INTERNATIONAL STANDARD

# ISO 4272

First edition
2022-09

# Intelligent transport systems — Truck platooning systems (TPS) — Functional and operational requirements

*Systèmes de transport intelligents — Systèmes de convois de camions (TPS) — Exigences fonctionnelles et opérationnelles*

Reference number
ISO 4272:2022(E)

© ISO 2022

ISO 4272:2022 - Preview only Copy via ILNAS e-Shop

ISO 4272:2022 - Preview only Copy via ILNAS e-Shop

**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2022

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



© ISO 2022 – All rights reserved

# Contents

Page

**Foreword** ... **v**
**Introduction** ... **vi**
**1 Scope** ... **1**
**2 Normative references** ... **1**
**3 Terms and definitions** ... **1**
**4 Symbols and abbreviated terms** ... **4**
4.1 Abbreviated terms ... 4
**5 Types of truck platooning systems** ... **4**
5.1 Top-down-managed platooning ... 4
5.1.1 LV-managed platooning ... 4
5.1.2 BO- and LV-managed platooning ... 5
5.2 Peer-to-peer platooning ... 5
**6 Types of truck platoon formation** ... **5**
6.1 Overview ... 5
6.2 Formation on the motorway ... 5
6.2.1 General ... 5
6.2.2 Ad-hoc platoon formation on the motorway ... 5
6.2.3 Planned platoon formation on the motorway ... 5
6.3 Formation at the staging area ... 6
6.3.1 Ad-hoc platoon formation at the staging area ... 6
6.3.2 Planned platoon formation at the staging area ... 6
**7 Operation state diagram** ... **6**
7.1 General ... 6
7.2 Operation state diagram of platooning operations ... 6
**8 Platooning operation control function (POCF)** ... **7**
8.1 General ... 7
8.2 Join ... 7
8.3 Leave ... 8
8.4 Operation ... 9
8.4.1 Join operation ... 9
8.4.2 Leave operation ... 10
8.5 Requirements ... 10
8.5.1 Join requirements ... 10
8.5.2 Leave requirements ... 11
**9 Platooning manoeuvre control function (PMCF)** ... **11**
9.1 General ... 11
9.2 Longitudinal control ... 11
9.3 Lateral control ... 14
9.4 Longitudinal control operations ... 15
9.4.1 Join manoeuvre ... 15
9.4.2 Cruising operation ... 15
9.4.3 Leave manoeuvre ... 15
9.4.4 Cut-in operation ... 15
9.4.5 Cut-out operation ... 16
9.5 Lateral control operations ... 16
9.5.1 Cruising (in-lane) operation ... 16
9.5.2 Lane change operation ... 16
9.6 Longitudinal control requirements ... 17
9.6.1 Join manoeuvre requirements ... 17
9.6.2 Cruising requirements ... 17
9.6.3 Leave manoeuvre requirements ... 17

ISO 4272:2022 - Preview only Copy via ILNAS e-Shop

© ISO 2022 – All rights reserved

9.6.4 Cut-in requirements 18
9.6.5 Cut-out requirements 18
9.7 Lateral control requirements 18
9.7.1 Cruising requirements 18
9.7.2 Lane change requirements 18

**10 Communication data (V2V/V2I) 19**
10.1 General 19
10.2 Requirements of communication 19
10.3 Communication data 19
10.3.1 General 19
10.3.2 Communication data for PMM 19
10.3.3 Communication data for PCM 22

**11 Functional evaluation test method 23**
11.1 Evaluation test conditions 23
11.2 Evaluation test method 23
11.2.1 General 23
11.2.2 Join evaluation test 23
11.2.3 Leave evaluation test 26
11.2.4 Cruising evaluation test 27
11.2.5 Cut-in evaluation test 28
11.2.6 Cut-out evaluation test 30

**Annex A** (informative) **Use cases of POCF 32**

**Annex B** (informative) **Use cases of PMCF 37**

**Bibliography 42**

ISO 4272:2022 - Preview only Copy via ILNAS e-Shop


© ISO 2022 – 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 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.

ISO 4272:2022 - Preview only Copy via ILNAS e-Shop

© ISO 2022 – All rights reserved 

# Introduction

A truck platoon is a vehicle string in which multiple vehicles are driving under coordinated longitudinal and possible lateral control.

Truck platooning is beneficial for the transportation industry because it can improve the operational efficiency of motorway transportation, improve safety and reduce the energy consumption of truck operation, as well as improving drivers' working environment and reducing workload. In addition, truck platooning improves the road capacity and efficiency for overall traffic.

The truck platooning system consists of a platooning control system and optionally a back office (BO) as shown in Figure 1. Information from the back office can be helpful and effective for planning platoon operations.

The platooning control system controls the processes by which vehicles join or leave the platoon and the manoeuvring of the platoon under coordinated longitudinal vehicle control strategies such as cooperative adaptive cruise control (CACC). Each vehicle has vehicle-to-vehicle (V2V) over-the-air communication to exchange information with the other vehicles in the platoon and recognizes its participation in a platoon. Each vehicle controls its own motions in a platoon based on the data obtained from sensors such as radar, lidar and camera, and the data received from the over-the-air communication.

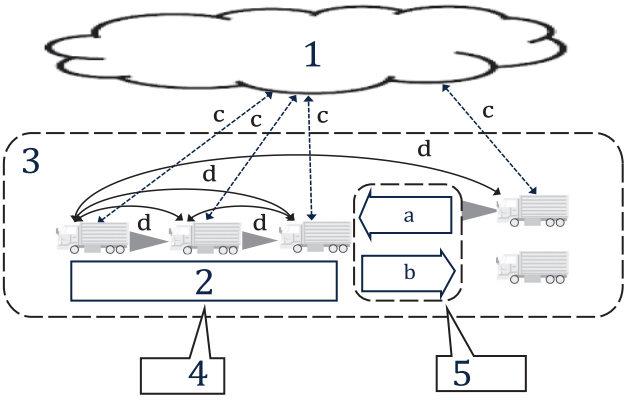
The truck platooning system may include a back office infrastructure system to support the platooning control system. BO functions can include platooning demand matching, and platooning formation and operation management. Platooning demand matching covers forming requests, matching requests, route management and charge/payment of platoon from operators such as shippers and fleet operators. Platooning formation and operation management may issue notifications about the acceptance/refusal of platooning requests, truck sequence in platoon, route selection/permission/recommendation, and geographical limitations on the platooning.

The platooning operational control function controls changes in the membership of platoon; the platooning manoeuvre control function controls interactions within the platoon.

This document provides the common base needed for platooning system development. It also supports market introduction of the platooning system and assists in accelerating the deployment of truck platooning.

ISO 4272:2022 - Preview only Copy via ILNAS e-Shop


© ISO 2022 – All rights reserved




**Key**

1 back office
2 platoon (steady state)
3 platooning control system
4 platooning manoeuvre control function
5 platooning operation control function

[a] Join.
[b] Leave.
[c] Vehicle to infrastructure (V2I) communication.
[d] Vehicle to vehicle (V2V) communication.

**Figure 1 — Overall architecture of the truck platooning system (TPS)**

ISO 4272:2022 - Preview only Copy via ILNAS e-Shop

© ISO 2022 – All rights reserved