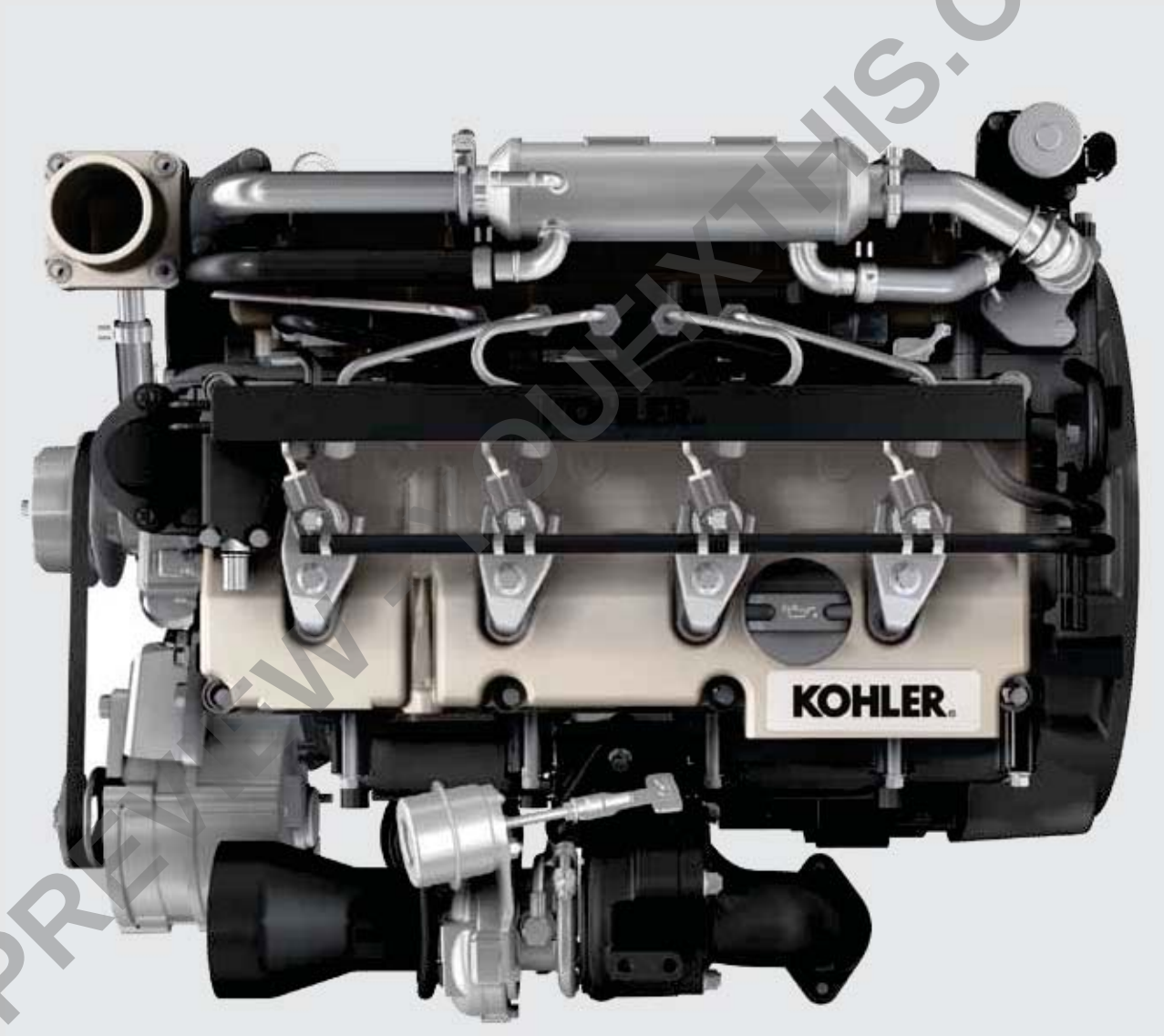
1903 TCR -2504 TCR

WORKSHOP MANUAL

KOHLER® Diesel KDI



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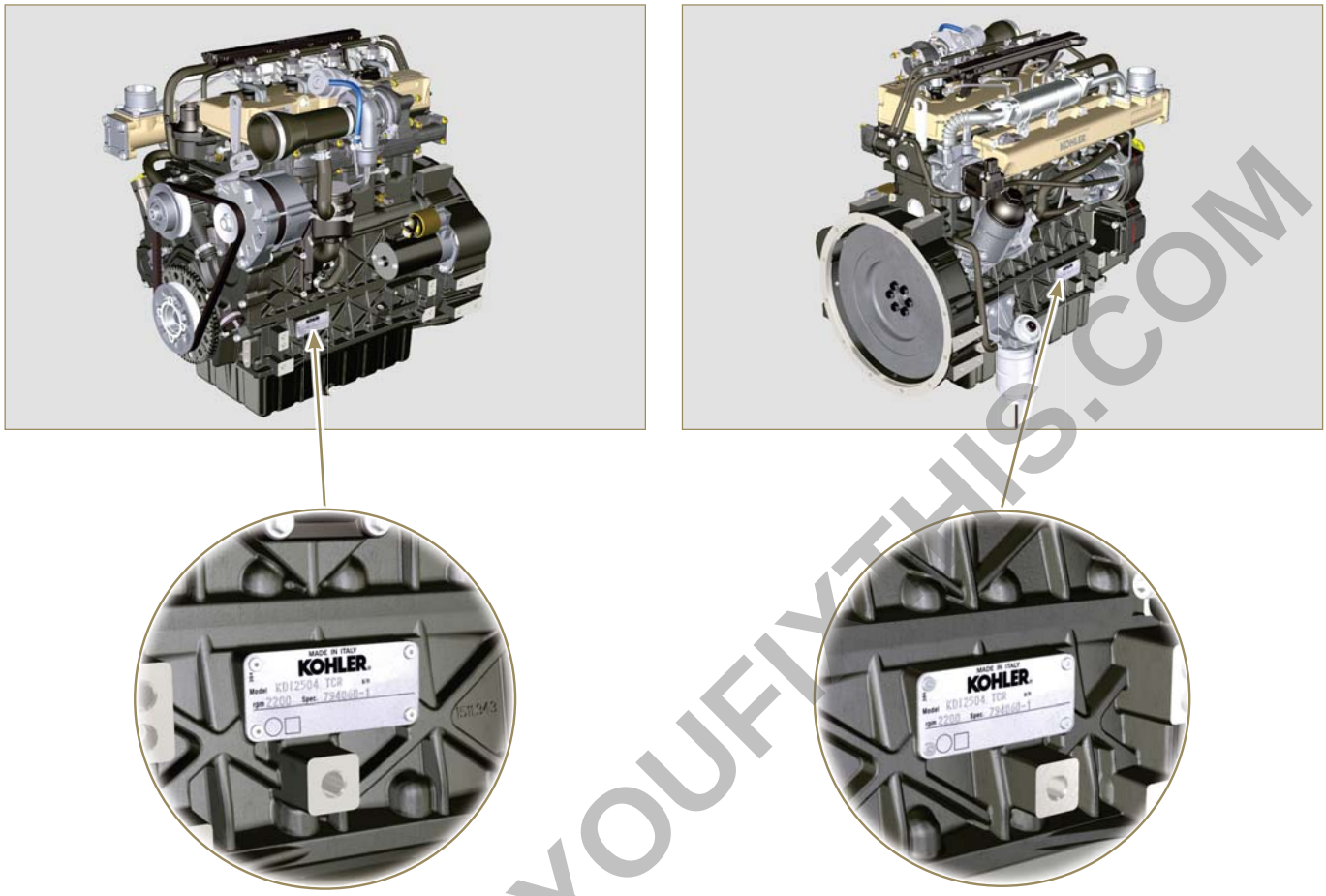
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1.1 Manufacturer and engine identification

The engine identification nameplate is located on side find timing system or flywheel as below.



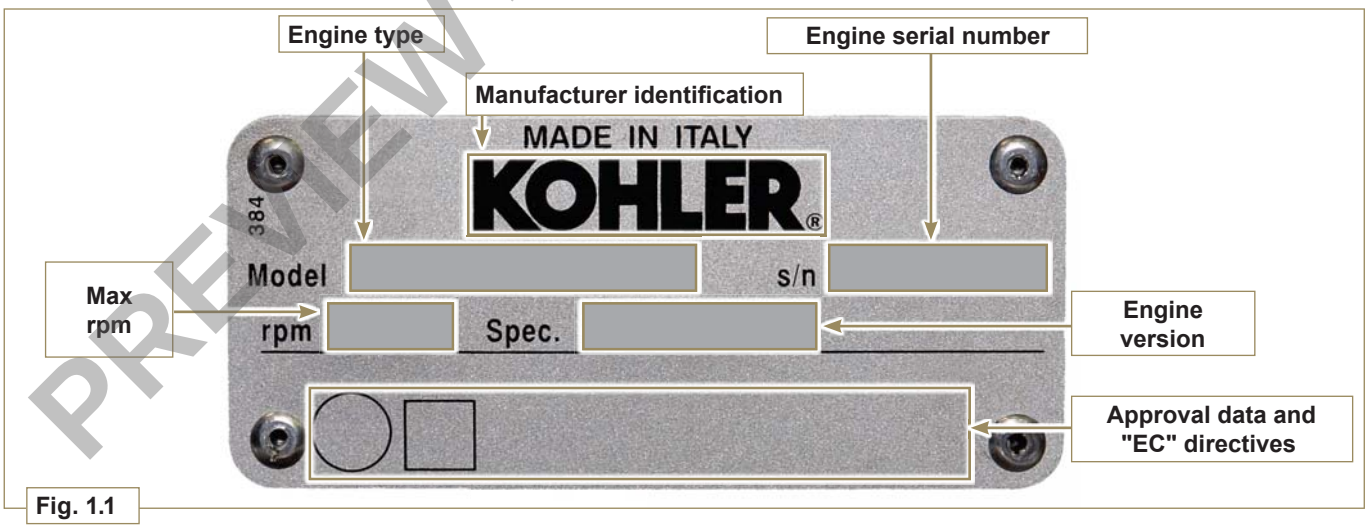


Fig. 1.1

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9.17 Summary table of tightening torques and the use of sealants

Tab. 9.1

DESCRIPTION	DIAMETER PER STEP (mm)	MAX. INSTALLATION TORQUE (mm)	SEALANT	PAGE
BALANCER SHAFTS (4-CYLINDER)				
Fastening screw shaft holder	M10x1.5	50		140÷140
Fastening screw box closure plate	M6x1	8		
CAMSHAFT				
Fastening screw gear	M10x1	100		
ALTERNATOR				
Alternator fixing bolt	M8x1.25	10		
Fastening screw bracket	M8x1.25	10		
CRANKCASE				
Crankcase tightening cycle				
Fastening screw lower crankcase	M12x1.25	40		
Fastening screw lower crankcase	M12x1.25	70		
Fastening screw lower crankcase	M12x1.25	120		
Fastening screw lower crankcase	M8x1.25	20		
Fastening screw lower crankcase	M8x1.25	35		
Fastening screw lower crankcase	M8x1.25	20		
Fastening screw lower crankcase	M8x1.25	35		
Locking screw crankcase lubricant hole	M14x1.5		Loctite 270	
Plug hole water discharge	M16x1.5	50		
Pressure switch	M12x1.5	35		
Vent pipe underpan	M12x1,5		Loctite 648	
Fastening screw MIM. oil sprayers	M6x1	10		
CONNECTING ROD				
Screw tightening cycle connecting rod				
Fastening Screw	M10x1	40		
Fastening Screw	M10x1	85		
OIL SUMP CRANKCASE DISTRIBUTOR				
Cover fastening screw	TG6	8		
ROCKER ARM COVER				
Fastening screw rocker cap	M6x1	10		
TIMING SYSTEM CRANKCASE				
Fastening screw phase sensor	TG6	8		
Fastening screw distributor crankcase	M8x1.25	25		
Fastening screw speed sensor	TG6	8		
Fastening screw phonic wheel clamp sensor	TG6	8		
Pressure relief valve cap	M16x1.5	50		
CLOSING HOLE BLOW BY M				
Plate closure fastening screw	M6x1	10		
INTAKE MANIFOLD				
Fastening screw MAP and water pipes sensor	TG6	8		
Fastening screw intake manifold head	M8x1.25	25		
Fastening screw intake flange	TG8	25		
Fastening screw semi-collector	TG8	25		
COVER 3 PTO				
Fastening Screw	M8x1.25	25		
COVER 4 PTO				
Fastening Screw	TG6	8		
OIL SUMP				
Oil intake pipe fastening screw	M6x1	10		
Fastening Screw	M8x1.25	25		
Oil drain plug	M18x1.5	50		
CRANKCASE SETTLING TANK				
Fastening screw settling tank flange	M6x1	10		
GEAR TIMING SYSTEM				
Fastening screw phonic wheel	M5x0.8	5		

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15.1 Diagnostic tool error list

N.	ERROR CODE	DESCRIPTION
1	P0088	C/Rail pressure exceeds high upper limit3
2	P0112	Intake Air Temperature Sensor Signal to Low.
3	P0113	Intake Air Temperature Sensor Signal too High
4	P0116	Coolant temperature sensor performance invalid.
5	P0117	Coolant temperature sensor signal too low.
6	P0118	Coolant temperature sensor signal too high.
7	P0122	Accelerator pedal sensor No.1 signal too low.
8	P0123	Accelerator Pedal Sensor n. 1 Signal too High.
9	P0182	Fuel Temperature Sensor Signal too Low.
10	P0183	Fuel Temperature Sensor Signal too High
11	P0191	Fuel Rail Pressure Sensor "A" Circuit Range/Performance
12	P0192	Common Rail Pressure Sensor - Signal Too Low.
13	P0193	Common Rail Pressure Sensor-Signal Too Low
14	P0200	Capacitor charge-up circuit malfunction injector (excessive charge).
15	P0201	Injector Circuit/Open - Cylinder 1.
16	P0203	Injector Circuit/Open - Cylinder 3
17	P0205	Injector Circuit/Open - Cylinder 2
18	P0206	Injector Circuit/Open - Cylinder 4
19	P0217	Engine Coolant Temperature Exceeds Upper Limit
20	P0219	Engine Overrun.
21	P0222	Accelerator Pedal Sensor n. 2 Signal too Low
22	P0223	Accelerator Pedal Sensor n. 2 Signal too High
23	P0227	Accelerator Pedal for ASC (PTO) Sensor Signal too Low
24	P0228	Accelerator Pedal for ASC (PTO) Sensor Signal too High
25	P0229	Boost Pressure Sensor Exceed Lower Limit
26	P0234	Boost Pressure Sensor Exceed Upper Limit
27	P0236	Boost Pressure Sensor Performance Invalid ECU has detected a fault on the TMAPSens.
28	P0237	Boost Pressure Sensor Signal Too Low ECU has detected a fault pressure on the TMAP Sensor.
29	P0238	Boost Pressure Sensor Signal Too High
30	P0263	Engine angle speed error1 (injector#1)
31	P0269	Engine angle speed error3 (injector#3)
32	P0275	Engine angle speed error2 (injector#2)
33	P0278	Engine angle speed error4 (injector#4)
34	P0336	Crankshaft Position Sensor - Performance Invalid
35	P0337	Crankshaft Position Sensor - No Pulse
36	P0341	Camshaft Position Sensor - Performance Invalid
37	P0342	Camshaft Position Sensor - No Pulse
38	P0385	Crankshaft Position Sensor - Camshaft Position Sensor NO PULSE
39	P0400	Exhaust Gas Recirculation valve
40	P0404	EGR motor drive circuit invalid and/or battery tension
41	P0462	Fuel level sensor signal too low
42	P0463	Fuel level sensor signal too High
43	P0488	EGR valve stick/initialization failure.
44	P0501	Vehicle speed sensor signal invalid
45	P0502	Vehicle speed sensor input open/ short
46	P0503	Vehicle speed sensor frequency too high
47	P0524	Engine Oil Pressure Down
48	P0541	Glow relay output open load/short to GND
49	P0542	Glow relay output short to BATT
50	P0562	Vehicle System Voltage Too Low (< 8.0 volts)

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6.1.2 High pressure fuel pipes disassembly (rail/electronic injectors)

Danger

- The fuel is under high pressure, disassemble the components carefully.
- Make sure that the rail is not under pressure.

1 - Undo the nut **H** on the rail **L** and then the nut **M** on the electronic injector **F** and remove the pipe **N**.

Important

- In the event that the electronic injectors are disassembled (not necessarily replaced), mark them with the relevant cylinder number from which they originate so as not to confuse them during re-assembly.
- After removing the pipes protect all fittings on the electronic injectors **F** and on the rail **L** with special caps.

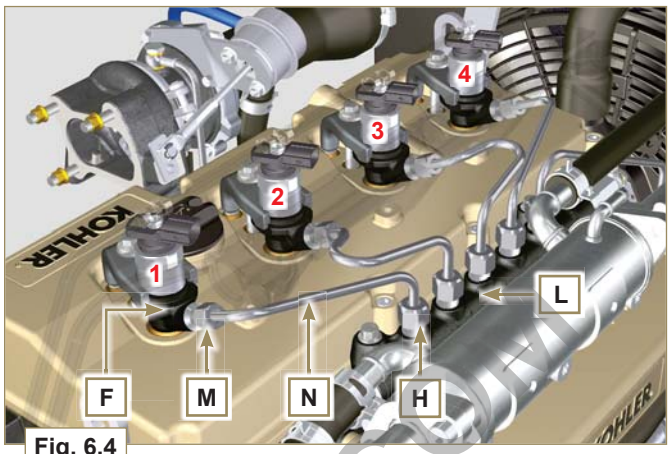


Fig. 6.4

6.1.3 Electronic injectors disassembly

1 - Undo and remove the screw **P** with the washer **R** and remove the bracket **Q**.

2 - Pull out the electronic injector **F**.
In case of difficulty in withdrawing the injector, use a 34mm diameter key (acting only at point BC) to assist in removal.

Important

- Be careful not to damage the gaskets **X**.

3 - Seal with the relevant plugs.

4 - Ensure that gasket S has remained in the correct position (**Fig. 6.6**).
Otherwise, recover the gasket from inside the injector sleeve **T**.

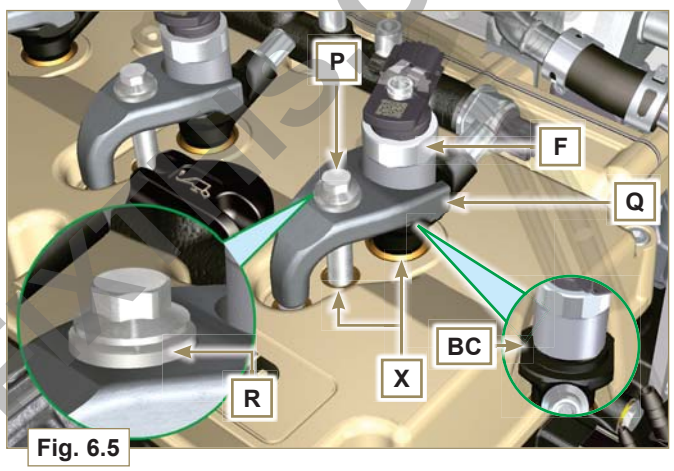


Fig. 6.5

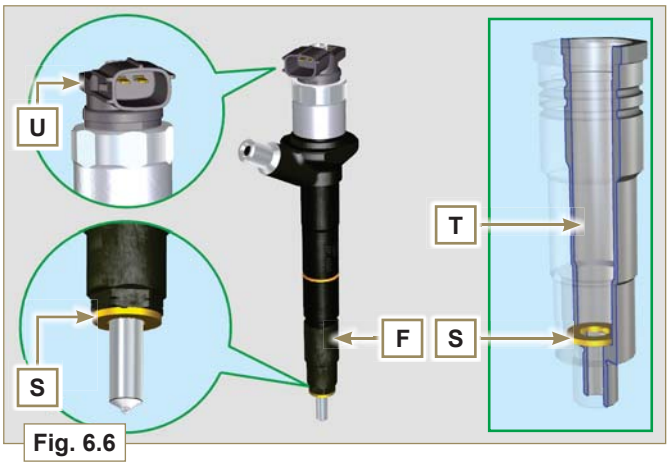


Fig. 6.6

6.1.4 Electronic injector assembly

Important

- Always replace and lubricate the gaskets **AA** and **S** of the electronic injectors **F** with fuel, every time they are replaced.
- To prevent damaging the injection system, the protection caps (ST_23, ST_24 and ST_25) must be removed during assembly. Connect the pipes and the electric connectors **U** (**Fig. 6.6**).
- If a new (or different) electronic injector is fitted on the engine, the new calibration data must be re-entered in the ECU control unit via a specific instrument (Cap. 15).
- Pay attention when repositioning the electronic injectors, using the marks made when disassembling as described in Par. 7.10.5.

1 - Insert the gasket **S** on the electronic injectors **F** (**Fig. 6.7**).

2 - Insert the electro-injectors into the sleeve and position them as shown in the picture **Fig. 6.7**.

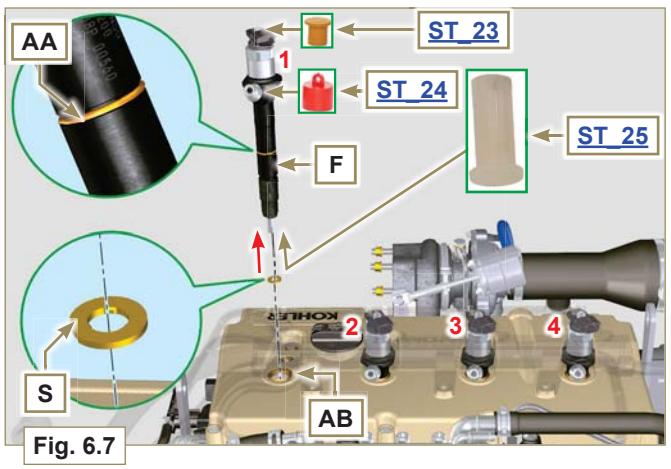


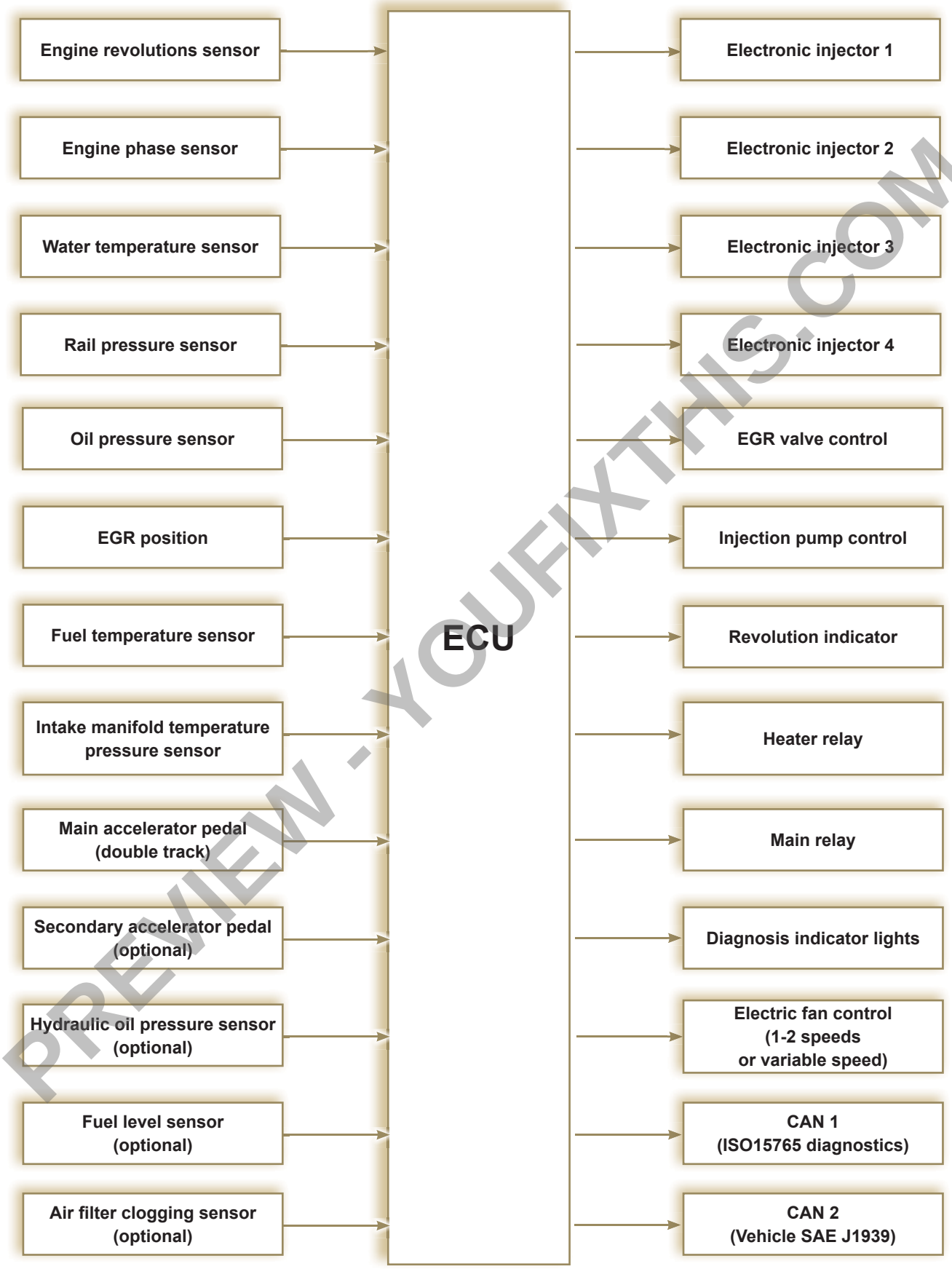
Fig. 6.7

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2.13 Electric system

2.13.1 Electric control unit diagram



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14.1 Possible causes and trouble shooting

THE ENGINE MUST BE TURNED OFF IMMEDIATELY WHEN:

1 - The engine rpms suddenly increase and decrease;
2 - A sudden and unusual noise is heard;
3 - The colour of the exhaust fumes suddenly darkens or turns white;
4 - The oil pressure indicator light turns on during operation;
5 - The coolant temperature indicator light turns on during operation.

TABLE OF LIKELY ANOMALIES AND THEIR SYMPTOMS

The following table contains the possible causes of some failures which may occur during operation.
Always perform these simple checks before removing or replacing any part.

POSSIBLE CAUSE		TROUBLES													
		Engine does not start	Engine starts but stops	No acceleration	Variable speed	Black smoke	White smoke	Low oil pressure	Oil level increase	Excessive oil consumption	Oil and fuel drip from the exhaust	Engine overheats	Inadequate performance	High noise level	The Warning Lamp switches on
FUEL CIRCUIT	Clogged fuel hoses	■	■	■	■								■		
	Fuel filter clogged	■	■	■	■		■						■		
	Air or water in the fuel supply circuit	■	■	■	■		■						■	■	
	The tank cap vent hole is clogged	■	■	■	■								■		
	Faulty fuel feeding pump	■													■
	No fuel	■	■												
ELECTRIC SYSTEM	Cable connection uncertain or incorrect	■													
	Faulty starting motor	■													
	Heater (optional)	■					■								
MAINTE-NANCE	Clogged air filter	■	■	■	■	■				■			■		
	Excessive idle operation						■			■	■				
	Incomplete run-in						■			■			■		
SETTINGS REPAIRS	Rings worn or sticking	■					■			■	■	■	■		
	Worn cylinder	■					■			■	■	■	■		
	Worn out valve guides						■			■	■	■			
	Badly sealed intake valve	■				■					■	■	■		
	Crankshaft/Connecting rod bearings worn out							■					■	■	
	Damaged cylinder head gasket	■			■		■		■	■		■	■		
	Defective timing system	■			■		■					■	■	■	

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2.1 Engine specifications

GENERAL INFORMATION	UNIT OF MEASURE	ENGINE TYPE	
		KDI 1903 TCR	KDI 2504 TCR
Operating cycle		diesel - 4-stroke	
Cylinders	No.	3	4
Bore x stroke	mm	88x102	
Displacement	cm^3	1861	2482
Compression ratio		17:1	
Intake		Supercharged with Turbocharger	
Cooling		Liquid	
Crankshaft rotation (view from flywheel side)		Counterclockwise	
Combustion sequence		1-3-2	1-3-4-2
Timing System			
Valves per cylinder		4	
Timing System		Rods and rocker arms - Camshaft in the crankcase	
Tappets		Hydraulic	
Injection		Direct - Common rail	
Engine dry weight		233	267
Maximum inclination 30' continuous operation		25°	
Maximum inclination 1' intermittent operation		35°	
Volume of aspirated air (2600 rpm)	Kg/h	240	280
POWER AND TORQUE			
MAX. operating speed	rpm	2600	
MAX. operating power (ISO TR 14396 - SAE J1995 - CE 97/68)	kW	42	55.4
Maximum torque (at 1500 rpm)	Nm	225	300
Admissible axial load on crankshaft	Kg	300	
CONSUMPTIONS			
Specific fuel consumption (best point)	g/kWh	210	
Oil consumption	%Fuel	< 0.05	
FUEL SUPPLY SYSTEM			
Type of fuel		Diesel UNI-EN590 - ASTM D975-09	
Injection pump		DENSO HP3	
Fuel supply		Low pressure electric pump (if necessary)	
Fuel filter			
Filtering surface	cm^2	2300	
Degree of filtration	µm	Efficiency >95% - 5 µm	
Maximum pressure at injection pump inlet	bar	0.2	
LUBRICATION CIRCUIT			
Lubrication		API CJ4 LOW SAPS - SAE 5W-40 / 10W-30	
Circuit forced		Gear pump	
Oil sump capacity (**MAX.**)	L	7,5	9,75
Oil sump capacity balancer shafts (optional) (**MAX.**)	L		7
Oil pressure switch			
Intervention pressure (**MIN.**)	bar	0.8±0.1	
Oil filter			
Maximum operating pressure	bar	4.0	
Degree of filtration	µm	17 ±2	
Filtering surface	cm^2	1744	

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2.8 Periodic maintenance

The intervals of preventive maintenance in **Tab. 2.6** and **Tab. 2.7** refer to the engine operating under normal operating conditions with fuel and oil meeting the recommended specifications.

Tab. 2.6

CLEANING AND CHECKING						
OPERATION DESCRIPTION	PERIODICITY (HOURS)					
	10	200	500	1000	1500	5000
Engine oil level	■					
Coolant level	■					
Dry-type air filter (1)		■				
Radiator heat-exchange surface and Intercooler (1)		■				
Alternator belt tension			■ (5)			
Rubber hoses			■			
Starter Motor						■
Alternator						■
Fuel hose			■			

Tab. 2.7

REPLACEMENT							
OPERATION DESCRIPTION		PERIODICITY (HOURS)					
		10	200	500	1000	1500	5000
Engine oil (1)				■			
Oil filter cartridge (1)				■			
Fuel filter cartridge (1)				■			
Alternator V belt (3)				■			
Alternator Poly-V belt	Not heavy environmental condition						■
	Heavy environmental condition					■	
Coolant (4) (interior radiator cleaning)					■		
Intake manifold sleeve (air filter - intake manifold)					■		
Coolant hoses					■		
Dry air cleaner external cartridge (2)		After 6 checks with cleaning					
Fuel hose						■	

(1) - In case of low use: 12 months.
(2) - The period of time that must elapse before checking the filter element depends on the environment in which the engine operates.
The air filter must be cleaned and replaced more frequently under very dusty conditions.
(3) - In case of low use: 36 months.
(4) - In case of low use: 24 months.
(5) - Not Poly-V type.

Important

• In the event one does not reach the times scheduled for maintenance, one must in any case replace:

DESCRIPTION	PERIOD
Engine oil	12 months
Oil filter cartridge	12 months
Fuel filter cartridge	12 months
Dry air filter cartridge	12 months
Coolant	24 months
Fan/alternator belt	36 months

(*) Once removed, the fan/alternator belt must be replaced, even if it has not reached its service life.

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3.4 Safety signal description

- To ensure safe operation please read the following statements and understand their meaning.
- Also refer to your equipment manufacturer's manual for other important safety information.
- This manual contains safety precautions which are explained below.
- Please read them carefully.



Read the Operation and Maintenance handbook before performing any operation on the engine.



Hot Parts.
Danger of burns.



Presence of rotating parts.
Danger of jamming or cutting.



Presence of explosive fuel.
Danger of fire or explosion.



Presence of steam and pressurized coolant.
Danger of burns.



Danger

- This indicates situations of grave danger which, if ignored, may seriously threaten the health and safety of individuals.



Important

- This indicates particularly important technical information that should not be ignored.



Warning

- This indicates that failure to comply with it can cause minor damage or injury.



Use protective gloves before carrying out the operation.



Use protective glasses before carrying out the operation.



Use sound absorbing protections before carrying out the operation.



Lifting point.



Electrical shock.
Danger of severe scalding or death.



High pressure fluid.
Danger of fluid penetration.



Lethal Exhaust Gases.
Danger of poisoning or death.

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