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Function blocks Part 1: Architecture

Function blocks Part 1: Architecture

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61499-1:2005 sisaldab Euroopa standardi EN 61499-1:2005 ingliskeelset teksti. Käesolev dokument on jõustatud 27.09.2005 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN 61499-1:2005 consists of the English text of the European standard EN 61499-1:2005. This document is endorsed on 27.09.2005 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: defines a generic architecture and presents guidelines for the use of function blocks in distributed Industrial-Process Measurement and Control Systems (IPMCSs). This architecture is presented in terms of implementable reference models, textual syntax and graphical representations.	**Scope:** defines a generic architecture and presents guidelines for the use of function blocks in distributed Industrial-Process Measurement and Control Systems (IPMCSs). This architecture is presented in terms of implementable reference models, textual syntax and graphical representations.

ICS 25.040.40, 35.240.50

Võtmesõnad:

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Standardite reprodutseerimis- ja levitamisõigus kuulub Eesti Standardikeskusele

EUROPEAN STANDARD **EN 61499-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM August 2005

ICS 25.040.40; 35.240.50

English version

Function blocks
Part 1: Architecture
(IEC 61499-1:2005)

Blocs fonctionnels
Partie 1: Architecture
(CEI 61499-1:2005)

Funktionsbausteine für industrielle Leitsysteme
Teil 1: Architektur
(IEC 61499-1:2005)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Ref. No. EN 61499-1:2005 E

Foreword

The text of the International Standard IEC 61499-1:2005, prepared by IEC TC 65, Industrial-process measurement and control, was submitted to the formal vote and was approved by CENELEC as EN 61499-1 on 2005-06-01 without any modification.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2006-06-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2008-06-01

Annex ZA has been added by CENELEC.

_____

Endorsement notice

The text of the International Standard IEC 61499-1:2005 was approved by CENELEC as a European Standard without any modification.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE Where an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60050-351	1998	International Electrotechnical Vocabulary Part 351: Automatic control	-	-
IEC 61131-3	2003	Programmable controllers Part 3: Programming languages	EN 61131-3	2003
ISO/IEC 7498-1	1994	Information technology - Open systems interconnection - Basic reference model Part 1: The basic model	EN ISO/IEC 7498-1	1995
ISO/IEC 8824-1	2000	Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation	-	-
ISO/IEC 8825-1	2000	Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)	-	-
ISO/IEC 10646	2003	Information technology - Universal multiple-octet coded character set (UCS)	-	-
ISO/IEC 10731	1994	Information technology - Open Systems Interconnection Basic reference model - Conventions for the definition of OSI services	-	-
ISO/AFNOR ISBN 2-12-4869111-6	1989	Dictionary of computer science - The standardised vocabulary	-	-

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INTERNATIONAL STANDARD

IEC 61499-1

First edition
2005-01

Function blocks –

Part 1: Architecture

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Reference number
IEC 61499-1:2005(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

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INTERNATIONAL STANDARD

IEC 61499-1

First edition
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Function blocks –

Part 1: Architecture

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International Electrotechnical Commission
Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FUNCTION BLOCKS –

Part 1: Architecture

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FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61499-1 has been prepared by IEC technical committee 65: Industrial-process measurement and control.

This standard cancels and replaces IEC/PAS 61499-1 published in 2000. This first edition constitutes a technical revision.

The following major technical changes have occurred between the PAS edition and this edition:

a) Syntax for network segments, links and parameters has been added in Clause B.3 to correspond to the system model of 4.1.
b) Syntax for parameters instead of constant data connections has been included for parameterization of function blocks, devices and resources in Clauses B.2 and B.3 for better consistency with IEC 61131-3.
c) The execution control model of 5.2.2.2 has been simplified and updated for consistency with modern models of state machine control.

The text of this standard is based on the following documents:

CDV	Report on voting
65/338/CDV	65/346/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 61499 consists of the following parts, under the general title *Function blocks:*

Part 1: Architecture

Part 2: Software tool requirements

Part 3: Tutorial information

Part 4: Rules for compliance profiles [1]

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this standard may be issued at a later date.

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[1] Under consideration.

INTRODUCTION

The IEC 61499 series consists of four Parts:

d) Part 1 (this part of IEC 61499) contains:
   - general requirements, including scope, normative references, definitions, and reference models;
   - rules for the declaration of *function block types*, and rules for the behavior of *instances* of the types so declared;
   - rules for the use of function blocks in the *configuration* of distributed Industrial-Process Measurement and Control *Systems* (IPMCSs);
   - rules for the use of function blocks in meeting the communication requirements of distributed IPMCSs;
   - rules for the use of function blocks in the management of *applications, resources* and *devices* in distributed IPMCSs.

e) Part 2 defines requirements for *software tools* to support the following systems engineering tasks enumerated in Clause 1 of this part of IEC 61499:
   - the specification of function block types;
   - the functional specification of resource types and device types;
   - the specification, analysis, and validation of distributed IPMCSs;
   - the *configuration*, *implementation*, operation, and maintenance of distributed IPMCSs;
   - the exchange of *information* among *software tools*.

f) Part 3 has the purpose of increasing the understanding, acceptance, and both generic and domain-specific applicability of IPMCS architectures and software tools meeting the requirements of the other Parts, by providing:
   - answers to Frequently Asked Questions (FAQs) regarding the IEC 61499 series;
   - examples of the use of IEC 61499 constructs to solve frequently encountered problems in control and automation engineering.

g) Part 4 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.

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FUNCTION BLOCKS –

Part 1: Architecture

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1 Scope

This part of IEC 61499 defines a generic architecture and presents guidelines for the use of *function blocks* in distributed Industrial-Process Measurement and Control Systems (IPMCSs). This architecture is presented in terms of implementable reference *models*, textual syntax and graphical representations. These models, representations and syntax can be used for:

- the specification and standardization of *function block types*;
- the functional specification and standardization of system elements;
- the implementation independent specification, analysis, and validation of distributed IPMCSs;
- the *configuration*, *implementation*, operation, and maintenance of distributed IPMCSs;
- the exchange of *information* among *software tools* for the performance of the above *functions*.

NOTE 1 This part of IEC 61499 does not restrict or specify the functional capabilities of IPMCSs or their system elements, except as such capabilities are represented using the elements defined herein. IEC 61499-4 addresses the extent to which the elements defined in this part of IEC 61499 may be restricted by the functional capabilities of compliant systems, subsystems, and devices.

Part of the purpose of this part of IEC 61499 is to provide reference models for the use of function blocks in other standards dealing with the support of the system life cycle, including system planning, design, implementation, validation, operation and maintenance. The models given in this part of IEC 61499 are intended to be generic, domain independent and extensible to the definition and use of function blocks in other standards or for particular applications or application domains. It is intended that specifications written according to the rules given in this part of IEC 61499 be concise, implementable, complete, unambiguous, and consistent.

NOTE 2 The provisions of this part of IEC 61499 alone are not sufficient to ensure interoperability among devices of different vendors. Standards complying with this part of IEC 61499 may specify additional provisions to ensure such interoperability.

NOTE 3 Standards complying with this part of IEC 61499 may specify additional provisions to enable the performance of *system*, *device*, *resource* and *application* management *functions*.

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.

IEC 60050-351:1998, *International Electrotechnical Vocabulary (IEV) – Part 351: Automatic Control*

IEC 61131-3:2003, *Programmable controllers – Part 3: Programming languages*

ISO/IEC 7498-1:1994, *Information Technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

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

ISO/IEC 8825-1, *Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ISO/IEC 10646, *Information technology - Universal Multiple-Octet Coded Character Set (UCS)*

ISO/IEC 10731, *Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services*

ISO/AFNOR, *Dictionary of Computer Science*, 1989, ISBN 2-12-4869111-6

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the ISO/AFNOR *Dictionary of computer science*, as well as the following apply.

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

3.1
acceptor
function block instance which provides a *socket adapter* of a defined *adapter interface type*

3.2
access path
association of a symbolic name with a *variable* for the purpose of open communication

3.3
adapter connection
connection from a *plug adapter* to a *socket adapter* of the same *adapter interface type*, which carries the flows of *data* and *events* defined by the adapter interface type

3.4
adapter interface type
type which consists of the definition of a set of *event inputs, event outputs, data inputs*, and *data outputs*, and whose *instances* are *plug adapters* and *socket adapters*

3.5
algorithm
finite set of well-defined rules for the solution of a problem in a finite number of *operations*

3.6
application
software functional unit that is specific to the solution of a problem in industrial-process measurement and control

NOTE An application may be distributed among *resources*, and may communicate with other applications.

3.7
attribute
property or characteristic of an *entity*, for instance, the version identifier of a *function block type* specification

3.8
basic function block type
function block type that cannot be decomposed into other function blocks and that utilizes an *execution control chart (ECC)* to control the *execution* of its *algorithms*

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