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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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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.

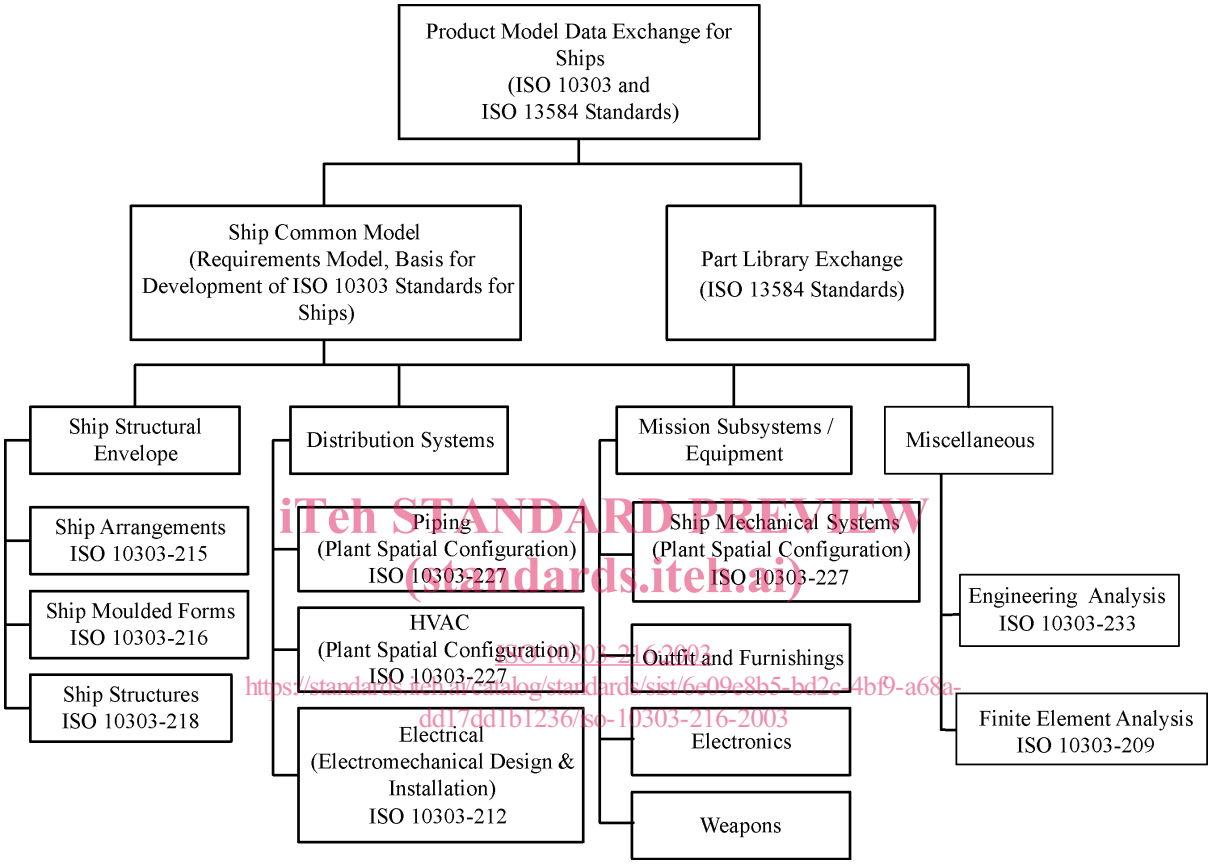

Figure 1 — Shipbuilding application protocols

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).

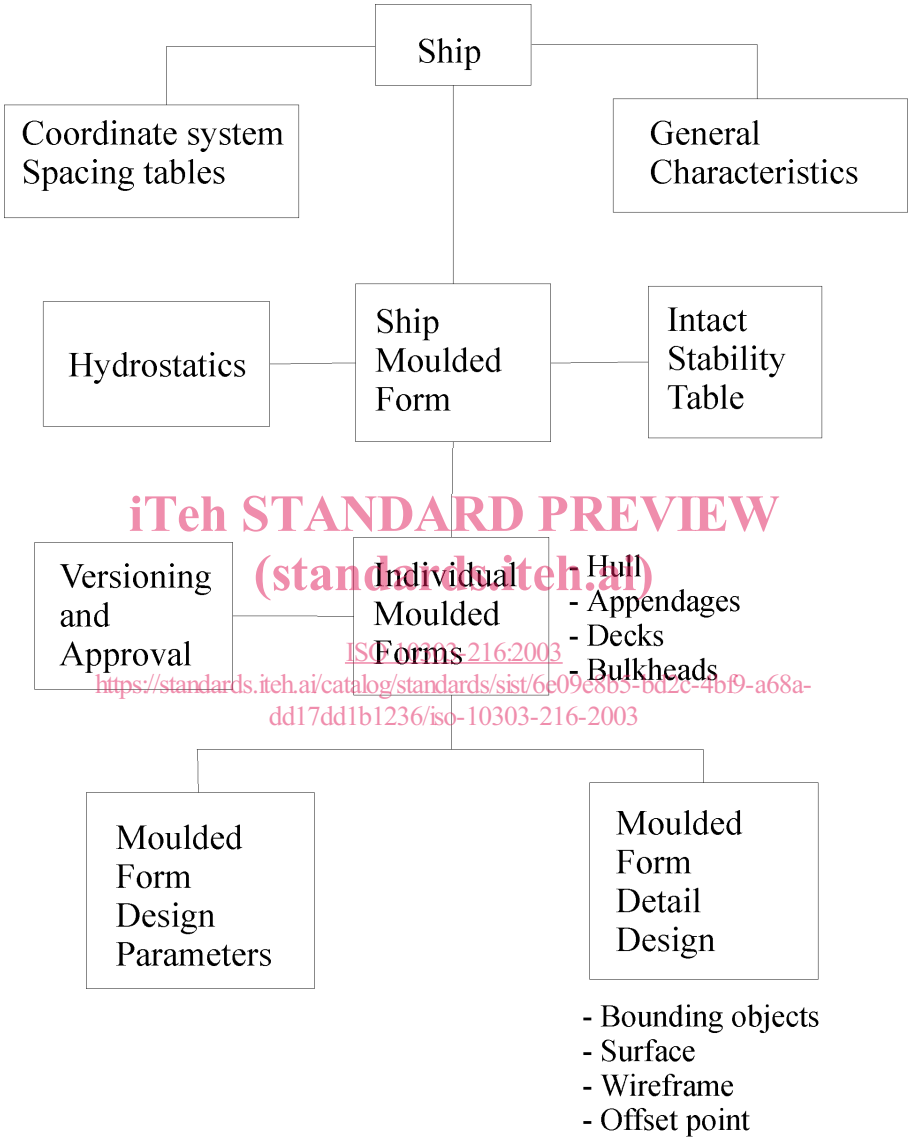

Figure 2 — Data planning model

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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.

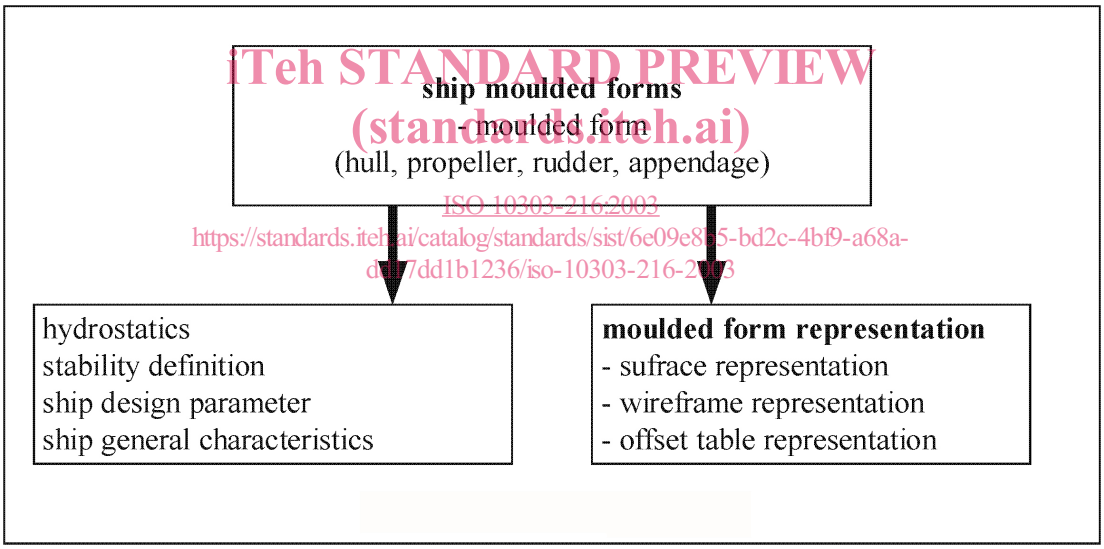

Figure 3 — Ship moulded forms overview

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;

— 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.

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

— product definition data related to hull plating defined on the moulded form;

— product definition data related to ship compartmentation and ship arrangements;

NOTE 3 ISO 10303-215 may be used to represent ship compartmentation and arrangement data.

— product definition data related to ship structures and ship assemblies;

NOTE 4 ISO 10303-218 may be used to represent ship structures such as panel systems.

— product definition data related to ship machinery and ship superstructures;

— mechanical systems and material aspects of propellers, rudders and control surfaces;

— product definition data from the decommissioning stage of the ship life cycle;

— hydromechanic properties of the ship;

— damage stability properties of ships;

NOTE 5 ISO 10303-215 may be used to represent damage stability data.

— ship longitudinal strength.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 31 (all parts), *Quantities and units*

ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units*

ISO 10303-1:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 1: Overview and fundamental principles*

ISO/IEC 8824-1:1998, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation*

ISO 10303-11:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 11: Description methods: The EXPRESS language reference manual*

ISO 10303-21:2002, *Industrial automation systems and integration — Product data representation and exchange — Part 21: Implementation methods: Clear text encoding of the exchange structure*

