INTERNATIONAL STANDARD

ISO 26021-1

Second edition

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

PROOF/ÉPREUVE

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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).

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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[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.

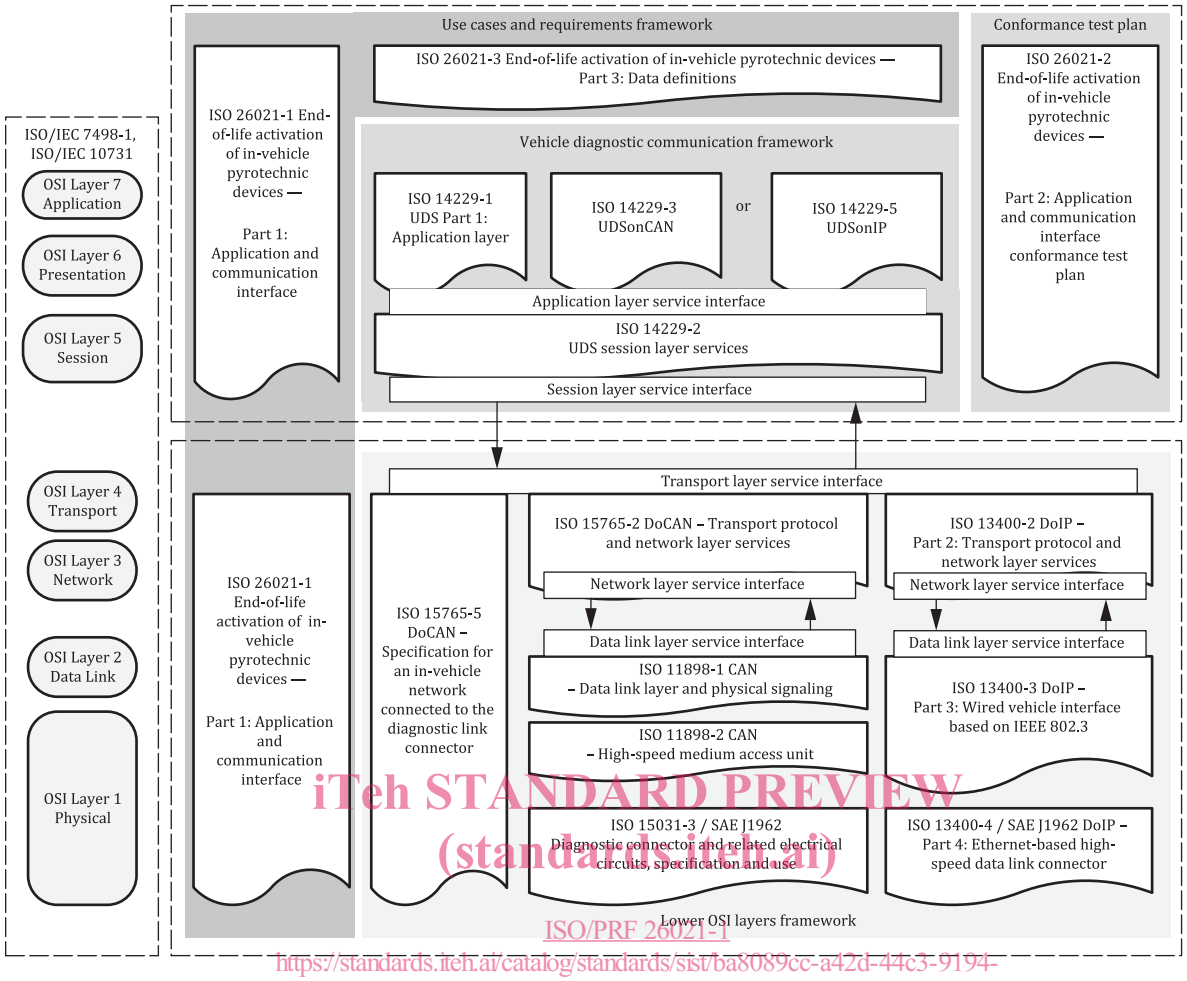

Figure 1 — ISO 26021 documents reference according to OSI model

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 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 26021-3:2021.

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

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

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.