



Technical and product information



OVERVIEW



NEWS

Good visibility
for safety



FOCUS

The exhaust system:
a complex, efficient circuit



A/C SYSTEM

External temperature sensors
and pressure switches



GARAGE

Repair methods:
Toyota Yaris III

1945
2020

» #thefuturerestartsfromhere

75
TOGETHER
SINCE 1945



The world has slowed down, **but we have learned to find new ways** of dedicating ourselves to our loved ones, our passions and our work.

We start again from here, with a new way of staying close to each other.







For 75 years, we at M&D Group have faced the challenges of a world that never stands still.

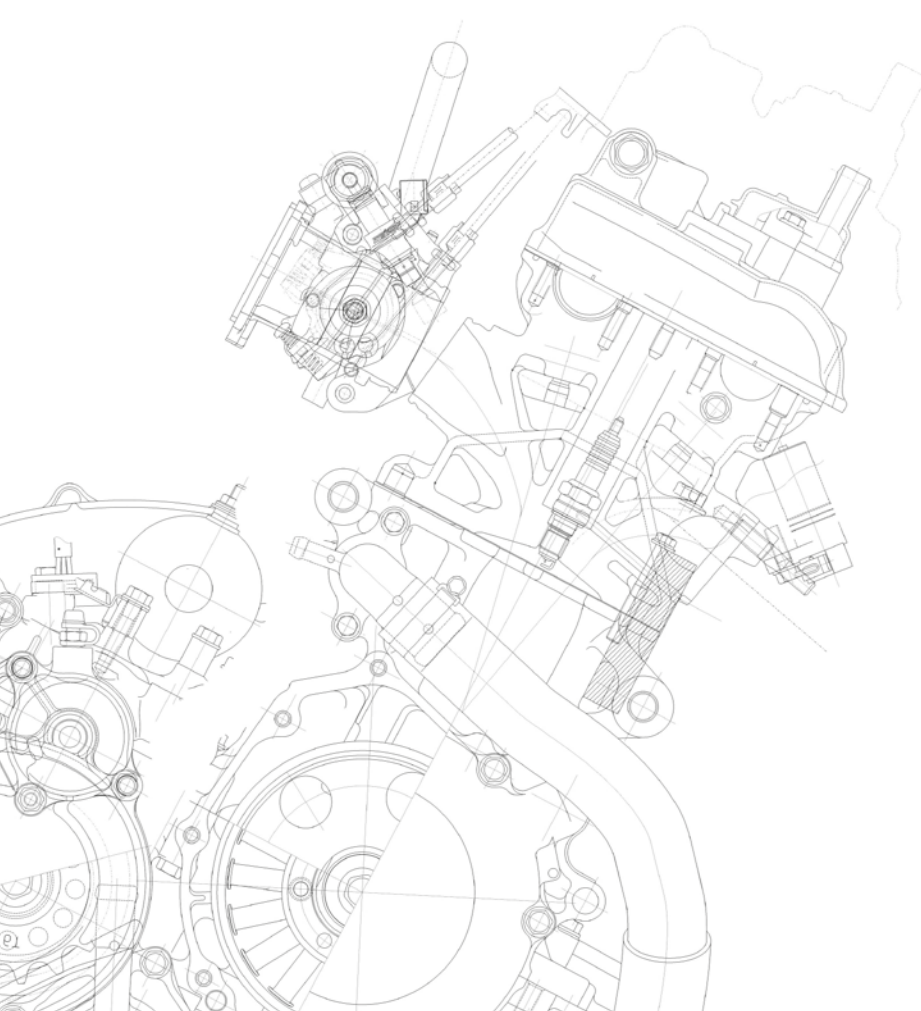


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OVERVIEW

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M&D Group

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With the technical support of:

INFOPRO
digital

For further information:
marketing@meat-doria.com



NEWS

Good visibility for safety



“ The windshield wiper system can be damaged by being overloaded or due to water and damp in the windshield wiper motor circuitry. ”



WINDSCREEN WIPER MOTOR

As an important system for the safety of the driver and passengers alike, the first windshield wiper systems were developed in the early years of the last century.

The first mechanical prototype was made by Mary Anderson, an American who had the idea during a New York taxi ride in 1903. Due to a heavy snowfall, the taxi driver was forced to stop several times to clean the windshield, which obviously increased the charge for the ride.

This experience inspired Mary Anderson to create a system for wiping the windshield which consisted in a manual mechanism operated from inside the passenger compartment; she completed the design and patented it, despite the scepticism of her contemporaries.

However, the extraordinary practicality of the invention led to the development of other designs and prototypes, resulting eventually in the creation of intermittent electric windshield wipers like the ones familiar to us today. But it was only in the late Sixties that such systems were introduced on a large scale.

The Nineties saw major technological developments with the introduction of intelligent systems which



used a sensor to regulate the speed of the wipers to suit the intensity of the rainfall.

How are windshield wipers actuated?

Windscreen wipers are actuated by a timed relay which sends a series of electrical signals to the motor, under the control of the selector on the steering column.

More recent cars feature an automatic windscreen wiper mode, in which the speed of the wipers is controlled by the rain sensor at the top of the windscreen; in this mode the steering column selector is bypassed and does not control the system.

Windscreen wiper systems, which by nature do not have a constant duty cycle - they are used when required, for short periods and subject to high mechanical stress - may be damaged for the following reasons:

- **Overloading** by snow, dirt and other causes of friction accumulated on the windscreen, which make it hard for the windscreen or rear window wipers to do their job;
- **Water and damp** in the windscreen wiper motor circuits, which rust the contacts and irreparably damage the electrical systems.

Together with the windscreen wiper motor, **the frame may also be damaged**, forced out of its guides or fulcrums when overloaded; and the bearings and bushes in the wiper joints can also wear out too quickly.

Depending on the seriousness of the damage and the type of spare parts available, it may be sufficient to replace the wipers themselves (if the damage is not electrical) or just the motor. However, often the only option offered to the owner is to replace the entire windscreen washer system, and the entire component must be swapped out.

Windscreen washer systems usually have other spare parts, like the windscreen washer pump and the wiper brushes, as well as the wipers themselves.

Our range and our quality tests

M&D Group is offering a new product range with **over 400 item codes for windscreen wiper motors and 60 complete windscreen washer systems**.

The range is continually being updated, with the objective of growing to be the most complete product offering on the market, with solutions for the entire distribution chain.

Our windscreen wiper motors and complete assemblies are subjected to **rigorous quality controls** and must pass the following production line tests: rated and test voltage, rated and maximum current, no load speed, nominal and peak torque, reduction ratio, protection rating, and weight.

Our range of products in this category is rounded out by our already available **windscreen washer pumps**, with over 80 items available from stock.

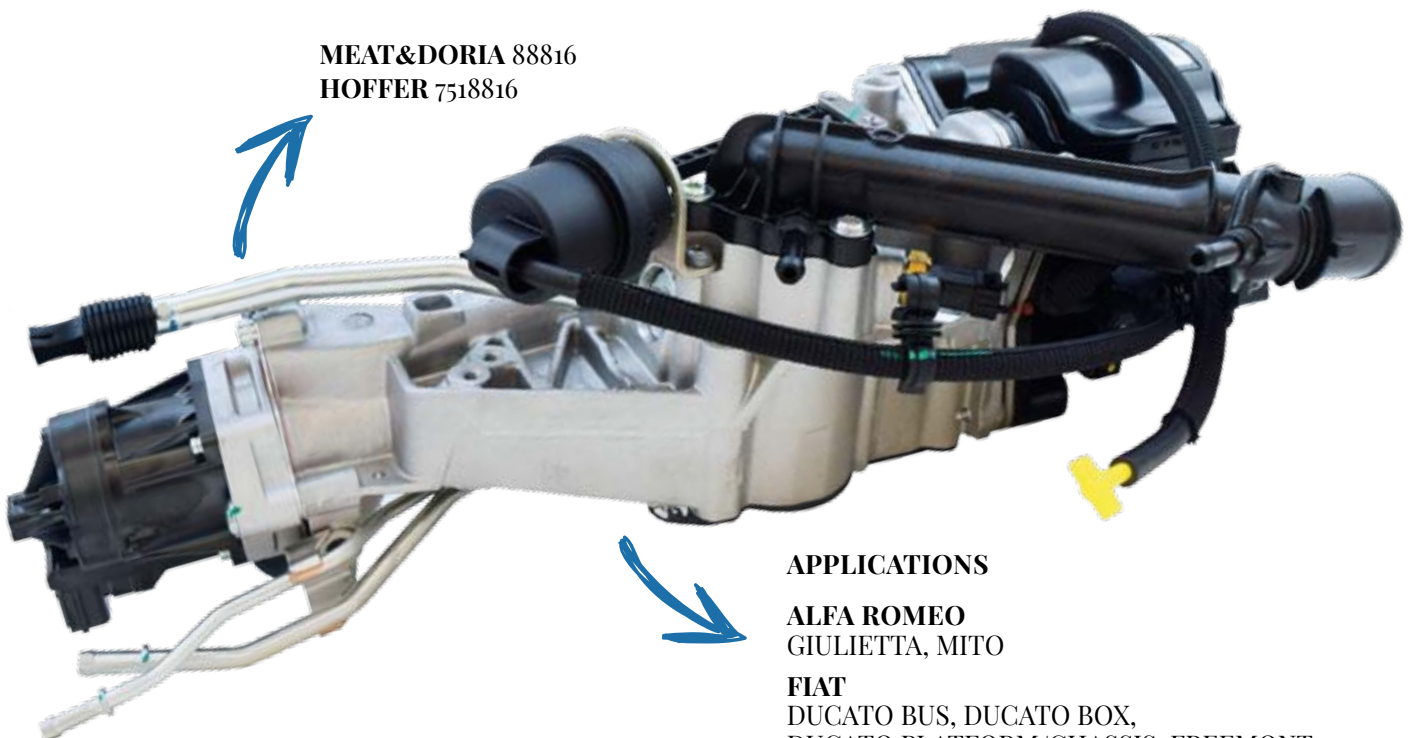


FOCUS

The exhaust system: a complex, efficient circuit

“ An engine’s exhaust circuit consists of several subsystems: the EGR circuit, the exhaust gas management and monitoring systems, and the SCR systems. ”

MEAT&DORIA 88816
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APPLICATIONS

ALFA ROMEO
GIULIETTA, MITO

FIAT
DUCATO BUS, DUCATO BOX,
DUCATO PLATFORM/CHASSIS, FREEMONT

OPEL
ZAFIRA TOURER, INSIGNIA



A modern exhaust system is designed to convey the combusted engine gas to the rear of the vehicle in complete safety.

It plays an essential role in reducing environmental pollution and optimising driver and passenger comfort and the efficiency of the engine itself.

The operation of the exhaust system relates to the following issues:

- **Health:** the exhaust pipes keep the noxious gases away from the passenger compartment and its occupants.
- **Temperature:** exhaust gas is very hot, and the exhaust gas lines contain and dissipate the heat efficiently.
- **Noise:** the exhaust system also acts as a silencer.
- **Engine management:** by monitoring and analysing the exhaust gas, the engine control unit easily

understands whether the engine is at its proper combustion settings, and can immediately remedy the situation as needed.

- **Pollution reduction and abatement:** the amount of polluting substances emitted by the engine can be reduced with advanced systems. The applicable regulations are increasingly restrictive and advanced exhaust gas after-treatment systems are in continual development.

An engine's exhaust circuit consists of several subsystems: **the EGR circuit, the exhaust gas management and monitoring systems, and the selective catalytic reduction (SCR) systems.**

The EGR system has the following components

EGR COOLER



EGR VALVE



SOLENOID VALVE



EGR ASSEMBLY



The EGR (Exhaust Gas Recirculation) circuit

The EGR circuit returns a specific amount of engine exhaust gas - generally 5 to 15% - back to the combustion chamber via the exhaust manifold and intake manifold.

The combusted gas is inert, and thus does not react with the atmosphere and the fuel injected into the chamber. However, it does occupy a certain volume in the cylinders, and thus reduces the peak temperature in the combustion chamber and hence the amount of nitrogen oxide (NO_x) produced.

Nitrogen oxide is a toxic pollutant which forms in high temperature combustion conditions.

Lowering the engine's operating temperature thus

prevents it being formed and reduces the vehicle's environmental impact.

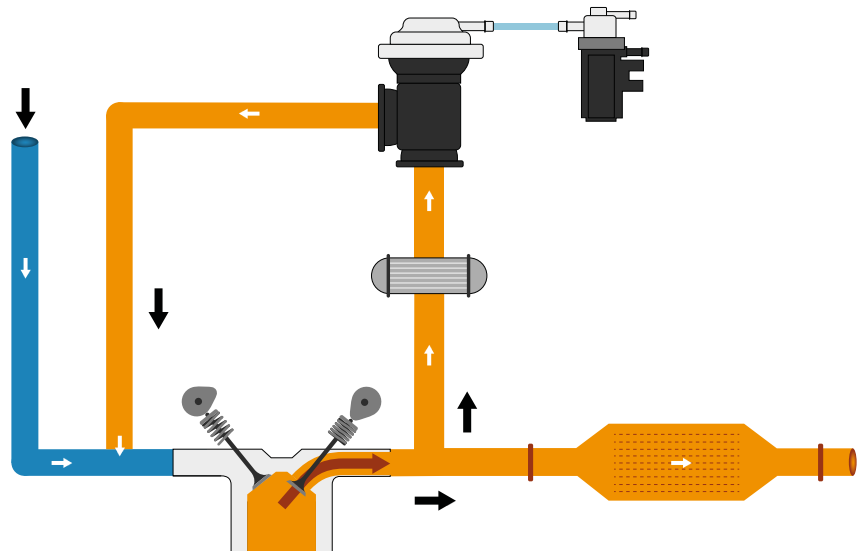
The main component in the exhaust gas recirculation circuit is the **EGR valve**, which returns the gas to the manifold under the suction caused by low pressure from the manifold itself.

It is controlled by the ECU in relation to the engine's operating load and temperature setpoint. In more recent engines, with high compression ratios and hence higher operating temperatures, the EGR valve works together with a heat exchanger (the EGR cooler) which further reduces the temperature of the exhaust gas.

The continuous flow of exhaust gas through the cir-

“

The EGR system recycles part of the engine exhaust gas (generally 5 to 15%) into the combustion chamber via the exhaust and intake manifolds, thus reducing the peak temperature in the chamber and consequently lowering nitrogen oxide production.



cuit causes dirt and carbon residue to accumulate on the shaft and plate, which risks locking up the valve mechanism itself.

Furthermore, in diesel engines, which have a high compression ratio than petrol engines, the efficient operation of the valve is compromised by use in city traffic. The fact that the engine is continually being

turned off and on again means that the engine does not reach the right operating temperature, and since the EGR valve is disabled at low temperature, impurities accumulate even faster on the valve and cooler.

However, such problems are also frequently the result of a blocked particulate filter, which forces the exhaust gas to seek other ways of venting.

“

The main component in the exhaust gas recirculation circuit is the EGR valve, which returns the gas to the manifold under the suction caused by low pressure. ”



EGR valve error codes

The error codes reporting a malfunction of a diesel engine EGR valve are **codes P0400 to P0409**.
Codes P0405 to P0409 refer to the valve's position signal.

ERROR CODE	CAUSE	SOLUTION
P0400 This is a frequent error which reports a generic fault without further information. Additional diagnostics are required.	Generic code.	Run diagnostics at the workshop.
P0401 Low exhaust gas flow.	The EGR valve's rod is blocked closed, air flow meter damaged.	Check / replace the EGR valve / air flow meter as necessary.
P0402 Excessive exhaust gas flow.	The EGR valve's rod is blocked open, air flow meter damaged.	Check / replace the EGR valve / air flow meter as necessary.
P0403 EGR valve control fault.	The EGR valve cannot be operated properly.	Check / replace the EGR valve.
P0404 Incorrect EGR control.	EGR valve rod position out of range.	Check / replace the EGR valve.
P0405 Sensor A, sc negative.	EGR signal A shorted to ground, the ground cable is not connected properly or the sensor reference voltage is open.	Check the EGR cabling and position sensor.
P0406 Sensor A, sc positive.	EGR valve fault, excessive carbon residue, cables shorted or damaged.	Check the EGR valve cabling and the valve itself, clean residue off the valve rod, replace the cabling / EGR sensor as necessary.
P0407 Sensor B, sc negative.	EGR signal B shorted to ground, the ground cable is not connected properly or the sensor reference voltage is open.	Check the EGR cabling and position sensor.
P0408 Sensor B, sc positive.	EGR valve fault, excessive carbon residue, cables shorted or damaged.	Check the EGR valve cabling and the valve itself, clean residue off the valve rod, replace the cabling / EGR sensor as necessary.
P0409 Sensor A fault.	EGR valve fault, excessive carbon residue, cables shorted or damaged.	Check the EGR valve cabling and the valve itself, clean residue off the valve rod, replace the position sensor, actuator, cabling / EGR sensor as necessary.



OXYGEN SENSOR



EXHAUST GAS TEMPERATURE SENSOR



EXHAUST GAS PRESSURE SENSOR

Exhaust gas monitoring and control systems

These systems monitor and control the engine's timing: this is because the nature of the exhaust gas is an indicator of the efficiency of the engine and the exhaust system itself.

The engine management oxygen sensor

The oxygen sensor measures the amount of oxygen in the exhaust gas, which is then used to restore the correct mixture of air and fuel in the combustion chamber. The oxygen sensor is thus used to control the engine's combustion settings.

The engine diagnostics oxygen sensor

This sensor monitors the operation of the catalytic converter which uses inert substances to regulate the composition of the exhaust gas and make it less noxious. In other words, the gas at the catalytic converter outlet is different from the gas at its intake, and should have a higher oxygen content. If the diagnostic oxygen sensor measures the same amount of oxygen at the outlet and intake, it means the catalytic converter is not working properly, most likely because it is exhausted.

M&D Group has been the market leader for more than 20 years, and offers a range of more than 650 products.

Exhaust gas temperature sensor

This sensor is part of the system which controls the temperature at a number of strategic points of the circuit, for instance at the turbocharger outlet and the particulate filter. It monitors the temperature of the exhaust gas to ensure that it does not damage the components in question. It also plays an important role in the regeneration of the particulate filter and in controlling noxious emissions.

M&D Group offers the widest range on the market, with more than 730 items available from stock.

Exhaust gas pressure/pressure differential sensor

This sensor is located next to the particulate filter and measures the extent to which it is clogged, returning an electrical signal: if this signal is too high, the filter is clogged in proportion to it, resulting in excessive intake pressure.

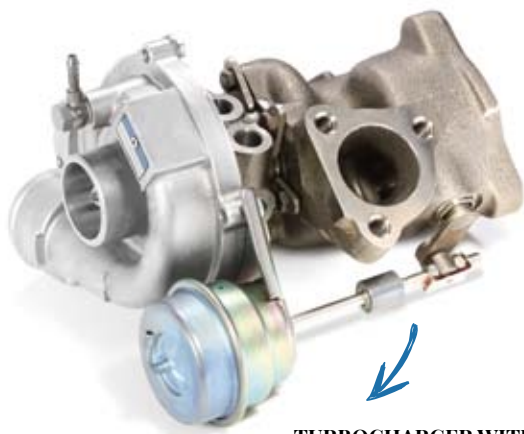
The most recent type of this sensor is called a pressure differential sensor, and features two lines,

rather than one, to monitor the pressure both upstream and downstream of the particulate filter, for more precise and predictive control data.

The pressure sensor monitors the efficiency of the particulate filter.

M&D Group has a range of 80 items available from stock.

SECONDARY AIR PUMP



TURBOCHARGER WITH WASTE-GATE VALVE



VARIABLE GEOMETRY

Waste-gate valve (non-variable geometry turbochargers)

This valve is mounted to the turbocharger on the exhaust side, and acts as a pressure valve to limit the turbocharger speed which, under constant acceleration, can run too fast and damage itself.

Instead, the valve opens to reduce the turbine pressure and prevent its overloading. The waste-gate valve protects the turbocharger on both the intake and exhaust sides.

Variable geometry valve (variable geometry turbochargers)

This is located on the exhaust side of the turbocharger and acts to change the direction of the gas impinging on the turbine. Not only does this reduce turbo-lag, it also prevents damage due to positive feedback, in which the impeller, driven by a constantly increasing flow of air, runs faster and faster until it damages itself irreparably. The variable geometry valve protects the turbocharger on both the exhaust and intake sides.

M&D Group has a range of 40 items available from stock.

Secondary air pump

This component is used on petrol engines, and is used to drive atmospheric air directly into the exhaust manifold when the engine has just started, in order to:

- Clean any combustion residue from previous use of the engine out of the manifold's ducts;
- Make the combustion - initially richer due to the residue left by previous use of the engine - leaner, and thus reduce polluting emissions.

The secondary air pump optimises the operation of the engine when it is cold.

M&D Group has a range of over 50 items in its catalogue.

Selective catalytic reduction (SCR) systems

SCR systems are all the additional equipment used to limit nitrogen oxide (NOx) emissions, which have been made necessary by the introduction of the Euro 6 emissions regulations.

The standard, issued in 2014, represents an important development in the optimisation of exhaust gas.

Urea pump

The urea pump is mounted to the urea reservoir and contains two sensors: one pressure sensor and one temperature sensor.

It controls the flow of urea to the injection system, and as an electrical component it can be damaged prematurely.

Urea heater

The urea heater uses a heating element to control the temperature of the AdBlue: liquid urea has a relatively high freezing point, and the heater is used to stop it freezing inside the reservoir.

AdBlue injector

This is located upstream of the catalytic converter, and is controlled by the respective control unit. It injects the AdBlue under pressure when actuated: the fluid is driven into the catalytic converter together with the exhaust gas, thus initiating a chemi-

cal reaction which transforms the nitrogen oxides into less noxious compounds. After a few kilometres, the injector is prone to clogging by solid AdBlue residue, and may need to be replaced.

Diesel injector

Mounted upstream of the catalytic converter, the diesel injector optimises the exhaust gas with micro-injections of atomised fuel, rather than AdBlue, introduced after the catalytic converter. This increases the temperature and facilitates the transformation of nitrogen oxides into innocuous gas. It is operated by the ECU for forced regeneration cycles or when the exhaust line temperature is too low. This component typically suffers from problems like accumulated dirt which, over time, can compromise its effectiveness and cause it to malfunction.

NOx sensor

Located downstream of the catalytic converter, the NOx sensor detects the residual content of nitrogen oxide and communicates it to the engine ECU, which adjusts the AdBlue injection accordingly.

M&D Group is actively engaged in the development of these new product lines which will certainly play an ever greater role in the automotive industry.





A/C SYSTEM

External temperature sensors and pressure switches

Every car has **heat sensitive resistors which read the temperature** inside and outside the vehicle to a high level of precision. These thermistors (an abbreviation of *thermally sensitive resistor*) report the temperature readings to the ECU in real time, for use in operating the climate control system.

The climate control system determines the cooling power delivered by the cooling circuit. There are two different commercially available types of sensor: NTC sensors, which use a negative temperature coefficient (“N”= Negative, in the range -6% to -2% per degree centigrade), so that their

resistance reduces as the temperature rises, and PTC sensor, which use a positive temperature coefficient (“P”= Positive). The readings output by both types of sensors are used to operate the climate control system, since they offer precise, efficient use of the power required to reach and maintain the temperature setpoint, thus limiting power consumption and maximising the system’s efficiency.

Any malfunction will cause the system to fail, since improper operation or incorrect reporting or failure to report the real time readings would cause the last outdoors temperature saved to the ECU to be



Outdoors temperature sensor
Meat&Doria / Hoffer: K103031
Krios AC: 10.3031



Outdoors temperature sensor
Meat&Doria / Hoffer: K103036
Krios AC: 10.3036

used, thus creating problems for the car as well as the driver and passengers. In detail, the outdoors temperature sensor is only present on cars with automatic climate control. It is usually located on the underside of the right rearview mirror and is connected to the driver door node (NPG), which transmits the outdoors temperature readings over the CAN bus. Any fault with this sensor must be repaired immediately, since it can damage the climate control system. The fault may be a false contact, which can be resolved by replacing either the sensor or the entire rearview mirror assembly.

Krios AC, constantly engaged in introducing new products into its catalogue, has recently launched its own version of this component and entered the codes from applications with the greatest defect rates. Further to the sensors, another major cooling circuit component is the **pressure switch**, an electromechanical control device which prevents critical conditions from arising.

Also known as the A/C circuit pressure switch, it protects the system's other components against malfunctions in the high pressure circuit; in particular, if it detects a too low pressure (<2 or 3 bar) or too high

Continue on page 16



Pressure switch
Meat&Doria / Hoffer: K52102
Krios AC: 5.2102



Pressure switch
Meat&Doria / Hoffer: K52106
Krios AC: 5.2106



How does an automatic climate control system work?

An automatic climate control system keeps the temperature inside the passenger compartment constant (once the temperature and humidity have been set manually) by means of parametric regulation using data transmission between the ECU, sensors, processing unit and the actuator.



pressure (>27 to 32 bar), it responds by activating or deactivating the compressor. Another basic function of this component is to regulate the condensation pressure with the aid of the cooling fan, by actuating it when the pressure reaches 16 bar and stopping it when it returns to its normal value (below 12 bar).

This is why the pressure switches are located on the circuit's high pressure side, between the condenser and the expansion valve, and connected directly either to the engine ECU or, for automatic climate control systems, to the dedicated ECU.

Along with maximum and minimum pressure switches, there are also binary, trinary and quadrinary pressure switches, classified according to the type and number of regulations they offer.

Composed respectively of two, three or four internal contacts, they have pre-ordered mechanisms which operate discontinuously in response to the pressure setpoints (set during calibration). There are also linear pressure switches which, in contrast to the other two types described above, provide continuous monitoring and regulation.

These latest generation components have the following features:

- the sensor's operating range is 3 to 29.5 bar;
- the power voltage can vary by as much as +/-10%;
- the service temperature is between +5°C and +80°C.

The Krios AC product range covers 100% of options currently in use throughout Europe.

i

How does a pressure switch work?

A pressure switch is basically an ON/OFF switch which acts on a stainless steel diaphragm which expands and contracts as the pressure varies.

The movement of the diaphragm moves a piston which opens and closes an electrical contact



Pressure switch
MeataDoria / Hoffer: K52095
Krios AC: 5.2095



Pressure switch
MeataDoria / Hoffer: K52098
Krios AC: 5.2098



Customer service - Technical team Krios AC

Tel: 011/647.40.57 ext. 5

Mail: helpdesk@kriosac.it

Skype: helpdesk.kriosac

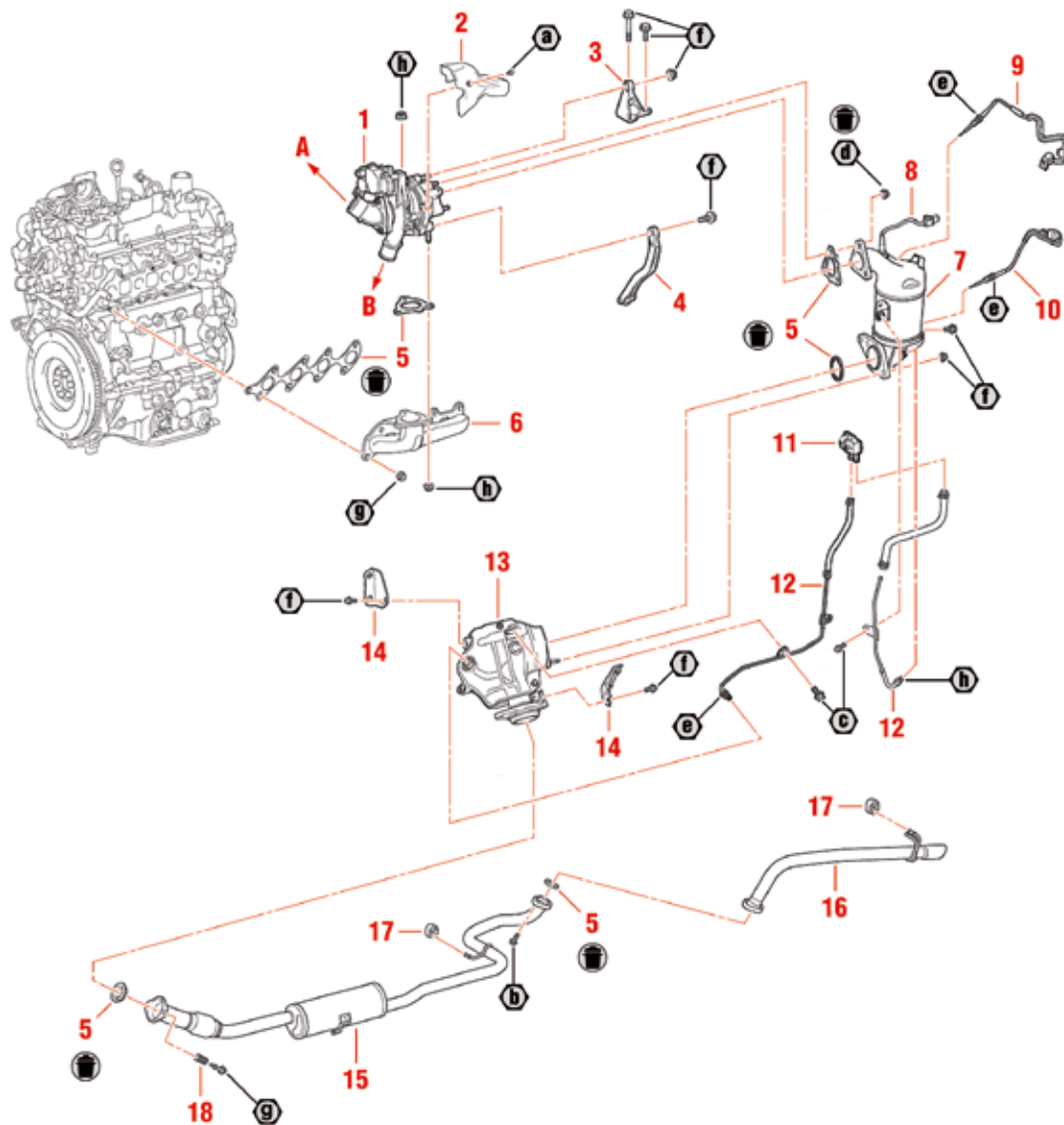


► Toyota Yaris III 1.4 D4 D 90 CV 03/2011 and later

► REPAIR METHODS

This procedure is provided by Infopro Digital Automotive

ANTI-POLLUTION AND EXHAUST CIRCUIT



A. To air filter casing
B. To air/air exchanger

- 1. Turbocharger
- 2. Heat shield
- 3. Turbocharger reinforcement*
- 4. Exhaust manifold reinforcement
- 5. Gaskets
- 6. Exhaust manifold
- 7. Catalytic converter
- 8. Lambda sensor

- 9. Upstream exhaust gas temperature sensor
- 10. Downstream exhaust gas temperature sensor
- 11. Differential pressure sensor
- 12. Pressure intake line
- 13. Particulate filter
- 14. Exhaust manifold mounts*
- 15. Front hose
- 16. Rear hose
- 17. Silentbloc
- 18. Spring

- a. 0,7 daN.m
- b. 1,9 daN.m
- c. 2 daN.m
- d. 2,6 daN.m
- e. 3 daN.m
- f. 3,7 daN.m
- g. 4,3 daN.m
- h. 5,3 daN.m

* Follow the torquing sequence

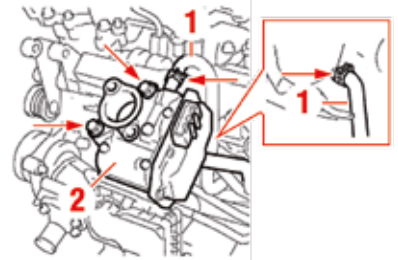
DISCONNECTION-RECONNECTION



- Remove the water/EGR exchanger (see corresponding operation)
- Disconnect the connector (Pic. 28).
- Disconnect the hoses **(1)** (Pic. 29).
- Disconnect the EGR valve **(2)**.
- Reassemble in the reverse order of the removal procedure.
- If you have replaced the EGR filter, calibrate the system with an appropriate diagnostics tool.



Pic. 28

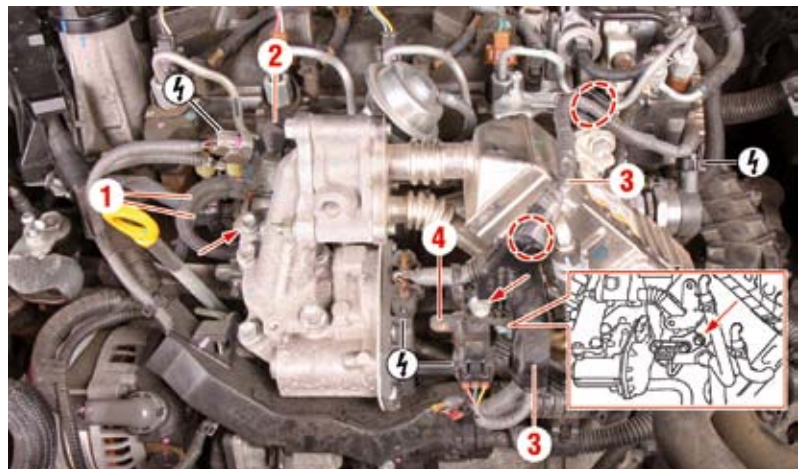


Pic. 29

DISCONNECTION-RECONNECTION THE WATER/EGR EXCHANGER

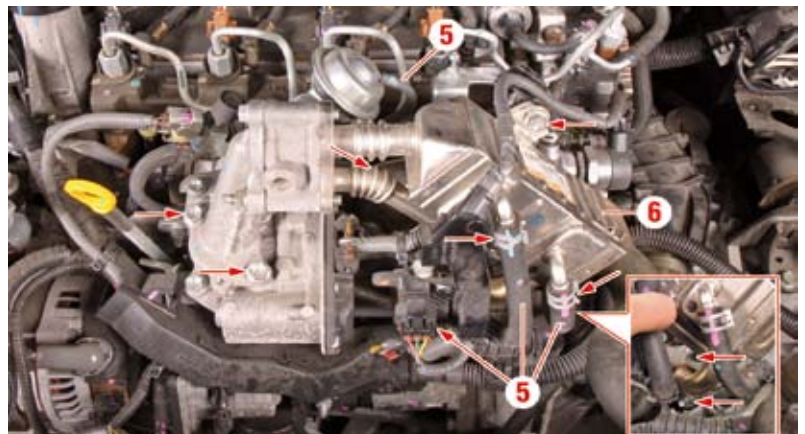


- Discharge the cooling circuit.
- Disconnect the hoses **(1)** (Pic. 30).
- Remove the solenoid valve **(2)**.
- Move the cable bundles aside **(3)**.
- Disconnect the supercharged air pressure sensor **(4)**.



Pic. 30

- Disconnect the hoses **(5)** (Pic. 31).
- Remove the water/EGR exchanger **(6)**.
- Reassemble in the reverse order of the removal procedure.



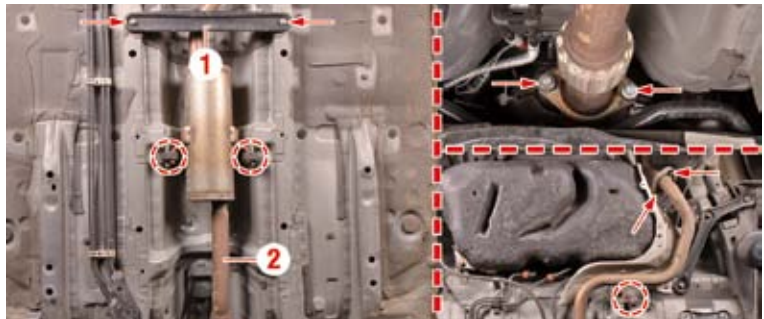
Pic. 31

DISCONNECTION-RECONNECTION THE CATALYTIC CONVERTER



Disconnection

- Remove:
 - the windscreen wiper mechanism,
 - the grille,
 - the protective strut.
- Remove the shelf reinforcement **(1)** (Pic. 32).
- Remove the front exhaust hose **(2)**.



Pic. 32

- Detach the frame.
- Release the cable bundle **(3)** (Pic. 33).
- Detach the mount **(4)**.
- Disconnect the hose **(5)** (Pic. 34).
- Detach the heat shield **(6)** from turbocharger

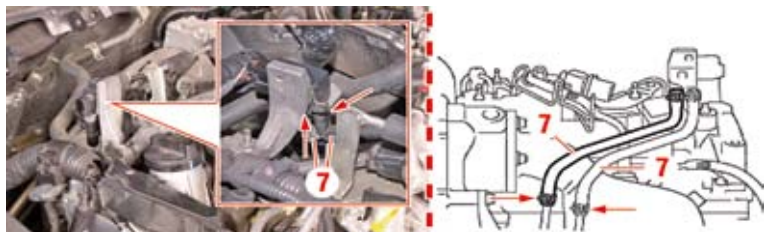


Pic. 33



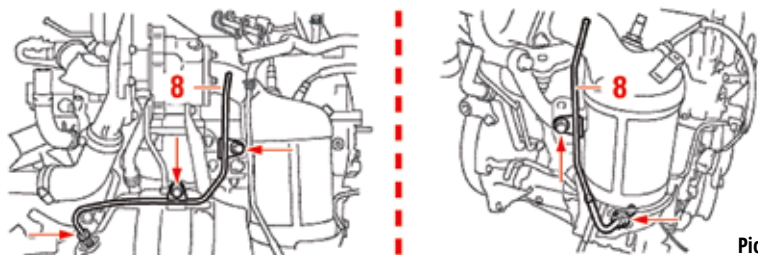
Pic. 34

- Disconnect the pressure sensor hoses **(7)** and pressure intake lines (Pic. 35).



Pic. 35

- Detach the pressure intake lines **(8)** (Pic. 36).

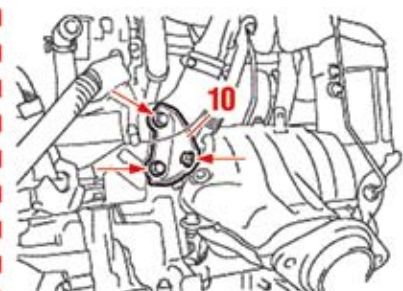
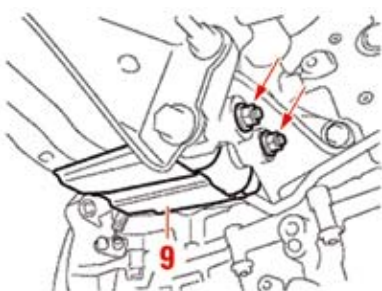


Pic. 36

- Take off (Pic. 37):

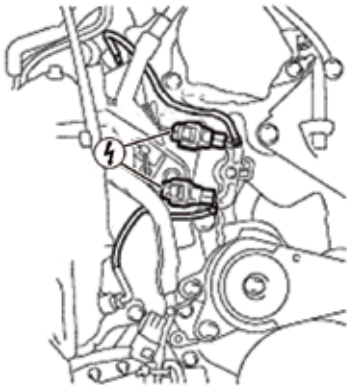
- the heat shield **(9)**

- the exhaust manifold mounts **(10)**

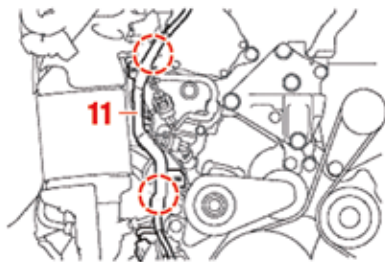


Pic. 37

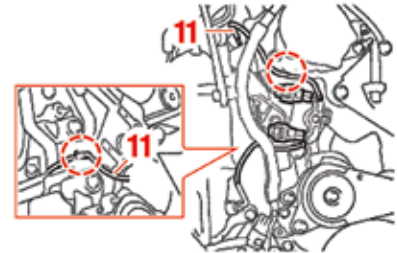
- Disconnect the connectors (Pic. 38).
- Release the cable bundle **(11)** (Pic. 39).



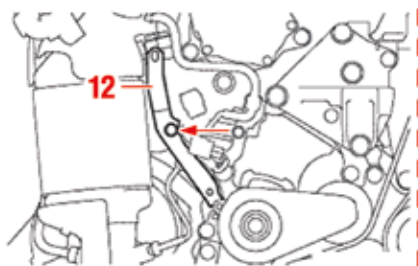
Pic. 38



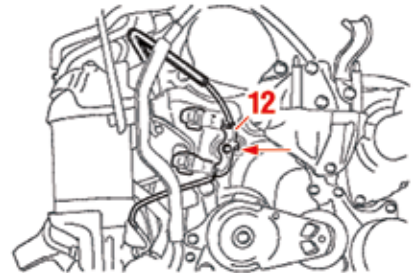
Pic. 39



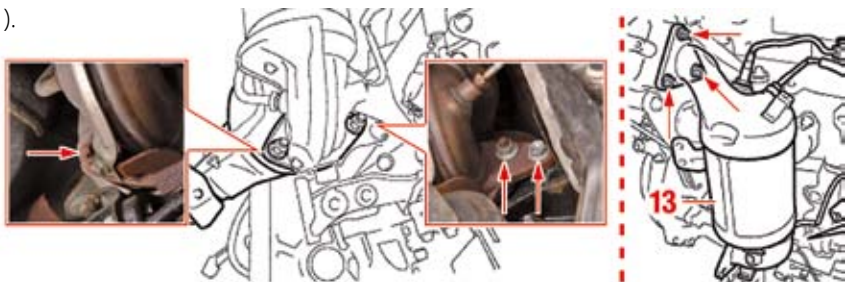
- Disconnect the mounts **(12)** (Pic. 40).



Pic. 40



- Detach the catalytic converter **(13)** (Pic. 41).



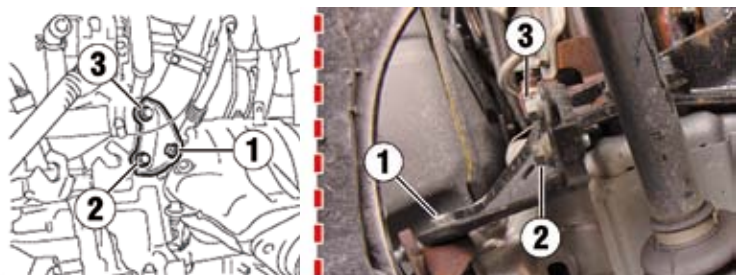
Pic. 41

Reconnection

- Proceed in the reverse order to the removal procedure.
- Observe the following points:
 - Reposition the exhaust manifold mounts observing the torquing sequence (Pic. 42).
 - Check the length of the front exhaust hose compression springs.



The minimum value is 41.5 mm. If this is not the case, replace the spring.



Pic. 42



MARKET

The ABS system: operation and faults



The ABS system is an active safety component which prevents the wheels locking up during braking, thus improving vehicle stability.

Although it is a highly advanced system, it is not a recent invention: the first tests of an anti-wheel lock system go back to 1974, when Swedish car manufacturer Volvo started adopting it on their prototypes. It was Bosch, however, that officially brought it to market as an integrated safety system.

Over the years the technology has developed significantly: the number of wheel sensors has increased, EBD and ASR have been integrated and, most recently, the system has been made bi-directional.

In 2004, the European Union made ABS systems obligatory standard equipment on all cars, and in 2016 the system was also implemented on motorcycles with a displacement of more than 125 cc.

How does it work?

The ABS system has the following active components, which communicate over a redundant high speed data network:

- **The ABS sensor**

This is similar to a speed sensor which uses the signal from a phonic wheel on the car's wheel to determine the speed of each wheel separately.

The aim is to prevent the wheel locking up: when one or more wheels are about to lock up during braking, the ABS sensor detects this condition and instantly reports it to the respective ECU.

There are two types of ABS sensor:

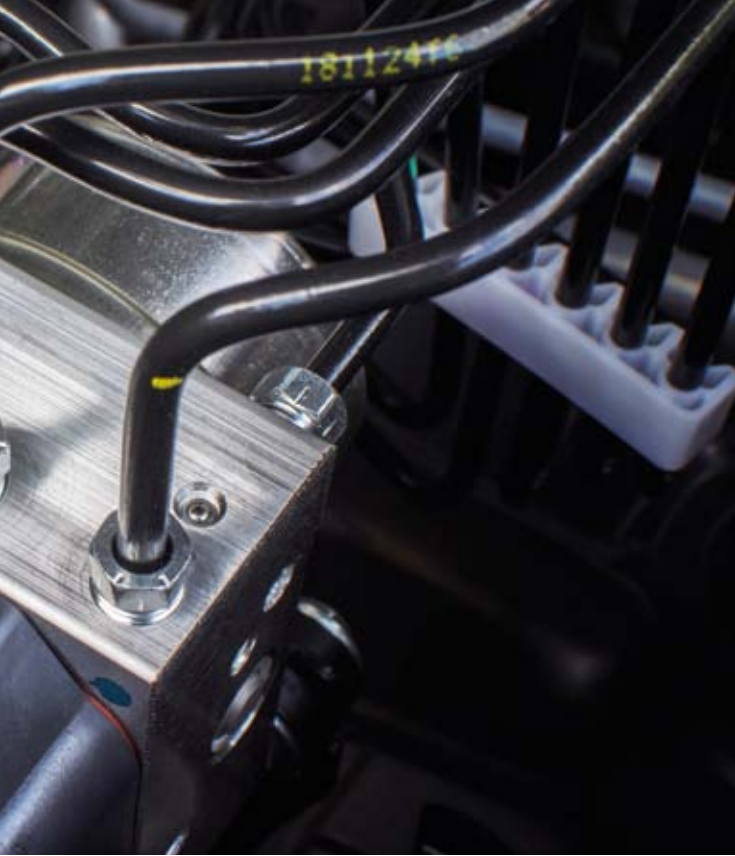
- **active:** electrically powered, this type emits a square wave signal with a maximum value of 5V. They are powered at 12V by the ECU;
- **passive:** an obsolete type which does not require electrical power to operate, and thus emits a resistance rather than a voltage signal.

When replaced by a new one, the sensor works immediately without the need for coding.

M&D Group offers a range of over 1.100 ABS sensors.



ABS SENSORS



- **Steering angle sensor**

This sensor monitors the steering angle and reports it to the ABS ECU over the CAN bus. It enables predictive safety, for example, when the driver steers the car suddenly in emergency conditions: the ABS ECU detects the anomalous situation before it receives the lock up signals from the wheel sensors.

- **ABS unit (ECU + hydraulic pack)**

This is an advanced component which uses the ABS sensor signals to determine the difference in speed between the wheels and whether any of them is locking up. The ECU is a processing unit that receives inputs from the sensors and outputs corrective action commands to the ABS pump; the latter, on the other hand, is a hydraulic pack which regulates the oil flow to the brake callipers. There are two types of ABS units:

- **One-way ABS pump.** In this case, braking is modulated by simply reducing the braking force delivered by the driver so as to prevent the wheels locking up;
- **Two-way ABS pump.** In this case, braking can be modulated even by increasing the braking force, thus reducing the braking distance and remedying situations in which the driver is dis-

tracted. It is used on the most recent cars, which have autonomous emergency braking.

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- **Hydraulic and brake circuit**

This is composed of the brake fluid lines, the brake pads and the brakes themselves.

Faults

In case of fault, the stability control system is deactivated and, along with it, the ABS system. Braking is now completely hydraulic and is not assisted by the safety systems.

The ABS system warning light lights up on the dashboard to report the fault.

The generic error codes are listed on the following page.



Essential data

If the ECU needs replacing, it is important to migrate all data and variant codes from the old to the new unit (the rim and tyre diameters, and other parameters).

When the hydraulic unit is replaced, the new one is supplied charged with fluid. Do not drain it, doing so can introduce air into the circuit. It must be purged however. The brake fluid should be replaced every 2 years.

ERROR CODE	POSSIBLE CAUSES	CHECKS
P1637	CAN bus connection to the ABS unit.	Check the CAN bus communications.
P1649	No CAN bus communications with the ABS unit.	Check the CAN bus communications.
C0031 C0032 C0033 C0034	ABS sensor: incorrect signal or no signal, wrong sensor mounted or sensor mounted on the wrong side, short circuit. The error depends on the side and position of the sensor.	Check the affected sensor, which has probably been mounted in the wrong position or is of the wrong type.
C0030 C0033 C0036 C0039	Phonic wheel fault: it may have suffered a blow or the wheel hub bearing may be defective.	Inspect the phonic wheel for defects.
C003B	Implausible ABS sensor speed signal: the sensor is seen by the system but its readings are wrong.	Check any parameters which may affect the readings: tyre pressure, size of rims and tyres. Also check the rim tightening torques.
C003C	ABS sensor power voltage out of range, the sensor returns a faulty signal.	Run the same checks as above.
C0047	ABS unit pressure sensor interrupted: there is suddenly no signal from the sensor, it is interrupted.	Check the ECU cabling (positive, negative, peripheral). If the cables are in good order, the ABS unit must be replaced as a whole.
C0051	Steering angle sensor circuit interrupted / initialisation failure / implausible signal / CAN bus disturbed: the sensor disconnected or contact is poor, the sensor can communicate but has not been initialised properly with the tester, the signal is not plausible or the CAN bus may be disturbed.	Check the power positive and negative and the sensor's CAN bus line.
C0061 C0062	Transverse/longitudinal acceleration sensor: non-plausible signal, defective. Check the acceleration sensor, it is malfunctioning and the signal is not within specification. If the sensor is a separate unit, error codes 61 to 63 apply.	Check the power positive and negative and the C-CAN bus. Replace the sensor if necessary.
C0063 C006A	ESP sensor unit - unit not calibrated / overheating. If the sensor is integrated into the ESP ECU, it is possible that it has not been calibrated properly or the temperature may be too high.	Check the ABS ECU positives and negatives. Also check the steering angle sensor readings. If the sensor has not been calibrated, run a zero calibration. If the error persists after the above, the ABS ECU must be replaced.
C0211	ESP ECU - CAN bus error.	First check the ECU positives and negatives, then test the CAN bus on the pins: the measured resistance must be in the range 55 to 65 Ohm.
C1000	ESP regulator - plausibility with ABS regulation.	Check the ECU positives and negatives and check the signals from all ABS sensors. If the system is OK the ECU must be replaced again.

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