CASE Engines
445/M2, 445T/M2 and 668T/M2

Service Manual

Bur 6-74500NA

CASE ENGINES
445/M2 445T/M2 668T/M2

SERVICE MANUAL

Part Number: 6-74500

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CONTENT OF SECTIONS

PREFACE TO USER'S GUIDELINE MANUAL

Section I describes the engine illustrating its features and working in general.

Section 2 describes the type of fuel feed.

Section 3 relates to the specific duty and is divided in four separate parts:

1. Mechanical part, related to the engine overhaul, limited to those components with different characteristics based on the relating specific duty.
2. Electrical part, concerning wiring harness, electrical and electronic equipment with different characteristics based on the relating specific duty.
3. Maintenance planning and specific overhaul.
4. Troubleshooting part dedicated to the operators who, being entitled to provide technical assistance, shall have simple and direct instructions to identify the cause of the major inconveniences.

Sections 4 and 5 illustrate the overhaul operations of the engine overhaul on stand and the necessary equipment to execute such operations.

Installation general prescriptions are reported within the appendix.

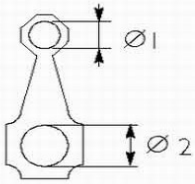
Such prescriptions shall be strictly followed by the operators in–charge of installation to avoid incorrect working as well as serious failures which may reduce performance and life of the engine.

Furthermore, the appendix reports general safety prescriptions to be followed by all operators whether being in–charge of installation or maintenance, in order to avoid serious injury.

SPECIAL REMARKS

Where possible, the same sequence of procedures has been followed for easy reference.
Diagrams and symbols have been widely used to give a clearer and more immediate illustration of the subject being dealt with, (see next page) instead of giving descriptions of some operations or procedures.

Example



Ø 1 = housing for connecting rod small end bush

Ø 2 = housing for connecting rod bearings

Tighten to torque
Tighten to torque + angular value

Graph and symbols

	Removal Disconnection
	Refitting Connection
	Removal Disassembly
	Fitting in place Assembly
	Tighten to torque
	Tighten to torque + angle value
	Press or caulk
	Regulation Adjustment
	Warning Note
	Visual inspection Fitting position check
	Measurement Value to find Check
	Equipment
	Surface for machining Machine finish
	Interference Strained assembly
	Thickness Clearance
	Lubrication Damp Grease
	Sealant Adhesive
	Air bleeding

	Intake
	Exhaust
	Operation
	Compression ratio
	Tolerance Weight difference
	Rolling torque
	Rotation
	Angle Angular value
	Preload
	Number of revolutions
	Temperature
	Pressure
	Oversized Higher than.... Maximum, peak
	Undersized Less than.... Minimum
	Selection Classes Oversizing
	Temperature < 0 °C Cold Winter
	Temperature > 0 °C Hot Summer

UPDATING

SECTION	DESCRIPTION	PAGE	DATE OF REVISION

ENGINES

General information

Thanks to a centenary engine tradition as well as to a continuous research and development process focused on product advancement, E.B.U. is able to ensure the highest level of versatility and efficiency on the market.

The new range of engines is the result of a project originated by the partnership among some of the most important sector manufacturers in the World to meet the expectations of the customer and comply with the new European regulations ruling preservation of the environment.

In addition to their better performances in terms of stout, power, efficiency, reliability and life, these engines comply not only with the anti–pollution Euro 3 regulations and the relevant prescriptions for noise limit allowed but will also meet the prescriptions of the future more severe specifications with no need of substantial modifications.

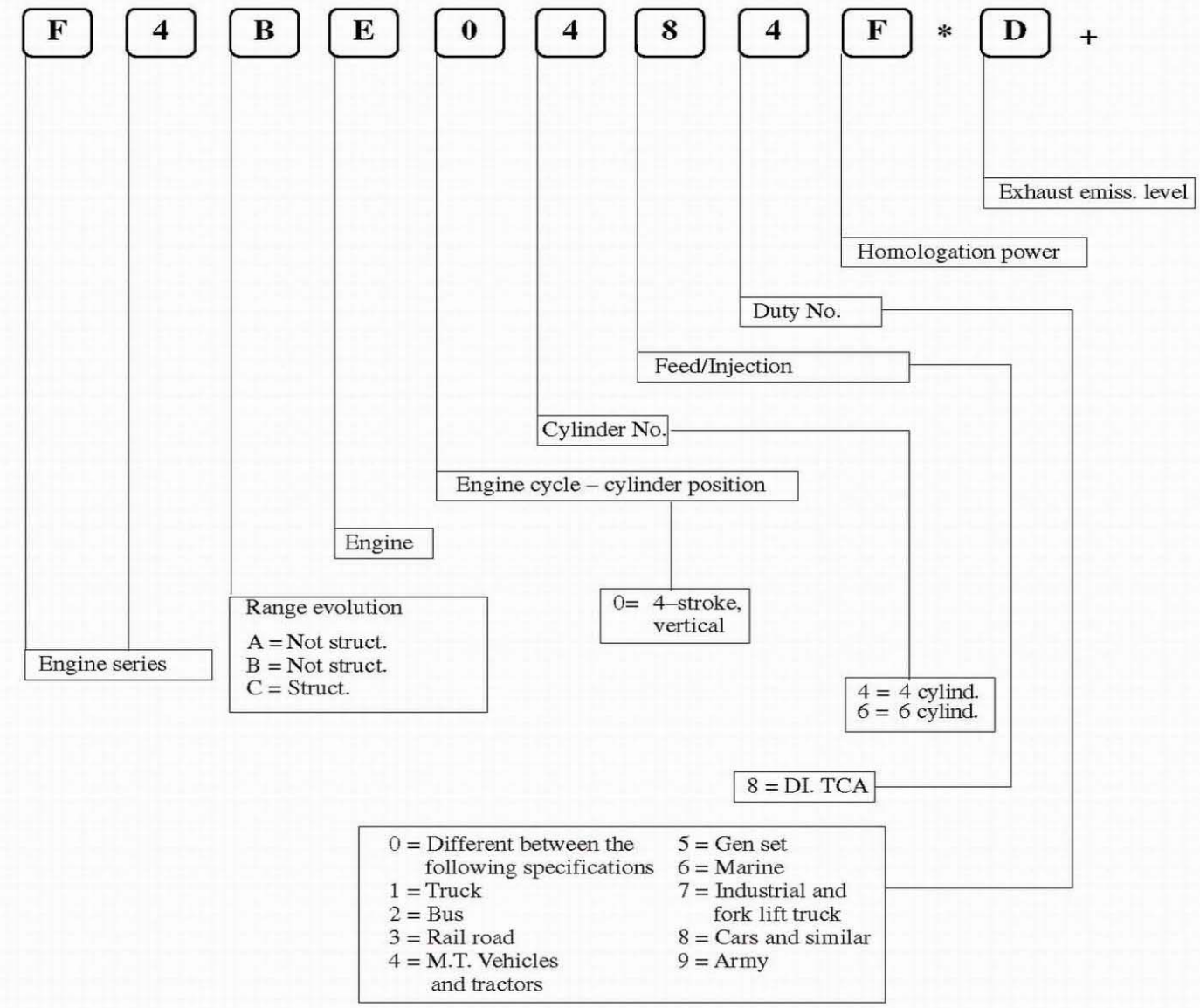
The improvement of the above mentioned features has been possible thanks to the utilisation of new materials, new technologies and technical solutions such as: cylinder head with two–four valves per cylinder, induction and exhaust manifolds improving the dynamic flow of air as well as of exhaust emissions, and pistons with new shaped combustion chamber.

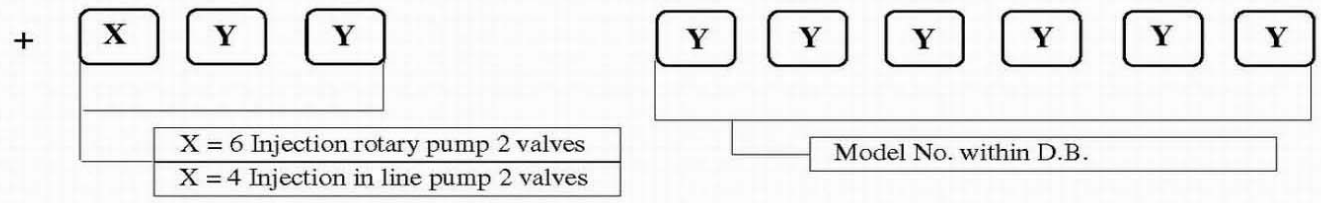
Furthermore, the reliability and cost reduction has been enhanced reducing the number of components and utilising the same parts not only for engines destined to road engine applications but also for the most different purposes such as marine and station engines.

SECTION 1

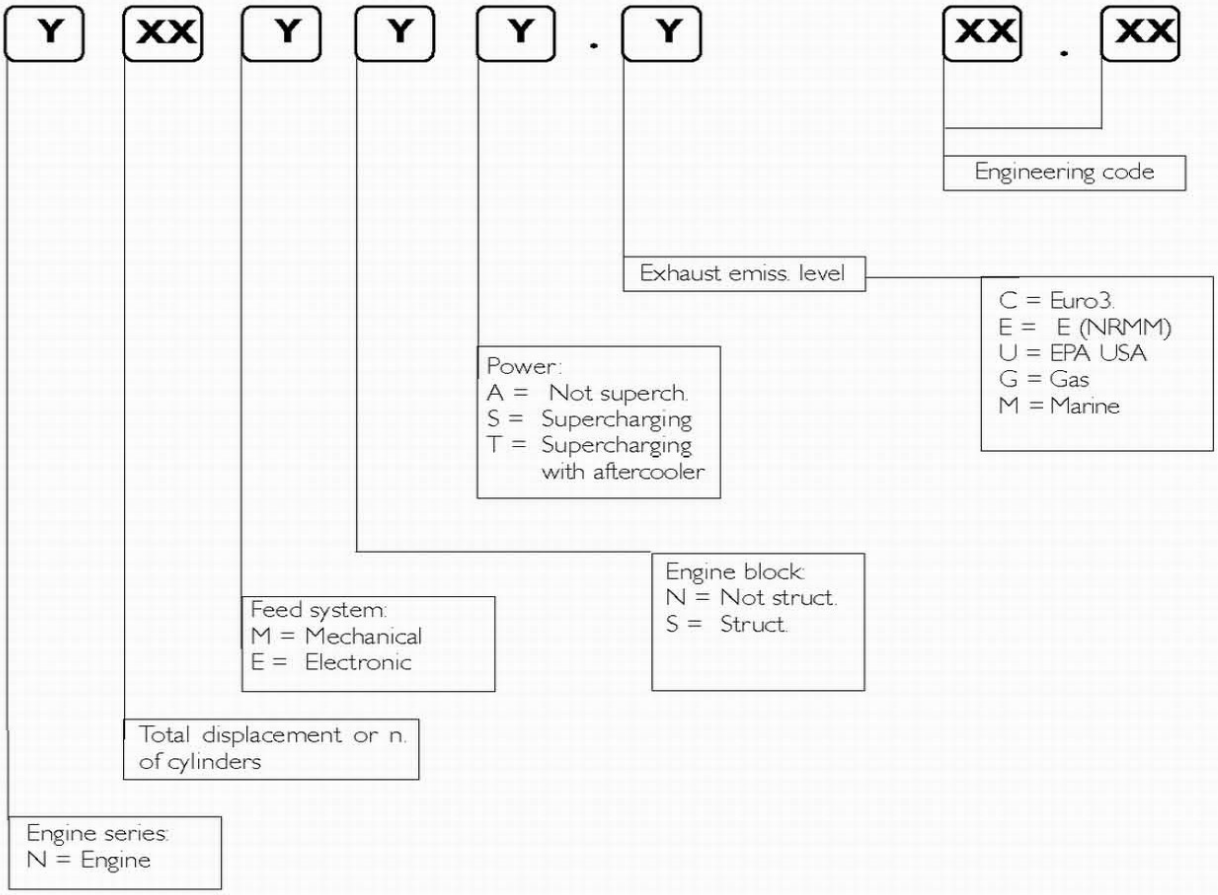
General Specifications

ENGINE IDENTIFICATION CODE





SPECIFIC ENGINE CODE



EXAMPLES:

N40ENTC
N = Engine
40 = 4 liters
E = Electronic
N = Type of Engine block
T = Supercharger with aftercooler
C = Euro3

LUBRICATION

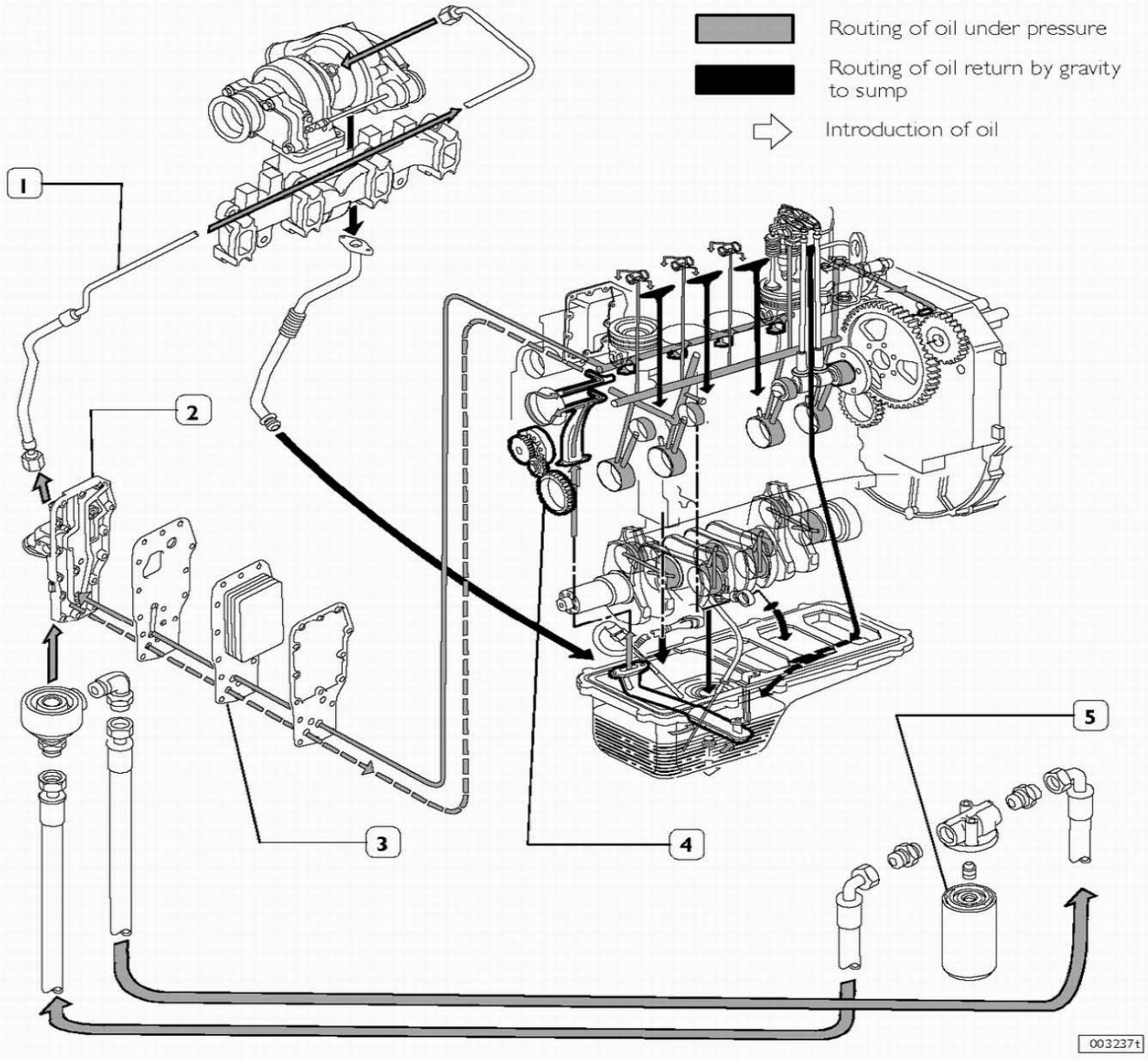
Lubrication by forced circulation is achieved through oil rotary expansion pump (4), placed in the front part of the basement, driven by the straight–tooth gear splined to the shaft's bar hold.

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

Lubrication involves the heat exchanger (2,3) as well, the supercharged (through pipe 1) and the eventual compressor for any eventual compressed air system.

All these components may often vary according to the specific duty.

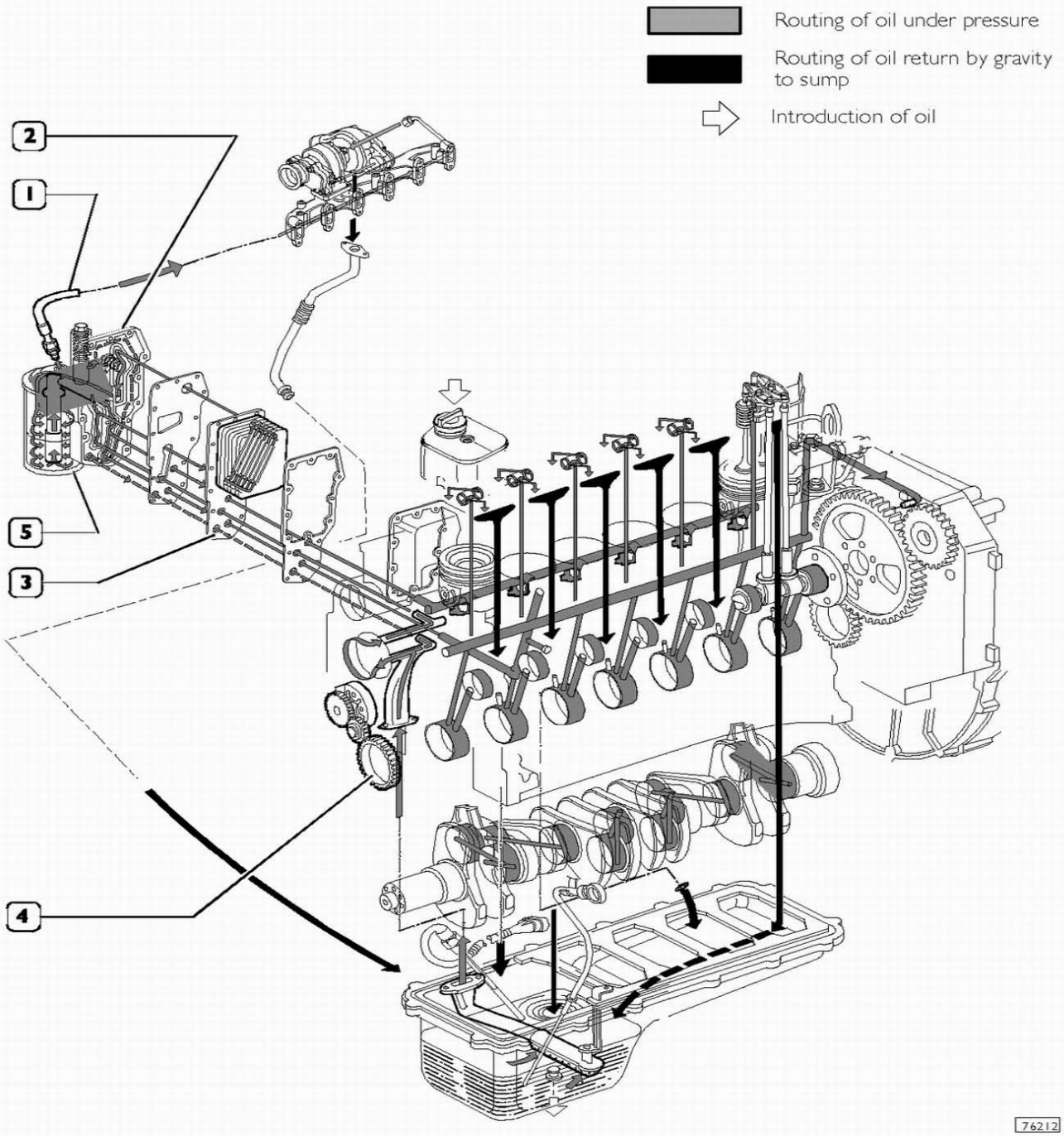
Figure 1



LUBRICATION SYSTEM LAYOUT (4 cyl. engines)

1. Lubrication oil pipe to supercharger – 2. Heat exchanger body – 3. Heat exchanger – 4. Oil rotary expansion pump – 5. Oil filter

Figure 2

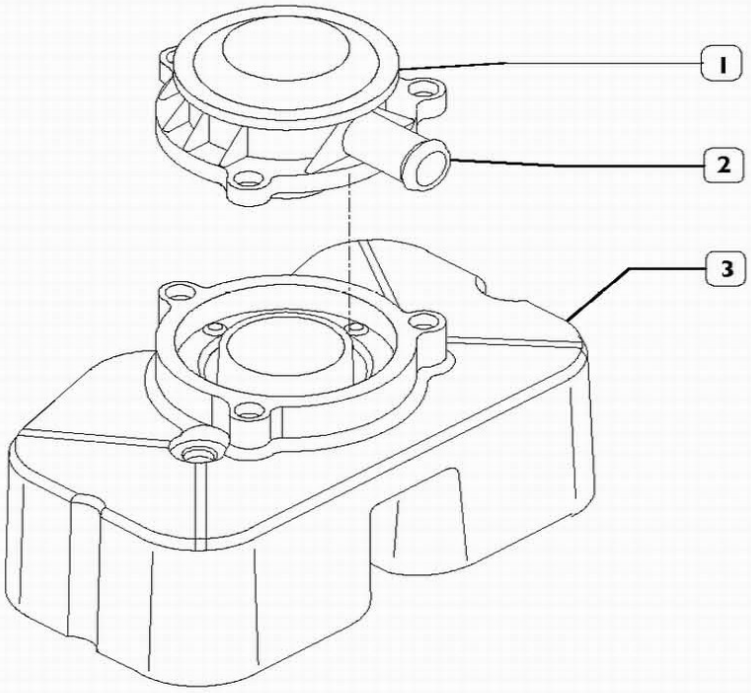


LUBRICATION SYSTEM LAYOUT (6 cyl. engines)

1. Lubrication oil pipe to supercharger – 2. Heat exchanger body – 3. Heat exchanger – 4. Oil rotary expansion pump – 5. Oil filter

OIL VAPOUR RECIRCULATING SYSTEM

Figure 3



1. Valve – 2. Breather pipe – 3. Tappet Cap

On the tappet cap (3) there is a valve (1) whose duty is to condense oil vapour inducing these to fall down because of gravity, to the Tappet cap underneath.

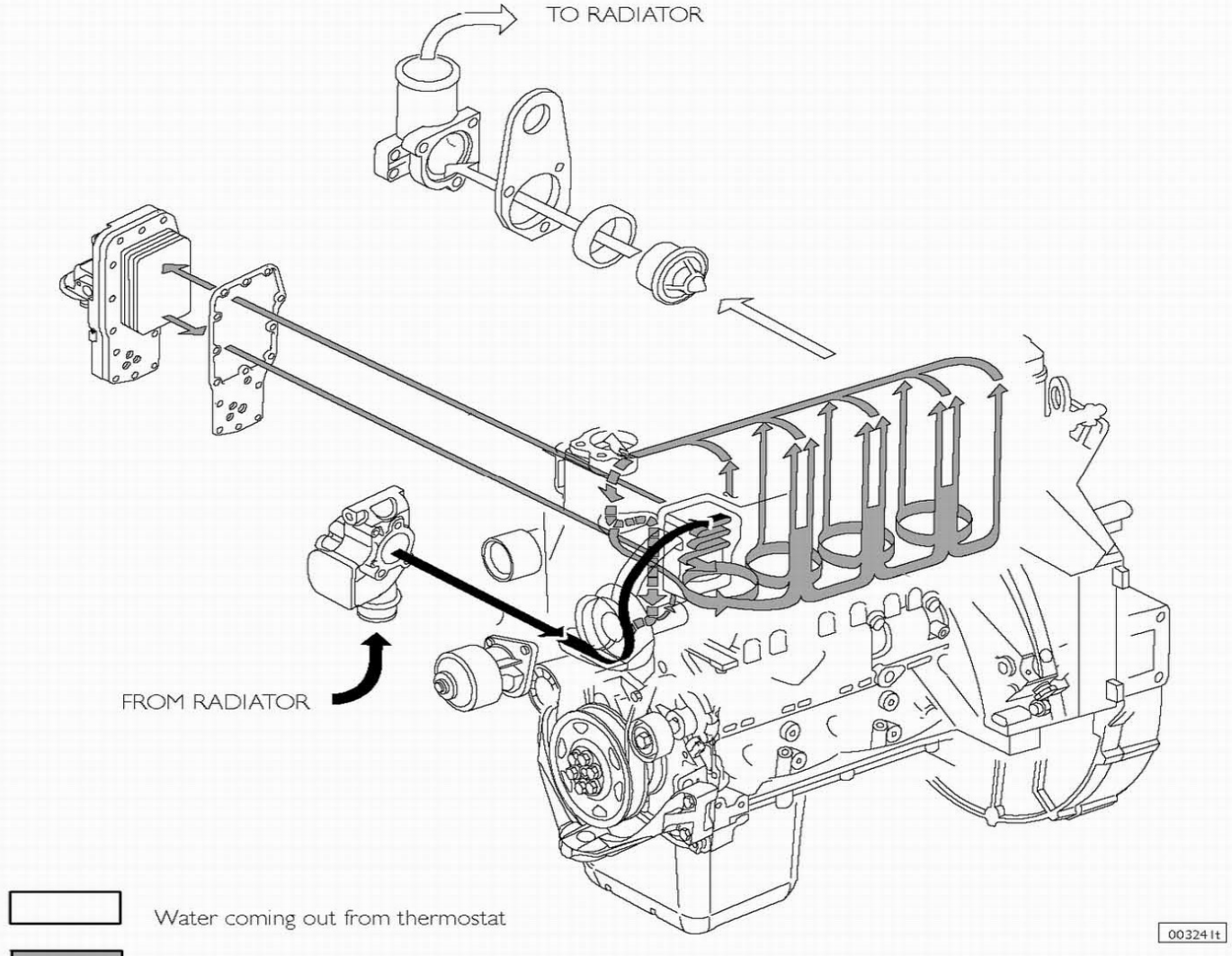
The remaining non–condensed vapours shall be properly conveyed through the breather pipe (2), by suction as an example (connection towards these vapours shall be designed by the Engineer).

COOLING SYSTEM

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

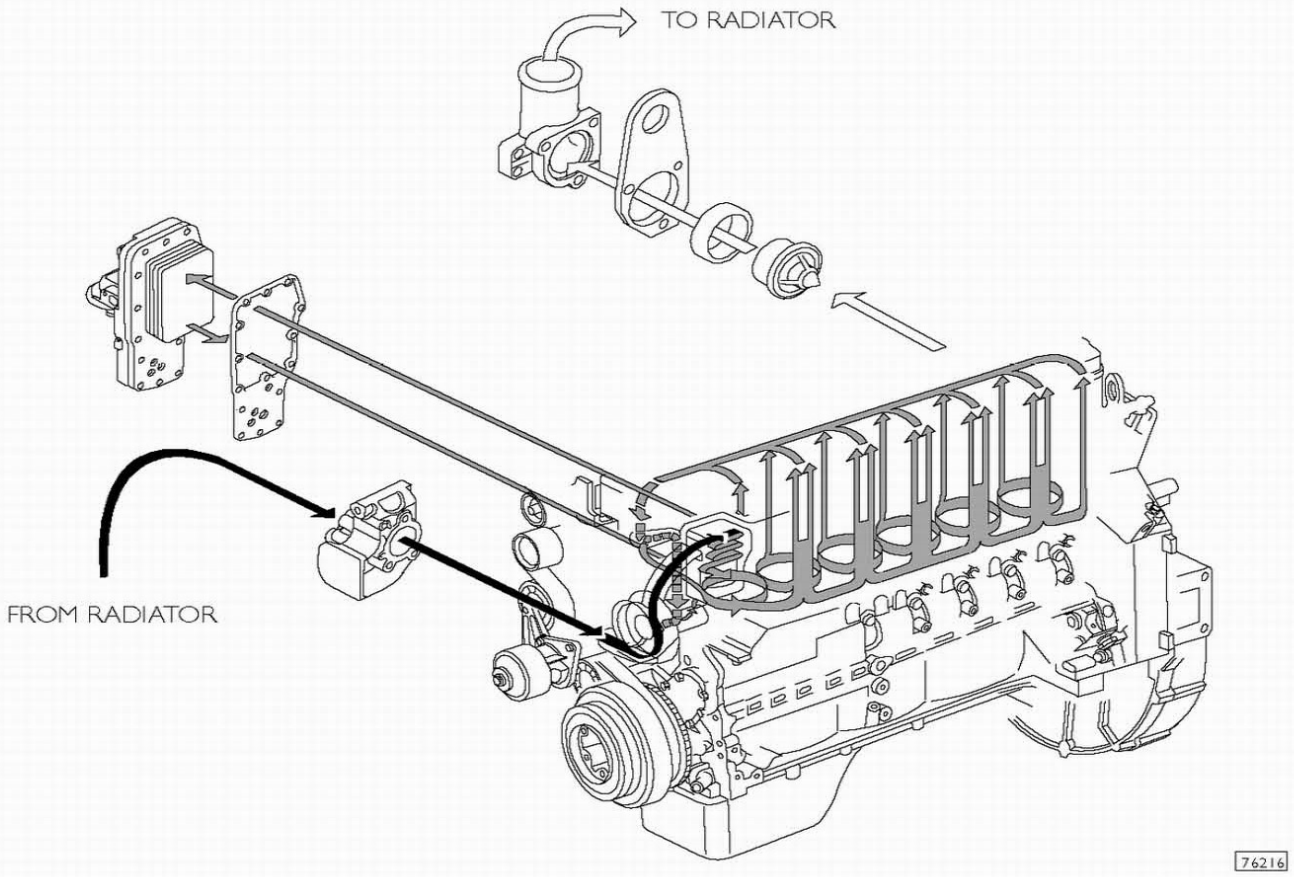
- Expansion tank; placement, shape and dimensions are subject to change according to the engine's equipment.
- Radiator, which has the duty to dissipate the heat subtracted to the engine by the cooling liquid. Also this component will have specific peculiarities based on the equipment developed, both for what concerns the placement and the dimensions.
- Visc 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.

Figure 4



COOLING SYSTEM LAYOUT (4 cyl. engines)

Figure 5



Water coming out from thermostat

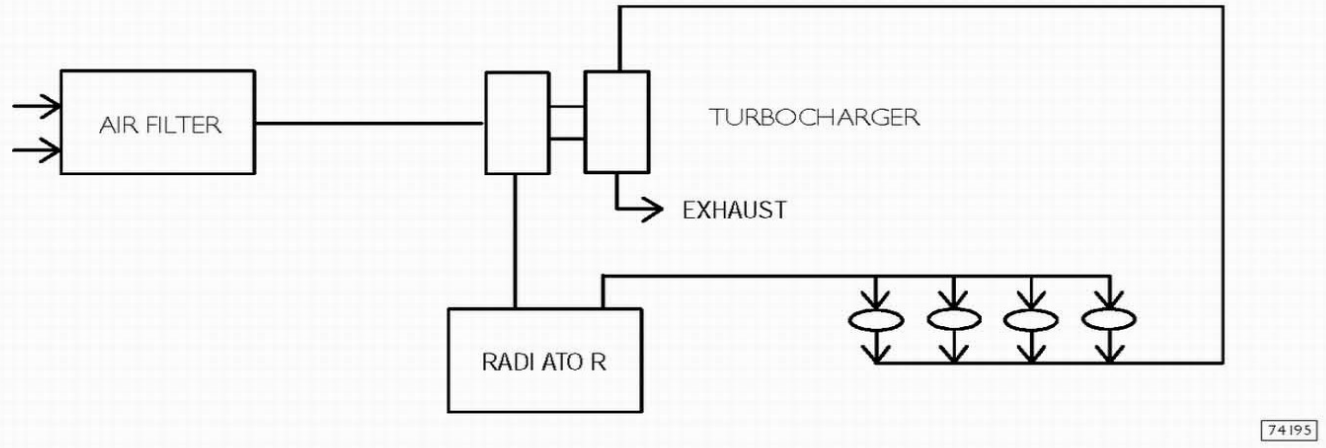
Water recirculating in engine

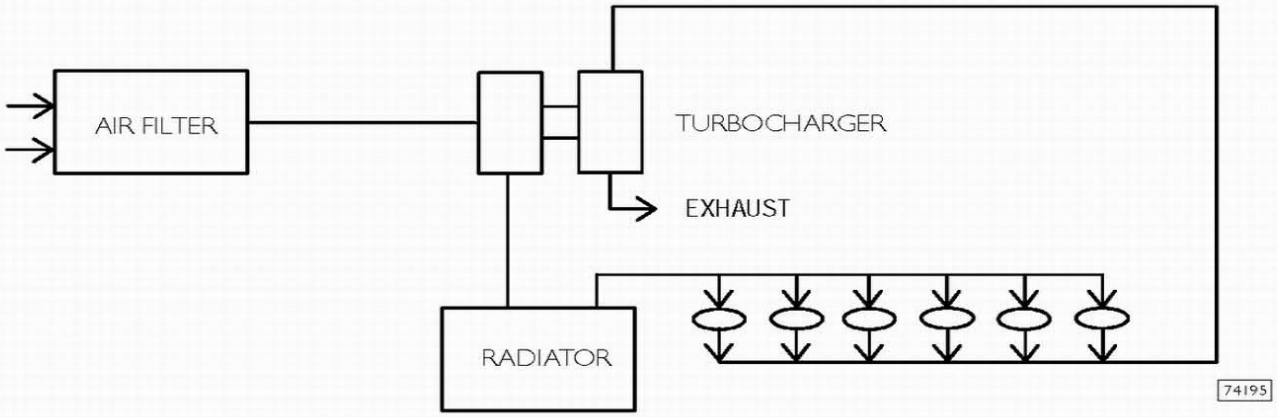
Water coming into pump

COOLING SYSTEM LAYOUT (6 cyl. engines)

BOOST FEEDING DIAGRAM

Figure 6





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 emission flow through the body of the turbine, provoking 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 sucked 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 duty is to choke 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.

SECTION 2

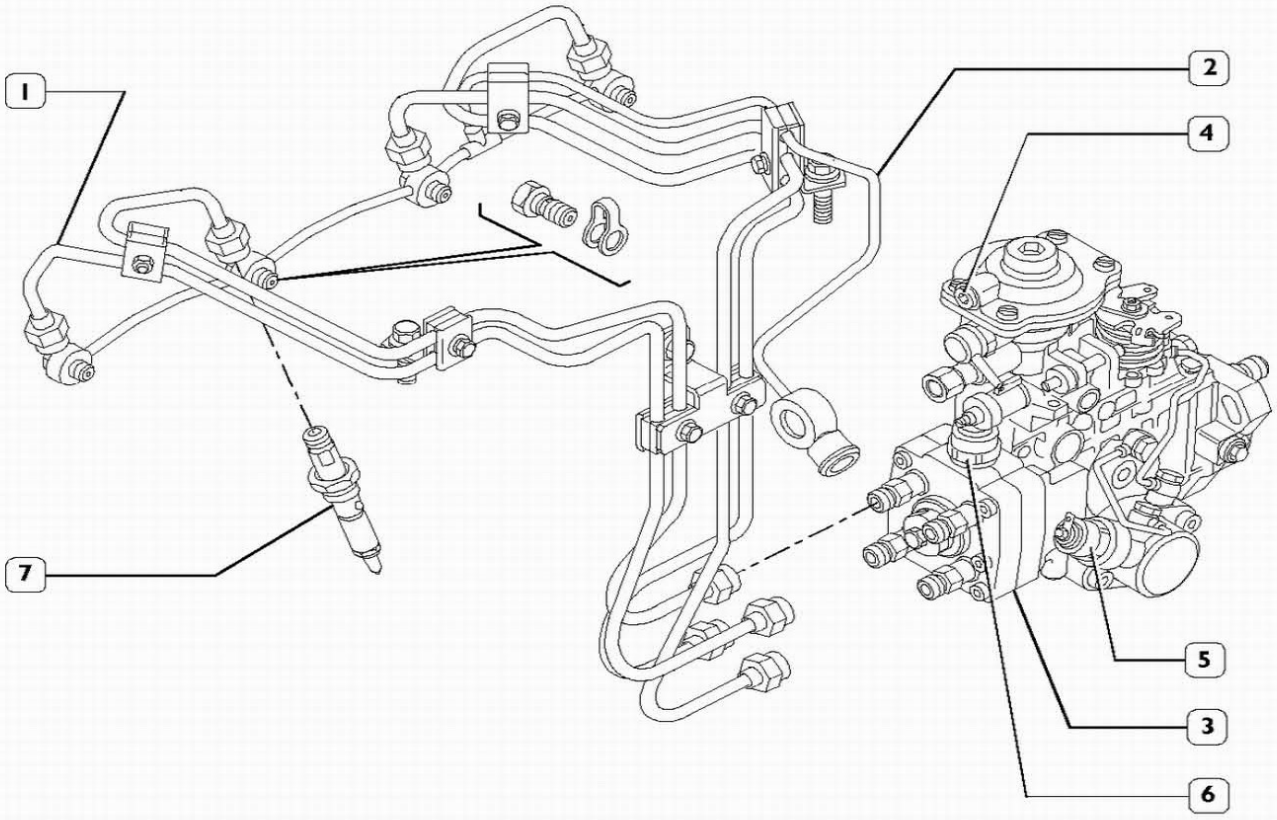
INJECTION FEED SYSTEM BY MECHANICAL ROTARY PUMP

General information

Fuel feed system is composed by:

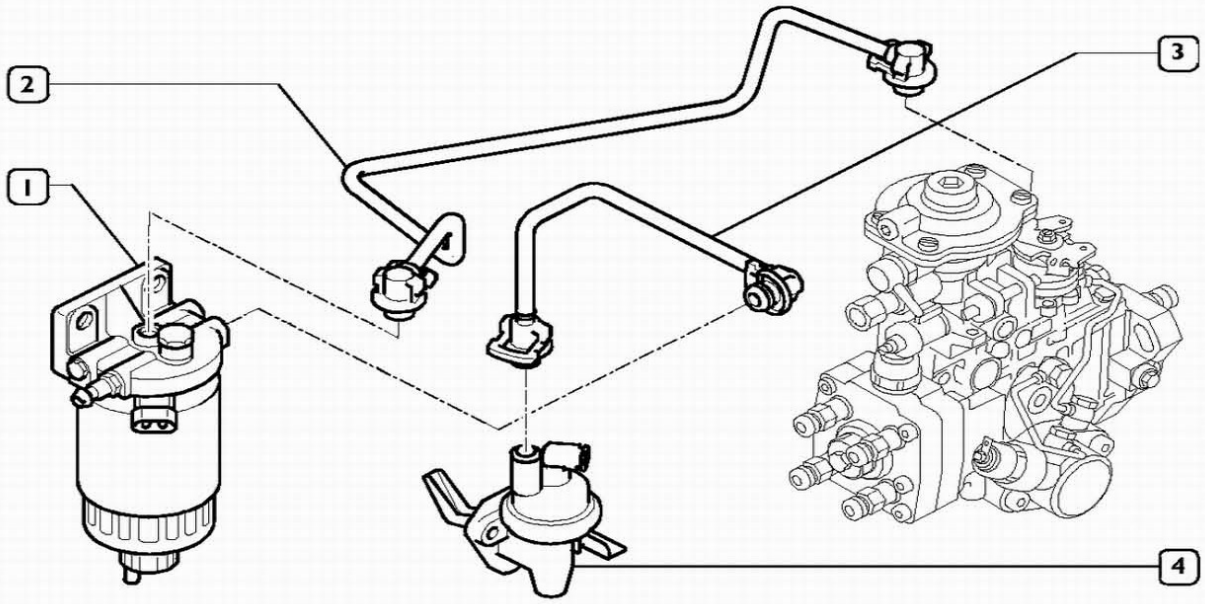
- ❑ Fuel tank (placed on the machine)
- ❑ Fuel delivery and back-flow to tank
- ❑ Fuel pre-filter (if available, it is usually placed close to the engine on the machine frame)
- ❑ Priming pump, assembled to the engine and driven by the camshaft
- ❑ Fuel filter (assembled to the engine in different positions according to equipment application and duty)
- ❑ Injector feed pipeline (from fuel feed pump to injectors)
- ❑ Injectors

Figura 1



1. Injector feed pipes – 2. Fuel exhaust pipes from injectors – 3. Fuel feed rotary pump – 4. Connector for LDA pressure gauge pipe within suction collector – 5. KKSB thermal bulb – 6. Electro-valve – 7. Injector

Figura 2



1. Fuel filter – 2. Feed pipeline from filter to fuel pump – 3. Feed pipeline from priming pump to filter – 4. Priming pump

Description of working principles

Fuel is sucked from the fuel tank by the priming pump. This last one is placed on the engine basement and is driven by the camshaft.

Throughout the filter/s, the fuel is piped to the union fitting vacuum chamber of the transfer pump. (For applications to be equipped in cold climate areas, the fuel filter is provided with heater).

Transfer pump is placed inside the feed pump, and is bladed type; its duty is to increase fuel pressure in correspondence with the increase of the number of revolutions.

The fuel arrives therefore to the valve gauging the pressure inside feed pump.

The distribution plunger further increases this pressure and delivers fuel throughout the delivery pipe fitting to the injectors.

The fuel drawing from the injectors is recovered and delivered to the tank again.

FEED PUMP

VE 4 12 1150L rotary type pump is driven by a gear mating the camshaft's one.

Identification

V = Distribution rotary plunger

E = Pump dimensions

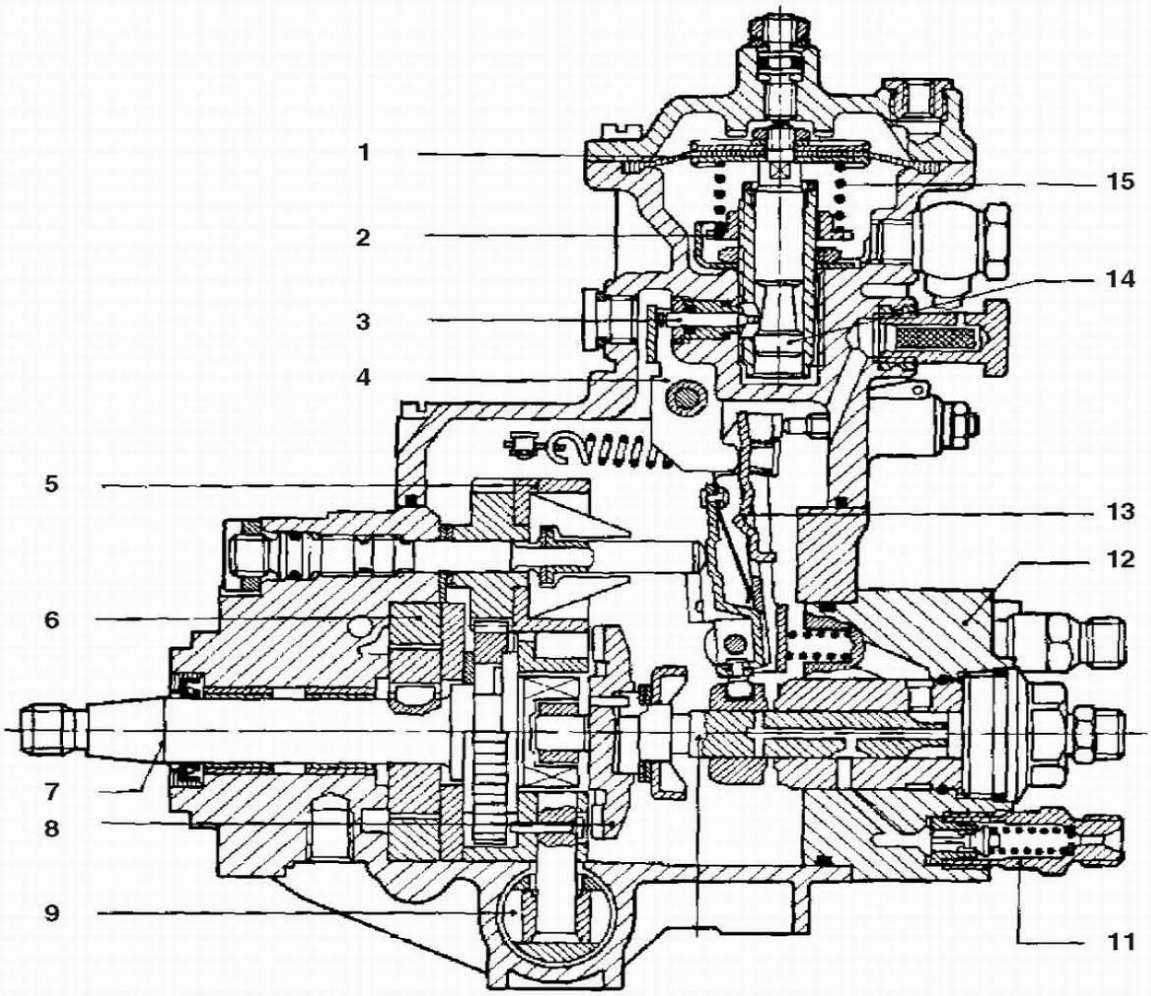
4 = 4 cylinders engine

12 = Distribution plunger in mm.

1150 = Number of pump revolutions per minute

LV = Left direction of rotation

Figura 3



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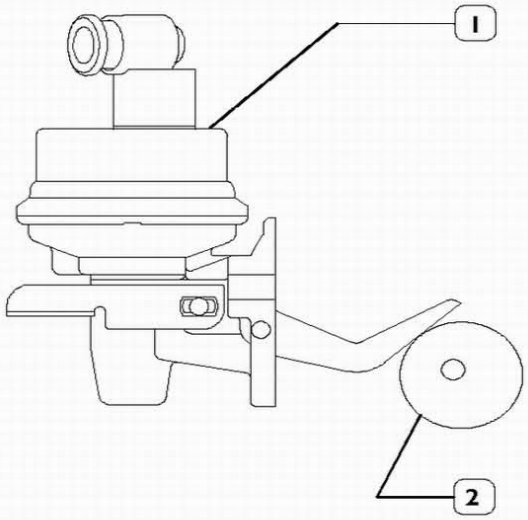
Injection pump longitudinal section

1. Diafram 2. Locking nut 3. Pivot 4. Drive lever 5. Speed gauge 6. Transfer pump 7. Drive shaft 8. Cam disk 9. Advance converter 10. Distribution plunger 11. Delivery pipe fitting 12. Hydraulic head 13. Drive plate 14. Gauge pin 15. Counteracting spring.

PRIMING PUMP

This pump has the specific duty to prime the fuel available in the tank and convey it to the feed pump inlet. It is assembled to the engine basement and driven by the camshaft.
The picture here following shows the pump (1) and the position that the pump drive lever assumes depending on the camshaft rotation (2) and on its eccentricity.

Figura 4



3246t

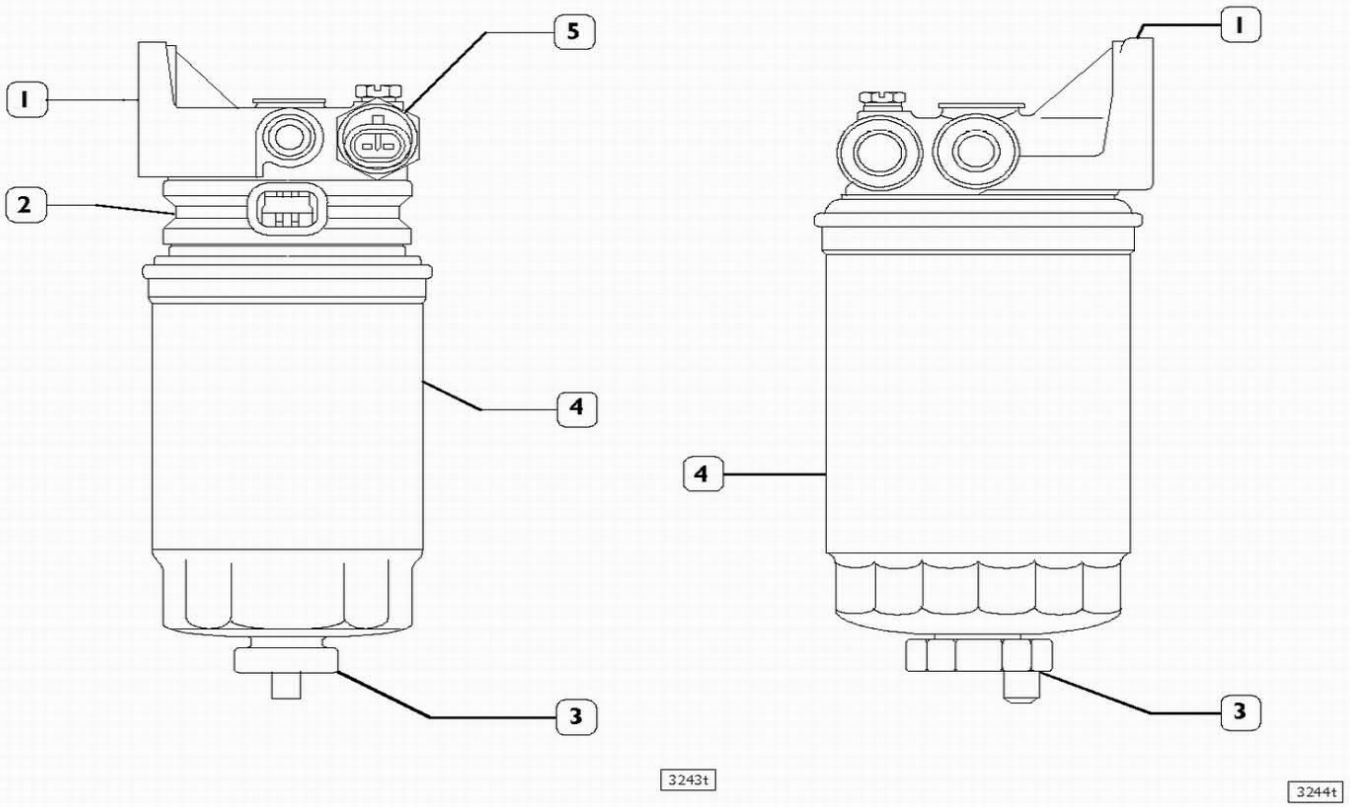
1. Priming pump – 2. Camshaft

FUEL FILTER

The filter is assembled close to the feed and priming pump and has the specific duty to provide barrier to the impurities and separation of water from fuel.

On the filter cartridge base (4) there is a water dump screw, throughout which it is possible to provide regular drainage; on the bearing (1) for those equipment applications requiring it (cold climate areas), there can be a heater assembled to (2) and a temperature sensor (5).

Figura 5



1. Fuel filter bearing – 2. Heater – 3. Water dump screw – 4. Filter cartridge – 5. Temperature sensor