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**Automatic vehicle and equipment  
identification — Electronic Registration  
Identification (ERI) for vehicles —**

**Part 2:  
Operational requirements**

*Identification automatique des véhicules et des équipements —  
Identification d'enregistrement électronique (ERI) pour les véhicules —  
Partie 2: Exigences de fonctionnement*



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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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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/TS 24534-2 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*, and by Technical Committee CEN/TC 278, *Road transport and traffic telematics* in collaboration.

ISO/TS 24534 consists of the following parts, under the general title *Automatic vehicle and equipment identification — Electronic Registration Identification (ERI) for vehicles*:

- *Part 1: Architecture*
- *Part 2: Operational requirements*
- *Part 3: Vehicle data*
- *Part 4: Secure communications using asymmetrical techniques*
- *Part 5: Secure communications using symmetrical techniques*

## Introduction

A quickly emerging need has been identified with administrations to improve the unique identification of vehicles for a variety of services. Situations are already occurring where manufacturers intend to fit lifetime tags to vehicles. Various governments are considering the needs and benefits of Electronic Registration Identification (ERI) as a legal proof of vehicle identity with potential mandatory uses. There is commercial and economic justification both in respect of tags and infrastructure that a standard enables an interoperable solution.

ERI is a means of uniquely identifying road vehicles. The application of ERI will offer significant benefits over existing techniques for vehicle identification. It will be a suitable tool for the future management and administration of traffic and transport, including applications in free-flow, multi-lane traffic conditions with the capability to support mobile transactions. ERI addresses the need of authorities and other road users for a trusted electronic identification, including roaming vehicles.

The unique vehicle identifier is held in a secure environment within an Electronic Registration Tag (ERT) fitted to a vehicle. The identifier used to identify a vehicle is called the vehicle identifier or vehicleId. The preferred identifier is the VIN, assigned to the vehicle by its manufacturer in accordance with ISO 3779, or it may be a variant of this identifier.

The ERT may contain vehicle data in addition to the unique identifier, as required by authorities or their agents for ERI applications (e.g. vehicle registration details). An ERT is the core component for simple to complex applications of ERI, ranging from a simple read-only device, with more complex applications requiring one or more communication systems.

The ERT may be accessed by an Electronic Registration Reader (ERR), either to read, read/write data, from or to an ERT.

Optionally, the ERT may communicate with other onboard vehicle equipment. The potential range of ERI applications, simple to complex, will require interoperability to exist between an ERT and an ERR by application.

Whilst it is desirable to determine a single set of requirements for operation in all environments and under all operating conditions, this could impose unacceptable costs for an ERI application. This part of ISO/TS 24534 provides classification categories of operational parameters for different aspects of a system specification, enabling appropriate performance parameters to be selected for an ERI application. Annex A provides example ERI user requirements with operational scenarios.

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# Automatic vehicle and equipment identification — Electronic Registration Identification (ERI) for vehicles —

## Part 2: Operational requirements

### 1 Scope

This part of ISO/TS 24534 provides the requirements for electronic registration that is based on an identifier assigned to a vehicle (e.g. for recognition by national authorities) suitable to be used for:

- electronic identification of local and foreign vehicles by national authorities,
- vehicle manufacturing, in-life-maintenance and end-of-life identification (vehicle life cycle management),
- adaptation of vehicle data (e.g. for international resales),
- safety-related purposes,
- crime reduction, and
- commercial services.

It adheres to privacy and data protection regulations.

This part of ISO/TS 24534 defines the operational requirements for the remaining parts of ISO/TS 24534 and the more limited but relevant provisions of ISO 24535.

Whilst the definition of the organizational framework required to implement, operate and maintain an ERI system is outside the scope of this part of ISO/TS 24534, a list of potential stakeholders in the public and private sector has been included.

### 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/TS 24534-3, *Automatic vehicle and equipment identification — Electronic Registration Identification (ERI) for vehicles — Part 3: Vehicle data*

ISO 7498-2, *Information processing systems — Open Systems Interconnection — Basic Reference Model — Part 2: Security Architecture*

ISO 14815:2005, *Road transport and traffic telematics — Automatic vehicle and equipment identification — System specifications*

EN 301 489-1, *Radio equipment and systems, EMC, common technical requirements*

IEC 60215:1987, *Safety requirements for radio transmitting equipment*

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

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

EN 300 764, *Electromagnetic compatibility and radio spectrum matters (ERM) — Road Transport and Traffic Telematics (RTTT) — Technical characteristics and test methods for data transmission equipment operating in the 5.8GHz industrial, scientific and medical (ISM) band*

### 3 Terms and definitions

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

#### 3.1

##### **access control**

prevention of unauthorized use of a resource, including the prevention of use of a resource in an unauthorized manner

[ISO 7498-2]

#### 3.2

##### **access control list**

list of entities, together with their access right, which are authorized to have access to a resource

[ISO 7498-2]

#### 3.3

##### **authentication**

entity authentication which provides each entity with the assurance of the other's identity

#### 3.4

##### **back office**

facility for the control and data management of an ERI system by an authority, or for the provision of related services by a service provider

#### 3.5

##### **ERI Data**

vehicle identifier and possible additional vehicle data as defined in ISO/TS 24534-3

#### 3.6

##### **Electronic registration identification**

##### **ERI**

action or act of identifying a vehicle by electronic means for the purposes described in the scope of this part of ISO/TS 24534

#### 3.7

##### **Electronic registration reader**

##### **ERR**

device used to read or read/write data from or to an "Electronic Registration Tag"

#### 3.8

##### **Electronic registration tag**

##### **ERT**

onboard ERI device that contains the ERI data, including relevant security provisions and one or more interfaces to access that data

NOTE In case of high security this is a type of SAM.



**3.9****interoperability**

ability of systems to provide services to and accept services from other systems and to use these services to enable the systems to operate effectively together

**3.10****lifetime**

period of time over which an item of equipment exists and functions according to the requirements of the defining standard

[ISO 14815]

**3.11****onboard ERI equipment**

equipment fitted within or on the outside of the vehicle and used for ERI purposes

NOTE The onboard ERI equipment comprises an ERT and may also comprise any additional communication devices.

**3.12****operator**

entity responsible for the operational management of an ERI system

**3.13****privacy**

right of individuals to control or influence what information related to them may be collected and stored and by whom and to whom that information may be disclosed

[ISO 7498-2]

**3.14****read only**

property that data content cannot be changed by a reader/interrogator

**3.15****read/write**

data mode corresponding to an ERT in which data content can be changed by means of a compatible interrogator via the air interface

**3.16****read/write cycle**

complete sequence of interaction by the reader/interrogator where the ERT is unambiguously identified and new data, comprising either whole or part of the full data set, is written onto the ERT by means of the air interface

**3.17****registration authority**

authority responsible for the registration and maintenance of vehicle records

NOTE The authority may provide vehicle records to accredited organizations.

**3.18****registration authority (with respect to the ERI data)**

organization responsible for the ERI data and security data, according to local legislation

NOTE The registration authority with respect to the ERI data may be the same as the registration authority (defined in 3.17). This part of ISO/TS 24534, however, does not require this.

**3.19**

**roadside equipment**

equipment located at a fixed position along the road transport network, for the purpose of communication and data exchanges with the onboard equipment of passing vehicles

**3.20**

**security**

protection of information and data so that unauthorized persons or systems cannot read or modify them and authorized persons or systems are not denied access

**3.21**

**service provider**

person or organization providing a service that requires the vehicle identity and/or other information concerning the vehicle

**3.22**

**specific vehicle identification**

action or act of establishing the identity of a specific vehicle

**3.23**

**vehicle vicinity identification**

action or act of establishing the identity of a specific vehicle near an external ERI reader (ERR) without pinpointing the exact position of the vehicle

## **4 Abbreviations**

For the purpose of this part of ISO/TS 24534, the following abbreviations apply throughout the document unless otherwise specified.

**4.1**

**AIB**

Accredited, Independent Testing Body

**4.2**

**ERI**

Electronic Registration Identification

**4.3**

**EMC**

Electro Magnetic Compatibility

**4.4**

**ERM**

Electromagnetic compatibility and radio spectrum matters

**4.5**

**ERR**

Electronic Registration Reader

**4.6**

**ERT**

Electronic Registration Tag

**4.7**

**ELV**

End of Life Vehicles

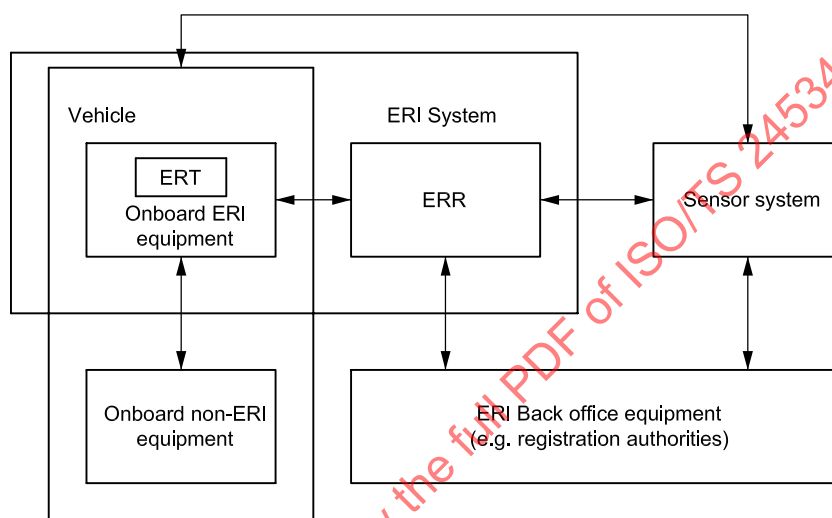
## 4.8

**SAM**

Secure Application Module

**5 Onboard ERI equipment requirements****5.1 ERI System context**

Figure 1 provides a context diagram (informative) of the environment within which the ERT functions, with the wider relationships which may exist with other components of an ERI system.



**Figure 1 — Fully featured ERI system, with onboard ERT component**

**5.2 ERT**

The ERT shall contain the vehicle identifier and may include additional vehicle data.

The ERT shall communicate directly or indirectly, with an ERR.

**NOTE** The ERT may also communicate with other onboard ERI equipment, or onboard non-ERI equipment, when ERI data are required to support other transport applications.

**5.3 Operational parameters****5.3.1 General**

In the classes defined herein, the ERT shall have the capability to communicate ERI data over a wireless link to an ERR.

An ERI system may be required to operate from stationary or low vehicle speeds; also, with traffic travelling in congested traffic conditions or at free flow, motorway speeds. In order to claim compliance with this part of ISO/TS 24534, equipment shall achieve the performance of a declared classification parameter, or combination of parameters, specified in the tables defined in this clause.

**NOTE** Reading parameters are defined within this clause; writing parameters are subject to many factors and are outside the scope of this part of ISO/TS 24534.

### 5.3.2 ERT lifetime classification

The ERT shall be capable of operating without maintenance according to one of the class definitions given in Table 1.

**Table 1 — ERT lifetime classification**

Lifetime classification	ERT lifetime
ERT-A0	More than 30 years
ERT-A1	30 years
ERT-A2	25 years
ERT-A3	15 years
ERT-A4	10 years
ERT-A5	3 years
ERT-A6	Less than 3 years

### 5.3.3 ERT power sources

An ERT may function without a battery electrical supply, or require a battery supply source. For an exchangeable battery within the ERT, the battery lifetime shall be according to the class definitions in Table 2. These requirements are independent of technology.

**Table 2 — ERT power source lifetime classification**

Lifetime classification	Lifetime Based on 500 ERT transactions per month
ERT-B0	More than 15 years
ERT-B1	15 years
ERT-B2	10 years
ERT-B3	5 years
ERT-B4	3 years
ERT-B5	1 year
ERT-B6	No battery required

### 5.3.4 ERT read classification

#### 5.3.4.1 ERT read range

ERI data shall be capable of being read from the ERT by an external ERR which may, according to application, operate as a close proximity reader (i.e. handheld), mobile (i.e. vehicle mounted), or a fixed location (i.e. Road Side Equipment).

The ERR shall be capable of reading the unique vehicle identifier from the ERT according to the Class definitions in Table 3.

**Table 3 — ERT read range classification**

ERT read range	Minimum read range
ERT-C1	1000 metres
ERT-C2	500 metres
ERT-C3	250 metres
ERT-C4	100 metres
ERT-C5	50 metre
ERT-C6	10 metres
ERT-C7	3 metres
ERT-C8	1 metre
ERT-C9	Proximity (minimum 4mm)

#### 5.3.4.2 ERT passing vehicle speed range

An ERR shall be capable of reading ERI data from the ERT at vehicle passing speeds according to the class definitions in Table 4.

**Table 4 — ERT vehicle speed classification**

ERT read capability	Passing vehicle speed
ERT-D1	0 - 500 km/h
ERT-D2	0 - 250 km/h
ERT-D3	0 - 150 km/h
ERT-D4	0 - 50 km/h
ERT-D5	0 - 25 km/h
ERT-D6	Below 5 km/h

#### 5.3.5 ERI system interoperability

The ERI system shall provide interoperability with other ERI systems developed in conformance to this part of ISO/TS 24534.

NOTE Contractual arrangements between registration authorities or their agents are outside the scope of this part of ISO/TS 24534.

### 5.4 ERT memory allocation

#### 5.4.1 ERT memory

The ERI system shall have the requirement that the ERT has secure memory dedicated to the storage of the vehicle identification data. Such requirements are determined in this part of ISO/TS 24534 and associated standards (ISO/TS 24534 Parts 3, 4, 5 and ISO 24535).

For applications of ERI, where additional information is required to support vehicle identification (e.g. vehicle classification), a minimum data set is determined in ISO/TS 24534-3.

#### 5.4.2 ERT Read/Write Cycles

The memory of an ERT having read/write capabilities shall, with the exception of the unique vehicle identifier or any other permanently locked data, be capable of being accessed for the purpose of reading or changing data a minimum of 100 000 times.

#### 5.5 Security of ERI data

Access to ERI data memory, for read or write functions, shall be controlled through an authorized user access control list.

The data security elements of the ERT concerning confidentiality, integrity, authenticity and non-repudiation are given in ISO/TS 24534-4 and ISO/TS 24534-5.

#### 5.6 Onboard ERI equipment categories

Onboard ERI equipment shall be classified as five separate categories. Environmental operating conditions are classified according to ISO 14815.

The ERI equipment categories are defined as follows:

- **Category 1: Ruggedized interoperable** — ERI equipment capable of being mounted and operating externally on vehicle. Capable of functioning in extreme (class 1) environmental and system operational conditions.
- **Category 2: Standard interoperable** — ERI equipment mounted within vehicle, with the possible exception of the antennae. Capable of functioning within standard (maximum class 2) environmental and system operational conditions.
- **Category 3: Interoperable within selected environmental classes** — ERI equipment mounted within vehicle, with the possible exception of the antennae. Capable of operating within standard (maximum class 2) system operational conditions and conforming to selected environmental classes.
- **Category 4: Interoperable within selected operational classes** — ERI equipment mounted within vehicle, with the possible exception of the antennae. Capable of operating within normal (maximum class 2) environmental conditions and conforming to selected operational classes.
- **Category 5: Interoperable within selected operational and environmental classes** — ERI equipment mounted within vehicle, with the possible exception of the antennae. Capable of operating within selected operational and environmental classes.

#### 5.7 ERT location

The ERT shall be fixed permanently to the vehicle and should be located to minimize exposure to the road environment (e.g. stone damage).

The ERT location shall not interfere with physical access for vehicle maintenance.

NOTE The identification of locations on a vehicle, suitable for ERT installation, is outside the scope of this part of ISO/TS 24534.

#### 5.8 Onboard ERI equipment safety

##### 5.8.1 Mechanical

The onboard ERI equipment shall be securely mounted to the vehicle and present no hazard to vehicle occupants or the safe operation of the vehicle.

### 5.8.2 Electrical

An ERT requiring an electrical power supply may operate from its own internal battery, or through connection to the vehicle electrical system.

An ERT, or onboard ERI equipment powered by the vehicle electrical supply, shall use a fused connection and operate at electrical power levels commensurate with the vehicle and ERI equipment specifications.

The electric or magnetic fields produced shall not exceed the levels as specified in IEC 60215 and/or EN 301 489. For a radio link, EN 300 764 applies. With regard to electromagnetic compatibility testing, refer to IEC 1000-4-6.

### 5.8.3 Visual

The onboard ERI equipment shall not obscure or interfere with the driver's view of the road, or be a distraction to the driving task.

### 5.8.4 Controls

An ERI transaction shall not require driver intervention.

## 5.9 Environmental requirements

The ERT and any other onboard ERI equipment shall comply with the environmental parameters for onboard equipment specified (Class: H1, H2, and H3) in accordance with IEC 721-3-5 and also specified in 5.10.2 of ISO 14815:2005.

NOTE Basic environmental testing procedures are provided by IEC 68-1:1987 and IEC 68-4:1987.

## 5.10 ERT security

### 5.10.1 Electronic data security

Data regarded as confidential shall be accessed or modified only by authorized parties. ISO/TS 24534-4 references confidentiality, authentication and access control provisions.

The ERT shall be capable of reporting to the ERR any attempted tampering with the normal operation of the ERT and security that may be compromised, if the ERT remains operable after such tampering.

### 5.10.2 Physical security

An ERT shall resist removal from the fixed location on the vehicle.

An ERT shall indicate deliberate attempts to physically remove or tamper with the placement on a vehicle of permanently displaying visual evidence. If an ERT remains operable following physical tampering, the ERR shall be notified in communications that physical security may have been compromised.

In the event of an ERT being physically removed from the vehicle, it shall be rendered permanently inoperable and require replacement by an authorized supplier.

## 5.11 ERT life cycle

The ERT life cycle may be dependent on the functionality of the ERT and the physical placement of the ERT on a vehicle, e.g. ERT windscreen placement may be expected to have a much shorter life cycle compared to less exposed placements on a vehicle.

NOTE A typical life cycle for an ERT installed on a vehicle, for the full life of the vehicle, is given in Annex B.

## 6 ERI system organizational framework

A list of potential stakeholders in the public and private sector, required to implement, operate and maintain ERI based systems is provided in Annex C.

The definition of an organizational framework required for the operation of ERI systems is outside the scope of this part of ISO/TS 24534.

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## **Annex A**

### **(informative)**

## **Example user requirements and operational scenarios**

### **A.1 User requirements**

#### **A.1.1 Categories of users**

This annex distinguishes the following categories of users:

- vehicle owners/drivers/fleet operators;
- public sector authorities (including enforcement authorities);
- automotive industry; and
- other private service providers.

#### **A.1.2 Vehicle owners/drivers/fleet operators**

The vehicle owner, vehicle driver or vehicle fleet operator requirements for ERI systems and onboard ERI equipment may include the following:

- onboard equipment should not distract the driver from the driving task, or obstruct the driver from the safe control and operation of the vehicle;
- onboard equipment should be low cost, with ease of installation, and require minimal maintenance;
- onboard equipment should be reliable in operation and may include the capability to flag a malfunction to the vehicle driver or the system operator;
- onboard equipment should be tamperproof and rendered permanently inoperable if removed;
- ERI vehicle data should be secure (authenticity) with the vehicle identifier maintained as unique to a vehicle;
- ERI vehicle data should be secure (confidentiality) with the privacy of user data maintained according to national regulations;
- onboard equipment may be required for other services available from different service providers;
- ERI vehicle data should be verifiable with the vehicle owner able to read the ERI data stored in the onboard ERI equipment.

**NOTE** The requirement relating to verification and readability may impact on the security provisions for ERI vehicle data.

### A.1.3 Public sector authorities

Public sector authority requirements for ERI systems and onboard ERI equipment may include the following:

- onboard ERI equipment with an expected operational lifetime as long as the expected lifetime of a vehicle, with the option of retrofitting to vehicles currently in use on the roads;
- enforcement capability for identification of vehicles (e.g. stolen or abandoned), including stationary/parked vehicles, through comparison of ERI vehicle data with the vehicle construction plate (VIN);
- prevention of vehicle registration plate fraud by comparison of a vehicle registration plate with the corresponding ERI vehicle identifier for both stationary and moving vehicles;
- detection of malfunctioning (or unequipped) onboard ERI equipment;
- vehicle vicinity identification of moving local and foreign vehicles, the vehicle vicinity identification suitable as legal evidence, for foreign vehicles, both in the jurisdiction in which it is identified and in the jurisdiction where it is registered;
- specific vehicle identification of moving local and foreign vehicles, the specific vehicle identification suitable as legal evidence for foreign vehicles, both in the jurisdiction in which it is identified, and in the jurisdiction where it is registered;
- support after theft vehicle recovery measures (standards being developed by CEN/TC278/WG14 *After theft recovery of stolen vehicles*);
- usable as an Electronic Car ID (ECI) as requested in the eEurope action plan of the Fiera European Council, 19-20 June 2000;
- usable for an End-Of-Life administration to support measures as required by directive 2000/53/EC;
- readable with fixed, mobile and hand-held equipment;
- provision of additional vehicle information as required by local legislation;
- provision for the addition of a group identifier to cater for a subset of vehicles.

NOTE 1 This list does not contain any localization services for, e.g., after theft recovery (refer TC278/WG 14).

NOTE 2 It is assumed that vehicle identification data (and additional vehicle related data) are registered and maintained centrally by registration authorities and other authorities for access.

Table A.1 identifies technical applications that may be based on the requirements above. The table indicates whether vicinity identification will suffice, or whether specific vehicle identification is required.

**Table A.1 — Technical applications and public sector authorities requirements**

Application category	Vicinity identification only	Specific vehicle Identification
Fulfilment of (legal) vehicle documentation e.g. tax paid, insurance, periodic motor vehicle test	X	
Speed monitoring a defined distance at the point of detection	X	X
Infringement of closed or restricted lanes (e.g. bus lanes or HGV-lanes) based on: registered vehicle category/parameters (e.g. public service vehicle) measured vehicle parameters at the point of detection	X	X
Traffic monitoring (collecting floating car data) for: congestion management route advises traffic flow measurement	X	
Access control		X
Road user charging enforcement for system with onboard fee calculation fee determination for system with fee calculation external to the vehicle		X X

NOTE 1 if a vehicle is required to be stopped by an authority at the time of detection, specific vehicle identification is required.

NOTE 2 ISO 612 provides terms and definitions for the parameters/dimensions of motor vehicles and towed vehicles.

#### A.1.4 Automotive industry

The automotive industry may have the following requirements for onboard ERI equipment:

- low cost (e.g. component, internal and external logistic chain, maintenance);
- clearly defined process for process of obtaining and commissioning an ERI device;
- unobtrusiveness to the vehicle design;
- not distracting the driver from the driving task, or obstructing the control and safe operation of the vehicle;
- deployment of onboard ERI equipment should not hinder the performance of other vehicle components particularly a vehicle electronic management system;
- easily fitted into new and existing vehicles and easily replaced in case of defects;
- adherence to end of life regulatory requirements (ELV Directive);
- ERI onboard equipment optionally used with other service providers;
- usable during the manufacturing process.

Table A.2 identifies technically feasible applications that may be based on the requirements above which will require specific vehicle identification.