

This is a preview of "BS ISO 27145-4:2016". [Click here to purchase the full version from the ANSI store.](#)

BS ISO 27145-4:2016



BSI Standards Publication

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

bsi.

...making excellence a habit.™

This is a preview of "BS ISO 27145-4:2016". [Click here to purchase the full version from the ANSI store.](#)

This British Standard is the UK implementation of ISO 27145-4:2016. It supersedes BS ISO 27145-4:2012 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AUE/16, Data Communication (Road Vehicles).

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2016.
Published by BSI Standards Limited 2016

ISBN 978 0 580 89823 5

ICS 43.040.10; 43.180

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 April 2016.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

This is a preview of "BS ISO 27145-4:2016". [Click here to purchase the full version from the ANSI store.](#)

Second edition
2016-04-01

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

Part 4:

Connection between vehicle and test equipment

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

Partie 4: Connexion entre véhicule et équipement d'essai



Reference number
ISO 27145-4:2016(E)

© ISO 2016

This is a preview of "BS ISO 27145-4:2016". Click here to purchase the full version from the ANSI store.



COPYRIGHT PROTECTED DOCUMENT

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

This is a preview of "BS ISO 27145-4:2016". Click here to purchase the full version from the ANSI store.

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms, definitions and abbreviated terms	2
3.1 Terms and definitions.....	2
3.2 Abbreviated terms.....	2
4 Conventions	3
5 Document overview	3
6 Vehicle and external test equipment connection requirements	4
6.1 Overview.....	4
6.2 Data link independent requirements.....	5
6.3 Support of only one WWH-OBD-compliant external test equipment at a time.....	5
7 Wired CAN connection based on ISO 15765-4	5
7.1 Network scenario requirements.....	5
7.2 Initialization sequence.....	5
7.3 ISO 27145-3 WWH-OBD protocol validation sequence.....	5
7.4 Application layer — DoCAN.....	5
7.4.1 General.....	5
7.4.2 Diagnostic protocol communication types.....	6
7.4.3 Maximum number of WWH-OBD servers/ECUs.....	6
7.4.4 Diagnostic protocol timing parameters.....	6
7.4.5 External test equipment logical addresses.....	6
7.4.6 Server/ECU logical addressing.....	6
7.5 Presentation layer.....	6
7.6 Session layer.....	7
7.7 Transport layer.....	7
7.7.1 General information.....	7
7.7.2 Mapping of data-link-independent service primitives onto DoCAN data-link-dependent service primitives.....	7
7.7.3 Mapping of T_PDU onto N_PDU for message transmission.....	7
7.8 Network layer.....	8
7.9 Data link layer.....	8
7.10 Physical layer.....	8
7.11 Diagnostic connector.....	8
8 Wired Ethernet connection based on ISO 13400	8
8.1 Network scenario requirements.....	8
8.2 Initialization sequence.....	9
8.3 ISO 27145-3 WWH-OBD protocol validation sequence.....	12
8.4 Application layer — DoIP.....	13
8.4.1 General.....	13
8.4.2 Diagnostic protocol communication types.....	13
8.4.3 Maximum number of WWH-OBD servers/ECUs.....	14
8.4.4 Diagnostic protocol timing parameters.....	14
8.4.5 External test equipment logical addresses.....	14
8.4.6 Server/ECU logical addressing.....	14
8.5 Presentation layer.....	14
8.6 Session layer.....	14
8.7 Transport layer.....	15
8.7.1 General information.....	15

This is a preview of "BS ISO 27145-4:2016". [Click here to purchase the full version from the ANSI store.](#)

8.7.2	Mapping of data-link-independent service primitives onto the Internet Protocol data-link-dependent service primitives.....	15
8.7.3	Mapping of T_PDU onto DoIP_PDU for message transmission.....	15
8.8	Network layer.....	16
8.9	Data link layer.....	16
8.10	Physical layer.....	16
8.11	Diagnostic connector.....	16
Bibliography		17

This is a preview of "BS ISO 27145-4:2016". Click here to purchase the full version from the ANSI store.

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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

This second edition cancels and replaces the first edition (ISO 27145-4:2012), 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*
- *Part 6: External test equipment*

This is a preview of "BS ISO 27145-4:2016". Click here to purchase the full version from the ANSI store.

Introduction

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. When mapped on this model, the services specified by ISO 27145 are broken 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-DA (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 this part of ISO 27145 with reference to ISO 13400-2, ISO 15765-2 and ISO 15765-4;
- network layer services (layer 3), specified in this part of ISO 27145 with reference to ISO 15765-4, ISO 15765-2 and ISO 13400-2;
- data link layer (layer 2), specified in this part of ISO 27145 with reference to ISO 11898-1, ISO 15765-4, ISO 13400-3 and IEEE 802.3;
- physical layer (layer 1), specified in this part of ISO 27145 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 7 layer	WWH-OBD document 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-DA (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		
	Physical (layer 1)	ISO 11898-1 CAN DLL ISO 11898-2 CAN HS, ISO 15765-4 DoCAN		ISO 13400-3 DoIP, IEEE 802.3

This is a preview of "BS ISO 27145-4:2016". Click here to purchase the full version from the ANSI store.

SAE document reference concept

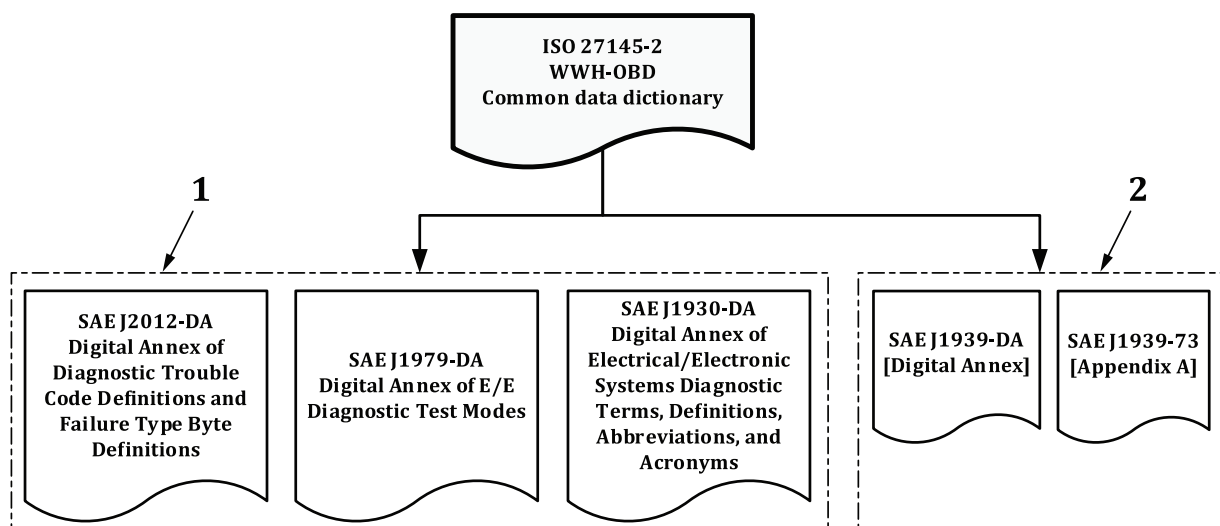
ISO 27145 makes reference to several SAE documents which contain the terms, data and diagnostic trouble code (DTC) definitions.

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-DA and SAE J1939-73: SAE J1939-DA 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-DA is a document which supplements the SAE J1939 family of International 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

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.

This is a preview of "BS ISO 27145-4:2016". Click here to purchase the full version from the ANSI store.

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", 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

This is a preview of "BS ISO 27145-4:2016". Click here to purchase the full version from the ANSI store.

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

Part 4: Connection between vehicle and test equipment

1 Scope

This part of ISO 27145 defines the requirements to successfully establish, maintain and terminate communication with a vehicle that implements the requirements of the WWH-OBD GTR (Global technical regulation No. 5; see Reference [16]). This requires plug and play communication capabilities for the vehicle, as well as for any test equipment that intends to establish communication with a vehicle. This part of ISO 27145 details all the OSI layer requirements to achieve this goal.

This part of ISO 27145 is intended to become the single communication standard for access to information relating to vehicle on-board diagnostics (VOBD). To allow for a smooth migration from the existing communication standards to this future world-wide standardized communication standard, the communication concept as specified in this part of ISO 27145 is based on two different data links:

- diagnostic communication over Controller Area Network (DoCAN), ISO 15765-4;
- diagnostic communication over Internet Protocol (DoIP), ISO 13400 (all parts).

NOTE It is intended that this part of ISO 27145 will be extended as necessary upon introduction of additional communication media.

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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 13400-2:2012, *Road vehicles — Diagnostic communication over Internet Protocol (DoIP) — Part 2: Transport protocol and network layer services*

ISO 13400-3,¹⁾ *Road vehicles — Diagnostic communication over Internet Protocol (DoIP) — Part 3: Wired vehicle interface based on IEEE 802.3*

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 15765-2,¹⁾ *Road vehicles — Diagnostic communication over Controller Area Network (DoCAN) — Part 2: Transport protocol and network layer services*

ISO 15765-4, *Road vehicles — Diagnostic communication over Controller Area Network (DoCAN) — Part 4: Requirements for emissions-related systems*

1) To be published.