Ducato (250)
NEW VERSIONS - MY 2011
Main technical specifications

Service News

Fiat Group Automobiles S.p.A.

Ducato (250)

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09.11

Versions: all models MY 2011

0000 0 000 AA **NEW VERSIONS - MY 2011**
Main technical specifications

The new MY 2011 versions are being introduced with the name Fiat Ducato (Fig. 1) unchanged.
For these new versions, various technical and functional innovations were introduced, including:
-the new range of engines, all Euro 5, with increased power and higher differentiation.-the Traction Plus, the innovation traction control system, that improves the vehicle traction on the most challenging surfaces, with poor grip.-The "myport" for the Blue&Me TomTom navigator, the integrated Blue&Me system that manages many functions through voice controls along with the controls on the steering wheel
Finally, it offers a new, more articulated and diversified range: with the matching of body-engine-mechanic components you can have 2000 articulated versions for goods transport, people transport and basic versions for conversions and different trims; in particular, the van range has 8 different load volumes, from 8 to 17 m³.
At the beginning, the MY 2011 range offers the following engines:
-115 MultiJet-130 MultiJet-150 MultiJet-180 MultiJet

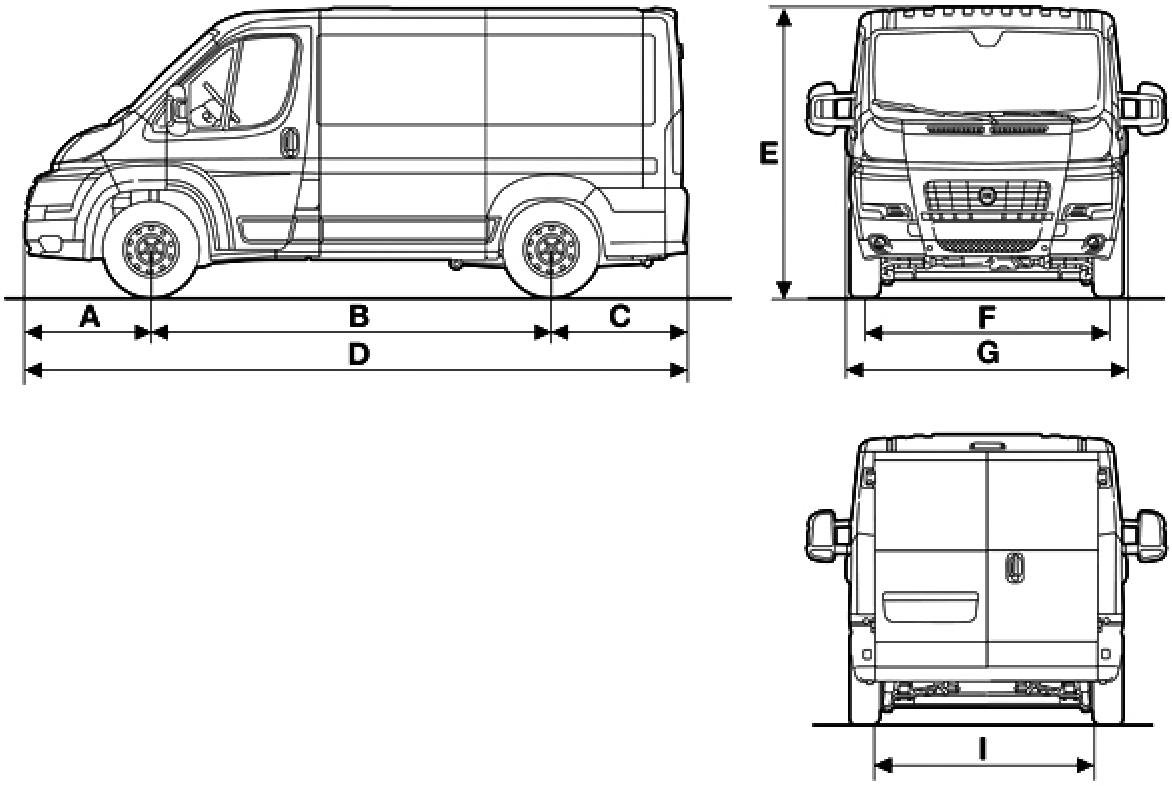
Fig. 1 – Front view - Van version

The identification data of the new versions and data related to the new engines are given here below, along with the main technical data and specifications for new MY 2011 versions.

DIMENSIONS

Dimensions are expressed in mm and refer to the vehicle fitted with standard tyres.
Height is measured with vehicle unladen

Fig. 2 – Van version

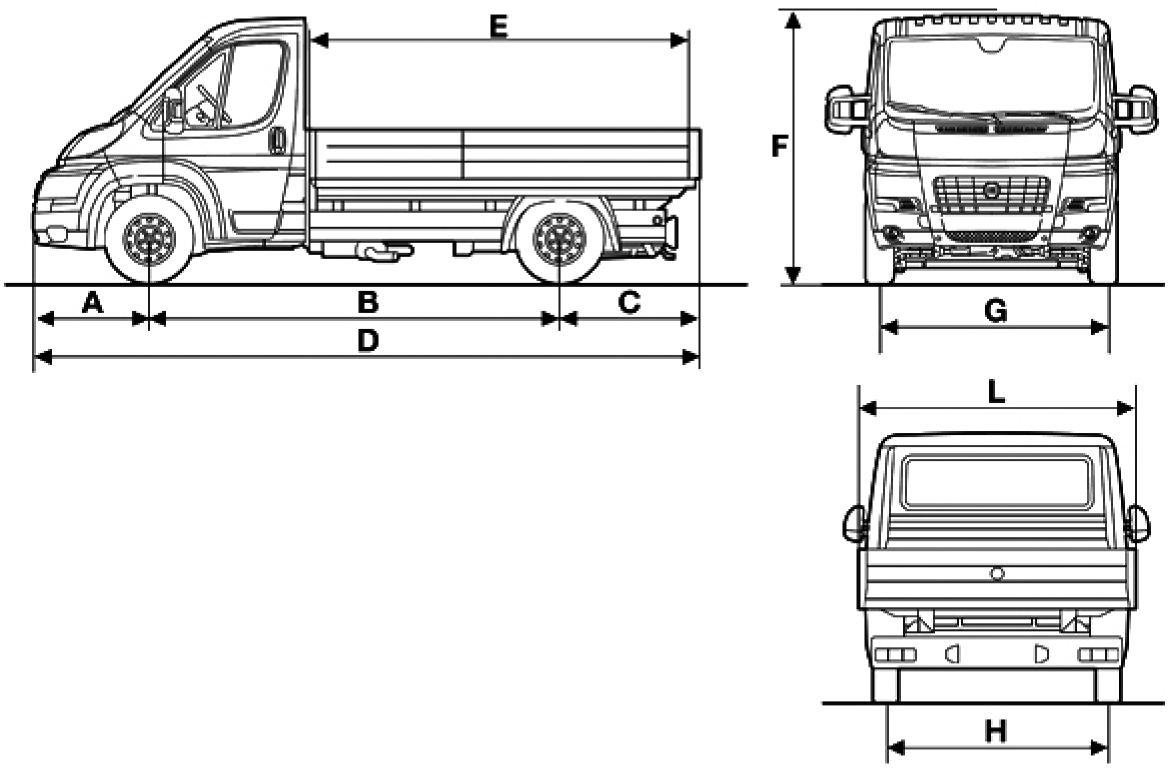


	Van version							
	Short wheelbase		**Medium wheelbase**		**Long wheelbase**		**Extra long wheelbase**	
	Low roof	**High roof**	**Low roof**	**High roof**	**Low roof**	**High roof**	**High roof**	Extra high roof
A	948	948	948	948	948	948	948	948
B	3000	3000	3450	3450	4035	4035	4035	4035
C	1015	1015	1015	1015	1015	1015	1380	1380
D	4963	4963	5413	5413	5998	5998	6363	6363
E	2254	2524	2254	2524	2254	2524	2254	2524
F	1810	1810	1810	1810	1810	1810	1810	1810
G	2050	2050	2050	2050	2050	2050	2050	2050

I	1790	1790	1790	1790	1790	1790	1790	1790

The sizes vary according to the versions within the limits indicated above.

Fig. 3 – Truck version



	Flatbed				**Chassis cab**			
	Short wheelbase - Low roof	**Medium wheelbase - Low roof**	**Long wheelbase - Low roof**	**Extra long wheelbase - Low roof**	**Short wheelbase - Low roof**	**Medium wheelbase - Low roof**	**Long wheelbase - Low roof**	**Extra long wheelbase - Low roof**
A	948	948	948	948	948	948	948	948
B	3000	3450	4035	4035	3000	3450 - 3800	4035	4035
C	1345	1345	1345	1710	960	960	960	1325
D	5293	5743	6328	6693	4908	5358 - 5708	5943	6308
E	2798	3248	3833	4198	-	-	-	-
F	2254	2254	2254	2254	2254	2254	2254	2254
G	1810	1810	1810	1810	1810	1810	1810	1810
H	1790	1790	1790	1790	1790 - 1980	1790 - 1980	1790 - 1980	1790 - 1980
L	2100	2100	2100	2100	2050	2050	2050	2050

The sizes vary according to the versions within the limits indicated above.

	Chassis cowl				Special chassis cab			
	Short wheelbase - Low roof	Medium wheelbase - Low roof	Long wheelbase - Low roof	Extra long wheelbase - Low roof	Short wheelbase - Low roof	Medium wheelbase - Low roof	Long wheelbase - Low roof	Extra long wheelbase - Low roof
A	925	925	925	925	948	948	948	948
B	3000	3450 - 3800	4035	4035	3000	3450 - 3800	4035	4035
C	860	860	860	1225	880	880	880	1245
D	4785	5235 - 5585	5820	6125	4828	5278 - 5628	5863	6228
E	-	-	-	-	-	-	-	-
F	-	-	-	-	2254	2254	2254	2254
G	1810	1810	1810	1810	1810	1810	1810	1810
H	1790 - 1980	1790 - 1980	1790 - 1980	1790 - 1980	1790 - 1980	1790 - 1980	1790 - 1980	1790 - 1980
L	2050	2050	2050	2050	2050	2050	2050	2050

The sizes vary according to the versions within the limits indicated above.

	Special chassis cowl			
	Short wheelbase Low roof	Medium wheelbase Low roof	Long wheelbase Low roof	Extra long wheelbase - Low roof
A	925	925	925	925
B	3000	3450 - 3800	4035	4035
C	880	880	880	1245
D	4805	5255 - 5605	5840	6205
G	1810	1810	1810	1810
H	1790 - 1980	1790 - 1980	1790 - 1980	1790 - 1980
L	2050	2050	2050	2050

The sizes vary according to the versions within the limits indicated above.

ENGINES

All Ducatos feature four cylinder in line engines with four valves per cylinder and a twin overhead camshaft. 2.0 and 2.3, 130 HP engines have a fixed geometry turbocharger with intercooler, while the two more performing engines, 2.3, 148 HP and 3.0, 177 HP, have a variable geometry turbocharger.
The engine head is made from aluminium alloy, whilst the crankcase is cast iron. The pistons have cooling ducts, the geometry of the inlet and exhaust manifolds has been improved.
All engines are equipped with an EGR system with exhaust gas recirculation cooling, managed directly by the engine management control unit.

The main features and specifications of the different engines are provided below.

MAIN SPECIFICATIONS

2.0 MultiJet (115)	
Engine marking	250A1000
Total displacement	1956 cm³
EEC max. power	84.6 kW " 115 HP
At a speed of	3750 rpm
EEC max. torque	280 Nm
At a speed of	1500 rpm
Timing system	DOHC
Power supply	Common Rail MultiJet ~ direct injection”
2.3 MultiJet (130)	
Engine marking	F1AE3481D
Total displacement	2287 cm³
EEC max. power	96 kW " 130 HP
At a speed of	3600 rpm
EEC max. torque	320 Nm
At a speed of	1800 rpm
Timing system	DOHC
Power supply	Common Rail MultiJet ~ direct injection”
2.3 MultiJet (150)	
Engine marking	F1AE3481E
Total displacement	2287 cm³
EEC max. power	109 kW " 148 HP
At a speed of	3600 rpm
EEC max. torque	350 Nm
At a speed of	1500 rpm
Timing system	DOHC

Power supply	Common Rail MultiJet ~ direct injection”
3.0 MultiJet (180)	
Engine marking	F1CE3481E
Total displacement	2999 cm³
EEC max. power	130 kW “ 177 HP
At a speed of	3500 rpm
EEC max. torque	400 Nm
At a speed of	1400 rpm
Timing system	DOHC
Power supply	Common Rail MultiJet ~ direct injection”

2.0 MultiJet (115) ENGINE

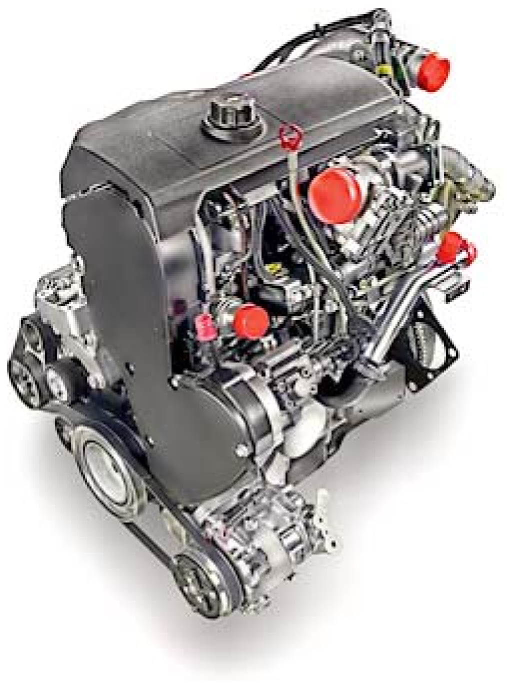
This engine is featured by low consumption and high flexibility and is the ideal solution for being used especially on short-medium journeys (Fig. 4). When compared with the previous 2.2 JTD, 100 HP Euro 4 engine, the new 2.0 MultiJet, 115 HP engine has increased power (15% of power and +12% of max. torque) while ensuring more acceleration and setting-off capacity uphills and dramatically reducing consumption and emission at the same time. The 2.0 MultiJet 115 HP engine is featured by a low weight (about 180 kg).

Fig. 4 – 2.0 MultiJet engine (115)

2.3 MultiJet (150) ENGINE

Ducato MY 2011 has a 148 HP engine, with variable geometry, high efficiency turbocharger (Fig. 5). This engine has a prompt reply and brilliant performance thanks to its remarkable power and torque increase, with emission and consumption values similar to the previous 2.3 JTD, 130 HP engine.

Fig. 5 – 2.3 MultiJet (150) engine



3.0 MultiJet (180) ENGINE
It is the most powerful engine of the new Ducato. Compared with the previous 3.0, 157 HP Euro 4 engine, this power unit achieves a 13% power increase with consumption and CO2 emission reduction.
The 3.0 MultiJet 180 engine (Fig. 6) uses a variable geometry turbocharger, with glow plugs directly located in the combustion chamber, controlled by the engine management control unit.
The power unit has a cast iron lower crankcase, with integrated bearings and double mass flywheel to dampen vibrations generated by the engine, with a remarkable noise reduction. The timing is the chain-driven type with twin overhead camshaft.
Fig. 6 – 3.0 MultiJet (180) engine

GEARBOXES

The following types of gearbox are fitted depending on the various engine types:

-2.0 MultiJet 115 – M38 gearbox, with 5 synchronised forward gears plus reverse-2.3 MultiJet 130 – M38 gearbox, with 6 synchronised forward gears plus reverse-2.3 MultiJet 150 – M38 gearbox, with 6 synchronised forward gears plus reverse-3.0 MultiJet 180 – M40 gearbox, with 6 synchronised forward gears plus reverse

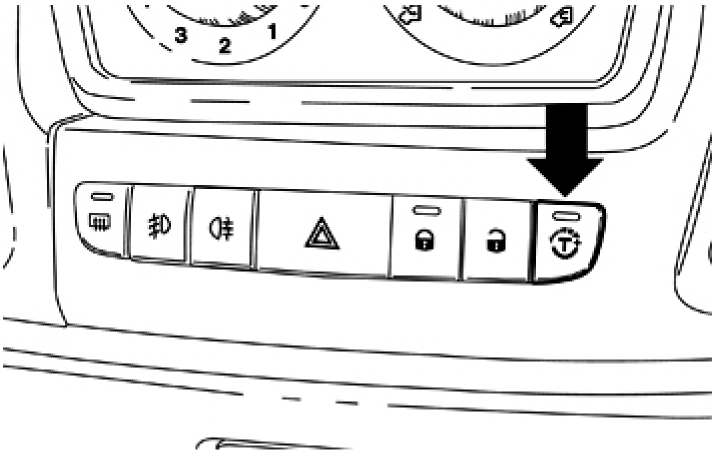
BRAKES

The vehicle is standard fitted with the **ABS** system formed by a hydraulic control unit with 8 solenoid valves, 4 active sensors and 4 channels with Electronic Brake-force Distribution (EBD), dividing the braking action over all four wheels to prevent wheel locking and guarantee full control of the vehicle.
The **ESP** (Electronic Stability Program) is available upon demand, which intervenes in emergency conditions to control the vehicle dynamic manoeuvres. Basing on the vehicle rotation data around its vertical axis (yaw speed), on lateral acceleration and on steering wheel angle set by the driver, the system calculates whether the vehicle is driving round a bend within the limits of its grip and, in case of need, brakes the wheel concerned or reduces the quantity of fuel sent to the engine to reduce engine power.
The ESP is integrated by the following systems:
-**LAC** (Load Adaptive Control) which identifies the load and the position of the vehicle centre of gravity;-**Hill Holder** which extends the pressure on the brake calipers when the driver's foot is lifted from the brake pedal, for making departures uphills easier;-**HBA** (Hydraulic Brake Assistance) which automatically increases the pressure in the braking circuit during emergency braking;-**ASR** (Anti Slip Regulation), the traction control function preventing the slipping effects of one or both driving wheels acting on the individual brakes and/or temporarily reducing the engine power;-**MSR** (Motor-Schleppmoment-Regelung) which intervenes in the event of a sudden change of gear whilst downshifting, thereby avoiding excessive drag of the driving wheels.
All vehicles come with front and rear disc brakes, with the following features:

	12 - 15 qt	17 qt Light	17 qt Heavy	20 qt
FRONT BRAKES	Self-ventilated disc 280 x 24	Self-ventilated disc 280 x 24	Self-ventilated disc 300 x 24	Self-ventilated disc 300 x 31
REAR BRAKES	Solid disc 280 x 16	Solid disc 280 x 16	Solid disc 280 x 16	Solid disc 300 x 16

TRACTION PLUS SYSTEM

Upon demand, MY 2011 vehicles with ESP can be equipped with **Traction Plus** traction control system, with increases the vehicle driving capacity on rough grounds, with poor grip, by locally engaging the braking system, acting like a limited slip differential.
When a driving wheel is in poor grip conditions, the system control unit detects the slip and commands the hydraulic circuit to apply braking force to the slipping wheel, thus shifting drive to the wheel on the surface offering better grip. This makes the vehicle easy to drive, maintains directional stability and control and ensures the best possible traction even over the roughest and most slippery surfaces.
The system is operated by the button T+ on the dashboard (Fig. 7) and can function at speeds of up to 30 km/h; once this speed is exceeded, the system is automatically deactivated.
Fig. 7



RIMS/TYRES

Versions	Rim	Tyre

Ducato (except recreational)	6J x 15"	215/70 R15C 109/107S 225/70 R15C 112/110S
Ducato (recreational)	6J x 15"	215/70 R15CP 109/107Q
Ducato Maxi (except recreational)	6J x 16"	215/75 R16C 116/114R 225/75 R16C 118/116R
Ducato Maxi (recreational)	6J x 16"	225/75 R16CP 116/114Q

Spare wheel: 125/80R15 95H space-saver wheel on 5-seater people transport versions; standard wheel on other versions.

Only use the tyres indicated on the vehicle registration document. If using class C tyres on a Camping vehicle, always use wheels with a metal inflation valve. When replacing, it is always advisable to use Camping tyres.

COLD TYRE INFLATION PRESSURE (bar)

Tyre	Use	Front	Rear
215/70 R15	3000 GVW(*) with basic tyres, except PANORAMA	4.0 ± 0.05	4.0 ± 0.05
215/70 R15	3300 GVW(*) / 3500 GVW (*) with basic tyres	4.1 ± 0.05	4.5 ± 0.05
215/70 R15	PANORAMA with basic tyres	4.1 ± 0.05	4.5 ± 0.05
225/70 R15	3000 GVW(*) with oversized tyres, except PANORAMA	4.0 ± 0.05	4.0 ± 0.05
225/70 R15	3300 GVW(*) / 3500 GVW (*) with oversized tyres	4.1 ± 0.05	4.5 ± 0.05
225/70 R15 C	Winter tyres M+S class C on Camping vehicle	4.3 ± 0.05	4.75 ± 0.05
225/70 R15	PANORAMA with oversized tyres	4.1 ± 0.05	4.5 ± 0.05
215/70 R15 CP	Range with camping tyres	5.0 ± 0.05	5.5 ± 0.05
215/75 R16	Maxi range with basic tyres	4.5 ± 0.05	5.0 ± 0.05
225/75 R16	Maxi range with oversized tyres	4,5 ± 0,05	5,0 ± 0,05
225/75 R16 C	Winter tyres M+S class C on Camping vehicle	5.2 ± 0.05	5.2 ± 0.05
225/75 R16 CP	Maxi range with Camping tyres	5.5 ± 0.05	5.5 ± 0.05

(*) GVW: Gross Vehicle Weight

When the tyres are warm, the inflation pressure should be + 0.3 bar compared with the prescribed figure. However, recheck that the value is correct with the tyre cold.

With snow tyres, add +0.2 bar to the inflation pressure value prescribed for standard tyres.

FRONT WHEEL TOE IN

The figure given refers to checking the toe in with vehicle unladen and in running conditions, i.e.: with a spare wheel, tools, accessories, supplies, full fuel tank and tyres inflated to the prescribed pressure.

Toe in

-1 ± 1 mm.

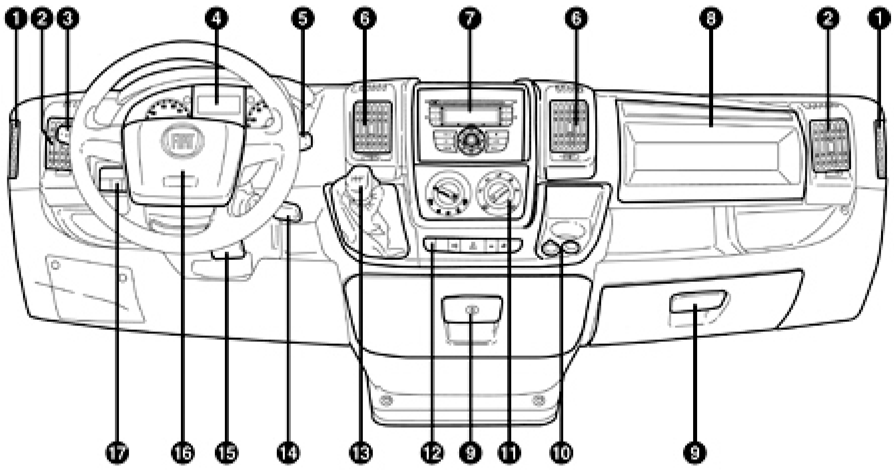
INTERIORS

The interiors of Ducato MY 2011 were renewed with the colours matching the plastic parts of the dashboard and new fabrics for the seats.

INSTRUMENT PANEL

The presence and position of the controls, instruments and indicators on the dashboard (Fig. 8) may vary depending on the version.

Fig. 8 - Dashboard



Key

1. Fixed side air vents
2. Adjustable side air vents
3. Left stalk: external light control
4. Instrument panel and warning lights
5. Right stalk: windscreen wiper, rear window wiper, trip computer controls
6. Adjustable centre air vents
7. Sound system (for versions/markets, where provided)
8. Front air bag on passenger side (glove compartment for versions/markets, where provided)
9. Glove compartment
10. Cigar lighter/12 V socket
11. Heating/ventilation/climate control system controls
12. Controls in the dashboard
13. Gear lever
14. Ignition switch
15. Steering wheel adjustment lever
16. Driver's front airbag/Horn
17. Control plate for lamp/headlamp alignment adjustment/digital display/multifunction display

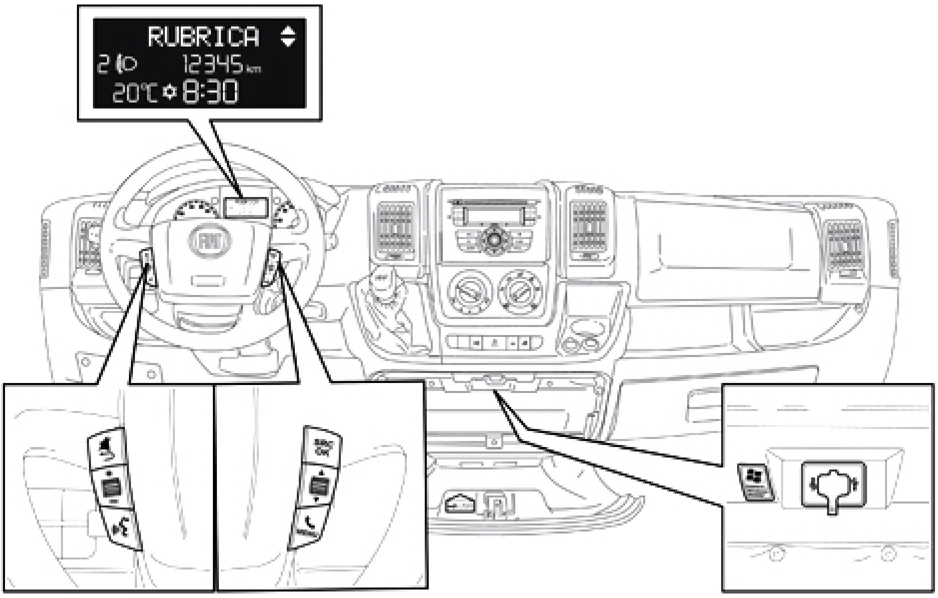
TELEMATIC SYSTEM

Different systems or preparations are available on the Ducato MY 2011 (fitted as standard or available on request for certain versions/markets) designed to meet all requirements, namely:
-Radio preparation;-Radio with CD player or radio with CD player and Mp3-Blue&Me™ system;-Steering wheel controls.-Preparation to install a portable navigation system;

BLUE&METM SYSTEM

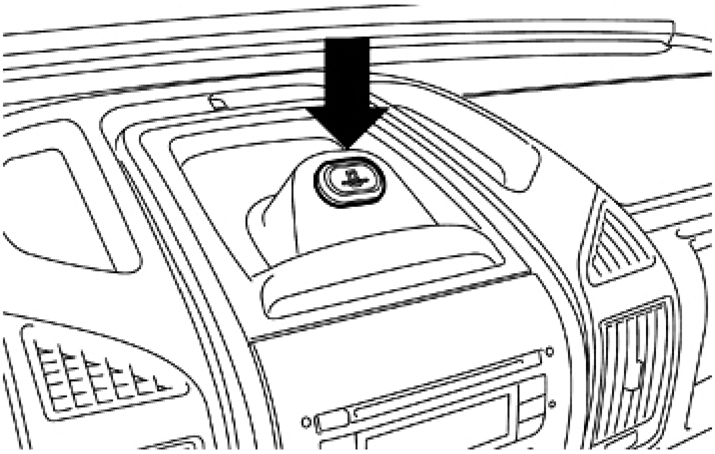
Upon demand, the vehicle can be fitted with the Blue&MeTM telematic system. Thanks to its complete integration with the voice commands, the steering wheel controls, the car radio controls, the USB port and the information on the instrument panel multifunction display, it performs all the handsfree, SMS reader and Media Player functions.

Fig. 9 - Display, controls on the steering wheel and USB port



PREPARATION TO INSTALL A PORTABLE NAVIGATION SYSTEM

(for versions/markets, where provided)
On car equipped with the **Blue&Me™** system, there may be the possibility to install the **Blue&Me™ TomTom®** portable satellite navigation system which is available from Lineaccessori.
Install the portable navigation system by fitting the relevant mounting bracket in the housing shown (myport) in Fig. 10.
Fig. 10 - Myport



NETWORK INTERVENTIONS

-For general information, technical specifications, descriptions and operation, diagnosis, tests, repair procedures, wiring diagrams, scheduled servicing and PDI operations, refer to the Service Manual.-For the diagnosis of the electronic systems equipped with self-diagnosis, use the Examiner updated with the new release programme 8.20 or later.

SCHEDULED MAINTENANCE PLAN

Thousands of miles	30	60	90	120	150
Thousands of kilometres	48	96	144	192	240
Months	24	48	72	96	120
Check battery charge status and possibly recharge	●	●	●	●	●
Check tyre condition/wear and adjust pressure, if necessary	●	●	●	●	●
Check operation of lighting system (headlamps, direction indicators, hazard warning lights, luggage compartment, passenger compartment, glove compartment, instrument panel warning lights, etc.)	●	●	●	●	●
Check operation of windscreen wiper/washer system and adjust jets, if necessary	●	●	●	●	●
Check the position/wear of the windscreen/rear window wiper blades	●	●	●	●	●
Check cleanliness of bonnet and tailgate locks and cleanliness and lubrication of linkages	●	●	●	●	●
Visually inspect condition of: exterior bodywork, underbody protection, pipes and hoses (exhaust, fuel system, brakes), rubber elements (boots, sleeves, bushes, etc.)	●	●	●	●	●
Check condition and wear of front disc brake pads and operation of pad wear indicator	●	●	●	●	●
Check condition and wear of rear disc brake pads and operation of pad wear indicator (for versions/markets where provided)	●	●	●	●	●
Check and, if necessary, top-up fluid levels (engine cooling, hydraulic clutch/brakes, windscreen washer, battery, etc.)	●	●	●	●	●
Visual check of accessory drive belt(s) (versions without automatic tensioner) (110 (*)-130-150-180 Multijet versions)		●			●
Check tension of accessory drive belt (versions without automatic tensioner) (▲)	●			●	
Check tension of accessory drive belt (versions without automatic tensioner) (115 MultiJet versions (*)) (▲)	●		●		●

(▲) When the engine oil is changed for the first time, check the tension of the accessories drive belt.

(*) Versions for specific markets

Thousands of miles	30	60	90	120	150
Thousands of kilometres	48	96	144	192	240
Months	24	48	72	96	120
Check condition of toothed timing drive belt (110 (▲)-130-150 MultiJet versions)		●			
Check condition of toothed timing drive belt (115 MultiJet versions (▲))	●	●	●	●	●
Check handbrake lever travel and adjust, if required	●	●	●	●	●
Check exhaust gas emissions/smokiness	●	●	●	●	●
Check operation of engine management systems (using diagnosis socket)	●	●	●	●	●
Check cleanliness of sliding side door lower guides for versions with S.S.D. (or every 6 months)	●	●	●	●	●
Replace fuel filter cartridge (diesel versions)	●	●	●	●	●
Replace accessory drive belt(s)			●		
Replace accessory drive belt(s) (115 MultiJet versions (▲))		●		●	
Replace toothed timing drive belt (*) (110 (▲)-130-150 MultiJet versions)				●	
Replace toothed timing drive belt (*) (115 MultiJet versions (▲))			●		
Replace air filter cartridge (***)	●	●	●	●	●
Replace engine oil and oil filter (versions with DPF) (**) (▲)					
Change brake fluid (or every 24 months)		●		●	
Replace pollen filter (or every 24 months)	●	●	●	●	●

(*) Regardless of mileage, the timing belt must be replaced every 3 years for Australian Conditions.

(**)The actual interval for changing the oil and replacing the engine oil filter depends on the vehicle usage conditions and is signalled by the warning light or message (if present) in the instrument panel ("Warning lights and messages") or every 12 months.

() Change engine oil and filter every 12 months.

Service News

Fiat Group Automobiles S.p.A.

Various models

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10.09

All types Diesel with DPF (500 - Panda (169) - Grande Punto - Idea - Stilo - Bravo - Multipla - Sedici - Croma - Doblò - Ulysse 179 - Fiorino/Qubo - Scudo 272 - Ducato 250)

0000 0 000 AA **DEGRADED OIL INDICATION**
Warning light operation and oil change – Information to the network

Supersedes Service News 00.20.08 dated 31/07/2008 for more information on the engine control system warning light.

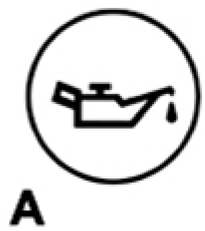
On vehicles with diesel engines provided with DPF system (particulate trap), operating conditions may occur which cause the following indications:

1. Degraded engine oil indication:

the red minimum engine oil pressure warning light (A – Fig. 1) will blink and a specific message may appear on the display (where provided). The warning light may blink as follows according to the versions:
-for one minute every two hours;-for three minute cycles with the light off for 5 seconds until the oil is changed.

The warning light will come on steady to indicate insufficient engine oil pressure at the specific message will appear on the display (where provided).

Fig. 1



The blinking of the warning light is not a fault but indicates that the oil needs to be changed as a consequence of normal use.
Supplementary amounts of fuel which are not burnt during combustion are injected during the DPF filter regeneration process: a small amount of fuel may leak through the piston rings and dilute the engine oil which increases its level. The engine ECU stores this data to calculate the engine oil degrading state **and informs the driver when the oil needs to be changed.**
Remember that engine oil degrading is accelerated by:
-prevalent use in cities which makes the DPF regeneration process more frequent-use for short distances in which the engine does not reach running temperature-repeated regeneration interruptions indicated by means of the DPF warning light (see paragraph 2)

AS A CONSEQUENCE, THE DEGRADED ENGINE OIL MUST BE ALWAYS CHANGED WHEN THE WARNING LIGHT STARTS BLINKING (A - FIG. 1).

If the engine oil warning light lights up after travelling a short distance (e.g. 3000 – 4000km), check whether the fault is caused by the incorrect operation of teh DPF/catalyser systems which continuously control regeneration attempts.

After the first indication, whenever the engine is started, the warning light will blink in the previously illustrated method (see introduction) until the oil is changed. A message will appear on the display (where provided), in addition to the warning light.

For vehicles equipped with DPF, the engine oil change frequency is based on actual degrading and not on the Service Schedule.

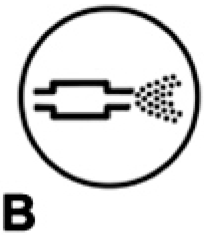
The warning light will come on when the engine oil has lost its lubricating properties. It is not related to the engine oil level and thus topping up when the oil when the warning light comes on is to recommended.

The engine may be seriously damaged due to the increased engine oil level and the blow-up operation if the indication is reset by means of Examiner but the degraded oil is not changed.

2. Particulate trap during regeneration

-The amber warning light comes on (B - Fig. 2) and a specific message is shown on the display (where provided).

Fig. 2



Operation of this warning light**does not indicate faulty operation of the vehicle**.

The warning light comes on to indicate that the DPF needs to be regenerated. It is advisable to keep the engine running until the warning light goes out to indicate that the procedure is over. The warning light will be turned on by the engine ECU after the engine has been repeated stopped during the DPF regeneration.

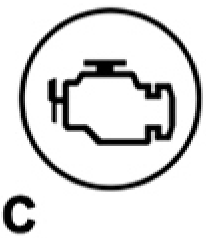
Ignoring the warning light will cause:
- High risk of DPF obstruction and consequent lighting of the MIL warning light (see paragraph 3).
- Continuous DPF regeneration attempts will consequent early oil decay (see paragraph 1).

In optimal conditions, for regenerating the DPF, the car must travel at a speed higher than 60 km/h at approximately 1800 rpm, respecting the highway code and the traffic and weather conditions in all cases.
DPF regeneration will last for approximately 15 minutes in average in these conditions.

3. Obstructed particular trap and engine control system fault

-The amber warning light comes on (C - Fig. 3) in some cases with warning light (B - Fig. 2) and a specific message is shown on the display (where provided). Examiner finds presence of error **P1206 - Level 1 or P2002 - Level 2.**

Fig. 3



Operation of this warning light indicated faulty operation of the engine system. DPF could not dispose of the accumulated particulate and the CCM indicates that the car must be taken to a workshop to have the system seen to.
If the car reaches the workshop in these conditions, seek the causes which led to DPF obstruction by applying the checklist shown in SN 10.16.09. After having identified and eliminated the fault, carry out a forced DPF regeneration to eliminate accumulated particulate.

- The engine control system warning light and the presence of error **P1206- Level 1** in the engine ECU memory indicates that the system needs to be carefully checked (see SN 10.16.09) followed by Service regeneration carried out by a diagnostic operator at the service centre because the DPF filter is obstructed. In these conditions, the engine ECU actuates a recovery procedure and slightly limits the engine performance.
- The engine control system warning light and the presence of error **P2002- Level 2** in the engine ECU memory indicates that the system needs to be carefully checked (see SN 10.16.09) followed by Service regeneration carried out by a diagnostic operator at the service centre because the DPF filter is excessively obstructed and probably needs to be replaced. In these conditions, the engine ECU actuates a recovery procedure and slightly

limits the engine performance.
- Replace the DPF if the service regeneration is interrupted by excessively high back pressure.

Description of warning light operation

The DPF (Diesel Particulate Filter) is a mechanical filter, integral with the exhaust system, that physically traps particulates present in the exhaust gases of Diesel engines. The diesel particular filter has been adopted to eliminate almost totally particulates in compliance with current / future law regulations.
During normal use of the vehicle, the engine control unit records a set of data (e.g.: travel time, type of route, temperatures, etc.) and it will then calculate how much particulates has been trapped by the filter.
Since this filter physically traps particulate, it should be regenerated (cleaned) at regular intervals by burning carbon particles.
In normal conditions, the warning lights come on and go out after a few seconds at key-on (A - Fig. 1, B - Fig. 2 and C - Fig. 3).
Regeneration occurs in average every 800/1000 km (the distance travelled between two regeneration procedures depends on vehicle use). In particularly demanding conditions (mainly in cities and short distances), the frequency between regeneration processes may be reduced to a few hundreds of kilometres (250-300). When the engine control system cannot regenerate the DPF filter due to the driving profile the DPF warning light (B – Fig. 2) will come on if the temperature is higher than 80°C (a future development will consist in lower the threshold to 70°C). The following conditions may occur during regeneration:
-limited increase of idling ratio;-operation of the fan;-slight increase of smokiness;-high temperatures in exhaust; therefore, these situations - which do not effect handling or the environment - are not faults.

FAQ:

Some questions that the customer may ask and the answers are listed below:

1. **QUESTION**: Does the degraded oil warning light (Fig. - 1) indicate an engine fault?
ANSWER: The degraded oil warning light does not indicate a fault but simply indicates that it is time to change the oil. Cars with DPF particulate filter have a different engine oil change management strategy: the oil change frequency no longer depends on the distance driven but is indicated by the warning light (Fig. - 1) on the instrument panel. The engine ECU records the vehicle use conditions and indicates when the engine oil needs to be changes.
2. **QUESTION**: What effects the oil life?
ANSWER: Some fuel crosses the piston rings and ends up in the engine oil whenever the DPF is regenerated. The consequent reduction of engine oil causes a partial reduction of the lubricant features of the oil and increases the engine oil level. Driving missions which cause frequent regeneration will inevitably cause early engine oil degrading.
3. **QUESTION**: What can I do to increase engine oil life?
ANSWER: Engine oil degrading depends on the conditions of use of the vehicle. Engine oil is degraded in the following conditions:
- When the car is driven for short distances and the engine does not warm up; prevalent use during engine warm up will imply more frequent DPF regeneration, consequent engine oil and repeated interruption of the regeneration process controlled by the CCM.
- Prevalent use in cities: use on motorways will allow to partially evaporate some of the fuel contained in the oil. The CCM will take partial oil condition recovery in consideration.
- Ignoring DPF warning light (see par 2): if the engine is stopped when the DPF light is on, the regeneration process will not be completed and therefore the CCM will start a new regeneration when the engine is started again.
4. **QUESTION: What happens if I ignore the oil degraded warning light?**
ANSWER: Ignoring the oil degrading warning light will imply:
- Early engine wear caused by engine operation with oil excessively diluted by fuel.
- Increase of engine oil level in sump which in the most severe conditions may cause severe engine damage.
5. **QUESTION: Does the oil warning light indicate low engine oil level?**
ANSWER: No, the indication is not linked to engine oil level. Adding oil when the warning light comes on could be very dangerous for the engine. The warning light indicates that the oil has lost its lubricating features.
6. **QUESTION: What happens if I repeatedly ignore the DPF warning light and stop the engine before finishing the regeneration procedure?**
ANSWER: Nothing will happen if the DPF warning light is ignored. The CCM will start the regeneration process again when the engine is started again. Repeatedly ignoring the warning light, however, may increase the DPF regeneration frequency and consequently cause DPF obstruction and early oil degrading.

It is always advisable to wait for the DPF warning light to go out before stopping the engine.

7. **QUESTION: What are optimal DPF regeneration conditions?**
ANSWER: The optimal conditions for DPF regeneration are reached when the car is travelling at a speed of 60 km/h with engine at approximately 1800 rpm.

Always respect the highway code and drive compatibly with traffic and weather conditions.

8. **QUESTION: How long does the regeneration process take?**
ANSWER: The regeneration process lasts for approximately 8 minutes, in addition to the time needed for the engine to warm up which according to driving conditions may last from 2 to 6 minutes. The regeneration process lasts for approximately 15 minutes.
9. **QUESTION: Can the DPF be regenerated when the engine is running and the car is standing?**
ANSWER: With the engine running and the car standing, the CCM will need to increase the amount of fuel injected in the DPF to keep the regeneration temperatures high and this will increase the risk of fuel diluting the engine oil. The CCM will interrupted the process after 3.5 minutes of regeneration in all cases. Although some of the particulate will be destroyed in this way, it is advisable to avoid DPF regeneration in these conditions to avoid early degrading of the oil.

10. **QUESTION: Why is a DPF fitted on this cars? What does it do?**
ANSWER: In order to comply with the increasingly more stringent environment protection standards, Fiat has invested in high engine technology and alternative fuels. Fiat is today European leader offering a product range with the lowest average CO2 emission level. Specifically, Fiat 500 is the first car on the market to comply with the most stringent environmental protection standard - Euro 5. In perspective, this will increase the residual commercial value of the car with respect to restrictions which are enforced in some cities. Specifically, Euro 5 level for diesel engines is reached by using a sophisticated Particulate Filter (DPF) capable of trapping and then eliminated particles.

RELATED TOPICS

See SN 10.17.09 all types JTD - DPF Particulate Filter for more information on the operation of the particulate filter.
See the diagnostic checklist shown in SN 10.16.09 for full DPF diagnostics (in case of system faults).
Refer to specific SN (where provided) for each model for upgrading the CCM software.

250 - DUCATO 3.0 JTD EURO V/EURO5 PRODUCTS 5.

SPECIFICATIONS AND RECOMMENDED PRODUCTS

Use	Fluid and lubricant properties for correct vehicle operation	Genuine fluids and lubricants	Application
Diesel engine lubricants	SAE 5W-30 grade synthetic base lubricants. FIAT Classification 9.55535-SI	SELENIA WR P.E. (*) Contractual Technical Reference No. 510.D07	Second planned maintenance programme
Lubricants for methane engines	SAE 5W-40 ACEA C3 grade synthetic base lubricant, FIAT 9.55535-S2 certification. (Contractual Technical Reference No. F603.C07)	SELENIA KP.E	Second planned maintenance programme
Lubricants for motion transmission	SAE 75W-80 grade synthetic lubricant. Exceeds API GL-4 specifications	TUTELA CAR EXPERYA Contractual Technical Reference No. F178.B06	Manual gearbox and differential
	SAE 75W-85 grade synthetic lubricant. Exceeds API GL-4 specifications	TUTELA CAR MATRYX Contractual Technical Reference No. F108.F02	Manual gearbox and differential
	Lithium-based grease with molybdenum bisulphate NL.GI. 2 consistency	TUTELA STAR 500	Wheel side constant velocity joints
	Lithium-based grease NI.GI. 0 consistency	TUTELA MRM ZERO	Differential-side constant velocity joints
	Poly-urea synthetic-based grease suitable	TUTELA STAR 325 Contractual Technical	Differential-side

	for high temperatures. NL.GI.2 consistency	Reference No. F301.D03	constant velocity joints
	Lubricant for power steering and automatic transmissions. Exceeds ATF DEXRON III specifications	TUTELA CAR GI/E Contractual Technical Reference No. F001.C94	Hydraulic power steering
Brake fluid	Synthetic fluid, NHTSA no. 116 DOT 4, ISO 4925, SAE J-1704, CUNA NC 956-01 FIAT Classification 9.55597	TUTELA TOP 4 Contractual Technical Reference No. F001.a93	Hydraulic brakes and hydraulic clutch controls
Protective agent for radiators	Red protective with antifreeze action, based on inhibited monoethyl glycol with organic formula. Exceeds CUNA NC 956-16, ASTM D 3306 specifications FIAT Classification 9.555323	PARAFLU UP (**) Contractual Technical Reference N° F101.M01	Cooling circuit usage percentage: 50% water 50% PARAFLU
Windscreen/rear window washer fluid	Mixture of spirits and surfactants. Exceeds CUNA NC 956-11 specifications. FIAT Classification 9.55522	TUTELA PROFESSIONAL SC 35 Contractual Technical Reference No. F201.D02	To be used diluted or undiluted in windscreen/rear window washer/wiper systems
Diesel additive	Additive for diesel antifreeze, protecting diesel engines	TUTELA DIESEL ART - Contractual Technical Reference No. F601.L06	To be mixed with the diesel fuel (25cc per 10 l)

* For diesel engines, in the event of an emergency in which the original products are not available, lubricants with at least ACEA C2 performance are acceptable; however, in this case optimum engine performance is not guaranteed and the lubricants should be replaced with recommended products as soon as possible at a Fiat Dealership.
The use of products with lower specifications than ACEA C2 could cause damage to the engine not covered by the warranty.
For particularly harsh climate conditions, ask a Fiat Dealership for the appropriate product from PETRONAS LUBRICANTS.

(**) Do not top up or mix with other fluids which have different specifications from the ones described.

Service News

Fiat Group Automobiles S.p.A.

Ducato (250)

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53.09

All 3.0 models (Euro V)

0000 0 000 AA **NEW VERSION 3.0 (EURO V)**
Main technical specifications

The model range in question has been extended through the launch of the new 3.0 Euro V (fifth) version, initially available for M2 models only.
The engines are the following:
-100 Multijet (Euro 4)-120 Multijet (Euro 4)-130 Multijet (Euro 4)-160 Multijet (Euro 4)-160 Multijet (new Euro V engine)
Listed below are the main technical specifications and identification data of the new Euro V version and a short description of the main components of the new engine.

IDENTIFICATION DATA

Engine codes and bodywork versions

VERSIONS	ENGINE CODES	BODYWORK VERSIONS
3.0 Multijet 160	SOFIM FICE3481M	(*)

(*) For the bodywork version initials, see Service News 00.18.06 of 26/05/2006.

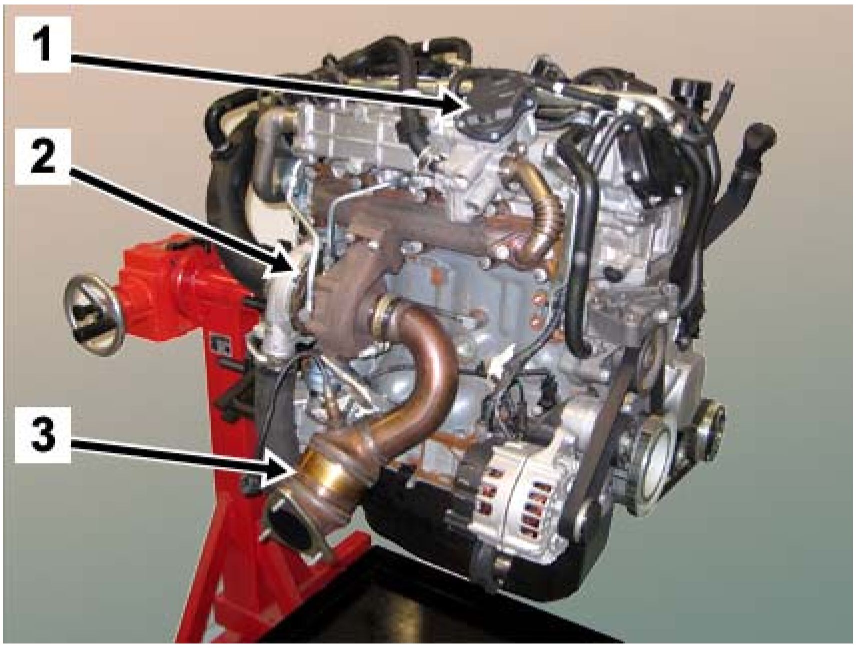
SPECIFICATIONS

Engine marking	Sofim FICE3481M
Total displacement	2999 cm^3
EEC max. power	115 kW (156 HP)
At a speed of	3500 rpm
EEC max. torque	400 Nm
At a speed of	1700 rpm
Timing system	2OHC
Fuel system	Common Rail Multijet direct injection

3.0 MULTIJET ENGINE

The new Euro V engine has a capacity of 2999 cc, a maximum power output of 115 kW at 3500 rpm and a maximum torque of 400 Nm at 1700 rpm, with a practically constant rate between 1700 and 2500 rpm.
The flexibility of the new engine result in greater driving comfort and remarkable noise reduction.
The main differences compared to the current Euro 4 engine are:
-new intake unit (1 - Fig. 1)-new thermostat unit (2 - Fig. 1)
Fig. 1

-new EGR unit (1 - Fig. 2)-new turbocharger unit (2 - Fig. 2)-new exhaust unit (3 - Fig. 2)-new engine mountings.
Fig. 2



The lay-out of the following systems has also been modified:
-engine control (oxygen sensor, injection control unit, etc...)-power supply-cooling-exhaust (exhaust manifold, turbine exhaust sleeve, pre-catalytic converter, etc...)-steering-braking system-electrical.

GEARBOX

The new 3.0 Multijet Euro V engine has a 3-shaft gearbox, M40CV6 type, with 6 synchronised forward ranges plus reverse.

Gearbox ratios

1st	**2**nd	**3**rd	**4**th	**5**th	**6**th	**Reverse**	**Ratio at the axle**
1:4,167	1:2,350	1:1,462	1:0,955	1:0,695	1:0,552	1:4,083	1:4,562

OPERATIONS IN NETWORK

-For the routine P.D.I. operations, refer to Service News 00.24.09-For the Scheduled Servicing Programme, refer to Service News 00.23.09-For general information, technical data, descriptions and operation, fault diagnosis, tests, repair procedures and wiring diagrams, refer to the Service Manual.-For the diagnosis of electronic systems equipped with self-diagnosis, use the Examiner updated with programme release 7.80 and higher.

250 - DUCATO 3.0 JTD EURO V/EURO5 Introduction - ENGINE (Euro 5, Euro 5)

VALID FOR VERSIONS WITH: Euro 5

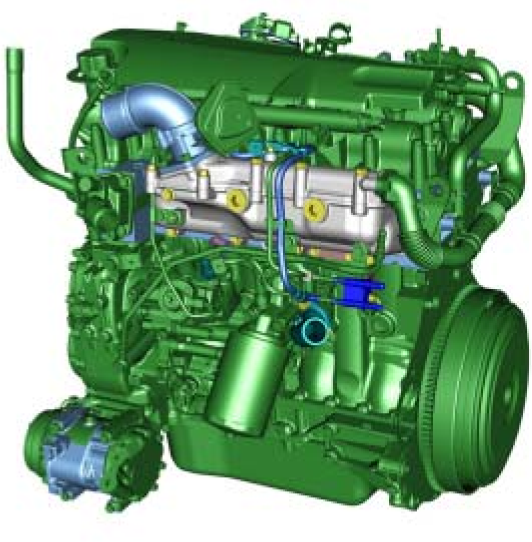
General information

The main specifications of the 3.0 JTD Euro 5 engine are as follows:

- supercharged MultiJet Diesel engine with variable geometry turbocharger;
- emission level conforms with Euro 5 standards;
- developed power: 180 HP;
- four cylinder in-line arrangement;
- cylinder capacity 2999 cc;
- bore: 95.8 mm;
- stroke: 104 mm;
- compression ratio: 17.5:1;
- injection order: 1 - 3 - 4 - 2
- dual overhead camshaft with 16-valve timing system;
- aluminium alloy head;
- camshaft housing containing the camshaft supports;
- chain-driven timing;
- rocker arms with hydraulic tappets;
- centrifugal type water pump incorporated in the crankcase;
- engine management control unit: Bosch EDC17CP52;
- high pressure pump: Bosch CP4.1 (without geared transfer pump);
- mono bloc made from spheroidal cast iron;
- pressed steel oil sump.

View of engine, exhaust side.

View of engine, inlet side.

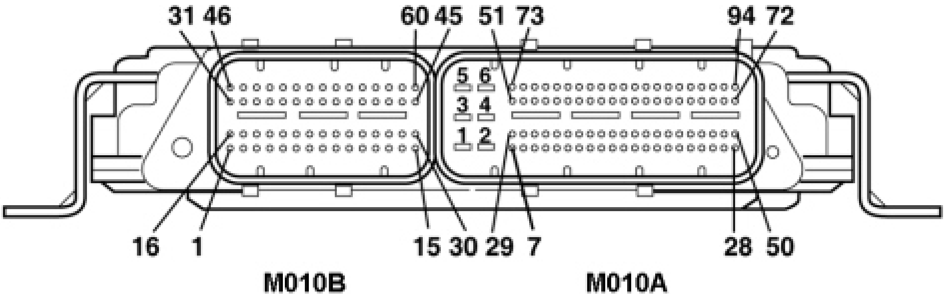


250 - DUCATO 3.0 JTD EURO V/EURO5 Introduction - DIESEL INJECTION PRESSURE PUMP ELECTRONIC CONTROL (Euro 5, Euro 5)

VALID FOR VERSIONS WITH: Euro 5

Injection control unit

This is fitted in the engine compartment on the right side. The control unit is the flash EPROM type, i.e. it can be reprogrammed from the outside without operations to the hardware.
The injection control unit incorporates the absolute pressure sensor.
The following diagram shows the control unit.



Connector M010A
1 - Ignition-controlled power supply from main relay
2 - Earth 1 control unit
3 - Ignition-controlled power supply from main relay switch
4 - Earth 2 control unit
5 - Ignition-controlled power supply from main relay
6 - Earth 3 control unit
7 - NC
8 - Potentiometer earth 2 accelerator pedal
9 - NC
10 - NC
11 - Exhaust gas temperature sensor signal 1
12 - Exhaust gas temperature sensor signal 2
13 - NC
14 - NC
15 - NC
16 - NC
17 - Brake pedal switch (signal)
18 - Particulate filter differential sensor negative
19 - NC
20 - Diagnosis K line
21 - NC
22 - Particulate filter differential sensor supply
23 - NC
24 - NC

25 - NC
26 - Radiator solenoid valve 1st relay switch coil control
27 - NC
28 - NC
29 - NC
30 - Potentiometer earth 1 accelerator pedal
31 - NC
32 - NC
33 - NC
34 - NC
35 - Accelerator pedal potentiometer 2 signal
36 - Climate control linear sensor signal
37 - NC
38 - NC
39 - Climate control linear pressure sensor (earth)
40 - NC
41 - NC
42 - NC
43 - NC
44 - NC
45 - Potentiometer power supply 1 accelerator pedal
46 - Potentiometer power supply 2 accelerator pedal
47 - Radiator solenoid valve 2nd relay switch coil control
48 - NC
49 - NC
50 - NC
51 - Lambda sensor heating (negative)
52 - Feedback input for heater plugs preheataing time/fault detection
53 - NC
54 - Particulate filter differential sensor signal
55 - NC
56 - Oxygen sensor reference current
57 - Accelerator pedal potentiometer 1 signal
58 - NC
59 - NC
60 - Exhaust gas temperature sensor 1 earth
61 - NC
62 - NC
63 - Exhaust gas temperature sensor 2 earth
64 - Signal D+ from alternator
65 - NC
66 - NC
67 - NC
68 - NC
69 - NC
70 - Climate control compressor relay switch coil control
71 - NC
72 - Main relay switch coil control
73 - NC
74 - NC
75 - Clutch pedal pressed positive signal (NC)

76 - Oxygen sensor pumping current
77 - NC
78 - Oxygen sensor Nerst cell reference voltage signal
79 - NC
80 - NC
81 - Water in diesel filter sensor signal
82 - Ignition-operated power supply from ignition switch
83 - CAN line coming from NBC - (CAN low)
84 - CAN line coming from NBC - (CAN high)
85 - NC
86 - Earth for Lambda sensor signal
87 - Cruise control activation/deactivation control lever positive
88 - Climate control linear pressure sensor (positive)
89 - NC
90 - Oil vapour recirculation heater (blow-by heater)
91 - Fuel pump relay switch coil control
92 - NC
93 - Spark plug preheating control signal
94 - Engine cooling fan 3rd speed engagement relay feed
Connector M010B
1 - Injector no. 3 (negative control)
2 - Injector no. 2 (negative control)
3 - NC
4 - NC
5 - NC
6 - Intake air temperature and pressure sensor (negative)
7 - Rpm sensor (negative)
8 - Fuel pressure sensor on rail (negative)
9 - NC
10 - NC
11 - Turbine vane position sensor (signal)
12 - Intake air temperature and pressure sensor (temperature signal)
13 - Intake air temperature and pressure sensor (pressure signal)
14 - Timing sensor (power supply)
15 - Fuel pressure control solenoid valve on rail
16 - Injector no. 3 (positive control)
17 - Injector no. 2 (positive control)
18 - Turbine vane position sensor (negative)
19 - Turbine vane position actuator control
20 - Throttle body solenoid valve control
21 - Oil level sensor (earth)
22 - Rpm sensor (signal)
23 - Engine coolant temperature sensor (negative)
24 - NC
25 - Intake air temperature and pressure sensor (positive)
26 - NC
27 - EGR solenoid valve position sensor (signal)
28 - NC
29 - EGR solenoid valve position sensor (positive)
30 - Fuel pressure regulator on pump
31 - Injector 1 (positive control)

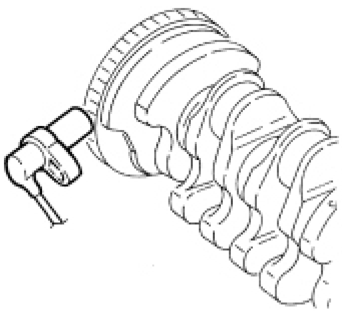
32 - Injector 4 (positive control)
33 - EGR solenoid valve position sensor (negative)
34 - NC
35 - EGR solenoid valve control
36 - Timing sensor (negative)
37 - NC
38 - Flow meter air rate signal
39 - Fuel pressure sensor on rail (positive)
40 - NC
41 - NC
42 - Air flow meter temperature signal
43 - Fuel pressure sensor on rail (signal)
44 - Flow meter (earth)
45 - Fuel pressure control solenoid valve on rail
46 - Injector 1 (negative control)
47 - Injector 4 (negative control)
48 - Turbine vane position sensor (positive)
49 - NC
50 - EGR solenoid valve control
51 - Oil level sensor (signal)
52 - Engine oil pressure switch
53 - Timing sensor (signal)
54 - Fuel temperature sensor (negative)
55 - Engine coolant temperature sensor (signal)
56 - NC
57 - Fuel temperature sensor (signal)
58 - NC
59 - NC
60 - Fuel pressure regulator on pump

Rpm sensor

Characteristics

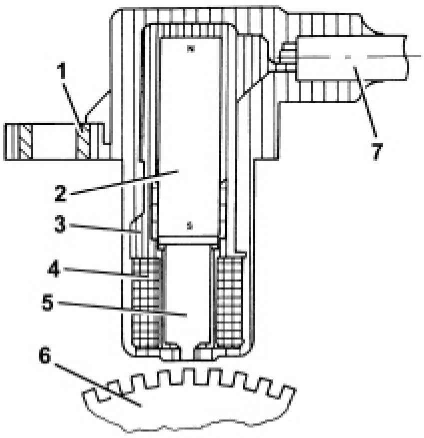
The rpm sensor is mounted on the engine block and faces the phonic wheel on the crankshaft; it is a inductive sensor and therefore works by calculating variations in the magnetic field generated by the passage of the teeth on the phonic wheel (60 - 2 teeth).
The injection control unit uses the RPM signal to:

- determine the rotation speed;
- determining the angular position of the crankshaft.



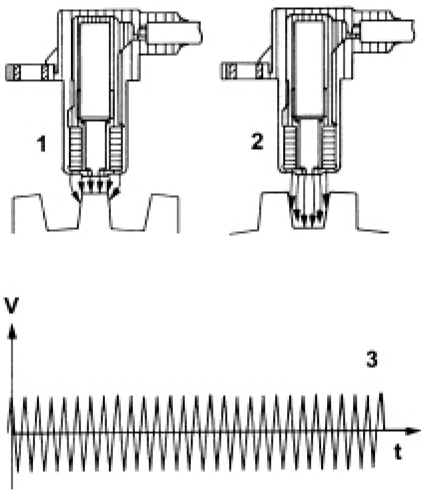
Operation

The changeover from full to empty determined by the presence or absence of a tooth brings about a change in the magnetic flux sufficient to generate an induced alternating voltage proportional to the number of teeth on the ring (or phonic wheel).
The frequency and amplitude of the voltage sent to the electronic control unit provides it with details of crankshaft angular speed.



1 - Brass bush
2 - Permanent magnet
3 - Plastic sensor casing
4 - Coil winding
5 - Core
6 - Ring gear or phonic wheel
7 - Coaxial paired cable or electrical connection

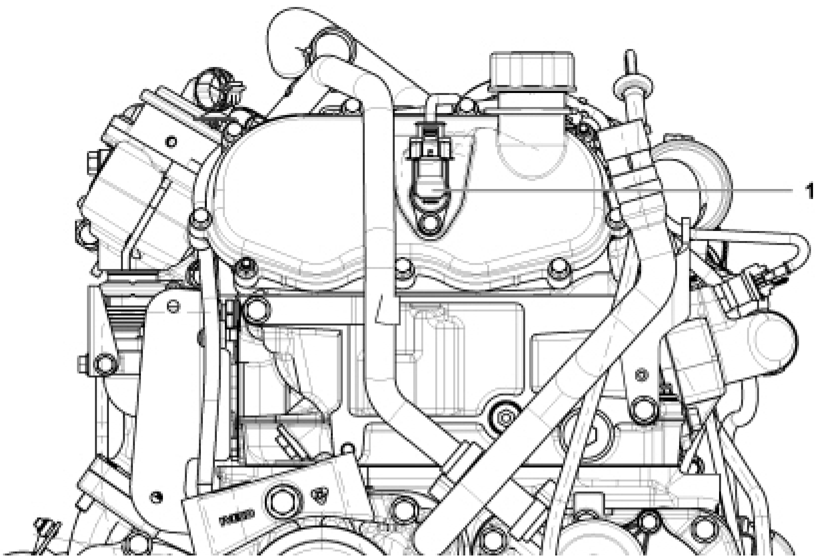
The recommended distance (gap), between the end of the sensor and flywheel, to produce correct signals, should be between 0.8 and 1.5 mm.
This distance is not adjustable.Therefore, if the gap is found to be outside the tolerance limits, check the condition of the sensor and phonic wheel.



timing sensor

Characteristics

The timing sensor is a Hall effect sensor. It is located on the engine oil filler cap on the upper cylinder head.
The timing sensor detects the engine operating phase by "reading" the position of the inlet shaft drive gear.
The injection control unit uses the timing sensor signal to identify T.D.C. at the end of compression.

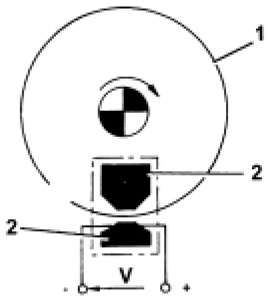


1 - Timing sensor

Operation

A current-carrying semiconductor layer immersed in a normal magnetic field (force lines at right angles to current direction) generates a potential difference known as a Hall voltage at its terminals.

If current intensity remains constant, the generated voltage depends on magnetic field intensity alone.Periodic changes in magnetic field intensity are sufficient to generate a modulated electrical signal with frequency proportional to the speed of magnetic field change. This change is achieved by making a magnetic ring with an opening (the internal part of the pulley), pass the sensor.
As it moves, the metal part of the ring covers the sensor to block the magnetic field and thus generate a low ouput signal. Conversely, the sensor generates a high signal when the opening is over the sensor and a magnetic field is present.
Together with the rpm and TDC signal, this signal allows the control unit to identify the cylinders and determine the injection point.



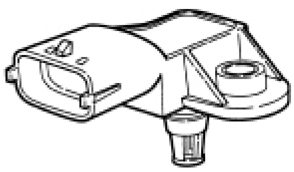
1 - Inlet control shaft gear
2 - Magnetic material

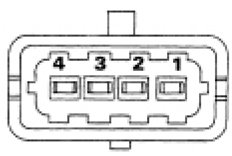
Excess pressure and air intake temperature sensor

Characteristics

The excess pressure and intake air temperature sensor is an integral component designed to measure the pressure and the temperature of the air inside the intake manifold.
The sensor is fitted on the intake manifold; the signal sent to the engine management control unit is used to:

- modulate the turbocharger pressure
- protect the engine from overheating
- diagnose the operation of the air flow meter



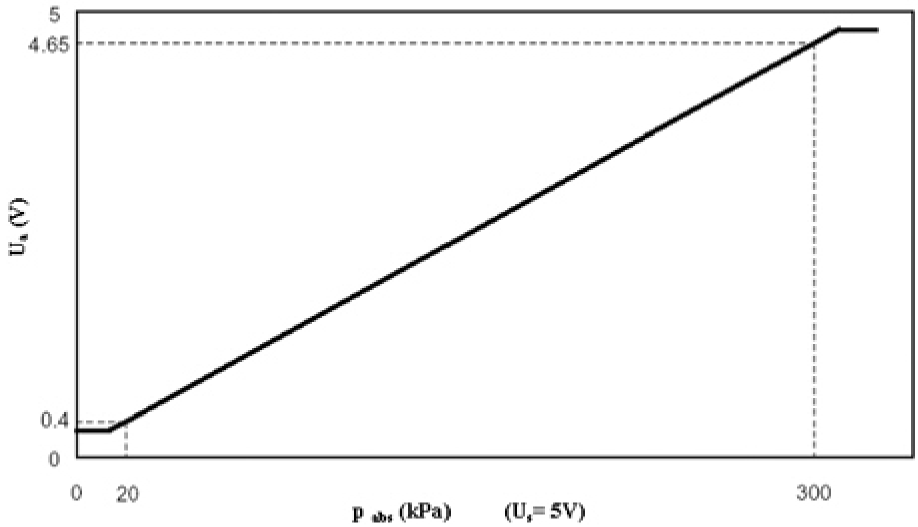


Sensor pin-out:
1- Earth
2 - Air temperature signal
3 - 5 Volt power supply (from the engine management control unit)
4 - Turbocharging pressure output signal

Pressure sensor transfer function

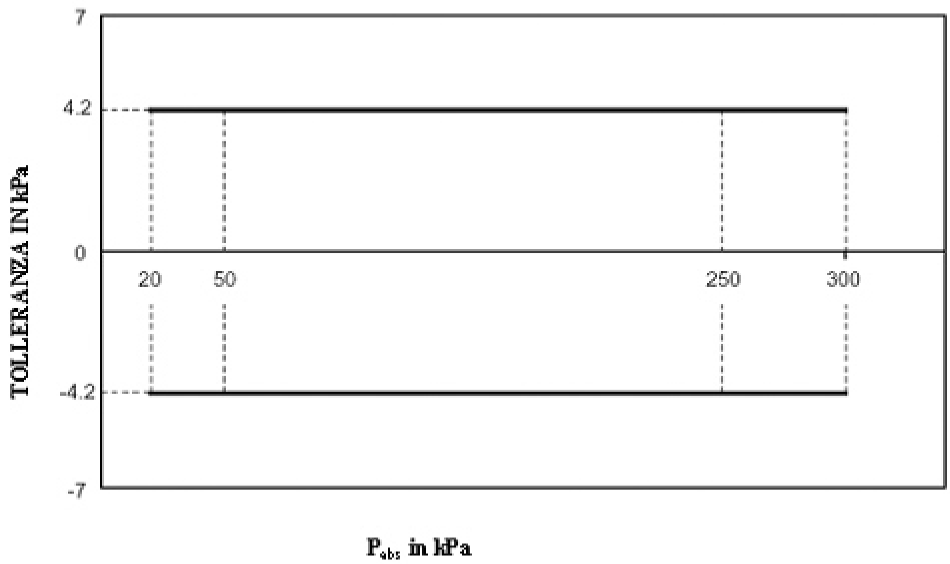
The voltage of the output signal from the sensor varies according to the absolute pressure in accordance with this rule:
Ua=(c1*pabs+c0)*Us
where:

- Ua = voltage of output signal in V
- Us = supply voltage in V
- pabs = absolute pressure in kPa
- c0 = 5.4/280
- c1 = 0.85/280 kPa-1



Tolerance of output signal (pressure)

The graph below illustrates the progress of the tolerance of the output signal depending on the pressure.



The table below show the resistance values of the temperature sensor according to the air temperature

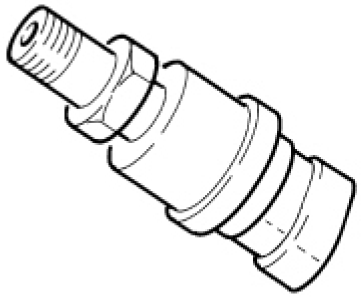
Temperature (°C)	Resistance in Ohms.		
	Minimum	Rated	Maximum
-40	45301	48153	51006
-35	33703	35763	37823
-30	25350	26854	28359
-25	19265	20376	21487
-20	14785	15614	16443
-15	11453	12078	12702
-10	8951	9426	9901
-5	7055	7419	7783
0	5605	5887	6168
5	4487	4707	4926
10	3618.7	3791.1	3693.5
15	2938.5	3074.9	3211.3
20	2401.9	2510.6	2619.3
25	1975.8	2062.9	2150.1
30	1644.7	1715.4	1786.2
35	1374.2	1431.8	1489.5
40	1152.4	1199.6	1246.7
45	969.9	1008.6	1047.4
50	819.1	851.1	883.0
55	694.2	720.7	747.1

60	590.3	612.3	634.2
65	503.6	521.9	540.2
70	431.0	446.3	461.6
75	370.1	382.89	395.7
80	318.68	329.48	340.27
85	275.25	284.37	293.48
90	238.43	246.15	253.86
95	207.12	213.67	220.23
100	180.42	186.00	191.58
105	157.37	162.35	167.32
110	137.63	142.08	146.52
115	120.68	124.66	128.63
120	106.09	109.65	113.21
125	93.48	96.68	99.88
130	82.58	85.45	88.32

Engine coolant temperature sensor

Characteristics

The engine coolant temperature sensor is fitted on the thermostatic oil cup and uses a double NTC thermistor with negative resistance coefficient to determine the temperature of the liquid.
One NTC thermistor sends a signal to the injection control unit, whilst the other sends a signal to the temperature gauge and the warning light in the instrument panel.



The sensor is designed using semiconductor technology. In other words, the resistance level decreases if sensor element temperature increases with the coolant temperature.
The non-linear change in resistance is greater for changes at low temperatures and lesser for changes at high temperatures.

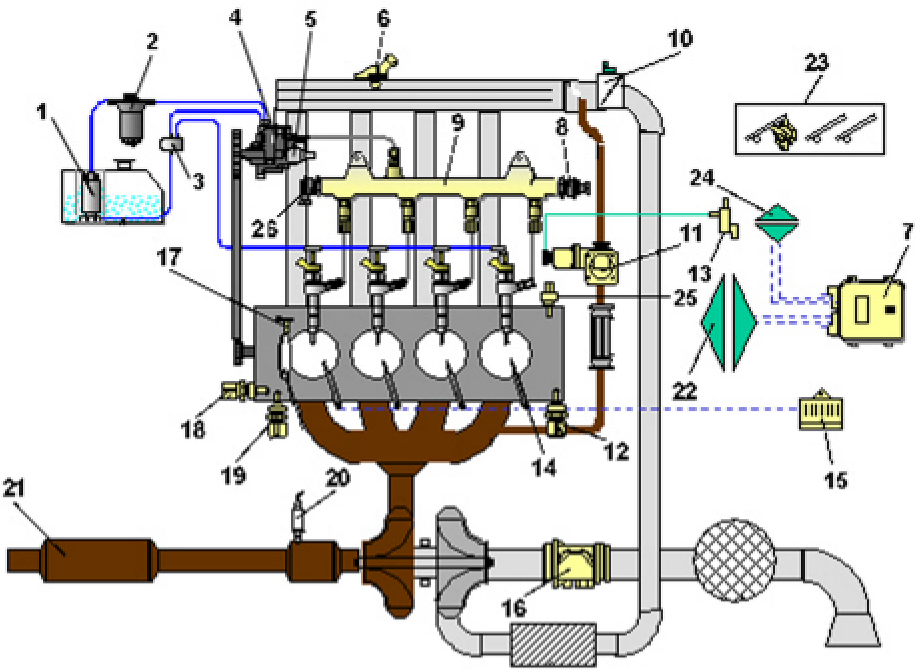
250 - DUCATO 3.0 JTD EURO V/EURO5 General information

The EDC17CP52 Common Rail is a high pressure electronic injection system for fast, direct injection diesel engines.
Its main features are:

- the availability of high injection pressure (1800 bar);
- possibility of modulating pressures from 150 bar up to a maximum operating pressure of 1800 bar, regardless of engine rpm and load;
- ability to work at high engine rpm (up to 6000 rpm in full load conditions);
- high pressure pump with three pumping elements;
- precision injection control (injection advance and duration);
- reduced fuel consumption;
- reduced emissions.

The main functions of the system are basically as follows:

- fuel temperature control;
- engine coolant temperature control;
- control of amount of fuel injected;
- idle speed control;
- fuel cut-off during over-run;
- cylinder balance check when idling;
- control of anti-judder function;
- control of exhaust fumes during acceleration;
- exhaust gas recirculation control (E.G.R.);
- maximum torque limit control;
- maximum speed limit control;
- heater plug control;
- control of climate control system activation (where fitted);
- fuel pump control;
- cylinder position control;
- main and pilot injection advance check;
- closed cycle injection pressure control;
- electrical balance control;
- supercharging control;
- self-diagnosis;
- connection with the Fiat CODE control unit (Immobilizer).



1. Auxiliary fuel pump
2. Fuel filter
3. Fuel return manifold
4. Pressure pump
5. Pressure regulator on pump
6. Turbocharging sensor
7. Injection control unit
8. Pressure sensor
9. Rail
10. Throttle body
11. EGR solenoid valve
12. Oil level sensor
13. EGR control actuator
14. Heater plugs
15. Heater plugs control unit
16. Flow meter
17. Rpm sensor
18. Timing sensor
19. Minimum oil pressure switch
20. Lambda sensor on pre-catalyzer
21. Main catalytic converter
22. Engine wiring
23. Pedal unit
24 Vehicle wiring
25. Water temperature sensor
26. Pressure regulator on rail

OPERATION

Operating strategies

In this Common Rail injection system with CP4.1 pump, the pressure regulator located upstream of the high pressure pump modulates the fuel flow to the level required by the low pressure system. The high pressure pump then supplies the Rail correctly.
Because this solution only pressurises the required amount of fuel, energy efficiency is improved and system fuel heating is limited.
The CP4.1 pump continuously maintains the fuel at high pressure regardless of the timing and the cylinder receiving the injection. Pressure thus accumulates in a duct shared by all injectors (rail). Fuel at an injection pressure calculated by the ECU is therefore always available at the injector input.
When the solenoid of one injector is excited by the electronic control unit, fuel taken directly from the Rail is injected into the relevant cylinder.
The hydraulic system comprises one low pressure circuit and one high pressure circuit. The high pressure circuit consists of the following pipes:

- pipe connecting the high pressure pump outlet to the Rail;
- Common Rail;
- pipes that supply the injectors from the Rail.

The low pressure circuit consists of the following pipes:

- fuel inlet pipe from the tank to the prefilter;
- pipes supplying the mechanical supply pump and the prefilter;
- pipes supplying the high pressure pump via the fuel filter;
- return pipe from high pressure pump;
- return pipe from injectors;
- return pipe to tank.

For safety reasons, due to the high pressures in this hydraulic system, it is absolutely necessary to:

- avoid tightening the high pressure pipe fittings to an approximate torque;
- avoid disconnecting the high pressure pipes with the engine running (do NOT attempt to bleed because this is absolutely pointless and dangerous!)

Because the low pressure circuit must also be undamaged for the system to operate efficiently, avoid handling or modification and take action immediately to rectify leaks.

Fuel temperature control

When the fuel temperature, measured by the sensor on the fuel filter, is greater than 75°C, the control unit operates the pressure regulator to reduce the line pressure (it does not alter the injection times). If the temperature exceeds 90ºC, power is decreased to 60%.

Engine coolant temperature control

Depending on the temperature of the engine coolant, the supercharging air and the fuel, the control unit controls the radiator fan and switches on the coolant temperature warning light.

Control of injected fuel quantity

The control unit uses the signals coming from the sensors and the stored values to:

- controls the pressure regulator
- alters the "pilot" injection time up to 2200 rpm
- alters the "main" injection time.

Idling speed control

The control unit processes the signals from the various sensors and regulates the amount of fuel injected: it controls the pressure regulator and varies the injection times. Within certain thresholds, the speed takes battery voltage into account.

- controls the pressure regulator
- modulates the injector injection times.

Within certain thresholds, the speed takes battery voltage into account.

Fuel cut-off during pedal release (cut-off)

When the accelerator pedal is released, the control unit implements the following strategies:

- cuts off the supply to the injectors
- partly reactivates the supply to the injectors before idle speed is reached
- controls the fuel pressure regulator.

Control of cylinder balancing when idling

According to the signals received by the sensors the control unit monitors the regularity of the torque at idle speed and varies the amount of fuel injected in the single injectors (injection time).

Control of engine rotation regularity (anti-judder)

It ensures the engine rotation regularity at constant speed during the rpm increase.
According to the signals received from the sensors, the control unit determines the amount of fuel to be injected through the pressure regulator and the injector opening time.

Exhaust fumes control during acceleration

With high acceleration, according to the signals received from the flow meter and the engine rpm sensor, the control unit determines the optimum amount of fuel to inject:

- controls the pressure regulator
- alters the injector injection times.

Control of exhaust gas recirculation (e.g.r.)

On the basis of the engine load and the signal from the accelerator pedal sensor, the control unit limits the quantity of intake air, implementing the partial intake of exhaust gases.

Maximum speed limit control

According to the rpm, the control unit implements two intervention strategies: at 4250 rpm the control unit limits the fuel flow by reducing the injector opening time. Above 5000 rpm it deactivates the injectors.

Control of rotation regularity during acceleration

Regular progression is guaranteed in every condition by controlling the pressure regulator and the injector opening time.

Heater plug control unit control

During the starting/post-starting stage, the injection control unit times the spark plug operation according to the engine temperature.

Air conditioning system start-up check

The control unit operates the air conditioning compressor:

- switching it on/off when the switch is pressed
- switching it off temporarily (about 6 sec.) if the engine coolant reaches the prescribed temperature.

Fuel pump control

Irrespective of the rpm, the control unit:

- supplies the auxiliary fuel pump with the ignition ON
- cuts off the auxiliary pump supply if the engine is not started within a few seconds.

Diesel preheating control

It times the diesel preheating operation on the basis of the ambient temperature.

Cylinder position check

During each engine revolution, the control unit detects which cylinder is in the combustion phase and controls the injection sequence to the relevant cylinder.

Main and pilot injection advance check

According to the signals from the various sensors, including the absolute pressure sensor built into the control unit itself, the control unit determines the optimum injection point according to an internal map.

Injection pressure closed loop check

On the basis of the engine load, determined by processing the signals from the various sensors, the control unit controls the regulator to produce optimum line pressure.

Fuel metering

The fuel metering is calculated on the basis of:

- accelerator pedal position
- engine rpm
- quantity of air drawn in

The result can be corrected according to water temperature and the percentage of NOx (nitrogen oxide) in the exhaust gases or to prevent:

- noise
- fumes
- overloading
- overheating
- turbine overrevs.

The supply can be changed in case of:

- intervention of external devices (ABS, ABD, EBD etc.)
- serious problems that cause a load reduction or the engine stop

After determining the mass of air drawn in by measuring its volume and temperature, the control unit calculates the corresponding mass of fuel to be injected in the cylinder concerned (mg. for each supply) also taking the diesel fuel temperature into account.
The fuel mass thus calculated is first converted into volume (mm3 for each supply) and then into crank degrees, that is duration of injection.

Flow correction according to water temperature

The operation resistance is higher when the engine is cold: the mechanical friction is high, the oil is still very viscous and the various clearances are not yet optimised.
In addition the injected fuel tends to condensate on the metal surfaces which are still cold.
When the engine is cold the fuel metering is therefore higher.

Flow correction to prevent noise, fumes or overloading

The behaviours which could cause the above mentioned problems are known.
To prevent them, the engineers have included suitable instructions in the control unit.

De-rating

In the event of engine overheating, the injection is changed by reducing the flow proportionally to the coolant temperature.

Electronic control of injection advance

The advance (supply start, expressed in degrees) can vary from one injection to the next and also

from one cylinder to another. Like the flow it is calculated on the basis of the engine load (accelerator position, engine rpm and air drawn in).
The advance is suitably corrected during acceleration phases according to the water temperature to reduce emissions, noise and overloading and to improve the vehicle acceleration.
At start-up the advance is very high, according to the water temperature.
The supply start feedback is obtained from the variation in injector solenoid valve impedance.

Speed regulator

The electronic speed regulator has the characteristics of a regulator of: idle speed, maximum speed and all engine speeds. It remains stable within ranges where traditional mechanical regulators become inaccurate.

Starting the engine

During the first engine drive rotations, the phase signals and the cylinder no. 1 recognition signals (flywheel sensor and camshaft sensor) are synchronised.
At start-up the signal from the accelerator pedal is ignored.
The start-up flow is set exclusively according to the water temperature by means of a suitable map.
When the control unit detects a speed and flywheel acceleration high enough to establish that the engine start-up has been successful and that the engine is no longer driven by the starter, it re-enables the accelerator pedal.

Cut off

It interrupts the fuel supply during vehicle deceleration (accelerator pedal released).

Cylinder balancing

Balancing of the single cylinders increases comfort and driveability.
This function allows an individual and personalised control of the fuel flow and the supply start for each cylinder, even varying from one cylinder to the next, to compensate for the injector hydraulic tolerances.
The flushing differences (flow properties) between the injectors cannot be directly evaluated by the control unit. This information is supplied by reading the bar code of each injector during fitting.

Synchronisation search

The control unit is able to recognise the cylinders in which to inject the fuel even if the camshaft sensor signal is lost.
If this happens when the engine is already running, the combustion sequence is already acquired, therefore the control unit continues with the sequence already synchronised.
If this happens when the engine is stopped, the control unit energises a single solenoid valve.
At the most within 2 crankshaft rotations an injection will take place in that cylinder; therefore the control unit only has to synchronise on the combustion order and start the engine.

Cold starting

Even if only one of the three temperature sensors (water, air or diesel) measures a temperature lower than 10ºC, the preheating/postheating is activated.

At the key-on the preheating warning light comes on and remains on for a period which varies according to the temperature (while the spark plugs on the cylinder head heat the air), then it flashes. At this point the engine can be started.
When the engine is running the warning light switches off but the spark plugs are still supplied for a certain (variable) period and perform the postheating.
If the engine is not started within 20 - 25 seconds (oversight period) when the warning light flashes, the operation is cancelled to prevent a useless drain on the battery.
The preheating curve also varies according to the battery voltage.

Warm starting

If all reference temperatures exceed 10°C, at the key-on the warning light switches on for about 2 sec. for a short test, then switches off. At this point the engine can be started.

Run up

When the key is inserted, the control unit transmits the information stored during the previous engine cut out to the main memory (see: After run), and performs a system diagnosis.

After run

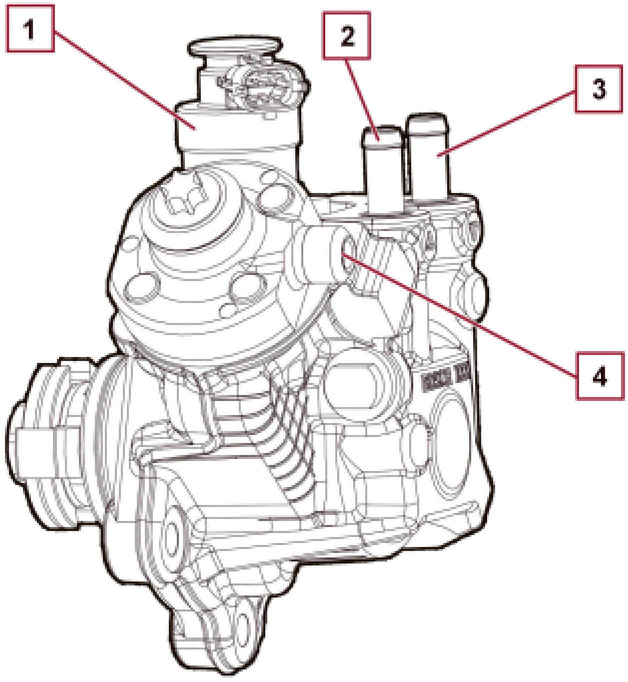
Each time the engine is turned off (key OFF), the control unit is still supplied for a few seconds by the main relay.
In this way the microprocessor can transfer data from the main (volatile) memory to a non-volatile, erasable and re-writable memory (EEprom), so that it is available at the next start-up (see: Run up).
This data is:
- various settings (engine idle speed, etc.);
- calibration of some components;
- fault memory.
The process takes a few seconds, usually from 2 to 7 (according to the quantity of data to be saved).
Then the ECU sends a command to the main relay and disconnects it from the battery.
It is very important that this process is not interrupted, for example by turning the engine off by disconnecting the battery, or by disconnecting the battery disconnector before at least 10 seconds have elapsed from the engine switching off.
It this is the case, system functionality is guaranteed but repeated interruptions can damage the control unit.

Self-diagnosis

Full injection system electronic diagnosis is carried out by connecting an appropriate tester (EXAMINER or SDC station) to the tester input located in the engine bay.
The system also comes with a self-diagnostic function that detects, stores and indicates faults.
If a fault is detected in a sensor or actuator, signal reconstruction strategies (recovery) are immediately activated to ensure the engine operates at an acceptable level without impairing service. The vehicle can therefore be driven to a service workshop for the necessary repairs.

250 - DUCATO 3.0 JTD EURO V/EURO5 Introduction - DIESEL PRESSURE PUMP AND CONTROL

The CP4.1 supply pump for the Common Rail system is called Radialjet because the pumping action is obtained through three pumping elements (pistons) arranged radially relative to the pump shaft's rotational axis. The angle between one pumping element and the other is 120°.
The quantity of fuel sent to the pumping pistons is regulated by a flow rate regulator operated by the engine management control unit.



1 - Pressure regulator
2 - Fuel inlet from filter
3 - Fuel return to the tank
4 - High pressure fuel supply to the rail

Radial jet pump specifications

The movement of the pistons is determined by the rotation of a triangular-shaped cam integrated with the pump shaft. This cam causes the movement of the three pistons in succession, through the movement of a mechanical interface (tappet) between the cam and the foot of the piston. The contact between the cam and each individual tappet is ensured by means of a spring.
Each pumping unit is equipped with an intake valve and a supply ball valve. All three delivery valves of the pumping elements are united inside the pump and send the fuel to the common manifold via a single duct. A feature of this pump is that it is lubricated and cooled at the same time by the diesel fuel circulating inside it, via special ports.
There is a low pressure regulator solenoid on the pump to adjust the supply pressure at the pump intake in order to compress only the amount of diesel fuel needed to reach the pressure mapped in the control unit

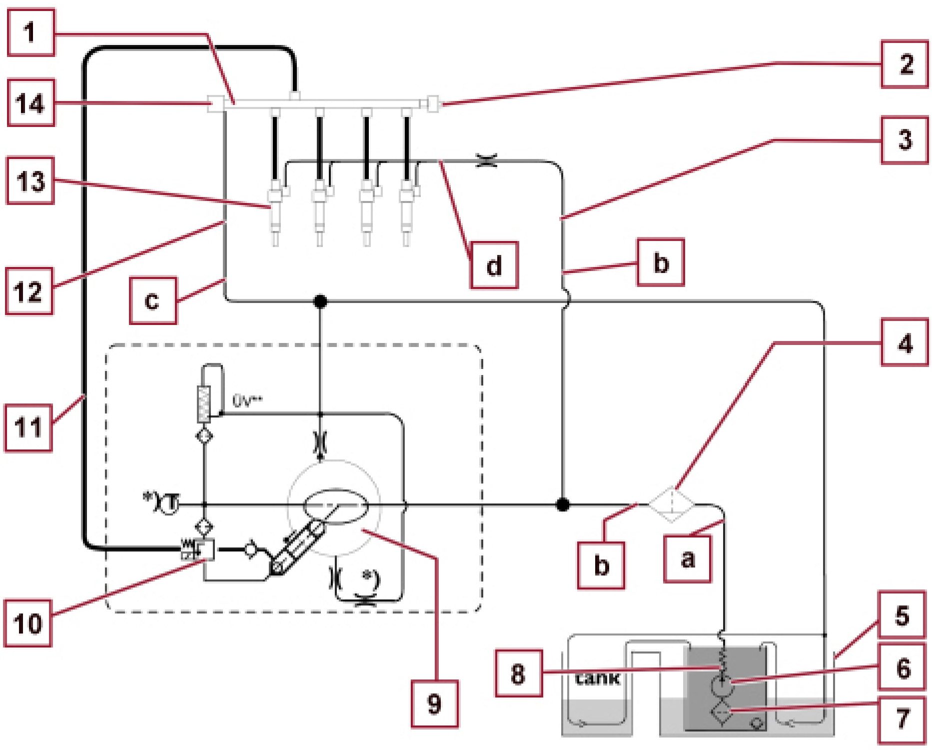
The main specifications of the Radial jet pump are described below:

- type: radialjet with radial pumping elements
- number of pumping elements: 3
- maximum operating pressure: 1800 bar
- supply: diesel at a pressure of 3.5 - 5.0 bar
- lubrication: carried out by the same diesel fuel supply
- cooling: carried out by the same diesel fuel supply.

The high pressure pump cannot be serviced and therefore must not be removed. The retaining bolts must not be tampered with either.

FUNCTION

The pump is driven by the engine at a rotational speed equal to that of the engine itself through a double chain. The timing and injection duration are, in this injection system, tasks of the electronic control system; this pump only carries out the task of permanently maintaining the fuel contained in the manifold at the requested pressure level.
The pump supply circuit hydraulic system is illustrated in the diagram below.



1 - Common Rail
2 - Fuel pressure sensor
3 - Injector return pipe
4 - Filter with water separator
5 - Tank
6 - Fuel pump
7 - Fuel pump inlet filter
8 - Fuel pump check valve
9 - High pressure pump

10 - Pressure relief valve
11 - High pressure supply pipe
12 - Common Rail return pipe
13 - Injectors
14 - Pressure regulator valve on rail
Circuit pressures:

- (a) 4.4 bar < p < 5.8 bar (*)
- (b) 4.4 bar < p < 6.0 bar (**)
- (c) p < 2 bar
- (d) p < 10 bar

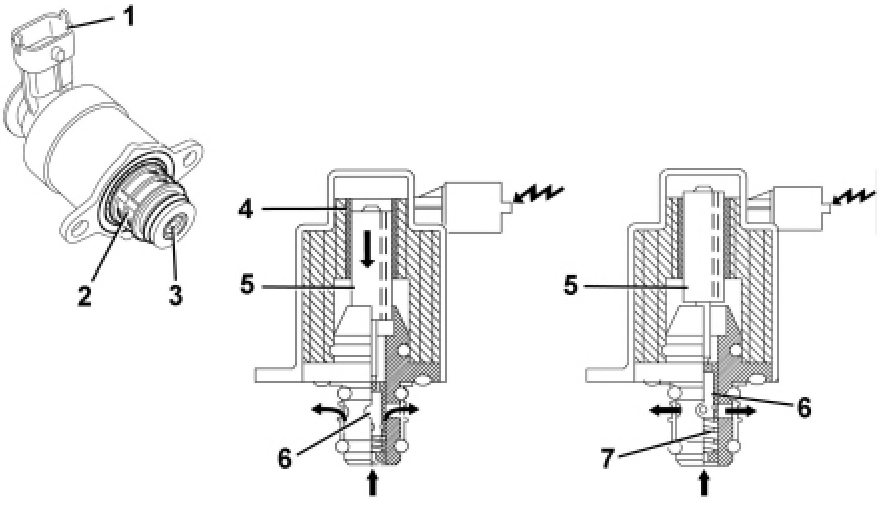
(*) Relative pressure
(**) Absolute pressure

Pressure regulator

The fuel pressure regulator is fitted to the low pressure circuit of pump CP4.1.
The pressure regulator modulates the amount of fuel sent to the high pressure circuit on the basis of commands received directly from the engine management control unit
The pressure regulator consists mainly of the following components:

- connector,
- case,
- solenoid,
- preload spring,
- plunger cylinder.

In the absence of a signal, the pressure regulator is normally open, i.e. with the pump in maximum output condition.
The engine control unit modulates fuel flow in the high pressure circuit via a PWM (Pulse Width Modulation) signal. This is achieved by partly closing or opening fuel passage cross sections in the low pressure circuit.



1 - Connector
2 - Fuel outlet ports

3 - Fuel inlet port
4 - Solenoid
5 - Magnetic core
6 - Plunger cylinder
7 - Preload spring

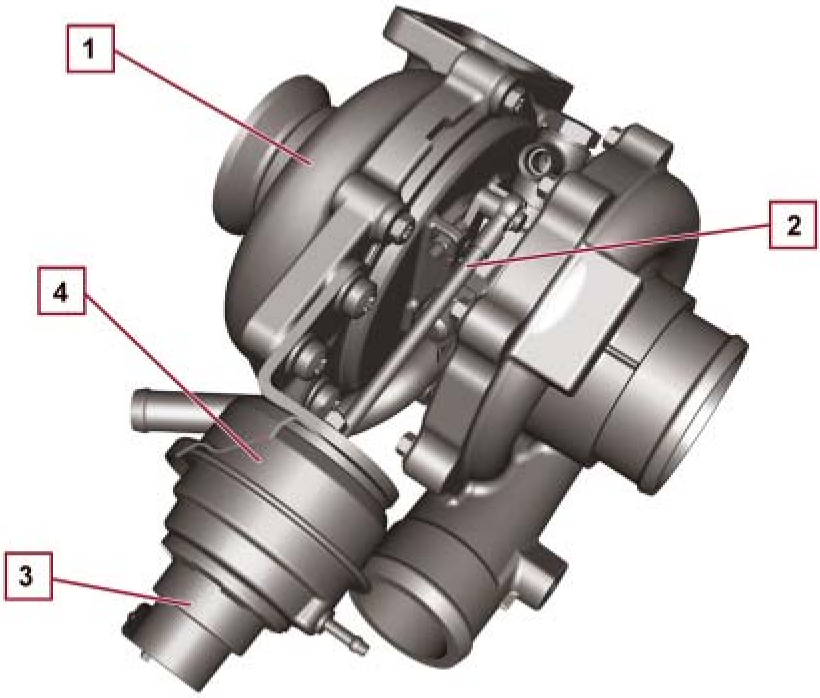
Operation

When the engine management control unit governs the pressure regulator (via a PWM signal), the solenoid (4) is energised which in turn generates the movement of magnetic core (5).
Core movement causes the plunger cylinder (6) to move sideways and choke the fuel flow.
When the solenoid (4) is not energised, the magnetic core is pushed into rest position by the preload spring (7).
Under these conditions, the plunger cylinder (6) is in a position that offers the fuel the maximum cross section.

250 - DUCATO 3.0 JTD EURO V/EURO5 INTRODUCTION - ENGINE TURBOCHARGING SYSTEM

TURBOCHARGER

Variable geometry turbocharger (VGT) managed by the engine management node through the vacuum solenoid and turbine vane direction actuator position sensor.

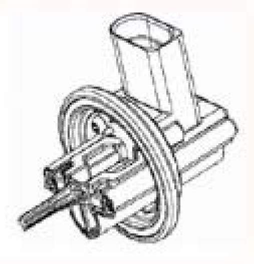


1. Variable geometry turbocharger
2. Turbine vane control rod
3. Turbine vane direction actuator position sensor
4. Pneumatic actuator

The position sensor (3) allows the engine management control unit to check the pressure and the actuator directly in parallel.
This strategy extends the range (20% - 90%) of the duty cycle that the engine management control unit controls the vacuum modulating valve with resulting in the following advantages:
- improved system reaction speed in operating the turbocharger vanes
- improved supercharging stability during transition
- rapid transition with improved acceleration performance.

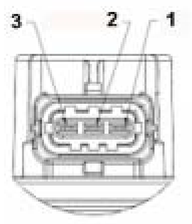
Position sensor

It has the task of measuring the movement of the pneumatic actuator stem in relation to the vane minimum opening position.



The sensor fitted on this device is the type without contacts where the sensitive element is a Hall effect sensor.
This involves improved precision and reliability as there are no mechanical components inside the sensor.

Pin out



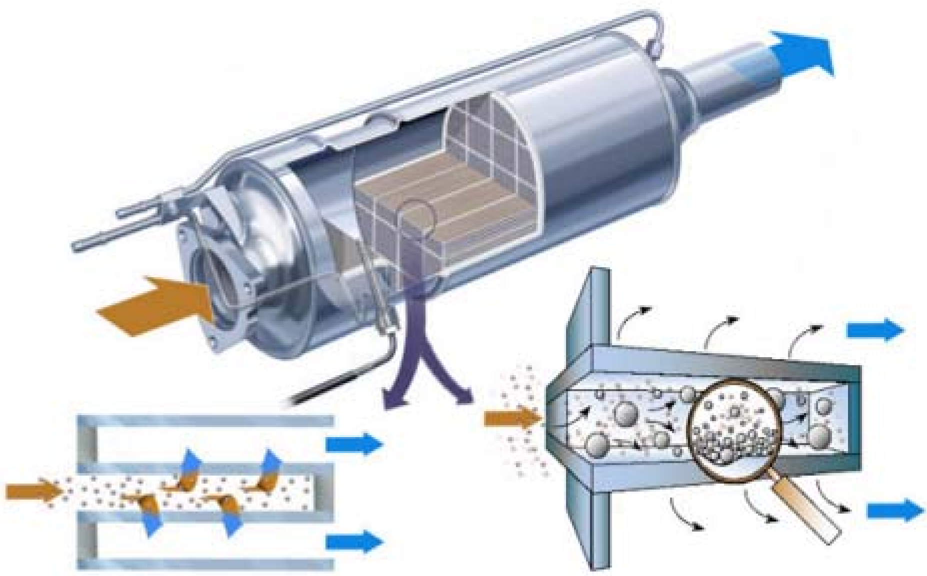
1. Earth
2. Output signal
3. Power supply (5 V)

250 - DUCATO 3.0 JTD EURO V/EURO5 2.3 JTD / 3.0 JTD (DPF, DPF)

VALID FOR VERSIONS WITH: DPF

Introduction

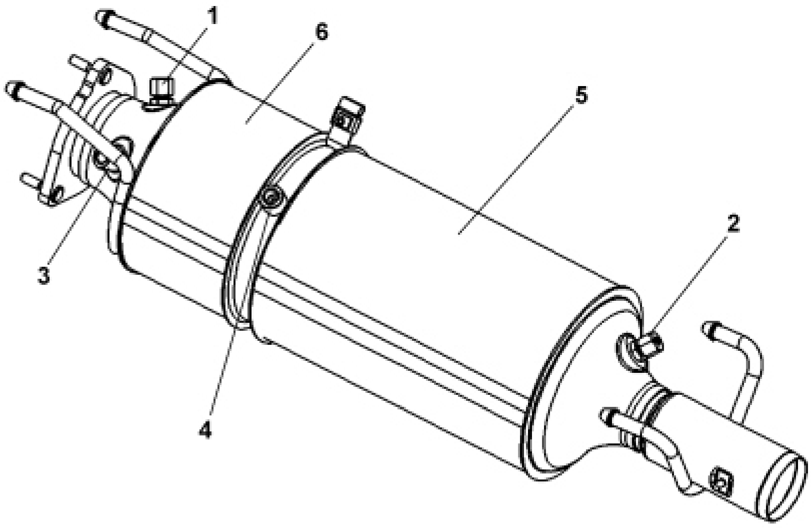
The DPF system (Diesel Particulate Filter) is fitted on vehicles equipped with Diesel engines in order to reduce the particles present in the exhaust gases by more than 95% in line with Euro 4 and 5 standards.
Particles consist of carbon compound microspheres resulting from the imperfect combustion of diesel fuel in the combustion chambers.
Particles cannot be eliminated through the use of normal catalyzers, but require the use of special filters known precisely as "anti-particle". The latter regenerate more effectively is used in extra-urban cycles.
The DPF system allows the automatic regeneration of the particulate filter whilst the vehicle is working, thereby keeping it at a constant level of efficiency in all usage conditions for the life of the vehicle.



Composition

The operation of the DPF system is managed by the engine injection control unit by means of suitable strategies.
In addition to the actual filter the DPF system comprises an exhaust gas temperature sensor and a differential pressure sensor.
The differential pressure sensor measures the pressure of the exhaust gases upstream and downstream of the filter, by means of special pipes, signalling the gradual accumulation of particulate to the control unit.

The particulate accumulation process and the relative increase in the pressure of the exhaust gases inside the filter depends on the engine load, the style of driving and the route, the weight of the vehicle and the engine capacity and power.
Therefore the particulate needs to be removed on a regular basis, regenerating the filter following a procedure that makes use of multiple injections to increase the temperature of the exhaust gases (about 650°C) and burn the particulate.
The regeneration procedure is controlled by the injection control unit which acts: on fuel metering (up to five fuel injections in the same engine cycle per cylinder) and on air control (E.G.R. and turbo pressure).
The regeneration phase takes place over a few minutes and does not affect the continuity of the torque supplied by the engine in terms of normal operation.



1. Pressure intake upstream of the filter
2. Pressure intake downstream of the filter
3. Temperature sensor housing upstream of the catalytic converter (UFC)
4. Temperature sensor housing downstream of the catalytic converter (UFC)
5. Filter
6. Front Catalyst

Particle filter

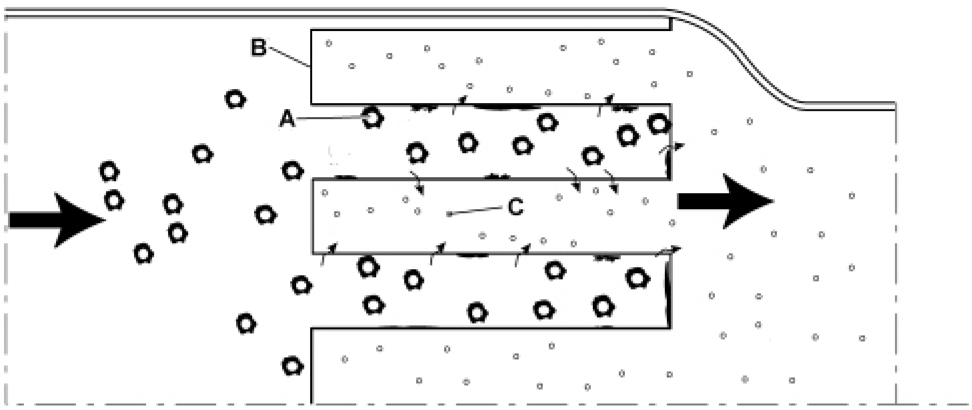
The anti-particulate filter is made from silicon carbide with a porous structure with channels that force the flow of exhaust gases through the walls. It is incorporated in the exhaust pipe fastened to the catalyzer.

The special structure of the filter allows:

- large filter capacity (up to 0.1 micron),
- loss of reduced load,
- good resistance to thermal, mechanical and chemical stresses,
- large storage capacity for particles which limits the regeneration frequency.

The following elements are trapped by the filter:

- particulate: burnt both during the natural regeneration and during the artificial regeneration,
- solid residues from engine wear and combustion of oils.



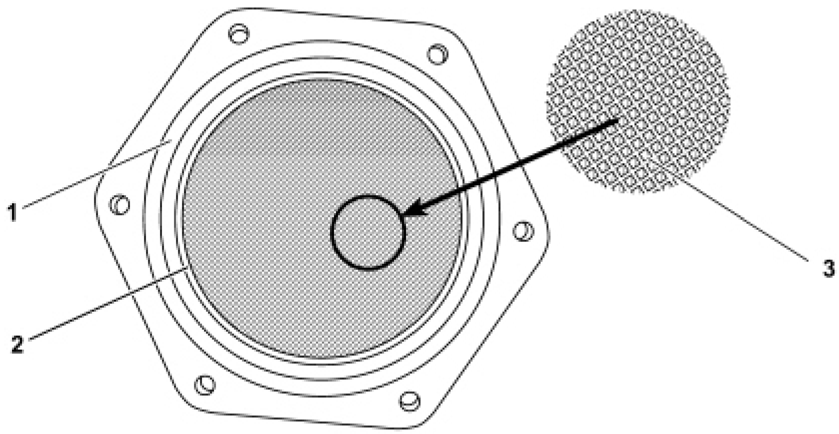
A. particulate
B. ceramic material walls
C. filtered exhaust gases
The accumulation of particulate whilst the engine is running gradually causes the filter to become clogged.

Catalytic converter

The catalytic converter reduces the carbon monoxide (CO) and unburnt hydrocarbons (HC) transforming them into carbon dioxice (CO_2) and water vapour.

The catalytic converter consists of:

- a stainless steel outer casing
- thermal insulation
- a honeycomb ceramic structure impregnated with precious metals.

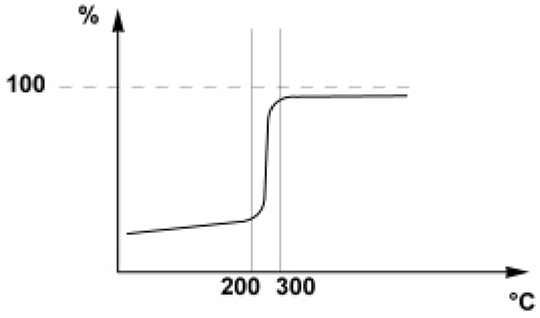


1. stainless steel outer casing
2. thermal insulation
3. ceramic structure

The chemical transformation inside the catalytic converter increases during the post-injection stage with the combustion of unburnt hydrocarbons (HC). This post-combustion, which increases the temperature of the exhaust gases (catalytic combustion), is controlled by the temperature sensors upstream and downstream of the catalytic converter.
An initial series of post-injections gradually increases the catalyzation process until the maximum

conversion level is reached (around 98%, starting at 200°C). Beyond this level, a further increase in the temperature of the exhaust gases almost totally destroys the hydrocarbons.

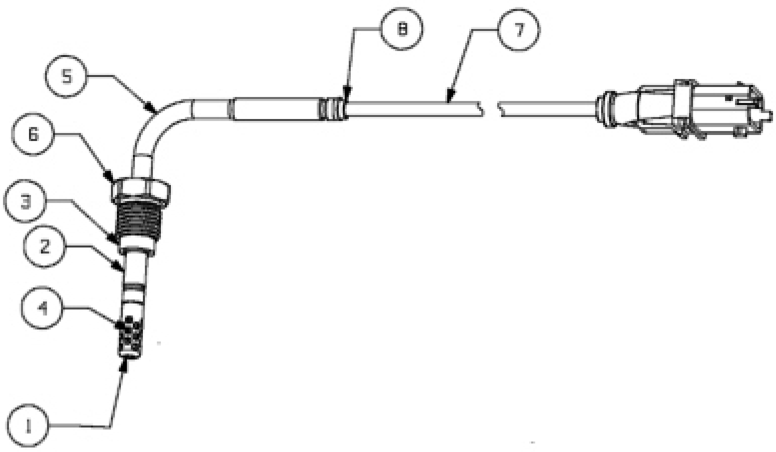
it is possible that (non harmful) white fumes may be produced during acceleration following the prolonged use of the vehicle at low speeds; these fumes are produced inside the catalytic converter (when the temperature of the latter goes from being cold to being very hot) through the chemical of the hydrocarbons, water vapour and nitrogen oxide.



% = conversion %

Exhaust gas temperature sensors

The PTC type temperature sensors with the body bent at 90° have the task of sending the temperature values for the exhaust gases entering and leaving the catalytic converter to the control unit which needs them to activate a post fuel injection in order to maintain the temperature of the filter above 350 °C. The upstream sensor performs the function of temperature protection whilst the downstream one checks that the regeneration temperature is within the safety limits thereby guaranteeing the complete combustion of the particulate.
The upstream sensor carries out the temperature protection function, whilst the downstream one checks that the regeneration temperature of the filter is within the safety limits and at a value that guarantees the complete combustion of the particulate.



1. Terminal protection

2. Protective pipe
3. Flange
4. Thermocouple
5. Rigid cable
6. Securing ring nut
7. Flexible cable
8. Teflon pipe

Specifications and operation

The table below contains the specifications of the temperature sensors.

Pull-up power supply:	5 V +/- 0,1%
Pull-up resistance:	1000 Ohm +/- 0.1%
Rated resistance at 0ºC:	200 Ohm
Operating range:	from -40°C to +1000°C

The electrical opration of the sensors is always monitored/diagnosed whilst a diagnostic check on the consistency of the value measured compared with the other temperature sensors in the engine management system is only carried out during starting.
The table below contains the resistance values for the sensor with a casing at a 90° angle depending on the exhaust gas temperature

Temperature (°C)	Resistance (ohm)
-40	170,2
-20	185,6
0	201,0
25	220,1
50	239,0
100	276,4
150	313,2
200	349,5
250	385,1
300	420,2

400	488,6
500	554,6
600	618,3
700	679,7
800	738,7
900	795,4
1000	849,7

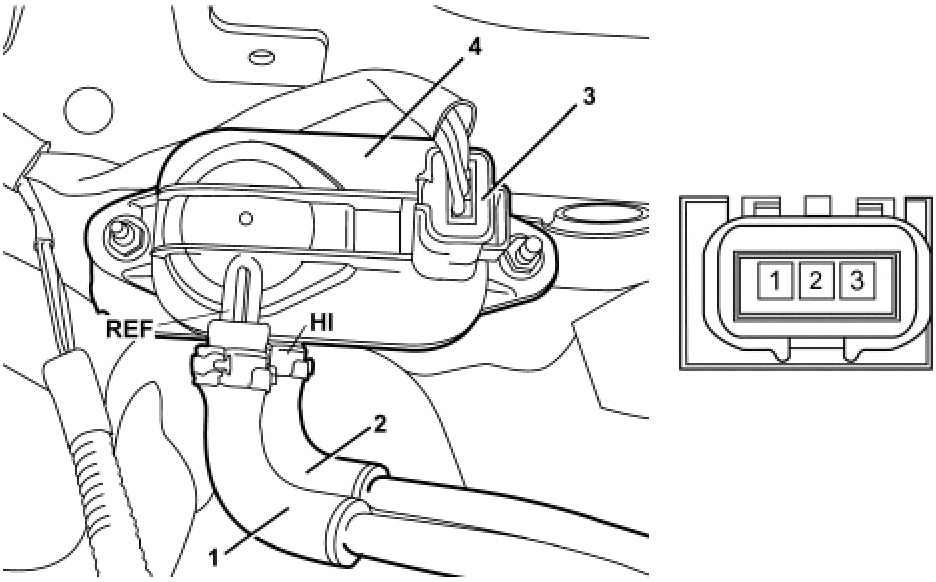
Differential pressure sensor

The sensor comprises:

- an electronic circuit for amplifying the signal,
- a sensitive diaphragm.

The diaphragm is subjected on one side to the catalytic converter inlet pressure (upstream) and on the other side to the filter oulet pressure (downstream).
The sensor provides a voltage proportional to the differential pressure measured by the diaphragm (ΔP = upstream pressure - downstream pressure).

⚠ never mix up the inlet and outlet pipes because the management of the particle filter depends on the information produced by this sensor.



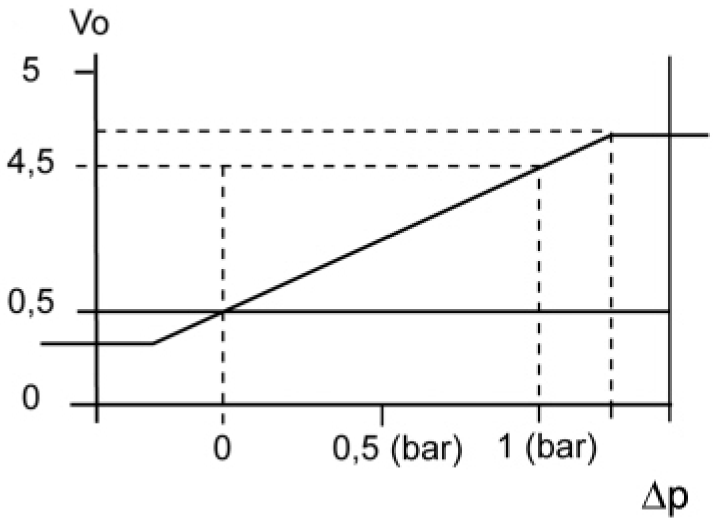
1. HI: entry of information upstream of the filter
2. REF: entry of information downstream of the filter
3. connector
4. differential pressure sensor

Connector pin out

- Pin 1 - Signal
- Pin 2 - Earth
- Pin 3 - Power supply

Operation

The differential pressure sensor constantly measures the difference in pressure (Δp) between the inlet and outlet of the catalytic converter/particulate filter assembly.
This measurement makes it possible to determine the filter blockage level.
The value Δp shown in the graph below is converted into a voltage Vo which is sent to the engine management control unit.

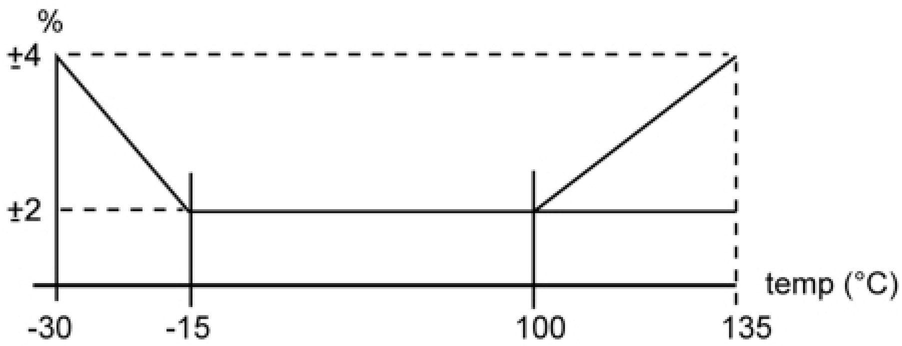


Vo. Output voltage
Δp. Difference between catalyzer outlet and inlet pressure

Specifications

Sensor breaking pressure on high pressure side.	3 bar
Sensor breaking pressure on low pressure side	2 bar
Sensor maximum energizing current	20 mA
Sensor output impedance.	< 100 Ω
Sensor operating temperature interval	-40° - +145 °C

The graph below illustrates the error percentage (%) variation depending on the variation in temperature (°C) within the sensor operating range.



Particulate filter control function

The role of the control function is to:

- determine the state of the filter (blockage level),
- determine whether the activation of the regeneration is necessary,
- check the efficiency of the regeneration.

The following information is used by the engine management node in this area:

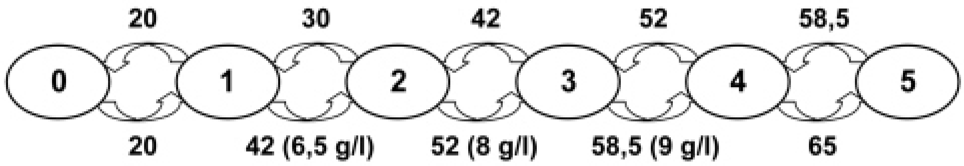
- distance travelled,
- differential pressure value,
- exhaust gas temperature downstream of the catalytic converter,
- exhaust gas temperature upstream of the catalytic converter,
- intake air flow rate.

Determining the filter blockage level

The filter blockage level is monitored by the system by means of a physical model based on actual engine emissions at the various operating points. This model continues to increase/decrease the soot level (particulate) in grams inside the DPF. A decrease takes place when temperatures and/or quantities of oxygen are present in the DPF which cause spontaneous regeneration.

Particulate filter regeneration assistance function

The soot level in the DPF is continuously updated with the value expressed in grams. The DPF blockage level is evaluated by a machine where the exceeding of certain accumulation levels causes the change from one status to another.



When 52g or 42g is exceeded (if the vehicle is travelling above 85 Km/h) the control unit launches the regeneration procedure.

Controlled regeneration

Controlled regeneration is managed by the engine management control unit by means of commands designed to increase the temperature of the exhaust gases until the particulate combustion level is reached.

The regeneration involves two stages:

- stage 1: increase in the temperature of the catalytic converter,
- stage 2: increase in the DPF temperature.

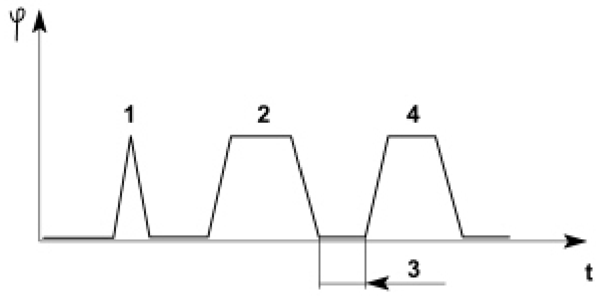
The engine management system oversees the shift from the first stage to the second stage according to the temperature of the temperature sensors located before the catalytic converter and before the DPF

Each time the regeneration is activated, the engine management system:

- interrupts the exhaust gas recirculation (EGR);
- activates the after and post injection (which heats the catalytic converter and the DPF),

First stage regeneration

When first stage regeneration is required, the engine management system adapts the after injection strategies to increase the temperature of the catalytic converter.

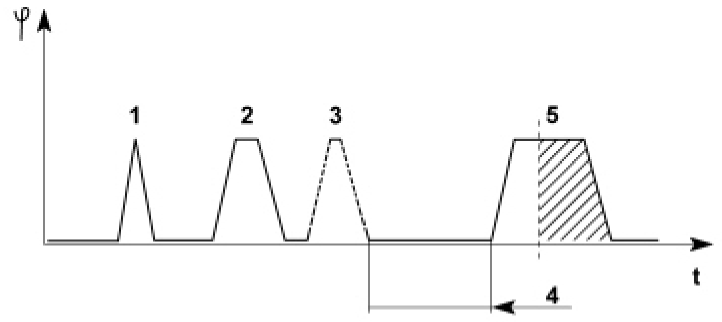


1. Pilot injection (PILOT)
2. Main injection (MAIN)
3. Interval before injection (AFTER)
4. Injection (AFTER)

After injection takes place immediately after the main injection which makes it possible to increase the temperature of the exhaust gases through combustion in the cylinder after top dead centre.
This stage ensures an increase in the temperature of the catalytic converter until the maximum efficiency level is reached.
By comparing the temperature of the exhaust gases upstream and downstream of the catalytic converter, the engine management system uses its internal strategy to determine whether the catalytic converter has reached its maximum conversion level; when this level is reached, it activates the second artificial regeneration stage.

Second stage regeneration

At the end of the first artificial regeneration stage, the engine management system implements strategies that allow a further increase in the temperature of the exhaust gases (second stage).



1. Pilot injection
2. Main injection
3. After injection (depending on the engine point)
4. First post-injection period
5. Post-injection

The period that separates the main injection from the post-injection is longer than for the first stage, the post-injection period is longer and is divided into two parts:
This is split in two - three injections are carried out to reduce the oil dilution.

Artificial regeneration activation conditions

Before activating the artificial regeneration strategies, the engine management system checks that:

- the temperature of the engine coolant is 50°C,
- the engine speed is equal to a pre-set level, regeneration is inhibited during idling,

Differential pressure sensor signal (δp)

The signal is used to advance the regeneration normally operated by the status machine.

Service News

Fiat Group Automobiles S.p.A.

Various models

10
17.09

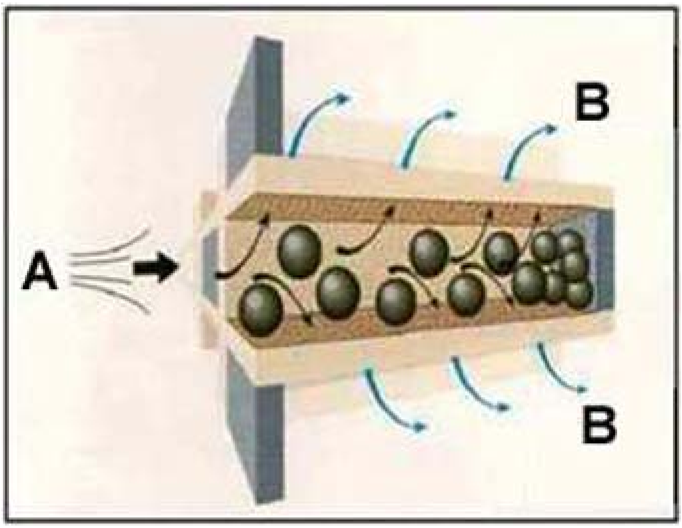
All types Diesel with DPF (Nuova 500 - Panda - Grande Punto - Idea - Stilo - Nuova Bravo - Multipla - Sedici - Croma - Doblò - Fiorino/Qubo - Ducato 250 - Ulysse 179 - Scudo 272)

1080 B 810 AA **DPF PARTICULATE FILTER**
Information to the network

Supersedes the following SN:
- 10.31.07 dated 16-11-2007 CD 06/2007;

TYPES OF PARTICULATE FILTERS

The particulate filter inserted in the exhaust system and integrated with the catalytic converter consists of a monolithic porous silicone carbide based support. It allows to reduce the amount of emitted particulate to less than one thousandth including the smallest sized particles (<20nm). It is a mechanical filter provided with a series of channels in which the particulate is trapped while the exhaust gases cross the porous walls (Fig. 1).
Fig. 1



A Input exhaust gases
B Output filtered exhaust gases
Because these filters are mechanical traps, they need to be regularly cleaned out. The cleaning procedure is called "regeneration". During the regeneration process, the particulate contained inside the filter is burnt thus clear the pores in which the powder is collected.
This process is run in average every 800/1000 km, but may be needed more frequently (less than 400 km) if the vehicle is used in particularly demanding conditions: the distance travelled between one regeneration and the next depends on the operating conditions and the use of the vehicle/engine.
There are essentially two types of particular filter systems used by engineers:

FAP OR DPF

These two types of filtering system have different names and different features and operation. The greatest difference essentially concerns the regeneration strategy of the ceramic filters.

FAP

FAP is the brand name of the particulate filters fitting in cars made by Peugeot-Citroen-PSA.
This type of filter was the first to be installed on standard production cars (the 2.2 HDI Peugeot 607 engine). Use was later extended to 2.0 HDI and gradually installed on an increasing number of cars, including those of the FIAT-PSA joint venture (Ulysse-Phedra).
From a technical point of view, FAP belongs to the type of filters which require the use of additives (cerium oxides, iron oxide, etc.). Eolys is the brand name of an additive.
These were the first filters to be installed on cars and therefore are also the one which are best known, in terms of problems, servicing methods and repair procedures.
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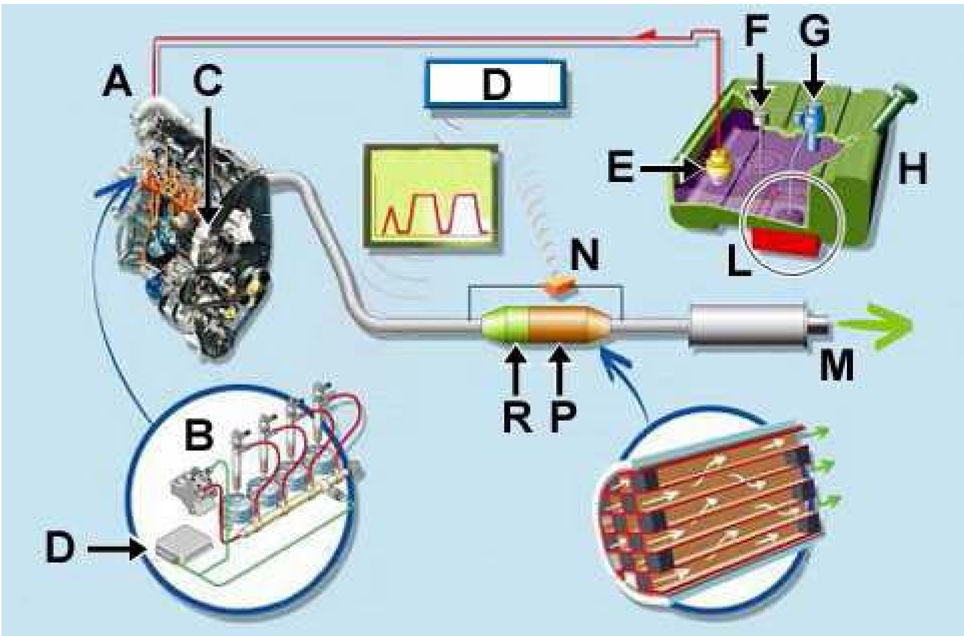
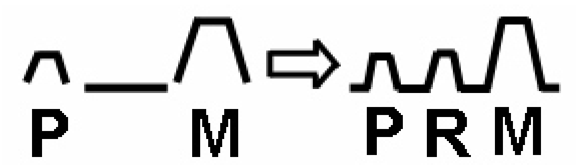
The FAP filters were the first filters to be installed on cars and therefore are also the one which are best known, in terms of problems, servicing methods and repair procedures.
FAP filters thus require an additive for active regeneration.
As previously mentioned, the filter regeneration process consists of burning the particulate collected by the trap.
The particulate is burnt at a temperature of approximately 600-650°C. In order to reach such temperatures, modern diesel engines carry out post-injections after TDC which burn on the oxidising catalyser arranged in front of the filter. The purpose is to increase the temperature of the exhaust gases.
Additive is appropriately added to the fuel to lower the regeneration threshold by reducing the particulate combustion temperature to approximately 450°C. The gas temperature reaches 450°C with the post-injections to that the particulate inside the filter is burnt and the filter is regenerated.

Fig. 2 – System diagram with FAP filter



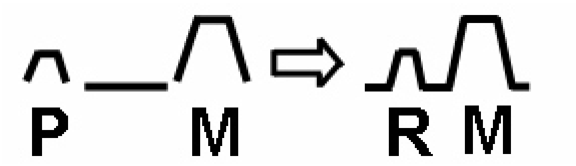
A. Engine
B. Common rail
C. High pressure pump
D. Engine ECU
E. Fuel pump
F. Level indicator
G. Injector and adjuster
H. Fuel tank
L. Additive
M. Muffler
N. Sensor

P. Particulate filter
R. Pre-catalyst
DPF
This particulate filter does not use additives because the exhaust gas temperature is increased to 600-650°C. The temperature is increased by means of a series of post-injections and post-combustions (partially in the exhaust manifold and in the oxidising catalysers). The resulting temperatures are widely sufficient to fully burn the particulate collected in the filter. Noble metals which act as catalysers are inserted in the walls of the filter to facilitate the collected particulate combustion process.
The system without additive has the advantage of not requiring additive top-ups. The additive is rather expensive, in addition to being dangerous for human health. On the other hand, the filter without additive requires higher regeneration triggering temperatures. Furthermore, the filter without additive causes a certain contamination (dilution) of the engine oil due to the increased post-injection. The engine oil may therefore be degraded more rapidly than normal because it is diluted by fuel according to the number of regenerations and thus the adopted driving style. The DPF generation method is based on the common rail multiple injection system (MultiJet).
Fig. 3A - Cold combustion check flexibility



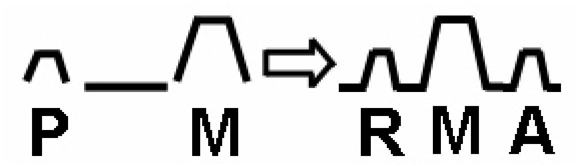
Cold combustion check flexibility	Less noise	Lower compression ratio	- Better performance. - Nox/PM reduction

Fig. 3B - Very rapid pilot injection



Very rapid pilot injection flexibility	Less particulate	More recirculation gas (EGR)	Nox/PM reduction

Fig. 3C - AFTER injection



AFTER injection	Oxidation of particulate	More recirculation gas	Nox/PM reduction

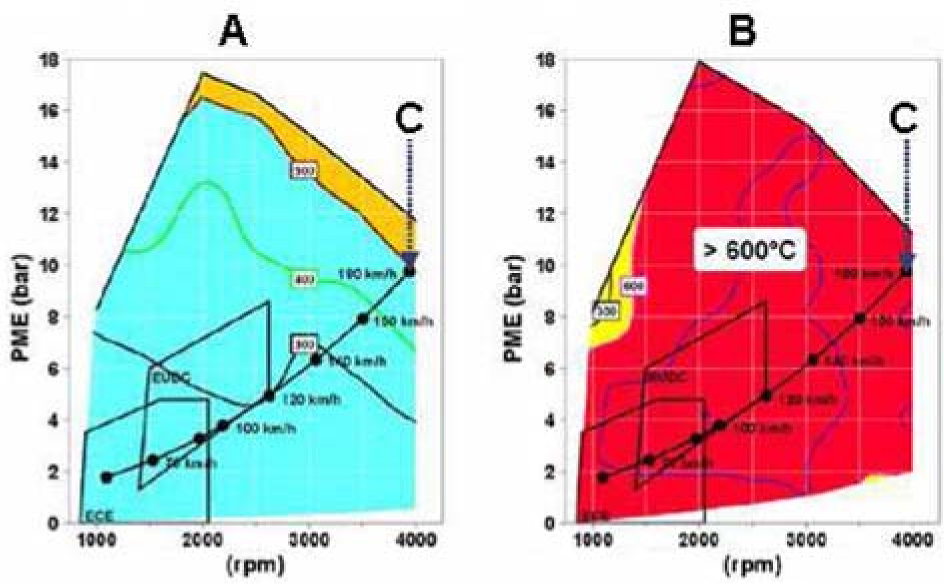
Fig. 3D - AFTER injection + POST for post-treatment

AFTER injection + POST for	Lower exhaust gas temperature and	Higher post-treatment	Filter regeneration

post-treatment	hydrocarbon injection (HC)	system inlet temperature	

P = Pilot injection
M = Main injection
R = Pre-injection
A = Next injection
PS = Post-injection

Fig. 4 - Particulate filter inlet temperature (°C)



A. Base
B. With regeneration strategies
C. Vehicle operating curve

MAIN DIFFERENCES BETWEEN FAP AND DPF APPLICATIONS

The main difference between FAP and DPF depends on the use of additive or not which as mentioned is used to lower the regeneration temperature to approximately 450°C. The difference regeneration strategy causes a partial diversification of the filter itself:
-the FAP has a mechanical filtering structure for burning the particulate by means of the additive;-in the DPF, the filtering structure is coated by noble metals (as classical catalysers) which increase the temperature and promote the regeneration process.
For these reasons, these two filter types have advantages and disadvantages:

	FAP	**DPF**
Advantages	Low regeneration temperature Low back pressure	Simple system No additives
Disadvantages	Complex system Short life	High regeneration temperature Oil dilution

The two types of filter described above are both used on FGA vehicles.

FAP	PSA vehicles	Ulysse and Phedra
DPF	FIAT vehicles	The other FIAT, LANCIA and ALFA ROMEO vehicles

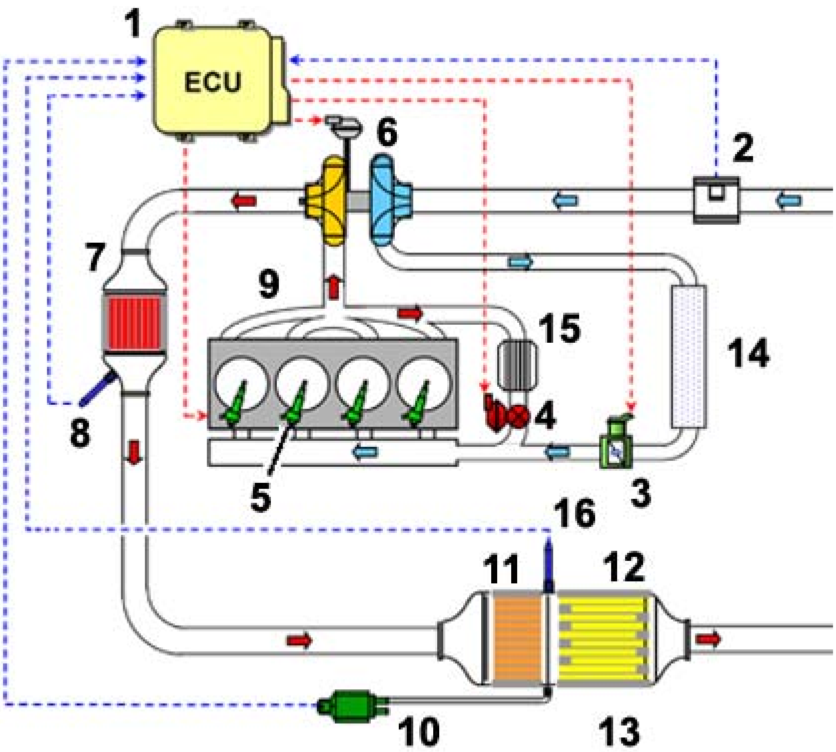
DPF SYSTEM CONSTRUCTION

The DPF (Diesel Particulate Filter) consists of the following parts:

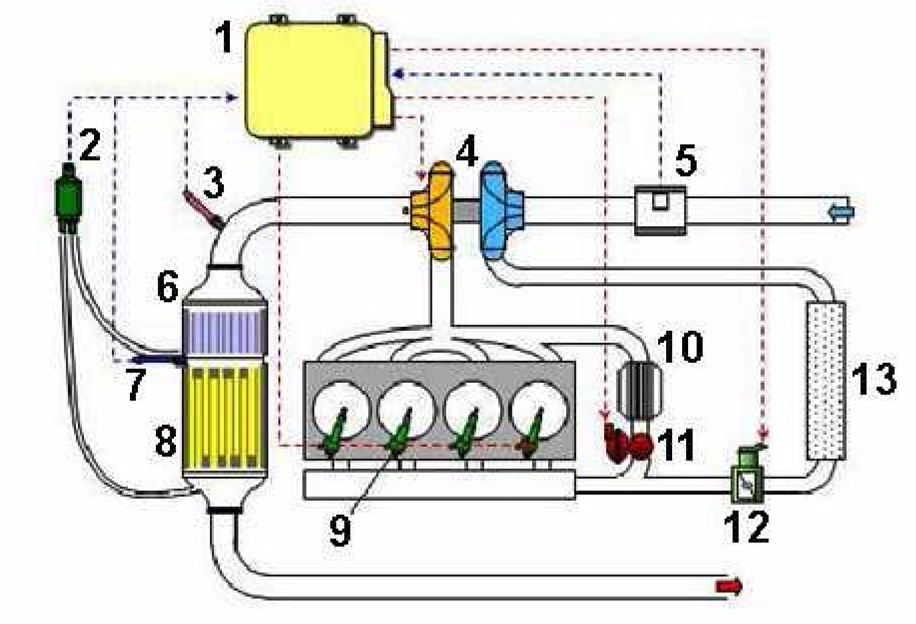
DPF Euro 4

-Double oxidising catalyser + DPF-2 exhaust gas temperature sensors-1 differential pressure sensor-Engine ECU with specific strategies-DPF warning light + message on instrument panel .

Fig. 5 - DPF Euro 4 system diagram



Key
1. Engine ECU
2. Air flow meter
3. Motorized throttle
4. EGR
5. Injections
6. Turbine
7. Pre-catalyser
8. Exhaust gas temperature sensor (pre-cat)
9. Engine
10. Exhaust gas differential pressure sensor
11. Central catalyser
12. Exhaust gas temperature sensor (DPF)
13. DPF filter
14. Intercooler
15. EGR heat exchanger
16. Exhaust gas temperature sensor (DPF)
DPF Euro 5
-One oxidising catalyser + DPF-1 exhaust gas temperature sensor-1 differential pressure sensor (with two measuring points)-1 Lambda sensor-Engine ECU with specific strategies-DPF warning light + message on instrument panel.
Fig. 6 - DPF Euro 5 system diagram



1. Engine ECU
2. Exhaust gas differential pressure sensor
3. Lambda sensor
4. VGT turbine
5. Air flow meter
6. Front catalyser
7. Exhaust gas temperature sensor (DPF)
8. DPF filter
9. Injectors
10. EGR heat exchanger
11. EGR
12. Motorized throttle
13. Intercooler

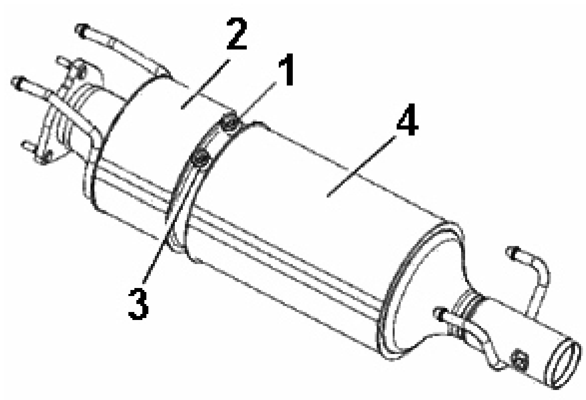
DPF (Diesel Particulate Filter)

Introduction

The system consists of two main components:
-Oxidising catalyser-Particulate filter
The filter is generally located under the body (Euro 4 versions), but in the future (Euro 5) the units will be fitted in the engine compartment instead of the pre-cat which will be eliminated.

It will not always be possible to move the unit into the engine compartment: it will depend on engine version and the available space in the engine compartment.

Fig. 7 – DPF filter



1. Pressure vent upstream of the DPF filter
2. Oxidising catalyser
3. DPF temperature sensor housing

4. Particulate filter (DPF)

Materials used and geometric configurations

The materials with which the filter is made and its geometric configuration are key elements in the DPF system. Various factors must be carefully evaluated: exhaust back pressure, particulate withholding property, regeneration ease, duration of performance in time, and finally costs.

Silica carbide is the material normally used for making DPF filters. This material ensures:

-high filtering efficiency;-low load loss;-good resistance to heat, mechanical and chemical stress;-good storage capacity of the particulate to limit regeneration frequency.

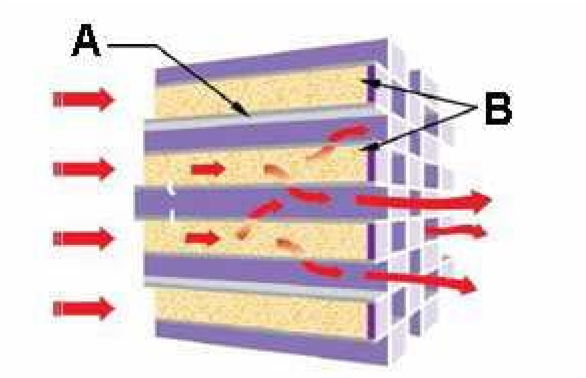
Silica carbide features:

-Melting point: 1723° C-Working temperature: 900° C-Thermal expansion coefficient: 5·10-6/°C

The average temperature of the DPF during regeneration is 700-800°C.
The DPF could be damaged by thermal shock at temperatures higher than 1000°C.
Breakage by vibrations may be caused in incorrect assembly of the filter in the container.

The structure of the DPF (Fig. 8) consists of alternatively blocked channels for obtaining a filtering surface of several square metres. The object of the filter is to force the motion of exhaust gases through the porous holes of the filtering element thus allowing the mechanical removal of the particles of particulate matter (PM).

Fig. 8



A. Filtering wall

B. Particulate matter (PM)

The particulate which is collected in the DPF (Fig. 9) and when a predetermined threshold stored in the system during design and calibration is reached, the engine ECU starts a regeneration procedure to burn the PM.

Fig. 9

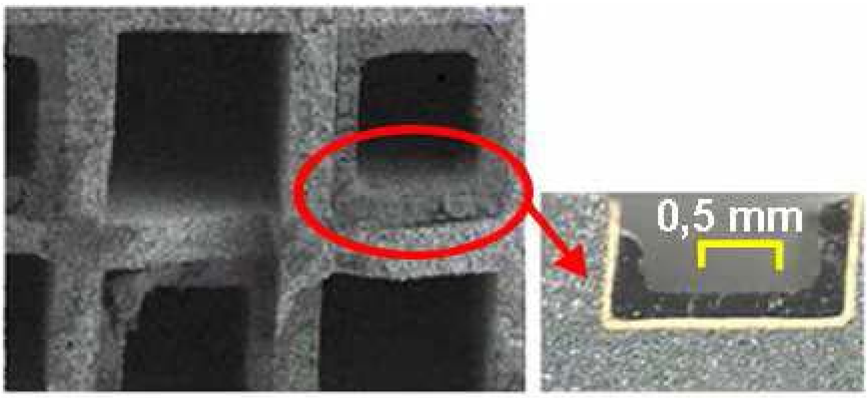
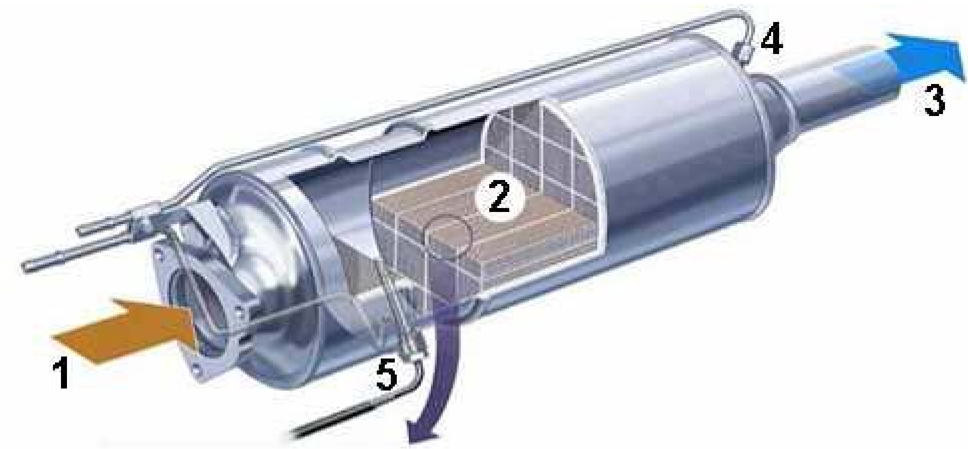


Fig. 10 – DPF filter example



1. Exhaust gas inlet
2. DPF filter
3. Filtered exhaust gas outlet
4. Differential pressure sensor measuring point (downstream of the filter)
5. Exhaust gas temperature sensor

Remember that the particulate filter must never be washed using water jets or other devices. In case of excessive obstruction which cannot be solved by means of a forced regeneration procedure, the filter must be replaced.

After reach regeneration process an amount of unburnt solid residues (ashes) will remain. This determines the lifespan of a DPF filter. The normal lifespan of a DPF is 250,000 km, but this distance may be reduced according to driving style, engine oil consumption and number of regeneration.

Central catalyser and DPF location

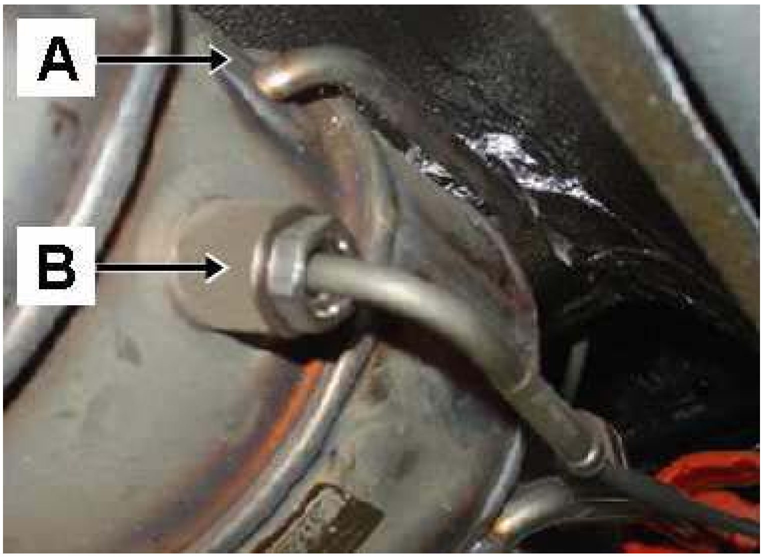
Figure 11 shows the location of the central catalyser and the particulate filter. The unit is normally fitted under the middle part under the body in Euro 4 systems.

Fig. 11

DPF setup

Figure 12 shows the arrangement with single tube differential pressure sensor.

Fig. 12

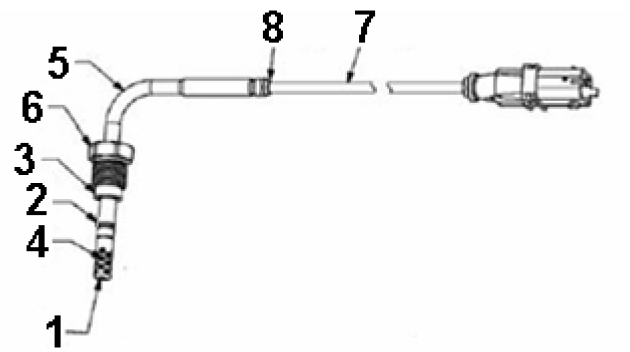


A. Pressure measuring tube upstream of DPF.
B. Exhaust gas temperature upstream of DPF.

EXHAUST GAS TEMPERATURE SENSOR

The temperature sensor (Fig. 13) of the PTC type is used to send the exhaust gas temperature value to the engine ECU (CCM) to manage the following operating strategies:
-Exhaust gas temperature > 600 °C at DPF inlet-Ensure complete PM combustion.-Safety limits.

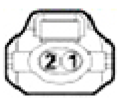
Fig. 13



1. End protection
2. Protective pipe
3. Flange
4. Thermocouple
5. Rigid cable
6. Securing ring nut
7. Flexible cable
8. Teflon pipe

Exhaust gas temperature sensor pinout

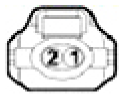
Fig. 14 – K188 (DPF temperature sensor)



	Sensor	**CCM**
Mass	1	35 – A

Signal	2	34 - A

Fig. 15 – K189 (Pre-cat temperature sensor)



	Sensor	CCM
Mass	1	33 – A
Signal	2	32 - A

Location of exhaust gas temperature sensor electric connectors

There are two exhaust gas temperature sensors (Fig. 16) arranged as follows:
-one at pre-cat outlet (A - Euro 4 only)-one straddling the central filter and the DPF filter (B - for Euro 4 and Euro 5 systems)
The temperature sensor electric connectors are arranged in the position shown in Fig. 16.

Fig. 16

A. K189 Pre-cat temperature sensor connector (engine compartment)
B. K188 DPF temperature sensor connector (underbody)

DIFFERENTIAL PRESSURE SENSOR

Figure 17 shows a single tube pressure sensor.

Fig. 17

A. Additional hole for atmospheric pressure
B. Atmospheric pressure
C. Exhaust gas pressure inlet
D. Atmospheric pressure
E. Exhaust gas pressure measured upstream of DPF.

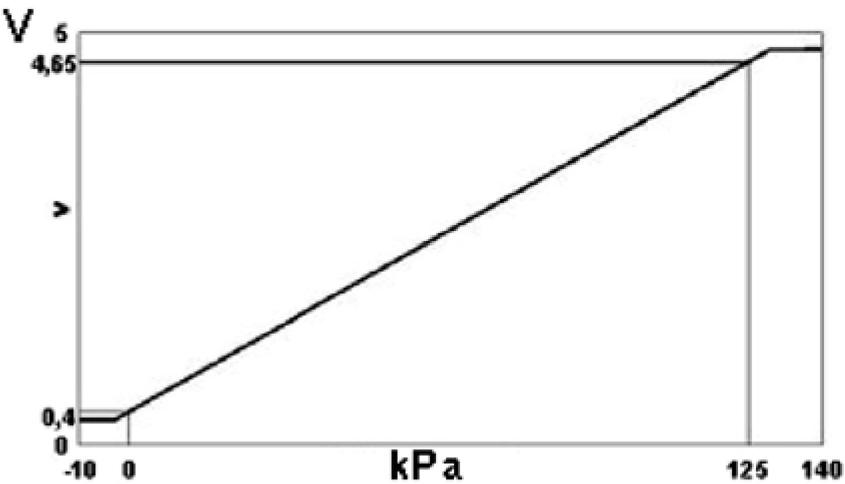
The sensor, appropriately calibrated, provides a voltage proportional to the differential pressure measured by the sensor:
Differential pressure = pressure upstream of DPF - atmospheric pressure
This signal is used by the engine ECU (CCM) to check the DPF obstruction level and to actuate regeneration strategies.

Differential pressure sensor location
The differential pressure sensor (Fig. 18) is generally arranged on the engine compartment wall in the central area next to the coolant expansion vessel.
Fig. 18

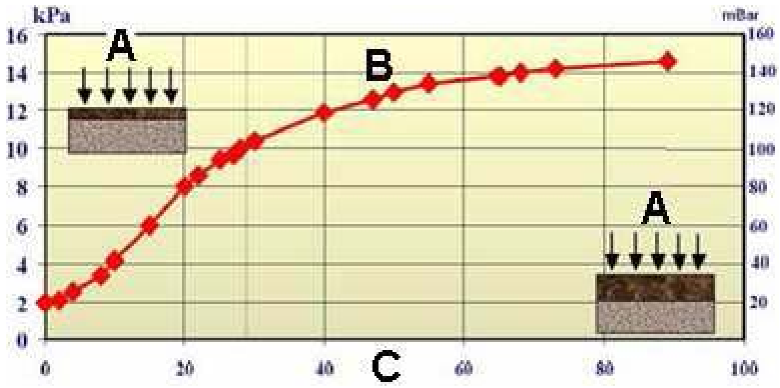
Differential pressure sensor pinout
Fig. 19 – K187 (differential pressure sensor)

	Sensor	CCM
Power (+5 Volt)	1	44 - A
Ground (GND)	2	37 - A
Signal (0 - 4.65 Volt)	3	36 - A

Differential pressure sensor electric signal.
The following chart (Fig. 20) shows the pattern of the electric signal generated by the pressure sensor; the table in Fig. 21 shows the transcoding of the pressure value and the electric signal (mbar/volt).
Fig. 20



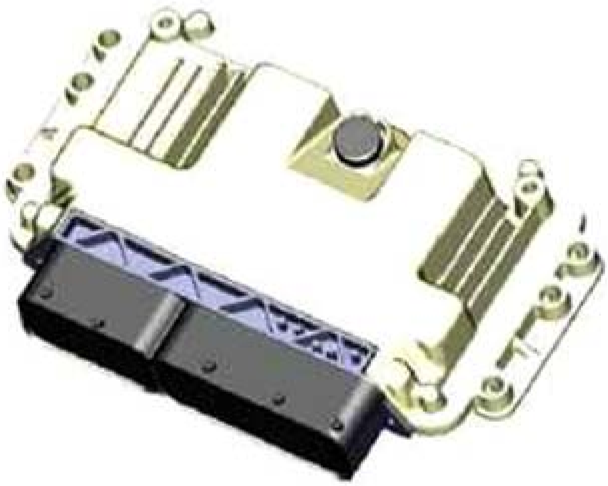
A possible back pressure value is shown in the following chart (Fig. 21) according to the amount of particulate matter collected in the DPF:
Fig. 21



A. Flow
B. Back pressure
C. PM weight, g

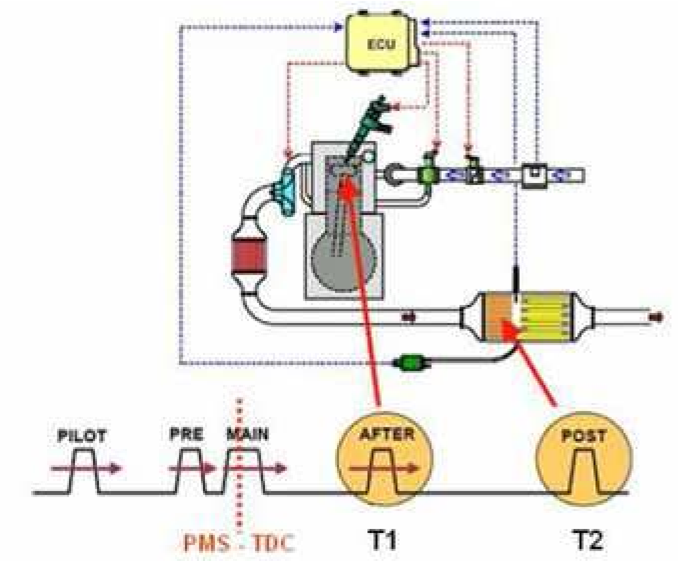
ENGINE ECU (CCM)

In versions with DPF, the engine ECU implemented specific functions for controlling the accumulation of particulate and for DPF filter regeneration strategies.
Fig. 22 – Engine ECU

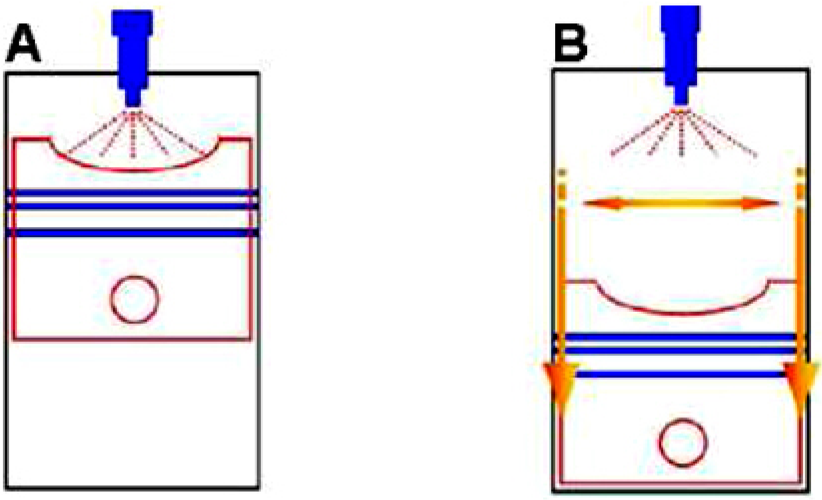


ENGINE ECU STRATEGIES

DPF filter regeneration
The particulate accumulate in the DPF is burnt by means of the regeneration process.
When the regeneration process is started, the engine ECU will implement the following strategies:
-PILOT, PRE, MAIN injection times;-Injection pressure;-EGR closes;-Throttle opens;-Turbo pressure;-AFTER injection activation increases the exhaust gas temperature to T1 (450°C) with combustion in the combustion chamber.-POST injection activation increase the exhaust gas temperature to T2 (600°C) with combustion inside the exhaust pipe (pre-cat and catalyser).
Conditions:
-Regeneration time approximately 12 min.
Fig. 23 - Injection process



Engine oil dilution
Pilot, Pre, Main, After are activate with piston in top position (A Fig. 27), while post injection occurs when the position is in bottom position (B Fig. 27): this causes atomisation of fuel on the cylinder walls causing increase of fuel leakage into the oil sump.
Fig. 24



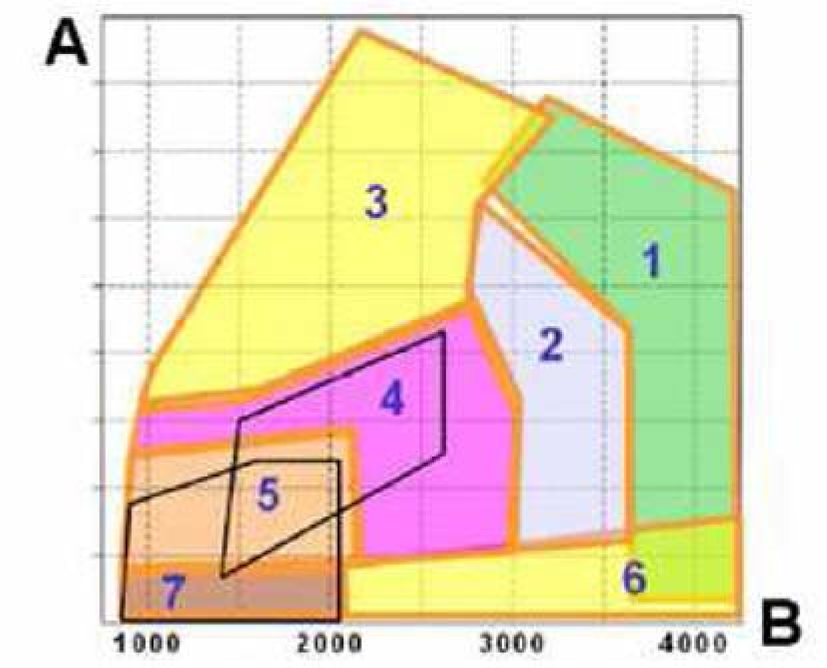
In order to prevent risks for the engine, the engine ECU calculates engine oil degrading and lights up the engine oil warning light when the safety threshold is reached (Fig. 28).
Fig. 25 – Engine oil warning light

The oil replacement frequency therefore differs from that show on the service schedule and becomes flexible (15000 km - 50000 km).
The driver is informed of the need to change the oil and given a 1000 km notice.
The parameters must be reset with Examiner after changing the engine oil.

DRIVING PROFILES

The zones related to the driving profiles stored in the engine ECU are shown in the following chart (Fig. 29). The engine ECU to determine the driving profile is based on:
-Vehicle speed,-Engine rpm,-Accelerator pedal,-Coolant temperature,-Air temperature,-Fuel amount-Exhaust gas temperature

Fig. 26 – Driving profiles



A. Torque
B. Engine rpm

Possible driving profiles defined in Euro 4 applications (Fig. 26):

1 - Fast Highway
2 - Slow Highway
3 - Fast Acceleration / Uphill
4 - Extra Urban Driving
5 - Urban Driving
6 - Downhill
7 - Slow Urban Driving

Other profiles are stored in the ECU and not shown, namely:
-Warm up-Cold start

Determining the filter blockage level

The filter regeneration levels (burnt PM amount) depend on the engine operating condition (driving profile).
The engine ECU (CCM) to determine the PM accumulation level in the filter is based on the following parameters:
-Odometer-Driving profiles (a sportier driving style generates more frequent regeneration frequency).-Differential pressure sensor (see note).

The engine ECU uses the signal from the differential pressure sensor for the following strategies:

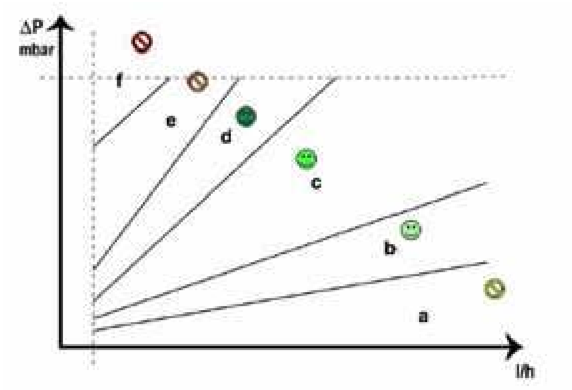
A - Euro 4 models

-This is used to check the coherence of the particulate filter obstruction parameter calculation. The engine ECU warning light (MIL) will light up if a discrepancy of the calculation made by the ECU and that made by the differential pressure.

B - Euro 5 models

-This is used to check the coherence of the particulate filter obstruction parameter calculation. The engine ECU warning light (MIL) will light up if a discrepancy of the calculation made by the ECU and that made by the differential pressure.-Regeneration is operated if the differential pressure exceeds certain values.
A maximum of 6 regenerations are attempted. After this, if the result is negative, the engine ECU lights up the MIL warning light(s) (the system advises to go to the nearest service centre to have a service regeneration procedure run due to excessive DPF obstruction).
The following chart (Fig. 27) shows the size DPF filter operating areas.

Fig. 27



DP. Differential pressure
l/h. Exhaust gas flow rate
a. Perforated filter
b. Regenerated filter
c. Intermediate zone
d. Partially obstructed filter
e. Obstructed filter
f. Fully obstructed filter

Normal operating zone: "b, c, d"

In the passage from the intermediate zone (c) to zone (d) occurs more or less rapidly according to the driving profile and the engine ECU runs a controlled regeneration procedure to bring the the differential pressure values back into zone (b) or zone (c), according to the driving profile.

Critical operating zone: "e"

Excessive filter obstruction may occur in case of lack of coherence between estimated particulate collection model in CCM and the actual particulate production and the pressure difference at the filter ends may vary more rapidly. The engine ECU will detect the overload conditions and the engine warning light (MIL) will light up on the instrument panel.
In these conditions, the engine ECU requires Service regeneration for bringing the differential pressure values back to zone (b) or zone (c).

A limited fuel flow strategy is activated to protect the engine. The vehicle performance will be reduced as a consequence.

Abnormal operating zones: "a" and "f"

Zones "a" and "f" represent the conditions in which the differential pressure is anomalous. Fully obstructed filter zone "f": the differential pressure is constantly higher than a threshold which varies according to the exhaust gas flow rate. In this condition, the engine ECU indicates filter overload by lighting up the instrument panel warning light (MIL).
In these conditions, the engine ECU requests Service regeneration attempt to bring the differential pressure values back to zone "b" or zone "c". The DPF must be replaced if the regeneration attempt fails.

A major fuel flow limitation strategy is activated to protect the engine. The vehicle performance will be reduced as a consequence.

Perforated filter zone (a): the differential pressure is lower than a given threshold which depends on flow rate. In this condition, the engine ECU indicates perforated filter state by lighting up the diagnostic warning light (E5 applications only).

DPF FILTER REGENERATION TYPES

The DPF is a mechanical filter in which particulate is trapped. Periodical cleaning - called regeneration (RGN) - is required. The regeneration process consists in burning the particulate matter collected inside the filter and clear the pore.
This process is carried out in average every 800/1000 km (the distance travelled between one regeneration and the next depends on the vehicle use and the driving profile (example: sporty, urban, highway, etc.).
There are three types of DPF regeneration:
-spontaneous-controlled-Service.

Spontaneous regeneration

The particulate matter collected in the filter burns spontaneously. No intervention by the engine ECU is required in this case.
Driving conditions directly effect exhaust gas temperature and consequently the temperature inside the filter.
The intervention thresholds are:
-exhaust gas temperature: 280°C < T > 500°C;-NO_2/PM ratio: much higher than 10.

The thresholds for spontaneously activating are difficult to reach during normal driving profiles.

Controlled regeneration

Controlled regeneration is automatically managed by the engine ECU when travelling on the road by means of controls for increasing the exhaust gas temperature to reach the particulate matter combustion threshold.
During the regeneration process, the engine ECU:
-interrupts exhaust gas recirculation (EGR);-operates the turbine in order to maintain the engine torque constant;-

activates post injections (which heat up the exhaust gases directly);

The effects of controlled regeneration

During regeneration, the engine ECU corrects some operating strategies:

- Engine torque

At constant engine rpm and load, post injection increases an engine torque increase. In order to maintain the same driving conditions and avoid engine torque variations, the engine ECU:
-reduces fuel flow during main injection,-adjusts supercharging pressure.

- Supercharger pressure adjustment

To maintain the engine torque unchanged during regeneration, the engine ECU reduces supercharger pressure to improve handling.
This is because the exhaust gases during regeneration are hotter and tend to increase turbine rotation.

- Exhaust gas recirculation adjustment (EGR)

At each regeneration, the engine ECU may actuate two EGR solenoid valve strategies:
-EGR closed: in the case, several post-injections are maintained in order to keep the exhaust gas temperature high.-EGR slightly open: in this case, the recycled gases make the air/fuel mixture richer; as a consequence, the exhaust gases are hotter than there are fewer post injections.

- Motorized throttle

During particulate filter regeneration, in case of cut-off, the post injection only is maintained to keep the exhaust gases at approximately 600°C in the oxidising catalyser. In these conditions, the engine ECU reduces the motorised throttle opening to decrease the fresh air flow taken in by the engine. This strategy prevents excessive exhaust gas cooling to prevent compromising the DPF regeneration process.

Service regeneration

Service regeneration is managed by the ECU and only activated by a diagnostic operator using the diagnostic tool (EXAMINER).
Regeneration must be carried out after the engine ECU lights up (MIL) and in presence of error code P1206.

The engine must be warm to activate Service regeneration.

If the claimed fault is present, check the parameters in Table 1 Examiner parameters shown in the Diagnostic section before running a Service regeneration.

Take note if the data determined by Examiner before the Service because the data must be submitted to TE.SE.O or other departments if the fault is not solved.

Drive a complete cycle to regenerate the filter completely after the regeneration procedure.

For DPF system diagnostics

DIAGNOSTICS (EDC16 C39 - F4)

Parameters

The following items (specific for DPF versions) are listed in the parameter environment:
-Differential sensor pressure-Particulate filter obstruction-Pre-cat temperature-Particulate filter temperature-Particulate filter state-Average distance of last five regenerations-Average time of last five regenerations-Average temperature of last five regenerations-Odometer last regeneration (km)-Odometer last DPF replacement (km)

Differential sensor pressure

This indicates the back pressure value upstream of the particulate filter.

Particulate filter obstruction

This indicates the value expressed in percentage (%) of the estimated particulate matter by the CCM

The Particulate filter obstruction parameter is calculated by the CCM on statistic basis and only meaningful when error P1206 is not present.

Pre-cat temperature

This indicates the exhaust gas temperature measured by the sensor located at the pre-cat outlet.

Particulate filter temperature

this indicates the exhaust gas temperature measured by the sensor located at the particulate filter inlet.

Particulate filter state

This indicates the level of obstruction of the particulate filter in all conditions by the CCM.

Average distance of last five regenerations

This indicates the distance travelled between one DPF regeneration and the other.

The engine ECU calculates the weighed average of the sum of the last five distances (km) travelled between one regeneration and the next (the weight of the last RGN is 70%).

Average time of last five regenerations

This indicates the average time required for the last five particulate filter regenerations.

Average temperature of last five regenerations

This indicates the average temperature of the last five particulate filter regenerations.

Odometer last regeneration (km)

This parameter indicates the distance travelled since the last regeneration (force and/or spontaneous). The value is set to 0 at the end of the successful regeneration (spontaneous and/or automatic using instrument) or when the particulate filter is replaced. If the engine ECU is replaced, the parameter must be updated with the same odometer reading in the CCM.

Odometer last DPF replacement (km)

This indicates the kilometres driven since the last particulate filter replacement. This parameter is set to 0 km by the particulate filter replacement procedure. If the engine ECU is replaced, the parameter must be updated with the same odometer reading in the CCM.

Configurations / Procedures:

The following items (specific for DPF versions) are listed in the configuration environment:

-Engine oil change-Particulate filter replacement-Particulate filter regeneration

Engine oil change (DPF versions only)

The engine oil change frequency is no longer determined by the service schedule of the car but is not based on the number of DPF regeneration cycles. Regeneration causes a higher increase of dilution of fuel in the oil sump. The engine ECU calculates engine oil degrading and informs the driver when the oil needs to be changed.

Particulate filter (DPF) replacement

Reset the DPF parameters with the Examiner procedure.

Particulate filter (DPF) regeneration

The particulate filter regeneration must must run in the following cases:

-Engine warning light (MIL) on and present of **P1206 - Level 1** in the engine ECU memory. This informs the driver that the system is requiring Service generation, carried out a diagnostic operator at a service centre, because the DPF is obstructed. In these conditions, the engine ECU actuates a recovery procedure and slightly limits the engine performance.-Engine warning light (MIL) on and present of **P2002 - Level 2** in the engine ECU memory. This informs the driver that the system is requiring Service generation, carried out a diagnostic operator at a service centre, because the DPF is excessively obstructed and probably needs to be replaced. In these conditions, the engine ECU actuates a recovery procedure and slightly limits the engine performance.

Error P1206 may be caused by failure or incorrect operation of some engineering parameters. Read the following chapter carefully: **CAUSES & TROUBLESHOOTING** below

MAIN FAULTS

As previously mentioned, the engine produces particulate matter which is trapped in the filter during normal use. The collection of particulate matter increases the pressure at turbocharger outlet and decreases vehicle performance.

This fault is indicated by the ECU by means of an error code, which indicates non-coherence between pressure read by the differential pressure sensor and the particulate % calculated by the CCM

Most typical faults:

-Engine warning light fault P1206-Poor engine efficiency

During Service regeneration, it is advisable to apply a series of loads (lights, windscreen wiper, A/C system, etc.) to increase the possibility of success.

There could be two causes if the Service regeneration is not successful:

-excessively obstructed filter (in this case, the DPF must be replaced)-injection system problems (see injector paragraph below).

CAUSES & TROUBLESHOOTING

The particulate filter obstruction parameter is a statistic calculation run by the engine ECU. If the engine ECU finds an errors in this calculation, DPF system faults are caused: the MIL is lit up and error P1206 is generated.

The differential pressure sensor and its signal helps the engine ECU to verify calculated value plausibility.

In case of normal use, there may be various causes of incorrect system operation:

1 - Incorrect thermostat operation
2 - Incorrect flow meter reading
3 - Incorrect injection operation
4 - Presence of oil in intake circuit
5 - Turbo compressor problems
6 - EGR value problems
7 - Condensation
8 - Oil leakage from valve guides

Thermostat

Incorrect operation of the thermostat (including excessive opening and closing tolerances) causes a high production of smokiness (causes a different calibration of the reference threshold in the engine ECU: approximately 88° C): this causes incorrect calculation (rounded down of the amount of PM collected in the DPF.

This amount of particulate in excess not calculated by the ECU causes incoherence between the percentage calculated by CCM and the back pressure in exhaust. This causes the engine warning light (MIL) to light up.

Solution:

this problem is diagnosed by running a test drive (with engine warm) at a speed from 70 to 90 km/h in 4/5 gear. With EXAMINER on-board, check that the engine coolant temperature is always: **> 85**℃

If the temperature is lower than 85° C, replace the thermostat and check that with the new component, the engine coolant temperature is higher than the reference value.

The tolerance of the mechanical thermostat generate lower engine operation temperature, causing an incorrect EGR management, causing more generation of PM than that estimated by the engine ECU.

For EURO 5, the threshold is 70° C.

Air flow meter

Incorrect operation of the air flow meter (including excessive reading tolerances) causes high smoke production.
In this case, the high production of smoke is caused by a greater opening of the EGR with consequent exhaust gas recirculation inside the engine.

Solution:

Diagnosing this fault is not simple. This is because flow meter problems may occur also with incorrect air flow readings when engine is idling.
The solution in this case is to replace the air flow meter.

The air mass measured with the engine idling for at least 2 minutes (to close the EGR) and ensure intake air temperature measured by air flow meter lower than 35 °C:
- for 1.9 and 2.4 JTD engines, 480 mg/iniet.
- for 1.3 JTD engines, from 280 to 310 mg/iniet.

Injectors

The incorrect FBC value (Fuel Borne Catalyst or injection time correction factor) is analysed by means of EXAMINER checking that the FBC of the single injector is comprised between -2 and +2 mm3/injet with the engine idling and warm.
The incorrect FBC value generates the following problems:
-high particulate production-regeneration cannot be run.

Solution:

This problems may be solved in principle as follows:
-check correspondence between IMA injector codes and injector codes written in ECU.-try to reset self-learnt injection amount.-replace the injectors.

Check number of washers present in injector seat and thickness. Only one washer must be present. The thickness must be:
- 2mm for 1.6 JTD, 1.9 JTD and 2.4 JTDM
- 1.5mm for 1.3 JTDM.

Presence of oil in intake circuit

Check for presence of oil in intake circuit, check all pipes from compressor inlet to intake manifold inlet.
As known, the presence of a small coat of oil in diesel pipes is normal. Check for "puddles" in the air intake which are not normal.
The presence of oil in intake may depend on several causes:
-excessive oil level-high engine blow-by-turbocharger problem

Solution:

Regardless of the cause of the presence of oil, the first operation consists in washing out the intake circuit (air path).
Analysing the single causes:

- excessive oil level

-The oil level must always be between the min. and the max. level. When topping up engine oil, never excess the maximum level, preferably 2 mm under the max. line (restore correct level if required).

- high engine blow-by

-Run a diagnostic test on the engine (compression test).

Turbocharger problem

In many cases, the presence of a turbocharger fault is indicated by the presence of CCM errors. In this case, follow the procedures indicated for the specific procedure (see applicable Service News).
Diagnosing this component with regards to DPF problems is more difficult.
Possible faults include:

- presence of oil at compressor outlet

-turbocharger replacement and intake circuit washing (pipes and intercooler)

- max. supercharging pressure not reached

-Check conditions of pipes and intercooler checking for leakage of oil. Replace the turbocharger if leakage of air is found. The difference between target pressure and measured pressure is 100 - 200 mbar.

Run the turbo pressure test when the DPF is not obstructed.

- excessive acceleration response delay

-Replace turbocharger.

EGR valve

The EGR value problems are the most difficult to diagnose.
Faults of this component will cause high smokiness and as in the other cases, incoherent CCM data and consequent lighting of the engine warning light (MIL) and the generation of fault code P1206.
In the most severe cases, the ECU has an internal diagnostic procedure with the generation of a specific error code.
The faults of this component are not easy to diagnose in the least severe cases. Replacement is therefore recommended.

Solution:

As previously mentioned, the component should be replaced if faults caused by this component are found.
In many cases, cleaning this component may be useful.
This solution may apply in cases of vehicles with high odometer reading. It is advisable to replace the component on new vehicles.

Condensation

Water may be accumulated in the DPF (condensation). This occurs on new cars with low odometer reading on which no regeneration has yet been carried out. This causes a fault reading by the differential pressure sensor (high pressure - obstructed filter - error P1206). The engine ECU light up the MIL warning light.

Solution:

Disconnect the central unit under the body (catalyser + DPF) and eliminate the water contained in the DPF.
Oil leakage from valve guides
Oil leakage from one or more valves generates a percentage of PM which is not included in calculation.
Solution:
Check for oil scaling in the combustion chamber (piston top and injectors) and not intake.

RELATED TOPICS

See SN 00.10.09 more information on instrument panel indications related to degraded engine oil and the obstructed particulate filter.
See the following for diagnosing engine operation faults caused by particulate filter obstruction:
-SN - 10.16.09 for 1.3 Multijet;-SN - 10.11.09 for 1.9 JTD 8/16v and 2.4 JTD 20v
Refer to specific SN (where provided) for each model for upgrading the CCM software.

2.3 JTD Euro 5 Engine Intro

250 - DUCATO 2.3 JTD E4/E5 General information (Euro 5, Euro 5)

VALID FOR VERSIONS WITH: Euro 5

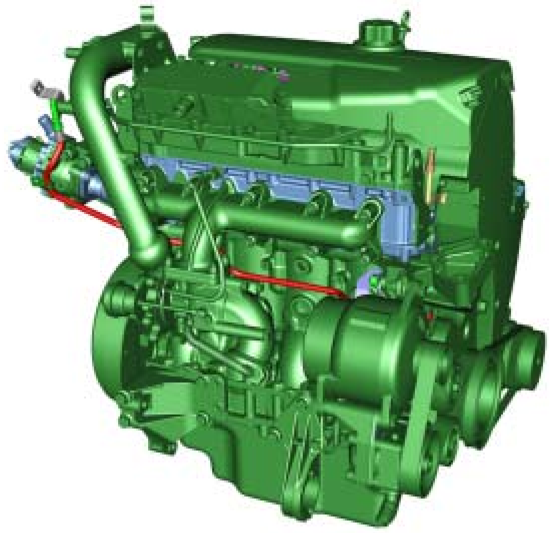
General information

The main specifications of the 2.3 JTD Euro 5 engines are as follows:

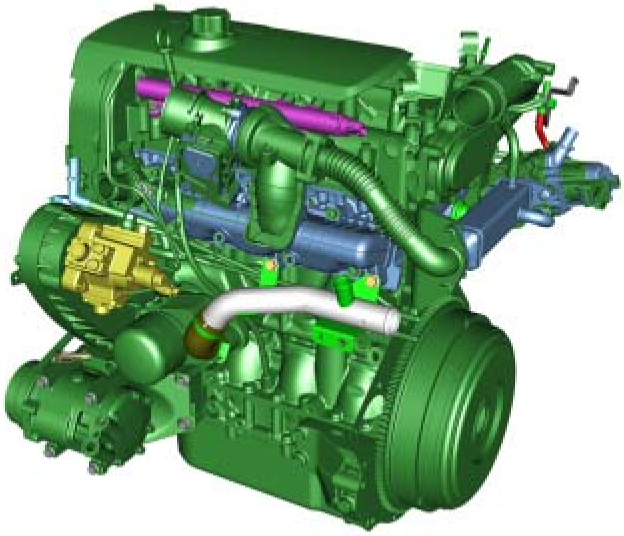
- Supercharged MultiJet diesel engine with fixed geometry turbocharger and wastegate valve and a power of 130 HP;
- Supercharged MultiJet diesel engine with variable geometry turbocharger and a power of 150 HP;
- emission level conforms with Euro 5 standards;
- four cylinder in-line arrangement;
- displacement 2287 cc;
- bore: 88 mm;
- stroke: 94 mm;
- compression ratio: 16.2:1;
- dual overhead camshaft with 16-valve timing system;
- aluminium alloy head;
- camshaft housing containing the camshaft supports;
- timing system with drive belt on the control shaft for the inlet valves and chain-driven idler for the exhaust valve control shaft;
- rocker arms with hydraulic tappets;
- centrifugal type water pump incorporated in the crankcase;
- engine management control unit: MJD 8F3;
- high pressure pump: Bosch CP1h;
- mono bloc made from spheroidal cast iron;
- steel oil sump.

VALID FOR VERSIONS WITH: 130 CV, Euro 5

View of engine, exhaust side.

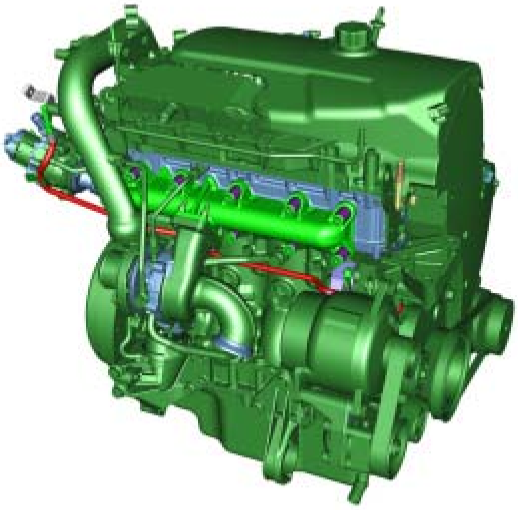


View of engine, inlet side.

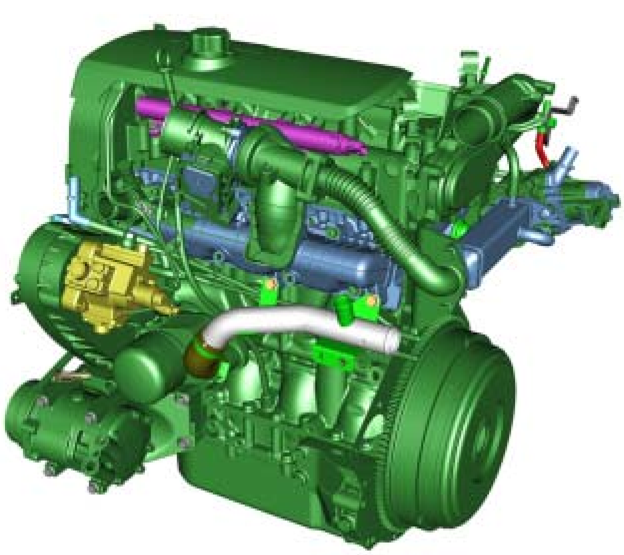


VALID FOR VERSIONS WITH: Euro 5, 150 CV

View of engine, exhaust side.



View of engine, inlet side.



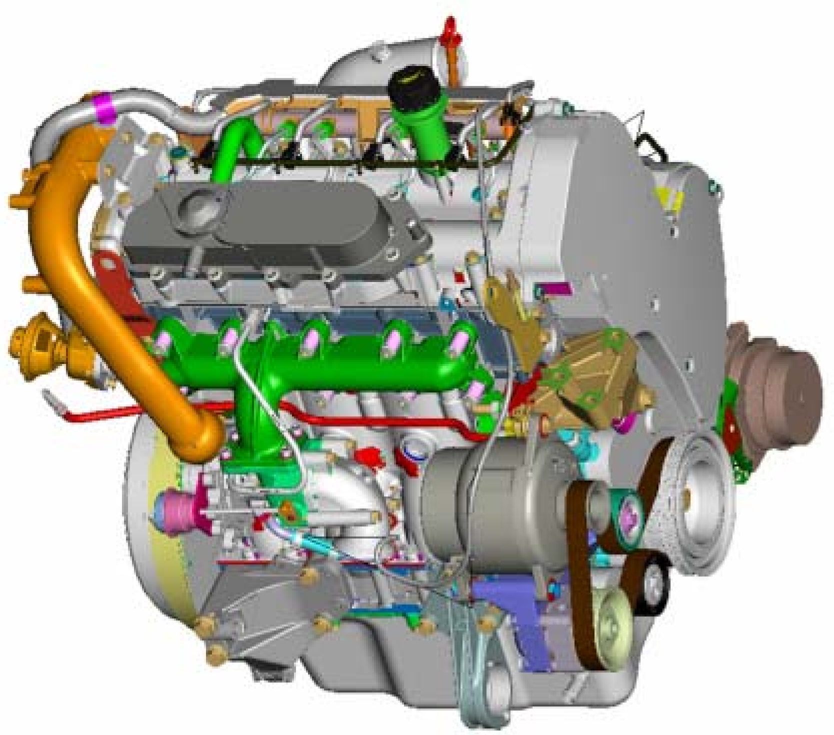
250 - DUCATO 2.3 JTD E4/E5 Introduction

Introduction

The main specifications of the 2.3 JTD engine are as follows:

- supercharged Diesel engine with fixed geometry turbocharger;
- emission level conforms with Euro 4 standards
- power developed: 120 CV and 130 CV;
- four cylinder in-line arrangement;
- cylinder capacity 2287 cc;
- bore: 88 mm;
- stroke: 94 mm;
- compression ratio: 19±0,5:1
- dual overhead camshaft with 16 valve timing system;
- aluminium alloy head;
- camshaft housing containing the camshaft supports;
- timing system with drive belt on the control shaft for the inlet valves and chain-driven idler for the exhaust valve control shaft;
- rocker arms with hydraulic tappets;
- centrifugal type water pump incorporated in the crankcase;
- engine management control unit: Bosch EDC16C39;
- high pressure pump: Bosch CP1h
- mono bloc made from spheriodal cast iron;
- steel oil sump;

View of engine, exhaust side.



View of engine, inlet side.