



NHVIM – Section 2

# BASIC BRAKES MAINTENANCE



Chair – Lance Fisher, JLP

### Panel Members

- Andrew Archibald, TMR Queensland
- Renzo Barone, Meritor
- Kevin Gibson, Knorr-Bremse



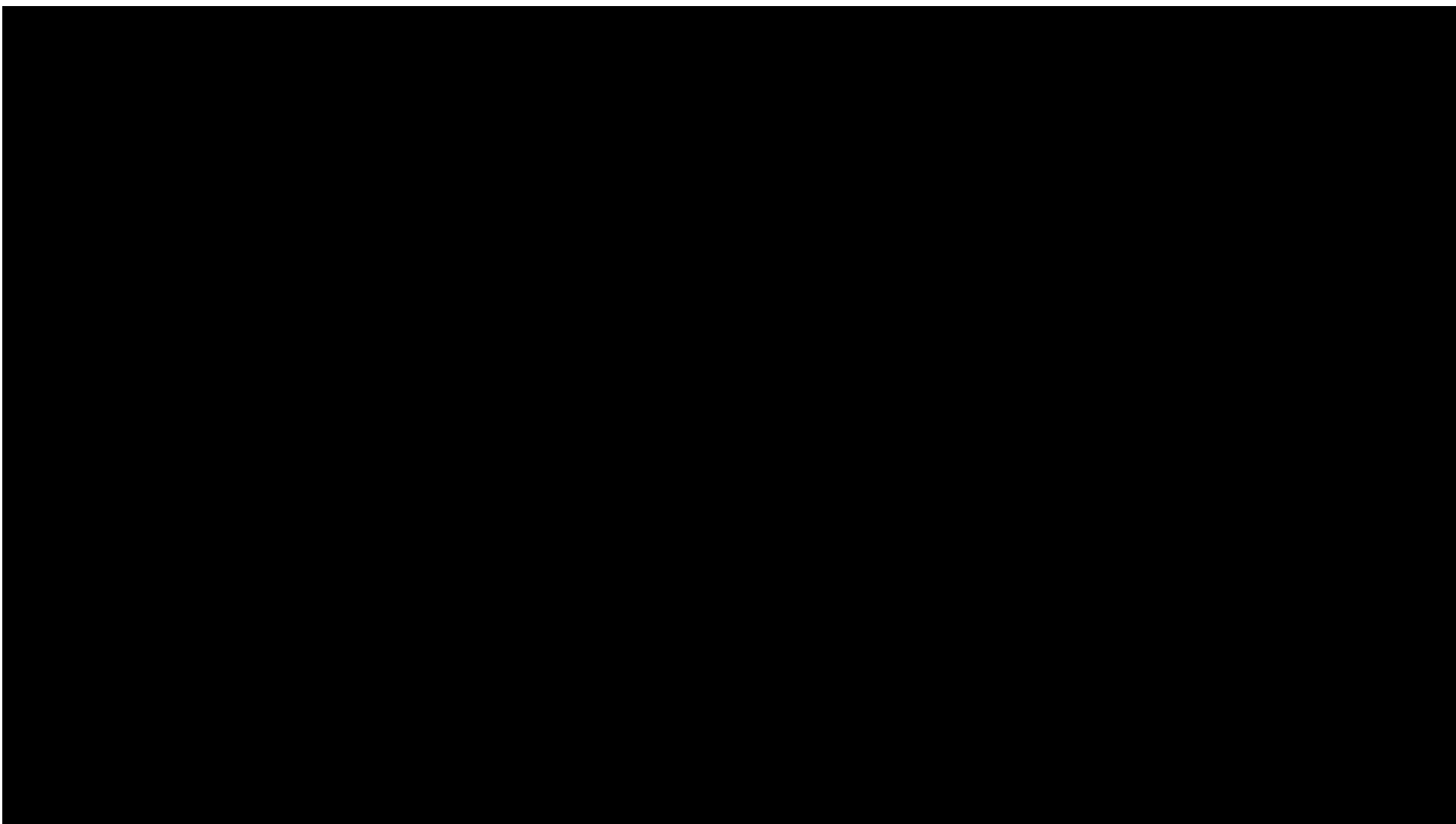


## Chair – Lance Fisher, JLP

### Panel Members

- Andrew Archibald, TMR Queensland
- Renzo Barone, Meritor
- Kevin Gibson, Knorr-Bremse





Chair – Lance Fisher, JLP

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- Renzo Barone, Meritor
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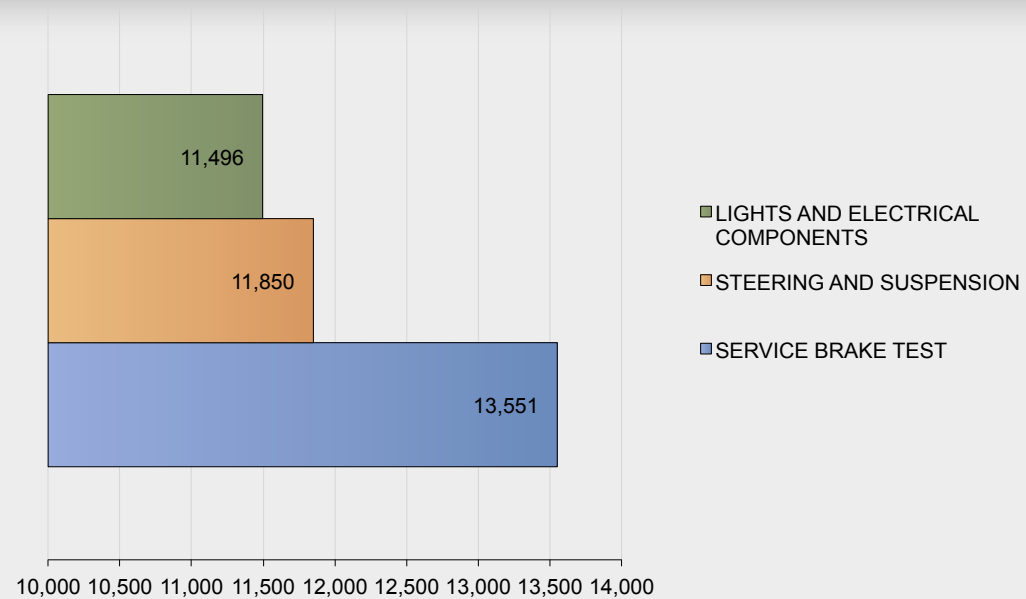


## Top 3 Defects

11,496 = 31% Lights and Electrical

11,850 = 32% Steering and Suspension

13,551 = 36% Service Brakes









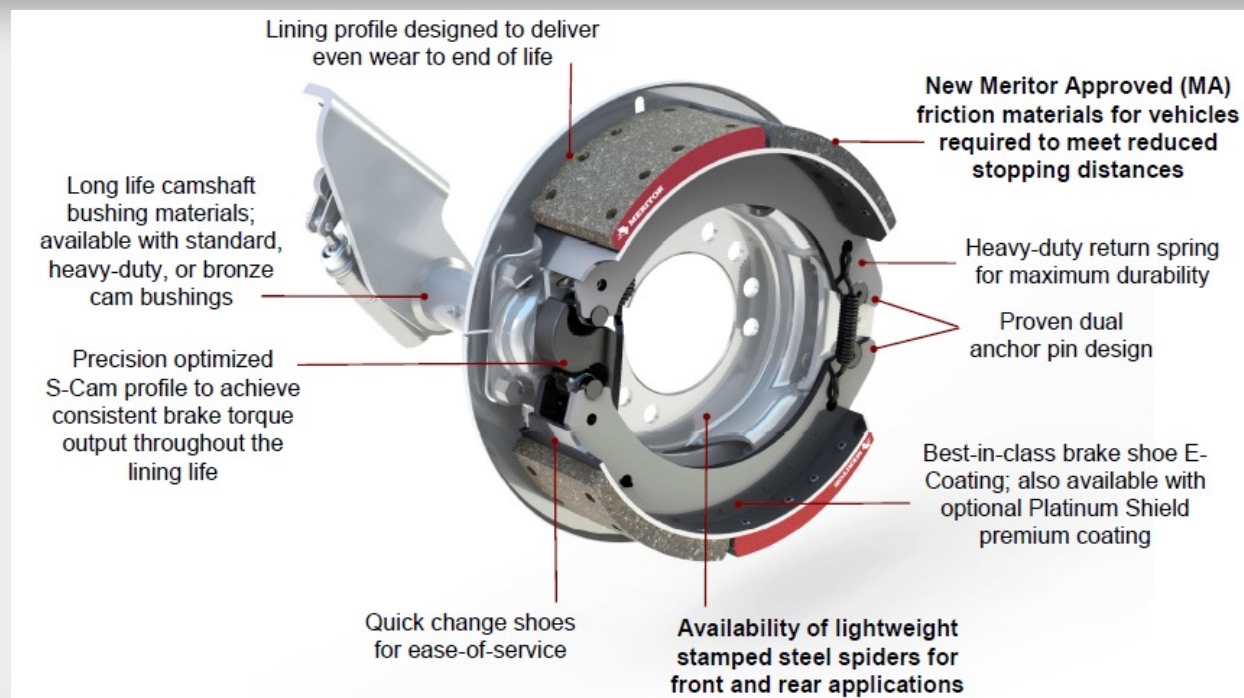
Chair – Lance Fisher, JLP

Panel Members

- Andrew Archibald, TMR Queensland
- **Renzo Barone, Meritor**
- Kevin Gibson, Knorr-Bremse/Bendix



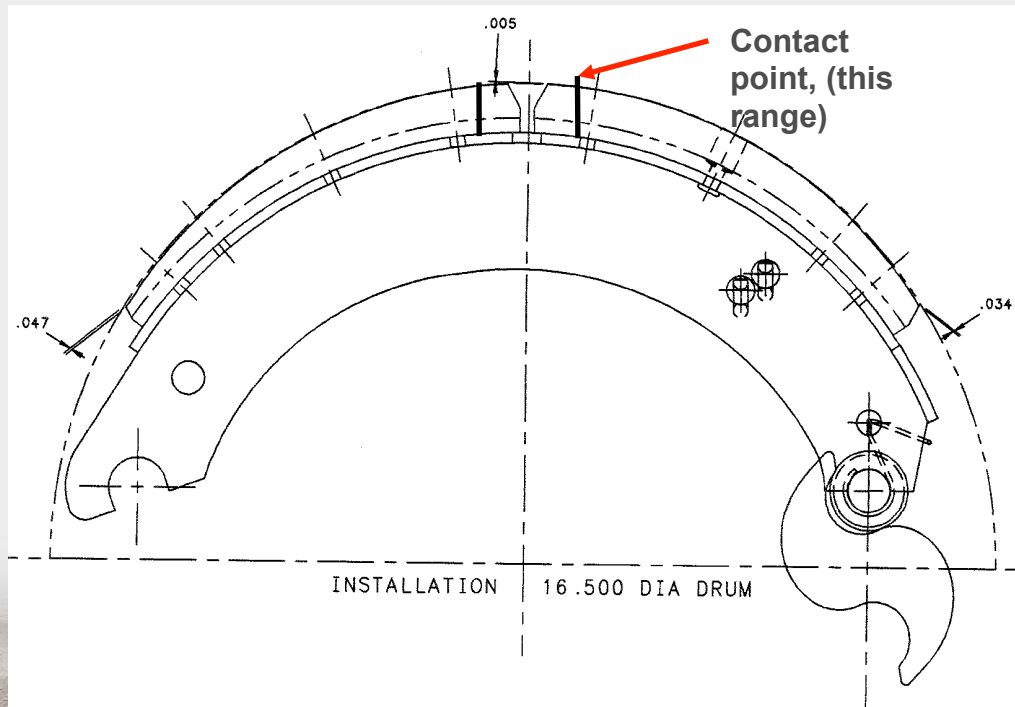
# Meritor Q Plus™ Brake



# Shoe Contact Fundamental



BY DESIGN, THE ANCHOR END WILL BE AT 0.047" CLEARANCE AND THE CAM END WILL BE AT 0.034" CLEARANCE.



# Shoe Contact Fundamental



- The Meritor Q-plus shoe is designed to contact at the center of the shoe at new lining condition.
- This designed “crown” is necessary to control brake torque.
- Due to tolerance stack ups the crown is designed to contact the drum first.
- This condition will exist until the linings wear to the drum inside diameter over several brake applications.
- This is often called “bedding”, “burnishing” or “green lining condition”.
- Once the bedding is complete, a full contact of lining to drum will exist.
- Without the crown the brake torque output will vary depending on the point of contact. Varying initial contact may cause an instability of the vehicle.





# BRAKE MAINTENANCE & DIAGNOSTICS



- Measure lining thickness.
- Minimum thickness is 1/4" (6.3 mm)
- 1/16" (2 mm) over rivets.



## Reline the Brakes

Reline the brakes when the lining thickness is 0.25-inch (6.3 mm) at the thinnest point. The rivets or bolts must not touch the drum. Damage to components will result. Meritor recommends that you replace the springs, rollers, camshaft bushings and anchor pins at each reline. Reline the brakes when the lining thickness is 0.25-inch (6.3 mm) at the thinnest point. Replace shoe retainer springs, check the drum, and perform a major inspection when you reline the brakes.



# CHECK CAMSHAFT MOVEMENT

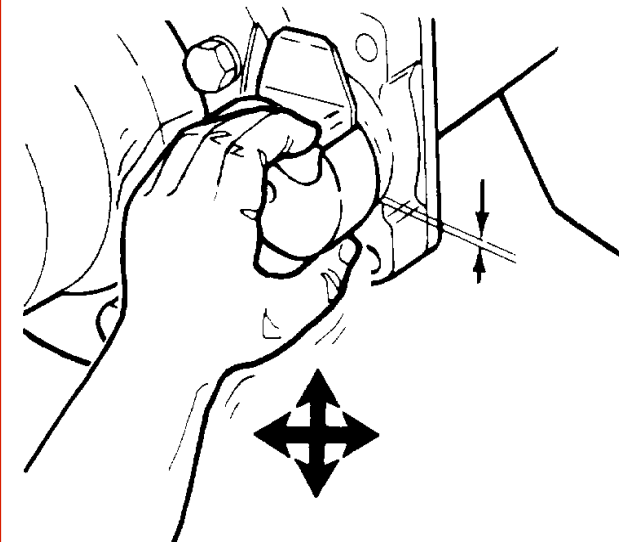


**Check the up-and-down and side-to-side end play of the camshaft to determine if you must replace the camshaft bushings.**

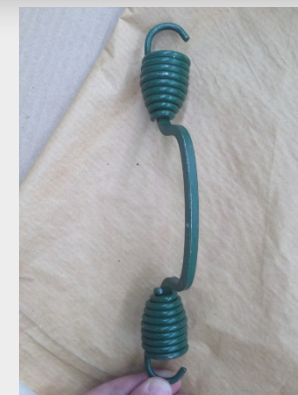
**If the total movement is more than 0.030 inch (0.76 mm), replace the bushings.**

**If axial end play exceeds 0.060 inch (1.52mm) remove snap ring & add an appropriate number of spacing washers between the slack adjuster & snap ring. Correct specification 0.005 – 0.060inch (0.127 – 1.52mm)**

Figure 4



# STEER BRAKE RETURN SPRING





# BRAKE SYSTEM COMPONENT FACTS



Brake force imbalance will result in premature lining and drum wear from the brakes being over-worked.

Brake imbalance can be defined as each brake in a vehicle or a combination vehicle not doing its equal share of the braking.

Brake imbalance can be caused by; pneumatic imbalance, well-adjusted and poorly-adjusted brakes, incorrect lining mix for the application, using the trailer brakes to stop the combination vehicle, worn foundation components, etc.





# COMMERCIAL VEHICLE SAFETY ALLIANCE CRITERIA



**According to the CVSA, a defective brake, (out-of-service) is defined as one or more of the following conditions:**

Lining cracks or voids over 1/16" (2 mm) in width observable at the lining edge.

Cracks that exceed 1.5" (38 mm) in length.

Missing portions of a lining segment such that a fastener is exposed when viewed from the lining edge.

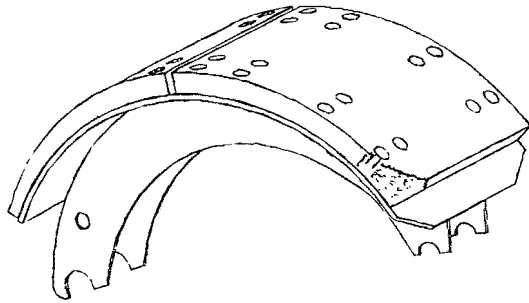
Cracks extending across the lining face through the lining edges.

Loose lining segments.

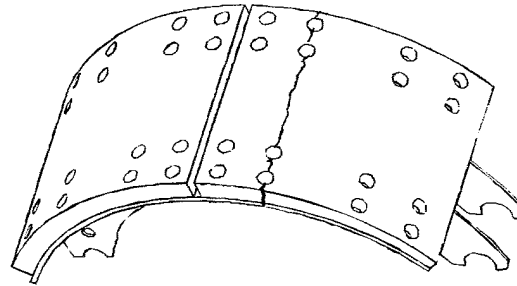
Complete lining segment missing.



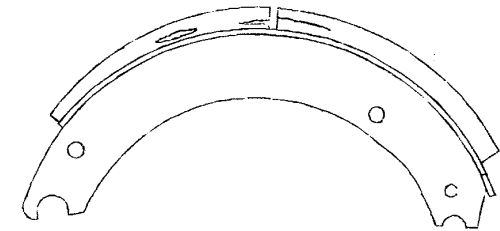
# OUT-OF-SERVICE CRITERIA



OUT OF SERVICE PORTION OF  
LINING MISSING THAT EXPOSES  
A FASTENING DEVICE



CRACKS ACROSS THE LINING FACE THAT  
EXTEND THROUGH THE LINING EDGES



CRACKS OR VOIDS THAT  
EXCEED 1/16" IN WIDTH  
CRACKS THAT EXCEED 1-1/2" IN LENGTH

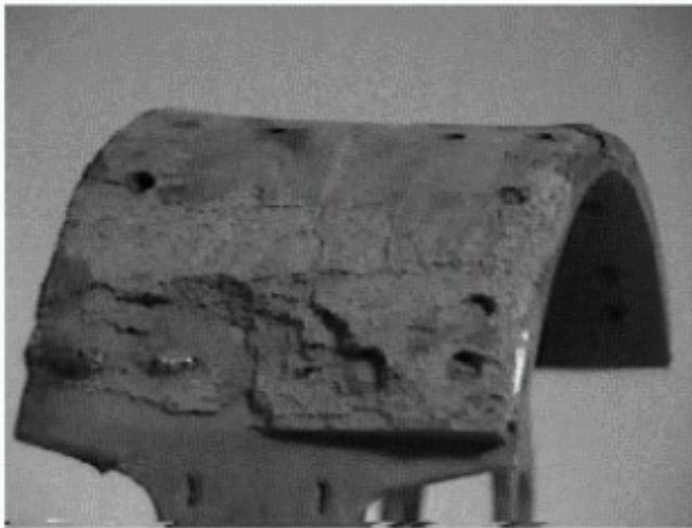


# ADDITIONAL BRAKE BLOCK WEAR PATTERNS & CAUSES



**Effect: Chunks out of lining. Fuzzy effect on lining surface.**

**Probable Cause: Overworked lining. Excessive Heat**



# ADDITIONAL BRAKE BLOCK WEAR PATTERNS & CAUSES



**Effect:** Lining worn on one side more than the other.

**Probable Cause:** Bell-Mouthed Drum





# ADDITIONAL BRAKE BLOCK WEAR PATTERNS & CAUSES

**Effect:** Excessive Lining Wear in Middle

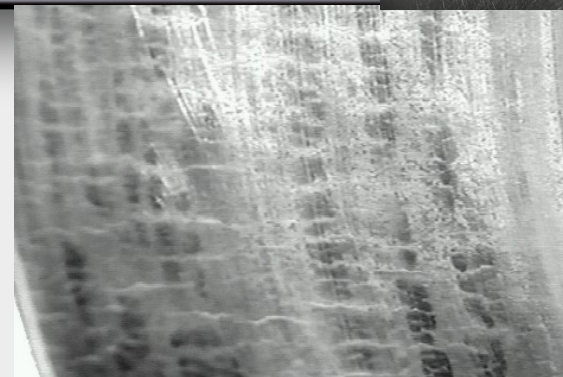
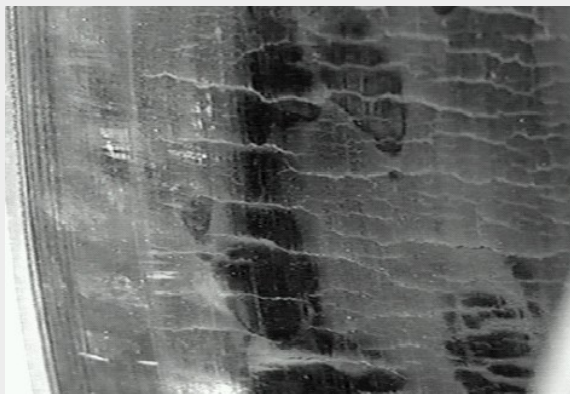
**Probable Cause:** Grooved Drum



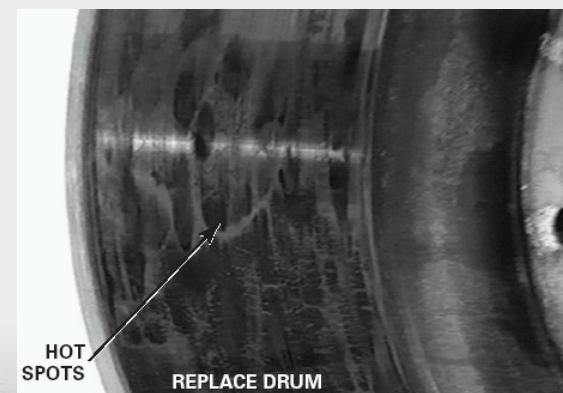
# DRUM HOT SPOTTING (BLACK SPOTS)



- On one side only, replace the brake drum.
- Over the entire drum surface, replace the brake drum.



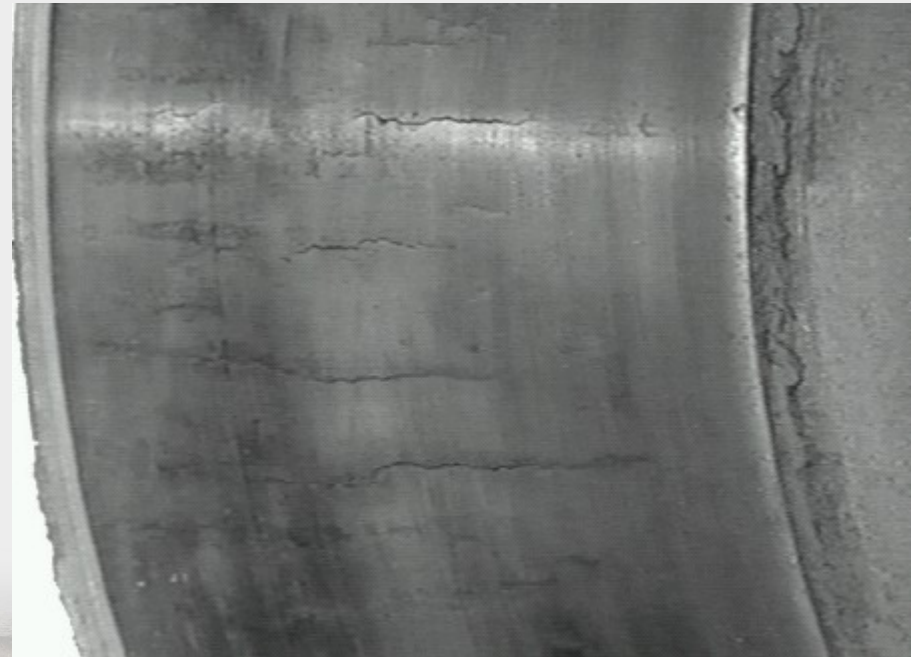
- In equally distant places, replace the brake drum.



# DRUM HEAT CHECKING



Cracks that are 1" (25 mm) or more long are usually deep and require that you replace the brake drum.





# ADJUSTING DRUM BRAKES



## MANUAL SLACK ADJUSTERS

Raise wheel off the ground and support axle.



Chock wheels on another axle to prevent vehicle moving when raised.

Push down lock on adjusting nut.

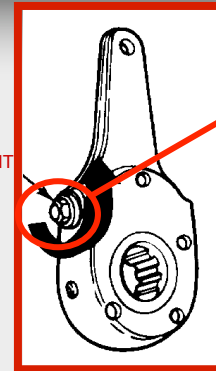
Turn the adjusting nut until the brake linings touch the drum.

Turn the adjusting nut in opposite direction for one or two clicks so that linings just clear the drum.

Rotate the drum to check for clearance.

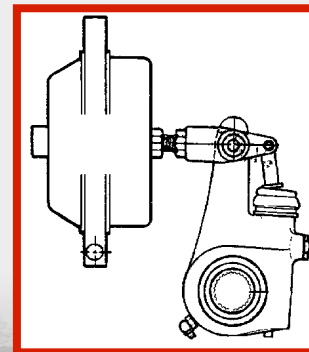
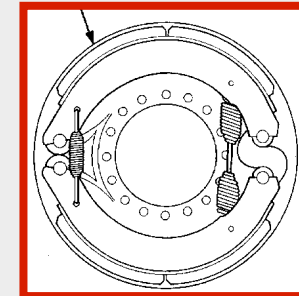
Brake **MUST NOT** drag.

ADJUSTMENT  
NUT



**NOTE**  
Lock ring **must** be engaged after adjustment

CLEARANCE BETWEEN  
BOTH SHOES & DRUM





# ADJUSTING DRUM BRAKES



## ■ AUTO SLACK ADJUSTERS

Raise wheel off the ground and support axle.

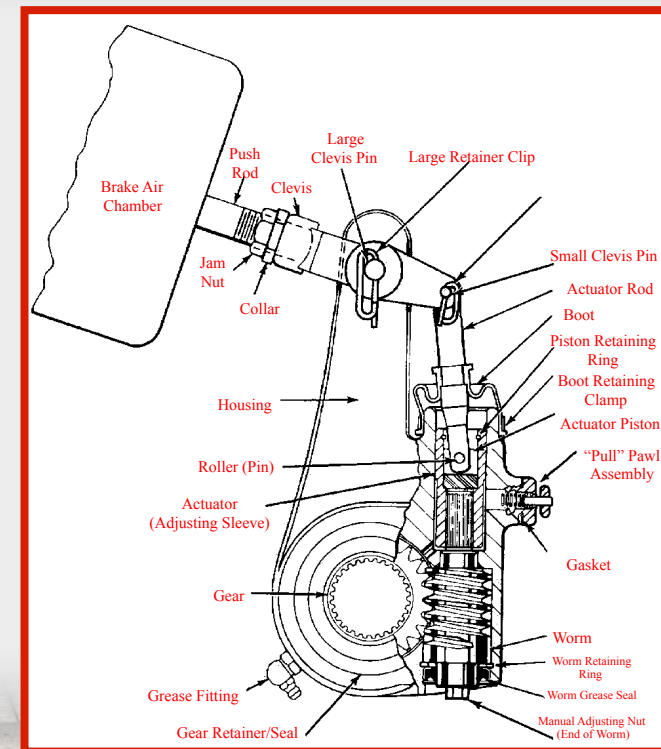


Chock wheels on another axle to prevent vehicle moving when raised.

Disengage or remove the pawl as required.  
Turn the adjusting nut until the linings touch the drum, then turn the adjusting nut  $\frac{1}{2}$  a turn in the opposite direction.

Rotate the drum to check for clearance.

Brake **MUST NOT** drag.



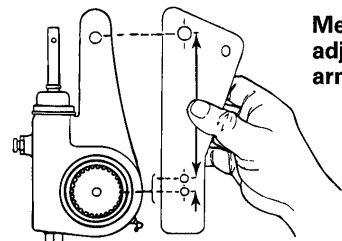
# MERITOR AUTO SLACK ADJUSTERS



If the brake chamber has been replaced or slack adjuster clevis removed, the clevis position on the chamber rush rod must be set.



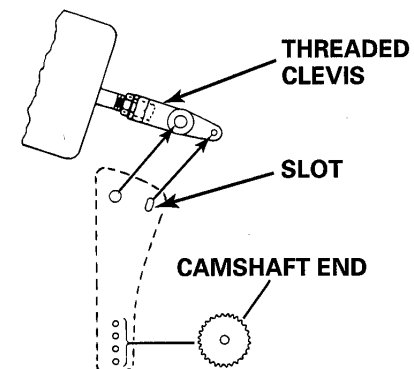
Color of Template	Part Number	Applications
Dark brown	TP-4786	Truck or tractor drum brake
Tan	TP-4787	Trailer drum brake
White	TP-4781	Coach drum brake



Measure the slack adjuster arm length.

**CAMSHAFT CENTER**

4000369b

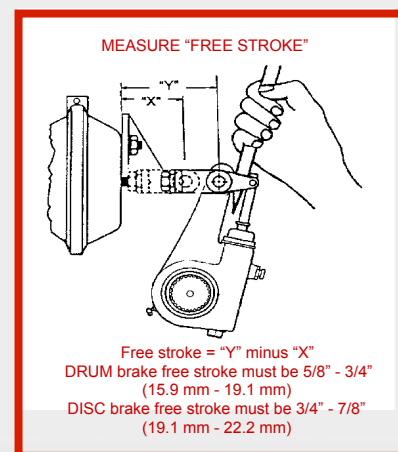
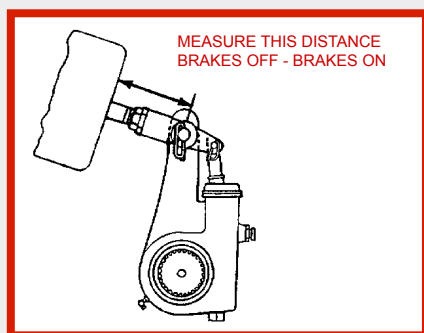


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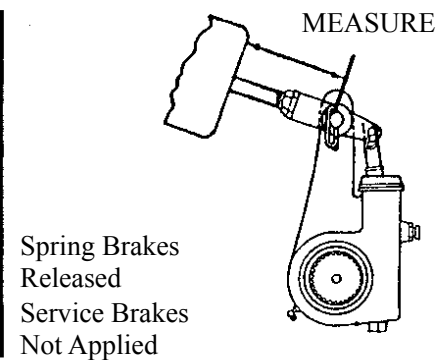
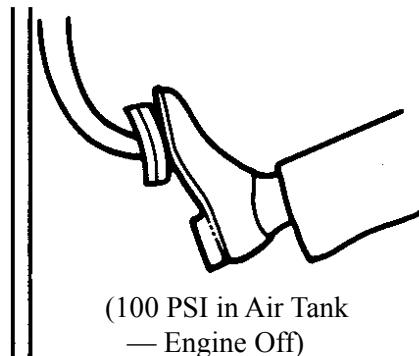
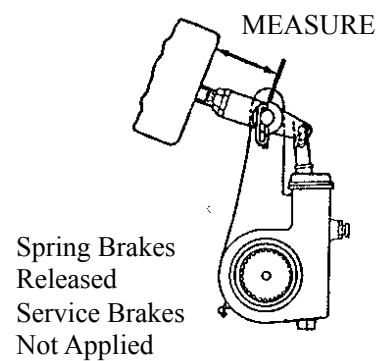
# ADJUSTING DRUM BRAKES



“free stroke” is between 5/8” - 3/4” (15.9 - 19.1mm)



# BRAKE ADJUSTMENT INSPECTION





# BRAKE ADJUSTMENT INSPECTION



Maximum stroke at which brake must be adjusted\*.  
80-90 PSI (550-620 kPa) air pressure in the air chamber.  
Clamp type air chamber.

Chamber Type (Size)	Stroke Length Not to exceed:
9	1-3/8 inches (34.9 mm)
12	1-3/8 inches (34.9 mm)
16	1-3/4 inches (44.4 mm)
20	1-3/4 inches (44.4 mm)
24	1-3/4 inches (44.4 mm)
30	2 inches (50.8 mm)
36	2-1/4 inches (57.1 mm)

mm)

*\*NOTE: The U.S. Department of Transportation (DOT), Federal Highway Administration has issued the above specifications for cam brakes.*



Chair – Lance Fisher, JLP

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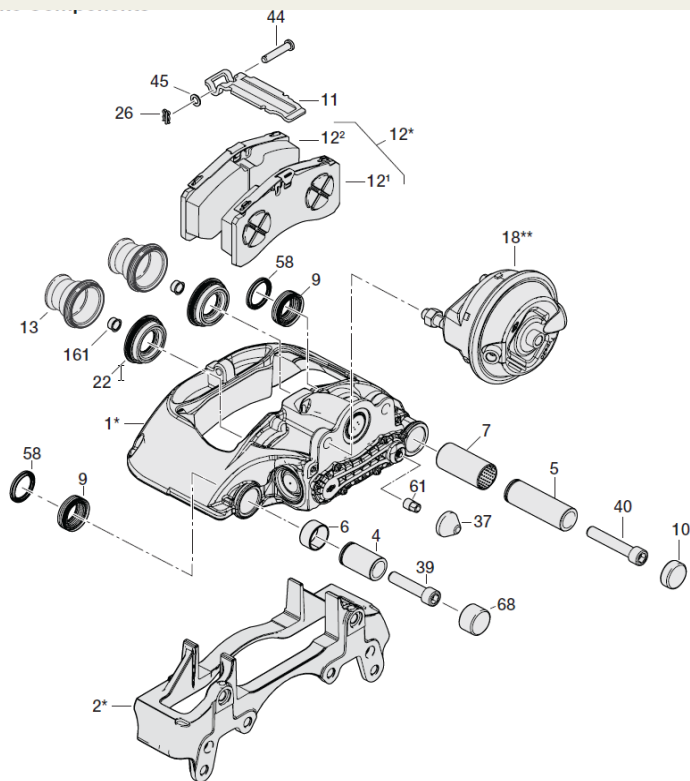
Kevin Gibson

Knorr-Bremse

***Air Disc Brakes - Basic Maintenance***



## Serviceable Components - Air Disc Brakes



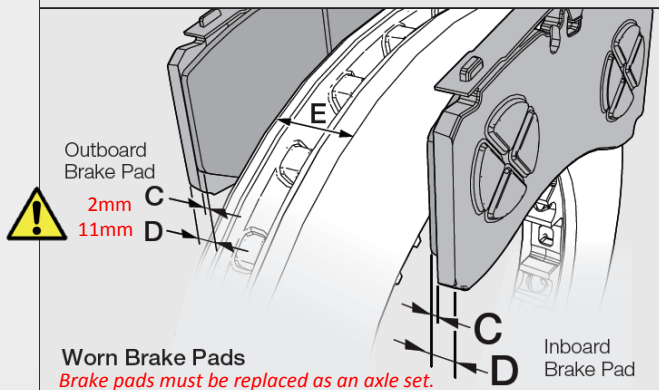
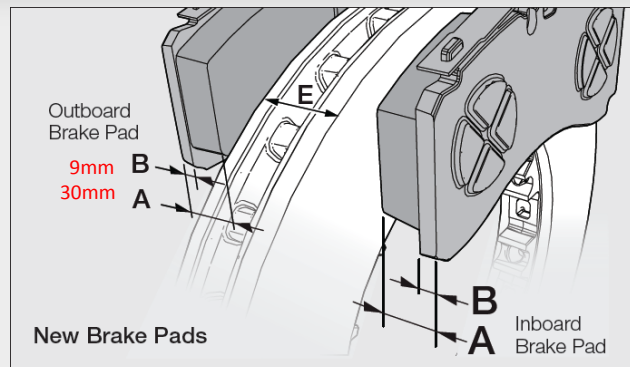
### Legend

- |                             |                     |
|-----------------------------|---------------------|
| 1 Caliper*                  | 18 Brake Actuator** |
| 2 Carrier*                  | 22 Inner Seal       |
| 4 Guide Pin                 | 26 Spring Clip      |
| 5 Guide Pin                 | 37 Adjuster Cap     |
| 6 Guide Sleeve              | 39 Caliper Bolt     |
| 7 Brass Bush                | 40 Caliper Bolt     |
| 9 Inner Boot                | 44 Pad Retainer Pin |
| 10 Cover                    | 45 Washer           |
| 11 Pad Retainer             | 58 Ring             |
| 12 Brake Pad*               | 61 Shear Adapter    |
| 12.1 Inboard Brake Pad      | 68 Cover            |
| 12.2 Outboard Brake Pad     | 161 Tappet Bush     |
| 13 Tappet and Boot Assembly |                     |

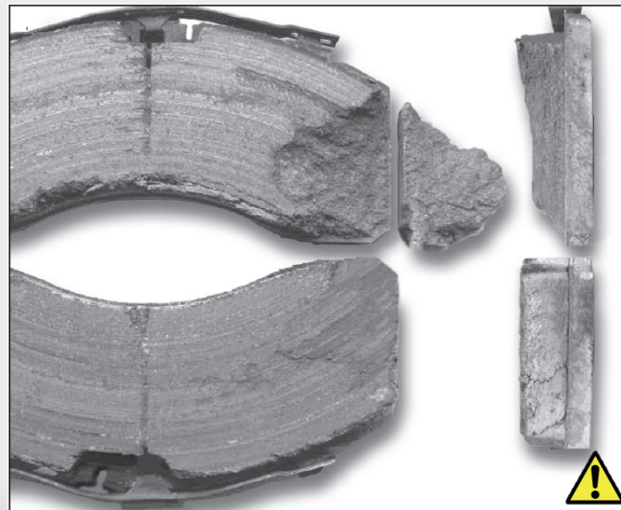




## Brake Pads - Functional & Visual Checks



Brake Pad with minor damage (permitted)



Brake Pad with major damage (not permitted)

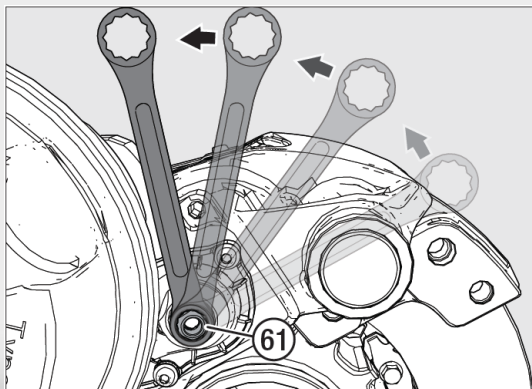
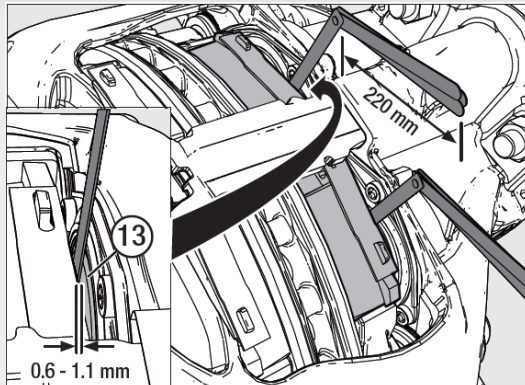


### Possible causes (Failure Modes),

- Incorrect adjustment
- Faulty Adjuster
- Performance (damaged components)
- System issues (leaking chambers)
- Pad Spring damage & fatigue
- Foreign material (rocks & road junk)
- Harsh & Abusive braking
- Non-genuine Pads
- Mixed Pad Brands
- Bearing run-out



## Brake Pads - Functional & Visual Checks

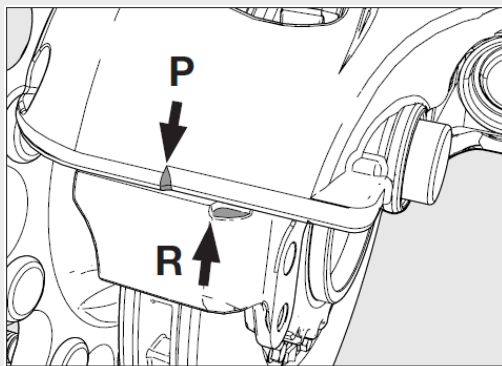


Checking the GAP between Tappets & Pad (0.6 -1.1mm)  
If the gap difference between the two tappets is  $> 0.25$  mm then the caliper bearing clearance must be checked.

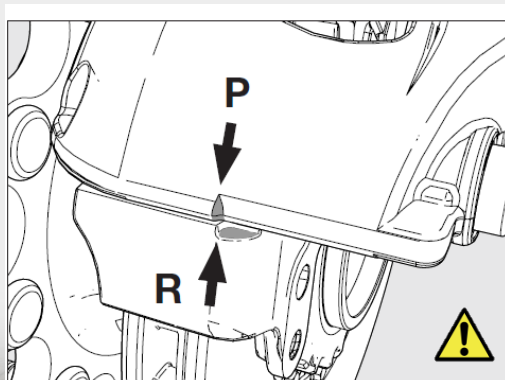
If the GAP between Tappets & Pad is  $> 1.1$ mm the Adjuster must be checked using Manufacture procedure.



## Brake Pad/Disc Wear Check (on vehicle)

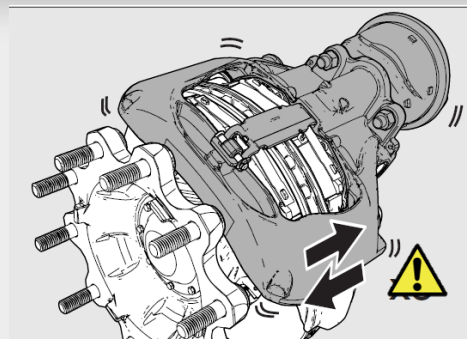


NEW Brake Pads & Disc Indicator position example.

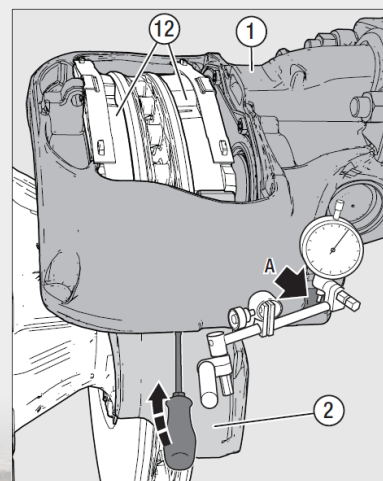


WORN Brake Pads & Disc Indicator position example.

## Caliper Movement & Running Clearance



Check for axial movement when brakes are in released position.

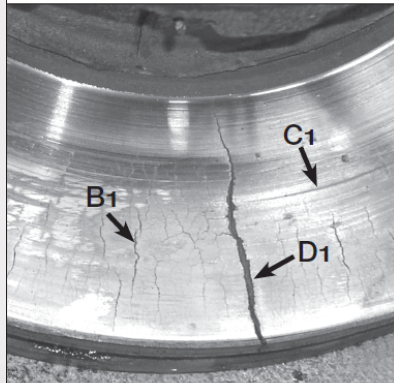
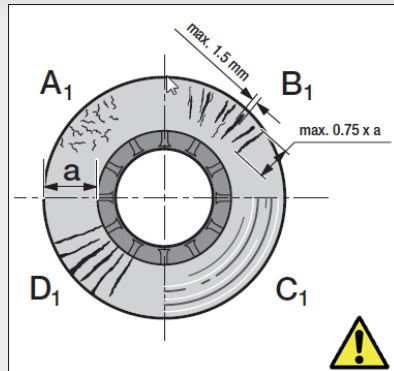


Measuring Guide Pin Bearing Clearance (max . 1mm).





## Brake Discs (Rotors) - Functional & Visual Checks



### Disc surface condition checks:

- A: Network-type tears = permissible
- B: Radial cracks up to max. 1.5 mm width and depth = permissible
- C: Uneven disc surface less than 1.5 mm = permissible
- D: Continuous cracks = not permissible

### Technical details:

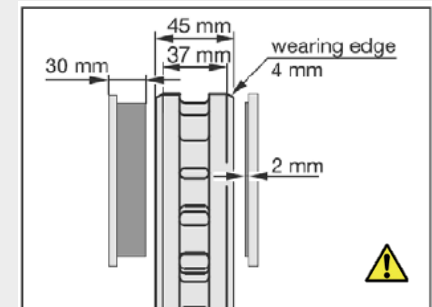
- When thickness is  $\leq 39$  mm, renewed when the brake pads are changed.

In the case of surface conditions **A - C**, the brake disc can be used until the minimum permissible disc thickness has been reached.

### IMPORTANT!

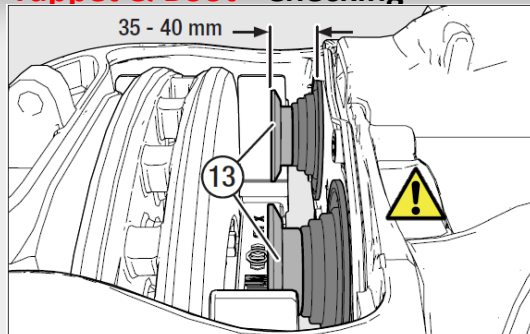
To prevent damage to the brake discs, the brake pads should be replaced when their thickness (excluding backing plate) is **2 mm** or less.

Pad thickness < 2mm

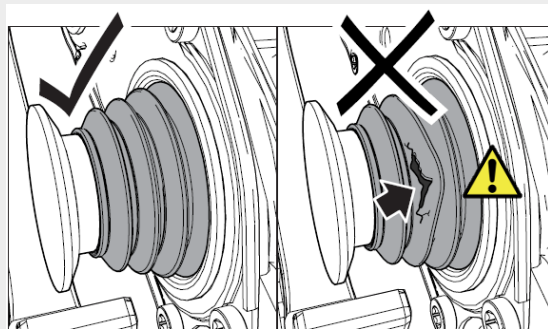




### Tappet & Boot - Checking

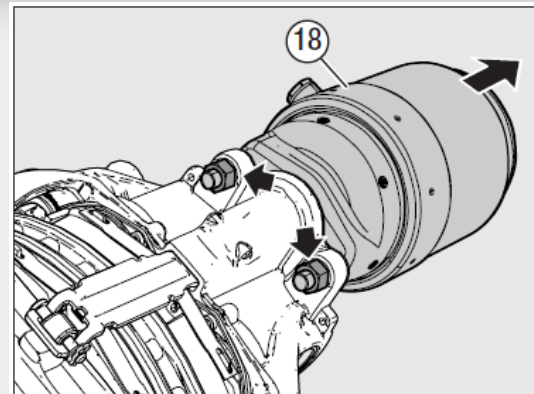


If Gap difference between the two tappets is  $> 0.25$  mm check caliper bearing clearance.



Tappet Boots must not have any cuts/tears/damage will lead to corrosion and impair the function of the clamping mechanism and wear adjuster.

### Brake Actuators (Spring Brakes, Brake Chambers)



#### Matching OE Brake Actuators

- Damage
- Leaks
- Loose fasteners – Secure
- Loose Clamp hoops
- Drain Plugs
- Port Damage – cracks, cross thread



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Questions

