INTERNATIONAL STANDARD

ISO 27145-2

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

Part 2: Common data dictionary

Véhicules routiers — Mise en application des exigences de communication pour le diagnostic embarqué harmonisé à l'échelle mondiale (WWH-OBD) —

Partie 2: Dictionnaire de données communes

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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 27145-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

This first edition of ISO 27145-2 cancels and replaces ISO/PAS 27145-2:2006, 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 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 this part of ISO 27145 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

<table>
<tr><th>Applicability</th><th>OSI seven layer</th><th colspan="3">WWH-OBD reference</th></tr>
<tr><td rowspan="8">Seven layers according to ISO/IEC 7498-1 and ISO/IEC 10731</td><td>Application (layer 7)</td><td colspan="3">ISO 14229-1, ISO 27145-3</td></tr>
<tr><td>Presentation (layer 6)</td><td colspan="3">This part of ISO 27145,
SAE J1930-DA, SAE J1939 Companion Spreadsheet (SPNs),
SAE J1939-73:2010, Appendix A (FMIs), SAE J1979-DA, SAE J2012-DA</td></tr>
<tr><td>Session (layer 5)</td><td colspan="3">ISO 14229-2</td></tr>
<tr><td>Transport (layer 4)</td><td rowspan="2">ISO 15765-2 DoCAN,
ISO 15765-4 DoCAN</td><td rowspan="4">ISO 27145-4</td><td rowspan="2">ISO 13400-2 DoIP
TCP and IP</td></tr>
<tr><td>Network (layer 3)</td></tr>
<tr><td>Data link (layer 2)</td><td rowspan="2">ISO 11898-1 CAN DLL,
ISO 11898-2 CAN HS,
ISO 15765-4 DoCAN</td><td rowspan="2">ISO 13400-3 DoIP,
IEEE 802.3</td></tr>
<tr><td>Physical (layer 1)</td></tr>
</table>

0.2 SAE document reference concept

ISO 27145 makes reference to several SAE documents which contain the relevant 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):

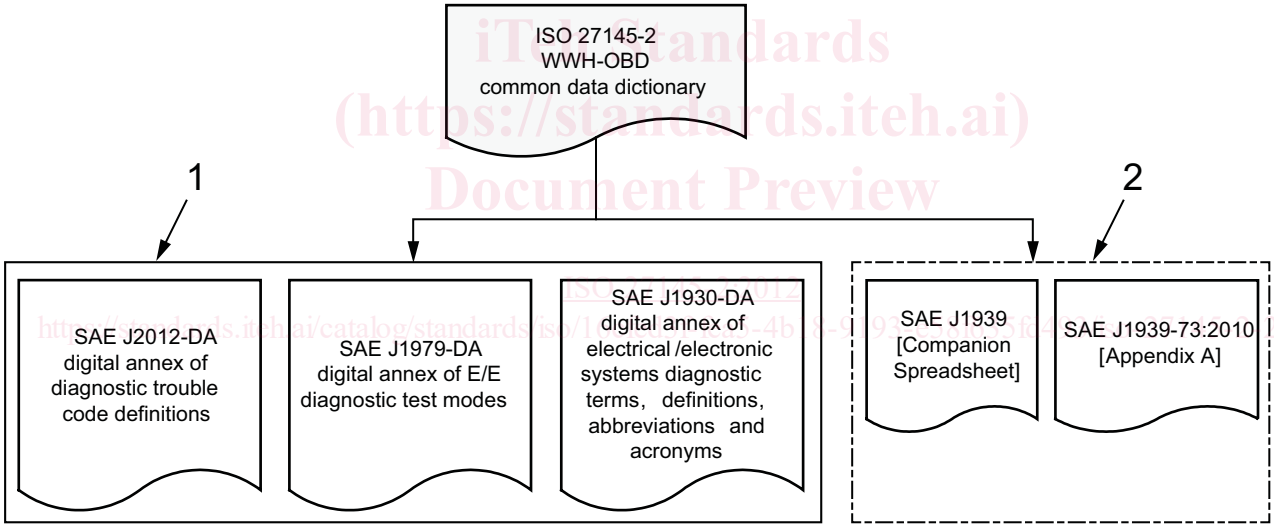
— SAE J1930-DA: this digital annex contains all standardized naming objects, terms and abbreviations.

— SAE J1939 Companion Spreadsheet and SAE J1939-73: SAE J1939 Companion Spreadsheet indexes names for suspect parameter numbers (SPNs), which 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 PGNs.

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

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

This part of ISO 27145 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 2: Common data dictionary

1 Scope

This part of ISO 27145 defines all regulatory data elements of the ISO 27145 series. The data elements are used to provide the external test equipment with the diagnostic status of the vehicle on-board diagnostics (VOBD) system in the vehicle. All data elements are communicated with the unified diagnostic services as defined in ISO 27145-3. The data elements are diagnostic trouble codes (DTCs), data identifiers (DIDs) and routine identifiers (RIDs). The mapping from parameter identifiers (PIDs), monitor identifiers (MIDs) and info type identifiers (ITIDs) is described in this part of ISO 27145.

If new legislated WWH-OBD GTR modules are established, it is intended that ISO 27145 be applicable with possible extensions, which can be included in this part of ISO 27145, can be specified as enhancements of the SAE Digital Annexes or can even be part of other referenced documents which are intended to include the applicable data definitions.

ISO 27145 is intended to become the single communication standard for access to OBD-related information (VOBD). To allow for a smooth migration from the existing communication standards to this future world-wide communication standard, the communication concept as specified in ISO 27145-4 is based on two different data links: ISO 15765-4 and ISO 13400 (all parts).

In view of the usage of standard network layer protocols, future extensions to optional physical layers (e.g. wireless) are possible.

NOTE It is expected to extend ISO 27145-4 as necessary upon introduction of additional communication media.

ISO 27145-4 is the entry point to establish communication with the vehicle. Based on the results of the initialization, the external test equipment determines which protocol and diagnostic services are supported by the vehicle's emissions-related system, i.e.

— legislated OBD: ISO 15031 series, and

— legislated WWH-OBD: ISO 27145.

Vehicles according to ISO 27145 provide VOBD system support as envisioned for WWH-OBD by Global Technical Regulation (GTR) No. 5.

IMPORTANT — Use cases deriving from country-specific implementation of 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:— [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 interfaces*

ISO 27145-1, *Road vehicles — Implementation of World-Wide Harmonized On-Board Diagnostics (WWH-OBD) communication requirements — Part 1: General information and use case definition*

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*

SAE J1939, *Companion Spreadsheet*

SAE J1939-73:2010, *Application layer — Diagnostics*

SAE J1979-DA, *Digital Annex of E/E Diagnostic Test Modes*

SAE J2012-DA, *Digital Annex of Diagnostic Trouble Code Definitions and Failure Type Byte Definitions*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions given in ISO 27145-1 and ISO 14229-1 apply.

3.1.1
calibration identifier
CALID
identification code for the software installed in the electronic control unit

3.1.2
calibration verification number
CVN
server/ECU calculated verification number used to verify the integrity of the software in the electronic control unit

3.1.3
central gateway
CGW
electronic control unit that connects in-vehicle communication networks

3.1.4
data identifier
DID
indicator making reference to a data item in the server

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1) To be published. (Revision of ISO 14229-1:2006)

3.1.5
diagnostic trouble code
DTC
value making reference to a specific fault in a system implemented in the server

NOTE It is defined in SAE J2012-DA or as SPN and FMI as defined in SAE J1939 Companion Spreadsheet and SAE J1939-73:2010, Appendix A.

3.1.6
info type identifier
ITID
indicator making reference to identification information

EXAMPLE Calibration identifier in the server.

NOTE The ITIDs are defined in SAE J1979-DA.

3.1.7
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.

3.1.8
monitor identifier
MID
indicator making reference to an OBD monitor function

NOTE An example of an OBD monitor function is a misfire monitor in the server. The MID is defined in SAE J1979-DA.

3.1.9
standard/manufacturer monitor test identifier
SMTID
OBD identifier which is defined in SAE J1979-DA or by the vehicle manufacturer

3.1.10
parameter identifier
PID
unique identifier used to refer to a specific data value within a server

3.1.11
routine identifier
RID
identifier making reference to a routine function

NOTE 1 An example of a routine function is an evaporation monitor routine in the server.

NOTE 2 Routine identifiers are defined in SAE J1979-DA.

3.1.12
suspect parameter number
SPN
numeral that identifies a particular element, a fault associated with a component, such as a sensor, or a parameter associated with an ECU

3.1.13
uniform resource locator
URL
uniform resource identifier which, in addition to identifying a resource, provides a means of locating the resource by describing its primary access mechanism

NOTE An example of primary access mechanism is its network location.

3.2 Abbreviated terms

CALID	calibration identification
CAN	controller area network
CGW	central gateway
CM	conversion method
CVN	calibration verification number
DID	data identifier
DoCAN	diagnostics communication over controller area network
DoIP	diagnostics communication over internet protocol
DP	data parameter
DP_DB	data parameter data byte
DTC	diagnostic trouble code
ECM	engine control module
ECU	electronic control unit
ECUNAME	electronic control unit name
EVAP	evaporative system
FMI	failure mode indicator
FTB	failure type byte
GTR	global technical regulation
ITID	info type identifier
IUPT	in-use performance tracking
ITP	info type parameter
ITP_DB	info type parameter data byte
MI	malfunction indicator
MID	monitor identifier
Mod	module
MP	monitor parameter
MP_DB	monitor parameter data byte
N/A	not applicable
OC	occurrence count
Param	parameter
PID	parameter identifier
req	requirement
RID	routine identifier