INTERNATIONAL STANDARD

ISO 15031-3

Second edition
2016-04-15

Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics —

Part 3: Diagnostic connector and related electrical circuits: Specification and use

Véhicules routiers — Communications entre un véhicule et un équipement externe pour le diagnostic relatif aux émissions —

Partie 3: Connecteur de diagnostic et circuits électriques associés: spécifications et utilisation

Reference number
ISO 15031-3:2016(E)

International Organization for Standardization

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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 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 15031-3:2004), which has been technically revised.

ISO 15031 consists of the following parts, under the general title *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics*:

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

— *Part 2: Guidance on terms, definitions, abbreviations and acronyms*

— *Part 3: Diagnostic connector and related electrical circuits: Specification and use*

— *Part 4: External test equipment*

— *Part 5: Emissions-related diagnostic services*

— *Part 6: Diagnostic trouble code definitions*

— *Part 7: Data link security*

Introduction

ISO 15031 consists of a number of parts which, taken together, provide a coherent self-consistent set of specifications to facilitate emissions-related diagnostics. ISO 15031-1 provides an introduction to the series of International Standards. ISO 15031-2 through ISO 15031-7 are based on SAE recommended practices. This part of ISO 15031 is based on SAE J1962 (Diagnostic connector).

ISO 15031 includes the communication between the vehicle's on-board diagnostic (OBD) systems and test equipment implemented across vehicles within the scope of the legislated emissions-related OBD.

To achieve this, it 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 specified by ISO 15031 are broken into the following in accordance with Table 1.

— Diagnostic services (layer 7), specified in the following:
  — ISO 15031-5 (emissions-related OBD);
  — ISO 27145-3 (WWH-OBD).
— Presentation layer (layer 6), specified in the following:
  — ISO 15031-2, SAE J1930-DA;
  — ISO 15031-5, SAE J1979-DA;
  — ISO 15031-6, SAE J2012-DA (OBD);
  — ISO 27145-2, SAE J2012-DA (WWH-OBD).
— Session layer services (layer 5), specified in the following:
  — ISO 14229-2 supports ISO 15765-4 DoCAN and ISO 14230-4 DoK-Line protocols;
  — ISO 14229-2 is not applicable to the SAE J1850 and ISO 9141-2 protocols.
— Transport layer services (layer 4), specified in the following:
  — DoCAN: ISO 15765-2 Transport protocol and network layer services;
  — SAE J1850: ISO 15031-5 Emissions-related diagnostic services;
  — ISO 9141-2: ISO 15031-5 Emissions-related diagnostic services;
  — DoK-Line: ISO 14230-4, ISO 15031-5 Emissions-related diagnostic services.
— Network layer services (layer 3), specified in the following:
  — DoCAN: ISO 15765-2 Transport protocol and network layer services;
  — SAE J1850: ISO 15031-5 Emissions-related diagnostic services;
  — ISO 9141-2: ISO 15031-5 Emissions-related diagnostic services;
  — DoK-Line: ISO 14230-4, ISO 15031-5 Emissions-related diagnostic services.
— Data link layer (layer 2), specified in the following:
  — DoCAN: ISO 15765-4, ISO 11898-1;
  — SAE J1850;
  — ISO 9141-2;

— DoK-Line: ISO 14230-2.

— Physical layer (layer 1), specified in the following:

— DoCAN: ISO 15765-4, ISO 11898-1, ISO 11898-2;

— SAE J1850;

— ISO 9141-2;

— DoK-Line: ISO 14230-1.

Table 1 — Legislated emissions-related OBD/WWH-OBD diagnostic specifications applicable to the OSI layers

<table>
<tr><th>Applicability</th><th>OSI 7 layers</th><th colspan="6">Emissions-related OBD communication requirements</th><th colspan="3">Emissions-related WWH-OBD communication requirements</th></tr>
<tr><td rowspan="9">Seven layers according to ISO/IEC 7498-1 and ISO/IEC 10731</td><td>Application (layer 7)</td><td colspan="6">ISO 15031-5</td><td colspan="3">ISO 27145-3</td></tr>
<tr><td rowspan="2">Presentation (layer 6)</td><td colspan="6">ISO 15031-2, ISO 15031-5, ISO 15031-6
SAE J1930-DA/SAE J1979-DA</td><td colspan="3">ISO 27145-2
SAE J1930-DA/SAE J1979-DA</td></tr>
<tr><td colspan="6">SAE J2012-DA (OBD)</td><td colspan="3">SAE J2012-DA (WWH-OBD)</td></tr>
<tr><td>Session (layer 5)</td><td colspan="2">Not applicable</td><td colspan="4">ISO 14229-2</td></tr>
<tr><td>Transport (layer 4)</td><td colspan="2" rowspan="2">ISO 15031-5</td><td>ISO 14230-4</td><td>ISO 15765-2</td><td rowspan="3">ISO 15765-4</td><td>ISO 15765-2</td><td rowspan="3">ISO 27145-4</td><td>ISO 13400-2</td></tr>
<tr><td>Network (layer 3)</td><td rowspan="2">ISO 14230-2</td><td rowspan="2">ISO 11898-1</td><td rowspan="2">ISO 11898-1,</td><td rowspan="3">ISO 13400-3</td></tr>
<tr><td>Data link (layer 2)</td><td rowspan="2">SAE J1850</td><td rowspan="2">ISO 9141-2</td></tr>
<tr><td>Physical (layer 1)</td><td>ISO 14230-1</td><td>ISO 11898-1, ISO 11898-2</td><td>ISO 11898-1, ISO 11898-2</td></tr>
</table>

Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics —

Part 3: Diagnostic connector and related electrical circuits: Specification and use

1 Scope

This part of ISO 15031 references the latest publication of SAE J1962.

On-board diagnostic (OBD) regulations require road vehicles to be equipped with a standardized connector for purposes of access to OBD information by ISO 15031-4 compliant external test equipment. This part of ISO 15031 describes the requirements for the physical connection and associated pin usage to allow for standard access to the OBD data.

The first edition of this part of ISO 15031 was based on SAE J1962 and was intended to meet European OBD requirements for 2000 and later model year vehicles, and added a modified connector type to accommodate vehicles with a 24 V system. This revised part of ISO 15031 is technically equivalent to SAE J1962 with the exception of the specific requirements identified in the document.

This part of ISO 15031 specifies additional requirements related to right hand driven (RHD) vehicles.

Annex A and Annex B are for information and not required to fulfil emissions-related OBD.

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.

SAE J1962:2015, *Diagnostic connector*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions of SAE J1962 apply.

3.2 Abbreviated terms

ACL	additional communication line
CAN	Controller Area Network
RHD	right-hand-driven

4 Conventions

ISO 15031 is based on the conventions discussed in the OSI Service Conventions (ISO/IEC 10731) as they apply for diagnostic services.

5 Connector requirements

5.1 Normative reference to SAE J1962

This part of ISO 15031 corresponds to SAE J1962 diagnostic connector.

5.2 RHD vehicle connector system performance requirements

For RHD vehicles the performance requirement "It shall also withstand a force of 220 N applied in all other axial directions without mechanical failure." as specified in SAE J1962:2015, 5.10.4 e) does not apply.

5.3 RHD location and position of vehicle connector type A

This definition replaces SAE J1962: 2015, 4.1.1.

RHD vehicles with connector type A shall have the connector located in the first row foot well region.

The vehicle connector shall be securely mounted to the vehicle in order to facilitate mating and un-mating.

The connector shall be mounted such that the face of the vehicle connector is pointing downward (90° from horizontal, the –z direction) or toward the rear of the vehicle (0° from horizontal, the –x direction), or any angle in between (see SAE J1962: 2015 Figure 2). Tolerance: ±5°

The connector may be mounted vertically or horizontally, (see SAE J1962: 2015 Figure 2), but may not be oriented in any other angles.

6 Ethernet

The reference to the Ethernet connector layout, pin-out information and simplified test equipment circuitry example for Ethernet option #1 and #2 is specified in Annex A.

7 ACL for on-board pyrotechnic devices

The reference to the ACL for on-board pyrotechnic devices connector layout and pin-out information is specified in Annex B.

Annex A
(informative)

Ethernet pin assignment option #1 and #2 according to ISO 13400-4

The requirements of Ethernet pin assignment option #1 and #2 are specified in ISO 13400-4.

Annex B
(informative)

ACL according to ISO 26021 pin assignment

The ISO 26021- series include two parts which specify the requirements of the ACL. These parts of ISO 26021 are:

— ISO 26021-4: Additional communication line with bidirectional communication

— ISO 26021-5: Additional communication line with pulse width modulated signal.

The physical layer of ACL with bidirectional communication is compliant with ISO 14230-1 (see ISO 26021-4).

The physical layer of ACL with pulse width modulated signal is compliant with ISO 14230-1 (see ISO 26021-5).

The external pyrotechnic device deployment tool (PDT) uses the ACL connected to the in-vehicle pyrotechnic control unit (PCU) to enable the deployment sequence. Further details are specified in ISO 26021-4 and ISO 26021-5.

Bibliography

[1] ISO 6722-3:1993[1)], *Road vehicles — Unscreened low-tension cables — Part 3: Conductor sizes and dimensions for thick-wall insulated cables*

[2] ISO 6722-4:1993[2)], *Road vehicles — Unscreened low-tension cables — Part 4: Conductor sizes and dimensions for thin-wall insulated cables*

[3] ISO 9141-2, *Road vehicles — Diagnostic systems — Part 2: CARB requirements for interchange of digital information*

[4] ISO 13400-3, *Road vehicles — Diagnostic communication over Internet Protocol (DoIP) — Part 3: IEEE 802.3 based wired vehicle interface*

[5] ISO 13400-4[3)], *Road vehicles — Diagnostic communication over Internet Protocol (DoIP) — Part 4: Ethernet-based high-speed data link connector*

[6] ISO 14230-4, *Road vehicles — Diagnostic systems — Keyword Protocol 2000 — Part 4: Requirements for emission-related systems*

[7] ISO 15031-1, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 1: General information and use case definition*

[8] ISO 15031-4, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 4: External test equipment*

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

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

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

[12] SAE J1850, *Class B Data Communications Network Interface*

[13] IEEE 802.3, *IEEE Standard for Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements — Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

1) Withdrawn.

2) Withdrawn.

3) To be published.

ICS 43.180; 13.040.50; 43.040.10

Price based on 5 pages