2.12 Fault codes

Fault codes are assigned to the stored errors.When the fault code memory is being read out, these fault codes are shown in the “scan tool” display.
The fault codes are five-digit.

There are two types of fault codes:

- Fault codes standardised according to SAE J 2012/ISO 9141-2 are identified by a “0” in the second position.
- Manufacturer-specific fault codes are identified by a “1” in the second position.

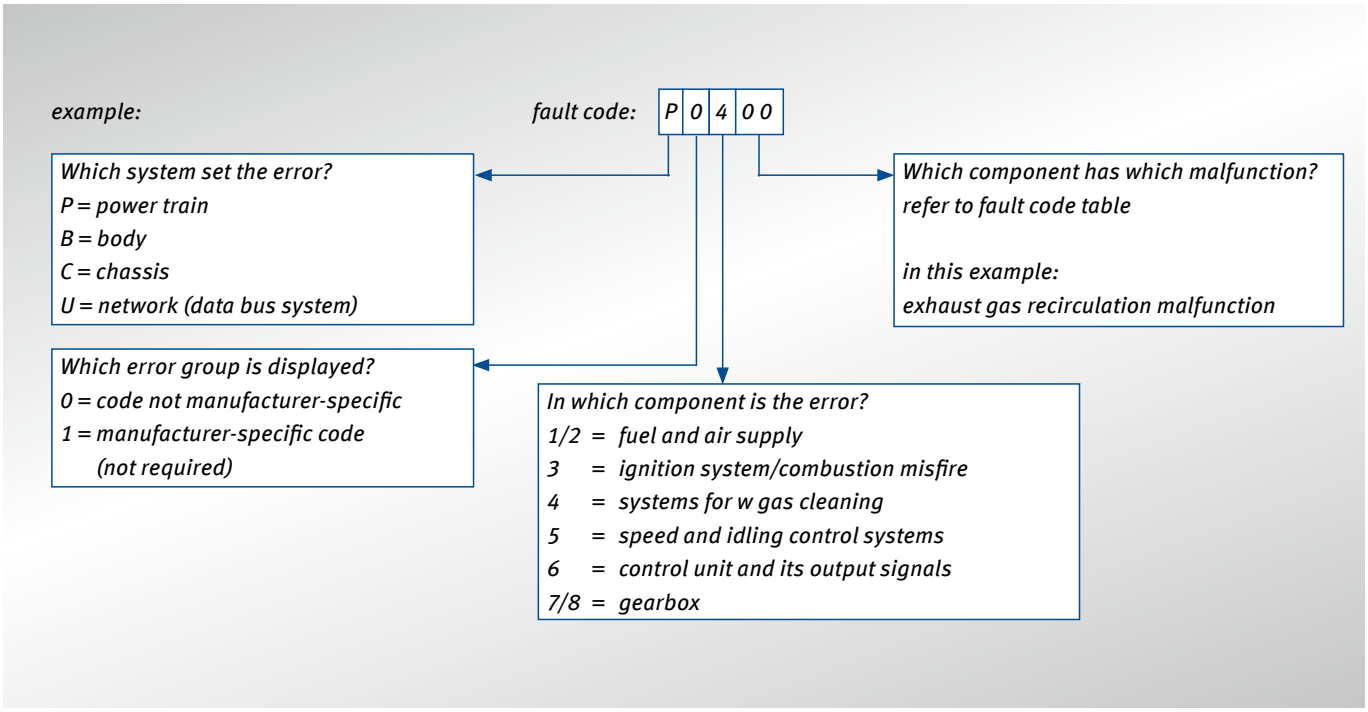

Fig. 10: structure of the fault codes

Manufacturer	Manufacturer-specific code	(E)OBD
Audi	16706	P0320
BMW	67	
Citroen/Peugeot	41	
Ford	227	
Mercedes-Benz	045	
Opel	19	
Toyota	6	
Volkswagen	00514	
Volvo	214	

Fig. 11: P0 fault code, one for many

Thanks to standardisation, uniform fault codes are now assigned to errors that are recorded for the first time since there have been fault code memories.
The various fault codes of the individual manufacturers for an error are now replaced by a P0 code.

Important note:
For standard P0 fault codes see Sections 6.4; [9].

The fault code names the component involved and the type of error. A distinction is made between two types of errors:

Errors that are the result of malfunctions
In specific diagnosis, for example, are registered:
- malfunction
- quantity too small/too great
- rate too low/too high
- leak
- insufficient effect
- lean/rich control limit

Errors in component monitoring (comprehensive components).
Here all exhaust gas relevant sensors and actuators are monitored.

Examples of sensors are:
- air mass sensor
- pressure sensors
- speed sensor
- phase sensor
- temperature sensors
- position potentiometer

Examples of actuators are:
- valve actuators
- electric switch-over valves
- EGR valves
- electropneumatic transducer

P01/2xx	(fuel and air supply)	
P0117	coolant temperature sensor	signal too low
P0171	cylinder row 1	mixture too lean
P0213	cold start valve	malfunction in electrical circuit
P0234	turbocharging	limit exceeded
P03xx	(ignition system or combustion misfire)	
P0301	cylinder 1	misfire determined
P0325	knock sensor	malfunction in electric circuit
P0350	ignition coil	malfunction in electric circuit
P04xx	(additional system for emission control)	
P0400	exhaust gas recirculation	malfunction
P0411	injection system secondary air	incorrect flow rate
P0444	solenoid valve activated carbon filter	open electrical circuit
P0473	exhaust gas pressure sensor	signal too high
P05xx	(vehicle speed and idling control systems)	
P0506	idling control	engine speed below set-point
P0510	idle switch	malfunction in electrical circuit
P06xx	(control unit and its output signals)	
P0642	control unit	knock control defective
P07/8xx	(gearbox)	

Fig. 12: excerpt from the list of P0 fault codes

Examples of actuators are:
In component monitoring a distinction is made between electric errors and range errors (deviations from the set-point):

Examples of electric errors are:
- short circuit to earth
- short circuit to the supply voltage (plus connection)
- interruption/no signal

Examples of range errors are:
- signal/voltage
- not plausible (implausible operating range)
- outside the range
- too high or too low
- too little or too great
- lower/upper limit exceeded

Important note:
Please note that the wording of the text describing the fault code indicated can differ depending on the manufacturer of the scan tool.

Example: text display of different scan tools for fault code P0191

P0191	fuel rail pressure sensor	measuring range or power problem
P0191	fuel distribution pressure sensor	range/function error
P0191	pressure sensor circuit	fuel rail range operating behaviour
P0191	fuel pressure sensor G247	implausible signal

The following sections are intended to give you an overview of the individual systems and diagnosis of an On-Board-Diagnosis.

The diagnostic instructions at the end of the respective system are intended to be a help in determining the causes of errors for the system described.
They contain practical hints for error diagnosis and correction for emissions-relevant components. Many of these instructions are the result of customer queries and technical consultations with our Service Department.

Therefore this brochure concentrates on PIERBURG products.

Important note:
Because it is only since 2003 that EOBD also applies to passenger vehicles and light utility vehicles with diesel engines, emphasis is placed on vehicles with petrol engines.

3.1 System knowledge required

(E)OBD is a device that detects, records and displays errors.
The intention is to prevent severe damage to engine components and thus to avoid negative impact on the environment.
The diagnostic system can indeed detect a faulty component or a function that is not working properly, but often not the cause of the damage or the component causing the damage.
When there is a malfunction, error diagnosis is made easier by reading out the fault code and by putting out error relevant data for the workshop, but it is not always the case that a component that is indicated by the scan tool as faulty is actually the cause of the damage as well.

The actual cause can often be several components.
This requires the expertise of a specialist with knowledge of the system.

When the error is being diagnosed, the fault code should first be read out by a scan tool, and the component indicated as faulty should be checked.

The fault codes that are output give important indications of possibly faulty modules or components.
But often they also do not give any indications of simple causes such as buckled or leaky vacuum lines, stuck or leaky valves etc.

Depending on the vehicle manufacturer and scan tool, components can be activated in an actuator diagnosis.
It is practical to read out the fault code memory first and then to run the actuator diagnosis according to the manufacturer data of the scan tool.
A component activated by the actuator diagnosis is actuated in intervals so that it will be connected audibly or tangibly.
If it is connected audibly or tangibly, the voltage supply and the component must be OK electrically. This does not, however, determine leakage or internal soiling.
Electrical errors in the wiring harness or component itself are recorded in most applications as errors. Just like mechanical errors such as leaks, stuck valves etc., they also have to be tracked using conventional testing equipment.

In troubleshooting, attention should also be given to
- leaks in hose lines
- bad contacts in plug connections
- smooth running of actuators ("pressure boxes", actuators etc.)

The fault code memory must be erased after a test and if replaced.

3.2 Safety instructions

This brochure was designed exclusively for automotive specialists.

Each of the applicable conditions and relevant safety instructions must be observed, especially when handling fuel and fuel vapours.

Plug-in connections must not be disconnected or connected when the ignition is ON. Voltage peaks resulting from such action could damage the electronic components.
The resistance of components may be measured only after disconnecting the plug, as this could otherwise damage interior circuits. Safety devices must not be switched off or bypassed.
The manufacturer's specifications must be observed.

3.3 Further possibilities for diagnosis

In addition to the diagnostic instructions listed below there is an abundance of information sources that offer you assistance in diagnosing errors.
You will find a selection in Section 6.4 "Sources and further reading".