INTERNATIONAL STANDARD

ISO 14816

First edition
2005-11-01

Road transport and traffic telematics — Automatic vehicle and equipment identification — Numbering and data structure

Télématique de la circulation et du transport routier — Identification automatique des véhicules et équipements — Codification et structure des données

Reference number
ISO 14816:2005(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

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

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14816 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*, in collaboration with Technical Committee CEN/TC 278, *Road transport and traffic telematics*.

This first edition cancels and replaces (ISO/TS 14816:2000).

Introduction

This International Standard specifies a data structure that enables upwards integration and expansion from the simplest low-cost AVI/AEI system to more complex functions. The structure is designed to be flexible and enabling rather than prescriptive.

This International Standard has been designed to provide for the differing requirements of AVI and AEI by the use of separate application specifics. By retaining these differing requirements within one supervisory document, the interoperability is maximized, particularly in the case where both AVI and AEI are required at the same time in the road environment.

In order to support systems using both active and passive On Board Equipment (OBE), the basic data structures have been minimized. This enables any manufacturer/operator with an OBE with a user addressable memory of only 56 bits to be able to conform to a full core identification according to this International Standard.

Abstract Syntax Notation One (ASN.1) is widely applied. Its usage provides maximum interoperability and conformance to existing International Standards, and meets the specifically defined requirements for a generic standard model for RTTT in that it:

— Uses existing standard Syntax Notation and Encoding Rules,

— Is adaptable and expandable,

— Does not include unnecessary information for a specific system, and

— Incurs a minimum of overhead in storage and transmission.

Readers who are unfamiliar with ASN.1 are advised to read ANNEX C before reading the main body of this International Standard. Readers are also advised to read ISO/IEC 8824, ISO/IEC 8825-1, ISO/IEC 8825-2 and ISO/IEC 8825-3 and other published work on ASN.1 before reading the main body of this International Standard.

ISO 14814 provides a reference architecture model for AVI/AEI systems.

Sections 4.1-4.6 of ISO 14816 provide a standardized yet flexible and interoperable framework for numbering schemes. A structure for AVI/AEI unambiguous identification and several numbering schemes associated with AVI/AEI systems are determined in this International Standard.

The core AVI/AEI numbering scheme, central to the effective use of many of the constructs, is a structure to provide unambiguous identification. 4.7 of this International Standard provides a data element coding for Automatic Vehicle and Equipment Identification (AVI/AEI) in RTTT applications. This coding provides a structure with the possibility of 2^{56} (in excess of 72 million billions) unique identifiers, provided within a 56-bit code structure when ISO/IEC 8825-2 (PER) is used, i.e. no overhead is incurred.

Road transport and traffic telematics — Automatic vehicle and equipment identification — Numbering and data structure

1 Scope

1.1 Overall numbering scheme

This International Standard establishes a common framework data structure for unambiguous identification in RTTT/ITS systems. It excludes any physical aspects such as interfaces. It is neither frequency- nor air interface protocol-specific.

Data elements that form part of transmission or storage protocols such as headers, frame markers and checksums are thus excluded.

The specifications for protecting against changes, classifying and qualifying security aspects of the data structure elements are not included within this International Standard.

The principles of data element structure and description determined in ISO/IEC 8824, ISO/IEC 8825-1 and ISO/IEC 8825-2 have been adopted to provide an interoperable architecture within a standard framework according to guidelines from ISO/TC 204 and CEN/TC 278.

This International Standard defines data structures based on the ISO/IEC 8824-1 ASN.1 `UNIVERSAL CLASS` types that may be directly `IMPORTED` to other application standards that would need only subsets of the full `APPLICATION CLASS` types. These `UNIVERSAL CLASS` and `APPLICATION CLASS` types are uniquely defined as an ASN.1 module in Annex B. This module may be directly linked into an application data definition.

This International Standard defines default encoding for simple AVI/AEI applications where no other relevant application standard exists. This definition forms Clause 4.

1.2 AVI/AEI numbering scheme

The principal registered schemes for AVI/AEI are determined in 4.7 and 4.8 of this International Standard. Other relevant and interoperable schemes are detailed in subsequent clauses and subclauses.

The structures defined in this International Standard provide interoperability, not only between simple AVI/AEI and more complex RTTT/ITS functions, but also with pre-existing International Standards (e.g. ISO 10374).

There is one Central Registration Authority that administers the AVI numbering scheme according to the rules of CEN and ISO (see Annex A).

The choices available to the issuer to operate its structure include, amongst others:

— simple identification, in which case the separate identities may be openly available, at the discretion of the issuer or nation state;

— an alias basis, in which case the “identities” are known, but secured under provisions of data protection to maintain privacy and therefore not available; and

— dynamically encrypted identities in an anonymous system.

2 Normative references

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

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

ISO 3779, *Road vehicles — Vehicle identification number (VIN) — Content and structure*

ISO 3780, *Road vehicles — World manufacturer identifier (WMI) code*

ISO 6346, *Freight containers — Coding, identification and marking*

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

ISO/IEC 8825-1, *Information technology — ASN.1 encoding rules — Part 1: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

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

ISO/IEC 8859-1, *Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No.1*

ISO/IEC 8859-2, *Information technology — 8-bit single-byte coded graphic character sets — Part 2: Latin alphabet No. 2*

ISO/IEC 8859-3, *Information technology — 8-bit single-byte coded graphic character sets — Part 3: Latin alphabet No. 3*

ISO/IEC 8859-4, *Information technology — 8-bit single-byte coded graphic character sets — Part 4: Latin alphabet No. 4*

ISO/IEC 8859-5, *Information technology — 8-bit single-byte coded graphic character sets — Part 5: Latin/Cyrillic alphabet*

ISO/IEC 8859-6, *Information technology — 8-bit single-byte coded graphic character sets — Part 6: Latin/Arabic alphabet*

ISO/IEC 8859-7, *Information technology — 8-bit single-byte coded graphic character sets — Part 7: Latin/Greek alphabet*

ISO/IEC 8859-8, *Information technology — 8-bit single-byte coded graphic character sets — Part 8: Latin/Hebrew alphabet*

ISO/IEC 8859-9, *Information technology — 8-bit single-byte coded graphic character sets — Part 9: Latin alphabet No. 5*

ISO/IEC 8859-10, *Information technology — 8-bit single-byte coded graphic character sets — Part 10: Latin alphabet No. 6*

ISO 10374, *Freight containers — Automatic identification*

ISO/IEC 10646-1, *Information technology — Universal Multiple-Octet Coded Character Set (UCS) — Part 1: Architecture and Basic Multilingual Plane*

ISO/TR 14813-3, *Transport information and control systems — Reference model architecture(s) for the TICS sector — Part 3: Example elaboration*

ISO 14814, *Road transport and traffic telematics — Automatic vehicle and equipment identification — Reference architecture and terminology*

3 Terms, definitions and notations

For the purposes of this document, the terms and definitions given in ISO 14814 apply.

The term “Issuer” applies to any of the coding schemes CS1, CS2 and CS8.

Numerical notations are represented as follows:

— Decimal (“normal”) notation has no subscript.

EXAMPLE 127.

— Hexadecimal numbers are noted by subscript 16.

EXAMPLE Example: $7F_{16}$.

— Binary numbers are noted by subscript 2.

EXAMPLE Example: 01111111_{2}.

Characters are represented as follows:

— Characters have no subscript or quotes.

EXAMPLE ABC5EFD.

4 Requirements

4.1 Overall coding structure

The AVI/AEI coding structure determined in this International Standard:

— is unambiguous and flexible enough to include relevant transport related numbering schemes,

— follows relevant International Standards, available at the time of writing,

— provides an exact coding of the data elements,

— is extendible to enable future expansion, and

— is able to accommodate private structures.

4.2 General requirements

The coding structure determined in this International Standard is an “enabling” structure. It is designed to accommodate, within its framework, coding structures for a variety of RTTT/ITS systems from simple AVI/AEI to more complex transactions with a wide variety of uses, and to allow combinations of data elements to be used in a composite data construct. It is designed to allow as much interoperability of the data elements within

an EDI/EDT environment as is possible, and provide capability for a significant expansion of the number of RTTT/ITS applications in the future.

This International Standard recognizes and accommodates the operation of systems of different capabilities. It shall enable, within its structure, the interoperability of one OBE in any country so long as there is a common air interface and protocol, even though the operator systems themselves may be significantly different. Even where information has to be collected by a separate interrogator because air interface compatibility does not exist, the data, once collected, is in a commonly interoperable format, and may thus be used accurately and effectively within an EDI/EDT environment.

The data structures defined in this International Standard enable “tree and branch” or “cascade” structures, with the ability to build complex data element constructs.

This International Standard has been optimized for ISO/IEC 8825-2 as recommended by ISO/TS 14813-3.

It uses ISO/IEC 8824-1 in all its syntax descriptions.

By adopting the ISO/IEC 8824, ISO/IEC 8825-1, ISO/IEC 8825-2 and ISO/IEC 8825-3 Abstract Syntax Notation (ASN.1), the flexibility is provided for data elements of any length and combination to be supported. Also, this data structure standard is itself given a migration path so that, as technological developments allow further capabilities, subsequent International Standards may provide additional data fields for use in all, or some, sector-specific applications, whilst maintaining the upwards compatibility from and to this document.

The ASN.1 encoding rules enable the chaining of multiple data elements from different application sectors to build complex data element constructs. (See examples in Annex C.)

4.3 Data structure

The data structuring requirements as defined in ISO/IEC 8824, ISO/IEC 8825-1, ISO/IEC 8825-2 and ISO/IEC 8825-3 apply, and in particular ISO/TS 14813-3.

4.4 Residency of data

The data construct is designed to be free-standing and independent of the media. It therefore normally resides in the OBE.

In specific cases, such as the standardized European DSRC 5.8 GHz link, where part of the message is already known because of L7 services, the use of ASN.1Packed Encoding Rules (PER) proposed within this International Standard enables only the unknown part of the message to be transferred, thus achieving minimum redundancy.

The examples given in the remainder of this International Standard assume the use of ASN.1 PER. Where Basic Encoding Rules (BER) are used, there is additional overhead as defined in ISO/IEC 8825-1. See Annex C for implementation examples.

4.5 Table of coding structure identifiers

Table 1 — Coding structure identifiers

Coding Structure Identifier (CSI) Number	RTTT/ITS Coding Structure
0	Reserved for CEN/ISO
1	AVI/AEI for use in RTTT applications
2	RTTT Manufacturer Serial Number
3	RTTT Validity Limitation (Time and Place)
4	Licence Plate
5	Vehicle (VIN) Chassis Number
6	Reserved for CEN/ISO
7	Freight Container Numbering
8	Tax Authority Code
9	Reserved for CEN/ISO
...	...
30	Reserved for CEN/ISO
31	Reserved for CEN/ISO (Extension)

4.6 Coding structure data elements (AVI/AEI applications)

Table 2 shows the seven defined CS in a short form table detailing the primitive elements (`UNIVERSAL TYPES`). The definitions are given in 4.7 and Annex C.

Table 2 — Minimum size of data elements

CSI	Length	Coding Structure Data Field			
1	7 Octets / 56 bits	Country Code	Issuer Identifier	Service Number	
		10	14	32	
2	6 Octets / 48 bits	Manufacturer Identifier	Service Number		
		16	32		
3	22 Octets / 176 bits	Start Time	Stop Time	Geographic Limit	Application Limit
		80	80	8	8
4	Variable	Country Code	Alphabet Indicator	Licence Plate Number	
		10	6	Not defined	
5	17 Octets / 136 bits	Vehicle Identification (Chassis) Number			
		136			
6	Variable	Reserved for CEN/ISO			
		Not defined			
7	93 bits	Freight Container Numbering			
		93			
8	Variable	Country Code	Tax Code		
		10	Not defined		

NOTE 1 The overhead of each coding structure data field is excluded from the table. The numbers of bits in the data fields are only indications when using PER as the coding rules.

NOTE 2 When the term “Service Number” is used in this International Standard, it indicates both “Service Code” and “Unique Number”.

4.7 CS1- AVI/AEI Numbering scheme

4.7.1 General requirements

This AVI/AEI numbering scheme provides an unambiguous identification element of 56 bits (PER encoding) to be held on the OBE. This data structure is designed to be used for simple AVI/AEI, and may also be used to form the AVI/AEI element of RTTT messages where AVI/AEI is a component.

Registration procedures including the structures that are with National Issuing Authorities are mandatory for this structure. Provisions for registration can be found in Annex A.

4.7.2 Data structure

4.7.2.1 Data structure elements

The format provides a “read only” On Board Equipment Permanent Code Mandatory Field providing specific adaptation to the requirements for AVI/AEI in the RTTT/ITS environment.

Operators who wish to provide additional data fields, of read only or read/write nature, can do so by adding additional ASN.1 identifier sets as described in Annex C.

4.7.2.2 ASN.1 Data type definitions

4.7.2.2.1 CS1 Definition

```
CS1::= SEQUENCE {
       countryCode            CountryCode,
       issuerIdentifier       IssuerIdentifier,
       serviceNumber          ServiceNumber
       }
```

4.7.2.2.2 CountryCode definition

```
CountryCode::= BIT STRING(Size(10))
```

Value assignment is done in accordance with ISO 3166-1 and by using the ITA.2 alphabet. For value assignment, please refer to: http://www.nen.nl/cen278/14816_NRAI_register_by_country.html.

4.7.2.2.3 IssuerIdentifier definition

```
IssuerIdentifier::= INTEGER(0 .. 16383)
```

See Annex A for registration.

4.7.2.2.4 ServiceNumber definition

```
ServiceNumber::= BIT STRING(Size(32))
```

4.8 CS2-Manufacturers numbering

4.8.1 General requirements

Manufacturers numbering enables manufacturers to provide, if they so choose, a numbering system that is independent of a particular country. It is expected that this numbering scheme will primarily be used as an electronic serial number in systems requiring direct knowledge of manufacturer and equipment versions (e.g. for QA/QC purposes). This number may also be used as a cryptographic hidden identity in systems with a combination of anonymity and strong security requirements.

The following structure details the content of the manufacturers numbering data “primitive” and is to be read in conjunction with the notes shown below the structure.

Registration procedures are similar to the procedures of CS1, with the exception that the structures are not registered with any National Issuing Authority. Provisions for registration can be found in Clause 5.

4.8.2 Data structure

4.8.2.1 Data structure elements

Operators who wish to provide additional data fields, of read only or read/write nature, can do so by adding additional ASN.1 identifier sets as described in Annex C.

4.8.2.2 Detailed data structure

The numbering scheme views the ID as a data element, and the common basic data structure is only a data identifier code.

The framework of this data structure, into which the manufacturers numbering data field fits, follows the principles defined in CS1 (AVI/AEI numbering scheme), and is applied in this structure as follows:

4.8.2.2.1 CS2 Definition

```
CS2::= SEQUENCE {
               issuerIdentifier   ManufacturerIdentifier,
               serviceNumber   ServiceNumber
       }
```

4.8.2.2.2 ManufacturerIdentifier definition

```
ManufacturerIdentifier::= INTEGER(0 .. 65535)
```

4.8.2.2.3 ServiceNumber definition

`ServiceNumber` is defined in 4.7.2.2.4.

4.9 CS3 – Validity limitation

4.9.1 General requirements

The validity limitation structure is a data element structure that specifies value(s) to provide limits, either in time, geography or application.

The time limitation provides a starting or issuing date/time group formatted according to a UNIVERSAL ASN.1 TYPE, and an expiration date/time group formatted the same way. This type is referenced to universal coordinated time (UTC, Z).

The geographical limitation restricts the use of the referenced number to the issuer area, district, country or continent. It shall use the bit field described in 4.9.2.3.1.

Application or service limitation is to restrict the type of service for which this validity limitation number is issued: post-payment, pre-payment, access control, fleet control, etc. The use of this parameter is valid for issuers providing more than one service, and for users that want to avoid responsibility for a certain set of these services. It shall use the bit field described in 4.9.2.3.2.

Registration procedures are not applicable in this case.

4.9.2 Data structure

4.9.2.1 Data structure elements

Operators who wish to provide additional data fields, of read only or read/write nature, can do so by adding additional ASN.1 identifier sets as described in an example of Annex C.

4.9.2.2 Detailed data structure

4.9.2.2.1 CS3 Definition

```
CS3::= SEQUENCE {
                startTime    StartTime,
                stopTime     StopTime,
                geographLimit      GeoGraphicalLimit,
                serviceAppLimit    ServiceApplicationLimit
        }
```

4.9.2.2.2 StartTime definition

```
StartTime::= UTCtime
```

Recommended format is YYMMDDhhmmZ.

NOTE Due care should be taken when implementing the applications to avoid the Year 2000 problems. As the century component (CC) is not transferred, its value is inferred from the value of the year component (YY) by e.g. the following rules:

— if 80 <= YY <= 99 then CC = 19;

— if 00 <= YY <= 50 then CC = 20.

4.9.2.3 StopTime definition

```
StopTime::= UTCtime
```

Recommended format is YYMMDDhhmmZ.

4.9.2.3.1 GeoGraphicalLimit definition

```
GeoGraphicalLimit::= BIT STRING {
       globalRestriction            (0),
       regionalRestriction          (1),
       nationalRestriction          (2),
       district                     (3),
       issuerCoverageRestriction    (4),
       reservedForCEN/ISO1          (5),
       reservedForCEN/ISO2          (6),
       issuerSpecificRestriction    (7)
   }
```

The restriction shall be active if bit position is set to 1_2. If all bits are 0_2, then there is no geographic restriction.

4.9.2.3.2 ServiceApplicationLimit definition

```
ServiceApplicationLimit::= BIT STRING {
              notForPostpayment            (0),
              notForPrepayment             (1),
              notForVehicleaccess          (2),
              notForFleetcontrol           (3),
              issuerSpecificRestriction1   (4),
              issuerSpecificRestriction2   (5),
              issuerSpecificRestriction3   (6),
              issuerSpecificRestriction4   (7)
}
```

The restriction shall be active if bit position is set to 1_2. If all bits are 0_2, then there is no restriction.

The lower order bits (0-3) are of a general nature and sets restrictions outside the area of the issuer. The higher order bits (4-7) are for specific limitations inside the operator area.

EXAMPLE The following lines and show how the Validity Limitation value may be encoded:

— Start/Issue Time : 93-01-01 (date), 12:00 (time);

— Stop/Expire Time : 94-12-31 (date), 23:59 (time);

— Geographical Limit : 01001011_2;

— Application Limit : 11111000_2.

NOTE The Z-indicator is not used.

Table 3 — Example of validity limitation encoding

Start//Issue Time	Stop//Expire Time	Geographic Limit	Application Limit
9301011200	9412312359	01001011_2	11111000_2

4.10 CS4 – Vehicle license number coding

4.10.1 General requirements

In some systems, there is a requirement to represent the vehicle licence plate number electronically. This must be achieved unambiguously, and as the licence numbers in different nations/states/countries may be the same, there is also a need to include a country identifier.

Because several nations/states/countries issue licence plates with non-Latin characters (such as Cyrillic or Greek) there is a need to identify which character set is used. These two requirements are combined in this CS4 vehicle licence number coding.

4.10.2 Data structure

4.10.2.1 Data structure elements

Authorities who wish to provide additional data fields, of read only or read/write nature, can do so by adding additional ASN.1 identifier sets as described in Annex C.

4.10.2.2 ASN.1 Data type specifications

4.10.2.2.1 CS4 Definition

```
CS4::= SEQUENCE {
countryCode CountryCode,
            alphabetIndicator AlphabetIndicator,
licPlateNumber OCTET STRING
}
```

4.10.2.2.2 CountryCode definition

`CountryCode` is defined in 4.7.2.2.2.

4.10.2.2.3 AlphabetIndicator definition

```
        AlphabetIndicator::= ENUMERATED {
              latinAlphabetNo1    (1), -- encoded as 00 00 00'B
              latinAlphabetNo2    (2), -- encoded as 00 00 01'B etc
              latinAlphabetNo3    (3),
              latinAlphabetNo4    (4),
              latinCyrillicAlphabet  (5),
              latinArabicAlphabet(6),
              latinGreekAlphabet  (7),
              latinHebrewAlphabet(8),
              latinAlphabetNo5    (9),
              latinAlphabetNo6    (10),
              twoOctetBMP         (11),
              fourOctetCanonical  (12),
              reservedForUse1     (13),
```

```
        reservedForUse2     (14),
        reservedForUse3     (15),
        reservedForUse4     (16),
        reservedForUse5     (17),
        reservedForUse6     (18),
        reservedForUse7     (19),
        reservedForUse8     (20),
        reservedForUse9     (21),
        reservedForUse10    (22),
        reservedForUse11    (23),
        reservedForUse12    (24),
        reservedForUse13    (25),
        reservedForUse14    (26),
        reservedForUse15    (27),
        reservedForUse16    (28),
        reservedForUse17    (29),
        reservedForUse18    (30),
        reservedForUse19    (31),
        reservedForUse20    (32),
        reservedForUse21    (33)
} -- 6 bits, latinAlphabetNo1 recommended -- ,
```

ISO/IEC 8859 parts 1 to 10 and ISO/IEC 10646-1 define the characters of the different alphabets included in the `AlphabetIndicator` type.

4.10.2.2.4 LicPlateNumber definition

```
LicPlateNumber::= OCTET STRING
```

`LicPlateNumber` is short form for License Plate Number.

4.11 CS5 – Vehicle Identification Number (VIN)

4.11.1 General requirements

The Vehicle Identification Number (VIN) defined in ISO 3779 and ISO 3780 is a structured combination of characters assigned to a vehicle by its manufacturer for identification purposes. The manufacturer is responsible for the uniqueness of the VIN.

The VIN defined in ISO 3779 and ISO 3780 shall consist of three sections: the World Manufacturer Identifier (WMI) section, the Vehicle Descriptor Section (VDS), and the Vehicle Indicator Section (VIS).

4.11.2 Data structure

4.11.2.1 Data structure elements

Operators who wish to provide additional data fields can do so by adding additional ASN.1 identifier sets as described in Annex C.

4.11.2.2 ASN.1 Data type specifications

The numbering scheme views the ID as a data element, and the common basic data structure is only a data identifier code.

4.11.2.2.1 CS5 Definition

```
CS5::= VISIBLE STRING
```

4.12 CS6 – Reserved for CEN/ISO

CS6 is reserved for future use in International Standards.

4.13 CS7 – Freight container numbering

4.13.1 General requirements

The freight container data shall be based on ISO 10374 and consist of the following:

— owner code, in accordance with ISO 6346;

— serial number, in accordance with ISO 6346;

— check digit, in accordance with ISO 6346;

— length (in centimetres);

— height (in centimetres);

— width (in centimetres);

— container type code, in accordance with ISO 6346;

— maximum gross mass (in hundreds of kilograms);

— tare mass (in hundreds of kilograms);

Where rounding is required, data shall be rounded down to the closest whole number allowed within the permitted bit space.

4.13.2 Data structure

4.13.2.1 Data structure elements

Operators who wish to provide additional data fields can do so by adding additional ASN.1 identifier sets as described in Annex C.

4.13.2.2 ASN.1 Data type definitions

4.13.2.2.1 CS7 Definition

```
CS7::= FreightContainerData
```

4.13.2.2.2 FreightContainerData definition

```
FreightContainerData::= SEQUENCE {
       OwnerCode            BIT STRING(SIZE(19)),       -- 19bits
       serialNumber         INTEGER(0 .. 1000000),      -- 20bits
       checkDigit           INTEGER(0 .. 10),           -- 4bits
       length               INTEGER(1 .. 2000),         -- 11bits
       height               INTEGER(1 .. 500),          -- 9bits
       width                INTEGER(200 .. 300),        -- 7bits
       containerTypeCode    INTEGER(0 .. 127),          -- 7bits
       maximumGrossMass     INTEGER(19 .. 500),         -- 9bits
       tareMass             INTEGER(0 .. 99)            -- 7bits
}
```

4.14 CS8 – Tax authority code

4.14.1 General requirements

The Tax Authority Code shall normally be used to determine an electronic vignette in licence, taxation and classification related applications. It shall normally be used in combination with CS3.

4.14.2 Data structure

4.14.2.1 Data structure elements

Authorities who wish to provide additional data fields such as CS3 can do so by adding additional ASN.1 identifier sets as described in the examples given in Annex C.

4.14.2.2 ASN.1 Data type definitions

4.14.2.2.1 CS8 Definition

```
CS8::= SEQUENCE {
       countryCode          CountryCode,
       taxCode              TaxCode
}
```

4.14.2.2.2 CountryCode definition

`CountryCode` is defined in 4.7.2.2.2.

4.14.2.2.3 TaxCode definition

```
TaxCode::= OCTET STRING
```

Annex A
(normative)

Management and general rules for the administration of coding structures CS1, CS2 and CS8

A.1 General rules

This annex describes the administration procedure for numbers issued under the coding structure for CS1, CS2 and CS8.

In order to ensure interoperability, it is essential that the coding structures defined in this International Standard be applied in a consistent manner. The structures of this International Standard are so constructed that they may be administered at a local level without danger of ambiguity of number series. In general terms, this allows the (political) principles of subsidiarity to be followed. However, there is a requirement for central maintenance of issuer identifiers. It is up to Nation States to determine which issuers will be authorized in respect of nationally determined schemes, and the role of the CRA shall be limited to registering such decisions.

Management procedures for the structures shall be minimized and shall be restricted to simple recording and registration of local systems.

The Central and all National Registration Authorities shall conform to all regional and national legislative requirements with respect to data protection and privacy within the domain of the scheme.

A.1.1 Registration hierarchy

Figure A.1 depicts the layout of the registration hierarchy.

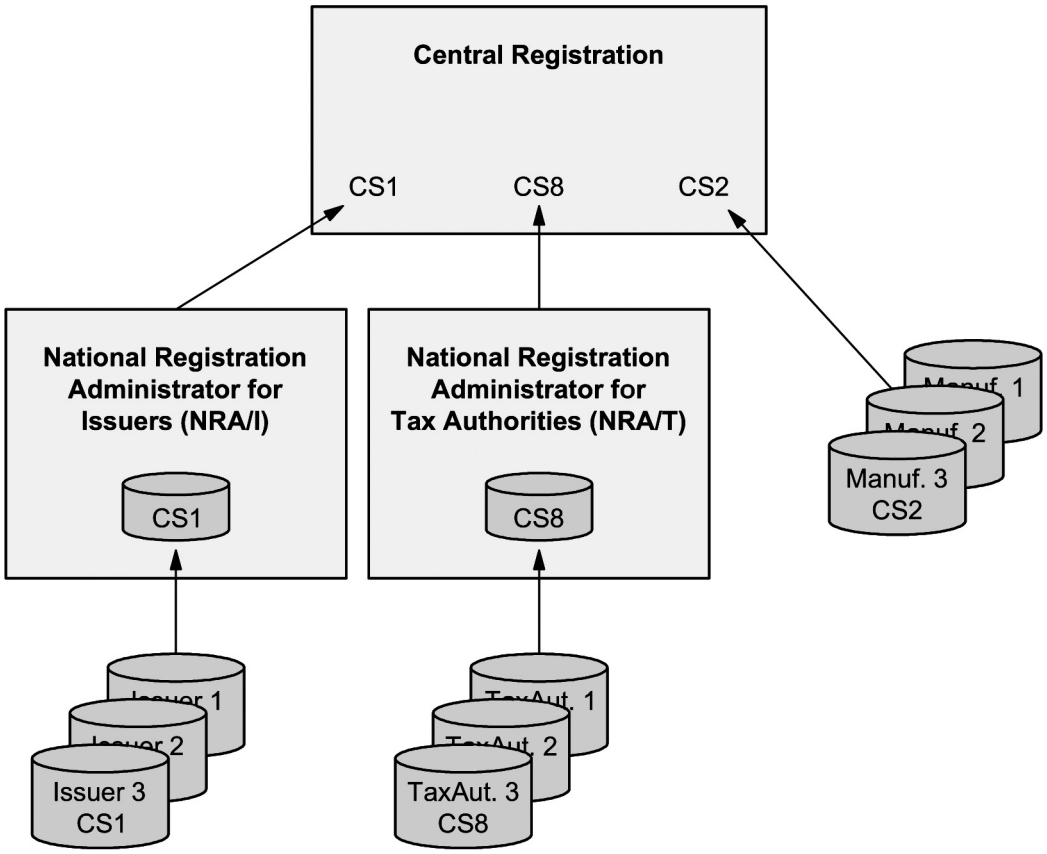

Figure A.1 — Layout of the registration hierarchy

A.1.2 Definition of actors

A.1.2.1 Central Registration Administrator (CRA)

A body which maintains the registers of National Registration Administrators (NRA/I and NRA/T), and the Register of Manufacturers. See A.1.3.

NOTE At the date of publication of this document, the ISO 14816 CRA was:

Nederlands Normalisatie-instituut (NEN)
P.O. Box 5059
NL-2600 GB Delft
The Netherlands

A.1.2.2 National Registration Administrator for Issuers (NRA/I)

A body appointed by the nation state to authorize CS1 issuers and to issue CS1 issuer identifiers at nation state level. NRA/I is registered by the CRA, and it is expected that this will normally be the national standardization body or its appointee.

A.1.2.3 Issuer

A body authorized by the NRA/I to issue a CS1 service code/unambiguous number and identified by a unique identifier (issuer identifier) within a country in accordance with this International Standard.

A.1.2.4 Issuer register

The NRA/I shall maintain a register of all issuers and structure details on a national level. The NRA/I shall provide a copy of its register of issuers at agreed intervals to the CRA, who shall maintain and make available a copy of the full register of issuers. The issuer register shall not contain any personal information.

A.1.2.5 National Registration Administration for Tax authorities (NRA/T)

A body appointed by the nation state to register tax authorities and issue CS8 tax authority identifiers at the national/federal level. NRA/T shall be registered by the CRA, and it is expected that it will normally be the national standardization body or the national tax authority.

A.1.2.6 Tax authority register

The NRA/T shall maintain a register of all issued tax authorities and their tax codes on a national level.

The NRA/T shall provide a copy of its register of tax authorities at agreed intervals to the CRA, which shall maintain and make available this register.

A tax authority may request several tax codes, which may be granted by the NRA/T.

NOTE It is recognized that the handling of taxation and its legislation is solely a nation state responsibility. A.3 and data type CS8 are therefore intentionally kept more open than CS1 and CS2. NRA/Ts are advised to adopt the parts of A.2 that apply in their case.

The terms may be understood as follows: A tax authority that together with the identification of (one of) its transport tax(es) is identified by a tax code. (The combination in one identifier is done to give maximal flexibility to nation states) See also the example under A.3.

A.1.3 Central Registration Administrator (CRA)

A.1.3.1 General

The Central Registration Administrator has been appointed in the first place by agreement of the plenary of the technical committees (ISO TC204 and CEN TC278) and any replacement shall be managed by the ISO Central Secretariat in accordance with ISO rules.

A.1.3.2 Responsibilities

The responsibilities of the CRA shall be:

a) to maintain a register of NRA/Is and NRA/Ts;

b) to compile, collate and issue a register of all NRA/I registers and to circulate a copy of this register to all NRA/Is in an agreed format;

c) to compile, collate and issue a register of all NRA/T registers and to circulate a copy of this register to all NRA/Ts in an agreed format;

d) to maintain a register of manufacturers according to the rules in A.4;

e) to keep CS1, CS2 and CS8 registers on a central level, and to make these registers available to the public. The preferred method would be free public Internet access.

NOTE The home page of the CRA is: http://www.nen.nl/cen278/14816main.html.

At this Web site, more information can be found and application forms can be downloaded.

A.2 Application and registration procedures for CS1: issuers

A.2.1 Issuer

A.2.1.1 Application procedure for assignment of an issuer identifier.

The “applicant” issuer shall apply in writing to its National Registration Administrator for Issuers (NRA/I) for the assignment of an issuer identifier. The NRA/I shall satisfy itself of the status of the applicant and shall assign an unused issuer identifier.

In unforeseen cases, an issuer may wish to appeal against the decision of its NRA/I. In this case, the issuer should lodge a written appeal with the CRA. The CRA shall immediately notify ISO/TC 204 of any appeal lodged. In cases where the CRA cannot solve the issue, it may request guidance from CEN/TC 278 or ISO/TC 204.

An issuer may request several Issuer Identifiers. This may be granted by the NRA/I. Each Issuer Identifier shall then be handled as belonging to a separate issuer.

The reuse of issued identifiers should be avoided, and in any case expired identifiers shall not be reused until 3 years after their expiration period.

A.2.1.2 Criteria for approval of an application for a CS1 Issuer Identifier

Applications for an Issuer Identifier shall meet the criteria for approval below:

a) The applicant shall be a single entity with a legal status.

b) The applicant shall use the Issuer Identifier for an agreed use within the intended scope.

c) The applicant shall pay any fees required by the NRA/I based on the guidelines in A.5

d) The Issuer Identifier shall only be issued by the NRA/I when there is expected to be an immediate use, or when the NRA/I considers that such requirement is imminent.

e) The NRA/I may request a national service code/unambiguous coding structure. The details that the NRA/I may request shall be the details of his local numbering sub structures within his service code/unambiguous number structure, but the unambiguous identification codes shall not be revealed to the NRA/I.

Multinational companies or similarly a group of mutually independent Issuers in several member countries may agree to form an alliance under a single entity to use a single issuer identification (CS1). Where such companies already hold an Issuer Identifier in one country, they may apply for the issue of a similar number in another country, which may be issued out of sequence, so long as that number is not already in use. Where the number is already in use, the applicant may request a new number in the first country, which may be granted at the discretion of the **NRA/I**.

A.2.1.3 Responsibilities of the issuer

The responsibilities of the issuer are the following:

a) to comply fully with the numbering system and the requirements of this International Standard and its annexes (An Issuer may not issue a number that has not been formally allocated to it by the relevant NRA/I.);

b) to retain the letter of authorization of its Issuer Identifier by the NRA/I;

c) to issue service codes/unambiguous numbers using the issuer identifier number assigned by the NRA/I, in accordance with the requirements of this International Standard;

d) to communicate to the NRA/I any proposed changes that would alter material facts contained within the original registration;

e) to keep a register of issued service codes/unambiguous numbers within the limits of its intended use, and to maintain such records in a secure place and in accordance with the requirements for data protection in the country/countries of their sphere of operation;

f) where the issuer is required to provide an anonymous mode, to maintain a service code/unambiguous coding structure that will enable this in an efficient manner;

g) to pay fees in accordance with agreements with the NRA/I based on the guidelines in A.5;

h) where the issuer wants to terminate the issuing operation, to give three months notice to the NRA/I.

All privacy related materials shall be destroyed in accordance with the requirements for data protection in the country/countries of their sphere of operation.

A.2.2 National Registration Administrator for Issuers (NRA/I)

A.2.2.1 Eligibility to become a National Registration Administrator for Issuers (NRA/I)

The NRA/I shall be a single entity designated in each country by the nation state authorities, usually the national standards authorities.

A.2.2.2 Resignation

If an NRA/I, which is not a standardization member body, finds it necessary to resign, six months notice in writing shall be given to the national standards body.

A.2.2.3 Non compliance

If the CRA has reasonable cause to believe that a NRA/I is not complying properly with the structure as defined in this International Standard, it shall provide formal notice in writing to the NRA/I and national authorities.

A.2.2.4 Responsibilities

The responsibilities of an NRA/I shall be:

a) to ensure that the application fully complies with the procedures for application laid down in this International Standard;

b) to verify that the applicant's use and service codes/unambiguous number structures comply with the scope of this International Standard;

c) to process, within 60 days of receipt of the application, the issuer identifiers, within their areas of responsibility;

d) to send notification to the applicant in writing, within the same period of 60 days of receipt of the application, as to the disposition of the application;

e) to assign an unambiguous issuer identifier to each approved issuer;

f) to maintain a register providing details of all registered issuers, together with their issuer identifier and summary of their structures;

g) to retain a copy of each application;

h) to provide an annual report of activity to the CRA, which shall include an up-to-date copy of their issuer register, and the number of applications for issuer, together with the number granted in the period; and

i) to respond to general enquiries related to this International Standard.

A.2.2.5 National register of issuers

A.2.2.5.1 Publication and availability

The NRA/I shall publish an issuer register. The register shall be published in both *numerical* (issuer identifier) and *alphabetical* (issuer name) order.

The final issue of unambiguous numbers shall remain private and shall not be declared to the NRA/I, and shall therefore not appear on any published register whatsoever.

The national register of issuers shall be a publicly available document. The register may be available at the cost of reproduction, or the NRA/I may choose to publish it on the Internet according to the provisions in A.5.

A.2.2.5.2 Contents

The CS1 issuer register shall contain the following information:

a) name of issuer;

b) address and communication address (e.g. telephone, fax, e-mail) of issuer and principal contacts within the organization as indicated in the application;

c) issuer identifier number assigned to the issuer by the NRA/I;

d) date of issuing and date of end of issuing, if any;

e) for each issuer, a summary of its service codes/unambiguous numbers and substructures, if applicable.

A.3 Application and registration procedures for CS8: tax codes

A.3.1 National Registration Administrator for Tax authorities (NRA/T)

A.3.1.1 Eligibility to become a National Registration Administrator for Tax authorities (NRA/T)

The NRA/T shall be a single entity designated in each country by the nation state authorities.

NOTE It is recognized that the handling of taxation and its legislation is solely a nation state responsibility. Section A.3 and data type CS8 are therefore intentionally kept more open than CS1 and CS2. NRA/Ts are advised to adopt the parts of A.2 that apply in their case.

The terms may be understood as follows: A tax authority that together with the identification of (one of) its transport tax(es) is identified by a tax code. (The combination in one identifier is done to give maximal flexibility to nation states) See also the example under A.3.

A.3.1.2 Resignation

If an NRA/T finds it necessary to resign, six months notice in writing shall be given to the national standards body.

A.3.1.3 Responsibilities

The responsibilities of a NRA/T shall be:

a) to decide and register the national tax code structure, i.e. the number of tax authorities in this nation state, and the range of tax identities that each tax authority will use;

b) to assign an unambiguous tax authority identity to each relevant national tax authority in accordance with this International Standard;

c) to maintain a register providing details of all registered tax authorities; and

d) to respond to general enquiries related to this International Standard.

A.3.1.4 National register of tax authorities

A.3.1.4.1 Publication and availability

The NRA/T shall publish a tax authority register. The register shall be published in both numerical (tax code) and alphabetical (tax authority name) order. The national register of tax codes shall be a publicly available document. The register may be available at the cost of reproduction, or the NRA/T may choose to publish it on the Internet according to the provisions in A.6.

A.3.1.4.2 Contents

The tax authority register shall contain the following information:

a) name of the tax authority;

b) address and communication address (e.g. telephone, fax, e-mail) of the tax authority and principal contacts within the organization as indicated in the application;

c) tax code assigned to the tax authority by the NRA/T; and

d) date of issuing and date of end of issuing, if any.

A.3.1.5 Tax authorities

The nation state authorities designate the tax authorities. The tax authorities issue tax identities to the individual taxed objects according to the national rules laid out by the NRA/T.

A tax authority may request several tax codes. This may be granted by the NRA/T. Each tax code shall then be handled as belonging to a separate tax authority.

The reuse of issued codes should be avoided, and in any case expired codes shall not be reused until 3 years after their expiration period.

EXAMPLE The described TaxCode structure applies mainly in situations where a nation state has several tax authorities, for example in different states.

In other situations the tax authorities and NRA/T may be one and the same entity. Their role would then be to issue electronic vignette codes to vehicles for national tax purposes. In this case, the TaxCode data type would only contain individual tax identities. It is strongly recommended that the TaxCode contains both the national tax authority identifier and any individual electronic vignette ID. This electronic vignette would then typically contain the following data:

```
TaxVignette::= SEQUENCE {

CS8::= SEQUENCE {
     countryCode          CountryCode,   -- ISO 3166-1 2 char alpha
     taxCode              TaxCode         --Tax Authority
                                          --Identifier and
                                          --Individual vignette ID
}
CS3::= SEQUENCE {
     startTime            StartTime,           --YYMMDDhhmmZ
     stopTime             StopTime,            --YYMMDDhhmmZ
     geographLimit        GeoGraphicalLimit,
     serviceAppLimit      ServiceApplicationLimit
}}
```

A.4 Application and registration procedures for CS 2: manufacturers

A.4.1 Application procedure for assignment of a manufacturer identifier

The application procedure for assignment of a manufacturer identifier is as follows:

1. The “applicant” manufacturer shall apply in writing to the CRA for the assignment of a manufacturer identifier.

2. The CRA shall assign an unused manufacturer identifier to any company or organization that fulfils the criteria in A.4.2.

3. In unforeseen cases, there may be a need for a manufacturer to consult ISO/TC 204 as an appeal procedure against the decision of the CRA. In this case, the consulting party shall make a written request for clarification to the TC Chairman, with copy to the Secretariat. The TC Chairman may then delegate the resolution of this request to the relevant Working Group.

4. A manufacturer may request several manufacturer identifiers. This may be granted by the CRA. Each manufacturer identifier shall then be handled as belonging to a separate manufacturer.

5. The reuse of issued manufacturer identifiers should be avoided, and in any case expired manufacturer identifiers shall not be reused until 3 years after their expiration period.

A.4.2 Criteria for approval of an application for an manufacturer identifier

Applications for a manufacturer identifier shall meet the criteria for approval below:

a) The applicant shall be a single entity with a legal status.

b) The applicant shall use the manufacturer identifier for an agreed use within the intended scope.

c) The applicant shall pay any fees required by the CRA according to the rules in A.5.

A.4.3 Responsibilities of the manufacturer

The responsibilities of the manufacturer are:

a) to comply fully with the numbering system and the requirements of this International Standard and its annexes (A manufacturer may not issue a number that has not been formally allocated to it by the CRA.);

b) to retain the letter of authorization of its manufacturer identifier by the CRA;

c) to issue service codes/unambiguous numbers using the manufacturer identifier number assigned to itself by the CRA, in accordance with the requirements of this International Standard;

d) to communicate to the CRA any proposed changes that would alter material facts contained within the original registration;

e) to keep a register of issued service codes/unambiguous numbers within the limits of its intended use, and to maintain such records in a secure place in accordance with the requirements for data protection in the country/countries where the register is maintained;

f) to pay fees in accordance with agreements with the CRA based on the guidelines in A.5.

A.4.4 Responsibilities CRA for manufacturer register

The responsibilities of a CRA shall be:

a) to ensure that the application fully complies with the procedures for application for manufacturer identifier in this International Standard;

b) to verify that the applicant's use of service codes/unambiguous coding structures complies with the scope of this International Standard;

c) to process, within 60 days of receipt of the applications, applications for a manufacturer identifier;

d) to send notification to the applicants in writing, within the same period of 60 days of receipt of the application, as to the disposition of their application;

e) to assign an unambiguous manufacturer identifier to each approved manufacturer;

f) to maintain a register providing details of all registered manufacturers, together with their manufacturer identifier;

g) to retain a copy of each application; and

h) to respond to general enquiries covering this International Standard.

A.4.5 Register of manufacturers

A.4.5.1 Publication and availability

The CRA shall publish a manufacturer register. The register shall be published in both numerical (manufacturer identifier) and alphabetical (manufacturer name) order.

The final issue of service codes/unambiguous numbers shall remain private and shall not be declared to the CRA and shall therefore not appear on any published register whatsoever.

The register of manufacturers shall be a publicly available document. The register may be available at the cost of reproduction, or the CRA may choose to publish it on the Internet according to the provisions in A.3.

A.4.5.2 Contents

The manufacturer register shall contain the following information:

a) name of manufacturer;

b) address and communication address (e.g. telephone, fax, e-mail) of the manufacturer and principal contacts within its organization;

c) manufacturer identifier assigned to the manufacturer by the CRA;

d) date of issuing and date of end of issuing, if any.

A.5 Cost aspects

The cost of the entire registration procedure shall be recovered on the basis of nominal cost. An issuer shall pay a registration fee and an annual renewal fee to its NRA (or CRA, in case of CS2). The NRA shall pay a fee to the CRA. The fee structure shall be determined locally. The registration fees may be set to cover a free public Internet access to the NRA/CRA registry. The charges for issuing of documents shall be at the cost recovery basis.

A.6 Disclaimer

The following declaration by the registration administrator should be used to protect its position against possible misuse of the coding structure by bodies outside its control.

A similar declaration replacing *issuer* with *manufacturer* or *tax authority* should be made for CS2 and CS8.

"IMPORTANT INFORMATION REGARDING YOUR NUMBER ASSIGNMENT"

This number is issued with the understanding that it will be used in accordance with the requirements in ISO 14814 and ISO 14816. It should be understood that in assigning an identifier in response to your application, the National Registration Administrator (NRA) is designating the assigned number as identifying the organization specified as an "issuer" as described in ISO 14816.

The use of this number or any other number by a party that chooses not to comply with the provisions of ISO 14814 and ISO 14816 with or without the knowledge of the NRA is beyond the control of the NRA. Therefore, the NRA cannot guarantee the sole and unambiguous use of this identifier to your organization.

The operation of the NRA is a voluntary non-profit service to issuers complying with ISO 14816 and its success depends, in part, on the co-operation of issuers. The NRA will not be held financially liable for errors in the registration, reservation or assignment of any issuer identifier or the publication of those identifiers and the names and addresses of the parties to which they are assigned.

Annex B
(normative)

A summary of CS definitions

According to advice from ISO/IEC 8824, and in order to make the coding structures defined within this document valid for use in other RTTT/ITS application standards, the definitions below shall be their reference.

```
AVIAEINumberingAndDataStructures {iso(1) standard(0) iso14816(14816) } AUTOMATIC
TAGS DEFINITIONS::= BEGIN
--EXPORTS everything;

        CS1::= SEQUENCE {
                CountryCode             CountryCode,
                issuerIdentifier        IssuerIdentifier,
                serviceNumber           ServiceNumber
        }

        CS2::= SEQUENCE {
                IssuerIdentifier        ManufacturerIdentifier,
                serviceNumber           ServiceNumber
         }

       CS3::= SEQUENCE {
                startTime               StartTime,              --YYMMDDhhmmZ
                stopTime                StopTime,               --YYMMDDhhmmZ
                geographLimit           GeoGraphicalLimit,
                serviceAppLimit         ServiceApplicationLimit
       }

       CS4::= SEQUENCE {
                countryCode CountryCode,
             alphabetIndicator AlphabetIndicator,
             licPlateNumber OCTET STRING
       }

       CS5::= VisibleString
```

```
CS7::= FreightContainerData::= SEQUENCE {
        ownerCode             BIT STRING(SIZE(19)),       -- 19bits
        serialNumber          INTEGER(0 .. 1000000),      -- 20bits
        checkDigit            INTEGER(0 .. 10),           -- 4bits
        length                INTEGER(1 .. 2000),         -- 11bits
        height                INTEGER(1 .. 500),          -- 9bits
        width                 INTEGER(200 .. 300),        -- 7bits
        containerTypeCode     INTEGER(0 .. 127),          -- 7bits
        maximumGrossMass      INTEGER(19 .. 500),         -- 9bits
        tareMass              INTEGER(0 .. 99)            -- 7bits
}

CS8::= SEQUENCE {
        countryCode            CountryCode,
        taxCode               TaxCode
}

CountryCode::= BIT STRING(SIZE(10))
```

Value assignment is done in accordance with ISO 3166-1 and by using the ITA.2 alphabet. For value assignment, please refer to: http://www.nen.nl/cen278/14816_NRAI_register_by_country.html.

```
IssuerIdentifier::= INTEGER(0 .. 16383)

ManufacturerIdentifier::= INTEGER(0 .. 65535)

LicPlateNumber::= OCTET STRING

ServiceNumber::= BIT STRING(SIZE(32))

TaxCode::= OCTET STRING

AlphabetIndicator::= ENUMERATED {
        latinAlphabetNo1    (1), -- encoded as 00 00 00'B
        latinAlphabetNo2    (2), -- encoded as 00 00 01'B etc
        latinAlphabetNo3    (3),
        latinAlphabetNo4    (4),
        latinCyrillicAlphabet  (5),
        latinArabicAlphabet (6),
        latinGreekAlphabet  (7),
        latinHebrewAlphabet (8),
        latinAlphabetNo5    (9),
```

```
        latinAlphabetNo6    (10),
        twoOctetBMP         (11),
        fourOctetCanonical  (12),
        reservedForUse1     (13),
        reservedForUse2     (14),
        reservedForUse3     (15),
        reservedForUse4     (16),
        reservedForUse5     (17),
        reservedForUse6     (18),
        reservedForUse7     (19),
        reservedForUse8     (20),
        reservedForUse9     (21),
        reservedForUse10    (22),
        reservedForUse11    (23),
        reservedForUse12    (24),
        reservedForUse13    (25),
        reservedForUse14    (26),
        reservedForUse15    (27),
        reservedForUse16    (28),
        reservedForUse17    (29),
        reservedForUse18    (30),
        reservedForUse19    (31),
        reservedForUse20    (32),
        reservedForUse21    (33)
 } -- 6 bits, latinAlphabetNo1 recommended -- ,

StartTime::= UTCTime    --Recommended format is YYMMDDhhmmZ

StopTime::= UTCTime --Recommended format is YYMMDDhhmmZ

GeoGraphicalLimit::= BIT STRING {
        globalRestriction                (0),
        regionalRestriction              (1),
        nationalRestriction              (2),
        district                         (3),
        issuerCoverageRestriction        (4),
        reservedForCEN1                  (5),
        reservedForCEN2                  (6),
        issuerSpecificRestriction        (7)
}
```

```
        ServiceApplicationLimit::= BIT STRING {
                notForPostpayment             (0),
                notForPrepayment              (1),
                notForVehicleaccess           (2),
                notForFleetcontrol            (3),
                issuerSpecificRestriction1    (4),
                issuerSpecificRestriction2    (5),
                issuerSpecificRestriction3    (6),
                issuerSpecificRestriction4    (7)
        }
END
```

Where there is a need for the first three coding structures (CS1, CS2 and CS3) defined within this International Standard or in another RTTT/ITS application standard, the formal ASN.1 syntax needed for including the AVI/AEI coding structures to this RTTT/ITS application standard shall be as follows:

```
IMPORTS CS1, CS2, CS3, ManufacturerIdentifier FROM
AVIAEINumberingAndDataStructures;
```

NOTE the UNIVERSAL CLASS elements such as `ManufacturerIdentifier` can be imported without an explicit `EXPORT` in this document.

Annex C
(informative)

Examples on the use of AVI/AEI coding structures

C.1 ASN.1 Introduction and general explanation

Abstract Syntax Notation One (ASN.1) is a data specification language and is standardized in ISO/IEC 8824 parts 1 through 4. ASN.1 allows unambiguous specification of complex data structures, including those with variable-length fields, optional fields and recursion.

ASN.1 comprises a set of data types, notably ASN.1 types. Examples of such types are the BOOLEAN type, the BIT STRING type, the INTEGER type, the OBJECT IDENTIFIER type, the OCTET STRING type and the SEQUENCE type.

ASN.1 comprises a specification language, which is a set of rules of how to specify the types by means of syntax and semantics. This also includes a set of reserved words. In ASN.1, a “module” is a basic building block that all ASN.1 specifications employ. Moreover, the ASN.1 module is a collection of types, values and other items that can be defined in ASN.1, grouped together because they are somehow logically related. The ASN.1 module can include an unambiguous identifier such that referencing the module by other modules is made possible. This identifier is an OBJECT IDENTIFIER type.

All specifications developed using ASN.1 must conform to the ASN.1 syntax and semantics in ISO/IEC 8824 in order to be used in real systems. ASN.1 syntax checkers can ease this conformity process.

The ASN.1 types are transformed into programming language types in order to be applied in a computer environment. ASN.1 compilers can be used to automatically transform ASN.1 type definitions into the data representation of various programming languages, such as C, C++, Java and Pascal.

Before types can be transferred between communicating entities, the types need to be encoded by the transmitter and decoded by the receiver. The encoding and decoding is covered in other International Standards, notably ISO/IEC 8825-1 (Basic Encoding Rules or BER) and ISO/IEC 8825-2 (Packed Encoding Rules or PER). BER may allow data to be decoded by systems that have general knowledge of ASN.1 but do not know the details of the specification used to form the data. In other words, the data types are encoded along with the data values. PER is much more efficient, since only data values are encoded and the coding is designed with very little redundancy. This method can be used when both the transmitter and the receiver expect data to adhere to a known structure.

The encoding and decoding routines for the ASN.1 types must be implemented in a programming language, as must the target of the ASN.1 compilers.

This International Standard enables the use of the PER. Since both sides of a call know that messages will conform to this International Standard, it is not necessary to encode that specification into the messages.

C.2 RTTT examples

C.2.1 Example 1: An ASN.1 module with CS 2: AVI/AEI manufacturer ID

```
Example1Module DEFINITIONS::= BEGIN

IMPORTS CS2 FROM WG12CodingStructures;
CodingScheme  CS2
END

value CodingScheme::= { '8AE'H 'AB4130'H}
```

Table C.1 — Encoding of CS2 using BER

CodingScheme		
Element	**Value**	**Binary representation**
Identifier	'30'H	00110000
Length	'0A'H	00001010
Identifier	'02'H	00000010
Length	'02'H	00000010
Manufacturer ID	'08AE'H	0000100010101110
Identifier	'01'H	00000001
Length	'20'H	00100000
Service Number	'00AB4130'H	00000000101010110100000100110000

Table C.2 — Encoding of CS2 using PER octet aligned

CodingScheme		
Element	**Value**	**Binary representation**
Manufacturer ID	'08AE'H	0000100010101110
Service Number	'00AB4130'H	00000000101010110100000100110000

C.2.2 Example 2: Combination of CS2 and CS3 with optional coding

This example demonstrates how the manufacturer identifier and service limitation can be combined into one ASN.1 message. Please note that the time format in UTCTime type allows for precision within a second, which is shown in the example.

```
Example2Module DEFINITIONS::= BEGIN

IMPORTS CS2 CS3 FROM WG12CodingStructures;
CodingScheme ::= SEQUENCE {
    cs2 CS2 OPTIONAL,
    cs3 CS3 OPTIONAL
}
END
```

The value is assigned to the coding scheme as follows:

```
value CodingScheme::=
{
        cs2
        {
                issuerIdentifier 8898,
                serviceNumber '30323334'H
        },
```

```
        cs3
        {
                startTime "970101000000Z",
                stopTime "971231235900Z",
                geographLimit '80'H,
                serviceAppLimit '80'H
        }
}
```

C.2.2.1 Encoding of example 2 using BER definite length

```
Hexadecimal view:
3031300B 020222C2 03050030 32333430 22170B39 37303130 31303030 305A170B
39373132 33313233 35395A03 02008003 020080

Binary view:
00110000 00110001 01100000 00001011 00000010 00000010 00100010 11000010
00000011 00000101 00000000 00110000 00110010 00110011 00110100 00110000
00100010 00010111 00001011 00111001 00110111 00110000 00110001 00110000
00110001 00110000 00110000 00110000 00110000 01011010 00010111 00001011
00111001 00110111 00110001 00110010 00110011 00110001 00110010 00110011
00110101 00111001 01011010 00000011 00000010 00000000 10000000 00000011
00000010 00000000 10000000
```

C.2.2.2 Encoding of example 2 using PER octet aligned

```
Hexadecimal view:
C022C230 3233340D 39373031 30313030 30303030 5A0D3937 31323331 32333539
30305A01 800180

Binary view:
11000000 00100010 11000010 00110000 00110010 00110011 00110100 00001101 00111001
00110111 00110000 00110001 00110000 00110001 00110000 00110000
00110000 00110000 00110000 00110000 01011010 00001101 00111001 00110111
00110001 00110010 00110011 00110001 00110010 00110011 00110101 00111001
00110000 00110000 01011010 00000001 10000000 00000001 10000000
```

C.2.3 Example 3: Combination of CS2 and data not defined as ASN.1 types

The example below comprises an ASN.1 module, which illustrates that both ASN.1 types and non-ASN.1 types may be combined in the same module. This example also includes how the encoding may be for specific values of the different ASN.1 types and non-ASN.1 types.

```
ITS DEFINITIONS::= BEGIN
EXPORTS ITSMessage;
IMPORTS CS1, CS2, CS3, CS4, CS5 FROM iso14816;
CS::= CHOICE {
 cs1 CS1,
 cs2 CS2,
 cs3 CS3,
 cs4 CS4,
 cs5 CS5,
 ...
}
```

```
UsefulType::= CHOICE {
        smallint[0]INTEGER(0 .. 255),
        cs   [1]CS
}

interIndustryDataObjectId OBJECT IDENTIFIER::= { iso (1) standard (0) 7816 part6 (6) }

edifactmsg0 OBJECT IDENTIFIER::= {iso (1) identified-organization (3) edifactboard (5) msg0 (0)}
edifactmsg1 OBJECT IDENTIFIER::= {iso (1) identified-organization (3) edifactboard (5) msg1 (1)}

EDIFACTMSG0           TYPE-IDENTIFIER::= {{OCTET STRING IDENTIFIED BY edifactmsg0}}
EDIFACTMSG1           TYPE-IDENTIFIER::= {{BIT STRING IDENTIFIED BY edifactmsg1}}
INTERINDUSTRYDO       TYPE-IDENTIFIER::= {{OCTET STRING IDENTIFIED BY interIndustryDataObjectId}}

OBJSET  TYPE-IDENTIFIER::= { EDIFACTMSG0 | EDIFACTMSG1 | INTERINDUSTRYDO }

ITSMessage::= CHOICE {
    usefulType   [0]UsefulType,
    anObject     [1]INSTANCE OF TYPE-IDENTIFIER({OBJSET})
}

END
```

From this module the resulting encoding is included for the three different types (smallint, cs: CS2 and edifactmsg0) in the encoding examples below.

C.2.3.1 Encoding example of small integer

The ITS message is a small integer, “smallint” as defined in the module above. It is assigned the value 10.

```
value ITSMessage::= usefulType: smallint: 10
```

C.2.3.1.1 BER DEFINITE-Length Encoding

```
ITSMessage CHOICE
 usefulType: tag = [0] constructed; length = 5
  UsefulType CHOICE
   smallint: tag = [0] constructed; length = 3
    INTEGER: tag = [UNIVERSAL 2] primitive; length = 1
     10

Hexadecimal Representation (length of 7 octets):
A005A003 02010A

Binary Representation (length of 7 octets):
10100000 00000101 10100000 00000011 00000010 00000001 00001010
```

C.2.3.1.2 PER ALIGNED Encoding

```
ITSMessage CHOICE [index = 0]
 usefulType UsefulType CHOICE [index = 0]
  smallint INTEGER [length (not encoded) = 1.0]
   10
Total PDV length = 2.0

Hexadecimal Representation (length of 2 octets):
000A

Binary Representation (length of 2 octets):
00000000 00001010
```

C.2.3.2 Encoding example of CS2

The ITS message is CS2 as defined in ISO 14816, and comprises a structure of the manufacturer identifier (1000) and a service number (825373492 = '31323334'H).

```
value ITSMessage::= usefulType: cs: cs2:
   {
    issuerIdentifier 1000,
    serviceNumber '31323334'H
   }
```

C.2.3.2.1 BER DEFINITE-Length Encoding

```
ITSMessage CHOICE
 usefulType: tag = [0] constructed; length = 15
  UsefulType CHOICE
   cs: tag = [1] constructed; length = 13
    CS CHOICE
     cs2 CS2 SEQUENCE: tag = [UNIVERSAL 16] constructed; length = 11
      issuerIdentifier ManufacturerIdentifier INTEGER: tag = [UNIVERSAL 2] primitive;length= 2
       1000
      serviceNumber ServiceNumber BIT STRING: tag = [UNIVERSAL 3] primitive; length = 5
       0x0031323334

Hexadecimal Representation (length of 17 octets):
A00FA10D 300B0202
03E80305 00313233 34

Binary Representation (length of 17 octets):
10100000 00001111 10100001 00001101 00110000 00001011 00000010 00000010
00000011 11101000 00000011 00000101 00000000 00110001 00110010 00110011 00110100
```

C.2.3.2.2 PER ALIGNED Encoding

```
ITSMessage CHOICE [index = 0]
 usefulType UsefulType CHOICE [index = 1]
  cs CS CHOICE [index = 1]
   cs2 CS2 SEQUENCE [fieldcount (not encoded) = 2]
    issuerIdentifier ManufacturerIdentifier INTEGER [length (not encoded) = 2.0]
     1000
    serviceNumber ServiceNumber BIT STRING [length (not encoded) = 4.0]
     0x31323334
Total PDV length = 7.0

Hexadecimal Representation (length of 7 octets):
4403E831 323334

Binary Representation (length of 7 octets):
01000100 00000011 11101000 00110001 00110010 00110011 00110100
```

C.2.3.3 Encoding example of edifactmsg0

The ITS message is a fictitious edifact message named "edifactmsg0" comprising the value "ABCDEF".

```
value ITSMessage::= anObject:
 {
  type-id { 1 3 5 0 },
  value '414243444546'H
 }
```

C.2.3.3.1 BER DEFINITE-Length Encoding

```
ITSMessage CHOICE
 anObject: tag = [1] constructed; length = 15
  SEQUENCE: tag = [UNIVERSAL 8] constructed; length = 13
   type-id OBJECT IDENTIFIER: tag = [UNIVERSAL 6] primitive; length = 3
    { 1 3 5 0 }
  value: tag = [0] constructed; length = 6
   OpenType
    0x414243444546

Hexadecimal Representation (length of 17 octets):
A10F280D 06032B05
00A00641 42434445 46

Binary Representation (length of 17 octets):
10100001 00001111 00101000 00001101 00000110 00000011 00101011 00000101
00000000 10100000 00000110 01000001 01000010 01000011 01000100 01000101 01000110
```

C.2.3.3.2 PER ALIGNED Encoding

```
ITSMessage CHOICE [index = 1]
 anObject SEQUENCE [fieldcount (not encoded) = 2]
  type-id OBJECT IDENTIFIER [length = 3.0]
   { 1 3 5 0 }
  value OpenType [length = 6.0]
   0x414243444546
Total PDV length = 12.0

Hexadecimal Representation (length of 12 octets):
80032B05 00064142
43444546

Binary Representation (length of 12 octets):
10000000 00000011 00101011 00000101 00000000 00000110 01000001 01000010
01000011 01000100 01000101 01000110
```

C.3 Encoding of country codes

Table C.3 is a transcription from ITU-T Recommendation S.1, *Telegraphy — Alphabetical telegraph terminal equipment — International telegraph alphabet No. 2*, commonly known as the “ITA-2 alphabet”.

Table C.3 — ITA-2 alphabet

A	11000	N	00110
B	10011	O	00011
C	01110	P	01101
D	10010	Q	11101
E	10000	R	01010
F	10110	S	10100
G	01011	T	00001
H	00101	U	11100
I	01100	V	01111
J	11010	W	11001
K	11110	X	10111
L	01001	Y	10101
M	00111	Z	10001

Table C.4 shows a few selected country codes from ISO 3166-1 with their ITA-2 binary encoding.

Table C.4 — Examples of binary country encoding

Country short name	ISO 3166-1 Alpha 2 code	ITA2 Binary Encoding
Austria	AT	11000 00001
Belgium	BE	10011 10000
Burkina Faso	BF	10011 10110
Czech Republic	CZ	01110 10001
India	IN	01100 00110
Japan	JP	11010 01101

Bibliography

ISO/IEC 8824-2:1998, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 2: Information object specification*

ISO/IEC 8824-3:1998, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 3: Constraint specification*

ISO/IEC 8824-4:1998, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 4: Parameterization of ASN.1 specifications*

ITU-T Recommendation S.1, *Telegraphy — Alphabetical telegraph terminal equipment — International telegraph alphabet No. 2*

ICS 03.220.20; 35.240.60

Price based on 35 pages