
**Industrial automation systems and
integration — Product data
representation and exchange**

Part 216:

**Application protocol: Ship moulded
forms**

*Systèmes d'automatisation industrielle et intégration — Représentation
et échange de données de produits —*

Partie 216: Protocole d'application: Formes moulées de navires

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Contents	Page
1 Scope	1
2 Normative references	3
3 Terms, definitions and abbreviations	4
3.1 Terms defined in ISO 10303-1	4
3.2 Terms defined in ISO 10303-31	5
3.3 Terms defined in ISO 10303-42	6
3.4 Other terms and definitions	6
3.5 Abbreviations	13
4 Information requirements	13
4.1 Units of functionality	14
4.1.1 basic_geometry	15
4.1.2 configuration_management	15
4.1.3 definitions	16
4.1.4 external_references	16
4.1.5 hull_class_applicability	17
4.1.6 hydrostatics	17
4.1.7 items	18
4.1.8 location_concepts	18
4.1.9 offset_table_representations	19
4.1.10 ship_design_parameter	20
4.1.11 ship_general_characteristics	20
4.1.12 ship_measures	21
4.1.13 ship_moulded_forms	21
4.1.14 surface_representations	22
4.1.15 wireframe_representations	22
4.2 Application objects	23
4.3 Application assertions	163
5 Application interpreted model	180
5.1 Mapping specification	180
5.2 AIM EXPRESS short listing	394
6 Conformance requirements	601
Annex A (normative) AIM EXPRESS expanded listing	612
Annex B (normative) AIM short names	788
Annex C (normative) Implementation method specific requirements	797
Annex D (normative) Protocol Implementation Conformance Statement (PICS) proforma	798
Annex E (normative) Information object registration	800

Annex F (informative) Application activity model	801
Annex G (informative) Application reference model	828
Annex H (informative) AIM EXPRESS-G	854
Annex J (informative) Computer interpretable listings	881
Annex K (informative) Application protocol usage guide	882
Annex L (informative) Technical discussions	883
Bibliography	900
Index	901
 Figures	
Figure 1 — Shipbuilding application protocols	x
Figure 2 — Data planning model	xii
Figure 3 — Ship moulded forms overview	1
Figure 4 — Bilge keel	26
Figure 5 — Shaft bossings	27
Figure 6 — Shaft strut	28
Figure 7 — Shaft struts	29
Figure 8 — Keel dimensions	33
Figure 9 — Dimensions of the bulbous bow	35
Figure 10 — Global axis placements	58
Figure 11 — Transverse meta- centre	68
Figure 12 — Measuring shell thickness	70
Figure 13 — Local coordinate system	74
Figure 14 — Midship tumble	76
Figure 15 — Ship hull with bulbous bow and thruster tunnels	79
Figure 16 — Ship hull with bulbous bow	83
Figure 17 — Bulkheads and decks	84
Figure 18 — Double bottom	85
Figure 19 — Outer and inner bottom with profiles	85
Figure 20 — Double ship hull	86
Figure 21 — Frames and decks	87
Figure 22 — Girders	88
Figure 23 — Rudder and propeller	89
Figure 24 — Screw propeller model	89
Figure 25 — Thruster	90
Figure 26 — Decks and superstructure	90
Figure 27 — Transom stern	91
Figure 28 — Transverse bulkheads	91
Figure 29 — Vertical axis propeller	102
Figure 30 — Vertical axis propeller technology	103
Figure 31 — Propeller location	104

Figure 32 — Propeller dimensions	105
Figure 33 — Controllable propeller blade	108
Figure 34 — Fixed propeller blade	109
Figure 35 — Ducted propeller	110
Figure 36 — Controllable screw propeller	112
Figure 37 — Rudder dimensions	114
Figure 38 — Ship curves	119
Figure 39 — Buttock lines	120
Figure 40 — Station lines	122
Figure 41 — Waterlines	122
Figure 42 — Ship hull, rudder and propeller	126
Figure 43 — Ship hull dimensions	128
Figure 44 — Ship points	130
Figure 45 — Ship types	141
Figure 46 — Ship types	142
Figure 47 — Spacing position	146
Figure 48 — Surface representation	151
Figure 49 — Thruster propeller	152
Figure 50 — Form stability	153
Figure 51 — Wireframe	159
Figure F.1 — IDEF0 Basic notation	801
Figure F.2 — Node A0 - moulded form life cycle	814
Figure F.3 — Node A0 - perform ship life cycle	815
Figure F.4 — Node A1 - specify ship	816
Figure F.5 — Node A12 - prepare bid	817
Figure F.6 — Node A122 - create preliminary design	818
Figure F.7 — Node A1221 - create preliminary hull form	819
Figure F.8 — Node A12214 - generate initial hull form definition	820
Figure F.9 — Node A1223 - estimate hydrodynamics and powering	821
Figure F.10 — Node 12231 - estimate resistance and powering	822
Figure F.11 — Node A2 - complete and approve ship design	823
Figure F.12 — Node A22 - finalize and approve hull form	824
Figure F.13 — Node A23 - finalize and approve hydrodynamics and powering	825
Figure F.14 — Node A3 - produce and inspect a ship	826
Figure F.15 — Node A34 - test ship	827
Figure G.1 — ARM EXPRESS-G diagram 1 of 25	829
Figure G.2 — ARM EXPRESS-G diagram 2 of 25	830
Figure G.3 — ARM EXPRESS-G diagram 3 of 25	831
Figure G.4 — ARM EXPRESS-G diagram 4 of 25	832
Figure G.5 — ARM EXPRESS-G diagram 5 of 25	833
Figure G.6 — ARM EXPRESS-G diagram 6 of 25	834
Figure G.7 — ARM EXPRESS-G diagram 7 of 25	835
Figure G.8 — ARM EXPRESS-G diagram 8 of 25	836
Figure G.9 — ARM EXPRESS-G diagram 9 of 25	837
Figure G.10 — ARM EXPRESS-G diagram 10 of 25	838
Figure G.11 — ARM EXPRESS-G diagram 11 of 25	839
Figure G.12 — ARM EXPRESS-G diagram 12 of 25	840
Figure G.13 — ARM EXPRESS-G diagram 13 of 25	841
Figure G.14 — ARM EXPRESS-G diagram 14 of 25	842

Figure G.15 — ARM EXPRESS-G diagram 15 of 25	843
Figure G.16 — ARM EXPRESS-G diagram 16 of 25	844
Figure G.17 — ARM EXPRESS-G diagram 17 of 25	845
Figure G.18 — ARM EXPRESS-G diagram 18 of 25	846
Figure G.19 — ARM EXPRESS-G diagram 19 of 25	847
Figure G.20 — ARM EXPRESS-G diagram 20 of 25	848
Figure G.21 — ARM EXPRESS-G diagram 21 of 25	849
Figure G.22 — ARM EXPRESS-G diagram 22 of 25	850
Figure G.23 — ARM EXPRESS-G diagram 23 of 25	851
Figure G.24 — ARM EXPRESS-G diagram 24 of 25	852
Figure G.25 — ARM EXPRESS-G diagram 25 of 25	853
Figure H.1 — application context - AIM diagram 1 of 26 in EXPRESS-G	855
Figure H.2 — product definition - AIM diagram 2 of 26 in EXPRESS-G	856
Figure H.3 — property definition - AIM diagram 3 of 26 in EXPRESS-G	857
Figure H.4 — representation - AIM diagram 4 of 26 in EXPRESS-G	858
Figure H.5 — action - AIM diagram 5 of 26 in EXPRESS-G	859
Figure H.6 — person and organization - AIM diagram 6 of 26 in EXPRESS-G	860
Figure H.7 — person and organization assignment - AIM diagram 7 of 26 in EXPRESS-G	861
Figure H.8 — approval - AIM diagram 8 of 26 in EXPRESS-G	862
Figure H.9 — date and time - AIM diagram 9 of 26 in EXPRESS-G	863
Figure H.10 — classification assignment and group - AIM diagram 10 of 26 in EXPRESS-G	864
Figure H.11 — identification assignment external source - AIM diagram 11 of 26 in EXPRESS-G	865
Figure H.12 — document - AIM diagram 12 of 26 in EXPRESS-G	866
Figure H.13 — measure with unit - AIM diagram 13 of 26 in EXPRESS-G	867
Figure H.14 — measure value - AIM diagram 14 of 26 in EXPRESS-G	868
Figure H.15 — geometric and topological representation - AIM diagram 15 of 26 in EXPRESS-G	869
Figure H.16 — point - AIM diagram 16 of 26 in EXPRESS-G	870
Figure H.17 — placement - AIM diagram 17 of 26 in EXPRESS-G	871
Figure H.18 — curve - AIM diagram 18 of 26 in EXPRESS-G	872
Figure H.19 — bounded curve - AIM diagram 19 of 26 in EXPRESS-G	873
Figure H.20 — surface - AIM diagram 20 of 26 in EXPRESS-G	874
Figure H.21 — elementary surface AIM diagram 21 of 26 in EXPRESS-G	875
Figure H.22 — bounded surface - AIM diagram 22 of 26 in EXPRESS-G	876
Figure H.23 — solid model and shell - AIM diagram 23 of 26 in EXPRESS-G	877
Figure H.24 — topology - AIM diagram 24 of 26 in EXPRESS-G	878
Figure H.25 — name attribute and role association - AIM diagram 25 of 26 in EXPRESS-G	879
Figure H.26 — id and description attribute - AIM diagram 26 of 26 in EXPRESS-G	880
Figure L.1 — Ship Product Model	884
Figure L.2 — Structure of this part of ISO 10303	885
Figure L.3 — Modeling framework	888
Figure L.4 — Life cycle concept	889
Figure L.5 — Redeclaration of attributes	889

Tables

Table 1 — Key mappings for AP216	181
Table 2 — Conformance classes	602

Table 3 — Conformance class elements	602
Table B.1 — AIM short names of entities	788
Table L.7 — ARM measures and corresponding AIM measures and units	891

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 10303-216 was prepared by Technical Committee ISO/IEC/TC 184, *Industrial automation systems and integration*, Subcommittee SC 4, *Industrial data*.

This International Standard is organized as a series of parts, each published separately. The structure of this International Standard is described in ISO 10303-1.

Each part of this International Standard is a member of one of the following series: description methods, implementation methods, conformance testing methodology and framework, integrated generic resources, integrated application resources, application protocols, abstract test suites, application interpreted constructs, and application modules. This part is a member of the 200 series.

A complete list of parts of ISO 10303 is available from the Internet:

<<http://www.tc184-sc4.org/titles/STEP-titles.rtf>>

Introduction

ISO 10303 is an International Standard for the computer-interpretable representation of product information and for the exchange of product data. The objective is to provide a neutral mechanism capable of describing products throughout their life cycle. This mechanism is suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases, and as a basis for archiving.

This part of ISO 10303 is a member of the application protocol series. This part of ISO 10303 specifies an application protocol (AP) for ship moulded forms and related hydrostatic properties.

The definition of ship moulded forms supports the geometrical representation of the ship hull, propellers, rudders, appendages, and internal structures of the ship.

This part of ISO 10303 is one of a series of shipbuilding application protocols, that together aim to provide an integrated computer interpretable product model for ships.

The series of shipbuilding application protocols assumes that the ship product model can be divided into separate ship systems that each covers a key element of the ship for its whole life cycle. These key elements are: ship moulded forms, ship arrangements, ship distribution systems, ship structures, ship mechanical systems, ship outfit and furnishings, and ship mission systems. Each separate system is described by one or more application protocols. The full series of shipbuilding application protocols is shown in Figure 1. Those aspects of the ship product model that are common to each shipbuilding application protocol are described consistently and identically in each application protocol. Annex L has additional information on the shipbuilding application protocols and their elements. It also contains information on data common to the shipbuilding application protocols.

Within the series of shipbuilding application protocols this part of ISO 10303 details the geometry of a ship moulded form.

A moulded form is the shape and a set of design parameters of different parts of the ship that does not include information on the thickness of the material from which it is constructed. A moulded form may describe a ship hull, propeller, rudder, appendage, deck, or a ship structural element such as a bulkhead. A moulded form of particular interest is the ship hull, which is referred to as the hull moulded form. The hull moulded form will be exchanged between companies during the initial design and it is the basis of hydrostatic calculations.

All moulded forms are covered by this part of ISO 10303, and a collection of moulded forms that describe the ship as a whole is termed a ship moulded form.

This application protocol satisfies an industrial need of reducing the time required for hull form design, performance prediction, and ship structural design by facilitating the electronic exchange of hull moulded form geometry and hydrostatics between different companies. Also, it satisfies an industrial need for individual companies to integrate computer applications by providing an electronically accessible common view of hull and internal ship geometry for ship design and manufacture.

The fundamental assumptions for ship moulded forms are:

- ship moulded form and each moulded form have a definition;

- the definitions are approved and versioned;
- a ship moulded form is associated with a ship and is composed of moulded forms;
- a moulded form provides a geometric representation for a ship.

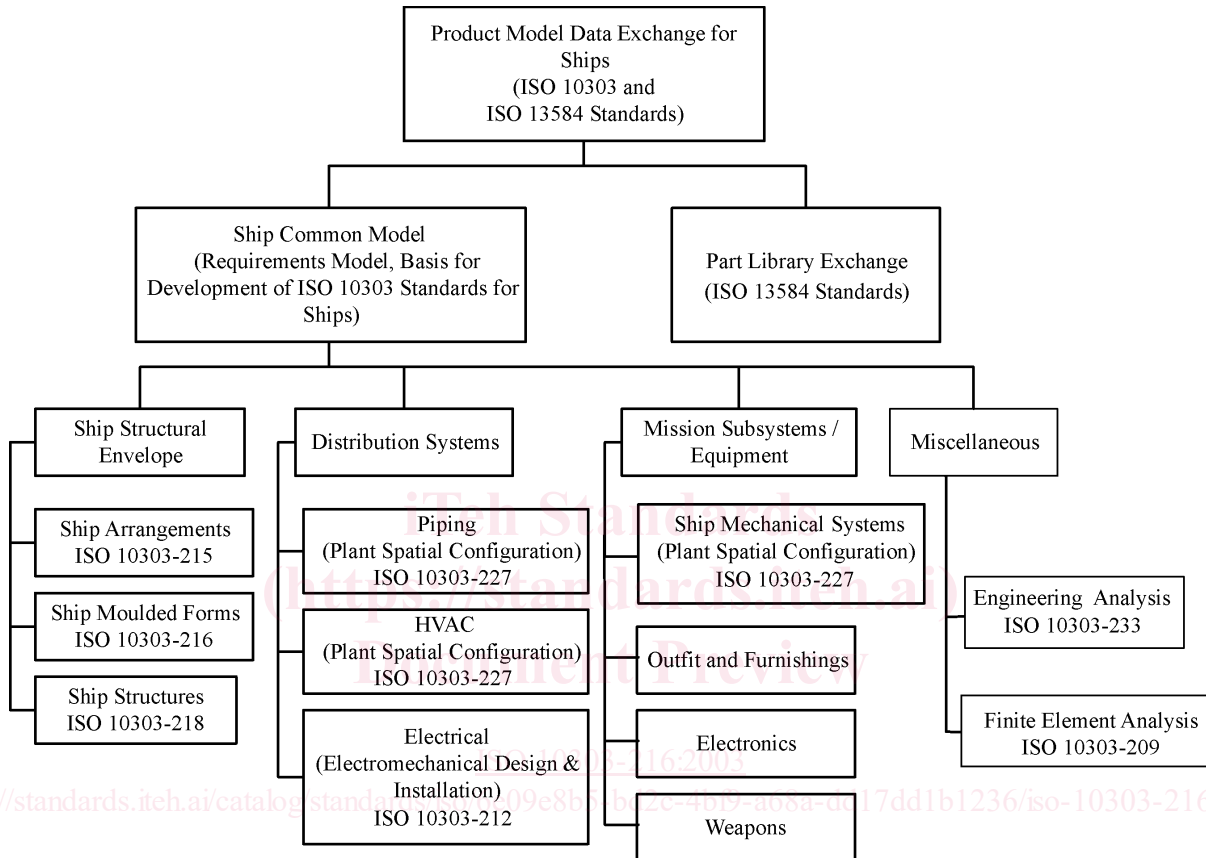


Figure 1 — Shipbuilding application protocols

The representations that are described reflect the different input and output capabilities of CAD, CAM, and other software systems in common usage of the shipbuilding process.

The geometric representations supported are:

- offset table representation;
- wireframe representation;
- surface representation.

All geometric representations assume no knowledge of the thickness of the ship moulded form. All measurements are based on one set of units defined for the ship. Geometric representations are used to

describe a hull surface moulded form or other moulded surfaces of the ship.

The hydrostatic properties are considered as a particular type of lifecycle definition for a moulded form. The hydrostatic properties are those of the intact hull that depend on the ship's draught, such as displacement, centre of buoyancy, and centre of flotation. Damage stability is not covered since no information on ship compartmentation is described by this application protocol.

NOTE ISO 10303-215 maybe used to represent damage stability data.

This application protocol defines the context, scope, and information requirements for the exchange of ship moulded form definitions, geometric representations, related hydrostatic properties, and specifies the integrated resources necessary to satisfy these requirements.

Application protocols provide the basis for developing implementations of ISO 10303 and abstract test suites for the conformance testing of AP implementations.

Clause 1 defines the scope of the application protocol and summarizes the functionality and data covered by the AP. Clause 3 lists the words defined in this part of ISO 10303 and gives pointers to words defined elsewhere. An application activity model that is the basis for the definition of the scope is provided in Annex F. The information requirements of the application are specified in Clause 4 using terminology appropriate to the application. A graphical representation of the information requirements, referred to as the application reference model, is given in Annex G.

Resource constructs are interpreted to meet the information requirements. This interpretation produces the application interpreted model (AIM). This interpretation, given in 5.1, shows the correspondence between the information requirements and the AIM. The short listing of the AIM specifies the interface to the integrated resources and is given in 5.2. The definitions and EXPRESS provided in the integrated resources for constructs used in the AIM may include select list items and subtypes which are not imported into the AIM. The expanded listing given in Annex A contains the complete EXPRESS for the AIM without annotation. A graphical representation of the AIM is given in Annex H. Additional requirements for specific implementation methods are given in Annex C.

Figure 2 contains the data planning model that provides a high level description of the requirements for this application protocol. This planning model was created from the in-scope data from the activities of the application activity model (AAM) and grouped into logical units of functionality. This planning model is used as a guide in developing the application reference model (ARM).

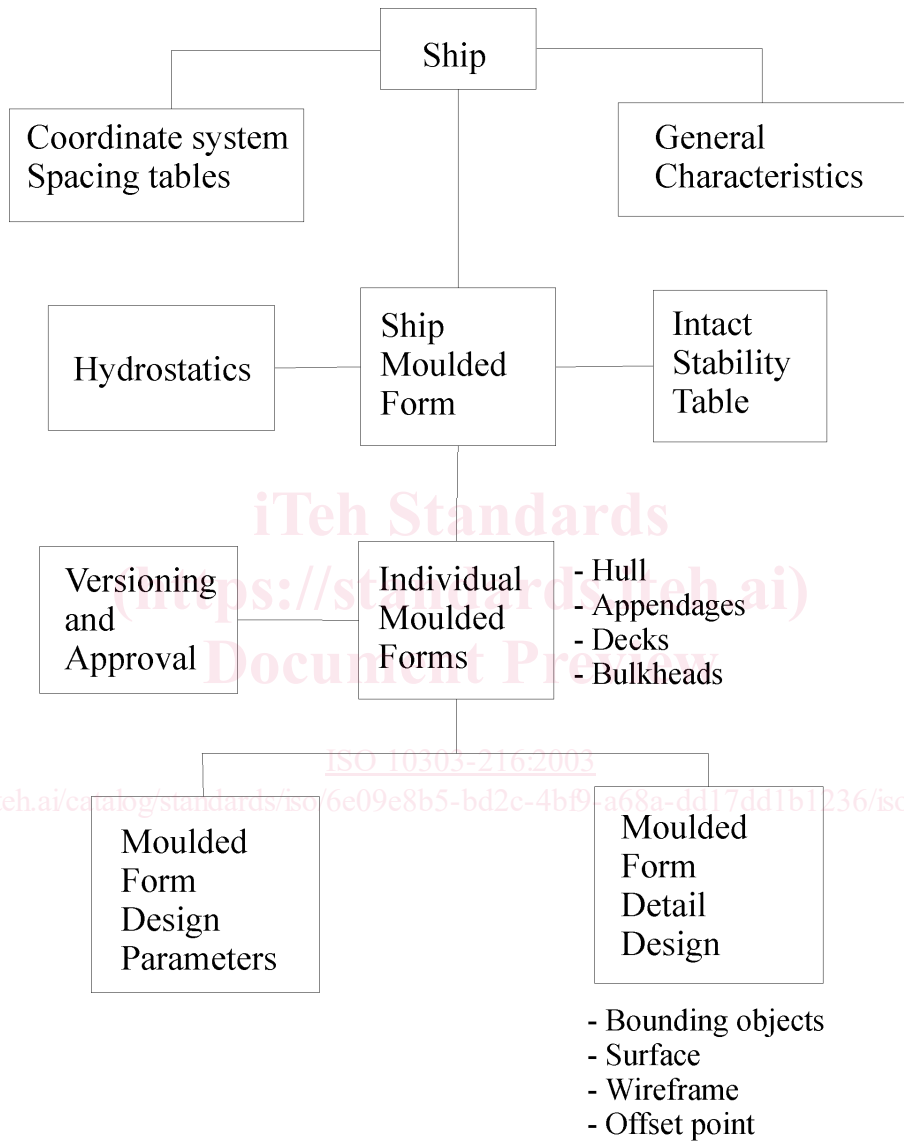


Figure 2 — Data planning model

Industrial automation systems and integration — Product data representation and exchange — Part 216: Application protocol: Ship moulded forms

1 Scope

This part of ISO 10303 specifies the scope and information requirements for the exchange of ship moulded form definitions, geometric representations, and related hydrostatic properties.

NOTE 1 The application activity model in Annex F provides a graphical representation of the processes and information flows which are the basis for the definition of the scope of this part of ISO 10303.

NOTE 2 An overview of the AP Ship Moulded Forms is given in Figure 3.

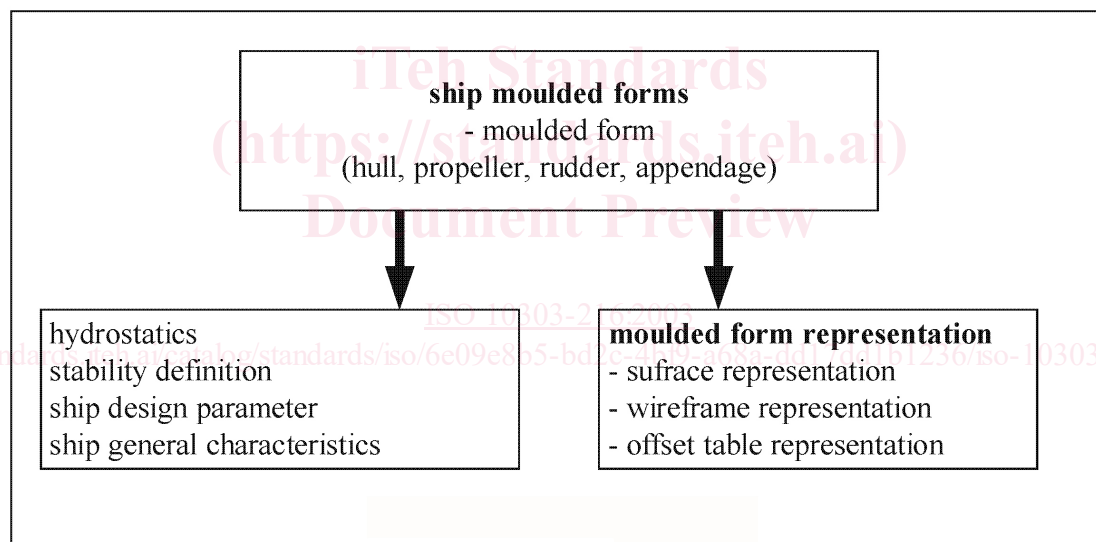


Figure 3 — Ship moulded forms overview

The following are within the scope of this part of ISO 10303:

- definition of moulded form geometry related to commercial and naval ships;
- definition of moulded form geometry of the preliminary design, detailed design, and production stages of the life cycle of a ship;

ISO 10303-216:2003(E)

— definition of moulded form geometry that describe the hull moulded form of the ship, including mono hullforms, multi-hullforms, the bulbous bow, transom stern, thruster tunnels, and additional appendages;

EXAMPLE 1 Types of moulded form geometry are bilge keel, spray rails, shaft struts, and shaft bossings that are part of the final moulded form of the ship hull.

- definition of moulded form geometry that describe the moulded form of propellers and rudders;
- definition of moulded geometry that describe the moulded form of decks including camber and sheer;
- definition of moulded geometry of internal ship compartment boundaries and the moulded form geometry of ship structural and non-structural elements;

EXAMPLE 2 Bulkheads, girders, and profiles are examples of moulded form geometry of ship structural elements.

— definition of general characteristics;

EXAMPLE 3 Main dimensions, ship type, shipyard, ship owner, and classification data are examples of general characteristics.

— definition of design parameters for the ship hull, bulbous bow, propeller, rudder, and appendages that are necessary to describe the moulded form, and are required to calculate hydrostatic properties;

— definition of hydrostatic properties of the ship moulded form that depend on the draught of the ship;

EXAMPLE 4 Displacement, centre of buoyancy, centre of flotation, metacentric height, and cross curves of stability are example of hydrostatic properties.

— definition of global and local co-ordinate systems and spacing tables used in naval architecture for position purposes;

— shape definition of ship moulded forms that use one of the following specified types of geometric representation:

- offset table representation;
- wireframe representation;
- surface representation.

— geometric representations containing geometric elements used in naval architecture;

EXAMPLE 5 Waterlines and buttock lines are examples of geometric representations.

— version control and approval of moulded forms and related hydrostatics.