
**Industrial automation systems and
integration — Process specification
language —**

**Part 41:
Definitional extension: Activity
extensions**

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*Systemes d'automatisation industrielle et integration — Langage de
specification de procede —*

Partie 41. Extension de definition: Extensions d'activite

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Published in Switzerland

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Foreword

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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.

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ISO 18629-41 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC 4, *Industrial data*.

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A complete list of parts of ISO 18629 is available from the Internet:

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

Introduction

ISO 18629 is an International Standard for the computer-interpretable exchange of information related to manufacturing processes. Taken together, all the parts contained in ISO 18629 provide a generic language for describing a manufacturing process throughout the entire production process within the same industrial company or across several industrial sectors or companies, independently from any particular representation model. The nature of this language makes it suitable for sharing process specifications and properties related to manufacturing during all the stages of a production process.

This part of ISO 18629 provides a description of the definitional extensions of the language related to activity extensions defined within ISO 18629.

All parts of ISO 18629 are independent of any specific process representation model used in a given application. Collectively, they provide a structural framework for improving the interoperability of these applications.

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Industrial automation systems and integration — Process specification language —

Part 41:

Definitional extension: Activity extensions

1 Scope

This part of ISO 18629 provides a specification of non-primitive concepts of the language, using a set of definitions written in the language of ISO 18629. These definitions provide an axiomatization of the semantics for terminology in this part of ISO 18629.

The following is within the scope of this part of ISO 18629:

- definitions of concepts specified using concepts of ISO 18629-11 and ISO 18629-12 that are independent of state and time relations, and related to classes of activity such as those listed in Clause 5.

The following is outside the scope of this part of ISO 18629:

- definitions of state and time-related concepts specified using concepts of ISO 18629-11 and ISO 18629-12.

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

ISO 18629-1: 2004, *Industrial automation systems and integration – Process specification language – Part 1 : Overview and basic principles*

ISO 18629-11: 2005, *Industrial automation systems and integration – Process specification language – Part 11 : PSL core*

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

axiom

well-formed formula in a formal language that provides constraints on the interpretation of symbols in the lexicon of a language

[ISO 18629-1]

3.1.2

data

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

[ISO 10303-1]

3.1.3

defined lexicon

set of symbols in the non-logical lexicon which denote defined concepts

NOTE Defined lexicon is divided into constant, function and relation symbols.

EXAMPLE terms with conservative definitions.

[ISO 18629-1]

3.1.4

definitional extension

extension of PSL-Core that introduces new linguistic items which can be completely defined in terms of the PSL-Core

NOTE: Definitional extensions add no new expressive power to PSL-Core but are used to specify the semantics and terminology in the domain application.

[ISO 18629-1]

3.1.5

discrete manufacturing

production of discrete items

EXAMPLE Cars, appliances or computer.

[ISO 15531-1]

3.1.6

extension

augmentation of PSL-Core containing additional axioms

NOTE 1 The PSL-Core is a relatively simple set of axioms that is adequate for expressing a wide range of basic processes. However, more complex processes require expressive resources that exceed those of the PSL-Core. Rather than clutter the PSL-Core itself with every conceivable concept that might prove useful in describing one process or another, a variety of separate, modular extensions need to be developed and added to the PSL-Core as necessary. In this way a user can tailor the language precisely to suit his or her expressive needs.

NOTE 2 All extensions are core theories or definitional extensions.

[ISO 18629-1]

3.1.7

grammar

specification of how logical symbols and lexical terms can be combined to make well-formed formulae

[ISO 18629-1]

3.1.8

information

facts, concepts, or instructions

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[ISO 10303-1]

3.1.9

language

combination of a lexicon and a grammar

[ISO 18629-1]

3.1.10

manufacturing

function or act of converting or transforming material from raw material or semi-finished state to a state of further completion

[ISO 15531-1]

3.1.11

manufacturing process

structured set of activities or operations performed upon material to convert it from the raw material or a semifinished state to a state of further completion

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NOTE Manufacturing processes may be arranged in process layout, product layout, cellular layout or fixed position layout. Manufacturing processes may be planned to support make-to-stock, make-to-order, assemble-to-order, etc., based on strategic use and placements of inventories.

[ISO 15531-1]

3.1.12

model

combination of a set of elements and a truth assignment that satisfies all well-formed formulae in a theory

NOTE 1 The word "model" is used, in logic, in a way that differs from the way it is used in most scientific and everyday contexts : if a sentence is true in a certain interpretation, it is possible to say that the interpretation is a model of the sentence. The kind of semantics presented here is often called model-theoretical semantics.

NOTE 2 A model is typically represented as a set with some additional structure (partial ordering, lattice, or vector space). The model then defines meanings for the terminology and a notion of truth for sentences of the language in terms of this model. Given a model, the underlying set of axioms of the mathematical structures used in the set of axioms then becomes available as a basis for reasoning about the concepts intended by the terms of the language and their logical relationships, so that the set of models constitutes the formal semantics of the ontology.

[ISO 18629-1]

3.1.13

ontology

lexicon of specialised terminology along with some specification of the meaning of terms in the lexicon

NOTE 1: structured set of related terms given with a specification of the meaning of the terms in a formal language. The specification of meaning explains why and how the terms are related and conditions how the set is partitioned and structured.

NOTE 2: The primary component of a process specification language such as ISO 18629 is an ontology. The primitive concepts in the ontology according to ISO 18629 are adequate for describing basic manufacturing, engineering, and business processes.

NOTE 3: The focus of an ontology is not only on terms, but also on their meaning. An arbitrary set of terms is included in the ontology, but these terms can only be shared if there is an agreement about their meaning. It is the intended semantics of the terms that is being shared, not simply the terms.

NOTE 4: Any term used without an explicit definition is a possible source of ambiguity and confusion. The challenge for an ontology is that a framework is needed for making explicit the meaning of the terms within it. For the ISO 18629 ontology, it is necessary to provide a rigorous mathematical characterisation of process information as well as a precise expression of the basic logical properties of that information in the ISO 18629 language.

NOTE 5 In practice, extensions incorporate the axioms of the Outer Core.

[ISO 18629-1]

3.1.14

primitive concept

lexical term that has no conservative definition

[ISO 18629-1]

3.1.15

primitive lexicon

set of symbols in the non-logical lexicon which denote primitive concepts

NOTE Primitive lexicon is divided into constant, function and relation symbols.

[ISO 18629-1]

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]

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3.1.17

product

a thing or substance produced by a natural or artificial process

[ISO 10303-1]

3.1.18

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 but is included in the definition that applies for ISO 18629-14 and ISO 18629-44 that includes raw materials and consumables.

[ISO 15531-1]