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# Road vehicles — Diagnostic communication over K-Line (DoK-Line) —

## Part 2: Data link layer

*Véhicules routiers — Communication de diagnostic sur la ligne K (DoK-Line) —*

*Partie 2: Couche de liaison de données*

Reference number
ISO 14230-2:2016(E)

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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).

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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

This third edition cancels and replaces the second edition (ISO 14230-2:2013), which has been technically revised.

A list of parts in the ISO 14230 series can be found on the ISO website.

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# Introduction

This document has been established in order to define common requirements for vehicle diagnostic systems implemented on K-Line (UART based) communication link, as specified in ISO 14230-1.

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 14230 are broken into the following:

— Diagnostic services (layer 7), specified in ISO 14229-1, ISO 14229-6;

— Presentation layer (layer 6):

  — vehicle manufacturer specific;

  — legislated WWH-OBD: ISO 27145-2, SAE 1930-DA, SAE J1979-DA, SAE J2012-DA, SAE J1939:2011, Appendix C (SPN), SAE J1939-73:2010, Appendix A (FMI);

— Session layer services (layer 5):

  — legislated OBD: specified in ISO 14229-2;

  — legislated WWH-OBD: specified in ISO 14229-2;

— Transport layer services (layer 4), specified in ISO 14230-2;

— Network layer services (layer 3), specified in ISO 14230-2;

— Data link layer (layer 2), specified in ISO 14230-4, ISO 14230-2;

— Physical layer (layer 1), specified in ISO 14230-1;

in accordance with Table 1.

**Table 1 — Enhanced and legislated OBD diagnostic specifications applicable to the OSI layers**

<table>
<tr><th>OSI seven layer[a]</th><th>Enhanced diagnostics</th><th colspan="2">Legislated OBD (On-Board Diagnostics)</th><th colspan="2">Legislated WWH-OBD (On-Board Diagnostics)</th></tr>
<tr><td>Application (layer 7)</td><td>ISO 14229-1,<br>ISO 14229-6</td><td colspan="2">ISO 15031-5</td><td colspan="2">ISO 14229-1, ISO 27145-3</td></tr>
<tr><td>Presentation (layer 6)</td><td>vehicle manufacturer specific</td><td colspan="2">ISO 15031-2,<br>ISO 15031-5,<br>ISO 15031-6,<br>SAE J1930-DA,<br>SAE J1979-DA,<br>SAE J2012-DA</td><td colspan="2">ISO 27145-2, SAE 1930-DA,<br>SAE J1979-DA, SAE J2012-DA,<br>SAE J1939:2011,<br>Appendix C (SPN),<br>SAE J1939–73:2010,<br>Appendix A (FMI)</td></tr>
<tr><td>Session (layer 5)</td><td colspan="5">ISO 14229-2</td></tr>
<tr><td>Transport (layer 4)</td><td rowspan="2">ISO 14230-2</td><td rowspan="2">ISO 15765-2</td><td rowspan="3">ISO 15765-4</td><td>ISO 15765-4,<br>ISO 15765-2</td><td rowspan="3">ISO 27145-4</td></tr>
<tr><td>Network (layer 3)</td></tr>
<tr><td>Data link (layer 2)</td><td>ISO 14230-2</td><td>ISO 11898-1</td><td>ISO 15765-4,<br>ISO 11898-1</td></tr>
<tr><td>Physical (layer 1)</td><td>ISO 14230-1</td><td>ISO 11898-1,<br>ISO 11898-2</td><td>ISO 11898-1,<br>ISO 11898-2</td></tr>
<tr><td colspan="6">[a] Seven layers according to ISO/IEC 7498-1 and ISO/IEC 10731.</td></tr>
</table>

The application layer services covered by ISO 14229-6 have been defined in compliance with diagnostic services established in ISO 14229-1 and ISO 15031-5, but are not limited to use only with them.


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ISO 14229-6 is also compatible with most diagnostic services defined in national standards or vehicle manufacturer's specifications.

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# Road vehicles — Diagnostic communication over K-Line (DoK-Line) —

## Part 2: Data link layer

## 1 Scope

This document specifies data link layer services tailored to meet the requirements of UART-based vehicle communication systems on K-Line as specified in ISO 14230-1. It has been defined in accordance with the diagnostic services established in ISO 14229-1 and ISO 15031-5, but is not limited to use with them and is also compatible with most other communication needs for in-vehicle networks. The protocol specifies an unconfirmed communication.

The diagnostic communication over K-Line (DoK-Line) protocol supports the standardized service primitive interface as specified in ISO 14229-2.

This document provides the data link layer services to support different application layer implementations like the following:

— enhanced vehicle diagnostics (emissions-related system diagnostics beyond legislated functionality, non-emissions-related system diagnostics);

— emissions-related OBD as specified in ISO 15031, SAE J1979-DA and SAE J2012-DA;

— in addition, this document clarifies the differences in initialization for K-line protocols defined in ISO 9141 and ISO 14230. This is important since a server supports only one of the protocols mentioned above and the client has to handle the coexistence of all protocols during the protocol determination procedure.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 14230-4, *Road vehicles — Diagnostic systems — Keyword Protocol 2000 — Part 4: Requirements for emission-related systems*

## 3 Terms, definitions, symbols and abbreviated terms

### 3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

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**3.1.1**
**5 baud initialization**
**5-BAUD_INIT**
starts with bus idle and ends with inverted address byte sent by the server

**3.1.2**
**fast initialization**
**FAST_INIT**
starts with bus idle and ends with the reception of all positive responses of the StartCommunication service from all addressed servers

**3.1.3**
**topology**
serial link between client and servers and consists of a K-Line and an optional L-Line

**3.1.4**
**server**
function that is part of an electronic control unit and that provides the diagnostic services

**3.1.5**
**client**
function that is part of the tester and that makes use of the diagnostic services

Note 1 to entry: A tester normally makes use of other functions such as database management, specific interpretation, human-machine interface.

## 3.2 Symbols and abbreviated terms

| | |
|---|---|
| 5-BAUD_INIT | 5-baud initialization |
| ISO 9141-2 5-BAUD_INIT | Protocol on K-Line according to ISO 9141-2 including 5-BAUD_INIT |
| ISO 14230-2 5-BAUD_INIT | Protocol on K-Line according to ISO 14230-2 including 5-BAUD_INIT |
| ISO 14230-2 FAST_INIT | Protocol on K-Line according to ISO 14230-2 including FAST_INIT |
| ISO 14230-4 5-BAUD_INIT | Protocol on K-Line according to ISO 14230-4 including 5-BAUD_INIT |
| ISO 14230-4 FAST_INIT | Protocol on K-Line according to ISO 14230-4 including FAST_INIT |
| bus converter | electronic control unit that links bus systems |
| client | external test equipment |
| confirm | confirmation service primitive |
| Cvt | Convention: M = mandatory, C = conditional, U = user-optional |
| ECU | electronic control unit |
| FAST_INIT | fast initialization |
| FB | first byte |
| FMT | format byte |
| gateway | linking hardware between bus systems |
| DA | destination address |
| DoK-Line | Diagnostic communication over K-Line |


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