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

**Part 1:
Application and communication
interface**

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*Véhicules routiers — Activation de fin de vie des dispositifs
pyrotechniques embarqués —
Partie 1: Interface des couches application et communication*

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Contents

	Page
Foreword	viii
Introduction	ix
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

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[ISO/PRF 26021-1](https://standards.iteh.ai/catalog/standards/sist/ba8089cc-a42d-44c3-9194-2311b5d5c785/iso-prf-26021-1)

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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.

Introduction

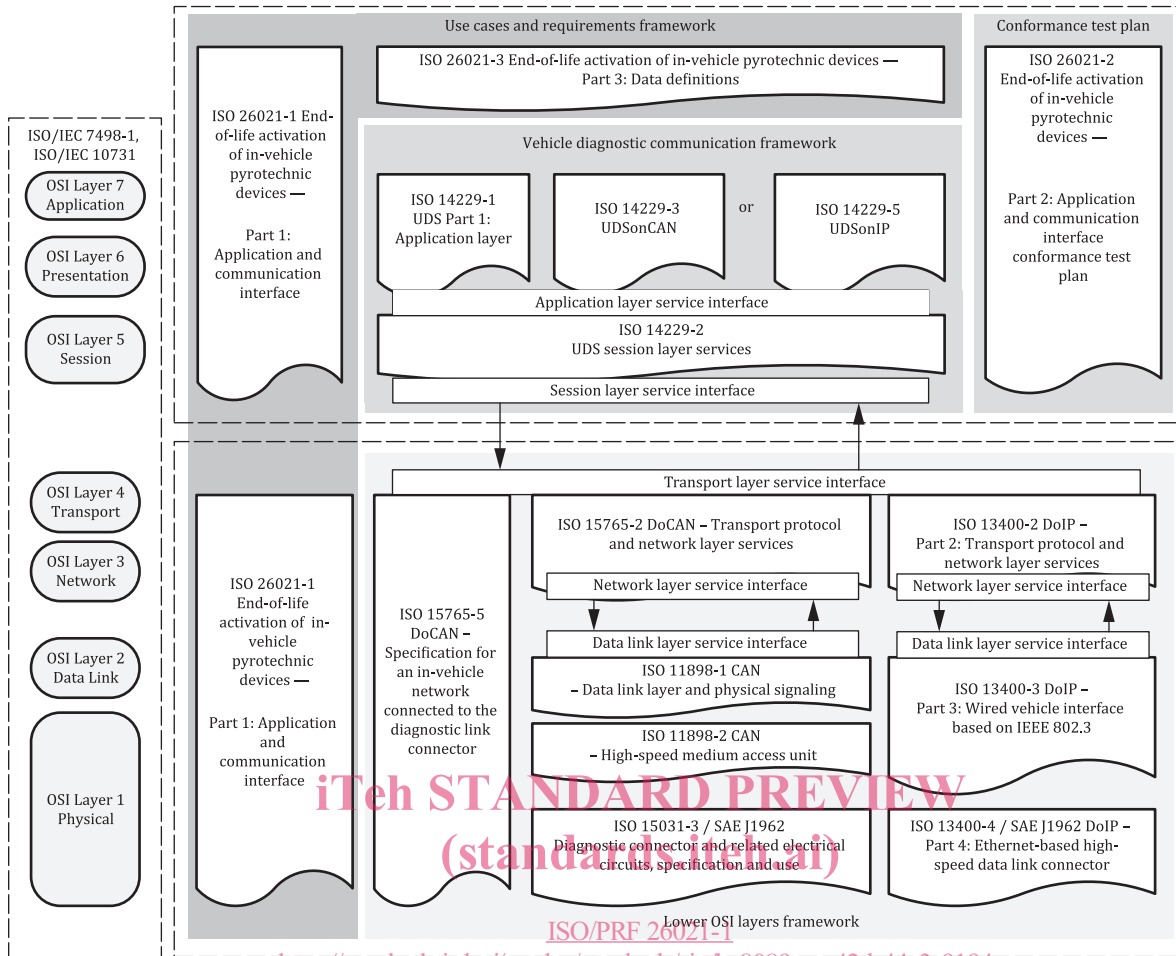
End-of-life deployment activation of on-board pyrotechnic devices is a part of a wider regime designed to ensure that road vehicles are scrapped in a safe and environmentally acceptable condition after their use.

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^[4], 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.



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Figure 1 — ISO 26021 documents reference according to OSI model

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 specifies:

- terminology;
- definition of end-of-life activation of in-vehicle pyrotechnic devices relevant use cases;
- communication establishment between the pyrotechnic device deployment tool (PDT) and the vehicle's pyrotechnic control unit(s) (PCU(s));
- optional usage of a credentials-based authentication and authorisation mechanism between the PDT and the vehicle;
- protection against tampering of the defined end-of-life activation of in-vehicle pyrotechnic devices;
- definition of 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 26021-1:2021(E)

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*

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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.

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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 (μ P) 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)

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4 Symbols and abbreviated terms

4.1 Symbols

Δ	delta
Δt_{P6_Client}	DoIP network design-dependent delays
$\Delta t_{P6^*_Client}$	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

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

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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.