INTERNATIONAL STANDARD

ISO 15531-32

First edition
2005-10-01

Industrial automation systems and integration — Industrial manufacturing management data: Resources usage management —

Part 32: Conceptual model for resources usage management data

Systèmes d'automatisation industrielle et intégration — Données de gestion de fabrication: Gestion d'emploi des ressources —

Partie 32: Modèle conceptuel pour les données de gestion d'emploi des ressources

Reference number
ISO 15531-32:2005(E)

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Published in Switzerland

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Foreword

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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 15531-32 was prepared by Technical Committee ISO TC184/SC4, *Industrial automation systems and integration*, Subcommittee SC4 *Industrial data*.

A complete list of parts of ISO 15531 is available from the Internet.

http://www.tc184-sc4.org/titles/

Introduction

Manufacturing resources form the basis and long-term potential of any company. The efficient use of these resources is one of the main goals in industrial management. Comprehensive information about available manufacturing resources is required in order to take the necessary decisions for efficient resource usage. Since many different enterprise functions and therefore also different IT-systems are dealing with manufacturing resources. A common, standardized model for resource description is necessary. That standardised model should enable a company to communicate internally and externally about manufacturing resources and furthermore enable to build up an industrial company's resource database. Its basis will be the definition of an information model for the description of manufacturing resources.

A complete description of manufacturing resources is out of scope of this information model. Only data relevant for decisions concerning the usage of manufacturing resources (e.g. within process planning or job scheduling) will be considered. Therefore only data describing manufacturing resources in terms of their static and dynamic capabilities and capacities to perform manufacturing tasks are within the scope of this information model for resource usage management. There mainly exist two different types of capabilities. On the one hand, there exist capabilities describing a manufacturing resource which are dedicated and unique characteristics in the context of resource management. On the other hand, there exist capabilities which are used within resource management but represent a specific view on characteristics belonging originally to the product description of a manufacturing resource.

EXAMPLE some geometrical or shape properties may belong to the product description and may be needed for the management of concerned resource.

Therefore there is a strong link to the product defining data of manufacturing resources, e.g. described by using the ISO 10303 standard.

On the other hand, the data residing in this information model for manufacturing resource management will mainly be used within process planning. This planning will result in the assignment of manufacturing resources and the required technological parameters for resource utilisation and these results will be documented by means of ISO 10303-240 On the other hand the data describing capability and capacity of manufacturing resources will be used together with process plans as input for scheduling tasks which will be conceptually defined in ISO 15531-4x series.

This part of ISO 15531 specifies a model of manufacturing resources that is written in EXPRESS and makes the fullest possible use of the "Integrated Resources" in ISO 10303. The model may therefore be used by other SC4 standards.

Industrial automation systems and integration – Industrial manufacturing management data: Resources usage management – Part 32: Conceptual model for resources usage management data

1 Scope

This part of ISO 15531 specifies the full description of the conceptual model for resources usage management data, based on the resource information model and basic principles described in ISO 15531-31.

The following are within the scope of this part 32 of ISO 15531:

— The description of the conceptual resource information model and related definitions for resource usage management data;

— The EXPRESS description of the model and related entities;

— The EXPRESS-G diagram of the model.

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/IEC 8824-1, *Information Technology - Abstract Syntax Notation One (ASN.1): Specification of Basic Notation.*

ISO 10303-1, *Industrial automation systems and integration - Product data representation and exchange - Part 1: Overview and Fundamental Principles.*

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

ISO 10303-41, *Industrial automation systems and integration - Product data representation and exchange - Part 41: Integrated generic resources: Fundamentals of product description and support.*

ISO 10303-49, *Industrial automation systems and integration - Product data representation and exchange - Part 49: Integrated generic resources: Process structure and properties.*

ISO 10303-214, *Industrial automation systems and integration - Product data representation and exchange - Part 214: Application Protocol: Core data for automotive mechanical design processes.*

ISO 10303-224, *Industrial automation systems and integration - Product data representation and exchange - Part 224: Application Protocol: Mechanical product definition for process planning using machining features.*

ISO 13584-1, *Industrial automation systems and integration – Parts library – Part 1: Overview and fundamental principles.*

ISO 13584-42, *Industrial automation systems and integration – Parts library – Part 42: Description methodology: Methodology for structuring parts families.*

ISO 15531-1, *Industrial automation systems and integration - Industrial manufacturing management data - Part 1: General overview.*

ISO 15531-31, *Industrial automation systems and integration - Industrial manufacturing management data - Part 31: Resource information model.*

ISO 15531-42, *Industrial automation systems and integration - Industrial manufacturing management data - Part 42: time model*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply:

3.1.1
attribute
a piece of information stating a property of an enterprise entity

NOTE – The concept provided here relates to the broad concept of entity as defined in European standard ENV 12204? The term entity used in the definition provided by the ENV 12204 has been replaced here by enterprise entity as in ISO 15531-1 to avoid any confusion and inconsistency with the reserved term “entity” defined in ISO 10303-11. The usage of this concept has been limited to the area of concern of ISO 15531 in order to enable the use of the term “enterprise entity” instead of “entity and the field of application of the term attribute is restricted to enterprise entities.

[ISO 15531-31]

3.1.2
capability
quality of being able to perform a given activity

NOTE The capability is defined by a group of characteristics that describes functional aspects of manufacturing resources or system.

[ISO 15531-1]

3.1.3
capacity
capability of a system, sub-system or resource to perform its expected function from a quantitative point of view

EXAMPLE The capacity of a system or a resource to produce a given quantity of output in a particular time period.

NOTE For a given system or resource the distinction between capacity available and capacity requested may be useful.

[ISO 15531-1]

3.1.4
classification
the process of arranging abstractions into a structure organised according to their distinguishing properties

[ISO 15531-31]

3.1.5
component
a product that is not subject to decomposition from the perspective of a specific application

[ISO 10303-1]

3.1.6
data
a representation of information in a formal manner suitable for communication, interpretation, or processing by human beings or computers

[ISO 10303-1]

3.1.7
definition of resource characteristics
set of resources properties that are characterised by physical values

NOTE - Those physical values may be qualitative or quantitative.

[ISO 15531-31]

3.1.8
definition of resource views
classified set of resource views

NOTE - Those resource view may be defined either by the user or catalogues.

[ISO 15531-31]

3.1.9
generic resource
structure belonging to resource hierarchy and encompassing the common properties of several resources

NOTE - The corresponding entity `generic_resource` includes a complete definition of the related attribute without link to actual value.

[ISO 15531-31]

3.1.10
information
facts, concepts, or instructions

[ISO 10303-1]

3.1.11
interpretation
the process of adapting a resource construct from the integrated resources to satisfy a requirement of an application protocol. This may involve the addition of restrictions on attributes, the addition of constraints, the addition of relationships among resource constructs and application constructs, or all of the above

[ISO 10303-1]

3.1.12
information model
a formal model of a bounded set of facts, concepts or instructions to meet a specified requirement

[ISO 10303-1]

3.1.13
integrated resource
a part of this International Standard that defines a group of resource constructs used as the basis for product data

[ISO 10303-1]

3.1.14
model
representation or description of an entity or a system, describing only the aspects considered to be relevant for its purpose

NOTE Entity is not used here with the meaning provided by ISO 10303-11 but with the sense usually given in ENV 12204

[ISO 15531-1]

3.1.15
object
concept or a physical thing which may exist in the real world

[IS015531-31]

3.1.16
process
structured set of activities involving various enterprise entities, that is designed and organised for a given purpose

NOTE The definition provided here is very close to that given in ISO 10303-49. Nevertheless ISO 15531 needs the notion of structured set of activities, without any predefined reference to the time or steps. In addition, from the point of view of flow management, some empty processes may be needed for a synchronisation purpose although they are not actually doing anything (ghost task).

[ISO 15531-1]

3.1.17
product
a thing or substance produced by a natural or artificial process

[ISO 10303-1]

3.1.18
product data
a representation of information about a product in a formal manner suitable for communication, interpretation, or processing by human beings or by computers

[ISO 10303-1]

3.1.19
property
a real world characteristic which is represented by either attributes or constraints

[ISO 15531-31]

3.1.20
resource
any device, tool and means, excepted raw material and final product components, at the disposal of the enterprise to produce goods or services

NOTE 1 Resources as they are defined here include human resources considered as specific means with a given capability and a given capacity. Those means are considered as being able to be involved in the manufacturing process through assigned tasks. That does not include any modelling of an individual or common behaviour of human resource excepted in their capability to perform a given task in the manufacturing process (e.g.: transformation of raw material or component, provision of logistic services). That means that human resources are only considered, as the other, from the point of view of their functions, their capabilities and their status (e.g.: idle, busy). That excludes any modelling or representation of any aspect of individual or common «social» behaviour.

NOTE 2 This definition includes ISO 10303-49 definition.

[ISO 15531-1]

3.1.21
resource characteristic
main property of a resource according to a given purpose

NOTE In ISO 15531 resource characteristics are mainly related to the management of the manufacturing resources.

[ISO 15531-31]

3.1.22
resource configuration
set of properties of resource configured for a specific manufacturing task

[ISO 15531-31]

3.1.23
resource hierarchy
structure designed to enable a classification of resources

[ISO 15531-31]

3.1.24
resources information model (RIM)
model of information addressing management of resources usage

[ISO 15531-31]

3.1.25
resource status
property which identifies an individual resource availability at some point in time

[ISO 15531-31]

3.1.26
resource view
specific set of resource characteristic associated to a given purpose

[ISO 15531-31]

3.1.27
structure
a set of interrelated parts of any complex thing, and the relationships between them

[ISO 10303-1]

3.1.28
structure of resource characteristics
set of classified resource characteristics

[ISO 15531-31]

3.2 Abbreviations

For the purpose of this part of ISO 15531, the following abbreviation applies:

ERP enterprise resources planning

RIM resources information model

SDAI standard data access interface

4 ISO 15531 general

ISO 15531 specifies the characteristics for a representation of manufacturing management information over the entire industrial process with the necessary mechanisms and definitions to enable manufacturing management data to be shared and exchanged within the factory, with other plants or with companies.

Exchanges are made through different computer systems and environments associated with the complete industrial process. The standard is focused on discrete manufacturing but not limited to it. Nevertheless any extension to industrial processes which does not belong to discrete manufacturing is always under consideration when it does not imply any contradiction or inconsistency with the initial objective of the standard.

The following are within the scope of ISO 15531:

— the representation of production and resources information including capacity, monitoring, maintenance constraints and control;

NOTE - Maintenance constraints and relevant maintenance management data are taken into account from the point of view of their impact on the flow control.

— the exchange and sharing of production information and resources information including storing, transferring, accessing and archiving.

The following are outside the scope of ISO 15531:

— enterprise modelling;

NOTE - That means that tools, architecture and methodologies for the modelling of an enterprise in its whole are not in the scope of ISO 15531.

— product data (representation and exchange of product information);

