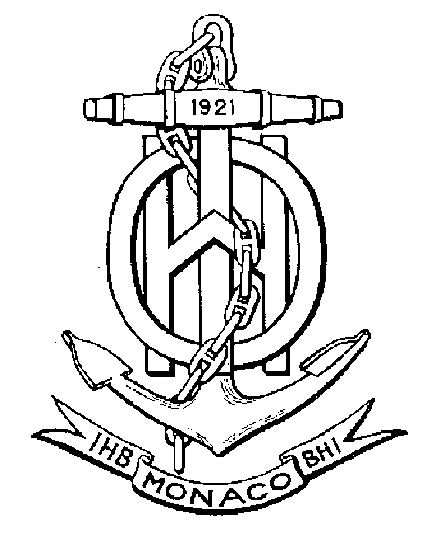
C:\Documents and Settings\julia.powell\My Documents\IHO TSMAD\S100-0 main\IHO S-100 Main Oct 1 2007.doc © ISO/IEC 2007 – All rights reservedISO-IEC\_ 63Complementary elementIntroductory element — Main elementÉlément introductif — Élément central — Élément complémentaireIntroductory element — Main element — Complementary elementE2007-10-2 ISO/IECISO/IEC     2007 ISO/IEC ISO/IEC \_(E).        2Heading 2Heading 1    02 STD Version 2.1c20   4             INTERNATIONAL HYDROGRAPHIC ORGANIZATION



S-129 Under Keel Clearance Management Information

Product Specification

**201X**

Published by the

International Hydrographic Bureau

MONACO

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# Overview

S-129 is the Under Keel Clearance Management Product Specification produced by the IHO.

This specification is intended to provide a suitable format for the exchange of digital data pertaining to maritime safety and efficiency of marine traffic. This specification defines a digital format with the necessary attribution features to enable the exchange of under keel clearance information. The primary intent of data products conformant to this specification is for use between an under keel clearance management system and the on-board navigation system. Usage of under keel clearance data products conformant to this specification is not limited to navigation systems.

## Introduction

A Ship’s Master has an obligation under SOLAS regulation V/34 to plan their passage from berth to berth. This Product Specification enables Under Keel Clearance Management (UKCM) information to be provided for users by a UKCM service.

**Voyage planning**

A ship is planning its voyage and needs to determine the available transit windows for when it arrives at a location where a UKCM system is in place. The UKCM system will determine possible transit windows after a ship provides its particulars (e.g. draught, hydrodynamic profile). The UKCM system uses dynamic ship specific modelling based on the ship’s particulars and combines the results with forecast environmental conditions (e.g. tides, wind, swell, tidal stream) to generate available tidal windows and a UKC route plan. The available tidal windows provide the ship with options of when to transit the UKCM operational area. A UKC route plan provides the ship with the necessary navigation information to safely pass through the UKCM operational area. The UKC route plan can be shared with other parties, such as the ship’s owners, management company, charterers, or the ship’s agent at the relevant port.

As the ship is on route to the UKCM operational area the UKCM system monitors and confirms the validity of the UKC route plan. The UKC route plan may change due to changes in predicted weather forecasts and heights of tide or some of the ship’s particulars. This monitoring process allows the ship to manage its speed to meet the time of arrival to execute the UKC route plan.

**Voyage monitoring**

The UKC route plan contains details of the earliest and latest times at which the ship can safely commence navigating shallow areas while maintaining the required UKC. The ship’s agent has been provided the UKC route plan and contacts relevant waterway authorities to make needed bookings such as for a pilot or for other arrangements such as a berth.

The ship picks up its pilot and enters the UKC operational area using the UKC route plan now displayed on its navigation system. The pilot has a portable pilot unit (PPU) that also shows the ships UKC route plan. This ensures the ship will be able to navigate the UKC operational area maintaining the required amount of UKC.

The ship has arrived at the UKC operational area (e.g. port limits or western approaches to the Strait of Malacca or the Torres Strait) and starts navigating in accordance with the UKC route plan, including keeping within a valid transit window.

The UKCM system tracks the vessel in real-time or near real-time and sends updates to the ship’s UKC route plan based on the ship’s speed and the current weather, tide and other met-ocean conditions.

The ship’s bridge team and the pilot are able to monitor, in real-time or near real-time, areas that have been calculated as non-navigable and becoming non-navigable on their onboard navigation system. The areas becoming non-navigable show the ship’s bridge team and the pilot the navigable areas that are getting close to becoming non-navigable at the time the ship will reach those locations.

If a Vessel Traffic Service (VTS) exists, it is able to monitor the ship’s transit and provide an information service, traffic organisation service or a navigational assistance service.

After the ship has completed its cargo operations and if it will be deep draught on exit from the port then the UKCM system will be similarly engaged to assist the ship’s safe departure from the port through the UKCM operational area.

## References

S-100 IHO Universal Hydrographic Data Model

S-101 IHO Electronic Navigational Chart (ENC)

S-102 IHO Bathymetric Surface Product Specification Edition 1.0.0 – April 2012

S-52 IHO Specifications for Chart Content and Display Aspects of ECDIS

S-421 IEC Route Plan Exchange FormatPTC2 report of WG 05 - 1985 issue Underkeel clearance for large ships in maritime fairways with hard bottom

ISO 10646 Information technology – Universal Coded Character Set (UCS)

ISO/IEC 15948 Information technology – Computer graphics and image processing – Portable Network Graphics (PNG): Functional specification

ISO 19100 Series of Geographic Information Standards

ISO 19101 Geographic information – Reference model

ISO 19103 Geographic information – Conceptual schema

ISO 19107 Geographic information – Spatial schema

ISO 19108

ISO 19109 Geographic information – Rules for application schema

ISO 19110 Geographic information – Methodology for feature cataloguing

ISO 19111 Geographic information – Spatial referencing by coordinates

ISO 19115 Geographic information – Metadata

ISO 19117 Geographic information – Portrayal

ISO/IEC 8211 Information technology – Specification for a data descriptive file for information exchange

ISO/IEC 8601 Data elements and interchange formats – Information exchange – Representation of dates and times

## Terms, definitions and abbreviations

### Use of Language

Within this document:

* “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.

### 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 1.2, modifications were made when necessary.

**Almost non-navigable area**

**coordinate**

one of a sequence of n numbers designating the position of a point in n-dimensional space

NOTE: In a coordinate reference system, the coordinate numbers are qualified by units

[ISO 19107, ISO 19111]

**coordinate reference system**

coordinate system that is related to an object by a datum

NOTE: For geodetic and vertical datums, the object will be the Earth

[ISO 19111]

**feature**

abstraction of real-world phenomena

EXAMPLE: The phenomenon named Eiffel Tower may be classified with other similar phenomena into a feature type named tower

NOTE 1: A feature may occur as a type or an instance. Feature type or feature instance shall be used when only one is meant

NOTE 2: In UML 2, a feature is a property, such as an operation or attribute, which is encapsulated as part of a list within a classifier, such as an interface, class, or data type

[ISO 19101, ISO/TS 19103, ISO 19110]

**feature attribute**

characteristic of a feature

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

EXAMPLE 2: A feature attribute named length may have an attribute value 82.4 which belongs to the data type real

NOTE 1: A feature attribute may occur as a type or an instance. Feature attribute type or feature attribute instance is used when only one is meant

NOTE 2: A feature attribute type has a name, a data type, and a domain associated to it. A feature attribute instance has an attribute value taken from the domain of the feature attribute type

NOTE 3: In a feature catalog, a feature attribute may include a value domain but does not specify attribute values for feature instances

[ISO 19101, ISO 19109, ISO 19110, ISO 19117]

**navigation surface**

a BAG data object representing the bathymetry and associated uncertainty with the methods by which those objects can be manipulated, combined and used for a number of tasks, certified for safety of navigation

[ONS FSD]

**non-navigable area**

**sea surface**

a two-dimensional (in the horizontal plane) field representing the air-sea interface, with high-frequency fluctuations such as wind waves and swell, but not astronomical tides, filtered out.

EXAMPLE: sea surface, river surface, and lake surface

NOTE: This implies marine water, lakes, waterways, navigable rivers, etc.

**UKC route plan**

**UKCM operational area**

**UKCM system**

an aid to navigation which contributes to navigational safety and efficiency. It uses data modelling which consists of detailed bathymetry, predicted and real-time environmental data and vessel particulars and motion, to provide a vessel-specific, real-time and/or forecast under keel clearance estimate for a given time and waterway.

### Abbreviations

This product specification adopts the following convention for presentation purposes:

ECDIS Electronic Chart Display Information System

ENC Electronic Navigation Chart

IHO International Hydrographic Organization

UKCM Under Keel Clearance Management

UML Universal Modelling Language

UTC Coordinated Universal Time

## General S-129 Data Product Description

Title: Under Keel Clearance Information

Abstract: Under keel clearance management systems are used in conjunction with ENC  
(S-101) and routes (S-421) for aiding vessels in safe passage through shallow waters. This S-129 under keel clearance management product specification details the information services provided by Dynamic Under Keel Clearance Management Systems by outlining the inputs for the UKCMS and explaining how those inputs are used. It also provides the relationship between safe under keel clearance and the timing for passing the shoalest areas as a control point along the route via the under keel clearance plan.

Old text:

This specification details the information services provided by Dynamic Under Keel Clearance Management Systems. These systems typically involve interaction between vessels and shore-based service providers and which calculate a vessel’s under keel clearance, and use sophisticated models and real-time met-ocean inputs to produce vessel-specific services (e.g. tidal windows, routes, no-go and almost no-go areas to ensure minimum under keel clearances are maintained). And mentions of ENC, S-421 for routes etc

Content: A conformant dataset may contain features associated with under keel clearance management. The specific content is defined by the Feature Catalogue and the Application Schema.

Spatial Extent:

Description: Global, marine areas only

East Bounding Longitude: 180

West Bounding Longitude: -180

North Bounding Latitude: 90

South Bounding Latitude: -90

Purpose: The data shall be produced for the purposes related to Under Keel Clearance Management.

## Data product specification metadata

Title: S-129 Under Keel Clearance Management Product Specification

S-100 Version: 4.0.0

S-129 Version: 0.0.1

Date: 31 Oct 18

Language: English

Classification: Unclassified

Contact: International Hydrographic Bureau,

4 quai Antoine 1er,

B.P. 445

MC 98011 MONACO CEDEX

Telephone: +377 93 10 81 00

Telefax: + 377 93 10 81 40

URL: www.iho.int

Identifier: S-129

Maintenance: For reporting issues which need correction, use the contact information.

### IHO Product Specification Maintenance

#### Introduction

Changes to S-129 will be released by the IHO as a new edition, revision, or clarification.

#### New Edition

New Editionsof S-129 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-129.

#### Revisions

*Revisions* are defined as substantive semantic changes to S-129. Typically, revisions will change S-129 to correct factual errors; 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 S-129. All cumulative *clarifications* must be included with the release of approved corrections 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 S-129.

#### Clarification

Clarifications are non-substantive changes to S-129. Typically, clarifications: remove ambiguity; correct grammatical and spelling errors; amend or update cross references; insert improved graphics in spelling, punctuation and grammar. A clarification must not cause any substantive semantic change to S-10n.

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 catalogues.

#### Version Numbers

The associated version control numbering to identify changes (n) to S-129 must be as follows:

New Editions denoted as **n**.0.0

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

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

# Specification Scope

This product specification describes one product and therefore requires only one scope.

Scope ID: Under Keel Clearance Management datasets

Hierarchical level: MD\_ScopeCode - 005

Hierarchical level name: dataset

Level description: information applies to the datasets

Extent: EX\_Extent.description: global coverage of maritime areas

# Dataset Identification

An under keel clearance dataset that conforms to this Product Specification uses the following general information for distinction:

Title: Under Keel Clearance Management Data Product

Alternate Title: None

Abstract: The data product is a file containing under keel clearance data for a particular geographic region and set of times, along with the accompanying metadata describing the content, variables, applicable times and locations, and structure of the data product. Under keel clearance management data includes depths assessed as being navigationally safe and windows within which these assessments are valid, based upon observed or mathematically-predicted values.

Topic Category:

Geographic Description: Areas specific to marine navigation

Spatial Resolution:

Purpose: Under keel clearance management data is intended to be used as a layer in an ENC

Language: English

Classification: Unclassified

Spatial Representation Type:

Point of Contact: Producing agency

Use Limitation: Invalid over land

# Data content and structure

## Introduction

Add detailed use case text which links the data model and the use of the items included in the data model (Kevin (KMOU), Chris)

This Section discusses the application schema, which is described in UML; the feature catalogue; dataset types, in which there is an extensive discussion of the current data; dataset loading and unloading; and geometry.

Under keel clearance management data consists of an under keel clearance plan, control points and areas considered navigable and non-navigable.

### Introduction

S-129 datasets are intended to be used with ENC, and optionally with S-102 high definition bathymetry datasets. S-101 gives the background information, while S-129 datasets gives additional information related specifically to underkeel clearance management.

Datasets are always considered whole datasets, but the content will change depending on purpose, which changes at various stages during a journey. The attribute ukcPurpose captures the intended purpose of a dataset. The possible values are pre-plan, actual plan and actual update.

### Dataset purpose

Pre-plan datasets are used in pre-planning and will give a vessel a set of tidal windows in an arrival port days or weeks in advance. In this case, it is likely that the UKCM system will simply compute tidal windows based on water levels and current forecast models, other weather statistics and standard assumed route.

Actual plan datasets are issued closer to the actual arrival/departure (approx. 24 hrs ahead), and will give the mariner (crew and/or pilot) a more detailed passage plan. This plan is generated from more accurate, frequent and precise weather observations/forecasts.

Actual plan update datasets include more up-to-date information and may be required every 5 to 10 minutes. These datasets includes the route, the go/no-go areas and the 'parent' UnderKeelClearancePlan feature. The dataset will be updated based on latest weather conditions and optionally, actual vessel position, heading and speed (e.g. as received in a UKCM system via AIS).

### Dataset updating

UKCM datasets are updated by whole dataset replacement. However, only the data that is actually at the various steps of the UKCM process need be in the dataset and update at the required frequency. Which data needs to be updated and how frequently, depends on the purpose of UKC calculation (as indicated by the 'ukcPurpose' attribute). Below is a typical updating scenario, but variations may exist depending on local circumstances.

In the pre-planning use case, a vessel requests a set of tidal windows in an arrival port days or weeks in advance. In this case, the UKCM system may simply compute a tidal window based on tide tables, forecast navigable depths, including safety/manoeuvrability margins, vessel maximum draught, speed and squat predictions, other forecast environmental conditions and standard assumed route. In this scenario, the UKCM system could only return a single dataset and generally no updates are required until approximately 24 hrs before the time when the vessel enters the UKCM zone.

About 24 hrs before the time when the vessel enters the UKCM zone the vessel will need a more detailed passage plan. This plan usually consists of more variable weather observations/forecasts and thus will need to be updated more frequently. In this case, only the go/no-go areas (UnderKeelClearanceNavigableArea vs. UnderKeelClearanceNonNavigableArea) and any tidal windows (via ControlPoints), and some metadata need to be updated. The rest can remain the same. Depending on the variability of the weather conditions at the area of interest, the update frequency ranges between 10 minutes to 60 minutes.

### Just prior to entering the UKCM zone and whilst underway, the use case changes again to become the actual plan and more up-to-date information is required every 5 to 10 minutes. In this case, it is likely that the whole information in the dataset needs to be updated - including the route, the go/no-go areas and the 'parent' UnderKeelClearancePlan feature. The dataset will be updated based on latest observed and forecast conditions, and optionally, actual vessel position, heading and speed (e.g. as received in a UKCM system via AIS).

## Dataset Loading and Unloading

S-129 datasets are intended to be overlays to ENC and always displayed with these in the background. Systems that support the display of S-129 datasets should provide the user with easy functions to turn on off S-129 datasets.

All S-129 datasets are scale independent and will therefore be usable with the whole scale range of ENCs in the UKCM zone. The various feature instances within the dataset may include scaleMinimum attributes, but these do not change the resolution or validity of the data, only if the data should be visible at a particular screen resolution.

Optionally, S-129 datasets can be viewed as overlays to a combination of ENC and S-102 datasets. The same requirements to allow the user to easily toggle the S-129 dataset on/off persist.

## Application Schema

## This application schema is expressed in UML 2.0.



## 

### Feature Types

#### UnderKeelClearancePlan

| **Role** | **Name** | **Description** | **Multi plicity** | **dataType** | **Remarks** |
| --- | --- | --- | --- | --- | --- |
| Class | UnderKeelClearancePlan | A UKC plan calculated for a particular vessel and a particular passage |  | MetaFeatureType |  |
| SimpleAttribute | generationTime | Time the plan was generated | [1] | DateTime |  |
| SimpleAttribute | vesselID | Unique identification of the vessel used for the calculation | [1] | Text |  |
| SimpleAttribute | sourceRouteName | Identification of the route used as a source for the calculation | [1] | Text | Using the value of S-421.Route.routeInfoName |
| SimpleAttribute | sourceRouteVersion | Identification of the route used as a source for the calculation | [1] | Integer | Using the value of S-421.RouteHistory.routeHistoryEditionNo |
| SimpleAttribute | maximumDraught | The maximum vessel draught in meters, used as base for the calculation | [1] | Real |  |
| SimpleAttribute | ukcPurpose | The purpose of the current calculation | [1] | underKeelClearancePurposeType |  |
| SimpleAttribute | typeOfCalculation | The type of calculation | [1] | underKeelClearanceCalculationType |  |
| SpatialAttribute | geometry | Boundaries of the Under Keel Clearance management area | [1] | GM\_OrientableSurface | geometric object come from Geometry class in S-100 standard |
| ComplexAttribute | fixedTimeRange | Time period | [1] | fixedTimeRange |  |

#### UnderKeelClearanceNonNavigableArea

| **Role** | **Name** | **Description** | **Multi plicity** | **dataType** | **Remarks** |
| --- | --- | --- | --- | --- | --- |
| Class | UnderKeelClearanceNonNavigableArea | An area of depth less than the calculated safe limit. |  | FeatureType | The area has a time-dependent dimension |
| SimpleAttribute | scaleMinimum | Integer | [1] | Integer |  |
| SpatialAttribute | geometry | Geometric object come from Geometry class in S-100 standard | [1] | GM\_OrientableSurface | To be used to describe the UKCM service area |

#### UnderKeelClearanceAlmostNonNavigableArea

| **Role** | **Name** | **Description** | **Multi plicity** | **dataType** | **Remarks** |
| --- | --- | --- | --- | --- | --- |
| Class | UnderKeelClearanceAlmostNonNavigableArea | An area of depth less than the calculated safe limit. |  | FeatureType | The area has a time-dependent dimension |
| SimpleAttribute | distanceAboveUKCLimit\_m |  | [1] | Real |  |
| SimpleAttribute | scaleMinimum | Integer | [1] | Integer |  |
| SpatialAttribute | geometry | Geometric object come from Geometry class in S-100 standard | [1] | GM\_OrientableSurface | To be used to describe the UKCM service area |

#### UnderKeelClearanceControlPoint

| **Role** | **Name** | **Description** | **Multi plicity** | **Data Type** | **Remarks** |
| --- | --- | --- | --- | --- | --- |
| Class | UnderKeelClearance ControlPoint | Especially selected critical passage point or line. |  | FeatureType |  |
| SimpleAttribute | distanceAboveUKCLimit\_m |  | [0]..[1] |  |  |
| SimpleAttribute | name | String | [0]..[1] | Text |  |
| SimpleAttribute | expectedPassingSpeed | float | [0]..[1] | Real |  |
| SimpleAttribute | expectedPassingTime | dateTime | [0]..[1] | DateTime |  |
| ComplexAttribute | fixedTimeRange |  | [0]..[1] | fixedTimeRange |  |
| SpatialAttribute | geometry | geometric object come from Geometry class in S-100 standard | [1] | GM\_Point |  |

### Associations

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source** | **Multi plicity** | **Target** | **Multi plicity** | **Notes** |
| Aggregation | UnderKeelClearanceNonNavigableArea | [1] | UnderKeelClearancePlan | [1]..[\*] | Source role – consistOf  Target role – componentOf |
| Aggregation | UnderKeelClearanceAlmostNonNavigableArea | [1] | UnderKeelClearancePlan | [0]..[\*] | Source role – consistOf  Target role –componentOf |
| Aggregation | UnderKeelClearanceControlPoint | [1] | UnderKeelClearancePlan | [1]..[\*] | Source role – consistOf  Target role –componentOf |

### Complex Attribute

#### FixedTimeRange

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Role** | **Name** | **Description** | **Multiplicity** | **Data Type** | **Remarks** |
| ComplexAttribute | fixedTimeRange |  |  |  |  |
| Attribute | TimeStart | dateTime | [1] | DateTime |  |
| Attribute | TimeEnd | dateTime | [1] | DateTime |  |

### Enumerations

#### underKeelClearancePurposeType

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Role** | **Name** | **Description** | **Multiplicity** | **Data Type** | **Remarks** |
| Enumeration | underKeelClearancePurposeType |  |  |  |  |
| Literal | preplan |  |  |  |  |
| Literal | actualPlan |  |  |  |  |
| Literal | actualUpdate |  |  |  |  |

#### underKeelClearanceCalculationType

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Role** | **Name** | **Description** | **Multiplicity** | **Data Type** | **Remarks** |
| Enumeration | underKeelClearanceCalculationType | Indication of how the plan was calculated |  |  |  |
| Literal | timeWindow | UkcPlan returns available TimeWindow(s) for given draught |  |  |  |
| Literal | maxDraught | UkcPlan returns maximum draught for given TimeWindow |  |  |  |

# Feature Catalogue (to be updated by Eivind)

### 5.1 Introduction

The S-129 Feature Catalogue describes the features, information types, attributes, attribute values, associations and roles which may be in in a under keel clearance management dataset. See Annex C – Feature Catalogue

## Feature Types

#### Geographic

Geographic (geo) feature types form the principle content of the dataset and are fully defined by their associated attributes and information types.

#### 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 features must be used to their maximum extent to reduce meta attribution on individual features.

### Feature Relationship

A feature relationship links instances of one feature type with instances of the same or a different feature type. There are four types of defined feature relationships in S-100, but S-129 use only one of these; aggregation.

#### Aggregation

An aggregation is a relationship between two or more feature types where the aggregation feature is made up of component features.

EXAMPLE An Under Keel Clearance Plan feature may be composed of multiple Under Keel Clearance Non Navigable Area features to indicate unsafe areas.

### Attributes

S-100 defines attributes as either simple or complex. S-129 uses XX types of simple attributes and are listed in table XX. S-129 contains XX types of complex attributes and are listed in table XX.

Table XX.X – Simple feature attribute types

|  |  |
| --- | --- |
| **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 (i.e. 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. |
| 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. |
| Date and Time | A DateTime is a combination of a date and a time type. Character encoding of a DateTime must follow ISO 8601:1988 |

# Dataset Types

Types of data sets to be included here (in plain English) (Nick and Chris)

Updates are by replacement and not incrementally updated

There are three types of data sets;

Tidal window, routes, and areas (almost no-go and no-go)

# Geometry

Geometry in S-129 datasets conforms to S-100 Geometry level 3a constrained to 2-dimensional geometry.

# Coordinate Reference Systems (CRS)

# The location of a feature in the S-100 standard is defined by means of coordinates, which relate a feature to a position.

## Horizontal Reference System

## In S-129 datasets the horizontal CRS must be the ellipsoidal (geodetic) system EPSG: 4326 (WGS84). The full reference to EPSG: 4326 can be found at [www.epsg-registry.org](http://www.epsg-registry.org)

Projection: EPSG:4326 (WGS84)

Coordinate reference system registry: [EPSG Geodetic Parameter Registry](http://www.epsg-registry.org/)

Date type (according to ISO 19115):

Responsible party: International Association of Oil and Gas Producers (IOGP)

URL: http://www.iogp.org

## Vertical Reference System

The vertical coordinate is directed upward (i.e., away from the Earth’s centre) from its origin, the vertical datum, and has units of metres. That is, a positive value for the level of the current relative to the vertical datum means that the level is above the vertical datum. This is consistent with the bathymetric CRS in S-102 1.0.0. The vertical datum is not an ellipsoid but is one of the following: (a) the sea surface (defined in Clause 1.4.2), (b) a vertical, sounding, or chart datum (MSL, LAT, etc.), or (c) the sea floor.

**8.3 Temporal Reference System**

The temporal reference system is the Gregorian calendar for date and UTC for time. Time is measured by reference to Calendar dates and Clock time in accordance with ISO 19108:2002, Temporal Schema clause 5.4.4. All date and time variables must follow the format specified in ISO 8601:2004.

* A date variable will have the following 8-character format: yyyymmdd.
* A time variable will have the following 7-character format: hhmmssZ.
* A date-time variable will have the following 16-character format: yyyymmddThhmmssZ.

# Data Quality

Areas where UKCM systems are in place are always covered by very high definition and up to date bathymetry, and have available met-ocean data.

Bathymetric and tidal data used to generate products in compliance with this S-129 Product Specification are provided by official sources using quality assured processes outside the scope of this Product Specification. This information is, therefore, of the highest possible quality and guaranteed by the processes employed by the relevant authorities.

Quality of under keel clearance management products used for navigation depends on the combined quality of many inputs including observed and forecast data (e.g. bathymetry, tide, water levels, currents, etc.) and vessel positional data. Quality information relevant to the many data inputs used by a UKCM system is difficult to produce as a meaningful metric of UKCM product quality that is able to be understood by the mariner.

Data validity is time limited and hence it is not practical to provide a meaningful measure of data quality for the UKCM products.

UKCM products are generated containing margins that account for uncertainty to guarantee safety for individual vessels and for the stated periods of validity.

# Data Capture and Classification

The Data Capture and Encoding Guide (DCEG) gives guidance for how to encoding UKCM datasets for the various stages of a journey to and through a UKCM zone. The document can be found in **Annex A**

# Maintenance

Dataset maintenance is dependent on local conditions and the policies of the UKCM service provider.

## Maintenance and Update Frequency

## In the pre-planning use case the UKCM system may simply compute a tidal window based on tide tables, forecast navigable depths, including safety/manoeuvrability margins, vessel maximum draught, speed and squat predictions, other forecast environmental conditions and standard assumed route. In this scenario, the UKCM system could only return a single dataset and generally no updates are required until approximately 24 hours before the time when the vessel enters the UKCM zone.

## About 24 hours before the time when the vessel enters the UKCM zone the vessel will need a more detailed passage plan, which will be updated more frequently. Depending on the variability of the observed and forecast conditions at the area of interest, the update frequency ranges between 10 minutes to 60 minutes.

## Just before the vessel is entering the UKCM zone and whilst underway, more up-to-date information is required and datasets may be updated as frequently as every 5 to 10 minutes.

## Data Source

## Data sources used when creating UKCM datasets vary with each UKCM zone. Various source information utilized are high definition bathymetric data, observed or forecast water level/current and observed or forecast climatic data. This information is compared with voyage inputs such as draught values, speed and position to create UKCM datasets that are individual to each vessel.

## Production Process

## The production process of UKCM datasets will vary depending on the sensors available in the individual UKCM zone, and may also vary depending on the stage of journey the vessel is on.

# Portrayal

Recommend the following objects be used to portrayal the outputs for Under Keel Clearance information:

1. Area Overlay
   1. Consideration should be given to whether the display should be configurable either to show or not to show “go” area.
      1. If selected to show the “go” area, the result is suppression of the depth area from the original ENC.
   2. Caution or warning area that will show that an area could potentially be a problem if factors change.
      1. Must have colour for day/night/dusk
      2. Recommend using one or both methods of symbolizing area:
         1. Recommend using semi-transparent colour fill should show through, and all other information is drawn on top (per IHO S-52 Appendix 2).
            1. Colour used be a appropriate contrast to the existing background ENC.
         2. Recommend using one-sided complex linestyles: to identify the side of the boundary line on which the area lies (per IHO S-52 Appendix 2).
   3. Indicate “no-go” area
      1. Must have colour for day/night/dusk
      2. Recommend using one or both methods of symbolizing area:
         1. Recommend using semi-transparent colour fill should show through, and all other information is drawn on top (per IHO S-52 Appendix 2).
         2. Recommend using one-sided complex linestyles: to identify the side of the boundary line on which the area lies (per IHO S-52 Appendix 2).
   4. The “no-go” and caution area features will need to be dynamically updated as input factors change.
2. Tidal Time Markers
   1. Recommend using a line with associated text which relates the location and date of safe passage based on speed of vessel.
      1. The text information will need to be dynamic and update as input factors change (i.e. vessel speed, water level changes, vessel squat, weather).
      2. The pattern and colour of the line should not be distracting and must be distinguishable from chart data.
      3. The size and colour of the text should not cause clutter or distract, and should be kept to a minimum.
         1. Recommend using format: [DDMMMYYYY to HHMM use the same format as established for time dependent features in ECDIS]
         2. Recommend using 24 hour format.

# Data Product format (encoding)

The GML encoding of S-129 datasets is based on the S-100 profile of GML 3.2.1. This is described in S-100 Edition 3.0.0 Part 10b.

Detailed documentation of the S-201 encoding schema is provided in Annex B of this document.

Format Name: GML

Version: 3.2.1

Character Set: UTF-8

Specification: S-100 4.0.0 profile of GML 3.2.1

## Encoding of Latitude and Longitude

Values of latitude and longitude must be expressed with a precision of 9 decimal places. Coordinates must be encoded as decimals in the format described below. The encoding is indicated by multiplication factor fields defined in the dataset identification record by the S-100 GML schemas.

### Encoding of coordinates as decimals

Values should be coded as decimal numbers with 9 or fewer digits after the decimal. The normative encoding is in degrees, with an accuracy of 10-9 degrees, i.e., 9 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 (e.g., 10-9 degrees for coordinates of default accuracy).

Latitude and longitude multiplication factors held in the Dataset Structure Information field under [coordMultFactorX] and [coordMultFactorY] must be set to a value corresponding to the encoding, e.g., {1} for coordinates encoded in decimal degrees.

EXAMPLE 1 A longitude = 42.0000 is converted into X = longitude \* coordMultFactorX = 42.0000 \* 1 = 42.000000000.

## 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.

## Text Attribute Values

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

## 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 summarised in Annex A – Data Classification and Encoding Guide.

## 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” with a GML *nilReason* attribute giving the reason for omission.

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

## Structure of dataset files

* + 1. **Sequence of objects**

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

1. Dataset Identification Information
2. Dataset structure information
3. Spatial records for by-reference geometries
   1. Point
   2. Multi point
   3. Curve
   4. Composite Curve
   5. Surface
4. Information objects
5. Feature objects (Geometry may be encoded inline or by reference.)
   1. Meta features
   2. Geo features
6. S-129 Collection objects

## 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.

## Dataset validation

Fields may be repeated or omitted as permitted by the XML schemas and the validation tests. Since XML schema cannot encode rules for conditional presence or attributes, these rules are checked by Schematron rules or other validation code.

## Data overlap

S-129 datasets shall not overlap temporally but may spatially overlap other S-129 datasets.

## Data quality

One or more QualityOfNonbathymetricData features shall cover the dataset.

# Data Product Delivery

## Introduction

This clause specifies the encoding and delivery mechanisms for an S-129 dataset. Data which conforms to this product specification must be delivered by means of an exchange set.

Units of Delivery: Exchange set

Transfer Size: Unlimited

Medium Name: Digital data delivery

Other Delivery Information:

Each dataset must be contained in a separate, uniquely identified file on the transfer medium.

Each exchange set has a single exchange catalogue which contains the discovery metadata for each dataset and references to any support files.

Support files are supplementary information which are linked to the features and information types by attributes. The attributes containing these links are described in the application schema and feature catalogue.

An exchange set may be encapsulated into a form suitable for transmission by a mapping called a transmission encoding. An encoding translates each of the elements of the exchange set into a logical form suitable for writing to media and for transmission online. An encoding may also define other elements in addition to the exchange set contents (i.e., media identification, data extents etc…) and also may define commercial constructs such as encryption and compression methods.

If the data is transformed (e.g., for encryption or compression purposes) its content must not be changed.

This product specification does not define the transmission encoding which must be used as a default for transmission of data between parties.

The exchange set elements are as follows:

Mandatory Elements

* S-129 datasets – GML encoding of features/attributes and their associated geometry and metadata.
* Exchange Catalogue – the XML encoded representation of exchange set catalogue features [discovery metadata].

Optional Elements

* Supplementary files – These are contained within the exchange set as files and the map from the name included within the dataset and the physical location on the media is defined within the Exchange Catalogue.
* Feature Catalogue – If it is necessary to deliver the latest feature catalogue to the end user it may be done using the S-129 exchange set mechanism for datasets – i.e., include the updated feature catalogue in an exchange set.
* Portrayal Catalogue - If it is necessary to deliver the latest portrayal catalogue to the end user it may be done using the S-129 exchange set mechanism for datasets datasets – i.e., include the updated feature catalogue in an exchange set.

S-129 Exchange set structure conforms to S-100 3.0.0 Figure 4a-D-3 without modification.

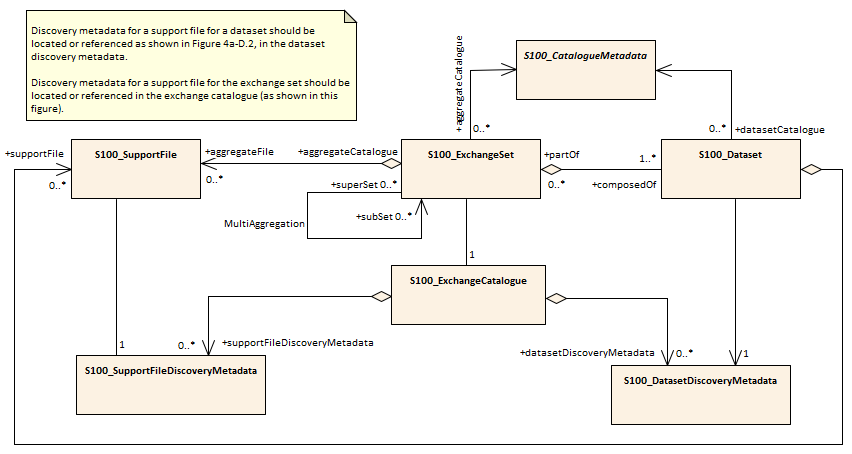


Figure XX - Exchange set structure

### 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 Section X.X.

## Dataset

### Datasets

Datasets are distributed as files which are part of exchange sets structured as described in this specification. The distribution media are left to the discretion of the producer and distributor.

The following types of dataset files may be produced and contained within an exchange set:

* New dataset and new edition of a dataset (base dataset): Each new edition of a dataset must have the same name as the dataset that it replaces. A new edition can also contain data that has previously been produced for the same UKCM zone. The encoding structure is located in Annex B.
* Cancellation: The dataset is cancelled and is deleted from the SYSTEM. The structure for a cancellation is described in clause 13.2.X.

A dataset shall be considered cancelled when the validTimeEnd of the UnderKeelClearancePlan is exceeded.

### Dataset size

UKCM datasets shall not exceed ??MB

### Dataset file naming

Dataset files shall be named

129XXXXYYYYYYYY.GML

The file name forms a unique identifier where:

* the first three characters are fixed to 129, and identify the dataset as a S-129 based dataset.
* The fourth to seventh characters indicate the issuing agency (mandatory) in accordance with IHO S-62.
* the eight to fifteenth characters are optional and may be used in any way by the producer to provide the unique file name. It is not required to use all characters. The following characters are allowed in the dataset name, A to Z, 0 to 9 and the special character \_ (underscore).
* GML – the character sequence “GML” or “gml”.

## Support Files

Support files contain ancillary textual or graphic information in separate (linked in dataset) files. Information should be encoded in a structured format as defined by W3C. The following formats would be suitable for graphics:

* Portable Network Graphics (PNG) [Edition 2.0]
* Scalable Vector Graphics (SVG) [Edition 1.1]
* Tagged Image File Format (TIFF) [Edition 6.0]
* Joint Photographic Experts Group (JPEG) [Edition 1.02 ]

Note: PNG is an extensible file format designed for lossless, portable storage of raster images. It provides a patent-free replacement for the GIF format and also replicates many common uses of TIFF. The PNG edition 2 format has been adopted as an ISO standard, (ISO/IEC 15948:2003). SVG is a language for describing two-dimensional graphics in XML [XML10]. SVG allows for three types of graphic objects: vector graphic shapes (e.g., paths consisting of straight lines and curves), images and text. The JPEG standard specifies the codec, which defines how an image is compressed into a stream of bytes and decompressed back into an image, but not the file format used to contain that stream. (The term "JPEG" is an acronym for the Joint Photographic Experts Group, which is the body that created the standard).

### Support File Naming

files shall be named

129XXXXYYYYYYYY.EEE

The file name forms a unique identifier where:

* the first three characters are fixed to 129, and identify the dataset as a S-129 based dataset.
* The fourth to seventh characters indicate the issuing agency (mandatory) in accordance with IHO S-62.
* the eight to fifteenth characters are optional and may be used in any way by the producer to provide the unique file name. It is not required to use all characters. The following characters are allowed in the dataset name, A to Z, 0 to 9 and the special character \_ (underscore).
* EEE – support file extension. (Must conform to the file format.)

# Metadata

## Introduction

The UKCM metadata description is based on the S-100 metadata document section, which is a profile of the ISO 19115 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.

Two metadata packages are described in this product specification: dataset metadata and exchange set metadata.



Figure 18 - Metadata packages

Note 1: Types with CI\_, EX\_, and MD\_ prefixes are from packages defined in ISO 19115 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 other metadata fields must be blank.

Note 3: The implication of only updating by new edition is that, if a support file is terminated, a new edition of the dataset is required.

**Use of S-421 for providing UKCM related routes**

Add text to describe how S-129 makes use of S-421



## Language

The language used for the metadata is English

## S100\_ExchangeCatalogue

Each exchange set has a single S100\_ExchangeCatalogue which contains meta information for the data and support files in the exchange set.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_ExchangeCatalogue | An exchange catalogue contains the discovery metadata about the exchange datasets and support files | - | - | - |
| identifier | Uniquely identifies this exchange catalogue | 1 | S100\_CatalogueIdentifier |  |
| contact | Details about the issuer of this exchange catalogue | 1 | S100\_CataloguePointOfContact |  |
| productSpecification | Details about the product specifications used for the datasets contained in the exchange catalogue | 0..1 | S100\_ProductSpecification | Conditional on all the datasets using the same product specification |
| metadataLanguage | Details about the Language | 1 | CharacterString | Value shall be English |
| exchangeCatalogueName | Catalogue filename | 1 | CharacterString | Value shall be CATLOG.XML |
| exchangeCatalogueDescription | Description of what the exchange catalogue contains | 1 | CharacterString |  |
| exchangeCatalogueComment | Any additional Information | 0..1 | CharacterString |  |
| compressionFlag | Is the data compressed | 0..1 | Boolean | 1 indicates Yes and 0 indicates No |
| algorithmMethod | Type of compression algorithm | 0..1 | CharacterString |  |
| sourceMedia | Distribution media | 0..1 | CharacterString |  |
| replacedData | If a data file is cancelled is it replaced by another data file | 0..1 | Boolean |  |
| dataReplacement | Cell name | 0..1 | CharacterString |  |

### S100\_CatalogueIdentifier

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_CatalogueIdentifier | An exchange catalogue contains the discovery metadata about the exchange datasets and support files | - | - | - |
| identifier | Uniquely identifies this exchange catalogue | 1 | CharacterString |  |
| editionNumber | The edition number of this exchange catalogue | 1 | CharacterString |  |
| date | Creation date of the exchange catalogue | 1 | Date |  |
| time | Creation time of the exchange catalogue | 0..1 | Time |  |

### S100\_CataloguePointofContact

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_CataloguePointOfContact | Contact details of the issuer of this exchange catalogue | - | - | - |
| organization | The organization distributing this exchange catalogue | 1 | CharacterString | This could be an individual producer, value added reseller, etc. |
| phone | The phone number of the organization | 0..1 | CI\_Telephone |  |
| address | The address of the organization | 0..1 | CI\_Address |  |

## S100\_DatasetDiscoveryMetaData

| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| --- | --- | --- | --- | --- |
| S100\_DatasetDiscoveryMetadata | Metadata about the individual datasets in the exchange catalogue | - | - | - |
| fileName | Dataset file name | 1 | CharacterString |  |
| filePath | Full path from the exchange set root directory | 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> |
| description | Short description giving the area or location covered by the dataset | 1 | CharacterString | E.g. the underkeel clearance management zone. |
| dataProtection | Indicates if the data is encrypted | 0..1 | Boolean | 0 indicates an unencrypted dataset  1 indicates an encrypted dataset |
| protectionScheme | specification or method used for data protection | 0..1 | CharacterString | Eg S-63 |
| digitalSignature | Indicates if the data has a digital signature | 1 | CharacterString |  |
| copyright | Indicates if the dataset is copyrighted | 0..1 | MD\_LegalConstraints ->MD\_RestrictionCode <copyright> (ISO 19115) |  |
| classification | Indicates the security classification of the dataset | 0..1 | Class  MD\_SecurityConstraints>MD\_ClassificationCode (codelist) | 1. unclassified  2. restricted  3. confidential  4. secret  5. top secret |
| purpose | The purpose for which the dataset has been issued | 1 | MD\_Identification>purpose  CharacterString | pre plan, actual plan, or actual update. |
| specificUsage | The use for which the dataset is intended | 1 | MD\_USAGE>specificUsage (character string)  MD\_USAGE>userContactInfo (CI\_ResponsibleParty) | For navigation through <name of UKCM zone> by <vessel name>. |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| issueDate | date on which the data was made available by the data producer | 1 | Date |  |
| issueTime | time on which the data was made available by the data producer | 1 | Time |  |
| productSpecification | The product specification used to create this dataset | 1 | S100\_ProductSpecification |  |
| producingAgency | Agency responsible for producing the data | 1 | CI\_ResponsibleParty |  |
| optimumDisplayScale | The scale with which the data is optimally displayed | 0..1 | Integer | Example: A scale of 1:25000 is encoded as 25000 |
| maximumDisplayScale | The maximum scale with which the data is displayed | 0..1 | Integer |  |
| minimumDisplayScale | The minimum scale with which the data is displayed | 0..1 | Integer |  |
| horizontalDatumReference | Reference to the register from which the horizontal datum value is taken | 1 | characterString | EPSG |
| horizontalDatumValue | Horizontal Datum of the entire dataset | 1 | Integer | 4326 |
|  |  |  |  |  |
|  |  |  |  |  |
| dataType | The encoding format of the dataset | 1 | S100\_DataFormat | Must be GML |
| otherDataTypeDescription | Encoding format other than those listed. | 0..1 | CharacterString |  |
| dataTypeVersion | The version number of the dataType. | 1 | CharacterString | 3,2,1 S-100 4.0.0 Profile |
| dataCoverage | Provides information about data coverages within the dataset | 1..\* | S100\_DataCoverage |  |
| comment | any additional information | 0..1 | CharacterString |  |
| layerID | Identifies other layers with which this dataset is intended to be used or portrayed | 0..\* | CharacterString | In navigation system, S-129 datasets must be used with ENC. |

### S100\_DataCoverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_DataCoverage |  | - | - | - |
| ID | Uniquely identifies the coverage | 1 | Integer | - |
| boundingBox | The extent of the dataset limits | 1 | EX\_GeographicBoundingBox | - |
| boundingPolygon | A polygon which defines the actual data limit | 1..\* | EX\_BoundingPolygon | - |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

### S100\_DataFormat

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_DataFormat | The encoding format | - | - | - |
| ISO/IEC 8211 |  | - | - | - |
|  |  |  |  |  |
| GML |  | - | - | - |
| HDF5 |  |  |  |  |
| Other |  | - | - | - |

### S100\_ProductSpecification

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_ProductSpecification | The Product Specification contains the information needed to build the specified product | - | - | - |
| name | The name of the product specification used to create the datasets | 1 | CharacterString | 129 |
| version | The version number of the product specification | 1 | CharacterString | 1.0.0 |
| date | The version date of the product specification | 1 | Date | CCYYMMDD |

## S100\_SupportFileDiscoveryMetadata

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_SupportFiletDiscoveryMetadata | Metadata about the individual support files in the exchange catalogue | - | - | - |
| fileName | Name of the support file | 1 | CharacterString |  |
| fileLocation | Full location from the exchange set root directory | 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 | The purpose for which the dataset has been issued | 1 | S100\_SupportFilePurpose | E.g. new, re-issue, new edition, update etc. |
| editionNumber | The edition number of the dataset | 1 | CharacterString | when a data set 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 | date on which the data was made available by the data producer | 1 | Date |  |
| productSpecification | The product specification used to create this file | 1 | S100\_ProductSpecification |  |
| dataType | The encoding format of the dataset | 1 | S100\_SupportFileFormat |  |
| otherDataTypeDescription | Encoding format other than those listed. | 0..1 | CharacterString |  |
| dataTypeVersion | The version number of the dataType. | 1 | CharacterString |  |
| comment |  | 0..1 | CharacterString |  |
| digitalSignatureReference | Digital Signature of the file | 0..1 | CharacterString | Reference to the appropriate digital signature algorithm |
| digitalSignatureValue | Value derived from the digital signature | 0..1 | CharacterString |  |
| fileName | Name of the support file | 1 | CharacterString |  |

### S100\_SupportFileFormat

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_SupportFormat | The format used in the support file | - | - | - |
| ASCII |  | - | - |  |
| JPEG2000 |  | - | - |  |
| HTML |  | - | - |  |
| XML |  | - | - |  |
| XSLT |  | - | - |  |
| VIDEO |  | - | - |  |
| TIFF |  |  |  |  |

### S100\_SupportFilePurpose

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_SupportFilePurpose | The reason for inclusion of the support file in this exchange set | - | - | - |
| new | A file which is new | - | - | Signifies a new file. |
| replacement | A file which replaces an existing file | - | - | Signifies a replacement for a file of the same name |
| deletion | Deletes an existing file | - | - | Signifies deletion of a file of that name |

## S100\_CatalogueMetadata

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_Catalogue |  | - | - | - |
| filename | The name for the catalogue | 1..\* | CharacterString |  |
| fileLocation | Full location from the exchange set root director | 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> |
| scope | Subject domain of the catalogue | 1..\* | S100\_CatalogueScope |  |
| versionNumber | The version number of the product specification | 1..\* | CharacterString |  |
| issueDate | The version date of the product specification | 1..\* | Date |  |
| productSpecification | The product specification used to create this file | 1..\* | S100\_ProductSpecification |  |
| digitalSignatureReference | Digital Signature of the file | 1 | CharacterString | Reference to the appropriate digital signature algorithm |
| digitalSignatureValue | Value derived from the digital signature | 1 | CharacterString |  |

### S100\_CatalogueScope

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Description** | **Mult** | **Type** | **Remarks** |
| S100\_CatalogueScope |  | - | - | - |
| featureCatalogue |  |  |  |  |
| portrayalCatalogue |  |  |  |  |

1. Data Classification and Encoding Guide

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IHO Definition: **FEATURE:** Definition. (Authority for definition). | | | | | | |
| **S-101 Geo Feature: Feature (S-57 Acronym)** S-101 feature and corresponding S-57 acronym | | | | | | |
| **Primitives: Point, Curve, Surface** Allowable geometric primitive(s) | | | | | | |
| *Real World*  Example if real world instance(s) of the Feature. | *Paper Chart Symbol*  Example(s) of paper chart equivalent symbology for the Feature. | | | *ECDIS Symbol*  Example(s) of ECDIS symbology for the Feature. | | |
| **S-101 Attribute** | | **S-57 Acronym** | **Allowable Encoding Value \*** | | **Type** | **Multiplicity** |
| Category of beer | |  | 1 : ale  2 : lager  3 : porter  4 : stout  5 : pilsener  6 : bock beer  7 : wheat beer | | EN | 1,1 |
| This section liststhe full list of allowable attributes for the S-101 feature. Attributes are listed in alphabetical order. Sub-attributes (Type prefix (S)) of complex (Type C) attributes are listed in alphabetical order and indented directly under the entry for the complex attribute (see below for example). | | This section liststhe corresponding S-57 attribute acronym. A blank cell indicates no corresponding S-57 acronym. | This section liststhe allowable encoding values for S-101 (for enumerate (E) Type attributes only). Further information about the attribute is available in Section XX. | | Attribute type (see clause X.X). | Multiplicity describes the “cardinality” of the attribute in regard to the feature. See clause X.X. |
| Fixed date range | |  |  | | C | 0,1 |
| Date end | | (DATEND) |  | | (S) DA | 0,1 |
| Date start | | (DATSTA) |  | | (S) DA | 0,1 |
| INT 1 Reference: The INT 1 location(s) of the Feature – by INT1 Section and Section Number.  **X.X.X Sub-clause heading(s) (see S-4 – B-YYY.Y)**  Introductory remarks. Includes information regarding the real world entity/situation requiring the encoding of the Feature in the ENC, and where required nautical cartographic principles relevant to the Feature to aid the compiler in determining encoding requirements.  Specific instructions to encode the feature.  Remarks:   * Additional encoding guidance relevant to the feature.   **X.X.X.X Sub-sub-clause heading(s) (see S-4 – B-CCC.C)**  Clauses related to specific encoding scenarios for the Feature. (Not required for all Features).  Remarks:   * Additional encoding guidance relevant to the scenario (only if required).   Distinction: List of features in the Product Specification distinct from the Feature. | | | | | | |

Feature Attributes and Enumerate Proposals

|  |
| --- |
| **Attribute Name:** IHO Definition:   1. **Enumerate Name**   IHO Definition: If Applicable   1. **Enumerate Name**   Remarks: |

|  |
| --- |
| **Attribute Name:** IHO Definition:  Unit:  Resolution:  Format:  Example:  Remarks:   * No remarks. |

Associations/Aggregations/Compositions

|  |  |  |  |
| --- | --- | --- | --- |
| **Association/Aggregation/Composition Name:** IHO Definition:  Remarks: | | | |
| **Role Type** | **Role** | **Features** | **Multiplicity** |
| Association  Aggregation  Composition |  |  |  |
|  |  |  |
|  |  |  |

1. Data Product format (encoding)
2. Feature Catalogue
3. Portrayal Catalogue
4. Validation Checks