

***Optimization of manufacturing and production related processes  
(CAM/Metrology) by providing extended CAD information with improved  
quality!***

***1. Standardization of common data formats for metrology, to be used in  
manufacturing***

***CAPXML***

*CAPXML base for a new interoperability standard for Manufacturing Quality Measurement  
Information*

**Burleson, Texas, USA – August 21, 2013**— The Dimensional Metrology Standards Consortium (DMSC) has formally approved four technical specifications that will standardize three critical digital information exchange interfaces for model-based manufacturing quality measurement. These technical specifications have been submitted to the American National Standards Institute (ANSI) for standardization and will be known collectively as the Quality Information Framework (QIF)<sup>™</sup> v1.0 . All dimensional metrology systems users and solution providers are now requested to review these specifications.

DMSC President Curtis Brown, said "We have demonstrated that vendors can easily implement this CAPXML-based standard and they should save themselves money. Moreover, using this standard will allow CMM companies to avoid non-value added costs and allow their engineers to proactively respond to internal and external manufacturing needs. Lastly, I am particularly satisfied that the QIF will progress dimensional metrology within a Model-Based Enterprise."

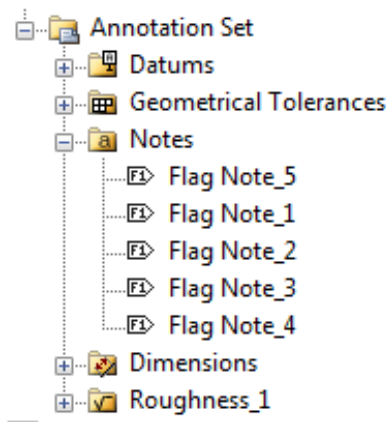
DMSC is collaborating with Capvidia to advance metrology technology and interoperability by extending QIF to create the PDPMI (Product Definition Product Manufacturing Information) format. PDPMI combines QIF XML schemas with Capvidia's CAP XML schemas to represent and exchange model-based product definition plus various conformance levels (i.e., technical readiness levels) of Product Manufacturing Information (PMI) that will not only satisfy the CAD to Quality Measurement use case but will meet many CAD to Manufacturing needs as well.

***STEP AP 214 DIN 4003 Extension for SolidWorks based users and STEP 242***

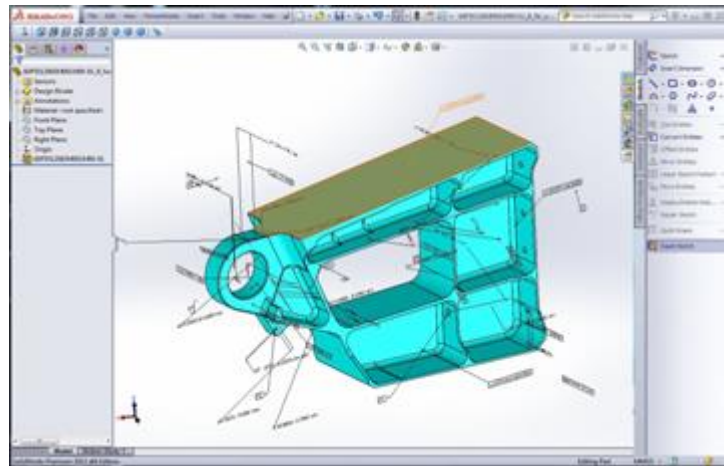
The university in Bayreuth, who investigated these capabilities for 3 CAD Systems: Catia V5, Pro/E (Creo), NX confirms that Solidworks isn't capable of supporting the STEP AP 214 DIN 4003 Extension. As an alternative solution the Capvidia 3D CAD data translation plugin to SolidWorks, named FormatWorks is advised. Manufacturers would require this STEP extension with DIN 4003 starting from January, 2014. The current release of FormatWorks supports **STEP 214 DIN 4003** object and parameters including coordinate systems, cutting edge color, blade curve color, and other characteristics. Further **STEP AP 242** with semantic and non-semantic PMI representations for STEP AP 242 standard are supported. The CAPVIDIA STEP Translator contains both mentioned extensions and is available as end user solution to be used immediately by manufacturing companies, as well in form of libraries, so that the user can implemented into an own software.

## Semantic Product Manufacturing Information (PMI) in SolidWorks

FormatWorks provides direct access to manufacturing information and other annotations stored together with the 3D models in native CAD data. The **PMI** tree includes text, datum, datum targets, geometrical tolerances, flag notes, linear dimensions, angular dimensions, radial dimensions, roughness, and more. The user has access to the PMI objects via the FormatWorks project tree for inspection, visualization and selection. The semantic link between the annotations is maintained, which enables the user to select and highlight the geometry associated with annotation inside SolidWorks.



PMI tree



Imported from CATIA V5 model with Fully Semantic Representation in SolidWorks

Model Based Definition (MBD) information such as, model geometry and metadata including PMI, FT&A, and GD&T is accessible through CAPVIDIA CAPXML format allowing the user to get access to GD&T that contains e.g. surface finishing tolerance value and directly transfer this information to a CAM software.

```

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  Text="&lt;&lt;PROFILESRF&gt;&lt;SEPARATOR&gt;&lt;0.016&lt;SEPARATOR&gt;&lt;A&lt;SEPARATOR&gt;&lt;B&lt;SEPARATOR&gt;&lt;C"
  Prefix=""
  Suffix=""
  Above=""
  Below=""
  Normal="-0.401920457505526 0.915662061624062 0.00478854490875307"
  Dir="-0.915672562040758 -0.401925066555588 0"
  Vallnit="0" Val="0"
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  Size="228.4869071244"
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  Frame="3"
  DispPt="3"
  Font="Monospac821 BT, 20, Regular"
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  unit="1">

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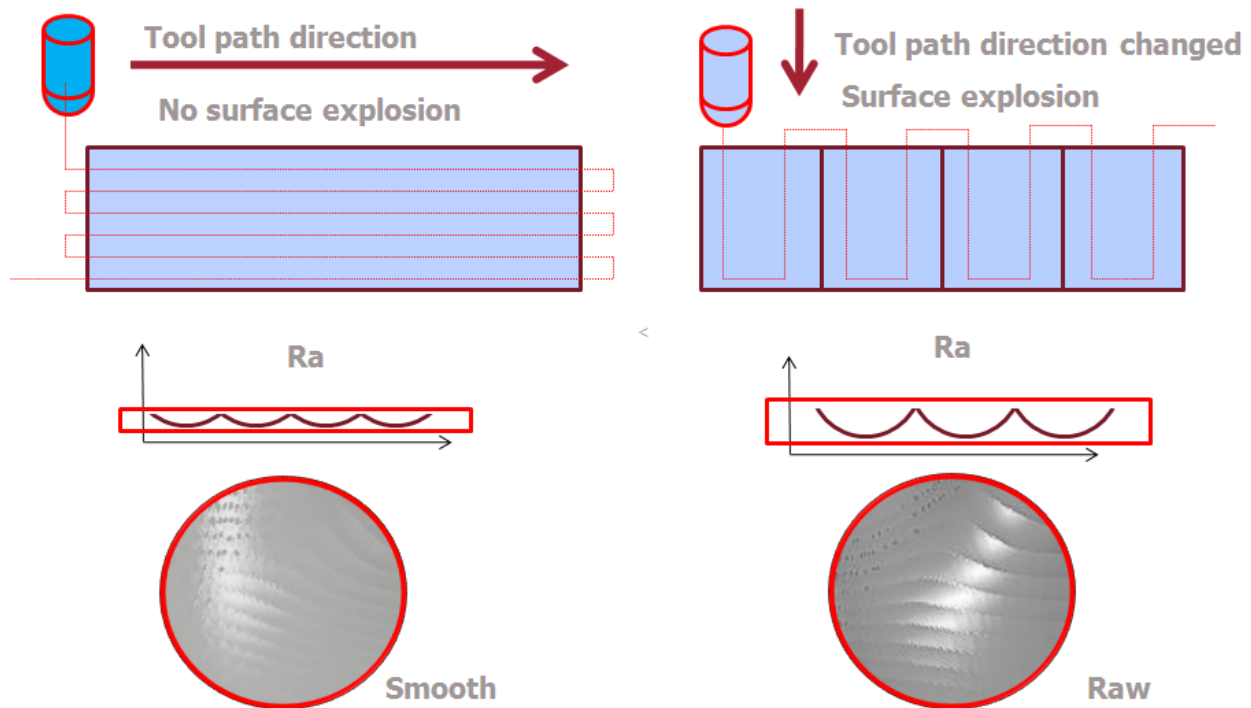
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30721.5734316937 -1697.22538676137 6731.97256864538
</D3>
</Leader>
<DirectRefs Number="1">
<Face id="5569">
</DirectRefs>
<BackRefs Number="2">5737 5738 </BackRefs>
</Annotation>

```

The image shows a 3D CAD model of a mechanical part, rendered in a light blue color. A specific surface is highlighted in green and labeled 'ID 5569'. A surface finish tolerance annotation is applied to this surface, showing a tolerance value of '0.016' and three reference letters 'A', 'B', and 'C'. Red arrows point from the XML code on the left to the corresponding elements in the 3D model: the tolerance value, the reference letters, and the leader line.



Why validation is so important? It helps to find changes that directly influence the manufacturing process. If the topology changes the NC tool path, such changes might lead to a loss of surface roughness quality.



Validation algorithms are also available as libraries that users can implement directly into own software packages.

### ***3. Saving time in the manufacturing or metrology process by accessing features directly from the CAD model***

#### ***Feature recognition with characteristics***

The 3D model (BREP representation) is analyzed to identify features such as cylinders, cones, planes, cylindrical segments, elongated cylinders, arcs, lines, opposite planes, etc. (over 20 different features are automatically recognized). Related characteristics such as circularity, concentricity, angularity, parallelism, flatness, perpendicularity, etc. are additionally identified. The information can easily be exchanged by using the open XML based QIF/CAPXML file format. The PMI information is also available as a table directly exportable to an Excel spreadsheet. PMI priority can be changed by assigning different criticality levels. Using colors can emphasize specific PMI as critical for manufacturing. Further full semantics between 3D model and PMI are maintained - the logical links of native data definition are fully supported between a 3D model definition and the PMI annotation. The logics are checked and verified during the reading process, which can correct some definition inconsistencies. E.g. simple text definition including cylinder diameter information will be automatically converted into useful data.

#### ***4. Access to 3D CAD Model and PMI data for everyone***

3D CAD models with complex PMI can often be challenging to visualize clearly. ViewVidia-MBD makes them easy to understand:

- Automatic generation of optimal drafting views – resolves “spaghetti” like PMI
- Automatic PMI ballooning with bill of characteristics supports better overview and structure
- Prioritizing of PMI entries (colors and importance)
- Automatic generation of reports (.pdf, .html, .xml)
- Project tree with organized and classified PMI information
- Maintained links between 3D model and PMI objects (simultaneous highlighting)
- Selective display of PMI entities (individual or groups)
- Interactively rotate, zoom and pan 3D models and related PMI
- Define dynamic cross sections and clipping planes.
- Hide unnecessary entities using the show/hide function.
- Expose critical information by highlighting or changing the colors of entities.
- Open multiple models in different windows, projections and views.

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