



Supporting the Digital Transformation of the Mobility Industry

March 2026

Leslie McKay, Director of Digital Standard Development
and Vice-Chair of Digital Standards Alliance



120 Years
History with
Standards

SAE
INTERNATIONAL®

9,800+
Published
Standards

2900+
Companies

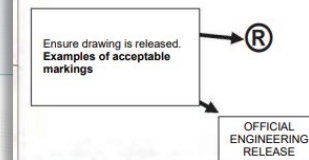
16,000+
Active
Participants

60+
Countries

2,000+
Active WIPs

600+
Committees

The Vision



3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2249.

3.2 Melting Practice

Alloy shall be multiple melted. The first melt shall be made by vacuum consumable electrode, nonconsumable electrode, electron beam cold hearth, or plasma arc cold hearth melting practice. The subsequent melt or melts shall be made using vacuum arc remelting (VAR) practice. Alloy additions are not permitted in the final VAR melt.

3.2.1 The atmosphere for nonconsumable electrode melting shall be vacuum or shall be argon and/or helium at an absolute pressure not higher than 1000 mm of mercury.

3.2.2 The electrode tip for nonconsumable electrode melting shall be water-cooled copper.

3.3 Condition

The product shall be supplied in the following condition:

3.3.1 Sheet and Strip

Hot rolled with or without subsequent cold reduction, annealed, descaled, and leveled, having a surface appearance comparable to a commercial corrosion-resistant steel No. 2D finish (see 8.2).

3.3.2 Plate

Hot rolled, annealed, descaled, and flattened, having a surface appearance comparable to a commercial corrosion-resistant steel No. 1 finish (see 8.2). Plate product shall be produced using standard industry practices designed strictly for the production of plate stock to the procured thickness. Bar, billet, forgings, or forging stock shall not be supplied in lieu of plate.

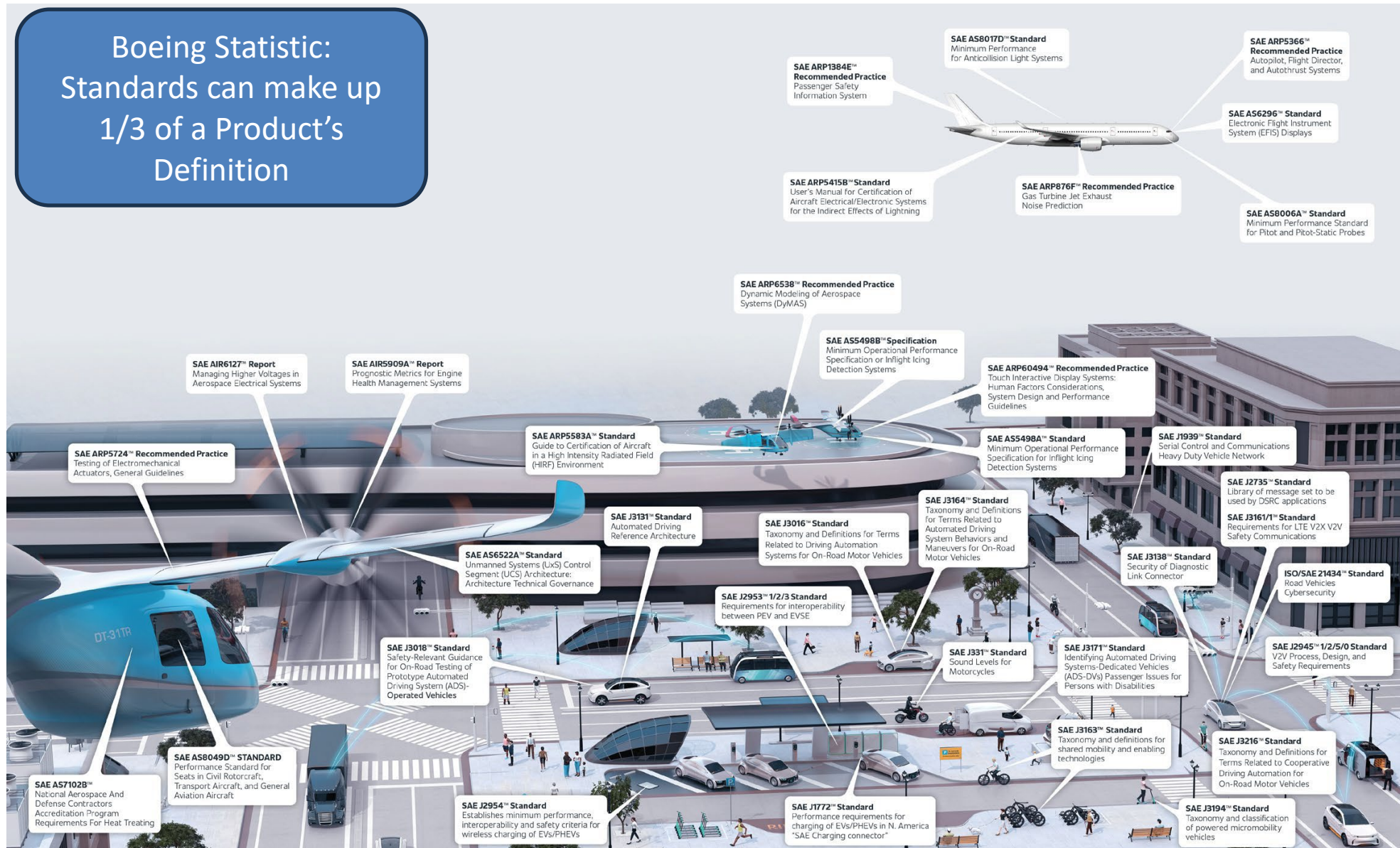
- Design Validation – Confirmation through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled. Testing and/or analysis to ensure the product design conforms to defined user needs and/or requirements. Design validation follows successful design verification and may involve pre-production product (e.g., development, prototype) [reference AIAG Advanced Product Quality Planning and Control Plan].

... We have to start

You may not think of standards often, but they are everywhere

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Boeing Statistic:
Standards can make up
1/3 of a Product's
Definition



A large commercial airplane is shown from a low-angle, front-facing perspective on a runway at night. The runway is illuminated by a central line of lights and side lights, leading towards the plane. The sky is dark with some clouds. The text "A Short History Lesson" is overlaid in white, centered on the image.

A Short History Lesson

SAE Digital Standards System Vision: OnQue

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Dimensions

Parts Criteria

Type
Bolt (986)

Sub-Type
Bolt, Hexagon Drilled/Undrilled Head (385)

☒ Part Sub-type Drawing

Dimension	Units	Min	Max
L	Inch	0.02	.5
AC			

Materials Identifier

AMS # UNS

Detailed Material Search

- A
- AD
- AE
- AF
- AG
- AK
- C
- CR
- D Nominal Thread Size
- K
- K (Duplicate)
- Lead Thread Chamfer Diameter (ØA...
- M
- N
- P
- Shank Diameter
- Thread Class
- Thread Series

Composition

Parts Criteria

Bolt (986)

Sub-Type
Bolt, Hexagon Drilled/Undrilled Head (385)

☒ Part Sub-type Drawing

Dimension	Units	Min	Max
L	Inch	0.02	.5

Materials Identifier

Detailed Material Search

Type
Metals

Sub-Type
Corrosion Heat Resistant Alloys

Composition (% by weight)

Element	Exclude	Min	Max
Aluminum (Al)	☐	0.02	91

Material Properties

Property	Units	Min	Max
----------	-------	-----	-----

- Aluminum + Titanium
- Titanium + Aluminum
- Beryllium (Be)
- Beryllium Oxide
- Bismuth (Bi)
- Boron (B)
- Calcium (Ca)
- Carbon (C)
- Total Carbon
- Carbon (see
- Carbon + Manganese + Silicon + Ph...
- Carbon + Nitrogen
- Chromium (Cr)
- Chromium + (Titanium - 4 x Carbon)
- Chromium + (Titanium - 4x Carbon)
- Chromium + (Titanium - 4x Carbon)
- Cobalt (Co)
- Columbium (Niobium)
- Columbium + Tantalum
- Copper (Cu)
- Copper (3.1.1.2)
- Geranium

Materials Properties

Parts Criteria

Sub-Type
Bolt, Hexagon Drilled/Undrilled Head (385)

☒ Part Sub-type Drawing

Dimension	Units	Min	Max
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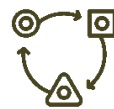
Material Properties

Property	Units	Min	Max
----------	-------	-----	-----

- A Heavy
- A Thin
- B
- B Heavy
- B Thin
- C
- C Heavy
- C Thin
- D
- D Heavy
- D Thin
- E
- Outer Diameter Increase %
- Outside Diameter to Wall Thickness...
- Accept
- Accept/Reject
- Angle
- Arbor Diameter - Coiling Parameters
- Arbor Diameter - Diameter vs Arbor ...
- ASTM Number
- Average Reduction of Area
- Average Value
- Axial Stress



Eliminate Transcription Errors



Support Systems Integration



Maximize Re-Use



Lower Costs



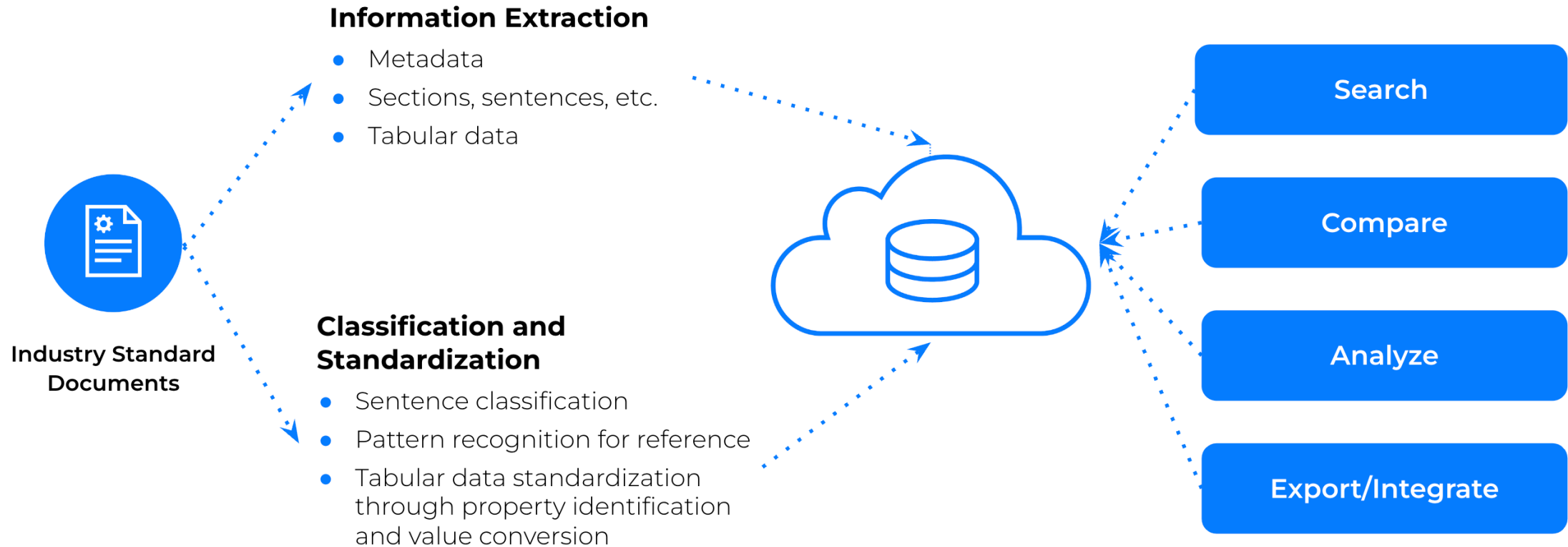
Minimize Change Management



Digitally Track Requirements

SAE's Digitization Approach

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Guess What We Learned?

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- Standards are not written to be “read” by machines
- AI technologies can help us, but will not perform miracles
 - Too much ambiguity
 - Difficult to classify information types
 - Too many conflicting statements
- Collaboration is essential across SDOs and Industry
- Current XML schemas for standards are document-focused rather than data-focused
- POCs and agile approach is needed
- Standards need to be consumable by PLMs, ERPs, and more



Thoughts from Our Customers Driving SAE Digital Initiatives

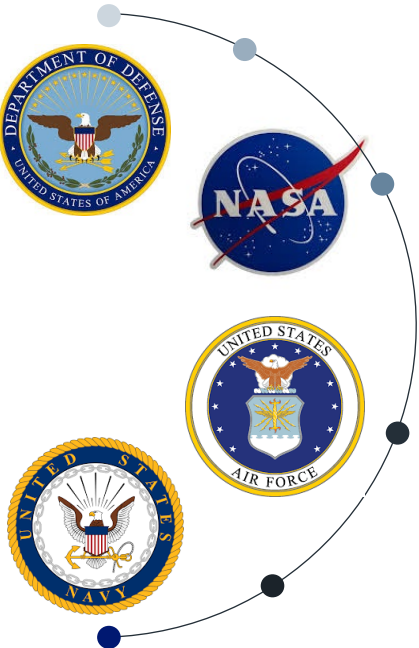
VOC Efforts

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Standards as PLM Libraries



Government Feedback



Standards as Digital Models



Benefits:

Efficiency Gains	Increased Quality	Cost Reduction	Faster TTM	Competitive Advantage
Reusability	Automated Compliance	Interoperability	Authoritative Source	Traceability

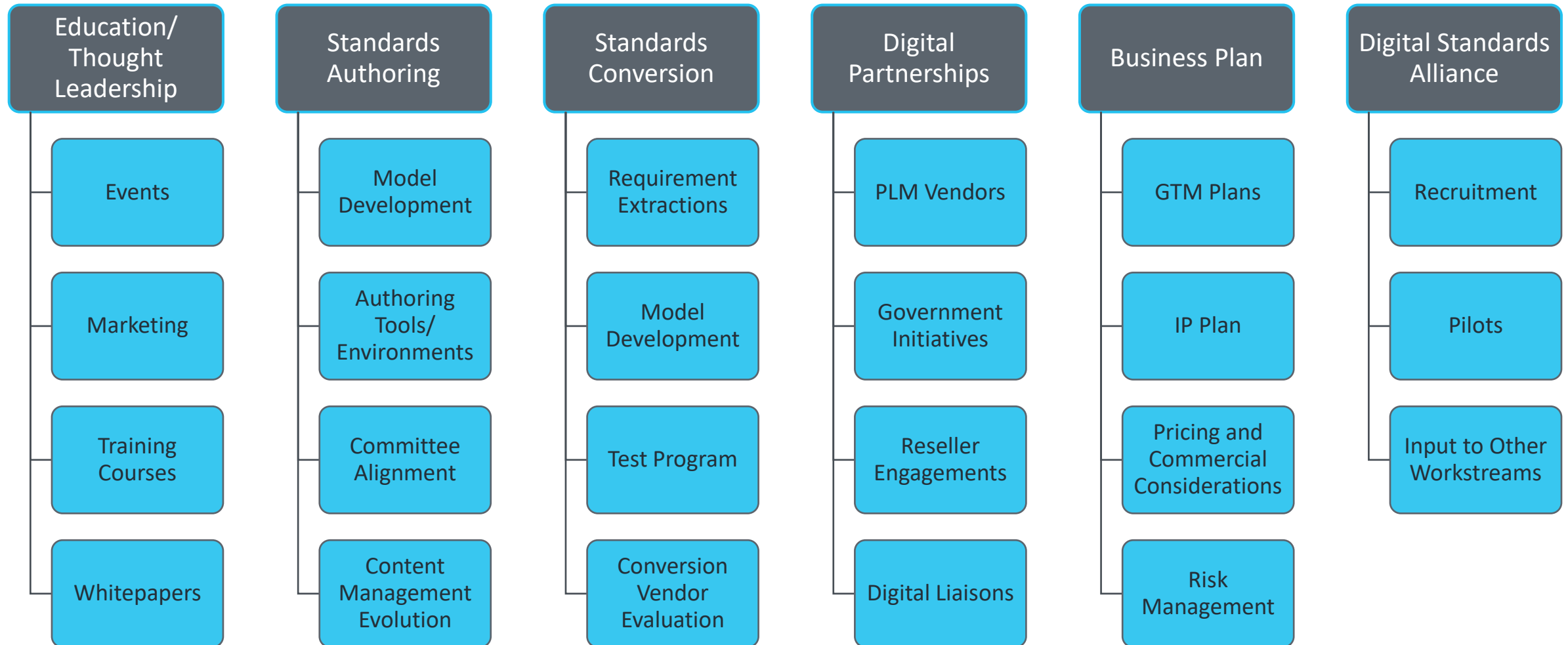
Gaps:

Modularity	Ontology	Machine Readable	Digital Licensing	Relationships	Interoperability
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SAE's Digitalization Strategy

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Digital Data from Standards Integrated into Digital Ecosystems



Education and Thought Leadership

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Table 2 - Hardness and minimum tensile properties

Condition	Tensile Strength ksi (MPa)	Yield Strength at 0.2% Offset ksi (MPa)	Elongation in 4D %	Reduction of Area %	Hardness (1) HB	Hardness (1) HRC	Temperature/ Time °F (°C)/Hours
H800	190 (1310)	170 (1172)	10	40 (2)	388-444	40-47	900 (482)/1 (3)
H925	170 (1172)	155 (1069)	10	44 (2)	375-429	38-45	925 (496)/4 (4)
H1025	155 (1069)	145 (1000)	12	45	331-401	34-42	1025 (552)/4 (4)
H1075	145 (1000)	125 (862)	13	45	311-375	31-38	1075 (579)/4 (4)
H1100	140 (965)	115 (793)	14	45	302-363	30-37	1100 (593)/4 (4)
H1150	135 (931)	105 (724)	16	50	277-352	28-37	1150 (621)/4 (4)
Solution Heat Treated					363 (5)	39 (5)	1900 (1038) (6)

NOTES:
1. Hardness shall not be the basis for rejection if tensile properties are acceptable, determined on specimens taken from the same sample as that with nonconforming hardness or from another sample with similar nonconforming hardness.
2. For sizes over 3 inches (76 mm), 35% for H800 condition and 38% for H925 condition.
3. Temperature tolerance $\pm 10^\circ\text{F}$ ($\pm 6^\circ\text{C}$); time tolerance ± 0.1 hour (± 5 minutes); cool in air.
4. Temperature tolerance $\pm 10^\circ\text{F}$ ($\pm 6^\circ\text{C}$); time tolerance ± 0.3 hour (± 15 minutes); cool in air.
5. Maximum; alternate for wire: 175 ksi (1207 MPa) or equivalent hardness (see 3.3).
6. Temperature tolerance $\pm 25^\circ\text{F}$ ($\pm 14^\circ\text{C}$); time commensurate with thickness, heating equipment, and procedure used, and cooling as required to below 90°F (32°C).

Table Structure

- Keep tables simple
- One data element/cell
- Managing blank cells
- Row/column design

3.3.2 Average Grain Size

Shall be no larger than 20 microns (20 μm), determined in accordance with ASTM E112, using the intercept method at 500X magnification.

3.4 Quality

The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

3.4.1 Density

Shall be at least 99.0% of theoretical density, determined by the water displacement method. The accuracy of density determination shall be to the second decimal, or better.

3.4.1.1 The theoretical density shall be calculated using Equation 1:

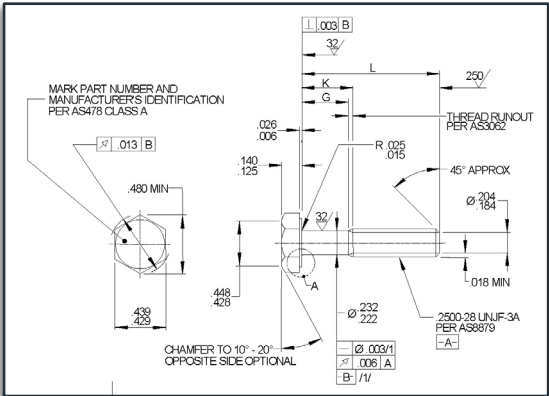
$$\text{Theoretical Density (gm/cm}^3\text{)} = \frac{100 - \% \text{BeO}}{1.8477 \text{ gm/cm}^3} + \frac{\% \text{BeO}}{3.009 \text{ gm/cm}^3} \quad (\text{Eq. 1})$$

3.4.1.2 Thermally Induced Porosity (TIP) Resistance

3.4.1.2.1 Sample product shall be subjected to a TIP test consisting of a heat treatment in inert atmosphere or under vacuum at 1450°F (788°C) for 1 hour.

Content

- Consistency, consistency, consistency
- Avoid calculations in tables
- Avoid using fractions or scientific notations



Drawings and Variables

- Standard variable names
- Data extraction

Nickel Alloy, Brazing Filler Metal
73Ni - 0.75C - 4.5Si - 14Cr - 3.1B - 4.5Fe
1790 °F (977 °C) Solidus to 1970 °F (1077 °C) Liquidus
(Composition similar to UNS N99600)

RATIONALE

AMS4775K incorporates industry standard requirements of AWS A5.8, revises Title, Burn-off of Binder (3.3.1.1, 3.3.2.2) Powder mesh designations (3.5.1.1), Sampling and Testing (4.3.2.1), and Reports (4.4), prohibits unauthorized exceptions (3.6), and is a Five-Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a nickel alloy in the form of wire, rod, strip, foil, and powder and a viscous mixture (paste) of the powder in a suitable binder.

1.2 Application

This filler metal has been used typically for joining corrosion and heat-resistant steels and alloys requiring corrosion and oxidation resistant joints with good strength at elevated temperatures, but usage is not limited to such applications. Also may be used as a corrosion and oxidation resistant hard coating.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

Document Structure

- Use complete sentences
- Requirements handling
- Table or figure references

How to Write a Digital-Ready Standard

Education and Thought Leadership

Mobility, Advanced*

Foundations of Model-Based Definition (MBD) and Model-Based Enterprise (MBE): A Path to a Traceable Digital Thread

Foundations of MBD



Gain a solid understanding of MBD concepts, how models are created, and how they replace 2D drawings with clear, consistent product definition.

Using Industry Standards



Apply ASME and ISO standards to ensure accurate, interoperable product data **with ASME MBD Committee Chairman, Evan Kessick.**

MBD Within the Enterprise



See how MBD supports consistence, reusable data across engineering and operations.

Human & Machine-Readable Data



Improve clarity and automation with structured annotations and readable data.

Navigating Digital Transformation



Learn cultural and technical strategies to overcome common transformation barriers.

Advancing MBE Maturity



Use the MBE Index to assess readiness and plan a path toward a digital thread.

Interested in Teaching with SAE? Contact Stacey.zusy@sae.org

Standards Authoring

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First SAE MBSE-Compatible Standard Published

- AS7140: Data Model for Rotorcraft Health and Maintenance Info

Introducing SAE MBSE Environment

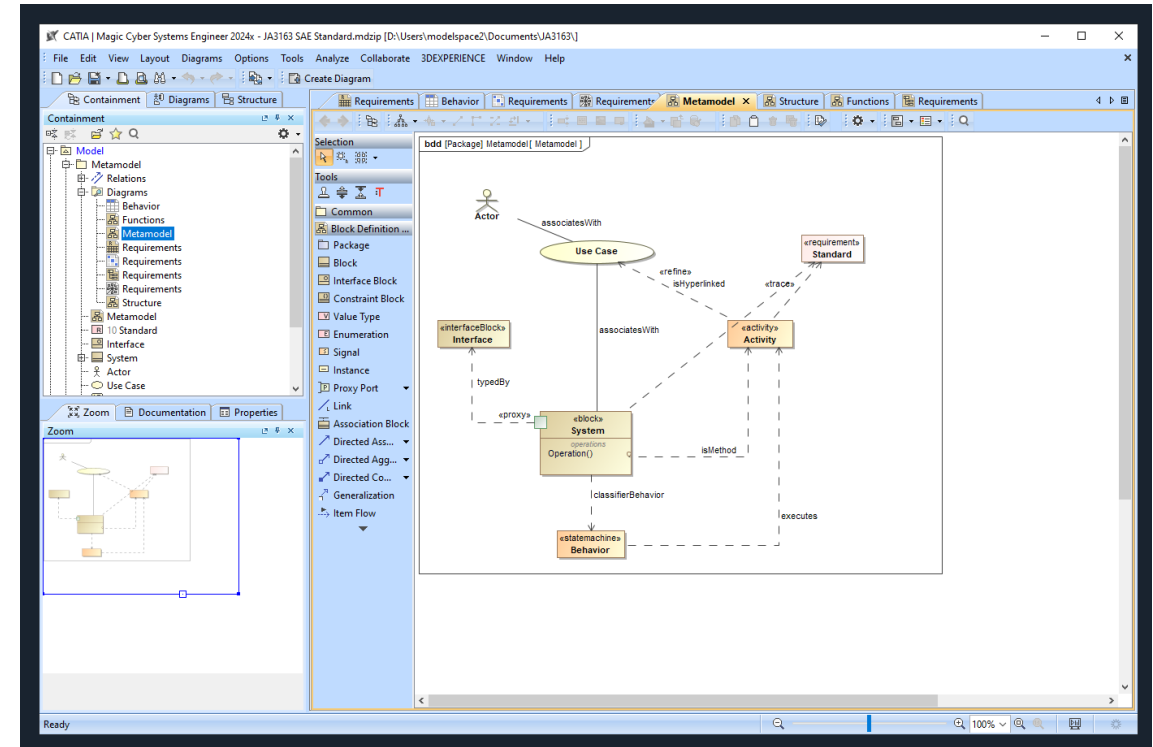
- Virtual environment set up on SAE network in Sept
- Accessible by SAE committees to write standards in a digital format
- First step to providing digital authoring capabilities

New Digital Engineering Committee: S-19

- Unify model-based engineering across SAE standards
- Promotes digital model development, interoperability, and simulation-based certification
- Develop standards for digital standards and help digitize traditional standards
- [Join today!](#)

MBSE Training

- MBSE professional development curriculum



Digital Standards Alliance

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Establishing best practices for the authoring and use of digital standards in the entire product development lifecycle (R&D, design, simulation/testing, verification/validation, certification, procurement, manufacturing, operation, & MRO)



Interoperability

Identify families of standards that share similarities and develop a standard ontology for each family



Education

Rules for authoring digital-ready standards and education about efficiency gains, ROI



Licensing & Business

Establish guidelines around licensing, pricing, and other



digitalstandardsalliance@sae-itc.org

DSA in Action: Pilot on Manufacturing Process

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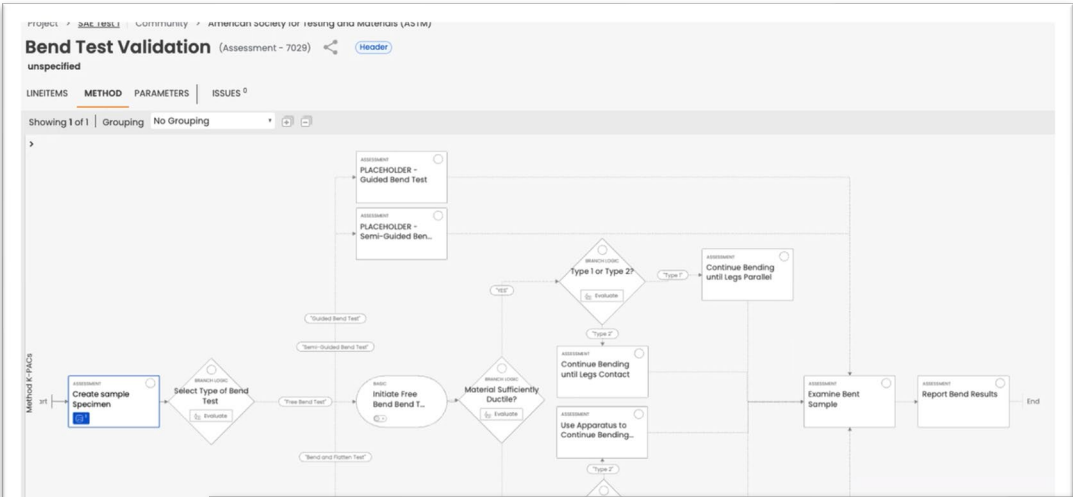
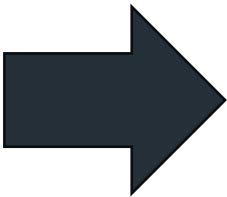
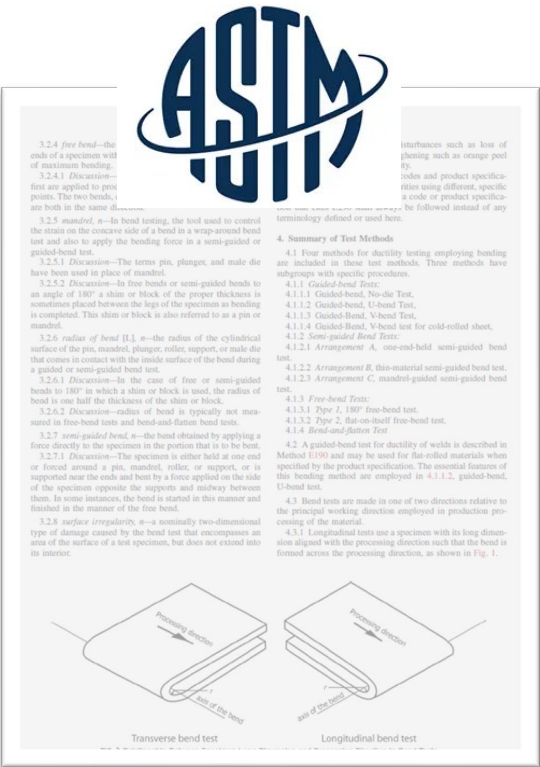


3.4.1.3 Bending

Product 0.275 inch (6.98 mm) and under in nominal thickness shall be tested in accordance with ASTM E290 using a sample prepared nominally 0.75 inch (19.0 mm) in width with its axis of bending parallel to the direction of rolling and shall withstand without cracking when bending at room temperature through the angle and bend diameter shown in Table 3. In case of dispute, the results of tests using the guided bend test of ASTM E290 shall govern.

Table 3 - Bending requirements

Nominal Thickness Inch	Nominal Thickness Millimeters	Type of Bend	Angle Deg. Min	Bend Factor
Up to 0.1874, incl	Up to 4.760, incl	Free Bend	180	1
Over 0.1874 to 0.275, incl	Over 4.760 to 6.98, incl	Free Bend	180	3



Project: SAE Test1 Community: American Society for Testing and Materials (ASTM)

Bend Test Validation (Assessment - 7029) Header

unspecified

LINITEMS METHOD PARAMETERS ISSUES 0

Showing 1 of 1 | Grouping: No Grouping

Method K-PACs

Placeholder - Guided Bend Test

Placeholder - Semi-Guided Bend Test

Guided Bend Test

Semi-Guided Bend Test

Select Type of Bend Test

Free Bend Test

Initiate Free Bend Test

Material Sufficiently Ductile?

Continue Bending until Legs Contact

Examine Bent Sample

Use Apparatus to Continue Bending

Report Bend Results

End

Project: SAE Test1 Community: American Society for Testing and Materials (ASTM)

Spec Requirement Step (Assessment - 7030) Header

unspecified

LINITEMS PARAMETERS ISSUES 1

Showing 19 of 19 | Grouping: No Grouping

Conformance State

K-PAC ID

S K

Description

Green

AST-136

V

perform the bend test using a similar 20 mm wide specimen. Refer to Test Methods 88/89 for the use of 3/4 in. wide blanks.

Green

ASTM-135

V

When samples are taken by core drilling, a 13 mm by 13 mm (1/2 in. by 1/2 in.) square cross section specimen may be machined from the core to make a bend-test specimen.

Green

ASTM-136

V

One major surface of rectangular specimens of reduced thickness shall be an as-fabricated surface of the section. [ASTM-253](#)

Yellow

ASTM-137

V

Surface Finishing of Specimen Edges—The longitudinal edges of a rectangular specimen, [ASTM-254](#) may be rounded to a radius not exceeding 15 mm (1/8 in.) for specimens equal to or less than 50 mm (2 in.), and rounded to a radius not exceeding 3 mm (1/8 in.) for specimens over 50 mm (2 in.) in thickness. [ASTM-255](#) Flame-cut surfaces shall be machined to remove metal affected by the flame cutting. Sheared edge surfaces shall be either machined or smoothed with a belt sander, file, or similar abrasive to remove metal affected by the shearing.

Yellow

ASTM-133

V

Machined surface of Specimens—For materials exceeding 13 mm (1/2 in.) in nominal thickness, distance across flats, or diameter. [ASTM-255](#) the specimen may be machined from the material when full-section, or full-thickness specimens are not used. The thickness or diameter of the specimen shall be at least 13 mm (1/2 in.). The ratio of width to thickness of rectangular specimens shall be at least 2:1 ([ASTM-248](#)), and the length shall be sufficient to permit bending to the angle of bend specified.

Yellow

ASTM-127

V

Full-cross-section Specimens—If the smallest dimension ([ASTM-248](#)) ([ASTM-132](#)) of the cross-section is equal to or less than 38 mm (1 1/2 in.), the specimen can be of the full thickness provided there is sufficient specimen length ([ASTM-248](#)) to permit bending to the specified angle of bend.

When it is not practicable to test full-cross-section specimens, but when it is still practicable to test full-thickness specimens from materials not exceeding 38 mm (1 1/2 in.) nominal thickness ([ASTM-132](#)), the specimens shall be of the thickness of

ASTM-136

Description

One major surface of rectangular specimens of reduced thickness shall be an as-fabricated surface of the section. [ASTM-253](#)

Parameters

BT_As_Fabricated_Surface_YN ([ASTM-253](#))

Assumptions

Issues

Knowledge Model

Value Table

is one major surface of rectangular specimens of reduced thickness on as-fabricated surface?

YES/NO

BT_As_Fabricated_Surface_YN

Other Info

K-PAC Type Requirement

Author Mullis, Tera(mullis)

Risk Level High

K-PAC Status Active

Current Version Published Date 02-Jul-2025

Support Document

Attributes

Pushed To(CoP)

Approved for Use Agencies

Document Section Sampling

Document Structure 08.03.07

Process Step Sample

Specification ID E290-22

Help us with validation! We need materials engineers or manufacturing engineers!

DSA in Action: Pilot on Standard Parts

Mobility, Advanced™

How Does This:

AS3101B BOLT, MACHINE - HEXAGON HEAD, PD SHANK, CORROSION AND HEAT RESISTANT STEEL, UNS S66286, .3125-24 UNJF-3A

Revised 03/03/2024

Description View **2D/3D** Data Sets Citation

2D/3D Drawings

Part Number	AS3101-13	
Thread Size - UNJF-3A	.3125-24	
Material	Corrosion Resistant Steel	
Procurement Specification	AS7477	
L Length	1.052-1.072	Inch
G Min	.044	Inch
K Max	.188	Inch
Approx mass - per unit	0.02870	lb
Approx mass - per package 100 pieces	2.87000	lb
Standard Revision Info	AS3101, Rev. B, Revised 2024-03	

Download CAD

Download PDF datasheet

You have not yet generated a CAD or PDF file for download.

3D Dimension

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Compare to These Data Models:

International Association of Oil & Gas Producers

WebFLIS® - Web Federal Logistics Information System

Access WebFLIS®

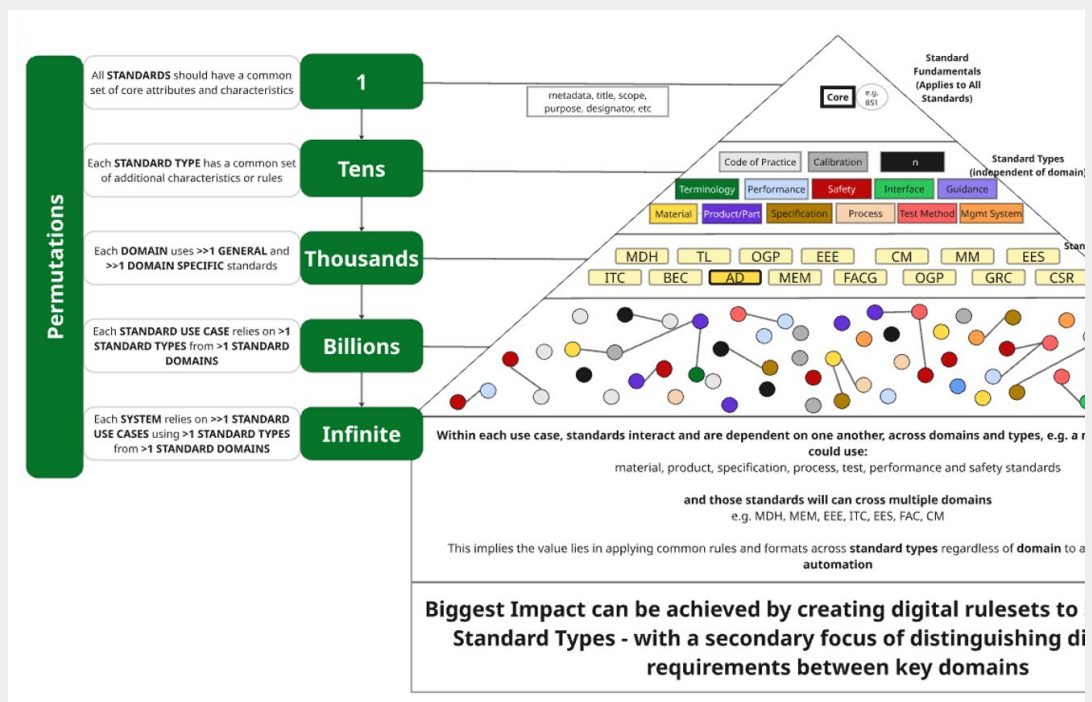
OEM-Developed Data Models

2026 DSA Pilots

Evolving from Documents to Data

Mobility, Advanced™

Schema-Driven Standards Codification



Persistent Identifiers

Paragraphs

Explicit Requirements

Implicit Requirements

Tables

Data points within Tables?

Normative and Informative References

Diagrams

Data within Diagrams?

Bibliography

Metadata

Formulae

For each of these, what happens:

- When a standard is withdrawn?
- When a standard is amended?
- When a corrigenda is issues?
- When the standard is an adoption of an international standard?

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Join Us on Our Digital Journey!

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Leslie McKay

Director, Digital Standards Development at SAE International

Vice-Chair of the Digital Standards Alliance

Professional experience

- Over 20 years' experience leading software and hardware product development projects.
- Over 10 years' developing solutions that leverage artificial intelligence and machine learning.
- Dedicated to establishing best practices for authoring and use of digital standards.

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Contact the DSA Directly: digitalstandardsalliance@fullsight.org