Completing The Digital Thread With Model Based Characteristics For Quality And Manufacturing

GLOBAL PRODUCT DATA INTEROPERABILITY SUMMIT 2025

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Abstract Intent

- Engineering has been generating rich data and Product Manufacturing Information (PMI) as a part of the model-based engineering practices, but that data has struggled to find its way through to quality and manufacturing in a traceable and consistent format. The Digital Metrology Standards Consortium (DMSC) has provided a standard for Model-Based Characteristics to extend a definition and structure for exchanging and tracing characteristics using a model-based approach. Take a dive with us into the first PLM centered process that is supporting the DMSC Model based characteristics standard for authoring characteristics from PMI and managing them across the product lifecycle for use by manufacturing sites, quality teams, and suppliers.

Presenters Bio

Roth Chan
Product Marketing Manager, NX

Joined Siemens in 2018 after earning his MSc in mechanical engineering from Oregon State University. Joined the NX team in 2022 and is supporting workflows including characteristics and sustainability.

Scott Felber
Sr. Technical Product Manager, NX

35 Years with Siemens
Roles have included technical pre-sales, product marketing and technical product manager

Attended University of Wisconsin – Milwaukee and Marquette University

Russ Simpson
Industry Strategist Aerospace & Defense

Responsible to drive adoption of Digitalization, Digital Twin, and Digital Thread technologies across multiple sectors. Before joining Siemens in 2025, Russ had a distinguished career in aerospace and defense.

Digital Thread Backbone

VIRTUAL
Concept & Engineering

Series development

PHYSICAL
Manufacturing & Operations

One platform – data intelligence and collaboration

Ideation
- Voice of customer
- Portfolio
- Resources
- Budget

System
- MBSE
- Requirements
- Features
- Architecture

Design
- Mechanical
- Software
- E/E

Analysis
- 1D – 3D
- Multi-physics
- Simulation

Multi-domain EBOM

Prototype

Color parts

Manufacturing planning, simulation & execution

MBOM
- Plant MBOM
- Plant BOP
- Plant BOE
- As-built

SBOM
- Service plan
- Spares, kits
- Publications
- As-maintained

Physical Assets

Service planning, simulation & execution

Quality	APQP · PPAP · FAI · root cause · risk management
Supply chain	market intelligence · visibility · selection · integration · logistics
Program management	deliverables · work breakdown structures · schedule
Unified Change, Unified Configuration	Change · Variability managements

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Tc/Easy Plan

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Opcenter

Service planning, simulation & execution

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Tc Q

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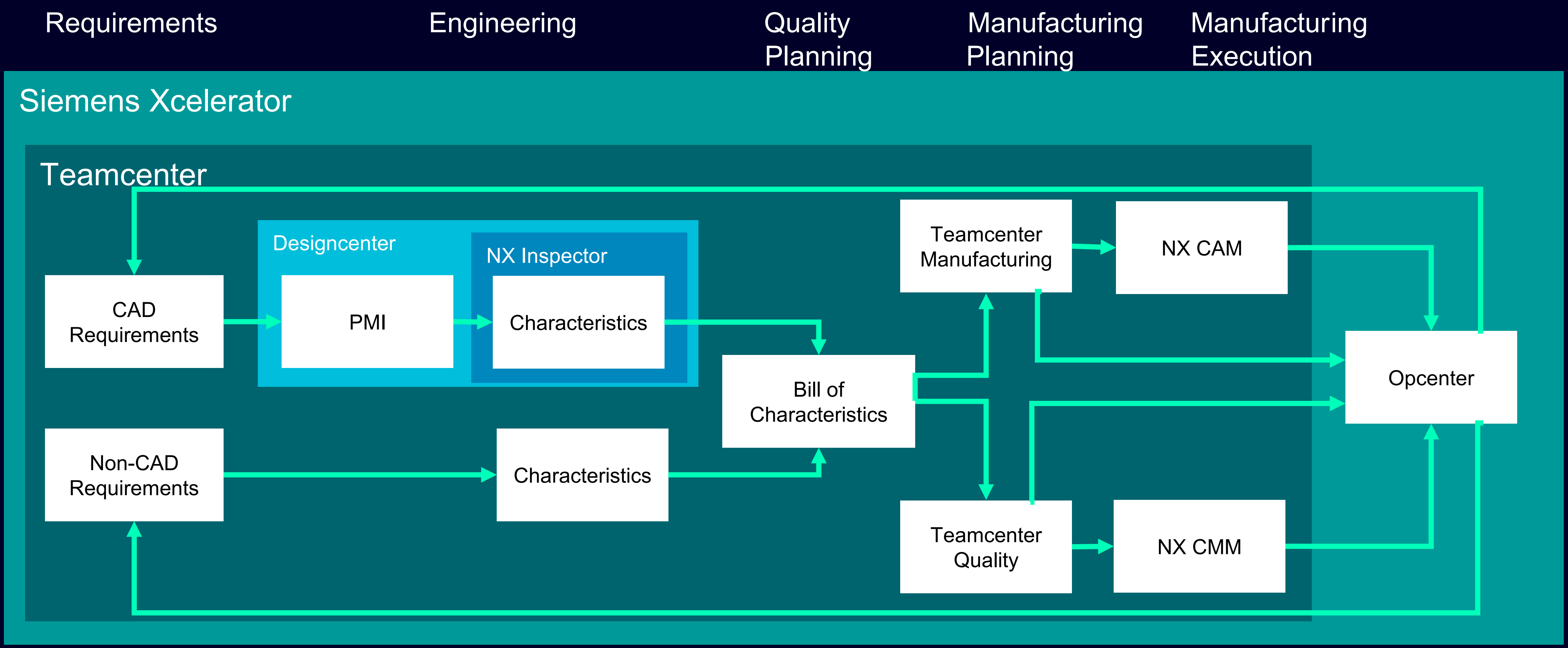
Workflow



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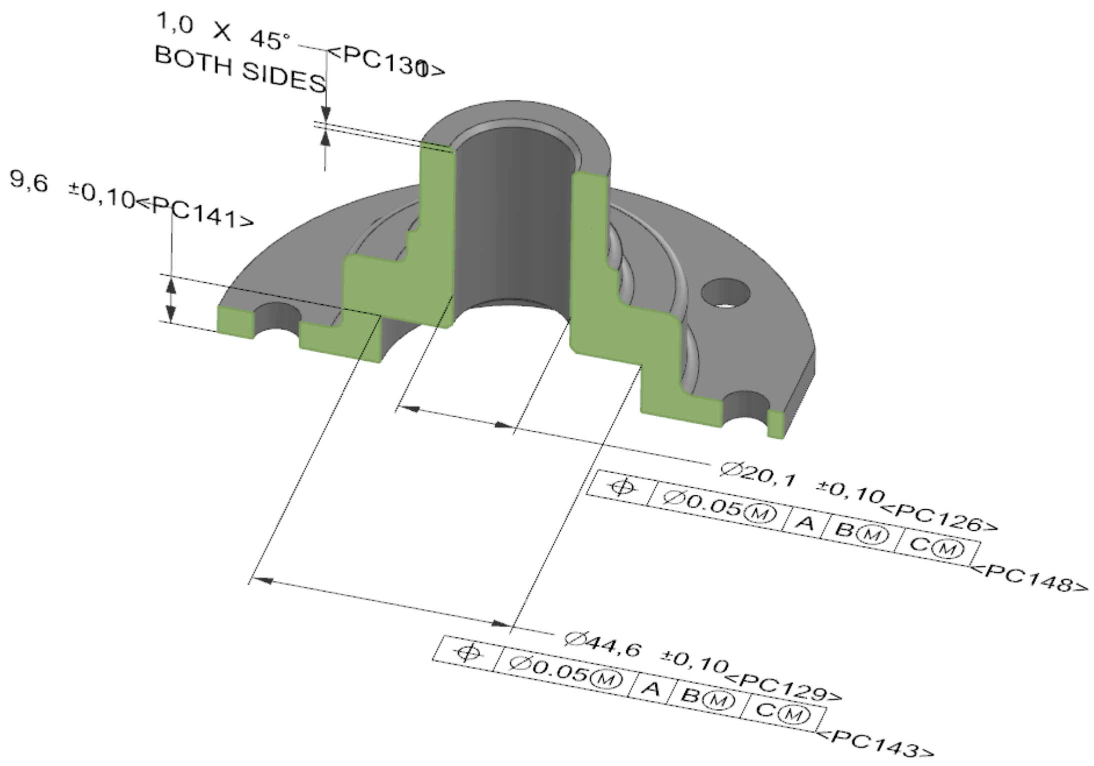
Enabling PMI for Consistent Consumption

NX PMI provides a comprehensive model-based representation of engineering requirements. It allows complete semantic definition of a product's form, fit, and function.

A single PMI can generate multiple quality and manufacturing requirements. These individual requirements are known as “characteristics”.

Definition and management of characteristics is critical to consuming of engineering requirements downstream.



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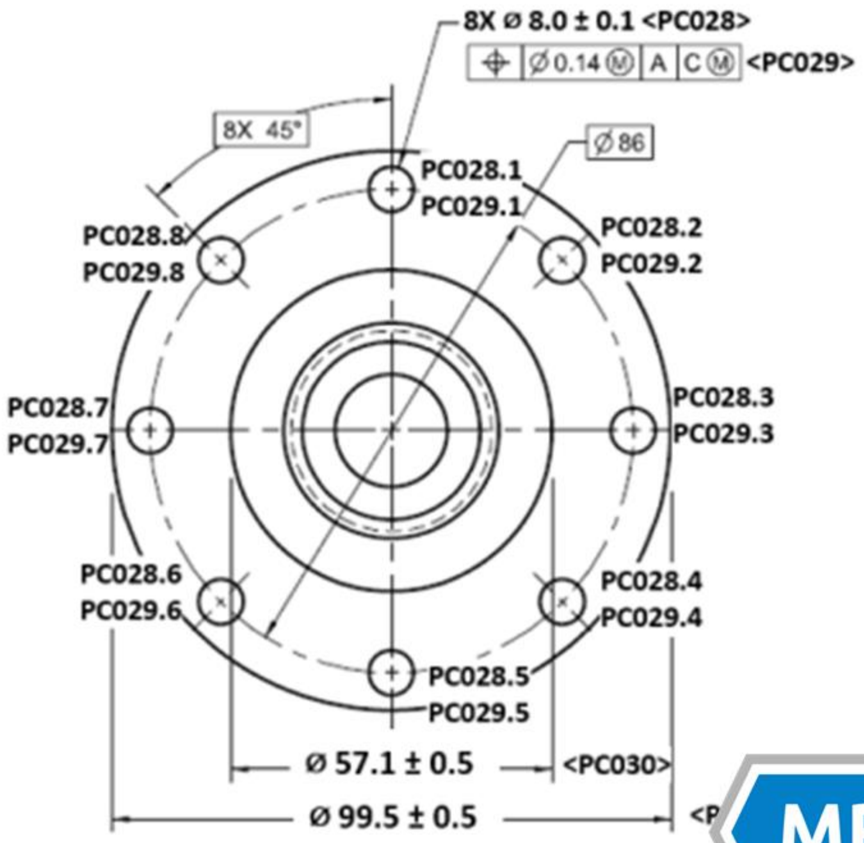
DMSC Model-Based Characteristics (MBC)

The Digital Metrology Standards Consortium provides a standard for Model-Based Characteristics. This standard provides the definition and structure for exchanging characteristics using a model-based approach.

NX Inspector provides the first CAD native implementation of the DMSC MBC standard. This provides a first to market model-based approach for defining and consuming engineering data consistently and completely in quality and manufacturing workflows



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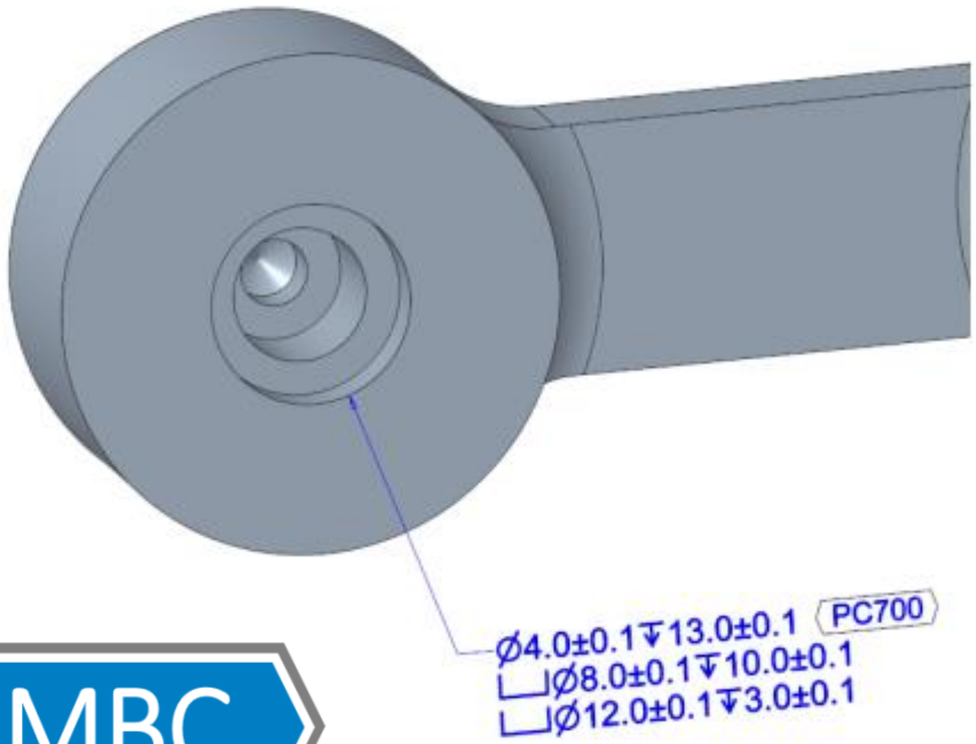
DMSC model-based characteristic standard support

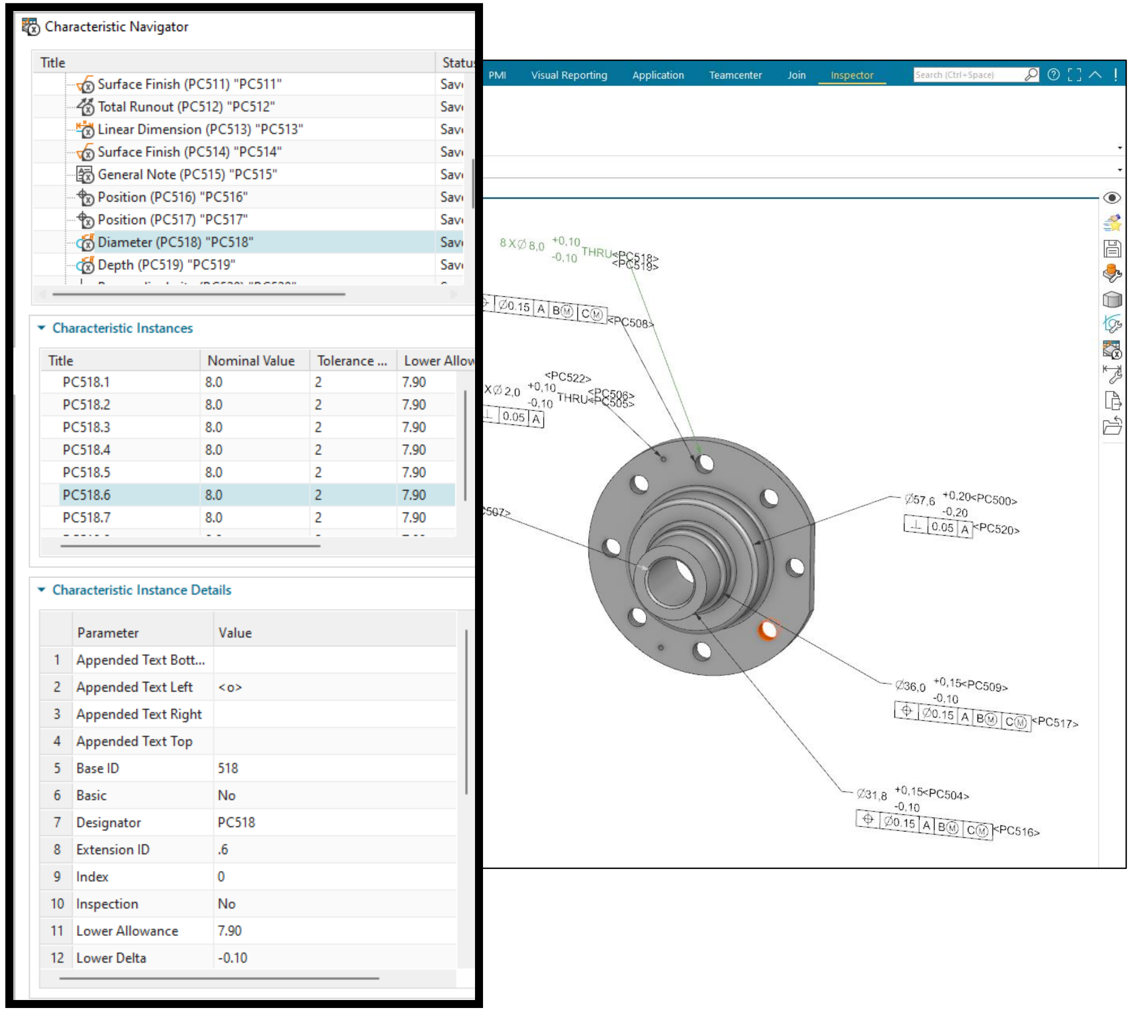


Support for DMSC MBC standard definition, symbology and data structure.

- PMI characterization occurs as per the DMSC standard
- Characteristic augmentation supported
- Provides UUID identification for making characteristics accountable across the digital thread

Key benefits of NX Inspector
Characteristic accountability

- Characterization support for multiple PMI types including feature control frames, dimensions, and notes
- Direct associativity to PMI objects allow for real time update of characteristics as changes occur
- DMSC and ANSI MBC standard support for characteristic semantics and display
- Support for CAD neutral formats including PLMXML and QIF
- Downstream support including a first-class representation in Teamcenter, Teamcenter Quality and Opcenter



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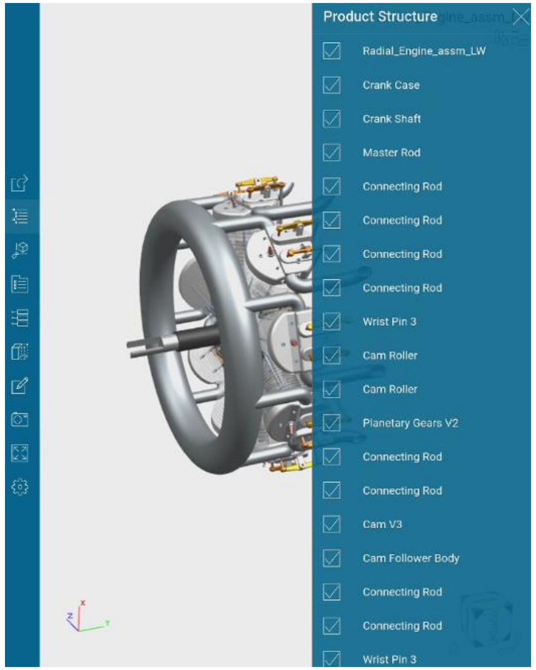
CAD neutral support for PLMXML and QIF

NX Inspector provides export of model-based characteristics to CAD neutral formats

- Supports export to the DMSC QIF standard via Capvidia and Elysium partner applications
- Supports CAD Neutral PLMXML representation which will export JT and provide characteristic and PMI associativity



JT COMPONENTS
PLM XML

QIF by DMSC

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Bill of characteristics

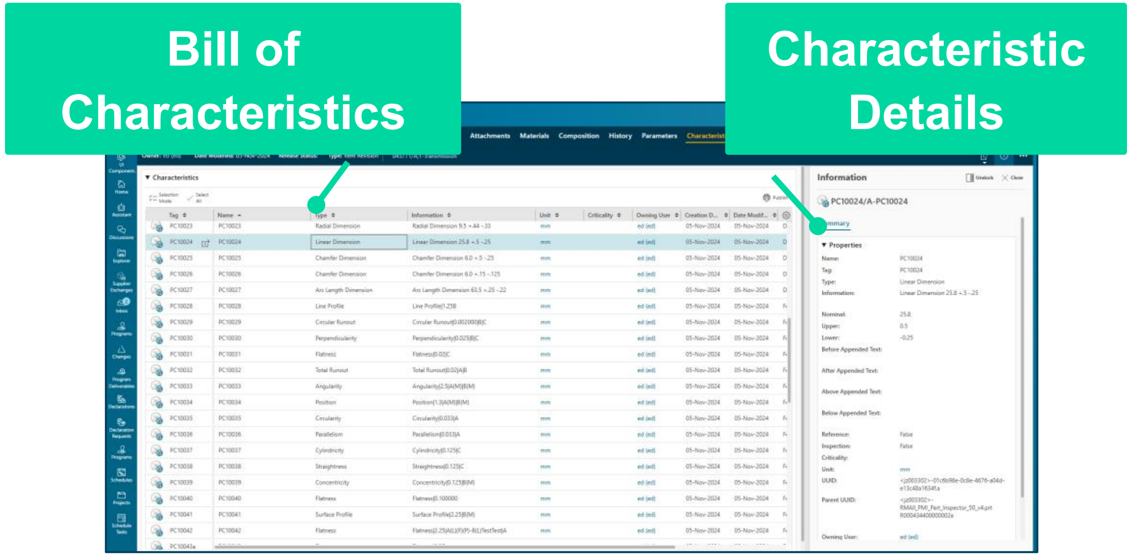
Manage characteristics as revisable objects in Teamcenter. Tracking and history per change and preparation for any downstream consumption

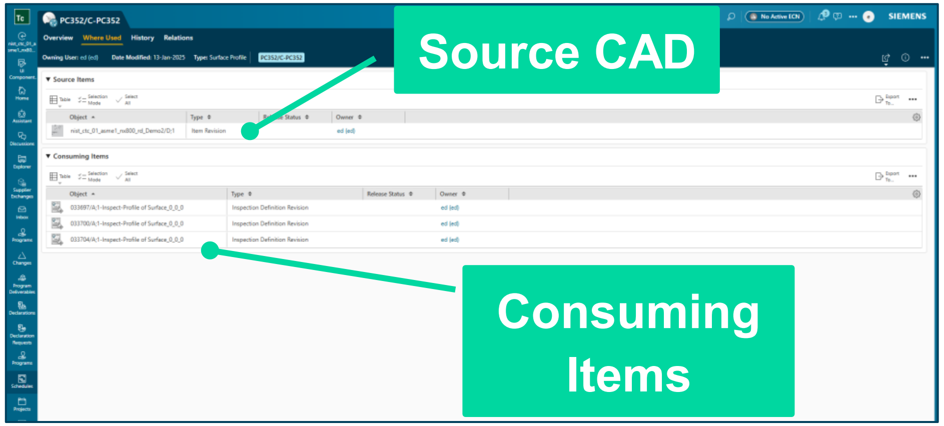
Characteristic Tab

- Available on NX parts under Characteristic Tab as the Bill of Characteristics
- Full support for the newly released DMSC 1.0 Standard for Characteristics

Where Used Tab

- Supports “Where Used” showing upstream “source” and “consuming” downstream object





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Bill of characteristics traceability

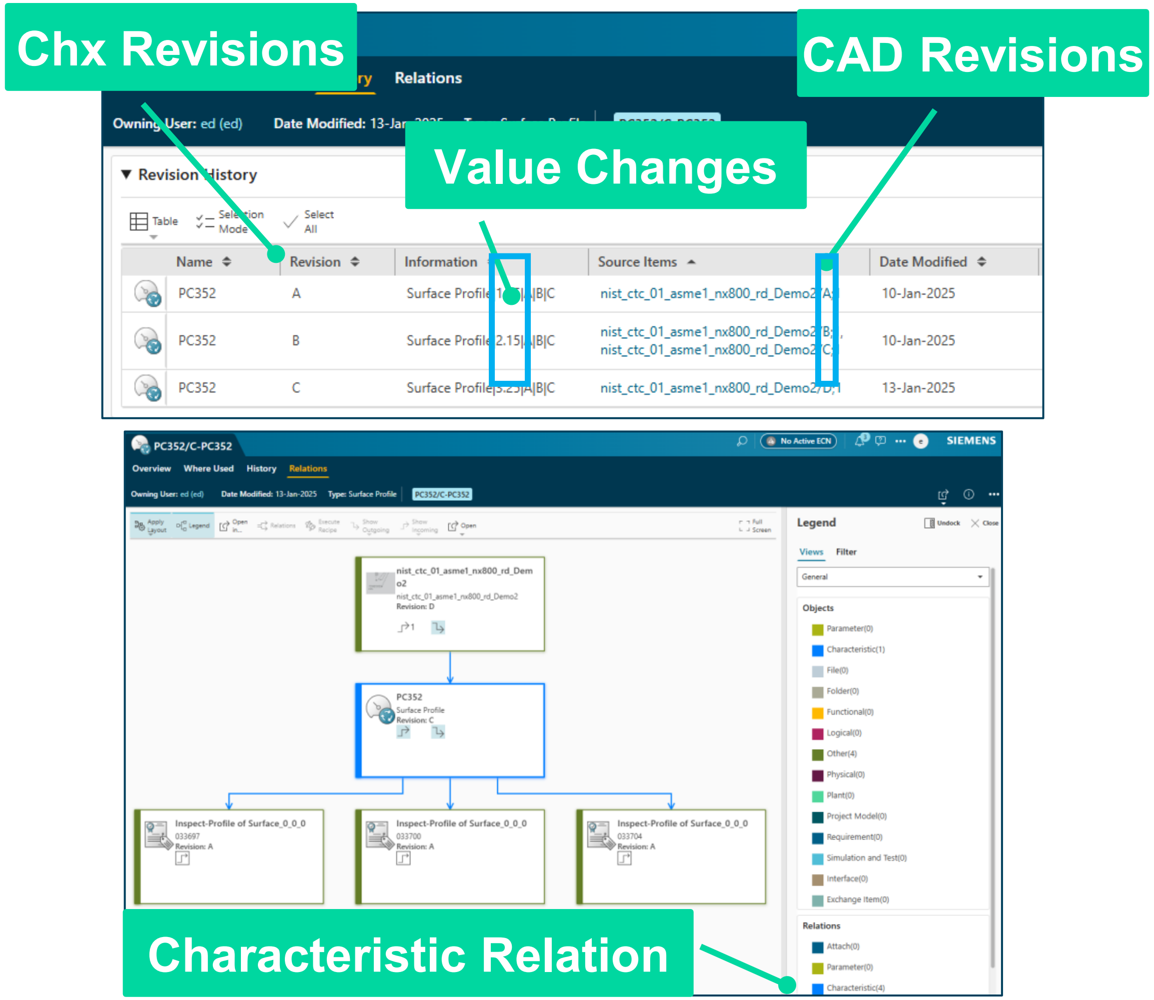
History Tab and Relation Browser view of relationships

History Tab

- Value changes per characteristic revision
- CAD source revision

Relations Tab

- Graphical “Where Used”
- Characteristics will render in the Relations Browser
- You can walk up to the source and its other relations
- You can also walk down to the consuming objects and further to their related objects



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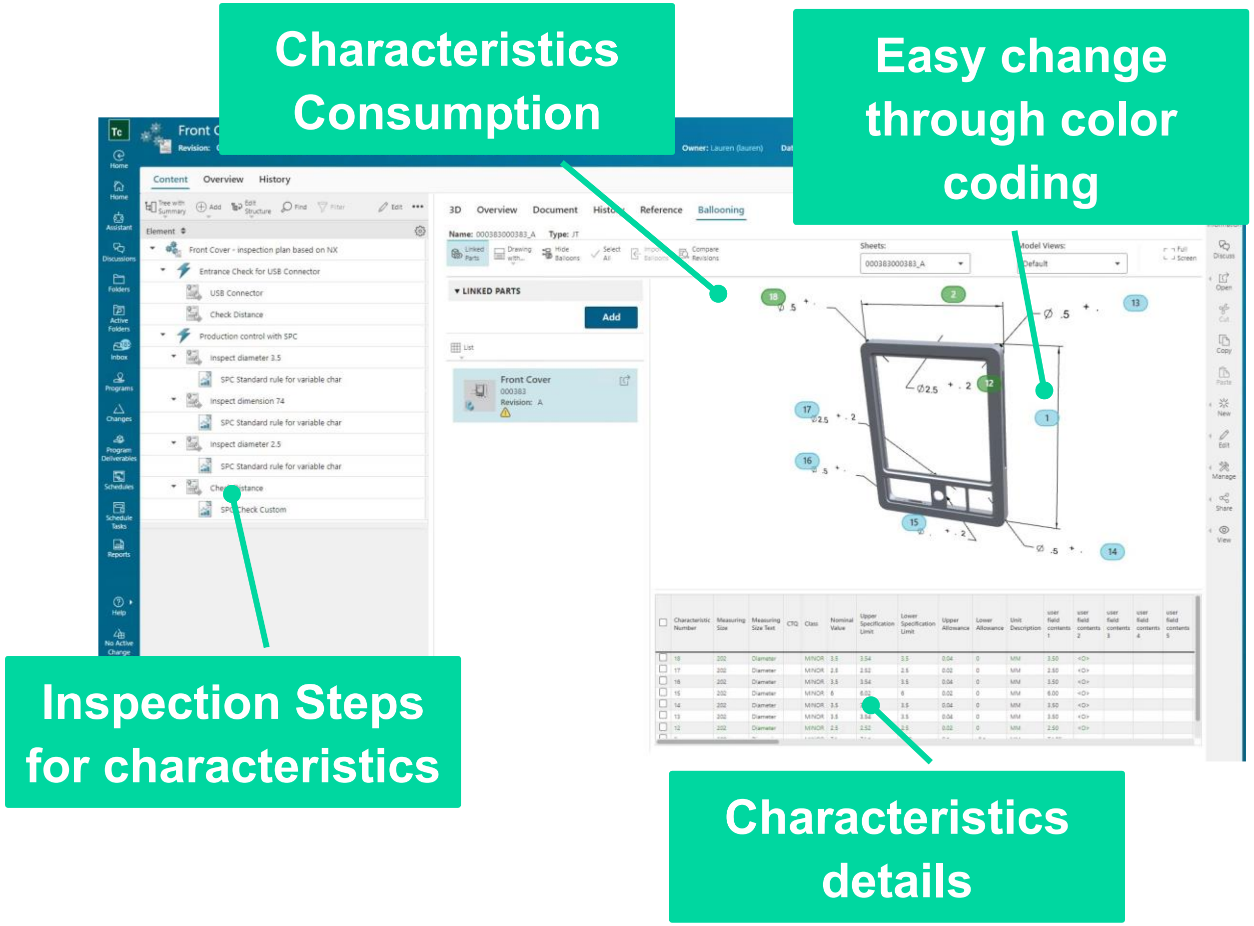
Downstream consumption in quality planning

Teamcenter Quality extends NX Integration with the new characteristics in Teamcenter

- New Characteristics in Teamcenter aligned to Characteristics Library in Teamcenter Quality and replaces old PMI data object
- Inspection Plans consume characteristics instances within inspection steps in the same way with leveraging the knowledge base within the Characteristics Library



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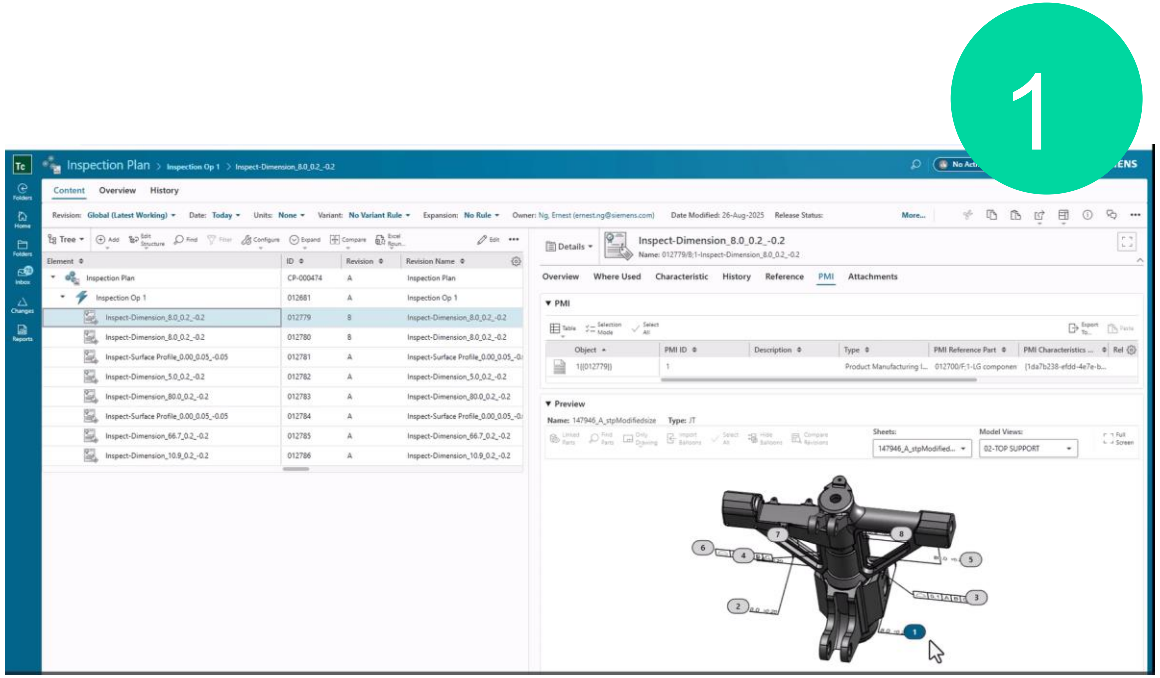
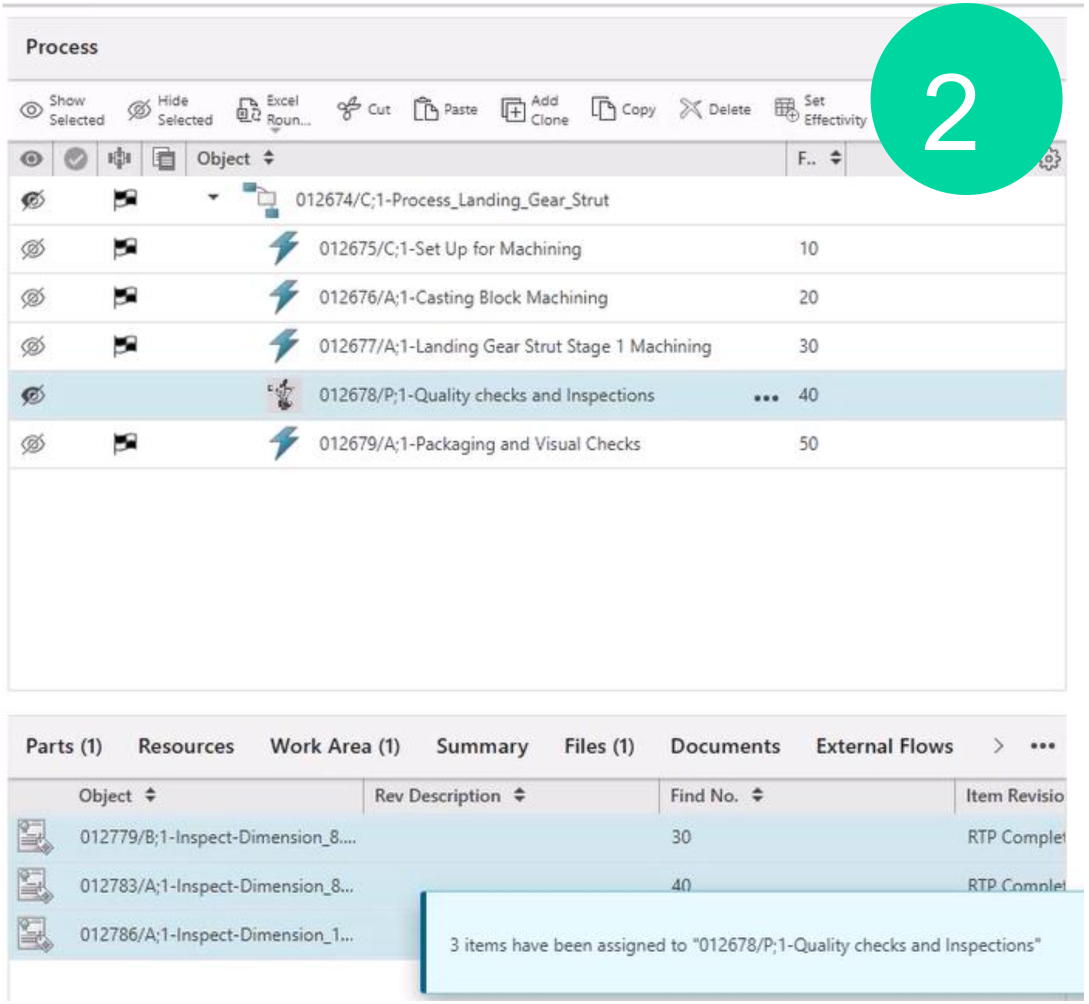
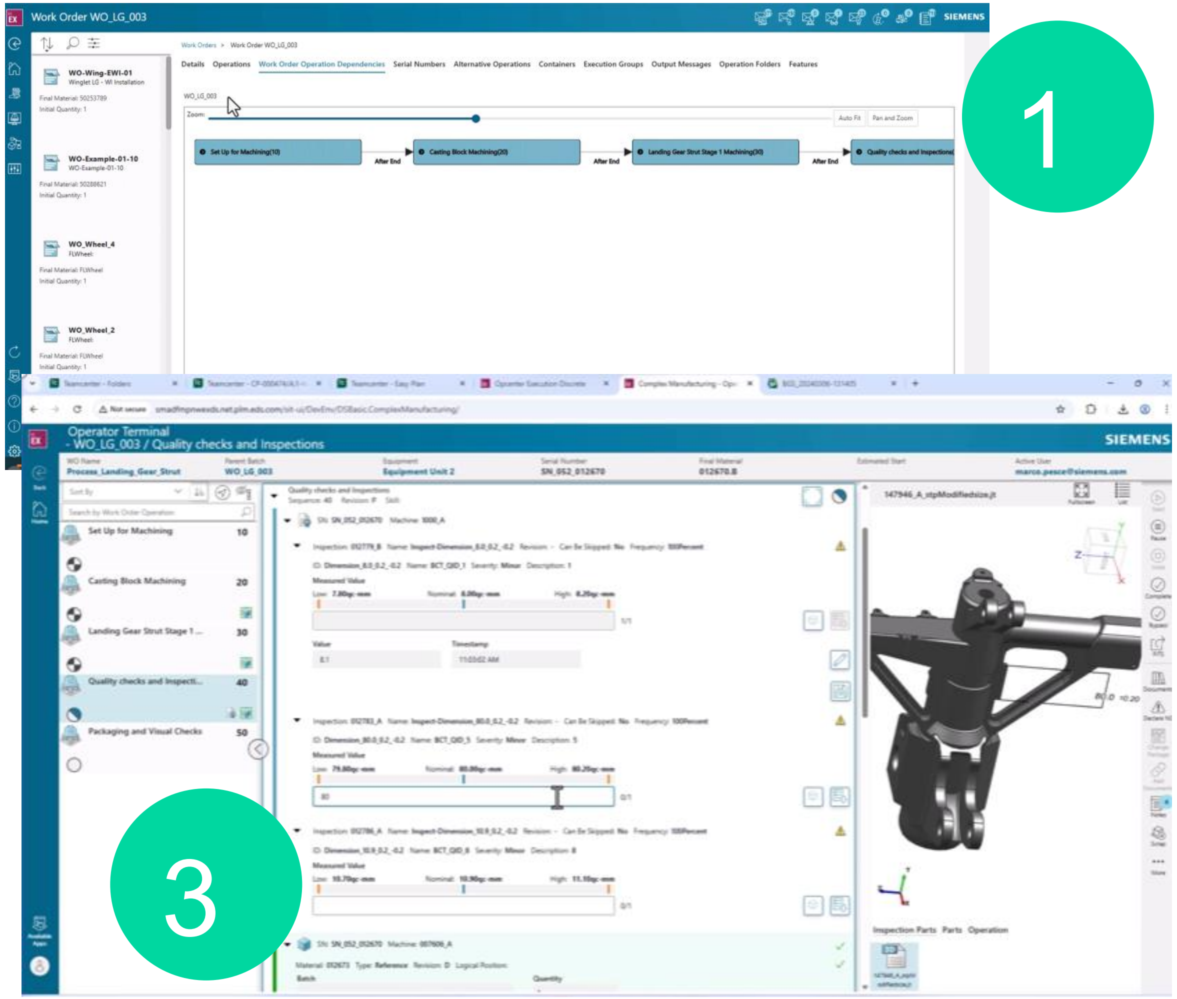
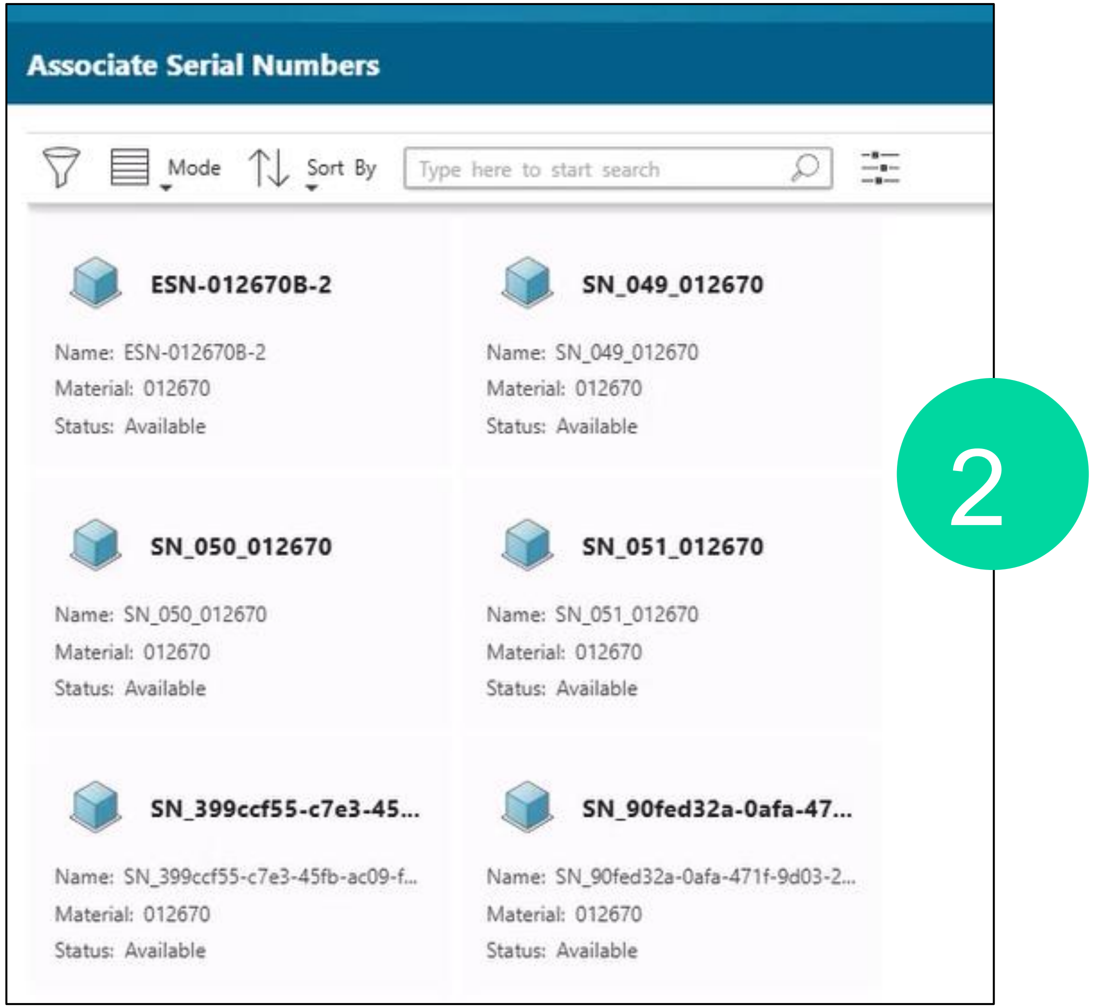
Downstream consumption in execution Easy Plan





Downstream consumption in execution Opcenter Discrete





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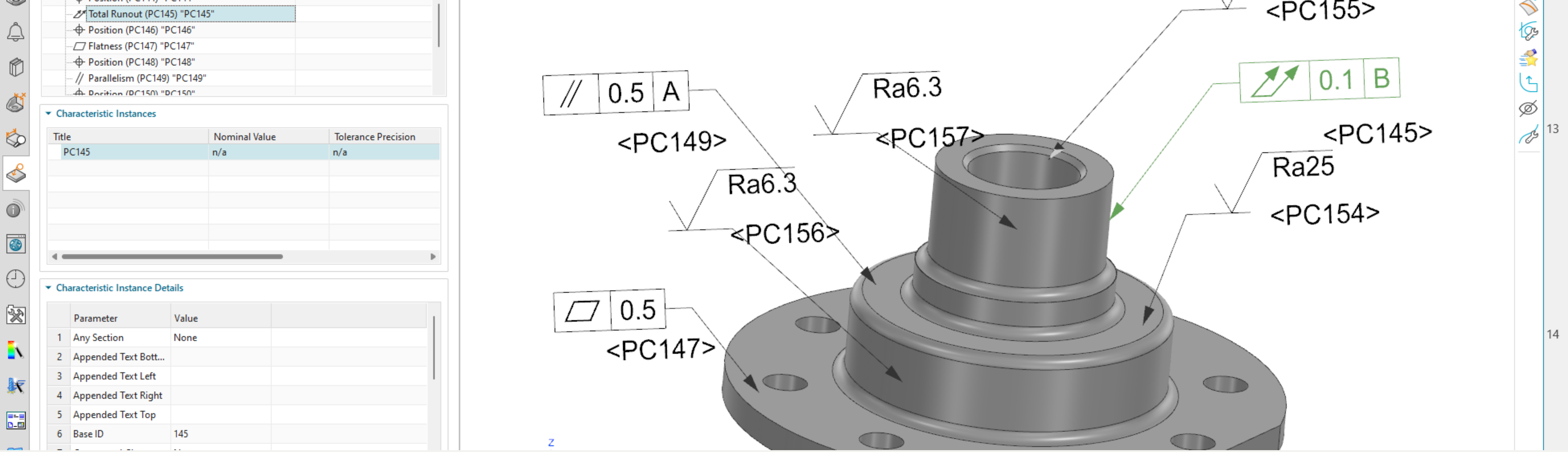

Demonstration Capability/Functionality

Supporting the Characteristic Digital Thread

NX Inspector characterizes product manufacturing information (PMI) to ensure consistent interpretation and consumption of engineering requirements and design data from design to quality and manufacturing. This offering brings together manufacturing, quality management, and metrology, in a way that should bring promising value to those looking to fully embrace a model-based enterprise.

Michelle Boucher, Vice President, Tech Clarity

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