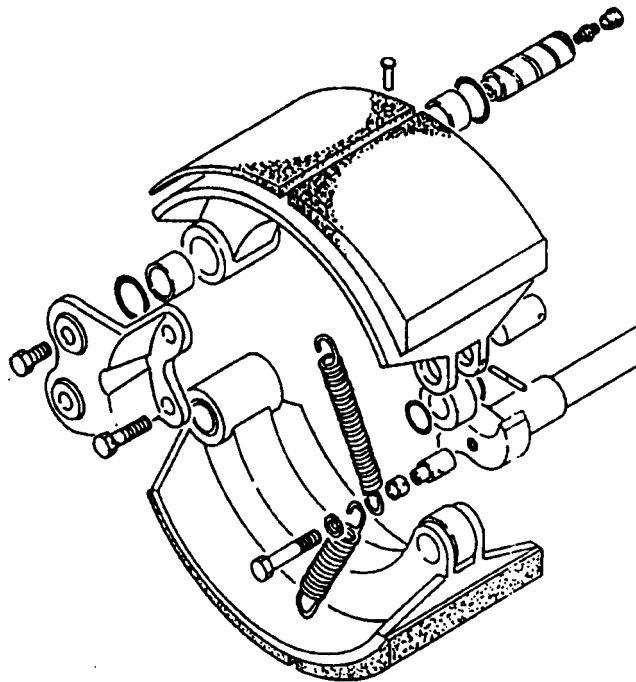




# Axles

## Sisu S-Cam Drum Brakes

(For hub reduction rear axles since 1992)



## Maintenance Manual

Sisu Axles, Inc.  
Autotehtaan tie 1  
P.O. Box 189  
FIN-13101 Hämeenlinna  
Finland  
Phone int + 358 204 55 2999  
Fax int + 358 204 55 2900

BRKS\_ABS.pdf (6/2017)



List of contents .....	Page
BRAKES .....	3
Servicing .....	3
Lubrication .....	3
Inspection .....	3
Manual adjustment .....	4
Brake drum .....	5
Brake drum machining .....	5
Brake linings .....	6
Brake maintenance .....	7
Riveting brake linings .....	7
Brake vibrations .....	8
Attaching the wheel .....	8
S-camshaft .....	9
Brake tightening torques: .....	9
Brake repairs .....	11
Dismantling .....	11
Removing the brake shoes .....	11
Attaching the brake shoes .....	11
S-camshaft .....	12
Removal .....	12
Attaching .....	12
Brake adjustment .....	12
Automatic brake adjusters .....	13
Installation .....	13
Inspection (in use) .....	14



*NOTE! This Manual is intended for use by experienced mechanics using safe procedures in properly equipped shops. Safety precautions should always be followed such as wearing safety glasses, using adequate lifting aids, and using tools and equipment in good condition. Sisu Axles, Inc., its agents, associates or representatives are not responsible for damage or injury occurring while working on their components.*

### *Appendix 1. INSTALLATION OF ABS PARTS IN RIGID REAR AXLES*



# 1 BRAKES

## 1.1 MAINTENANCE

To ensure long, trouble-free operation, it is essential to service the brakes carefully and at regular intervals.

The service required is presented below.

### 1.1.1 Lubrication

Use a good grade of chassis grease. At each service, squeeze grease into the brake slack adjusters, S-camshaft bearings and anchor bolts. Before greasing, clean the nipple heads carefully to prevent any dirt getting into the bearings.

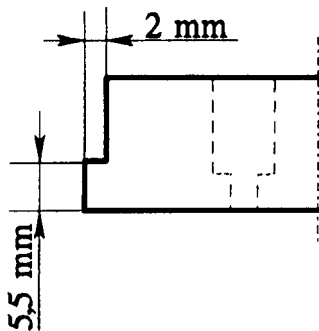
While greasing the S-camshaft and anchor bolts, it is advisable to depress and release the brake pedal so that the grease spreads more evenly on the bearing surfaces.

Over-greasing must be avoided, as the excess grease may get into the brake drum.



*Note! From beginning of year 1997 there are no grease nipples in the anchor pins. Anchor pins shall be lubricated within brake shoe service only. If there are no grease nipples, lubricant for the anchor pins is Molycote Cu 7439 (or equivalent). The expander roller and its pin shall be lubricated with Molycote. Cavities between brake shoe bearing bushes shall be filled with grease too. Anchor pins with grease nipples were introduced again as optional during year 2000 and they shall be lubricated as instructed above.*

### 1.1.2 Inspection



Picture 1: Wear indicator at the leading surface of the brake lining

Checking and adjusting the brakes at regular intervals will ensure safe brakes. Wear to the brake linings can be checked through the inspection hole in the dust shield.

It is advisable to make this check before adjusting the brakes. Brake linings have a 2 mm wide and 5.5 mm deep wear indicator on the leading surface of the brake lining.

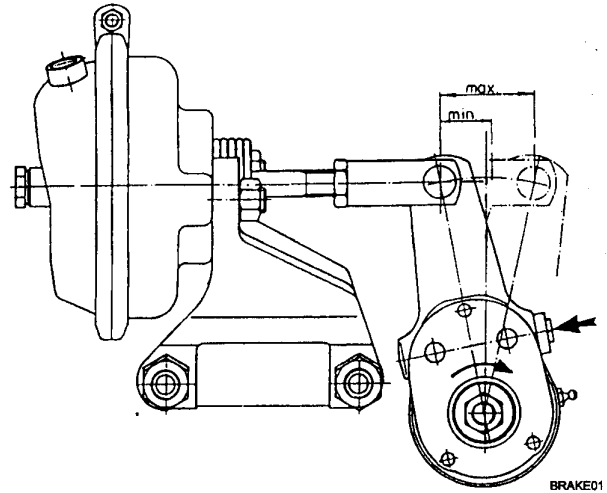
The brake assembly must be dismantled, checked and cleaned at least once a year. The brake linings must be changed in good time before the rivet heads begin to touch the brake drum.

### 1.1.3 Manual adjustment

The brakes must be adjusted at the latest when the brake chamber push rod stroke exceeds the values shown in the table below.

**Table 1: Slack adjuster travel**

Slack adjuster travel on braking with a pressure of 600 kPa (6 kp/cm <sup>2</sup> )		
Brake chamber size	To be adjusted if the travel exceeds	Adjustment (min. travel)
30"	52 mm	32 mm
24"	45 mm	25 mm
20"	45 mm	25 mm



Picture 2: Slack adjuster travel adjustment

1. The recommended method to adjust the linings to the drag limit is as follows:
2. Raise the wheel concerned off the ground.
3. Depress the adjustment screw locking sleeve of the brake slack adjuster to release the screw.
4. Using the adjustment screw, tighten the linings against the brake drum so that the wheel is prevented from turning.
5. Slacken the adjustment screw until the wheel rotates freely.
6. Make sure the adjustment screw is locked.



*NOTE: When turning the adjustment screw, note the direction of rotation of the S-camshaft in the middle of the brake slack adjustment lever. The brakes become tighter when the end of the S-camshaft rotates in the same direction as during the braking movement*

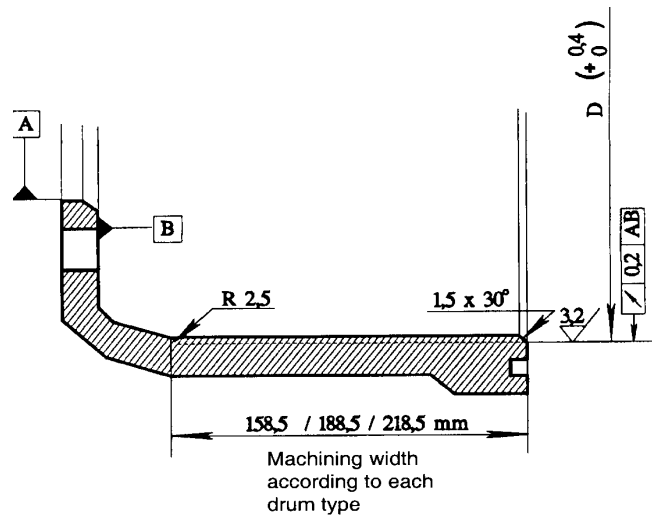
7. If the wheel cannot be jacked up for the adjustment to be made, use the movement of the lever as the basis for the adjustment. Turn the brake lever adjustment screw until the movement of the lever reaches its minimum; this is then close to the drag limit (the point where the brake shoes just touch the drum).



## 1.1.4 Brake drum

**Table 2: Brake drum diameter “D”**

Nominal diameter	410 mm
Nominal diameter for oversized linings	414 mm
Largest permitted turning diameter	416 mm
Rejection limit	418 mm



Picture 3: Brake drum machining measurements

### 1.1.4.1 Brake drum machining

Machine the drum as shown in the illustration. Standard size brake linings are used for brake drum diameters of 410-413.5 mm. It should be remembered, however, that brake linings do not “sit” against a re-machined drum and must be carefully “run in” by braking. We recommend a hub lathe for machining the linings to the correct radius when the size is over 412 mm.

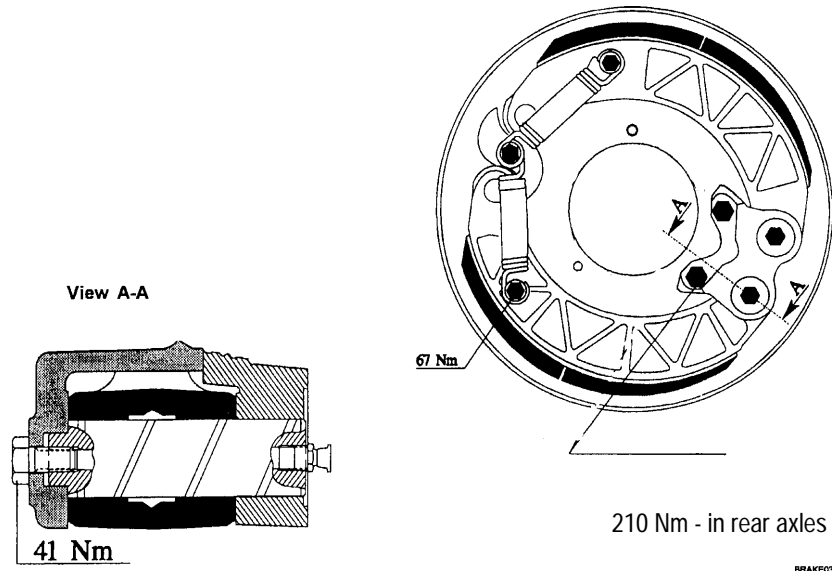
Oversize linings must be used for drum diameters of 414-416 mm. With oversize linings, machining is not necessary.

## 1.2 Brake linings

Identification of the brake linings is as follows: (Marked on the edge surface of the brake lining)

SISU XXXX YYYY, where XXXX are four last digits of the respective spare part no. and YYYY indicates the quality of respective brake lining (see the complete part numbers in the spare part book).

In linings, the lining wear indicator is marked on the leading surface of the lining with a 2 mm wide shoulder.



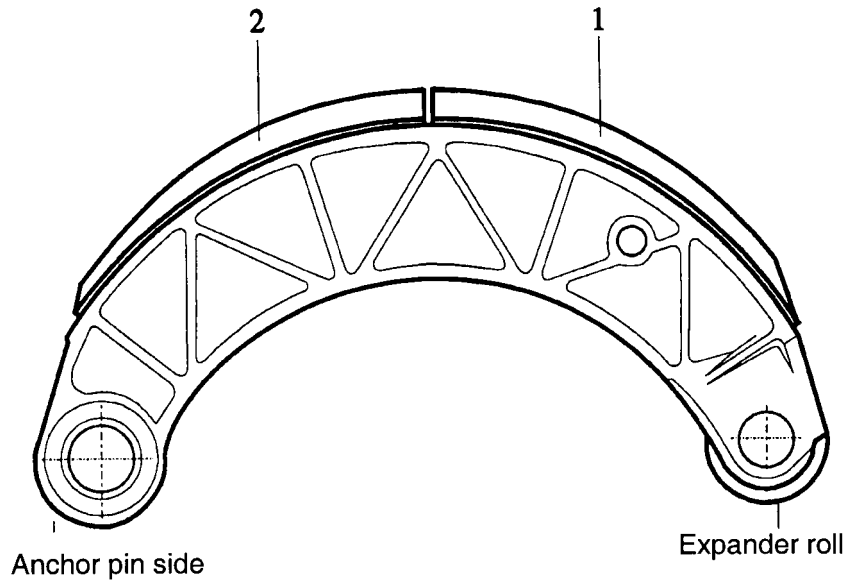
Picture 4: Brake detail



## 1.3 BRAKE MAINTENANCE

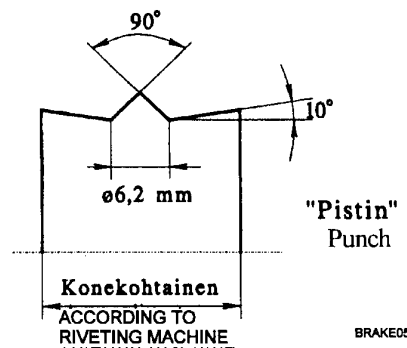
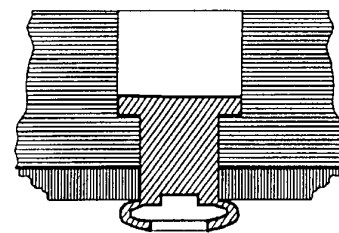
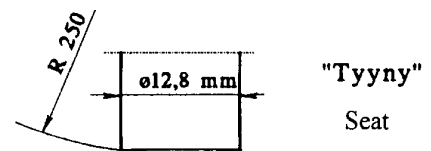
### 1.3.1 Riveting brake linings

Note that friction blocks differ, and must be mounted with the thinner block (2) on the anchor pin side and the other block (1) on the expander roll side.



Picture 5: Brake shoe with linings

To rivet the linings, use tools like those shown in the adjoining diagram. The correct punch force is 25 ... 28 kN.



Picture 6: Riveting tools

## 1.4 Brake vibrations

During braking, the brakes may develop noise and vibration. Should this be serious enough to warrant repairs, a clear explanation must be given to the workshop to avoid unnecessary work.

Find out which wheel or pair of wheels is causing the problem, and establish the nature of the vibration (frequency, intensity and conditions under which it occurs, e.g. speed, braking force).

1. During braking, a jerky type of vibration that varies with speed indicates out-of-roundness of the brake drums.  
This defect can be checked by inserting a dial gauge through the inspection hole without removing the disc wheel. The maximum permitted reading on the gauge is 0.20 mm. If a corresponding defect is not found with the drum detached, check the fastening of the drum and disc wheel. The wrong torque in the wheel fastening screws can cause this defect.

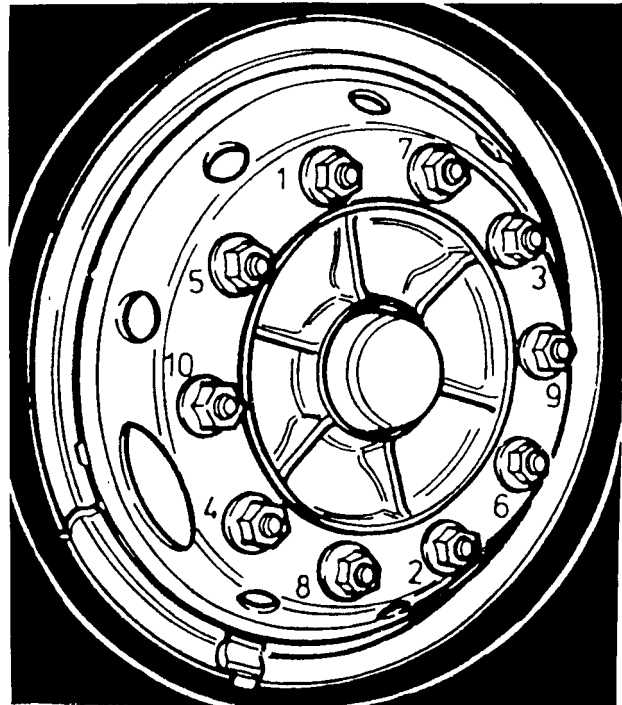
## 1.5 Attaching the wheel

Check that the wheel nuts and bolts are clean and undamaged. Lubricate the bolt threads with a little oil. The tightening torque of the nuts (M22x1,5) is 550 - 650 Nm. Check the tightness of the nuts again at the latest after one day's driving.

2. Very high-frequency vibration or noise in the front axle brakes can often be rectified by shortening the friction blocks at the end of the anchor pin side by about 50 mm. This results in a smaller opening angle, which reduces the pressure at this end, making the brake shoes less susceptible to vibration.
3. Strong low-frequency vibration in the driving axle brakes and affecting the entire vehicle may occur at low speeds just before the vehicle stops. The vibration is caused by masses outside the wheel brakes being brought onto the same vibration frequency.

To rectify this, adjust the turning resistance of the S-camshaft by adjusting the tension in the Belleville springs. (in early versions).

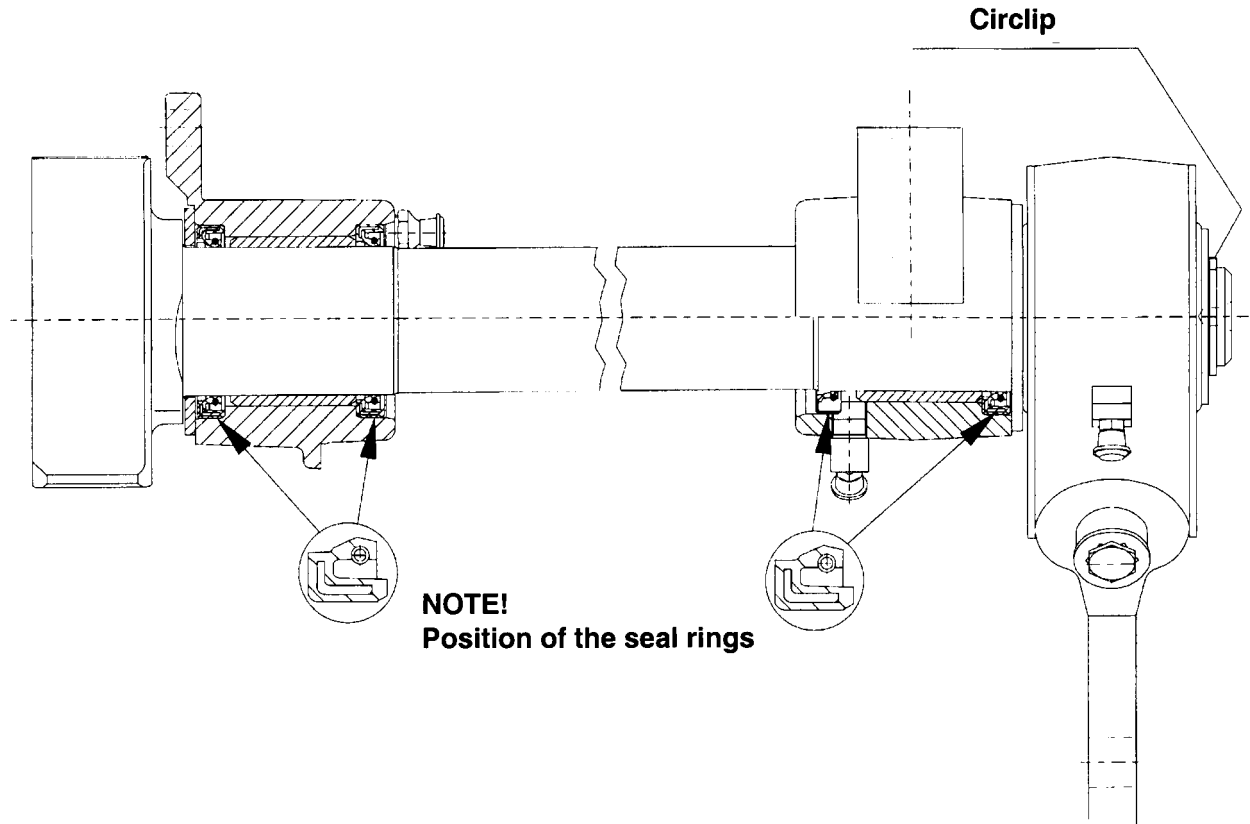
In brakes with bearing bushings in S-cam shaft there brake vibrations are rare.



**BRAKE07**

Picture 7: Wheel nut tightening sequence

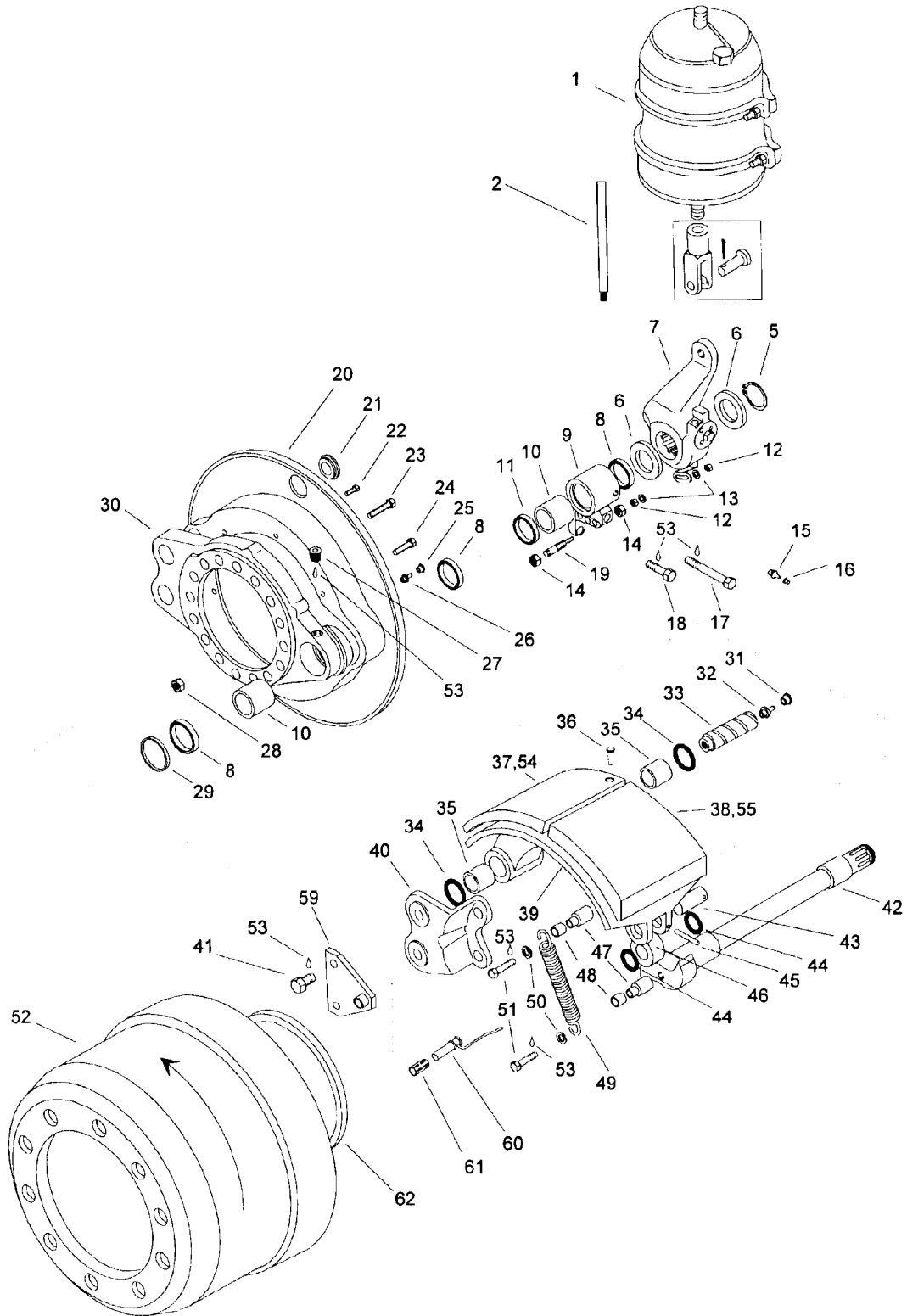
## 1.6 S-camshaft



Picture 8: S-camshaft installation

### 1.6.1 Brake tightening torques:

Brake anchor pin bracket mounting nuts	210 Nm - In rear axles
Anchor bolt retaining screws	41 Nm
Brake shoe spring anchor screw	67 Nm



Picture 9: Brake details

## 1.7 Brake repairs

### 1.7.1 Dismantling

(Reference to the numbers in the text can be found in picture 9)

#### 1.7.1.1 Removing the brake shoes

Raise the wheels off the ground.

Remove the wheels.

1. Remove the brake drum by pulling outwards. Utilize pulling screws if necessary. Clean the brake drum centring surface with abrasive tape.
2. Release the brake shoe springs by removing the spring anchor screws (51).
3. Remove the anchor bolt screws (41).
4. Remove the brake shoe anchor bolt support (40) by unscrewing the nuts (28). Use a 19 mm socket, joint and extension arm. Turn the hub until the extension arm goes into the hole in the hub flange.
5. Carefully remove the support by tapping with a bar.
6. Remove the brake shoes by pulling outwards.

#### 1.7.1.2 Attaching the brake shoes

Grease the anchor pins (33) with heat resistant grease and install the brake shoes.

1. Mount the brake shoe springs using the anchor screws (51). Apply thread securing medium (Loctite 242 or equivalent) to the threads and tighten the screws to a torque of 67 Nm.
2. Mount the brake shoe anchor bolt support (40) and tighten the nut (28) to a torque of 210 Nm.
3. Apply thread securing medium (Loctite 242 or equivalent) to the anchor bolt screw (41) threads and tighten to a torque of 41 Nm.



*Note! O-rings (44 in picture 9) for expander roll pins are not any more installed in new axles (from -96 onwards). These O-rings are not required in earlier axles either and they can be omitted within repair works.*



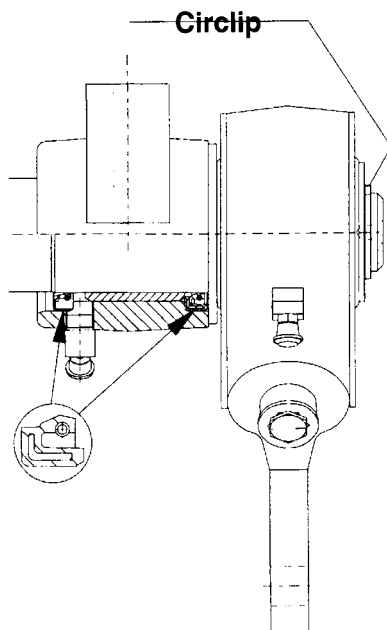
*Note! O-rings (34 in picture 9) were not installed in brake shoes from February 1997 till October 1999. Never use brake shoes which are without these O-rings together with anchor bolts which are equipped with grease nipples. In such cases the grease nipples have to be removed and plugs installed instead.*

## 1.7.2 S-camshaft

Reference to the numbers in the text can be found in picture 4.

### 1.7.2.1 Removal

Remove the wheels, brake drum, the cover of the planetary gear housing, the planet carrier, drive shaft, annulus, annulus hub and wheel hub. Remove the brake shoes (see page 11).



Picture 10: Brake adjuster installation

1. Unscrew the brake lever circlip.
2. Remove the cotterpin and yoke pin from the brake chamber piston rod.
3. Open the automatic slack adjuster locking. Remove the brake lever.
4. Pull the S-camshaft out of its housing. To change the bearings, remove the brake mounting frame by first unscrewing the mounting nuts.

### 1.7.2.2 Attaching

Install the new bearings and seals.

1. Tighten the nuts (28) securing the brake mounting frame to a torque of 210 Nm. Grease the seals and bearings.
2. Install the greased expander shaft.
3. Install the brake lever.
4. Install the wheel hub.
5. Install the brake shoes (See page 11).
6. Install the brake drum and the wheel.

### 1.7.3 Brake adjustment

The brakes must be adjusted at the latest when the free movement of the brake cylinder reaches 40 mm.

Raise the wheel in question off the ground.

1. Depress the adjustment screw locking sleeve on the brake lever and turn the screw clockwise until the wheel no longer turns. Loosen the screw until the wheel again turns freely.
2. Brakes fitted with an automatic brake slack adjuster do not need to be adjusted

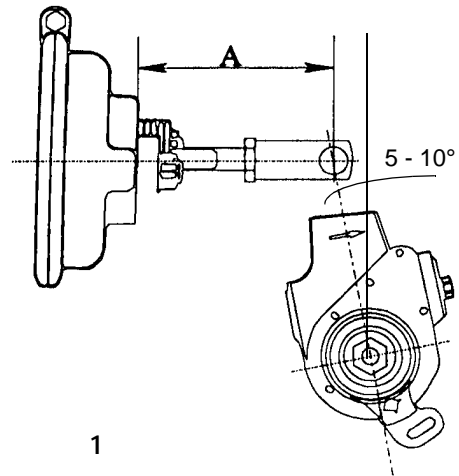
## 1.8 Automatic brake adjusters

### 1.8.1 Installation

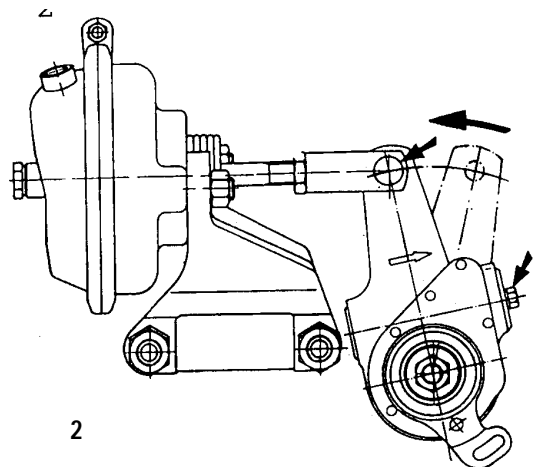
Check that the brake cylinder pushrod is in its rest position, as in Fig. 1. Adjust the length if necessary.

The lever should be perpendicular to the pushrod at the half of the stroke.

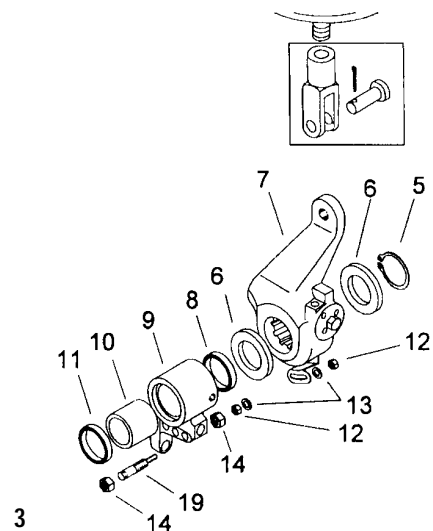
This means that the lever shall be 5 - 10 degrees towards the brake cylinder at the rest position.



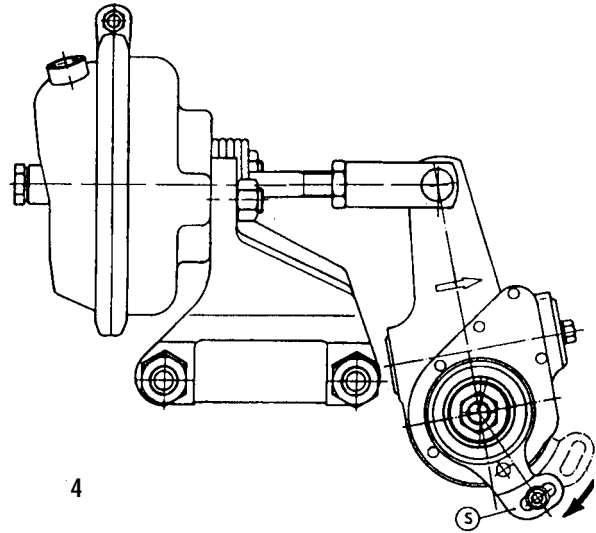
3. Place the anchor pin (19) loosely into its hole.
4. Mount the adjustment lever so that the arrow on the lever arm indicates the direction of braking, with the arm in front of the pushrod fork (Fig. 2)
5. Turn the hexagonal-head adjustment screw clockwise until the holes in the lever arm and pushrod fork are in line, and the fork pin slides easily into place. Lock the pin with a cotter (Fig. 2).



6. Attach the support spacer (6) on the end of the S-camshaft and lock the slack adjuster and the spacer with the circlip (5) (Fig. 3).



7. **IMPORTANT!** Turn the control arm (s) in the direction of the arrow on the lever arm as far as it will go. Do not hammer the control arm! Tighten the nuts to secure the anchor pin in its hole and fix the control arm onto the anchor pin using a nut and washer. Make sure the arm is not deflected sideways. Also check to see that this procedure does not change the set position (Fig. 4).
8. Adjust the clearance between the friction blocks and the brake drum as follows: Turn the adjustment screw until the brake clearance is zero, either by measuring or by feeling the wheel turn against the drum. Now turn the screw 3/4 of a turn back (loud ratchet noise).
9. Check the operation of the brake slack adjuster by braking several times in succession. Anti-clockwise rotation of the adjustment screw during the return stroke shows that the adjuster is working. Continue braking until the correct clearance of 0.4 - 0.8 mm is obtained. Also check the stroke of the brake chamber pushrod at a pressure of 6.5 - 7 bar: the rod should move 23-40 mm.



## 1.9 Inspection (in use)

About every 40,000 km, check that the movement of the pushrod has not changed greatly from its normal value.

Check the adjustment resistance of the lever once a year. Measure the resistance by turning the hexagonal head of the adjustment screw with a torque wrench. Turn the wrench anti-clockwise and check that the one-way clutch or conical clutch does not slip at torque below 18 Nm. Carry out the measurement three times with the same slack adjuster. If slippage occurs, change the slack adjuster.

If there is any suspicion of greater than normal wear to the friction blocks, possibly caused by the action of the adjuster, measure the brake clearance with the brakes cool twice during 1000-2000 km. If the clearance is less than 0.25 mm (minimum value) check the position of the adjustment arm according to the instructions and repeat the clearance measurement.

The brake clearance varies from one braking to another from 0.25 mm (min.) to 1.0 mm (max.), depending on the force with which the brakes are applied, the braking frequency and the brake drum temperature.



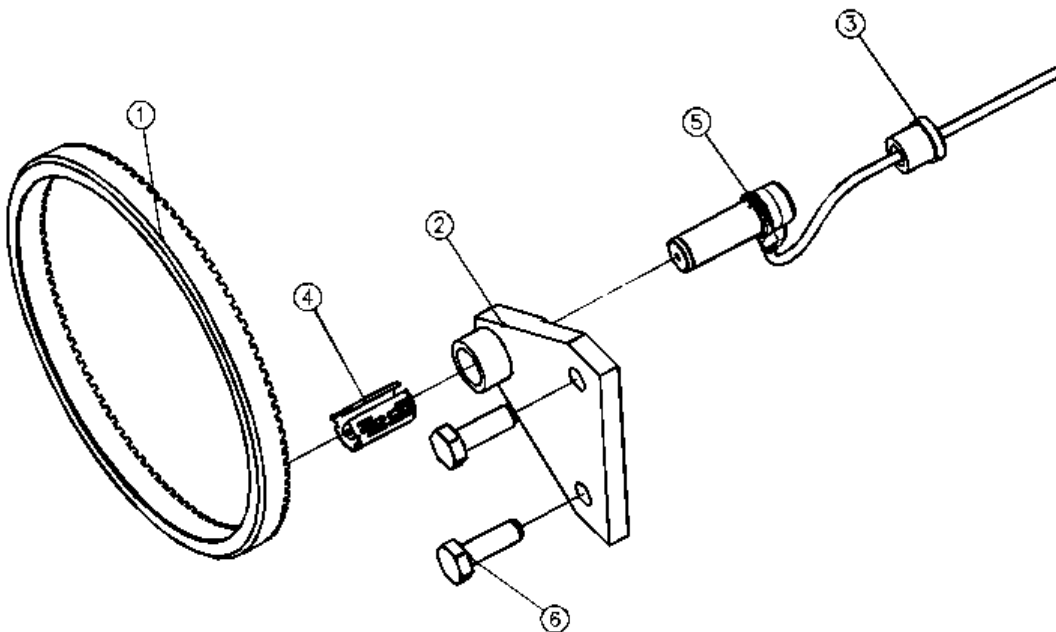
## INSTALLATION OF ABS PARTS IN RIGID REAR AXLES

### 1. Installation of the ABS-sensor (See Picture 1.):

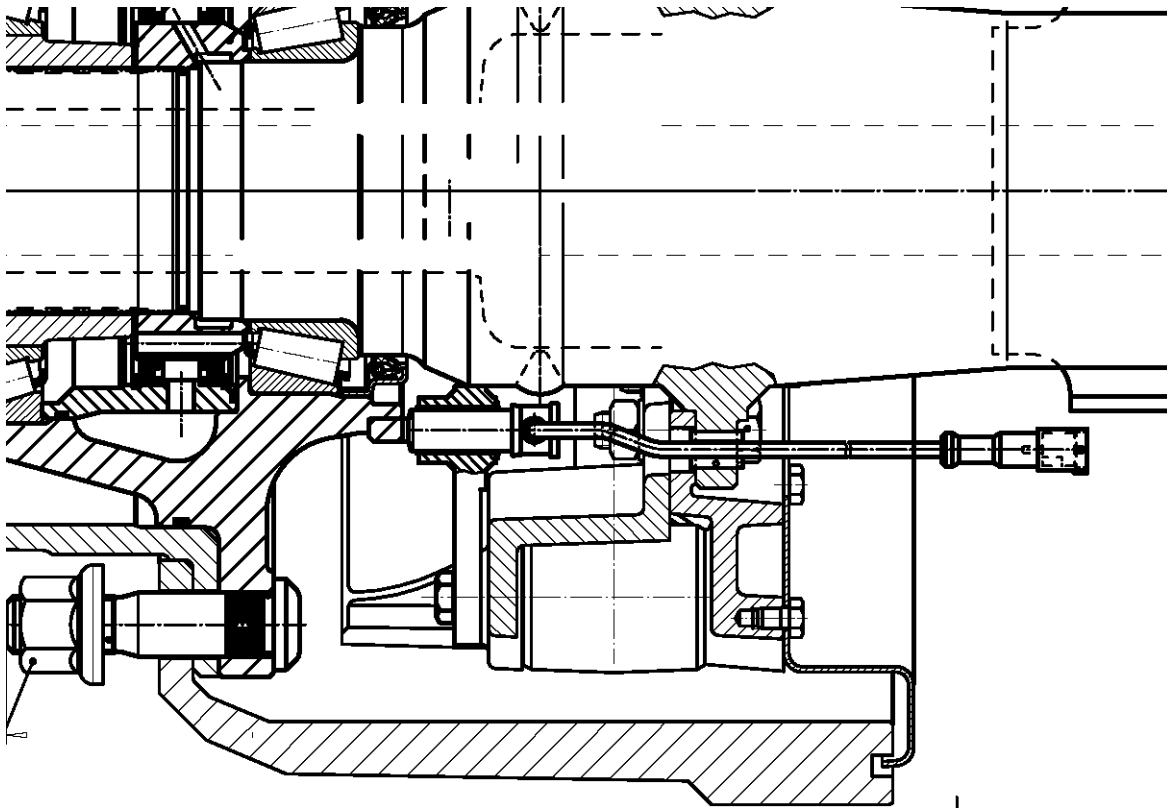
- Remove original shorter anchor pin screws
- Apply thread securing medium (Loctite 245) to the anchor pin screw (6) threads.
- Mount ABS sensor bracket(2) with two screws (6) and tighten to a torque of 41 Nm.
- Install ABS bush (4). Note installation direction.
- Grease metal surface of ABS-sensor with DUOTEMPI PMY 45 mounting paste.
- Push ABS-sensor (5) inside bush.

### 2. Installation of ABS-ring and adjustment of the ABS sensor (See Picture 1.):

- Clean the tone ring (1) shoulder of the wheel hub.
- Heat the tone-ring with induction heater.
- Press the tone ring on hub shoulder.
- Install hub and adjust hub bearings.
- Push ABS-sensor (5) against tone ring.
- By rotating hub couple of turns ABS-sensor finds its location.
- Install rubber bushing (3) securing ABS sensor wire.



**Picture 1. ABS Parts**



**Picture 2. Principle drawing of ABS sensor positioning and wire routing**

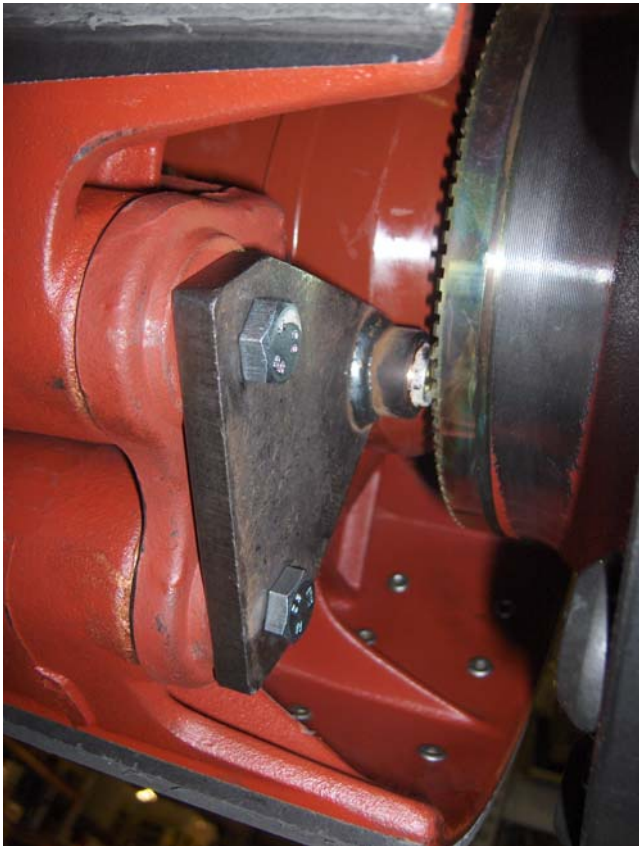
Please see the following 4 photos showing the bracket mounting, wire routing and tone ring installed to the wheel hub.



Picture 3.



Picture 4.



Picture 5.



Picture 6.

### **Re-adjustment for the ABS sensor (See Pictures):**

1. Remove the rubber bushing securing the ABS sensor wire.
2. Use suitable screwdriver and set it through the hole for the ABS sensor wire and locate the ABS sensor with the tip of the screwdriver.
3. Push the ABS sensor against the tone ring .
4. By rotating the hub couple of turns ABS-sensor finds its location
5. install the rubber bushing securing the ABS sensor wire.

### **Sisu Axles, Inc.**

Technical Support  
Autotehtaan tie 1  
PO Box 189  
FIN-13101 Hämeenlinna  
Finland  
Phone +358 204 55 2999  
Fax +358 204 55 2900