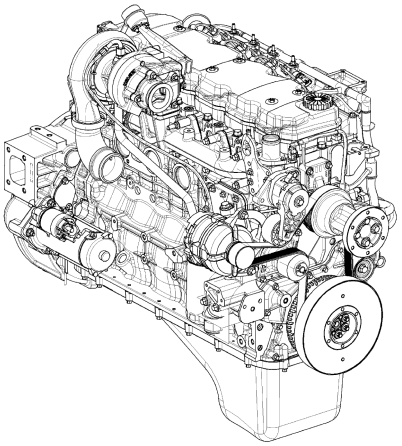
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6 Cylinder 6.7L NEF Tier 3 Engine

For Magnum 180, 190 and 210 Tractors

Service Manual

84202702
Issued February, 2009
First Printing

CASE IH AGRICULTURE

PRELIMINARY REMARKS

Manuals for repairs are split into Parts and Sections, each one of which is marked by a numeral; the contents of these sections are indicated in the general table of contents.
The sections dealing with things mechanic introduce the specifications, tightening torque values, tool lists, assembly detaching/reattaching operations, bench overhauling operations, diagnosis procedures and maintenance schedules.
The sections (or parts) of the electric/electronic system include the descriptions of the electric network and the assembly's electronic systems, wiring diagrams, electric features of components, component coding and the diagnosis procedures for the control units peculiar to the electric system.
The manual uses proper symbols in its descriptions; the purpose of these symbols is to classify contained information. In particular, there have been defined a set of symbols to classify warnings and a set for assistance operations.

SYMBOLS - WARNINGS



Danger for persons

Missing or incomplete observance of these prescriptions can cause serious danger for persons' safety.



Danger of serious damage for the assembly

Failure to comply, both fully or in part, with such prescriptions will involve serious damage to the assembly and may sometimes cause the warranty to become null and void.



General danger

It includes the dangers of above described signals.



Environment protection

Moreover, it describes the correct actions to be taken to ensure that the assembly is used in such a way so as to protect the environment as much as possible.

NOTE It indicates an additional explanation for a piece of information.

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Part 1
F4HE NEF ENGINES

Sezione

General specifications 1

Fuel 2

Duty - Industrial application 3

Overhaul and technical specifications 4

Tools 5

Safety prescriptions **Appendix**

PREFACE TO USER'S GUIDELINE MANUAL

Section 1 describes the NEF engine illustrating its features and working in general.

Section 2 describes the type of fuel feed.

Section 3 relates to the specific duty and is divided in four separate parts:

1. Mechanical part, related to the engine overhaul, limited to those components with different characteristics based on the relating specific duty.
2. Electrical part, concerning wiring harness, electrical and electronic equipment with different characteristics based on the relating specific duty.
3. Maintenance planning and specific overhaul.
4. Troubleshooting part dedicated to the operators who, being entitled to provide technical assistance, shall have simple and direct instructions to identify the cause of the major inconveniences.

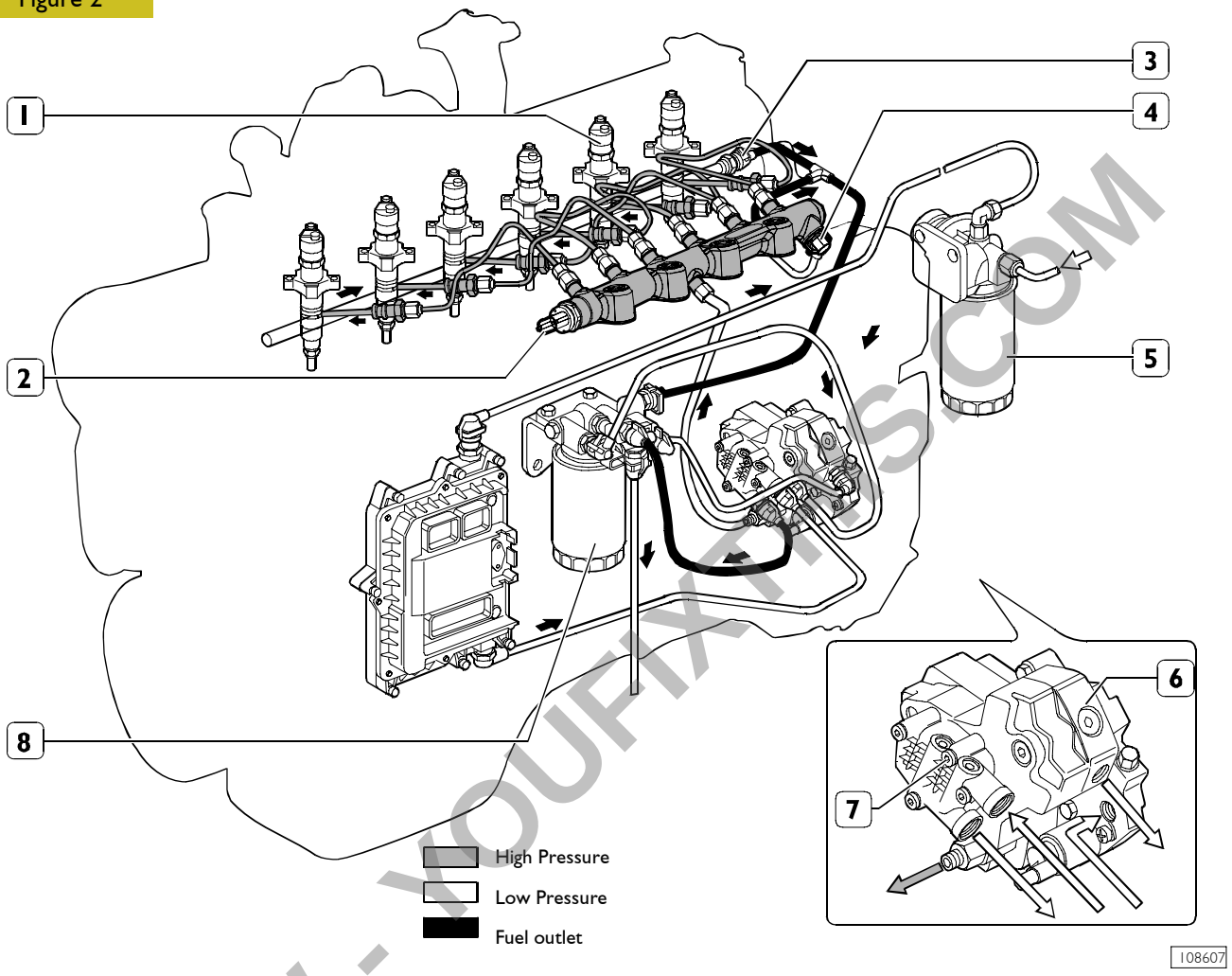
Sections 4 and 5 illustrate the overhaul operations of the engine overhaul on stand and the necessary equipment to execute such operations.
The appendix reports general safety prescriptions to be followed by all operators whether being in-charge of installation or maintenance, in order to avoid serious injury.

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WORKING PROCESS

Figure 2



1. Electro-injector - 2. Common Rail - 3. Pressure limiting device for fuel return - 4. Common rail pressure relief valve - 5. Pre-filter mounted on the frame - 6. High-pressure pump - 7. Mechanical vane pump - 8. Fuel filter.

The Common Rail system has a special pump that continuously keeps fuel at high pressure, independently from stroke and cylinder that has to receive the injection and accumulates fuel in a common duct for all injectors.

Therefore, fuel at the injection pressure computed by the ECU is always available at the injectors inlet.

When an injector solenoid valve is energised by the electronic control unit, the injection of fuel directly taken from rail takes place in the related cylinder.

The hydraulic system is implemented by a low-pressure circuit and a high-pressure circuit.

The high-pressure circuit is composed of the following pipings:

- ❑ piping connecting high-pressure pump outlet to rail;
- ❑ pipings supplying injectors from rail.

The low-pressure circuit is composed of the following pipings:

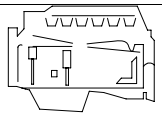
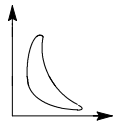
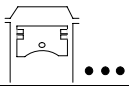
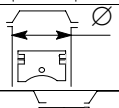
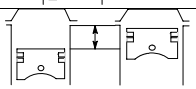
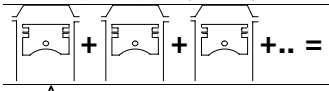
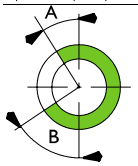
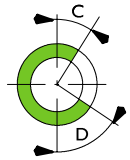
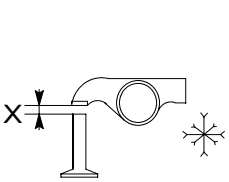
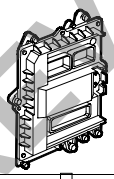
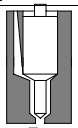
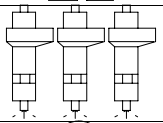
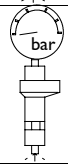
- ❑ fuel suction piping from tank to prefilter;
- ❑ pipings supplying the mechanical supply pump through the control unit heat exchanger, manual priming pump and prefilter;
- ❑ pipings supplying the high-pressure pump through the fuel filter.

The fuel draining circuit from rail and from injectors and the high-pressure pump cooling circuit complete the system.

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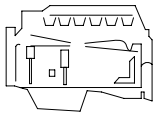
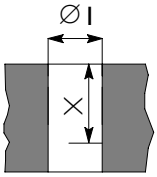
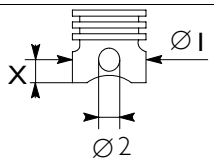
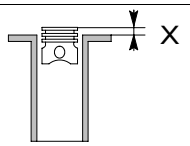
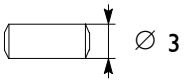
GENERAL SPECIFICATIONS

	Type		4 CYLINDERS	6 CYLINDERS
	Cycle		Four-stroke diesel engine	
	Power		Turbocharged with intercooler	
	Injection		Direct	
	Number of cylinders		4	6
	Bore	mm	104	
	Stroke	mm	132	
	Total displacement	cm^3	4485	6728
   	**TIMING** start before T.D.C. end after B.D.C. start before B.D.C. end after T.D.C.	 A B D C	 18.5° 29.5° 67° 35°	
	Checking timing X	mm mm	- -	
	Checking operation X	mm mm	0.20 to 0.30 0.45 to 0.55	
	**FUEL FEED** Injection Type:	 Bosch	 high pressure common rail EDC7 ECU	
	Injector		CRIU 2	
	Nozzle type		DSLA and DLLA	
	Injection sequence		1 - 3 - 4 - 2	1 - 5 - 3 - 6 - 2 - 4
	Injection pressure	bar	250 - 1600	

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CLEARANCE DATA

	Type		4 CYLINDERS	6 CYLINDERS
CYLINDER UNIT AND CRANKSHAFT COMPONENTS			mm	
	Cylinder barrels	Ø1	102.009 to 102.031	
		> Ø1	0.4	
	Pistons			
	Size	X	55.9 / 49.5 (•)	
	Outside diameter	Ø 1	103.714 to 103.732 / 103.759 to 103.777 (•)	
	Pin housing	Ø 2	38.010 to 38.016	
	Piston diameter	Ø 1	0.4	
	Piston protrusion	X	0.28 to 0.52	
	Piston pin	Ø 3	37.994 to 38.000	
	Piston pin – pin housing		0.01 to 0.022	

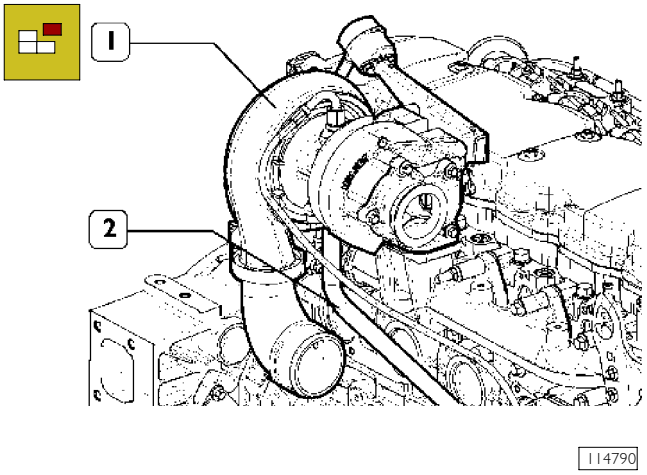
(•) Valid for engines F4HE9684P
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F4HE9687P
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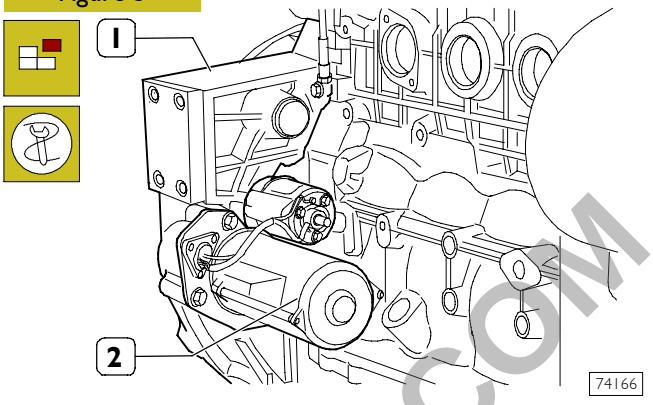
On the right hand side of the engine:

Figure 4



Remove the screws and remove the oil pipe (1) from the turbocharger pipe (2) and from the engine block.

Figure 5



Remove the starter (2) from the flywheel housing (1).

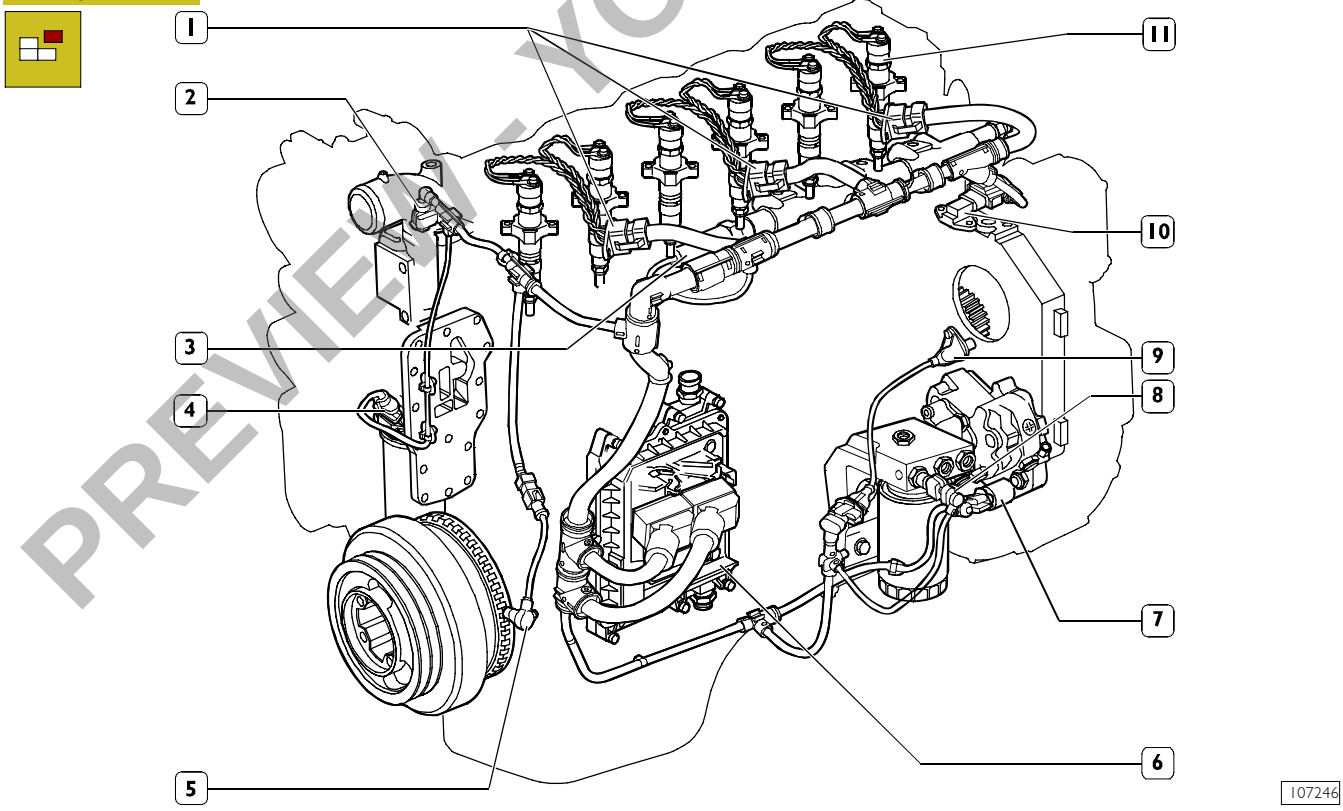
Apply brackets 99361037 to engine block and use them to secure the engine to the revolving stand 99322205. Remove sump cap and drain out oil.

Remove the fan from the output shaft pulley.

Collect and dispose of engine oil according to rules in force.

Disassembly of application components

Figure 6



1. Connections for Electro-injectors - 2. Engine cooling liquid temperature's sensor - 2. Cable of the fuel pressure sensor - 4. Sensor of engine's oil temperature and pressure - 5. Driving shaft sensor - 6. EDC 7 gearbox - 7. Temperature - air pressure sensor - 8. Timing system sensor - 9. Cable of fuel heater and fuel temperature's sensor - 10. Cable of pressure regulating gauge - 11. Electro-injector.

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ENGINE OVERHAUL

Preface

Part of the operations illustrated within this section can be partially executed while the engine is assembled on the vehicle, depending on the room available for access to the engine and on the equipment application as well.

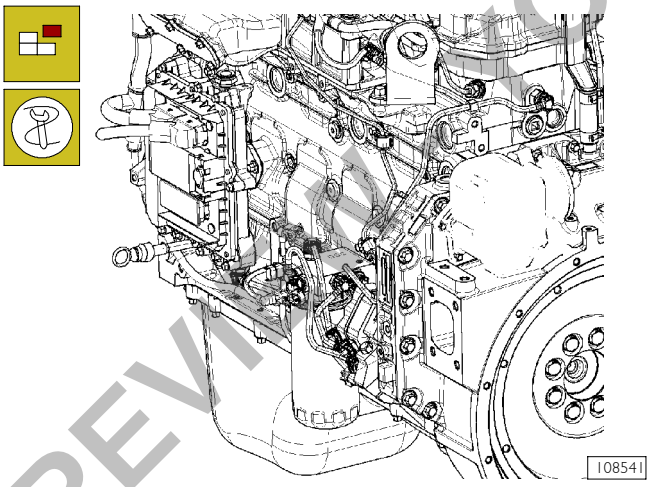
NOTE With regard to the engine disassembly operations from the machine, please apply for Information consulting the specific manual.
All operations of Engine disassembly operations as well as overhaul operations must be executed by qualified technicians provided with the specific tooling and equipment required.

The following information relates to the engine overhaul operations only for what concerns the different components customising the engine, according to its specific duties.

In section "General overhaul", all the operations of engine block overhaul have been contemplated. Therefore the above mentioned section is to be considered as following the part hereby described.

Engine setting operations for the assembly on turning stand

Figure 2



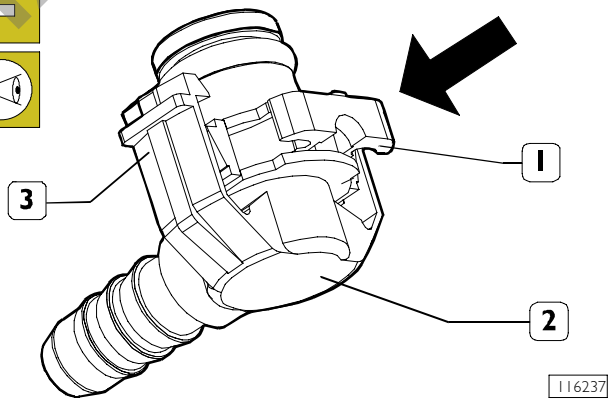
In order to apply the brackets 99361037 to the engine block to fix it on to the stand for the overhaul, it is necessary to perform the following operations on the left hand side of the engine:

- ❑ using the tool 99360073 disassembly the fuel filter and remove it from the support;
- ❑ disconnect the electrical connection from the support and the heater's one (placed on the filter support as well);
- ❑ disconnect the fuel low pressure pipelines from the support;
- ❑ disconnect pipeline from the support;
- ❑ remove the sustaining support bracket from the block;
- ❑ disconnect the high pressure fuel pipeline from the rail diffuser and from the high pressure pump and disassemble it from the engine block removing the fixing clamps.
- ❑ disconnect the pipeline feeding the mechanic pump that is combined to the high pressure pump through the exchanger of the engine control module;
- ❑ disassemble the oil introduction tube (if present) by undoing and removing the fixing screws. Remove the O-ring from the tube.

NOTE Because of the high pressure in the pipelines running from the high pressure pump to the rail and from this last one to the electro-injectors, it is absolutely required NOT to:

- ❑ disconnect the pipelines when the engine is working;
- ❑ re-use the disassembled pipelines.

Figure 3



To disconnect the low pressure fuel pipe from the relevant connecting joint, you need to hold the clasp (1) pressed, and release the quick fitting joint (2).

To connect the low pressure fuel pipe to the connecting joint, insert the quick fitting joint (2) into the connecting joint, and push until the clip (3) is fastened.

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Injectors connector (A)

ECU PIN	FUNCTION
1	Cylinder 5 injector
2	Cylinder 6 injector
3	Cylinder 4 injector
4	Cylinder 1 injector
5	Cylinder 3 injector
6	Cylinder 2 injector
7	-
8	-
9	Pressure regulator
10	Pressure regulator
11	Cylinder 2 injector
12	Cylinder 3 injector
13	Cylinder 1 injector
14	Cylinder 4 injector
15	Cylinder 6 injector
16	Cylinder 5 injector

Sensors connector (C)

ECU PIN	ECU PIN
1	-
2	-
3	-
4	-
5	-
6	-
7	-
8	-
9	Timing sensor
10	Timing sensor
11	-
12	Negative for rail temperature and pressure sensor
13	Positive for rail temperature and pressure sensor
14	Signal from rail temperature and pressure sensor
15	Coolant temperature sensor
16	-
17	-
18	Signal from fuel temperature sensor
19	Engine rpm sensor
20	-
21	-
22	-
23	Engine rpm sensor
24	Negative for engine oil pressure and temperature sensor
25	Negative for air temperature and pressure sensor
26	Coolant temperature sensor
27	Signal from engine oil pressure sensor
28	Signal from engine oil temperature sensor
29	-
30	-
31	-
32	Positive for engine oil pressure and temperature sensor
33	Positive for air temperature and pressure sensor
34	Signal from air pressure sensor
35	Negative for fuel temperature sensor
36	Signal from air temperature sensor

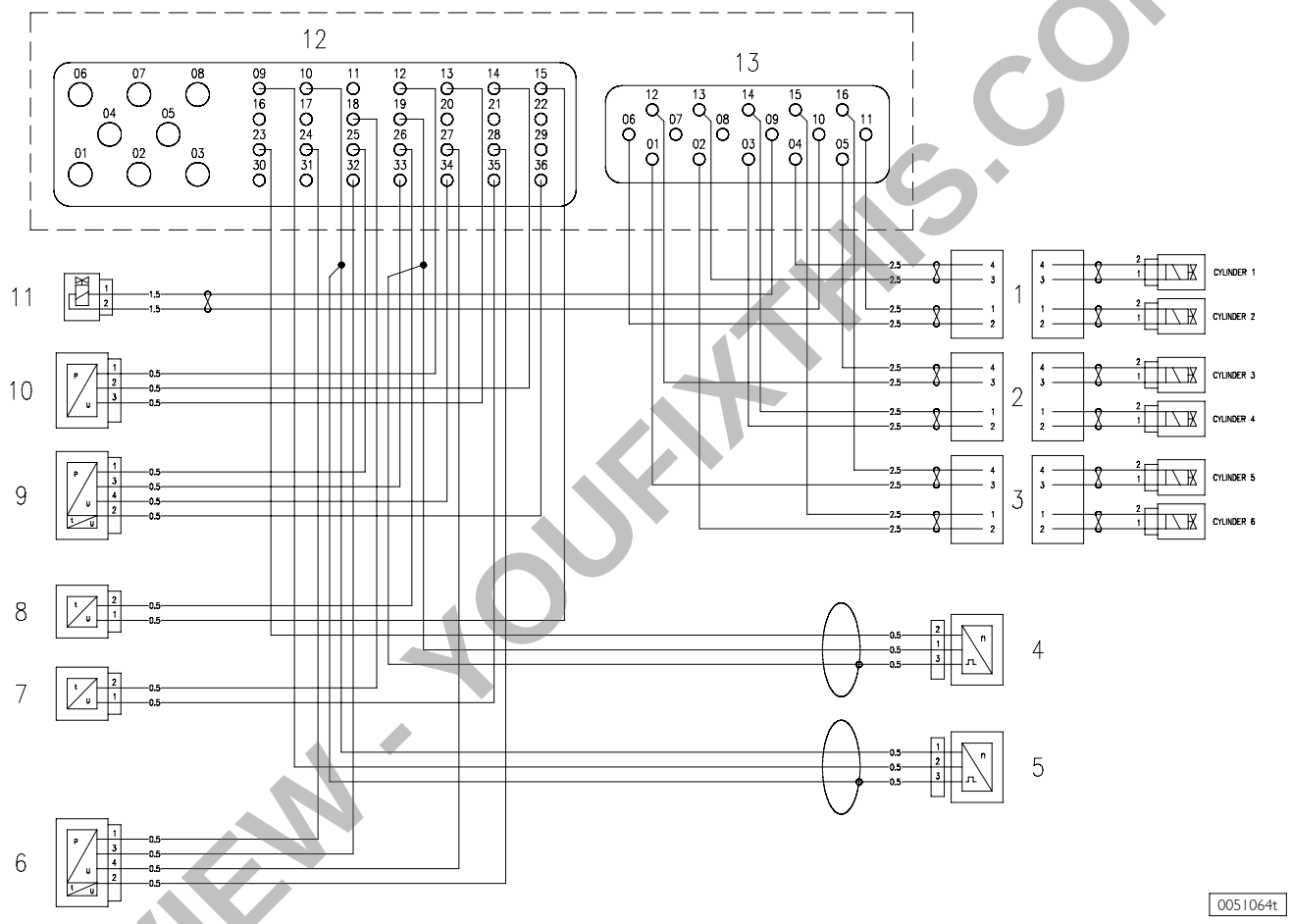
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Cable on engine

All the components described below refer to the engine cable in question, therefore the connections to the pins are a preliminary version, in other words at the approval stage.

Figure 98



1. Injectors for cylinders 1-2 - 2 Injectors for cylinders 3-4 - 3. Injectors for cylinders 5-6 - 4. Engine rpm sensor - 5. Timing sensor - 6. Engine oil pressure and temperature sensor - 7. Fuel temperature sensor - 8. Coolant temperature sensor - 9. Air temperature and pressure sensor - 10. Rail temperature and pressure sensor - 11. Pressure regulator - 12. Connector C EDC control unit (signal) - 13. Connector A EDC control unit (power).

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FAULT CODES

Failure code	Failure description
	Vehicle 1 ((Sensors / Consistency tests)
1.1.2	ACCELERATOR PEDAL
1.1.9	PLAUSIBILITY +15
1.1.A	PLAUSIBILITY +50
	Vehicle 2 (Indicator lamps / Relais / Actuators)
1.2.3	EDC LAMP
1.2.5	MAIN RELAY DEFECT
1.2.6	BATTERY VOLTAGE
1.2.8	MAIN RELAY - SHORT CIRCUIT TO BATTERY
1.2.9	AIR-CONDITIONER COMPRESSOR RELAY
1.2.B	THERMOSTARTER RELAY 1 (HEATER)
1.2.E	MANAGEMENT SYSTEM PRE/POST-HEATING (ACTIVE)
2.2.5	INTERRUPTED AFTER-RUN
2.2.8	MAIN RELAY - SHORT CIRCUIT TO GROUND
	Engine 1 (Temperature and pressure sensors)
1.3.1	COOLANT TEMPERATURE SENSOR
1.3.2	COOLANT TEMPERATURE SENSOR (TEST)
1.3.3	AIR TEMPERATURE SENSOR BOOST AIR
1.3.4	BOOST PRESSURE SENSOR
1.3.5	FUEL TEMPERATURE SENSOR
1.3.6	RAIL PRESSURE SENSOR OR SIGNAL ERROR
1.3.7	DBV VALVE MANAGEMENT (BOOST PRESSURE)
1.3.8	OIL PRESSURE SENSOR
1.3.A	OIL TEMPERATURE SENSOR
2.3.2	COOLANT TEMPERATURE SENSOR ABSOLUTE TEST
2.3.6	RAIL PRESSURE SENSOR OFFSET
2.3.8	OIL LOW PRESSURE
2.3.A	OIL TEMPERATURE ABOVE NORMAL
	Engine 2 (Speed sensors/actuators)
1.4.1	CRANKSHAFT SPEED
1.4.2	ENGINE WORKING ONLY WITH CAMSHAFT SENSOR
1.4.3	CAMSHAFT SENSOR
1.4.4	FAULT BETWEEN FLYWHEEL SENSOR AND CAMSHAFT
	Damage information
1.4.D	ENGINE OVERSPEED
1.5.B	HIGH PRESSURE TEST (DEACTIVATES RAIL PRESS.MONITORING)
1.9.D	INDICATES TORQUE LIMITATION DUE TO PERFORMANCE LIMITER
4.9.E	INDICATES THE TORQUE LIMITATION DUE TO ENGINE PROTECTION
6.9.E	INDICATES TORQUE LIMITATION DUE TO FUEL QUANTITY LIMITATION

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ANOMALY	POSSIBLE CAUSE (*) = if available in the equipment	RECOMMENDED TESTS OR INTERVENTION	REMARKS
Low performance at load request. Possible exessive smoke. Possible blink-code 8.1	Insufficient fuel level in the tank.	Check fuel level.	The excessive smoke is due to the fact that, in case of insufficient fuel feeding, the engine control module tries to compensate prolonging the injectors working time.
	Fuel tank device partially obstructed by impurities or deformed because of overheating.	Check if the priming pump of the pre-filter is working correctly. If the pump plunger is permanently depressed disassemble and check the tank pick.-up tube. If this is in order, replace the pre-filter.	
	Obstructed air filter.	Replace the air filter.	Solve the cause of the filter's obstruction.
	Excessive fuel blow-by from rail boost valve.	Check the O Rings and the correct connection of the pipe fittings under the feeding pump (the lockers must stay outside and the fittings must be well locked). Visually check the low pressure pipeline integrity.	Unless the leakage is significant, no performance failures will be detected. To verify O-rings integrity, extract from the tank the fuel recycling pipeline, seal the end and activate the priming pump driving the low pressure circuit.
	Excessive fuel blow-by from rail boost valve.	Disconnect the pipe and visually check if there are any significant blow-by from the boost gauge valve; in such case replace the valve.	
The engine suddenly stops (with no previous problems) and does not start again.	Obstructed fuel filter.	Replace the fuel filter.	Solve the cause of the filter's obstruction (empty and clean the tank and the part of the circuit over the filter, refill with clean fuel).

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