

# Maintenance Manual for Brake of Geared Traction Machine

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## **1. Introduction**

This manual describes the maintenance of brake equipment of geared traction machines whose type written in the nameplate begins with EM or EH.

Elevators need to be inspected and maintained periodically by competent maintenance persons. If elevators are used without proper maintenance, they may not be able to deliver the performance that we expect. The components specified in this manual are particularly critical for safety of users and maintenance persons. Therefore, please plan for proper maintenance in accordance with this manual.

For maintenance of Mitsubishi Electric elevators, we recommend that you sign a maintenance contract with our official distributor. To contact our official distributor, please visit our website below.  
<http://www.mitsubishielectric.com/elevator/network/index.html>

This manual specifies important points which require special attention in basic maintenance. The owner of the installation and operation manager shall request the maintenance organization to be sure to include those points in maintenance.

**This manual is applicable only to the region (Region and Locale) and the product (Elevator) selected when you downloaded this manual from our website.  
Do not use this manual for other regions and products.**

## **2. Maintenance of brake of geared traction machine**

The brake of elevators is a critical component, as it deteriorates over time. Since the deterioration speed differs depending on the frequency and environment of use of elevator, it is necessary to carry out maintenance to keep it in good condition at all times.

This document describes key points to be checked in basic maintenance of the brake of geared traction machines.

Take the following into consideration to determine the frequency of maintenance as described in 4.

- a) The number of trips per year, operating time and non-operating periods of time
- b) Age and condition of installation
- c) Environment where the installation is situated and external environmental elements such as weather condition (rain, heat or cold) or vandalism




## **3. General precaution**

This manual summarizes important maintenance information for competent maintenance persons who carry out basic elevator maintenance. The competent maintenance persons shall understand and observe the instructions thoroughly.



### **3.1 Safety symbols**

Safety symbols below represent the degree of hazard that would arise should the provided instructions be neglected. The definitions of the symbols are as follows.

#### (1) Definitions of danger, warning and caution symbols

Symbol	Description
 <b>Danger</b>	Indicates an imminently hazardous situation which, if it is not observed, will result in death or serious injury.
 <b>Warning</b>	Indicates a potentially hazardous situation which, if it is not observed, could result in death or serious injury.
 <b>Caution</b>	Indicates a potentially hazardous situation which, if it is not observed, may result in injury or damage to the elevator equipment.

#### (2) Definitions of precaution symbols





Symbol	Description
	Indicates a mandatory action.
	Indicates a prohibited action.

### **3.2 Precautions after inspection and maintenance**

#### (1) Fault



If any fault has been found during inspection and/or maintenance, take appropriate measures immediately.

- 1) Take the elevator out of service until the fault is repaired. Report the state to the operation manager.
- 2) Record the detail of fault, replacement and repair in the Work Log, and maintain it permanently.
- 3) If any abnormality has been found during inspection, and replacement, repair or adjustment by Mitsubishi Electric Corporation is required, please contact our official distributor.

 <b>Caution</b>	 Be sure to close the doors of the elevator taken out of service.
	 Use the Mitsubishi Electric's genuine parts for replacement.
	 If there is any problem with the product, contact our official distributor.

(2) Restoration



- 1) Restore screws loosened, covers removed, etc. for inspection or maintenance to the original state.
- 2) If no abnormality has been found during inspection and/or maintenance, confirm the safety and restore the elevator to the automatic (normal) operation.



 <b>Caution</b>	 Before resuming automatic (normal) operation, check that there is no problem with elevator operation by first running the car manually, then stopping the car at every floor in automatic (normal) operation, and running the car from the top to the bottom floor in automatic (normal) operation at the end.
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**3.3 Latest maintenance information**

For supply of parts, contact our official distributor.

Please note however that parts supply may not be possible when the product is too old or is used in poor condition. In that case, we recommend modernization of the product.

 <b>Caution</b>	 This manual may be subject to change without notice. Before starting maintenance, visit the URL below to check the latest manual. <a href="http://www.mitsubishielectric.com/elevator/maintenance/index.html">http://www.mitsubishielectric.com/elevator/maintenance/index.html</a>
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 <b>Danger</b>	 For EM-1100 traction machine, do not apply oil or lubricant on and around the brake.
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	Check the traction machine type with the nameplate attached on the traction machine.
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#### 4. Check items and frequency of maintenance

Maintenance	Section No.	Check item	Frequency of maintenance (standard)	Remarks
Check of brake condition and operation (visual check)	6.1	Checking brake operation	Every basic maintenance (less than 1 year)	Single brake only Except EH-3800 and EM-1100
	6.2	Checking brake drum (disk) and lining		
	6.3	Checking fixing nut of brake screw		
	6.4	Checking contact state of brake levers with plunger rod		
	6.5	Checking lining clearance		
Check and adjustment of coil stroke, plunger stroke and lining clearance	7.1	Worm-gear traction machine -Checking coil stroke	1 year	EM-1100 only
	7.2	Worm-gear traction machine -Checking plunger stroke -Adjusting plunger stroke		Except EM-1100
	7.3	Helical-gear traction machine -Checking plunger stroke -Adjusting plunger stroke		Except EH-3500, EH-3700 and EH-3800
	7.4	Helical-gear traction machine -Checking coil stroke -Checking lining clearance		EH-3500 and EH-3800 only
	7.5	Helical-gear traction machine -Checking coil stroke		EH-3700 only
Inspection of functions and maintenance	8.1	Inspecting brake arm	1 year	Except EM-1100 and EH-3700
	8.2	Inspecting brake shoe and spherical surface		Except EM-1100 and EH-3700
	8.3	Inspecting lining		Except EM-1100 and EH-3700
	8.4	Disassembling and inspecting brake lever	Less than 1 year <sup>*2</sup>	Except EM-1100, EH-3500, EH-3700 and EH-3800
	8.5	Inspecting brake drum or disk	1 year	Except EM-1100, EH-3500, EH-3700 and EH-3800
	8.6	Inspecting plunger and plunger rod		
	8.7	Checking clearance between stud bolt and bracket		
	8.8	Inspecting rubber and plastic components		
	8.9	Inspecting and adjusting brake switch		
Lubrication	9.1	Lubricating brake arm pin	Less than 1 year <sup>*1</sup>	Except EM-1100 and EH-3700
	9.2	Lubricating brake lever pin	<sup>*2</sup>	Except EM-1100, EH-3500, EH-3700 and EH-3800
	9.3	Lubricating contact surface of brake lever with adjusting bolt	Less than 1 year <sup>*1</sup>	EH-3500, EH-3700 and EH-3800

				3800
Check of brake torque to hold a car stationary	10	Checking brake torque to hold a car stationary	1 year	
Check of lubrication prevention cover	11	Checking lubrication prevention cover	1 year	

\*1: Carry out the maintenance more frequently depending on the start frequency of the elevator.

\*2: The brake lever is classified into two types: lubricated brake lever and non-lubricated brake lever. For the non-lubricated brake lever, disassembly and cleaning are not required if there is no abnormality in operation. Note that lubricating the brake lever pin of non-lubricated brake lever is not allowed. See the referral section for details.



## **5. Brake structure**

Check the brake structure of the traction machine, referring to the table below.

The traction machine type is indicated on the nameplate of the traction machine.

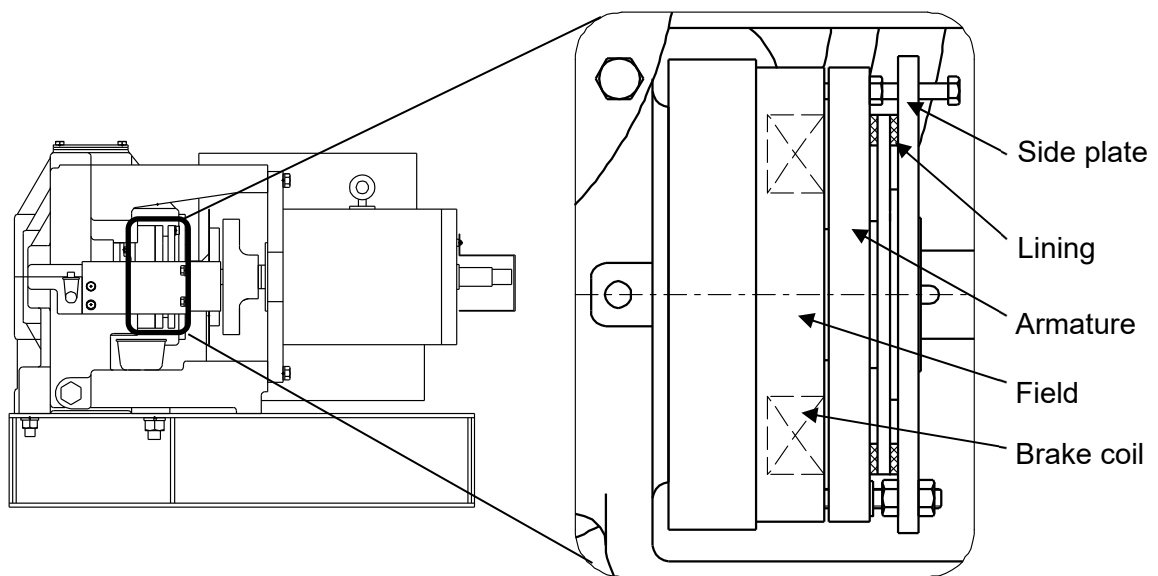
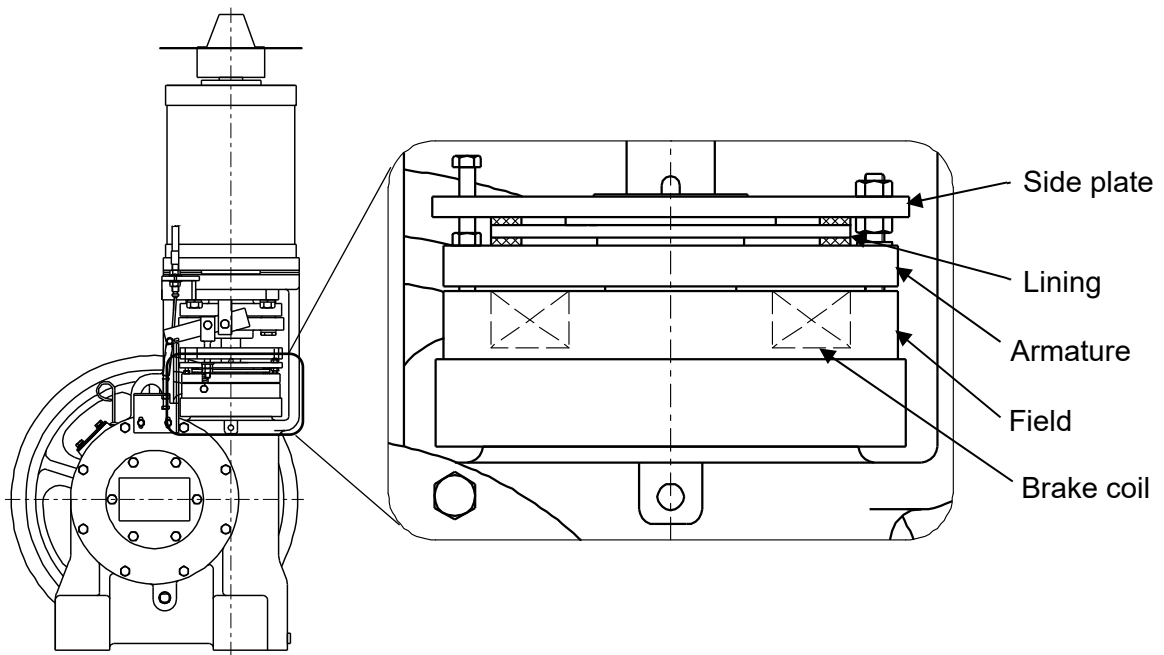
Type numbers of worm-gear traction machines and helical-gear traction machines begin with EM and EH, respectively.

Traction machine type	Brake type		Referral section	Traction machine type number*
Worm-gear traction machine	Clutch brake		5.1	EM-1100
	Drum brake	Single brake	5.2	Other than EM-1100
		Double-brake	5.3	
Helical-gear traction machine	Drum brake	Single brake	5.2	EH-4200 EH-4500 EH-5100 EHB-5100 EH-6200 EHB-6200 EHC-6200 EH-6300 EHB-6300
	Disk brake (1)		5.4	EH-4100 EHB-4100 EHC-4100 EHD-4100 EH-5400 EHB-5400 EHC-5400
	Disk brake (2)		5.5	EH-3500 EH-3800
	Clutch brake		5.1	EH-3700

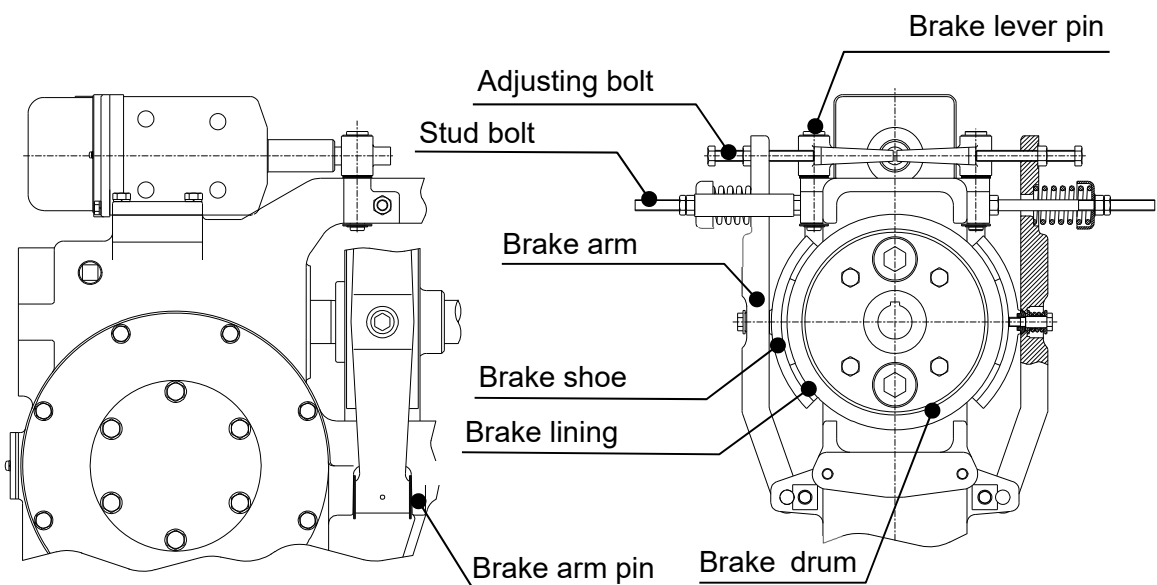
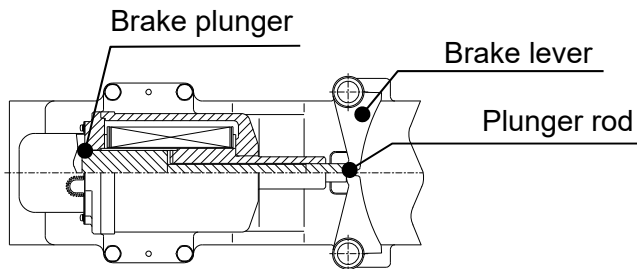
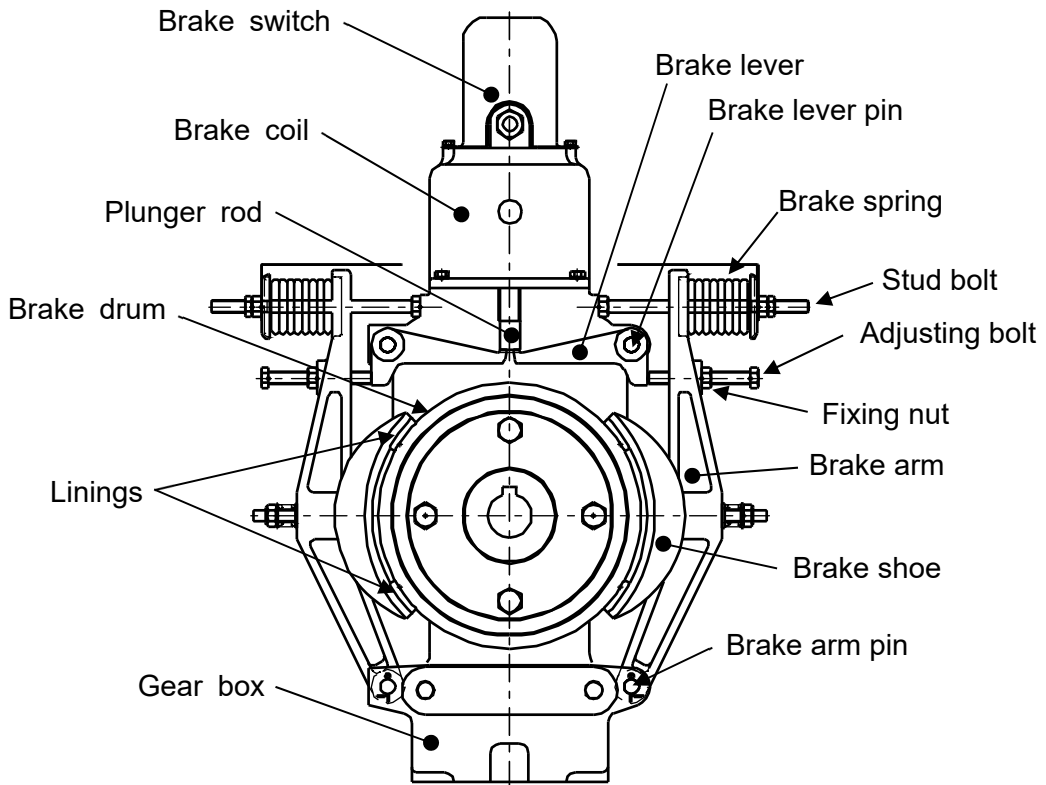
\*The traction machine type numbers listed in this table are typical traction machine type numbers. The last two digits of an actual type number indicated on the nameplate differ depending on the gear ratio.

Example: When the traction machine type indicated on the nameplate is EHC-6210 or EHC-6220, the type is described as EHC-6200 in this document.

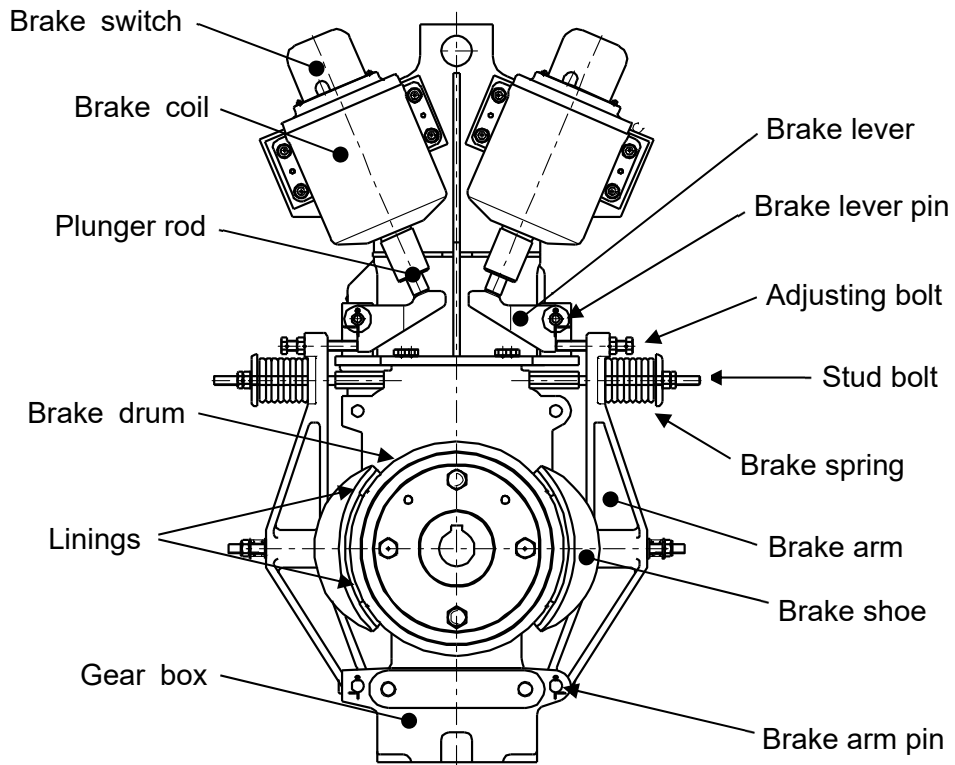
## 5.1 Clutch brake



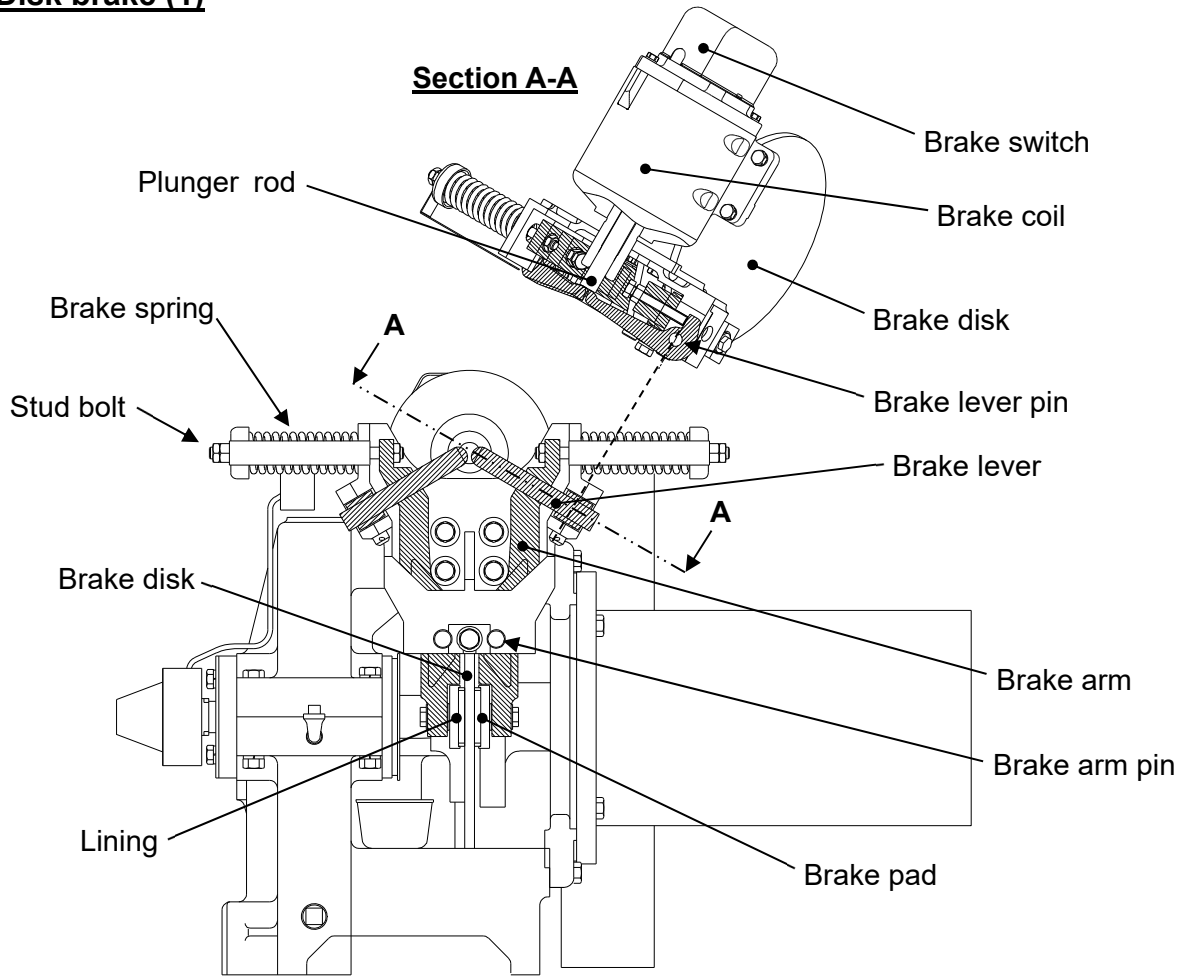
**5.2 Drum brake (single brake)**



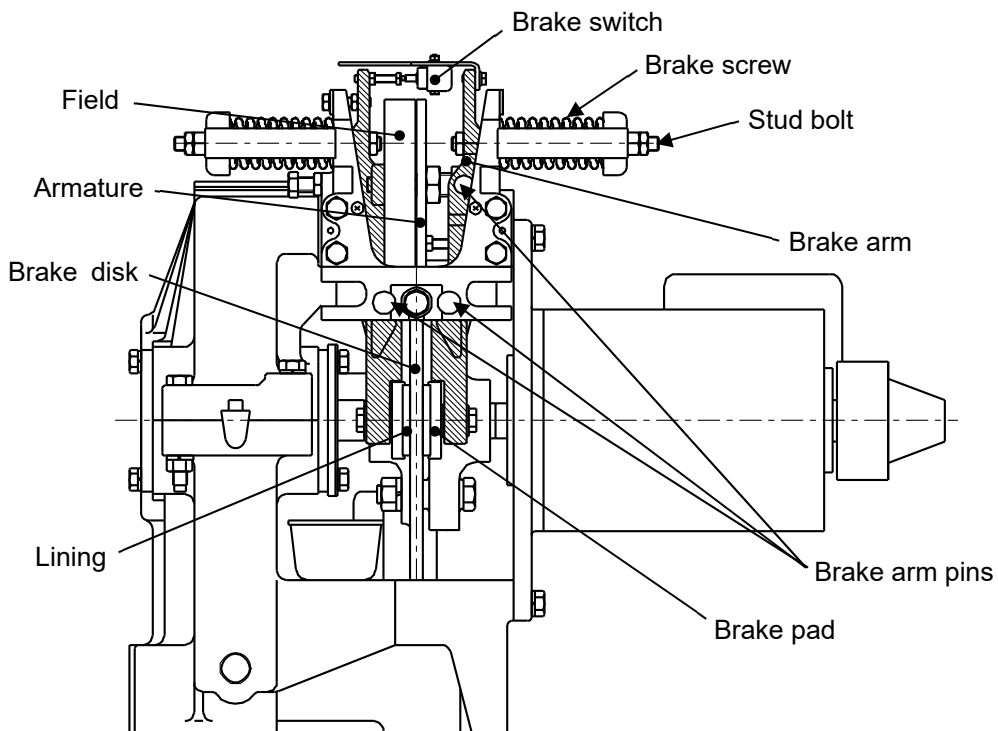
**5.3 Drum brake (double-brake):** Equipped with two brake coils  
(EM-1500, EM-1600, EM-2400, EM-3600, EMJ-500, EML-500 and EMB-600)



### 5.4 Disk brake (1)



### 5.5 Disk brake (2)



## **6. Check of brake condition and operation**

### **6.1 Checking brake operation**

Check that the brake arm, brake lever and plunger work smoothly and that there is no abnormality such as interference.



If they do not work smoothly, inspect them, referring to the following section.

Component to be inspected	Referral section
Brake arm	8.1
Brake lever	8.4
Plunger	8.6
Brake switch	8.7

### **6.2 Checking brake drum (disk) and lining**

Check that there is no foreign object, oil, scratch or any other abnormality on the brake drum or disk and the lining.



**Danger**



Shut off the power before checking the brake drum (disk) and lining.



If there is any abnormality, inspect the brake drum or disk, referring to 8.5.

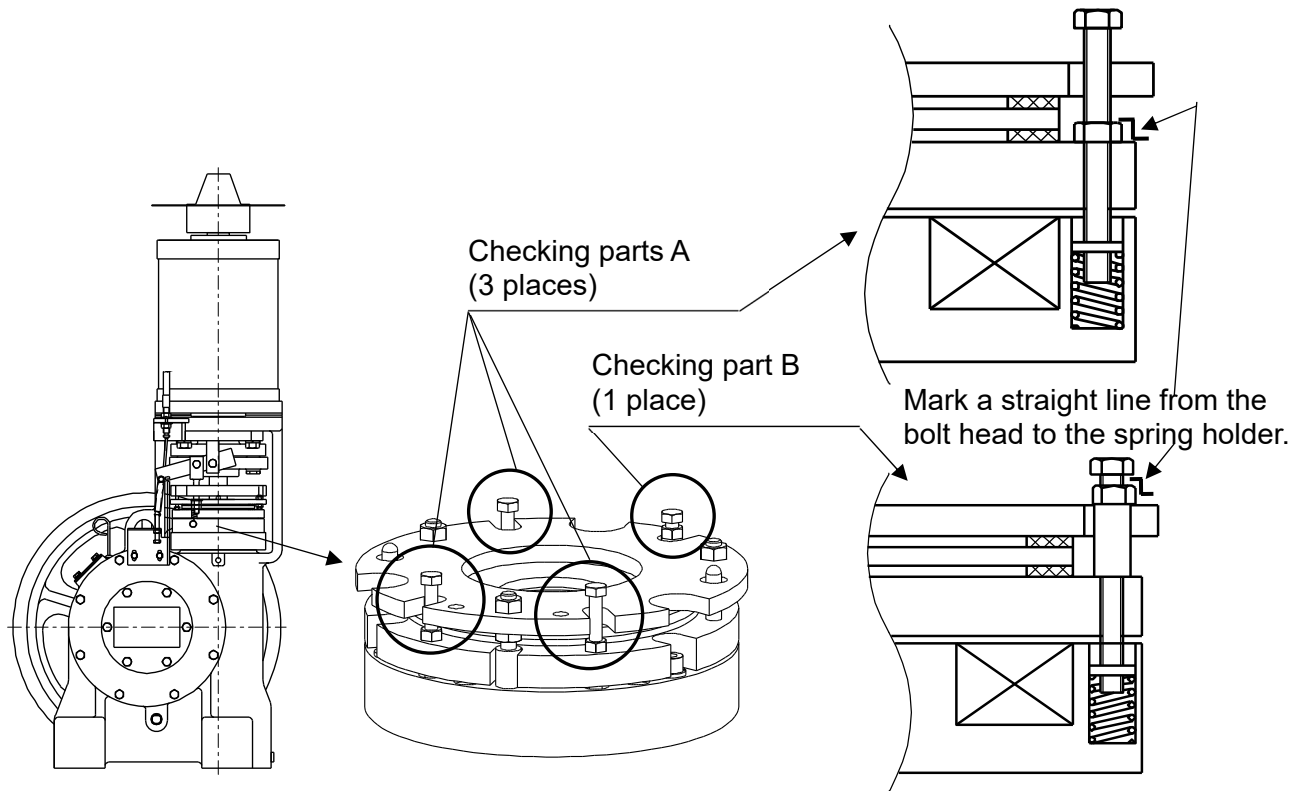
### **6.3 Checking fixing nut of brake screw**

Check that the fixing nuts of the brake screws are not loose (the marks on the nuts and screw holders are aligned).

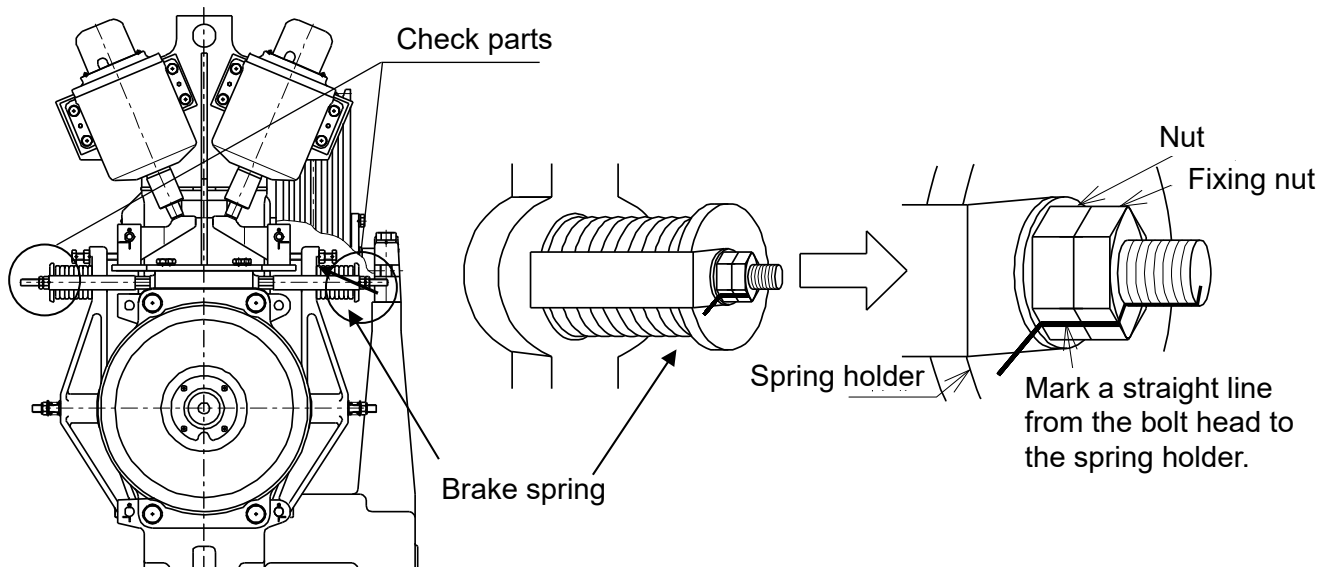
When the screw length is adjusted or there is no mark on the nuts, be sure to mark a line after brake torque check is complete. See 10 for brake torque check method.

Traction machine type	Traction machine type number	Brake type	Referral section	Remarks
Worm-gear traction machine	EM-1100	Clutch brake	6.3.1	The screw length has been adjusted before shipping. It is unnecessary to adjust it by local.
	Other than EM-1100			
Helical-gear traction machine	EH-4200 EH-4500 EH-5100 EHB-5100 EH-6200 EHB-6200 EHC-6200 EH-6300 EHB-6300	Drum brake	6.3.2	
	EH-4100 EHB-4100 EHC-4100 EHD-4100 EH-5400 EHB-5400 EHC-5400	Disk brake (1)	6.3.3	
	EH-3500 EH-3800	Disk brake (2)	6.3.4	
	EH-3700	Clutch brake	6.3.1	The screw length has been adjusted before shipping. It is unnecessary to adjust it by local.

### 6.3.1 Instructions for checking clutch brake of worm-gear traction machine



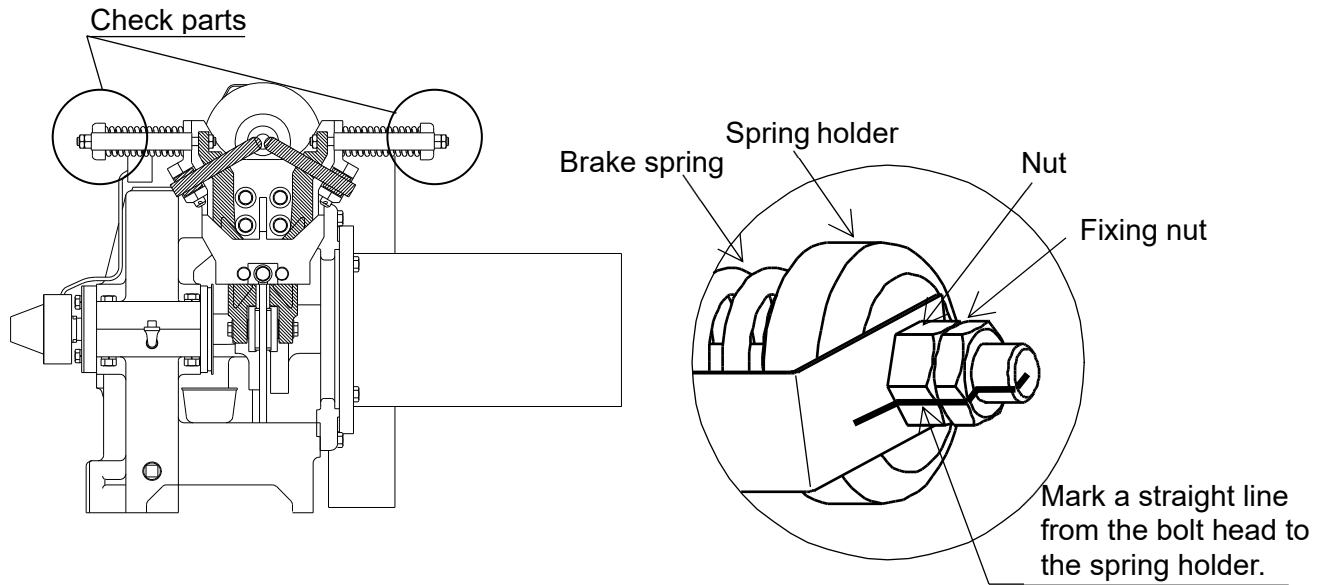
### 6.3.2 Instructions for checking drum brake of worm-gear and helical-gear traction machines



Mark a straight line from the bolt head to the spring holder as shown in the figure above.

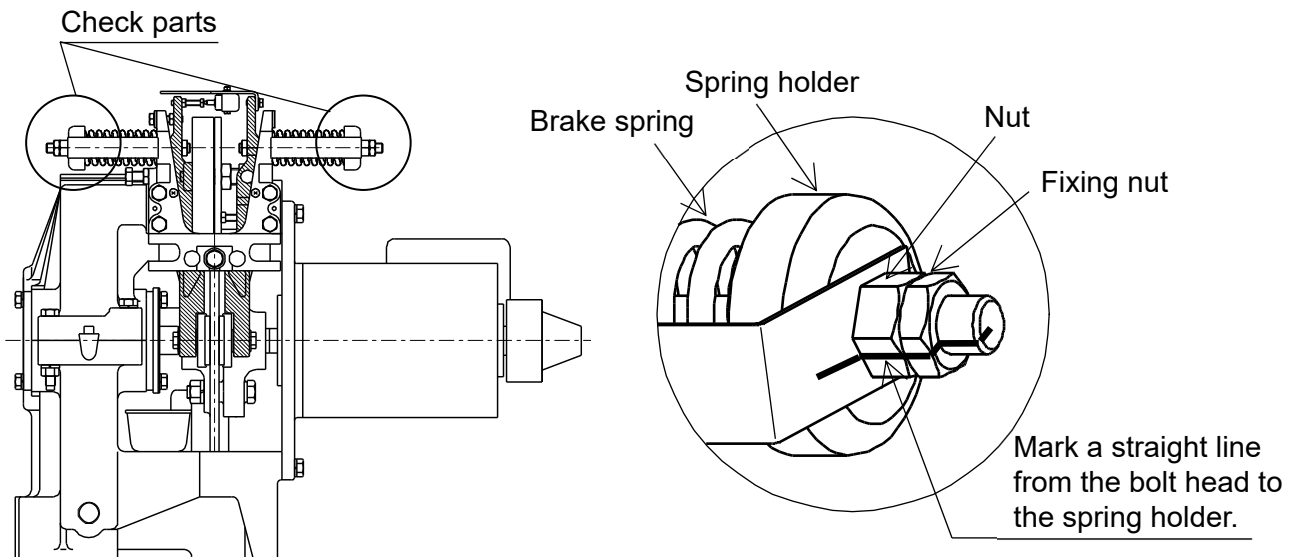


### **6.3.3 Instructions for checking disk brake (1) of helical-gear traction machine**



Mark a straight line from the bolt head to the spring holder as shown in the figure above.

### **6.3.4 Instructions for checking disk brake (2) of helical-gear traction machine**



Mark a straight line from the bolt head to the spring holder as shown in the figure above.

## 6.4 Checking contact state of brake levers with plunger rod (only for single brake)

Traction machine type	Traction machine type number	Brake type
Worm-gear traction machine	Other than EM-1100	Single brake
Helical-gear traction machine	Other than EH-3500, EH-3700 and EH-3800	



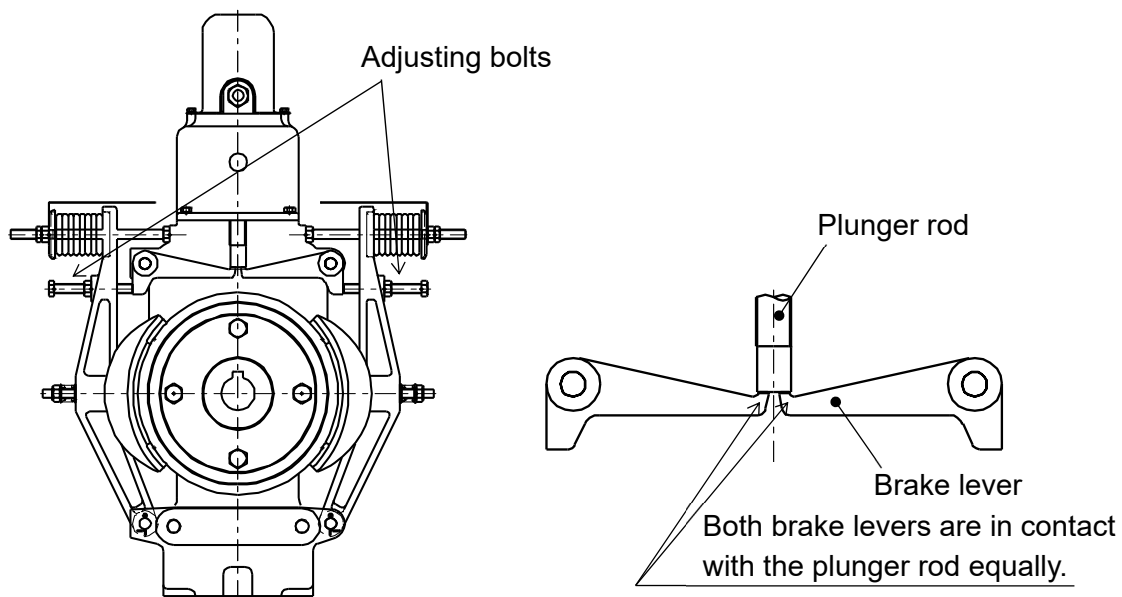
**Danger**



Shut off the power before checking the contact state.

Check that both brake levers are in contact with the plunger rod equally.

If the brake levers are not in contact with the plunger rod equally, space between a brake lever and the plunger rod will be generated when the brake is applied. If there is space between a brake lever and the plunger rod, tighten the adjusting bolt to remove the space after checking or adjusting the plunger stroke shown in 7.2 and 7.3.



## 6.5 Checking lining clearance

Check that the brake drum or disk does not interfere with the lining while the elevator is running.  
(Visual check and check of noise)



**Danger**



Beware of the rotating objects such as brake drum or disk and sheave when checking the lining clearance.



If the lining interferes with the drum or disk, check the brake stroke in accordance with 7.



If the lining interferes with the drum or disk though the brake stroke is within the allowable range, inspect the brake shoe and spherical surface in accordance with 8.2. If the lining still interferes with the drum or disk after inspection, contact our official distributor.

## 7. Check and adjustment of coil stroke, plunger stroke and lining clearance



**Danger**



Adjust the brake correctly. Otherwise, the braking force may decrease.

Check the coil stroke, plunger stroke and lining clearance and adjust them if they are out of allowable range in accordance with the instructions in an appropriate section, referring to the table below.

Traction machine type	Traction machine type number	Brake type	Referral section					
			Coil and plunger stroke		Lining clearance			
			Check	Adjustment	Check	Adjustment		
Worm-gear traction machine	EM-1100	Clutch brake	7.1.1	-	6.5	-		
	Other than EM-1100	Drum brake	7.2.1	7.2.2		-		
Helical-gear traction machine	EH-4200 EH-4500 EH-5100 EHB-5100 EH-6200 EHB-6200 EHC-6200 EH-6300 EHB-6300		Drum brake	7.3.1		7.3.2	6.5	-
	EH-4100 EHB-4100 EHC-4100 EHD-4100 EH-5400 EHB-5400 EHC-5400	Disk brake (1)						
	EH-3500 EH-3800	Disk brake (2)	7.4.1 7.4.2	-	7.4.3	-		
	EH-3700	Clutch brake	7.5.1	-	6.5	-		

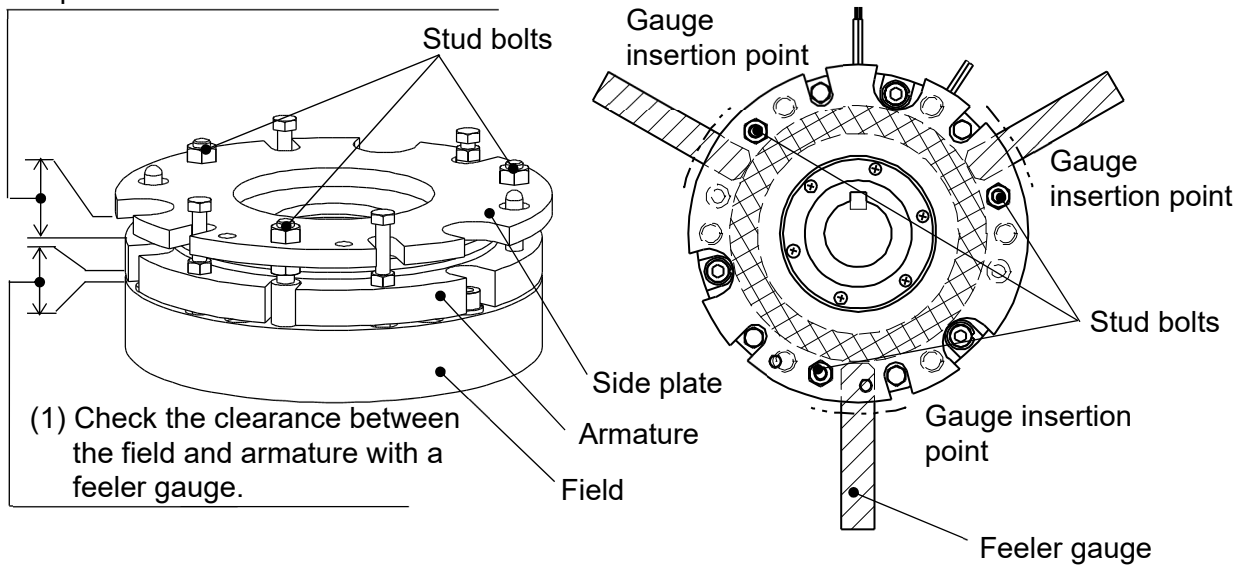
## 7.1 Worm-gear traction machine (EM-1100)

### 7.1.1 Checking coil stroke

- (1) Measure the clearance between the field and the armature at three stud-bolt positions with a feeler gauge, and check that the dimensions are within the range of standard clearance.

Traction machine type number	Standard clearance
EM-1100	0.20 mm or more and less than 0.35 mm The clearance at each stud-bolt position is within this range and is equal (the difference is 0.05 mm or less).

- (2) Check the clearance between the side plate and armature with a steel rule.



- (2) Measure the clearance between the top surface of the armature and the bottom surface of the side plate with a steel rule. Check that the entire clearance is 7.5 mm or more.

Traction machine type number	Standard clearance
EM-1100	Entire clearance is 7.5 mm or more. *If the clearance is 7.5 mm or less, replace the brake.



If the coil stroke is out of the standard range, replace the brake.

## 7.2 Worm-gear traction machine (Other than EM-1100)

### 7.2.1 Checking plunger stroke

Measure the plunger stroke with a steel rule and check that it is within the range below.\_

Control system	Traction machine type number	Brake type	Standard plunger stroke (mm)
AC-1, AC-2, AC-R AC1_EBS, AC1_BSC-1 AC1_BSC, BSC-1 ACE1LE, ACE2LE ACEE-1, ACEE-2 ACE1LEA, ACE2LEB ACEE-2A, ACEE-2B	EM-1600, EM-2400, EM-3600, EMX-3600, EMB-200, EMC-200, EME-200, EMF-200, EME-300, EMF-300, EMG-300, EMH-300, EMK-300, EML-300, EME-400, EMF-400, EMG-400, EMH-400, EMK-400, EMX-400, EME-500, EMH-500, EMK-500, EMJ-500, EM-600, EMB-600	Single brake	2.0 +/- 0.5
VF DL, VF DL-M, VF DL A VF DL A-M, VF EL, VF EL-M VF EL R, VF EL R M, VF EL R N VF EL R L, VF EL R K, VF GL VF GL B, VF GL B R, VF GL B R N VF GL B R M, VF GL B R M N	EM-1600, EM-3600, EMX-3600, EMB-200, EMC-200, EMF-200, EMF-400, EMG-400, EMK-400, EME-500, EMH-500, EMK-500, EMJ-500, EML-500, EM-600, EMB-600	Single brake Double-brake	3.0 +/- 0.5
	EM-2400	Double-brake	
VF CL	EM-1600, EM-3600, EMX-3600, EMJ-500, EMB-600	Single brake	3.0 +/- 0.5
VF CL A	EM-1600		
VF DL, VF DL-M, VF DL A VF DL A-M, VF EL, VF EL-M VF EL R, VF EL R M, VF EL R N VF EL R L, VF EL R K, VF GL VF GL B, VF GL B R, VF GL B R N VF GL B R M, VF GL B R M N	EME-200, EME-300, EMF-300, EMG-300, EMH-300, EMK-300, EML-300, EME-400, EMH-400, EMX-400	Single brake	2.0 +/- 0.5
	EM-2400	Single brake	
VF CL, VF CL A	EM-2400	Single brake	

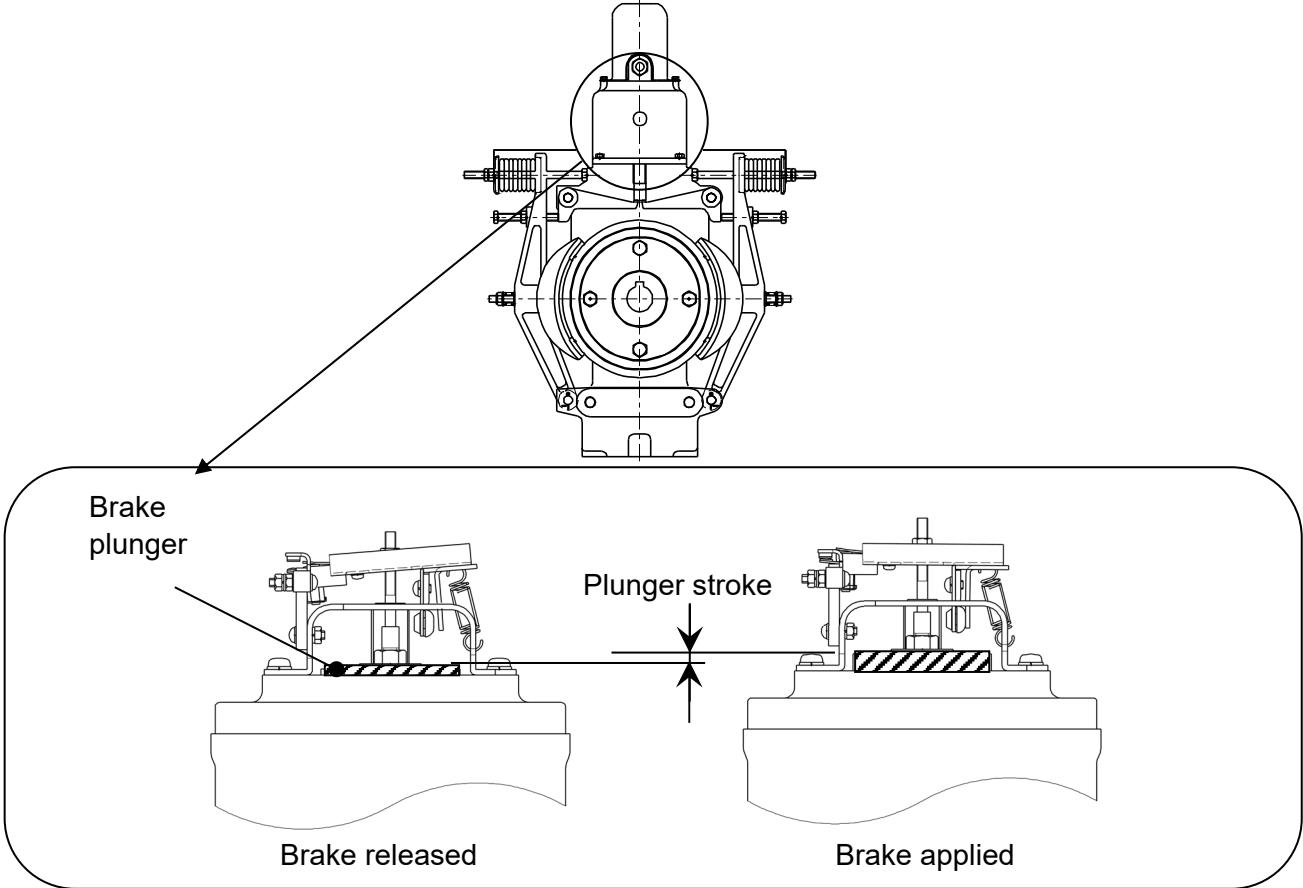


Check the traction machine type number on the nameplate attached on the traction machine.

Check the control system on the nameplate attached on the control panel.



If the plunger stroke is out of the standard range, adjust it and confirm the conformity in accordance with 7.2.2.



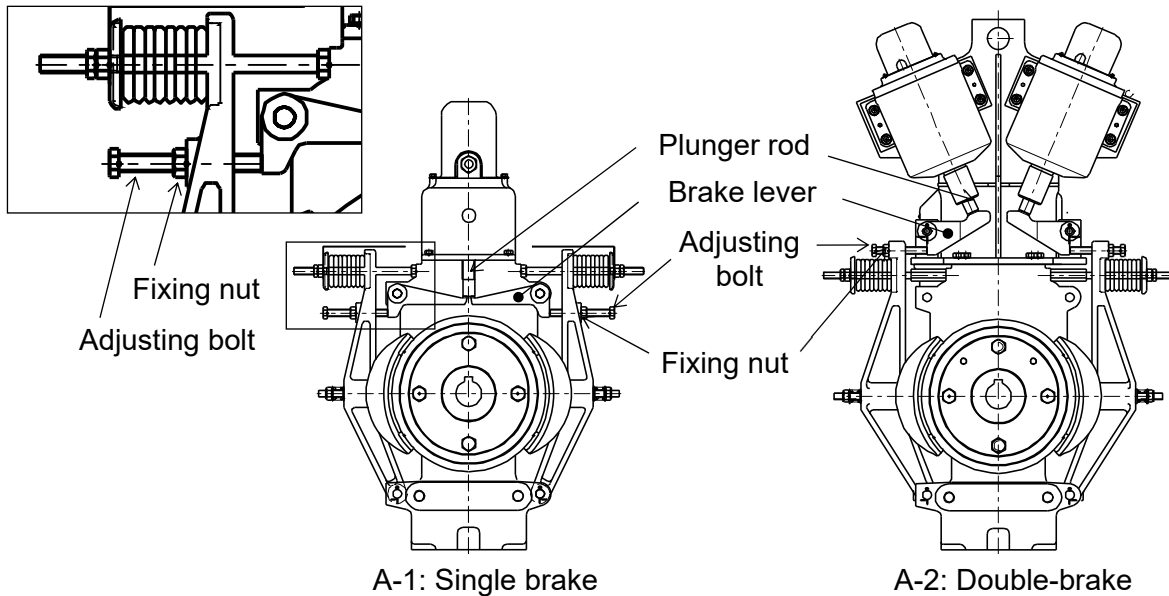
## **7.2.2 Adjusting plunger stroke**

### A-1: Procedure for single brake

Set the plunger stroke to the standard value with one of the adjusting bolts, and adjust the other adjusting bolt to make both brake levers come in contact with the plunger rod equally. Then, release the brake two or three times to check that the brake levers are in contact with the plunger rod equally.

### A-2: Procedure for double-brake

Set the plunger stroke of each brake to the standard value by adjusting the adjusting bolt.



After adjusting the plunger stroke in accordance with the procedure in A-1 or A-2, check the following (B) and (C).

### B: Checking that the adjusting bolt is locked

Fasten the fixing nut of the adjusting bolt to fix the adjusting bolt. Check that the fixing nut is fastened.

For single brake, if the adjusting bolt rotates, the plunger stroke changes and the brake levers are not in contact with the plunger rod equally. Be sure to check that the brake levers come in contact with the plunger rod equally. (See A-1.)

If the adjusting bolt of single brake or double-brake loosens, the brake may be applied. Therefore, be sure to fasten the adjusting bolt firmly with the fixing nut.

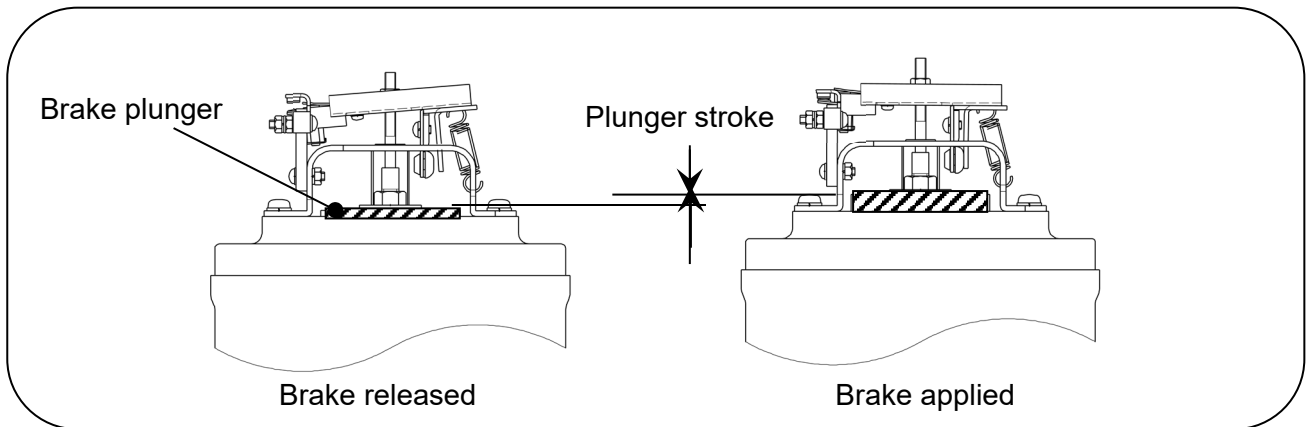
### C: Checking that the linings are not rubbing against the brake drum (or disk) while the elevator is running

After fixing the adjusting bolt, move the elevator up and down in manual operation and check that the linings are not rubbing against the brake drum (or disk). If the linings are rubbing against the brake drum (or disk), inspect them in accordance with 8.2.


**7.3 Helical-gear traction machine (Other than EH-3500, EH-3700 and EH-3800)**

**7.3.1 Checking plunger stroke**

Traction machine type number	Brake type	Standard value of plunger stroke (mm)	
EH-4200 EH-4500	Drum brake	2.0 +/- 0.5	
EH-5100 EHB-5100 EH-6200 EHB-6200 EHC-6200 EH-6300 EHB-6300		2.5 +/- 0.5	
EH-4100 EHB-4100 EH-5400 EHB-5400 EHC-5400		Disk brake	3.0 +/- 0.5
EHC-4100 EHD-4100			3.5 +/- 0.5



**7.3.2 Adjusting plunger stroke**

 If the plunger stroke is out of the standard range, adjust and check it in accordance with 7.2.2.

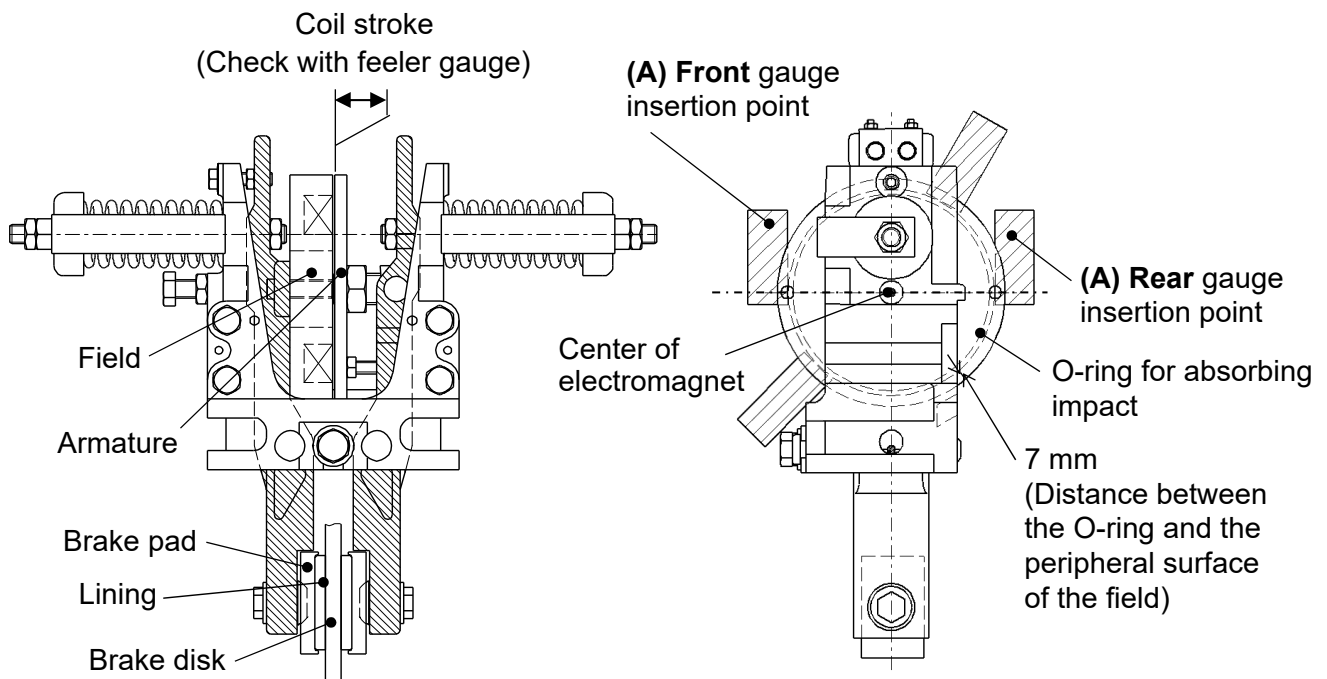


## 7.4 Helical-gear traction machine (EH-3500 and EH-3800)

### 7.4.1 Checking coil stroke

Insert the feeler gauges simultaneously into the clearance (A) between the field and the armature at two points (front and rear) on the horizontal line passing through the center of the electromagnet. Check that the clearance is within the standard clearance range below.

Traction machine type number	Standard clearance (feeler gauge thickness)
EH-3500	0.6 mm or more and less than 1.0mm
EH-3800	The feeler gauge of 0.6 mm can be inserted and one of 1.0 mm cannot be inserted at two points described above.



**Danger**

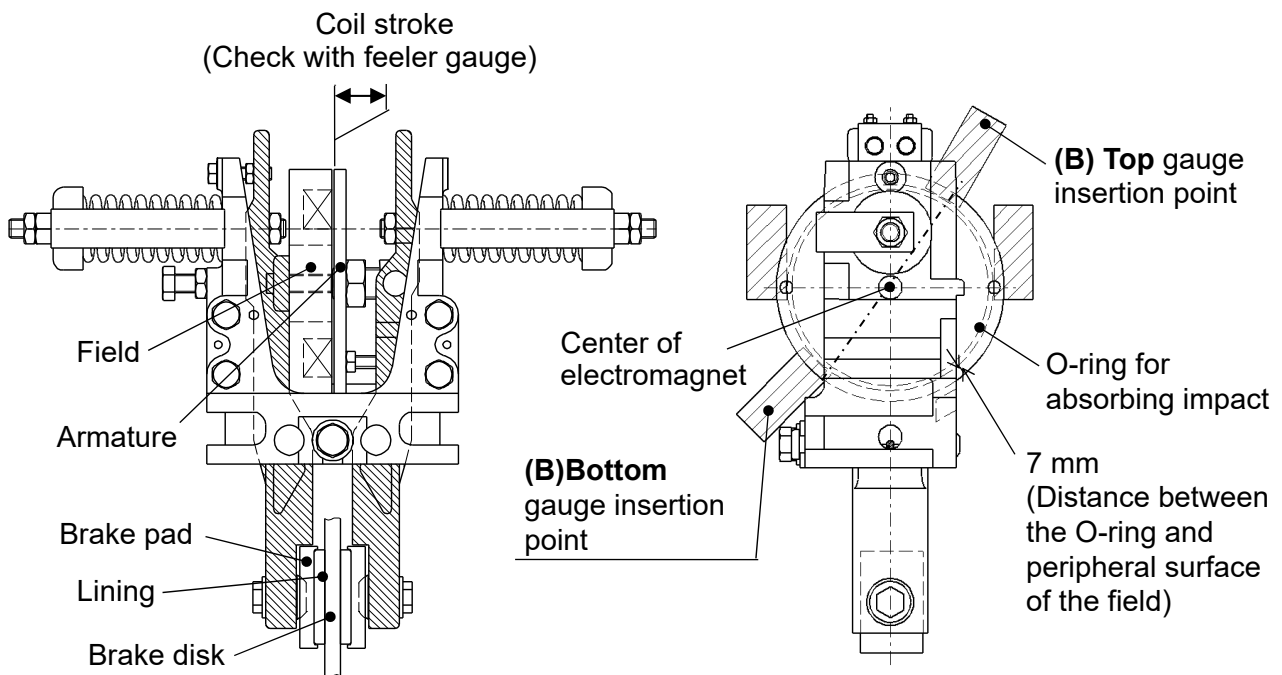


Do not insert the feeler gauge 7 mm or deeper because an O-ring for absorbing impact of brake operation is installed in a depth of 7 mm from the peripheral surface of the field.

### 7.4.2 Checking parallelism between field and armature

Insert the feeler gauges into the clearance (B) between the field and the armature at two points (top and bottom) on the vertical line passing through the center of the electromagnet. Check that the clearance is within the standard clearance range below.

Traction machine type number	Standard clearance (feeler gauge thickness)
EH-3500	0.6 mm or more and less than 1.0 mm
EH-3800	The feeler gauge of 0.6 mm can be inserted and one of 1.0 mm cannot be inserted at two points described above.



Do not insert the feeler gauge 7 mm or deeper because an O-ring for absorbing impact of brake operation is installed in a depth of 7 mm from the peripheral surface of the field.



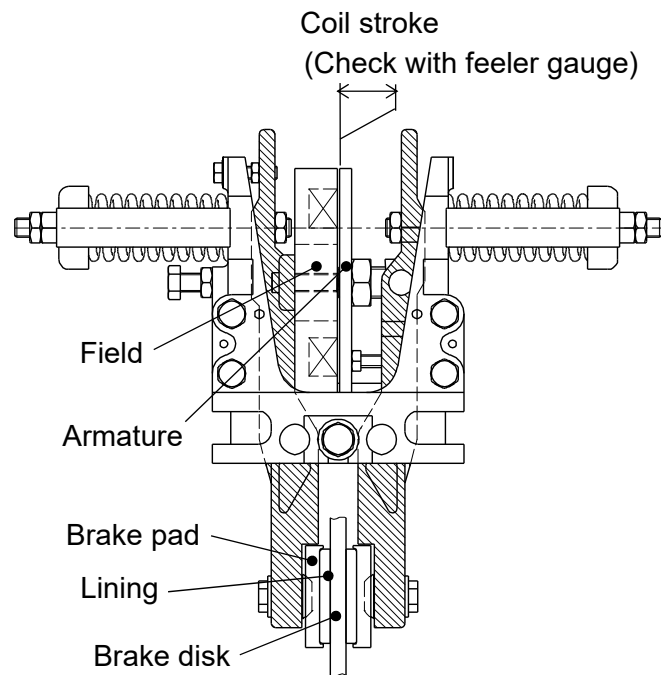
Insert the feeler gauge gently into the clearance on the top side because the armature inclines and the clearance becomes large if the feeler gauge is inserted forcibly.

### **7.4.3 Checking lining clearance**

Check that the brake disk does not interfere with the brake pads when the electromagnetic coil is energized and the brake is released. Also, check that the clearances between the brake disk and right and left linings are almost the same.



If any of the dimensions measured in 7.4.1, 7.4.2 and 7.4.3 is out of allowable range, replace the brake.



## 7.5 Helical-gear traction machine (EH-3700)

### 7.5.1 Checking coil stroke

- (1) Measure the clearance between the field and armature at three stud-bolt positions with a feeler gauge, and check that the dimensions are within the standard clearance range.

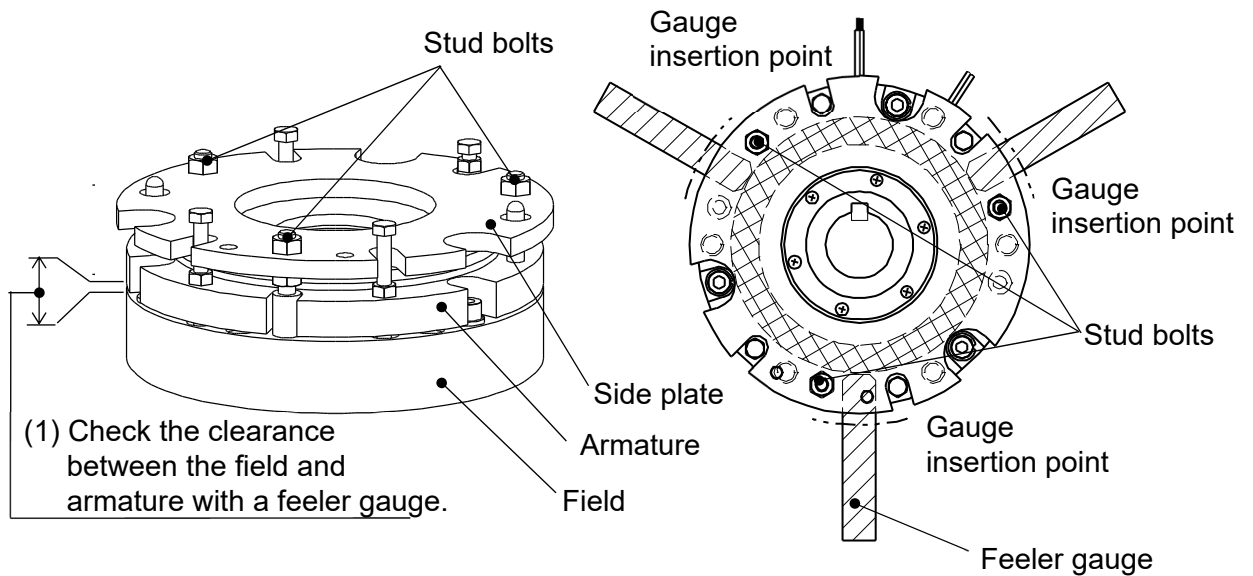
Traction machine type number	Standard clearance
EH-3700	0.15 mm or more and less than 0.25 mm Check that the feeler gauge of 0.15 mm can be inserted and one of 0.25 mm cannot be inserted in the clearance at the three stud-bolt positions.



If the dimensions are out of the standard range, replace the brake.



If any of the clearance at three stud-bolt positions is 0.35 mm or more, take the elevator out of service.



## 8. Inspection of functions and maintenance

### 8.1 Inspecting brake arm (Other than EM-1100 and EH-3700)



**Danger**



Before inspection, close the car and landing doors, let the counterweight overrun the bottom floor and shut off the power.

- (1) Clean the brake arm pin and its sliding part. Check that there is no damage on the sliding surface and apply Mitsubishi elevator oil No. 52.

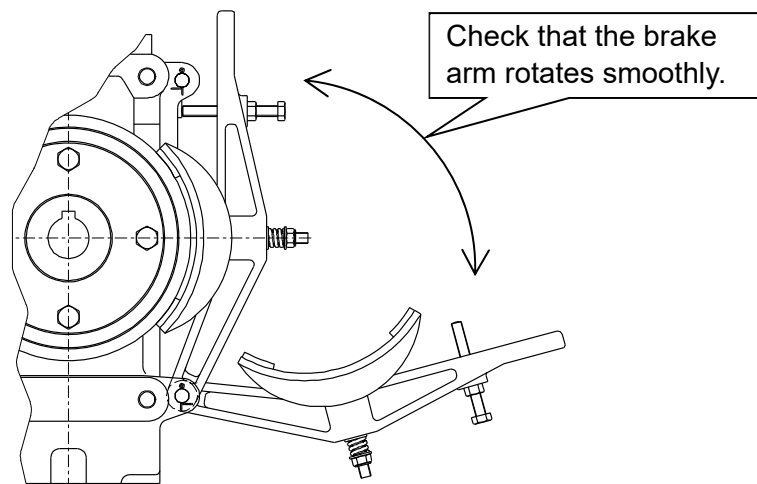


**Danger**



Keep the brake drum and disk clear of oil. Oil adhesion can cause a great danger of decrease in brake torque.

- (2) Mount the brake arm pin on the brake arm and check that the brake arm rotates smoothly.
- If there is a scratch on the surface, remove it with sandpaper #400 or greater, wipe the surface with a cloth and apply Mitsubishi elevator oil No. 52.
  - If the brake arm does not rotate smoothly, a foreign object may be caught in the sliding part or the sliding resistance between the brake arm and the gear box may have increased. In that case, clean the sliding part or adjust the position of the brake arm by replacing the spacers on the ends of the brake arms.





## Caution



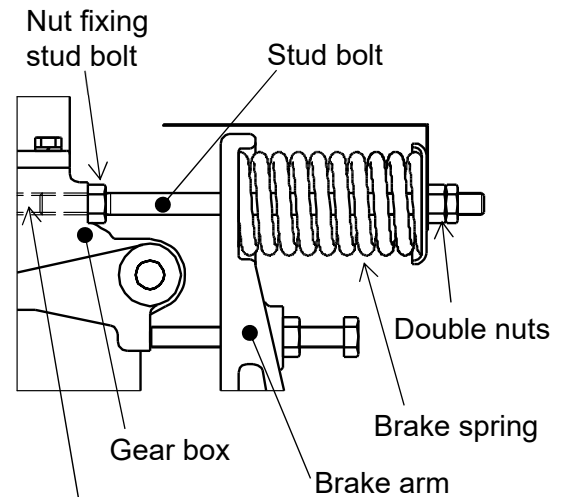
To prevent the internal thread of gear box from being damaged, do not remove the brake arm by loosening only the nut fixing the stud bolt of brake spring.

### Procedure for removing stud bolt:

- 1) Loosen the double nuts on the stud bolt.
- 2) Uncompress the brake spring.
- 3) Loosen the nut fixing the stud bolt.
- 4) Remove the stud bolt from the gear box.
- 5) Remove the stud bolt from the hole on the brake arm.

### Procedure for mounting stud bolt:

- 1) Pass the stud bolt through the hole on the brake arm.
- 2) Attach the stud bolt into the threaded hole of the gear box.
- 3) Fasten the nut fixing the stud bolt.
- 4) Compress the brake spring to a specified length.
- 5) Fasten the double nuts on the spring.  
Check the plunger stroke.
- 6) If the line marked on the bolt, nuts and holder is not aligned, delete it and mark a new line.

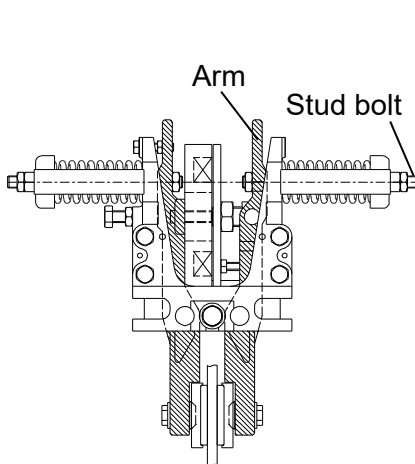


Be careful not to damage the internal thread.

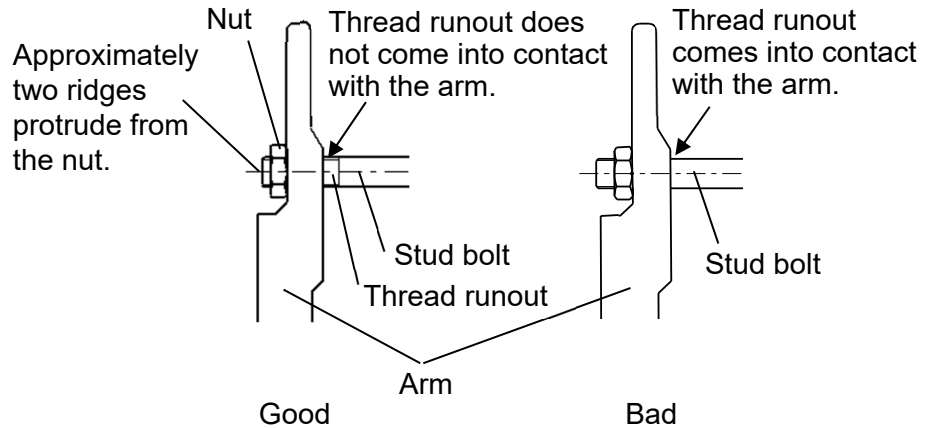


Do not tighten the brake arm or the nut up to the thread runout of the stud bolt. If stress is concentrated on the thread runout portion, fatigue fracture may occur at the portion after repeated brake operation.

- 1) Traction machine with thread runout where stress concentration occurs owing to interference with brake arm: EH-3500, EH-3800, EH-4100, EHB-4100, EHC-4100, EHD-4100 and EH-5400

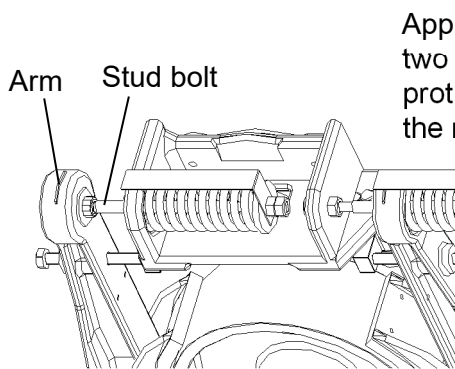


Components of brake device  
(Example: EH-3800)

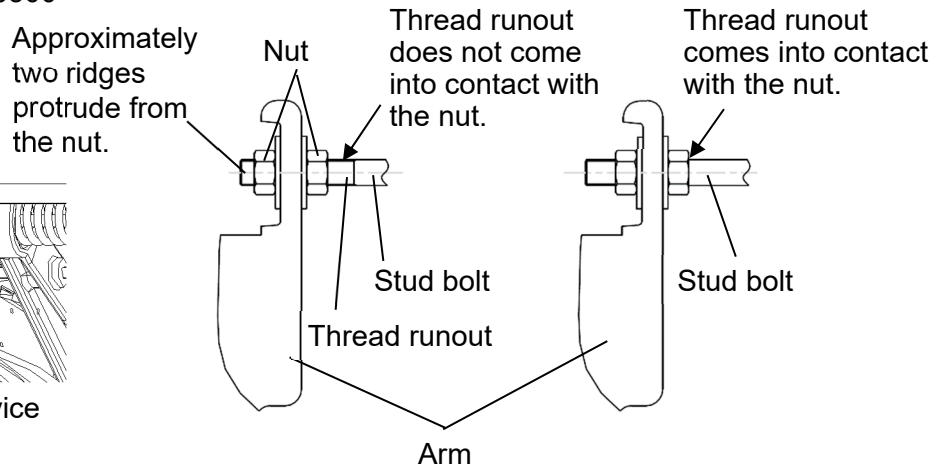


Instructions on stud bolt installation  
(Example: EH-3800)

- 2) Traction machine with thread runout where stress concentration occurs owing to interference with nut: EH-4200, EH-4250, EH-4260, EH-5100, EHB-5100, EH-6200, EHB-6200, EHC-6200, EH-6300 and EHB-6300



Components of brake device  
(EHB-6300)



Instructions on stud bolt installation  
(Example: EHB-6300)

## 8.2 Inspecting brake shoe and spherical surface (Other than EM-1100 and EH-3700)



**Danger**



Before inspection, close the car and landing doors, let the counterweight overrun the bottom floor and shut off the power.

- (1) Clean the spherical surface of the brake shoe and the bearing surface of the brake arm (where the sphere fits into), and check that there is no scratch on both surfaces. Then, apply Mitsubishi elevator oil No. 5 on the surfaces.
- (2) After checking the surfaces, check that the brake shoe can be moved up and down smoothly by hand.
- (3) If there is a scratch on the surface, remove it with sandpaper #240 or greater, and apply Mitsubishi elevator oil No. 5.



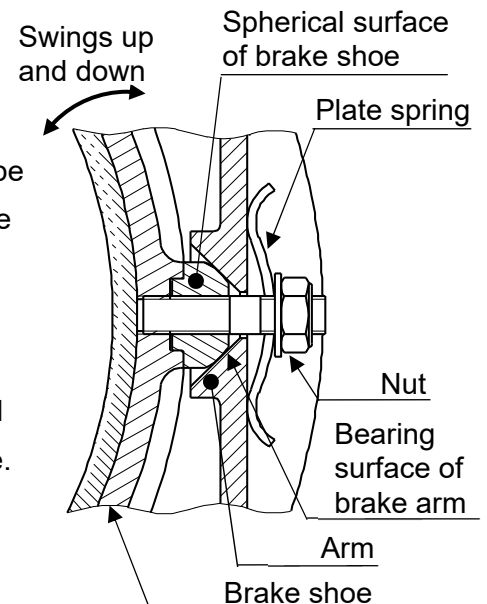
Be sure to check the brake shoe is swung by hand. It is desirable that the brake shoe moves lightly and does not move by the weight of its own.

- (4) If the brake shoe does not swing by hand or it swings by the weight of its own, adjust it again as follows.

- (A) For EMB-200, EMC-200 and EME-200:

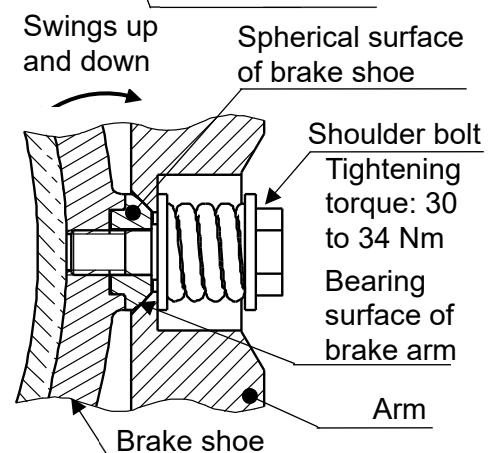
Tighten the nut until it comes in contact with the plate spring. Then, loosen the nut so that the brake shoe can be swung up and down by hand and it does not swing by the weight of its own.

This inspection is applicable to the traction machines equipped with the brake shoes with spherical surface. Note that some of the traction machines in EMB-200 and EMC-200 do not use a brake shoe with spherical surface.



Some of the traction machines in EME-200 do not use a brake shoe with plate spring. For the adjustment procedure of those traction machines, check (C).

- (B) For EM-1500, EM-1600, EH-5100, EHB-5100, EH-6200, EHB-6200, EHC-6200, EH-6300 and EHB-6300: Tighten the shoulder bolt at a torque of 30 to 34 Nm. Then, the brake shoe swings up and down. If the shoulder bolt loosens, the brake shoe comes off and it causes an accident. Therefore, be sure to check that the bolt is not loose.



**Danger**



If the shoulder bolt is loose, tighten it with a torque of 30 to 34 Nm.



(C) For other traction machines equipped with drum brake:

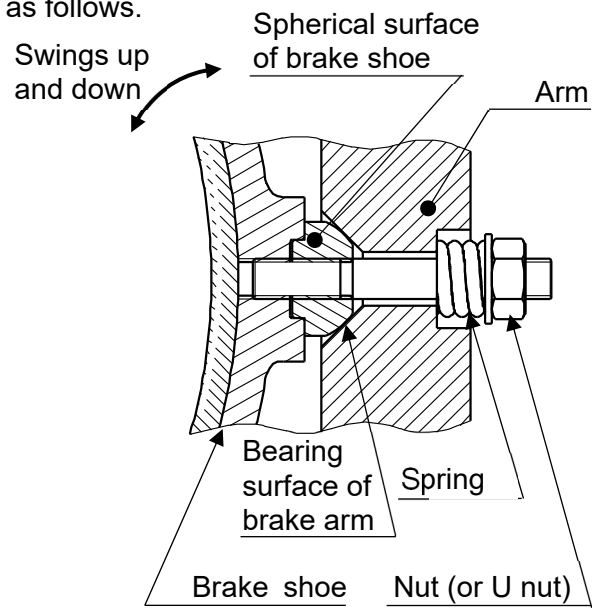
Tighten the nut (U nut) until the spring is fully compressed. Then, adjust the brake shoe by turning the nut reversely several times.

The number of times of turning reverse is as follows.

- |                 |   |           |
|-----------------|---|-----------|
| EME-200         | } | Once      |
| EMF-200         |   |           |
| EML-300         |   |           |
| EMH-400         | } | 1.5 times |
| EM-2400 (SB/DB) |   |           |
| EM-3600 (SB/DB) |   |           |
| EMJ-500 (SB/DB) |   |           |
| EMB-600 (SB/DB) |   |           |

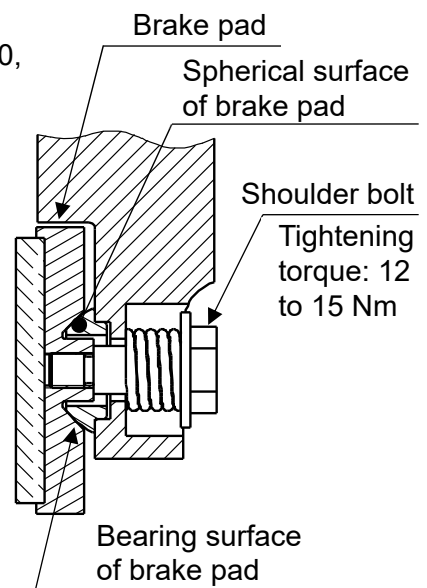
\*SB: single brake

\*DB: double brake



(D) For EH-3500, EH-3800, EH-4100, EHB-4100, EHC-4100, EHD-4100, EH-5400, EHB-5400 and EHC-5400 (equipped with disk brake):

The brake pad is fixed with the shoulder bolt. If the bolt loosens, the brake pad comes off and it causes an accident. Therefore, be sure to check that the bolt is not loose.



**Caution**



The head size of the shoulder bolt is equal to M10 bolt, but the thread is equal to M8 bolt. Tighten the bolt with a torque of 12 to 15 Nm so as not to cut off the thread.



**Danger**



If the shoulder bolt is loose, tighten it with a torque of 12 to 15 Nm.

### 8.3 Inspecting lining (Other than EM-1100 and EH-3700)



**Danger**



Before inspection, close the car and landing doors, let the counterweight overrun the bottom floor and shut off the power.

(1) Check that oil is not adhering to the friction surface of the lining.

If oil is adhering to the surface, follow the procedure below.

- 1) Replace the brake shoe or pad.
- 2) Clean the brake drum or disk. (See 8.5.)
- 3) Carry out fitting the brake to move the elevator and make an emergency stop several times.  
Check the brake torque. See 10 for brake torque check method.



**Danger**



Keep the brake drum and disk clear of oil. Oil adhesion can cause a great danger of decrease in brake torque.

(2) If the thickness of the lining does not meet the standard value of the remaining thickness set by us, replace the lining. Please refer to maintenance manual published on our website for “Remaining Thickness Standard for Brake Pad of Traction Machine”.



For a worm-gear traction machine, be sure to replace the entire brake shoes or pads on both right and left sides at the same time when replacing the lining.

(3) Check that there is no crack on the lining.

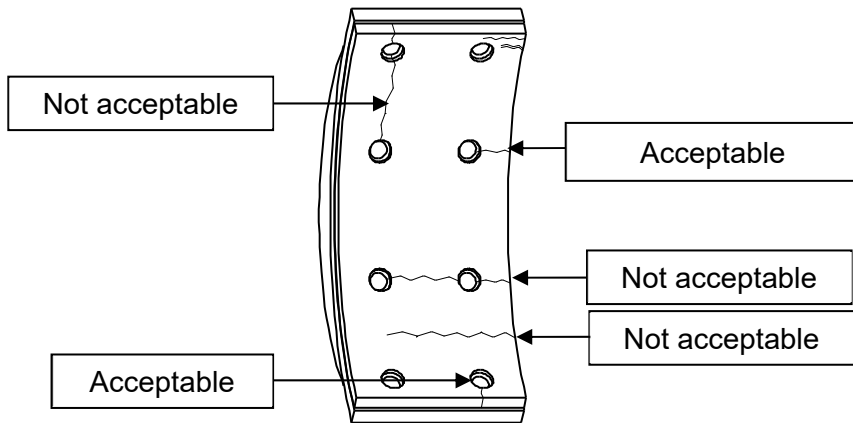
If there is a crack, check if it is acceptable or not, referring to the figure below. If the crack is not acceptable, replace the brake shoe or pad.



**Danger**



After replacing the lining, be sure to fit the brake by moving the car several times.



(4) Check that the rivet or countersunk screw is not loose or broken.

If it is loose or broken, replace the brake shoe or pad.

(5) Check that at least 90% of the lining surface comes into contact with the brake drum or disk.



**Danger**

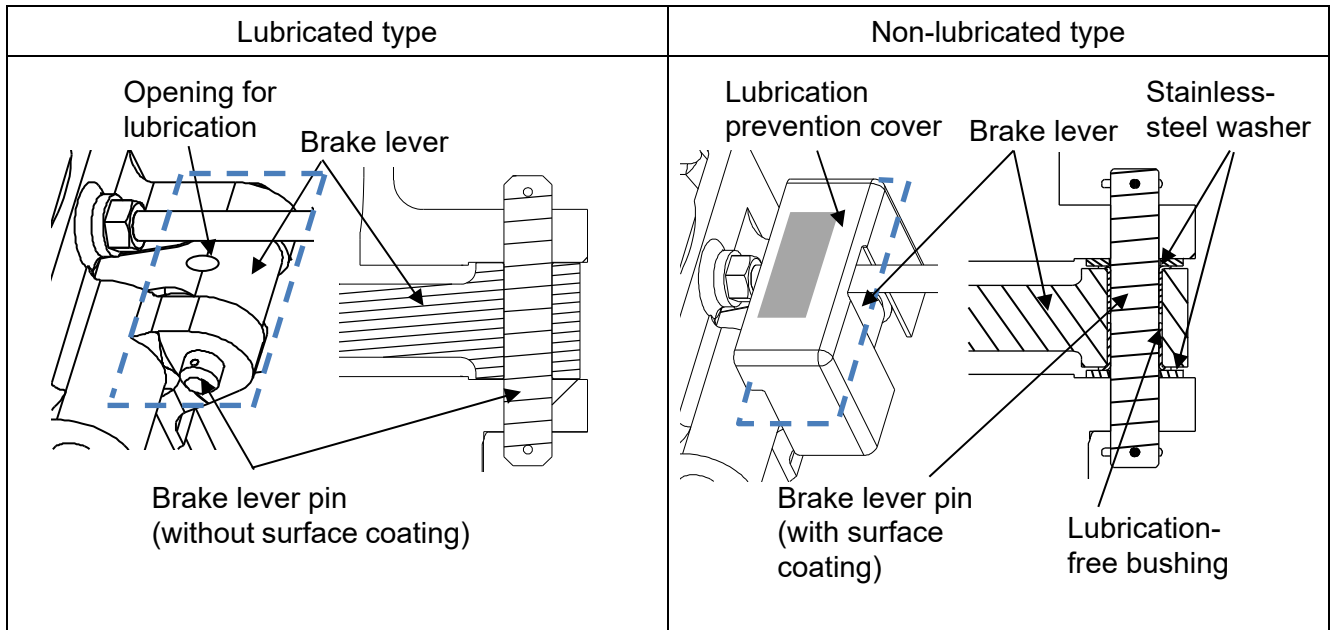


If the lining surface comes into contact with the brake drum or disk less than 90%, make an adjustment by moving the car several times to increase the contact surface to at least 90%.

## 8.4 Disassembling and inspecting brake lever (Other than EM-1100, EH-3500, EH-3700 and EH-3800)



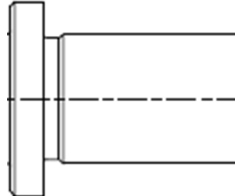
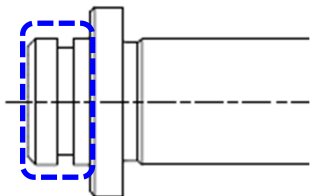
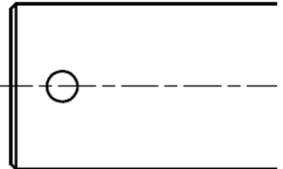
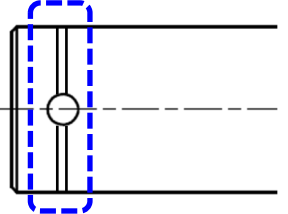
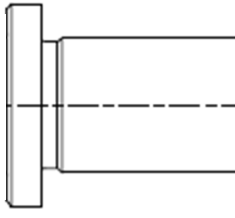
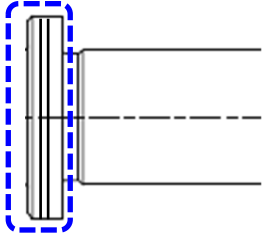
The brake lever is classified into two types: lubricated type and non-lubricated type. If the existing brake lever type is a lubricated type, it can be changed to a non-lubricated type by replacing the brake lever and the brake lever pin. Since the maintenance method differs depending on the type, maintain the brake lever in accordance with this manual.

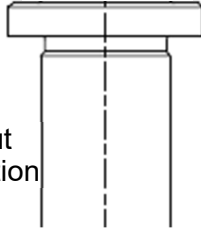
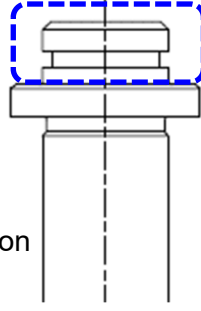


To change the brake lever from a lubricated type to non-lubricated type, replace the brake lever, the brake lever pin and the lubrication prevention cover at the same time.



To identify the brake lever type, check if a projection or a V-shaped groove is provided on the edge of the brake lever pin.

Traction machine type	Traction machine type number	Brake type	Shape of brake lever pin edge	
			Lubricated type	Non-lubricated type
Worm-gear traction machine	EM-1500 EM-1600 EME-200 EMB-200 EMC-200 EMF-200	Single brake	 Without projection	 With projection
	EM-2400 EM-3600 EMX-3600 EMJ-500 EML-500 EM-600 EMB-600	Single brake  Double-brake	 Without V-shaped groove	 With V-shaped groove
	EME-300 EMF-300 EMG-300 EMH-300 EMK-300 EML-300 EMH-500 EMX-400 EMH-500 EME-400 EMF-400 EMG-400 EMK-400 EME-500 EMK-500	Single brake		
	EM-1500 EM-1600	Double-brake	 Without V-shaped groove	 With V-shaped groove

Traction machine type	Traction machine type number	Brake type	Shape of brake lever pin edge	
			Lubricated type	Non-lubricated type
Helical-gear traction machine	EH-4100 EHB-4100 EHC-4100 EHD-4100 EH-5400 EHB-5400 EHC-5400	Disk brake	 <p>Without projection</p>	 <p>With projection</p>
	EH-4200 EH-4500 EH-5100 EHB-5100 EH-6200 EHB-6200 EHC-6200 EH-6300 EHB-6300	Drum brake		

### 8.4.1 Disassembling and inspecting lubricated brake lever



**Danger**



Before disassembly and inspection, close the car and landing doors, let the counterweight overrun the bottom floor and shut off the power.



**Danger**



Lack of inspection and cleaning of the brake lever pin can increase the sliding resistance of the brake lever and consequently can cause a great danger of decrease in brake torque.

#### (1) Removing brake lever and brake lever pin

Pull out the brake lever pin, and remove the brake lever from the gear box or the mounting plate. If a washer is attached, remove it and keep it securely. As for the traction machine EM-3600, EMJ500 and EMB-600 with a single brake, however, the brake lever pin cannot be removed because it comes into contact with the sheave and the motor mounting plate; slide the pin to the shaft as much as possible.

#### (2) Cleaning brake lever and brake lever pin

##### 1) Brake lever pin

Clean the brake lever pin and the inside of the brake lever pin hole, and check that there is no rust, scratch or wear on the pin and the inside of the pin hole. Apply a small amount of Mitsubishi elevator oil No. 52 on the surface of the pin.

##### 2) Contact surface with adjusting bolt

Clean the contact surface of the brake lever with the adjusting bolt and visually check wear on the contact surface. If there is no wear, apply a small amount of Mitsubishi elevator oil No. 5.



**Danger**



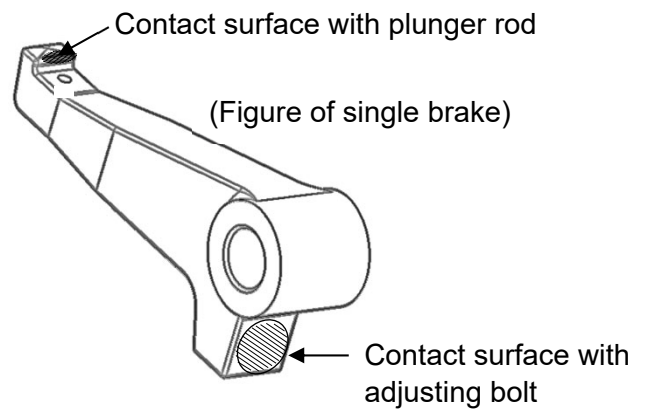
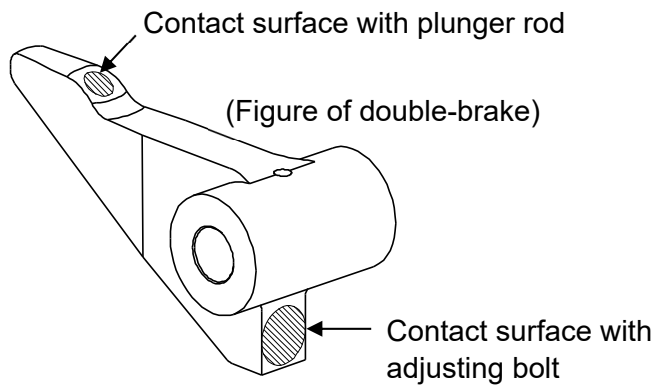
If the surface has been worn down approximately 0.5 mm in depth, replace the brake lever and the adjusting bolt, which has been subject to repetitive bending force.



**Danger**



Keep the brake drum or disk clear of oil. Oil adhesion can cause a great danger of decrease in brake torque. Do not apply oil too much to prevent it from dripping onto the brake drum or disk. If oil is adhering to the brake drum or disk, the mounting plate (double-brake only) or the grease guide (EM-1600 equipped with double-brake), clean it off in accordance with 8.5.



### 3) Contact surface with plunger rod

Clean the contact surface of the brake lever with the plunger rod and visually check wear on the contact surface. If there is no wear, apply a small amount of Mitsubishi elevator oil No. 5.



**Danger**



If it is worn out so badly as to create a level difference with a surface without wear, replace the brake lever.



**Danger**



Keep the brake drum or disk clear of oil. Oil adhesion can cause a great danger of decrease in brake torque.  
Do not apply oil too much to prevent it from dripping onto the brake drum or disk. If oil is adhering to the brake drum or disk or the mounting plate (double-brake only), clean it off in accordance with 8.5.



If there is a scratch or wear on the tip of the plunger rod, disassemble the brake lever and check it in further detail.

### (3) Setting brake lever and brake lever pin

Set the brake lever and the pin to the original position. Lift the plunger by hand and check that the brake lever drops by the weight of its own, or push the lever by finger and check that it moves smoothly.



Do not reuse the split pin.

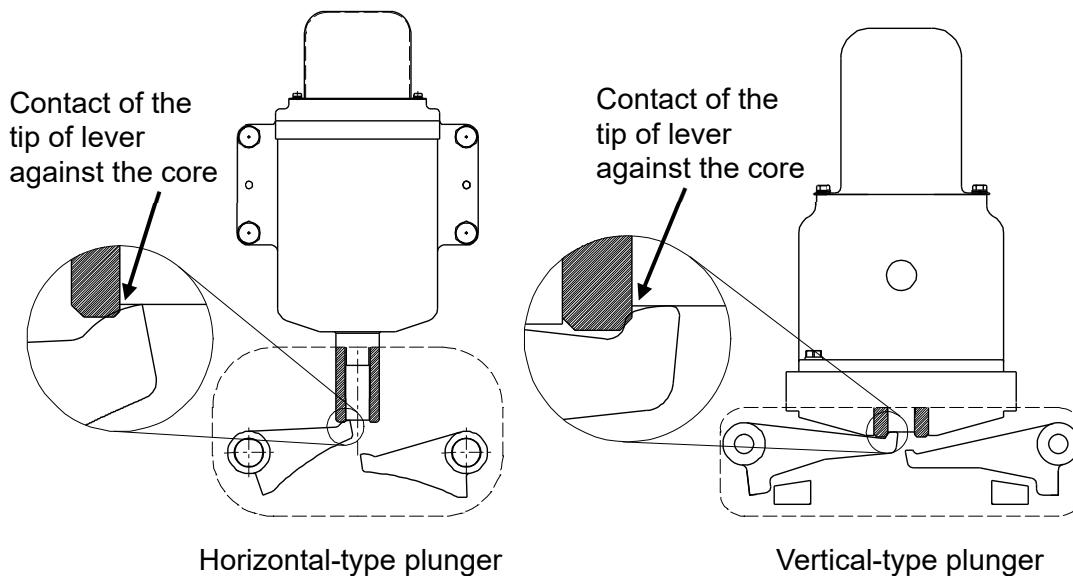


**Danger**



Keep the tip of the brake lever off the core when checking the lever movement. A contact between the brake lever tip and the core can deform the core and increase the sliding resistance of the plunger, and may consequently decrease the brake torque. If a contact has occurred, check that the plunger moves smoothly.





### 8.4.2 Disassembling and inspecting non-lubricated brake lever



**Danger**



Before disassembly and inspection, close the car and landing doors, let the counterweight overrun the bottom floor and shut off the power.

#### (1) Checking brake lever movement

Lift the plunger by hand and check that the brake lever whose tip is lifted drops by the weight of its own, or push the lever by finger and check that it moves smoothly.



If there is no problem with the movement of the brake lever pin, the periodic disassembly and cleaning are not required. If there is any abnormality in movement of the brake lever pin, if any of the following environmental conditions applies, or if the brake drum has rusted badly, disassemble and clean the brake lever in accordance with the procedure in (2) and (3) below.

Category	Environmental condition
Wind and rain	Wind and rain enter the machine room.
Ambience	There is hazardous chemical gas (hydrogen sulfide gas, sulfurous acid gas, hydrogen chloride gas, chlorine gas and ammonia gas), salty wind and dirt (iron dust, coal dust and dust in a chemical plant) that can wear or corrode metal.
Humidity	There is icing and condensation.

#### (2) Removing brake lever and brake lever pin

Pull out the brake lever pin, and remove the brake lever from the gear box or the mounting plate. As for a traction machine EM-3600, EMJ-500 or EMB-600 with a single brake, however, the brake lever pin cannot be removed because it comes in contact with the sheave or the motor mounting plate; slide the pin to the shaft as much as possible.

(3) Cleaning brake lever and brake lever pin

1) Brake lever pin

Clean the brake lever pin and the inside of the brake lever pin hole with a cloth, and check that there is no rust and scratch on the pin and the inside of the pin hole.



Do not sand the brake lever pin or apply oil on the pin.



Do not sand the inside of the brake lever pin hole or apply oil on the pin hole.



If there is any abnormality such as rust and scratch on the brake lever pin and the inside of the brake lever pin hole, replace the brake lever pin and the brake lever.

2) Contact surface of brake lever with adjusting bolt

Same as the procedure for the lubricated brake lever in 8.4.1 (2) 2).

3) Contact surface of brake lever with plunger rod

Same as the procedure for the lubricated brake lever in 8.4.1 (2) 3).

(4) Setting brake lever and brake lever pin

Set the brake lever pin to the original position. Lift the plunger by hand and check that the brake lever whose tip is lifted drops by the weight of its own, or push the lever by finger and check that it moves smoothly.



Check that the brake lever is aligned with the center of the plunger. If the brake lever is not aligned with the center of the plunger, adjust it by replacing the washers so that the brake lever comes into contact with the center of the plunger.



**Danger**



Do not insert too many metal washers. If too many washers are inserted, the brake lever may not move smoothly.



**Danger**



If the washer is rusty badly or deformed, replace it with a new one.



Be sure to mount the stainless-steel washers to protect the sliding surface covered with resin coating. Face the surface with the rounded edge outside.



If it is difficult to insert the brake lever pin into the hole of the gear box, or if there is any protrusion in the hole of the gear box, remove the protrusion and sand the hole surface with sandpaper #1000 or greater and wipe the surface with a cloth carefully.



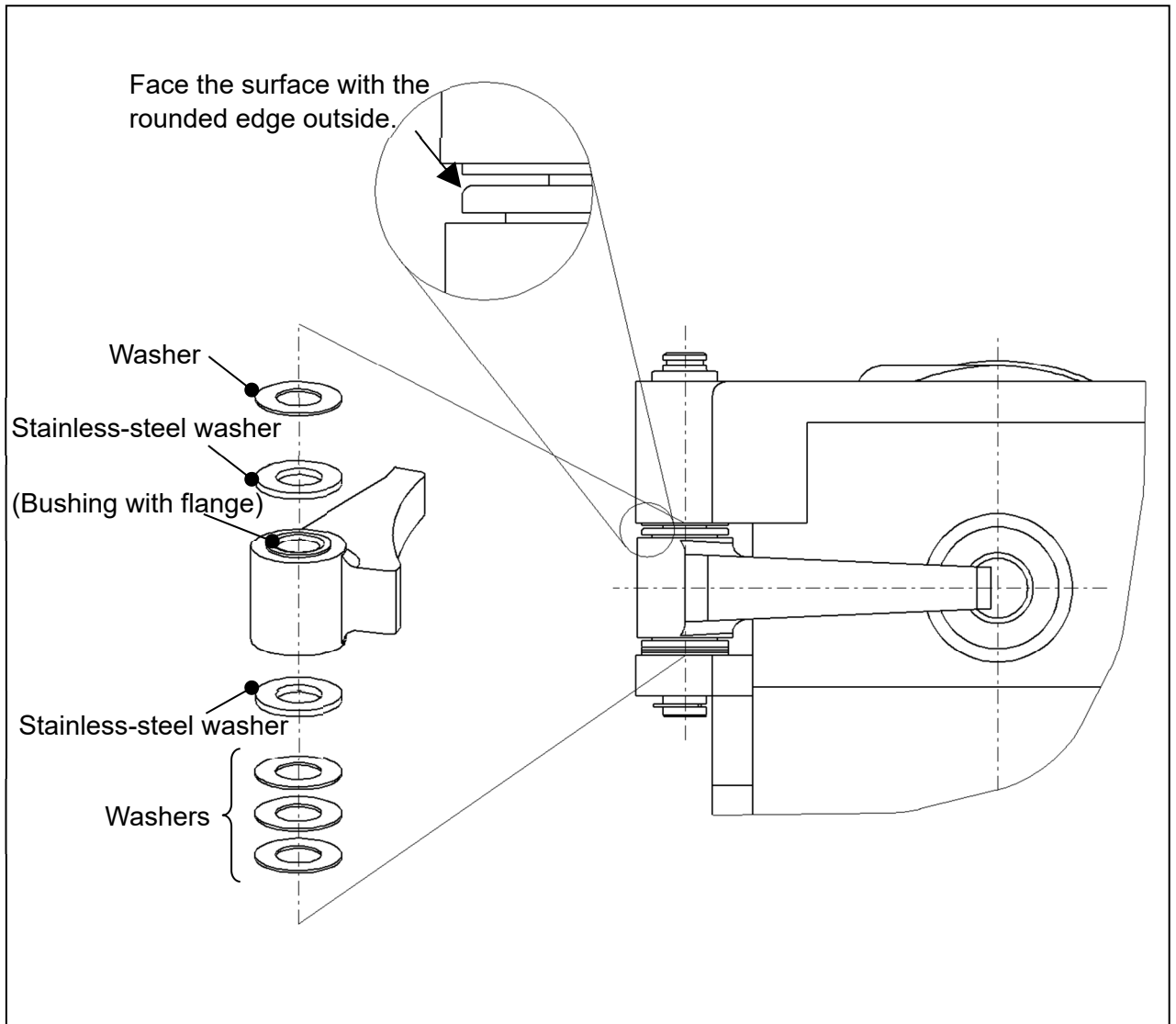
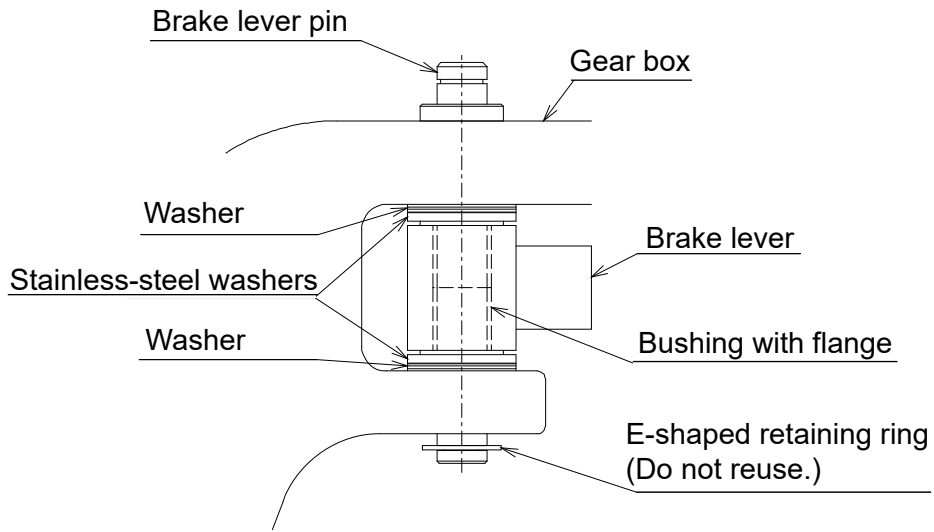
Do not insert the brake lever pin forcibly by using a tool such as hammer to prevent the coating of the brake lever pin from peeling off.



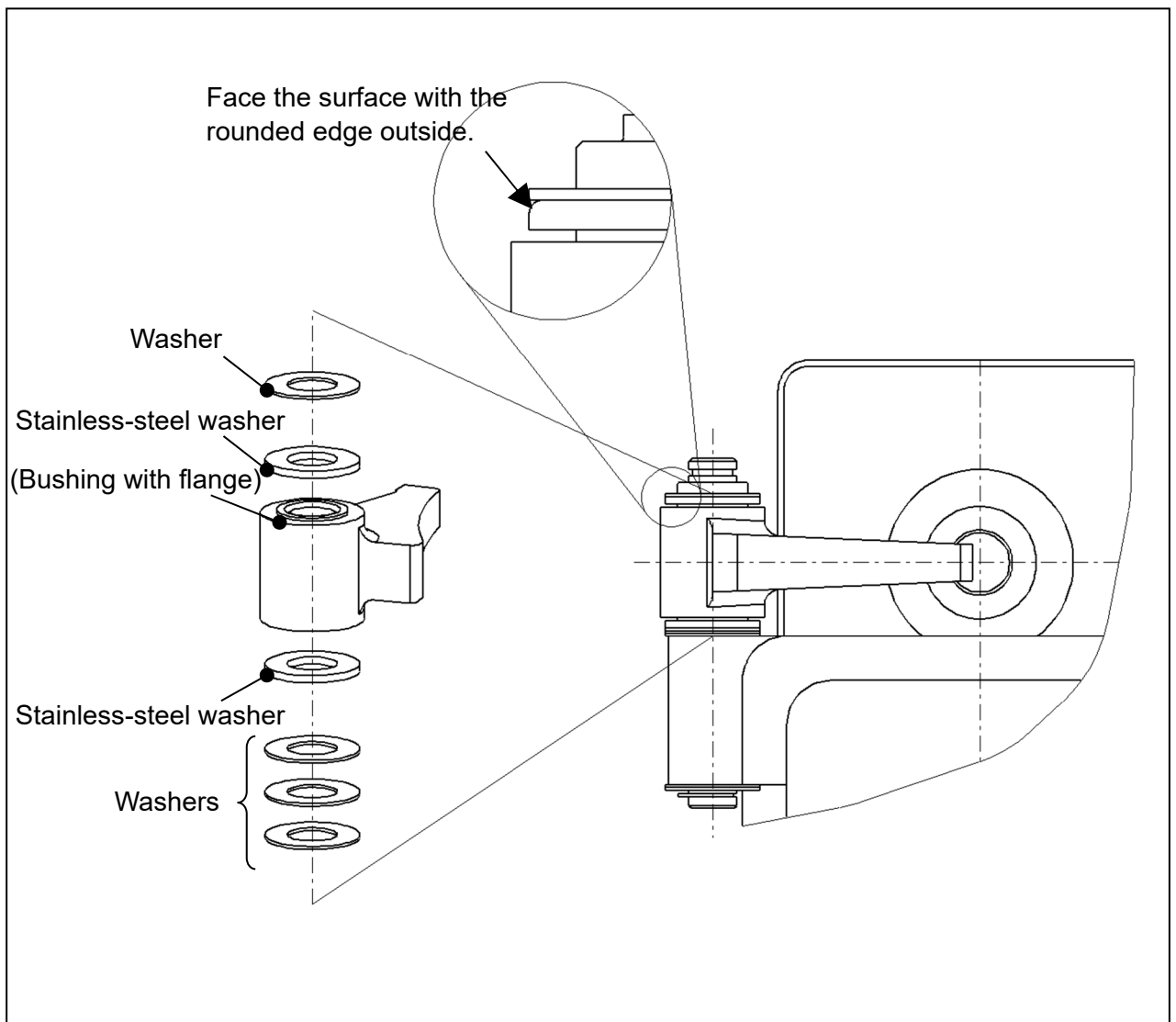
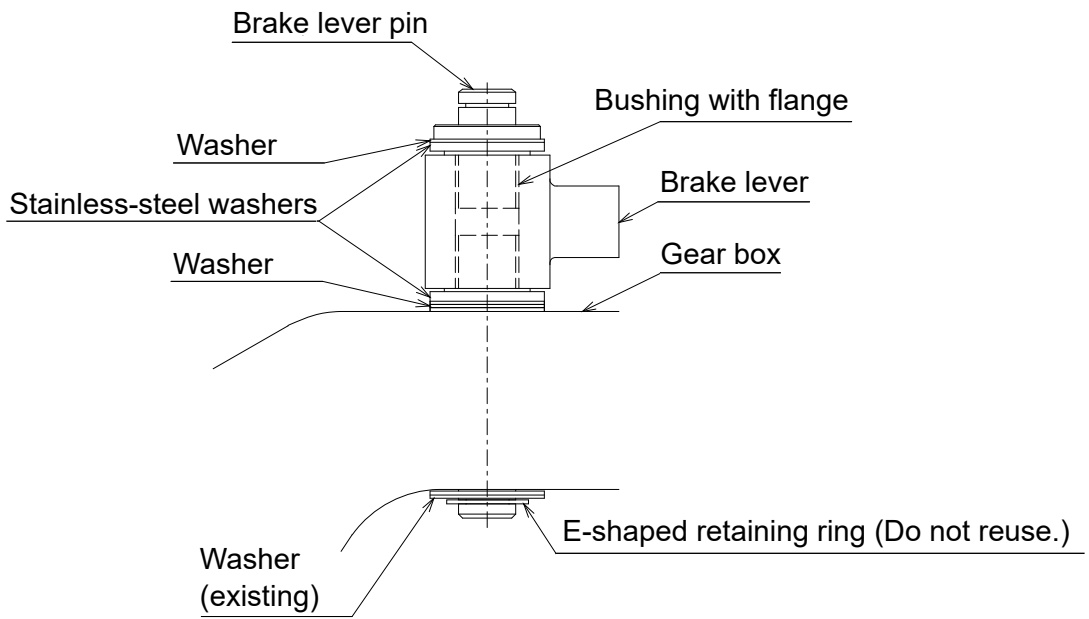
Do not reuse the split pins and E-shaped retaining rings.

Traction machine type	Brake type	Traction machine type number	Referral section
Worm-gear traction machine	Single brake	EMB-200, EMC-200, EME-200, EMF-200	3a)
		EM-1500, EM-1600	3b)
	Double-brake	EM-1500, EM-1600	3c)
	Single brake	EM-2400, EME-300, EMF-300, EMG-300 EMH-300, EMK-300, EML-300, EMK-400 EME-500, EMK-500, EM-600, EMB-600	3d)
		Double-brake	
	Single brake	EM-3600, EMX-3600, EME-400, EMF-400 EMG-400, EMH-400, EMX-400, EMH-500 EMJ-500	3e)
		Double-brake	
Helical-gear traction machine	Disk brake	EH-4100	3f)
	Drum brake	EH-4200	
	Disk brake	EHB-4100, EHC-4100, EHD-4100	3g)
		Drum brake	
	Disk brake	EH-5400	3h)
	Disk brake	EHB-5400, EHC-5400	3i)

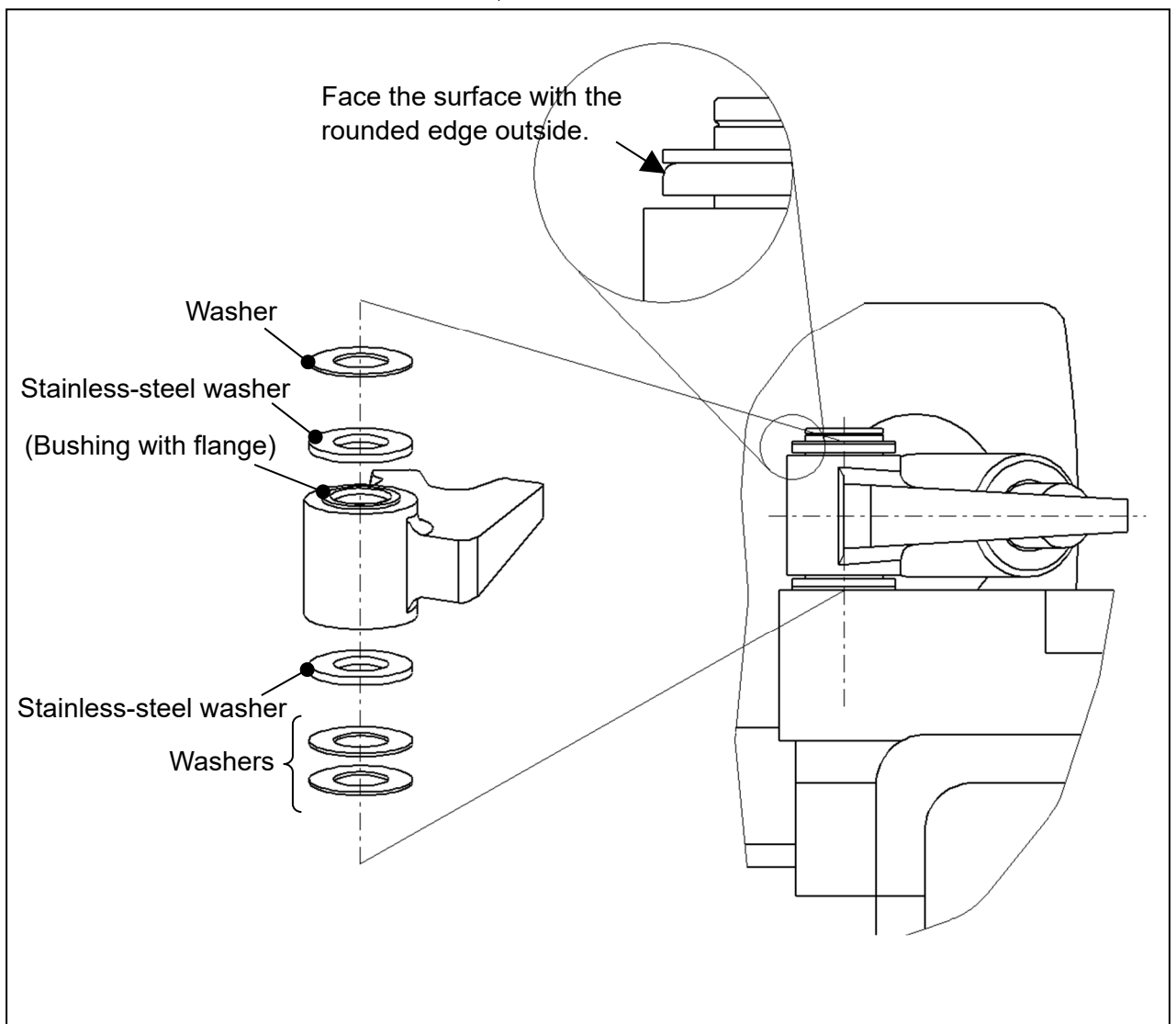
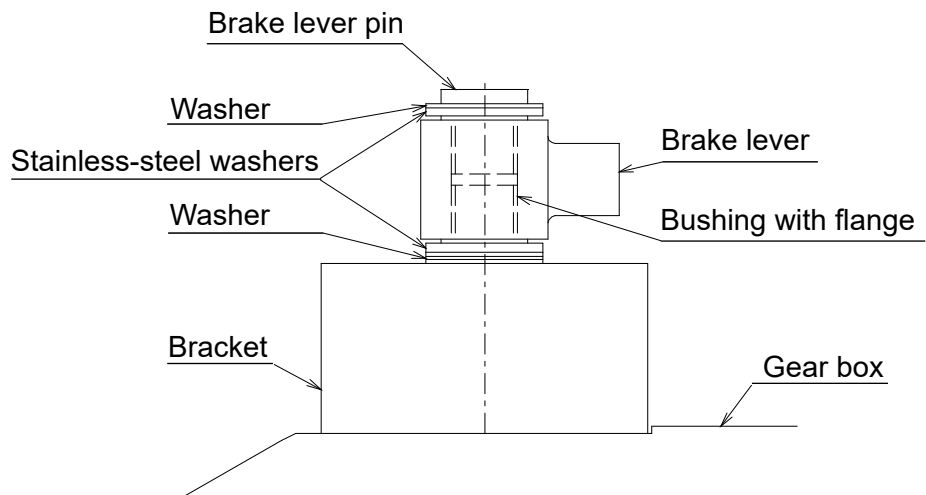
3a) For EMB-200, EMC-200, EME-200 and EMF-200 (single brake)



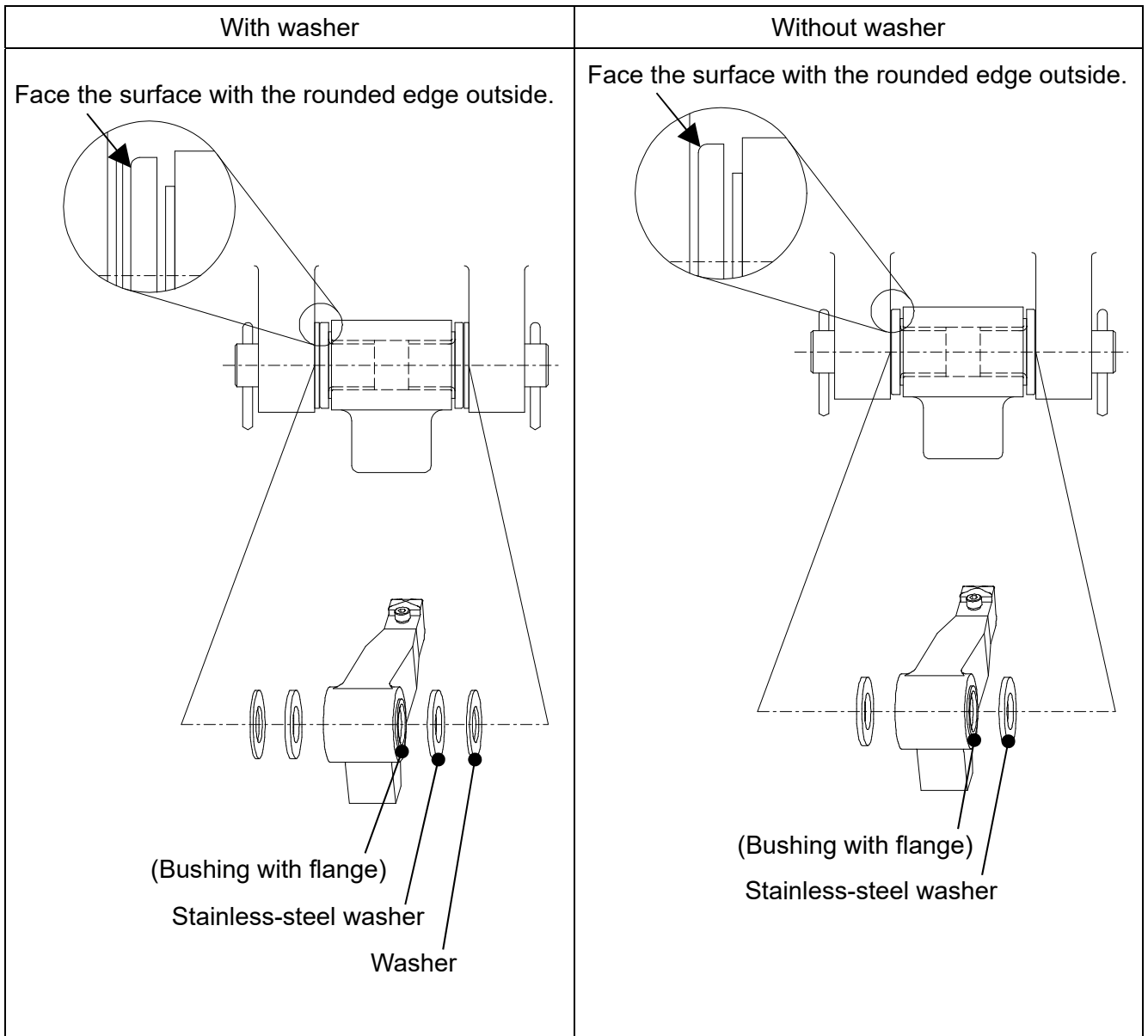
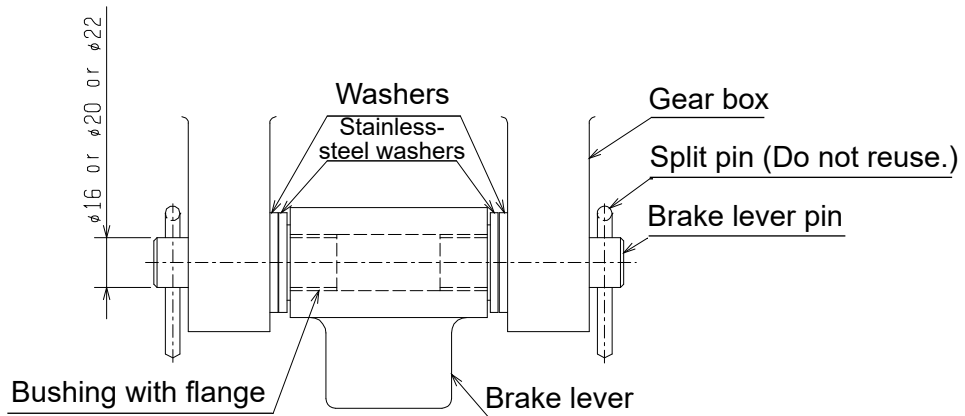
3b) For EM-1500/1600 (single brake)



3c) For EM-1500/1600 (double-brake)



3d) For EM-2400, EME-300, EMF-300, EMG-300, EMH-300, EMK-300, EML-300, EMK-400, EME-500, EMK-500, EM-600 and EMB-600 (single brake)  
 For EM-2400 (double-brake)



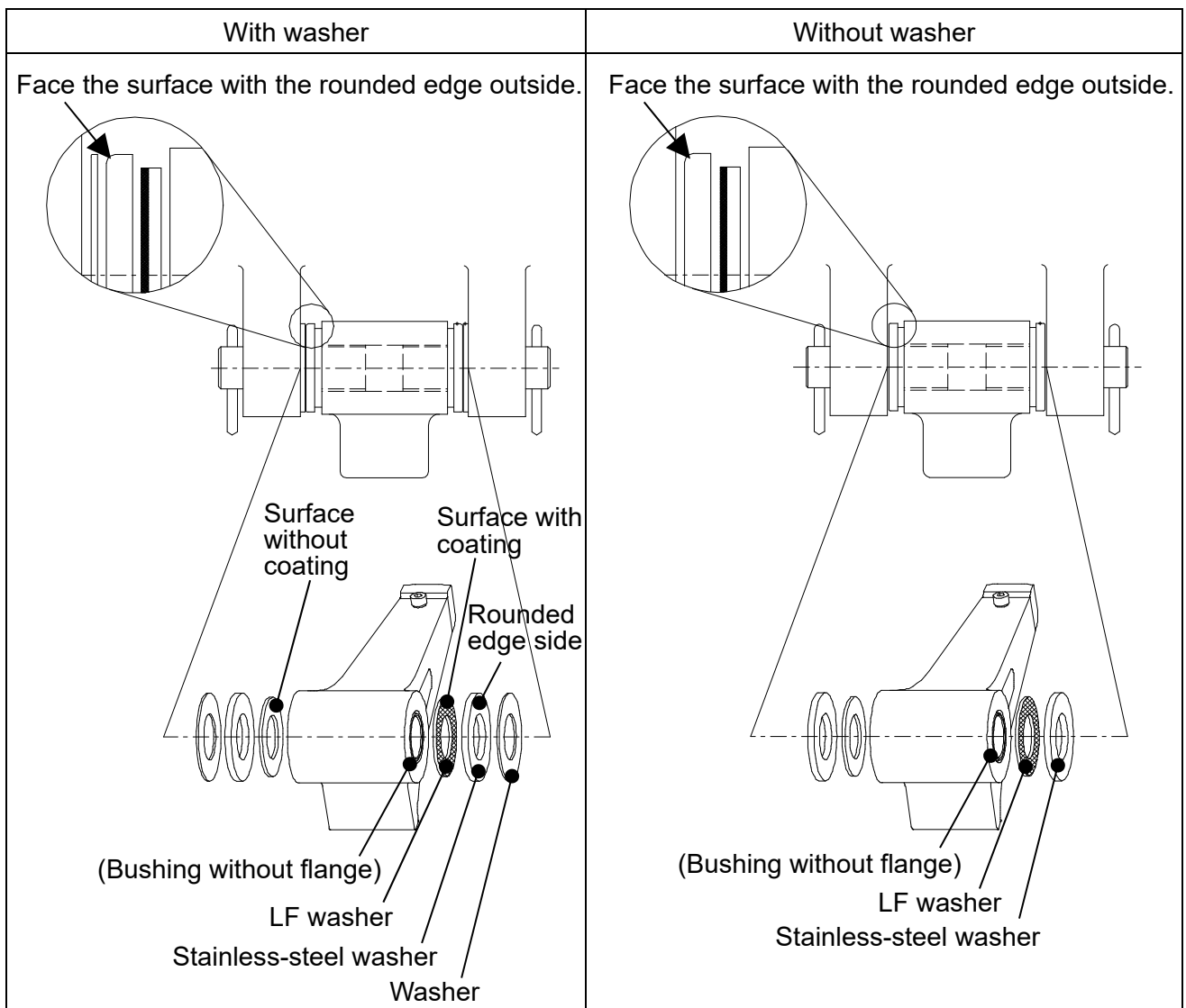
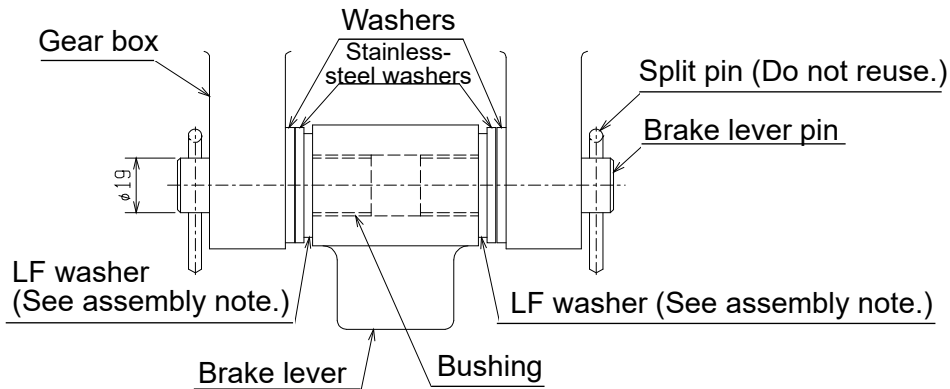


3e) For EM-3600, EMX-3600, EME-400, EMF-400, EMG-400, EMH-400, EMX-400, EMH-500 and EMJ-500 (single brake)

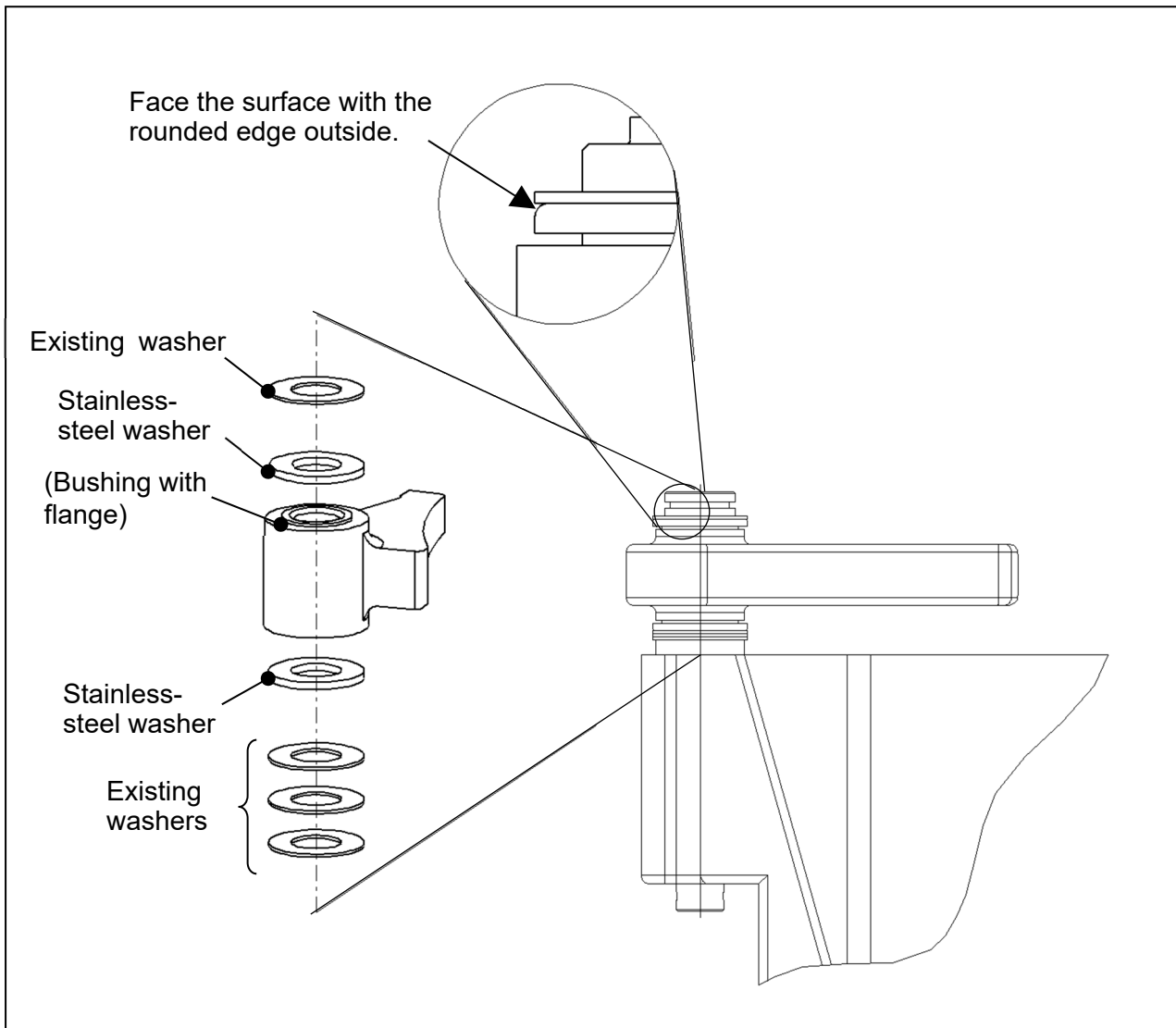
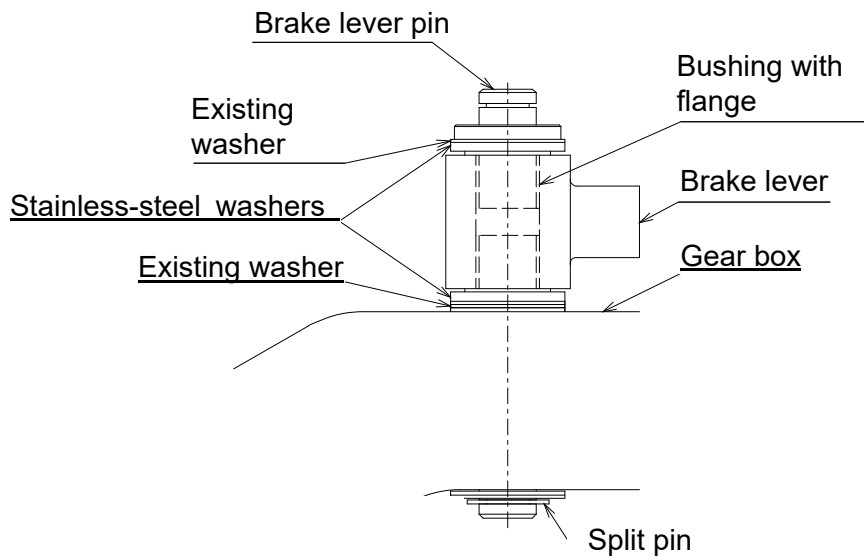
For EM-3600, EMJ-500, EML-500 and EMB-600 (double-brake)



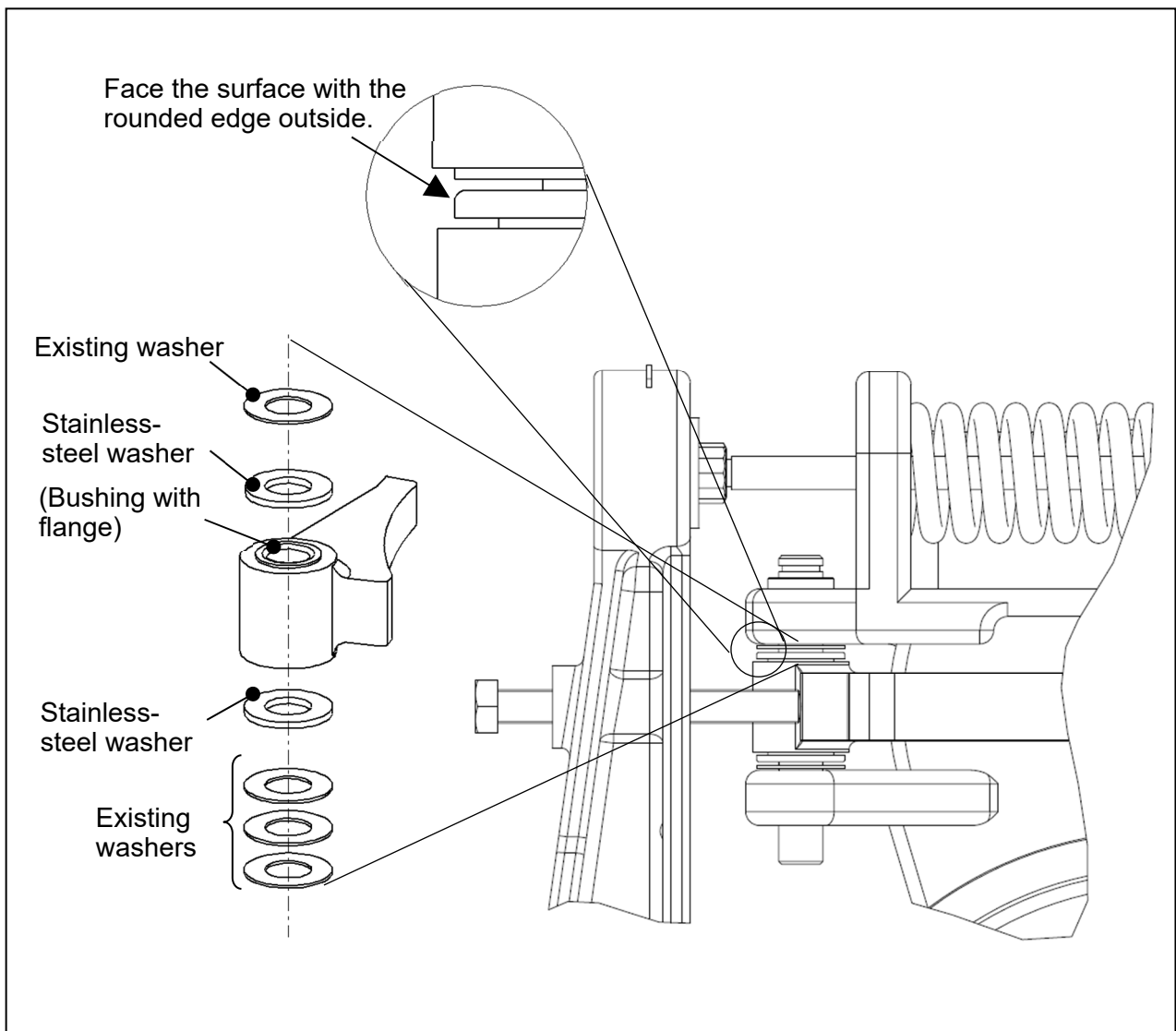
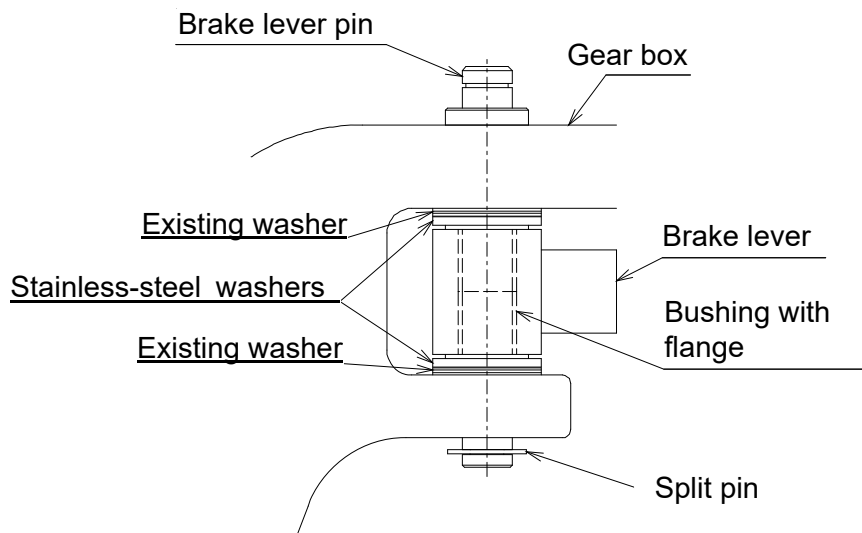
Face the resin layer side (the surface which is not silver) of the LF washer towards the stainless-steel washer.



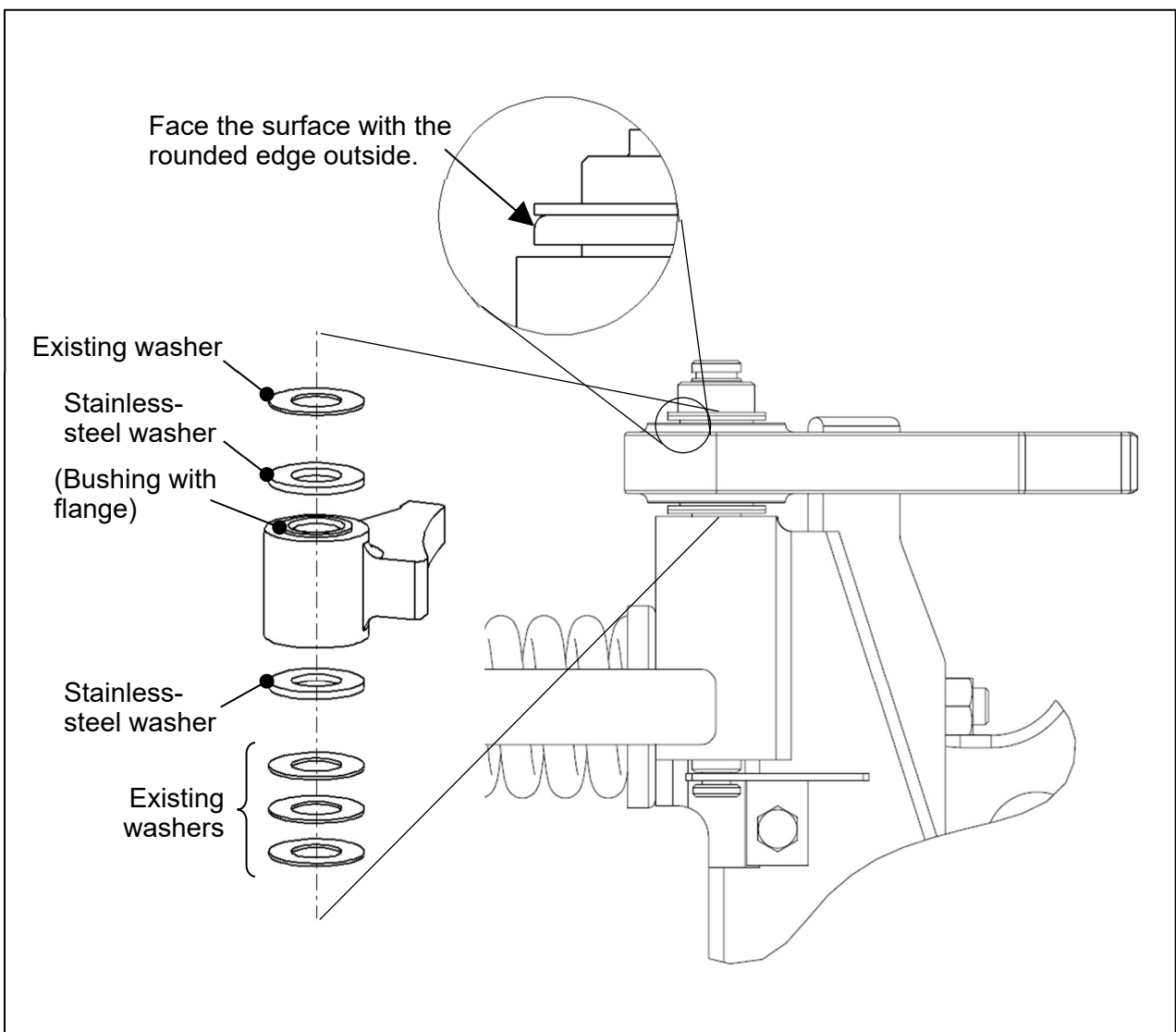
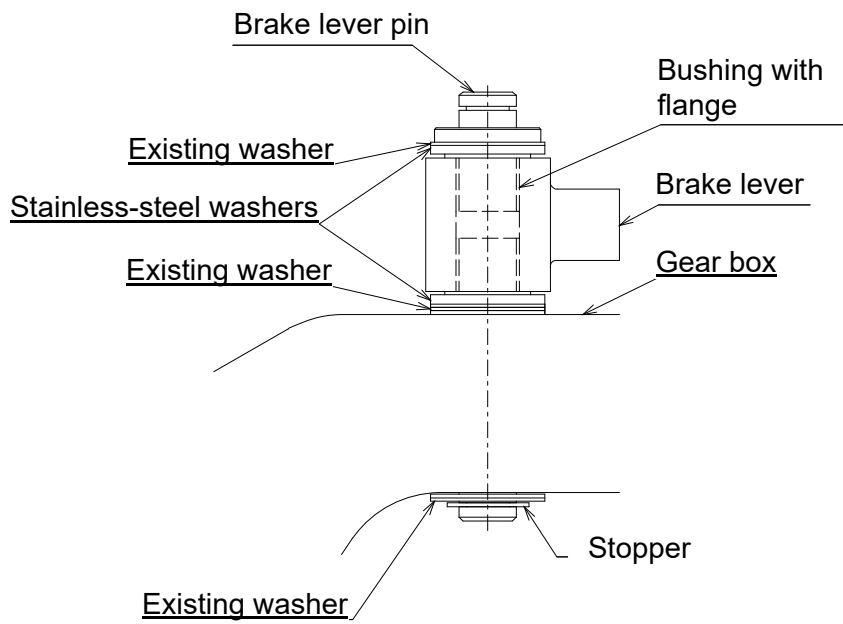
3f) For EH-4100 and EH-4200



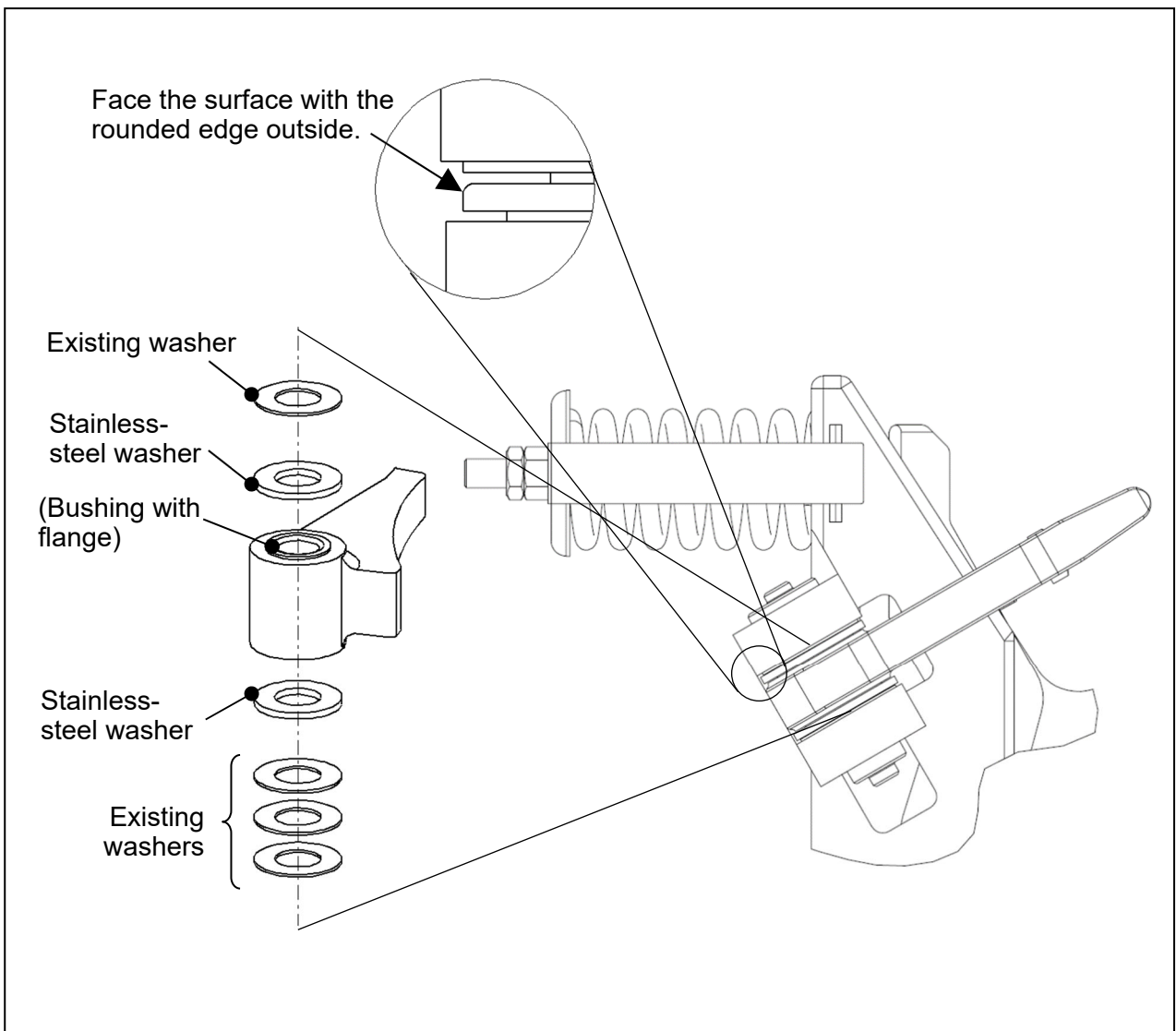
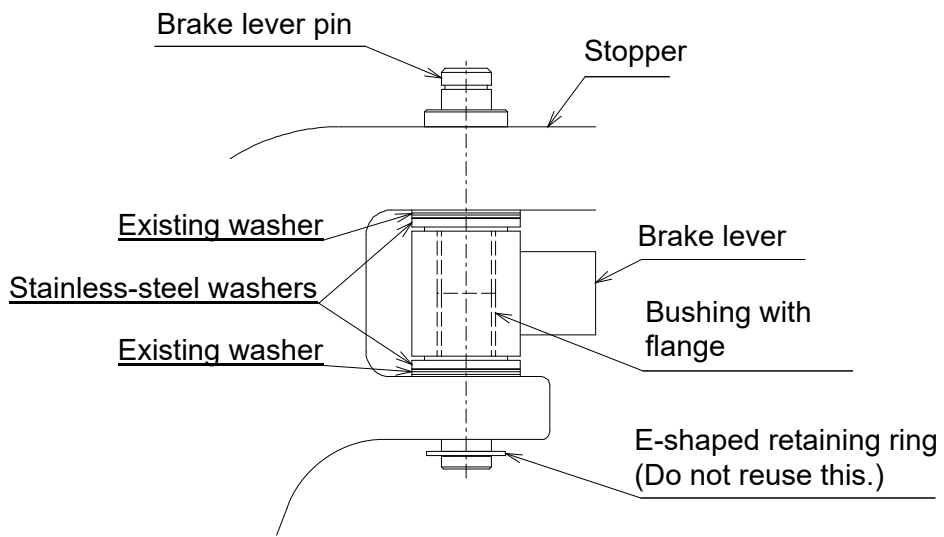
3g) For EHB-4100, EHC-4100, EHD-4100, EH-4500, EH-5100, EHB-5100, EH-6200, EHB-6200, EHC-6200, EH-6300 and EHB-6300



3h) For EH-5400







3i) For EHB-5400 and EHC-5400



## 8.5 Inspecting brake drum or disk

(1) Check that oil is not adhering to the sliding surface of the brake drum or disk.



 <b>Danger</b>	 Before inspection, close the car and landing doors, let the counterweight overrun the bottom floor and shut off the power.
---	--




 <b>Danger</b>	 If too much oil is applied on the brake lever pin or the contact surface of the brake lever with plunger rod, the oil may drop on the brake drum or disk. After application, check that there is no oil drop.
---	---

If oil is adhering to the brake drum or disk, wipe it off with the following solvent.

Available solvent for brake drum or disk cleaning

White gasoline
Acetone
Trichloroethylene
Tetrachloroethylene
Ethyl acetate

 <b>Danger</b>	 Do not use any solvent other than listed above.
---	---

 After cleaning the brake drum or disk, be sure to check the brake torque. See 10 for brake torque check method to hold a car stationary.
 If the brake torque does not meet the standards, replace the brake shoe or pad. After replacing the brake shoe or pad, move the elevator and make an emergency stop several times to adjust the brake. Then, check that the brake torque meets the standards.
 If oil is adhering to the lining, check the lining in accordance with 8.3.



(2) Check that there is no rust on the sliding surface of the brake drum or disk.



Note that the sliding surface of the brake may rust if the elevator has been out of service for a long time. If there is rust on the sliding surface, sand the brake drum or disk in the circumferential direction with sandpaper #180 or #240 (coarse-grid), and further with sandpaper #1000 or #1200 (fine-grid) to finish the surface.



- (3) Check that there is no scratch or roughness on the sliding surface of the brake drum or disk. Wear develops rapidly on a rough or scratched surface when brake is applied; check the surface carefully. If the surface is rough or scratched, sand the surface in the circumferential direction with sandpaper #180 or #240 (coarse-grid), and further with sandpaper #1000 or #1200 (fine-grid) to finish the surface.
- If the surface is in good condition, a film is formed and slightly lusters the brake drum or disk. Do not touch the sliding surface of the brake drum or disk by hand.

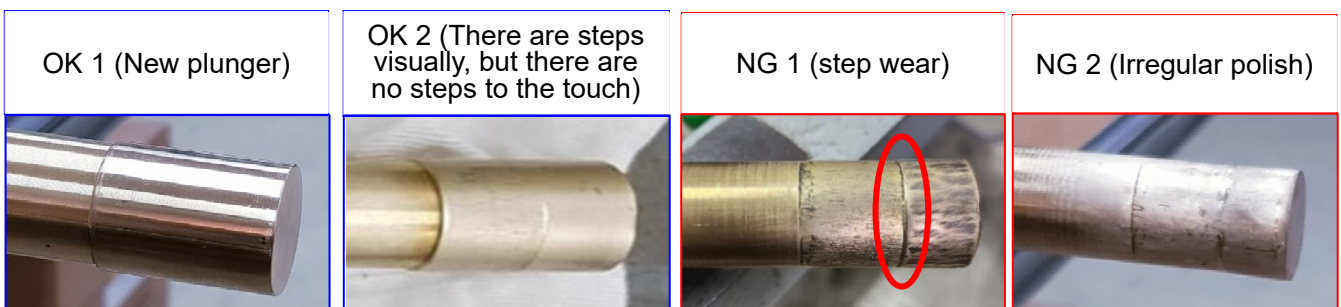
### **8.6 Inspecting plunger and plunger rod (Other than EM-1100, EH-3500, EH-3700 and EH-3800)**

- (1) Check that there is no scratch and no step wear on the sliding surfaces of the plunger and plunger rod. Clean the sliding surfaces of the plunger and plunger rod. Check that there is no scratch and no step wear on the surfaces and apply Mitsubishi elevator oil No. 11 by rubbing it into the surface.

 <b>Danger</b>	 <p>If there is a scratch on the surfaces of the plunger that slides with the bush of the plunger, the brake will be kept releasing and it can cause a serious accident. If there is a scratch, remove it with sandpaper #400 over. If the scratch cannot be removed, replace the plunger and bush at the same time.</p>
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 <b>Danger</b>	 <p>If there is a step wear on the side of the plunger rod, the dropping operation of the plunger will be mechanically restrained due to wear of the lining or biting of foreign object in the step wear. As a result, the brake will be kept releasing and it can cause a serious accident. If there is a step wear like the sample shown in NG1 below, remove the step wear with sandpaper #400 over. If the step wear cannot be removed with sandpaper and there is a step wear by visual inspection and by touching with nails, replace the plunger and bush at the same time.</p>
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 <b>Danger</b>	 <p>If it cannot be polish the plunger rod so that the diameter is uniform as shown in NG2 below, replace the plunger and bush at the same time.</p>
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Sample of plunger rod



If there is a scratch, remove it with sandpaper #400 or greater by sanding the sliding surface of the bushing with the plunger, the sliding surface of the plunger, the sliding surface of the core with the plunger rod or the sliding surface of the plunger rod.



After sanding, check that the plunger and plunger rod move smoothly.



If the bushing has worn down and the plunger can come into contact with the upper end of the brake cover, replace the bushing.



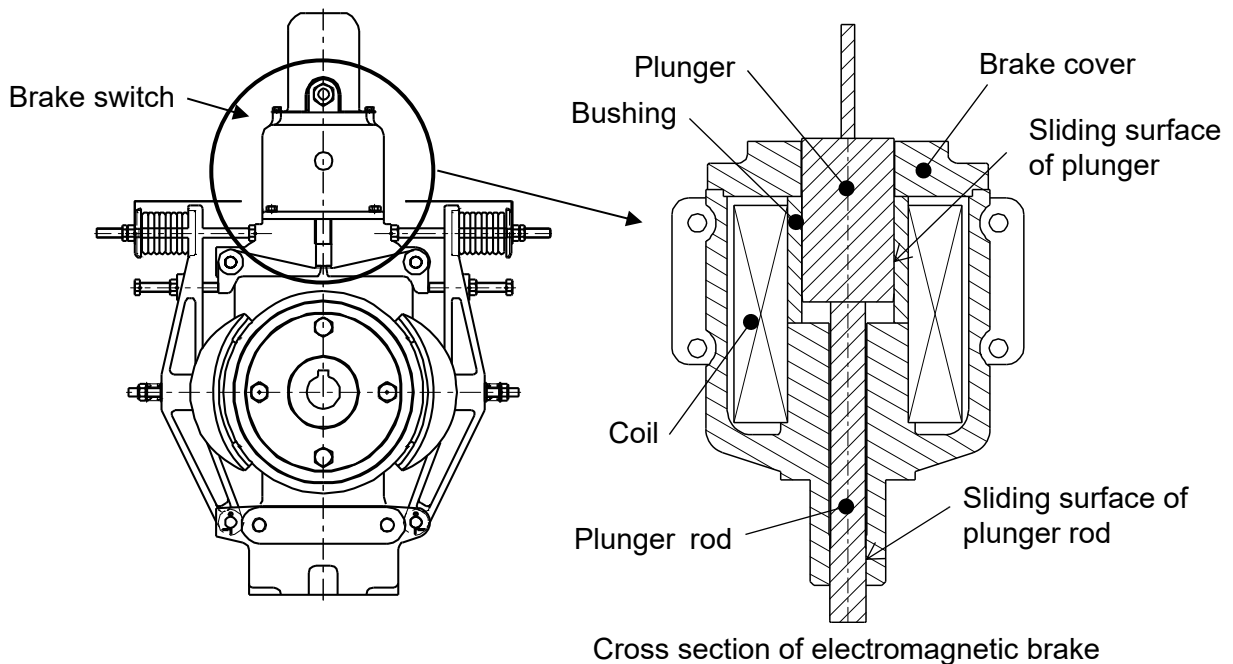
Check that the stud bolt of the brake switch does not come into contact with the bracket. See 8.7 for detail.



Scratch that touched with the plunger

Upper end of brake cover

Bush





(2) Check that the plunger rod has no scratch on the contact surface with the brake lever.

Clean the plunger rod contact surface with the brake lever and the side of the plunger rod.

Check that there is no scratch on the surface visually and by hand, and apply Mitsubishi elevator oil No. 5.



**Danger**



If too much oil is applied on the contact surface of the plunger rod with the brake lever, the oil may drop onto the brake drum or disk.

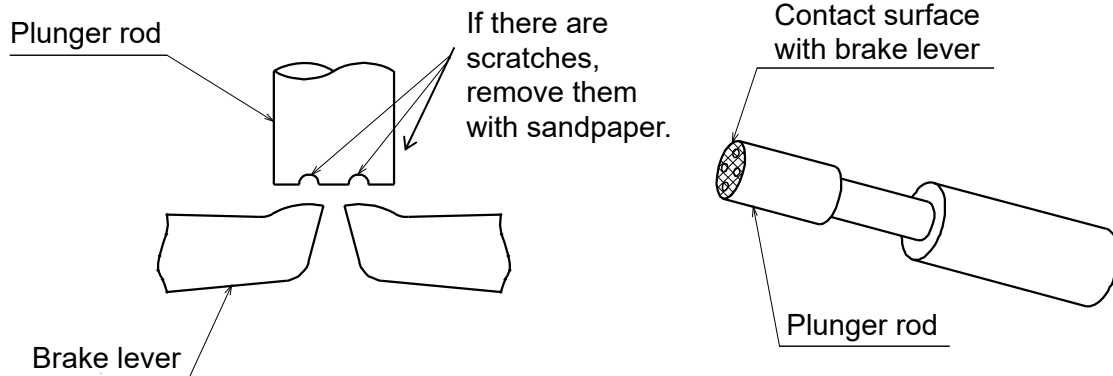


If there is a scratch on the contact surface, remove it with sandpaper #400 or greater.

When sanding, be careful not to slant the tip of the plunger rod to prevent the plunger from turning so that the plunger stroke remains unchanged.





If a scratch or level difference cannot be removed with sandpaper #400 or greater, replace the plunger including the plunger rod.

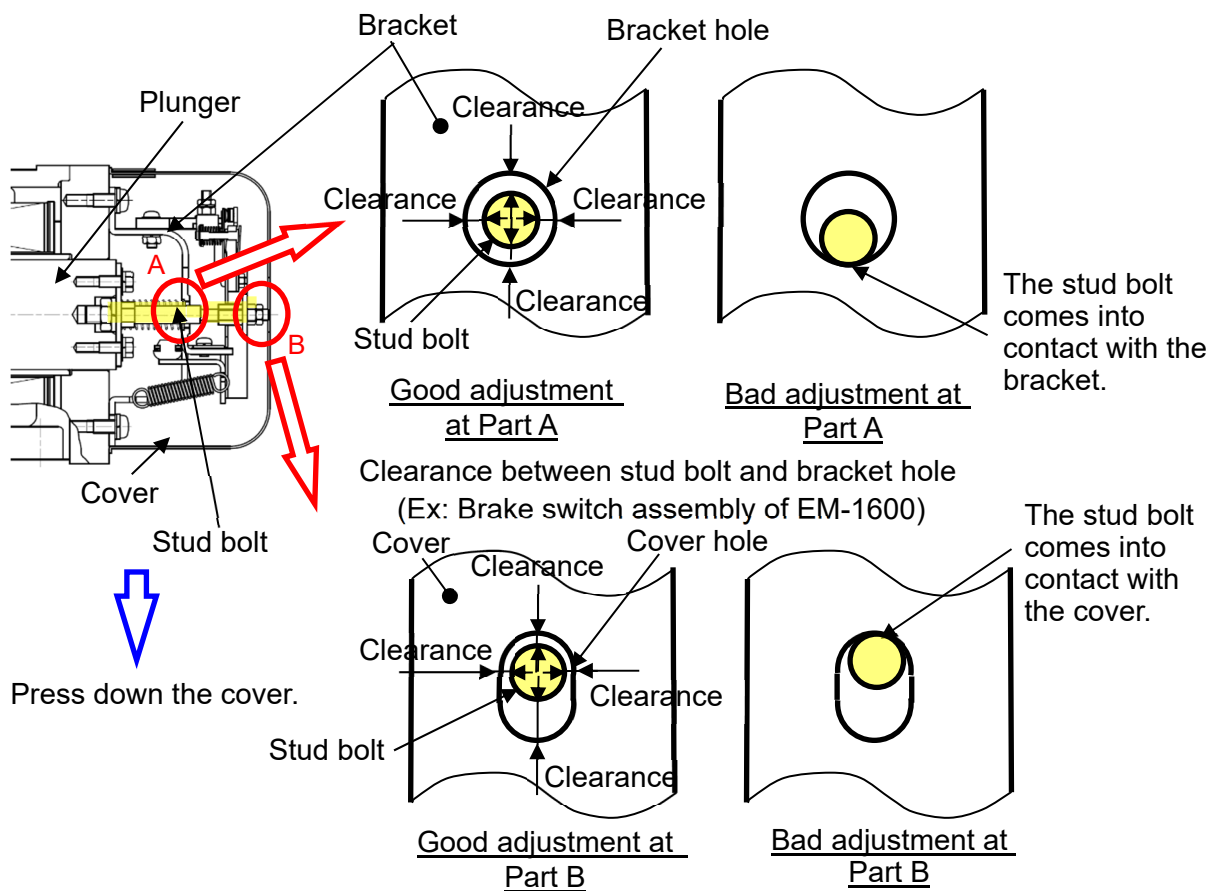


## 8.7 Checking clearance between stud bolt and bracket



While the elevator is parked, check the clearance between the stud bolt and the bracket hole of the brake switch. (Part A in the figure below)

- (1) Check that there is clearance all around the stud bolt in the bracket hole so that the bolt is not in contact with the bracket.
- (2) Rotate the stud bolt (plunger) once and check that the clearance in (1) above is secured.

 <b>Danger</b>	 <p>Without clearance all around the stud bolt, the stud bolt comes into contact with the bracket, and it can cause a danger of decrease in the brake torque. To secure the clearance, adjust the position of the bracket. (The bracket can be adjusted vertically.)</p>
---	---



- (3) Tighten the mounting bolt while pressing down the cover. Check that there is clearance between the stud bolt and the cover hole.

 <b>Danger</b>	 <p>If the bolts and nuts shown in the figure above are loose or has come off, the brake cannot operate properly. Check that the bolts and nuts (especially, the double nuts on the stud bolt end) are firmly tightened not only at the clearance check above but also at the end of the entire maintenance operation.</p>
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## 8.8 Inspecting rubber and plastic components

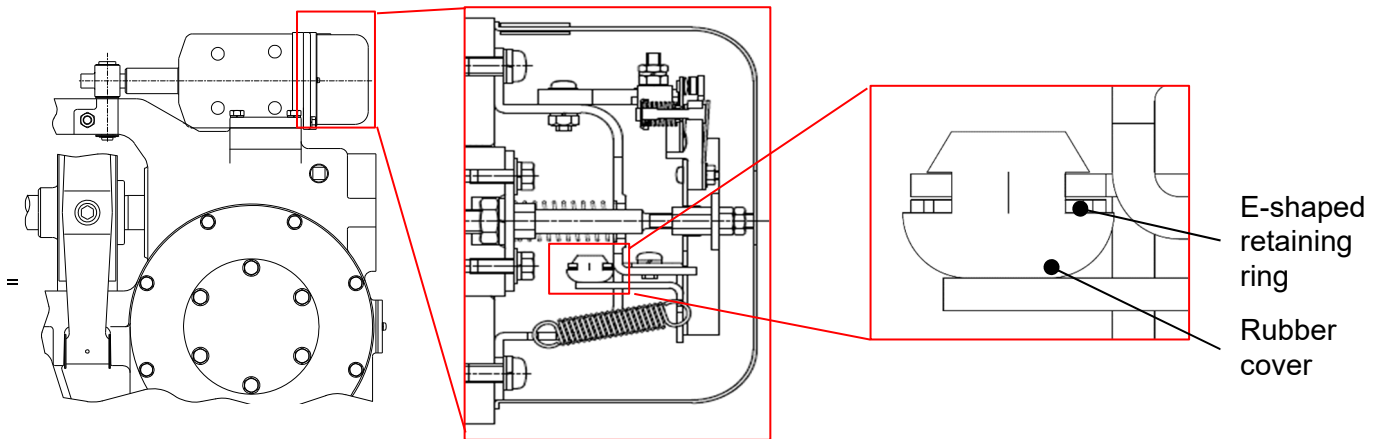
Check that the rubber or plastic components which deteriorate continuously have no cracks and have not become hard. If they have a crack or have hardened, replace them with new ones.

### (1) Brake switch

1) Check that the rubber cover has no cracks and has not hardened.

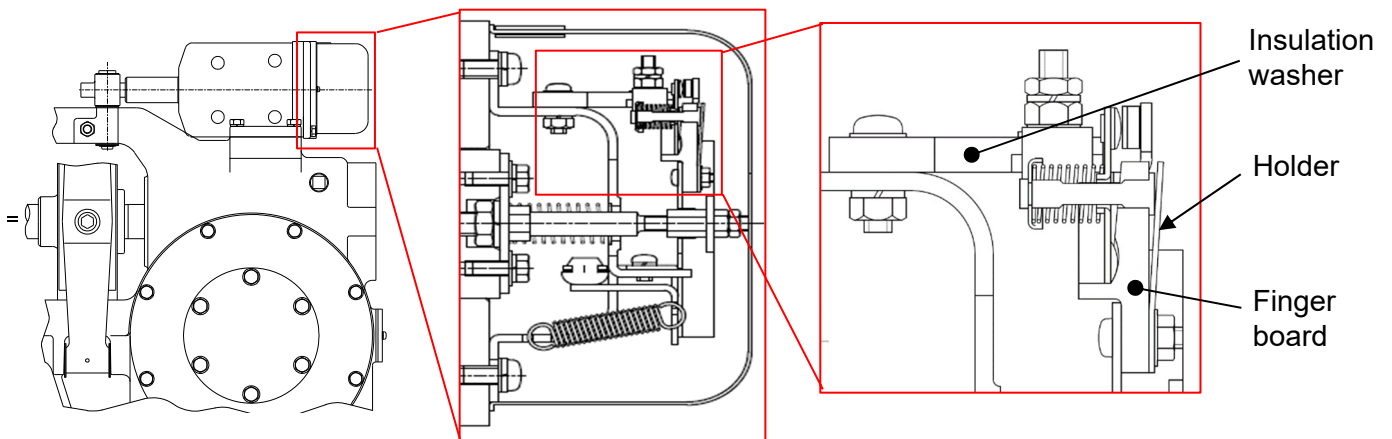
If the rubber cover has a crack or is hard (too hard to be deformed when pressed by finger), replace it with a new one.

For a switch in the shape shown below, an E-shaped retaining ring is inserted in the groove of the rubber cover. Replace the E-shaped retaining ring together with the rubber cover.



2) Check that the finger board, holder and insulation washer have no cracks.

If they have a crack, replace them with new ones.



**Danger**



Check the components shown in the figure above carefully. If they have deteriorated and come off, the brake cannot operate properly.

### (2) Others

1) Check that the bolt with rubber on the brake drum has no cracks and has not hardened. If it has a crack or is hard, replace it with a new one.

## 8.9 Inspecting and adjusting brake switch

The brake switch is classified into two types: contact type and microswitch type.

### 8.9.1 Inspecting contact-type brake switch

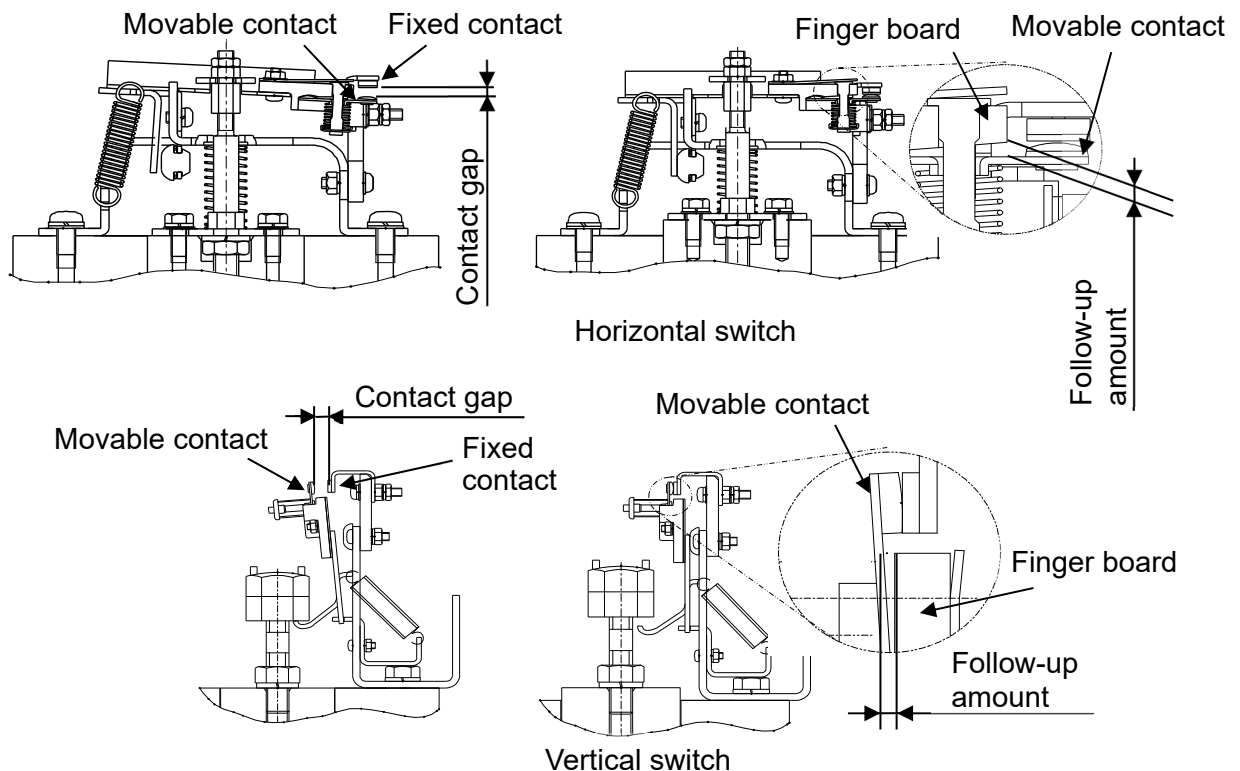
The contact-type brake switch has two structure types: horizontal switch and vertical switch.

#### (1) Contact gap and follow-up amount

Visually check the contact gap and follow-up amount of the brake switch.

The contact gap means the clearance between the fixed and movable contacts when the brake is released. Visually check that the clearance when the brake is released is 1.5 +/- 0.5 mm.

The follow-up amount means the clearance between the finger board and the movable contact when the brake is applied. Visually check that the follow-up amount when the brake is applied is 0.8 to 1.2 mm.



**Danger**



Do not touch the fixed and movable contacts by hand as they are live parts. Be sure to visually check them.



**Danger**



If the bolts and nuts are loose, the nuts may come off, and it can cause a great danger in improper brake operation. Be sure to tighten the bolts and nuts further.

#### (2) Damage of contact

Visually check that there is no damage or excessive wear on the surfaces of the movable and fixed contacts.



If the surfaces of the movable and fixed contacts have been damaged or have worn out badly, replace them with new ones.

### 8.9.2 Inspecting and adjusting microswitch-type brake switch

The microswitch-type brake switch has two structure types. The both types can be adjusted by the same method.

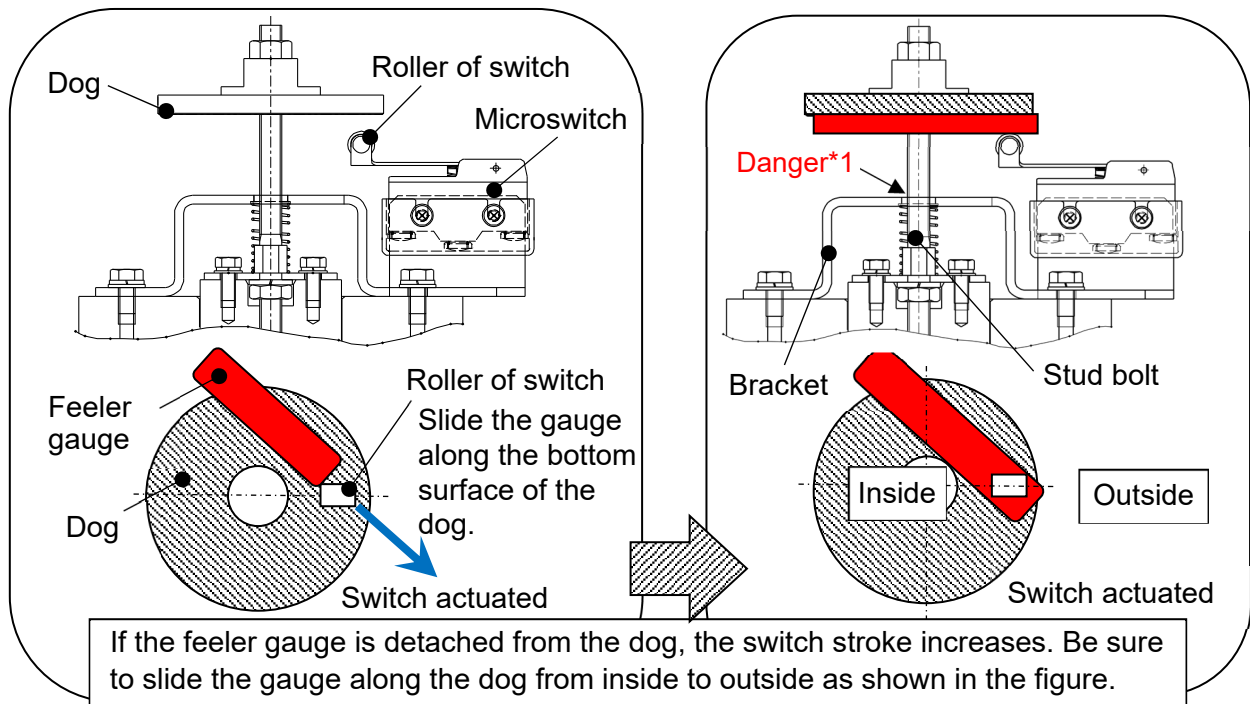
Check the operating point of the microswitch. If there is any failure, adjust the operating point.

(1) Checking the operating point of microswitch

- 1) Apply the brake, insert a 2.3 mm feeler gauge between the dog and the roller of the switch, and check that the microswitch clicks.



Slide the gauge along the bottom surface of the dog from inside to outside. Be sure to keep the gauge touching the dog while sliding it. If the gauge is moved from outside to inside, it may be difficult to keep the gauge touching the dog.

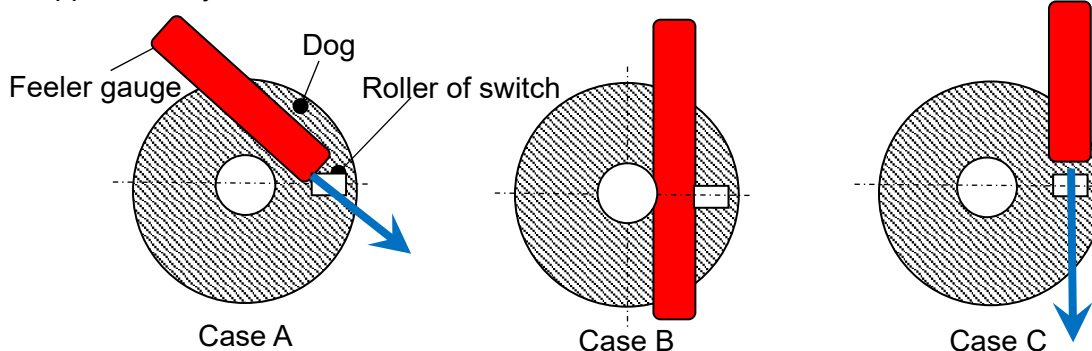


**Danger**



At the point shown as Danger\*1 above, check that there is clearance all around the stud bolt in the bracket hole, referring to 8.7.

Supplementary information



When the feeler gauge is slid along the dog as shown in case A and B, the contact surface of the feeler gauge with the dog is larger than that when the gauge is detached from the dog as shown in case C; therefore, the stroke of the switch can be checked correctly.

2) Rotate the plunger 90 degrees and check 1) above again. Repeat this step three more times.



Check that the microswitch clicks at every operating point.

3) Apply the brake, insert a 1.2 mm feeler gauge, and check that the microswitch does not click.



Slide the gauge along the bottom surface of the dog from inside to outside. Be sure to keep the gauge touching the dog while sliding it. If the gauge is moved from outside to inside, it may be difficult to keep the gauge touching the dog.

4) Rotate the plunger 90 degrees and check 3) above again. Repeat this step three more times.



Check that the microswitch clicks at every operating point.

## (2) Adjusting the operating point of microswitch

1) Release the brake and then apply the brake in manual operation. Check that the plunger stroke is 3 +/- 0.5 mm.



If the plunger stroke is 2.5 mm or less, a contact failure may be detected when the brake is applied. Take a variation in measuring the plunger stroke into consideration and adjust the operating point so that the plunger stroke becomes 2.5 mm or more.

2) Apply the brake and tighten the dog slowly until the microswitch clicks.



The click sound of the microswitch differs depending on the operating points. The switch clicks when the dog is tightened and when the dog is loosened for readjustment after it has been tightened. Note that the click sound to be checked here is the sound made when the dog is tightened.

3) Apply the brake and tighten the dog 1.75 mm (one and three-fourth rotation).



When loosening the dog, check the mark on the dog and tighten it to 1.75 mm (one and three-fourth rotation) properly. The permissible angle error of the tightened dog after tightening the nut in 4) is +/- 10 degrees.



Check that the plunger does not rotate together with the dog.

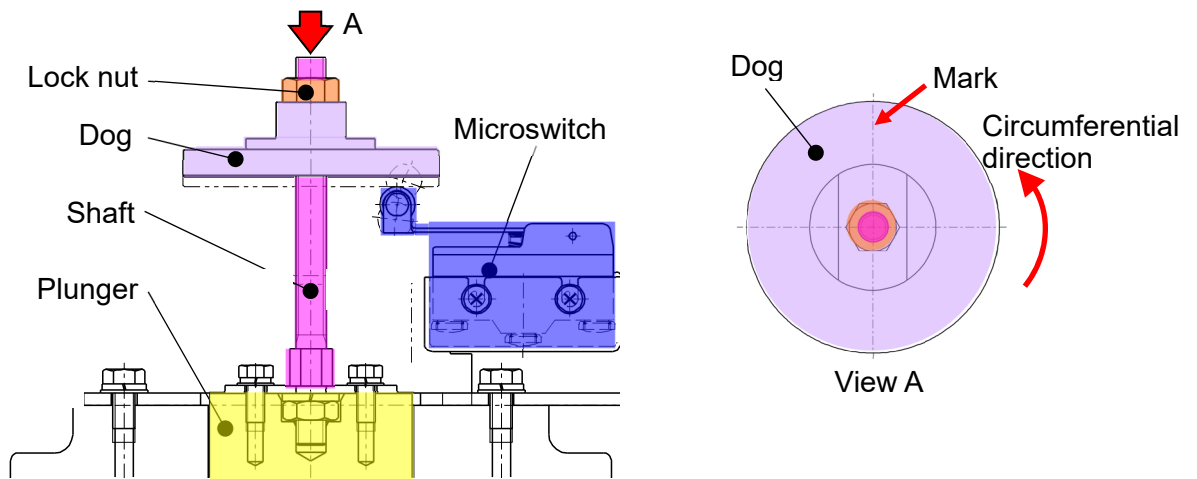
4) Apply the brake, slip a wrench over the dog to prevent the dog from rotating, and tighten the lock nut with a wrench.



While tightening the lock nut, check that the dog is not rotating by watching the mark on the dog.



If the lock nut is missing, do not use a coarse nut (M8 x 1.25), instead of the lock nut, not to damage the thread of the shaft.



## 9. Lubrication

### 9.1 Lubricating brake arm pin (Other than EM-1100 and EH-3700)

Apply two or three drops of Mitsubishi elevator oil No. 52 from the opening for lubrication on the brake arm bearing insertion point.

If there is no opening for lubrication, apply oil from the spacers of the right and left brake arms.



**Danger**



For some of the helical-gear traction machines, note that oil may adhere to the brake disk if too much oil is applied. Also, note that oil may drop into the hoistway from rope holes if too much oil is applied.

## **9.2 Lubricating brake lever pin (Other than EM-1100, EH-3500, EH-3700 and EH-3800)**

See 8.4 for how to identify the brake lever type.

### **9.2.1 Lubricating brake lever pin (lubricated type) (Other than EM-1100 and EH-3800)**

For a lubricated type, apply two or three drops of Mitsubishi elevator oil No. 52 from the opening for lubrication on the brake lever bearing insertion point.



**Danger**



If oil adheres to the brake drum or disk, it can cause a great danger of decrease in brake torque.  
Also, note that oil may drop on the brake drum or disk if too much oil is applied.



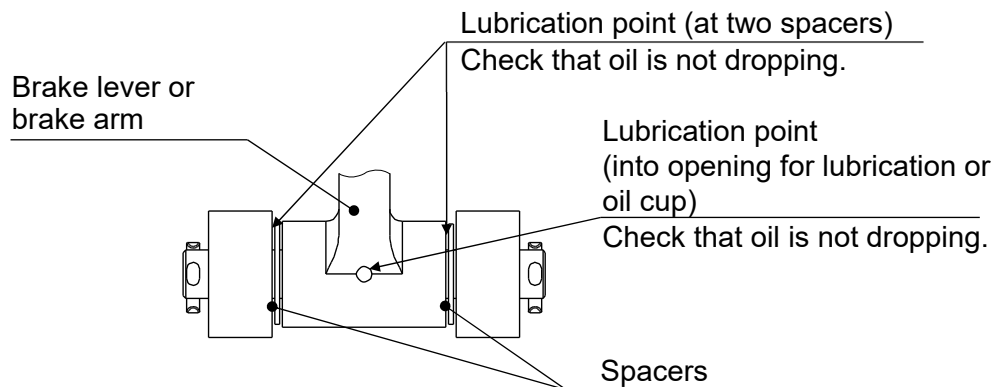
If oil is adhering to the brake drum or disk or the brake mounting plate (double-brake only), clean it in accordance with 8.5.



Check that oil is not adhering to the lining. If oil is adhering, replace the brake shoe or pad in accordance with 8.3.



If oil dropped onto the gear box or the brake mounting plate (double-brake only), wipe it off.





Traction machine type	Traction machine type number	Brake type	Lubrication point
Worm-gear traction machine	Other than EM-1100		
Helical-gear traction machine	EH-4200 EH-4500 EH-5100 EHB-5100 EH-6200 EHB-6200 EHC-6200 EH-6300 EHB-6300	Drum brake	Fig. 1
	EH-4100 EHB-4100 EHC-4100 EHD-4100 EH-5400 EHB-5400 EHC-5400	Disk brake (1)	Fig. 2
	EH-3500 EH-3800	Disk brake (2)	Fig. 3

Drum brake

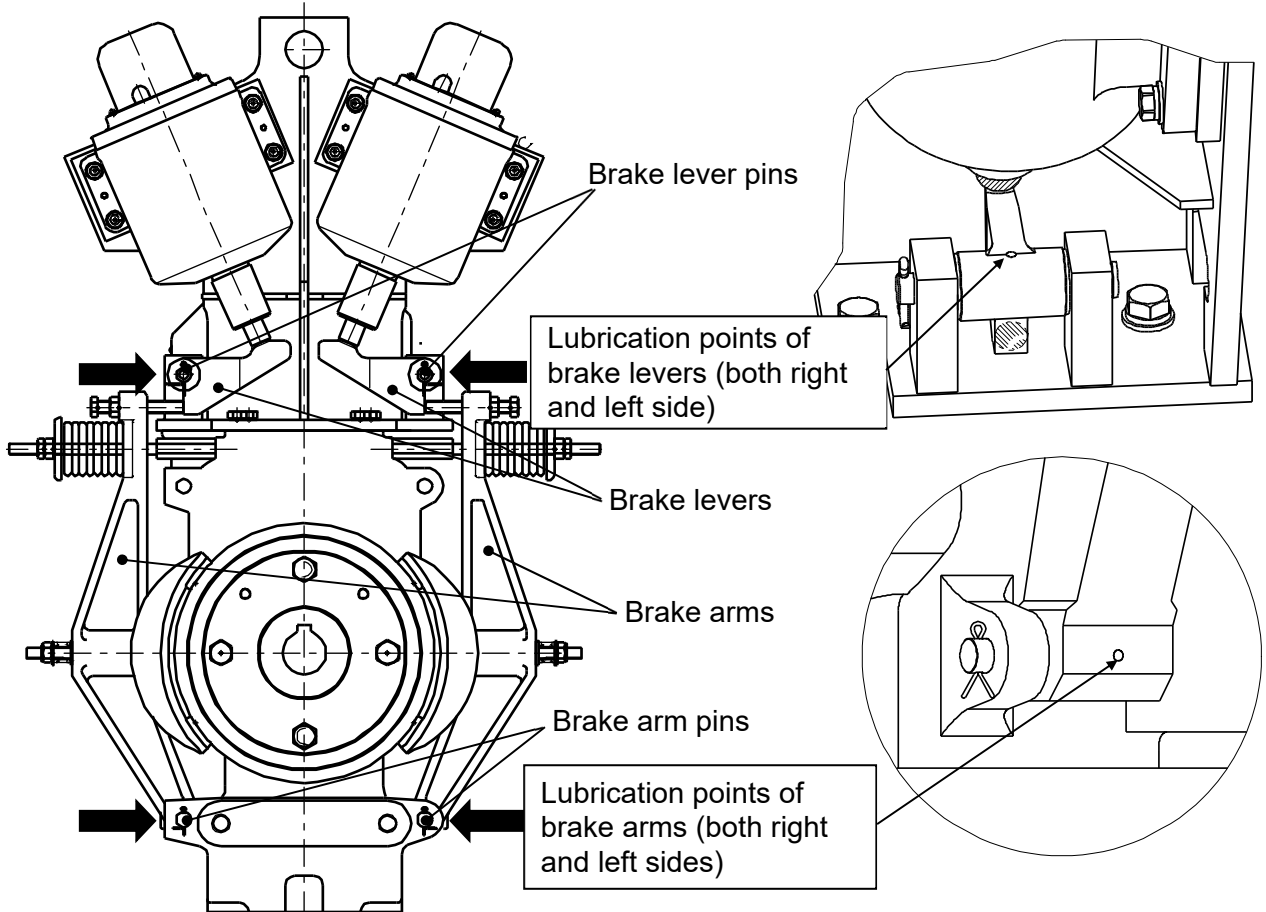


Fig. 1 Drum brake

Disk brake (1)

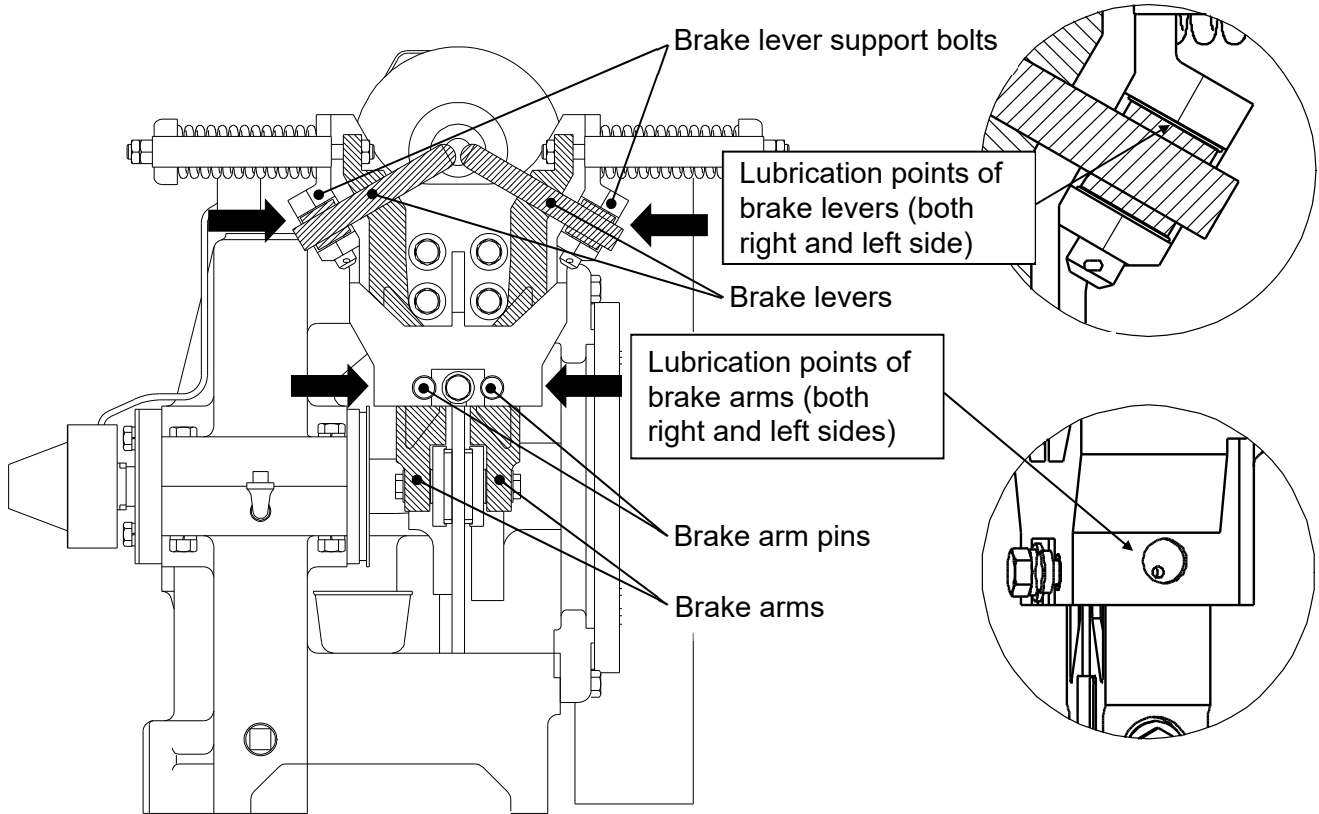


Fig. 2 Disk brake (1)

Disk brake (2)

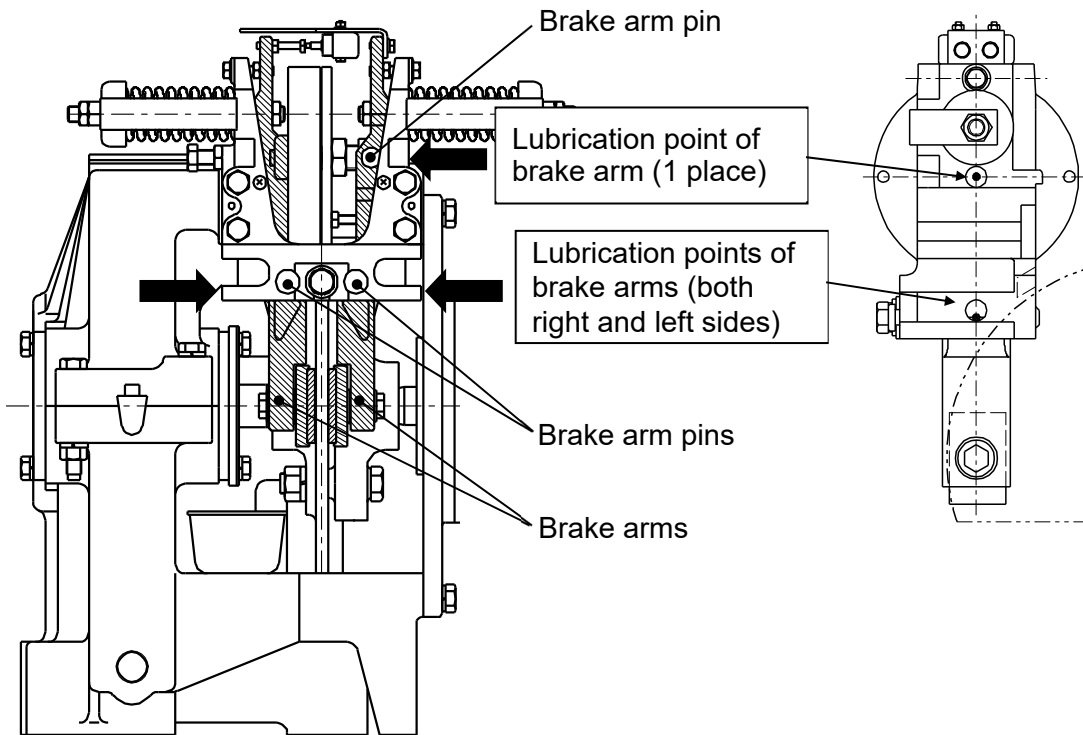





Fig. 3 Disk brake (2)

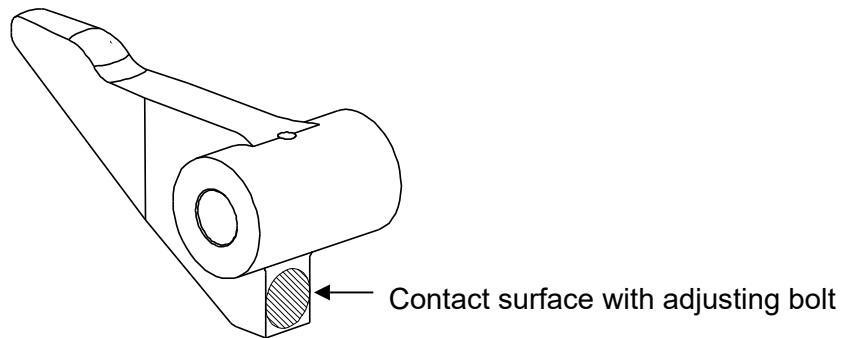
**9.2.2 Lubricating brake lever pin (non-lubricated type) (Other than EM-1100, EH-3500, EH-3700 and EH-3800)**

 Do not apply oil on the brake lever pin of a non-lubricated brake lever.

**9.3 Lubricating contact surface of brake lever with adjusting bolt (Other than EM-1100, EH-3500, EH-3700 and EH-3800)**

Pull up the plunger rod by brake lever, and slightly apply Mitsubishi elevator oil No. 5 on the contact surface with the adjusting bolt.

 **Danger**  Keep the brake drum and disk clear of oil. Oil adhesion can cause a great danger of decrease in brake torque.  
Do not apply oil too much to prevent it from dripping onto the brake drum or disk. If oil is adhering to the brake drum or disk or the brake mounting plate (double-brake only), clean it off in accordance with 8.5.



**9.4 Oil list**

Oils applied to brake components are as follows. Do not use any oil other than listed below.

Oil type	Designation	Application	Product name (manufacturer)
Grease	Mitsubishi elevator oil No.5	<ul style="list-style-type: none"> <li>• Spherical surface</li> <li>• Brake lever</li> </ul>	Shell Alvania Grease S 2 (Shell), Epnoc Grease AP(N)2 (JXTG Nippon Oil & Energy)
	Mitsubishi elevator oil No.11	<ul style="list-style-type: none"> <li>• Plunger</li> <li>• Plunger rod</li> </ul>	Moly Paste 500 (Sumico Lubricant) MOLYKOTE G-n plus (Dow Corning)
Lubricant	Mitsubishi elevator oil No.52	<ul style="list-style-type: none"> <li>• Brake arm pin</li> <li>• Brake lever pin</li> </ul>	UNIWAY SF68 (JXTG Nippon Oil & Energy)







## **10. Check of brake torque to hold a car stationary**

Check the brake torque in accordance with the procedure below.

Procedure for checking brake torque to hold a car stationary:

Load the weight of 160% of the rated capacity in the car and check that the car remains stationary.

\*Observe the following instructions to prevent the car from moving down.

 <b>Danger</b>	<ul style="list-style-type: none"><li> Park the car at the bottom floor to load weights.</li><li> Do not load many weights at a time. Load them in several batches.</li><li> Do not put weights on one side of the car. Disperse them to spread the load evenly over the floor.</li></ul>
 <b>Caution</b>	<ul style="list-style-type: none"><li> Be careful not to damage the hall and car when loading weights.</li></ul>

## **11. Check of lubrication prevention cover (non-lubricated type only)**

If the brake lever is a non-lubricated type, check that the lubrication prevention cover is attached to the brake lever pin. Also, check that the cover is not interfering with other components.

The following in this section describes the procedure for attaching the cover.



If no cover is provided on the brake lever pin of a non-lubricated brake lever, order and attach the cover.



If the cover has been deformed, discolored, cracked or damaged, replace it with a new one.



If the cover is interfering with other components, check that it is attached in the correct position.



Be careful not to damage the cover when removing the snap retainer.

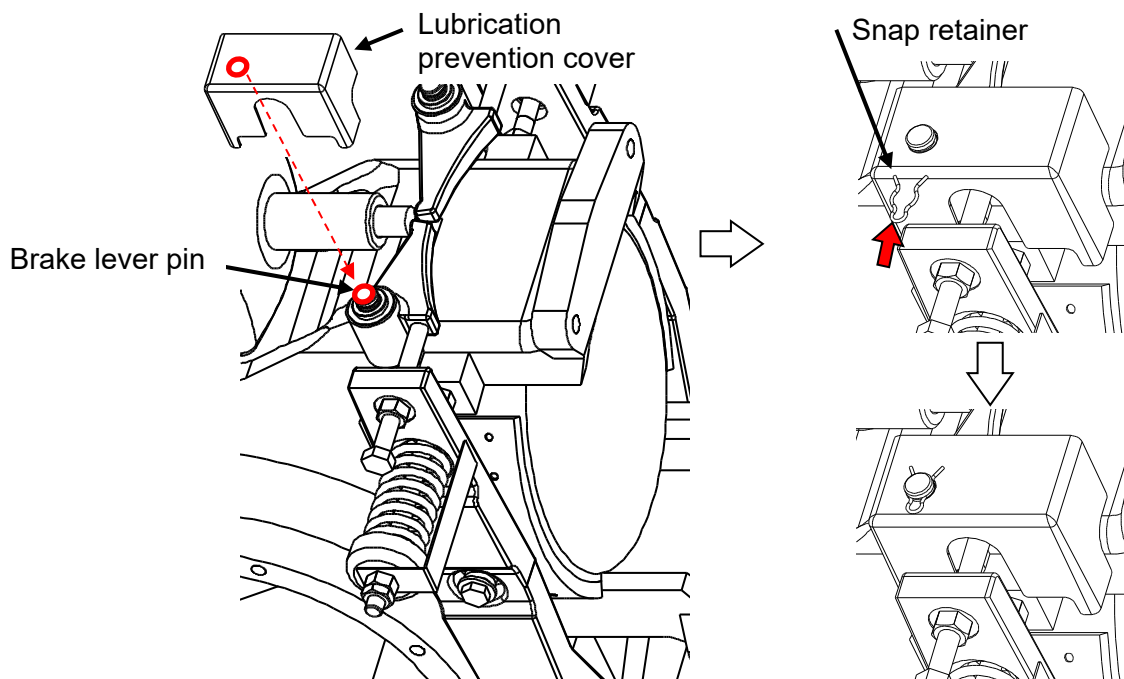


Adhesion of a solvent on the cover can cause a crack or discoloration.

Traction machine type	Traction machine type number	Brake type	Referral section
Worm-gear traction machine	EM-1500, EM1600, EME-200	Single brake	11.1
	EM-2400, EM-3600, EM-X3600 EMH-400, EMX-400, EMH-400 EMJ-500, EM-600, EMB-600		11.2
	EMB-200, EMC-200		11.3
	EMF-200		11.4
	EME-300, EMF-300, EMG-300 EMH-300, EMK-300, EML-300 EMK-400, EMK-500		11.5
	EME-400, EMF-400, EMG-400, EME-500		11.6
	EM-1500, EM-1600	Double-brake	11.7
	EM-2400, EM-3600, EM-J-500, EM-B-600	11.8	
Helical-gear traction machine	EH-4100, EH-5400	Disk brake	11.9
	EH-4200, EH-5100, EHB-5100, EH-6200 EHB-6200, EHC-6200, EH-6300, EHB-6300	Drum brake	
	EHB-4100, EHC-4100, EHD-4100 EHB-5400, EHC-5400	Disk brake	11.10
	EH-4500	Drum brake	11.11

### 11.1 EM-1500, EM-1600 and EME-200 (single brake)

- (1) Put the lubrication prevention cover straight down to the brake lever pin.
- (2) Attach the cover to the brake lever pin and fasten it with a snap retainer.



- (3) Rotate the cover on the brake lever pin, and check that the cover does not interfere with the brake arm and the adjusting bolt.



The shape of the lubrication prevention cover is asymmetrical. Be sure to attach it in the correct orientation.

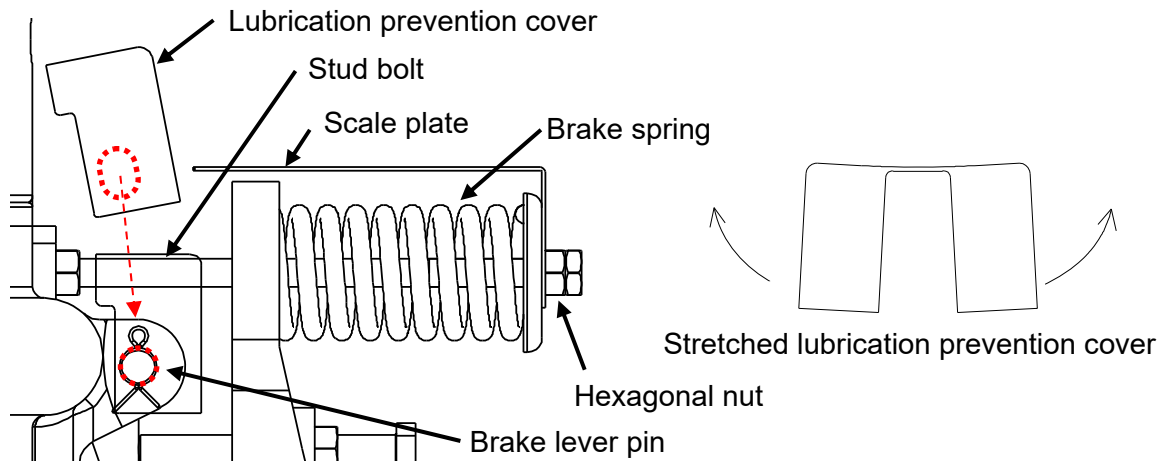


After attaching the lubrication prevention cover, check that it is not interfering with the gear box, the brake arm and the adjusting bolt.

**11.2 EM-2400, EM-3600, EMH-400, EMX-400, EMH-500, EMJ-500, EM-600 and EMB-600**

**(single brake)**

- (1) Stretch the lubrication prevention cover and put it in the gap between the scale plate and the brake cover. Hook the cover on the stud bolt, and stretch to attach it to the brake lever pin.

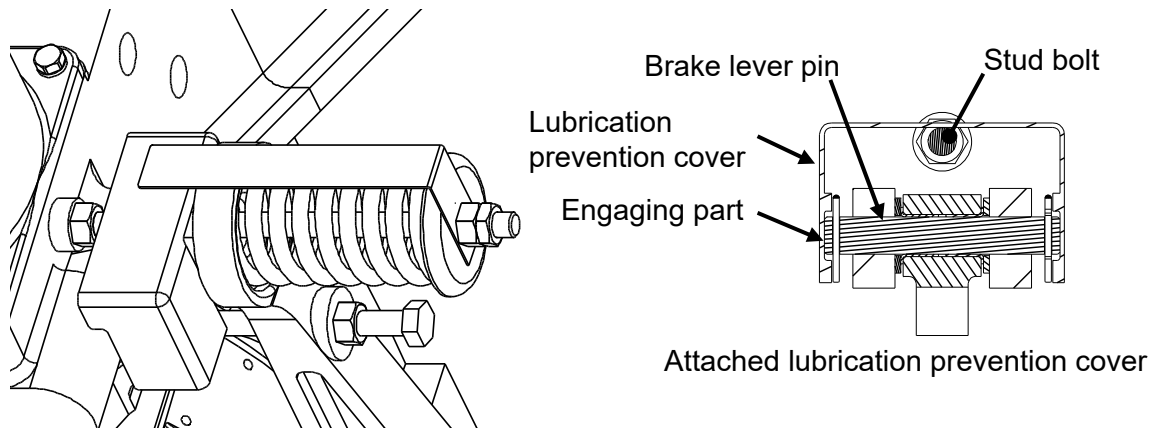


If the gap between the scale plate and the brake cover is narrow, check the compressing amount of the brake spring with the scale plate, and loosen the hexagonal nut and move the scale plate to secure the space for the cover.



Be careful not to stretch the lubrication prevention cover too much to prevent it from breaking.

- (2) Move the cover up and down and side to side to check that it is firmly attached to the brake lever pin. If it is firmly attached, tighten the hexagonal nut.



After attaching the lubrication prevention cover, check that it is not interfering with the gear box, the brake arm and the adjusting bolt.



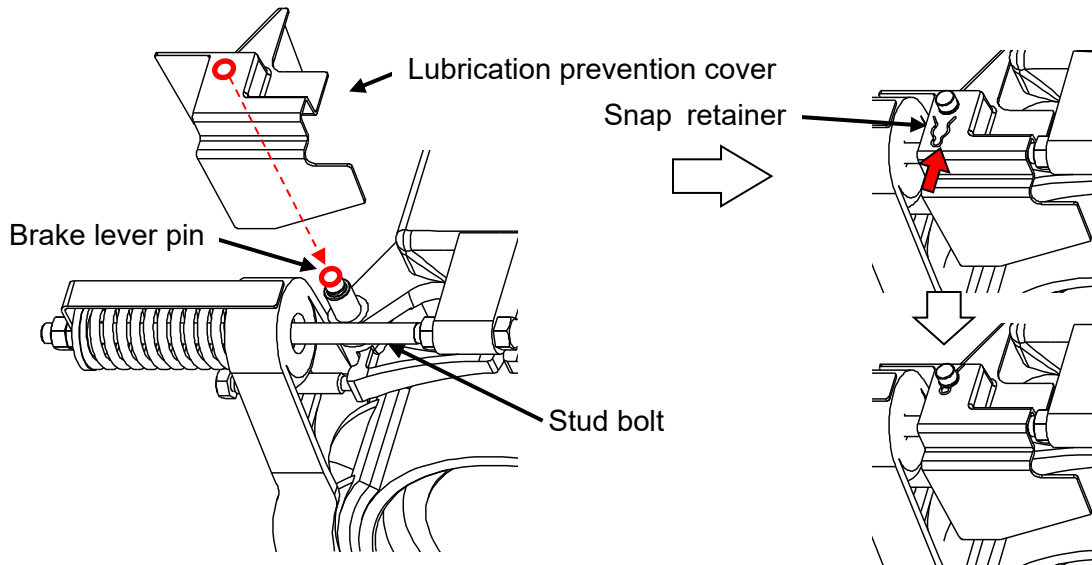
**Caution**



If you have loosened the hexagonal nut, be sure to tighten it until the compressing amount of the brake spring becomes to the original length. Then, fix the brake spring with double-nut.

### 11.3 EMB-200 and EMC-200

- (1) Put the lubrication prevention cover straight down to the brake lever pin. Hook the cover on the stud bolt and attach it to the brake lever pin. Then, fasten the cover with a snap retainer.



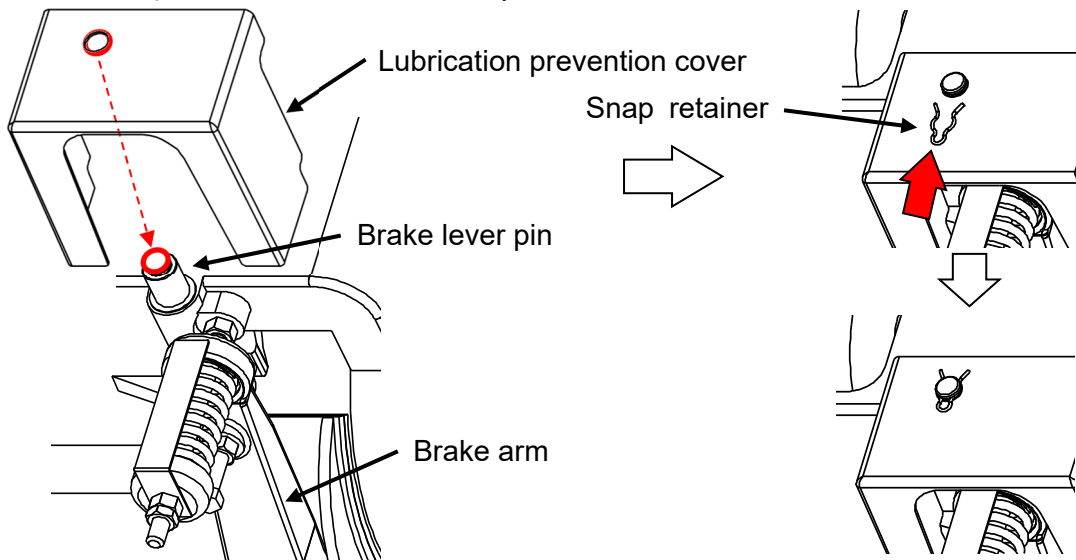
The shape of the lubrication prevention cover is asymmetrical. Be sure to attach it in the correct orientation.



After attaching the lubrication prevention cover, check that it is not interfering with the gear box, the brake arm and the adjusting bolt.

### 11.4 EMF-200

- (1) Put the lubrication prevention cover straight down to the brake lever pin. Attach the cover to the brake lever pin and fasten it with a snap retainer.



The shape of the lubrication prevention cover is asymmetrical. Be sure to attach it in the correct orientation.

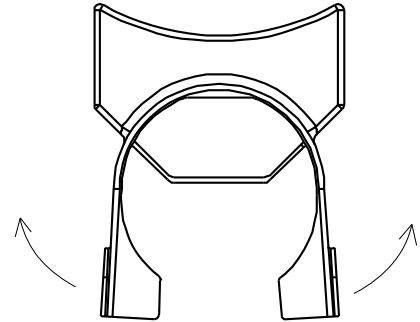
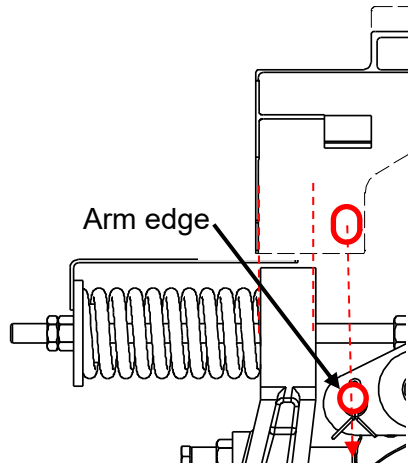


After attaching the lubrication prevention cover, check that it is not interfering with the gear box, the brake arm and the adjusting bolt.



## 11.5 EMK-300 and EML-300

- (1) Stretch the lubrication prevention cover and insert it from above the brake arm. Put the rib inside the cover onto the stud bolt and engage the hollow of the cover with the brake lever pin. The cover can be attached easily by inserting it while pressing the inside against the arm edge.

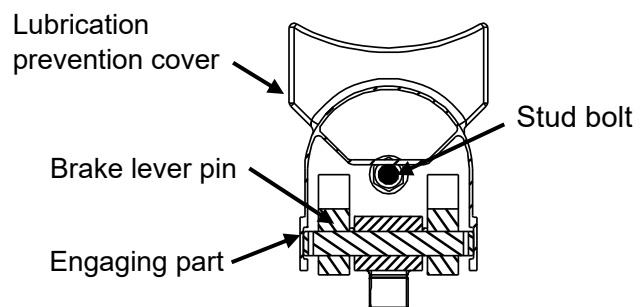
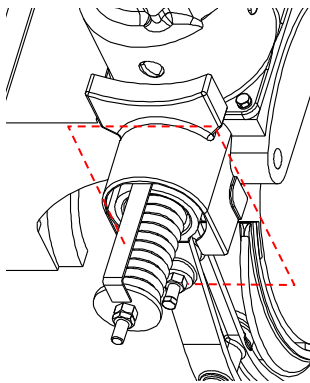


Stretched lubrication prevention cover



Be careful not to stretch the lubrication prevention cover too much to prevent it from breaking.

- (2) Move the cover up and down and side to side to check that it is firmly attached to the brake lever pin.



Attached lubrication prevention cover

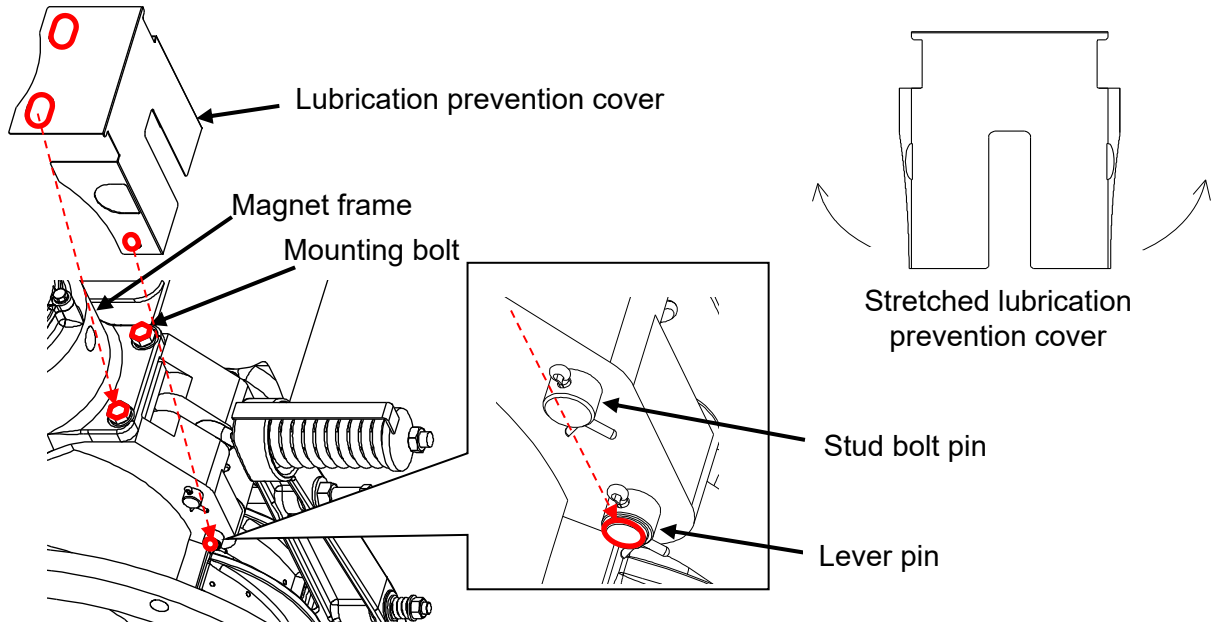


After attaching the lubrication prevention cover, check that it is not interfering with the gear box, the brake arm and the adjusting bolt.

## 11.6 EME-300, EMF-300, EMG-300, EMH-300, EME-400, EMF-400, EMG-400, EMK-400

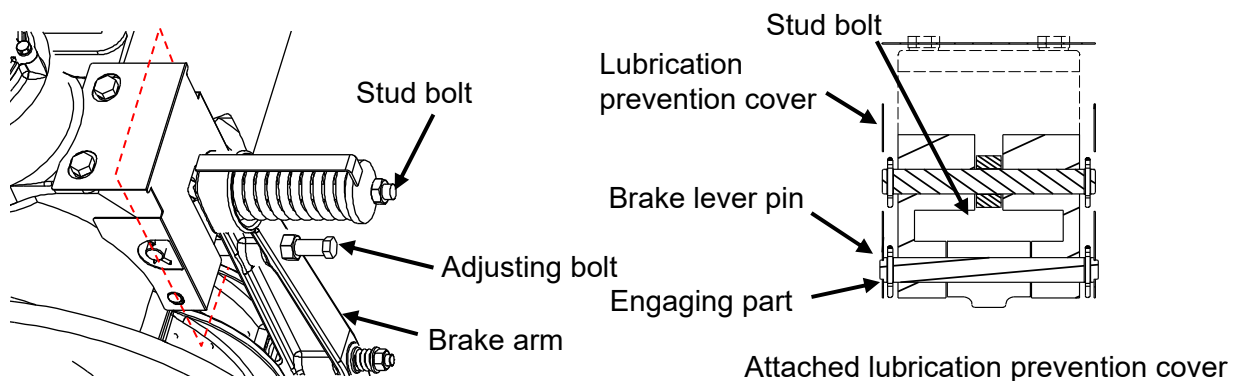
### EMK-500 and EME-500

- (1) Stretch the lubrication prevention cover and put it straight down to the brake lever. Hook the cover on the mounting bolts of the magnet frame and attach it to the brake lever pin. Do not stretch the cover too much to prevent deformation.



- ! Be careful not to stretch the lubrication prevention cover too much to prevent it from breaking.
- ! Do not stretch the cover made by sheet metal too much to prevent deformation. (For EME-400, EMF-400, EMG-400, EMK-400 and EMK-500)

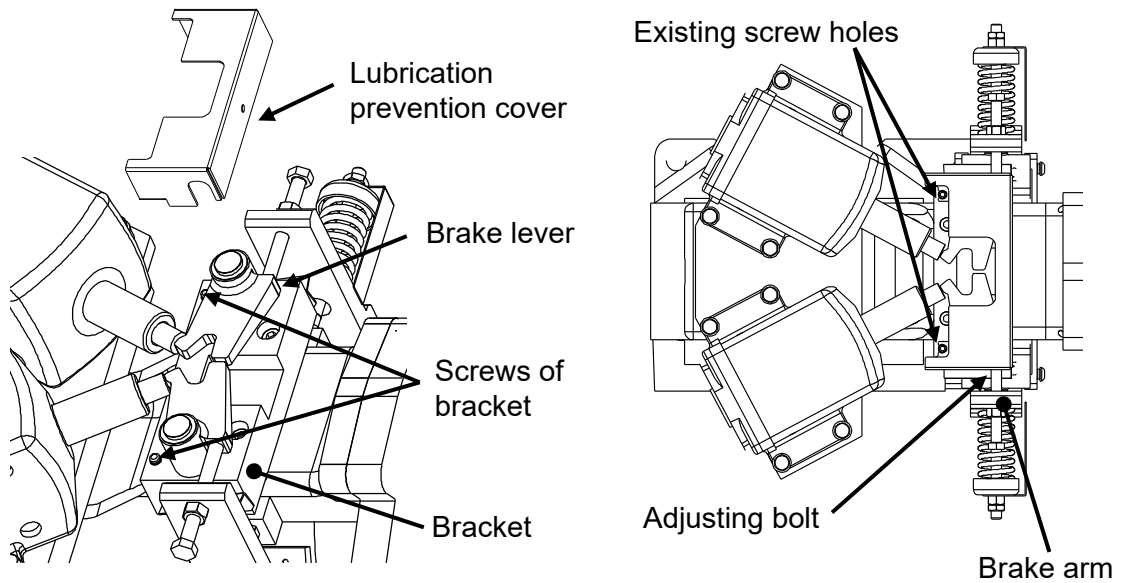
- (2) Move the cover up and down and side to side to check that it is firmly attached to the brake lever pin.



- ! After attaching the lubrication prevention cover, check that it is not interfering with the gear box, the brake arm, the adjusting bolt and the stud bolt.

## 11.7 EM-1500 and EM-1600 (Double-brake)

- (1) Put the lubrication prevention cover straight down to the brake lever and fix it to the screw holes of the bracket.



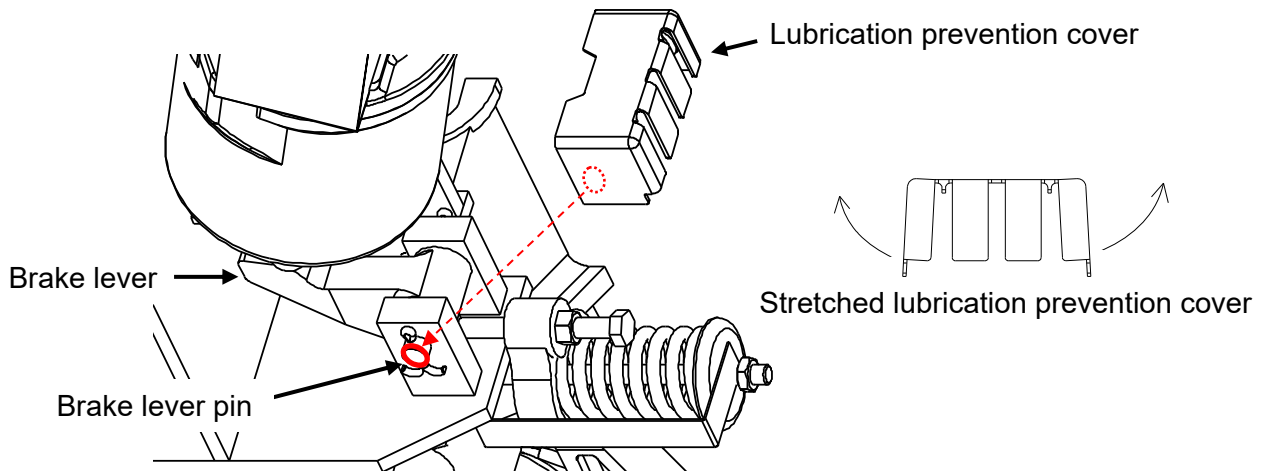
Use the existing screws and screw holes of the bracket to attach the lubrication prevention cover.



After attaching the lubrication prevention cover, check that it is not interfering with the brake arm and the adjusting bolt.

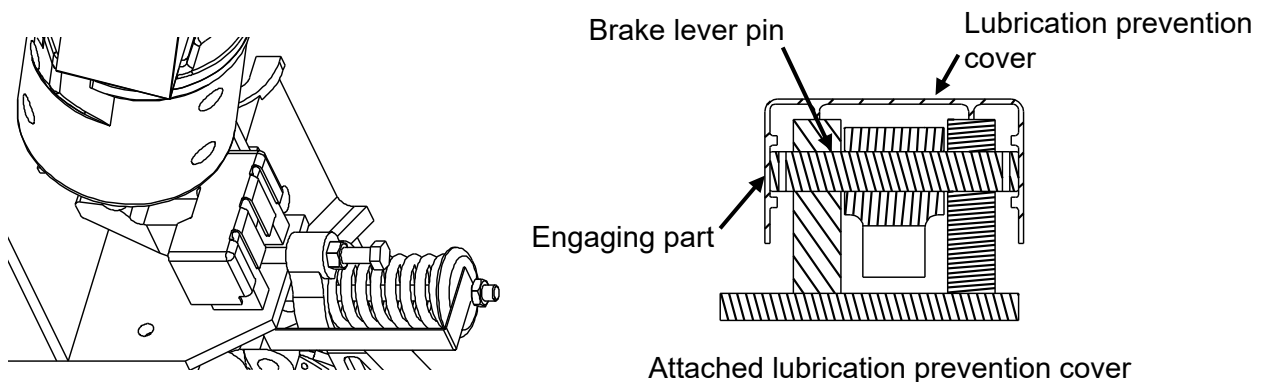
## 11.8 EM-2400, EM-3600, EMJ-500, EML-500 and EMB-600 (Double-brake)

- (1) Stretch the lubrication prevention cover, put it down diagonally and attach it to the brake lever pin.



Be careful not to stretch the lubrication prevention cover too much to prevent it from breaking.

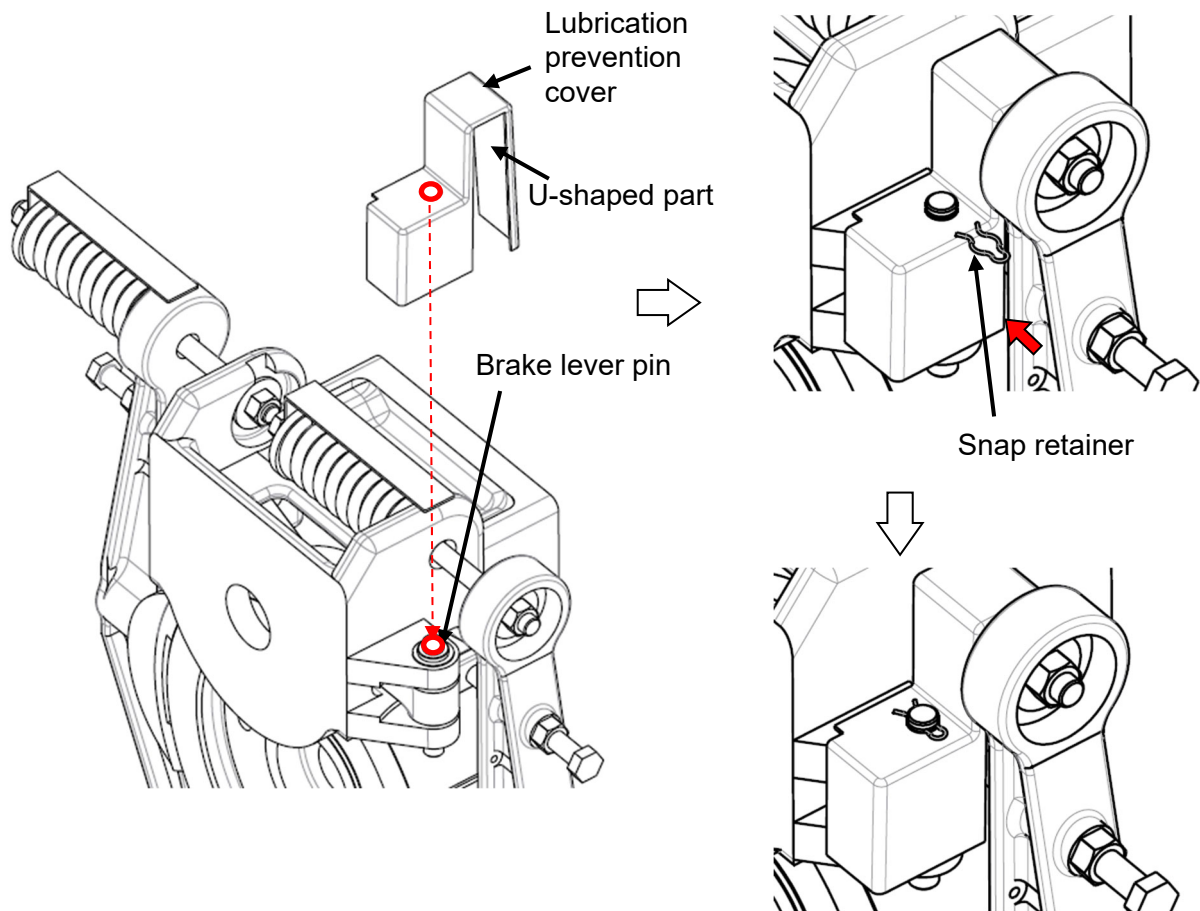
- (2) Move the cover up and down and side to side to check that it is firmly attached to the brake lever pin.



After attaching the lubrication prevention cover, check that it is not interfering with the brake arm and the adjusting bolt.

**11.9 EH-4100, EH-5400, EH-4200, EH-5100, EHB-5100, EH-6200, EHB-6200, EHC-6200, EH-6300, EHB-6300**

- (1) Put the lubrication prevention cover straight down to the brake lever pin.  
(For EH-5100, EHB-5100, EH-6200, EHB-6200, EHC-6200, EH-6300 and EHB-6300, make sure that the U-shaped part of the lubrication prevention cover crosses over the double-end stud of brake spring.)
- (2) Put the lubrication prevention cover onto the brake lever pin and fit the snap retainer to the pin by hand.



- (3) Rotate the lubrication prevention cover around the brake lever pin and check that the cover is not in contact with the brake arm and the adjusting bolt.



**Warning**



Put the lubrication prevention cover in the correct orientation so as not to come into contact with the adjusting bolt.

## 11.10 EHB-4100, EHC-4100, EHB-5400, EHC-5400, EHD-5400

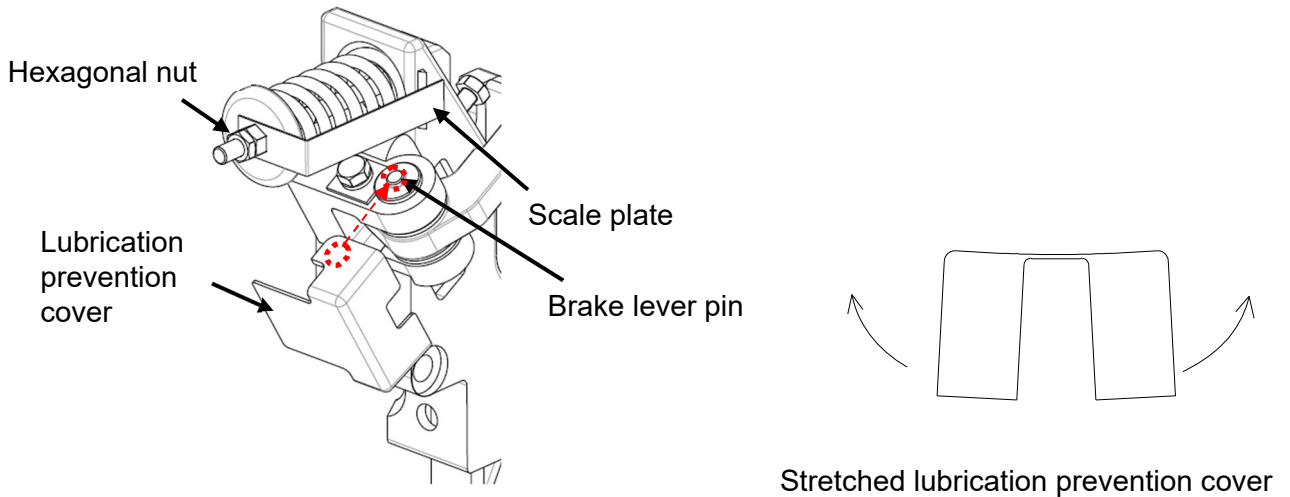
- (1) Stretch the lubrication prevention cover and put it onto the brake lever pin on the bottom of the brake spring. If the clearance between the brake spring and the lubrication prevention cover is small, loosen the hexagonal nut and adjust the cover to the position of the brake spring and double-end stud.



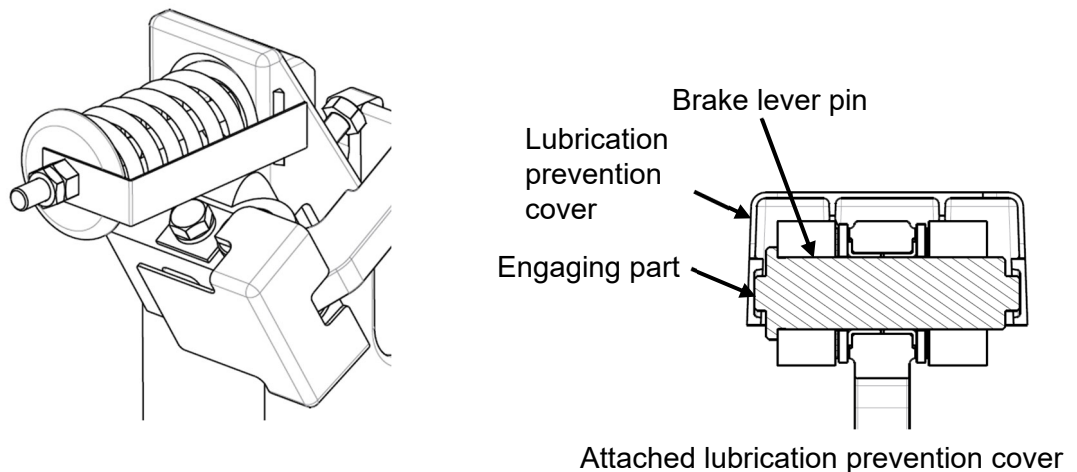
### Warning



Be careful not to stretch the lubrication prevention cover too much to prevent it from breaking or deforming.



- (2) Move the lubrication prevention cover up and down and side to side, and check that the cover is firmly attached to the brake lever pin.





## 11.11 EH-4500

For EH-4500, the lubrication prevention cover consists of two parts (covers A and B).

- (1) Insert the cover A between the brake lever and gear box and put it with the U-shaped cut and convex part facing the brake arm.
- (2) Insert the cover B between the gear box and brake arm, and put the convex part of cover A into the groove of cover B and put the brake lever pin into the hole of cover B.
- (3) Attach a snap retainer.

Move the covers A and B up and down and side to side. Check that they are not rattling and are not in contact with the brake arm.

 <b>Caution</b>	 Put the covers A and B in the correct orientation, referring to the figures below.
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