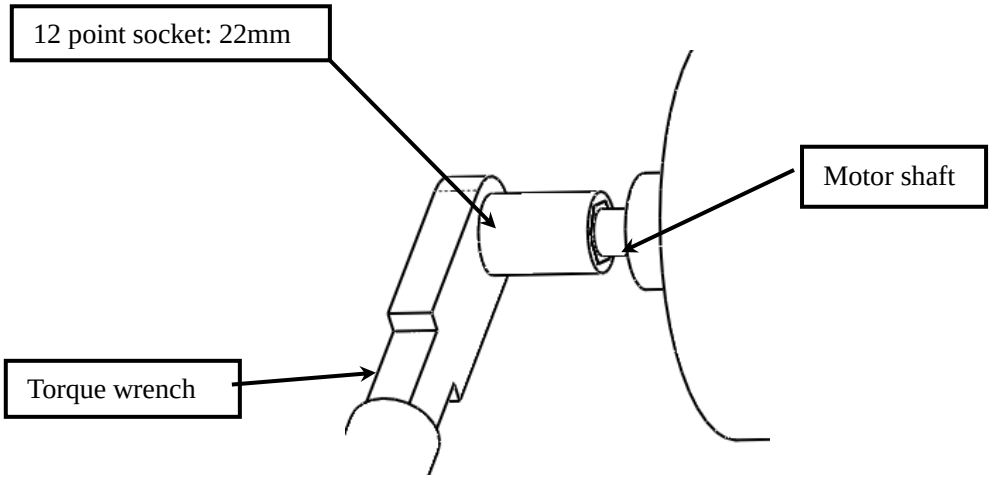


Figure 13 Emergency Brake Torque Test

7.2 Brake Stroke Adjustment

Generally, the brake stroke has been adjusted in the factory and does not need to be re-adjusted any more.

Proper brake operations with regard to loading MUST be verified before anyone is allowed to ride on the platform.

7.2.1 Normal Brake Stroke Adjustment

Required Tools & Materials:

Open End Wrench: 18mm (2 pieces)

Feeler gauges

7.2.1 Normal brake stroke adjust procedure

If the brake stroke is too small, the brake drum and brake lining could rub and the machine will make abnormal noise when it runs.

1. Loosen the Stroke adjustment locknut1 and locknut2, verify that the top block and the Stroke Adjustment Bolt just contact when the brake's power is on, and screw the Stroke Adjustment Bolt into the direction of the brake solenoid to 1.2~1.5mm (0.047"~0.059"). See Figure 14.

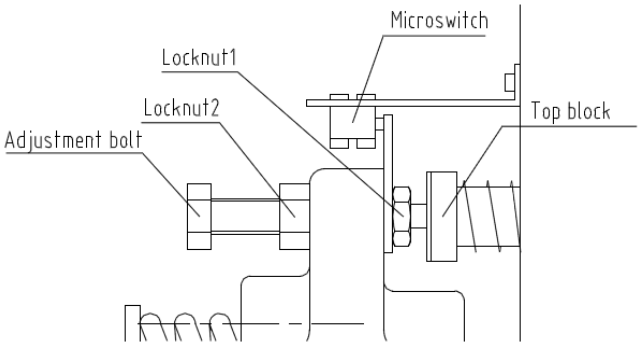


Figure 14 Normal Brake Stroke Adjustment

2. Measure the gap at the bottom of the Brake Lining and the drum, verify it is 0.1-0.5 mm (0.004”~0.02”) with feeler gauges, and make sure the gap is about uniform from top to bottom. If the gap of the top is too much, tighten the bolt clockwise to reduce it. If the gap is too small, loose the bolt counter-clockwise to increase the gap. See Figure 15.

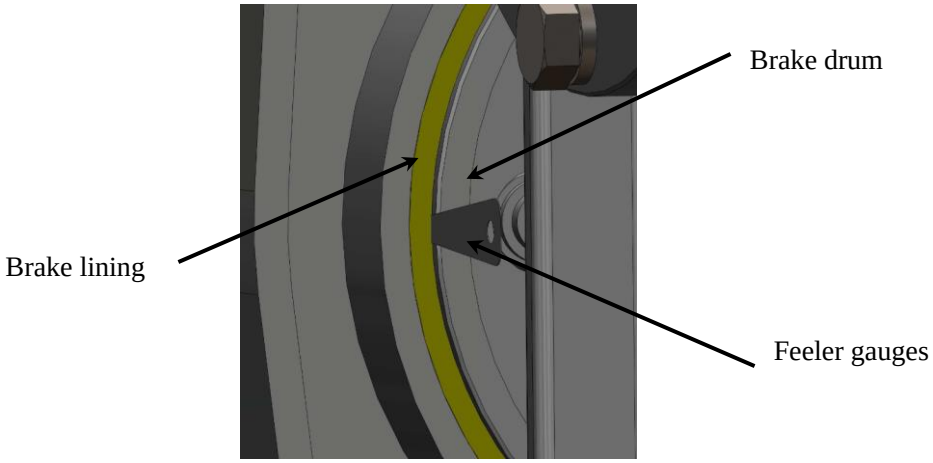


Figure 15 Normal Brake Stroke Adjustment

3. Tighten the Spring Adjustment Locknut1 and Locknut2, and check the adjustment of the brake switch. See Section 8.2.1.3 Normal Brake Switch Adjustment.

7.2.2 Emergency Brake Stroke Adjustment

Required Tools & Materials:

Open End wrench: 7mm, 13mm, (2) 30mm

Phillips Screwdriver

Dial indicator

Feeler gauge

Rubber hammer

Torque Wrench (60Nm) (45 ft-lb)

Adjustment Procedure Steps

1. Measure the gap between the side of the drive sheave and emergency brake lining, with the feeler gauge 0.05～0.1mm (0.002”~0.004”) when the brake is open. See Figure 16. Use the 0.05 mm (0.002”) feeler gauge as a “go gauge”, and the 0.1 mm (0.004”) as a “no go gauge”.

   Note: Feeler gauge should be able to be inserted to 1 inch depth.

2. If the gap is too big loosen (1/6th of a turn at a time) the thin locknut M20 and nut M20 with a 30mm open end wrench counter-clockwise to reduce it. See Figure 16. Otherwise, tighten (1/6th of a turn at a time) the nut M20 clockwise to increase it.

   Note: Make sure the Brake holding voltage ＜70% Brake rated voltage when adjusting the thin nut M20 and nut M20. Tighten the thin nut M20 after the adjustment to prevent the reading of dial indicators changing.

3. Attach two (2) dial indicators to the side of the drive sheave with the gauge head touching brake arm part I on one side and brake arm part II on the other side. See Figure 17. Check that the reading of the two dial indicators ≤0.25mm (0.01”), when the state of brake changes from open to closed.

   Note: The dial indicators must be attached to the sheave as shown in Figure 17.

4. Make sure the reading of both sides is approximately the same. If one side is reading less loosen locknut’s M8 on both sides, then tighten the synchronization bolt M8 on the opposite side and/or loosen the synchronization bolt M8 on this side until the reading is even. Repeat step 3.

   Note: If necessary the adjustment may be done on both sides.

5. Tighten the locknuts M8 after the adjustment is synchronized.
6. Measure the distance between the center hole of Stud and Brake arm part I. It should be between 17mm and 18mm. See Figure 18.
7. If the distance is too small, write down the distance between the two (2) thin nuts (L); loosen the thin locknut’s M20 and nut M20 with a 30mm open end wrench to free the spring. See Figure 18.
8. Tighten the other side nut M20 and thin locknut M20 with a 30mm open end wrench to compress spring.
9. If the gap is too big use the opposite method.

   Note: The two (2) thin locknut's distances (L) should be the same as measured in Step 7 after adjusting.

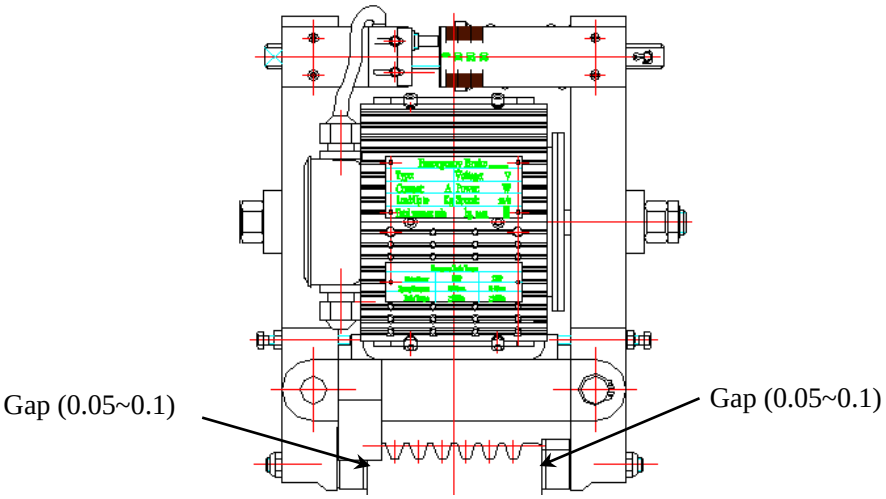


Figure 16 Gap check

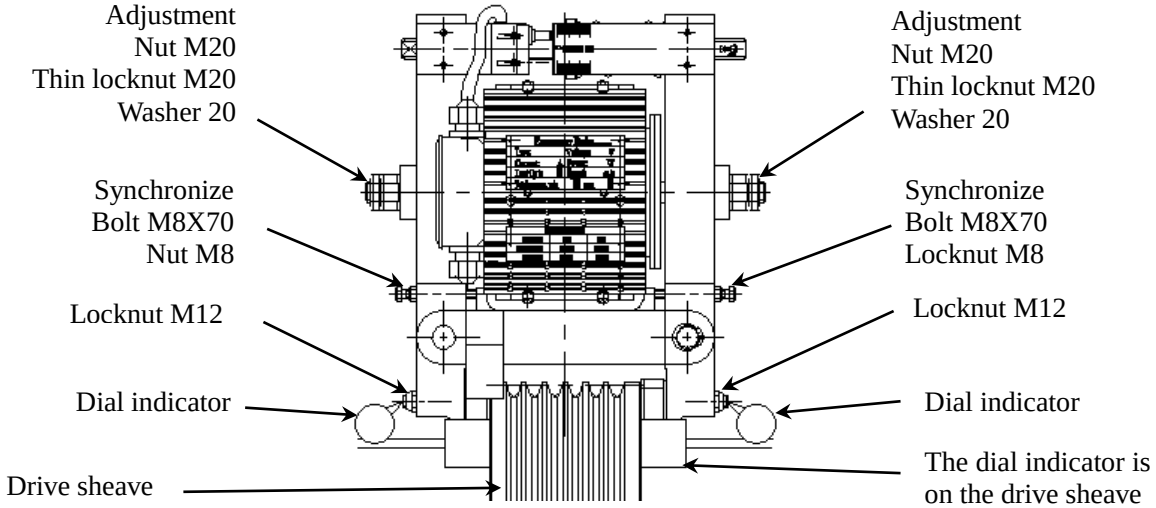


Figure 17 Dial indicator check

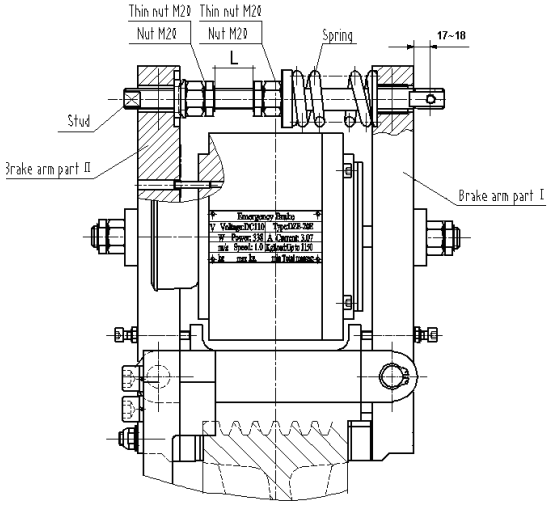


Figure 18 Check from brake arm part I and hole

7.3 Brake Synchronous Adjustment

CAUTION! This step should be done after the brake torque is in specification.

Required Tools & Materials:

Open End Wrench: 18mm

7.3.1 Normal Brake Synchronous Adjustment Instructions

1. If a Brake Arm opens slower than the other arm, loosen the Synchronization lock nut and bolt of slower arm or tighten the faster arm synchronization bolt after loosening its lock nut, until both arms opens and closes at the same time.
2. Once both arms open and close at the same time, then tighten the lock nuts.
3. After adjusting, verify the brake torque

7.3.2 Emergency Brake Synchronous Adjustment Instructions

4. If a Brake Arm opens slower than the other arm, loosen the Synchronization lock nut M8 and the bolt of slower arm, or tighten the faster arm synchronization bolt M8 after loosening its locknut M8, until both arms open and close at the same time.
5. Once both arms open and close at the same time, then tighten the lock nuts M8.
6. After adjusting, verify the brake torque

7.4 Brake Switch Adjustment

WARNING! Generally, the brake stroke has been adjusted in the factory and does not need to be re-adjusted any more.

See Section 8.2.1.3 Normal Brake Switch Adjustment or Section 8.2.2.3 Emergency Brake Switch Adjustment.

8.0 Replacement

WARNING! The user who does the replacement must make sure that the machine is powered off and the elevator is secure and will not be moved unexpectedly. Only qualified personnel are allowed to perform the replacement work.

WARNING! Please refer to the troubleshooting procedure first and make sure that the component is actually bad before performing this replacement procedure.

8.1 Encoder Replacement

Required Tools & Materials:

Encoder

Small flathead screwdriver

Hex wrench: 9/64”, 4mm, 6mm, 8mm

Clean cloth

8.1.1 Encoder removal

1. Remove the encoder cover using a hex wrench 6mm.
2. Remove the encoder cable using a small flathead screwdriver.
3. Loosen the locking bolt of the encoder using a 9/64” hex wrench and loosen the bolt which connects the motor and the encoder bracket with a 8mm hex wrench, then remove the broken encoder.

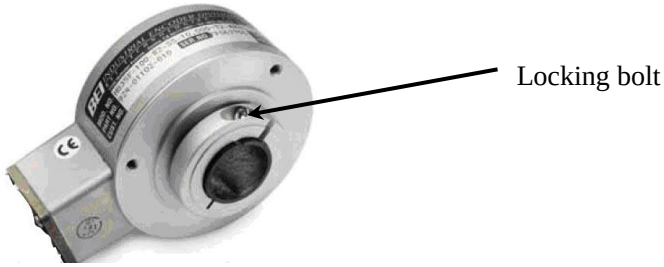


Figure 19 Encoder Replacement

8.1.2 Encoder mounting instructions

1. Attach the encoder bracket to the encoder so the cable connection is near the opening of the cover.
2. Check new encoder by slowing spinning to check for a smooth operation before installing.
3. Clean the motor shaft with clean cloth, then slip the new encoder on to the shaft.
4. Tighten the bolt into the motor through the encoder bracket with a 8mm hex wrench and tighten the locking bolt with the 9/64” Hex wrench.
5. Connect the encoder and the transducer cable, and install the encoder cover.

8.2 Brake Switch Replacement

WARNING! Please refer to the troubleshooting procedure first and make sure that the switch is actually bad before performing this replacement procedure.

8.2.1 Normal brake switch replacement

Required Tools & Materials:

Brake switch

Philips screw driver

Multimeter

Small flathead screw driver

Open end wrench (6mm)

Feeler gauges: 0.8mm, 1mm

Clean cloth

Loctite 290

8.2.1.1 Normal Brake Switch Removal instructions

1. Loosen the bolts and the washers in the brake terminal box using the Philips head screw driver, and remove the terminal box cover.
2. Remove the brake switch cable that needs to be replaced from the brake terminal using a small flathead screw driver.
3. Remove the adjustment bolts and locknuts which are used to attach the microswitch using a Philips screw drive and the end open wrench (6mm). See Figures 20 and 21.

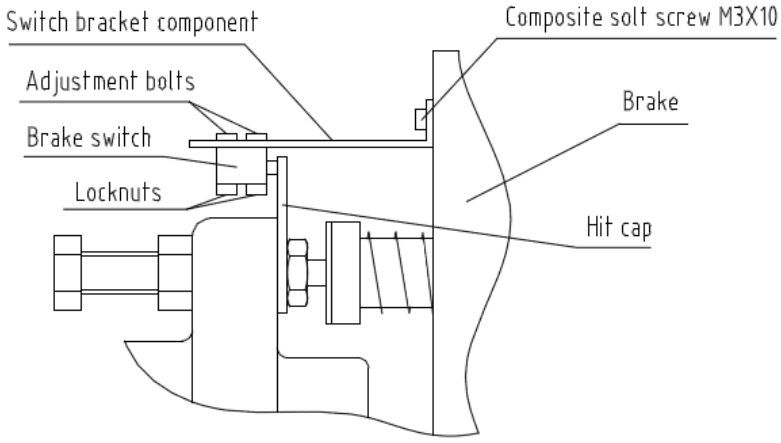


Figure 20 Normal brake switch mounting

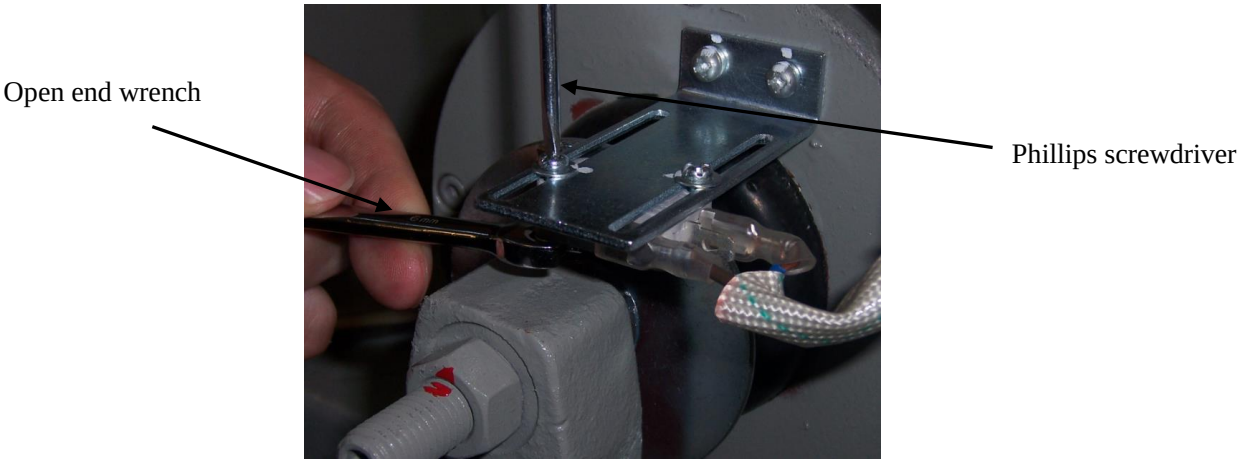


Figure 21 Remove the adjustment bolts and locknuts

8.2.1.2 Normal Brake switch mounting instructions

1. Clean the switch bracket component mating surface if it is not clean.
2. Install the new brake switch on the switch bracket component by Philips head screw driver and the open end wrench (6mm).
3. Reconnect the new brake switch cable.

8.2.1.3 Normal Brake Switch adjustment

1. Loosen the adjustment bolts using a Phillips head screwdriver and adjustable end wrench, and adjust the position of the brake switch.
2. Place a 1mm feeler gauge between the Hit cap and the brake switch, and adjust the switch slowly. When the switch operates, tighten the adjustment bolts and locknuts and remove the feeler gauge. See Figure 22.

   Note: Multimeter can be used to determine when the new switch operates.
3. Apply loctite 290 between the screw heads and the switch body.

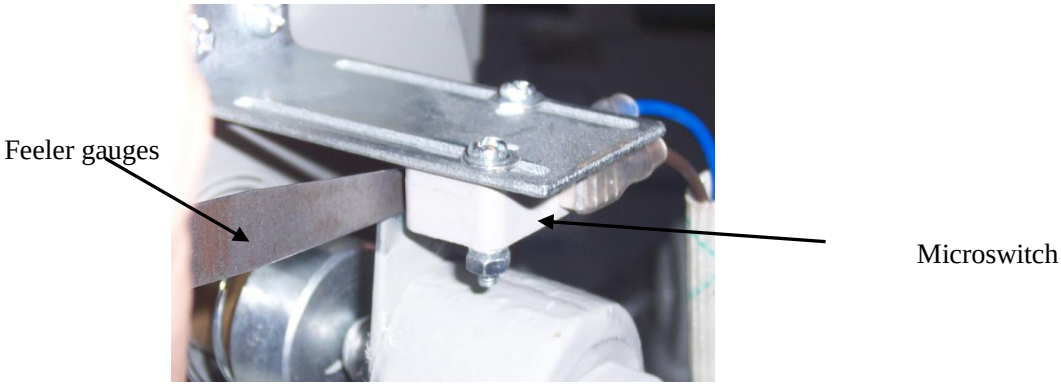


Figure 22 Brake switch adjustment

8.2.2 Emergency Brake Switch Replacement

Required Tools & Materials:

Brake switch

Phillips screwdriver

Small flathead screwdriver

Loctite 290

Multimeter

Open end wrench: 7mm (x 2)

Feeler gauges: 1mm

8.2.2.1 Emergency Brake switch removal instructions

1. Remove the two (2) Screws M3X10 and then remove the terminal box cover. See Figure 23.

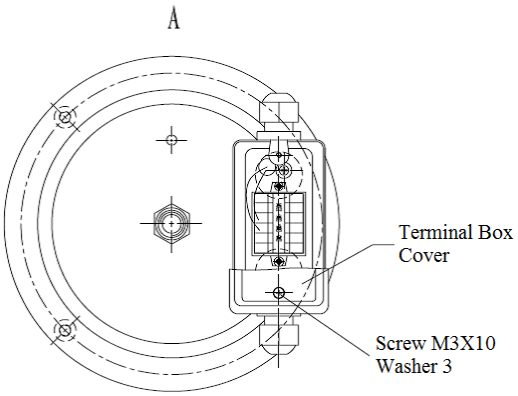


Figure 23 Emergency Brake terminal

2. Remove the brake switch cable in the terminal box using a small flathead screwdriver.
3. Remove the two (2) Screws M4X10 and then remove the Brake switch with plate.
4. Remove the two (2) bolts M4X30, Nuts M4, washers-4 and lock washers-4 and then remove the brake switch.

8.2.2.2 Emergency Brake switch mounting instructions

1. Clean the mating surface of the Plate and new Brake switch.
2. Place the new Brake switch on the Plate, insert the two (2) Bolts M4X30 and washers-4, washer-4, lock washer-4 and Nuts M4 to tighten. See Figure 24.
3. Install the Brake switch with plate and then tighten with two (2) screws M4X10 and washers-4; attach the wires from the new Brake switch to the terminal box.

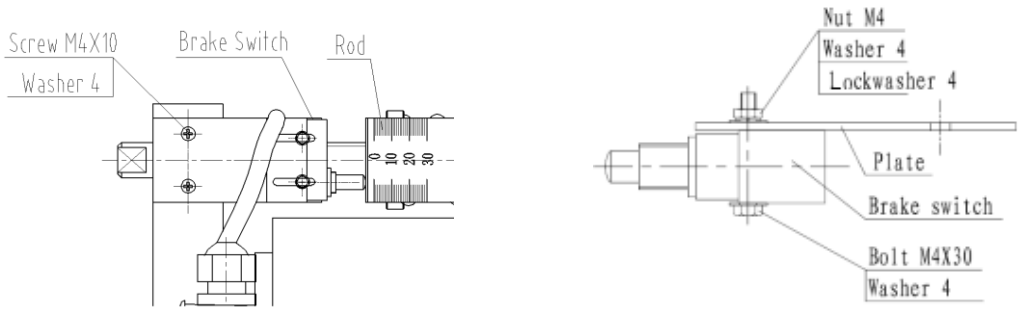


Figure 24 Emergency Brake Switch Replacement

8.2.2.3 Emergency Brake Switch adjustment

1. Loosen the bolts M4x30 using a 7mm open end wrench (X2), and adjust the position of the brake switch.
2. Adjust the Brake switch's position: Close the brake, loosen the Nut M4 and adjust the Brake switch's position so a 1mm (0.04") feeler gauge can be squeezed between the brake switch and the rod does not trigger the switch, but a 2mm (0.79") feeler gauge does trigger the switch. See Figure 25.
3. Apply Loctite 290 between the bolt heads and the switch body.

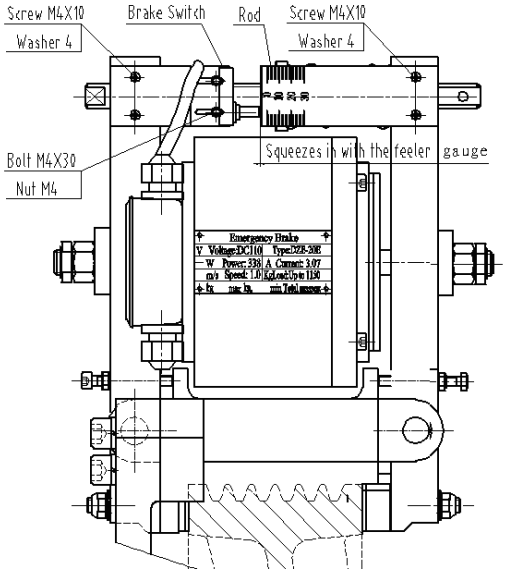


Figure 25 Emergency Brake switch adjustment

8.3 Motor Replacement

Required Tools & Materials:

Hoisting equipment

Open end wrench 24mm

Arm Puller

Clean cloth

Lubricating oil

8.3.1 Motor removal instructions

1. Remove the elevator from service.
2. Remove the encoder from the motor. See Section 8.1.1 Encoder removal.
3. Remove the power cable from the terminal box.
4. Install a hoist and rigging over the motor, and hoist the motor until pressure is applied to the rigging. See Figure 26.
5. Remove the Bolts M16x55 and washers (4 groups) by open end wrench (24mm).

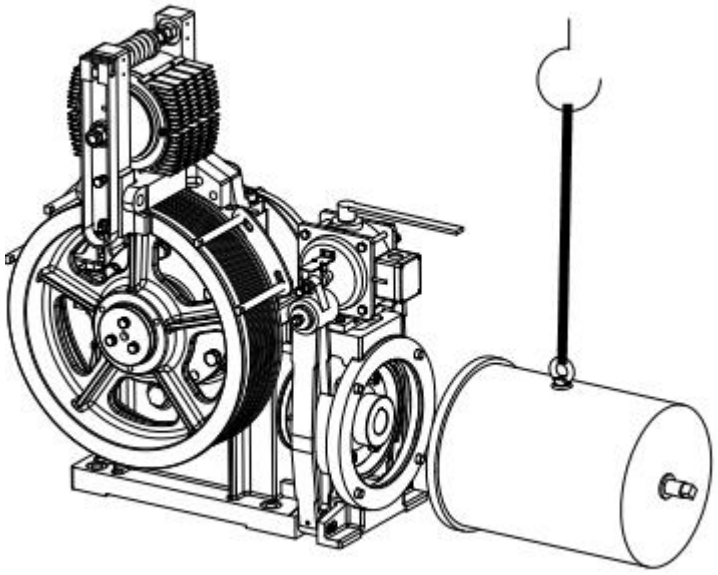


Figure 26 Motor replacement

6. Move the motor away from the traction machine.
7. Place large blocks on the ground, below the motor, and lower the motor onto the blocks. The blocks should be large enough to support the motor.

8.3.2 Motor installation instructions.

1. Apply some lubricating oil on the flexible coupling, hoist the motor and keeping it level. **Make sure the position of the motor coupling's keyway and the position of the brake drum's keyway are opposite of each other.**
2. Tighten the bolts M16x55 and washers (4 groups).
3. Turn the motor and measure the radial travel movement (brake float) of the brake drum, it should be no more than 0.004" if using a dial indicator.
4. Re-connect the motor leads, and double check wiring before closing motor terminal box.
5. Re install the encoder, please refer to this manual, Section 8.1.2 Encoder Mounting Instructions.
6. Place hoist ropes back onto drive sheave in machine room and then begin lowering the elevator to slowly apply pressure back onto the hoist ropes. Double check to make sure the ropes are in the proper grooves before continuing on.

8.4 Brake Replacement

WARNING! The personnel who perform this replacement work must make sure that the machine power is off and the elevator will not move unexpectedly.

8.4.1 Normal Brake Coil Replacement

Required Tools & Materials:

Open end wrench: 16mm

8.4.1.1 Normal brake coil removal instructions

1. Remove the brake cable and the brake switch cable from the brake terminal box.
2. Loosen the bolts M10x35 and washers 10 (4 groups), and remove the broken brake from the reduction box. See Figure 27.

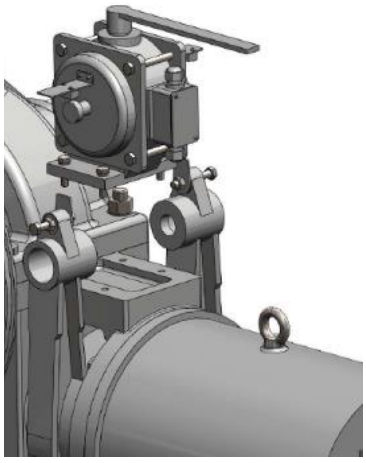


Figure 27 Normal Brake Removal

8.4.1.2 Normal brake coil installation instructions

1. Install the new brake onto the reduction box, and secure it with the bolts M10x35 and washers 10, but do not tighten. See Figure 28.
2. Adjust the position of the brake, make the axis of the solenoid, the Spring Threaded Stud and the Stroke Adjustment Bolt aligned in the same plane, and tighten the bolts M10x35, making the position of the brake secure.
3. For Normal Brake Torque Adjustment see Section 7.1.1.
4. For Normal Brake Stroke Adjustment see Section 7.2.1.

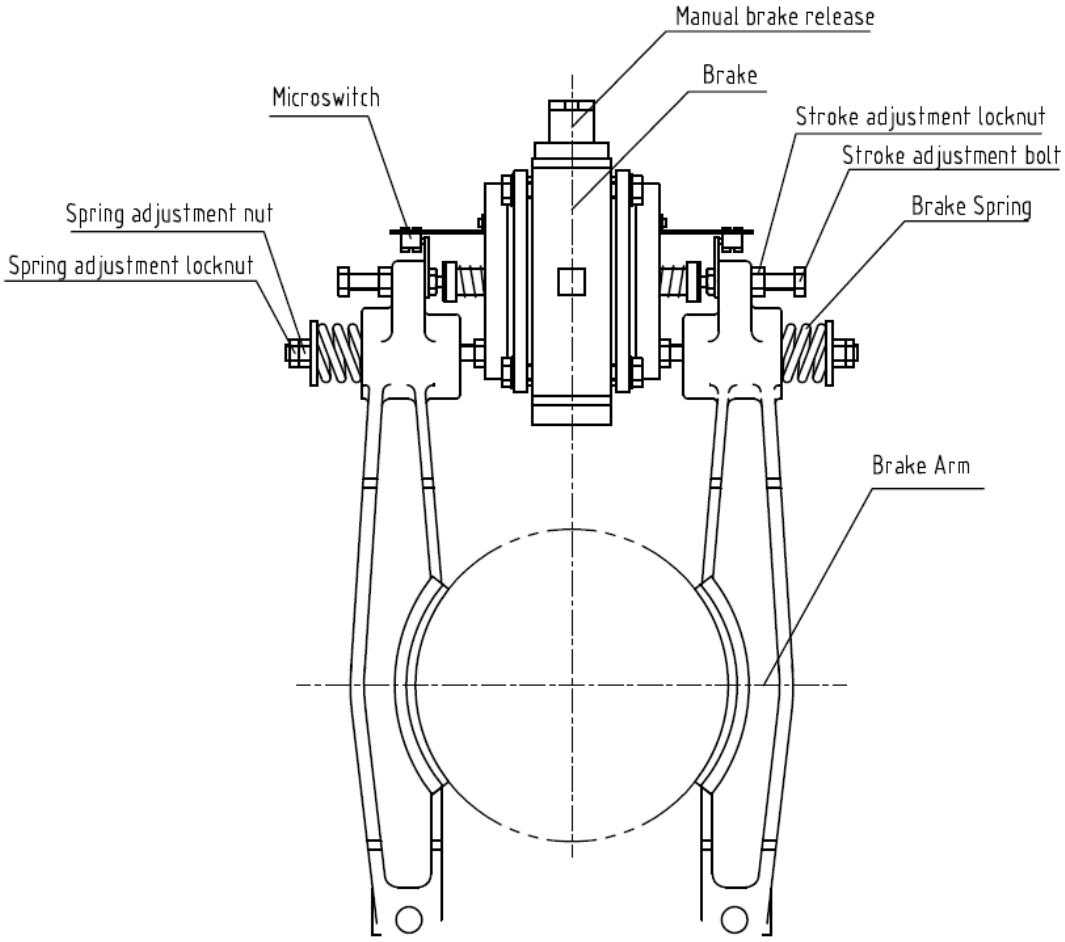


Figure 28 Normal Brake Installation

8.4.2 Emergency Brake Replacement

Required Tools & Materials:

Open end wrench: 7mm, 13mm, 19mm, (2x) 30mm

Phillips screwdriver

Small flathead screwdriver

Feeler gauge

Rubber hammer

Torque Wrench (60Nm) (45 ft-lb)

Loctite 243

Snap Ring pliers

NOTE: This procedure removes the complete emergency brake. If only the coil is bad follow steps 1-11

8.4.2.1 Emergency Brake removal instructions.

1. Remove the elevator from service, and ensure proper operation the primary brake before proceeding with any work on the emergency brake.
2. Remove the terminal box cover and disconnect the wiring to the brake. See figure 29.
3. Remove the two (2) Screws M4X10 and then remove the Brake switch and plate. See figure 29.
4. Remove the two (2) Screws M4X10 and then remove the Rod. See figure 29.
5. Loosen the Nut M20 and Thin nut M20, freeing the spring. See figure 30.
6. Remove the Stud retaining pin.
7. Remove the Nut M20, Thin nut M20 and Washer 20 (Both sides of brake coil). See figure 30.
8. Remove the two (2) snap rings, then use the screwdriver and Rubber hammer to push the Pin out of the Brake arm part I. See figure 30.
9. Remove the Brake arm part I.
10. Remove the Stud (Including Nuts and spring). See figure 30.
11. Remove the broken Brake. See figure 30.
12. Loosen the (4) bolts M16X75 lock washers 16 and then remove the brake support and brake arm part II from the support. See figure 30.
13. Use the Screwdriver and Rubber hammer to push the Pin out of the Brake arm part II.
14. Remove the Brake arm part Ⅱ from the brake support. See figure 30.

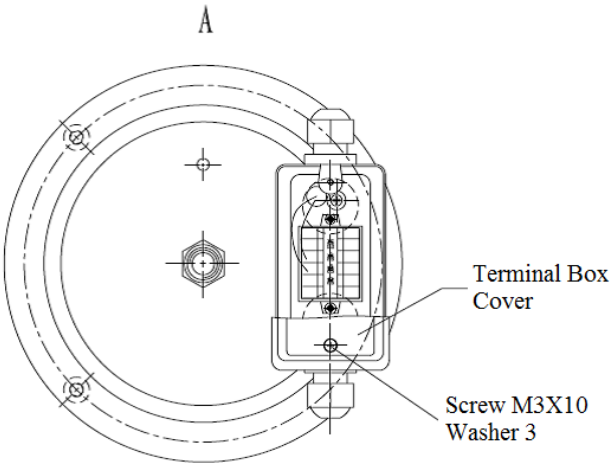


Figure 29 Emergency Brake Terminal box

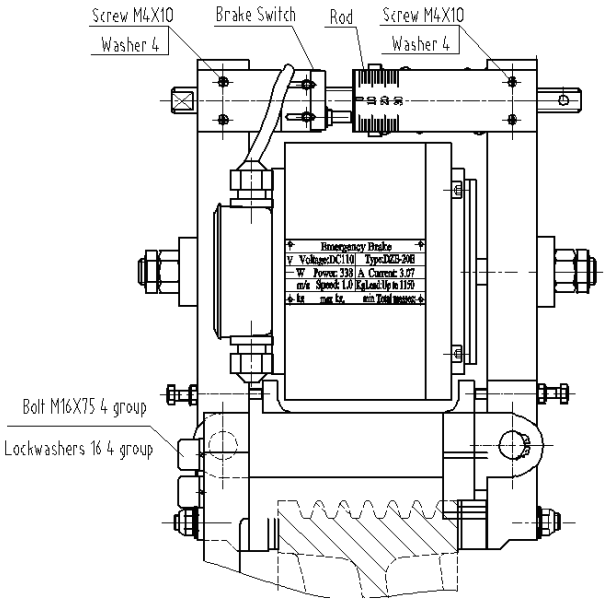


Figure 30 Emergency Brake

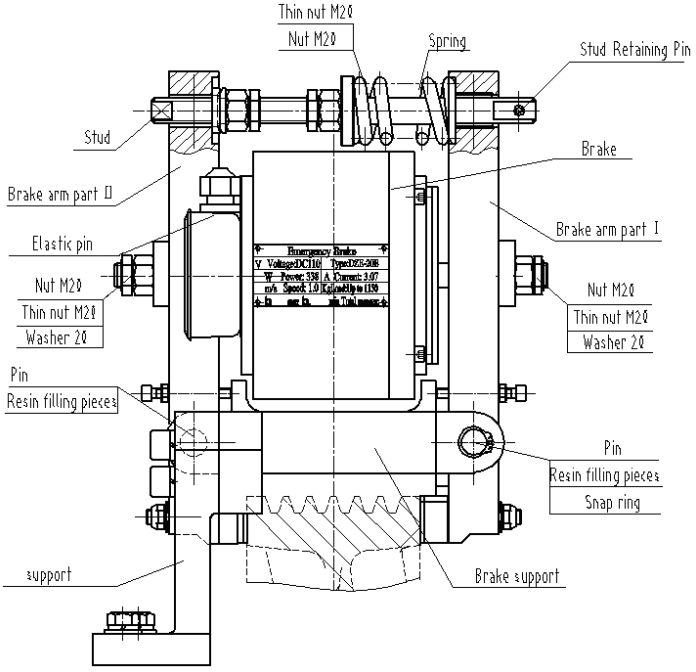


Figure 31 Emergency Brake Replacement

NOTE: If you are only replacing the brake coil follow steps 4 - 14

8.4.2.2 Emergency Brake mounting instructions

1. Place the Brake arm part II into the Brake Support; put two (2) Resin filling pieces into the gap which between Brake arm part II and Brake Support (both sides). See figure 31.
2. Insert the Pin into the hole from Brake Support to Brake arm part II. See figure 31.
3. Install the Brake support onto the Support, and attach it with (4) Bolts M16X75 and lock washers 16.

   Note: Put the Elastic pin 6X35 of brake into the hole of Brake arm part II. See figure 32.
4. Install the new Brake into the hole of Brake arm part II. See figure 32.
5. Install the stud (Including Spring, Nuts and Gasket) into the hole of Brake arm part II. See figure 32.
6. Place the Brake arm part I into Brake Support. See figure 33.
7. Put the two (2) Resin filling pieces into the gap which is between Brake Arm Part I and Brake Support (one on each side).
8. Insert the Pin into the hole from brake support to Brake arm part I.
9. Install the two (2) snap rings onto the Pin.
10. Install the washer 20, thin nut M20 and nut M20 (both sides of Brake).
11. Re install the brake switch with plate and rod with screws M4x10.
12. Tighten the Nut M20 and Thin nut M20 of Stud to compress spring and reinstall Stud Retaining Pin.

13. For Emergency Brake Torque Adjustment see section 7.1.2 & for Stroke adjustment see section 7.2.2.
14. Reconnect the wiring in the terminal and place the cover on terminal box.

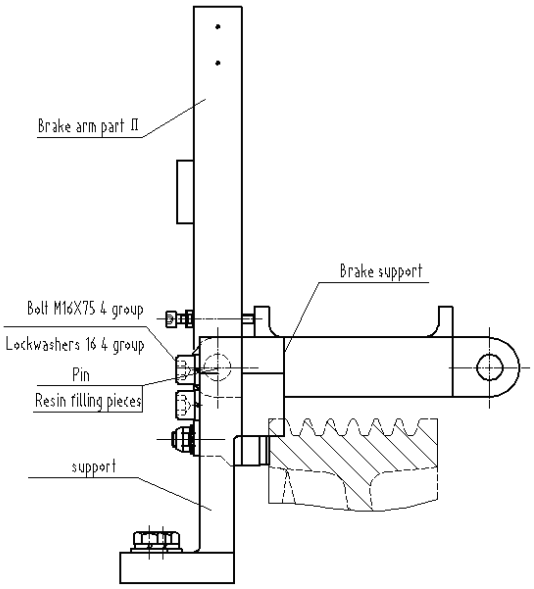


Figure 32 Emergency Brake Installation

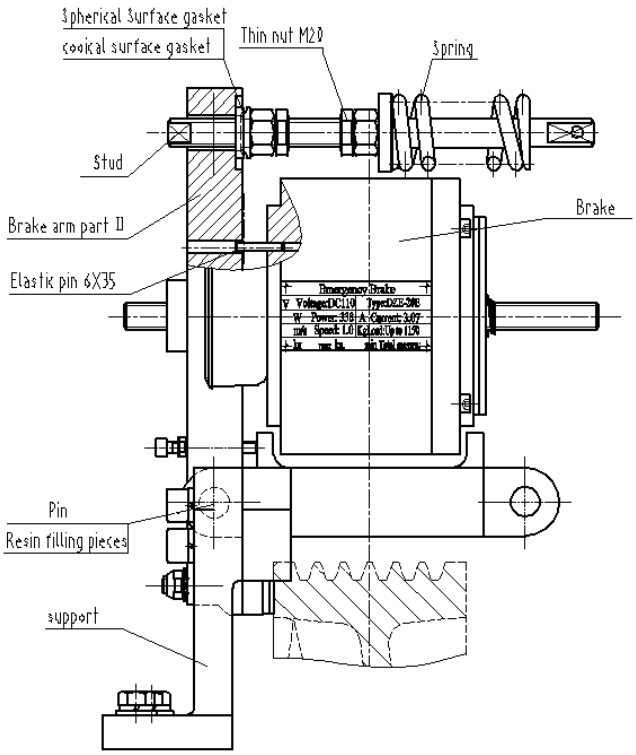


Figure 33 Emergency Brake Installation

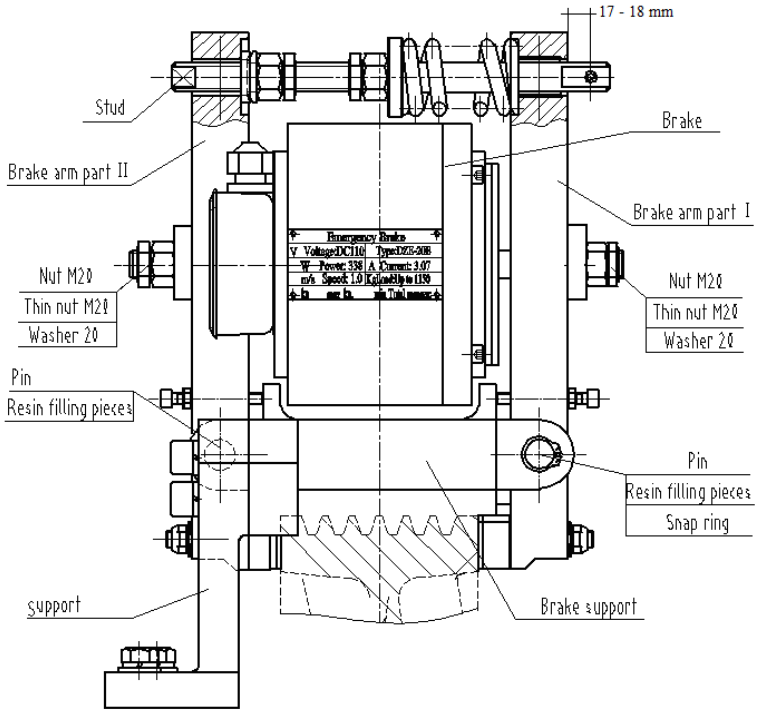


Figure 34 Emergency Brake Installation

8.5 Brake Lining Replacement

WARNING! Please refer to the troubleshooting procedure first and make sure that the part is actually bad before performing this replacement procedure.

If the brake lining wears more than 2mm, must replace the whole brake arm assembly.

CAUTION! Because the normal brake lining is struck with the brake arm, only replace the whole brake arm assembly if the brake lining wears more than 2mm.

8.5.1 Normal Brake Lining Replacement

Required Tools & Materials:

Open end wrench: 18mm, 24mm

Hammer

Retainer pliers

Clean cloth

Loctite 243

8.5.1.1 Normal Brake arm removal

1. Remove the elevator from service.
2. Remove the spring adjustment nut & locknut, the brake spring, and the spring bolt.

3. Remove the two bolts M6X16 and washers 6. See Figure 35.

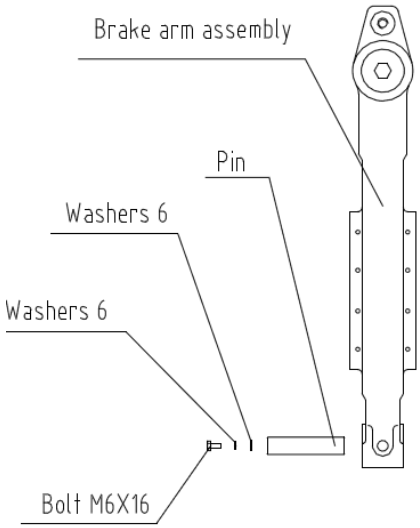


Figure 35 Normal brake lining replacement

4. Remove the brake arm pins using a hammer.
5. Remove the brake arm from the machine.

NOTE: This brake arm is not heavy enough to require rigging and can be remove by a hand.

8.5.1.2 Normal brake arm installation

1. Clean the brake arm and new brake lining with clean cloth.
2. Install the brake arm assembly into the hole of the gear box. Insert Pin.
3. Apply Loctite on bolt M6X16, tighten bolt and the washers 6 into the pin.
4. Install the brake spring, the spring cover, spring adjustment nut, and adjustment locknut.
5. For Normal Brake Torque Adjustment refer to this manual section 6.1.1 & for Stroke adjustment see section 6.2.1.

8.5.2 Emergency Brake Lining Replacement

Required Tools & Materials:

End wrench: 7mm, 13mm, 19mm, (2x) 30mm

Screwdriver

Dial indicator

Feeler gauge

Rubber hammer

Torque Wrench (60Nm) (45 ft-lb)

Loctite 243

Note: Emergency Brake arms must be removed prior to replacing emergency brake lining. See Section 8.4.2.1 Emergency Brake removal instructions.

8.5.2.1 Emergency brake lining removal instructions

1. Remove the Locked nut M12 from the Brake arm. See figure 35.
2. Remove the Brake lining part from the Brake arm.

   Note: Do not lose the Elastic pin 6X26 when removing the Brake lining part.
3. Remove the bolt, separate Brake lining from the support. See figure 36.

8.5.2.2 Emergency brake lining installation instructions

4. Clean the mating surface of the support and new brake lining.
5. Apply Loctite 243 on bolt see figure 36 below. Tighten bolt to 60Nm (45 ft-lb).
6. Place the Brake lining part into the hole of Brake arm part put two (2) washers 12 and tighten the bolt with locked nut M12, then the locked nut M12 must be unscrewed one half turn. **Note: Tighten the locked nut M12 to get the measurement 63±0.2mm. See Figure 37.**
7. Reassemble the Emergency Brake arms. See Section 8.4.2.2 Emergency Brake mounting instructions
8. For Emergency Brake Torque Adjustment see Section 7.1.2 & for Stroke adjustment see section 7.2.2.

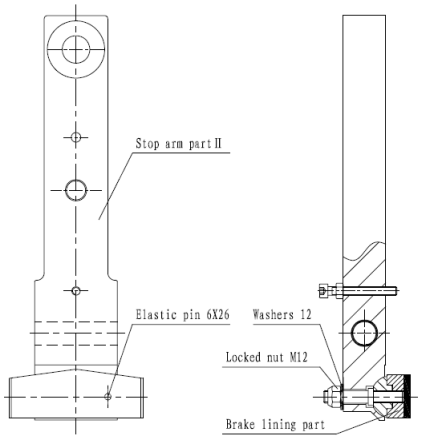


Figure 35 Emergency Brake Arm

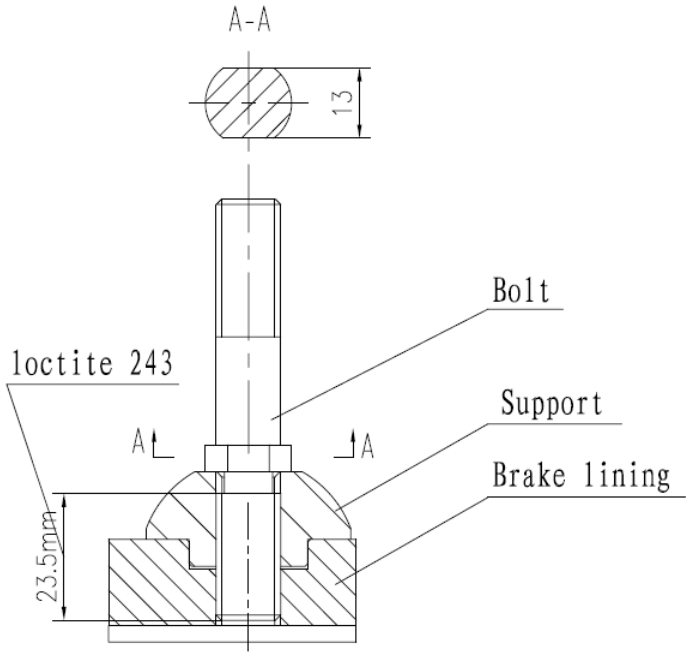


Figure 36 Emergency Brake Lining

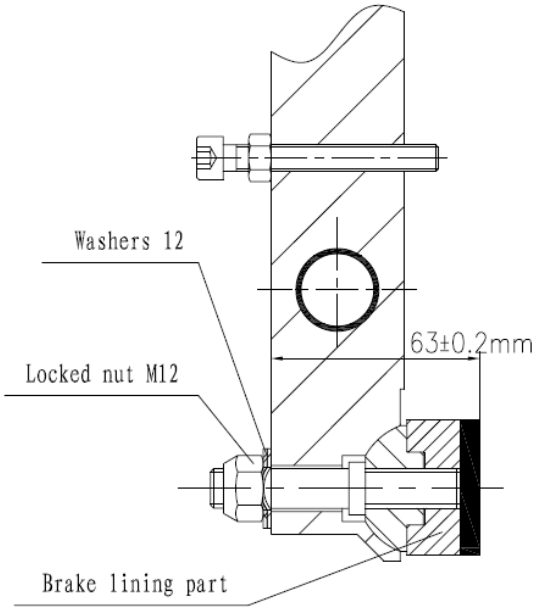


Figure 37 Emergency Brake Lining Replacement

8.6 Sheave replacement

Required Tools & Materials:

Hoisting equipment

Torque wrench

Dial indicator

Open end wrench: 16mm

Clean cloth

Drawplate

Machine oil

Drift pin

8.6.1 Sheave removal instructions

1. Remove the elevator from service, hang the elevator in hoist way with the proper hoisting and rigging equipment. Add a rope block and then begin hoisting the car until you have enough slack in the ropes to remove them from the drive sheave, but do not attempt to remove ropes until emergency brake is removed (if so equipped).
2. Make sure to trip the governor as a secondary safety device.
3. If the machine has the Emergency Brake, remove the Emergency Brake and Support. See Section 8.6.2.1 Emergency Brake removal instructions.
4. Remove the Nut M20 with open wrench 32 mm to remove rope retainers. See Figure38.
5. Cut off the power of machine, and take off the load in sheave.

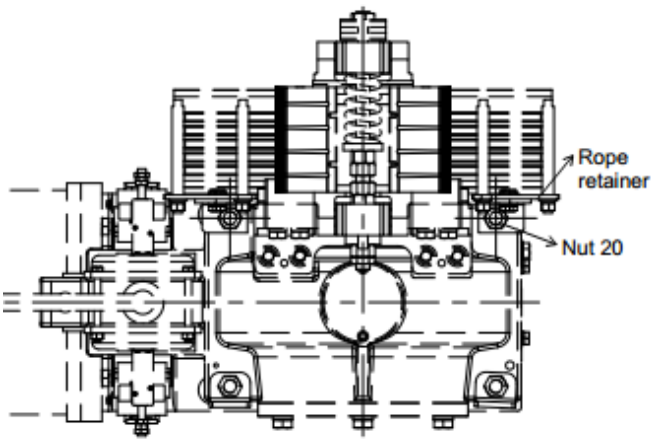


Figure 38 Rope retainer removal

6. Remove the bolts M12X45 and the washers 12 (3 groups) which are used to attach the pressure pad by open end wrench 16mm, and then remove the pressure pad. See Figure 39.

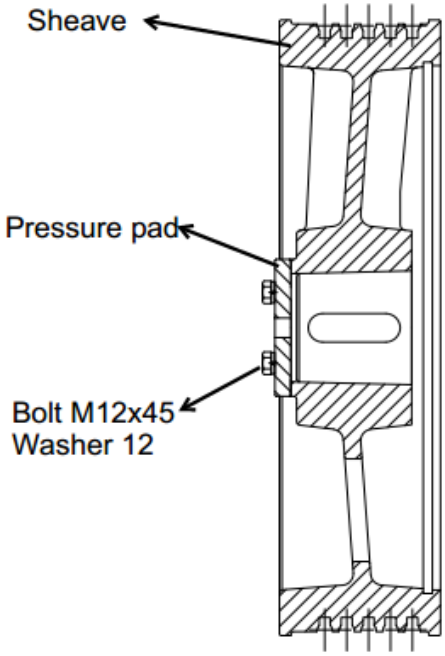


Figure 38 Rope retainer removal

7. Attach hoisting equipment through the sheave and hoist the sheave until pressure is applied to the rigging. See Figure 39.

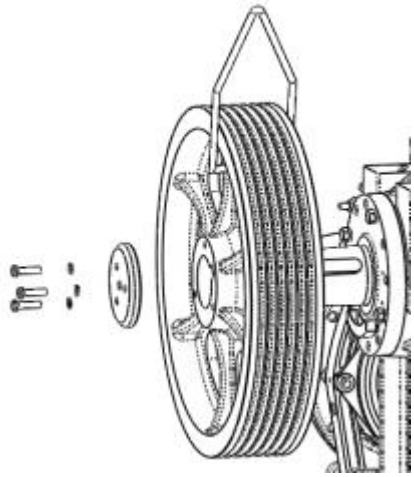


Figure 39 Sheave Replacement

8. Remove the sheave from the main shaft with the drawplate.

8.6.2 Sheave installation instructions

1. Clean the main shaft with the clean cloth. Apply a small amount of machine oil on the main shaft.

2. Hoist the new sheave with the hoisting equipment, align the sheave's key slot and the main shaft's key slot, and install the sheave onto the main shaft.

3. Tighten the bolts M12X45 and washers 12 (3 groups) to 37-44ft-lb through the pressure pad.

4. Attach a dial indicator as shown in Figure 40. Energize the normal brake, and turn the sheave more than a one full turn. Measure the runout with dial indicator, make sure it is <0.008".

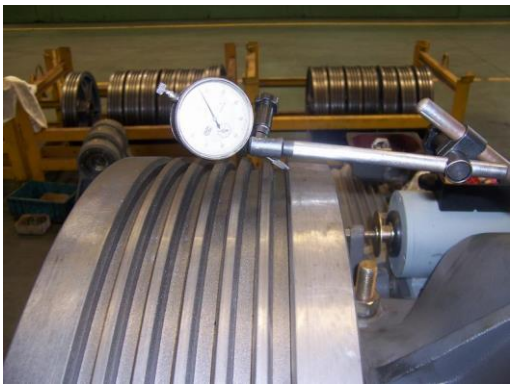


Figure 40 Measure sheave groove

8.7 Ring Gear Replacement

WARNING! Please refer to the troubleshooting procedure first and make sure that the ring gear is actually bad before performing this replacement procedure.

Required Tools & Materials:

Hoisting equipment

Torque wrench

Dial indicator

Open end wrench: 10mm, 18mm, 27mm, 30mm

Clean cloth

Drawplate

Hand hammer

Sealant

Clean cloth

Heating equipment

Tinted paint

8.7.1 Ring gear removal

1. Cut off the power to the machine, dismantle the rope retainers and remove the ropes from the sheave.
2. Remove the sheave. See Section 8.6.1 Sheave removal.
3. Remove the key from the main shaft's key slot.

4. Remove the oil drain bolt, drain the oil. See Figure 41.

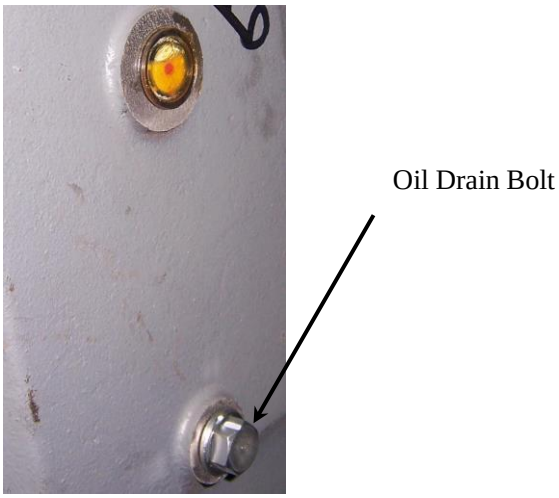


Figure 41 Drain oil

5. Remove the bolts M6X16 (2 groups) using the open end wrench (10mm) that holds the Top cover on the top gear case. See Figure 42.
6. Remove the bolts M18X50 and washers (6 groups) which are used to attach the main shaft through cover using the open end wrench (27mm), and then remove the main shaft through cover.

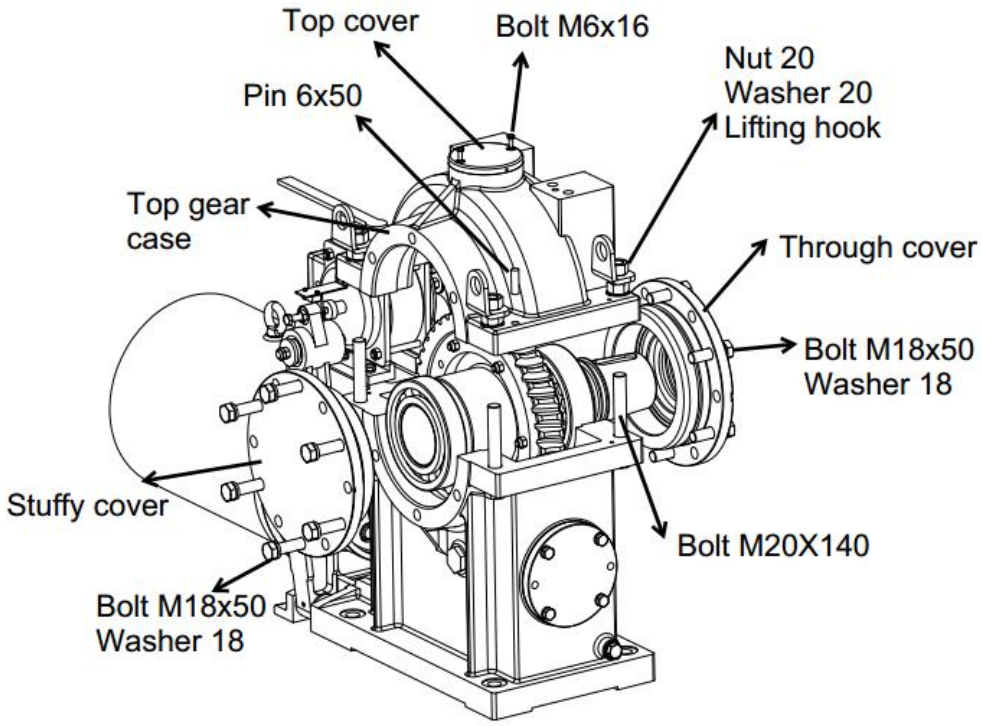


Figure 42 Remove Through and Rear covers

7. Remove the bolts M18X50 and washers (6 groups) which are used to attach the main shaft stuffy cover using the open end wrench (27mm), and then remove the main shaft stuffy cover.

8. Remove the pin 6X50 (2 groups) which are used to attach the top gear case using a hand hammer.
9. Remove the bolts M20X130, nuts M20, and the washers (2 groups) and the bolts M20X110, nuts M20 and the washers (2 groups) which are used to attach the top gear case, then remove the top gear case using hoisting equipment.
10. Remove the output shaft with ring gear from the gearbox base with hoisting equipment being careful not to damage the bearings. See Figure 43.

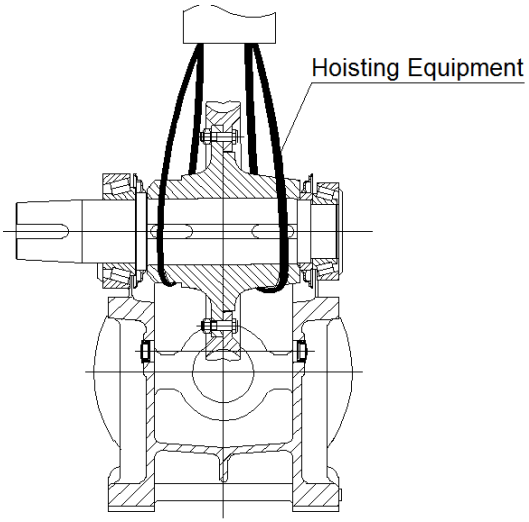


Figure 43 Remove the output shaft and ring gear

11. Remove the Bolts M12X1.25X58 and the Nuts M12X1.25 (6 groups) which secure the ring gear flange and the ring gear. Note: there are the split pins in the bolts and the nuts.

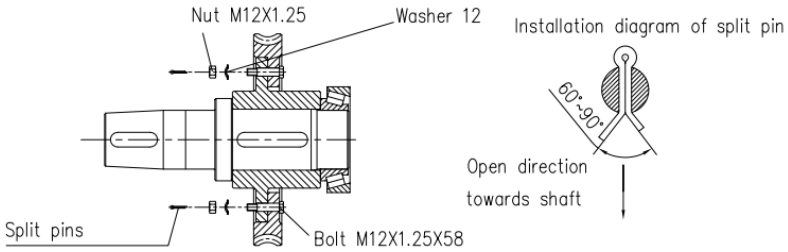


Figure 44 Remove bolts holding ring gear to hub

12. Support the output shaft on the sheave end and remove the ring gear.

8.7.2 Ring gear installation

1. Clean the mating surfaces of the ring gear flange and the new worm gear, heat the worm gear and slip the worm gear on to the ring gear flange when the ring gear's temperature is reached 70±15°C (158±59°F). Align the ring gear flange and ring gear with a drift pin.

2. Ream the ring gear and the flange with the drift pin, clean all shavings and tap the bolts M12X1.25X50 (6 groups) into place with the hammer. When the ring gear has cooled, tighten the bolts M12X1.25 (6 groups) to 37-44ft.lb. Reinstall the split pins as shown in Figure 44.
3. Install the output shaft stuffy cover and output shaft through cover. Hoist the output shaft ring gear components into the gear reducer box.

8.7.3 Backlash Adjustment

1. Tighten the bottom gear case and the stuffy cover with the bolts M18X50 (2 groups), tighten the bottom gear case and the through cover with the bolts M18X60 (2 groups). See Figure 45.

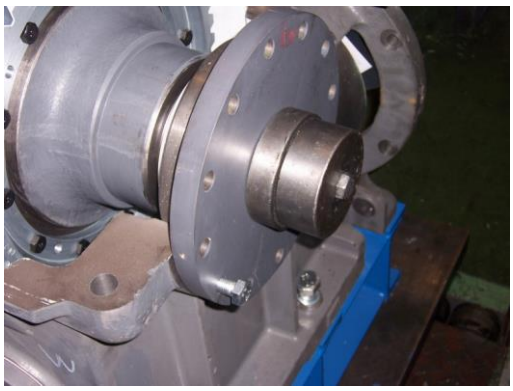


Figure 45 Install stuffy cover and through cover

2. Install the magnetic base of the dial indicator to the bottom gear case.

Figure 46 Check backlash

3. Turn the worm wheel, make it meshing and read the amount of gear movement. The displacement is ≤0.0024". Measure at 3 equally spaced spots around the ring gear.
4. If the displacement does not meet specification, turn the through cover or stuffy cover one hole position and recheck the backlash. Repeat as necessary until the backlash is within specification.
5. Spread tinted paint on three teeth (equally spaced around the sheave), and allow it to dry completely.
6. Place the car on inspection Operation. Turn on the mainline disconnect.

7. Run the machine in one direction until the color is wiped off and the pattern can be seen.

Note: The gearbox top does not have to be installed for this test, but may be if so desired.

8. Repeat Step 7, but run the machine in the opposite direction.
9. Survey the gear pattern carefully. See Figure 47.

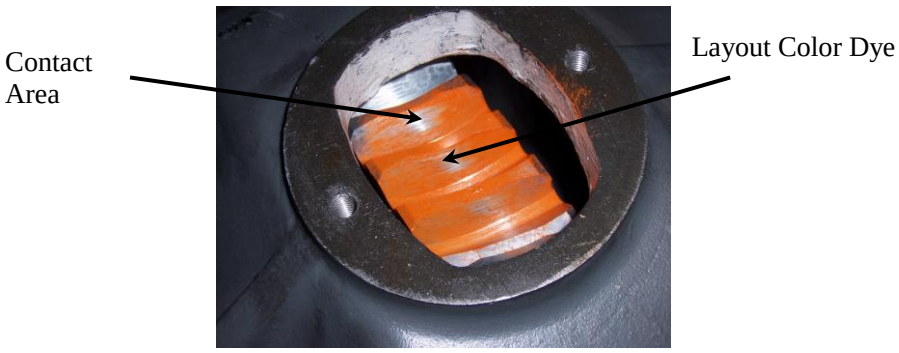


Figure 47 Survey gear mesh contact area

10. Make sure that the Contact Area accounts for 30% of the direction of the gear's width, and for 55% of the direction of the gear's height. If the Contact Area is to left, increase the shims of the left side cover, or reduce the shims of the right side cover. If the contact Area is to right, reduce the shims of the left side cover, or increase the shims of the right side cover. Adjust as needed to meet the requirements.
11. Clean the mating surface of the bottom gear case and the top gear case with clean cloth, apply sealant around the surface of the bottom gear case. See Figure 48.

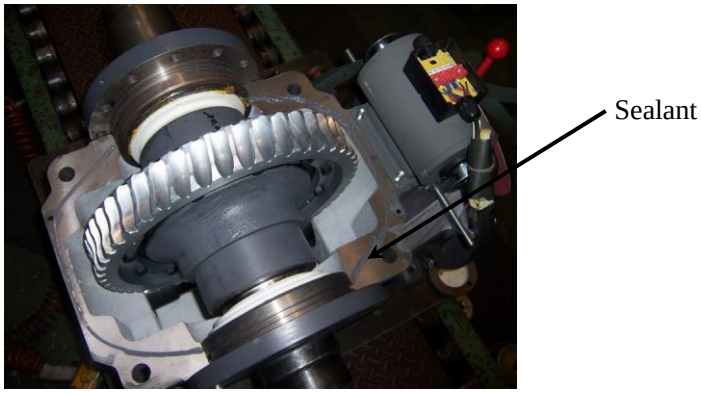


Figure 48 Apply sealant

12. Hoist the top gear case onto the bottom gear case with the hoisting equipment being careful not to damage the shims. Install the pin 6X50 using a hammer.
13. Tighten the bolts M20X140, nuts M20 and the washers. See Figure 42 above.
14. Tighten the bolts M18X50 and washers (6 groups) to the main shaft through cover, and tighten the bolts M18X50 and washers (6 groups) to the main shaft stuffy cover.
15. Reinstall the sheave. See Section 8.6.2 Sheave installation.
16. Fill the gear case with elevator gear oil (7.3L (1.9 Gal)), fit on the cover board, and tighten it with the bolts M6X16 (2 groups) using an open end wrench (10mm).

Note: Fill gear case to the red dot on the sight glass. DO NOT overfill.

17. Connect the mainline and test the machine. Return machine to service.

8.8 Bearing Replacement

WARNING! Please refer to the troubleshooting procedure first and make sure that the component is actually bad before performing this replacement procedure.

Required Tools & Materials:

Hoisting equipment

Bearing heater

Open end wrench: 16mm, 18mm, 24mm

Arm puller

3# General purpose lithium lubricating grease

Protecting jacket

8.8.1 Output shaft bearing replacement

8.8.1.1 Output shaft bearing removal

1. Remove the output shaft. See Section 8.7.1 Ring gear replacement Steps 1~10.

Note: Don't damage the seal in the output shaft bearing through cover.

2. Place the output shaft assembly on stands so the bearings can be removed.
3. Remove the bearing with the arm puller.

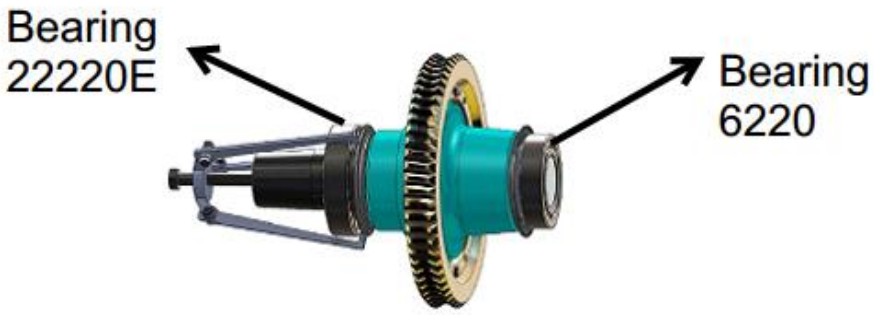


Figure 49 Main Shaft bearings

8.8.1.2 Output shaft bearing installation

1. Place the new bearing 22220E on the bearing heater, and heat it to about 80±15°C (180±60°F).
2. With a gloved hand, quickly slide the heated bearing fully onto the output shaft.
3. When the bearing has cooled completely, pack the bearing.
4. Apply a small amount of 3# General purpose lithium lubricating grease on the seal of the output shaft through cover, and install it to the main shaft.

5. Replace the bearing 6220 using the same method, refer the Step 3~7.
6. Hoist main output worm gear assembly into the bottom gear case, and adjust the backlash. See Section 8.7.3 Backlash Adjustment.

8.8.2 Worm Shaft Bearing Replacement

8.8.2.1 Worm Shaft Bearing Removal

1. Remove the motor. See Section 8.3 Motor Replacement
2. Remove the oil drain bolt; drain the oil.
3. Remove the bolt M12X45 and the washer which are used to secure the worm end closure using an open end wrench (18mm), and then remove the end closure. See Figure 50.
4. Use the manual brake release to open the brake and then remove the brake drum and secure the key.

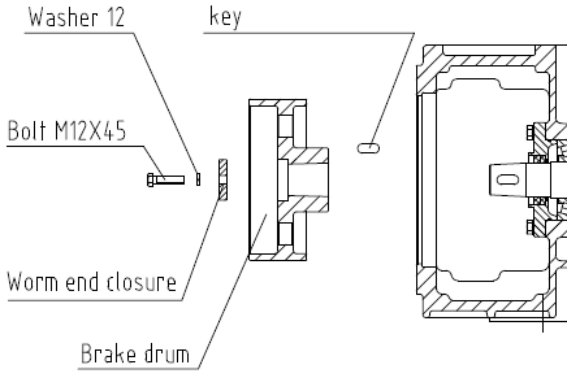


Figure 50 Remove brake drum

5. Remove the bolts M12X40 and the washers (4 groups) which are used to attach the worm shaft through cover using the open end wrench (16mm), and then remove the worm shaft through cover. See Figure 51.
6. Remove the bolts M12X40 and the washers (4 groups) which are used to attach the worm stuffy cover using the open end wrench (16mm), and then remove the worm stuffy cover.
7. Turn the shaft sheave by hand to remove the worm shaft from the bottom gear case.
8. Install an arm puller on the bearing, and remove the bearing. The front bearing and the back bearing are same. Remove them same way.

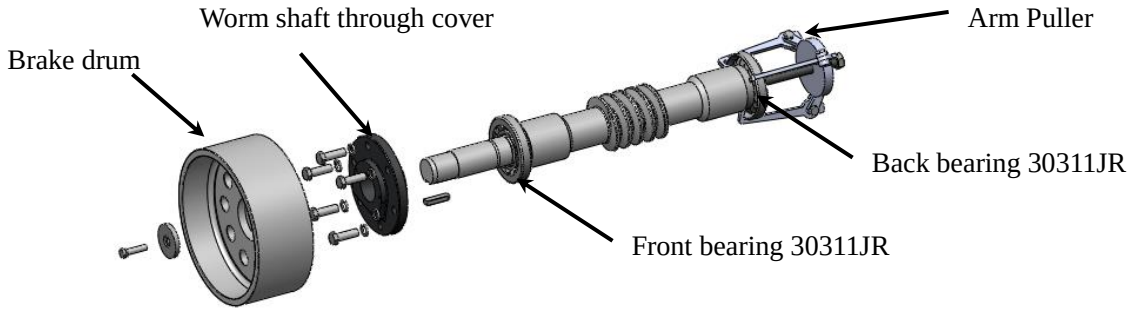


Figure 51 Worm bearing replacement

8.8.2.2 Worm Shaft Bearing Installation

1. Place the new **FRONT bearing** in the heater, and heat it to about 80±15℃(180±60°F), then quickly slide the heated bearing fully onto the worm shaft. Pack the bearing after it has cooled.
2. Install the bearing cup of the back bearing into the back bearing bore of the bottom gear case, and apply some 3# general purpose lithium lubricating grease on it.
3. Turn the shaft sheave by hand to install the worm shaft into the bottom gear case, and install the bearing cup of the back bearing into the back bearing bore of the bottom gear case with 3# general purpose lithium lubricating grease. (Pack the bearing.)

Note: Do not wear gloves when doing 4-5.

4. Install the worm shaft stuffy cover, a new O-ring (if needed), and shims into the end of the gearbox and screw in two bolts M12X40 and washers opposite each other. Do not tighten. See Figure 51.
5. Place a seal into the worm shaft covered through, and lightly coat with some 3# general purpose lithium lubricating grease. Place it and washer into the worm shaft motor side. Secure the worm shaft covered through with the bolts M12X40 and washers (4 groups). Tighten to 37-44 ft-lb.
6. Install the remaining M12x40 bolts in the worm shaft stuffy cover. Tighten all 4 bolts to 37-44 ft-lb.

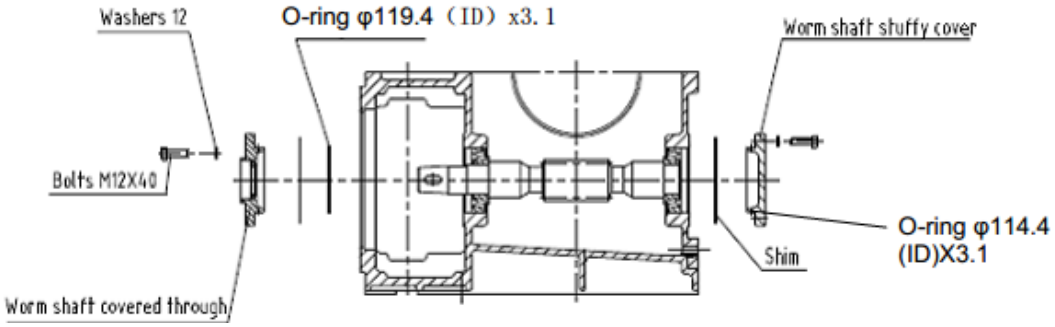


Figure 51 Worm O-ring

7. Install the key and brake drum into the worm shaft, then install the worm end enclosure, tighten it with bolt M12X45 and washer, making sure it is fully pressed on the worm shaft.

Note: Hold the normal brake open manually while reinstalling the brake drum.

8. Measure the radial travel movement of the brake pulley excircle and the axial gap of the worm shaft with dial indicator, the radial movement in no more than 0.0024",the axial gap is 0.0012"~0.0031". Adjustment the quantity of the shims on the stuffy cover until they are within specification. See Figure 52.

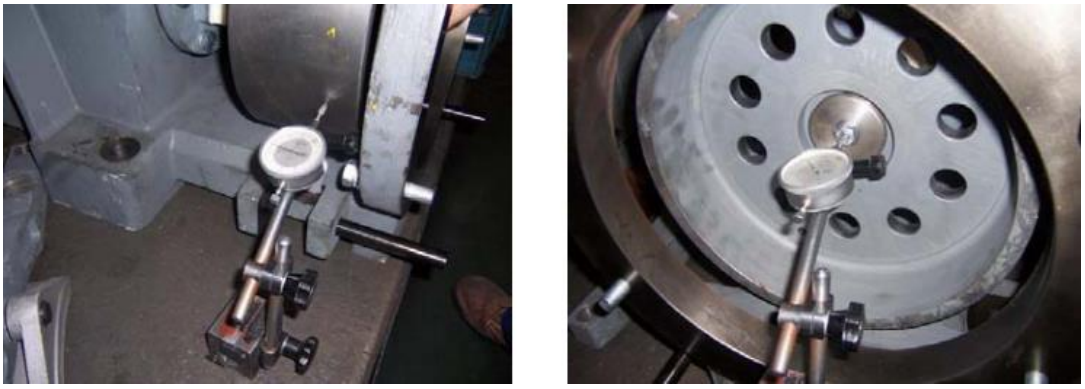


Figure 52 Measure the radial and axial movement

9. Loosen the bolt M6X16 to turn Top cover, then add about 7.3L (1.9 Gal) elevator oil.

Note: Fill to the red dot in the sight glass on the side of the gearbox. DO NOT over fill!

10. Install motor. See Section 8.3.2 Motor Installation.
11. Connect the mainline and test the machine.

8.9 O-rings and Seal Replacement

Required Tools & Materials:

Open end wrench: 18mm, 27mm

3# general purpose lithium lubricating grease

8.9.1 Output shaft O-ring Replacement

8.9.1.1 If oil leaked happened the output shaft stuffy cover:

a) Loosen the bolts M18x50 and washers (6 groups) and remove the bearing stuffy cover, and then remove the old O-Ring.

b) Apply some 3# General purpose lithium lubricating grease into the new O-Ring (Φ219.3 (ID) X5.7), and install it onto the bearing gland.

c) Tighten the Bolts M18x50 and washers (6 groups).

8.9.1.2 If oil leaked happened the output shaft bearing through cover:

d) Remove the sheave. See Section 8.6.1 Sheave Removal.

e) Loosen the bolts M18x50 and washers (6 groups) and remove the bearing covered through, then remove the old O-Ring. See Figure 53.

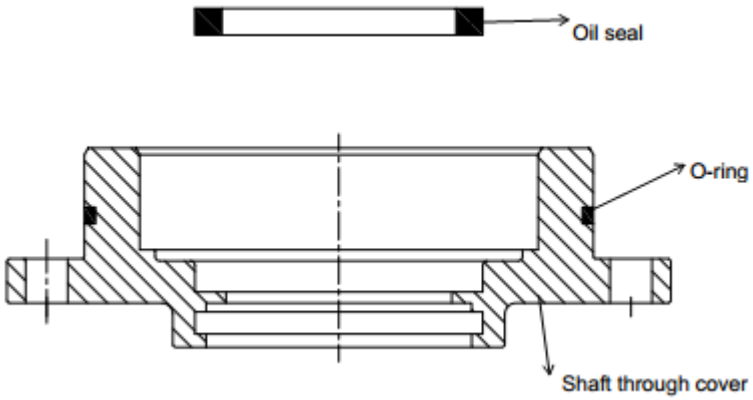


Figure 53 Through cover oil seal and O-ring

f) Remove the bearing cup from the cover, examine the seal and replace it with new one if it damaged.

g) Apply some 3# General purpose lithium lubricating grease into the new O-Ring (Φ219.3 (ID) X5.7) and the seal (TC 100X130X13), and install them onto the through cover.

h) Tighten the Bolts M18x50 and washers (6 groups).

i) Install the sheave. See Section 8.6.2 Sheave Installation.

8.9.2 Worm shaft O-ring Replacement

8.9.2.1 If oil leaked happened the worm shaft stuffy cover:

a) Drain the oil from the gearbox. See Section 6.3 Lubrication Check.

b) Loosen the bolts M12x40 and washers (4 groups) and remove the bearing stuffy cover, then remove the old O-Ring.

c) Apply some 3# General purpose lithium lubricating grease into the new O-Ring (Φ114.4 (ID) X3.1), and install it onto the worm shaft back cover.

d) Tighten the Bolts M12x40 and washers (4 groups).

e) Add oil. See Section6.3 Lubrication Check.

8.9.2.2 If oil leaked happened the Worm through cover:

a) Drain the oil from the gearbox. See Section 6.3 Lubrication Check & Oil Change.

b) Remove the motor. See Section 8.8.1 Motor Removal.

c) Remove the brake drum. See Section 8.8.2.1 Worm Shaft Bearing Removal, Steps 1-4.

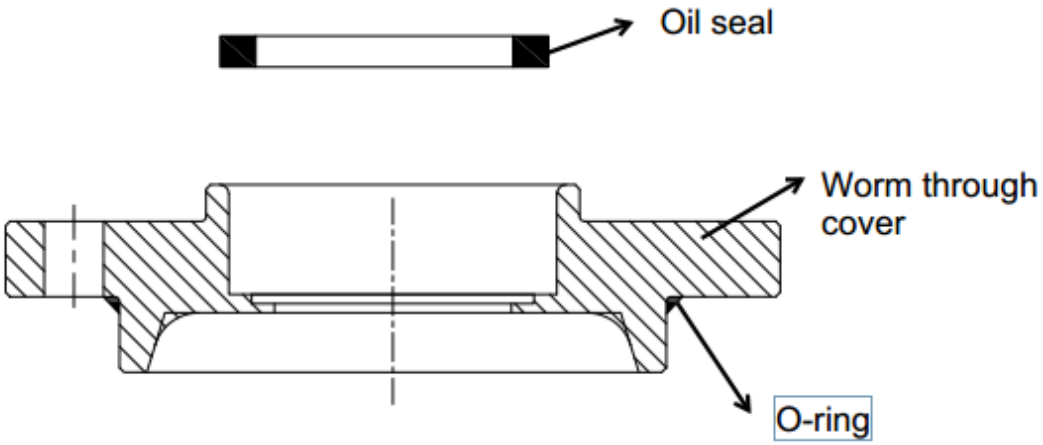


Figure 54 Worm through cover oil seal and O-ring

c) Examine the seal and replace it with new one (TC 50 72 12) if it damaged.

d) Apply some 3# General purpose lithium lubricating grease into the new O-Ring (Φ119.4 (ID) X3.1), and install it onto the Worm through cover.

e) Reinstall Worm through cover.

f) Add oil. See Section 6.3 Lubrication Check and Oil Change.

g) Reinstall Brake Drum. See Section 8.8.2.2 Worm Shaft Bearing Installation, steps 7-8.

h) Reinstall the motor.

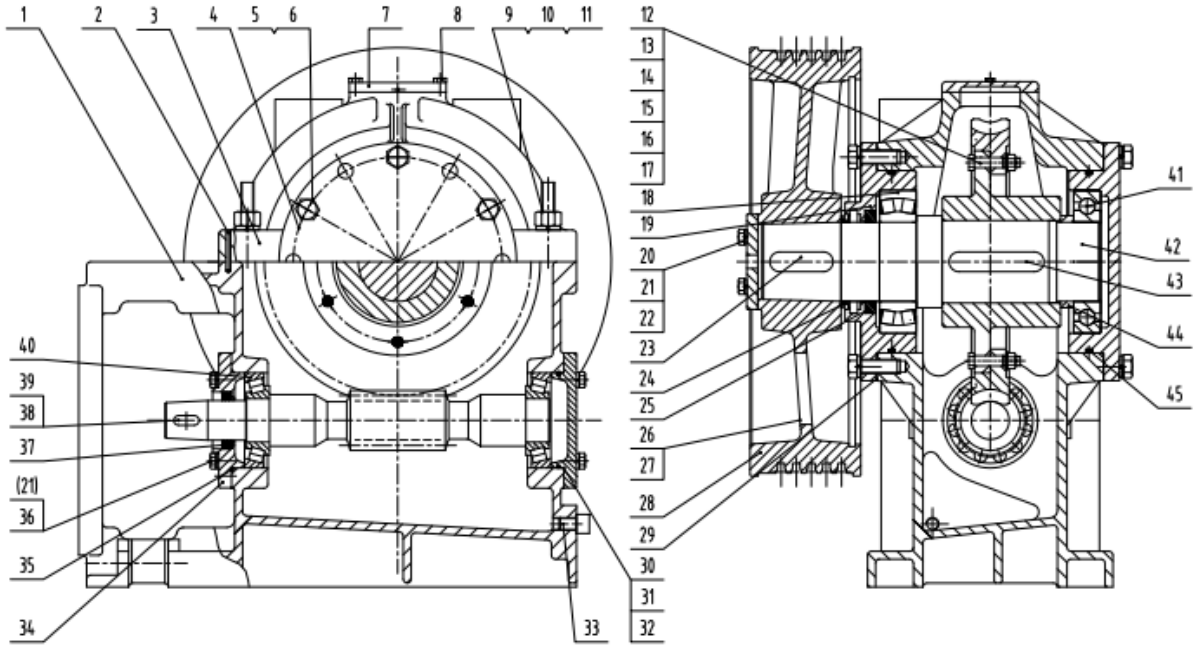
i) Reconnect the machine and test. Return to service.

9.0 Troubleshooting chart

WARNING! The proper maintenance of the gear machines requires adequately trained qualified personnel and proper tools.

Faults	Possible causes	Possible solutions
Motor not working	a. Incorrect inverter wiring	Verify the inverter wiring to make sure it is done correctly.
	b. Incorrect inverter parameters	Verify the inverter parameters.
	b. Incorrect encoder wiring	Verify the encoder wiring is correct.
	c. Bad encoder alignment	Verify the inverter alignment procedure is performed correctly.
	d. Loose encoder mounting	Tighten the encoder mounting screws
	e. Bad encoder	Replace the encoder.
	f. Bad brakes	Verify the brake operations
	g. Bad motor contactor	Replace motor contactor.
Abnormal noise or vibration	a. Brake friction noise	a. Verify brake control currents. b. Verify brake strokes.
	b. Bad grounding	Verify that earth ground is good.
	c. Bad inverter parameters	Make sure inverter parameters are correct
	d. Bad encoder feedbacks	Check grounding and shielding.
	e. Bad bearing	Replace the machine or bearing.
Electrical shocks	a. Bad grounding	Make sure that ground is solid.
	b. Bad humidity level	Make sure the humidity is within the specs.
	c. Broken cable insulation	Replace the cable.
Brake not working	a. Oil or grease on brake disk	Remove the oil and change the brake lining.
	b. Incorrect brake stroke	Readjust the brake stroke to factory standard
	c. Brake lining wear out to much	Check the brake lining thickness and readjust the brake stroke or replace the brake
	d. Bad brake coils	Replace the brake assembly
	e. Incorrect counterweight percentage	Verify counterweight percentage
	f. Noise absorber height is too big	Reduce the absorber height
Brake switch Not working	a. Bad wiring	Verify brake wiring
	b. The position of brake switch not installed correctly	Readjust the brake switch position
	c. Bad brake switch	Replace the switch
Motor is too hot	a. Elevator is overloaded	Verify elevator loading and duty cycle
	b. Incorrect counterweight percentage	Verify counterweight percentage

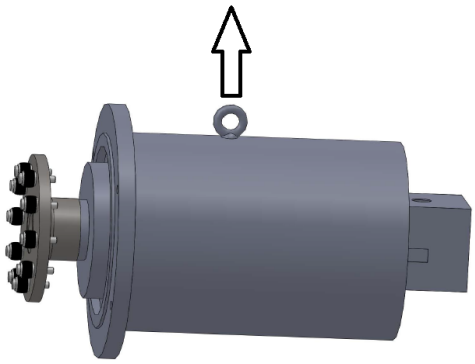
10.0 Traction Machine Assembly



No.	Torin Drive Part No.	Description
1	*	Machine body
2	*	Pin 6x50
3	*	Top gear case
4	*	Main shaft stuffy cover
5	*	Bolt M18X50
6	*	Washer 18
7	*	Top cover
8	*	Bolt M6X16
9	*	Bolt M20X140
10	*	Washer 20
11	*	Nut M20
12	*	Worm wheel
13	*	Worm wheel flange
14	*	Lock Washer 12
15	*	Nut M12X1.25
16	*	Hinged bolts M12X1.25X58
17	*	Spilt pin φ3x20
18	*	Bearing SKF 22220E
19	*	Shaft through cover
20	*	Bolt M12X45
21	*	Washer12

22	*	Pressure Pad
23	*	Key A
24	*	Oil retainer
25	*	NOK Oil seal TC 100 130 13
26	*	Nameplate of sheave
27	*	Rivets for nameplate
28	*	Sheave
29	*	Packing paper A
30	*	Shaft stuffy cover
31	*	Packing paper B
32	*	NOK O-ring φ114.4（ID）X3.1
33	*	Oil plug
34	*	Worm through cover
35	*	NOK O-ring φ119.4（ID）X3.1
36	*	Bolt M12X40
37	*	NOK Oil seal TC 50 72 12
38	*	Key B
39	*	Worm
40	*	Bearing 30311JR
41	*	Bearing SKF 6220
42	*	Shaft
43	*	Key C
44	*	Bearing spacer
45	*	NOK O-ring φ219.3（ID）X5.7

11.0 Induction Motors & Encoder

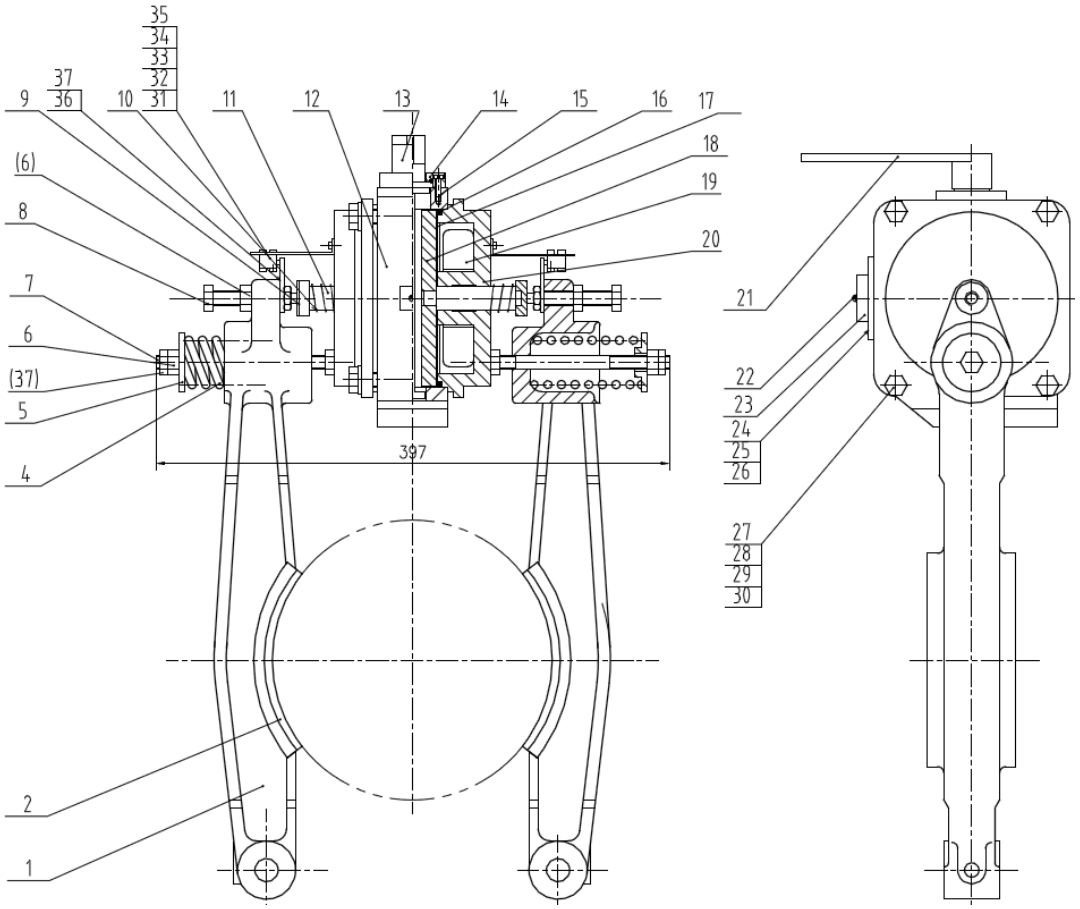


NO.	Torin Drive Part NO.	Motor Description
1	MOT-TGD0-6P-10HP- DV	10 HP (7.5 KW) motor for TGD0-1715. Coupling installed, 460/208~230V
2	MOT-TGD0-4P-12HP-DV	12 HP (9 KW) motor for TGD0-1720. Coupling installed, 460/208~230V
3	MOT-TGD0-4P-20HP-DV	20 HP (15KW) motor for TGD0-1735. Coupling installed, 460/208~230V

NO.	Torin Drive Part NO.	Encoder Description
1	PEN004	HS35F-100-R2-SS-2048-ABZC-28V/V-TB BEI Encoder
2	PEN004A	HS35R2048H37X36 Dynapar Encoder
3	PEN009	Encoder Cap for TGL1/2/3 with Hardware

12.0 Brake Assembly

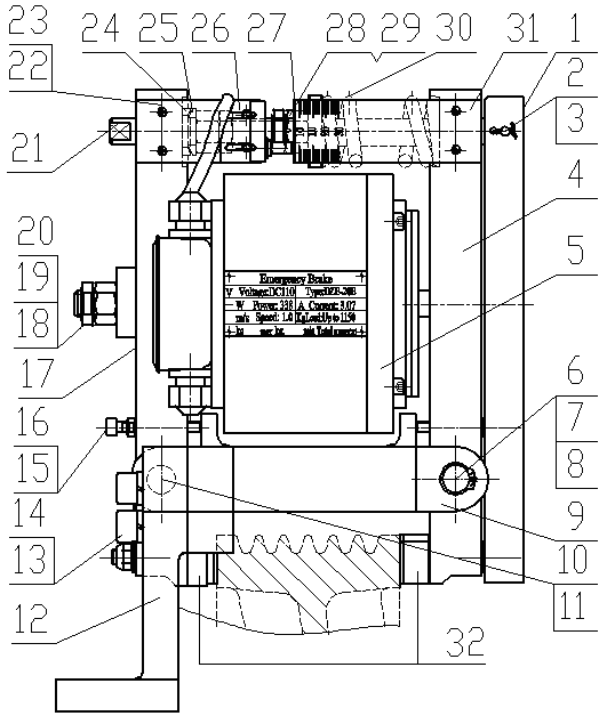
12.1 Normal Brake Assembly



No.	Torin Drive Part No.	Description
1	*	Brake arm
2	*	Brake lining
4	*	Brake spring
5	*	Spring cover
6	*	Nut M12X1.25
7	*	Threaded stud
8	*	Stop screw
9	*	Top block
10	*	Small spring
11	*	Brake shaft
12	*	Brake
13	*	Brake release lever
14	*	Compression ring
15	*	Bolt M5X16

16	*	Obturating ring
17	*	Separated magnetic
18	*	Disk
19	*	Coil
20	*	Coil holder
21	*	Brake release lever
22	*	Bolt M3X18
23	*	Post head
24	*	Bolt M3X10
25	*	Junction box
27	*	Nut M10
28	*	Washer 10
29	*	Washer 10
30	*	Bolt M10X110
31	*	Switch bracket
32	*	Bolt M3X10
33	*	D2VW-5-1M Micro switch
34	*	Bolt M3X15
35	*	Nut M3
36	*	Hit piece
37	*	Nut M12X1.25

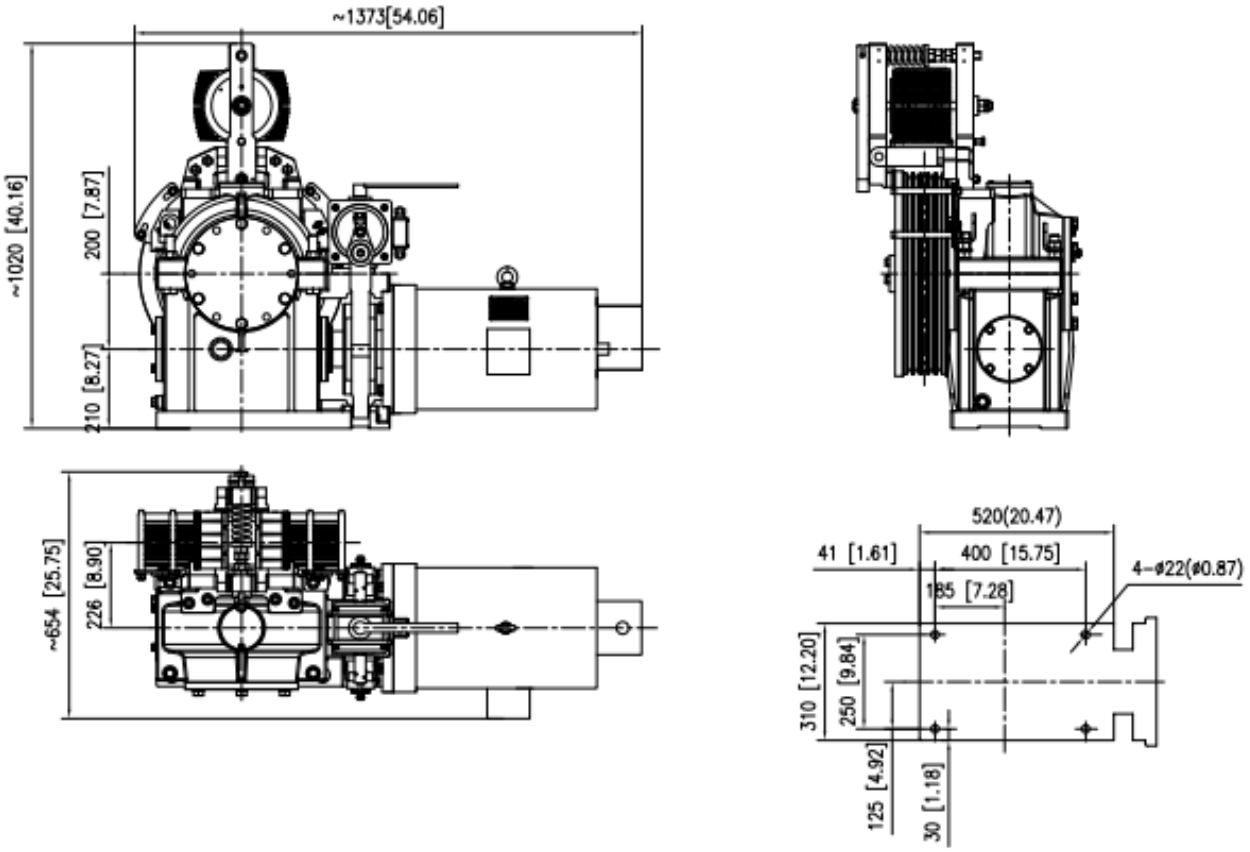
12.2 Emergency Brake Assembly



No.	Torin Drive Part No.	Description
1	PBK035	Brake lever
2	*	Pin
3	PBK036	Cotter pin 3.2x15
4	*	Brake arm part Ⅰ
5	PBK021	Emergency Brake
6	PBK037	Pin
7	*	Snap ring 22
8	PBK038	Resin filling pieces
9	*	Brake support
10	PBK039	Pin
11	PBK038	Resin filling pieces
12	*	Support
13	*	Bolt M16X75
14	*	Nut M16
15	*	Bolt M8X70
16	*	Nut M8
17	*	Brake arm part Ⅱ
18	*	Nut M20X1.5

19	*	Thin Nut M20X1.5
20	*	Washer 20
21	*	Stud
22	*	Screw M4X10
23	*	Washer 4
24	*	Spherical surface gasket
25	*	Conical surface gasket
26	PSW003	Emergency Brake Micro switch
27	*	Rod
28	*	Nut M20
29	*	Thin nut M20
30	*	Spring adjustment washer
31	PBK040	Spring
32	PBK041	Brake lining, emergency brake

13.0 MECHANICAL DIMENSIONS



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