

Bathymetric Surface Validation Checks

Edition 1.0.0 – December 2025

Aligned to S-102 Edition 3.0.0

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Document History

Changes to this Specification are coordinated by the IHO S-100 Working Group S-102 Project Team. New editions will be made available via the IHO web site. Maintenance of the Specification shall conform to IHO Resolution 2/2007 (as amended).

Version Number	Date	Author/Editor	Purpose
0.1.0	2024-10-15	RM	Initial draft for S100 Validation Checks GitHub repository. This is based on the August 2023 checks from the S-102 PT, which are aligned to the unpublished S-102 Edition 2.3.0.
0.2.0	2024-11-18	RM	Editorial updates agreed at S-100 WG9. Continues to be based on the August 2023 checks.
1.0.0	2025-09-30	DROH (BSH)	Update to version S-102 3.0.0 via the S-102PT25

Summary of Substantive Changes in Edition 1.0.0

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

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

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1 Introduction

This document specifies a set of checks that producers of S-102 Bathymetric Surface validation tools must implement in their validation software. Validation software is used to ensure that S-102 data are compliant with the S-102 Product Specification. The initial list of checks for S-102 was compiled by the IHO S-102 Project Team of the IHO S-100 Working Group.

The checks listed in this document are product-specific. They supplement but do not replace the generic S-100 validation checks applicable to all S-100 products which are defined in a separate IHO publication (S-158:100 – Universal Hydrographic Model Validation Checks).

1.1 Scope

This document, designated as “S-158:102” by the IHO, specifies validation checks for data products conforming to Edition(s) 3.0.x of the S-102 (Bathymetric Surface) Product Specification.

This document specifies product-specific validation checks for both S-102 datasets and exchange sets containing S-102 datasets.

The checks specified in this document supplement the checks described in Edition 1.0.0 of S-158:100 (Universal Hydrographic Data Model Validation Checks). Both sets of validation checks, those described in S-158:100 as well as those defined in S-158:102, must be applied to test the validity of S-102 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.

The checks described are intended for production systems designed to produce S-102 datasets. The checks can be administered at any time during the production phase.

1.2 Conformance

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

The validation checks described herein conform to Edition(s) 3.0.x of IHO Product Specification S-102 (Bathymetric Surface).

1.3 References

2 Normative references

S-98	<i>Data Product Interoperability in S-100 Navigation Systems, IHO Publication S-98, Edition 2.0.0, ??? 2024. In Preparation.</i>
S-100	<i>IHO Universal Hydrographic Data Model, Edition 5.2.0, June 2024</i>
S-102	<i>Bathymetric Surface Product Specification, Edition 3.0.0, January 2025.</i>
S-158	<i>Validation Checks – Introduction and Structure, Edition 1.0.0, February 2025.</i>
S-158:100	<i>Universal Hydrographic Data Model Validation Checks, Edition 1.0.0, February 2025.</i>

3 Informative references

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

3.1 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:

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 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)

4 Abbreviations

This Specification uses the abbreviated terms defined in S-158.

In addition, this Specification uses the following abbreviated terms:

FDG Feature Data Group. The values group specified in S-100 Part 10c and represented by Level 3 and Level 4 in S-102 Figure 10 (Hierarchy of S-102 product).

FIDS Feature Information Dataset in "Group_F" - see S-100 Part 10c. See S-102 Figure 10 (Hierarchy of S-102 product) and S-102 clause 10.2.3.

FINST Feature Instance. Instance of BathymetryCoverage in S-102 3.0.0. Represents the BathymetryCoverage.nn groups within the BathymetryCoverage feature type group.

FTYPE Feature Type. Represents the container group BathymetryCoverage in S-102. See Level 1 of Figure 10 (Hierarchy of S-102 product).

FTYPE.N Feature instance groups. "N" denotes the N-th Feature instance group in the dataset. See Level 2 of Figure 10 (Hierarchy of S-102 product).

QINST Quality feature instance. Instance of QualityOfBathymetryCoverage in S-102 3.0.0. Represents the BathymetryCoverage.nn groups within the BathymetryCoverage feature type group.

QTYPE Quality Feature Type. Represents the container group for QualityOfBathymetryCoverage in S-102 (ed. 3.0.0). See Level 1 of Figure 10 (Hierarchy of S-102 product).

QTYPE.N Instance groups for the quality features. "N" denotes the N-th Quality feature instance group in the dataset. See Level 2 of Figure 10 (Hierarchy of S-102 product).

5 Symbols

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

5.1 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.

5.2 General description

S-158:102 is a specification describing product-specific validation checks for S-102 products. There are no data products based directly on this edition of S-158:102 and therefore no general information applicable to data products conforming to it.

The validation checks are intended for production systems designed to produce S-102 Bathymetric Surface datasets. The checks can be administered at any time during the production phase.

5.3 Specification metadata and maintenance

6 Specification metadata

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

Title: Bathymetric Surface Validation Checks

Version: 1.0.0

Date: 2025-12-31

Language: English

Classification: Unclassified

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Role: Owner

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

Identifier: S-158:102

Maintenance: Changes to this Specification are coordinated by the IHO S-102 Project Team of the IHO S-100 Working Group 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.

7 Specification maintenance

8 Introduction

Changes to S-158:102 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-158:102 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.

9 New Edition

New Editions of S-158:102 introduce significant changes.

The term “New Edition” conforms to the definition in S-158 clause 1.6.2.2.

10 Revision

Revisions are defined as substantive semantic changes to S-158:102.

The term “Revision” conforms to the definition in S-158 clause 1.6.2.3.-

11 Clarification

Clarifications are changes to S-158:102 arising from non-substantive reasons or from introduction of a new edition or revision of S-102.

The term “Clarification” conforms to the definition in S-158 clause 1.6.2.4.

12 Version numbers

The associated version control numbering to identify changes (n) to S-158:102 must be as follows:

New Editions denoted as **n.0.0**

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

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

13 Check Structure

Check structure in S-158:102 includes the fields specified in S-158 plus the additional fields specified in Table 13-1.

Table 13-1 - Extensions to check structure

Column Name	Description
Prerequisites	Checks which must succeed (check condition evaluates to FALSE) before this check can be executed. Trivial prerequisites are omitted from this column (such as requiring the presence of an attribute before using it in a condition).
Terminate if failure	Whether failure of the check (the check condition evaluates to TRUE) will force termination of check processing before all validation checks can be executed. Valid values are TRUE and FALSE. The default is FALSE. The HDF5 format is hierarchical and the validity or even the existence of certain parts of the dataset depends on structure or content required to be provided in the dataset. Validation checks for such fundamental structure or content have this field set to TRUE so that subsequent checks which depend on that structure or content are not unnecessarily attempted if the fundamental structure or content fails its own validation check. For example, checks on groups which are members of another group are not attempted if the container group is missing.

Termination of check processing need not be immediate but is recommended at the end of the validation phase during which the failure occurs. Validation phases are explained in clause 15.

14 Check Syntax

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

15 Organisation

The list of validation checks for this edition of S-158:102 is available separately (see clause 20). The list of checks accompanies this specification and forms an integral part of it.

The numeric component of the check ID is a 4-digit number whose first digit indicates the phase to which the check belongs (see Table 15-1 below).

Table 15-1 - Division of product-specific checks into processing phases

Phase	Check Numbers	Name	Description
1	102_1xxx	Validate Dataset Root and Feature Information	Validation of root group of HDF5 file and feature type information.
2	102_2xxx	Validate Feature Container Groups	Validation of metadata and structure for each feature type ("Feature Container"). In S-102 there are two feature containers (one for the bathymetry data and another for survey information), so this set of checks is executed only once for each.
3	102_3xxx	Validate Feature Instance Groups	Validation of feature instances. This set of checks, along with Phase 4 checks, must be executed once for each feature instance group contained within a feature container.
4	N/A	Validate Positioning Groups	There are no Phase 4 checks for S-102, which does not use positioning groups. This phase is mentioned in this table only for compatibility with S-158:1xx for coverages which do use positioning groups.
5	102_5xxx	Validate Values Datasets	Validation of bathymetry data values. This set of checks is applied to the values group in a feature instance group.
6	102_9xxx	Validate Exchange Catalogue	This set of checks relates to product-specific requirements for exchange catalogues

Dataset validation checks the structure and content of individual HDF5 data files. The checks for each HDF5 dataset file are divided into four phases

16 Other Applicable Checks

16.1 Generic S-100 checks

S-102 datasets and exchange sets must also be validated using the following subset of the generic S-100 validation checks defined in S-158:100:

Document reference in S-158:100 list	Checks	Apply to	Remarks
Part 1	All	Product Specification	No direct implementation on datasets or exchange sets
Part 2 / 2a	All	Product Specification	No direct implementation on datasets or exchange sets
Part 4a	All	Exchange catalogue	
Part 4b	All	Product Specification	No direct implementation on datasets or exchange sets
Part 5 / 5a	100_5010	Product Specification	No direct implementation on datasets or exchange sets
	100_0001 100_0002 100_0003 100_0004 100_0005 100_0006	Datasets	
Part 6		Datasets	
Part 7	Only checks for polygons	Domain extent polygons	S-102 uses vector geometry only for domain extent polygons. Note also that domain extent polygons as used in S-102 do not have interior boundaries.
Part 8	Only checks applicable to regular grid coverages	Dataset	
Part 9 / 9a / 13		Product Specitication	Validation checks for Portrayal Catalogue
Part 10a	None	N/A	S-102 does not use the ISO 8211 format
Part 10b	None	N/A	S-102 does not use the S-100 GML format
Part 10c	Only checks applicable to "Regular Grid" and "Feature oriented Regular Grid" coverages	Dataset	S-102 uses only the "Regular Grid" and "Feature oriented Regular Grid" coverage type
Part 11	100_0255	Dataset	There is only one Part 11 generic check, for dataset size
Part 15	100_0256 100_0257 100_0258 100_0259 100_0260 100_0261 100_0262 100_0263 100_0264 100_0265	Exchange catalogue Exchange set	

Document reference in S-158:100 list	Checks	Apply to	Remarks
	100_0266 100_0267		
Part 17	All	Exchange catalogue Exchange set	

16.2 Interoperability checks

S-102 datasets and exchange sets intended for use on ECDIS must also pass the applicable interoperability checks from those listed in S-158:98.

17 Check Application Sequence

The check application sequence expands and modifies the application sequence described in S-158.

Table 17-1 - 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
2	Product-specific checks for datasets	S-158:102	Dataset, in isolation
2.1	Root group checks	S-158:102 checks numbered 102_1xxx	Dataset, in isolation
2.2	Feature Container group checks	S-158:102 checks numbered 102_2xxx	Dataset, in isolation
2.3	Feature Instance group checks	S-158:102 checks numbered 102_3xxx	Dataset, in isolation
2.4	Values group checks	S-158:102 checks numbered 102_5xxx	Dataset, in isolation
3	Interoperability checks for single S-102 dataset	S-158:98	Dataset, in isolation
4	Inter-dataset, intra-product checks	S-158:102 checks numbered 102_0xxx	Adjacent or intersecting datasets
5	Interoperability checks for combinations of datasets from different products	S-158:98	S-102 dataset in combination with relevant datasets from other products (e.g., S-102)
6	S-100 generic checks for exchange sets	S-158:100	Exchange set

Order	Check Collection	Defined in	Apply to
7	Product-specific checks for exchange sets	S-158:102 checks numbered 102_9xxx	Exchange set
8	Product catalogue checks	S-158:128	S-128 datasets describing S-102 datasets

18 Check Classification

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

19 Geometry and Spatial Operators

S-102 Edition 3.0.0 datasets use vector geometry only for domain extent polygons. Any spatial operators mentioned in checks on domain extent polygons conform to the operators for vector products described in S-158.

For all spatial operators a default tolerance of zero should be applied in validation software.

20 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-102 validation checks named S-158_102_1_0_0.