
**Road vehicles — Diagnostic
communication over Controller Area
Network (DoCAN) —**

**Part 4:
Requirements for emissions-related
systems**

*Véhicules routiers — Diagnostic sur gestionnaire de réseau de
communication (DoCAN) —*

Partie 4: Exigences applicables aux systèmes associés aux émissions



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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 15765-4 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 15765-4:2005), which has been technically revised.

ISO 15765 consists of the following parts, under the general title *Road vehicles — Diagnostic communication over Controller Area Network (DoCAN)*:

- *Part 1: General information and use case definition*
- *Part 2: Transport protocol and network layer services*
- *Part 3: Implementation of unified diagnostic services (UDS on CAN)*
- *Part 4: Requirements for emissions-related systems*

1) ISO 15765-3 will be replaced by ISO 14229-3.

Introduction

This part of ISO 15765 has been established in order to define common requirements for vehicle diagnostic systems implemented on a Controller Area Network (CAN) communication link, as specified in ISO 11898. Although primarily intended for diagnostic systems, it also meets requirements from other CAN-based systems needing a network layer protocol.

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 as shown in Table 1.

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

Applicability	OSI 7 layers	Vehicle manufacturer enhanced diagnostics	Legislated OBD (on-board diagnostics)	Legislated WWH-OBD (on-board diagnostics)
Seven layers according to ISO/IEC 7498-1 and ISO/IEC 10731	Application (layer 7)	ISO 14229-1, ISO 14229-3	ISO 15031-5	ISO 27145-3, ISO 14229-1
	Presentation (layer 6)	Vehicle manufacturer specific	ISO 15031-2, ISO 15031-5, ISO 15031-6, SAE J1930-DA, SAE J1979-DA, SAE J2012-DA	ISO/PAS 27145-2, SAE 1930-DA, SAE J1979-DA, SAE J2012-DA, SAE J1939 Appendix C (SPN), SAE J1939-73 Appendix A (FMI)
	Session (layer 5)	ISO 14229-2	ISO 15765-2, ISO 15765-4, ISO 11898-2	ISO 14229-2
	Transport protocol (layer 4)	ISO 15765-2		ISO 15765-4, ISO 15765-2
	Network (layer 3)			ISO 27145-4
	Data link (layer 2)	ISO 11898-1		
	Physical (layer 1)	User defined		

The application layer services covered by ISO 14229-3 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.

The transport protocol and network layer services covered by this part of ISO 15765 have been defined to be independent of the physical layer implemented, and a physical layer is only specified for legislated on-board diagnostics (OBD).

For other application areas, ISO 15765 can be used with any CAN physical layer.

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Road vehicles — Diagnostic communication over Controller Area Network (DoCAN) —

Part 4: Requirements for emissions-related systems

1 Scope

This part of ISO 15765 specifies requirements for controller area networks (CAN) where one or more controllers comply with on-board diagnostics (OBD) or world-wide harmonized on-board diagnostics (WWH-OBD) regulations. The network presumes the use of an external test equipment for inspection and repair diagnostics, as defined by the regulations. The CAN network requirements for the vehicle and the external test equipment are based on the specifications of ISO 15765-2, ISO 11898-1 and ISO 11898-2.

This part of ISO 15765 places restrictions on those International Standards for the fulfilment of the regulations. It does not specify in-vehicle CAN bus architecture, but seeks to ensure that the vehicle's regulated CAN communications comply with external test equipment requirements.

This part of ISO 15765 defines the requirements to successfully establish, maintain and terminate communication with a vehicle that implements the requirements of the OBD/WWH-OBD regulations. Plug-and-play communication capabilities among vehicles and test equipment are defined to assure the interoperation of external test equipment and vehicles. This part of ISO 15765 details all of the OSI layer requirements to achieve this goal.

This part of ISO 15765 is the entry point for DoCAN (Diagnostic communication over CAN). Based on the results of the initialization, the external test equipment determines which protocol and diagnostic services are supported by the vehicle's emissions-related system:

- legislated OBD: ISO 15031 (all parts),
- legislated WWH-OBD: ISO 27145 (all parts).

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 11898-1, *Road vehicles — Controller area network (CAN) — Part 1: Data link layer and physical signalling*

ISO 11898-2, *Road vehicles — Controller area network (CAN) — Part 2: High-speed medium access unit*

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 15765-2, *Road vehicles — Diagnostic communication over Controller Area Networks (DoCAN) — Part 2: Transport protocol and network layer services*

ISO 27145-3 ²⁾, *Road vehicles — Implementation of World-Wide Harmonized On-Board Diagnostics (WWH-OBD) communication requirements — Part 3: Common message dictionary*

ISO 27145-4 ³⁾, *Road vehicles — Implementation of World-Wide Harmonized On-Board Diagnostics (WWH-OBD) communication requirements — Part 4: Connection between vehicle and test equipment*

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 15765-2 apply.

3.2 Symbols

Symbol	Definition	Unit
C_{AC1}, C_{AC2}	capacitance of a.c. termination	F
C_{CAN_H}	capacitance between CAN_H and ground potential	F
C_{CAN_L}	capacitance between CAN_L and ground potential	F
C_{DIFF}	capacitance between CAN_H and CAN_L	F
Δf	oscillator tolerance	Hz
l_{CABLE}	maximum cable length between OBD/WWH-OBD connector and external test equipment	m
Prop_Seg	propagation segment	
Phase_Seg1	phase segment 1	
Phase_Seg2	phase segment 2	
R_{AC1}, R_{AC2}	resistance of a.c. termination	Ω
Sync_Seg	synchronization segment	
t_{BIT}	bit time	μs
t_{BIT_RX}	receive bit time	μs
t_{BIT_TX}	transmit bit time	μs
t_{CABLE}	external-test-equipment cable propagation delay (without external test equipment CAN interface delay)	μs
t_{SEG1}	timing segment 1	μs
t_{SEG2}	timing segment 2	μs
t_{SJW}	resynchronization jump with	μs
$t_{SYNCSEG}$	synchronization segment	μs
t_{TOOL}	external test equipment CAN interface propagation delay (without external test equipment cable delay)	μs
t_Q	time quantum	μs

2) To be published. (Revision of ISO/PAS 27145-3:2006)

3) To be published. (Revision of ISO/PAS 27145-4:2006)