Overview of STEP AP242 e2 standard

Jean-Yves DELAUNAY : Airbus
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Successful ballot of ISO 10303 STEP AP242 edition 2

• Approval at the unanimity by 10 countries, without technical comments

• Expected publication of AP242 ed2 beginning of 2020 by ISO

Congratulations for the American and European AP242 ed2 project team! with the support of ISO /TC 184 /SC 4 /W12 convener and ISO /TC 184 /SC 4 chairman
Overview of ISO 10303 STEP AP242 edition 2

Managed Model Based 3D Engineering

AP242 ed2 project supported by
- AFNeT
- PDES Inc
AP242 ed2 new capability for **Electrical Wiring Harness**

**Electrical harness design (2D, 3D...)**

**Connectivity information:** Wire List...

**Electrical devices:** connectors, backshelves, splices, braid, wrap, terminals...

http://www.ap242.org/electrical-harness

**Scope:** focus on physical electrical harness (topology, wires, lengths, protections...)

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PDES, Inc.
AP242 ed2 mechanical: enhancements for 3D geometry and 3D PMI

<table>
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<tr>
<th>New semantic PMI supported in AP242 Edition 2</th>
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<tbody>
<tr>
<td>• Surface texture parameters, ISO 1302</td>
</tr>
<tr>
<td>• ISO 1101 Intersection plane / orientation plane, new modifiers, Geometric tolerances with a Restrictive specifications</td>
</tr>
<tr>
<td>• Spot face dimension / countersunk / counterbore / hole depth</td>
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<table>
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<th>Enhancements for Geometry</th>
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<tbody>
<tr>
<td>• 3D scan</td>
</tr>
<tr>
<td>• Advanced tessellation (cubic bézier triangle)</td>
</tr>
<tr>
<td>• Persistent ID</td>
</tr>
<tr>
<td>• Surface visual texture</td>
</tr>
<tr>
<td>• Vertex colors for tessellated geometry</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Enhancement</th>
<th>AP242 Ed. 1 (2014)</th>
<th>AP242 ed.2</th>
</tr>
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<tbody>
<tr>
<td>3D exact geometry</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3D tessellated geometry</td>
<td>Yes</td>
<td>Yes + enhancement</td>
</tr>
<tr>
<td>Graphic PMI/annotation</td>
<td>Yes</td>
<td>Yes + enhancement</td>
</tr>
<tr>
<td>Semantic PMI/annotation</td>
<td>Yes</td>
<td>Yes + enhancement</td>
</tr>
<tr>
<td>Composite</td>
<td>Yes</td>
<td>Yes + enhancement</td>
</tr>
<tr>
<td>Additive manufacturing</td>
<td>No</td>
<td>Yes (NEW)</td>
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PDES, Inc.
AP242 ed2 Mechanical domain: extension to Additive Manufacturing

Support of new entities in AP242 ed2 for:
• Build orientation
• Build plate size
• Build volume
• Build plate placement

//http://www.ap242.org/additive-manufacturing

Planned extensions for STEP AP242 ed3 and following editions (according to resources)
• Heterogeneous materials
• Representation Lattice structures:
• Semantic representation of PMI for Additive manufacturing

In consistency with ISO 14649 part 17 « Process data for additive manufacturing” and STEP AP238 ed2
Enhancements of AP242 ed2 for **Composite design**

Definition of new types of Rosette

Description of:
- the Engineering End of Ply (EEoP)
- the Manufacturing End of Ply (MEoP)

http://www.ap242.org/ed2-composite-design-interoperability
Harmonization of AP242 ed2 and STEP AP239 ed3 PLCS for PDM and Requirement, Validation & Verification management

**AP239 ed3 specific capabilities**
- Planning, scheduling
- Risk
- Probability
- Task description
- Resources
- Slot
- Observation

**Capabilities shared by AP239 ed3 and AP242 ed2**
- Common resources
  - Incl.: Classification, Date & Time, Effectivity, Property, Condition, State, Identification, name & description
- Management resources
  - Incl.: Person, organization and Address, Approval/Certification, Information rights, Contract and project
- Message
- Delta change
- Document Management
- Breakdown
- Analysis
- Activity
  - Individual Part
- Work Management
- Planned and evaluated characteristics
- Requirement Management, V&V
- Representation and external element reference
- Product Specification and Configuration
- Product Data Management
- Interface

**AP242 ed2 specific capabilities**
- Material
- Mating
- Kinematics
- Process Plan
- Electrical Harness
- Composite Structural Shape and Structure
- Shape Association and Structure
- 3D geometry

**Target:** harmonization of AP242 ed2 – AP239 ed3 for PDM – CM finalized in Q4 2019

AP 242 Edition 2 has enhanced functionalities for Electrical Harness interoperability

The objective of this page is to provide an overview of the enhanced functionalities of AP242 edition 2 in development for Electrical Harness interoperability. It is summed up according to the following paragraphs:

- Overview and illustration of capabilities
- Examples of associated use cases
- Dependencies / related standards
- Status of development
- Status of prototyping in COTS solutions
- Planning of recommended practices / implementers forums
- Planned extensions of Electrical domain in AP242 Edition 3

Overview and illustration of capabilities
Content of AP242 ed2 Domain model: User friendly documentation

Tabs for the main components of the standard:
The AP with Activity model, Domain model with XD implementation, AP Module with EXPRES implementation

ISO new graphical charter

Objects grouped by Capability

For each object, presentation of the model definition, the diagrams, the mapping and the implementation schema extract all available as switchable tabs
Summary: time for actions!

• AP242 ed2 brings key extensions to support 3D Model Based Engineering
  • Electrical Wiring Harness, Additive Manufacturing (basic)
  & important enhancements: Composite, PMI, PDM harmonization with AP239 ed3 PLCS

• AP242 ed2 relies on the STEP Extended Architecture, using SysML as modelling language of the Domain model, and providing user friendly documentation

• AP242 ed2 DIS2 is available via the national standardization bodies

• AP242 ed2 “International Standard” planned to be published beg? of 2020

• Now time
  • for the PLM editors and integrators to implement AP242 ed2, and to test their COTS AP242 ed2 interfaces in the appropriate Interoperability Forums!
  • For the OEMs to prepare the deployment of AP242 ed2 solutions in their supply chain!