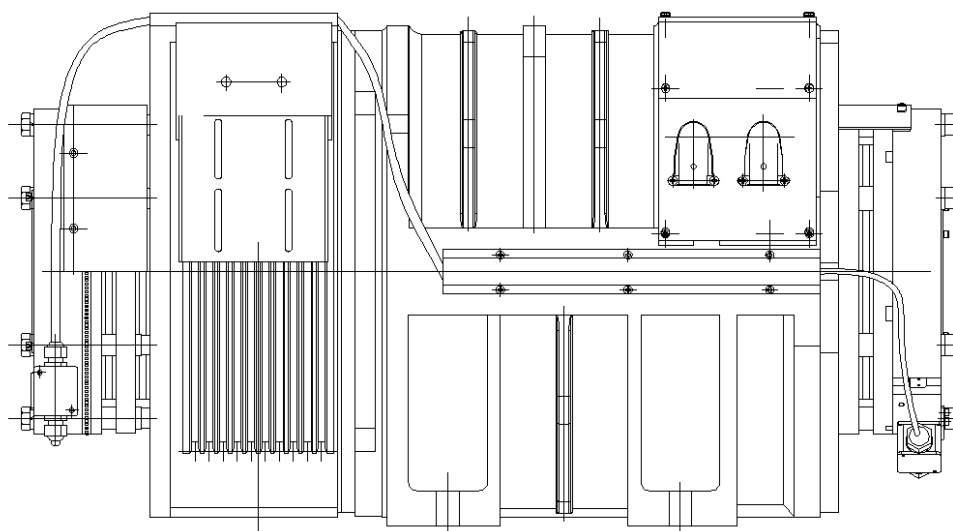


TSM/TMGL1/TMGL2/ TMGL2A/TMGL3 Series

PMS Gearless Elevator Traction Machine

Complete Operation and Service Manual



SUZHOU TORIN DRIVE EQUIPMENT CO., LTD.

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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 only by qualified elevator personnel. In the interest of your personal safety and the safety of others, do NOT attempt ANY procedures 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 because high voltage may 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 TMGL2/TMGL2A Machine **MUST** be balanced during hoisting. See Hoisting Methods in the Arrival 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.

2.0 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. Keep the machine cover secured and zip-tied as received if feasible. There are desiccant bags inside the machine cover that will contain the moisture within.

If the machine has been stored more than 3 months, before using, please energize the machine and rotate the machine in both directions. It will help distribute the lubrication evenly on the bearings.

2.3 Hoisting

The TMGL2/TMGL2A machine can be lifted by using a combination of hooks, chains & slings designed to safely carry the weight of the machine. See Figure 1 and Figure 2.

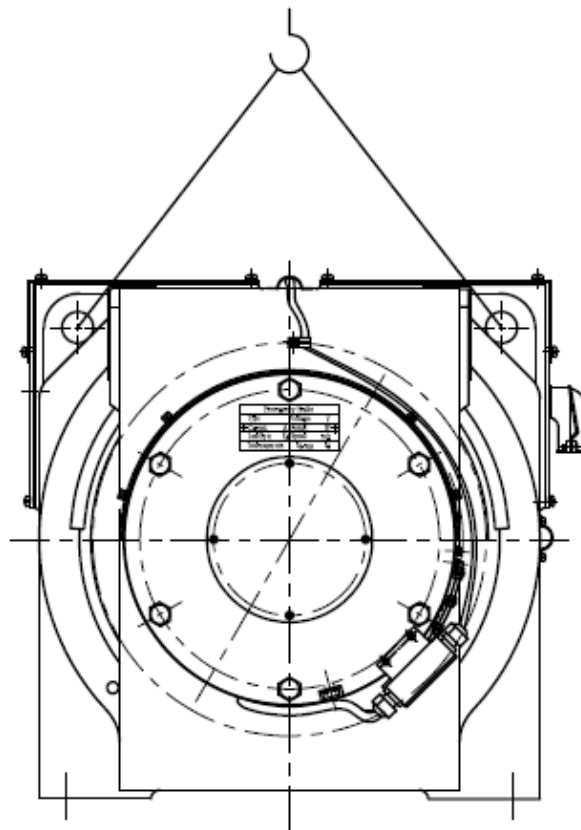


Figure 1 TSM/TMGL1 Machine Recommended Hoisting Method

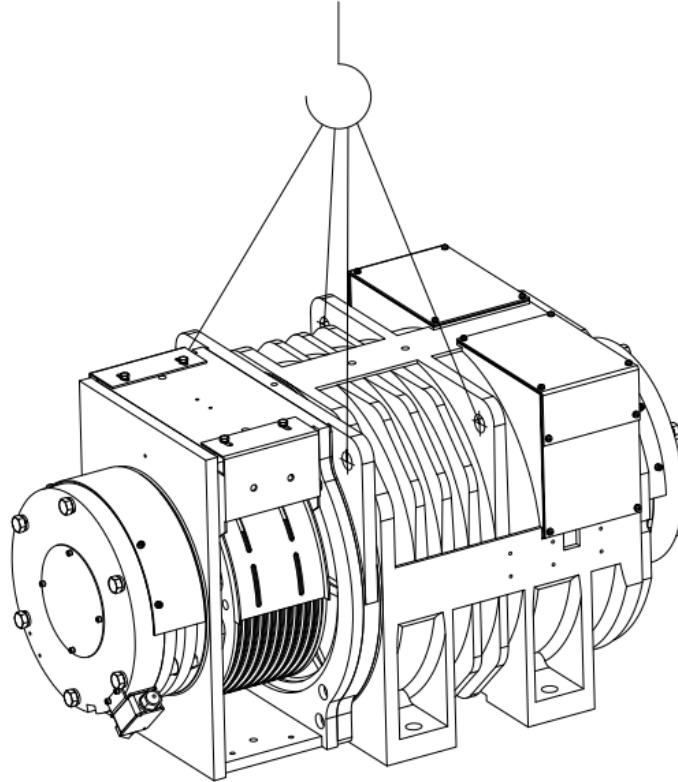


Figure 2 TMGL2/2A Machine Recommended Hoisting Method

3.0 Applications

3.1 Overview

TSM Machine is a synchronous permanent magnet gearless machine designed for elevators. Its configuration allows elevator speed up to 500 fpm (2.54m/s) and an elevator capacity up to 5000 lbs. (2273Kg) in 2:1 roping and single wrap applications.

TMGL1 and TMGL2A Machines are synchronous permanent magnet gearless machine designed for elevators. Its configuration allows elevator speed up to 500 fpm (2.54m/s) and an elevator capacity up to 2500 lbs. with 1 to 1 roping and single wrap applications.

TMGL2 Machine is a synchronous permanent magnet gearless machine designed for elevators. Its configuration allows elevator speed up to 500 fpm (2.54m/s) and an elevator capacity up to 3500 lbs. with 1 to 1 roping and single wrap applications.

TMGL3 Machine is a synchronous permanent magnet gearless machine designed for elevators. Its configuration allows elevator speed up to 350 fpm (2.54m/s) and an elevator capacity up to 4500 lbs. with 1 to 1 roping and single wrap applications.

Each machine has two independent clutch-disc brakes: normal and emergency brake.

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 C to 50 C

Storage temperature: 0 C to 60 C

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

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

3.4 Machine Specifications

Maximum Sheave Shaft Load: Up to 12814 lbs. (57 kN) (TSM)

Maximum Sheave Shaft Load: Up to 16000 lbs. (72 kN) (TMGL1)

Maximum Sheave Shaft Load: Up to 20000 lbs. (80kN) (TMGL2)

Maximum Sheave Shaft Load: Up to 20000 lbs. (80kN) (TMGL2A); Up to 11250 lbs. (50 kN) basement application

Maximum Sheave Shaft Load: Up to 25000 lbs. (111kN) (TMGL3)

Maximum Speed: Up to 500 fpm (2.54 m/s) (TSM/TMGL1/TMGL2)

Maximum Speed: Up to 350 fpm (1.78 m/s) (TMGL2A)

Maximum Capacity: Up to 5000 lbs. (2273 Kg) @ 50% Counterweighting (2:1 Roping) (TSM)

Maximum Capacity: Up to 2500 lbs. (2273 Kg) @ 50% Counterweighting (1:1 Roping)
(TMGL1/TMGL2A)

Maximum Capacity: Up to 3500 lbs. (1591 Kg) @ 50% Counterweighting (1:1 Roping) (TMGL2)

Maximum Capacity: Up to 4500 lbs. (2041 Kg) @ 45% Counterweighting (1:1 Roping) (TMGL3)

Designed for 180 starts per hour at 50% elevator duty cycle

Sheave Diameter: 20 in (508 mm) (TMGL2A/TMGL3)

Sheave Diameter: 17.32 in (440 mm) (TSM/TMGL1)

Sheave Diameter: 16.14 in (410 mm) (TMGL2)

Rope Size: 10 mm (TSM/TMGL1/TMGL2); 0.5in (12.7mm) (TMGL2A/TMGL3)

Maximum Power: Up to 45HP (33.5 KW) (TSM)

Maximum Power: Up to 22.3HP (16.6 KW) (TSM)

Maximum Power: Up to 32.4 HP (24.2KW) (TMGL2)

Maximum Power: Up to 16.2HP (12.1KW) (TMGL2A)

Maximum Power: Up to 31.9HP (23.8KW) (TMGL3)

Motor Voltage: 350VAC (suitable for 460VAC inverter drives) (TSM/TMGL1/TMGL2A/TMGL3)

Motor Voltage: 330VAC (suitable for 460VAC inverter drives) (TMGL2)

Normal Brake Model Number PZ1600: Gap (Stroke): 0.23 - 0.31mm

Pick Voltage/Current: 90VDC/2.05A

Hold Voltage/Current: 45VDC/1.0A (TSM)

Normal Brake Model Number PZ1600A: Gap (Stroke): 0.23 - 0.31mm

Pick Voltage/Current: 90VDC/2.8A

Hold Voltage/Current: 45VDC/1.4A (TMGL1)

Normal Brake Model Number SPZ1600A: Gap (Stroke): 0.34 - 0.42mm

Pick Voltage/Current: 90VDC/2.05A

Hold Voltage/Current: 45VDC/1.0A (TMGL2/TMGL2A/TMGL3)

Emergency Brake Model Number SPZ1600A: Gap (Stroke): 0.34 - 0.42mm

Pick Voltage/Current: 90VDC/2.05A

Hold Voltage/Current: 45VDC/1.0A (TSM/TMGL1)

Emergency Brake Model Number SPZ1600B: Gap (Stroke): 0.34 - 0.42mm

Pick Voltage/Current: 90VDC/2.05A

Hold Voltage/Current: 45VDC/1.0A

(TMGL2/TMGL2A)

The TMGL3 has no emergency brake, so it requires the use of a rope gripper

Recommended Lubrication: Shell Gadus S3 V220C or any equivalent EP2 lithium grease.

Table 1: Detailed Machine Specifications

Model number		TSM-3535	TSM-5035	TSM-3550	TSM-5050	TSM-5020
Roping		2:1	2:1/1:1	2:1	2:1	2:1/1:1
Elevator capacity	lbs.	Up to 3500	5000/2500	Up to 3500	5000	5000/2500
Elevator speed	fpm	Up to 350	350/700	500	500	200/400
Sheave diameter/grooves	inch	17.32 / 7	17.32 / 8	17.32 / 7	17.32 / 8	17.32 / 8
Rated power	HP	21.8	31.2	31.2	44.6	17.6
Rated torque	Ft-lbs.	742.6	1061.2	742.6	1061.2	1061.2
Acceleration torque	Ft-lbs.	1856.5	2653	1856.5	2653	2653
Rated speed	rpm	155	155	221	221	87
Rated amps	A	32.9	46.9	46.5	67	27.6
Rated voltage (+/-5%)	V	350	350	350	350	350
Rated frequency	Hz	25.8	25.8	36.8	36.8	14.5
Max. allowable amps	A	6 x Rated amps	6 x Rated amps	6 x Rated amps	6 x Rated amps	6 x Rated amps
Min. normal brake torque	Ft-lbs.	1099	1530	1099	1530	1530
Min. emergency brake torque	Ft-lbs.	1456	2046	1456	2046	2046
Max. shaft load	lbs.	12814	12814	12814	12814	12814
Total moment of inertia	lbs-ft ²	143	161	143	161	161

Model number		TMGL1-2520	TMGL1-2535	TMGL1-2550
Roping		1:1	1:1	1:1
Elevator capacity	lbs.	Up to 2500	Up to 2500	Up to 2500
Elevator speed	fpm	Up to 200	Up to 350	Up to 500
Sheave diameter/grooves	inch	17.32 / 8	17.32 / 8	17.32 / 8
Rated power	HP	9.1	15.8	22.3
Rated torque	Ft-lbs.	1061	1061	1061
Acceleration torque	Ft-lbs.	2.5 x Rated torque	2.5 x Rated torque	2.5 x Rated torque
Rated speed	rpm	45	78	111
Rated amps	A	15.4	24.5	34.2
Rated voltage (+/-5%)	V	350	350	350
Rated frequency	Hz	7.5	13.0	18.5
Max. allowable amps	A	6 x Rated amps	6 x Rated amps	6 x Rated amps
Min. normal brake torque	Ft-lbs.	2275	2275	2275
Min. emergency brake torque	Ft-lbs.	2775	2775	2775
Max. shaft load	lbs.	16000	16000	16000
Total moment of inertia	lbs-ft ²	161	161	161

Model number		TMGL2-3520	TMGL2-3535	TMGL2-3550
Roping		1:1	1:1	1:1
Elevator capacity	lbs.	Up to 3500	Up to 3500	Up to 3500
Elevator speed	fpm	Up to 200	Up to 350	Up to 500
Sheave diameter/grooves	inch	16.14/ 10	16.14 / 10	16.14/ 10
Rated power	HP	12.9	22.7	32.4
Rated torque	Ft-lbs.	1438	1438	1438
Acceleration torque	Ft-lbs.	2.5 x Rated torque	2.5 x Rated torque	2.5 x Rated torque
Rated speed	rpm	47	83	118
Rated amps	A	22.3	36.5	50.0
Rated voltage (+/-5%)	V	330	330	330
Rated frequency	Hz	7.9	13.8	19.7
Max. allowable amps	A	6 x Rated amps	6 x Rated amps	6 x Rated amps
Min. normal brake torque	Ft-lbs.	2087	2087	2087
Min. emergency brake torque	Ft-lbs.	2773	2773	2773
Max. shaft load	lbs.	18000	18000	18000
Total moment of inertia	lbs-ft ²	185	185	185

Model number		TMGL2A-2520-LV	TMGL2A-2520-HV	TMGL2A-2535-LV	TMGL2A-2535-HV
Roping		1:1	1:1	1:1	1:1
Elevator capacity	lbs.	Up to 2500	Up to 2500	Up to 2500	Up to 2500
Elevator speed	fpm	Up to 200	Up to 200	Up to 350	Up to 350
Sheave diameter/grooves	inch	20/ 6	20/ 6	20/ 6	20/ 6
Rated power	HP	9.3	9.3	16.2	16.2
Rated torque	Ft-lbs.	1272	1272	1272	1272
Acceleration torque	Ft-lbs.	2.5 x Rated torque	2.5 x Rated torque	2.5 x Rated torque	2.5 x Rated torque
Rated speed	rpm	38	38	67	67
Rated amps	A	30.7	14.8	52.4	24.5
Rated voltage (+/-5%)	V	160	350	160	360
Rated frequency	Hz	6.4	6.4	11.1	11.1
Max. allowable amps	A	6 x Rated amps	6 x Rated amps	6 x Rated amps	6 x Rated amps
Min. normal brake torque	Ft-lbs.	2087	2087	2087	2087
Min. emergency brake torque	Ft-lbs.	2773	2773	2773	2773
Max. shaft load	lbs.	18000	18000	18000	18000
Total moment of inertia	lbs-ft ²	185	185	185	185

Model number		TMGL2A-3035-LV	TMGL2A-3035-HV	TMGL2A-3050-HV	TMGL2A-5050-HV	TMGL3-4535-HV
Roping		1:1	1:1	1:1	2:1	1:1
Elevator capacity	lbs.	Up to 3000	Up to 3000	Up to 3000	Up to 5000	Up to 4500
Elevator speed	fpm	Up to 350	Up to 350	Up to 500	Up to 500	Up to 350
Sheave diameter/grooves	inch	20/ 6	20/ 6	20/ 6	20/ 6	20/10
Rated power	HP	19.4	19.4	27.7	49.1	31.9
Rated torque	Ft-lbs.	1527	1527	1527	1350	2497
Acceleration torque	Ft-lbs.	2.5 x Rated torque	2.5 x Rated torque	2.5 x Rated torque	2.5 x Rated torque	2.5 x Rated torque
Rated speed	rpm	67	67	95	191	67
Rated amps	A	61.5	29.8	42	68.5	49
Rated voltage (+/-5%)	V	160	350	350	350	350
Rated frequency	Hz	11.1	11.1	15.9	31.8	11.1
Max. allowable amps	A	6 x Rated amps	6 x Rated amps	6 x Rated amps	6 x Rated amps	6 x Rated amps
Min. normal brake torque	Ft-lbs.	2235	2235	2235	2087	3830
Min. emergency brake torque	Ft-lbs.	2773	2773	2773	2980	NA
Max. shaft load	lbs.	18000	18000	18000	18000	25000
Total moment of inertia	lbs-ft ²	135	135	135	135	135

Table 2 General Bolt Torque Specifications

Metric Bolt Torque Specifications									
Bolt Type	All Class 8.8 Bolts				Bolt Type	All Class 8.8 Bolts			
	Newton-Meters		Foot-lbs.			Newton-Meters		Foot-lbs.	
	Max	Min	Max	Min		Max	Min	Max	Min
M3	1.6	1.2	1.2	0.9	M18	265	210	195	155
M3.5	2.6	1.8	1.9	1.3	M20	375	300	277	221
M4	3.8	2.7	2.8	2.0	M22	515	410	380	302
M5	5.5	4.5	4.1	3.3	M24	650	520	479	384
M6	10	7.5	7.4	5.5	M27	950	760	701	561
M8	22	18	16	13	M30	1290	1035	951	763
M10	45	35	33	26	M36	2260	1805	1667	1331
M12	80	60	59	44	M42	3615	2890	2666	2132
M14	125	100	92	74	M48	5430	4345	4005	3205
M16	190	155	140	114					

4.0 Machine Overview

The following is a list of major components of Machine. Along with a description of their functions, there is an overview of some of the critical adjustments and maintenance information. See Installation and Maintenance in detail.

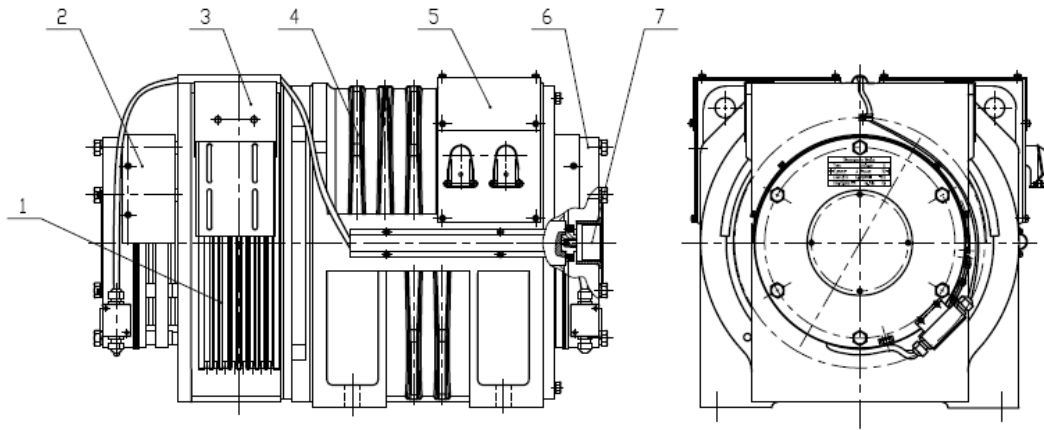


Figure 3 Machine Assembly

1. **Sheave** - A grooved sheave is connected directly to the output shaft. The grooves provide the proper coefficient of traction between the sheave and the hoist ropes.
2. **Emergency Brake** - The electromechanical device is used to prevent the elevator from moving at emergency state.
3. **Sheave cover** - Keep the rope out of touch after hang up the ropes.
4. **PMS Motor** - The part is used to provide the necessary torque and speed to move the elevator in operation.
5. **Motor/ Brake Wires** – Junction box for motor and brake wires.
6. **Normal Brake** - The electromechanical device is used to prevent the elevator from moving when the car is at rest.
7. **Encoder** - This device is directly coupled to the main shaft of the hoisting motor. It is provided to give the absolute speed feedback of the hoist motor to the inverter drive system and the elevator controller.

5.0 Installation

5.1 Motor Connection

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



WARNING! Direct connection to the three-phase power is forbidden, it may destroy the motor.

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. See Figure 4.

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

NOTE: Check and tighten all leads (motor side and line side) on installation.

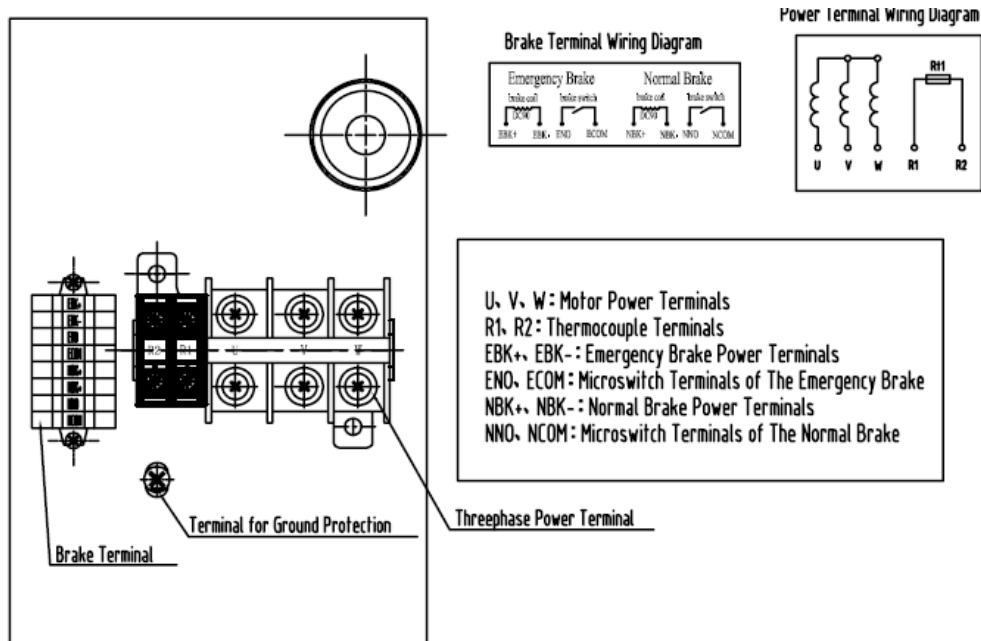


Figure 4 Motor and Brake Connections

5.2 Brake Connection

The power terminal of emergency brake is EBK+ (positive pole), EBK- (negative pole), and the power terminal of normal brake is NBK+ (positive pole), NBK- (negative pole). See Figure 5.

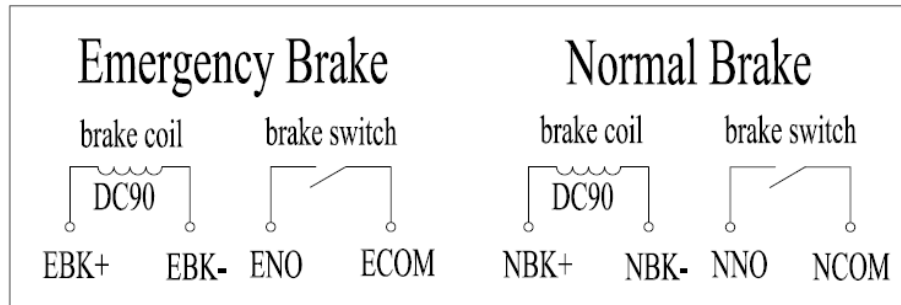


Figure 5 Normal and Emergency Brake Wiring

There are two micro switches installed in the brake that are used to feed back the action of the brake, one is for emergency brake (ENO, ECOM normally opened contact) and another is for normal brake (NNO, NCOM normally opened contact). User can connect it according to your control system requests.

5.2.1 Brake Burnishing

All new brakes, or brake replacements, must be burnished to develop max. stopping torque.

1. Braking surface should be clean and free of dust or grease.
2. Reduce the voltage applied to the brake.
3. Run the elevator, in the direction of the load, one or two floors on inspection then stop to allow the brake to cool.
4. Repeat step 3.
5. Verify brake voltages are restored and brake thicknesses/gaps meet allowable specifications.

5.3 Absolute Encoder Connection

These machines are supplied with an absolute encoder using Endat interface with 12-pin PCB connector. The sine/cosine incremental resolution is 2048 pulses per revolution. See Figure 6.

Encoder Cable Diagram

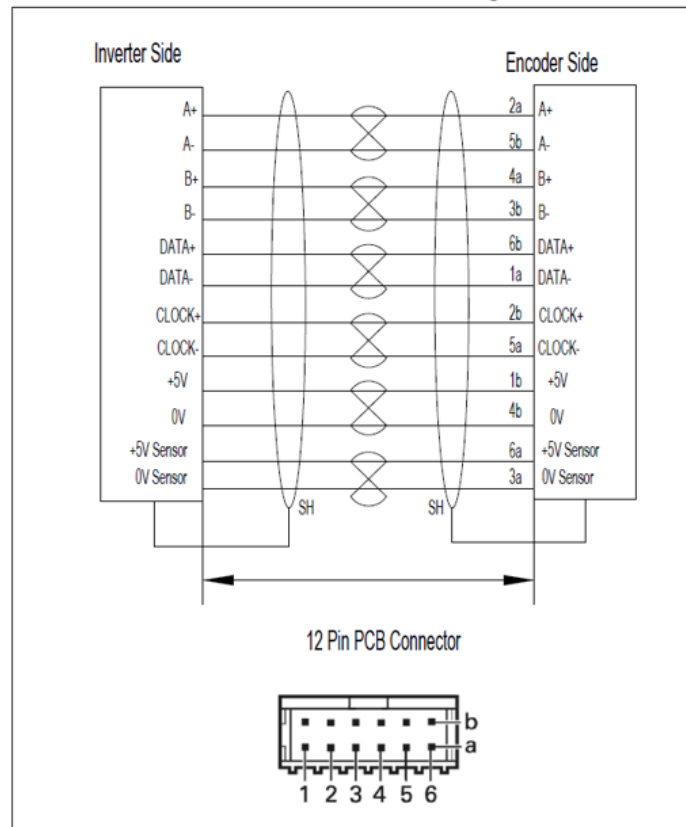


Figure 6 Encoder wiring

6.0 Adjustments

6.1 Brake Stroke Adjustment



VERIFY THAT THE BRAKE STROKE IS WITHIN TOLERANCE BEFORE OPERATION. Generally, the brake stroke has been adjusted in the factory and does not need to be re-adjusted.

Proper brake operations with regard to loading **MUST** be verified before anyone is allowed to ride on a construction platform or in the elevator cab.

Please pay close attention to the value of brake stroke as described in the following pictures in the course of routine maintenance.



If the brake lining wears out, the brake stroke will be increased; if the brake stroke is greater than 1mm, the brake may be disabled due to the inability of the electromagnetic coil to overcome the spring tension at that length.

6.1.1 Emergency Brake Stroke Adjustment

It will be of great benefit to read the whole brake stroke adjustment procedure before attempting to adjust the brake. This procedure takes meticulous adjustments and patience must be practiced. Adjusting the brake will become second nature once a feel for the sensitivity has been acquired.

Required Tools & Materials:

Torque Wrench with 24mm socket set to 140ft-lbs (190 Nm).

Open End Wrench: 24mm

Hex wrench: 5mm

Feeler Gauges: 0.34mm, 0.43mm, 0.50mm

Emergency Brake Stroke Check & Adjustment

Step 1:

With the elevator secured and power removed from the machine, remove the screw M6x16 and lock washer6 (4 pieces) using the hex wrench (5mm), then remove the dustproof ring and nylon ring which is used to prevent contaminants from entering the brake gaps. See Figure 7.

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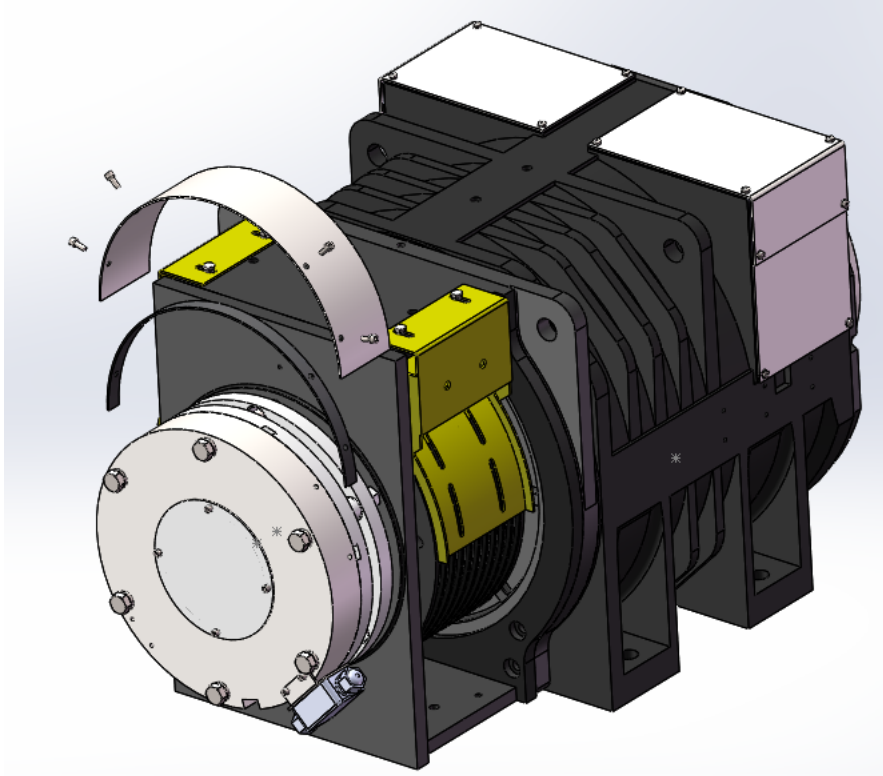


Figure 7 Remove Emergency Brake Dust Cover

Step 2:

Slightly loosen all of the M16x165 bolts $\frac{1}{2}$ turn. Use the torque wrench set to 140 ft-lbs and re-torque all six M16x165 bolts (tighten the bolts in a STAR pattern). This ensures an accurate starting point with all bolts at the same torque prior to checking any brake gaps. **DO THE GAP CHECK ONLY WHEN THE BOLTS ARE AT 140 FT-LBS TORQUE.** Now check Gap “A” at the six points referenced in Figure 8 with the largest feeler gauge that will fit. Measure to the left of each bolt. Note what and where the biggest gap is in reference to all six M16 bolts. If adjustment is necessary, the bolt with the largest measured gap will serve as your starting point for the adjustment procedure.

If Gap “A” is even and less than 0.50mm then no readjustment is necessary. If the gap is uneven (a difference of $>0.10\text{mm}$ between any two points) or $>0.50\text{mm}$, it must be re-adjusted to the recommended range of 0.34~0.42mm as shown in Figure 9 below.

The normal gap “A” as shown in the picture below should be 0.34~0.42mm (Use 0.34 mm feeler gauge as a “GO” gauge, and then use 0.43 mm feeler gauge as a “NO GO” gauge). The “GO” gauge should fit into Gap A smoothly and the “NO GO” gauge should not fit.

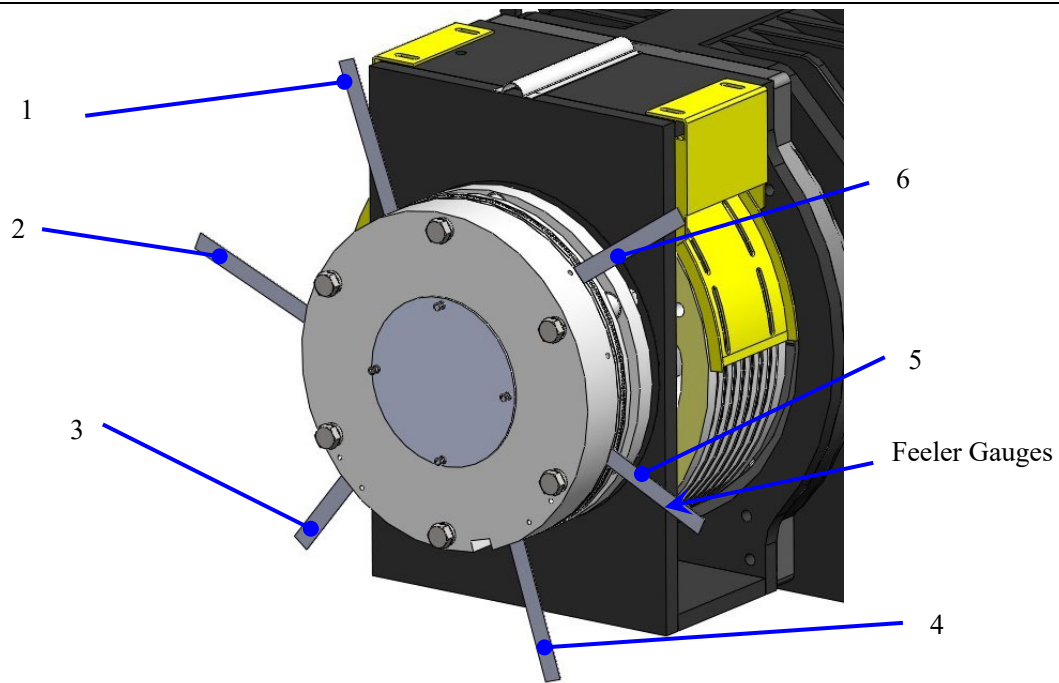


Figure 8 Emergency Brake Stroke Check locations

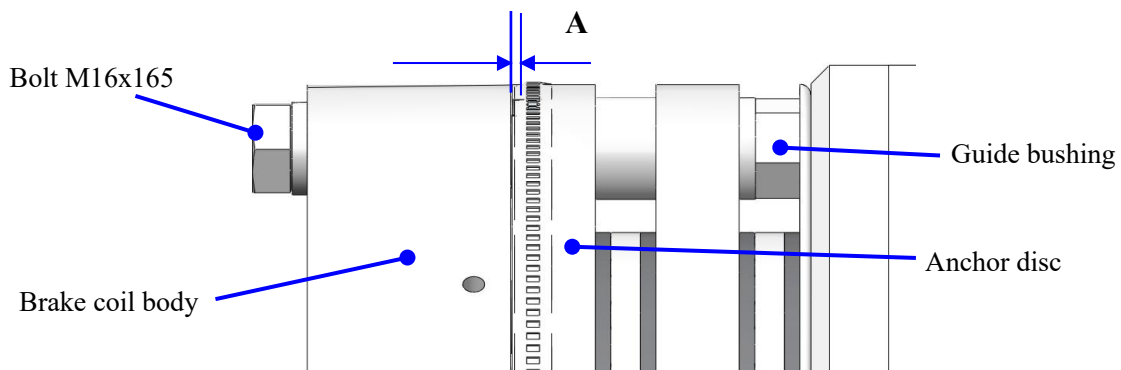


Figure 9 Emergency Brake Gap

Adjustment Procedure:

1. Loosen the bolt M16 with the largest gap one full turn using the open end wrench (24mm). See Figure 10.
2. Then adjust the guide bushing slowly using the open end wrench (24mm). If the gap is too big, turn the guide bushing (the pitch of guide bushing is 2mm) counter-clockwise to reduce it. Otherwise, turn the guide bushing clockwise to increase. **Anticipate turning the bushing a very small amount (approximately 1/18th of a turn).** Keep in mind that on the initial attempt to turn the bushing it may give quickly and rotate easily after applying a relative amount of force. Keep a steady hand to avoid over adjusting.
3. Then tighten the bolts M16 use open end wrench (24mm) to 140 ft-lb (190 Nm).
4. Test the clearance again to make sure the gap is between 0.34~0.42mm.
5. Adjust the other points where the gap is out of range using the same method.
6. Once all six points have been adjusted, check all six once more to be sure of the adjustment.
7. Reinstall the dustproof ring and nylon ring.

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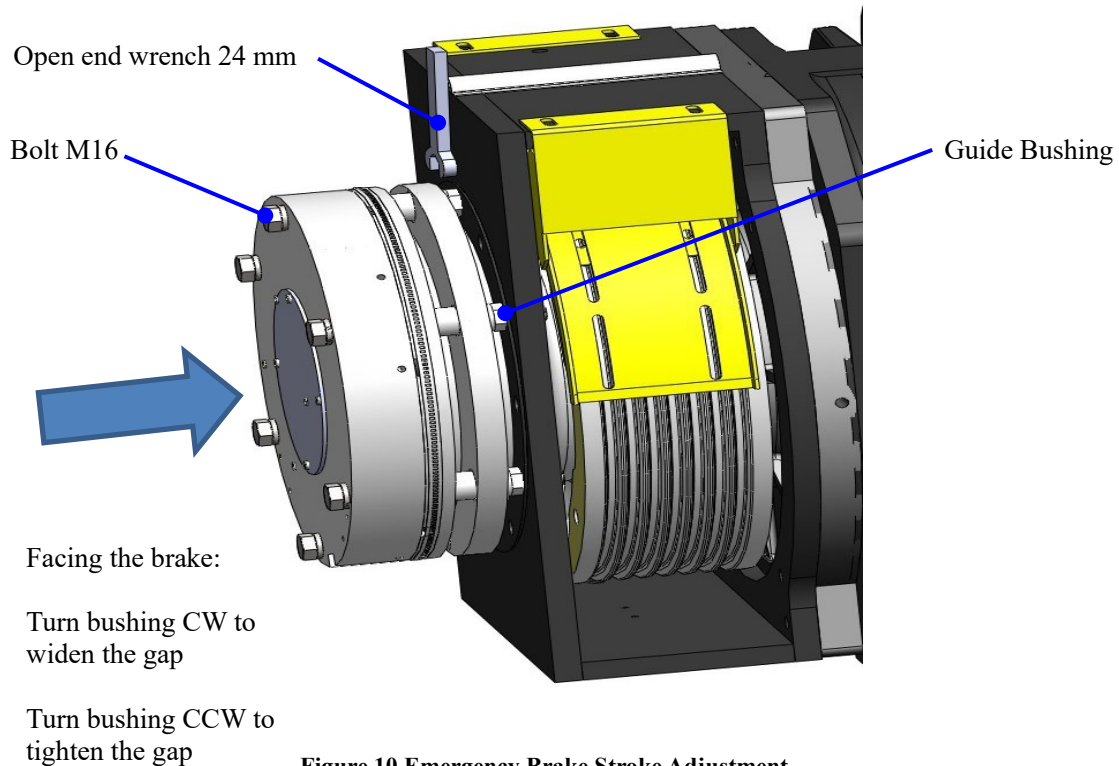


Figure 10 Emergency Brake Stroke Adjustment

6.1.2 Normal Brake Stroke Adjustment

It will be of great benefit to read the whole brake stroke adjustment procedure before attempting to adjust the brake. This procedure takes meticulous adjustments and patience must be practiced. Adjusting the brake will become second nature once a feel for the sensitivity has been acquired.

Required Tools & Materials:

Torque Wrench with 24mm socket set to 140 ft-lbs. (190Nm)

Special Open End Wrench: 24mm (TDI# PTO-004) See Figure 13.

Hex wrench: 5mm

Feeler Gauges:

0.23mm, 0.32mm, 0.36mm (TSM/TMGL1)

0.34mm, 0.43mm, 0.5mm (TMGL2/TMGL2A/TMGL3)

Normal Brake Stroke Check & Adjustment

Step 1:

With the elevator secured and power removed from the machine, remove the screw M6x16 and lock washer6 (4 pieces) using the hex wrench (5mm), then remove the dustproof ring and nylon ring which is used to prevent contaminants from entering the brake gaps.

Step 2: Slightly loosen all of the M16x165 bolts ½ turn. Use the torque wrench set to 140 ft-lbs (190Nm) and re-torque all six M16x165 bolts (tighten the bolts in a STAR pattern). See Figure 11. This ensures an accurate starting point with all bolts at the same torque prior to checking any brake gaps. **DO THE GAP CHECK ONLY WHEN THE BOLTS ARE AT 140 FT-LBS TORQUE.** Now check **Gap “B”** at the six points referenced in Figure 11 with the largest feeler gauge that will fit. Measure to the left of each bolt. Note what and where the biggest gap is in reference to all six M16 bolts. If adjustment is necessary, the bolt with the largest measured gap will serve as your starting point for the adjustment procedure.

TSM/TMGL1: No adjustment is required unless Gap “B” is even and less than 0.36mm. If the gap is uneven (a difference of more than 0.10mm between any two points) or over 0.36mm, it must be re-adjusted to the recommended range of 0.23~0.31mm as shown in Figure 12.

The normal gap “B” as shown in Figure 12 should be 0.23~0.31mm (Use 0.23 mm feeler gauge as a “GO” gauge, and then use 0.32 mm feeler gauge as a “NO GO” gauge).

TMGL2/2A/3: No adjustment is required unless Gap “B” is even and less than 0.5mm. If the gap is uneven (a difference of more than 0.10mm between any two points) or over 0.5mm, it must be re-adjusted to the recommended range of 0.34~0.42mm as shown in Figure 12.

Note that the TMGL3 has 2 Normal Brakes. Both must be adjusted.

The normal gap “B” as shown in Figure 12 should be 0.34~0.42mm (Use 0.34 mm feeler gauge as a “GO” gauge, and then use 0.43 mm feeler gauge as a “NO GO” gauge).

Adjustment Procedure:

1. Loosen the bolt M16 with the largest gap one full turn using the open end wrench (24mm). See Figure 13.
2. Then adjust the guide bushing slowly using the open end wrench (24mm). If the gap is too big, turn the guide bushing (the pitch of guide bushing is 2mm) counter-clockwise to reduce it. Otherwise, turn the guide bushing clockwise to increase. **Anticipate turning the bushing a very small amount (approximately 1/18th of a turn).** Keep in mind that on the initial attempt to turn the bushing it may give quickly and rotate easily after applying a relative amount of force. Keep a steady hand to avoid over adjusting.
3. Then tighten the bolts M16 use open end wrench (24mm) to 140 ft-lb (190 Nm).
4. Test the clearance again to make sure the gap is between 0.34~0.42mm.
5. Adjust the other points where the gap is out of range using the same method.
6. Once all six points have been adjusted, check all six once more to be sure of the adjustment.

7. Reinstall the dustproof ring and nylon ring.

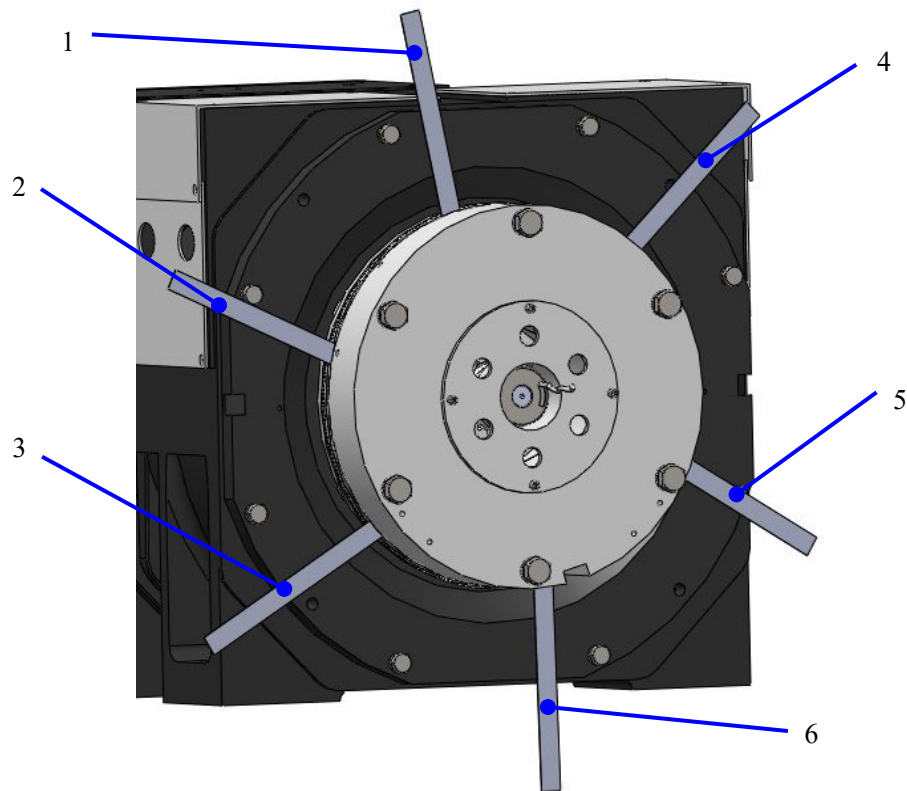


Figure 11 Normal Brake Stroke Check locations

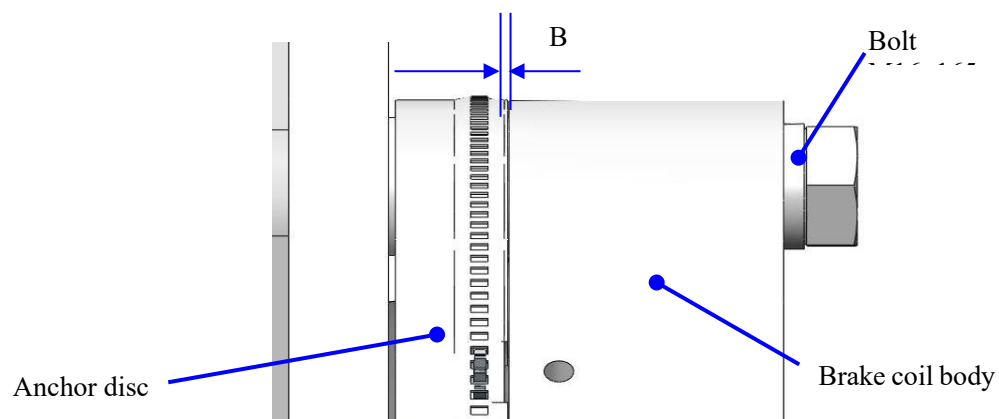


Figure 12 Normal Brake Gap

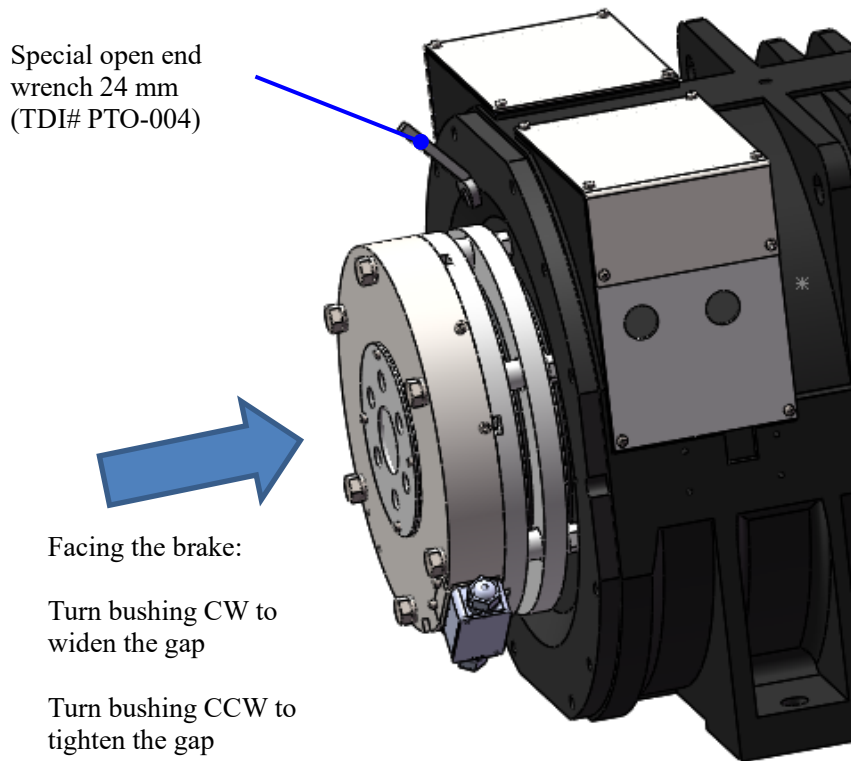


Figure 13 Special Open End 24mm Wrench

6.2 Brake Noise Adjustment



Generally brake noise adjustment has been performed at the factory and there is no need to be adjusted anymore; however, after few months of operation there may be a need to perform brake noise adjustment to optimize the brake noise absorber height for noise reduction purpose.

Required Tools & Materials:

Open End Wrench: 8mm (x2), 10mm

6.2.1 Brake PZ1600A of TMGL1 Noise Adjustment

Adjustment: Loosen nut M6 with the open-ended wrench (10mm). Adjust bolts M6x60. Six location bolts should be adjusted uniformly. Retest the brake open noise until the noise level is acceptable, then lock the nut M6. After adjustment check the hold current (voltage) can hold the brake. See Figure 14.

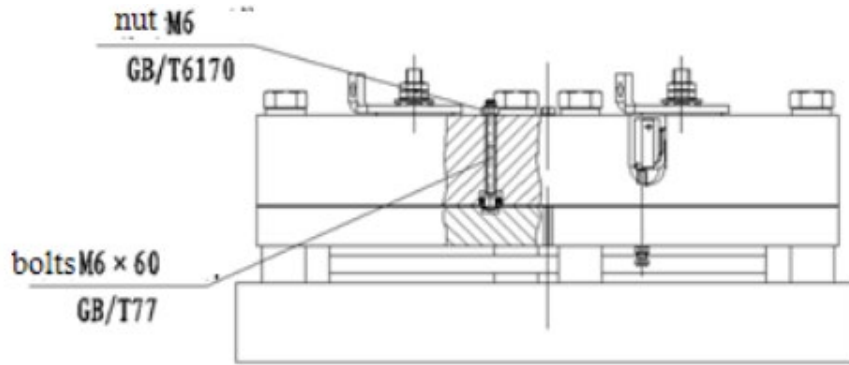


Figure 14 PZ1600A Brake Noise Adjustment

6.2.2 All Other Brake Noise Adjustment

Note: It is important for the teeth of the six (6) brake absorber pads to be in the slots of the brake adjustment band.

If the brake noise is too high, the brake absorber pad height should be readjusted as follows:

1. Loosen the nut M5 II. See Figure 15.
2. Tighten the nut M5 I one turn at a time to increase the height of noise absorb pad.
3. Retest the brake open noise until the noise level is acceptable. If not, repeat step 2.
4. Operate the brake to ensure it picks completely. Make sure the hold current (voltage) can hold the brake.
The brake stroke gap should be fully closed 360° around the brake.
5. Re-tighten the M5 II.

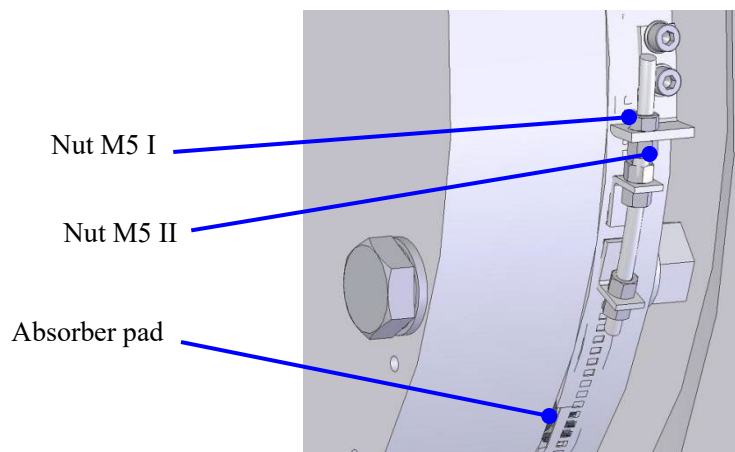


Figure 15 Brake Noise adjustment

6.3 Brake Switch Adjustment



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

See Section 8.2.3 Brake Switch Adjustment for adjustment instructions.

7.0 Maintenance



Only qualified personnel are allowed to perform any maintenance work.

This machine requires minimum maintenance. Please perform the below procedures as per the suggested intervals.

7.1 Brake Stroke Check

Suggested check cycle

Every 6 months

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

Criteria benchmark

Emergency brake: < 0.50mm (emergency brake gap (stroke) “A” should be less than 0.50mm)

See Section 6.1.1, Emergency Brake Stroke Adjustment

Normal Brake PZ1600/PZ1600A of TSM/TMGL1: < 0.36mm

Normal brake SPZ1600A of TMGL2/TMGL2A: < 0.5mm

See Section 6.1.2, Normal Brake Stroke Adjustment

7.2 Brake Lining Check

Suggested check cycle

Every 12 months



If the brake lining wears too much (Total abrasion ≥ 1 mm), the brake maybe disabled.

Criteria benchmark

The original brake disc thickness is 16mm. Total abrasion of the brake lining wear must be less than 1mm.

Check the distance A between the anchor disc 1 and the 2, it must greater than 15mm. See Figure 16.

If the gap is less than 15mm, then the brake disc is worn beyond specification and must be replaced. Contact Torin Drive International if it is unclear about replacement of the brake discs or the whole brake assembly.

For Emergency Brake Lining Replacement see Section 8.3.

For Normal Brake Lining Replacement see Section 8.4.

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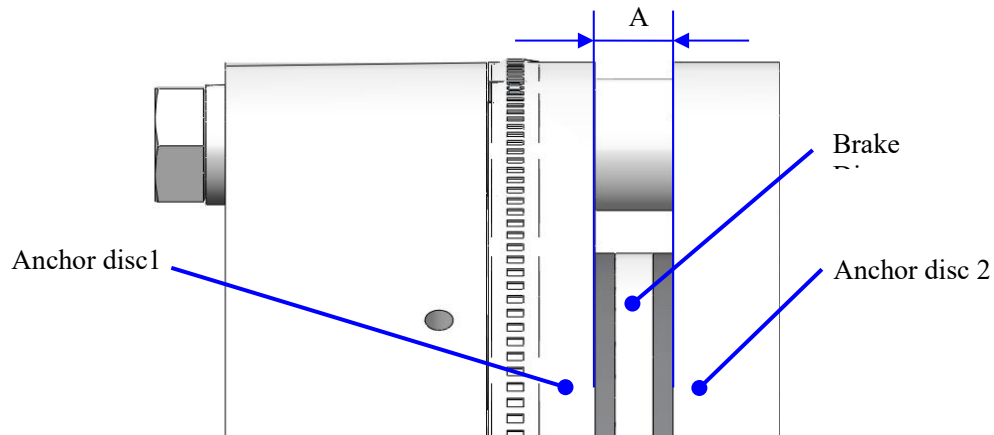


Figure 16 Brake Lining Wear Check

7.3 Machine Greasing Interval

Bearings:	Drive End Bearing (Sheave Side)
Grease Type:	Lithium Base – Extreme Pressure 2 (EP2) Grease
Grease Quantity:	15.0 grams
Grease Interval:	Annually (12 months)

Required Tools & Materials:

Grease Gun
Lithium Base EP2 Grease
5mm Hex wrench



Certain greases are incompatible. DO NOT mix greases unless the grease base has been confirmed and verified to be compatible. Torin Drive only recommends to use Lithium Base EP2 grease.

Procedure:

1. Remove the grease relief plug found roughly at 4 o'clock when facing the sheave using the #5 hex wrench. See Figure 17.
2. It is recommended to run the car while greasing the bearing if possible and able to do safely. Inspection or contract speed are both acceptable.
3. Grease the bearing with 15.0 grams of lithium based EP2 grease at the grease fitting found at 12 o'clock when facing the sheave.

4. Wipe off any excess grease. Grease may or may not exit out of the grease relief port. Grease will only exit once the excess grease cavity is properly full from regular greasing intervals.
5. Replace the grease relief plug with the 5mm hex wrench.

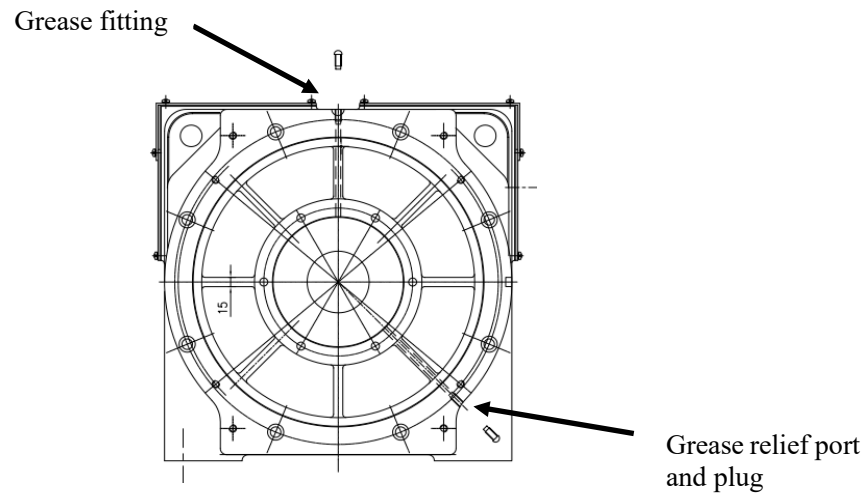


Figure 17 Grease fitting and relief port location

8.0 Replacement



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.



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:

Hex wrench (2mm, 4mm, 8mm)

Wide blade screwdriver

Inner hexagon bolt M10x1.5x50 (Supplied with new encoder)

Clean cloth

8.1.1 Encoder Removal

1. Remove the end cover using either the 4mm hex wrench or the wide blade screwdriver. See Figure 18.

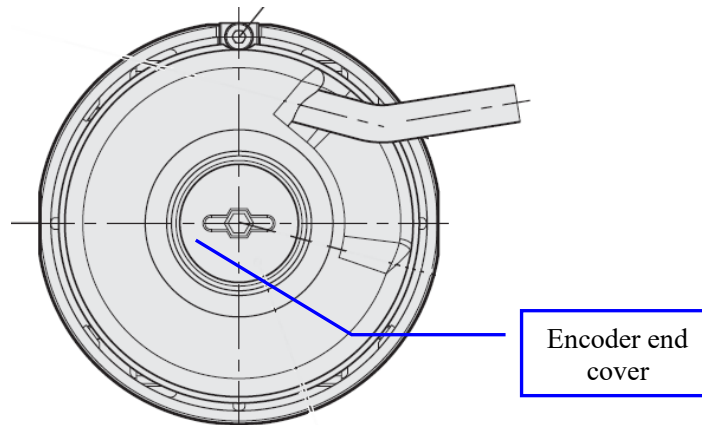
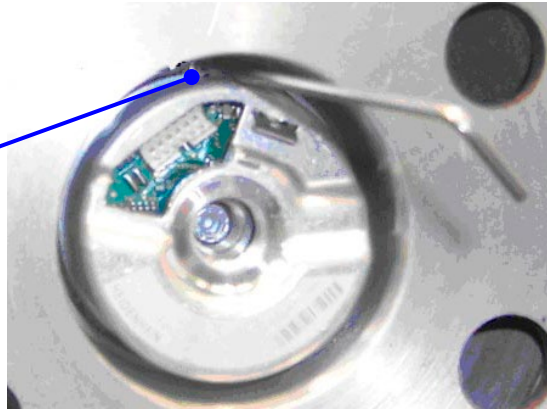


Figure 18 Remove encoder end cover

2. Loosen the bolt M2.5 with hex wrench (2mm) 5-6 turns. It should not be removed. See Figure 19.

Bolt M2.5

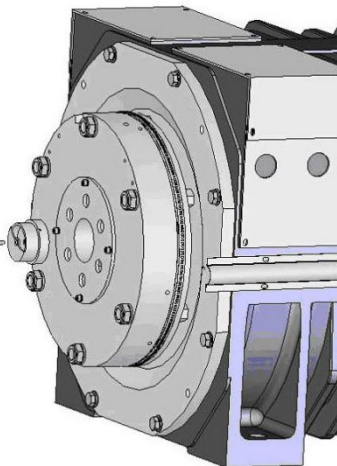
**Figure 19 Loosen M2.5 bolt**

3. Loosen bolt M5x50 with hex wrench (4mm) 1.5 turns. See Figure 20.
4. Hand tighten the M10x1.5x50 bolt into the encoder then turn about one half turn to push the encoder loose from the encoder shaft using the 8mm hex wrench. Remove the bolt M10 and bolt M5. Install the M10 bolt a few turns and use it as a handle to pull the encoder out.

End-cover

Bolt M10

Bolt M5x50

**Figure 20 Remove encoder**

8.1.2 Encoder Installation

1. Remove the encoder end-cover using the 4mm hex wrench or flat blade screwdriver.
2. Install the encoder in the encoder housing. Tighten the bolt M5x50 with hex wrench (4mm) to 44 in-lbs.
3. Install the encoder cable and secure it, install the encoder end-cover. Tighten to 44 in-lbs.
4. Tighten the M2.5 bolt with hex wrench (2mm) to 9 in-lbs.

Make sure that correct torque specified by the encoder manufacturer is observed when tightening these bolts.

8.2 Brake Switch Replacement



Please refer to the Troubleshooting Chart first and make sure that the switch is actually bad before performing this replacement procedure.

Required Tools & Materials:

Brake switch

Scissors

Hex wrench (2.5mm)

Philips head screw driver

Straight head screw driver

Torque screw driver (Need to measure 1.8, 8.8 in-lb.)

Breakable blue Loctite 243

Multi-meter

Feeler gauges (0.1mm, 0.2 mm)

Rubberized electrical tape

8.2.1 Brake Switch Removal

1. Open the brake junction box using a Philips head screw driver.
2. Take off the brake side cable in brake terminal using a straight head screwdriver, then remove the cable through the connector. See Figure 21 and Figure 22.

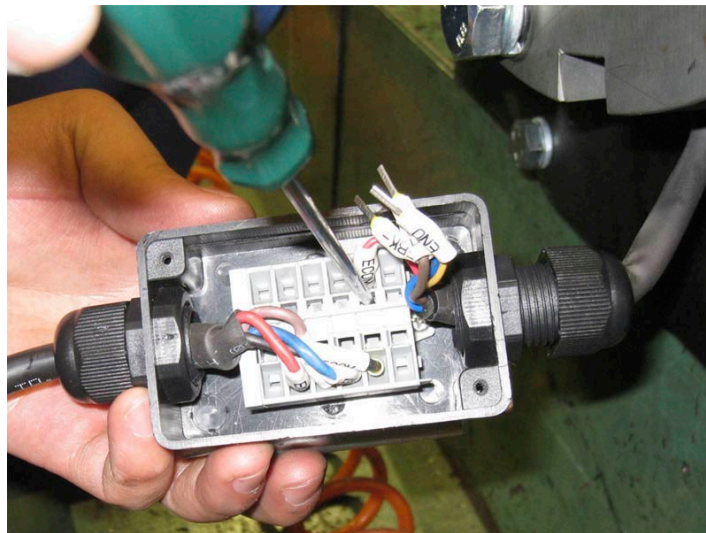


Figure 21 Brake Switch Terminal

Notes: For machines manufactured after July 2009, there is no terminal inside the box; therefore, cut off the cable then remove it through the connector.

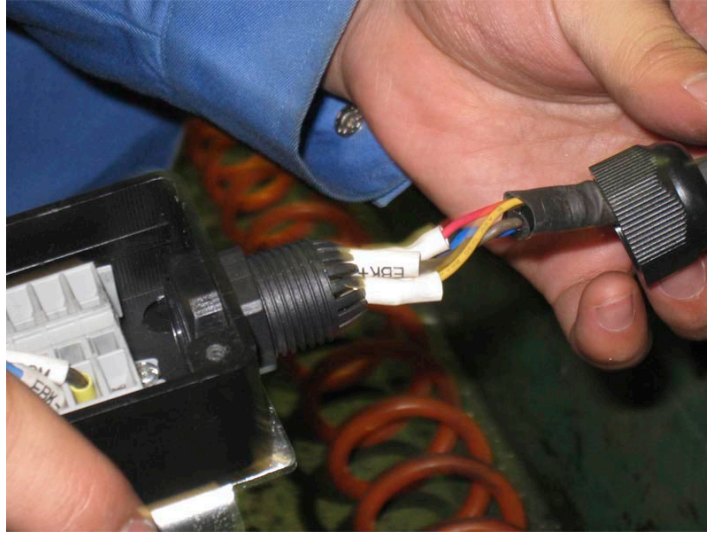


Figure 22 Brake Switch Connection

3. Remove the bolt M3x14 with the hex wrench (2.5mm), then take off the brake switch from brake. See Figure 23.

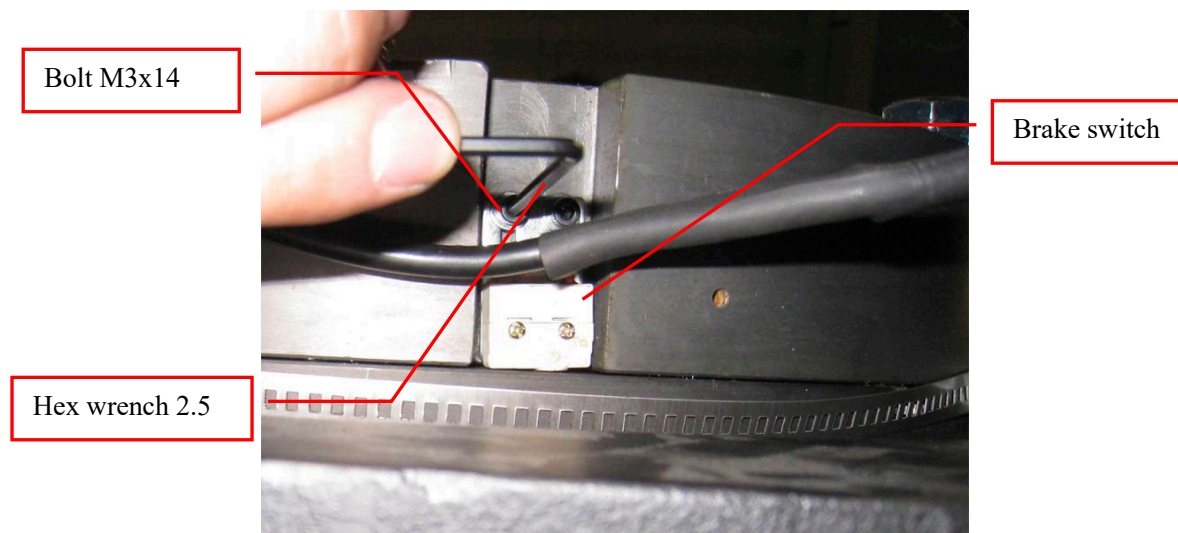


Figure 23 Remove Brake Switch

4. Cut off the heat shrink tubing which protects the brake cable using scissors. See Figure 24.

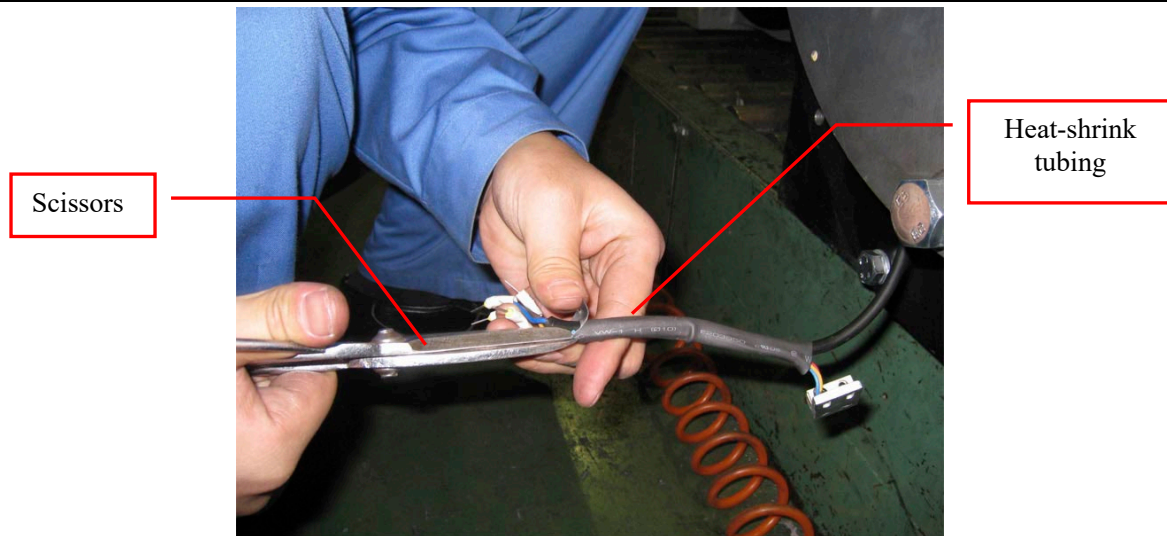


Figure 24 Remove heat shrink tubing

5. Loosen the screws M2x10 using a Philips head screw driver. The switch is secured with glue, so use the straight head screwdriver to separate it from the bracket. See Figure 25 and Figure 26.

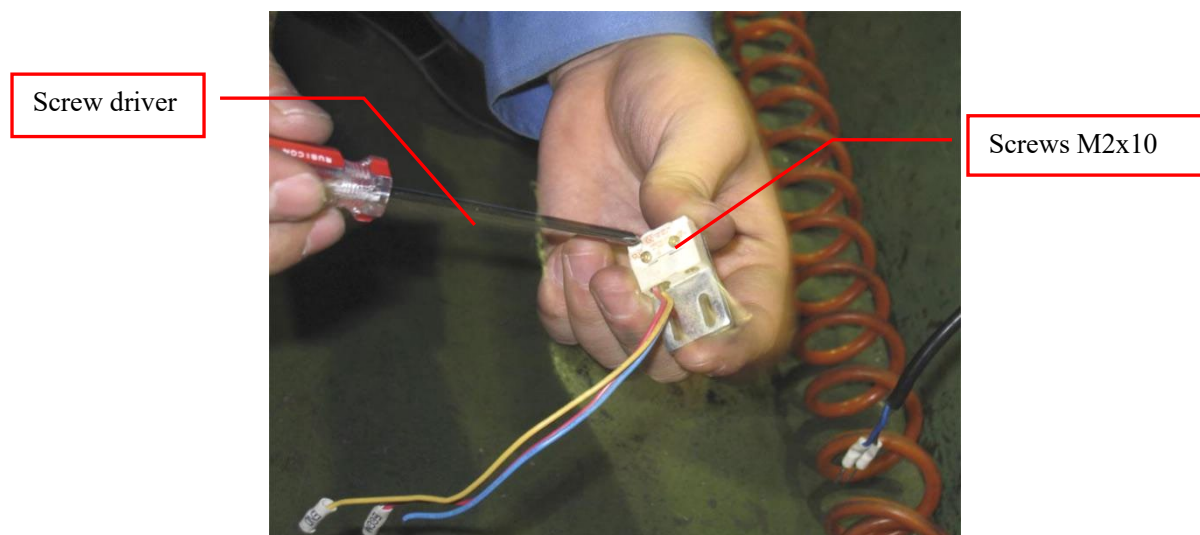


Figure 25 Remove Brake Switch from bracket

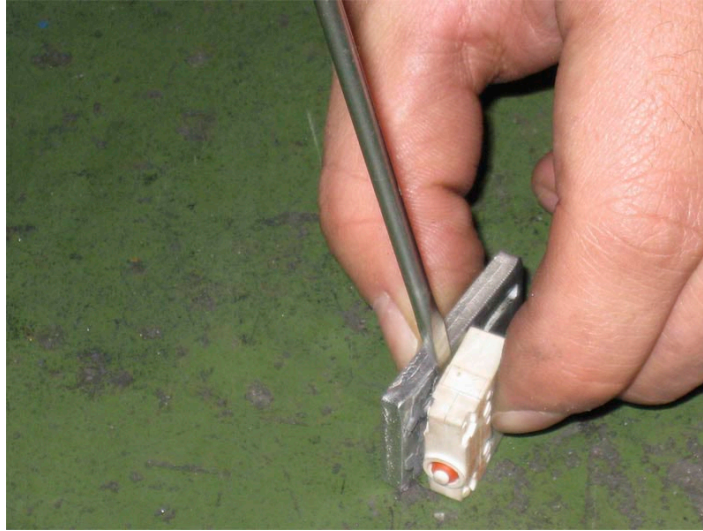


Figure 26 Separate Brake switch and bracket

8.2.2 Brake Switch Installation

1. Clean the brake switch bracket surface. See Figure 27.



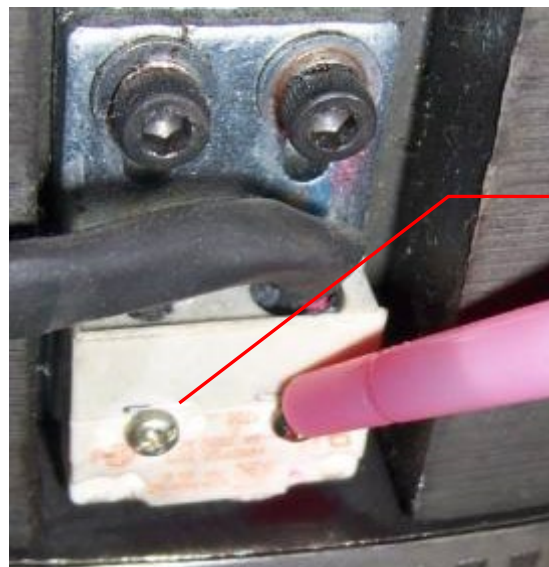
Figure 27 Clean Brake switch bracket

2. Apply the coating sealant (Loctite 243 or equivalent) on brake switch and bracket surface. See Figure 28.



Figure 28 Apply sealant to Brake switch

3. Install the new switch to the bracket using screws M2x10 with a Philips head screw driver. Use torque screw driver to tighten the bolt to 1.8 in-lb. Then apply blue Loctite 243 or equivalent between the screw head and the switch body for anti-vibration purpose. See Figure 29.



Screws M2x10

Figure 29 Apply Loctite 243 or equivalent

4. Install the switch and bracket to the brake body but do not tighten the bolts. See Figure 30.

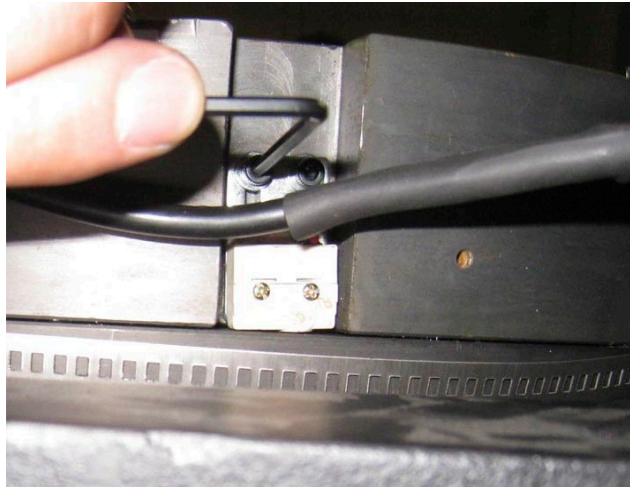


Figure 30 Reinstall Brake switch and bracket

5. Cover the brake switch cable with and brake power lines with electrical tape. See Figure 31.

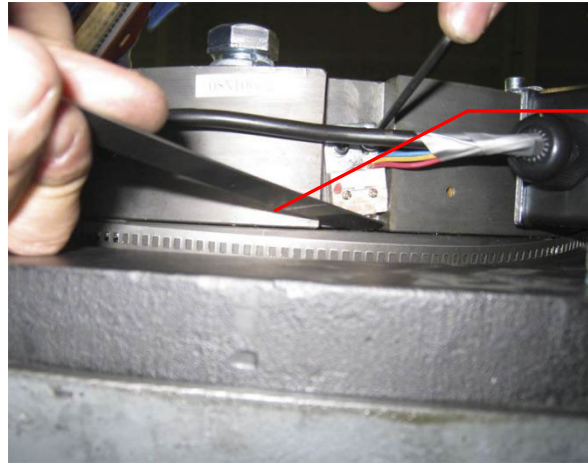


Figure 31 Wrap with electrical tape

6. Install the brake cable to the brake box, and then properly connect the cable according to the marking. Close the junction box cover.

8.2.3 Brake switch Adjustment

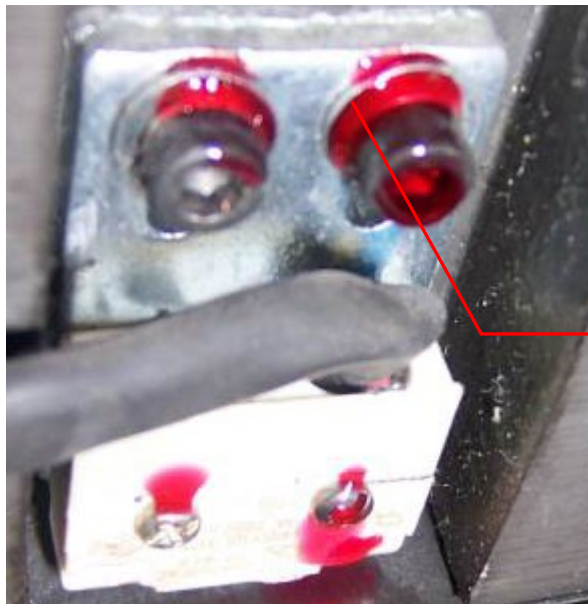
1. Use a multi-meter to make sure the new switch is functional by inserting feeler gauges between the brake plate and switch. The switch should not be activated when inserting a 0.1mm (0.004") feeler gauge and should be activated when inserting a 0.2mm (0.008") feeler gauge. Otherwise the brake switch bracket position must be readjusted. See Figure 32.



Feeler gauge

Figure 32 Brake switch adjustment

2. After the adjustment is correctly confirmed, tighten the screws M3 with hex wrench 2.5. Use a torque screw driver to tighten the bolt to 9 in-lb. Then apply red Loctite 480 or equivalent between the screw head and the installing plate for anti-vibration purpose. See Figure 33.



Loctite 243

Figure 33 Apply Loctite 243 or equivalent

8.3 Emergency Brake & Friction Lining Replacement TSM & TMGL1/2/2A

Required Tools & Materials:

Open end wrench: 24mm

Hex wrench: 4mm, 5mm

Screwdriver

Clean cotton fabric

Hoisting ropes

Cleaner (alcohol based)

Vaseline

Threaded rod M16x2x320 (12.5")

8.3.1 Emergency Brake and Friction Lining Removal

1. Disconnect the brake cable from emergency brake junction box.
2. Remove the screws M5x12 and washer5 (4 pieces) with hex wrench (4mm), and remove the 4 screws M6x16 and lock washer6 (4 pieces) with hex wrench (5mm), then remove the cover, dustproof ring and nylon ring. See Figure 34 and Table 2.
3. Remove the bolt M16x165 with open end wrench (24mm).

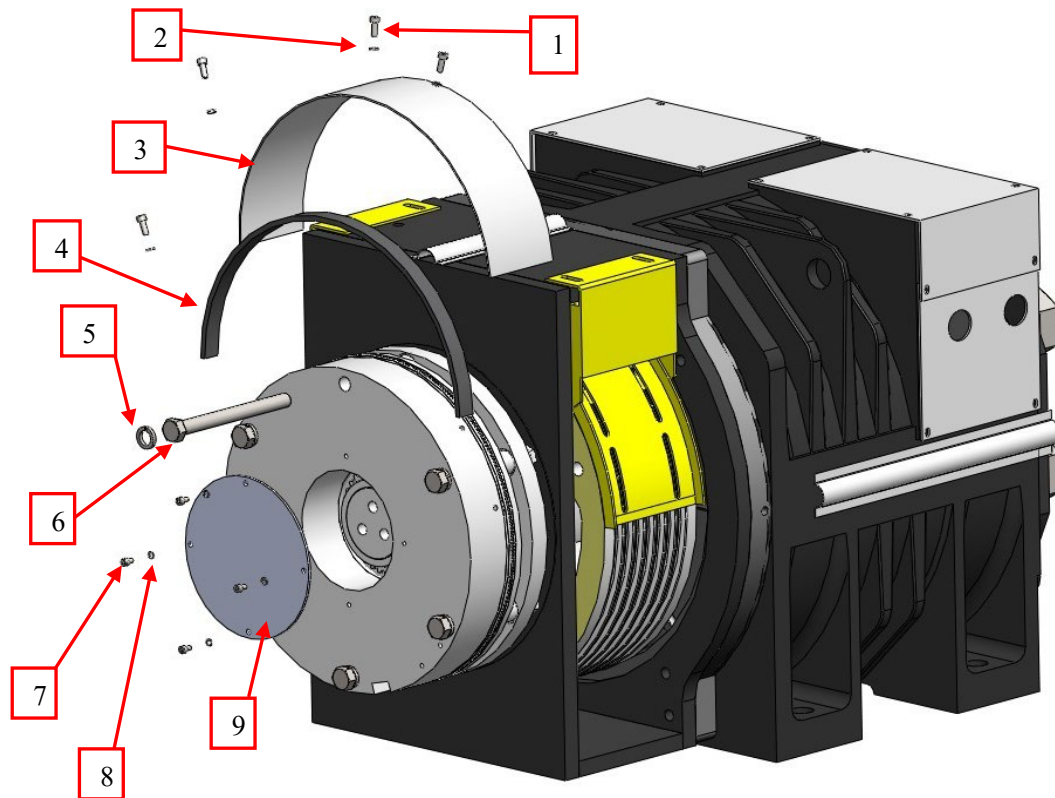
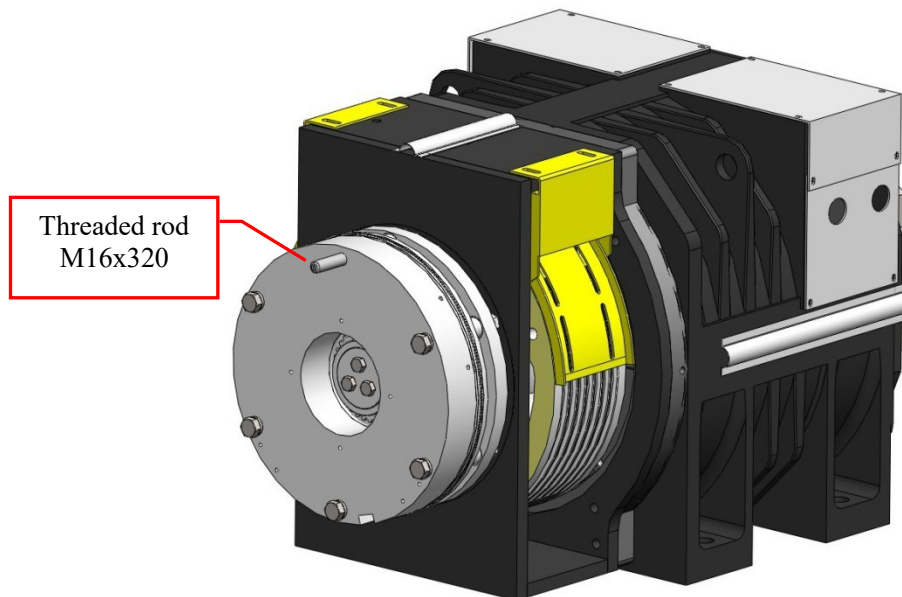


Figure 34 Emergency Brake Cover Parts

Table 2: TSM & TMGL1/2/2A Emergency Brake Cover Parts

No.	Name	No.	Name
1	Screw M6x165	6	Bolt M16x165
2	Lock washer 6	7	Screw M5x12
3	Dustproof ring	8	Lock washer 5
4	Nylon ring	9	Cover
5	Lock washer 16		

4. Then install the threaded rod M16x2x320 into the hole. See Figure 35.

**Figure 35 Install Threaded rod**

5. Loosen other 5 bolts M16x165 evenly; move out the emergency brake; then hoist out the brake with hoisting ropes (See Figure 36, Figure 37 and Table 3). Remove the brake coil body, friction lining part A, anchor disc and friction lining part B.

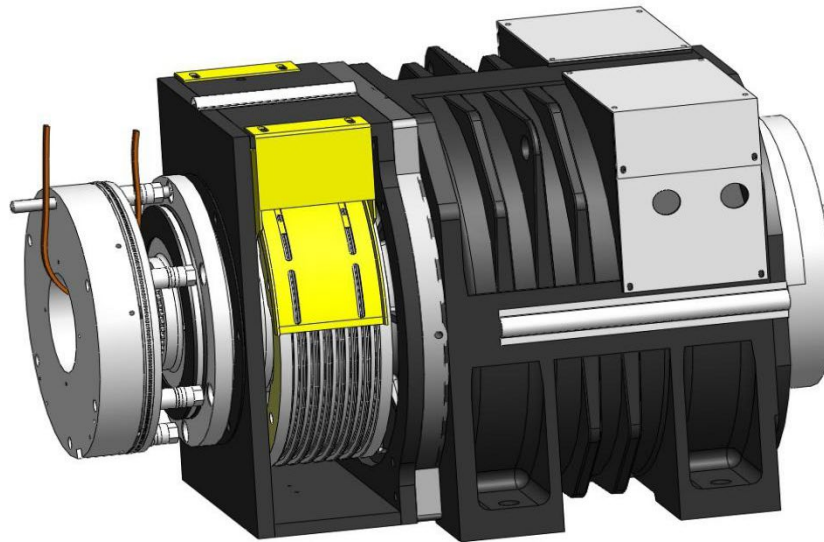


Figure 36 Remove Emergency Brake

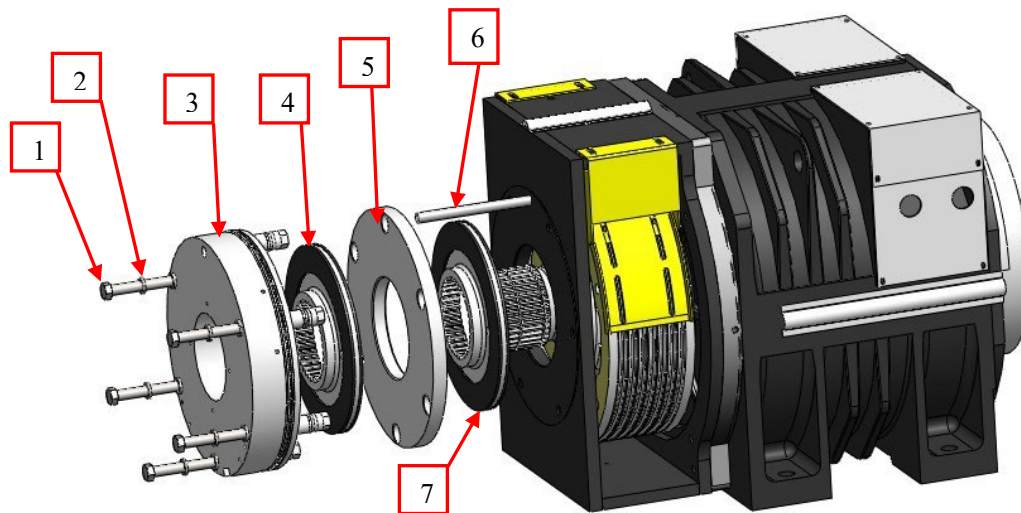


Figure 37 Emergency Brake Parts

Table 3: TSM & TMGL1/2/2A Emergency Brake Parts

No.	Name	No.	Name
1	Bolt M16x165	5	Anchor disc
2	Lock washer 16	6	Threaded rodM16x320
3	Brake coil body	7	Friction lining part B
4	Friction lining part A		

6. Replace the O-ring (Ø109x3.1) if necessary. See Figure 38.

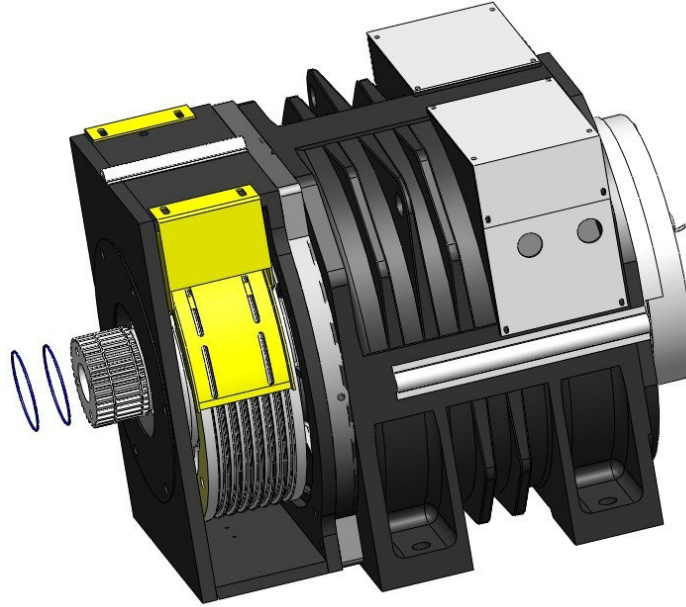


Figure 38 Install O-rings

8.3.2 Emergency Brake and Friction Lining Installation

1. Clean the spline, brake frame, and friction lining with cleaner.
2. Coat Vaseline on the new O-rings, then install them to the O-ring groove of the shaft.
3. Then install the new friction lining part B. It is OK to apply a little force using rubber hammer to press it in and move it forward through the spline (Be careful not to damage the O-ring.); make sure the friction lining part moves easily. See Figure 39.

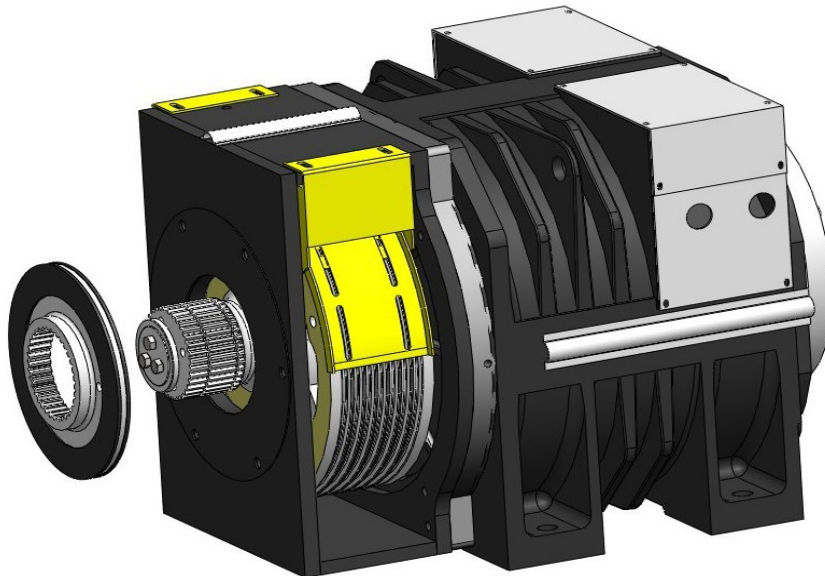


Figure 39 Install Friction Lining Part B

4. Install the threaded rod M16x320 into the top-hole of brake frame as shown by item 6 in Figure 40 and Table 4.

5. Install the anchor disc using the guide bolt.
6. Install the friction lining part A. It is OK to apply a little force using rubber hammer to press it in and move it forward through the spline (Be careful not to damage the O-ring.); make sure the friction lining part moves easily.

Then install the other brake components. See Figure 40. Tighten bolts M16x165 and lock washer 16 (5 pieces) diagonally and evenly.

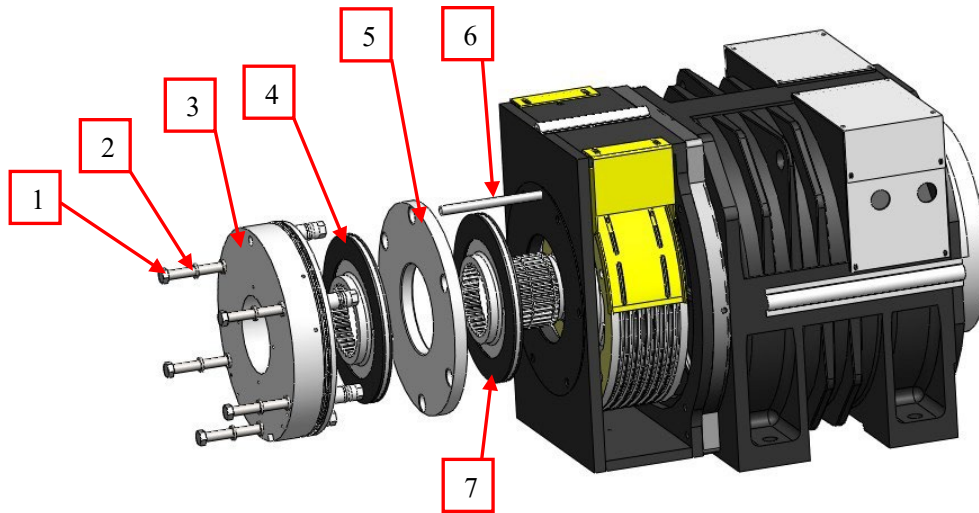


Figure 40 Reinstall Emergency Brake

Table 4: TSM & TMGL1/2/2A Emergency Brake Parts

No.	Name	No.	Name
1	Bolt M16x165	5	Anchor disc
2	Lock washer 16	6	Threaded rodM16x320
3	Brake coil body	7	Friction lining part B
4	Friction lining part A		

7. Remove the threaded rod M16x320; tighten remaining bolt M16x165 and lock washer 16. See Figure 41.

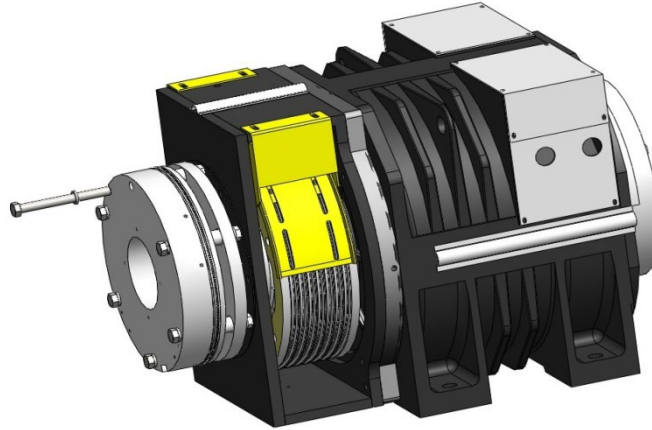


Figure 41 Final Bolt installation

8. Re-connect the brake cable.
9. Re-install dust proof cover.

8.3.3 Emergency Brake adjustment

After the installation, the brake stroke must be rechecked and readjusted. See Section 6.1.1 Emergency Brake Stroke Adjustment for the procedure.

8.3.4 Emergency Brake Test



Retest and confirm the new brake holding ability with regard to loading before using the elevator.

8.4 TSM & TMGL1 Normal Brake & Friction Lining Replacement

Required Tools & Materials:

Open end wrench: (24mm)
Hex wrench (4mm)
Screwdriver
Clean cotton fabric
Hoisting ropes
Cleaner (alcohol based)
Vaseline
Threaded rod M16x2x320

8.4.1 Normal Brake & Friction Lining Removal

1. Remove the encoder (Refer to Section 8.1, Encoder Replacement).

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2. Disconnect the brake cable from normal brake junction box.
3. Loosen the 4 screws M6x16 and lock washer 6 (4 pieces) with hex wrench (5mm), and then remove the cover, dustproof ring and nylon ring. See Figure 42 and Table 5.

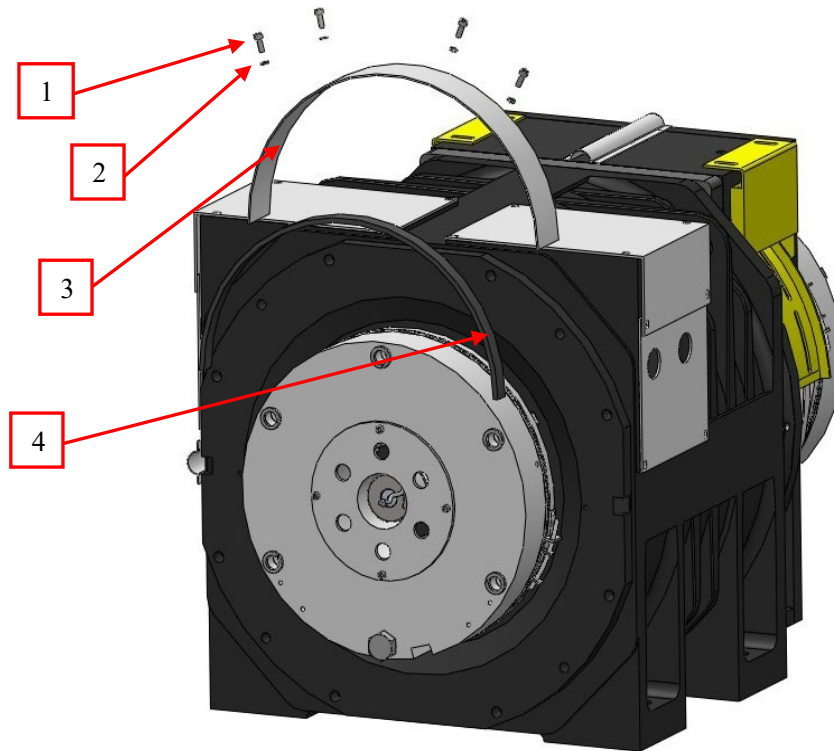


Figure 42 Remove Normal Brake Dust Cover

Table 5: Normal Brake Dust Cover Parts

No.	Name	No.	Name
1	Screw M6x16	3	Dustproof ring
2	Lock washer 6	4	Nylon ring

4. Remove the bolt M16x165 with open end wrench (24mm). See Figure 43.

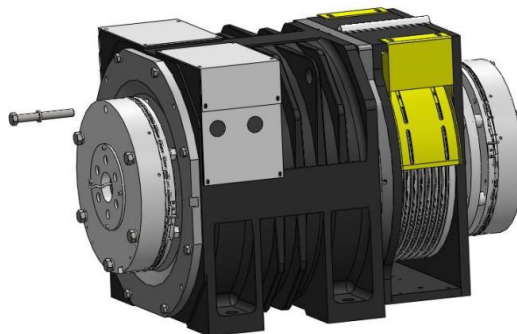


Figure 43 Remove M16x130 bolt

5. Then install the threaded rod M16x320 into the hole. See Figure 44.

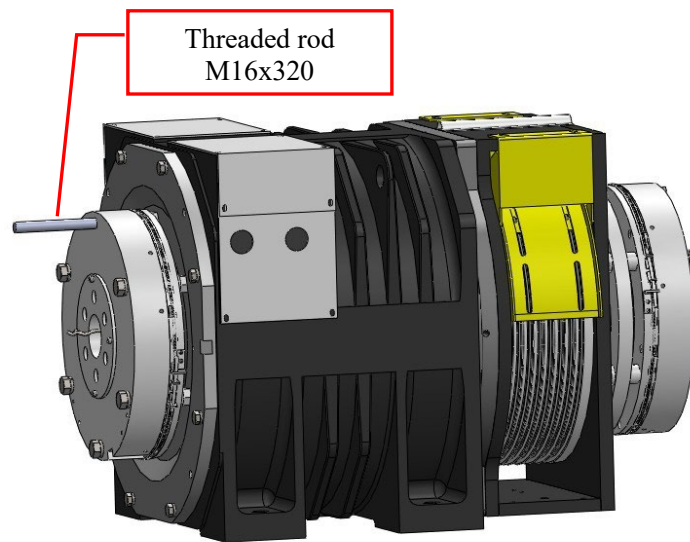


Figure 44 Install Threaded rod

6. Remove other 5 bolts M16x165 evenly, move out the normal brake; and then hoist out the brake with hoisting ropes and remove brake coil body and friction lining. See Figure 45.
7. Replace the O-ring ($\varnothing 60 \times 2.65$) if necessary.

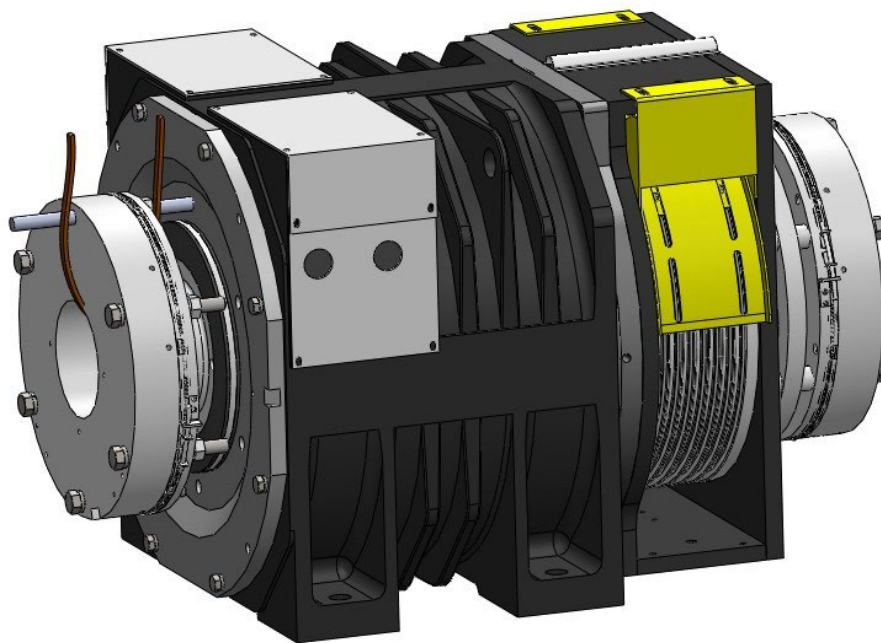


Figure 45 Remove Normal Brake

8.4.2 Normal Brake & Friction Lining Installation

1. Clean the spline, brake frame, and friction lining with cleaner.
2. Coat Vaseline on the new O-rings, then install them to the O-ring groove of the shaft.
3. Install the new friction lining. It is OK to apply a little force using rubber hammer to press it in and move it forward through the spline (Be careful not to damage the O-ring.); make sure the friction lining moves easily. See Figure 46.

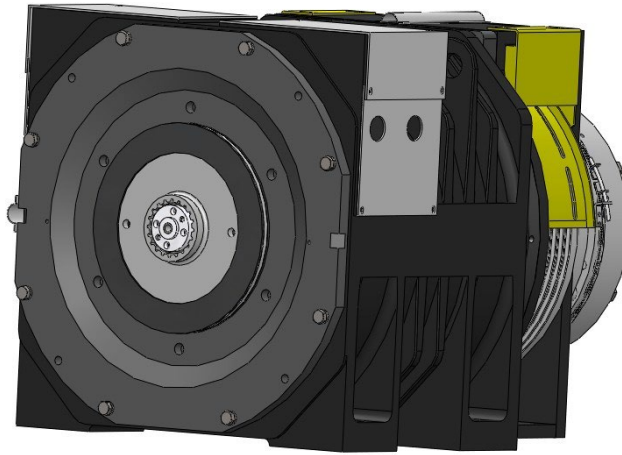


Figure 46 Reinstall Friction lining

4. Install the threaded rod M16x320 into the top-hole of the end-cover. Figure 47.
5. Install the brake coil body through the threaded rod.
6. Tighten bolt M16x165 with lock washer16 (5 pieces) diagonally and evenly.

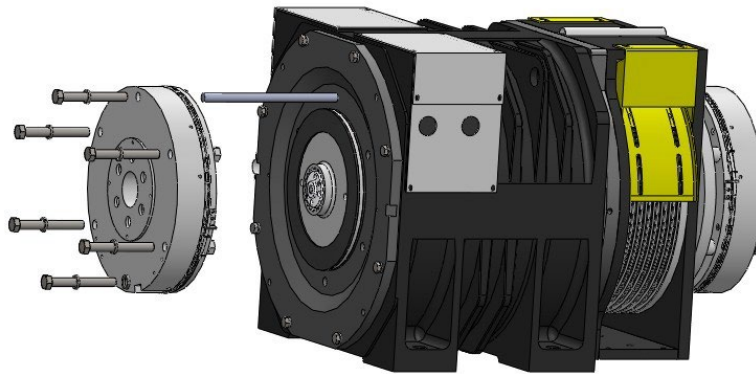


Figure 47 Reinstall Normal Brake

7. Remove the threaded rod M16x320, and tighten remaining bolt M16x165 with lock washer16.
8. Re-connect the brake cable.
9. Re-install dust proof cover.
10. Re-install the encoder. (See Section 8.1.2 Encoder installation).

8.4.3 Normal Brake Adjustment

After the installation, the brake stroke must be rechecked and readjusted. See Section 6.1.2 Normal Brake Stroke Adjustment.

8.4.4 Normal Brake Test



Retest and confirm the new brake holding ability with regard to loading before using the elevator.

8.5 TMGL2/TMGL2A/TMGL3 Normal Brake & Friction Lining Replacement

Note that the TMGL3 has two normal brakes

Required Tools & Materials:

Open end wrench: (24mm)

Hex wrench (4mm, 5mm)

Screwdriver

Clean cotton fabric

Hoisting ropes

Cleaner (alcohol based)

Vaseline

Threaded rod M16x2x320 (12.5")

8.5.1 Normal Brake & Friction Lining Removal

1. Disconnect the brake cable from emergency brake junction box.
2. Remove the screws M5x12 and washer5 (4 pieces) with hex wrench (4mm), and remove the 4 screws M6x16 and lock washer6 (4 pieces) with hex wrench (5mm), then remove the cover, dustproof ring and nylon ring. See Figure 48 and Table 6.
3. Remove the bolt M16x165 with open end wrench (24mm).

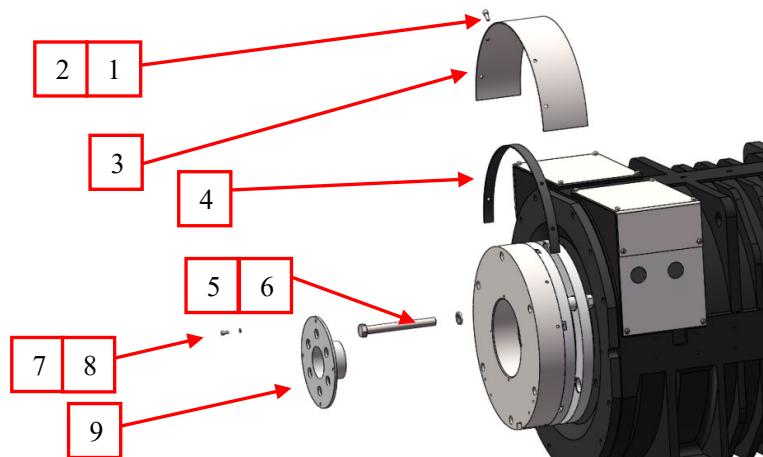
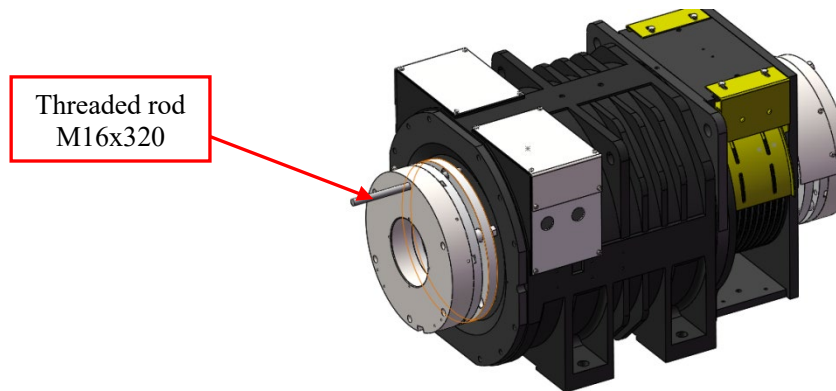


Figure 48 Remove TMGL2/2A/3 Normal Brake Dust Cover

Table 6: TMGL2/TMGL2A/TMGL3 Normal Brake Dust Cover Parts

No.	Name	No.	Name
1	Screw M6x165	6	Bolt M16x165
2	Lock washer 6	7	Screw M5x12
3	dustproof ring	8	Lock washer 5
4	Nylon ring	9	Cover
5	Lock washer 16		

8. Then install the threaded rod M16x320 into the hole. See Figure 49.

**Figure 49 Install Threaded rod**

9. Remove other 5 bolts M16x165 evenly, move out the normal brake, and then hoist out the brake with hoisting ropes and remove brake coil body and friction lining. See Figure 50.
10. Replace the O-ring (Ø60x2.65) if necessary.

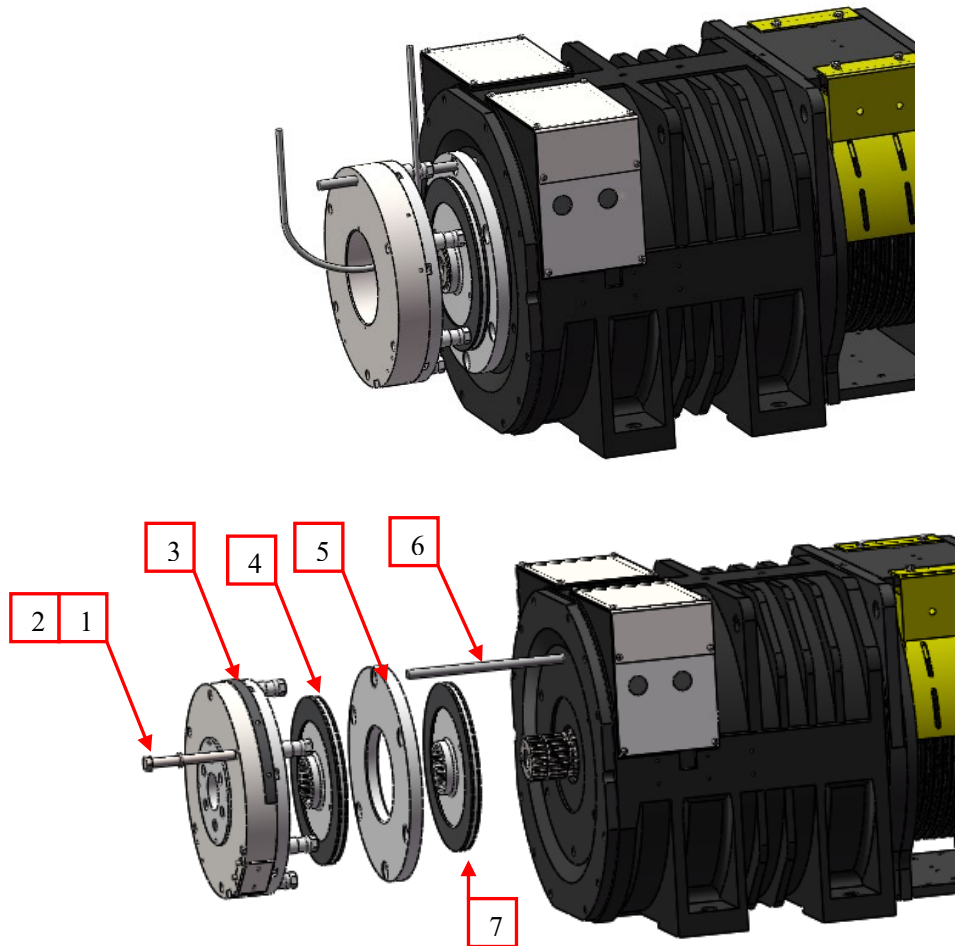


Figure 50 Remove Normal Brake (TMGL2/2A/3)

Table 7: Normal Brake Parts of TMGL2/2A/3

No.	Name	No.	Name
1	Bolt M16x165	5	Anchor disc
2	Lock washer 16	6	Threaded rod M16x320
3	Brake coil body	7	Friction lining part B
4	Friction lining part A		

8.5.2 Normal Brake & Friction Lining Installation

1. Clean the spline, brake frame, and friction lining with cleanser.
2. Coat Vaseline on the new O-rings, then install them in the O-ring groove of the shaft. See Figure 51.

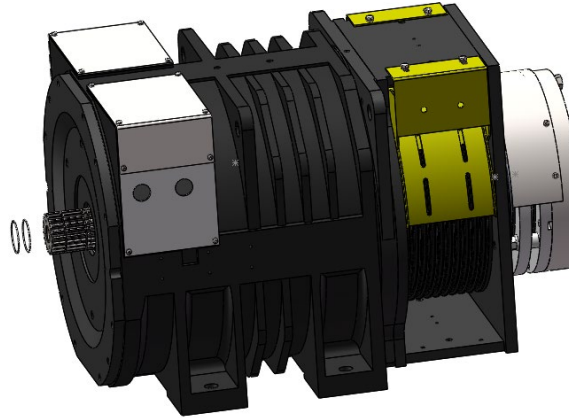


Figure 51 Install O-rings

3. Install the new friction lining. It is OK to apply a little force using rubber hammer to press it in and move it forward through the spline (Be careful not to damage the O-rings.); make sure the friction lining moves easily. See Figure 52.

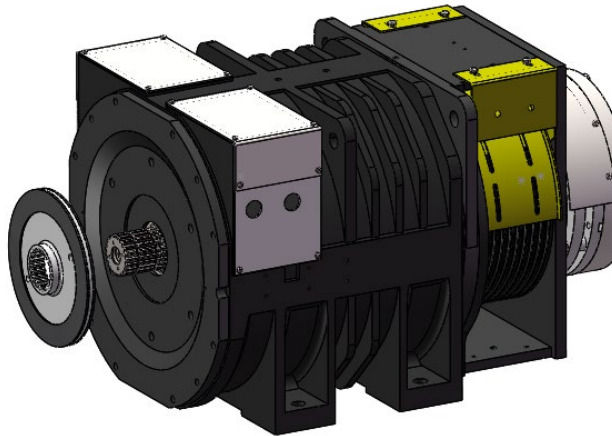


Figure 52 Install Friction lining B

4. Install the threaded rod M16x320 into the top hole of brake frame as shown by item 6 in Figure 53 and Table 8.
5. Install the anchor disc using the guide bolt.
6. Install the friction lining part A. It is OK to apply a little force using rubber hammer to press it in and move it forward through the spline (Be careful not to damage the O-ring.); make sure the friction lining part moves easily.
7. Then install the other brake components. See Figure 53.
8. Tighten bolts M16x165 and lock washer 16 (5 pieces) diagonally and evenly.

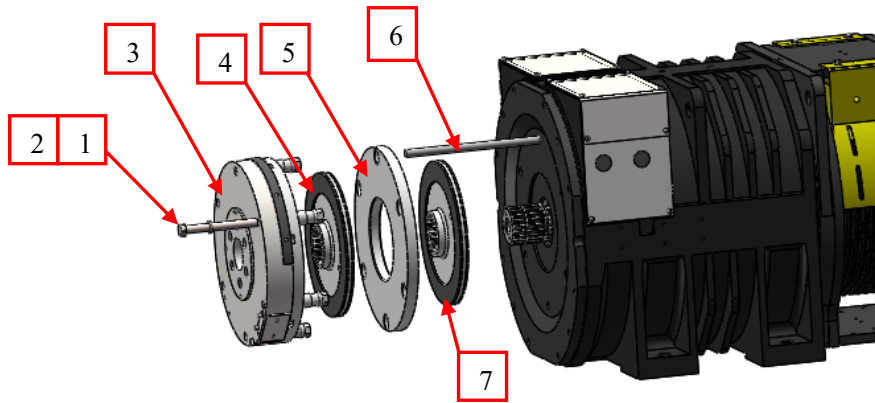


Figure 53 Reinstall Normal Brake

Table 8: TMGL2/2A/3 Normal Brake parts

No.	Name	No.	Name
1	Bolt M16x165	5	Anchor disc
2	Lock washer 16	6	Threaded rodM16x320
3	Brake coil body	7	Friction lining part B
4	Friction lining part A		

9. Remove the threaded rod M16x320; tighten remaining bolt M16x165 and lock washer 16. See Figure 54.

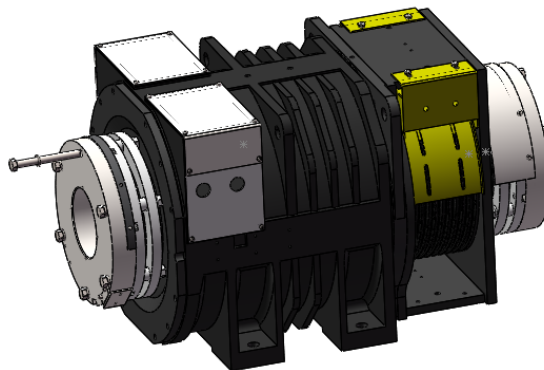


Figure 54 Final bolt installation

10. Re-connect the brake cable.
11. Re-install dust proof cover.

8.5.3 Normal Brake Adjustment

After the installation, the brake stroke must be rechecked and readjusted. See Section 6.1.2 Normal Brake Stroke Adjustment.

8.5.4 Normal Brake Test



Retest and confirm the new brake holding ability with regard to loading before using the elevator.

8.6 Brake Noise Adjustment Ring Replacement

Required Tools & Materials:

Open end wrench: 8mm (x2)

Replacement Procedure:

1. If the Brake Noise Adjustment Ring is broken loosen Nut M5 III and remove Nut M5 I. See Figure 55.

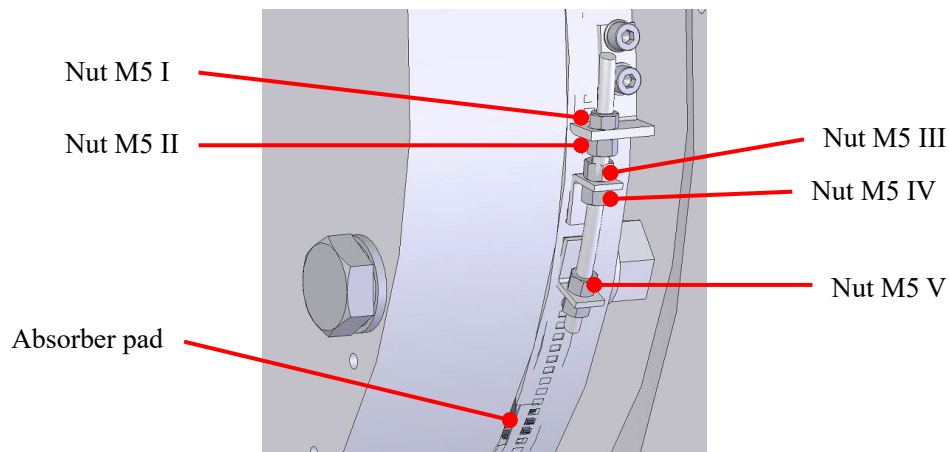


Figure 55 Brake Noise Adjustment Ring

2. The Noise Adjustment Ring should be loose enough to slide off the noise adjustment sprockets.
CAUTION! The edges are sharp. See Figure 56.

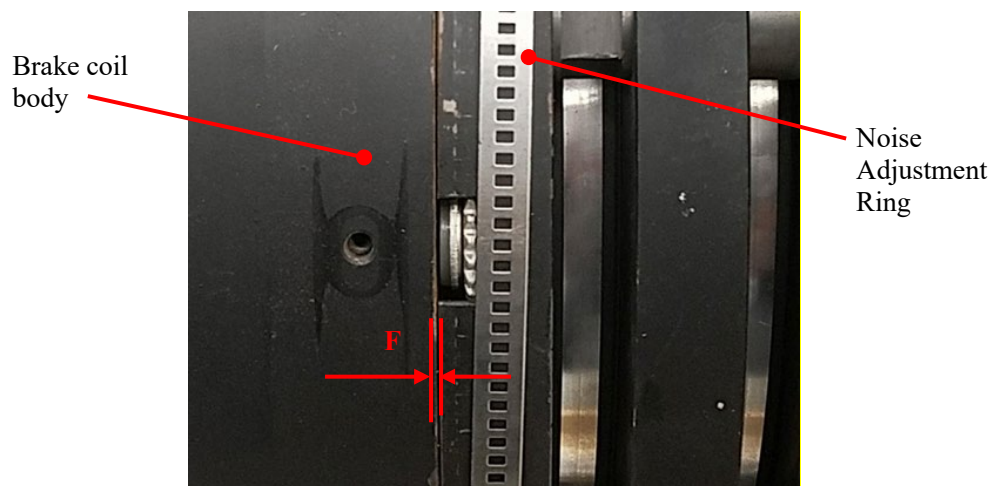


Figure 56 Slide off the Noise Adjustment Ring

3. Loosen all of the noise adjustment sprockets so that there is maximum gap in between the pad and the brake coil body. Reference gap “F” in Figure 56 above.
4. **IMPORTANT!** Adjust the brake gap to factory specifications.
5. Now, tighten all of the noise adjustment sprockets until they are making full contact with the **brake coil body**. See Figure 57.



Figure 57 Noise Adjustment sprocket

6. Snug-up all of the noise adjustment sprockets by approximately a 1/16th of a turn – just enough to keep them from loosening if you lightly run your finger across the sprocket. This ensures they don’t move when reinstalling the Brake Noise Adjustment Ring.
7. Remove Nut M5 I from the new noise adjustment ring. Place the Brake Noise Adjustment Ring back over the noise adjustment sprockets with the threaded rod through the hole in the attachment bracket. Install Nut M5 I.
8. Loosen Nut M5 IV 3-4 turns towards Nut M5 V.
9. Ensure there is no slack in the Brake Noise Adjustment Ring and that it is in contact with all sprockets.
10. Make sure that the Brake Noise Adjustment Ring will not block the brake gap from feeler gauge measurements. See Figure 58.



Figure 58 Brake Gap

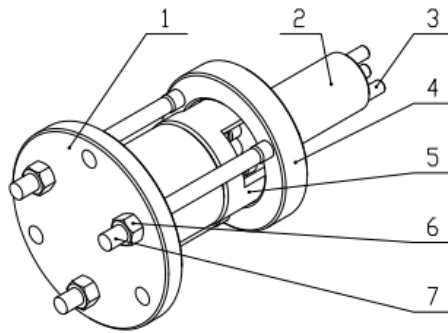
11. Hand tighten the Nut M5 III until it firmly contacts the Brake Noise Adjustment Ring.
12. Tighten the Nut M5 III another face (1/6th turn)
13. Re-tighten the Nut M5 IV against the steel tape and Nut M5 III.
14. Loosen Nut M5 I 2 turns
15. Tighten the Nut M5 II 1 full turn
16. Re-tighten the Nut M5 I.

The noise adjustment band is now factory set and can be adjusted as per the adjustment procedure. See Section 6.2 Brake Noise Adjustment.

8.7 Sheave Replacement

Required Tools & Materials:

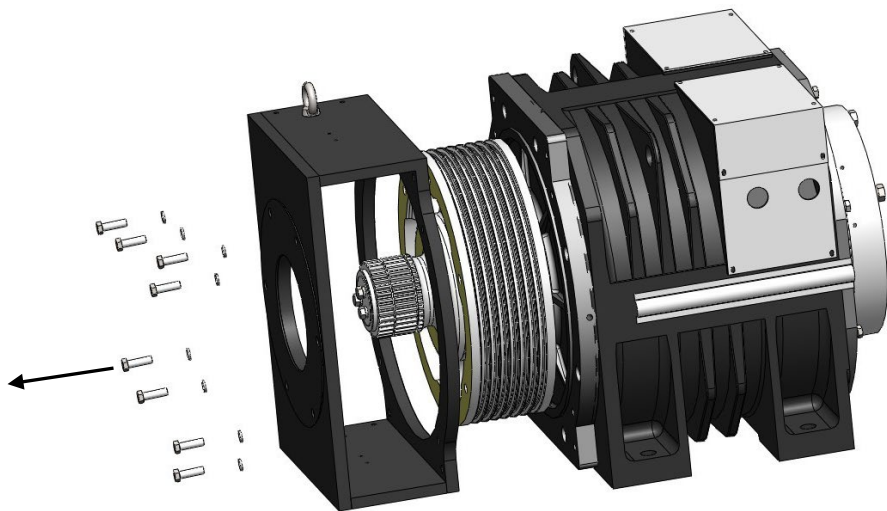
Open end wrench (18mm)
Internal hexagonal wrench (10mm)
Dial gauge
Hydraulic jack (15T)
File
Clean cloth
Underprop-plate
Thick nut M16 (2 pieces)
Loctite 609
Grade 12 threaded rod M16x2x500 (~19-5/8") (2 pieces)
Stow-stick
Eye bolts (M12 - 2 pieces) (M16 - 1 piece)
Hoist chain
Hoisting plate

**Figure 59 Hoisting Plate Apparatus**

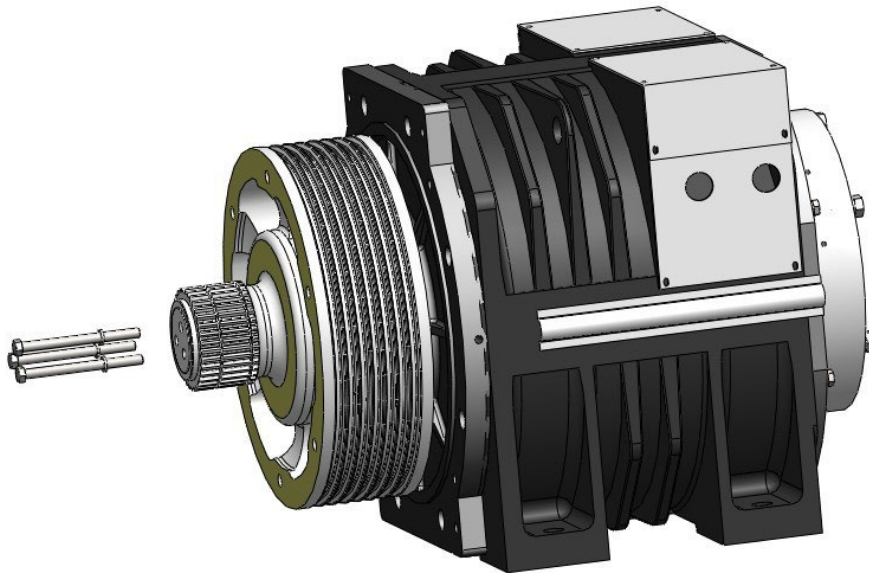
No.	Name	No.	Name
1	Hydraulic jack pedestal	5	Sheave press block
2	Bearing block	6	Hex nut M16
3	Hex socket head cap screw M12x160	7	Grade 12 threaded rod M16x230
4	Block		

8.6.1 Sheave Removal

1. Remove the emergency brake. See Section 8.3.1 Emergency brake& friction lining removal.
2. Hoist lightly the brake frame with the hoist chain, remove the screws M12 with open end wrench (18mm); hoist out the brake frame. See Figure 60.

**Figure 60 Remove Brake Frame**

3. Remove the 3 bolts M12x150 and lock washer12 (3 pieces), remove the shaft cover. See Figure 61.

**Figure 61 Remove Shaft Cover**

5. Hoist lightly the sheave with the hoisting equipment. See Figure 62 and Table 9.
6. Install 2 threaded rods M16x500 (item 4) into the M16 hole of sheave opposite each other.
7. Put the stow-stick (item 5) into the center-hole of the sheave, install the Underprop-plate (item 1) through the threaded rods, and install the hydraulic jack, and tighten the thick nuts M16 (item 2), make sure the hydraulic jack is steady.
8. Operate the hydraulic jack to loosen the sheave slowly.

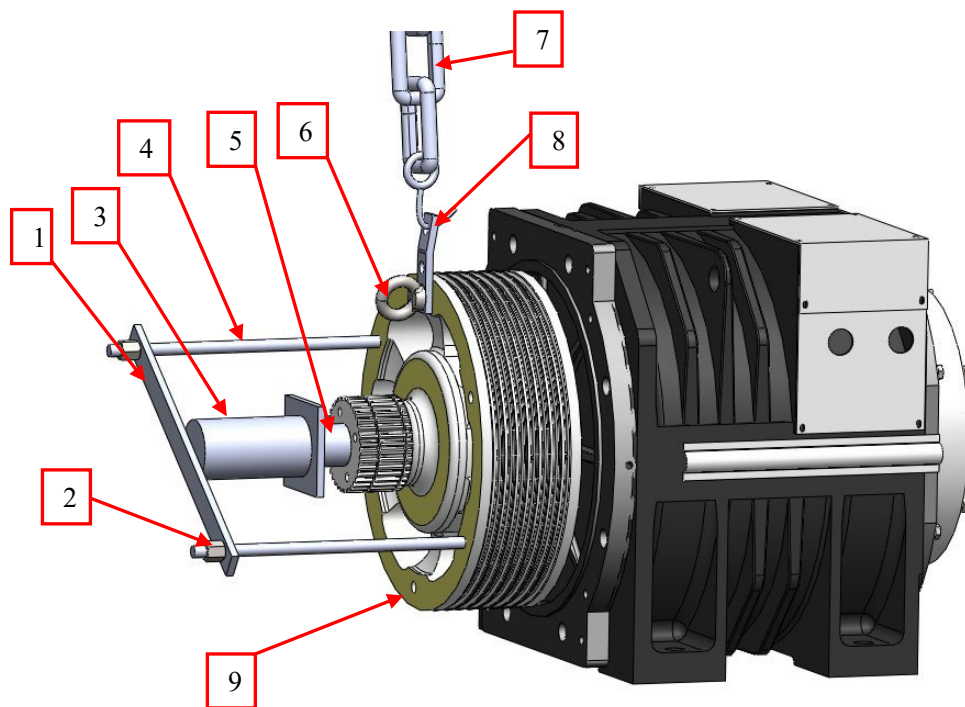
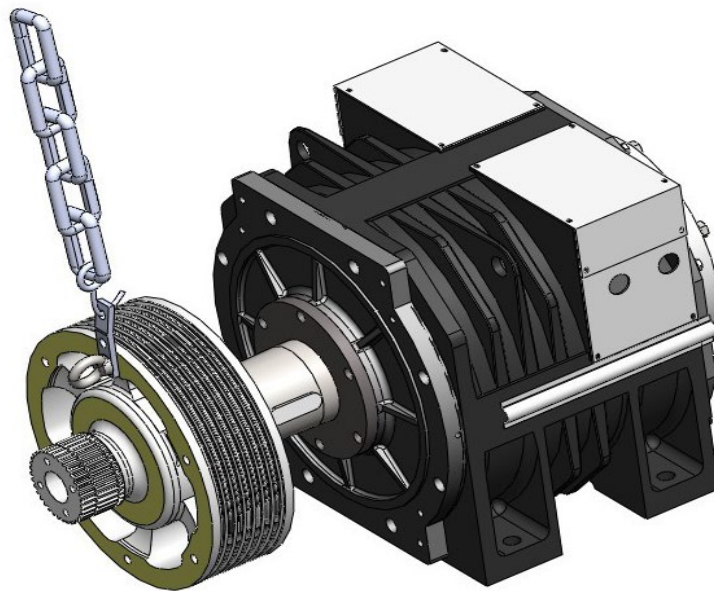
**Figure 62 Remove Sheave**

Table 9: Sheave removal parts

No.	Name	No.	Name
1	Underprop plate	6	Eye bolts M16 ring
2	Thick nut M16	7	Hoist chain
3	Hydraulic jack	8	Hoisting plate
4	Grade 12 threaded rod M16x500	9	Sheave
5	Stow stick		

9. After the sheave is loosened, remove the hydraulic jack and other tools. Then hoist out the sheave. See Figure 63.

**Figure 63 Hoist the Sheave**

8.6.2 Sheave Installation

1. De-burr the key and sheave with a file, then clean the shaft and sheave; put Loctite 609 on the bottom of the key and seat it in the keyway.
2. Hoist the sheave and align the keyway of the sheave with the key, then pull it into the machine shaft. Use the hydraulic jack apparatus to press the sheave on with 15 metric tons of pressure. See Figure 64 and Figure 65.

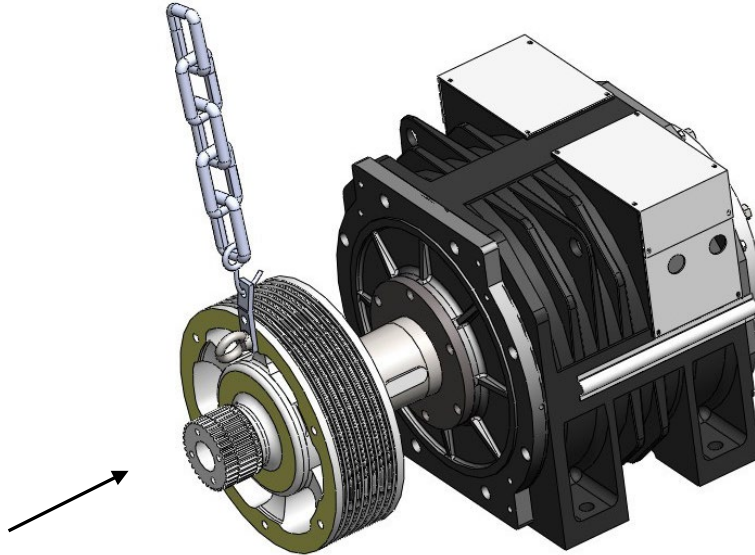


Figure 64 Locate Sheave

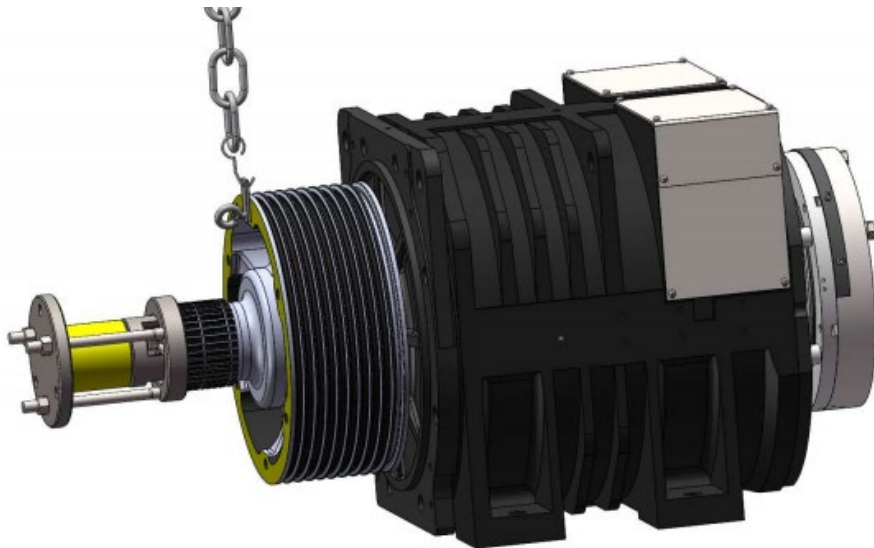


Figure 65 Press Sheave onto shaft

3. Install the cover and tighten the bolts M12x150 with lock washer12 (3 pieces) use open end wrench (18mm) and then remove the hoisting equipment. See Figure 66.

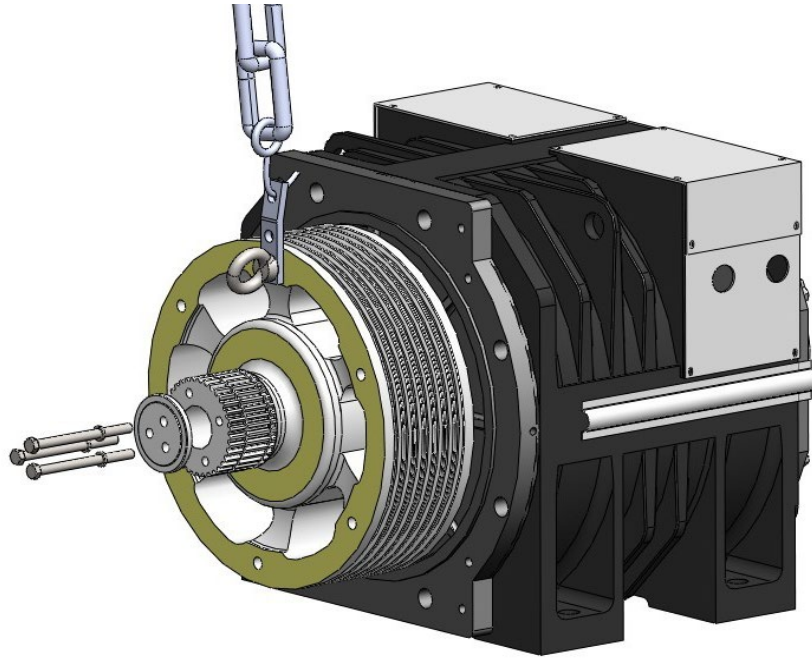


Figure 66 Install Sheave cover

4. Test the sheave groove weave. It shall not exceed 0.12mm (0.005”) and groove run out shall not exceed 0.10mm (0.004”) as measured with a dial gauge. See Figure 67.



Figure 67 Check groove weave and run out

5. Hoist the brake frame of brake and install it, tighten eight bolts M12x40 (TMGL2/TMGL2A hexagon socket screw M12) with lock washer¹². See Figure 68.
6. Install the Emergency Brake (Refer to Section 8.3.2 Emergency Brake & Friction Lining Installation).

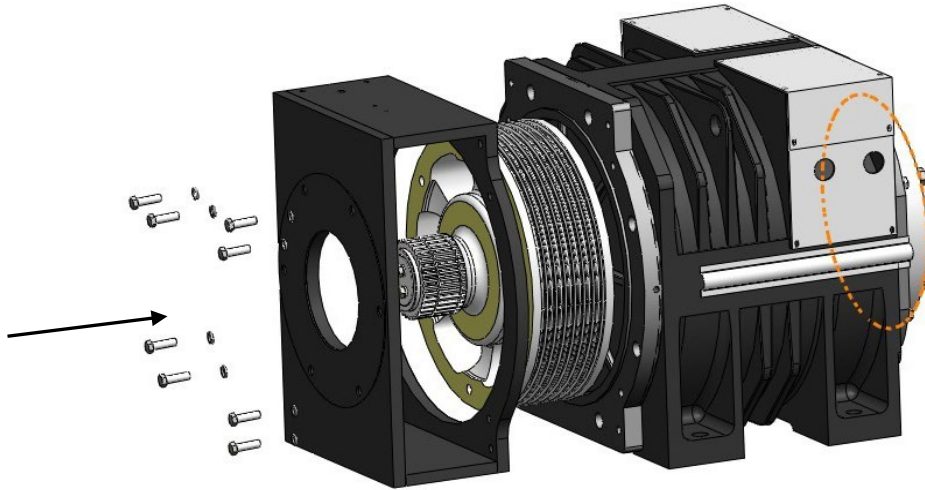


Figure 68 Install Brake frame

7. Connect the mainline and test the machine.

8.7 Bearing Replacement



WARNING! The bearing replacement work must be done on the ground, so the machine must be lifted and moved out of the hoist way when performing the bearing replacement work! (Applies to MRL installations)

8.7.1 Rear Bearing Replacement

Required Tools & Materials:

- Open end wrench (18mm)
- Hex wrench (4mm)
- Hydraulic bearing puller
- Retainer ring plier
- Rubber hammer
- Clean cloth
- Grade 12 threaded rod M12x1.75x220 (8.625") (2 pieces)
- Bearing heater
- Bolt M12x1.75x80 (3.25") (2 pieces)
- Nut M12
- Hoist chain
- Hoisting plate
- Loctite
- Bearing grease (a quality EP2 grade)

8.7.1.1 Rear Bearing Removal

Remove the encoder (See Section 8.1.1 Encoder Removal)

Remove the normal brake (See Section 8.4.1 Normal brake& friction lining removal)

Note: Make a reference mark for the friction lining and spline.

1. Make a mark for the end-cover and machine base. Then loosen eight bolts M12x40 with open end wrench (18mm). See Figure 69.

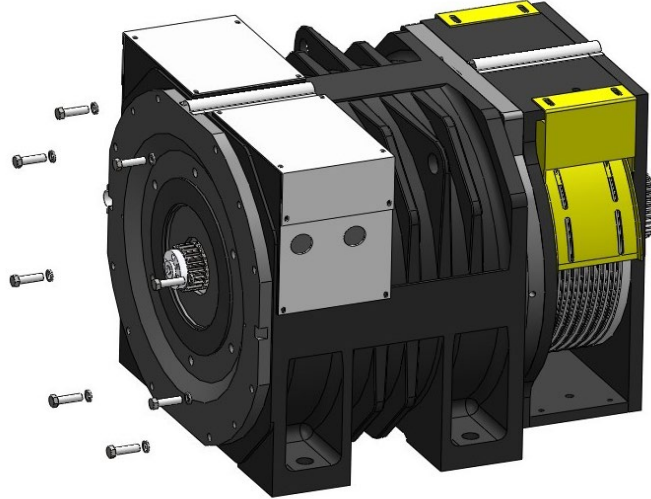


Figure 69 Remove End Cover bolts

2. Screw the 2 pieces threaded rod M12x200 into the M12 hole of machine base opposite each other. See Figure 70.
3. Screw the 2 bolts M12x80 into the M12 hole of end cover on the diagonal line. Tighten the 2 bolts M12x80 evenly and slowly with end wrench (18mm) to move out the end cover.

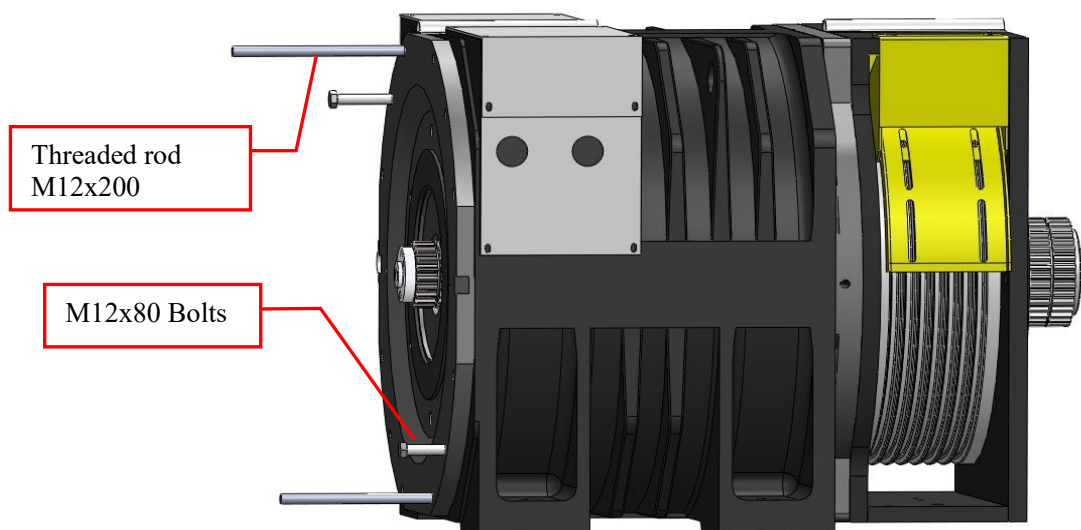


Figure 70 Install Threaded rod and M12 bolts

4. Hoist out the end cover with hoisting equipment, until the end cover is out of the bearing. Then take out the wave-spring. See Figure 71.

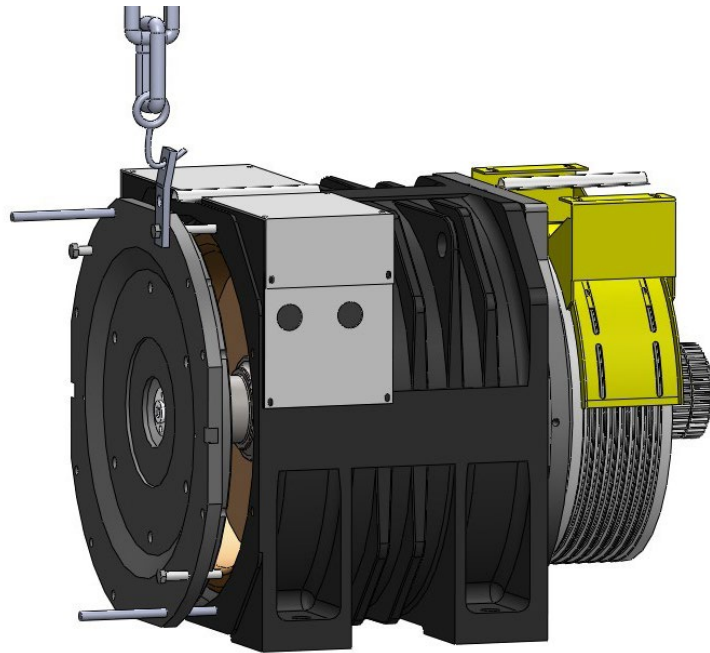


Figure 71 Remove End Cover

5. Then take off the threaded rod.
6. Make a mark for encoder shaft and spline, loosen 4 screws M5x16 with hex wrench (4mm), and take off shaft of encoder shaft. See Figure 72.

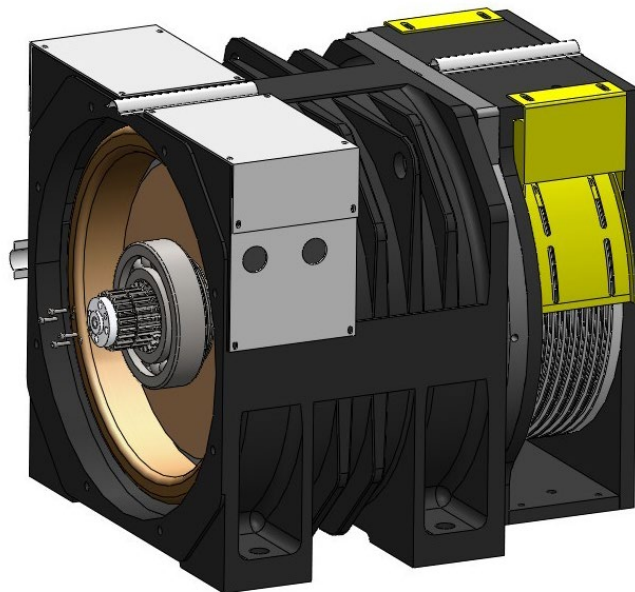


Figure 72 Remove Encoder Shaft

7. Take off the retainer ring 90 with the retainer ring plier then take off the bearing (6318-DDU) with the hydraulic bearing puller. (It is permissible to cut the bearing off.) See Figure 73.

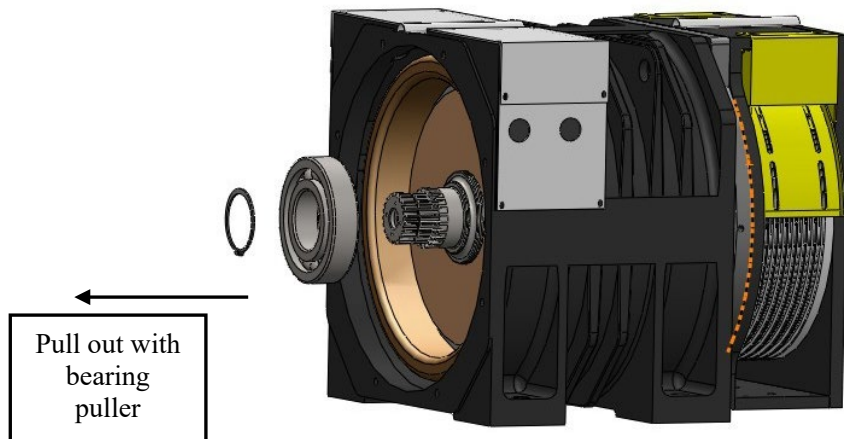


Figure 73 Remove Rear Bearing

8.7.1.2 Rear Bearing Installation

1. Clean the main shaft and machine base, heat the bearing to 80°C (176°F) with the bearing heater. Then install the new bearing into the main shaft.
2. When the bearing has cooled to room temperature, pack it with grease (a quality EP2 grade).
3. Then install the retainer ring 90 with retainer ring plier. See Figure 74.

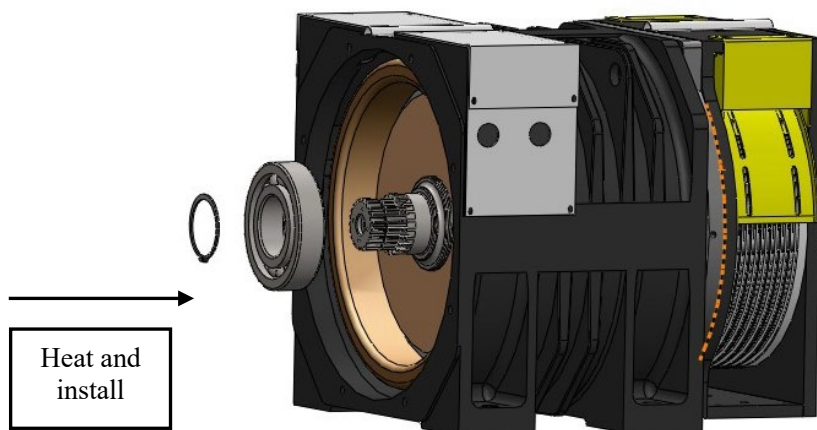


Figure 74 Install Rear Bearing

4. Clean the end cover and install a wave-spring in it; then hoist the End Cover using hoisting equipment, and install it in the bearing through the threaded rods (Note: Align the mark made in the disassemble process); then take off hoisting equipment.
5. Hammer the End Cover with a rubber hammer evenly, and make it in the bearing well. See Figure 75.

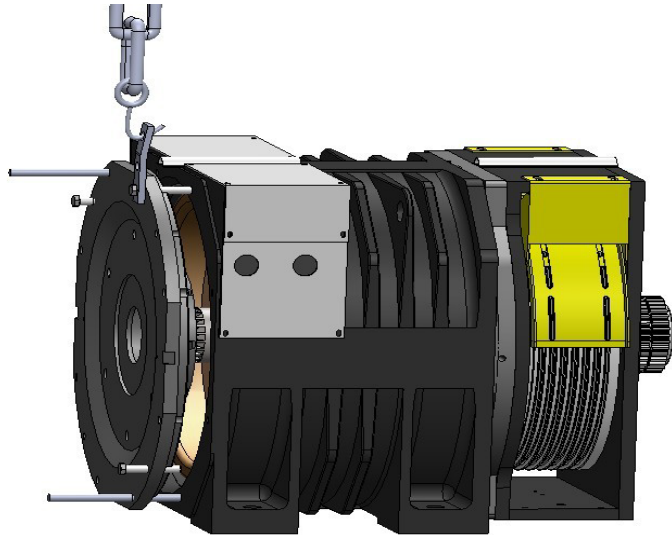


Figure 75 Install End Cover

6. Take off the threaded rod. Tighten the bolts M12x40 with lock washer 12 (8 pieces), install Encoder Shaft (align the mark) and tighten screws M5x16 (4 pieces) (coat with Loctite) with lock washers 5. See Figure 76 and Table 10.

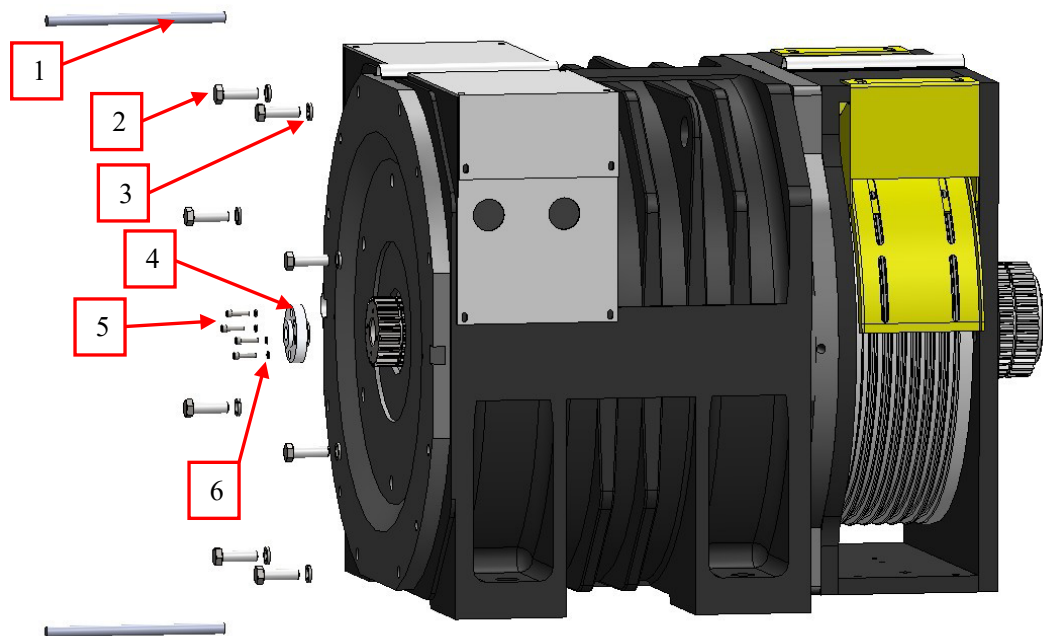


Figure 76 Install Encoder Shaft

Table 10: Encoder Shaft parts

No.	Name	No.	Name
1	Threaded rod M12x200	4	Encoder shaft
2	Bolt M12x40	5	Screw M5X16
3	Lock washer 12	6	Lock washer 5

7. Install the Normal Brake (See Section 8.4.2 Normal Brake & Friction Lining Installation).
8. Install the Encoder (See Section 8.1.2 Encoder Installation).
9. Test the machine.

8.7.2 Front Bearing Replacement

Required Tools & Materials:

Open end wrench (18mm)
 Hex wrench (10mm, 14mm)
 Bearing puller
 Rubber hammer
 Clean cloth
 Cleanser
 Bearing heater
 Bearing grease (a quality EP2 grade)
 Sealant
 Loctite 480
 Grade 12 threaded rod M16x2x200 (~7-7/8") (2 pieces)
 Bolt M12x1.75x100 (2 pieces)
 Guide cover of bearing
 Hoist chain
 Hoisting plate
 Nut M16 (2)
 Bolt M16x2x55
 Bolt M12x2x60

8.7.2.1 Front Bearing Removal

1. Remove the Emergency Brake (See Section 8.3.1 Emergency Brake & Friction Lining Removal).
2. Remove the brake frame and sheave (See Section 8.5.1 Sheave removal). Take off the key on the main shaft.

3. Loosen the Screw M12x35 (8 pieces) with hex wrench (10mm), and remove the Junction Plate. See Figure 77. **(This step is only for TMGL2A)**

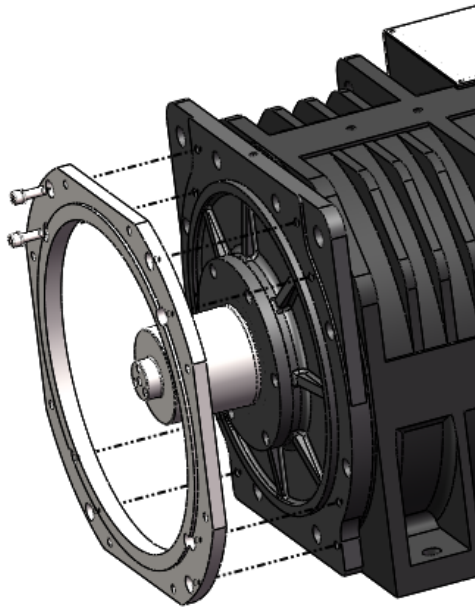


Figure 77 Remove Junction Plate (TMGL2A only)

4. Loosen the bolts M12x105 (6 pieces) with hex wrench (10mm), and take off the Outer Cover. See Figure 78.

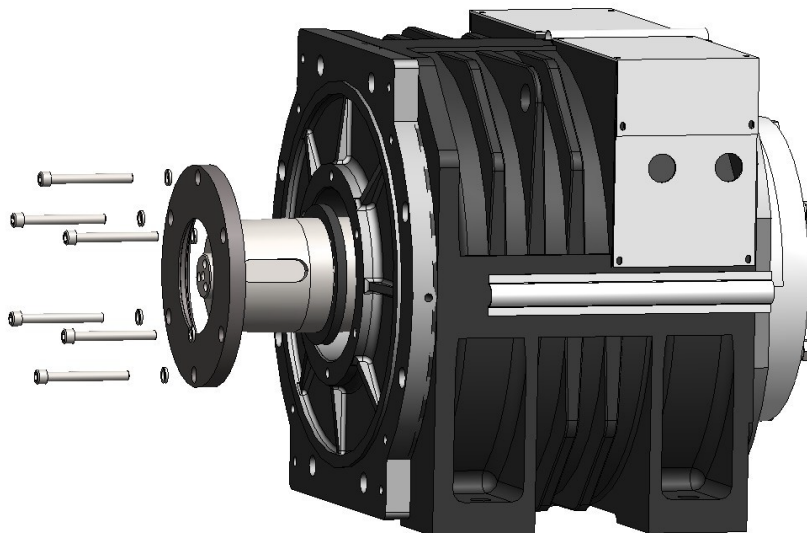


Figure 78 Remove Outer Cover

5. Replace the oil seal SC Ø140xØ170x14 if necessary.
6. Make a mark in the Front Cover and machine base. Remove 8 hex screws M16x40 with hex wrench (14mm). See Figure 79.

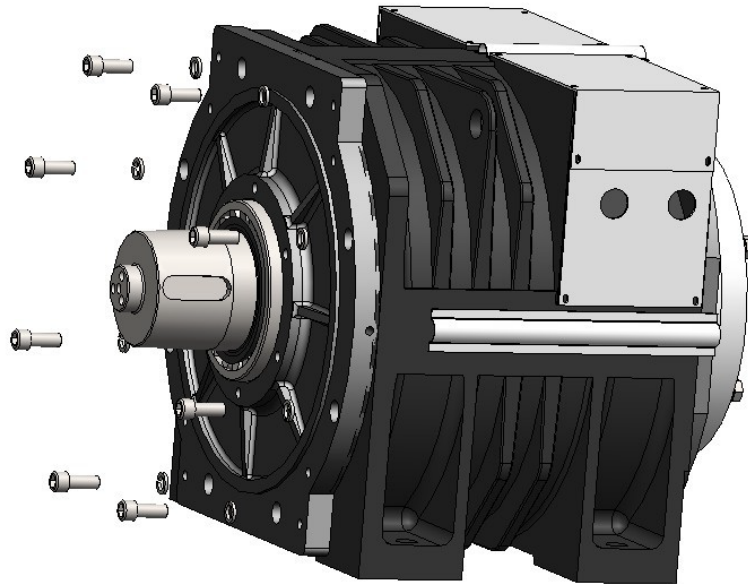


Figure 79 Remove Front Cover bolts

7. Screw the threaded rod M16x200 (2 pieces) into the M16 hole of machine base opposite each other. Screw the bolts M12x100 into the M12 hole of Front Cover opposite each other. Tighten the bolt M12x100 (2 pieces) evenly and slowly with open end wrench (18mm) until the Front Cover is out of the bearing. See Figure 80 and Figure 81.

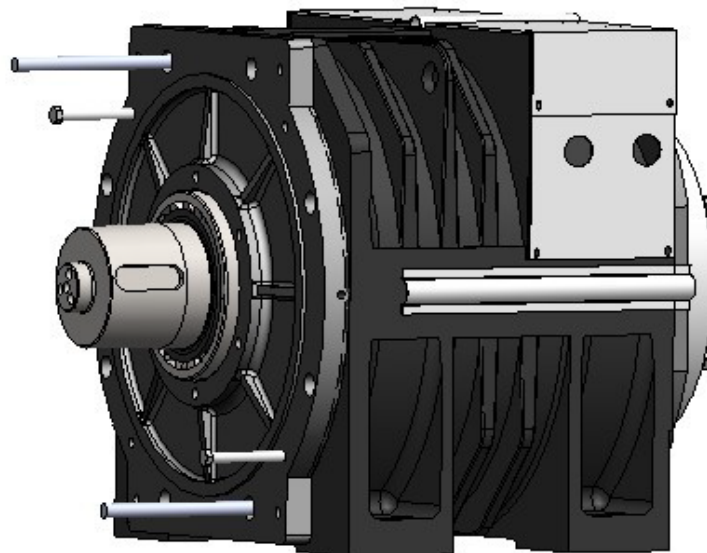


Figure 80 Install threaded rods and M12 bolts

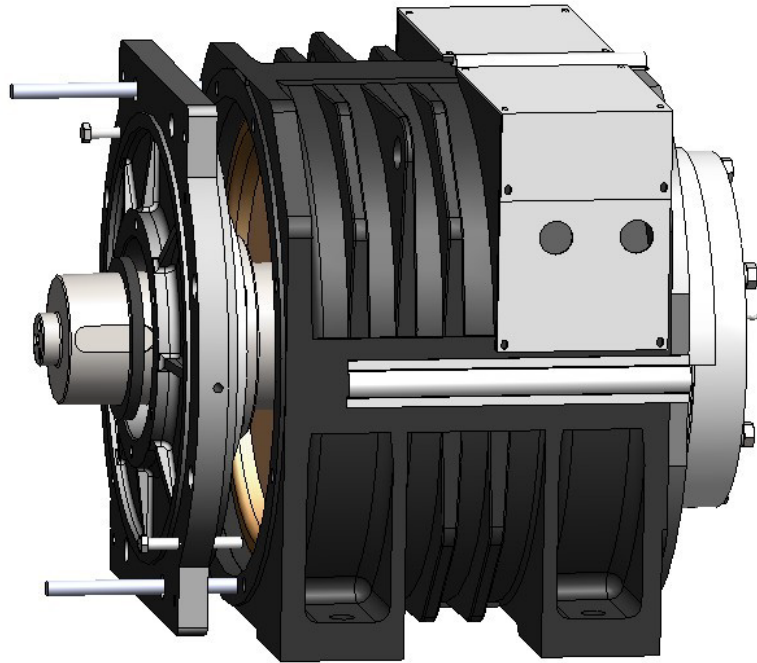


Figure 81 Remove Front Cover

8. Hoist out the Front Cover with hoisting equipment; remove the threaded rod. See Figure 82.

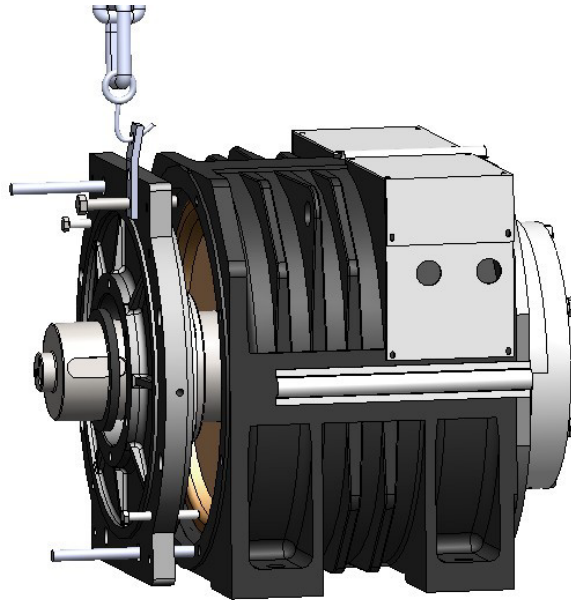


Figure 82 Hoist Front Cover

9. Pull out the bearing with the bearing puller. (It is permissible to cut the bearing off.) See Figure 83.

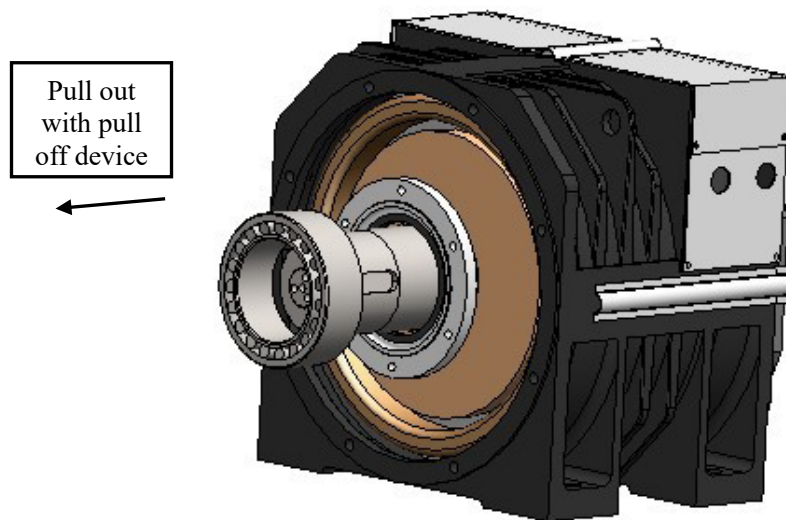


Figure 83 Remove Front bearing

10. Take off the inner cover and clean it.
11. Replace the oil seal SC Ø155xØ190x14 if necessary.

8.7.2.2 Front Bearing Installation

1. Clean the main shaft; put bearing grease in the Inner Cover and then install it in the main shaft. See Figure 84.

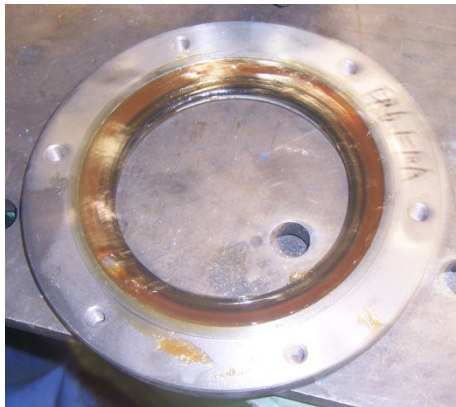


Figure 84 Apply grease to the Inner Cover

2. Heat the bearing to 80°C (176°F) with the bearing heater, then install it on the main shaft. See Figure 85 and Figure 86. When the bearing has cooled to room temperature pack bearing grease in the bearing cone.



Figure 85 Front Bearing

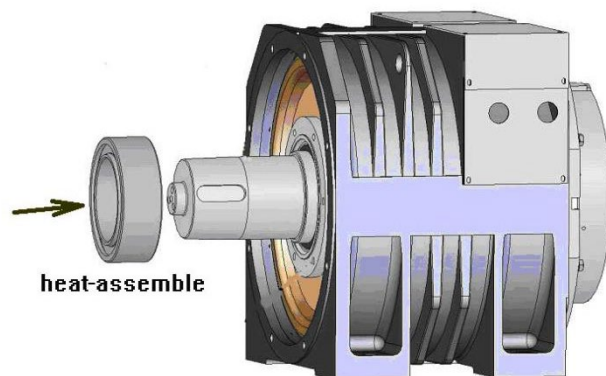


Figure 86 Install Front Bearing

3. Install the guide cover of bearing in the main shaft, and then tighten the bolt M12x60 Screw the threaded rod M12x220 to the inner cover. See Figure 87 and Table 11.

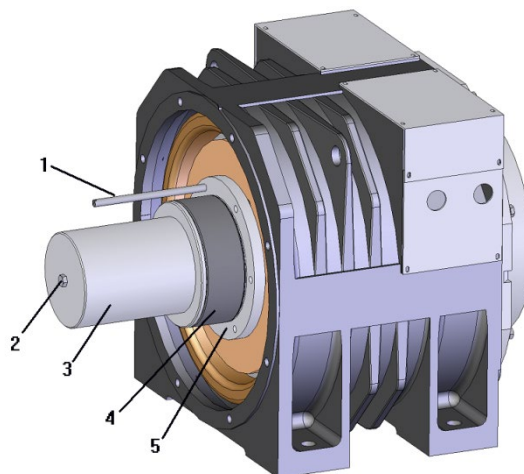
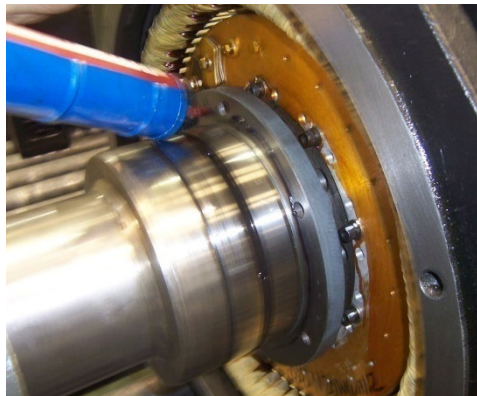


Figure 87 Install guide cover

Table11: Guide cover parts

No.	Name	No.	Name
1	Grade 12 threaded rod M12x220	4	Bearing NSK 24028 W33
2	Bolt M12x60	5	Inner cover
3	Guide cover of bearing		

4. Coat the sealant on the inner cover face. See Figure 88.

**Figure 88 Apply sealant on the Inner Cover**

5. Clean the Front Cover and hoist it with the hoisting equipment, then fit it onto the bearing through the threaded rod (align the mark made earlier). See Figure 89 and Table 12.

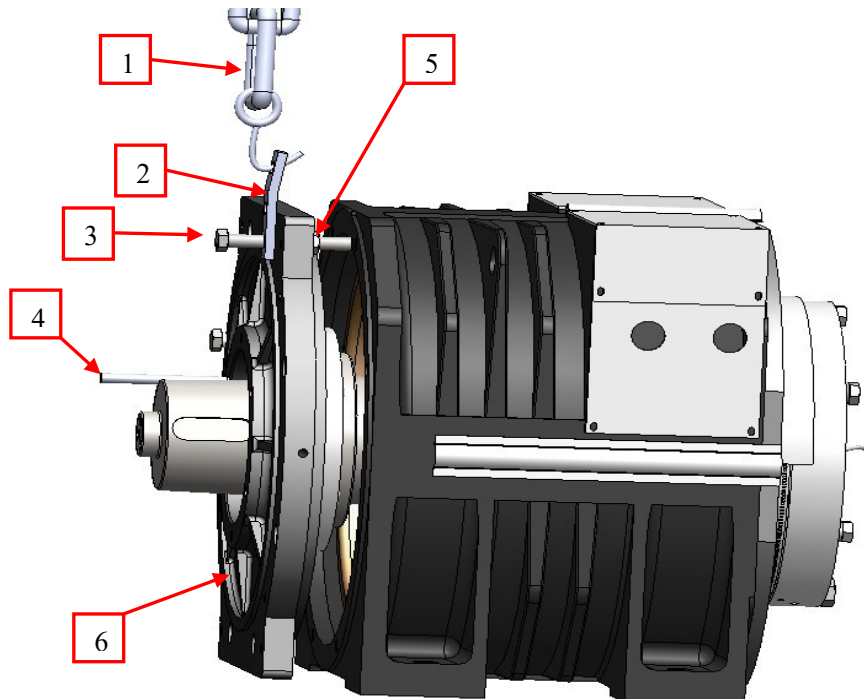
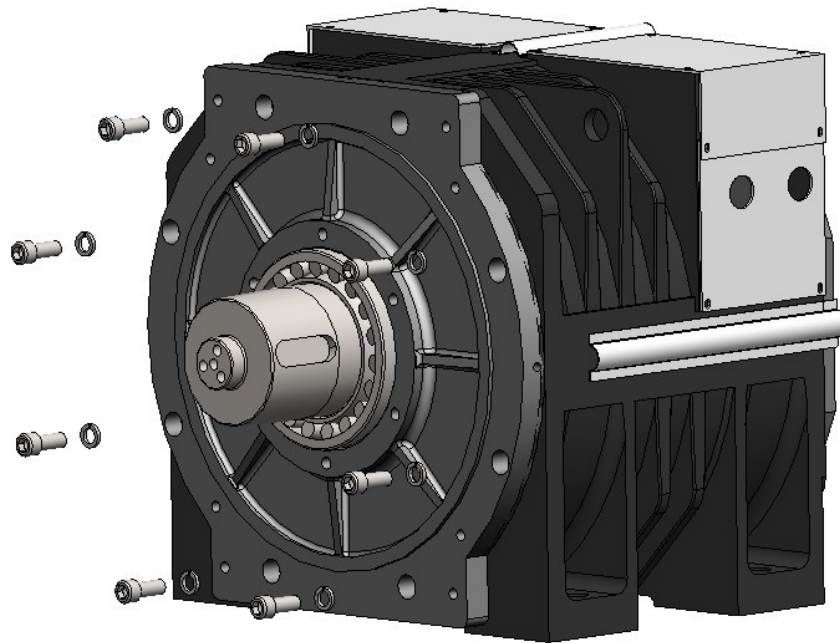
**Figure 89 Reinstall Front Cover**

Table 12: Front Cover parts

No.	Name	No.	Name
1	Hoist chain	4	Threaded rod M12x220
2	Hoisting plate	5	Nut M16
3	Bolt M16x60	6	Front Cover

6. Take off the hoisting equipment. Hammer the Front Cover with the rubber hammer, and make it fit in the bearing well; tighten 8 hex screws M16x40 with lock washer16 with hex screw (14mm). Then take off the guide cover from the bearing. See Figure 90.

**Figure 90 Secure the Front Cover**

7. Clean the Outer Cover, coat sealant on the Front Cover surface which mates with the Outer Cover surface. See Figure 91.

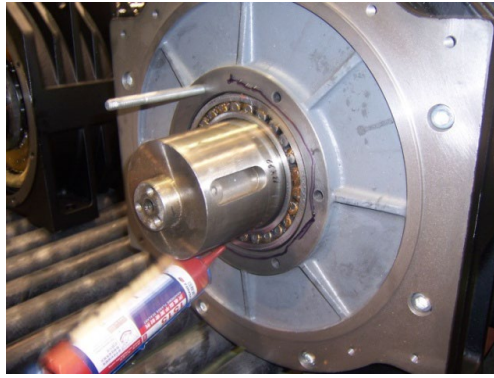


Figure 91 Apply sealant on Front Cover

8. Put the bearing grease (a quality EP2 grade) in the Outer Cover. See Figure 92.



Figure 92 Apply grease to Outer Cover

9. Install the Outer Cover on the Front Cover through the threaded rod; tighten (5) hex screws M12x105 with lock washer¹². See Figure 93 and Table 13.

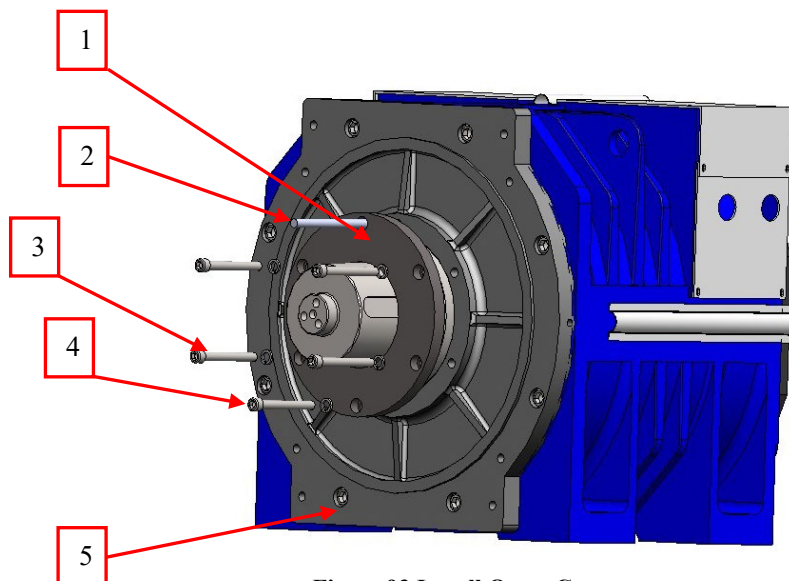
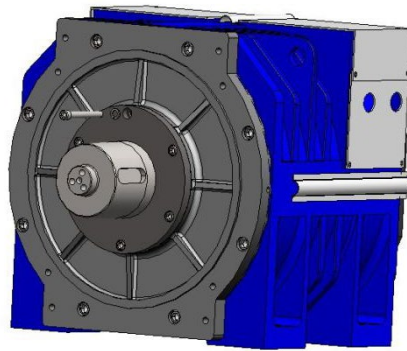


Figure 93 Install Outer Cover

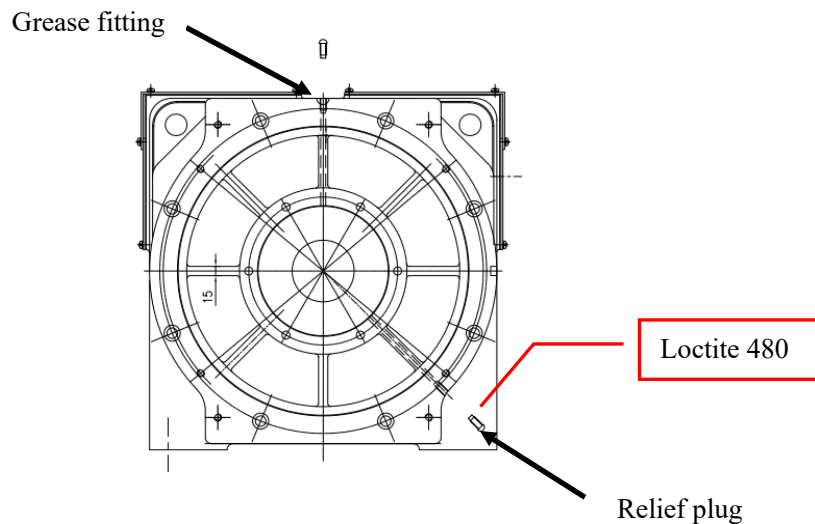
Table 13: Outer cover parts

No.	Name	No.	Name
1	Outer cover	4	Hex screw M12x105
2	Guide screw M12x220	5	Front cover
3	Lock washer 12		

10. Take off the guide screw and tighten the remaining hex screw M12x105 with lock washer12. See Figure 94.

**Figure 94 Install remaining M12x50 bolt**

11. Let the main shaft rotate, add grease at the grease fitting until the grease overflows from the relief port, then apply the coating sealant on screw (Loctite 480 or equivalent). See Figure 95.

**Figure 95 Add grease**

12. Install the Sheave (See Section 8.5.2 Sheave Installation).
 13. Install the Emergency Brake (See Section 8.3.2 Emergency Brake and Friction Lining Installation).
 14. Test the machine.

9.0 Troubleshooting Chart

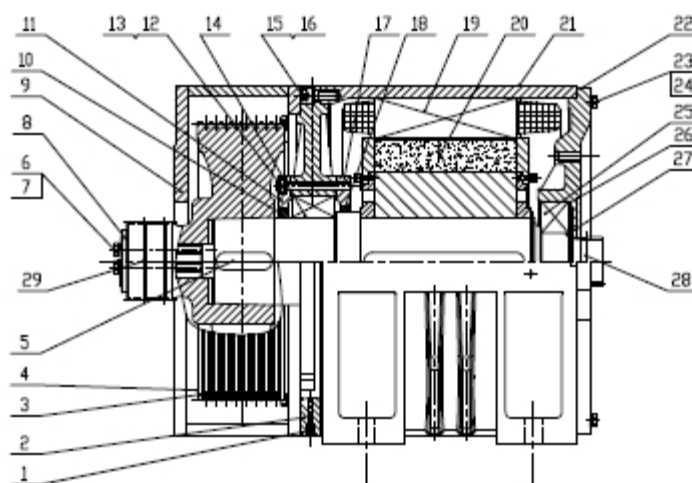


The proper maintenance of the gearless lift machines requires adequately trained specialist personnel and proper tools.

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	See Section 8.1 and reseal the encoder
	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 ground is secure and ≤ 0.10 ohms
	b. Bad inverter parameters	Make sure inverter parameters are correct
	c. Bad encoder feedbacks	Check grounding and shielding.
	d. Bad bearing	Replace the machine or bearing.
Electrical shocks	a. Bad grounding	Verify ground is secure and ≤ 0.10 ohms
	b. Bad humidity level	Make sure the humidity is within the specs.
	c. Broken cable insulation	Replace the cable.
Brake opening and closing noise	a. Brake noise when picking/dropping	See Section 6.1 Verify/adjust adjustment of brake stroke
	b. Brake noise when picking only	See Section 6.2 Verify/adjust adjustment of brake noise
	c. Brake noise when dropping only	See Section 6.1 Verify/adjust brake stroke
Brake not working	a. Brakes not burnished	Follow procedure in section 5.2.1
	b. Oil or grease on brake disk	Remove the oil and change the brake lining.
	c. Incorrect/uneven brake stroke	See Section 6.1 Adjust brake stroke
	d. Brake lining worn out	See Section 7.2 Perform brake lining check
	e. Bad brake coils	Replace the brake assembly
	f. Incorrect counterweight percentage	Verify counterweight percentage
	g. Noise absorber height is too big	Reduce the absorber height
Brake switch not working	a. Bad wiring	Verify brake wiring
	b. Brake stroke is out of spec.	See Section 6.1 Verify brake stroke spec
	c. Brake switch is misaligned	See Section 8.2.3 Adjust the brake switch
	d. Bad brake switch	Replace the brake switch. See Section 8.2
Motor is too hot	a. Elevator is overloaded	Verify elevator loading and duty cycle
	b. Incorrect counterweight percentage	Verify counterweight percentage

10.0 Machine Assembly

10.1 TSM/TMGL1

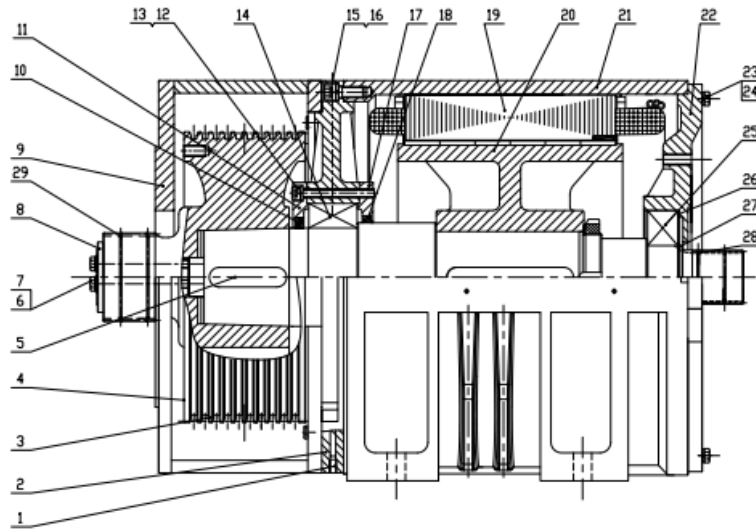


(*) Indicates a non-stock item of TSM/TMGL1

No.	Torin Drive Part No.	Description
1	*	screw M10x20
2	*	Front Cover
3	MSV-TSM/TMGL1-10mmX8	TSM/ TMGL1 Drive Sheave -10mmX8X440-V40/92-HRC50,with tag, bolts, washer and 2 O-rings (109X2.65)
4	*	sheave nameplate
5	*	key 28x85
6	*	bolt M12x150
7	*	lock washer 12
8	*	cover
9	*	brake frame
10	OSL-006	TSM/ER6, TMGL1/2/2A, TGL1/2 Sheave side Oil Seal
11	*	Outer Cover
12	*	screw M12x105
13	*	lock washer 12
14	BRN-009	TSM/ER6/TMGL1/2/2A Sheave end bearing
15	*	screw M16x40
16	*	lock washer 16
17	*	Inner Cover
18	OSL-007	TSM/ER6,TMGL1/2/2A, TGL1/2 Rotor side Oil Seal
19	*	stator

20	*	rotor
21	*	machine-base (frame)
22	*	Back Cover
23	*	bolt M12x40
24	*	lock washer 12
25	BRN-010	TSM/ER6/TMGL1/2/2A, TGL1/2 Encoder end bearing
26	*	wave spring D190
27	*	snap ring 90
28	ORN-012	TSM/ER6 and TMGL1/2/2A O-ring on the Shaft for normal brake pad
29	ORN-008	TSM/ER6 and TMGL1/2/2A O-ring on the Sheave for emergency brake pad
	SHG-TSM-001	Sheave Guard Assembly, TSM/TMGL1 Machines
	JUN-TSM-001	TSM, TMGL1, TMGL2, TMGL2A Machine Junction Box Cover
	JUN-TSM/TPM2/3/4-TER	Motor Terminal Block for TSM/TMGL1/TMGL2/TMGL2A, TPM2/3/4
	GRN-M10	Grease Fitting Nozzle, M10X1
	GRP-M10	Grease Drain Plug, M10X1

10.2 TMGL2

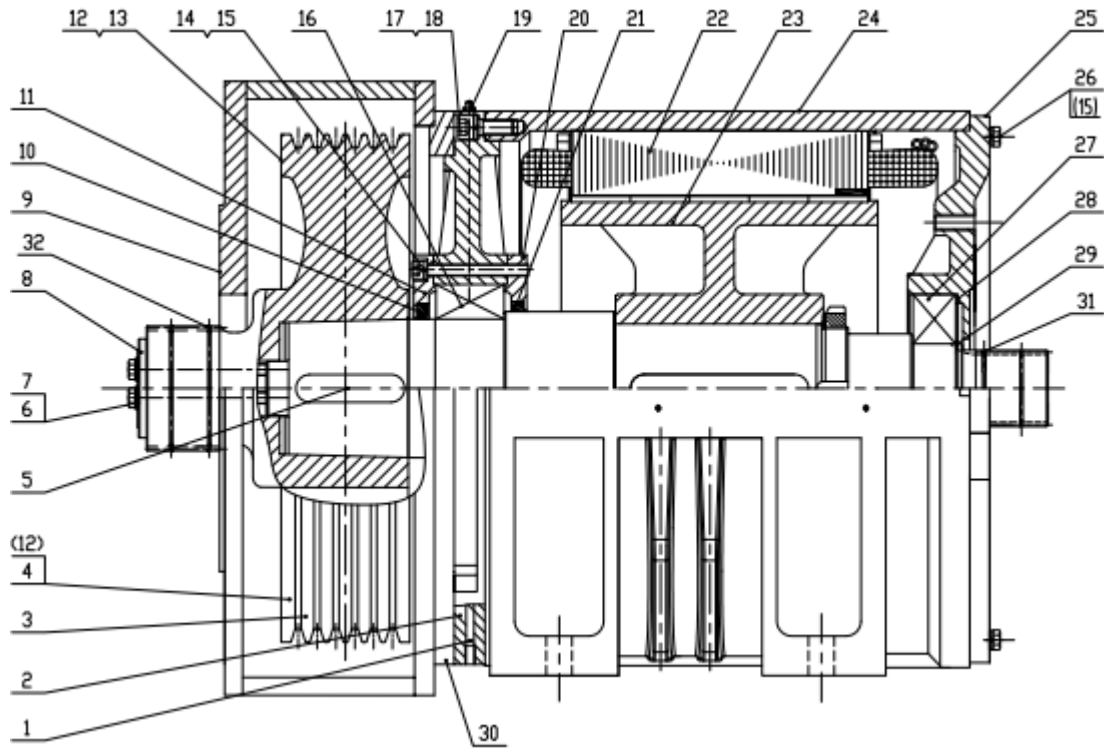


(*) Indicates a non-stock item of TMGL2

No.	Torin Drive Part No.	Description
1	*	screw M10x20
2	*	Front Cover
3	MSV-TMGL2-10mm	TMGL2 Drive Sheave - 10X10mmX16mm(pitch)X410-V40/92(V2)-HRC50, with diameter tag installed, bolts, washer and 2 O-ring (109X2.65mm)
4	*	sheave nameplate
5	*	key 28x85
6	*	bolt M12x150
7	*	lock washer 12
8	*	cover
9	*	brake frame
10	OSL-006	TSM/ER6, TMGL1/2/2A, TGL1/2 Sheave side Oil Seal
11	*	Outer Cover
12	*	screw M12x105
13	*	lock washer 12
14	BRN-009	TSM/ER6/TMGL1/2/2A Sheave end bearing
15	*	screw M16x40
16	*	lock washer 16
17	*	Inner Cover
18	OSL-007	TSM/ER6,TMGL1/2/2A, TGL1/2 Rotor side Oil Seal
19	*	stator
20	*	rotor

21	*	machine-base (frame)
22	*	Back Cover
23	*	bolt M12x40
24	*	lock washer 12
25	BRN-010	TSM/ER6/TMGL1/2/2A, TGL1/2 Encoder end bearing
26	*	wave spring D190
27	*	snap ring 90
28	ORN-012	TSM/ER6 and TMGL1/2/2A O-ring on the Shaft for normal brake pad
29	ORN-008	TSM/ER6 and TMGL1/2/2A O-ring on the Sheave for emergency brake pad
	SHG-TSM-002	Sheave Guard Assembly, TMGL2 Machines
	JUN-TSM-001	TSM, TMGL1, TMGL2, TMGL2A Machine Junction Box Cover
	GRN-M10	Grease Fitting Nozzle, M10X1
	GRP-M10	Grease Drain Plug, M10X1

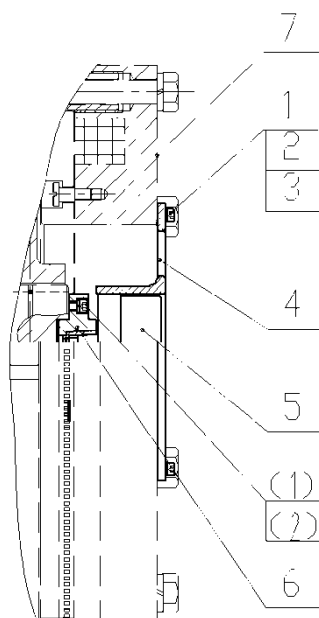
10.3 TMGL2A



No.	Torin Drive Part No.	Description
1	*	screw M10x20
2	*	Front Cover
3	MSV-TMGL2-1/2"	TMGL2A Drive Sheave -6X1/2"X3/4"(pitch)X508-V40/92(V8)-HRC50, with diameter tag installed, bolts, washer and 2 O-ring (109X2.65mm)
4	*	sheave nameplate1
5	*	key 28x110
6	*	bolt M12x150
7	*	lock washer 12
8	*	cover
9	*	brake frame
10	OSL-006	TSM/ER6, TMGL1/2/2A, TGL1/2 Sheave side Oil Seal
11	*	Outer Cover
12	*	sheave nameplate 2
13	*	Rivets for nameplate 3x6
14	*	screw M12x105
15	*	lock washer 12

16	BRN-009	TSM/ER6/TMGL1/2/2A Sheave end bearing
17	*	screw M16x40
18	*	lock washer 16
19	GRN-M10	Grease Fitting Nozzle, M10X1
20	*	Inner Cover
21	OSL-007	TSM/ER6,TMGL1/2/2A, TGL1/2 Rotor side Oil Seal
22	*	stator
23	*	rotor
24	*	machine-base (frame)
25	*	back-cover
26	*	bolt M12x40
27	BRN-010	TSM/ER6/TMGL1/2/2A, TGL1/2 Encoder end bearing
28	*	wave spring D190
29	*	snap ring 90
30	*	Junction plate
31	ORN-012	TSM/ER6 and TMGL1/2/2A O-ring on the Shaft for normal brake pad
32	ORN-008	TSM/ER6 and TMGL1/2/2A O-ring on the Sheave for emergency brake pad
	GRP-M10	Grease Drain Plug, M10X1
	SHG-TSM-003	Sheave Guard Assembly, TMGL2A Machines
	JUN-TSM-001	TSM, TMGL1, TMGL2, TMGL2A Machine Junction Box Cover
	JUN-TSM/TPM2/3/4-TER	Motor Terminal Block for TSM/TMGL1/TMGL2/TMGL2A, TPM2/3/4

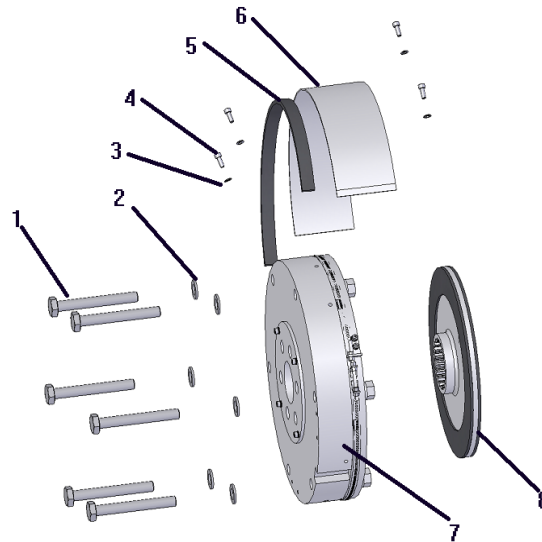
11.0 Encoder Assembly



(*) Indicates a non-stock item

No.	Torin Drive Part No.	Description
1	*	bolt M5X16
2	*	lock washer 5
3	*	washer 5
4		Setting of encoder
5	ENC-Gearless-002	Heidenhein 1313 Encoder
6	*	Connect Shaft
7	*	Normal brake

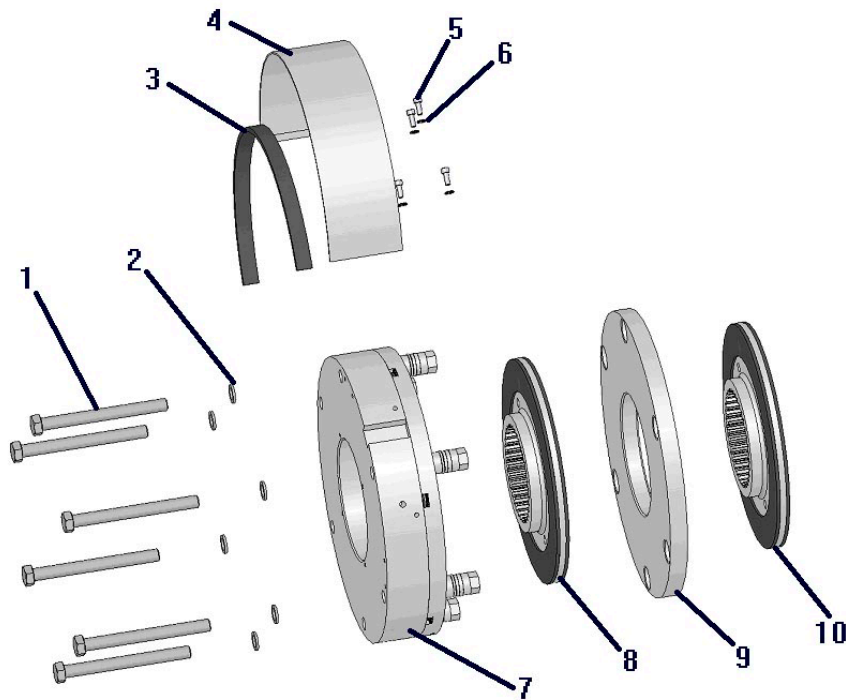
12.0 Normal Brake Assembly



(*) Indicates a non-stock item

No.	Torin Drive Part No.	Description
1	*	bolt M16x130
2	*	lock washer 16
3	*	lock washer 6
4	*	screw M6x16
5	*	nylon ring
6	*	dustproof ring
7	NBK-TSM-002	TSM/ER6 Normal Brake Assembly with dust cover installed (include brake disc)
	NBK-TSM-003	TMGL1 Normal Brake Coil Assembly with dust cover and hardware (include brake disc)
	NBK-TSM-007	TMGL2/2A Normal Brake Coil Assembly with dust cover installed (include brake disc)
8	NBK-TSM-001	TSM/ER6/ TMGL Machines Normal brake disc, with 1 O-ring (60X2.65mm), each
9	ENBK-TSM-Switch	Brake Switch Kit - TSM/ER6/TMGL -Burgess V4NS-300mm, with plate and hardware
	ENBK-TSM-JUN	TSM/ER6/TMGL1 Brake connecting Box with terminal block
	PTO-004	TSM/TMGL1 Normal Brake Special adjustment wrench, 24 mm

13.0 Emergency Brake Assembly

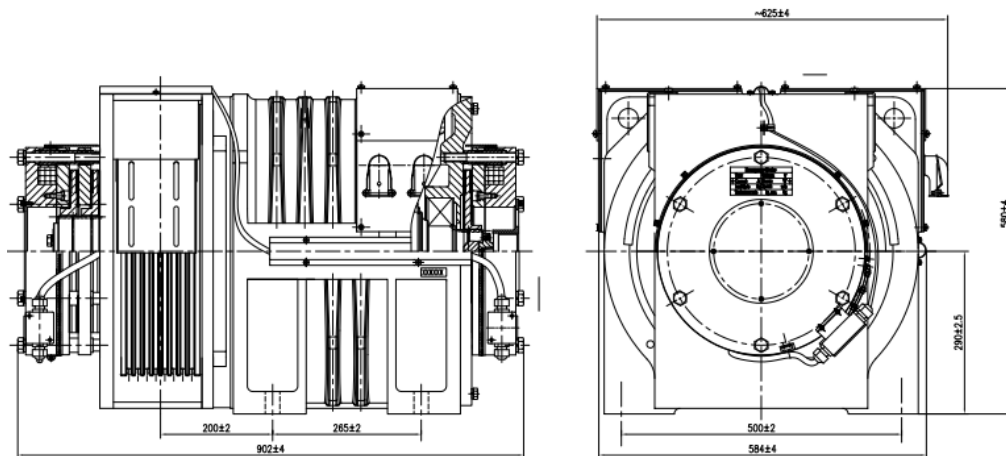


(*) Indicates a non-stock item

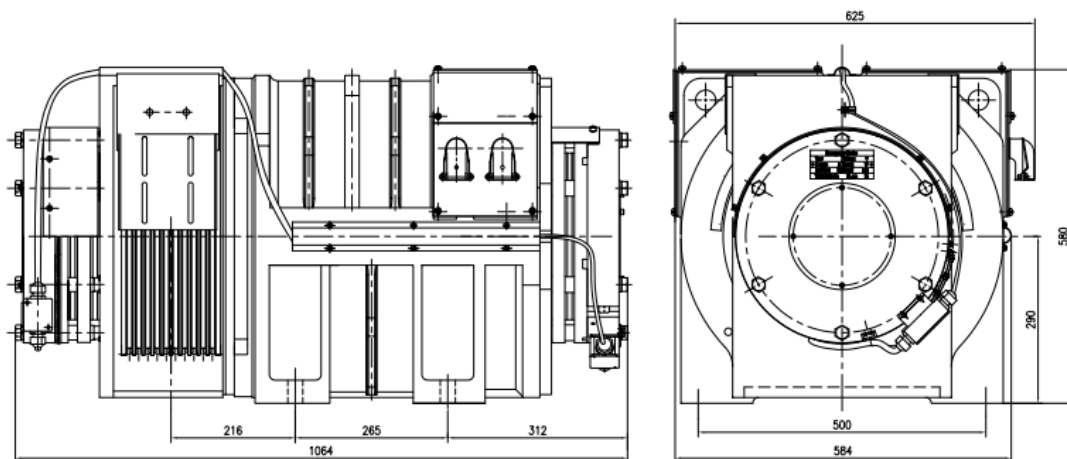
No.	Torin Drive Part No.	Description
1	*	bolt M16x165
2	*	lock washer 16
3	*	nylon ring
4	*	dustproof ring
5	*	screw M6x16
6	*	lock washer 6
7	EBK-TSM-004	TSM /ER6/ TMGL1 Emergency Brake Coil Assembly with dust cover installed (include brake disc)
8, 10	EBK-TSM-006	TSM /ER6/ TMGL Machines emergency brake disc, with 2 O-ring (109X2.65mm), pair
	EBK-TSM-005	TMGL2/TMGL2A Emergency Brake Coil Assembly with dust cover installed (include brake disc)
9	ER6.2-3	Brake plate
	ENBK-TSM-Switch	Brake Switch Kit - TSM/ER6/TMGL -Burgess V4NS-300mm, with plate and hardware
	ENBK-TSM-JUN	TSM/ER6/TMGL1 Brake connecting Box with terminal block

14.0 Machine Dimensions

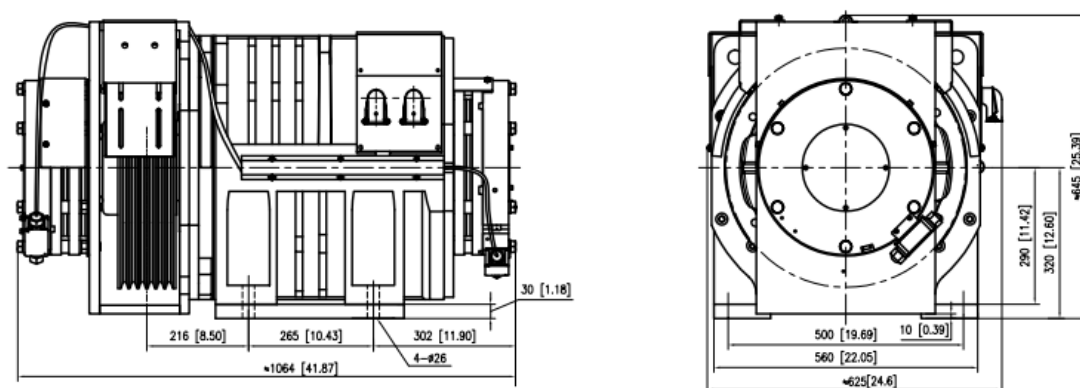
14.1 TSM/TMGL1

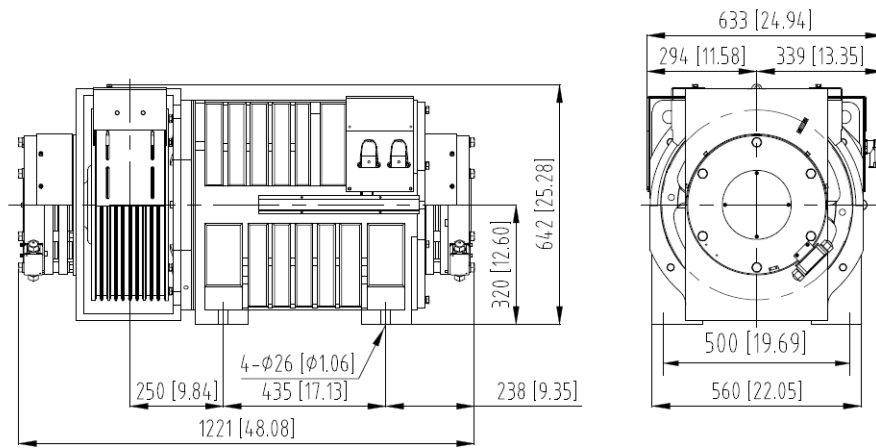


14.2 TMGL2



14.3 TMGL2A



14.4 TMGL3

15.0 Addendum

15.1 Suggested Methods of Opening Sticky Brakes during Start-up

Method 1. Perform “dynamic encoder alignment procedure” again allowing the sheave to move.

Method 2. Use a flat head screw driver as shown below.

1. Loosen the screw M6x16 and lock washer 6 (4 pieces) by hex wrench (5mm), then remove the dustproof ring and nylon seal. See Figure 96.

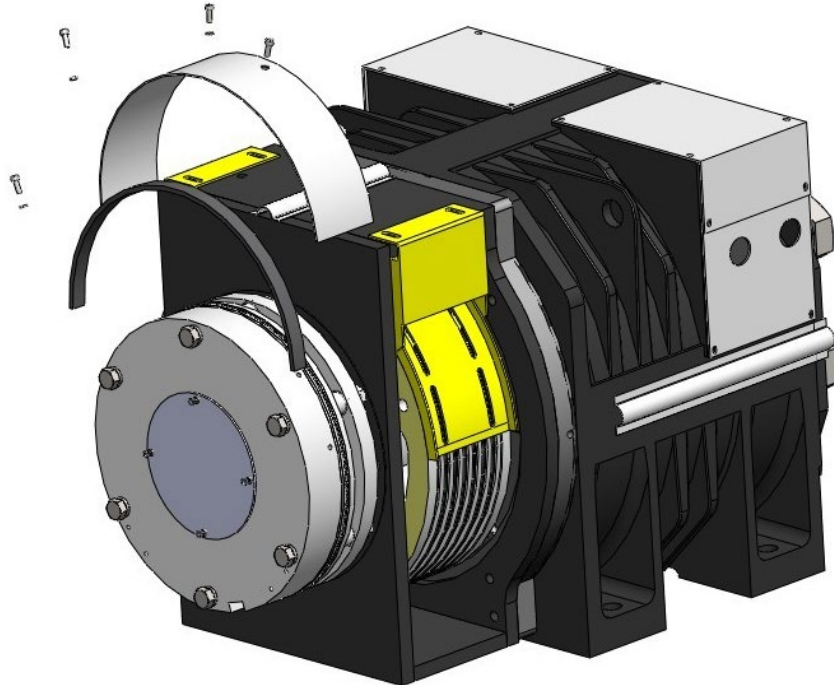


Figure 96 Remove dustproof ring and nylon seal

2. Energize both Normal and Emergency brake coils. Use a flat head screw driver to pry open the brake lining from its braking surface as shown in the following picture. Then repeat it for both sides of lining surfaces and for both brakes. See Figure 97.

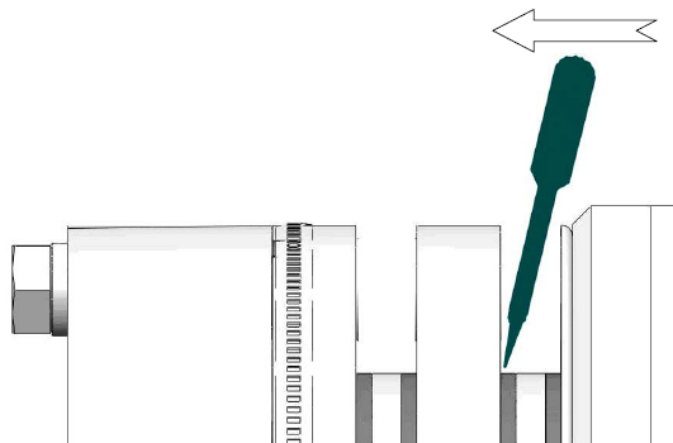


Figure 97 Pry stuck brake open

Method 3. Rotate the sheave with torque wrench.**Required Tools & Materials:**

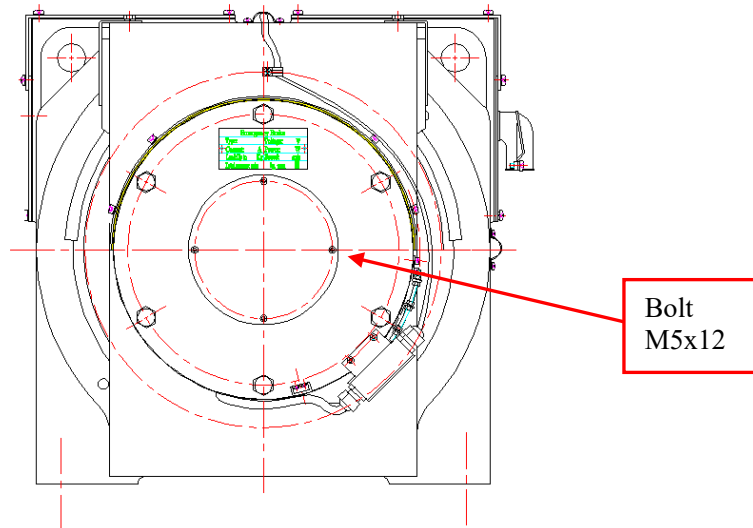
Hex wrench (4mm)

Long type socket 18mm

Socket wrench

Procedure:

1. Loosen the screws M5x12 and washer 5 (4 pieces) with hex wrench (4mm), then remove the Front Cover. See Figure 98.

**Figure 98 Remove Front Cover**

2. Connect both emergency and normal brake cable to the brake power supply and energize the brakes.
3. Install the long type (deep well) 18mm socket at top of M12 bolt in the main shaft. See Figure 99.

**Figure 99 18mm deep well socket on M12 bolt**

4. Install the socket wrench to rotate the shaft to open the sticky brake. See Figure 100.

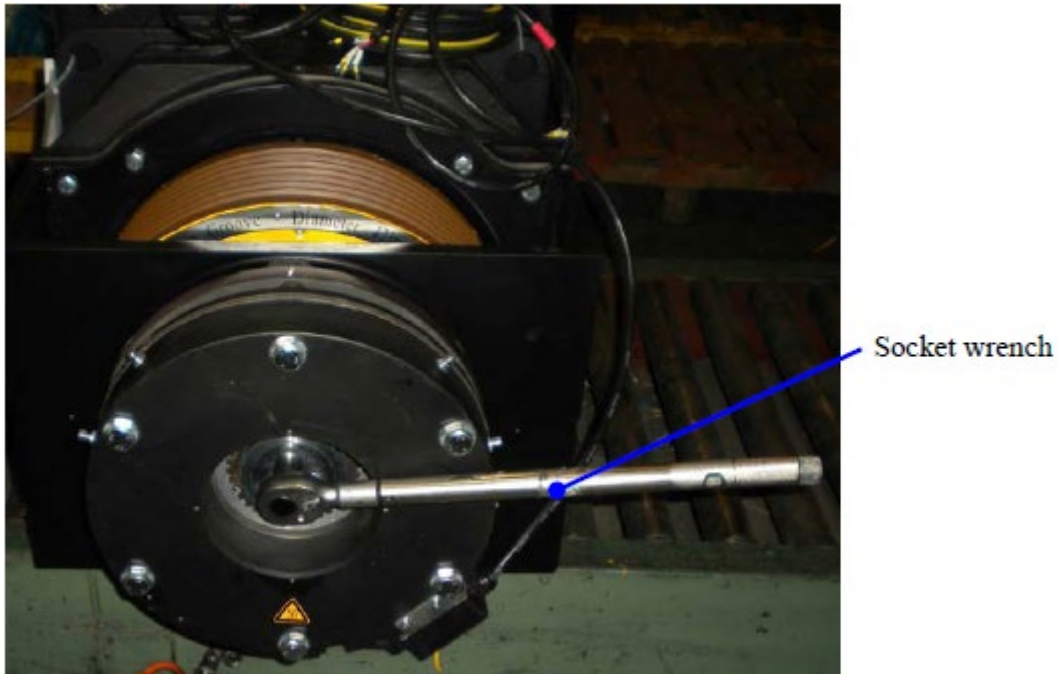
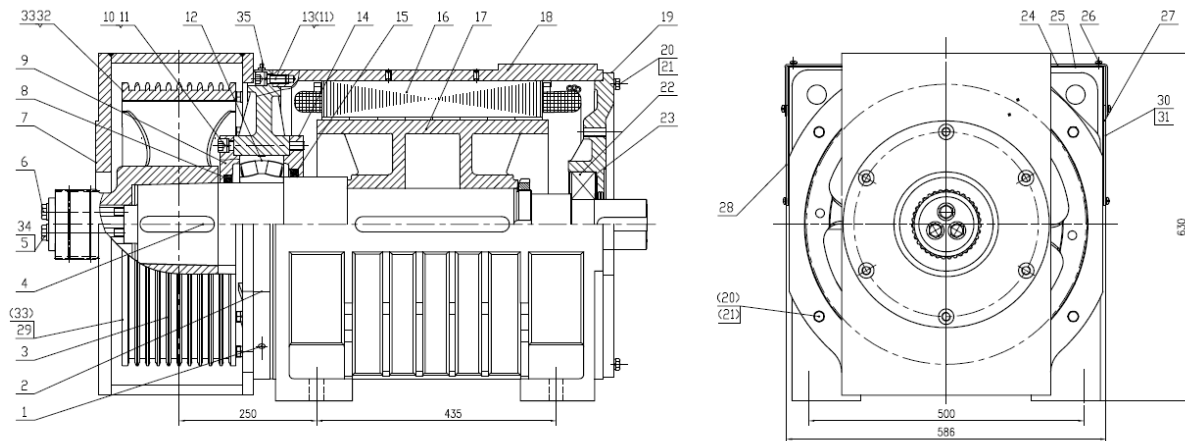


Figure 100 Rotate shaft to free sticky brake

5. Reinstall the front protect cover piece.

15.2 TMGL3 Spare Part List



(*) Indicates a non-stock item of TMGL3

No.	Torin Drive Part No.	Description
1	*	Fine tooth set screw M10X20
2	*	Front cover
3	MSV-TMGL3-1/2"	TMGL3 Drive Sheave -10X1/2"X3/4"(pitch)X508-V40/92(V8)-HRC50, with diameter tag installed, bolts, washer and 2 Oring (109X2.65mm)
4	*	Key 28x110
5	*	Bolt M16x160
6	ORN-008	TSM/ER6 and TMGL1/2/2A O-ring on the Sheave for EBK pad, TMGL3 Oring on NBK pad
7	*	Brake frame
8	OSL-017	TGL2A/TMGL3 Sheave Side Oil Seal (Ø150xØ180x14)
9	*	Outer cover
10	*	screw M16x140
11	*	Lock washer 16
12	BRN-026	TGL2A/TMGL3 Sheave and bearing (23130)
13	*	screw M16X40
14	*	Inner cover
15	OSL-018	TGL2A/TMGL3 Sheave Side Oil (Ø170xØ200x16)
16	*	Stator
17	*	Rotor

18	*	Machine-base (frame)
19	*	Back cover
20	*	bolt M12x40
21	*	Lock washer 12
22	BRN-010	TSM/ER6/TMGL1/2/2A/3/TGL1/2/2A ENC end bearing (6318DDU)
23	*	Wave spring D190
24/25/ 26/27	JUN-TSM-001	Machine junction box cover kit
28	*	Wiring cover
29	*	Traction wheel nameplate 1
30/31	*	Wiring diagram tag
32	*	Traction wheel nameplate 2
33	*	Rivet 3x6 for nameplate
34	*	lock washer 16
35	GRN-M10	Grease fitting nozzle, M10x1

Torin Drive North America
4949 E. Raines Rd. #101
Memphis, TN 38118, USA
Phone: 901-290-1600
Fax: 901-290-1680
E-mail: torindrive@hyperion-solutions.com