ISO 26021-1:2022-02 (E)

Road vehicles - End-of-life activation of in-vehicle pyrotechnic devices - Part 1: Application and communication interface

Contents

Page

Foreword ..... **vii**

Introduction ..... **viii**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **2**

4 Symbols and abbreviated terms **3**
4.1 Symbols 3
4.2 Abbreviated terms 3

5 Conventions **5**

6 Basic principles and use cases overview **5**
6.1 Basic principles 5
6.2 Use case groups and associated use cases 6

7 Use cases definition (UC) **7**
7.1 UCG 1 – Perform communication interface discovery 7
7.1.1 UC 1.1 – Discover DoCAN communication interface 7
7.1.2 UC 1.2 – Discover DoIP communication interface 7
7.2 UCG-2 – Perform authentication 7
7.2.1 UC 2.1 – Perform PDT authentication 7
7.2.2 UC 2.2 – Perform fixed-address PCU/PCU(s) authentication 8
7.3 UCG 3 – Perform system initialisation (Sys-Init) 8
7.3.1 UC 3.1 – Report PCU hardware deployment method 8
7.3.2 UC 3.2 – Report number of PCU(s) 9
7.3.3 UC 3.3 – Report address information of PCU(s) 9
7.3.4 UC 3.4 – Report vehicle identification number 9
7.3.5 UC 3.5 – Report dismantling documentation of PCU 10
7.4 UCG 4 – Perform PCU initialisation (PCU-Init) 10
7.4.1 UC 4.1 – Report PCU deployment loop identification table 10
7.4.2 UC 4.2 – Initiate safetySystemDiagnosticSession 11
7.4.3 UC 4.3 – Keep-alive safetySystemDiagnosticSession 11
7.4.4 UC 4.4 – Unlock security of PCU 12
7.4.5 UC 4.5 – Execute PCU(s) scrapping program module loader 12
7.5 UCG 5 – Perform PCU and ACL sequence (PCU- and ACL-Scrapping) 13
7.5.1 UC 5.1 – Report ACL deployment sequence (ACL-Init) 13
7.5.2 UC 5.2 – Write dismantling documentation into PCU (Device-Deploy) 13
7.5.3 UC 5.3 – Perform ACL deployment confirmation sequence (Device-Deploy) 14
7.5.4 UC 5.4 – Perform PCU pyrotechnic device scrapping via loop identification (Device-Deploy) 14
7.6 UCG 6 – Terminate PCU pyrotechnic device deployment (PCU-End) 15
7.6.1 UC 6.1 – Terminate PCU pyrotechnic device scrapping via communication interface 15
7.6.2 UC 6.2 – Terminate PCU pyrotechnic device scrapping via ACL 15

8 Application (APP) **16**
8.1 APP – Preconditions of end-of-life activation of pyrotechnic devices 16
8.2 APP – Overview of end-of-life activation of pyrotechnic devices sequence 17
8.3 APP – Software provisions 19
8.3.1 APP – Scrapping program module (SPM) 19
8.3.2 APP – Scrapping program module loader (SPL) 19

8.3.3 APP – PCU loop identification table ... 19
8.4 APP – Mapping of use cases to requirements ... 20
8.5 APP – Application timing definition ... 21
8.6 APP – Discovery of communication interface (Com I/F-Discovery) ... 22
8.6.1 APP – Overview of discovery of communication interface (Com-Discovery) ... 22
8.6.2 APP – Setup DoCAN communication interface ... 22
8.6.3 APP – Setup DoIP communication interface ... 24
8.6.4 APP – Determination of DoCAN or DoIP communication interface in the vehicle ... 25
8.7 APP – Perform authentication – Optional (Sys-Auth) ... 26
8.7.1 APP – Overview of the authentication – Optional (Sys-Auth) ... 26
8.7.2 APP – PDT authentication against fixed-address PCU – Optional (Sys-Auth) ... 26
8.7.3 APP – Fixed-address PCU authentication against PDT – Optional (Sys-Auth) ... 27
8.8 APP – Perform system initialisation (Sys-Init) ... 27
8.8.1 APP – Overview of the system initialisation (Sys-Init) ... 27
8.8.2 APP – Report PcuHardwareDeploymentMethod (Sys-Init) ... 28
8.8.3 APP – Report number of PCUs (Sys-Init) ... 28
8.8.4 APP – Report DoCAN address information of PCUs (Sys-Init) ... 28
8.8.5 APP – Report DoIP address information of PCUs (Sys-Init) ... 30
8.8.6 APP – Report vehicle identification number (Sys-Init) ... 31
8.8.7 APP – Report dismantling documentation of PCU (Sys-Init) ... 31
8.9 APP – Perform PCU initialisation (PCU-Seq) ... 31
8.9.1 APP – Overview of the PCU initialisation (PCU-Seq) ... 31
8.9.2 APP – Report PCU deployment loop identification table (PCU-Seq) ... 32
8.9.3 APP – Initiate safetySystemDiagnosticSession (PCU-Seq) ... 33
8.9.4 APP – Keep-alive safetySystemDiagnosticSession (PCU-Seq) ... 33
8.9.5 APP – Unlock security of PCU (PCU-Seq) ... 33
8.9.6 APP – Execute PCU scrapping program module loader (PCU-Seq) ... 33
8.10 APP – Perform PCU and ACL scrapping (Device-Deploy) ... 34
8.10.1 APP – Overview of the PCU- and ACL-Scrapping (Device-Deploy) ... 34
8.10.2 APP – Report ACL deployment sequence (ACL-Prep) ... 34
8.10.3 APP – Write dismantling documentation into PCU (Device-Deploy) ... 35
8.10.4 APP – Confirm ACL deployment sequence (Device-Deploy) ... 35
8.10.5 APP – Perform device scrapping (Device-Deploy) ... 35
8.10.6 APP – Evaluation of device scrapping (Device-Deploy) ... 35
8.10.7 APP – Next pyrotechnic device (Device-Deploy) ... 36
8.11 APP – Terminate PCU and ACL pyrotechnic device deployment (PCU-End) ... 36
8.11.1 APP – Overview of the PCU- and ACL-Termination (PCU-End) ... 36
8.11.2 APP – Terminate PCU pyrotechnic device scrapping (PCU-End) ... 36
8.11.3 APP – Terminate PCU pyrotechnic device scrapping via ACL (PCU-End) ... 37
8.12 APP – Terminate system deployment (Sys-End) ... 37

9 Service interface (SI) definition between application and OSI layers ... 37
9.1 SI — A_Data.req, A_Data.ind, and A_Data.conf service interface (SI) ... 37
9.2 SI — A_Data.req, A_Data.ind, and A_Data.conf service interface (SI) parameter mapping ... 38
9.3 Service interface parameters (SIP) ... 39
9.3.1 SIP – General ... 39
9.3.2 SIP – Data type definitions ... 39
9.3.3 SIP – Mtype, message type ... 39
9.3.4 SIP – TAtype, target address type ... 39
9.3.5 SIP – AE, address extension ... 39
9.3.6 SIP – TA, target address ... 39
9.3.7 SIP – SA, source address ... 40
9.3.8 SIP – Length, length of PDU ... 40
9.3.9 SIP – PDU, protocol data unit ... 40
9.3.10 SIP – Result, result ... 40

10 Application layer (AL) ... 40
10.1 AL – Applicable ISO 14229-1 UDS functionality ... 40
10.2 AL – PCU timing parameters ... 41
10.3 AL – Authentication ... 41
10.3.1 AL – Requirements specification – PDT authentication ... 41

10.3.2 AL – Requirements specification – Fixed-address PCU/PCU(s) authentication 42
10.4 AL – ReadDataByIdentifier – Read PCU hardware deployment method 42
10.4.1 AL – Requirements specification – Read PCU hardware deployment method 42
10.4.2 AL – Message sequence requirements – Read PcuHardwareDeploymentMethod 43
10.4.3 AL – Message sequence example – Read PcuHardwareDeploymentMethod 43
10.5 AL – ReadDataByIdentifier – Read NumberOfPcu in vehicle 44
10.5.1 AL – Requirements specification – Read NumberOfPcu in vehicle 44
10.5.2 AL – Message sequence requirements – Read number of PCUs in vehicle 44
10.5.3 AL – Message sequence example – Read NumberOfPcu in vehicle 45
10.6 AL – ReadDataByIdentifier – Read PcuAddressInfo 45
10.6.1 AL – Requirements specification – Read PcuAddressInfo 45
10.6.2 AL – Message sequence requirements – Read PcuAddressInfo of PCU 46
10.6.3 AL – Message sequence example – Read PcuAddressInfo of DoCAN PCU 46
10.6.4 AL – Message sequence example – Read PcuAddressInfo of DoIP PCU 47
10.7 AL – ReadDataByIdentifier – Report VIN from PCU 48
10.7.1 AL – Requirements specification – Report VIN from PCU 48
10.7.2 AL – Message sequence requirements – Report VIN from PCU 48
10.7.3 AL – Message sequence example – Report VIN from PCU 48
10.8 AL – ReadDataByIdentifier – Report dismantler information 49
10.8.1 AL – Requirements specification – Report dismantler information 49
10.8.2 AL – Message sequence requirements – Report dismantler information 50
10.8.3 AL – Message sequence example – Report dismantler information 50
10.9 AL – ReadDataByIdentifier – Read deployment loop identification table 50
10.9.1 AL – Requirements specification – Read deployment loop identification table 50
10.9.2 AL – Message sequence requirements – Read deployment loop identification table 51
10.9.3 AL – Message sequence example – Read deployment loop identification table 52
10.10 AL – DiagnosticSessionControl – safetySystemDiagnosticSession 53
10.10.1 AL – Requirements specification – safetySystemDiagnosticSession 53
10.10.2 AL – Message sequence requirements – safetySystemDiagnosticSession 53
10.10.3 AL – Message sequence example – safetySystemDiagnosticSession 53
10.11 AL – TesterPresent 54
10.11.1 AL – Requirements specification – TesterPresent 54
10.11.2 AL – Message sequence requirements – TesterPresent 54
10.11.3 AL – Message sequence example – TesterPresent 55
10.12 AL – SecurityAccess 55
10.12.1 AL – Requirements specification – SecurityAccess 55
10.12.2 AL – Message sequence requirements – SecurityAccess 56
10.12.3 AL – Message sequence example – SecurityAccessType = RequestSeed 57
10.12.4 AL – Message sequence example – SecurityAccessType = SendDeploymentKey 57
10.13 AL – WriteDataByIdentifier – Write dismantler information 58
10.13.1 AL – Requirements specification – Write dismantler identification information 58
10.13.2 AL – Message sequence requirements – Write dismantler identification information 58
10.13.3 AL – Message sequence example – Write dismantler identification information 59
10.14 AL – RoutineControl 59
10.14.1 AL – Requirements specification – RoutineControl 59
10.14.2 AL – Message sequence requirements – RoutineControl 61
10.14.3 AL – Message sequence example – ExecuteSPL with SF = startRoutine 61
10.14.4 AL – Message sequence example – ExecuteSPL with SF = requestRoutineResult 62
10.14.5 AL – Message sequence example – DeployLoopRoutineID with SF = startRoutine 62

10.14.6 AL – Message sequence example – DeployLoopRoutineID with SF = requestRoutineResult ... 63
10.15 AL – ACL request deployment sequence (optional) ... 64
10.15.1 AL – Requirements specification – ACL request deployment sequence ... 64
10.15.2 AL – Message sequence requirements – ACL request deployment sequence ... 64
10.16 AL – ACL confirm deployment sequence (optional) ... 64
10.16.1 AL – Requirements specification – ACL confirm deployment sequence ... 64
10.16.2 AL – Message sequence requirements – ACL confirm deployment sequence (optional) ... 65
10.17 AL – ACL terminate deployment sequence (optional) ... 65
10.17.1 AL – Requirements specification – ACL terminate deployment sequence (optional) ... 65
10.17.2 AL – Message sequence requirements – ACL terminate deployment sequence ... 65
10.18 AL – EcuReset ... 66
10.18.1 AL – Requirements specification – EcuReset ... 66
10.18.2 AL – Message sequence requirements – EcuReset ... 66
10.18.3 AL – Message sequence example – hardReset ... 66

11 Presentation layer (PL) ... 67
11.1 PL – Data type UNUM8 ... 67
11.2 PL – Data type UNUM16 ... 67
11.3 PL – Data type UNUM32 ... 67
11.4 PL – Data type UCHAR8 ... 67

12 Session layer (SL) ... 67
12.1 SL – Timing parameters ... 67
12.2 SL – Error detection ... 68

13 Transport layer (TL) ... 68
13.1 TL – DoCAN ... 68
13.2 TL – DoIP ... 68

14 Network layer (NL) ... 68
14.1 NL – DoCAN ... 68
14.2 NL – DoIP ... 69

15 Data link layer (DLL) ... 69
15.1 DLL – CAN L_Data frame padding bytes ... 69
15.2 DLL – ACL with bidirectional communication ... 69
15.2.1 DLL – `tP4_Sender` timing specification ... 69
15.2.2 DLL – Bit rate and byte format specification ... 69

16 Physical layer (PHY) ... 70
16.1 PHY – Connection between PDT and vehicle PCU(s) ... 70
16.2 PHY – Conformance to CAN ... 71
16.3 PHY – Conformance to Ethernet ... 71
16.4 PHY – In-vehicle ACL with bidirectional communication (optional) ... 71
16.4.1 PHY – Determine ACLType ... 71
16.4.2 PHY – ACL_CommMode hardware provision ... 71
16.4.3 PHY – ACL_CommMode conformance to ISO 14230-1 ... 72
16.5 PHY – In-vehicle ACL with PWM signal (optional) ... 74
16.5.1 PHY – Determine ACLType ... 74
16.5.2 PHY – ACL_PWMMode hardware provision ... 74
16.5.3 PHY – ACL PWM signal specification ... 75

Annex A (informative) **Typical configuration of PDT and vehicle PCU ... 79**

Annex B (informative) **Network architecture examples ... 81**

Bibliography ... 88