BS ISO 26021-1:2022

BSI Standards Publication

Road vehicles - End-of-life activation of in-vehicle pyrotechnic devices

Part 1: Application and communication interface

Documents
Document Sharing Hub

Full document details: BS ISO 26021-1:2022

National foreword

This British Standard is the UK implementation of ISO 26021-1:2022. Together with BS ISO 26021-3:2022, it supersedes BS ISO 26021-1:2008, BS ISO 26021-2:2008, BS ISO 26021-4:2009 and BS ISO 26021-5:2009, which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AUE/16, Data Communication (Road Vehicles).

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2022
Published by BSI Standards Limited 2022

ISBN 978 0 539 14450 5

ICS 43.040.80

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2022.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS ISO 26021-1:2022

INTERNATIONAL STANDARD

ISO 26021-1

Second edition
2022-02

Road vehicles — End-of-life activation of in-vehicle pyrotechnic devices —

Part 1: Application and communication interface

Véhicules routiers — Activation de fin de vie des dispositifs pyrotechniques embarqués —

Partie 1: Interface des couches application et communication

Reference number
ISO 26021-1:2022(E)

Documents
Document Sharing Hub
© ISO 2022

Full document details: BS ISO 26021-1:2022

COPYRIGHT PROTECTED DOCUMENT

© ISO 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub

Full document details: BS ISO 26021-1:2022

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

AVA Documents
Document Sharing Hub

© ISO 2022 – All rights reserved

Full document details: BS ISO 26021-1:2022

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

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

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

Documents
Document Sharing Hub

© ISO 2022 – All rights reserved

Full document details: BS ISO 26021-1:2022

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

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

This second edition cancels and replaces the first edition (ISO 26021-1:2008, ISO 26021-2:2008, ISO 26021-2:2008/Cor 1:2009, ISO 26021-4:2009, ISO 26021-5:2009), which have been technically revised.

The main changes are as follows:

— restructuring of four parts into a single document including use cases and application requirements;

— introduction of requirement structure with numbering and name;

— support of ISO 13400 DoIP (diagnostic communication over Internet Protocol);

— support of ISO 13400-4 DoIP diagnostic connector.

A list of all parts in the ISO 26021 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Introduction

End-of-life deployment activation of on-board pyrotechnic devices is a part of a wider regime designed to ensure that road vehicles are scrapped in a safe and environmentally acceptable condition after their use.

Newly designed products implement new security features like the authentication service. Such vehicle PCU(s) can not be supported by pyrotechnic device deployment tools (PDTs) without security implementation.

The ISO 26021 series is based on the Open Systems Interconnection (OSI) basic reference model specified in ISO/IEC 7498-1 and ISO/IEC 10731[1], which structures communication systems into seven layers. When mapped on this model, the application layer protocol and data link layer framework requirements specified/referenced in the ISO 26021 series are structured according to Figure 1.

Figure 1 illustrates a standard-based documentation concept, which consists of the following main clusters:

— vehicle diagnostic communication framework: covers all relevant basic vehicle diagnostic communication specifications of OSI layers 7, 6 and 5;

— vehicle diagnostic communication use case framework: covers the use cases and requirements of the subject matter of OSI layer 7;

— presentation layer framework: covers all data-relevant specifications of OSI layer 6;

— conformance test plan: covers the conformance test plan requirements of the use cases and communication requirements of OSI layers 7, 6 and 5;

— lower OSI layer framework: covers all vehicle diagnostic protocol standards of OSI layers 4, 3, 2 and 1, which are relevant and referenced by the use case specific standard.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

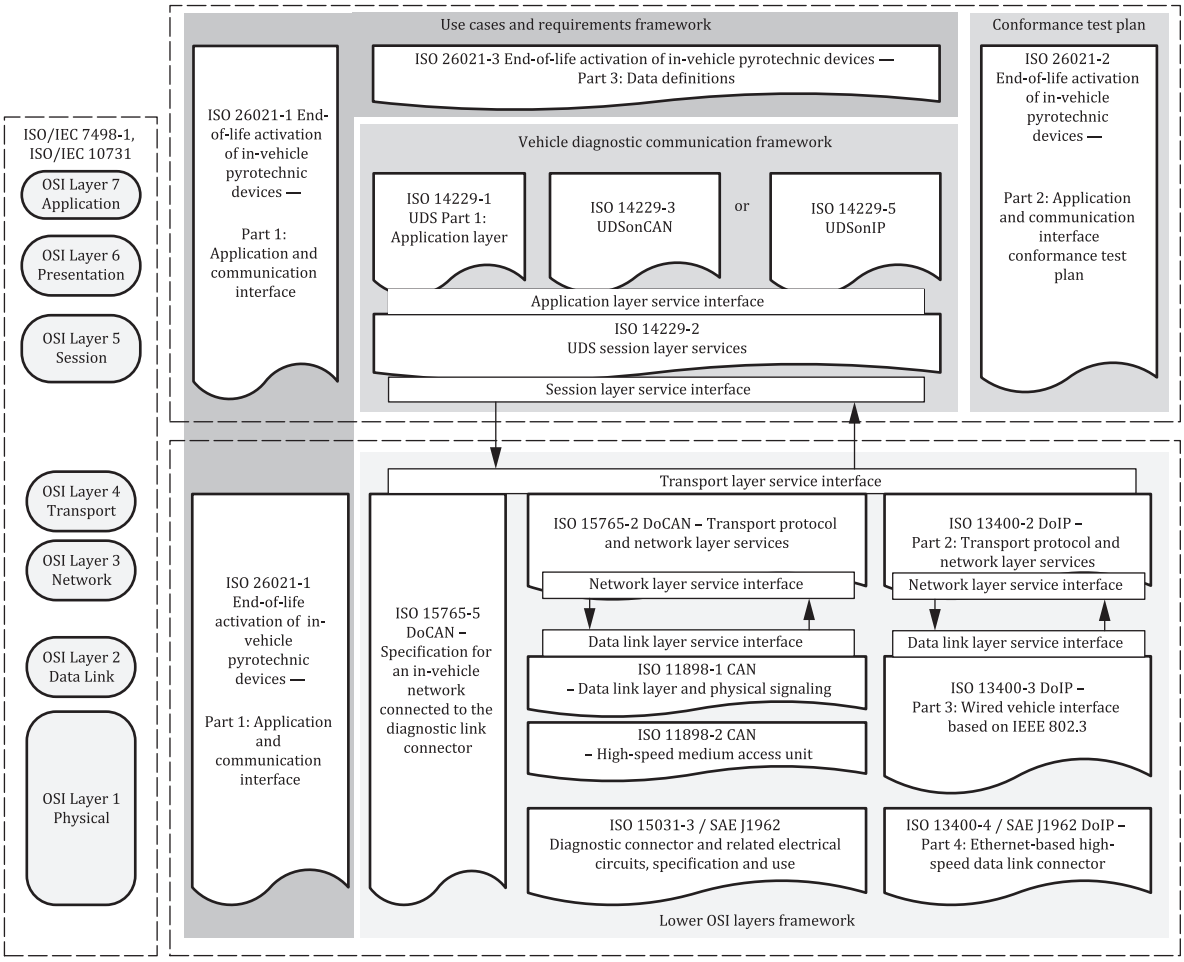


Figure 1 — ISO 26021 documents reference according to OSI model

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Documents
Document Sharing Hub

INTERNATIONAL STANDARD **ISO 26021-1:2022(E)**

Road vehicles — End-of-life activation of in-vehicle pyrotechnic devices —

Part 1: Application and communication interface

1 Scope

This document is applicable to road vehicles, where the electronic vehicle interface of the diagnostic link connector (DLC) is used to perform an end-of-life (EoL) activation of in-vehicle pyrotechnic devices. Apart from actual removal, this is the method to assure that no pyrotechnic substances are left in an EoL vehicle. On-board activation is an effective and safe method.

This document describes use cases and specifies technical requirements in order to support the end-of-life activation of in-vehicle pyrotechnic devices via the electronic communication interface. This document references the ISO 14229 series unified diagnostic services implemented on diagnostic communication over controller area network (DoCAN) and Internet Protocol (DoIP) along with the required provision of data definitions.

This document comprises:

— terminology definitions;

— definition of end-of-life activation of in-vehicle pyrotechnic devices relevant use cases;

— requirements for the establishment of communication between the pyrotechnic device deployment tool (PDT) and the vehicle's pyrotechnic control unit(s) (PCU(s));

— requirements for the optional usage of a credentials-based authentication and authorisation mechanism between the PDT and the vehicle;

— requirements for the protection against tampering of the defined end-of-life activation of in-vehicle pyrotechnic devices;

— PCU-relevant technical requirements.

PDT-relevant requirements are specified in a test equipment-specific standard with PDT-specific requirements.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 7498-1, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model*

ISO/IEC 9834-1, *Information technology — Procedures for the operation of object identifier registration authorities: General procedures and top arcs of the international object identifier tree — Part 1:*

ISO 11898-1, *Road vehicles — Controller area network (CAN) — Part 1: Data link layer and physical signalling*

ISO 11898-2, *Road vehicles — Controller area network (CAN) — Part 2: High-speed medium access unit*

© ISO 2022 – All rights reserved

AVA Documents Document Sharing Hub

Full document details: BS ISO 26021-1:2022

ISO 13400-2, *Road vehicles — Diagnostic communication over Internet Protocol (DoIP) — Part 2: Transport protocol and network layer services*

ISO 13400-3, *Road vehicles — Diagnostic communication over Internet Protocol (DoIP) — Part 3: Wired vehicle interface based on IEEE 802.3*

ISO 13400-4, *Road vehicles — Diagnostic communication over Internet Protocol (DoIP) — Part 4: Ethernet-based high-speed data link connector*

ISO 14229-1, *Road vehicles — Unified diagnostic services (UDS) — Part 1: Application layer*

ISO 14229-2, *Road vehicles — Unified diagnostic services (UDS) — Part 2: Session layer services*

ISO 14229-3, *Road vehicles — Unified diagnostic services (UDS) — Part 3: Unified diagnostic services on CAN implementation (UDSonCAN)*

ISO 14229-5, *Road vehicles — Unified diagnostic services (UDS) — Part 5: Unified diagnostic services on Internet Protocol implementation (UDSonIP)*

ISO 14230-1, *Road vehicles — Diagnostic communication over K-Line (DoK-Line) — Part 1: Physical layer*

ISO 15031-3, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 3: Diagnostic connector and related electrical circuits: Specification and use*

ISO 15765-2, *Road vehicles — Diagnostic communication over Controller Area Network (DoCAN) — Part 2: Transport protocol and network layer services*

ISO 15765-5, *Road vehicles — Diagnostic communication over Controller Area Network (DoCAN) — Part 5: Specification for an in-vehicle network connected to the diagnostic link connector*

ISO 26021-3,[1)]*Road vehicles — End-of-life activation of on-board pyrotechnic devices — Part 3: Data definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 7498-1, ISO 14229-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
key
data value sent from the external test equipment to the on-board controller in response to the *seed* (3.9) in order to gain access to the locked services

3.2
pyrotechnic control unit
PCU
electronic control unit in the vehicle network which controls the activation of pyrotechnic devices

3.3
pulse width modulation
PWM
signal linked by the ACL to the independent hardware path in the *pyrotechnic control unit* (3.2)

Note 1 to entry: The PWM signal is active during the deployment session.

1) Second edition under preparation. Stage at the time of publication: ISO/DIS 26021-3:2022.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

3.4
pyrotechnic device deployment tool
PDT
tool designed to be plugged into the OBD interface in order to communicate via the internal computer network in an end-of-life vehicle with control units which are able to activate pyrotechnic devices

3.5
safing
mechanism whose primary purpose is to prevent an unintended functioning of the *pyrotechnic control unit* (3.2) processor prior to detection of a crash situation

3.6
safing unit
part of the *pyrotechnic control unit* (3.2) that allows the pyrotechnic component deployment microprocessor (µP) to deploy the pyrotechnic devices via the driver stage

EXAMPLE An electromechanically operated switch or a separate processor.

3.7
scrapping program module
module responsible for firing the selected pyrotechnic device loops one by one

3.8
scrapping program module loader
module responsible for converting the *scrapping program module* (3.7) to an executable format

3.9
seed
pseudo-random data value sent from the on-board controller to the external test equipment, which is processed by the security algorithm to produce the *key* (3.1)

4 Symbols and abbreviated terms

4.1 Symbols

Δ	delta
Δt_{P6_Client}	DoIP network design-dependent delays
Δt_{P6*_Client}	DoIP network design-dependent extended delays
Δt_{P2}	DoCAN network design-dependent delays
t	time
t_{S3_Client}	client session timer
t_{S3_Server}	server session timer
$t_{P2_Server_Max}$	server response timer maximum value
$t_{P2*_Server_Max}$	server extended response timer maximum value
$t_{P3_Client_Phys}$	time between end of server response and start of new client request

4.2 Abbreviated terms

ACL	additional communication line

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

AL	application layer
APP	application
BP	basic principle
CAN	controller area network
CANID	CAN identifier
DID	data identifier
DLC	diagnostic link connector
DLL	data link layer
DoCAN	diagnostic communication over CAN
DoIP	diagnostic communication over internet protocol
EoL	end-of-life
IDIS	international dismantling information system
IO	input, output
LSb	least significant bit
LSB	least significant byte
M	mandatory
MSb	most significant bit
MSB	most significant byte
MsgParam	message parameter
N/A	not applicable
NRC	negative response code
NL	network layer
O	optional
OBD	on-board diagnostic
OSI	open systems interconnection
PCU	pyrotechnic control unit
PDT	pyrotechnic device deployment tool
PDU	protocol data unit
PHY	physical layer
PL	presentation layer
PosRspMsgParam	positive response message parameter

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

PWM	pulse width modulation
RAM	random access memory
REQ	requirement
ReqMsgParam	request message parameter
RID	routine identifier
SA	source address
SL	session layer
SI	service interface
SIP	service interface parameter
SPL	scrapping program module loader
SPM	scrapping program module
SRS	supplemental restraint system
SF	SubFunction
TA	target address
TL	transport layer
µC	microcontroller
UDS	unified diagnostic services
VIN	vehicle identification number
VM	vehicle manufacturer

5 Conventions

This document is based on OSI service conventions as specified in ISO/IEC 10731[1].

6 Basic principles and use cases overview

6.1 Basic principles

Basic principles are established as a guideline to develop this document.

— BP1: use cases describe the interaction between the PDT and the vehicle's pyrotechnic device(s) utilising the vehicle's communication interface and/or additional communication line at the diagnostic link connector.

— BP2: use cases of the same subject are combined in one use case group.

— BP3: use cases described in this document are described from a vehicle's point of view.

— BP4: use cases are described independently of the vehicle system group, e.g. safety systems.

— BP5: all communication messages comply with the ISO 14229 series.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

— BP6: all data definitions comply with the ISO 14229 series.

— BP7: fixed parameter values, for example, hardware deployment method, number of PCU(s), address information, VIN, dismantling information, and routine controls are assigned to standardized identifiers (DIDs, RIDs) and are mandatory for applicable use cases and interface requirements unless otherwise noted.

— BP8: requirements inherit the classification of the corresponding use cases.

— BP9: a "REQ X.Y" requirement specifies a single requirement (not multiple).

— BP10: only diagnostic services and data that are within the scope of the ISO 26021 series are guaranteed to work in the context of end-of-life deployment activation of on-board pyrotechnic devices.

6.2 Use case groups and associated use cases

Table 1 provides an overview of the main use case groups, associated use cases.

Table 1 — Use case groups and associated use cases

#	Use case group (UCG)	Use case reference
1	UCG 1 – Perform communication interface discovery	UC 1.1 – Discover DoCAN communication interface UC 1.2 – Discover DoIP communication interface
2	UCG-2 – Perform authentication	UC 2.1 – Perform PDT authentication UC 2.2 – Perform fixed-address PCU/PCU(s) authentication
3	UCG 3 – Perform system initialisation (Sys-Init)	UC 3.1 – Report PCU hardware deployment method UC 3.2 – Report number of PCU(s) UC 3.3 – Report address information of PCU(s) UC 3.4 – Report vehicle identification number UC 3.5 – Report dismantling documentation of PCU
4	UCG 4 – Perform PCU initialisation (PCU-Init)	UC 4.1 – Report PCU deployment loop identification table UC 4.2 – Initiate safetySystemDiagnosticSession UC 4.3 – Keep-alive safetySystemDiagnosticSession UC 4.4 – Unlock security of PCU UC 4.5 – Execute PCU(s) scrapping program module loader
5	UCG 5 – Perform PCU and ACL sequence (PCU- and ACL-Scrapping)	UC 5.1 – Report ACL deployment sequence (ACL-Init) UC 5.2 – Write dismantling documentation into PCU (Device-Deploy) UC 5.3 – Perform ACL deployment confirmation sequence (Device-Deploy) UC 5.4 – Perform PCU pyrotechnic device scrapping via loop identification (Device-Deploy)
6	UCG 6 – Terminate PCU pyrotechnic device deployment (PCU-End)	UC 6.1 – Terminate PCU pyrotechnic device scrapping via communication interface UC 6.2 – Terminate PCU pyrotechnic device scrapping via ACL

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

7 Use cases definition (UC)

7.1 UCG 1 – Perform communication interface discovery

7.1.1 UC 1.1 – Discover DoCAN communication interface

Table 2 defines the UC 1.1 – Discover DoCAN communication interface.

Table 2 — UC 1.1 – Discover DoCAN communication interface

Item	Description
Name	UC 1.1 – Discover DoCAN communication interface
Goal	The fixed-address PCU/gateway listens on the DoCAN communication interface connected to the vehicle's diagnostic link connector to discover the PDT selected protocol.
Actor	PDT and fixed-address PCU/gateway
Input	The fixed-address PCU/gateway listens on the DoCAN communication interface for a request message sent by the PDT.
Output	Transmission of a positive response message on the DoCAN communication interface by the fixed-address PCU/gateway
Function	The fixed-address PCU/gateway (depends on in-vehicle network architecture implementation) listens on the DoCAN communication interface(s) connected to the vehicle diagnostic link connector according to ISO 15031-3 for a request message sent by the PDT. The fixed-address PCU/gateway responds with a positive response message on the DoCAN communication interface.
Classification	Mandatory

7.1.2 UC 1.2 – Discover DoIP communication interface

Table 3 defines the UC 1.2 – Discover DoIP communication interface.

Table 3 — UC 1.2 – Discover DoIP communication interface

Item	Description
Name	UC 1.2 – Discover DoIP communication interface
Goal	The fixed-address PCU/gateway listens on the DoIP communication interface connected to the vehicle's diagnostic link connector to discover the PDT selected protocol.
Actor	PDT and fixed-address PCU/gateway
Input	The fixed-address PCU/gateway listens on the DoIP communication interface for a request message sent by the PDT.
Output	Transmission of positive response message on the DoIP communication interface by the fixed-address PCU/gateway
Function	The fixed-address PCU/gateway (depends on in-vehicle network architecture implementation) listens on the DoIP communication interface connected to the vehicle diagnostic link connector according to ISO 13400-4 for a request message sent by the PDT. The fixed-address PCU/gateway responds with a positive response message on the DoIP communication interface.
Classification	Mandatory

7.2 UCG-2 – Perform authentication

7.2.1 UC 2.1 – Perform PDT authentication

Table 4 defines the UC 2.1 – Perform PDT authentication.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Table 4 — UC 2.1 – Perform PDT authentication

Item	Description
Name	UC 2.1 – Perform PDT authentication
Goal	Authenticate the PDT against the fixed address PCU/gateway/PCU(s)
Actor	PDT and fixed-address PCU/gateway/PCU(s)
Input	Valid credentials sent by the PDT to the fixed address PCU/gateway/PCU(s)
Output	The fixed address PCU/gateway/PCU(s) send(s) the result of the authentication to the PDT. A positive authentication response message confirms the authenticity.
Function	The PDT uses credentials to authenticate against the fixed address PCU/gateway/PCU(s). The fixed address PCU/gateway/PCU(s) respond(s) with the result of the authentication and if successful, grant access rights to all diagnostic services and data necessary to fulfil the use cases specified in this document.
Classification	Optional

7.2.2 UC 2.2 – Perform fixed-address PCU/PCU(s) authentication

Table 5 defines the UC 2.2 – Perform fixed-address PCU/PCU(s) authentication.

Table 5 — UC 2.2 – Perform fixed-address PCU/PCU(s) authentication

Item	Description
Name	UC 2.2 – Perform fixed-address PCU/PCU(s) authentication
Goal	Authenticate the fixed address PCU(s)/gateway/PCU(s) against the PDT
Actor	PDT and fixed-address PCU/gateway/PCU(s)
Input	Valid credentials sent by the fixed address PCU(s)/gateway/PCU(s) to the PDT
Output	The PDT sends the result of the authentication to the fixed address PCU/gateway/PCU(s). A positive authentication response message confirms the authenticity.
Function	The fixed address PCU(s)/gateway/PCU(s) use(s) credentials to authenticate against the PDT. The PDT responds with the result of the authentication.
Classification	Optional

7.3 UCG 3 – Perform system initialisation (Sys-Init)

7.3.1 UC 3.1 – Report PCU hardware deployment method

Table 6 defines the UC 3.1 – Report PCU hardware deployment method.

Table 6 — UC 3.1 – Report PCU hardware deployment method

Item	Description
Name	UC 3.1 – Report PCU hardware deployment method
Goal	The fixed-address PCU provides the hardware deployment method information upon request by the PDT.
Actor	PDT and fixed-address PCU(s)
Input	Fixed-address PCU(s) receive(s) request message with DID = PCUHardwareDeploymentMethod.
Output	Fixed-address PCU(s) transmit(s) the positive response message with DID = PCUHardwareDeploymentMethod, its value, and the ACL type parameter to the PDT.
Function	The PDT requests the PCUHardwareDeploymentMethod. The fixed-address PCU(s) respond(s) with the PCUHardwareDeploymentMethod information.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Table 6 *(continued)*

Item	Description
Classification	Mandatory

7.3.2 UC 3.2 – Report number of PCU(s)

Table 7 defines the UC 3.2 – Report number of PCU(s).

Table 7 — UC 3.2 – Report number of PCU(s)

Item	Description
Name	UC 3.2 – Report number of PCU(s)
Goal	The fixed-address PCU provides the number of PCU(s) information upon request by the PDT.
Actor	PDT and fixed-address PCU(s)
Input	Fixed-address PCU(s) receive(s) request message with DID = NumberOfPCU.
Output	Fixed-address PCU(s) transmit(s) the positive response message with DID = NumberOfPCU and its value to the PDT.
Function	The PDT requests the NumberOfPCU. The fixed-address PCU(s) respond(s) with the NumberOfPCU information. The NumberOfPCU value specifies the outer loop of the scrapping sequence, which is stored for later use in the sequence executed by the PDT.
Classification	Mandatory

7.3.3 UC 3.3 – Report address information of PCU(s)

Table 8 defines the UC 3.3 – Report address information of PCU(s).

Table 8 — UC 3.3 – Report address information of PCU(s)

Item	Description
Name	UC 3.3 – Report address information of PCU(s)
Goal	The fixed-address PCU(s) provide(s) the address information of PCUs upon request by the PDT.
Actor	PDT and fixed-address PCU(s)
Input	Fixed-address PCU(s) receive(s) request message with DID = AddressInfoOfPCUs
Output	Fixed-address PCU(s) transmit(s) the positive response message with DID = AddressInfoOfPCUs and its information of each PCU installed in the vehicle to the PDT.
Function	The purpose of this feature is to support the backward compatibility of used addressing methods implemented in PCUs. The PDT requests the AddressInfoOfPCUs. The fixed-address PCU(s) respond(s) with the AddressInfoOfPCUs information. The AddressInfoOfPCUs information consists of the data record PCU address format #1, PCU request address #1, the PCU response address #1, up to PCU address format #N, PCU request address #N, the PCU response address #N.
Classification	Mandatory

7.3.4 UC 3.4 – Report vehicle identification number

Table 9 defines the UC 3.4 – Report vehicle identification number.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Table 9 — UC 3.4 – Report vehicle identification number

Item	Description
Name	UC 3.4 – Report vehicle identification number
Goal	The fixed-address PCU(s) provide(s) the VIN.
Actor	PDT and fixed-address PCU(s)
Input	Fixed-address PCU(s) receive(s) request message with DID = VIN.
Output	Fixed-address PCU(s) transmit(s) the positive response message with DID = VIN and its information to the PDT.
Function	The PDT requests the VIN. The fixed-address PCU(s) respond(s) with the VIN. The VIN is used to uniquely identify the vehicle.
Classification	Mandatory

7.3.5 UC 3.5 – Report dismantling documentation of PCU

Table 10 defines the UC 3.5 – Report dismantling documentation of PCU.

Table 10 — UC 3.5 – Report dismantling documentation of PCU

Item	Description
Name	UC 3.5 – Report dismantling documentation of PCU
Goal	The fixed-address PCU(s) receive(s) a request to report the dismantling information from the vehicle's fixed-address PCU(s) protected, permanent memory.
Actor	PDT and fixed-address PCU(s)
Input	Fixed-address PCU(s) receive(s) request message with DID = DismantlerIdentification.
Output	The DismantlerIdentification number, the PCU deployment device identification value, the year, month, and the day of deployment is read from the fixed-address PCU's protected, permanent memory.
Function	The PDT requests the DismantlerIdentification data. The fixed-address PCU responds with the DismantlerIdentification information.
Classification	Mandatory

7.4 UCG 4 – Perform PCU initialisation (PCU-Init)

7.4.1 UC 4.1 – Report PCU deployment loop identification table

Table 11 defines the UC 4.1 – Report PCU deployment loop identification table.

Table 11 — UC 4.1 – Report PCU deployment loop identification table

Item	Description
Name	UC 4.1 – Report PCU deployment loop identification table
Goal	Determine the number and status of pyrotechnic devices supported in the vehicle.
Actor	PDT and PCU #1 to #N
Input	The addressed PCU #1 to #N listens on the supported communication interface for a ReadDataByIdentifer request message with DID = NumOfDeployLoopTableRecAndStatus sent by the PDT.
Output	Transmission of a ReadDataByIdentifer positive response message with the DeploymentLoopIdTable on the communication interface supported by the PCU #1 to #N

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Table 11 *(continued)*

Item	Description
Description	The addressed PCU #1 to #N listens on the supported communication interface connected to the vehicle diagnostic link connector according to either ISO 15031-3, ISO 13400-4 for a ReadDataByIdentifer request message with DID = DeploymentLoopIdTable sent by the PDT. The addressed PCU #1 to #N responds with a positive response message on the supported communication interface.
Classification	Mandatory

7.4.2 UC 4.2 – Initiate safetySystemDiagnosticSession

Table 12 defines the UC 4.2 – Initiate safetySystemDiagnosticSession.

Table 12 — UC 4.2 – Initiate safetySystemDiagnosticSession

Item	Description
Name	UC 4.2 – Initiate safetySystemDiagnosticSession
Goal	Transit one of the PCUs into the safety system diagnostic session
Actor	PDT and PCU #1 to #N
Input	The addressed PCU #1 to #N listens on the supported communication interface for a DiagnosticSessionControl request message with the SubFunction parameter set to safetySystemDiagnosticSession sent by the PDT.
Output	The addressed PCU #1 to #N transmits a DiagnosticSessionControl positive response message on the communication interface.
Function	The addressed PCU #1 to #N (depends on in-vehicle network architecture implementation) listens on the supported communication interface connected to the vehicle diagnostic link connector according to either ISO 15031-3, ISO 13400-4 for a DiagnosticSessionControl request message with the SubFunction parameter set to safetySystemDiagnosticSession. The addressed PCU #1 to #N responds with a DiagnosticSessionControl positive response message on the supported communication interface.
Classification	Mandatory

7.4.3 UC 4.3 – Keep-alive safetySystemDiagnosticSession

Table 13 defines the UC 4.3 – Keep-alive safetySystemDiagnosticSession.

Table 13 — UC 4.3 – Keep-alive safetySystemDiagnosticSession

Item	Description
Name	UC 4.3 – Keep-alive safetySystemDiagnosticSession
Goal	Keep-alive active safetySystemDiagnosticSession
Actor	PDT and PCU
Input	The addressed PCU listens on the supported communication interface for any request message.
Output	Transmission of a positive response message on the supported communication interface by the addressed PCU
Description	The addressed PCU (depends on in-vehicle network architecture implementation) listens on the supported communication interface(s) connected to the vehicle diagnostic link connector according to either ISO 15031-3, ISO 13400-4 for any request message. The addressed PCU responds with a positive response message on the supported communication interface which keeps the active diagnostic session alive.
Classification	Mandatory

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

7.4.4 UC 4.4 – Unlock security of PCU

Table 14 defines the UC 4.4 – Unlock security of PCU.

Table 14 — UC 4.4 – Unlock security of PCU

Item	Description
Name	UC 4.4 – Unlock security of PCU
Goal	Enable security deployment with SecurityAccess service
Actor	PDT and PCU
Input	1. The addressed PCU listens on the supported communication interface for a SecurityAccess request message with a SecurityAccessType set to RequestDeploymentSeed. 2. The addressed PCU listens on the supported communication interface for a SecurityAccess request message with a SecurityAccessType set to SendDeploymentKey and the SecurityKey value required to successfully unlock the PCU.
Output	1. Transmission of a SecurityAccess positive response message with a SecuritySeed for RequestDeploymentSeed on the communication interface supported by the addressed PCU. 2. Transmission of a SecurityAccess positive response message with a SecurityAccessType set to sendKey.
Function	The SecurityAccess is a 2-step sequence between the PDT and the PCU. In the first step the addressed PCU (depends on in-vehicle network architecture implementation) listens on the supported communication interface connected to the vehicle diagnostic link connector according to either ISO 15031-3, ISO 13400-4 for a SecurityAccess request message with a SecurityAccessType set to RequestDeploymentSeed sent by the PDT. The addressed PCU responds with a SecurityAccess positive response message with a SecuritySeed for RequestDeploymentSeed. In the second step the addressed PCU listens on the supported communication interface for a SecurityAccess request message with a SecurityAccessType set to SendDeploymentKey and the SecurityKey value required to successfully unlock the PCU. The addressed PCU responds with a SecurityAccess positive response message with a SecurityAccessType set to SendKey.
Classification	Mandatory

7.4.5 UC 4.5 – Execute PCU(s) scrapping program module loader

Table 15 defines the UC 4.5 – Execute PCU(s) scrapping program module loader.

Table 15 — UC 4.5 – Execute PCU(s) scrapping program module loader

Item	Description
Name	UC 4.5 – Execute PCU(s) scrapping program module loader
Goal	PDT prepares the PCU for deployment of connected pyrotechnic devices.
Actor	PDT and PCU
Input	1. The addressed PCU listens on the supported communication interface for a RoutineControl request message with a routineControlType = startRoutine, a routineIdentifier = ExecuteSPL, and a routineControlOptionRecord = ExecuteSPL parameter. 2. The addressed PCU listens on the supported communication interface for a RoutineControl request message with a routineControlType = requestRoutineResult and a routineIdentifier = ExecuteSPL.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Table 15 *(continued)*

Item	Description
Output	1. Transmission of a RoutineControl positive response message on the communication interface supported by the addressed PCU after the routine stops and the scrapping module is in an executable form. 2. Transmission of a RoutineControl positive response message on the communication interface is supported by the addressed PCU with a routineStatusRecord.
Function	The scrapping program module (SPM) is stored in a non-executable format. The scrapping program loader (SPL) is responsible for converting the SPM into an executable format. The PDT requests RoutineControl with ExecuteSPL to the PCU. The SPL copies the SPM into a free RAM space. The RAM space is initialized after a reset. The SPL converts the SPM into an executable format, e.g. the SPL overwrites some values of the port input/output or function addresses with the correct values.
Classification	Mandatory

7.5 UCG 5 – Perform PCU and ACL sequence (PCU- and ACL-Scrapping)

7.5.1 UC 5.1 – Report ACL deployment sequence (ACL-Init)

Table 16 defines the UC 5.1 – Report ACL deployment sequence (ACL-Init).

Table 16 — UC 5.1 – Report ACL deployment sequence (ACL-Init)

Item	Description
Name	UC 5.1 – Report ACL deployment sequence (ACL-Init)
Goal	PCU(s) report(s) ACL deployment sequence via ACL with bidirectional communication/PWM signal.
Actor	PDT and PCU
Input	UC 4.1 – Report PCU deployment loop identification table; PCU receives an ACL request for deployment message/signal code via the ACL.
Output	PCU transmits the ACL command for deployment or signal code via the ACL.
Description	In this use case the fixed-address PCU reports via UC 4.1 – Report PCU deployment loop identification table that the vehicle architecture supports a PCU(s) with an ACL with bidirectional communication/PWM signal at the diagnostic link connector. The PCU awaits reception of an ACL request for deployment message/signal code via the ACL. Then the PCU transmits the ACL command for deployment or signal code via the ACL.
Classification	Optional

7.5.2 UC 5.2 – Write dismantling documentation into PCU (Device-Deploy)

Table 17 defines the UC 5.2 – Write dismantling documentation into PCU (Device-Deploy).

Table 17 — UC 5.2 – Write dismantling documentation into PCU (Device-Deploy)

Item	Description
Name	UC 5.2 – Write dismantling documentation into PCU (Device-Deploy)
Goal	The fixed-address PCU receives a request to write the dismantling information in the protected, permanent memory.
Actor	PDT and fixed-address PCU
Input	Fixed-address PCU receives a request message with DID = DismantlerIdentification.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Table 17 *(continued)*

Item	Description
Output	The DismantlerIdentification data of the PDT, the PCU deployment device identification value, year, month, and day of deployment is written into the fixed-address PCU's protected, permanent memory.
Function	The dismantler information is used to document the deployment process. Once the dismantler information record is written to the protected, permanent memory of the fixed-address PCU, such data become read-only.
Classification	Mandatory

7.5.3 UC 5.3 – Perform ACL deployment confirmation sequence (Device-Deploy)

Table 18 defines the UC 5.3 – Perform ACL deployment confirmation sequence (Device-Deploy).

Table 18 — UC 5.3 – Perform ACL deployment confirmation sequence (Device-Deploy)

Item	Description
Name	UC 5.3 – Perform ACL deployment confirmation sequence (Device-Deploy)
Goal	PCU reports the ACL deployment confirmation sequence via the ACL with bidirectional communication/PWM signal.
Actor	PDT and PCU
Input	UC 4.1 – Report PCU deployment loop identification table (e.g. hardware switch, ACL bidirectional communication with or without DoCAN/DoIP); PCU receives an ACL deployment confirmation message/signal code via the ACL.
Output	PCU transmits the ACL deployment confirmation response message/signal code via the ACL.
Function	In this use case the fixed-address PCU reports via UC 4.1 – Report PCU deployment loop identification table that the vehicle architecture supports a PCU(s) with an ACL with bidirectional communication/PWM signal at the diagnostic link connector. The PCU awaits reception of an ACL deployment confirmation message/signal code via the ACL. Then the PCU transmits the ACL deployment confirmation response message/signal code via the ACL.
Classification	Optional

7.5.4 UC 5.4 – Perform PCU pyrotechnic device scrapping via loop identification (Device-Deploy)

Table 19 defines the UC 5.4 – Perform PCU pyrotechnic device scrapping via loop identification (Device-Deploy).

Table 19 — UC 5.4 – Perform PCU pyrotechnic device scrapping via loop identification (Device-Deploy)

Item	Description
Name	UC 5.4 – Perform PCU pyrotechnic device scrapping via loop identification (Device-Deploy)
Goal	Scrapping of PCU's connected pyrotechnic devices
Actor	PDT and PCU
Input	The requested input is based on the output of UC 4.1 – Report PCU deployment loop identification table. The addressed PCU listens on the supported communication interface for a RoutineControl request message with a routineControlType = startRoutine, a routineIdentifier = DeployLoopRoutineID, and a routineControlOptionRecord with DeploymentLoopID information.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Table 19 *(continued)*

Item	Description
Output	The PCU determines the number of internal loops to execute the firing of one or multiple pyrotechnic devices. The PCU transmits a RoutineControl positive response message with a routineControlType = startRoutine, a routineIdentifier = DeployLoopRoutineID, and a routineStatusRecord including DeploymentLoopID information.
Description	To support the work of the dismantler, it is necessary to identify the number and area of installed PCU pyrotechnic devices. Every PCU can support a defined number, 1 to 255, of pyrotechnic devices. There is no standardized allocation between the PCU channel and the type of PCU generator. One or multiple pyrotechnic devices are connected to a PCU via mapped PCU channels. Each PCU has an internal loop identification table, which describes the link between the PCU channel and the system-specific allocation of the firing loops. The PCU receives a request message RoutineControl with startRoutine, RID = ExecuteSPL, and parameter loop ID to the PCU (for each pyrotechnic device connected to this PCU). — The SPM fires the pyrotechnic device. — The PDT receives the result. — The SPM updates the LoopStatus. — The PDT requests PCU-Reset, which clears the RAM and deletes the executable SPM.
Classification	Mandatory

7.6 UCG 6 – Terminate PCU pyrotechnic device deployment (PCU-End)

7.6.1 UC 6.1 – Terminate PCU pyrotechnic device scrapping via communication interface

Table 20 defines the UC 6.1 – Terminate PCU pyrotechnic device scrapping via communication interface.

Table 20 — UC 6.1 – Terminate PCU pyrotechnic device scrapping via communication interface

Item	Description
Name	UC 6.1 – Terminate PCU pyrotechnic device scrapping via communication interface
Goal	After deployment of all PCUs, the deployment termination becomes active via the communication interface.
Actor	PDT and PCU
Input	PCU does not receive any diagnostic messages for a timeout period specified in ISO 14229-2 or receives an ECUReset diagnostic request.
Output	PCU ends the safetySystemDiagnosticSession.
Function	To terminate the PCU pyrotechnic device scrapping via the communication interface, the PCU does not receive any diagnostic messages for a timeout period specified in ISO 14229-2 or receive an ECUReset diagnostic request. This causes the PCU to end the safetySystemDiagnosticSession.
Classification	Mandatory

7.6.2 UC 6.2 – Terminate PCU pyrotechnic device scrapping via ACL

Table 21 defines the UC 6.2 – Terminate PCU pyrotechnic device scrapping via ACL.

Table 21 — UC 6.2 – Terminate PCU pyrotechnic device scrapping via ACL

Item	Description
Name	UC 6.2 – Terminate PCU pyrotechnic device scrapping via ACL

© ISO 2022 – All rights reserved

AVA Documents Document Sharing Hub
Full document details: BS ISO 26021-1:2022

Table 21 *(continued)*

Item	Description
Goal	After deployment of all PCUs the deployment termination becomes active via the ACL.
Actor	PDT and PCU
Input	PCU receives a deployment termination command via the ACL.
Output	PCU ends the safetySystemDiagnosticSession.
Description	To terminate the PCU pyrotechnic device scrapping via the ACL, the PCU receives a deployment termination command via the ACL. This causes the PCU to end the safetySystemDiagnosticSession.
Classification	Optional

8 Application (APP)

8.1 APP – Preconditions of end-of-life activation of pyrotechnic devices

Vehicle manufacturers require the fulfillment of preconditions to enable the end-of-life activation of pyrotechnic devices. Such preconditions vary across brand, vehicle type, model year, and model. Variations are caused by technical design decisions related to the in-vehicle network and PCU implementation. This impacts the actions to be performed by the dismantler person prior to the deployment of pyrotechnic devices.

REQ	**8.1 APP – Preconditions of end-of-life activation of pyrotechnic devices – Access to vehicle interior**
The vehicle shall provide access to the vehicle interior, grant a suitable identification method via ignition key or keyless entry unit, and shall be in standstill.	

NOTE 1 Ignition on status is visualized by the instrument panel cluster.

NOTE 2 Additional handling information is given in the International Dismantling Information System (IDIS) [2].

The vehicle systems are switched into operational state.

REQ	**8.2 APP – Preconditions of end-of-life activation of pyrotechnic devices – Report PcuHardware-DeploymentMethodVersion**
The fixed-address PCU in the vehicle shall report PcuHardwareDeploymentMethod information (PcuHardwareDeploymentMethodVersion, PcuIdentificationString) upon request by the PDT.	

The vehicle manufacturer documents preconditions required for each brand, vehicle type, model year, and model in the IDIS[2] to provide the information needed by the dismantler person to perform the deployment.

EXAMPLE Vehicle-manufacturer specific information on IDIS:

— disconnect/cutoff a diagnosable device as precondition;

— belt buckle;

— peripheral sensor;

— other diagnosable devices;

— network separation and security gateway (authentication, end to end security, etc.).

REQ	**8.3 APP – Preconditions of end-of-life activation of pyrotechnic devices – Release loading of the scrapping program module**
When the fulfilment of the vehicle manufacturer specific requirements (see IDIS[2]) are detected by the PCU, the PCU shall release the loading of the scrapping program module (SPM).	

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

REQ	**8.4 APP – Preconditions of end-of-life activation of pyrotechnic devices – Reject loading of the scrapping program module**
When the fulfilment of the vehicle manufacturer specific requirements (see IDIS[2]) are not detected by the PCU, the PCU shall not release the loading of the scrapping program module (SPM) and shall respond with a negative response message including NRC = conditionsNotCorrect (see ISO 14229-1) information upon a RoutineControl request message with the RID = ExecuteSPL.	

8.2 APP – Overview of end-of-life activation of pyrotechnic devices sequence

The end-of-life activation of pyrotechnic devices sequence consists of the following subsequences:

— APP – Discovery of communication interface (Com I/F-Discovery);

— APP – Perform authentication – Optional (Sys-Auth);

— APP – Perform system initialisation (Sys-Init);

— APP – Perform PCU initialisation (PCU-Seq);

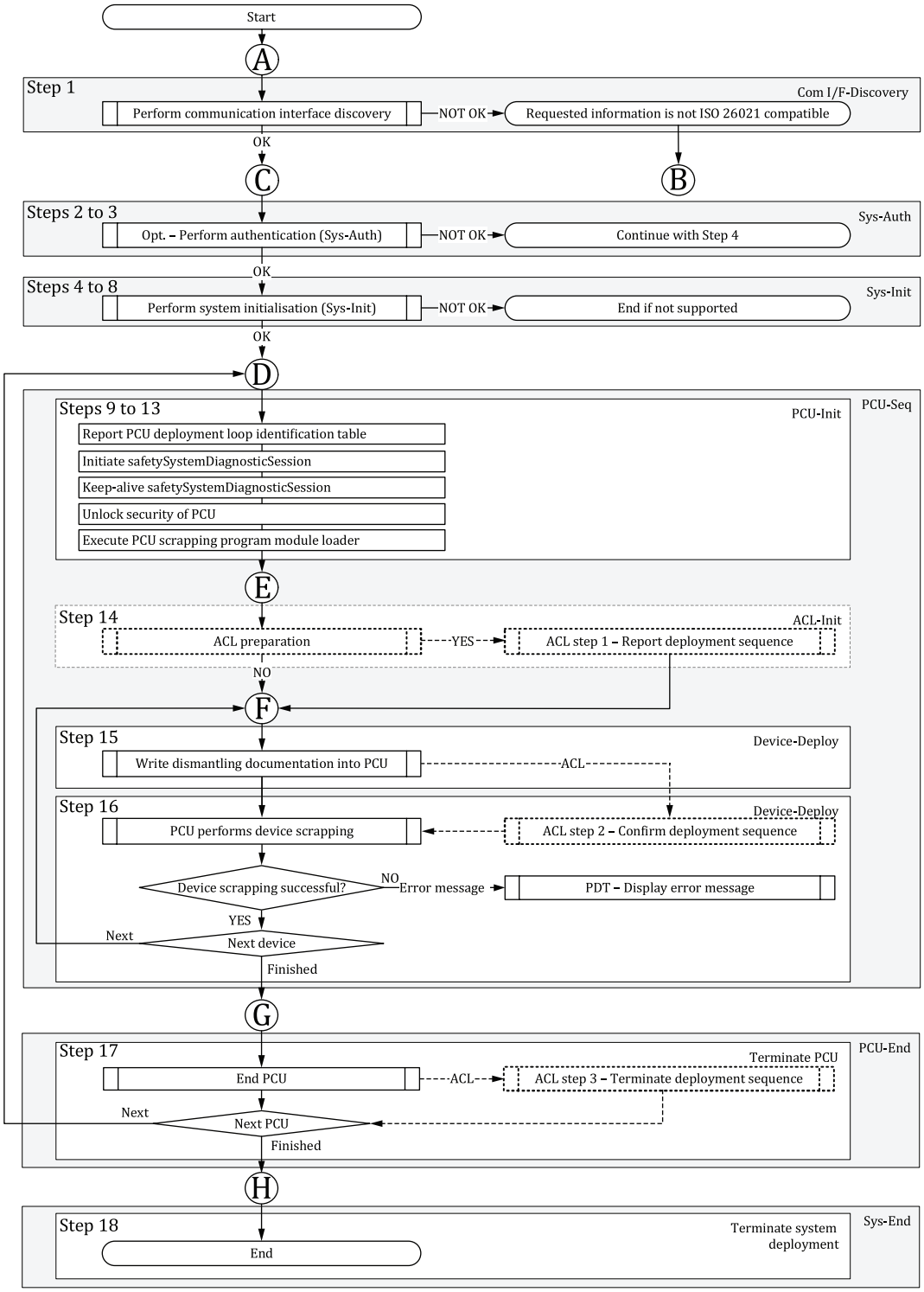
— APP – Perform PCU and ACL scrapping (Device-Deploy); and

— APP – Terminate PCU and ACL pyrotechnic device deployment (PCU-End).

Figure 2 specifies the end-of-life activation of pyrotechnic device sequence.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022



Key

A vehicle's fixed-address PCU listens to the DoCAN or DoIP network for a diagnostic request message

B vehicle's fixed-address PCU determines that the diagnostic request message on the DoCAN or DoIP network is not compatible with this document

C vehicle's fixed-address PCU determines that the diagnostic request message on the DoCAN or DoIP network is compatible with this document

D vehicle's fixed-address PCU determines that the authentication (optional) and the system initialisation is successful

E vehicle's PCU #1 to #N determines that the PCU initialisation is successful

F vehicle's PCU #1 to #N determines that ACL is not supported

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022

G PCU sequence reaches the state PCU-End, next PCU

H PCU sequence reaches the state “finished”

Figure 2 — End-of-life activation of pyrotechnic device sequence

8.3 APP – Software provisions

8.3.1 APP – Scrapping program module (SPM)

The SPM is usually stored in a ROM/FLASH memory of the PCU. To reduce the RAM space, only the security-related part of the program, which enables the output stages, can be executed from RAM.

REQ	**8.5 APP – Software provisions – APP – Scrapping program module (SPM)**
The SPM shall be stored in the PCU in a non-executable format.	

8.3.2 APP – Scrapping program module loader (SPL)

The SPL is responsible for converting the SPM format to an executable format.

REQ	**8.6 APP – Software provisions – APP – Scrapping program module loader (SPL)**
The SPL shall convert the SPM into an executable format.	

8.3.3 APP – PCU loop identification table

To support the work of the dismantler, it is necessary to identify the number and area of installed PCU components. Every PCU can support a defined number of pyrotechnic devices (1 to 255). There is no standardized allocation between the PCU channel and the type of PCU generator.

REQ	**8.7 APP – Software provisions – APP – PCU loop identification table – Channel identification**
The APP – PCU loop identification table shall include channel identification for the purpose of simple identification of the mapped PCU channels.	

REQ	**8.8 APP – Software provisions – APP – PCU loop identification table – Loop identifier**
Each PCU shall have an internal APP – PCU loop identification table, which specifies the link between the PCU and the system-specific allocation of the firing loops identified by the loop identifier (see Figure 3).	

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 26021-1:2022