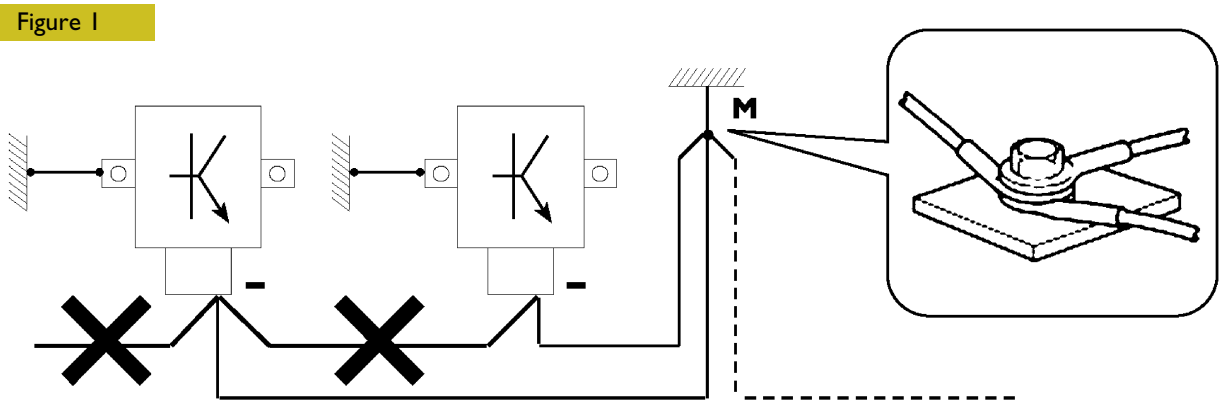
Bonding and screening

Negative leads connected to a system bonded point must be both as short and possible and "star"-connected to each other, trying then to have their centering tidily and properly made (Figure 1, re. M).

Further, following warnings are to be compulsorily observed for electronic components:

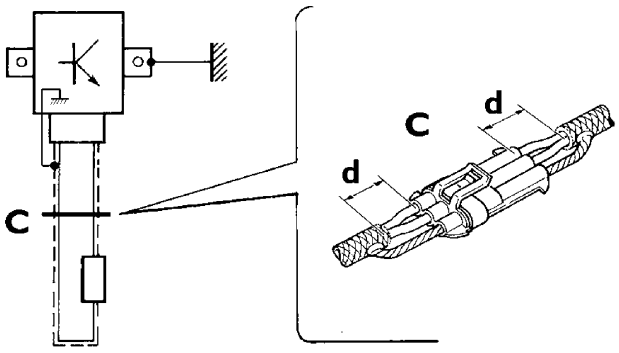
- Electronic central units must be connected to system bonding when they are provided with a metallic shell.
- Electronic central units negative cables must be connected both to a system bonding point such as the dashboard opening bonding (avoiding "serial" or "chain" connections), and to battery negative terminal.
- Analog bonding (sensors), although not connected to battery negative system/terminal bonding, must have optimal isolation. Consequently, particularly considered must be parasitic resistances in lugs: oxidising, clinching defects, etc.
- Screened circuits braiding must only electrically contact the end towards the central unit entered by the signal (Figure 2).
- If junction connectors are present, unscreened section **d**, near them, must be as short as possible (Figure 2).
- Cables must be arranged such as to result to be parallel to reference plane, i.e. as close as possible to chassis/body structure.

Figure 1



1. NEGATIVE CABLES "STAR" CONNECTION TO SYSTEM BONDING **M**

Figure 2



88039

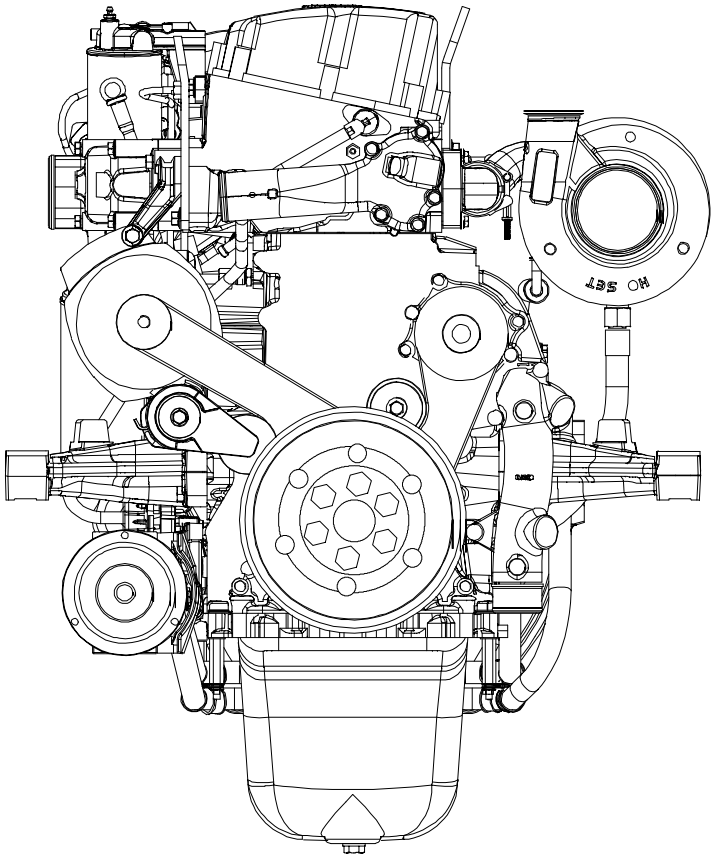
2. SCREENING THROUGH METALLIC BRAIDING OF A CABLE TO AN ELECTRONIC COMPONENT – **C.** CONNECTOR **d.** DISTANCE → 0

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
	Replacement Original spare parts
	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

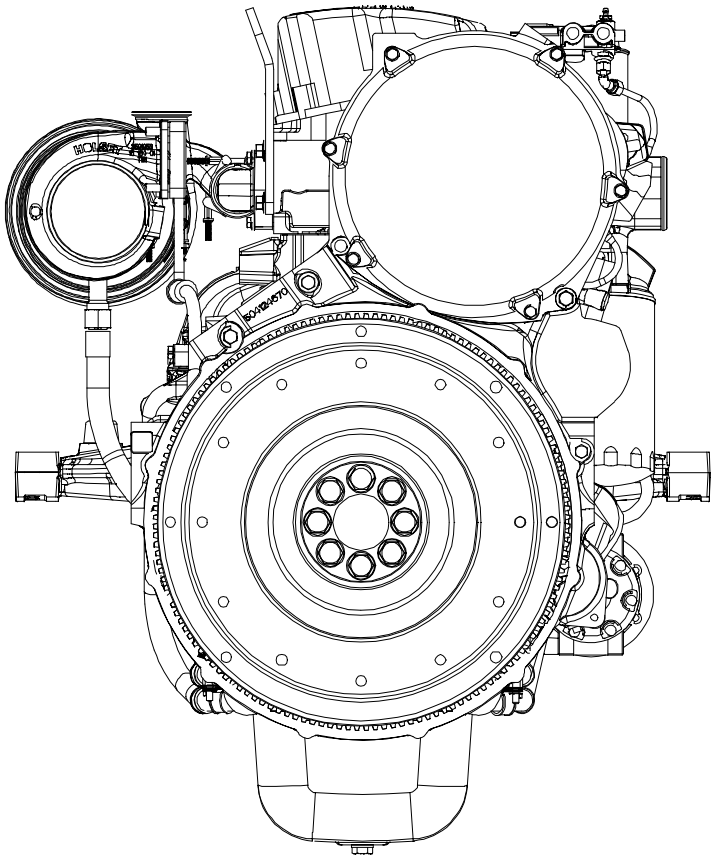
Figure 8



114205

FRONT-HAND SIDE VIEW

Figure 9



104206

REAR-HAND SIDE VIEW

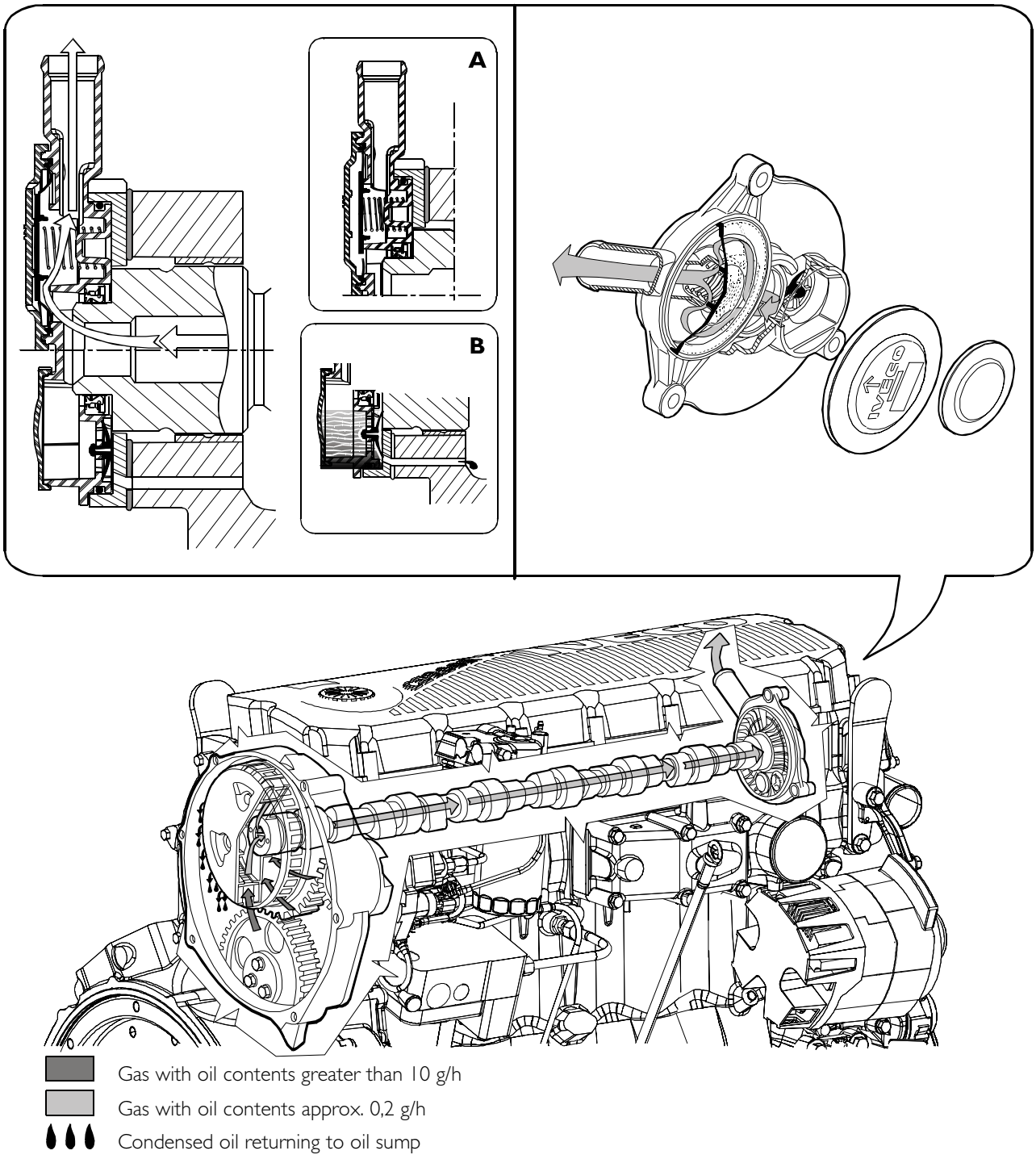
Oil fume recycle (Blow-by)

Part of gas produced by combustion during engine operation leaks through piston elastic ring openings into sump, mixing with oil fumes in sump.

This mixture, conveyed upward, is partially separated from oil by a device located in timing cover upper part and introduced in air intake circuit.

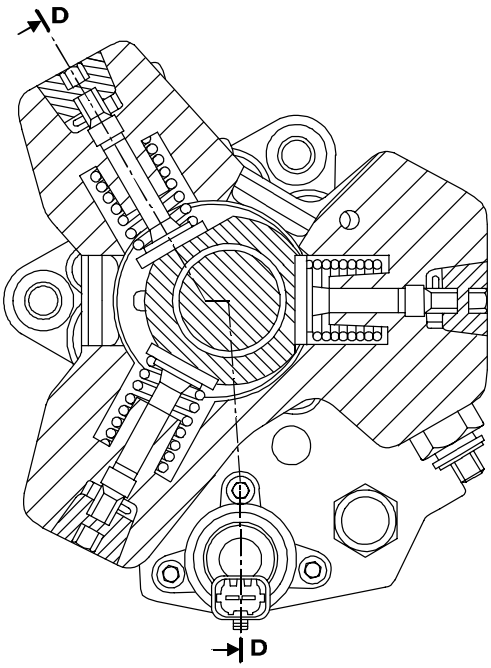
The device mainly consists of a rotary filter secured on propeller shaft and by a front cover housing normally closed valves controlling mixture flow.

Figure 20

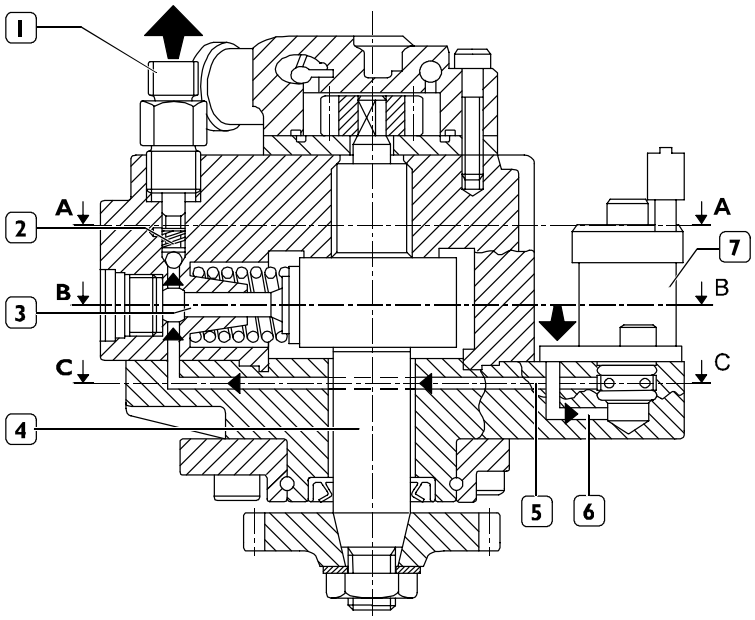


Operating principle

Figure 8



Sec. B – B



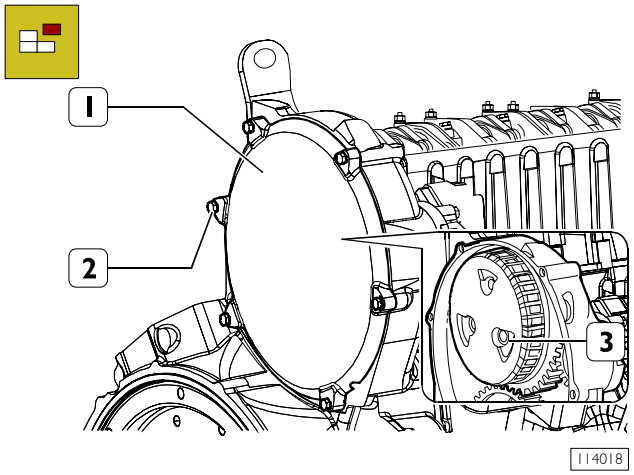
Sec. D – D

72597

1. Fuel outlet fitting to rail - 2. Delivery valve to rail - 3. Pumping element - 4. Pump shaft - 5. Pumping element supply duct - 6. Pressure regulator supply duct - 7. Pressure regulator

Pumping element (3) is oriented to pump shaft (4) cam. During intake, the pumping element is supplied through supply duct (5). The fuel amount to be sent to the pumping element is set by the pressure regulator (7). The pressure regulator meters fuel flow to pumping element according to the PWM signal received from ECU. During pumping element compression stage, fuel reaches the pressure required to open the delivery valve to common rail (2) and to feed it through outlet (1).

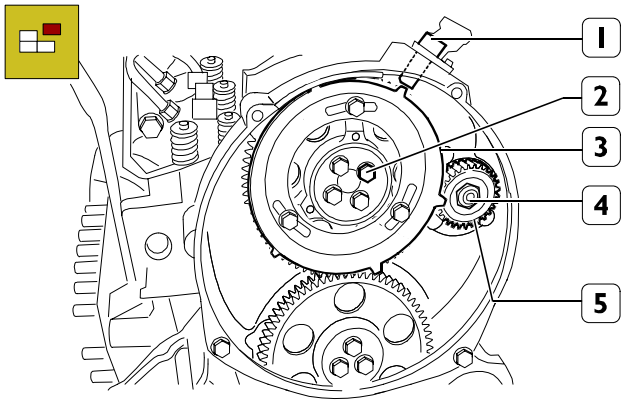
Figure 10



114018

Unlock screws (1) and remove cover (2). Remove centrifugal filter (3) below.

Figure 11



114019

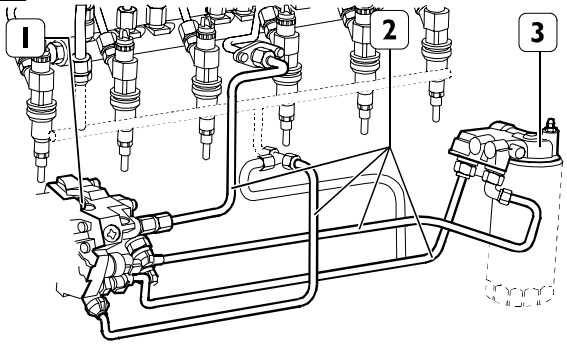
Use specific spanner to unlock screws (2) and remove gear (3) complete with tune wheel.

Unlock nut (4) and remove control gear (5) of high pressure pump.

Remove rpm sensor (1).

NOTE In case removal of gear (5) is difficult, release high pressure pump screws with light beater strokes on control shaft and remove gear (5).

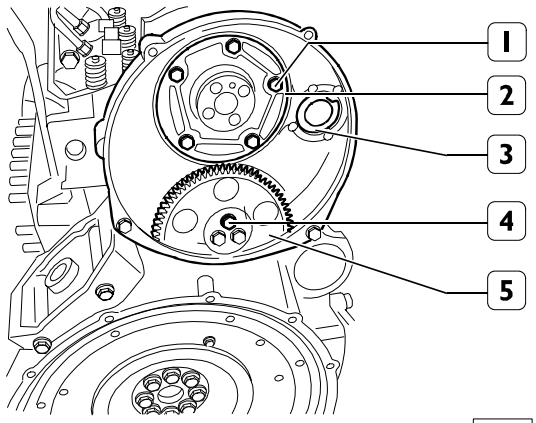
Figure 12



114014

Disconnect fuel lines (2), unlock retaining screws and remove high pressure pump (1). Remove fuel filter support (3) complete with pipeline.

Figure 13



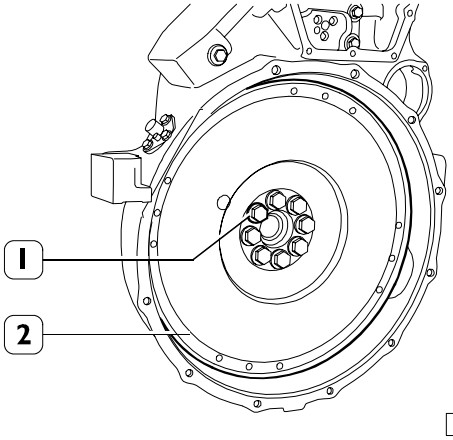
114020

Unlock screws (1) and remove thrust plate (2).

Use specific spanner to unlock screws (4) and remove relay gear (5).

Remove high pressure pump mount flange (3).

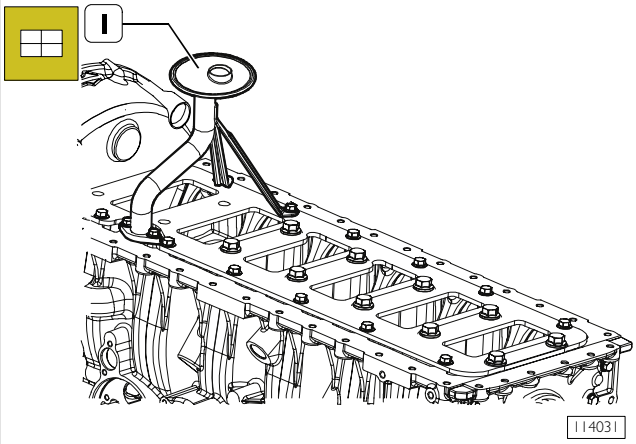
Figure 14



114009

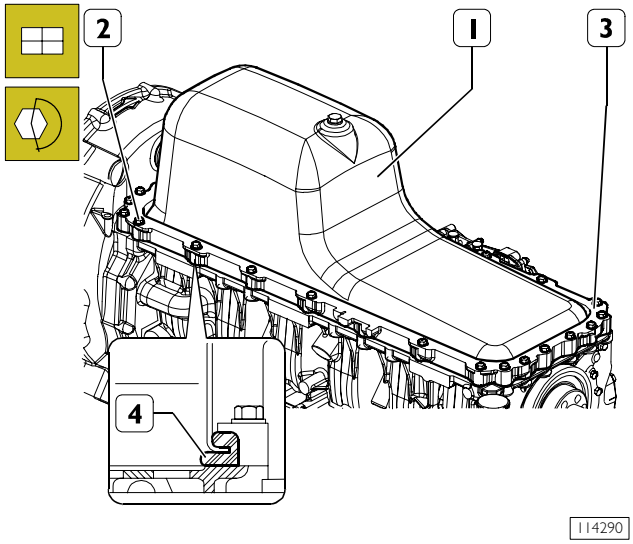
Use specific tool lock engine flywheel (2) rotation, unlock retaining screws (1) and remove engine flywheel.

Figure 63



Install suction rose (1).

Figure 64



Rotate engine.

Fit seal (4) on oil sump (1), fit spacer (3) and install sump on engine block locking screws (2) at required torque.

ENGINE ASSEMBLY COMPLETION

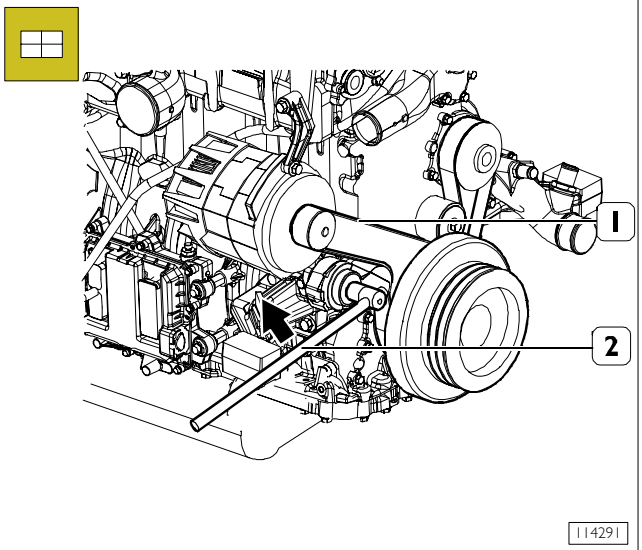
Complete engine assembly fitting or connecting parts below:

- complete fuel filter support and pipelines;
- EDC ecu;
- intake manifold with pre-heating resistor;
- heat exchanger;
- exhaust manifold;
- turbocharger and related water and oil;
- pulley and damper flywheel assy (install fixed guide pulley 5, Figure 3, before assy);
- thermostat assy;
- belt tensioner, water pump, alternator;
- oil level rod;
- start-up motor;
- oil filter;
- electric connections and sensors.

NOTE Fittings of pipelines, cooling water and turbocharger lube oil must be locked at:

- 35 ± 5Nm, water pipeline fittings;
- 55 ± 5Nm, oil pipeline female fitting;
- 20-25 Nm, oil pipeline make fitting.

Figure 65



Use specific equipment (2) to install belt (1) on belt tensioner, in direction shown by arrow.

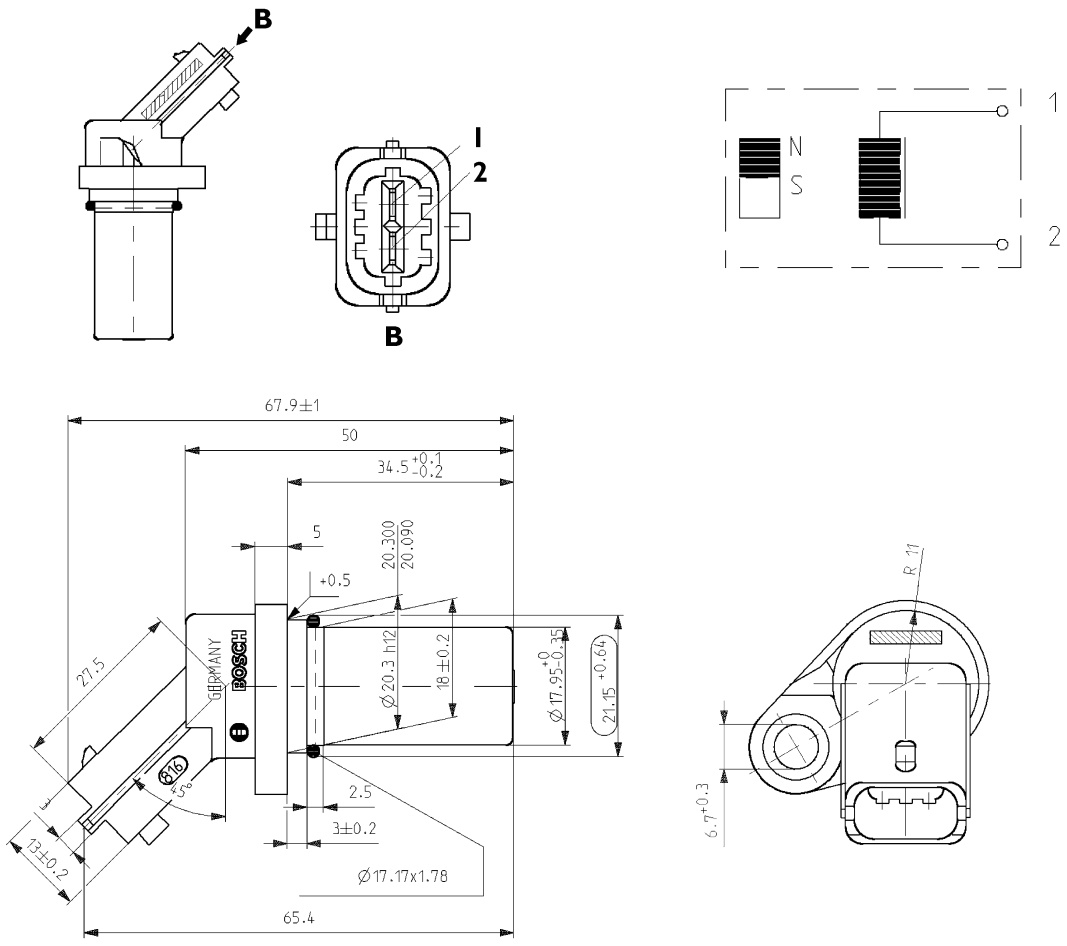
NOTE Belt tensioner is automatic, therefore no further adjustments are required after installation.

Flywheel pulse transmitter

Specifications

Supplier	BOSCH
Max. tightening torque	8 ± 2 Nm

Figure 10



104269

Description	Cable colour
To pin 19 of EDC control unit (Sensor connector "C")	B
To pin 23 of EDC control unit (Sensor connector "C")	W

This procedure must never be interrupted, by cutting the engine off from the battery cutout or disconnecting the latter before 10 seconds at least after engine cutout.

In this case, system operation is guaranteed until the fifth improper engine cutout, after which an error is stored in the breakdown memory and the engine operates at lower performance at next start while the EDC warning light stays on.

Repeated procedure interruptions could in fact lead to center damage.

Cut-off

It refers to the supply cut-off function during deceleration.

Cylinder Balancing

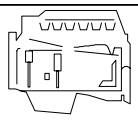
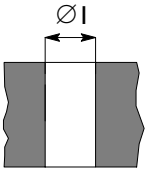
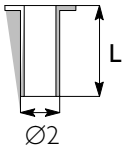
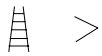
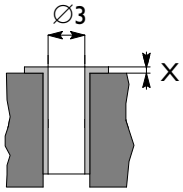
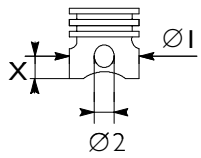
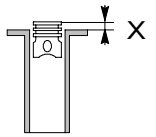
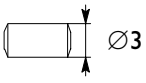
Individual cylinder balancing contributes to increasing comfort and operability.
This function enables individual personalized fuel delivery control and delivery start for each cylinder, even differently between each cylinder, to compensate for injector hydraulic tolerances.
The flow (rating feature) differences between the various injectors cannot be evaluated directly by the control unit. This information is provided by the entry of the codes for every single injector, by means of the diagnosis instrument.

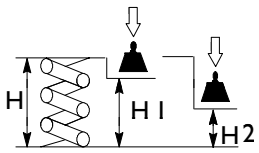
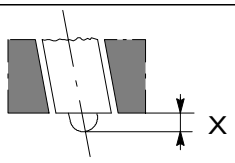
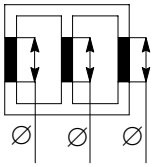
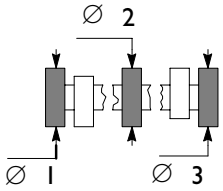
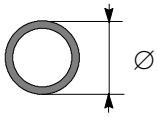
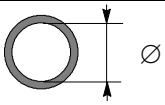
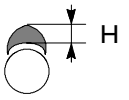
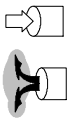
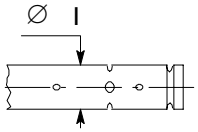
NOTE Not present on agricultural versions.

Synchronization search

The center can anyhow recognize the cylinder to inject fuel into even in the absence of a signal from the camshaft sensor.
If this occurs when the engine is already started, combustion sequence is already acquired, so the center continues with the sequence it is already synchronized on; if it occurs with the engine stopped, the center only actuates one electro valve. Injection occurs onside that cylinder within 2 shaft revs at the utmost so the center is only required to synchronize on the firing sequence and start the engine.

ASSEMBLY CLEARANCE DATA

	Type	F2C
CYLINDER BLOCK AND CRANKMECHANISM COMPONENTS		mm
	Bores for cylinder liners: Ø1 upper Ø1 lower	 130.500 to 130.525 129.510 to 129.535
	Cylinder liners: external diameter: Ø2 upper Ø2 lower length L	 130.461 to 130.486 129.475 to 129.500 226.15
	Cylinder liners - crankcase bores upper lower	 0.014 to 0.064 0.010 to 0.060
IVECO PARTS 	External diameter Ø2	-
 * Selection class	Cylinder sleeve inside diameter Ø3A* inside diameter Ø3B* Protrusion X	 117.000 to 117.012 117.010 to 117.022 0.035 to 0.065
	Pistons: measuring dimension X external diameter Ø1A external diameter Ø1B pin bore Ø2	 15 116.894 to 116.906 116.904 to 116.916 52.010 to 52.016
 * Selection class	Piston - cylinder sleeve A* B*	 0.094 to 0.118 0.094 to 0.118
IVECO PARTS 	Piston diameter Ø1	-
	Pistons protrusion X	0.873 to 1.117
	Gudgeon pin Ø3	51.994 to 52.000
	Gudgeon pin - pin housing	0.010 to 0.022

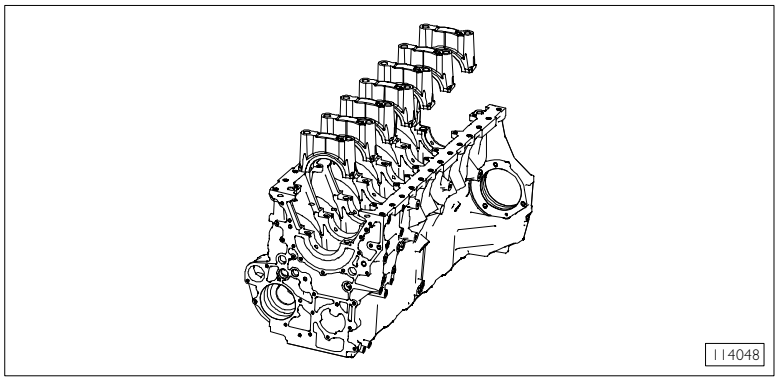
	Type	F2C	
		mm	
	Valve spring height:		
	free height H	70.77	71.34
	under a load of:		
	N 460 ± 23 H1A	51	
	N 460 ± 22 H1B		
	N 740 ± 33 H2A	39	
	N 731,4 ± 42 H2B		
	Injector protrusion X	1.2 to 1.5	
	Camshaft bushing housing in the cylinder head: 1 ⇒ 7 Ø	69.000 to 69.030	
	Camshaft bearing journals: 1 ⇒ 7 Ø	64.924 to 64.080	
	Outer diameter of camshaft bushings: Ø	69.090 to 69.130	
	Inner diameter of camshaft bushings: Ø	65.080 to 65.116	
	Bushings and housings in the cylinder head	0.060 to 0.130	
	Bushings and bearing journals	0.100 to 0.192	
	Cam lift: 	7.4034	
		8.2108	
	Rocker shaft Ø1	31.964 to 31.980	

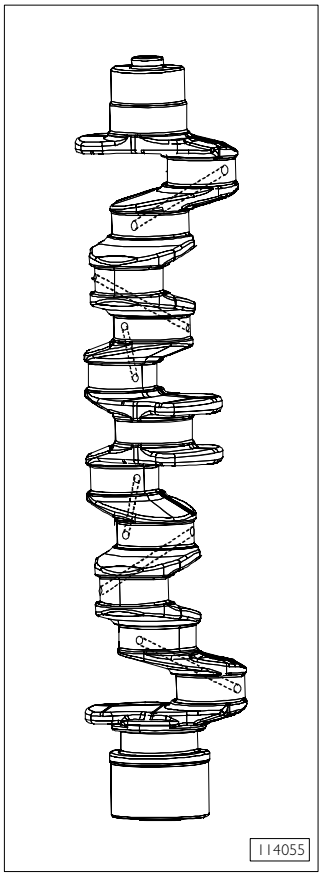
Selection of main half-bearings (nominal diameter pins)

After detecting, for each journal, the necessary data on block and crankshaft, select the type of half-bearings to be used, in compliance with the following table:

Figure 27

STD.

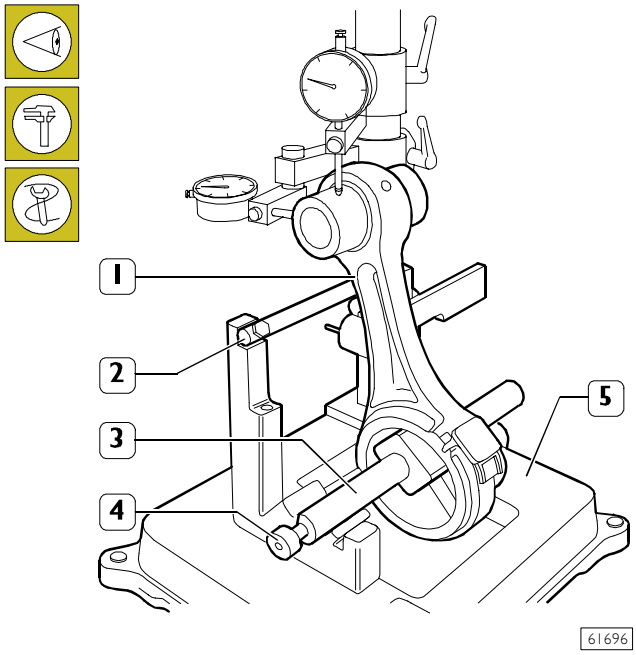




	1	2	3
1	green	green	yellow
	green	yellow	yellow
2	red	green	green
	green	green	yellow
3	red	red	green
	red	green	green

Checking connecting rod alignment

Figure 54



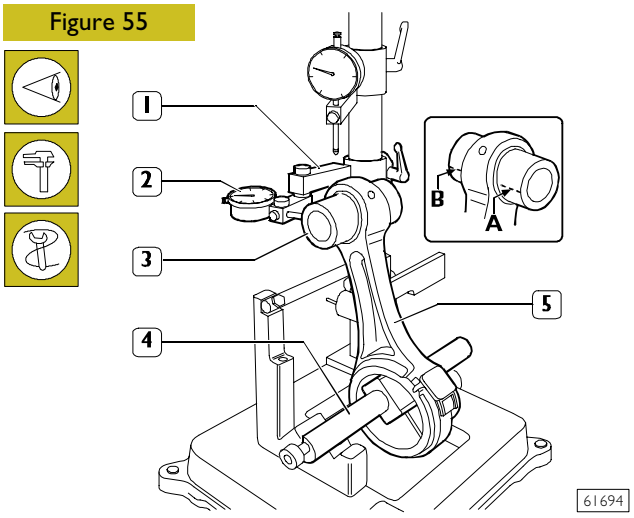
Checking axis alignment

Check the alignment of the axes of the connecting rods (1) with device (5), proceeding as follows:

- ❑ Fit the connecting rod (1) on the spindle of the tool (5) and lock it with the screw (4).
- ❑ Set the spindle (3) on the V-prisms, resting the connecting rod (1) on the stop bar (2).

Checking torsion

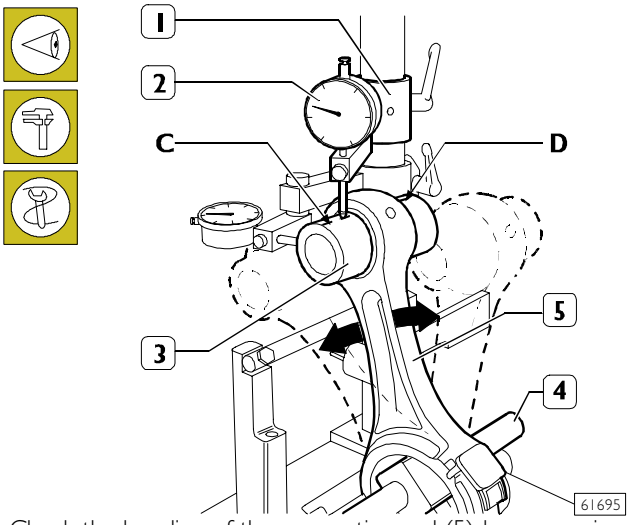
Figure 55



Check the torsion of the connecting rod (5) by comparing two points (**A** and **B**) of the pin (3) on the horizontal plane of the axis of the connecting rod.
Position the mount (1) of the dial gauge (2) so that this pre-loads by approx. 0.5 mm on the pin (3) at point **A** and zero the dial gauge (2). Shift the spindle (4) with the connecting rod (5) and compare any deviation on the opposite side **B** of the pin (3): the difference between **A** and **B** must be no greater than 0.08 mm.

Checking bending

Figure 56



Check the bending of the connecting rod (5) by comparing two points **C** and **D** of the pin (3) on the vertical plane of the axis of the connecting rod.
Position the vertical mount (1) of the dial gauge (2) so that this rests on the pin (3) at point **C**.
Swing the connecting rod backwards and forwards seeking the highest position of the pin and in this condition zero the dial gauge (2).
Shift the spindle (4) with the connecting rod (5) and repeat the check on the highest point on the opposite side **D** of the pin (3). The difference between point **C** and point **D** must be no greater than 0.08 mm.

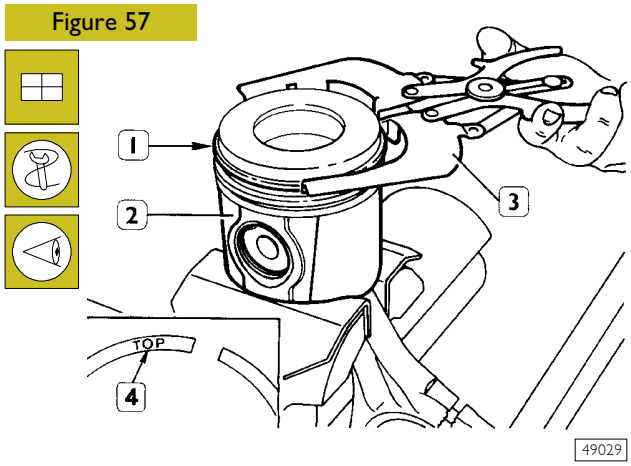
Mounting the connecting rod - piston assembly

Carry out the steps for removal described on pages 27 and 28 in reverse order.

NOTE The connecting rod screws can be reused as long as the diameter of the thread is not less than 11.4 mm.

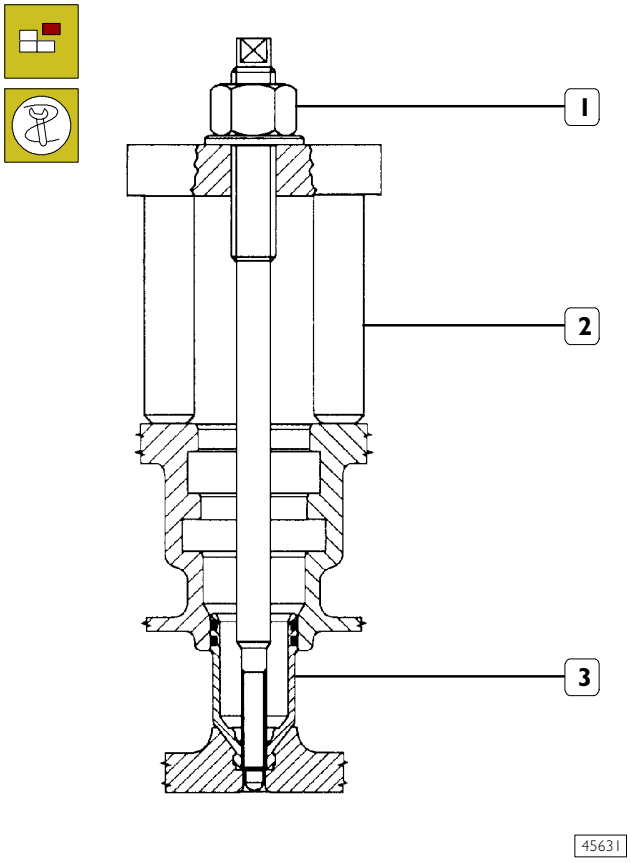
Mounting the piston rings

Figure 57



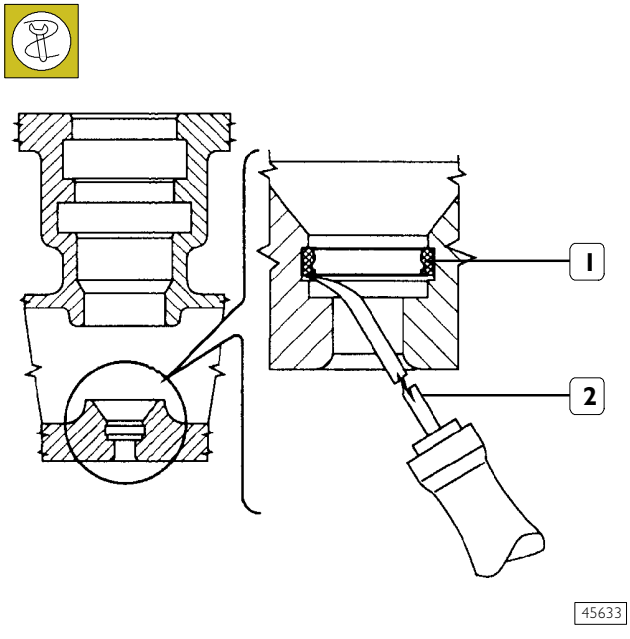
To fit the piston rings (1) on the piston (2) use the pliers 99360184 (3).
The rings need to be mounted with the word "TOP" (4) facing upwards. Direct the ring openings so they are staggered 120° apart.

Figure 69



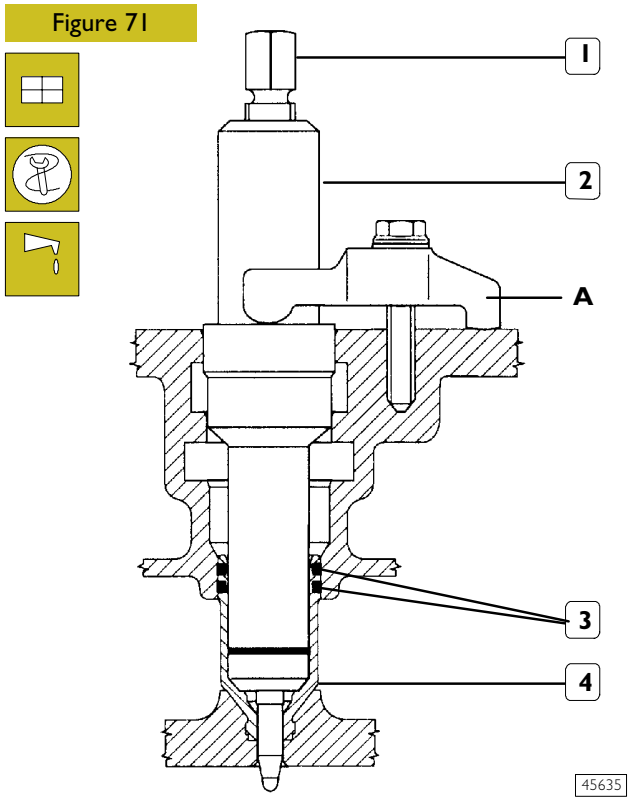
❑ fasten extractor 99342149 (2) to case (3), by tightening the nut (1), and pull out the case from cylinder head.

Figure 70



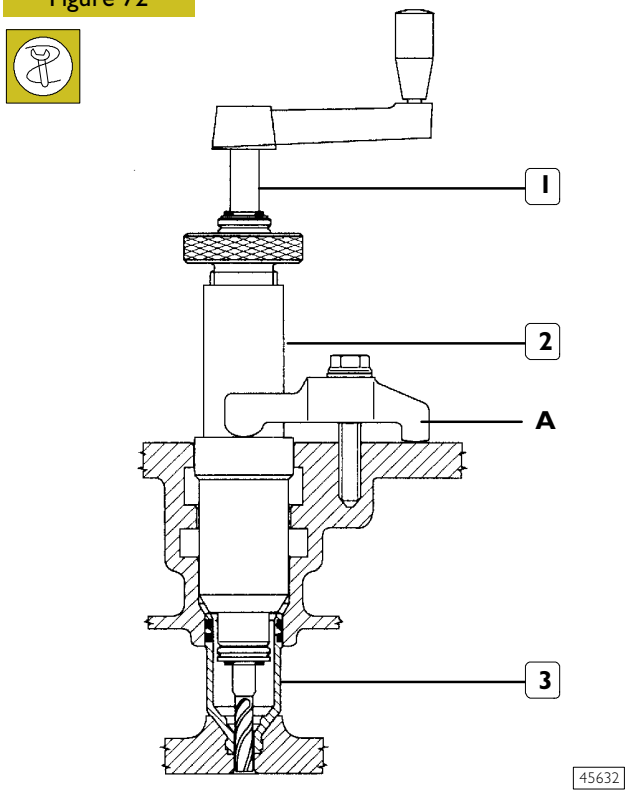
❑ Remove any residue (1), with tool 99390772 (2), from the cylinder head groove.

Figure 71



❑ Lubricate sealing rings (3) and fit them to the case (4); fix tool 99360554 (2) to the cylinder head by means of bracket **A**, install the new case, tighten the screw (1), upsetting the case lower part.

Figure 72



❑ Adjust the casing hole (3) with borer 99394043 (1) and guide bushing 99394045 (2).

PART		TORQUE	
		Nm	kgm
Damper flywheel fastening screws ♦		115 ± 15	11.5 ± 1.5
Idler gear pin fastening screws ♦			
First stage	pre-tightening	30	3
Second stage	angle closing	90°	
Idle gear link rod fastening screw		24.5 ± 2.5	2.4 ± 0.2
Oil pump fastening screw		24.5 ± 2.5	2.4 ± 0.2
Oil pump suction rose fastening screw		24.5 ± 2.5	2.4 ± 0.2
Front cover fastening screw to cylinder block		19 ± 3	1.9 ± 0.3
Control unit fastening screw to cylinder block		19 ± 3	1.9 ± 0.3
Fuel filter support fastening screw to cylinder head ♦		24.5 ± 2.5	2.4 ± 0.2
Screw securing the engine support to the wheelcase ♦			
First stage	pre-tightening	100	10
Second stage	angle closing	60°	
Turbo-compressor fastening screws and nuts •			
pre-tightening		35 ± 5	3.5 ± 0.5
tightening		46 ± 2	4.6 ± 0.2
Water pump fastening screw to cylinder block		24.5 ± 2.5	2.4 ± 0.2
Pulley fastening screw to hub		55 ± 5	5.5 ± 0.5
Rocker arm cover fastening screws		8.5 ± 1.5	0.8 ± 0.1
Thermostat box fastening screws to cylinder head		24.5 ± 2.5	2.4 ± 0.2
Automatic tightener fastening screws to cylinder block		45 ± 5	4.5 ± 0.5
Fixed tightener fastening screws to cylinder block		105 ± 5	10.5 ± 0.5
Fan support fastening screws to cylinder block		24.5 ± 2.5	2.4 ± 0.2
Starter fastening screws		44 ± 4	4 ± 0.4
Air heater on cylinder head		50 ± 5	5 ± 0.5
Hydraulic power steering pump gear fastening nut		105 ± 5	10.5 ± 0.5
Air conditioner compressor fastening screw to support		24.5 ± 2.5	2.4 ± 2.5
Alternator support superior fastening screw		71.5 ± 4.5	7.1 ± 0.4
Alternator bracket fastening screw to cylinder block		24.5 ± 2.5	2.4 ± 0.2
Water pipe unions		35	3.5
Water temperature sensor		32.5 ± 2.5	3.2 ± 0.2

♦ Lubricate with oil MOLYKOTE before assembly
• Lubricate with graphitized oil before assembly