# Primer on the new DMSC Model-Based Characteristics (MBC) Standard


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# Agenda

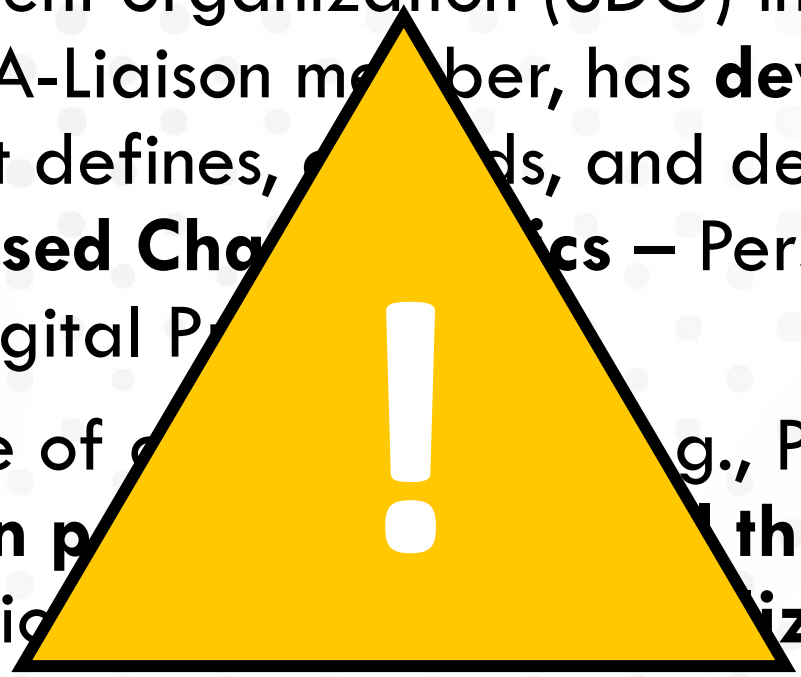
- Introduction
- Scope & Purpose
- Product Characteristics (PC)
- Augmentations
  - Criticality Classification (CC) Augmentation
  - Product Requirement Association (PRA) Augmentation
  - Verification Plan Requirement (VPR) Augmentation
- Product Characteristics Identification Framework
  - Reference ID
  - Instance ID
  - Use-Cases
- Applications
  - PTC Control Characteristics
  - QIF Characteristics
- Questions

# BLUF – Bottom Line Up Front

The **Digital Metrology Standards Consortium** (DMSC), a standards development organization (SDO) in America and an ISO TC184 SC4 A-Liaison m ber, has **developed** a **new DMSC standard** that defines, ds, and describes the usages of **Model-Based Cha ics** – Persistent Identification and Digital P

Standardizes the use of g., PTC, QIF) to **establish connection p thread** within the model-based definiti ization process.

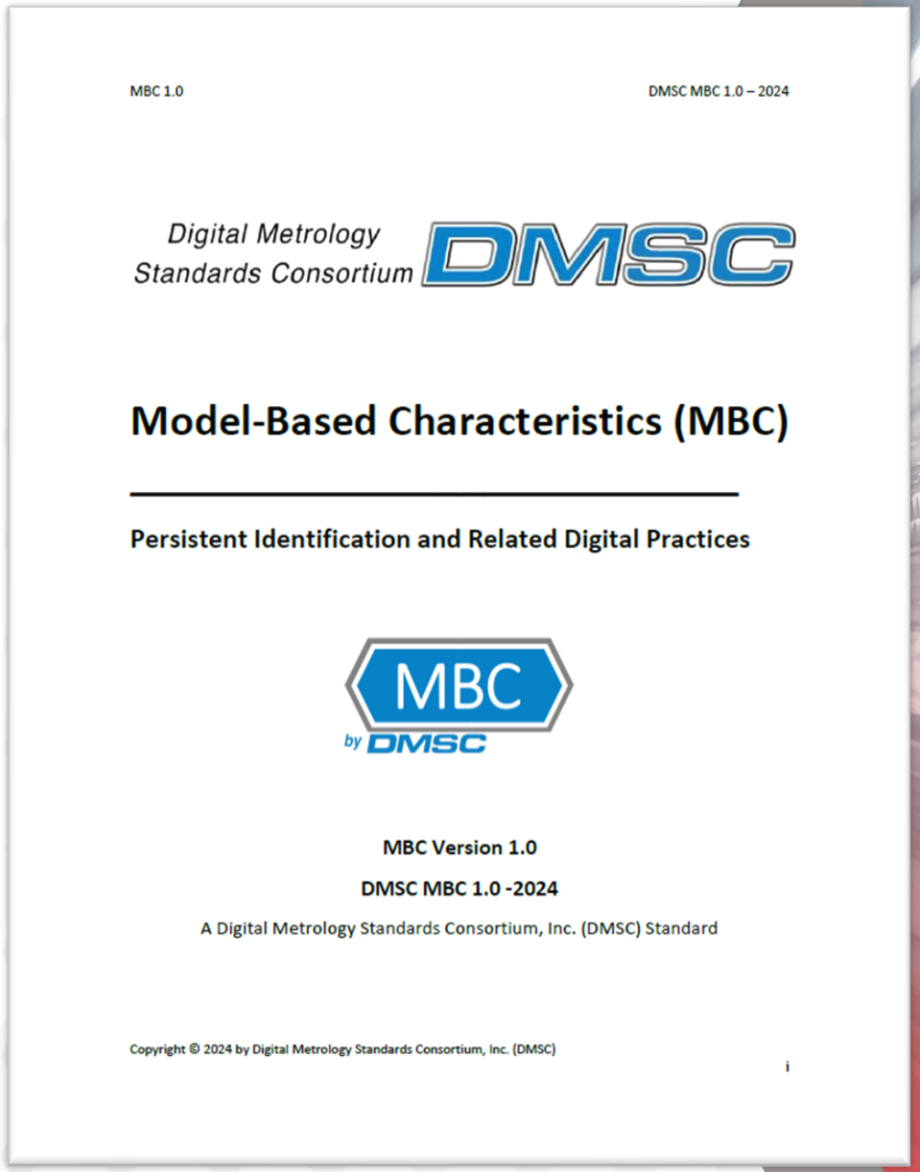
It should be available as a **free** download from the DMSC Q1CY24.



# Introduction

**DMSC MBC v1.0 2024 Model-Based Characteristics (MBC)** standard:

- **defines** common nomenclature, definitions, symbols, data structures
- **practices** for identifying, communicating, and exchanging model-based characteristics with various optional augmentations
- **behaviors** within a model-based system
- **through** both a logical data model and supporting documentation.



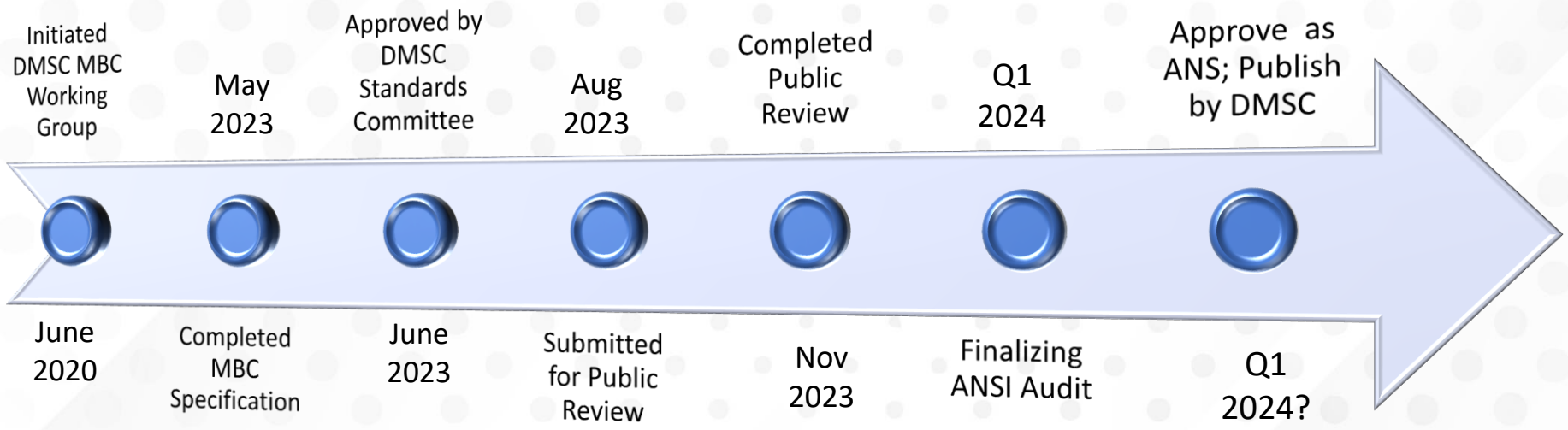
# DMSC MBC v1.0 2024 - Outline


- Contents
- Foreword
- Introduction
- 1 Scope and Purpose
- 2 Normative References
- 3 Terms and Definitions
- 4 Characteristics
- 5 Product Characteristics
- 6 Criticality Classifications (CC) Augmentation
- 7 Product Requirement Association (PRA) Augmentation
- 8 Verification Plan Requirement (VPR) Augmentation
- 9 MBC Structure Information Model
- 10 Informative Appendix


# DMSC Model-Based Characteristics:

## Persistent Identification and Related Digital Practices

Digital Metrology Standards Consortium (DMSC) – developers and maintainers of the ANSI/ISO DMIS* and ANSI/ISO QIF**.




MBC by DMSC

Will be available free of charge from the DMSC
On-line Article "Finish Line in Sight for New MBC Standard"
https://qifstandards.org/finish-line-in-sight-for-new-mbc-standard

* Dimensional Measuring Interface Standard (DMIS) – ISO 22093
** Qualify Information Framework (QIF) – ISO 23952

# DMSC MBC Working Group & Contributors

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- Curtis **Brown**, Honeywell FM&T (Vice-Chair, Editor)
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- Hermit Vega Albino, Pratt & Whitney
- Rosemary Astheimer, NIST
- Ryan Bounds, Newport News Shipbuilding
- Kevin **Braun**, John Deere
- Larry Bergquist, SKF Group
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- Jan De Nijs, Lockheed Martin
- Nathan Denver, L3Harris
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- Geoff Foulds, Origin International
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- Fred McMaier, Lockheed Martin
- John Tom Meeks, Boeing Co.
- Andrew Pierce, GE Appliances
- Jacob Sherwood, Pratt & Whitney
- Ray Stahl, 2BMobile
- Robert Stone, Origin International
- Jon Stothfang, B&W Software
- Annalise **Suzuki**, Elysium
- Mark Thomas, DMSC
- Mark White, LANL
- Benny Yap, Lam Research

# Scope and Purpose:

- Establishes a **baseline** for **characteristics** that are applied to product definition.
- Focuses on **Product Characteristics** (**PC**) and their optional **augmentations:**
  - Criticality classifications (CC),
  - Product requirement associations (PRA), and
  - Verification plan requirements (VPR).
- **Uniquely identifies verification requirement(s)** from annotations and specification documentation. ("Taming the wild west of print ballooning the drawing" – B. Stone)
- Introduces a **Product Characteristic identification framework** that specifies both the use of:
  - locally unique, **human-readable tag** identifiers coupled with
  - universally unique, **machine-readable** identifiers (**UUIDs**).

# Scope and Purpose:

- Complements and contributes to **extending** the Quality Information Framework (**QIF**) via next-gen QIF.
- Enables connection points that establishes a **digital thread** at the PC definition level
- Facilitates **persistent** and **explicit** means for:
  - Identifying verification Items for a **Bill of Characteristics**
  - Referencing Items within product definition **change control**
  - Referencing Items within Non-Conformance **Reports**
  - Obfuscating Item's Sensitive Information
- Captures MPC framework as **SysML** block diagrams
- Describes **system behaviors** for model-based applications that produce and/or use product characteristics.

# Terms and Definitions

Contains: Fifty-one Terms (noun, adjectives) w/ Definitions: (Samples)

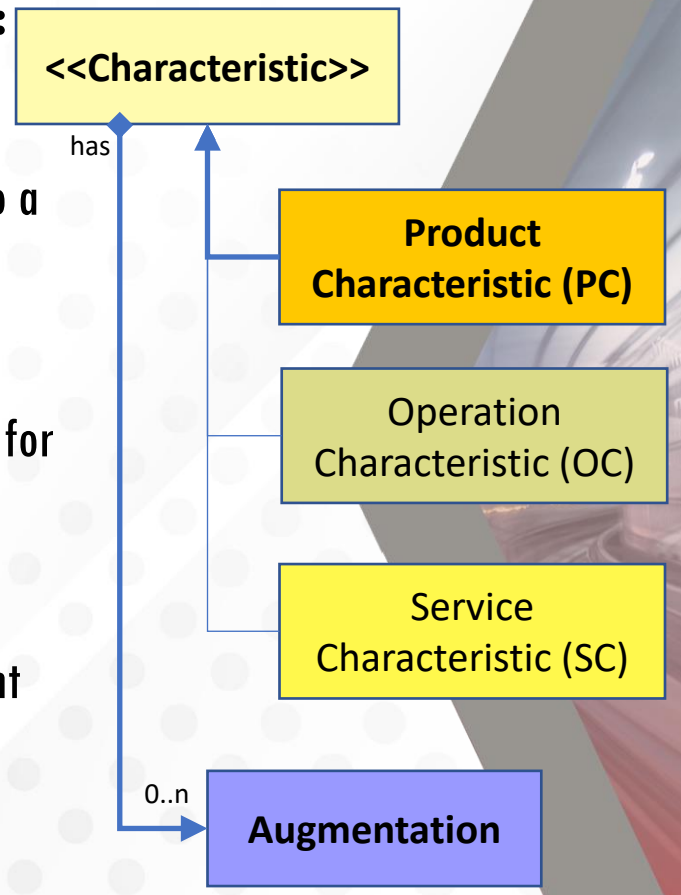
- Characteristic
- Characteristic Augmentation
- Characteristic, Product (PC)
- Criticality Classification (CC)
- Designator
- Identifier, Product Characteristic Extension
- Identifier, Product Characteristic Instance
- Identifier, Product Characteristic Reference
- Model, Model-Based Definition (MBD)
- Product Requirement Association (PRA)
- Tag, Product Characteristic
- Tag, General
- Universally Unique Identifier
- Verification Plan Requirement (VPR)

# Mode-Based Characteristic (MBC)

Establishes a **baseline for characteristics**, they can be a:

- **Product Characteristic (PC)**
  - a characteristic, which is created to identify a verification requirement, applied to a feature or of a product, initiated during the product definition activity.
- Operation (Process) Characteristics (OC)
  - a characteristic, which is created to identify an operation or process requirement for the product realization process of a product or of a feature of a product.
- Service Characteristic (SC)
  - a characteristic, which is created to identify a service or maintenance requirement for the sustainment of a product or of a feature of a product.

Has zero or many augmentations:




**This version** of the MBC standard specifically **focuses** on **product characteristics** (PC) and **their optional augmentations**.

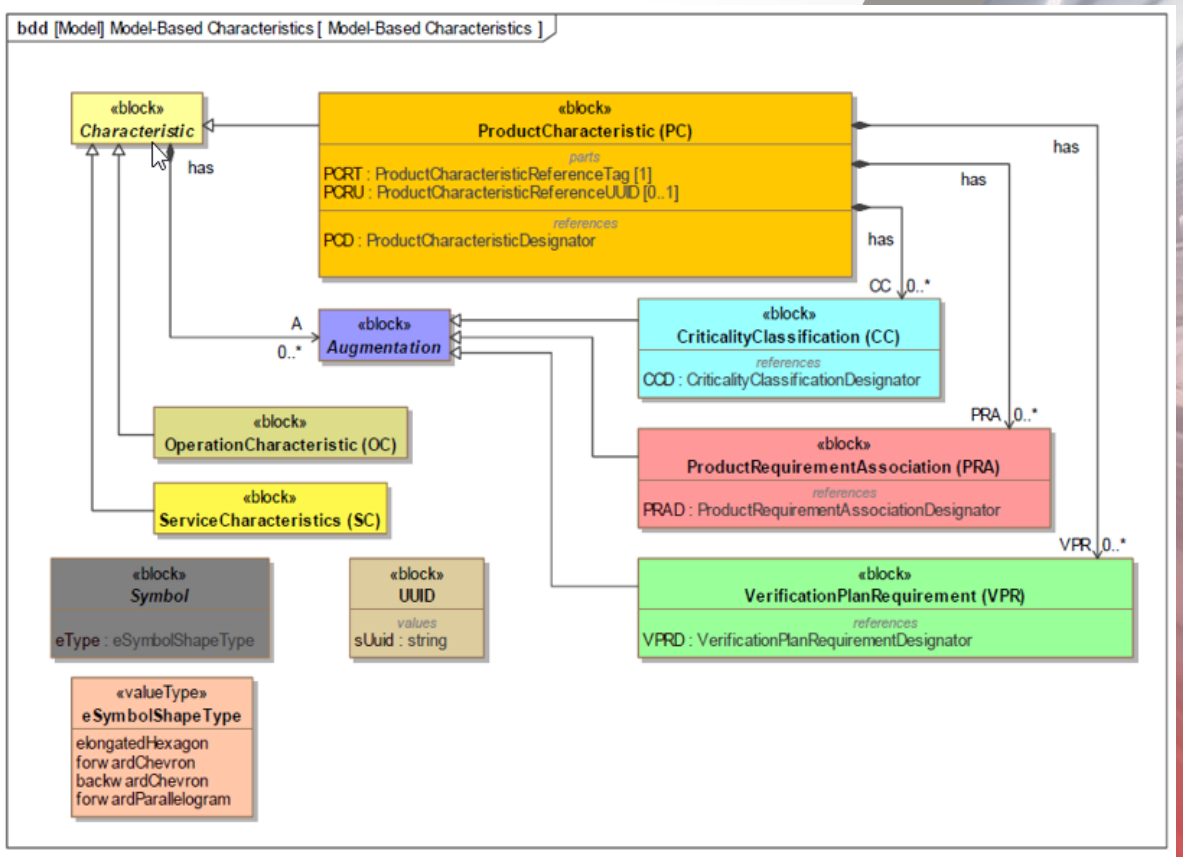
# Product Characteristic (PC)

Is a **Characteristic** which is **created to identify a verification requirement applied to a product or a feature of a product.**

Has zero or many **augmentations:**

- Criticality Classification (CC)
- Product Requirement Association (PRA)
- Verification Plan Requirement (VPR)

**Verification Requirements** are **tolerances** or **specifications** applied to a part feature or product which **requires verification** to **assure product acceptance**, typically **communicated** via **annotations**, attributes, and/or **specification documents**.



# Product Characteristic Identifier Structure

## Locally Unique, Human-Readable Tag Identifier

| PC Tag Formats | With PC Prefix | Without PC Prefix |
|---|---|---|
| PC Designator Symbol | ⟨PC42⟩ | ⟨007⟩ |
| PC Designator Textual | <PC42> | <007> |

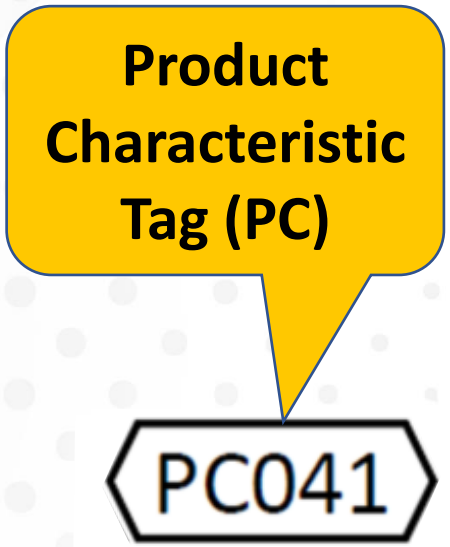
PC Reference Tag Designator Presentation Examples

## Universally Unique, Machine-Readable Identifying Attribute (UUID)

**DA8612FE-B1E4-423B-8191-B746E224C595**

PC Reference UUID adheres to the **ISO/IEC 9834-8 standard** as a universal unique identifier

# Product Characteristics Designations

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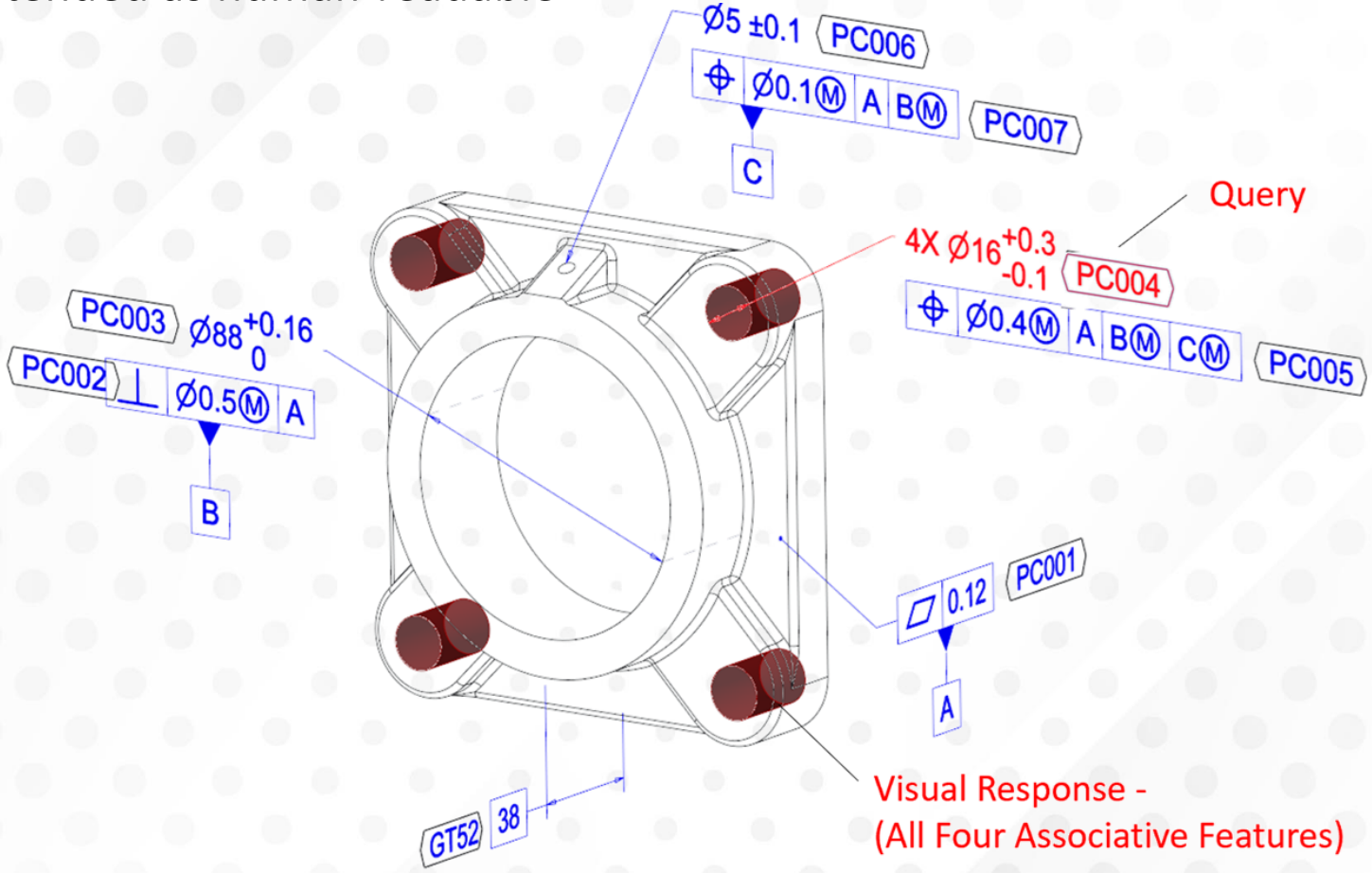
PC Reference Tag

# Product Characteristic (PC) Tag w/Annotation

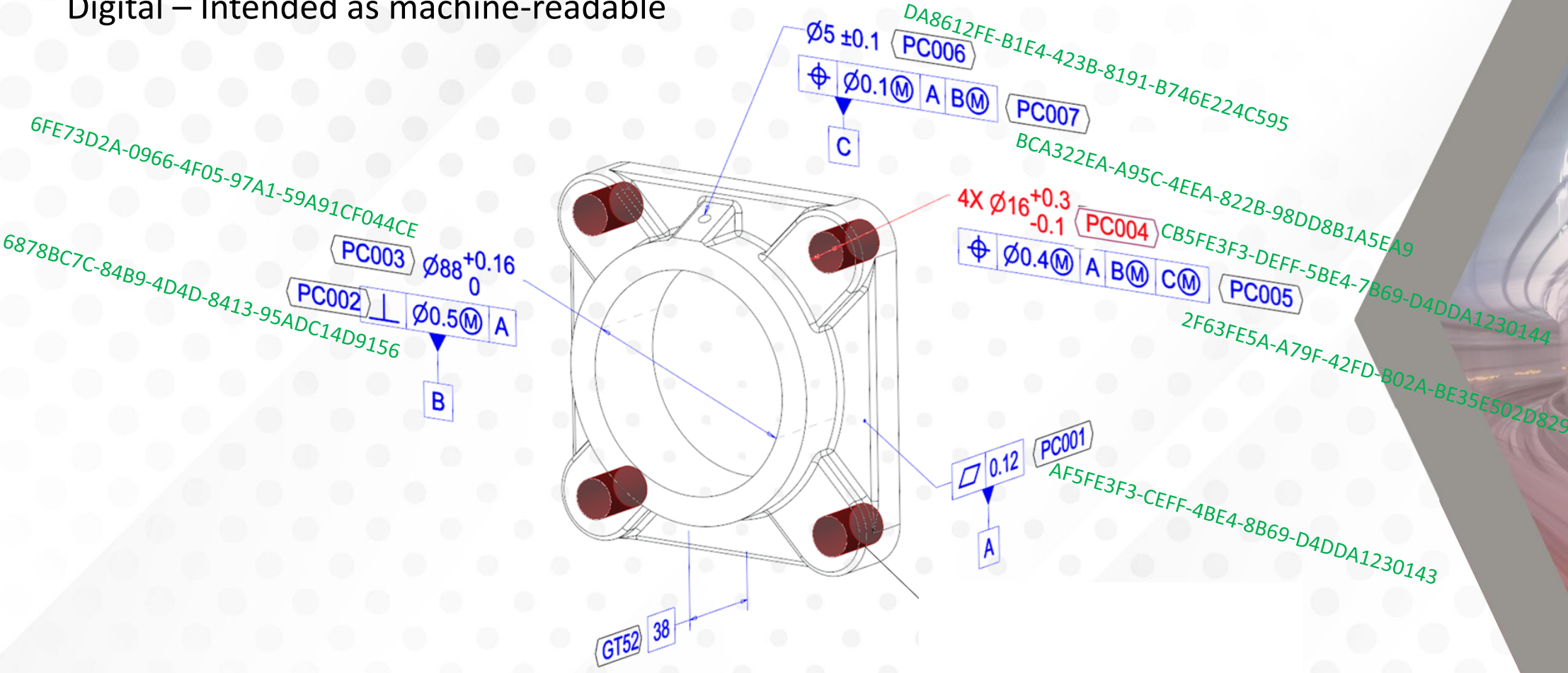
Electronic – Intended as human-readable




Visualization of a Model-Based Definition with Product Characteristic Reference Tags

# Product Characteristic (PC) UUID Attributes

Digital – Intended as machine-readable




Representation of a Model-Based Definition with Product Characteristic Reference Tags & UUIDs



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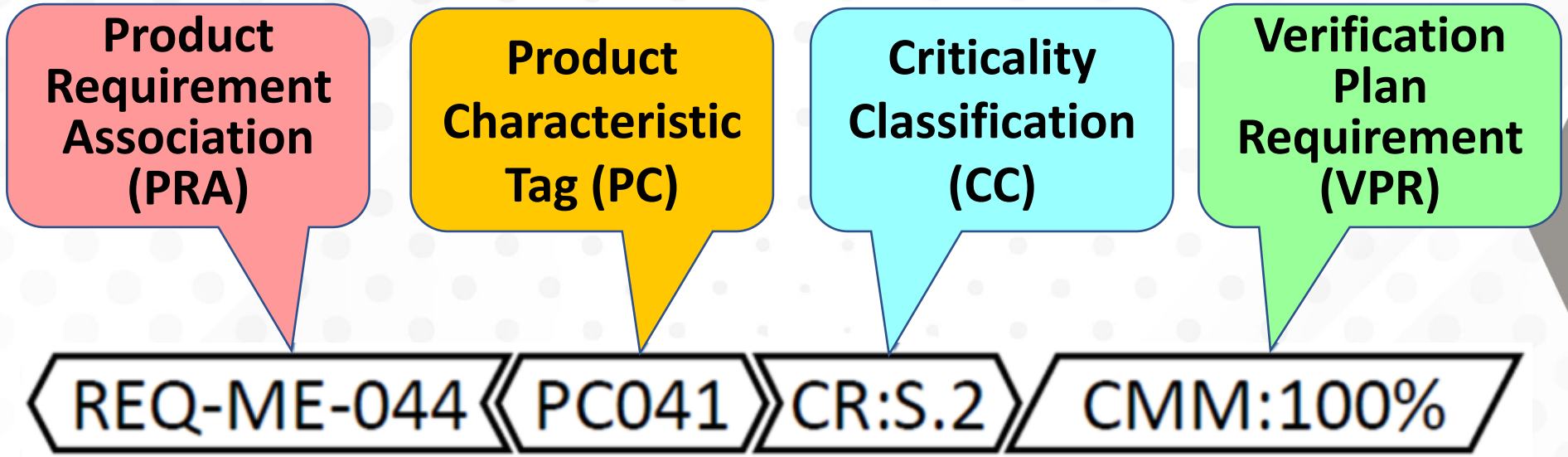
# Product Characteristics Designations with all optional Augmentations Example

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PC Reference Tag with All Augmentations

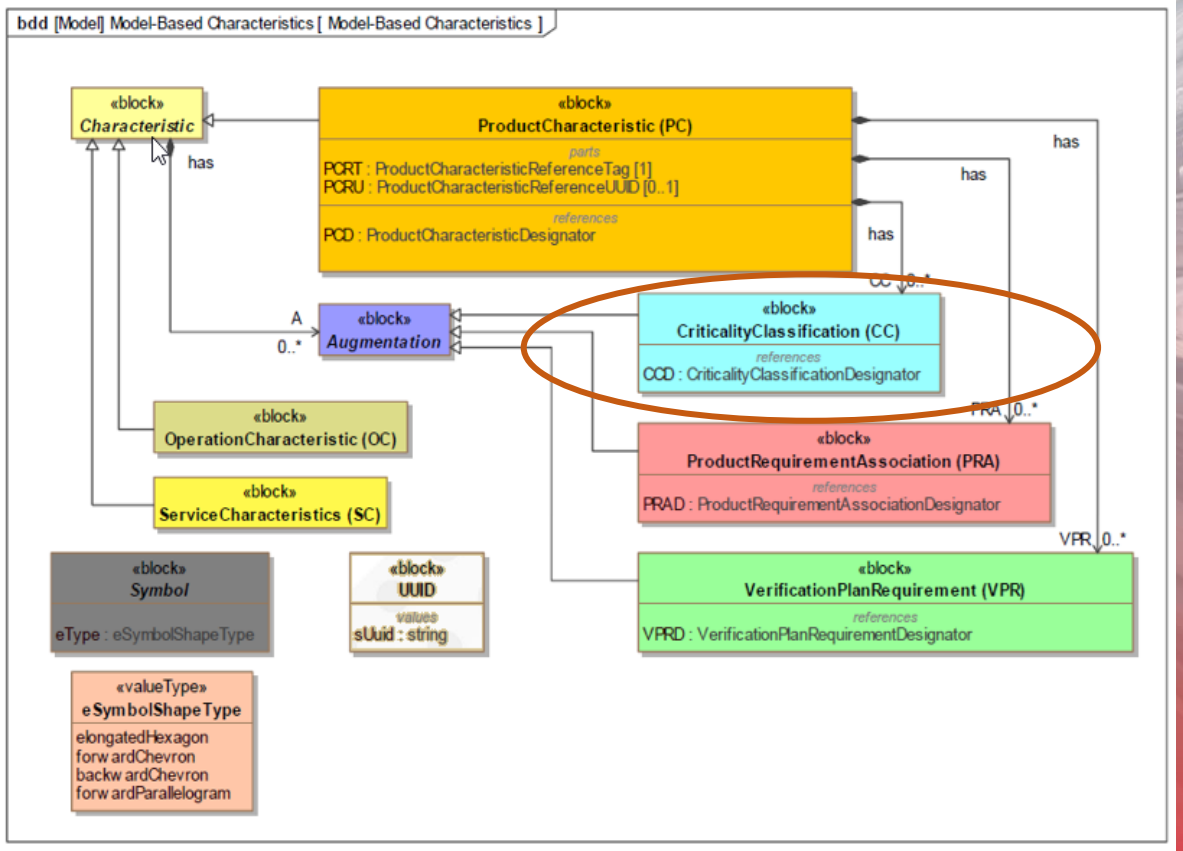
# Product Characteristic (PC) w/CC

**Is a Characteristic which is created to identify a verification requirement applied to a product or a feature of a product.**

Has zero or many augmentations :

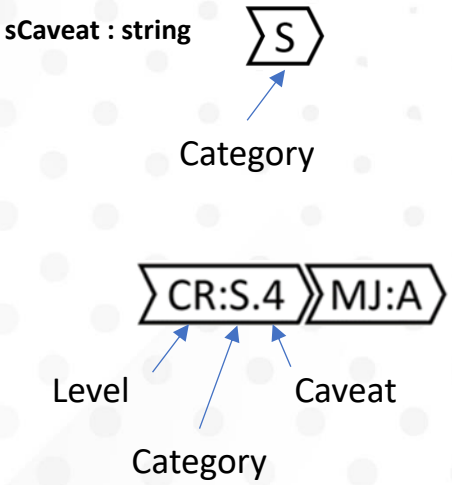
- **Criticality Classification (CC)**
- Product Requirement Association (PRA)
- Verification Plan Requirement (VPR)

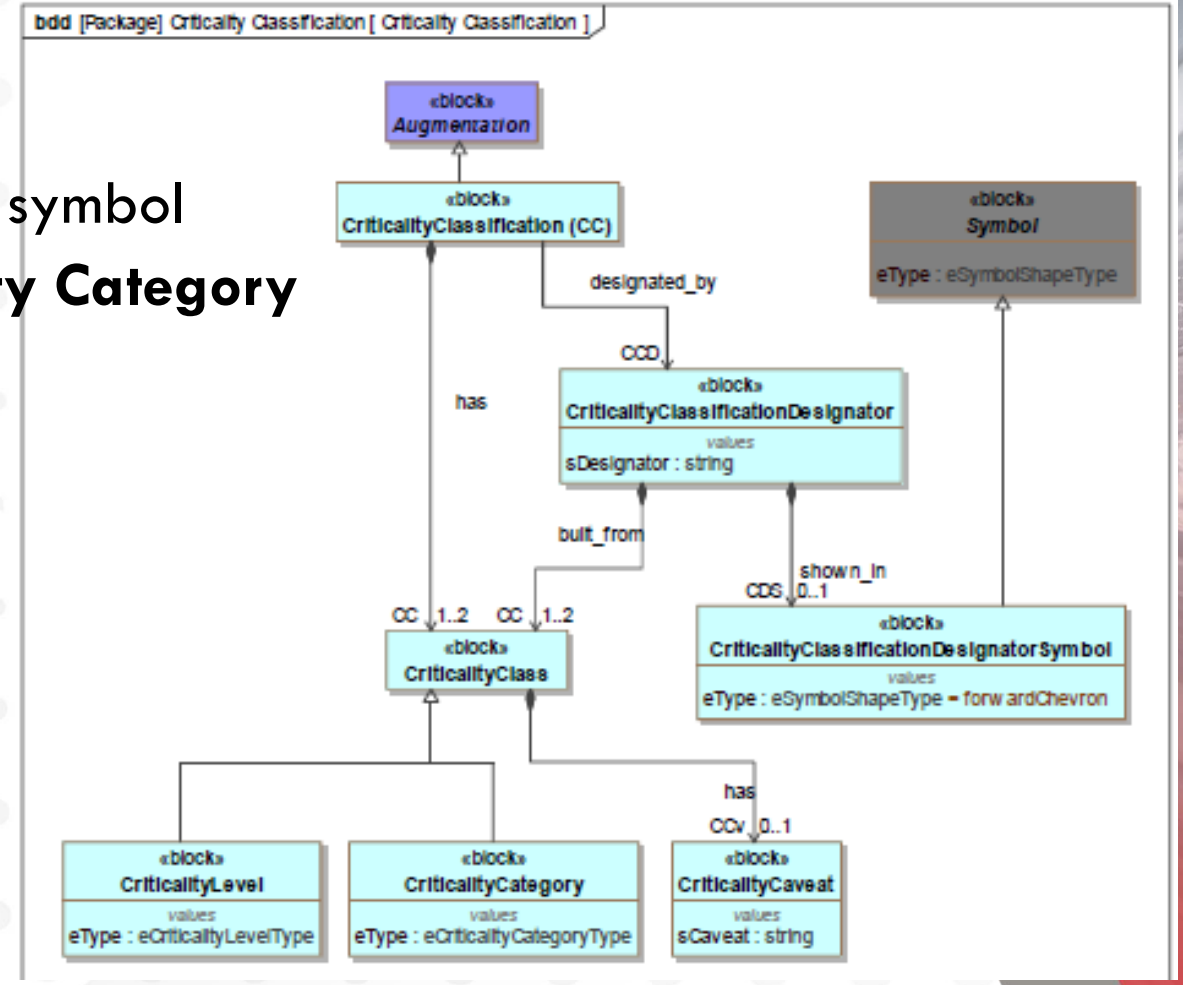
**Verification Requirements** are **tolerances** or **specifications** applied to a part feature or product which **requires verification** to **assure product acceptance**, typically **communicated** via annotations, attributes, and/or specification documents.cc



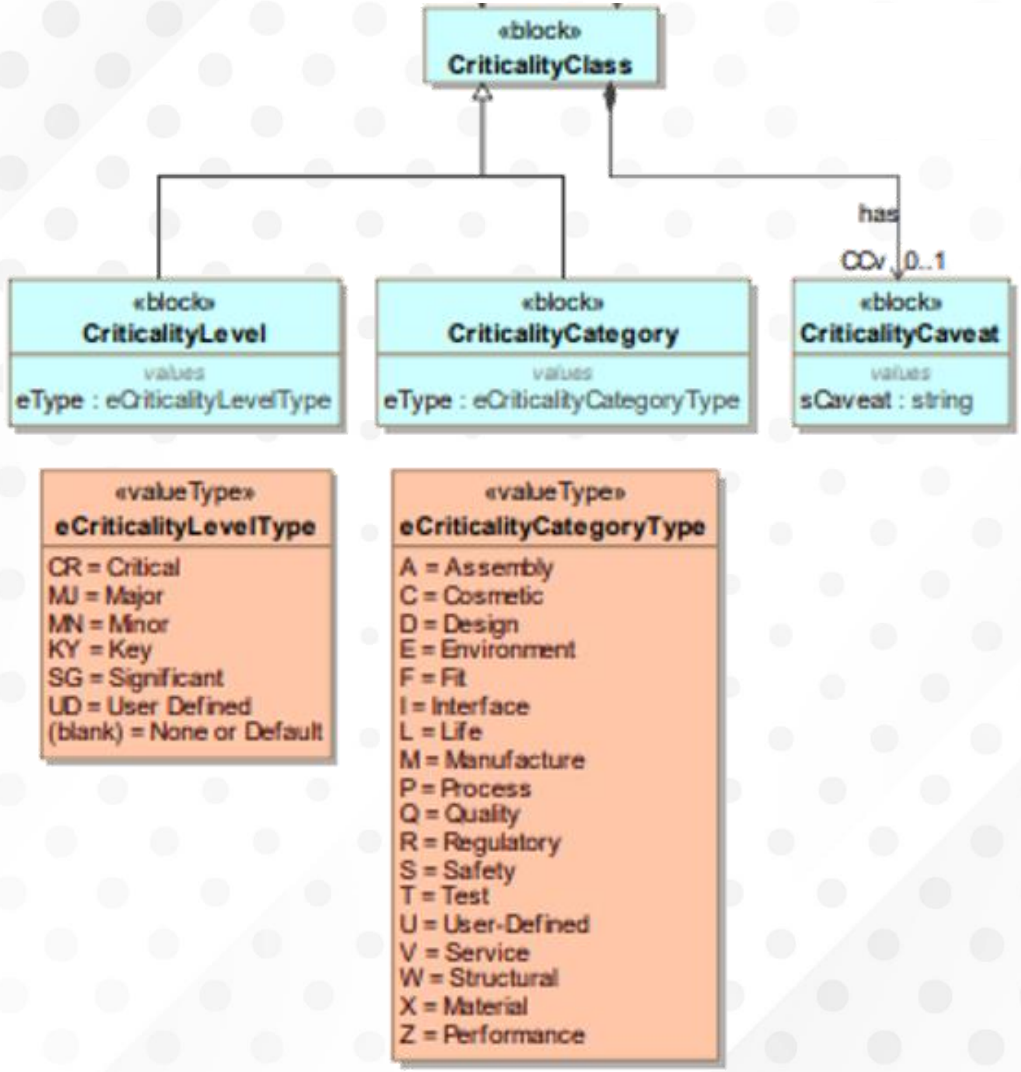
# Criticality Classification (CC) Augmentation

- A **PC** may have one or many **Criticality Classifications** (CC)
- CC is a PC Augmentation
- CC designates the criticality of the PC
- CC has a designator w/**Forward-Chevron** symbol
- CC has a **Criticality Level** and/or **Criticality Category**
- CC may have a **Criticality Caveat**

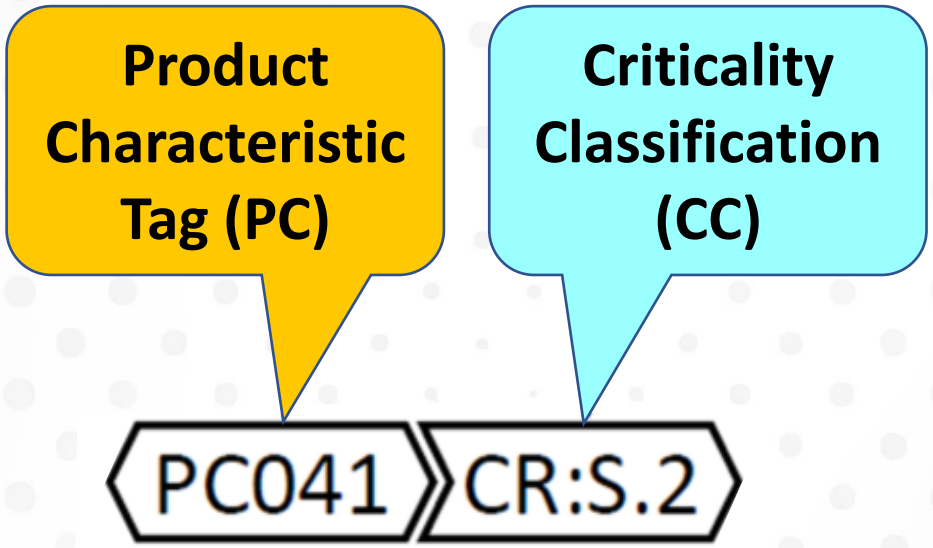



# Criticality Levels, Categories, & Caveats



# Product Characteristic Designation with an optional CC Augmentation Designation

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PC Reference Tag with an Augmentation

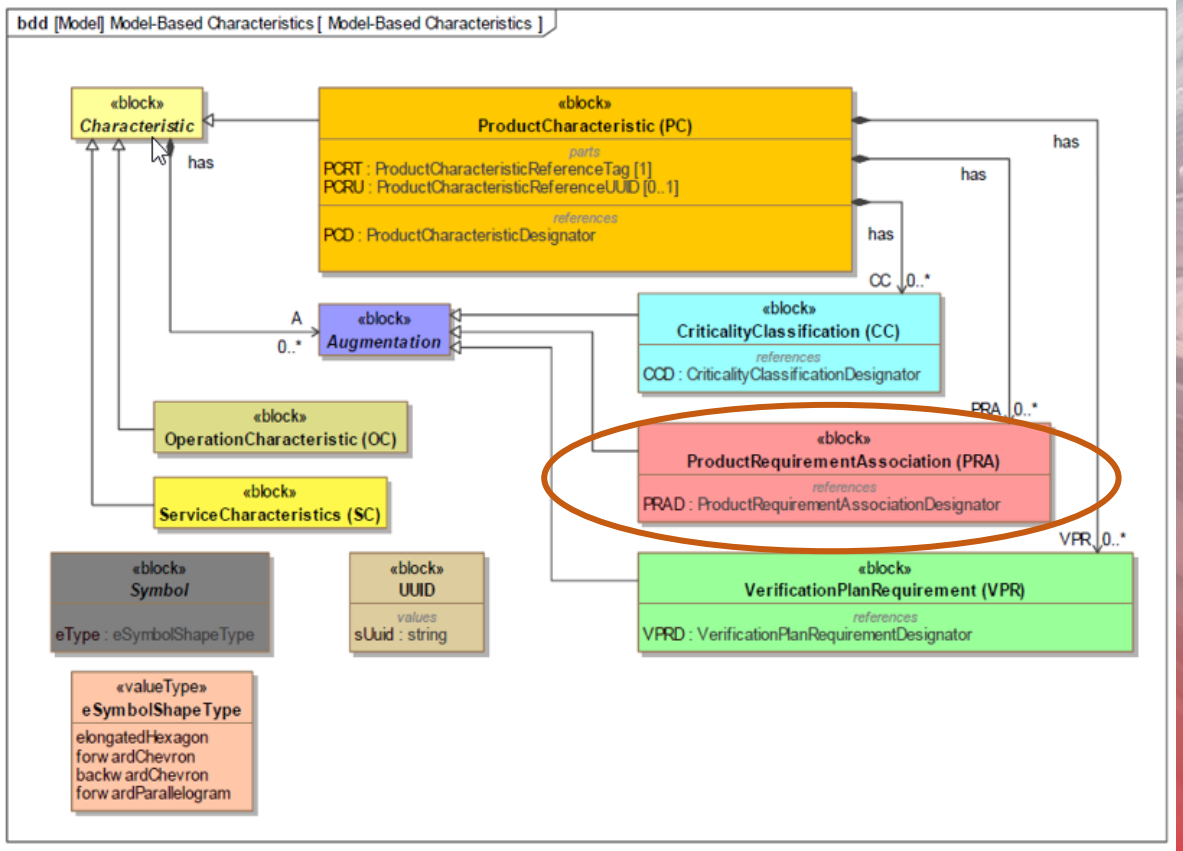
# Product Characteristic (PC) w/PRA

**Is a Characteristic which is created to identify a verification requirement applied to a product or a feature of a product.**

Has zero or many augmentations :

- Criticality Classification (CC)
- ***Product Requirement Association (PRA)***
- Verification Plan Requirement (VPR)

**Verification Requirements** are **tolerances** or **specifications** applied to a part feature or product which **requires verification** to **assure product acceptance**, typically **communicated** via annotations, attributes, and/or specification documents.cc



# Product Requirement Association (PRA) Augmentation

A **PC** may have one or many **Product Requirement Associations** (PRA)

- PRA is an PC Augmentation
- PRA designates/associates the Product Requirement driving this PC
- PRA has a Designator w/Backward-Chevron Symbol
- PRA may have a **UUID**
- PRA may have a **Reference Link**

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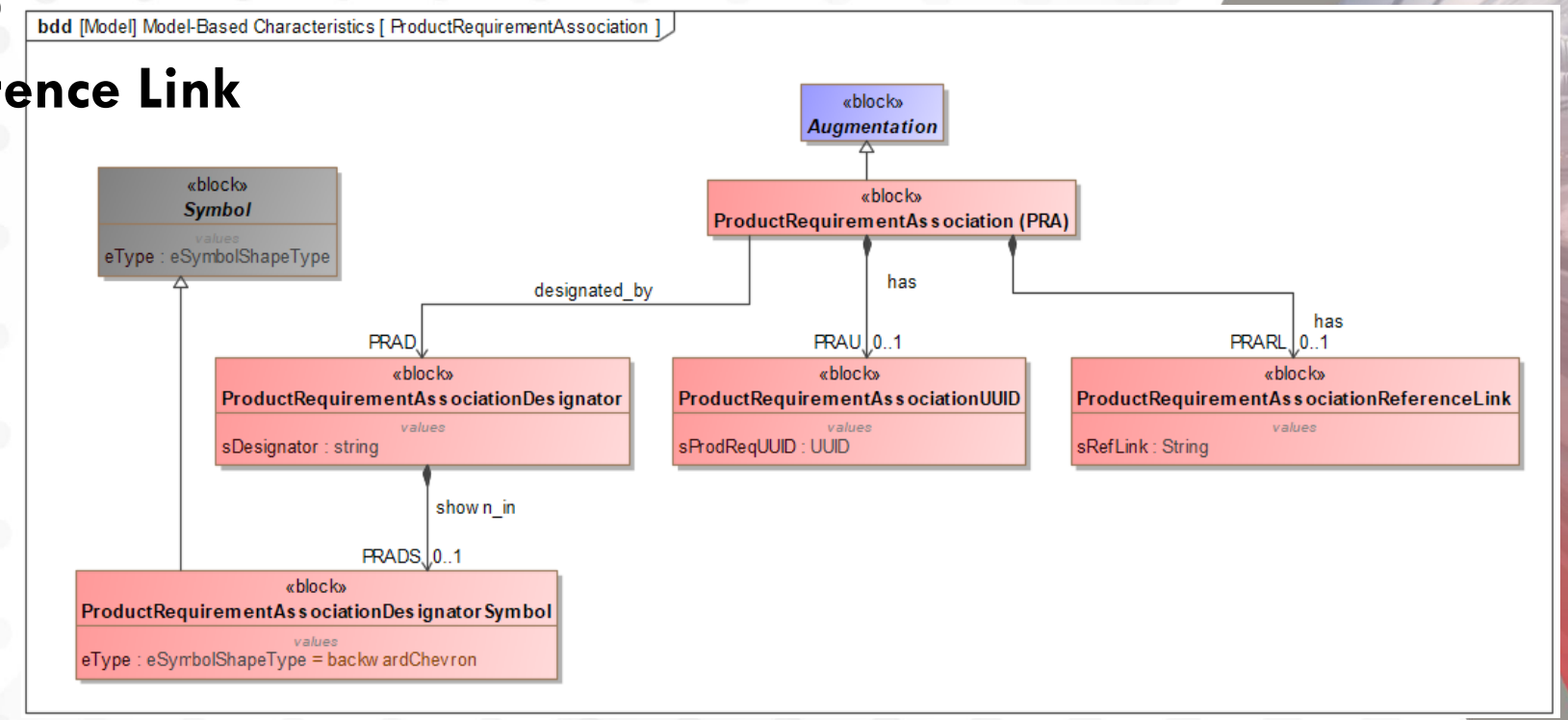
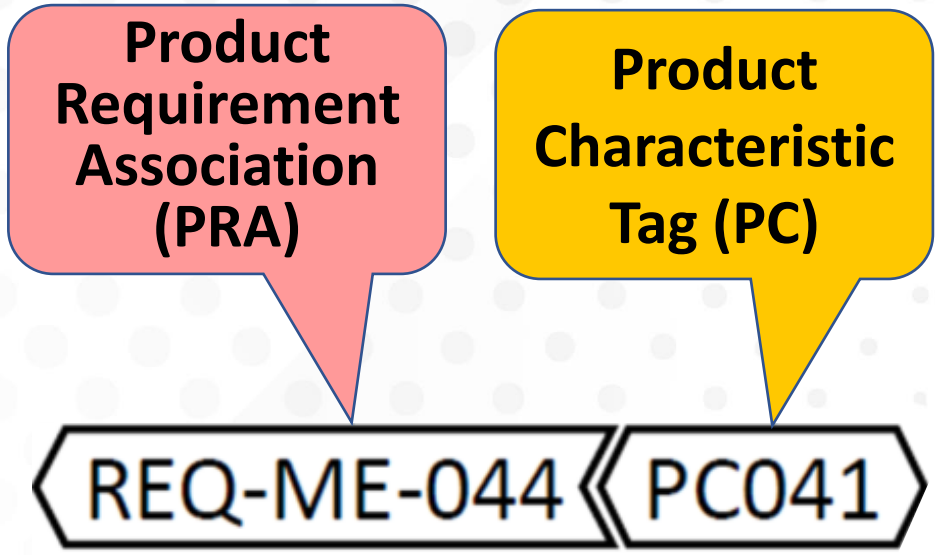


# Product Characteristic Designation with an optional PRA Augmentation Designation

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PC Reference Tag with an Augmentation

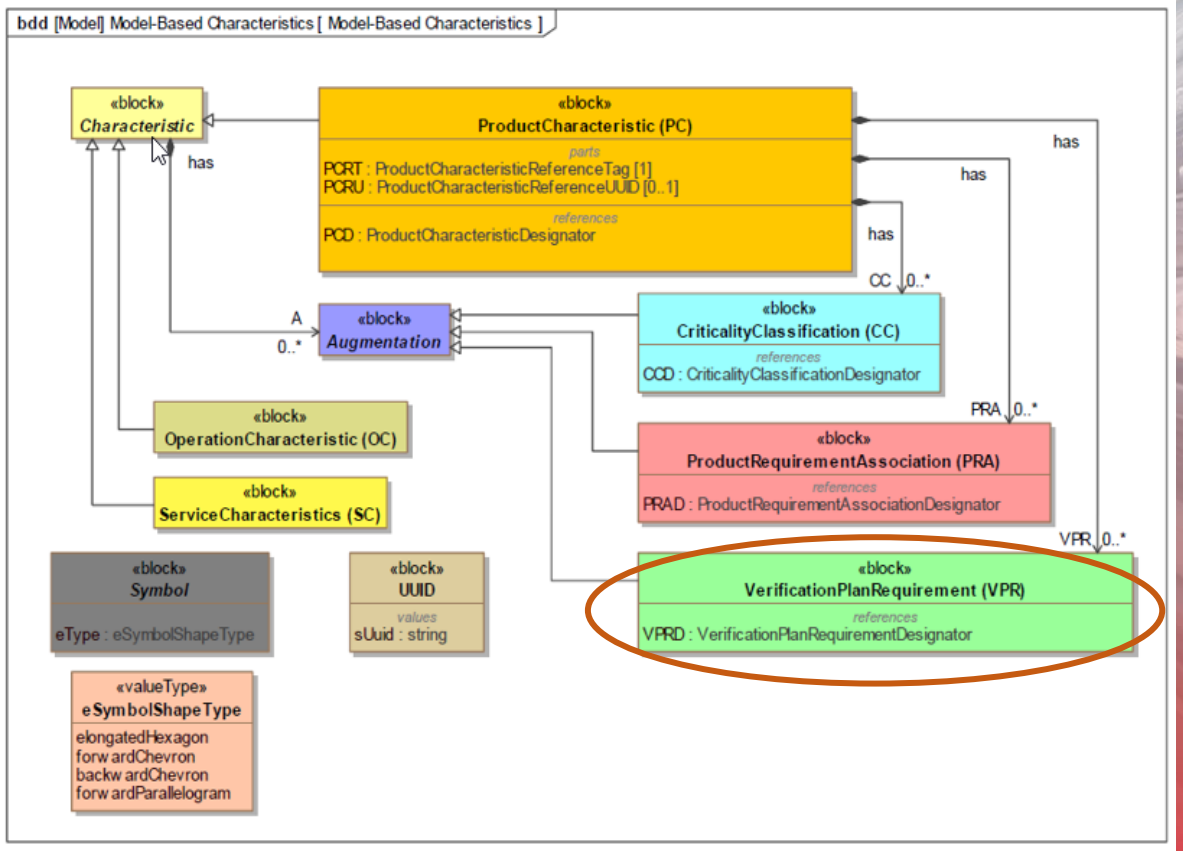
# Product Characteristic (PC) w/VPR

**Is a Characteristic which is created to identify a verification requirement applied to a product or a feature of a product.**

Has zero or many augmentations :

- Criticality Classification (CC)
- Product Requirement Association (PRA)
- ***Verification Plan Requirement (VPR)***

**Verification Requirements** are **tolerances** or **specifications** applied to a part feature or product which **requires verification** to **assure product acceptance**, typically **communicated** via annotations, attributes, and/or specification documents.cc



# Verification Plan Requirement (VPR) Augmentation

A **PC** may have one or many **Verification Plan Requirements** (VPR)

- VPR is a PC Augmentation
- VPR designates requirements for the product Verification Plan
- VPR has a Designation w/Forward-Parallelogram Symbol
- VPR has a **Verification Method**
- VPR may have a **Verification Context**
- VPR may have a **Verification Alternative**
- VPR may have a **Sampling Plan**

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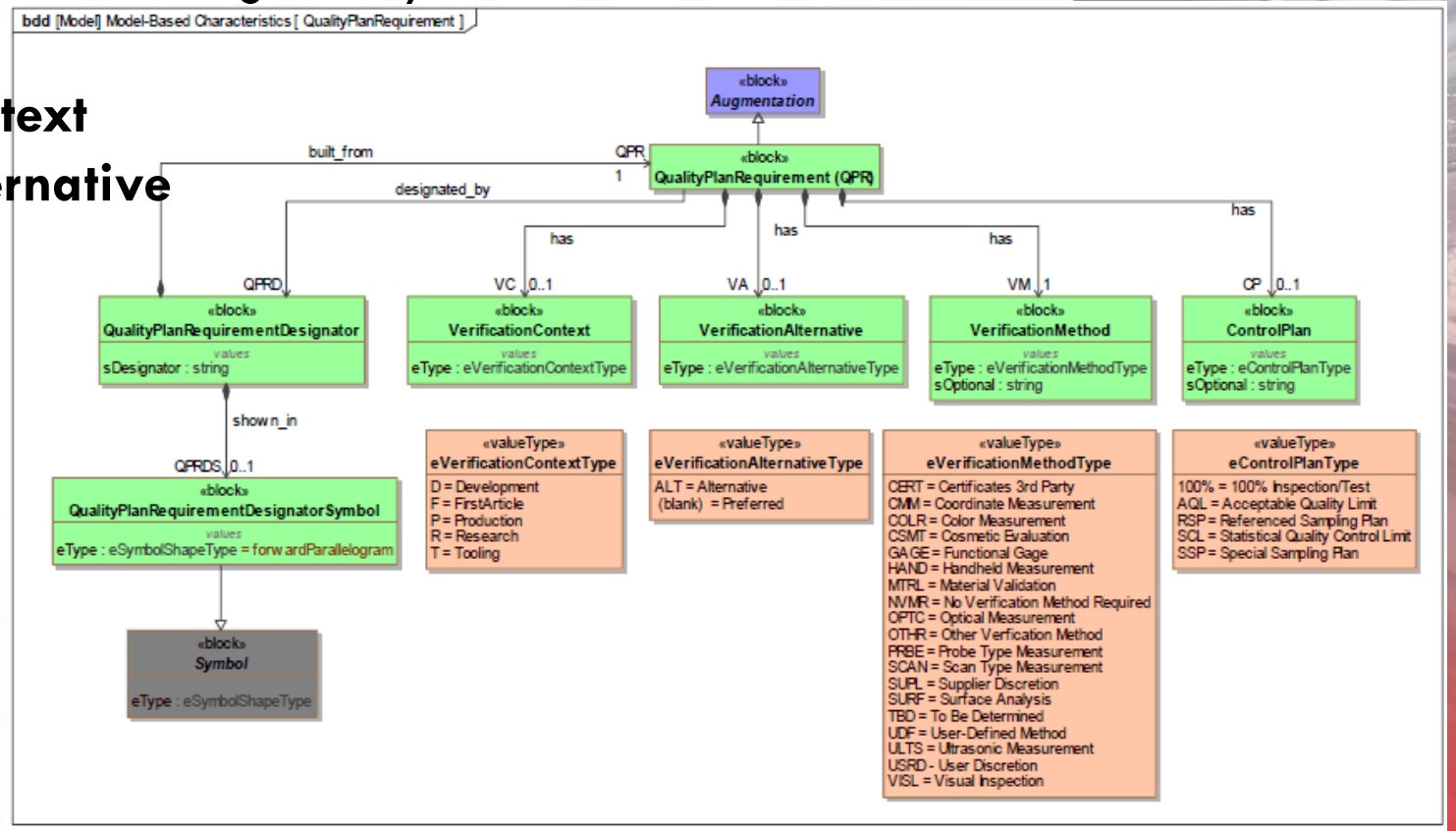
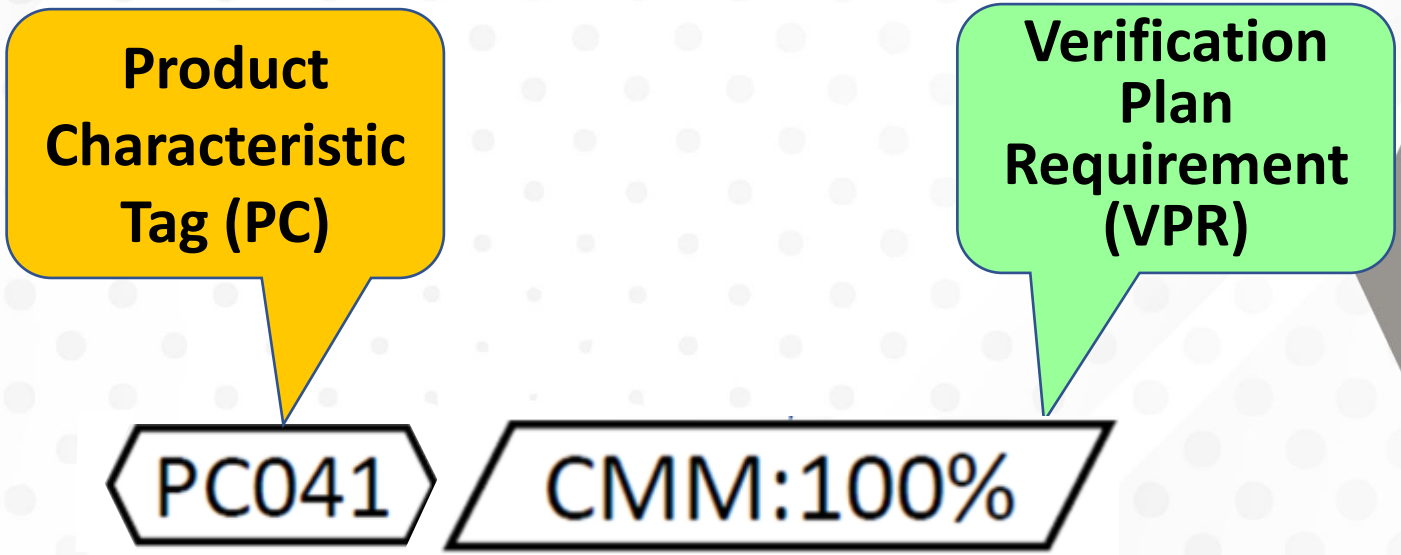


# Product Characteristic Designation with an optional VPR Augmentation Designation

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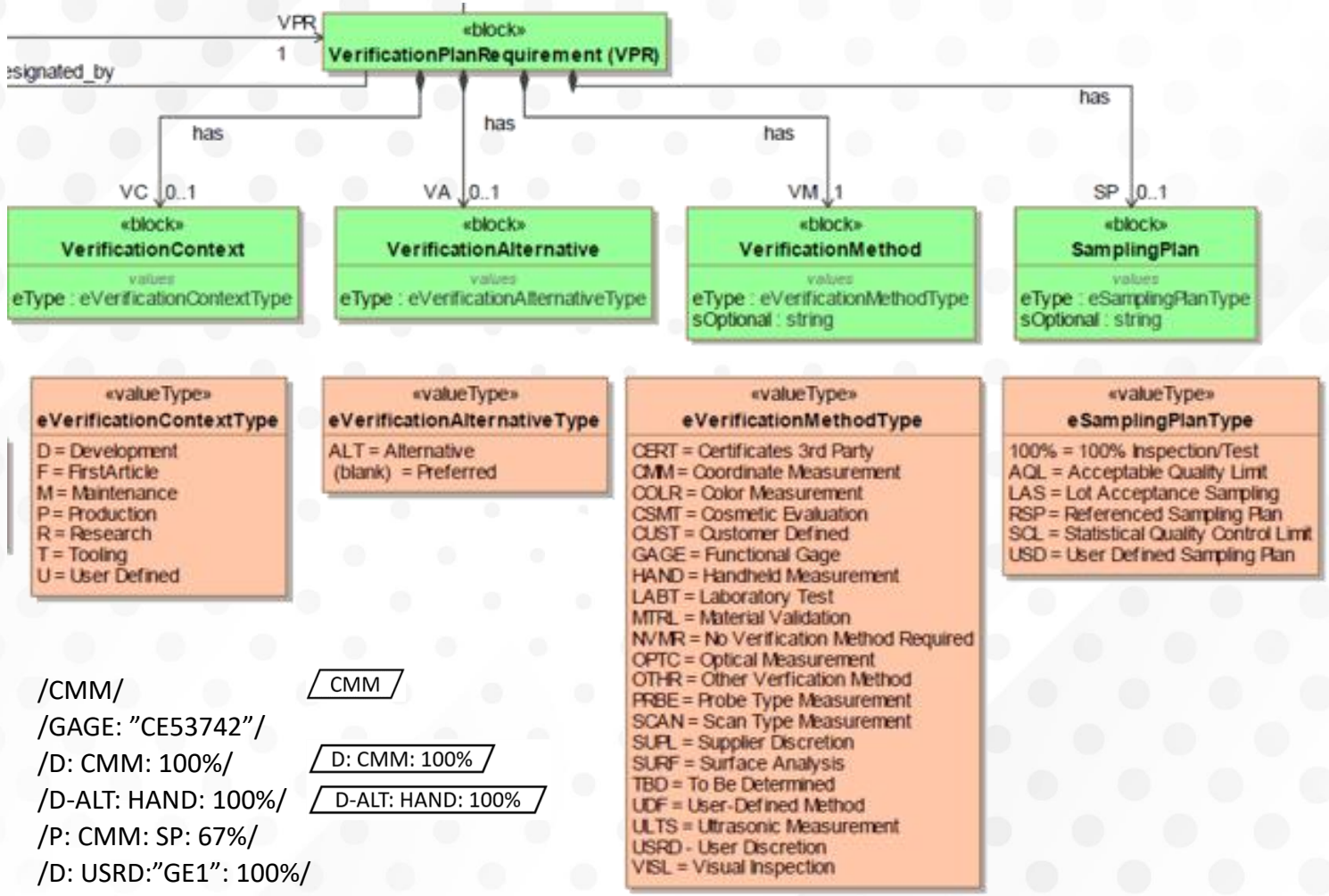
PC Reference Tag with an Augmentation

# Verification Plan Requirement (VPR) Method, Context, Alternative, Sampling Plan

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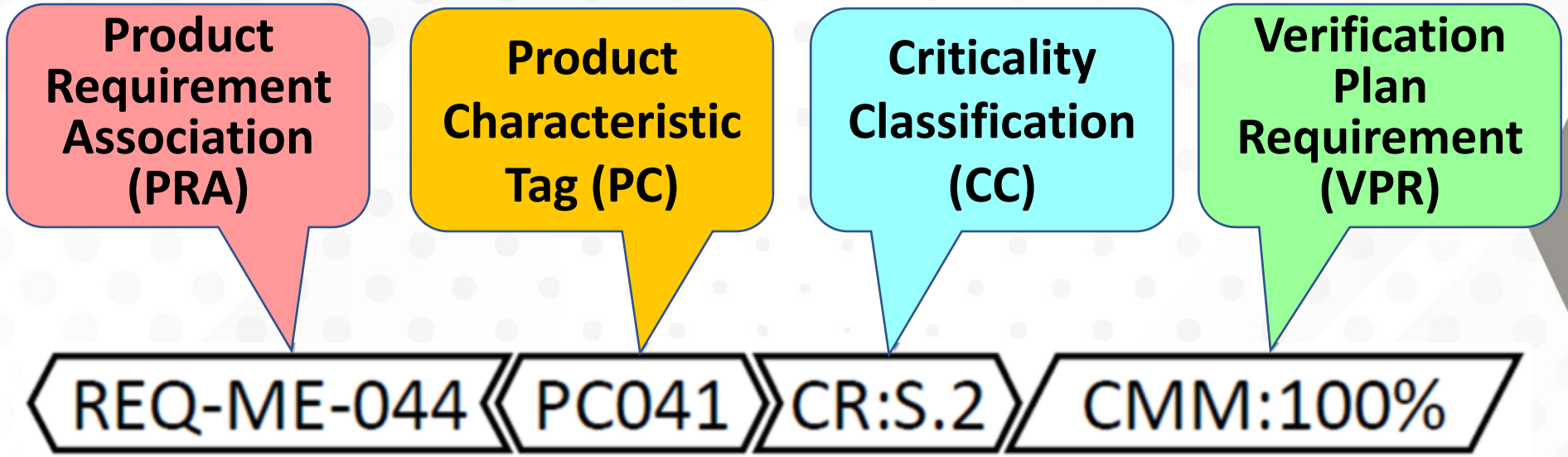
# Product Characteristics Designations with all optional Augmentations Example

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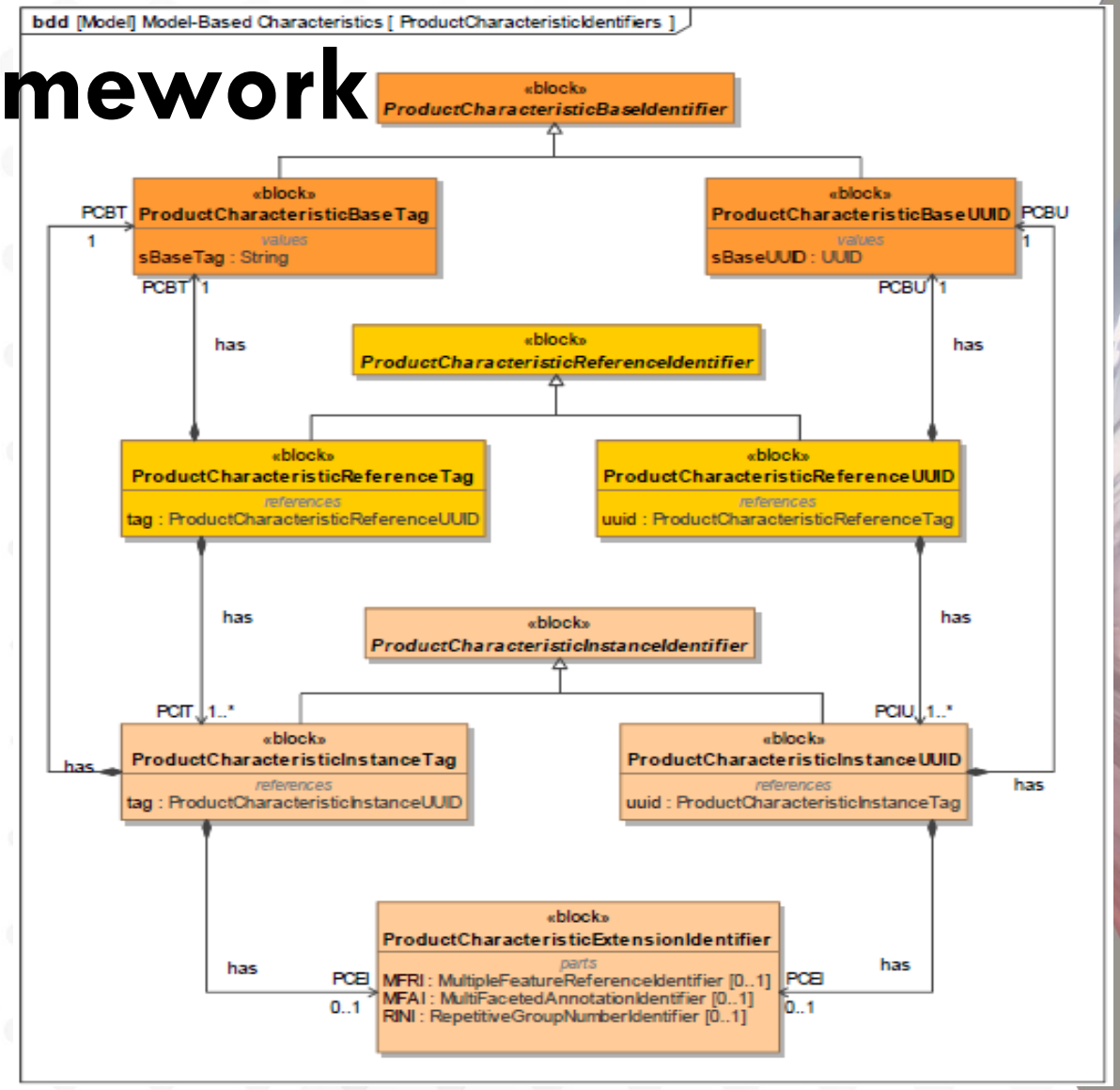
PC Reference Tag with All Augmentations

# PC Identification Framework

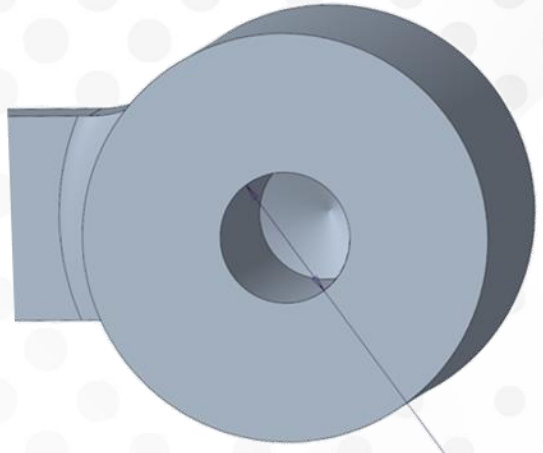
- Human & Computer **Identifiers**
  - **Tags**
  - **UUIDs**
- **Base** Identifier, basis for:
  - Reference Identifiers
  - Instance Identifiers
- **Reference** Identifiers
- **Instance** Identifiers
- **Extension** Identifiers
  - Uniquely extends Instance ID
  - Multi-Faceted Annotation
  - Multiple Feature Reference
  - Repetitive Group Number



# PC Identification Framework – PC Reference ID

- PC **Reference** Identifier – Section [5]
  - Associated with Annotation [Verification Requirement] (e.g., Tolerance, Specification)
  - Has a human-readable **PC Reference Tag**
    - Shown with Annotation [Verification Requirement]
  - Should have a computer-readable **PC Reference UUID**
  - Has one or many **PC Instance** Identifiers
    - As Human-Readable PC Instance Tag
    - As Computer-Readable PC Instance UUID
- Non-PC **General** Tag (GT) – Section [5.19]
  - Shown with annotation [Non-Verification Requirement] (e.g., BASIC Dimension)

# Product Characteristic for an Application [5.6]



Ø9.6±0.2 (71)
↧ 20.2 ± 0.5 (72)

Ra 3.2 <PC006>

| | | | | | |
|---|---|---|---|---|---|
| ⌓ | 1 | A | B | C | <PC030> |
| // | 0.5 | A | | | <PC031> |
| ▱ | 0.12 | | | | <PC032> |

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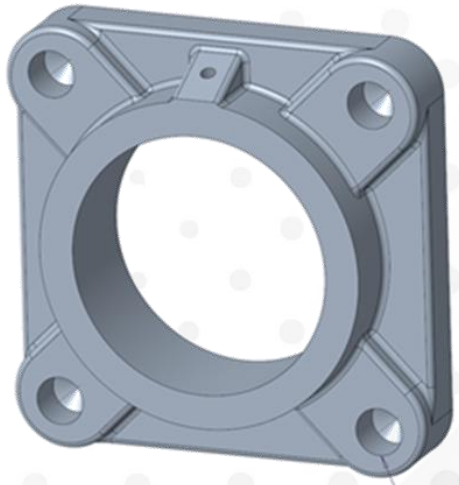
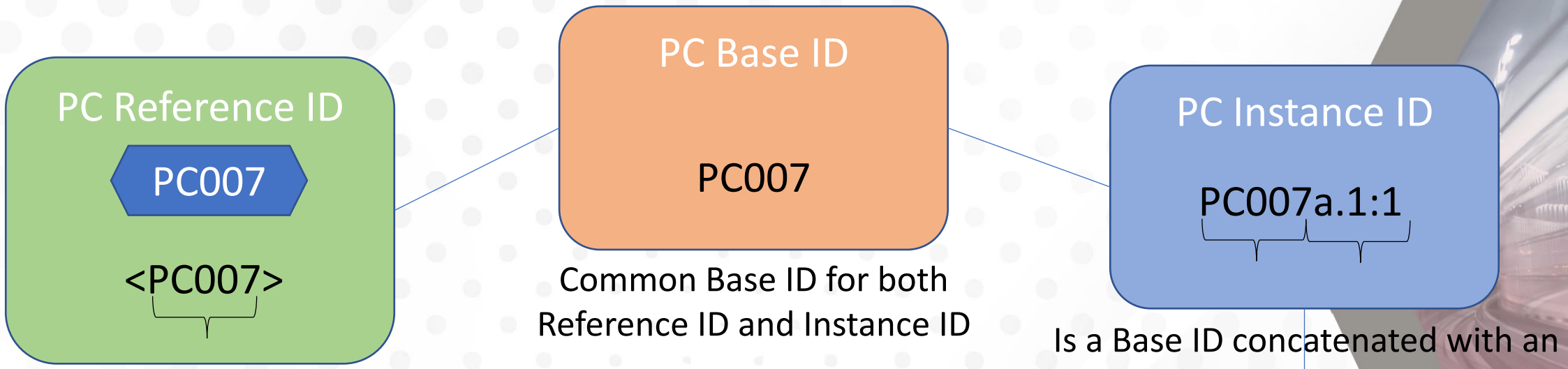


4X M6 x 1–5H6H (PC763)
MAX DRILL DEPTH 9 (PC764)
MIN FULL THD 6.3 (PC765)
⌖ Ø0.1Ⓜ D BⓂ CⓂ (PC766)

# PC Identification Framework

- The PC **Reference** Identifier and PC **Instance** Identifier are both **built from** a common PC **Base** Identifier.
- PC ID can be a **human-readable Tag** or **computer-consumable UUID**




Common Base ID for both Reference ID and Instance ID

Is a Base ID housed within a Symbol or Bookend with "<" and ">"; Used to designate a Product Characteristic

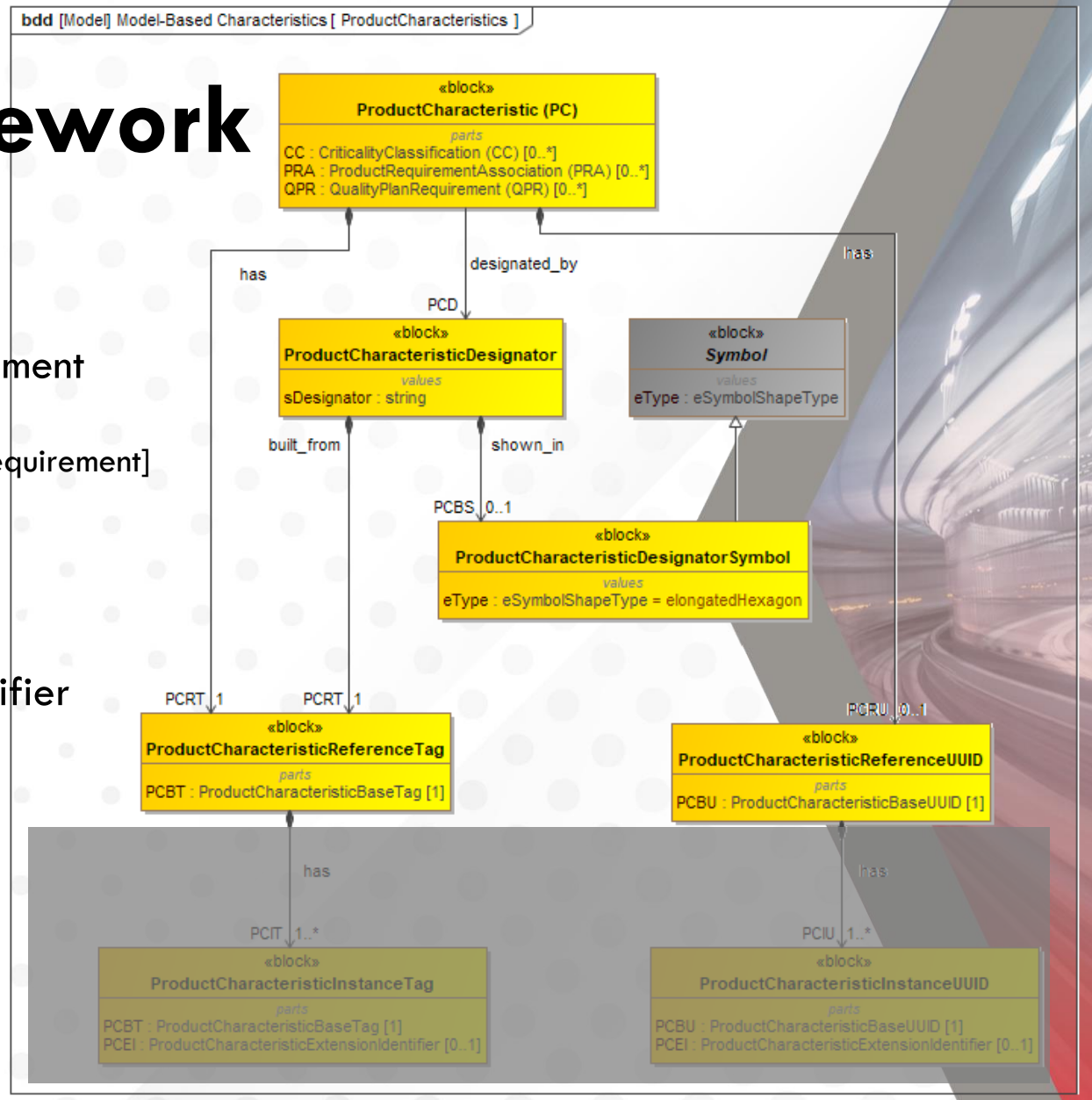
Is a Base ID concatenated with an Extension ID. Used to designate multi verification instance use-cases.

**PC Extension ID**

- Multi-Faceted Annotation
- Multiple Feature Reference
- Repetitive Group Number

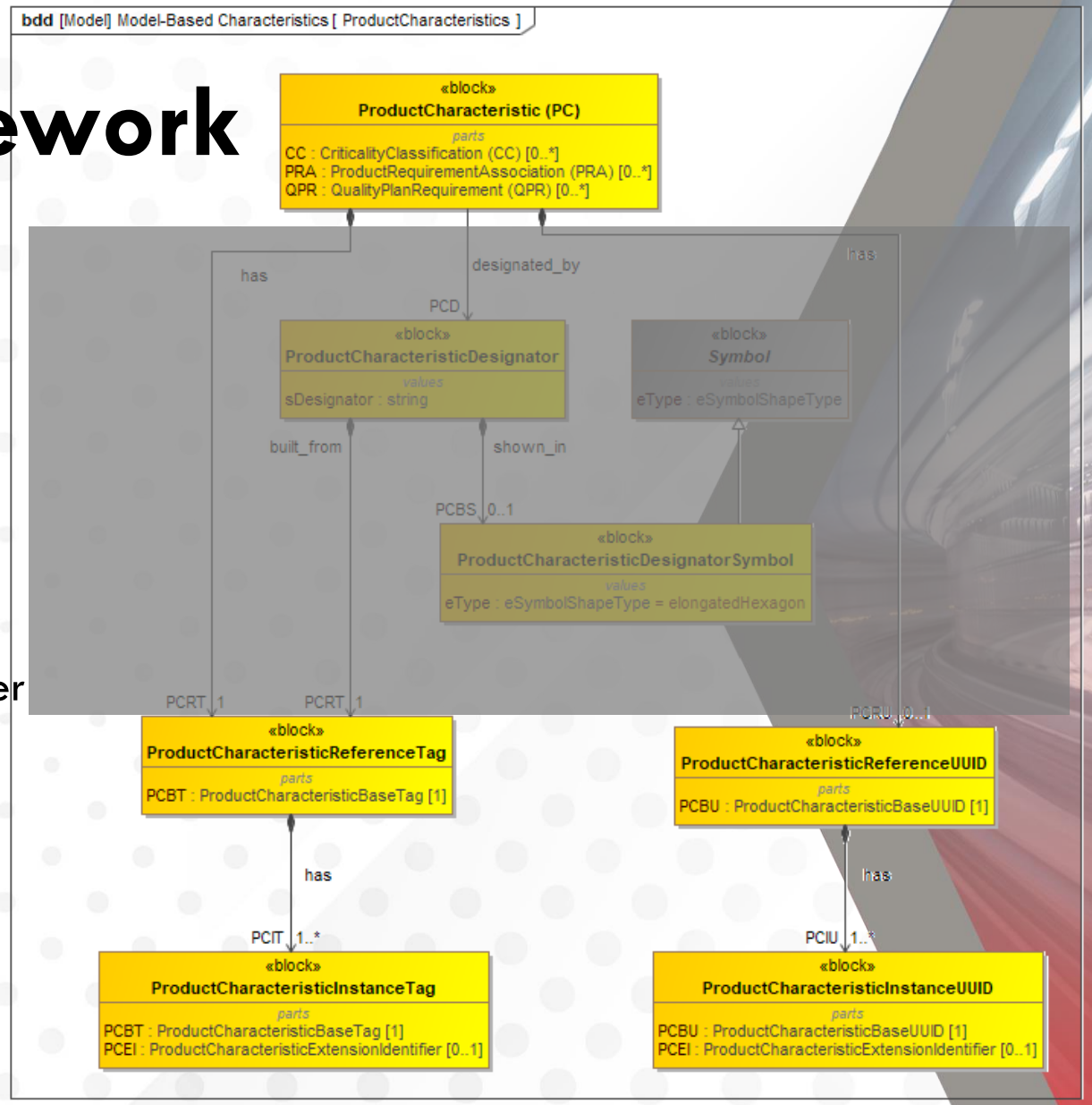
# PC Identification Framework

- Has a PC **Reference** Tag
  - Is a human-readable PC **Reference** Identifier
  - Is shown/identified with a Verification Requirement
    - CAD Annotation [Verification Requirement]
    - Non-CAD Specification/Requirement [Verification Requirement]
  - Is associated with PC **Reference** UUID
  - Has one or many PC **Instance** Tags
- Has a PC **Reference** UUID
  - Is a computer-consumable PC **Reference** Identifier
  - Is associated with PC **Reference** Tag
  - Has one or many PC **Instance** UUIDs
- Designated by a PC Designator
  - Shown in a PC Designator Symbol
  - Built from the PC Reference Tag

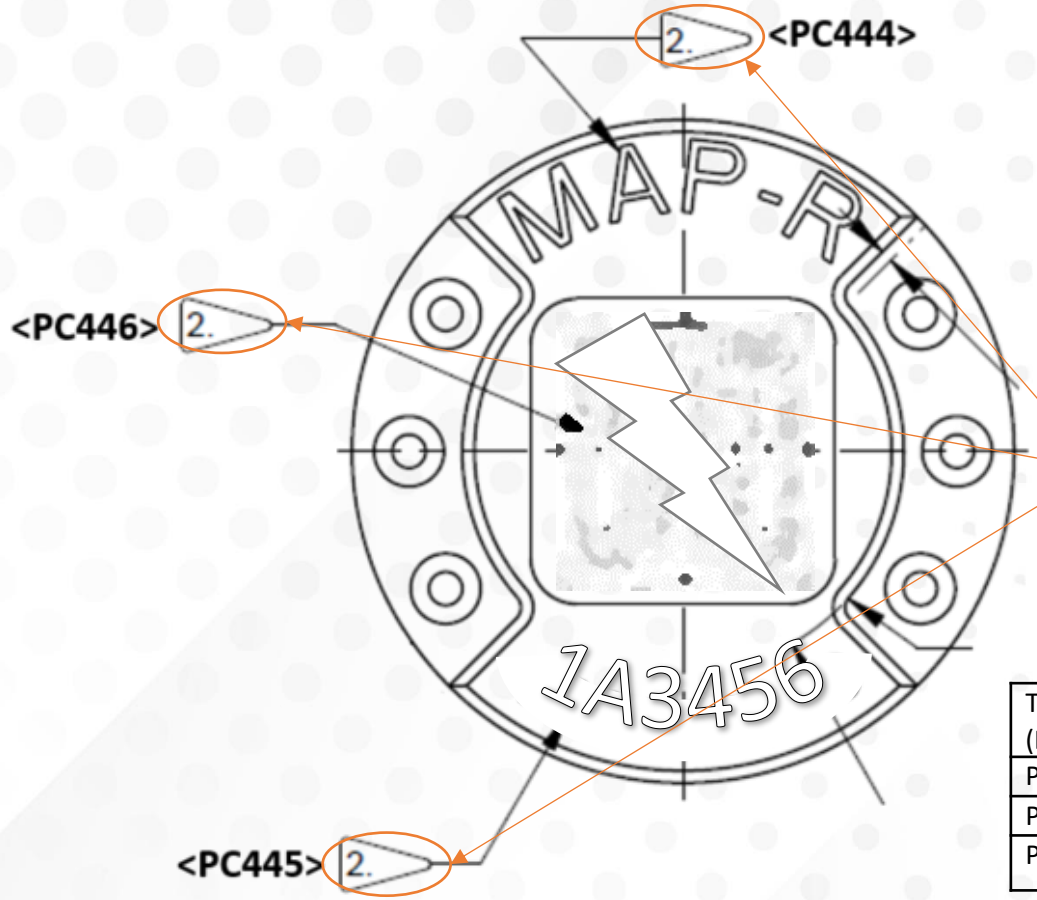


# PC Identification Framework

- PC Reference has one or many PC Instances
- A PC **Instance** Tag
  - Is a human-readable PC **Instance** Identifier
  - Is associated with PC **Reference** Tag
  - Shares PC **Base** Tag with PC **Reference** Tag
  - Has a PC **Extension** Tag
- A PC **Instance** UUID
  - Is a computer-consumable PC **Instance** Identifier
  - Is associated with PC **Reference** UUID
  - Shares PC **Base** Tag with PC **Reference** Tag
  - Has a PC **Extension** Tag
- Designated by a PC Designator
  - Built from the PC **Reference** ID's Base ID
  - Built from the PC Reference Tag



# Product Characteristics – Flagged Notes




NOTES:

1. PRODUCT CHARACTERISTICS ARE DENOTED BY <PC####>. GENERAL TAGS ARE DENOTED BY <GT####>. THESE SYMBOLS ARE USED TO REFER TO CORRESPONDING ANNOTATIONS.
   1A. THERE ARE 52 PRODUCT CHARACTERISTICS ON THIS DRAWING. THE NUMBERS RANGED FROM PC0001 TO PC0054. NUMBERS NOT USE ARE: PC0013.
   1B. THERE ARE 27 GENERAL TAGS ON THIS DRAWING. THE NUMBERS RANGED FROM GT5000 TO GT5026. NUMBERS NOT USED ARE: NONE.
2. PART MARKINGS:

2. MARK PART NAME, PART NUMBER, AND LOGOS AS SHOWN PER CLASS K-1-A, PER

| Tag (Base) | UUID (Base) | Description |
|---|---|---|
| PC444 | f0079160-e989-420a-b83a-19df30d57c7b | Marking of Part Name |
| PC445 | 7f92f319-3175-4214-8eb2-62f857f1c3b4 | Marking of Part Number |
| PC446 | 5ce27d7f-e66d-404a-8327-d7c24229b20d | Marking of Logo |

# Product Characteristics - Supplemental Specification Document

SS1A345

Special Specifications for part 1A345:

1 – Special Workmanship

1.1 – Statement about …

1.2 – Statement about …

1.3 – Statement about …

<PC901> 1.4 – Verify that …

<PC902> 1.5 – Verify that …

1.6 – Statement about …

<PC903> 1.7 – Verify that …

<PC904> 1.8 – Verify that …

2 – Special Markings

2.1 – Statement about …

<PC905> 2.2 – Verify that …

2.3 – Statement about …

| Tag (Base) | UUID (Base) | Description |
|---|---|---|
| PC901 | 48bf4540-63eb-4460-999d-bdaffad3f793 | Doc. SS1A345, Sect. 1.4 |
| PC902 | af11745b-d897-491c-8887-05404c5941cc | Doc. SS1A345, Sect. 1.5 |
| PC903 | 9e2f8155-113d-4f0d-8159-b766c836065d | Doc. SS1A345, Sect. 1.7 |
| PC904 | ecf53b0d-8891-4634-8cb9-0dd50ac25e53 | Doc. SS1A345, Sect. 1.8 |
| PC905 | 7bbfbae1-65d8-4970-9987-da22e84f5403 | Doc. SS1A345, Sect. 2.2 |

# Product Characteristics – General Notes

Only **notes** that have a **verify or shall statement** (e.g., verification requirement) should be **tagged** as a PC

5.6.5 Individual General Notes

NOTES:
1. First General Note
<PC825> 2. Second General Note with verify …
<PC826> 3. Third General Note with verify …
<PC827> 4. Deleted General Note with verify …
5. Fifth General Note

5.8.6 Group General Note:

<PC811> NOTES:
1. First General Note
2. Second General Note with verify …
3. Third General Note with verify …
4. Deleted General Note with verify …
5. Fifth General Note

| Tag (Base) | UUID (Base) | Description |
|---|---|---|
| PC825 | 1af1745b-d897-491c-8887-05404c5941cc | Second General Note |
| PC826 | 29ef8155-113d-4f0d-8159-b766c836065d | Third General Note |
| PC827 | cef53b0d-8891-4634-8cb9-0dd50ac25e53 | Deleted General Note |

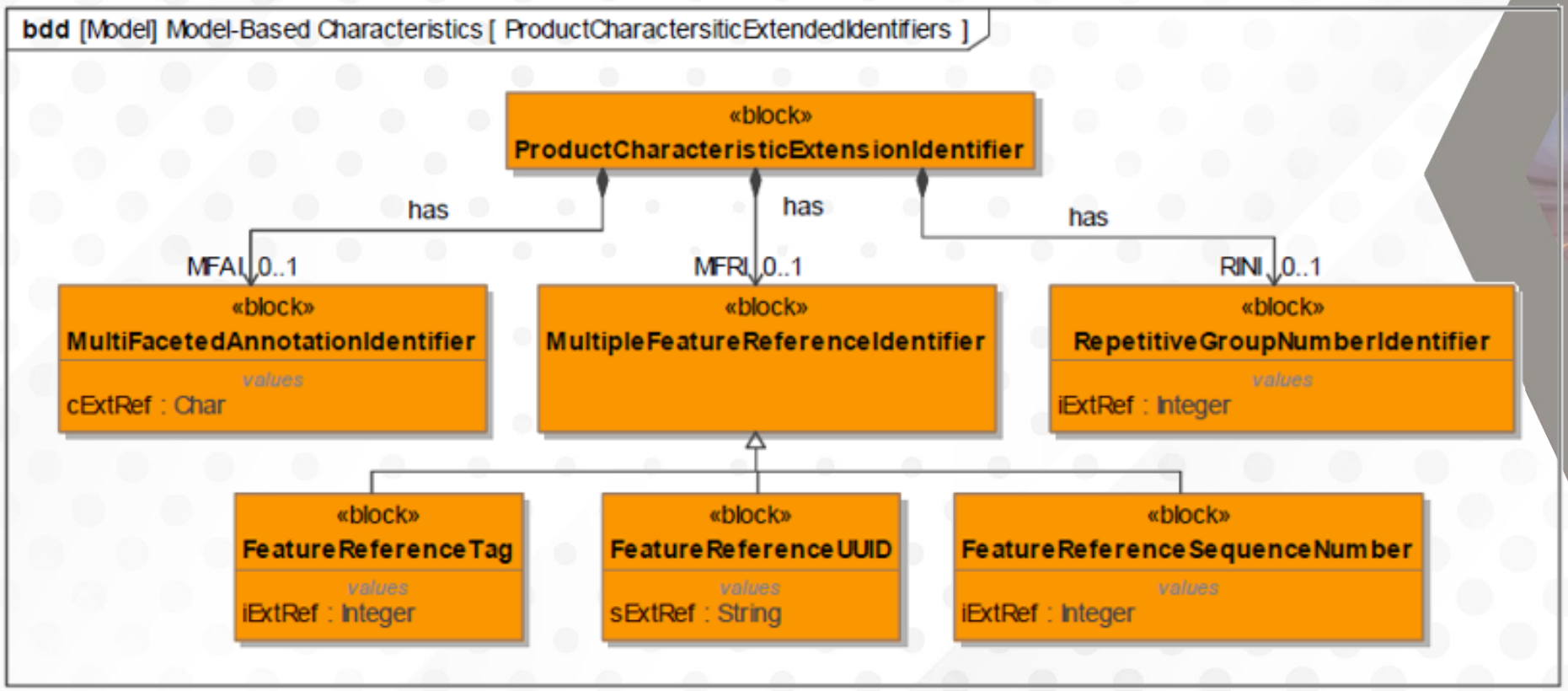
| PC Base ID | PC Extension ID | | | PC Instance ID Example |
|---|---|---|---|---|
| | MFAI | MFRI | RGNI | |
| PC811 | n | Y | n | PC811.2 |
| PC811 | n | Y | n | PC811.3 |
| PC811 | n | Y | n | PC811.4 |

# PC Identification Framework

- PC **Instance** Identifier
  - Has a PC Reference Identifier
  - Can be a PC Instance Tag
  - Can be a PC Instance UUID
  - Built from a PC Base Identifier AND one or more PC Extension Identifiers
- PC **Base** Identifier
- PC **Extension** Identifier
  - Has zero or one Multi-Faceted Annotation Identifier (MFAI)
  - Has zero or one Multiple Feature Reference Identifier (MFRI)
    - Can be a Feature Reference Tag
    - Can be a Feature Reference UUID
    - Can be a Feature Reference Sequence Number
  - Has zero or one Repetitive Group Number Identifier (RGNI)

# Product Characteristic Extension Identifiers

- The Instance Identifier is extended by the Extension Identifier for use-cases involving multi-faceted annotations, multiple feature references, and repetitive groups.

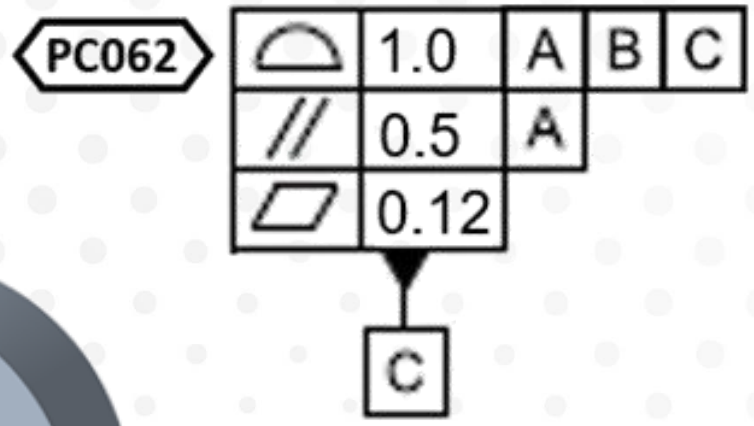


# PC Extension Identifiers

- **Multi-Faceted** Annotations Identifier (MFAI). See section 5.4.7.1 for more details.
  - PC007**a**
  - PC007**b**
  - PC007**c**
- **Multiple Feature** Reference Identifier (MFRI). See section 5.4.7.2 for more details.
  - Feature Reference Tag (FRT). See section 5.4.7.2.1 for more details.
    - PC007.**518**
    - PC007.**1961**
    - PC007.**1982**
  - Feature Reference UUID (FRU). See section 5.4.7.2.2 for more details.
    - PC007. **A64B5992-3A8B-456C-81E6-39020C268C13**
    - PC007. **C3F0BAB3-DA40-4C21-B04B-DC495336A4D0**
  - Feature Reference Sequence Number (FRSN). See section 5.4.7.2.3 for more details.
    - PC007.**1**
    - PC007.**2**
    - PC007.**3**
- **Repetitive Group** Number Identifier (RGNI). See section 5.4.7.3 for more details.
  - PC007.1:**1**
  - PC007.1:**2**
  - PC007.1:**3**

# PC Instance w/derived Multi Faceted Annotation [5.8]

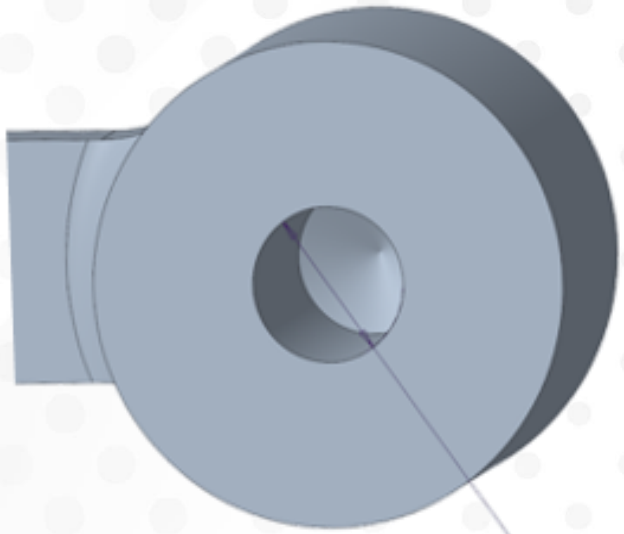
- PC007a
- PC007b
- PC007c




PC062.a

PC062.b

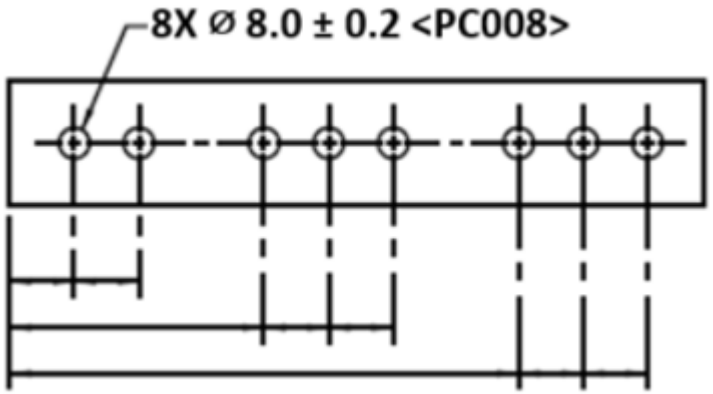
PC062.c



Ø9.6±0.2 ↧ 20.2 ± 0.5 71

71.a 71.b

# PC Instances with Multiple Feature References

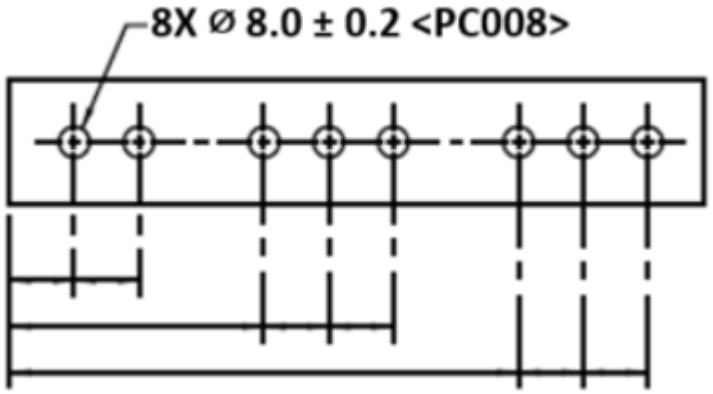



Repetitive Feature Tolerance with Reference Tag

Example:

- **PC Reference Tag <PC008>** is **applied** to **eight different features**!
  - Thus <PC008> has  eight verification occurrences.
- So, how do we specify each feature instance?
  - With a unique **PC Instance Tag** for each verification occurrence.
  - Which, **requires** a **unique Feature Reference Tag** for each multiple feature PC Instance Tag
- DMSC MBC allows for **three approaches** based upon the **maturity** and **capabilities** of the application system and/or organizational business practices.
  - By **FeatureReferenceTag** (e.g., 518, 1961, 1982)
  - By **FeatureReferenceUUID** (e.g., A64B5992-3A8B-456C-81E6-39020C268C13, C3F0BAB3-DA40-4C21-B04B-DC495336A4D0)
  - By **FeatureReferenceSequenceNumber** (e.g., 1, 2, 3, 4)

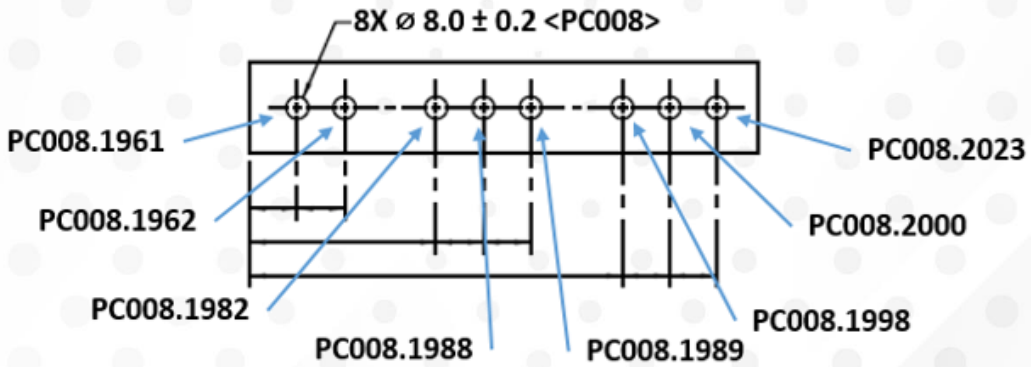
# Dimensional Tolerance w/Multiple Feature Instances



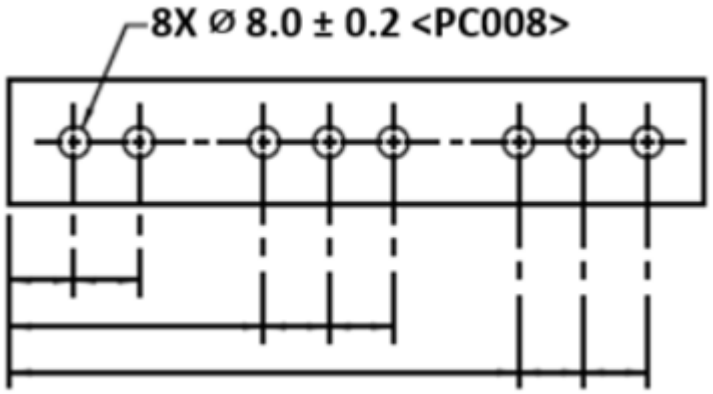

Repetitive Feature Size Tolerance with Reference Tag

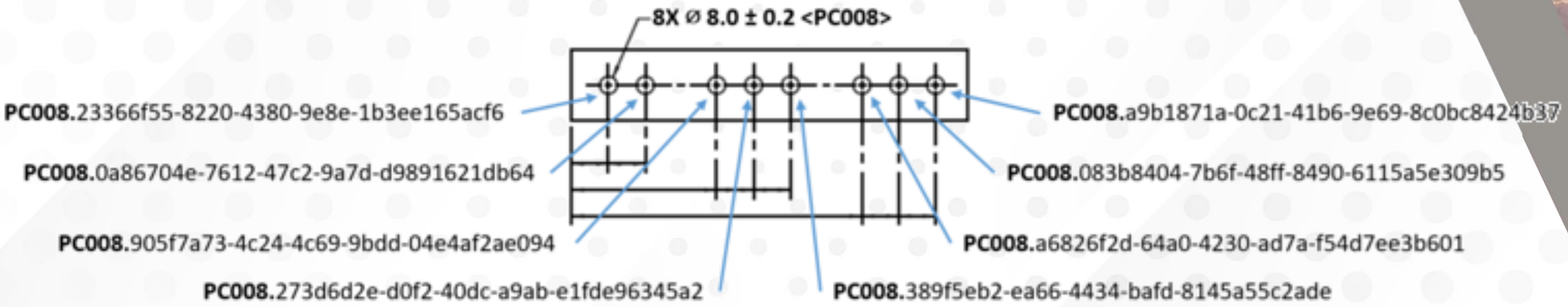
Repetitive Feature Size Tolerance with PC Instance Tags using the modeler's **Feature Reference Tag**

- PC008.1961
- PC008.1962
- PC008.1982
- PC008.1988
- PC008.1989
- PC008.1998
- PC008.2000
- PC008.2023



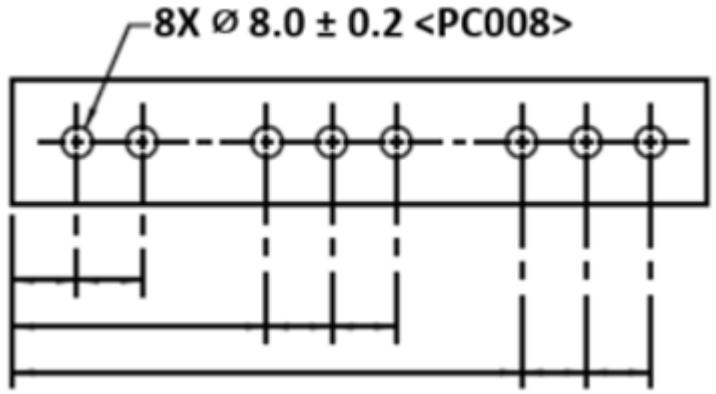
# Dimensional Tolerance w/Multiple Feature Instances



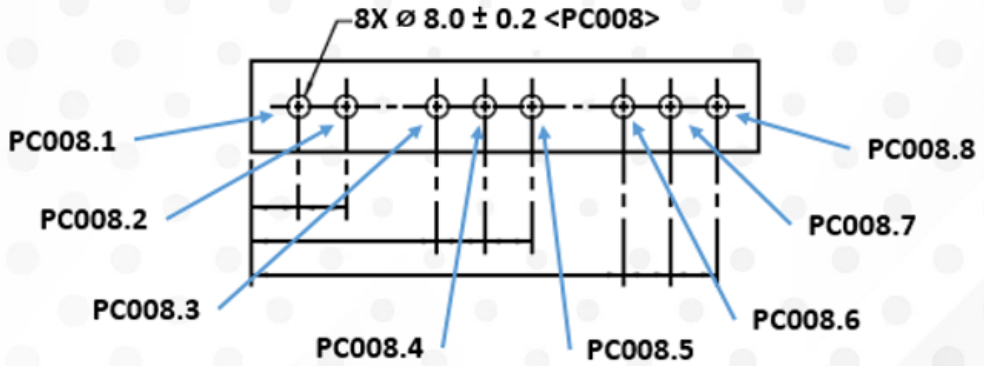




Repetitive Feature Size Tolerance with PC Instance Tags using **Feature Reference UUID**

# Dimensional Tolerance w/Multiple Feature Instances



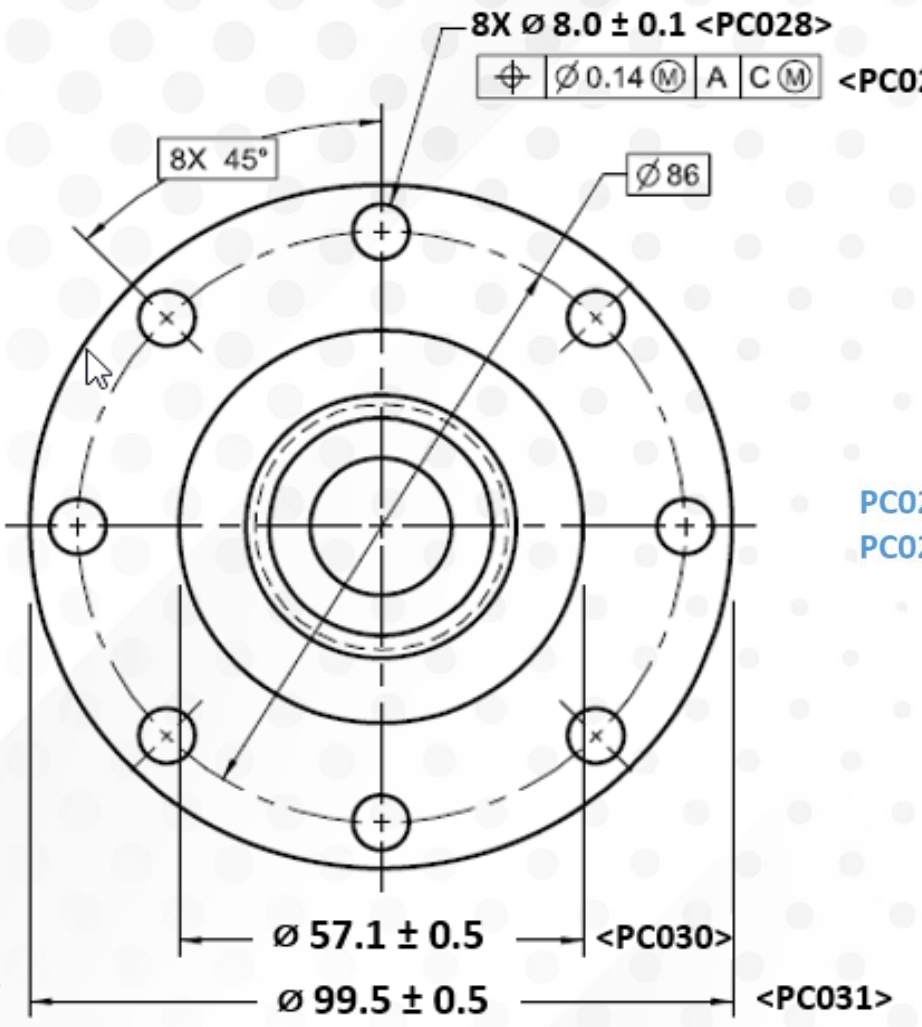

Repetitive Feature Size Tolerance with Reference Tag

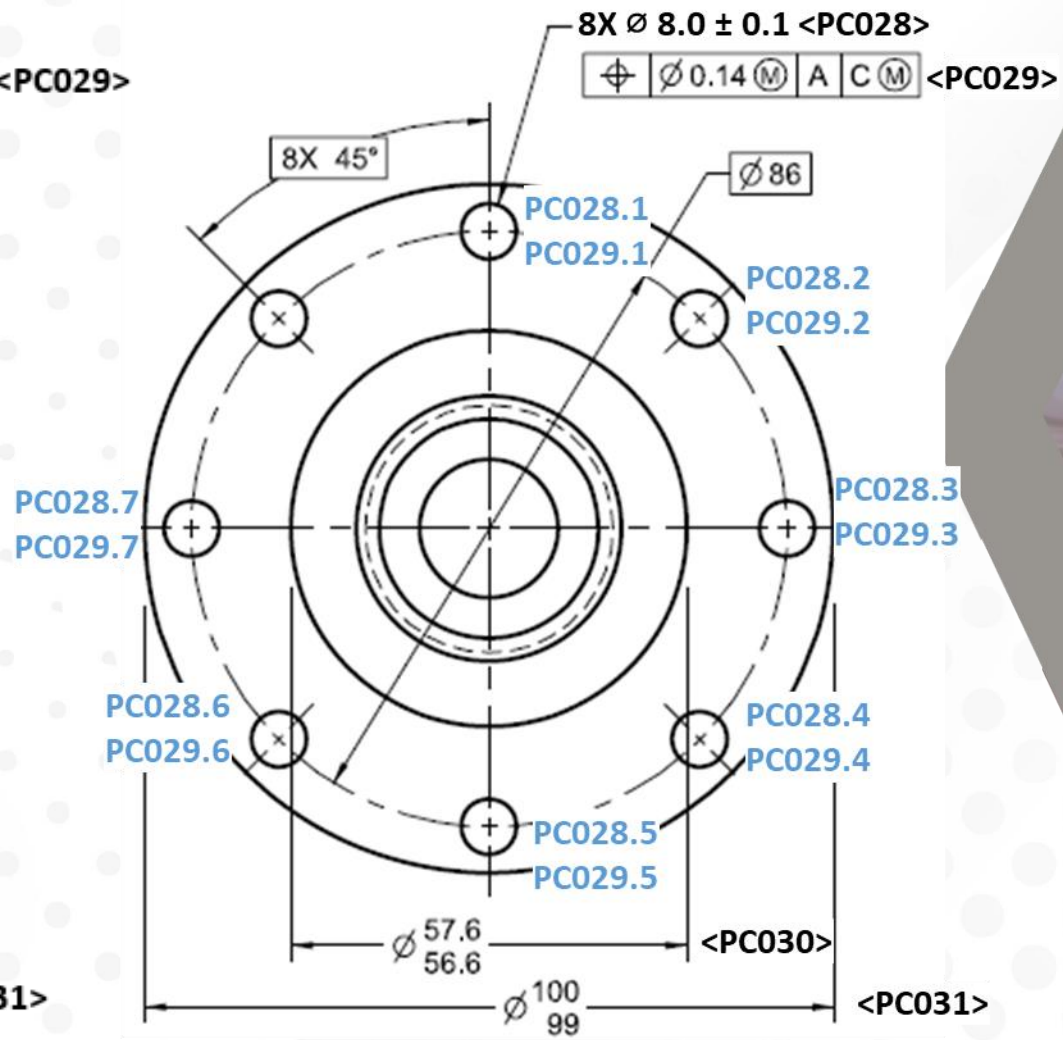



Repetitive Feature Size Tolerance with Instance Tags using a **Feature Sequencing** algorithm

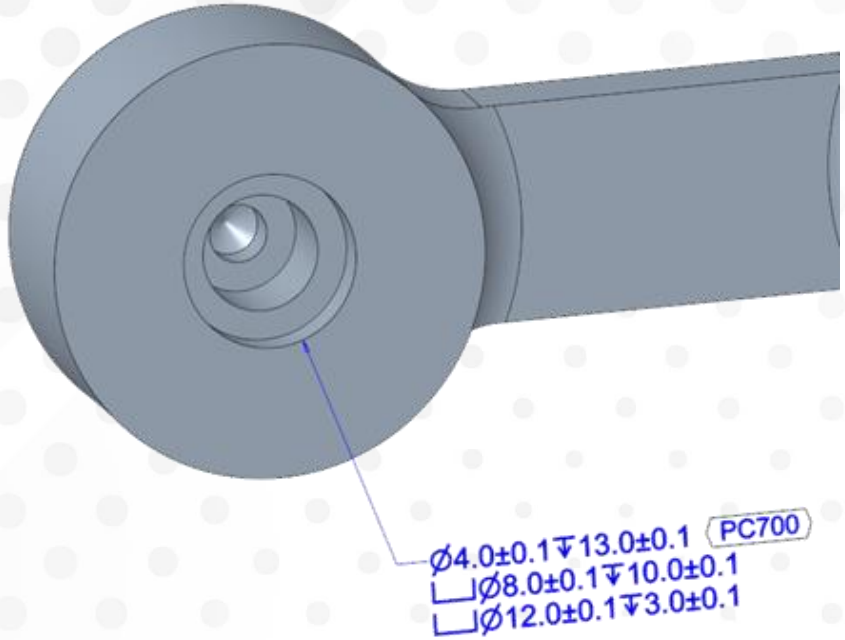
- PC008.1
- PC008.2
- PC008.3
- PC008.4
- PC008.5
- PC008.6
- PC008.7
- PC008.8

# Geometric Tolerance w/Multiple Feature Instances



# PC with Mixed Multiple Extensions




- PC700a.1
- PC700b.1
- PC700a.2
- PC700b.2
- PC700a.3
- PC700b.3

| Tag (Base) | Tag (Ext) | UUID (Base) | UUID (Ext) | Description |
|---|---|---|---|---|
| PC700 | a.1 | 3f2e8414-5074-48c9-976f-0b890cefcd00 | a.1 | ± 0.1 for Ø 4.0 Diameter |
| PC700 | b.1 | 3f2e8414-5074-48c9-976f-0b890cefcd00 | b.1 | ± 0.1 for ↧ 13.0 Hole Depth |
| PC700 | a.2 | 3f2e8414-5074-48c9-976f-0b890cefcd00 | a.2 | ± 0.1 for Ø 8.0 Counterbore Diameter |
| PC700 | b.2 | 3f2e8414-5074-48c9-976f-0b890cefcd00 | b.2 | ± 0.1 for ↧ 10.0 Counterbore Depth |
| PC700 | a.3 | 3f2e8414-5074-48c9-976f-0b890cefcd00 | a.3 | ± 0.1 for Ø 12.0 Counterbore Diameter |
| PC700 | b.3 | 3f2e8414-5074-48c9-976f-0b890cefcd00 | b.3 | ± 0.1 for ↧ 3.0 Counterbore Depth |

# Other PC Use-Cases

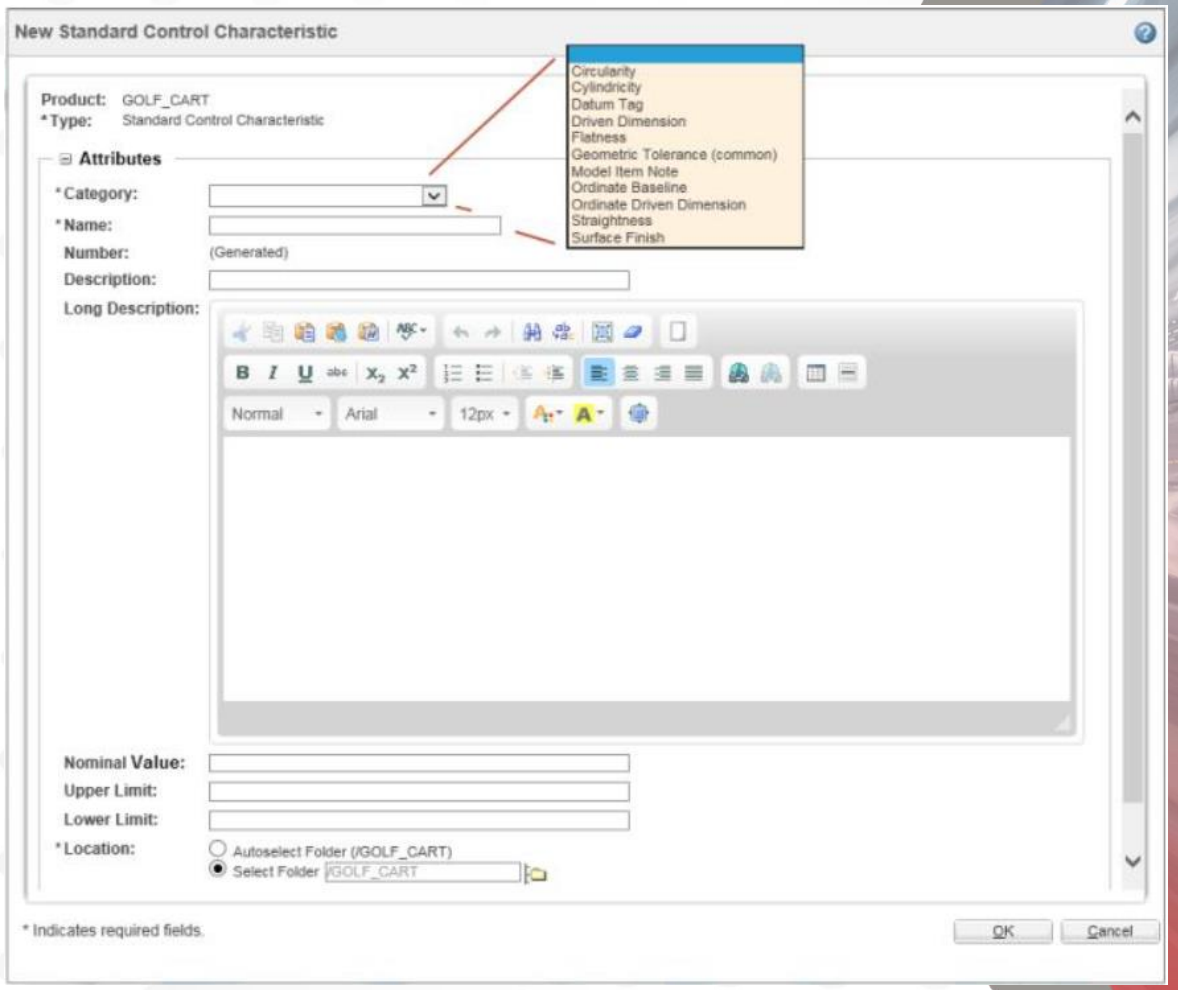
- 5 Product Characteristics
  - 5.1 Identification
  - 5.2 Data Structure
  - 5.3 Data Taxonomy
  - 5.4 Data Objects
  - 5.5 Annotation Applications
  - 5.6 Single Product Characteristic with Single Application (Feature)
  - 5.7 Single Product Characteristic with Defined Multi-Faceted Annotation
  - 5.8 Single Product Characteristic with Derived Multi-Faceted Annotation
  - 5.9 Single Product Characteristic with Multiple Feature References Applications
  - 5.10 Single Product Characteristic including Repetitive Group Applications
  - 5.11 Single Product Characteristic with Mixed Multiple Extension Applications
  - 5.12 Product Characteristics with an Assembly
  - 5.13 Product Characteristics in Support Documents (Text-based support artifacts)
  - 5.14 Product Characteristics in System Information Models
  - 5.15 Product Characteristics on Surrogate Surfaces
  - 5.16 Product Characteristics on Representative Test Artifacts
  - 5.17 Product Characteristics on Embellished Derivatives
  - 5.18 Application to Serialized Parts which enables Digital Twins
  - 5.19 Non-Product Characteristics, General Tag

# PTC's Control Characteristics and DMSC's Product Characteristics

- Within a process, part, assembly, or system, PTC **control characteristics** are any functional features, geometrical or material properties, that can be qualified, measured, or quantified and for which variation or deviation control is necessary.
- Assume that **PTC's Control Characteristics** are conceptually similar to DMSC's Product Characteristics.
- Can **PTC Control Characteristics functionality** be **extended** to support the **MBC Product Characteristics DMSC standard**?
  - Creo (Designate an annotation in Creo as a control Characteristic)
  - PDMLink (Designated Control Characteristic are created in PDMLink upon check-in)
  - MPMLink (Designated Control Characteristic are used in MPMLink)
- **Yes**, by adding **subtyping**, **data attributes**, user **symbols**, and **application behaviors!**

# PTC Control Characteristics

- **MPMLink Attributes** in Control Characteristics Tab
- The following attributes are present in the Control Characteristics tab of MPMLink BOM Transformer:
  - Number
  - Name
  - Severity (editable)
  - Description (editable)
  - Model Item Graphical Representation (e.g., model item)
  - Version
  - Context
- You can edit the values Severity and Description of a control characteristic inline.
- If a model item is associated with a control characteristic, then the information about the model item is displayed in **Model Item Graphical Representation**.

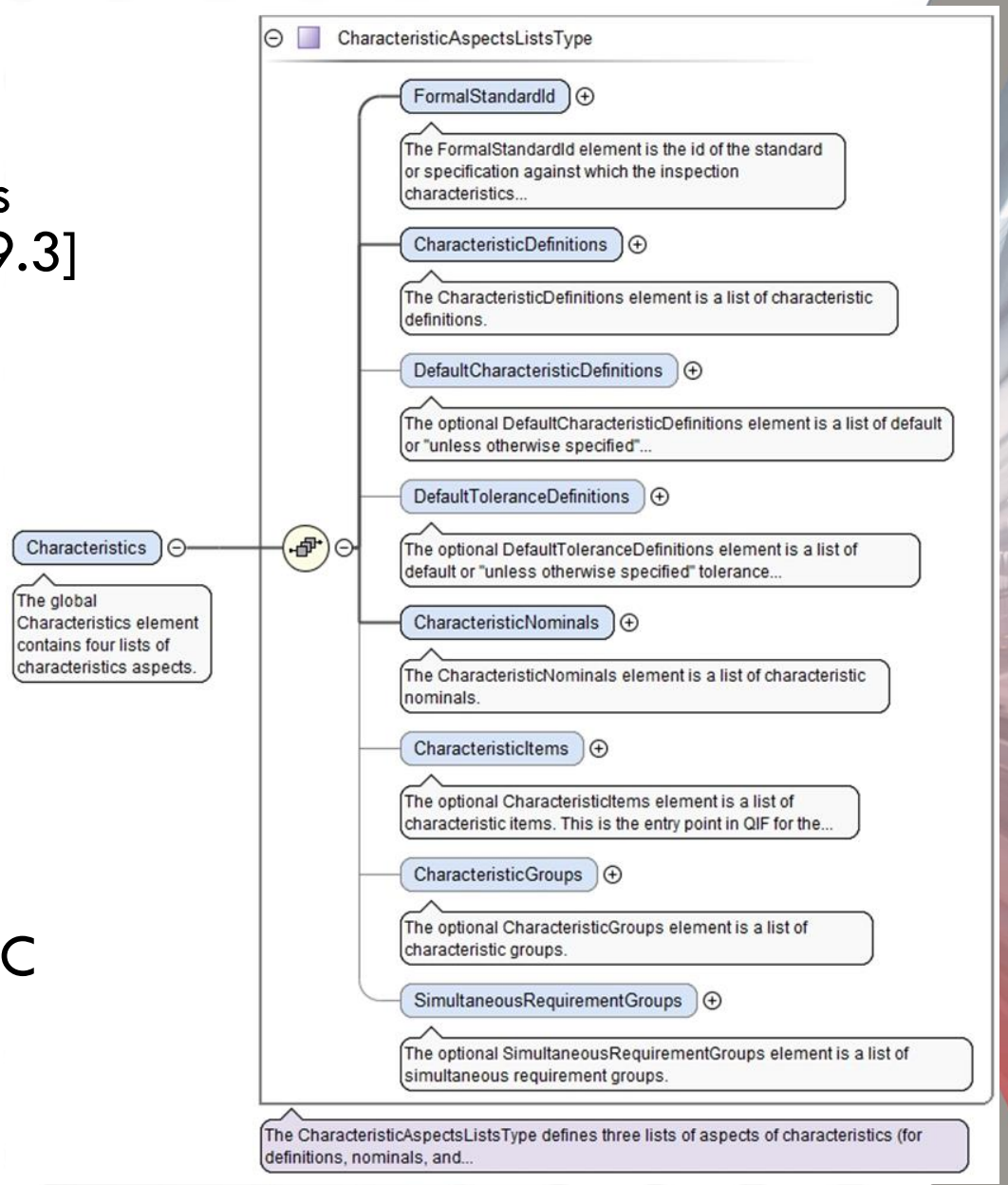


# PTC's Control Characteristics / DMSC's Characteristic Mapping (Proposed)

| Control Characteristics | Characteristics |
|---|---|
| has: Number | has: UUID |
| has: Name | has: Tag |
| | has: Symbol |
| | has: Augmentations |
| | type: Product Characteristics (PC) |
| has: Severity (editable) | has: Criticality Classification (CC) |
| | has: Product Requirement Association (PRA) |
| | has: Verification Plan Requirement (VPR) |
| | type: Operation (Process) Characteristics |
| | type: Service Characteristics |
| has: Description (editable) | |
| has: Model Item Graphical Rep. | |
| has: Version | |
| has: Context | |

# QIF Characteristics

- Within QIF, the Characteristic object contains four types of characteristics aspects [QIF 5.9.3]
  - Definition
  - Nominal
  - Item
  - Measurement
- Characteristic Designation Includes optional:
  - Designation (Tag)
  - Criticality Level
  - UUID
- MPC includes a QIF Mapping/Comparison appendix [Annex J]
- The Next QIF (i.e., QIF 4.0) incorporates MPC characteristic capabilities.



# Questions?

# Thank You!

# Fly-By of MBC Specification

- Sections
  - Terms & Definitions (noun, adjective)
  - Product Characteristics (PC)
  - Criticality Classifications (CC) Augmentation
  - Product Requirement Association (PRA) Augmentation
  - Verification Plan Requirements (VPR) Augmentation
  - SysML Information Models
- Appendixes
  - A-N

Digital Metrology Standards Consortium DMSC

Model-Based Characteristics: Nomenclature, Definitions, Symbols, Data Structures, and Practices for Product Definition: Includes Model-Based Definition with Persistent Identification

WIP MBC Version 0.9a

ANSI/DMSC MBC 1.0--202X

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# Selection Criteria for a Characteristic Designator Symbol

C1. Symbol must be a recognizable unique shape.
C2. Symbol must be easily creatable using existing office/CAD tools.
C3. Symbol must be able to enclose a set of alphanumeric identifiers.
C4. Symbol must not conflict with other regularly used symbols in related ASME / ISO standards.
C5. Symbol can be easily associated with an annotation (e.g., Dimensional Tolerance, Geometric Tolerance, Surface Texture, General Note, and Flagged Note).
C6. Symbol must be able to accommodate Criticality symbol(s) before or after.
C7. Symbol can be chained with one or more Product Requirement symbol(s).
C8. Symbol must be easily created as a textual field.
C9. Symbol must be applicable for 2D drawings, 3D drawings, and 3D MBDs.
C10. Symbol can be both human-readable, and when implemented within a digital MBD, be machine-readable.
C11. The digital implementation of the symbol instance should be digitally associated with the respective annotation.
C12. The digital implementation of the symbol should digitally associate with a persistent universally unique identifier for the symbol instance.