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

Part 24:

**Implementation methods: C language  
binding of standard data access interface**

*Systemes d'automatisation industrielle et integration — Représentation et  
échange de données de produits —*

*Partie 24: Méthode de mise en application: Liant de langage C à l'interface  
d'accès aux données normalisées*



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Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.ch](mailto:copyright@iso.ch)  
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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 3.

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 part of ISO 10303 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 10303-24 was prepared by Technical Committee ISO/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 implementation methods series.

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

<<http://www.nist.gov/sc4/editing/step/titles/>>

Annex A forms a normative part of this part of ISO 10303. Annex B is for information only.



## 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 specifies a C programming language late binding of capability specified in ISO 10303-22, the standard data access interface (SDAI). The SDAI defines a data access interface to data defined using ISO 10303-11 (EXPRESS). The SDAI specifies operations that give the application programmer the capability to manipulate data through an interface based upon its description in the defining schema or schemas. This part of ISO 10303 specifies manifestation of that interface in the C programming language that is independent of the EXPRESS data definitions being manipulated. The standardization of a data access interface along with data definitions facilitates integration of different software components from different vendors.

The document is structured corresponding to ISO 10303-22. The major subdivisions in this part of ISO 10303 are:

- Clause 4 is an overview of the C language late binding to the SDAI. It specifies the requirements common to all C language late binding functions.
- Clause 5 specifies the C language late bindings to the EXPRESS and binding specific constants and data types.
- Clause 6 specifies the C language late binding functions to the SDAI operations to handle the programming environment.
- The specification of the C language late binding functions for the SDAI operations follows the categories defined in ISO 10303-22 clause 10.

Computer application systems are implemented using computing languages. Since there are many computing languages, many SDAI language bindings are possible. Additional SDAI language bindings are specified as other parts of ISO 10303 within the implementation method series.

Implementations of this part of ISO 10303 are not required to support the complete set of capabilities specified in ISO 10303-22. Specific sets of capability are grouped into implementation classes. The implementation classes against which conformance may be claimed are defined in ISO 10303-22 clause 13.

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# Industrial automation systems and integration — Product data representation and exchange — Part 24: Implementation methods: C language binding of standard data access interface

## 1 Scope

This part of ISO 10303 specifies a C programming language late binding of the capability specified in ISO 10303-22 - Standard data access interface (SDAI). This binding is a late binding and as such, none of the constants, data types, and functions depend on the application schema being accessed.

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

- access to and manipulation of data types and entities which are specified in ISO 10303-22;
- convenience functions suitable to this language binding;
- late binding requirements specified in ISO 10303-22:24-2001

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

- memory arrangement of data structures used by implementations of this part of ISO 10303;
- early binding requirements as specified in ISO 10303-22;
- all items listed as out of scope in ISO 10303-22.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 10303. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 10303 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 9899:1999, *Programming languages — C*

## ISO 10303-24:2001(E)

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

ISO 10303-1:1994, *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 10303-21:1994, *Industrial automation systems and integration - Product data representation and exchange - Part 21: Implementation methods: Clear text encoding of the exchange structure*

ISO 10303-22:1998, *Industrial automation systems and integration - Product data representation and exchange - Part 22: Implementation methods: Standard data access interface*

## 3 Terms, definitions, and abbreviations

### 3.1 Terms defined in ISO 10303-1

For the purposes of this part of ISO 10303, the following terms defined in ISO 10303-1 apply.

— application;

— application protocol; <https://standards.iteh.ai/catalog/standards/sist/f759b357-6f03-461c-81f5-7cc000899130/iso-10303-24-2001>

— conformance testing;

— data;

— implementation method;

— information;

— model.

### 3.2 Terms defined in ISO 10303-11

For the purposes of this part of ISO 10303, the following terms defined in ISO 10303-11 apply.

— complex entity data type;

— data type;

— entity;

- entity data type;
- entity instance;
- instance.

### 3.3 Terms defined in ISO 10303-22

For the purposes of this part of ISO 10303, the following terms defined in ISO 10303-22 apply.

- application schema;
- constraint;
- identifier;
- iterator;
- implementation class;
- repository;
- schema instance;
- SDAI language binding;
- SDAI-model;
- session;
- validation.

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### 3.4 Other definitions

For the purposes of this part of ISO 10303, the following definitions apply:

#### 3.4.1

##### **attribute data block**

a C structure containing both a value and the data type of the value that is accessed through a handle.

#### 3.4.2

##### **function**

a C language late binding specific interpretation of an SDAI operation, a combination of several SDAI operations or an operation unique to this binding.

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### 3.4.3

#### **function prototype**

the definition of a C programming language function in an include file.

### 3.4.4

#### **handle C type**

a function parameter that is a C language pointer type containing the address of a datum or a structured data.

## 3.5 Abbreviations

For the purposes this part of ISO 10303, the following abbreviations apply:

aggr	Aggregate
app	Application
attr	Attribute
ADB	Attribute Data Block
BN	By name <a href="https://standards.iteh.ai/catalog/standards/sist/f759b357-6f03-461c-81f5-7cc00899130/iso-10303-24-2001">ISO 10303-24:2001</a>
Deq	Domain equivalent
Enum	Enumeration
Id	Identifier
Itr	Iterator
NPL	Non-persistent List
Rep	Repository
RO	Read only
RW	Read write
SDAI	Standard Data Access Interface
Trx	Transaction
Uni	Uniqueness

## 4 Overview of the C language late binding of SDAI

### 4.1 Language bindings

ISO 10303-22 specifies operations independently of any programming language. Language bindings of the operations are developed for programming languages to define the capability required of conforming implementations. Two types of language bindings are identified: late bindings and early bindings. The concept of language bindings is defined in ISO 10303-22 clause 4. This part of ISO 10303 specifies a C language late binding of the SDAI operations.

This part of ISO 10303 supports all of the functionality defined in ISO 10303-22. There is not a one-to-one correspondence between the operations described in ISO 10303-22 and the functions defined in this part of ISO 10303. This part of ISO 10303 extends the functionality defined in ISO 10303-22 to provide more efficient or convenient operations.

### 4.2 Conformance

An implementation of this part of ISO 10303 shall conform to an implementation class as specified in ISO 10303-22 clause 13. The implementation shall support all C language binding functions whose original specification in ISO 10303-22 contains an operation required by the implementation level and shall support all convenience functions defined in this part of ISO 10303.

### 4.3 Use of late binding functions

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#### 4.3.1 Invalid parameter values

If a parameter to a C late binding function has an invalid value (such as a value outside the domain of the function, a pointer outside the address space of the program, or a NULL pointer), the behaviour of the function is not specified in this part of ISO 10303.

#### 4.3.2 Error handling

In the event an error is detected during the execution of a function, the values of the input parameters, the state of the implementation, and the application data managed by the implementation shall be unchanged, except in the event of a fatal underlying system error where the outcome is dependent on system and implementation design. Whether the output parameters are affected in the event of an error is left to the implementation.

#### 4.3.3 Memory management

When applicable, functions are strongly typed to return either a designated value or an instance identifier. The function parameters do not include output parameters except where required to return untyped data in application managed storage. The output parameters are typed `void*` to accept arbitrarily typed pointers to output buffers for attribute and aggregate member values or ADBs passed from the implementation to the application program.