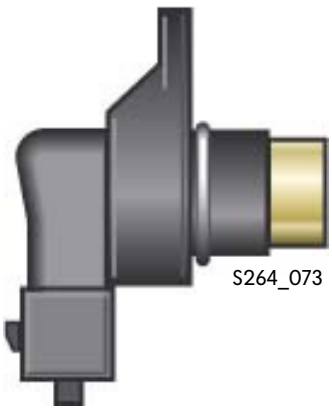
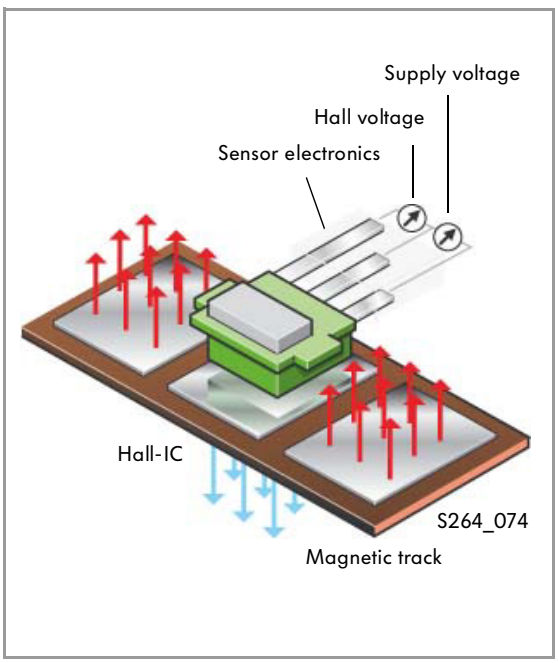


S264_073



Active wheel sensing

There is another type of rotational speed sensors which are called active sensors and will be used with increasing frequency for determining wheel speeds. The term „active“ refers to the required voltage supply for the sensors, which is not necessary for inductive sensors.

● How it works

The heart of the sensor is a Hall integrated circuit (IC).

When current flows through this semi-conductor chip, a Hall voltage is created. Changes in the magnetic environment of the sensor cause proportional changes in the Hall voltage because the resistance in the Hall IC changes.

Depending on the version of the sensor, it can be paired with either a magnetic sender wheel or a sender wheel with a magnetic track.

As the sender wheel moves past the sensor, the magnetic environment and, consequently, the Hall voltage change.

● How the signal is used

The control unit can determine the rotational speed based on the frequency of changes in voltage.

With active sensors, even very low speeds can be detected.

● Self-diagnosis

A defect in a speed sensor is detected by self-diagnosis and saved in the fault memory.

The hydraulic brake assist system

ABS return flow pump V39

During ABS operation, the return flow pump returns a quantity of brake fluid against the pressure developed by the brake pedal and the brake servo.

● How it works

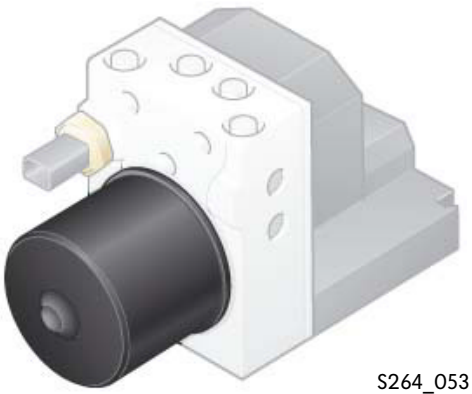
It is a double-acting piston hydraulic pump which can be switched on or off by the ABS control unit. In this case, „double acting“ means that with each piston stroke a suction and a discharge action are performed. With a single-acting piston, the two actions occur consecutively.
The double action is achieved through the design, which includes working chambers in front of and behind the piston. When the piston moves to the left, the front chamber is emptied and brake fluid is drawn into the back chamber. When the piston moves to the right, brake fluid is forced out of the back chamber back into the suction line. The pre-pressure on the suction side produces a nearly uniform discharge so that pressure can be built up quickly. An additional pump for building up pre-pressure is no longer necessary.

● Failure of return flow pump

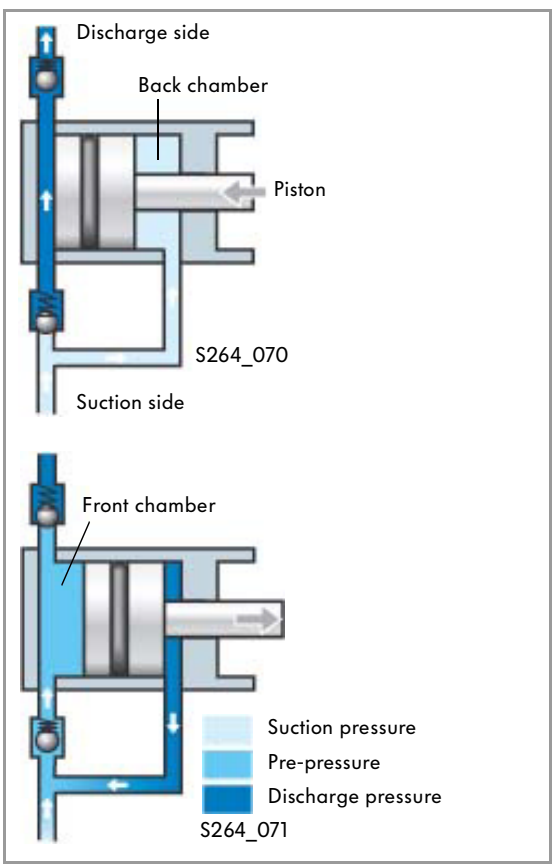
Without the contribution of the return flow pump, many brake system functions like, for example ABS, fail. The brake assist system is likewise non-functional.

● Self-diagnosis

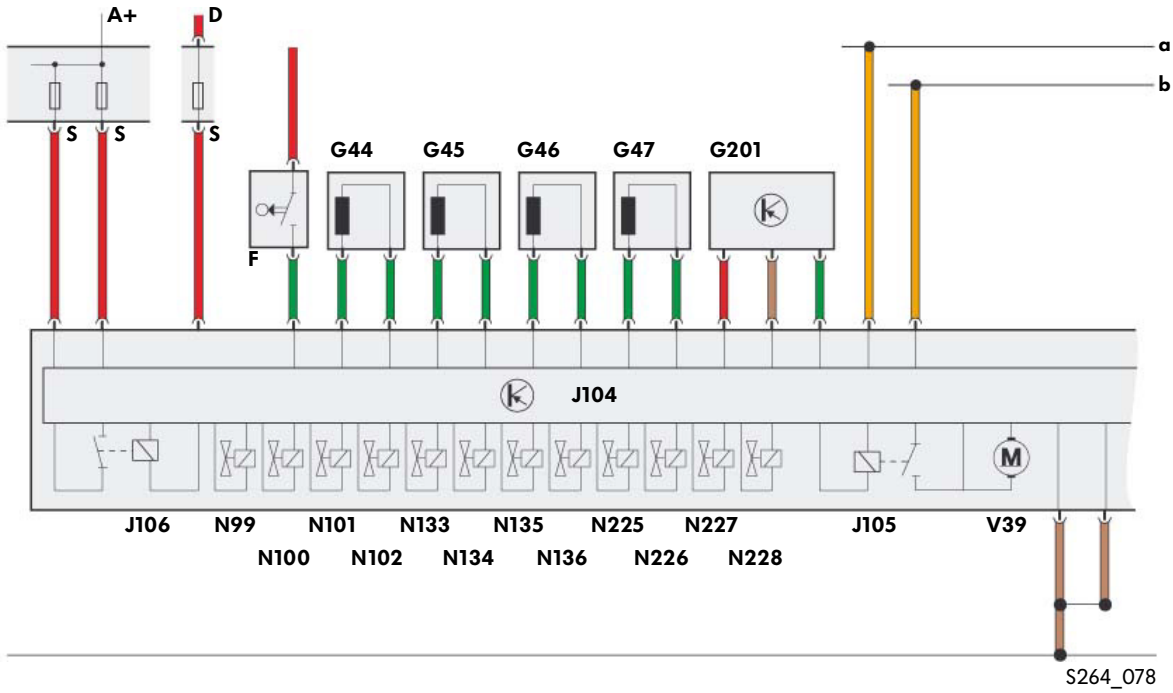
A defect in the return flow pump is detected by self-diagnosis and stored in the fault memory.



S264_053



Functional diagram



A+ Battery
D Ignition/starter switch

F Brake light switch

G44 Rear right speed sensor
G45 Front right speed sensor
G46 Rear left speed sensor
G47 Front left speed sensor
G201 Brake pressure sender

J104 ABS control unit
J105 ABS return flow pump relay
J106 ABS solenoid valve relay

N99 ABS inlet valve, front right
N100 ABS outlet valve, front right
N101 ABS inlet valve, front left
N102 ABS outlet valve, front left
N133 ABS inlet valve, rear right
N134 ABS inlet valve, rear left
N135 ABS outlet valve, rear right
N136 ABS outlet valve, rear left

N225 ESP switch valve -1-
N226 ESP switch valve -2-
N227 ESP high-pressure valve -1-
N228 ESP high-pressure valve -2-

S Fuse

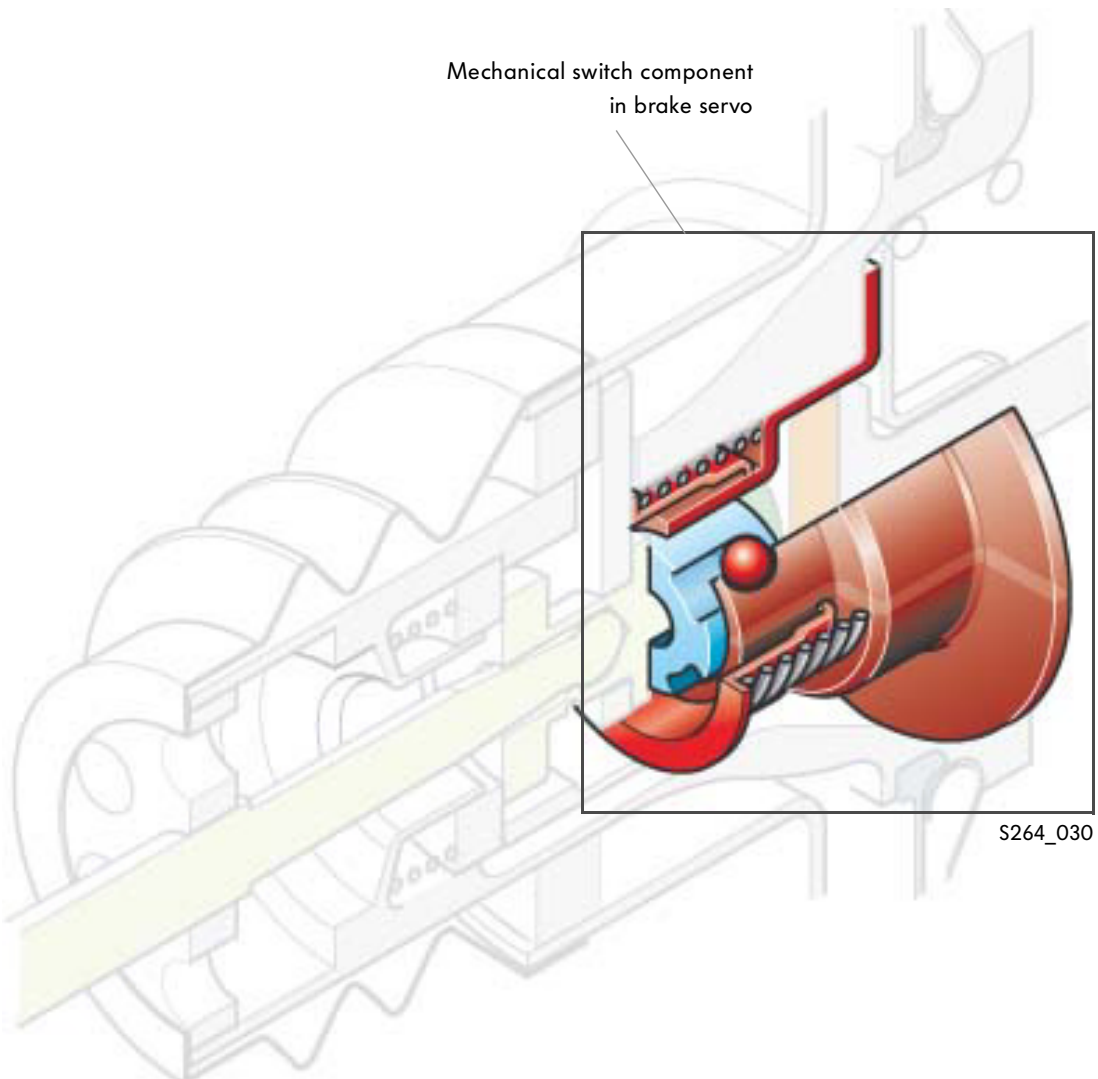
V39 ABS return flow pump

a CAN high
b CAN low

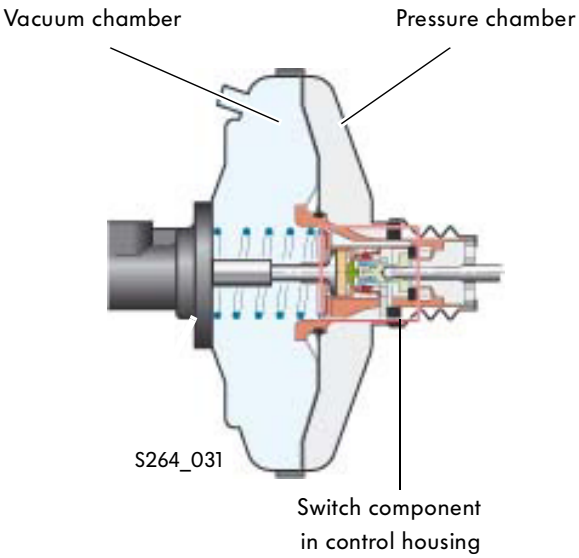
The mechanical brake assist system

Design ...

The heart of the Continental-TEVES mechanical brake assist system is a mechanical switch component in the brake servo.

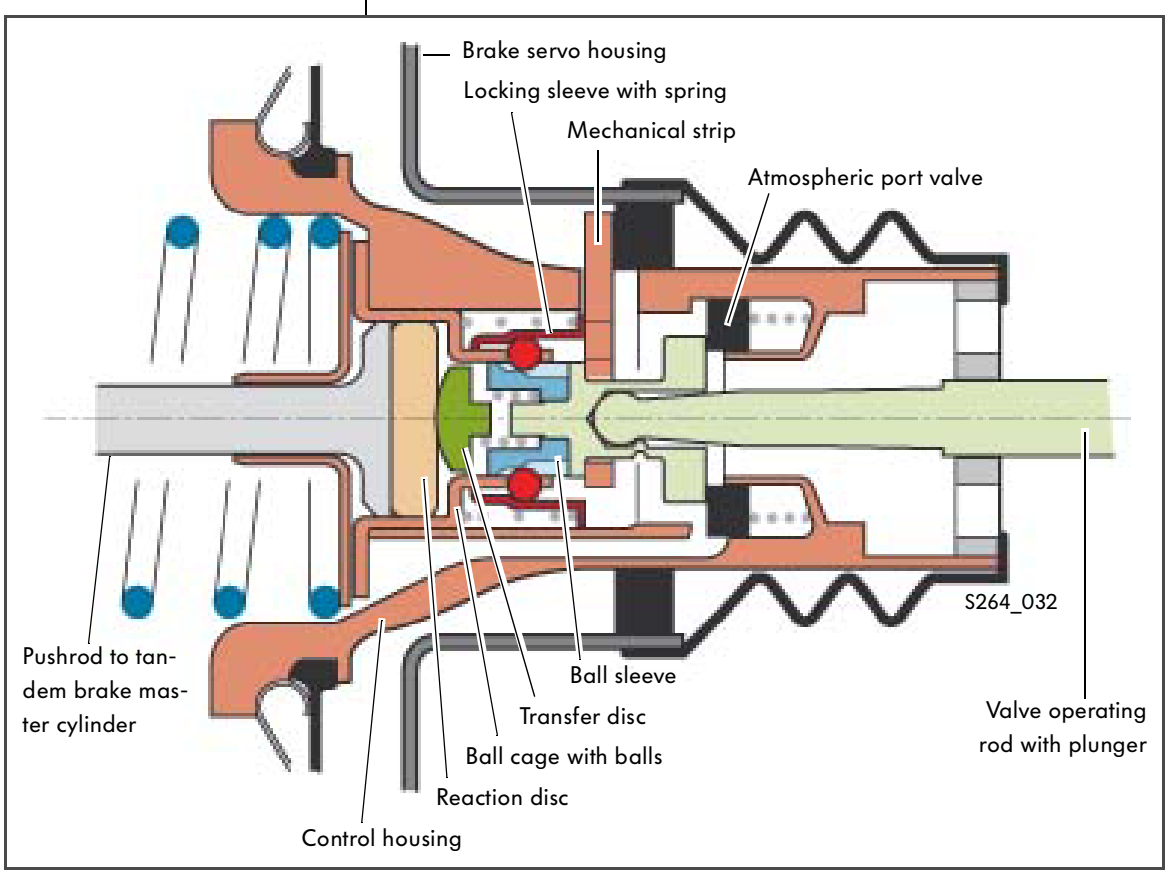


S264_030



The brake servo has a pressure and a vacuum chamber. When the brakes are not applied, vacuum is created by the intake manifold in both chambers. The brake force is amplified when, during brake application, the pressure chamber is pressurised with atmospheric pressure.
This creates a pressure differential between pressure and vacuum chambers, so that the external air pressure supports the braking motion.

The mechanical switch component consists of a locking sleeve with spring, a valve piston and a ball cage with balls and ball sleeve.

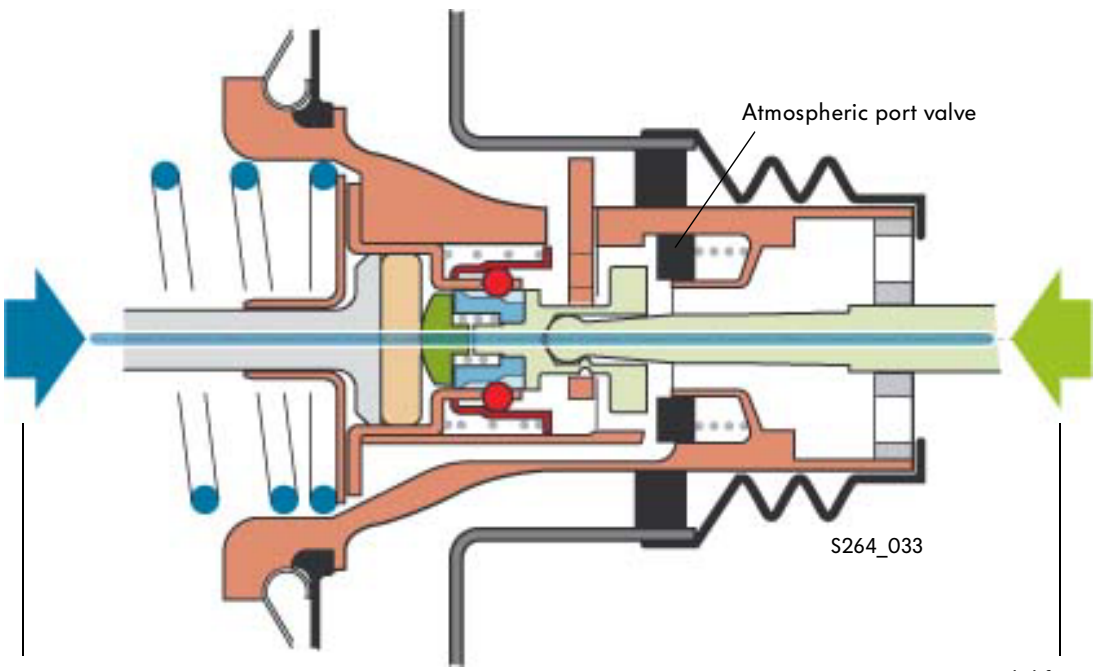


The mechanical brake assist system

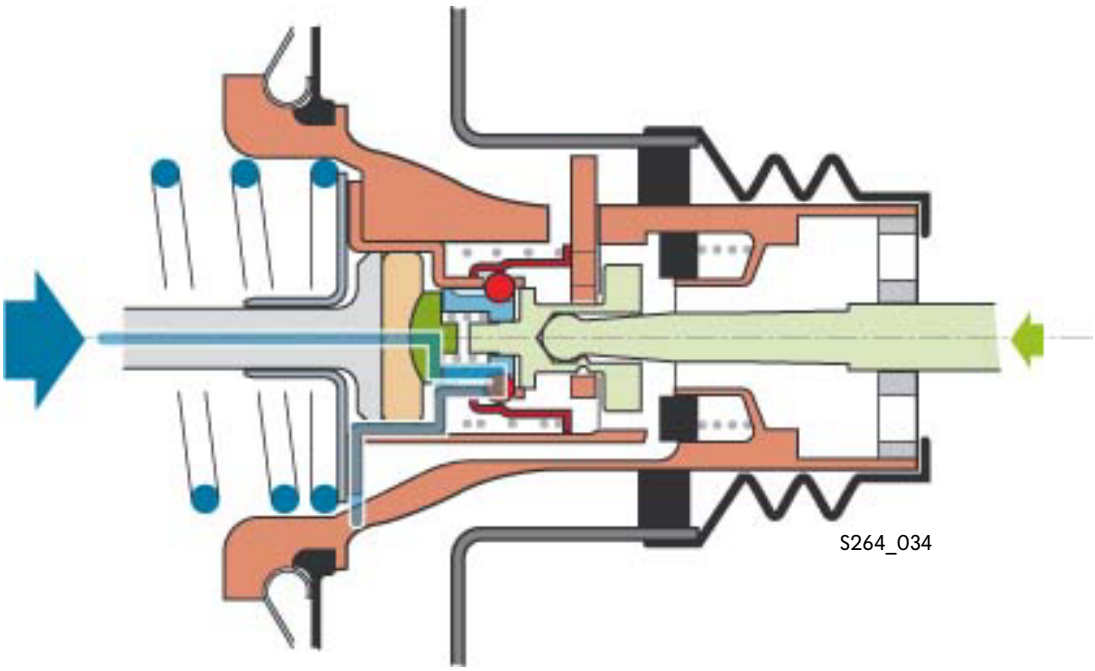
... and Function

As pressure develops in the brake system, the driver feels a counter-pressure in the brake pedal. The principle of the mechanical brake assist system is to divert this force to the control housing, relieving the driver physically. The locking mechanism holds the atmospheric port valve open and provides air to the pressure chamber.

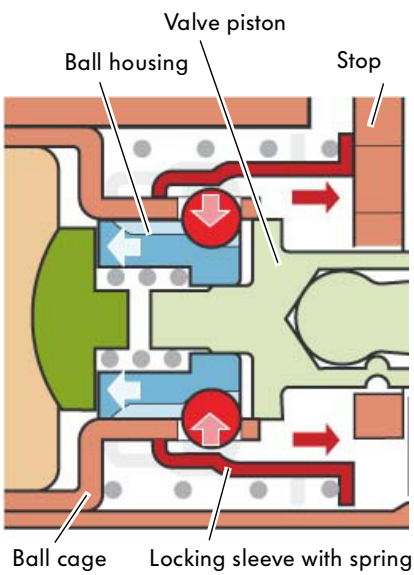
Path of force without brake assist system



Path of force with brake assist system



When the brake pedal is pressed with a certain force and a certain velocity, the switch component locks and the brake assist system intervenes.



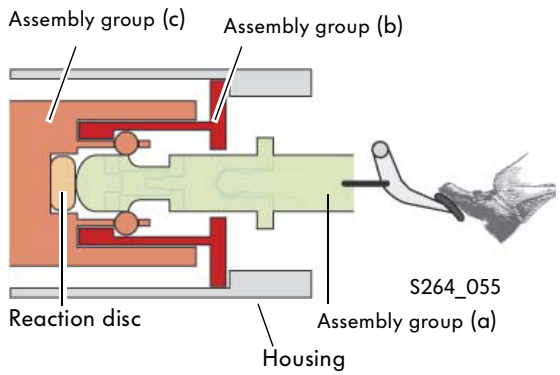
Switch component in emergency braking operation S264_038

In this case, the valve piston moves and the balls are moved inward in the ball cage. Consequently the locking sleeve can move to its stop. The switch component is locked.

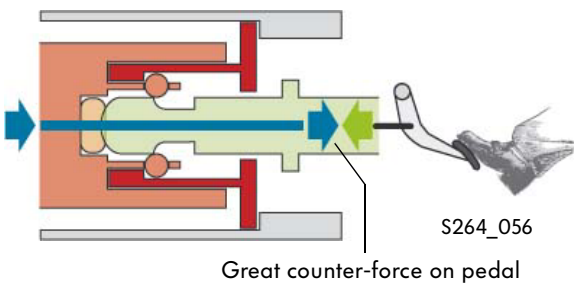
Because the mechanical events are difficult to present in a detailed diagram, the individual steps will be explained in strongly simplified drawings.

The mechanical brake assist system

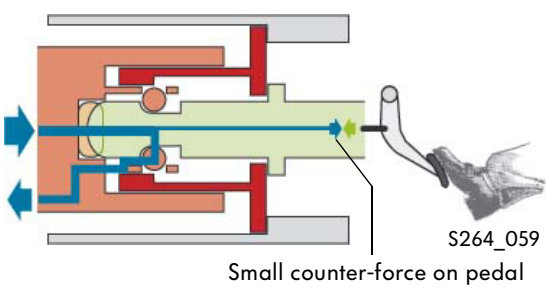
Assembly group	Parts	Colour
a	Valve operating rod, valve piston, ball housing, transfer disc	
b	Locking sleeve, mechanical stop	
c	Ball cage, balls, control housing	



If the brake is applied too slowly, the brake assist function is not triggered. That means that the driver feels the full counter-pressure from the brake system through the brake pedal as counter-force which he must overcome in order to brake more heavily.



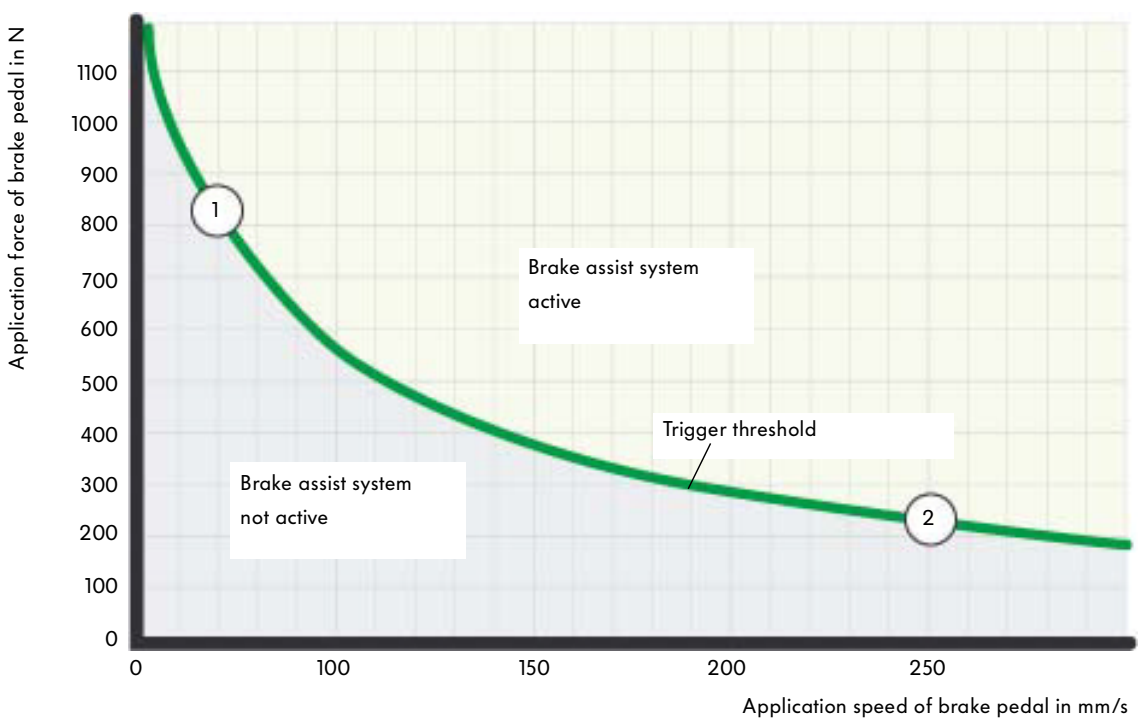
If the brake pedal is pressed very fast, the brake assist function is triggered.
The major portion of the counter-force is diverted through the locking of the assembly groups to the housing. The driver has to overcome only a very small force to brake more heavily.



Brake assist system intervention

A relation of two values triggers the mechanical brake assist system. One is the velocity with which the brake pedal is pressed and the other is the force of the brake pedal.
The trigger threshold is presented in the graph. In the green area above the trigger threshold, the brake assist system is active.

Example:



S264_082

1 Low application speed at high application force

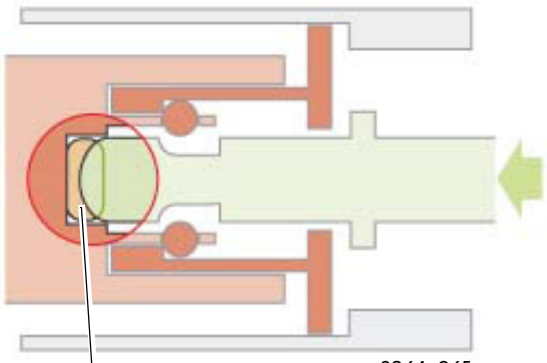
2 High application speed at low application force

The mechanical brake assist system

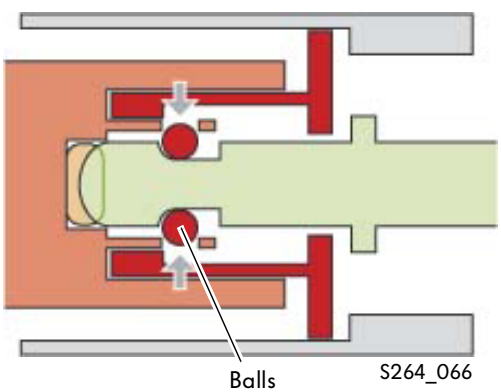
In Detail

The following, strongly simplified drawings illustrate the movements of the individual parts in relation to each other.

If the trigger threshold is exceeded, the green assembly group presses hard into the reaction disc. Due to its inertia, the light red assembly group cannot respond so quickly to the fast initial movement.

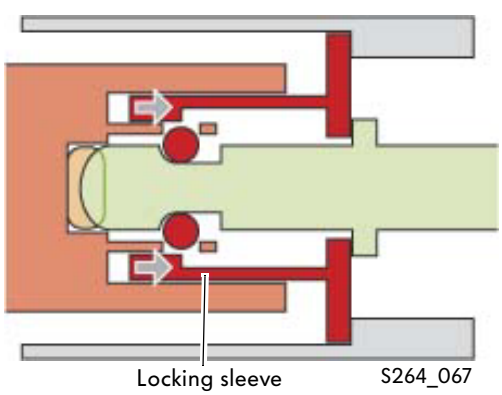


The movement of the green assembly group in relation to the light red group, enables the balls to roll into the groove in the green group.

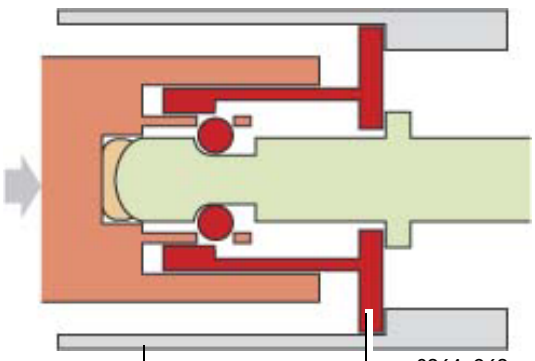


Only now can the locking sleeve (dark red) can slide over the balls, locking the switch component. The balls cannot return to their initial position due to the new position of the locking sleeve.

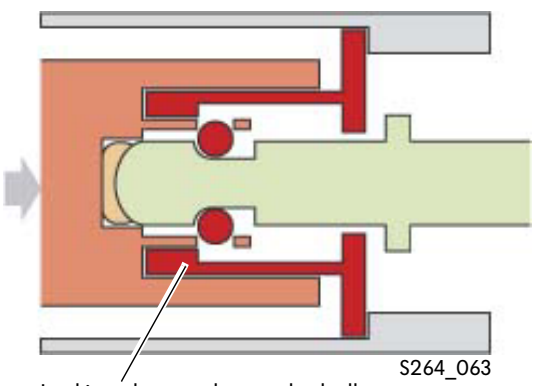
In this position, the counter-forces are diverted, as previously explained, from the brake system onto the housing.



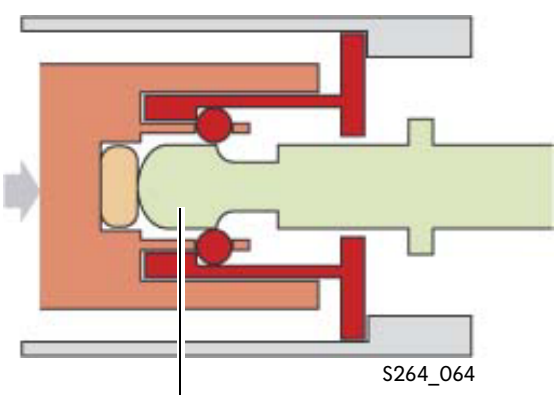
Concluding the brake assist function



If the driver takes his foot from the brake pedal, both red and the green assemblies move back together until the stop rests against the housing.



Because the entire mechanism moves further back within the brake servo, the light red part now moves in relation to the dark red part. Consequently, the locking sleeve releases the balls.



In the last phase of the movement, the balls are pressed back into their initial position by the green assembly group.

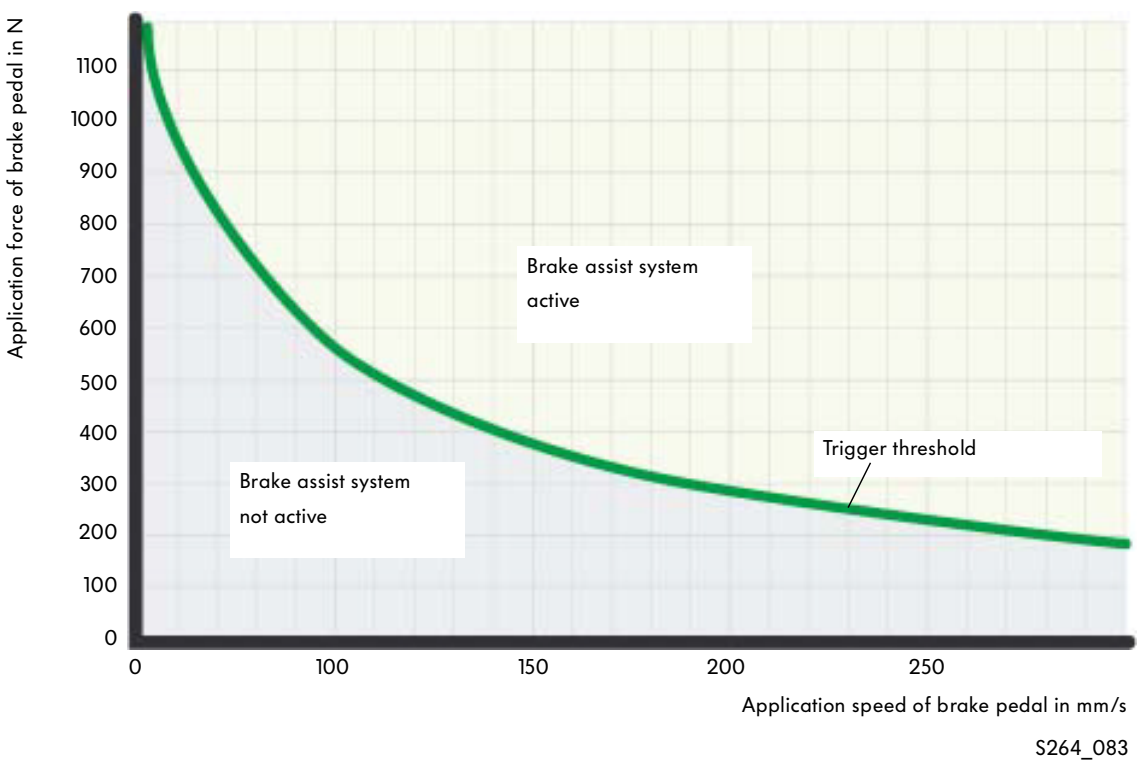
The emergency brake assist function is switched off.

Testing function

The brake pedal must be pressed with the engine running and the vehicle stationary so that the maximum vacuum boost is assured.

The mechanical brake assist system will be activated when the brake pedal is pressed to stop above the trigger threshold. A click in the brake servo can be heard when the brake assist system is triggered. The brake pedal can now be partially released and pressed with a small force.

When the brake pedal is released completely, the brake assist system must release (no hydraulic pressure in the brake system).



Test your knowledge

1. What is the function of the brake assist system?

- [ ] a It prevents the wheels from locking during emergency braking.
- [ ] b It supports the driver when braking in emergency situations.
- [ ] c It indicates to the driver how hard he must brake.
- [ ] d It attains the greatest possible braking effect while maintaining steering ability.

2. In which vehicles is the hydraulic brake assist system currently installed?

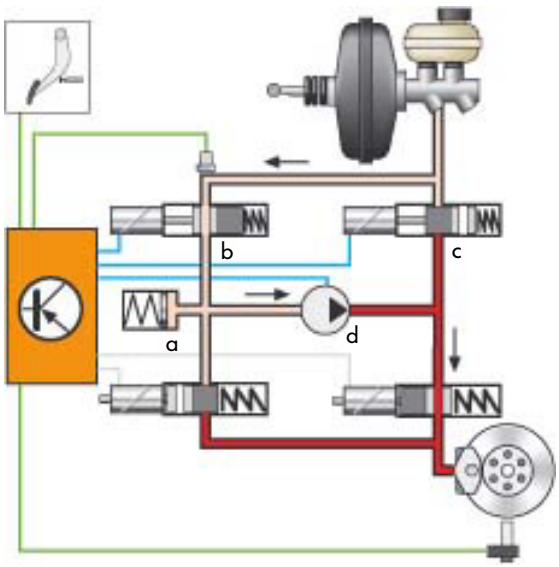
- [ ] a Golf
- [ ] b Polo 2002
- [ ] c Passat W8
- [ ] d Lupo 3L

3. The signals of which sensors are used for evaluating the trigger conditions?

- [ ] a Brake pressure sender
- [ ] b Engine speed sender
- [ ] c Speed sensors on wheels
- [ ] d ABS pressure sender
- [ ] e Brake light switch

Test your knowledge

4. Identify the components in the drawing.



a = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

b = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

c = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

d = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

5. What is the effect of the mechanical brake assist system based on?

☐ a The intake manifold vacuum works against the brake force so that the driver does not feel any counter-force in the brake pedal.

☐ b The counter-force from the pressure build-up in the brake system is diverted to the control housing.

6. Which conditions must be fulfilled to activate the mechanical brake assist system?

☐ a The application force must be sufficiently great when the application speed is low.

☐ b The application speed must be sufficiently great when the application force is small.

☐ c The activation condition depends entirely on the distance the pedal moves.

Notes

Answers:

1. b, d
2. b, c
3. a, c, e
4.

a = Accumulator
b = ESP (brake pressure) switch valve N225
c = ESP high-pressure valve N227
d = Return flow pump

5. b
6. a, b

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