TECHNICAL SPECIFICATION

ISO/TS 19321

First edition
2015-04-15

Intelligent transport systems — Cooperative ITS — Dictionary of in-vehicle information (IVI) data structures

Systèmes intelligents de transport — Coopérative STI — Dictionnaire de structures de données d'informations dans les véhicules (IVI)

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

Reference number
ISO/TS 19321:2015(E)

© ISO 2015

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

COPYRIGHT PROTECTED DOCUMENT

© ISO 2015

All rights reserved. Unless otherwise specified, 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
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

© ISO 2015 – All rights reserved

Contents

Page

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – 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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary Information.

ISO/TS 19321 was prepared by European Committee for Standardization (CEN) in collaboration with ISO/TC 204, *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

Introduction

In Cooperative-ITS (C-ITS), presenting information related to the traffic situation or regulation of a road to the driver of a vehicle is an important component of road operations. The road operators are responsible for road setup, operation, signage, and maintenance for traffic management and road safety, and in some countries, also for the enforcement of road laws. For road operators, efficient transport of vehicles on roadways ensures a safe and predictable trip for all road users. Road operators, together with equipment manufacturers, be it that they are of vehicles or of roadside equipment, contribute to how road information is properly presented to drivers.

So far, one defined C-ITS method for notifying road users of road and/or traffic situations and events is by transmission of messages such as Cooperative Awareness Messages (CAM), Decentralized Environment Notification Messages (DENM), or Basic Safety Messages (BSM).

This Technical Specification supports mandatory and advisory road signage such as contextual speeds and road works warnings. In-vehicle information can be sent by an ITS-S and either corresponds to physical road signs such as static or variable road signs or not correspond to physical road signs (a virtual sign) or correspond to road works. IVI does not include identification of road events as already provided by DENM.

This Technical Specification provides a toolbox of information elements for IVI. It can be used to fulfil the requirements of the service provider considering the needs of receiving ITS-S. The container concept provides a way for an ITS-S to manage the relevant IVI information, determine where the IVI is relevant, and to provide details for the application of IVI. The description of data elements encompasses the data syntax and semantics, i.e. a definition of data format and content, together with a description of how to use those data elements.

This Technical Specification is of an enabling nature. It does not specify which information is necessary for a certain service, but it supports those IVI information elements that can be necessary to be transmitted to a receiving ITS-S to carry out a certain service. Usage of the IVI information elements depends on the specific context and application of IVI for a specific service and usage is established as mandatory or optional only for messaging purposes, not for application purposes. The IVI Structure is intended to be profiled to fulfil the requirements of a specific service.

This Technical Specification refers to ISO/TS 14823 as one system of standardized codes for existing road signs codes. Note that ISO/TS 14823 does not contain codes for specific national or regional signs which are not commonly used. ISO/TS 14823 also does not represent a catalogue of road sign pictograms for all applicable nations.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

Intelligent transport systems — Cooperative ITS — Dictionary of in-vehicle information (IVI) data structures

1 Scope

This Technical Specification specifies the in-vehicle information (IVI) data structures that are required by different ITS services (for example, refer to ISO/TS 17425 and ISO/TS 17426) for exchanging information between ITS Stations. A general, extensible data structure is specified (see Clause 5). This is split into structures called containers to accommodate current-day information (see Clause 6). Transmitted information includes IVI such as contextual speed, road works warnings, vehicle restrictions, lane restrictions, road hazards warnings, location-based services, re-routing, etc. The information in the containers is organized in sub-structures called data frames and data elements which are described in terms of its content (see Clause 7) and its syntax (see Annex A).

The data structures are specified as communications agnostic. This Technical Specification does not provide the communication protocols. This Technical Specification then provides scenarios for usage of the data structure, e.g. in case of real time, short-range communications.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 639-1:2002, *Codes for the representation of names of languages — Part 1: Alpha-2 code*

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*

ISO 14816:2005, *Road transport and traffic telematics — Automatic vehicle and equipment identification — Numbering and data structure*

ISO 14906:2011, *Electronic fee collection — Application interface definition for dedicated short-range communication*

ISO/IEC 8824-1:2008, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation*

ISO/TS 14823, *Traffic and travel information — Messages via media independent stationary dissemination systems — Graphic data dictionary for pre-trip and in-trip information dissemination systems*

ETSI/TS 102 894-2 V1.1.12, *Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary*

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

3 Terms and definitions

3.1
application data unit
data unit exchanged between ITS-S applications

3.2
container
group of *data frames* (3.4) and data elements semantically belonging together in one place in the IVI structure

© ISO 2015 – All rights reserved

3.3
data element
data type that contains one single data

[SOURCE: ETSI/TS 102 894-2 V1.1.1]

3.4
data frame
data type that contains more than one *data element* (3.3) in a predefined order

[SOURCE: ETSI/TS 102 894-2 V1.1.1]

3.5
detection zone
part of the road network that is passed by a vehicle in approach of the *relevance zone* (3.12)

3.6
driver awareness zone
parts of road network on which a message is presented to inform drivers about upcoming situations

Note 1 to entry: This definition will be aligned with ISO/TS 17425.

3.7
in-vehicle information
information contained in the In-vehicle Information (IVI) data structure that is required by different ITS services

3.8
in-vehicle signage
ITS service that provides static, as well as dynamic road sign and message sign information to drivers

Note 1 to entry: This definition will be aligned with ISO/TS 17425.

3.9
International Terrestrial Reference Frame
realisation of the ITRS

[SOURCE: ISO 17572-1:2008]

3.10
International Terrestrial Reference System
reference system for the earth derived from precise and accurate space geodesy measurements not restricted to GPS Doppler measurements which is periodically tracked and revised by the International Earth Rotation Service

[SOURCE: ISO 17572-1:2008]

3.11
Minimum Dissemination Area
parts of the road network where the IVS message can be received by the potentially targeted vehicles

Note 1 to entry: This definition will be aligned with ISO/TS 17425.

3.12
Relevance Zone
parts of the road network for which the information in an Application Container is valid

[SOURCE: ISO/TS 17425]

3.13
road hazard warning
ITS service that provides road hazard information to drivers

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

3.14
Road Works Warning
alerts for routing road users around road construction and/or road repair

3.15
Variable Message Sign
electronic sign board presenting text, symbols, or a combination of them

4 Abbreviated terms

The following abbreviations are used in this document.

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ASN.1	Abstract Syntax Notation One
BLOB	Binary Large Object
DAZ	Driver Awareness Zone
DE	Data Element
DENM	Decentralized Environmental Notification Message
DF	Data Frame
ETRF	European Terrestrial Reference Frame
HOT	High-Occupancy Toll (lane)
HOV	High-Occupancy Vehicle
ID	Identification
ITRF	International Terrestrial Reference Frame
ITRS	International Terrestrial Reference System
ITS	Intelligent Transport Systems
ITS-S	ITS Station
IVI	In-vehicle Information
IVS	In-vehicle Signage
MDA	Minimum Dissemination Area
OEM	Original Equipment Manufacturer
POI	Point of Interest
RZ	Relevance Zone
RWW	Road Works Warning
VMS	Variable Message Sign

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

5 In-vehicle Information (IVI) data structure

5.1 Structural model

5.1.1 General model

The IVI Structure represents the Application Data Unit to be transmitted and received by an ITS-Station (ITS-S). The IVI Structure shall comply with the syntax defined in Annex A as the data type `IviStructure`. This means that it shall be composed of Containers defined in this Technical Specification and follow the form depicted in Figure 1.

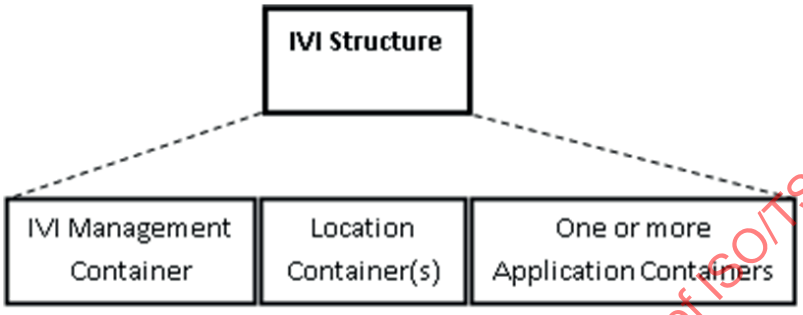


Figure 1 — IVI Structure

The IVI Structure is extensible and other containers can be added in the future.

The IVI Structure is intended to be encapsulated in a message with the appropriate ITS Common Header, for example, the ItsPduHeader of ETSI/TS 102 894-2. The header structure and contents are out of the scope of this Technical Specification

The IVI Structure shall contain a Management Container. The information in the IVI Management Container is applicable to the entire IVI Structure. This Container is mandatory to be present and provides a receiving ITS-S with enough information to handle the IVI Structure and decide on its further processing.

The IVI Structure can contain one or more Location Container(s). The Location Container describes the essential information for application(s) in the receiving ITS-S. Applications can use the location information to understand how to apply information provided by IVI Application Containers. Location Containers can carry information relevant for different IVI Application Containers or carry the same content, but expressed in different forms (see 5.2). This enables a receiving ITS-S to choose the appropriate location referencing system that the ITS-S supports.

The IVI Structure can contain one or more IVI Application Container(s). The IVI Application Container provides IVI information for use by an application. Application information is self-contained and refers to the location information for its spatial validity. Application information of the same type shall not refer to overlapping Reference Zones. Each Application Container refers to zones defined in the Location Container identified by their IDs for the following usage: 1) Detection Zone, 2) Relevance Zone, and 3) Driver Awareness Zone. An Application Container may optionally provide information about the minimum awareness time, that is, the minimum time that the IVI should be available before the vehicle enters the Relevance Zone. This MinimumAwarenessTime information can be used by the receiving ITS-S to determine the appropriate Driver Awareness Zone.

5.1.2 Conceptual zones

When an ITS-S receives the IVI Structure, the ITS-S is able to interpret the application information in the context of the appropriate location information. Principally, there are four conceptual zones:

1) Minimum Dissemination Area (MDA);

2) Detection Zone;

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

 © ISO 2015 – All rights reserved

3) Driver Awareness Zone (DAZ);

4) Relevance Zone (RZ).

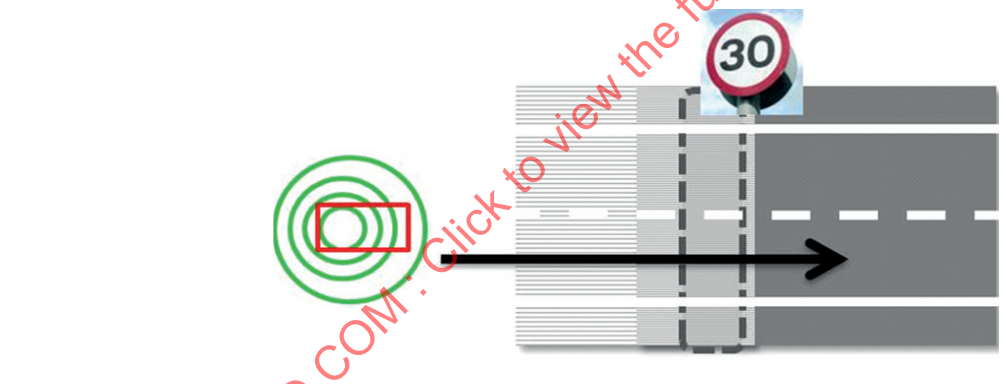
The MDA refers to the minimum area where the IVI Structure is disseminated by an ITS-S based on application requirements. The MDA is defined in the relevant application standards or specification(s) and is therefore out of scope of this Technical Specification.

In some situations, a vehicle ITS-S must be able to detect whether or not it is approaching a Relevance Zone at a certain minimum time before it enters the Relevance Zone. This is, for example, to guarantee that the Relevance Zone is detected immediately at its entry (e.g. in case of a very small Relevance Zone) or to guarantee that the Relevance Zone is correctly detected (in case it is near to other road segments, e.g. parallel or on different altitude level). Therefore, a Detection Zone occurs in approach to a Relevance Zone. If a receiving ITS-S moves through the Detection Zone, then the received IVI will be enabled for further usage in the receiving ITS-S.

The IVI can be used to inform drivers about upcoming situations in the DAZ. The DAZ can be determined by the receiving ITS-S because the DAZ can be based on the dynamic status of the receiving ITS-S and can depend on the presence of other higher priority information to be presented. Alternatively, the DAZ can be provided by the sending ITS-S for usage by the receiving ITS-S.

The final zone and the Relevance Zone covers the area where the IVI is applicable.

Examples of the Detection and Relevance Zones for the spatial validity of the IVI Structure are illustrated in Figure 2. The Driver Awareness Zone (outside the scope of this Technical Specification) can be physically overlapping with the Detection Zone (but is not necessarily equal in size).



Key

minimum dissemination area (not transmitted)

detection zone

driver awareness zone

relevance zone

Figure 2 — Spatial validity for IVI: Detection and Relevance Zones

The Location Container always contains a definition of one or more zones which can represent a Detection Zone, a Relevance Zone, or both. In Figure 2, from left to right, the first zone represents a Detection Zone and the second zone represents a Relevance Zone.

In Figure 3, from left to right, the first zone represents a Detection Zone. The second zone then represents Relevance Zone 1, but this same zone also serves as a Detection Zone for Relevance Zone 2.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

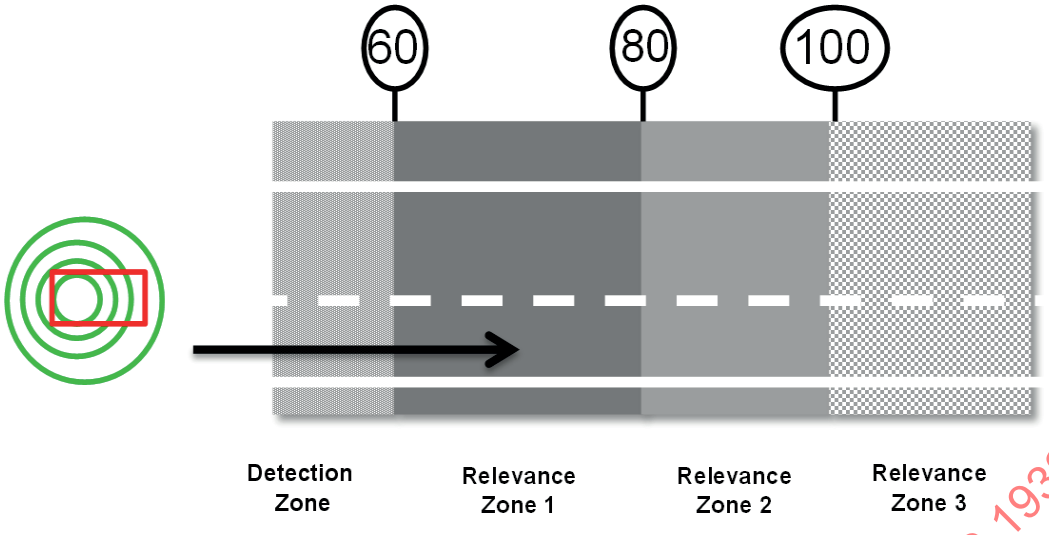


Figure 3 — Concatenated Relevance Zones

5.2 Location referencing

5.2.1 General

There are essentially two different ways of referencing road locations. It is called map-based location referencing in this Technical Specification when referencing attributes of the road network itself. It is called geographic location referencing in this Technical Specification when referencing a regular or irregular division of space which exists independent of the representation of the road network.

5.2.2 Geographic positioning

Geographic location systems or coordinate systems are location maps composed of imaginary, intersecting lines forming a grid. Coordinate values of the grid, expressed as numeric or alphanumeric characters, are used to describe a position.

To translate position data expressed in longitude, latitude, and height to the corresponding real position on earth or vice-versa, the earth-centred, earth-fixed, polar-coordinate geodetic datum WGS84 (G1150) according to NIMA TR8350.2 version 3 shall be used. Alternatively, any earth-centred, earth-fixed polar coordinate geodetic datum can be used as long as the maximum datum displacement relative to the geodetic datum agreed on, or relative to WGS84 (G1150) in case of no agreement, is acceptable to the application.

NOTE A suggested tolerance of 0.3 meters in datum displacement (also called datum shift) is intended, for example, to allow for using the International Terrestrial Reference Frame (ITRF) or the European Terrestrial Reference Frame (ETRF) geodetic datum as alternative to the WGS84. Datum displacements are suggested to be calculated according to the definitions in ASME Y14.5 – 2009.

An ITS-S sending an IVI Structure provides one or more Reference Point(s). The Reference Point can be the reference for the description of a static zone or a dynamic (moving) zone. The zone can be described by a polygonal line which delineates a segment or an area, or can be described by a distance value indicating the extension of the relevance zone from the Reference Position and the heading relative to the Reference Position.

The detection zone can optionally be provided as a polygonal line in approach to the Reference Position. If the Reference Position is the position of a moving object, the polygonal line is represented by the last positions of the path of the moving object (e.g. the trace of a roadworks vehicle).

Determining the relevance of IVI is carried out by referencing the location of a receiving ITS-S relative to a reference in a coordinate-based system.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

 © ISO 2015 – All rights reserved

As a vehicle progresses, its motion creates a series of points. The series, when assembled as a set, trace the path of the vehicle. The path enables a receiving ITS-S to detect the applicability of a Relevance Zone and the approach into a Relevance Zone.

5.2.3 Map-based location referencing

Determining the relevance of IVI can also be carried out by referencing the location of a receiving ITS-S relative to a map reference (refer to ISO 17572-1). This can be a global map available in the receiving ITS-S or it can be a local map distributed in the same dissemination area as IVI.

Map-based location referencing can be incorporated in future revisions of this Technical Specification.

6 IVI Containers

6.1 IVI Management Container

6.1.1 Definition

IVI Management Container contains information regarding the management of the IVI Structure which supports the receiving ITS-S to deal with the lifecycle of the IVI. It includes information which allows receiving ITS stations to identify further processing. Table 1 describes the contents for inclusion in the IVI Management Container. The syntax is defined in Annex A as mandatory component of the data type `IviStructure`.

Table 1 — IVI Management Container

Container	Component	M/O[a]	Description
IVI Management Container	`serviceProviderId`	M	Identifies the organization that provided the IVI by using the DE `Provider`; contains a country code according to ISO 3166-1. Numbers shall be assigned on national basis. See ISO 14816 for registration.
	`iviIdentificationNumber`	M	Identifier of the IVI Structure, as assigned by the Service Provider using the DE `IviIdentificationNumber`.
	`timestamp`	O	Timestamp of the generation or last change of information content.
	`validFrom`	O	Start time of the validity period of the message.
	`validTo`	O	End time of the validity period of the message.
	`connectedIviStructures`	O	List of other `iviIdentificationNumber` identifying other IVI Structures of the same authority which are connected to the IVI Structure using the DE `IviIdentificationNumber`.
	`iviStatus`	M	Status of the IVI Structure using the DE `IviStatus`.

[a] Mandatory (M) shall be included in the container. Optional (O) may be included in the container.

6.1.2 Usage — IVI Management Container

The sending ITS-S shall include the component `serviceProviderId`, `iviIdentificationNumber`, and can include the component `timeStamp`. The organization providing the IVI (e.g. the Service Provider, as defined in ISO/TS 17427) should apply for a `serviceProviderId`.

NOTE 1 For detailed information, see http://www.itsstandards.eu/index.php?option=com_content&view=article&id=186&Itemid=151

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

The iviIdentificationNumber in the IVI Management Container is assigned by the Service Provider and should be retained as long as the IVI Structure exists throughout its various updates and changes.

The component timeStamp should identify different versions of the IVI Structure due to updates managed by the Service Provider. This component should be included if the sending ITS-S foresees to send updates of the IVI Structure.

The sending ITS-S can include the components validFrom and validTo.

The sending ITS-S shall include the component iviStatus.

The optional components validFrom and validTo indicate the overall validity of the IVI Structure as provided by the service provider. If validFrom is not present, the IVI Structure is valid when received. If validTo is not present, no information about the expiration of the information is given.

A receiving ITS-S should check whether the status of the IVI Structure is any one of the following:

— new, that is, if the iviStatus is "new" and/or if the combination of serviceProviderId and iviIdentificationNumber is different from other received messages;

— update of a received IVI Structure, that is, if the iviStatus is "update" and/or if the combination of serviceProviderId and iviIdentificationNumber equals to those from another received structure and the timestamp is more recent;

— duplicate of a received structure, that is, if the iviStatus is "update" and/or if the combination of serviceProviderId and iviIdentificationNumber equals to those from another received structure and the timestamp is the same;

— cancellation, that is, if the iviStatus is "cancellation";

— negation, that is, if the iviStatus is "negation".

The definition of any actions for IVI handling based on the status and validity of the IVI Structure is outside the scope of this Technical Specification.

The Service Provider can divide the IVI in structures of appropriate size in relation to the capabilities of the communication technology and connect those IVI Structures belonging together.

A sending ITS-S can include the component connectedIviStructures to connect the IVI Structure to other IVI Structures provided by the same Service Provider that have been transmitted previously or by other ITS-S.

EXAMPLE Vehicles to which special regulations apply (such as heavy vehicles) may need to observe national regulations rather than a specific contextual regulation in place (e.g. a limitation to 100 km/h due to congestion does not apply to heavy vehicles which must observe the national limit of 80 km/h). For this purpose, the IVI Structure transmitted for contextual speed purposes can be connected to a different IVI carrying the national speed regulation in force for all vehicles.

NOTE 2 The identification of the ITS-S (ITS-S ID) is not contained in the IVI Management Container because it is protocol layer information which is contained, for example, in the ITS PDU Header. Additionally, since the IVI Structure can be signed at the Service Provider before transmission, it is not possible to add the ID of the sending ITS-S to the IVI Structure.

6.2 IVI Location Container

6.2.1 General

The IVI Structure can include several Location Containers. The Location Container contains information on the zones to support the Application Containers.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

 © ISO 2015 – All rights reserved

6.2.2 Geographic Location Container

6.2.2.1 Definition

The Location Container is built up of a common content that provides information about the common Reference Position and the repetition of *n* parts which define the zones with reference to that Reference Position. Having in common only the Reference Position, the zones can be defined independently from each other.

The data elements for inclusion in the Location Container are described in Table 2. The syntax is then defined in Annex A as the data type `GeographicLocationContainer`.

Table 2 — Geographic Location Container

Container parts	Component	M/O[a]	Description
Common location Container content	`referencePosition`	M	Any suitable position which serves as reference for the polygonal line, using the DE `ReferencePosition`.
	`referencePositionTime`	O	Time at which the Reference Position, if dynamic, was valid.
	`referencePositionHeading`	O	Direction of the Reference Position, if dynamic, using the DE `Heading`.
	`referencePositionSpeed`	O	Actual speed of the Reference Position, if dynamic, using the DE `Speed`.
Location Container Part (*n* parts)	`zoneId`	M	Identifier of the definition of the zone, using the DE `Zid`.
	`laneNumber`	O	Identification of the lane represented by the Location Container using the DE `LaneNumber`.
	`zoneExtension`	O	Extension of the zone as a circular area around the Reference Position in 10m units.
	`zoneHeading`	O	Applicable heading of the zone, e.g. the effective direction of applicability of the sign, at the Reference Position, using the DE `Heading`.
	`zone`	O	Definition of a zone using the DF `Zone`.

[a] Mandatory (M) shall be included in the container. Optional (O) may be included in the container.

6.2.2.2 Usage

The sending ITS-S shall define, in one or more of the Location Container(s), the zones referred to by the Application Containers. All definitions of zones that are based on the same Reference Position, be it that they are connected or not interconnected, should be included in the same Geographic Location Container to achieve a more efficient coding.

The sending ITS-S shall include the component `referencePosition` in the Location Container to describe the common Reference Position. The sending ITS-S can include the optional components `referencePositionTime`, `referencePositionHeading`, and `referencePositionSpeed` in the Location Container when describing a common Reference Position for a moving Zone.

The sending ITS-S shall include, for each zone, the component `zoneId`. This component shall be used by Application Containers to refer to the zone definition.

The sending ITS-S shall include the optional component `laneNumber` for each zone if the zone definition is restricted to specific lane(s). If the zone definition applies to the entire carriageway (all lanes), the component shall be absent.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

The sending ITS-S shall include, for each zone, one or more of the following optional components to define the zone: the component `zoneExtension` and/or the component `zoneHeading` or, alternatively, the component zone.

6.3 IVI Application Containers

6.3.1 General

The specific IVI information for a given situation can be found in one or more Application Containers. In this Technical Specification, three Application Containers are specified:

— the General IVI Container supporting services such as In-vehicle Signage (IVS), Contextual Speeds, and Roadworks Warning (RWW);

— the Road Configuration Container for transmitting the configuration of the road in terms of lanes, their type, and status;

— the Text Container for transmitting text and optionally, images;

— the Layout Container conveying information about the potential layout of IVI.

6.3.2 General IVI Container

6.3.2.1 Definition

The purpose for a General IVI Application Container is to contain information associated with fixed and dynamic road signs (e.g. matrix signs and parts of variable message signs) to support use cases like In-vehicle Signage, Contextual Speeds, and Road Works Warning. For descriptions of these use-cases, see Annex B.

The data elements in the General IVI Application Container are described in Table 3. The syntax is then defined in Annex A as the data type `GeneralIviContainer`.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

 © ISO 2015 – All rights reserved

Table 3 — General IVI Application Container

Container parts	Component	M/O[a]	Description
Application container part (*n* parts)	detectionZoneIds	O	List of Identifier(s) of the definition(s) of the Detection Zone(s), using the DE Zid.
	its-Rrid	O	Identifier of the ITS Regulatory Region to which the IVS Container is applicable. See DE Its-Rrid.
	relevanceZoneIds	O	List of Identifier(s) of the definition(s) of the Relevance Zone(s), to which the IVS Container applies, using the DE Zid.
	direction	O	Direction of relevance within the relevance zone using the DE Direction.
	driver AwarenessZoneIds	O	List of Identifier(s) of the definition(s) of the Driver Awareness Zone(s), using the DE Zid.
	minimumAwarenessTime	O	Time in tenths of seconds before the vehicle enters the relevance area, in which the IVI should be available as a minimum.
	applicableLanes	O	List of identifiers of the lane(s) to which the IVS Container applies using the DE LaneNumber.
	iviType	M	Priority of the Container information within the overall context of IVI. See DE IVIType.
	iviPurpose	O	See DE IviPurpose.
	laneStatus	O	Status of the lane(s) to which the Application Container Part applies. See DE LaneStatus.
	vehicleCharacteristics	O	Characteristics of vehicle, for which the IVI is applicable. See DE CompleteVehicleCharacteristics. The applicable regulations, such as limits, are defined as part of the RoadSignCode component.
	driverCharacteristics	O	Driver characteristics relevant for regulations. See DE DriverCharacteristics.
	layoutId	O	Identifier of the connected layout definition in the IVI Structure.
	preStoredLayoutId	O	Identifier of a pre-stored layout definition.
	roadSignCode	M	Ordered list of applicable road sign codes according to the selected catalogue, including additional attributes, using the DF RSCode. If present, an additional panel shall follow the sign to which it is associated.
	extraText	O	List of text lines associated to the ordered list of road sign codes. Each piece contains language code plus extra, limited-size text in the selected language using the DF Text.

[a] Mandatory (M) shall be included in the container. Optional (O) may be included in the container.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

6.3.2.2 Usage

The sending ITS-S can define the information associated with fixed and dynamic road signs in one or more General IVI Container Parts. All Parts that semantically belong together should be included in the same container (e.g. all parts belonging to the same situation such as a road works warning).

The sending ITS-S shall, at minimum, include the identifier(s) of a Relevance Zone in the component relevanceZoneIds or of an ITS Regulatory Region in the component its-Rrid. If both components are present, the ITS Regulatory Region Identifier points to the regulatory region definition and to the

© ISO 2015 – All rights reserved

national regulations in place. If only the component `its-Rrid` is present, the ITS Regulatory Region Identifier points to the regulatory region definition only.

The sending ITS-S shall include the component `direction` to describe the direction of relevance within a Relevance Zone representing a road segment. Inclusion of Identifier(s) for Detection Zone(s) in the component `detectionZoneIds` is optional.

For driver awareness purposes, the sending ITS-S can include either the Identifier(s) of recommended Driver Awareness Zone(s) in the component `driverAwarenessZoneIds` or the recommended minimum awareness time in the component `minimumAwarenessTime` or none of those.

The sending ITS-S can include the component `applicableLanes` to describe independently from information in the Location Container the lane(s) to where the information applies. This serves as a basis to correlate the information to a lane even if the location information does not support lane identification. If the information applies to the entire carriageway (all lanes), the component shall be absent.

The sending ITS-S shall include the component `iviType` to provide a means to triage the IVI information based on degree of criticality. This does not provide prioritization over other relevant information such as those from Cooperative Awareness Messages or Decentralised Event Notification Messages.

The sending ITS-S can include the following optional components: `iviPurpose`, `laneStatus` `driverCharacteristics`, and `vehicleCharacteristics`. The component `laneStatus` describes special properties of the relevant lane(s) and can be used as an alternative to the Road Configuration Container. The `vehicleCharacteristics` indicates for which vehicles the information is applicable and can be used by the receiving ITS-S to filter out non-applicable IVI Application Container Parts.

The sending ITS-S shall include the component `roadSignCode` to specify which road signs are applicable for a Relevance Zone. Road sign codes are dependent on the referenced classification scheme. A sending ITS-S should select the road sign from a catalogue which is known to be supported by a receiving ITS-S. Additional attributes to the road sign code can be added as provided by the options in the Data Frame `RSCode`.

The sending ITS-S can include either the component `layoutId` to connect the content of the IVS container to a definition of the layout as defined in the Layout Container in the IVI Structure or the component `preStoredLayoutId` to connect the content of the IVS container to a pre-stored layout template defined by the Service Provider.

The sending ITS-S can include the component `extraText`. It can repeat the same text in different languages with the appropriate language code.

6.3.3 Road Configuration Container

6.3.3.1 Definition

The purpose for the Road Configuration Container is to convey information regarding the actual or planned configuration of a road segment in one or more zone(s). This information can be used by the receiving ITS-S to support use cases like In-vehicle Signage, Contextual Speeds, and Road Works Warning and/or for localization purposes.

The data elements in the Road Configuration Container are described in Table 4. The syntax is then defined in Annex A as the data type `RoadConfigurationContainer`.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

Table 4 — Road Configuration Container

Container parts	Component	M/O[a]	Description
Road configuration container part (*n* parts)	`zoneIds`	M	List of Identifier(s) of the definition(s) of the zones to which the container applies, using the DE `Zid`.
	`roadType`	M	Type of road in the zone, see DE `RoadType`.
	`laneConfiguration`	M	List of information records about single lanes composing the road, using the DE `LaneInformation`.
[a] Mandatory (M) shall be included in the container. Optional (O) may be included in the container.			

6.3.3.2 Usage

The sending ITS-S can define information associated with the Road Configuration in one or more Road Configuration Container Parts as an alternative to using the component laneStatus in the General IVI Container. All Parts that relate to the same Location Container should be included in the same Road Configuration Container.

The sending ITS-S shall include the identifiers of the applicable Zones describing a road segment in the component `zone`.

The sending ITS-S shall include a list of data elements `LaneInformation` corresponding to the lanes composing the road in the identified zone(s) in the component `laneConfiguration` in the following way: the data element `LaneInformation` can be repeated as often as needed to describe all lanes present; the data element `LaneInformation` can be repeated more time for the same lane in order to convey information regarding logically distinct, but physically overlapping lanes or information regarding different validity periods.

6.3.4 Text Container

6.3.4.1 Definition

The purpose for Text Container is to allow the presentation of additional information for usage in the in-vehicle signage use case or of information which is not IVS related. This information is in the form of text or an image file.

The data elements in the Text Container are described in Table 5. The syntax is then defined in Annex A as the data type `TextContainer`.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

Table 5 — Text Container

Container parts	Data Element	M/O[a]	Description
Text Container (*n* parts)	detectionZoneIds	O	List of Identifier(s) of the definition(s) of the Detection Zones, using the DE Zid.
	relevanceZoneIds	M	List of Identifier(s) of the definition(s) of the Relevance Zone(s), to which the Text Container applies, using the DE Zid.
	Direction	O	Direction of relevance within the Relevance Zone using the DE Direction.
	driver AwarenessZoneIds	O	List of Identifier(s) of the definition(s) of the Driver Awareness Zone(s), using the DE Zid.
	minimumAwarenessTime	O	Time in seconds before the vehicle enters the relevance area, in which the IVI should be available as a minimum.
	applicableLanes	O	List of Identifier(s for the lane(s) to which the Text Container applies, using the DE LaneNumber.
	layoutId	O	Identifier of the connected layout definition in the IVI Structure.
	preStoredLayoutId	O	Identifier of a pre-stored layout definition.
	text	O	List of language codes and text in the selected language, using the DF Text.
	data	O	Data BLOB of a defined type (file).`

[a] Mandatory (M) shall be included in the container. Optional (O) may be included in the container.

6.3.4.2 Usage

The sending ITS-S can define text information or data associated with dynamic road signs in one or more Text Container Parts. All Parts that semantically belong together should be included in the same container (e.g. all parts belonging to the same sign).

The sending ITS-S shall, at minimum, include one identifier of the applicable Relevance Zone in the component relevanceZoneIds. A sending ITS-S shall at include the component direction to describe the direction of relevance within a Relevance Zone representing a road segment.

For driver awareness purposes, the sending ITS-S can include either the Identifier(s) of recommended Driver Awareness Zone(s) in the component driverAwarenessZoneIds or the recommended minimum awareness time in the component minimumAwarenessTime, or none of those.

The sending ITS-S can include the component applicableLanes to describe independently from information in the Location Container the lane(s) to where the Text Container applies. This serves as a basis to correlate the information to a lane even if the location information does not support lane identification. If the component is absent the Application Container applies to all lanes. A sending ITS-S can include either the component layoutId to connect the content of the IVS container to a definition of the layout as defined in the Layout Container in the IVI Structure or the component preStoredLayoutId to connect the content of the IVS container to a pre-stored layout template.

The sending ITS-S can include either the component text and/or the component data. The sending ITS-S can repeat the same text in the component text in different languages with the appropriate language code. The sending ITS-S can also include data of any predefined type in the component data.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

6.3.5 Layout Container

6.3.5.1 Definition

The purpose for the Layout Container is to convey information about the suggested layout of the information provided by General IVI Container(s) and/or Text Container(s) being displayed to the driver. This can be used, for example, to present the information in the vehicle with a similar arrangement as is presented on the road, i.e. by reflecting the real layout of the VMS on the road or in other more appropriate ways.

The data elements in the Layout Container are described in Table 6. The syntax is then defined in Annex A as the data type `LayoutContainer`.

Table 6 — Layout Container

Container Parts	Component	M/O[a]	Description
Layout container art (*n* parts)	`layoutId`	M	Identifier of the layout definition inside the IVI Structure.
	`height`	O	Height of the layout grid in number of units.
	`width`	O	Width of the layout of the grid in number of units.
	`layoutComponents`	M	List of definitions of the components on the grid using the DE `LayoutComponent`.
[a] Mandatory (M) shall be included in the container. Optional (O) may be included in the container.			

6.3.5.2 Usage

The sending ITS-S can define layout information associated to General IVI Container(s) and or Text Container(s) in one or more Layout Container Parts. Each Part shall specify one single layout.

The sending ITS-S shall specify the layout as a grid of coordinates with a defined width and height in units and with a set of components. The centre of the reference system is in the lower left corner of the grid with the x coordinate horizontally and the y coordinates vertically. Components are rectangles defined by their width and height and the position of their lower left corner on the grid.

The sending ITS-S shall include for each layout the components `layoutId` and `layoutComponents`. The components `height` and `width` are optional and describe the dimensions of the layout. They can also be implicitly deduced from the sum of the components on the layout. The sending ITS-S shall include all definitions of components of a layout in the component `layoutComponents`.

7 Description of data frames and data elements

7.1 General

The following clauses contain the definition of the semantics of Data Frames and Data Elements used by the IVI Containers in alphabetic order. The syntax is then defined in Annex A.

Data Frames and Data Elements are either defined in this Technical Specification or imported by reference from other standards.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

7.2 Data Frames

7.2.1 AnyCatalogue

The data frame `AnyCatalogue` shall indicate the road sign code according to a catalogue of road signs as agreed, for example, between the roles Service provision and Presentation Provision (see ISO/TS 17427):

— the component `owner` shall indicate the owner of the catalogue as coded by the Data Element `Provider`;

— the component `version` shall indicate the version of the catalogue;

— the component `pictogramCode` shall indicate the code of the pictogram representing the road sign;

— the component `value`, if present, shall indicate a value associated to the sign;

— the component `unit`, if present, shall indicate the unit associated to the sign;

— the component `attributes`, if present, shall indicate additional attributes associated to the sign as coded by the DF `ISO14823Attributes`.

7.2.2 CompleteVehicleCharacteristics

The data frame `CompleteVehicleCharacteristics` shall contain the definition of the characteristics of the vehicles to which an Application Container is applicable. It can be used by the receiving ITS-S to filter out non-applicable containers. It is defined as follows:

— the component `tractor`, if present, shall contain the characteristics applicable to the (motorized) pulling vehicle, as coded by the Data Element `TractorCharacteristics`;

— the component `trailer`, if present, shall contain the characteristics applicable to one or more trailers, as coded by the Data Element `TrailerCharacteristics`;

— the component `train`, if present, shall contain the characteristics applicable to the entire vehicle train, as coded by the Data Element `TrainCharacteristics`.

7.2.3 ComputedSegment

The data frame `ComputedSegment` shall contain the definition of a road segment as computed from another already defined adjacent road segment where

— the component `zoneId` shall indicate the ID of the segment from which this segment is computed, as coded by the Data Element Z,

— the component `laneNumber` shall indicate the lane number of the segment from which this segment is computed, as coded by the Data Element `LaneNumber`,

— the component `laneWidth` shall indicate the width of the computed segment, as coded by the data element `LaneWidth`,

— the component `offsetDistance`, as a first option, shall indicate the perpendicular offset from the reference lane that the computed lane is offset from, in units of 1 cm, and

— the component `offsetPosition`, as a second option, shall indicate the reference position in relation to the Reference Position of the lane which has been taken as a reference, as coded by the Data Element `deltaReferencePosition` imported from ETSI/TS 102 894-2.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

7.2.4 DDD

The data frame DDD shall contain the information corresponding to the DDD Code in ISO/TS 14823 where

— either one of the `dcj, dcr,` or `tpl` components corresponding to the DCJ, DCR, TPL qualifiers for Diverging Point Configuration in ISO/TS 14823 shall be present, and

— the component `ioList` shall contain a list of DDD Information objects of type `DDD_IO` (this list can contain one or more information objects associated to the same direction and/or to different directions in the order given by the configuration).

7.2.5 DDD_IO

The data frame `DDD_IO` shall contain single Direction/Destination/Distance Information Objects associated to a single direction of the Diverging Point Configuration. It has the following components which correspond to and extend the DDD qualifiers of ISO/TS 14823:

— `drn` corresponding to `DRN`, which shall always be present;

— `dp` as defined by the DF `DestinationPlace` and can be repeated as often as necessary inside the same DDD_IO to convey information on destination places which belong semantically together;

— `dr` as defined by the DF `DestinationRoad` and can be repeated as often as necessary inside the same DDD_IO to convey information on destination roads which belong semantically together (e.g. connected highways leading to a place destination);

— `rne` corresponding to RNE;

— `stnId` corresponding to STN;

— `stnText` which provides a STN description in free text;

— `dcp` corresponding to DCP;

— `ddp` corresponding to DDP.

7.2.6 DestinationPlace

The data frame DestinationPlace shall provide information about a destination place where

— the component `depType` as defined by the Data Element `DDD_DEP` represents an extension of the qualifier DEP of ISO/TS 14823,

— the component `depRSCode,` as defined by the Data Frame `RSCode`, indicates a pictogram code as a destination,

— the component `depBlob` provides a BLOB depicting a pictogram in a suitable format,

— the component `plnId` corresponding to the PLN qualifier of of ISO/TS 14823, and

— the component `plnText` which provides a PLN description in free text (e.g. “Vienna”).

7.2.7 DestinationRoad

The data frame DestinationPlace shall provide information about a destination road where

— The component `derType,` as defined by the Data Element `DDD_DER,` represents an extension of the qualifier DER of ISO/TS 14823,

— the component `ronId` corresponds to the qualifier RON of ISO/TS 14823, and

— the component `ronText` provides a RON description in free text (e.g. “A21”).

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

7.2.8 ISO14823Attributes

The data frame `ISO14823Attributes` provides a list of attributes in accordance to ISO/TS 14823, 6.7. The attributes SET and NOL are not supported because these attributes are providing duplicated information already supported in the Application Container.

The single attributes are coded as data frames. Some attributes extend the ISO/TS 14823 attribute definition (see description of DDD). For a description of the other attributes, see directly ISO/TS 14823.

7.2.9 ISO14823Code

The data frame `ISO14823Code` shall indicate the road sign code according to ISO/TS 14823 as follows:

— the component `pictogramCode` shall contain the pictogram code subdivided in country code, service category code, and pictogram code as defined in ISO/TS 14823, 6.4;

— the component `attributes` shall contain the applicable attributes as defined in ISO/TS 14823, 6.7 and as coded by the data frame `ISO14823Attributes`.

7.2.10 LaneInformation

The data frame `LaneInformation` shall provide information about a single lane of a road as follows:

— the component `laneNumber` shall contain the identifier of the lane to which the information applies, as coded by the data frame `LanePosition`;

— the component `direction` shall contain the direction of the road section to which the lane belongs, as coded by the data element `Direction`;

— the component `validity` shall contain the validity period of the information contained in the data frame, as coded by the data element `DTM`;

— the component `laneType` shall contain the type of lane during the indicated validity period, as coded by the data element `LaneType`;

— the component `laneTypeQualifier`, if present, shall contain information qualifying the lane to be dedicated to vehicles with defined characteristics, as coded by the data element `CompleteVehicleCharacteristics`;

— the component `laneStatus` shall contain the status of the lane during the indicated validity period, as coded by the data element `LaneStatus`;

— the component `laneWidth` shall contain the width of the lane, as coded by the data element `LaneWidth`.

The component `laneTypeQualifier` can be present to qualify lane types `7 dedicatedVehicle`, `8 bus`, `9 taxi`, `10 hov`, and `11 hot`.

7.2.11 LayoutComponents

The data frame `LayoutComponents` shall specify a single component of a layout according to the following terms:

— the component id within the layout;

— the height of the component in number of units;

— the width of the component in number of units;

— the x position of its lower left corner;

— the y position of its lower left corner;

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

 © ISO 2015 – All rights reserved

— the scripting direction of the text in the component (if applicable).

7.2.12 LoadType

The data frame `loadType` shall contain information about the vehicle's load as follows:

— the component `goodsType` shall contain information about the goods being transported as coded by the data element `GoodsType`;

— the component `dangerousGoodsType`, if present, shall contain the type of dangerous goods according to ADR as coded by the data element `DangerousGoodsBasic` imported from ETSI/TS 102 894-2,

— the component `specialTransportType`, if present, shall contain the type of special transport according to local regulations as coded by the data element `SpecialTransportType` imported from ETSI/TS 102 894-2.

7.2.13 PolygonalLine

The data frame `PolygonalLine` shall contain the definition of a polygonal line as one of the following alternatives:

— a sequence of delta points with respect to the previous position, with latitude and longitude, as coded by the data element `DeltaPosition`, the first position being the Reference Position in the Location Container;

— a sequence of delta points with respect to the previous position, with latitude, longitude, and altitude, as coded by the data element `DeltaReferencePosition` and as defined in ETSI/TS 102 894-2, the first position being the Reference Position in the Location Container;

— a sequence of absolute positions, with latitude and longitude, as coded by the data element `AbsolutePosition`, in this case, the Reference Position in the Location Container serves as the first point in the polygonal line;

— a sequence of absolute positions, with latitude, longitude, and altitude, as coded by the data element `AbsolutePositionWAltitude`. In this case, the Reference Position in the Location Container serves as the first point in the polygonal line.

NOTE The data frame contains an extension indicator which can be used in the future to allocate additional alternatives such as those provided by ISO/TS 19091.

7.2.14 RSCode

The content of the data frame `RSCode` can be associated to a layout component of Referenced Layout using the data element `layoutComponentId`.

The data frame `RSCode` shall contain the definition of the road sign code. It allows different options pointing to different pictogram catalogues:

— the alternative `viennaConvention` shall indicate the road sign code according to the Vienna Convention, as coded by the Data Frame `VcCode`;

— the alternative `iso14823` shall indicate the road sign coded according to ISO/TS 14823, as coded by the Data Frame `ISO14823Code`;

— the alternative `itisCodes` shall indicate the road sign code according to SAE J2540;

— the alternative `reducedCatalogue` shall indicate the road sign code as coded by the data frame `AnyCatalogue`.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

7.2.15 Segment

The data frame `Segment` shall contain the definition of road segment where

— the component `line` shall contain the definition of the segment as an open polygonal line, and

— the component `laneWidth` shall indicate the width of the segment as coded by the data element `LaneWidth`.

7.2.16 TractorCharacteristics

The data frame `TractorCharacteristics` shall contain the definition of characteristics applicable to pulling vehicles, as the logical AND of the single characteristics defined in the following components:

— the component `equalTo` shall contain the definition of a series of applicable discrete vehicle characterics, as coded by the data frame `VehicleCharacteristicsFixValues`;

— the component `ranges` shall contain the definition of a series of applicable ranges of continuous vehicle characterics, as coded by the data frame `VehicleCharacteristicsRanges`.

7.2.17 TrailerCharacteristics

The data frame `TrailerCharacteristics` shall contain the definition of characteristics applicable to trailed vehicles as the logical AND of the single characteristics defined in the following components:

— the component `equalTo` shall contain the definition of a series of applicable discrete vehicle characterics, as coded by the data frame `VehicleCharacteristicsFixValues`;

— the component `ranges` shall contain the definition of a series of applicable ranges of continuous vehicle characterics, as coded by the data frame `VehicleCharacteristicsRanges`.

7.2.18 TrainCharacteristics

The data frame `TrainCharacteristics` shall contain the definition of characteristics applicable to an entire vehicle train, as coded by the data frame `TractorCharacteristics`.

7.2.19 Text

The content of the data frame `text` can be associated to a layout component of the referenced layout using the data element `layoutComponentId`.

The data frame `Text` shall contain the following:

— in its component `language` the ISO 639-1 language code;

— in its component `textContent` the text itself.

7.2.20 VcCode

The data frame `VcCode` shall indicate the road sign code according to the Vienna Convention as follows:

— its component `roadSignClass` shall indicate the Vienna Convention Sign Class (e.g. the “A” in A, 28 a), as coded in the data element `VcClass`;

— its component `roadSignCode` shall contain the code of the road sign (e.g. the “28” in A, 28 a);

— its component `vcOption` shall contain the option of the road sign (e.g. the “a” in A, 28 a), as coded in data element `VcOption`;

— its component `validity`, if present, shall indicate validity information associated to the sign is indicated by a list of DTM attributes, as defined in ISO/TS 14823, 6.7 and as coded in the Data Element `DTM`;

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

— its component `value`, if present, shall indicate a value associated to the road sign;

— its component `unit`, if present, shall indicate the unit associated to such value (e.g. 50 km/h associated to road sign C,14), as coded in the Data Element `RSCUnit`.

7.2.21 VehicleCharacteristicsFixValues

The data frame `VehicleCharacteristicsFixValues` shall contain characteristics of the vehicle to which the Application Container is applicable in discrete values. The data frame offers the following alternatives:

— the alternative `simpleVehicleType` shall contain the simple vehicle type, as coded by the data element `StationType` from ETSI/TS 102 894-2;

— the alternative `euVehicleCategoryCode` shall contain European vehicle category code, as coded by the data element `EuVehicleCategoryCode` imported from ISO 24534;

— the alternative `iso3833VehicleType` shall contain the complex vehicle type, as coded by the data element `ISO3833VehicleType` imported from ISO 24534;

— the alternative `euroAndco2` shall contain the value Euro and CO_2 values, as coded by the data element `EnvironmentalCharacteristics` imported from ISO 14906;

— the alternative `engineCharacteristics` shall contain the engine characteristics, as coded by the data element `EngineCharacteristics` imported from ISO 14906;

— the alternative `loadType` shall contain information about the vehicle's load, as coded by the data element `LoadType`;

— the alternative `exhaustEmissionValues` shall contain the exhaust emission values, as coded by the data element `ExhaustEmissionValues` imported from ISO 14906;

— the alternative `usage` shall contain the type of claimed usage of the vehicle, as coded by the data element `VehicleRole` imported from ETSI/TS 102 894-2.

7.2.22 VehicleCharacteristicsRanges

The data frame `VehicleCharacteristicsFixValues` shall contain characteristics of the vehicle to which the Application Container is applicable in ranges of continuous values. The data frame is defined as follows:

— the component `comparisonOperator` shall indicate the logical operator to be used when comparing the limit given in the component `limits` with the actual vehicle characteristics;

— the component `limits` shall indicate the applicable limit through one of the following alternatives:

  — the alternative `numberOfAxles` shall contain information the limit of the number of axles;

  — the alternative `vehicleDimensions` shall contain the limit of the dimensions of the vehicle, as coded by the data element `VehicleDimensions` imported from ISO 14906;

  — the alternative `vehicleWeightLimits` shall contain the limit of the vehicle's weight, as coded by the data element `VehicleWeightLimits` imported from ISO 14906;

  — the alternative `axleWeightLimits` shall contain the limits of the weight on the vehicle's single axles, as coded by the data element `AxleWeightLimits` imported from ISO 14906;

  — the alternative `passengerCapacity` shall contain the limits of the weight on the vehicle's single axles, as coded by the data element `PassengerCapacity` imported from ISO 14906;

  — the alternative `exhaustEmissionValues` shall contain the exhaust emission limits of the vehicle, as coded by the data element `ExhaustEmissionValues` imported from ISO 14906;

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

— the alternative `dieselEmissionValues` shall contain the exhaust emission limits of the vehicle, as coded by the data element `DieselEmissionValues` imported from ISO 14906;

— the alternative `soundLevel` shall contain the limits of the vehicle's sound emission, as coded by the data element `SoundLevel` imported from ISO 14906.

7.2.23 Zone

The data frame `Zone` shall contain the definition of a zone according to one of the following options:

— the alternative `segment` shall contain the definition of a road segment as an open polygonal line, as coded by the data frame `Segment`;

— the alternative `area` shall contain the definition of an area as a closed polygonal line, as coded by the data frame `PolygonalLine`;

— the alternative `computedSegment` shall contain the definition of a road segment, as computed from another already defined adjacent road segment, as coded by the data frame `ComputedSegment`.

7.3 Data Elements

7.3.1 AbsolutePosition

The data element `AbsolutePosition` provides the information regarding an absolute position comprising the following:

— in its component `latitude`, the latitude as coded by the data element `Latitude` imported from ETSI/TS 102 894-2;

— in its component `longitude`, the longitude as coded by the data element `Longitude` imported from ETSI/TS 102 894-2.

7.3.2 AbsolutePositionWAltitude

The data element `AbsolutePositionWAltitude` provides the information regarding an absolute position comprising the following:

— in its component `latitude`, the latitude as coded by the data element `Latitude` imported from ETSI/TS 102 894-2;

— in its component `longitude`, the longitude as coded by the data element `Longitude` imported from ETSI/TS 102 894-2;

— in its component `altitude`, the altitude as coded by the data element `Altitude` imported from ETSI/TS 102 894-2.

7.3.3 ComparisonOperator

The data element `ComparisonOperator` contains the logical comparison to be used in comparison of actual values to given limit. The values are defined in Table 7.

Table 7 — ComparisonOperator

Value	Name	Definition
0	greaterThan	Values shall be greater than the given limit.
1	greaterThanEqualTo	Values shall be equal to or greater than the given limit.
2	lessThan	Values shall be less than the given limit.
3	lessThanOrEqualTo	Values shall be equal to or less than the given limit.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

7.3.4 DayOfWeek

The data element `DayOfWeek` provides the choice of week days.

7.3.5 DeltaPosition

The data element `DeltaPosition` provides the information regarding a relative position comprising the following:

— in its component `deltaLatitude`, the latitude as coded by the data element `DeltaLatitude` imported from ETSI/TS 102 894-2;

— in its component `deltaLongitude`, the longitude as coded by the data element `DeltaLongitude` imported from ETSI/TS 102 894-2.

7.3.6 Direction

The data element `Direction` contains the indication of the relevant direction in relation to the direction implicitly defined in the definition of a zone. The values are defined in Table 8.

Table 8 — Direction

Value	Name	Usage
0	sameDirection	Same direction as implicitly defined in the definition of the zone
1	bothDirections	Both directions
2	oppositeDirection	Opposite direction as implicitly defined in the definition of the zone

7.3.7 Distance

The data element `Distance` contains the distance value in space together with the unit.

7.3.8 DistanceOrDuration

The data element `DistanceOrDuration` contains the distance value in space or time together with the unit.

7.3.9 DriverCharacteristics

The data element `DriverCharacteristics` contains classes of driver characteristics to which the Application Container is applicable. The values are defined in Table 9.

Table 9 — DriverCharacteristics

Value	Name	Usage
0	unexperiencedDrivers	Indicates the class of drivers which are unexperienced according to the regulation in place.
1	experiencedDrivers	Indicates the class of drivers which are experienced according to the regulation in place.

7.3.10 GoodsType

The data element `GoodsType` specifies the type of goods of the vehicle. The values are defined Table 10.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

Table 10 — GoodsType

Value	Name	Usage
0	ammunition	Transport of ammunition.
1	chemicals	Transport of chemicals of unspecified type.
2	empty	Empty load.
3	fuel	Transport of fuel of unspecified type.
4	glass	Transport of glass.
5	dangerous	Transport of materials classified as of dangerous or hazardous nature.
6	liquid	Transport of liquids of an unspecified nature.
7	liveStock	Transport of livestock.
8	dangerousForPeople	Transport of materials classed as being of a danger to people or animals.
9	dangerousForTheEnvironment	Transport of materials classed as being potentially dangerous to the environment.
10	dangerousForWater	Transport of materials classed as being dangerous when exposed to water.
11	perishableProducts	Transport of fresh products or produce that will significantly degrade in quality or freshness over a short period of time.
12	pharmaceutical	Transport of pharmaceutical materials.
13	vehicles	Transport of vehicles of any type.

7.3.11 Heading

The data element `Heading` contains the heading of a moving Reference Position. The data element is imported from ETSI/TS 102 894-2.

7.3.12 HoursMinutes

The data element `HoursMinutes` contains either the hours and minutes value of absolute time or of a period of time.

7.3.13 Its-Rrid

The data element `Its-Rrid` contains an ITS Regulatory Region Identifier, e.g. according to ISO/TS 17419.

7.3.14 IviIdentificationNumber

The data element `IviIdentificationNumber` contains the identifier of the IVI Structure.

7.3.15 IviStatus

The data element `IviStatus` contains the status of the IVI Structure. The values are defined in Table 11.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

Table 11 — IVIStatus

Value	Name	Usage
0	new	Indicates that the IVI Structure is sent out in its first edition.
1	update	Indicates that the IVI Structure is sent out as an update of an already sent out IVI Structure.
2	cancellation	Indicates that the IVI is cancelled by the Service Provider that provided it.
3	negation	Indicates that the IVI is negated by an authorized Service Provider that is different from the one that provided it.

7.3.16 IviType

The data element `IviType` provides the type of IVI to allow for classification and prioritization of IVI at the receiving ITS-S. The values are defined in Table 12.

Table 12 — IVIType

Value	Name	Usage
0	Immediate danger warning messages	Information regarding immediate danger warning.
1	Regulatory messages	Information regarding regulatory messages.
2	Traffic-related information messages	Traffic-related information which is not linked to immediate danger.
3	Pollution messages	Information messages and warning messages excluding driving prohibitions and obligations.
4	Not traffic-related information messages	Other information not linked to the traffic.

7.3.17 IviPurpose

The data element `IviPurpose` provides the purpose of the IVI for further usage by the receiving ITS-S.

The values are defined in Table 13.

Table 13 — IVIPurpose

Value	Name	Usage
0	Safety	IVI provided for road safety purposes such as in case of incidents or weather conditions.
1	Environmental	IVI provided for environmental purposes such reduction of air or noise pollution.
2	TrafficOptimisation	IVI provided for traffic optimization purposes such as optimal traffic flow in case of dense traffic.

7.3.18 LaneNumber

The data element `LaneNumber` provides the identifier of the lane based on its transversal position as imported from ETSI/TS 102 894-2.

The `LaneNumber` value 0 shall exclusively be used to identify the hard shoulder, i.e. the outside emergency lane, if present. If no hard shoulder is present, the counting of lanes shall start from the value 1.

A lane identified by `LaneNumber` value 0 shall have associated lane type “emergency” only.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

7.3.19 LaneStatus

The data element `LaneStatus` provides information on the status of the lanes with regards to traffic (see Table 14).

Table 14 — LaneStatus

Value	Name	Usage
0	Open	Lane is open to traffic according to its type defined in LaneType.
1	Closed	Lane is closed to traffic.
2	mergeR	Lane is merging into the right adjacent lane.
3	mergeL	Lane is merging into the left adjacent lane.
4	mergeLR	Lane is merging into both the left and right adjacent lane.
5	provisionallyOpen	Lane is only provisionally open to normal traffic, e.g. hard shoulder open to traffic.
6	diverging	Lane is diverging to left and right, e.g. due to obstacle or road works.

7.3.20 LaneType

The data element `LaneType` defines the type of lane with respect to the permitted movements of specific vehicles (see Table 15).

Table 15 — LaneType

Value	Name	Usage
0	traffic	Lane dedicated for the movement of vehicles.
1	through	Lane dedicated for the movement of vehicles travelling ahead and not turning.
2	reversible	Lane where the direction of traffic can be changed to match the peak flow.
3	acceleration	Lane that allows vehicles entering a road to accelerate to the speed of through traffic before merging with it.
4	deceleration	Lane that allows vehicles exiting a road to decelerate before leaving it.
5	leftHandTurning	Lane reserved for slowing down and making a left turn, so as not to disrupt traffic.
6	rightHandTurning	Lane reserved for slowing down and making a right turn so as not to disrupt traffic.
7	dedicatedVehicle	Lane dedicated to movement of motor vehicles with specific characteristics, such as heavy goods vehicles, etc.
8	bus	Lane dedicated to movement of buses providing public transportation.
9	taxi	Lane dedicated to movement of taxis.
10	hov	Carpooling lane or high occupancy vehicle lane.
11	hot	High occupancy vehicle lanes that is allowed to be used without meeting the occupancy criteria by paying a toll.
12	pedestrian	Lanes dedicated to pedestrians such as pedestrian sidewalk paths.
13	bikeLane	Lane dedicated to exclusive or preferred use by bicycles.
14	median	Lane not dedicated to movement of vehicles but representing medians and channelization such as the central median separating the two directional carriageways of the highway.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

Table 15 *(continued)*

Value	Name	Usage
15	striping	Lane not dedicated to movement of vehicles but covered with roadway markings.
16	trackedVehicle	Lane dedicated to movement of trains and trolleys.
17	parking	Lanes dedicated to vehicles parking, stopping and loading lanes.
18	emergency	Lane dedicated to vehicles in breakdown or to emergency vehicles also called hard shoulder.
19	verge	Lane representing the verge, i.e. a narrow strip of grass or plants and sometimes also trees located between the road surface edge and the boundary of a road.

7.3.21 LaneWidth

The data element `LaneWidth` contains the width of the lane in centimetres measured at the reference point.

7.3.22 MonthDay

The data element `MonthDay` contains either the start or end date without year.

7.3.23 Provider

The data element `Provider` contains the ID of the service provider through its two components:

— `CountryCode` indicates the ISO 3166-1 country code;

— `IssuerIdentifier` indicates the identifier of the service provider as registered.

7.3.24 RSCUnit

The data element `RSCUnit` contains a list of units that can be associated to road sign values. The values are defined in Table 16.

Table 16 — RSCUnit

Value	Name	Usage
0	kmperh	Speed in kilometres per hour
1	milesperh	Speed in miles per hour
2	kilometre	Distance in kilometres
3	metre	Distance in metre
4	decimetre	Distance in decimetres
5	centimetre	Distance in centimetres
6	mile	Distance in miles
7	yard	Distance in yards
8	foot	Distance in foot
9	minutesOfTime	Time in minutes
10	tonnes	Weight in units of 1 000 kg
11	hundredkg	Weight in units of 100 kg
12	pound	Weight in pounds
13	rateOfIncline	Rate of incline in percentage

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

7.3.25 ReferencePosition

The data element `ReferencePosition` provides a Reference Position for the definition of a zone. It is imported from ETSI/TS 102 894-2.

7.3.26 Speed

The data element `Speed` contains the speed of a moving Reference Position. The data element is imported from ETSI/TS 102 894-2.

7.3.27 VcClass

The data element `VcClass` indicates the Vienna Convention Sign Class (e.g. the “A” in A, 28a).

7.3.28 VcOption

The data element `VcOption` indicates the Vienna Convention option of the road sign (e.g. the “a” in A, 28a).

7.3.29 Weight

The data element `Weight` contains the weight value together with the unit.

7.3.30 Zid

The data element `Zid` contains the ID of a defined zone which is unique in the context of the IVI Structure or of the combination of IVI Structures. It is used in the definition of zone in the Location Container and to refer to a defined zone from inside the Application Container.

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

Annex A
(normative)

ASN.1 module

This Annex presents the abstract syntax notation one (ASN.1) definition of the data types related to IVI structure, containers, data frames, and data elements in accordance with the ASN.1 technique specified in ISO/IEC 8824-1.

```
IVI {iso (1) standard (0) ivi (19321) version1 (1)}

DEFINITIONS AUTOMATIC TAGS::=
BEGIN
IMPORTS
Altitude, DangerousGoodsBasic, DeltaLatitude, DeltaLongitude, DeltaReferencePosition,
Heading, HeadingValue, Latitude, LanePosition, Longitude, ReferencePosition, RoadType,
SpecialTransportType, Speed, StationType, TimestampIts, VehicleRole
FROM ITS-Container {  itu-t (0) identified-organization (4) etsi (0) itsDomain (5) wg1 (1)
ts (102894) cdd (2) version (1) }

AxleWeightLimits, DieselEmissionValues, ExhaustEmissionValues, EngineCharacteristics,
EnvironmentalCharacteristics, PassengerCapacity, Provider, SoundLevel, VehicleDimensions,
VehicleWeightLimits
FROM EfcModule {iso standard 14906 modules(0) efc(0) version(1)}

EuVehicleCategoryCode, Iso3833VehicleType
FROM ElectronicRegistrationIdentificationVehicleDataModule {iso(1) standard(0) iso24534
(24534) vehicleData (1) version (1)}

VarLengthNumber
FROM CITSapplMgmtIDs {iso(1) standard(0) cits-applMgmt (17419) ids (1) version1 (1)};

--Definition of IVI Structure

IviStructure::= SEQUENCE{
     Mandatory         ManagementContainer,
     optional          SEQUENCE (SIZE (1..8,...)) OF IviContainer OPTIONAL
     }

--Definition of Containers

IviContainer::= CHOICE {
     glc               GeographicLocationContainer,
     gic               GeneralIviContainer,
     rcc               RoadConfigurationContainer,
     tc                TextContainer,
     lac               LayoutContainer,
     ...              -- extension for future containers
     }

ManagementContainer::= SEQUENCE {
     serviceProviderId           Provider,
     iviIdentificationNumber     IviIdentificationNumber,
     timestamp                   TimestampIts OPTIONAL,
     validFrom                   TimestampIts OPTIONAL,
     validTo                     TimestampIts OPTIONAL,
     connectedIviStructures      SEQUENCE (SIZE(1..8)) OF IviIdentificationNumber OPTIONAL,
     iviStatus                   IviStatus,
     ...
     }

GeographicLocationContainer::= SEQUENCE {
     referencePosition           ReferencePosition,
     referencePositionTime       TimestampIts OPTIONAL,
```

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

```
     referencePositionHeading    Heading OPTIONAL,
     referencePositionSpeed      Speed OPTIONAL,
     parts                       SEQUENCE (SIZE (1..16,...)) OF GlcPart,
     ...
     }

GlcPart::= SEQUENCE {
     zoneId                      Zid,
     laneNumber                  LanePosition OPTIONAL,
     zoneExtension               INTEGER (0..255) OPTIONAL,
     zoneHeading                 HeadingValue OPTIONAL,
     zone                        Zone OPTIONAL,
     ...
     }

GeneralIviContainer::= SEQUENCE (SIZE (1..16,...)) OF GicPart

GicPart::= SEQUENCE {
     detectionZoneIds         SEQUENCE (SIZE (1..8,...)) OF Zid OPTIONAL,
     its-Rrid                 VarLengthNumber OPTIONAL,
     relevanceZoneIds         SEQUENCE (SIZE (1..8,...)) OF Zid OPTIONAL,
     direction                Direction OPTIONAL,
     driverAwarenessZoneIds   SEQUENCE (SIZE (1..8,...)) OF Zid OPTIONAL,
     minimumAwarenessTime     INTEGER (0..255) OPTIONAL,
     applicableLanes          SEQUENCE (SIZE (1..8,...)) OF LanePosition OPTIONAL,
     iviType                  IviType,
     iviPurpose               IviPurpose OPTIONAL,
     laneStatus               LaneStatus OPTIONAL,
CompleteVehicleCharacteristics OPTIONAL
     driverCharacteristics    DriverCharacteristics OPTIONAL,
     layoutId                 INTEGER(1..4,...) OPTIONAL,
     preStoredlayoutId        INTEGER(1..64,...) OPTIONAL,
     roadSignCodes            SEQUENCE (SIZE (1..4),...) OF RSCode,
     extraText                SEQUENCE (SIZE (1..4),...) OF Text (WITH COMPONENTS
{layoutComponentId, language, textContent (SIZE(1..32))}) OPTIONAL,
     ...
     }

RoadConfigurationContainer::= SEQUENCE (SIZE (1..16,...)) OF RccPart

RccPart::= SEQUENCE{
     zoneIds                  SEQUENCE (SIZE (1..8,...)) OF Zid,
     roadType                 RoadType,
     laneConfiguration        SEQUENCE (SIZE (1..16,...)) OF LaneInformation,
     ...
     }

TextContainer::= SEQUENCE (SIZE (1..16,...)) OF TcPart

TcPart::= SEQUENCE
     detectionZoneIds         SEQUENCE (SIZE (1..8,...)) OF Zid OPTIONAL,
     relevanceZoneIds         SEQUENCE (SIZE (1..8,...)) OF Zid,
     direction                Direction,
     driverAwarenessZoneIds   SEQUENCE (SIZE (1..8,...)) OF Zid OPTIONAL,
     minimumAwarenessTime     INTEGER (0..255) OPTIONAL,
     applicableLanes          SEQUENCE (SIZE (1..8,...)) OF LanePosition OPTIONAL,
     layoutId                 INTEGER(1..4,...) OPTIONAL,
     preStoredlayoutId        INTEGER(1..64,...) OPTIONAL,
     text                     SEQUENCE (SIZE (1..4),...) OF Text OPTIONAL,
     data                     OCTET STRING,
     ...
     }

LayoutContainer::=SEQUENCE{
     layoutId                 INTEGER(1..4,...),
     height                   INTEGER(10..73) OPTIONAL,
     width                    INTEGER(10..265) OPTIONAL,
     layoutComponents         SEQUENCE SIZE (1..4,...) OF LayoutComponent,
     ...
     }
```

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

```
---------- Definition of Data Frames & Elements

AbsolutePosition::= SEQUENCE{
     latitude        Latitude,
     longitude       Longitude
                     }

AbsolutePositionWAltitude::= SEQUENCE{
     latitude        Latitude,
     longitude       Longitude
     altitude        Altitude
     }

AnyCatalogue::=SEQUENCE{
     owner                  Provider,
     version                INTEGER(0..255),
     pictogramCode          INTEGER(0..65535),
     value                  INTEGER (0..65535) OPTIONAL,
     unit                   RSCUnit OPTIONAL,
     attributes             ISO14823Attributes OPTIONAL
     }

ComparisonOperator::= INTEGER {
     greaterThan              (0),
     greaterThanOrEqualTo     (1),
     lessThan                 (2),
     lessThanOrEqualTo        (3)
} (0..3)

CompleteVehicleCharacteristics::= SEQUENCE{
     tractor          TractorCharacteristics OPTIONAL,
     trailer          SEQUENCE (SIZE (1..3)) OF TrailerCharacteristics OPTIONAL,
     train            TrainCharacteristics OPTIONAL
     }

ComputedSegment::= SEQUENCE {
     zoneId               Zid,
     laneNumber           LanePosition,
     laneWidth            LaneWidth,
     offsetDistance       INTEGER (-32768..32767) OPTIONAL,
     offsetPosition       DeltaReferencePosition
     }

DeltaPosition::=SEQUENCE{
     deltaLatitude    DeltaLatitude,
     deltaLongitude   DeltaLongitude
                      }

Direction::= INTEGER{
     sameDirection       (0),
     oppositeDirection   (1),
     bothDirections      (2),
     valueNotUsed        (3)
     } (0..3)

Distance::= SEQUENCE {
     Value           INTEGER(1..16384),
     unit            RSCUnit (2..4|6..8)
                     }

DistanceOrDuration::= SEQUENCE {
     value           INTEGER(1..16384),
     unit            RSCUnit (2..9)
                     }

DriverCharacteristics::= INTEGER{
     unexperiencedDrivers        (0),
     experiencedDrivers          (1),
     rfu1                        (2),
     rfu2                        (3)
     } (0..3)
```

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

```
GoodsType::= INTEGER {
     ammunition                  (0),
     chemicals                   (1),
     empty                       (2),
     fuel                        (3),
     glass                       (4),
     dangerous                   (5),
     liquid                      (6),
     livestock                   (7),
     dangerousForPeople          (8),
     dangerousForTheEnvironment  (9),
     dangerousForWater           (10),
     perishableProducts          (11),
     pharmaceutical              (12),
     vehicles                    (13)
     -- other values  reserved for future use
     } (0..15,...)


ISO14823Attributes::= SEQUENCE (SIZE(1..8),...) OF CHOICE{
     dtm DTM,  -- Date/Time/Period
     edt       EDT, -- Exemption status of Date/Time/Period
     dfl       DFL, -- Directional Flow of Lane
     ved       VED,    -- Vehicle Dimensions
     spe       SPE,    -- Speed
     roi       ROI, -- Rate of Incline
     dbv       DBV, -- Distance Between Vehicles
     ddd       DDD  -- Destination/Direction/Distance
     }

ISO14823Code ::= SEQUENCE{
     pictogramCode           SEQUENCE {
      countryCode             OCTET STRING (SIZE (2)) OPTIONAL,
      serviceCategoryCode     CHOICE {
       trafficSignPictogram      ENUMERATED {dangerWarning, regulatory, informative,...},
       publicFacilitiesPictogram      ENUMERATED {publicFacilities, ...},
       ambientOrRoadConditionPictogram   ENUMERATED {ambientCondition, roadCondition,...},
       ...},
         pictogramCategoryCode   SEQUENCE {
            nature            INTEGER (1..9),
            serialNumber      INTEGER (0..99)
            }},
      attributes        ISO14823Attributes OPTIONAL
      }

IviIdentificationNumber::=INTEGER(1..32767,...)

IviPurpose::= INTEGER {
     safety                 (0),
     environmental          (1),
     trafficOptimisation  (2)
     } (0..3)

IviStatus::= INTEGER {
     new                    (0),
     update                 (1),
     cancellation           (2),
     negation               (3)
     }(0..7)

IviType::= INTEGER {
     immediateDangerWarningMessages         (0),
     regulatoryMessages                     (1),
     trafficRelatedInformationMessages      (2),
     pollutionMessages                      (3),
     notTrafficRelatedInformationMessages   (4)
     } (0..7)

LaneInformation::= SEQUENCE{
     laneNumber           LanePosition,
```

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

```
     direction            Direction,
     validity             DTM OPTIONAL,
     laneType             LaneType,
     laneTypeQualifier    CompleteVehicleCharacteristics OPTIONAL,
     laneStatus           LaneStatus,
     laneWidth            LaneWidth OPTIONAL,
     ...
     }

LaneStatus::= INTEGER {
     open                   (0),
     closed                 (1),
     mergeR                 (2),
     mergeL                 (3),
     mergeLR                (4),
     provisionallyOpen      (5),
     diverging              (6)
     -- value 7 reserved for future use
} (0..7, ...)

LaneType::= INTEGER{
     traffic              (0),
     through              (1),
     reversible           (2),
     acceleration         (3),
     deceleration         (4),
     leftHandTurning      (5),
     rightHandTurning     (6),
     dedicatedVehicle     (7),
     bus                  (8),
     taxi                 (9),
     hov                  (10),
     hot                  (11),
     pedestrian           (12),
     bikeLane             (13),
     median               (14),
     striping             (15),
     trackedVehicle       (16),
     parking              (17),
     emergency            (18),
     verge                (19)
-- values 20 to 31 reserved for future use
     }(0..31)


LaneWidth::= INTEGER (0..1023)

LayoutComponent::=SEQUENCE{
     layoutComponentId       INTEGER(1..8,...),
     height                  INTEGER(10..73),
     width                   INTEGER(10..265),
     x                       INTEGER(10..265),
     y                       INTEGER(10..73),
     textScripting           INTEGER {horizontal (0),  vertical (1)}(0..1)
     }

LoadType::= SEQUENCE{
     goodsType               GoodsType,
     dangerousGoodsType      DangerousGoodsBasic,
     specialTransportType    SpecialTransportType
     }

PolygonalLine::= CHOICE {
     deltaPositions                 SEQUENCE (SIZE (1..32,...)) OF DeltaPosition,
     deltaPositionsWithAltitude     SEQUENCE (SIZE (1..32,...)) OF DeltaReferencePosition,
     absolutePositions              SEQUENCE (SIZE (1..8,...)) OF AbsolutePosition,
     absolutePositionsWithAltitude  SEQUENCE (SIZE (1..8,...)) OF
AbsolutePositionWAltitude,
     ...
     }
```

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

```
RSCode::= SEQUENCE{
     layoutComponentId   INTEGER(1..4,...) OPTIONAL,
     code                CHOICE {
                    viennaConventionVcCode, -- see Vienna Convention Annex A
                    iso14823        ISO14823Code,
                    itisCodes           INTEGER (0..65535), -- see SAE J2540
                    anyCatalogue    AnyCatalogue,
                    ...
                    }}

RSCUnit::= INTEGER {
     kmperh              (0),
     milesperh           (1),
     kilometre           (2),
     meter               (3),
     decimetre           (4),
     centimetre          (5),
     mile                (6),
     yard                (7),
     foot                (8),
     minutesOfTime       (9),
     tonnes              (10), --1000 kg, not Ton!
     hundredkg           (11),
     pound               (12), --lbs
     rateOfIncline       (13)
     -- other value reserved for future use
     } (0..15)


Segment::= SEQUENCE {
     line                PolygonalLine,
     laneWidth           LaneWidth OPTIONAL
     }

Text::= SEQUENCE {
     layoutComponentId  INTEGER(1..4,...) OPTIONAL,
     language           BIT STRING (SIZE(10)),
     textContent        UTF8String
     }

TractorCharacteristics::=SEQUENCE{
     equalTo     SEQUENCE (SIZE (1..4,...)) OF  VehicleCharacteristicsFixValues OPTIONAL,
     notEqualTo  SEQUENCE (SIZE (1..4,...)) OF  VehicleCharacteristicsFixValues OPTIONAL,
     ranges      SEQUENCE (SIZE (1..4,...)) OF  VehicleCharacteristicsRanges OPTIONAL
}

TrailerCharacteristics::=SEQUENCE{
     equalTo          SEQUENCE (SIZE (1..4,...)) OF VehicleCharacteristicsFixValues (WITH
COMPONENTS {..., euroAndCo2value ABSENT, engineCharacteristics ABSENT}) OPTIONAL,
     notEqualTo       SEQUENCE (SIZE (1..4,...)) OF VehicleCharacteristicsFixValues (WITH
COMPONENTS {..., euroAndCo2value ABSENT, engineCharacteristics ABSENT}) OPTIONAL,
     ranges           SEQUENCE (SIZE (1..4,...)) OF VehicleCharacteristicsRanges (WITH
COMPONENTS {comparisonOperator, limits (WITH COMPONENTS {..., exhaustEmissionValues
ABSENT, dieselEmissionValues ABSENT, soundLevel ABSENT})})  OPTIONAL
     }

TrainCharacteristics::= TractorCharacteristics

VcClass::= INTEGER {
     classA          (0),
     classB          (1),
     classC          (2),
     classD          (3),
     classE          (4),
     classF          (5),
     classG          (6),
     classH          (7)
     } (0..7)

VcCode::= SEQUENCE {
     roadSignClass   VcClass,  -- see Vienna Convention
```

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved

```
     roadSignCode     INTEGER (1..64),
     vcOption         VcOption, -- e.g. the "a" in H, 3a
     validity         SEQUENCE (SIZE (1..8),...) OF DTM OPTIONAL,
     value            INTEGER (0..65535) OPTIONAL,
     unit             RSCUnit OPTIONAL
     }

VcOption::= INTEGER {
     None             (0),
     a                (1),
     b                (2),
     c                (3),
     d                (4),
     e                (5),
     f                (6),
     g                (7)
     } (0..7)

VehicleCharacteristicsFixValues::= CHOICE{
     simpleVehicleType           StationType,
     euVehicleCategoryCode       EuVehicleCategoryCode,
     iso3833VehicleType          Iso3833VehicleType,
     euroAndCo2value             EnvironmentalCharacteristics,
     engineCharacteristics       EngineCharacteristics,
     loadType                    LoadType,
     usage                       VehicleRole,
     ...}

VehicleCharacteristicsRanges::= SEQUENCE{
     comparisonOperator          ComparisonOperator,
     limits    CHOICE{
                    numberOfAxles              INTEGER(0..7),
                    vehicleDimensions          VehicleDimensions,
                    vehicleWeightLimits        VehicleWeightLimits,
                    axleWeightLimits           AxleWeightLimits,
                    passengerCapacity          PassengerCapacity,
                    exhaustEmissionValues      ExhaustEmissionValues,
                    dieselEmissionValues       DieselEmissionValues,
                    soundLevel                 SoundLevel,
                    ...}}

Weight::= SEQUENCE {
                     value    INTEGER(1..16384),
                     unit     RSCUnit (10..12)
                    }

Zid::= INTEGER (1..32,...)

Zone::= CHOICE {
     segment                  Segment,
     area                     PolygonalLine,
     computedSegment          ComputedSegment,
     ...
     }

-- Definition of the single ISO 14823 Attributes


DTM ::= SEQUENCE {
     year              SEQUENCE { -- contains SYR and EYR
                    syr  INTEGER(2000..2127,...),
                    eyr      INTEGER(2000..2127,...)
                             } OPTIONAL,
     month-day      SEQUENCE { -- contains SMD and EMD
                    smd      MonthDay,
                    emd  MonthDay
                             } OPTIONAL,
     pmd             PMD OPTIONAL,
     hourMinutes    SEQUENCE { -- contains SHM and EHM
                    shm    HoursMinutes,
                    ehm    HoursMinutes
```

STANDARDSISO.COM : Click to view the full PDF of ISO/TS 19321:2015

© ISO 2015 – All rights reserved