D 700-D750 series

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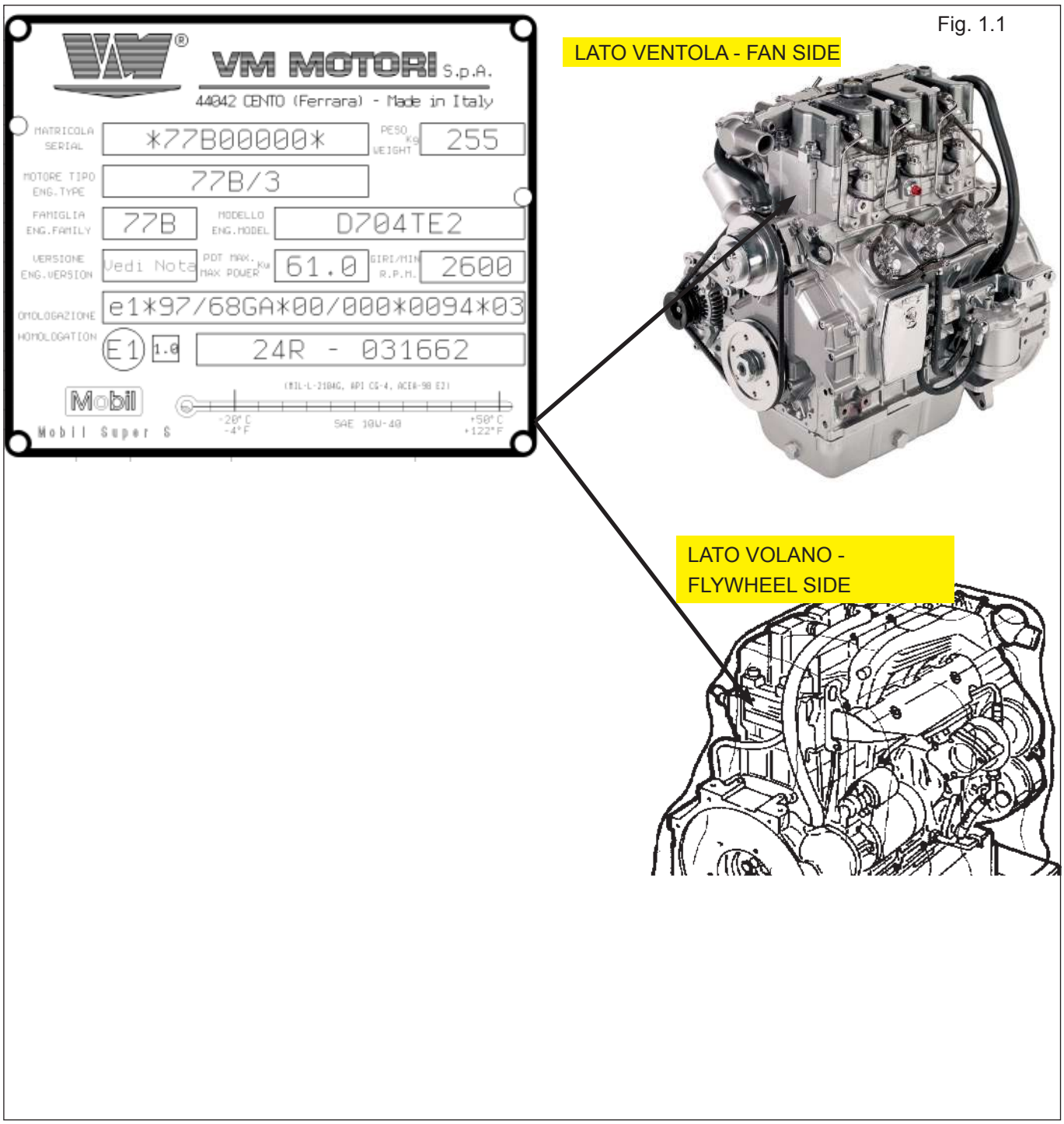
1 IDENTIFICATION

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1.1 IDENTIFICATION DATA

The engine identification data can be found in the following positions:
- engine nameplate showing identification data (fig. 1.1):

Fig. 1.1



MODEL		D703TE3	D703IE3
DIMENSIONS			
A	mm	616	
B	mm	504	
C	mm	730	
GENERAL TECHNICAL DATA			
Combustion cycle		Diesel Four stroke	
Displacement, total	liters	2.082	
No. cylinders	n.	3	
Bore x Stroke	mm	94 x 100	
Compression ratio		17,8 +/- 0.5 : 1	
Intake		with turbocharger - Dry air filter	With Intercooler - Dry air filter
Cooling		coolant	
Heat exchanger		coolant/oil	
Rotation (looking at the flywheel)		counterclockkwise	
Firing Order		1-3-2	
Timing		Pushrods and rocker arms with hydraulic tappets and camshaft	
		Gear cascade control and camshaft fitted on the crankcase	
Minimum idling speed (standard engine)	rpm	1000 +/- 50	
Dry engine weight	Kg	215	
Maximum permanent lengthwise inclination (with handwheel up)	Grades	30°	
Maximum permanent lengthwise inclination (with handwheel down)	Grades	35°	
Maximum permanent crosswise inclination	Grades	30°	
POWER AND TORQUE			
Maximum operating speed	(rpm)	2600	2600
Maximum power	k W (CV)	41,2 (56)	48,6 (66,1)
Maximum torque	N m (kgm) @ rpm	195Nm (19,9 Kgm)@1400rpm	260Nm (26,5 Kgm) @ 1200 rpm
CONSUMPTION AT MAXIMUM POWER			
Specific fuel consumption	g/kWh (g/CV)	/	
Specific oil consumption	g/CVh	0,5 - 1	
FUEL SUPPLY CIRCUIT			
Type of injection		Direct Injection	
Type of fuel		The engine has been designed to be powered by standard fuels available on the European market (according to specifications DIN EN 590). If it is to be powered by BIODIESEL fuels (according to specifications UNI EN 14214), it can be mixed, up to 5%, with fuel available on the European market (according to regulation DIN EN 590).	
Fuel supply		Diaphragm pump	
Injector supply		n° 1 immersed injection pump per cylinder	

VM MOTORI S.p.A.

CARATTERISTICHE TECNICHE / Technical Features							rev.00	pag.2/2
MOTORE / Engine:		D703TE0					16C - 3000 rpm	
Aspirazione *Intake*	**giri/min** *r.p.m.*		**1500**	**1800**	**2000**	**2300**	**2600**	**3000**
	Consumo aria comburente *Air Cosumption*	**kg/h**	147,0	191,0	216,5	249,8	275,1	305,1
	Pressione aria dopo compressore (P_2) *BOOST pressure after compressor (P2)*	*mbar*	735	960	1050	1099	1102	1118
	Temperatura aria dopo compress. T_{amb}=25°C	**°C**	116	127	131	134	136	138,0
	Air temperature after compressor T_{amb} =25°C	*F*	*240,8*	*260,6*	*267,8*	*273,2*	*276,8*	*280,4*
	Depressione ammessa filtro nuovo secco (kPa)	**1,5**						
	Permissible depressure with new filter dry (Ib.sq.in)	*0,22*						
	Depressione max omologata (kPa)	**3**	**Temperatura aria massima dopo intercooler (°C)**					/
	Max Homologated Depressure (Ib.sq.in)	*0,43*	*Maximum air temperature after intercooler (°F)*					/
Ventilatore *Fan*	**Assiale su asse pompa (KW)**	/						
	Axial on Pump axle (CV)	/						
	Portata aria (m3/h)	/						
	Air Capacity (cu ft/min)	/						
Acqua (50% Glicole) *Water (50% Antifreeze)*	**Portata pompa acqua (l/min)** *Water Pump Flow (l/min)*	**V.grafico** *see graph*	**Press.circ.H_2O a nnnn rpm(bar)** *Water circuit press.@ nnnn rpm(bar)*				1,1	
	Inizio/Fine apert.valv.termostatica °C *Therm.valve start/end opening °F*	**80 - 95** *176 - 203*	**Max temp.acqua in funz.to(°C)** *Max water temp. in operation(°F)*				107 *224,6*	
			Pressione aperura tappo espansione **Expansion tank cap opening pressure**				bar	1,1
Momento inerzia *Inertia Moment*	**Volano standard** - *standard flywheel*		**J=** 0,46 **kgm²**			Note (SAE ...) :		
	Motore compl.senza volano - *eng. without flywheel*		**J=** 0,057 **kgm²**			Note :		
	Volano G.E. - *generator set flywheel*		**J=** 1,26 **kgm²**			Note :		
	Baricentro (fra asse motore e profilo basamento) e relativi momenti di inerzia-*Barycenter (bw cranckshaft assy and block side) and related inertia moment*		**X=** / **mm**			**Jx=** / **kgm²**		
			Y= / **mm**			**Jy=** / **kgm²**		
			Z= / **mm**			**Jz=** / **kgm²**		
Pendenze/Inclinazioni coppa std. *Std. Oil Sump Slopes/Incline*	**Max raggiungibili e in movimento**/*max achievable and moving*							
	Longitudinale volano in basso - *flywheel low*		35°			70%		
	Longitudinale volano in alto - *flywheel up*		30°			57%		
	Trasversale nei due sensi - *bank in both directions*		30°			57%		
Temp. gas di scarico *Exhaust Gas Temp.*	Secondo ECE R120 Conform to ECE R120	**°C**	644	616	609	614	625	628
		°F	1191	1141	1128	1137	1157	1162
Bilancio termico *Heat Balance*	**Potenza termica totale**	**kcal/hx1000**	81,3	96,3	106,6	117,2	128,9	/
	Total Thermal Power	*kJ/h x 1000*	340,4	403,3	446,2	490,8	539,5	/
	Potenza utile - *Useful Power*	**%**	35,5	35,8	34,8	33,8	32,0	/
	Pot. raff.acqua - *Water Cooling Power*	**%**	31,5	29,0	28,2	27,6	27,1	/
	Pot. raff.olio - *Oil Cooling Power*							
	Potenza allo scarico - *Exhaust Power*	**%**	29,0	29,7	30,7	31,1	32,7	/
	Potenza all'intercooler	**%**	/	/	/	/	/	/
	Pot. di irraggiamento - *Issued Power*	**%**	4,0	5,5	6,3	7,5	8,2	/
Gas di scarico *Exhaust Gas*	**Portata Gas di Scarico**	**m^3/h**	417,5	431,0	465,0	486,0	533,6	/
	Exhaust Gas Volume	*cu.ft/min*	245,6	253,5	273,5	285,8	313,9	/
	Contropressione max allo scarico (Kpa)	25	**Temp. massima dopo turbo(°C)**				/	
	Exhaust max Backpressure (Kpa)		*Max temp. after turbocharger(°F)*				/	
Avv. Elettrico *Elect.Starter*	**Tensione e capacità batteria. (V-Ah)**	12 - 110	**Potenza Mot.Avv. -** *Starter Output (kW)*					2,3
	Battery Voltage and Capacity (V-Ah)		**Corrente all'avviamento -15°C (A)**					560
	CCA (Cold Cranking Amps) (A) EN (EuroNorm)	880	*Starting current 5°F (A)*					
	Velocità avv. *Starting speed (rpm)*	210 - 230	**Intensità all'avv.(nel trascinamento) -15°C (A)**					360
	Avviamento a freddo senza mezzi ausiliari (°C)	fino a - 10	*Current when starting(during running) 5°F (A)*					
	Cold start without aux. device (°F)	up to 14	**Caratteristche alternatore** *Alternator Output(W-A)*					770 - 55
	Olio utilizzato per test avv. a freddo *Cold Start test oil type*							
Capacità *Capacities*	**Capacità circuito di raffreddamento -** *Engine coolant capacity (with cooling equipment)* *OPU&Marine engine only*						l	/
	Capacità circuito di raffreddamento(solo motore)-*Engine coolant capacity(engine only)*						l	3,7
	Capacità circuito olio primo riempimento - *Engine oil capacity, initial filling*						l	5,1
	Quantità olio sostituzione, max - *Oil change quantity, max.*						l	/
	Capacità coppa olio - *Oil pan capacity*						l	/
Circuito acqua mare *Raw water circuit (open circuit)*	**Pompa acqua mare: max portata-***Raw water pump:max flow rate*						l/min	/
	NPSHr						m H2O	/

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CARATTERISTICHE TECNICHE / *Technical Features*						rev.01	pag.1/2	
MOTORE/*Engine*:	D754TPE2.MTP					97C-P/23@2300		
	n/1' r.p.m.		1500	1800	2000	2300	2600	3000
Aspirazione *Intake*	**Consumo Aria Comburente** *Air Cosumption*	kg/h	249	296		359		
	Depressione Ammessa con Filtro Nuovo (secco) *Permissible depressure with new filter (dry) [mbar]*		20	25		40		
	Depressione max Omologata [mbar] *Max Homologated Depressure*		20	25		40		
Ventilatore *Fan*	**Assiale su asse pompa** *Axial on Pump axle*	*kW* / *CV*	/ /	/ /		/ /		
	Portata Aria *Air Capacity*	*m3/h* / *cu ft/min*	/ /	/ /		/ /		
Acqua *Water*	**Portata Pompa Acqua** *Water Pump Flow*	l/min	140,3	168,8		215,8		
	Giri Pompa Acqua n/1' / Water Pump r.p.m.		1973	2367		3025		
	Capacità circuito senza radiatore (litri) *Circuit capacity without radiator*	5	**Pressione Circuito H_2O (bar)** *Water Circuit Pressure (bar)*			**0,9÷1,1**		
	Inizio/Fine apert.valv.termostatica °C *Therm.valve start/end opening °F*	80 ÷ 95 *176÷203*	**Max temp.acqua in funz.to(°C)** *Max water temp. in operation(°F)*			107 *224,6*		
Momento inerzia *Inertia Moment*	**Volano Standard** - *Standard Flywheel*		**(SAE 4) J=** 0,46 **kg*m²**					
	Motore senza Volano - *Eng. Without Flywheel*		**J=** 0,057 **kg*m²**					
	Volano G.E. - *Generator Set Flywheel*		**J=** 1,26 **kg*m²**					
Pendenze coppa standard *Standard Oil Sump Slopes*			**Permanente** - Permanent					
	Longitudinale Volano in basso - *Flywheel Low*		35°			70%		
	Longitudinale Volano in alto - *Flywheel Up*		30°			57%		
	Trasversale nei due sensi - *Bank in both directions*		30°			57%		
Temp. Gas di Scarico *Exhaust*	**ECE REGULATION R120**	°C	651	653		670		
		°F	1204	1207		1238		
Bilancio Termico *Heat Balance*	**Potenza Termica Totale** *Total Thermal Power*	kW	159,3	175,2		198,7		
	Potenza Utile - *Useful Power*	kW	56,0	61,0		62,0		
	Pot. Raff.Acqua - *Water Cooling Power*	kW	48,5	51,2		57,0		
	Pot. Raff.Olio - *Oil Cooling Power*							
	Potenza allo Scarico - *Exhaust Power*	kW	45,9	54,5		71,1		
	Potenza all'intercooler	kW	0,0	0,0		0,0		
	Pot. di Irraggiamento - *Issued Power*	kW	8,9	8,5		8,6		
Gas di scarico *Exhaust Gas*	**Portata Gas di Scarico** *Exhaust Gas Flow*	kg/h	263	311		375		
	Contropress. Max allo scarico *Exhaust max Backpressure*	mbar	110	150		230		
Rad. Olio *Oil Cool*	**Fa parte dell'allestimento standard**		*It's a standard engine component*					

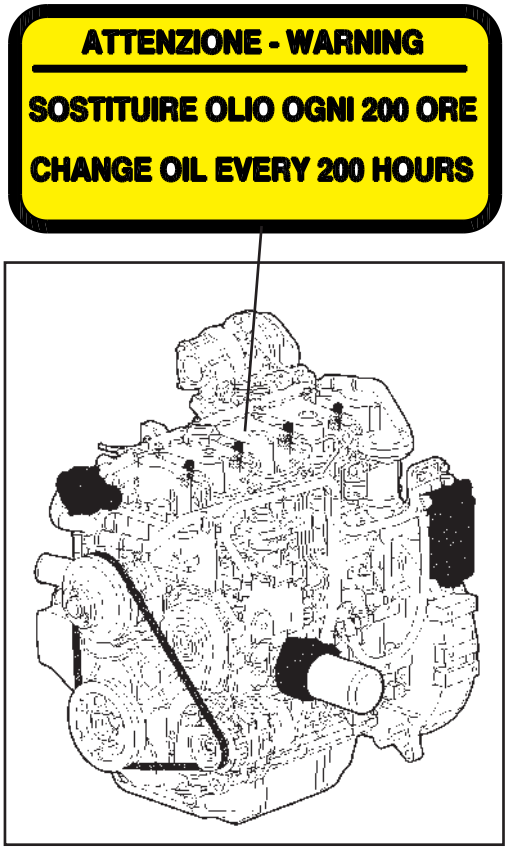
Avviamento Elettrico *Elect.Starter*	**Capacità batteria (Ah)** *Battery Capacity (Ah)*	110	**Potenza motorino avviamento (kW)** *Starter motor power (kW*	2,3
	Corrente di spunto max CCA EN (A) *Max starting current CCA EN (A)*	880	**Tensione alimentazione motorino avviam. (V)** *Starter motor voltage (V*	12
	Velocità avviamento (rpm) *Starting speed (rpm*	>120	**Coppia in avviamento (Nm)** *Starting torque (Nm*	/
	Min.temp.avv.senza mezzi ausiliari(°C) *Extra Power Source free start (°F)*	-20 up to -4	**Corrente all'avviamento a -15°C (A)** *Current when starting 5°F (A*	/
	Caratteristche alternatore (W - A) *Alternator Output (W - A*	770 - 55	**Corrente in trascinamento a -15°C (A)** *Current when starting (during running) 5°F (A)*	/

EVERY 200 HOURS

(ONLY FOR D754 SE3_TE3_IE3 WITH STANDARD OIL PAN AND DECAL ON ROCKER ARMS COVER)

CHANGE Engine oil (see chapter 9 "Running tests and adjustments" for oil capacity)

Change the engine oil on D754 SE3_TE3_IE3 if these models are equipped with a standard pan oil: these models are recognizable from a decal-label on rocker arms cover.



EVERY 300 HOURS

TIGHTEN Fuel line union screws and nuts

CHANGE Engine oil (see chapter 9 "Running tests and adjustments" for oil capacity)
(must be changed at least once every 12 months in any event).

OWING TO THE FACT THAT THE ENGINE WORKS IN HARSCH CONDITIONS SUCH AS DUSTY ENVIRONMENTS AND HEAVY LOADS, MAKE SURE TO CHANGE THE ENGINE OIL EVERY 150 HOURS

CHANGE Oil filter cartridge

CHANGE Fuel filter cartridge
(the fuel filter cartridge must be renewed at least once every 12 months, regardless of the hours of duty).

EVERY 500 HOURS

CHECK Injectors

CHECK Glowplugs (when fitted)

CHANGE Air filter cartridge

CHANGE Coolant mixture (must be performed at least once every 24 months in any event).
(see chapter 9 "Running tests and adjustments" for coolant capacity)

EVERY 1000 HOURS

CLEANING Fuel tank

CHANGE Alternator drive belt

EVERY 2000 HOURS

CHECK Starter motor brushes

CHECK Turbocharger

AFTER 4000 HOURS

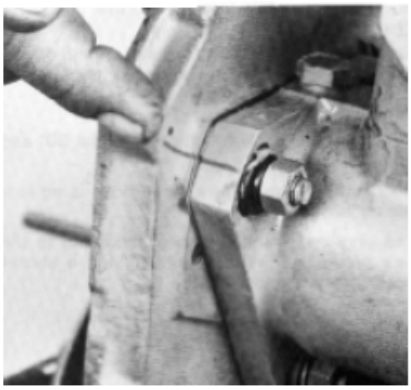
OVERHAUL Partial engine

AFTER 8000 HOURS

OVERHAUL Major engine

INJECTION PUMP

BOSCH INJECTION PUMP REMOVAL WITHOUT REMOVING THE TIMING COVER



Before removing the injection pump, mark the injection pump flange and crankcase (see picture), in order to reassemble the pump in the same position by obtaining the previous injection timing advance.

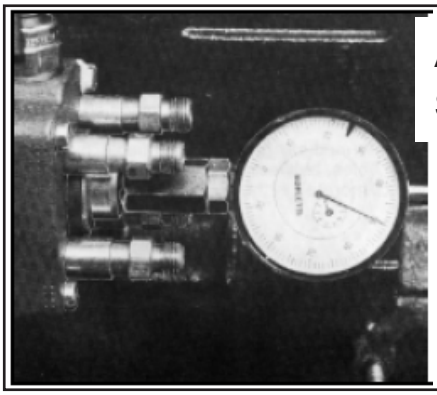
Install the **special tool AG** and dial gauge in place of 1st injector (timing side). Bring the cylinder number 1 piston top dead center (TDC) of compression stroke. Set the dial indicator to zero "0"

Install the **special tool X** and dial gauge on the injection pump.

Rotate the engine counterclockwise 15° - 20° before cylinder number 1 piston top dead center (BTDC) of compression stroke. While rotating the crankshaft look at the dial indicator needle on injection pump: when the needle stops moving, stop the rotation of the engine. Set the dial indicator to zero "0".



Attrezzo AG
Special Tool AG



Attrezzo X
Special Tool X

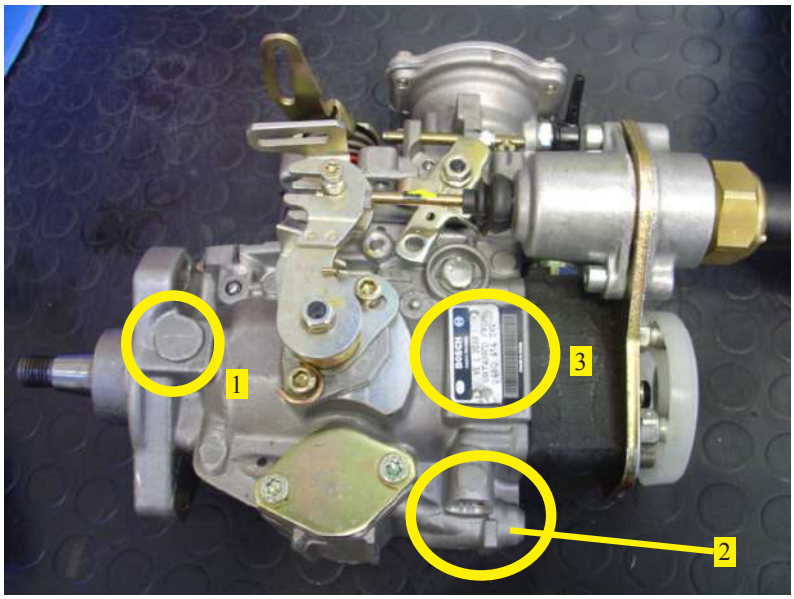
IMPORTANT:

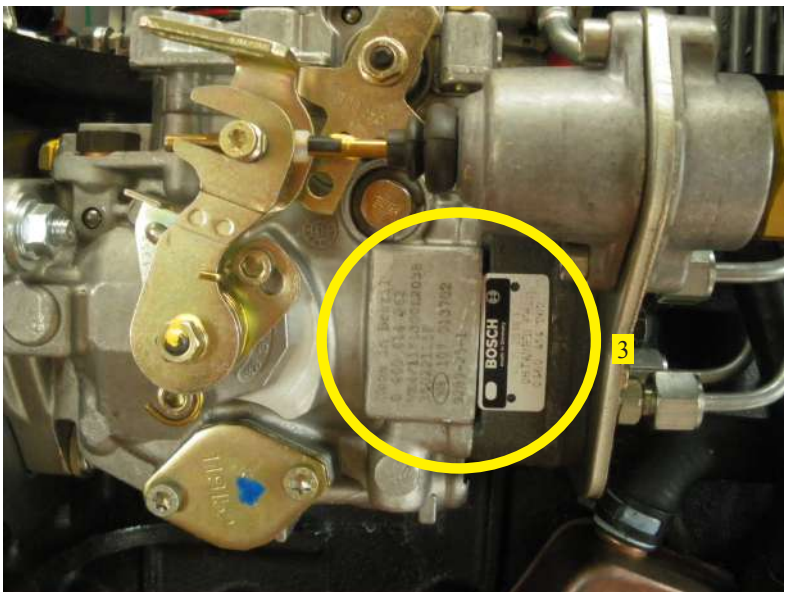
If the engine is brought again at TDC the value red on the injection pump dial gauge indicator **is the static injection pump timing advance value in mm**.

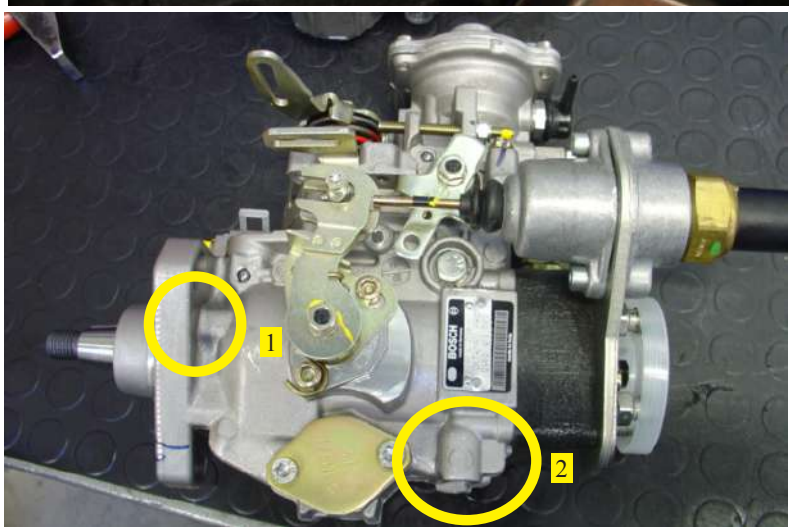
Refer to also Chapter 6 paragraph 6.34 about static injection pump timing advance values

D754TE3-SE3-IE3 engine models can be equipped with 2 type of injection pump: in case of replacement it is necessary to identify which type is installed.

For identification check the presence of particulars no. 1 - 2 - 3.







POMPA ATTUALMENTE IN PRODUZIONE
VM pn 35022115

particolare 1: borchia
particolare 2: valvola
particolare 3: targhetta identificativa: codice 35022115

INJECTION PUMP NOW IN PRODUCTION
VM pn 35022115

particular 1: *protrusion*
particular 2: *valve*
particular 3: *identification plate: VM pn 35022115*

POMPA NON PIU' FORNITA
VM pn35022089

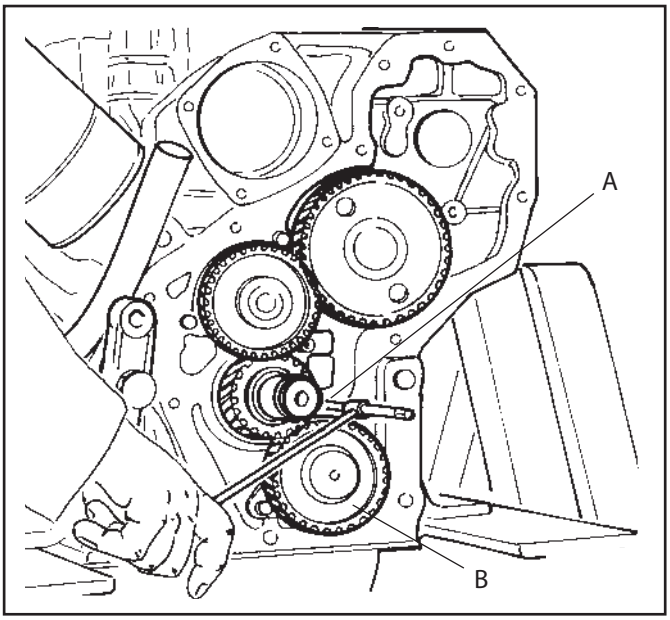
particolari 1 e 2: non presenti

INJECTION PUMP - NO LONGER SUPPLIED
VM pn35022089

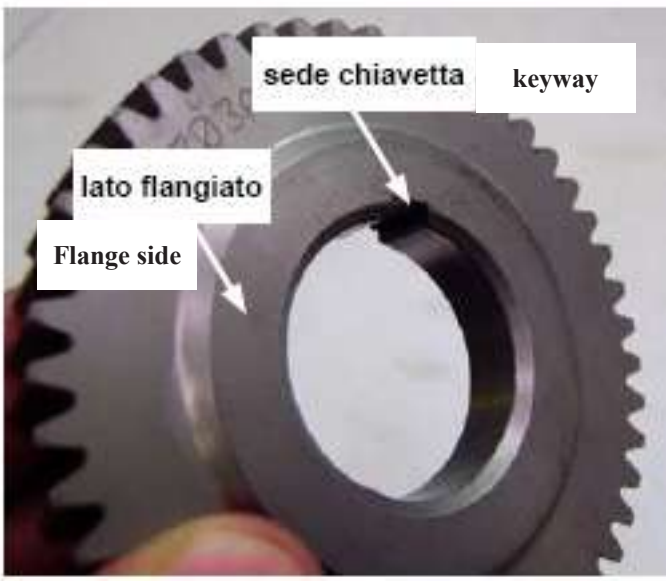
particulars 1 and 2: *not present*

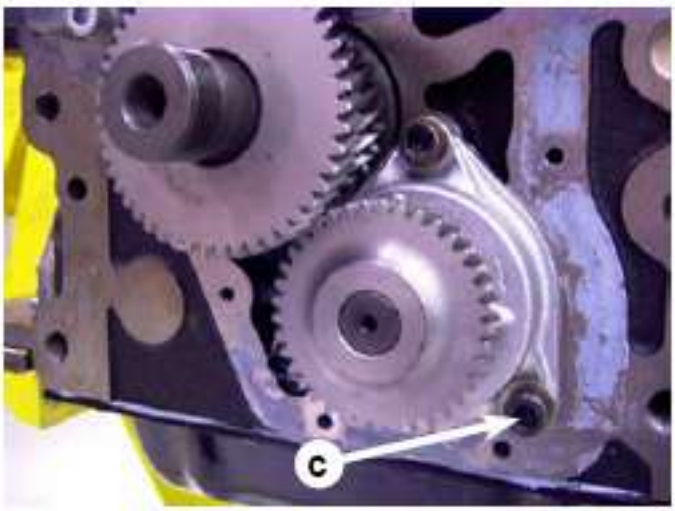
OIL PUMP

Unscrew retaining bolts **A** and withdraw oil pump **B**.



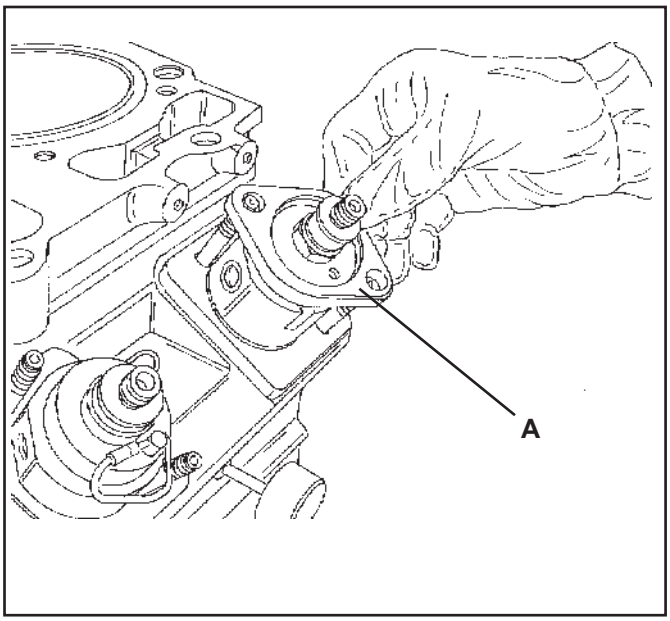




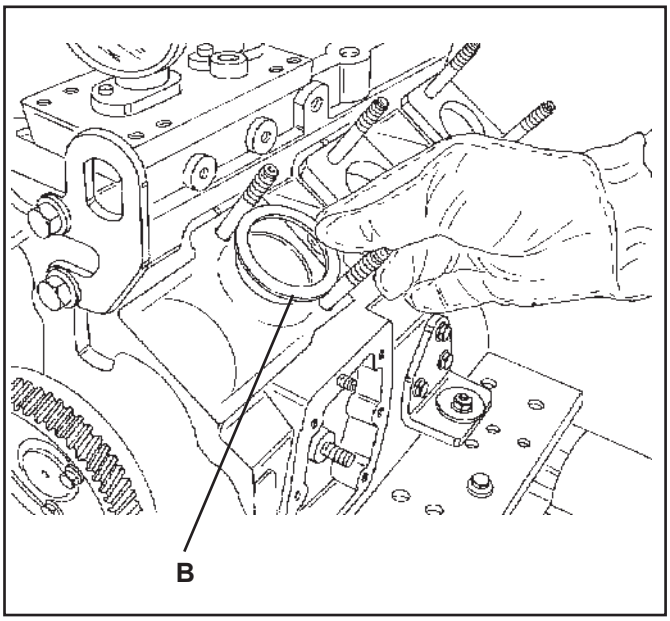


Remove the fixing flange (**A**) and take the pump out of its seat.

If it is to be used again, we advise marking its position with a crayon in order to remount it in its original position.
If it is to be substituted, this operation is not necessary.



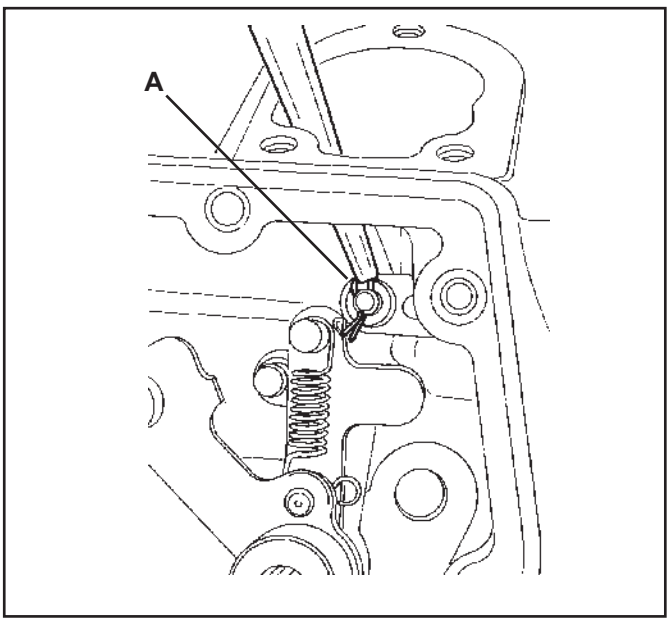
Remove the gasket (**B**), marking its position as well.



PUMP CONNECTING RACK

OLD MODEL

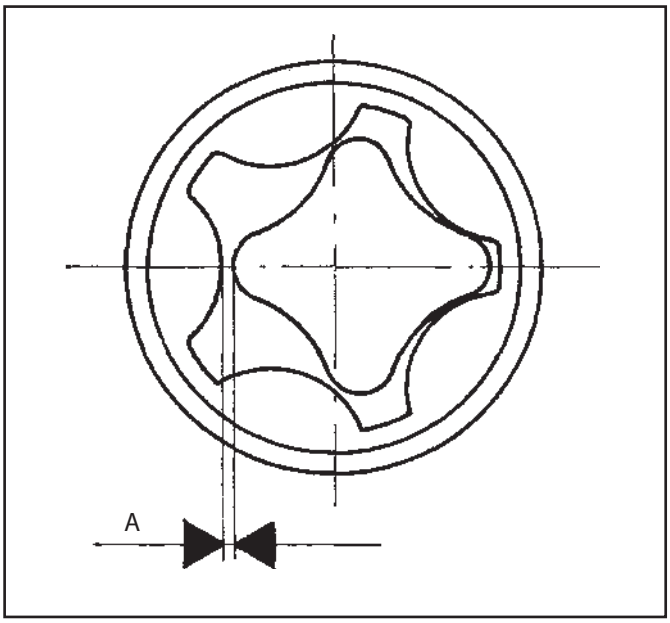
Remove the rack spit pin (**A**).

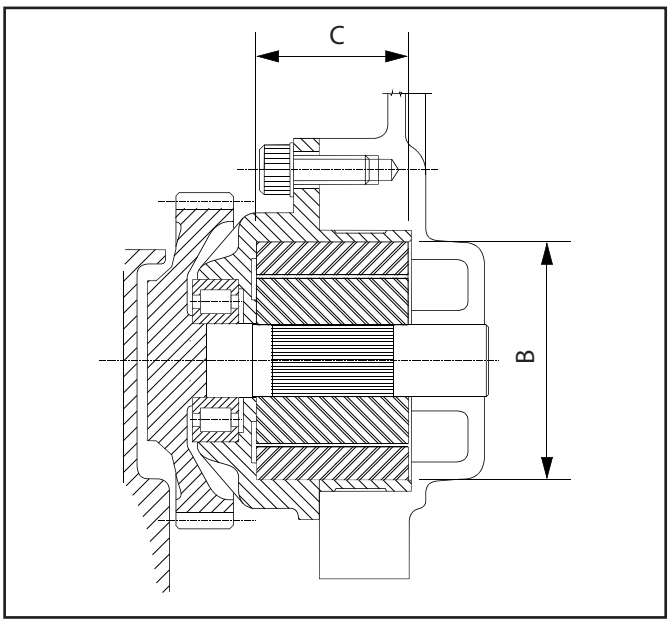


Dimensions and clearances

Rotor height: **32.487 ÷ 32.500** mm.
Max. clearance **(A)** between rotors: **0.152** mm
Clearance between rotor height and rotor housing: **0.081 ÷ 0.097** mm.
Axial clearance between pump gear and pump body: **0.050 ÷ 0.070** mm.
Diameter of rotor housing **(B)**: **58.105 ÷ 58.130**.
Depth of rotor housing **(C)**: **32.403 ÷ 32.406** mm.
Clearance between housing and outer rotor: **0.105 ÷ 0.106** mm, limit: **0.500** mm.

Reassemble with the bevelled end of the outer rotor towards the pump gear and check that the rotor and gear coupling resists a torque of 9 kgm.





7.15 OIL PUMP

D703

Check that the oil pump components are assembled as shown in the figure, making sure that the internal rotor is installed with the bevelled end towards the seat in the pump housing **A**.

Fit the oil pump, meshing the pump gear with the crankshaft gear.

Tighten bolts **B** to specified torque value and check for teeth backlash.

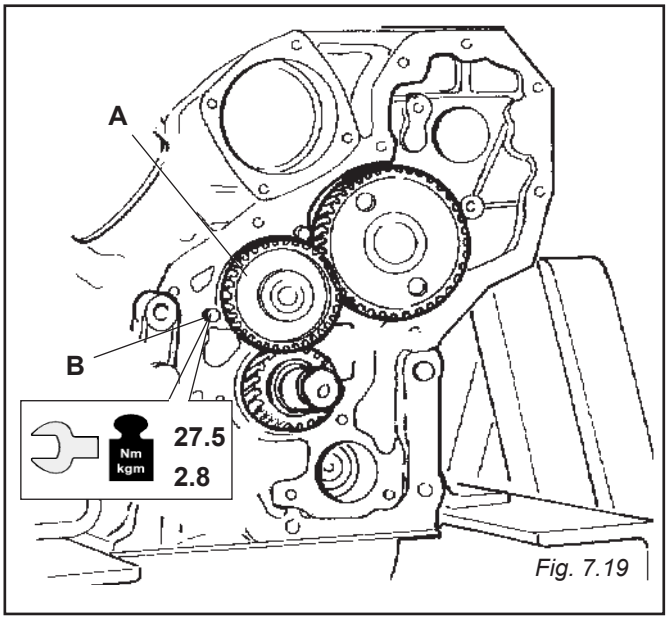
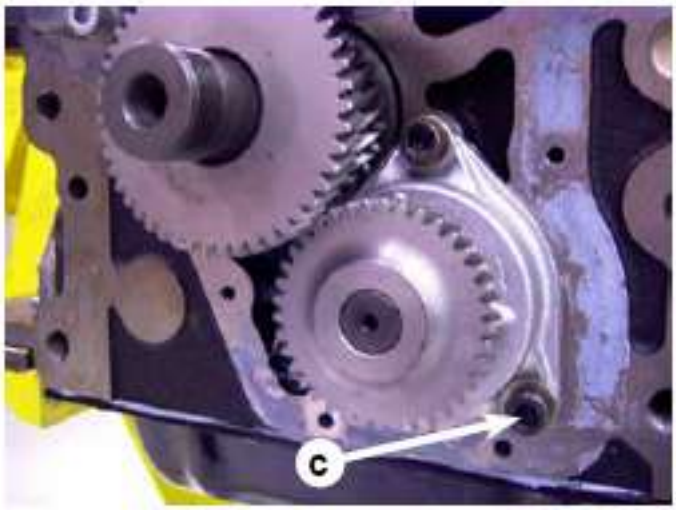


Fig. 7.19

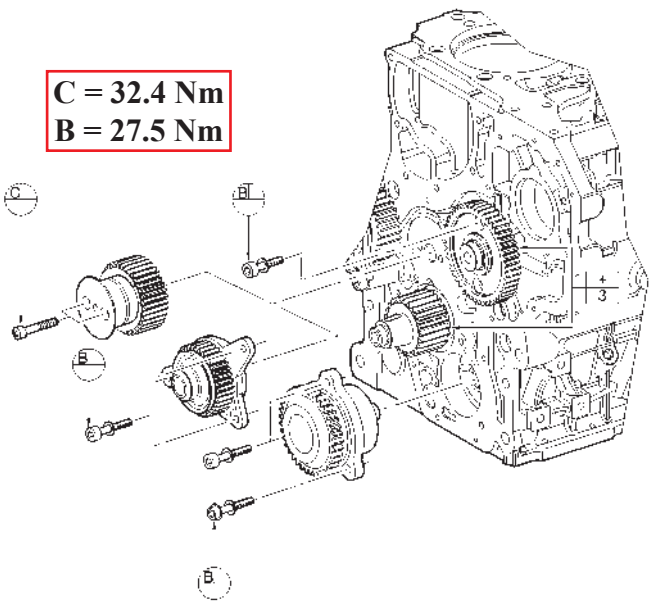






D704 - D754 D753- D706

C = 32.4 Nm
B = 27.5 Nm



7.31 COOLANT PUMP

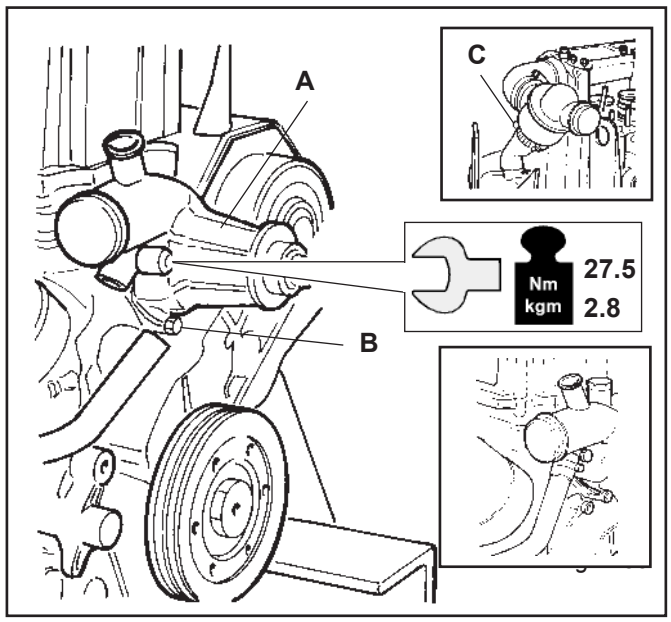
Old type

Fit coolant pump **A** as shown in the figure.

Tighten bolts **B** to the specified torque.

Connect hose between pump **A** and thermostat valve **C**.

Tighten hose clamps to the specified torque.



New type with majored flow rate

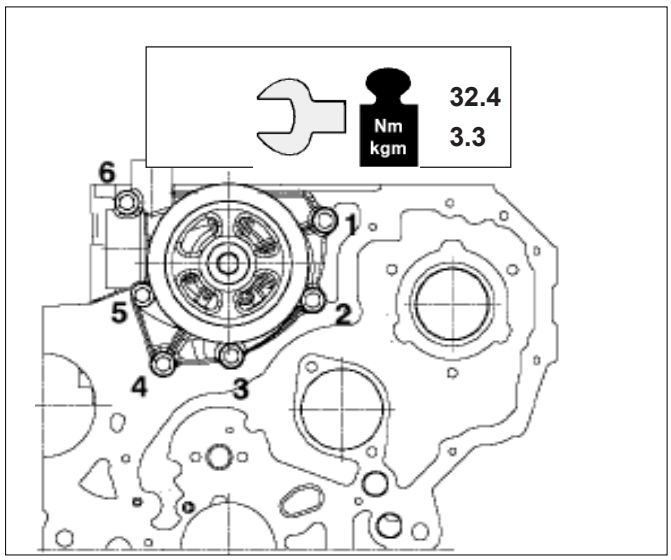
Insert the screws into holes 1-2-3-6.

Approach the pump to crankcase torquing the screw 2 by hands.

Approach the other screws (1-3-6) and torque them at indicated value in picture with sequence 6-3-1.

Torque other screws with sequence 4-2-5.

Retorque all screws with sequence 6-3-1-4-2-5.



7.36B COOLANT PUMP PULLEY

Fit pulley into coolant pump and tighten the screws to specified torque.

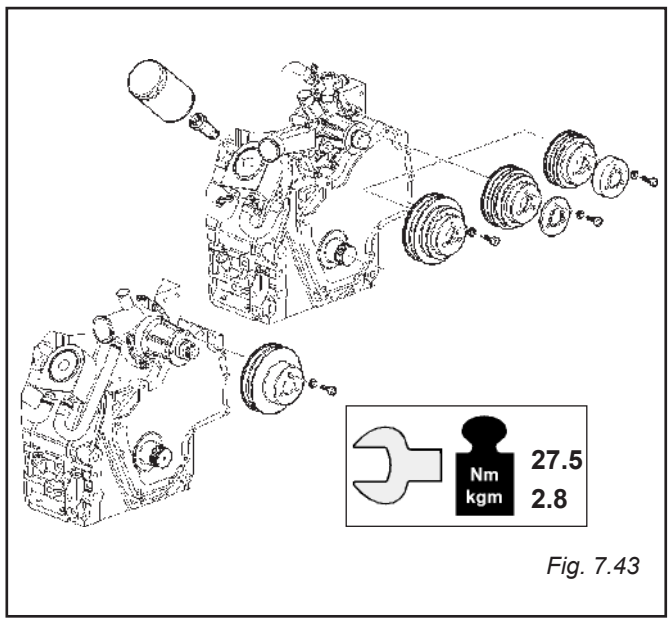
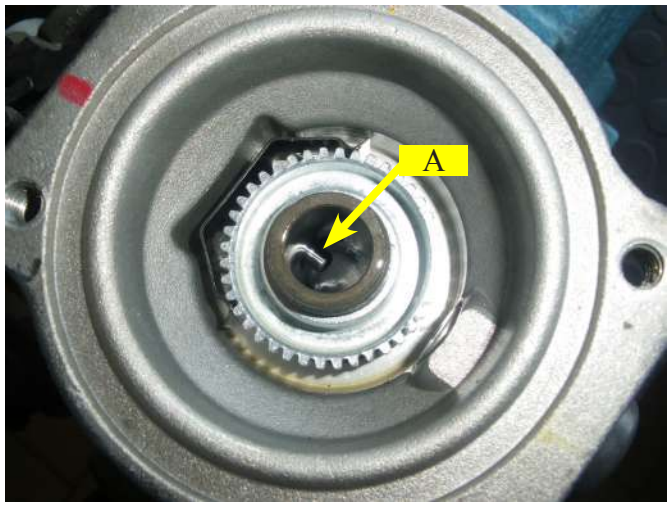


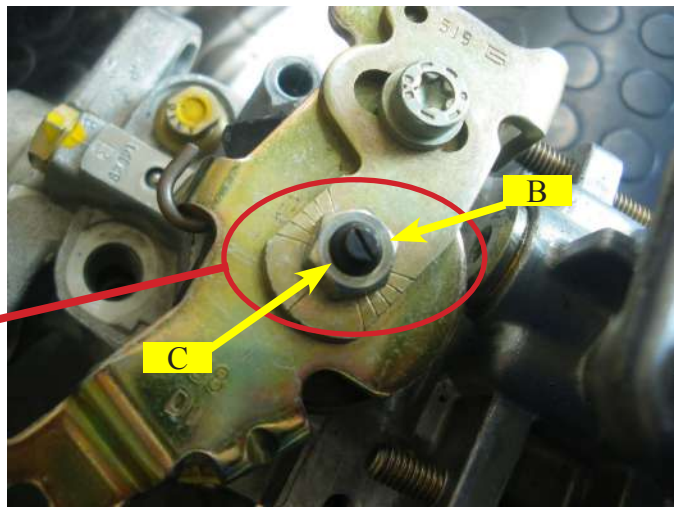
Fig. 7.43

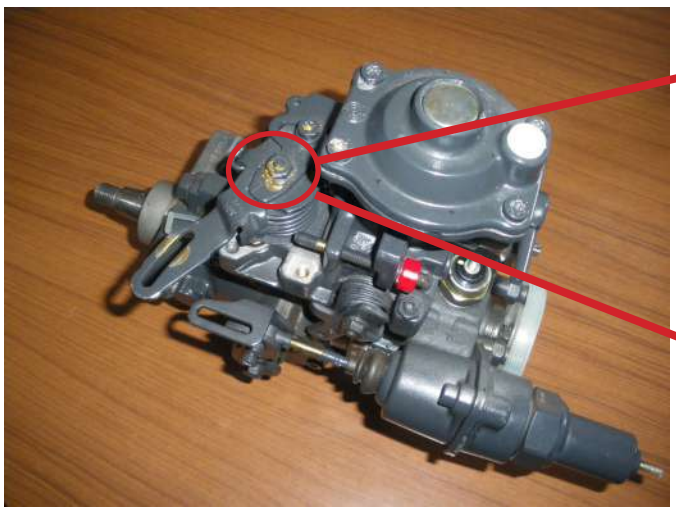
Move the accelerator lever to Wide open throttle (WOT) position.
Verify that LDA valve drive pin "A" comes out as shown in the photo.

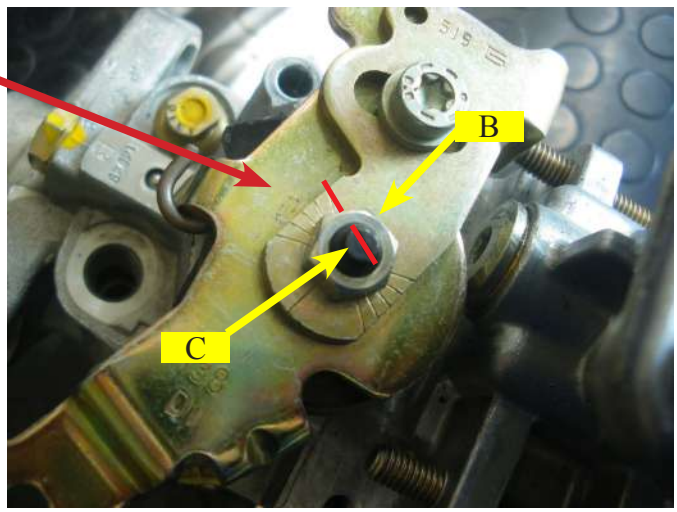


IMPORTANT: if the pin "A" does not come out, it is necessary to remove the accelerator lever. Here below accelerator lever removal procedure is described. If the pin comes out use lubricant spray on the pin and push it inside the pump. Move the acceleraton lever to WOT position and lubricate again the pin. Make sure the travel pin is free for moving.

Mark, as shown n the picture, the accelerator lever and pin C. On pin A is already presente a reference. Loosen the nut B and remove the accelerator lever.







Components removed: accelerator lever, nut, spring and spring plastic support.



9.3 BLEEDING AIR FROM THE FUEL SYSTEM

(fig. 9.2 - 9.3)

- Bleed air from the fuel filter by loosening off the bleed screw **B** and operating the lever **A** until a continuous flow of fuel is obtained at the bleed screw.

The injection pump is self-purging.

- Loosen off the unions of the injector fuel feed pipes.
- Turn the engine over by means of the starter motor until the fuel flowing from the injector feed pipe unions is completely free of air.
- Re-tighten the injector fuel feed pipe unions and start the engine.

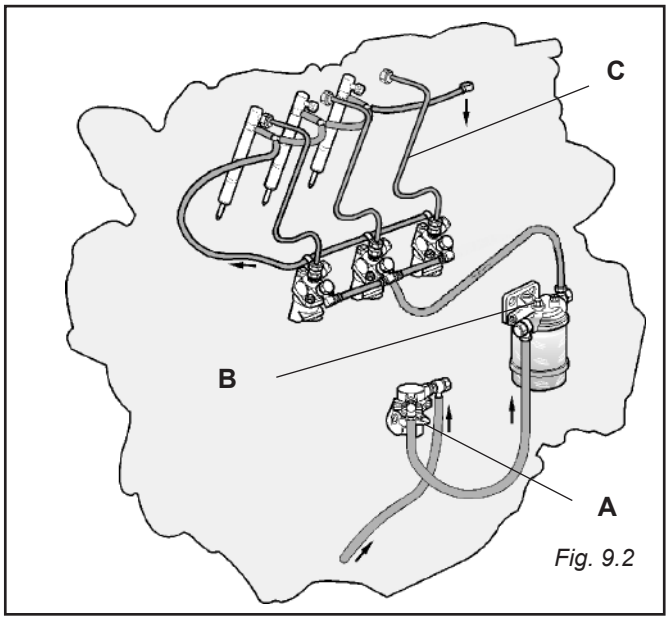
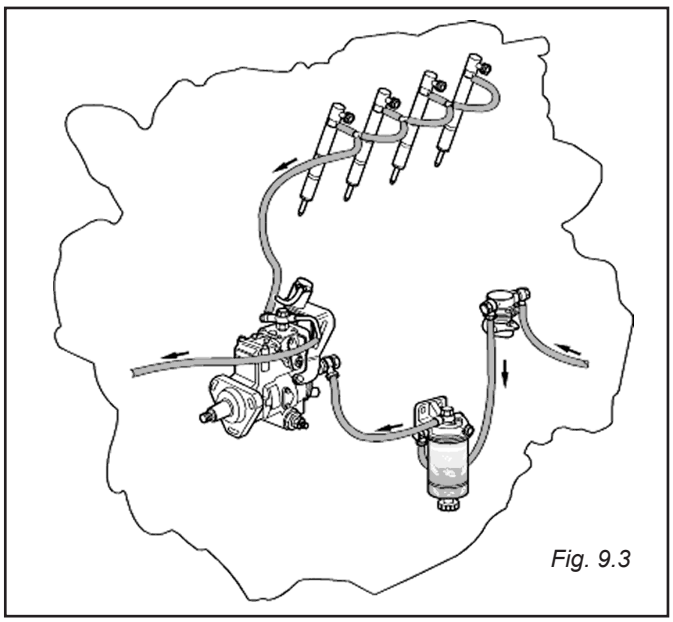


Fig. 9.2


WEAR SAFETY GOGGLES TO PROTECT AGAINST RISK OF FUEL SPRAYING OUT UNDER PRESSURE.


WEAR GLOVES TO PROTECT SKIN FROM CONTACT WITH FUEL.


Fig. 9.3

9.4 IDLE RUNNING TEST

All adjustments are to be made with the engine hot and with the aid of a tachometer.

- Run the engine at low speed to warm it up to normal operating temperature.
- Connect a 10 kPa pressure gauge to the last main bearing carrier oil line on the crankcase and check the oil pressure while the engine is running.
- Check for possible oil or water leaks, abnormal noise or vibration.
- Check the electrical system.