
**Road transport and traffic telematics —
Automatic vehicle and equipment
identification — System specifications**

*Télématique de la circulation et du transport routier — Identification
automatique des véhicules et équipements — Spécification des
systèmes*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 14815 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 278, *Road transport and traffic telematics*, in collaboration with Technical Committee ISO/TC 204, *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition cancels and replaces ISO/TS 14815:2000, which has been technically revised.

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Introduction

System specification

This International Standard is designed to enable users and suppliers of AVI/AEI systems to specify system specification that will enable a nominal interoperability based on a DSRC link.

The terms “AVI” and “AEI” are used both to describe “independently functioning AVI/AEI systems” and as “the function of identification within other RTTT/TICS systems”. This International Standard supports both such uses where no other application or sector standard applies.

Whilst it may be desirable to determine a single set of requirements for operation in all environments and under all operating conditions, this could impose unacceptable costs.

This International Standard therefore provides standard “classes” for different aspects of system specification, such that a system specifier may select the appropriate performance parameters to meet a particular requirement. Supporting informative annexes also provide a number of general use “categories” which may be used to specify the environmental and operating parameters to support interoperable applications.

The architecture descriptions provided in this International Standard are in compliance with the guidelines provided by CEN/TC 278 WG13 ISO/TC 204 WG1.

For the data structure elements, Abstract Syntax Notation One (ASN.1) Packed Encoding Rules (PER) (ISO 8825-2) are used. This usage provides maximum interoperability and conformance to existing standards.

For detailed information on the use of ASN.1 PER for AVI/AEI applications, reference is made to ISO 14816.

This International Standard provides classification procedures and details test requirements needed to support system definition. These requirements are, wherever possible, determined by reference to existing standards and established practices.

Test requirements

Test requirements are determined for AVI/AEI system components. The requirements to meet this International Standard encompass general performance measurement, operational, and environmental aspects.

How to use this International Standard

It is also an objective to provide users with different applications and in different environmental circumstances a useful tool that is flexible enough to serve the various different needs. The categorization and classification system in this International Standard provides for this.

A brief guide showing how to use this International Standard is provided at the end of Annex A.

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Road transport and traffic telematics — Automatic vehicle and equipment identification — System specifications

1 Scope

This International Standard defines a generic AVI/AEI System specification for nominal AVI/AEI to provide an *enabling* International Standard, which, whilst allowing the system specifier to determine the performance levels and operating conditions, provides a framework for nominal interoperability.

Within the road context of the Transport and Traffic Telematics Sector, AVI and AEI systems have the specific objective of achieving a unique or unambiguous positive identification of a vehicle or item of equipment, and to make that identification automatically.

Whilst AVI may also be seen as an essential component of some applications, the particular needs of such systems are outside the scope of this International Standard. As far as is possible, care is still taken to provide a useful tool for such applications.

This International Standard only refers to AVI/AEI in the road environment. Multimodal and intermodal exchanges of AVI/AEI are outside the scope of this International Standard.

Where AVI/AEI applications are part of a larger system, and where no standardized application-specific test requirements exist, these test requirements apply.

Anonymity and privacy issues are discussed in ISO 14816, and are not handled in this International Standard.

This International Standard is designed for system specification that will enable a nominal interoperability based on a DSRC link. AVI/AEI systems that are relying on other link types are outside the scope of this International Standard for those parameters where the link type influences parameters.

The scope of this International Standard is confined to generic AVI/AEI system specification for systems that have the following “core” components:

- A means of communication between the vehicle/equipment and the reading station (e.g. a DSRC link);
- operation within a reference architecture which enables compatible systems to read and interpret the identification (See ISO TR 14814);
- compliance to commonly understood data structures that enable meaningful interpretation of the data exchanged in the identification sequence (See ISO 14816);
- the provision of operating and environmental parameters (or classes of operating parameters) within which such systems must successfully function without impairing interoperability. This is to ensure that the system specifier can state his requirements clearly to Implementation Designers and Integrators, and measure the performance of such systems (covered in this International Standard).

2 Normative references

The following referenced documents are indispensable for the application 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 7637-1:1990, *Road vehicles — Electrical disturbance by conduction and coupling — Part 1: Passenger cars and light commercial vehicles with nominal 12 V supply voltage — Electrical transient conduction along supply lines only*

ISO/IEC 8825-2, *Information technology — ASN.1 encoding rules: Specification of Packed Encoding Rules (PER) — Part 2*

ISO/TR 14814¹⁾, *Road transport and traffic telematics — Automatic vehicle and equipment identification — Reference architecture and terminology*

ISO 14816¹⁾, *Road transport and traffic telematics — Automatic vehicle and equipment identification — Numbering and data structure*

ENV 12795, *Road Transport and Traffic Telematics (RTTT) — Dedicated Short-Range Communication (DSRC) — DSRC Data Link Layer: Medium Access and Logical Link Control*

IEC 68-1:1987, *Basic Environmental Testing Procedures — Part 1: General and Guidance*

IEC 68-4:1987, *Environmental testing — Part 4: Information for specification writers — Test summaries*

IEC 215:1987, *Safety requirements for radio transmitting equipment (EN 60215)*

IEC 721-3-4:1988, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Stationary use at non-weather protected locations*

IEC 721-3-5:1988, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Ground vehicle installations*

IEC 801-2:1984, *Electromagnetic compatibility for industrial-process measurement and control equipment*

IEC 1000-4-6, *Electromagnetic compatibility (EMC) — Part 4: Testing and measuring techniques — Section 6: Immunity to conducted disturbances, induced by radio-frequency fields*

CEPT/ERC T/R 22/04:1991, *Harmonisation of Frequency Bands for Road Transport Information Systems*

3 Compliance

In order to claim compliance with this International Standard, a supplier shall provide, for each physically separated component, detail of the classification of its product for all relevant (environmental and operational) parameters determined within this International Standard.

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply:

4.1

AVI/AEI system

AVI/AEI application in an RTTT system, either as a stand-alone system or as part of an RTTT application

1) To be published.

4.2**bi-directional monologue**

“read only” functionality with a start signal from the FE side

4.3**category**

groupings of common class requirements to support interoperability between AVI/AEI systems of common purpose (e.g. a “ruggedized” category versus a “standard” category)

4.4**class**

differentiation between system components with different “grades” of requirements for parameters (e.g. class 1 for “extreme” operational and environmental requirements)

4.5**environmental parameters**

describe different environmental component properties/specifications

4.6**extreme**

refers to class 1 requirements for the “ruggedized” system category “A”

4.7**Fixed Equipment (FE)**

equipment required to interrogate, receive and interpret the data in the On-Board Equipment (OBE) in order to present the identification

4.8**lifetime**

period of time during which an item of equipment exists and functions according to the relevant requirements of this International Standard

4.9**maintainability**

ability to keep in a condition of good repair or efficiency

4.10**Mean Time to Failure**

average time that a system functions before first failure

4.11**Mean Time between Failures**

mean cycle (one failure and one repair) time of a maintained system

4.12**Nominal Interoperability**

“Application Area Interoperability” in a region spanning two or more areas with cross-border operation between operator domains, districts or nations, the capability for a nominal AVI/AEI system FE to operate with a nominal AVI/AEI system OBE

4.13**normal**

class 2 requirements for the “standard” system category “B”

4.14**On-Board Equipment (OBE)**

equipment fitted to the vehicle or item to be identified and containing the unique or unambiguous positive identification

4.15
operational parameters

different operational component properties/specifications

4.16
physical architecture

physical configuration and physical interconnection of equipment to achieve its function (not the equipment itself)

4.17
selected

class 1-6 requirements for the system categories “3 - 6”

4.18
shadowing

condition where the close proximity of a vehicle/equipment interposed between FE and OBE obscures the signals, thus preventing a successful AVI/AEI transaction

NOTE The shadowing caused by normal traffic behaviour is taken into account and overcome to provide a successful transaction. Abnormal shadowing may be caused by large or unusually shaped vehicles/equipment or by vehicles travelling too closely together.

4.19
(AVI/AEI) transaction

completed cycle of communication (across the air interface at reference point delta) wherein a message identifying a vehicle or item of equipment is successfully received and understood by the receiver during one passage through the read zone

NOTE The number of attempts, retries and repeats is not relevant, it is only that one fully completed identification process communication cycle is successfully completed to the extent that no communications error could be detected.

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5 Abbreviations

The following abbreviations are used in this International Standard:

AEI	Automatic Equipment Identification
AIB	Accredited, Independent, Testing Body
ASN.1	Abstract Syntax Notation One
AVI	Automatic Vehicle Identification
CEPT	Comité Européenne de Postes et Telecommunication (Fr.) European Committee for Post and Telecommunication
DSRC	Dedicated Short Range Communication
DUT	Device Under Test
FE	Fixed Equipment
MTBF	Mean Time Between Failures
OBE	On-Board Equipment
OSI	Open Systems Interconnection
RTTT	Road Transport and Traffic Telematics (CEN/TC 278)
TICS	Transport Information and Control Systems (ISO/TC 204)

The following abbreviations are used to designate the IEC 721 — Environmental classes:

B	Biological
C	Chemical substances
F	Contaminating fluids
K	Climatic
M	Mechanical
S	Mechanical substances
Z	Special climatic conditions

6 Requirements

6.1 Generic system specification for AVI/AEI systems

This clause summarizes the generic system specification for AVI/AEI systems in terms of functions supported, data exchanges, categorization and classification. The requirements defined in this clause:

- provide operation within the reference architecture defined in ISO/TR 14814,
- allocate application data in accordance with ENV ISO 14816, and
- enable nominal interoperability.

To obtain interoperability, it is a requirement that nominal AVI/AEI system FE shall have the capability to operate with nominal AVI/AEI system OBE, albeit of different capability using an air interface as referenced in 6.5.

However, the environmental and operating conditions within which such equipment has to function may be different according to geographical location, traffic operating conditions, etc. This International Standard provides environmental/operational classes grouped into categories to enable the marketplace to decide the most appropriate FE for individual fixed locations. This is with the knowledge that, within the operating/environmental constraints selected, any properly configured standard compliant AVI/AEI system OBE shall have the capability to be identified by all standard compliant AVI/AEI system FE.

To obtain nominal AVI/AEI system interoperability, it is a requirement that OBEs shall have the capability to operate with nominal AVI/AEI system FE.

However, the environmental and operating conditions within which on-board equipment has to function may be different according to geographical location, vehicle or equipment type, OBE location, etc. This International Standard provides options and environmental/operational classes to enable the marketplace to select the most appropriate OBE equipment, with the knowledge that, within the operating/environmental constraints selected, any properly configured standard compliant AVI/AEI system FE shall have the capability to identify all standard compliant AVI/AEI OBEs passing within its compass.

These generic system specifications provide a migration path to later generations of equipment and to equipment of greater capability.

In order to enable an AVI/AEI system to operate across wide areas, it is necessary for the system to use the standardized interfaces architecture and data structures normalized in this family of AVI/AEI European Standards. As particular system specifications will vary, well-declared and flexible structures are used. It is important, for example, that AVI/AEI system FE facilities can effectively operate different variants of OBE. The system specification defined in this International Standard supports the numbering schemes and data structuring defined in ISO 14816.

6.2 System specification: architecture

It is the **Vision** of the AVI/AEI system specification International Standard to:

“provide a method (trans-national and interoperable) of automatically identifying a vehicle or item of equipment using a standard DSRC link.”

Other subsequent standards may determine requirements for AVI/AEI systems working at other air interfaces.

It is the **Mission** of the AVI/AEI system specification International Standard to:

“Define the functionality, environmental and operating parameters (system specification for AVI/AEI) such that they may achieve the objectives of the Vision Statement in an Open Systems Environment, enabling interoperability, whilst retaining the ability for different equipment to coexist.”

According to the operational situation, AVI/AEI systems may be viewed either as a service to support an application (such as the vehicle identification component in a public transport system or freight management system), or as an application in itself (for example, the identification of a “probe” vehicle in a traffic management situation or in an enforcement situation). As such, the AVI/AEI system function may be achieved using purpose-specific dedicated equipment (such as an AVI/AEI system transponder), or may be achieved using equipment installed for the application that it supports, or indeed, using existing equipment installed for another application (such as a freight logistics system utilizing AVI techniques). Such multi-application support and interoperability will be particularly common in respect of the OBE, although it will also be required in respect of the FE.

6.2.1 Conceptual architecture

See ISO/TR 14814.

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6.2.2 Logical architecture

See ISO/TR 14814.

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6.2.3 Functional architecture

See ISO/TR 14814.

6.2.4 Control architecture

See ISO/TR 14814.

6.2.5 Identification principles

This International Standard adheres to the Open Systems Interconnection (OSI) philosophy, i.e. the definition is concerned with the exchange of information between systems and not the internal functioning of each individual system component.

In order to cooperate, entities in any OSI layer, other than the lowest layer, communicate by means of the set of services provided by the next lower OSI layer.

This International Standard references the series of International Standards developed by CEN/TC 278/WG9.

The work of ISO/TC 204, especially WG1/SG3, is taken into account as far as possible, as are other existing relevant definitions of data elements [such as the “Data elements to be used in surface transport applications of machine readable cards” (CEN/TC 224/WG11)].