N TIER
3 SERIES

Industrial application

N45

N45 ENT.X - N45 MSS.X - N45 MNS.X
N45 MRT.X - N45 MST.X - N45 MNT.X

N67

N67 ENT.X - N67 ERT.X
N67 MST.X - N67 MRT.X - N67 MNT.X

Technical and Repair manual

LUBRICATION

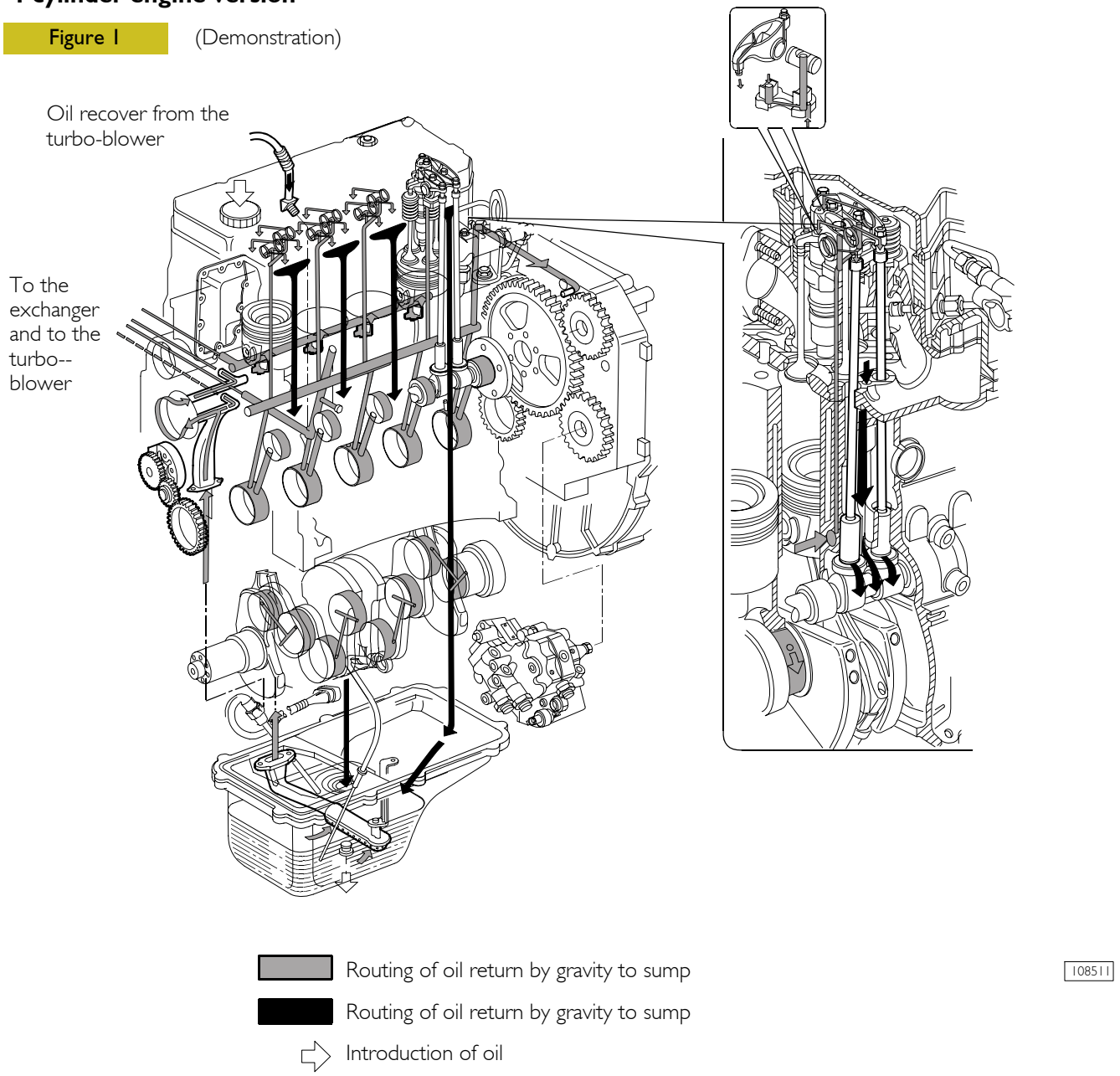
Lubrication by forced circulation is achieved through oil rotary expansion pump (1), placed in the front part of the basement, driven by the straight-tooth gear splined to the shaft's bar hold.

From the pan, the lubrication oil flows to the driving shaft, to the camshaft and to the valve drive.

Lubrication involves the heat exchanger as well, the turbo--blower and the eventual compressor for any eventual compressed air system. All these components may often vary according to the specific duty and will therefore be examined in the specific section.

4-cylinder engine version

Figure 1 (Demonstration)



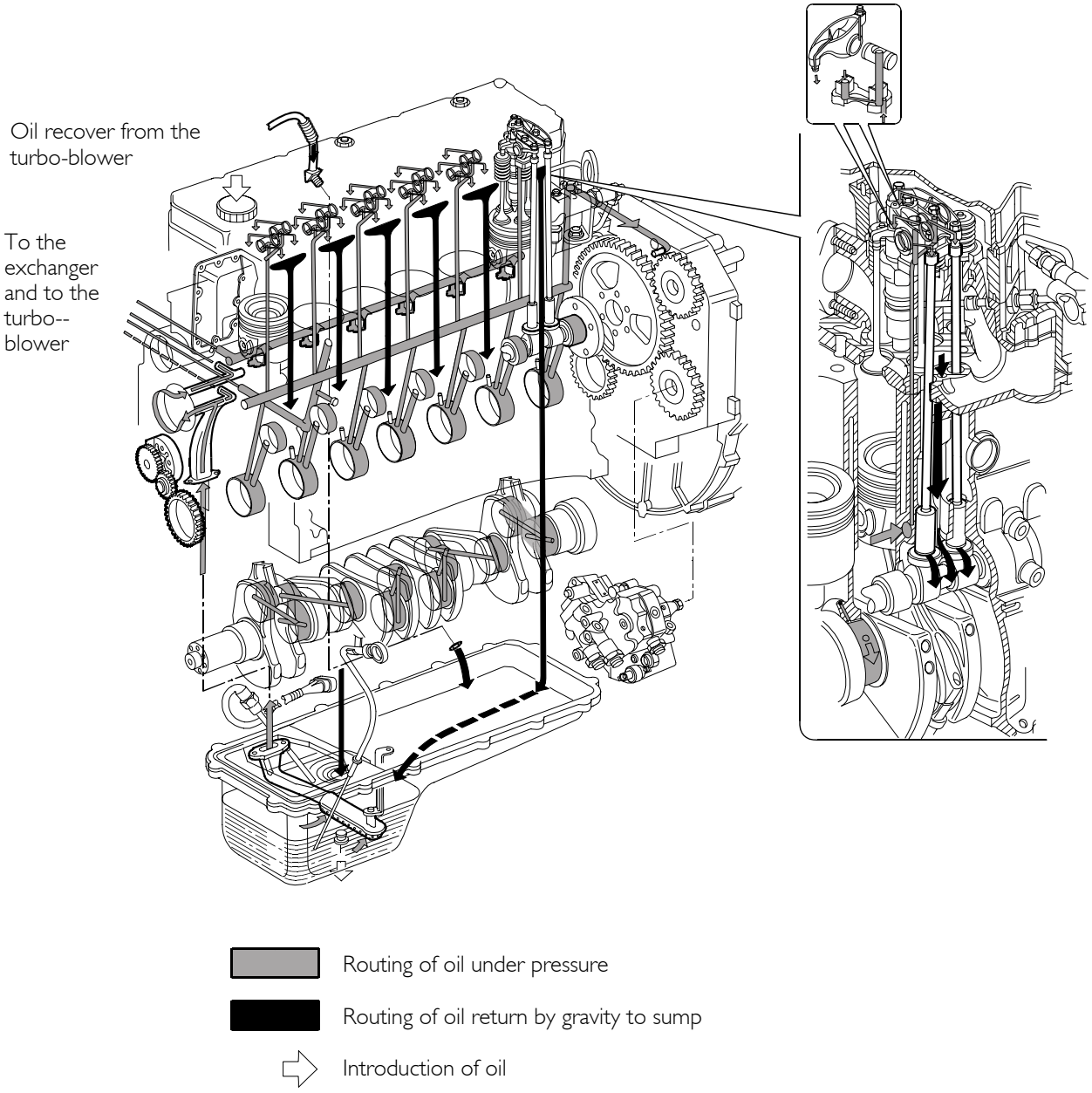
LUBRICATION SYSTEM LAYOUT
(4-cylinder engines)

6-cylinder engine version

Even for the 6 cylinders version lubrication is obtained by forced circulation and achieved through an oil rotary expansion pump similar to the 4 cylinders' one.

Also in this case, the components such as the oil exchanger, the turbo-blower and the eventual compressor are specifically studied and made out to suit the equipment or the duty for which the engine has been developed.

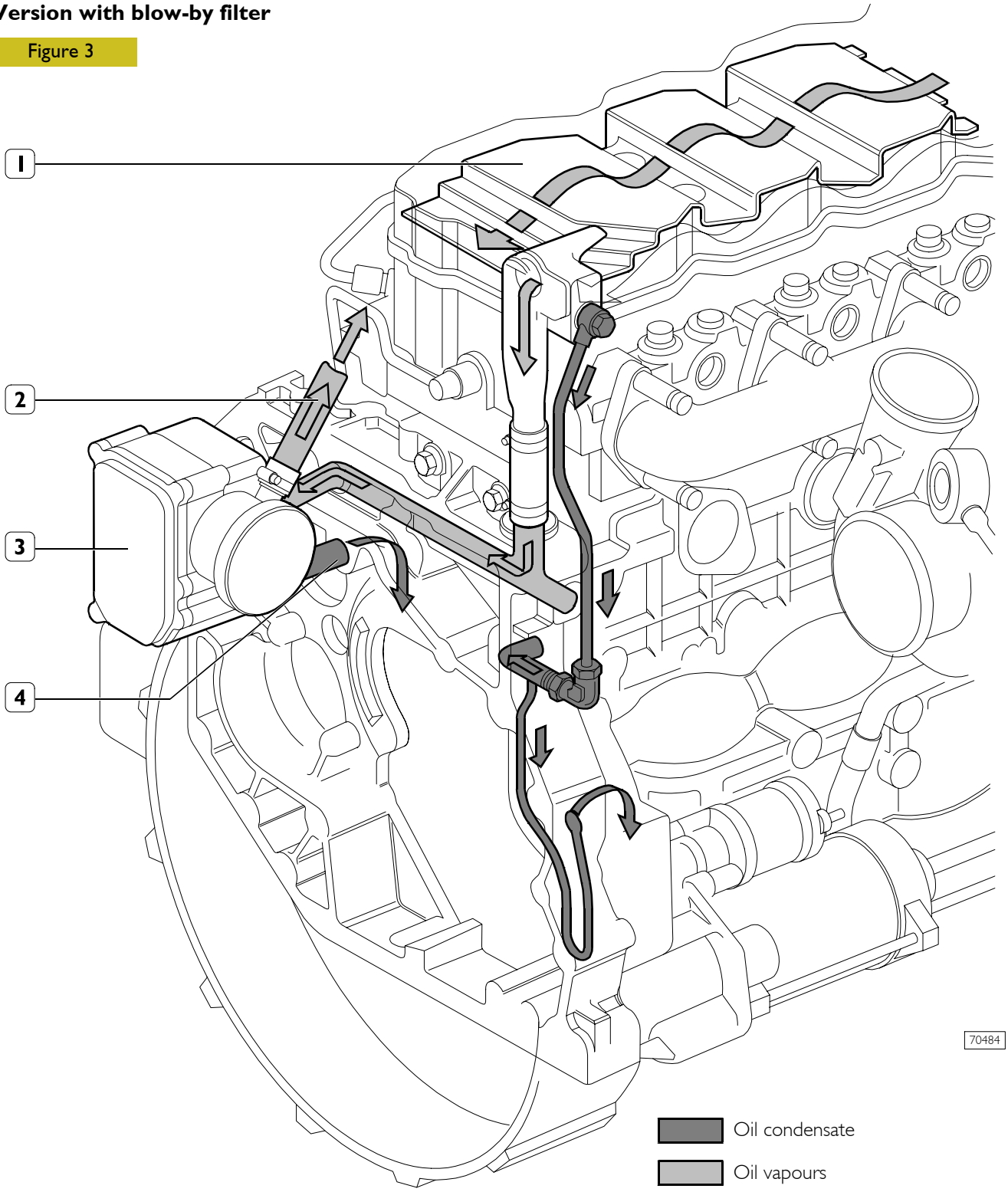
Figure 2 (Demonstration)



LUBRICATION SYSTEM LAYOUT
(6-cylinder engines)

OIL VAPOUR RECYCLING
Version with blow-by filter

Figure 3



1. Pre-separator - 2. Exhaust to the outside (temporary) - 3. Filter - 4. Return to engine.

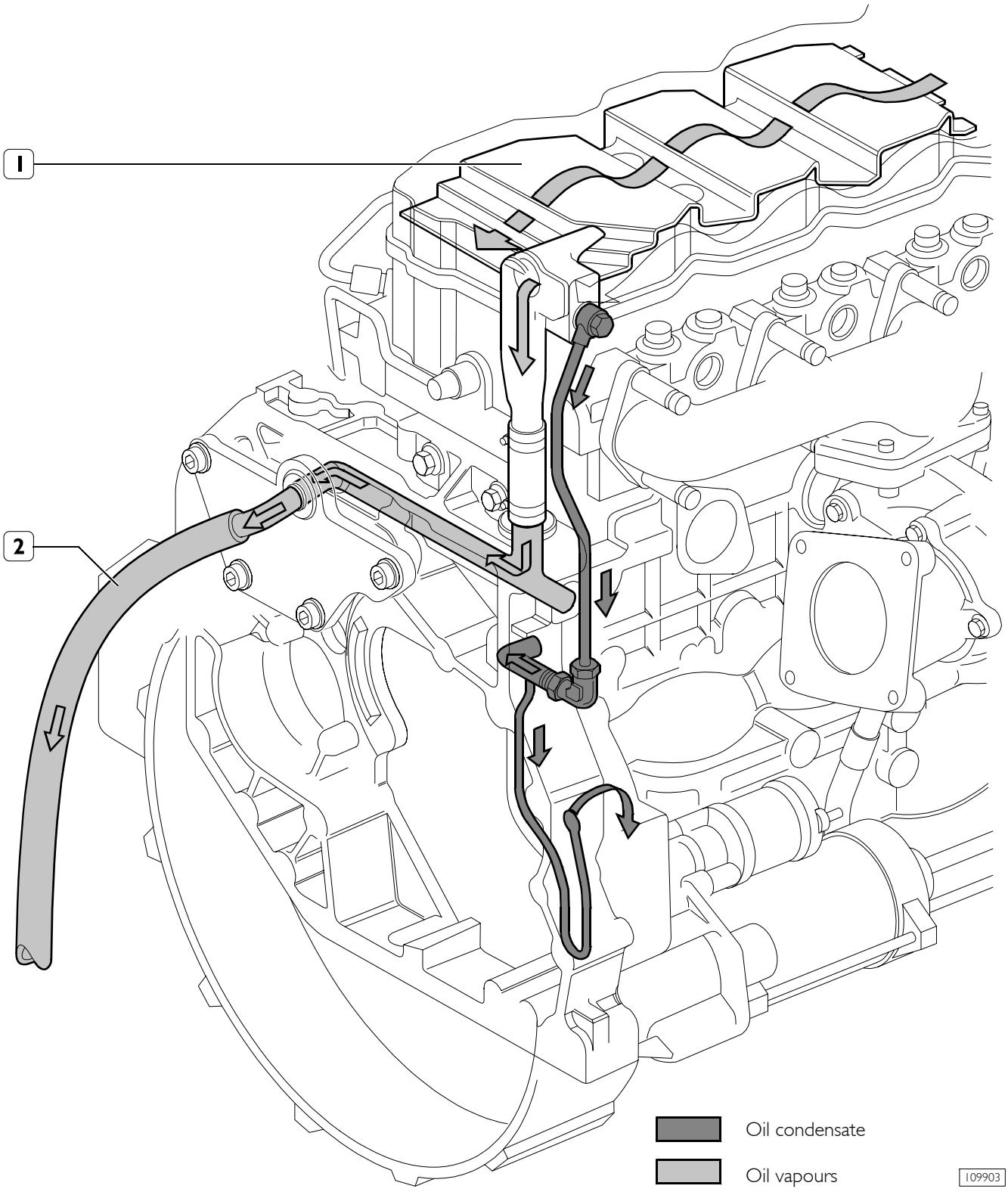
The tappet cover houses the pre-separator (1), whose shape and position determines an increase in oil vapour outlet speed and condenses a part of vapours at the same time.

Condensate oil returns to the oil sump whereas the residual vapours are ducted, collected and filtered in the blow-by (3).

In the blow-by (3), part of the vapours condense and return to the oil sump whereas the remaining part is put into cycle again through pipe (2).

Version without blow-by filter

Figure 4



1. Pre-separator - 2. Bleeder on side.

The tappet cover houses the pre-separator (1), whose shape and position determines an increase in oil vapour outlet speed and condenses a part of vapours at the same time.

The condensed oil returns to the oil sump, whereas the residual vapour is conveyed, collected and discharged into the open air through the bleeder on the side (2).

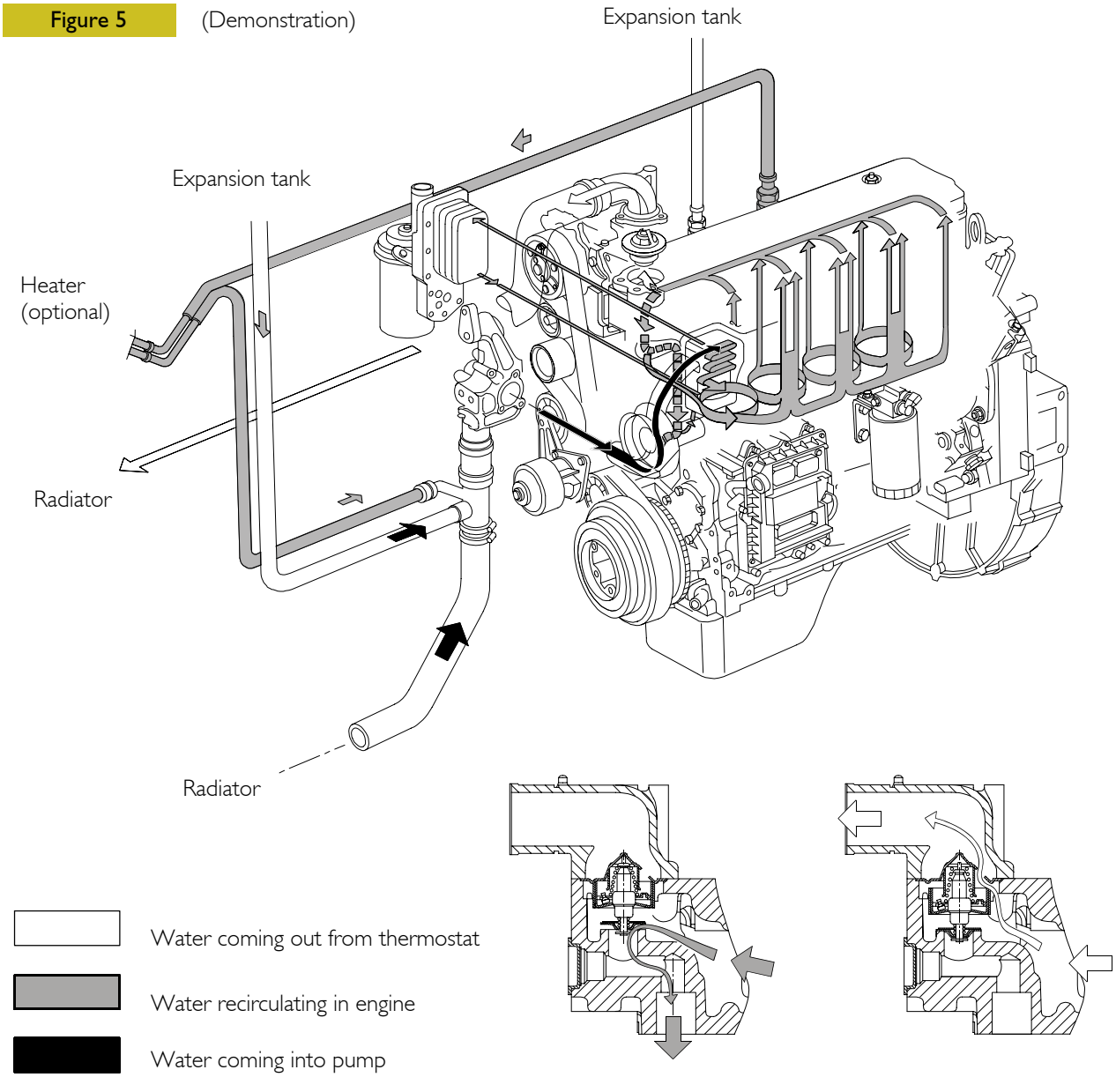
COOLING SYSTEM

The engine cooling system, closed circuit forced circulation type, generally incorporates the following components:

- ❑ Expansion tank; placement, shape and dimensions are subject to change according to the engine's equipment.
- ❑ Radiator, which has the duty to dissipate the heat subtracted to the engine by the cooling liquid. Also this component will have specific peculiarities based on the equipment developed, both for what concerns the placement and the dimensions.
- ❑ Viscous pusher fan, having the duty to increase the heat dissipating power of the radiator. This component as well will be specifically equipped based on the engine's development.
- ❑ Heat exchanger to cool the lubrication oil: even this component is part of the engine's specific equipment.
- ❑ Centrifugal water pump, placed in the front part of the engine block.
- ❑ Thermostat regulating the circulation of the cooling liquid.
- ❑ The circuit may eventually be extended to the compressor, if this is included in the equipment.

4-cylinder engine version

Figure 5 (Demonstration)



COOLING SYSTEM LAYOUT
4-cylinder engines

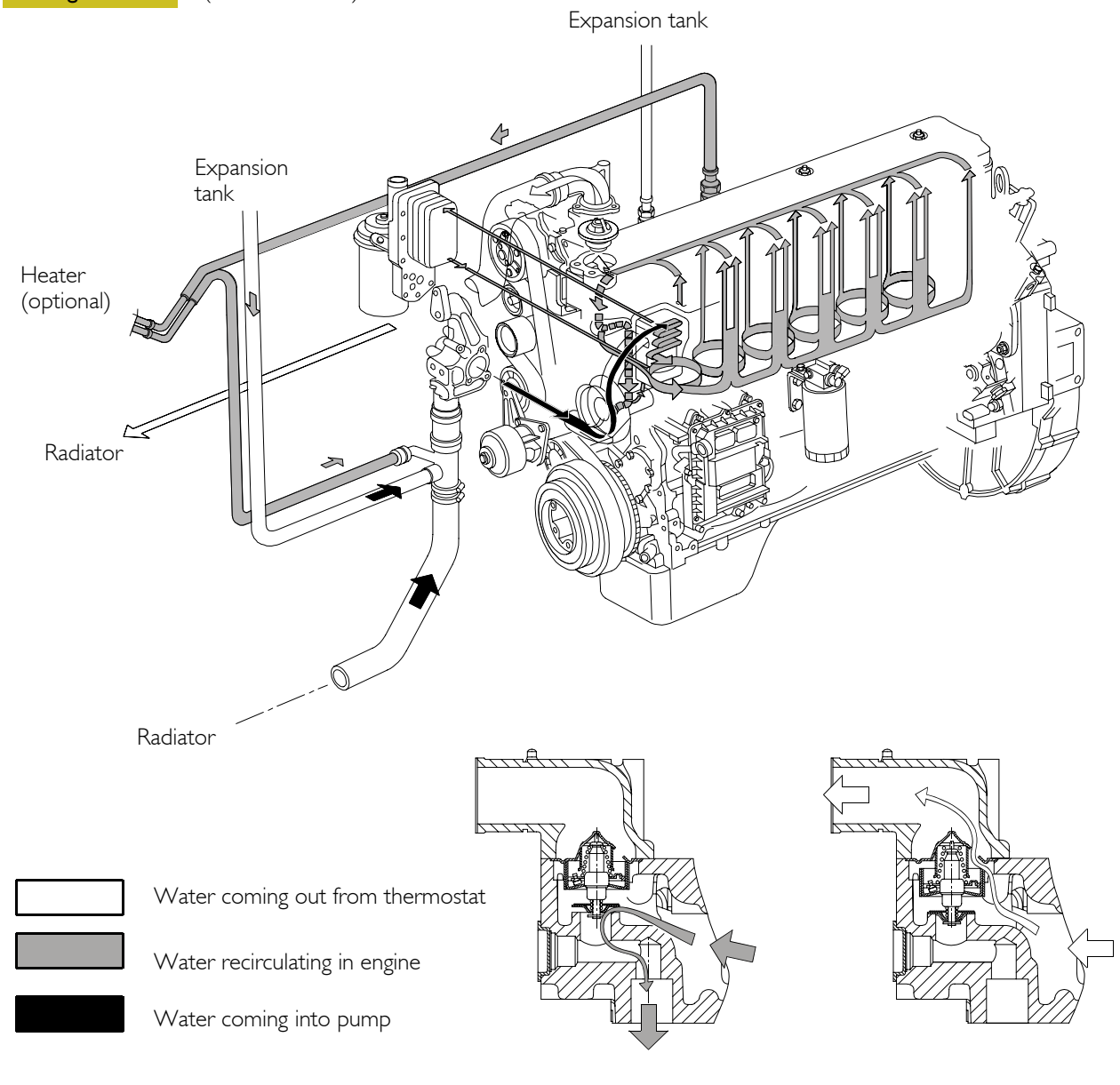
6-cylinder engine version

The engine cooling system, closed circuit forced circulation type, is of a similar design as the 4 cylinders engine.

It incorporates necessary components such as the radiator, the heat exchanger, the expansion tank and some ancillary components such as the heater or the compressor for the compressed air.

Such components always vary according to the engine's equipment and duty.

Figure 6 (Demonstration)

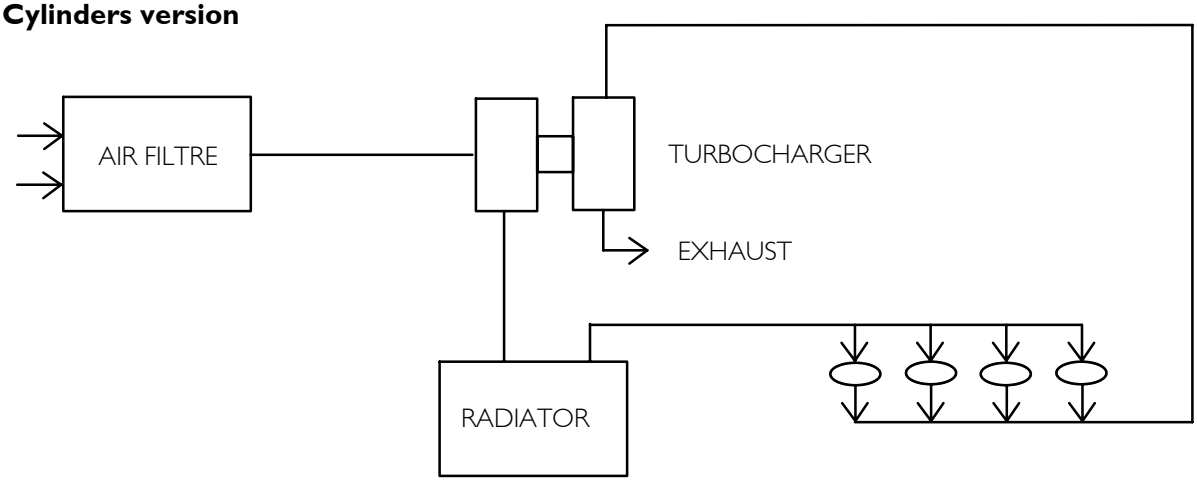


COOLING SYSTEM LAYOUT
6-cylinder engines

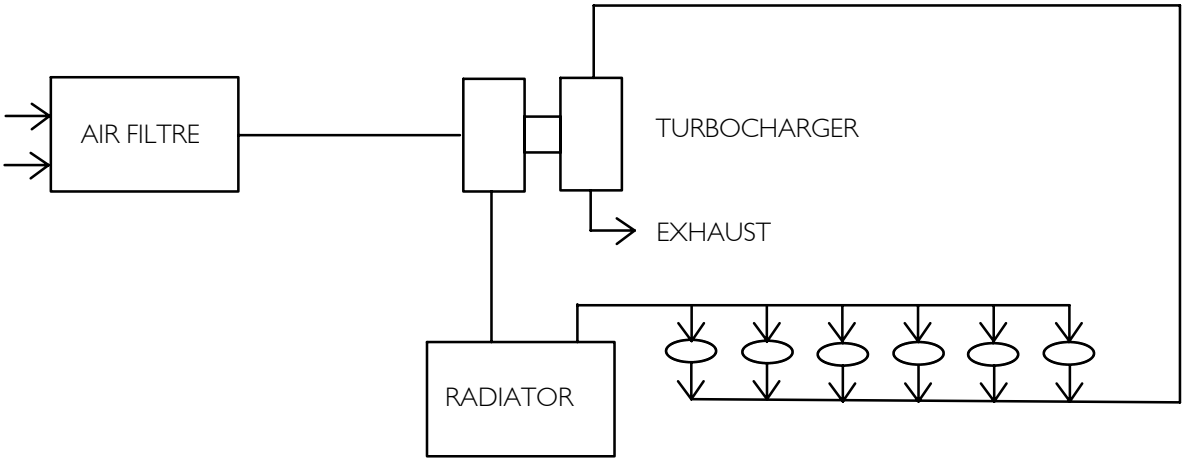
AIR INDUCTION - BOOST DIAGRAM

Figure 7

4 Cylinders version



6 Cylinders version



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Description

The turbocharger is composed by the following main parts: one turbine, one transforming valve to regulate the boost feeding pressure , one main body and one compressor.

During engine working process, the exhaust emissions flow through the body of the turbine, causing the turbine disk wheel's rotation.

The compressor rotor, being connected by shaft to the turbine disk wheel, rotates as long as this last one rotates, compressing the drawn air through the air filter.

The above mentioned air is then cooled by the radiator and flown through the piston induction collector.

The turbocharger is equipped with a transforming valve to regulate the pressure , that is located on the exhaust collector before the turbine and connected by piping to the induction collector.

It's funchon is to restrict the exhaust of the emissions , releasing part of them directly to the exhaust tube when the boost feeding pressure, over the compressor, reaches the prescribed bar value.

The cooling process and the lubrication of the turbocharger and of the bearings is made by the oil of the engine.

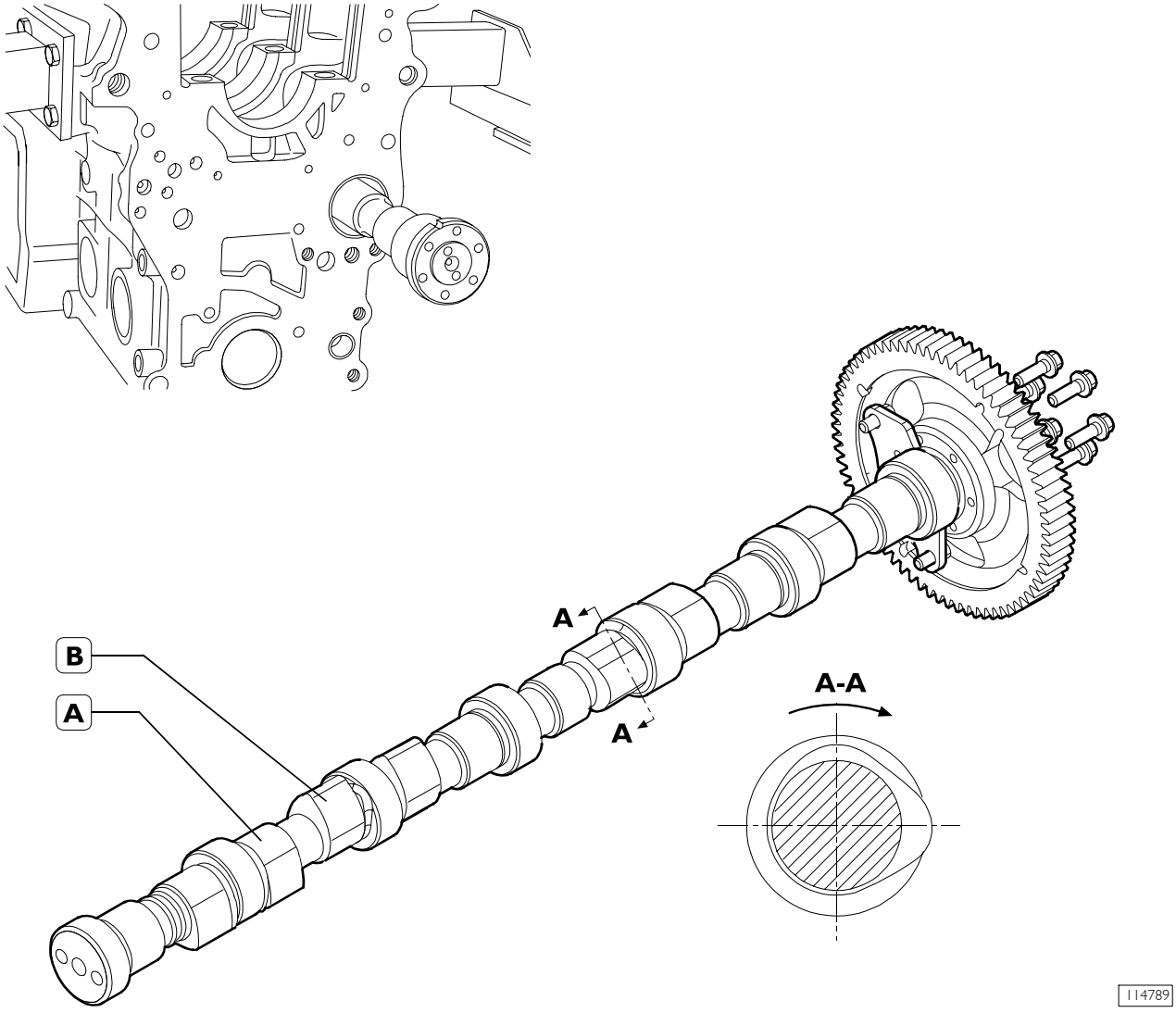
EXHAUST GAS RE-CIRCULATION SYSTEM (EGR)

In the TIER 3 version, the profile of the exhaust cam has been modified in order to allow the partial opening of the relative valve during the aspiration phase (re-circulation of EGR exhaust gas) with the subsequent re-introduction of part of the exhaust gas into the engine cylinders.
The exhaust gases can partially be re-directed into the cylinders so as to reduce the maximum combustion temperature values responsible for the production of nitric acid (NO_x).
The exhaust gas re-circulation system (EGR), reducing the combustion temperature by means of the diminishing of the concentration of oxygen in the combustion chamber, represents therefore an efficient control system of the emission of NO_x .

The internal EGR system is not equipped with any electronically controlled elements: the system is always active. Its configuration does not need additional elements i.e.checking valves, piping or heat exchangers.

The exhaust cam (B) has another lobe apart from the major lobe (see Section. A-A fig.) with respects to the configuration without EGR.
The additional lobe, during the aspiration phase in the cylinder in question, allows a brief opening of the exhaust valve generating re-circulation due to the intake of the exhaust gases caused by depression which is created in the aspiration phase inside the cylinder.

Figure 8



A. Aspiration valve control - B. Exhaust valve control.

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