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Road vehicles — Diagnostic communication over Internet Protocol (DoIP) —

Part 4:
Ethernet-based high-speed data link connector

Véhicules routiers — Communication de diagnostic sur protocole Internet (DoIP) —

Partie 4: Connecteur de lien de données haut débit fondées sur l'éthernet

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Foreword

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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).

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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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

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

ISO 13400 consists of the following parts, under the general title *Road vehicles — Diagnostic communication over Internet Protocol (DoIP)*:

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

— *Part 2: Transport protocol and network layer services*

— *Part 4: Ethernet-based high-speed data link connector*

The following parts are under preparation:

— *Part 3: Wired vehicle interface based on IEEE 802.3*

Introduction

Vehicle diagnostic communication has been developed, starting with the introduction of the first legislated emission-related diagnostics and has evolved over the years, now covering various use cases ranging from emission-related diagnostics to vehicle manufacturer specific applications like calibration or electronic component software updates.

With the introduction of new in-vehicle network communication technologies, the interface between the vehicle's electronic control units and the external test equipment has been adapted several times to address the specific characteristics of each new network communication technology requiring optimized data link layer definitions and transport protocol developments in order to make the new in-vehicle networks usable for diagnostic communication.

With increasing memory size of electronic control units and the demand to update this increasing amount of software and an increasing number of functions provided by these control units, technology of the connecting network and buses has been driven to a level of complexity and speed similar to computer networks. New applications (x-by-wire, infotainment) require high band-width and real time networks (like FlexRay, MOST), which cannot be adapted anymore to be the direct interface to a vehicle. This requires gateways to route and convert messages between the in-vehicle networks and the vehicle interface to external test equipment.

The intent of the ISO 13400 series is to describe a standardized vehicle interface which

— separates in-vehicle network technology from the external test equipment vehicle interface requirements to allow for a long-term stable external vehicle communication interface,

— utilizes existing industry standards to define a long-term stable state-of-the-art communication standard usable for legislated diagnostic communication, as well as for manufacturer specific use cases, and

— can easily be adapted to new physical and data link layers by using existing adaptation layers.

To achieve this, it is based on the Open Systems Interconnection (OSI) Basic Reference Model specified in 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 14229 series are divided into:

— unified diagnostic services (layer 7), specified in ISO 14229-1, ISO 14229-5, ISO 27145-3;

— presentation (layer 6):

  — for enhanced diagnostics, specified by the vehicle manufacturer;

  — for WWH-OBD, specified in ISO 27145-2, SAE J1930-DA, SAE J1979-DA, SAE J2012-DA;

— session layer services (layer 5), specified in ISO 14229-2;

— transport protocol (layer 4), specified in ISO 13400-2;

— network layer (layer 3) services, specified in ISO 13400-2;

— physical and data link services (layers 1 and 2), specified in ISO 13400-3

in accordance with Table 1.

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

Applicability	OSI 7 layers	Vehicle manufacturer enhanced diagnostics	WWH-OBD document reference
Seven layers according to ISO/IEC 7498-1 and ISO/IEC 10731	Application (layer 7)	ISO 14229-5, ISO 14229-1	ISO 27145-3; ISO 14229-1
	Presentation (layer 6)	Vehicle manufacturer specific	ISO 27145-2, SAE J1930-DA, SAE J1979-DA, SAE J2012-DA
	Session (layer 5)	ISO 14229-2	ISO 14229-2
	Transport (layer 4)	ISO 13400-2	ISO 13400-2
	Network (layer 3)		
	Data link (layer 2)	ISO 13400-3	ISO 13400-3
	Physical (layer 1)		

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

The transport and network layer services covered by ISO 13400-2 have been defined to be independent of the physical layer implemented.

For other application areas, ISO 13400-3 can be used with any Ethernet physical layer.