INTERNATIONAL STANDARD

ISO 23374-1

First edition
2023-07

Intelligent transport systems — Automated valet parking systems (AVPS) —

Part 1: System framework, requirements for automated driving and for communications interface

Systèmes de transport intelligents — Systèmes de parking avec voiturier automatisé (AVPS) —

Partie 1: Cadre du système, exigences relatives à la conduite automatisée et à l'interface de communication

Reference number
ISO 23374-1:2023(E)

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Published in Switzerland

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Foreword

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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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This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

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

The aim of this document is to contribute to the realization of safe and reliable level 4 driverless operation of vehicles within parking facilities, and to support a fast and smooth market introduction by achieving interoperability among vehicles provided by different manufactures and within different parking facilities managed by different organizations.

An automated valet parking system (AVPS) will automatically operate unoccupied vehicles from the drop off area (where the driver and passengers leave the vehicle) to a parking destination, and will also send the vehicle to a pickup area upon the user's request.

An AVPS will not only provide enhanced user experiences, but is also expected to contribute to accident reduction, lowering energy consumption and CO_2 emissions of vehicles searching for available parking spaces, and effectively utilize land by densely parking vehicles in the available space.

An AVPS can be utilized in places such as the large-scale public parking facilities of shopping malls, airports, large apartment buildings, time-based small public parking lots, or fleet management carpools. By implementing the system in parking facilities, the service provider will gain the opportunity to add other related services such as moving electric vehicles to and from charging stations or providing access to the trunk for the delivery of goods. Rather than having fully-automated vehicles driving around and searching for space, the system allows the service provider to govern the vehicles for improved traffic management.

In order to contribute to the realization of safe and reliable level 4 driverless operation, the requirements specified in this document are based on the performance of state-of-the-art technologies that are available at the time of publication. Thus, this document will be revised in the future in accordance with relevant technology enhancement.

Within this document, specific technological solutions for the communications interface (e.g. communication method, message protocol) are intentionally left open due to differences in available and commonly-used technology (e.g. spectrum allocation) around the world. Therefore, it is recommended that the communications interface be further discussed at the national/regional level to ensure interoperability.

Intelligent transport systems — Automated valet parking systems (AVPS) —

Part 1: System framework, requirements for automated driving and for communications interface

1 Scope

Automated valet parking systems (AVPSs) perform level 4 automated driving of individual or multiple unoccupied vehicles within a prescribed area of a parking facility. This document specifies performance requirements for the operation functions, the environmental conditions within parking facilities where automated vehicle operation is performed, and the test procedures to verify the performance requirements.

An AVPS is comprised of physically separated sub-systems distributed among vehicles, facility equipment and user domains. The functionalities of AVPSs are realized by cooperation of these sub-systems, which are, in many cases, provided by different organizations. This document defines the system architecture and the communication interfaces between the sub-systems at the logical level.

An AVPS manages its system participants (i.e. AVPS-compliant vehicles and parking facilities) and provides interfaces to other facility users and involved persons (e.g. system operators, facility managers). This document contains requirements for the management functions such as checking compatibility between vehicles and parking facilities, performing remote assistance and recovery when automated driving cannot be performed, and executing operation stop commands in response to the actions of other facility users.

AVPSs are intended for use by a service provider upon receiving authority over vehicles from individual service recipients. This document does not include parking automation technologies that are solely based on usage by an individual user. If the vehicle is put into driverless operation directly by the user, this is not considered to be part of the AVPS.

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 20900, *Intelligent transport systems — Partially-automated parking systems (PAPS) — Performance requirements and test procedures*

ISO 8608, *Mechanical vibration — Road surface profiles — Reporting of measured data*

ISO 19206-2, *Road vehicles — Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions — Part 2: Requirements for pedestrian targets*

ISO 19206-3, *Road vehicles — Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions — Part 3: Requirements for passenger vehicle 3D targets*

ISO 19206-4, *Road vehicles — Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions — Part 4: Requirements for bicyclist targets*

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

IEC 61508 (all parts),, *Functional safety of electrical/electronic/programmable electronic safety-related systems*

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

ISO/SAE 21434, *Road vehicles — Cybersecurity engineering*

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
service provider
organization that hands over or receives authority to or from users through an automated valet parking system (AVPS)

Note 1 to entry: See 5.5.2 for further information.

3.2
user
<of an automated valet parking system> individual service recipient that hands over or retrieves authority to or from service providers through an automated valet parking system (AVPS)

Note 1 to entry: Both the owner of a personal vehicle and a user of a car share service can be a user of an AVPS.

Note 2 to entry: Within ISO/SAE PAS 22736, the term "user" is defined as the human role specifically in relation to driving automation systems. An AVPS is a system that includes system participant management functions in addition to level 4 automated driving functions. Within this document, the term "system operator" (see 3.28 and 5.5.3) is used as a role which performs dispatching and remote assistance in relation to the level 4 automated driving functions of an AVPS. The term "user" is assigned to the individual service recipient, and not to the dispatcher or remote assistant.

3.3
authority
rights and ability to perform certain tasks on the subject vehicle

Note 1 to entry: Within this document, authority is transferred between the user and the service provider, and does not exist among the two at the same time. One always has priority regarding the management and operation of the subject vehicle (SV).

Note 2 to entry: See 5.1.2.2 for further information.

3.4
subject vehicle
SV
light vehicle[1] which is equipped with the vehicle operation sub-system of an automated valet parking system (AVPS)