

~~ISO/DTS 23792-1:20##(2023(E)~~

~~ISO TC 204/WG 14~~

~~Date: 2023-01~~

~~Secretariat: ANSI~~

~~Intelligent transport systems -- Motorway **Chauffeur Systems** chauffeur systems  
(MCS) -- Part 1: Framework and general requirements~~

~~DTS stage~~

**Warning for WDs and CDs**

~~This document is not an ISO International Standard. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an International Standard.~~

~~Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.~~

(standards.iteh.ai)

ISO/DTS 23792-1

<https://standards.iteh.ai/catalog/standards/sist/16adefdf-4063-4667-8f-dts-23792-1>

Style Definition: Heading 1: Indent: Left: 0 cm, First line: 0 cm, Line spacing: Exactly 13.5 pt, Tab stops: Not at 0.76 cm

Style Definition: Heading 2: Indent: Left: 0 cm, First line: 0 cm, Line spacing: Exactly 12.5 pt, Tab stops: Not at 2.14 cm

Style Definition: Heading 3: Indent: Left: 0 cm, First line: 0 cm, Line spacing: Exactly 11.5 pt

Style Definition: Heading 4: Indent: Left: 0 cm, First line: 0 cm, Line spacing: Exactly 11.5 pt, Tab stops: 1.66 cm, Left + 1.9 cm, List tab + Not at 1.8 cm + 2.66 cm

Style Definition: a2: Font: 14 pt, Line spacing: Exactly 13.5 pt, Don't keep with next, Tab stops: 0.63 cm, List tab + 0.88 cm, Left + Not at 1 cm

Style Definition: a3: Font: 11 pt, Space Before: 0 pt, Line spacing: Exactly 12.5 pt, Don't keep with next, Tab stops: 1.13 cm, Left

Style Definition: a4: Font: Space Before: 0 pt, Don't keep with next

Style Definition: a5: Font: Space Before: 0 pt, Don't keep with next, Tab stops: 2.01 cm, Left + Not at 2.2 cm

Style Definition: a6: Font: Space Before: 0 pt, Don't keep with next, Tab stops: 2.01 cm, Left + Not at 2.2 cm

Style Definition: ANNEX: Space After: 38 pt

Style Definition: Biblio Title: Font: Space After: 38 pt, Line spacing: At least 14 pt, Page break before

Style Definition

Style Definition

Style Definition

Style Definition

Style Definition

Style Definition: Footer: (Asian) Japanese

Style Definition: Header: (Asian) Japanese

Style Definition

Style Definition: Footnote Text: (Asian) Japanese

Style Definition: Footnote Reference

Style Definition: 未解決のメンション

Style Definition: FollowedHyperlink

Formatted: zzCover, Left

Formatted: Font: 11 pt, English (United Kingdom)

Formatted: Font: 11 pt, English (United Kingdom)

Formatted: Font: 11 pt, English (United Kingdom)

Formatted: English (United Kingdom)

Formatted: English (United Kingdom)

Formatted

Formatted: Font: 11 pt

Formatted

Formatted: Font: 11 pt

Formatted: Font: 11 pt

Formatted: Font: 11 pt



© ISO 2017

# iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO/DTS 23792-1

<https://standards.iteh.ai/catalog/standards/sist/16adefdf-4063-4667-8f06-8d8a0b70be1a/iso-dts-23792-1>

© ISO 2023

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](http://www.iso.org)

Published in Switzerland

[www.iso.org](http://www.iso.org)

Formatted: Space After: 0 pt, Line spacing: single

Formatted

Formatted: Font color: Blue

Formatted: Justified, Indent: First line: 0.71 cm, Space Before: 0 pt, No page break before, Border: Box: (Single solid line, Blue, 0.5 pt Line width)

Formatted: Font: 11 pt, Font color: Blue

Formatted: Font: 11 pt, Font color: Blue

Formatted: Font: 11 pt, Font color: Blue

Formatted: Font color: Blue

Formatted: Justified, Indent: First line: 0.71 cm, Space Before: 0 pt, No page break before, Border: Box: (Single solid line, Blue, 0.5 pt Line width)

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO/DTS 23792-1

<https://standards.iteh.ai/catalog/standards/sist/16adefdf-4063-4667-8f06-8d8a0b70be1a/iso-dts-23792-1>

Formatted: Font: 11 pt

Formatted: Space Before: 0 pt, Line spacing: single, Tab stops: Not at 17.2 cm

Formatted: Space After: 0 pt, Line spacing: single

## Contents

Formatted: Space Before: 48 pt, Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

Foreword.....	v
Introduction.....	vi
1 — Scope.....	1
2 — Normative references.....	1
3 — Terms and definitions.....	1
4 — Abbreviated terms.....	3
Abbreviated terms.....	3
5 — Characteristics of MCS.....	3
5.1 — General.....	3
5.2 — Operational design domain.....	4
5.2.1 — General.....	4
5.2.2 — Roadway physical characteristics.....	4
5.2.3 — Traffic in the surrounding environment.....	5
5.2.4 — Abnormalities in roadway operational condition.....	5
5.2.5 — Ambient environmental conditions.....	5
5.3 — System functionalities.....	6
5.3.1 — General.....	6
5.3.2 — Basic functionalities to realize in-lane operation.....	6
5.3.3 — Lane changing functionalities.....	6
5.4 — System limitations.....	7
5.5 — Providing information to the user.....	7
6 — Operational requirements.....	7
6.1 — Operating conditions.....	7
6.1.1 — General.....	7
6.1.2 — Engagement conditions.....	7
6.1.3 — Disengagement triggering conditions.....	7
6.1.4 — Direct disengagement conditions.....	7
6.2 — State transition.....	8
6.2.1 — General.....	8
6.2.2 — Off state.....	8
6.2.3 — Standby state.....	9
6.2.4 — Normal state.....	10
6.2.5 — Requesting fallback state.....	11
6.3 — System functions.....	12
6.3.1 — General.....	12
6.3.2 — Object and event detection and response (OEDR).....	12
6.3.3 — Vehicle motion control (VMC).....	13
6.3.4 — Generation of Request to intervene (RTI).....	13
6.3.5 — Status indication.....	14
6.3.6 — User control interface.....	15
6.3.7 — FRU input detection.....	16
6.3.8 — MCS monitoring the FRU.....	17
6.3.9 — Subject vehicle condition monitor.....	17
6.3.10 — MCS condition monitor.....	18
6.3.11 — Localization.....	18

Formatted: Font: 11 pt

Formatted: Space Before: 0 pt, Line spacing: single, Tab stops: Not at 17.2 cm

6.3.12 External warning generation .....18

6.3.13 Function required for route following functionalities .....18

6.3.14 Related functions .....18

6.4 Requirements for continuing operation after detecting disengagement triggering conditions .....19

6.4.1 General .....19

6.4.2 Classification of adverse situations .....19

6.4.3 Responses to adverse situations .....20

7 Minimum performance requirements of the DDT .....20

7.1 General .....20

7.2 Operating speed range .....21

7.3 Normal operation .....21

7.3.1 Sustained longitudinal vehicle motion control .....21

7.3.2 Sustained lateral vehicle motion control .....22

7.3.3 Crash avoidance .....22

7.4 Performance-impaired operation .....22

7.5 MCS reaction to unresponsive FRU .....23

8 Test procedures .....23

8.1 General .....23

8.1.1 Purpose .....23

8.1.2 Driving environment .....23

8.1.3 System settings and test driver roles .....24

8.1.4 Common test pass criteria .....24

8.1.5 Confirmation of the HMI design .....24

8.1.6 Success rate and number of trials .....24

8.1.7 List of Test Scenarios .....24

8.1.8 Test sites .....25

8.2 Scenario 1: MCS reaction to unresponsive FRU .....25

8.2.1 Test scenario .....25

8.2.2 Pass criteria .....25

8.3 Scenario 2: Direct disengagement by steering input .....26

8.3.1 Test scenario .....26

8.3.2 Pass criteria .....26

8.4 Scenario 3: Continued operation after brake intervention .....26

8.4.1 Test scenario .....26

8.4.2 Pass criteria .....26

8.5 Scenario 4: Forward vehicle braking hard .....26

8.5.1 Test scenario .....26

8.5.2 Pass criteria .....27

8.6 Scenario 5: Aggressive cut-in from the adjacent lane .....27

8.6.1 Test scenario .....27

8.6.2 Pass criteria .....28

8.7 Scenario 6: Obstacle in lane .....28

8.7.1 Test scenario .....28

8.7.2 Pass criteria .....29

8.8 Scenario 8: Approaching geographical ODD boundary .....30

8.8.1 Test scenario .....30

8.8.2 Pass criteria .....30

8.9 Scenario 9: Engagement restricted outside ODD .....30

8.9.1 Test scenario .....30

8.9.2 Pass criteria ..... 30

Bibliography ..... 31

Foreword ..... viii

Introduction ..... ix

1 Scope ..... 1

2 Normative references ..... 1

3 Terms and definitions ..... 1

4 Abbreviated terms ..... 5

5 Characteristics of MCS ..... 6

5.1 General ..... 6

5.2 Operational design domain ..... 6

5.2.1 General ..... 6

5.2.2 Roadway physical characteristics ..... 8

5.2.3 Traffic in the surrounding environment ..... 8

5.2.4 Abnormalities in roadway operational condition ..... 8

5.2.5 Ambient environmental conditions ..... 9

5.3 System functionalities ..... 9

5.3.1 General ..... 9

5.3.2 Basic functionalities to realize in-lane operation ..... 9

5.3.3 Lane changing functionalities ..... 10

5.4 System limitations ..... 10

5.5 Providing information to the user ..... 10

6 Operational requirements ..... 10

6.1 Operating conditions ..... 10

6.1.1 General ..... 10

6.1.2 Engagement conditions ..... 11

6.1.3 Disengagement triggering conditions ..... 11

6.1.4 Direct disengagement conditions ..... 11

6.2 State transition ..... 11

6.2.1 General ..... 11

6.2.2 Off state ..... 13

6.2.3 Standby state ..... 13

6.2.4 Normal state ..... 14

6.2.5 Requesting fallback state ..... 15

6.3 System functions ..... 16

6.3.1 General ..... 16

6.3.2 Object and event detection and response (OEDR) ..... 17

6.3.3 Vehicle motion control (VMC) ..... 18

6.3.4 Generation of request to intervene (RTI) ..... 18

6.3.5 Status indication ..... 19

6.3.6 User control interface ..... 20

6.3.7 FRU input detection ..... 21

6.3.8 MCS monitoring the FRU ..... 22

6.3.9 Subject vehicle condition monitor ..... 22

6.3.10 MCS condition monitor ..... 22

6.3.11 Localization ..... 23

6.3.12 External warning generation ..... 23

Formatted: Font: 11 pt

Formatted: Space Before: 0 pt, Line spacing: single, Tab stops: Not at 17.2 cm

6.3.13 Function required for route following functionalities .....23

6.3.14 Related functions .....23

6.4 Requirements for continuing operation after detecting disengagement-triggering conditions .....23

6.4.1 General .....23

6.4.2 Classification of adverse situations .....24

6.4.3 Responses to adverse situations .....25

7 Minimum performance requirements of the DDT .....25

7.1 General .....25

7.2 Operating speed range .....26

7.3 Normal operation .....26

7.3.1 Sustained longitudinal vehicle motion control .....26

7.3.2 Sustained lateral vehicle motion control .....27

7.3.3 Crash avoidance .....27

7.4 Performance-impaired operation .....27

7.5 MCS reaction to unresponsive FRU .....28

8 Test procedures .....28

8.1 General .....28

8.1.1 Purpose .....28

8.1.2 Driving environment .....28

8.1.3 System settings and test driver roles .....29

8.1.4 Common test pass criteria .....29

8.1.5 Confirmation of the HMI design .....29

8.1.6 Success rate and number of trials .....29

8.1.7 List of test scenarios .....29

8.1.8 Test sites .....30

8.2 Scenario 1: MCS reaction to unresponsive FRU .....30

8.2.1 Test scenario .....30

8.2.2 Pass criteria .....30

8.3 Scenario 2: Direct disengagement by steering input .....31

8.3.1 Test scenario .....31

8.3.2 Pass criteria .....31

8.4 Scenario 3: Continued operation after brake intervention .....31

8.4.1 Test scenario .....31

8.4.2 Pass criteria .....31

8.5 Scenario 4: Forward vehicle braking hard .....32

8.5.1 Test scenario .....32

8.5.2 Pass criteria .....32

8.6 Scenario 5: Aggressive cut-in from the adjacent lane .....32

8.6.1 Test scenario .....32

8.6.2 Pass criteria .....34

8.7 Scenario 6: Obstacle in lane .....35

8.7.1 Test scenario .....35

8.7.2 Pass criteria .....35

8.8 Scenario 8: Approaching geographical ODD boundary .....36

8.8.1 Test scenario .....36

8.8.2 Pass criteria .....36

8.9 Scenario 9: Engagement restricted outside ODD .....36

8.9.1 Test scenario .....36

8.9.2 Pass criteria .....36



Formatted: Space After: 0 pt, Line spacing: single

**Bibliography .....37**

Formatted: Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

# iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO/DTS 23792-1

<https://standards.iteh.ai/catalog/standards/sist/16adefdf-4063-4667-8f06-8d8a0b70be1a/iso-dts-23792-1>

Formatted: Font: 11 pt

Formatted: Space Before: 0 pt, Line spacing: single, Tab stops: Not at 17.2 cm

Formatted: Space After: 0 pt, Line spacing: single

## 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.

Formatted: English (United States)

Formatted: Foreword Text

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)).

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

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)).

Formatted: English (United States)

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

Formatted: English (United States)

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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

Formatted: English (United States)

Formatted: English (United States)

Formatted: English (United States)

Field Code Changed

This document was prepared by Technical Committee ISO/TC 204, *Intelligent Transport Systems*.

Formatted: English (United States)

Formatted: Font: Italic, English (United States)

Formatted: English (United States)

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](http://www.iso.org/members.html).

Formatted: Font: 11 pt

Formatted: Space Before: 0 pt, Line spacing: single, Tab stops: Not at 17.2 cm

Formatted: Space After: 0 pt, Line spacing: single

## Introduction

An automated driving system (ADS) needs to be designed with the capability to cope with various conditions such as the driving environment, behaviour of other vehicles in the surroundings, traffic regulations, etc.

Formatted: No page break before, Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

Formatted: Body Text, Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

In addition, an ADS designed to operate on motorways may encounter various situations such as merging into the main lane of traffic, adjusting the speed according to congested or freely flowing traffic, overtaking other vehicles, or changing lanes when approaching an exit/lane closure.

Formatted: Body Text, Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

For Level 3 automated driving, the ADS issues a request to the fallback-ready user (FRU) to take over driving tasks when it cannot respond to certain conditions/situations.

~~This~~The ISO 23782 series of documents identifies the performance requirements for an ADS based on its capability to respond to certain conditions and situations. The requirements are derived in order to reliably transfer the control between the human driver and ADS, and for the safe operation by the ADS.

Formatted: std\_docPartNumber

Formatted: Body Text, Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

~~This~~The ISO 23782 series of documents focuses on the system functionalities, under the assumption that the fallback ready user FRU is available and responsive to system requests to take over driving tasks.

Formatted: Body Text, Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

Formatted: std\_docPartNumber

iteh STANDARD PREVIEW  
(standards.iteh.ai)

ISO/DTS 23792-1

<https://standards.iteh.ai/catalog/standards/sist/16adefdf-4063-4667-8f06-8d8a0b70be1a/iso-dts-23792-1>

Formatted: Font: 11 pt

Formatted: Space Before: 0 pt, Line spacing: single, Tab stops: Not at 17.2 cm



# Intelligent transport systems — Motorway chauffeur systems (MCS) Part 1: Framework and general requirements

## 1 Scope

Motorway ~~Chauffeur Systems~~ chauffeur systems (MCS) perform level 3 automated driving<sup>[1]</sup> on limited access motorways with the presence of a fallback-ready user (FRU). MCS ~~will can~~ be implemented in various forms capable of responding to different driving scenarios. This document describes a framework of MCS including system characteristics, system states/transition conditions, and system functions.

~~MCS is~~ MCSs are equipped with a basic set of functionalities to ~~realize~~ perform in-lane operation and ~~may can also~~ be equipped with additional functionalities such as lane changing.

This document specifies requirements of the basic set of functionalities and test procedures to verify these requirements. The requirements include vehicle operation to perform the entire dynamic driving task (DDT)<sup>[1]</sup> within the current lane of travel, to issue a request to intervene (RTI)<sup>[1]</sup> before disengaging, and to extend operation and temporarily continue to perform the DDT after issuing an RTI.

This document describes one specific form of system engagement, ~~while also other~~ Other forms are possible. These other system engagement forms, especially those provided in combination with other driving automation system features, are not within the scope of this document.

Requirements and test procedures for the additional functionalities are provided in other parts of the later documents of this set, ISO 23782 series.

Means related to setting a destination and selecting a route to reach the destination are not ~~in~~ within the scope of this document. This document applies to MCS installed in light vehicles<sup>[2]</sup>.

## 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 15622:2018, Intelligent transport systems — Adaptive cruise control systems — Performance requirements and test procedures

ISO/SAE PAS 22736, Taxonomy and definitions for terms related to driving automation systems for on-road motor vehicles

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/SAE PAS 22736 and the following apply.

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

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

— IEC Electropedia: available at <https://www.electropedia.org/>

- Formatted: Different first page header
- Formatted: Font: Bold, Font color: Blue
- Formatted: Font: Bold, Font color: Blue
- Formatted: Space Before: 20 pt, After: 38 pt, Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers
- Formatted: Font: Bold, Font color: Blue
- Formatted: Font: Bold, Font color: Blue
- Formatted: Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers
- Formatted: cite\_bib
- Formatted: English (United Kingdom)
- Formatted: English (United Kingdom)
- Formatted: English (United Kingdom)
- Formatted: English (United Kingdom)
- Formatted: cite\_bib
- Formatted: cite\_bib
- Formatted: English (United Kingdom)
- Formatted: cite\_bib
- Formatted: English (United Kingdom)
- Formatted: cite\_bib
- Formatted: English (United Kingdom)
- Formatted: Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers
- Formatted: Body Text
- Formatted: std\_publisher
- Formatted
- Formatted: std\_docNumber
- Formatted: std\_year
- Formatted: std\_docTitle, Font: Not Italic
- Formatted: Font: Not Italic
- Formatted
- Formatted: Body Text
- Formatted: std\_publisher
- Formatted: std\_docNumber
- Formatted: English (United States)
- Formatted: English (United States)
- Formatted
- Formatted: English (United States)
- Formatted
- Formatted: English (United States)
- Formatted