SVENSK STANDARD SS-EN IEC 62714-1

Fastställd	Utgåva	Sida	Ansvarig kommitté
2018-09-12	2	1 (1+83)	SEK TK 65

Dataformat för utbyte av konfigurationsdata för industriella automationssystem (AutomationML) – Del 1: Arkitektur och allmänna fordringar

Engineering data exchange format for use in industrial automation systems engineering – Automation markup language – Part 1: Architecture and general requirements

Som svensk standard gäller europastandarden EN IEC 62714-1:2018. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 62714-1:2018.

Nationellt förord

Europastandarden EN IEC 62714-1:2018

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC
– **IEC 62714-1, Second edition, 2018 - Engineering data exchange format for use in industrial automation systems engineering - Automation markup language - Part 1: Architecture and general requirements**

utarbetad inom International Electrotechnical Commission, IEC.

EN från CENELEC som är identiska med motsvarande IEC-standarder och som görs tillgängliga för nationalkommittéerna efter den 1 januari 2018 får en beteckning som inleds med EN IEC istället för som tidigare bara EN.

Tidigare fastställd svensk standard SS-EN 62714-1, utgåva 1, 2015, gäller ej f r o m 2021-06-04.

ICS 25.040.40; 35.060.00; 35.240.50

Denna standard är fastställd av SEK Svensk Elstandard,
som också kan lämna upplysningar om **sakinnehållet** i standarden.
Postadress: Box 1284, 164 29 KISTA
Telefon: 08 - 444 14 00.
E-post: sek@elstandard.se. Internet: www.elstandard.se

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard
Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 62714-1

June 2018

ICS 25.040.40; 35.060; 35.240.50

Supersedes EN 62714-1:2014

English Version

Engineering data exchange format for use in industrial automation systems engineering - Automation markup language - Part 1: Architecture and general requirements (IEC 62714-1:2018)

Format d'échange de données techniques pour une utilisation dans l'ingénierie des systèmes d'automatisation industrielle - Automation markup language - Partie 1: Architecture et exigences générales (IEC 62714-1:2018)

Datenaustauschformat für Planungsdaten industrieller Automatisierungssysteme - Automation markup language - Teil 1: Architektur und allgemeine Festlegungen (IEC 62714-1:2018)

This European Standard was approved by CENELEC on 2018-06-04. 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.

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, Serbia, 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: Rue de la Science 23, B-1040 Brussels

Ref. No. EN IEC 62714-1:2018 E

European foreword

The text of document 65E/582/FDIS, future edition 2 of IEC 62714-1, prepared by SC 65E "Devices and integration in enterprise systems" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62714-1:2018.

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)	2019-03-04
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2021-06-04

This document supersedes EN 62714-1:2014.

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

Endorsement notice

The text of the International Standard IEC 62714-1:2018 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 60027 Series	NOTE	Harmonized as EN 60027 Series.
IEC 62264-1	NOTE	Harmonized as EN 62264-1.
IEC 62714-2	NOTE	Harmonized as EN 62714-2.
IEC 62714-3	NOTE	Harmonized as EN 62714-3.
ISO 80000-1	NOTE	Harmonized as EN ISO 80000-1.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1 Where 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.

Publication	Year	Title	EN/HD	Year
IEC 62424	2016	Representation of process control engineering - Requests in P&I diagrams and data exchange between P&ID tools and PCE-CAE tools	EN 62424	2016
IEC 62714	Series	Engineering data exchange format for use in industrial automation systems engineering - Automation markup language	EN 62714	Series
ISO/PAS 17506	-	Industrial automation systems and integration - COLLADA digital asset schema specification for 3D visualization of industrial data	-	-
ISO/IEC 29500-2	-	Information technology - Document description and processing languages - Office Open XML File Formats - Part 2: Open Packaging Conventions	-	-
IETF RFC 2046	-	Multipurpose Internet Mail Extensions (MIME) - Part Two: Media Types [viewed 2017-11-13]. Available at <http://www.ietf.org>	-	-
IETF RFC 4122	-	A Universally Unique IDentifier (UUID) URN Namespace [viewed 2017-11-13]. Available at <http://www.ietf.org>	-	-
IETF RFC 5646	-	Tags for Identifying Languages [viewed 2017-11-13]. Available at <http://www.ietf.org>	-	-

COLLADA 1.4.1:March 2008, COLLADA – Digital Asset Schema Release 1.4.1 [viewed 2017-11-13]. Available at <http://www.khronos.org/files/collada_spec_1_4.pdf>

PLCopen XML 2.0:December 3rd 2008 and PLCopen XML 2.0.1:May 8th 2009, XML formats for IEC 61131-3 [viewed 2017-11-13]. Available at <http://www.plcopen.org>

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ENGINEERING DATA EXCHANGE FORMAT FOR USE IN INDUSTRIAL AUTOMATION SYSTEMS ENGINEERING – AUTOMATION MARKUP LANGUAGE –

Part 1: Architecture and general requirements

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 62714-1 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) use of CAEX 3.0 according to IEC 62424:2016 which provides technical improvements as attribute libraries, nested interfaces, new fields for indicating the source of an object, a refinement of the mirror concept and native support of multiple roles, native meta information about the CAEX file source tool, identification of instances via unique IDs instead of pathes, etc.,

b) improved modelling of references to documents outside of the scope of the present standard,

c) modelling of references between CAEX attributes and items in external documents, e.g. within an Excel sheet,

d) revised role libraries,

e) modified Port concept,

f) modelling of multilingual expressions,

g) modelling of structured attribute lists or array,

h) a new AML container format,

i) a new standard AML attribute library.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
65E/582/FDIS	65E/586/RVD

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

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

A list of all parts in the IEC 62714 series, published under the general title *Engineering data exchange format for use in industrial automation systems engineering – Automation markup language*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document 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.

INTRODUCTION

IEC 62714 is a solution for data exchange focusing on the domain of automation engineering.

The data exchange format defined in the IEC 62714 series (Automation Markup Language, AML) is an XML schema based data format for plant engineering data. AML and has been developed in order to support the data exchange in a heterogeneous engineering tools landscape. The goal of AML is to interconnect engineering tools in their different disciplines, e.g. mechanical plant engineering, electrical design, process engineering, process control engineering, HMI development, PLC programming, robot programming, etc. The application of IEC 62714 is industry independent. It is applicable in all industries that require data exchange in their engineering tool chain, e.g. in discrete industry or process industry.

AML stores engineering information following the object-oriented paradigm and allows modelling of physical and logical plant components as data objects encapsulating different aspects. An object may consist of other sub-objects, and can itself be part of a larger composition or aggregation. Typical objects in plant automation comprise information on topology, geometry, kinematics and logic, whereas logic comprises sequencing, behaviour and control. Therefore, an important focus in the data exchange in engineering is the exchange of object oriented data structures, geometry, kinematics and logic.

AML combines existing industry data formats that are designed for the storage and exchange of different aspects of engineering information. These data formats are used on an “as-is” basis within their own specifications and are not branched for AML needs.

The core of AML is the top-level data format CAEX. CAEX is utilized to interconnect the different data formats. Therefore, AML has an inherent distributed document architecture.

Figure 1 illustrates the basic AML architecture and the distribution of topology, geometry, kinematics and logic information.

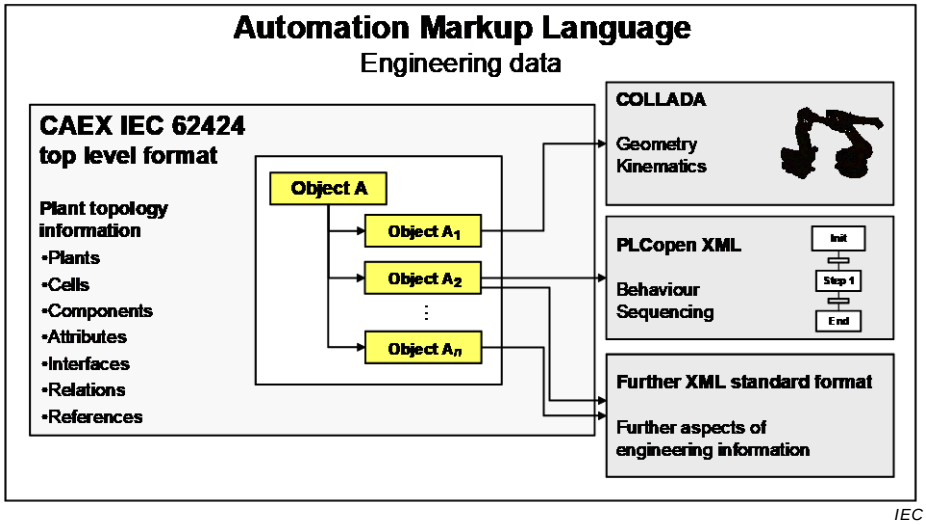

Figure 1 – Overview of the engineering data exchange format AML

Due to the different aspects of AML, the IEC 62714 series consists of different parts focusing on different aspects:

- IEC 62714-1: Architecture and general requirements

  This part specifies the general AML architecture, the modelling of engineering data, classes, instances, relations, references, hierarchies, basic AML libraries and extended AML concepts. It is the basis of all future parts, and it provides mechanisms to reference other subformats.

- IEC 62714-2: Role class libraries

  This part specifies additional AML libraries.

- IEC 62714-3: Geometry and kinematics

  This part specifies the modelling of geometry and kinematics information.

- IEC 62714-4[1]: Logic

  This part specifies the modelling of logics, sequencing, behaviour and control related information.

Further parts will be added in the future in order to interconnect further data standards to AML.

As long as no further parts describe the integration of further standards, it is important to focus on a limited set of sub data formats. Otherwise, it would open up the usage of any data format and data exchange would not work.

Clause 1 defines the scope for IEC 62714.

Clause 2 provides normative references.

Clause 3 provides terms, definitions and abbreviations.

Clause 4 defines the conformity to IEC 62714.

Clause 5 describes general architecture specifications for IEC 62714.

Clause 6 defines the basic AML libraries.

Clause 7 describes how to model user-defined data.

Clause 8 describes extended AML concepts.

Annex A gives an informative introduction, use cases and examples regarding AML.

Annex B gives an informative XML representation of the libraries defined in this part of IEC 62714.

[1] Under consideration.

ENGINEERING DATA EXCHANGE FORMAT FOR USE IN INDUSTRIAL AUTOMATION SYSTEMS ENGINEERING – AUTOMATION MARKUP LANGUAGE –

Part 1: Architecture and general requirements

1 Scope

This part of IEC 62714 specifies general requirements and the architecture of automation markup language (AML) for the modelling of engineering information, which is exchanged between engineering tools for industrial automation and control systems. Its provisions apply to the export/import applications of related tools.

This part of IEC 62714 does not define details of the data exchange procedure or implementation requirements for the import/export tools.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 62424:2016, *Representation of process control engineering – Requests in P&I diagrams and data exchange between P&ID tools and PCE-CAE tools*

IEC 62714 (all parts), *Engineering data exchange format for use in industrial automation systems engineering – Automation markup language*

ISO/PAS 17506, *Industrial automation systems and integration – COLLADA digital asset schema specification for 3D visualization of industrial data*

ISO/IEC 29500-2, *Information technology – Document description and processing languages – Office Open XML File Formats – Part 2: Open Packaging Conventions*

IETF RFC 2046, *Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types* [viewed 2017-11-13]. Available at <http://www.ietf.org>

IETF RFC 4122, A Universally Unique Identifier (UUID) URN Namespace
[viewed 2017-11-13]. Available at <http://www.ietf.org>

IETF RFC 5646, *Tags for Identifying Languages*
[viewed 2017-11-13]. Available at <http://www.ietf.org>

COLLADA 1.4.1:March 2008, COLLADA – Digital Asset Schema Release 1.4.1
[viewed 2017-11-13]. Available at <http://www.khronos.org/files/collada_spec_1_4.pdf>

PLCopen XML 2.0:December 3rd 2008 and PLCopen XML 2.0.1:May 8th 2009, *XML formats for IEC 61131-3* [viewed 2017-11-13]. Available at <http://www.plcopen.org>