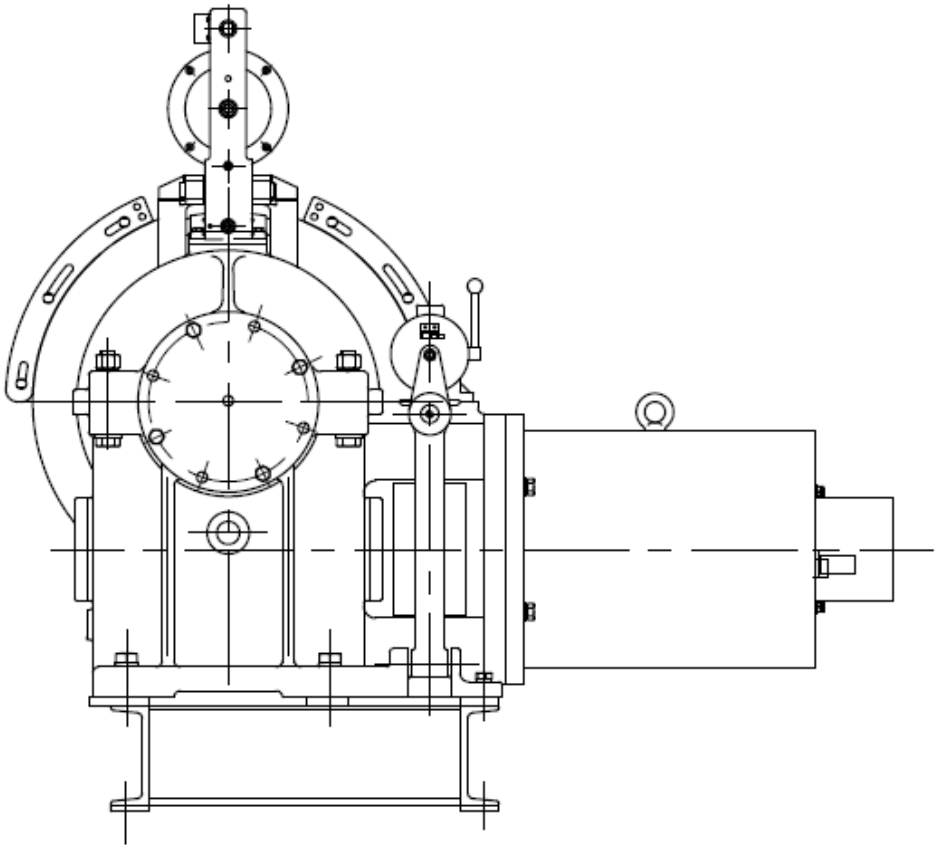
TGD2-SB

Geared Machine with optional sheave brake

Complete Operation and Service Manual



SUZHOU TORIN DRIVE EQUIPMENT CO., LTD.

Manual No. TDI-005-TGD2 **Revision 19 February 2016**

Contents

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.

1.0 Safety Precautions

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

Important!

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.

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.

1.1 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.

1.2 General Safety

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

1.3 Electrical Safety

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

1.4 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.

1.5 Mainline Disconnect

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

1.6 Test Equipment Safety

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

Meggering or 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.

1.7 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**.

1.8 Product Specific Warnings

The TGD2 Machine MUST be balanced during hoisting. See Hoisting Methods in the Installation section for proper lifting procedures.

Hang the elevator car before removing ANY bolts. Failure to do so may result in severe injury and equipment damage.

2. Arrival of the Equipment

2.1 Receiving

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

2.2 Storing

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

2.3 Hoisting

TGD2-SB machines can be lifted by using a combination of hooks, chains & slings designed to safely carry the weight of the machine. See Figure 1.

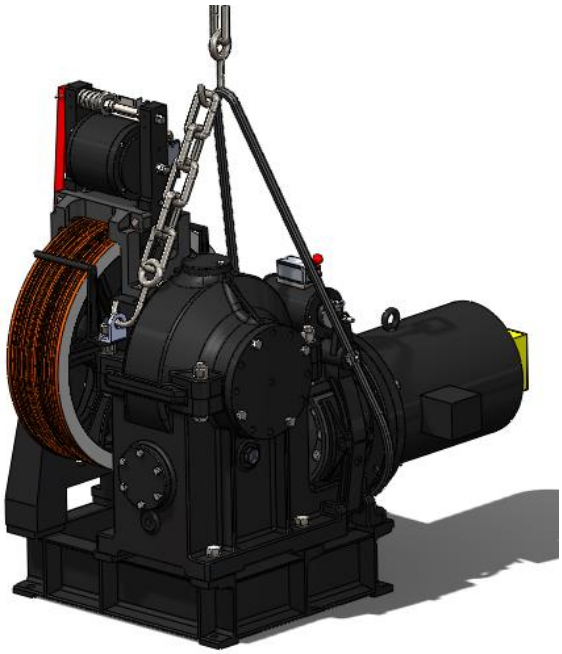


Figure 1 TGD2-SB Machine Recommended Hoisting Method

3. Application

3.1 Overview

The TGD2 Machine is a geared machine designed for elevators. Its worm and gear configuration allows speeds up to 500 fpm (maximum), and an elevator capacity of up to 3500lbs. 1:1, and 7000 lbs. 2:1 maximum.

The TGD2 machine used one (or two) drum brake with dual brake solenoids. The qualified elevator personnel can adjust the length of the spring to control the brake torque.

3.2 Codes and Standards

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

3.3 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

3.4 Machine Specifications

Induction motors: 480V / 60Hz / 4-poles / 3-phase

Normal Brake coils: 110VDC/2A

Optional Emergency Brake coils: 110VDC/3.6A

Maximum full load mass: 24200 lbs

Demountable bronze gear

Sheave diameter: 25.6 inches

Up to 8 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: 2000 lbs.

Lubricating oil: 13.5L (3.5 gal)

Recommended oil is Shell Omala 460 or equivalent elevator oil that has similar performance.

Recommended grease is Shell Gadus S5 V100 2

Normal Brake Model: DZE-12E
Pick/Hold Voltage: 110/65 VDC
Pick/Hold Current: 2.00/1.18 A
Resistance: 55 Ohms

Emergency brake model: DZE-21E
Pick/Hold Voltage: 110/70 VDC
Pick/Hold Current: 3.60/1.5 A
Resistance: 30.5 Ohms

Table 1 Machine Duty Table

Geared Machines For Single Wrap Applications					
Model Number		TGD2-3520-HV-R -SB	TGD2-3520-HV-L -SB	TGD2-3535-HV-R -SB	TGD2-3535-HV-L -SB
Motor Power	Hp	25	25	35	35
Elevator Capacity	lbs	3500	3500	3500	3500
Elevator Speed	fpm	200	200	350	350
Sheave Diameter	inches	25.6	25.6	25.6	25.6
Gear Ratio		50:1	50:1	61:2	61:2
Motor Use Speed	Rpm	1493	1493	1593	1593
Motor Voltage	VAC	480	480	480	480
Motor Rate Current	A	28	28	40	40
Cwt	%	40	40	40	40
Geared Machines For Single Wrap Applications					
Model Number		TGD2-2545-HV-R -SB	TGD2-2545-HV-L -SB	TGD2-2550-HV-R -SB	TGD2-2550-HV-L -SB
Motor Power	Hp	35	35	35	35
Elevator Capacity	Lbs	2500	2500	2500	2500
Elevator Speed	fpm	450	450	500	500
Sheave Diameter	inches	25.6	25.6	25.6	25.6
Gear Ratio		49:2	49:2	70:3	70:3
Motor Use Speed	Rpm	1646	1646	1741	1741
Motor Voltage	VAC	480	480	480	480
Motor Rate Current	A	40	40	40	40
Cwt	%	40	40	40	40

Geared Machines For Single Wrap Applications			
Model Number		TGD2-3540-HV-R-SB	TGD1-3540-HV-L-SB
Motor Power	Hp	40	40
Elevator Capacity	Lbs	3500	3500
Elevator Speed	fpm	400	400
Sheave Diameter	inches	25.6	25.6
Gear Ratio		55:2	55:2
Motor Use Speed	Rpm	1642	1642
Motor Voltage	VAC	480	480
Motor Rate Current	A	45	45
Cwt	%	40	40

4. Machine Overview

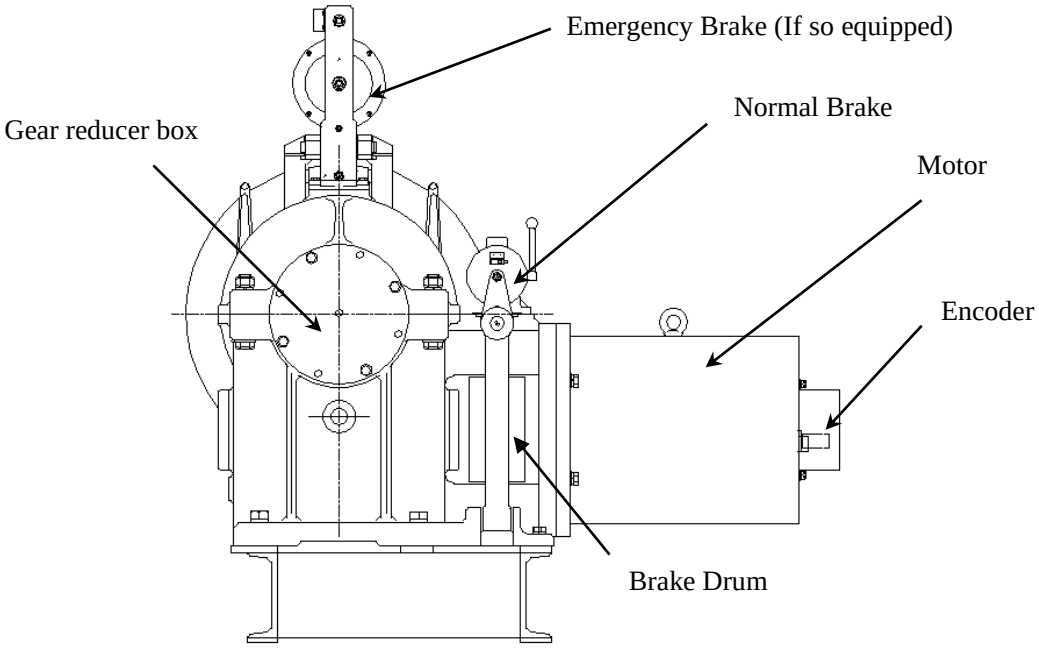


Figure 4 TGD2-SB Machine Assembly

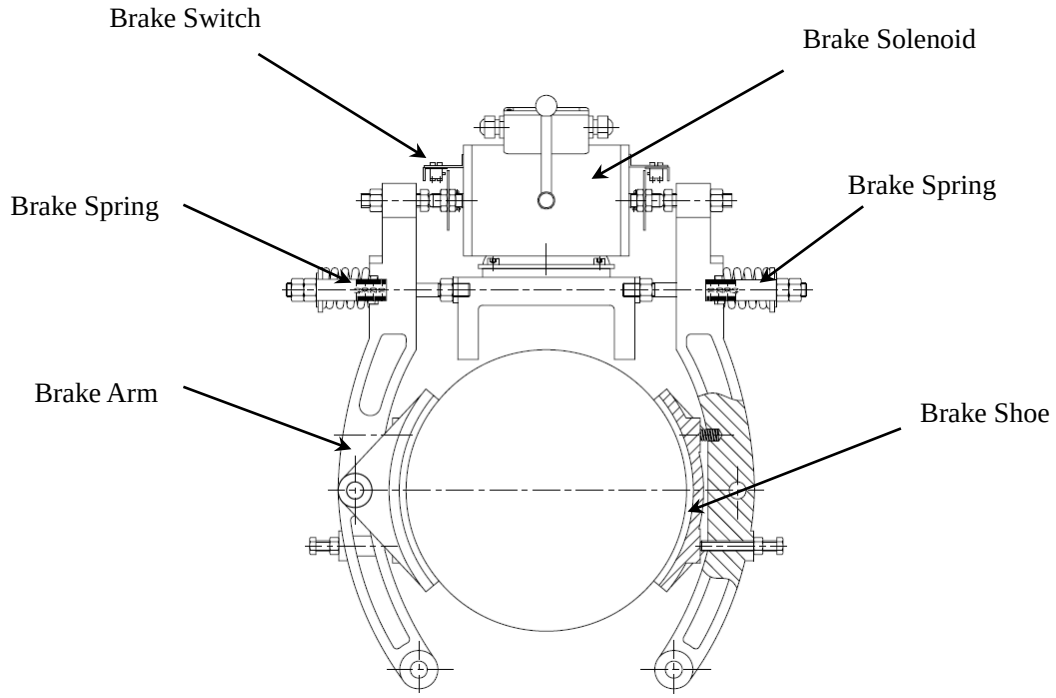


Figure 2 Normal Brake Assembly

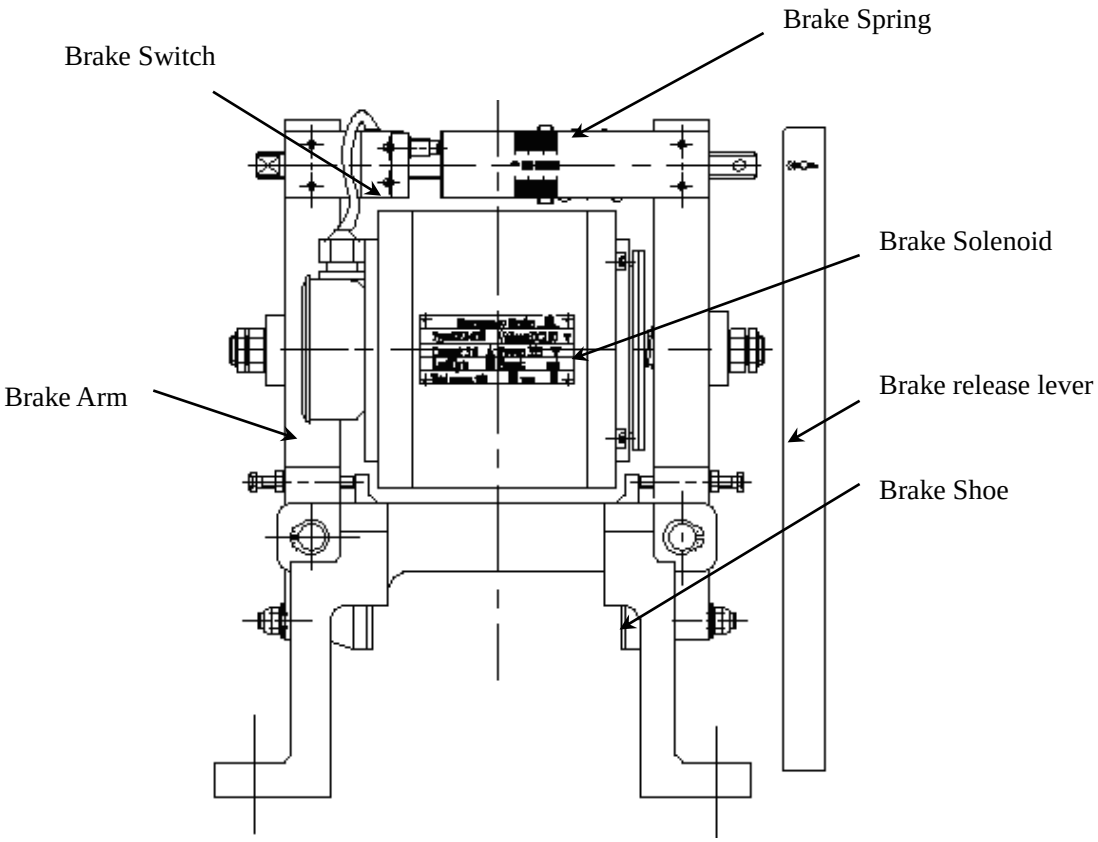


Figure 3 Emergency Brake Assembly

5. 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.

5.2 Brake Connection

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

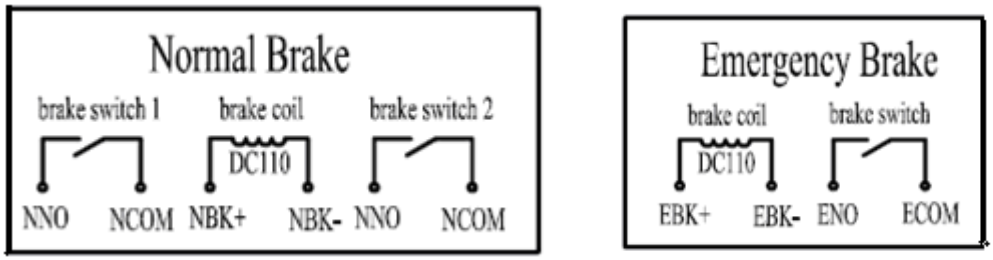


Figure 5 Normal & Emergency Brake Wiring

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 Incremental Encoder Connection

These machines are supplied with BEI HS35 Incremental Optical Encoder. The incremental resolution is 2048 pulses per revolution. The field personnel can connect the encoder to the inverter using special shielded-twisted-pair 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

6. Adjustments

6.1 Brake Torque Adjustment

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.

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.

6.1.1 Normal Brake Torque Adjustment

Required Tools & Materials:

Open end wrench: 18mm

Torque wrench

Adjustable wrench

12 point 22mm socket

Hex wrench: 6mm

Loctite 271

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 the following compress distance length See Table 2, otherwise the length must be readjusted.
2. Park the counterweight on the buffers & remove the elevator from service.

Table 2 Normal Brake Spring Length Decrement

Motor Power	Compress distance
25Hp	12-14mm
35Hp	14-16mm
40Hp	16-18mm

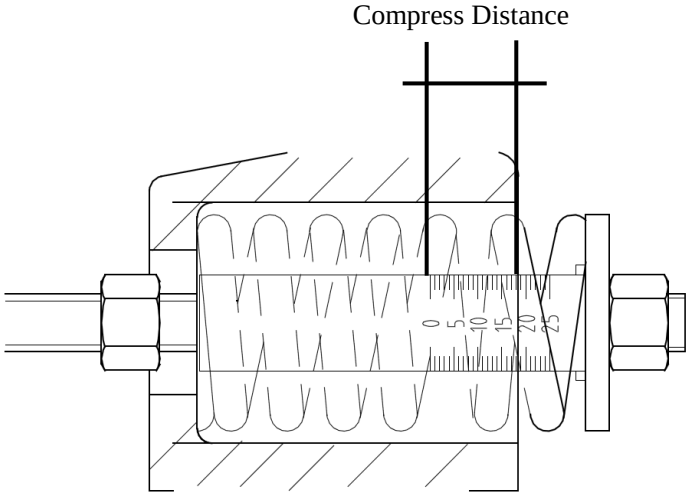


Figure 7 Normal Brake Spring Length Decrement

3. Loosen the Spring Adjustment Locknut by open end wrench (18mm), then adjust the Spring Adjustment Washer slowly to ensure the length is in range.

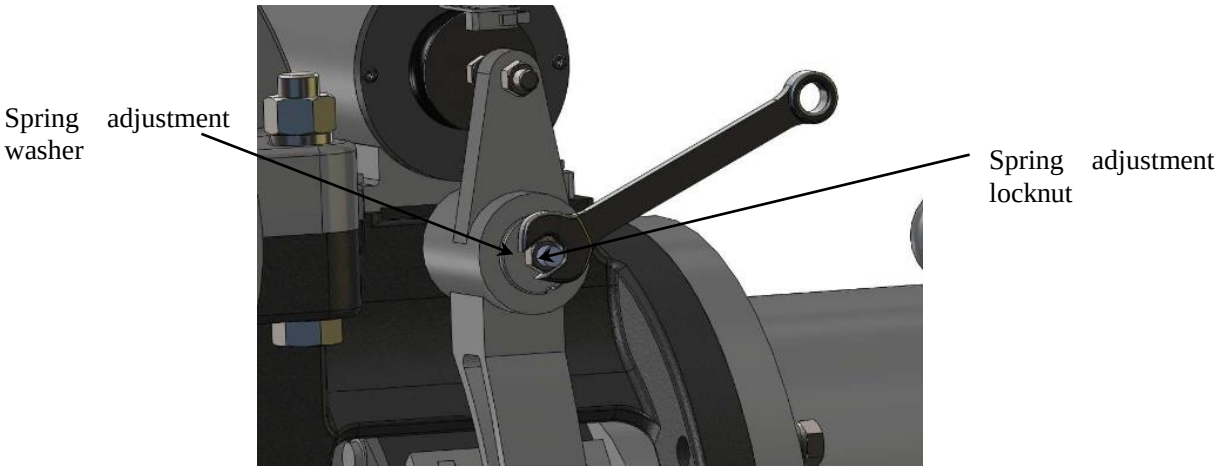


Figure 8 Brake Spring Adjustment

4. If the compress distance is too big, loosen the spring adjustment washer counterclockwise to reduce it. If the compress distance is too small, tighten the spring adjustment washer clockwise to increase the length.
5. Re-measure and confirm that the dimension is correct.

6. Also measure the brake torque by torque wrench. First, 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 11. The torque should match the value in Table 3. For information regarding how to remove the encoder cover, please refer to this manual, Section 8.1 Encoder Replacement.

Table 3 Normal Brake Torque

Motor Power	B
25Hp	⩾235Nm (173 ft-lb)
35Hp	⩾280Nm (206 ft-lb)
40Hp	⩾320Nm (236 ft-lb)

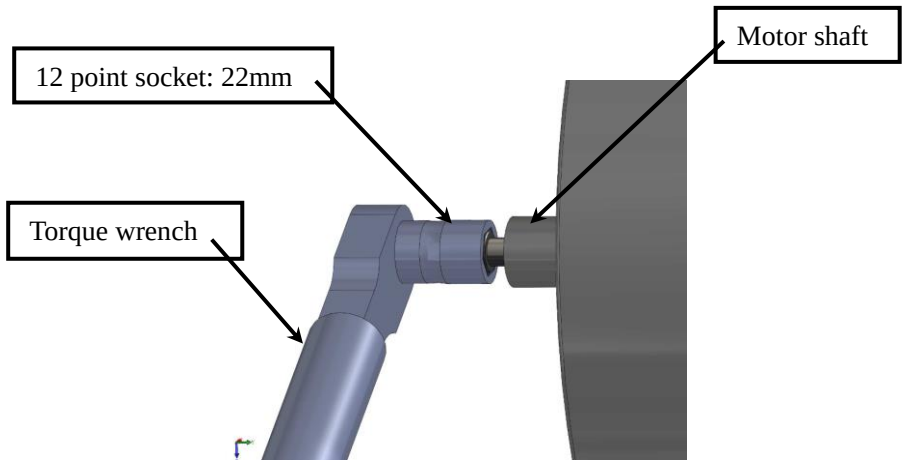


Figure 9 Normal Brake Torque Test

6.1.2 Emergency Brake Torque Adjustment

Required Tools & Materials:

Open end wrench: 30mm (2 piece)

Torque wrench

12 point 22mm socket

Hex wrench: 6mm

Loctite 271

Adjustment Procedure Steps

1. Check the length of the spring's decrement, which is shown on the surveyor's rod. The surveyor's rod should show the length [A] as in Table 4, otherwise the length must be readjusted. See Figure 10.

Table 4 Emergency Brake Spring Length Decrement

Rated Load	A
2500 lbs	16-18mm
3500lbs	24-26mm

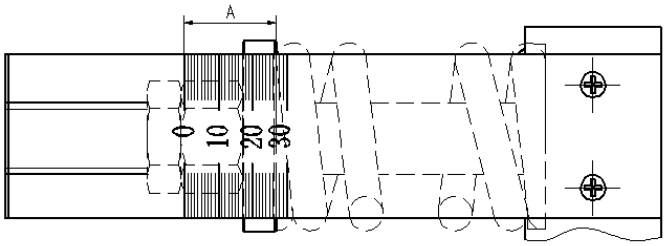


Figure 10 Emergency Brake Spring Length Decrement

2. Park the counterweight on the buffers and remove the elevator from service.
3. Loosen the Spring Adjustment Locknut by open end wrench (30mm), then adjust the Spring Adjustment Washer slowly to ensure the length is in range. See Figure 11.

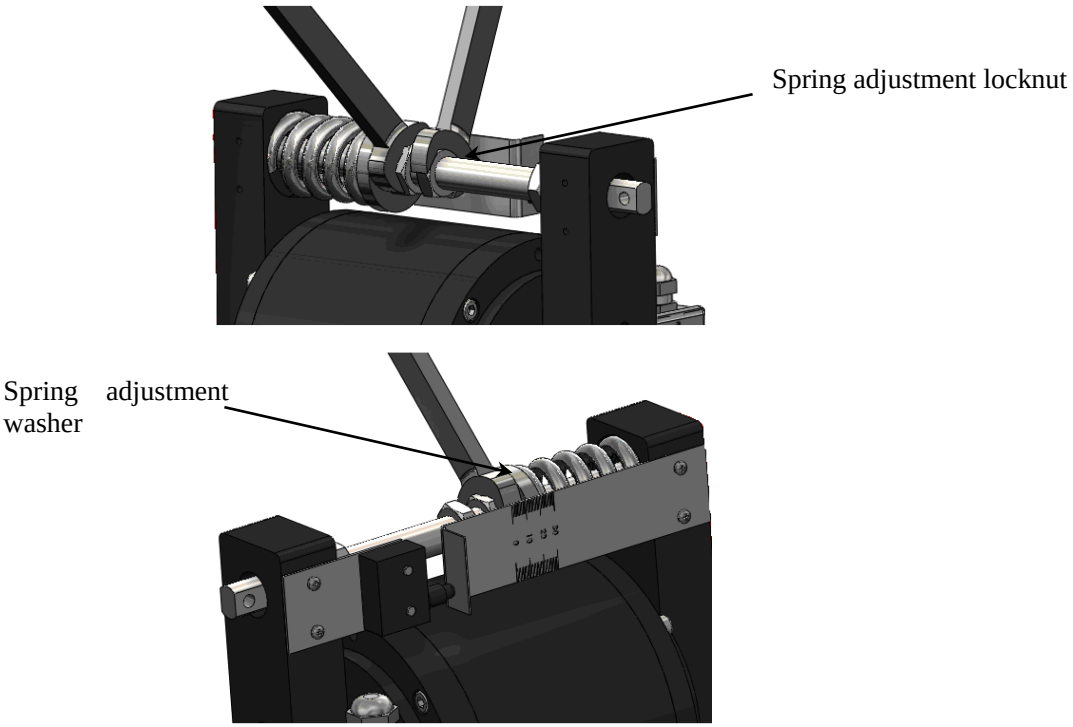


Figure 11 Emergency Brake Spring Adjustment

5. If the "A" dimension is too big, loosen the spring adjustment nut counter clockwise to reduce it. If the "A" dimension is too small, tighten the spring adjustment nut clockwise to increase the dimension.
6. Re-measure and confirm that the value of length is correct.

7. Also measure the brake torque by torque wrench. First of all, remove the encoder cover from the motor shaft. With a 12 point, 22 mm socket and torque wrench on the end of the motor shaft measure the torque, making sure the normal brake is open. See Figure 12. The torque should match the value "B" in Table 5. For information regarding how to remove the encoder cover, please refer to this manual, Section 8.1 Encoder Replacement.

Table 5 Emergency Brake Torque

Rated Load	Speed	B
2500lbs	2.29m/s (450fpm)	⩾212Nm (156 ft-lb)
2500lbs	2.54m/s (500 fpm)	⩾210Nm (155 ft-lb)
3500lbs	1m/s (200 fpm)	⩾166Nm (122 ft-lb)
3500lbs	1.78m/s (350 fpm)	⩾218Nm (161 ft-lb)
3500lbs	2.03m/s (400 fpm)	⩾261Nm (192 ft-lb)

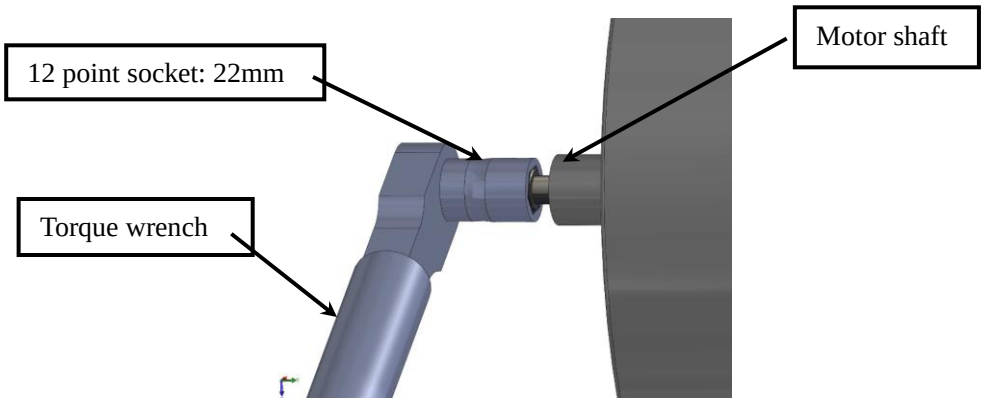


Figure 12 Emergency Brake Torque Test

8. Then apply red Loctite 271 between the bolt and luck nut for anti-vibration purpose.

6.2 Brake Stroke Adjustment

WARNING! 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.

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.

6.2.1 Normal Brake Stroke Adjustment

Required Tools & Materials:

Open End Wrench: 18mm

Hex wrench: 6mm

Feeler gauges

Adjustment Procedure Steps

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

1. Loosen the Stroke adjustment locknut, verify that the Hit Cap and the Stroke Adjustment Bolt just make contact when the brake's power is on, and screw the Stroke Adjustment Bolt with a hex wrench 6mm into the direction of the brake solenoid to 1.6~2.0mm (0.063"~0.079"). See Figure 13.

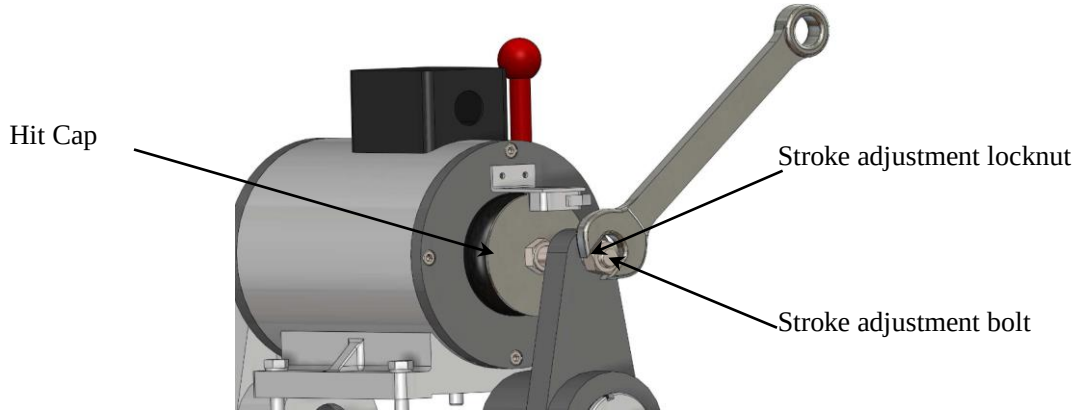


Figure 13 Normal Brake Stroke Adjustment

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 big, tighten the bolt clockwise to reduce it. If the gap is too small, loosen the bolt counter-clockwise to increase the gap. See Figure 14.

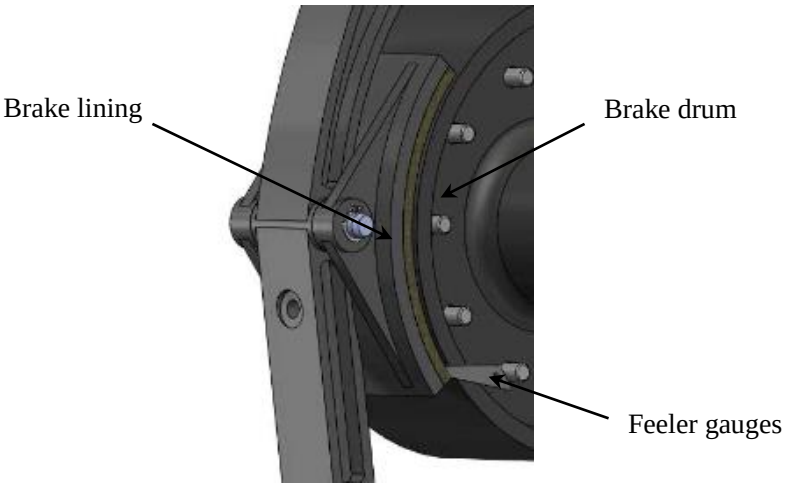


Figure 14 Normal Brake gap

3. Tighten the Stroke adjustment locknut then apply red Loctite 271 between the locknut and the bolt.

6.2.2 Emergency Brake Stroke Adjustment

Required Tools & Materials:

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

Phillips screwdriver

Dial indicator (2)

Feeler gauge

Rubber hammer

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

Adjust 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 15. 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 ($1/6^{th}$ of a turn at a time) the thin nut M20 and nut M20 with an open end wrench 30 mm counter-clockwise to reduce it. See Figure 16. Otherwise tighten ($1/6^{th}$ 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 the Figure 16.

4. 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 16.

5. 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 bolt M8 on the opposite side until the reading is even. Then repeat step 3.

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

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

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

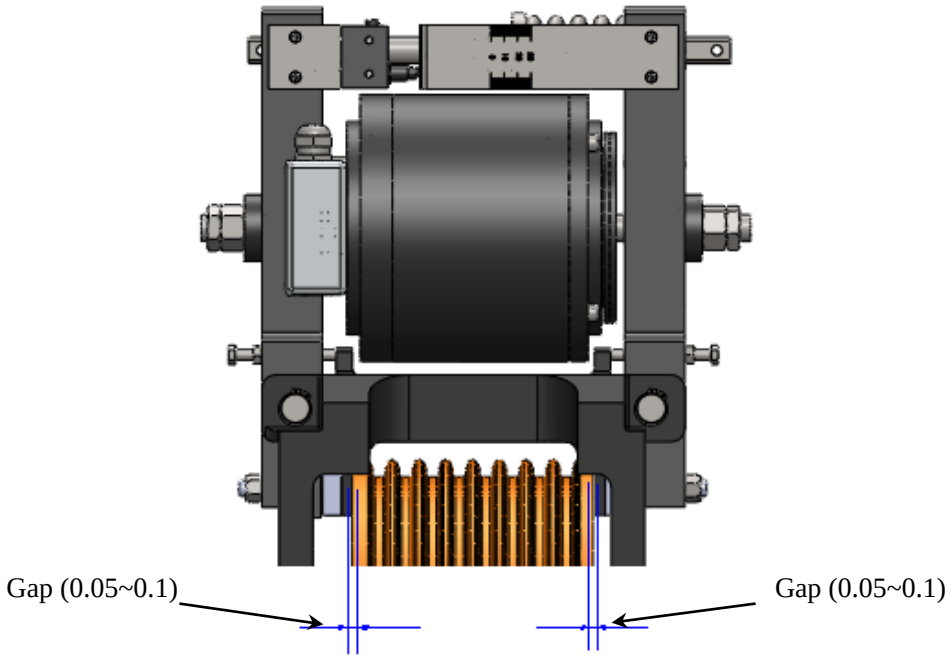


Figure 15 Emergency Brake Gap

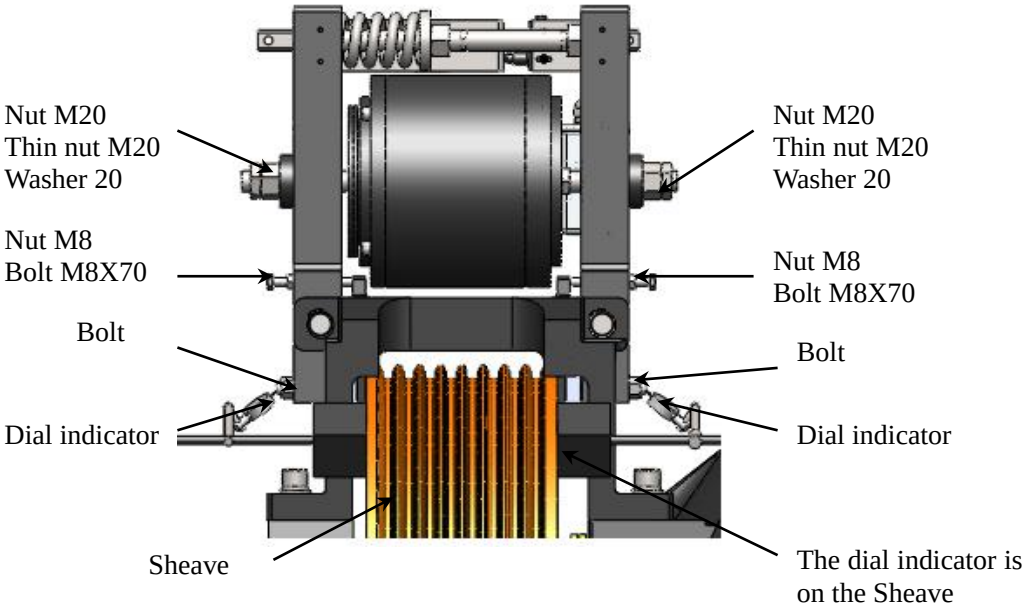


Figure 16 Emergency Brake Adjustment

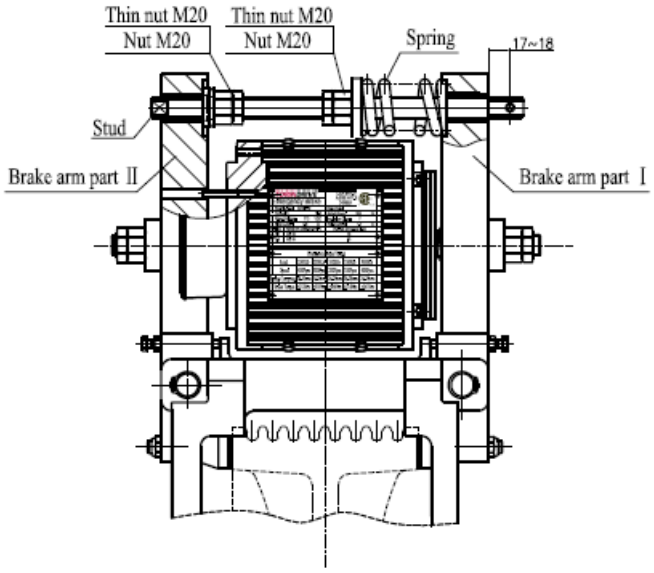


Figure 17 Emergency Brake Stud Location

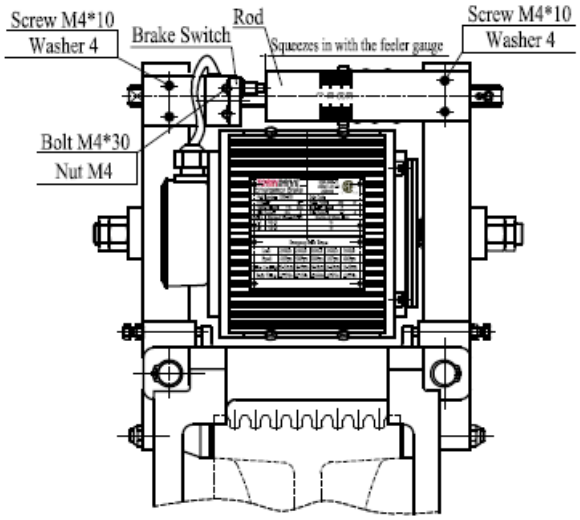


Figure 18 Emergency Brake Reassembled

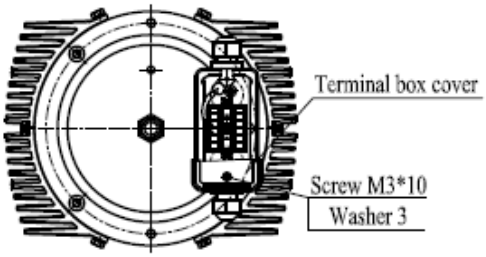


Figure 19 Emergency Brake Terminal Box

6.3 Brake Synchronous Adjustment

CAUTION! This step should be done when the brake torque meets the specified value [B] (See Table 3).

Required Tools & Materials:

Open End Wrench: 18mm

Adjustment Procedure Steps for Normal Brake

1. If a Brake Arm opens slower than the other arm, loosen the Synchronization locknut and bolt of slower arm or tighten the faster arm synchronization bolt after loosening its locknut, until both arms opens and closes at the same time.
2. Once both arms opens and closes at the same time tighten the locknuts.
3. After adjusting, verify the brake torque according to Section 6.1.1 Normal Brake Torque Adjustment.

Adjustment Procedure Steps for Emergency Brake

4. If a Brake Arm opens slower than the other arm, loosen the Synchronization locknut M8 and bolt of slower arm or tighten the faster arm synchronization bolt M8 after loosening its locknut M8, until both arms opens and closes at the same time.
5. Once both arms opens and closes at the same time tighten the locknuts M8.
6. After adjusting, verify the brake torque according to Section 6.1.2 Emergency Brake Torque Adjustment**.**

7. Maintenance

Only qualified personnel are allowed to perform any maintenance work. The person who performs the maintenance work must be very careful because some work must be performed when the machine is running.

7.1 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, the brake will become disabled. Generally, the brake stroke has been adjusted in the factory and does not need to be adjusted in the field.

Suggest check cycle

Every 3 months after install in the first 6 months. Every 1 year afterwards.

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 the bottom of the Emergency Brake Shoe and the sheave should 0.05~0.1mm (0.002”~0.004”).

7.2 Brake Lining Wear Check

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

Suggest check cycle

Every 1 year

Benchmark Criteria

The **Normal** brake lining wear must be <2mm (0.079”). Use steel rule to measure the thickness of the brake shoe, the thickness must be >6mm (0.236”). Otherwise replace the brake lining or replace the whole brake assembly. See Figure 20.

The **Emergency** brake lining wear must be <2mm (0.079”). Use steel rule to measure the Gap B must be >20mm (0.79”). Otherwise replace the brake lining or replace the whole brake assembly. See Figure 21.

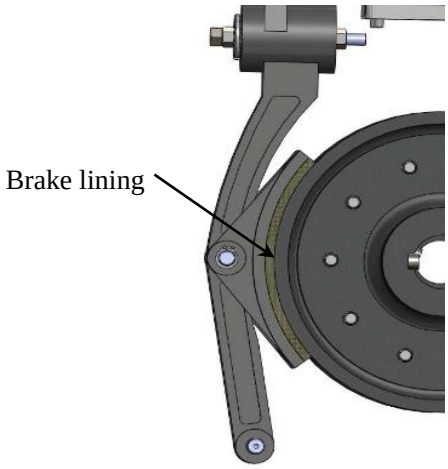


Figure 20 Normal brake lining

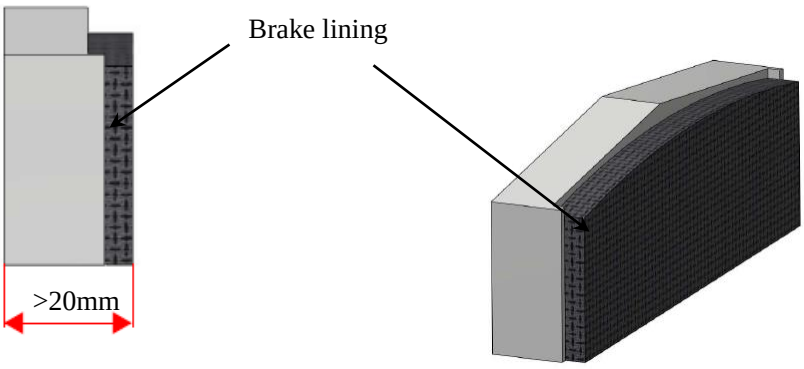


Figure 21 Emergency brake lining

7.3 Lubrication Check

The oil type we recommend is Shell Omala 460 elevator oil.

The grease we recommend is Shell Gadus S5 V100 2.

Whether the gear oil needs to be changed depends on the cleanliness and ageing degree. Check the oil color, smell and degree of cleanliness to determine whether oil needs to be changed. If oil turns black and has a foul smell, it should be changed. Filter paper may be used to check hot oil and watch for metal shavings to see if the oil needs changing. The oil volume of the TGD2 machine is 13.5L (3.5 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, oil will leak out.

If the machine is stored for more than 1 year, the oil should be changed before use.

Suggested cycle check

When using conventional 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 oil each 2000-3000 hours (at most 12-18 months).

Bearing grease should be checked every 6 months.

8. Replacement

WARNING! The personnel who do the replacement work 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”, 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 hex wrench 9/64” and loosen the bolt which connects the motor and the encoder bracket with a hex wrench 8mm, then remove the broken encoder. See Figure 22.

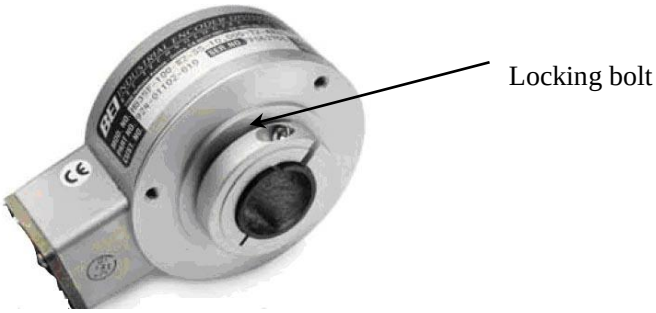


Figure 22 Encoder

8.1.2 Encoder mounting

1. Attach the encoder bracket to the encoder so that the cable connection is near the opening in the encoder cover.
2. Clean the motor shaft with clean colth, then slip the encoder on to the shaft.

3. Tighten the bolt into the motor through the encoder bracket with a hex wrench 8mm and tighten the locking bolt with the Hex wrench 9/64".
4. Connect the encoder and the transducer cable, and install the encoder cover.

8.2 Brake Switch Replacement

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

Phillips screwdriver

Small flathead screwdriver

Loctite 290

Multimeter

Adjustable end wrench

Feeler gauges:1mm

8.2.1.1 Normal Brake switch removal

1. Loosen the bolts and the washers on the brake terminal box using a Phillips head screwdriver, and remove the terminal box cover.
2. Remove the cable of the brake switch that needs to be replaced from the brake terminal using a small flathead screwdriver.
3. Loosen the Composite slot screw M4x10 using a Phillips head screwdriver, then remove the broken switch with bracket. See Figure 23.

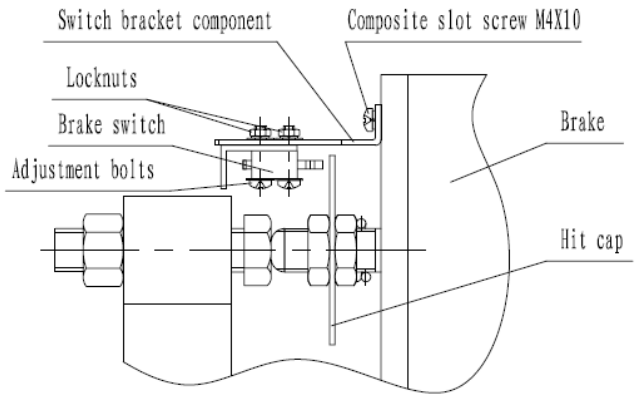


Figure 23 Normal Brake switch mounting

8.2.1.2 Normal Brake switch installation

1. Clean the switch bracket component mating surface if it is not clean.
2. Install the brake swith and the bracket component on the brake surface using the composite slot screw M4x10.
3. Reconnect the new brake switch cable to terminal block.

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 gauges between the Hit cap and the brake switch, and adjust the switch slowly. When the switch operates tighten the ajustment bolts and locknuts, and remove the feeler gauges.
3. Apply Loctite 290 between the screw heads and the switch body.

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

1. Remove the two (2) Screws M3X10 and then remove the terminal box cover. See Figure 19 on page 20.
2. Take off the brake switch cable in the terminal using a small flathead screwdriver.
3. Remove the two (2) Screws M4X10 and then remove the Brake switch with plate. See Figure 24.
4. Remove the two (2) bolts M4X30, Nuts M4, washers 4 and lockwashers 4 and then remove the brake switch.

8.2.2.2 Emergency Brake switch installation

1. Clean the fitting 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.
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.

8.2.2.3 Emergency Brake Switch adjustment

1. Loosen the bolts M4x30 using a open wrench 7mm (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 squeezed between the brake switch and the rod does not trigger the switch, but a 2mm (0.79") feeler gauge does trigger the switch.
3. Apply loctite 290 between the bolt heads and the switch body.

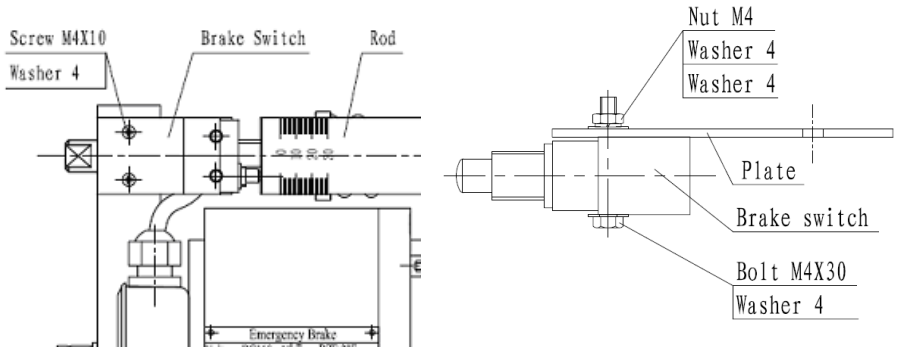


Figure 24 Emergency Brake Switch Replacement

8.3 Motor Replacement

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

Required Tools & Materials:

Hoisting equipment

Open end wrench: 24mm

Clean cloth

Lubricating oil

Torque Wrench

Phillips screwdriver

Flat head screwdriver

8.3.1 Motor removal

1. Remove the elevator from service.
2. Remove the encoder from the motor, for information regarding how to remove the encoder, please refer to this manual, Section 8.1 Encoder Replacement.
3. Remove the motor terminal box cover, then 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 25.
5. Remove the Bolts M16x65 and washers (4 groups).

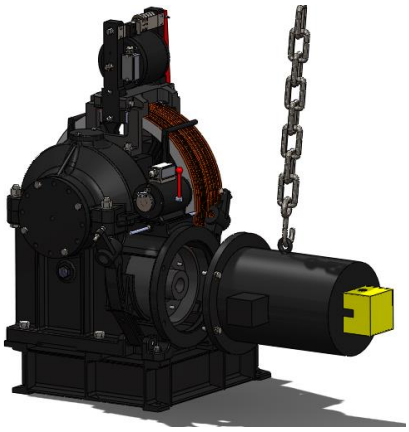


Figure 25 Motor Replacement

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

1. Apply some lubricating oil on the flexible coupling, hoist the motor and keep level, make the position of the motor coupling's keyway and the position of the brake drum's keyway opposite of each other. (Note: A mark on the encoder end of the motor shaft in line with the key to make alignment easier.)
2. Tighten the bolts (4) M16x65 and washes to 125Nm - 150Nm (92 ft-lb - 110 ft-lb).
3. Turn the motor and measure the radial travel movement of the brake drum ex-circle is no more than 0.004" use dial indicator.
4. Reinstall the encoder. See section 8.1.2 and reconnect wiring.

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 Replacement

Required Tools & Materials:

Hex wrench (6mm)

Phillips screwdriver

Small flathead screwdriver

8.4.1.1 Normal Brake removal

1. Remove the elevator from service. Remove the brake cable and the brake switch cable from the brake terminal box.
2. Loosen the hexagonal bolts (4) M8x20 and washers with hex wrench 6mm, and remove the broken brake from gear box. See Figure 26.

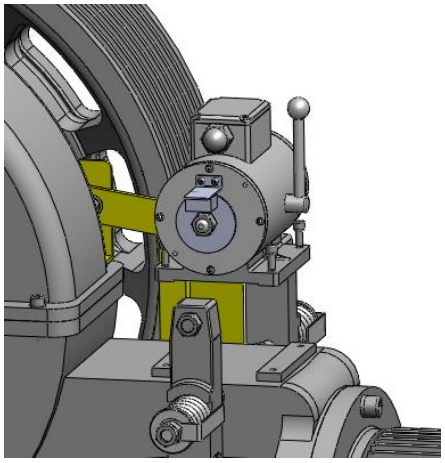


Figure 26 Normal Brake Removal

8.4.1.2 Normal Brake installation

1. Install the new brake onto the gear box, and attach it with the bolts M8x16 and washers, but do not tighten. See Figure 27.
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 (4) M8x20, make the position of the brake secure.
3. For Normal Brake Torque Adjustment refer to this manual section 6.1.1 and for Stroke adjustment see section 6.2.1.

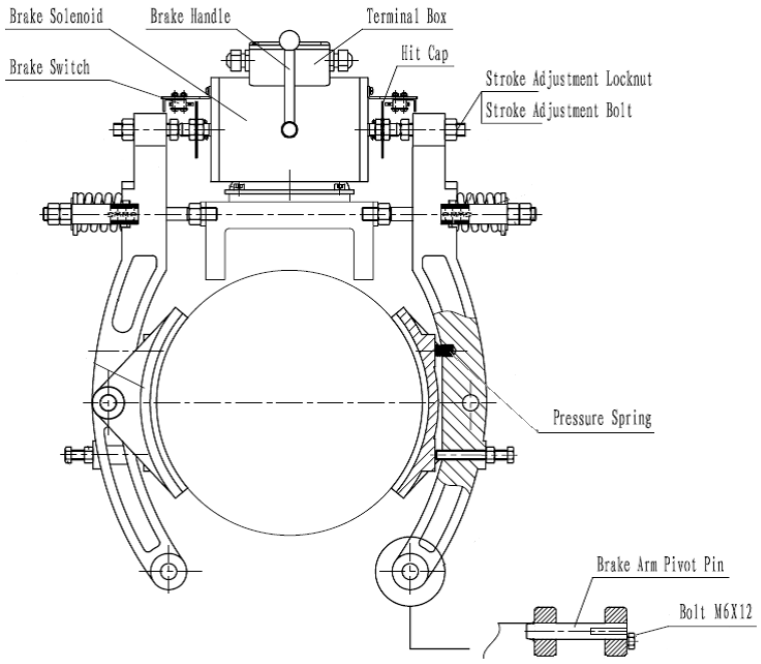


Figure 27 Normal Brake

8.4.2 Emergency Brake Replacement

Required Tools & Materials:

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

Phillips screwdriver

Small flathead screwdriver

Large flathead screwdriver

Snap ring pliers

Feeler gauge

Rubber hammer

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

Loctite 243

Note:

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

8.4.2.1 Emergency Brake removal

1. Remove the elevator from service.
2. Remove the terminal box cover. Disconnect the wiring to the brake. See Figure 28.
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.

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).
8. Remove the two (2) snap rings, then use the large screwdriver and Rubber hammer to push the Pin out of the Brake arm part I.
9. Remove the Brake arm part I.
10. Remove the Stud (Including Nuts and spring).
11. Remove the Brake.
12. Remove the two (2) snap rings and then use the Screwdriver and Rubber hammer to push the Pin out of the Brake arm part II.
13. Remove the Brake arm part II from the brake support.

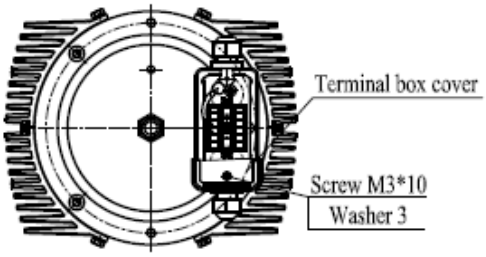


Figure 28 Emergency Brake Terminal box

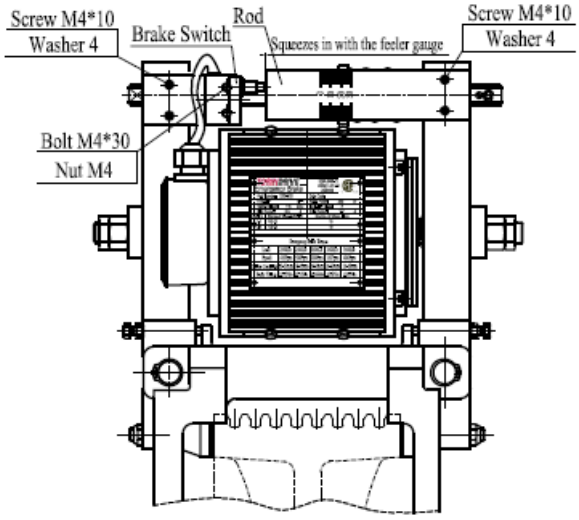


Figure 29 Emergency Brake

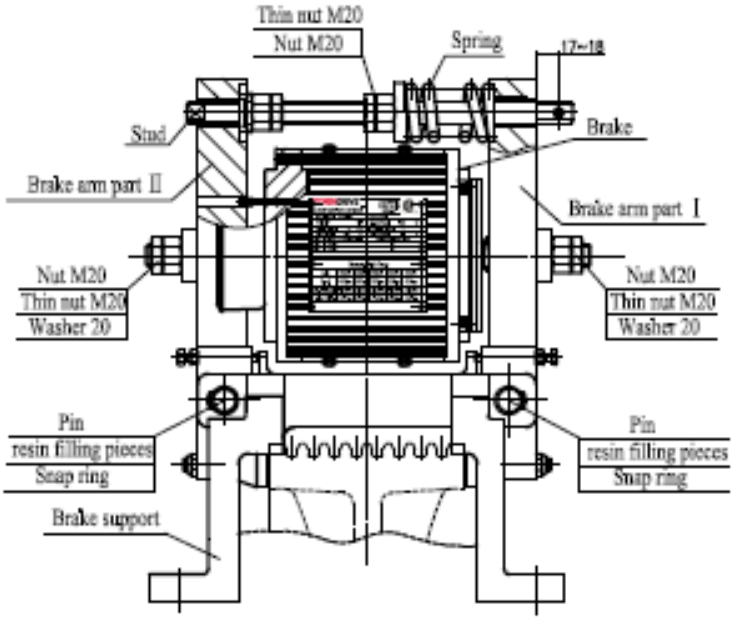


Figure 30 Emergency Brake Replacement

8.4.2.2 Emergency Brake installation

Note: If you are only replacing the brake coil follow steps 4 thru 14.

1. Place the Brake arm part I into the Brake Support; put two (2) Resin filling pieces into the gap which between Brake arm part I and Brake Support (both sides). See Figures 31-33.
2. Insert the Pin into the hole from Brake Support to Brake arm part I.
3. Install the two (2) snap rings onto the Pin.
4. Install the stud (Including Spring, Nuts and Gasket) into the hole of Brake arm part I.
5. Install the new Brake into the hole of Brake arm part I.
6. Place the Brake arm part II into Brake Support.

   Note: Put the Elastic pin 6X35 of brake into the hole of Brake arm part II.
7. Put the two (2) Resin filling pieces into the gap which between Brake arm part II and Brake Support (both sides).
8. Insert the Pin into the hole from brake support to Brake arm part II.
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. Tighten the Nut M20 and Thin nut M20 of Stud to compress the Spring about 26mm.
12. For brake adjustment, refer to this manual, Emergency Brake Adjustment Section 6.2.2
13. Reconnect the wiring in the terminal box. Replace the cover.

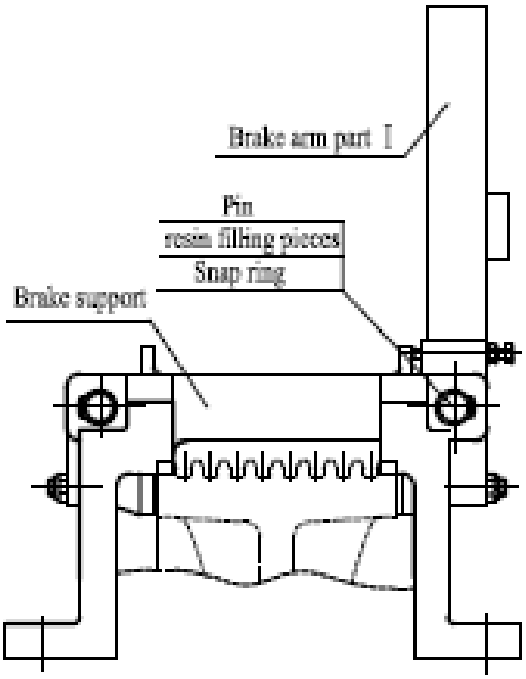


Figure 31 Emergency Brake Installation

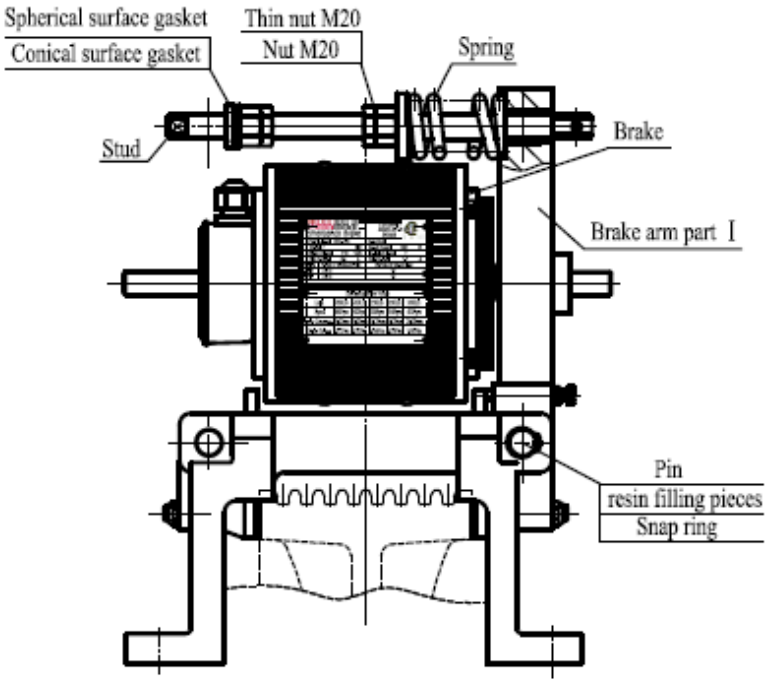


Figure 32 Emergency Brake Installation

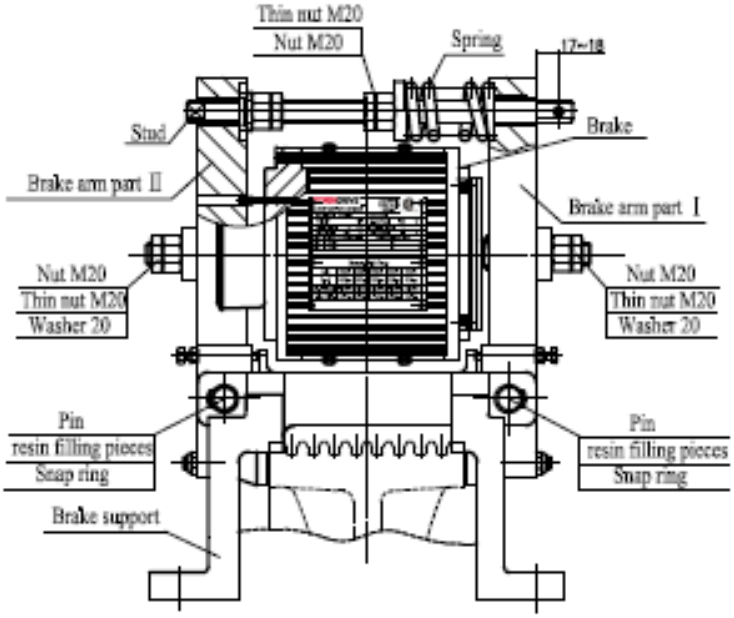


Figure 33 Emergency Brake Installation

8.5 Brake Lining Replacement

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

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

8.5.1 Normal Brake Lining Replacement

Required Tools & Materials:

Open end wrench: 18mm

Hex wrench: 6mm

Flathead screwdriver

Hammers: 1 ball peen and 1 soft face

Snap ring pliers

Drift punch

M6x50 bolt

M8x50 bolt

8.5.1.1 Normal Brake Lining removal

1. Remove the elevator from service.

2. Loosen the spring adjustment nut & washer, taking the pressure off the brake spring. See Figure 34.
3. Remove the set screws M6x12 and washers, and install the M6x50 bolt into the end of the brake arm pivot pin.
4. Remove the brake arm pins by pulling on the bolt installed in Step (3).
5. Remove the spring adjustment nut, washer & brake spring. On the sheave side also remove the spring threated stud.
6. Remove the brake arm, and move it away from the machine.

   Note: **This brake arm is not heavy enough to require rigging and can be remove by hand.**
7. Remove the snap ring, and remove the pin with a hammer and a bolt M8x50.
8. Remove the worn brake lining.

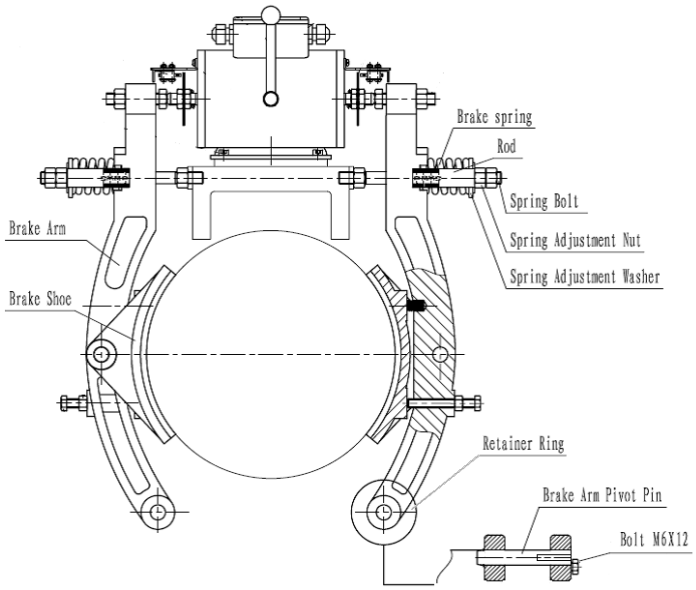


Figure 34 Normal Brake Lining

8.5.1.2 Normal Brake Lining installation

1. Clean the brake arm and new brake lining with clean cloth.
2. Install the pressure spring into the hole of the brake arm, and attach the brake lining with the pin and the snap ring. See figure 34.
3. Install the brake arm assembly into the gear box with the brake arm pivot pin and secure it with the bolt M6x12 and washer.
4. Install the spring threaded stud, (on the sheave side) brake spring, spring adjustment nut, and adjustment washer.
5. For Normal Brake Torque Adjustment refer to this manual section 6.1.1 and for Stroke adjustment see section 6.2.1.

6. With the manual brake release lever in the 12 o'clock position, check that there is play on both plungers.

8.5.2 Emergency Brake Lining Replacement

Required Tools & Materials:

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

Screwdriver（3X75）

Dial indicator

Feeler gauge

Rubber hammer

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

Loctite 243

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

8.5.2.1 Emergency brake lining removal

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.

8.5.2.1 Emergency brake lining installation

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.**

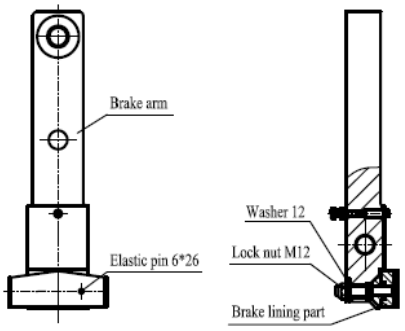


Figure 35 Emergency Brake Arm

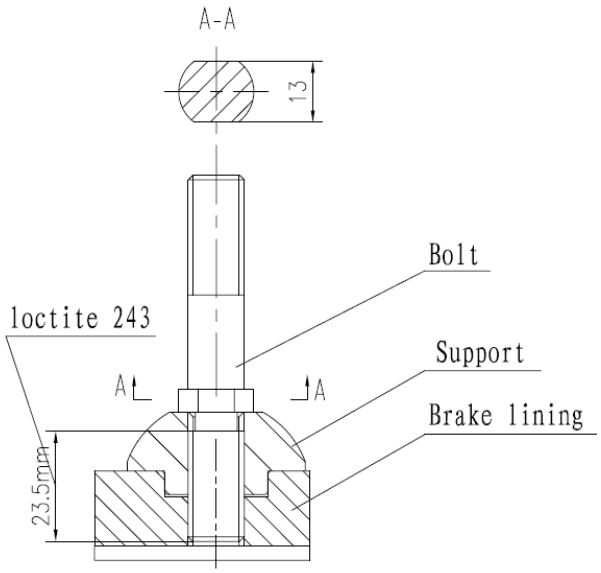


Figure 36 Emergency Brake Lining

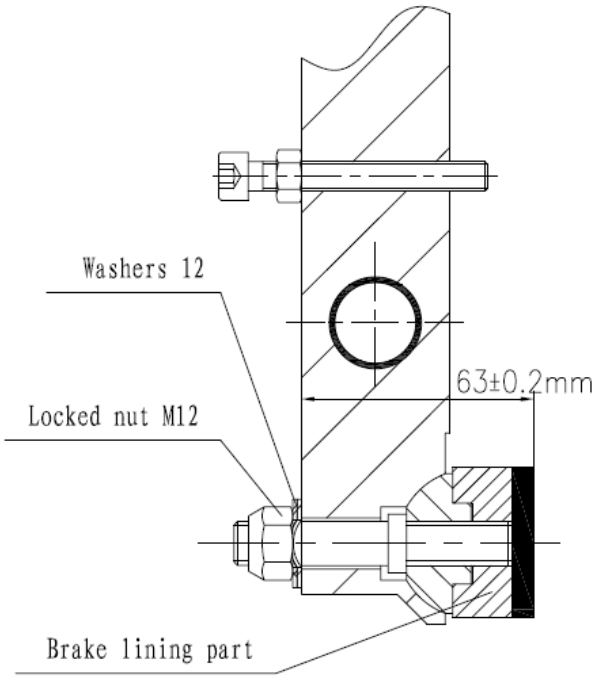


Figure 37 Emergency Brake Lining Replacement

7. Reassemble the Emergency Brake arms, refer to this manual Section 8.4.2.2 Emergency Brake mounting instructions
8. For Emergency Brake Torque Adjustment refer to this manual section 6.1.2 & for Stroke adjustment see section 6.2.2.

8.6 Traction Base Replacement

Required Tools & Materials:

Open end wrench: 24mm, 36mm

Hex wrench: 17mm

Hoisting equipment

Dial indicator

Shims

8.6.1 Traction Base replacement instructions

1. Cut off the power to machine, remove the rope retainers or guards.
2. If the machine has the Emergence Brake remove it. See Section 8.4.2.1
3. Remove the ropes from the sheave.
4. Attach hoisting equipment to the traction machine. See Section 2.2 for hoisting procedure.
5. Remove all of the bolts and washers which are fastening the traction machine to the traction base: Bolts M24x90, washers 24 (4 groups), bolts M16x60, washers 16 (6 groups including 4 groups from the Spindle Bracket). See Figures-38-40.
6. Hoist the traction machine from the traction base.
7. Lower the traction machine onto the new traction base, fasten the Bolts M24x90 and washers 24 (4 groups), bolts M16x60 and washers 16 (2 groups with the traction body). The bolts M16x60 and washers 16 (4 groups with the Spindle Bracket) do not need to be tightened.
8. Attach a dial indicator to measure the run-out of the sheave. Add shims under the Spindle Bracket and tighten the Bolts M16X60 and Washers 16. Measure the run-out of the sheave to be: -0.06～0mm.
9. Reinstall the rope, Emergency Brake (if so equipped see Section 8.4.2.2), and retainers or guards.
10. Reconnect the power to the machine and test it.

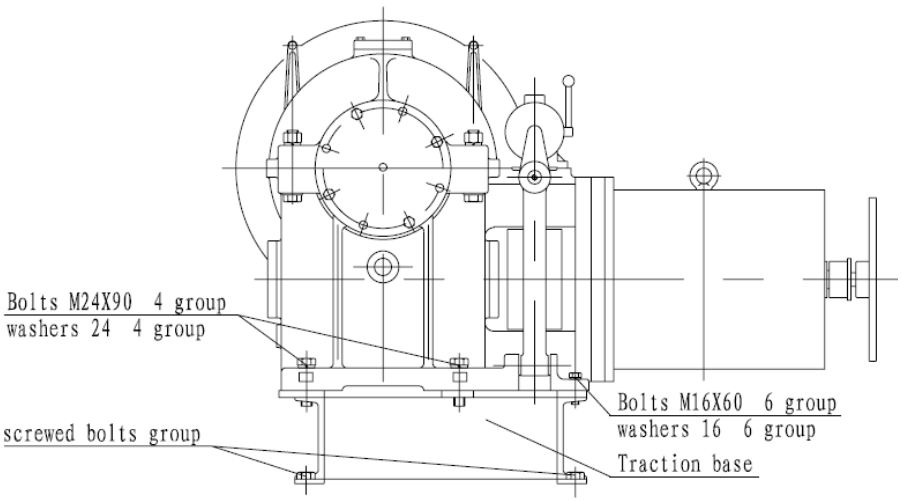


Figure 38 Traction Base

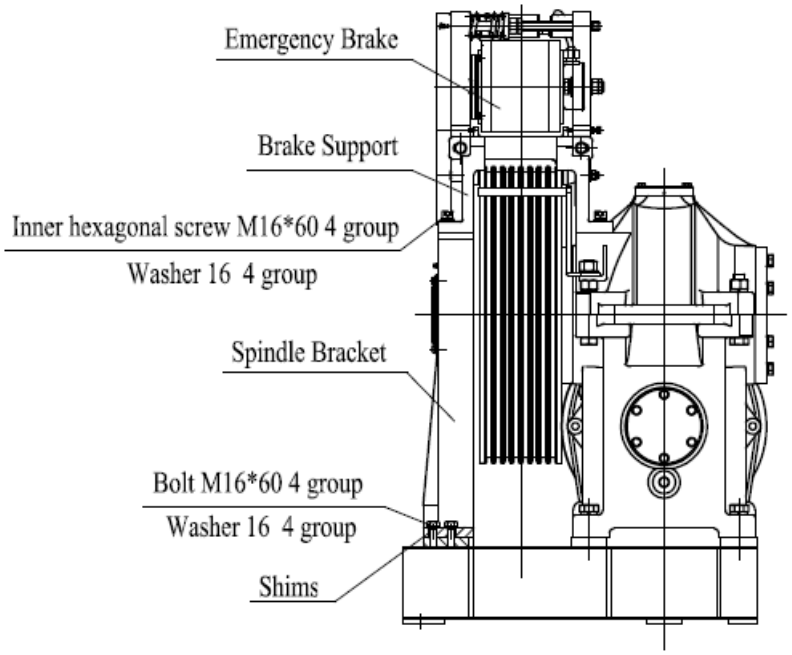


Figure 39 Traction Base

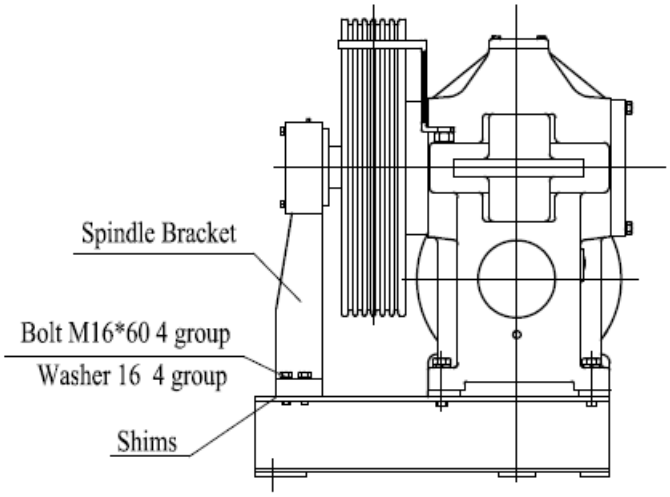


Figure 40 Traction Base

8.7 Spindle bracket replacement

Required Tools & Materials:

Open end wrench: 13mm

Hoisting equipment

Torque wrench

Dial indicator

Hammer

Flat head screwdriver

Adjustable wrench

Sockets: 16mm, 24mm

Ratchet

Pull handle

Bearing removal tool

Grease gun with EP2 grease

8.7.1 Spindle Bracket removal

1. Cut off the power to the machine, remove the rope retainers/guards and take the ropes off the sheave.
2. Remove the Sheave Brake (if so equipped) by removing bolt Mxxxxx (4 groups). Pick the brake and hoist off the machine.
3. Remove the bolt M16x60 and the washers 16 (4 groups) which connect the spindle bracket and the traction base using the open end wrench (24mm). See Figures 40 and 41.

4. Remove the M8x16 and the washers 8 (6 groups) which fasten the spindle bracket's stuffy cover with an open end wrench (13mm) and remove the stuffy cover. See Figure 41.
5. Bend back the tabs of the locked spacer; remove the M10x35 (3 groups) which fasten the cushion cover; remove the locked spacer and the cushion cover.
6. Install the bearing removal tool
7. Remove the whole spindle bracket (including bearing 22214C W33 and seal FBØ85xØ115x12), Then remove the cushion.

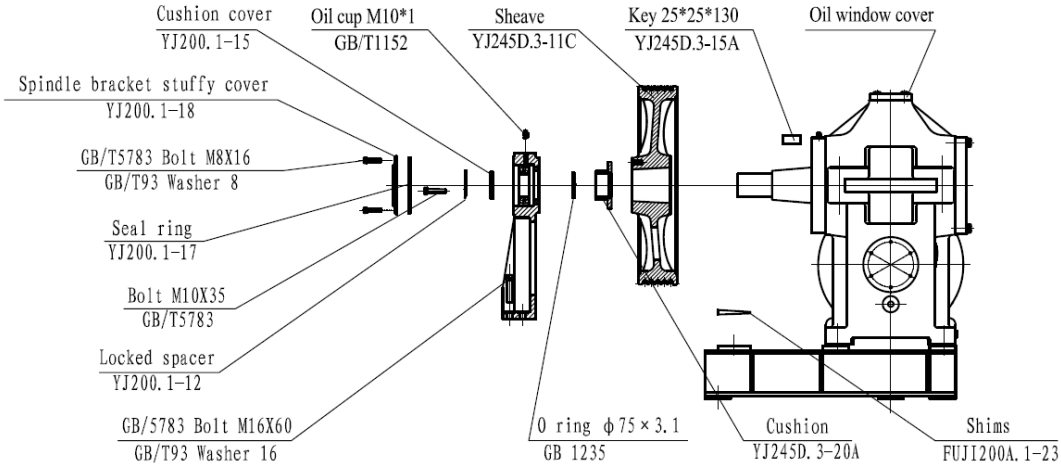


Figure 41 Spindle Bracket Replacement

8.7.2 Spindle Bracket installation

1. Apply a small amount of grease on the spindle bracket bearing opening, place the oil seal FBØ85xØ115x12 flat on the spindle bracket bearing opening, and tap slowly into place using a hammer. Then apply a small amount of grease on the seal opening when it is in place.
2. Place the bearing 22214C W33 flat on the spindle bracket's bearing opening, and tap slowly into place using a hammer. Then apply a small amount of grease on the bearing chamber when it is in place.
3. Install the cushion and spindle bracket assembly on to the main shaft, apply grease on it, then install the cushion cover and the locked spacer, tighten the bolts M10x35 (3 groups) with open end wrench (16mm), bend up the locking tabs, tighten the bolt which connect the Gear reducer box and the traction base to 400-500Nm (295 ft-lb-369 ft-lb).
4. Test with Dial indicator：add shims as needed, fasten the Bolts M16x60 and Washers 16, make sure the run-out is: -0.06～0mm.
5. Apply grease in the spindle bracket's stuffy cover, and install it on the spindle bracket, tighten the bolts M8x16 and washers (6 groups) with open end wrench (13mm).
6. Connect the power supply to the machine and test it.

8.8 Sheave replacement

Required Tools & Materials:

Hoisting equipment

Torque wrench

Dial indicator

Open end wrench: 36mm, 24mm, 18mm

Clean cloth

Arm puller

8.8.1 Sheave replacement

1. Cut off the power to the machine, remove the rope retainers/guards and take the ropes off the sheave. Remove the Emergency Brake if so equipped. See Section 8.4.2 Emergency Brake Replacement.
2. Remove the spindle bracket. Refer to this manual Section 8.7.1 Spindle bracket replacement.
3. Attach hoisting equipment; hoist the sheave until pressure is applied to the rigging. See Figure 42.

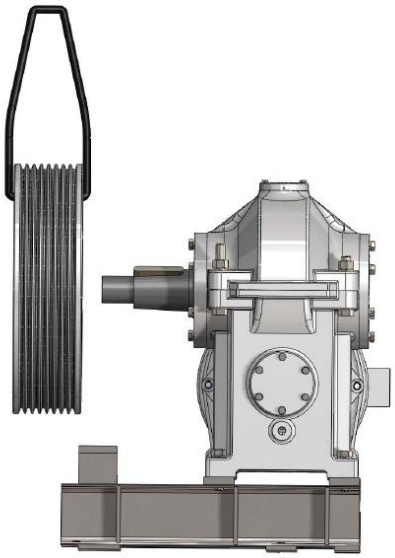


Figure 42 Sheave Removal

4. Remove the sheave from the main shaft with the arm puller. Protect the threaded hole in the center of the main shaft.
5. Clean the main shaft with the clean cloth. Apply a small amount of grease on the main shaft.

6. Hoist the new sheave with the hoisting equipment, make sure the sheave's key slot and the main shaft's key slot are aligned, and install the sheave on to the main shaft.
7. Install the spindle bracket. Refer to section 8.7.1.2 Spindle Bracket Installation Instructions and test the mounting dimensions.
8. Measure sheave groove run-out with the dial indicator, make sure the value is <0.012".

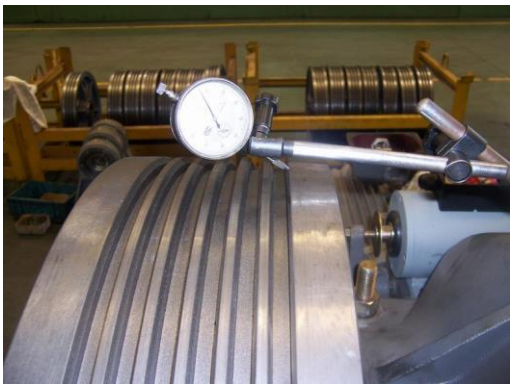


Figure 43 Sheave Run out check

8.9 Ring Gear 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:

Open end wrench 16mm 24mm

Hammer

Dial indicator

Color ink

Hoisting equipment

Clean cloth

M4x50 hexagonal bolt

M10 eye bolt & M16 eye bolt (optional)

Torque wrench 106 Nm (80lb-ft)

Adjustable wrench

Sealant

8.9.1. Ring Gear Replacement instructions

1. Cut off the power of machine, remover rope retainers/guards, and take the ropes off the sheave. Remove the Emergency Brake if so equipped. See Section 8.4.2 Emergency Brake Replacement.

2. Remove the sheave. Refer to this manual Section 8.8 Sheave replacement.
3. Remove bolts M10x35 with open end wrench 16mm remove top cover, loosen the oil plug and drain the oil.

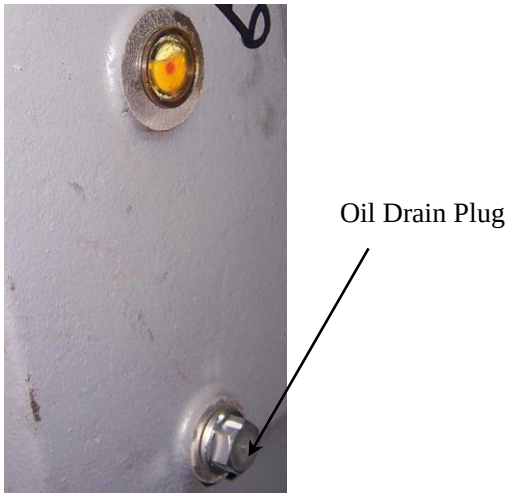


Figure 44 Oil Drain

4. Thread an M4x50 bolt into each of the two drive pins on the gear box top. Close a large adjustable end wrench on the bolt below the head. Use a hammer or mallet against the wrench to remove the drive pins. Remove the Bolts M16x60 from the Spindle Through Cover and the Bolts M16x50 from the Bearing Gland. Then remove the Spindle Through Cover and Bearing Gland. See Figure 45.
5. Remove the Nuts M24, the Bolts M24x170 and the Bolts M24x140.

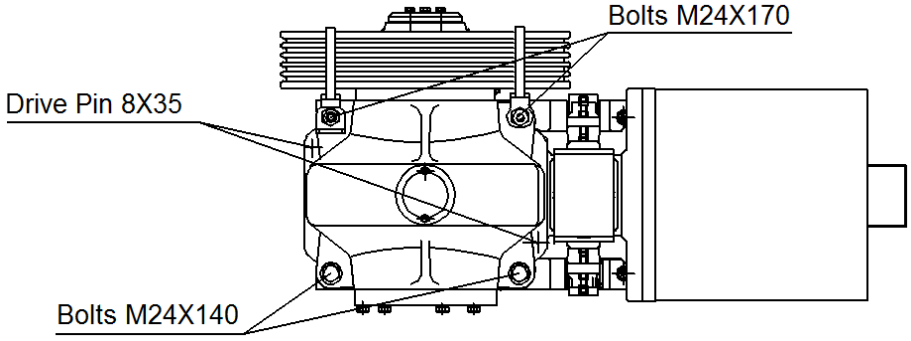


Figure 45 Top housing

6. Install M10 eye bolt on top of housing so it can be hoisted from the machine. Lift the top gear case using lifting equipment, and safely set aside. See Figure 46.
7. Place two stands approximately 12” apart in an area of the machine room with enough clearance to work the output shaft and ring gear.

8. Hoist the output shaft assembly from the bottom housing, and lower onto stands. See Figures 46 and 47.

   Note: Stands should support the output shaft, NOT the gear.

9. Place some protective material between the ring gear and the stands.
10. With the assembly resting on the stands, remove the output shaft sling, and set the sheave side of the output shaft pointing down. See figure 48.

    Note: An M16 eye bolt may be threaded in to the end of the output shaft.

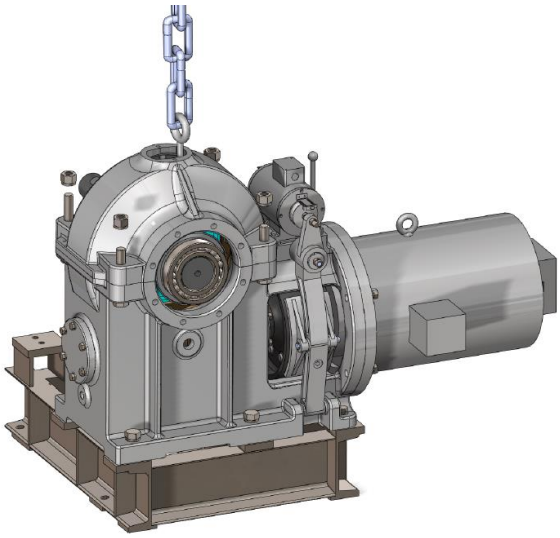


Figure 46 Gear Top Case Removal

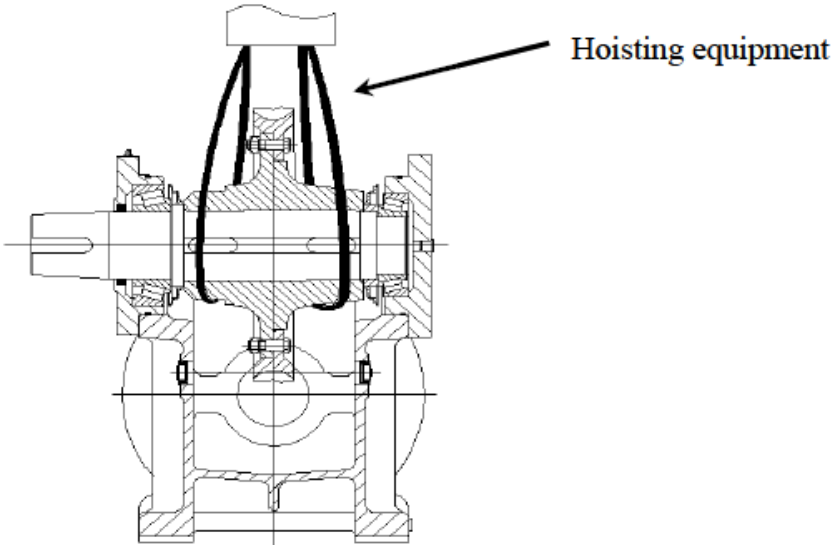


Figure 47 Output shaft removal

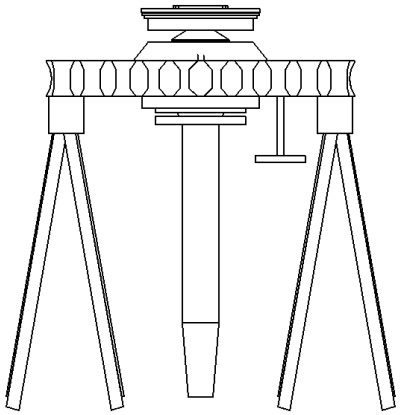


Figure 48 Ring Gear Removal

11. Remove the Bolts M16x1.5x60/M12x1.25x50 and the nuts M16x1.5/M12x1.25 (12 groups) which attach the Ring Gear and the Output Shaft. Remove the Ring Gear.
12. Contact the building engineer to turn off the machine room smoke detectors.
13. Clean the mating surface of the output shaft flange and the new worm gear; heat the worm gear and slip the it on to the output shaft flange when the worm gear's temperature is reaches 70±15°C (160±60°F) and let it cool down. Use a drift pin or bolt to align the worm gear and output shaft flange.
14. Ream the worm wheel and the flange, clean the shavings and install bolts M16x1.5x50 (6 groups)/M12x1.25x50 (12 groups) gently tapping into place with a hammer, tighten it with M16x1.5 (6 groups)/M12x1.25 nuts (12 groups) to 125-150Nm (92lb.ft-111lb.ft).
15. Hoist the main shaft worm wheel component into the gear reducer box, install the Bearing Gland and the Spindle Through Cover.

8.9.2 Backlash Adjustment

1. Tighten the bottom gear case and the Bearing Gland with the bolts M16x50 (2 groups); tighten the bottom gear case and the Spindle Through Cover with the bolts M16x60 (2 groups). See Figure 49.

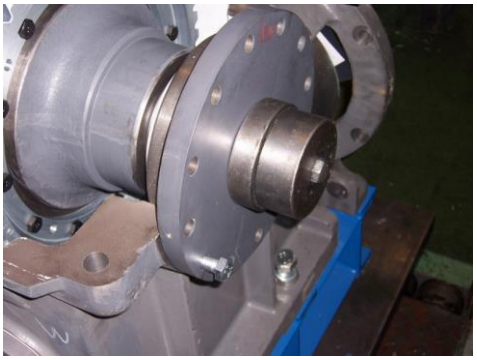


Figure 49 Bearing Gland replacement

2. Install the magnetic base of the dial indicator to the bottom gear case. See Figure 50.

Figure 50 Backlash Adjustment

14. Turn the worm wheel, and read the amount of gear movement. The displacement for the motor<15kw (20HP) is 0.006”~0.0098”, for the motor ≥15kw (20HP) is 0.0079”~0.012”, measured at 3 equally spaced points around the worm gear.
15. If the displacement is not within specification, turn the Bearing Gland or Spindle Through Cover one position of the 12 holes in the piece, then recheck. Continue to rotate one or the other until the backlash is within specification.
16. Put layout color dye on three teeth (equally spaced around the sheave), and allow it to dry completely.
17. Install top housing, turn on the mainline disconnect and place the machine on inspection operation.
18. Run the machine in one direction until the color is wiped off and the pattern can be seen.
19. Repeat Step 18, but run the machine in the opposite direction.
20. Survey the gear pattern carefully.

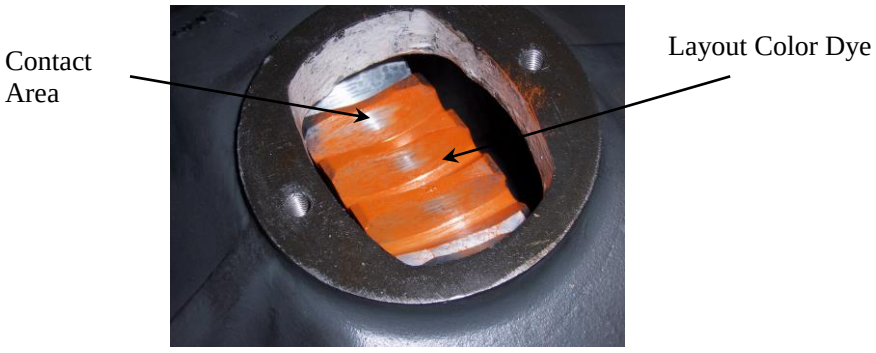


Figure 51 Contact Area Adjustment

21. Make sure that the Contact Area accounts for 30% of the gear's width, and for 55% 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. Repeatedly adjust to meet the specification.

22. Remove top housing with hoisting equipment. Clean the mating surface of the bottom gear case and the top gear case with clean cloth, daub the sealant around the surface of the bottom gear case.

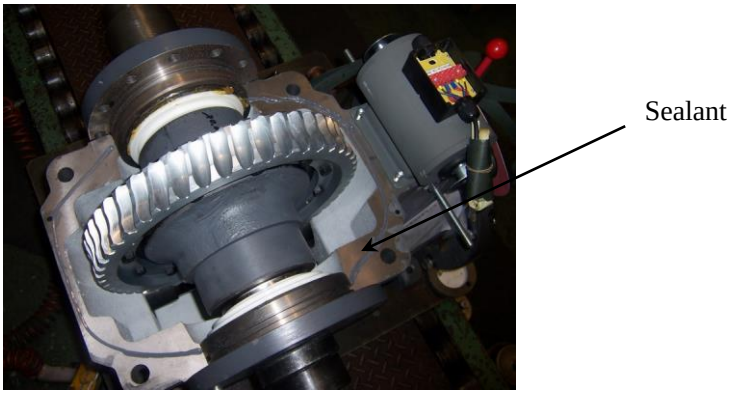


Figure 52 Sealant application

23. Hoist the top housing onto the bottom housing with the hoisting equipment, then secure them with Bolt M24x170 (2), Bolt M24x140 (2), Nut M24 (4) and Washers 24 (4).

Figure 53 Gear Case Top reinstallation

24. Tighten the Bolt M16x60 (4) to fasten the Spindle Through Cover and tighten the Bolt M16x50 (4) to fasten the Bearing Gland. See Figure 54.

Figure 54 Spindle Through Cover

25. Put the drive pins into the case and the case cover, and add 13.5L (3.5 gal) elevator oil into the case, fit on the top cover, and tighten it with Bolt M10x35.
26. Connect the power and test the machine.

8.10 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: 18mm, 24m
Arm puller
3# General purpose lithium lubricating grease

8.10.1 Output shaft bearing replacement

1. Remove the main shaft from the bottom gear case. Refer to Section 8.9.1 Ring Gear Replacement of this manual, Replacement Steps 1~8.
2. Remove the bearing 32222 with the arm puller. **Note: Do not damage the internal threads in the sheave shaft with the arm puller.**

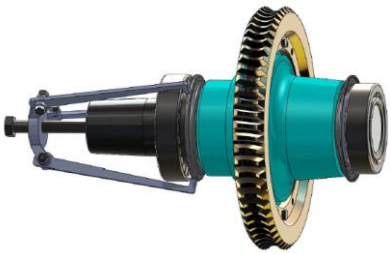


Figure 55 Output Shaft Bearing Replacement

3. Remove the new bearing's housing washer, place the new bearing on the bearing heater, and heat it to about 80±15°C (176±59°F).
4. With a gloved hand, quickly slide the heated bearing fully onto the main shaft.
5. When the bearing has cooled completely, grease the inside track of the bearing.
6. Apply 3# General purpose lithium lubricating grease on the seal of the Output Shaft Through Cover, and install it on the output shaft.
7. Replacement of the bearing 6219 on the Bearing Gland end is the same method, refer the Step 3~6.
8. Hoist main shaft assembly into the bottom gear case, and adjust the Backlash Adjustment, refer to this manual Ring Gear Replacement—Backlash Adjustment Section 8.9.2.

8.10.2 Worm Shaft Bearing Replacement

1. Remove the brake system. Refer to this manual Normal Brake Replacement Section 8.4.1 and Normal Brake Lining Replacement, Section 8.5.1 steps 1~6.
2. Remove the motor. Refer to this manual motor replacement Section 8.3
3. Remove the oil drain plug; drain the oil. Replace the drain plug.
4. Remove the bolt M12x35 and the washer which secures the worm shaft front cover with the 18mm open end wrench, and remove the worm shaft front cover. See Figure 56 below.
5. Remove the brake drum and put away the keyway.
6. Remove the bolts M12x45 and the washers (6) which secures the Worm Shaft Through Cover with the 18mm open end wrench, and remove the Worm Shaft Through Cover.
7. Remove the bolts M12x45 and the washers (6) from the Worm Shaft Back Cover and remove it.
8. Turn the shaft sheave by hand to remove the worm shaft from the bottom gear case.
9. Install an arm puller on the bearing, and remove the bearing. The front bearing and the back bearing are same and are removed the same way.

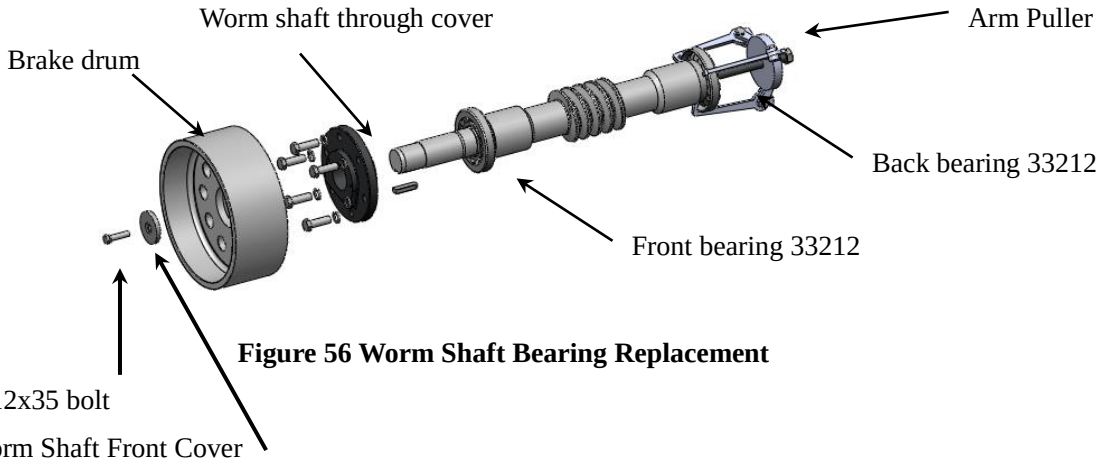


Figure 56 Worm Shaft Bearing Replacement

10. Place the new bearing in the heater, and heat it to about 80±150°C (176±59°F), then quickly slide the heated bearing fully onto the worm shaft.

Note: Do not wear gloves when doing steps 11~12.

11. Install the bearing cup of the front bearing into the front bearing bore of the bottom gear case, and apply some 3# general purpose lithium lubricating grease on it.
12. 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.
13. Install the Worm Shaft Back Cover and some shims into the end of the bottom gear case with two bolts M12x45 and washers opposite each other, but do not tighten.

14. Install the protecting jacket into the worm shaft motor side, place the seal into the Worm Shaft Through Cover, and smear some 3# general purpose lithium lubricating grease in it. Place it and washer into the worm shaft motor side, and remove the protecting jacket, tighten the Worm Shaft Through Cover with the bolts M12x45 and washers (6 groups) to 37-44 ft-lb.
15. Tighten the Worm Shaft Back Cover with the bolts M12x45 and washers (6 groups) to 50-60 Nm (37-44 ft-lb).
16. Replace the brake drum into the worm shaft, then install the Worm Shaft Front Cover and tighten it with bolt M12x45 and washer to press the brake drum into the position, note the position of the keyway for motor installation. (The keyways of the brake and motor must be opposite each other upon installation.)
17. Measure the radial travel movement of the brake drum excircle and the axial gap of the worm shaft with dial indicator, the radial movement in no more than 0.0039”,the axial gap is 0.0012”~0.0031”. Adjustment the quantity of shims until the measurements are within specification.

Figure 57 Brake Pulley Radial and Axial movement measurement

18. Remove the bolts M12x45 and washers (2 groups) then remove the Worm Shaft Back Cover, install the O-ring, apply some 3# general purpose lithium lubricating grease. And place the shims to the back bearing bore, tighten it with the bolts M12x45 and washers (6 groups) to 37-44 ft-lb.
19. Loosen the bolt M10x35 to remove the oil windows hood, then add about 13.5L (3.5 gal) elevator oil.
20. Install motor. Refer to this manual Motor replacement Section 8.3.2 Motor Reassembly Instructions. Connect the main power and test the machine.

8.11 O-rings and Seal Replacement

Required Tools & Materials:

Open end wrench: 18mm, 24mm

3# general purpose lithium lubricating grease

8.11.1 Replacement on Output shaft

1. If oil leak happened on the Output Shaft Bearing Gland:
   a) Loosen the bolts M16x50 and washers (4 groups) and remove the Bearing Gland, then remove the old O-Ring.
   b) Apply some 3# General purpose lithium lubricating grease into the new O-Ring (Ø230xØ220x5.7), and install it onto the Bearing Gland.
   c) Tighten the Bolts M16x50 and washers (4 groups).
2. If oil leak happened on the Output Shaft Through Cover:
   a) Remove the sheave and the Spindle Bracket. Refer to this manual Spindle Bracket Replacement Section 8.7.1 and Sheave Replacement Section 8.8.1.
   b) Loosen the bolts M16x60 and washers (4 groups) and remove the Spindle Through Cover, then remove the old O-Ring.

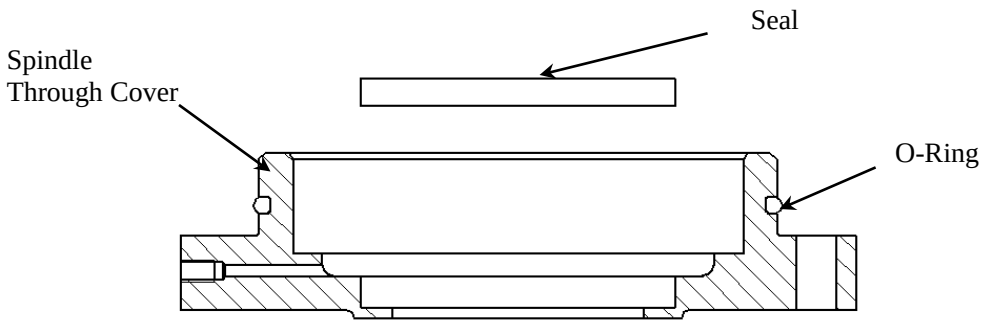


Figure 58 Output shaft seal and O-ring

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

d) Apply some 3# General purpose lithium lubricating grease into the new O-Ring (Ø230xØ220x5.7) and the seal (FBØ110x140x12), and install them onto the Spindle Through Cover.

e) Tighten the Bolts M16x60 and washers (4 groups).

f) Install the sheave and the Spindle Bracket. Refer to this manual Sheave Replacement Section 8.8.1 and Spindle Bracket Replacement Section 8.7.1.

8.11.2 Replacement on worm shaft

1. If oil leak happened on the Worm Shaft Back Cover:

   a) Drain the oil. Remove the bolts M12x45 and washers (6 groups) and remove the Worm Bearing Back Cover, then remove the old O-Ring.

   b) Apply some 3# General purpose lithium lubricating grease into the new O-Ring (Ø110xØ105x3.1), and install it onto the Worm Shaft Back Cover.

   c) Tighten the Bolts M12x45 and washers (6 groups).

2. If oil leak happened on the Worm Shaft Through Cover:

   a) Remove the motor. Refer to this manual Bearing Replacement—Worm gear bearing replacement Section 8.10 Steps1~6.

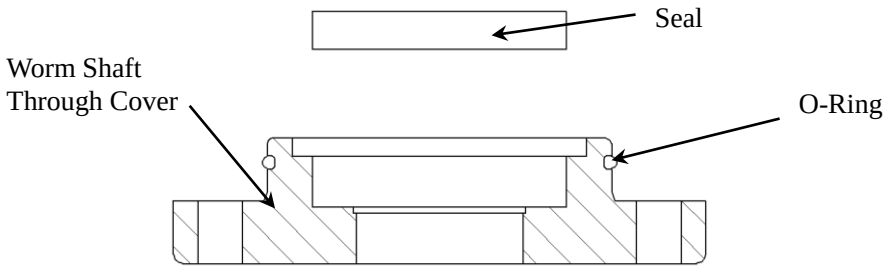


Figure 59 Worm shaft seal and O-ring

   b) Examine the seal and replace it with new one (FBØ55xØ80x12) if it damaged.

   c) Apply some 3# General purpose lithium lubricating grease into the new O-Ring (Ø110xØ105x3.1), and install it onto the Worm Shaft Through Cover.

   d) Reinstall parts. Refer to this manual Bearing Replacement—Worm Gear Bearing replacement Section 8.10 Steps 13~21.

9.0 Manual brake release instructions

WARNING! When the elevator traction machine is run，the brake release lever cannot be installed on the Emergency brake, only if you want to use the manual brake release, you can install it as follow methods.

9.1 Method of application

1. Install the Brake lever as the following picture shows.
2. Pull up the brake release until the traction sheave can move.

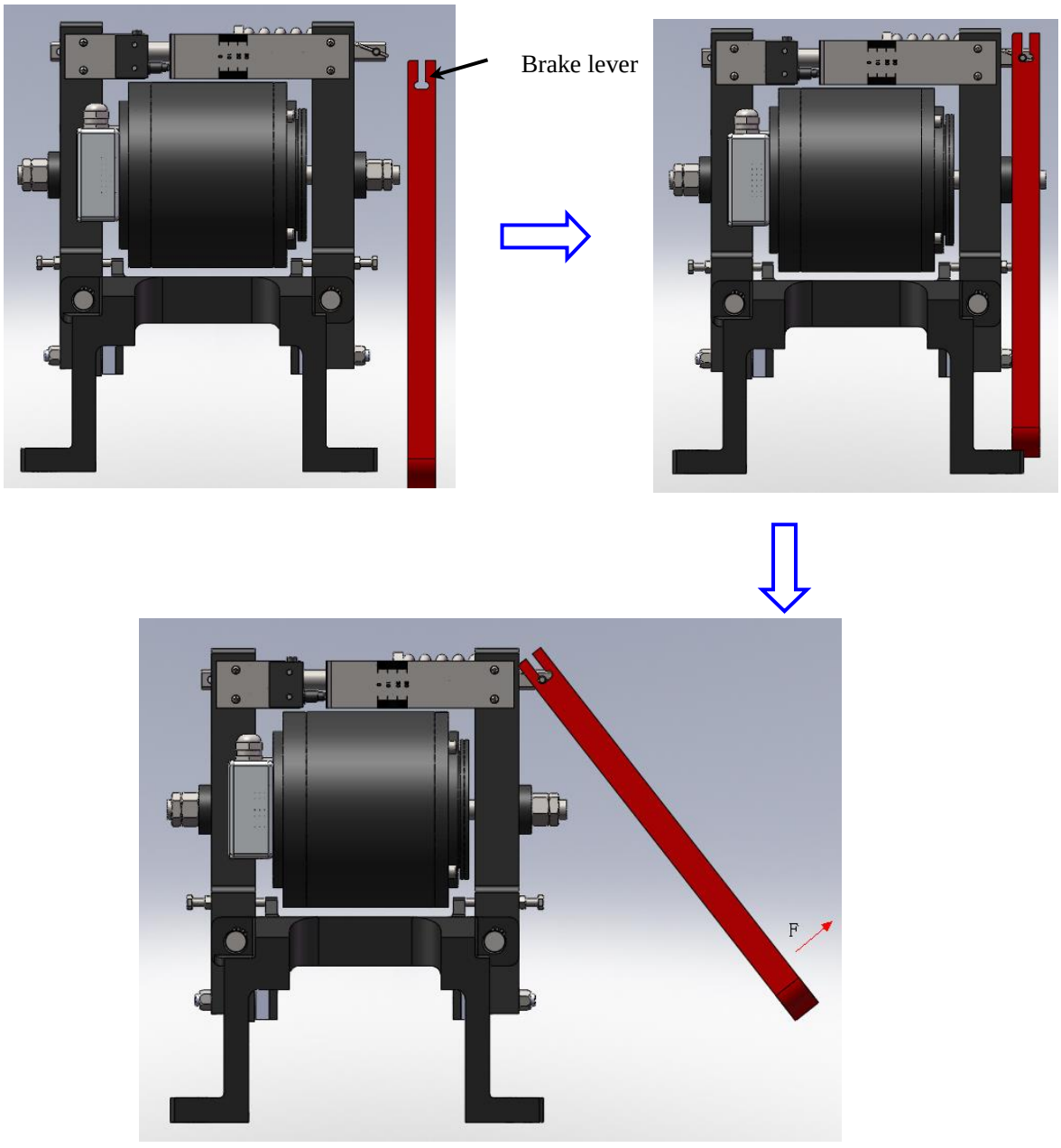


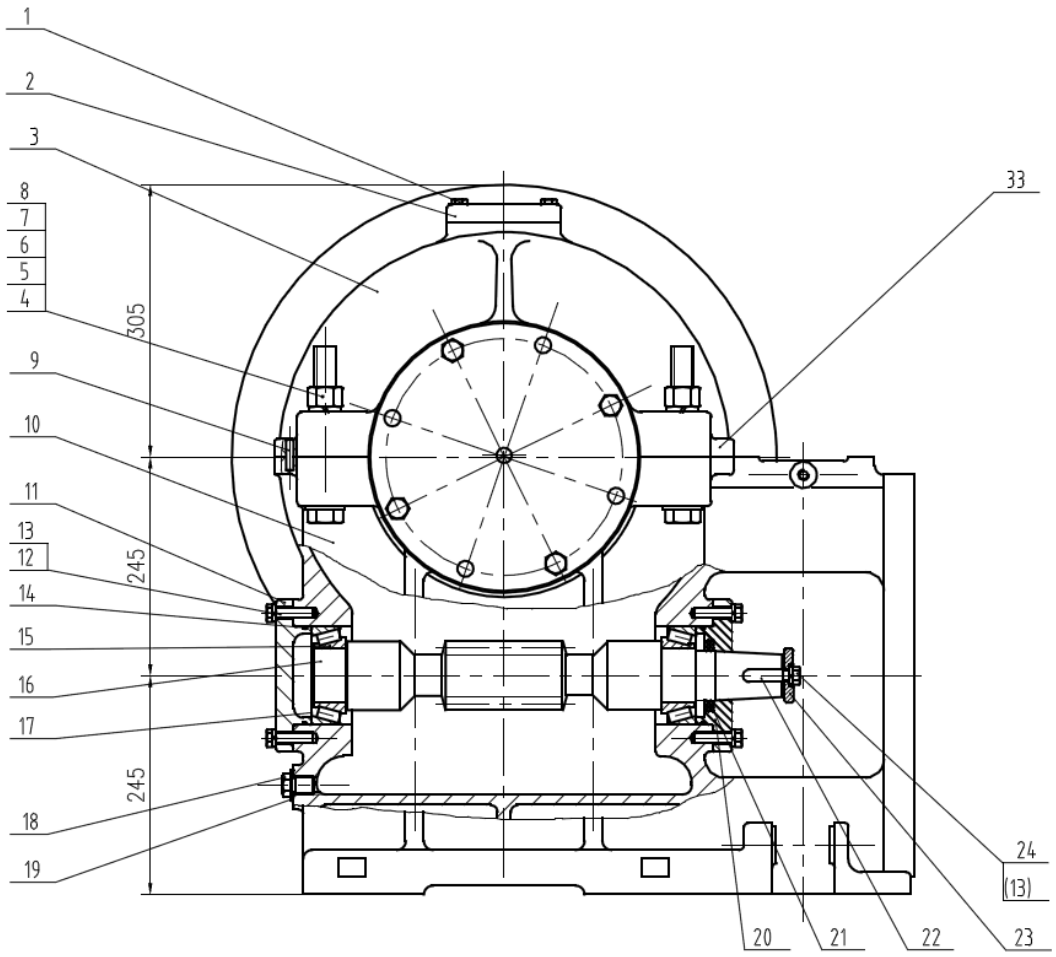
Figure 60 Emergency Brake Manual Release

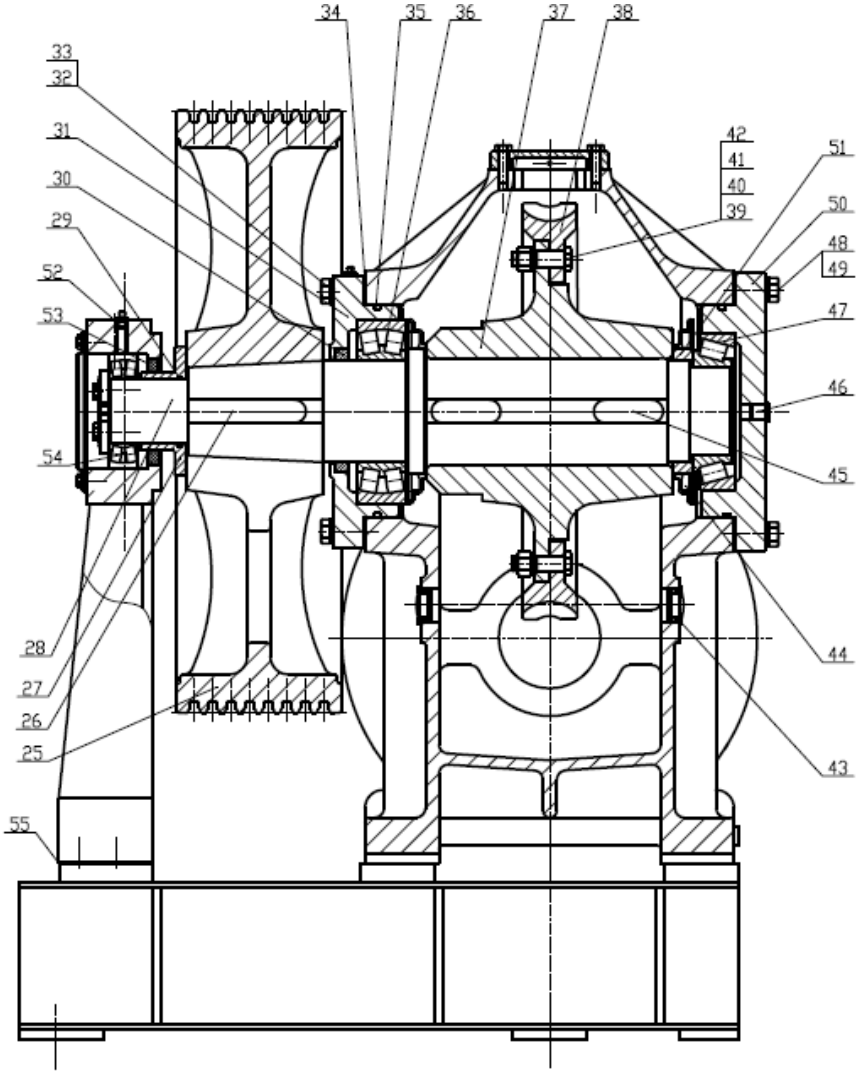
10.0 Troubleshooting chart

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

11.0 Traction Machine Assembly





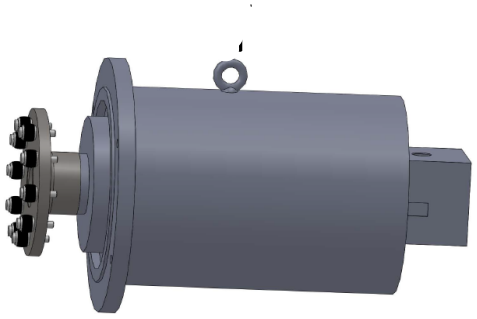
* Indicates a non-stock item

No.	Torin Drive Part No.	Description
1	*	Bolt M10x35
2	*	Top Cover
3	*	Top gear case
4	*	Bolt M24x140
5	*	Bolt M24x170
6	*	Washer 24
7	*	Washer 24
8	*	Nut M24
9	*	Drive Pin 8x35
10	*	Bottom gear case

11	*	Worm bearing stuffy cover
12	*	Bolt M12x45
13	*	Washer 12
14	POR002	Worm Shaft O-ring Ø110*Ø104*3.1
15	PBR001	Worm Shaft Bearing 33212
16	*	Worm
17	See below	Worm Shaft Paper Shims
	PPS002-0.05	0.05 mm thickness
	PPS002-0.15	0.15 mm thickness
	PPS002-0.5	0.5 mm thickness
	PPS002-1.0	1.0 mm thickness
18	*	Oil Drain Bolt
19	*	Oil plug pad of paper
20	*	Worm bearing covered through
21	PBR009	Worm Shaft Front Seal TC558012
22	*	Key 14x9x45
23	*	Worm Shaft Front Cover
24	*	Bolt M12x35
25	MSHV-TGD2-SB	Machine Sheave for TGD2, 650mm
26	*	Key 25x25x130
27	*	Cushion Cover
28	*	Main shaft
29	POR005	O ring Ø75*3.1
30	PBR002	Drive Sheave Shaft SealØ110*Ø140*14
31	*	Main shaft through cover
32	*	Bolt M16x60
33	*	Washer 16
34	See below	Drive Sheave Paper Shims
	PPS001-0.1	0.1 mm thickness
	PPS001-0.2	0.2 mm thickness
35	POR001	Drive Sheave Output Shaft O-ringØ220*Ø210*5.7
36	PBR015	Bearing 22222 (Drive Sheave Side)
37	*	Worm gear flange
38	*	Worm Gear
39	*	Bolt M16x1.5x53
40	*	Nut M16x1.5

41	*	Bolt M12x1.25x53
42	*	Nut M12x1.25
43	*	Oil Scale (view window)
44	*	Retaining cap
45	GB/T1096	Key 25x14x80
46	PBR017	Seal Lock
47	PBR016	Bearing 6219 (Opposite Drive Sheave side)
48	*	Bolt M16*50
49	*	Washer 16
50	*	Bearing Gland
51	*	Cushion cover
52	*	Oil cup M10*1 (grease fitting)
53	PBR031	Pedestal Seal TC85*115*12
54	PBR032	Pedestal Bearing 22214
55		Pedestal Paper Shims
	PPS006-0.1	0.1 mm thickness
	PPS006-.02	0.2 mm thickness
	PPS006-0.5	0.5 mm thickness

12.0 Induction Motors & Encoders

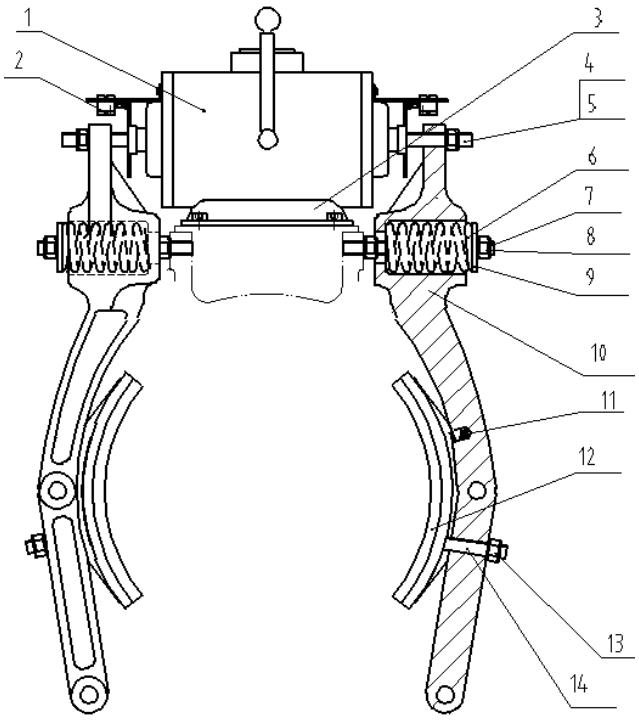


NO.	Torin Drive Part NO.	Motor Description
1	PMNC-3520HV	25 HP (18.5KW) motor for TGD2-3520. Coupling installed, 460V
2	PMNC-3535HV	35 HP (26 KW) motor for TGD2-3535. Coupling installed, 460V
3	PMNC-2545HV	35 HP (26 KW) motor for TGD2-2545. Coupling installed, 460V
4	PMNC-2550HV	35 HP (26 KW) motor for TGD2-2550. Coupling installed,460V
5	PMNC-3540HV	40 HP (30 KW) motor for TGD2-3540. Coupling installed, 460V
	PMNC-EC001	Elastic Coupling Insert for TGD1/2/3

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

13.0 Brake Assembly

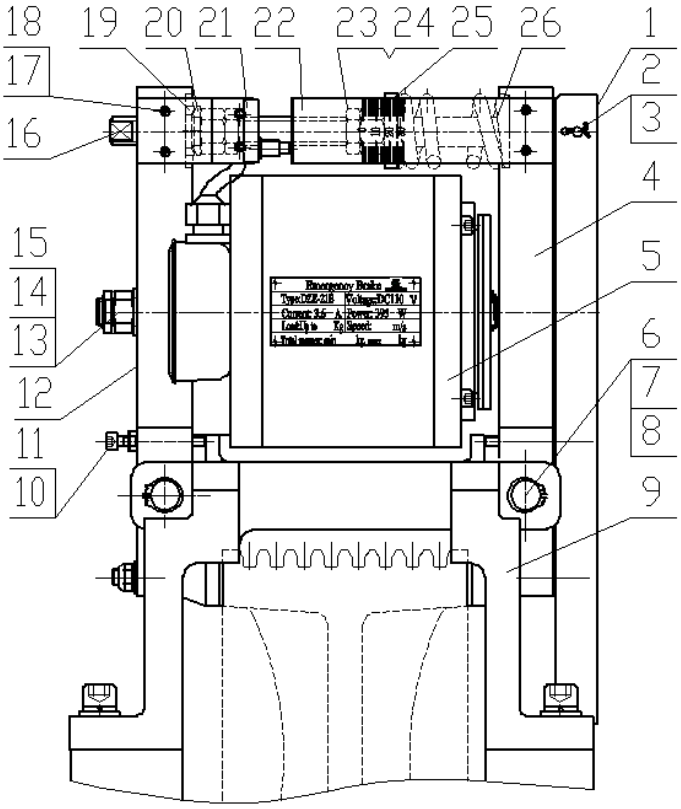
13.1 Normal Brake Assembly



(*) Denotes a non-stock item.

No.	Torin Drive Part No.	Description
1	PBK013	Normal Brake Solenoid
2	PSW004	Normal Brake Micro switch
3	*	Bracket
4	*	Bolt M12X65
5	*	Nut M12
6	*	Brake Spring
7	*	Threaded Stud
8	*	Bolt M12X65
9	*	Spring Gland Bush
10	*	Brake Arm
11	PBK034	Pressure (Bucking) Spring
12	PBK020	Normal Brake lining (shoe)
13	*	Nut M12
14	*	Bolt M12X65

13.2 Emergency Brake Assembly

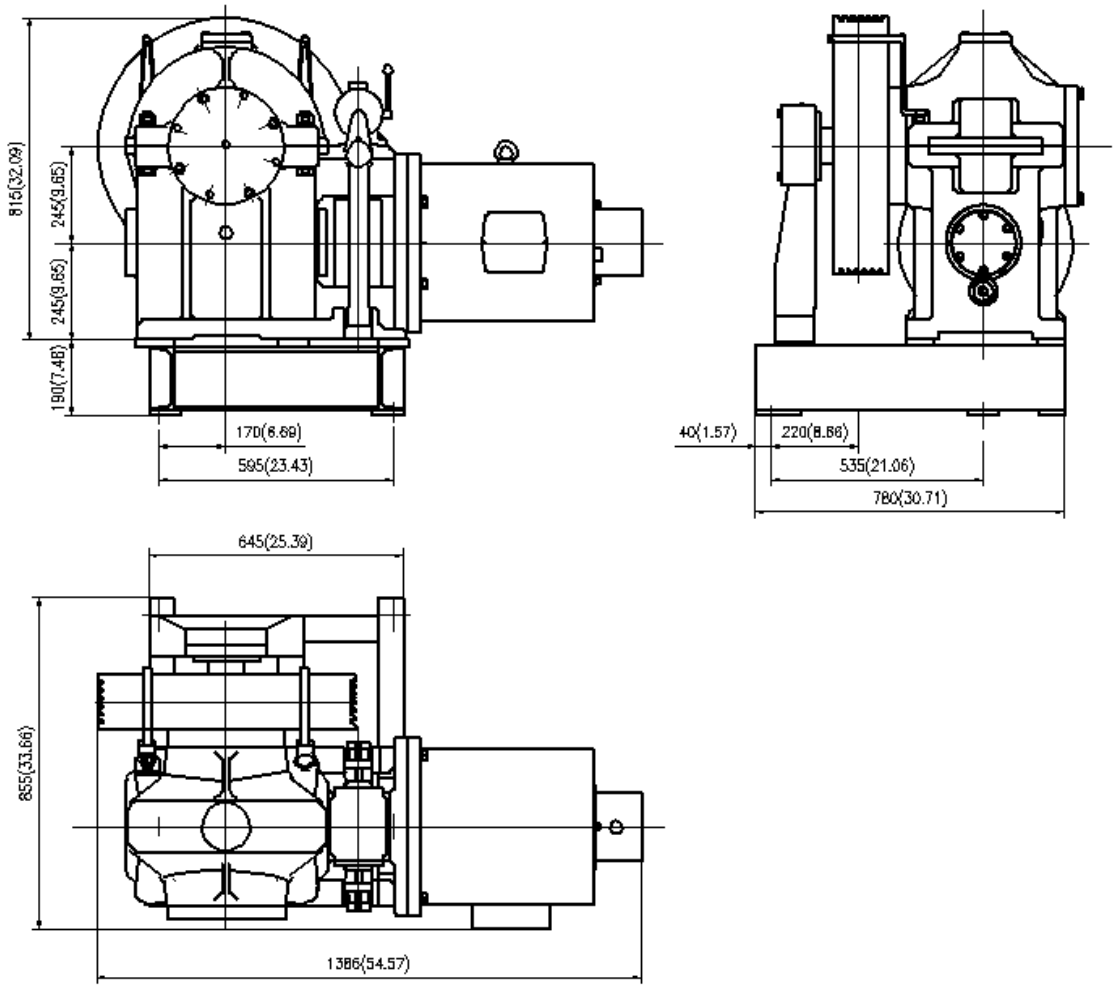


(*) Denotes a non-stock item

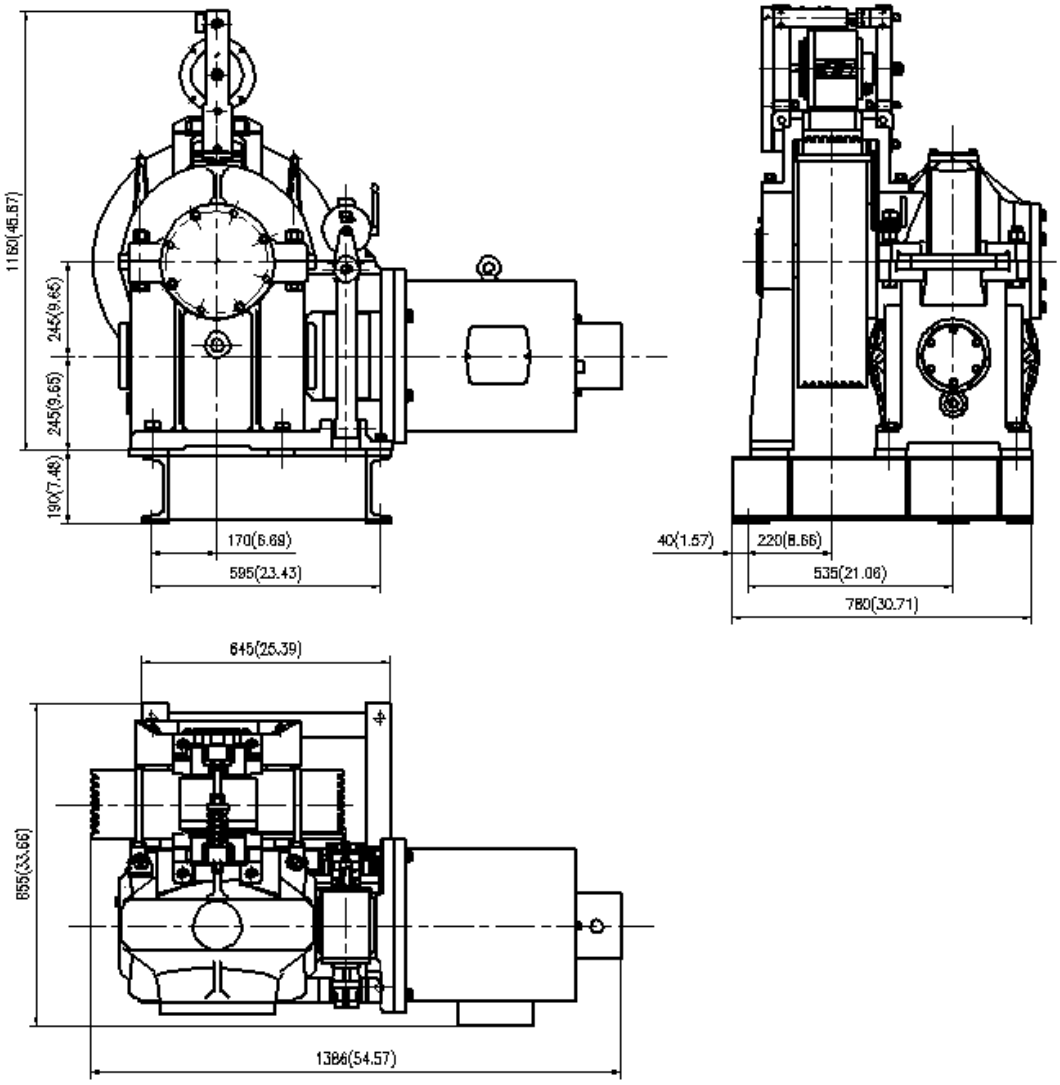
No.	Torin Drive Part No.	Description
1	PBK036	Emergency Brake release lever
2	*	Pin
3	PBK037	Cotter pin 3.2x15
4	*	Brake arm part Ⅰ
5	PBK022	Emergency Brake Solenoid
6	PBK038	Emergency Brake long Pivot Pin
7	*	Snap ring 22
8	PBK039	Resin filling pieces (plastic bushing)
9	*	Brake support
10	*	Inner hexangular screw M8X70
11	*	Nut M8
12	*	Brake arm part Ⅱ
13	*	Nut M20X1.5

14	*	Thin Nut M20X1.5
15	*	Washer 20
16	*	Stud
17	*	Screw M4X10
18	*	Washer 4
19	*	Spherical surface gasket
20	*	conical surface gasket
21	PSW003	Emergency Brake Micro switch
22	*	Rod
23	*	Nut M20
24	*	Thin nut M20
25	*	Spring adjustment washer
26	*	Spring
27	PBK020	Emergency Brake lining (shoe)
28	PBK019	Emergency Sheave Brake Assembly for TGD2

14.0 MECHANICAL DIMENSIONS



MECHANICAL DIMENSIONS (with Emergency Brake)



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