

Pneumatically released, spring-applied brakes

One, two and three plate versions

1. Function

The housing (11) is centred on the machine frame and secured with studs (8), which should be secured with Loctite, and hexagon nuts (9), and should if possible be pinned. The housing (11) is internally splined to accept the pressure plate (2) and outer plates (3). The inner plates (4) fit on the splined hub (1) and are arranged alternately between the outer plates (3) which have a friction lining. The piston (6) moves axially within the cylinder (10) and is sealed with U-seals (7). When air (operating pressure 5.5 bar; max. permissible operating pressure 6 bar) is fed into the cylinder through the three equi-spaced (120°) inlets "a", the piston is moved axially and releases the brake. When the air pressure is released, the springs (5) return the pressure plate (2) and piston (6) to their rest position, giving a positive connection and transmission of the braking torque.

2. Installation

Locate the hub (1) on the shaft and secure to prevent axial movement. After screwing the studs (8), which should be secured with Loctite, into the machine frame, fit the housing (11) on to the centering. Starting with an outer plate (3) which has a lining on just one side, slide the outer and inner plates (4) alternately into the housing/on to the hub.

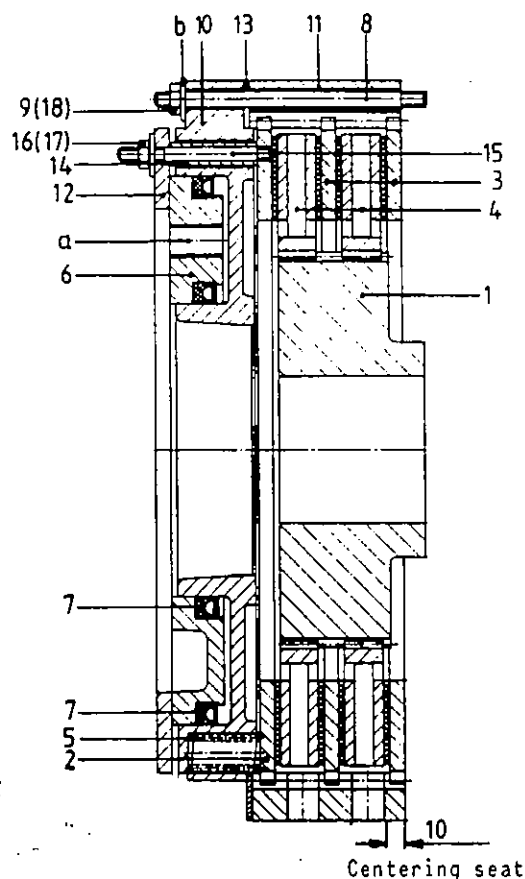


Fig. 1: Two-plate version

Table 1 Part no.	Brake size												
	43	51	59	66	72	75	78	80	84	85	90	91	
1 Hub													
2 Pressure plate													
3 Outer plate													
4 Inner plate													
5 Spring													
6 Piston													
7 U-seal													
8 Stud													
9 Hex. nut	M_A in Nm	8.5	14	35	69	69	120	120	290	295	295	580	580
10 Cylinder													
11 Housing													
12 Support plate													
13 Shim		not fitted on the single-plate version											
14 Bush													
15 Stud													
16 Hex. nut	M_A in Nm	2.9	6	10	25	49	25	86	49	86	86	210	210
17 Lockwasher													
18 Lockwasher													
Total wear of plates	single-plate version	3	3	3.75	4.5	5.5	5.5	5.5	6.5	7	7.5	8	8.5
	two/three-plate version	6	6	7	7.8	9.9	9.8	10	12	13	14	15	16

Slide the actuator, which is a sub-assembly consisting of pressure plate (2) with studs (15), bush (14), support plate (12), lockwasher (17), and hexagonal nuts (16), piston (6) with U-seal (7), as well as cylinder (10) with springs (5), on to the studs (8) and secure firmly with hexagonal nuts (9) to the housing, observing the tightening torques M_A given in table 1.

3. Adjustment

The point of maximum wear has been reached on single plate brakes when the support plate (12), which is attached in a fixed manner to the pressure plate (2), has almost started to make contact with the cylinder (10). The outer plates (3) and pressure plate (2) must be replaced at this point. In the case of the two and three plate versions, only half maximum wear has taken place at this point. The brake can be reset as follows: Slacken hexagonal nuts (9), take out shims (13) and replace at position "b" in front of the cylinder (10). Tighten up the hexagonal nuts (9) again with the tightening torques in table 1. With these versions, the point of max. wear has been reached when the support plate (12) has again almost started to make contact with the cylinder (10). The outer plates (3) and the pressure plate (2) must be replaced at this point.

4. Replacement of lining

When the wear on the lining can no longer be compensated for by adjustment, the outer plates (3) and pressure plate (2) must be replaced. When removing the pressure plate, please note that the nuts (16) are to be loosened crosswise since they are under spring pressure. Brakes up to and including size 85 have their linings bonded on to them and the complete part must be replaced. On size 90 brakes and larger the lining are riveted to the plate base and can be renewed.

- a Brake
- b Clutch
- c Pressure switch
- d 3/2 way valve
- e Oiler

5. Switching of a clutch in combination with a pneumatic clutch

The times during which the clutch is engaged must not overlap with the times during which the brake is applied since this would lead to overheating and excessive plate wear. When air is released from the cylinder, the brake is automatically acting on it. When pressurised air is applied, the brake is released. The following circuits are possible:

5.1 Using one valve

(Spring return pressure acting on clutch and brake equal)

Actuation of the solenoid valve causes both the clutch and brake cylinder to be pressurised. The clutch springs must be dimensioned in such a way that the clutch must not engage until the brake has been released. Thus the spring return pressure acting on the brake must be equal to or can be up to 0.2 bar less than that acting on the clutch cannot take place with this arrangement.

5.2 Using two valves

(Spring return pressure acting on clutch and brake not equal)

If the spring return pressure of the brake is larger than that of the clutch, overlapping can be avoided by using pressure-sequence-controlled valves. In the valve circuit shown in fig. 2, clutch and brake are controlled electrically by separate 3 way valves. Pressure switches are provided in the control lines between valve and clutch/brake. These bring about the engaging/disengaging of one working element when the pressure acting on the other working element reaches particular preset levels.

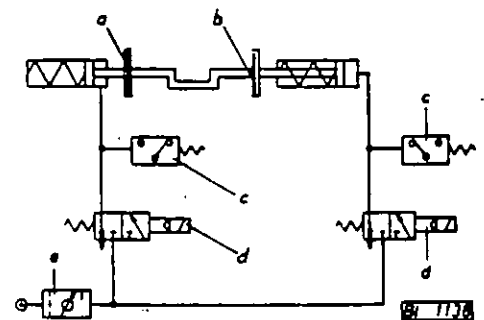


Fig. 2

6. Maintenance faults and their elimination

Brake starts to slip:

The wear on the plates is too great. Replace the plates. Or the air pressure is lower than that required. Unless otherwise stated, the brake requires an air pressure of 5.5 bar.

The brake overheats:

At high engagement frequencies or where high masses have to be braked, a heating up of the brake cannot be avoided since the work of friction is inevitably released as heat. If temperatures of over 80° C on the cylinder or 100° C on the housing are found, steps must be taken to improve the extraction of the heat. If the above-mentioned temperatures are exceeded for any length of time, the seals will vulcanise and become hard and brittle. They will then be no longer airtight and must be renewed. Or the functioning of the brake and clutch are overlapping. This must be prevented as described in para. 5.

7. Spare parts (see fig. 1)

When ordering spare parts, please always quote the serial number of the brake in addition to the part number. The serial number is normally stamped on the hub or housing of the unit. To avoid the possibility of errors, all orders should be placed in writing.

8. Ancilliary equipment

8.1 Air system

Where there is no compressed air supply line, the size of the compressor required must be determined in accordance with the air consumption of the brake. See table 2 for the cylinder volumes. To the cylinder volume must be added the volume of the lines from the compressor up to the valve. The quantity of air required is then:

$$Q = 1.5 \cdot V \cdot p \cdot z \text{ (l/min)}$$

Q = quantity of air drawn in by the compressor

V = cylinder volume + volume of line between brake and valve in litres.

p = max. operating pressure in bar.

z = max. engagement frequency/min.

1,5 = factor for leakage losses (depends on the actual operating conditions).

Where the compressor supplies more than one brake, the quantity of air required must be increased appropriately.

Attention! Use filtered air only air to which 1 to (max.) 3 drops of oil per m³ have been added.

8.2 Accumulator

Where high engagement frequencies arise, it is advisable to fit an appropriately sized accumulator immediately before the valve to ensure that there is always sufficient pressurised air available to around 3 to 4 times the volume of the cylinder (table 2) plus the volume of the line times the operating pressure:

$$V_{\text{acc.}} = 3 \text{ to } 4 \cdot V \cdot p$$

It is of advantage to fit a pressure monitor in order to be able to monitor the operating pressure since, if the air pressure is too low, the brake can slip and then fail as the result of overheating or wear. During engagement, the air pressure when measured directly before the brake should not fall below 90% of the operating pressure.

Operating pressure 5.5 bar.

Max. permissible operating pressure 6 bar.

Size	Cylinder volume in l
43	0.052
51	0.102
59	0.169
66	0.340
72	0.507
75	0.603
78	0.769
80	0.970
84	1.268
85	2.230
90	2.438
91	3.680

Table 2

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