INTERNATIONAL STANDARD

ISO 15031-6

Second edition
2010-08-15

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

Part 6: Diagnostic trouble code definitions

Véhicules routiers — Communications entre un véhicule et un équipement externe concernant le diagnostic relatif aux émissions — Partie 6: Définition des codes d'anomalie de diagnostic

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 15031-6 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 15031-6:2005), which has been 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

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 is based on SAE J2012.

ISO 15031-1 provides an introduction to the series of International Standards.

This document set 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 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;
  — this part of ISO 15031, 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 DoCAN and ISO 14230-4 DoK-Line protocols;
  — ISO 14229-2 are not applicable to the SAE J1850 and ISO 9141-2 protocols;
— transport layer services (layer 4), specified in
  — ISO 15765-2;
  — 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 15765-2;
  — 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/WWH[1]-OBD diagnostic specifications applicable to the OSI layers

<table>
<tr><th>Applicability</th><th>OSI 7 layers</th><th colspan="3">Emissions-related OBD communication requirements</th><th colspan="3">Emissions-related WWH-OBD communication requirements</th></tr>
<tr><td rowspan="8">Seven layer according to ISO/IEC 7498-1 and ISO/IEC 10731</td><td>Application (layer 7)</td><td colspan="3">ISO 15031-5</td><td colspan="3">ISO 27145-3</td></tr>
<tr><td rowspan="2">Presentation (layer 6)</td><td colspan="3">ISO 15031-2, ISO 15031-5, ISO 15031-6</td><td colspan="3">ISO 27145-2</td></tr>
<tr><td colspan="3">SAE J1930-DA/SAE J1979-DA/
SAE J2012-DA (OBD)</td><td colspan="3">SAE J2012-DA (WWH-OBD)</td></tr>
<tr><td>Session (layer 5)</td><td colspan="2">ISO 14229-2</td><td colspan="2">Not Applicable</td><td>ISO 14229-2</td></tr>
<tr><td>Transport (layer 4)</td><td rowspan="2">ISO 15765-2</td><td rowspan="4">ISO 15765-4</td><td colspan="3" rowspan="2">ISO 15031-5</td><td rowspan="4">ISO 14230-4</td></tr>
<tr><td>Network (layer 3)</td></tr>
<tr><td>Data link (layer 2)</td><td rowspan="2">ISO 11898-1
ISO 11898-2</td><td rowspan="2">SAE J1850</td><td rowspan="2">ISO 9141-2</td><td>ISO 14230-2</td></tr>
<tr><td>Physical (layer 1)</td><td>ISO 14230-1</td></tr>
</table>

1) World-Wide Harmonized

0.2 SAE document reference concept

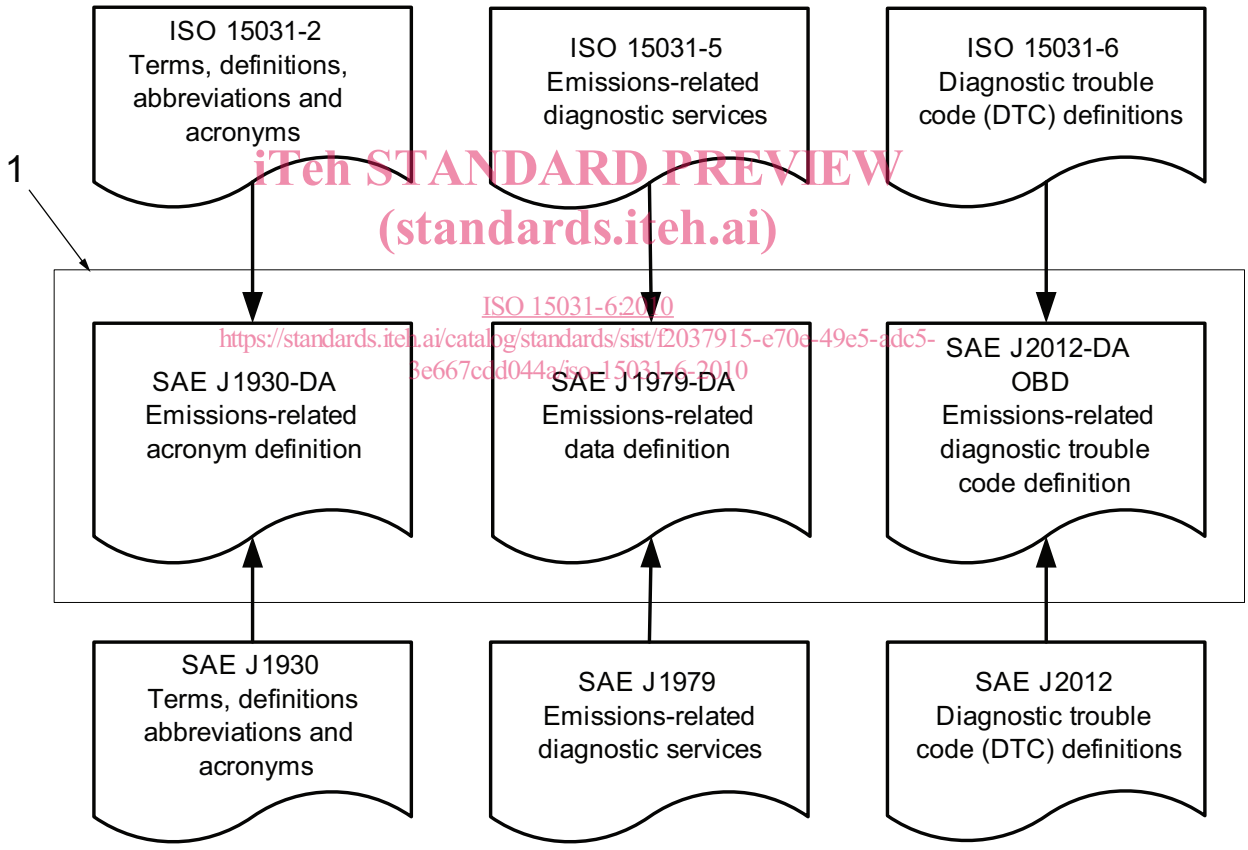
ISO 15031 references several SAE documents which contain all terms, data and DTC (diagnostic trouble code) definitions.

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 (failure type bytes).



Key

1 SAE Digital Annexes

Figure 1 — SAE Digital Annex document reference

On-Board Diagnostic (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 J2012-DA (OBD) Digital Annex

This part of ISO 15031 references SAE J2012-DA. SAE J2012-DA is concerned with the definition of DTCs and FTB information.

SAE J2012-DA (OBD) includes several appendices for:

— DTC naming guidelines;

— powertrain system DTCs;

— network communication system, body systems, and chassis systems;

— DTC failure category and subtype definition.

0.4 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.

Revision request forms and instructions for updating the registers to this part of ISO 15031 can be obtained on the Registration Authority's website at:

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 e-mail with the completed revision request form as an attachment to:

SAE Headquarters
755 West Big Beaver Road
Suite 1600
Troy, MI 48084-4093, USA
Fax: +1 (248) 273-2494
mailto: saej2012@sae.org

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

Part 6: Diagnostic trouble code definitions

1 Scope

This part of ISO 15031 provides uniformity for standardized Diagnostic Trouble Codes (DTC) that electrical/electronic On-Board Diagnostic (OBD) systems of motor vehicles are required to report when malfunctions are detected. It also provides guidance for uniform messages (text descriptor) associated with these codes.

This part of ISO 15031 specifies the rules and guidelines for the definition of:

a) the DTC format, which consists of:
   1) addressing format;
   2) structure;
   3) messages;

b) a standardized set of DTC and descriptions;

c) a standardized set of DTC subtypes known as failure types.

This part of ISO 15031 specifies all general rules and guidelines to define new DTCs. This part of ISO 15031 references the SAE J2012-DA (Digital Annex), which includes all standardized DTCs (number and text descriptor) as well as all DTC subtypes known as failure types.

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

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

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 15031-2 apply.

3.2 Abbreviated terms

B1S1	bank 1 sensor 1
B1S2	bank 1 sensor 2
B1S3	bank 1 sensor 3
B2S1	bank 2 sensor 1
B2S2	bank 2 sensor 2
B2S3	bank 2 sensor 3
BARO	barometric atmospheric pressure
CVN	calibration verification number
DTC	diagnostic trouble code
ECM	engine control module
ISR	interrupt service routine
LSB	least significant bit
MAF	mass air flow
MAP	manifold absolute pressure
MIL	malfunction indicator light
MSB	most significant bit
OBD	on-board diagnostics
OSI	open systems interconnection
PCM	powertrain control module
SI	international system of units
TCM	transmission control module

4 Conventions

ISO 15031 is based on the conventions discussed in the OSI Service Conventions (ISO/IEC 10731:1994) as they apply for diagnostic services.

The protocol initialization identifies whether ISO 15765-4 DoCAN, SAE J1850, ISO 14230-4 DoK-Line or ISO 9141-2 is the data link layer supported by the vehicle. ISO 15031 references the standards as an applicable data link for emissions-related OBD.

ISO 15031-5 specifies the applicable emissions-related diagnostic services. This part of ISO 15031 specifies the data record structures and references SAE J1930-DA, SAE J1979-DA and SAE J2012-DA which include all emissions-related OBD data definitions.

5 Document overview

Figure 2 illustrates the document references.

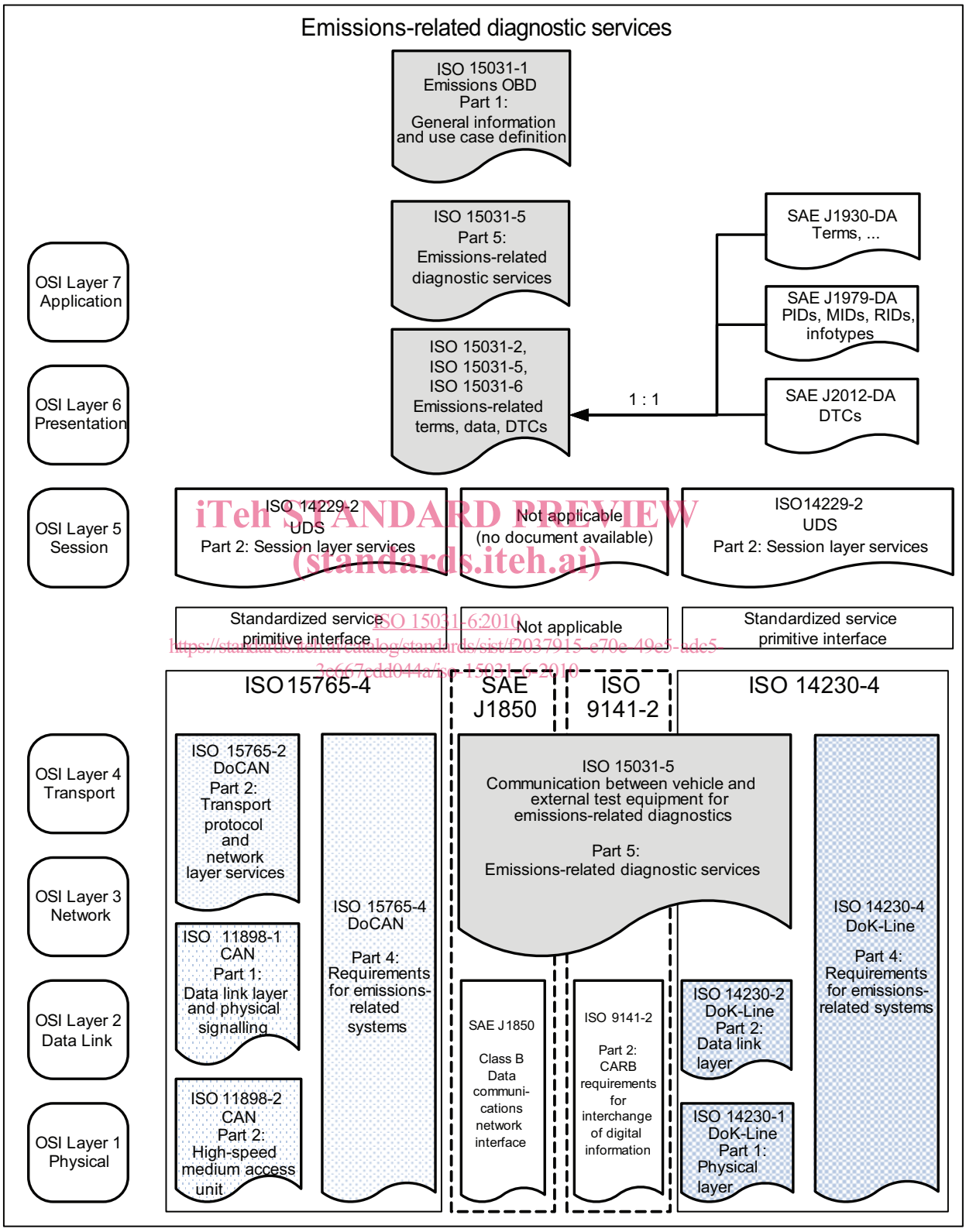


Figure 2 — Emissions-related OBD on ISO 15765-4, SAE J1850, ISO 9141-2, ISO 14230-4 document reference according to OSI model