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

**Part 4:
External test equipment**

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

Partie 4: Équipement d'essai externe



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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.

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. 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. 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.

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electric and electronic equipment*.

This second edition cancels and replaces the first edition (ISO 15031-4:2005), which has been technically revised.

ISO 15031 consists of the following parts, under the general title *Road vehicles — Communication between vehicle and external test 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

0.1 Overview

This International Standard 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 to ISO 15031-7 are based on Society of Automotive Engineers (SAE) recommended practices. This part of ISO 15031 is based on SAE J1978.

This International Standard includes the communication between the vehicle's On-Board Diagnostics (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 this International Standard are broken into the following:

- Diagnostic services (layer 7), specified in:
 - ISO 15031-5 (emissions-related OBD);
- Presentation layer (layer 6), specified in:
 - ISO 15031-2, SAE J1930-DA;^[4]
 - ISO 15031-5, SAE J1979-DA;^[8]
 - ISO 15031-6, SAE J2012-DA (OBD);^[10]
- Session layer services (layer 5), specified in:
 - 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:
 - 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:
 - 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:
 - DoCAN: ISO 15765-4;
 - CAN: ISO 11898-1, ISO 11898-2;
 - SAE J1850;

ISO 15031-4:2014(E)

- ISO 9141-2;
- DoK-Line: ISO 14230-2;
- Physical layer (layer 1), specified in:
 - DoCAN: ISO 15765-4;
 - CAN: ISO 11898-1, ISO 11898-2;
 - SAE J1850;
 - ISO 9141-2;
 - DoK-Line: ISO 14230-1;

in accordance with [Table 1](#).

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

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

0.2 SAE document reference concept

This International Standard references several SAE documents which contain all terms, data, and DTC definitions.

See [Figure 1](#) with the following definition of content in ISO 15031-2, ISO 15031-5, and ISO 15031-6:

- SAE J1930: 15031-2 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: 15031-5 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, TIDs, OBDMIDs, and ITIDs.
- SAE J2012: 15031-6 is concerned with the procedure for defining emissions-related diagnostic trouble codes. It references SAE J2012-DA which contains all standardized data items like DTCs and FTBs.

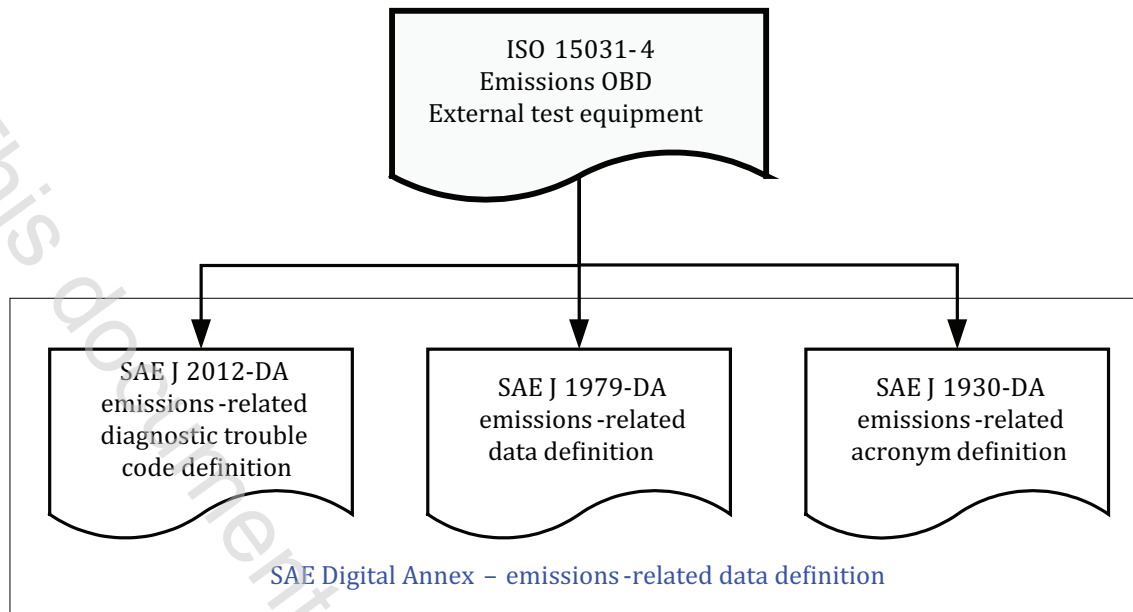


Figure 1 — SAE Digital Annex document reference

OBD regulations require passenger cars and light, medium, and heavy duty trucks to support a minimum set of diagnostic information to external (off-board) “generic” test equipment.

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 diagnostic trouble codes 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 the SAE J1930-DA,^[4] SAE J1979-DA,^[8] and SAE J2012-DA.^[10] Once the information has been balloted and approved, the documents will be published on the SAE Store website.

The revision request forms and instructions for updating the Registers to ISO 15031-2, ISO 15031-5, and ISO 15031-6 can be obtained from the Registration Authority’s website.

- For ISO 15031-2: <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 ISO 15031-5: <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 ISO 15031-6: <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.

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

Part 4: External test equipment

1 Scope

This part of ISO 15031 specifies a set of standard diagnostic services to be provided by vehicles (OBD services). This part of ISO 15031 specifies a complementary set of facilities, to be provided by external test equipment, which will include scan tool facilities. These facilities provide complete, efficient, and safe access to all of the public OBD (on-board diagnosis) services on any vehicle, which is compliant with this part of ISO 15031.

This part of ISO 15031 specifies

- a means of establishing communications between an OBD-equipped vehicle and external test equipment, and
- a set of diagnostic services to be provided by the external test equipment in order to exercise the services defined in ISO 15031-5.

This part of ISO 15031 does not preclude the inclusion of additional capabilities or functions in external test equipment. However, it is the responsibility of the external test equipment designer to ensure that no such capability or function can adversely affect either an OBD-equipped vehicle, which may be connected to the external test equipment or the external test equipment itself.

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 7637-2:2011, *Road vehicles — Electrical disturbances from conduction and coupling — Part 2: Electrical transient conduction along supply lines only*

ISO 9141-2:1994, *Road vehicles — Diagnostic systems — Part 2: CARB requirements for interchange of digital information*

ISO 14230-2:2013, *Road vehicles — Diagnostic communication over K-Line (DoK-Line) — Part 2: Data link layer*

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

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 15031-5, *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 15765-4, *Road vehicles — Diagnostic communication over Controller Area Network (DoCAN) — Part 4: Requirements for emissions-related systems*

ISO 16750-2, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 2: Electrical loads*

SAE J1699-2, *Test Cases for OBD-II Scan Tools and I/M Test Equipment*

SAE J1850:MAY2001, *Class B Data Communications Network Interface*

3 Terms, definitions, symbols, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15031 (all parts) apply.

3.2 Abbreviated terms

Addr	address
DoCAN	diagnostic communication over Controller Area Networks
DoK-Line	diagnostic communication over K-Line
DTC	diagnostic trouble code
ECU	electronic control unit
IPT	in-use performance tracking
ITID	infotype identifier
MIL	malfunction indicator lamp
NRC	negative response code
OBDMID	on-board monitor identifier
OBD	on-board diagnostics
PID	parameter identifier
PWM	pulse width modulated
RPM	rounds per minute
TID	test identifier
VPM	variable pulse width