

# Valves

The gastight seat of the valves is of decisive importance for the performance of an engine. This can only be achieved by reworking valves, valve seats and valve guides with utmost accuracy. The required tools are described in detail.

The valve guides and valve seats must be strictly concentric, and the valve cone must bear on its entire surface.

## Removal, Installation and Grinding of Valves

Types 220 and 220a

Operation No.
M 22

### Special Tool:

Valve lifter, 4 parts 186 589 02 31

two oil wiper rings with sealing ring retainer ring must also be removed (see Operation No. M 26b).

### Equipment:

Spring testing scale 000 589 00 65

2. Remove the valves.

### Procedure:

1. Remove valve cone halves, spring retainers, inner and outer springs and spring supporting ring by means of valve lifter 186 589 02 31 (Fig. M 22/1).

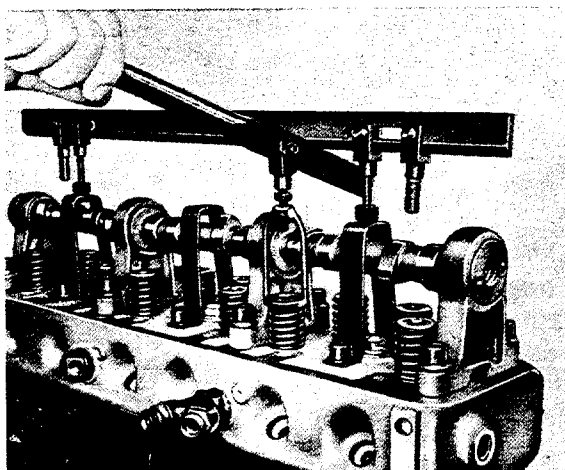


Fig. M 22/1

**Note:** If the former valve packing is used, the sealing ring retainer with sealing ring or the

### Checking and Reconditioning:

The dimensions of both intake and exhaust valves are given in Table 12.

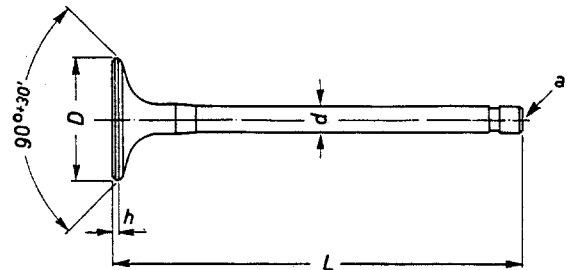


Fig. M 22/00

**Table 12**  
Valve Dimensions  
in mm (in.)

	Valve head dia. D	Stem dia. d	Length L	Valve seat angle
Intake	39.2 (1.543)	$\frac{8.97}{8.95}$ (0.3531) (0.3524)	128 (5.039)	90° + 30'
Exhaust	35.2 (1.386)	$\frac{9.95}{9.93}$ (0.3917) (0.3910)	112.75 (4.439)	

3. Check valves on a valve tester for wear and out of true of valve head and stem (Fig. M 22/3).

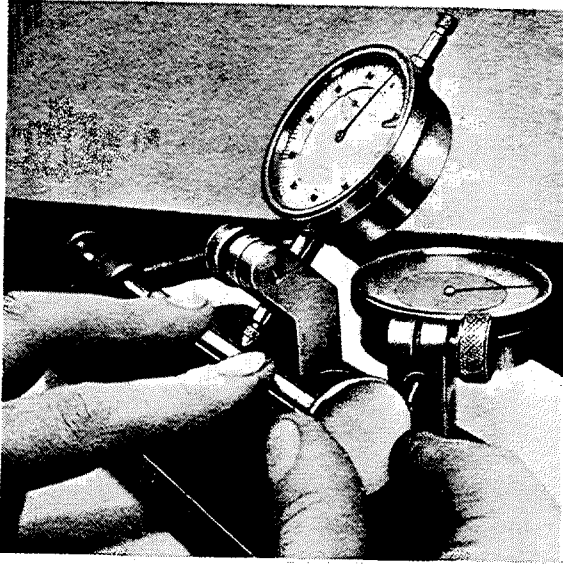


Fig. M 22/3

For checking, press valve firmly against butting face. The valve cone must run concentric with the valve stem inside 0.02 to 0.03 mm (0.0008 to 0.0012"). Replace the valve, if valve stem is worn to less than 8.95 mm (0.3524") in an intake valve or 9.93 mm (0.3910") in an exhaust valve, or if valve head is distorted.

4. Grind valve cone on a valve cone grinding machine under  $90^\circ \pm 30'$  (Fig. M 22/4). Be careful to avoid any percussion or chatter marks.

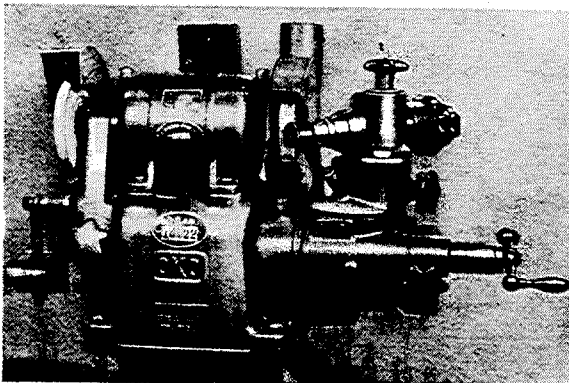


Fig. M 22/4

**Note:** Replace the valve, if height  $h$  of valve head is less than 1 mm (0.04") in an intake valve or less than 1.5 mm (0.06") in an exhaust valve.

If valve foot "a" is deformed, regrind it on a valve cone grinding machine. The Rockwell hardness of surface "a" should be 55 to 61 HRC.

The exhaust valve seats are armoured. Designation and part number of the valves are given on the end of stem.

5. Test valve springs against Table 13.

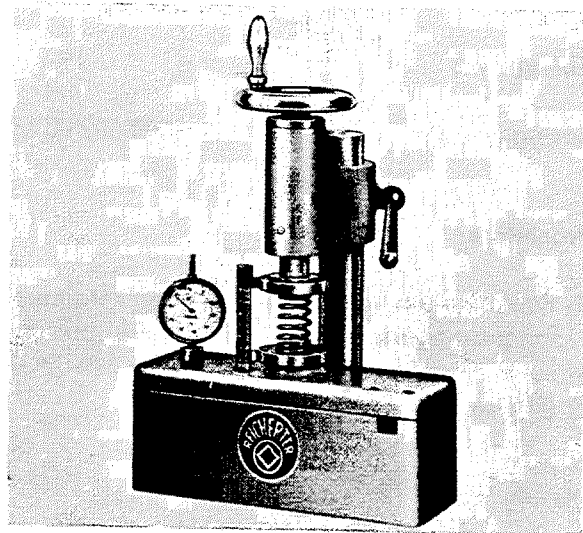


Fig. M 22/5

6. Reinstall all parts that have been removed.

Install the valves. Mount spring supporting ring, inner and outer spring, valve spring retainer with sealing ring and valve cone halves. Use valve lifter 186 589 02 31.

When exchanging the valve packing with Burgmann sealing ring for the repair design, first install the two oil wiper rings, sealing ring retainer ring and sealing ring retainer, then inner and outer spring, valve spring retainer and valve cone halves (see also Operation No. M 26b).

**Note:** The diameter of the spring supporting ring in a light metal cylinder head is larger, so that both outer and inner spring rest on the ring; in the case of a cast iron cylinder head the spring supporting ring has a smaller diameter so that only the inner spring rests on the ring, whereas the outer spring rests on the cylinder head. Be careful not to interchange the rings!

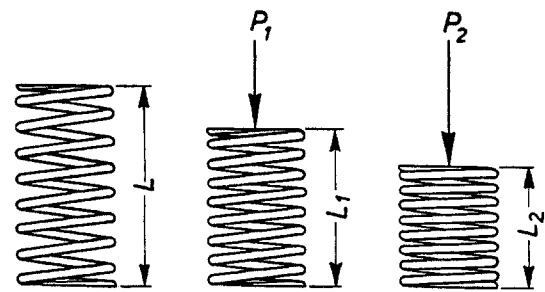


Fig. M 22/5a

### Intake and Exhaust Valve Spring Testing Table

Table 13

Type		Outer dia. D	Wire thickness d mm (in.)	Length L unloaded mm (in.)	Length L <sub>1</sub> at load P <sub>1</sub> (valve open)		Length L <sub>2</sub> at load P <sub>2</sub> (valve closed)	
					mm (in.)	kg (lb.)	mm (in.)	kg (lb.)
220	Inner spring	20.5 (0.81)	2.5 (0.098)	43.2 (1.70)	35.3 (1.39)	7.3 (16.0)	27.0 (1.06)	15.0 (33.0)
	Outer spring	29.6 (1.17)	3.6 (0.14)	49.8 (1.96)	40.3 (1.59)	17.0 (37.5)	32.0 (1.26)	32.0 (70.5)
220 a	Inner spring	20.7 (0.815)	2.6 (0.10)	42 (1.65)	34.2 (1.35)	8.9 (19.5)	25.7 (1.01)	18.6 $\pm \frac{2}{1}$ (41.0 $\pm \frac{4.4}{-2.2}$ )
	Outer spring	30.6 (2.205)	4 (0.16)	47 (1.85)	38.4 (1.51)	23.1 (51.0)	29.9 (1.18)	45.9 $\pm \frac{4.5}{2.2}$ (101.2 $\pm \frac{9.9}{4.8}$ )

**Note:** The valve springs for Type 220 a may be used in an engine for Type 220, but not vice versa.