

Machining of Valve Seats in Cylinder Head

Job No.

01-8

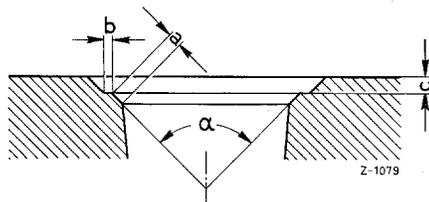


Figure 01-8/1

Valve seat backed off with a backed-off cutting tool or with valve seat cutting tool

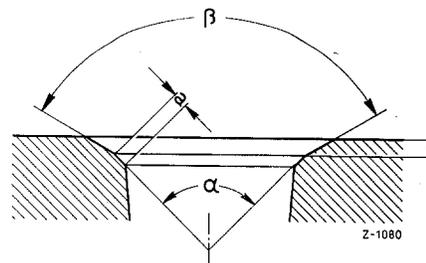


Figure 01-8/2

Valve seat backed off with a milling cutter of 120 deg or with a valve seat turning tool

- a = Width of valve seat (1.25 to 1.75 mm)
- b = Recess at least 0.1 mm under an angle of 0° to 90°
- c = Cutting depth of the recess (see page 01-0/2)
- α = Valve seat angle (90°-30')
- β = Recess (120°)

A gastight seat of the valves is of essential importance for the performance of an engine. The machining of the valve seats should therefore be done with the adequate care.

The machining of the valve seats can be carried out with the following tools:

- a) with a valve seat cutting tool
- b) with a valve seat milling cutter
- c) with a valve seat grinding machine

In order to obtain a tight valve seat, the valve seat must be backed off so much, that the valve seat width "a" becomes 1.25 to 1.75 mm wide. The recess "b" should at least be 0.1 mm or should be carried out under an angle of 120 deg (see Figure 01-8/1 and 01-8/2). Regarding the OM 636: after remachining the valve seats for the intake and exhaust valves, the seat should not be deeper by more than 0.8 mm as compared to the new seat; with the OM 621 this value is 0.4 mm (see table on page 01-0/2). Do not fail to keep to these measures in order to avoid an undue enlargement of the compression space.

Check the valve guides before machining the valve seats, replace if necessary (see Job No. 01-6). The valve guides must be in good condition, if the machining of the valve seats is to be done properly. Furthermore, the valve seats must be checked to determine whether they have already been machined too much, thus demanding milling-off at the contact surface of the cylinder head or inserting new valve seat rings, in the case the OM 621. If the minimum height of the cylinder head (see Job No. 01-0) has been reached, then the cylinder head for the OM 636 has to be replaced, and if the OM 621 is concerned, the valve seat rings have to be replaced. For measuring the distance, it is recommended to use a new valve.

Check the taper and the out-of-true of the valve seat using the following special tools, an out-of-true and taper of up to 0.05 mm being permissible (see Figure 01-8/3).

The special tool consists of:

Denomination of the special tools	OM 636 part No.	OM 621 part No.
Holder for dial gauge	187 589 0421	187 589 0421
Measuring cone for intake and exhaust valve seat	636 589 0221	187 589 0321
Arbor for measuring cone for intake and exhaust valve seat	636 589 0121	187 589 0621

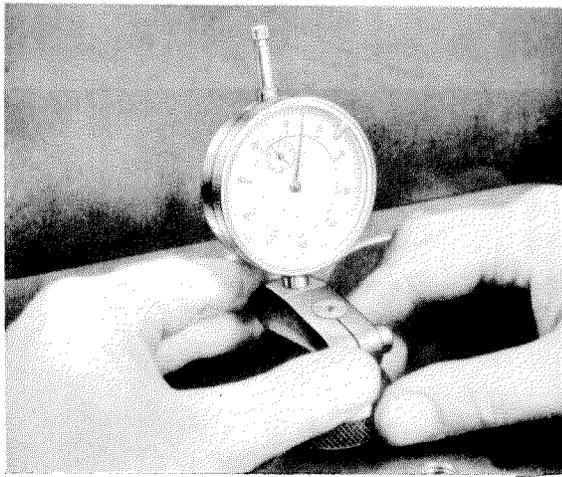


Figure 01-8/3

Check the contact between the valve and the valve seat in the cylinder head with a machined or new valve and blue dye. For this purpose spread blue dye evenly and lightly over the contact surface of the valve disk. Then insert the valve and turn several times clockwise and counter-clockwise approx. 60 deg.

If there are differences between the contact surfaces, adjust the machined valve seat in the cylinder head and/or the contact surface of the valve by grinding it on the valve grinding machine to its respective mate.

After the machining of the valve seats lightly lap in valves with a fine-grained lapping paste. A prolonged lapping, however, makes the valve seat worse.

After machining the valve seats, do not fail to check the valves for leaks by the gasoline test.

The application of the different tools is described below., i.e.:

a) Machining of the valve seat with the Valve Seat Cutting Tool Part No. 000 589 00 69.

The cutting tool is guided, centered and pivoted by the pilot (11) and is held in position by the backrest (5) (see Figure 01-8/4).

By holding the feed control (7) while turning the crank, the carriage (9) with the cutter (12)

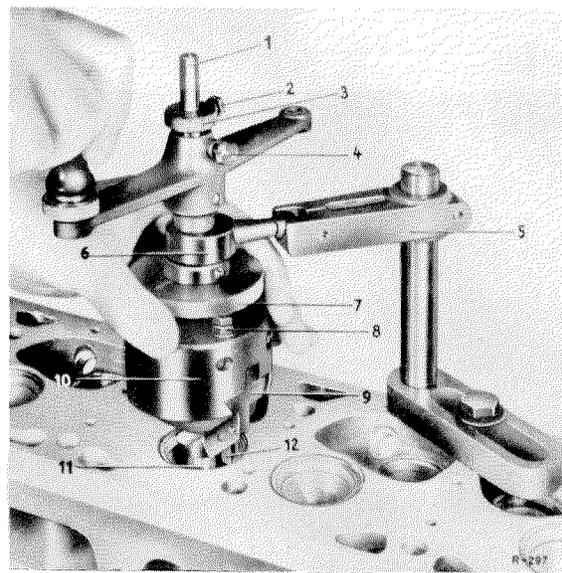


Figure 01-8/4

- | | |
|-------------------------------|-------------------------------|
| 1 Contact mandrel | 7 Feed control |
| 2 Fixing screw | 8 Rapid adjustment |
| 3 Knurled nut for cut control | 9 Carriage |
| 4 Fixing screw | 10 Head with built-in gearing |
| 5 Backrest | 11 Pilot with collet |
| 6 Backrest bearing | 12 Cutter |

describes a spiral path from the inside to the outside (see Figure 01-8/4). By turning the rapid adjustment (8) the carriage is returned to its original position (see Figure 01-8/4). After the cutter has been returned, make sure that the lower nut of the rapid adjustment is tightened again, because otherwise the automatic feed will be disengaged.

The cut control (adjusting the cutting depth) is operated by turning the knurled nut (3) (see Figure 01-8/4).

One scale division = 0.1 mm.

1. Place the pilot with collet (11) in the bore of the valve guide and fix it in position (see Figure 01-8/4).
2. Secure the cutter (12) on the carriage (9) by means of the carriage screw (see Figure 01-8/4).
3. Loosen the lower nut of the rapid adjustment (8), slide the cutting tool over the guide bolt and move the rapid adjustment by turning the upper nut, so that the cutter touches at the middle of the valve seat (see Figure 01-8/4). Do not allow the tool to drop.

4. Now press down the contact mandrel (1) of the pilot (11) and lock it with the screw (2). For this purpose the knurled nut (3) must be screwed down completely and the locking screw (4) must be tightened (see Figure 01-8/4).
5. Mount the backrest so that it will be free of tension. The ball of the backrest bearing (6) should be located in the center of the pivot joint and the distance between the crank and the backrest bearing should be approx. 5 mm (see Figure 01-8/4).
6. By turning the upper nut of the rapid adjustment move the cutter next to the inner edge of the seat and then tighten the lower nut. **Do not advance the cut control yet.** Hold the feed control (7) and turn the crank (see Figure 01-8/4).

During this operation the cut is usually irregular.

After completing the cut loosen the lock nut of the rapid adjustment and return the cutter to its original position.

7. Loosen the locking screw (4) and turn the knurled nut (3) approx. $\frac{1}{2}$ to 2 divisions counter-clockwise (1 division = 0.1 mm). Secure the locking screw (4) and the rapid adjustment and make a new cut (see Figure 01-8/4).
8. Advance the feed as often as necessary to obtain a clean-cut seat, then go through one more cycle without advancing the feed.

Take care when machining the valve seat on the OM 621. The maximum distance must not be exceeded (see Figure 01-5/4 and Job No. 01-0, page 01-0/2).

9. Backing-off of the valve seat can also be done with this cutting tool (also see operating instructions of valve seat cutting tool).

When backing off at 120 deg the caulked points on the valve seat of the light metal cylinder head of OM 636 must never be cut off.

It is therefore recommended that the **backing off is made at an angle of 90 deg** as shown in Figure 01-8/1.

b) Machining of valve seat with valve seat and backing-off cutter.

Special tools:

Designation	OM 636 Part No.	OM 621 Part No.
Inlet valve seat cutter	136 589 00 51	636 589 01 51
Exhaust valve seat cutter	636 589 00 51	636 589 01 51
Cutter arbor	636 589 06 31	187 589 02 31
Handle for cutter arbor	187 589 06 31	187 589 06 31
Exhaust backing-off cutter	636 589 02 51	621 589 01 51
Inlet backing-off cutter	636 589 03 51	621 589 00 51
Valve grinder for lapping-in of valves	000 589 09 67	000 589 09 67

1. If the valve seat is insufficiently backed-off or not at all, the valve seat must be backed off. The relieving "b" should at least be 0.1 mm or should be done at an angle of 120 deg (see Figures 01-8/1 and 01-8/2).
2. After backing-off rough-mill and finish the valve seat. The finishing should only be done by applying a light central pressure to the cutter arbor.

If the valve seat is still out-of-true after the surface of the seat has become bright, correct this deflection by light pressure to the cutter arbor in the respective lateral direction.

Note: In order to save the cutter we recommend putting emery paper over the cutter first to remove the hard surface of the valve seat.

c) Machining of valve seat with an eccentric valve seat grinder (see Figure 01-8/5).

1. Dress the grinding cones on the trimming device to an angle of exactly 90°-30'.

2. Rough-grind the valve seat and then finish-grind.

Note: During the grinding of the valve seats the pressure applied to the valve seat grinder should not be too high, so that not too much is ground off. For this reason frequently check the valve seats to see if the seat is smooth and/or finished.

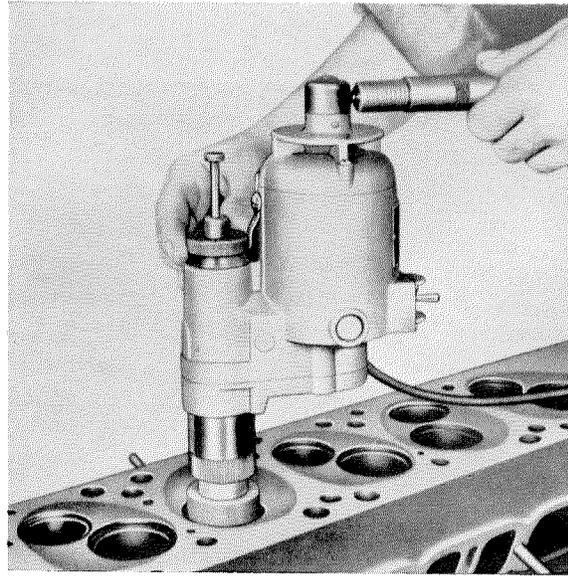


Figure 01-8/5