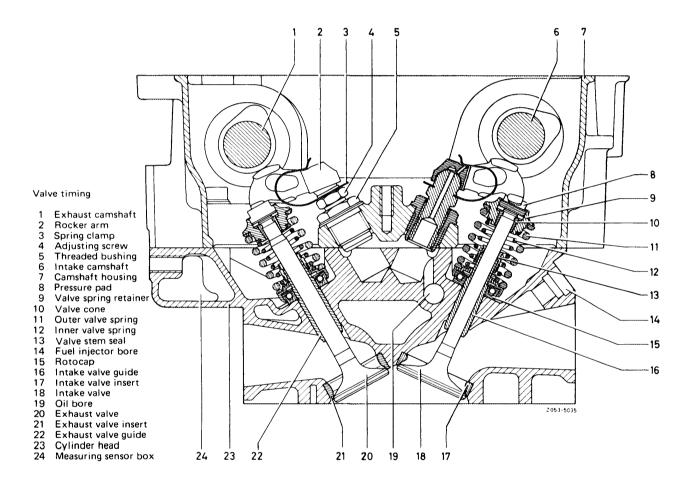
| Exhaust 0.25 0.30 Tightening torques Nm Cylinder head bolts M 12 x 1.5 100 M 8 bolts for camshaft housing 25 Mounting bolts for camshaft sprockets 80 Ball locating ring in chain tensioner 25 Cylinder head cover bolts and capped nuts 5 Special tools Rail to hold down valve springs 110 589 06 62 00 Magnetic lifter for valve collets 116 589 06 63 00 Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) 116 589 00 33 00 M 6 x 50 bolt for impact extractor 116 589 01 04 00 Valve adjusting wrench 17 mm, 1/2" square 110 589 00 100 Wrench socket 27 mm, 1/2" square 101 589 65 09 00 | Valve clearance | Cold engine (ca. 20 °C) | Warm engine (60 $^{\circ}$ C ± 15 $^{\circ}$ C) |
|---|--|-------------------------|---|
| Tightening torques Nm Cylinder head bolts M 12 x 1.5 100 M 8 bolts for camshaft housing 25 Mounting bolts for camshaft sprockets 80 Ball locating ring in chain tensioner 25 Cylinder head cover bolts and capped nuts 5 Special tools Rail to hold down valve springs 110 589 06 62 00 Magnetic lifter for valve collets 110 589 04 61 00 Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) M 6 x 50 bolt for impact extractor Valve adjusting wrench 17 mm, 1/2" square Nerench socket 27 mm, 1/2" square Nm Nm Nm Nm Nm Nm Nm Nm Nm N | Intake | 0.10 ¹) | 0.151) |
| Tightening torques Cylinder head bolts M 12 x 1.5 M 8 bolts for camshaft housing 25 Mounting bolts for camshaft sprockets 80 Ball locating ring in chain tensioner 25 Cylinder head cover bolts and capped nuts 5 Special tools Rail to hold down valve springs 110 589 06 62 00 Magnetic lifter for valve collets 116 589 06 63 00 Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) M 6 x 50 bolt for impact extractor Valve adjusting wrench 17 mm, 1/2" square Nench socket 27 mm, 1/2" square | Exhaust | 0.25 | 0.30 |
| Cylinder head bolts M 12 x 1.5 M8 bolts for camshaft housing 25 Mounting bolts for camshaft sprockets 80 Ball locating ring in chain tensioner 25 Cylinder head cover bolts and capped nuts 5 Special tools Rail to hold down valve springs 110 589 06 62 00 Magnetic lifter for valve collets 116 589 06 63 00 Depressor for valve spring 110 589 04 61 00 Chain tensioner holder Impact extractor for bearing pin (basic unit) M6 x 50 bolt for impact extractor Valve adjusting wrench 17 mm, 1/2" square Wrench socket 27 mm, 1/2" square | 1) 0.05 mm more for consistent outside temp | peratures below -20 °C. | |
| M8 bolts for camshaft housing 25 Mounting bolts for camshaft sprockets 80 Ball locating ring in chain tensioner 25 Cylinder head cover bolts and capped nuts 5 Special tools Rail to hold down valve springs 110 589 06 62 00 Magnetic lifter for valve collets 116 589 06 63 00 Depressor for valve spring 110 589 04 61 00 Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) 116 589 20 33 00 M6 x 50 bolt for impact extractor 116 589 01 34 00 Valve adjusting wrench 17 mm, 1/2" square Wrench socket 27 mm, 1/2" square 001 589 65 09 00 Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | Tightening torques | | Nm |
| Mounting bolts for camshaft sprockets Ball locating ring in chain tensioner Cylinder head cover bolts and capped nuts 5 Special tools Rail to hold down valve springs 110 589 06 62 00 Magnetic lifter for valve collets 116 589 06 63 00 Depressor for valve spring 110 589 04 61 00 Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) 116 589 20 33 00 M 6 x 50 bolt for impact extractor Valve adjusting wrench 17 mm, 1/2" square Nrench socket 27 mm, 1/2" square Out 589 65 09 00 Nrench socket 27 mm, 1/2" square Out 589 65 09 00 | Cylinder head bolts M 12 x 1.5 | | 100 |
| Ball locating ring in chain tensioner Cylinder head cover bolts and capped nuts 5 Special tools Rail to hold down valve springs 110 589 06 62 00 Magnetic lifter for valve collets 116 589 06 63 00 Depressor for valve spring 110 589 04 61 00 Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) 116 589 20 33 00 M6 x 50 bolt for impact extractor Valve adjusting wrench 17 mm, 1/2" square Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | M 8 bolts for camshaft housing | | 25 |
| Special tools 110 589 06 62 00 110 589 06 62 00 110 589 06 63 00 110 589 06 63 00 110 589 04 61 00 110 589 04 61 00 110 589 02 31 00 110 589 00 33 00 110 589 01 34 00 110 589 01 34 00 110 589 00 01 00 110 589 00 01 00 110 589 00 01 00 110 589 00 01 00 110 589 00 01 00 110 589 00 01 00 110 589 00 01 00 110 589 00 01 589 65 09 00 110 | Mounting bolts for camshaft sprockets | | 80 |
| Rail to hold down valve springs 110 589 06 62 00 Magnetic lifter for valve collets 116 589 06 63 00 Depressor for valve spring 110 589 04 61 00 Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) 116 589 01 34 00 Valve adjusting wrench 17 mm, 1/2" square Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | Ball locating ring in chain tensioner | | 25 |
| Rail to hold down valve springs 110 589 06 62 00 Magnetic lifter for valve collets 116 589 06 63 00 Depressor for valve spring 110 589 04 61 00 Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) 116 589 20 33 00 M 6 x 50 bolt for impact extractor Valve adjusting wrench 17 mm, 1/2" square 110 589 00 01 00 Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | Cylinder head cover bolts and capped n | uts | 5 |
| Magnetic lifter for valve collets 116 589 06 63 00 Depressor for valve spring 110 589 04 61 00 Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) 116 589 20 33 00 M 6 x 50 bolt for impact extractor Valve adjusting wrench 17 mm, 1/2" square 110 589 00 01 00 Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | Special tools | | |
| Depressor for valve spring 110 589 04 61 00 Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) 116 589 20 33 00 M 6 x 50 bolt for impact extractor 116 589 01 34 00 Valve adjusting wrench 17 mm, 1/2" square 110 589 00 01 00 Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | Rail to hold down valve springs | 11004 - 7002 | 110 589 06 62 00 |
| Chain tensioner holder 110 589 02 31 00 Impact extractor for bearing pin (basic unit) 116 589 20 33 00 M 6 x 50 bolt for impact extractor 116 589 01 34 00 Valve adjusting wrench 17 mm, 1/2" square 110 589 00 01 00 Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | Magnetic lifter for valve collets | 11004-6702 | 116 589 06 63 00 |
| Impact extractor for bearing pin (basic unit) M 6 x 50 bolt for impact extractor Valve adjusting wrench 17 mm, 1/2" square 110 589 00 01 00 Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | Depressor for valve spring | | 110 589 04 61 00 |
| M 6 x 50 bolt for impact extractor 116 589 01 34 00 Valve adjusting wrench 17 mm, 1/2" square 110 589 00 01 00 Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | Chain tensioner holder | 1004-7005 | 110 589 02 31 00 |
| Valve adjusting wrench 17 mm, 1/2" square 110 589 00 01 00 Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | Impact extractor for bearing pin (basic | | 116 589 20 33 00 |
| Wrench socket 27 mm, 1/2" square 001 589 65 09 00 | M 6 x 50 bolt for impact extractor | _ | 116 589 01 34 00 |
| 1 1 1 2 3 6 9 6 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 | Valve adjusting wrench 17 mm, 1/2" sq | uare | 110 589 00 01 00 |
| | Wrench socket 27 mm, 1/2" square to turn engine | 11004-4113 | 001 589 65 09 00 |

Conventional tool

Cylinder leak tester

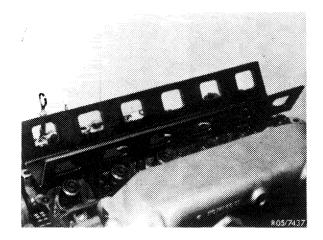
e.g. made by Bosch EFAW 210 A e.g. made by SUN CLT 228



Removal

- 1 Remove camshaft housing (01-470).
- 2 Remove pressure pads (8).
- 3 Unscrew spark plug of respective cylinder and set piston to ignition TDC to prevent valves from dropping in.

- 4 Bolt hold-down rail to cylinder head.
- 5 Support valves with pneumatic air (cylinder leak tester).

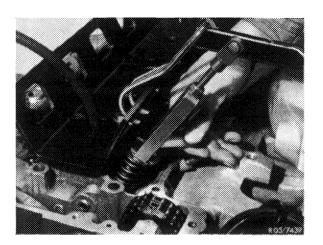


- 6 Loosen valve collets by applying light knocks from a hammer to valve spring retainers.
- 7 Press down valve spring retainer with removal and installation tool and remove valve collets with magnetic lifter.

Attention!

Valves must not rest on piston skirt, since this could bend the valves.

8 Remove valve spring retainer, outer and inner valve springs.



Installation

- 9 Check valve springs and replace if necessary (05-260).
- 10 Replace valve stem seals (05-270).
- 11 Further installation in reverse sequence of removal.

Attention!

Install valve springs that tighter coil ends rest on rotocap.

Valves and rocker arms

- Spring clamp
- Rocker arm
- 3 Adjusting screw
- 4 Threaded but 5 Pressure pad Threaded bushing with adjusting screw
- Valve cone
- Valve spring retainer
- 8 Outer valve spring
- 9 Inner valve spring

- 10 Rotocap
- 11 Exhaust valve stem seal
- 12 Intake valve stem seal
- 13 Circlip 14 Exhaust valve guide
- 15 Intake valve guide 16 Exhaust valve insert
- 17 Intake valve insert
- 18 Exhaust valve 19 Intake valve

