

Test instruction

i Prior to testing read carefully the safety instructions.

Notes on Safety

 **WARNING**

Testing the device on the test bench is to be made only by qualified personnel with a specific system knowledge.

Always start testing only after you have read and understood all information required for testing.

Test the device only on a calibrated test bench.

In case of doubt, use test values specified by the vehicle manufacturer.

While testing the device implicitly observe this test instruction.

 **CAUTION**

Keep company's as well as national accident prevention regulations

Unlock screws, hoses and equipment parts only when the respective lines of the test bench are vented.

Test instruction for device 461 310 ... 0

550	553	560
551	554	562
552	555	570

Symbols and Signal Words

 **WARNING**

Possible hazard situation. Disregarding it may cause grave personal injuries or death.

 **CAUTION**

Possible danger: Any non-compliance can result in minor or medium severe personal injuries.

- Handling
- List
- i** Instructions, explanations, information, tips
-  Gauge indication

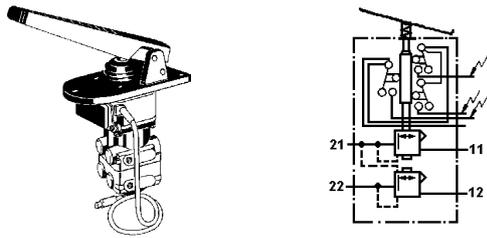


Fig. 1 + 2 Brake valve 461 310 ... 0 / functional symbol

i Necessary equipment/tools

- Test bench 435 197 000 0 or an adequate testing equipment
- Adequate equipment:
 - for clamping the brake valve,
 - for actuating the pedal with degree graduation.
- 3 test lamps for checking the pass of the switches

i Additional documents:

(see www.wabco-auto.com => INFORM)

- Test Values 2/2:
to be found by entry of the product number in INFORM
- Test Bench - Operating Instructions:
435 197 000 0
- General Repair and Test Hints:
820 001 074 3 (de)
820 001 075 3 (en)
820 001 076 3 (es)
820 001 077 3 (fr)
820 001 078 3 (it)

Check sequence

- Perform test procedure as per specified sequence
Find test values P1 to P15 and G1 to G13 in document "Test values 2/2".
Reservoir pressure is 8 bar max. / 7 bar min.

! CAUTION

Before starting any test ensure that cut-off cocks are in their correct normal position (see table 1).

Cock	A	B	C	D	F	L	V	2	3	4	6	7	11	12	21	22
on	x												x		x	
off		x	x	x	x	x	x	x	x	x	x	x		x		x

Table 1: Normal position of cut-off cocks on the test bench

1. External evaluation

- Inspect device for external visible damage.
- Check all ports of the device for free passage by visual inspection.

2. Preparation I

2.1 Adjustment arrangement of brake valves

- Assemble the brake valve except for the insertion of fully assembled graduating piston and the flange of the whole actuation.

- Measure dimensions a and b (see fig. 3), dimension $C = b - a$.

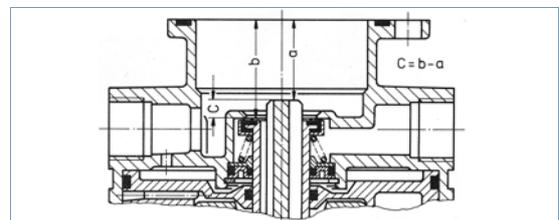


Fig. 3 Dimension C

- Adjust dimension $d = C + 0,8$ mm in the graduating piston by turning the set screw (see fig. 4).

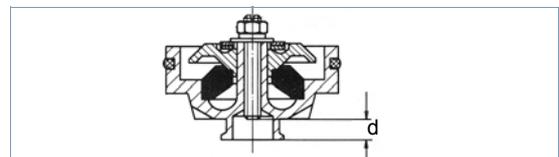


Fig. 4 Dimension d (Device with one rubber spring)

- Counter set screw by turning the hexagon nut (see fig. 5).

- The adjustment levels off also at devices with longer graduation travel (two rubber springs), see fig. 5.

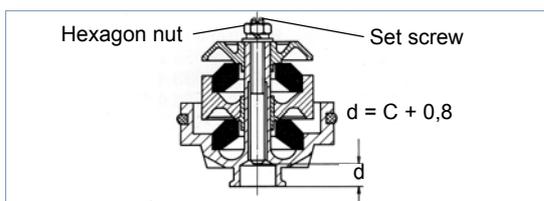


Fig. 5 Dimension d (Device with two rubber springs)

- Assemble the device.
- Fix device in clamping equipment.
- Connect device to test bench ports (see fig. 6).

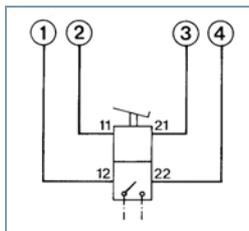


Fig. 6 Test bench ports



CAUTION

Make sure that plug-in connections on test bench and device are safely plugged.

- Close one of the port 21 and 22 with screw plug M 22x1.5.

3. Check tightness



WARNING

Never install an untightened brake valve on the vehicle.

3.1 Exhaust

- From a non-actuated device no air must exceed from the exhaust.
- Vent ports 11 and 12 with P1.
- Fully operate device several times.
- Wait until excess pressure has decreased.
- Check exhaust of the device for tightness.
- No leakages admissible.

3.2 Complete device

- Fix measuring scale to device.
- 0-position of the pedal means 0-position of the graduation at the same time.
- Adjust pedal to G1 (stop within device).
- Cover complete device with soap and check tightness.
- No leakages admissible.
- With soap bubbling the device is not tight.
- Re-adjust pedal to 0°.
- ⌚ Gauges 3 and 4 must indicate 0 bar.

4. Obtain maximum pressure

- Adjust pedal to G9 (stop within device).
- Pressure must increase immediately.
- ⌚ Gauges 3 and 4 must indicate P11.
- Re-adjust pedal to 0°.
- ⌚ Gauges 3 and 4 must indicate 0 bar.

5. Graduability

- In all pressure scopes incremental steps of max. 0.3 bar must be possible.

6. Adjust pedal

- Adjust stop screw for the pedal without clearance.
- The plunger must not execute any stroke movement at the same time.
- Counter stop screw with 20 Nm.

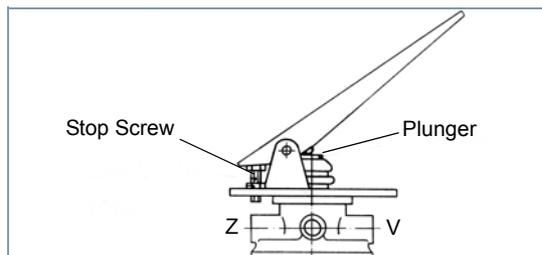


Fig. 7 Pedal

7. Settings

- Operate pedal three times up to 4 bar.
- ⌚ Gauges 3 and 4 must indicate immediate pressure increase resp. decrease.
- In accordance with the type of device, one circuit must have predominance.
- Adjust pedal to G2.
- ⌚ Gauges 3 and 4 must indicate P2.

7.1 Switch I, II and III

- Remove cap from the switch (see fig. 10).
- Connect test lamps.
- Release cylinder screw d (see fig. 8).
- Tighten set screw e until cut in point is reached (see fig. 8).

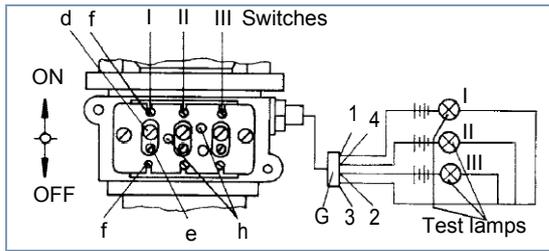


Fig. 8 Connection of the test lamps

- Turn set screw e by about one quarter of a turn.
- Turn cylinder screw d with 1.2 Nm (see fig. 8).
i Test lamps I, II and III must light up.
- Re-adjust pedal to 0°.
⌚ Gauges 3 and 4 must indicate 0 bar.
i Test lamps I, II and III must be off.

If the test lamps are still lighting up, you must act as follows:

- Release cylinder screw f of the concerning switch slightly (see fig. 8).
- Slide the switch toward the OFF direction until test lamp is off.

7.2 Switching points

Switch I

- Adjust pedal to G3.
⌚ Gauges 3 and 4 must indicate 0 bar.
i Test lamp for Switch I lights up.

If an adjustment is necessary, you must act as follows:

- Release cylinder screw f slightly.
- On the cylinder screws f (see fig. 8) move the concerning switch in direction OFF and then in direction ON until cut in point is reached.
- Tighten cylinder screw f with 0.6 Nm.

Switch II

- Adjust pedal to G4.
⌚ Gauges 3 and 4 must indicate 0 bar.
i Test lamp for Switch II lights up.
- i** If an adjustment is necessary, you must act as described under Switch I.

Switch III

- Adjust pedal to G5.
⌚ Gauge 3 must indicate P3.
Gauge 4 must indicate P4.
- Adjust pedal to G6.
⌚ Gauge 3 must indicate P5.
Gauge 4 must indicate P6.
i Test lamp for Switch III lights up.
- i** If an adjustment is necessary, you must act as described under Switch I.

8. Check pressure increase

8.1 Distance until venting of P7/P8

- Adjust pedal to G7.
i Pressure must increase immediately.
⌚ Gauge 3 must indicate P7.
Gauge 4 must indicate P8.
i Test lamps I, II and III must light up.

8.2 Distance until venting of P9/P10

- Adjust pedal to G8.
i Pressure must increase immediately.
⌚ Gauge 3 must indicate P9.
Gauge 4 must indicate P10.
i Test lamps I, II and III must light up.

8.3 Distance until venting of P11

- Adjust pedal to G9.
i Pressure must increase immediately.
⌚ Gauges 3 and 4 must indicate P11.
i Test lamps I, II and III must light up.

9. Switch off test lamps

9.1 Test lamp I

- Adjust pedal to G10.
⌚ Gauge 3 must indicate P12.
Gauge 4 must indicate P13.
i Test lamp I must be off.

9.2 Test lamp II

- Adjust pedal to G11.
⌚ Gauge 3 must indicate P14.
Gauge 4 must indicate P15.
i Test lamp II must be off.

9.3 Test lamp III

- Adjust pedal to G12.
- ⊗ Gauges 3 and 4 must indicate 0 bar.
- i** Test lamp III must be off.
- Insert plate 461 908 107 4 in the locating bore h (see fig. 8).
- Re-adjust pedal to 0°.
- ⊗ Gauges 3 and 4 must indicate 0 bar.
- i** Test lamps I, II and III must be off.

10. Circuit failure

10.1 Failure of circuit 1

- Vent port 11 to 0 bar.
- ⊗ Gauge 1 must indicate 0 bar.
- i** Test lamps I, II and III must be off.
- Adjust pedal to G13.
- ⊗ Gauges 3 and 4 must indicate 0 bar.
- i** Test lamps I, II and III must light up.

Adjust pressure point on the pedal

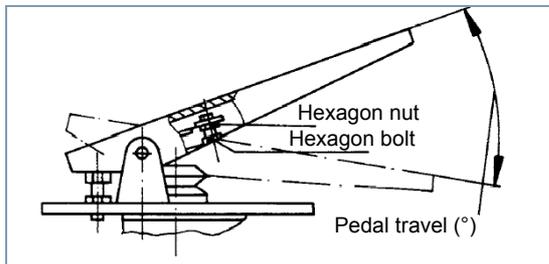


Fig. 9 Pedal

- Release hexagon nut (see fig. 9).
- Screw hexagon bolt up to the pedal and counter it with hexagon nut (M = 4 Nm), see fig. 9.
- Re-adjust pedal to 0°.
- Adjust pedal to G13.
- ⊗ Gauges 3 and 4 must indicate 0 bar.
- i** Test lamps I, II and III must light up.
- Operate pedal with G9 (stop within the device) by hand.
- i** The preset pressure point must be tangible at G13.
- The pressure point must be between the cut in points of Switch I and Switch II.

- Re-adjust pedal to 0°.
- ⊗ Gauges 3 and 4 must indicate 0 bar.
- i** Test lamps I, II and III must be off.

10.2 Failure of circuit 2

- Vent port 11 with P1.
- Vent port 12 to 0 bar.
- ⊗ Gauge 1 must indicate P1.
- Gauge 2 must indicate 0 bar.
- i** Test lamps I, II and III must be off.
- Adjust pedal to G9 (stop within device).
- ⊗ Gauge 3 must indicate P11.
- Gauge 4 must indicate 0 bar.
- i** Test lamps I, II and III must light up.
- Re-adjust pedal to 0°.
- ⊗ Gauges 3 and 4 must indicate 0 bar.
- i** Test lamps I, II and III must be off.

11. Completion of test

- Vent port 11.
- ⊗ Gauges 1 and 2 must indicate 0 bar.

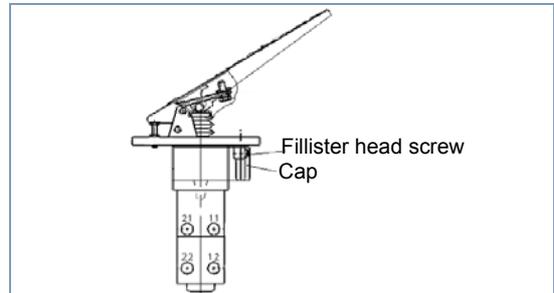


Fig. 10 Brake valve 461 310 ... 0

- Put the cap on and screw fillister head screw with 2.5 Nm.
- Check the electrical connections 1-4 within the plug casing G against ground (see fig. 4).

CAUTION

Disconnect pipe connections only after having exhausted the device to 0 bar before.

- Removing device from fixture.
- Cleaning device.