

S-128

# Catalogue of Nautical Products

Edition 1.0.0 – May 2022

IHO



International  
Hydrographic  
Organization

Published by the  
International Hydrographic Organization  
4b quai Antoine 1<sup>er</sup>  
Principauté de Monaco  
Tel: (377) 93.10.81.00  
Fax: (377) 93.10.81.40  
info@iho.int  
www.iho.int

© Copyright International Hydrographic Organization 2022

This work is copyright. Apart from any use permitted in accordance with the Berne Convention for the Protection of Literary and Artistic Works (1886), and except in the circumstances described below, no part may be translated, reproduced by any process, adapted, communicated or commercially exploited without prior written permission from the International Hydrographic Organization (IHO). Copyright in some of the material in this publication may be owned by another party and permission for the translation and/or reproduction of that material must be obtained from the owner.

This document or partial material from this document may be translated, reproduced or distributed for general information, on no more than a cost recovery basis. Copies may not be sold or distributed for profit or gain without prior written agreement of the IHO Secretariat and any other copyright holders.

In the event that this document or partial material from this document is reproduced, translated or distributed under the terms described above, the following statements are to be included:

*“Material from IHO publication [reference to extract: Title, Edition] is reproduced with the permission of the IHO Secretariat (Permission No ...../...) acting for the International Hydrographic Organization (IHO), which does not accept responsibility for the correctness of the material as reproduced: in case of doubt, the IHO’s authentic text shall prevail. The incorporation of material sourced from IHO shall not be construed as constituting an endorsement by IHO of this product.”*

*“This [document/publication] is a translation of IHO [document/publication] [name]. The IHO has not checked this translation and therefore takes no responsibility for its accuracy. In case of doubt the source version of [name] in [language] should be consulted.”*

The IHO Logo or other identifiers shall not be used in any derived product without prior written permission from the IHO Secretariat.

## TABLE OF CONTENTS

1	Overview.....	1
1.1	Introduction.....	1
2	References.....	1
2.1	Normative.....	1
2.2	Informative.....	1
3	Terms, Definitions and Abbreviations.....	2
3.1	Terms and Definitions.....	2
3.2	Abbreviations.....	3
3.3	Use of language.....	4
3.4	UML notations.....	4
4	Specification Description.....	4
4.1	Informal description of data product.....	4
4.2	Data product specification metadata.....	5
4.3	Product Specification Maintenance.....	5
4.3.1	Introduction.....	5
4.3.2	New Edition.....	5
4.3.3	Revisions.....	5
4.3.4	Clarification.....	5
4.3.5	Version numbers.....	6
4.4	Specification scope.....	6
5	Data Product Identification.....	6
6	Data Content and Structure.....	7
6.1	Introduction.....	7
6.2	Application Schema.....	8
7	Feature Catalogue.....	11
7.1	Introduction.....	11
7.2	Feature types.....	12
7.2.1	Geographic.....	12
7.2.2	Meta.....	12
7.2.3	Feature relationship.....	12
7.2.4	Information types.....	12
7.2.5	Attributes.....	12
7.2.5.1	Simple Attributes.....	12
7.2.5.2	Complex attributes.....	13
7.3	Units of measure.....	13
7.4	Geometric representation.....	13
8	Coordinate Reference System (CRS).....	14
8.1	Introduction.....	14
8.2	Horizontal reference system.....	14
8.3	Projection.....	14
8.4	Vertical coordinate reference system.....	14
8.5	Temporal reference system.....	14
8.6	Coverage of nautical products data and scale.....	15
9	Data Quality.....	15
9.1	Introduction.....	15
10	Data Capture and Classification.....	15
10.1	Data encoding and product delivery.....	16
10.1.1	Data encoding.....	16
10.1.2	Types of datasets.....	16
10.1.3	Content of update datasets.....	16
10.2	Encoding of latitude and longitude.....	16
10.2.1	Encoding of coordinates as decimals.....	16
10.3	Numeric attribute encoding.....	17
10.4	Text attribute values.....	17
10.5	Mandatory attribute values.....	17
10.6	Unknown attribute values.....	17
10.7	Structure of dataset files.....	17
10.7.1	Sequence of objects.....	17

10.8	Object identifiers.....	18
10.9	Data coverage .....	18
10.10	Data overlap .....	18
10.11	Data extent .....	18
11	Data Delivery .....	18
11.1	Data product delivery information .....	18
11.1.1	Dataset loading .....	19
11.1.2	New Editions .....	19
11.2	Dataset size.....	19
11.3	Exchange Set .....	19
11.4	Support Files .....	20
11.5	Support file naming convention .....	20
11.6	Dataset naming convention.....	20
11.7	Update dataset naming convention.....	21
11.8	Catalogue file naming convention .....	21
12	Dataset Maintenance .....	21
12.1	Introduction.....	21
12.2	Production process for base and update datasets.....	21
12.3	Dataset updates and cancellation .....	22
12.4	Support file updates .....	22
12.5	Feature and Portrayal Catalogues .....	22
12.6	Feature history, versions, and change tracking .....	22
12.7	Dataset encryption .....	22
13	Portrayal .....	22
14	Metadata .....	23
14.1	Introduction.....	23
14.2	Dataset metadata .....	25
14.2.1	Metadata for new datasets and New Editions.....	25
14.2.2	Update and cancellation dataset metadata.....	27
14.3	Support file metadata .....	28
14.4	Exchange Set Catalogue and metadata .....	29
14.4.1	Catalogue file metadata .....	29
14.5	Metadata about Feature and other Catalogues .....	30
Appendix A - S-128 Maintenance - Change Proposal Form (normative) .....		33

## Document History

Changes to this Product Specification are coordinated by the IHO Nautical Information Provision Working Group (NIPWG). New editions will be made available via the IHO web site. Maintenance of the Product Specification shall conform to IHO Technical Resolution 2/2007 (as amended).

Version Number	Date	Approved By	Purpose
0.0.1	28 Dec 2018	KHOA	First Draft
0.7.5	20 Nov 2019	KHOA	Working Draft
1.0.0	11 Mar 2022	KHOA	Release 1.0.0
1.0.0	May 2022	HSSC	Initial published version for evaluation and testing.

Page intentionally left blank

## 1 Overview

### 1.1 Introduction

This document has been produced by the IHO Nautical Information Provision Working Group (NIPWG) in response to a requirement to produce a data product that can be used as a Nautical Publication Information Overlay (NPIO) within an Electronic Chart Display and Information System (ECDIS). It is based on the IHO S-100 framework Specification and the ISO 19100 series of standards. It is a vector Product Specification that is primarily intended for encoding the content of Catalogues of Nautical Products, for navigational purposes.

Catalogue of Nautical Products (CNP) datasets describe the availability of paper charts, ENCs and other nautical products, applications for navigational purposes, online services and e-Navigation services. This includes their issue date, status, producing agency, and coverage.

## 2 References

### 2.1 Normative

The following normative documents contain provisions that, through reference in this text, constitute provisions of this document.

IHO Publication S-100, *IHO Universal Hydrographic Data Model*, Edition 4.0.0 (December 2018).

ISO 8601:2004, *Data elements and interchange formats - Information interchange - Representation of dates and times*, 2004.

ISO 19101-2:2008, *Geographic Information - Rules for Application Schema*.

ISO/TS 19103:2005, *Geographic Information - Conceptual schema language*.

ISO 19106:2004, *Geographic Information – Profiles*.

ISO 19107:2003, *Geographic Information – Spatial schema*.

ISO 19109:2005, *Geographic Information - Rules for Application Schema*.

ISO 19111:2003, *Geographic information - Spatial referencing by coordinates*.

ISO 19115-1:2014, *Geographic information – Metadata*, Amended by Amendment 1, 2018.

ISO 19115-2:2009, *Geographic information - Metadata: Extensions for imagery and gridded data*.

ISO 19123:2005, *Geographic information - Schema for coverage geometry and functions*.

ISO 19129:2009, *Geographic information - Imagery gridded and coverage data framework*.

ISO 19131:2007, *Geographic information - Data product specifications*.

ISO 19136:2007, *Geographic Information – Geography Markup Language*.

ISO 19136-2:2015, *Geographic Information – Geography Markup Language*.

ISO/TS 19139, *Geographic Information – Metadata – XML schema implementation*.

### 2.2 Informative

The following informative documents provide additional information, including background information, but are not required to develop applications for data conforming to this specification.

ISO/IEC 19757-3, *Information technology – Document Schema Definition Languages (DSDL) – Part 3 Rule-based validation – Schematron*.

IHO Publication S-101, *IHO Electronic Navigational Chart Product Specification*, Edition 1.0.2, 2022.

## 3 Terms, Definitions and Abbreviations

### 3.1 Terms and Definitions

The S-100 framework is based on the ISO 19100 series of geographic standards. The terms and definitions provided here are used to standardize the nomenclature found within that framework, whenever possible. They are taken from the references cited in clause 2.1. Modifications have been made when necessary.

#### **Application**

Manipulation and processing of data in support of user requirements (ISO 19101).

#### **Application Schema**

**Conceptual schema** for data required by one or more **applications** (ISO 19101).

#### **Conceptual Model**

Model that defines concepts of a **universe of discourse** (ISO 19101).

#### **Conceptual Schema**

Formal description of a **conceptual model** (ISO 19101).

#### **Coverage**

**Feature** that acts as a function to return values from its range for any direct position within its spatial, temporal or spatiotemporal **domain** (ISO 19123).

EXAMPLE: Raster image, polygon overlay, digital elevation matrix.

#### **Data Product**

**Dataset** or **dataset series** that conforms to a **data Product Specification**.

#### **Data Product Specification**

Detailed description of a **dataset** or **dataset series** together with additional information that will enable it to be created, supplied to, and used by another party

NOTE: A data Product Specification provides a description of the universe of discourse and a specification for mapping the universe of discourse to a dataset. It may be used for production, sales, end-use, or other purpose.

#### **Dataset**

Identifiable collection of data (ISO 19115).

NOTE: A dataset may be a smaller grouping of data which, though limited by some constraint such as spatial extent or feature type, is located physically within a larger dataset. Theoretically, a dataset may be as small as a single feature or feature attribute contained within a larger dataset. A hardcopy map or chart may be considered a dataset.

#### **Dataset Series**

Collection of **datasets** sharing common characteristics (ISO 19115).

#### **Domain**

Well-defined set (ISO/TS 19103).

NOTE: Well-defined means that the definition is both necessary and sufficient, as everything that satisfies the definition is in the set and everything that does not satisfy the definition is necessarily outside the set.

#### **Feature**

Abstraction of real world phenomena (ISO 19101).

NOTE: A feature can occur as a type or an instance. Feature type or feature instance will be used when only one is meant.

#### **Feature Association**

Relationship that links instances of one **feature** type with instances of the same or a different **feature** type (ISO19110).

#### **Feature Attribute**

Characteristic of a **feature** (ISO 19101-1:2014, 4.1.12).

EXAMPLE 1: A feature attribute named "colour" can have an attribute value "green" which belongs to the data type "text".



EXAMPLE 2: A feature attribute named length can have an attribute value “82,4” which belongs to the data type “real”.

NOTE 1: A feature attribute has a type name, a data type and a value domain associated to it. A feature attribute for a feature instance also has an attribute value taken from the value domain.

NOTE 2: In a Feature Catalogue a feature attribute can include a value domain but does not specify attribute values for feature instance.

NOTE 3: In UML, attribute associations and operations are representation types and are not fundamental to the type of a characteristic nor to the type of feature. All three are equally capable of representing the same characteristics of a feature. Every implementation of a characteristic is allowed to use the representation type that is most appropriate and can use several different representations for a single characteristic if required.

Feature associations and feature operations therefore are different types of feature attribute, the distinction between them being based on storage and access mechanism rather than semantics.

### **Geographic Data**

Data with implicit or explicit reference to a location relative to the Earth (ISO 19109).

NOTE: Geographic information is also used as a term for information concerning phenomena implicitly or explicitly associated with a location relative to the Earth.

### **Metadata**

Information about a resource” (ISO 19115 – 1: 2014, 4.10).

### **Model**

Abstraction of some aspects of reality (ISO 19109).

### **Portrayal**

Presentation of information to humans (ISO 19117).

NOTE: Within the scope of this International Standard Portrayal is restricted to the portrayal of geographic information” (ISO 19117:2012; 4.20).

### **Quality**

Totality of characteristics of a product that bear on its ability to satisfy stated and implied needs (ISO 19101).

### **Universe of Discourse**

View of the real or hypothetical world that includes everything of interest (ISO 19101).

## **3.2 Abbreviations**

This Product Specification adopts the following convention for symbols and abbreviated terms:

ASCII	American Standard Code for Information Interchange
ECDIS	Electronic Chart Display and Information Systems
ENC	Electronic Navigational Chart
GML	Geography Markup Language
IHO	International Hydrographic Organization
IOC	International Oceanographic Commission
ISO	International Organization for Standardization
NIPWG	IHO Nautical Information Provision Working Group
NPIO	Nautical Publication Information Overlay
UML	Unified Modeling Language
URI	Uniform Resource Identifier
URL	Uniform Resource Locator

WMS	Web Map Service
WFS	Web Feature Service
www	World Wide Web
WGS	World Geodetic System
XML	Extensible Markup Language
XSLT	eXtensible Stylesheet Language Transformations

### 3.3 Use of language

Within this document, including Appendices and Annexes:

- “Must” indicates a mandatory requirement.
- “Should” indicates an optional requirement, that is the recommended process to be followed, but is not mandatory.
- “May” means “allowed to” or “could possibly”, and is not mandatory.

### 3.4 UML notations

In this document, conceptual Schemas are presented in the Unified Modeling Language (UML). Several model elements used in this Schema are defined in ISO Standards or in IHO S-100 documents. In order to ensure that class names in the model are unique, ISO TC/211 has adopted a convention of establishing a prefix to the names of classes that define the TC/211 defined UML package in which the UML class is defined. The IHO Standards and this Product Specification make use of classes derived directly from the ISO Standards; this convention is also followed in this document. In the IHO Standards class names are identified by the name of the Standard, such as "S100" as the prefix optionally followed by the bi-alpha prefix derived from ISO Standard. For the classes defined in this Product Specification the prefix is "S128". In order to avoid having multiple classes representing the same root classes, the ISO classes and S-100 classes have been used where possible; however, a new represented class is required if there is a need to alter a class or relationship to prevent a reverse coupling between the model elements introduced in this document and those defined in S-100 or the ISO model.

## 4 Specification Description

### 4.1 Informal description of data product

This clause contains general information about the data product.

<b>Title:</b>	Catalogue of Nautical Products Product Specification
<b>Abstract:</b>	Catalogue of Nautical Products (CNP) datasets describe the availability and reliability of paper chart, ENC, S-100 based nautical products, application for navigational purpose, online service and e-Navigation services. This includes their issue date, publication status, producing agency, and source indication. CNP is intended to exchange status of nautical products and to be a supplement to ENC, and therefore does not describe the geographic information in detail equal to ENC, rather it is shown as a coverage of nautical products.
<b>Content:</b>	Datasets conforming to this Specification will contain Catalogues of all relevant nautical products information for the area of coverage such as paper chart, ENC, Nautical Publication, S-100 based nautical products and e-Navigation services.
<b>Spatial Extent:</b>	Global coverage of maritime areas.
<b>Specific Purpose:</b>	Describing status of nautical products, and to allow the producer to exchange catalogue of nautical products with interested stakeholders.

## 4.2 Data product specification metadata

This information uniquely identifies this Product Specification and provides information about its creation and maintenance. For further information on dataset metadata, see clause 14.

<b>Title:</b>	Catalogue of Nautical Products
<b>S-100 Version:</b>	4.0.0
<b>S-128 Version:</b>	1.0.0
<b>Date:</b>	May 2022
<b>Language:</b>	English
<b>Classification:</b>	Unclassified
<b>Contact:</b>	International Hydrographic Organization (IHO) 4b quai Antoine 1er, B.P. 445 MC 98011 MONACO CEDEX Telephone: +377 93 10 81 00 Fax: + 377 93 10 81 40 Email: <a href="mailto:info@iho.int">info@iho.int</a>
<b>URL:</b>	<a href="https://iho.int">https://iho.int</a>
<b>Identifier:</b>	S-128
<b>Maintenance:</b>	Amendments to this Specification will be produced on a needs basis. For reporting issues with this Specification which need correction, use the contact information.

## 4.3 Product Specification Maintenance

### 4.3.1 Introduction

Changes to S-128 will be released by the IHO as a New Edition, a revision, or as a document that includes clarifications. These are described below.

### 4.3.2 New Edition

*New Editions* introduce significant changes. *New Editions* enable new concepts, such as the ability to support new functions or applications, or the introduction of new constructs or data types. *New Editions* are likely to have a significant impact on either existing users or future users of S-128.

### 4.3.3 Revisions

*Revisions* are defined as substantive semantic changes. Typically, *revisions* will introduce change to correct factual errors or introduce necessary changes that have become evident as a result of practical experience or changing circumstances. A *revision* must not be classified as a clarification. *Revisions* could have an impact on either existing users or future users of this specification. All cumulative clarifications will be included with the release of approved *revisions*.

Changes in a *revision* are minor and ensure backward compatibility with the previous versions within the same Edition. Newer *revisions*, for example, introduce new features and attributes. Within the same Edition, a dataset of one version could always be processed with a later version of the Feature and Portrayal Catalogues. In most cases a new Feature or Portrayal Catalogue will result in a *revision* of this Specification.

### 4.3.4 Clarification

*Clarifications* are non-substantive changes. Typically, *clarifications*: remove ambiguity; correct grammatical and spelling errors; amend or update cross references or; insert improved graphics in spelling, punctuation, and grammar. A *clarification* must not cause any substantive semantic changes.

Changes in a *clarification* are minor and ensure backward compatibility with the previous versions within the same Edition. Within the same Edition, a dataset of one *clarification* version could always be processed with a later version of the Feature and Portrayal Catalogues, and a Portrayal Catalogue can always rely on earlier versions of the Feature Catalogue.

Changes in a *clarification* are minor and ensure backward compatibility with the previous versions.

#### 4.3.5 Version numbers

The associated version control numbering to identify changes (n) to this Specification must be as follows:

New Editions denoted as **n**.0.0

Revisions denoted as n.**n**.0

Clarifications denoted as n.n.**n**

## 4.4 Specification scope

This Product Specification describes one data product and therefore requires only one scope which is described below:

<b>Scope ID:</b>	Catalogue of Nautical Products
<b>Hierarchical level:</b>	MD_ScopeCode – 005 (dataset)
<b>Hierarchical level name:</b>	CNP Dataset
<b>Level description:</b>	Information applies to the dataset
<b>Extent:</b>	EX_Extent.description: Global coverage of maritime areas

## 5 Data Product Identification

This section describes how to identify data sets that conform to the Specification. A dataset that conforms to this Product Specification may be identified by its discovery metadata as defined in clause 14 of this Specification. The information identifying the data product may include the following items from S-100 Edition 4.0.0, clause 11-6 (adapted from ISO 19115).

<b>Title:</b>	Catalogue of Nautical Products
<b>Abstract:</b>	Catalogue of Nautical Product (CNP) is a vector dataset containing all relevant information regarding Catalogue of Nautical Products like nautical charts and nautical publications.
<b>Alternate Title:</b>	CNP
<b>Content:</b>	Catalogue of Nautical Products information, such as type of products, coverage, producing agency, and issue date.
<b>Geographic Description:</b>	<b>EX_GeographicDescription:</b> For example, official name of region
<b>Spatial Resolution</b>	MD_Resolution>equivalentScale.denominator (integer) or MD_Resolution>levelOfDetail (CharacterString). For example, "All scales"
<b>Purpose:</b>	Describing status of nautical products, and to allow the producer to exchange Catalogue of Nautical Products with interested stakeholders
<b>Language:</b>	English

## 6 Data Content and Structure

### 6.1 Introduction

The S-128 product is based on the S-100 General Feature Model (GFM), and is a feature-based vector product. Figure 6-1 below shows how the S-128 Application Schema is realized from the S-100 GFM. All S-128 features and information classes are derived from one of the abstract classes **FeatureType** and **InformationType** defined in the S-128 Application Schema, which realize the GFM meta-classes **S100\_GF\_FeatureType** and **S100\_GF\_InformationType** respectively.

CNPs are encoded as vector entities which conform to S-100 geometry configuration level 3a (S-100 Part 7). S-128 further constrains Level 3a with the following:

- Coincident linear geometry must be avoided when there is a dependency between features.
- The interpolation of GM\_CurveSegment must be loxodromic.
- Linear geometry is defined by curves which are made of curve segments. Each curve segment contains the geographic coordinates as control points and defines an interpolation method between them. The distance between two consecutive control points must not exceed 0.3 mm at a permitted display scale.

The following exception applies to S-128:

- The use of coordinates is restricted to two dimensions.
- Soundings features which use GM\_Point or GM\_Multipoint with three dimensional coordinates are not currently included in S-128.

This section contains the Application Schema expressed in UML and an associated Feature Catalogue. The Feature Catalogue is included in Annex B, and provides a full description of each feature type including its attributes, attribute values, and relationships in the data product. Figure 6-1 shows an overview of the S-128 Application Schema.

The class comprising the S-128 Application Schema is the S-128 Domain model containing the features and information types that model the CNP application domain specifically. Geographic features in all three packages use the spatial types from S-100 Part 7, which are imported as-is into the S-128 spatial type package and therefore can be used as types for S-128 spatial attributes. The spatial types package also contains definitions of ‘union types’ (combinations of the S-100 spatial types), since S-100 allows features to have different kinds of geometry but UML does not allow an attribute of a class to have multiple types. The S-128 Application Schema models spatial attributes as attributes of feature classes.

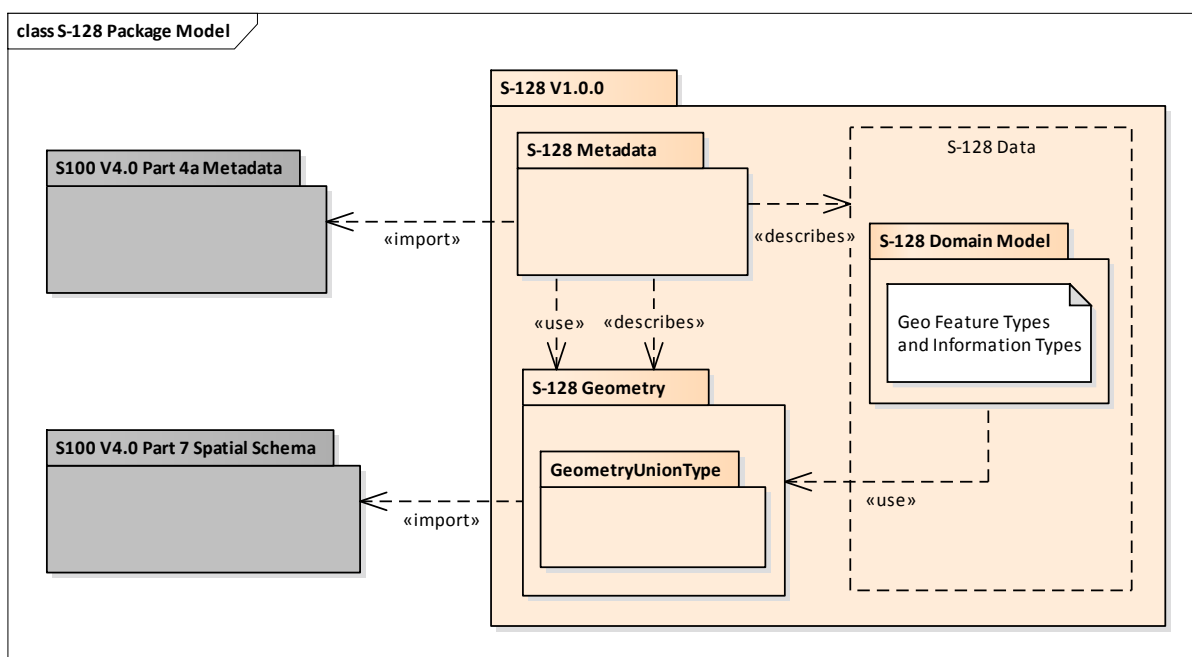


Figure 6-1 – S-128 Data model overview

## 6.2 Application Schema

The UML models shown in the Figures below are the overall CNP Application Schema.

This section contains a general overview of the classes and relationships in the S-128 Application Schema. Detailed information about how to use the feature types and information types to encode CNP information is provided in the S-128 Data Classification and Encoding Guide.

The following conventions are used in the UML diagrams depicting the Application Schema:

- Standard UML conventions for classes, associations, inheritance, roles, and multiplicities apply. These conventions are described in Part 1 of S-100.
- *Italic* font for a class name indicates an abstract class.
- Feature classes are depicted with green background; the dark shade for abstract feature classes and the light shade for ordinary (non-abstract) feature classes.
- Information type classes are depicted with blue background; the dark shade for abstract information type classes and the light shade for ordinary information types.
- Association classes are depicted with a white background.
- Complex attributes are depicted with a pink background.
- Enumeration lists and codelists are depicted with a tan background. The numeric code corresponding to each listed value is shown to its right following an '=' sign.
- No significance attaches to the colour of associations.
- Where the association role or name is not explicitly shown, the default rules for roles and names apply:
  - The role name is 'the<CLASSNAME>' where <CLASSNAME> is the name of the class to which that association end is linked.
  - The association name is '<CLASSNAME1>\_<CLASSNAME2>' where <CLASSNAME1> is the source and <CLASSNAME2> the target. In case of a feature/information association the feature is the source. For feature/feature or information/information associations without explicit names the source/target are indicated by an arrowhead.

The S-128 domain model consists of two classes: feature type and information type.

The class for geographic features is feature type and the class for information types is information type.

CNP (Catalogue of Nautical Products) data products include Nautical Products, Electronic Chart, and Paper Chart. The geographic features included in the S-128 are:

- Electronic Chart: Electronic chart products like S-57 ENC, S-101 ENC and digital charts for special purposes.
- Paper Chart: Nautical paper charts and special purpose charts published in paper format.
- Nautical Products: Nautical publications, online services, S-100 compliant products and e-Navigation services and all nautical products except nautical charts.

The CNP data products have a `CatalogueOfNauticalProduct` feature type. Attributes like `featureName`, `issueDate` and `editionNumber` in `CatalogueOfNauticalProduct` are mandatory, but others are optional.

The abstract class `CatalogueElements` and `AbstractChartProducts` is an abstract class from which the geographic feature classes in the Application Schema are derived. `CatalogueElements` has common attributes for all nautical products. `AbstractChartProducts` has common attributes for chart type products. The attributes defined in `CatalogueElements` are inherited by all S-128 geographic feature types. All the attributes in `CatalogueElements` are optional. A derived class may impose additional constraints, which will be described in the definition of the derived class or the S-128 DCEG.

Geographic features use spatial types defined in the geometry package for spatial attributes. Datasets comprised of S-128 features are described by metadata as defined in the S-128 metadata package. Metadata uses selected spatial types (specifically, it uses the polygon type to describe the coverage of a dataset).

`ContactDetails` is the information type in the S-128 domain model. `ContactDetails` has attributes for `contactInstructions`, `contactAddress`, `information`, `onlineResource`, and `telecommunications` and

sourceIndication. All the attributes of ContactDetails are optional. A derived class may impose additional constraints, which will be described in the definition of the derived class or in the S-128 DCEG.

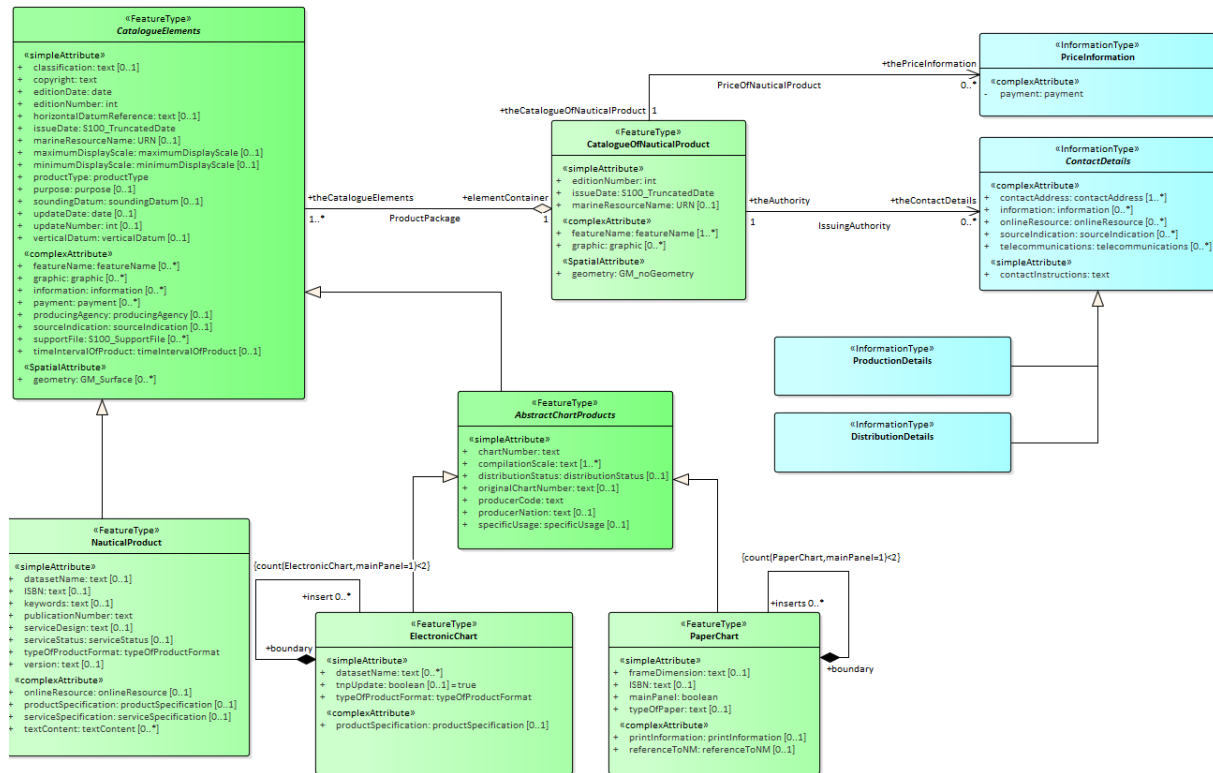


Figure 6-2 – S-128 Application Schema (feature type, information type)

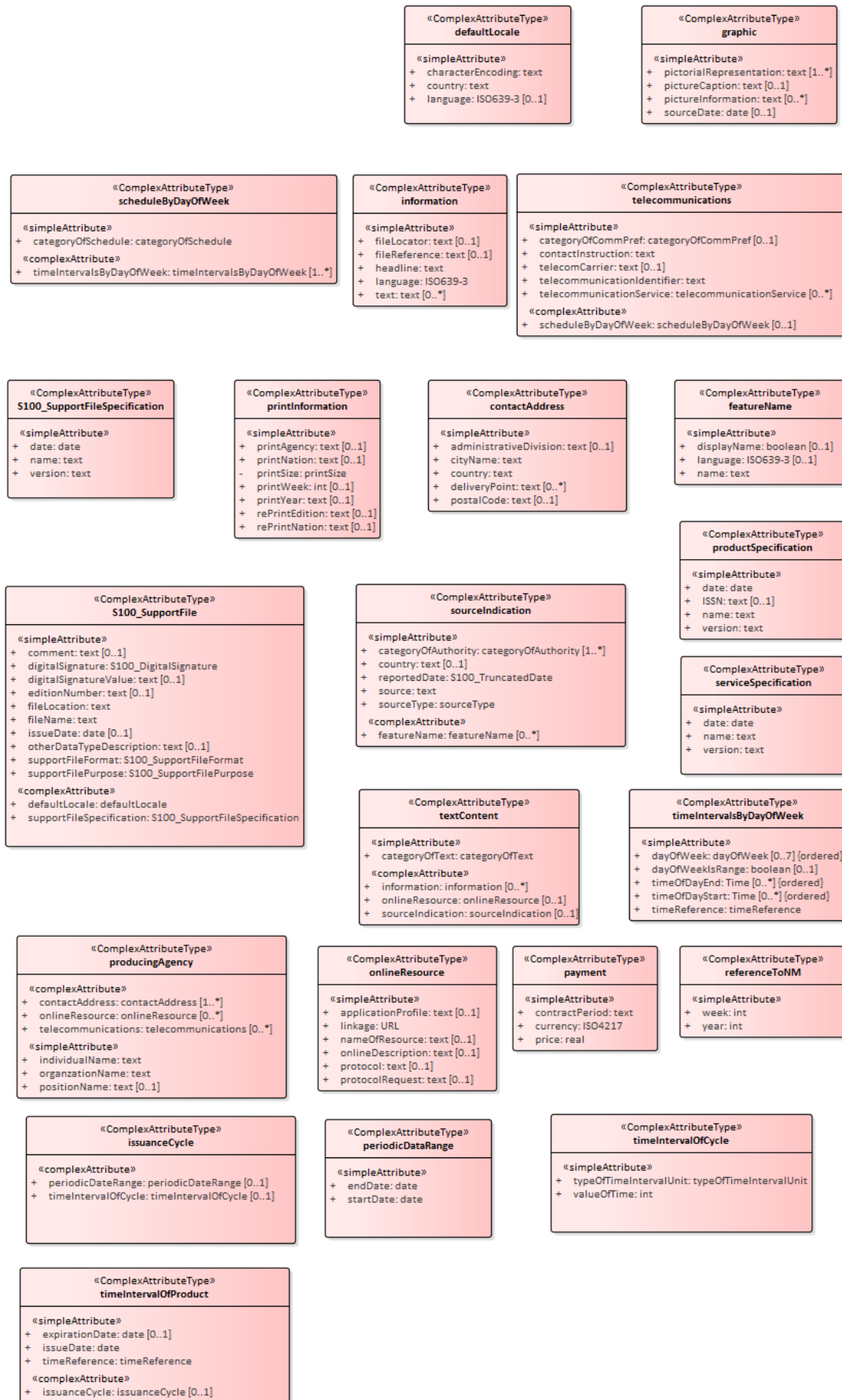


Figure 6-3 – S-128 Application Schema (complex attribute type)



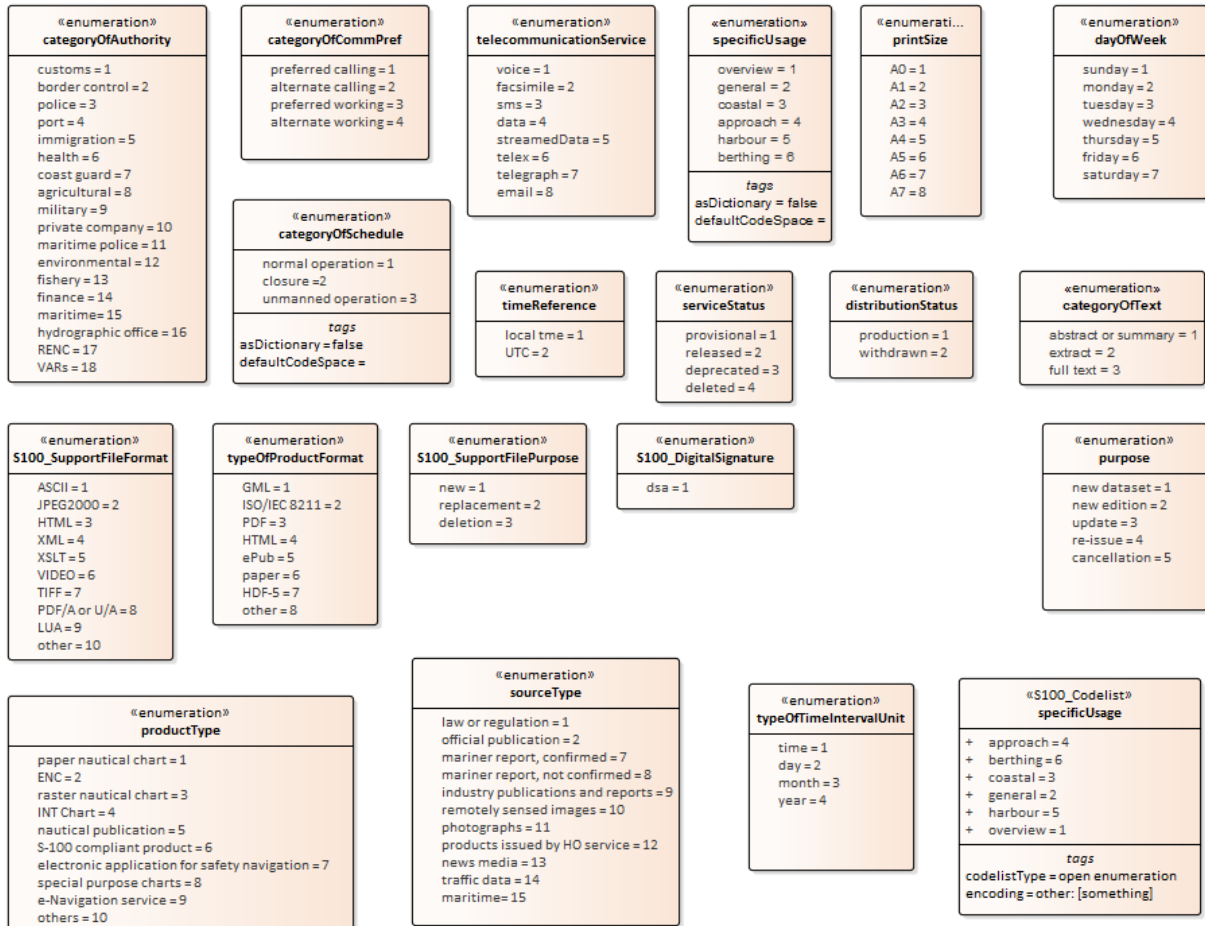


Figure 6-4 – S-128 Application Schema (enumeration)

## 7 Feature Catalogue

### 7.1 Introduction

The Feature Catalogue describes the feature types, information types, attributes, attribute values, associations and roles which may be used in the product. The S-128 Feature Catalogue is available in an XML document which conforms to the S-100 XML Feature Catalogue Schema and can be downloaded from the IHO website (<https://iho.int>). Simple attributes used in this specification are listed in Table 7-1 below.

**Name:** Catalogue of Nautical Products

**Scope:** Ocean, Coastal, Ports, Harbours and Inland waters

**Version Number:** 1.0.0

**Version Date:** **Xxxx** 2022

**Producer:** International Hydrographic Organization (IHO),  
4 quai Antoine 1er,  
B.P. 445  
MC 98011 MONACO CEDEX  
Telephone: +377 93 10 81 00  
Fax: + 377 93 10 81 40  
Email: [info@iho.int](mailto:info@iho.int)

**URL:** <https://iho.int>

**Language:** English

## 7.2 Feature types

Feature types contain descriptive attributes that characterize real-world entities. The word 'feature' may be used in one of two senses – feature type and feature instance. A feature type is a class and is defined in a Feature Catalogue. A feature instance is a single occurrence of the feature type and represented as an object in a dataset. A feature instance is located by a relationship to one or more spatial instances. A feature instance may exist without referencing a spatial instance.

### 7.2.1 Geographic

Geographic (Geo) feature types carry the descriptive characteristics of a real world entity.

### 7.2.2 Meta

Meta features contain information about other features within a data set. Information defined by meta features override the default metadata values defined by the data set descriptive records. Meta attribution on individual features overrides attribution on meta features.

### 7.2.3 Feature relationship

A feature relationship links instances of one feature type with instances of the same or a different feature type.

### 7.2.4 Information types

Information types are identifiable pieces of information in a dataset that can be shared between other features. They have attributes but have no relationship to any geometry; information types may reference other information types.

### 7.2.5 Attributes

S-128 defines attributes as either simple or complex.

#### 7.2.5.1 Simple Attributes

S-128 uses ten types of simple attributes; they are listed in the Table 7-1 below.

**Table 7-1 – Simple feature attributes**

Type	Definition
Enumeration	A fixed list of valid identifiers of named literal values.
Boolean	A value representing binary logic. The value can be either True or False. The default state for Boolean type attributes (that is, where the attribute is not populated for the feature) is False.
Real	A signed Real (floating point) number consisting of a mantissa and an exponent.
Integer	A signed integer number. The representation of an integer is encapsulation and usage dependent.
CharacterString	An arbitrary-length sequence of characters including accents and special characters from a repertoire of one of the adopted character sets.
Date	A date provides values for year, month, and day according to the Gregorian Calendar. Character encoding of a date is a string which must follow the calendar date format (complete representation, basic format) for date specified by ISO 8601:1988. EXAMPLE 19980918 (YYYY-MM-DD)
Time	A time is given by an hour, minute, and second. Character encoding of a time is a string that follows the local time (complete representation, basic format) format defined in ISO 8601:1988. EXAMPLE 183059 or 183059+0100 or 183059Z
Date and Time	A DateTime is a combination of a date and a time type. Character encoding of a DateTime shall follow ISO 8601:1988. EXAMPLE 19850412T101530
Codelist	A type of flexible enumeration. A codelist type is a list of literals which may be extended only in conformance with specified rules.

Truncated Date	One or more components of the Date type are omitted.
----------------	--

### 7.2.5.2 Complex attributes

Complex attributes are aggregations of other attributes that are either simple or complex. The aggregation is defined by means of attribute bindings.

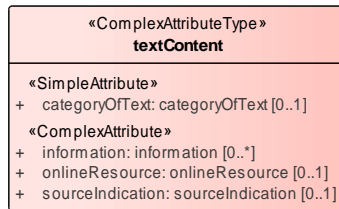


Figure 7-1 – textContent (complex attribute)

### 7.3 Units of measure

The following units of measure are used in Catalogue of Nautical Products datasets:

- Uncertainty is given in meters.

### 7.4 Geometric representation

Geometric representation is the digital description of the spatial component of an object as described in S-100 and ISO 19107. This Product Specification uses three types of geometries: GM\_Point, GM\_OrientableCurve, and GM\_OrientableSurface.

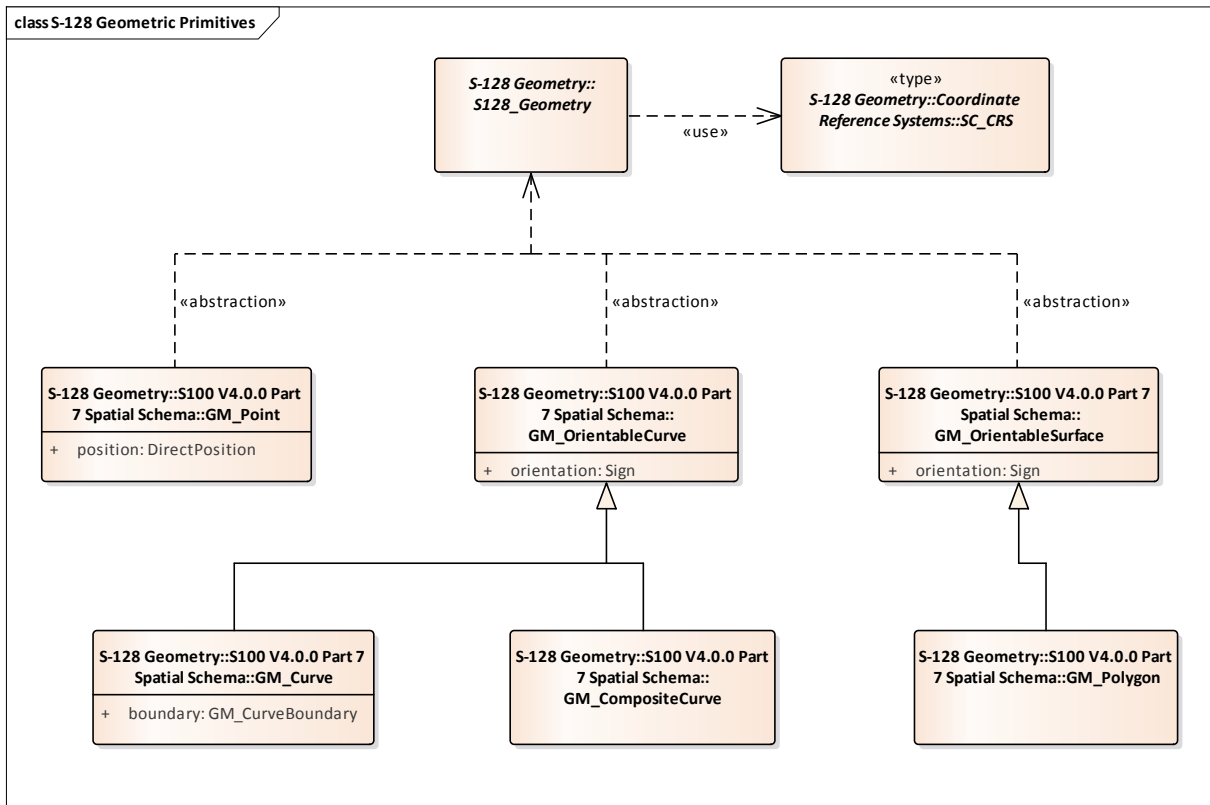


Figure 7-2 – Geometric primitives

## 8 Coordinate Reference System (CRS)

### 8.1 Introduction

The location of an object in the S-100 Standard is defined by means of coordinates which relate a feature to a position. The coordinate reference system used for this Product Specification is World Geodetic System 1984 (WGS 84) which is defined by the European Petroleum Survey Group (EPSG) code 4326, (or similar - North American Datum 1983 / Canadian Spatial Reference System).

Spatial data is expressed as latitude ( $\varphi$ ) and longitude ( $\lambda$ ) geographic coordinates. Latitude values are stored as a negative number to represent a position south of the Equator. Longitude values are stored as a negative number to represent a position west of the International Prime Meridian. Coordinates are expressed as real value, degree / degree decimal format. Datasets conforming to this product specification are not projected.

**Horizontal coordinate reference system:** WGS 84

**Projection:** None

**Vertical coordinate reference system:** Although all coordinates in a data set must refer to the same horizontal CRS different Vertical Datums can be used for the depth component of a coordinate tuple. Therefore the vertical CRS can be repeated. For each Vertical CRS a unique identifier is defined. Those identifiers will be used to indicate which Vertical CRS is used. Units must be in meters. (From S-101 Product Specification).

**Temporal reference system:** Gregorian calendar

**Coordinate reference system registry:** [EPSG Geodetic Parameter Registry](#)

**Date type (according to ISO 19115):** 002 - publication

### 8.2 Horizontal reference system

Positional data is expressed in latitude and longitude geographic coordinates to one of the reference horizontal reference systems defined in the horizontalDatum attribute. Unless otherwise defined, the World Geodetic System 84 (WGS 84) will be used for CNP data products.

### 8.3 Projection

CNP data products are un-projected.

### 8.4 Vertical coordinate reference system

Although all coordinates in a data set must refer to the same horizontal CRS different Vertical Datums can be used for the depth component of a coordinate tuple. Therefore the vertical CRS can be repeated. For each Vertical CRS a unique identifier is defined. Those identifiers will be used to indicate which Vertical CRS is used. Units must be in meters.

### 8.5 Temporal reference system

Time is measured by reference to Calendar dates and Clock time in accordance with ISO 19108:2002 Temporal Schema, clause 5.4.4.

## 8.6 Coverage of nautical products data and scale

CNP data must be compiled in the best applicable scale. The use of the data itself is "scale independent". That means that the data can be used at any scale. S-100 allows the association of multiple spatial attributes to a single feature instance. Each of these-spatial attributes can in principle be qualified by maximum and minimum scales.

For example, it is possible, within one dataset, to have a single instance of a feature that has more than one area geometry. Each of these geometries has different scale max/min attributes. Moreover, due to cluttering in smaller scales, the scale minimum attribute may be used to turn off portrayal of some features at smaller scales.

## 9 Data Quality

### 9.1 Introduction

Data quality allows users and user systems to assess fitness for use of the provided data. Data quality measures and the associated evaluation are reported as metadata of a data product. This metadata improves interoperability with other data products and provides usage by user groups that the data product was not originally intended for. The secondary users can make assessments of the data product usefulness in their application based on the reported data quality measures.

For S-128 the following data quality elements have been included:

- Conformance to this Product Specification;
- Intended purpose of the data product;
- Completeness of the data product in terms of coverage;
- Logical Consistency;
- Positional uncertainty and accuracy;
- Thematic accuracy;
- Temporal quality;
- Aggregation measures;
- Elements specifically required for the data product (none currently identified for S-128);
- Validation checks or conformance checks including:
  - General tests for dataset integrity;
  - Specific tests for a specific data model.

## 10 Data Capture and Classification

S-128 products must be generated from data obtained from the product creator and released by an appropriate CNP defining authority such as Hydrographic Offices. The product creator can be described for each product within a CNP.

The production process used to generate CNP products may be described in the dataset metadata.

**Table 10-1 – Data capture information**

Item Name	Description	Multiplicity	Type
dataSource	Identification of the kinds of data sources usable to product datasets compliant with the considering Specification	0..*	CharacterString
productionProcess	Link to a textual description of the production process (including encoding guide) applicable to the datasets compliant with the considering Specification	0..*	CharacterString (URL)

## 10.1 Data encoding and product delivery

### 10.1.1 Data encoding

The principal encoding will be the Open Geospatial Consortium (OGC), Geography Markup Language (GML) format. GML is an XML grammar designed to express geographical features. It serves as a modelling language for geographic systems as well as an open interchange format for geographic transactions.

### 10.1.2 Types of datasets

A dataset is a grouping of features, attributes, geometry, and metadata which comprises a specific coverage. The types of CNP datasets produced and contained within an Exchange Set are listed in Table 10-2 below:

**Table 10-1 – CNP dataset types**

Dataset	Explanations
New dataset (base dataset):	Data for an area different (in coverage and/or extent) to existing datasets.
New Edition of a dataset:	A re-issue plus new information which has not been previously distributed by Updates. Each New Edition of a dataset must have the same name as the dataset that it replaces and should have the same spatial extents. The Edition number in the dataset discovery metadata shall increment up by one from the previous Edition.
Update dataset	A delta change of the latest Edition of a dataset. If there is more than one update dataset, the subsequent update will be a delta of the base dataset + earlier update datasets.
Re-issue	Including all the updates applied to the original dataset up to the date of the reissue. A Re-issue does not contain any new information additional to that previously issued by updates.
Cancellation	Used to cancel a dataset and any related update datasets.

### 10.1.3 Content of update datasets

Update datasets can only contain replacements, deletions, and additions of whole feature instances or information instances. This means that when a feature or information instance is updated, the new version must contain all the attributes of the old instance, including any inline spatial attributes (that is, inline geometry), except those attributes that are being removed.

An association to an instance of a feature or information type is treated as an attribute of the referring instance, and therefore adding or deleting an association means the original referring instance must be replaced with a new version. The instance at the other end of the association needs to be replaced if and only if it contains a reference to the first instance.

Spatial objects that are not inline (that is, geometry that is encoded as an independent spatial object in the dataset) are treated like any other object; that is, it needs to be updated if and only if the primitive has changed (for example, a coordinate is updated).

Feature and information type instances are deleted without replacement by setting the `fixedDateRange.dateEnd` attribute of the instance to the date of deletion, which will usually be the issue date of the update.

## 10.2 Encoding of latitude and longitude

Values of latitude and longitude must not be more accurate than 7 decimal places. Coordinates must be encoded as decimals in the format described in clause 10.2.1.

### 10.2.1 Encoding of coordinates as decimals

Values should be coded as decimal numbers with 7 or fewer digits after the decimal. The normative encoding is in degrees, with an accuracy of  $10^{-7}$  degrees; that is, 7 digits after the decimal point.

The decimal point must be indicated by the “.” character.

Trailing zeroes after the decimal point (and the decimal point itself if appropriate) may be omitted at producer discretion, but the accuracy must still be as indicated (for example,  $10^{-7}$  degrees for coordinates of default accuracy).

### 10.3 Numeric attribute encoding

Floating point and integer attribute values must not contain leading zeros. Floating point attribute values must not contain non-significant trailing zeros.

### 10.4 Text attribute values

Character strings must be encoded using the character set defined in ISO 10646-1, in Unicode Transformation Format-8 (UTF-8).

### 10.5 Mandatory attribute values

There are four reasons why attribute values may be considered mandatory:

- They determine whether a feature is in the display base.
- Certain features make no logical sense without specific attributes.
- Some attributes are necessary to determine which symbol is to be displayed.
- Some attributes are required for safety of navigation.

All mandatory attributes are identified in the Feature Catalogue and summarized in Annex A – Data Classification and Encoding Guide.

### 10.6 Unknown attribute values

When a mandatory attribute code or tag is present but the attribute value is missing, it means that the producer wishes to indicate that this attribute value is unknown. Missing mandatory attributes must be “nilled”.

Optional attributes must be omitted altogether if the value is unknown or missing. They must not be “nilled.”

**EXAMPLE** A landmark feature has unknown category of landmark (mandatory attribute) and function (optional attribute). The feature could be coded as:

```
<Landmark>
  <categoryOfLandmark xsi:nil="true"/>
  <function>radio</function>
  ... other attributes...
  ... <status> is NOT coded ...
</Landmark>
```

## 10.7 Structure of dataset files

### 10.7.1 Sequence of objects

The order of data objects in each dataset file is described below:

- Dataset identification information
- Dataset structure information
- Spatial records for by-reference geometries
  - Point
  - Multi point

Curve  
 Composite Curve  
 Surface

Information objects

Feature objects (geometry may be encoded inline or by reference)

Meta features  
 Geo features

## 10.8 Object identifiers

The “name” of feature records must provide a unique world-wide identifier of feature records. The “name” of the record is the combination of the subfields **agency**, **featureObjectIdentifier**, and **featureIdentificationSubdivision** elements of the **featureObjectIdentifier** element of the object.

Features, information types, collection objects, meta features, and geometries (inline or external) are all required by the Schema to have a **gml:id** attribute with a value that is unique within the dataset. The **gml:id** values must be used as the reference for the object from another object in the same dataset or another dataset.

## 10.9 Data coverage

All areas of a dataset must be covered by a **DataCoverage** meta feature.

An update dataset must not change the limit of a **Data Coverage** feature for the base dataset. Where the limit of a **Data Coverage** feature for a base dataset is to be changed, this must be done by issuing a New Edition of the dataset.

## 10.10 Data overlap

S-128 datasets can overlap other S-128 datasets.

## 10.11 Data extent

Datasets must not cross the 180° meridian of longitude.

# 11 Data Delivery

## 11.1 Data product delivery information

This data Product Specification defines GML as the primary format in which CNP data products are delivered. The delivery format is described by the following items (from ISO 19131:2005): format name, version, specification, language, and character set.

**Table 11-1 – Data product delivery format**

Name	ISO 19131 Elements	Value
Format name	DPS_DeliveryInformation.deliveryFormat > DPS_DeliveryFormat.formatName	GML*
Version	DPS_DeliveryInformation.deliveryFormat > DPS_DeliveryFormat.version	3.2.1
Specification description	DPS_DeliveryInformation.deliveryFormat > DPS_DeliveryFormat.specification	GML*
Language	DPS_DeliveryInformation.deliveryFormat > DPS_DeliveryFormat.language	English
Character set	DPS_DeliveryInformation.deliveryFormat > DPS_DeliveryFormat.characterSet > MD_CharacterSetCode	004 – utf8



\* GML is an XML encoding for the transport and storage of geographic information, including both the geometry and the properties of geographic features, between distributed systems. The XML Schema for the GML Application Schema is provided in a Schema document S128.xsd which imports other Schema(s) defining common types. (All files are available on the S-100 distribution site <https://github.com/IHO-S100WG>). Feature instance shall validate against S128.xsd and conform to all other requirements specified in this data Product Specification including all constraints not captured in the XML Schema document.

**11.1.1 Dataset loading**

Datasets must always be loaded in the order of base dataset first, then update datasets in the corrected sequential order. Systems are not to load updates out of order, for example if update 1-5 is present and update 1-6 is missing, update 1-7 must not be loaded.

**11.1.2 New Editions**

When a New Edition of a dataset is received, the system must replace the previous Edition, along with any updates, with the New Edition of the dataset. Loading of subsequent updates follows the same rule as above.

**11.2 Dataset size**

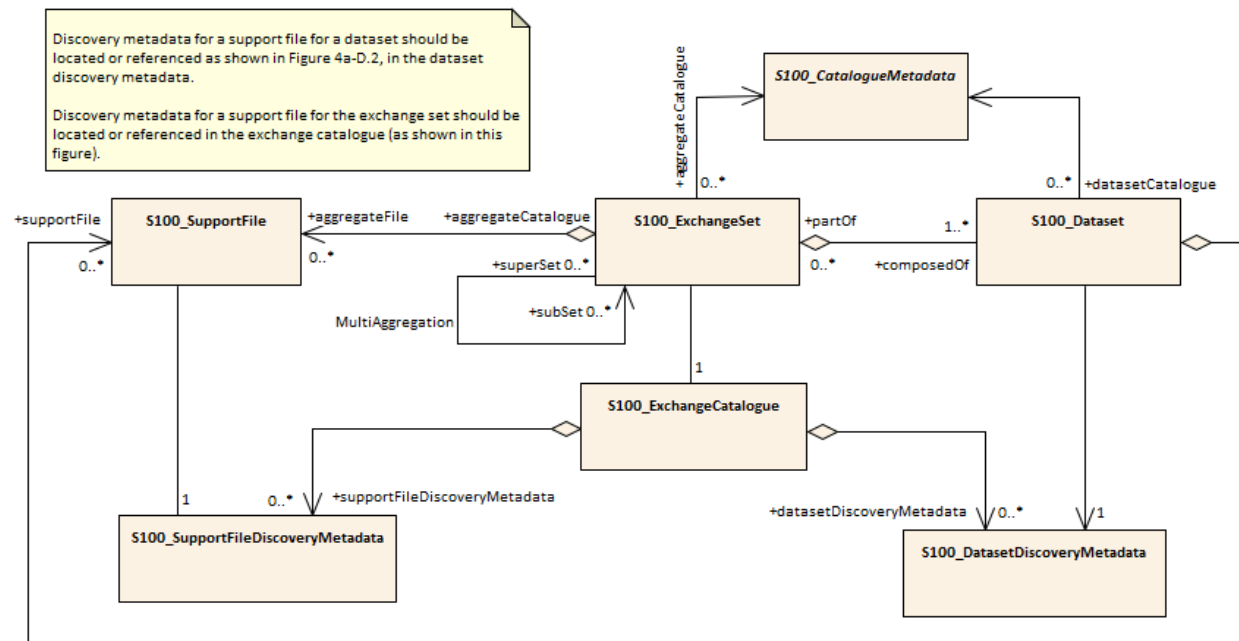
CNP datasets shall not exceed 20MB.

Update datasets shall not exceed 500KB.

**11.3 Exchange Set**

Data which conforms to this product specification must be delivered by means of an Exchange Set.

An Exchange Set will consist of one or more CNP datasets. An Exchange Set may also include one or more support files containing supplementary information encoded in separate files. These are linked to the CNP dataset features, by feature and information type attributes defined in the application schema; for example, **fileReference**. Each Exchange Set will include a single (XML) Catalogue file. S-128 Exchange Set Catalogues conform to S-100 Edition 4.0.0, Part 4a, Figure 4a-D-2 without modification, containing discovery metadata for each CNP dataset as well as support files. S-128 Exchange Set structure conforms to S-100 Edition 4.0.0, Part 4a, Figure 4a-D-3 without modification.



**Figure 11-1 – Exchange Set structure**

## 11.4 Support Files

Support files contain ancillary textual or graphic information in separate (linked to the dataset) files. The following formats are allowed for support files:

- Plain text files must contain only general text as defined in this Standard. Files must use the UTF-8 character set encoding.
- HTML and XML files must contain only text and markup as defined in the relevant W3C standards. Files must use the UTF-8 character set encoding. References in datasets to HTML and XML support files must treat them as text files (that is, they should not be referenced using attributes intended for picture files).
- Picture files must be in the Tagged Image file Format (TIFF) [Edition 6.0].

Support files shall be used for data management and additional information to users. Portraying and using support files in ECDIS or other systems is not mandatory. Table 11-2 describes the constraints on support file formats and provides the corresponding file extensions.

**Table 11-2 – Support file formats and extensions**

File type	Extension	Description
Text	TXT	
	HTM	HTML files must only include inline or embedded Cascading Style Sheet (CSS) information and must not contain embedded Javascript or other dynamic content; for example DHTML, Flash etc.
	XML	XML documents must only be included in accordance with guidance provided within the Data Classification and Encoding Guide (Annex A) and must not contain embedded Javascript or other dynamic content.
Picture	TIF	Baseline TIFF 6.0.

## 11.5 Support file naming convention

All support files will have unique world-wide file identifiers. The file identifier of support information should not be used to describe the physical content of the file. The support file metadata that accompanies the file will inform the user of the name and purpose of the file (new, replacement or deletion).

In this encoding the support files are named according to the specifications given below:

128CCCCXXXXXXXXXX.YYY

The main part forms an identifier where:

- The first three characters are always “128” and identify the dataset as an S-128 dataset.
- The next four characters identify the issuing agency by its alphanumeric agency code in the IHO Producer Code Register in the IHO GI Registry (that is, the IHO is identified as “AA”, not “1810”). Where the agency code consists of fewer than four characters, sufficient zeros must be suffixed to make the length exactly four characters (for example, “AA00” for IHO).
- The eighth up to the seventeenth characters can be used in any way by the producer to provide a unique file name for the dataset. The following characters are allowed in the dataset name: A to Z, 0 to 9, and the special character \_ (underscore). The ninth through seventeenth characters are optional (that is, at least one character must be used).
- .YYY – support file extension. The YYY portion must conform to the file format as described in Table 11-2 above.

## 11.6 Dataset naming convention

All dataset files will have unique world-wide file identifiers. The file identifier of the dataset should not be used to describe the physical content of the file. The dataset file metadata that accompanies the file will inform the user of the name and purpose of the file (new, replacement or deletion).

In this encoding the dataset files are named according to the specifications given below:

128CCCCXXXXXXXXXX.GML

The main part forms an identifier where:

- The first three characters are always “128” and identify the dataset as an S-128 dataset.
- The next four characters identify the issuing agency by its alphanumeric agency code in the IHO Producer Code Register in the IHO GI Registry (that is, the IHO is identified as “AA”, not “1810”). Where the agency code consists of fewer than four characters, sufficient zeros must be suffixed to make the length exactly four characters (for example, “AA00” for IHO).
- The eighth up to the seventeenth characters can be used in any way by the producer to provide a unique file name for the dataset. The following characters are allowed in the dataset name, A to Z, 0 to 9 and the special character \_ (underscore). The ninth through seventeenth characters are optional (that is, at least one character must be used).

## 11.7 Update dataset naming convention

All update dataset files will have an identical name to the base dataset, aside from the separator and update number sequence.

In this encoding the update dataset files are named according to the specifications given below:

128CCCCXXXXXXXXXX\_XXX.GML

The main part forms an identifier where:

- The first up to the seventeenth characters are the same as the dataset being updated and therefore conform to the rules described in clause **Error! Reference source not found..**
- The next character must be an underscore “\_”.
- The next three characters must be numerical (000-999) to indicate the place of the update dataset in the update sequence.

## 11.8 Catalogue file naming convention

The Exchange Catalogue acts as the table of contents for the Exchange Set. The Catalogue file of the Exchange Set must be named CATALOG.XML. No other file in the Exchange Set may be named CATALOG.XML. The content of the Exchange Catalogue file is described in clause 14.

# 12 Dataset Maintenance

## 12.1 Introduction

Datasets are maintained as needed and must include mechanisms for CNP updating. Data updates will be made by New Editions or updates. The maintenance and update frequency of CNP datasets should be defined by the producers (official national authority) implementing this Specification.

Data Producers must use applicable sources to maintain and update data and provide a brief description of the sources that were used to produce the dataset in the appropriate metadata field.

## 12.2 Production process for base and update datasets

Data Producers should follow their established production processes for maintaining and updating datasets. Data is produced against the DCEG and checked against the appropriate set of validation checks in Appendix X.

### **12.3 Dataset updates and cancellation**

The purpose of issue of the dataset is indicated in the “purpose” field of the dataset discovery metadata. In order to terminate a dataset, an update dataset file is created for which the Edition number must be set to 0 (000). This convention is only used to cancel a base dataset file.

Where a dataset is cancelled and its name is reused at a later date, the issue date must be greater than the issue date of the cancelled dataset.

When the dataset is cancelled, it must be removed from the system.

An Exchange Set may contain base dataset files and update dataset files for the same datasets. Under these circumstances the update dataset files must follow in the correct sequential order from the last update applied to the base dataset file.

### **12.4 Support file updates**

The purpose of issue is indicated in the “purpose” field of the support file discovery metadata. Support files carrying the “deletion” flag in metadata must be removed from the system. When a feature or information type pointing to a text, picture, or application file is deleted or updated so that it no longer references the file, the system software must check to see whether any other feature or information type references the same file, before that file is deleted.

Updates, in form of a New Edition or a replacement, or deletions of a support file may require concurrent updates to feature or information type instance attributes that depend on the file; for example, pictorialRepresentation, fileReference, and fileLocator attributes.

### **12.5 Feature and Portrayal Catalogues**

For each new version of the S-128 Product Specification a new Feature and Portrayal Catalogue may be released. The system must be able to manage datasets and their Catalogues that are created on different versions of the S-128 Product Specification.

### **12.6 Feature history, versions, and change tracking**

If applications or production systems require versioning of individual instances of feature or information types, maintenance of histories, or change tracking, the methods for versioning, history management, and change tracking and display are left to the application or production system.

### **12.7 Dataset encryption**

Details about dataset encryption are still to be determined, and may mirror the method described in S-101.

## **13 Portrayal**

Portrayal is not defined in this version of S-128 Catalogue of Nautical Products Specification. Users are free to choose the means and methodology of portrayal as they see best suited for their needs. It should be noted that future versions of S-128 may include a Portrayal Catalogue, and any implementer should therefore anticipate this, and make sufficient provisions in any system supporting S-128.

## 14 Metadata

### 14.1 Introduction

The CNP metadata specification conforms to the S-100 metadata specification in Part 4a, which is a profile of the ISO 19115-1 Standard. These documents provide a structure for describing digital geographic data and define metadata elements, a common set of metadata terminology, definitions, and extension procedures.

The overall structure of metadata in S-128 Exchange Sets is the same as in S-100, and is depicted in Figure 14-1 below. Metadata in Exchange Sets consists of discovery metadata for the datasets and support files in the Exchange Set (classes S100\_DatasetDiscoveryMetadata and S100\_SupportFileDiscoveryMetadata); metadata in ISO 19115-1 format for datasets; and metadata about any Feature, Portrayal, or Interoperability Catalogues which are in the Exchange Set (S100\_CatalogueMetadata).

The discovery metadata classes have numerous attributes which enable important information about the datasets and accompanying support files to be examined without the need to process the data, for example decrypt, decompress, load, etc. Other Catalogues such as Feature and Portrayal Catalogues can be included in the Exchange Set in support of the datasets.

More detailed information for the classes is depicted in Figure 14-2 and details about the metadata classes are provided in clauses 14.2–14.5.

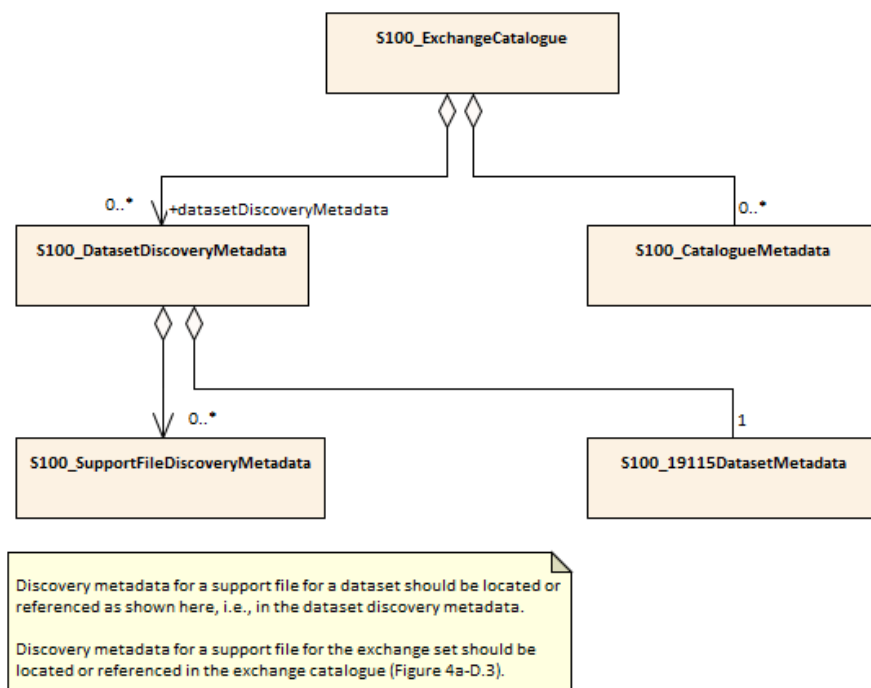


Figure 14-1 – Metadata in Exchange Catalogue

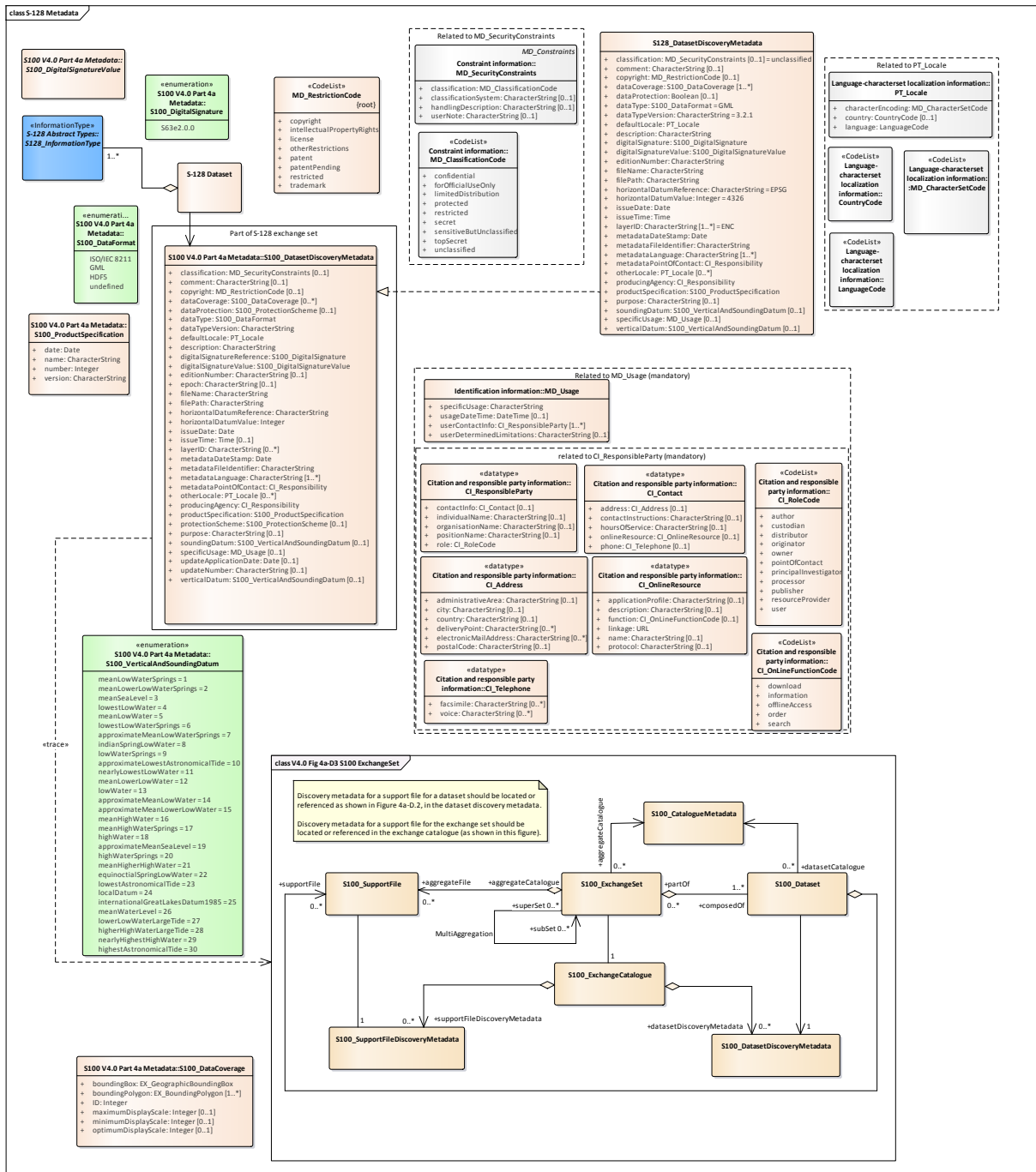


Figure 14-2 – S-128 Exchange Catalogue and discovery metadata

NOTE 1: Types with CI\_, EX\_, and MD\_ prefixes are from packages defined in ISO 19115-1 and 19115-3 and adapted by S-100. Types with S100\_ prefix are from packages defined in S-100.

NOTE 2: When a dataset is terminated, the purpose metadata field is set to 3 (terminated) and the editionNumber metadata field is set to 0. All inapplicable but mandatory metadata fields must be nilled.

NOTE 3: Figure 14-2 will be updated following S-124 Navigational Warnings Product Specification with MD\_Usage and S-128 Product Specification Package version 1.1.

In Figure 14-2 and the following clauses, classes show only those attributes which are used in S-128 Exchange Catalogues. Similarly, enumerations show only those values which are allowed in S-128 Exchange Catalogues.

## 14.2 Dataset metadata

Dataset metadata is intended to describe information about a dataset. It facilitates the management and exploitation of data and is an important requirement for understanding the characteristics of a dataset. Whereas dataset metadata is usually fairly comprehensive, there is also a requirement for a constrained subset of metadata elements that are usually required for discovery purposes. Discovery metadata are often used for building web Catalogues; and can help users determine whether a product or service is fit for purpose and where they can be obtained.

### 14.2.1 Metadata for new datasets and New Editions

Dataset discovery metadata for new datasets and new editions of published datasets is described in Table 14-1.

**Table 14-1 – Dataset discovery metadata**

Name	Multiplicity	Type	Remarks
S100_DataSetDiscoveryMetadata		Class	The following S-100 attributes are not used: verticalDatum, soundingDatum, optimumDisplayScale, maximumDisplayScale, minimumDisplayScale.
fileName	1	CharacterString	Dataset file name (see 11.6).
filePath	1	CharacterString	Full path from the exchange set root directory.
description	1	CharacterString	Short description of the area covered by dataset; for example, area, harbour, or port name, between two named locations etc.
dataProtection	0..1	Boolean	TRUE: Encrypted FALSE: Unencrypted
protectionScheme	0..1	S100_ProtectionScheme	See S-100 Appendix 4a-D.
digitalSignatureReference	1	S100_DigitalSignature	Specifies the algorithm used to compute digitalSignatureValue. See S-100 Appendix 4a-D.
digitalSignatureValue	1	S100_DigitalSignatureValue	The value resulting from application of digitalSignatureReference. Implemented as the digital signature format specified in S-100 Part 15.
copyright	0..1	MD_LegalConstraints>MD_RestrictionCode <copyright> (ISO 19115-1)	"copyright" for copyrighted datasets, omitted otherwise.
classification	0..1	Class MD_SecurityConstraints>MD_ClassificationCode (codelist) ISO 19115-1	1. unclassified 2. restricted 3. confidential 4. secret 5. top secret 6. sensitive but unclassified 7. for official use only 8. protected 9. limited distribution
purpose	1	MD_Identification>purpose (character string)	1. new dataset 2. new edition

Name	Multiplicity	Type	Remarks
specificUsage	1	MD_USAGE>specificUsage (character string) MD_USAGE>userContactInfo (CI_Responsibility)	Brief description of the resource and/or resource series usage
editionNumber	1	CharacterString	When a dataset is initially created, the Edition number "1" is assigned to it. The Edition number is increased by one with each New Edition.
issueDate	1	Date	Date on which the dataset was generated.
issueTime	0..1	Time	Encoded only if time of issue is significant.
productSpecification	1	S100_ProductSpecification	See Notes below this table for constraints on values.
producingAgency	1	CI_Responsibility>CI_Organisation or CI_Responsibility>CI_Individual	Party responsible for generating the dataset. See Part S-100 4a, Tables 4a-2 and 4a-3.
horizontalDatumReference	1	CharacterString	
horizontalDatumValue	1	Integer	WGS84.
epoch	0..1	CharacterString	For example, G1762 for the 2013-10-16 realization of the geodetic datum for WGS84.
dataType	1	S100_DataFormat	The only value allowed is "GML".
dataTypeVersion	1	CharacterString	
dataCoverage	1..*	S100_DataCoverage	See S-100 Appendix 4a-D. A new or New Edition S-128 dataset must have at least one coverage.
comment	0..1	CharacterString	Any additional Information
layerID	1..*	CharacterString	Dataset must be used with ENC in an ECDIS. Mandatory for S-128 new datasets and New Editions.
defaultLocale	1	PT_Locale	See S-100 Appendix 4a-D.
otherLocale	0..*	PT_Locale	See S-100 Appendix 4a-D.
metadataFileIdentifier	1	CharacterString	For example, identifier for ISO 19115-3 metadata file.
metadataPointOfContact	1	CI_Responsibility>CI_Individual or CI_Responsibility>CI_Organisation	See S-100 Part 4a Tables 4a-2 and 4a-3.
metadataDateStamp	1	Date	Metadata creation date, which may or may not be the dataset creation date
metadataLanguage	1..*	CharacterString	
--	0..*	Aggregation S100_SupportFileDiscoveryMetadata	One for each support file linked to this dataset and present in the exchange set.



NOTES:

- 1) Attribute *productSpecification*: The values of sub-attributes *name* and *version* must correspond to this version of the S-128 product specification. (Clause **Error! Reference source not found.**). The value of sub-attribute *number* must be the number assigned to this version of the S-128 product specification in the GI registry.

**14.2.2 Update and cancellation dataset metadata**

Update dataset metadata (Table 14.2) is intended to describe information about an update dataset. It facilitates the management and exploitation of data and is an important requirement for understanding the characteristics of an update dataset. Whereas dataset metadata is usually fairly comprehensive, metadata for update datasets only describe the issue date and sequential relation to the base dataset.

Update dataset discovery metadata omits the *dataCoverage*, *specificUsage* and *layerID* metadata attributes.

**Table 14-2 – Update dataset metadata**

Name	Multiplicity	Type	Remarks
S100_DataSetDiscoveryMetadata		Class	The following S-100 attributes are not used for update datasets: <i>verticalDatum</i> , <i>soundingDatum</i> , <i>optimumDisplayScale</i> , <i>maximumDisplayScale</i> , <i>minimumDisplayScale</i> , <i>dataCoverage</i> , <i>specificUsage</i> , <i>layerID</i> .
<i>fileName</i>	1	CharacterString	Dataset file name (see 11.7)
<i>filePath</i>	1	CharacterString	Full path from the exchange set root directory.
<i>description</i>	1	CharacterString	Brief description of the update.
<i>dataProtection</i>	0..1	Boolean	Value must be same as base dataset.
<i>protectionScheme</i>	0..1	S100_ProtectionScheme	Value must be same as base dataset.
<i>digitalSignatureReference</i>	1	S100_DigitalSignature	Specifies the algorithm used to compute <i>digitalSignatureValue</i> . See S-100 Appendix 4a-D.
<i>digitalSignatureValue</i>	1	S100_DigitalSignatureValue	The value resulting from application of <i>digitalSignatureReference</i> . Implemented as the digital signature format specified in S-100 Part 15.
<i>copyright</i>	0..1	MD_LegalConstraints>MD_RestrictionCode <copyright> (ISO 19115-1)	Value must be same as base dataset.
<i>classification</i>	0..1	Class MD_SecurityConstraints>MD_ClassificationCode (codelist)	Value must be same as base dataset.
<i>purpose</i>	1	CharacterString	3. update 4. cancellation
<i>editionNumber</i>	1	CharacterString	Value must be same as base dataset.
<i>updateNumber</i>	1	CharacterString	Update sequence number, must match file name.
<i>updateApplicationDate</i>	1	Date	Date of update.
<i>issueDate</i>	1	Date	Date on which the dataset was generated.

Name	Multiplicity	Type	Remarks
issueTime	0..1	Time	Encoded only if time of issue is significant such as when more than one update is planned in a day.
productSpecification	1	S100_ProductSpecification	Value must be same as base dataset.
producingAgency	1	CI_Responsibility>CI_Organisation or CI_Responsibility>CI_Individual	Party responsible for generating the dataset. See Part 4a Tables 4a-2 and 4a-3.
horizontalDatumReference	1	CharacterString	
horizontalDatumValue	1	Integer	WGS84.
epoch	0..1	CharacterString	Must be same as base dataset.
dataType	1	CharacterString	
dataTypeVersion	1	CharacterString	
comment	0..1	CharacterString	Any additional Information.
defaultLocale	1	PT_Locale	Must be same as base dataset. See S-100 Appendix 4a-D.
otherLocale	0..*	PT_Locale	Must be same as base dataset. See S-100 Appendix 4a-D.
metadataFileIdentifier	1	CharacterString	For example, for ISO 19115-3 metadata file.
metadataPointOfContact	1	CI_Responsibility>CI_Individual or CI_Responsibility>CI_Organisation	See S-100 Part 4a, Tables 4a-2 and 4a-3.
metadataDateStamp	1	Date	Metadata creation date, which may or may not be the dataset creation date.
metadataLanguage	1..*	CharacterString	Must be same as base dataset.
--	0..*	Aggregation S100_SupportFileDiscoveryMetadata	One for each support file that is referenced by the update dataset and present in the Exchange Set.

### 14.3 Support file metadata

Support file metadata (Table 14-3 below) is intended to describe information about a data resource. It facilitates the management and exploitation of data and is an important requirement for understanding the characteristics of a data resource.

**Table 14-3 – Support file metadata**

Name	Multiplicity	Type	Remarks
S100_SupportFileDiscoveryMetadata		Class	
fileName	1	CharacterString	
fileLocation	1	CharacterString	Path relative to the root directory of the Exchange Set. The location of the file after the Exchange Set is unpacked into directory <EXCH_ROOT> will be <EXCH_ROOT>/<filePath>/<filename>.

purpose	1	S100_SupportFile Purpose	New, replacement, or deletion. Values "replacement" and "deletion" are allowed only in update datasets.
editionNumber	1	CharacterString	When a dataset is initially created, the Edition number 1 is assigned to it. The Edition number is increased by 1 at each New Edition. Edition number remains the same for a re-issue.
issueDate	1	Date	
supportFileSpecification	1	S100_SupportFile Specification	See S-100 Appendix 4a-D.
dataType	1	S100_SupportFile Format	The only values allowed for support files referenced in datasets are: ASCII (for text files), TIFF, and HTML. Values XML, XSLT, and LUA are reserved for Portrayal Catalogue files.
otherDataTypeDescription	0..1	CharacterString	
comment	0..1	CharacterString	
digitalSignatureReference	0..1	S100_DigitalSignature	Specifies the algorithm used to compute digitalSignatureValue. See S-100 Appendix 4a-D.
digitalSignatureValue	0..1	S100_DigitalSignatureValue	The value resulting from application of digitalSignatureReference. Implemented as the digital signature format specified in S-100 Part 15.
defaultLocale	1	PT_Locale	See S-100 Appendix 4a-D.
otherLocale	0..*	PT_Locale	See S-100 Appendix 4a-D.

#### 14.4 Exchange Set Catalogue and metadata

Frequently datasets are packaged and distributed as composite exchange sets by third party vendors. An Exchange Set could contain many different types of datasets, sourced from different data producers. For example an Exchange Set may contain numerous dataset files, ancillary data files, discovery metadata files and others. Exchange Set metadata contains metadata about the contents of the Exchange Set and metadata about the data distributor.

##### 14.4.1 Catalogue file metadata

All S-128 Catalogue metadata files must contain at least the following metadata elements:

**Table 14-4 – S100\_ExchangeCatalogue**

Name	Multiplicity	Value	Type	Remarks
S100_ExchangeCatalogue			Class	
identifier	1		S100_CatalogueIdentifier	See Notes below this Table.
contact	1		S100_CataloguePointOfContact	No special constraints on the S-100 class.
productSpecification	0..1		S100_ProductSpecification	Conditional on all the datasets using the same Product Specification. See Note below this Table for constraints on values.

metadataLanguage	1	English	CharacterString	All datasets conforming to this PS must use English language. A Catalogue in English must be provided. Discovery metadata elements within Catalogues have their own locale attributes and may be repeated in languages other than English.
exchangeCatalogueName	1	CATALOG.XML	CharacterString	Catalogue filename.
exchangeCatalogueDescription	1		CharacterString	
exchangeCatalogueComment	0..1		CharacterString	Any additional Information.
compressionFlag	0..1		Boolean	TRUE: compressed FALSE: not compressed If compressed, the method must be that specified in S-100 Part 15.
sourceMedia	0..1		CharacterString	
replacedData	0..1		Boolean	
dataReplacement	0..1		CharacterString	
datasetDiscoveryMetadata	0..*		Aggregation S100_DatasetDiscovery Metadata	
--	0..*		Aggregation S100_CatalogueMetadata	Metadata for the Feature, Portrayal, and Interoperability Catalogues, if any.
supportFileDiscoveryMetadata	0..*		Aggregation S100_SupportFileDiscoveryMetadata	

## NOTES:

- 1) Attribute *productSpecification*: Class **S100\_ProductSpecification** is defined in S-100 Appendix 4a-D. The values of sub-attributes *name* and *version* must correspond to this version of the S-128 Product Specification (clause **Error! Reference source not found.**). The value of sub-attribute *number* must be the number assigned to this version of the S-128 Product Specification in the IHO GI Registry.
- 2) Attribute *catalogueIdentifier*: Class **S100\_CatalogueIdentifier** is defined in S-100 Appendix 4a-D. The value of sub-attribute *S100\_CatalogueIdentifier>identifier* must be chosen so that a 1/1 mapping from Exchange Set name to Catalogue identifier is recommended. This assumes a system for assigning unique names to Exchange Sets – as opposed to datasets – is developed, either by the producer or in this Specification. Note that an Exchange Set may contain multiple datasets.

## 14.5 Metadata about Feature and other Catalogues

**S100\_CatalogueMetadata** describes Feature, Portrayal and Interoperability Catalogues. This is an optional element that allows for descriptions of Feature, Interoperability and Portrayal Catalogues that are delivered within the Exchange Set. This class is described in S-100 Part 4a, Appendix 4a-D. S-128 uses the S-100 class without modification, with the following constraints on allowed values:

- 1) Attribute *productSpecification*: For Feature and Portrayal Catalogues, the values of sub-attributes *name* and *version* must correspond to this version of the S-128 Product Specification (clause **Error! Reference source not found.**). For Interoperability Catalogues, the values of sub-

attributes *name* and *version* must correspond to the appropriate version of the S-98 Product Specification.

- 2) Attribute *productSpecification*: The value of sub-attribute *number* must be the number assigned to this version of the S-128 Product Specification in the IHO GI Registry. For Interoperability Catalogues, the values of sub-attribute *number* must correspond to the appropriate version of the S-98 Product Specification.

Page intentionally left blank

## Appendix A

### S-128 Maintenance - Change Proposal Form (normative)

---

Organization

Date

Contact

Email

#### Change Proposal Type *Select only one option*

1. Clarification

2. Revision

3. New Edition

#### Location *Identify all change proposal locations*

S-128 Version No.

Part No.

Section No.

Proposal Summary

#### Change Proposal

*Please provide a detailed change proposal.*

#### Change Proposal Justification

*Please provide a suitable explanation for the change and where applicable supporting documentation.*

**Please send completed forms and supporting documentation to the IHO Secretariat (addt@iho.int).**

Page intentionally left blank