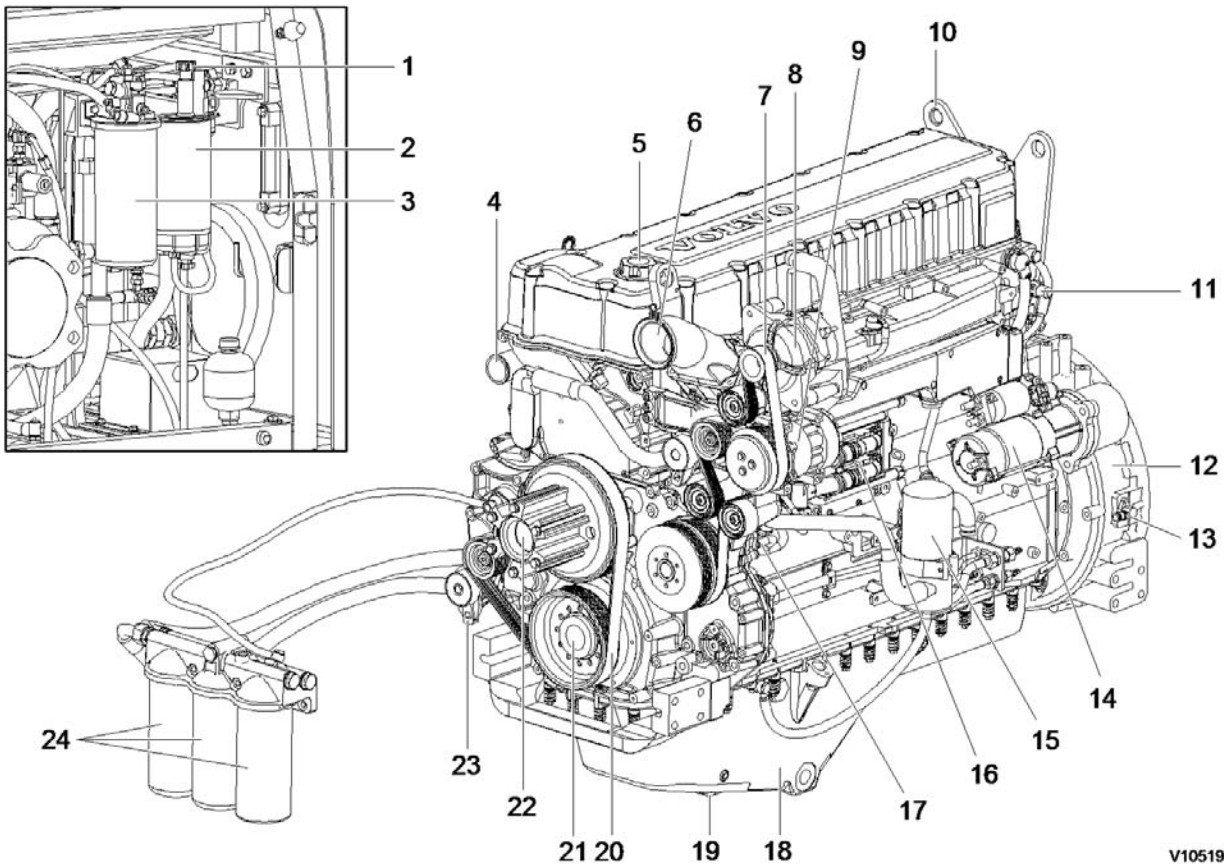


Document Title: <b>Engine, description</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2015/2/21</b>
Profile: <b>PIP, PL4608 [GB]</b>			

## Engine, description

- The D12D is the model number of the Volvo 12 liter engine.
- The engine is a 6-cylinder, 4-stroke, direct injection diesel with a 12 liter cylinder volume, turbocharger, charge air cooler and electronic controlled fuel injection, EMS (Engine Management System).
- The serial number of the engine is to be found stamped in the cylinder block on the rear left side.
- The cylinder head is of cast iron and manufactured in one piece which is necessary in order to provide stable bearings for the overhead camshaft.
- The cylinder liner is sealed against the coolant casing with rubber rings.
- The D12D has a four-valve system and overhead camshaft.
- The engine timing gear transmission is located at the front of the engine on a 10 mm thick steel plate bolted to the cylinder block.
- The crankshaft is drop forged and has induction hardened bearing surfaces and fillets.
- The engine is force fed lubricated by an oil pump which is gear driven from the engine crankshaft via an intermediate gear
- The fuel system for D12D has electronic control with unit injectors one for each cylinder and which operate at a very high pressure.
- The fuel feed pump is a gear driven type and is driven from the engine timing gear with the same gear.



V1051975

**Figure 1**  
**Engine, structure**

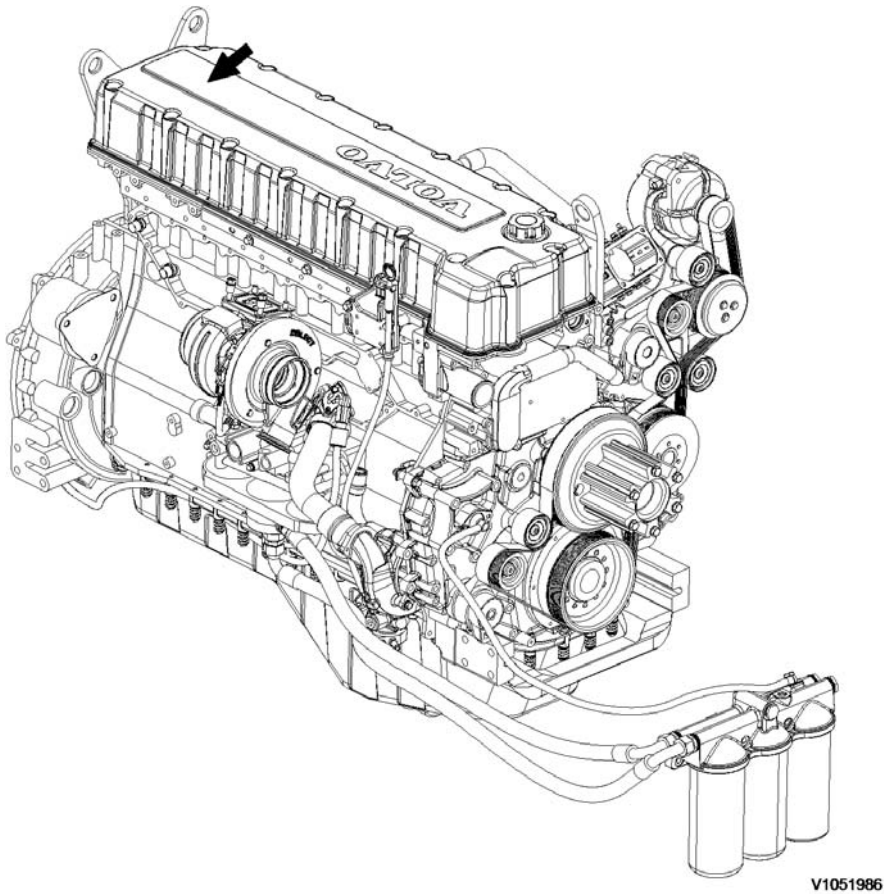
1	Hand pump	9	Air conditioner compressor	17	Fuel feed pump
2	Water separator	10	Lifting bracket	18	Oil pan
3	Fuel filter	11	Coolant temperature sensor	19	Engine oil drain valve
4	To radiator	12	Flywheel housing	20	Fan belt
5	Engine oil filler	13	Speed sensor	21	Crankshaft pulley
6	From charge air cooler	14	Starter motor	22	Fan drive and pulley
7	Alternator belt	15	Breather	23	Belt tensioner
8	Alternator	16	E-ECU	24	Engine oil filter

Document Title: <b>Engine, identification</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2015/2/21</b>
Profile: <b>PIP, PL4608 [GB]</b>			

## Engine, identification

### Identification plate

The engine model, serial number and performance data are stamped on an identification plate which is attached on the cylinder head cover. The engine model designation and serial number must be indicated when ordering spare parts.

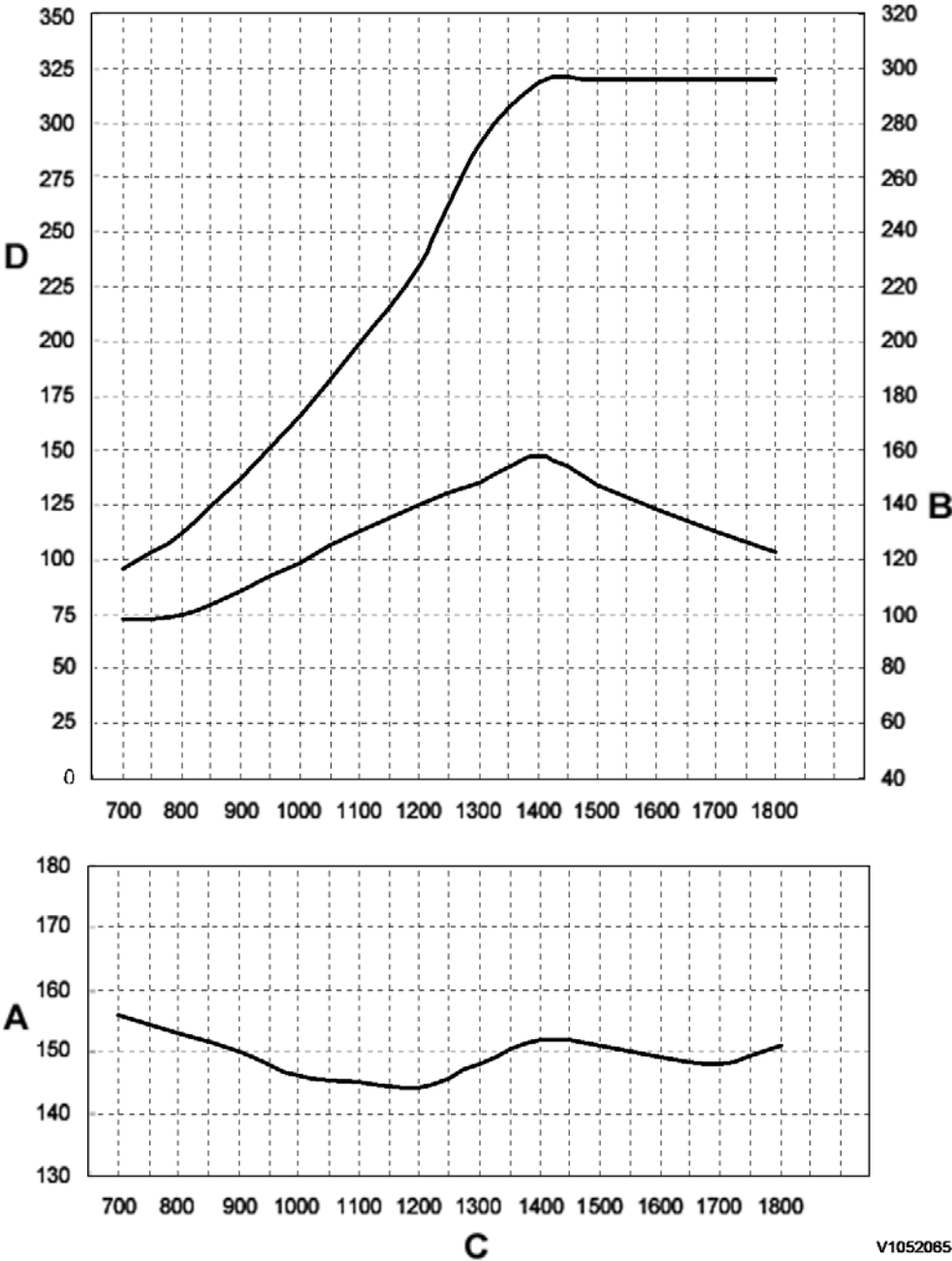


**Figure 1**  
**Engine identification plate location**

Document Title: <b>Engine characteristic curve</b>	Function Group: <b>210</b>	Information Type: <b>Service Information</b>	Date: <b>2015/2/21</b>
Profile: <b>PIP, PL4608 [GB]</b>			

## Engine characteristic curve

Engine characteristic curve



V1052065

**Figure 1**  
**Engine characteristic curve**

- A Fuel consumption : g/kWh (g/PS-HR)
- B Torque : Nm (kgf m)
- C Engine speed (rpm)
- D Power kW (PS)

Document Title: <b>Basic check, Engine</b>	Function Group: <b>210</b>	Information Type: <b>Service Information</b>	Date: <b>2015/2/21</b>
Profile: <b>PIP, PL4608 [GB]</b>			

## Basic check, Engine

### NOTE!

Certain tests and checks are performed with unlocked safety locking lever. Make sure that the machine cannot operate unexpectedly when the safety locking lever is unlocked.

### Purpose of the basic check

The purpose of the basic check is to provide fast and accurate information about the general condition of the engine.

The basic check should be performed and evaluated according to instructions in the PC-tool VCADS Pro.

### Tests included in the basic check

The basic check which is divided into the following tests should be performed after **reading out error codes and checking parameters**.

### Tests:

1. **Cylinder compression, test**  
The purpose of the test is to show if any cylinder has a deviating compression pressure. The test replaces the old pressure check method but does not give any absolute values.
2. **Cylinder balancing, test**  
The purpose of the test is to show if there is any deviation in the fuel injection to a cylinder.
3. **Feed pressure, test**  
The purpose of the test is to check that the feed pressure is as per specification.
4. **Sensor, test**  
The purpose of the test is to check the function of all sensors.

Document Title: <b>Troubleshooting</b>	Function Group: <b>210</b>	Information Type: <b>Service Information</b>	Date: <b>2015/2/21</b>
Profile: <b>PIP, PL4608 [GB]</b>			

## Troubleshooting

### General about troubleshooting

When a malfunction is suspected or has been confirmed, it is important to identify the cause as soon as possible.

The starting point for all troubleshooting is that there is some type of trouble symptom or malfunction.

Malfunctions can be indicated by:

- generation of error codes
- detection of a malfunction symptom.

### Troubleshooting work

The first step in troubleshooting is to gather information from the operator concerning the malfunction symptoms, see Electrical and information system, Collection of basic data. Then, attempt to pin-point the cause by checking in a certain order, for more information, see Electrical and information system, troubleshooting strategy.

The different checking steps are:

- Check error codes
- Check parameters
- Perform basic check

### Troubleshooting information

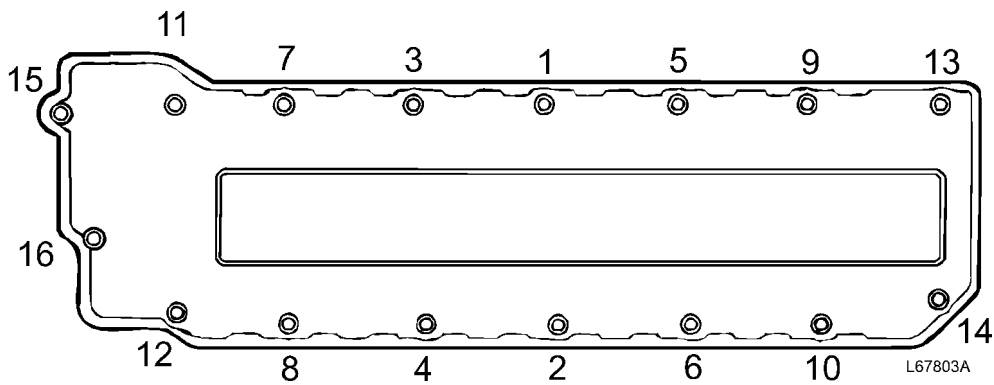
The following is included in Electrical and information system and is used when troubleshooting:

1. **Troubleshooting strategy**  
Describes troubleshooting work, step by step.
2. **Troubleshooting, assistive devices**  
Brief summary of the assistive devices that are available for troubleshooting.
3. **Functional checks and tests, VCADS Pro**  
Brief description of VCADS Pro. For a detailed description, see VCADS Pro User's Manual.
4. **Error code information**  
Contains information regarding error code design, lists of all error codes and error code information about each error code.
5. **Components, troubleshooting and specifications**  
Contains methods and measuring values for troubleshooting of components. Also includes wiring diagrams and certain specifications.
6. **Parameters**  
Incorrectly set parameters may cause malfunction symptoms. The parameter list includes all limit and command values for parameters.
7. **Control units, functional description**  
Describes the functions of the control units, inputs and outputs as well as communication between the various control units.
8. **Control units, active and passive measuring**  
Contains measuring values for active and passive measuring of the ECUs.
9. **Software functions**  
Describes the pre-requisite conditions for the control and monitoring functions that are performed by the software in the ECUs.

Document Title: <b>Valve cover, tightening torque</b>	Function Group: <b>211</b>	Information Type: <b>Service Information</b>	Date: <b>2015/2/21</b>
Profile: <b>PIP, PL4608 [GB]</b>			

## Valve cover, tightening torque

Stud bolt, valve cover	30 Nm (22,1 lbf ft)
Valve cover (see diagram)	20 Nm (14,8 lbf ft)



**Figure 1**  
**Tightening diagram valve cover**

Document Title: <b>Internal Exhaust Gas Recirculation description</b>	Function Group: <b>214</b>	Information Type: <b>Service Information</b>	Date: <b>2015/2/21</b>
Profile: <b>PIP, PL4608 [GB]</b>			

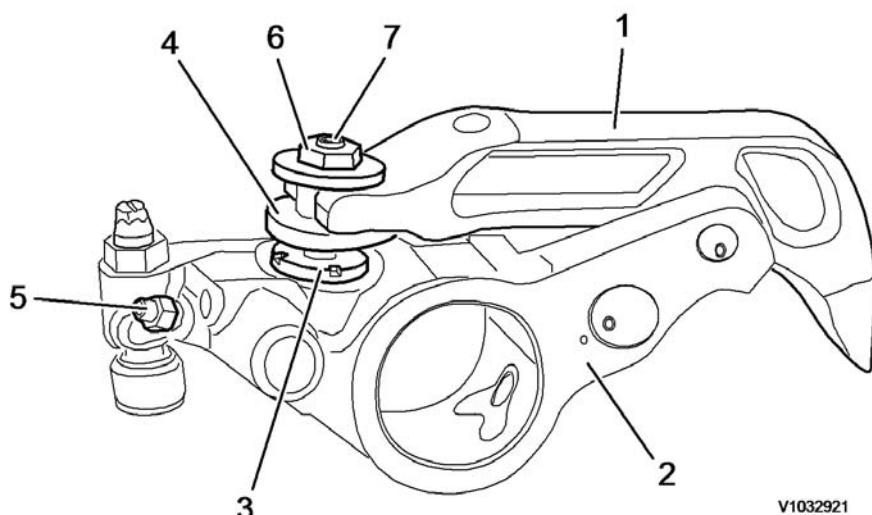
## Internal Exhaust Gas Recirculation (IEGR), description

As a part of V-ACT (Volvo Advanced Combustion Technology), a system is used for IEGR ( **I**nternal **E**xhaust **G**as **R**ecirculation). On D12D this takes place using a double rocker arm, consisting of an exhaust rocker arm and a follower arm, which enables a second opening of the exhaust valves. When activated, the follower arm will give a limited valve opening of the exhaust valves during the inlet phase, which leads exhausts back into the cylinder.

The clearance between the follower arm and the camshaft is adjusted on the camshaft's base circle. The clearance shall always be checked and adjusted, if needed, when the valve clearance is checked and adjusted.

When replacing follower arm due to damage or wear, the entire double rocker arm shall be replaced, complete.

It is important to keep the follower arm clean, pay special attention to the contact face against the camshaft.



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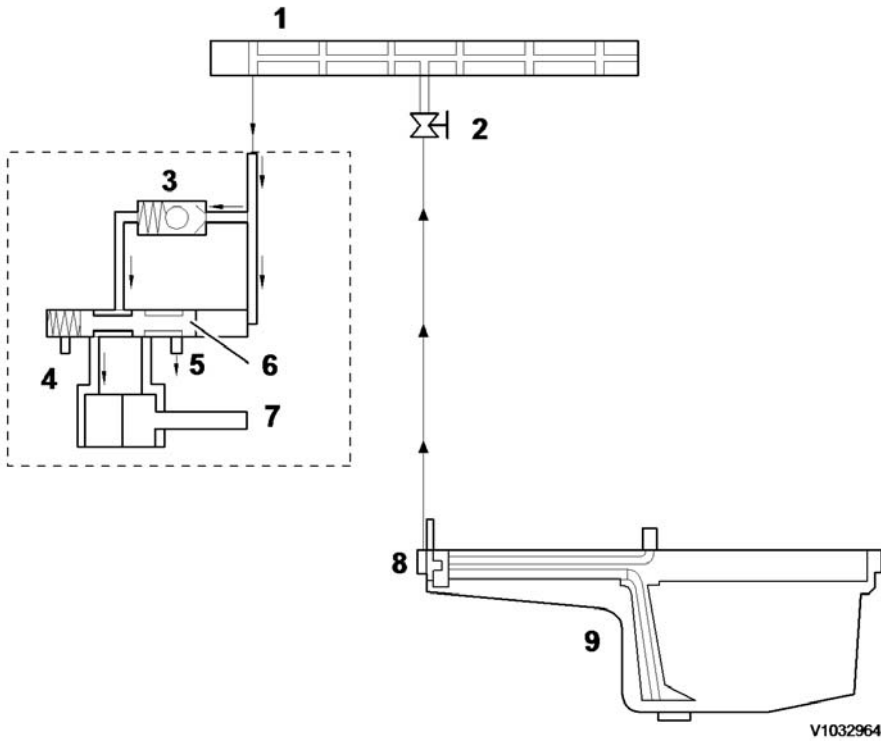
**Figure 1**  
**Double rocker arm with follower arm**

1. Follower arm
2. Exhaust rocker arm
3. Stop nut
4. Sleeve
5. Nipple
6. Lock nut
7. Adjusting screw/piston

### Hydraulic system for piston movement

The piston controls the follower arm.

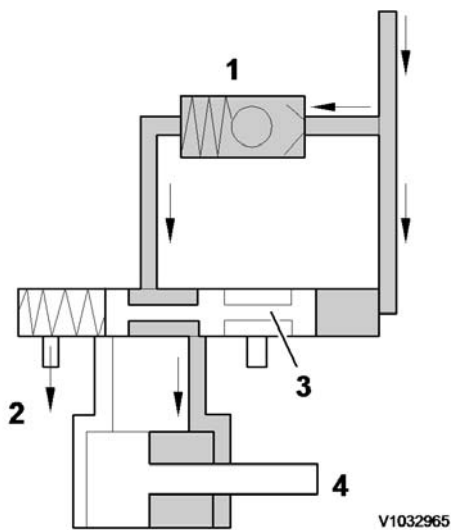




**Figure 2**  
**Oil system for double rocker arm, engaging and disengaging IEGR**

1. Rocker arm shaft
2. IEGR valve
3. Non-return valve
4. Drain valve
5. Drain valve
6. Control slide
7. Piston
8. Oil pump
9. Oil sump

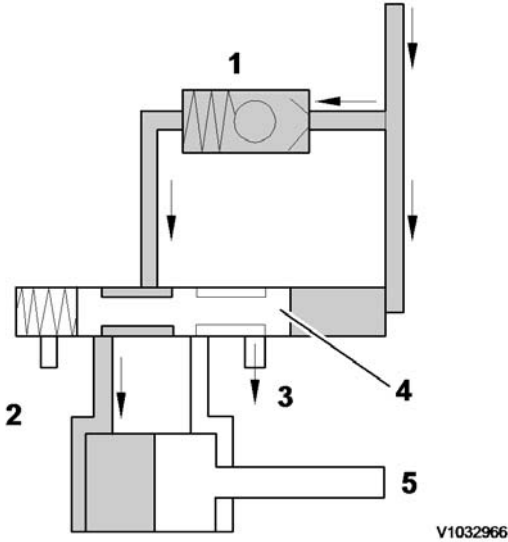
The oil comes from the oil sump and passes via the oil pump, the IEGR valve and rocker arm shaft to the double rocker arm. The rocker arm shaft is provided with lubrication oil through a hole in the rocker arm bushing (oil is only allowed through the non-return valve in one direction).



**Figure 3**  
**IEGR disengaged**

1. Non-return valve
2. Drain valve
3. Control slide
4. Piston

If the oil pressure in the rocker arm is 150 kPa (1.5 bar, 21.8 PSI) or lower, the spring force in the control slide will not be overcome. The control slide will remain in the original position.



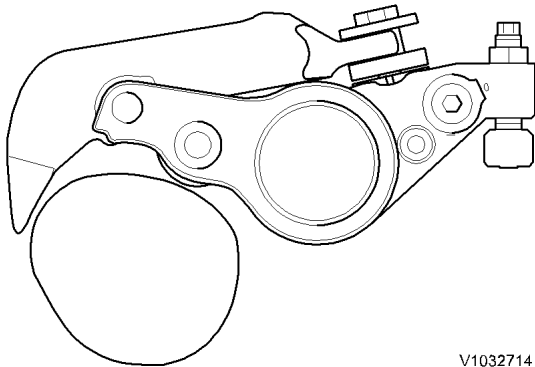
**Figure 4**  
**IEGR engaged**

1. Non-return valve
2. Drain valve
3. Drain valve
4. Control slide
5. Piston

If the oil pressure exceeds 180 kPa (1.8 bar, 26.1 PSI), the spring force in the control slide will be overcome. The slide will move toward the left position.

**IEGR not activated**

Oil pressure forces the piston to its bottom position, the follower arm follows along. The camshaft will now pass without touching with the follower arm's contact face.



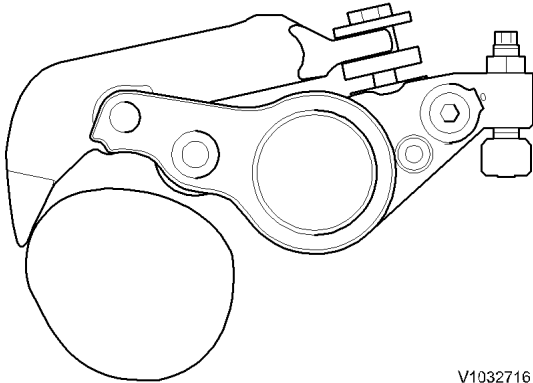
**Figure 5**  
**Double rocker arm not activated**

### IEGR activated

The oil pressure forces the piston to its upper position. The follower arm follows along.

When the camshaft rotates, it will first strike "the roller" on the exhaust rocker and the normal valve lift will take place.

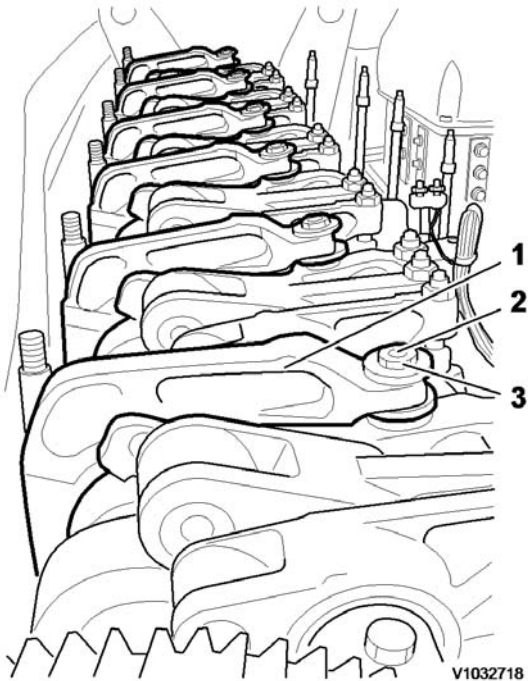
The next step is that the camshaft will strike the contact face on the follower arm. The camshaft forces the follower arm and piston downward. The force passes through the piston via compressed oil to the exhaust rocker which gives a second, smaller, valve lift.



**Figure 6**  
**Double rocker arm activated**

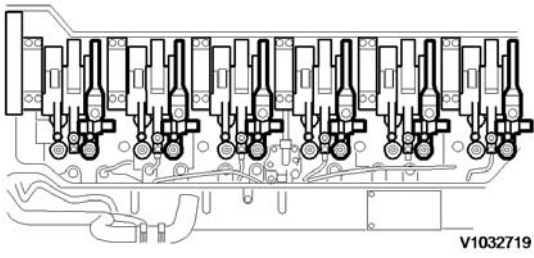
### Checking and adjusting

The double rocker arm's adjustment shall be checked after the engine's first 1000 hours, adjust as needed. Thereafter checking and adjusting shall be performed together with valves, checking and adjusting.



**Figure 7**  
**Double rocker arm, installed in engine**

1. Double rocker arm
2. Adjusting screw
3. Lock nut



**Figure 8**  
**Valves with double rocker arm**

Document Title: <b>Valves, adjusting</b>	Function Group: <b>214</b>	Information Type: <b>Service Information</b>	Date: <b>2015/2/21</b>
Profile: <b>PIP, PL4608 [GB]</b>			

## Valves, adjusting

Op nbr 214-012

[88820003 Setting tool](#)

[9993590 Gear wheel](#)

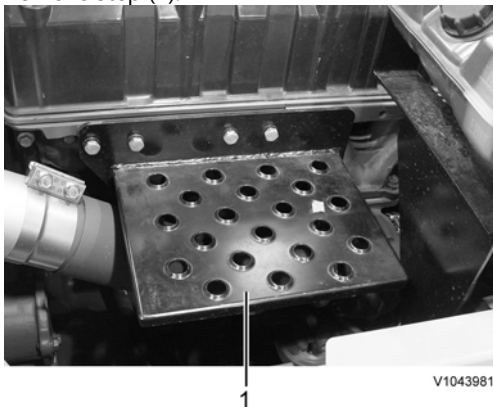
Feeler gauge



### **WARNING**

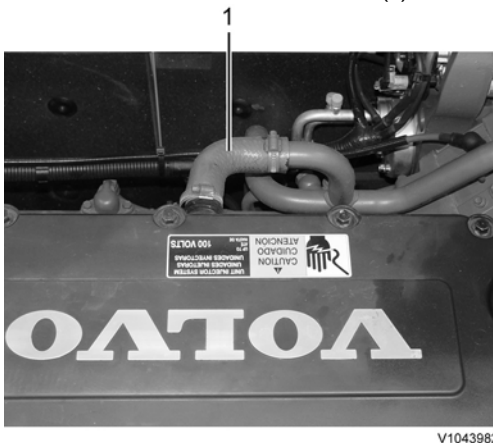
**Risk of burns - stop the diesel engine and allow it to cool down before starting any work.**

1. Place the machine in service position B. See [091 Service positions](#)
2. Open the engine hood.
3. Remove step (1).



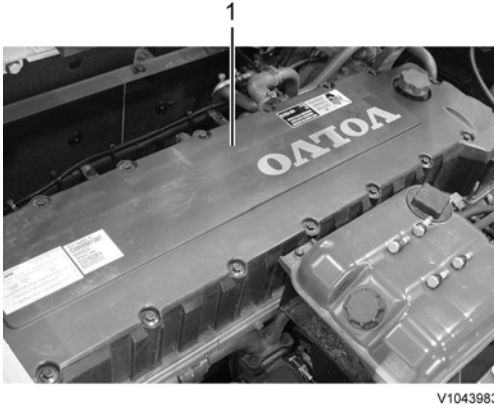
**Figure 1**  
**Removal, step**

4. Remove crankcase ventilation hose (1).



**Figure 2**  
**Removal, crankcase ventilation hose**

5. Remove valve cover (1).



**Figure 3**  
**Removal, valve cover**

6. Remove the protective cover on the flywheel housing and install tool 9993590, an extension and a ratchet handle.



**Figure 4**  
**9993590, extension and ratchet handle**

### **Adjusting inlet valve**

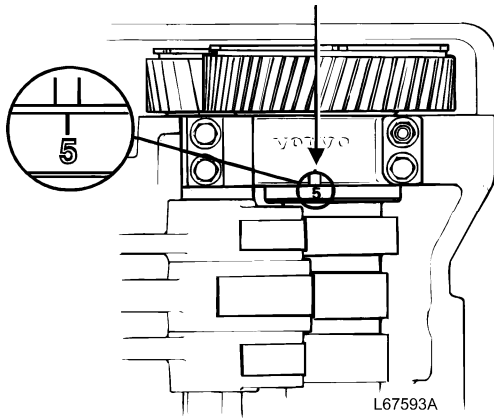
7. Turn the flywheel with tool 9993590 until the nearest dash marking on the camshaft is between the marks on the bearing cap.

**NOTE!**

The number identifies the cylinder for which both inlet and exhaust valves are in correct position for adjusting.

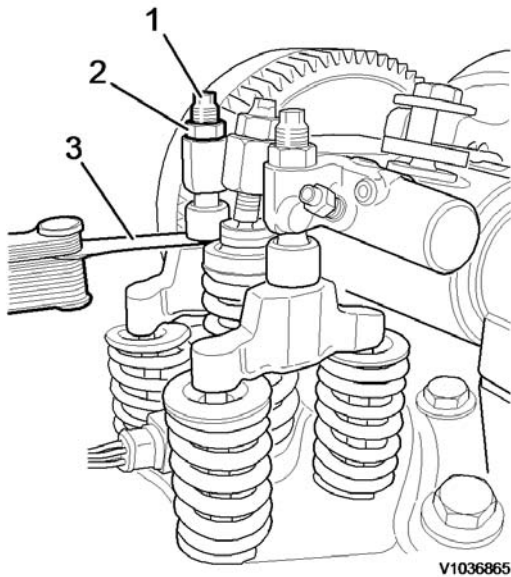
**NOTE!**

Cylinder 1 is closest to the engine timing gear.



**Figure 5**  
**Camshaft marking**

8. Loosen lock nut (2) on the rocker arm and adjust screw (1) to get the correct valve clearance according to [214 Valve mechanism, double rocker arm](#) and tighten the lock nut. Tightening torque: see [214 Valve mechanism, tightening torques](#)



**Figure 6**

1. Adjusting screw
2. Lock nut
3. Feeler gauge

### Adjusting exhaust valve

9. Loosen lock nut (2) on the rocker arm and adjust screw (1) to get the correct valve clearance according to [214 Valve mechanism, double rocker arm](#) and tighten the lock nut. Tightening torque: see [214 Valve mechanism, tightening torques](#)

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