



BSI Standards Publication

# Engineering data exchange format for use in industrial automation systems engineering - Automation Markup Language

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Part 1: Architecture and general requirements

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## National foreword

This British Standard is the UK implementation of EN IEC 62714-1:2018. It is identical to IEC 62714-1:2018. It supersedes BS EN 62714-1:2014, which will be withdrawn on 4 June 2021.

The UK participation in its preparation was entrusted to Technical Committee GEL/65/3, Industrial communications: process measurement and control, including fieldbus.

A list of organizations represented on this committee can be obtained on request to its secretary.

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### Amendments/corrigenda issued since publication

Date	Text affected
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## EUROPÄISCHE NORM

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.

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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.

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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.

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(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](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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 < <a href="http://www.ietf.org">http://www.ietf.org</a> >	-	-
IETF RFC 4122	-	A Universally Unique IDentifier (UUID) URN Namespace [viewed 2017-11-13]. Available at < <a href="http://www.ietf.org">http://www.ietf.org</a> >	-	-
IETF RFC 5646	-	Tags for Identifying Languages [viewed 2017-11-13]. Available at < <a href="http://www.ietf.org">http://www.ietf.org</a> >	-	-

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](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>>

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## CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	11
2 Normative references .....	11
3 Terms, definitions and abbreviations .....	12
3.1 Terms and definitions.....	12
3.2 Abbreviations .....	14
4 Conformity.....	15
5 AML architecture specification .....	15
5.1 General.....	15
5.2 General AML architecture .....	15
5.3 Sub document versions and AML superior document information .....	16
5.4 Meta information about the AML source tool .....	17
5.5 AML relations specification .....	18
5.5.1 General .....	18
5.5.2 Class-instance-relations .....	18
5.5.3 Instance-instance-relations.....	18
5.5.4 Identification of objects.....	20
5.6 AML document reference specification.....	20
5.6.1 General .....	20
5.6.2 Referencing COLLADA documents .....	20
5.6.3 Referencing PLCopen XML documents.....	20
5.6.4 Referencing additional documents in the scope of IEC 62714 (all parts) .....	20
5.6.5 Referencing documents outside of the scope of IEC 62714 (all parts).....	20
5.6.6 Referencing CAEX attributes to items in external documents .....	21
6 AML base libraries.....	21
6.1 General.....	21
6.2 General provisions .....	21
6.3 AML interface class library – AutomationMLInterfaceClassLib.....	22
6.3.1 General .....	22
6.3.2 InterfaceClass AutomationMLBaseInterface.....	24
6.3.3 InterfaceClass Order .....	24
6.3.4 InterfaceClass Port.....	25
6.3.5 InterfaceClass PPRConnector .....	25
6.3.6 InterfaceClass ExternalDataConnector .....	26
6.3.7 InterfaceClass COLLADAInterface .....	26
6.3.8 InterfaceClass PLCopenXMLInterface .....	27
6.3.9 InterfaceClass ExternalDataReference .....	27
6.3.10 InterfaceClass Communication .....	27
6.3.11 InterfaceClass SignalInterface .....	28
6.4 AML basic role class library – AutomationMLBaseRoleClassLib.....	28
6.4.1 General .....	28
6.4.2 RoleClass AutomationMLBaseRole.....	30
6.4.3 RoleClass Group .....	31
6.4.4 RoleClass Facet .....	31
6.4.5 RoleClass Resource .....	31

This is a preview of BS EN IEC 62714-1:2018. [Click here to purchase the full version from the ANSI store.](#)

6.4.6	RoleClass Product .....	32
6.4.7	RoleClass Process .....	32
6.4.8	RoleClass Structure .....	33
6.4.9	RoleClass ProductStructure .....	33
6.4.10	RoleClass ProcessStructure .....	34
6.4.11	RoleClass ResourceStructure .....	34
6.4.12	RoleClass ExternalData .....	34
6.5	AML basic attribute type library .....	35
6.5.1	General .....	35
6.5.2	Attributes of the AutomationMLBaseAttributeTypeLib .....	36
7	Modelling of user-defined data .....	39
7.1	General .....	39
7.2	User-defined attributes .....	39
7.3	User-defined AttributeTypes .....	39
7.4	User-defined InterfaceClasses .....	40
7.5	User-defined RoleClasses .....	41
7.6	User-defined SystemUnitClasses .....	42
7.7	User-defined InstanceHierarchies .....	43
8	Extended AML concepts .....	44
8.1	General overview .....	44
8.2	AML Port interface .....	44
8.3	AML Facet object .....	44
8.4	AML Group object .....	45
8.5	Splitting of AML top-level data into different documents .....	45
8.6	Internationalization, AML multilingual expression .....	45
8.7	Version information of AML objects .....	46
8.8	Modelling of structured attribute lists or arrays .....	46
8.9	AML Container .....	46
Annex A (informative)	General introduction into the Automation Markup Language .....	48
A.1	General Automation Markup Language concepts .....	48
A.1.1	The Automation Markup Language architecture .....	48
A.1.2	Modelling of plant topology information .....	49
A.1.3	Referencing geometry and kinematics information .....	51
A.1.4	Referencing logic information .....	51
A.1.5	Referencing documents outside of the scope of IEC 62714 .....	52
A.1.6	Interlinking CAEX attributes and attributes in external documents .....	53
A.1.7	Modelling of relations .....	54
A.2	Extended AML concepts and examples .....	57
A.2.1	General overview .....	57
A.2.2	AML Port concept .....	57
A.2.3	AML Facet concept .....	60
A.2.4	AML Group concept .....	62
A.2.5	Process-Product-Resource concept .....	66
A.2.6	AML multilingual expression concept .....	74
A.2.7	Attribute lists and arrays .....	75
Annex B (informative)	XML representation of standard AML base libraries .....	79
Bibliography	.....	81

This is a preview of BS EN IEC 62714-1:2018. [Click here to purchase the full version from the ANSI store.](#)

Figure 1 – Overview of the engineering data exchange format AML .....	9
Figure 2 – AML document version information .....	17
Figure 3 – XML text of the AML source tool information .....	17
Figure 4 – Example of a relation as block diagram and as object tree .....	19
Figure 5 – Example relation between the objects “PLC1” and “Rob1” .....	19
Figure 6 – XML text of the example relation between the objects “PLC1” and “Rob1” .....	19
Figure 7 – AML basic interface class library .....	23
Figure 8 – XML description of the AML basic interface class library .....	24
Figure 9 – AML basic role class library .....	29
Figure 10 – AutomationMLBaseRoleClassLib .....	30
Figure 11 – XML text of the AutomationMLBaseRoleClassLib .....	30
Figure 12 – AML basic attribute type library .....	35
Figure 13 – XML text of the AutomationMLBaseAttributeTypeLib .....	36
Figure 14 – Example of a user-defined attribute .....	39
Figure 15 – Examples for user-defined AttributeTypes .....	40
Figure 16 – XML code of the examples for user-defined AttributeTypes .....	40
Figure 17 – Example of a user-defined InterfaceClass in a user-defined InterfaceClassLib .....	41
Figure 18 – XML code of the example of a user-defined InterfaceClass in a user- defined InterfaceClassLib .....	41
Figure 19 – Example of a user-defined RoleClass in a user-defined RoleClassLib .....	42
Figure 20 – XML code of the example of a user-defined RoleClass in a user-defined RoleClassLib .....	42
Figure 21 – Examples for different user-defined SystemUnitClasses .....	42
Figure 22 – XML code of the examples for different user-defined SystemUnitClasses .....	43
Figure 23 – Example of a user-defined InstanceHierarchy .....	43
Figure 24 – AML representation of a user-defined InstanceHierarchy .....	44
Figure A.1 – AML general architecture .....	48
Figure A.2 – Plant topology with AML .....	50
Figure A.3 – Reference from CAEX to a COLLADA document .....	51
Figure A.4 – Reference from a CAEX to a PLCopen XML document .....	51
Figure A.5 – Example of referencing an external document .....	52
Figure A.6 – XML text of the example for referencing an external document .....	52
Figure A.7 – Example of referencing a CAEX attribute to an item in an external document .....	53
Figure A.8 – XML text of the example for referencing a CAEX attribute to an item in an external document .....	54
Figure A.9 – Relations in AML .....	55
Figure A.10 – XML description of the relations example .....	56
Figure A.11 – XML text of the SystemUnitClassLib of the relations example .....	56
Figure A.12 – XML text of the InstanceHierarchy of the relations example .....	57
Figure A.13 – Port concept .....	58
Figure A.14 – Example describing the AML Port concept .....	58
Figure A.15 – XML description of the AML Port concept .....	59
Figure A.16 – XML text describing the AML Port concept .....	60

This is a preview of BS EN IEC 62714-1:2018. [Click here to purchase the full version from the ANSI store.](#)

Figure A.17 – Definition of a user-defined AML Port class “UserDefinedPort” .....	60
Figure A.18 – AML Facet example .....	61
Figure A.19 – XML text of the AML Facet example .....	62
Figure A.20 – AML Group example .....	63
Figure A.21 – XML text for the AML Group example .....	63
Figure A.22 – Combination of the Facet and Group concept .....	64
Figure A.23 – XML text view for the combined Facet-Group example .....	65
Figure A.24 – Generic HMI template “B” visualizing a process variable “Y” of a conveyor .....	66
Figure A.25 – Generated HMI result “B” visualizing both conveyors with individual process variables .....	66
Figure A.26 – Base elements of the Product-Process-Resource concept .....	67
Figure A.27 – PPRConnector interface .....	67
Figure A.28 – Example for the Product-Process-Resource concept .....	68
Figure A.29 – AML roles required for the Process-Product-Resource concept .....	68
Figure A.30 – Elements of the example .....	69
Figure A.31 – Links within the example .....	69
Figure A.32 – Links of the resource centric view on the example .....	70
Figure A.33 – InstanceHierarchy of the example in AML .....	71
Figure A.34 – InternalElements of the example .....	72
Figure A.35 – InternalLinks of the example .....	72
Figure A.36 – InstanceHierarchy of the example in XML .....	73
Figure A.37 – Example describing the AML multilingual expression concept .....	74
Figure A.38 – XML description of the AML multilingual expression concept .....	74
Figure A.39 – XML text describing the AML multilingual expression concept .....	74
Figure A.40 – AML model of a multilingual AttributeType .....	75
Figure A.41 – XML code of the a multilingual AttributeType .....	75
Figure A.42 – Attribute list “SupportedFrequencies” .....	76
Figure A.43 – XML code for the attribute list “SupportedFrequencies” .....	76
Figure A.44 – Example CAEX model of the array “Edges” .....	77
Figure A.45 – XML code for the attribute array “Edges” .....	78
Figure B.1 – XML text of the standard AML interface class library, role class library and attribute type library .....	80
Table 1 – Abbreviations .....	15
Table 2 – Interface classes of the AutomationMLInterfaceClassLib .....	22
Table 3 – InterfaceClass AutomationMLBaseInterface .....	24
Table 4 – InterfaceClass Order .....	25
Table 5 – Optional attributes for AML Port interfaces .....	25
Table 6 – InterfaceClass PPRConnector .....	26
Table 7 – InterfaceClass ExternalDataConnector .....	26
Table 8 – InterfaceClass COLLADAInterface .....	26
Table 9 – InterfaceClass PLCopenXMLInterface .....	27
Table 10 – InterfaceClass ExternalDataReference .....	27

This is a preview of BS EN IEC 62714-1:2018. [Click here to purchase the full version from the ANSI store.](#)

Table 11 – InterfaceClass Communication .....	28
Table 12 – InterfaceClass SignalInterface .....	28
Table 13 – RoleClass AutomationMLBaseRole .....	31
Table 14 – RoleClass Group .....	31
Table 15 – RoleClass Facet .....	31
Table 16 – RoleClass Resource .....	32
Table 17 – RoleClass Product .....	32
Table 18 – RoleClass Process .....	33
Table 19 – RoleClass Structure .....	33
Table 20 – RoleClass ProductStructure .....	33
Table 21 – RoleClass ProcessStructure .....	34
Table 22 – RoleClass ResourceStructure .....	34
Table 23 – RoleClass ExternalData .....	34
Table 24 – Attribute Types of the AutomationMLBaseAttributeTypeLib .....	36
Table 25 – Sub-attributes of the attribute “Cardinality” .....	38
Table 26 – Sub-attributes of the attribute “AssociatedValue” .....	38
Table A.1 – Overview of major extended AML concepts .....	57

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## 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.
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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 paths, etc.,

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- 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.**

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## 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 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.

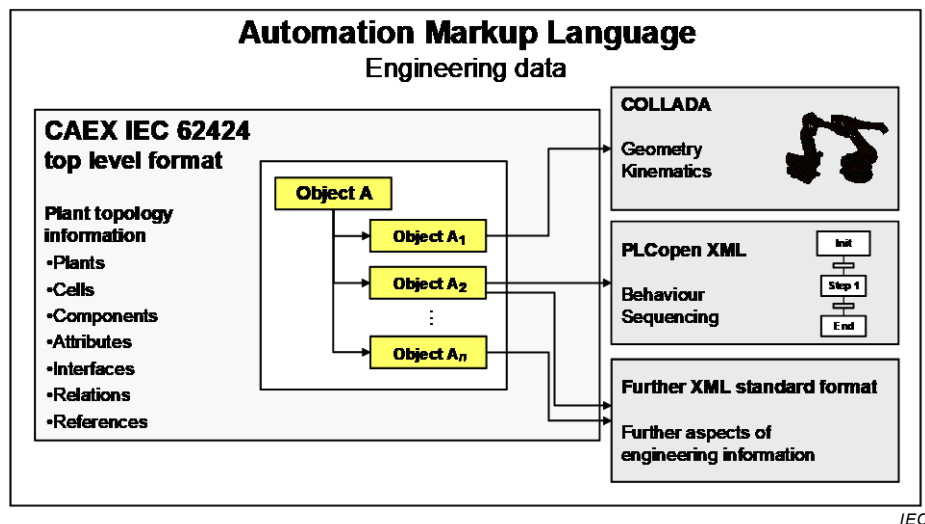


Figure 1 – Overview of the engineering data exchange format AML

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.

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- 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<sup>1</sup>: 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.

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<sup>1</sup> Under consideration.

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# 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>>

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