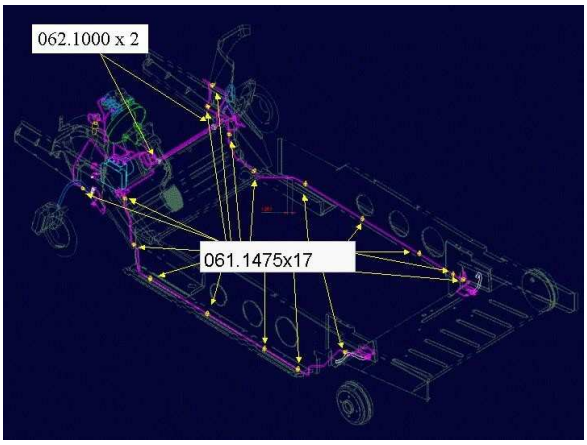
Chapter E

Brakes

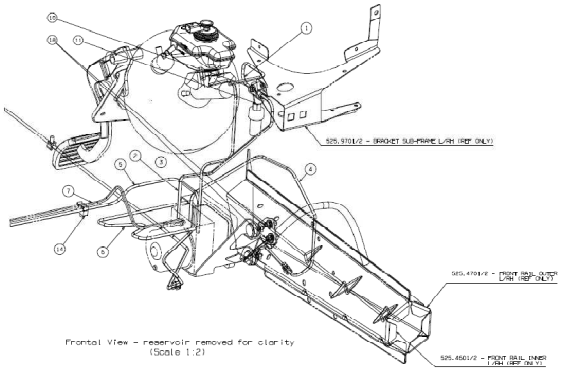


E.1 System description

E.1.1 Main system

Hydraulic, diagonally divided twin-circuit braking system with brake servo and vacuum pump. If one circuit fails, brake function will remain on one front wheel and the opposite rear wheel.
Brake discs in front and brake drums at the rear. ABS brakes is standard.

The illustration is showing where the brake pipes are fastened with clips to the frame.



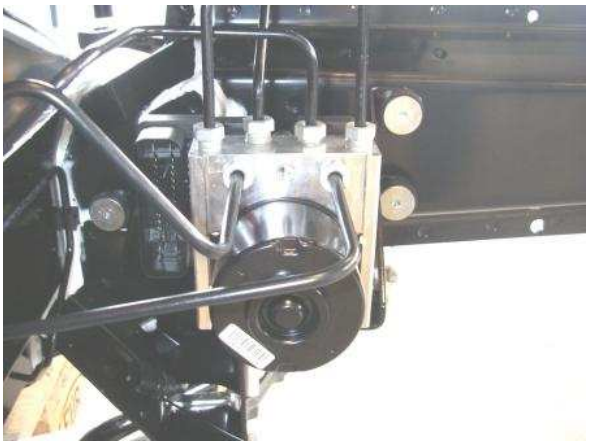
E.1.2 Hydraulic system

The brake fluid reservoir is located on the master sylinder. The fluid level is visually controlled on the transparent reservoir. The system also has level control warning if brake fluid level is too low.

IMPORTANT: Only use DOT 4 brake fluid when topping up if brake fluid level is too low.

E.1.3 Vacuum pump

As opposed to cars with combustion engines the electrical vehicle has no engine to supply the brake servo with vacuum. Because of this the THINK City is equipped with a pump delivering vacuum to the brake servo.

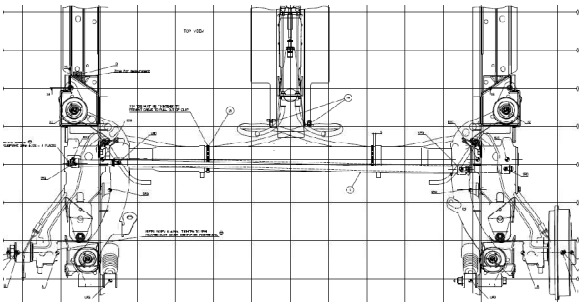


E.1.4 ABS

The ABS control unit is connected between the master sylinder and the brake pipes. It received signals from sensor on the wheels. When needed the ABS control unit will reduce the pressure in the brake pipes to prevent the wheels from blocking.

E.1.5 Brake pressure sensor

The brake pressure sensor monitors the pressure in the brake circuit from the brake servo and into the ABS control unit. The measured value is communicated to the PCU.



E.1.6 Handbrake

The handbrake activates the rear wheels by cables from the handbrake lever between the seats.

E.1.7 Brake bleeding

Usually the brake bleeding can be performed without any particular actions.

The exception is if there is air in the ABS control unit. To remove air from the ABS control unit the diagnostic tool must be connected to control opening and closing of the valves in the unit.

E.1.8 Specifications

Diameter:
Wheel sylinder, front = 48 mm
Wheel sylinder, rear = 20,6 mm

Thickness brake discs front:
New = 10 mm, minimum = 8 mm

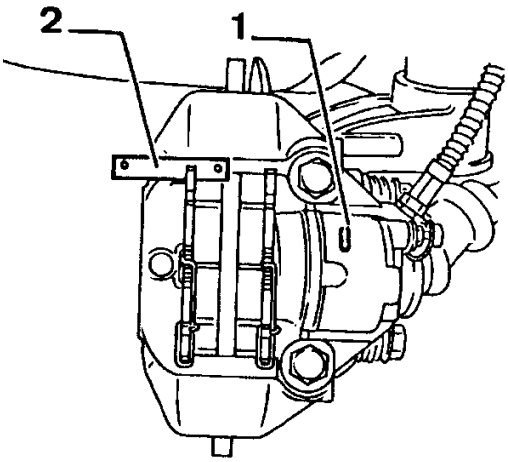
Thickness new brake pads:
Pad = 18 mm, lining = 13 mm
Minimum lining = 3 mm
Material = JURID 519

Inner diameter rear brake drums:
New = 203 mm, maximum = 204,4 mm

Thickness new rear brake shoes:
Shoe and lining = 4,7 mm, lining = 3,3 mm
Minimum lining = 1,5 mm
Material: DON 8259

E.1.9 Tightening torques

Brake hose bracket front:	9 Nm
Hub nut rear:	200 Nm
Hub nut front:	245 Nm
Brake shield rear to susp.arm:	35 Nm
Brake caliper to susp. pivot:	120 Nm
Bleed nipple front:	6,5 Nm
Bleed niplle rear:	6 Nm
M10 and M12 nipples:	14 Nm
Brake hoses:	11 Nm
Brake pedal bracket to bulkhead:	7 Nm
Brake servo to bracket:	18 Nm
Brake pedal to bracket:	25 Nm
Handbrake lever to bracket:	15 Nm
Brake pressure sensor:	7 Nm



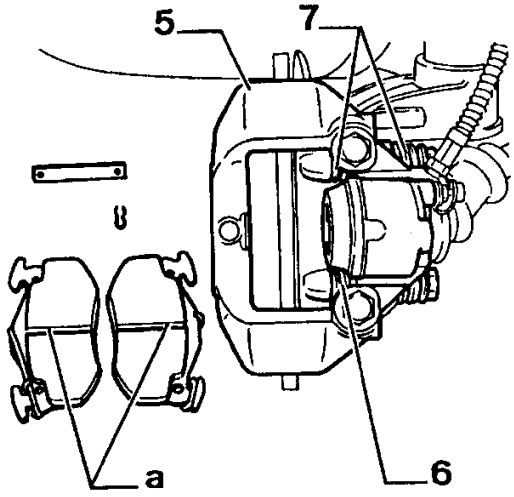
E.2 Brake pads – front

E.2.1 Disassembling

- Lift the vehicle.
- Remove the wheels.
- Suck up some brake fluid from the reservoir.

Disassemble:
- Cotter pin (1).
- Stop plate (2).

Tilt the upper edge of the outer brake pad out and remove it.
Press the caliper inwards and tilt the lower edge of the inner brake pad out and remove it.

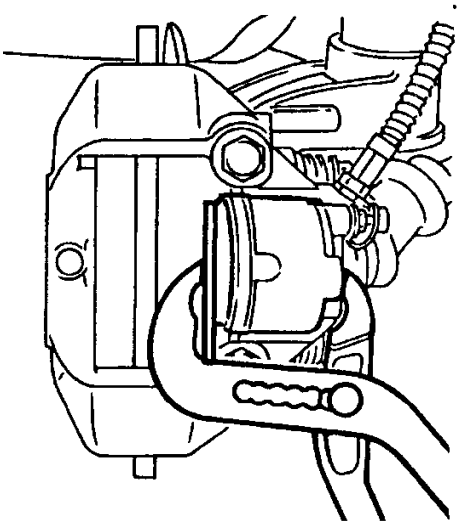


Inspect all parts for damages and wear.

Do a visual inspection of:
- Sealing around the pistons.
- The condition of the sleeves around the pistons (6) and the gaiters (7).
- Brake disc wear (min. thickness 8 mm.)

Replace any damaged/worn-out parts.

Replace worn-out pads.

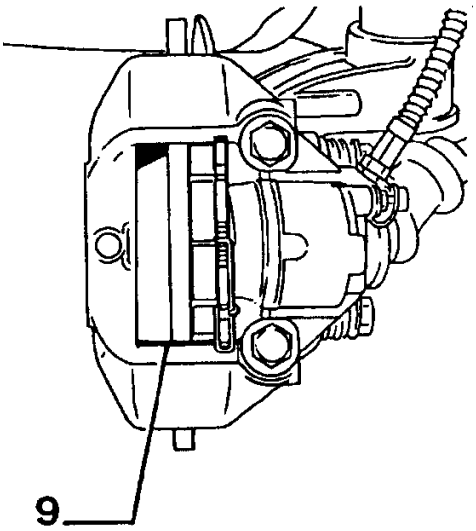


E.2.2 Assembling

Clean:

- Brake sylinder seal and piston edge.
- The caliper.
- The brake disc with a suitable solvent if there is grease or other dirt on the disc.

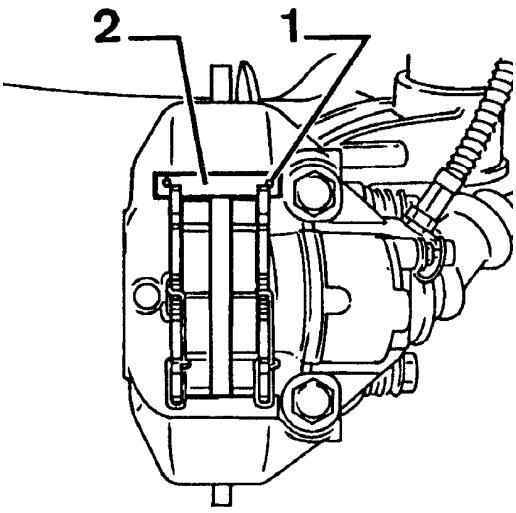
Press the piston completely back in the housing.



Apply a **thin** layer of copper pasta on the lower glide track for the brake pads (9).

First install the inner brake pad, then the outer brake pad.

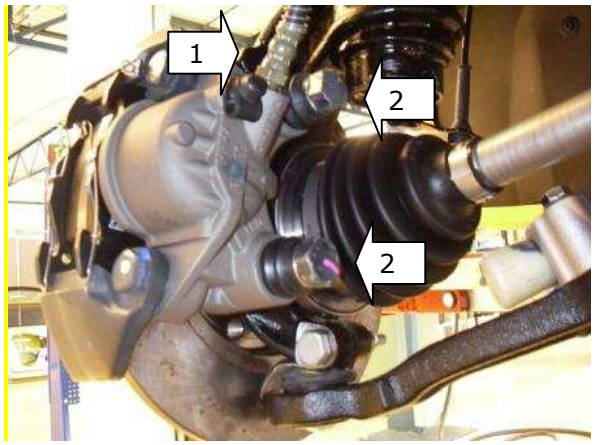
Make sure the tension springs on the brake pads are correctly installed and place the pads correctly against the lower glide track (9) on the caliper.



Press the stop plate in (2) after applying a **thin** layer of copper paste on both sides.
Install new cotter pin (1).
Fit the wheels.
Lower the vehicle to the ground.

Tight the wheel fasteners to 82,5 Nm for steel rims and 110 Nm for aluminium rims.

IMPORTANT: Before driving the car after working on the brakes, the brake fluid level must always be controlled and the brake pedal must be activated several times to be sure the vehicle has sufficient brake effect.



E.3 Brake caliper

E.3.1 Disassembling

Remove the brake pads.

- Loosen the brake hose (1) from the brake pipe and plug the brake pipe.

Disassemble:
- Fasteners (2).
- Brake hose (1) from the caliper.
- The brake caliper.

E.3.2 Assembling

Attach the brake hose (1) to the caliper and brake pipes. Tightening torques = 15 Nm.

Place the caliper and install the bolts (2).

Anchor bolt tightening torque (M12) = 120 Nm. Use Locktight.

Install the brake pads.

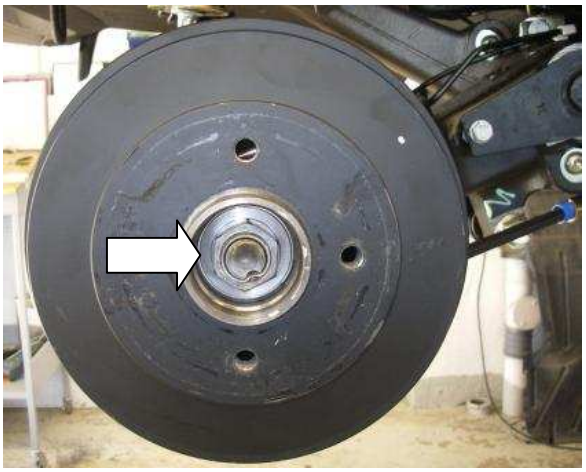
Bleed the brakes.

E.4 Rear brakes

E.4.1 Brake drum disassembling

Lift the vehicle and secure it with ramps before the wheel is removed.

Remove the hub cover with a screwdriver or a chisel.



Loosen the nut.

Remove the washer (for example with a magnetic tool) before pulling the drum off.

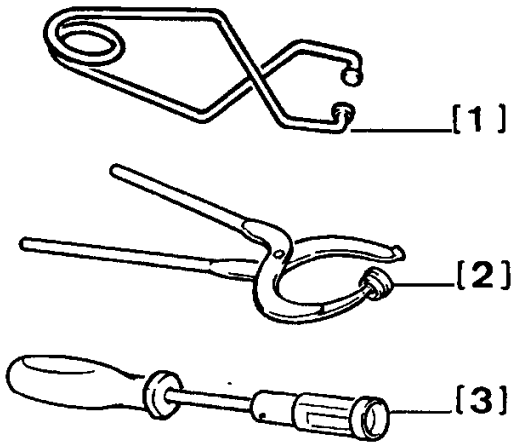
E.4.2 Assembling

The brake drum and brake shoes must be without oil and grease.

Assemble:

- New seal (>) (apply grease to the seal and the shaft extension)
- Brake drum (max diameter 204,4 mm)
- New washer
- New nut, tightening torque = 200 Nm
- New hub cover

Fit the wheel and fasten the wheel fasteners to 82,5 Nm for steel rims and 110 Nm for aluminium rims.



E.5 Brake shoes

E.5.1 Recommended tools

[1] – Clamp for brake cylinder.

[2] – Pincers for spring disassembling and assembling.

[3] – Tool for stop plate disassembling and assembling.

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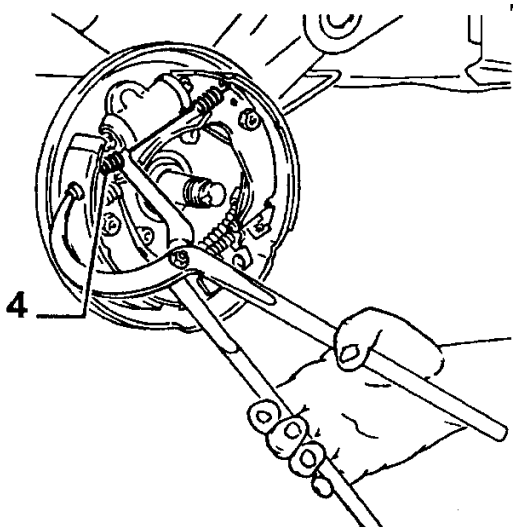
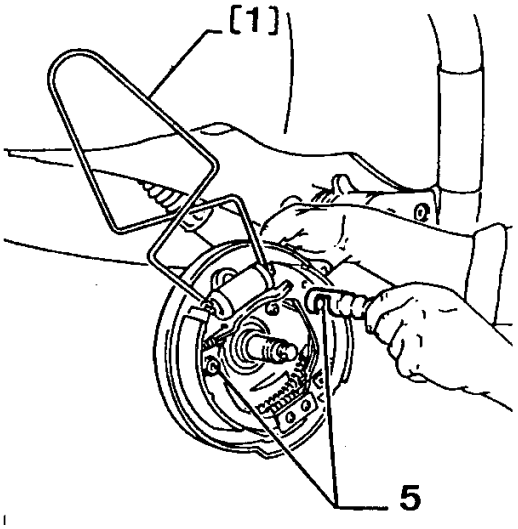


E.5.2 Disassembling

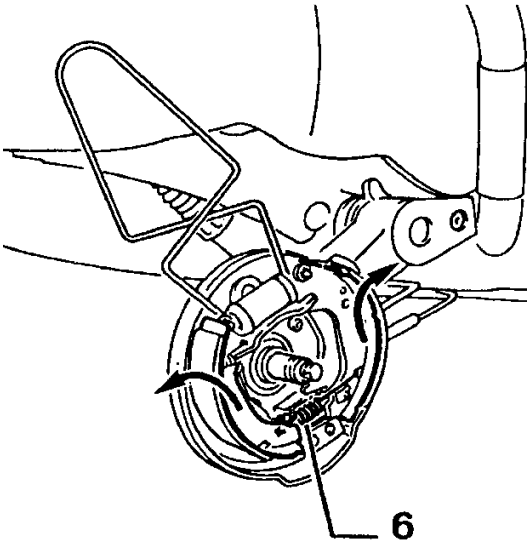
Remove hub nut and washer and brake drum with bearing.

Remove the spring (4).



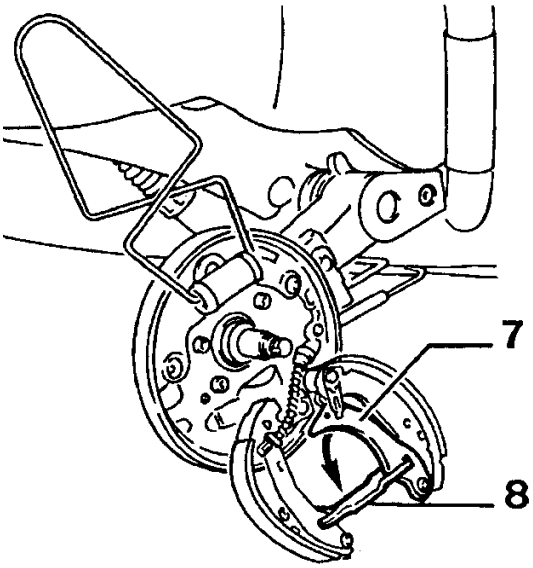
Install the clamp [1] on the brake cylinder.

Remove the stop plates from the bolts keeping the brake shoes to the brake shield. Remove bolts and springs (5).



Pull the brake shoes apart and loosen them from the lower fixing points.

Disconnect the spring (6).

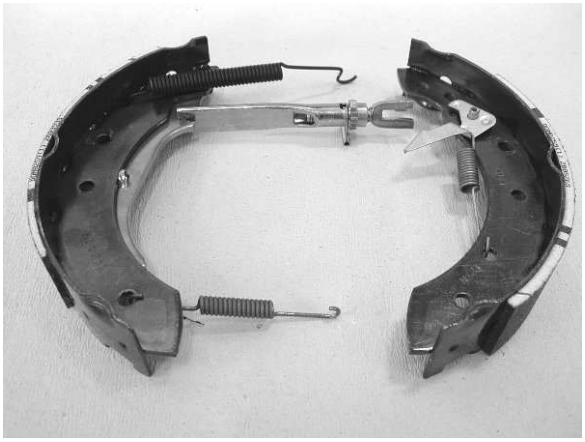


Twist the arm (7) to dismount the bar (8).

Disconnect the handbrake cable and release the brake shoes.

Check:

- Function and leakages in brake cylinders
- Dust cap condition
- Brake drum wear (max diameter 204,4 mm)



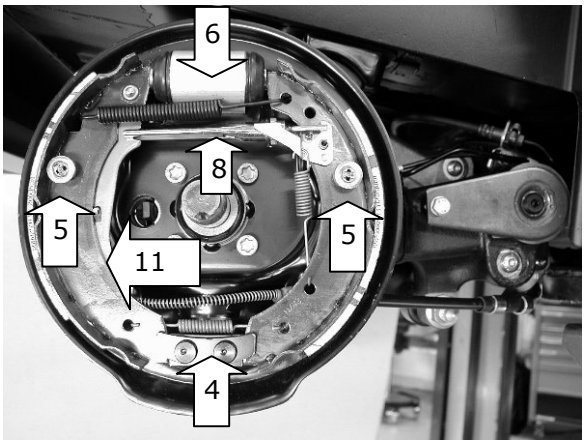
E.5.3 Assembling

IMPORTANT: There must be no oil, grease or brake fluid on the brake drums or on the brake shoes. If it is, clean the brake drum with solvent and replace the brake shoes.

Apply a thin layer copper paste on the brake shield where it is in contact with the brake shoes.

Before assembling the brake shoes the handbrake cable must be connected to the arm.

Install the brake shoes.



Install the handbrake cable behind the bracket (11).

- Install the bar (8) between the brake shoes.

Attach:
- Spring (6).
- Spring (4).

- Centre brake shoes and install stop plates above the springs (5).

Assemble the self adjusting bar and spring.

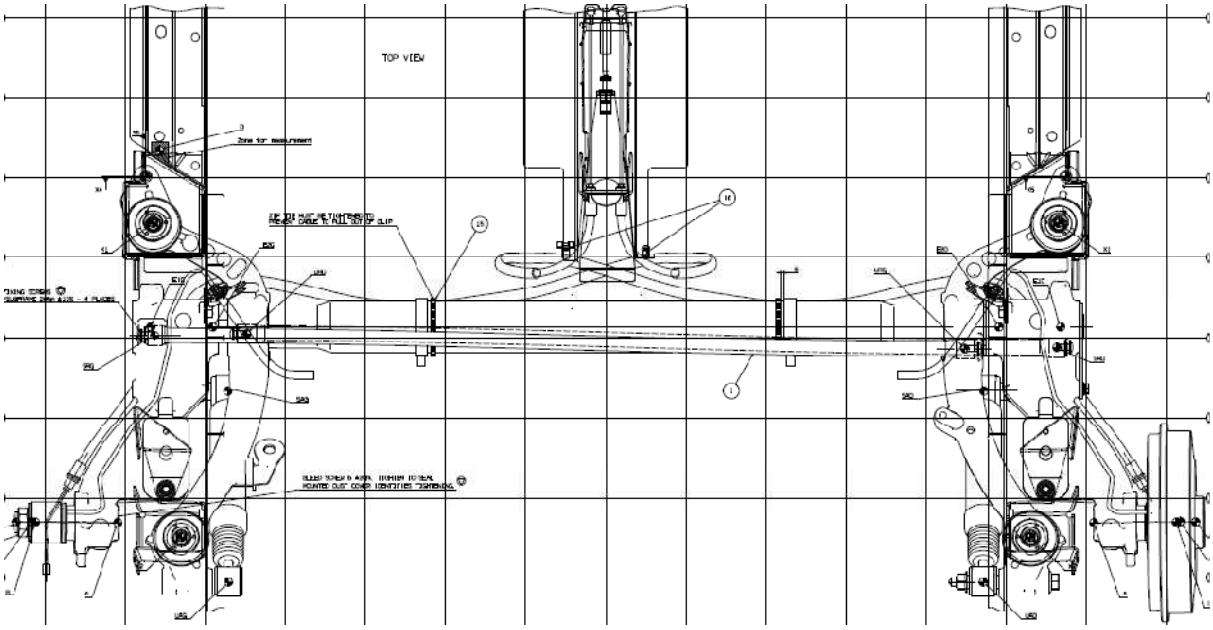
Install the drum with hub and bearing.
Install washer and nut.

Nut tightening torque = 140 Nm.

Install the hub cover.

Fit the wheels and fasten the wheel fasteners to 82,5 Nm for steel rims and 110 Nm for aluminium rims.

E.6 Parking brake



NOTE: The cables cross each other.

E.6.1 Inspection

Lift the rear wheels and check if they rotate freely without any signs of shuffling when the handbrake is completely released.

If the wheels are not rotating freely check the following:

- That the handbrake lever and cables move normally and return completely when the handbrake lever is released.

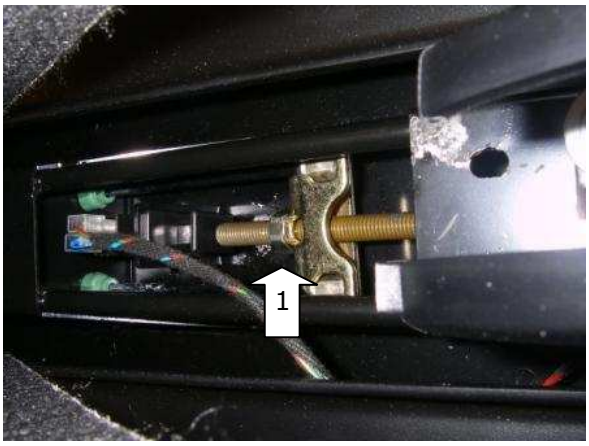
- If the cables lock up or are not correctly adjusted.

If the handbrake is not completely released you will have irregular brake shoe wear and also heat generation when driving.

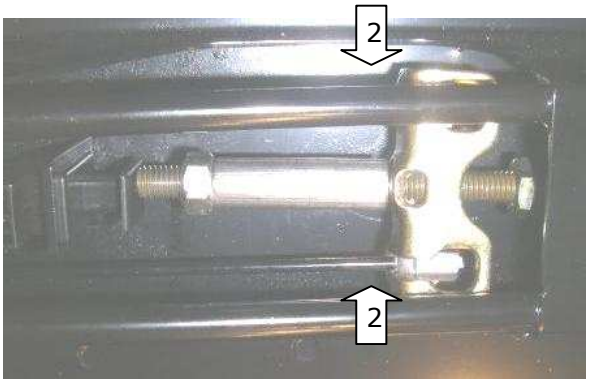
E.6.2 Adjustment

NOTE: The brake system must be without air and in normal function before performing this procedure.

- Press the brake pedal several times with the ignition key in drive position.
  The handbrake lever must be released.
- Pull the handbrake lever 1 step (from ”off” position).

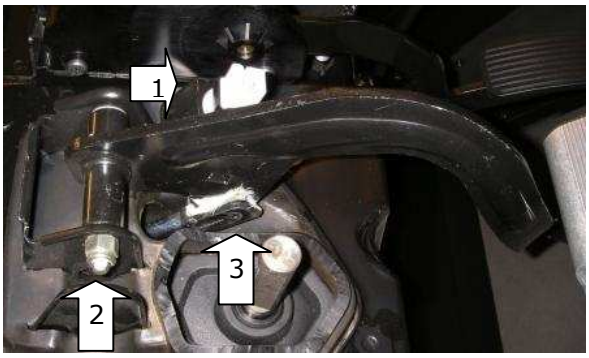


- Tighten the set screw (1) just as much that the brake drums move “heavily”.
- Verify that the total handbrake lever movement is max 0° - 45°.
- Verify that the wheels rotate freely when the handbrake lever is released.



- Verify that both seconday cables (2) connected to the compensator move in parallel.

NOTE: The cables cross each other because of the length; the right cable operates the left wheel and the left cable operates the right wheel.



E.7 Brake pedal

E.7.1 Disassembling

- Disconnect the brake switch connector (1)
- Loosen the nut (2)
- Remove the clips to the brake servo and remove the bolt (3)

E.7.2 Assembling

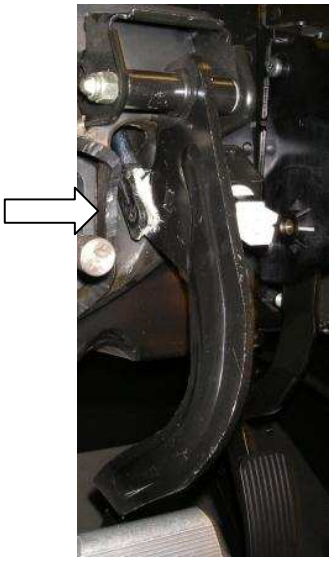
Assemble in reverse order.

E.8 Master cylinder, brake servo and reservoir

Reservoir, master cylinder and brake servo are delivered as one unit from the manufacturer and is replaced as one complete unit. See picture.

E.8.1 Disassembling

- Loosen the wiper and leaf screen below the windscreen.
- Remove the wiper motor and hood latch with bracket.
- Disconnect and remove the vacuum pump.
- Loosen the el subframe and pull it as far forward as possible. The el subframe is fastened with 4x2 bolts. See section C.8 (PCU disassembling) for el subframe fastening.
- Disconnect the brake fluid level gauge.
- Drain the reservoir for brake fluid.
- Loosen brake pipes and plug the pipes.



- Remove the bolt for the push rod from the brake pedal after removing the clip first.
- Remove the four bolts fastening the brake servo to the bulkhead.

Wriggle the brake servo out with the master cylinder and the reservoir.

E.8.2 Assembling

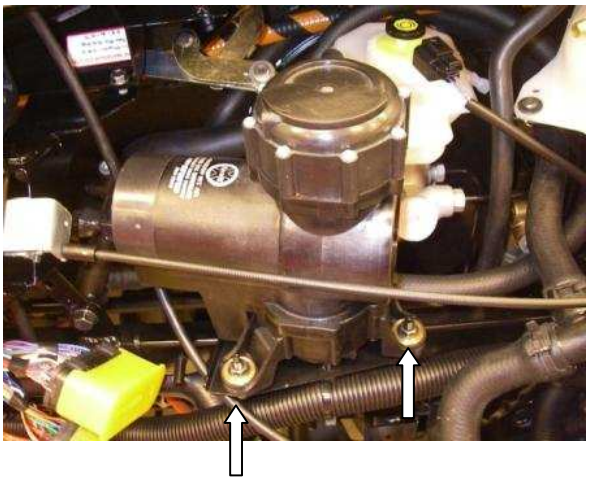
- Assemble in reverse order.
- Bleed the brake system and fill brake fluid if necessary.

Tightening torques:
Brake servo to mounting bracket = 18 Nm.
Brake pipes = 15 Nm.

E.9 Vacuum pump

The vacuum pump is a 12 V electrical motor supplying underpressure to the brake servo.

When the ignition is on the pump should start and stop automatically supplying the brake servo with necessary underpressure.



E.9.1 Disassembling

- Open the hood.
- Disconnect the 12 V battery.
- Disconnect the electrical contact to the pump.
- Remove the hose to the brake servo.
- Loosen the three bolts (two on the picture and one on the back) fastening the pump.
- Remove the pump.

E.9.2 Assembling

- Assemble in reverse order.

Tightening torques for bolts to vacuum pump = 10Nm.

E.10 ABS system

E.10.1 Disassembling the control unit

- Read and save error codes if possible.
- Disconnect the 12 V battery.
- Loosen connectors.
- Loosen brake pipes; six in total.
- Loosen fasteners below.

E.10.2 Assembling

Assemble in reverse order.

Tightening torques:
Brake pipes = 15 Nm
Fastening bolts = 9 Nm

E.10.3 Brake bleeding

After the ABS control unit is replaced the brake system must be bleeded according to a specific procedure.

- Connect the diagnostic tool
- Choose *"**break bleed procedure"*** and follow the instructions

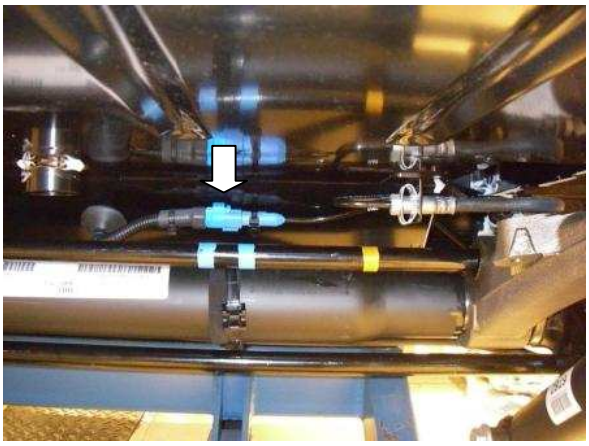
E.10.4 Front sensors

The ABS sensors on the front wheels are located as shown in the picture.
To loosen: unscrew the bolt holding the sensor and pull the sensor out.

- Disconnect the cable and unhook the harness from the fastener.

E.10.5 Rear sensors

The ABS sensors on the rear wheels are located as shown in the picture.
To loosen: unscrew the bolt holding the sensor and pull the sensor out.

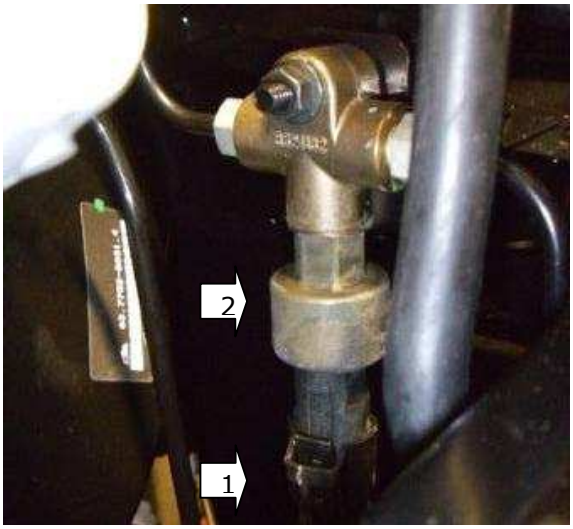


- Disconnect the blue connector and unhook the cable from the fastener.

E.10.6 Assembling

- Assemble in reverse order.

Tightening torques:
Front sensor = 7 Nm
Rear sensor = 9 Nm



E.11 Brake pressure sensor

The brake pressure sensor measures the pressure in the brake circuit out from the brake servo and in to the ABS unit. The measured value is communicated to the PCU.

E.11.1 Disassembling

- Disconnect the contact (1).
- Unscrew the sensor (2) from the T-connection and plug the pipe.

E.11.2 Assembling

Assemble in reverse order.

Tightening torques:
Sensor to T-connection = 14 Nm