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Ships and marine technology — Offshore wind energy — Supply chain information flow

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INTERNATIONAL STANDARD

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Navires et technologie maritime — Énergie éolienne offshore — Flux d'informations dans la chaîne d'approvisionnement

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Contents

Page

Foreword ... **v**
Introduction ... **vi**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Abbreviated terms ... **5**
5 Supply chain processes: Planning, ordering and monitoring ... **5**
5.1 General ... 5
5.2 Production of parts and components ... 7
5.3 Inland and nearshore transport ... 8
5.3.1 Transport by ground ... 8
5.3.2 Transport by ship ... 8
5.3.3 Transport by rail ... 8
5.3.4 Transport by aircraft ... 9
5.4 Storage ... 9
5.5 Installation ... 10
5.6 Maintenance and repair ... 11
5.7 Return of load carriers and equipment ... 11
5.8 Decommissioning ... 12
6 Exchange of logistics information via EPCIS ... **12**
7 Identification of relevant parties, objects and elements ... **14**
7.1 General ... 14
7.2 Roles and parties ... 14
7.2.1 General ... 14
7.2.2 Manufacturer ... 14
7.2.3 Supplier ... 14
7.2.4 Transport operator ... 15
7.2.5 Logistic service provider ... 15
7.2.6 Port operator ... 15
7.2.7 Installation operator ... 15
7.2.8 Project owner ... 15
7.2.9 Others ... 15
7.3 Identifying parties and business locations ... 15
7.3.1 General ... 15
7.3.2 Unique identifier for involved parties ... 15
7.3.3 Unique identifier for locations ... 16
7.4 Parts and components ... 16
7.4.1 General ... 16
7.4.2 Components ... 16
7.4.3 Bundles of components ... 17
7.4.4 Load carriers and lifting equipment ... 17
7.5 Transport media and machinery ... 17
7.5.1 General ... 17
7.5.2 Trucks ... 17
7.5.3 Trains and wagons ... 17
7.5.4 Vessels ... 18
7.5.5 Aircraft ... 18
7.5.6 Other ... 18
7.6 Container ... 18
7.7 Unique identification numbers ... 18
7.7.1 General ... 18
7.7.2 Representation of unique identifiers ... 18

AVA Documents
Document Sharing Hub

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Full document details: BS ISO 29404:2015

7.7.3 Usage of existing unique numbering systems ... 19

8 Master data ... 19

9 Event data ... 20
9.1 General ... 20
9.2 General extensions of event fields ... 21
9.3 Plan data ... 21
9.4 Order data ... 23
9.5 Material flow event messages ... 24
9.6 Extensibility and specific implementation design ... 26
9.6.1 General ... 26
9.6.2 Vocabulary extensions ... 27
9.6.3 Event field extensions ... 27

10 Data formats ... 28

11 Data carriers ... 28
11.1 General ... 28
11.2 Barcodes ... 28
11.3 RFID ... 29
11.4 Others ... 29

Annex A (normative) **XML scheme for field extensions ... 30**

Annex B (informative) **Example messages in the offshore supply chain ... 31**

Bibliography ... 36

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 8, *Ships and marine technology*.

This International Standard is part of a series for offshore structures of the offshore wind industry. The full series consists of the following:

— ISO 29400, *Ships and marine technology — Offshore wind energy — Port and marine operations*

— ISO 29404, *Ships and marine technology — Offshore wind energy — Supply chain information flow*

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Introduction

The complexity and the number of parties involved in the offshore wind farm (OWF) supply chains, both during the construction and the operational phase with their repair and maintenance requirements, depend on IT applications to facilitate planning and control of all physical processes.

In order to minimize frictions in data communication between different business parties, content and format of data need to be standardized.

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INTERNATIONAL STANDARD ISO 29404:2015(E)

Ships and marine technology — Offshore wind energy — Supply chain information flow

1 Scope

This International Standard specifies content and format of the messages initiating and controlling the physical movement of wind turbine generator (WTG) components from suppliers to the construction site during the construction phase as well as for repair and maintenance purposes.

This International Standard is applicable to all organizations involved in the production, transportation, storage and installation of WTG parts and related components. This International Standard is not intended to be applied to substations.

Messages described in this International Standard covers only the operational aspects of logistics and therefore this International Standard will represent only one aspect of the entire information flow.

This International Standard does not specify the technical implementation of appropriate IT products. It rather provides an approach based on the EPC Information System (EPCIS) standard and describes the usage of extension mechanisms provided by the EPCIS standard for the exchange of information in the offshore wind supply chain. It aims at standardizing the exchange of essential logistic information. This International Standard specifies elementary informational needs of involved parties in the offshore supply chain and defines mechanisms for the exchange of this information via the EPCIS. Due to the high degree of specialization along different offshore supply chains, partners exchanging information might require mechanisms for personalizing according to their individual demands. The underlying extendable EPCIS concept allows end users and industry consortiums to extend and to refine the information exchange. These extensions might go far beyond the basic information exchange described in this International Standard.

2 Normative references

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

ISO 29400, *Ships and marine technology — Offshore wind energy — Port and marine operations*

EPC Information Services (EPCIS) Version 1.1 Specification

Core Business Vocabulary (CBV) GS1 Standard Version 1.1

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 29400 and the following apply.

3.1
automatic identification data capturing
AIDC
methods of automatically identifying objects, collecting data about them, and entering that data directly into computer systems

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3.2
bar code
linear array of rectangular marks of (possibly) varying width, height and vertical alignment, separated by spaces of (possibly) varying width, in which the positioning and size of marks and spaces are used to encode information

Note 1 to entry: Bar code may be 1D bar code or 2D bar code, also called Aztec code.

3.3
component
arbitrarily parts of a WTG, comprising foundations and all parts of a wind turbine generator as well as elements of a wind turbine generator tower

EXAMPLE Tripods, jackets, monopoles and other foundation types and blades and hubs.

3.4
container owner code
BIC code
coding scheme used for coding, identification and marking of containers used within containerized intermodal freight transport

Note 1 to entry: For detailed information, see Reference [1].

3.5
coordinate
one of a sequence of *n* numbers designating the position of a point in *n*-dimensional space

Note 1 to entry: In a coordinate reference system, the coordinate numbers are qualified by units.

[SOURCE: ISO 19111:2007, 4.5]

3.6
coordinate tuple
tuple composed of a sequence of coordinates

Note 1 to entry: The number of coordinate tuple equals the dimension of the coordinate system; the order of coordinates in the coordinate tuple is identical to the order of axes of the coordinate system.

[SOURCE: ISO 19111:2007, 4.12 — modified]

3.7
IMO number
unique identifiers for ships governed by IMO

Note 1 to entry: For more information, see IMO Resolution A.600(15).

Note 2 to entry: The issuing agency for IMO numbers is IHS Fairplay.

3.8
installation site
offshore location where WTGs are installed in an offshore wind farm

3.9
inland transport
transport of components which does not operate in offshore or coastal areas

EXAMPLE Via roads, via rail, via inland vessel and via plane.

3.10
issuing agency
agency that defines and governs unique numbering schemes

Note 1 to entry: For more information, see ISO/IEC 15459-2.

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3.11
location
uniquely identifiable physical point or area

Note 1 to entry: The location can be characterized by coordinates.

3.12
logistics hub
location where flows of components are consolidated, stored or transhipped

Note 1 to entry: Logistic hubs are usually located in the inland or the coastal area.

Note 2 to entry: Supply chains may comprise multiple logistics hubs.

3.13
logistic service provider
role in the offshore supply chain which is responsible for the organization of parts or of the entire logistics chain

3.14
manufacturer
organization that produces one or more components for offshore wind turbines

3.15
n-tier
organization that supplies one or more manufacturer with raw material and semi-finished products

3.16
nearshore transport
water-based transport operated next to the coast or in mouths of rivers

3.17
offshore transport
transportation of components from designated marshalling port or another fabrication yard to the offshore installation site in the offshore wind farm

3.18
sea fastening
temporary fastening items which keep movable items in position during sea and waterways transport

3.19
sending party
legal entity that sends components to a receiving party

3.20
storage frames
structure to support storing of the WTG components

3.21
supplier
company which produces semi-finished products for the assembly of components of a WTG

3.22
radio-frequency identification
RFID
wireless non-contact use of radio-frequency electromagnetic fields to transfer data

3.23
telemetry
automated collection of operational data and its transfer via an information and communication infrastructure

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3.24
trailer
system of steerable wheels, connected to a central spine beam by hydraulic suspension that can be raised or lowered

3.25
transport media
all kinds of vehicle that may be used to transport components, bundles of component, load carriers, lifting equipment and other related objects

3.26
unique identifier
identifier which is guaranteed to be unique among all identifiers used for those objects and for a specific purpose

Note 1 to entry: For more information, see ISO/IEC 15459-1.

3.27
process state
state of a process that describes the disposition and the current business step of a process

3.28
extensible markup language
XML
schema that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable

3.29
xml scheme
abstract collection of metadata, consisting of a set of schema components with element and attribute declarations and complex and simple type definitions

Note 1 to entry: For more information, see References [18] and [21].

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4 Abbreviated terms

AIS	Automatic Identification System
CBV	Core Business Vocabulary
EPC	Electronic Product Code
EPCIS	EPC Information Services
IMO	International Maritime Organization
GIAI	Global Individual Asset Identifier
GLN	Global Location Number
GTIN	Global Trade Item Number
GPS	Global Positioning System
GRAI	Global Returnable Asset Identifier
OWF	Offshore Wind Farm
SGLN	Global Location Number With or Without Extensions
SGTIN	Serialised Global Trade Item Number
SSCC	Serial Shipping Container Code
SPMT	Self-Propelled Modular Transporter
URIs	Uniform Resource Identifiers
URL	Uniform Resource Locator

5 Supply chain processes: Planning, ordering and monitoring

5.1 General

This Clause describes the data communications needs arising through the different stages of production, transport and maintenance. Planning and control of activities along the offshore supply chain requires reliable information about states of processes, locations of components, availability of resources. Especially, the exchange of planning information and order information, such as estimated arrival times of components or vessels, allows harmonizing the material flow along the whole offshore logistics supply chain. Due to the different roles in the offshore supply chain, the involved parties have different information needs. In particular, this International Standard addresses the different stages of the offshore logistic supply chain and the following informational needs:

— production of parts and components by manufacturers;

— transport to marshalling ports;

— intermediate storage;

— transport to installation site;

— installation of WTG components;

— maintenance and repair;

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— decommissioning.

The information flow, which is necessary to initiate the physical material flow, is organized by the exchange of information between the participants of the supply chain. In general, three different types of information have to be exchanged between involved parties. These messages are characterized as follows:

— Planning data — contains information about initial plans for component or for transport media. It comprises information about planned arrival dates of transport units at the transport origin and at the transport destination.

— Order data — contains information about short-term planning data (e.g. the estimated time of arrival of a vessel in a port). The physical information flow is initiated by this information. This order message comprises announcements for any kind of transport initiation or other related actions.

— Material flow event data — events that occur after the completion of planning or ordering processes. Events represent the actual status of particular processes in the supply chain (e.g. the arrival of a component at a marshalling port or another logistics hub).

The basic information requirements of each step of the offshore supply chain mentioned above are described hereafter. Figure 1 depicts a general supply chain for the installation of offshore wind turbines. The description of tasks, processes and related informational demands are based on Figure 1.

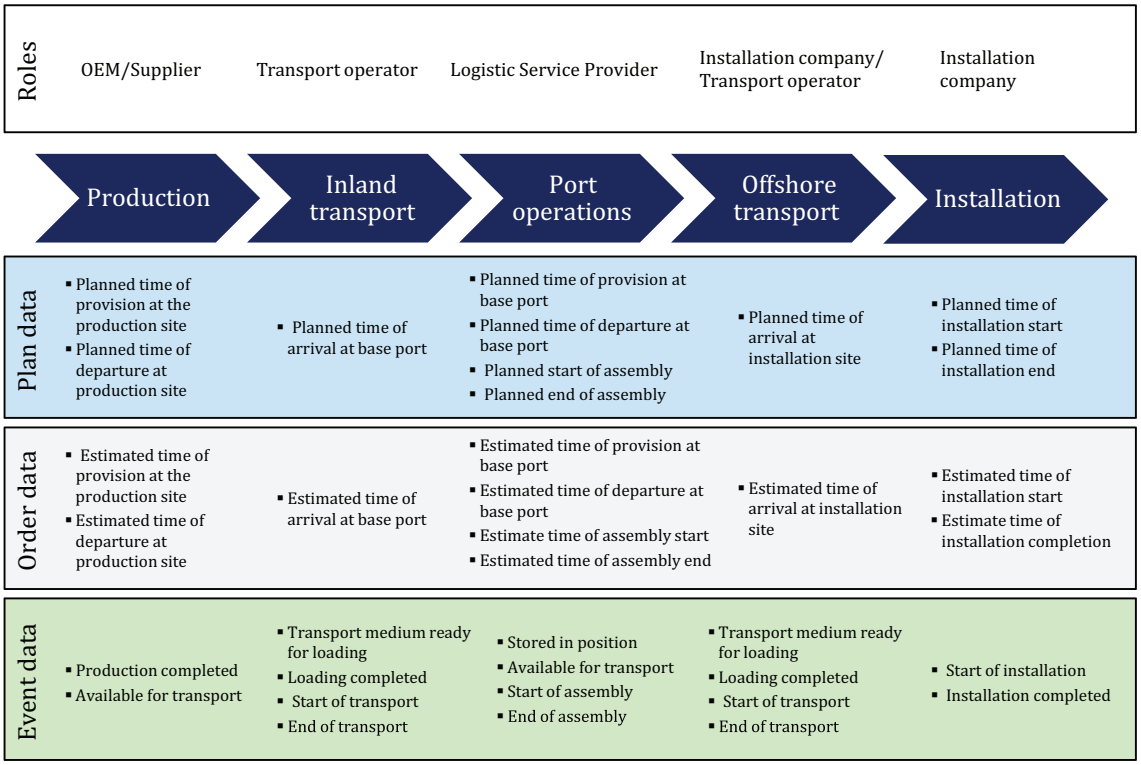

Figure 1 — General offshore wind energy installation supply chain

Relevant data for maintenance and repair operations as well as relevant data for the decommissioning is not depicted in Figure 1. Informational needs therefore are described in 5.6 and 5.8. The process-related tasks shown in Figure 1 are as follows.

a) Production of parts and components: production of WTG components.

b) Inland and nearshore transport: transport of WTG components from manufacturers or logistic hubs to the marshalling port. Inland transport can be organized via roads, via railways, via aircraft, via inland and nearshore waterways.

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c) Port operations: Port operations cover all activities from receiving, storing, handling, assembling and providing components.

d) Offshore transport: This process covers the pick-up of components and the transport of components by an installation or other vessel.

e) Installation: This process covers all activities for the physical installation of a component at the installation site at the OWF.

Maintenance operations, as indicated in Figure 1, are also included in this generic scheme. Maintenance in the context of this International Standard covers the removal of parts from a WTG, the transport of components and the installation of new components to a WTG.

5.2 Production of parts and components

The production of components is triggered by orders of customers (e.g. general contractor). The contracting phase as well as the production planning of manufacturers is not in the scope of this International Standard. However, ordering of components is the starting point of the offshore logistic supply chain. The completion of a production order is a relevant event in the offshore supply chain. This event triggers all transport activities concerning the particular component. At least the following basic information has to be exchanged between transportation operators and manufacturers:

— unique identification attribute of component;

— planned time of provision at the manufactures site;

— estimated time of provision at the manufacturer's site;

— location of the component (e.g. location ID);

— destination of the component (e.g. location ID);

— required transport medium (e.g. transportation by ship or barge, ground-based transport via roads or transport by air).

This information is relevant for different parties of the supply chain. Transport operators and logistic service providers use this information for their operative planning processes. On this basis, the transport operator gives a reply to this request comprising information about

— planned time of arrival of the transport unit at the manufacturer's site,

— estimated time of arrival of the transport unit at the manufacturer's site,

— planned time of arrival at the destination, and

— estimated time of arrival at the destination

For other actors, these data are of informative character.

The status of a component should be sent to different parties in the supply chain after the production of a particular component has been finished. This event data confirms that components are potentially available for transport. Relevant information in this context are the following:

— unique identification attribute of component;

— current status of component (i.e. production completed);

— location of provision for transport (e.g. location ID).

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