IEC 62714-2

Edition 2.0 2022-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Engineering data exchange format for use in industrial automation systems engineering – Automation markup language – Part 2: Semantics libraries

Format d'échange de données technique pour une utilisation dans l'ingénierie des systèmes d'automatisation industrielle – Automation markup language – Partie 2: Bibliothèques de sémantique

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

Part 2: Semantics libraries

FOREWORD

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IEC 62714-2 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

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

a) additional explanation about usage of external semantics in AML Attributes;
b) adaption to CAEX V3.0;
c) additional new RoleClasses e.g. for Industrie 4.0.

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

Draft	Report on voting
65E/871/FDIS	65E/889/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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 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- withdrawn,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.

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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 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 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.

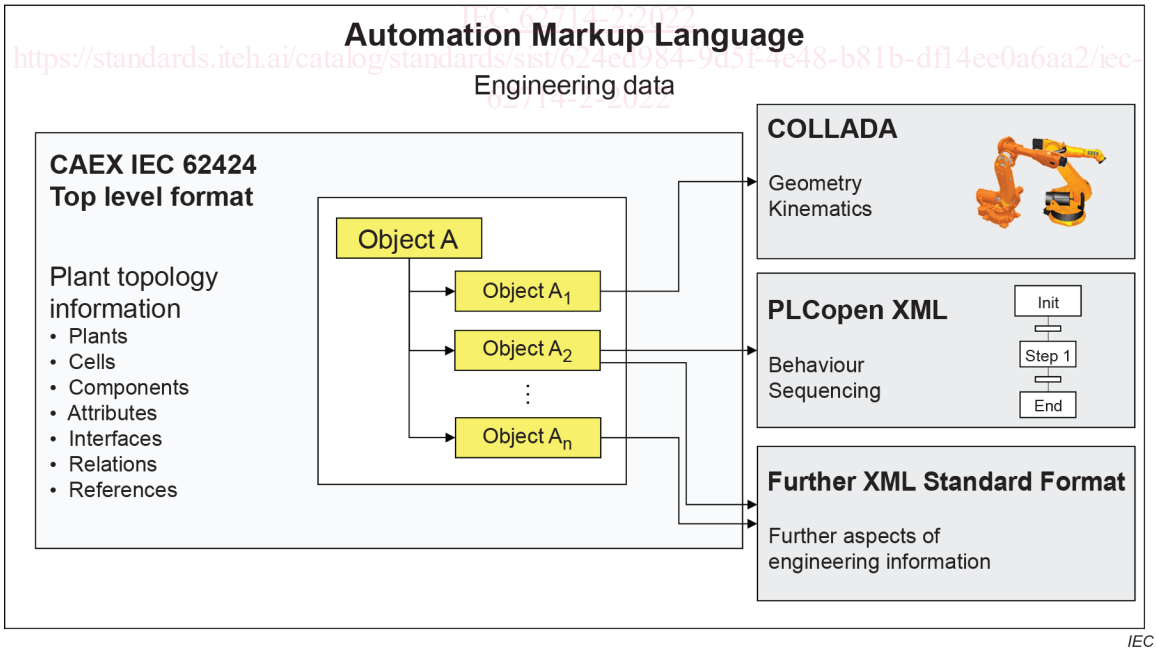

Figure 1 – Overview of the engineering data exchange format (AML)

Due to the different aspects of AML, IEC 62714 (all parts) 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.

- IEC 62714-2: Semantics libraries

  This part specifies AML role class libraries and the usage of AML attributes to represent semantics.

- IEC 62714-3: Geometry and kinematics

  This part specifies the modelling of geometry and kinematics information.

- IEC 62714-4: Logic

  This part specifies the modelling and referencing of logic information.

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

Clause 5 describes normative role class libraries within AML.

Annex A describes the informative AML extended role class library.

Annex B gives an informative example for the usage of AML role classes.

Annex C shows some user-defined role class libraries of different origins.

Annex D 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 2: Semantics libraries

1 Scope

IEC 62714 (all parts) specifies an engineering data exchange format for use in industrial automation systems.

This part of IEC 62714 specifies normative as well as informative AML libraries for the modelling of engineering information for the exchange between engineering tools in the plant automation area by means of AML. Moreover, it presents additional user-defined libraries as an example. Its provisions apply to the export/import applications of related tools.

This part of IEC 62714 specifies AML role class libraries and the usage of AML attributes to represent semantics. Role classes provide semantics to AML objects, attribute types provide semantics to AML attributes. The association of role classes to AML objects or attribute types to AML attributes represent the possibility to add (also external) semantic information to it. By associating a role class to an AML object or an attribute type to an AML attribute, it gets semantic information. This part of IEC 62714 does not define details of the data exchange procedure or implementation requirements for the import/export tools.

NOTE In the future, it is possible to include AML attribute type libraries in this part of IEC 62714.

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 62714-1:2018, *Engineering data exchange format for use in industrial automation systems engineering – Automation Markup Language – Part 1: Architecture and general requirements*

IEC 61360, *IEC Common Data Dictionary* (available at https://cdd.iec.ch/)

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

Extensible Markup Language (XML) 1.0:2008, *W3C Recommendation* (available at http://www.w3.org/TR/2008/REC-xml-20081126/

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62714-1:2018 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/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
robot
industrial robot
automatically controlled, reprogrammable, multipurpose manipulator, programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications

[SOURCE: ISO 8373:2012, 2.9, modified – The preferred term "robot" has been added; the notes have been removed.]

3.1.2
sensor
part of a measuring instrument, or measuring chain, which is directly affected by the measurand and which generates a signal related to the value of the measurand

EXAMPLE Limit switch, proximity sensor, pressure transmitter, vibration transducer, strain gauge, photo detector.

[SOURCE: IEC 60050-311:2001, 311-05-01]

3.1.3
measurand
particular quantity subject to measurement

[SOURCE: IEC 60050-311:2001, 311-01-03]

3.1.4
actuator
functional unit that generates the manipulated variable, required to drive the final controlling element, from the output variable of the controlling element

EXAMPLE Contactor, variable speed drive.

[SOURCE: IEC 60050-351:2013, 351-49-07, modified – The notes, example, and figures have been removed, a new example has been added.]

3.2 Abbreviated terms

For the purposes of this document the abbreviated terms given in IEC 62714-1:2018, as well as those given in Table 1, apply.

Table 1 – Abbreviated terms

AGV	Automated guided vehicle
IPC	Industrial PC
NC	Numerical controller
PAC	Programmable automation controller
PLC	Programmable logic controller
PC	Personal computer
RC	Robot controller

4 Conformity

To claim conformity to this part of IEC 62714 with respect to the support of AML, the requirements of Clause 5 shall be fulfilled.

5 AML role classes

5.1 Location and inheritance relationship of role classes in role class libraries

The storage of role classes is organized in hierarchies within role class libraries.

The location inside this hierarchy is called "path for element reference" in the context of this document.

NOTE The relation from one AML object to a role class is described in IEC 62714-1:2018 in 5.5.2 "Class-instance-relations".

The "path for element reference" is used to address the role class from other AML objects (see the example in Figure 2).

```
<InstanceHierarchy Name="RoleExample">
  <InternalElement Name="Cell" ID="{d6d584a2-4f97-42a8-9354-c9b3ee7d5362}">
    <InternalElement Name="Ressource" ID="{39eb3ed9-c6ea-44c8-8227-ab4b1667c593}">
      <InternalElement Name="RB1" RefBaseSystemUnitPath="ExampleSystemUnitClassLib/Roboter" ID="{a62705df-2951-4a2f-8562-f65cdc4eabc4}">
        <SupportedRoleClass RefRoleClassPath="AutomationMLDMIRoleClassLib/DiscManufacturingEquipment/Robot"/>
      </InternalElement>
```

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Figure 2 – Example addressing of role class "Robot" in AML object "RB1"

The "semantic base" of a role class within a role class library describes which role class it is semantically inherited from.

This describes the heritage relation of role classes regardless of their storage location inside a role class library.

Even if the role class library includes a flat list of role classes, the inheritance relationship can be more complex (see the example in Figure 3).

```
<RoleClassLib Name="AutomationMLExtendedRoleClassLib">
    <RoleClass Name="Conveyor" RefBaseClassPath="AutomationMLDMIRoleClassLib/DiscManufacturingEquipment/Transport">
```

IEC

Figure 3 – Example inheritance relationship

NOTE This semantic base is called "Parent class" in IEC 62714-1.

5.2 AML role class libraries

Table 2 gives an overview about the AML related role class libraries specified in IEC 62714-1 and this part of IEC 62714.