

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



**Engineering data exchange format for use in industrial automation systems  
engineering – Automation markup language –  
Part 3: Geometry and kinematics**

**Format d'échange de données techniques pour une utilisation dans l'ingénierie  
des systèmes d'automatisation industrielle – Automation markup language –  
Partie 3: Géométrie et cinématique**



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INTERNATIONAL  
ELECTROTECHNICAL  
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COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 01.040.01; 25.040.01; 35.240.30

ISBN 978-2-8322-3794-6

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## CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	10
2 Normative references .....	10
3 Terms, definitions and abbreviations .....	10
3.1 Terms and definitions.....	10
3.2 Abbreviations .....	11
4 Conformity.....	11
5 Extensions of AML libraries for geometry and kinematics.....	11
5.1 General.....	11
5.2 AutomationMLBaseRoleClassLib – RoleClass Frame.....	11
5.3 AutomationMLInterfaceClassLib.....	11
5.3.1 InterfaceClass COLLADAInterface.....	11
5.3.2 InterfaceClass AttachmentInterface .....	12
6 Frame attribute .....	12
7 Integration of COLLADA documents .....	13
8 Attachment of two AML objects.....	14
9 Meta information about the COLLADA source tool.....	15
Annex A (informative) Referencing methods for geometric/kinematic descriptions.....	17
A.1 Integration of a common COLLADA document with explicit referencing.....	17
A.1.1 General .....	17
A.1.2 Definition of the Frame attribute.....	18
A.1.3 Structure of the COLLADA documents.....	20
A.1.4 Referencing using URI and fragments without a target and ID .....	23
A.1.5 Referencing using URI and fragments including a target without an ID .....	23
A.1.6 Referencing using URI without a fragment, including a target and an ID .....	24
A.1.7 Referencing using URI and fragments including a target and an ID.....	25
A.1.8 Referencing using URI without a fragment, target and ID.....	26
A.2 Implicit referencing of COLLADA elements.....	27
A.2.1 General .....	27
A.2.2 Implicit referencing .....	27
A.2.3 Implicit referencing to COLLADA subdocuments .....	29
A.2.4 Publishing elements of a COLLADA document in CAEX.....	33
A.3 Attachment between objects in CAEX .....	35
Annex B (informative) Modelling of kinematic systems and their combination in AML.....	41
B.1 General.....	41
B.2 Modelling an AML document of a linear unit in CAEX and COLLADA .....	41
B.2.1 General .....	41
B.2.2 Definition of the visual scene .....	41
B.2.3 Definition of the joint.....	43
B.2.4 Definition of the kinematic model .....	43
B.2.5 Definition of the articulated system .....	43
B.2.6 Definition of the kinematic scene .....	45
B.2.7 Assembling of the scene.....	45
B.2.8 Combination of CAEX and COLLADA into AML.....	46

B.3	Modelling an AML document of a robot in CAEX and COLLADA.....	47
B.3.1	General .....	47
B.3.2	Definition of the visual scene .....	48
B.3.3	Definition of joints.....	50
B.3.4	Definition of the kinematic model .....	51
B.3.5	Definition of the articulated system .....	51
B.3.6	Definition of the kinematic scene .....	54
B.3.7	Assembling of the scene.....	55
B.3.8	Combination of CAEX and COLLADA into AML.....	56
B.4	Modelling an AML document of a combined system including a robot and a linear axis in CAEX and COLLADA .....	58
B.5	Modelling an AML document of a gripper connected to robot in CAEX and COLLADA .....	61
B.5.1	General .....	61
B.5.2	Definition of the visual scene .....	62
B.5.3	Definition of the kinematic system.....	63
B.5.4	Assembling of the scene.....	71
B.5.5	Combination of CAEX and COLLADA into AML.....	72
B.6	Modelling an AML document of a work piece connected to a gripper in CAEX and COLLADA .....	75
B.6.1	General .....	75
B.6.2	Implicit upper boundary .....	75
B.6.3	Definition of the work piece.....	77
B.6.4	Combination of CAEX and COLLADA into AML.....	78
Annex C (informative)	XML representation of AML libraries .....	82
C.1	AutomationMLBaseRoleClassLib .....	82
C.2	AutomationMLInterfaceClassLib .....	82
Figure 1	– Overview of the engineering data exchange format AML .....	8
Figure 2	– Required XML text in case of ISO/PAS 17506 .....	16
Figure 3	– Required XML text in case of COLLADA 1.4.1.....	16
Figure A.1	– Decision tree of different referencing methods.....	17
Figure A.2	– Two frames represented in the InstanceHierarchy of an AML document.....	18
Figure A.3	– XML representation of the AML document.....	18
Figure A.4	– Translation and spatially fixed rotation .....	19
Figure A.5	– COLLADA scene used in this example .....	20
Figure A.6	– Structure and References .....	20
Figure A.7	– Content of the COLLADA document cube.dae.....	21
Figure A.8	– Content of the COLLADA document red_blue_cubes.dae.....	22
Figure A.9	– “RedCube” – Hierarchy of the AML document .....	23
Figure A.10	– XML representation of the AML document.....	23
Figure A.11	– Referencing the red cube by ID.....	23
Figure A.12	– “BlueCube” – Hierarchy of the AML document.....	24
Figure A.13	– XML representation of the AML document.....	24
Figure A.14	– Referencing the blue cube .....	24
Figure A.15	– Hierarchy of the AML document .....	24
Figure A.16	– XML representation of the AML document.....	25

Figure A.17 – Referencing the blue cube starting from the element “subpart” .....	25
Figure A.18 – Hierarchy of the AML document .....	25
Figure A.19 – XML representation of the AML document .....	25
Figure A.20 – Referencing the blue cube .....	26
Figure A.21 – Hierarchy of the AML document .....	26
Figure A.22 – XML representation of the AML document .....	26
Figure A.23 – Referencing the complete COLLADA scene .....	27
Figure A.24 – Implicit Referencing: Hierarchy of the AML document .....	28
Figure A.25 – XML representation of the AML document .....	28
Figure A.26 – Structure and relations of referenced COLLADA subdocuments .....	29
Figure A.27 – Content of the modified COLLADA document red_blue_cubes.dae .....	30
Figure A.28 – Content of the COLLADA document red_cube.dae .....	30
Figure A.29 – Content of the COLLADA document blue_cube.dae .....	31
Figure A.31 – XML representation of the AML document .....	32
Figure A.33 – Additional frame element in COLLADA document .....	33
Figure A.34 – Publishing frames: Hierarchy of the AML document .....	34
Figure A.35 – XML representation of the AML document .....	35
Figure A.36 – Structure for attachments between objects in COLLADA .....	36
Figure A.37 – Visualization of yellow cube with additional frame .....	36
Figure A.38 – COLLADA document of yellow cube with additional frame .....	37
Figure A.39 – Hierarchy of the AML document .....	38
Figure A.40 – XML representation of the AML document .....	39
Figure A.41 – Attachment between geometrical AML objects .....	40
Figure A.42 – XML representation of the AML document .....	40
Figure B.1 – Visualization of the linear joint .....	41
Figure B.2 – Definition of the visual scene .....	42
Figure B.3 – Definition of the joint .....	43
Figure B.4 – Definition of kinematic model .....	43
Figure B.5 – Definition of the articulated system library .....	44
Figure B.6 – Definition of the kinematic articulated system .....	44
Figure B.7 – Definition of the motion articulated system .....	45
Figure B.8 – Definition of the kinematic scene .....	45
Figure B.9 – Instantiation of the kinematic scene .....	46
Figure B.10 – Hierarchy of the AML document .....	46
Figure B.11 – XML representation of the AML document .....	47
Figure B.13 – Definition of the visual scene .....	50
Figure B.14 – Definition of joints .....	50
Figure B.15 – Definition of kinematic model .....	51
Figure B.16 – Definition of the articulated system library .....	51
Figure B.17 – Definition of the kinematic articulated system .....	53
Figure B.18 – Definition of the motion articulated system .....	54
Figure B.19 – Definition of the kinematic scene .....	55
Figure B.20 – Instantiation of the kinematic scene .....	56

Figure B.21 – Hierarchy of the AML document .....	57
Figure B.22 – XML representation of the AML document.....	57
Figure B.24 – Hierarchy of the AML document .....	59
Figure B.25 – XML representation of the AML document.....	60
Figure B.26 – XML representation of the AML document.....	60
Figure B.27 – Visualization of the robot attached to the linear unit .....	61
Figure B.30 – Definition of the visual scene .....	63
Figure B.31 – Definition of the kinematics .....	64
Figure B.32 – Definition of joints .....	64
Figure B.33 – Definition of kinematic model .....	65
Figure B.34 – Definition of the articulated system .....	66
Figure B.35 – Definition of the articulated system .....	67
Figure B.36 – Definition of the kinematic scene.....	68
Figure B.37 – Definition of the joint dependency using MathML .....	68
Figure B.38 – XML representation of the COLLADA document gripper_kinematic.dae.....	71
Figure B.39 – XML representation of the COLLADA document gripper.dae .....	72
Figure B.40 – Hierarchy of the AML document .....	73
Figure B.41 – XML representation of the AML document.....	74
Figure B.42 – XML representation of the AML document.....	75
Figure B.43 – Visualization of the robot on a linear unit and attached gripper .....	75
Figure B.44 – Example for implicit upper boundary .....	76
Figure B.45 – Structure for attachments between objects in CAEX.....	76
Figure B.46 – Visualization of the work piece with additional frame.....	77
Figure B.48 – Hierarchy of the AML document .....	79
Figure B.49 – XML representation of the AML document.....	81
Figure B.50 – Attachment between geometric AML objects .....	81
Figure B.51 – XML representation of the AML document.....	81
Figure C.1 – XML representation of AML libraries AutomationMLBaseRoleClassLib.....	82
Figure C.2 – XML representation of AML libraries AutomationMLInterfaceClassLib.....	83
Table 1 – Abbreviation .....	11
Table 2 – Role Class Frame.....	11
Table 3 – InterfaceClass COLLADAInterface .....	12
Table 4 – InterfaceClass AttachmentInterface .....	12
Table 5 – Attribute “Frame” .....	13
Table 6 – Sub-attributes of the attribute “Frame” .....	13
Table 7 – Rules for resolving document and entry point .....	14
Table 8 – Meta information about the COLLADA source tool .....	16

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

**Part 3: Geometry and kinematics**

**FOREWORD**

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

CDV	Report on voting
65E/497/CDV	65E/508/RVC

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 publication 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.

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## INTRODUCTION

The data exchange format defined in IEC 62714 (Automation Markup Language, AML) is an XML schema based data format and has been developed in order to support the data exchange between engineering tools in a heterogeneous engineering tool landscape. IEC 62714-1 gives an overview about the format.

The goal of AML is to interconnect engineering tools from the existing heterogeneous tool landscape in their different disciplines, e.g. mechanical plant engineering, electrical design, process engineering, process control engineering, HMI development, PLC programming, robot programming etc.

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 may 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.

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 "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 that connects 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, kinematic and logic information.

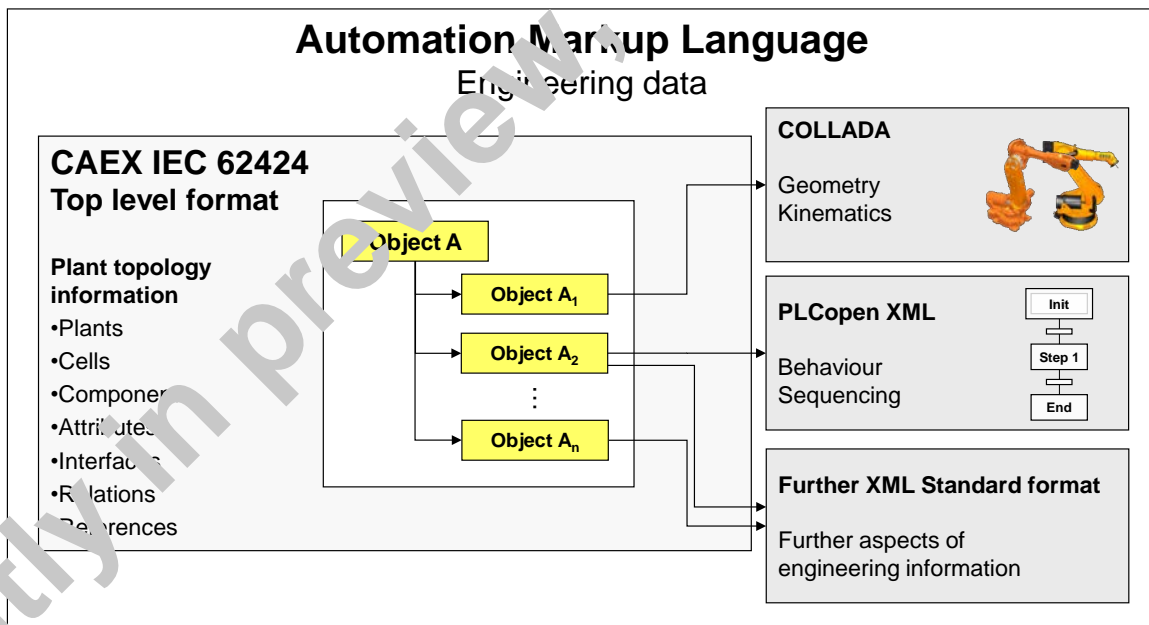


Figure 1 – Overview of the engineering data exchange format AML

Due to the different aspects of AML, IEC 62714 consists of different parts focussing 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.

- 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.

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

Clause 5 describes the geometry related extensions of the role class libraries.

Clause 6 describes the frame attribute which can be used to represent the geometric position of an InternalElement, InstanceHierarchy, SystemUnitClass, or SystemUnitClassLibrary with respect to another CAEX Object.

Clause 7 gives a normative description regarding referencing COLLADA documents.

Clause 8 specifies the normative provisions for the attachment of two geometric AML objects.

Clause 9 defines how to store meta informations about the source tool directly into the COLLADA document.

Annex A describes the referencing methods for geometric and kinematic models.

Annex B provides an example for modelling of kinematic systems and their combination in AML.

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

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

## Part 3: Geometry and kinematics

### 1 Scope

This part of IEC 62714 specifies the integration of geometry and kinematics information for the exchange between engineering tools in the plant automation area by means of AML.

It 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 62714-1:2014, *Engineering data exchange format for use in industrial automation systems engineering – Automation markup language – Part 1: Architecture and general requirements*

IEC 62714-2:2015, *Engineering data exchange format for use in industrial automation systems engineering – Automation markup language – Part 2: Role class libraries*

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

COLLADA 1.4.1: March 2008 COLLADA – Digital Asset Schema Release 1.4.1  
(available at <[http://www.khronos.org/files/collada\\_spec\\_1\\_4.pdf](http://www.khronos.org/files/collada_spec_1_4.pdf)>)

Extensible Markup Language (XML) 1.0:2004, W3C Recommendation  
(available at <<http://www.w3.org/TR/2004/REC-xml-20040204/>>)

### 3 Terms, definitions and abbreviations

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62714-1:2014 and of IEC 62714-2:2015 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/> [access on 26th September 2016]
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