

Valve Stem Packing

Types 220 and 220 a

Operation No.
M 26 b

Two types of valve stem packings are used:

a) The former design with sealing ring (Fig. M 26 b/00) and the pertaining repair design with two oil wiper rings (Fig. M 26 b/01).

b) The present design with bell (Fig. M 26 b/02).

Figs. M 26 b/00, 01 and 02 show the two designs as well as the repair design.

When exchanging all valve guides of former design, install guides of the new design in connection with the valve packing shown in Fig. M 26 b/02. Replace the valve spring retainers as well and install spring supporting rings (see Fig. M 26 b/02). See also Operation No. M 26.

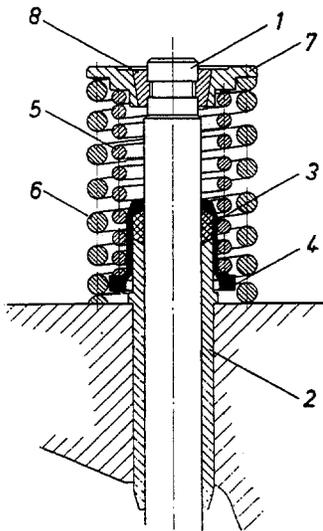


Fig. M 26b/00

Former design with sealing ring
(obsolete)

- 1 Exhaust valve
- 2 Valve guide
- 3 Sealing ring
- 4 Sealing ring retainer
- 5 Inner valve spring
- 6 Outer valve spring
- 7 Valve spring retainer
- 8 Valve cone halves

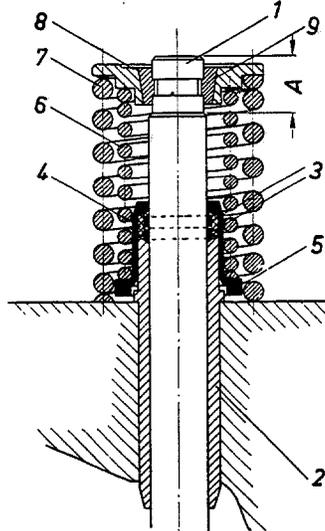


Fig. M 26b/01

Repair design used in the place
of the valve packing shown in
Fig. M 26 b/00

- 1 Exhaust valve
- 2 Valve guide
- 3 Oil wiper rings
- 4 Sealing ring
retainer ring
- 5 Sealing ring retainer
- 6 Inner valve spring
- 7 Outer valve spring
- 8 Valve spring retainer
- 9 Valve cone halves

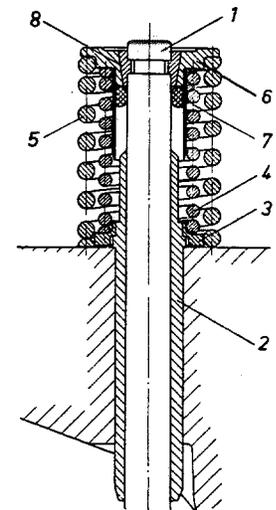


Fig. M 26b/02

Present design

- 1 Intake valve
- 2 Valve guide
- 3 Spring supporting ring
- 4 Inner valve spring
- 5 Outer valve spring
- 6 Valve spring retainer
with bell
- 7 Sealing ring
- 8 Valve cone halves

Special Tools:

Torque wrench 0 to 6 mkg
(0. to 43.5 ft.lb.)

000 589 27 21

Socket screw wrench insert,
width over flats 8 mm (0.315"),
length 80 mm (3.15"),
for rocker arm brackets

000 581 06 07

Socket wrench insert,
opening 17 mm (0.67"),
fore rocker arm brackets, from

000 589 18 09

Special Allen wrench,
width over flats 8 mm (0.315"),
length 300 mm (11.81"),
for rocker arm brackets

187 589 04 07

Valve lifter, 4 parts

186 589 02 31

Special wrench,
opening 14 mm (0.55"),
for lower check nut at rocker arm

187 589 00 01

Wrench combination for upper
check nut at rocker arm

187 589 01 09

Valve gauge bracket with
tolerance tape

136 589 00 23

For the sake of clarity the former and present valve packing designs will be described separately.

a) **Former Design** (see Fig. M.26 b/01).

Give the following your particular attention:

- a) See that gap of installed valve cone halves is equal on either side.
- b) Be sure that valve cone halves bear against stem on either side of groove; they must by no means bear against the bottom of the groove.
- c) Check whether inner valve spring bears against the block. In compressed condition the maximum height must not be more than 24 mm (0.95").
- d) It must be possible to push the sealing ring retainer over the valve guide with ease. However, there must be no play between retainer and guide. See that inside of retainer is sufficiently beveled at the point where the sealing ring retainer ring abuts against the retainer.
- e) Exchange exhaust valves with distance $A = 20 \text{ mm (0.79")}$ and install valves having a distance A of 13 mm (0.51").
- f) Make sure that in the case of intake valves the groove for the valve cone halves shows no burrs.

Procedure:

- 1a. Loosen breather line at cylinder head cover as well as air filter. Unscrew cylinder head cover and remove all parts.

Note: In Type 220 the radiator stay must also be dismantled.

- 2a. Loosen rocker arm bracket screws and remove the brackets. When removing the rocker arm brackets, position the camshaft so that no load is placed on the rocker arms.
- 3a. Cover sprocket housing and opening at last camshaft bracket with plates. (This is to avoid that the valve cone halves fall in.) Set pistons 1 and 6 to TDC and carry out operations cf. 4a-9a, then set the next two pistons 2 and 5 to TDC and perform operations cf. 4a-9a, and so on.
- 4a. Take off valve cone halves, spring retainer, inner and outer spring, sealing ring retainer and sealing ring. Use valve lifter 186 589 02 31.

Note: In case the oil wiper rings have already been installed in the place of the sealing ring, the valve stems must be checked. Replace valves whose stem is found to be worn.

- 5a. To install the valve parts, proceed as follows. First push two new oil wiper rings (3) over the valve stem (space joints 180° apart!), until they abut against the valve guide. (Fig. M 26b/01). Proceed with care!
- 6a. Slip a new sealing ring retainer ring (4) over the oil wiper rings.
- 7a. Push sealing ring retainer (5) over valve guide until it abuts against the sealing ring retainer ring (4).
- 8a. Install inner (6) and outer (7) valve spring.
- 9a. Put on valve spring retainer (8) and depress with valve lifter, so that the two valve cone halves (9) can be inserted.
- 10a. Continue installation in reverse order of removal (see also Operation No. M 20, cf. 14-17).

The dimensions of sealing ring retainers, sealing ring retainer rings and oil wiper rings of intake and exhaust valves are specified in Tables 15, 16 and 17 to ensure that these parts will not be interchanged.

Sealing Ring Retainers

Table 15 Dimensions in mm (in.)

	Inner dia.	Height h
Intake valve	$\frac{9.04}{9.13}$ (0.3559) (0.3595)	20 (0.79)
Exhaust valve	$\frac{10.04}{10.13}$ (0.3953) (0.3988)	15 (0.59)

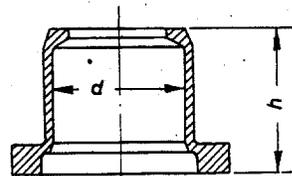


Fig. M 26b/03

Sealing Ring Retaining Rings

Table 16 Dimensions in mm (in.)

	Inner dia. d	Inner dia. d ₁	Outer dia. D	Height h
Intake valve	9.5 (0.375)	$\frac{10.5}{10.7}$ (0.413) (0.421)	$\frac{13.8}{13.6}$ (0.543) (0.535)	5 (0.20)
Exhaust valve	10.5 (0.413)	$\frac{11.5}{11.7}$ (0.453) (0.461)	$\frac{13.8}{13.6}$ (0.543) (0.535)	5 (0.20)

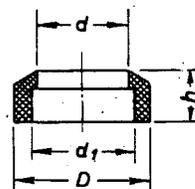


Fig. M 26b/04

Oil Wiper Rings

Table 17 Dimensions in mm (in.)

	Inner dia. d	Outer dia. D	Height h
Intake valve	$\frac{8.670}{8.692}$ (0.34134) (0.34221)	$\frac{10.184}{10.157}$ (0.40095) (0.39988)	2 (0.079)
Exhaust valve	$\frac{9.650}{9.672}$ (0.37992) (0.38079)	$\frac{11.184}{11.157}$ (0.44032) (0.43925)	2 (0.079)

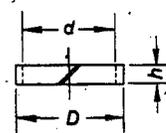


Fig. M 26b/05

Present Design (see Fig. M 26 b/02)

Give the following your particular attention. Points a), b) and c) are same as with formerly used design.

- When installing new exhaust valves, use only valves whose dimension A is 13 mm (0.51"). Exhaust valves with dimension A = 11 mm (0.43") are to be exchanged (see Fig. M 26 b/01).
- Note that bell of valve spring retainer must not cover the valve guide by more than 1.5 to 2 mm (0.06 to 0.08"). See Fig. 26 b/8 b.
- If spring supporting ring is higher than recessed portion of valve guide, provide ring at two opposite points with a notch (Fig. M 26 b/6 b).
- In a light metal cylinder head only spring supporting rings with an outer diameter of 29.5 mm (1.16") must be used. (Outer dia. of spring supporting ring for cast iron cylinder head: 22.4 mm = 0.88").
- When installing the valve, be sure that valve springs and spring retainer with bell are free to move.

Procedure:

Note: If a repair has to be carried out, install the same valve packing as before. Always replace the rubber ring. Check all parts to determine whether they can be reused, and exchange them only if they are found to be unserviceable.

- 1b. The removal operations are the same as described in connection with the formerly used design, cf. 1a-3a.
- 2b. Set the respective piston to TDC.
- 3b. Remove valve cone halves, spring retainer with sealing ring, inner and outer spring and spring supporting ring. Use valve lifter 186 589 02 31.
- 4b. After the valve parts have been taken apart and checked, grease bore of spring retainer bell lightly.
- 5b. Press a new rubber ring (7) into bell of valve spring retainer and move into correct position by means of a suitable punch fitting into the bore.
- 6b. Push spring supporting ring (3) over valve guide.

Note: If spring supporting ring projects beyond recessed part of valve guide, provide the ring at two opposite points with a notch (Fig. M 26b/6b).

The spring supporting rings in light metal cylinder heads have a larger outer diameter (29.5 mm = 1.16"), so that both the inner and outer spring rest on the ring; in the case of cast iron cylinder heads the spring supporting rings have a smaller

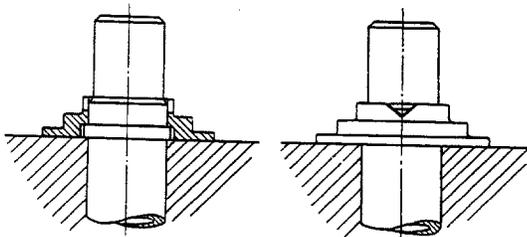


Fig. M 26b/6b

outer 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 spring supporting rings!

- 7b. Install inner and outer valve spring.
- 8b. Put on valve spring retainer with rubber ring inserted and install valve cone halves. When putting on the valve spring retainer, be careful not to damage the rubber ring. If necessary, use a new rubber ring. Make sure that rubber ring is properly seated and does not stick. To facilitate the assembly, provide valve stem with oil. If the rubber ring bears heavily against the valve cone halves, these may be reground, but by no means more than 0.3 to 0.5 mm (0.012 to 0.02").

Note: The bell of the valve spring retainer must not cover the valve guide by more than 1.5 to 2 mm (0.06 to 0.08"), otherwise the bell must be shortened until the prescribed coverage is reached (Fig. M 26/8b).

Before you attempt to install the valve springs, we recommend to put on the valve spring retainer alone and to make a mark on the valve guide. After removing the retainer it is possible to measure the distance from upper end of valve guide to the mark.

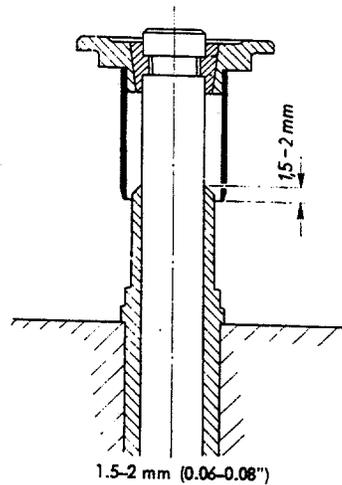


Fig. M 26b/8b

- 9b. Continue assembly of the valve in reverse order of removal (see also Operation No. M 20, cf. 14-17).