INTERNATIONAL STANDARD

ISO 26021-1

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Road vehicles — End-of-life activation of on-board pyrotechnic devices —

Part 1: General information and use case definitions

Véhicules routiers — Activation de fin de vie des dispositifs pyrotechniques embarqués —
Partie 1: Informations générales et définitions de cas d'usage

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 26021-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

ISO 26021 consists of the following parts, under the general title *Road vehicles — End-of-life activation of on-board pyrotechnic devices*:

— *Part 1: General information and use case definitions*

— *Part 2: Communication requirements*

— *Part 3: Tool requirements*

— *Part 4: Additional communication line with bidirectional communication*

— *Part 5: Additional communication line with pulse width modulated signal*

NOTE Additional parts will be introduced as necessary to take into account requirements not yet covered by the standard.

Introduction

ISO 26021 describes a method for the in-vehicle deployment of pyrotechnically activated components (also referred to as pyrotechnic components or pyrotechnic devices) in cars.

Worldwide, nearly all new vehicles are equipped with one or more safety systems. Advanced protection systems using pyrotechnic actuators are becoming more common. All components which contain pyrotechnic substances should be handled in the same way.

Recycling of these vehicles requires a new process which ensures that the deployment of all the pyrotechnic components will be safe and cost-efficient. Based on the harmonization of the on-board diagnostics (OBD) interface, there is an opportunity to use this interface for on-board deployment, utilizing the same tools and processes.

The representatives of the global automobile industry have decided the following:

— automobile manufacturers do not support reuse as an appropriate treatment method for pyrotechnic devices;

— automobile manufacturers believe treatment of pyrotechnic devices is required before shredding;

— automobile manufacturers support in-vehicle deployment as the preferred method.

Based on this decision, the four major automobile manufacturer associations (ACEA, Alliance, JAMA and KAMA) started to develop a method for the in-vehicle deployment of pyrotechnic components in cars with the pyrotechnic device deployment tool (PDT). The vision is that, one day, a dismantler will need only one tool without any accessories in order to deploy all the pyrotechnic devices inside an end-of-life vehicle (ELV). The target is to use an existing interface to the car.

This International Standard has been developed in order to define common requirements for communication between the tool and the pyrotechnic control unit (PCU) when deploying pyrotechnic devices. This communication should use earlier standardized hardware and software. Based on emissions-related diagnostics (see ISO 15031-3), the physical layer specified for legislated OBD and the diagnostic connector was defined. The software used is an implementation of diagnostic services and transaction protocols on CAN.

Because of the automobile manufacturers' specific requirements and safety concepts, an additional communication line (ACL) may be used beside the basic CAN communication method. This line is usable in two different ways:

— as an additional communication line with bidirectional communication for additional communication functions;

— as an additional communication line with a pulse width modulated signal for hardware safing.

Although primarily intended for airbag deployment systems, ISO 26021 has also been developed to meet requirements for other pyrotechnically activated systems.

To achieve this, this International Standard makes use of on-board diagnostics and is based on the open systems interconnection (OSI) basic reference model in accordance with ISO/IEC 7498-1 and ISO/IEC 10731 which structures communication systems into seven layers. When mapped on this model, the services used by a diagnostic tester (client) and an electronic control unit (ECU) (server) are broken down in accordance with Table 1, as follows:

— a pyrotechnic devices deployment application using application services, specified in this International Standard;

— application services (layer 7), specified in ISO 14229-1;

— communication services (layers 1 to 6).

Table 1 — Deployment of pyrotechnic devices — Specifications applicable to the OSI layers

Applicability	OSI layer	Airbag deployment application
Seven layers in accordance with ISO/IEC 10731	User application	ISO 26021-1
	Application (layer 7)	ISO 14229-1/ISO 15765-3
	Presentation (layer 6)	—
	Session (layer 5)	ISO 14229-1
	Transport (layer 4)	ISO 15765-2
	Network (layer 3)	ISO 15765-2
	Data link (layer 2)	ISO 11898/ISO 26021-4 and ISO 26021-5
	Physical (layer 1)	ISO 11898/ISO 26021-4 and ISO 26021-5

For the deployment of pyrotechnic devices via on-board diagnostics by a dismantler, it is required that future modifications to this International Standard provide long-term backwards compatibility.

Road vehicles — End-of-life activation of on-board pyrotechnic devices —

Part 1: General information and use case definitions

1 Scope

This part of ISO 26021 gives an overview of the structure of ISO 26021 and the way it has been divided into parts, as well as showing the relationship between the parts. In addition, it outlines the use case scenarios in which the ISO 26021 document set will be used. It also defines terminology that is used throughout the ISO 26021 document set.

2 Normative references

The following referenced documents are indispensable for the application 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 10731, *Information technology — Open Systems Interconnection — Basic Reference Model — Conventions for the definition of OSI services*

ISO 14229-1, *Road vehicles — Unified diagnostic services (UDS) — Part 1: Specification and requirements*

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 — Diagnostics on Controller Area Networks (CAN) — Part 2: Network layer services*

ISO 15765-3, *Road vehicles — Diagnostics on Controller Area Networks (CAN) — Part 3: Implementation of unified diagnostic services (UDS on CAN)*

ISO 15765-4, *Road vehicles — Diagnostics on Controller Area Networks (CAN) — Part 4: Requirements for emissions-related systems*

ISO 26021-2, *Road vehicles — End-of-life activation of on-board pyrotechnic devices — Part 2: Communication requirements*

ISO 26021-4, *Road vehicles — End-of-life activation of on-board pyrotechnic devices — Part 4: Additional communication line with bidirectional communication*

ISO 26021-5, *Road vehicles — End-of-life activation of on-board pyrotechnic devices — Part 5: Additional communication line with pulse width modulated signal*

3 Terms and definitions

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

3.1
activation/deployment of pyrotechnic devices
burning off all pyrotechnic substances inside an end-of-life vehicle to activate/deploy the devices concerned, the aim being to avoid any device containing such substances coming into the shredding process

3.2
emissions-related diagnostic
specific element of the on-board diagnosis in accordance with ISO 14229-1 and ISO 15031-3

3.3
end-of-life vehicle
ELV
vehicle prepared to be scrapped [e.g. as defined in Article 1(a) of Directive 75/442/EEC], but containing all essential components necessary for normal usage

NOTE This means that the communication network and the power supply to the pyrotechnic devices in the vehicle are functioning.

3.4
pyrotechnic control unit
PCU
electronic control unit in the vehicle network which controls the activation of pyrotechnic devices

3.5
pyrotechnic device deployment tool
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 all control units which are able to activate pyrotechnic devices

NOTE This tool will comprise e.g. a computer, a connection between the computer and the diagnostic connector, and some software.

3.6
safing
mechanism whose primary purpose is to prevent an unintended functioning of the PCU processor prior to detection of a crash situation

3.7
safing unit
part of the PCU (e.g. an electromechanically operated switch or a separate processor) that allows the pyrotechnic component deployment microprocessor (µP) to deploy the pyrotechnic devices via the driver stage

4 Symbols and abbreviated terms

ACL	additional communication line
CAN	controller area network
ELV	end-of-life vehicle
OBD	on-board diagnostics
PCU	pyrotechnic control unit

PDT	pyrotechnic device deployment tool
RAM	random access memory
SRS	supplementary restraint system
µP	microprocessor

5 Conventions

ISO 26021 is based on the conventions for the definition of OSI services (see ISO/IEC 10731) as they apply to diagnostic services.

6 Document overview

The ISO 26021 document set provides an implementer with all documents and references required to support the end-of-life activation of on-board pyrotechnic devices in accordance with the requirements of relevant national legislation for the handling and storage of pyrotechnic devices in vehicles.

— ISO 26021-1 (this part) gives general information and use case definitions. It provides an overview of the document set along with use case definitions and a common set of resources (definitions, references) for use with all subsequent parts.

— ISO 26021-2 gives a description of the general communication requirements when no additional communication line (ACL) is used. The general purpose is communication between tool and control unit by standard diagnostic services.

— ISO 26021-3 specifies the requirements for the PDT, based on the functionality of the PCU and the communication network. In addition, it defines the functionality test method (hardware/software).

— ISO 26021-4 specifies an additional communication line with bidirectional communication and describes the specific requirements for this communication method which uses a direct HW connection between tool and PCUs.

— ISO 26021-5 specifies an additional communication line with a pulse width modulated signal. It uses the direct HW connection described in ISO 26021-4 for systems with a specific safing concept.

7 Use case descriptions

7.1 Overview

The end-of-life activation of on-board pyrotechnic devices is, apart from actual removal, the only method of making sure that no pyrotechnical substances are left in an ELV. On-board activation is deemed to be the most effective and the safest method. To avoid a dismantler needing different tools, or at least different adapters, for different vehicles, the diagnostic connector was selected as the hardware connector to the vehicle.

To have visual and audible verification that activation has been carried out successfully, it is necessary to deploy the pyrotechnic devices one by one. In the case of dual-stage devices, it may nevertheless not be possible after activation to detect whether both stages have been deployed.