CURSOR TIER 3 SERIES

Industrial application

C13 TURBOCOMPOUND

Technical and Repair manual

GENERAL WARNINGS ON THE ELECTRIC SYSTEM

If an intervention has to be made on the electric/electronic system, disconnect batteries from the system; in this case, always disconnect, as a first one, the chassis bonding cable from batteries negative terminal.

Before connecting the batteries to the system, make sure that the system is well isolated.

Disconnect the external recharging apparatus from the public utility network before taking apparatus pins off battery terminals.

Do not cause sparks to be generated in checking if the circuit is energised.

Do not use a test lamp in checking circuit continuity, but only use proper control apparatuses.

Make sure that the electronic devices wiring harnesses (length, lead type, location, strapping, connection to screening braiding, bonding, etc.) comply with IVECO Motors system and are carefully recovered after repair or maintenance interventions.

Measurements in drive electronic central units, plugged connections and electric connections to components can only be made on proper testing lines with special plugs and plug bushes. Never use improper means like wires, screwdrivers, clips and the like in order to avoid the danger of causing a short circuit, as well as of damaging plugged connections, which would later cause contact problems.

To start up the engine, do not use fast chargers. Start up must only be performed with either separate batteries or special truck.

A wrong polarisation of supply voltage in drive electronic central units (for instance, a wrong polarisation of batteries) can cause them to be destroyed.

Disconnect the batteries from the system during their recharging with an external apparatus.

On connecting, only screw up connector (temperature sensors, pressure sensors etc.) nuts at prescribed tightening torque.

Before disconnecting the junction connector from an electronic central unit, isolate the system.

Do not directly supply electronic central units servo components at nominal vehicle voltage.

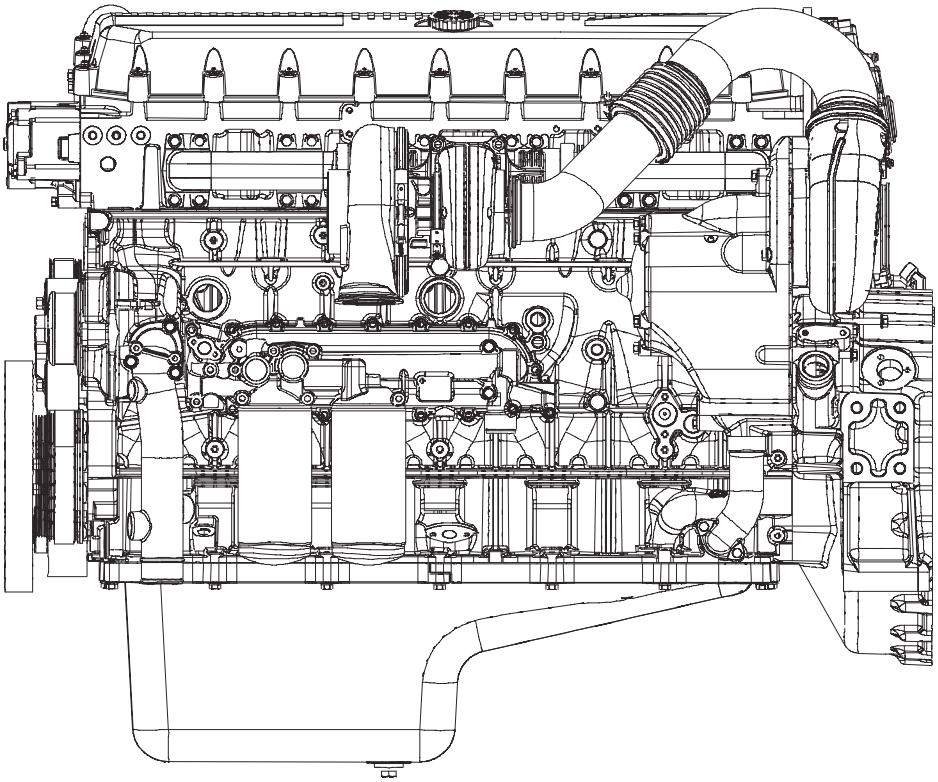
Cables must be arranged such as to result to be parallel to reference plane, i.e. as close as possible to chassis/body structure.

Once the intervention on the electric system has been completed, recover connectors and wiring harnesses according to original arrangement.

NOTE Connectors present must be seen from cable side. Connectors views contained in the manual are representative of cable side.

VIEWS OF ENGINE F3CE0684A*E001

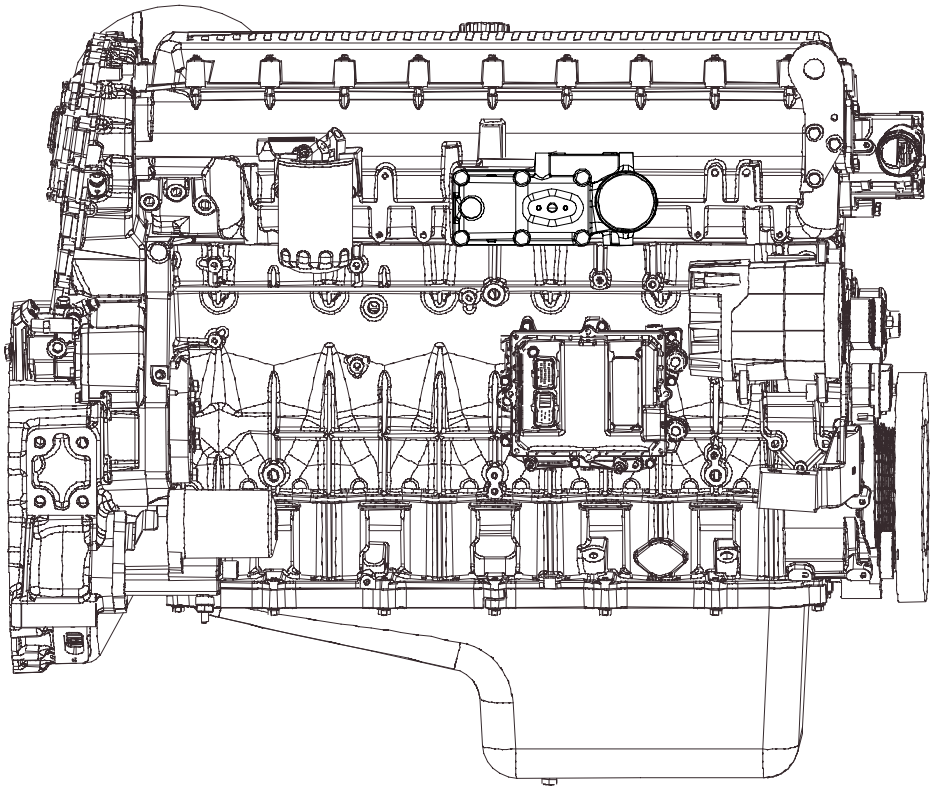
Figure 1



110587

LEFT-HAND SIDE VIEW

Figure 2

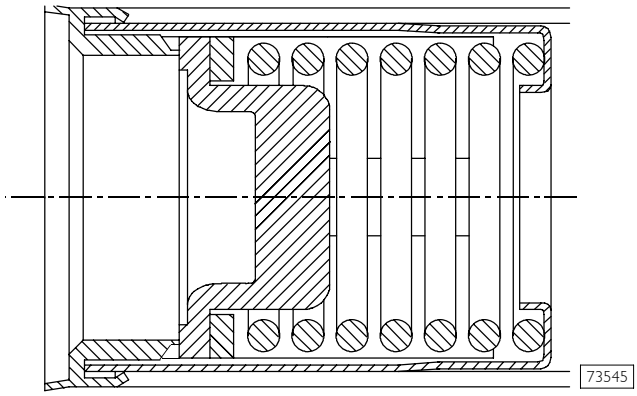


110588

RIGHT-HAND SIDE VIEW

By-pass valve

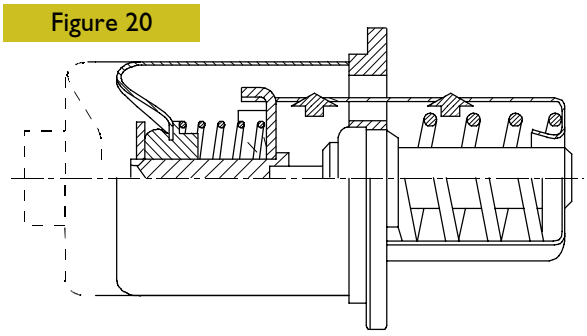
Figure 19



The valve quickly opens at a pressure of: 3 bars.

Thermostatic valve

Figure 20



Start of opening:

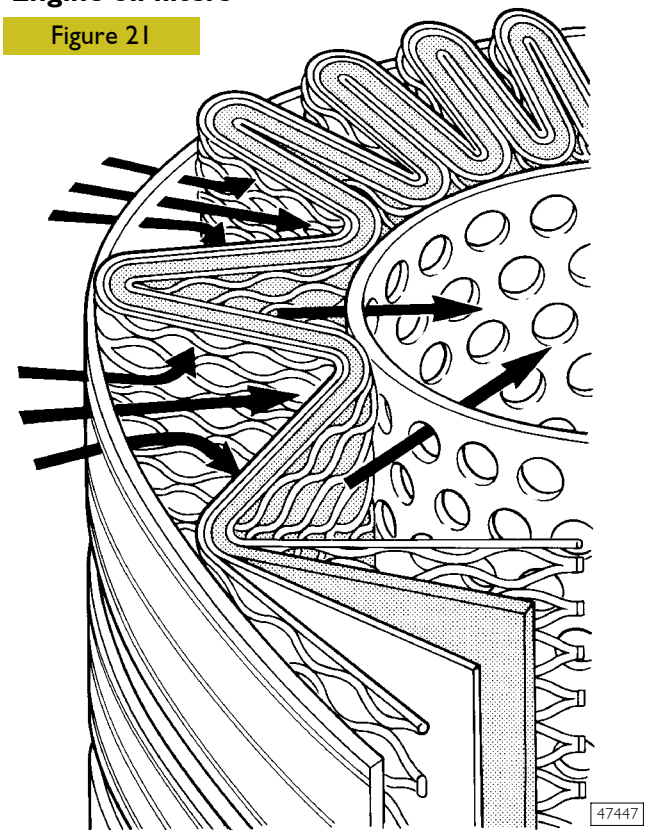
- travel 0.1 mm at a temperature of 82 ±2°C.

End of opening:

- travel 8 mm at a temperature of 97°C.

Engine oil filters

Figure 21



This is a new generation of filters that permit much more thorough filtration as they are able to holder back a greater amount of particles of smaller dimensions than those held back by conventional filters with a paper filtering element.

These high-filtration devices, to date used only in industrial processes, make it possible to:

- reduce the wear of engine components over time;
- maintain the performance/specifications of the oil and thereby lengthen the time intervals between changes.

External spiral winding

The filtering elements are closely wound by a spiral so that each fold is firmly anchored to the spiral with respect to the others. This produces a uniform use of the element even in the worst conditions such as cold starting with fluids with a high viscosity and peaks of flow. In addition, it ensures uniform distribution of the flow over the entire length of the filtering element, with consequent optimization of the loss of load and of its working life.

Mount upstream

To optimize flow distribution and the rigidity of the filtering element, this has an exclusive mount composed of a strong mesh made of nylon and an extremely strong synthetic material.

Filtering element

Composed of inert inorganic fibres bound with an exclusive resin to a structure with graded holes, the element is manufactured exclusively to precise procedures and strict quality control.

Mount downstream

A mount for the filtering element and a strong nylon mesh make it even stronger, which is especially helpful during cold starts and long periods of use. The performance of the filter remains constant and reliable throughout its working life and from one element to another, irrespective of the changes in working conditions.

Structural parts

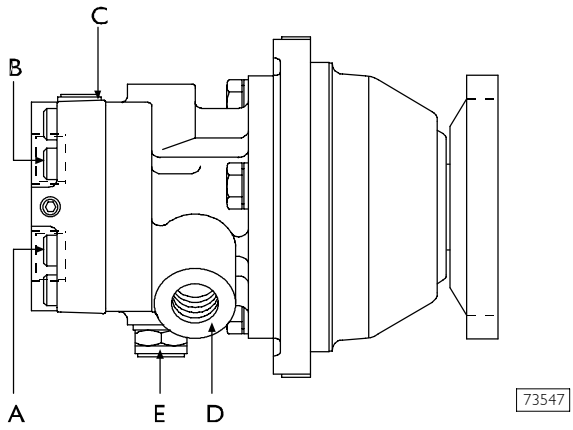
The o-rings equipping the filtering element ensure a perfect seal between it and the container, eliminating by-pass risks and keeping filter performance constant. Strong corrosion-proof bottoms and a sturdy internal metal core complete the structure of the filtering element.

When mounting the filters, keep to the following rules:

- Oil and fit new seals.
- Screw down the filters to bring the seals into contact with the supporting bases.
- Tighten the filter to a torque of 35-40 Nm.

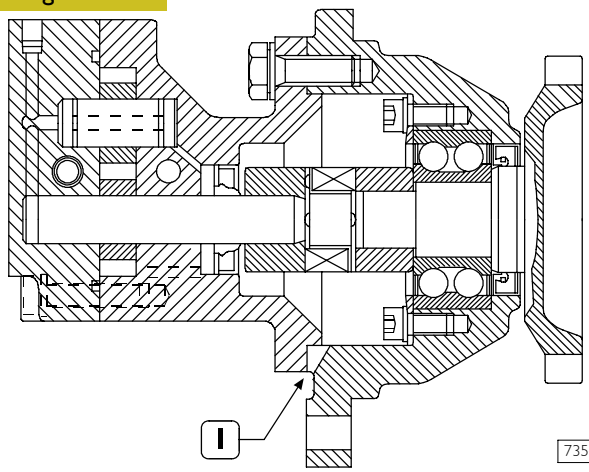
Fuel pump

Figure 3



A. Fuel inlet – B. Fuel delivery – C. By-pass nut – D. Fuel return from the pump-injectors – E. Pressure relief valve – Opening pressure: 5 - 5.8 bars.

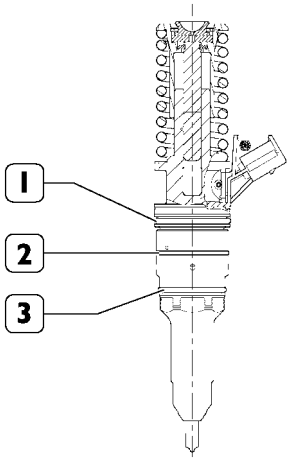
Figure 4



CROSS-SECTION OF THE FUEL PUMP
1. Oil and fuel leakage indicator.

Injector-pump

Figure 5



1. Fuel/oil seal – 2. Fuel/diesel seal – 3. Fuel/exhaust gas seal.

The injector-pump is composed of: pumping element, nozzle, solenoid valve.

Pumping element

The pumping element is operated by a rocker arm governed directly by the cam of the camshaft.
The pumping element is able to ensure a high delivery pressure. The return stroke is made by means of a return spring.

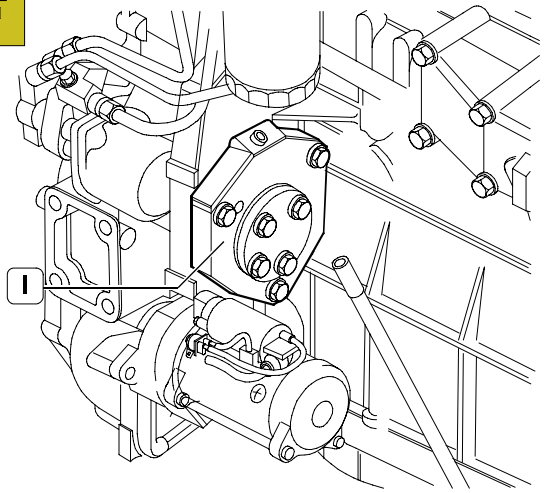
Nozzle

Garages are authorized to perform fault diagnosis solely on the entire injection system and may not work inside the injector-pump, which must only be replaced.
A specific fault-diagnosis program, included in the control unit, is able to check the operation of each injector (it deactivates one at a time and checks the delivery of the other five).
Fault diagnosis makes it possible to distinguish errors of an electrical origin from ones of a mechanical/hydraulic origin.
It indicates broken pump-injectors.
It is therefore necessary to interpret all the control unit error messages correctly.
Any defects in the injectors are to be resolved by replacing them.

Solenoid valve

The solenoid, which is energized at each active phase of the cycle, via a signal from the control unit, controls a slide valve that shuts off the pumping element delivery pipe.
When the solenoid is not energized, the valve is open, the fuel is pumped but it flows back into the return pipe with the normal transfer pressure of approximately 5 bars.
When the solenoid is energized, the valve shuts and the fuel, not being able to flow back into the return pipe, is pumped into the nozzle at high pressure, causing the needle to lift.
The amount of fuel injected depends on the length of time the slide valve is closed and therefore on the time for which the solenoid is energized.
The solenoid valve is joined to the injector body and cannot be removed.
On the top there are two screws securing the electrical wiring from the control unit.
To ensure signal transmission, tighten the screws with a torque wrench to a torque of 1.36 – 1.92 Nm (0.136 – 0.192 kgm).

Figure 15



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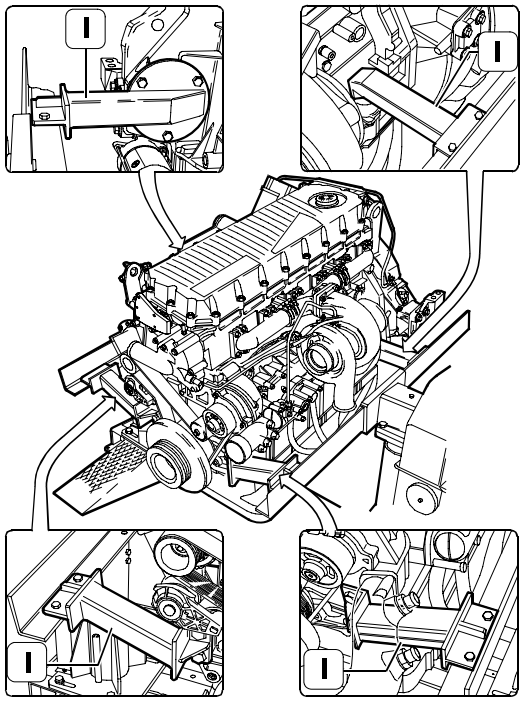
Remove the engine supports;
Remove the drive (1).

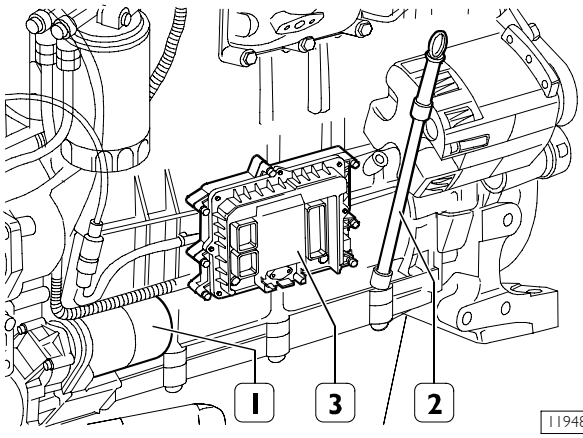
Figure 16



104248

Secure the engine to the rotary stand with the brackets (1).
Drain the lubricating oil from the sump.

Figure 17

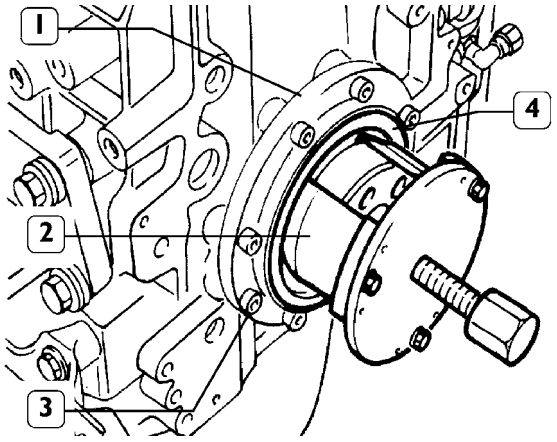


119480

Remove:

- ❑ the starter motor (1);
- ❑ the control unit (2) and its support;
- ❑ the oil dipstick (3) from the crankcase.

Figure 18



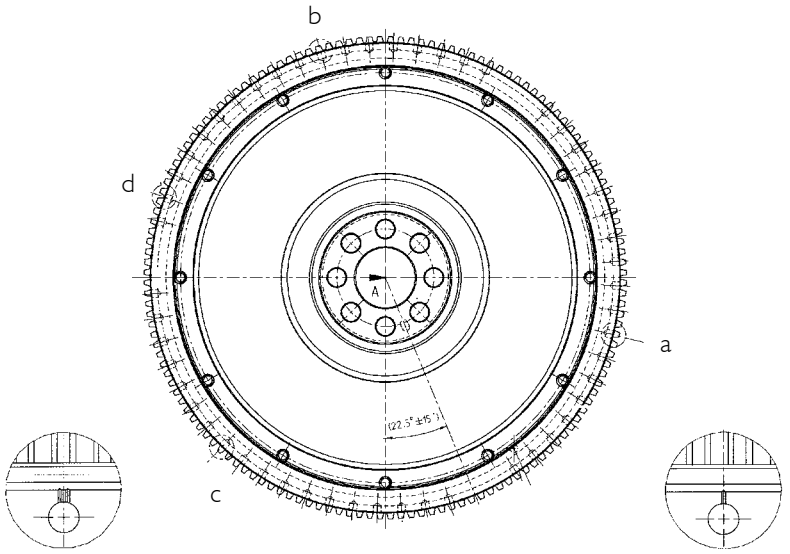
99361

With the extractor 99340053 (2) applied as shown in the figure, extract the seal (4). Undo the screws (3) and take off the cover (1).

ENGINE FLYWHEEL

Fitting engine flywheel (For F3CE0684B*E003 engines)

Figure 62



VIEW OF HOLES: A – B – C

VIEW OF HOLE: D

DETAIL OF PUNCH MARKS ON ENGINE FLYWHEEL FOR PISTON POSITIONS

A = Hole on flywheel with one reference mark, corresponding to the TDC of pistons 3-4.

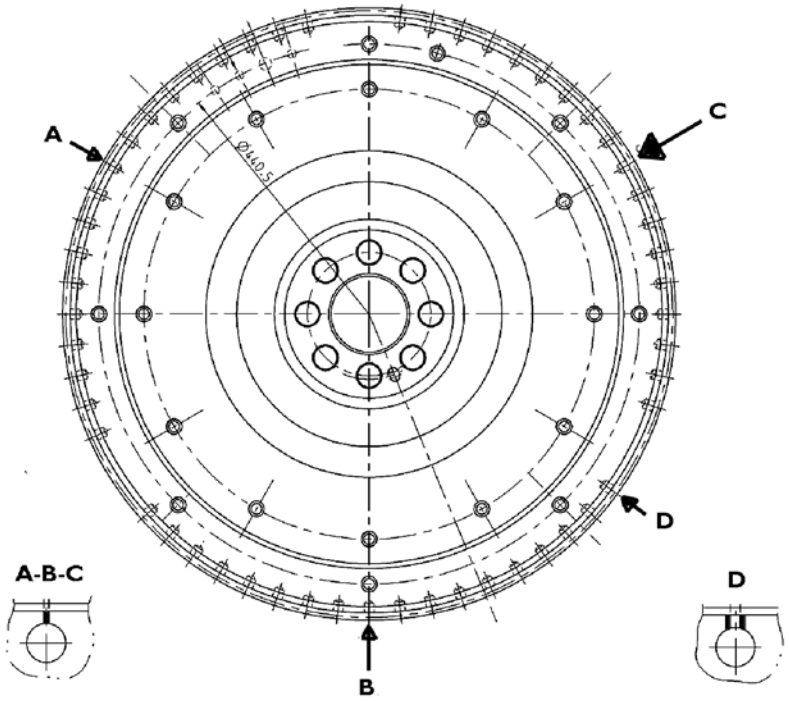
B = Hole on flywheel with one reference mark, corresponding to the TDC of pistons 1-6.

C = Hole on flywheel with one reference mark, corresponding to the TDC of pistons 2-5.

D = Hole on flywheel with two reference marks, position corresponding to 54°.

Fitting engine flywheel (For F3CE0684A*E001 engines)

Figure 63



DETAIL OF PUNCH MARKS ON ENGINE FLYWHEEL FOR PISTON POSITIONS

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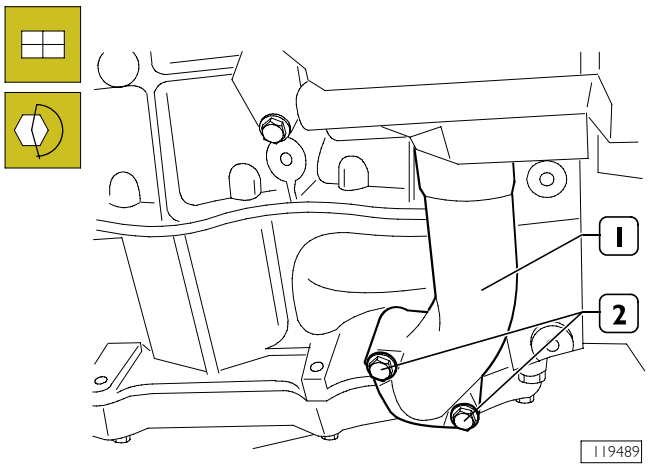
D = Hole on flywheel with two reference marks, position corresponding to 54°.

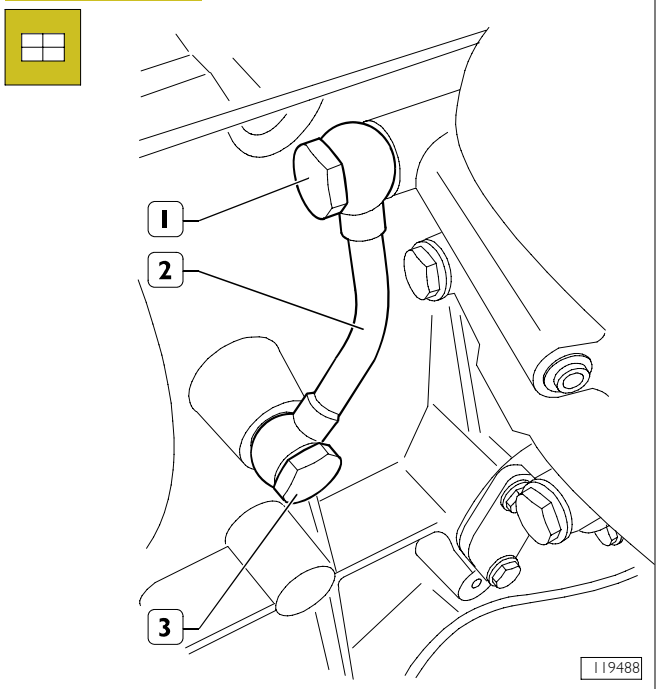
Figure 96



Fit the oil return pipe (1).

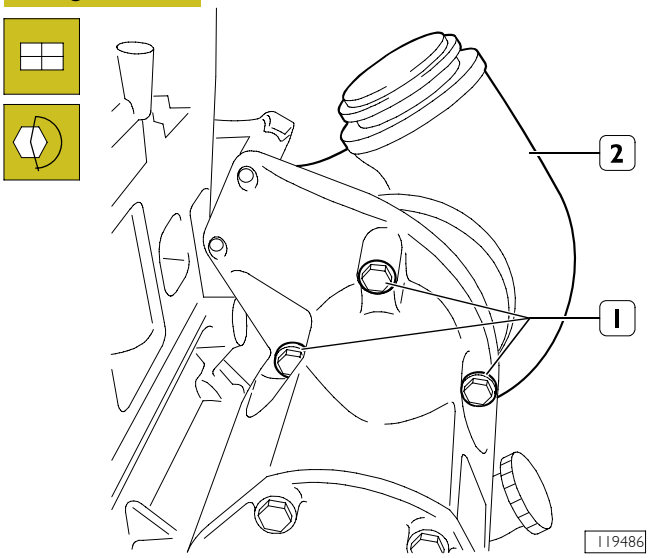
Fasten the screws (2) fastening the pipe (1) to the crankcase. Tighten the screws (2) at a torque of 23 Nm.

Figure 97



Fit the oil delivery pipe (2) to the hydraulic coupling fastening it with fittings (1) and (3).

Figure 98



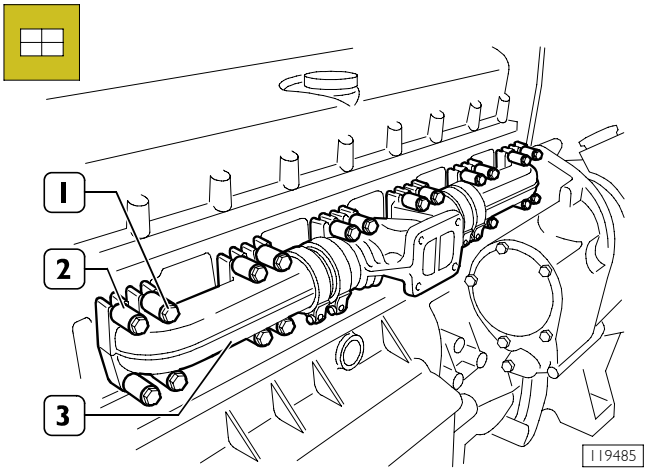
Fit the power turbine (2) onto the hydraulic coupling.

NOTE Lubricate the accommodation seat on the hydraulic coupling with Loctite AS600 before fitting the power turbine.

When fitting the power turbine on the hydraulic coupling, pay attention to the meshing of the gears which transmit motion from one element to the other.

Tighten the fastening screws (1).
Tighten the screws (1) at a torque of 40 Nm.

Figure 99



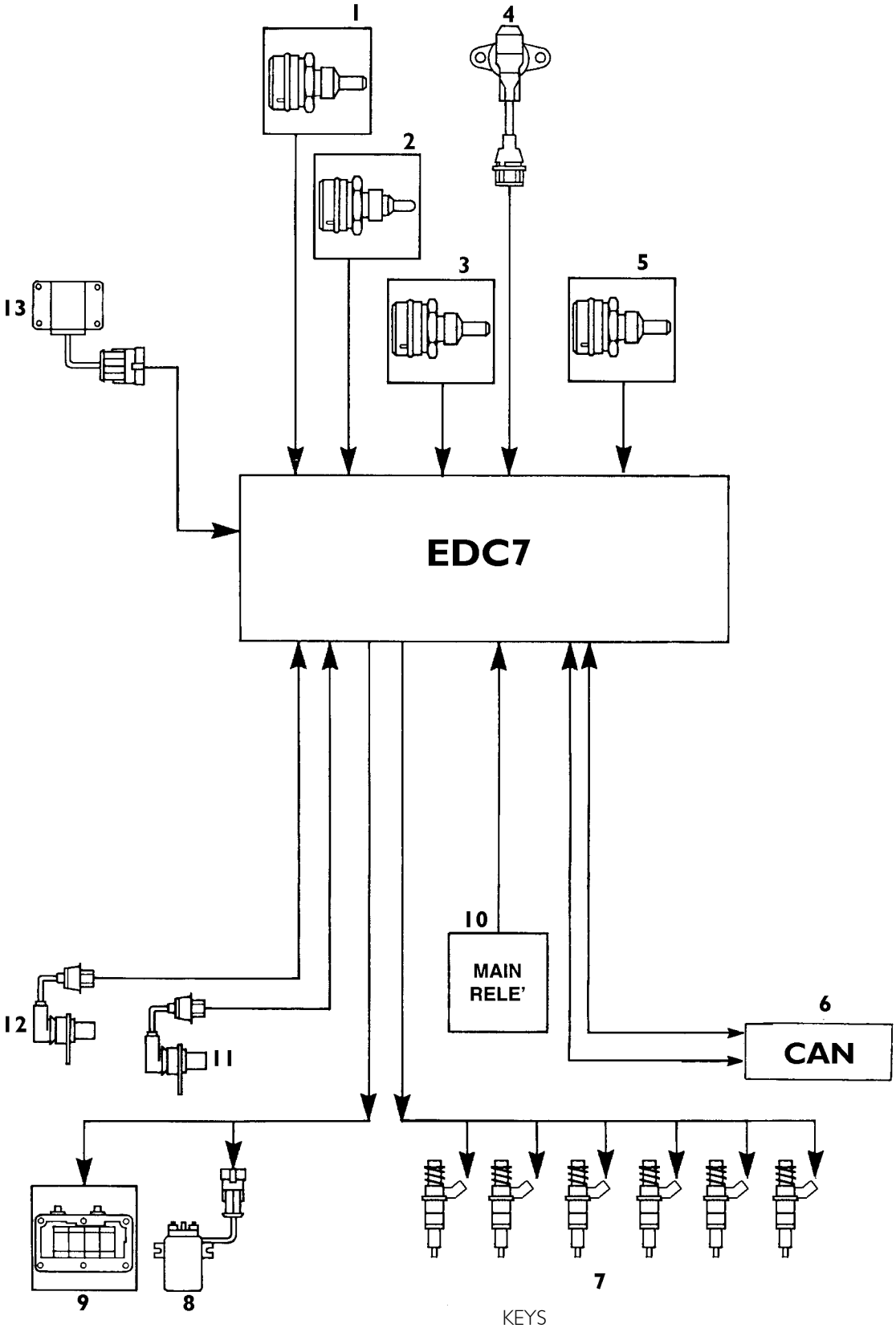
Fit the exhaust manifold.

NOTE Remove the seals between the exhaust manifold and the crankcase

Insert the seals (2) between the fastening screws (1) and the intake manifold.

BLOCK DIAGRAM

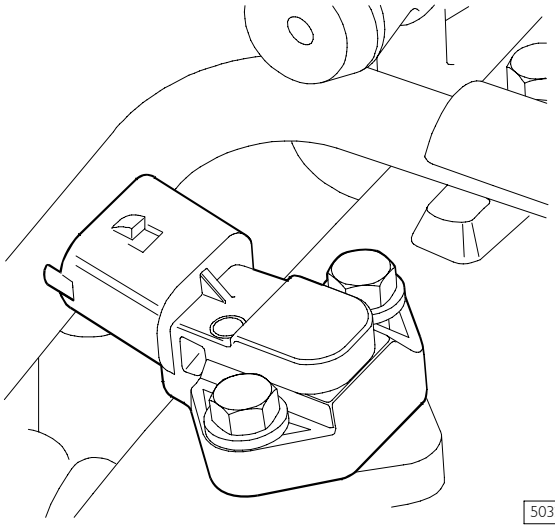
Figure 5



KEYS

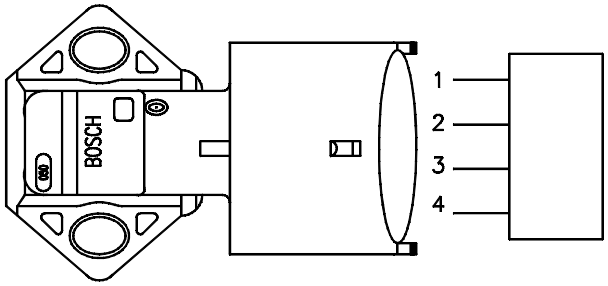
1. Engine coolant temperature sensor – 2. Oversupply air temperature sensor – 3. Fuel temperature sensor – 4. Oversupply air pressure sensor – 5. Engine oil pressure and temperature sensor - 6. CAL L-H line – 7. Pump-injectors – 8. Remote control switch for pre/post-heating activation – 9. Pre/post-heating resistance – 10. Main remote control switch – 11. Flywheel sensor – 12. Distribution sensor – 13. Primary / secondary brake switch.

Figure 16



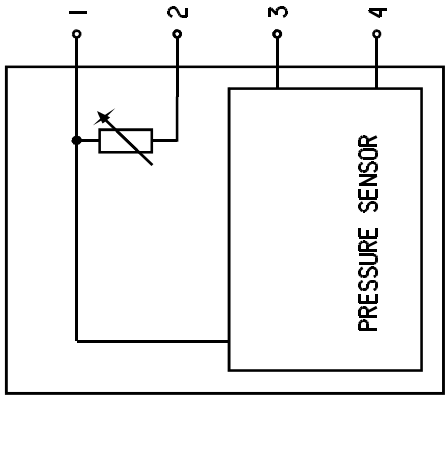
Sensor external view

Figure 17



Linking connector

Figure 18



Wiring diagram

Air pressure/temperature sensor (85156).

This component incorporates a temperature sensor and a pressure sensor.

Ilt replaces the temperature sensors (85155) and pressure sensors (85154) available in the preceding systems.

It is fitted onto the intake manifold and measures the maximum supplied air flow rate used to accurately calculate the amount of fuel to be injected at every cycle.

The sensor is powered with 5 V.

The output voltage is proportional to the pressure or temperature measured by the sensor.

Pin (EDC)	25/C - 33/C	Power supply
Pin (EDC)	36/C	Temperature
Pin (EDC)	34/C	Pressure

Oil temperature/pressure sensor (42030 / 47032)

This component is identical to the air pressure/temperature sensor and replaced single sensors 47032 / 42030.

It is fitted onto the engine oil filter, in a horizontal position.

It measures the engine oil temperature and pressure.

The measured signal is sent to the EDC control unit which controls, in turn, the indicator instrument on the dashboard (low pressure warning lights / gauge).

Pin (EDC)	24/C - 32/C	Power supply
Pin (EDC)	27/C	Temperature
Pin (EDC)	28/C	Pressure

The engine oil temperature is used only by the EDC control unit.

Ref.	Description	Control unit pin	
		Oil	Air
1	Ground	24C	25C
2	Temp. Sign.	27C	36C
3	+5	32C	33C
4	Press. Sign.	28C	34C

PREFACE

A successful troubleshooting is carried out with the competence acquired by years of experience and attending training courses.

When the user complains for bad efficiency or working anomaly, his indications must be kept into proper consideration using them to acquire any useful information to focus the intervention.

After the detection of the existing anomaly, it is recommended to proceed with the operations of troubleshooting by decoding the auto-troubleshooting data provided by the EDC system electronic central unit.

The continuous efficiency tests of the components connected to, and the check of working conditions of the entire system carried out during working, can offer an important diagnosis indication, available through the decoding of the "failure/anomaly" codes issued by blinking of the failure led: the "blink-code" (whether programmed).

Please consider that the interpretation of the indications provided by the blink-code is not sufficient to guarantee the solution to the existing anomalies.

Use of appropriate diagnostic tools allows to decode the error codes, to exploit the internal database and to obtain other information for identifying the origin of the fault.

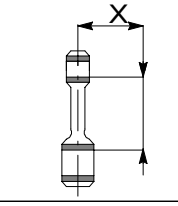
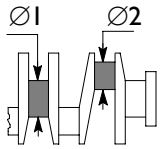
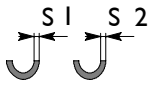
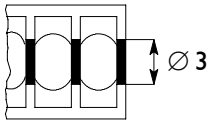
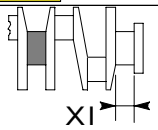
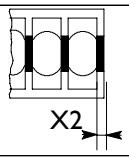
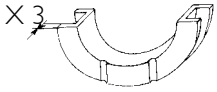
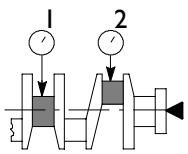
Every time there is a breakdown claim and this breakdown is actually detected, it is necessary to proceed inquiring the electronic unit in one of the ways indicated and then proceed with the diagnostic research making trials and tests in order to have a picture of the working conditions and identify the root causes of the anomaly.

In case the electronic device is not providing any indication, it will be necessary to proceed relying on the experience, adopting traditional diagnosis procedures.

In order to compensate the operators' lack of experience in this new system, we are hereby providing the USER's GUIDELINE FOR TROUBLESHOOTING in the following pages.

Any kind of operation on the electronic center unit must be executed by qualified personnel, duly authorized.

Any unauthorized tamper will involve decay of after-sales service in warranty.

	Type		F3C
			mm
	Measuring dimension	X	125
	Max. connecting rod axis misalignment tolerance	⫽	0.08
	Main journals - rated value - class - class - class	Ø1 1 2 3	 99.970 to 100.000 99.970 to 99.979 99.980 to 99.989 99.990 to 100.000
	Crankpins - rated value - class - class - class	Ø2 1 2 3	 89.970 to 90.000 89.970 to 89.979 89.980 to 89.989 89.990 to 90.000
	Main bearing shells Red Green Yellow*	S1 	 3.110 to 3.120 3.121 to 3.130 3.131 to 3.140
	Big end bearing shells Red Green Yellow*	S2 	 1.965 to 1.975 1.976 to 1.985 1.986 to 1.995
	Main bearing housings - rated value - class - class - class	Ø3 1 2 3	 106.300 to 106.330 106.300 to 106.309 106.310 to 106.319 106.320 to 106.330
	Bearing shells - main journals		0.060 to 0.100
	Bearing shells - big ends		0.050 to 0.090
	Main bearing shells		0.127 - 2.254 - 0.508
	Big end bearing shells		0.127 - 2.254 - 0.508
	Main journal, thrust bearing	X1	47.95 to 48.00
	Main bearing housing, thrust bearing	X2	40.94 to 40.99
	Thrust washer halves	X3	3.38 to 3.43
	Crankshaft end float		0.10 to 0.30
	Alignment Ovalization Taper	⫽ ⬭ ⟋	1 - 2 1 - 2 1 - 2	≤ 0.025 0.010 0.010

* Fitted in production only and not supplied as spares

Preliminary measurement of main and big end bearing shell selection data

For each of the journals of the crankshaft, it is necessary to carry out the following operations:

MAIN JOURNALS:

- ❑ Determine the class of diameter of the seat in the crankcase.
- ❑ Determine the class of diameter of the main journal.
- ❑ Select the class of the bearing shells to mount.

CRANKPINS:

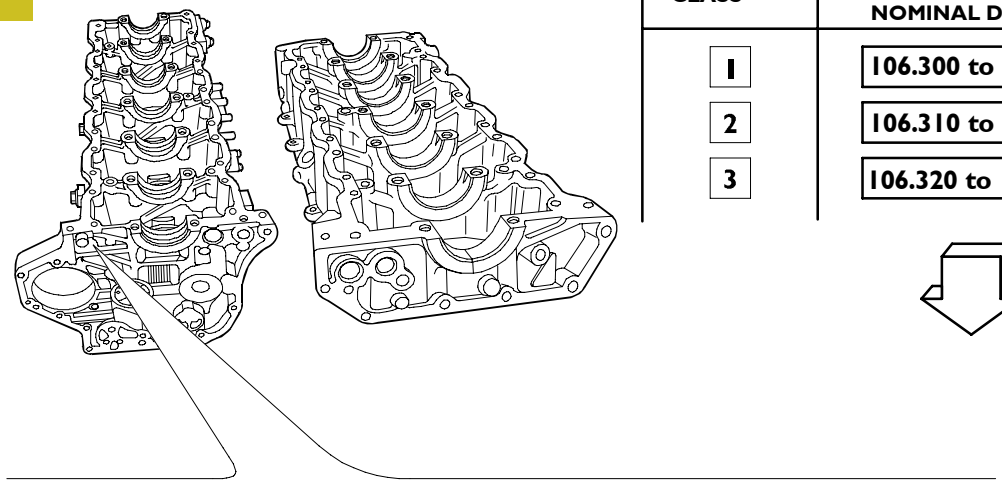
- ❑ Determine the class of diameter of the seat in the connecting rod.
- ❑ Determine the class of diameter of the crankpin.
- ❑ Select the class of the bearing shells to mount.

DEFINING THE CLASS OF DIAMETER OF THE SEATS FOR BEARING SHELLS ON THE CRANKCASE

On the front of the crankcase, two sets of numbers are marked in the position shown (Figure 24 at top).

- ❑ The first set of digits (four) is the coupling number of the crankcase with its base.
- ❑ The following seven digits, taken singly, are the class of diameter of each of the seats referred to (Figure 24 at bottom).
- ❑ Each of these digits may be **1**, **2** or **3**.

Figure 24



CLASS	MAIN BEARING HOUSING NOMINAL DIAMETER
1	106.300 to 106.309
2	106.310 to 106.319
3	106.320 to 106.330

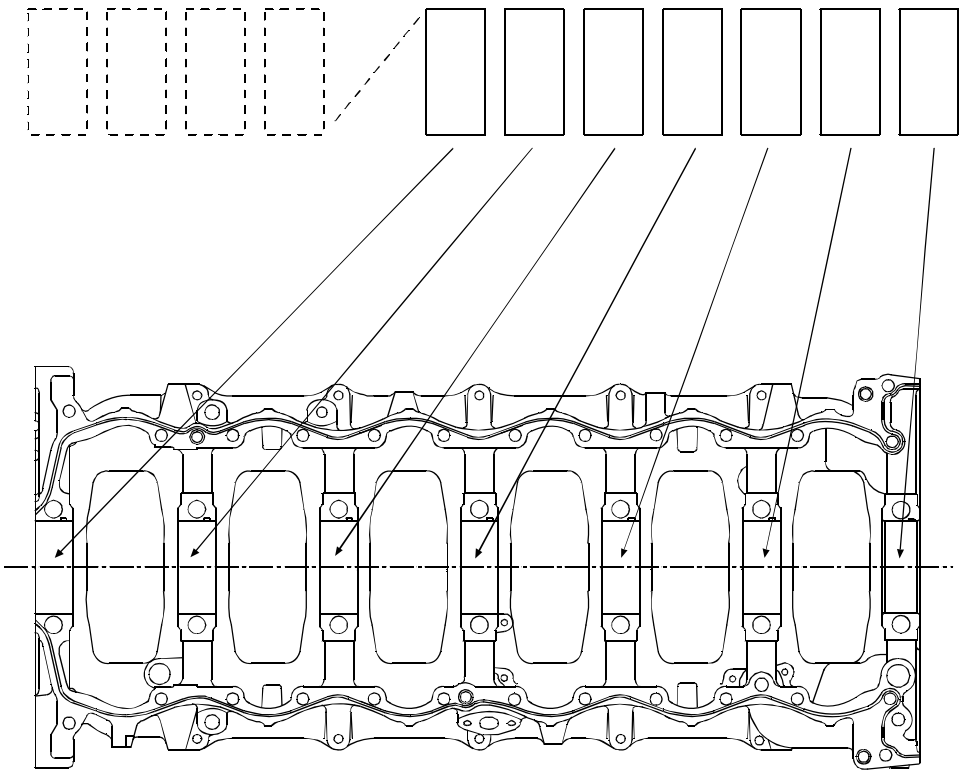


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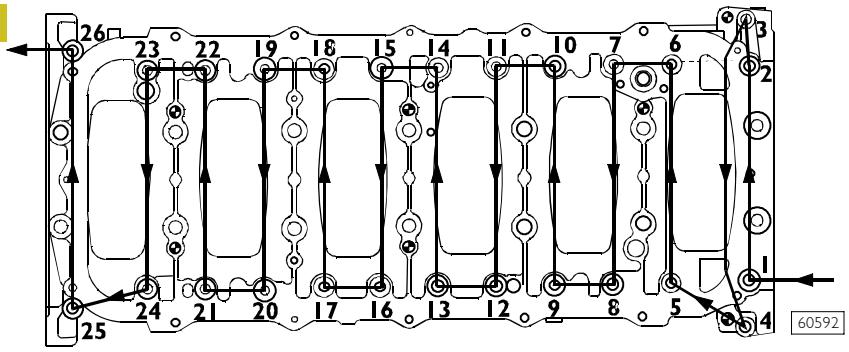
DIAGRAM SHOWING THE UNDERBLOCK FIXING SCREWS TIGHTENING ORDER

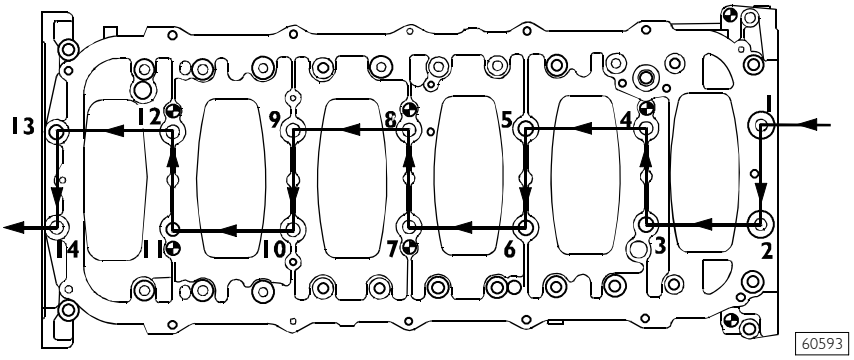
Figure 47

FRONT SIDE



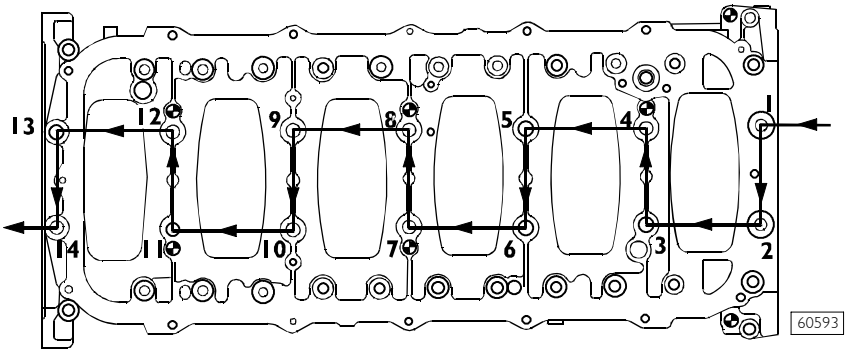
stage 1: pretightening outer screws (30 Nm)

FRONT SIDE



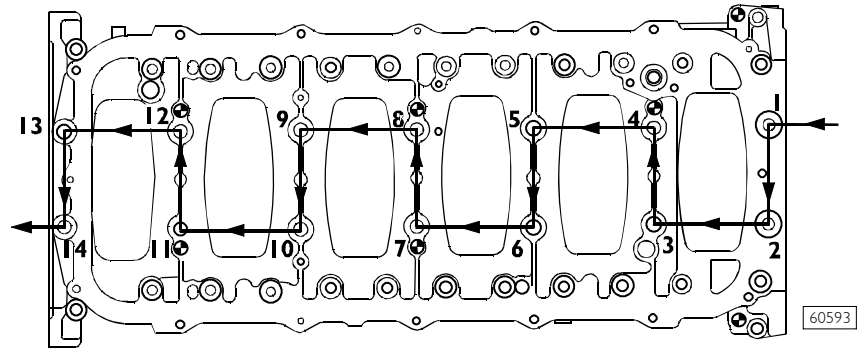
stage 2: pretightenig inner screws (120 Nm)

FRONT SIDE



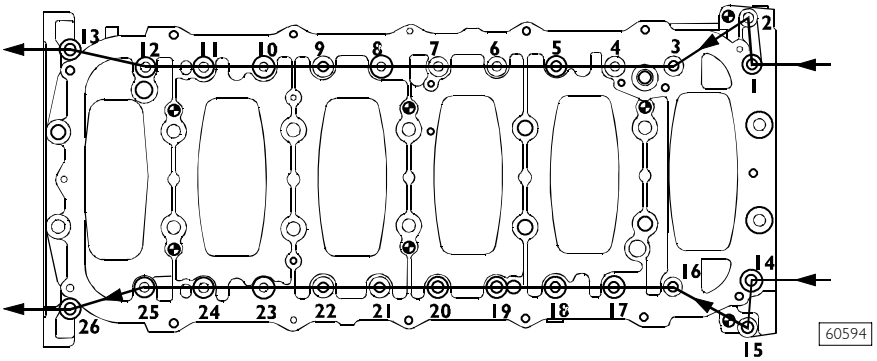
stage 3: angle inner screws (60°)

FRONT SIDE



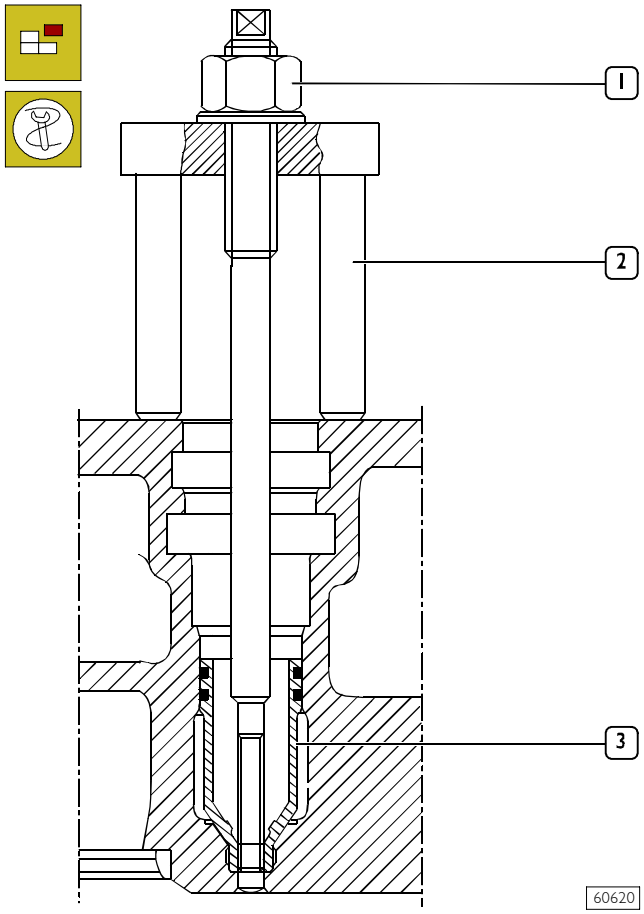
stage 4: angle inner screws (55°)

FRONT SIDE



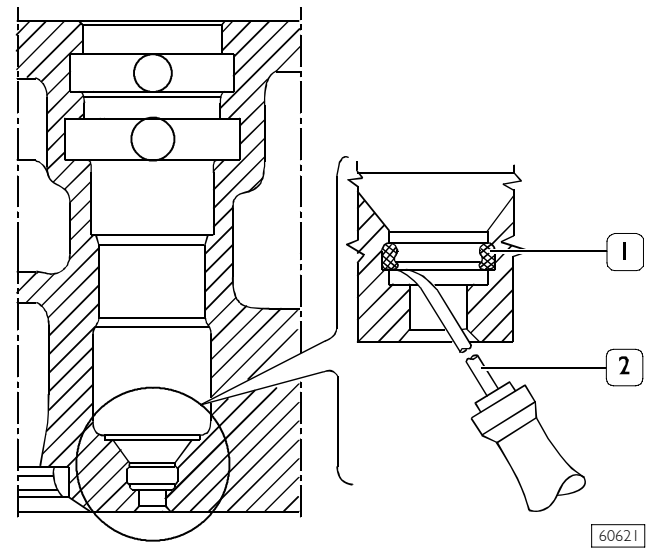
stage 5: angle outer screws (60°)

Figure 77



❑ Screw the extractor 99342149 (2) into the case (3). Screw down the nut (1) and take the case out of the cylinder head.

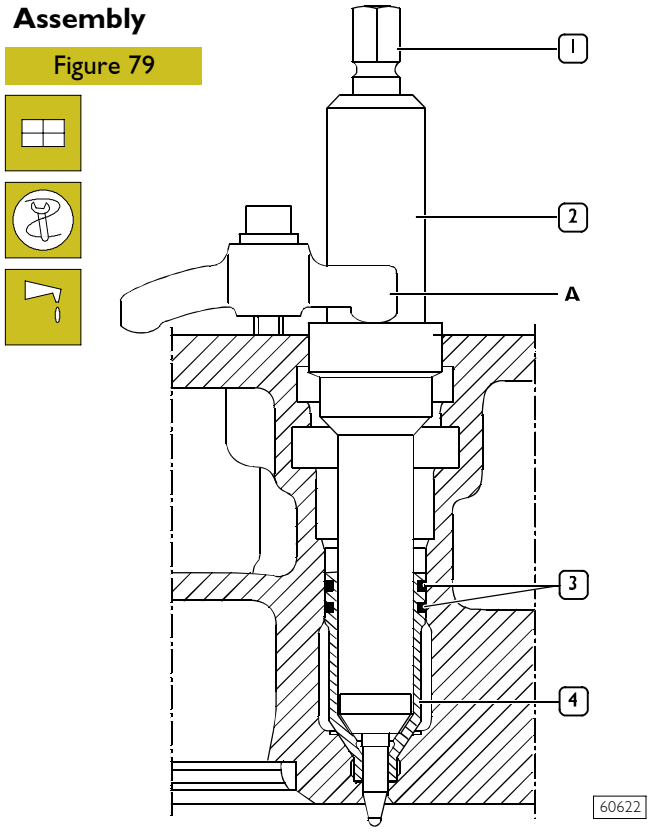
Figure 78



❑ Using the tool 99390772 (2) remove any residues (1) left in the groove of the cylinder head.

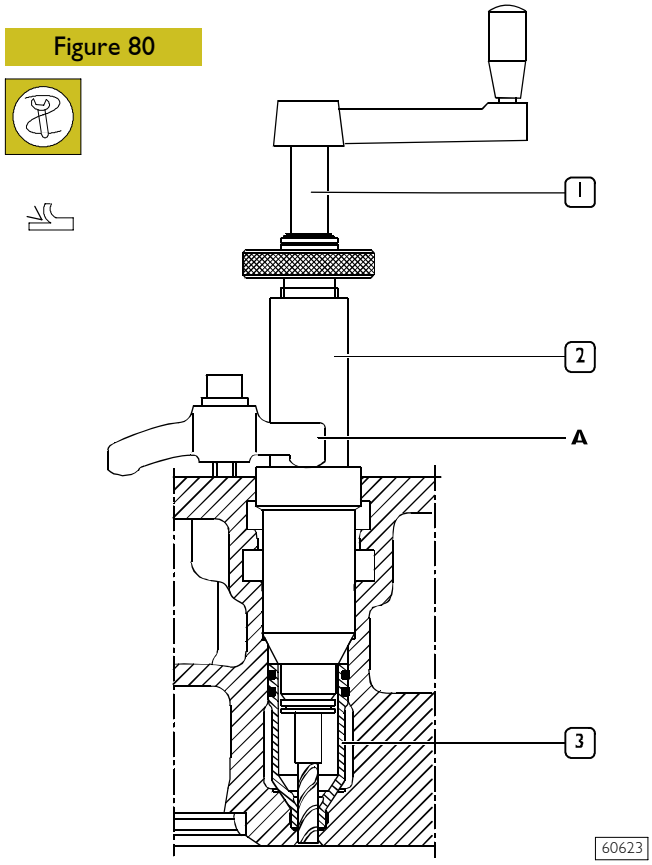
Assembly

Figure 79



❑ Lubricate the seals (3) and fit them on the case (4). Using tool 99365056 (2) secured to the cylinder head with bracket **A**, drive in the new case, screwing down the screw (1) upsetting the bottom portion of the case.

Figure 80



❑ Using the reamer 99394041 (1-2), rebore the hole in the case (3).

PART			TORQUE	
			Nm	kgm
Screw fixing alternator	M 10x1,5	l = 35 mm	30 ± 3	(3 ± 0.3)
	M 10x1,5	l = 60 mm	44 ± 4	(4.4 ± 0.4)
Screws fixing air-conditioner compressor to mount			24.5 ± 2.5	(2.5 ± 0.25)
Screws fixing guard			24.5 ± 25	(2.5 ± 0.25)
Filter clogging sensor fastening			55 ± 5	(5.5 ± 0.5)
Water/fuel temperature sensor fastener			35	(3.5)
Thermometric switch/transmitter fastener			25	(2.5)
Air temperature transmitter fastener			35	(3.5)
Pulse transmitter fastener			8 ± 2	(0.8 ± 0.2)
Injector-pump connections fastener			1.36 ± 1.92	(0.13 ± 0.19)
Turbocompound Unit				
Intermediate gear support shaft fixing screws M12x30			115	(11.5)
Intermediate gear fixing screw M12x80			115	(11.5)
Screw that fixes the hydraulic joint to the flywheel box		M10x70	45	(4.5)
		M10x110	45	(4.5)
		M10x150	45	(4.5)
Oil return pipe to block fixing screws M8x70x1.25			23	(2.3)
Oil delivery pipe to hydraulic joint threaded fittings			55	(5.5)
Screws that fix the power turbine to hydraulic joint M10x50			40	(4.0)
Screws that fix the turbine to the exhaust manifold			70	(7.0)
Nuts that fix the turbine to the exhaust manifold			45	(4.5)
Clamps that fix the manifold to the turbines			8.5	(0.85)

♦ Before assembly, lubricate with UTDM oil
• Before assembly, lubricate with graphitized oil