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# SLOVENSKI STANDARD
# SIST EN 16157-5:2020

## 01-november-2020

**Nadomešča:**
**SIST-TS CEN/TS 16157-5:2014**

**Inteligentni transportni sistemi - Specifikacije za izmenjavo podatkov DATEX II pri upravljanju prometa in informiranju - 5. del: Merjeni in obdelani podatki za objavo**

Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 5: Measured and elaborated data publications

Intelligente Transportsysteme - DATEX II Datenaustausch Spezifikationen für Verkehrsmanagement und Verkehrsinformation - Teil 5: Gemessene und ausgearbeitete Datenveröffentlichungen

**Ta slovenski standard je istoveten z:**     **EN 16157-5:2020**

## ICS:

| | | |
|---|---|---|
| 35.240.60 | Uporabniške rešitve IT v prometu | IT applications in transport |

**SIST EN 16157-5:2020**     **en,fr,de**

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

**EN 16157-5**

August 2020

ICS 35.240.60

Supersedes CEN/TS 16157-5:2014

English Version

# Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 5: Measured and elaborated data publications

Systèmes de transport intelligents - Spécifications Datex II d'échange de données pour la gestion du trafic et l'information routière - Partie 5 : Publications de données mesurées et de données calculées

Intelligente Verkehrssysteme - DATEX II Datenaustauschspezifkation für Verkehrsmanagement und Verkehrsinformation - Teil 5: Gemessene und ausgearbeitete Datenveröffentlichungen

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Ref. No. EN 16157-5:2020 E

EN 16157-5:2020 (E)

# Contents

2

EN 16157-5:2020 (E)

# European foreword

This document (EN 16157-5:2020) has been prepared by Technical Committee CEN/TC 278 "Intelligent transport systems", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2021, and conflicting national standards shall be withdrawn at the latest by February 2021.

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

This document supersedes CEN/TS 16157-5:2014.

In comparison with the previous edition, the following technical modifications have been made:

— application of the modelling methodology defined in EN 16157-1,

— correction of bugs,

— addition of requested features,

— removal of redundancy between elaborated and measured data publications.

A list of all parts in the EN 16157 series can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

# Introduction

The EN 16157 series defines a common set of data exchange specifications to support the vision of a seamless interoperable exchange of traffic and travel information across boundaries, including national, urban, interurban, road administrations, infrastructure providers and service providers. Standardization in this context is a vital constituent to ensure interoperability, reduction of risk, reduction of the cost base, promotion of open marketplaces and many social, economic and community benefits to be gained from more informed travellers, network managers and transport operators.

Delivering European Transport Policy in line with the White Paper issued by the European Commission requires co-ordination of traffic management and development of seamless pan European services. With the aim to support sustainable mobility in Europe, the European Commission has been supporting the development of information exchange mainly between the actors of the road traffic management domain for a number of years. In the road sector, DATEX II has been long in fruition, with the European Commission being fundamental to its development through an initial contract and subsequent co-funding through the Euro-Regional projects. With this standardization of DATEX II, there is a real basis for common exchange between the actors of the traffic and travel information sector.

EN 16157 includes the framework and context for exchanges, the modelling approach, data content, data structure and relationships.

It supports a methodology that is extensible.

This document deals with the publication sub-models within the DATEX II model that support the exchange of measured and elaborated information. These publications are intended to support the exchange of information from the organization having the measured data and creating elaborated data to other organisations providing ITS services or onward information exchange. It also includes the exchange of static information about measurement sites.

EN 16157-5:2020 (E)

## 1 Scope

This document is the fifth part of the DATEX II European Standard which deals with the publication sub-models within the DATEX II model that support the exchange of measured and elaborated information.

These publications are intended to support the exchange of informational content from the organization having the measured data and creating elaborated data to other organisations providing ITS services or onward information exchange. It also includes the exchange of static information about measurement sites.

This is specified in three sub-models, a DATEX II Measurement Site Table Publication sub-model, a DATEX II Measured Data Publication sub-model and a DATEX II Elaborated Data Publication sub-model.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 16157-1:2018, *Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 1: Context and framework*

EN 16157-2, *Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 2: Location referencing*

EN 16157-7:2018, *Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 7: Common data elements*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16157-1, EN 16157-7, EN 16157-2, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp/ui

— IEC Electropedia: available at http://www.electropedia.org/

### 3.1
**elaborated data**
data which is derived/computed from one or more measurements over a period of time

Note 1 to entry: It can be a current value or a forecast value predicted from historical measurements.

### 3.2
**measured data**
quantitative data measured against a quantified scale (possibly using standard units of measure)

Note 1 to entry: In comparison to elaborated data, measured data can be considered to represent more directly observed measurements.

**3.3**
**measurement site**
location from where a stream of measured data can be derived

Note 1 to entry:    It can be a point, a linear road section or an area. Linear sections may even be specified as itineraries or predefined location sets, e.g. for travel time routes which comprise one or more different roads.

**3.4**
**physical quantity**
quantity used for the quantitative description of physical phenomena

**3.5**
**site measurement**
measurement data set derived from a specific measurement site

## 4   Symbols and abbreviations

ANPR    Automatic number plate recognition

PCU     Passenger car unit

SCOOT   Split cycle and offset optimization technique

UML     Unified Modeling Language

XML     eXtensible Markup Language

## 5   Conformance

This document specifies a DATEX II measurement site table publication, a DATEX II measured data publication and a DATEX II elaborated data publication, except for the elements that relate to location information which are specified in EN 16157-2, and the common elements (i.e. shared between several publications) which are defined in EN 16157-7.

The DATEX II platform independent data model, of which these three publication sub-models are a part, corresponds to the level A model as defined in EN 16157-1.

Conformance with this document shall require platform independent models from which platform specific models are generated to comply with the UML modelling rules defined in EN 16157-1 and with the following requirements of the sub-models which are expressed in this document:

— comply with all stipulated minimum and maximum multiplicity requirements for UML elements and relationships,

— comply with all definitions, types and ordering,

— employ optional elements as specified,

— comply with all expressed constraints.

It should be noted that conformance of a publication service with all the structural requirements stated above does not necessarily ensure that the informational content of that service will be semantically comprehensible.

EN 16157-5:2020 (E)

## 6    UML notation

The UML notation used in this document shall be as described in ISO/IEC 19505-1 [1].

NOTE        Some introductory guides to UML 2 are provided in the Bibliography of EN 16157-1:2018.

## 7    The "RoadTrafficData" namespace

This namespace gathers packages and classes related to road traffic data. Figure 1 represents the different packages and classes belonging to the "RoadTrafficData" namespace, which uses the namespace prefix "roa".
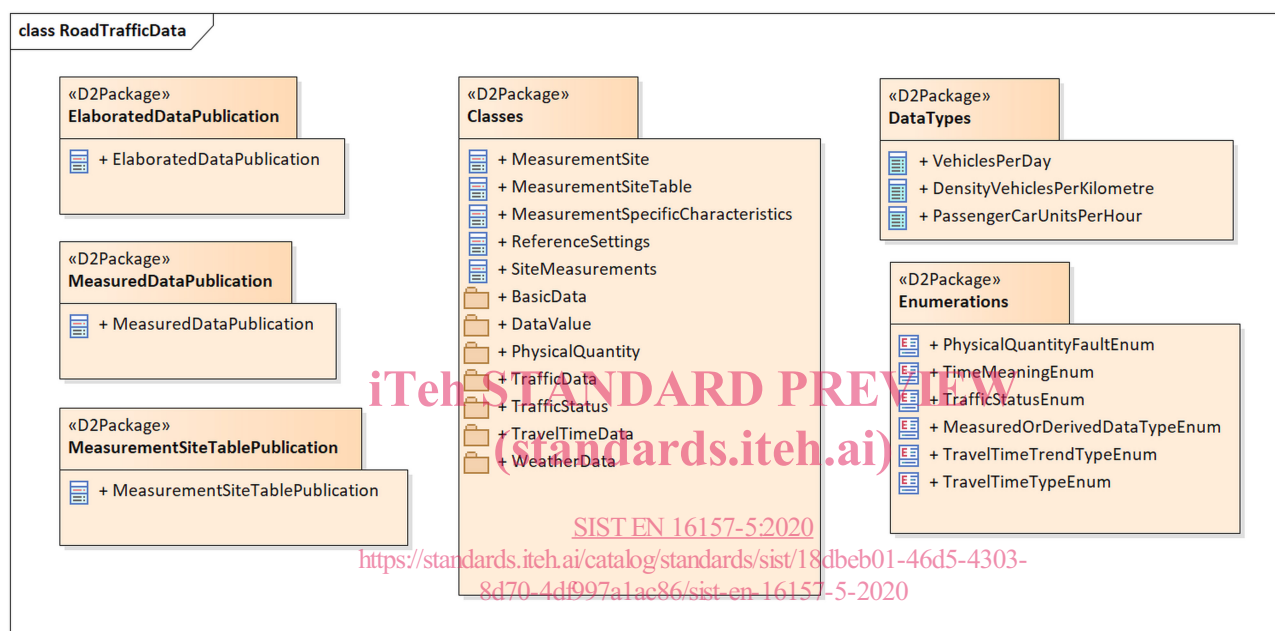


**Figure 1 — The "RoadTrafficData" model**

The "RoadTrafficData" namespace shall include the following six packages:

— ElaboratedDataPublication,

— MeasuredDataPublication,

— MeasurementSiteTablePublication,

— Classes,

— DataTypes,

— Enumerations.

The two publications "MeasuredDataPublication" and "ElaboratedDataPublication" handle similar data. It is the responsibility of the data producer to choose the publication he/she estimates as the best to fulfil his/her need. As guidance, "ElaboratedDataPublication" should be used where there is no defined measurement site for each calculated value, for example in the case of data derived directly from a probe vehicle.

The classes, attributes, data types and enumerations that are specific to this document are defined in Annex A.

The XML schema corresponding to this document is provided in Annex B.

## 8 The measurement site table publication model

### 8.1 Overview of the measurement site table publication model

The measurement site table publication model comprises a top-level package, "MeasurementSiteTablePublication" which uses some classes from the "Common" package and the "LocationReference" package. The "MeasurementSitePublication" class is a specialization of the "PayloadPublication" class and hence forms the top of the hierarchy of the measurement site table publication sub-model.

The "MeasurementSiteTablePublication" package delineates measurement site tables comprising a number of data sets, each describing the location from where a stream of measured data can be derived. Each location is known as a "measurement site" which can be a point, a linear road section or an area.

Each "MeasurementSiteTablePublication" class instance shall contain one or more tables represented as instances of the "MeasurementSiteTable" class, each table containing a number of measurement sites represented by the "MeasurementSite" class. Each instance of "MeasurementSite" shall be described by one location and specific characteristics through the class "MeasurementSpecificCharacteristics", each instance of which describes a specific measurement such as traffic flow, speed….

### 8.2 The "MeasurementSiteTablePublication" package

#### 8.2.1 Overview of the "MeasurementSiteTablePublication" package

The "MeasurementSiteTablePublication" package shall comprise a sub-model for defining publishable measurement site tables which comprise records defining the measurement sites. The following Figure 2 represents the sub-model including the relationships between classes.

Each publication may contain one or more tables, allowing logical partitioning of measurement sites information as deemed most appropriate for recipients of measured data information by the supplier (e.g. by road designation or other geographic criteria or by type of measurement site, etc.).
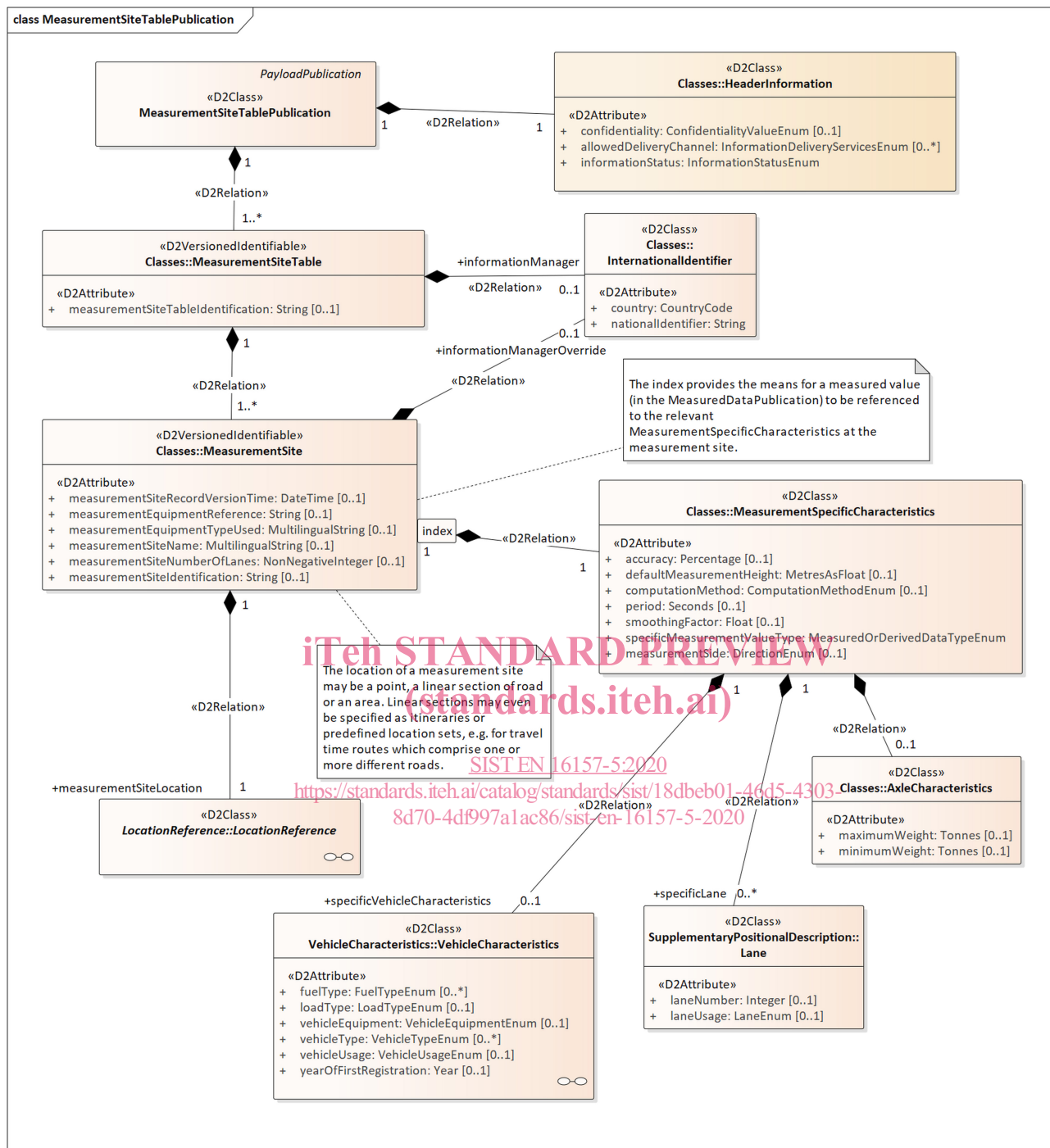
**Figure 2 — The "MeasurementSiteTablePublication" package class model**

### 8.2.2 Semantics of the "MeasurementSiteTablePublication" package

#### 8.2.2.1 "MeasurementSiteTablePublication" class

The "MeasurementSiteTablePublication" class is a specific instantiable case of the "PayloadPublication" class. Each instance of the "MeasurementSiteTablePublication" class may contain any number of separate measurement site tables.

The "MeasurementSiteTablePublication" class is the base class for containing the published measurement site tables.

#### 8.2.2.2 "HeaderInformation" class

Each instance of a "MeasurementSiteTablePublication" shall have associated metadata contained in an instance of the "HeaderInformation" class which allows the supplier of the measurement site table publication to specify how the recipient should handle the information contained in it. This class is defined in EN 16157-7.

#### 8.2.2.3 "MeasurementSiteTable" class

An identifiable versioned instance of the "MeasurementSiteTable" class shall contain any logical collection of measurement sites (class "MeasurementSite").

A "MeasurementSiteTable" class instance may be associated with an operator whose information is described with an "InternationalIdentifier" class.

#### 8.2.2.4 "MeasurementSite" class

An identifiable versioned instance of the "MeasurementSite" class shall contain the characteristics information relating to a specific measurement site.

Each instance shall be located by using an instance of the "LocationReference" class.

Each instance shall have one indexed "MeasurementSpecificCharacteristics" sub-record for containing the characteristics of each measurement individually. The index provides the means for a measured value (in the measured data publication) to be referenced to the corresponding instance of the "MeasurementSpecificCharacteristics" class at the measurement site.

A "MeasurementSite" class instance may be associated with an operator whose information is described with a "InternationalIdentifier" class.

#### 8.2.2.5 "InternationalIdentifier" class

This class belongs to the "Common" package specified in EN 16157-7.

#### 8.2.2.6 "LocationReference" class

Each instance of the "MeasurementSite" class shall be located by an instance of the "LocationReference" class. This class belongs to the "LocationReferencing" package specified in EN 16157-2.

#### 8.2.2.7 "MeasurementSpecificCharacteristics" class

An instance of the "MeasurementSpecificCharacteristics" class contains characteristics which are specific to a measurement type (specified in a known order) at the given measurement site. Each measurement may relate to specific vehicles which are described by the "VehicleCharacteristics" class (see 8.2.2.8), or to a specific lane which is described by the "Lane" class (see 8.2.2.10).

#### 8.2.2.8 "VehicleCharacteristics" class

This class describes the characteristics of a vehicle, e.g. a lorry of gross weight greater than 30 tonnes. It is defined in the "VehicleCharacteristics" package specified in EN 16157-7.

EN 16157-5:2020 (E)

### 8.2.2.9 "AxleCharacteristics" class

This class describes the axle characteristics of a vehicle in terms of minimum and maximum weights when it is used for classifying axle flows.

### 8.2.2.10 "Lane" class

This class describes the characteristics of a lane. It is defined in the "SupplementaryPositionalDescription" package specified in EN 16157-2.

## 9 The measured data publication model

### 9.1 Overview of the measured data publication model

The measured data publication model shall comprise a top-level package, "MeasuredDataPublication". The "MeasuredDataPublication" class shall be inherited from the "PayloadPublication" class and hence shall form the top of the hierarchy in the measured data publication model.

### 9.2 The "MeasuredDataPublication" package

### 9.2.1 Overview of the "MeasuredDataPublication" package

The "MeasuredDataPublication" package shall comprise a sub-model for defining a publication containing one or more measurement data sets, each set being composed of a number of values measured at a single measurement site.

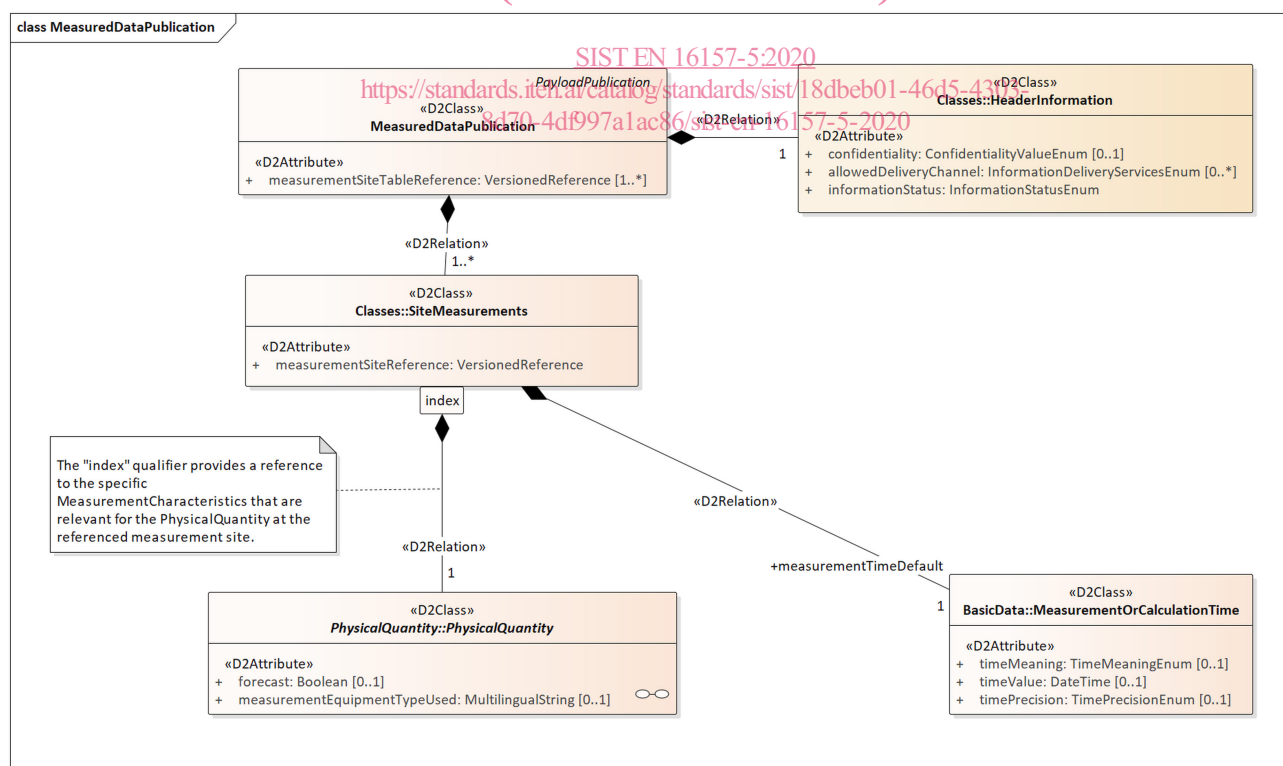It is represented including the relationships between the classes in Figure 3.



**Figure 3 — The "MeasuredDataPublication" package class model**

### 9.2.2 Semantics of the "MeasuredDataPublication" package

#### 9.2.2.1 "MeasuredDataPublication" class

The "MeasuredDataPublication" class shall be the only entry point of the package and shall be a specific instantiable case of a "PayloadPublication". Each instance of the "MeasuredDataPublication" class shall contain one or more measurement data sets, each set being measured at a single measurement site. The "MeasuredDataPublication" class shall be the base class for containing the published measured data.

#### 9.2.2.2 "HeaderInformation" class

Each instance of a "MeasuredDataPublication" shall have associated metadata contained in an instance of the "HeaderInformation" class, used by the supplier of the publication to specify how the recipient of the "MeasuredDataPublication" class instance should handle the information contained in it. This class is specified in EN 16157-7.

#### 9.2.2.3 "SiteMeasurements" class

The "SiteMeasurements" class shall contain a measurement data set derived from a specific measurement site.

Each measurement site, at a given time, has an indexed set of objects representing physical quantities associated with measurements. The "index" qualifier provides a reference to the specific measurement characteristics that are relevant for the physical quantities at the referenced measurement site.

The "measurementTimeDefault" association end provides the time associated with the set of measurements. It may be the time of the beginning, the end or the middle of the measurement period.

#### 9.2.2.4 "PhysicalQuantity" class

The "PhysicalQuantity" class contains optional characteristics for the specific measured value (indexed to correspond with the defined measurement characteristics at the referenced measurement site) which override the static characteristics defined in the "MeasurementSiteTable" class.

The "PhysicalQuantity" class is described in 11.2.

## 10 The elaborated data publication model

### 10.1 Overview of the elaborated data publication model

The elaborated data publication model shall comprise a top-level package, "ElaboratedDataPublication". The "ElaboratedDataPublication" class shall be inherited from the "PayloadPublication" class and hence shall form the top of the hierarchy in the elaborated data publication model.

### 10.2 The "ElaboratedDataPublication" package

#### 10.2.1 Overview of the "ElaboratedDataPublication" package

The "ElaboratedDataPublication" package shall comprise a sub-model for defining a publication containing one or more physical quantities.