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Ships and marine technology — Standard data for shipboard machinery and equipment

Navires et technologie maritime — Données normalisées pour les machines et équipements à bord des navires

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation and ship operations*.

This second edition cancels and replaces the first edition (ISO 19848:2018), which has been technically revised.

The main changes are as follows:

- Annex-A has been updated to define JSON as an equivalent implementation alternative to XML for DataChannelLists and TimeSeriesData. JSON schemas have been introduced to ensure precise definition and validation.
- The example of the codebook in B.2 has been extended to include navigational information, voyage information, weather information around the ship, oil property information and ship motion information.
- In -B.3, a full set of standard data names has been added as references, to improve usability.
- In Annex C, the naming scheme has been changed from “dnvgl-vis” to “dnv-v2”, as well as various updates to the rules for constructing the local ID.

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Introduction

On-board computer applications for safety and energy-efficient operations have become increasingly popular. These applications require access to the data of shipboard machinery and equipment.

To access data of navigational equipment, the IEC 61162 series, which covers data exchange, can be used. However, there are no existing standards covering the access of data from other on-board components and systems (e.g., machinery, safety equipment, and hull).

Exchanging ~~nonstandardised~~~~nonstandardized~~ data between and/or among applications requires name-based aggregation and format mapping. However, this involves a large amount of labour, which hinders the use of such data.

To improve such situations, this document defines unified requirements and ~~guidelines~~~~guidelines~~ for developing machine and human-readable identifiers and data structures for shipboard machinery and equipment, with the objective of facilitating the exchange and processing of sensor data from ships.

This document defines two concepts and their models for data exchange: one is Data Channel, and the other is Time Series Data. This document thus defines two distinct data structures and file formats: A Data Channel List, which contains the necessary meta-data, and a Time Series Data format for measurements. The time-series format is designed to be lightweight and therefore contains minimal meta-data information, only in the form of a reference to the channel list.

Data ~~Channels~~~~Channel~~ is a concept that represents virtual data transmission channels, and defines time-invariant properties. Data ~~Channel~~~~can~~~~Channel~~ can be viewed as a static description for the different sensor data streams. Data Channel is composed of Data Channel ID and Data Channel Property. Data Channel ID uniquely identifies the logical data channels. Data Channel Property defines attributes of Data Channel.

The purpose of this document is to provide guidance and requirements on exchanging data on-board a ship. However, in the future, it is possible that shipboard machinery and equipment will be connected directly to the Internet.

Therefore, considering the compatibility between Data Channel ID and URLs, which are used to identify data on the Internet, Data Channel ID has a hierarchical structure with slashes as delimiters. To represent a hierarchy, Data Channel is ~~categorised~~~~categorized~~ in accordance with the ~~standardised~~~~standardized~~ naming scheme, called Naming Rule, and named by concatenating these category names with slashes.

Annexes B and C provide two types of naming scheme, ~~an~~ example of a codebook ~~and~~ lists of ~~standardised~~~~standardized~~ category names given according to these schemes.

These naming schemes provided in Annexes ~~B~~ and C are not designed to unify Data Channel ID, but it is assumed that some entities will develop, maintain and manage codebooks and that ~~they~~~~these codebooks~~ will be disclosed widely.

Data Channel Property is assumed to be used to automate data processing and help understanding of data. Data Channel Property should be used because it is considered to be essential to both computer applications and humans for the reasons mentioned above.

Time Series Data is a concept that represents collection of time-stamped data. Time Series Data is assumed to be used for sharing latest data and for analysing trends made over time-stamped data.

For reliable data exchange, this document recommends the use of Extensible Markup Language (XML) and XML Schema for data encoding and data structure definition. Using XML and XML schemas makes it possible to define data structures precisely and validate data according to such definitions. As a result, data can be exchanged more reliably between and/or among computer applications.

Furthermore, for convenience and efficiency, this document also defines data structures in JavaScript Object Notation (JSON) and Comma Separated Values (CSV) format.

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Ships and marine technology — Standard data for shipboard machinery and equipment

1 Scope

This document provides requirements and guidance on the capture and processing of data from sensors monitoring:

- the structure of the ship, ~~the~~
- shipboard machinery and equipment ~~and of~~ on board the ship;
- ship operational information.

It is intended for implementers of ~~the~~ software used to capture and process such data.

This document describes how to name the sensor and required data item, as well as how to describe the data for shipboard machinery and equipment.

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.

ISO 8601-1, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO 80000 (all parts), *Quantities and units*

IEC 80000 (all parts), *Quantities and units*

IEC 62923-1:2018, *Maritime navigation and radiocommunication equipment and systems — Bridge alert management — Part 1: Operational and performance requirements, methods of testing and required test results*

Extensible Markup Language (XML) 1.0 (Fifth Edition), W3C Recommendation

W3C XML Schema Definition Language (XSD) 1.1 Part 1: Structures, W3C Recommendation

W3C XML Schema Definition Language (XSD) 1.1 Part 2: Datatypes, W3C Recommendation

RFC 4180, *Common Format and MIME Type for Comma-Separated Values (CSV) Files*

3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

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3.1

alert data

information that represents abnormal conditions of shipboard machinery and equipment

3.2

analogue data

numerical information obtained from sensors such as temperature sensors and pressure sensors

Note 1 to entry: Analogue data *isare* a physical value converted from raw electric signals, such as 4-*mA*-20 mA or 0-*V*-5 V.

3.3

codebook

list of standardized names

3.4

data

measurement value from shipboard machinery and equipment to which a time stamp is added

3.5

Data Channel

virtual channel for data transmission from shipboard machinery and equipment to shipboard data server, defining static properties of data

3.6

Data Channel ID

identifier for *a Data Channel* (3.5) that identifies Data Channel universally and on-board a ship

Note 1 to entry: There are three types of Data Channel ID: Universal ID, Local ID and Short ID.

3.7

Data Channel List

list of definitions for *Data Channel* (3.5) that define *Data Channel ID* (3.6) and *Data Channel Property* (3.8), and is shared through the shipboard data server

3.8

Data Channel Property

attributes of *Data Channel* (3.5), such as units and ranges

3.9

Data Set

set of *data* (3.4) having the same time stamp

3.10

Extensible Markup Language

XML

text-based data description language used for exchanging data on the Internet

3.11

Hyper Text Transfer Protocol

HTTP

communication protocol used to exchange Hyper Text Markup Language (HTML) or other content on the Internet

3.12

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IMO Number

unique reference number for ships that is given by the International Maritime ~~Organisation~~ Organization (IMO)

3.13

logical structure

structure of *data* (3.4) that is independent of physical implementation

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3.14

measurement value

numeric value or a status symbol, produced as a result of measuring, calculating or estimating the state of various objects

3.15

metadata

data that describes information about other data

3.16

Name Object

building block of *Data Channel ID* (3.6) used to define the hierarchical structure of Data Channel ID

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3.17

namespace

set of names that is used in order to avoid conflicting names

3.18

shipboard data server

information hub of the ship that stores data from *shipboard machinery and equipment*, (3.19), shares data at sea including machine data, and sends stored data outboard

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Note 1 to entry: See ISO 19847¹ for details.

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3.19

shipboard machinery and equipment

various systems located in ships, such as main engine, generator, pumps, fans, valves, pipelines and electric control systems

3.20

Time Series Data

collection of a *Data Set* (3.9)

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3.21

XML Schema

data definition language used for *Extensible Markup Language (XML)* (3.10)

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4 Abbreviated terms

ABNF	augmented Backus-Naur form
AMS	alarm monitoring system
BNF	Backus-Naur form

¹ Under preparation. Stage at the time of publication: ISO/FDIS 19847:2023.

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CSV	Comma Separated Values
IAS	integrated automation system
IMO	International Maritime Organization
HIN	hull identification number
HTML	Hyper Text Markup Language
HTTP	Hypertext Transfer Protocol
JSON	JavaScript Object Notation
RDBMS	Relational Data Base Management System
RFC	Request for Comments
SI	the International System of Units
URI	Uniform Resource Identifier
UTC	Coordinated Universal Time
UTF-8	UCS Transformation Format 8
XML	Extensible Markup Language

5 Data Channel

5.1 Data Channel ID

5.1.1 General

There are three types of Data Channel ID:

- Universal ID
- Local ID
- Short ID

Universal ID is intended for identifying an on-board Data Channel universally.

Local ID, meanwhile, is intended for identifying an on-board Data Channel locally. For instance, on-board computer systems, such as the Integrated Automation System integrated automation system (IAS) and the Alarm Monitoring System alarm monitoring system (AMS), have their own Data Channel List, which is composed of a unique Channel ID. This Channel ID can correspond to a Local ID.

Short ID is an optional short alternative identifier of Local ID for usability and data compression. This short identifier, for instance, can be used as a Data Channel identifier in the Time Series Data format.

Universal ID shall be universally unique, while Local ID and Short ID shall be unique for a ship.

These IDs shall be case-insensitive to avoid mistyping.

NOTE Data Channel of channels representing the same kind type of sensors sensor data on different ships is are expected to have the same Local ID. Conversely, even if the Data Channel has the same meaning, the Short ID can be different for each ship.

5.1.2 Universal ID

Universal ID is an URI conforming to the requirements in this subclause, in addition to the requirement of the URI- specified in RFC 3986. The URI definition allows for many different compositions, but the Universal ID is a subset of these and shall be in the following format.

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The format is defined by using Augmented BNF (ABNF), which is defined in RFC 5234, as follows.

```

_UniversalID    = [protocol] "/" NamingEntity ShipID LocalID
_NamingEntity   = authority
_ShipID         = path-element
_path-element   = "/" unreserved
_path-elements  = path-element | path-element path-elements

```

The definition of the "Local ID" element is mentioned in 5.2.2.1.3.

The "authority" and "unreserved" element is defined in the URI definition: specified in RFC 3986. The "protocol" element is optional.

NOTE Although the path element of URI that is defined in RFC 3986 accepts many more characters, such as RFC 3986 "sub-delimiters", "-", ":", "@", etc., this document only accepts RFC 3986 "unreserved" characters since these characters can be used as control character in ISO 19847. The terms sub-delimiters and unreserved are defined in RFC 3986.

The slash ("/") is a reserved character for describing hierarchies.

The definition of each element of the Universal ID is as follows.

a) Naming Entity

The Naming Entity element shall be domain owned or controlled by the entity producing the Local ID.

EXAMPLE 1

```

— data.shipdatacenter.jp
— data.dnv.com
— data.shipdatacenter.jp
— data.dnv.com

```

b) Ship ID

Ship ID is for identifying ships universally.

Usually, an IMO number or HIN should be used for the Ship ID.

If ships have no IMO number or HIN, an identifier provided by countries or regions, or other means may be used instead.

EXAMPLE 2

```

— /IMO1234567
— /JP-HXAB7A33G293

```

5.1.3 Local ID

Local ID consists of the Naming Rule and Local Data Name.

Local ID composition is defined by using ABNF as follows.

```

_LocalID    = NamingRule LocalDataName

```

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 (standards.iteh.ai)
 ISO/FDIS 19848
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