



**International
Standard**

ISO 23792-1

**Intelligent transport systems —
Motorway chauffeur systems
(MCS) —**

**Part 1:
Framework and general
requirements**

*Systèmes de transport intelligents — Systèmes de conduite
automatisée sur voie à chaussée séparée (MCS) —*

Partie 1: Cadre et exigences générales

**First edition
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Contents

	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Abbreviated terms	4
5 Characteristics of motorway chauffeur systems (MCS)	4
5.1 General.....	4
5.2 Operational design domain (ODD).....	5
5.2.1 General.....	5
5.2.2 Roadway physical characteristics.....	6
5.2.3 Traffic in the surrounding environment.....	6
5.2.4 Abnormalities in roadway operational condition.....	6
5.2.5 Ambient environmental conditions.....	6
5.3 System functionalities.....	7
5.3.1 General.....	7
5.3.2 Basic functionalities to realize in-lane operation.....	7
5.3.3 Lane changing functionalities.....	7
5.4 Classification.....	8
5.5 System limitations.....	8
5.6 Providing information to the user.....	8
6 General system requirements	8
6.1 Operating conditions.....	8
6.1.1 General.....	8
6.1.2 Engagement conditions.....	8
6.1.3 Disengagement-triggering conditions.....	8
6.1.4 Direct disengagement conditions.....	9
6.2 State transition.....	9
6.2.1 General.....	9
6.2.2 Off state.....	10
6.2.3 Standby state.....	10
6.2.4 Nominal operation state.....	11
6.2.5 Requesting fallback state.....	12
6.3 System functions.....	13
6.3.1 General.....	13
6.3.2 Object and event detection and response (OEDR).....	13
6.3.3 Vehicle motion control (VMC).....	14
6.3.4 Generation of request to intervene (RTI).....	14
6.3.5 Status indication.....	15
6.3.6 User control interface.....	16
6.3.7 Fallback-ready user (FRU) input detection.....	17
6.3.8 Motorway chauffeur system (MCS) monitoring the fallback-ready user (FRU).....	18
6.3.9 Subject vehicle condition monitor.....	18
6.3.10 Motorway chauffeur system (MCS) condition monitor.....	18
6.3.11 Localization.....	18
6.3.12 External warning generation.....	18
6.3.13 Function required for route-following functionalities.....	18
6.3.14 Related functions.....	19
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

ISO 23792-1:2026(en)

6.5	Misuse countermeasures.....	21
6.5.1	General.....	21
6.5.2	Hazardous situations involving reasonably foreseeable misuse.....	21
7	Minimum performance requirements of the dynamic driving task (DDT).....	21
7.1	General.....	21
7.2	Following traffic rules.....	22
7.3	Operating speed range.....	22
7.4	Normal operation.....	22
7.4.1	General.....	22
7.4.2	Sustained longitudinal vehicle motion control.....	22
7.4.3	Sustained lateral vehicle motion control.....	23
7.4.4	Crash avoidance.....	23
7.5	Performance-impaired operation.....	24
7.6	Reaction to unresponsive fallback ready user (FRU).....	24
8	Test procedures.....	24
8.1	General.....	24
8.1.1	Purpose.....	24
8.1.2	Driving environment.....	24
8.1.3	System settings and test driver roles.....	25
8.1.4	Common test pass criteria.....	25
8.1.5	Confirmation of the human machine interface (HMI) design.....	25
8.1.6	Success rate and number of trials.....	25
8.1.7	List of test scenarios.....	25
8.1.8	Test sites.....	26
8.2	Scenario 1: Reaction to unresponsive fallback-ready user.....	26
8.2.1	Test scenario.....	26
8.2.2	Pass criteria.....	26
8.3	Scenario 2: Direct disengagement by steering input.....	27
8.3.1	Test scenario.....	27
8.3.2	Pass criteria.....	27
8.4	Scenario 3: Continued operation after brake input.....	27
8.4.1	Test scenario.....	27
8.4.2	Pass criteria.....	27
8.5	Scenario 4: Forward vehicle braking hard.....	27
8.5.1	Test scenario.....	27
8.5.2	Pass criteria.....	28
8.6	Scenario 5: Aggressive cut-in from the adjacent lane.....	28
8.6.1	Test scenario.....	28
8.6.2	Pass criteria.....	29
8.7	Scenario 6: Obstacle in lane.....	29
8.7.1	Test scenario.....	29
8.7.2	Pass criteria.....	30
8.8	Scenario 8: Approaching geographical operational design domain (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
	Annex A (informative) MCS Type 2 description and design considerations.....	31
	Bibliography.....	38

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 document 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 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 204, *Intelligent transport systems*.

This first edition cancels and the first edition of ISO/TS 23792-1:2023, which has been technically revised.

The main changes are as follows:

- addition of Type 2 systems (5.4) and requirements associated with Type 2 systems;
- addition of requirements associated with misuse countermeasures (6.5);
- addition of Type 2 system description and design considerations (Annex A).

A list of all parts in the ISO 23792 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.

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.

In addition, an ADS designed to operate on motorways can 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 or lane closure.

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 or situations.

The ISO 23792 series 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 safe operation by the ADS.

The ISO 23792 series focuses on the system functionalities, under the assumption that the FRU is available and responsive to system requests to take over driving tasks.

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Intelligent transport systems — Motorway chauffeur systems (MCS) —

Part 1: Framework and general requirements

1 Scope

Motorway chauffeur systems (MCS) perform Level 3 automated driving on limited access motorways with the presence of a fallback-ready user (FRU).

This document describes a framework of MCS including system characteristics, system states and transition conditions and system functions.

This document specifies requirements for the basic set of functionalities of a MCS, and test procedures to verify these requirements.

The requirements include vehicle operation to perform the entire dynamic driving task (DDT) within the current lane of travel, to issue a request to intervene (RTI) before disengaging, and to extend operation and temporarily continue to perform the DDT after issuing an RTI.

Requirements and test procedures for additional functionalities (such as lane changing) are provided in other parts of the ISO 23792 series.

Means related to setting a destination and selecting a route to reach the destination are not within the scope of this document. This document applies to MCS installed in light vehicles^[9].

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, *Intelligent transport systems — Adaptive cruise control systems — Performance requirements and test procedures*

ISO 21448, *Road vehicles — Safety of the intended functionality*

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 terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1
subject vehicle

SV
vehicle equipped with a motorway chauffeur system (MCS) feature

3.2
motorway

road specially designed and built for motorized traffic that does not serve properties bordering on it, and does not cross at level with any road, railway or tramway track, or footpath

Note 1 to entry: Specific characteristics of motorways include the following;

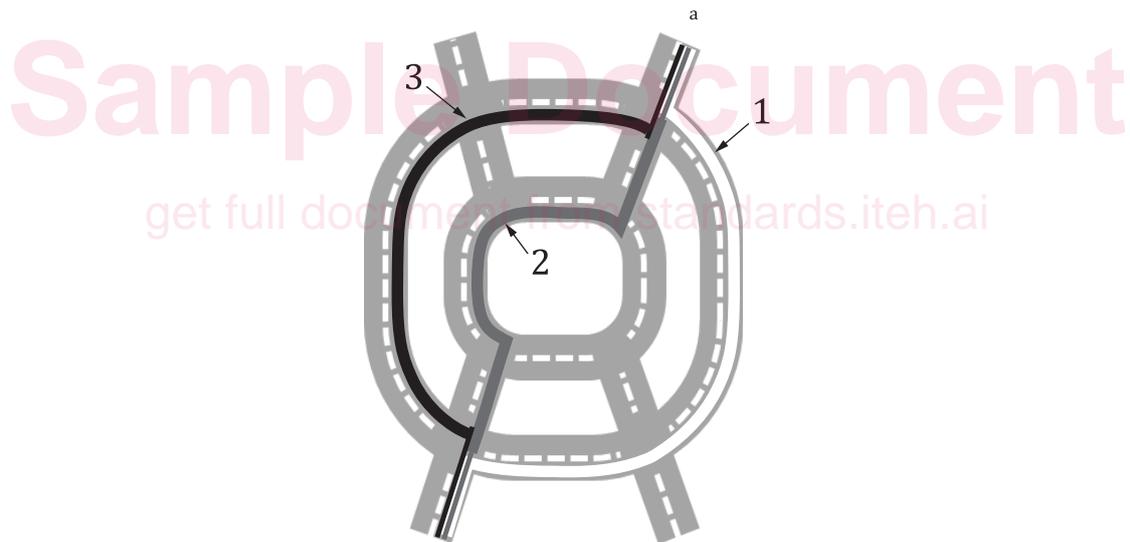
- they provide, except at special points or temporarily, separate carriageways for the two directions of traffic, separated from each other either by a dividing strip not intended for traffic or, exceptionally, by other means;
- they are specifically sign-posted as a motorway;
- they are prohibited for access from non-motorized road users, such as pedestrians and cyclists.

Note 2 to entry: Roads which satisfy the conditions listed in Note 1 to entry can be referred to using different terms in different countries.

3.3
route

planned sequence of waypoints to reach a destination

Note 1 to entry: See [Figure 1](#).



Key

- 1 route A
- 2 route B
- 3 route C
- a To destination.

Figure 1 — Route

3.4
path

combination of one or more neighbouring lanes in the same direction of travel along a given route

Note 1 to entry: See [Figure 2](#).



Key

- 1 path A
- 2 path B

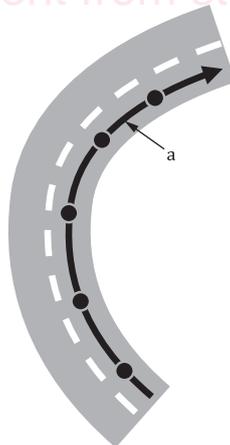
Figure 2 — Path

3.5 trajectory

sequence of locations that define the intended motion vector of the subject vehicle (SV) used as references for vehicle motion control

Note 1 to entry: The motion vector includes longitudinal position and/or speed, also lateral position and/or the vehicle's orientation information.

Note 2 to entry: See [Figure 3](#).



a Trajectory.

Figure 3 — Trajectory

3.6 vehicle motion control VMC

activities necessary to adjust vehicle movement continuously in real time, including lateral control and longitudinal control

Note 1 to entry: “Lateral vehicle motion control” and “longitudinal vehicle motion control” are defined in ISO/SAE PAS 22736.

4 Abbreviated terms

ACC	adaptive cruise control
ADS	automated driving system
DDT	dynamic driving task
FRU	fallback-ready user
FV	forward vehicle
HMI	human machine interface
MCS	motorway chauffeur system
MRC	minimal risk condition
MRM	minimal risk manoeuvre
ODD	operational design domain
OEDR	object and event detection and response
RTI	request to intervene
SV	subject vehicle
TTC	time to collision
VMC	vehicle motion control
V2X	vehicle to everything (wireless communication)

5 Characteristics of motorway chauffeur systems (MCS)

5.1 General

This document covers a variety of implementations of MCS based on its operational design domain (ODD) (see 5.2) and functionalities (see 5.3).

The ODD definition of an MCS is considered to be design-specific for its implementation. Therefore, the requirements in this document apply to the functionalities and performance of the MCS within its prescribed ODD.

5.2 Operational design domain (ODD)

5.2.1 General

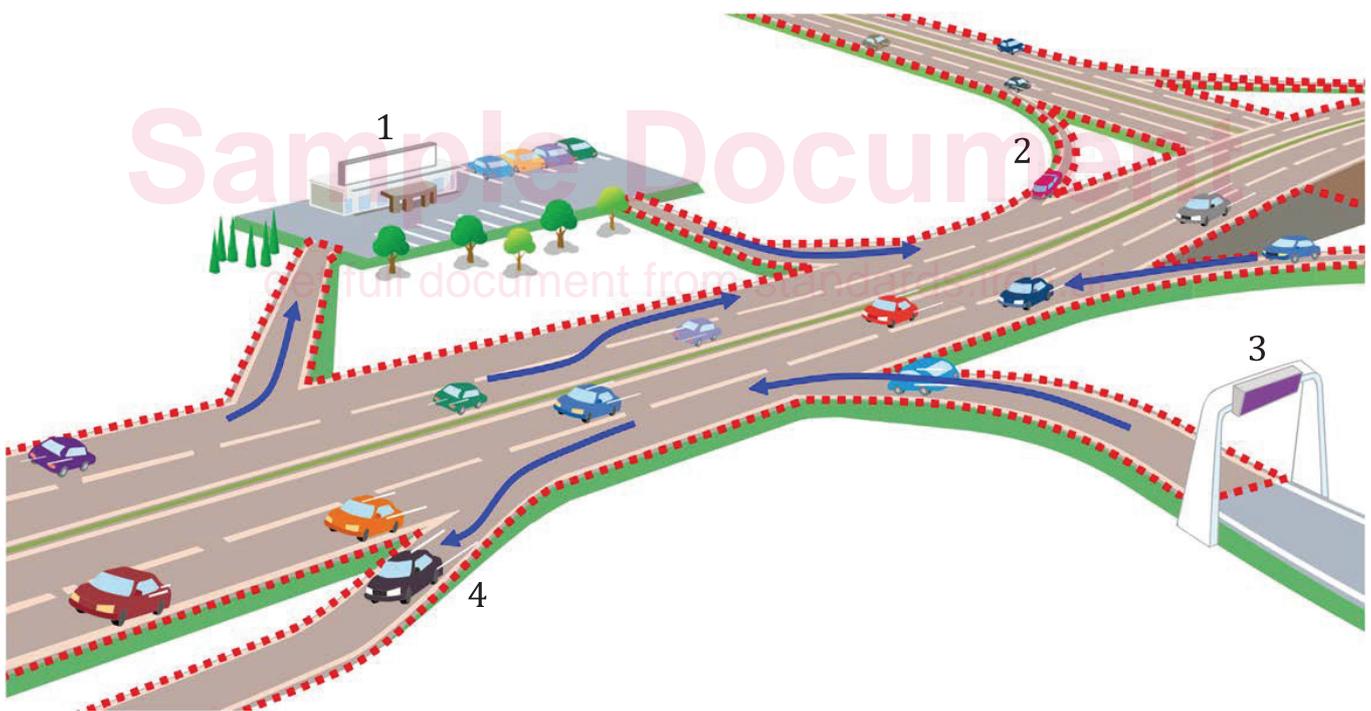
Each MCS shall have a pre-defined ODD, and the user shall be informed of the general ODD limitations (i.e. to make clear under which conditions a given MCS is capable of operating or not).

The description of an ODD shall, at minimum, include the following information unless the item does not represent a restriction for system operation.

- Roadway physical characteristics.
- Traffic in the surrounding environment.
- Abnormalities in roadway operational condition.
- Ambient environmental conditions.

[Subclauses 5.2.2](#) to [5.2.5](#) provide examples of possible ways to describe the above-mentioned ODD attributes. However, such attributes are not limited to those listed below, and more details should also be added as needed. ISO 34503 provides a sample list of ODD attributes.

[Figure 4](#) illustrates an image of the geographical ODD boundaries for an MCS capable of operating from the entrance to the exit of a motorway.



Key

- 1 service area
- 2 junction
- 3 tollgate
- 4 exit



example of geographical ODD of MCS

An MCS may also be designed to operate within more restricted boundaries that do not include entrance and exit ramps or merging and lane changing locations.

Figure 4 — Example of geographic boundary (geofence)

5.2.2 Roadway physical characteristics

Roadway characteristics should be considered as possible ODD attributes. An MCS may be designed to operate on roads with or without certain characteristics such as those mentioned below.

- Road configuration (e.g. number of lanes in each direction, existence of medians, road shoulders).
- Road structure characteristics (e.g. curvatures, slopes, undulations).
- Quality and visibility of lane markings.
- Surface characteristics of road structures (e.g. irregularity, running resistance friction coefficient, potholes).

NOTE To explain the above general roadway characteristics as part of the ODD to the user, sections of the motorway can be mentioned. For example, if the absence of a median strip to divide the carriageway is an out of ODD condition, the starting point and the end point of the section with no median strips can be considered as the geographical boundaries of the ODD.

5.2.3 Traffic in the surrounding environment

The existence of traffic in the surrounding environment and its motions (e.g. travelling speed, travelling direction) may be considered as a possible ODD attribute. Vehicles in the forward direction, as well as in the adjacent lanes and behind the subject vehicle (SV) may be considered as ODD attributes for an MCS to operate.

The existence of emergency vehicles (e.g. ambulance) may also be considered as a possible ODD attribute. If an MCS is not capable of responding appropriately to emergency vehicles, the existence of approaching emergency vehicles should be considered as an out of ODD condition.

5.2.4 Abnormalities in roadway operational condition

Restrictions in roadway operational conditions, such as those in the following list, should be considered as possible ODD attributes.

- Lane blockage.
- Traffic incident (e.g. crash, failed vehicle).
- Existence of road work (e.g. construction, maintenance).

5.2.5 Ambient environmental conditions

Characteristics related to ambient environmental conditions (including weather conditions), such as those in the following list, should be considered as possible ODD attributes.

- Lighting conditions (e.g. illuminance, direction).
- Temperature.
- Rain, snow, hail (e.g. precipitation impact on visibility).
- Wind (e.g. speed, direction).
- Fog (e.g. visual distance).

NOTE Time of day can be used to explain the above ambient environmental conditions as ODD limitations, and potentially other ODD limitations that are subject to regular changes during time of the day. For example, if illuminance condition is an ODD limitation for the ADS designed to operate in areas without streetlamps, "night time" can be used to express such ODD limitation.