



SLOVENSKI STANDARD SIST EN 62424:2017

01-maj-2017

Nadomešča:
SIST EN 62424:2009

Predstavitev tehnike nadzora procesov - Zahteve pri diagramih P&I in za izmenjavo podatkov med orodji P&ID ter PCE-CAE (IEC 62424:2016)

Representation of process control engineering - Request in P&I diagrams and data exchange between P&ID tools and PCE-CAE tools (IEC 62424:2016)

Darstellung von Aufgaben der Prozessleittechnik - Fließbilder und Datenaustausch zwischen EDV-Werkzeugen zur Fließbilderstellung und CAE-Systemen (IEC 62424:2016)

Représentation de l'ingénierie de commande de processus - Demandes sous forme de diagrammes P&I et échange de données entre outils P&ID et outils PCE-CAE (IEC 62424:2016)

Ta slovenski standard je istoveten z: EN 62424:2016

ICS:

25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control
35.240.50	Uporabniške rešitve IT v industriji	IT applications in industry

SIST EN 62424:2017

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 62424:2017

<https://standards.iteh.ai/catalog/standards/sist/1a2be1c7-1855-46f7-a3ba-8296e46c9900/sist-en-62424-2017>

EUROPEAN STANDARD

EN 62424

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2016

ICS 25.040.40; 35.240.50

Supersedes EN 62424:2009

English Version

Representation of process control engineering -
Requests in P&I diagrams and data exchange
between P&ID tools and PCE-CAE tools
(IEC 62424:2016)

Représentation de l'ingénierie de commande de processus -
Demandes sous forme de diagrammes P&I et échange de
données entre outils P&ID et outils PCE-CAE
(IEC 62424:2016)

Darstellung von Aufgaben der Prozessleittechnik -
Fließbilder und Datenaustausch zwischen EDV-Werkzeugen
zur Fließbilderstellung und CAE-Systemen
(IEC 62424:2016)

This European Standard was approved by CENELEC on 2016-08-19. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

[https://standards.iteh.ai/catalog/standards/sist/1a2be1c7-1855-46f7-a3ba-](https://standards.iteh.ai/catalog/standards/sist/1a2be1c7-1855-46f7-a3ba-8296e46c9900/sist-en-62424-2017)

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 65/544/CDV, future edition 2 of IEC 62424, prepared by IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62424:2016.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-05-19
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2019-08-19

This document supersedes EN 62424:2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Endorsement notice

[SIST EN 62424:2017](https://standards.iteh.ai/catalog/standards/sist/1a2be1c7-1855-46f7-a3ba-8296e46c9900/sist-en-62424-2017)

<https://standards.iteh.ai/catalog/standards/sist/1a2be1c7-1855-46f7-a3ba-8296e46c9900/sist-en-62424-2017>

The text of the International Standard IEC 62424:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60848	NOTE	Harmonized as EN 60848.
IEC 61512-1	NOTE	Harmonized as EN 61512-1.
IEC 61987-1	NOTE	Harmonized as EN 61987-1.
ISO 10628-1	NOTE	Harmonized as EN ISO 10628-1.
ISO 10628-2	NOTE	Harmonized as EN ISO 10628-2.
ISO 13628-6	NOTE	Harmonized as EN ISO 13628-6.
ISO 13703	NOTE	Harmonized as EN ISO 13703.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61511-1	-	Functional safety - Safety instrumented systems for the process industry sector - Part 1: Framework, definitions, system hardware and application programming requirements	EN 61511-1	-
IEC 81346-1	2009	Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations - Part 1: Basic rules	EN 81346-1	2009
ISO 13849-1	-	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design	EN ISO 13849-1	-
W3C XML 1.0	2004	Extensible Markup Language (XML) 1.0	-	-

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 62424:2017

<https://standards.iteh.ai/catalog/standards/sist/1a2be1c7-1855-46f7-a3ba-8296e46c9900/sist-en-62424-2017>



IEC 62424

Edition 2.0 2016-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Representation of process control engineering – Requests in P&I diagrams and data exchange between P&ID tools and PCE-CAE tools

Représentation de l'ingénierie de commande de processus – Demandes sous forme de diagrammes P&I et échange de données entre outils P&ID et outils PCE-CAE

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 25.040.40; 35.240.50

ISBN 978-2-8322-3477-8

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	12
2 Normative references.....	12
3 Terms and definitions	12
4 Abbreviations	17
5 Conformity.....	18
6 Representation of PCE requests in a P&ID.....	19
6.1 PCE request and PCE loop	19
6.2 Objectives and principles.....	20
6.3 Requirements for the reference designation and representation of PCE requests.....	20
6.3.1 General	20
6.3.2 Types of lines	21
6.3.3 Displaying the location of the operator interface.....	21
6.3.4 PCE categories and processing functions	22
6.3.5 PCE request reference designation system.....	25
6.3.6 PU-vendor and typical identification.....	26
6.3.7 Device information.....	26
6.3.8 Alarming, switching and indicating.....	27
6.3.9 Safety-relevant, GMP and quality-relevant PCE requests.....	27
6.3.10 PCE control functions.....	28
7 Neutral data exchange of PCE relevant P&ID information	29
7.1 Objectives.....	29
7.2 Meaning of P&ID elements	29
7.3 PCE relevant information of P&ID tools.....	30
7.4 Formal description of PCE relevant information of P&ID tools.....	31
7.4.1 General object model of a plant hierarchy.....	31
7.4.2 General object model of a PCE request.....	31
7.5 Modeling PCE relevant information using the CAEX system description language.....	32
7.5.1 Overview	32
7.5.2 Basic CAEX mappings	33
7.5.3 Standard CAEX library of PCE request related attributes	34
7.5.4 Mapping of indirect links between PCE requests of different plant sections.....	35
7.5.5 CAEX description of direct links between PCE requests of different plant sections.....	38
7.5.6 PCE loops.....	40
8 Additional PCE attributes	40
Annex A (normative) CAEX – Data model for machine information exchange	42
A.1 CAEX and its diagram conventions	42
A.2 General CAEX concepts.....	43
A.2.1 General CAEX terms.....	43
A.2.2 General CAEX concept description	46
A.2.3 Data definition of SystemUnitClass.....	50

A.2.4	Definition of attributes	52
A.2.5	Data definition of an AttributeType	54
A.2.6	Data definition of InterfaceClass	56
A.2.7	Data definition of RoleClass	59
A.2.8	Modelling of relations	60
A.2.9	Usage of paths	68
A.2.10	CAEX role concept	69
A.2.11	Use of the CAEX MappingObject	74
A.2.12	References to external CAEX files	76
A.3	CAEX schema definition	78
A.3.1	General	78
A.3.2	Element CAEXFile	79
A.3.3	CAEXFile/SuperiorStandardVersion	81
A.3.4	CAEXFile/ SourceDocumentInformation	81
A.3.5	CAEXFile/ExternalReference	82
A.3.6	CAEXFile/InstanceHierarchy	83
A.3.7	CAEXFile/InstanceHierarchy/InternalElement	84
A.3.8	CAEXFile/InterfaceClassLib	85
A.3.9	CAEXFile/InterfaceClass	86
A.3.10	CAEXFile/RoleClassLib	87
A.3.11	CAEXFile/RoleClass	88
A.3.12	CAEXFile/SystemUnitClassLib	89
A.3.13	CAEXFile/SystemUnitClass	90
A.3.14	CAEXFile/AttributeTypeLib	91
A.3.15	Group Header	93
A.3.16	CAEX complex type AttributeFamilyType	98
A.3.17	CAEX complex type AttributeFamilyType/AttributeType	99
A.3.18	CAEX complex type AttributeType	100
A.3.19	CAEX complex type CAEXBasicObject	108
A.3.20	CAEX complex type CAEXObject	109
A.3.21	CAEX complex type InterfaceClassType	110
A.3.22	CAEX complex type InterfaceFamilyType	113
A.3.23	CAEX complex type InternalElementType	115
A.3.24	CAEX complex type RoleClassType	123
A.3.25	CAEX complex type RoleFamilyType	125
A.3.26	CAEX complex type SourceDocumentInformationType	128
A.3.27	CAEX complex type SystemUnitClassType	129
A.3.28	CAEX complex type SystemUnitFamilyType	136
A.3.29	CAEX simpleType ChangeMode	138
Annex B (informative)	Examples of PCE requests	139
Annex C (normative)	Full XML schema of the CAEX model	149
Annex D (informative)	CAEX modelling examples	155
D.1	CAEX Attribute Type Library definition for additional attributes	155
D.2	Example of CAEX InterfaceLib definition	156
D.3	Example of a CAEX RoleLib definition	157
D.4	Example CAEX definition of PCE relevant P&ID information	158
Annex E (informative)	List of major changes and extensions of the second edition	163
Bibliography	166

Figure 1 – Information flow between P&ID and PCE tool.....	11
Figure 2 – Organization of PCE requests.....	20
Figure 3 – General representation of a PCE-Request in a P&ID	21
Figure 4 – Multi-sensing element.....	21
Figure 5 – Local interface	22
Figure 6 – Manually operated switch in local control panel.....	22
Figure 7 – Pressure indication in central control room by a central control system	22
Figure 8 – Example of PCE request reference designation.....	26
Figure 9 – Example of flow measurement with indication in the CCR delivered by vendor A specified by typical identification A20.....	26
Figure 10 – Example of pH-measurement with indication in the CCR.....	26
Figure 11 – Example of flow measurement with indication in the CCR and high and low alarm.....	27
Figure 12 – Flow measurement with indication in the CCR and high alarm and a high-high switching function.....	27
Figure 13 – Flow measurement with indication in the CCR and a high-high switch limit, a high alarm, a low alarm and a low-low switch limit for a safety function	27
Figure 14 – GMP relevant, safety relevant and quality relevant flow measurement with indication in the CCR.....	28
Figure 15 – Control function.....	28
Figure 16 – Safety relevant control function.....	29
Figure 17 – P&ID elements and associations (PCE relevant items are shown in dark lines).....	30
Figure 18 – Process data model (PCE relevant items are shown in dark lines)	31
Figure 19 – PCE request data model.....	32
Figure 20 – CAEX data model of major PCE request related attributes.....	35
Figure 21 – XML code of the attribute type library.....	35
Figure 22 – Example of two plant sections and a signal connection via external interfaces	36
Figure 23 – Simplified CAEX model of indirect links between PCE requests across different plant hierarchy items	37
Figure 24 – Simplified CAEX model of indirect links between PCE requests across different plant hierarchy items	38
Figure 25 – Example of two plant sections and a direct connection	39
Figure 26 – Simplified CAEX model of direct links between PCE requests across different sections of a plant.....	39
Figure 27 – XML code of the simplified CAEX model.....	40
Figure A.1 – XML text of the CAEX source document information.....	49
Figure A.2 – CAEX architecture of a SystemUnitClass	51
Figure A.3 – Example of a SystemUnitClassLib	51
Figure A.4 – XML code of the example of a SystemUnitClassLib	52
Figure A.5 – Examples of attributes.....	53
Figure A.6 – XML code of the example	54
Figure A.7 – Example of an AttributeTypeLib and its application in an instance hierarchy	55

Figure A.8 – XML code of the AttributeTypeLib example	55
Figure A.9 – Example of an InterfaceClassLib	56
Figure A.10 – XML code of the example of an InterfaceClassLib	57
Figure A.11 – Second example of an InterfaceClassLib and the usage of nested interfaces	57
Figure A.12 – XML code of the second example	58
Figure A.13 – Usage of Links	59
Figure A.14 – XML code for the usage of links.....	59
Figure A.15 – Example of a RoleClassLib	60
Figure A.16 – Relations in CAEX.....	61
Figure A.17 – XML description of the relations example	62
Figure A.18 – XML text of the InstanceHierarchy of the relations example.....	62
Figure A.19 – XML text of the SystemUnitClassLib of the relations example	62
Figure A.20 – Example of a parent-child-relation between CAEX InternalElements	63
Figure A.21 – Example for a hierarchical plant structure	63
Figure A.22 – Example of a parent-child relation between classes	64
Figure A.23 – Multiple crossed structures	67
Figure A.24 – Example for mirror attributes and restructured mirror objects.....	67
Figure A.25 – CAEX role concept	70
Figure A.26 – CAEX data definition for use case 1.....	70
Figure A.27 – CAEX data definition for use case 2.....	71
Figure A.28 – CAEX data definition for use case 3.....	71
Figure A.29 – XML code for use case 3.....	72
Figure A.30 – Multiple role support.....	73
Figure A.31 – XML code of the multiple role support example	74
Figure A.32 – CAEX data definition of a MappingObject.....	75
Figure A.33 – XML code for the data definition of a MappingObject.....	76
Figure A.34 – Distribution of data in several CAEX files	77
Figure A.35 – Referencing of external CAEX files	77
Figure A.36 – XML code for referencing of external CAEX files	77
Figure A.37 – Example of how to use alias names	78
Figure A.38 – XML code for the alias example	78
Figure B.1 – Local level indication, 1 process connection.....	139
Figure B.2 – Local level indication, 2 process connections	139
Figure B.3 – Local flow indication	139
Figure B.4 – Local pressure indication.....	139
Figure B.5 – Local temperature indication.....	139
Figure B.6 – Local control panel, pressure indication, high alarm	140
Figure B.7 – Local temperature indication, CCR temperature high alarm	140
Figure B.8 – Local pressure indication, CCR pressure high alarm and switch	140
Figure B.9 – CCR flow indication, device information: Orifice Plate	140
Figure B.10 – CCR pressure indication, low, low low and high alarm.....	140
Figure B.11 – CCR temperature indication and registration	141

Figure B.12 – CCR level indication and registration, 1 process connection	141
Figure B.13 – CCR level indication, 2 process connections	141
Figure B.14 – Two flow indications and flow ratio control in CCR	141
Figure B.15 – CCR flow indication and high alarm, flow control, control valve with extra interlock and open/close indication	142
Figure B.16 – Local pressure indication, CCR pressure indication, high alarm and high high safety relevant switch; representation of transmitters with integrated local display (if not otherwise defined in a specification of the field device)	142
Figure B.17 – Local pressure indication, CCR pressure indication, alarms and switches	142
Figure B.18 – CCR pressure indication, high and low alarm, safety relevant switch action on on/off valve	143
Figure B.19 – Switched valve with on/off indication and switching action, safety relevant switched valve	143
Figure B.20 – Pressure restriction	143
Figure B.21 – Flow restriction	143
Figure B.22 – PT compensated flow control, safety-relevant pressure switch (two out of three (2oo3) shutdown), switched control valve with on/off indication and switching action at open position	144
Figure B.23 – CCR temperature control, additional manual switch actions from CCR with indication and local control panel	144
Figure B.24 – Motor typical, local on/off control, CCR off control, current, fault with alarm and running indication	145
Figure B.25 – Multivariable controller	145
Figure B.26 – On/off valve with position indication	146
Figure B.27 – On/off valve with safety relevant switch and position indication	146
Figure B.28 – Level control with continuous controller	146
Figure B.29 – Level control with on/off switch	146
Figure B.30 – Cascade control for temperature as control input, flow control as follow-up controller	147
Figure B.31 – Safety directed high control to a subsequent valve, manual control for reset function and manual control for manual/automatic switch of the valve, valve with open/close indication and safety-relevant switch to subsequent valve	147
Figure B.32 – Flow control in CCR	147
Figure B.33 – Temperature control with high alarm and high switch	148
Figure B.34 – Manual control from CCR	148
Figure B.35 – Flow measurement with display and alarms in CCR, high high switch on process control function and switch on/off valve	148
Figure B.36 – Local P-/F-/T-/S- control without auxiliary power (stand-alone)	148
Figure C.1 – Full XML text of the CAEX Schema file “CAEX_ClassModel_V.3.0.xsd”	154
Figure D.1 – Attribute type library with additional PCE request related attributes	155
Figure D.2 – XML code of the Attribute type library	156
Figure D.3 – Example of CAEX interface library	156
Figure D.4 – XML code of the example CAEX interface library	156
Figure D.5 – Example CAEX role library illustrating the modeling of a PCE request role referencing PCE request related attributes	157
Figure D.6 – XML code for the example CAEX role library	158
Figure D.7 – Example P&ID data to be mapped with CAEX	159

Figure D.8 – CAEX model of the example described in Figure D.7	160
Figure D.9 – XML code of the example described in Figure D.7	162
Table 1 – Abbreviations	17
Table 2 – PCE categories	23
Table 3 – PCE processing function.....	24
Table 4 – Sequence combinations.....	25
Table 5 – PCE processing functions for final controlling equipments	25
Table 6 – P&ID attributes relevant in PCE environment.....	41
Table 7 – Data handling attributes.....	41
Table A.1 – XML notation conventions.....	42
Table A.2 – CAEX data types and elements.....	43

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[SIST EN 62424:2017](https://standards.iteh.ai/catalog/standards/sist/1a2be1c7-1855-46f7-a3ba-8296e46c9900/sist-en-62424-2017)

<https://standards.iteh.ai/catalog/standards/sist/1a2be1c7-1855-46f7-a3ba-8296e46c9900/sist-en-62424-2017>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**REPRESENTATION OF PROCESS CONTROL ENGINEERING –
REQUESTS IN P&I DIAGRAMS AND DATA EXCHANGE
BETWEEN P&ID TOOLS AND PCE-CAE TOOLS**

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 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 62424 has been prepared by IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2008. This edition constitutes a technical revision.

This second edition is a compatible extension of the first edition. The main changes and extensions are detailed in Annex E and are summarized below:

- a) updated definitions and new definitions;
- b) identification replaced with reference designation;
- c) updated PCE categories and process functions;
- d) CAEX version 3.0, introduction of:
 - native multiple role support;

- nested interfaces;
 - life cycle meta information;
 - a separate Attribute library;
 - updated examples;
- e) updated electronic data model of the PCE request:
- new normative attribute library for basic PCE request attributes;
 - new informative extended attribute library for further PCE request attributes;
 - new informative electronic data model for the PCE request.

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

CDV	Report on voting
65/544/CDV	65/560B/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.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.