



Workshop Manual VW Marine Boat Engine

Engine code	BGM	BGL	ANC		
<i>Booklet</i> 4-Cyl. Diesel Engine with Distributor Injection Pump					

Edition 09.03

Contents

00	Technical data	Page
	Safety Precautions and Technical Data	00-1
	- Safety precautions	00-1
	- Technical Data	00-5
	- Engine characteristics	00-6
01	Self-diagnosis	Page
	Self-Diagnosis	01-1
	- Properties of self-diagnosis	01-1
	- Technical data for self-diagnosis	01-2
	- Connecting fault reader	01-4
	Fault memory	01-9
	- Interrogating fault memory	01-9
	- Erase fault memory	01-11
	Fault table	01-13
	Final control diagnosis	01-31
	- Carry out final control diagnosis	01-31
	Measuring value blocks	01-35
	- Safety measures	01-35
	- Read measuring value block	01-35
	- Evaluate measuring value blocks at idle speed with ignition on	01-38
	- Display group 010 with ignition on	01-49
	- Evaluate measuring value blocks at full load	01-56

10	Removing and installing engine	Page
	Removing and installing engine	10-1
	- Removing engine	10-3
	- Mounting engine on repair stand	10-11
	- Notes on installation	10-12
	- Tightening torques	10-17
	- Unit mounting/engine mount and gearbox bell	10-18
13	Crankshaft group	Page
	Dismantling and assembling engine	13-1
	- Removing and installing ribbed V-belt for seawater pump	13-10
	- Removing and installing ribbed V-belt for alternator	13-12
	- Check semi-automatic toothed belt tensioner	13-14
	Removing and installing sealing flange and flywheel	13-15
	- Removing and installing flywheel	13-18
	- Renewing crankshaft oil seal -belt pulley end-	13-21
	- Removing and installing sealing flange -belt pulley end-	13-25
	Removing and installing crankshaft	13-30
	- Crankshaft dimensions	13-34
	Dismantling and assembling piston and conrod	13-35
	- Checking piston height at TDC	13-43
	- For piston and cylinder dimensions	13-45

15	Cylinder head, Valve gear	Page
	Removing and installing cylinder head	15-1
	- Removing and installing cylinder head cover	15-7
	- Removing and installing, tensioning toothed belt	15-9
	- Removing and installing cylinder head	15-20
	- Checking compression pressure	15-27
	Servicing valve gear	15-30
	- Reworking valve seats	15-37
	- Checking valve guides	15-40
	- Renewing valve stem seals	15-41
	- Removing and installing camshaft	15-44
	- Checking hydraulic bucket tappets	15-49
17	Lubrication	Page
	Removing and installing parts of lubrication system	17-1
	- Removing and installing oil sump	17-12
	- Checking oil pressure and oil pressure switch	17-17

19	Cooling system	Page
	Removing and installing parts of cooling system	19-1
	- Parts of seawater pump	19-3
	- Parts of gearbox oil cooler	19-5
	- Dismantling and assembling housing-radiator package	19-8
	- Dismantling and assembling seawater filter	19-13
	- Parts of cooling system on engine	19-15
	- Connection diagram for coolant hoses	19-21
	- Draining and filling coolant	19-23
	- Removing and installing coolant pump	19-28
	- Removing and installing seawater pump	19-31
	- Dismantling and assembling seawater pump	19-35
	- Removing and installing thermostat	19-38
20	Fuel supply system	Page
	Removing and installing parts of fuel system	20-1
	- Safety precautions when working on fuel supply system	20-2
	- Rules for cleanliness	20-4
	- Servicing fuel filter	20-5
	- Dismantling and assembling parts of circulation filter	20-7
	- Servicing throttle controls	20-9
	- Checking accelerator pedal position sender	20-11
	- Checking accelerator lever position sender	20-18

23	Mixture preparation, Injection	Page
	Servicing diesel direct injection system	23-1
	- Rules for cleanliness	23-2
	- Overview of Installation Points	23-3
	- Servicing injection pump	23-8
	- Dismantling and assembling air filter	23-12
	- Removing and installing injection pump	23-14
	- Testing and adjusting injection commencement dynamically	23-20
	- Removing and Fitting the Injection Nozzles	23-24
	- Checking injectors	23-27
	- Replacing O-ring on cover of injection timing device	23-29
	Checking components and functions	23-30
	- Checking the Power Supply for the Diesel Direct Injection System	23-30
	- Checking the Engine Speed Sender	23-36
	- Checking the Coolant Temperature Sender	23-39
	- Checking the Fuel Temperature Sender	23-44
	- Checking the modulating piston movement sender and quantity adjuster	23-48
	- Checking the Needle Lift Sender	23-55
	- Check injection timing device adjustment range	23-58
	- Check intake manifold flap motor	23-62
	Checking additional signals	23-65
	- Checking speed signal	23-65
	Engine control unit	23-66
	- Renewing engine control unit	23-66
	- Code engine control unit	23-68
	- Checking terminating resistor for data bus	23-70

26	Exhaust system	Page
	Removing and installing parts of exhaust system	26-1
	- Dismantling and assembling exhaust system	26-2
27	Starter, Current supply	Page
	Starter	27-1
	- Removing and installing starter	27-2
	Alternator	27-5
	- Compact alternator with ribbed V-belt drive	27-5
	- Checking carbon brushes for alternator	27-7
	- Renewing ribbed V-belt pulley on alternator	27-8
	- Checking ribbed V-belt	27-10
	- Alternator brackets and ribbed V-belt routing	27-11
	- Overview of ribbed V-belt drive	27-14
	- Removing and installing ribbed V-belt	27-15
28	Glow plug system	Page
	Checking glow plug system	28-1
	- Checking glow plugs	28-2
90	Gauges, Instruments	Page
	Instrument panel	90-1
	- Removing and installing instrument panel	90-1
	- Removing and installing individual instruments	90-2
	- Function overview of instrumentation	90-3

97	Wiring	Page
	Fuse box/relay plate	97-1
	- Removing and installing fuse box/relay plate	97-1
	- Connection assignment of fuse box/relay plate	97-4
	- Removing and installing earth switch-off relay	97-12
	- Wiring loom versions	97-15
	Wiring loom and connector repair	97-16

Safety Precautions and Technical Data

Safety precautions

Introduction

This Workshop Manual contains technical data, descriptions and repair instructions for the 4-cylinder Volkswagen Marine SDI boat engine. The individual repair groups of the Volkswagen Marine boat engine are listed in the contents.

General information

Spare parts for electrical systems and fuel systems are subject to legal provisions. Genuine Volkswagen Marine parts comply with these provisions. Injuries and damage caused from the use of non-genuine spare parts are excluded from the guarantee.

Volkswagen Marine boat engines are certified in accordance with BSO 2 under the certificate numbers:
M 103 300 05, M 103 300 06 and M 103 300 07.

Important

Read the safety precautions carefully before beginning with the repair instructions. The dangers and safety measures that should always be observed when operating and performing maintenance on the engine are listed in the following:

- *Stop the engine by switching off the power supply to the engine at the stop switch of the central electrics.*
- *Always conduct maintenance work with the engine switched off. However, certain adjustment work must be carried out with the engine running.
When the engine is running, make sure loose clothing, long hair or tools cannot get caught in rotating parts and cause serious injuries.*
- *During maintenance work or test drives, be sure to wear appropriate shoes (deck shoes) and work clothing.*
- *Stop the engine and close the seawater valve when working on the cooling system.*

- *Open the cap of the cooling system extremely carefully when the engine is hot (danger of scalding) and do not remove the cap until the pressure is completely released.*
- *Connect and disconnect the cables of the glow plug and fuel injection system - including measurement device cables - only when the ignition is switched off.*
- *If the engine is to be run at starting speed without actually starting, e.g. during a compression test, disconnect all connectors for the injection pump.*
- *Only use motor oils approved by Volkswagen Marine (⇒ Operating Manual for Volkswagen Marine Boat Engine).*
- *Only start the engine in a well-ventilated area. When operating the engine in a closed room, make sure that the exhaust bases are routed out of the working area with a suitable ventilation system.*
- *Exercise extreme caution in case of leaks in the fuel system. Wear protective goggles when testing the injectors. Fuel spraying down can cause serious injuries due to the high injection pressure.*

- *Incorrect connection of the battery can lead to sparks that cause an explosion. Avoid open flame and welding work near the battery.*
- *Hydrogen gas escapes when charging batteries that forms a highly explosive mixture with oxygen. Therefore, wear protective goggles and appropriate protective clothing. As the mixture is heavier than air, it can collect in the bilge. Use only onboard charging units and, if possible, gel batteries.*

Torques

- *The tighten torques for screw connections are tightened with a torque spanner. All torques listed in this Workshop Manual refer to the cleaned thread, screw/bolt head and contact surfaces.*
- *When tightening to a specified torque setting and a rotating angle, first apply the specified torque with a torque spanner. Then additionally tighten to the specified angle using the protractor scale.*

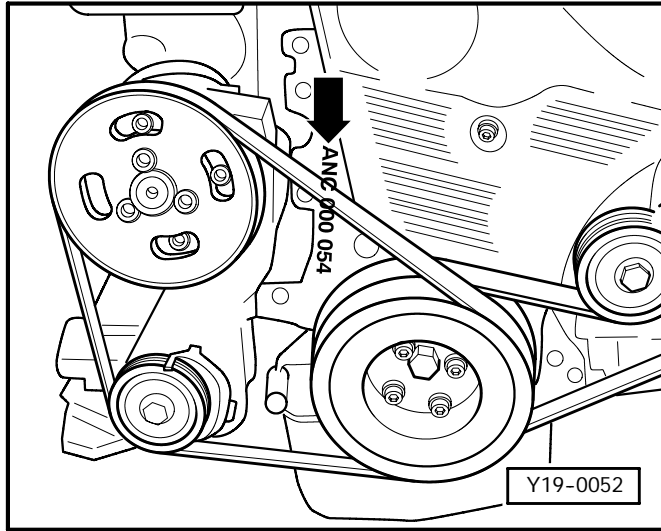
Technical Data

Engine number

- ▶ The engine number -arrow- ("engine code" and "serial number") is located on the face of the cylinder block.

In addition, an adhesive label with "engine code" and "serial number" is located on the toothed belt guard.

The engine number consists of up to nine characters (alphanumeric). The first part (maximum of 3 code characters) represents the "engine code", the second part (six places) the "serial number". If more than 999,999 engines with the same code have been produced, the first of the six places is replaced with a letter.



Engine characteristics

Code letters	BGM	BGL	ANC
Manufactured	07.03 ►	07.03 ►	07.03 ►
Exhaust values as per	BSO 2	BSO 2	BSO 2
Displacement l	1.9	1.9	1.9
Output kW at rpm	29/2600	37/3000	44/3600
Torque Nm at rpm	125/1600 - 2800	125/1600 - 2800	125/1600 - 2800
Bore Ø mm	79,5	79,5	79,5
Stroke mm	95.5	95.5	95.5
Compression ratio	19.5	19.5	19.5
CZ at least	49	49	49
Firing order	1-3-4-2	1-3-4-2	1-3-4-2
Weight (dry, with sub-assemblies, cooling system and coupling flange) kg	198	198	198
Certificate No. as per BSO 2	M 103 300 05	M 103 300 05	M 103 300 05

Self-Diagnosis

Properties of self-diagnosis

The control unit for the diesel direct injection system is equipped with a fault memory.

If faults occur in the sensors or components monitored, these are stored in the fault memory together with details of the type of fault.

Faults that only occur temporarily (sporadically) are also printed out with the supplement "sporadically occurring fault". These faults appear on the display with the supplement "/SP". The cause of sporadic faults can be, for example, a loose connection or a brief break in the line. If a sporadic fault no longer occurs after 50 warm-up phases, it is deleted from the fault memory.

If faults that influence the vehicle handling are detected, the glow period warning lamp flashes.

The stored faults can be read out with the fault reader V.A.G 1552 or the tester VAS 5052 ⇒ page 01-9.

After the fault(s) has (have) been eliminated, the fault memory must be erased ⇒ page 01-11.

Note:

General information on self-diagnosis is contained in the operating manual for the fault reader V.A.G 1552 (VAS 5052).

Technical data for self-diagnosis**Equipment**

- ◆ The data is interchanged between the control unit and fault reader V.A.G 1551 in the "Rapid data transfer" operating mode.
- ◆ Fault memory: Permanent and temporary memory¹⁾
¹⁾ Deleted after the 50th warm-up phase if the fault has not recurred.

Reading out control unit version

The control unit version is displayed when the fault reader V.A.G 1552 or the tester VAS 5052 is connected and the control unit for the engine electronics is selected ⇒ page 01-4.

Selectable functions using the tester V.A.G 1552 or VAS 5052 under address word 01, engine electronics

Note:

Please consult the following table to see the requirements for selection of the desired functions.

Function		Condition		
Functions on V.A.G 1552/VAS 5052		Engine stopped, ignition switched on	Engine runs at idle	Boat in driving mode
01	Reading out control unit version	yes	yes	yes
02	Interrogating fault memory	yes ¹⁾	yes	yes
03	Final control diagnosis	yes	yes	no
04	Basic setting	no	yes	no
05	Erase fault memory	yes	yes	yes
06	End output	yes	yes	yes
07	Code control unit	yes	no	no
08	Read measurement value block	yes	yes	yes

¹⁾ Only carry out with ignition switched on when engine fails to start.

Connecting fault reader

All functions possible with the fault reader V.A.G 1552 can also be carried out with the tester VAS 5051, VAS 50522 or V.A.G 1551.

Connect V.A.G 1552

Connecting VAS 5052 ⇒ page 01-7

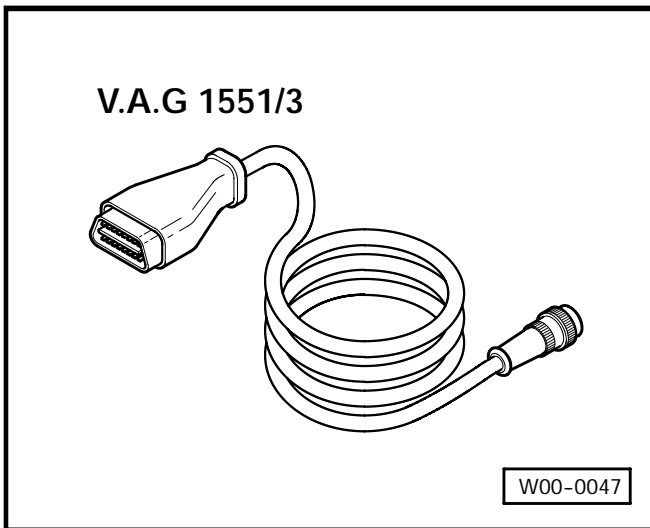
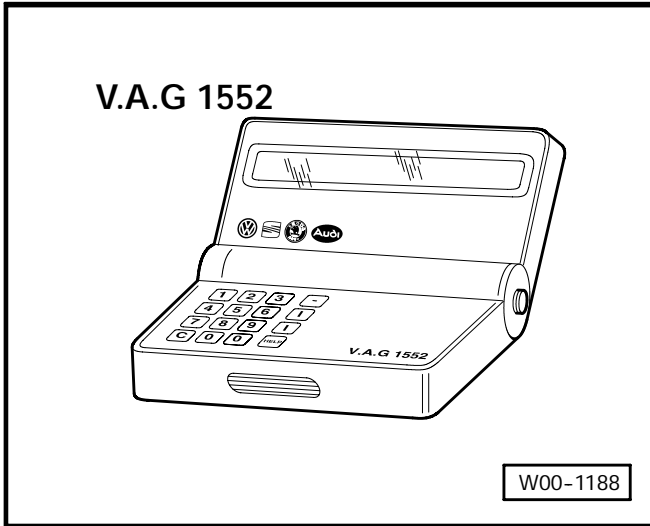
Special tools, workshop equipment, test and measuring equipment and accessories required

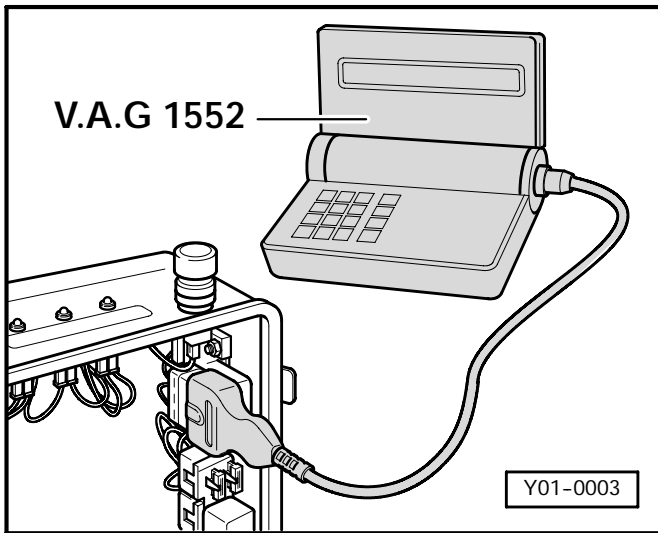
◆ Fault reader V.A.G 1552

◆ Cable V.A.G 1551/3

Test conditions:

- The battery voltage must be at least 11.5 V.
- Fuse 190 OK.





Procedure

- Open the cover of the fuse box/relay plate ⇒ page 23-5.
- ◀ - Connect the fault reader V.A.G 1552 with the cable V.A.G 1551/3.
- Depending on the function desired, you must:
switch on the ignition
or
start the engine ⇒ page 01-3, "Selectable Functions" table.

Notes:

- ◆ *If the display remains dark, check the power supply for the diagnosis plug using the CFD:*
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
- ◆ *If the displays indicated in the work procedure are not achieved:*
⇒ Operating instructions for the fault reader
- ◆ *If input errors produce the message "Fault in the data interchange!", remove the cable from the fault reader, reconnect it and repeat the work steps.*

Display:

- Keep an eye on the information that appears on the display while operating the fault reader:
- Press buttons 0 and 1 for "Engine electronics" address word and confirm entry with Q button.

Vehicle system test
Enter address word XX

HELP

064906018A S50-4 MDC 0000SG 5291 →
Coding 00001 WSC00000

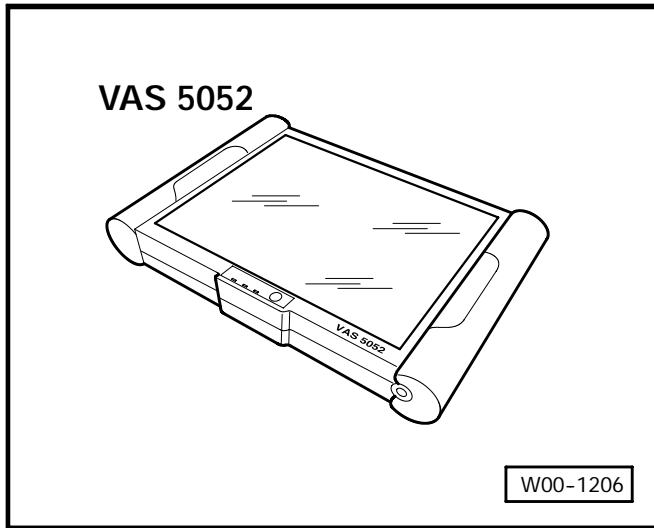
◀ The control unit identification appears on the display of the fault reader V.A.G 1552, e.g.:

- ◆ 064906018A = Part no. of the control unit (for current control unit version, see Spare Parts Catalogue)
 - ◆ S50-4 = 4-cyl. SDI engine with 50 hp
 - ◆ MDC 0000SG = Injection system (Marine Diesel Electronic Control)
 - ◆ 5291 = Software version of control unit
 - ◆ Coding 00001 = Coding variant
 - ◆ WSC xxxxx = Dealership identifier
- Press the → button.

Rapid data transfer HELP
Select function XX

◀ Display:

- See repair procedures for further procedure.



Connecting VAS 5052

Special tools, workshop equipment, test and measuring equipment and accessories required

- ◆ Fault reader VAS 5052

Test conditions:

- The battery voltage must be at least 11.5 V.
- Fuse 190 OK. ⇒ page 23-5

Procedure

- Open the cover of the fuse box/relay plate ⇒ page 23-5.



- Connect fault reader VAS 5052.

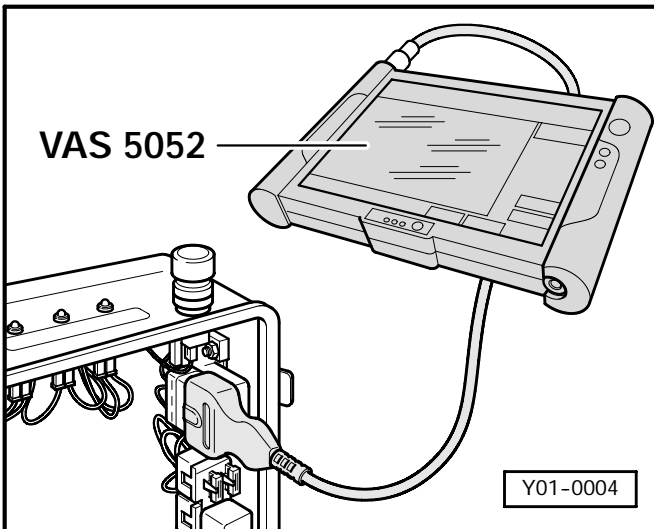
Select operating mode:

- Press the button for "Vehicle Self-Diagnosis" on the display.

Select vehicle system:

- Press the button "01 - Engine electronics" on the display.

The control unit identification of the engine control unit is shown on the display.



Selecting diagnosis function:

All diagnosis functions that can be carried out are available on the display.

- Press the button for the desired function on the display.

Notes:

The display fields in the functions 04 - Basic setting and 08 - Reading measurement value block, are shown from top to bottom.

The following test procedures are described for the fault reader V.A.G 1552.

Fault memory

Interrogating fault memory

Special tools, workshop equipment, test and measuring equipment and accessories required

- ◆ Fault reader V.A.G 1552 with cable V.A.G 1551/3 or fault reader VAS 5052

Procedure

- Connect the fault reader V.A.G 1551 (VAS 5052) and select the engine electronics control unit with the "Address word" 01. Here, the engine should be idling.
(Connecting fault reader and selecting engine control unit ⇒ page 01-4)

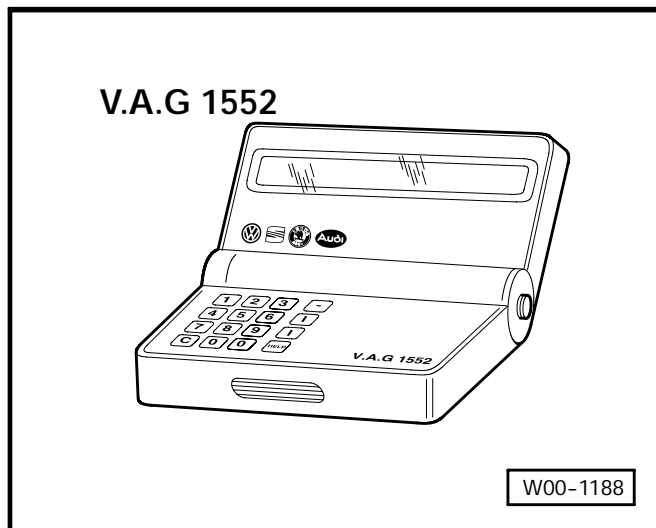
Only if the engine does not start:

- Switch on the ignition.

◀ Display:

- Keep an eye on the information that appears on the display while operating the fault reader:
- Press the keys 0 and 2 for the function "Query fault memory" and confirm the input using the Q key.

◀ The display shows the number of faults stored or "No faults detected!".



Rapid data transfer HELP
Select function XX

X faults detected!

If one or more faults are stored:

With the → key you can now display the individual fault numbers with the related texts.

- ◀ - Press the → key repeatedly until all the stored faults have been displayed and the display is as follows:
- Remedy the fault using the fault table ⇒ page 01-13.
- Then erase the fault memory ⇒ page 01-11

If the memory contains no faults:

- Press the → button.
- ◀ Display:
 - Press keys 0 and 6 for "End data transfer" function and acknowledge entry with Q key.

Rapid data transfer	HELP
Select function XX	

Rapid data transfer	HELP
Select function XX	

Erase fault memory

Special tools, workshop equipment, test and measuring equipment and accessories required

- ◆ Fault reader V.A.G 1552 with cable V.A.G 1551/3 or fault reader VAS 5052

Test condition

- Fault rectified

Note:

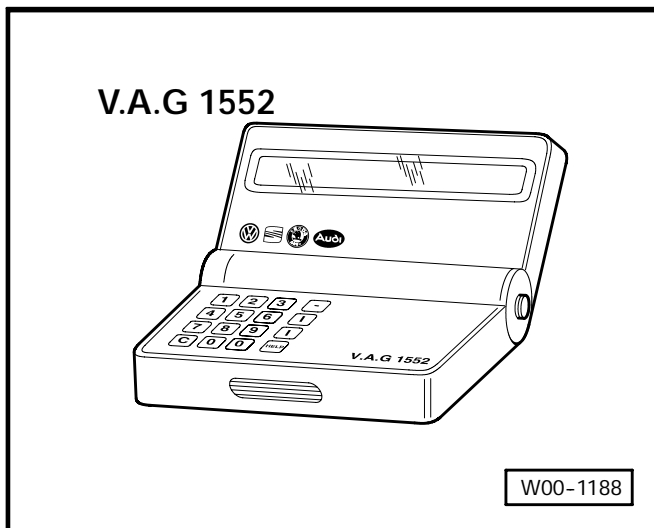
After the fault has been rectified, the fault memory must again be queried as described below and then deleted.

Procedure

- Connect the fault reader V.A.G 1551 (VAS 5052) and select the engine electronics control unit with the "Address word" 01. Here, the engine should be idling.
(Connecting fault reader and selecting engine control unit ⇒ page 01-4)

◀ Display:

- Press the keys 0 and 2 for the function "Query fault memory" and confirm the input using the Q key.



Rapid data transfer
Select function XX

HELP

Rapid data transfer HELP
Select function XX

- ▶ - Press the → key repeatedly until all the previously stored faults have been displayed and the display is as follows:
- Press the keys 0 and 5 for the function "Delete fault memory" and confirm the input using the Q key.

Rapid data transfer →
Fault memory has been erased!

- ▶ Display:
 - If the fault memory cannot be deleted, there is still a fault to be rectified.
 - Press the → -button.

Rapid data transfer HELP
Select function XX

- ▶ Display:
 - Press keys 0 and 6 for "End data transfer" function and acknowledge entry with Q key.

Fault table

Notes:

- ◆ *The fault table is arranged according to the 5-digit fault code on the left-hand side.*
- ◆ *In addition, the so-called P-codes, e.g. P0118, are output. These P-codes can currently be ignored, as they will first be used in future self-diagnosis systems.*
- ◆ *Explanations on the fault types (e.g. "Open circuit/Short to earth"):*
⇒ Operating instructions for the fault reader
- ◆ *If components are output as defective:*
First check the cables and connectors to these components and the earth cables of the system using the current flow diagram. Only when no faults are found here should components be replaced. This especially applies when faults are output as "sporadic" (SP).
- ◆ *Erase the fault memory after eliminating existing faults.*

Output on V.A.G 1552/VAS 5052, e.g.:

16502 P0118 035
Coolant temperature sender -G62
Signal too large
Sporadic fault

Explanation:

- ◆ *16502 = Fault code*
- ◆ *P0118 = Additional fault code*
- ◆ *035 = Fault type as number*
- ◆ *Coolant temperature sender -G62 = Defective current path or fault location*
- ◆ *Signal too large = Fault type as text*
- ◆ *Sporadic fault = Fault not always present, e.g. loose contact*

Output on V.A.G 1552/VAS 5052	Possible Cause(s) of Fault(s)	Possible Effects	Fault Remedy
16705 P0321 Engine speed sender - G28 Implausible signal	<ul style="list-style-type: none"> ◆ G28 defective ◆ Distance between speed sender and sender wheel too large ◆ Metal chips on G28 or retaining base loose 	<ul style="list-style-type: none"> ◆ Glow plug warning lamp flashes ◆ Engine does not start ◆ Engine dies ◆ No display on rev counter 	<ul style="list-style-type: none"> - Check G28 ⇒ page 23-36
16706 P0322 Engine speed sender - G28 No signal	<ul style="list-style-type: none"> ◆ G28 defective ◆ Break in wiring or short circuit 	<ul style="list-style-type: none"> ◆ Glow plug warning lamp flashes ◆ Engine does not start ◆ Engine dies ◆ No display on rev counter 	<ul style="list-style-type: none"> - Check G28 ⇒ page 23-36

Output on V.A.G 1552/VAS 5052	Possible Cause(s) of Fault(s)	Possible Effects	Fault Remedy
16989 P0605 Control unit defective	<ul style="list-style-type: none"> ◆ Internal defect in control unit 	<ul style="list-style-type: none"> ◆ Preheating warning lamp may flash ◆ Poor driveability ◆ Engine stops 	<ul style="list-style-type: none"> - Renew J248 ⇒ page 23-66
17570 P1162 Fuel temperature sender -G81 Short circuit to earth	<ul style="list-style-type: none"> ◆ G81 defective ◆ Wiring has short circuit to earth 	<ul style="list-style-type: none"> ◆ Goes to default value - 5.34 °C ◆ Increased emissions 	<ul style="list-style-type: none"> - Check G81 ⇒ page 23-44



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