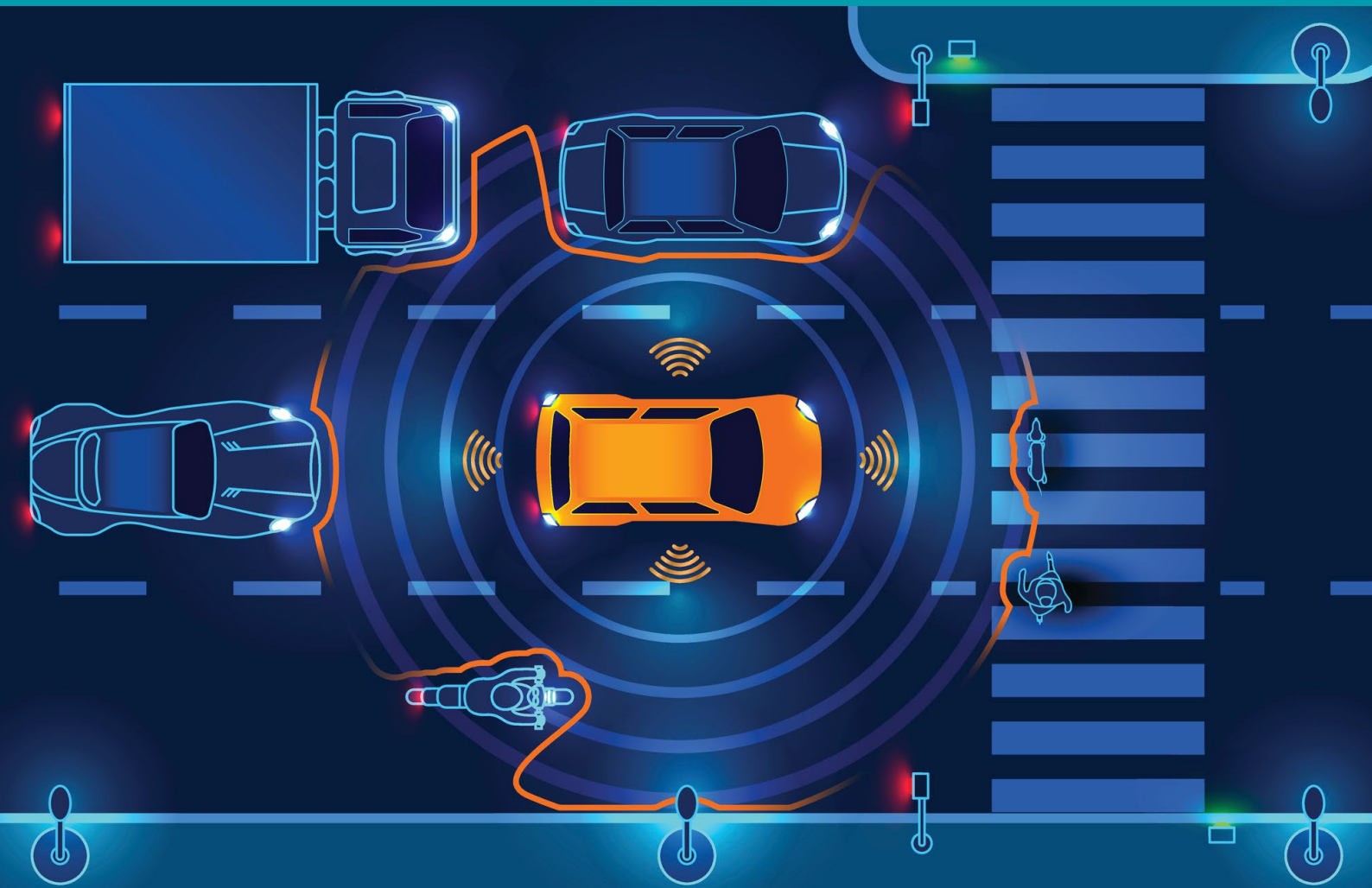


PAS 1881:2020

Assuring the safety of automated vehicle trials and testing – Specification



Centre for Connected
& Autonomous Vehicles

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Published by BSI Standards Limited 2020.

ISBN 978 0 539 04058 6

ICS 43.020

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Publication history

First published February 2020

Contents

Foreword	ii
Introduction	iv
1 Scope	1
2 Normative references	2
3 Terms and definitions	2
4 Safety case requirements and ownership	5
5 Contents of the safety case	6
Annexes	
Annex A (informative) Safety case development and case studies	15
Annex B (informative) Operational guidance	22
Bibliography	24
List of figures	
Figure A.1 – Overview of safety case development	15
Figure A.2 – Continuous improvement process	19

Foreword

This PAS was sponsored by the UK's Centre for Connected and Autonomous Vehicles (CCAV). Its development was facilitated by BSI Standards Limited and it was published under licence from The British Standards Institution. It came into effect on 29 February 2020.

Acknowledgement is given to Camilla Fowler of TRL, as the technical author, and the following organizations that were involved in the development of this PAS as members of the steering group:

- Adelard LLP
- Centre for the Protection of National Infrastructure (CPNI)
- Connected Places Catapult
- Consumer and Public Interest Network (CPIN)
- FiveAI
- Highways England
- HORIBA MIRA
- Loughborough University
- Millbrook Proving Ground
- Oxbotica
- Oxfordshire County Council
- Potenza Technology Ltd
- Remote Applications in Challenging Environments (RACE)
- Royal Borough of Greenwich
- Transport for London (TfL)
- Warwick Manufacturing Group (WMG)

Acknowledgement is also given to the members of a wider review panel who were consulted in the development of this PAS.

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Use of this document

It has been assumed in the preparation of this PAS that the execution of its provisions shall be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Relationship with other publications

PAS 1881 has been developed as part of a wider programme sponsored by CCAV in conjunction with the Department for Transport (DfT), Innovate UK and Zenzic to develop a suite of standardization products to promote the safe testing and deployment of automated vehicles in the UK and inform wider international standardization activity.

PAS 1881 specifies requirements for operational safety cases for automated vehicle trials and development testing in the UK to demonstrate that trialling and testing activities can be undertaken safely and securely. It is intended to be read in conjunction with:

- guidance on system safety, including PAS 1880¹⁾, PAS 1882²⁾, PAS 1883³⁾ and PAS 11281;
- where applicable to the trial, safety and stakeholder requirements, including the DfT's *Code of practice: Automated vehicle trialling* [1], Transport for London's (TfL) *Connected and autonomous vehicles: Guidance for London trials* [2], and Highways England's *GG104: Requirements for safety risk assessment* [3]; and
- existing legislation for UK vehicles and roads.

Particular attention is drawn to the following specific legislation:

- The Road Traffic Regulation Act 1984 [4];
- The Road Vehicles (Construction and Use) Regulations 1986 [5];
- The Road Traffic Act 1988 [6];
- The General Data Protection Regulation (GDPR) [7];
- The Road Vehicles (Approval) Regulations 2009 [8];
- The Data Protection Act 2018 [9]; and
- The Automated and Electric Vehicles Act 2018 [10].

Presentational conventions

The provisions of this PAS are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. "organization" rather than "organisation").

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

¹⁾ In preparation.

²⁾ In preparation.

³⁾ In preparation.

Introduction

As automated vehicle technologies are developed, there is an increasing demand to test and trial driving automation technologies and mobility services on the UK road network. There has been significant government and industry investment in the development of automated vehicle technology, and the UK government is committed to ensuring that automated vehicle trials and ongoing technology testing are conducted safely and securely. The UK government is also committed to building public and consumer trust and acceptance of the technology. This PAS supports the government's commitment by creating a standardized and consistent approach to safety case development for trialling organizations to adopt, and encourages safety to be prioritized during technology development and testing. This PAS also provides the guidance to enable robust and transparent safety cases.

Safety assurance for automated vehicles can be categorized into two interdependent areas: system safety and operational safety. System safety is achieved through ensuring adequate functional safety, safety of the intended functionality (SOTIF) and cybersecurity. This forms an integral part of the vehicle development and includes the vehicle specification, design, implementation, and verification and validation of the automated vehicle's functions. System safety assessments can also be risk-based assessments that identify the vehicle's minimum safety and security requirements for achieving an acceptable level of risk and ensure that this level of risk has been achieved. Operational safety assurance considers the interaction of an automated vehicle with the operating environment, including the route, safety driver or operator, passengers and other road users and road workers. System safety and operational safety are intrinsically linked, but this PAS focuses on the operational safety and references the required outputs from system safety assessments. Further guidance on automated vehicle safety is also available in PAS 1880, which provides a guide for developing and assessing automated control systems, PAS 1883, which focuses on the operational design domain (ODD) and PAS 11281, which focuses on the impact of security on safety.

A safety case is a structured argument supported by a body of evidence that demonstrates that the safety risks have been identified, managed and reduced as low as reasonably practicable (ALARP). The safety case includes (but is not limited to) risks associated with the vehicle, operating platform, vehicle control and the operating environment, and considers risks to all affected parties, including other vehicles, vulnerable road users, the safety driver or operator, passengers, road workers and third parties. The safety case provides assurance to stakeholders, including highway authorities, road operators, landowners, leaseholders, insurers and members of the public. The safety case is a live document that, when updated to reflect changes and learning throughout a trial, promotes continuous improvement and safety assurance.

The safety case framework detailed in this PAS has been developed for automated vehicle trials but is based on existing safety standards and safety governance good practice; the DfT's *Code of practice* [1] recommends that trialling organizations develop a detailed safety case before conducting trials in public domains. This safety case framework has been applied to a number of automated vehicle trials and has been continually refined and updated to reflect learning from those trials and input from stakeholders.

1 Scope

This PAS specifies requirements for safety cases for automated vehicle trials and development testing in the UK to demonstrate that trialling and testing activities can be undertaken safely and securely.

It covers the development of an operational safety case to demonstrate that the risks to all affected parties throughout automated vehicle trials and testing are reduced as low as reasonably practicable (ALARP). This includes operational risk assessments, safety testing, training, safety monitoring, compliance and permissions granted. It is applicable to all real-world testing environments, including test tracks and public domains and to all levels of driving automation systems. However, a safety case developed for test tracks might not need to include all elements detailed in this PAS.

This PAS does not cover the system safety of the vehicle (e.g. functional safety, safety of the intended functionality (SOTIF) and cybersecurity assessments) but does rely on their outputs. This PAS does not include the safety case requirements for the testing of a connected vehicle that is not also automated.

This PAS is intended for use by trialling organizations, including private developers and original equipment manufacturers (OEMs), developing safety cases for automated vehicle trials and testing. Compliance with this PAS does not guarantee acceptance of the safety case by relevant organizations.

This PAS might be of interest to organizations requiring assurance that a safety case has been developed in line with good practice, for example, highway authorities, road operators, landowners, leaseholders and insurers.