

This is a preview of "ISO 11898-1:2015". [Click here to purchase the full version from the ANSI store.](#)

Second edition  
2015-12-15

---

---

## Road vehicles — Controller area network (CAN) —

### Part 1: Data link layer and physical signalling

*Véhicules routiers — Gestionnaire de réseau de communication (CAN) —*

*Partie 1: Couche liaison de données et signalisation physique*



Reference number  
ISO 11898-1:2015(E)

© ISO 2015

This is a preview of "ISO 11898-1:2015". [Click here to purchase the full version from the ANSI store.](#)



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, 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  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

This is a preview of "ISO 11898-1:2015". Click here to purchase the full version from the ANSI store.

## Contents

	Page
<b>Foreword</b> .....	<b>vi</b>
<b>Introduction</b> .....	<b>vii</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Conformance</b> .....	<b>1</b>
<b>3 Normative references</b> .....	<b>2</b>
<b>4 Terms and definitions</b> .....	<b>2</b>
<b>5 Symbols and abbreviated terms</b> .....	<b>5</b>
<b>6 Basic concepts of CAN</b> .....	<b>7</b>
6.1 CAN properties.....	7
6.2 Frames.....	8
6.3 Bus access method.....	8
6.4 Information routing.....	8
6.5 Network flexibility.....	8
6.6 Data consistency.....	8
6.7 Remote data request.....	8
6.8 Error detection.....	9
6.9 Error signalling and recovery time.....	9
6.10 ACK.....	9
6.11 Automatic retransmission.....	9
6.12 Fault confinement.....	9
6.13 Error-active.....	9
6.14 Error-passive.....	9
6.15 Bus-off.....	10
<b>7 Layered architecture of CAN</b> .....	<b>10</b>
7.1 Reference to OSI model.....	10
7.2 Protocol specification.....	11
7.3 Format description of services.....	11
7.3.1 Format description of service primitives.....	11
7.3.2 Types of service primitives.....	12
7.4 LLC interface.....	12
<b>8 Description of LLC sub-layer</b> .....	<b>12</b>
8.1 General.....	12
8.2 Services of LLC sub-layer.....	13
8.2.1 Types of connectionless-mode transmission services.....	13
8.2.2 Service primitive specification.....	13
8.3 Functions of LLC sub-layer.....	18
8.3.1 General.....	18
8.3.2 Frame acceptance filtering.....	18
8.3.3 Overload notification.....	18
8.3.4 Recovery management.....	19
8.4 Structure of LLC frames.....	19
8.4.1 General.....	19
8.4.2 Specification of LLC DF.....	19
8.4.3 Specification of LLC RF.....	20
8.5 Limited LLC frames.....	21
<b>9 Interface between LLC and MAC</b> .....	<b>21</b>
9.1 Services.....	21
9.2 Time and time triggering.....	21
9.2.1 Description.....	21
9.2.2 Time base.....	21
9.2.3 Time reference point.....	21

9.2.4	Event generation.....	22
9.3	Disabling automatic retransmission.....	22
9.3.1	Retransmission of frames.....	22
9.4	Message time stamping.....	22
<b>10</b>	<b>Description of MAC sub-layer.....</b>	<b>22</b>
10.1	General.....	22
10.2	Services of MAC sub-layer.....	22
10.2.1	Service description.....	22
10.2.2	Service primitives specification.....	23
10.3	Functional model of MAC sub-layer architecture.....	27
10.3.1	Capability.....	27
10.3.2	Frame transmission.....	27
10.3.3	Frame reception.....	28
10.4	Structure of MAC frames.....	29
10.4.1	Description.....	29
10.4.2	Specification of MAC DF.....	29
10.4.3	Specification of MAC RF.....	34
10.4.4	Specification of EF.....	34
10.4.5	Specification of OF.....	35
10.4.6	Specification of inter-frame space.....	36
10.5	Frame coding.....	37
10.6	Frame acknowledgement.....	37
10.7	Frame validation.....	37
10.8	Order of bit transmission.....	38
10.9	Medium access method.....	39
10.9.1	General.....	39
10.9.2	Multi-master.....	39
10.9.3	Bus access.....	40
10.9.4	Bus integration state.....	40
10.9.5	Protocol exception event.....	40
10.9.6	Transmission of MAC frames.....	40
10.9.7	Content-based arbitration.....	40
10.9.8	Frame priority.....	41
10.9.9	Collision resolution.....	41
10.9.10	Disabling of frame formats.....	41
10.10	MAC data consistency.....	41
10.11	Error detection.....	41
10.12	Error signalling.....	42
10.13	Overload signalling.....	43
10.14	Bus monitoring.....	44
10.15	Restricted operation.....	44
<b>11</b>	<b>PL specification.....</b>	<b>44</b>
11.1	General and functional modelling.....	44
11.2	Services of PL.....	44
11.2.1	Description.....	44
11.2.2	PCS_Data.Request.....	45
11.2.3	PCS_Data.Indicate.....	45
11.2.4	PCS_Status.Transmitter.....	45
11.2.5	PCS_Status.Receiver.....	45
11.3	PCS specification.....	45
11.3.1	Bit encoding/decoding.....	45
11.3.2	Synchronization.....	50
11.3.3	Transmitter delay compensation.....	52
11.4	AUI specification.....	54
11.4.1	General.....	54
11.4.2	PCS to PMA messages.....	55
11.4.3	PMA to PCS message.....	55

This is a preview of "ISO 11898-1:2015". [Click here to purchase the full version from the ANSI store.](#)

<b>12</b>	<b>Description of supervisor FCE</b> .....	<b>55</b>
12.1	Fault confinement.....	55
12.1.1	Objectives.....	55
12.1.2	Strategies.....	55
12.1.3	Fault confinement interface specification.....	56
12.1.4	Rules of fault confinement.....	58
12.1.5	Network start-up.....	60
12.2	Bus failure management.....	60
<b>Annex A (informative) Additional Information</b> .....		<b>61</b>
<b>Bibliography</b> .....		<b>65</b>

## 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](http://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](http://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 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*.

This second edition cancels and replaces the first edition (ISO 11898-1:2003), which has been technically revised. It also incorporates the Corrigendum ISO 11898-1:2003/Cor 1:2006.

ISO 11898 consists of the following parts, under the general title *Road vehicles — Controller area network (CAN)*:

- *Part 1: Data link layer and physical signalling*
- *Part 2: High-speed medium access unit*<sup>1)</sup>
- *Part 3: Low-speed, fault-tolerant, medium-dependent interface*
- *Part 4: Time-triggered communication*
- *Part 5: High-speed medium access unit with low-power mode*<sup>1)</sup>
- *Part 6: High-speed medium access unit with selective wake-up functionality*<sup>1)</sup>

---

1) Parts 2, 5, and 6 are being revised. They will be merged under a new edition of Part 2.

This is a preview of "ISO 11898-1:2015". Click here to purchase the full version from the ANSI store.

## Introduction

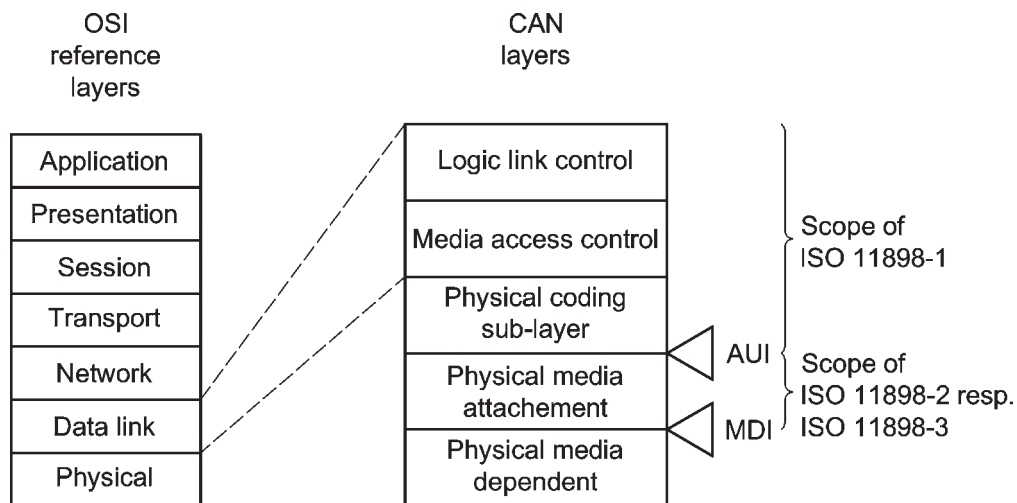
ISO 11898 was first published as one document in 1993. It covered the CAN data link layer, as well as the high-speed physical layer.

In the reviewed and restructured ISO 11898 series:

- Part 1 defines the data link layer including the logical link control (LLC) sub-layer and the medium access control (MAC) sub-layer, as well as the physical signalling (PHS) sub-layer;
- Part 2 defines the high-speed physical medium attachment (PMA);
- Part 3 defines the low-speed fault-tolerant physical medium attachment (PMA);
- Part 4 defines the time-triggered communication;
- Part 5 defines the power modes of the high-speed physical medium attachment (PMA);
- Part 6 defines the selective wake-up functionality of the high-speed physical medium attachment (PMA).

NOTE ISO 11898-2 is updated in parallel to the update of this part of ISO 11898 to combine the functions described in ISO 11898-2, ISO 11898-5 and ISO 11898-6. (The future edition of ISO 11898-2 will cancel and replace the current ISO 11898-2:2003, ISO 11898-5:2007 and ISO 11898-6:2013)

[Figure 1](#) shows the relations between the OSI reference layers and the parts of the ISO 11898 series.



NOTE ISO 11898-2 refers to the future edition that will cancel and replace the current ISO 11898-2:2003, ISO 11898-5:2007 and ISO 11898-6:2013.

**Figure 1 — CAN data link and physical sub-layers relation to the OSI model**