

TURBOCHARGER

DEB

EXHAUST BRAKE

0

1

2

3

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1. DESCRIPTION OF COMPONENTS

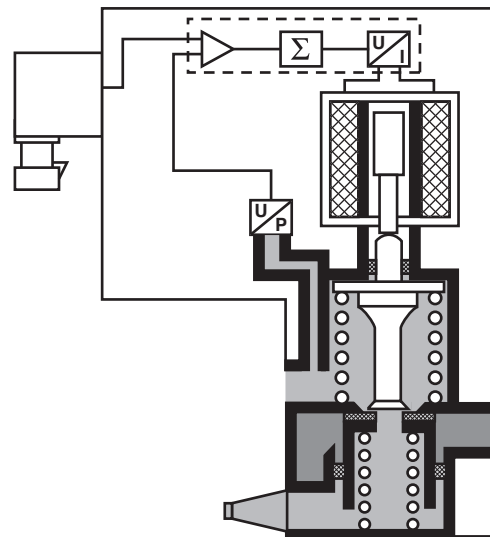
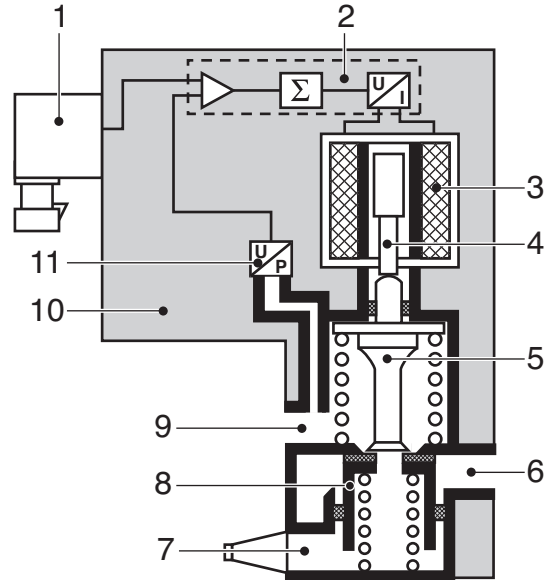
1.1 WASTE GATE VALVE

- 1 Electrical connection
- 2 Internal electronics
- 3 Coil
- 4 Core
- 5 valve
- 6 Air connection, supply(1)
- 7 Vent (3)
- 8 Piston
- 9 Air connection, waste gate (2) control pressure
- 10 Accommodation
- 11 Internal pressure sensor

The waste gate valve controls opening and closing of the waste gate on the turbocharger. The waste gate valve air supply (6) comes directly from the air supply unit circuit 4 (approx. 10 bar) and is adjusted in the valve to a control pressure (9) for the diaphragm housing of the waste gate. The waste gate valve checks the output pressure using an internal pressure sensor (11). The signal issued by the internal pressure sensor is compared by the internal electronics (2) to the signal from the electronic unit. The internal electronics energises the coil (3) with a duty cycle (PWM) signal. If the required pressure differs from the actual pressure, the internal electronics modifies the duty cycle.

Rest position/bleeding

In the rest position or during bleeding, the coil (3) is not energised. The piston (8) and valve (5) are pushed up by the force of the spring. This also pushes up the metal core (4). The outlet (9) is now connected to the air bleed vent (7).



TURBOCHARGER

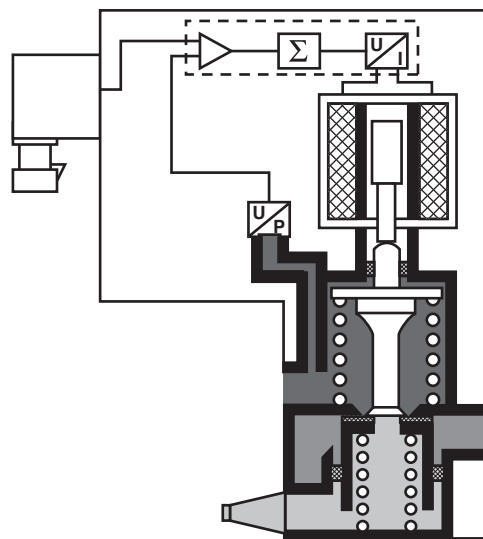
Description of components

XF105 series

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Constant pressure

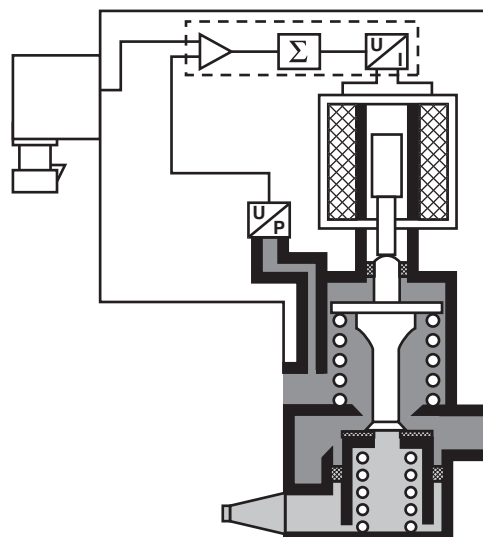
When the coil (3) is energised, the metal core (4) is pushed down. The valve (5) closes off the opening to the air bleed vent on the piston (8). The pressure present in the outlet (9) now stays constant.



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Pressure increase

If the coil (3) remains activated for longer, the valve (5) will push the piston (8) further down and the air supply opening (6) to the outlet (9) is released. This increases the output pressure.



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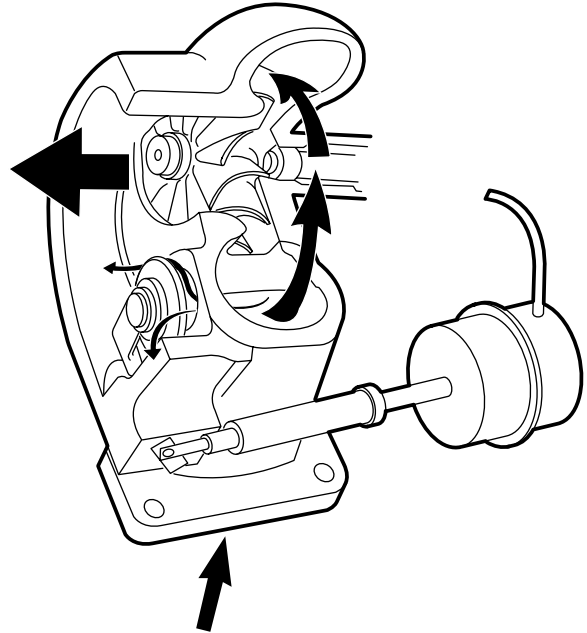
2. SYSTEM DESCRIPTION

2.1 TURBOCHARGER WITH MECHANICAL WASTEGATE

The compressor is driven by a turbine installed in the exhaust. The energy that is normally lost through the exhaust gases is therefore now utilised. To make the engine more responsive at lower engine speeds, a turbocharger is used that produces a better charge ratio at these speeds. Without any additional provision for this, the boost pressure yielded by this turbocharger would be too high at maximum engine speeds. Use of a wastegate prevents this.

The wastegate valve is controlled by means of a rod-membrane mechanism. This spring-loaded membrane is controlled by a pipe connected to the outlet of the turbocharger housing. The control rod operates a valve in the turbine housing, which is opened when the maximum pre-set pressure has been reached.

When the valve is opened, some of the exhaust gases will be discharged directly to the exhaust pipe rather than being used to propel the turbocharger's turbine wheel. This limits the speed of the turbocharger and prevents the boost pressure becoming too high.



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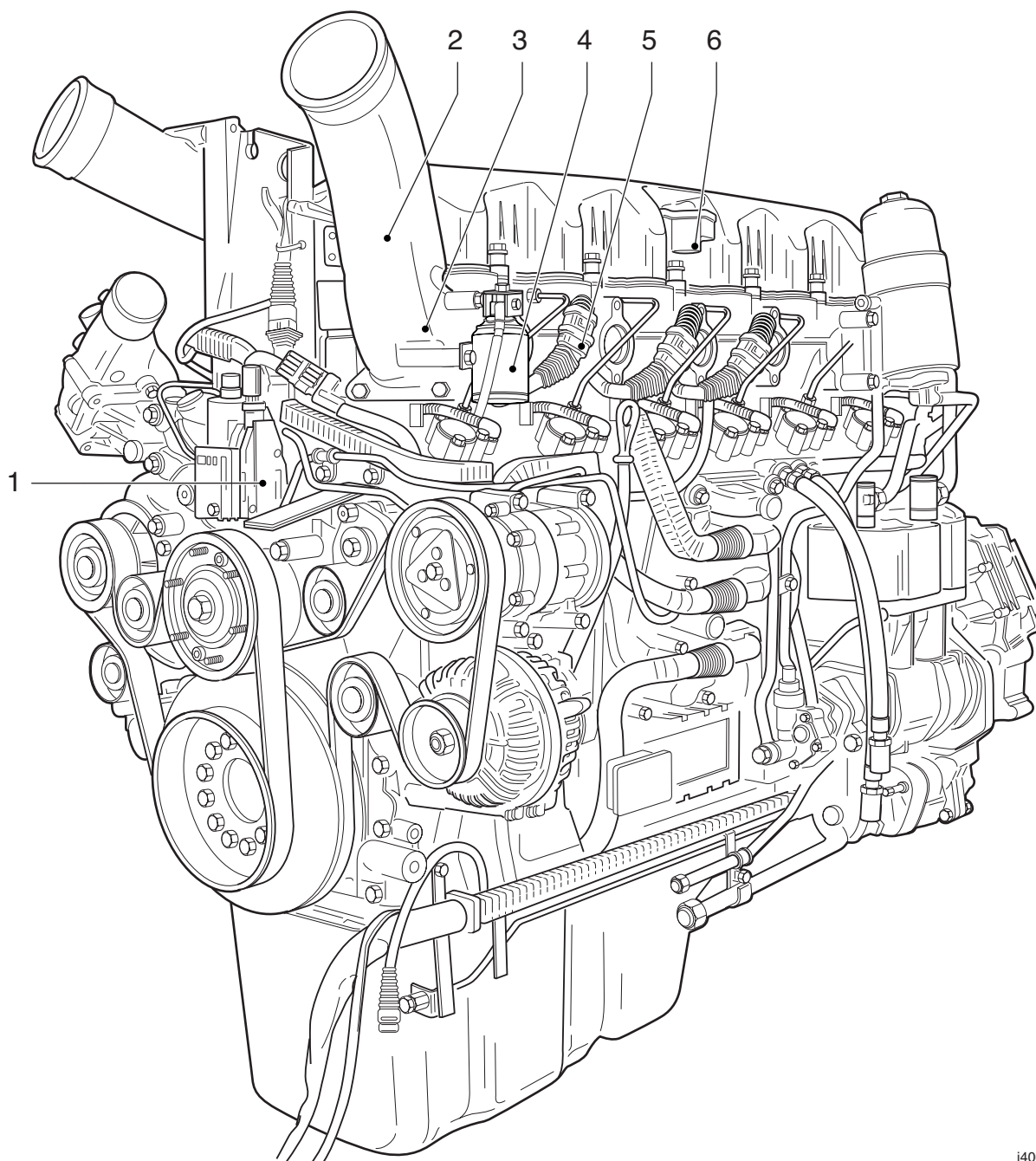
TURBOCHARGER

System description

XF105 series

2.2 TURBOCHARGER WITH ELECTRONICALLY CONTROLLED WASTEGATE

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1 Wastegate control valve

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XF105 series

The compressor is driven by a turbine installed in the exhaust. The energy that is normally lost through the exhaust gases is therefore now utilised. To make the engine more responsive at lower engine speeds, a turbocharger is used that produces a better charge ratio at these speeds. Without any additional provision for this, the boost pressure yielded by this turbocharger would be too high at maximum engine speeds. Use of a wastegate prevents this. The wastegate valve is controlled by means of a rod-membrane mechanism.

The wastegate valve is controlled by means of a rod-membrane mechanism. This spring-loaded membrane is controlled by an electropneumatic valve. The electropneumatic valve is controlled by a duty cycle signal from the engine management system.

The control rod operates a valve in the turbine housing, which is opened when the maximum pre-set pressure has been reached. When the valve is opened, some of the exhaust gases will be discharged directly to the exhaust pipe rather than being used to propel the turbocharger's turbine wheel. This limits the speed of the turbocharger and prevents the boost pressure becoming too high.

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1. DEB

1.1 DEB SYSTEM DESCRIPTION, GENERAL

Introduction

The exhaust brake is fitted as a standard. An additional engine brake, the DEB, is now optional.

The abbreviation DEB stands for "DAF Engine Brake". This decompression brake delivers the best performance in the higher engine-speed range, indicated in blue on the rev counter. The DEB always operates in conjunction with the exhaust brake.

The electronic unit in the engine management system switches the DEB on and off.

General operation of DEB

If the engine brake is activated, both the exhaust brake and the DEB come into operation. This means that the DEB always works in conjunction with the exhaust brake. If the DEB has been activated, no fuel is injected and hence no combustion will take place.

Position A: Induction stroke

The piston moves down and the cylinder is filled with clean air. Since the exhaust brake is also operated, a high pressure is built up in the exhaust manifold.

By opening the exhaust valves briefly during the induction stroke, additional charge pressure is obtained in the cylinder.

Position B: Compression stroke

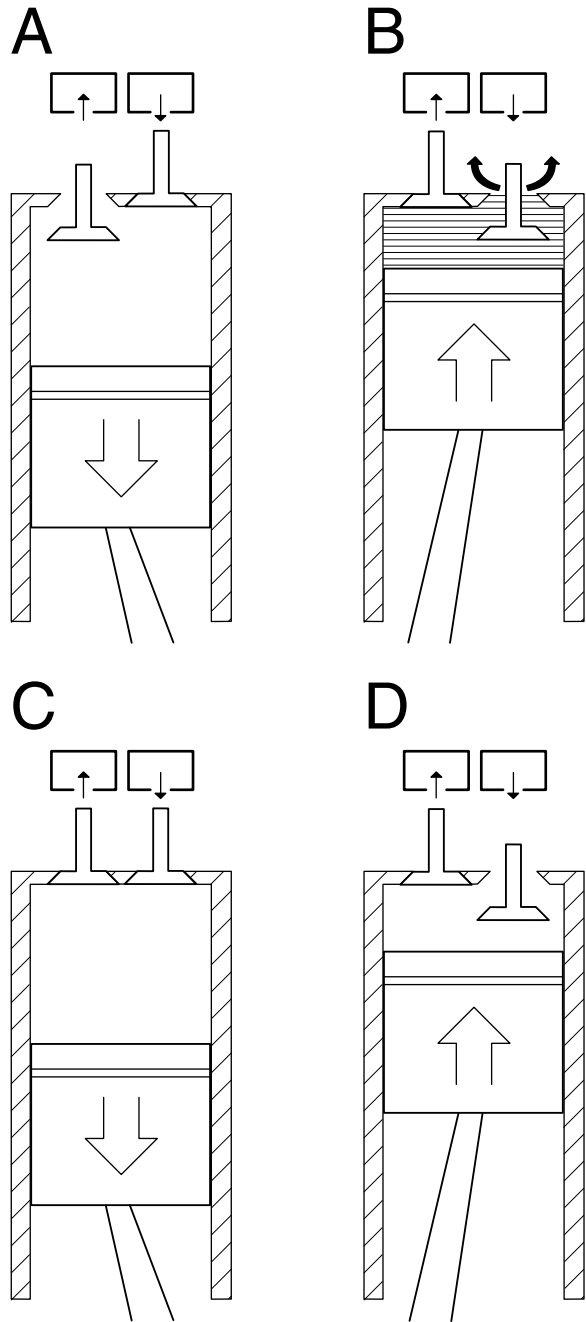
The piston moves up and compresses the air in the cylinder, creating a braking force. At the end of the compression stroke the exhaust valves are opened. The compressed air can now escape to the exhaust system. Otherwise this compressed air would press the piston down faster.

Position C: Power stroke

The piston moves down and the exhaust valves are closed.

Position D: Exhaust stroke

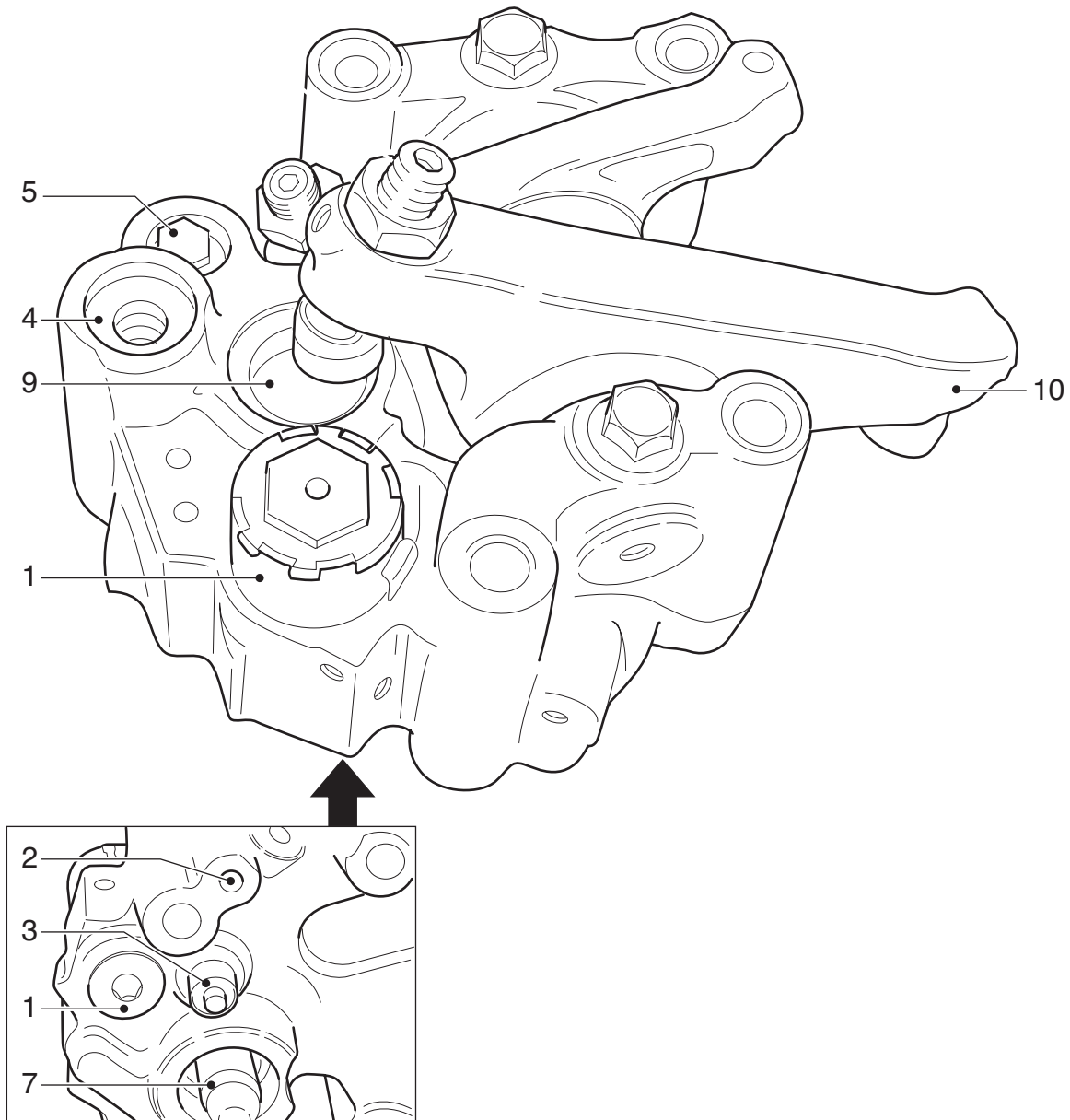
The piston moves up, as during a normal exhaust stroke.



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1.2 SYSTEM DESCRIPTION, DEB

The DEB consists of six identical housings integrated in the rocker seat.
Each cylinder has its own DEB housing.
Each housing contains various valves, pistons, and a solenoid valve.

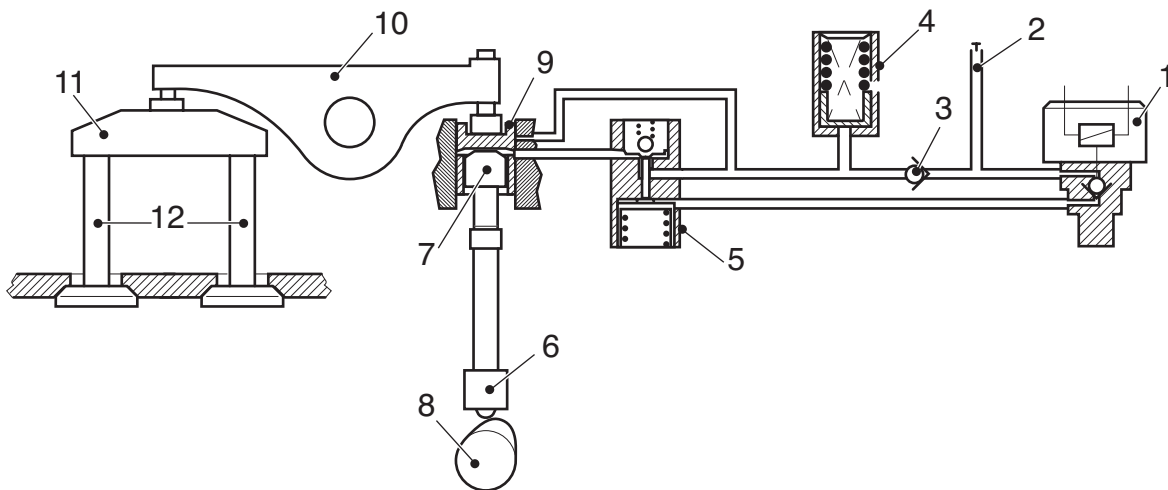


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When the DEB is activated, fuel ceases to be injected and the exhaust valves will be opened hydraulically/mechanically at the end of the compression stroke. This means that the compressed air can escape into the exhaust system, so that during the power stroke this pressure does not help the piston to fall. The power required to compress the air provides the braking effect of the DEB. The more air that is compressed, the greater the braking effect. This is why the DEB renders the best performance in the higher engine-speed range. This range is shown in blue on the rev counter.

DEB operation, hydraulic

DEB disengaged

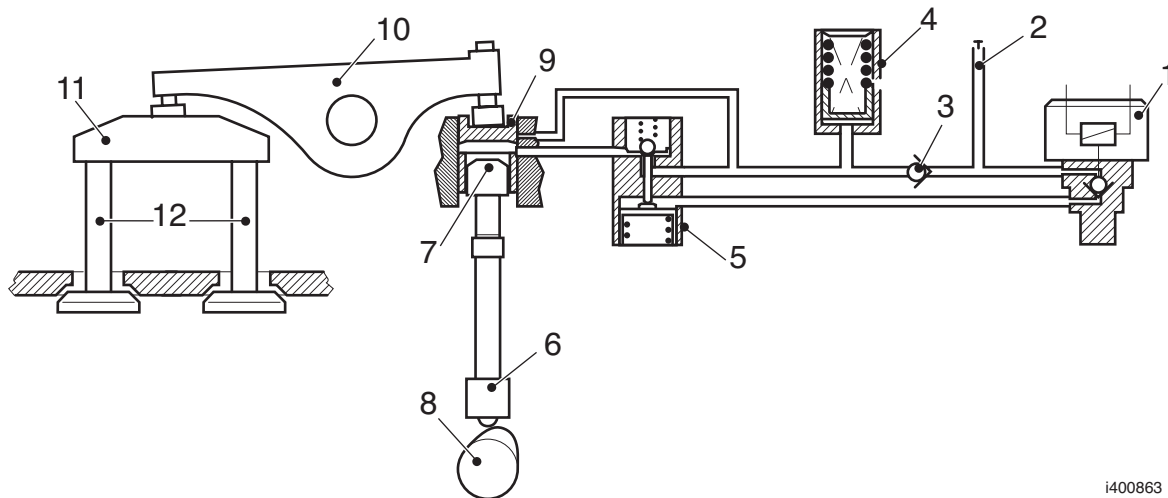


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1. Solenoid valve
2. Cylinder head oil supply
3. Non-return valve
4. Accumulator
5. Control valve
6. Exhaust valve push rod
7. Piston operating valve
8. Camshaft
9. Operating valve
10. Exhaust valve rocker
11. Bridge for exhaust valves
12. Exhaust valves

The solenoid valve (1) is not energised. Lubricating oil is not allowed through to the control valve (5). As a result, the oil that flows via the non-return valve (3) and control valve (5) to the operating valve (9) can also flow back through the control valve (5) when the push rod (6) moves upwards. The returning oil is collected in the accumulator (4).

Activating DEB



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When the solenoid valve (1) is energised, lubricating oil (2) is allowed through to the control valve (5).

The oil pushes the control valve (5) downwards against the spring pressure. The spring then pushes the small ball onto its seat, so that the control valve starts to function as a non-return valve. The operating valve (9) is now filled with lubricating oil, which can no longer flow back to the accumulator (4).

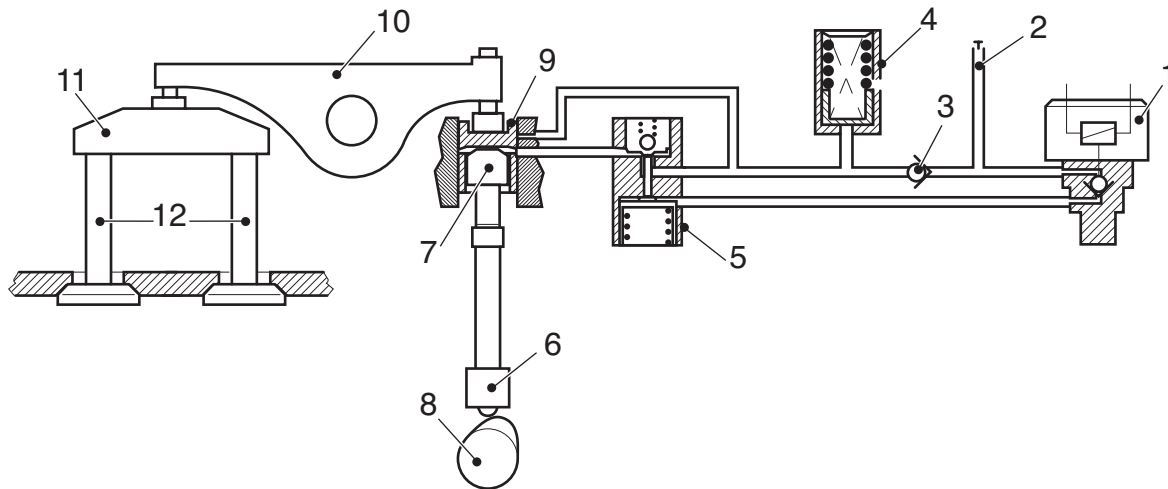
The oil causes the main piston (9) to move up until it rests on the set screw of the exhaust valve rocker (10).

The oil trapped between the operating valve (9) and the piston (7) causes the push rod (6) to extend. Thanks to the special exhaust cam shape of the camshaft (6), the exhaust valves can be opened at the correct moment (during the inlet stroke and at the end of the compression stroke). To prevent the exhaust valves from touching the top of the engine piston during the compression stroke, the stroke of the operating valve (9) is limited by the top bore.

If the space between the operating valve (9) and the piston (7) passes this bore, the oil is able to return to the accumulator.

In the case of loss of oil during operation, the oil will automatically be refilled via the non-return valve (3).

Disengaging the DEB



i400862

The solenoid valve (1) is no longer energised. The control valve (5) is pushed upwards by the spring pressure and presses the ball against the spring pressure of the seat; the oil can now freely flow back to the accumulator.

Protection against excessive lubricating oil pressure

If the pressure in the accumulator (4) becomes too high, and as a result the piston is raised above the opening, the pressure will be released and consequently limited.

Note:

Examples of causes of high pressures in the DEB include:

- cold lubricating oil;
- defective lubricating-oil pressure-relief valve.

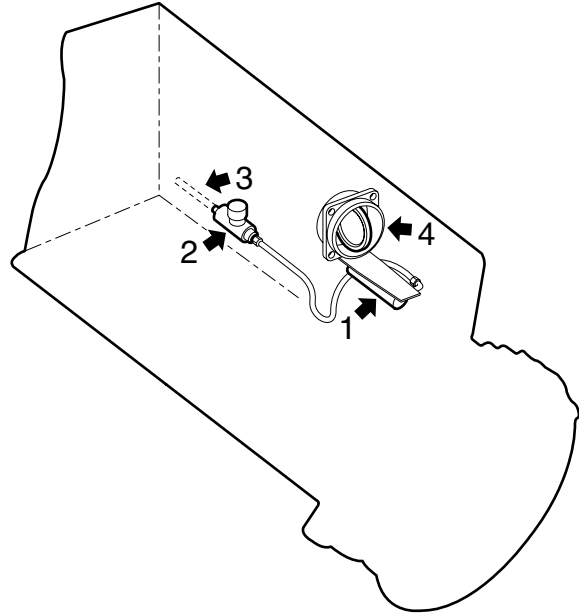
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1. EXHAUST BRAKE

1.1 SYSTEM DESCRIPTION

1. Butterfly valve operating cylinder
2. Exhaust brake valve
3. Supply pressure
4. Butterfly valve



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Switching on the exhaust brake

The exhaust brake consists of an engine brake valve (2) and an operating cylinder butterfly valve (1) connected to the butterfly valve (4) in the exhaust pipe.

If the exhaust brake operating switch in the cabin floor or the steering wheel switch (if present) is operated, a signal is sent to the electronic unit of the VIC, which transforms this signal into a CAN message. After receiving this message, the engine management system interrupts the fuel supply to the various cylinders. The engine management system also energises the exhaust brake valve, causing compressed air to flow to the operating cylinder (2). The cylinder closes the butterfly valve in the butterfly valve housing. The exhaust pipe is then almost completely closed off. Controlled discharge of exhaust gases is still possible through a calibrated hole in the butterfly valve.

The engine now acts as a compressor, creating a braking action.

The higher the engine speed, the greater the braking action of the exhaust brake.

Switching off the exhaust brake

If the engine brake control switch is released, the fuel supply to the various cylinders will be reinstated and the butterfly valve will be re-opened.

EXHAUST BRAKE

Exhaust brake

XF105 series

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