



## GESTIONE ELETTRONICA MOTORI DIESEL

300 - Qubo

## DIESEL ENGINE ELECTRONIC MANAGEMENT - DESCRIPTION

An electronic control system supervises and governs all engine parameters to optimise performance and fuel consumption by means of a real-time response to different operating conditions.

Diesel engines are equipped with a COMMON RAIL type injection system.

This features the use of an electronically controlled high injection pressure. The supply of fuel, known as the pilot injection, is optimized by the electronic control unit by means of the injector, rather than being managed by the pump.

In this 4 valve per cylinder version, the common rail injection system uses Multijet technology: i.e. during each engine stroke, it carries out more than the two injections normally used: it performs two pre-injections (before the piston is at top dead centre), one main and two post-injections.

This solution improves fuel consumption, emissions, noise levels and performance because it allows better control of temperature in the combustion chamber by lowering the maximum value and extending the optimum combustion area.

Depending on the signals received from numerous sensors, the control unit manages the injectors connected to it, handling the following systems:

- fuel supply;
- air supply;
- heater plugs;
- accelerator pedal;
- engine cooling;
- emission control (oxygen sensor)

To respect the latest emissions control regulation (EURO 4), the most recent electronic on-board management version is used, comprising new components (injectors, pressure regulator and high pressure pump, digital flow meter) and the adoption of a Lambda sensor.

For more details,

See descriptions 1060 DIESEL INJECTION FUEL SYSTEM

The system is also controlled by dedicated relays in the engine compartment junction unit. Lines supplying the control unit and various system components (sensors and actuators) are protected by dedicated fuses that are also located in the junction unit.

# DIESEL ENGINE ELECTRONIC MANAGEMENT - FUNCTIONAL DESCRIPTION

Engine management control unit M010 controls and governs the entire electronic ignition and injection system.

The key-operated supply comes from the line protected by fuse F216 of the engine compartment control unit B001 to pin 23 of connector A of M010.

The direct power supply comes from the line protected by fuse F18 of the engine compartment control unit B001 to pin 50 of the connector A of M010.

Pins 1, 2 and 3 of connector A of M010 are earthed (C040).

The main injection relay switch T09 of B001 controls the entire system: it is protected by the line protected by fuse F18 of engine compartment control unit B001 and is energised by a control signal (earth) from pin 80 of connector A of control unit M010 and thus sends the power supply:

- to pin 5 of connector A of the control unit, through the line from fuse F17 of B001;
- to pins 4 and 6 of connector A of the control unit itself, through the line from fuse F22 of B001;
- to pin 5 of connector B of the control unit itself, to the oxygen sensor K040, the plug control unit M015 and the EGR solenoid valve L030 through the line from fuse F11 of B001.

The fuel pump relay T10 of B001 is supplied by the line for fuse F21 of B001. It is energised by a control signal from pin 85 of connector A of the control unit M010 and supplies power to fuel pump N040.

The control unit M015, which manages preheating of the heater plugs A040 is supplied - connector B - directly from the battery through the line protected by the MAXIFUSE F81 of B001.

It is supplied - connector A - from the line for fuse F11 of B001 and exchanges command and control signals with pins 70 and 74 of connector A of M010, which controls the timing. Connector C is connected to the heater plugs A040.

The engine management control unit M010 receives signals from the various sensors, thereby keeping all the engine operating parameters under control.

Rpm sensor K046 supplies information on engine speed, through a frequency signal exchanged with pins 43 and 59 of connector B of control unit M010.

The timing sensor K047 is supplied from pin 21 of connector B of M010. It receives a reference earth from pin 56 of connector B of control unit M010 and this in turn generates a frequency signal corresponding to the phase at pin 25 of connector B.

The engine temperature sensor K036 receives a reference earth from pin 29 of connector B of control unit M010 and sends a signal proportional to the engine coolant temperature to pin 54 of connector B.

The air flow meter K041 - with an ignition controlled supply (15/54) from fuse F27 of the control unit B001 - receives a reference earth from pin 27 of connector B of M010 and sends a signal proportional to the air flow rate to pin 14 of connector B.

An air temperature sensor inside K041 also sends an air temperature signal to pin 10 of connector B of M010.

Accelerator pedal K055 contains two built-in potentiometers (a main one and a safety one).

The former receives power and earth signals from pins 35 and 83 respectively of connector A of M010 and sends a corresponding signal to pin 65.

The latter receives power and earth signals respectively from pins 15 and 32 of connector A of M010 and sends a signal to pin 41.

The fuel temperature sensor, incorporated in the diesel filter K101, detects the temperature of the incoming diesel fuel. It receives a reference earth from pin 61 of connector A of M010 and sends a fuel temperature signal to pin 13.

The turbocharging sensor K082 measures the pressure in the intake chamber, downstream of the turbocharger. It is supplied by pin 24 of connector B of M010 and receives a reference earth from pin 23 of connector B. The signal corresponding to the pressure value is sent to pin 41 of connector B of control unit M010.

Fuel pressure sensor K083 supplies the injection control unit with a feedback signal to modulate injection pressure and duration.

It receives power and a reference earth respectively from pins 38 and 6 of connector B of M010; it then sends a pressure signal to pin 8.

The oxygen sensor K040 - ONLY PRESENT ON VERSIONS WITHOUT PARTICULATE FILTER - sends signals to pins 44, 45 and 47 of connector A of M010 while pin 46 supplies a reference earth. Sensor K040 is heated by a resistance to ensure it works efficiently even when cold. The coil is supplied by the line for fuse F11 of B001 and receives an earth signal from pin 12 of connector A of control unit M010.

The fuel pressure regulator on the rail N087 controls the high pressure produced by the pump; the two control signals come from pins 4 and 34 of connector B of control unit M010.

EGR solenoid valve L030 controls exhaust gas recirculation. It is supplied by the line protected by fuse F11 of B001 and is controlled by a signal from pin 15 of connector B of M010.

The engine management control unit sends the command to the injectors N070 from pins 16-47, 17-49, 31-48, 1-46 of connector B of M010 for cylinders 1, 2, 3 and 4, respectively.

Pin 81 of connector A of M010 receives a signal from brake light switch I030 - NO contact - provided with an ignition-operated power supply from fuse F37 of Body Computer M001. Through the CAN, it receives a signal - NC contact - from brake light switch I030, supplied with an ignition-operated supply from fuse F51 of Body Computer M001.

Pin 22 of connector A of M010 receives the signal from the clutch switch I031, with ignition-controlled supply from the fuse F87 of the Body Computer M001.

The control unit M010 receives - at pin 9 of connector B - a signal for the minimum engine oil pressure sensor K030.

The water in diesel filter sensor built into filter K101 receives an ignition-operated supply from fuse F87 of control unit B001 and sends a corresponding signal to pin 90 of connector A of M010.

Control unit M010 is then connected through the CAN - pins 40-64 of connector A of M010 - to the Body Computer M001 and to the other network nodes: information on the following is sent through this connection:

- system self-diagnosis, which may be used by connecting to connector R010;
- engine coolant temperature, which is sent to the instrument panel E050 which manages the gauge and the warning light;
- engine rpm, which is sent to the instrument panel E050 rev counter;
- minimum engine oil pressure, which is sent to the instrument panel E050 which manages the warning light;
- heater plugs pre-heating, which is sent to instrument panel E050 that controls the warning light;
- water in the diesel filter, sent to instrument panel E050, which controls the indication on the display;

It receives the speedometer signal, via the CAN, produced by the ABS control unit M050.

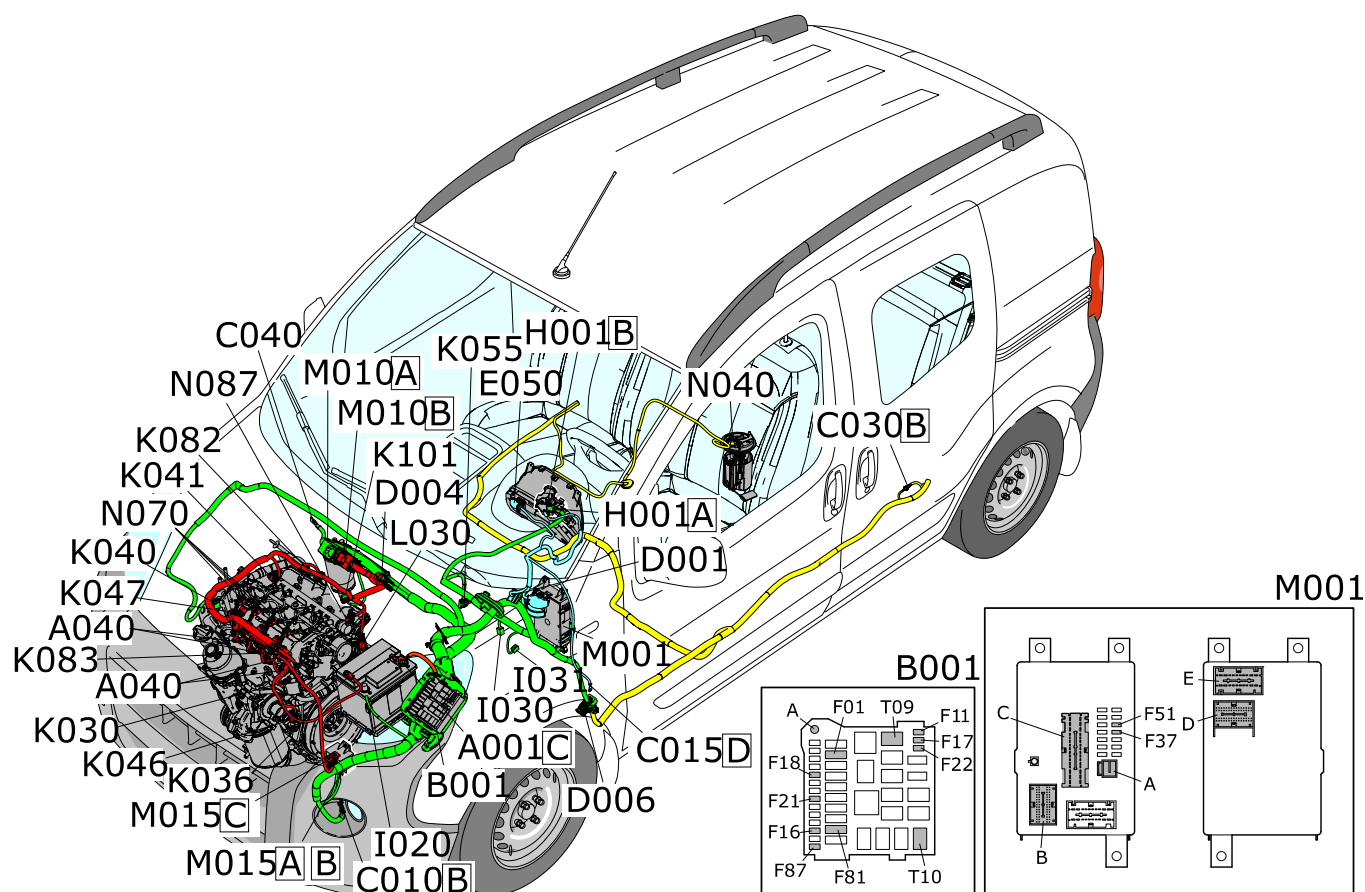
The self-diagnosis system for the control unit M010 also produces a signal - which comes out from 78 of connector A - which is connected directly to the EOBD warning light in the instrument panel E050, pin 18.



Component Code	Description	Reference to the operation
A001	BATTERY	Op. 5530B10 BATTERY - R+R
A040	HEATER PLUGS	Op. 5520C10 HEATER PLUGS - R+R
A040	HEATER PLUGS	Op. 5590A02 HEATER PLUG CONNECTOR - R.R.
B001	JUNCTION UNIT	Op. 5505A28 CONTAINER FOR ADDITIONAL JUNCTION UNIT IN ENGINE COMPARTMENT - R.R.
C010	LEFT FRONT EARTH	-
C015	DASHBOARD EARTH, DRIVER'S SIDE	-
C030	LEFT REAR EARTH	-
C040	EARTH ON ENGINE	-
D001	FRONT/DASHBOARD COUPLING	-
D004	FRONT/ENGINE COUPLING (ENGINE)	-
D006	FRONT/REAR COUPLING	-
E050	INSTRUMENT PANEL	Op. 5560B10 CONTROL PANEL - R+R
I020	REVERSING LIGHTS SWITCH	Op. 5550D22 REVERSING LIGHT SWITCH - R+R
I030	BRAKE PEDAL SWITCH	Op. 1060G38 BRAKE PEDAL SWITCH - R.R.
I031	CLUTCH PEDAL SWITCH	Op. 1060D42 SWITCH ON CLUTCH PEDAL- R. R (DIESEL ENGINES)
K030	ENGINE OIL PRESSURE SENSOR (SWITCH) (ENGINE)	Op. 1084A42 ENGINE OIL PRESSURE WARNING LIGHT SWITCH - R.R.
K030	ENGINE OIL PRESSURE SENSOR (SWITCH) (ENGINE)	Op. 5590A03 ENGINE OIL PRESSURE SENSOR CONNECTOR - R.R.
K036	ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT (ENGINE)	Op. 1060G14 ENGINE COOLANT TEMPERATURE SENSOR - R.R.
K036	ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT (ENGINE)	Op. 5590A06 ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT CONNECTOR - R.R.
K040	LAMBDA SENSOR	Op. 1080B90 LAMBDA SENSOR - R.R.
K041	AIR FLOW METER (ENGINE)	Op. 1060G10 AIR FLOW METER - R.R.
K041	AIR FLOW METER (ENGINE)	Op. 5590A08 AIR FLOW METER CONNECTOR - R.R.
K046	RPM SENSOR (ENGINE)	Op. 1060G20 ENGINE RPM SENSOR - R.R.
K046	RPM SENSOR (ENGINE)	Op. 5590A10 RPM SENSOR CONNECTOR - R.R.
K047	TIMING SENSOR (ENGINE)	Op. 1060G22 CAM ANGLE SENSOR - R.R.

K047	TIMING SENSOR (ENGINE)	Op. 5590A11 PHASE SENSOR CONNECTOR - R.R.
K055	ACCELERATOR PEDAL POTENTIOMETER	Op. 1068A20 ACCELERATOR PEDAL WITH BUILT-IN POTENTIOMETER - R.R
K082	SUPERCHARGING SENSOR	Op. 1060G16 EXCESS PRESSURE SENSOR - R.R.
K082	SUPERCHARGING SENSOR	Op. 5590A12 SUPERCHARGING SENSOR CONNECTOR - R.R.
K083	FUEL PRESSURE SENSOR (ENGINE)	Op. 1060G28 FUEL PRESSURE SENSOR ON FUEL MANIFOLD TO INJECTORS - R.R
K083	FUEL PRESSURE SENSOR (ENGINE)	Op. 5590A13 FUEL PRESSURE SENSOR CONNECTOR - R.R.
K101	FUEL TEMPERATURE AND WATER IN FUEL FILTER SENSOR	Op. 1060G30 WATER PRESENCE SENSOR IN FUEL FILTER - R.R.
L030	EGR SOLENOID (ENGINE)	Op. 1080C82 E.G.R. - VALVE HEAT EXCHANGER ASSEMBLY - CONNECTOR PIPES - R.R.
L030	EGR SOLENOID (ENGINE)	Op. 5590A21 EGR SOLENOID VALVE CONNECTOR - R.R.
M001	BODY COMPUTER	Op. 5505A35 MAIN BODY COMPUTER/JUNCTION UNIT - R.R.
M010	ENGINE MANAGEMENT CONTROL UNIT	Op. 1060G80 DIESEL ELECTRONIC INJECTION CONTROL UNIT - R.R
M015	HEATER PLUGS CONTROL UNIT	Op. 5520C20 HEATER PLUGS CONTROL UNIT - R.R
M015	HEATER PLUGS CONTROL UNIT	Op. 5590A26 GLOW PLUG CONTROL UNIT CONNECTOR - R.R.
N040	FUEL PUMP AND LEVEL GAUGE	Op. 1040A70 SUBMERGED PUMP ASSEMBLY COMPLETE WITH LEVEL GAUGE CONTROL - R + R
N070	INJECTOR	Op. 1060F10 INJECTORS - R.R.
N070	INJECTOR	Op. 5590A27 INJECTOR CONNECTOR - R.R.
N087	FUEL PRESSURE REGULATOR ON RAIL	Op. 1060G31 FUEL PRESSURE REGULATOR ON SINGLE MANIFOLD TO INJECTORS - R.R.
N087	FUEL PRESSURE REGULATOR ON RAIL	Op. 5590A30 FUEL PRESSURE REGULATOR CONNECTOR ON RAIL - R.R.

# DIESEL ENGINE ELECTRONIC MANAGEMENT - COMPONENT LOCATION



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A040	HEATER PLUGS	Op. 5590A02 HEATER PLUG CONNECTOR - R.R.
B001	JUNCTION UNIT	Op. 5505A28 CONTAINER FOR ADDITIONAL JUNCTION UNIT IN ENGINE COMPARTMENT - R.R.
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C015	DASHBOARD EARTH, DRIVER'S SIDE	-
C030	LEFT REAR EARTH	-
C040	EARTH ON ENGINE	-
D001	FRONT/DASHBOARD COUPLING	-
D004	FRONT/ENGINE COUPLING (ENGINE)	-
D006	FRONT/REAR COUPLING	-
E050	INSTRUMENT PANEL	Op. 5560B10 CONTROL PANEL - R+R
I020	REVERSING LIGHTS SWITCH	Op. 5550D22 REVERSING LIGHT SWITCH - R+R
I030	BRAKE PEDAL SWITCH	Op. 1060G38 BRAKE PEDAL SWITCH - R.R.
I031	CLUTCH PEDAL SWITCH	Op. 1060D42
K030	ENGINE OIL PRESSURE SENSOR (SWITCH) (ENGINE)	Op. 1084A42 ENGINE OIL PRESSURE WARNING LIGHT SWITCH - R.R.
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K036	ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT (ENGINE)	Op. 5590A06 ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT CONNECTOR - R.R.
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K046	RPM SENSOR (ENGINE)	Op. 5590A10 RPM SENSOR CONNECTOR - R.R.
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K047	TIMING SENSOR (ENGINE)	Op. 5590A11 PHASE SENSOR CONNECTOR - R.R.
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K082	SUPERCHARGING SENSOR	Op. 1060G16 EXCESS PRESSURE SENSOR - R.R.
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K083	FUEL PRESSURE SENSOR (ENGINE)	Op. 5590A13 FUEL PRESSURE SENSOR CONNECTOR - R.R.
K101	FUEL TEMPERATURE AND WATER IN FUEL FILTER SENSOR	Op. 1060G30 WATER PRESENCE SENSOR IN FUEL FILTER - R.R.
L030	EGR SOLENOID (ENGINE)	Op. 1080C82 E.G.R. - VALVE HEAT EXCHANGER ASSEMBLY - CONNECTOR PIPES - R.R.
L030	EGR SOLENOID (ENGINE)	Op. 5590A21 EGR SOLENOID VALVE CONNECTOR - R.R.
M001	BODY COMPUTER	Op. 5505A35 MAIN BODY COMPUTER/JUNCTION UNIT - R.R.
M010	ENGINE MANAGEMENT CONTROL UNIT	Op. 1060G80 DIESEL ELECTRONIC INJECTION CONTROL UNIT - R.R.
M015	HEATER PLUGS CONTROL UNIT	Op. 5520C20 HEATER PLUGS CONTROL UNIT - R.R.
M015	HEATER PLUGS CONTROL UNIT	Op. 5590A26 GLOW PLUG CONTROL UNIT CONNECTOR - R.R.
N040	FUEL PUMP AND LEVEL GAUGE	Op. 1040A70 SUBMERGED PUMP ASSEMBLY COMPLETE WITH LEVEL GAUGE CONTROL - R + R
N070	INJECTOR	Op. 1060F10 INJECTORS - R.R.
N070	INJECTOR	Op. 5590A27 INJECTOR CONNECTOR - R.R.
N087	FUEL PRESSURE REGULATOR ON RAIL	Op. 1060G31 FUEL PRESSURE REGULATOR ON SINGLE MANIFOLD TO INJECTORS - R.R.
N087	FUEL PRESSURE REGULATOR ON RAIL	Op. 5590A30 FUEL PRESSURE REGULATOR CONNECTOR ON RAIL - R.R.

ELECTRICAL EQUIPMENT 1 ELECTRICAL FUNCTIONS ADDITIONAL INFORMATION CABLE COLOR CODE KEY

Each cable in the wiring diagrams features a code (with one or two letters) which identifies the colour, as set out in the table below.

Cable colour	Code
BLACK	N
WHITE	B
LIGHT BLUE	A
BROWN	M
YELLOW	G
RED	R
GREEN	V
GREY	H
PINK	S
ORANGE	C
PURPLE	Z
BLUE	L

 In the combined colour cables, the first colour indicated is the predominant one. E.g. R/V = red cable with green stripes