

Function blocks for industrial-process measurement and control systems –

Part 4: Rules for compliance profiles

PUBLICLY AVAILABLE SPECIFICATION



INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

Reference number
IEC/PAS 61499-4

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CONTENTS

| | |
|--|---|
| FOREWORD | 3 |
| 1 General provisions | 4 |
| 1.1 Scope | 4 |
| 1.2 Normative references | 4 |
| 1.3 Definitions | 5 |
| 2 Contents of compliance profiles | 6 |
| 2.1 General provisions | 6 |
| 2.1.1 Scope | 6 |
| 2.1.2 Normative references | 7 |
| 2.1.3 Definitions | 7 |
| 2.2 Portability provisions | 7 |
| 2.3 Interoperability provisions | 7 |
| 2.4 Configurability provisions | 7 |
| 2.5 ANNEXES | 7 |
| ANNEX A (informative) - EXAMPLE COMPLIANCE PROFILE | 7 |
| ANNEX B (informative) - EXAMPLE DEVICE CONFIGURABILITY CLASSES | 8 |
| Figure 1 – Scope of a typical compliance profile | 4 |
| Table 1 – Contents of compliance profiles | 6 |
| Table B.1 – Device configurability classes (informative) | 9 |

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FUNCTION BLOCKS FOR INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL SYSTEMS –

Part 4: Rules for compliance profiles

FOREWORD

A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC-PAS 61499-4 has been processed by IEC technical committee 65, Industrial-process measurement and control.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document:

| Draft PAS | Report on voting |
|------------|------------------|
| 65/288/PAS | 65/293/RVD |

Following publication of this PAS, the technical committee or subcommittee concerned will investigate the possibility of transforming the PAS into an International Standard.

This is Part 4 of a projected four-part Standard under development by Working Group 6 of IEC Technical Committee 65. The projected Parts of the Standard are:

- Part 1 – Architecture
- Part 2 – Engineering task support
- Part 3 – Application guidelines
- Part 4 – Rules for compliance profiles

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FUNCTION BLOCKS FOR INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL SYSTEMS –

Part 4: Rules for compliance profiles

1 General provisions

1.1 Scope

This document defines rules for the development of *compliance profiles* which specify the features of IEC 61499-1 and IEC 61499-2 to be implemented in order to promote the following *attributes* of IEC 61499-based systems, devices and software tools:

- *interoperability* of devices from multiple suppliers;
- *portability* of software between software tools of multiple suppliers; and
- *configurability* of devices from multiple vendors by software tools of multiple suppliers.

These attributes are illustrated in Figure 1.

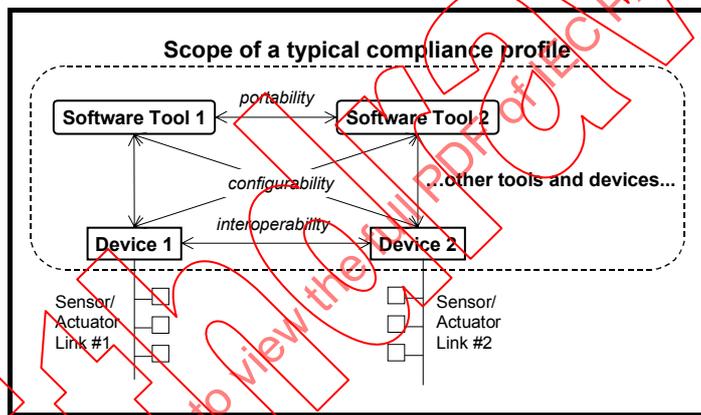


Figure 1 – Scope of a typical compliance profile

NOTE 1 The specification of provisions for the facilitation of device *interchangeability* is beyond the scope of this Part.

NOTE 2 The sensor/actuator links designated #1 and #2 in Figure 1 may be non-interoperable. However, it is intended that systems complying with a particular profile may show the transfer of *events* and *data* from sensors on one link to actuators on another link using appropriately configured and interconnected *service interface function blocks*.

NOTE 3 Compliance profiles may extend their scope beyond that shown in Figure 1 to include interoperability of sensors and actuators.

NOTE 4 Suppliers of *software tools* should assure that their products conform to the requirements of IEC 61499-2 as well as any specific requirements defined in compliance profiles applicable to their particular software tools.

1.2 Normative references

The following normative documents contain provisions and references to other normative documents which, through reference in this text, constitute provisions of this agreement. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to this agreement are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of the IEC and ISO maintain registers of currently valid International Standards.

IEC-PAS 61499-1, Edition 1.0, 2000-09, Publicly Available Specification – *Function blocks for industrial-process measurement and control systems – Part 1: Architecture*

IEC 65/260/PAS, Voting Draft, IEC 61499-2: *Function blocks for industrial-process measurement and control systems – Part 2: Software tools requirements*

ISO/IEC Directives, *Part 2 – Rules for the structure and drafting of International Standards*, 4th Edition, 2001

ISO/IEC 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*, December 1996

ISO/IEC TR 10000-1:1998, *Information technology – Framework and taxonomy of International Standardized Profiles – Part 1: General principles and documentation framework*

ISO/DIS 15745-1.6.00, *Industrial automation systems and integration – Open systems application integration frameworks – Part 1: Generic reference description*, 2000-11-02

1.3 Definitions

NOTE 1 Terms defined in this clause are *italicized* where they appear in the bodies of definitions.

NOTE 2 The ISO/AFNOR *Dictionary of computer science* and the *International Electrotechnical Vocabulary* should be consulted for terms not defined or referenced in this Part.

All definitions given in IEC 61499-1 and IEC 61499-2 apply to this Part. In addition, the following definitions apply for the purposes of this Part.

1.3.1

comply (to or with a specification)

to meet all the requirements (of a specification)

EXAMPLE A *compliance profile* developed according to the rules given in this Part is said to "comply with" or to be "compliant with" this Part.

1.3.2

compliance profile

a specification *complying* with the rules given in this Part

1.3.2

configurability (of a functional unit)

ability to be *configured*

EXAMPLE The *configurability* of a *device* can be expressed by the extent to which it *conforms* to the configurability requirements of a *compliance profile*.

1.3.3

conform (to or with a specification)

to satisfy some but not necessarily all of the requirements (of a specification)

EXAMPLE A *software tool* or a *device* developed meeting some but not necessarily all of the requirements of a *compliance profile* is said to "conform to" or to be "conformant with" that compliance profile.

1.3.4

interoperable

able to operate together to perform a specified set of *functions*

EXAMPLE Two *devices* may be considered *interoperable* if they are able to operate together to perform the *functions* specified in a *system configuration*.

1.3.5

interchangeable (with a functional unit)

able to be substituted for (a *functional unit*)

EXAMPLE A *device* may be considered *interchangeable* with another device if it can be substituted for the device in such a way that any distributed *applications* will continue to operate as before the substitution, including identical dynamic responses of any distributed *applications* involving the device.

1.3.6

portable (between software tools)

able to be accepted and correctly interpreted (by multiple software tools)

EXAMPLE A software library element is *portable* between two *software tools* if it can be accepted and correctly interpreted by both software tools.

2 Contents of compliance profiles

The contents of compliance profiles shall follow the general outline given in Table 1. Rules for the writing of specific clauses and subclauses of such profiles are given in the remainder of this Clause.

The title of a compliance profile shall have the form "IEC 61499 Compliance Profile for <yyy>", where <yyy> denotes the scope of applicability of the profile. The title page or a Foreword shall also denote the organization(s) or individual(s) responsible for the development and maintenance of the compliance profile.

Compliance profiles may define features not specified in IEC 61499-1 and IEC 61499-2. Such features shall be described as "extensions to IEC 61499-1" or "extensions to IEC 61499-2" and the compliance profile shall specify their *mapping* to the elements described in IEC 61499-1 or IEC 61499-2, respectively.

Table 1 – Contents of compliance profiles

| |
|---|
| 0. TITLE |
| 0.1 Foreword |
| 1. GENERAL PROVISIONS |
| 1.1. Scope |
| 1.2. Normative references |
| 1.3. Definitions |
| 2. PORTABILITY PROVISIONS |
| 3. INTEROPERABILITY PROVISIONS |
| 3.1 Physical layer |
| 3.2 Data link layer |
| 3.3 Network, Transport and Session layers |
| 3.4 Presentation layer |
| 3.5 Application layer |
| 4. CONFIGURABILITY PROVISIONS |
| 4.1 Software tools |
| 4.2 Device management services |
| 4.3 Devices |

2.1 General provisions

This subclause provides rules for the composition of the subclauses of Clause 1 of a compliance profile.

2.1.1 Scope

Subclause 1.1 of a compliance profile shall address the following subjects:

1. the kinds of *applications* addressed by the compliance profile;
2. the functional scope addressed by the compliance profile. This may be addressed by a suitably edited version of Figure 1 of this Part accompanied by appropriate text;
3. any additional requirements or restrictions beyond those of IEC 61499-1 and IEC 61499-2 which must be met within the scope of the compliance profile;
4. any requirements of IEC 61499-1 and IEC 61499-2 which need not be met within the scope of the compliance profile;
5. provisions of the compliance profile which contradict the normative requirements of IEC 61499-1 and IEC 61499-2, and the technical reasons for such contradiction.

In the case that any elements of type 5 above exist, the IEC Central Office shall be notified of the possible necessity to change the corresponding normative requirements of IEC 61499.

NOTE Writers of compliance profiles should ascertain that they are referring to the current version of IEC 61499-1, since it is anticipated that its normative requirements may be relaxed in editions following the version of September 2000.

2.1.2 Normative references

Subclause 1.2 of a compliance profile shall follow the rules for presentation of normative references given in subclause 6.2.2 of Part 2 of the ISO/IEC Directives.

2.1.3 Definitions

Subclause 1.3 of a compliance profile shall follow the rules for presentation of definitions given in subclause 6.3.1 of Part 2 of the ISO/IEC Directives.

2.2 Portability provisions

Clause 2 of a compliance profile shall contain the following information:

- The extent to which conforming *software tools* shall be capable of producing library elements in the syntax and with the semantics defined in Annexes A and B of IEC 61499-2.
- The extent to which conforming software tools shall be capable of correctly parsing and interpreting library elements in the syntax and with the semantics defined in Annexes A and B of IEC 61499-2.
- The format of filenames (if any) to be used for the exchange of library elements, for instance `<LibraryElementName>.xml`.

2.3 Interoperability provisions

Clause 3 of a compliance profile shall specify the means (if any) to be used to meet the requirements for communication among entities within the functional scope of the compliance profile, in terms of the **semantics** of the event and data inputs and outputs of *communication function blocks* defined IEC 61499-1, subclause 3.2.

NOTE The **syntax** of the event and data inputs and outputs of communication function blocks may, but are not required to, be used to meet the requirements of this subclause.

2.4 Configurability provisions

Clause 3 of a compliance profile shall specify the means (if any) to be implemented by *devices* and *software tools* to achieve *configurability* of the latter by the former. This may include the definition of one or more configurability classes for devices.

NOTE An example of the definition of three configurability classes is shown in Annex B.

2.5 ANNEXES

A compliance profile may contain normative or informative annexes. A normative annex contains provisions which must be satisfied by conformant implementations, while an informative annex shall not contain such provisions. The normative or informative nature of each Annex shall be made clear by the way in which it is referred to in the text, by a statement to this effect in a foreword to the compliance profile, and by an indication in the profile's table of contents and under the heading of the annex.

ANNEX A (informative) – EXAMPLE COMPLIANCE PROFILE

An example document used to guide and record the results of an IEC 61499 feasibility demonstration project undertaken by the Holonic Manufacturing Systems (HMS) Consortium is available online at <http://www.holobloc.com/doc/ita/index.htm>. To save space, this document is not included here. Since this project is still in progress, the cited website should be consulted for current information. Notices of updates to the referenced document will be posted at <http://www.holobloc.com/>.

ANNEX B (informative) – EXAMPLE DEVICE CONFIGURABILITY CLASSES

NOTE This Annex is copied from and is intended to replace subclause 5.2 of IEC 61499-1.

Types and instances of devices conforming with this specification shall be specified according to the rules given in Clause 3 of IEC 61499-1.

Devices conforming to this specification shall be characterized as belonging to one of three configurability classes, namely:

- Class 0: Simple devices
- Class 1: Simple programmable devices
- Class 2: User-reprogrammable devices

Configurability is specified in terms of the management commands to which each type of device can respond, as given in Table B.1.

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Table B.1 – Device configurability classes (informative)

| CMD ^a | OBJECT | CLASS 0 | CLASS 1 | CLASS 2 |
|--|-------------------------|-----------------------|-----------------------|-----------------------|
| CREATE | type_declaration | | | Required |
| | fb_type_declaration | | | Required |
| | fb_instance_definition | | Required | Required |
| | connection_definition | Required ^b | Required | Required |
| | access_path_declaration | | Required ^c | Required ^c |
| DELETE | data_type_name | | | Required |
| | fb_type_name | | | Required |
| | fb_instance_reference | | Required | Required |
| | connection_definition | | Required | Required |
| | access_path_name | | Required ^c | Required ^c |
| START | fb_instance_reference | Required | Required | Required |
| | application_name | Required | Required | Required |
| STOP | fb_instance_reference | Required | Required | Required |
| | application_name | Required | Required | Required |
| KILL | fb_instance_reference | | Required | Required |
| QUERY | all_data_types | Required | Required | Required |
| | all_fb_types | Required | Required | Required |
| | data_type_name | | | Required |
| | fb_type_name | | | Required |
| | fb_instance_reference | | Required | Required |
| | connection_start_point | | Required | Required |
| | application_name | | Required | Required |
| | access_path_name | | Required ^c | Required ^c |
| READ | access_path_name | Required ^c | Required ^c | Required ^c |
| WRITE | access_path_data | Required ^c | Required ^c | Required ^c |
| ^a See 3.3.2 for definition of the semantics of these commands ^b Only connection of a new <i>parameter</i> value to a <i>data input</i> of a function block is required of Class 0 devices. ^c This capability is required only in devices that support <i>access paths</i> . | | | | |