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Road vehicles — Unified diagnostic services (UDS —

Part 3: Unified diagnostic services on CAN implementation (UDSonCAN)

Véhicules routiers — Services de diagnostic unifiés (SDU) —

Partie 3: SDU sur l'implémentation du gestionnaire de réseau de communication (SDUsurCAN)

ICS 43.180

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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.

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ISO 14229-3 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

This first edition cancels and replaces the first edition ISO 15765-3:2004, of which has been technically revised.

ISO 14229 consists of the following parts, under the general title *Road vehicles — Unified diagnostic services (UDS)*:

— *Part 1: Specification and requirements*

— *Part 2: Session layer services*

— *Part 3: Unified diagnostic services on CAN implementation (UDSonCAN)*

— *Part 4: Unified diagnostic services on FlexRay implementation (UDSonFR)*

— *Part 5: Unified diagnostic services on Internet Protocol implementation (UDSonIP)*

The following parts are under preparation / are planned:

— *Part 6: Unified diagnostic services on K-Line implementation (UDSonK-Line)*

Introduction

This part of ISO 14229 has been established in order to enable the implementation of unified diagnostic services, as specified in ISO 14229-1, on Controller Area Networks (UDS on CAN).

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 are divided into

— Application layer (layer 7), specified in ISO 14229-1, ISO/DIS 14229-3;

— Presentation layer (layer 6), vehicle manufacturer specific;

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

— Transport layer services (layer 4), specified in ISO 15765-2, ISO 15765-4;

— Network layer services (layer 3), specified in ISO 15765-2, ISO 15765-4;

— Data link layer (layer 2), specified in ISO 11898-1, ISO 11898-2, ISO 11898-3, ISO 11898-5;

— Physical layer (layer 1), specified in ISO 11898-1, ISO 11898-2, ISO 11898-3, ISO 11898-5;

in accordance with Table 1.

Table 1 — DoCAN enhanced diagnostics, legislated OBD and WWH-OBD specification reference applicable to the OSI layers

<table>
<tr><th>Applicability</th><th>OSI 7 layers</th><th>Vehicle manufacturer enhanced diagnostics</th><th>Legislated OBD (On-Board Diagnostics)</th><th colspan="3">Legislated WWH-OBD (On-Board Diagnostics)</th></tr>
<tr><td rowspan="7">Seven layer according to ISO 7498-1 and ISO/IEC 10731</td><td>Application (layer 7)</td><td>ISO 14229-1, ISO/DIS 14229-3</td><td>ISO 15031-5</td><td colspan="3">ISO 14229-1, ISO 27145-3</td></tr>
<tr><td>Presentation (layer 6)</td><td>vehicle manufacturer specific</td><td>SAE J1930-DA, SAE J1979-DA, SAE J2012-DA</td><td colspan="3">SAE J1930-DA, SAE J1979 DA, SAE J2012-DA, SAE J1939 Appendix C (SPNs), SAE J1939-73 Appendix A (FMIs)</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 15765-2</td><td rowspan="2">ISO15765-4, ISO15765-2</td><td rowspan="2">ISO15765-4, ISO15765-2</td><td rowspan="4">ISO 27145-4</td><td rowspan="2">ISO 13400-2</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, ISO 11898-3, ISO 11898-5</td><td rowspan="2">ISO 15765-4, ISO 11898-1, ISO 11898-2</td><td rowspan="2">ISO 15765-4, ISO 11898-1, ISO 11898-2</td><td rowspan="2">ISO 13400-3, IEEE 802.3</td></tr>
<tr><td>Physical (layer 1)</td></tr>
</table>

Road vehicles — Unified diagnostic services (UDS —

Part 3:
Unified diagnostic services on CAN implementation (UDSonCAN)

1 Scope

This part of ISO 14229 specifies the implementation of a common set of unified diagnostic services (UDS) on controller area networks (CAN) in road vehicles (UDSonCAN).

UDSonCAN references Part°1 and Part°2 of ISO 14229 and specifies implementation requirements of the diagnostic services to be used for diagnostic communication over CAN.

NOTE UDSonCAN does not specify any requirement for the in-vehicle CAN bus architecture.

This part of ISO 14229 does not include any redundant information of the documents as listed in the Introduction. It focuses on

— additional requirements specific to the implementation of UDS on the CAN network, and

— specific restrictions in the implementation of UDS on the CAN network.

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 14229-1, *Road vehicles — Unified diagnostic services (UDS) — Part 1: Specification and requirements*

ISO 14229-2, *Road vehicles — Unified diagnostic services (UDS) — Part 2: Session layer services*

ISO 15765-1, *Road vehicles — Diagnostic communication over controller area network (DoCAN) — Part 1: General information and use case definition*

ISO 15765-2, *Road vehicles — Diagnostic communication over controller area network (DoCAN) — Part 2: Transport protocol and Network layer services*

ISO 15765-4, *Road vehicles — Diagnostic communication over controller area network (DoCAN) — Part 4: Requirements for emissions-related systems*

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 14229-1, ISO 14229-2, ISO 15765-1, ISO 15765-2 and ISO 15765-4 apply.

3.2 Abbreviated terms

CF	consecutive frame
DA	destination address
DLC	data length code
FF	first frame
FC	flow control
ID	identifier
NA	network address
SA	source address
SF	single frame
SM	subnet mask
SOM	start of message
STRT	serviceToRespondTo
TA	target address
UDS	unified diagnostic services
USDT	unacknowledged segmented data transfer
UUDT	unacknowledged unsegmented data transfer

4 Conventions

This part of ISO 14229 is based on the conventions discussed in the OSI Service Conventions (ISO/IEC 10731:1994) as they apply for diagnostic services.

5 Document overview

Figure 1 illustrates the documents required to implement UDSonCAN.

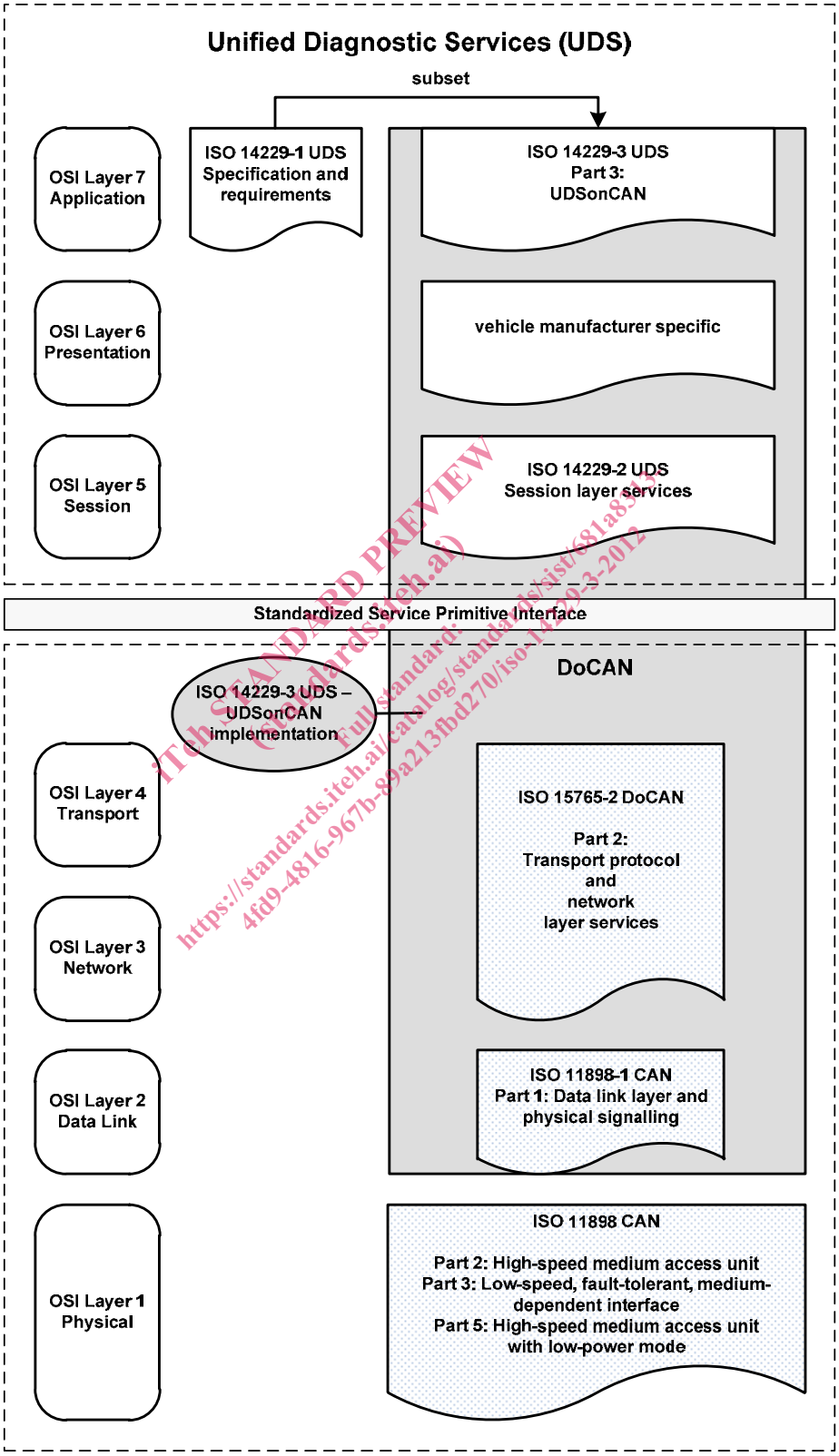

Figure 1 — UDSonCAN document reference according to OSI model

6 Unified diagnostic services implementation on CAN

6.1 General

This clause defines how the diagnostic services as defined in ISO 14229-1 apply to DoCAN. For each applicable service, the applicable subfunction and data parameters are defined.

NOTE The subfunction parameter definitions take into account that the most significant bit is used for the suppressPosRspMsgIndicationBit parameter as defined in ISO 14229-1.

6.2 UDS on CAN services overview

The purpose of Table 2 is to reference all ISO 14229-1 and ISO 14229-2 services as they are applicable for an implementation in ISO 14229-3 UDSonCAN. Table 2 contains the sum of all applicable services. Certain applications using this part of ISO 14229 to implement UDSonCAN may restrict the number of useable services and may categorize them in certain application areas/diagnostic sessions (default session, programming session, etc.).

Services in Table 2 that are marked "No CAN specific requirements" shall be implemented as defined in ISO 14229-1 and ISO 14229-2 with no additional restrictions. Services that are marked "CAN specific requirements" shall be implemented as defined by the subclause listed in the Table 2 entry.

Table 2 — Overview of applicable ISO 14229-1 Unified diagnostic services and data ranges

Diagnostic service name (ISO 14229-1)	Comment	Reference in this document
Diagnostic and Communication Management Functional Unit		
DiagnosticSessionControl	No CAN specific requirements	---
ECUReset	No CAN specific requirements	---
SecurityAccess	No CAN specific requirements	---
CommunicationControl	No CAN specific requirements	---
TesterPresent	No CAN specific requirements	---
SecuredData-Transmission	No CAN specific requirements	---
ControlDTCSetting	No CAN specific requirements	---
ResponseOnEvent	CAN specific requirements	see 6.3
LinkControl	No CAN specific requirements	---
Data Transmission Functional Unit		
ReadDataByIdentifier	No CAN specific requirements	---
ReadMemoryByAddress	No CAN specific requirements	---
ReadScalingDataByIdentifier	No CAN specific requirements	---
ReadDataByPeriodicIdentifier	CAN specific requirements	see 6.4
DynamicallyDefineDataIdentifier	CAN specific requirements	---
WriteDataByIdentifier	No CAN specific requirements	---
WriteMemoryByAddress	No CAN specific requirements	---