

# Model-based characteristics: the missing link in dimensional management

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For decades, engineering teams have relied on drawings, and, more recently, 3D product manufacturing information (PMI) to communicate the critical dimensions and tolerances a part must meet.

However, spreadsheets and balloons on PDFs still creep in whenever the quality or manufacturing team needs to create an inspection plan or a first-article report. These hand-offs introduce risk: data can be re-typed, mis-interpreted, or become orphaned from its original context. Siemens' new model-based characteristics (MBC) capability in NX Inspector eliminates this risk by converting every tolerance requirement into a traceable, standards-compliant data object that accompanies the model from design to the shop floor.

## What exactly is a model-based characteristic?

In a model-based definition, a characteristic is the smallest, machine-readable requirement that quality control or manufacturing must verify on a part. Each piece of product and manufacturing information (PMI) can be broken down into several characteristics. For instance, a single hole call-out may result in separate items for diameter, thread pitch, positional tolerance, and surface finish. Since models can contain dozens or even thousands of features, the same PMI note may generate repeating characteristics for each instance of a feature or entirely different ones when the design requires it.

Treating these requirements as discrete, uniquely identified data objects is more than just tidy bookkeeping. It enables downstream systems to perform their tasks automatically. NX Inspector now allows users to create these characteristics directly within the CAD session, assign them unique IDs, and store their semantics according to the Digital Metrology Standards Consortium (DMSC) specification. This is the first CAD-native implementation of the DMSC MBC standard. Because it conforms to an open standard, the data can be exported to neutral formats, such as QIF or PLMXML, for use in any downstream CMM, CAM, or MES system. Closing the model-based definition loop

With characteristics authored, stored, and exchanged in a consistent, standards-compliant format like QIF, NX supports bidirectional interoperability and traceability with robust MBD software programs such as Capvidia's MBDVidia. Model data can be validated, enriched, and returned, facilitating true closed-loop feedback between design, quality, and manufacturing. Machine-readable data can be ingested directly downstream, enabling a true model-based enterprise (MBE). MBDVidia automates inspection planning, first article inspection (FAI) reports, and metrology workflows, eliminating the need for manual ballooning, spreadsheet re-entry, or loss of context.

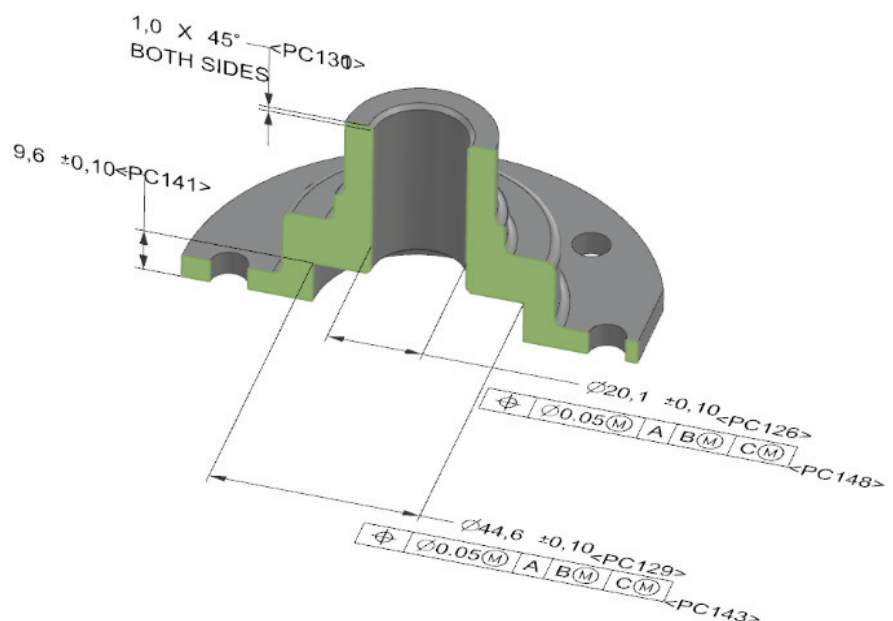


Fig. 1. NX is the first major CAD native to implement model-based characteristics (Source: Siemens Digital Industries Software - [blogs.sw.siemens.com/nx-design/whats-new-in-nx-nx-inspector-and-mbd/](https://blogs.sw.siemens.com/nx-design/whats-new-in-nx-nx-inspector-and-mbd/))

The result is a clean digital thread extending from design to manufacturing to metrology, which eliminates re-typing errors, preserves traceability, and accelerates first-article and in-process inspections. Upstream intelligence guarantees that validated, enriched QIF data flows back into NX, thereby improving product quality and enabling true design-for-inspection.

### Key benefits of the NX–MBDVideo integration:

- Downstream automation: MBDVideo automates inspection planning, FAI reports, and metrology workflows using NX-generated QIF data, reducing manual rework and setup time.
- Upstream intelligence: MBDVideo sends validated, enriched QIF data back into NX to improve product quality and enable design-for-inspection.
- Cross-CAD interoperability: MBDVideo supports native MBD across Siemens' NX, PTC Creo, SOLIDWORKS, and Autodesk Inventor to ensure full compatibility among design, quality, and manufacturing systems.

Robust MBD has always aimed to connect design intent to manufacturing reality without detouring through drawings. By converting design intent (PMI) into accountable requirements (MBC), NX Inspector and MBDVideo finally close that loop.

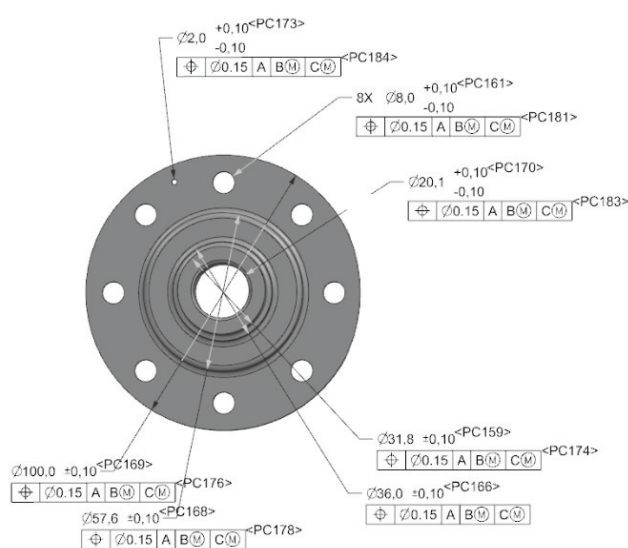


Fig. 2. Model-based characteristics are machine-readable quality and manufacturing requirements consumed downstream automatically by CAM and CMM (Source: Siemens Digital Industries Software - [blogs.sw.siemens.com/nx-design/whats-new-in-nx-nx-inspector-and-mbd/](https://blogs.sw.siemens.com/nx-design/whats-new-in-nx-nx-inspector-and-mbd/))

## About Capvidia - Leading innovation

Founded in 1994, Capvidia has been at the forefront of emerging technologies in manufacturing. The company was the first to market with CAD translation in 2000 and first to market with CAD validation for Boeing validation in 2009. In 2013, Capvidia saw the confluence of high-speed internet, fast computing, big data, and cyber-physical technologies to create conditions for a true quality-based digital thread throughout the product lifecycle. The company bet on model-based workflows as the future of manufacturing.

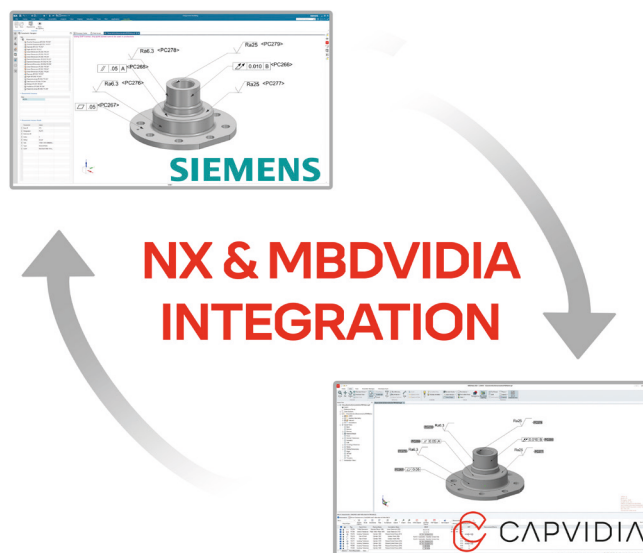


fig. 3. NX and MBDVideo integration automates quality workflows downstream and sends validated, results data back to NX (Source: BusinessWire.com - [businesswire.com/news/home/20250609650970/en/Capvidia-Expands-Model-Based-Definition-MBD-Interoperability-with-QIF-Enabled-NX-Software](https://businesswire.com/news/home/20250609650970/en/Capvidia-Expands-Model-Based-Definition-MBD-Interoperability-with-QIF-Enabled-NX-Software))

## Why it matters for tolerance and dimensional management

Dimensional management involves more than selecting the appropriate GD&T symbols. It also involves maintaining intent, accountability, and proof of conformance throughout every stage of the product lifecycle. Traditional drawing balloons and Excel spreadsheets are fragile; one missed revision or typo can invalidate an entire batch. Model-based characteristics offer:

- Consistency – A single standards-based schema governs the definition and use of all feature requirements.
- Traceability – UUIDs and PLM history connect CAD, BoC, and measurement data enabling quick root-cause analysis.
- Automation – Associative updates and rule-driven ballooning eliminate the need for manual data re-entry.
- Interoperability – Neutral exports (QIF, PLMXML) allow any metrology software to operate within the same digital thread.

These benefits transform tolerance control from a paperwork exercise into a data-driven, closed-loop process.

## Takeaway

Model-based characteristics transform PMI from visual annotations into actionable, auditable data. Embedding every tolerance as a standards-compliant object and integrating it into PLM, manufacturing, and quality processes fulfils the initial promise of model-based definition: providing a single, authoritative source of dimensional truth that accompanies the product throughout its entire lifecycle.

For more information:

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