INTERNATIONAL STANDARD

ISO 20730-1

First edition
2021-04

Road vehicles — Vehicle interface for electronic Periodic Technical Inspection (ePTI) —

Part 1: Application and communication requirements

Véhicules routiers — Interface de véhicule pour contrôle technique périodique électronique (ePTI) —

Partie 1: Exigences d'application et de communication

Reference number
ISO 20730-1:2021(E)

© ISO 2021



COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **vi**
Introduction ... **vii**
1 Scope ... **1**
2 Normative references ... **2**
3 Terms and definitions ... **3**
4 Symbols and abbreviated terms ... **5**
5 How to read this document ... **5**
5.1 Layout of the document ... 5
5.2 Use case structure explanation ... 6
5.3 Requirements statement structure ... 6
5.4 ePTI application example ... 7
6 ePTI inspection modules and use cases overview and principles ... **8**
6.1 Basic principles ... 8
6.2 ePTI inspection modules ... 9
7 IM-1 – Discover ePTI data link and ePTI-relevant system(s) ... **9**
7.1 UC 1.1 – Discover ePTI data link ... 9
7.2 UC 1.2 – Discover ePTI-relevant system(s) ... 10
8 IM-2 – Authentication, authorisation ... **10**
8.1 UC 2.1 – ePTI external test equipment authentication ... 10
8.2 UC 2.2 – Vehicle ECU authentication ... 11
9 IM-3 – Query available ePTI identifier(s) ... **11**
9.1 UC 3.1 – Query supported data identifier(s) ... 11
9.2 UC 3.2 – Query supported routine identifier(s) ... 12
9.3 UC 3.3 – Query supported input/output control identifier(s) ... 12
10 IM-4 – Query ePTI system information ... **13**
10.1 UC 4.1 – Query vehicle identification number ... 13
10.2 UC 4.2 – Query vehicle odometer value ... 13
10.3 UC 4.3 – Query system's software number ... 13
10.4 UC 4.4 – Identify installed system's software integrity information ... 14
10.5 UC 4.5 – Query information from system ... 14
11 IM-5 – Query system's self-test completion and error information ... **15**
11.1 UC 5.1 – Query system's self-test completion status ... 15
11.2 UC 5.2 – Query system status and error information ... 15
12 IM-6 – Activate system's routines, input/output control(s) ... **16**
12.1 UC 6.1 – Activate system's routine(s) ... 16
12.2 UC 6.2 – Activate system's input/output control(s) ... 16
13 Overview of vehicle system requirements ... **17**
13.1 ePTI external test equipment and vehicle message exchange sequence ... 17
13.2 Technical requirements and use case coverage ... 17
14 Application (APP) ... **18**
14.1 Setup vehicle's DoCAN data link framework ... 18
14.2 Setup vehicle's DoIP data link framework ... 20
14.3 Choice of DoCAN and DoIP data link in the vehicle ... 22
15 Application layer (AL) ... **22**
15.1 Applicable ISO 14229-1 UDS functionality ... 22
15.2 Authentication ... 23
15.2.1 Requirements definition — ePTI external test equipment authentication ... 23
15.2.2 Requirements definition — ECU authentication ... 24

© ISO 2021 – All rights reserved

15.3 ReadDataByIdentifier — Report ePTI-relevant system(s) 24
15.3.1 Requirements definition — Report ePTI-relevant system(s) 24
15.3.2 Message sequence implementation requirements — Report ePTI-relevant system(s) 24
15.3.3 Example of the message sequence — Report ePTI-relevant system(s) 25
15.4 ReadDataByIdentifier — Report ECU supported data identifier(s) 26
15.4.1 Requirements definition — Report ECU supported data identifier(s) 26
15.4.2 Message sequence implementation requirements — Report ECU supported data identifier(s) 27
15.4.3 Example of the message sequence — Report ECU supported data identifier(s) 27
15.5 ReadDataByIdentifier — Report ECU supported routine identifier(s) 28
15.5.1 Requirements definition — Report ECU supported routine identifier(s) 28
15.5.2 Message sequence implementation requirements — Report ECU supported routine identifier(s) 28
15.5.3 Example of the message sequence — Report ECU supported routine identifier(s) 29
15.6 ReadDataByIdentifier — Report ECU supported input/output control identifier(s) 29
15.6.1 Requirements definition — Report ECU supported input/output control identifier(s) 29
15.6.2 Message sequence implementation requirements — Report ECU supported input/output control identifier(s) 30
15.6.3 Example of the message sequence — Report ECU supported input/output control identifier(s) 30
15.7 ReadDataByIdentifier — Report VIN from ECU 30
15.7.1 Requirements definition — Report VIN from ECU 30
15.7.2 Message sequence implementation requirements — Report VIN from ECU 31
15.7.3 Example of the message sequence — Report VIN from ECU 31
15.8 ReadDataByIdentifier — Report vehicle odometer value 32
15.8.1 Requirements definition — Report vehicle odometer value 32
15.8.2 Message sequence implementation requirements — Report vehicle odometer value 32
15.8.3 Example of the message sequence — Report vehicle odometer value 33
15.9 ReadDataByIdentifier — Report vehicle's system software number(s) 33
15.9.1 Requirements definition — Report vehicle's system software number(s) 33
15.9.2 Message sequence implementation requirements — Report vehicle's system software number(s) 34
15.10 ReadDataByIdentifier — Report information from system 34
15.10.1 Requirements definition — Report information from system 34
15.10.2 Message sequence implementation requirements — Report information from system 35
15.10.3 Example of the message sequence — Report information from system 35
15.11 ReadDataByIdentifier — Report vehicle's ePTI system self-test completion and system status 35
15.11.1 Requirements definition — Report vehicle's ePTI system self-test completion and system status 35
15.11.2 Message sequence implementation requirements — Report vehicle's ePTI system self-test completion and system status 36
15.11.3 Example of the message sequence — Report vehicle's ePTI system self-test completion and system status 37
15.12 RoutineControl — Activate system's routines 37
15.12.1 Requirements definition — Activate system's routines 37
15.12.2 Message sequence implementation requirements — Activate system's routines 39
15.12.3 Example of the message sequence — Activate system's routines exterior lights 39
15.13 InputOutputControlByIdentifier — Activate system's input/output controls 39
15.13.1 Requirements definition — Activate system's input/output controls 39
15.13.2 Message sequence implementation requirements — Activate system's input/output controls 41

 © ISO 2021 – All rights reserved

15.13.3 Example of the message sequence — Activate system's input/output controls ... 41
16 Session layer (SL) ... 41
Bibliography ... 42

© ISO 2021 – All rights reserved

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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

A list of all parts in the ISO 20730 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO 2021 – All rights reserved

Introduction

Roadworthiness testing is a part of a wider regime designed to ensure that road vehicles are kept in a safe and environmentally acceptable condition during their use. This regime covers periodic roadworthiness testing of vehicles and technical roadside inspections of vehicles used for commercial road transport activities and provides a vehicle registration procedure allowing for the suspension of a vehicle's authorisation to be used in road traffic where the vehicle constitutes an immediate risk to road safety. Periodic testing is the main tool to ensure roadworthiness. Technical roadside inspections of commercial vehicles are merely complementary to periodic testing.

An ePTI system list, which is defined in ISO 20730-3, summarises ePTI-relevant systems and specifies a defined name (system), a unique identifier (ePTI system identifier) and a description for each ePTI system. All the definitions in this document refer to this ePTI system list.

The ISO 20730 series 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 application protocol and data link framework requirements specified/referenced in the ISO 20730 series are structured according to Figure 1.

Figure 1 illustrates a standard-based documentation concept, which consists of the following main clusters:

— vehicle diagnostic communication framework: covers all relevant basic vehicle diagnostic communication specifications of OSI layers 7, 6 and 5;

— vehicle diagnostic communication use case framework: covers the master specification, which specifies the use cases and requirements of the subject matter of OSI layer 7;

— presentation layer framework: covers all data relevant specifications of OSI layer 6;

— conformance test plan: covers the conformance test plan requirements of the use cases and communication requirements of OSI layers 7, 6 and 5;

— lower OSI layer framework: covers all vehicle diagnostic protocol standards of OSI layers 4, 3, 2 and 1, which are relevant and referenced by the use case specific standard.

© ISO 2021 – All rights reserved

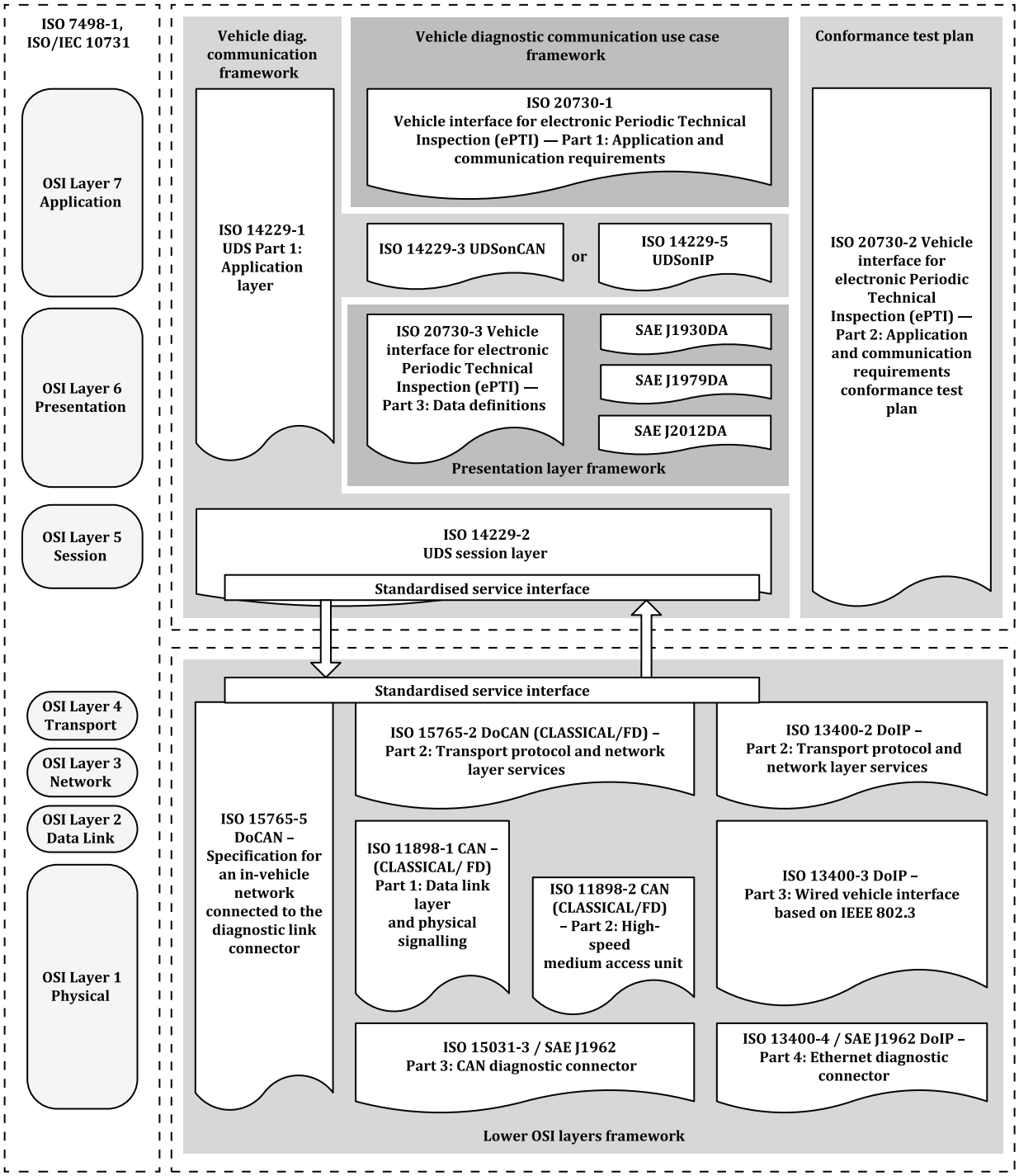


Figure 1 — ePTI document reference according to OSI model

© ISO 2021 – All rights reserved

Road vehicles — Vehicle interface for electronic Periodic Technical Inspection (ePTI) —

Part 1: Application and communication requirements

1 Scope

This document is applicable to road vehicles, where the electronic vehicle interface is used to perform a test method that is part of a periodic technical inspection (ePTI).

This document describes use cases and specifies technical requirements in order to support the ePTI-relevant vehicle safety system(s) checks during the periodic technical inspection via the electronic interface. This document references the ISO 14229 series, the unified diagnostic services implemented on diagnostic communication over controller area network (DoCAN) and the Internet protocol (DoIP) along with the required provision of data definitions.

The technical requirements of diagnostic services and data definitions of emissions-related systems are specified in other International Standards, for example, ISO 15031 and ISO 27145. Other environmental systems' ePTI use cases and technical requirements can be considered in the future.

This document defines:

— all requirements describing the vehicle-communication functionality via the diagnostic link connector related to ePTI, for example:

  1) discovery of the ePTI data link;

  2) discovery of the ePTI-relevant systems;

  3) query of ePTI-relevant systems’ information, including software identification, software integrity, current and/or stored values;

  4) query of ePTI-relevant systems’ error information;

  5) activation of ePTI-relevant systems’ actuators or routines;

— the use cases about the individual vehicle communication functionality, for example, query identification information, command functional test method.

This document does not directly specify any type of test method or pass/fail criteria of the ePTI-relevant system during a PTI, but provides data, which may support PTI test methods.

The document specifies:

— terminology;

— communication establishment between the ePTI external test equipment and the vehicle's ePTI-relevant systems;

— usage of a credentials-based authentication and authorisation mechanism between the ePTI external test equipment and the vehicle;

— protection against tampering of the defined ePTI methods;

© ISO 2021 – All rights reserved

— definition of ePTI-relevant use cases:

  — ePTI external test equipment discovers available data identifier as specified in ISO 20730-3;

  — ePTI external test equipment queries the ePTI-relevant system's information, including software numbers, software integrity information, current and/or stored values, self-test completion status, system status, and error information (e.g. DTC and/or DID information);

  — ePTI external test equipment activates the ePTI-relevant system's actuators or routines;

— definition of ePTI-relevant technical requirements;

— ePTI external test equipment minimum requirements.

This document excludes:

— process definitions for performing the PTI check;

— process and data definitions for off-board data provision;

— standardised data exchange formats;

— validation and verification of vehicle safety systems according to vehicle manufacturer specifications.

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 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 13400-2, *Road vehicles — Diagnostic communication over Internet Protocol (DoIP) — Part 2: Transport protocol and network layer services*

ISO 13400-3, *Road vehicles — Diagnostic communication over Internet Protocol (DoIP) — Part 3: Wired vehicle interface based on IEEE 802.3*

ISO 13400-4, *Road vehicles — Diagnostic communication over Internet Protocol (DoIP) — Part 4: Ethernet-based high-speed data link connector*

ISO 14229-1, *Road vehicles — Unified diagnostic services (UDS) — Part 1: Application layer*

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

ISO 14229-3, *Road vehicles — Unified diagnostic services (UDS) — Part 3: Unified diagnostic services on CAN implementation (UDSonCAN)*

ISO 14229-5, *Road vehicles — Unified diagnostic services (UDS) — Part 5: Unified diagnostic services on Internet Protocol implementation (UDSonIP)*

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

© ISO 2021 – All rights reserved

ISO 15765-5[1)], *Road vehicles — Diagnostic communication over Controller Area Network (DoCAN) — Part 5: Specification for an in-vehicle network connected to the diagnostic link connector*

ISO 19689, *Motorcycles and mopeds — Communication between vehicle and external equipment for diagnostics — Diagnostic connector and related electrical circuits, specification and use*

ISO 20730-3[2)], *Road vehicles — Vehicle interface for electronic Periodic Technical Inspection (ePTI) — Part 3: Data definitions*

SAE J1939-13, *Off-Board Diagnostic Connector*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14229-1 and the following apply.

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

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

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

3.1
credentials
data that are transferred to establish the claimed identity of an entity

[SOURCE: ISO/IEC 2382:2015, 2126254, modified — The notes to entry have been deleted.]

3.2
electronic periodic technical inspection
ePTI
standardised communication functionality utilising the electronic vehicle communication interface supporting the *PTI* (3.8)

3.3
ePTI external test equipment
test system external to the vehicle's diagnostic link connector, which uses serial communication to perform *ePTI-relevant system* (3.4) assessments, measurements and control functions

3.4
ePTI-relevant system
system which is able to perform a function required to be tested during the *PTI* (3.8)

Note 1 to entry: The *ePTI system list* (3.6), which is defined in ISO 20730-3, summarises safety-relevant systems which may be part of a PTI test.

Note 2 to entry: An *ePTI-relevant system* (3.4) consists of one or multiple ECUs with dedicated sensors and actuators.

3.5
ePTI inspection module
container of one or more use cases related to the same subject

1) Under preparation. Stage at the time of publication: ISO/FDIS 15765-5:2021.

2) Under preparation. Stage at the time of publication: ISO/DIS 20730-3:2021.

© ISO 2021 – All rights reserved

3.6
ePTI system list
list of *ePTI-relevant systems* (3.4)

Note 1 to entry: It contains a basis of defined electronic systems to be tested via the electronic vehicle interface as part of the *PTI* (3.8). The *ePTI system list* (3.6) specifies a defined name (system), a unique ID (ePTI system ID) and a description for each ePTI-relevant system.

3.7
ePTI system identifier
unique identifier for an *ePTI-relevant system* (3.4)

3.8
periodic technical inspection
PTI
roadworthiness testing at predefined intervals and authorized test facilities

Note 1 to entry: Roadworthiness testing is part of a wider regime designed to ensure that vehicles are kept in a safe and environmentally acceptable condition during their use.

[SOURCE: DIRECTIVE 2014/45/EC]

3.9
safety-relevant system
vehicle systems and components, that when not operating to their design criteria, affect the safety of the vehicle

3.10
system self-test completion status
finalised status of the on-board diagnosis of the *ePTI-relevant system(s)* (3.4)

3.11
technical classification
<use case> indication of the relevance of the use case related to the communication between the vehicle's *ePTI-relevant system(s)* (3.4) and the *ePTI external test equipment* (3.3) as specified in this document

3.12
use case
description of a system's behaviour as it responds to a request that originates from outside that system

[SOURCE: ISO 15118-1:2019, 3.1.71, modified — The notes to entry have been deleted.]

3.13
conditional
mandatory if a certain criterion is met

3.14
mandatory
keyword indicating an item that is required to be implemented as defined in this document to claim compliance with this document

[SOURCE: ISO/IEC 14776-113:2002, 3.3.3, modified — The word "standard" has been replaced by "document".]

3.15
optional
keyword indicating that the referenced item is not required to claim compliance with this document

Note 1 to entry: Implementation of an optional item should be as defined in this document.

© ISO 2021 – All rights reserved

[SOURCE: ISO/IEC 15205:2000, 2.1.23, modified — The wording “keyword indicating that” has been added; the word “standard” has been replaced by “document”; the last sentence in the definition has been moved to Note 1 to entry.]

4 Symbols and abbreviated terms

For the purposes of this document, the abbreviated terms given in ISO 14229-1 and the following apply.

BP	basic principle
CANID	CAN identifier
DID	data identifier
ePTI	electronic periodic technical inspection
ECU	electronic control unit
ETE	external test equipment
IM	inspection module
MsgParam	message parameter
N/A	not applicable
NRC	negative response code
PDU	protocol data unit
PTI	periodic technical inspection
PosRspMsgParam	positive response message parameter
REQ	requirement
ReqMsgParam	request message parameter
RID	routine identifier
RMI	repair and maintenance information
SEQ	sequence
SF	subFunction
UC	use case
VIN	vehicle identification number
VM	vehicle manufacturer

5 How to read this document

5.1 Layout of the document

This subclause provides an overview about the structuring of the content of this document. Table 1 describes the layout of the main clauses in the document.

© ISO 2021 – All rights reserved