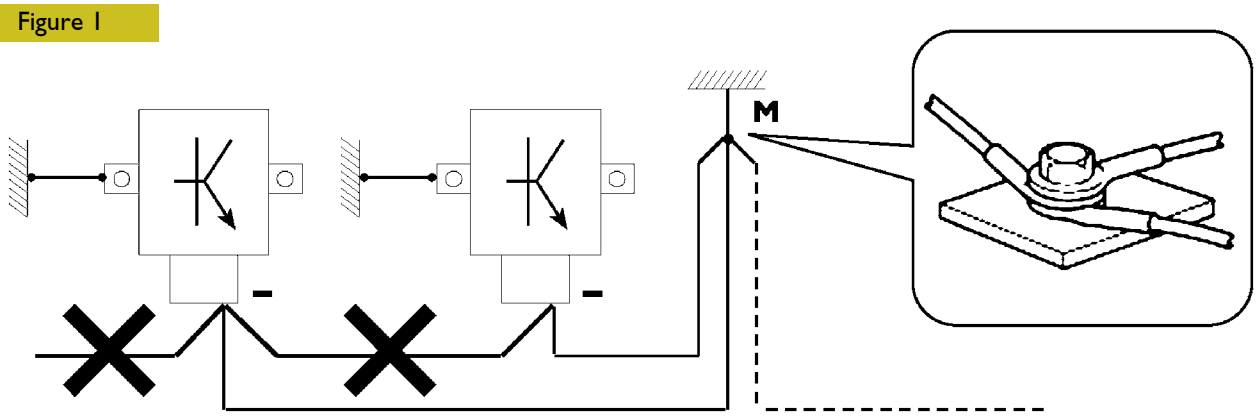
Bonding and screening

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:

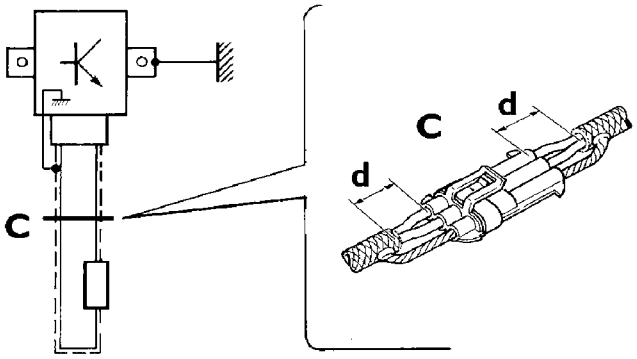
- Electronic central units must be connected to system bonding when they are provided with a metallic shell.
- Electronic central units negative cables must be connected both to a system bonding point such as the dashboard opening bonding (avoiding "serial" or "chain" connections), and to battery negative 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

ELECTRICAL SPECIFICATIONS OF THE GENERATING SETS

Generating set	Assembled Engine	Electrical specifications				
		Ratings	50 Hz		60 Hz	
			kVA	kW (*)	kVA	kW (*)
GE NEF 45M	**NEF 45 AM1**	Prime	45	36	50	40
		Stand By	50	40	55	44
GE NEF 60M	**NEF 45 SM1**	Prime	60	48	66	53
		Stand By	66	53	73	58
GE NEF 75M	**NEF 45 SM2**	Prime	75	60	75	60
		Stand By	82	66	82	66
GE NEF 85M	**NEF 45 TM1**	Prime	85	68	100	80
		Stand By	94	75	110	88
GE NEF 100M	**NEF 45 TM2**	Prime	100	80	110	88
		Stand By	110	88	121	97
GE NEF 125M	**NEF 67 SM1**	Prime	125	100	145	116
		Stand By	138	110	160	128
GE NEF 130M	**NEF 67 TM2**	Prime	130	104	145	116
		Stand By	143	114	160	128
GE NEF 160M	**NEF 67 TM3**	Prime	160	128	170	136
		Stand By	176	141	187	150
GS NEF 45M	**NEF 45 AM1**	Prime	45	36	50	40
		Stand By	50	40	55	44
GS NEF 60M	**NEF 45 SM1**	Prime	60	48	66	53
		Stand By	66	53	73	58
GS NEF 75M	**NEF 45 SM2**	Prime	75	60	75	60
		Stand By	82	66	82	66
GS NEF 85M	**NEF 45 TM1**	Prime	85	68	100	80
		Stand By	94	75	110	88
GS NEF 100M	**NEF 45 TM2**	Prime	100	80	110	88
		Stand By	110	88	121	97
GS NEF 125M	**NEF 67 SM1**	Prime	125	100	145	116
		Stand By	138	110	160	128
GS NEF 130M	**NEF 67 TM2**	Prime	130	104	145	116
		Stand By	143	114	160	128
GS NEF 160M	**NEF 67 TM3**	Prime	160	128	170	136
		Stand By	176	141	187	150

(*) Power factor 0.8.

Prime Power

The Prime Power is the maximum power available with varying loads for an unlimited number of hours. The average power output during a 24 h period of operation must not exceed 80% of the declared prime power between the prescribed maintenance intervals and at standard environmental conditions. A 10% overload is permissible for 1 hour every 12 hours of operation.

Stand-by Power

This is the maximum power available for a period of 500 hours/year with a mean load factor of 90% of the declared stand-by power. No kind of overload is permissible for this use.

LUBRICATION

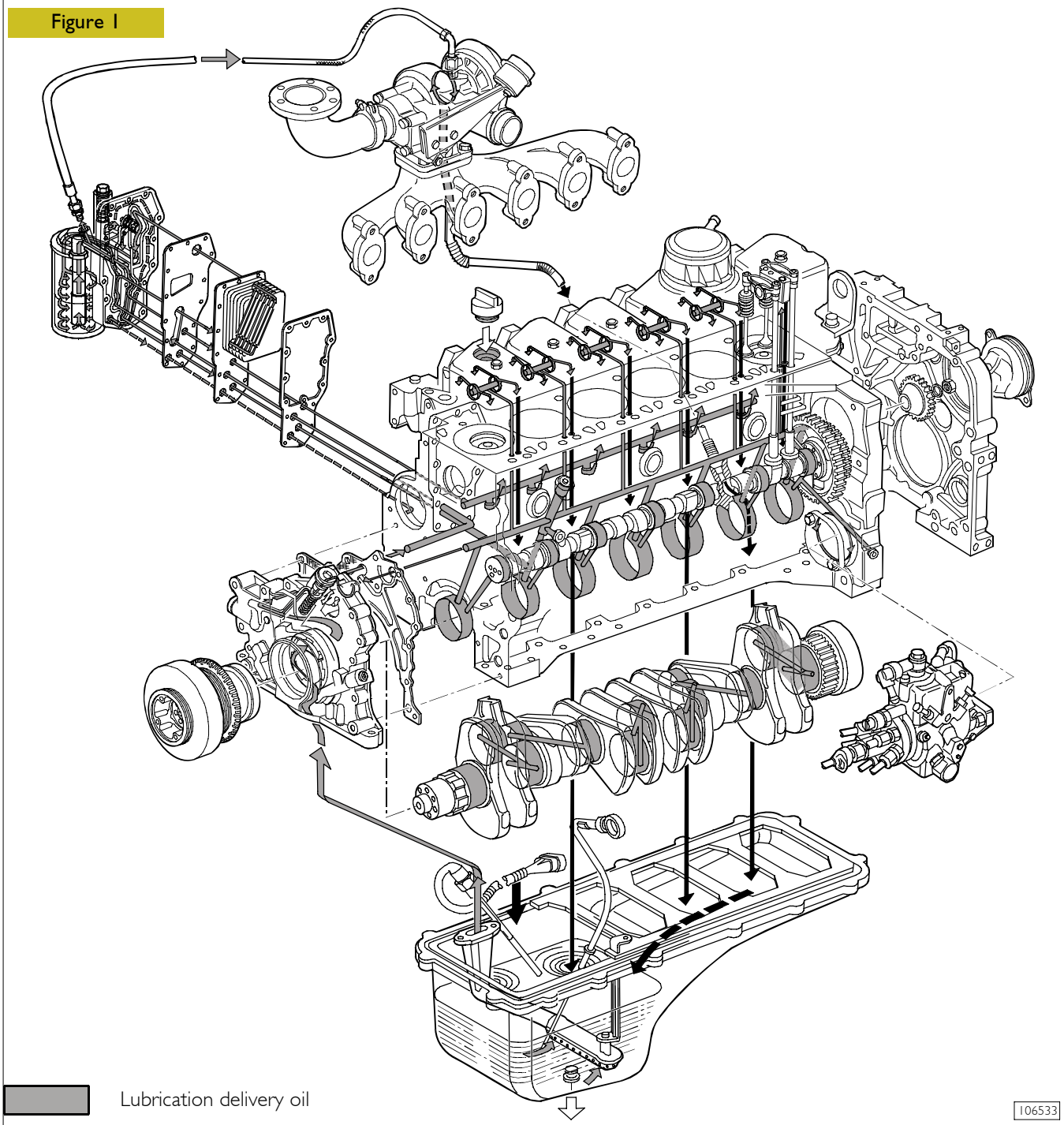
Lubrication by forced circulation is achieved through oil rotary expansion pump, placed in the front part of the basement, driven by the straight-tooth gear splined to the shaft's bar hold.

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), the turboblower for turbocompressed versions, and for any compressed air system.

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

Figure 1



LUBRICATION SYSTEM LAYOUT (6 cyl. engines)

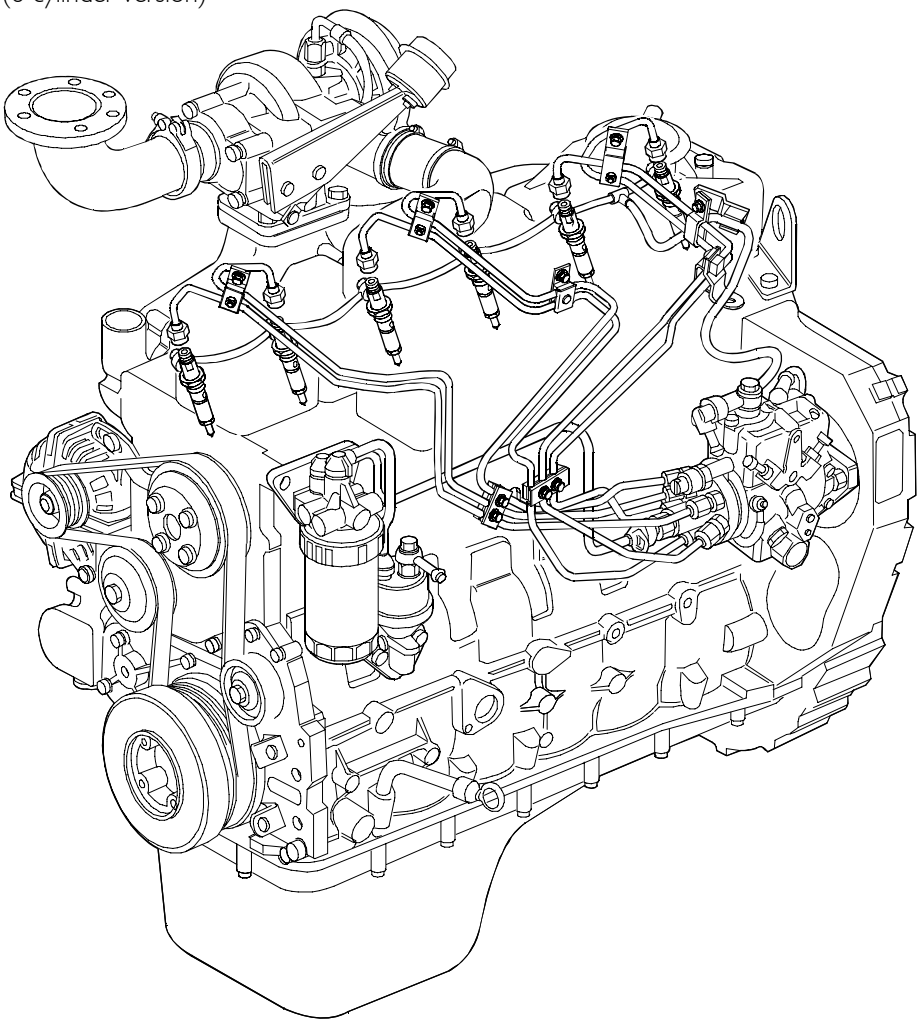
INJECTION FEED SYSTEM BY MECHANICAL ROTARY PUMP

General information

Fuel feed system is composed by:

- ❑ Fuel tank
- ❑ Fuel delivery and back-flow to tank
- ❑ Fuel pre-filter
- ❑ Priming pump, assembled to the engine and driven by the camshaft
- ❑ Fuel filter
- ❑ Fuel feed rotary pump
- ❑ Injector feed pipeline
- ❑ Injectors

Figure 1 (6-cylinder version)



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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, the fuel is piped to the union fitting vacuum chamber of the transfer pump.

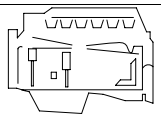
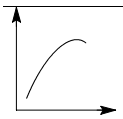
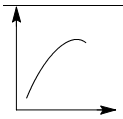
Transfer pump is placed inside the feed pump, and is bladed type; its duty is to increase fuel pressure in correspondence with the increase of the number of revolutions.

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.

Clearance data - 4 cyl.

			F4GE0405A*F600	F4GE0405B*F600
	Type			
ϱ	Compression ratio		17.5:1	
 	Working power	kW	50	52
		rpm	1500	1800
 	Working torque	Nm	318	-
		rpm	1500	-
	Loadless engine idling	rpm	.	-
	Loadless engine peak rpm	rpm	-	-
	Bore x stroke	mm	104 x 132	
	Displacement	cm^3	4485	
	**LUBRICATION**		Forced by gear pump, relief valve single action oil filter	
	Oil pressure (warm engine)			
	- idling	bar	0.70	
	- peak rpm	bar	3.50	
	COOLING		By centrifugal pump, regulating thermostat, heat exchanger, intercooler	
	Water pump control		Through belt	
	Thermostat			
	- start of opening	°C	81 ± 2	
 15W40 ACEA E3	**FILLING**			
	engine sump	liters	-	
	engine sump + filter	liters	-	

NOTE Data, features and performances are valid only if the setter fully complies with all the installation prescriptions provided by Iveco Motors.

Furthermore, the users assembled by the setter shall always be in conformance to couple, power and number of turns based on which the engine has been designed.

OVERHAULING THE 6-CYLINDER ENGINE

Introduction

The following description concerns the operations of overhauling the engine restricted to the components that differentiate it according to its specific use.

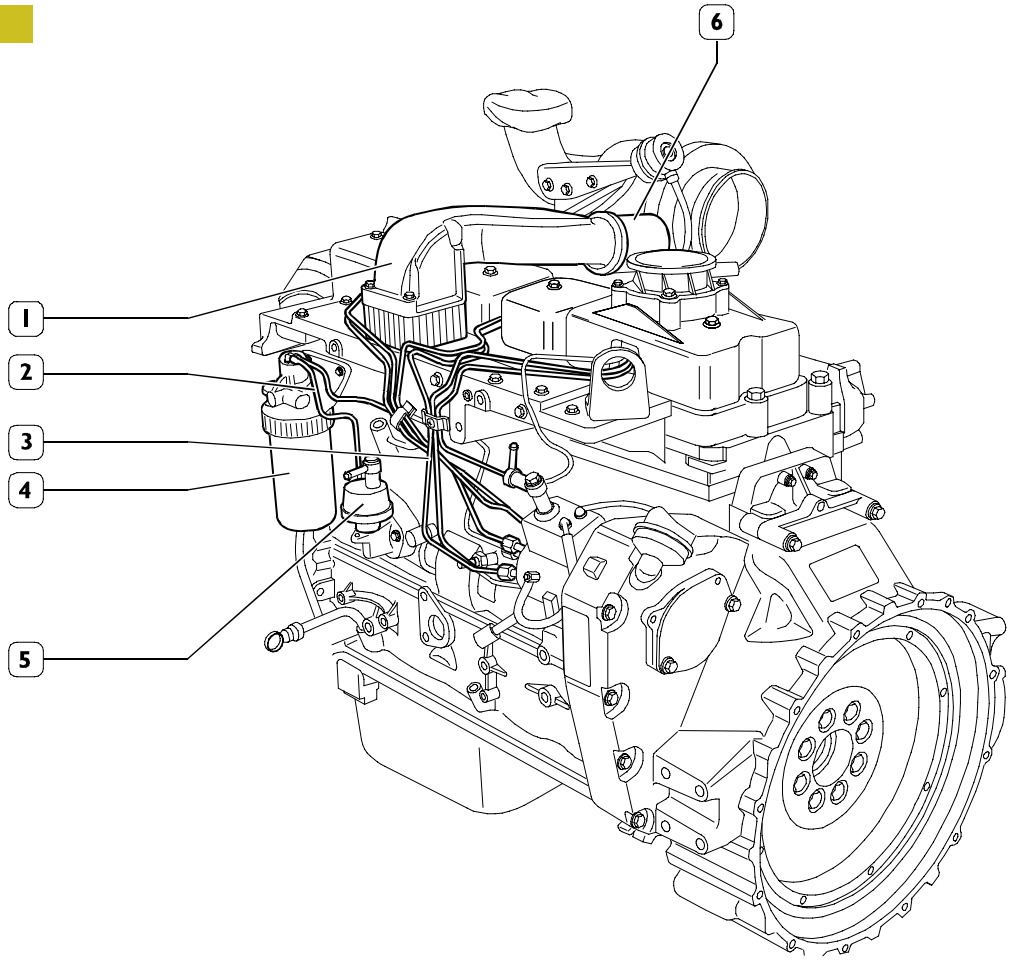
NOTE Due to requirements dictated by the application, some assemblies may be located on the engine in different positions.

The "General Overhaul" section contains all the operations of overhauling the engine block and this section is therefore to be considered as following this topic.

NOTE The operations of removing the engine, as those for overhauling, must be performed by skilled personnel with specific tools.

Operations of preparing the engine for assembly on the rotary stand

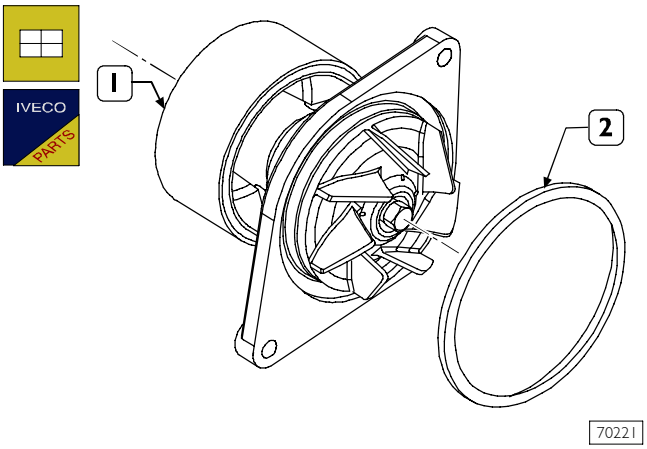
Figure 11



- ❑ Remove the intake manifold (1) and the sleeve (6).
- ❑ Remove the fuel hoses (2).
- ❑ Place a container under the diesel filter and unscrew the condensation bleed cock located under the filter; drain off all the diesel it contains.
- ❑ Fully unscrew the cock and, using tool 99360076, remove the diesel filter (4).
- ❑ Remove the fuel filter mounting (4) from the bracket secured to the cylinder head.
- ❑ Remove the priming pump (5).
- ❑ Disconnect the pipes (3) from the injection pump.

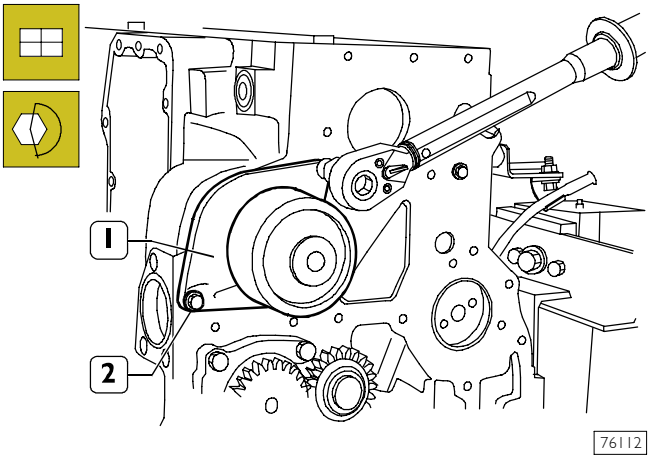
NOTE Removing the injection pump requires a specific procedure described in this section.

Figure 57



❑ Apply to the water pump (1) a new fixing ring (2).

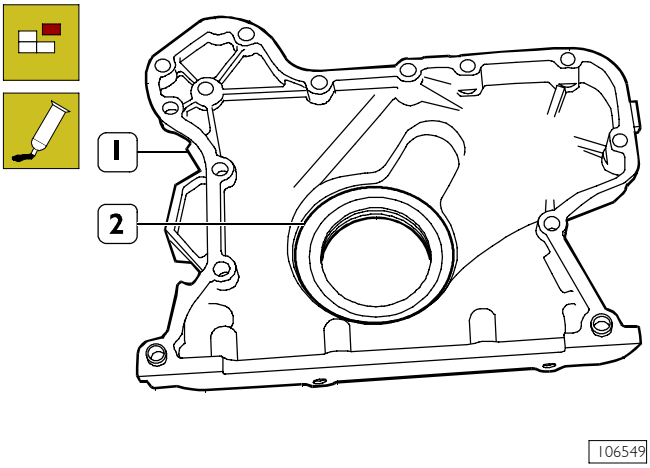
Figure 58



❑ Assemble the water pump (1).

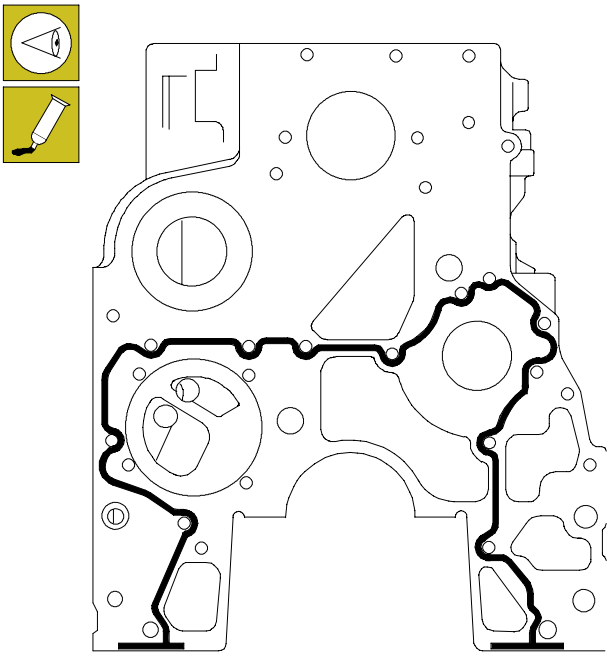
❑ Tighten the screws (2) and lock them to the prescribed couple.

Figure 59



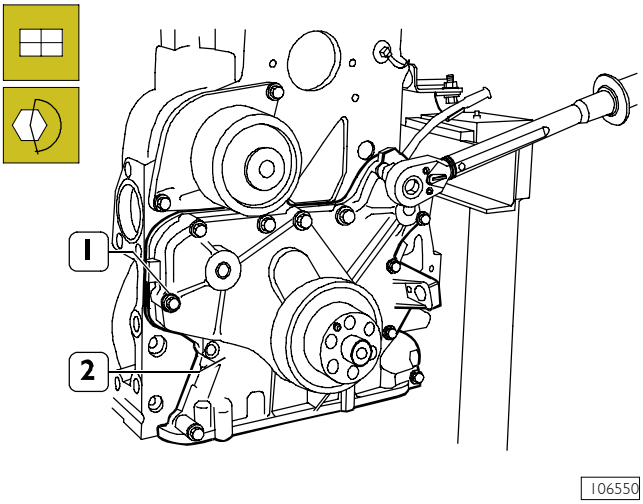
❑ Remove the fixing ring (2) from the front cover (1), accurately clean the plug surface.

Figure 60



❑ Accurately clean the contact surface of engine block and apply sealing LOCTITE 5205 on it in order to form a uniform and continuous kerbstone with no crumbs.

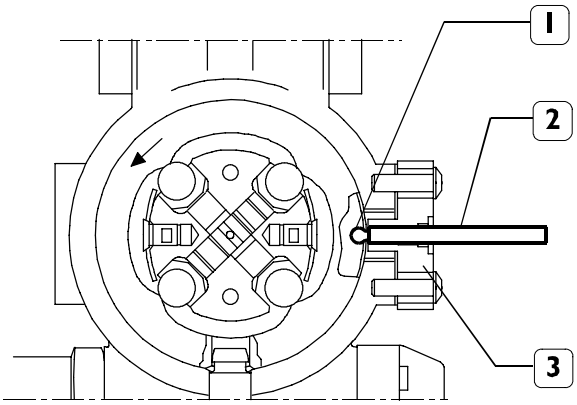
Figure 61



❑ Assemble the front cover (2) to the block and tighten the screws (1) fixing them to the prescribed couple.

Rotary feed pump setting check

Figure 98



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1. Slot on the hub of the hydraulic rotor -
2. Synchronization pin 99365196 - 3. Plate.

The synchronization pin 99365196 (2) has been designed for use in the event of the rotor shaft being inadvertently released.
The correct synchronization of the pump with the engine is obtained when the synchronization pin 99365196 (2), fitted in the hole on the plate (3), enters the slot (1) on the exterior of the hydraulic rotor hub.

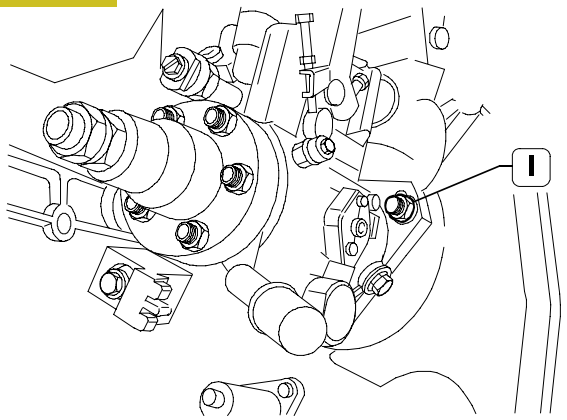
Therefore:

- ❑ Remove the screw cap (3) at the centre of the plate.
- ❑ Insert the synchronization pin (1) 99365196 in the hole on the plate (3). The synchronization position is obtained when the synchronization pin (2) enters the slot on the hydraulic rotor hub.
- ❑ Lock the control shaft in the correct position by means of the screw (1, Figure 95).
- ❑ Remove the synchronization pin and fit the screw cap of the plate (3). Tighten the cap using a torque of 2.3 ÷ 3.4 Nm.

NOTE Support the pump gear to prevent interference or sticking when the timing system gears turn.

Assembly

Figure 99



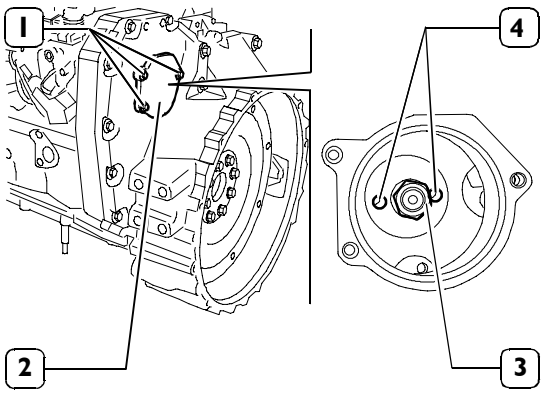
106658

When installing supplì pump on engine, cylinder no.1 must be at TDC, end of compression phase.

- ❑ Assemble the pump pre-set in its housing on the engine, fitting the shaft into the gear port (not provided with wrench).
- ❑ Tighten the fixing nuts (1) locking the pump flange in the slot centre.

NOTE The gasket removed during pump disassembly shall not be utilised again.
Always use original spare parts.

Figure 100



75693

- ❑ On the timing side, throughout the specially appointed port, fit the washer and screw up the fixing nut (3) to the pump shaft. Lock the nut to the 190-203 Nm couple.
- ❑ Assemble the cover (2) including gasket and tighten the screws (1).

GENERAL SPECIFICATIONS

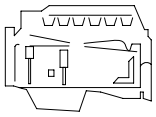
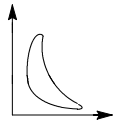
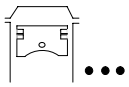
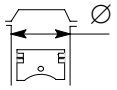
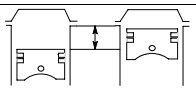
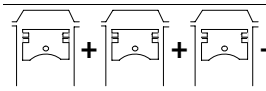
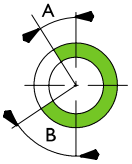
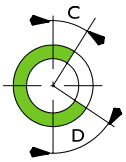
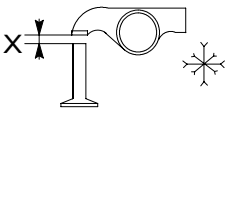
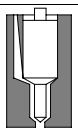
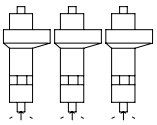
			4 CYLINDERS	6 CYLINDERS
	Type			
	Cycle		Four-stroke diesel engine	
	Power		Supercharged with intercooler	
	Injection		Direct	
	Number of cylinders		4 in-line	6 in-line
	Bore	mm	104	
	Stroke	mm	132	
	Total displacement	cm^3	4553	6728
	**TIMING**			
	start before T.D.C. end after B.D.C.	A B	15° 35°	
	start before B.D.C. end after T.D.C.	D C	69° 21°	
	Checking timing			
		mm	-	
	X	mm	-	
	Checking operation			
		mm	0.25 to 0.05	
	X	mm	0.50 to 0.05	
	FUEL FEED			
	Injection Type:	rotary	STANADYNE DB 4	
	Nozzle type		DSLA 145 P	
	Injection sequence		1 - 3 - 4 - 2	1 - 5 - 3 - 6 - 2 - 4

Figure 62

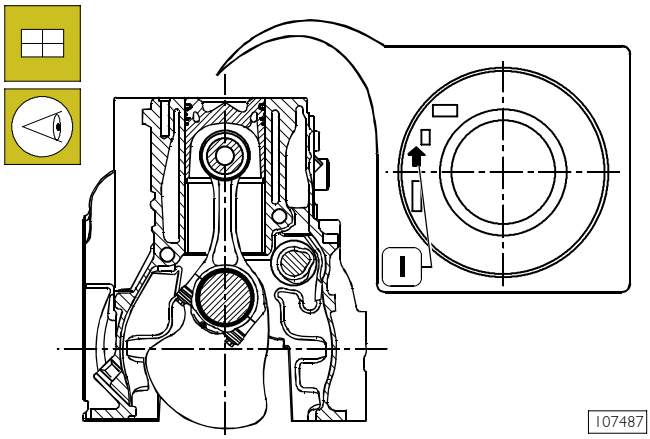
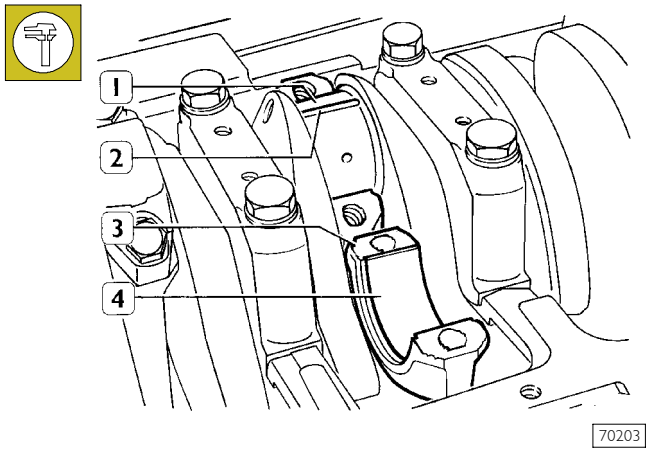


DIAGRAM FOR CONNECTING ROD-PISTON ASSEMBLY FITTING INTO BARREL

- ❑ Split ring openings shall be displaced with each other by 120°;
- ❑ connecting rod-piston assemblies shall have the same weight;
- ❑ the arrow marked on the piston crown shall be facing the front side of the engine block or the slot obtained on the piston skirt shall be corresponding to the oil nozzle position.

Finding crankpin clearance

Figure 63



To measure the clearance proceed as follows:

- ❑ clean the parts accurately and remove any trace of oil;
- ❑ set a piece of calibrated wire (2) on the output shaft pins (1);
- ❑ fit the connecting rod caps (3) with the relevant half bearings (4).

NOTE Before using the fixing screws again, measure them twice as indicated in the picture, checking D1 and D2 diameters:
if D1 - D2 < 0,1 mm the screw can be utilised again;
if D1 - D2 > 0,1 mm the screw must be replaced.

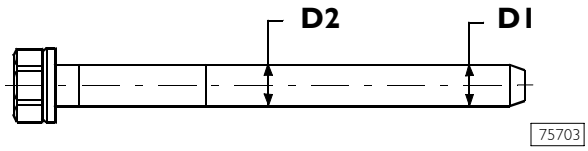
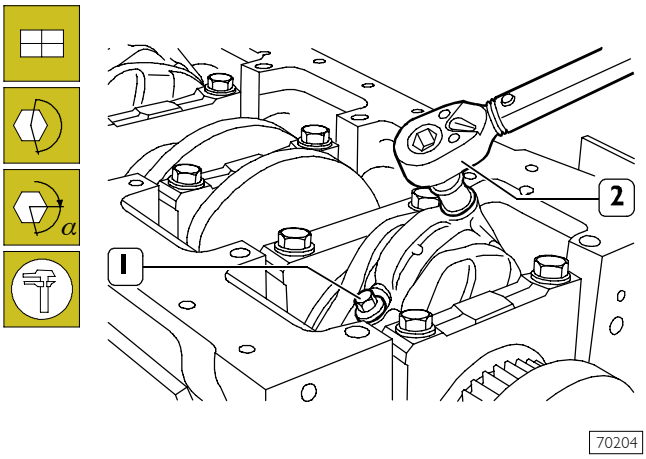
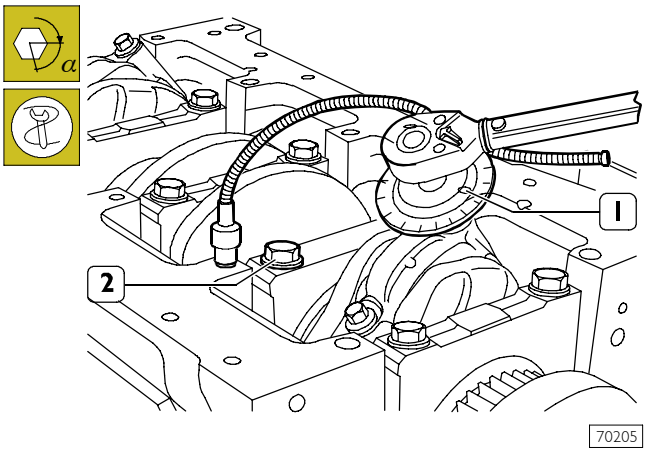


Figure 64



- ❑ Lubricate the screws (1) with engine oil and then tighten them to the specified torque using the dynamometric wrench (2).

Figure 65



- ❑ Apply tool 99395216 (1) to the socket wrench and tighten screws (2) of 60°.

TOOLS

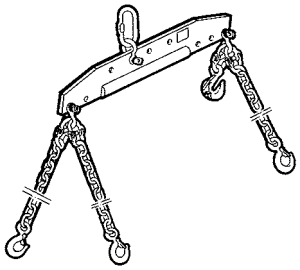
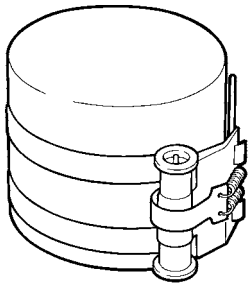
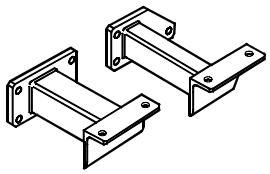
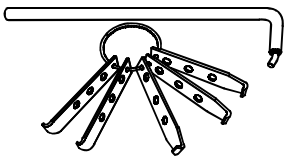
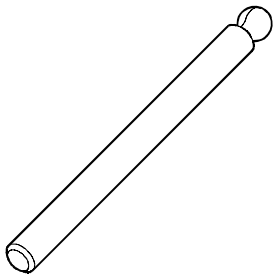
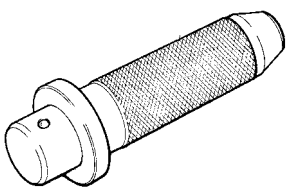
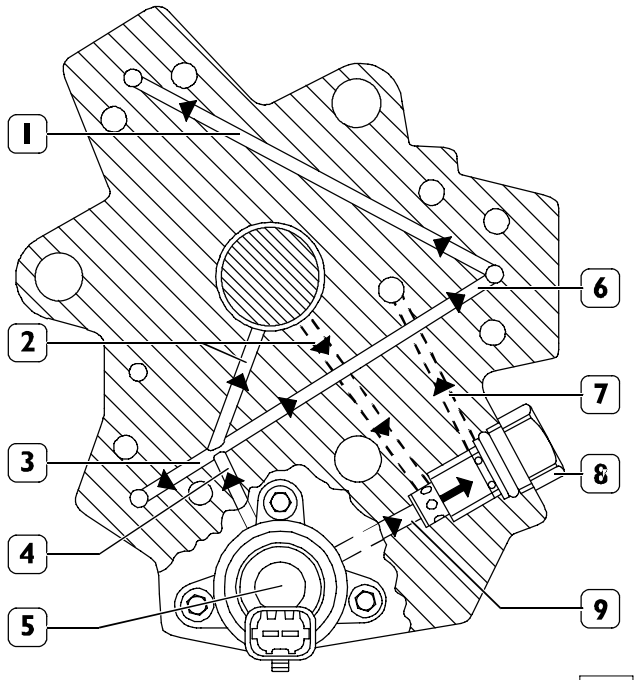
TOOL NO.		DESCRIPTION
99360595		Lifting rig for engine removal/refitting
99360605		Band for fitting piston into cylinder barrel (60 – 125 mm)
99361037		Brackets for fastening engine to revolving stand 99322205
99363204		Tool to remove gaskets
99365196		Tool for positioning the injection pump at the start of delivery
99370006		Interchangeable willow handgrip

Figure 10



Sec. C - C

1. Cylinder. – 2. Three-lobe element. – 3. Cap intake valve. – 4. Ball delivery valve. – 5. Piston. – 6- Pump shaft. – 7. Low-pressure fuel inlet. – 8. Pumping elements supplying fuel ducts.

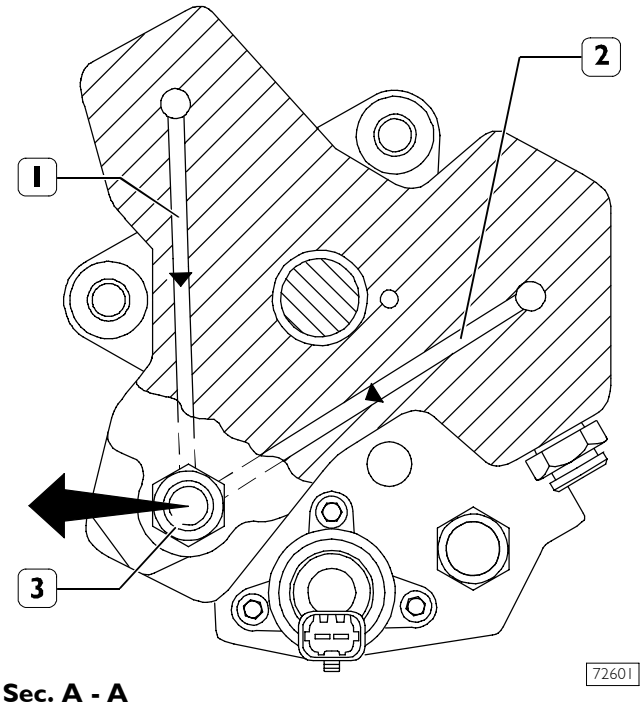
Picture 10 shows the fuel runs at low pressure inside the pump; the following elements are clearly visible: the main feeding line to the pumping elements (4); the feeding lines to the pumping elements (1-3-6), the duct lines run for the pump lubrication (2), the pressure gauge (5), the flow limiting valve to 5 bar (8) and the fuel exhaust flue (7).

The pump shaft is lubricated by the fuel through the feeding and recovery lines.

The pressure gauge (5) determines the quantity of fuel to feed the pumping elements: the fuel in excess flows through the exhaust gallery (9).

The limiting valve to 5 bar, in addition to recovering fuel exhaust as a collector has also function to keep the pressure constant to 5 bar limit at gauge entry.

Figure 11

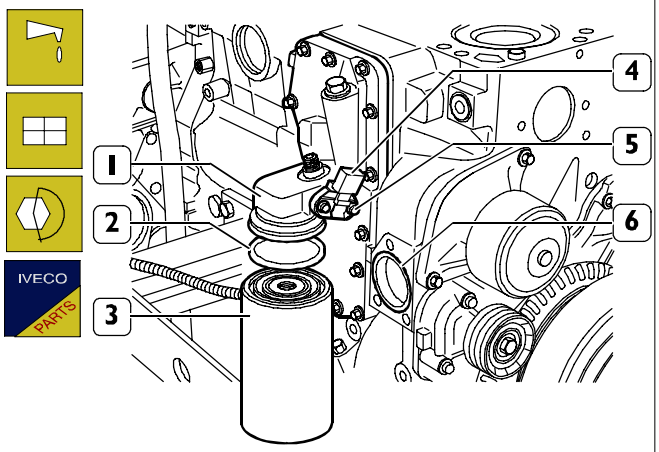


Sec. A - A

1. Fuel exhaust flue - 2. Fuel exhaust gallery - 3 Fuel exhaust flowing from pump with connector to high pressure pipe for common rail.

Figure 11 shows the fuel flow under high pressure running through the exhaust galleries of the pumping elements.

Figure 69 (Demonstrative)



Lubricate the sealing ring (2) with engine oil and set it on the oil filter (3).

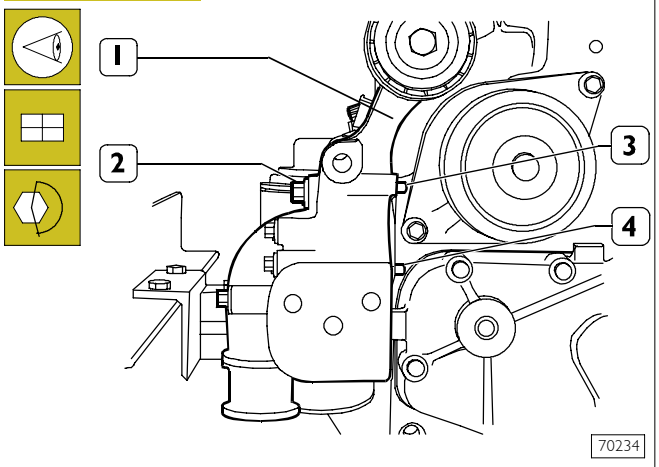
Screw manually to seat the oil filter (3) on the support connection (1) and then screw again the oil filter (3) by ¾ turn.

Apply a new sealing ring on the oil temperature/pressure sensor (4) and fit it on the support (1).

Tighten the screws (5) to the specified torque.

Fit a new sealing ring (6) in the engine block seat.

Figure 70 (Demonstrative)

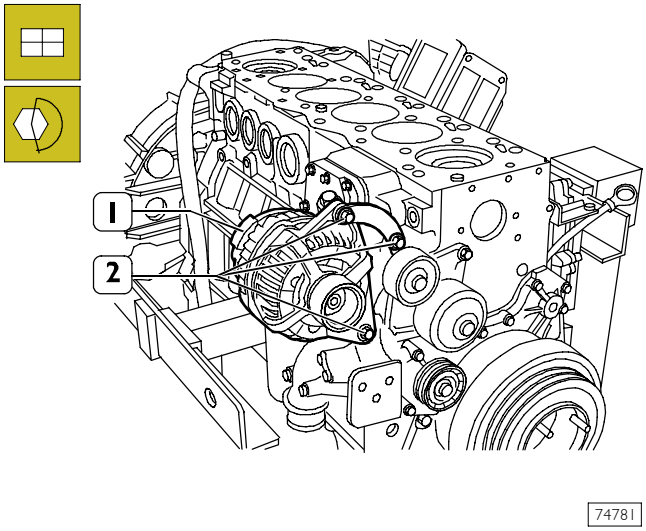


Position the alternator support (1) so that pins (3 and 4) are set against the engine block.

Tighten the screws (2) to the specified torque.

NOTE Before any assembly operation always verify that the hole and screw threads have no evidence of wear or dirt.

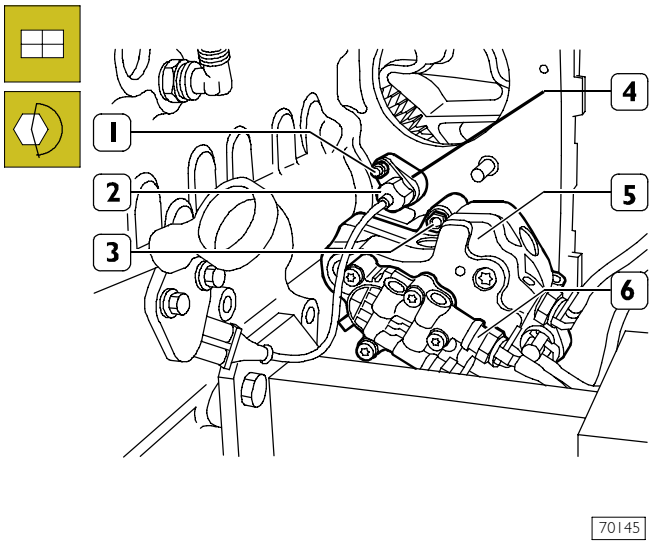
Figure 71



Reconnect the alternator (1).

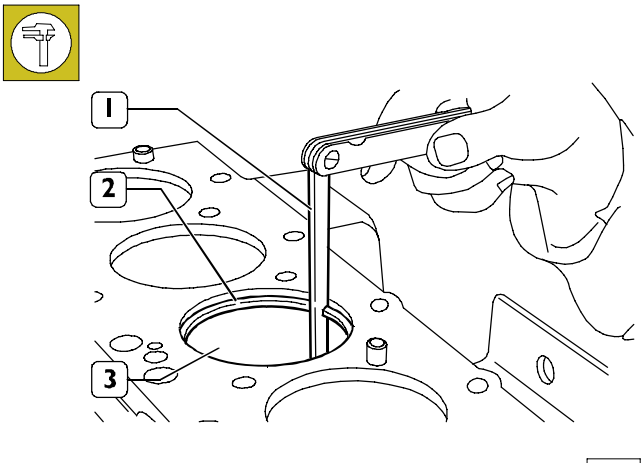
Tighten the screw (2) to the specified torque.

Figure 72



Refit the high pressure pump (6) including the feed pump (5) and tighten the nuts (3) to the specified torque. Fit the support (4) with a new sealing ring, the timing sensor (2) with a new sealing ring and tighten the relevant fastening nut (1) to the specified torque.

Figure 46

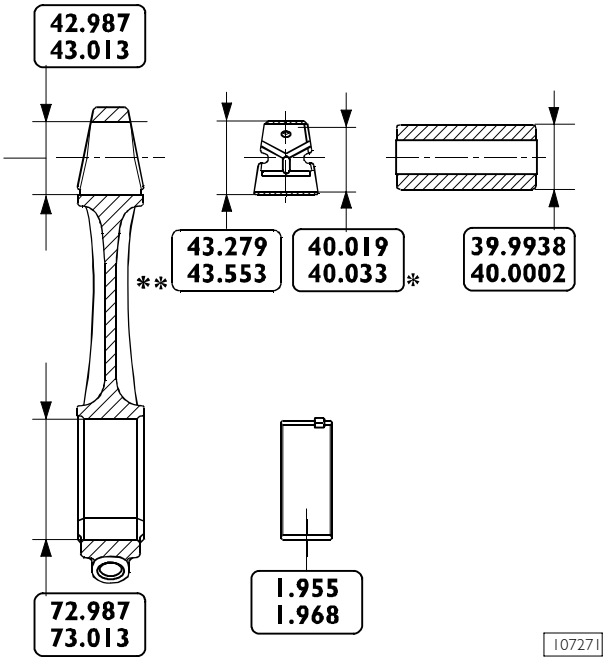


Use feeler gauge (1) to measure the clearance between the ends of the split rings (2) fitted into the cylinder barrel (3).

Use a micrometer (1) to check split ring (2) thickness.

Connecting rods

Figure 47

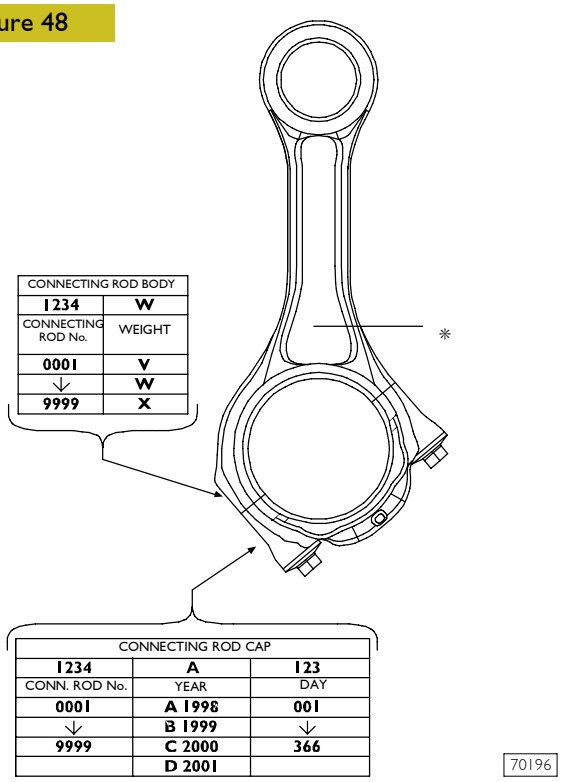


MAIN DATA FOR CONNECTING ROD, BUSH, PISTON PIN AND HALF BEARINGS

* Value for inside diameter to be obtained after driving in connecting rod small end and grinding.
** Value not measurable in released condition.

NOTE The surface of connecting rod and rod cap are knurled to ensure better coupling.
Therefore, it is recommended not to smooth the knurls.

Figure 48



NOTE Every connecting rod is marked as follows:

- ❑ On body and cap with a number showing their coupling and the corresponding cylinder.
  In case of replacement it is therefore necessary to mark the new connecting rod with the same numbers of the replaced one.
- ❑ On body with a letter showing the weight of the connecting rod assembled at production:
  - V, 1820 to 1860 (yellow marking);
  - W, 1861 to 1900 (green marking);
  - X, 1901 to 1940 (blue marking);

Bushes

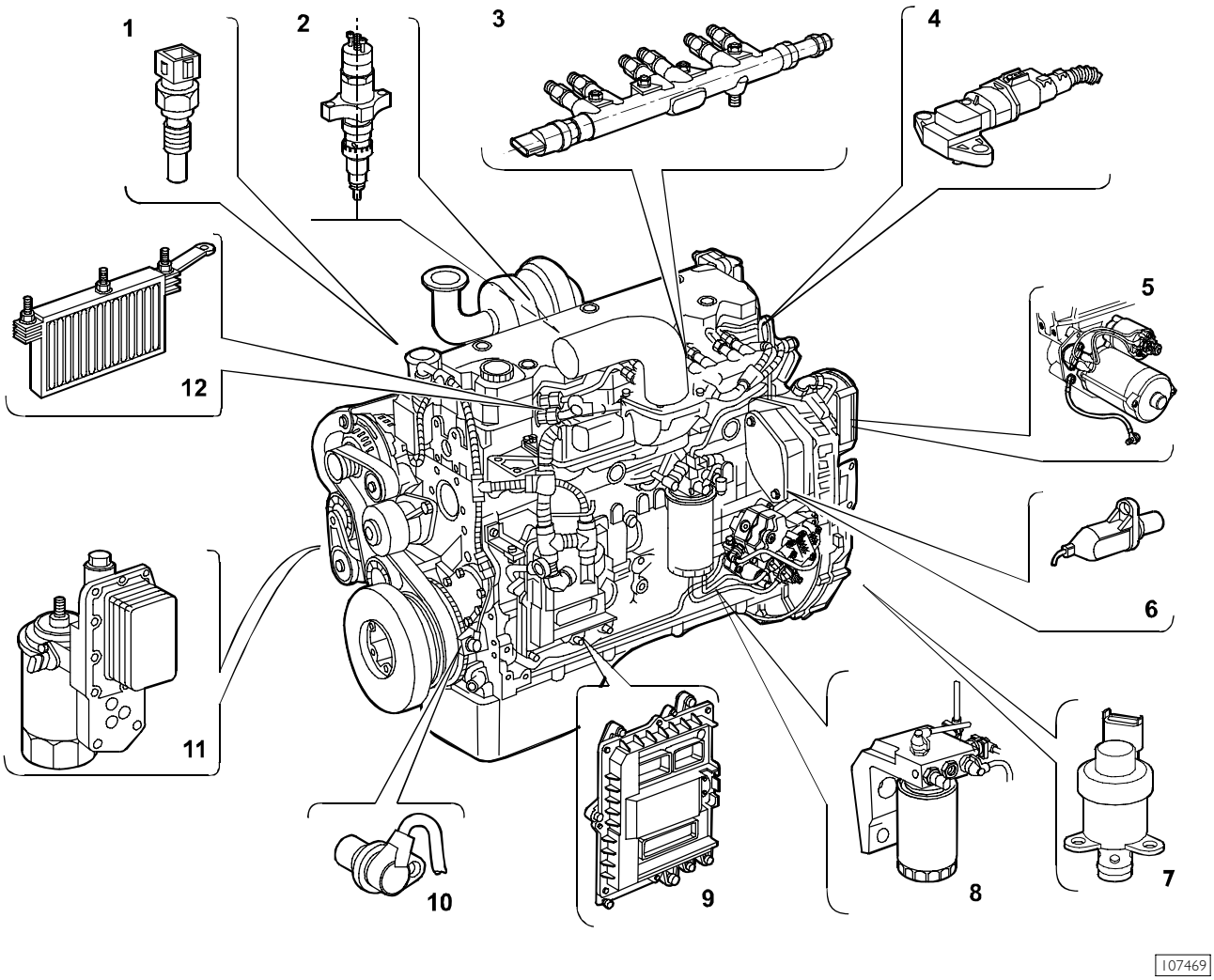
Check that the bush in the connecting rod small end is free from scoring or seizing and that it is not loosen. Otherwise replace.

Removal and refitting shall be performed using the proper beater.

When refitting take care to make coincide the oil holes set on the bush with those set on the connecting rod small end. Grind the bush to obtain the specified diameter.

EDC SYSTEM

Figure 33



1. Coolant temperature sensor - 2. Electro-injector - 3. RAIL pressure sensor -
4. Air temperature/pressure sensor - 6. Timing sensor -
7. Solenoid valve for pressure regulator - 8. Fuel temperature sensor -
9. EDC electronic control unit - 10. Crankshaft sensor -
11. Engine oil pressure/temperature sensor - 12. Heating element for pre-post heating.