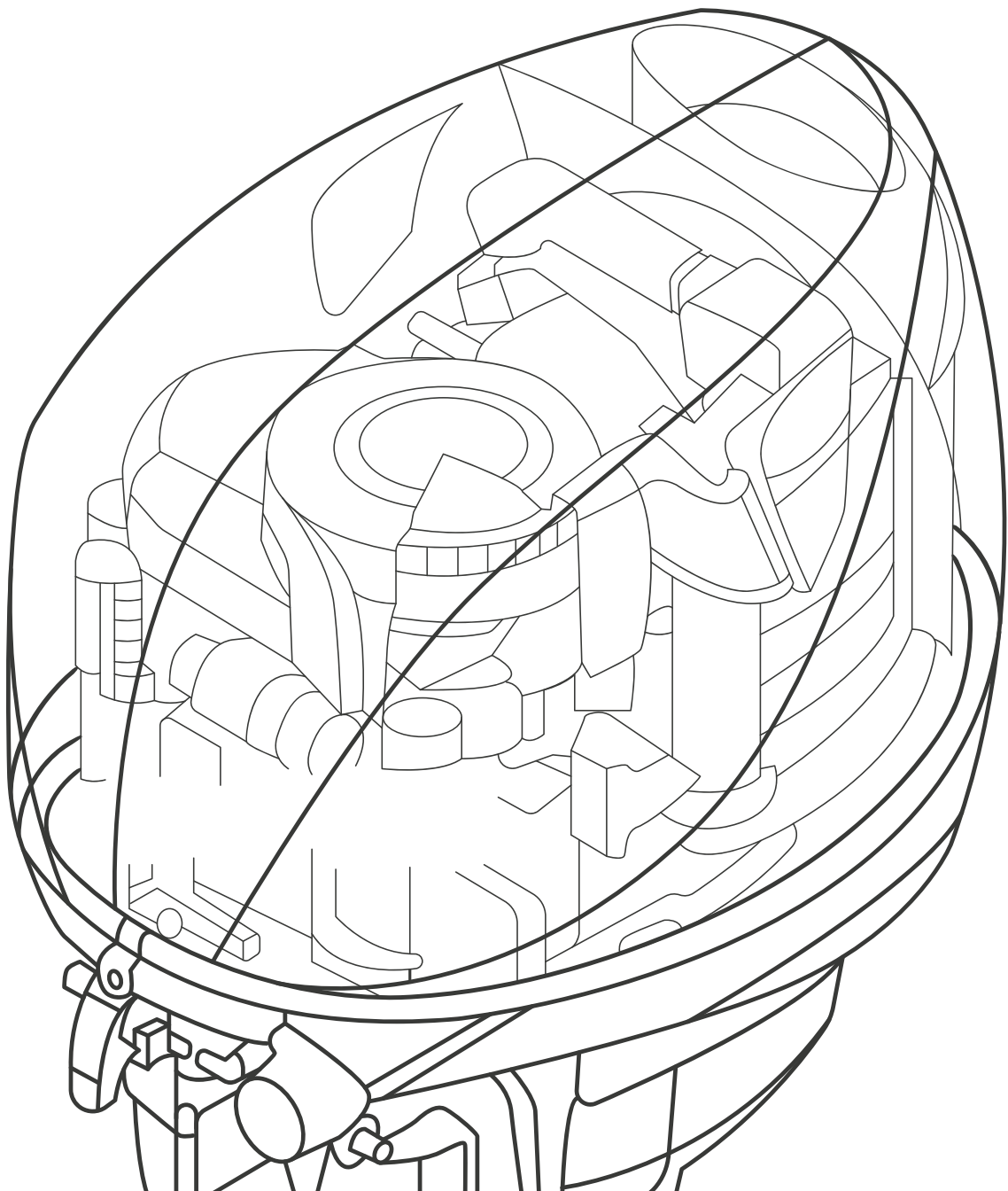# Engine Diagnostic Manual

Dtorque 50

ENGINE FAILURES / TROUBLESHOOTING
Introduction

This document is to be used in conjunction with the NEANDER Diagnostic tool.
It is important, before using the tool that the following points are observed.

1) It is safe to work on the outboard. Take care as some parts will be hot to touch.
Ideally, diagnostic work should be done with the boat tethered in the quay side and
not at open sea.

2) You have the correct level of training to work on the engine

3) You have fully read and understood the owners manual.

4) Do not remove the cowl cover with the engine running.

5) Check the simple things first;

       a) Are the battery connections in good condition?
       b) Is the battery charged?
       c) Do you have fuel in the tank?
       d) Do you know if the fuel is clean?
       e) Does the engine have the correct level of oil?
       f) Is the correct propeller fitted and the nut tight?
       g) Is the oil level in the PTT correct?
       h) Are the control cables adjusted correctly?
       i) Do a simple visual check for any obvious signs of damage.

If you are in any doubt, then stop and ask for help from a qualified person or contact
your nearest NEANDER Marine distributor.

The diagnostic tool will not be able to detect faults where the control system
parameters are within specifications. (For example, a blocked injector or fuel line).

Only connect the diagnostic tool after carrying out the above list of simple checks first.
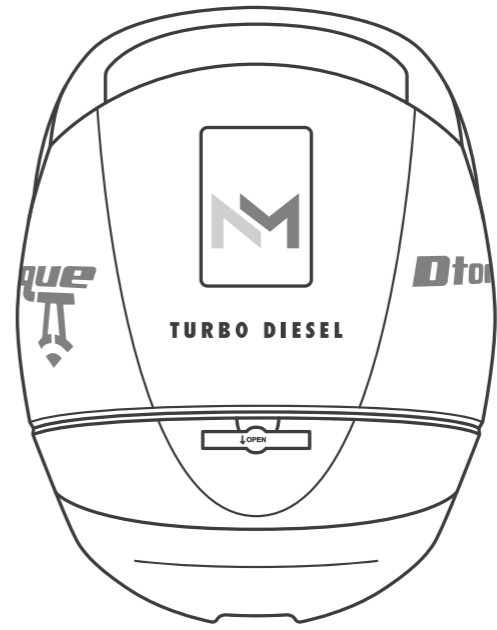
1 REMOVE COWLING

The engine is not running and has cooled sufficiently then:
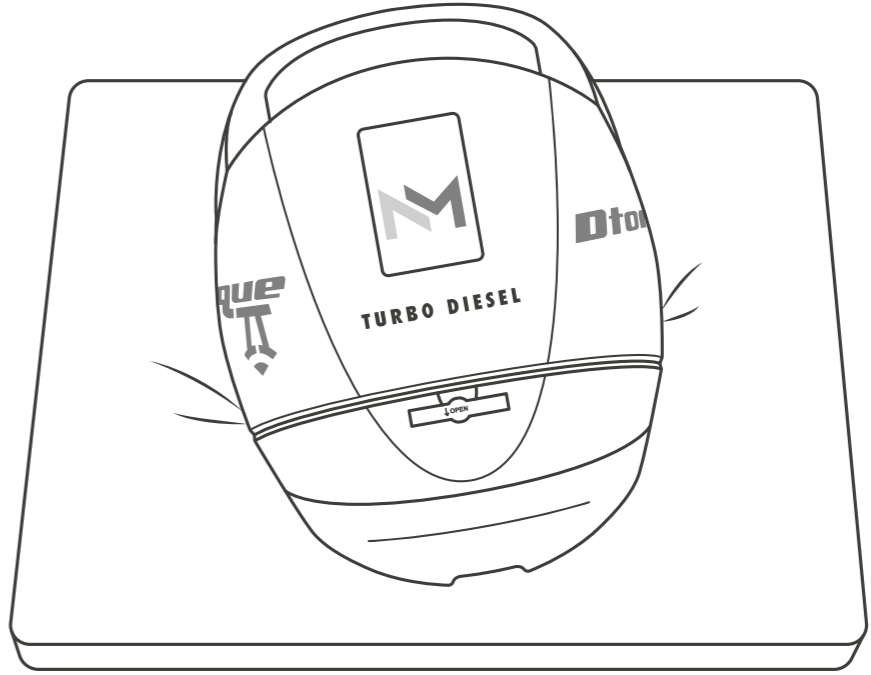
a) Turn the latches on the cowling anti-clockwise.
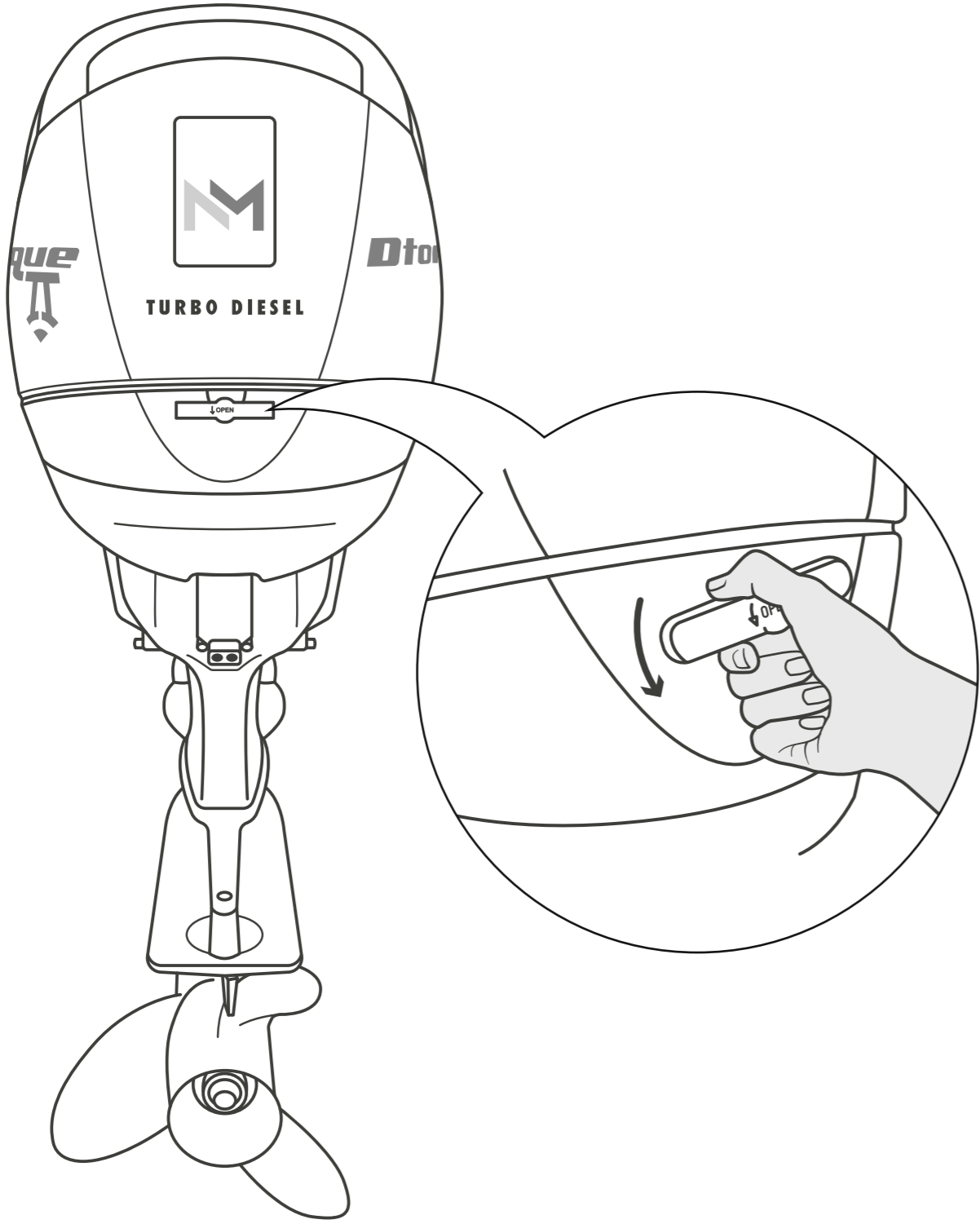
b) Carefully lift the cowling away from the engine.

c) Place the cowling in a safe place on a soft surface to prevent damage.

* **Safety notice:** there may be hot surfaces on the engine if it has been running.

2 CONNECT THE DIGANOSTIC TOOL TO THE ENGINE

a) Tip: Isolating the power before connection.

b) Locate the four pin 'Deutsch' connector, then press the small safety latch and pull apart the connector (this will be the connection from the engine to the Tachometer display).

a

b

c) Disconnect the Deutsch connector. Connect the "link lead" to each open Deutsch connector (shown in b).

d) Connect the 'Y' harness supplied with the Diagnostic tool. Connect the diagnostic tool to the converter box. Connect the lead to the top of the diagnostic tool.

c

d

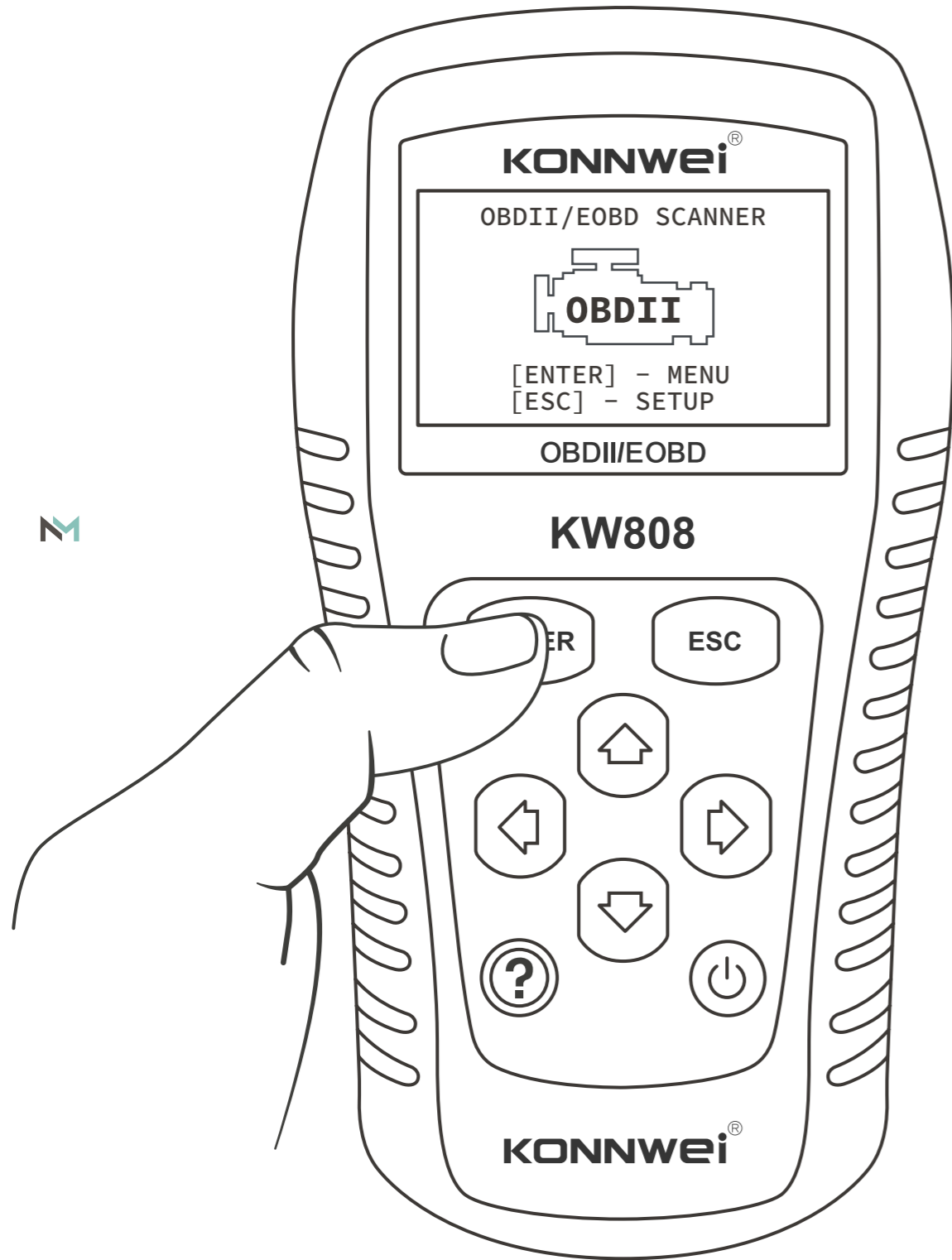**Tip:** Take care that cables are not trapped in the PTT or on rotating parts.

3 TURN ON DIAGNOSTIC TOOL

a) Do not start the engine, but turn the ignition to display the start-up. Now turn the main boat battery isolator on. Turn on the ignition key. The tool display should light up as shown.

KONNWEI®

KONNWE I

KONNWE I KW808
Version V2.8.8

OBDII/EOBD

KW808

ENTER   ESC

KONNWEI®

b) After a few seconds a 'menu' screen will appear. Push the **'enter'** button.

OBDII/EOBD SCANNER

OBDII

[ENTER] – MENU
[ESC] – SETUP

OBDII/EOBD

KW808

ER   ESC

?

a) Ensure **'Diagnostics'** is highlighted and push the **'enter'** button.

Main Menu

1/5

▶ Diagnostics
DTC LookUP
Review Data   ?
System SetUP
Tool Information

OBDII/EOBD

KW808

ENTER   ESC
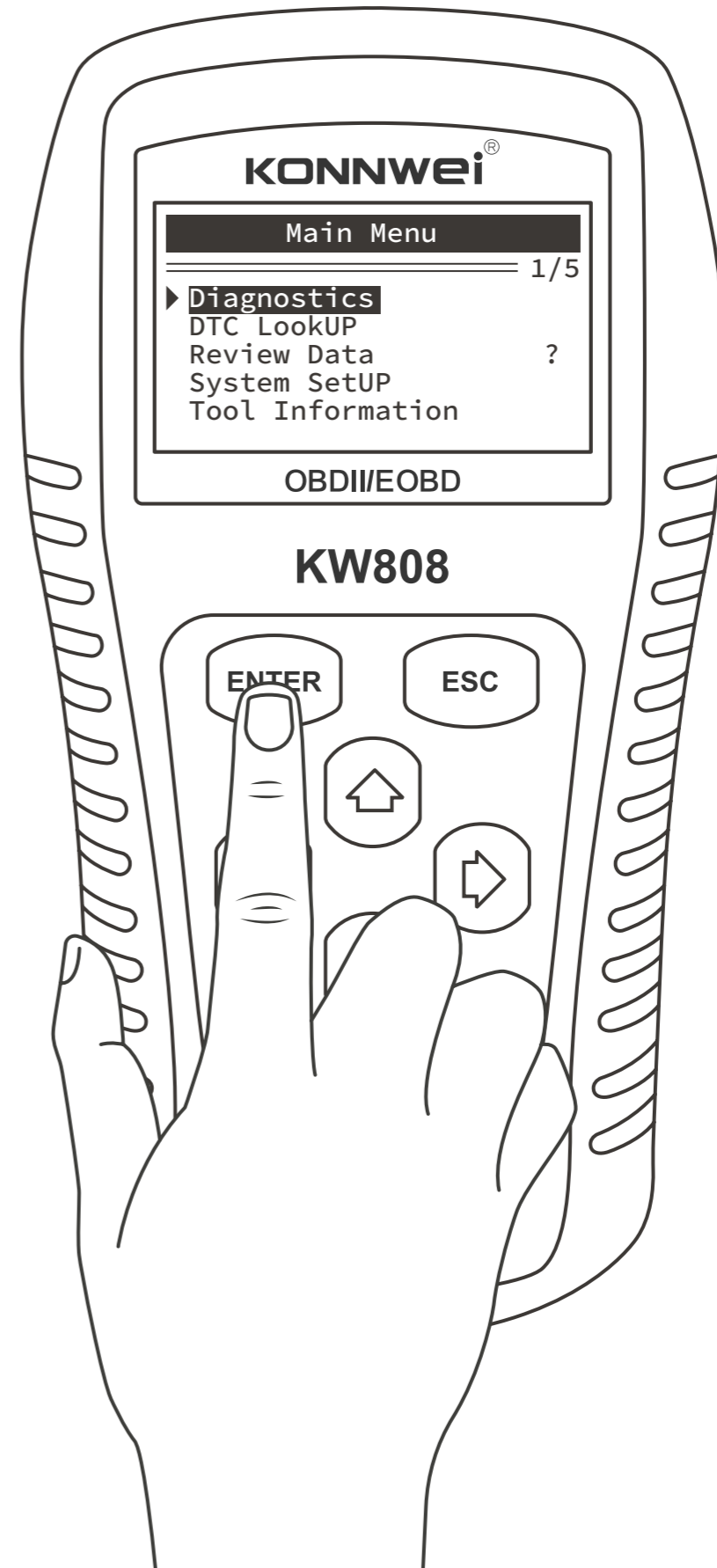
b) The tool will now connect to the engine and scan for faults.

KONNWEI®

Linking to Vehicle

SAE J1850 PWM

Waiting for vehicle
to respond.

OBDII/EOBD

KW808

ENTER   ESC

?

KONNWEI®
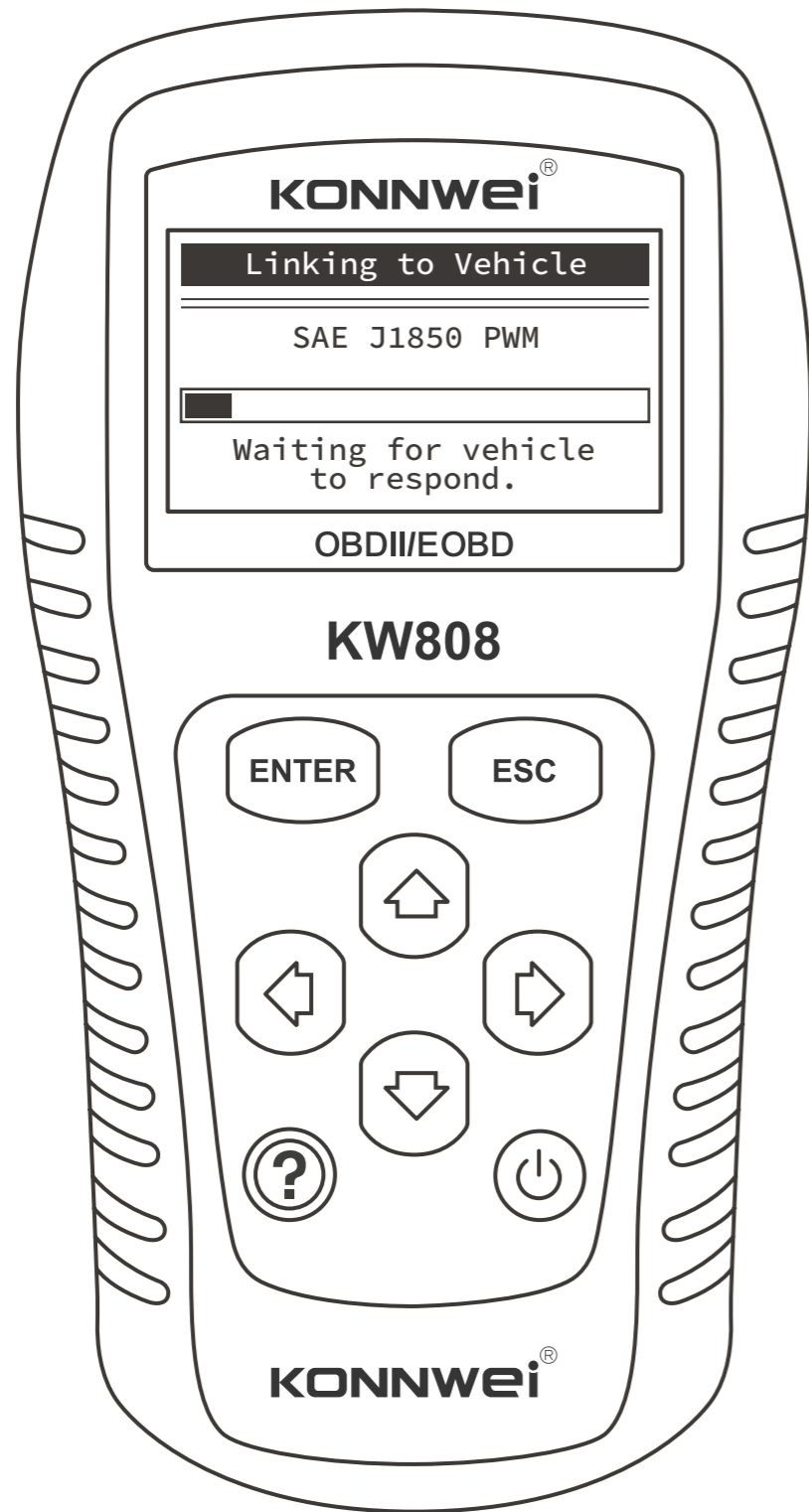
c) Push 'enter' to erase the previous data stored in the tool

KONNWEI®

Diagnostics

Erase previously
stored data to save
data from this test?

YES   NO

OBDII/EOBD

KW808

ENTER   ESC

?

KONNWEI®
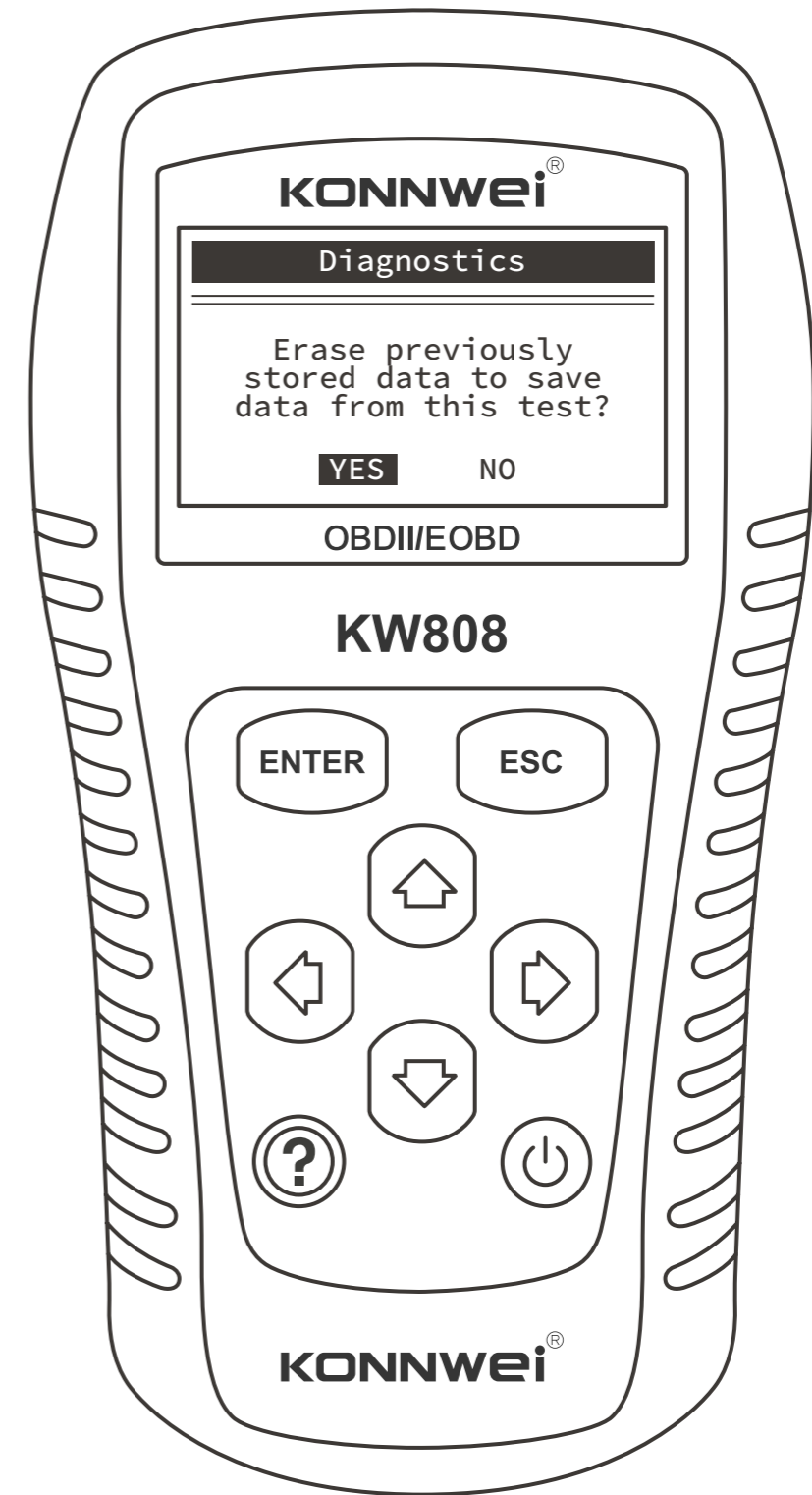
d) The tool will now display the number of faults saved in the ECU.

```
         System Status

MIL Status          OFF
Codes Found           4
Monitors N/A          8
Monitors Ok           3
Monitors INC          0
```

OBDII/EOBD

KW808

ENTER   ESC
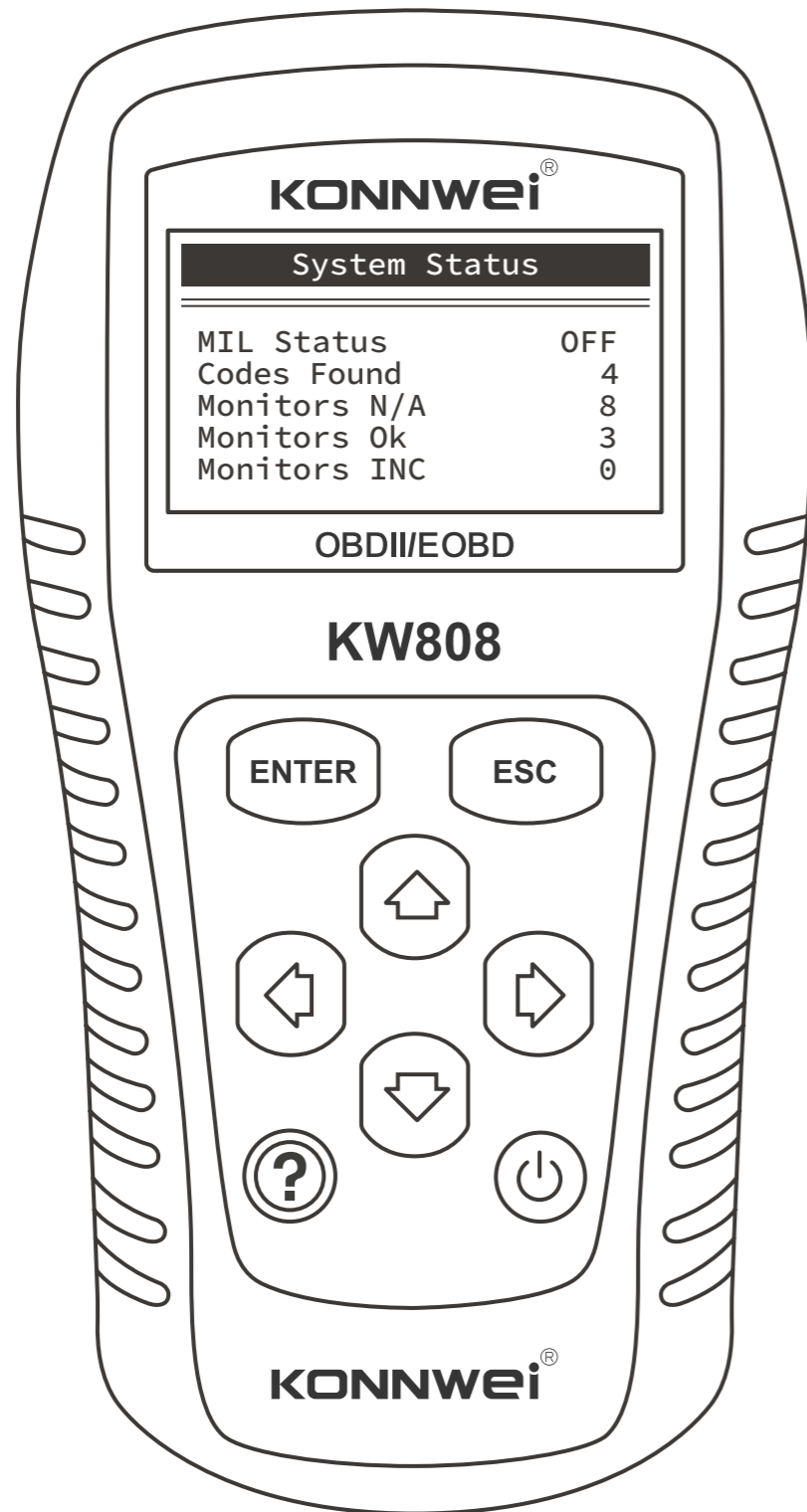
e) Push 'enter' to proceed. Note - stored codes are normally recorded to the ECU memory after a number of engine running cycles. If a fault occurred at the last ignition cycle "cycle" - then the codes will be stored in the "Pending Codes".

```
         Trouble Codes
                          1/2
▸ Stored Codes
  Pending Codes
                            ?
```

OBDII/EOBD

KW808

ENTER   ESC
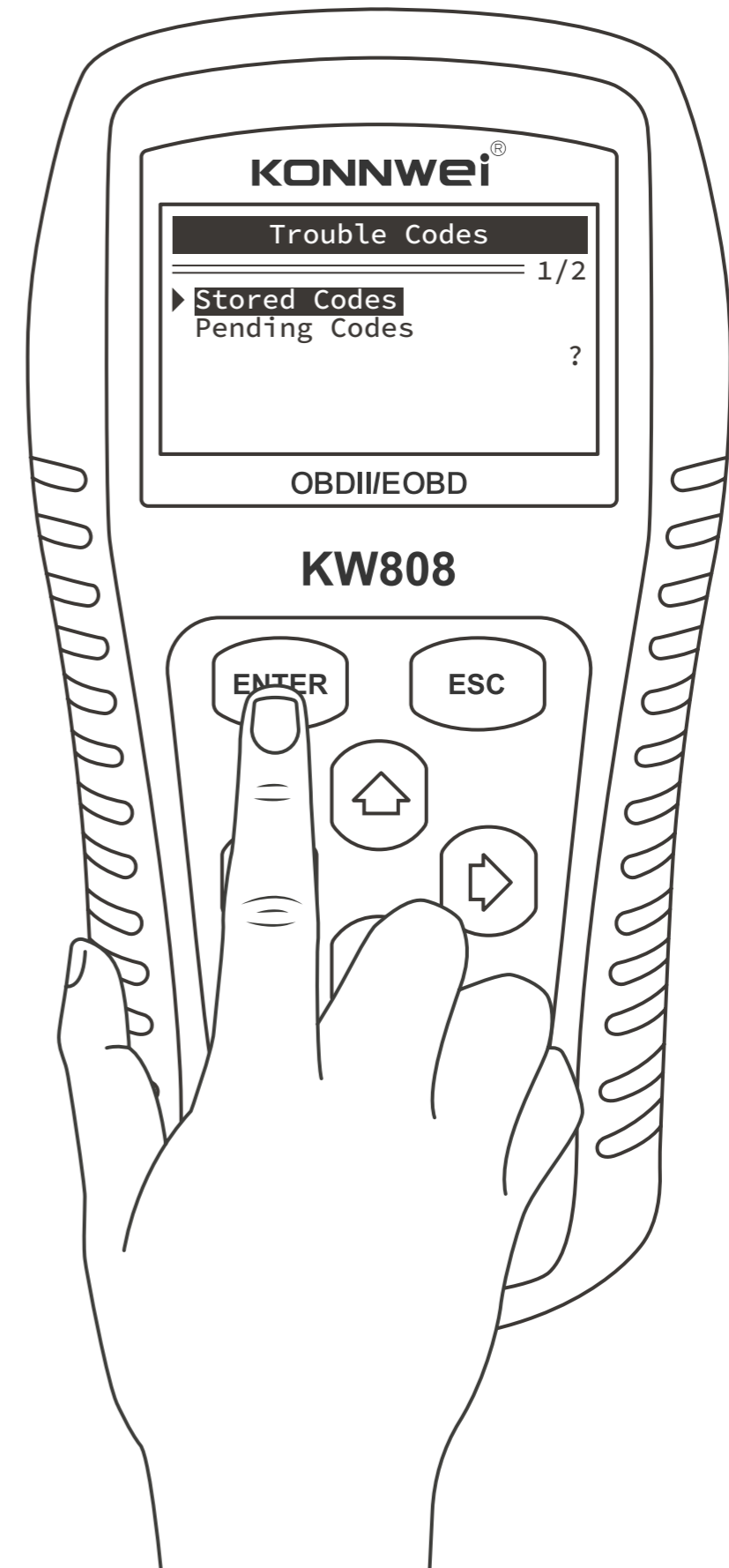
5 READ FAULT CODES

a) Push the down arrow to scroll through the codes

b) Make a note of these codes on a separate paper in order to look them up in the Engine Diagnostic Manual.

c) Push -ESC' to return to the previous menu.
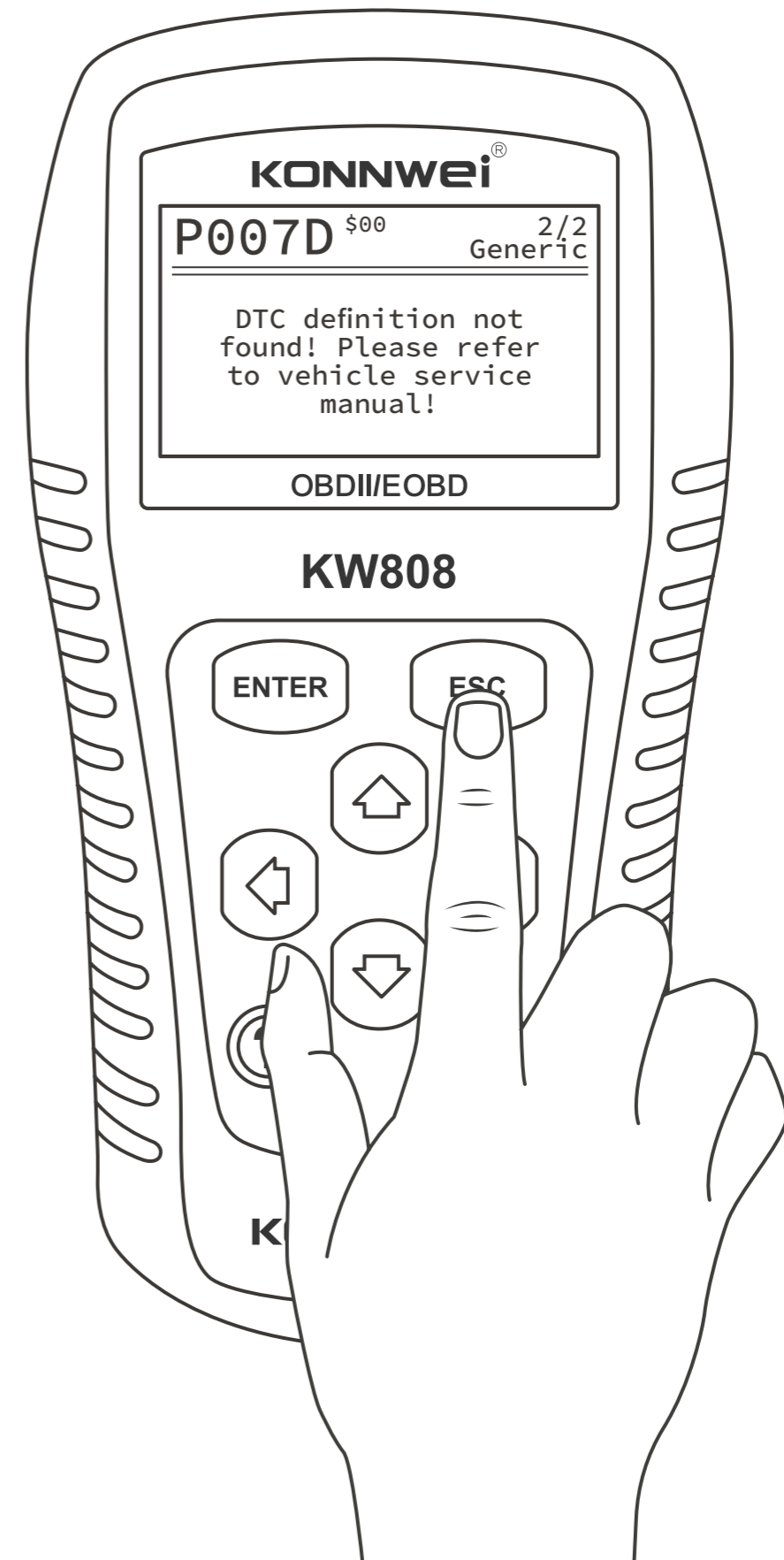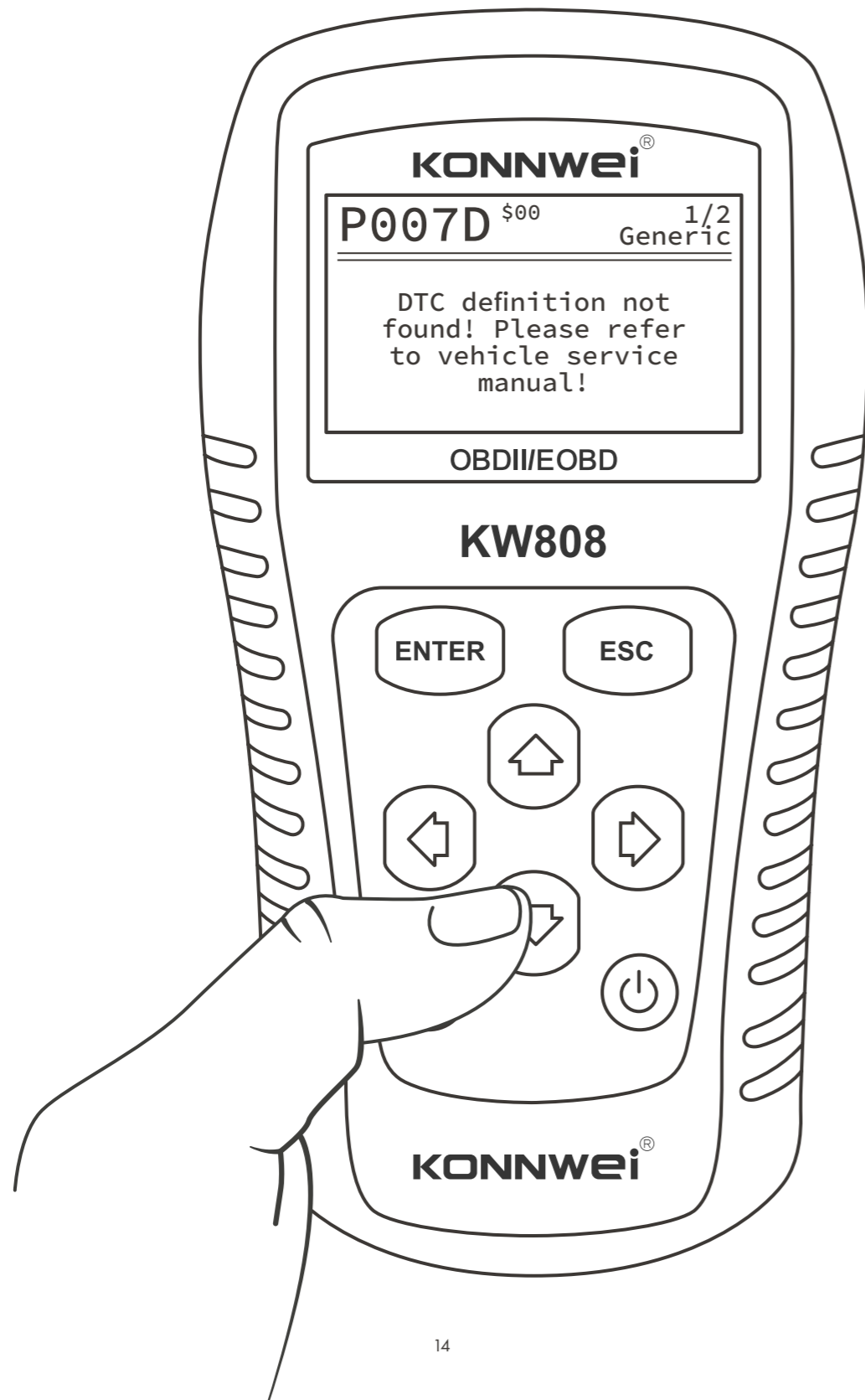
6 ERASE CODES AND FINISH

a) Ensure you only delete codes once you have carried out the checks defined in the Engine Diagnostic Manual.

b) Scroll down to highlight 'Erase Codes', then press 'enter'.

c) The tool will display this screen.
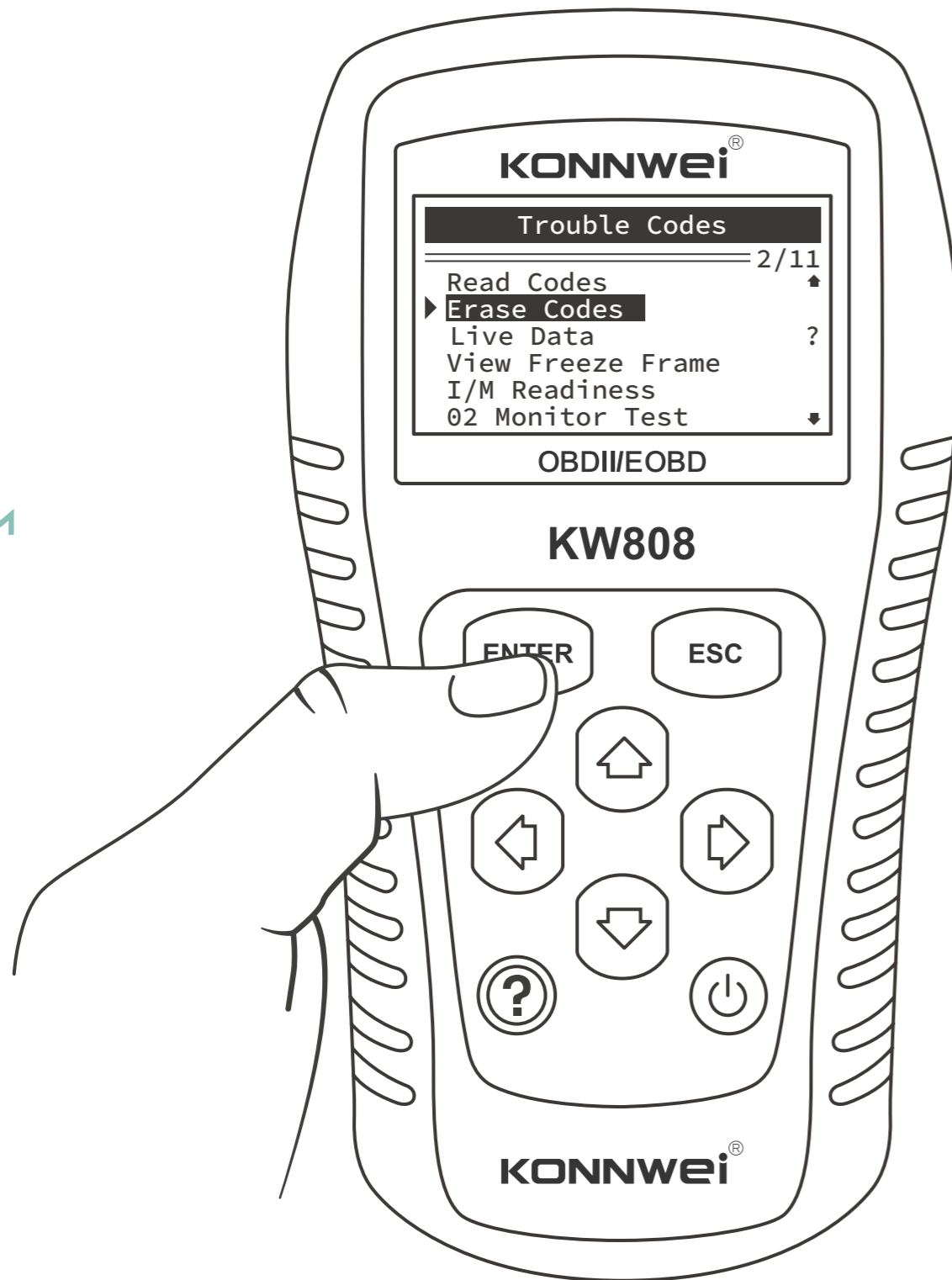
d) Push 'enter' to erase all codes'
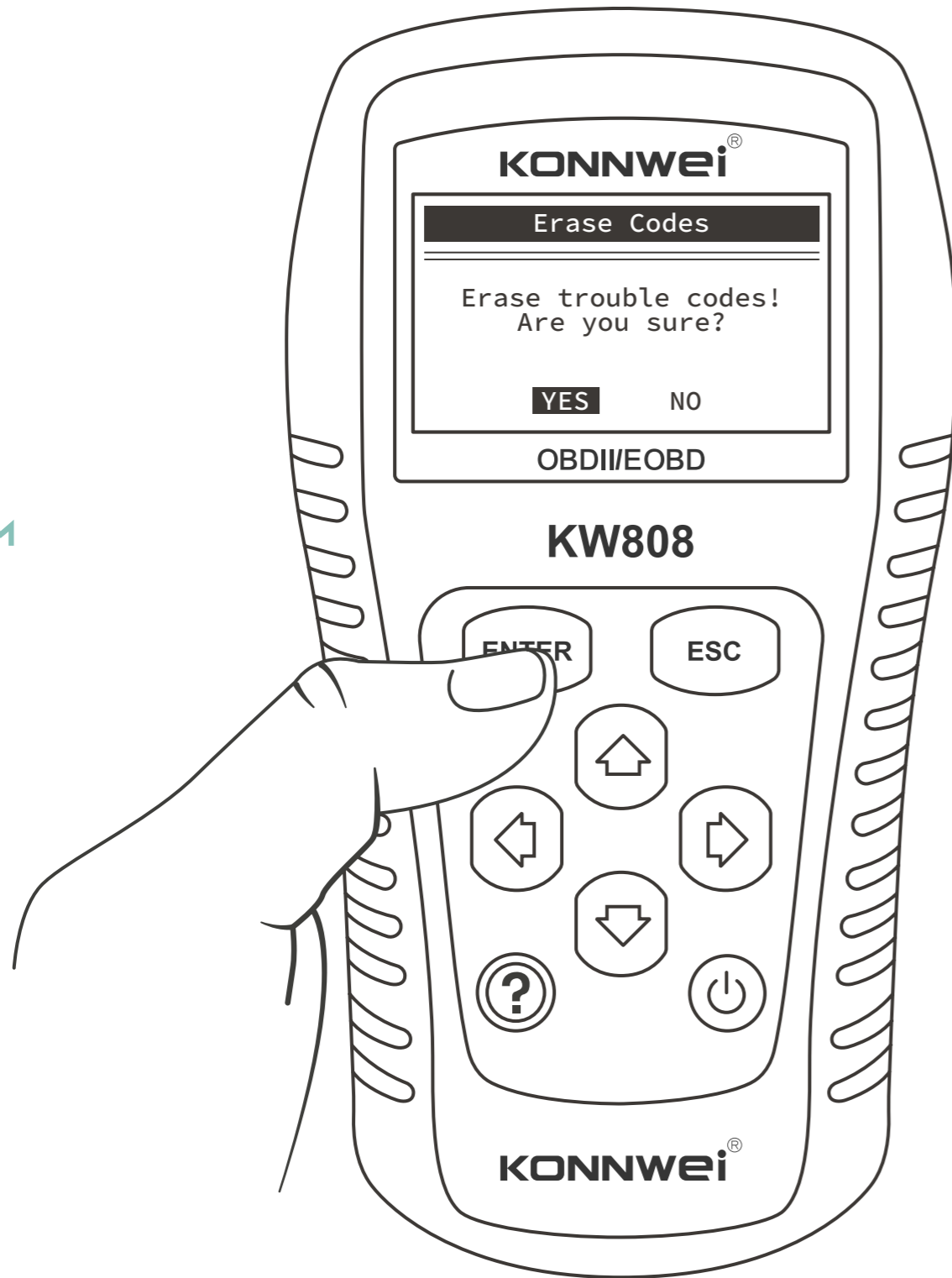
e) Push any key to return to the main menu.

KONNWⒺi®

Erase Codes

Erase trouble codes!
Are you sure?

YES   NO

OBDII/EOBD

KW808

ENTER   ESC

KONNWⒺi®

KONNWⒺi®

Erase Codes

Erase done!

Press any key to con.

OBDII/EOBD

KW808

ENTER   ESC

KONNWⒺi
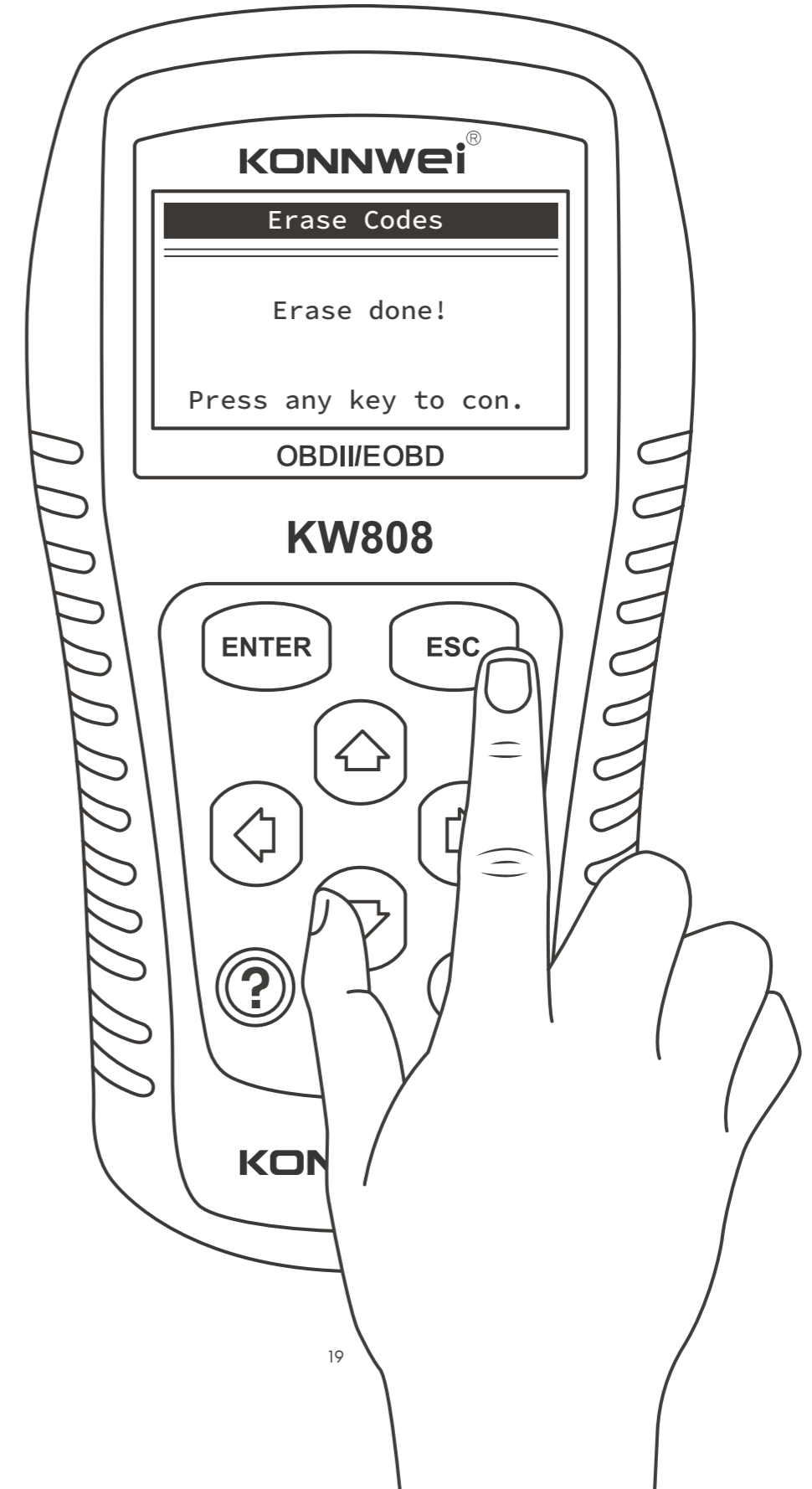
f) Once all fault codes are cleared, the tool will display this screen.

```
        System Status

MIL Status          OFF
Codes Fonud           0
Monitors N/A          8
Monitors Ok           3
Monitors INC          0
```

OBDII/EOBD

KW808

ENTER   ESC

CONTENTS

DFC Overview

DFC	LCD	DTC	Type	SPN	FMI	BLINK CODE / BEEP CODE	DTC Description	CATEGORY
DFC_EpmCaSl 1OfsErr	CHK ENG	P0016	09	190	2	1218	camshaft sensor–DFC for camshaft offset angle exceeded	Camshaft
DFC_PCACDsEnvPPls	CHK ENG	P007B	0D	2631	2	1411	Intake manifold pressure–Plausibility defect between CACDsP and EnvP	Others
DFC_PCACDsSRCMin	CHK ENG	P007C	04	2631	4	1413	Intake manifold pressure sensor–SRC low for Charged air cooler pressure (down stream)	MAP
DFC_TCACDsSRCMin	CHK ENG	P007C	01	2630	4	1422	Intake manifold temperature sensor–SRC low for Charge air cooler downstream Temperature	MAP
DFC_PCACDsSRCMax	CHK ENG	P007D	03	2631	3	1412	Intake manifold pressure sensor–SRC High for Charged air cooler pressure (down stream)	MAP
DFC_TCACDsSRCMax	CHK ENG	P007D	00	2630	3	1421	Intake manifold temperature sensor–SRC High for Charge air cooler downstream Temperature	MAP
DFC_RailMeUn0	CHK ENG	P0087	00	523613	0	3434	CR system–maximum positive deviation of rail pressure exceeded	
DFC_RailMeUn3	CHK ENG	P0087	0C	523613	1	3437	CR system–minimum rail pressure exceeded	
DFC_RailMeUn1	CHK ENG	P0088	07	523613	16	3435	CR system–maximum positive deviation of rail pressure exceeded concerning set flow of fuel	
DFC_RailMeUn2	CHK ENG	P0088	01	524105	0	3436	CR system–maximum negative rail pressure deviation with metering unit on lower limit is exceeded	
DFC_RailMeUn4	CHK ENG	P0088	0C	523613	16	3438	CR system–maximum rail pressure exceeded	
DFC_CEngDsTSRCMin	CHK ENG	P0117	04	110	4	1114	coolant temperature sensor–SRC low for Engine coolant temperature(down stream)	Coolant Temp
DFC_CEngDsTSRCMax	CHK ENG	P0118	03	110	3	1113	coolant temperature sensor–SRC High for Engine coolant temperature(down stream)	Coolant Temp
DFC_SRCLowAPP1	CHK ENG	P0122	02	91	4	1224	Accelerator pedal–Signal Range Check Low for APP1	Throttle

DFC	LCD	DTC	Type	SPN	FMI	BLINK CODE / BEEP CODE	DTC Description	CATEGORY
DFC_SRCHighAPP1	CHK ENG	P0123	02	91	3	1222	Accelerator pedal–Signal Range Check High for APP1	Throttle
DFC_FuelTSRCMin	CHK ENG	P0182	06	174	4	1612	Fuel temp. sensor–SRC low for fuel temperature sensor	Fuel Temp
DFC_FuelTSRCMax	CHK ENG	P0183	05	174	3	1611	Fuel temp. sensor–SRC high for fuel temperature sensor	Fuel Temp
DFC_RailPOfsTstMax	None	P0191	0D	157	0	3443	Rail pressure sensor–rail pressure raw value is above maximum offset	Rail Pressure
DFC_RailPOfsTstMin	None	P0191	0E	157	1	3444	Rail pressure sensor–rail pressure raw value is below minimum offset	Rail Pressure
DFC_RailPSRCMin	CHK ENG	P0192	0C	157	4	3447	Rail pressure sensor with metering unit system–Sensor voltage below lower limit	Rail Pressure
DFC_RailPSRCMax	CHK ENG	P0193	0E	157	3	3446	Rail pressure sensor with metering unit system–Sensor voltage above upper limit	Rail Pressure
DFC_OilTSRCMin	CHK ENG	P0197	03	175	4	1322	Oil temperature sensor–SRC low for Oil Temperature	oil temp and press
DFC_OilTSRCMax	CHK ENG	P0198	04	175	3	1321	Oil temperature sensor–SRC High for Oil Temperature	oil temp and press
DFC_InjVlv_DI_ScBnk	CHK ENG	P0216	06	2797	3	3115	Injection system–Short circuit of the power stage high-side (bank error)	Injector
DFC_EngPrtOvrSpd	CHK ENG	P0219	04	190	0	6312	Engine overspeed–Overspeed detection in component engine protection	rpm
DFC_SRCLowAPP2	CHK ENG	P0222	09	91	6	1225	Accelerator pedal–Signal Range Check Low for APP2	Throttle
DFC_SRCHighAPP2	CHK ENG	P0223	09	91	5	1223	Accelerator pedal–Signal Range Check High for APP2	Throttle

DFC	LCD	DTC	Type	SPN	FMI	BLINK CODE / BEEP CODE	DTC Description	CATEGORY
DFC_MeUnOL	CHK ENG	P0251	04	523615	13	3212	FCU–open load error	FCU
DFC_MeUnOT	CHK ENG	P0252	03	523615	12	3213	FCU / ECU–over temperature error	FCU
DFC_MeUnShCirLSGnd	CHK ENG	P0258	01	523615	4	3215	FCU / ECU–short circuit to GND error	FCU
DFC_MeUnShCirLSBatt	CHK ENG	P0259	00	523615	14	3214	FCU / ECU–short circuit to battery error	FCU
DFC_PSPOL	CHK ENG	P025A	0B	6323	5	3311	fuel pump relay (in fuse / relay box) open load error	Fuel Pump Relay
DFC_PSPOvrTemp	CHK ENG	P025B	0C	6323	12	3312	fuel pump relay (in fuse / relay box) over temperature error	Fuel Pump Relay
DFC_PSPSCG	CHK ENG	P025C	0A	6323	4	3314	fuel pump relay (in fuse / relay box) short circuit to ground error	Fuel Pump Relay
DFC_PSPSCB	CHK ENG	P025D	0D	6323	3	3313	fuel pump relay (in fuse / relay box) short circuit to battery error	Fuel Pump Relay
DFC_InjVlv_DI_ScCyl_0	CHK ENG	P0261	06	651	3	3116	Injector Cyl 1–Short circuit of the power stage low-side (cylinder error)	Injector
DFC_InjVlv_DI_ScHsLs_0	CHK ENG	P0262	04	651	4	3121	Injector Cyl 1–Short circuit between high-side and low-side of the power stage (high-side non plausible error)	Injector
DFC_InjVlv_DI_ScCyl_1	CHK ENG	P0264	05	653	3	3117	Injector Cyl 2–Short circuit of the power stage low-side (cylinder error)	Injector
DFC_InjVlv_DI_ScHsLs_1	CHK ENG	P0265	03	653	4	3122	Injector Cyl 2–Short circuit between high-side and low-side of the power stage (high-side non plausible error)	Injector

DFC	LCD	DTC	Type	SPN	FMI	BLINK CODE / BEEP CODE	DTC Description	CATEGORY
DFC_EpmCrSErrSig	CHK ENG	P0336	00	190	9	1219	crankshaft sensor–DFC for crankshaft signal diagnose–disturbed signal	Crankshaft
DFC_EpmCaSI1NoSig	CHK ENG	P0340	09	190	12	1217	camshaft sensor–DFC for camshaft signal diagnose–no signal	Camshaft
DFC_EpmCaSI1ErrSig	CHK ENG	P0344	02	190	8	1216	camshaft sensor–DFC for camshaft signal diagnose–disturbed signal	Camshaft
DFC_GlwPlgOL	CHK ENG	P037D	05	676	5	4513	Glow plug relay (in fuse / relay box) Open load error	Glow Plug Relay
DFC_GlwPlgSCG	CHK ENG	P037E	04	676	4	4516	Glow plug relay (in fuse / relay box) Short circuit to ground error	Glow Plug Relay
DFC_GlwPlgSCB	CHK ENG	P037F	03	676	3	4515	Glow plug relay (in fuse / relay box) Short circuit to battery error	Glow Plug Relay
DFC_OilPSwmpSRCMin	CHK ENG	P0522	04	100	4	1315	Oil pressure sensor–SRC low for Oil pressure sensor	oil temp and press
DFC_OilPSwmpSRCMax	CHK ENG	P0523	03	100	3	1314	Oil pressure sensor–SRC high for oil pressure sensor	oil temp and press
DFC_OilPSwmpPhysRngLo	CHK ENG	P0524	1	100	1	1312	Oil pressure–Physical Range Check low for Oil Pressure	oil temp and press
DFC_BattUSRCMin	CHK ENG	P0562	09	168	4	6112	Supply voltage–Diagnostic Fault Check for Signal Range Min Check of Battery Voltage	battery
DFC_BattUSRCMax	CHK ENG	P0563	03	168	3	6111	Supply voltage–Diagnostic Fault Check for Signal Range Max Check of Battery Voltage	battery
DFC_CEngPPhysRngLo	CHK ENG	P05C3	01	109	1	1116	Coolant pressure–Physical Range Check low for Coolant Pressure	coolant press
DFC_CEngPSRCMin	CHK ENG	P05C4	04	109	4	1122	Coolant pressure sensor–Diagnostic fault check for SRC low in coolant pressure sensor	coolant press

DFC	LCD	DTC	Type	SPN	FMI	BLINK CODE / BEEP CODE	DTC Description	CATEGORY
DFC_CEngPSRCMax	CHK ENG	P05C5	03	109	3	1121	Coolant pressure sensor–Diagnostic fault check for SRC high in coolant pressure sensor	coolant press
DFC_EngICO	CHK ENG	P0606	0D	524123	12	6311	ECU–Injection cut off demand (ICO) for shut off coordinator	ECU
DFC_OCWDACom	CHK ENG	P0607	01	524098	12	6532	ECU–Diagnostic fault check to report "WDA active" due to errors in query-/response communication	ECU
DFC_OCWDALowVltg	CHK ENG	P0607	04	524099	12	6533	ECU–Diagnostic fault check to report "ABE active" due to undervoltage detection	ECU
DFC_OCWDAOvrVltg	CHK ENG	P0607	03	524100	12	6534	ECU–Diagnostic fault check to report "ABE active" due to overvoltage detection	ECU
DFC_OCWDA ReasUnkwn	CHK ENG	P0607	00	524101	12	6535	ECU–Diagnostic fault check to report "WDA/ABE active" due to unknown reason	ECU
DFC_SWReset_0	CHK ENG	P0607	09	524120	14	6536	ECU–Visibility of SoftwareResets in DSM	ECU
DFC_SWReset_1	None	P0607	02	524121	14	6537	ECU–Visibility of SoftwareResets in DSM	ECU
DFC_SWReset_2	None	P0607	0B	524122	14	6538	ECU–Visibility of SoftwareResets in DSM	ECU
DFC_Cy327SpiCom	CHK ENG	P060C	03	524131	12	6511	ECU / CR system–CY327 SPI Communication Error	ECU
DFC_StrtOL	CHK ENG	P0615	05	677	5	6215	Starter Relay (in fuse / relay box)–Open load error	starter relay
DFC_StrtOvrTemp	None	P0615	0C	677	12	6212	Starter Relay (in fuse / relay box)–Over temperature error	starter relay
DFC_StrtLSSCB	None	P0615	03	677	14	6213	Starter Relay (in fuse / relay box)–Short circuit to battery error	starter relay

DFC	LCD	DTC	Type	SPN	FMI	BLINK CODE / BEEP CODE	DTC Description	CATEGORY
DFC_StrtLSSCG	None	P0615	04	677	31	6214	Starter Relay (in fuse / relay box)–Short circuit to ground error	starter relay
DFC_EEPRdErr	None	P062F	03	631	12	6512	ECU Memory Read Error–EEP Read Error based on the error in reading blocks from memory media	ECU
DFC_EEPWrErr	None	P062F	04	632	12	6513	ECU Memory Write Error–EEP Write Error based on the error in storing the blocks in memory media	ECU
DFC_SSpMon1	CHK ENG	P0641	09	1079	13	6411	ECU / wiring harness / sensors–Voltage fault at Sensor supply 1	ECU
DFC_SSpMon2	CHK ENG	P0651	09	1080	13	6415	ECU / wiring harness / sensors–Voltage fault at Sensor supply 2	ECU
DFC_TECUPhysRngLo	None	P0668	01	1136	16	1812	ECU temperature–Physical Range Check low for ECU temperature sensor	ECU
DFC_TECUPhysRngHi	None	P0669	00	1136	18	1811	ECU temperature–Physical Range Check high for ECU temperature sensor	ECU
DFC_MRlyErlyOpng	CHK ENG	P068A	02	2634	12	2511	Main Relay–Early opening defect of main relay	main relay
DFC_MRlyStk	CHK ENG	P068B	00	2634	13	2512	Main Relay–DFC for stuck main relay error	main relay
DFC_SSpMon3	CHK ENG	P0697	09	523601	13	6419	ECU / wiring harness / sensors–Voltage fault at Sensor supply 3	ECU
DFC_SyncAPP	CHK ENG	P2135	09	91	11	1226	Accelerator pedal–In case of dual analog accelerator pedal, it is the plausibility check between APP1 and APP2	throttle
DFC_InjVlv_DI_NoLd_0	CHK ENG	P21CF	03	651	5	3111	Injector Cyl 1–Open load on the power stage	Injector
DFC_InjVlv_DI_NoLd_1	CHK ENG	P21D0	02	653	5	3112	Injector Cyl 2–Open load on the power stage	Injector
DFC_PEnvSigRngMin	CHK ENG	P2228	01	108	4	1517	Ambient pressure sensor–fault check min signal range violated for ambient air pressure sensor	APS

DFC	LCD	DTC	Type	SPN	FMI	BLINK CODE	DTC Description	CATEGORY
						BEEP CODE		
DFC_PEnvSnsrPlaus	CHK ENG	P222F	04	108	2	1518	Ambient pressure–Ambient air pressure sensor sensor error by component self diagnosis	APS
DFC_FlSys_WtDet	CHK ENG	P2269	03	97	31	1513	Fuel System–Error in water in Fuel Detection switch	water in fuel
DFC_PCRBoostPMax	CHK ENG	P226B	0	1127	0	1414	Boost pressure sensor Error for maximum boost pressure reached	MAP
DFC_MeUnIntCtct	CHK ENG	P251C	05	523615	2	3211	FCU–Intermittent contact between ECU and FCU	FCU
DFC_T50Err	CHK ENG	P2533	09	523550	12	6216	T50 signal–Defective T50 switch	starter switch
DFC_EpmCrSNoSig	CHK ENG	P2617	00	190	18	1221	crankshaft sensor–DFC for crankshaft signal diagnose– no signal	crankshaft
DFC_GlwPlgOvrTemp	CHK ENG	P263C	0C	676	12	4514	Glow plug relay (in fuse / relay box) Over temperature error	Glow Plug Relay
DFC_IVAdjDialVAdj_0	None	P268C	05	651	13	3515	ECU–check of missing injector adjustment value programming	ECU
DFC_IVAdjDialVAdj_1	None	P268E	02	653	13	3516	ECU–check of missing injector adjustment value programming	ECU
DFC_MoCADCNTP	CHK ENG	P3301	09	524124	12	6514	ECU–Diagnostic fault check to report the NTP error in ADC monitoring	ECU
DFC_MoCADCTst	CHK ENG	P3302	0E	524059	12	6515	ECU–Diagnostic fault check to report the ADC test error	ECU
DFC_MoCADCVltgRatio	CHK ENG	P3303	0E	524060	12	6516	ECU–Diagnostic fault check to report the error in Voltage ratio in ADC monitoring	ECU
DFC_MoCComErrCnt	CHK ENG	P3304	0E	524061	12	6517	ECU–Diagnostic fault check to report errors in query-/response-communication	ECU
DFC_MoCComSPI	CHK ENG	P3305	0E	524062	12	6518	ECU–Diagnostic fault check to report errors in SPI-communication	ECU
DFC_MoCROMErrXPg	CHK ENG	P3306	0E	524063	12	6519	ECU–Diagnostic fault check to report multiple error while checking the complete ROM-memory	ECU
DFC_MoCSOPErrMMRespByte	CHK ENG	P3307	0E	524064	12	6521	ECU–Loss of synchronization sending bytes to the MM from CPU.	ECU
DFC_MoCSOPErrNoChk	CHK ENG	P3308	0E	524065	12	6522	ECU–DFC to set a torque limitation once an error is detected before MoCSOP's error reaction is set	ECU

DFC	LCD	DTC	Type	SPN	FMI	BLINK CODE	DTC Description	CATEGORY
						BEEP CODE		
DFC_MoCSOPErrRespTime	CHK ENG	P3309	0E	524066	12	6523	ECU–Wrong set response time	ECU
DFC_MoCSOPErrSPI	CHK ENG	P330A	0E	524067	12	6524	ECU–Too many SPI errors during MoCSOP execution.	ECU
DFC_MoCSOPLoLi	CHK ENG	P330B	0E	524068	12	6525	ECU–Diagnostic fault check to report the error in undervoltage monitoring	ECU
DFC_MoCSOPMM	CHK ENG	P330C	0E	524069	12	6526	ECU–Diagnostic fault check to report that WDA is not working correct	ECU
DFC_MoCSOPOSTimeOut	CHK ENG	P330D	0E	524070	12	6527	ECU–OS timeout in the shut off path test. Failure setting the alarm task period.	ECU
DFC_MoCSOPPsvTstErr	CHK ENG	P330E	0E	524071	12	6528	ECU–Diagnostic fault check to report that the positive test failed	ECU
DFC_MoCSOPTimeOut	CHK ENG	P330F	0E	524072	12	6529	ECU–Diagnostic fault check to report the timeout in the shut off path test	ECU
DFC_MoCSOPUpLi	CHK ENG	P3310	0E	524073	12	6531	ECU–Diagnostic fault check to report the error in overvoltage monitoring	ECU
DFC_MoFAPP	CHK ENG	P3311	0E	524074	12	6313	ECU–Diagnostic fault check to report the accelerator pedal position error	ECU
DFC_MoFESpd	CHK ENG	P3312	0E	524075	12	6314	ECU–Diagnostic fault check to report the engine speed error	ECU
DFC_MoFInjDatET	CHK ENG	P3313	0E	524076	12	6315	ECU–Diagnostic fault check to report the plausibility error between level 1 energizing time and level 2 information	ECU
DFC_MoFInjDatPhi	CHK ENG	P3314	0E	524077	12	6316	ECU–Diagnostic fault check to report the error due to plausibility between the injection begin v/s injection type	ECU
DFC_MoFInjQnt	CHK ENG	P3315	0E	524078	12	6317	ECU–Diagnostic fault check to report the error due to non plausibility in ZFC	ECU
DFC_MoFMode2	CHK ENG	P3317	0E	524080	12	6319	ECU–Diagnosis fault check to report the error to demand for an ICO due to an error in the Pol2 shut-off	ECU
DFC_MoFMode3	CHK ENG	P3318	0E	524081	12	6321	ECU–Diagnosis fault check to report the error to demand for an ICO due to an error in the Pol3 efficiency factor	ECU
DFC_MoFOvR	CHK ENG	P3319	0E	524082	12	6322	ECU–Diagnostic fault check to report the error due to Over Run	ECU

DFC	LCD	DTC	Type	SPN	FMI	BLINK CODE	DTC Description	CATEGORY
						BEEP CODE		
DFC_MoFQntCor	CHK ENG	P331A	0E	524084	12	6323	ECU–Diagnostic fault check to report the error due to injection quantity correction	ECU
DFC_MoFRailP	CHK ENG	P331B	0E	524085	12	6324	ECU–Diagnostic fault check to report the plausibility error in rail pressure monitoring	ECU
DFC_MoFStrt	CHK ENG	P331C	0E	524128	12	6325	ECU–function monitoring: fault in the monitoring of the start control	ECU
DFC_MoFTrqCmp	CHK ENG	P331D	0E	524087	12	6326	ECU–Diagnostic fault check to report the error due to torque comparison	ECU
DFC_MonLimCurr	CHK ENG	P331E	0E	524088	12	6327	ECU–Diagnosis of curr path limitation forced by ECU monitoring level 2	ECU
DFC_MonLimLead	CHK ENG	P331F	0E	524089	12	6328	ECU–Diagnosis of lead path limitation forced by ECU monitoring level 2	ECU
DFC_MonLimSet	CHK ENG	P3320	0E	524090	12	6329	ECU–Diagnosis of set path limitation forced by ECU monitoring level 2	ECU
DFC_BusDiagBusOffNodeA	CHK ENG	U0073	07	639	19	5114	CAN communication–BusOff error CAN A	ECU
DFC_ComIC1TO	None	U1152	9	523747	9	5128	Error on CAN	ECU

ECU

DTC

P CODE	P0606		
FMI	12	Name	ECU–Injection cut off demand (ICO) for shut off coordinator.
SPN	524123		
Blink / Beep Code	6311		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. An ICO is requested with engine speed > 1200 rpm.	

Actions when a malefunction occures

Fault Detection	The undebounced defect detection takes place in the standard ICO mode with an ICO requested and an engine speed higher than a threshold of 1200rpm.
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

ECU internal failure.

Check

1. Check the fault indication.
2. Check the fault indication again by turning ECU power off and on.
3. If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P0607		
FMI	12	Name	ECU–Diagnostic fault check to report "WDA active" due to errors in query-/response communication (WDA = Watch Dog Alarm).
SPN	524098		
Blink / Beep Code	6532		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
"WDA active" due to a defect query/response communication.	

Actions when a malefunction occures

Fault Detection	In the case of a non active shut–off path test, whose debounce time has expired and an active WDA wire, a defect detection takes place.
Fault Mode	No
Limited operation	No
Reset criteria	None, because software reset is released.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

ECU internal failure.

Check

1. Check the fault indication.
2. Check the fault indication again by turning ECU power off and on.
3. If this DTC is detected again, exchange the ECU.

ECU

DTC				
P CODE	P0607	Name	ECU–Diagnostic fault check to report "ABE active" due to undervoltage detection.	
FMI	12			
SPN	524099			
Blink / Beep Code	6533			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
"ABE active" due to undervoltage detection.	

Actions when a malefunction occures

Fault Detection	In the case of a non active shut–off path test, whose debounce time has expired and an active ABE wire due to undervoltage, there is an undebounced defect detection, after the battery voltage stays higher than a threshold of 8000mV.
Fault Mode	No
Limited operation	No
Reset criteria	None, because software reset is released.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

ECU internal failure.

Check

1. Check the fault indication.
2. Check the fault indication again by turning ECU power off and on.
3. If this DTC is detected again, exchange the ECU.

ECU

DTC				
P CODE	P0607	Name	ECU–Diagnostic fault check to report "ABE active" due to overvoltage detection.	
FMI	12			
SPN	524100			
Blink / Beep Code	6534			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
"ABE active" due to overvoltage detection.	

Actions when a malefunction occures

Fault Detection	In the case of a non active shut–off path test, whose debounce time has expired and an active ABE wire due to overvoltage a defect detection takes place.
Fault Mode	No
Limited operation	No
Reset criteria	None, because software reset is released.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

ECU internal failure.

Check

1. Check the fault indication.
2. Check the fault indication again by turning ECU power off and on.
3. If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P0607		Name	ECU–Diagnostic fault check to report "ABE active" due to undervoltage detection.
FMI	12			
SPN	524101			
Blink / Beep Code	6535			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
"ABE active" due to undervoltage detection.	

Actions when a malfunction occures

Fault Detection	In the case of a non active shut–off path test, whose debounce time has expired and an active ABE wire due to undervoltage, there is an undebounced defect detection, after the battery voltage stays higher than a threshold of 8000mV.
Fault Mode	No
Limited operation	No
Reset criteria	None, because software reset is released.
Remarks	0

Presumed cause of malfunction or abnormal condition

Description

ECU internal failure.

Check

1. Check the fault indication.
2. Check the fault indication again by turning ECU power off and on.
3. If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P0607		Name	ECU–Visibility of SoftwareResets_0 in DSM.
FMI	14			
SPN	524120			
Blink / Beep Code	6536			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. "Visible" resets are available.	

Actions when a malfunction occures

Fault Detection	The evaluation of the reset reason will be done after every reset. Depending on the configured visibility of the current reset one of the fault checks in the array will be set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	When the detected reset was no trap and no SoftwareReset all fault checks will be cleared.
Remarks	0

Presumed cause of malfunction or abnormal condition

Description

ECU internal failure.

Check

1. Check the fault indication.
2. Check the fault indication again by turning ECU power off and on.
3. If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P0607		
FMI	14	Name	ECU–Visibility of SoftwareResets_1 in DSM.
SPN	524121		
Blink / Beep Code	6537		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. "Locked" resets are available.	

Actions when a malefunction occures

Fault Detection	The evaluation of the reset reason will be done after every reset. Depending on the configured visibility of the current reset one of the fault checks in the array will be set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	When the detected reset was no trap and no SoftwareReset all fault checks will be cleared.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

ECU internal failure.

Check

1. Check the fault indication.
2. Check the fault indication again by turning ECU power off and on.
3. If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P0607		
FMI	14	Name	ECU–Visibility of SoftwareResets_2 in DSM.
SPN	524122		
Blink / Beep Code	6538		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. "Suppressed" resets are available.	

Actions when a malefunction occures

Fault Detection	The evaluation of the reset reason will be done after every reset. Depending on the configured visibility of the current reset one of the fault checks in the array will be set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	When the detected reset was no trap and no SoftwareReset all fault checks will be cleared.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

ECU internal failure.

Check

1. Check the fault indication.
2. Check the fault indication again by turning ECU power off and on.
3. If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P060C		Name	ECU/CR system communication error- CY327SPI.
FMI	12			
SPN	524131			
Blink / Beep Code	6511			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. A communication fault due to incorrect check-bytes or a data transfer not possible.	

Actions when a malefunction occures

Fault Detection	The SPI−communication is monitored by the CY327 driver. A fault is detected if the received data has incorrect check−bytes or a data transfer is not possible and FId_CY327Spi-CommErr is not inhibited. The detection cannot be calibrated.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal circuit failure.

Check

Initial diagnosis with diagnosis tool−or blink / beep code
 » Check the fault indication.
 » Check the fault indication again by turning ECU power off and on.
 » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P062F		Name	ECU Memory Read Error−EEP Read Error based on the error in reading blocks from memory media.
FMI	12			
SPN	631			
Blink / Beep Code	6512			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. While write – accesing.	ECU
2. EEPROM reading malfunctions. This error is based on check sum error while reading EEPROM.	

Actions when a malefunction occures

Fault Detection	Fault is set when data for when the number of blocks that could not be read from memory media is greater or equal to a number of error blocks (3).
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	However, the max value of number of error blocks is restricted to 3 by software.

Presumed cause of malefunction or abnormal condition

Description

ECU internal failure.

Check

Initial diagnosis with diagnosis tool−or blink / beep code
 » Check the fault indication.
 » Check the fault indication again by turning ECU power off and on.
 » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P062F		Name	ECU Memory Write Error–EEP Write Error based on the error in storing the blocks in memory media.
FMI	12			
SPN	632			
Blink / Beep Code	6513			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. While write – accesing.	ECU
2. EEPROM writing malfunctions. Error occurs if there are 3 failed attempts to write one data.	

Actions when a malefunction occures

Fault Detection	If a block cannot be written more than 3 times, an error will be registered.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malfunction or abnormal condition

Description

1. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P0641		Name	ECU / wiring harness / sensors–Voltage fault at Sensor supply 1.
FMI	13			
SPN	1079			
Blink / Beep Code	6411			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prequisite.	ECU Harness Components
2. Sensor supply voltage out of range.	

Actions when a malefunction occures

Fault Detection	The sensor supply voltage is monitored by an HW comparator. If the sensor supply voltage lies outside of the switching thresholds, a fault is output. The detection thresholds are defined by the hardware and cannot be calibrated.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	The supply voltage must lie within the thresholds.
Remarks	0

Presumed cause of malfunction or abnormal condition

Description

1. Wiring harness.
2. Component defect:
   » APP1 (Accelerator Pedal 1 sensor).
   » Neutral gear detection sensor.

3. ECU internal defect.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
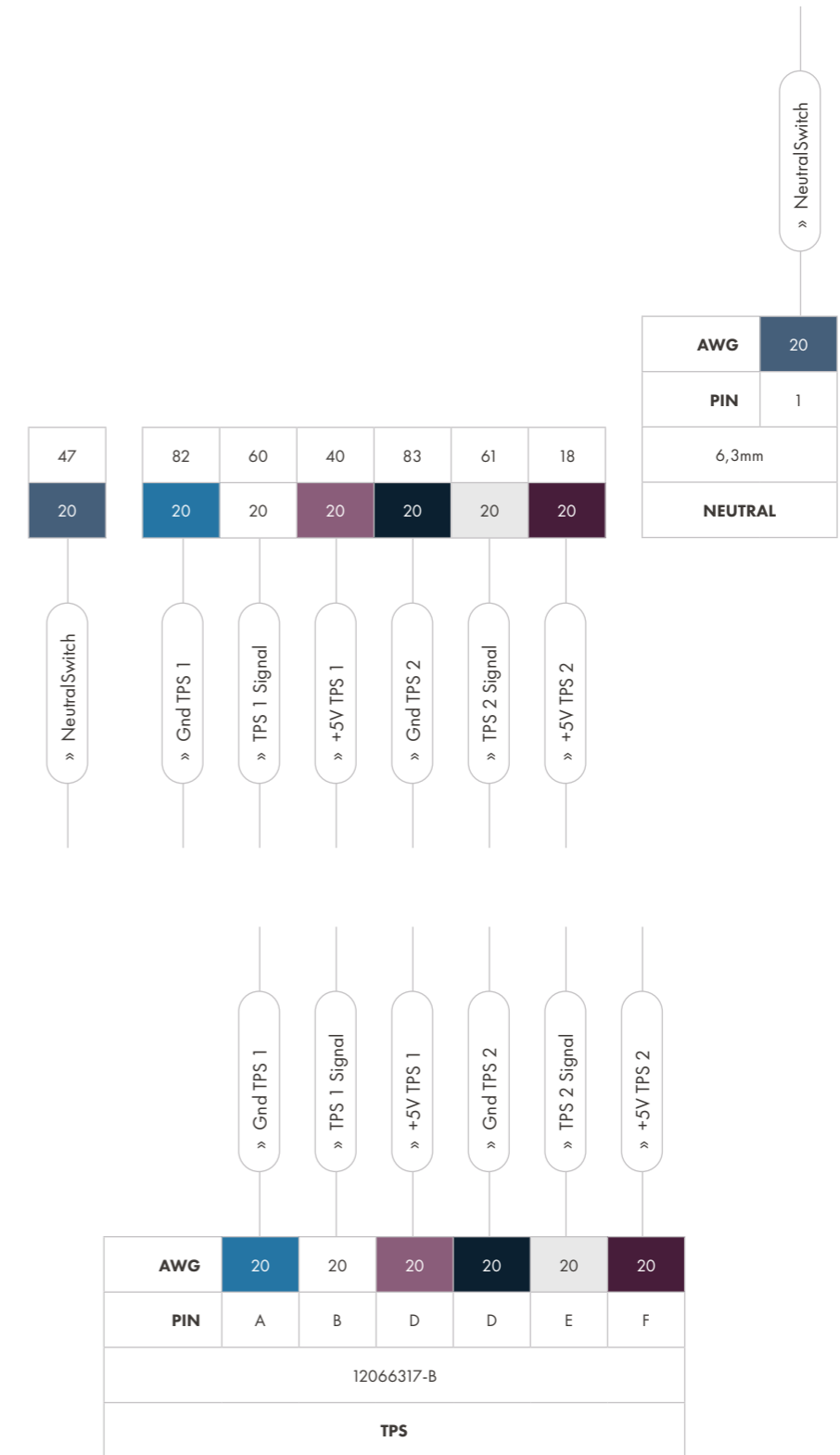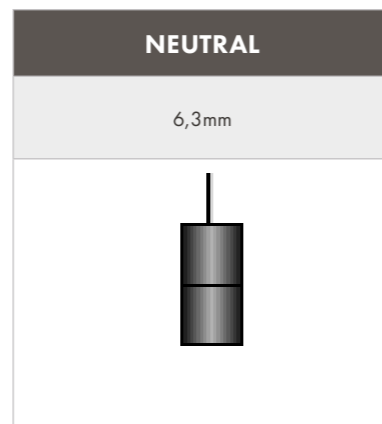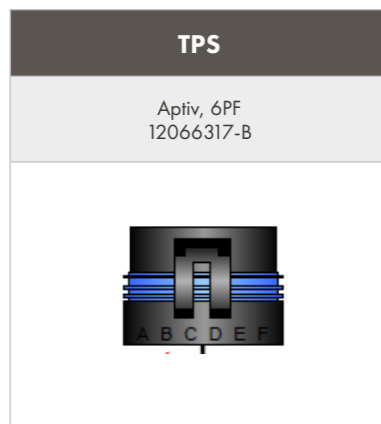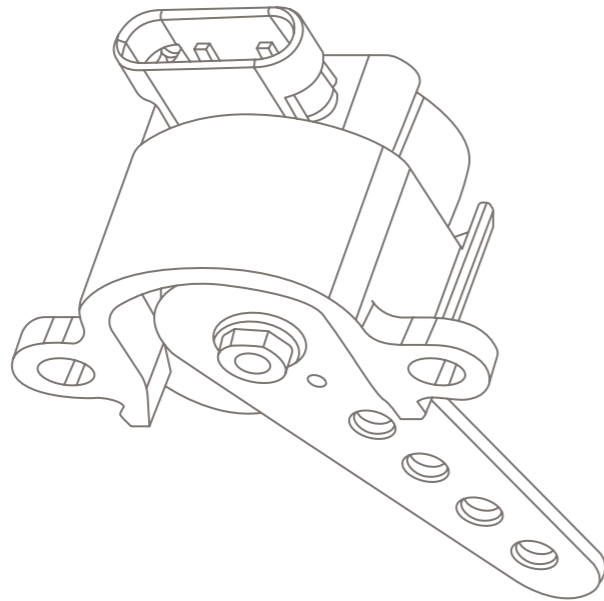   » If this DTC is detected again, check connector and wiring.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pins of the accelerator pedal 1, the camshaft, the boost pressure, the rail pressure and the oil pressure sensor
  for deformation and cracks, check condition of the connections
» Check whether the sensor wiring is disconnected or the wiring coating is peeled

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the supply voltage of the APP2 sensor. Measure the voltage between pin D & F. It must be in the range of 5 +/- 0,2V.
» 1) If the measured value is out of range measure the voltage between pin 83 & 18 at the ECU. If the measured voltage
  is still out of range replace the ECU, otherwise replace the wire harness.
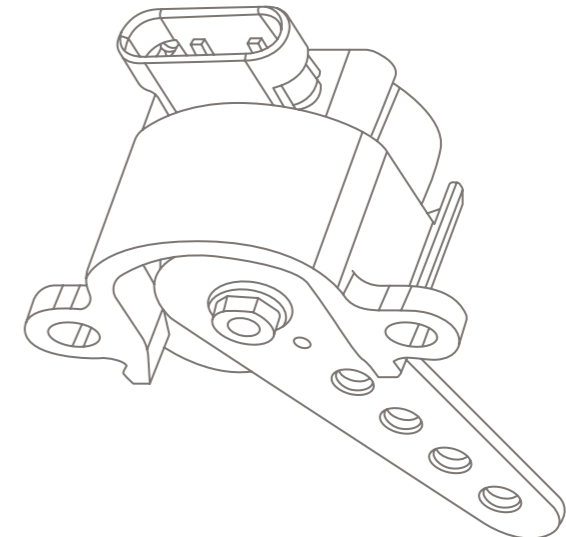» 2) If the supply voltage is in the defined range, replace the sensor.

TPS
Aptiv, 6PF 12066317-B

NEUTRAL
6,3mm

AWG	20
PIN	1
6,3mm	
NEUTRAL	

NeutralSwitch

47	82	60	40	83	61	18
20	20	20	20	20	20	20

» NeutralSwitch » Gnd TPS 1 » TPS 1 Signal » +5V TPS 1 » Gnd TPS 2 » TPS 2 Signal » +5V TPS 2

» Gnd TPS 1 » TPS 1 Signal » +5V TPS 1 » Gnd TPS 2 » TPS 2 Signal » +5V TPS 2

AWG	20	20	20	20	20	20
PIN	A	B	D	D	E	F
12066317-B						
TPS						

ECU

DTC	

P CODE	P0651		
FMI	13	Name	ECU / wiring harness / sensors–Voltage fault at Sensor supply 2.
SPN	1080		
Blink / Beep Code	6415		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prequisite.	ECU Harness Components
2. Sensor supply voltage out of range.	

Actions when a malefunction occures

Fault Detection	The sensor supply voltage is monitored by an HW comparator. If the sensor supply voltage lies outside of the switching thresholds, a fault is output. The detection thresholds are defined by the hardware and cannot be calibrated.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	The supply voltage must lie within the thresholds.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Wiring harness
2. Component defect
  » APP1 (Accelerator Pedal 1 sensor).
  » CaS (Camshaft sensor).
  » BPS (Boost pressure sensor).
  » RDS (Rail pressure sensor).
  » Analogue oil pressure sensor.

3. ECU internal defect

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
  » Check the fault indication.
  » Check the fault indication again by turning ECU power off and on.
  » If this DTC is detected again, check connector and wiring.

2. Connector / wiring check
  » Before beginning your work, be sure to turn off the ECU power.
  » Check the pins of the accelerator pedal 1, the camshaft, the boost pressure, the rail pressure and the oil pressure sensor

fordeformation and cracks, check condition of the connections.
» Check whether the sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis
» Check the supply voltage of the APP1 sensor. Measure the voltage between pin C & A. It must be in the range of 5 +/- 0,2V.
  1) If the measured value is out of range measure the voltage between pin 83 & 18 at the ECU. If the measured voltage is still out of range replace the ECU, otherwise replace the wire harness.
» Check the supply voltage of the camshaft sensor. Measure the voltage between pin 1 & 3. It must be in the range of 5 +/- 0,2V.
  1) If the measured value is out of range measure the voltage between pin 45 & 44 at the ECU. If the measured voltage is still out of range replace the ECU, otherwise replace the wire harness.
» Check the supply voltage of the boost pressure sensor. Measure the voltage between pin 1 & 3. It must be in the range of 5 +/- 0,2V.
  1) If the measured value is out of range measure the voltage between pin 78 & 35 at the ECU. If the measured voltage is still out of range replace the ECU, otherwise replace the wire harness.
» Check the supply voltage of the rail pressure sensor. Measure the voltage between pin 1 & 3. It must be in the range of 5 +/- 0,2V.
  1) If the measured value is out of range measure the voltage between pin 32 & 76 at the ECU. If the measured voltage is still out of range replace the ECU, otherwise replace the wire harness
» Check the supply voltage of the oil pressure sensor. Measure the voltage between pin 4 & 3. It must be in the range of 5 +/- 0,2V.
  1) If the measured value is out of range measure the voltage between pin 15 & 55 at the ECU. If the measured voltage is still out of range replace the ECU, otherwise replace the wire harness.
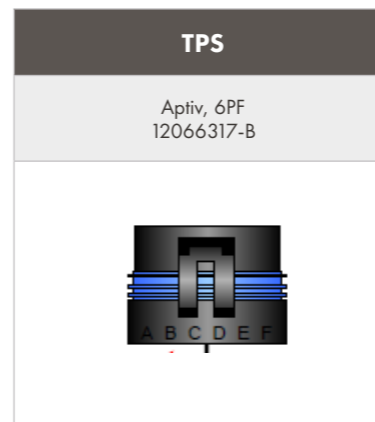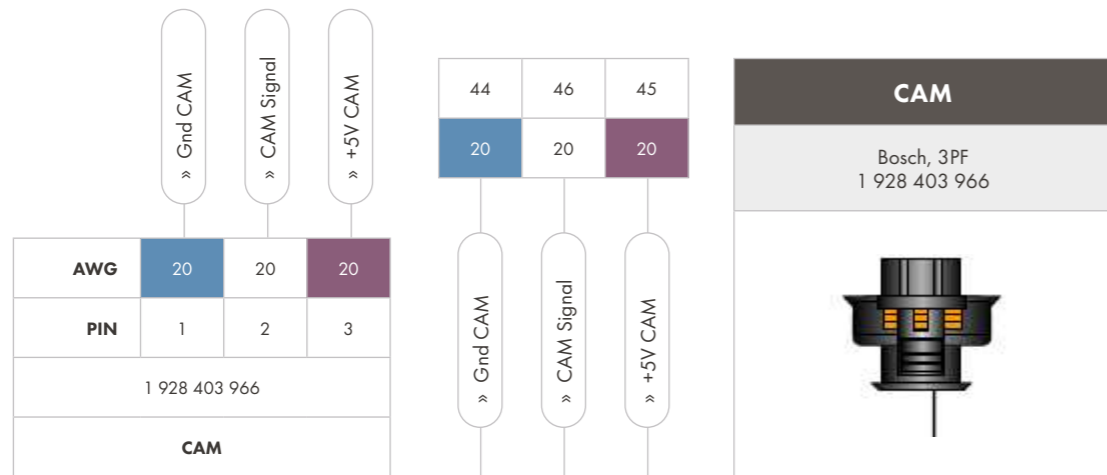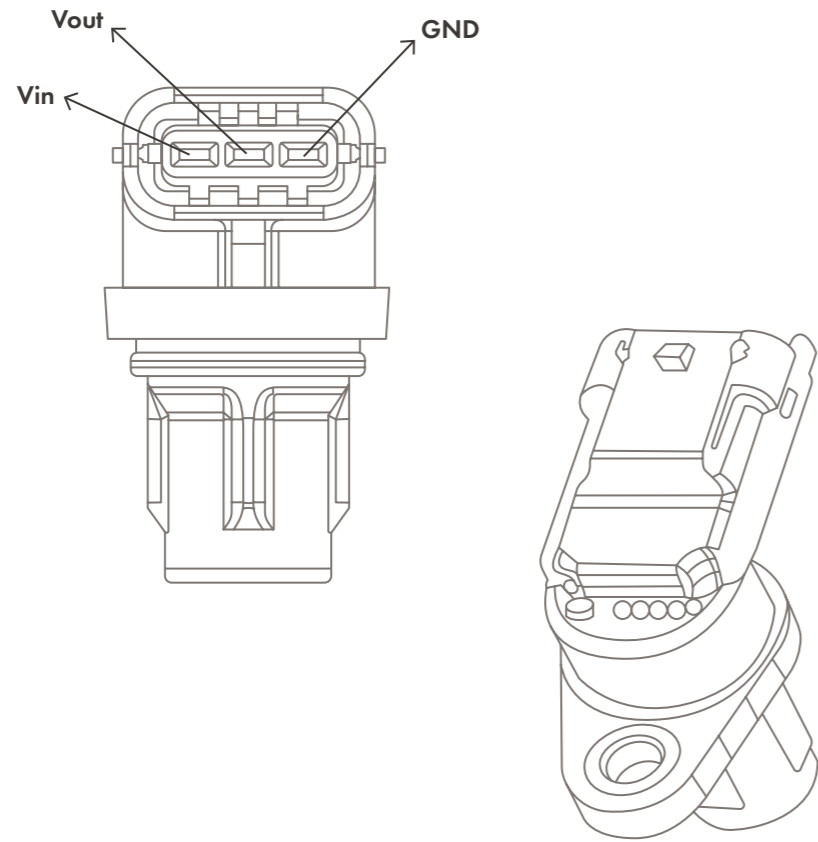 2) If the supply voltage is in the defined range, replace the sensors one after each other.

TPS

Aptiv, 6PF
12066317-B

A B C D E F

	Gnd TPS 1	TPS 1 Signal	+5V TPS 1	Gnd TPS 2	TPS 2 Signal	+5V TPS 2
AWG	20	20	20	20	20	20
PIN	A	B	D	D	E	F
12066317-B						
TPS						

82	60	40	83	61	18
20	20	20	20	20	20
» Gnd TPS 1	» TPS 1 Signal	» +5V TPS 1	» Gnd TPS 2	» TPS 2 Signal	» +5V TPS 2

Camshaft position sensor

Vout
Vin
GND

AWG	20	20	20
PIN	1	2	3
1 928 403 966			
CAM			

» Gnd CAM | » CAM Signal | » +5V CAM

44	46	45
20	20	20

» Gnd CAM | » CAM Signal | » +5V CAM

CAM
Bosch, 3PF 1 928 403 966

Pin 4: pressure output
Pin 3: power supply
Pin 2: temperatur output
Pin 1: GND

BOSCH
JJ-MM-TTABCD
1 2 3 4

» Gnd CAM | » CAM Signal | » +5V CAM

AWG	20	20	20
PIN	1	2	3
1 928 403 966			
CAM			

44	46	45
20	20	20

» Gnd CAM | » CAM Signal | » +5V CAM

CAM
Bosch, 3PF 1 928 403 966

Pin 2: Ausgang
PIN 2: OUTPUT

Pin 3: Versorgung (+)
PIN 3: SUPPLY VOLTAGE (+)

Pin 1: Masse (-)
PIN 1: GROUND (-)

13

Ø 26 ± 0.4

	Gnd P-Rail	P-Rail Signal	+5V P-Rail
	76	54	32
	20	20	20

AWG	20	20	20
PIN	1	2	3
1 928 403 968			
P-RAIL			

Gnd P-Rail	P-Rail Signal	+5V P-Rail

CAM

Bosch, 3PF
1 928 403 968

Page 55

Pin 2: Ausgang
PIN 2: OUTPUT

Pin 5: Ausgang NTC
PIN 5: OUTPUT NTC

Pin 4: Masse (-)
PIN 4: GROUND (-)

Pin 3: Versorgung (+)
PIN 3: SUPPLY VOLTAGE (+)

PT-OIL

Bosch, 5PF
1 928 405 159

	P-Oil Signal	+5V PT-Oil	Gnd PT-Oil	T-Oil Signal
	14	15	55	13
	20	20	20	20

AWG	20	20	20	20
PIN	2	3	4	5
1 928 403 159				
PT-Oil (1)				

P-Oil Signal	+5V PT-Oil	Gnd PT-Oil	T-Oil Signal

ECU

DTC

P CODE	P0668		
FMI	16	Name	ECU temperature – Physical Range Check low for ECU temperature sensor.
SPN	1136		
Blink / Beep Code	1812		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	
2. ECU internal temperature below -40°C.	

Actions when a malefunction occures

Fault Detection	
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU internal temperature is above -40°C.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Engine ventilation system defective or ineffective.
2. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the ECU internal temperatur value.

2. Engine check
   » Before beginning your work, be sure to turn off the ECU power.
   » Check the engine ventilation system.

3. Failure diagnosis
   » Check the T50 switch for defective.
   » Change ECU.

ECU

DTC

P CODE	P0669		
FMI	18	Name	ECU temperature – Physical Range Check high for ECU temperature sensor.
SPN	1136		
Blink / Beep Code	1811		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	Engine ventilation system ECU
2. ECU internal temperature above 105°C	

Actions when a malefunction occures

Fault Detection	
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU internal temperature is below 105°C.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Engine ventilation system defective or ineffective.
2. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the ECU internal temperatur value.

2. Engine check
   » Before beginning your work, be sure to turn off the ECU power.
   » Check the engine ventilation system.

3. Failure diagnosis
   » Check the T50 switch for defective.
   » Change ECU.

ECU

DTC

P CODE	P0697		
FMI	13	Name	ECU / wiring harness / sensors–Voltage fault at Sensor supply 3.
SPN	523601		
Blink / Beep Code	6419		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prequisite.	ECU
2. Sensor supply voltage out of range.	Harness Components

Actions when a malfunction occures

Fault Detection	The sensor supply voltage is monitored by an HW comparator. If the sensor supply voltage lies outside of the switching thresholds, a fault is output. The detection thresholds are defined by the hardware and cannot be calibrated.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	The supply voltage must lie within the thresholds.
Remarks	0

Presumed cause of malfunction or abnormal condition

Description

1. Wiring harness.
2. Component defect:
  » Crankshaft position sensor.
  » Rail pressure sensor.

3. ECU internal defect.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
  » Check the fault indication.
  » Check the fault indication again by turning ECU power off and on.

If this DTC is detected again, check connector and wiring.

2. Connector / wiring check
  » Before beginning your work, be sure to turn off the ECU power.
  » Check the pins of the crankshaft sensor and the rail pressure sensor for deformation and cracks, check condition of the connections.
  » Check whether the sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

» Check the supply voltage of the rail pressure sensor. Measure the voltage between pin 1 & 3. It must be in the range of 5 +/- 0,2V.
  1) If the measured value is out of range measure the voltage between pin 32 & 76 at the ECU. If the measured voltage is still out of range replace the ECU, otherwise replace the wire harness.
  2) If the supply voltage is in the defined range, replace the sensors one after each other.

Camshaft position sensor

CRANK
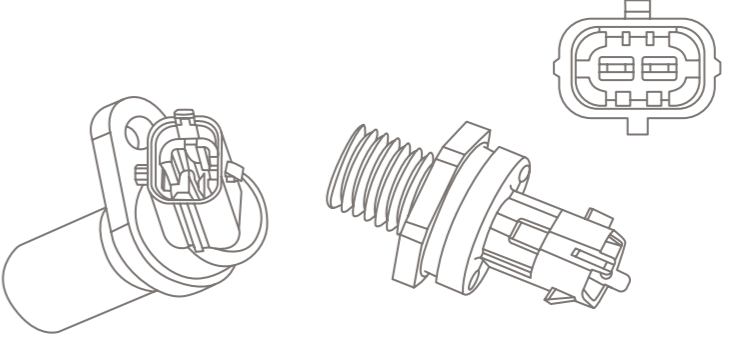
Bosch, 2PF
1 928 403 874

P-RAIL

Bosch, 3PF
1 928 403 968
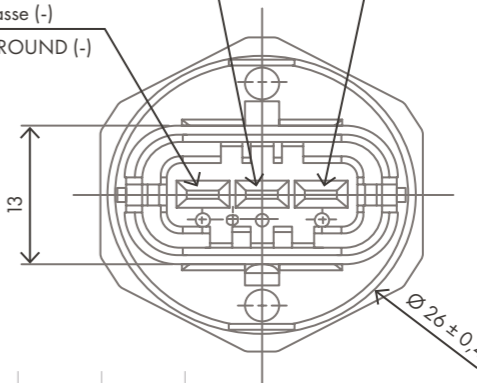
Pin 2: Ausgang
PIN 2: OUTPUT

Pin 3: Versorgung (+)
PIN 3: SUPPLY VOLTAGE (+)

Pin 1: Masse (-)
PIN 1: GROUND (-)

13

Ø 26 ± 0,4

	» Crankshaft -	» Crankshaft +
AWG	20	20
PIN	1	2
	1 928 403 874	
	CRANK	

	» Gnd P-Rail	» P-Rail Signal	» +5V P-Rail
AWG	20	20	20
PIN	1	2	3
	1 928 403 968		
	P-RAIL		

76	54	32		52	30
20	20	20		20	20

» Gnd P-Rail
» P-Rail Signal
» +5V P-Rail
» Crankshaft +
» Screen

ECU

DTC

P CODE	P268C		
FMI	13	Name	Injector 1- QR code data error.
SPN	651		
Blink / Beep Code	3515		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. During EEPROM initialization or value input.	ECU
2. The injector corrected value is not or mistakenly entered, and the EEPROM cannot be read.	

Actions when a malefunction occures

Fault Detection	
Fault Mode	Continuous operation]: Engine is not obstructed. (The operation continues by using default IQA values in the ECU).
Limited operation	No
Reset criteria	Yes: The fail mode is released when IQA values can be read of the EEPROM.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Input failure of the injector correction value.
2. ECU internal circuit fault.

Check

1. check IQA data (the error only occures if there are no IQA data saved on the ECU).

ECU

DTC

P CODE	P268E		
FMI	13	Name	Injector 1- QR code data error.
SPN	653		
Blink / Beep Code	3516		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. During EEPROM initialization or value input.	ECU
2. The injector corrected value is not or mistakenly entered, and the EEPROM cannot be read.	

Actions when a malefunction occures

Fault Detection	
Fault Mode	Continuous operation]: Engine is not obstructed. (The operation continues by using default IQA values in the ECU).
Limited operation	No
Reset criteria	Yes: The fail mode is released when IQA values can be read of the EEPROM.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Input failure of the injector correction value.
2. ECU internal circuit fault.

Check

1. Check IQA data (the error only occures if there are no IQA data saved on the ECU).

ECU

DTC

P CODE	P3301		Name	ECU- Diagostic fault check / error in ADC monitoring.
FMI	12			
SPN	524124			
Blink / Beep Code	6514			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Diagnostic fault check while testing the no-load pulse (NTP) operation.	

Actions when a malefunction occures

Fault Detection	If the voltage at ADC for acceleration pedal signal 2 is greater than the applicable threshold of 254mV, after the debounce counter has reached the final value 5, the DTC P3301 is released.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Input failure of the injector correction value.
2. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool-or blink / beep code
- » Check the fault indication.
- » Check the fault indication again by turning ECU power off and on.
- » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3302		Name	ECU- Diagostic fault check / error in ADC monitoring.
FMI	12			
SPN	524059			
Blink / Beep Code	6515			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error in plausibility in testing with test voltage.	

Actions when a malefunction occures

Fault Detection	If the test voltage, converted by the ADC, does not lie between two thresholds (4727–4829mV), after the debounce counter has reached the final value 15, the DTC P3302 is released.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool-or blink / beep code
- » Check the fault indication.
- » Check the fault indication again by turning ECU power off and on.
- » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3303	Name	ECU- Diagostic fault check / error in ADC monitoring.
FMI	12		
SPN	524060		
Blink / Beep Code	6516		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error in plausibility of ratiometric correction.	

Actions when a malefunction occures

Fault Detection	If the ratiometry correction does not lie between two thresholds (0,95 -1,05), and after the debounce counter has reached the final value 15, the DTC P3303 is released.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
  » Check the fault indication.
  » Check the fault indication again by turning ECU power off and on.
  » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3304	Name	ECU- Diagostic fault check / error in Communication monitoring.
FMI	12		
SPN	524061		
Blink / Beep Code	6517		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error in plausibility of the function controller and the monitoring module.	

Actions when a malefunction occures

Fault Detection	If there is no active shut–off path test and the error counter >= a threshold (5) there is an undebounced defect detection; DTC P3304.
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when condition for fault check is not met anymore.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
  » Check the fault indication.
  » Check the fault indication again by turning ECU power off and on.
  » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3305		Name	ECU- Diagostic fault check / error in Communication monitoring.
FMI	12			
SPN	524062			
Blink / Beep Code	6518			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error- interruption in the SPI communication.	

Actions when a malefunction occures

Fault Detection	If the error counter for SPI transmissions in communication with monitoring module is higher than 0 and there is no active shut−off path test, there is an undebounced defect detection; DTC P3305.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool−or blink / beep code
  » Check the fault indication.
  » Check the fault indication again by turning ECU power off and on.
  » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3306		Name	ECU- Diagostic fault check / error in ROM testing.
FMI	12			
SPN	524063			
Blink / Beep Code	6519			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Multiple error in complete ROM-testing during postdrive detected.	

Actions when a malefunction occures

Fault Detection	If multiple errors are detected while testing the complete ROM−memory (irreversibles error bit 2 is set), there is an undebounced defect detection; DTCP3306.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool−or blink / beep code
  » Check the fault indication.
  » Check the fault indication again by turning ECU power off and on.
  » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3307	Name	ECU- Diagostic fault check / loss of synchronization.
FMI	12		
SPN	524064		
Blink / Beep Code	6521		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Too less bytes received by Memory from CPU as response.	

Actions when a malefunction occures

Fault Detection	Irreversible error bit 5 set in the status of the shut-down path test and an error state reached due to time out; DTC P3307.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3308	Name	ECU–DFC to set a torque limitation once an error is detected before MoCSOP's error reaction is set.
FMI	12		
SPN	524065		
Blink / Beep Code	6522		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU ECU-connector
2. Error during the execution of the shut-off path testing.	

Actions when a malefunction occures

Fault Detection	If the status of the shut-down path test leads to the irreversible error bit 13, DTC P3308 is released.
Fault Mode	Level 2 (reduce engine output torque to 75 NM).
Limited operation	Yes: Level2 (reduce engine output torque to 75 NM). The engine operation is limited.
Reset criteria	No
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Plug of ECU not correct mounted.
2. If also an InjSys-DFC is stored this DFC is only for information. If DFC is stored without another InjSys-DFC then ECU is defective.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3309	Name	ECU–Wrong set response time.
FMI	12		
SPN	524066		
Blink / Beep Code	6523		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error in microcontroller monitoring due to wrong response and time out.	

Actions when a malefunction occures

Fault Detection	Irreversible error bit 8 set in status of the shut-down path test and error state reached due to time out.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
- » Check the fault indication.
- » Check the fault indication again by turning ECU power off and on.
- » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P330A	Name	ECU–Too many SPI errors during MoCSOP execution.
FMI	12		
SPN	524067		
Blink / Beep Code	6524		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error in microcontroller monitoring due to too many errors in the SPI (Serial Peripheral Interface) communication.	

Actions when a malefunction occures

Fault Detection	Irreversible error bit 6 set in status of the shut-down path test and error state reached due to time out.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
- » Check the fault indication.
- » Check the fault indication again by turning ECU power off and on.
- » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P330B	Name	ECU–Diagnostic fault check to report the error in undervoltage monitoring.
FMI	12		
SPN	524068		
Blink / Beep Code	6525		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error due to implausible under voltage detection or test not executable.	

Actions when a malefunction occures

Fault Detection	If the error reaction is requested due to the implausible test of the shut–off path of undervoltage detection or the test cannot be done, then the irreversible error bit 3 is set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P330C	Name	ECU–Diagnostic fault check to report that WDA is not working correct.
FMI	12		
SPN	524069		
Blink / Beep Code	6526		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error due to implausible test of shut-off path.	

Actions when a malefunction occures

Fault Detection	If the error reaction is requested due to the implausible test of the shut–off path of return valve, the irreversible error bit 1 is set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P330D	Name	ECU–OS timeout in the shut off path test. Failure setting the alarm task period.
FMI	12		
SPN	524070		
Blink / Beep Code	6527		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error due to time out in the of shut-off path test while asking for an error reaction.	

Actions when a malefunction occures

Fault Detection	If there is a timeout of the shut–off path and an error reaction due to failures in calling system services, the irreversible error bit 7 is set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P330E	Name	ECU–Diagnostic fault check to report that the positive test failed.
FMI	12		
SPN	524071		
Blink / Beep Code	6528		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error due to positive test of return valve.	

Actions when a malefunction occures

Fault Detection	If there is a positive test of return valve and a test bit is set, then the irreversible error bit 10 is set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P330F		
FMI	12	Name	ECU–Diagnostic fault check to report the timeout in the shut off path test.
SPN	524072		
Blink / Beep Code	6529		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error due to time monitoring in of shut-off path test.	

Actions when a malefunction occures

Fault Detection	Irreversible error bit 0 set due to time monitoring of the shut-off path test.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
  » Check the fault indication.
  » Check the fault indication again by turning ECU power off and on.
  » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3310		
FMI	12	Name	ECU–Diagnostic fault check to report the error in overvoltage monitoring.
SPN	524073		
Blink / Beep Code	6531		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error due to implausible overvoltage detection or test not executable.	

Actions when a malefunction occures

Fault Detection	If the error reaction is requested due to the implausible test of the shut–off path of overvoltage detection or the test cannot be done, then the irreversible error bit 2 is set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
  » Check the fault indication.
  » Check the fault indication again by turning ECU power off and on.
  » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3311		Name	ECU–Diagnostic fault check to report the accelerator pedal position error.
FMI	12			
SPN	524074			
Blink / Beep Code	6313			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Implausible accelerator pedal voltage.	

Actions when a malefunction occures

Fault Detection	Implausible accelerator pedal voltage. The two voltage values (ADC_VAL1, ADC_VAL2), detected by the accelerator pedal, are not plausible to each other.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
- » Check the fault indication.
- » Check the fault indication again by turning ECU power off and on.
- » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3312		Name	ECU–Diagnostic fault check to report the engine speed error.
FMI	12			
SPN	524075			
Blink / Beep Code	6314			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Implausible engine speed difference.	

Actions when a malefunction occures

Fault Detection	Implausible engine speed. The engine speed value, calculated in level 2 and engine speed from level 1 are not plausible to each other.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
- » Check the fault indication.
- » Check the fault indication again by turning ECU power off and on.
- » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3313	Name	ECU–Diagnostic fault check to report the plausibility error between level 1 energizing time and level 2 information.
FMI	12		
SPN	524076		
Blink / Beep Code	6315		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Implausible injection energizing time.	

Actions when a malefunction occures

Fault Detection	Implausible injection energizing time for either Pilx or MI1 or Polx.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. **Initial diagnosis with diagnosis tool–or blink / beep code**
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3314	Name	ECU–Diagnostic fault check to report the error due to plausibility between the injection begin v/s injection type.
FMI	12		
SPN	524077		
Blink / Beep Code	6316		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Energizing angles outtside the value range.	

Actions when a malefunction occures

Fault Detection	Implausible SOE of either Pilx or MI1 or Polx.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. **Initial diagnosis with diagnosis tool–or blink / beep code**
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3315		Name	ECU–Diagnostic fault check to report the error due to non plausibility in ZFC.
FMI	12			
SPN	524078			
Blink / Beep Code	6317			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Implausible energising times of zero fuel quantity calibration.	

Actions when a malefunction occures

Fault Detection	Implausible energising times. The energising times of the zero fuel quantity calibration ZFC are tested on their plausible value ranges.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3317		Name	ECU–Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI2 shut-off.
FMI	12			
SPN	524080			
Blink / Beep Code	6319			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error in the Post Injection2 shut–off.	

Actions when a malefunction occures

Fault Detection	Error in the PoI2 shut–off. The corrected PoI2 quantity during function monitoring is tested of its shut–off value in normal mode.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3318		Name	ECU-Diagnosis fault check to report the error to demand for an ICO due to an error in the Pol3 efficiency factor.
FMI	12			
SPN	524081			
Blink / Beep Code	6321			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error in the Post Injection3 shut-off.	

Actions when a malefunction occures

Fault Detection	Implausible Pol3 efficiencies. The efficiency of Pol3 (Efficiency of Pol3 from level 1 averaged in level 2) is tested of its plausible value range.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool-or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3319		Name	ECU-Diagnostic fault check to report the error due to Over Run.
FMI	12			
SPN	524082			
Blink / Beep Code	6322			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Current energising time is higher than the maximum permitted energising time.	

Actions when a malefunction occures

Fault Detection	The current energising time is higher than the maximum permitted energising time after overrun demand by the driver.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool-or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P331A		
FMI	12	Name	ECU−Diagnostic fault check to report the error due to injection quantity correction.
SPN	524084		
Blink / Beep Code	6323		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Implausible wave correction parts of the injection quantity correction.	

Actions when a malefunction occures

Fault Detection	Implausible wave correction parts of the injection quantity correction. The plausibility is displayed by the measuring different points.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool−or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P331B		
FMI	12	Name	ECU−Diagnostic fault check to report the plausibility error in rail pressure monitoring.
SPN	524085		
Blink / Beep Code	6324		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. If the rail pressure is outside calibrated thresholds, an error is triggered.	

Actions when a malefunction occures

Fault Detection	The rail pressure of level 1 is checked after a caliberatable ramp debounce of 2550ms in case of a SRC error. If the value lies outside a caliberatable window, an irreversible error is detected an reported to the DSM, after an error debouncing of 2550ms. Also in case of a rail pressure gradient error reported by the level 1, the error is reported after a debounce time of 2550ms. Additionally the error will be reported after a debounce time of 2550ms, if level 2 detects a gradient error and level 1 is not reporting it.
Fault Mode	Injection cut off.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool−or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P331C		
FMI	12	Name	ECU–function monitoring: fault in the monitoringof the start control.
SPN	524128		
Blink / Beep Code	6325		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Error in the plausibility of Starter Release Condition.	

Actions when a malefunction occures

Fault Detection	Start requested in level 1 , but not released in level 2.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P331D		
FMI	12	Name	ECU–Diagnostic fault check to report the error due to torque comparison.
SPN	524087		
Blink / Beep Code	6326		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. If the current actual torque exceeds the permissible inner engine torque, the irreversible error is set.	

Actions when a malefunction occures

Fault Detection	Error in the torque comparison between the permissible inner engine torque and the current plausible actual torque.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P331E		Name	ECU–Diagnosis of curr path limitation forced by ECU monitoring level 2.
FMI	12			
SPN	524088			
Blink / Beep Code	6327			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Diagnosis rail pressure path limitation due to a functional control unit monitoring.	

Actions when a malefunction occures

Fault Detection	If the setpoint path of the rail pressure control (Actual percent engine torque) is limited by the limitation torque of the functional control unit monitoring, DTC P331E is set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
 » Check the fault indication.
 » Check the fault indication again by turning ECU power off and on.
 » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P331F		Name	ECU–Diagnosis of lead path limitation forced by ECU monitoring level 2.
FMI	12			
SPN	524089			
Blink / Beep Code	6328			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Diagnosis air path limitation due to a functional control unit monitoring.	

Actions when a malefunction occures

Fault Detection	If the setpoint path of the air system (Inner torque lead value) is limited by the limitation torque of the functional control unit monitoring, DTC P331F is set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
 » Check the fault indication.
 » Check the fault indication again by turning ECU power off and on.
 » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	P3320		Name	ECU–Diagnosis of set path limitation forced by ECU monitoring level 2.
FMI	12			
SPN	524090			
Blink / Beep Code	6329			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Diagnosis quantity path limitation due to a functional control unit monitoring.	

Actions when a malefunction occures

Fault Detection	If the quantity setpoint path is limited by the limitation torque of the functional control unit monitoring, DTC P3320 is set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	U0073		Name	CAN communication–BusOff error CAN A.
FMI	19			
SPN	639			
Blink / Beep Code	5114			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. The error is detected and reported after the defect debouncing time when a busoff happened.	

Actions when a malefunction occures

Fault Detection	The error is detected and reported after the defect debouncing time when a busoff happened.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	The error is healed when no busoff error is recognized.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the fault indication again by turning ECU power off and on.
   » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	U1152		
FMI	9	Name	Error on CAN.
SPN	523747		
Blink / Beep Code	5128		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU
2. Diagnostic fault check for timeout of IC1.	

Actions when a malefunction occures

Fault Detection	Fault is detected if a TimeOut of the IC1 frame has occured.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	The error is healed when no busoff error is recognized.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
- » Check the fault indication.
- » Check the fault indication again by turning ECU power off and on.
- » If this DTC is detected again, exchange the ECU.

ECU

DTC

P CODE	U1174		
FMI	9	Name	Error on CAN.
SPN	247		
Blink / Beep Code	5127		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1.	
2. Fault is detected if a Time out of the HOURS frame has occurred.	

Actions when a malefunction occures

Fault Detection	Fault is detected if a Time out of the HOURS frame has occurred.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	The error is healed when no busoff error is recognized.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
- » Check the fault indication.
- » Check the fault indication again by turning ECU power off and on.
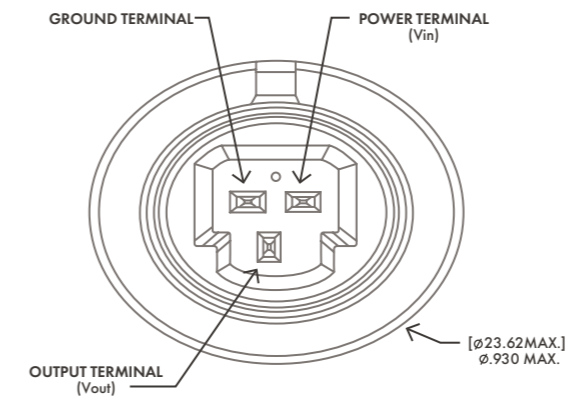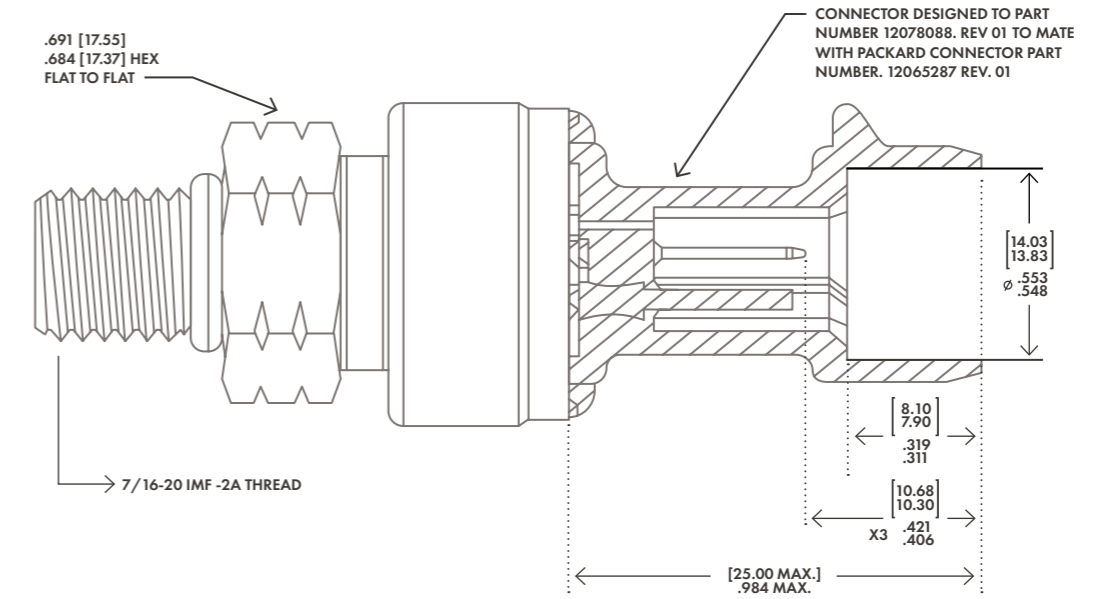- » If this DTC is detected again, exchange the ECU.
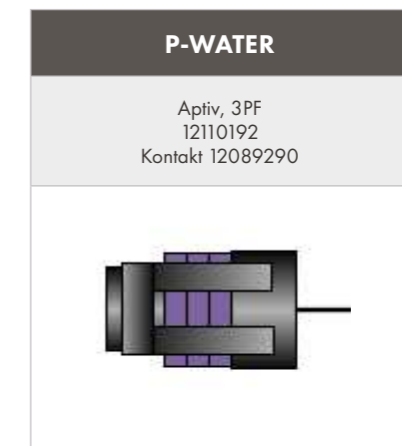
COOLANT PRESSURE

COOLANT PRESSURE SENSOR

DTC

P CODE	P05C3		
FMI	1	Name	Engine coolant pressure –too low.
SPN	109		
Blink / Beep Code	1116		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. The sensor voltage is normal. Engine running at 700 1/min or higher.	Waterentry @ leg Impeller Water pump Water hoses Coolant pressure sensor
2. If engine runs above 2000 1/min and coolant water pressure is below 0,2 bar_abs an error is detected.	

Actions when a malefunction occures

Fault Detection	If the sensed value of coolant pressure is less than the lower limit specified by a threshold curve for a certain duration (2s), then a physical range check low error is debounced and reported to DTC P05C3. If the pressure signal is higher than the limitation of the threshold curve for a certain duration (3s), then the physical range check low error is healed.
Fault Mode	Level 2 (reduce engine output torque to 75 NM).
Limited operation	Yes: Level2 (reduce engine output torque to 75 NM). The engine operation is limited.
Reset criteria	Yes: The fail mode is released when coolant pressure exceeds 0,2bar_rel above 2000 1/min.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Insufficient engine coolant.
2. Engine cooling equipment failure.
3. Coolant temperature sensor failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Engine & wiring check

» Stop the engine and turn off the ECU power.
» Check that the waterentry at the leg is not clogged.
» Check that the impeller of seawater pump is not damaged.
» Check operation of the thermostats, and replace if there is an abnormally.
» Check water-bearing engine covers for leakage.

» Re-check after cleaning or replacement.
» Check the pin of the coolant pressure sensor for deformation and cracks, check condition of the connection.
» Check whether the coolant pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

P-WATER

Aptiv, 3PF
12110192
Kontakt 12089290

AWG		20	20
PIN	C	B	A
12110192			
P-WATER			

10	53	45
20	20	20

Diagram (left page)

U$_H$ - 5,5 bis 15 V   U$_H$ - 5 V

680kΩ

68kΩ

ADC
Referenz
Drucksignal

1,5 nF   33 nF

1,5 nF

OUT

VCC

GND

Sensor

Elektronisches Steuergerät

PRESSURE
TRANSDUCER

VIn

Vout

- 10K 0hrs PULL DOWN

Gnd

ELECTRICAL SCHEMATIC

COOLANT PRESSURE SENSOR

DTC			
P CODE	**P05C4**		
FMI	4		
SPN	109	Name	Coolant pressure sensor signal diagnose−low range.
Blink / Beep Code	1122		

DTC detection criteria	
1. Prequisite, 2. Judgement Criteria	**Check Points**
1. No judgment is made during the engine start recognition.	Connector Wire harness Coolant pressure sensor ECU
2. The sensor voltage is below 0.34 V.	

Actions when a malefunction occures	
Fault Detection	The sensed raw voltage value is less than a threshold of 339mV.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level1 (reduce engine output torque to 95 NM). The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect sensor voltage higher than 0.34 V.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Loose connection or poor contact on socket of the connector.
2. Wiring failure of the wire harness.
3. Coolant temperature sensor failure.
4. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool−or blink / beep code

» Check the fault indication.
» Check the sensor voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the coolant pressure sensor for deformation and cracks, check condition of the connection.
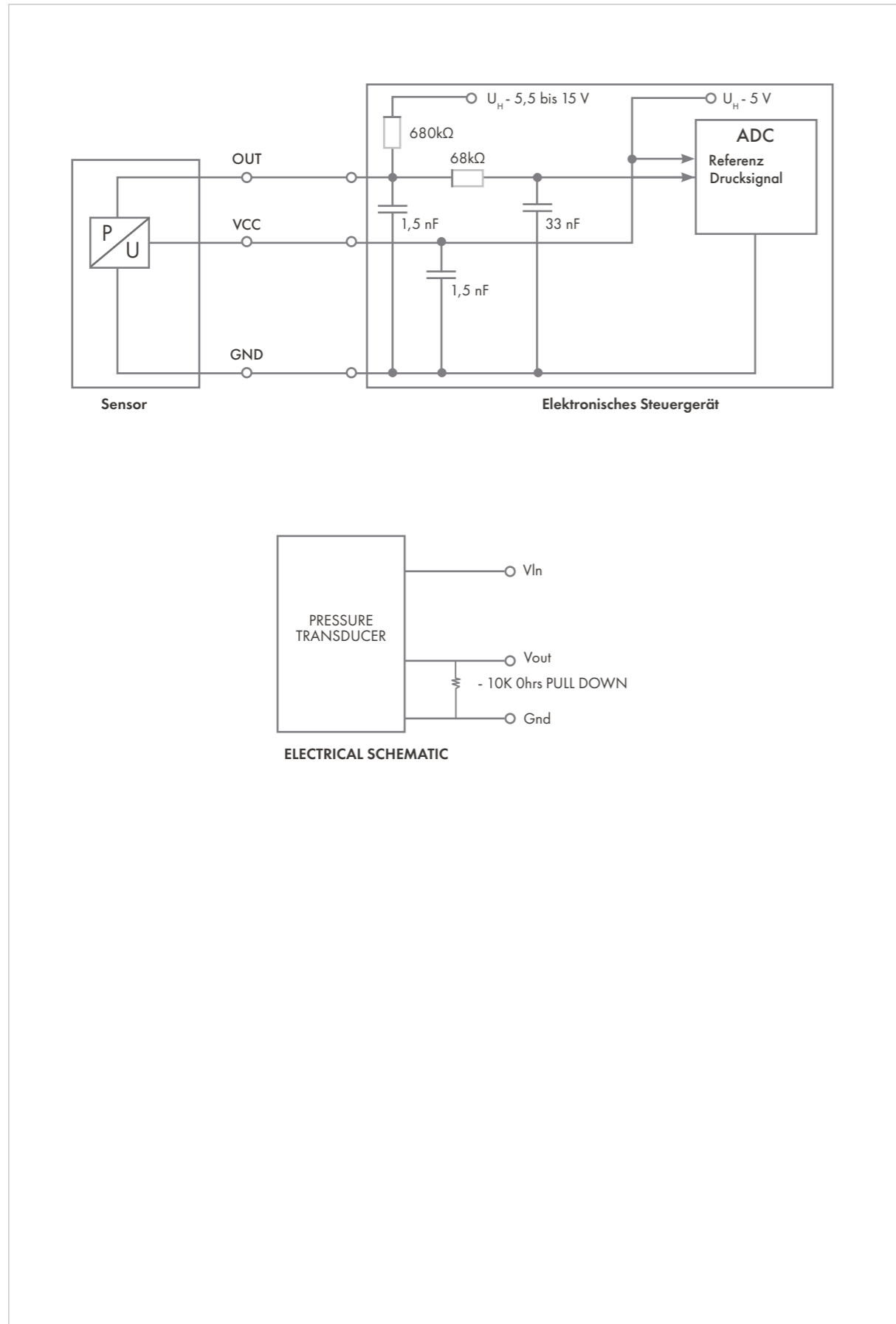» Check whether the coolant pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

- » Check the continuity of the wire harness. Disconnect the coolant pressure sensor from the wire harness and check continuity on the harness between pin C & B; between pin C & A and between pin B & A. If there is a continuity take off the connector of the ECU and repeat the measurement . If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.
- » Check the coolantpressure sensor voltage. Connect the ECU to the wire harness and disconnect the coolant pressure sensor. Turn on the ECU power. Check the voltage between pin B & A. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin C & A. . If the voltage is not in the range of 5,6V +/- 0.2V replace the ECU.

COOLANT PRESSURE SENSOR

DTC

P CODE	P05C5		
FMI	3	Name	Coolant pressure sensor signal diagnose – high range.
SPN	109		
Blink / Beep Code	1121		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	Connector Wire harness Coolant pressure sensor ECU
2. The sensor voltage is below 4.8 V.	

Actions when a malefunction occures

Fault Detection	The sensed raw voltage value is above a threshold of 4793mV.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level1 (reduce engine output torque to 95 NM) The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect sensor voltage lower than 4.8 V
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Loose connection or poor contact on socket of the connector.
2. Wiring failure of the wire harness.
3. Coolant temperature sensor failure.
4. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool – or blink / beep code

- » Check the fault indication.
- » Check the sensor voltage value.

2. Connector / wiring check

- » Before beginning your work, be sure to turn off the ECU power.
- » Check the pin of the coolant pressure sensor for deformation and cracks, check condition of the connection.
- » Check whether the coolant pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

- » Check the continuity of the wire harness. Disconnect the coolant pressure sensor from the wire harness and check continuity on the harness between pin C & B; between pin C & A and between pin B & A. If there is a continuity take off the connector of the ECU and repeat the measurement . If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.

» Check the coolantpressure sensor voltage. Connect the ECU to the wire harness and disconnect the coolant pressure sensor. Turn on the ECU power. Check the voltage between pin B & A. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin C & A. . If the voltage is not in the range of 5,6V +/- 0.2V replace the ECU.
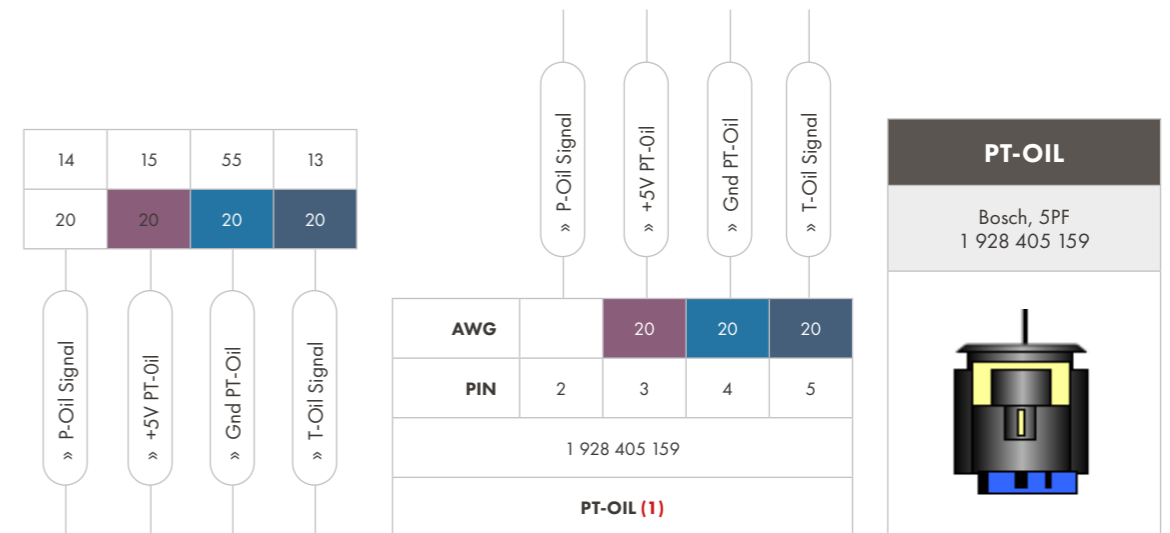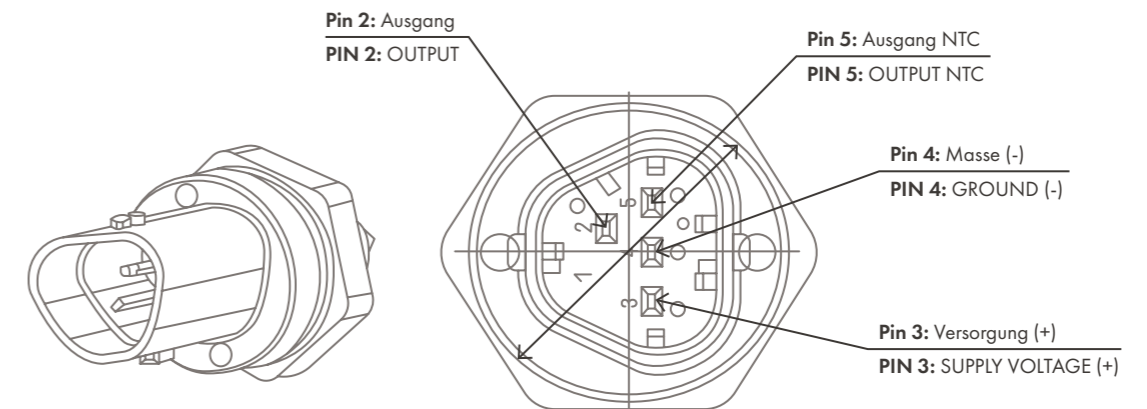
OIL TEMPERATURE & PRESSURE SENSOR

OIL TEMPERATURE & PRESSURE SENSOR

DTC

P CODE	P0197		
FMI	4	Name	Oil temperature sensor error–low range.
SPN	175		
Blink / Beep Code	1322		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	Connector Wire harness Coolant pressure sensor ECU
2. The sensor voltage is below 0.79 V.	

Actions when a malefunction occures

Fault Detection	If the measured raw signal is less than a threshold (79mV) for a certain duration (2s), an SRC low error is entered into the DTC P0182. If the raw signal is higher than or equal to the threshold (79mV) for a certain duration (2s), then the SRC low error is cleared from the fault code.
Fault Mode	[Continuous operation]: Engine is not obstructed. (The operation continues by using default oil temperature value in the ECU).
Limited operation	No
Reset criteria	Yes: The fail mode is released when the voltage becomes higher than 0.79 V.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector
2. Wiring failure of the wire harness
» GND short circuit of the sensor signal wire.

3. Oil temperature sensor failure
» Sensor output failure caused by a GND short circuit of the sensor internal wiring.

4. ECU internal circuit fault

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
» Check the fault indication.

2. Connector / wiring check
» Before beginning your work, be sure to turn off the ECU power.

» Check the pin of the oil temperature sensor for deformation and cracks, check condition of the connection.
» Check whether the oil temperature sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis
» Check the oil temperature sensor resistance value. Measure the resistance between pin 3 & 4 and compare it to the values in table 1.
» If the values is out of range replace the oil temperatur sensor.

14	15	55	13
20	20	20	20

	P-Oil Signal	+5V PT-Oil	Gnd PT-Oil	T-Oil Signal
AWG		20	20	20
PIN	2	3	4	5
1 928 405 159				
PT-OIL (1)				

PT-OIL

Bosch, 5PF
1 928 405 159

Temp. T in °C	Widerstand R in Ω*			Toleranz in K	Prüfgrenzen bei T ± 1K**	
	nominal	minimal	maximal		minimal	maximal
-40	44864,0	41559,0	48413,0	± 1,4	39236,0	51354,0
-35	33676,0	31294,0	36226,0	± 1,3	29602,0	38358,0
-30	25524,0	23790,0	27374,0	± 1,3	22546,0	28929,0
-25	19525,0	18251,0	20879,0	± 1,3	17327,0	22025,0
-20	15067,0	14123,0	16067,0	± 1,3	13430,0	16919,0
-15	11724,0	11019,0	12468,0	± 1,3	10495,0	13108,0
-10	9195,0	8665,0	9754,0	± 1,3	8265,0	10238,0
-5	7266,0	6864,0	7689,0	± 1,3	6558,0	8059,0
0	5784,0	5477,0	6106,0	± 1,2	5239,0	6390,0
5	4636,0	4400,0	4882,0	± 1,2	4215,0	5103,0
10	3740,0	3558,0	3930,0	± 1,2	3412,0	4102,0
15	3037,0	2895,0	3184,0	± 1,2	2780,0	3319,0
20	2480,0	2369,0	2595,0	± 1,2	2278,0	2702,0
25	2038,0	1950,0	2128,0	± 1,1	1877,0	2213,0
30	1683,0	1614,0	1755,0	± 1,1	1555,0	1823,0
35	1398,0	1343,0	1454,0	± 1,1	1295,0	1509,0
40	1167,0	1123,0	1212,0	± 1,1	1084,0	1256,0
45	978,9	943,9	1015,0	± 1,1	912,1	1051,0
50	825,0	796,9	853,8	± 1,0	770,8	883,5
55	698,5	675,8	721,7	± 1,0	654,2	746,1
60	594,0	575,6	612,7	± 1,0	557,7	632,9
65	507,2	492,2	522,4	± 1,0	477,3	539,1
70	434,9	422,7	447,2	± 0,9	410,2	461,2
75	374,3	364,3	384,4	± 0,9	353,8	396,1
80	323,4	315,2	331,6	± 0,9	306,4	341,4
85	280,4	273,7	287,1	± 0,9	266,2	295,4
90	244,0	238,5	249,5	± 0,8	232,1	256,6
95	213,0	208,5	217,6	± 0,8	203,0	223,5
100	186,6	182,9	190,3	± 0,8	178,1	195,4
105	164,0	160,5	167,5	± 0,8	156,4	171,8
110	144,5	141,3	147,8	± 0,9	137,8	151,5
115	127,8	124,8	130,8	± 1,0	121,7	134,0
120	113,3	110,5	116,1	± 1,1	107,9	118,9
125	100,7	98,1	103,3	± 1,1	95,8	105,7
130	89,8	87,4	92,2	± 1,2	85,4	94,3
135	80,2	78,0	82,5	± 1,3	76,3	84,3
140	71,9	69,8	74	± 1,3	68,3	75,6

Table header: **Messung des Widerstands im eingeschwungenen Zustand mit Messtrom ≤ 0,1 mA gemäß folgender Tabelle:**

OIL TEMPERATURE & PRESSURE SENSOR

DTC

P CODE	P0198		
FMI	3	Name	Oil temperature sensor error–high range.
SPN	175		
Blink / Beep Code	1321		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is below 4.9 V.	Connector Wire harness Coolant pressure sensor ECU

Actions when a malfunction occures

Fault Detection	If the measured raw signal is higher than a threshold (4895mV) for a certain duration (2s), an SRC high error is entered in the DTC P0183. If the raw signal is less than or equal to the threshold (4895mV) for a certain duration (2s), then the SRC high error cleared from the fault code.
Fault Mode	[Continuous operation]: Engine is not obstructed. (The operation continues by using default oil temperature value in the ECU).
Limited operation	No
Reset criteria	Yes: The fail mode is released when the voltage becomes lower than 4.9 V.
Remarks	0

Presumed cause of malfunction or abnormal condition

Description

1. Poor connection of the connector
2. Wiring failure of the wire harness
» Open circuit or power short circuit of the sensor GND wire.
» Open circuit or power short circuit of the sensor signal wire.

3. Oil temperature sensor failure
» Sensoroutput failure caused by an open circuit of the sensor internal wiring.

4. ECU internal circuit fault

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
» Check the fault indication.

2. Connector / wiring check
» Before beginning your work, be sure to turn off the ECU power.

» Check the pin of the oil temperature sensor for deformation and cracks, check condition of the connection.
» Check whether the oil temperature sensor wiring is disconnected or the wiring coating is peeled.

3. Failure diagnosis

» Check the oil temperature sensor resistance value. Measure the resistance between pin 3 & 5 and compare it to the values in table 1.
» If the values is out of range replace the oil temperatur sensor.

In case there is any damage replace the affected part.

OIL TEMPERATURE & PRESSURE SENSOR

DTC

P CODE	P0522		
FMI	4	Name	Oil pressure sensor signal diagnose –low range.
SPN	100		
Blink / Beep Code	1315		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	Connector Wire harness Coolant pressure sensor ECU
2. The sensor voltage is below 0.34 V.	

Actions when a malefunction occures

Fault Detection	If the raw oil press signal is less than a threshold (339mV) for a certain duration (2s), then an error is reported in DTC P0522. The SRC Min error is healed when raw oil press signal is higher than the threshold (339mV) for certain a duration (2s).
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level 1(reduce engine output torque to 95 NM). The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect sensor voltage higher than 0.34 V.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Loose connection or poor contact on socket of the connector.
2. Wiring failure of the wire harness.
3. Oil pressure sensor failure.
4. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check the sensor voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the oil pressure sensor for deformation and cracks, check condition of the connection.
» Check whether the oil pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the continuity of the wire harness. Disconnect the oil pressure sensor from the wire harness and check continuity on the harness between pin 2 & 3; between pin 2 & 4 and between pin 4 & 3. If there is a continuity take off the connector of the ECU and repeat the measurement . If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.

» Check the oil pressure sensor voltage. Connect the ECU to the wire harness and disconnect the sensor. Turn on the ECU power.

» Check the voltage between pin 4 & 3. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin 4 & 2. If the voltage is not in the range of 5,6V +/- 0.2V replace the ECU.

OIL TEMPERATURE & PRESSURE SENSOR

DTC			
P CODE	**P0523**		
FMI	3	Name	Oil pressure sensor signal diagnose – high range.
SPN	100		
Blink / Beep Code	1314		

DTC detection criteria	
1. Prequisite, 2. Judgement Criteria	**Check Points**
1. No judgment is made during the engine start recognition.	Connector Wire harness Oil pressure sensor ECU
2. The sensor voltage is above 4.8 V .	

Actions when a malefunction occures	
Fault Detection	If the raw oil press signal is higher than a threshold (4793mV) for a certain duration (2s), then an error is reported in the DTC P0523. The SRC Max error is healed when raw oil press signal is less than the threshold (4793mV) for a certain duration (2s).
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level 1(reduce engine output torque to 95 NM). The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect sensor voltage lower than 4.8 V.
Remarks	0

Presumed cause of malefunction or abnormal condition
Description

1. Loose connection or poor contact on socket of the connector.
2. Wiring failure of the wire harness.
3. Oil pressure sensor failure.
4. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool – or blink / beep code

» Check the fault indication.
» Check the sensor voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the oil pressure sensor for deformation and cracks, check condition of the connection.
» Check whether the oil pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the continuity of the wire harness. Disconnect the oil pressure sensor from the wire harness and check continuity on the harness between pin 2 & 3; between pin 2 & 4 and between pin 4 & 3. If there is a continuity take off the connector of the ECU and repeat the measurement . If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.

» Check the oil pressure sensor voltage. Connect the ECU to the wire harness and disconnect the sensor. Turn on the ECU power. Check the voltage between pin 4 & 3. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin 4 & 2. If the voltage is not in the range of 5,6V +/- 0.2V replace the ECU.

OIL TEMPERATURE & PRESSURE SENSOR

DTC				
P CODE	**P0524**			
FMI	1		Name	Oil pressure−too low.
SPN	100			
Blink / Beep Code	1312			

DTC detection criteria	
1. Prequisite, 2. Judgement Criteria	**Check Points**
1. Engine running at 700 1/min or higher. The sensor voltage is normal.	Oil pressure equipment
2. ECU detects error if sensed oil pressure is below minimum oil pressure curve (RPM dependent) stored in the ECU.	Oil level in oil sump Oil filter

Actions when a malfunction occures	
Fault Detection	When the oil pressure is less than a threshold map for a certain duration (5s), then a plausibility error "Oil Pressure too low" is set. This error is healed when the oil pressure is higher than the threshold map for a certain duration (1s).
Fault Mode	Level 2 (reduce engine output torque to 75 NM).
Limited operation	Yes: Level2 (reduce engine output torque to 75 NM). The engine operation is limited.
Reset criteria	Yes: The fail mode is released when sensed oil pressure is above minimum oil pressure curve stored in the ECU.
Remarks	0

Presumed cause of malfunction or abnormal condition
Description
1. Insufficient oil quantity. 2. Oil filter clogged. 3. Oil leakage. 4. Oil pressure sensor failure. 5. ECU internal circuit fault.
Check

1. Initial diagnosis with diagnosis tool−or blink / beep code

» Check the fault indication.
» Check whether the input signal is correctly recognized.

2. Engine check

» Stop the engine and turn off the ECU power.
» Check the oil level with the dipstick, and refill if insufficient.
» Check oil leakage from the oil system.
» Replace the oil filter if the oil pressure is still too low after oil level check.

3. Failure diagnosis

» Checl/replace oil pressure/temperatur sensor.
» Send the engine to the supplier. Don't continue running. Probably repair or overhaul is necessary.

Oil pressure (slightly) below the limit:

* worn oil pump
* worn bearings (crankshafts, conrods,...)
* clogged oil supply lines, filter, mesh,......
* oil pressure relief valve stucks open
* major oil leakage due to cracked channel.

No oil pressure:
* oil pump drive broken
* Oil pump connection seal failed.

FUEL TEMPERATURE SENSOR

FUEL TEMPERATURE SENSOR

DTC

P CODE	P0182		
FMI	4	Name	Fuel temperature sensor error—Low range.
SPN	174		
Blink / Beep Code	1612		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is below 0.1 V.	Connector Wire harness Fuel temperature sensor ECU

Actions when a malfunction occures

Fault Detection	If the measured raw signal falls below a limiting value (78mV) for a certain duration (2s) then it is classified as an SRC low error. This is reflected in the defect code DTC P0182. If the raw signal exceeds or equals the threshold (78mV) for a certain duration (2s), then the previously reported SRC low error is healed.
Fault Mode	[Continuous operation]: Engine is not obstructed. (The operation continues by using default fuel temperature value in the ECU.)
Limited operation	Yes: Level2 (reduce engine output torque to 75 NM). The engine operation is limited.
Reset criteria	Yes: The fail mode is released when the Voltage become higher than 0.1 V.
Remarks	0

Presumed cause of malfunction or abnormal condition

Description

1. Poor connection of the connector
2. Wiring failure of the wire harness
» GND short circuit of the sensor signal wire.

3. Fuel temperature sensor failure
» Sensor output failure caused by a GND short circuit of the sensor internal wiring.

4. ECU internal circuit fault

Check

1. Initial diagnosis with diagnosis tool—or blink / beep code
» Check the fault indication.

2. Connector / wiring check
» Before beginning your work, be sure to turn off the ECU power.

» Check the pin of the fuel temperature sensor for deformation and cracks, check condition of the connection.
» Check whether the fuel temperature sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis
» Check the fuel temperature sensor resistance value. Measure the resistance between pin1 & 2 and compare it to the values in table 1.

If the values is out of range replace the fuel temperatur sensor.

Pin 1   Pin 2

Schaltbild
WIRING DIAGRAM

T-FUEL		
Bosch, 2PF 1 928 403 874		

12	34
20	20

» T-Fuel Signal   » Gnd T-Fuel

» T-Fuel Signal   » Gnd T-Fuel

AWG	20	20
PIN	1	2
1928403874		
T-FUEL		

13 ±0.1   SW 19 -0,27   19.4 -0.2

Betriebsspanung / *Supply voltage:*   V ± 150 mV

Nennwiderstand bei + 100 ºC / *Nominal resistance at +100ºC:*   0.1866 kΩ ± 2%

Widerstand abhängig von Temperatur / *Resistance depending on temperature:*   siehe Tabelle 1 / *see Tabelle 1*

Temperatur / Temperature: [ºC]	Minimaler Widerstand / Minimal resistance: [Ω]	Nennwiderstand / Nominal resistance: [Ω]	Maximaler Widerstand / Maximal resistance: [Ω]
-40	40481	45303	50124
-30	23575	26108	28640
-20	14093	15458	16824
-10	8640	9395	10149
0	5465	5895	6324
+10	3541	3791	4042
+20	2351	2499	2648
+25	1940	2056	2173
+40	1118	1174	1231
+50	798	834	869
+60	573	595	618
+70	421	436	450
+80	313	323	332
+90	237	243	249
+100	183	187	190
+110	141	144	148
+120	110	113	116
+130	87	89	92
+140	69	71	74

FUEL TEMPERATURE SENSOR

DTC

P CODE	P0183		
FMI	3	Name	Fuel temperature sensor error–High range.
SPN	174		
Blink / Beep Code	1611		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	Connector Wire harness Fuel temperature sensor ECU
2. The sensor voltage is above 4.9 V.	

Actions when a malefunction occures

Fault Detection	If the measured raw signal exceeds a limiting value (4898mV) for a certain duration (2s), then it is classified as an SRC high error. This is reflected in the defect code DTC P0183. If the raw signal falls below or equals the threshold (4898mV) for a certain duration (2s) then the previously reported SRC high error is healed.
Fault Mode	[Continuous operation]: Engine is not obstructed. (The operation continues by using default fuel temperature value in the ECU.)
Limited operation	No
Reset criteria	Yes: The fail mode is released when the Voltage become lower than 4.9 V.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector
2. Wiring failure of the wire harness
  » Open circuit or power short circuit of the sensor GND wire.
  » Open circuit or power short circuit of the sensor signal wire.

3. Fuel temperature sensor failure
  » Sensoroutput failure caused by an open circuit of the sensor internal wiring.

4. ECU internal circuit fault

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
  » Check the fault indication.

2. Connector / wiring check

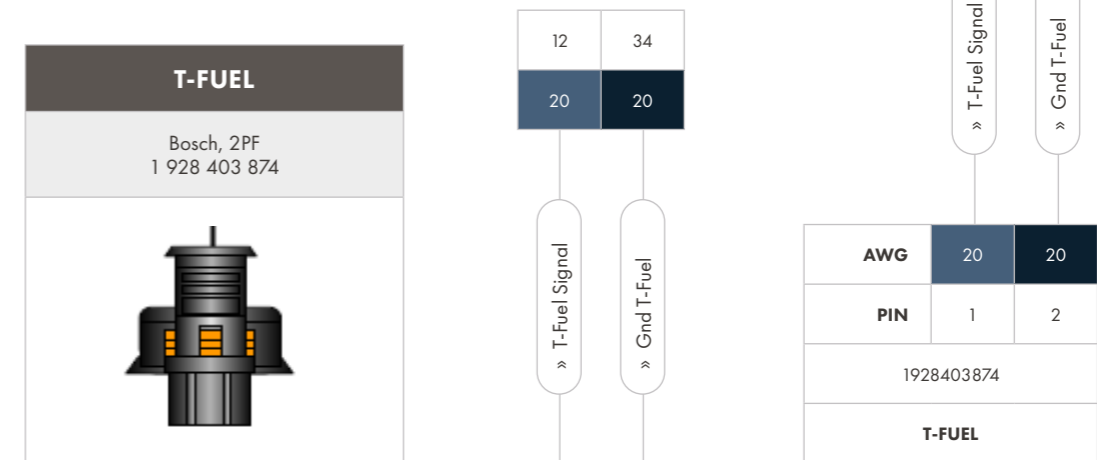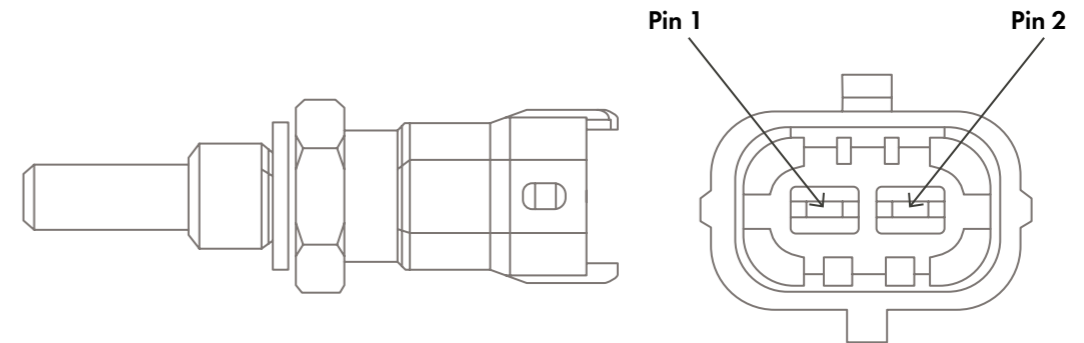» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the fuel temperature sensor for deformation and cracks, check condition of the connection
» Check whether the fuel temperature sensor wiring is disconnected or the wiring coating is peeled

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the fuel temperature sensor resistance value. Measure the resistance between pin 1 & 2 and compare it to the values in table 1.
» If the values is out of range replace the fuel temperatur sensor.

COOLANT TEMPERATURE SENSOR

COOLANT TEMPERATURE SENSOR

DTC			
P CODE	**P0117**		
FMI	4	Name	Coolant temperature sensor error−Low range.
SPN	110		
Blink / Beep Code	1114		

DTC detection criteria	
1. Prequisite, 2. Judgement Criteria	**Check Points**
1. No judgment is made during the engine start recognition.	Connector Wire harness Fuel temperature sensor ECU
2. The sensor voltage is below 0.1 V.	

Actions when a malefunction occures	
Fault Detection	If the sensor raw voltage is less than a limiting value for a certain time period, a sensor range check lower limit (SRC−Min / 78mV) is detected. The defect is healed when the raw voltage is more than or equal to a threshold for a duration higher than 1s.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level1 (reduce engine output torque to 95 NM) The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect sensor voltage higher than 0.1 V
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector
2. Wiring failure of the wire harness
   » GND short circuit of the sensor signal wire.

3. Coolant temperature sensor failure
   » Sensor output failure caused by a GND short circuit of the sensor internal wiring.

4. ECU internal circuit fault

Check

1. Initial diagnosis with diagnosis tool−or blink / beep code
   » Check the fault indication.

2. Connector / wiring check
   » Before beginning your work, be sure to turn off the ECU power.

» Check the pin of the fuel temperature sensor for deformation and cracks, check condition of the connection.
» Check whether the fuel temperature sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis
» Check the fuel temperature sensor resistance value. Measure the resistance between pin 1 & 2 and compare it to the values in table 1.
» If the values is out of range replace the fuel temperatur sensor.

Betriebsspanung / *Supply voltage:*   V ± 150 mV
Nennwiderstand bei + 100 ºC / *Nominal resistance at +100ºC:*   0.1866 kΩ ± 2%
Widerstand abhängig von Temperatur / *Resistance depending on temperature:*   siehe Tabelle 1 / *see Tabelle 1*

Temperatur / *Temperature: [ºC]*	Minimaler Widerstand / *Minimal resistance: [Ω]*	Nennwiderstand / *Nominal resistance: [Ω]*	Maximaler Widerstand / *Maximal resistance: [Ω]*
-40	40481	45303	50124
-30	23575	26108	28640
-20	14093	15458	16824
-10	8640	9395	10149
0	5465	5895	6324
+10	3541	3791	4042
+20	2351	2499	2648
+25	1940	2056	2173
+40	1118	1174	1231
+50	798	834	869
+60	573	595	618
+70	421	436	450
+80	313	323	332
+90	237	243	249
+100	183	187	190
+110	141	144	148
+120	110	113	116
+130	87	89	92
+140	69	71	74

Pin 1 **Pin 2**

13 ±0.1

SW 19   -0,27

19.4 -0.2

Schaltbild
WIRING DIAGRAM

T-ENGINE
Bosch, 2PF
1 928 403 874

» T-EngineSignal   » Gnd T-Engine

AWG	20	20
PIN	1	2
1928403874		
T-ENGINE		

33	11
20	20

» T-EngineSignal   » Gnd T-Engine

COOLANT TEMPERATURE SENSOR

DTC

P CODE	P0118		
FMI	3	Name	Coolant temperature sensor error–High range.
SPN	110		
Blink / Beep Code	1113		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made du ring the engine start recognition.	Connector
	Wire harness
2. The sensor voltage is above 4.9 V .	Coolant pressure sensor
	ECU

Actions when a malefunction occures

Fault Detection	If the sensor raw voltage is more than limiting value for a certain time period, a sensor range check upper limit (SRC–Max / 4898mV) is detected. The defect is healed when the raw voltage is less than or equal to the threshold for a duration higher tahn 1s.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level1 (reduce engine output torque to 95 NM) The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect sensor voltage lower than 4.9 V.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1.Poor connection of the connector
2. Wiring failure of the wire harness
» Open circuit or power short circuit of the sensor GND wireshort circuit of the sensor signal wire to voltage supply wire
» Open circuit or power short circuit of the sensor signal wire

3. Coolant temperature sensor failure
» Sensoroutput failure caused by an open circuit of the sensor internal wiring

4. ECU internal circuit fault

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
» Check the fault indication.
» Check the sensor voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the coolant pressure sensor for deformation and cracks, check condition of the connection.
» Check whether the coolant pressure sensor wiring is disconnected or the wiring coating is peeled.

3. Failure diagnosis

» Check the fuel temperature sensor resistance value. Measure the resistance between pin 1 & 2 and compare it to the values in table 1.
» If the values is out of range replace the fuel temperatur sensor.

CAMSHAFT
POSITION SENSOR

CAMSHAFT POSITION SENSOR

DTC

P CODE	P0116		
FMI	2	Name	Camshaft position sensor signal – offset angle exceeded.
SPN	190		
Blink / Beep Code	1218		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Engine running. Crank signal is normal.	Connector
	Wire harness
2. The condition with the phase difference of 25 degrees or larger, or -25 degrees or smaller between the cam and the crank is detected for min 6 times.	Trigger wheel
	Camshaft position sensor
	ECU

Actions when a malefunction occures

Fault Detection	For determination of the angle offset, every equidistant edge of the phase toothed wheel detected the angle offset between the crankshaft and the camshaft will be calculated and the result is stored in a ring buffer. Using the angle offset values an average value about one crankshaft rotation is determined. Is this mean value exceeding the calibrated limits, the function reports a malfunction of the angle offset diagnosis.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level1 (reduce engine output torque to 95 NM). The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect normal crank signal after restarting the engine.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Loose connection or poor contact on socket of the connector.
2. Wiring failure of the wire harness.
3. Changed air gap between sensor and trigger wheel (too big, too small, loose sensor mounting, sensor movement).
4. Trigger wheel, bended or broken teeth on crankshaft trigger wheel.
5. Trigger wheel, not rotating.
6. Camshaft position sensor failure.
7. Timing incorrect.
8. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
 » Check the fault indication.

2. Connector / wiring check

 » Before beginning your work, be sure to turn off the ECU power.
 » Check the pins of the camshaft position sensor for deformation and cracks, check the condition of the connection.
 » Check whether the camshaft position sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis
 » Check the continuity of the wire harness. Remove the wire harness from the cam speed sensor and the ECU. Perform a continuity check according the tables CAM.1. Replace the wire hareness if one conditions is not OK.
 » Check if the sensor is properly mounted and not loose.
 » Check if trigger wheel is turning by rotating crankshaft clockwise by hand.
 » Check the timing.

In case there is any damage replace the affected part.

Camshaft position sensor

CAM	44
Bosch, 3PF 1 928 403 966	20

	» Gnd CAM	» CAM Signal	» +5V CAM
AWG	20	20	20
PIN	1	2	3
1 928 403 966			
CAM			

CAM. 1

ECU side harness connector	Sensor side harness connector	Continuity	Condition
44	1	Yes	Ok
46	2	Yes	Ok
45	3	Yes	Ok

ECU side harness connector	Sensor side harness connector	Continuity	Condition
44		No	Ok
46	All others	No	Ok
45		No	Ok

CAMSHAFT POSITION SENSOR

DTC

P CODE	P0340		
FMI	12	Name	Camshaft position sensor signal diagnose–no signal.
SPN	190		
Blink / Beep Code	1217		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Engine running. Crank signal is normal.	Connector
	Wire harness
2. No camshaft trigger pulse or position detected while the crank is rotating for a certain number of rotations (4 rotations).	Trigger wheel
	Camshaft position sensor
	ECU

Actions when a malefunction occures

Fault Detection	In between of several crankshaft revolutions there is not any camshaft edge present. The defect debounce counter reaches the threshold. If the monitoring range is left, the debounce counter is reseted.
Fault Mode	Level 2 (reduce engine output torque to 75 NM).
Limited operation	Yes: Level 2 (reduce engine output torque to 75 NM). The engine operation is limited. (The operation continues with crankshaft position sensor only).
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect normal crank signal after restarting the engine.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Loose connection or poor contact on socket of the connector.
2. Wiring failure of the wire harness.
3. Changed air gap between sensor and trigger wheel (too big, too small, loose sensor mounting, sensor movement).
4. Trigger wheel, bended or broken teeth on crankshaft trigger wheel.
5. Trigger wheel, not rotating.
6. Camkshaft position sensor failure.
7. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.

» Check the pins of the camshaft position sensor for deformation and cracks, check the condition of the connection.
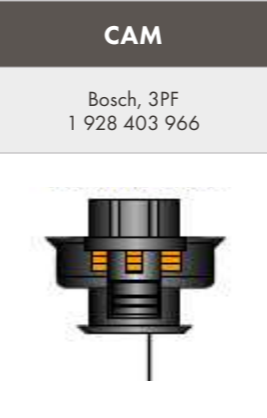» Check whether the camshaft position sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the continuity of the wire harness. Remove the wire harness from the cam speed sensor and the ECU. Perform a continuity check according the tables CAM.1. Replace the wire hareness if one conditions is not OK.
» Check if the sensor is properly mounted and not loose.
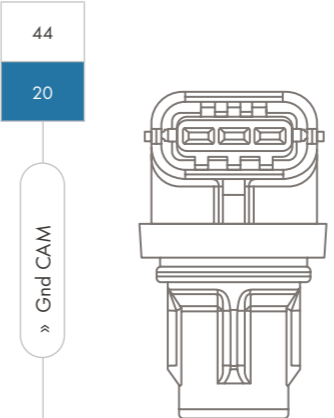» Check if trigger wheel is turning by rotating crankshaft clockwise by hand.
» Check the timing.
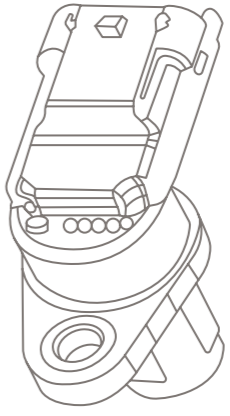
In case there is any damage replace the affected part.

CAMSHAFT POSITION SENSOR

DTC

P CODE	P0344		
FMI	8	Name	Camshaft position sensor signal diagnose–disturbed signal.
SPN	190		
Blink / Beep Code	1216		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Engine running. Crank signal is normal.	Connector
	Wire harness
2. Incorrect camshaft trigger pulse or position detected while the crank is rotating for a certain number of rotations (4 rotations)	Trigger wheel
	Camshaft position sensor
	ECU

Actions when a malfunction occures

Fault Detection	In between of several crankshaft revolutions there is not any camshaft edge present. The defect debounce counter reaches the threshold. If the monitoring range is left, the debounce counter is reseted.
Fault Mode	Level 2 (reduce engine output torque to 75 NM).
Limited operation	Yes: Level 2 (reduce engine output torque to 75 NM). The engine operation is limited. (The operation continues with crankshaft position sensor only).
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect normal crank signal after restarting the engine.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Loose connection or poor contact on socket of the connector.
2. Wiring failure of the wire harness.
3. Changed air gap between sensor and trigger wheel (too big, too small, loose sensor mounting, sensor movement).
4. Trigger wheel, bended or broken teeth on crankshaft trigger wheel.
5. Trigger wheel, not rotating.
6. Camshaft position sensor failure.
7. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.

» Check the pins of the camshaft position sensor for deformation and cracks, check the condition of the connection.
» Check whether the camshaft position sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the crankshaft position sensor resistance value. Remove the wire harness from the ECU with the crankshaft sensor connected. Measure the resistance between pin 74 and 52 of the ECU terminal. It has to be in the range of 860 W +/- 10%. If the measured value is out of range change the sensor.
» Check the continuity of the wire harness. If you have no continuity between pin 74 & pin 1 (sensor socket) and pin 52 & pin 2 (sensor socket) replace first the sensor, otherwise the wire harness.
» Check air gap between crankshaft position sensor and trigger wheel. The gap (LS) between sensor and trigger teeth must be 0.3 mm ≤ LS ≤ 1.8 mm.
» Check mounting condition of crankshaft position sensor.
» Check trigger wheel for bent or broken teeth.

In case there is any damage replace the affected part.

Camshaft position sensor

Pin 1   **Pin 2**

74	52	30
20	20	20

» Crankshaft -   » Crankshaft +   » Screen

» Crankshaft -   » Crankshaft +

CRANK

Bosch, 2PF
1 928 403 874

AWG	20	20
PIN	1	2
1 928 403 874		
CRANK		

Twisted pair

CRANKSHAFT SENSOR

DTC

P CODE	P0336		
FMI	9	Name	Crankshaft position sensor signal diagnose – disturbed signal.
SPN	190		
Blink / Beep Code	1219		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Engine running. Crank signal is normal.	Connector Wire harness Air gap, sensor to trigger wheel Trigger wheel Crankshaft position sensor ECU
2. Abnormal pulse detected for a constant number of times (15 times).	

Actions when a malefunction occures

Fault Detection	If the crankshaft signal is disturbed once or more often the reasons for this disturbance is visible in DTC P0336 and leads to a new synchronisation. If the number of signal plausibilisation errors reaches a threshold the signal error is set.
Fault Mode	Level 2 (reduce engine output torque to 75 NM).
Limited operation	Yes: Level 2 (reduce engine output torque to 75 NM). The engine operation is limited. (The operation continues with camshaft position sensor only)
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect normal crank signal after restarting the engine.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Loose connection or poor contact on socket of the connector.
2. Wiring failure of the wire harness.
3. Changed air gap between sensor and trigger wheel (too big, too small, loose sensor mounting, sensor movement).
4. Trigger wheel, bended or broken teeth on crankshaft trigger wheel.
5. Crankshaft position sensor failure.
6. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool – or blink / beep code

» Check the fault indication.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.

» Check the pins of the crankshaft position sensor for deformation and cracks, check the condition of the connection.
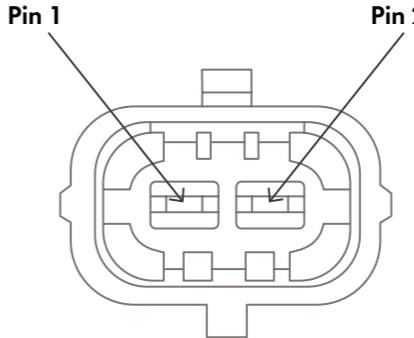» Check whether the crank position sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the crankshaft position sensor resistance value. Remove the wire harness from the ECU with the crankshaft sensor connected. Measure the resistance between pin 74 and 52 of the ECU terminal. It has to be in the range of 860 W +/- 10%. If the measured value is out of range change the sensor.
» Check the continuity of the wire harness. If you have no continuity between pin 74 & pin 1 (sensor socket) and pin 52 & pin 2 (sensor socket) replace first the sensor, otherwise the wire harness.
» Check air gap between crankshaft position sensor and trigger wheel. The gap (LS) between sensor and trigger teeth must be 0.3 mm ≤ LS ≤ 1.8 mm.
» Check mounting condition of crankshaft position sensor.
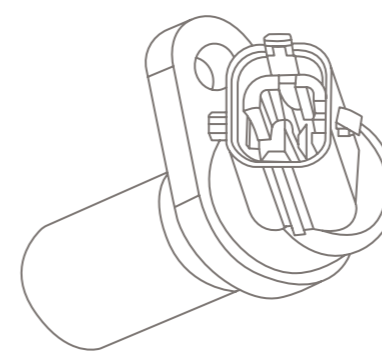» Check trigger wheel for bent or broken teeth.

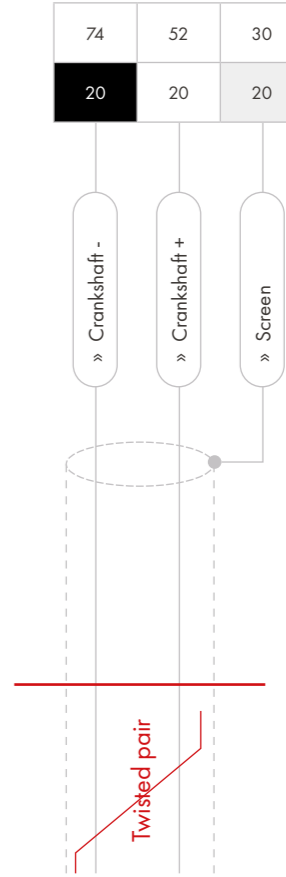In case there is any damage replace the affected part.

Crankshaft position sensor

Pin 1   Pin 2

74	52	30
20	20	20

» Crankshaft -   » Crankshaft +   » Screen

CRANK		
Bosch, 2PF 1 928 403 874		

» Crankshaft -   » Crankshaft +

AWG	20	20
PIN	1	2
1 928 403 874		
CRANK		

Twisted pair

Axialabtastung axial scanning

Mittenversatz displacement

Geberrad
(Zähne in Axialrichtung)
Camshaft wheel
(teeth in axial direction)
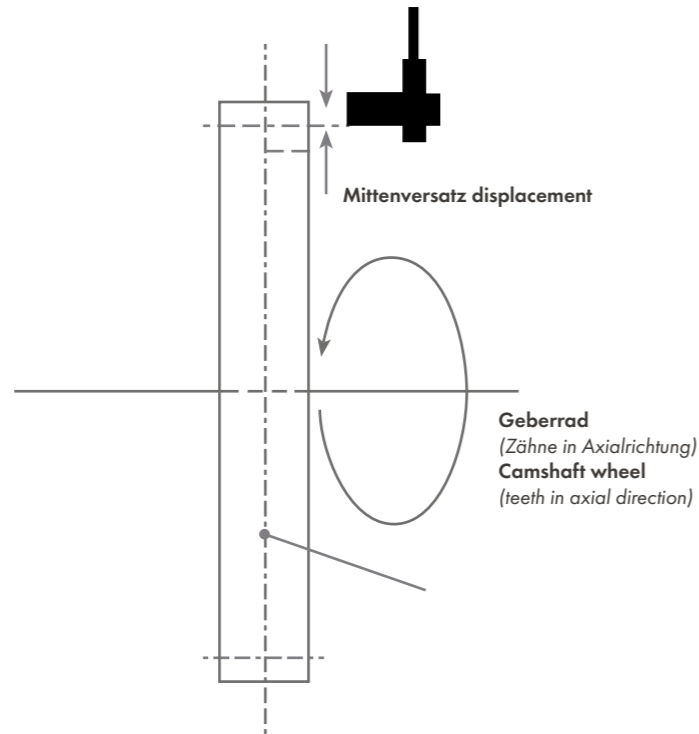
L = 370nH ±60mH bei 1kHz (Reihenshaltung)
Aufmagnetisiert und ohne Aufnahme genessen
Ri bei +20°C = 860Ω ±10%

N
5

1

2
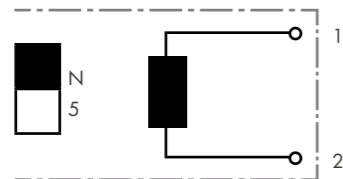
Achtuna Douermognet!
CAUTION PERMANENT MAGNET!

Zulässige magnetische FremdFelder
bei entgegener ichteten Feld aus
al len Richtungen < 2 kA/m. Anzohl
und Douer der Annäherungsspiele
beliebig

CRANKSHAFT SENSOR

DTC

P CODE	P2617		
FMI	18	Name	Crankshaft position sensor signal diagnose – No signal.
SPN	190		
Blink / Beep Code	1221		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Engine running. Crank signal is normal.	Connector Wire harness Air gap, sensor to trigger wheel Trigger wheel Crankshaft position sensor ECU
2. No crank pulser input while the cam is rotating for a certain number of rotations (2 rotations).	

Actions when a malefunction occures

Fault Detection	The engine is rotating but there is no crankshaft signal detectable. On the other hand the camshaft signal has been checked and it is plausible. The counter of camshaft rotation without crankshaft signal is checked every 100ms and reaches the threshold (2).
Fault Mode	Level 2 (reduce engine output torque to 75 NM).
Limited operation	Yes: Level2 (reduce engine output torque to 75 NM). The engine operation is limited. (The operation continues with camshaft position sensor only).
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect normal crank signal after restarting the engine.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. Loose connection or poor contact on socket of the connector.
2. Wiring failure of the wire harness.
3. Changed air gap between sensor and trigger wheel (too big, too small, loose sensor mounting, sensor movement).
4. Trigger wheel, bended or broken teeth on crankshaft trigger wheel.
5. Crankshaft position sensor failure.
6. ECU internal failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.

» Check the pins of the crankshaft position sensor for deformation and cracks, check the condition of the connection.
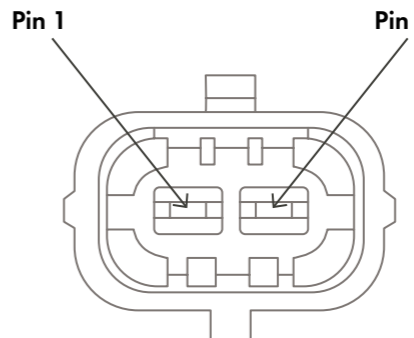» Check whether the crank position sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the crankshaft position sensor resistance value. Remove the wire harness from the ECU with the crankshaft sensor connected. Measure the resistance between pin 74 and 52 of the ECU terminal. It has to be in the range of 860 W +/- 10%. If the measured value is out of range change the sensor.
» Check the continuity of the wire harness. If you have no continuity between pin 74 & pin 1 (sensor socket) and pin 52 & pin 2 (sensor socket) replace first the sensor, otherwise the wire harness.
» Check air gap between crankshaft position sensor and trigger wheel. The gap (LS) between sensor and trigger teeth must be 0.3 mm ≤ LS ≤ 1.8 mm.
» Check mounting condition of crankshaft position sensor.
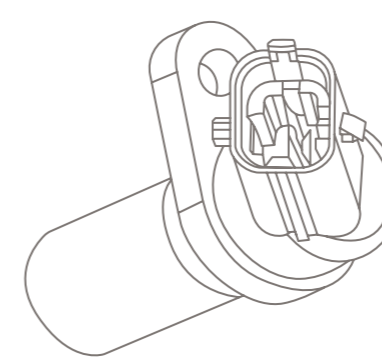» Check trigger wheel for bent or broken teeth.

In case there is any damage replace the affected part.

INTERNAL AMBIENT PRESSURE SENSOR
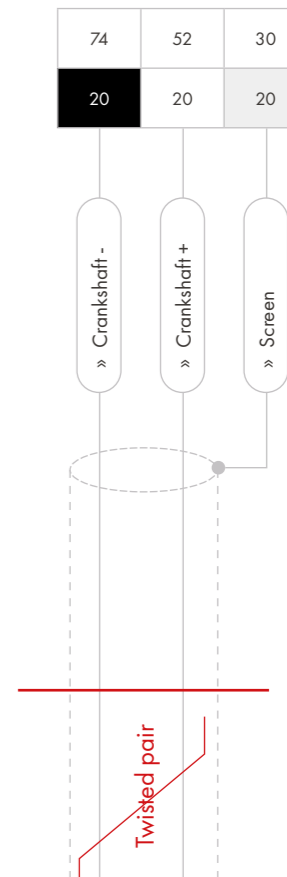
INTERNAL AMBIENT PRESSURE SENSOR

DTC

P CODE	P2228	Name	Ambient pressure sensor—fault check min signal range violated for ambient air pressure sensor.
FMI	4		
SPN	108		
Blink / Beep Code	1517		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	ECU
2. The sensor output is below 500 hPa (invalid range).	

Actions when a malefunction occures

Fault Detection	Min signal range violated for ambient air pressure sensor.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level 1 (reduce engine output torque to 95 NM). The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect sensor output above 500 hPa.
Remarks	0

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal ambient pressure sensor failure.

Check

1. Initial diagnosis with diagnosis tool—or blink / beep code
  » Check the fault indication.
  » Check the sensor output value.

3. Failure diagnosis
  » Change ECU.

INTERNAL AMBIENT PRESSURE SENSOR

DTC

P CODE	P2229	Name	Ambient pressure sensor—fault check max signal range violated for ambient air pressure sensor.
FMI	3		
SPN	108		
Blink / Beep Code	1516		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	ECU
2. The sensor output is above 1150 hPa (invalid range).	

Actions when a malefunction occures

Fault Detection	Max signal range violated for ambient air pressure sensor.
Fault Mode	
Limited operation	
Reset criteria	
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal ambient pressure sensor failure.

Check

1. Initial diagnosis with diagnosis tool—or blink / beep code
  » Check the fault indication.
  » Check the sensor output value.

3. Failure diagnosis
  » Change ECU.

INTERNAL AMBIENT PRESSURE SENSOR

DTC

P CODE	P222F		
FMI	2	Name	Ambient pressure–Ambient air pressure sensor sensor error by component self diagnosis.
SPN	108		
Blink / Beep Code	1518		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	ECU
2. Component self diagnosis failed.	

Actions when a malefunction occures

Fault Detection	This function analyses the measured signal of the ambient air pressure sensor for implausible values by means of diverse criteria. In fault cases the signals will be set invalid and a defect is reported to the DTC P222F.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level 1 (reduce engine output torque to 95 NM). The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect no sensor error.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. ECU internal ambient pressure sensor failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
- » Check the fault indication.
- » Check the sensor output value.

3. Failure diagnosis
- » Change ECU.

INTAKE MANIFOLD PRESSURE / TEMPERATURE SENSOR

INTAKE MANIFOLD PRESSURE / TEMPERATURE SENSOR

DTC

P CODE	P007C		
FMI	4	Name	Intake manifold pressure sensor–Low range.
SPN	2631		
Blink / Beep Code	1413		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	Connector Wire harness Intake manifold pressure sensor ECU
2. The sensor voltage is below 0.22 V.	

Actions when a malefunction occures

Fault Detection	The default value is transmitted when the charged air cooler pressure down stream sensor is defective. If the Raw voltage from sensor is less than 222mV then an error is reported in DFC P007C. If the raw voltage is higher than 222mV then no error is reported. If the raw voltage is less than 222mV for the debounce duration of 500ms, then a permanent error is set in DFC P007C. If the Raw voltage from sensor is higher than 222mV for the debounce duration of 500ms then the error is permanently healed in DFC P007C.
Fault Mode	[Continuous operation]: Engine is not obstructed. (The operation continues by using default intake manifold pressure value (780mbar) in the ECU.)
Limited operation	No
Reset criteria	Yes: The fail mode is released when the Voltage become higher than 0.22 V.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector
2. Wiring failure of the wire harness
   » Short circuit of the sensor signal wire to GND wire
3. Intake manifold pressure sensor failure
   » Sensor output failure caused by a short circuit of the sensor internal wiring
4. ECU internal circuit fault

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check the sensor voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the intake manifold pressure sensor for deformation and cracks, check condition of the connection.
» Check whether the intake manifold pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the continuity of the wire harness. Disconnect the MAP sensor from the harness and check continuity between pin 4 & 3; between pin 4 & 1 and between pin 1 & 3. If there is a continuity take off the connector of the ECU and repeat the measurement. If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.
» Check the intake manifold pressure sensor voltage. Connect the ECU to the wire harness and disconnect the MAP sensor. Turn on the ECU power. Check the voltage between pin 1 & 3. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin 1 & 4. If the voltage is not in the range of 5,6V +/- 0.2V replace the ECU.

Pin 4: pressure output
Pin 3: power supply
Pin 2: temperatur output
Pin 1: GND

Sensor | Elektronisches Steuergerät

$U_H = 5,5$ bis ... 16 V $U_S = 5$ V

680 kΩ, 68 kΩ, 1,5 nF, 33 nF, 1,47 kΩ, 10 kΩ, 1,5 nF, 38,3 kΩ, 33 nF, 1,5 nF

ADC Referenz Drucksignal Temperatursignal

	Gnd MAP	MAP (T) Signal	+5V MAP	MAP (P) Signal
	78	87	35	56
	20	20	20	20

	» Gnd MAP	» MAP (T) Signal	» +5V MAP	» MAP (P) Signal
AWG	20	20	20	20
PIN	1	2	3	4
	1 928 403 736			
	MAP			

CRANK

Bosch, 4PF
1 928 403 736

INTAKE MANIFOLD PRESSURE / TEMPERATURE SENSOR

DTC

P CODE	P007C		
FMI	4	Name	Intake manifold temperature sensor error–Low range.
SPN	2630		
Blink / Beep Code	1422		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is below 0.1 V.	Connector Wire harness Intake manifold temperature sensor ECU

Actions when a malefunction occures

Fault Detection	The default value is transmitted when the charged air cooler temperature down stream sensor is defective. If the Raw voltage from sensor is less than 97mV then an error is reported in DFC P007C. If the raw voltage is higher than 97mV then no error is reported. If the raw voltage is less than 97mV for the debounce duration of 655350ms, then a permanent error is set in DFC P007C. If the Raw voltage from sensor is higher than 97mV for the debounce duration of 655350ms then the error is permanently healed in DFC P007C.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Level 1 (reduce engine output torque to 95 NM) The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect sensor voltage higher than 0.1 V.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1.Poor connection of the connector
2. Wiring failure of the wire harness
   » Open circuit or GND short circuit of the sensor supply wire.
   » Open circuit or GND short circuit of the sensor signal wire.

3. Intake manifold temperature sensor failure
   » Sensor output failure caused by an open circuit of the sensor internal wiring.

4. ECU internal circuit fault

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
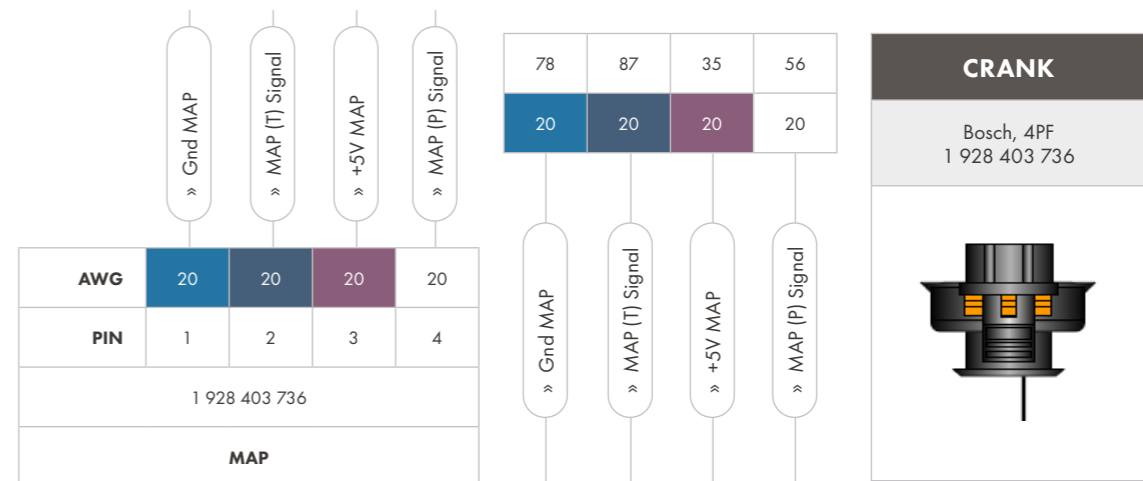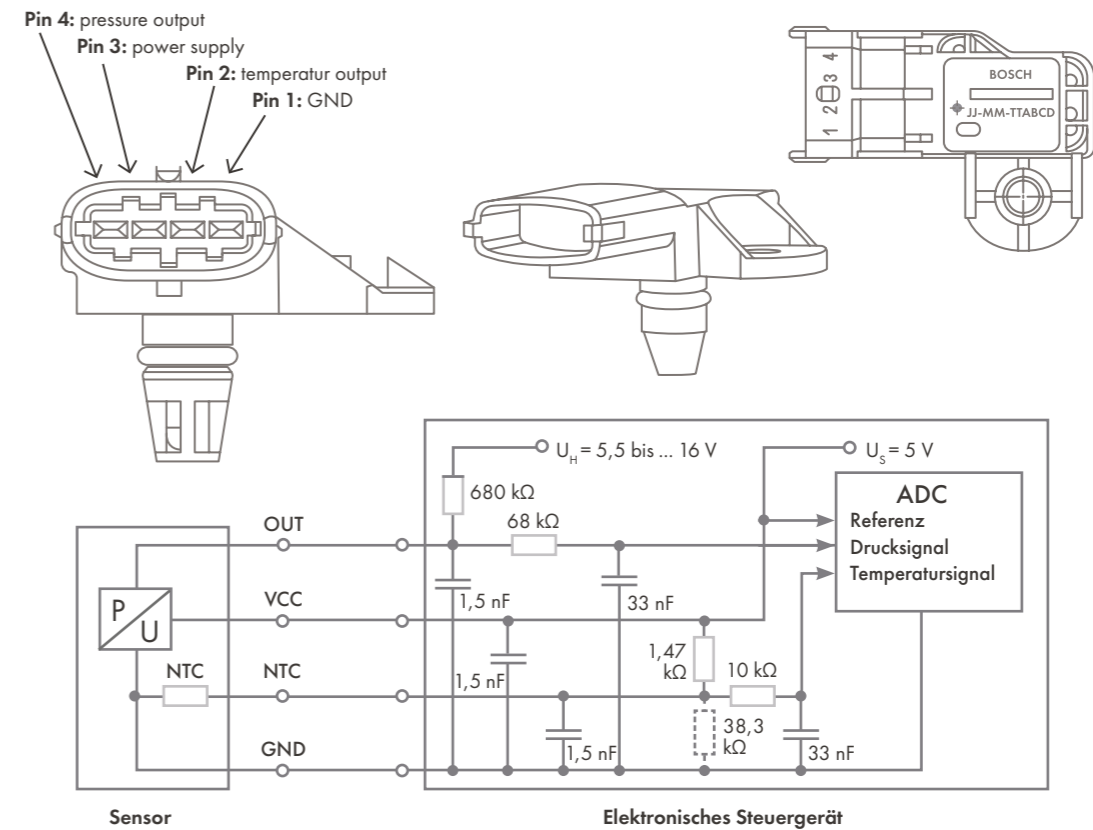   » the values in table MAP.1. If the values is out of range replace the MAP sensor.

2. Connector / wiring check
   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pin of the intake manifold temperature sensor for deformation and cracks, check condition of the connection.
   » Check whether the intake manifold temperature sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis
   » Check the intake manifold temperature sensor resistance value. Measure the resistance between pin 1 & 2 and compare it to the values in table MAP.1. If the values is out of range replace the MAP sensor.

Messung des Widerstands im eingeschwungenen Zustand mit Messtrom ≤ 0,1 mA gemäß folgender Tabelle:						
Temp. T in ºC	**Widerstand R in Ω***			**Toleranz in K**	**Prüfgrenzen bei T ± 1K****	
	nominal	minimal	maximal		minimal	maximal
-40	45303	43076	47529	± 0.9	40730	50314
-35	34273	32643	35902	± 0.9	30908	37953
-30	26108	24907	27309	± 0.9	23603	28829
-25	19999	19108	20889	± 0.9	18142	22023
-20	15458	14792	16124	± 0.8	14055	16970
-15	12000	11499	12501	± 0.8	10945	13144
-10	9395	9015	9775	± 0.8	8595	10261
-5	7413	7123	7704	± 0.8	6801	8074
0	5895	5671	6118	± 0.8	5420	6403
5	4711	4537	4884	± 0.8	4343	5106
10	3791	3656	3927	± 0.8	3504	4100
15	3068	2962	3174	± 0.8	2842	3310
20	2499	2416	2583	± 0.8	2323	2690
25	2056	1990	2123	± 0.8	1916	2207
30	1706	1653	1760	± 0.8	1591	1827
35	1411	1368	1455	± 0.8	1318	1510
40	1174	1139	1209	± 0.8	1100	1254
45	987.4	959.0	1016	± 0.8	927.0	1051
50	833.8	810.5	857.0	± 0.8	783.1	886.3
55	702.7	683.7	721.7	± 0.8	661.2	746.6
60	595.4	579.7	611.0	± 0.8	561.6	631.4
65	508.2	495.3	521.1	± 0.8	480.2	537.8
70	435.6	424.9	446.4	± 0.8	412.1	460.3
75	374.1	365.2	383.1	± 0.8	354.4	394.9
80	322.5	315.0	329.9	± 0.8	306.0	339.8
85	279.5	273.2	285.8	± 0.8	265.7	294.0
90	243.1	237.8	248.4	± 0.8	231.5	255.4
95	212.6	208.1	217.1	± 0.8	202.7	223.0
100	186.6	182.9	190.3	± 0.8	178.0	195,4
105	163.8	160.3	167.2	± 0.8	156.2	171.6
110	144.2	141.0	147.3	± 0.9	137.5	151.0
115	127.3	124.4	130.1	± 0.9	121.4	133.4
120	112.7	110.1	115.2	± 1.0	107.5	118.0
125	100.2	97.81	102.5	± 1.0	95.55	104.9
130	89.28	87.13	91.43	± 1.1	85.13	93.52

INTAKE MANIFOLD PRESSURE / TEMPERATURE SENSOR

DTC

P CODE	P007D		
FMI	3	**Name**	Intake manifold pressure sensor error–High range.
SPN	2631		
Blink / Beep Code	1412		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition. 2. The sensor voltage is above 4.87 V.	Connector Wire harness Intake manifold pressure sensor ECU

Actions when a malefunction occures

Fault Detection	The default value is transmitted when the charged air cooler pressure down stream sensor is defective. If the Raw voltage from sensor is higher than 4869mV then an error is reported in DFC P007D. If the raw voltage is lower than 4869mV then no error is reported. If the raw voltage is higher than 4869mV for the debounce duration of 500ms, then a permanent error is set in DFC P007D. If the Raw voltage from sensor is lower than 4869mV for the debounce duration of 500ms then the error is permanently healed in DFC P007D.
Fault Mode	[Continuous operation]: Engine is not obstructed. (The operation continues by using default intake manifold pressure value (780mbar) in the ECU.)
Limited operation	No
Reset criteria	Yes: The fail mode is released when the Voltage become lower than 4.87 V.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Wiring failure of the wire harness
» Short circuit of the sensor signal wire to voltage supply wire.

2. Intake manifold pressure sensor failure
» Sensoroutput failure caused by a short circuit of the sensor internal wiring.

3. ECU internal circuit fault

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
» Check the fault indication.
» Check the sensor voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the intake manifold pressure sensor for deformation and cracks, check condition of the connection.
» Check whether the intake manifold pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the continuity of the wire harness. Disconnect the MAP sensor from the harness and check continuity between pin 4 & 3; between pin 4 & 1 and between pin 1 & 3. If there is a continuity take off the connector of the ECU and repeat the measurement. If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.
» Check the intake manifold pressure sensor voltage. Connect the ECU to the wire harness and disconnect the MAP sensor. Turn on the ECU power. Check the voltage between pin 1 & 3. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin 1 & 4. If the voltage is not in the range of 5,6V +/- 0.2V replace the ECU.

INTAKE MANIFOLD PRESSURE / TEMPERATURE SENSOR

DTC			
P CODE	**P007D**		
FMI	3	Name	Intake manifold temperature sensor error–High range.
SPN	2630		
Blink / Beep Code	1421		

DTC detection criteria	
1. Prequisite, 2. Judgement Criteria	**Check Points**
1. No judgment is made during the engine start recognition.	Connector Wire harness Intake manifold pressure sensor ECU
2. The sensor voltage is above 4.87 V.	

Actions when a malefunction occures	
Fault Detection	The default value is transmitted when the charged air cooler temperature down stream sensor is defective. If the Raw voltage from sensor is higher than 4893mV then an error is reported in DFC P007D. If the raw voltage is lower than 4893mV then no error is reported. If the raw voltage is higher than 4869mV for the debounce duration of **655350ms**, then a permanent error is set in DFC P007D. If the Raw voltage from sensor is lower than 4893mV for the debounce duration of **655350ms** then the error is permanently healed in DFC P007D.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Level 1 (reduce engine output torque to 95 NM). The engine operation is limited.
Reset criteria	Yes: Engine must be stopped once. The fail mode is released when the ECU detect sensor voltage lower than 4.9 V.
Remarks	

Presumed cause of malefunction or abnormal condition
Description

1. Wiring failure of the wire harness

» Open circuit or power short circuit of the sensor supply wire.
» Open circuit or power short circuit of the sensor signal wire.

2. Intake manifold temperature sensor failure

» Sensoroutput failure caused by an open circuit of the sensor internal wiring.

3. ECU internal circuit fault

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the intake manifold temperature sensor for deformation and cracks, check condition of the connection.
» Check whether the intake manifold temperature sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the intake manifold temperature sensor resistance value. Measure the resistance between pin 1 & 2 and compare it to the values in table MAP.1. If the values is out of range replace the MAP sensor.

INTAKE MANIFOLD PRESSURE / TEMPERATURE SENSOR

DTC			
P CODE	**P226B**		
FMI	0	Name	Boost pressure sensor. Error for maximum boost pressure reached.
SPN	1127		
Blink / Beep Code	1414		

DTC detection criteria	
1. Prequisite, 2. Judgement Criteria	**Check Points**
1. Engine running at 700 1/min or higher. The sensor voltage is normal.	Waste gate Boost pressure sensor
2. ECU detects 1600 hPa (relative) or higher boost pressure for 2 seconds or more.	

Actions when a malefunction occures	
Fault Detection	Difference of intake manifold pressure and the environment pressure is higher than maximum boost pressure limit (1600mbar) i.e. boost pressure build up is too high.
Fault Mode	Level 2 (reduce engine output torque to 75 NM).
Limited operation	Yes: Level2 (reduce engine output torque to 75 NM). The engine operation is limited.
Reset criteria	Yes: The fail mode is released when boost pressure deceeds 1600 hPa for 5 second or more.
Remarks	

Presumed cause of malefunction or abnormal condition
Description
1. Waste gate blocked 2. Boost pressure sensor failure

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Engine check

» Stop the engine and turn off the ECU power.
» Check waste gate operator if blocked.
» If above condition is OK, replace the boost pressure sensor.

3. Failure diagnosis

» Check the continuity of the wire harness. Disconnect the MAP sensor from the harness and check continuity between pin 4 & 3; between pin 4 & 1 and between pin 1 & 3. If there is a continuity take off the connector of the ECU and repeat the measurement. If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.
» Check the intake manifold pressure sensor voltage. Connect the ECU to the wire harness and disconnect the MAP sensor. Turn on the ECU power. Check the voltage between pin 1 & 3. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin 1 & 4. If the voltage is not in the range of 5,6V +/- 0.2V replace the ECU.
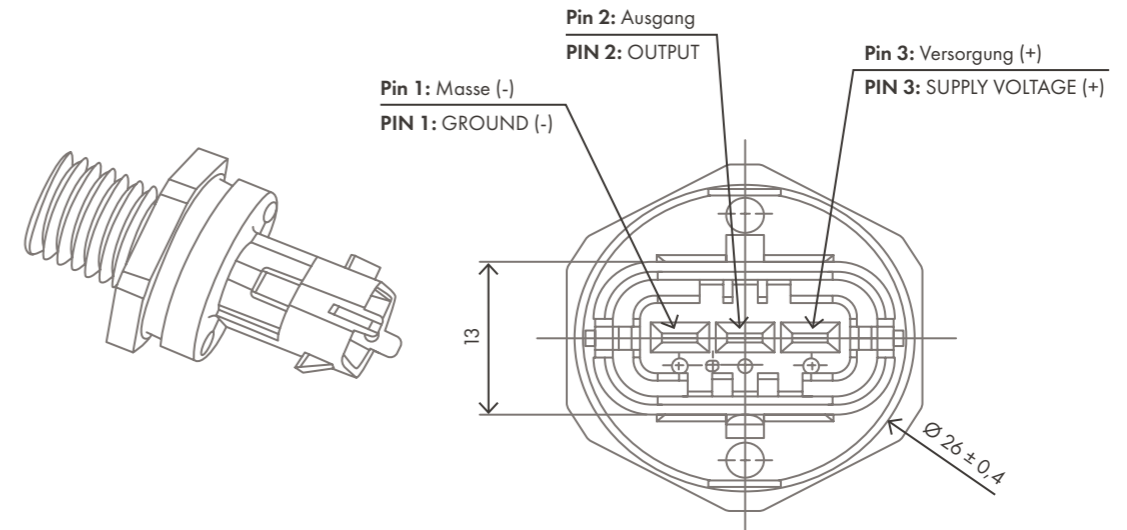
RAIL PRESSURE SENSOR

RAIL PRESSURE SENSOR

DTC

P CODE	P0191		
FMI	0	Name	Rail pressure raw values – above threshold.
SPN	157		
Blink / Beep Code	3443		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Fuel system Rail pressure sensor
2. ECU detects more than 3 raw values in rail pressure above threshold during start up or aftrerrun	

Actions when a malefunction occures

Fault Detection	If the raw value of the rail pressure remains above a threshold START (384mV) for a certain number of measurements (3) during startup or above the threshold RUN (384mV) for a certain number of measurements (3) during afterrun, the offset is too high in the positive direction and the rail pressure sensor will be classified as defective.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level 1 (reduce engine output torque to 95 NM). The engine operation is limited.
Reset criteria	Yes: The fail mode is released when the ECU detect rail pressure raw values to be within the threshold during start up or afterrun. Healing when an error is set will be possible only if no further errors are debounced thereafter.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness.
3. Rail pressure sensor failure.
4. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
  » Check the fault indication.
  » Check the sensor voltage value.

2. Connector / wiring check
  » Before beginning your work, be sure to turn off the ECU power.
  » Check the pin of the rail pressure sensor for deformation and cracks, check condition of the connection.
  » Check whether the rail pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis
  » Check the continuity of the wire harness. Disconnect the rail pressure sensor and check continuity on the wire harness between pin 2 & 3; between pin 2 & 1 and between pin 1 & 3. If there is a continuity take off the connector of the ECU and repeat the measurement . If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.
  » Check the rail pressure sensor voltage. Connect the ECU to the wire harness and disconnect the rail pressure sensor. Turn on the ECU power. Check the voltage between pin 1 & 3. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin 1 & 2. If the voltage is not in the range of **5,0V** +/- 0.2V replace the ECU.

Pin 2: Ausgang
PIN 2: OUTPUT

Pin 3: Versorgung (+)
PIN 3: SUPPLY VOLTAGE (+)

Pin 1: Masse (-)
PIN 1: GROUND (-)

$\varnothing\ 26 \pm 0.4$

13

1.5 Signalauswertung

Drucksensor

Steuergerät

Pin 3

+ 5 V (U_s)

Pull up Widerstand

Pin 2

Signal (U_{OUT})

A/D-Wandler und µC

Pin 1

GND

P-RAIL			
Bosch, 3PF 1 928 403 968			

	76	54	32
	20	20	20

» Gnd P-Rail | » P-Rail Signal | » +5V P-Rail

	» Gnd P-Rail	» P-Rail Signal	» +5V P-Rail
AWG	20	20	20
PIN	1	2	3
1 928 403 968			
P-RAIL			

RAIL PRESSURE SENSOR

DTC				
P CODE	**P0191**			
FMI	0	Name		Rail pressure raw values – below threshold.
SPN	157			
Blink / Beep Code	3444			

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Fuel system
2. ECU detects more than 3 raw values in rail pressure below threshold during start up or aftrerrun.	Rail pressure sensor

Actions when a malefunction occures

Fault Detection	For the evaluation a certain number measured values are registered during startup and a certain number measured values in afterrun. If the raw value of the rail pressure remains below a threshold START (251 mV) for a certain number of measurements (3) during startup or below a threshold RUN (251 mV) for a certain number of measurements (3) during afterrun, the offset is too high in the negative direction and the rail pressure sensor will be classified as defective.
Fault Mode	Level 1 (reduce engine output torque to 95 NM).
Limited operation	Yes: Level 1 (reduce engine output torque to 95 NM). The engine operation is limited.
Reset criteria	Yes: The fail mode is released when the ECU detect rail pressure raw values to be within the threshold during start up or afterrun.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness.
3. Rail pressure sensor failure.
4. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

 » Check the fault indication.
 » Check the sensor voltage value.

2. Connector / wiring check

 » Before beginning your work, be sure to turn off the ECU power.
 » Check the pin of the rail pressure sensor for deformation and cracks, check condition of the connection.
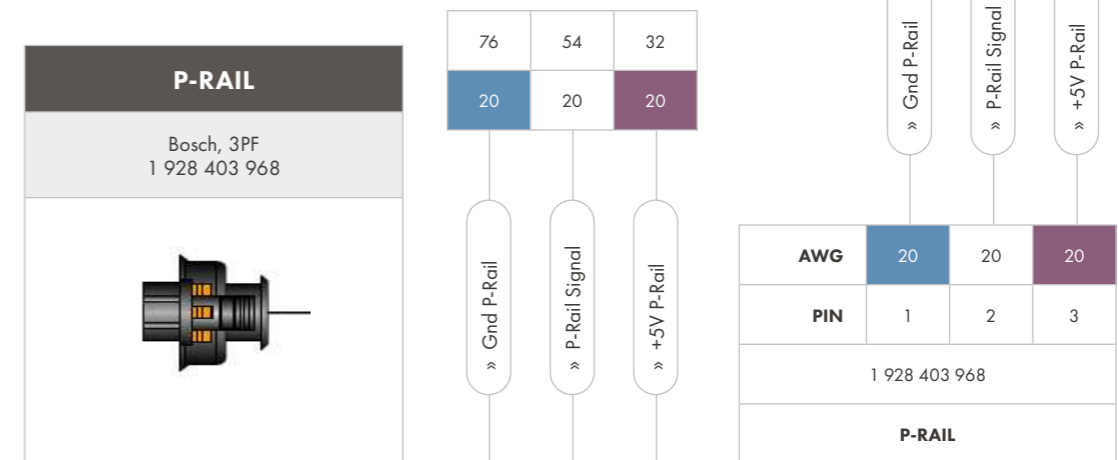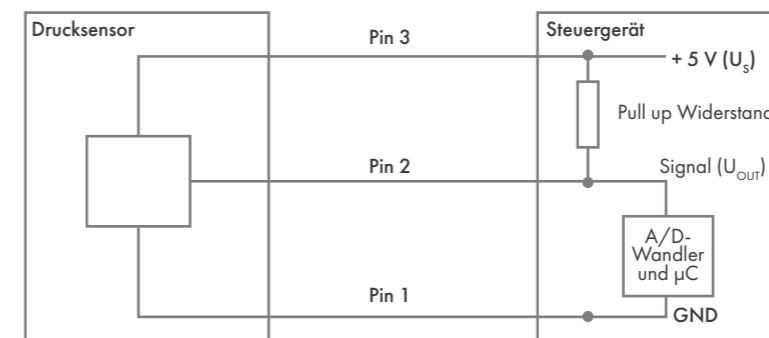 » Check whether the rail pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

 » Check the continuity of the wire harness. Disconnect the rail pressure sensor and check continuity on the wire harness between pin 2 & 3; between pin 2 & 1 and between pin 1 & 3. If there is a continuity take off the connector of the ECU and repeat the measurement . If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.
 » Check the rail pressure sensor voltage. Connect the ECU to the wire harness and disconnect the rail pressure sensor. Turn on the ECU power. Check the voltage between pin 1 & 3. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin 1 & 2. If the voltage is not in the range of **5,0V** +/- 0.2V replace the ECU.

RAIL PRESSURE SENSOR

DTC

P CODE	P0192		
FMI	4	Name	Rail pressure sensor error—Low range.
SPN	157		
Blink / Beep Code	3447		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No judgment is made during the engine start recognition.	Connector
	Wire harness
2. The sensor voltage is below 0.13 V.	Rail pressure sensor
	ECU

Actions when a malefunction occures

Fault Detection	If the raw sensor voltage falls below a limiting value (131 mV), a fault will be detected.
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness.
3. Rail pressure sensor failure.
4. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool—or blink / beep code

» Check the fault indication.
» Check the sensor voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the rail pressure sensor for deformation and cracks, check condition of the connection.
» Check whether the rail pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the continuity of the wire harness. Disconnect the rail pressure sensor and check continuity on the wire harness between pin 2 & 3; between pin 2 & 1 and between pin 1 & 3. If there is a continuity take off the connector of the ECU and repeat the measurement . If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.
» Check the rail pressure sensor voltage. Connect the ECU to the wire harness and disconnect the rail pressure sensor. Turn on the ECU power. Check the voltage between pin 1 & 3. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin 1 & 2. If the voltage is not in the range of **5,0V** +/- 0.2V replace the ECU.

RAIL PRESSURE SENSOR

DTC

P CODE	P0193		
FMI	3	Name	Rail pressure sensor error–High range.
SPN	157		
Blink / Beep Code	3446		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	**Check Points**
1. No judgment is made during the engine start recognition.	Connector Wire harness Rail pressure sensor ECU
2. The sensor voltage is above 3.17 V.	

Actions when a malefunction occures

Fault Detection	If the raw sensor voltage exceeds a Threshold (3169mV), a fault will be detected. If additionally the uncorrected raw sensor voltage exceeds another threshold (3290mV), an error will be detected.
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness.
3. Rail pressure sensor failure.
4. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

  » Check the fault indication.
  » Check the sensor voltage value.

2. Connector / wiring check

  » Before beginning your work, be sure to turn off the ECU power.
  » Check the pin of the rail pressure sensor for deformation and cracks, check condition of the connection.
  » Check whether the rail pressure sensor wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

  » Check the continuity of the wire harness. Disconnect the rail pressure sensor and check continuity on the wire harness between pin 2 & 3; between pin 2 & 1 and between pin 1 & 3. If there is a continuity take off the connector of the ECU and repeat the measurement . If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.
  » Check the rail pressure sensor voltage. Connect the ECU to the wire harness and disconnect the rail pressure sensor. Turn on the ECU power. Check the voltage between pin 1 & 3. If the voltage is not in the range of 5V +/- 0.2V replace the ECU. Check the voltage between pin 1 & 2. If the voltage is not in the range of **5,0V** +/- 0.2V replace the ECU.
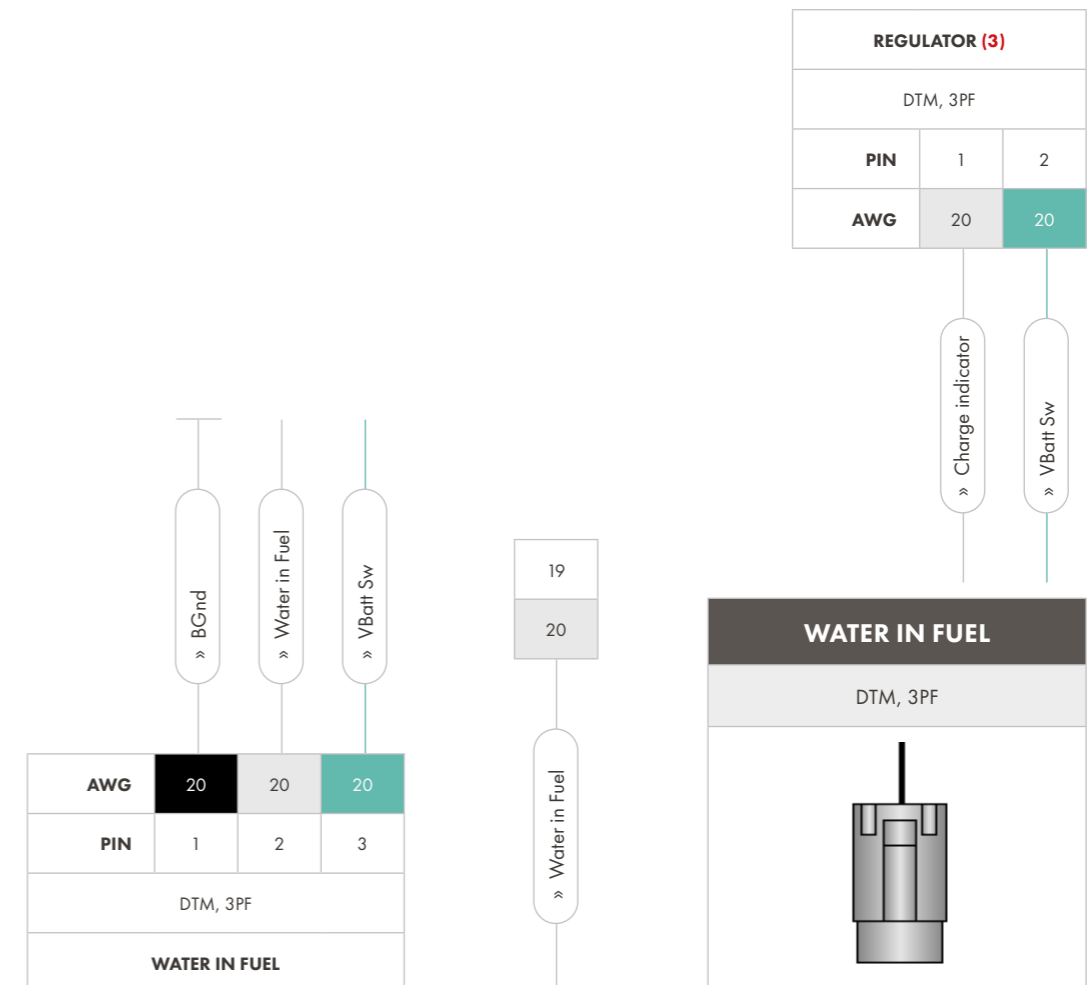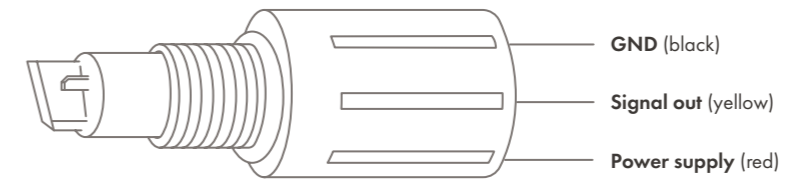
WATER IN FUEL SENSOR

RAIL PRESSURE SENSOR

DTC

P CODE	P2269		
FMI	31	Name	Water in fuel sensor – water detected.
SPN	97		
Blink / Beep Code	1513		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. The ignition switch is turned on and the battery voltage is 9 V or more.	Water separator under the fuel pre-filter. Connector. Wire harness. Water in fuel sensor. ECU.
2. The water alarm switch is turned on continuously.	

Actions when a malefunction occures

Fault Detection	In case the water in fuel sensor detects water, DTC P2269 will be active.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU does not detect the signal from the water in fuel sensor.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

Both, water in fuel and WIF system failure, are indicated by the DTC P2269. Most of the time there is water in the fuel!

» Water contain detected in the water separator under the pre-filter.
» Wiring failure of the wire harness.
» Power short circuit of the water in fuel sensor.
» Water in fuel sensor failure.
» Power short circuit of the water alarm switch internal circuit.
» ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check whether the input signal of the water in fuel sensor is correctly recognized.

2. Engine check

» Stop the engine and turn off the ECU power.
» Drain water from the water separator.
» Turn on the ignition key switch and check whether is still DTC is detected. If so, there is a failure on the system.

---

3. Failure diagnosis

» Check the water in fuel sensor system.
» Check the continuity of the wire harness. Disconnect the WIF sensor from the harness and check continuity between pin 1 & 2; between pin 1 & 3 and between pin 2 & 3. If there is a continuity take off the connector of the ECU and repeat the measurement. If there is still a continuity replace the harness, if not replace the ECU. Check both ends of each pin on the wire harness for continuity. If there is once no continuity, replace the wire harness.
» Check the WIF supply voltage. Connect the ECU to the wire harness and disconnect the WIF sensor. Turn on the ECU power.Check the voltage between pin 1 & 3. If the voltage is not in the range of 12,5V +/- 0.8V check the battery (voltage).

WIF (water in fuel sensor)

- **GND** (black)
- **Signal out** (yellow)
- **Power supply** (red)

REGULATOR (3)		
DTM, 3PF		
PIN	1	2
AWG	20	20

» Charge indicator
» VBatt Sw

» BGnd
» Water in Fuel
» VBatt Sw

	19
	20

AWG	20	20	20
PIN	1	2	3
DTM, 3PF			
WATER IN FUEL			

» Water in Fuel

WATER IN FUEL

DTM, 3PF

STARTER SWITCH T50

STARTER SWITCH T50

DTC			
P CODE	P2533		
FMI	12	Name	T50 input error – active for very long.
SPN	523550		
Blink / Beep Code	6216		

DTC detection criteria	
1. Prequisite, 2. Judgement Criteria	**Check Points**
1. No judgment is made during the engine start recognition.	
2. T50 input is active for very long time.	

Actions when a malefunction occures	
Fault Detection	The switch is found defective if the debounced signal is high (T50_st = 1) for a period longer than 60s. The error path DTC P2533 is set.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the T50 gets inactive fora time periode longer than 1s.
Remarks	May not start anymore.

Presumed cause of malefunction or abnormal condition

Description
1. T50 switch defective. 2. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
- » Check the fault indication.
- » Check the T50 input voltage.

2. Connector / wiring check
- » Before beginning your work, be sure to turn off the ECU power.
- » Check whether the T50 switch is connected faulty or the wiring coating is peeled.

3. Failure diagnosis
- » Check the T50 switch for defective.
- » Change ECU if switch is operating.

PIN	1	2	4	6	93	91	50	67	69	21
AWG	14	14	14	14	20	20	20	20	20	20

- » BGnd
- » BGnd
- » VBatt Sw
- » VBatt Sw
- » Start Relay out
- » Fuel Relay out
- » Main Relay out
- » Glow Relay out
- » Glowlamp Gnd
- » Start in

- » R1 / Kl. 86
- » R2 / Kl. 86
- » R4 / Kl. 86
- » R5 / Kl. 86
- » R1 / Kl. 85
- » R2 / Kl. 85
- » R3 / Kl. 85
- » R4 / Kl. 85
- » R5 / Kl. 85
- » F2 / Remote Control
- » Glowlamp Gnd
- » Start in

	D1	D3	D7	D9		B2	B4	B6	B8	B10	A2	AWG	1	2
AWG	20	20	20	20		20	20	20	20	20	20	PIN	20	20

MAIN RELAY

MAIN RELAY

DTC

P CODE	P068A		
FMI	12	Name	Main relay–Early opening (in Fuse/Relay Box).
SPN	2634		
Blink / Beep Code	2511		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. A judgement is made when the ECU is initialized.	Process of the ECU shutdown Main relay ECU
2. ECU power shutdown without performing the after run. (The after run is EEPROM writing process after turning off the ignition key switch. The after run starts when the ignition key switch is turned off, and it takes max 6 seconds.)	

Actions when a malfunction occures

Fault Detection	Diagnosis of early opening counter happens during ECU initialization. Diagnosis checks if the main relay was opened without a request or not. During every initialization a counter is incremented by one incase of PowerOnReset and stored to the EEPROM. Incase of reset other than PowerOnReset, counter value will not be incremented and old value will be updated to EEPROM. If ECU goes through proper shutdown procedure, shutdown module sets the counter to zero and updates to EEPROM. During initialization counter value will be read from EEPROM and verified against early opening count limit (4). If the counter value is greater than the limit, a fault will be reported to DSM.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off with performing the afterrun is detected.
Remarks	If T30 gets disconnected (battery main switch) while ECU power down, failure could occure.

Presumed cause of malfunction or abnormal condition

Description

1. Process of the ECU shutdown.
2. Main relay defective.
3. Circuit of ECU power supply.
4. ECU internal circuit failure.
5. Battery main switch is disconnected while ecu power down.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

---

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pins of the relay for deformation and cracks, check condition of the connection.
» In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins D5(86) & B6(85). If the measured resistance is not in the range of 82-90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D5 (86) (relay socket) & B5 (30) (relay socket) and between B6 (85) (relay socket) & 50 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B6 (85) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND, if not replace the ECU (ECU internal failure).
» If there is no mechanical damage on the hardware, replace main relay and / or ECU)

R3 = Main Relay

PIN	1	2	4	6	93	91	50	67
AWG	14	14	14	14	20	20	20	20

	BGnd	BGnd	VBatt Sw	VBatt Sw	Start Relay out	Fuel Relay out	Main Relay out	Glow Relay out

REGULATOR (3)		
DTM, 3PF		
PIN	1	2
AWG	20	20

	Charge indicator	VBatt SW

» R1 / Kl. 86	» R2 / Kl. 86	» R4 / Kl. 86	» R5 / Kl. 86	» R1 / Kl. 85	» R2 / Kl. 85	» R3 / Kl. 85	» R4 / Kl. 85	» R5 / Kl. 85	» F5 / Main Relay	» R3 / Kl. 30	» R3 / Kl. 86	» R3 / Kl. 87

20	20	20	20		20	20	20	20	20	12	12	20	12
D1	D3	D7	D9		B2	B4	B6	B8	B10	A5	B5	D5	D6

MAIN RELAY

DTC

P CODE	P068B		
FMI	13	Name	Main Relay–Stuck (in Fuse/Relay Box).
SPN	2634		
Blink / Beep Code	2512		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. A judgement is made when the ECU is shut off.	Main relay ECU
2. The main relay does not open after the elapse of 6 seconds at the time of shutting off the ECU.	

Actions when a malefunction occures

Fault Detection	Diagnosis of sticky main relay happens during ECU initialization.The main relay is reported as sticky to DSM incase main relay was not opened by 0,1 seconds aftercommanding to open main relay during shutdown. In this case the flag is set and saved to the EEPROM. This flag is evaluated by software during next Initialization. If this flag is set the DTC P068B will be reported as defect to DSM.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power off is detected.
Remarks	If T30 gets disconnected (battery main switch) while ECU power down, failure could occure.

Presumed cause of malefunction or abnormal condition

Description

1. Main relay contacts are stuck together.
2. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
  » Check the fault indication.
  » Check whether you can log in to the diagnosis tool after turning off the power switch on the instrument panel and the elapse of a given period of time.

2. Connector / wiring check
  » Before beginning your work, be sure to turn off the ECU power.
  » Check the pins of the relay, wiring for deformation and cracks, check condition of the connection.

  In case there is any damage replace the affected part.

3. Failure diagnosis
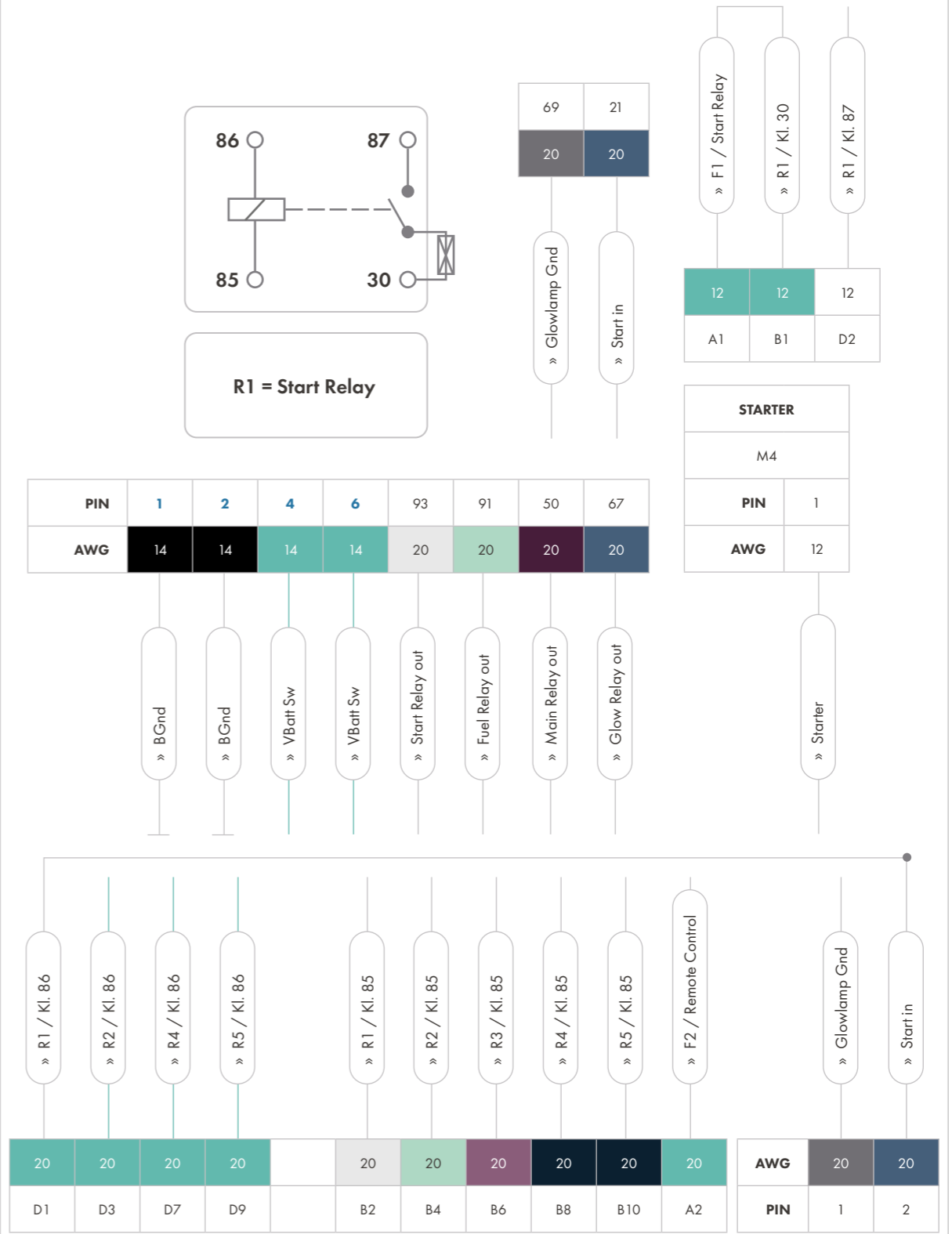 » If there is no mechanical damage on the hardware, replace main relay and / or ECU).

STARTER RELAY

MAIN RELAY

DTC

P CODE	P0615		
FMI	5	Name	Starter Relay – Open load (in Fuse/Relay Box).
SPN	677		
Blink / Beep Code	6215		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Starter relay Wire harness ECU
2. ECU detects open load on digital output for starter relay.	

Actions when a malefunction occures

Fault Detection	The low side power stage hardware reports a "no load" error.
Fault Mode	Continuous operation]: Engine is not obstructed.
Limited operation	No starting possible.
Reset criteria	Yes: The fail mode is released when the ECU detects load on digital output for starter relay.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Starter relay defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and starter relay.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check
   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pins of the relay for deformation and cracks, check condition of the connection.

   In case there is any damage replace the affected part.

---

3. Failure diagnosis

» Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins D1(86) & B2(85). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D1 (86) (relay socket) & pin 21 (ECU connector) and between B2 (85) (relay socket) & 93 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B2 (85) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

MAIN RELAY

DTC

P CODE	**P0615**		
FMI	12	Name	Starter Relay – error over temperature (in Fuse/Relay Box).
SPN	677		
Blink / Beep Code	6212		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Starter relay
2. ECU detects over temperature on power stage for digital output starter relay.	Wire harness ECU

Actions when a malefunction occures

Fault Detection	The Low side power stage hardware reports a OT error.
Fault Mode	Continuous operation]: Engine is not obstructed.
Limited operation	No starting possible.
Reset criteria	Yes: The fail mode is released when the ECU detects no over temperature digital output.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Starter relay defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and starter relay.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pins of the relay for deformation and cracks, check condition of the connection.

In case there is any damage replace the affected part.

---

3. Failure diagnosis

» Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins D1(86) & B2(85). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D1 (86) (relay socket) & pin 21 (ECU connector) and between B2 (85) (relay socket) & 93 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B2 (85) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

MAIN RELAY

DTC

P CODE	P0615	Name	Starter Relay – short circuit to battery (in Fuse/Relay Box).
FMI	14		
SPN	677		
Blink / Beep Code	6213		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Starter relay Wire harness ECU
2. ECU detects short circuit to battery on digital output starter relay.	

Actions when a malefunction occures

Fault Detection	The low side power stage hardware reports a SCB error.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No starting possible.
Reset criteria	Yes: The fail mode is released when the ECU detects no short circuit on digital output.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Starter relay defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and starter relay.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

   » Check the fault indication.
   » Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pins of the relay for deformation and cracks, check condition of the connection.

   In case there is any damage replace the affected part.

3. Failure diagnosis

   » Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins D1(86) & B2(85). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D1 (86) (relay socket) & pin 21 (ECU connector) and between B2 (85) (relay socket) & 93 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B2 (85) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

MAIN RELAY

DTC

P CODE	P0615		
FMI	31	Name	Starter Relay – short circuit to GND (in Fuse/Relay Box).
SPN	677		
Blink / Beep Code	6214		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Starter relay
	Wire harness
2. ECU detects short circuit to GND on digital output starter relay.	ECU

Actions when a malefunction occures

Fault Detection	The low side power stage reports an SCG error.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No starting possible.
Reset criteria	Yes: The fail mode is released when the ECU detects no short circuit on digital output.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Starter relay defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and starter relay.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

  » Check the fault indication.
  » Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

  » Before beginning your work, be sure to turn off the ECU power.
  » Check the pins of the relay for deformation and cracks, check condition of the connection.

In case there is any damage replace the affected part.

3. Failure diagnosis

  » Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins D1(86) & B2(85). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D1 (86) (relay socket) & pin 21 (ECU connector) and between B2 (85) (relay socket) & 93 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B2 (85) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

FUEL PUMP RELAY

FUEL PUMP RELAY

DTC

P CODE	P025A		
FMI	5	Name	Fuel Pump Relay – Open load (in Fuse/Relay Box).
SPN	6323		
Blink / Beep Code	3311		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Fuel pump relay Wire harness ECU
2. ECU detects open load on digital output for fuel pump relay.	

Actions when a malfunction occures

Fault Detection	The power stage hardware reports a "no load" error.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU detects load on digital output for fuel pump relay.
Remarks	

Presumed cause of malfunction or abnormal condition

Description

1. Fuel pump relay defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and fuel pump relay.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check
   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pins of the relay for deformation and cracks, check condition of the connection.

In case there is any damage replace the affected part.

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3. Failure diagnosis

» Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins D3 (86) & B4 (85). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D3 (86) (relay socket) & pin 4 (ECU connector) and between B4 (85) (relay socket) & pin 91 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B4 (85) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).
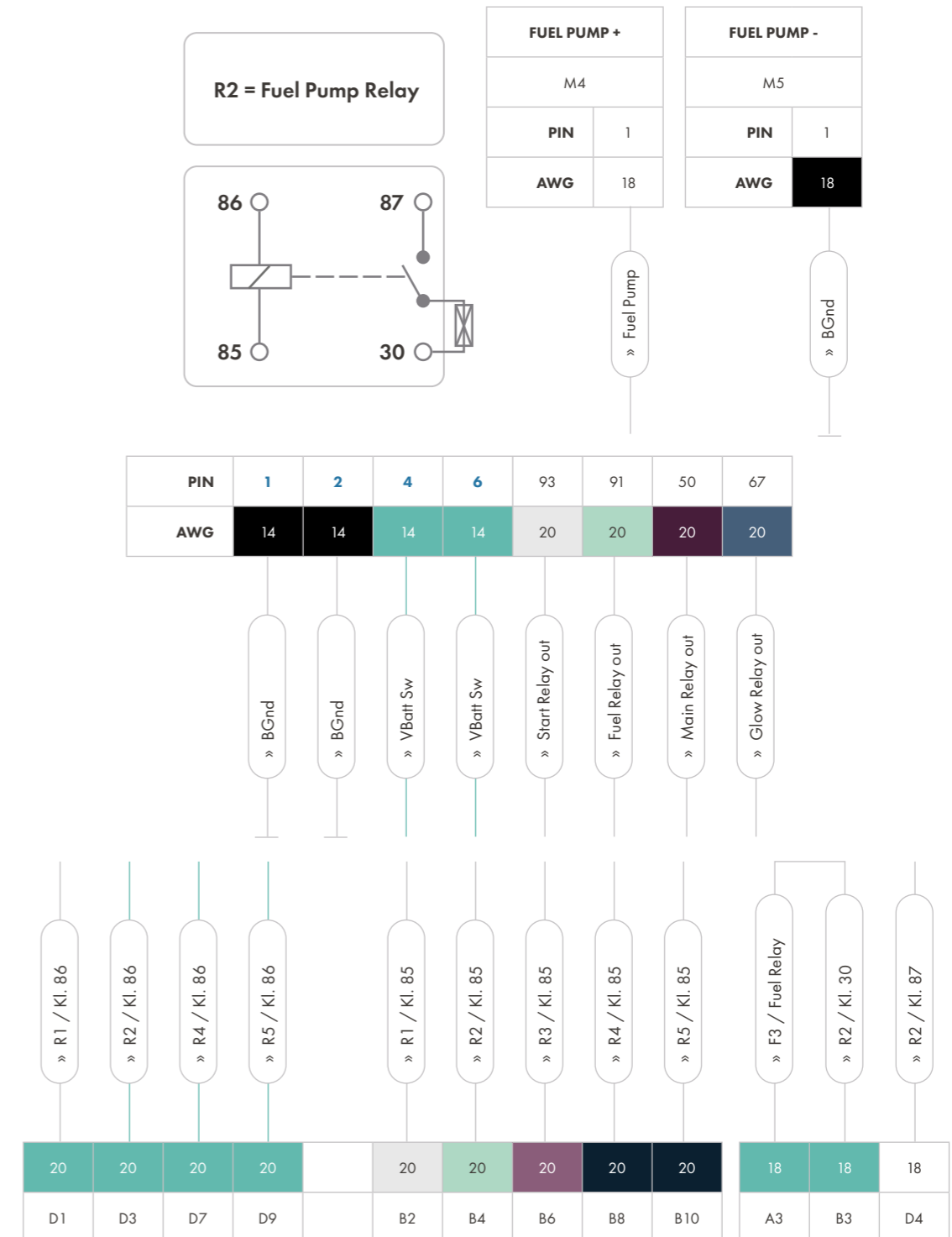
R2 = Fuel Pump Relay

Relay pins: 86, 87, 85, 30

FUEL PUMP +		FUEL PUMP -	
M4		M5	
PIN	1	PIN	1
AWG	18	AWG	18

PIN	1	2	4	6	93	91	50	67
AWG	14	14	14	14	20	20	20	20

Signals: » BGnd, » BGnd, VBatt Sw, VBatt Sw, Start Relay out, Fuel Relay out, Main Relay out, Glow Relay out

	D1	D3	D7	D9		B2	B4	B6	B8	B10	A3	B3	D4
AWG	20	20	20	20		20	20	20	20	20	18	18	18

Connections: » R1 / Kl. 86, » R2 / Kl. 86, » R4 / Kl. 86, » R5 / Kl. 86, » R1 / Kl. 85, » R2 / Kl. 85, » R3 / Kl. 85, » R4 / Kl. 85, » R5 / Kl. 85, » F3 / Fuel Relay, » R2 / Kl. 30, » R2 / Kl. 87

Also: » Fuel Pump, » BGnd

FUEL PUMP RELAY

DTC

P CODE	P025B		
FMI	12	Name	Fuel Pump Relay – error over temperature (in Fuse/Relay Box).
SPN	6323		
Blink / Beep Code	3312		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Fuel pump relay Wire harness ECU
2. ECU detects over temperature on power stage for digital output fuel pump relay.	

Actions when a malefunction occures

Fault Detection	The powerstage detects an over temperature error.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU detects no over temperature digital output.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Fuel pump relay defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and fuel pump relay.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

   » Check the fault indication.
   » Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pins of the relay for deformation and cracks, check condition of the connection.

   In case there is any damage replace the affected part.

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3. Failure diagnosis

   » Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins D3 (86) & B4 (85). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D3 (86) (relay socket) & pin 4 (ECU connector) and between B4 (85) (relay socket) & pin 91 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B4 (85) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

FUEL PUMP RELAY

DTC

P CODE	P025C		
FMI	4	Name	Fuel Pump Relay – short circuit to GND (in Fuse/Relay Box).
SPN	6323		
Blink / Beep Code	3314		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Fuel pump relay Fuel pump fuse Wire harness ECU
2. ECU detects short circuit to GND on digital output fuel pump relay.	

Actions when a malefunction occures

Fault Detection	The power stage reports an SCG error.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU detects no short circuit on digital output.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Fuel pump relay defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and/or fuel pump relay to GND.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pins of the relay for deformation and cracks, check condition of the connection.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins D3 (86) & B4 (85). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D3 (86) (relay socket) & pin 4 (ECU connector) and between B4 (85) (relay socket) & pin 91 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B4 (85) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

FUEL PUMP RELAY

DTC

P CODE	P025D	Name	Fuel Pump Relay – short circuit to battery (in Fuse/Relay Box).
FMI	3		
SPN	6323		
Blink / Beep Code	3313		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite. 2. ECU detects short circuit to battery on digital output fuel pump relay.	Fuel pump relay Fuel pump fuse Wire harness ECU

Actions when a malefunction occures

Fault Detection	The power stage reports an SCB error.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU detects no short circuit on digital output.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Fuel pump relay defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and/or fuel pump relay to battery +.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pins of the relay for deformation and cracks, check condition of the connection.

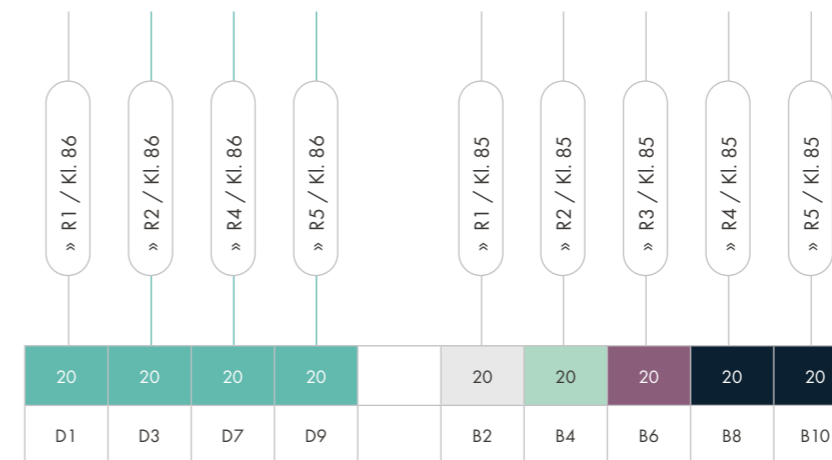In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins D3 (86) & B4 (85). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D3 (86) (relay socket) & pin 4 (ECU connector) and between B4 (85) (relay socket) & pin 91 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B4 (85) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

GLOW PLUG RELAY

GLOW PLUG RELAY

DTC

P CODE	P037D		
FMI	5	Name	Glow Plug Relay – Open load (in Fuse/Relay Box).
SPN	676		
Blink / Beep Code	4513		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Glow plug relay Wire harness ECU
2. ECU detects open load on digital output for glow plug relay.	

Actions when a malefunction occures

Fault Detection	The power stage reports an OL error.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No glowing possible.
Reset criteria	Yes: The fail mode is released when the ECU detects load on digital output for glow plug relay.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Glow plug relay defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and glow plug relay.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

   » Check the fault indication.
   » Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pins of the relay for deformation and cracks, check condition of the connection.

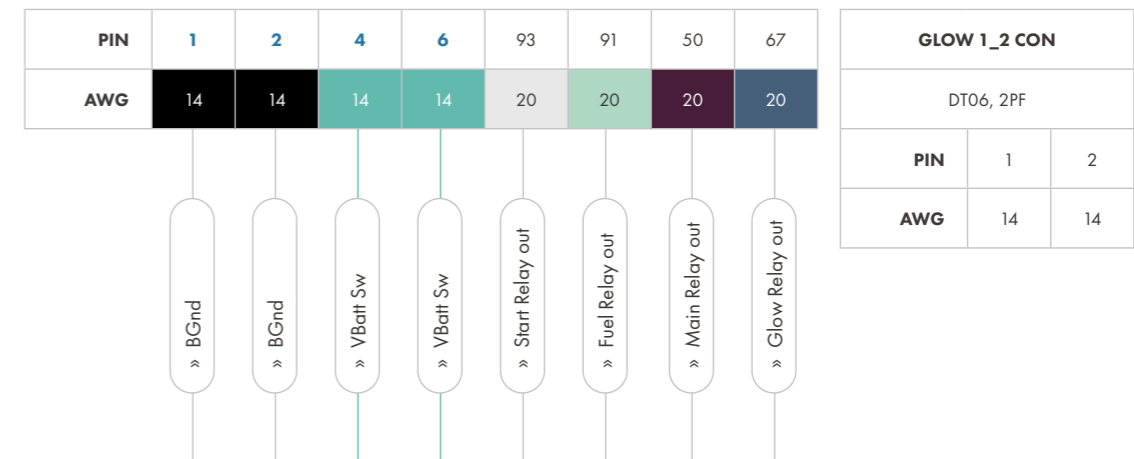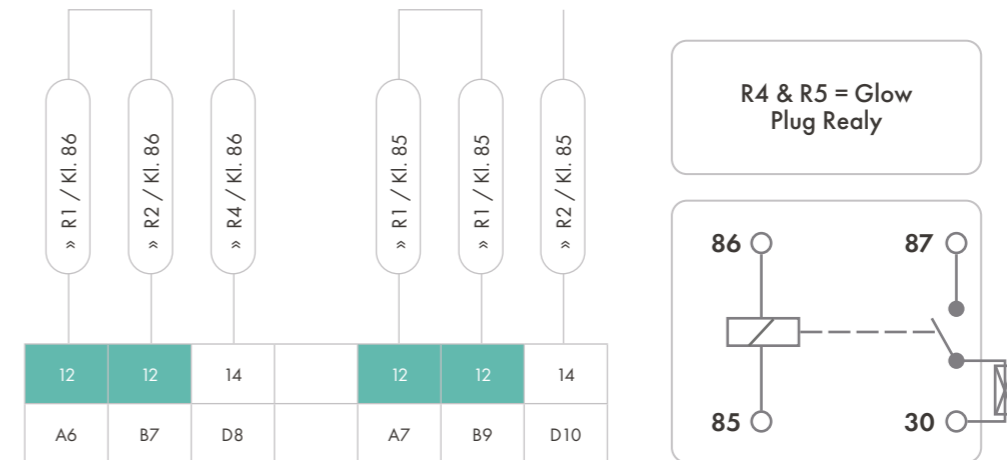   In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins B8 (85) & D7 (86) (B10 (85) & D9 (85)). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D7 (86) (D9 (86))(relay socket) & pin 4 (ECU connector) and between B8 (85) (B10 (85)) (relay socket) & pin 67 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B8 (85) (B10 (85)) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

R4 & R5 = Glow Plug Realy

	R1 / Kl. 86	R2 / Kl. 86	R4 / Kl. 86		R1 / Kl. 85	R1 / Kl. 85	R2 / Kl. 85
	12	12	14		12	12	14
	A6	B7	D8		A7	B9	D10

PIN	1	2	4	6	93	91	50	67		GLOW 1_2 CON	
AWG	14	14	14	14	20	20	20	20		DT06, 2PF	
	BGnd	BGnd	VBatt Sw	VBatt Sw	Start Relay out	Fuel Relay out	Main Relay out	Glow Relay out	PIN	1	2
									AWG	14	14

	R1 / Kl. 86	R2 / Kl. 86	R4 / Kl. 86	R5 / Kl. 86	R1 / Kl. 85	R2 / Kl. 85	R3 / Kl. 85	R4 / Kl. 85	R5 / Kl. 85
	20	20	20	20		20	20	20	20	20
	D1	D3	D7	D9		B2	B4	B6	B8	B10

GLOW PLUG RELAY

DTC				
P CODE	**P037F**		**Name**	Glow Plug Relay – short circuit to battery (in Fuse/Relay Box).
FMI	3			
SPN	676			
Blink / Beep Code	4515			

DTC detection criteria	
1. Prequisite, 2. Judgement Criteria	**Check Points**
1. No prerequisite.	Glow plug relay Wire harness ECU
2. ECU detects short circuit to battery on digital output for glow plug relay.	

Actions when a malefunction occures	
Fault Detection	The power stage reports an SCB error.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No glowing possible.
Reset criteria	Yes: The fail mode is released when the ECU detects no short circuit on digital output.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Glow plug relay defective.
2. Wiring failure of the wire harness.
   » Short circuit between ECU and / or glow plug relay tto battery +.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pins of the relay for deformation and cracks, check condition of the connection.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins B8 (85) & D7 (86) (B10 (85) & D9 (85)). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D7 (86) (D9 (86))(relay socket) & pin 4 (ECU connector) and between B8 (85) (B10 (85)) (relay socket) & pin 67 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B8 (85) (B10 (85)) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

GLOW PLUG RELAY

DTC

P CODE	P037E		
FMI	4	Name	Glow Plug Relay – short circuit to GND (in Fuse/Relay Box).
SPN	676		
Blink / Beep Code	4516		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Glow plug relay Wire harness ECU
2. ECU detects short circuit to GND on digital output for glow plug relay.	

Actions when a malefunction occures

Fault Detection	The power stage reports an SCG error.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No glowing possible.
Reset criteria	Yes: The fail mode is released when the ECU detects no short circuit on digital output.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Glow plug relay defective.
2. Wiring failure of the wire harness.
   » Short circuit between ECU and / or glow plug relay to GND.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pins of the relay for deformation and cracks, check condition of the connection.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins B8 (85) & D7 (86) (B10 (85) & D9 (85)). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D7 (86) (D9 (86))(relay socket) & pin 4 (ECU connector) and between B8 (85) (B10 (85)) (relay socket) & pin 67 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B8 (85) (B10 (85)) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

GLOW PLUG RELAY

DTC

P CODE	P263C		
FMI	12	Name	Glow plug relay (in fuse / relay box) Over temperature error.
SPN	676		
Blink / Beep Code	4514		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	**Check Points**
1. No prerequisite.	Glow plug relay Wire harness ECU
2. ECU detects over temperature on power stage for digital output glow plug relay.	

Actions when a malefunction occures

Fault Detection	The power stage detects an over temperature error.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU detects no over temperature on digital output.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Glow plug relay defective.
2. Wiring failure of the wire harness.
   » Short circuit between ECU and / or glow plug relay.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check
   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pins of the relay for deformation and cracks, check condition of the connection.

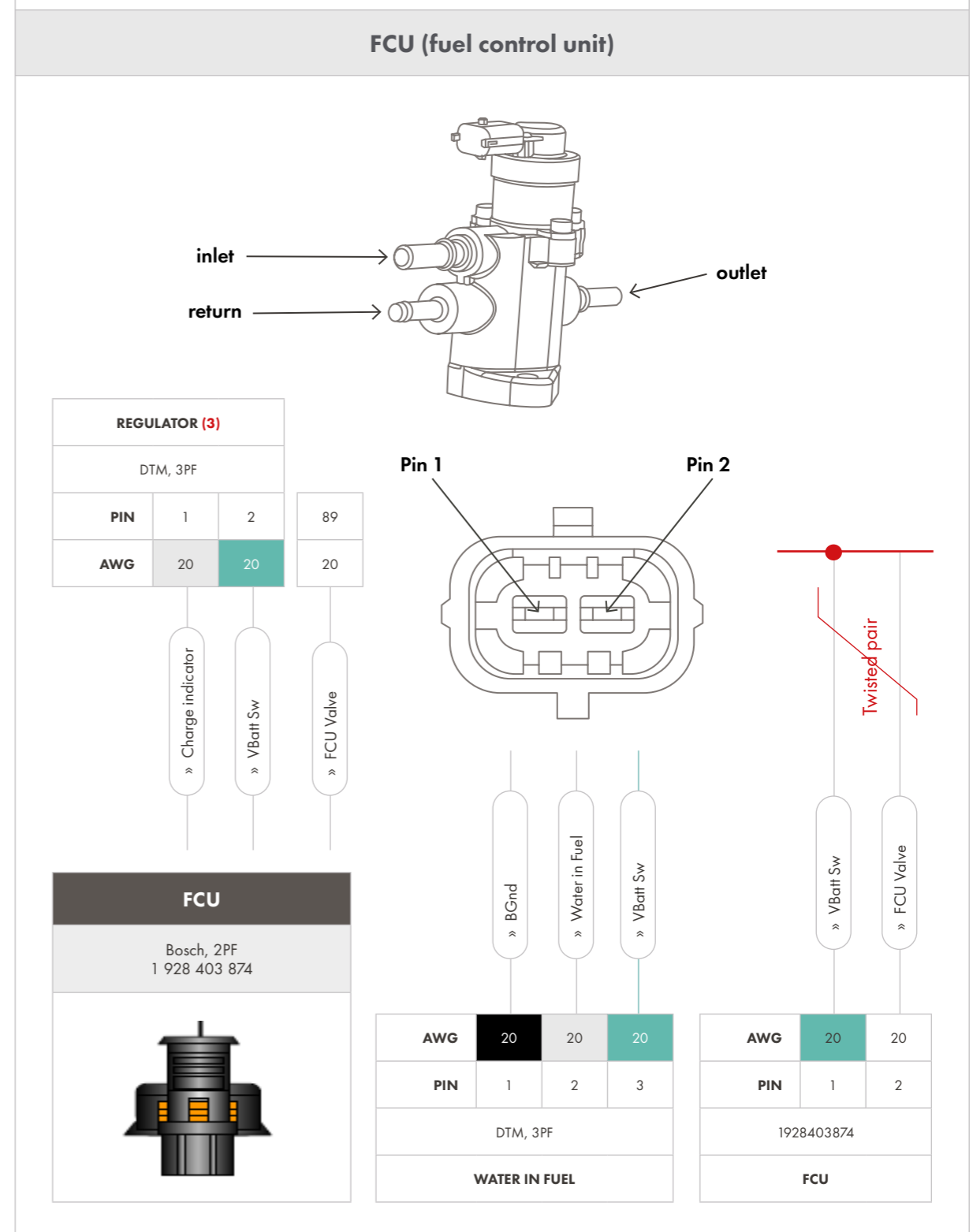In case there is any damage replace the affected part.

3. Failure diagnosis
   » Check the relay by taking off the relay in the fuse / relay box. Check the resistance between the two pins B8 (85) & D7 (86) (B10 (85) & D9 (85)). If the measured resistance is not in the range of 82–90 Ohms replace the relay; if so disconnect the wire harness from the ECU. Check the continuity between D7 (86) (D9 (86))(relay socket) & pin 4 (ECU connector) and between B8 (85) (B10 (85)) (relay socket) & pin 67 (ECU connector). If there is no continuity replace the wire harness (open circuit); if so, check the continuity between pin B8 (85) (B10 (85)) (relay socket) & ECU ground with the harness connected to the ECU. If there is continuity replace the wire harness (short circuit to GND), if not replace the ECU (ECU internal failure).

FCU

FCU

DTC

P CODE	P0251		
FMI	13	Name	FCU–Open load.
SPN	523615		
Blink / Beep Code	3212		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	FCU
	Wire harness
2. ECU detects open load on digital output for FCU.	ECU

Actions when a malfunction occures

Fault Detection	Detecting an open load fault in the metering unit.
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when the ECU detects load on the digital output, after power off/on.
Remarks	

Presumed cause of malfunction or abnormal condition

Description

1. FCU defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and FCU.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.
   » Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check
   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pin of the FCU for deformation and cracks, the condition of the connection.
   » Check whether the FCU wiring is disconnected or the wiring coating is peeled.

   In case there is any damage replace the affected part.

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3. Failure diagnosis
   » Check the FCU resistance value. Remove the wire harness from the FCU. Measure the resistance value between Pin 1 & 2 of the FCU. It has to be in the range of 2.60–3.15 Ohms @ 20 °C. If the resistance is different to the specification, replace the FCU; if not ceck the resistance value of FCU + wire harness. Connect the FCU and the harness and disconnect the ECU and the WIF sensor from the wire harness. Measure the restistance between Pin 89 (ECU) & Pin 3 (WIF) on the wire harness side. If resistance is different to the specification replace the wire harness as there is short circuit; if not replace the ECU as there is an internal circuit failure.

FCU (fuel control unit)

inlet • outlet • return

REGULATOR (3)			
DTM, 3PF			
PIN	1	2	89
AWG	20	20	20

» Charge indicator | » VBatt Sw | » FCU Valve

FCU	
Bosch, 2PF 1 928 403 874	

Pin 1 • Pin 2

Twisted pair

» BGnd | » Water in Fuel | » VBatt Sw

» VBatt Sw | » FCU Valve

AWG	20	20	20
PIN	1	2	3
DTM, 3PF			
WATER IN FUEL			

AWG	20	20
PIN	1	2
1928403874		
FCU		

FCU

DTC

P CODE	P0252		
FMI	12	Name	FCU–Over temperature error.
SPN	523615		
Blink / Beep Code	3213		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	FCU Wire harness ECU
2. ECU detects over temperature on power stage for digital output FCU.	

Actions when a malefunction occures

Fault Detection	Detection of a metering unit power stage overtemperature.
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when the ECU detects normal temperature, after power off/on.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. FCU defective.
2. Wiring failure of the wire harness.
   » Open circuit between ECU and/or FCU.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the FCU for deformation and cracks, the condition of the connection.
» Check whether the FCU wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the FCU resistance value. Remove the wire harness from the FCU. Measure the resistance value between Pin 1 & 2 of the FCU. It has to be in the range of 2.60–3.15 Ohms @ 20 °C. If the resistance is different to the specification, replace the FCU; if not ceck the resistance value of FCU + wire harness. Connect the FCU and the harness and disconnect the ECU and the WIF sensor from the wire harness. Measure the restistance between Pin 89 (ECU) & Pin 3 (WIF) on the wire harness side. If resistance is different to the specification replace the wire harness as there is short circuit; if not replace the ECU as there is an internal circuit failure.

FCU

DTC

P CODE	P0258		
FMI	4	Name	FCU – Short circuit to GND error.
SPN	523615		
Blink / Beep Code	3215		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	FCU Wire harness ECU
2. ECU detects short circuit to GND on power stage for digital output FCU.	

Actions when a malefunction occures

Fault Detection	Detecting a short circuit low side to ground in the metering unit.
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when the ECU detects no short circuit, after power off/on.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. FCU defective.
2. Wiring failure of the wire harness.
   » Short circuit between ECU and / or FCU to GND.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the FCU for deformation and cracks, the condition of the connection.
» Check whether the FCU wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check GND short circuit in the pump. Disconnect the wire harness from the FCU. Check the continuity between the two pins and the pump body (unpainted part). If there is a continuity replace the FCU.

FCU

DTC			
P CODE	**P0259**		
FMI	14	Name	FCU – Short circuit to GND error.
SPN	523615		
Blink / Beep Code	3214		

DTC detection criteria	
1. Prequisite, 2. Judgement Criteria	**Check Points**
1. No prerequisite.	FCU Wire harness ECU
2. ECU detects short circuit to battery on power stage for digital output FCU.	

Actions when a malefunction occures	
Fault Detection	Detecting a short circuit low side to battery voltage in the metering unit.
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when the ECU detects no short circuit, after power off/on.
Remarks	

Presumed cause of malefunction or abnormal condition
Description

1. FCU defective
2. Wiring failure of the wire harness
   » Short circuit between ECU and / or FCU to GND
3. ECU internal circuit failure

Check

 1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the FCU for deformation and cracks, the condition of the connection.
» Check whether the FCU wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check GND short circuit in the pump. Disconnect the wire harness from the FCU. Check the continuity between the two pins and the pump body (unpainted part). If there is a continuity replace the FCU.
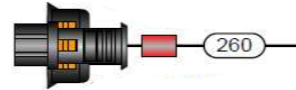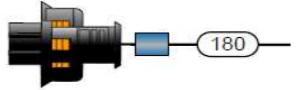
FCU

DTC

P CODE	P0251C		
FMI	2	Name	FCU – Intermittent contact between ECU and FCU.
SPN	523615		
Blink / Beep Code	3211		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	FCU Wire harness ECU
2. ECU detects intermittent contact on digital output for FCU.	

Actions when a malefunction occures

Fault Detection	
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU detects normal contact on digital output for FCU.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. FCU defective.
2. Wiring failure of the wire harness.
   » Intermittent circuit between ECU and FCU.
3. ECU internal circuit failure.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

   » Check the fault indication.
   » Check whether you still see the fault code when you turn off the key ignition switch, wait for 6 seconds or more and turn on the key ignition switch again.
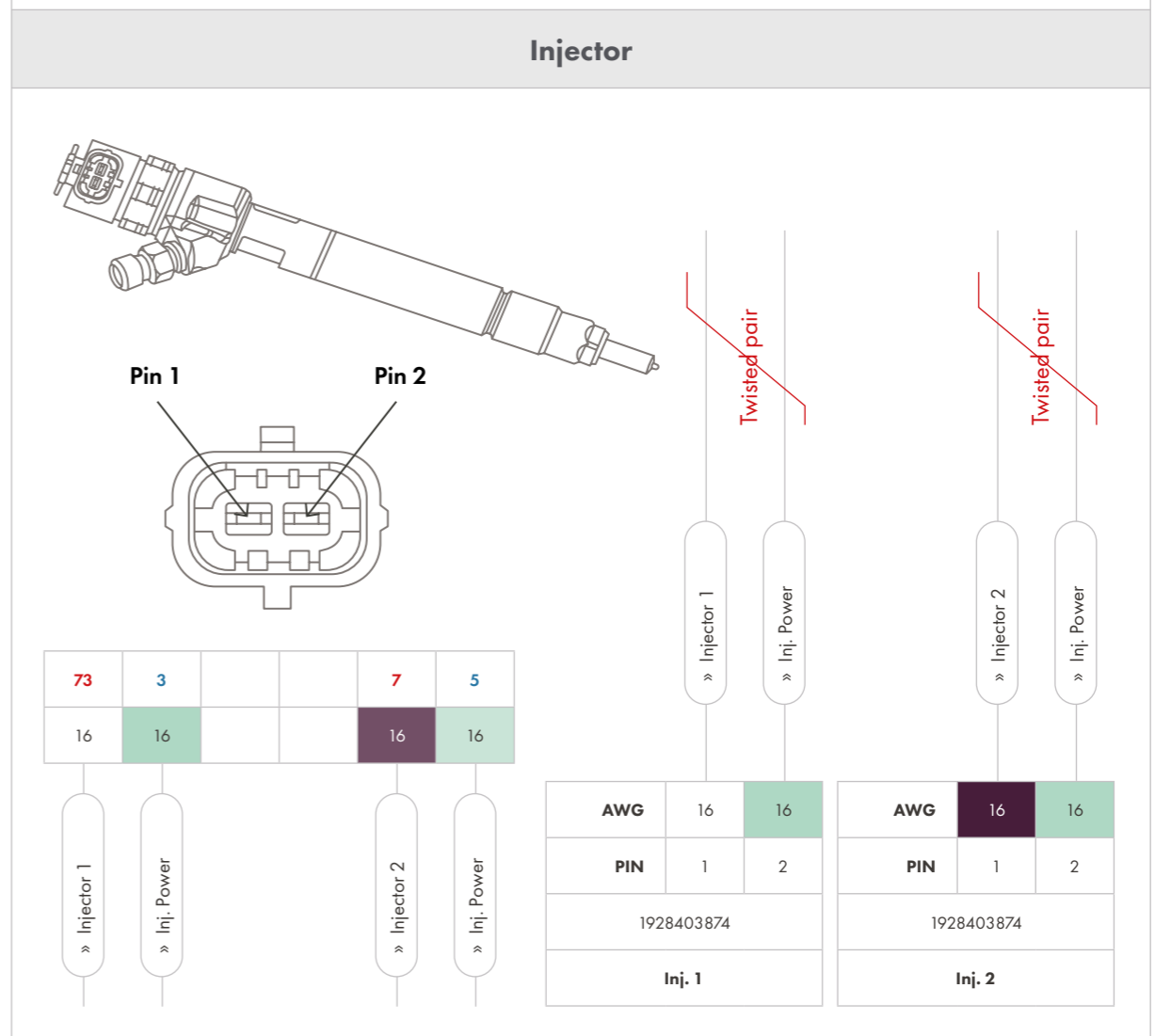
INJECTOR

INJECTOR

DTC

P CODE	P0216		
FMI	3	Name	Injector bank–Short circuit.
SPN	2797		
Blink / Beep Code	3115		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Cam/crank pulse is detected.	Connector Wire harness Injector ECU
2. GND short circuit between high side and low side in the injector drive circuit. Or +B short circuit of the high side in the injector drive circuit.	

Actions when a malefunction occures

Fault Detection	Short circuit in an injection bank (all injectors of the same bank can be affected).
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness.
   - » Power short circuit of the high side of the injector bank.
   - » GND short circuit of the high side of the injector bank.
   - » Power short circuit of the low side of the injector bank.
   - » GND short circuit of the low side of the injector bank.
3. Injector fault by power short circuit.
4. ECU internal circuit fault.

Check

1. **Initial diagnosis with diagnosis tool–or blink / beep code**
   - » Check the fault indication.

2. **Connector / wiring check**
   - » Before beginning your work, be sure to turn off the ECU power.
   - » Check the pin of the injector for deformation and cracks, the condition of the connection.
   - » Check whether the injector wiring is disconnected or the wiring coating is peeled.

   In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the injector resistance value. Remove the wire harness from the injector. Measure the resistance value between both Pin 1 & 2 of each injector. It has to be in the range of 0,2–0,8 Ohms. If the resistance is different to the specification, replace the injector; if not ceck the resistance value of injector + wire harness. Connect the injectors and the harness and disconnect the ECU from the wire harness. Measure the restistance between Pin 73 & 3 and Pin 5 & 7.on the ECU wire harness side. If resistance is different to the specification replace the wire harness as there is short circuit; if not replace the ECU as there is an internal circuit failure.

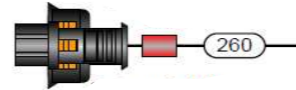| INJ. 1	INJ. 2
Bosch, 2PF 1 928 403 874	Bosch, 2PF 1 928 403 874
Schrumpfschlauch bedrucken mit **Inj. 1**	Schrumpfschlauch bedrucken mit **Inj. 2**
260	180

Injector

Pin 1   Pin 2

Twisted pair   Twisted pair

73	3		7	5
16	16		16	16

» Injector 1   » Inj. Power   » Injector 2   » Inj. Power

» Injector 1   » Inj. Power   » Injector 2   » Inj. Power

AWG	16	16
PIN	1	2
1928403874		
Inj. 1		

AWG	16	16
PIN	1	2
1928403874		
Inj. 2		

INJECTOR

DTC

P CODE	P0216		
FMI	3	Name	Injector 1: Short circuit of the power stage low–side (cylinder error).
SPN	651		
Blink / Beep Code	3116		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Cam/crank pulse is detected.	Connector Wire harness ECU Injector
2. + UB short circuit in the low side is detected in the injector drive circuit.	

Actions when a malefunction occures

Fault Detection	Short circuit low side to the ground or to battery in the injector 1.
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness.
   » Injector drive system short circuit.
3. ECU internal circuit fault.
4. Short circuit of the injector internal circuit.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
   » Check the fault indication.

2. Connector / wiring check
   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pin of the injector for deformation and cracks, the condition of the connection.
   » Check whether the injector wiring is disconnected or the wiring coating is peeled.

   In case there is any damage replace the affected part.

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3. Failure diagnosis

» Check the injector resistance value. Remove the wire harness from the injector. Measure the resistance value between both Pin 1 & 2 of each injector. It has to be in the range of 0,2–0,8 Ohms. If the resistance is different to the specification, replace the injector; if not ceck the resistance value of injector + wire harness. Connect the injectors and the harness and disconnect the ECU from the wire harness. Measure the restistance between Pin 73 & 3 and Pin 5 & 7.on the ECU wire harness side. If resistance is different to the specification replace the wire harness as there is short circuit; if not replace the ECU as there is an internal circuit failure.

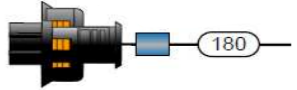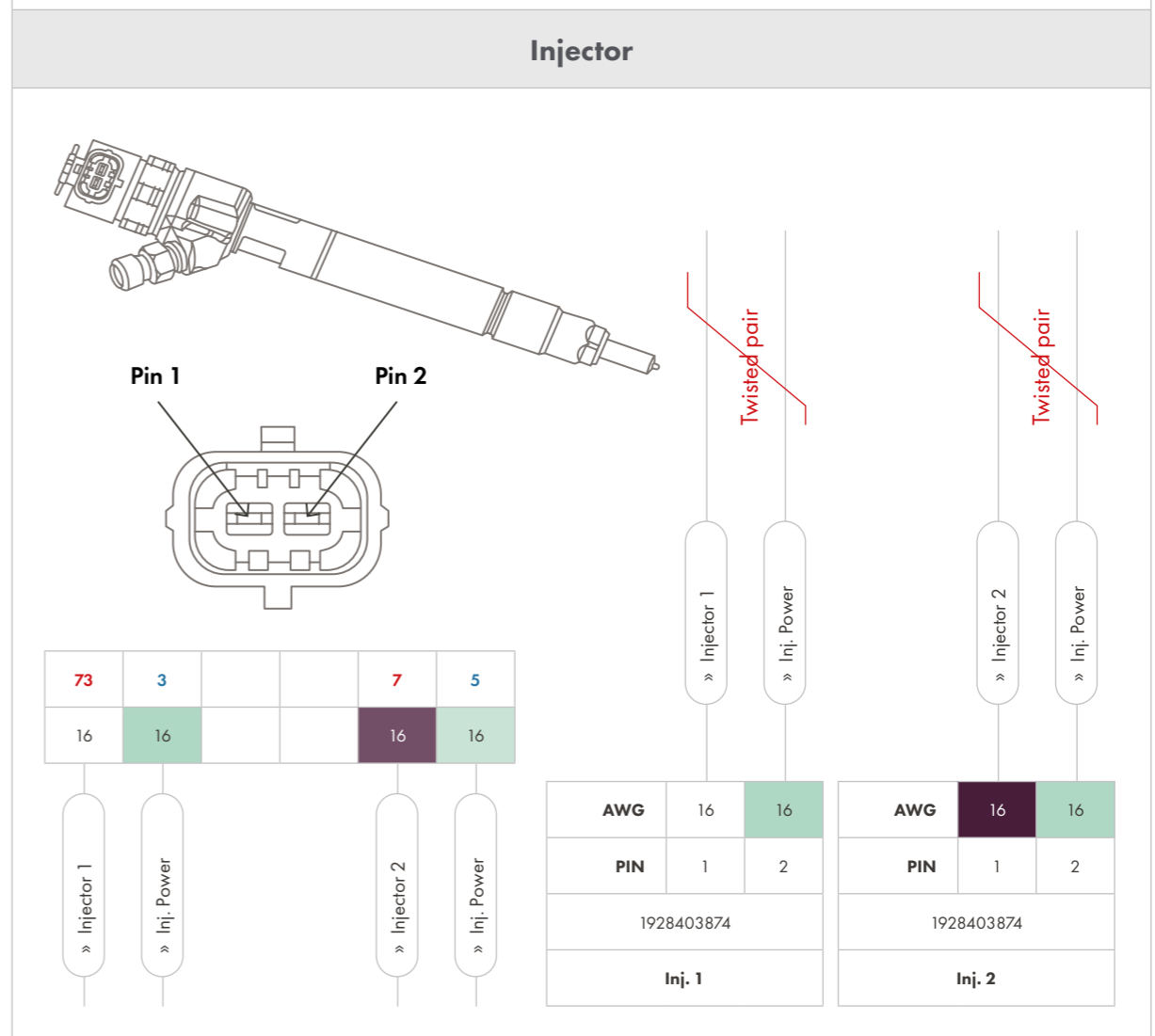| INJ. 1	INJ. 2
Bosch, 2PF 1 928 403 874	Bosch, 2PF 1 928 403 874
Schrumpfschlauch bedrucken mit **Inj. 1**	Schrumpfschlauch bedrucken mit **Inj. 2**
260	180

Injector

Pin 1   Pin 2

73	3		7	5
16	16		16	16

» Injector 1 » Inj. Power   » Injector 2 » Inj. Power

AWG	16	16
PIN	1	2
1928403874		
Inj. 1		

AWG	16	16
PIN	1	2
1928403874		
Inj. 2		

Twisted pair   Twisted pair

» Injector 1 » Inj. Power   » Injector 2 » Inj. Power

INJECTOR

DTC

P CODE	P0262		
FMI	4	Name	Injector Cyl 1–Short circuit between high-side and low-side of the power stage (high-side non plausible error).
SPN	651		
Blink / Beep Code	3121		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Cam/crank pulse is detected.	Connector Wire harness ECU Injector
2. Short circuit between high side and low side in the injector drive circuit.	

Actions when a malefunction occures

Fault Detection	Short circuit high–side to low–side in the injector 1.
Fault Mode	Cyl 1 (2) off, max engine power with cyl 2 (1) only.
Limited operation	Yes: Affected injector and corresponding cylinder is off, remaining cylinder is producing up to his max power output. The engine operation is limited.
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness.
   » Injector drive system short circuit.
3. ECU internal circuit fault.
4. Short circuit of the injector internal circuit.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

   » Check the fault indication.

2. Connector / wiring check

   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pin of the injector for deformation and cracks, the condition of the connection.
   » Check whether the injector wiring is disconnected or the wiring coating is peeled.

   In case there is any damage replace the affected part.

3. Failure diagnosis

   » Check the injector resistance value. Remove the wire harness from the injector. Measure the resistance value between both Pin 1 & 2 of the injector. It has to be in the range of 0,2–0,5 Ohms. If the resistance is different to the specification, replace the injector; if not ceck the resistance value of injector + wire harness. Connect the injectors and the harness and disconnect the ECU from the wire harness. Measure the restistance between Pin 73 & 3 on the ECU wire harness side. If resistance is different to the specification replace the wire harness as there is open circuit or short circuit of the wire harness; if not replace the ECU as there is an internal circuit failure or replace the wire harness as the coupler between harness and ECU may be defective.

INJECTOR

DTC

P CODE	P0264		
FMI	3	Name	Injector 2: Short circuit of the power stage low–side (cylinder error).
SPN	653		
Blink / Beep Code	3117		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Cam/crank pulse is detected.	Connector Wire harness ECU Injector
2. + UB short circuit in the low side is detected in the injector drive circuit.	

Actions when a malefunction occures

Fault Detection	Short circuit low side to the ground or to battery in the injector 2.
Fault Mode	Engine stop.
Limited operation	Engine stop.
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness.
    » Injector drive system short circuit.
3. ECU internal circuit fault.
4. Short circuit of the injector internal circuit.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
  » Check the fault indication.

2. Connector / wiring check
  » Before beginning your work, be sure to turn off the ECU power.
  » Check the pin of the injector for deformation and cracks, the condition of the connection.
  » Check whether the injector wiring is disconnected or the wiring coating is peeled.

  In case there is any damage replace the affected part.

3. Failure diagnosis
  » Check the injector resistance value. Remove the wire harness from the injector. Measure the resistance value between both Pin 1 & 2 of the injector. It has to be in the range of 0,2–0,5 Ohms. If the resistance is different to the specification, replace the injector; if not ceck the resistance value of injector + wire harness. Connect the injectors and the harness and disconnect the ECU from the wire harness. Measure the restistance between Pin 5 & 7 on the ECU wire harness side. If resistance is different to the specification replace the wire harness as there is short circuit; if not replace the ECU as there is an internal circuit failure.

INJECTOR

DTC

P CODE	P0265		
FMI	4	Name	Injector Cyl 2−Short circuit between high-side and low-side of the power stage (high-side non plausible error).
SPN	653		
Blink / Beep Code	3122		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Cam/crank pulse is detected.	Connector Wire harness ECU Injector
2. Short circuit between high side and low side in the injector drive circuit.	

Actions when a malefunction occures

Fault Detection	Short circuit high−side to low−side in the injector 2.
Fault Mode	Cyl 1 (2) off, max engine power with cyl 2 (1) only.
Limited operation	Yes: Affected injector and corresponding cylinder is off, remaining cylinder is producing up to his max power output. The engine operation is limited.
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness.
   » Injector drive system short circuit.
3. ECU internal circuit fault.
4. Short circuit of the injector internal circuit.

Check

1. Initial diagnosis with diagnosis tool−or blink / beep code
   » Check the fault indication.

2. Connector / wiring check
   » Before beginning your work, be sure to turn off the ECU power.
   » Check the pin of the injector for deformation and cracks, the condition of the connection.
   » Check whether the injector wiring is disconnected or the wiring coating is peeled.
   » In case there is any damage replace the affected part.

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3. Failure diagnosis
   » Check the injector resistance value. Remove the wire harness from the injector. Measure the resistance value between both Pin 1 & 2 of the injector. It has to be in the range of 0,2−0,5 Ohms. If the resistance is different to the specification, replace the injector; if not ceck the resistance value of injector + wire harness. Connect the injectors and the harness and disconnect the ECU from the wire harness. Measure the restistance between Pin 5 & 7 on the ECU wire harness side. If resistance is different to the specification replace the wire harness as there is open circuit or short circuit of the wire harness; if not replace the ECU as there is an internal circuit failure or replace the wire harness as the coupler between harness and ECU may be defective.

INJECTOR

DTC

P CODE	P21CF		
FMI	5	Name	Injector Cyl 1–Open load on the power stage.
SPN	651		
Blink / Beep Code	3111		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Cam/crank pulse is detected.	Connector Wire harness ECU Injector
2. Open circuit of the high side or low side in the Injector drive circuit.	

Actions when a malefunction occures

Fault Detection	Open load error of an injector (interruption of an electric connection).
Fault Mode	Cyl 1 (2) off, max engine power with cyl 2 (1) only.
Limited operation	Yes: Affected injector and corresponding cylinder is off, remaining cylinder is producing up to his max power output. The engine operation is limited.
Reset criteria	Yes: The fail mode is released when the normal electric current recovers.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the injector connector.
2. Injector connector disconnected.
3. Wiring failure of the wire harness.
   » Injector drive system open circuit.
4. ECU internal circuit fault.
5. Open circuit of the injector internal circuit.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the injector for deformation and cracks, the condition of the connection.
» Check whether the injector wiring is disconnected or the wiring coating is peeled.

In case there is any damage replace the affected part.

---

3. Failure diagnosis

» Check the injector resistance value. Remove the wire harness from the injector. Measure the resistance value between both Pin 1 & 2 of the injector. It has to be in the range of 0,2–0,5 Ohms. If the resistance is different to the specification, replace the injector; if not ceck the resistance value of injector + wire harness. Connect the injectors and the harness and disconnect the ECU from the wire harness. Measure the restistance between Pin 73 & 3 on the ECU wire harness side. If resistance is different to the specification replace the wire harness as there is short circuit; if not replace the ECU as there is an internal circuit failure.

INJECTOR

DTC

P CODE	P21D0		
FMI	5	Name	Injector Cyl 2–Open load on the power stage.
SPN	653		
Blink / Beep Code	3112		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Cam/crank pulse is detected.	Connector Wire harness ECU Injector
2. Open circuit of the high side or low side in the Injector drive circuit.	

Actions when a malefunction occures

Fault Detection	Open load error of an injector (interruption of an electric connection).
Fault Mode	Cyl 1 (2) off, max engine power with cyl 2 (1) only.
Limited operation	Yes: Affected injector and corresponding cylinder is off, remaining cylinder is producing up to his max power output. The engine operation is limited.
Reset criteria	Yes: The fail mode is released when the normal electric current recovers.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the injector connector.
2. Injector connector disconnected.
3. Wiring failure of the wire harness.
   » Injector drive system open circuit.
4. ECU internal circuit fault.
5. Open circuit of the injector internal circuit.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the injector for deformation and cracks, the condition of the connection.
» Check whether the injector wiring is disconnected or the wiring coating is peeled.

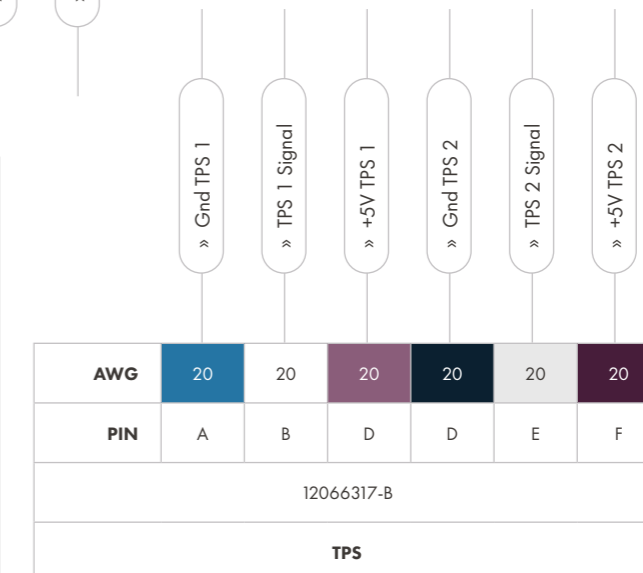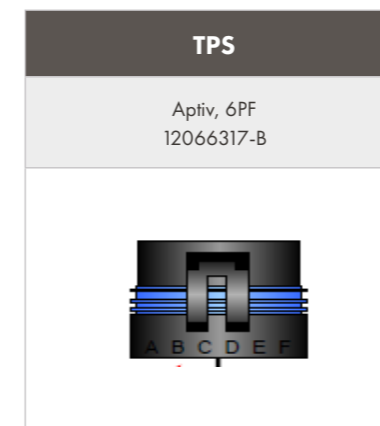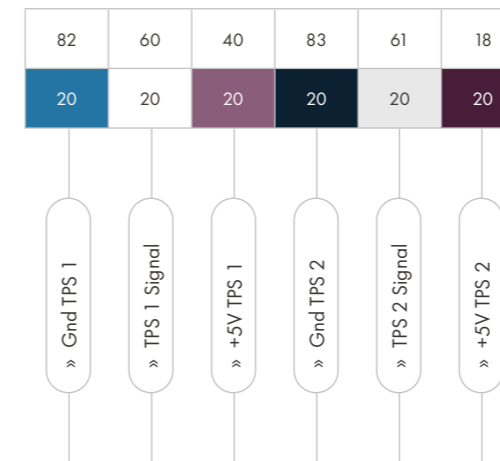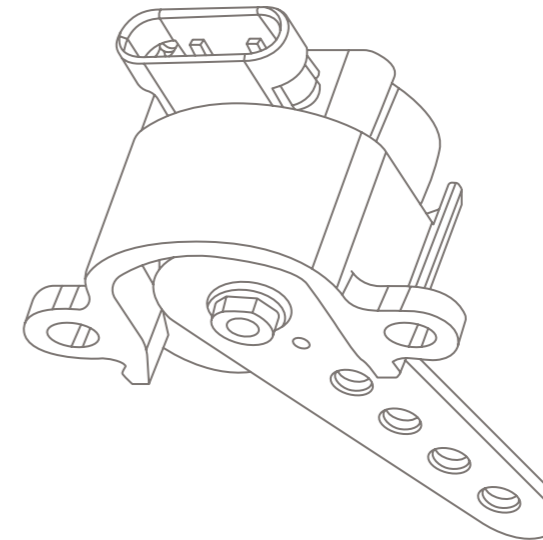In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the injector resistance value. Remove the wire harness from the injector. Measure the resistance value between both Pin 1 & 2 of the injector. It has to be in the range of 0,2–0,5 Ohms. If the resistance is different to the specification, replace the injector; if not ceck the resistance value of injector + wire harness. Connect the injectors and the harness and disconnect the ECU from the wire harness. Measure the restistance between Pin 5 & 7 on the ECU wire harness side. If resistance is different to the specification replace the wire harness as there is short circuit; if not replace the ECU as there is an internal circuit failure.

ACCELERATOR PEDAL /THROTTLE

ACCELERATOR PEDAL / THROTTLE

DTC

P CODE	P0122		
FMI	4	Name	Throttle position sensor 1 error–Low range.
SPN	91		
Blink / Beep Code	1224		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Connector
	Wire harness
2. The sensor voltage is below 0.37 V.	Throttle position sensor
	ECU

Actions when a malefunction occures

Fault Detection	If the signal is below an applicatable threshold (370mV), a signal range violation is detected after the debouncing.
Fault Mode	[Continuous operation]: Engine is not obstructed if no other throttle sensor related failure. (The operation continues with throttle position sensor 2 signal).
Limited operation	No
Reset criteria	Yes: The fault mode is released when the sensor voltage become higher than 0.37 V.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness. A lack of circuit continuity is detected and the short–to–ground fault is set.
3. Throttle position sensor failure.
4. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check the sensor voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the throttle position sensor for deformation and cracks, check condition of the connection
» Check whether the throttle position sensor wiring is cut or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

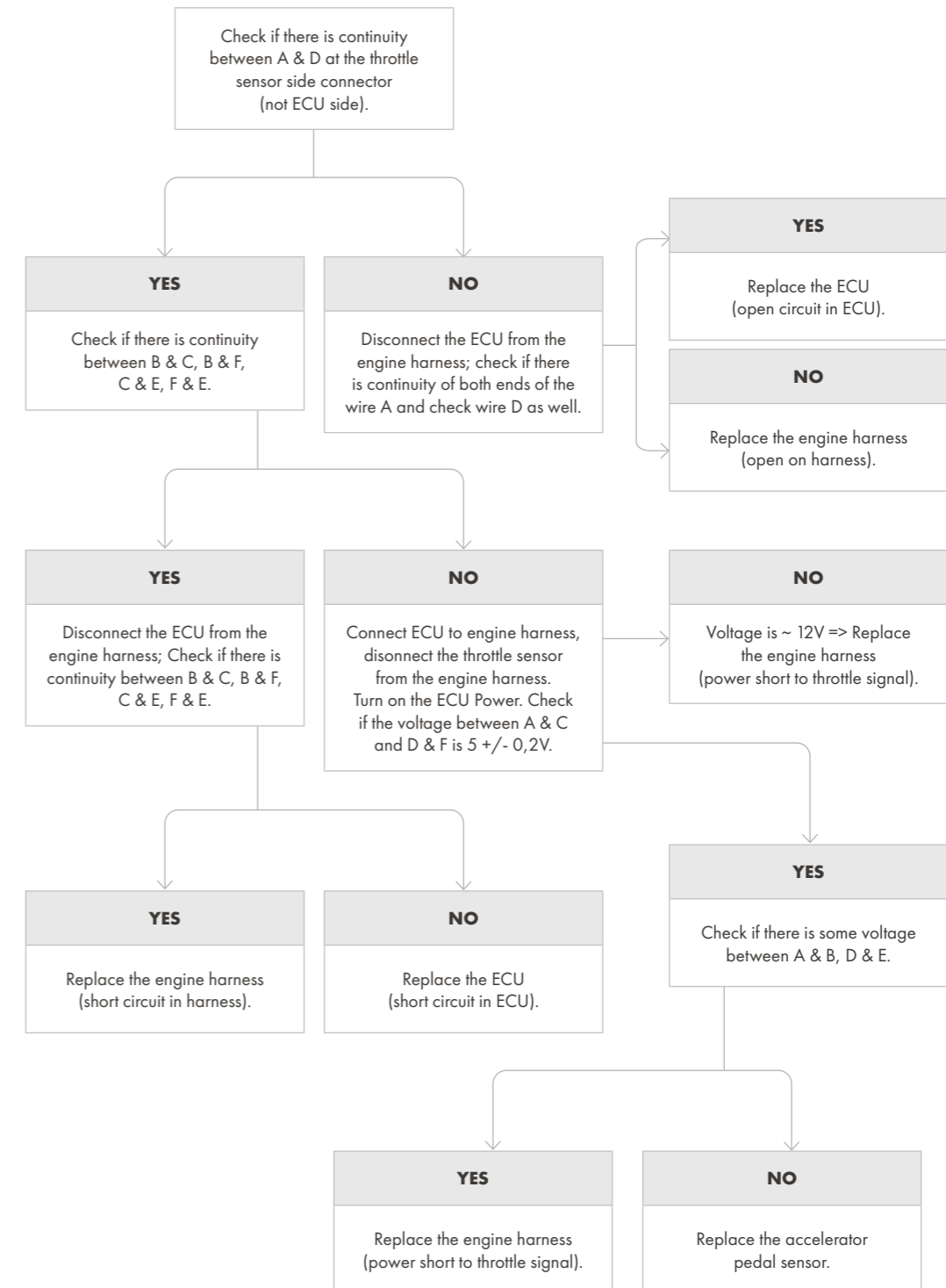» Check the continuity of the wire harness and the throttle position sensor output voltage according to THR.1.

82	60	40	83	61	18
20	20	20	20	20	20

» Gnd TPS 1	» TPS 1 Signal	» +5V TPS 1	» Gnd TPS 2	» TPS 2 Signal	» +5V TPS 2

TPS

Aptiv, 6PF
12066317-B

» Gnd TPS 1	» TPS 1 Signal	» +5V TPS 1	» Gnd TPS 2	» TPS 2 Signal	» +5V TPS 2

AWG	20	20	20	20	20	20
PIN	A	B	D	D	E	F
12066317-B						
TPS						

ACCELERATOR PEDAL / THROTTLE

DTC

P CODE	P0123		
FMI	3	Name	Throttle position sensor 1 error–High range.
SPN	91		
Blink / Beep Code	1222		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Connector Wire harness Throttle position sensor ECU
2. The sensor voltage is above 4.44 V.	

Actions when a malefunction occures

Fault Detection	If the signal exceeds an applicatable threshold (4440mV), a signal range violation is detected after debouncing. Healing if the signal is below the applicatable threshold.
Fault Mode	[Continuous operation]: Engine is not obstructed if no other throttle sensor related failure. (The operation continues with throttle position sensor 2 signal.)
Limited operation	No
Reset criteria	Yes: The fault mode is released when the sensor voltage become lower than 4.44 V.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Wiring failure of the wire harness. A lack of circuit continuity is detected and the short–to–high–voltage fault is set.
2. Throttle position sensor failure.
3. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code
- » Check the fault indication.
- » Check the sensor voltage value.

2. Connector / wiring check
- » Before beginning your work, be sure to turn off the ECU power.
- » Check the pin of the throttle position sensor for deformation and cracks, check condition of the connection
- » Check whether the throttle position sensor wiring is cut or the wiring coating is peeled.

In case there is any damage replace the affected part.

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3. Failure diagnosis
- » Check the continuity of the wire harness and the throttle position sensor output voltage according to THR.1.

ACCELERATOR PEDAL / THROTTLE

DTC

P CODE	P0222		
FMI	6	Name	Throttle position sensor 2 error–Low range.
SPN	91		
Blink / Beep Code	1225		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Connector Wire harness Throttle position sensor ECU
2. The sensor voltage is below 0.2 V.	

Actions when a malefunction occures

Fault Detection	If the signal is below an applicatable threshold (204mV), a signal range violation is detected after the debouncing.
Fault Mode	[Continuous operation]: Engine is not obstructed if no other throttle sensor related failure. (The operation continues with throttle position sensor 2 signal.)
Limited operation	No
Reset criteria	Yes: The fault mode is released when the sensor voltage become higher than 0.2 V.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness. A lack of circuit continuity is detected and the short–to–ground fault is set.
3. Throttle position sensor failure.
4. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check the sensor voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the throttle position sensor for deformation and cracks, check condition of the connection.
» Check whether the throttle position sensor wiring is cut or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the continuity of the wire harness and the throttle position sensor output voltage according to THR.1.

ACCELERATOR PEDAL / THROTTLE

DTC

P CODE	P0223		
FMI	5	Name	Throttle position sensor 2 error–High range.
SPN	91		
Blink / Beep Code	1223		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	Connector Wire harness Throttle position sensor ECU
2. The sensor voltage is above 3.4 V.	

Actions when a malefunction occures

Fault Detection	If the signal exceeds an applicatable threshold (3402mV), a signal range violation is detected after debouncing. Healing if the signal is below the applicatable threshold.
Fault Mode	[Continuous operation]: Engine is not obstructed if no other throttle sensor related failure. (The operation continues with throttle position sensor 2 signal.)
Limited operation	No
Reset criteria	Yes: The fault mode is released when the sensor voltage become lower than 3.4 V.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. 1Wiring failure of the wire harness. A lack of circuit continuity is detected and the short–to–high–voltage fault is set.
2. Throttle position sensor failure.
3. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check the sensor voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the throttle position sensor for deformation and cracks, check condition of the connection.
» Check whether the throttle position sensor wiring is cut or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the continuity of the wire harness and the throttle position sensor output voltage according to THR.1.

ACCELERATOR PEDAL / THROTTLE

DTC

P CODE	P2135	Name	Throttle position sensor error – error on plausibility check between sensor1 and sensor2.
FMI	11		
SPN	91		
Blink / Beep Code	1226		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite. 2. The sensor voltage of sensor2 is normally 50% of sensor1. ECU has stored a maximum derivation curve for this values. If the maximum derivation is exceeded the error is detected.	Connector Wire harness Throttle position sensor ECU

Actions when a malefunction occures

Fault Detection	If the permitted maximum for the difference of both the input signals is exceeded, this is reported in the DTC P2135.
Fault Mode	[Continuous operation]: Engine is not obstructed if no other throttle sensor related failure.
Limited operation	No
Reset criteria	Yes: The fault mode is released when the sensor voltage derivation deceeds the maximum limits.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Poor connection of the connector.
2. Wiring failure of the wire harness.
3. Throttle position sensor failure.
4. ECU internal circuit fault.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.
» Check the throttle position sensor1 and sensor2 voltage value.

2. Connector / wiring check

» Before beginning your work, be sure to turn off the ECU power.
» Check the pin of the throttle position sensor for deformation and cracks, check condition of the connection.
» Check whether the throttle position sensor wiring is cut or the wiring coating is peeled.

In case there is any damage replace the affected part.

3. Failure diagnosis

» Check the continuity of the wire harness and the throttle position sensor output voltage according to THR.1.

BATTERY

BATTERY

DTC

P CODE	P0562	Name	Battery voltage–too low.
FMI	4		
SPN	168		
Blink / Beep Code	6112		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Voltage sensor in ECU is normal.	Battery main switch Alternator Voltage Regulator Other equipments using common battery
2. ECU detects 8,5 Volt or lower power supply voltage for 5 seconds or longer.	

Actions when a malefunction occures

Fault Detection	Raw sensor signal battery voltage is lower than the threshold of 8.5 volts.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	ECU shuts down automatically if the power supply voltage becomes lower than 6 V.

Presumed cause of malefunction or abnormal condition

Description

1. Battery switch is not turned on.
2. Alternator malfunction.
3. Voltage Regulator malfunction.
4. Current draw to other equipment.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Failure diganosis

» Check the battery voltage.
» Check the Voltage regulator when engine is running, replace if necessary.
» Check the Alternator voltage when engine is running, replace if necessary.
» Check the current draw to other equipment.
» Check battery cable connections are clean.
» Check correct battery cable cross section is used (2.5 meters at 25 mm^2 conductor cross section).
» Check battery cable is not too long.

BATTERY

DTC

P CODE	P0563	Name	Battery voltage–too high.
FMI	3		
SPN	168		
Blink / Beep Code	6111		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Voltage sensor in ECU is normal.	Battery and cables Alternator Voltage Regulator
2. ECU detects 16 Volt or higher power supply voltage for 5 seconds or longer.	

Actions when a malefunction occures

Fault Detection	The raw sensor signal battery voltage is higher than the threshold of 16 volts.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. 24 V battery is connected mistakenly.
2. Booster is used.
3. Alternator malfunction.
4. Voltage Regulator malfunction.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Failure diganosis

» Check the battery voltage.
» Check that no booster is connected to ECU power supply cable.
» Check the alternator voltage when engine is running. Replace the alternator if necessary.
» Check the voltage regulator when engine is running. Replace the regulator if necessary.

RPM / OVERSPEED

RPM / OVERSPEED

DTC

P CODE	P0219		
FMI	0	Name	DFC_EngPrtOvrSpd Engine overspeed detected.
SPN	190		
Blink / Beep Code	6312		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. Voltage sensor in ECU is normal.	Crankshaft position sensor Camshaft position sensor Injectors ECU
2. The engine speed is greater than the threshold value of 4150rpm	

Actions when a malfunction occures

Fault Detection	Exceeding of the engine-speed threshold of 4150rpm.
Fault Mode	[Continuous operation]: Engine is not obstructed.
Limited operation	No
Reset criteria	Yes: The fail mode is released when the ECU power is turned off.
Remarks	

Presumed cause of malfunction or abnormal condition

Description

1. Crank speed sensor fault.
   » Temporary failure caused by external factors such as radio waves.
2. Cam speed sensor fault.
   » Temporary failure caused by external factors such as radio waves.
3. Injector failure.
4. ECU internal circuit fault.
5. Engine oil consumed by combustion (Excessive piston blow-by or crank case breather fault).

Check

1. Initial diagnosis with diagnosis tool-or blink / beep code
   » Check the fault indication.

2. Failure diganosis
   » Turn off the ECU power and start the engine after turning on the power switch again. Connect the diagnostic tool and check whether an error is detected or not on the current fault indication. If there is no indication check the fault history and if there is an indication check the malfunction condition. If there is still a current fault indication do a powercycle again. If the indication does not disappear replace the ECU or the injector.
   » Check - trigger wheel is tight on flywheel.
   » Check - Crankshaft speed sensor bracket is secure.
   » Check air gap of crankshaft speed sensor (0.5 to 1.5 mm).

OTHERS

OTHERS

DTC

P CODE	P007B		
FMI	2	Name	Plausibility check between ambient and boost pressure – error.
SPN	2631		
Blink / Beep Code	1411		

DTC detection criteria

1. Prequisite, 2. Judgement Criteria	Check Points
1. No prerequisite.	ECU- Air diaphragm Air box Turbo charger
2. ECU detects deviation higher than 500 mbar between ambient pressure and boost pressure at engine speed below 800 rpm.	

Actions when a malefunction occures

Fault Detection	If the engine speed is less than a threshold (800rpm) and if the PCACDs sensor is present, a plausibility error is decided based on the difference between the pressure upstream of the intake valve and the environment pressure. If the difference between the sensed pressure upstream of the intake valve and the environment pressure is higher than 500mbar for the duration of 1,5s the error will be reported via the DFC P007B.
Fault Mode	Level 2 (reduce engine output torque to 75 NM).
Limited operation	Yes: Level2 (reduce engine output torque to 75 NM). The engine operation is limited.
Reset criteria	Yes: This high error will be healed if the difference is less than or equal to 500mbar for a duration of 655s.
Remarks	

Presumed cause of malefunction or abnormal condition

Description

1. Air diaphragm at ECU clogged.
2. Air box entry clogged.
3. Turbo charger inlet clogged.

Check

1. Initial diagnosis with diagnosis tool–or blink / beep code

» Check the fault indication.

2. Failure diganosis

» Check the diaphragm at ECU is not clogged.
» Check that air box entry and snorkel have free entry and flow.
» Check the turbo charger entry is not clogged.