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

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

*Véhicules routiers — Communications entre un véhicule et
un équipement externe quant au diagnostic relatif aux émissions —*

Partie 1: Informations générales et définition de cas d'usage



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Published in Switzerland

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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 15031-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

This second edition cancels and replaces the first edition (ISO 15031-1:2001), 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*

ISO 15031 provides an implementer with all documents and references required to support the implementation of legislated on-board diagnostics (OBDS) in accordance with the requirements set forth in the country-specific emissions regulation.

- ISO 15031-1 provides general information and use case definitions and an overview of the document set along with the use case definitions and a common set of resources (definitions, references) for use by all subsequent parts.
- ISO 15031-2 is a guide to terms, definitions, abbreviations and acronyms used in emissions-related diagnostics, with respect to the communication between road vehicles and external equipment used in that field. It also specifies a procedure for constructing new terms. As it gives recommended usage of diagnostic terms applicable to electrical/electronic systems, it also makes reference to related mechanical terms, definitions, abbreviations and acronyms.

- ISO 15031-3 specifies a minimum set of requirements for a diagnostic connector used in communication between vehicle and external equipment for emissions-related diagnostics.
- ISO 15031-4 provides requirements to be fulfilled by any external test equipment connected to the vehicle.
- ISO 15031-5 provides the data reporting requirements of (OBD) regulations in the United States and Europe, and any other region that may adopt similar requirements in the future. ISO 15031-5 specifies:
 - message formats for request and response messages,
 - timing requirements between request messages from external test equipment and response messages from vehicles, and between those messages and subsequent request messages,
 - behaviour of both the vehicle and external test equipment if data is not available,
 - a set of diagnostic services, with corresponding content of request and response messages, to satisfy OBD regulations.
- ISO 15031-6 provides uniformity for standardized Diagnostic Trouble Codes (DTC) that electrical/electronic (OBD) systems of motor vehicles are required to report when malfunctions are detected. It further provides guidance for uniform messages (text descriptor) associated with these codes.
- ISO 15031-7 specifies a standard mechanism for limiting access to particular vehicle services (such as those intended for use only within the original manufacturing plant).

Introduction

0.1 Overview

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

Such standardization is of benefit to many sectors of the automotive industry, including service technicians who are required to work on a variety of vehicle types and component suppliers who wish to provide similar products to several vehicle manufacturers.

Some of the documents have a wider scope than just purely emissions-related issues. The legislator is the adequate authority to make the appropriate references.

ISO 15031 includes the communication between the vehicle's on-board diagnostic (OBD) systems and an external (off-board) "generic" test equipment within the scope of the emissions-related OBD legislation.

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 layers in accordance with Table 1:

- diagnostic services (layer 7), specified in
 - ISO 15031-5 (emissions-related OBD);
 - ISO 27145-3 (WWH-OBD);
- presentation layer (layer 6), specified in
 - 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
 - ISO 14229-2 support ISO 15765-4 and ISO 14230-4 protocol;
 - ISO 14229-2 are not applicable to the SAE J1850 and ISO 9141-2 protocols;
- transport layer services (layer 4), specified in
 - ISO 15765-4, ISO 15765-2 Transport protocol and network layer services;
 - SAE J1850 defined in ISO 15031-5;
 - ISO 9141-2 defined in ISO 15031-5;
 - ISO 14230-4 defined in ISO 15031-5;

- network layer services (layer 3), specified in
 - ISO 15765-4, ISO 15765-2 Transport protocol and network layer services;
 - SAE J1850 defined in ISO 15031-5;
 - ISO 9141-2 defined in ISO 15031-5;
 - ISO 14230-4 defined in ISO 15031-5;
- data link layer (layer 2), specified in
 - ISO 15765-4, ISO 11898-1 and ISO 11898-2;
 - SAE J1850,
 - ISO 9141-2;
 - ISO 14230-2;
- physical layer (layer 1), specified in
 - ISO 15765-4, ISO 11898-1 and ISO 11898-2;
 - SAE J1850;
 - ISO 9141-2;
 - ISO 14230-1.

Table 1 — Legislated emissions-related OBD(WWH¹)-OBD diagnostic specifications applicable to the OSI layers

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

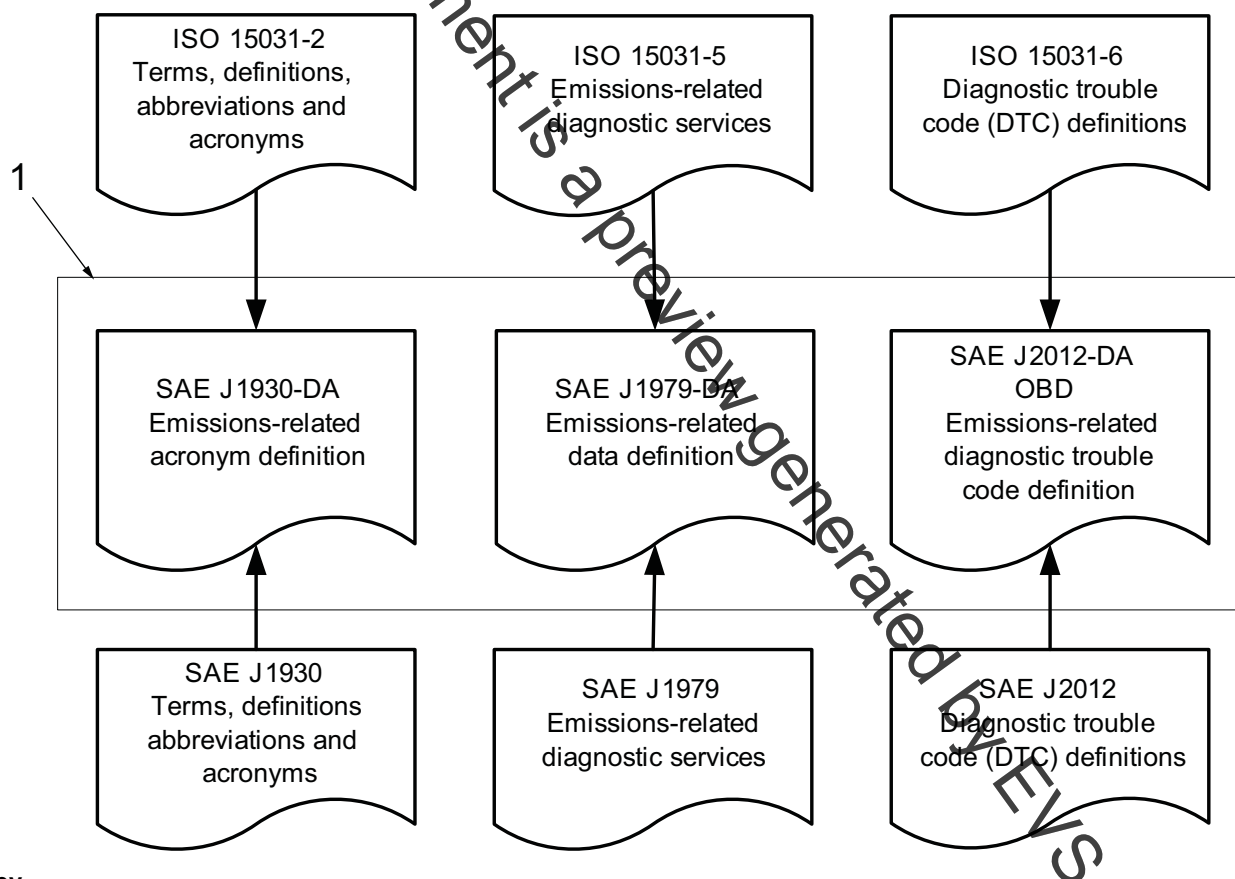
1) World-Wide Harmonized.

0.2 SAE document reference concept

ISO 15031 references several SAE documents which contain all terms, data and DTC (diagnostic trouble code) definitions.

This is illustrated in Figure 1. Additional information on the content of the referenced documents is given below:

- SAE J1930: the document is concerned with a procedure for naming objects and systems and with the set of words from which names are built. It references SAE J1930-DA, which contains all standardized naming objects, terms and abbreviations.
- SAE J1979: the document is concerned with the definition of emissions-related diagnostic services (diagnostic test modes). It references SAE J1979-DA, which contains all standardized data items like PIDs, Test Ids, Monitor Ids and InfoType Ids.
- SAE J2012: the document is concerned with the procedure for defining emissions-related DTCs. It references SAE J2012-DA, which contains all standardized data items like DTCs and FTBs.



Key

- 1 SAE Digital Annexes

Figure 1 — SAE Digital Annex document reference

0.3 SAE Digital Annex revision procedure

New emissions-related regulatory requirements drive new in-vehicle technology to lower emissions. New technology-related OBD monitor data and DTCs need to be standardized 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 15031-2, ISO 15031-5 and ISO 15031-6 reference a “Change Request Form” to be used for new data items to be defined by the SAE task force for standardization. The standardized data items will be defined in SAE J1930-DA, SAE J1979-DA and SAE J2012-DA. Once the information has been balloted and approved the documents will be published on the SAE Store Web Site.

The revision request forms and instructions for updating the registers to all parts of ISO 15031 can be obtained on the Registration Authority's website at:

- for Part 2: <http://www.sae.org/servlets/works/committeeHome.do?comtID=TEVDS7>
The column titled “Resources” shows a document with the title: J1930-DA_Revision_Request_Form.doc. Double click on the name and you will be asked to download the document with the filename: SAE_J1930-DA_Revision_Request_Form.doc
- for Part 5: <http://www.sae.org/servlets/works/committeeHome.do?comtID=TEVDS14>
The column titled “Resources” shows a document with the title: J1979-DA_Revision_Request_Form.doc. Double click on the name and you will be asked to download the document with the filename: SAE_J1979-DA_Revision_Request_Form.doc
- for Part 6: <http://www.sae.org/servlets/works/committeeHome.do?comtID=TEVDS9>
The column titled “Resources” shows a document with the title: J2012-DA_Revision_Request_Form.doc. Double click on the name and you will be asked to download the document with the filename: SAE_J2012-DA_Revision_Request_Form.doc

Fill out the revision request form with your request.

Please send an email with the completed revision request form as an attachment to:

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

Part 1: General information and use case definition

1 Scope

This part of ISO 15031 gives an overview of the structure and the partitioning of ISO 15031, and shows the relation between the different parts. It also defines the corresponding SAE recommended practices and reference to the SAE Digital Annexes. The terminology defined in this part of ISO 15031 is common for all parts of ISO 15031.

This part of ISO 15031 also describes the use cases applicable to the communication between vehicle and external test equipment for emissions-related diagnostics.

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 7498-1:1994, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model*

ISO/IEC 10731:1994, *Information technology — Open Systems Interconnection — Basic Reference Model — Conventions for the definition of OSI services*

ISO 15031-2, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 2: Guidance on terms, definitions, abbreviations and acronyms*

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

ISO 15031-5, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 5: Emissions-related diagnostic services*

ISO 15031-6, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 6: Diagnostic trouble code definitions*

ISO 15031-7, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 7: Data link security*