CURSOR SERIES
TIER 4B
STAGE IV

Industrial application

F3HFE613B*B010
F3HFE613D*B010
F3HFE613B*B011
F3HFE613D*B011

Technical repair manual

Introduction

GENERAL INFORMATION

Manuals for repairs are split into Parts and Sections, each one of which is marked by a number; the contents of these sections are indicated in the general table of contents.

Sections with mechanical contents include technical data, tightening torque collections, tool lists, assembly connections - disconnections, overhauls at the bench, troubleshooting and scheduled maintenance.

On sections or parts of the electric/electronic system section there are the descriptions of the electric network and the electronic systems of the assembly, wiring diagrams, electric characteristics of components, component codes and troubleshooting relative to the control units specific to the electric system.

Section 1 describes the engine operation and its general features.
Section 2 describes the type of fuel supply and the engine operating diagrams.
Section 3 refers specifically to the electrical equipment and regards wiring, electrical and electronic appliances which differ depending on use.
Section 4 describes scheduled maintenance and specific overhauling.
Section 5 deals with removal-refitting operations of the main components of the engine.
Section 6 describes the general mechanical overhaul of the engine fitted on the rotating stand.
Section 7 provides the technical specifications of the engine such as data, fitting clearance and tightening torques.
Section 8 deals with the equipment required for carrying out the operations.

The appendix provides a list of the general safety regulations which all operators, whether installers or maintenance technicians, must comply with to prevent any serious injury.

The manual uses proper symbols in its descriptions; the purpose of these symbols is to classify information. In particular, a set of symbols has been defined to classify warnings, while another set has been specified for service operations.

SYMBOLS - Warnings

Danger for persons

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

Risk of serious damage to the assembly

The partial or total non-observance of these instructions could cause serious damage to the assembly and may nullify the warranty.

General danger

Includes the dangers of both above described signals.

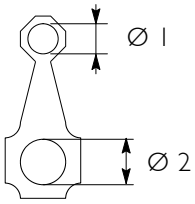
Environmental protection

Indicates correct behaviour in order for the assembly use to be as environmentally friendly as possible.

NOTE Indicates an additional explanation for a piece of information.

Service operations

Example:



Ø 1 = Housing for connecting rod small end bush.

Ø 2 = Housing for connecting rod bearings

Tighten to torque
Tighten to torque + angle value

	Removal Disconnect
	Refitting Connect
	Disassembly Dismantling
	Assembly Assemble
	Tighten to the specified torque
	Tighten to the specified torque + angle value
	Press or caulk
	Registration Adjustment
	Visual check Fitting position check
	Measuring Value to be found Check
	Tools
	Surface for machining Finished workpiece
	Interference Forced assembly
	Clearance Shim
	Lubricate Moisten Grease
	Coolant Sealant
	Bleeding air

	Intake
	Exhaust
	Operation
ϱ	Compression ratio
	Tolerance Weight difference
	Rolling torque
	Rotation
	Angle Angle value
	Preload
	Revolutions per time unit
	Temperature
	Pressure
>	Oversized Oversized by no more than ..... Max.
<	Undersized Undersized by no more than..... Min.
	Selection of oversizing class
	Temperature < 0° C Cold Winter
	Temperature > 0° C Hot Summer

GENERAL WARNINGS

The warnings shown may not be representative of all the dangerous situations that may occur. Therefore, supervisors should be contacted whenever a dangerous situation that has not been described occurs.

Use both specific and general-purpose toolings according to the prescriptions contained in respective use and maintenance handbooks. Check the working condition and suitability of tools not subject to periodic review.

The manual handling of loads must be assessed in advance since it also depends not only on weight but also on its size and on the path.

Handling by mechanical means must be with hoisters proper as for weight as well as for shape and volume. Hoisters, ropes and hooks used must show clear indications regarding maximum acceptable carrying capacity. The use of such tools is strictly permitted by authorised personnel only. Stay at a safe distance from the load and never below it.

In disassembly operations, always observe the provided prescriptions and prevent any mechanical parts being taken out from accidentally striking workshop personnel.

Shop activities performed by two technicians must always been executed with caution; avoid operations that may be dangerous for any collaborators due to lack of field of vision or incorrect position.

Keep any personnel not assigned to the operations clear of working area.

Learn the necessary concepts of operation and safety relating to the vehicle prior to working on it. Scrupulously observe all safety warnings on the assembly.

Do not leave the assembly in motion unattended during repair work.

When working on an assembly off the ground, make sure that it is resting firmly on the appropriate supporting stands and that the manual/automatic safety devices are activated in the event of lifting with a hydraulic ramp.

When working on assemblies fuelled with natural gas, in addition to the instructions given in the document, also observe all the specific safety regulations provided.

Only remove radiator cap when the engine is cold by cautiously unscrewing it in order to let system residual pressure out.

Flammable fuels and all fluids and liquids must be handled with care, according to the indications provided in the 12 point cards of harmful materials. Refuelling must be performed outdoors with the engine off, avoiding lit cigarettes, free flames or sparks, in order to prevent sudden fires/explosions. Adequately store inflammable, corrosive and polluting fluids and liquids according to what provided by regulations in force. Strictly avoid using containers for food to store harmful liquids. Avoid drilling or burning pressurised containers and discard cloths impregnated with inflammable substances into suitable containers.

Worn out, damaged or consumable parts must be replaced with original spare parts.

During workshop activities, always keep the workplace clean; promptly free or clean floors of any accidental spills and stains of liquids and oils. Electric sockets and electrical equipment necessary to perform repair operations must meet safety rules.

Wear all required P.P.E and garments when called for by the operation at issue. Contact with moving parts may cause serious injuries. Use suitable, preferably tight-fitting garments and avoid wearing jewellery, scarves, etc.

Do not leave the engine running in workshops not equipped with a pipe to extract exhaust fumes outside.

Do not breathe fumes from heating or welding of paint, as they are harmful; operate outdoors or in well-ventilated areas. Wear an appropriate respirator in the presence of paint dust.

Avoid contact with hot water or steam from the engine, radiator and hoses as they could cause serious burns. Avoid direct contact with liquids and fluids inside vehicle systems; consult the 12 remedy points sheet if accidental contact occurs.

Before overhauling, clean the assemblies and make sure they are integral and complete. Tidy up detached or disassembled parts with their securing elements (screws, nuts, etc.) into special containers.

Check the integrity of the parts that prevent the loosening of screws: split washers, split pins, clips, etc. Self-locking nuts with nylon inserts must always be replaced.

Avoid contact of rubber with diesel fuel, petrol or other incompatible substances.

Before pressure washing mechanical parts, protect electrical connectors and any control units.

The tightening of screws and nuts should always be carried out according to directions. FPT's sales and assistance network is available to provide any clarifications necessary to carry out any repair work not covered by this document.

Before welding:

- ❑ Disconnect all electronic control units and unplug the power cable from the battery's positive terminal (connecting it to the chassis ground) and connectors.
- ❑ Remove paint by using proper solvents or paint removers and clean relevant surfaces with soap and water.
- ❑ Wait approximately 15 minutes before proceeding with welding.
- ❑ Use suitable fire-resistant protections to protect hoses or other components in which fluids or other flammable materials flow when welding.

Should the vehicle be subjected to temperatures exceeding 80°C (dryer ovens), remove the electronic control units.

The disposal of all liquids and fluids should be carried out in strict compliance with specific regulations in force.

GENERAL WARNINGS REGARDING THE ELECTRICAL SYSTEM

When having to operate on the electrical/electronic circuit, disconnect the batteries from the circuit, disconnecting the chassis earth cable first of all from the negative terminal of the battery.

Before connecting the batteries to the system, make sure that the system is suitably insulated.

Disconnect the external recharging apparatus from the public utility network before removing the apparatus pins from the battery terminals.

Do not cause sparks to verify the presence of voltage in a circuit.

Do not use a test lamp to verify circuit continuity, but proper control equipment only.

Make sure that the wirings of electronic devices (length, type of cable, location, strapping, connection of screen braiding, grounding, etc.) conform with the FPT system and that they are carefully restored after repair or maintenance work.

Measurements on the ECUs, jack connections and electrical connections of components must be done only on regular test lines, with special jacks and jack bushings. Never use improvised equipment like metal wires, screwdrivers, pins or similar. This may not only cause short circuits, but also damage the jack connectors, resulting in poor contact.

Do not use fast chargers to start up the engine. Start up must only be performed with either separate batteries or special truck.

Incorrect polarisation of voltage supply to the electronic control units (for example, incorrect polarization of batteries) may lead to their destruction.

Disconnect the batteries from the system during their recharging with an external apparatus.

On connecting, only screw connector (temperature sensors, pressure sensors, etc.) nuts to the prescribed tightening torque.

Isolate the circuit prior to disconnecting the junction connector from an electronic control unit.

Do not directly supply current to components served by electronic control units with nominal vehicle voltage.

The cables must be routed in such a way as to be parallel to the reference plane, as close as possible to the chassis/body.

Upon completing work on the electrical circuit, restore the electrical connectors and wiring as originally provided.

NOTE The connectors are shown from cable side. Connector views contained in the manual are representative of cable side.

Grounding and screening

The negative conductors connected to circuit ground point must be as short as possible and connected in "star" form, ensuring that their tightening is done neatly and sufficiently (Figure 1 ref. M).

The following precautions must be observed regarding the electronic components:

– electronic control units must be connected to the system ground when equipped with metal housings.

– The negative cables of the electronic control units must be connected at a circuit ground point, such as dashboard compartment ground (avoiding "serial" or "chain" connections), as well as to the negative terminal of the battery or batteries.

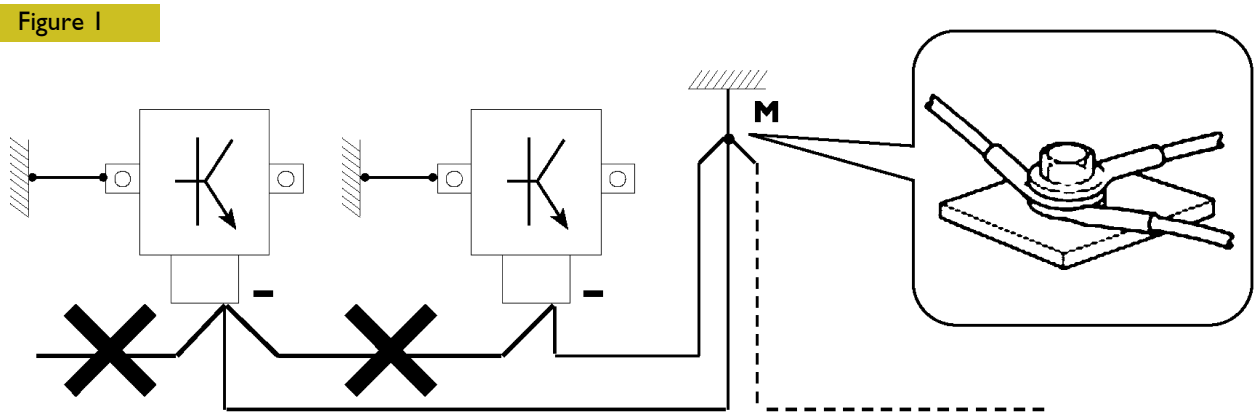
– Even if not connected to the circuit ground/battery negative terminal, analogue ground (sensors) should have optimal insulation. Consequently, particular care should be given to terminal parasitic resistances: oxidation, clinching defects, etc.

– The metal braid of shielded circuits must be in contact only at the ECU side to which the signal is to be sent (Figure 2).

– In the case of junction connectors, the unshielded section (**d**) near to the latter must be as short as possible (Figure 2).

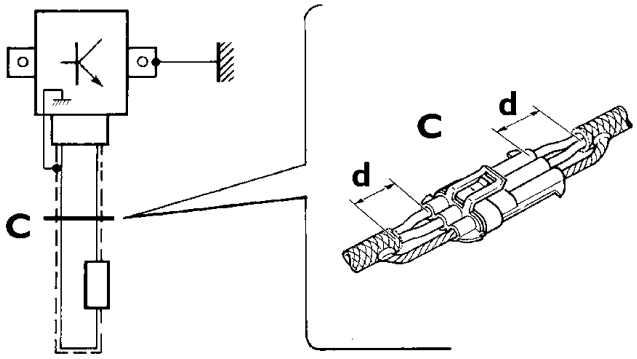
– The cables must be routed in such a way as to be parallel to the reference plane, as close as possible to the chassis/body.

Figure 1



1. "STAR" CONNECTIONS OF NEGATIVE CABLES TO THE CIRCUIT GROUND **M**

Figure 2



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2. SHIELDING BY METAL BRAID OF A CABLE TO AN ELECTRONIC COMPONENT - **C.** CONNECTOR
d. DISTANCE → 0

CONVERSIONS BETWEEN THE MAIN UNITS OF MEASUREMENT OF THE INTERNATIONAL SYSTEM AND THE MOST COMMONLY USED DERIVED SIZES

Power

1 kW = 1.36 HP
1 kW = 1.34 hp
1 HP = 0.735 kW
1 HP = 0.986 hp
1 hp = 0.746 kW
1 hp = 1,014 HP

NOTE The unit HP is converted into hp for simplicity according to a 1:1 ratio

1 hp = 1 CV.

Torque

1 Nm = 0.1019 kgm
1 kgm = 9.81 Nm

Revolutions per time unit

1 rpm = 0.1047 rad/s
1 rad/s = 9.55 rpm

Pressure

1 bar = 1.02 kg/cm^2
1 kg/cm^2 = 0.981 bar
1 bar = 10^5 Pa

NOTE Where accuracy is not particularly required:

- the unit Nm is converted into kgm for simplicity according to a ratio of 10:1
  1 kgm = 10 Nm;
- the unit bar is converted into kg/cm^2 for simplicity according to a ratio of 1:1
  1 kg/cm^2 = 1 bar.

Temperature

0° C = 273.15 K
0° F = 255.37 K
0° C = 32° F (the conversion factor between Celsius and Fahrenheit is 1:1.8)

PAGE HEADER AND FOOTER INTERPRETATION

Type of engine

Section title

Page number

MOTORI NEF F4HE — SEZIONE 4 - REVISIONE MECCANICA GENERALE 11

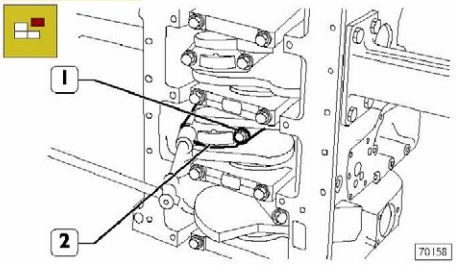
REVISIONE MOTORE 4 E 6 CIL. SMONTAGGIO DEL MOTORE AL BANCO

La trattazione seguente prevede che il motore sia stato montato sul cavalletto rotativo e si sia proceduto alla rimozione di tutti i componenti specifici dell'applicazione Iveco Motors (vedere la Sezione 3 del presente manuale).

La sezione riguarda quindi tutte le più importanti procedure di revisione del basamento motore.

Le operazioni seguenti riguardano il motore 4 cilindri, ma risultano analoghe per il 6 cilindri.

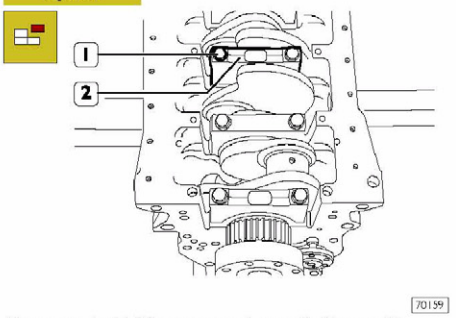
Figura 1



Svitare le viti di fissaggio (1) e rimuovere i cappelli di biella (2). Sfilare gli stantuffi completi di bielle dalla parte superiore del basamento.

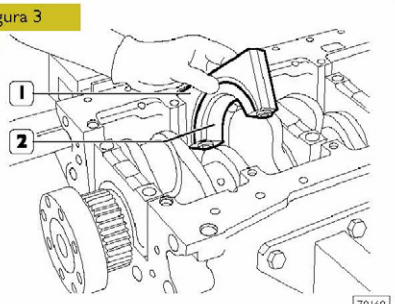
NOTA Mantenere i semicuscinetti nei rispettivi alloggiamenti, poiché, in caso di un loro utilizzo, dovranno essere montati nella posizione riscontrata allo smontaggio.

Figura 2



Rimuovere le viti (1) e smontare i cappelli di banco (2).

Figura 3

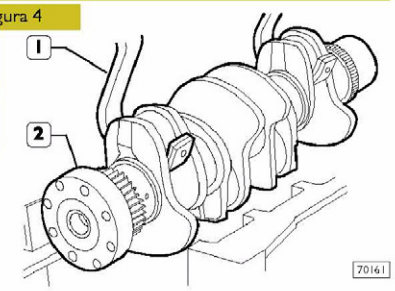


Il penultimo cappello di banco (1) e il relativo supporto hanno il semicuscinetto (2) dotato di spallamento.

NOTA Le viti M12 dei cappelli di banco, devono essere sostituite se il diametro nominale della parte filettata che non lavora, presenta un diametro < 0,1 mm rispetto al valore nominale.

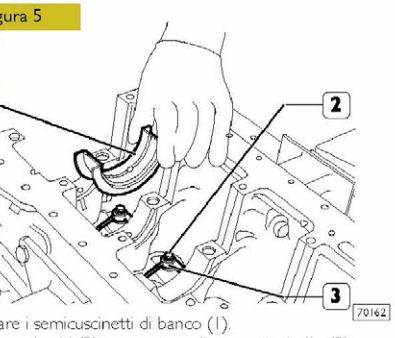
NOTA Annotare la posizione di montaggio dei semicuscinetti inferiori e superiori, poiché in caso di un loro riutilizzo, dovranno essere montati nella posizione riscontrata allo smontaggio.

Figura 4



Con l'attrezzo 99360500 (1) e sollevatore rimuovere l'albero motore (2) dal basamento.

Figura 5



Smontare i semicuscinetti di banco (1).
Rimuovere le viti (2) e smontare gli spruzzatori olio (3).

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CURSOR SERIES STAGE IV
CURSOR SERIES TIER 4B

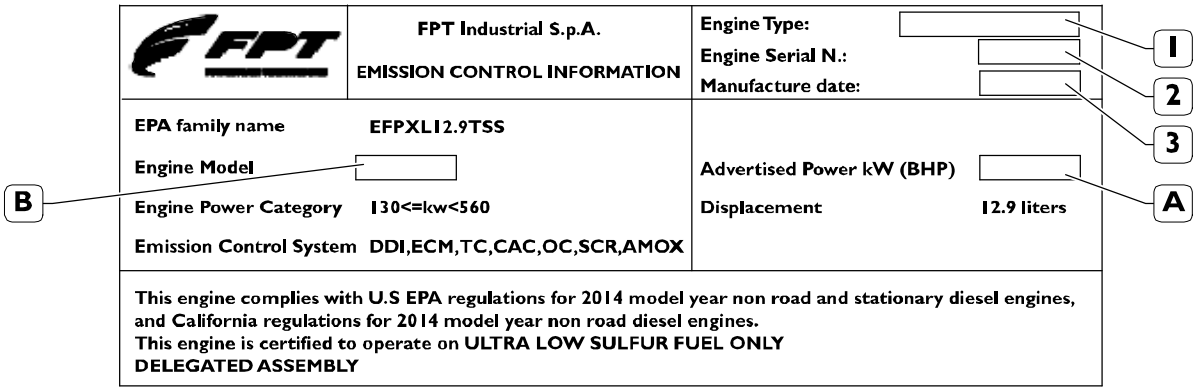
SECTION 1

General information

IDENTIFICATION DATA

F3HFE613B*B010 - F3HFE613D*B010

Figure 1

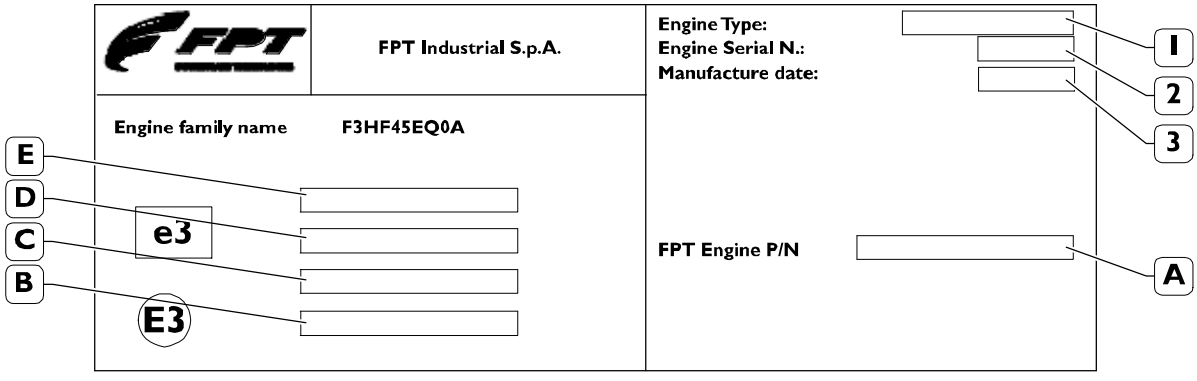


1. Engine technical code - 2. Engine serial number - 3. Manufacturing date (DD/MM/YY)

Ref.	F3HFE613B*B010	F3HFE613D*B010
A	407 (545)	384 (515)
B	F3HFE613B*B	F3HFE613B*D

F3HFE613B*B011 - F3HFE613D*B011

Figure 2



1. Engine technical code - 2. Engine serial number - 3. Manufacturing date (DD/MM/YY)

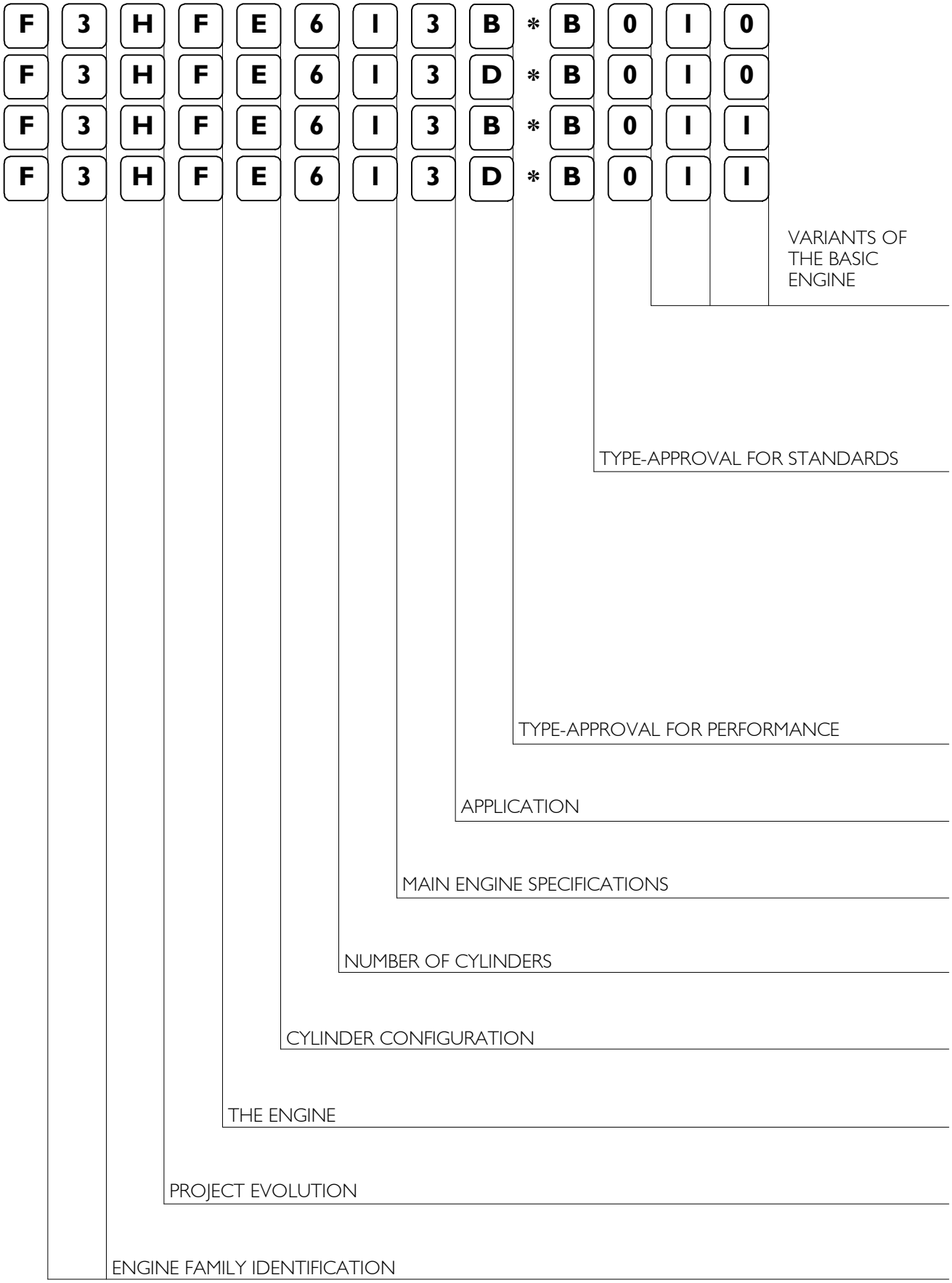
Ref.	F3HFE613B*B011	F3HFE613D*B011
A	5801904778 XZ	5801904779 XZ
B	120R-011220*00	120R-011227*00
C	24R-031589*00	24R-031588*00
D	*2000/25E*2010/22*1043*00	*2000/25E*2010/22*1043*00
E	e3*97/68QA*2010/26*1047*00	e3*97/68QA*2010/26*1074*00

CORRESPONDENCE BETWEEN TECHNICAL CODES AND COMMERCIAL CODES

Technical codes	Commercial Codes
F3HFE613B*B010 **F3HFE613D*B010**	**C13 ENT Z W**
F3HFE613B*B011 **F3HFE613D*B011**	**C13 ENT L W**

PRODUCT TECHNICAL CODE

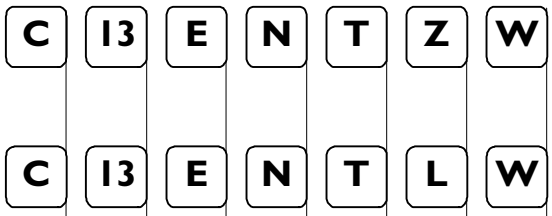
The technical code is assigned during production; it is used to identify the main characteristics, characterise the application and the corresponding level of power output. It is stamped on one side of the crankcase near the oil filter.



PRODUCT COMMERCIAL CODE

The commercial name has the aim of making the information on the engine characteristics more easily identifiable, bringing together engines of different families, origin and applications for which they are to be used.

The commercial acronym is not used for any technical purpose to recognise the parts which make up the engine.



CONTROL UNIT TYPE: W = EDC17 hp 41

EMISSIONS: L = STAGE IV, Z = Tier 4B

INTAKE: T = TURBOCHARGED WITH INTERCOOLER

CRANKCASE: N = NON-STRUCTURAL (standard distribution)

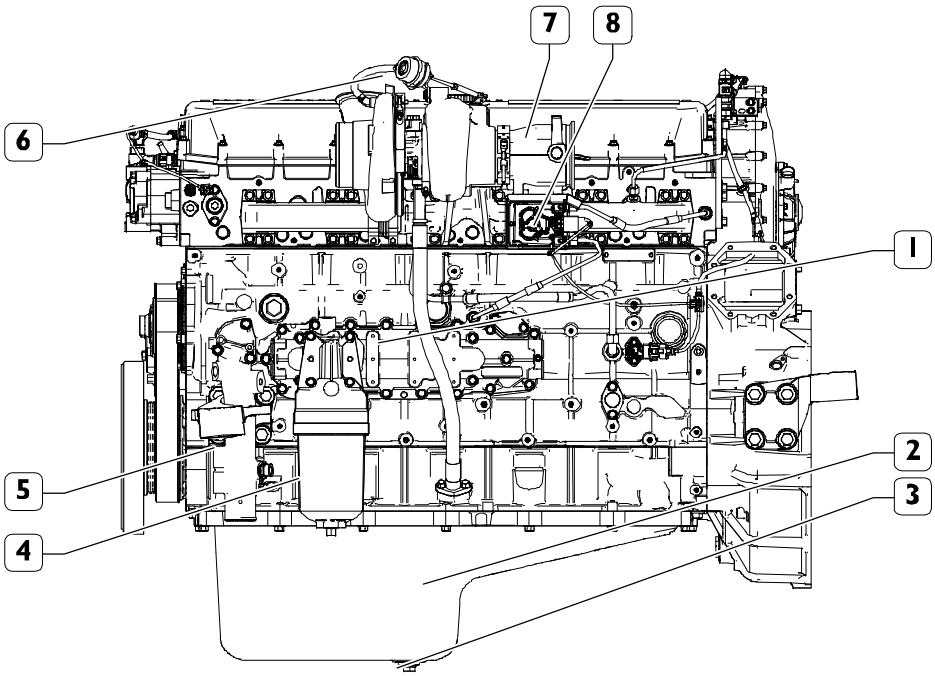
INJECTION: E= ELECTRONIC

DISPLACEMENT: 13 = 13,000 c.c. NOMINAL

ENGINE FAMILY IDENTIFICATION: C= CURSOR

ENGINE VIEWS

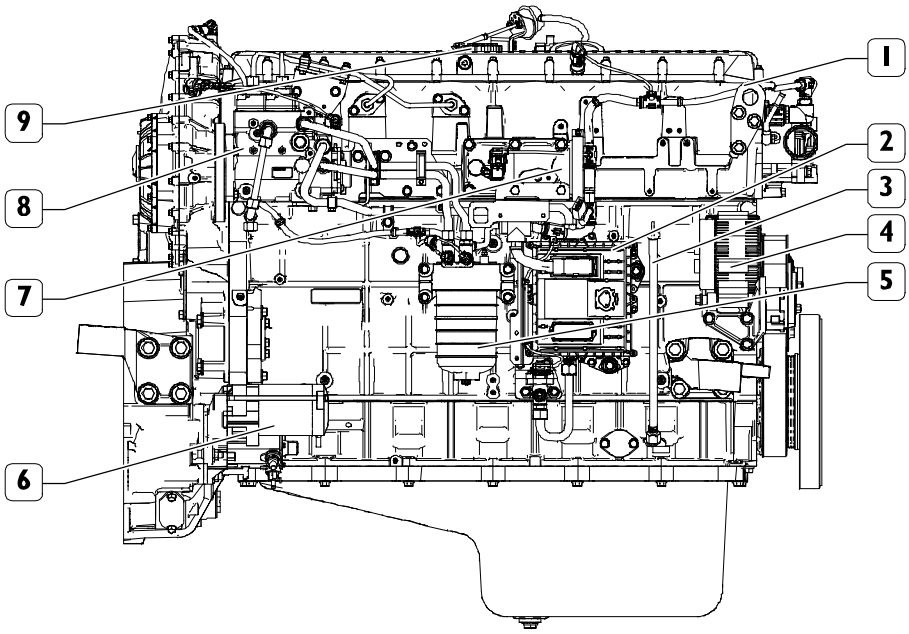
Figure 3



1. Heat exchanger lubricant oil - 2. Oil sump - 3. Oil sump drain plug - 4. Lubrication oil filter - 5. Coupling of engine coolant return fitting - 6. Turbocharger - 7. Turbocharger outlet pipe - 8. Electrically controlled engine brake valve

LEFT SIDE VIEW

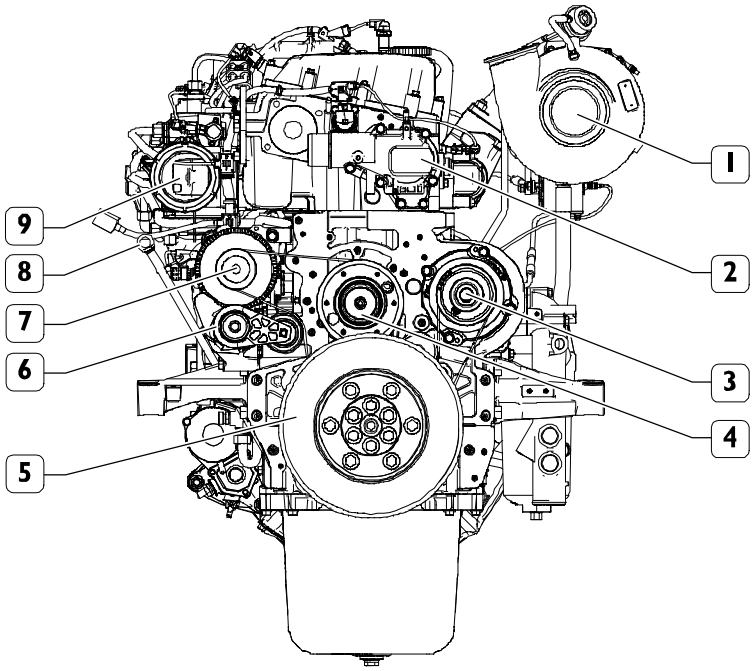
Figure 4



1. Lifting eyelet - 2. Electronic control unit ECU - 3. Lubricant oil level dipstick - 4. Alternator - 5. Fuel filter - 6. Electric starter motor - 7. Engine air inlet pipe - 8. High and low pressure pump for common rail system - 9. Engine oil filler cap

RIGHT SIDE VIEW

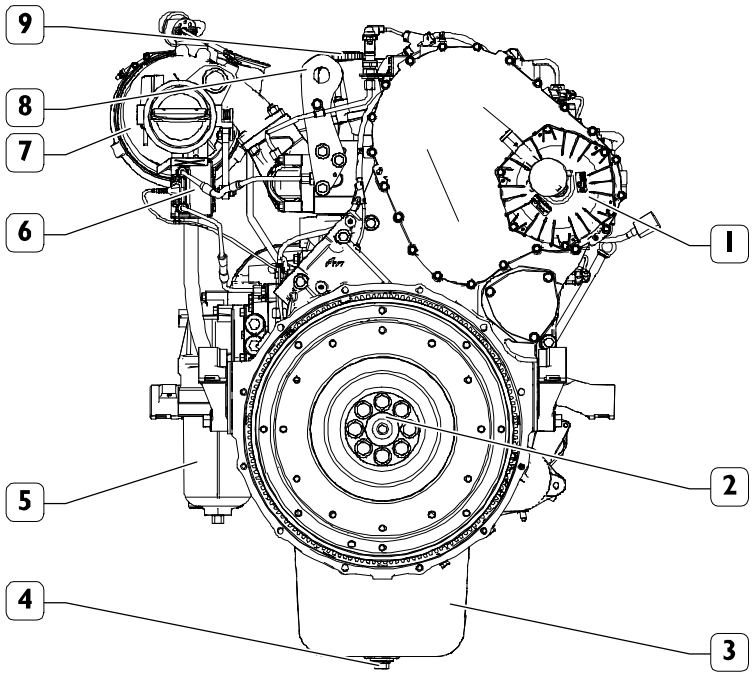
Figure 5



1. Turbocharger - 2. Thermostat unit and cylinder head water outlet pipe - 3. Water pump - 4. Fan control coupling - 5. Engine flywheel pulley - 6. Automatic tensioner - 7. Alternator - 8. Lubricant oil level dipstick - 9. Intake manifold inlet

SIDE VIEW FROM THE FRONT

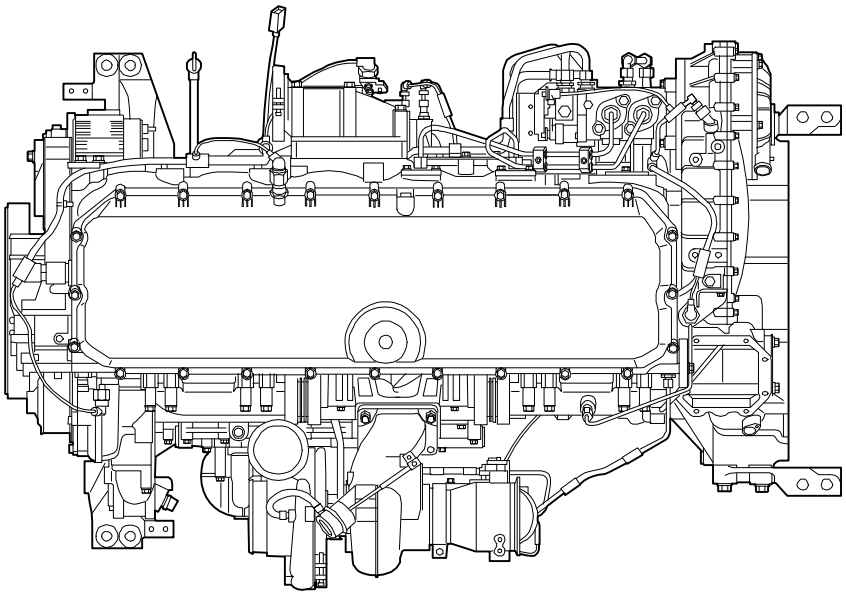
Figure 6



1. Blow-by breather housing - 2. Engine flywheel - 3. Oil sump - 4. Oil sump drain plug - 5. Lubrication oil filter - 6. Electrically controlled exhaust brake valve - 7. Turbocharger - 8. Lifting eyelet - 9. Engine oil filler cap

SIDE VIEW FROM THE REAR

Figure 7



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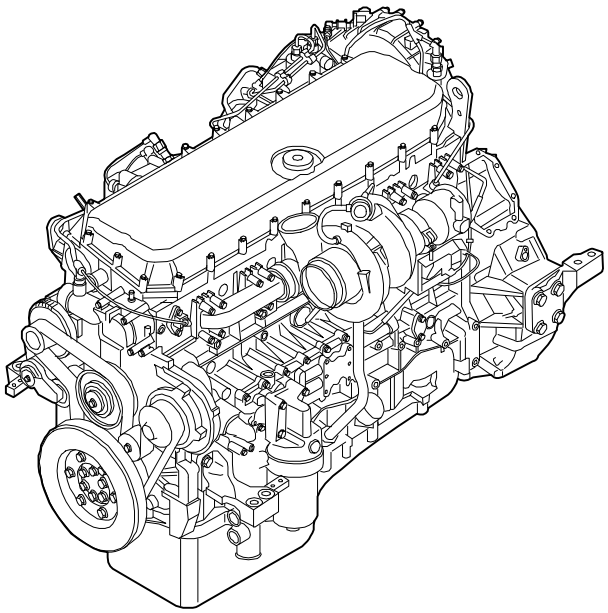
TOP SIDE VIEW

Figure 8



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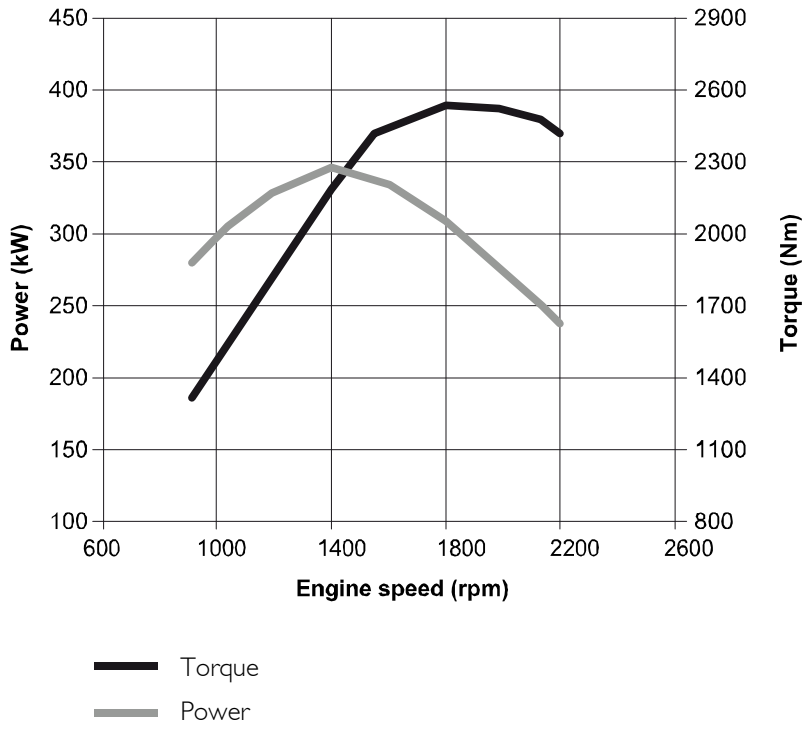
ISOMETRIC VIEW

POWER - TORQUE CURVES

F3HFE613D*B010 - F3HFE613D*B011

Figure 1



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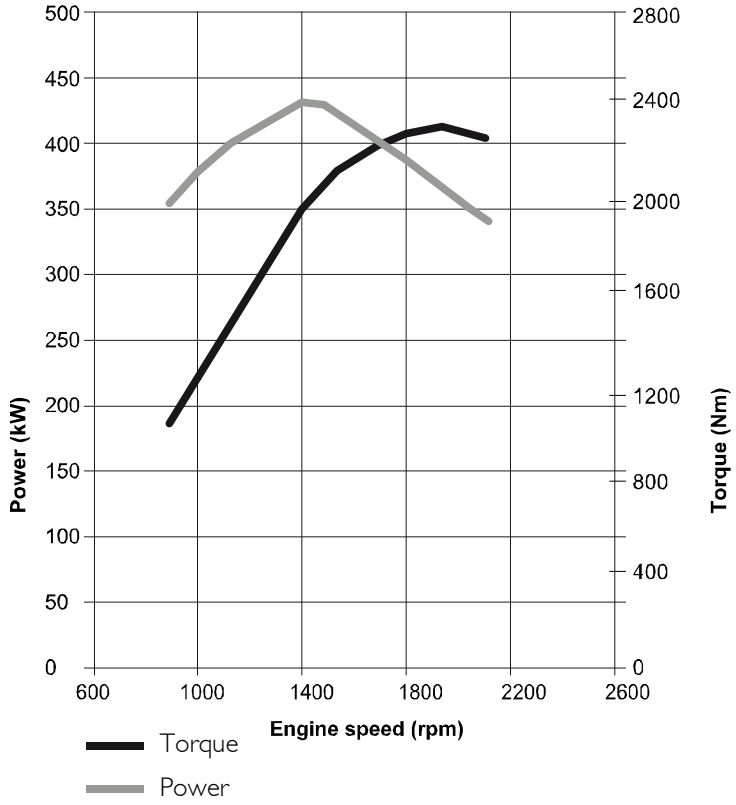
F3HFE613B*B010 - F3HFE613B*B011

Figure 2



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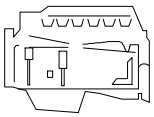
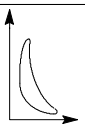
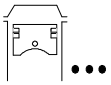
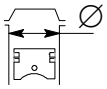
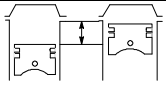
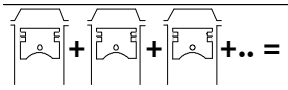
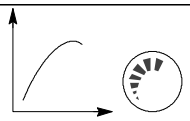
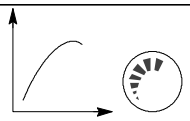
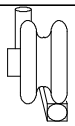
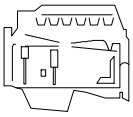
ENGINE CHARACTERISTICS

	Type		F3HFE613B*B010 F3HFE613B*B011	F3HFE613D*B010 F3HFE613D*B011
	Cycle		Diesel 4-stroke	
	Power supply		Turbocharged	
	Injection		Direct	
	Number of cylinders		6 in line	
	Bore	mm	135	
	Stroke	mm	150	
	Total displacement	cm^3	12882	
	Compression ratio		16.5: 1	
	Max. power	kW (HP) rpm	407 (553) 2100	384 (522) 2100
	Maximum torque	Nm (kgm) rpm	2407 (245) 1400	2258 (230) 1400
	Low idle speed	rpm	850 ± 100	
	High idle speed	rpm	2350 ± 50	
	**TURBOCHARGING** Turbocharger type		Intercooler Waste Gate HONEYWELL	
	**LUBRICATION** Oil pressure with engine warmed up: (oil temperature 120° C) - at idle speed - at max speed	 bar bar	 Forced by gear pump, pressure relief valve, oil filter 0.6 3.5	
	COOLING Water pump drive: **Thermostat**: - opening start - max. opening	 °C °C	Fluid By means of belt 80 90	

NOTE The data, specifications and performance figures are only valid if the fitter complies with all the installation instructions provided by FPT.

Furthermore, the fitted appliances must always be in compliance with the torque, power and engine speed for which the engine was designed.

	Type	F3HFE613B*B010 F3HFE613B*B011	F3HFE613D*B010 F3HFE613D*B011
REFILLING	Cooling circuit (1) Total capacity	19.5	
	Lubrication circuit (2) total capacity (3)	32 (28.8)	
	Periodic replacement: sump at minimum level sump at maximum level	 20 (18) 28 (25)	
	Fuel tank (4)	-	
	Urea tank (5)	-	

(1) The quantities indicated only refer to the engine in its standard configuration. Use a mix of 50% water and Actifull OT even in summer. As an alternative to Actifull OT, use another product that complies with the specifications FPI9.COOL002 and/or standard ASTM D-6210.

(2) Only use lubricants which comply with the international specifications API CJ-4 / ACEA E9. The recommended oil is SAE 10W-40 which complies with the specifications FPT FPI9.LUBR001. FPT recommends only the use of original lubricants AkcelA or AmbrA which comply with standard SAE 10W40. Oil consumption is considered acceptable up to quantities of 0.5% of fuel consumption.

(3) The quantities indicated refer to the first refuel only and are relative to the engine, oil sump and filter.

(4) Use STANDARD fuel which complies with standards ASTM D975 or EN 590. The indications connected to the fuel tank capacity are the responsibility of the vehicle/equipment manufacturer since these are subject to changes depending on the various vehicle/outfitting configurations.

(5) Only use AdBlue®/DEF which complies with specification ISO 22241.

Filling from drums or tanks can cause contamination of the diesel, with the consequent risk of damaging the injection system; if necessary, perform suitable filtration or sedimentation of the impurities before refuelling.

The data, specifications and performance figures are only valid if the fitter complies with all the installation instructions provided by FPT.

Furthermore, the fitted appliances must always be in compliance with the torque, power and engine speed for which the engine was designed.

SECTION 2

Operating diagrams

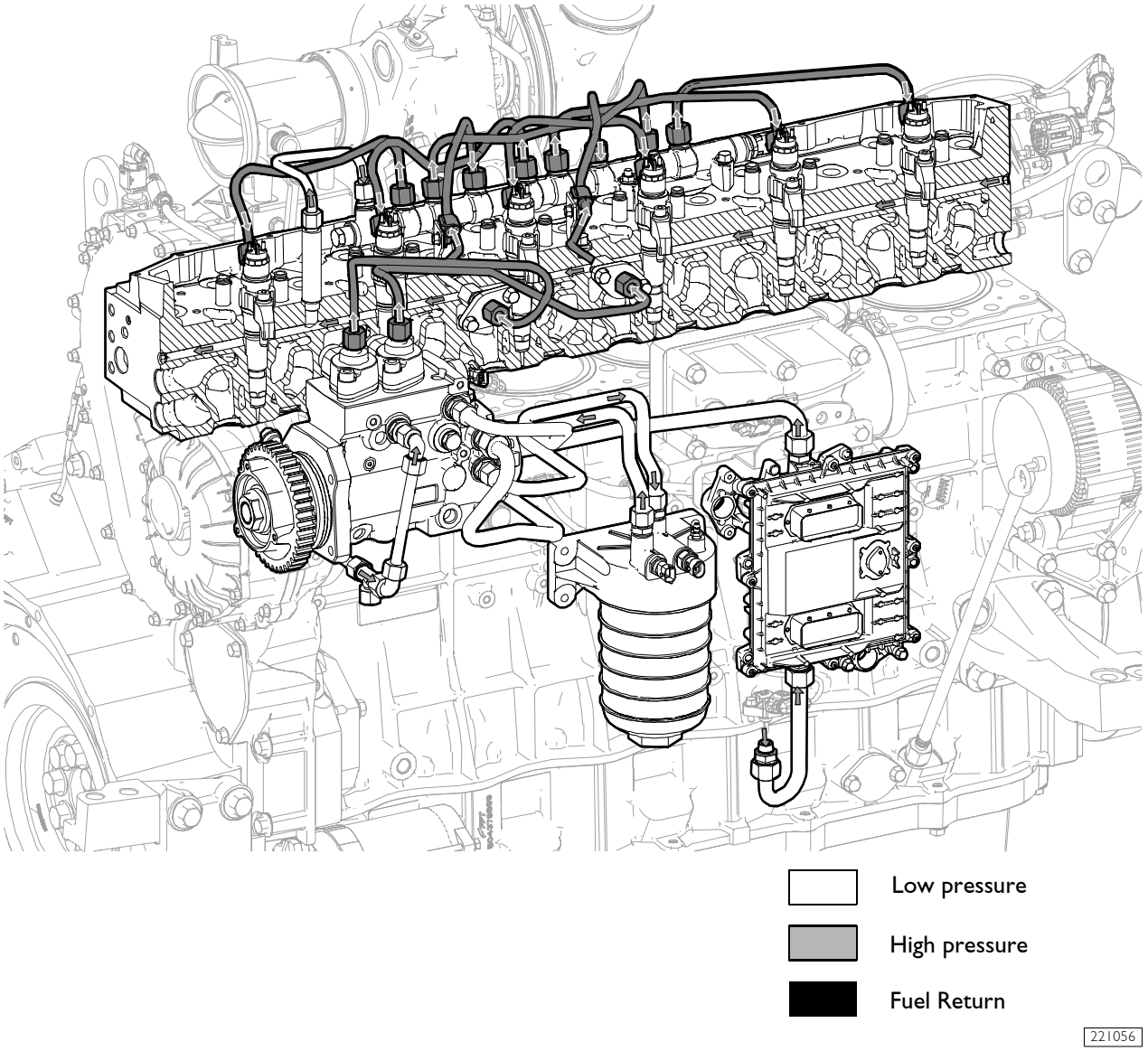
POWER SUPPLY

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

At the electro-injector inlet therefore, there is always fuel at the injection pressure calculated by the ECU.

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

Figure 1



1. Electro-injector - 2. Electronic control unit cooling - 3. ECU (EDC 17 hp41) - 4. Fuel filter - 5. High pressure fuel pump - 6. fuel return

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