Diagnostic Specification
IPC
Unspecified

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1 Document Conventions

- only activated Diagnostic Instances are exported;

- only Protocol Services and Data Types that are used in activated Diagnostic Instances are exported;

- Audience settings of Diagnostic Instances are not exported (but the Audience for which the export has been filtered is indicated at the document's title page);

- attributes of individual objects and State Transitions of Services are exported in an overview table;

- service addressing is only indicated if it differs from the addressing of the Protocol Service;

- the table of Negative Response Codes (NRC) in Diagnostic Instances is only exported if it differs from the NRCs listed in the negative response of the protocol service;

- export of Job Containers and Variant Coding Keys depends on the manufacturer;

- fd = data fixed in the template ("fixed data").

The chapter "Diagnostic Content" only describes data transmitted. It references each used Protocol Service. All used Protocol Services are listed in the chapter "Protocol Services".

The count of data bytes in the chapter "Diagnostic Content" starts at zero (0). Within a data byte, the count of bits also starts at zero (0) (LSB - least significant bit) independent from the order of data bit transportation.

The count of data bytes in the chapter "Protocol Services" starts - corresponding with the standardized specifications - at one (#1).

2 Abstract

This CANdela template is based on ISO 14229-1:2006.

3 Overview

ECU

IPC

This CANdela Document Template is based on the standards:

- Unified Diagnostic Services (ISO 14229-1:2006)
- Diagnostics on CAN (ISO 15765-3)

Variants

Common Diagnostics

4 Communication Parameter

Diagnostic CAN:

Name	Category	Value	Description
Bus Type	Communication	CAN	Type of transport media
Transport Protocol Type	Communication	ISO15765	Type of used Transport Protocol (e.g. ISO15765)
Addressing Scheme	Communication	Normal	Addressing Scheme used for physical requests and responses.
CAN-ID Type	Communication	11-Bit	CAN-ID Type used for physical requests and responses
Request CAN-ID	Communication	0x700	The request CAN identifier for physical requests. The hex value not only describes the identifier but also the priority of the message. The higher the number, the lower the priority.
Response CAN-ID	Communication	0x600	The response CAN identifier for physical responses.The response for functional requests is sent via the physical path.
Functional Addressing Scheme	Communication	Normal	Addressing Scheme used for functional requests.
Functional CAN-ID Type	Communication	11-Bit	CAN-ID Type used for functional request
Functional Request CAN-ID	Communication	0x750	The request CAN identifier for functional requests.
P2Client	Timing	150	Timeout for the client to wait after the successful transmission of a request message for the start of incoming response messages. In UDS this is the timeout for the default session.
P2Server	Timing	50	Performance requirement for the server to start with the response message after the reception of a request message. In UDS this is the timeout for the default session.The tester will also require the P2Server timeout, since in UDS service "DiagnosticSessionControl"returns the P2Server and P2*Server timeouts – the tester has to calculate the offset manually and has to add it to the returned P2Server and P2*Server timeouts.
P2*Client	Timing	2000	Enhanced timeout for the client to wait after the reception of a negative response message with response code 78 hex for the start of incoming response messages. In UDS this is the timeout for the default session.
P2*Server	Timing	1950	Performance requirement for the server to start with the response message after the transmission of a negative response message with response code 78 hex (enhanced response timing). In UDS this is the timeout for the default session.
S3Client	Timing	4000	Time between functionally addressed Tester Present request messages transmitted by the client to keep a diagnostic session other than the defaultSession active in multiple servers (functional communication) or maximum time between physically transmitted request messages to a single server (physical communication).
S3Server	Timing	5000	Time for the server to keep a diagnostic session other than the defaultSession active while not receiving any diagnostic request message
P3ClientPhys	Timing	100	Minimum time for the client to wait after the

Name	Category	Value	Description
			successful transmission of a physically addressed request message (indicated via N_USData.con) with no response required before it can transmit the next physically addressed request message. Minimum value = P2Server
TesterPresentPhys	Communication	0x3E00	Defines the TesterPresent message for physically addressed requests used to keep a diagnostic session active.
P3ClientFunc	Timing	100	Minimum time for the client to wait after the successful transmission of a functionally addressed request message (indicated via N_USData.con) before it can transmit the next functionally addressed request message in case no response is required or the requested data is only supported by a subset of the functionally addressed servers. Minimum value = P2Server.
TesterPresentFunc	Communication	0x3E80	Defines the TesterPresent message for functionally addressed requests used to keep a diagnostic session active.
STmin	Timing	20	(Separation Time) defines the minimum time gap between consecutive frames.Values from 0x00 to 0x7F (0 – 127) are absolute milliseconds.Values from 0xF1 to 0xF9 are even 100 micro seconds.Every other value range is reserved and should not be used.
Blocksize	Communication	0	The Blocksize parameter indicates, how many consecutive frames shall be sent in a transmission before a flow control frame is sent. The number 0 tells the sender, that no more flow controls should disrupt the sending of the remaining flow controls
Timeout As	Timing	100	Time for transmission of frame, sender side
Timeout Ar	Timing	100	Time for transmission of frame, receiver side
Timeout Bs	Timing	100	Time until reception of next flow control
Time Br	Timing	100	Time for next transmission of flow control
Time Cs	Timing	100	Time until next transmission of consecutive frame
Timeout Cr	Timing	100	Time until reception of next consecutive frame
Max Length of TP Message	Communication	4095	
Baudrate	Communication	500000	Bus Speed of the used transport media. Caution, the Bus Speed has to be set identical in all ECUs connected to one subnet.
CANFrameFillerByte	Communication	0x00	Fill byte used for filling CAN frames to eight byte length.
FillerByteHandling	Communication	true	Enables use of fill bytes; if "true", fill bytes are used, otherwise DLC may be smaller than 8.

5 Diagnostic Content

5.1 Common Diagnostics

Base model which all variants of the ECU must support.

5.1.1 DIDs

5.1.1.1 DID Engine Speed, 0xE102

Byte	Bit	Name	Conversion
0 - 1		DID Engine Speed	Engine Speed (2 Byte)

5.1.1.2 DID Engine Temperature, 0xE103

Byte	Bit	Name	Conversion
0		DID Temperature	Temperature(1Byte)

5.1.1.3 DID Power Supply Voltage, 0xE101

Byte	Bit	Name	Conversion
0 - 1		DID Voltage	Voltage (2Byte)

5.1.2 Sessions

This Diagnostic Class describes the use case of the Session Management.

5.1.2.1 Default Session ($01)

Subfunction: Type ($01)

Service	Protocol Service	Request	Pos.Resp.
Start	(0x10) DiagnosticSessionControl, see page 22.	10 01	50 01 zz

Parameter (zz)

Byte	Bit	Name	Conversion
0 - 1		P2	P2
2 - 3		P2Ex	P2Ex

Start NR

Response code	Error text	Description
0x22	Conditions not correct	
0x7E	Subfunction not supported in active session	

5.1.2.2 Extended Diagnostic Session ($03)

Subfunction: Type ($03)

Service	Protocol Service	Request	Pos.Resp.
Start	(0x10) DiagnosticSessionControl, see page 22.	10 03	50 03 zz

Parameter (zz)

Byte	Bit	Name	Conversion
0 - 1		P2	P2
2 - 3		P2Ex	P2Ex

Start NR

Response code	Error text	Description
0x12	Subfunction not supported	
0x22	Conditions not correct	

Response code	Error text	Description
0x7E	Subfunction not supported in active session	

5.1.2.3 Production Session ($60)

Subfunction: Type ($60)

Service	Protocol Service	Request	Pos.Resp.
Start	(0x10) DiagnosticSessionControl, see page 22.	10 60	50 60 zz

Parameter (zz)

Byte	Bit	Name	Conversion
0 - 1		P2	P2
2 - 3		P2Ex	P2Ex

Start NR

Response code	Error text	Description
0x12	Subfunction not supported	
0x22	Conditions not correct	
0x7E	Subfunction not supported in active session	

5.1.3 Identification

5.1.3.1 ECU Manufacturing Date ($0301)

Identifier: Identifier ($0301)

Service	Protocol Service	Request	Pos.Resp.
Read	(0x22) ReadDataByIdentifier, see page 24.	22 03 01	62 03 01 zz
Write	(0x2E) WriteDataByIdentifier, see page 26.	2E 03 01 zz	6E 03 01

Data (zz)

Byte	Bit	Name	Conversion
0		Manufacturing date - Year	BCD [0..99] (1Byte)
1		Manufacturing date - Month	BCD [1..12] (1Byte)
2		Manufacturing date - Day	BCD [1..31] (1Byte)

5.1.3.2 ECU Serial Number ($0302)

Identifier: Identifier ($0302)

Service	Protocol Service	Request	Pos.Resp.
Read	(0x22) ReadDataByIdentifier, see page 24.	22 03 02	62 03 02 zz
Write	(0x2E) WriteDataByIdentifier, see page 26.	2E 03 02 zz	6E 03 02

Data (zz)

Byte	Bit	Name	Conversion
0 - 8		Serial Number	ASCII (9Byte)

5.1.3.3 Vehicle Identification Number ($0303)

Identifier: Identifier ($0303)

Service	Protocol Service	Request	Pos.Resp.
Read	(0x22) ReadDataByIdentifier, see page 24.	22 03 03	62 03 03 zz
Write	(0x2E) WriteDataByIdentifier, see page 26.	2E 03 03 zz	6E 03 03

Data (zz)

Byte	Bit	Name	Conversion
0 - 16		VIN	ASCII (17Byte)

5.1.3.4 Active Diagnostic Session ($030A)

Identifier: Identifier ($030A)

Service	Protocol Service	Request	Pos.Resp.
Read	(0x22) ReadDataByIdentifier, see page 24.	22 03 0A	62 03 0A zz

Data (zz)

Byte	Bit	Name	Conversion
0		Diagnostic Session Type	Subfunction DiagnosticSessionControl

5.1.4 Security Access

5.1.4.1 Seed Level #1 ($01)

Subfunction: Type ($01)

Service	Protocol Service	Request	Pos.Resp.
Request	(0x27) SecurityAccess - Request seed, see page 25.	27 01	67 01 zz

Seed (zz)

Byte	Bit	Name	Conversion
0 - 3		SecuritySeed	HexDump (4 Byte)

Anfordern

Response code	Error text	Description
0x22	Conditions not correct	
0x7E	Subfunction not supported in active session	

5.1.4.2 Key Level #1 ($02)

Subfunction: Type ($02)

Service	Protocol Service	Request	Pos.Resp.
Send	(0x27) SecurityAccess - Send key, see page 25.	27 02 yy	67 02

Key (yy)

Byte	Bit	Name	Conversion
0 - 3		SecurityKey	HexDump (4 Byte)

Senden

Response code	Error text	Description
0x22	Conditions not correct	
0x7E	Subfunction not supported in active session	

5.1.4.3 Seed Level #2 ($03)

Subfunction: Type ($03)

Service	Protocol Service	Request	Pos.Resp.
Request	(0x27) SecurityAccess - Request seed, see page 25.	27 03	67 03 zz

Seed (zz)

Byte	Bit	Name	Conversion
0 - 3		SecuritySeed	HexDump (4 Byte)

Anfordern

Response code	Error text	Description
0x22	Conditions not correct	

Response code	Error text	Description
0x7E	Subfunction not supported in active session	

5.1.4.4 Key Level #2 ($04)

Subfunction: Type ($04)

Service	Protocol Service	Request	Pos.Resp.
Send	(0x27) SecurityAccess - Send key, see page 25.	27 04 yy	67 04

Key (yy)

Byte	Bit	Name	Conversion
0 - 3		SecurityKey	HexDump (4 Byte)

Senden

Response code	Error text	Description
0x22	Conditions not correct	
0x7E	Subfunction not supported in active session	

5.1.5 Fault Memory

Service	Protocol Service	Request	Pos.Resp.
Read (Number)	(0x19) ReadDtcInformation - Report number of DTC by status mask, see page 24.	19 01 zz	59 01 zz yy x
Read (identified errors)	(0x19) ReadDtcInformation - Report DTC by status mask, see page 23.	19 02 zz	59 02 zz *[xx zz]
Clear (all errors)	(0x14) ClearDiagnosticInformation, see page 23.	14 vv	54

DtcStatusMask (zz)

Byte	Bit	Name	Conversion
0		DTC Statusbyte	DTC Statusbyte
	0	Test failed	Test failed
	1	(reserved)	
	2	(reserved)	
	3	Confirmed DTC	Confirmed DTC
	4	Test not completed since last clear	Test not completed since last clear
	5	Test failed since last clear	Test failed since last clear
	6	Test not completed this monitoring cycle	Test not completed this monitoring cycle
	7	(reserved)	

Format Identifier (yy)

Byte	Bit	Name	Conversion
0		DTCFormatIdentifier	HexDump (1 Byte)

DTC Table (xx)

DTC	Error text
0x000001	Lost Conmmunication with Gateway
0x000002	Power Supply Voltage Too High
0x000003	Power Supply Voltage Too Low

0x000001: Lost Conmmunication with Gateway

Corrective action	Check wiring

0x000002: Power Supply Voltage Too High

Corrective action	Check power supply

0x000003: Power Supply Voltage Too Low

Corrective action	Check power supply

GroupOfDtc (vv)

Emission-related systems.
Supports individual DTCs: no.

5.1.6 Dynamic Data

5.1.6.1 DID Engine Speed ($E102)

Identifier: Identifier ($E102)

Service	Protocol Service	Request	Pos.Resp.
Read	(0x22) ReadDataByIdentifier, see page 24.	22 E1 02	62 E1 02 zz

Data (zz)

Byte	Bit	Name	Conversion
0 - 1		DID Engine Speed	DID Engine Speed 0xE102

5.1.6.2 DID Engine Temperature ($E103)

Identifier: Identifier ($E103)

Service	Protocol Service	Request	Pos.Resp.
Read	(0x22) ReadDataByIdentifier, see page 24.	22 E1 03	62 E1 03 zz

Data (zz)

Byte	Bit	Name	Conversion
0		DID Engine Temperature	DID Engine Temperature 0xE103

5.1.6.3 Power Supply Voltage ($E101)

Identifier: Identifier ($E101)

Service	Protocol Service	Request	Pos.Resp.
Read	(0x22) ReadDataByIdentifier, see page 24.	22 E1 01	62 E1 01 zz

Data (zz)

Byte	Bit	Name	Conversion
0 - 1		DataRecord	Voltage (2Byte)

5.1.7 Variant Coding

5.1.7.1 Variant Coding ($F110)

Identifier: Identifier ($F110)

Service	Protocol Service	Request	Pos.Resp.
Read	(0x22) ReadDataByIdentifier, see page 24.	22 F1 10	62 F1 10 zz
Write	(0x2E) WriteDataByIdentifier, see page 26.	2E F1 10 zz	6E F1 10

Data (zz)

Byte	Bit	Name	Conversion
0 - 1		Coding String	Unsigned (2 Byte)
	0 - 3	Vehicle Type	Vehicle type (4 Bit)
	4 - 7	Country Code	Country Code (4 Bit)
	8	Belt Warning	Belt Warning(1 Bit)
	9	OverSpeed Warning	OverSpeed Warning(1 Bit)

5.1.8 Communication Control

5.1.8.1 EnableRxAndEnableTx ($00)

Subfunction: Type ($00)

Service	Protocol Service	Request	Pos.Resp.
Control	(0x28) CommunicationControl, see page 26.	28 00 zz	68 00

CommunicationType (zz)

Byte	Bit	Name	Conversion
0		CommType	HexDump (1 Byte)
	0	NormalCommunicationMessages	Unsigned (1 Bit)
	1	NetworkCommunicationCommunicationMessages	Unsigned (1 Bit)
	2	DiagnosticCommunicationMessages	Unsigned (1 Bit)
	3 - 7	(reserved)	reserved (5 Bit)

Control

Response code	Error text	Description
0x22	Conditions not correct	
0x7E	Subfunction not supported in active session	

5.1.8.2 EnableRxAndDisableTx ($01)

Subfunction: Type ($01)

Service	Protocol Service	Request	Pos.Resp.
Control	(0x28) CommunicationControl, see page 26.	28 01 zz	68 01

CommunicationType (zz)

Byte	Bit	Name	Conversion
0		CommType	HexDump (1 Byte)
	0	NormalCommunicationMessages	Unsigned (1 Bit)
	1	NetworkCommunicationCommunicationMessages	Unsigned (1 Bit)
	2	DiagnosticCommunicationMessages	Unsigned (1 Bit)
	3 - 7	(reserved)	reserved (5 Bit)

Control

Response code	Error text	Description
0x22	Conditions not correct	
0x7E	Subfunction not supported in active session	

5.1.9 Ecu Reset

5.1.9.1 Hard Reset ($01)

Subfunction: Type ($01)

Service	Protocol Service	Request	Pos.Resp.
Reset	(0x11) EcuReset, see page 23.	11 01	51 01

5.1.10 Tester Present

Service	Protocol Service	Request	Pos.Resp.
Send	(0x3E) TesterPresent, see page 27.	3E 00	7E 00

6 State Dependency of Service Execution

The table cells define whether the service/job may be executed and the state the ECU will reach after the execution of the service/job:
"(no)": the service/job must not be executed;
"(yes)": the service/job may be executed, no transition.

6.1 Common Diagnostics

6.1.1 Session

Semantics: session

NRC: 0x7E Subfunction not supported in active session

Service/Job	Prefix	Default	Extended	Production Session
Sessions/*/Start	10 LL	(mixed)	(mixed)	(mixed)
- Default Session	10 01	Default	Default	Default
- Extended Diagnostic Session	10 03	Extended	Extended	Extended
- Production Session	10 60	(no)	Production Session	Production Session
Identification/*/Read	22 LL	(yes)	(yes)	(mixed)
- ECU Manufacturing Date	22 03 01	(yes)	(yes)	(no)
- ECU Serial Number	22 03 02	(yes)	(yes)	(no)
- Vehicle Identification Number	22 03 03	(yes)	(yes)	(no)
- Active Diagnostic Session	22 03 0A	(yes)	(yes)	(yes)
Identification/*/Write	2E LL zz	(no)	(yes)	(no)
- ECU Manufacturing Date	2E 03 01 zz	(no)	(yes)	(no)
- ECU Serial Number	2E 03 02 zz	(no)	(yes)	(no)
- Vehicle Identification Number	2E 03 03 zz	(no)	(yes)	(no)
Security Access/*/Request	27 LL	(no)	(yes)	(no)
- Seed Level #1	27 01	(no)	(yes)	(no)
- Seed Level #2	27 03	(no)	(yes)	(no)
Security Access/*/Send	27 LL yy	(no)	(yes)	(no)
- Key Level #1	27 02 yy	(no)	(yes)	(no)
- Key Level #2	27 04 yy	(no)	(yes)	(no)
Fault Memory/Read (Number)	19 01 zz	(yes)	(yes)	(no)
- Fault Memory	19 01 zz	(yes)	(yes)	(no)
Fault Memory/Read (identified errors)	19 02 zz	(yes)	(yes)	(no)
- Fault Memory	19 02 zz	(yes)	(yes)	(no)
Fault Memory/Clear (all errors)	14 vv	(yes)	(yes)	(no)
- Fault Memory	14 vv	(yes)	(yes)	(no)
Dynamic Data/*/Read	22 LL	(yes)	(yes)	(yes)
- DID Engine Speed	22 E1 02	(yes)	(yes)	(yes)
- DID Engine Temperature	22 E1 03	(yes)	(yes)	(yes)
- Power Supply Voltage	22 E1 01	(yes)	(yes)	(yes)
Variant Coding/*/Read	22 LL	(yes)	(yes)	(no)
- Variant Coding	22 F1 10	(yes)	(yes)	(no)
Variant Coding/*/Write	2E LL zz	(no)	(yes)	(no)
- Variant Coding	2E F1 10 zz	(no)	(yes)	(no)
Communication Control/*/Control	28 LL zz	(yes)	(yes)	(no)

Service/Job	Prefix	Default	Extended	Production Session
- EnableRxAndEnableTx	28 00 zz	(yes)	(yes)	(no)
- EnableRxAndDisableTx	28 01 zz	(yes)	(yes)	(no)
Ecu Reset/*/Reset	11 LL	(no)	(yes)	(no)
- Hard Reset	11 01	(no)	(yes)	(no)
Tester Present/Send	3E 00	(yes)	(yes)	(no)
- Tester Present	3E 00	(yes)	(yes)	(no)

6.1.2 SecurityAccess

Semantics: security

NRC: 0x33 Security access denied

Service/Job	Prefix	Locked	Unlocked L1	Unlocked L2
Sessions/*/Start	10 LL	(yes)	Locked	Locked
- Default Session	10 01	(yes)	Locked	Locked
- Extended Diagnostic Session	10 03	(yes)	Locked	Locked
- Production Session	10 60	(yes)	Locked	Locked
Identification/*/Read	22 LL	(mixed)	(yes)	(yes)
- ECU Manufacturing Date	22 03 01	(yes)	(yes)	(yes)
- ECU Serial Number	22 03 02	(yes)	(yes)	(yes)
- Vehicle Identification Number	22 03 03	(no)	(yes)	(yes)
- Active Diagnostic Session	22 03 0A	(yes)	(yes)	(yes)
Identification/*/Write	2E LL zz	(no)	(mixed)	(yes)
- ECU Manufacturing Date	2E 03 01 zz	(no)	(yes)	(yes)
- ECU Serial Number	2E 03 02 zz	(no)	(yes)	(yes)
- Vehicle Identification Number	2E 03 03 zz	(no)	(no)	(yes)
Security Access/*/Request	27 LL	(mixed)	(yes)	(yes)
- Seed Level #1	27 01	(yes)	(yes)	(yes)
- Seed Level #2	27 03	(no)	(yes)	(yes)
Security Access/*/Send	27 LL yy	(mixed)	(mixed)	(mixed)
- Key Level #1	27 02 yy	Unlocked L1	Unlocked L1	Unlocked L1
- Key Level #2	27 04 yy	(no)	Unlocked L2	Unlocked L2
Fault Memory/Read (Number)	19 01 zz	(yes)	(yes)	(yes)
- Fault Memory	19 01 zz	(yes)	(yes)	(yes)
Fault Memory/Read (identified errors)	19 02 zz	(yes)	(yes)	(yes)
- Fault Memory	19 02 zz	(yes)	(yes)	(yes)
Fault Memory/Clear (all errors)	14 vv	(yes)	(yes)	(yes)
- Fault Memory	14 vv	(yes)	(yes)	(yes)
Dynamic Data/*/Read	22 LL	(yes)	(yes)	(yes)
- DID Engine Speed	22 E1 02	(yes)	(yes)	(yes)
- DID Engine Temperature	22 E1 03	(yes)	(yes)	(yes)
- Power Supply Voltage	22 E1 01	(yes)	(yes)	(yes)
Variant Coding/*/Read	22 LL	(yes)	(yes)	(yes)
- Variant Coding	22 F1 10	(yes)	(yes)	(yes)
Variant Coding/*/Write	2E LL zz	(no)	(yes)	(yes)
- Variant Coding	2E F1 10 zz	(no)	(yes)	(yes)
Communication Control/*/Control	28 LL zz	(yes)	(yes)	(yes)

Service/Job	Prefix	Locked	Unlocked L1	Unlocked L2
- EnableRxAndEnableTx	28 00 zz	(yes)	(yes)	(yes)
- EnableRxAndDisableTx	28 01 zz	(yes)	(yes)	(yes)
Ecu Reset/*/Reset	11 LL	Locked	Locked	Locked
- Hard Reset	11 01	Locked	Locked	Locked
Tester Present/Send	3E 00	(yes)	(yes)	(yes)
- Tester Present	3E 00	(yes)	(yes)	(yes)

7 Data Types

Data Type	Conversion
ASCII (17Byte)	17 Byte; Field [17] Element(s) à 1 Byte; Ascii; no sizeinfo
ASCII (9Byte)	9 Byte; Field [9] Element(s) à 1 Byte; Ascii; no sizeinfo
BCD [0..99] (1Byte)	1 Byte; Bcd
BCD [1..12] (1Byte)	1 Byte; Bcd
BCD [1..31] (1Byte)	1 Byte; Bcd
Belt Warning(1 Bit)	1 Bit [0x00] Enable [0x01] Disable
Confirmed DTC	1 Bit [0x00] false [0x01] true
Country Code (4 Bit)	4 Bit [0x00] China [0x01] Korea [0x02] Brazil [0x05..0x0F] reserved
DataIdentifier	2 Byte; HighLow (Motorola) [0x0100..0xEFFF] VehicleManufacturerSpecific [0xF000..0xF00F] networkConfigurationDataForTractorTrailerApplicationDataIdentifier [0xF010..0xF0FF] vehicleManufacturerSpecific [0xF100..0xF17F] identificationOptionVehicleManufacturerSpecificDataIdentifier [0xF180] BootSoftwareIdentificationDataIdentifier [0xF181] applicationSoftwareIdentificationDataIdentifier [0xF182] applicationDataIdentificationDataIdentifier [0xF183] bootSoftwareFingerprintDataIdentifier [0xF184] applicationSoftwareFingerprintDataIdentifier [0xF185] applicationDataFingerprintDataIdentifier [0xF186] ActiveDiagnosticSessionDataIdentifier [0xF187] vehicleManufacturerSparePartNumberDataIdentifier [0xF188] vehicleManufacturerECUSoftwareNumberDataIdentifier [0xF189] vehicleManufacturerECUSoftwareVersionNumberDataIdentifier [0xF18A] systemSupplierIdentifierDataIdentifier [0xF18B] ECUManufacturingDateDataIdentifier [0xF18C] ECUSerialNumberDataIdentifier [0xF18D] supportedFunctionalUnitsDataIdentifier [0xF18E] VehicleManufacturerKitAssemblyPartNumberDataIdentifier [0xF190] VINDataIdentifier [0xF191] vehicleManufacturerECUHardwareNumberDataIdentifier [0xF192] systemSupplierECUHardwareNumberDataIdentifier [0xF193] systemSupplierECUHardwareVersionNumberDataIdentifier [0xF194] systemSupplierECUSoftwareNumberDataIdentifier [0xF195] systemSupplierECUSoftwareVersionNumberDataIdentifier [0xF196] exhaustRegulationOrTypeApprovalNumberDataIdentifier [0xF197] systemNameOrEngineTypeDataIdentifier [0xF198] repairShopCodeOrTesterSerialNumberDataIdentifier [0xF199] programmingDateDataIdentifier [0xF19A] calibrationRepairShopCodeOrCalibrationEquipmentSerialNumberDataIdentifier [0xF19B] calibrationDateDataIdentifier [0xF19C] calibrationEquipmentSoftwareNumberDataIdentifier [0xF19D] ECUInstallationDateDataIdentifier [0xF19E] ODXFileDataIdentifier [0xF19F] EntityDataIdentifier [0xF1A0..0xF1EF] identificationOptionVehicleManufacturerSpecific [0xF1F0..0xF1FF] identificationOptionSystemSupplierSpecific [0xF200..0xF2FF] periodicDataIdentifier [0xF300..0xF3FF] DynamicallyDefinedDataIdentifier [0xF400..0xF4FF] OBDDataIdentifier

Data Type	Conversion
	[0xF500..0xF5FF] OBDDataIdentifier [0xF600..0xF6FF] OBDMonitorDataIdentifier [0xF700..0xF7FF] OBDMonitorDataIdentifier [0xF800..0xF8FF] OBDInfoTypeDataIdentifier [0xF900..0xF9FF] TachographDataIdentifier [0xFA00..0xFA0F] AirbagDeploymentDataIdentifier [0xFA10..0xFAFF] SafetySystemDataIdentifier [0xFB00..0xFCFF] ReservedForLegislativeUse [0xFD00..0xFEFF] SystemSupplierSpecific
DTC Groups	3 Byte; HighLow (Motorola) [0x00] Emission-related systems [0x100000] Powertrain group [0x400000] Chassis group [0x800000] Body group [0xC00000] Network communication group [0xFFFFFF] All groups
DTC Statusbyte	1 Byte; Hex
Engine Speed (2 Byte)	2 Byte; HighLow (Motorola) y = x rpm; Lower limit (phys): 0 rpm; Upper limit (phys): 65535 rpm;
HexDump (1 Byte)	1 Byte; Hex
HexDump (4 Byte)	4 Byte; Hex; HighLow (Motorola)
OverSpeed Warning(1 Bit)	1 Bit [0x00] Enable [0x01] Disable
P2	2 Byte; HighLow (Motorola); ms
P2Ex	2 Byte; HighLow (Motorola) y = 10x ms; Lower limit (phys): 0 ms; Upper limit (phys): 655350 ms;
reserved (5 Bit)	5 Bit
Subfunction CommunicationControl	1 Byte [0x00] enableRxAndTx [0x01] enableRxAndDisableTx [0x02] disableRxAndEnableTx [0x03] disableRxAndTx [0x40..0x5F] vehicleManufacturerSpecific [0x60..0x7E] systemSupplierSpecific
Subfunction DiagnosticSessionControl	1 Byte [0x01] DefaultSession [0x02] ProductionSession [0x03] ExtendedDiagnosticSession [0x04] safetySystemDiagnosticSession [0x40..0x5F] vehicleManufacturerSpecific [0x60..0x7E] systemSupplierSpecific
Subfunction EcuReset	1 Byte [0x01] hardReset [0x02] keyOffOnReset [0x03] softReset [0x04] enableRapidPowerShutDown [0x05] disableRapidPowerShutDown [0x40..0x5F] vehicleManufacturerSpecific [0x60..0x7E] systemSupplierSpecific
Subfunction SecurityAccess	1 Byte [0x01] requestSeed [0x02] sendKey [0x03] requestSeed [0x04] sendKey [0x05] requestSeed [0x06] sendKey [0x60..0x7E] systemSupplierSpecific
Temperature(1Byte)	1 Byte; Float; 0 significant digits

Data Type	Conversion
	y = x DegC; Lower limit (phys): 0 DegC; Upper limit (phys): 255 DegC;
Test failed	1 Bit [0x00] false [0x01] true
Test failed since last clear	1 Bit [0x00] false [0x01] true
Test not completed since last clear	1 Bit [0x00] false [0x01] true
Test not completed this monitoring cycle	1 Bit [0x00] false [0x01] true
Unsigned (1 Bit)	1 Bit
Unsigned (2 Byte)	2 Byte; HighLow (Motorola)
Vehicle type (4 Bit)	4 Bit [0x00] Comfort [0x01] Elite [0x02] Luxury [0x03] Flagship [0x04..0x0F] (reserved)
Voltage (2Byte)	2 Byte; Float; 3 significant digits; HighLow (Motorola) y = (1/1000)x A; Lower limit (phys): 0 A; Upper limit (phys): 65.535 A;

8 Protocol Services

8.1 Overview

The following table lists all Protocol Services which are used in the document. The default addressing method and the default response behavior is marked by "X". If there are services in the Diagnostic Instances which differ from the default values, then this is marked here by "(*)" and described within the corresponding Diagnostic Instance.

SID	Name	phys req	func req	phys pos resp	func pos resp	SPRMIB phys req	SPRMIB func req	multi	periodic	required
$10	DiagnosticSessionControl	X	X	X	X	0/1	0/1			X
$11	EcuReset	X	X	X	X					
$14	ClearDiagnosticInformation	X	X	X	X					
$19	ReadDtcInformation - Report DTC by status mask	X	X	X	X	0/1	0/1			
$19	ReadDtcInformation - Report number of DTC by status mask	X	X	X	X	0/1	0/1			
$22	ReadDataByIdentifier	X	X	X	X					
$27	SecurityAccess - Request seed	X	X	X	X	0/1	0/1			
$27	SecurityAccess - Send key	X	X	X	X	0/1	0/1			
$28	CommunicationControl	X	X	X	X	0/1	0/1			
$2E	WriteDataByIdentifier	X		X						
$3E	TesterPresent	X	X	X	X	0/1	0/1			X

phys/func req =	Test system sends physical/functional request
phys/func pos resp =	ECU implements physical/functional positive response
SPRMIB phys/func req =	test system shall set the SPRMIB (Suppress Positive Message Indication Bit) in the physical/functional request: 1 = always (SPRMIB is always 1); 0/1 = user-defined (SPRMIB may be 0 or 1); 0 = never (SPRMIB is always 0)
multi =	ECU sends complete response split up into multiple diagnostic messages
periodic =	ECU sends responses periodically
required =	there is at least one service in a required, activated diagnostic instance within Common Diagnostics

8.2 (0x10) DiagnosticSessionControl

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$10
#2	Has 'Suppress Positive Response Message Indication Bit' Type	M	Subfunction DiagnosticSessionControl, see page 20

Positive Response:

Byte	Name	Cvt	Value
#1	SID-PR	M	$50
#2	Type	M	Subfunction DiagnosticSessionControl, see page 20
#3-3+a	SessionParameterRecord	-	

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$10
#3	RESPONSE CODE	M	

Negative Response Codes:

Response code	Error text	Description
0x22	Conditions not correct	

8.3 (0x11) EcuReset

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$11
#2	Type	M	Subfunction EcuReset, see page 20

Positive Response:

Byte	Name	Cvt	Value
#1	SID-PR	M	$51
#2	Type	M	Subfunction EcuReset, see page 20

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$11
#3	RESPONSE CODE	M	

Negative Response Codes:

Response code	Error text	Description
0x22	Conditions not correct	

8.4 (0x14) ClearDiagnosticInformation

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$14
#2-4	GroupOfDtc	M	

Positive Response:

Byte	Name	Cvt	Value
#1	SID-PR	M	$54

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$14
#3	RESPONSE CODE	M	

Negative Response Codes:

Response code	Error text	Description
0x22	Conditions not correct	

8.5 (0x19) ReadDtcInformation - Report DTC by status mask

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$19
#2	Has 'Suppress Positive Response Message Indication Bit' ReportDtcByStatusMask	M	$02

Byte	Name	Cvt	Value
#3	DtcStatusMask	M	

Positive Response:

Byte	Name	Cvt	Value
#1	SID-PR	M	$59
#2	ReportDtcByStatusMask	M	$02
#3	DTCAvailabilityMask	M	
#4 : : : #4+a	ListOfDTC=[DTC StatusOfDtc : DTC StatusOfDtc]	M	Number of Iterations: [0..*]

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$19
#3	RESPONSE CODE	M	

8.6 (0x19) ReadDtcInformation - Report number of DTC by status mask

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$19
#2	Has 'Suppress Positive Response Message Indication Bit' ReportNumberOfDtcByStatusMask	M	$01
#3	DtcStatusMask	M	

Positive Response:

Byte	Name	Cvt	Value
#1	SID-PR	M	$59
#2	ReportNumberOfDtcByStatusMask	M	$01
#3	DtcStatusAvailabilityMask	M	
#4	DTCFormatIdentifier	M	
#5-6	DTCCount	M	

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$19
#3	RESPONSE CODE	M	

8.7 (0x22) ReadDataByIdentifier

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$22
#2-3	Identifier (Byteorder: HighLow (Motorola))	M	DataIdentifier, see page 19

Positive Response:

Byte	Name	Cvt	Value

Byte	Name	Cvt	Value
#1	SID-PR	M	$62
#2-3	Identifier (Byteorder: HighLow (Motorola))	M	DataIdentifier, see page 19
#4-4+a	DataRecord	M	

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$22
#3	RESPONSE CODE	M	

Negative Response Codes:

Response code	Error text	Description
0x22	Conditions not correct	

8.8 (0x27) SecurityAccess - Request seed

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$27
#2	Has 'Suppress Positive Response Message Indication Bit' Type	M	Subfunction SecurityAccess, see page 20

Positive Response:

Byte	Name	Cvt	Value
#1	SID-PR	M	$67
#2	Type	M	Subfunction SecurityAccess, see page 20
#3-3+a	SecuritySeed	M	

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$27
#3	RESPONSE CODE	M	

Negative Response Codes:

Response code	Error text	Description
0x22	Conditions not correct	

8.9 (0x27) SecurityAccess - Send key

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$27
#2	Has 'Suppress Positive Response Message Indication Bit' Type	M	Subfunction SecurityAccess, see page 20
#3-3+a	SecurityKey	M	

Positive Response:

Byte	Name	Cvt	Value
#1	SID-PR	M	$67
#2	Type	M	Subfunction SecurityAccess, see page 20

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$27
#3	RESPONSE CODE	M	

Negative Response Codes:

Response code	Error text	Description
0x22	Conditions not correct	

8.10 (0x28) CommunicationControl

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$28
#2	Has 'Suppress Positive Response Message Indication Bit' Type	M	Subfunction CommunicationControl, see page 20
#3	CommunicationType	M	

Positive Response:

Byte	Name	Cvt	Value
#1	SID-PR	M	$68
#2	Type	M	Subfunction CommunicationControl, see page 20

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$28
#3	RESPONSE CODE	M	

Negative Response Codes:

Response code	Error text	Description
0x22	Conditions not correct	
0x33	Security access denied	

8.11 (0x2E) WriteDataByIdentifier

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$2E
#2-3	Identifier (Byteorder: HighLow (Motorola))	M	DataIdentifier, see page 19
#4-4+a	DataRecord	M	

Positive Response:

Byte	Name	Cvt	Value
#1	SID-PR	M	$6E
#2-3	Identifier (Byteorder: HighLow (Motorola))	M	DataIdentifier, see page 19

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$2E

Byte	Name	Cvt	Value
#3	RESPONSE CODE	M	

Negative Response Codes:

Response code	Error text	Description
0x22	Conditions not correct	

8.12 (0x3E) TesterPresent

Request:

Byte	Name	Cvt	Value
#1	SID-RQ	M	$3E
#2	Has 'Suppress Positive Response Message Indication Bit' ZeroSubfunction	M	$00

Positive Response:

Byte	Name	Cvt	Value
#1	SID-PR	M	$7E
#2	ZeroSubfunction	M	$00

Negative Response:

Byte	Name	Cvt	Value
#1	SID-NR	M	$7F
#2	SIDRQ-NR	M	$3E
#3	RESPONSE CODE	M	

9 Negative Responses

If the control unit cannot process a received request, it will answer with one of the following negative response codes (depending on the type of the error). Specific negative response codes are defined at each service individually.

Supported Negative Response Codes:

Response code	Error text	Description
0x10	General reject	
0x11	Service not supported	
0x12	Subfunction not supported	
0x13	Incorrect message length or invalid format	
0x14	Response too long	
0x21	Busy repeat request	
0x22	Conditions not correct	
0x24	Request sequence error	
0x31	Request out of range	
0x33	Security access denied	
0x35	Invalid key	
0x36	Exceed number of attempts	
0x37	Required time delay not expired	
0x70	Upload / Download not accepted	
0x71	Transfer data suspended	
0x72	General programming failure	
0x73	Wrong block sequence counter	
0x78	Request correctly received - response pending	
0x7E	Subfunction not supported in active session	
0x7F	Service not supported in active session	
0x81	RPM too high	
0x82	RPM too low	
0x83	Engine is running	
0x84	Engine is not running	
0x85	Engine runtime too low	
0x86	Temperature too high	
0x87	Temperature too low	
0x88	Vehicle speed too high	
0x89	Vehicle speed too low	
0x8A	Throttle / Pedal too high	
0x8B	Throttle / Pedal too low	
0x8C	Transmission range not in neutral	
0x8D	Transmission range not in gear	
0x8F	Break switch(es) not closed	
0x90	Shifter lever not in park	
0x91	Torque converter clutch locked	
0x92	Voltage too high	
0x93	Voltage too low	

Negative Response Codes for unsupported services:

Response code	Error text	Description
0x11	Service not supported	

Response code	Error text	Description
0x12	Subfunction not supported	

10 Service Index

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