Diesel
Customer Information
Kunden Information

Checking and adjusting the valve yoke and valve clearance Engines 32/40

Cus 193 • 01/03

Due to the importance of and the enquiries received in connection with adjusting and checking the valve yoke and valve clearance, we are sending you this Diesel Customer Information in order to draw your attention to the following:

Checking the valve yoke as well as the clearance of valve yoke and valve has to be carried out as a matter of routine, according to the work cards and maintenance schedule. During the valve-clearance checks and adjustments the valve yoke clearances are also to be checked and/or adjusted.

The yoke must evenly be supported by the exhaust valve and inlet valve, i.e. the thrust pads have to rest on the valve cones without any clearance. If necessary, a readjustment has to be carried out.

Readjustment of the above-mentioned clearances is necessary whenever new parts are installed or the cylinder head and the rocker arm casing are refitted after maintenance work has been carried out. In this connection, it has to be ensured that the setting nuts are tightened according to the instructions.

We recommend mounting the cylinder head and rocker arm casing individually, one after the other.

A correct adjustment is imperative to ensure undisturbed valve performance. An incorrect adjustment may result in valve damage (e.g., due to the fact that the valves are positioned obliquely).

Work cards 111.02 and 111.03 are to be observed in this connection.

MST7/MEDM

Please forward this Diesel Customer Information to the technical personal of your plants!

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Valve clearance
Checking and adjusting 111.02

Purpose of jobs to be done

Carry out work in time according to the maintenance schedule,
permit/support economic operation,
prevent operating problems/damage.

Brief description

The valve clearance is to be determined and, if necessary, corrected at regular intervals.

The work includes:
checking/adjusting the valve clearance.

Safety requirements

- Engine secured against starting

Personnel and time required

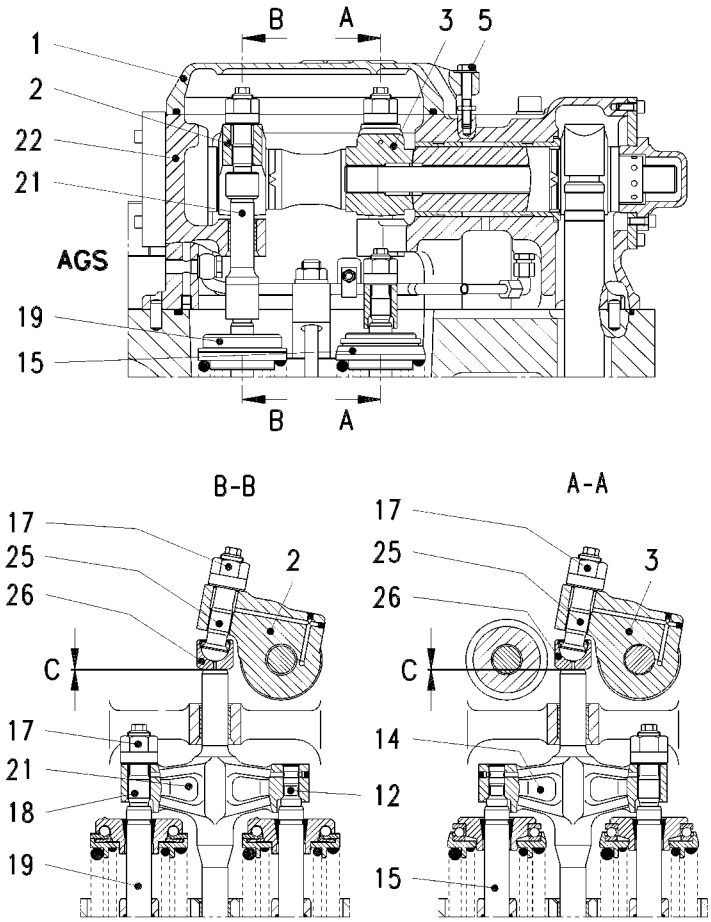
Numb	*Qualification*	*Time req.*
1	Technical assistant	0.5
1	Assistant	0.5

Tools/appliances required

Qty	*Designation*	*No.*	*Availability*
3	Setting gauge (inlet valve) 0.5	113.156	Standard
3	Setting gauge (exhaust valve) 0.7	113.154	Standard
1	Setting tool	111.126	Standard
1	Plate-type spanner, 32 mm	009.088	Standard
1	Ratchet	008.023	Standard
1	Torque wrench	008.011	Standard
1	Thickness gauges 0.05-1	000.454	Standard
1	Guide tube	021.032	Standard
1	Thickness gauges 0.05-1	000.451	Standard
1	Open-jaw and ring wrenches (set)	-	Standard
1	Lubricant (containing molybdenum disulphide)	-	Inventory

Related work cards

Work card	*Work card*	*Work card*
000.30	111.03	



1 Cylinder head cover
2 Lever (inlet valves)
3 Lever (exhaust valves)
5 Hexagon bolt
12 Thrust pad
14 Valve yoke exhaust valves)
15 Exhaust valve
17 Nut
18 Setting screw
19 Inlet valve
21 Valve yoke inlet valves)
22 Rocker arm casing
25 Valve adjuster
26 Calotte

C Valve clearance
AGS Exhaust gas counter side

Figure 1. Rocker arm casing with rocker arm, measuring the valve clearance (inlet valve on the left, exhaust valve on the right)

Preliminary remarks

Checking and, if necessary, adjusting the clearance of valve yoke and valve is to be carried out whenever new parts are installed or cylinder head and rocker arm casing are remounted after carrying out maintenance work. In this connection, it is to be ensured that the setting nuts are tightened to the specified torque (see work card 000.30).

In order to rule out mounting or adjusting errors, it is recommended not to remove the cylinder head together with the rocker arm casing.

Operating sequence 1 – Check the valve clearance

Starting condition

The engine is in the cold condition or at operating temperature (however, 30 minutes after engine shut-down at the earliest), i.e. the valves approx. have the same temperature as the cylinder head. The piston/connecting

rod assembly of the respective cylinder is in the ignition TDC position (all valves closed). The cylinder head cover has been removed.

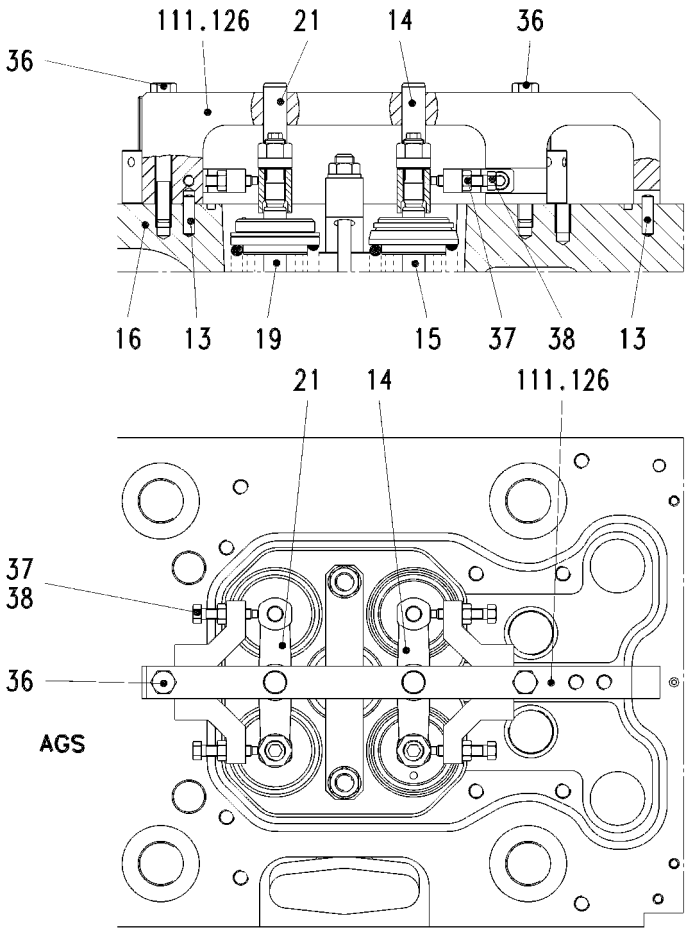
Checking the clearance between yoke and valve shaft

1. Use the feeler gauge (000.454) and the guide tube (021.032) to verify that the thrust pad (12) and the setting screw (18) rest on the exhaust and inlet valve (15 and 19) respectively without clearance; readjust if necessary (cf. operating sequence 2).

▲ ***Attention! The permissible clearance on one side of the yoke is max. 0.1 mm. In this connection it must be ensured, that there is no clearance on the other side of the yoke.***

Checking the valve clearance

2. Measure the valve clearance (C) for the exhaust and inlet valves (15 and 19) between the respective valve yoke (14 and/or 21) and the calotte (26), using the setting gauge (113.154 for the exhaust valve and 113.156 for the inlet valve resp.). For the specified values, refer to the operating instruction manual, Section 2.5.6.
3. If necessary, readjust the valve clearance (cf. operating sequence 2).
4. Put the cylinder head cover (1) onto the rocker arm casing (22) and mount in place.



13 Parallel pin
14 Valve yoke (exhaust valves)
15 Exhaust valve
16 Cylinder head
19 Inlet valve
21 Valve yoke (inlet valves)
36 Hexagon bolt M16x140
37 Hexagon nut M12
38 Hexagon bolt M 12x60

AGS Exhaust counter side

Figure 2. Fixing the valve yokes to loosen/tighten the nuts on the setting screws

Operating sequence 2 – Adjust the valve clearance

Starting condition

The engine is in the cold condition or at operating temperature (however, 30 minutes after engine shut-down at the earliest), i.e. the valves approx. have the same temperature as the cylinder head. The piston/connecting rod assembly of the respective cylinder is in the ignition TDC position (all

valves closed). Valve clearance has been checked (valve clearance too large or too small).

Adjustment of the clearance between yoke and valve stem

1. Using the thickness gauge (000.451) verify that the thrust pad (12) and the setting screw (18) properly contact the exhaust or inlet valve (15 or 19) respectively (clearance = zero).

▲ ***Attention! Should this not be the case, first carry out steps 2 to 13. Otherwise, continue with step 14.***

2. Remove the rocker arm casing with rocker arms (cf. work card 111.03).
3. Attach the setting tool (111.126) to the cylinder head (16) taking care of the centering bores and/or centering groove for parallel pins (13) and valve yokes (14 and 21) - refer to Figure 2.
4. Turn the hexagon bolts (38) until they contact the valve yokes. Secure the hexagon bolts by means of the hexagon nuts (37).
5. Loosen the nuts (17) on the setting screws (18) and screw them off, clean the threads and contact faces.
6. Screw back the setting screws (18).
7. Clean the contact faces on the valve cones, thrust pads and setting screws.
8. Place the thrust pad (12) on the valve cone, ensuring clearance-free contact. Screw the setting screw down until it also properly contacts the valve cone. There must not be any clearance.
9. Apply MoS_2 lubricant to the thread and contact face of nut (17), screw it in place and tighten it to the specified torque (cf. work card 000.30) holding the setting screws steady.
10. Verify once again that there is clearance-free contact between thrust pad and setting screw (there must not be any clearance).
11. Establish clearance-free contact of the second valve yoke in the same way (refer to items 8 to 10).
12. Loosen the hexagon nuts (37), turn the hexagon bolts (38) back and remove the setting tool.
13. Mount the rocker arm casing with rocker arms in place (cf. work card 111.03).

Adjustment of the valve clearance

14. Loosen the nuts (17) on the valve setting screws (25) and screw them off. Clean the threads and contact faces.
15. Screw back the valve setting screws.
16. Slip the setting gauge (113.156) inbetween the valve yoke and calotte (26) of the inlet valves.
17. Screw in the valve setting screw until there is clearance-free contact with the setting gauge.
18. Apply MoS_2 lubricant to the thread and contact face of the nut (17). Screw it in place and tighten it to the specified torque (refer to work card 000.30), holding the valve setting screw steady.
19. Remove the setting gauge.
20. Using setting gauge (113.154), adjust the valve clearance on the exhaust valves in the same way (refer to items 16 to 19).

Rocker arm casing with rocker arms
Removing and refitting 111.03

Purpose of jobs to be done

Impart required knowledge,
ensure correct execution of work.

Brief description

Rocker arm casings are to be disassembled within the scope of maintenance and repair work.

The work/steps include:
dismounting components,
mounting components.

Safety requirements

- Engine shut-down
- Engine secured against starting

Personnel and time required

Numb	*Qualification*	*Time requ*
1	Technical assistant	1
1	Assistant	1

Tools/appliances required

Qty	*Denomination*	*No.*	*Availability*
1	Setting tool	111.126	Standard
4	Guide rod	111.125	Standard
1	Suspension device	111.124	Standard
1	Suspension plate	111.124-1	Standard
1	Spring pin	111.124-3	Standard
1	Plate-type spanner 32	009.088	Standard
1	Ratchet	008.023	Standard
1	Torque wrench	008.011	Standard
1	Shackle A1.0	002.453	Standard
1	Extension piece 12.5x125	001.911	Standard
1	Screw driver insert 14x12.5	001.858	Standard
1	Thickness gauges 0.05-1	000.454	Standard
1	Guide tube	021.032	Standard
1	Thickness gauges 0.05-1	000.451	Standard

Qty	Denomination	No.	Availability
1	Open–jaw and ring wrench (set)	–	Standard
1	Lifting tackle with rope	–	Inventory
1	Lubricant (containing molybdenum disulphide)	–	Inventory
1	Grease (acid–free)	–	Inventory

Related work cards

Work card	Work card	Work card
000.30	111.02	

Technical details

Term	Information
Rocker arm casing with rocker arms	140 kg

Operating sequence 1 - Dismantle the rocker arm casing

Starting condition

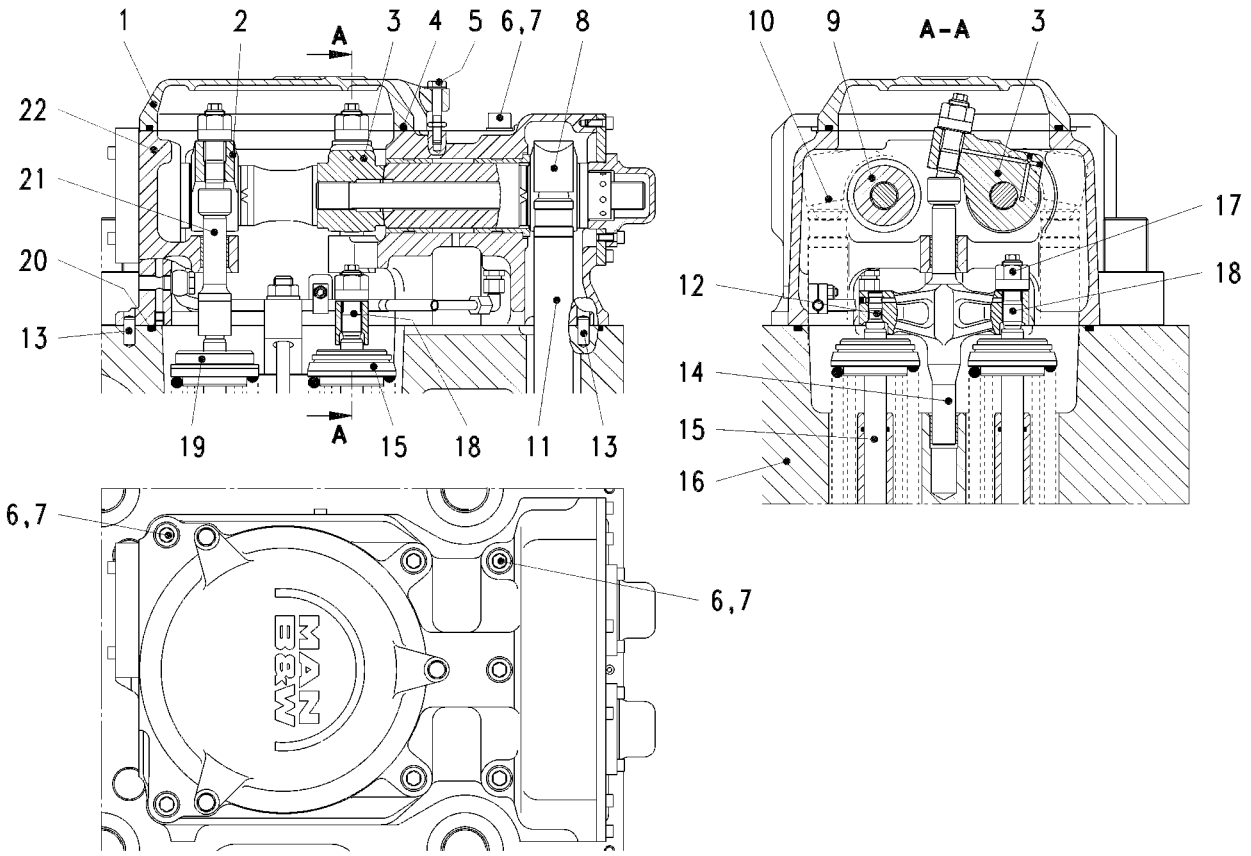
Running gear of the respective cylinder at ignition TDC (all valves closed).

Steps

1. Screw out the hexagon bolt (5) and take off the cylinder head cover (1). Refer to Figure 1.
2. Disconnect the lube oil supply pipe to the rocker arm casing (22) and close it to prevent dirt from entering.
3. Put the suspension plate (111.124-1) onto the rocker arm casing, and fit the spring pin (39) in the bore hole. Fasten the suspension plate (refer to Figure 2).
4. Attach rope (23) to suspension plate by means of shackle (002.453) and suspend from lifting tackle.

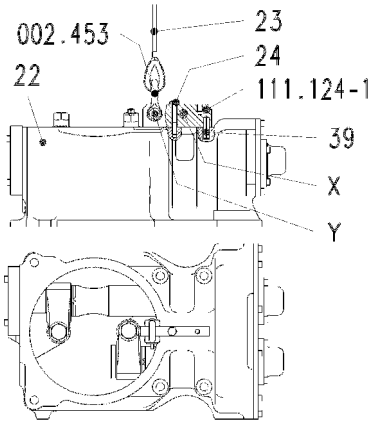
△ △ *Important! Make sure to use the correct suspension point (refer to Figure 2).*

5. Screw the hexagon socket bolts (6) out and take them off together with washers (7).
6. Screw the guide rods (111.125) into the cylinder head, down to contact (refer to Figure 4).
7. Carefully lift the rocker arm casing, taking due note of the valve yokes (14 and 21) and push-rods (11).
8. Completely lift off the rocker arm casing and put it down onto wooden pad.
9. Remove the valve yokes.



1 *Cylinder head cover*
2 *Rocker arm (inlet valves)*
3 *Rocker arm (exhaust valves)*
4 *O-ring seal*
4 *Hexagon bolt*
6 *Hexagon socket bolt*
7 *Washer*
8 *Rocker arm (exhaust valves)*
9 *Rocker arm shaft (inlet valves)*
10 *Rocker arm (inlet valves)*
11 *Push-rod*
12 *Thrust pad*
13 *Parallel pin*
14 *Valve yoke (exhaust valves)*
15 *Exhaust valve*
16 *Cylinder head*
17 *Nut*
18 *Setting screw*
19 *Inlet valve*
20 *O-ring seal*
21 *Valve yoke (inlet valves)*
22 *Rocker arm casing*

Figure 1. Rocker arm casing with rocker arms



22 Rocker arm casing
23 Rope
24 Hexagon bolt M10x65
39 Spring pin

X Suspension point for V-type engine
Y Suspension point for L-type engine

Figure 2. Attaching the rocker arm casing

Operating sequence 2 - Mount the rocker arm casing

Starting condition

Contact faces on the rocker arm casing, valve yokes, cylinder head cover, valve cones and cylinder head cleaned.

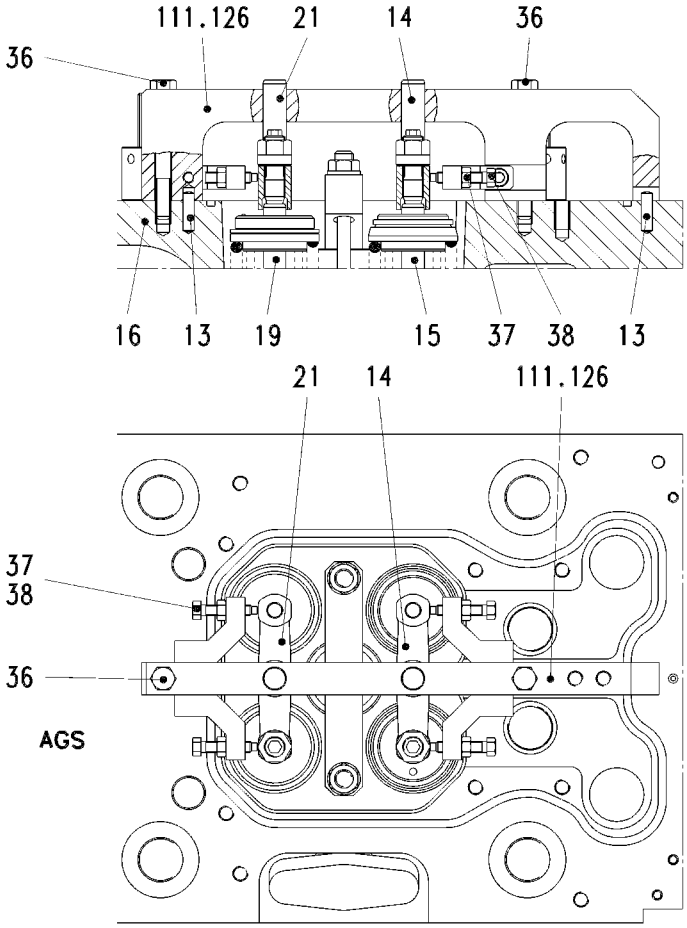
Steps

1. Apply clean lube oil to a new O-ring seal (20) and place the ring in the ring groove, taking care not to twist it.
2. Clean the guide sleeves in the cylinder head (16) for the valve yokes.
3. Apply oil to the sliding faces of the valve yokes (14 and 21) and insert the yokes in the cylinder head (setting screws with nut pointing towards the coupling end).

Checking the clearance between yoke and valve shaft

4. Use thickness gauge (000.451) and guide tube (021.032) to verify that the thrust pads (12) and setting screws (18) snugly contact the exhaust valve and/or inlet valve (15 and/or 19) – clearance = zero.

▲ ***Attention! If this is not the case, start with points 5 to 13. Otherwise, continue with point 14.***



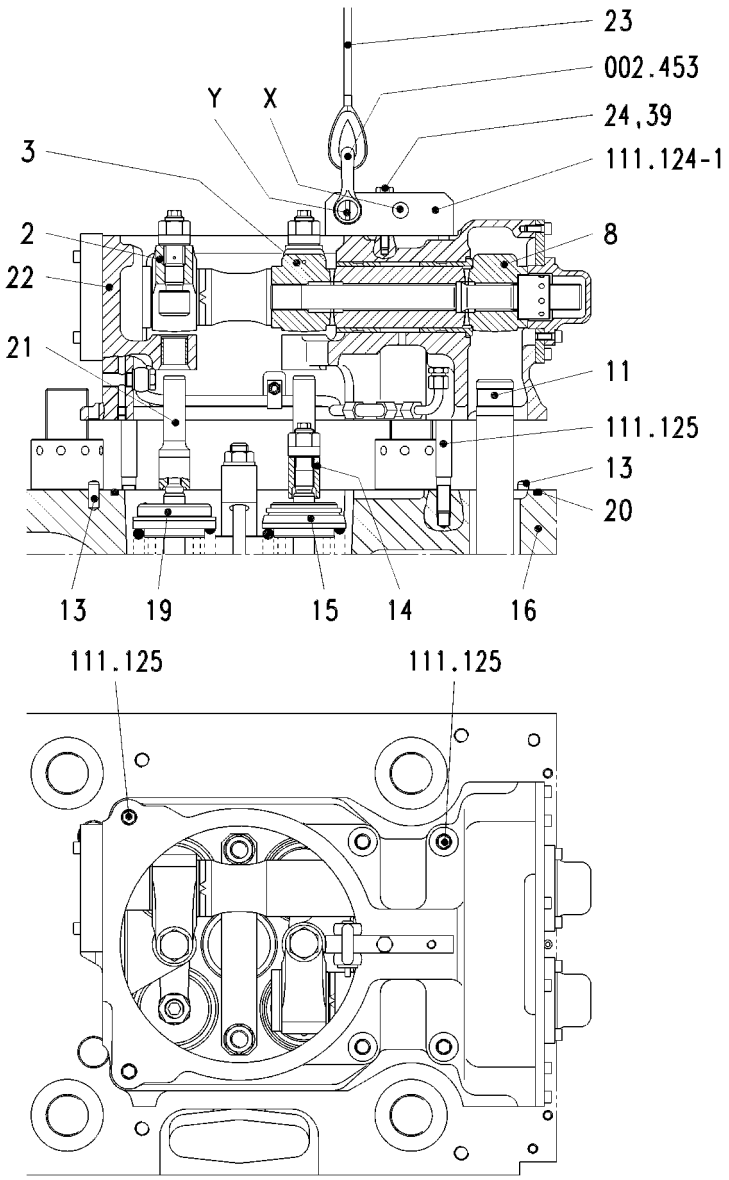
13 Parallel pin
14 Valve yoke (exhaust valves)
15 Exhaust valve
16 Cylinder head
19 Inlet valve
21 Valve yoke (inlet valves)
36 Hexagon bolt M16x140
37 Hexagon nut M12
38 Hexagon bolt M12x60

AGS Exhaust gas counter side

Figure 3. Fixing the valve yokes to loosen or tighten the nuts on the setting screws

Adjusting the clearance between yoke and valve shaft

5. Attach the setting device (111.126) to the cylinder head (16), taking due note of the centring bores and/or centring groove for parallel pins (13) and valve yokes (refer to Figure 3).
6. Turn the hexagon bolts (38) until they contact the valve yokes. Secure the hexagon bolts by means of the hexagon nuts (37).
7. Loosen the nuts (17) on the setting screws (18) and screw them off, clean the threads and contact faces.
8. Turn the setting screws (18) back.



2 Rocker arm (inlet valves)
3 Rocker arm (exhaust valves)
11 Push-rod
13 Parallel pin
14 Valve yoke (exhaust valves)
15 Exhaust valve
16 Cylinder head
19 Inlet valve
20 O-ring seal
21 Valve yoke (inlet valves)
22 Rocker arm casing
23 Rope
24 Hexagon bolt M10x65
39 Spring pin

X Suspension point for V-type engine
Y Suspension point for L-type engine

Figure 4. Mounting the rocker arm casing

9. Snugly place the thrust pad (12) onto the valve cone. Screw in the setting screw until it also snugly contacts the valve cone.
10. Apply MoS_2 lubricant to the thread and contact face of nut (17), screw the nut home and tighten to the specified torque (refer to work card 000.30), holding fast at the setting screw.
11. Verify again that the thrust pad and setting screw have snug contact.
12. Adjust snug contact of the second valve yoke in the same way (refer to points 9 to 11).
13. Loosen the hexagon nut (37), turn the hexagon bolts (38) back and remove the setting device.
14. Put the suspension plate (111.124-1) onto the rocker arm casing (22) and insert the spring pin (39) into the bore. Attach the suspension plate (refer to Figures 2 and 4).
15. Attach rope (23) with shackle (002.453) to suspension plate and suspend from lifting tackle.

△△ *Important! Make sure to use the correct suspension point (refer to Figures 2 and 4).*

16. **Screw the guide rods (111.125) into the cylinder head, down to contact** (refer to Figure 4).

17. Lift the rocker arm casing and move it to a position centrally above the cylinder.
18. Carefully lower the rocker arm casing, making sure that the guide rods engage in the guide bores to avoid that the valve yokes become tilted during inserting. In this connection, see to it that the thrust pads of rocker arms (8 and 10) correctly rest in the cups of the push-rods, and that the parallel pins (13) in the cylinder head engage in the bores of the rocker arm casing (refer to Figures 1 and 4).
19. Screw off the guide rods.
20. Apply MoS_2 lubricant to the threads and contact faces of the hexagon socket bolts (6), screw in the bolts together with washers (7), hand-tight, and tighten them to the specified torque (refer to work card 000.30).
21. Detach the suspension plate together with shackle and rope.

Adjusting the valve clearance

22. Readjust the valve clearance on the exhaust and inlet valves (refer to work card 111.02).
23. Mount the lube oil supply pipe on the rocker arm casing.
24. Check the O-ring seal (4) on the cylinder head cover (1) for damage and, if necessary, apply clean lube oil to a new O-ring seal and place it in the ring groove, taking care not to twist it.
25. Put the cylinder head cover onto the rocker arm casing and fasten it in place.