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**Transport information and control  
systems — Requirements for an ITS/TICS  
central Data Registry and ITS/TICS Data  
Dictionaries**

*Systèmes d'information et de commande des transports — Exigences  
pour un registre de données central ITS/TICS et pour les dictionnaires  
de données ITS/TICS*

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# Contents

Page

Foreword .....	v
Introduction .....	vi
0.1 Background .....	vi
0.2 Document overview .....	vii
1 Scope.....	1
2 Conformance .....	1
2.1 Conformance considerations .....	1
2.2 Strictly conforming implementations .....	2
2.3 Conforming implementations .....	2
3 Normative references .....	2
4 Terms and definitions.....	2
5 Symbols and abbreviated terms.....	5
6 Concept of operation .....	6
6.1 Summary .....	6
6.2 Framework .....	7
6.3 Organizational roles .....	8
6.4 Registration status levels .....	10
6.5 Procedures .....	11
6.6 Version control.....	12
7 Data concepts.....	12
7.1 Summary of data concepts .....	12
7.2 Interface dialogue .....	14
7.3 Message .....	14
7.4 Data frame.....	14
7.5 Object class .....	14
7.6 Association .....	14
7.7 Property.....	15
7.8 Data element concept.....	15
7.9 Value domain.....	15
7.10 Data element.....	15
8 Data concept meta attributes.....	15
8.1 Basic meta attributes of data concepts .....	15
8.2 Administrative meta attributes .....	17
9 Data concept names .....	18
9.1 Descriptive names .....	18
9.2 Data concept descriptive name formats.....	18
10 Meta attribute requirements for ITS/TICS data concepts.....	19
11 International relationships .....	19
Annex A (informative) ITS/TICS functional operating procedures .....	21
Annex B (normative) Contents of the ITS/TICS Data Registry and ITS/TICS Data Dictionaries: Meta attribute definitions .....	37
Annex C (normative) Contents of the ITS/TICS Data Registry and ITS/TICS Data Dictionaries: Meta attribute requirements for data concepts.....	51

<b>Annex D (normative) Data concept names.....</b>	<b>60</b>
<b>Annex E (informative) Data representation in an information model .....</b>	<b>66</b>
<b>Annex F (informative) ASN.1 information object specification for an ITS/TICS data concept.....</b>	<b>75</b>
<b>Bibliography.....</b>	<b>91</b>

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## Foreword

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

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

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

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

ISO 14817 was prepared by Technical Committee ISO/TC 204, *Transport information and control systems*.

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## Introduction

### 0.1 Background

This International Standard has been developed by ISO/TC 204/WG 1, *Architecture*, in order to provide a framework for the documentation and registration of data that passes through system interfaces within the Intelligent Transport System / Transport Information and Control Systems (ITS/TICS) domain.

The International Standard is designed to maximize interoperability and facilitate information reuse.

This International Standard defines the registration process for ITS/TICS. It further defines the Data Dictionary and the Data Registry content and Data Registry management procedures.

#### Vision statement

This International Standard envisions common use and maximum interoperability of data within the ITS/TICS sector by the creation and maintenance of an ITS/TICS Data Registry, supported by interface and application specific ITS/TICS Data Dictionaries, created and maintained in a common and interoperable form, and to ensure the minimization of duplication by clear rules for data concept definition and Data Registry management.

#### Mission statement

The mission is to develop a standard to define the principles and concepts; scope; field of application; rules and procedures; definition and concept of operation for a central ITS/TICS Data Registry and ITS/TICS functional Data Dictionaries; and to make provision for the migration of data from ITS/TICS functional Data Dictionaries to the central Registry so as to maximize interoperability and minimize proliferation of similar (but inconsistently defined) data entries.

This International Standard defines the framework, formats, and procedures used to define information and information exchanges within the ITS/TICS sector. The standard is designed to be used by the ITS/TICS community at large, but should be of special interest to application developers, equipment providers, and Data Registry managers.

This International Standard specifies a set of meta attributes for ITS/TICS Data Dictionaries, as well as associated conventions and schemes, that enables the description, standardization and management of all exchanged ITS/TICS data. Through consistent use of these common structures and associated conventions and schemes, interchange of data and information among the various ITS/TICS functional subsystems via their specific application systems can be maximized. This International Standard also supports reuse of data elements and other data concepts across various ITS/TICS functional subsystems and their specific application systems

The Data Registry process defined within this International Standard is consistent with implementation(s) of the ISO ITS/TICS System Architecture defined in the ISO 14813 Standardization deliverables, particularly ISO 14813 Parts 2 and 3. This does not preclude the application of the Data Registry using alternative International, Regional or National System Architecture methodologies or techniques, indeed, a common Data Registry will ease migration and interoperability between such approaches.

The ITS/TICS data concepts that populate the ITS/TICS Data Registry may originate from a Computer-Aided Software Engineering (CASE) tool implementation of the ISO 14813 TICS Reference Architecture, from International Standards for ITS, from National implementations for ITS, or from the submission by relevant users. Data Dictionary entries are not limited to those generated by object oriented methodologies.

## 0.2 Document overview

This clause provides an overview of this International Standard. Clause 1 identifies the scope of this International Standard. Clause 2 identifies requirements for conformance to this International Standard. Clause 3 identifies references required for proper implementation of this International Standard. Clause 4 defines terms used in this International Standard and Clause 5 lists the abbreviations.

The requirements for the ITS/TICS central Data Registry and ITS/TICS Data Dictionaries begin in Clause 6 with an overview of the concept of operations for the ITS/TICS Data Registry and ITS/TICS Data Dictionaries. A framework describing the registration of different types of data concepts in the ITS/TICS Data Registry and the registration status levels are presented.

Clause 7 identifies the fundamental ITS/TICS data concepts while Clause 8 identifies the basic and administrative meta attributes used to document them. Clause 9 describes the naming conventions and name abbreviation conventions used. Clause 10 states the requirements for the data concepts and the meta attributes contained in the ITS/TICS Data Registry and ITS/TICS Data Dictionaries.

Clause 11 provides a reference model for national, regional and international relationships and summarizes internationalization aspects associated with national and regional requirements for the ITS/TICS Data Registry and Data Dictionary environment.

The annexes to this International Standard describe the specific details for implementing the requirements introduced in Clauses 6 through 11. Annex A details ITS/TICS functional operating procedures for registration and harmonization of data concepts. Annex B prescribes the detailed definitions and descriptions of the ITS/TICS Data Registry and Data Dictionary meta attributes. Annex C prescribes the meta attribute requirements for data concepts contained in the ITS/TICS Data Registry and ITS/TICS Data Dictionaries. Annex D specifies the naming and name abbreviation conventions and the process for converting ITS/TICS descriptive names to ASN.1 names. Annex E contains the rules for data representation in an information model, along with examples. Annex F describes the ASN.1 information object specification for an ITS/TICS data concept with examples.

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The bibliography includes a list of documents related to this International Standard.

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# Transport information and control systems — Requirements for an ITS/TICS central Data Registry and ITS/TICS Data Dictionaries

## 1 Scope

This International Standard specifies the framework, formats, and procedures used to define information exchanges within the Intelligent Transport System/Transport Information and Control Systems (ITS/TICS) sector. It defines the content of the ITS/TICS central Data Registry and Data Dictionaries, the registration process to enter data concepts into the Data Registry. Throughout the text, the Data Registry should be taken to mean the ITS/TICS central Data Registry.

Specifically, this International Standard specifies:

- framework used to identify and define all information exchanges;
- framework used to extend standardized information exchanges to support local customizations and combinations;
- information modelling method for defining ITS/TICS data concepts, when used;
- meta attributes used to describe, standardize and manage each of the data concepts defined within this framework;
- requirements used to record these definitions; and
- formal procedures used to register these definitions within the Data Registry.

The Data Registry described herein supports, and is designed to include, data concepts using alternative International, Regional or National System Architecture methodologies or techniques. A common Data Registry will ease migration and interoperability between such approaches.

## 2 Conformance

### 2.1 Conformance considerations

This International Standard prescribes a conceptual model, but not a physical implementation. Therefore, the meta model need not be physically implemented exactly as specified. However, it should be possible to map unambiguously to and from the implementation and the meta model.

Regional and National Data Registries/Dictionaries have the option of adopting data concept definitions from the ITS/TICS Data Registry/Dictionaries, but are not required to do so. However, in the case of exchanging information internationally in application programs, claiming conformance with this or other international Standards in ITS/TICS sector, it *is* a requirement to use only data concepts that have already been registered in the ITS/TICS Data Registry.

## 2.2 Strictly conforming implementations

A strictly conforming implementation shall be a strictly conforming metadata set.

A strictly conforming implementation:

- a) shall support all mandatory, optional and conditional data concept attributes (see Annex C);
- b) shall not use, test, access, or probe for any extensions to data concept attributes;
- c) shall not exceed limits nor minimum-maximum values specified by this International Standard; and
- d) shall not interpret nor allow the production of data concept attributes that are dependent on any unspecified, undefined, or implementation-defined behaviour.

## 2.3 Conforming implementations

A conforming implementation shall be a conforming metadata set.

A conforming implementation:

- a) shall support all mandatory, optional and conditional data concept attributes (see Annex C);
- b) as permitted by the implementation, may exceed use, test, access, or probe for extensions to data concept attributes;
- c) as permitted by the implementation, may exceed limits or minimum-maximum values specified by this International Standard; and
- d) may interpret or allow the production of data concept attributes that are dependent on implementation-defined behaviour.

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## 3 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/IEC 8824-1:1998, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation*

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

ISO/IEC 9834-1:1993, *Information technology — Open Systems Interconnection — Procedures for the operation of OSI Registration Authorities: General procedures*

ISO 1000:1992, *SI Units and recommendations for use of their multiples and of certain other units*

ISO/IEC Directives, Part 1, 4<sup>th</sup> Edition, 2001

## 4 Terms and definitions

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

NOTE Definitions of Data Registry and Data Dictionary meta attributes are given in Annex B.

**4.1****association**

data concept; structural relationship

**4.2****classification scheme**

scheme for the arrangement or division of objects into groups by functional area

**4.3****data**

representations of static or dynamic objects in a formalized manner suitable for communication, interpretation, or processing by humans or by machines

**4.4****data concept**

any of a group of Data Dictionary structures defined in this International Standard (i.e. object class, property, value domain, data element concept, data element, data frame, message, interface dialogue, association) referring to abstractions or things in the natural world that can be identified with explicit boundaries and meaning and whose properties and behaviour all follow the same rules

**4.5****data concept instance**

individual occurrence of a data concept

**4.6****Data Dictionary  
DD**

organized and constructed (electronic data base) compilation of descriptions of data concepts that provides a consistent means for documenting, storing and retrieving the syntactical form (i.e. representational form) and the meaning and connotation of each data concept

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**4.7****data element**

data concept; some single unit of information of interest (such as a fact, proposition, observation, etc.) about some (entity) class of interest (e.g. a person, place, process, property, concept, association, state, event) considered to be indivisible in a particular context

NOTE A data element is represented by an object class, a property of the represented object class and a value domain.

**4.8****data element concept**

data concept; an expression of the inherent concept embodied in a data element without regard to the value domain(s) by which it can be physically represented

NOTE A data element concept is represented by an object class and a property of that object class.

**4.9****data frame**

data concept; grouping of data elements primarily for the purpose of referring to the group with a single name, and thereby efficiently reusing groups of data elements that commonly appear together (e.g. ASN.1 SEQUENCE, SEQUENCE OF, SET, SET OF or CHOICE) in a message specification

NOTE This data concept type may be used to specify groups of data elements for other purposes as well.

**4.10****data model**

description of the organization of data in a manner that reflects an information structure

NOTE See also information model.

#### 4.11

##### **Data Registry**

##### **DR**

store of data, characterized in a consistent manner, as determined according to the provisions of this International Standard, used for a specific purpose (in this case ITS/TICS)

**NOTE** The data registration process provides a determination of the ITS Data Dictionary items accepted into the ITS/TICS Data Registry. The Data Registry contains not only data about data concepts in terms of their names and representational forms but also substantial data about the semantics or meaning associated with the data concepts. A Data Registry may contain data that assists information interchange and reuse, both from the perspective of human users and for machine-interpretation of data concepts. The Data Registry is comprised of items only from ITS/TICS Data Dictionaries, showing their source; however, not all ITS/TICS Data Dictionary items shall necessarily be submitted for inclusion, or accepted, into the Data Registry.

#### 4.12

##### **data registrar**

organizational element or an individual appointed by ISO/TC 204 to undertake the day-to-day management of the Data Registry process

#### 4.13

##### **data registration process**

process by which data is formally described and provided to an approved location in the Data Registry

**NOTE** This process is effected under the control of the ITS/TICS data registrar, in accordance with the requirements of this International Standard.

#### 4.14

##### **data type**

classification of the collection of letters, digits, and/or symbols used to encode values of a data element based upon the operations that can be performed on the data element

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#### 4.15

##### **identifier**

means of designating or referring to a specific data concept instance

#### 4.16

##### **generalization**

specialization/generalization relationship in which an object class of a specialized element (child) is substituted for a generalized element (parent)

#### 4.17

##### **information model**

graphical representation that logically organizes various data concepts by depicting key relationships among the data concepts

**EXAMPLE** An information model might specify that a Vehicle may be described by a variety of properties, such as: Make, Model, Year, and Vehicle Identification Number. Likewise a Collision might be described by properties such as Time of Occurrence, Severity, and Number of Vehicles Involved. Finally, the model might depict that a Collision has a many-to-many relationship to a Vehicle.

**NOTE 1** Within the scope of this International Standard, information models are depicted using UML Class Diagrams.

**NOTE 2** This International Standard uses the term information model in order to reflect the fact that relationships give the data a context and thereby transforms data into information. Some groups use the term data model. See also data model.

#### 4.18

##### **interface dialogue**

data concept; collection of all the temporal sequences of messages, including variants such as multiple responses, that are used to accomplish the services that the interface dialogue provides

**4.19****message**

data concept; grouping of data elements and/or data frames, as well as associated message metadata, that is used to convey a complete unit of information

NOTE For the purposes of this International Standard, a message is an abstract description; it is not a specific instance.

**4.20****message instance**

occurrence of a message containing the actual values for the data elements and, in some cases, data about the message

**4.21****meta**

word denoting a description that is one level of abstraction above the concept being described

**4.22****meta attribute**

any documenting characteristic of a data concept

**4.23****metadata**

data that defines and describes other data

**4.24****name**

indexical term used by humans as a means of identifying data elements and other data concepts

**4.25****object class**

data concept; construct used to represent any kind of object (also referred to as an entity) within a ITS/TICS information environment

**4.26****property**

data concept; documenting characteristic of an object class used to group and differentiate individual objects

**4.27****semantics**

meaning, including concept(s), associated with a given data concept

**4.28****syntax**

structure of expressions in a language and the rules governing the structure of a language

**4.29****value domain**

data concept; expression of a specific and explicit representation of some information about something of interest within the ITS/TICS domain

## 5 Symbols and abbreviated terms

ASN.1	Abstract Syntax Notation One
ANSI	American National Standards Institute
CASE	Computer-Aided Software Engineering
CCC	(ITS/TICS Data Registry) Change Control Committee

DCI	Data Concept Identifier
DD	Data Dictionary
DR	Data Registry
ExCom	(ITS/TICS Data Registry) Executive Committee
ID	identification
IEC	International Electrotechnical Commission
IOS	Information Object Specification
ISO	International Organization for Standardization
ITS	Intelligent Transport System(s)
N/A	not applicable
OID	object identifier
OSI	Open System Interconnection
TC	Technical Committee
TICS	Transport Information and Control System(s)
UML	Unified Modeling Language
URL	Uniform Resource Locator

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## 6 Concept of operation

### 6.1 Summary

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The scope of ITS/TICS applications covers numerous ISO/TC 204 functional areas as well as national and regional ITS/TICS organizations, each having an established group of stakeholders. The international integration of ITS/TICS applications is one of the major development issues, so that data defined and gathered in one of these functional areas (e.g. traffic management, traveller information) can be applied in another. For this type of interoperability the definition of data that can persist across different functional areas must be standardized. The ITS/TICS Data Registry and ITS/TICS Data Dictionaries meet this requirement.

The ITS/TICS Data Registry/Data Dictionary system supports the harmonization of data concepts (e.g. data elements) from different stakeholder groups. The ITS/TICS stakeholder community is large and diverse as evidenced by the number of working groups within ISO/TC 204 and the number of national or regional ITS bodies participating. The definition of key data elements will arise from numerous sources. Moreover, different groups will have an interest in the definition of the same data concept, which could lead to the prospect of duplicate or similar definitions being developed.

The architecture of the ITS/TICS Data Registry and ITS/TICS Data Dictionaries is based on the specification of ISO/TC 204 working group (functional area) Data Dictionaries that support the data definition process of ISO/TC 204 working groups, as well as national or regional ITS Data Dictionaries that document their data definitions. In addition, the central ITS/TICS Data Registry supports standardization and harmonization processes that facilitate the different working groups and national or regional authorities to share data element definitions and avoid duplication.

The complete ITS/TICS distributed system will be very large, both in geographic extent and in the number and diversity of the application areas, inevitably leading to the independent development of sub-systems. In this context, a second major purpose of the ITS/TICS Data Dictionaries and the ITS/TICS Data Registry is to document and register information at interfaces. This process provides the main foundation for interoperability, by also focusing on those data elements which cross an interface, but which are not necessarily harmonized throughout ITS/TICS. The semantics of data elements may be documented by recording the associations of the information models in which they participate.

The operational concept of the data registration is described in the following subclauses. See Annex A for specific procedural details.

NOTE There may be regional and national variations of this concept of operations.

## 6.2 Framework

The overall framework for the ITS/TICS Data Registry and ITS/TICS Data Dictionaries is presented in Figure 1. It illustrates the relationships among the:

- ITS/TICS architectures (and information models),
- ITS/TICS Data Dictionaries (that are intended to include all data concepts),
- The ITS/TICS Data Registry, and
- ITS/TICS Applications.

For each of these physical elements, the diagram also lists their key functions. For Data Dictionaries, the Data Registry and the applications it further identifies the key stakeholders or stakeholder groups that participate in or manage their operations. Finally, the diagram illustrates the information exchanged between these operational elements.

The ITS/TICS Data Dictionaries shall contain data concepts based on information flows documented in an ITS/TICS Architecture. (Note that there may be multiple architectures, each with multiple versions that are referenced.) Each data concept in a Data Dictionary should reference one or more flows of information between specific objects documented in a specific version of an ITS/TICS Architecture, the primary architecture being as defined in ISO/TR 14813-2:2000<sup>[7]</sup>. Regional and National architectures are also accommodated. This includes the application of the registry using data concepts from alternative International, Regional or National system architecture methodologies or techniques. This will ease migration and interoperability between such approaches.

Each referenced flow should be characterized by a source entity, information exchanged and destination entity. The referenced architecture defines the information exchange requirements and the relevant Data Dictionary further defines the syntax and semantics of the data representation of that architecture information exchange requirement.

The Data Dictionaries in Figure 1 may be developed, for example, by ISO/TC 204 or regional or National Standards Development Organizations (SDOs), public agencies, or private companies. These Data Dictionaries are the responsibility of their respective SDOs, regional or National bodies. Each Data Dictionary shall be associated with a data steward and/or data submitter, using the process defined in this International Standard, to submit data concepts from their respective Data Dictionaries to the ITS/TICS Data Registry. Furthermore, these Data Dictionaries should use registered data concepts from the ITS/TICS Data Registry rather than invent new data concepts. The use of such registered data concepts will help to avoid redundancy in data concepts.

The ITS/TICS Data Registry shall be the repository for submitted data concepts. Through the efforts of the data stewards, the registrar and the Data Registry change control committee (CCC) support identification of harmonization opportunities, recommendations for harmonization, and promotion of data concepts to higher quality levels where warranted. Finally, the Data Registry can provide data concepts to developers and other users for use in ITS/TICS applications.

Developers and other users should use data concepts from the Data Registry at the highest (*Preferred*) quality level. The data concepts at this level are described unambiguously, harmonized across ITS/TICS sectors, and are considered representative of published data standards.

Table 1 presents a summary of the distinguishing characteristics between Data Dictionary and a Data Registry within the ITS/TICS sector.