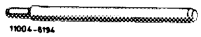
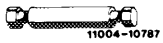
Valve guides

	Stages	Outer dia.	Color coding	Basic bore in cylinder head	Overlap[1])	Valve guide inner dia.
Intake	Standard dim.	14.043–14.050	grey-brown	14.030–14.035	0.008–0.020	9.000–9.015
	Repair stage	14.214–14.222	red	14.198–14.203	0.011–0.024	
Exhaust	Standard dim.	15.043–15.050	grey-brown	15.030–15.035	0.008–0.020	
	Repair stage	15.214–15.222	red	15.198–15.203	0.011–0.024	

[1]) The overlap must be between 0.007 and 0.025 mm.

Special tools

Plug gauge 9 mm dia. for intake and exhaust valve guide		11004-6211	117 589 03 23 00
Knocking-out mandrel 9 mm dia. intake and exhaust		 11004-6194	110 589 02 15 00
Plug gauge for valve guide basic bore		 11004-10787	117 589 05 23 00
Reamer 14.035 mm dia. intake		 11004-10587	110 589 03 53 00
Reamer 15.035 mm dia. exhaust		 11004-10587	110 589 02 53 00
Broach 14.2 mm dia. intake		 11004-6196	115 589 00 53 00
Broach 15.2 mm dia. exhaust		 11004-6196	110 589 00 53 00
Guide sleeve for broach intake 14.2 mm dia.	Engines 116.960/961 and 117	 11004-10589	102 589 01 63 00
	Engines 116.962/963	 11004-10588	102 589 00 63 00
Guide sleeve for broach exhaust 15.2 mm dia.		 11004-10590	117 589 00 63 00
Installing mandrel 9 mm dia. intake and exhaust (1st version)		 11004-6195	110 589 00 15 00
Installing mandrel 9 mm dia. intake and exhaust (2nd version)		 11004-11733	110 589 06 15 00
Reamer 8.99 mm dia. H 7 intake and exhaust		 11004-6197	000 589 10 53 00

Association engines – guide sleeves – broaches

Engine	Valve	Valve guide basic bore mm	Guide sleeve Part No.	Page	Broach Part No.
116.962/963	Intake	14.2	102 589 00 63 00	B	115 589 00 53 00
116.960/961, 117			102 589 01 63 00	A	
117.96	Exhaust	15.2	117 589 00 63 00	A	110 589 00 53 00
116				B	

Note

In the event of repairs, cylinder heads with standard normal dimension valve guides must be fitted with standard dimension valve guides (grey-brown). First, ream basic bores with reamers 14.035 mm dia. (intake) and 15.035 mm dia. (exhaust) to avoid too great an overlap.

Basic bores in which the use of standard dimension valve guides do not provide an adequately tight seat (minimum interference 0.007 mm) must be machined with broaches for repair stage valve guide installation.

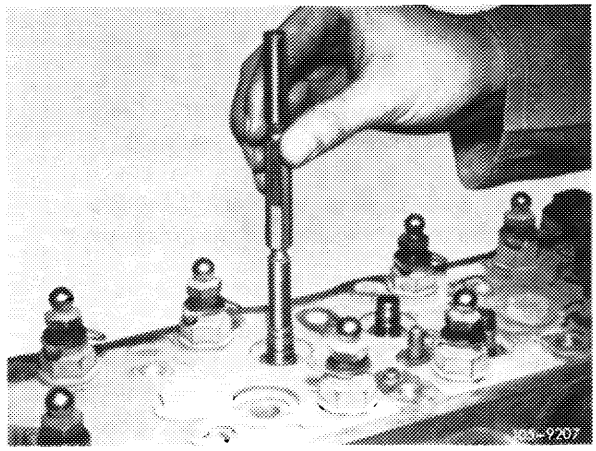
The broaches must be driven through the basic bores with a plastic hammer and the aid of guide sleeves.

Checking valve guides

With cylinder head removed, check valve guides by means of plug gauge in longitudinal and transverse direction.

Valve guides which accept the no-go end with the wear limit (+ 220) in its entire height (5 mm) must be renewed.

Valve guides which are worn outside on the valve stem seal seat so that the valve stem seal is no longer seated tightly, should also be replaced.



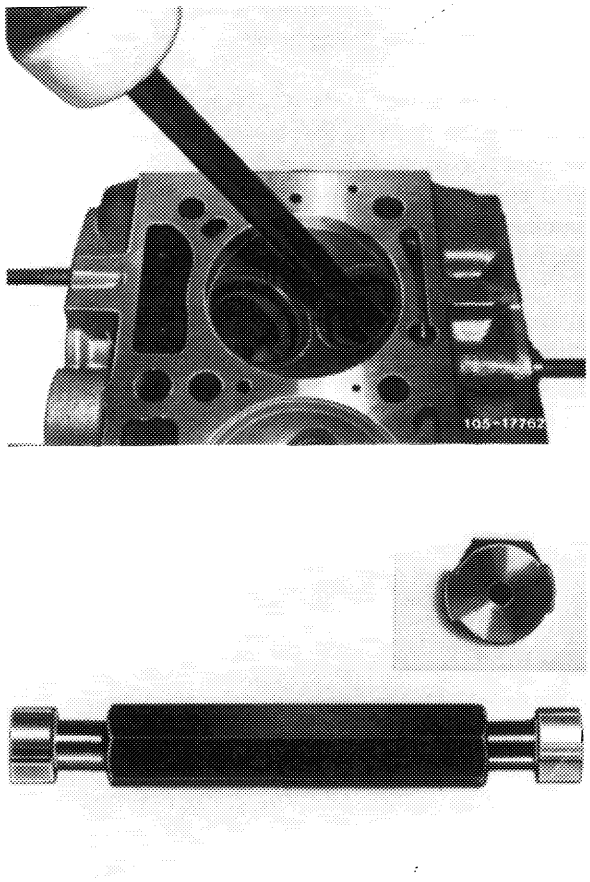
Replacing valve guides

1 Knock out valve guide from combustion chamber end by means of knocking mandrel.

2 Check valve guide basic bore with plug gauge in longitudinal and transverse direction.

Basic bores into which the measuring plug can be inserted at one point for its entire height (8 mm), must be finished to repair stage dimensions.

If the measuring plug cannot be inserted fully or only in part, the basic bore for the valve guide can be reamed to normal dimension for the valve guides.



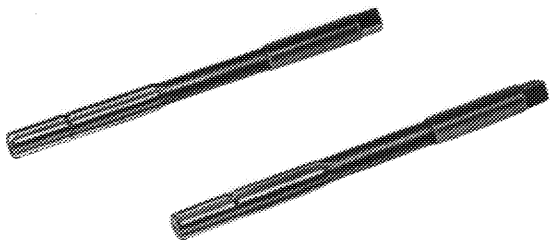
105-22767

Machining basic bore

Standard dimension

3 Ream basic bore with reamer 14.035 mm dia. or 15.035 mm dia. while lubricating with kerosene. Ream with low pressure and do not cant the reamer.

Note: Handle reamers carefully and put back into protective sleeve so that the cutting edges are not damaged.



105-21802

Machining basic bore

Repair stage

4 Remove all soot from cylinder head and clean, in particular the inside of the valve seat rings.

5 Remove metal chips (use stiff plastic brush or similar) from the cutting edges of the broach prior to use.

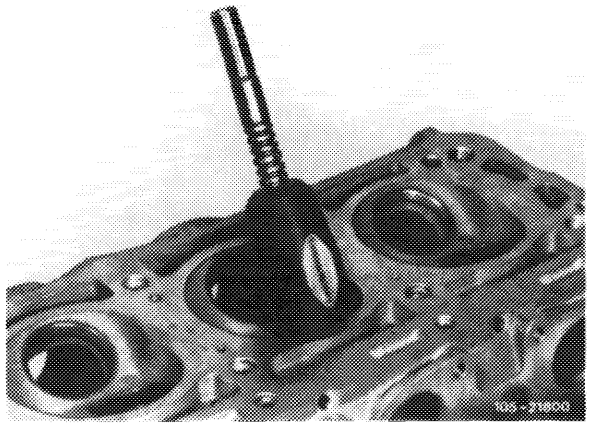
6 Select correct guide sleeve (refer to table). Make sure that the guide sleeve is centered only by the inner diameter of the valve seat ring concerned and is not impaired with carbon residue, casting projections, intake and exhaust port walls etc.

7 Liberally lubricate guide sleeve, basic bore and the entire broach with engine oil.

8 Introduce broach in the direction of broaching into the guide sleeve so that during the subsequent introduction of the guide sleeve into the cylinder head the broach will enter into the bore up to the first cutting edge. Center the sleeve in the valve seat ring by means of rotary movements.

9 Drive broach through the bore by means of an aluminum mandrel approx. 130 mm long and a plastic hammer of approx. 250 g.

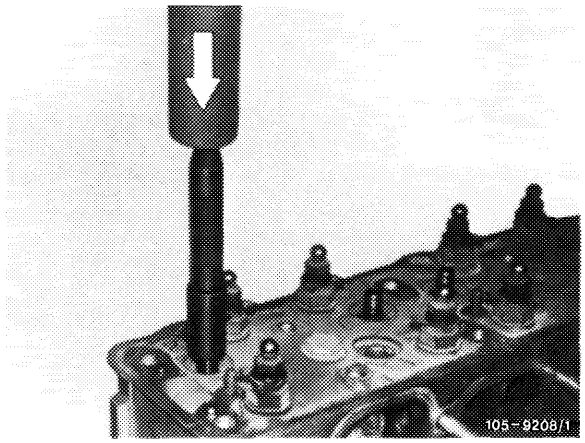
105-21801



Inserting valve guide

10 Cool valve guide in liquid nitrogen (approx. 3 minutes) and insert.

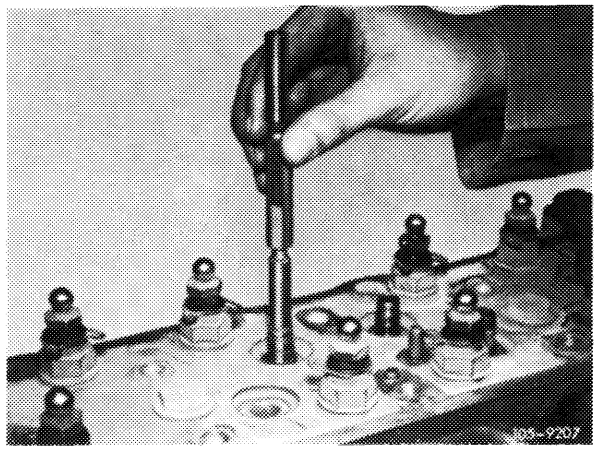
If no liquid nitrogen is available, heat cylinder head in a water bath to approx. 80 °C. Drive valve guide into the cylinder head by means of the installing mandrel until the locking ring contacts the cylinder head.



11 Check valve guide for tight seat with the cylinder head in a cooled-down condition.

12 Check inner dia. of valve guide with plug gauge.

The entire go end should be introduced into the bore.



13 If required, ream inner dia. with reamer.

14 Check valve seats for runout and refinish if required.