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Road vehicles — Implementation of World-Wide Harmonized On-Board Diagnostics (WWH-OBD) communication requirements —

Part 1: General information and use case definition

Véhicules routiers — Mise en application des exigences de communication pour le diagnostic embarqué harmonisé à l'échelle mondiale (WWH-OBD) — Partie 1: Informations générales et définition 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 27145-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

This first edition of ISO 21745-1 cancels and replaces ISO/PAS 27145-1:2006, which has been technically revised.

ISO 27145 consists of the following parts, under the general title *Road vehicles — Implementation of World-Wide Harmonized On-Board Diagnostics (WWH-OBD) communication requirements*:

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

— *Part 2: Common data dictionary*

— *Part 3: Common message dictionary*

— *Part 4: Connection between vehicle and test equipment*

The following parts are under preparation:

— *Part 6: External test equipment*

0 Introduction

0.1 Overview

The ISO 27145 series includes the communication between the vehicle's on-board diagnostics (OBD) systems and external test equipment within the scope of the World-Wide Harmonized On-Board Diagnostics Global Technical Regulations (WWH-OBD GTR).

It has been established in order to apply the unified diagnostic services (specified in ISO 14229-1) to WWH-OBD systems.

The ISO 27145 series includes the communication between the vehicle's WWH-OBD systems and external (off-board) "generic" test equipment within the scope of the country-specific regulatory requirements.

To achieve this, it is based on the Open Systems Interconnection (OSI) Basic Reference Model specified in ISO/IEC 7498-1 and ISO/IEC 10731, which structures communication systems into seven layers. Where mapped on this model, the services specified by ISO 27145 are divided into

— diagnostic services (layer 7), specified in ISO 27145-3 with reference to ISO 14229-1,

— presentation layer (layer 6), specified in ISO 27145-2 with reference to SAE J1930-DA, SAE J1939 Companion Spreadsheet (SPNs), SAE J1939-73:2010, Appendix A (FMIs), SAE J1979-DA and SAE J2012-DA,

— session layer services (layer 5), specified in ISO 14229-2,

— transport layer services (layer 4), specified in ISO 27145-4 with reference to ISO 13400-2, ISO 15765-2 and ISO 15765-4,

— network layer services (layer 3), specified in ISO 27145-4 with reference to ISO 15765-4, ISO 15765-2 and ISO 13400-2,

— data link layer (layer 2), specified in ISO 27145-4 with reference to ISO 11898-1, ISO 11898-2, ISO 15765-4, ISO 13400-3 and IEEE 802.3, and

— physical layer (layer 1), specified in ISO 27145-4 with reference to ISO 11898-1, ISO 11898-2, ISO 15765-4, ISO 13400-3 and IEEE 802.3,

in accordance with Table 1.

Table 1 — WWH-OBD specification reference applicable to the OSI layers

Applicability	OSI seven layer	WWH-OBD reference		
Seven layers according to ISO/IEC 7498-1 and ISO/IEC 10731	Application (layer 7)	ISO 14229-1, ISO 27145-3		
	Presentation (layer 6)	ISO 27145-2, SAE J1930-DA, SAE J1939 Companion Spreadsheet (SPNs), SAE J1939-73:2010, Appendix A (FMIs), SAE J1979-DA, SAE J2012-DA		
	Session (layer 5)	ISO 14229-2		
	Transport (layer 4)	ISO 15765-2 DoCAN, ISO 15765-4 DoCAN	ISO 27145-4	ISO 13400-2 DoIP TCP and IP
	Network (layer 3)			
	Data link (layer 2)	ISO 11898-1 CAN DLL, ISO 11898-2 CAN HS, ISO 15765-4 DoCAN		ISO 13400-3 DoIP, IEEE 802.3
	Physical (layer 1)			

0.2 SAE document reference concept

ISO 27145 makes reference to several SAE documents which contain the terms, data and diagnostic trouble code (DTC) definitions.

ISO 27145-2 defines a common data dictionary for the ISO 27145 series, according to the definitions in the following documents (see Figure 1):

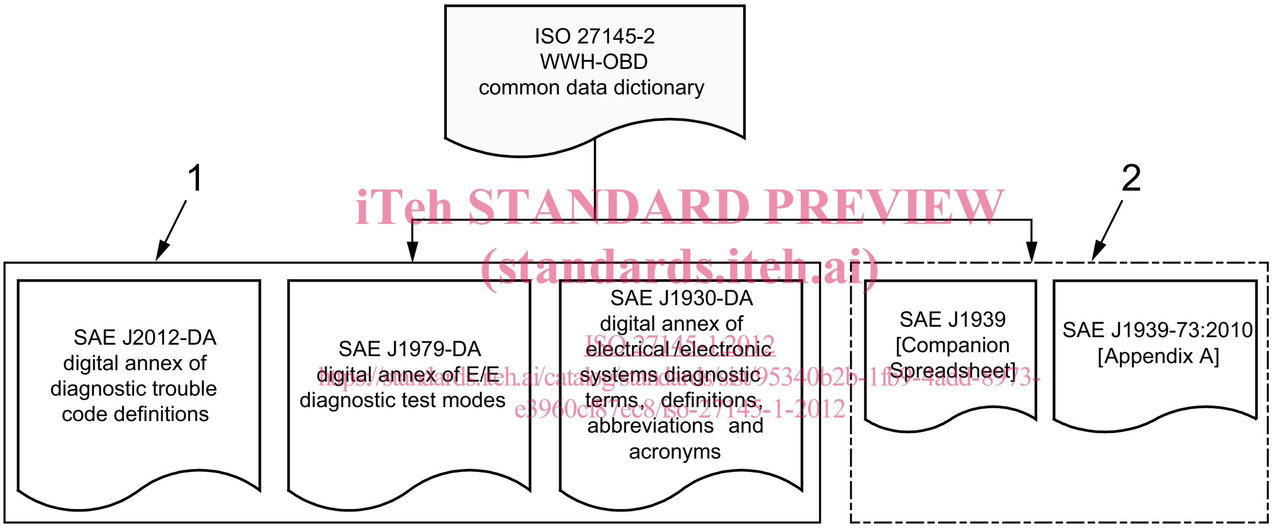
— SAE J1930-DA: this digital annex contains all standardized naming objects, terms and abbreviated terms.

— SAE J1939 Companion Spreadsheet and SAE J1939-73: SAE J1939 Companion Spreadsheet indexes names for suspect parameter numbers (SPNs) that provide an alternative presentation format for SAE J2012-DA DTCs. SPNs are combined with failure mode indicators (FMIs) to form the full alternative presentation. FMIs are described in SAE J1939-73:2010, Appendix A.

  NOTE The SAE J1939 Companion Spreadsheet is a document which supplements the SAE J1939 family of standards and contains SPNs and parameter group numbers (PGNs).

— SAE J1979-DA: this digital annex contains all standardized data items such as data identifiers (DIDs), test identifiers (TIDs), monitor identifiers (MIDs) and infotype identifiers (ITIDs).

— SAE J2012-DA: this digital annex contains all standardized data items such as DTC definitions and FTB (failure type byte) definitions.



Key

1 SAE digital annexes: data definitions

2 SAE J1939 series of documents: DTC definitions

Figure 1 — SAE digital annex document reference

0.3 SAE digital annex revision procedure

New regulatory requirements drive new in-vehicle technology to lower emissions, improve safety, etc. It is important to standardize new technology-related OBD monitor data and DTCs in order to support the external (off-board) "generic" test equipment. All relevant information is proposed by the automotive industry, represented by members of the appropriate SAE task force.

ISO 27145-2 references a "Change request form" for use with new data items to be defined by the SAE task force for standardization. It is intended that the standardized data items be defined in SAE J1930-DA, SAE J1979-DA, SAE J2012-DA and SAE J1939. It is intended that the documents be published on the SAE store website once the information has been balloted and approved.

The revision request forms and instructions for updating the registers to ISO 27145 can be obtained on the following data registration websites.

— For SAE J1930-DA: http://www.sae.org/servlets/works/committeeHome.do?comtID=TEVDS7

  The column entitled “Resources” shows a document with the title: J1930-DA_Revision_Request_Form.doc. Double click on the name to download the document with the filename: “SAE_J1930-DA_Revision_Request_Form.doc”.

— For SAE J1939: http://www.sae.org/

  Search “J1939 Request”, select “J1939 Request Processing Group”, and select “J1939 Request Processing Form and Guidelines”.

— For SAE J1979-DA: http://www.sae.org/servlets/works/committeeHome.do?comtID=TEVDS14

  The column entitled “Resources” shows a document with the title: J1979-DA_Revision_Request_Form.doc. Double click on the name to download the document with the filename: “SAE_J1979-DA_Revision_Request_Form.doc”.

— For SAE J2012-DA: http://www.sae.org/servlets/works/committeeHome.do?comtID=TEVDS9

  The column entitled “Resources” shows a document with the title: J2012-DA_Revision_Request_Form.doc. Double click on the name to download the document with the filename: “SAE_J2012-DA_Revision_Request_Form.doc”.

It is intended that the revision request form be filled out with the request.

It is intended that e-mails with completed revision request forms as attachments be sent to:

E-mail: saej1930@sae.org

E-mail: saej1979@sae.org

E-mail: saej2012@sae.org

E-mail: saej1939@sae.org

Road vehicles — Implementation of World-Wide Harmonized On-Board Diagnostics (WWH-OBD) communication requirements —

Part 1: General information and use case definition

1 Scope

This part of ISO 27145 provides an overview of the structure and the partitioning of the different parts of ISO 27145 and shows the relationship between the parts. In addition, it outlines the use case scenarios where the ISO 27145 series is used. All terminology that is common throughout the ISO 27145 series is also outlined.

ISO 27145 is intended to become the single communication standard for access to OBD-related information. To allow for a smooth migration from the existing communication standards to this future world-wide communication standard, the initial communication concept is based on the ISO 15765 series, i.e. Diagnostic communication over Control Area Network (DoCAN).

The intention is for the future communication concept to be based on the ISO 13400 series, i.e. Diagnostic communication over Internet Protocol (DoIP) utilizing Ethernet. In view of the usage of standard network layer protocols, future extensions to optional physical layers (e.g. wireless) are possible.

ISO 27145 has been extended to define the world-wide harmonized On-Board Diagnostics (OBD) communication standard. Based on the results of the initialization, the external test equipment determines which protocol and diagnostic services are supported by the vehicle's emission-related system, i.e.

— legislated OBD: ISO 15031 series (based on DoCAN), and

— legislated WWH-OBD: ISO 27145 series (based on DoCAN and DoIP).

IMPORTANT — Use cases deriving from country-specific implementation of Global Technical Regulation (GTR) No. 5 into local legislation are not included in this part of ISO 27145.

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

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

ISO 27145-2, *Road vehicles — Implementation of World-Wide Harmonized On-Board Diagnostics (WWH-OBD) communication requirements — Part 2: Common data dictionary*

ISO 27145-3, *Road vehicles — Implementation of World-Wide Harmonized On-Board Diagnostics (WWH-OBD) communication requirements — Part 3: Common message dictionary*

ISO 27145-4, *Road vehicles — Implementation of World-Wide Harmonized On-Board Diagnostics (WWH-OBD) communication requirements — Part 4: Connection between vehicle and test equipment*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

3.1.1
calibration identifier
CALID
identification code for a specific software/calibration contained in a server/ECU

NOTE If regulations require calibration identifications for emissions-related software, these are reported in a standardized format as specified in ISO 27145-2.

3.1.2
class A, B1, B2, C malfunction
attribute of a DTC, which characterizes the impact of a failure on emissions or on the OBD system's monitoring capability according to the requirements of the WWH-OBD GTR

3.1.3
continuous malfunction indicator
continuous-MI
malfunction indicator showing a steady indication at all times while the key is in the on (run) position with the engine running [ignition ON – engine ON]

3.1.4
continuous malfunction indicator counter
continuous-MI counter
conveys the amount of time the OBD system was operational during the time a continuous-MI was last activated

NOTE For a detailed definition, see GTR No. 5.

3.1.5
confirmed and active DTC
DTC status, which is detected during two consecutive operation cycles, in which the DTC is still present and commands the MI to be on if the DTC class is A, B1 or B2

NOTE For a DTC of class C, the MI is not illuminated.

3.1.6
cumulative continuous malfunction indicator counter
cumulative continuous-MI counter
cumulated operating hours with a continuous-MI activated

NOTE The cumulative continuous-MI counter counts up to the maximum value provided in a 2-byte counter with 1 h resolution and holds that value. The cumulative continuous-MI counter is not reset to zero by the engine system, a scan tool or a disconnection of a battery.

The cumulative continuous-MI counter operates in the following manner:

a) the cumulative continuous-MI counter begins counting once the continuous-MI is activated;

b) the cumulative continuous-MI counter halts and holds its existing value once the continuous-MI is no longer activated;

c) the cumulative continuous-MI counter continues counting from the point at which it had been held when a continuous-MI was activated.

3.1.7
calibration verification number
CVN
server/ECU calculated verification number used to verify the integrity of the software/calibration contained in a server/ECU

NOTE If regulations require calibration identifications for emissions-related software, those are reported in a standardized format as specified in ISO 27145- 2.

3.1.8
discriminatory display
requires the MI to be activated according to the class in which a malfunction has been classified

3.1.9
malfunction
failure or deterioration of a vehicle or engine system or component, including the OBD system, during which the WWH-OBD GTR specifically identifies the conditions which are considered to be failures

3.1.10
malfunction indicator
MI
display or gauge that clearly informs the driver of the vehicle in the event of a malfunction/failure

NOTE Additional details are included in the WWH-OBD GTR.

3.1.11
malfunction indicator counter
MI counter
conveys the amount of time during which the OBD system operates while a failure/breakdown is active

3.1.12
non-discriminatory display
indicator requiring only a single type of MI activation

3.1.13
on-board diagnostics
OBD
system that monitors some or all computer input and control signals

NOTE Signal(s) outside of the predetermined limits imply a fault in the system or in a related system.

3.1.14
previously active DTC
DTC status that is first detected during two consecutive operation cycles but later detection shows that the fault is no longer present

3.1.15
vehicle identification number
VIN
numeral identifying and specific and unique to each vehicle according to the applicable legal provisions of each national/regional authority

3.1.16
vehicle on-board diagnostics
providing a single access point for external test equipment to retrieve all data of the OBD system

3.2 Abbreviated terms

CALID	calibration identification
CVN	calibration verification number