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**Universal Hydrographic Data Model Validation Checks**

**(Draft) Edition 0.1.0-20240823**

**Aligned to S-100 Edition 5.2.0**

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Document History

Changes to this Specification are coordinated by the IHO S-100 working Group (S-100 WG). New editions will be made available via the IHO web site. Maintenance of the Specification shall conform to IHO Resolution 2/2007 (as amended).

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Summary of Substantive Changes in Edition x.x

Bold references in the Clauses Affected column indicate the principal sections/clauses that are affected by the described change.

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| Change Summary | Clauses Affected |
| (To be populated for editions following Edition 1.0.0) |  |
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# Introduction

This document specifies a set of checks that producers of validation tools for S-100 based data products must implement in their validation software. Validation software is used to ensure that data are compliant with the S-100 Universal Hydrographic Data Model and Product Specifications based on S-100. The initial list of checks for S-100 was compiled by the IHO S-100 Validation Checks sub-group for the IHO. This list of checks derives in part original material in the S-100 standard and in part from validation checks for S-57 ENCs defined in IHO S-58 (ENC Validation Checks), which were provided by a number of hydrographic offices and software companies.

The checks listed in this document are generic checks applicable to all S-100 products which include the relevant S-100 concepts.

## Scope

This document, designated as “S-158:100” by the IHO, specifies validation checks for data products conforming to Product Specifications based on Edition 5.2.0 and subsequent editions of the S-100 (Universal Hydrographic Data Model) Standard.

This document specifies validation checks for both datasets and exchange sets.

The checks specified in this document are intended to be supplemented by product-specific checks described in publications specific to each S-100 based Product Specification, designated as S-158:1xx publications, where “1xx” indicates the IHO number assigned to the data product. Both sets of validation checks, those described in S-158:100 as well as those defined in the applicable S-158:1xx publication, must be applied to test the validity of S-100 based datasets and exchange sets. For datasets and exchange sets intended for use on ECDIS, additional cross-product checks, defined in S-158:98, must also be applied.

## Conformance

This specification conforms to Edition 1.0.0 of IHO specfication S-158 (Validation Checks – Introduction and Structure).

The validation checks described herein conform to Edition 5.2.0 of S-100 (Universal Hydrographic Data Model).

## References

### Normative references

S-98 *Data Product Interoperability in S-100 Navigation Systems, IHO Publication S-98, Edition 2.0.0, ??? 2024*. In Preparation.

S-100 *IHO Universal Hydrographic Data Model*, Edition 5.2.0, June 2024

S-158 *Validation Checks – Introduction and Structure, Edition 1.0.0, ??? 2024.* In preparation.

### Informative references

ISO 19157:2013 *Geographic information – Data Quality.* As amended by Amendment 1, 2018

## Terms, definitions and abbreviations

### Terms and definitions

The terms and definitions listed in S-158 apply to this document. In addition, the following terms and definitions are used:

aggregation

special form of association that specifies a whole-part relationship between the aggregate (whole) and a component part (see composition) [ISO 19103]

association

semantic relationship between two or more classifiers that specifies connections among their instances [ISO 19103]

NOTE: A binary association is an association among exactly two classifiers (including the possibility of an association from a classifier to itself)

composition

form of aggregation association with strong ownership and coincident lifetime as part of the whole [ISO 19103]

NOTE: Parts with non-fixed multiplicity may be created after the composite itself, but once created they live and die with it (that is, they share lifetimes). Such parts can also be explicitly removed before the death of the composite. Composition may be recursive. Synonym: Composite aggregation.

enumeration

a fixed list of valid identifiers of named literal values. Attributes of an enumerated type may only take values from this list [???]

exterior

difference between the universe and the closure [ISO 19107]

NOTE The concept of exterior is applicable to both topological and geometric complexes

feature association

relationship that links instances of one feature type with instances of the same or a different feature type [ISO 19110]

feature attribute

characteristic of a feature [ISO 19101]

NOTE: 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: 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 value domain of the feature attribute type.

NOTE: In a Feature Catalogue, a feature attribute may include a value domain but does not specify attribute values for feature instances.

EXAMPLE 1: A feature attribute named communication channel may have an attribute value VHF0007 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

multiplicity

specification of the number of possible occurrences of a property, or the number of allowable elements that may participate in a given relationship [ISO 19103]

EXAMPLES: 1..\* (one to many); 1 (exactly one); 0..1 (zero or one)

registry

The IHO Geospatial Information Registry (<https://registry/iho.int>). May be referred to as “GI Registry” or simply “Registry”.

relationship

semantic connection among model elements [ISO 19103]

NOTE: Kinds of relationships include association, generalization, metarelationship, flow, and several kinds grouped under dependency.

### Abbreviations

This Product Specification uses the abbreviated terms defined in S-158. In addition, the following abbreviations are used:

FC Feature Catalogue

S-1xx S-100 based data product, where “1xx” stands for the product number assigned by the IHO (which may begin with numbers other than “1”)

### Symbols

The symbols used in logical and spatial expressions are defined in S-158 clause 1.3.3 (Symbols).

## 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.

## General description

S-158:100 is a specification describing generic validation checks for S-100 based products. There are no data products based directly on this edition of S-158:100 and therefore no general information applicable to data products conforming to it.

~~General information about data products conforming to this specification.~~

**~~Title:~~** ~~S-158:100 Universal Hydrographic Model Validation Checks~~

**~~Abstract:~~** ~~This document describes validation checks for S-100 based data products.~~

**~~Content:~~** ~~Not applicable~~

**~~Spatial Extent:~~**  ~~N/A~~

**~~Temporal Extent:~~** ~~N/A~~

**~~Specific Purpose:~~** ~~Validation of datasets and exchange sets conforming to Product Specifications based on S-100.~~

## Specification metadata and maintenance

### Specification metadata

This information uniquely identifies this Specification and provides information about its creation and maintenance.

**Title:** Universal Hydrographic Model Validation Checks

**Version:** 0.1.0

**Date:** 2024-08-23

**Language:** English

**Classification:** Unclassified

**Contact:** International Hydrographic Organization.

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**Role:** Owner

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

**Identifier:** S-158:100

**Maintenance:** Changes to this Specification are coordinated by the S-100 Validation Checks sub-group under the S-100 Working Group (S-100 WG) of the IHO and made available via the IHO Publications website. Maintenance of the Product Specification must conform to IHO Technical Resolution 2/2007 (revised 2010). For reporting issues which need correction, use the contact information.

### Specification maintenance

#### Introduction

Changes to S-158:100 will be released by the IHO as a New Edition, revision, or clarification.

The list of checks, which accompanies this document is considered part of this Specification and changes to it are considered changes to this Specification.

S-158:100 is not accompanied by separate artefacts such as an XML Schema, Feature or Portrayal Catalogue and therefore this clause does not address the question of changes to such derived artefacts.

#### New Edition

*New Editions* of S-158:100 introduce significant changes. *New Editions* enable new concepts, such as the ability to support new functions or applications, the introduction of new constructs or data types, or significant changes to the basic information or check structure arising from a new edition of S-158. *New Editions* are likely to have a significant impact on either existing users or future users of S-100 and S-158:100. All cumulative *revisions* and *clarifications* must be included with the release of approved New Editions.

#### Revision

*Revisions* are defined as substantive semantic changes to S-158:100. Typically, *revision*s will change S-158:100 to correct factual errors or introduce necessary changes that have become evident as a result of practical experience or changing circumstances, including support for new revisions of S-158. A *revision* must not be classified as a clarification. *Revisions* could have an impact on either existing users or future users of S‑158:100. All cumulative *clarifications* must be included with the release of approved revisions.

Changes in a revision of S-158:100 may or may not correspond to the same revision+edition number of S-100.

#### Clarification

*Clarifications* are changes to S-158:100 arising from non-substantive reasons or from introduction of a new edition or revision of S-100.

Typically clarifications for non-substantive reasons remove ambiguity; correct grammatical and spelling errors; amend or update cross references; revise check messages or clarify check descriptions; or revise classifications of checks as critical/error/warning. A *clarification* must not cause any substantive semantic change to S-158:100.

Clarifications to S-158:100 for alignment to a new edition or revision of S-100 may update validation checks or add new validation checks. Validation checks for older but still active editions or revisions of S-100 wil be retained but may be marked as *Deleted* for the new edition/revision of S-100.

#### Version numbers

The associated version control numbering to identify changes (n) to S-158:100 must be as follows:

New Editions denoted as **n**.0.0

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

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

# Check Structure

Check structure in S-158:100 includes the fields specified in S-158.

The “Standards document reference” column is used to indicate the S-100 Part.

# Check Syntax

The check syntax conforms to the syntax and operators for product-specific checks described in S-158 clause 4.2.

# Organisation

The list of validation checks for this edition of S-158:100 is available separately (see clause 8). The list of checks accompanies this specification and forms an integral part of it.

[Describe numbering scheme and organization after the numbering scheme for “Check ID” is decided.]

# Check Application Sequence

## Applicable subset

The S-100 standard defines alternative frameworks for certain portions of Product Specifications, such as data formats (Parts 10a/10b/10c). Where a Product Specification makes a choice between alternate S-100 framework concepts, only the checks relating to the alternative selected by the Product Specification need be applied.

## Application sequence

The check application sequence expands and modifies the application sequence described in S-158. The order below is recommended, not mandatory.

Table 5.1 - Suggested application order of validation checks

| **Order** | **Check Collection** | **Defined in** | **Apply to** |
| --- | --- | --- | --- |
| 1 | S-100 generic checks for datasets | S‑158:100 | Dataset, in isolation |
| 1a | Spatial integrity checks | S-158:100 checks Nxxx | CRS information and spatial primitives in single dataset |
| 1b | Thematic integrity checks | S-158:100 checks Nxxx | Features and information types in single dataset |
| 1c | Association integrity checks | S-158:100 checks Nxxx | Feature and information associations in single dataset |
| 1d | Dataset structural conformance | S-158:100 checks Nxxx | Single dataset |
| 2 | Product-specific and interoperability checks for single datasets | S-158:1xx | Dataset, in isolation. See the relevant S-158:1xx publication and S-158:98 for recommended order |
| 3 | S-100 generic checks for exchange sets | S-158:100 | Exchange set |
| 3a | Exchange set structural conformance | S-158:100 checks Nxxx | Structure of exchange set |
| 3c | Signature validity | S-158:100 checks Nxxx | Signatures |
| 3b | Discovery metadata value conformance | S-158:100 checks Nxxx | Values in CATALOG.XML |
| 3c | Discovery metadata/exchange set content conformance | S-158:100 checks Nxxx | Match contents of exchange set to discovery metadata in CATALOG.XML |
| 4 | Product-specific checks for exchange sets | S-158:1xx | Exchange set |
| 5 | Product catalogue checks | S-158:128 | S-128 datasets. See S-158:128 for recommended order |

# Check Classification

The check classification conforms to the scheme described in S-158.

# Geometry and Spatial Operators

Geometry and spatial operators conform to the operators for vector products described in S-158.

For Product Specifications which use coordinate multiplication factors, all spatial operators should use a default tolerance of 1/CMFX, 1/CMFY, or 1/CMFZ as appropriate should be applied in validation software.

# Other Components of this Specification

The other components of this Specification listed below are provided as separate documents or artefacts accompanying this document and form an integral part of this Specification.

1. Spreadsheet of S-100 validation checks named S-158\_100\_<version>\_<date>.xlsx.