# Notes

This Assessor Task Guide for the Digital Product Definition/Model Based Definition Checklist is intended to provide guidance and understanding of the questions of the check list to the Supplier that is undergoing a DPD assessment. It is also intended to provide the auditor with information for use during the execution of the assessment.

The task guide is split into 4 sections.

* **Section A** of the checklist is used to perform a basic Digital Product Definition (DPD) capability verification.
* **Section B** is used to perform Model Based Definition (MBD) capability verification.
* **Section C** is used for Coordinate Measurement System (CMS) capability verification.
* **Section D** is used to perform Plotter capability verification.

The checklists for Sections B, C & D are designed to build upon the basic DPD capability assessment from Section A, therefore, Section A must be performed prior to performing assessment for CMS or MBD. The MBD, CMS and Plotting sections may not be applicable if the supplier does not require these capabilities for tooling or production use.

The person performing the DPD assessment should review contract language for DPD, Tooling and Design requirements prior to performing assessment (some questions may not be applicable based on contract review).

Rapid change of equipment capabilities requires changing quality control practices. Guide questions/examples are not necessarily applicable to each supplier’s manufacturing process.

# Definitions

**Authority Dataset**

This is the engineering definition provided in a 3D representation of the product, viewable on a Computer Aided Design (CAD) system. In addition to the Authority dataset (aka CAD model), the entire product definition may typically include additional media such as parts lists, part coordination documents, material specifications, etc.

The Engineering definition may include:

1. The CAD model and fully dimensioned 2D drawing sheets.
2. The CAD model and simplified or reduced content 2D drawing sheets.
3. The 3D model and the engineering requirements displayed as text within the 3D viewing area of the model, as well as the remaining engineering requirements (in 2D form - notes list, part lists, etc.).

All three formats are considered Digital Product Definition (DPD). The second case is a reduced content format, and is sometimes labeled as Reduced Dimension Drawing (RDD) or Simplified Drawing (SD). The third is termed Model Based Definition (MBD).

The purpose of the DPD/MBD checklist is to verify that the supplier has processes to use any of these formats received from any Triumph site, to manufacture and inspect the product.

**Product Acceptance Software**

This is software used during Product Realization that potentially affects product conformity where there is no further, downstream verification of the product. (E.g., CAD, LEV, CMS, data handling/analysis, and in some cases, NC)

**Coordinate Measurement Systems (CMS)**

CMS devices check the 3D Features of products. Typical examples are the fixed Coordinate Measurement Machine (CMM), and several portable devices, Theodolite, Laser Tracker, Photogrammetry (includes Videogrammetry), and Portable CMM.

**Dataset Derivative**

The media created any time data is extracted from an Authority dataset for machine programming, visual aids, inspection aides, FAIs, tool fabrication/measurement, plotting mylars, or what have you. Derivative is data taken from its native environment and used in another CAD CAM or CAI software system. The geometry is translated from one system to another using a neutral format translator or manual into some 2 D systems.

**Enhanced Reference System (ERS)**

This is a documented permanent or temporary reference system used usually for large assembly tools, with a large number of digitally-defined, fixed target locations readable by coordinate measurement systems. It provides better repeatability than conventional tooling datum features.

**IGES, STEP, DXF, Parasolid**

Standardized formats for CAD data that are readable by multiple systems.

**Low End Viewer (LEV)**

An entry level, visualization CAD system used to view, analyze, extract, and print dimensional and other required data from the DPD dataset. Currently, the only Triumph approved LEV’s used with our Triumph’s MBD datasets are Enovia DMU and VisView. These systems usually do not support neutral format output.

| **Checklist Question** |  | **What to look for...** |
| --- | --- | --- |
| **A – Digital Product Definition** |
| 1. **Are there DPD/MBD documented processes or procedures that address all sections of SCMP 3.7 (a)?**

**Requirements SCMP 3.7 (a), Sec 1.1** | * **Does supplier have documented Digital Product Definition/Model Based Definition processes in place?**
 |
| 1. **Is there a flow diagram of the complete documented DPD processes?**

**Requirements SCMP 3.7 (a), Sec 1.2** | * **There must be a flow diagram that documents the complete DPD processes and identifies the applicable procedure references including segregation and secure storage of datasets and derivatives.**
* **Flow chart should include reference to affected organizations such as (engineering, manufacturing planning, tooling, inspection and procurement).**
 |
| 1. **Is there a requirement in the suppliers documented processes to notify customer within 30 days of any changes or at a minimum annually if no changes occur.**

**Requirements SCMP 3.7 (a), Sec 1.3** | * **The supplier must have a process that notifies the customer when changes are incorporated into their DPD process and impacts the customer (simple typographic errors need not apply)**
* **The process should include notification within 30 days of any changes that will affect product.**
 |
| 1. **1. Are documented DPD processes implemented with defined authority for change control & maintenance?**

**Requirements SCMP 3.7 (a), Sec 1.3** | * **Look for approval or signature page and a document control procedure**
* **Notification to affected personnel and sub-tier suppliers when changes occur.**
* **Processes should be under document control**
* **Definition in the procedure as to who is responsible for this document. (Maintenance)**
* **along with ownership**
 |
| 1. **Is there a process to ensure integrity and security of datasets from receipt throughout the manufacturing and acceptance processes?**

**Requirements SCMP 3.7 (a), Sec 2.1** | * **Storage of Triumph provided DPD and supplier created derivatives**
* **Archiving old revisions**
* **Encryption during send/receive**
* **Backup system with including remote storage and disaster recovery**
* **Access control with permission and/or password protection (read/write) to ensure Triumph provided datasets will not be inadvertently modified.**
 |
| 1. **Does the supplier have a process to control configuration of dataset derivative media?**

**Requirements SCMP 3.7 (a), Sec 2.2** | * **The derivatives/media must have a revision level process to keep the derivatives/media current with authority dataset revisions that affects its configuration. As an example look for these indicators:**
	+ **Creator/Date**
	+ **Sketch Revision Level**
	+ **Authority Dataset(s) Name, Location, Revision Level**
	+ **Other Derivative Dataset(s) Name, Location, Revision Level**
	+ **Feature Requirement(s) Identifier (e.g., GDT frame ID)**
	+ **Product identification**

**Note: Derivatives are modified copies or extracted data from the original authority dataset.****NC/CNC type programs and the geometry used to create them, visual aids, Mylars, digital tool designs and tools, inspection datasets, FAI datasets, etc.** |
| 1. **Are dataset derivatives traceable back to the current authority dataset?**

**Requirements SCMP 3.7 (a), Sec 2.2.1, 2.2.3, 2.2.4** | * **Traceability is looking at whether or not the derivative can be clearly identified and tied back to its Authority dataset, such as when visual aids or screen-prints are being used, they need to be traceable back to the current Authority dataset.**
* **Make sure you can trace all derivative back to the authority data. This may be by revision letter, number or even date and time stamps for N/C processed data.**
* **All must include reference to the Digital data nomenclature. Look for some sort of history of change.**
* **Make sure that this traceability covers SCDs when suppliers create designs.**
 |
| 1. . Does the planning package identify traceability to the current authority dataset?

Requirements SCMP 3.7 (a), Sec 2.2.2 | * **The supplier needs to have a documented process to ensure the planning is traceable to the correct authority dataset.**
* **Planning used for route sheets, travelers, work instructions, NC programs, inspection, etc. will be traceable to the authority dataset that controls the configuration being built. Any items used in FAI, Tool buyoff or conformity shall be traceable.**
 |
| 1. **Does the supplier have a change control process for dataset derivative media?**

**Requirements SCMP 3.7 (a), Sec 2.2.3** | * **Verify there is a change control process that updates all derivative dataset elements when the authority dataset is revised.**
* **Change control process includes review for:**
	+ **Tooling**
	+ **NC and CMM program**
	+ **Sketches, inspection plans, or 2-D drawings**
	+ **FAI documentation / Delta FAI or Tool inspection**
	+ **Sub-tier supplier notification**
 |
| 1. **Does the supplier have a process that includes control of non-current (obsolete) authority datasets and dataset derivatives?**

**Requirements SCMP 3.7 (a), Sec 2.2.4** | * **Segregation and clear identification of current and past revision level datasets in supplier’s directories.**
* **Ensure compliance to contract data retention requirements**
* **Look for separate files that are accessible to production**
* **Archive process**
 |
| 1. **If providing Type Design or Tool Design to Triumph, does the supplier have a documented process for design and development?**

**Requirements SCMP 3.7 (a), Sec 2.3** | * **The supplier shall describe a documented process for design and development to ensure compliance to customer requirements. Compliance to Triumph Drafting Standards and Tool Design standards.**
* **Designs will have traceability to engineering definition**
* **Supplier’s released design shall be reviewed for program requirements, the design will provide the data required to allow the product to be:**
	+ **Identified**
	+ **Manufactured**
	+ **Inspected**
* **All designs will include the part lists and specifications necessary to define the product or tool (e.g. material, process, features, annotation, specification, notes, and manufacturing and assembly data needed to ensure conformity of the product or tool).**
* **Must include a reference for customer approval when required**
 |
| 1. Does internal quality audits procedure include auditing or reviewing all internal and sub-tier operations for DPD data and related documentation?

Requirements SCMP 3.7 (a), Sec 4.0 | * Internal audit procedures identify DPD processes for review.
* Review audit checklist for compliance. Supplier checklist should address and be applicable to their processes.
* Review internal audit records for evidence of having a completed internal audit for DPD processes.
* Internal audit plan shall include provisions for audit of sub-tier supplier oversight
* Review procurement process for flow down and an established ASL for sub tiers approved to SCMP 3.7 (a) or its equivalent.
 |
| 1. Does the supplier’s documented procedure for corrective action include reporting, tracking and resolving hardware, software and dataset integrity (Including Triumph provided datasets) in accordance with Customer’s reporting system?

Requirements SCMP 3.7 (a), Sec 5.0 | * Ask Supplier what Customer reporting system they are using example, Supplier Information Request (SIR) process per Triumph Aerospace Structures Division. Note – Each division may be using a different system per contractual requirements.
* Processes to report, track, and resolve dataset or software discrepancies to customer, OEM and all affected personnel.
* Process to prevent use of discrepant datasets or software (remove from system)
* The supplier must have a documented process to disclose products inspected with discrepant media, equipment, and/or tooling on items shipped to Triumph and their customers. This would include an internal CA and resolution.
* Existing QMS non-conformance system process.
 |
| 1. Does supplier QA organization have responsibility for approval of all inspection media?

Requirements SCMP 3.7 (a), Sec 8.0 | * Inspection media (paper inspection plans, inspection datasets, CMM programs, Mylars, media of inspection (MOI) tools, etc...) needs to be traceable to the authority dataset.
* If the inspection media is created by an organization other than Supplier Quality Assurance, there needs to be a documented and audited process approved by QA.
* The suppliers Inspection Media and method shall ensure that all product features are planned for inspection.
 |
| 1. Does the supplier have a documented process to create inspection media from a 3D model in addition to the 2D drawing?

Requirements SCMP 3.7 (a), Sec 8.2, 8.3 | * A process to assure accuracy of derivative media (e.g. Mylars, tools, CMS programs, NC programs) from authority datasets.
* Plotted Mylar media should be validated at each point of use. Ref applicable document
* for plotted media
* Inspection media is independently derived from and traceable to the authority dataset.
* Media must be under configuration control.
* Media contains graphics and text sufficient to illustrate inspection operations , traceability and QA verification
* Review process (checker, checklist, or peer/team review)
* Media is created by qualified personnel.
* Digital inspection operations are performed by qualified personnel.
* Documentation of the coordinate system, datum targets, and datum features.
 |
| 1. Does the supplier document the current level of hardware configuration, software, software revisions and other digital system information (e.g. PTF(s), project files) required to maintain compatibility with Triumph supplied datasets and/or data exchange formats per applicable Triumph system(s) requirement documents?

Requirements SCMP 3.7 (a), Sec 9.1 | * Determine which Triumph sites send or will send datasets to the supplier. Note: The site specific data exchange requirements will determine the method of how you audit
* Supplier data exchange software compliant to Triumph requirements (e.g. encryption, file transfer protocol (FTP), web connection, etc...)
* Ensure software levels and equipment matches DPD Capability questionnaire.
* If system is not compatible, there must be documented process to verify Triumph received authority data is acceptable before release.
 |
| 1. Does the supplier verify dataset translations when a supplier translates Triumph authority datasets from their as received format into their manufacturing or inspection software?

Requirements SCMP 3.7 (a). Sec 9.2 | * When translations of digital datasets occur between CAD systems or digital equipment, a process must be in place to verify data. Examples of how this can be accomplished using IGES\_CHK, point cloud method or other software validation processes

**Something to go by:**1. Point to Point distance in CAD dataset equal point to point distance in digital equipment software.
2. Plane to Plane Angle in CAD dataset equal Plane to Plane angle in digital equipment software.

 **Note:** It is always comparisons to assure that no integrity of the geometry was lost during the translation. |
| 1. Does the supplier ensure that when Tool Design responsibility is flowed down to sub tier suppliers that the sub- tier supplier is approved by the supplier?

Requirements SCMP 3.7 (a), Sec 10.0 | * Locate several designed Special Tools. Assure that:
	+ The tool identification bears a Supplier and/or Triumph Tooling Acceptance Stamp. (A Triumph stamp may or may not be required depending upon ST Category).
	+ Authority Design information is identified on the tool and is legible or is available in Supplier records system.
	+ Supplier has contractual notes that flow Triumph DPD/MBD requirements to all their approved sub-tier suppliers.
* Compare list of suppliers receiving datasets to list of suppliers approved to receive datasets.
* When controlled datasets are provided to sub-tier suppliers, the supplier ensures sub-tier supplier is in compliance to Triumph ITAR, EAR and contract requirements prior to approval and release of DPD/MBD datasets.
* Supplier has assessed sub-tiers and ensures the proper capabilities to manage and use the Triumph DPD/MBD datasets being provided.
	+ ASL that shows an approval for controlling Tool Design
	+ Process for approval for Tool Design (Questionnaire with tool design questions)
	+ Contract language or PO note that flows down requirements from customer
	+ Supplier performance Metrics for the approved suppliers (What does it take to disapprove the supplier?)
	+ Is there a process for protecting Triumph data when it is transferred to sub-tier to suppliers (secure transfer)?
	+ Where a Triumph provided dataset is provided to a sub-tier supplier, the dataset transfer must be encrypted.
 |
| 1. Does the supplier have a documented process to ensure release, acceptance, identification, security, access and change control for:
* Tool design datasets
* Tool Inspection datasets

Requirements SCMP 3.7 (a), Sec 10.1 | * There must be a documented process to review, revise and control tooling when authority dataset changes affect tooling configuration.
* There must be a documented release process and secure storage of released tool design datasets.
* Digital definition of physical tooling (including templates, check fixtures) must conform to digital engineering definition or approved tool design.
* Tools and tool design/inspection datasets must be traceable to the authority dataset and the affected revision.
 |
| 1. Are digitally defined special tools and physical inspection media (check fixtures, templates, etc.) identified and traceable to the authority tool design dataset?

Requirements SCMP 3.7 (a), Sec 10.2 | * Special Tooling must contain at a minimum, Tool Identification and the authority design information.
* Non-Design Special Tooling - The revision level(s) of the Engineering Drawing/Dataset(s) used to fabricate the tool.
* Designed Special Tooling - The revision level(s) of the Tool Engineering Drawing/Dataset(s) used to fabricate the tool.
* Ideally, tools should be identified with Authority Design information somewhere on the tool. Either stamped directly on the tool or on a tag. (Ref UT6907). However, Authority Design information may also be contained within Supplier records. Locate several designed Special Tools. Assure that:
	+ Authority Design information is identified on the tool and is legible or is available in
* Supplier records system.
 |
| 1. Are special tools and tooling media accepted and periodically validated to the authority design at a frequency determined to ensure accuracy and repeatability?

Requirements SCMP 3.7 (a), Sec 10.3 | * Special Tooling must periodically be revalidated to its Authority Design requirements.
* This revalidation may be known as a PTI. It generally reviews several areas include but
* are not limited to:
	+ Comparison of As Designed configuration to As Built configuration.
	+ Visual Inspection for wear/damage
	+ Dimensional Validation
* Randomly sample some Special Tooling that bears Indication of Inspection Status (Sticker).Check to assure that the due date is somewhere after today.
* Check due date back to Suppliers Inventory and Recall system for due date agreement.
* Observe tool for obvious damage, nicks or de laminations, worn edges, etc.
* A verification plan should be created for each tool or Supplier should have documentation that describes how verification is performed and what is validated.
 |
| 1. Does the supplier define training requirements that:
* Assure competence and maintain employee training records, including on-the-job-training, for all DPD system users.
* Respond to changes to the DPD process, equipment, or software?

Requirements SCMP 3.7 (a), Sec 11.0 | * This can be a spreadsheet with a listing of personnel or job title that is cross referenced with the defined training that is required for DPD.
* The supplier must have a documented process that ensures the appropriate quality assurance and other affected personnel responsible for product acceptance have proper training to use DPD/MBD/Product Acceptance Software for inspection planning, measuring and product/tool acceptance.
* The supplier must have a documented process that ensures other affected personnel responsible have proper training to use DPD/MBD when it directly affects their job function.
* The training must be formally documented and kept on file. This includes OJT when used as a training tool.
* Look for changes to the training program in response to changes to the DPD process, equipment, or software.
 |

| **Checklist Question** | **What to look for…** |
| --- | --- |
| **B - Model Based Definition (MBD)** |
| 1. [Does the supplier’s CAD system have the ability to view annotation based on Triumph requirements?](https://mytriumph.triumphgroup.com/corpgroup/corpquality/SCMP3-7c.docx)

[Requirements SCMP 3.7 (a), Sec 9.1](https://mytriumph.triumphgroup.com/corpgroup/corpquality/SCMP3-7c.docx) | * Supplier data exchange software compliant to Triumph requirements (e.g. encryption, file transfer protocol (FTP), web connection, etc...)
* Ensure software levels and equipment matches supplier documentation
* Compatibility requirements may involve CAD systems or data exchange software.
 |
| 1. Does the supplier have a documented process to create inspection media from a 3D MBD model?

Requirements SCMP 3.7 (a), Sec 8.2, | * Process to determine when manufacturing and/or inspection views/sketches are needed to supplement authority dataset.
* Obtain measurement values of all product features from the Authority Model
* Supplier should assure only qualified personnel perform digital inspection
* Process to identify/segregate pre-release or reference datasets
* **Note:** Is supplier utilizing equipment capability (CAD, LEV, and CMS) to minimize/automate creation of inspection views? Preferred method is to utilize digital methods vs. creation of 2D media.
 |
| 1. Does the supplier have a process to ensure verification of all design requirements of the authority dataset? (e.g., all defined by feature control frames, annotation, specifications, notes and other specified requirements in the authority DPD dataset and associated parts list including dimensional and other properties)

Requirements SCMP 3.7 (a), Sec 8.4 | * When planning measurements for product acceptance, the suppliers QA must verify that all design requirements are identified and planned for inspection. Note: Compliance for this process is best verified by reviewing FAI documentation for a specific product.
* Measurement process must have guidelines to ensure the appropriate quantity of individual measurements are taken on the feature being measured (i.e., quantity of surface points for measurement, CMM hits).
* Process to ensure Key Characteristics identified on authority datasets are measured and the results are recorded for every unit.
* This should use AS9102 or equivalent as a guideline for product
* Note: Is supplier utilizing equipment capability (CAD, LEV, and CMS) to minimize/automate creation of inspection views? Preferred method is to utilize digital methods vs. creation of 2D media.

**Note**: **Compliance for this process is best verified by reviewing FAI documentation for customer approval. Validate processors have not changed from the FAI approval to the current supplier process.** |
| 1. Is there a process in place to document FAI’s for product produced from MBD datasets?

Requirements SCMP 3.7 (a), Sec 8.5 | * Process for reduced content datasets (MBD, RDD, SD, etc.) to ensure all dimensioned, un-dimensioned features and general / flag note requirements are planned for verification.
* Unique identification of each feature is required. Various acceptable methods are available to manage this data (e.g. 3D model, screen prints, sketches etc.)
* Measurement planning must have guidelines to ensure the appropriate quantity of individual measurements are taken on the feature being measured (i.e., quantity of surface points for measurement, CMM hits).
* Use AS9102 as a guideline for product

**Note**: **Compliance for this process is best verified by reviewing FAI documentation for customer approval. Validate processors have not changed from the FAI approval to the current supplier process.** |
| 1. Does the supplier have a process to assure sub-tier suppliers’ ability to work with MBD information?

Requirements SCMP 3.7 (a), Sec 6.0 | * + - Supplier has monitored sub tiers and ensures the proper capabilities to manage and use the Triumph DPD/MBD datasets being provided.
* Supplier maintains records of sub tier MBD capabilities (equipment and process)
* Supplier has documented process to ensure sub tier suppliers inspection planning is compliant when used to accept Triumph product.
* Supplier documented processes ensure sub tier CAD systems/format are verified when dataset translation occurs.
* Must control sub tier DPD/MBD suppliers to the same standard as prime supplier.
* Utilize the same Triumph DPD/MBD Checklist requirements.
* Flow down of SCMP 3.7 (a) (or comparable) requirements to sub tiers (PO Note).
* Look for a process for control of the suppliers i.e. what does it take to approve and disapprove them?
* Supplier has performed assessment for sub-tiers and ensures the proper capabilities to manage and use the Triumph DPD/MBD datasets being provided.
* Supplier performs periodic review on their DPD/MBD sub-tier supplier to ensure they are in compliance to DPD requirements, Triumph ITAR, EAR and contract requirements.
* Supplier encryption protection for sending/receiving of electronically transmitted data.

Example of supplier purchase order clause. Use Triumph PO clause as example, (includes ITAR & EAR)* **Note:** Encryption required for electronically transmitted data.
 |
| 1. Has the supplier identified specific training requirements for all functions associated with use and control of MBD datasets? (e.g. planning, purchasing, contract review and Mfg

Requirements SCMP 3.7 (a), Sec 11.1 | * This can be a spreadsheet or training matrix with a listing of personnel or job title that is cross referenced with the defined training that is required for DPD
* The supplier must have a documented process that ensures the appropriate quality assurance and other affected personnel responsible for product acceptance have proper training to use MBD for inspection planning, measuring and product/tool acceptance.
* The supplier must have a Documented Formal Process that ensures other affected personnel responsible have proper training to use MBD:
	+ When it affects their job function.
	+ This includes OJT when used as a training tool (formal quality system training process).
* Look for changes to the training program when the DPD/MBD process, equipment, or software.
* Process to ensure quality assurance or other persons responsible for product acceptance been brought into the digital measurement and measurement planning process.
* Process to train and document tasks when product acceptance or media generation is performed by non QA personnel.
* Process to provide training for users of CAD, NC, CMS equipment.
* Process to provide training when software changes are implemented
 |

| **Checklist Question** | **What to look for…** |
| --- | --- |
| **C – Coordinate Measuring Systems** |
| 1. Does the supplier use CMS equipment for Tooling and or Product acceptance?

Check all that apply:Requirements SCMP 3.7 (a), Sec 7.2 | [ ]  Articulating Arm - Portable Coordinate Measuring Machine[ ]  Digital Theodolite[ ]  Fixed Coordinate Measurement Machine[ ]  Fixed Scanning Coordinate Measurement Machine[ ]  Indoor Global Positioning System[ ]  Laser Projectors - Optical Layout Template[ ]  Laser Radar[ ]  Laser Scanner[ ]  Laser Tracker[ ]  Numerical Control Machine Inspection using probes or scanners[ ]  Photo or Video-grammetry[ ]  Other |
| 1. Does the supplier have a process to control critical functions of the CMS?

Requirements SCMP 3.7 (a), Sec 7.2.1 | 1. Purpose / Scope – Overview or statement of specific equipment and its intended use.
2. Calibration – Supplier shall define calibration intervals and maintain a system for periodic maintenance of measurement equipment. The supplier must document inventory of all specific components used for CMS and OLT measurement that could affect the integrity of data collection. This inventory should include and not be limited to target accessories (e.g. bushings, adapters, sphere mounts, bar/rod, probing, drift nest, supports, etc.), all reflector types, and weather station equipment.
3. Product Acceptance Software – Supplier shall perform Product Acceptance Software testing per section 3.0.
4. Field Checks / Set up – Establish criteria for field checks/set up to ensure data and system accuracy prior to collecting measurement data.
5. Drift Points / Stability – When environmental conditions, vibration, or stability of the product being measured could affect measurement data, drift point analysis is required. A record of drift points measured and acceptance tolerance used, before and after measurements is required as objective evidence.
6. Temperature Compensation / Scale Factors – When products are measured in an uncontrolled environment a documented process to compensate for thermal effects on the objects being measured is required. Verify compensation using a scale bar of like (product) material before and after measurements. A record of scale bars measured and acceptance tolerance used is required as objective evidence. The product dimensional characteristics being verified must meet the engineering definition requirements as defined in ANSI/ASME Y14.5, ANSI B89.6.2.1993.
7. Establish Coordinate System – Establish criteria for changing the coordinate system from a local coordinate system to a part or tool coordinate system. (e.g. tolerances, datum targets, datum features, tooling holes, tool enhanced reference system or best fit). Establishment of coordinate systems shall be in accordance with customer engineering definition and ANSI/ASME Y14.5 as applicable.
8. Multiple Station Set-up Criteria – When moving CMS equipment from one location to another, or combining CMS equipment during a survey, supplier shall document their process and acceptance tolerance. A minimum of seven adequately distributed common points used as reference for repositioning/adding the CMS equipment during a survey shall be verified and recorded as objective evidence.
9. Data Collection Parameters – Establish measurement guidelines and specific collection parameters for the CMS equipment prior to collecting measurement data. (e.g. point density, time/distance separation parameters, apex angles, distance limitations).
10. Data Analysis – Establish guidelines for the evaluation of 3D point data to tool engineering, engineering datasets, or drawings.
11. Reports – Establish standard process for CMS reports (e.g. job information, coordinate system establishment, object temperature, scale bars, drift points, data analysis and measured results). Reports shall be in English and in inches unless directed otherwise by customer contract.
12. Record Retention – Establish standard process for all inspection and test records to be archived and retained per customer contract requirements and provided to the customer upon request.
13. Training – Suppliers shall define training requirements to assure competence and maintain employee training records, including on-the-job-training, for all CMS users per section 11.0.

**Note:** Is supplier utilizing equipment capability (CAD, LEV, and CMS) to minimize/automate creation of inspection views? Preferred method is to utilize digital methods vs. creation of 2D media. |
| 1. Does the supplier maintain certification/calibration for equipment used for inspection, including:
* CMS equipment (Fixed and Portable):
* NC equipment with inspection probe capability used for product acceptance
* OLT's
* Ply Cutters
* Other equipment used to accept part attributes (Scale bar, adaptive tooling, ball bars, etc.)

Requirements SCMP 3.7 (a), Sec 7.1 | * Calibration records must be traceable and maintained for all CMS equipment & special target adapters, if applicable (target adapters are special tools that are used when target points are located off the part).
* CMS equipment must be calibrated at periodic intervals
* Calibration process must meet NIST or equivalent standards.
* Measuring equipment will be physically identified in accordance with certification records
* Process will provide records of date of acceptance/rejection and next maintenance due date

There must be a process to validate probes for CMM prior to use at each probe angle. This will be performed before each probe is used base on a certified monument (ball). |
| 1. Is there a process in place to validate Product Acceptance Software (PAS) independent of the software developer?

Requirements SCMP 3.7 (a), Sec 3.1 | Suppliers procedures must include:* Supplier PAS must be verified prior to product acceptance use.
* The supplier will establish and maintain a procedure independent of the software developer
* Determine that the software, and subsequent revisions, accomplishes its intended function.
* A means of identifying approved PAS software.
* Software Security and Storage
 |
| 1. Does the supplier develop software for inspection and acceptance of product?
* Is there a documented process to require creation of plans and instructions for the building, configuration management, loading and testing of “Supplier developed” product acceptance software?

Requirements SCMP 3.7 (a), Sec 3.2 | There must be a documented process for:* Control of the build/creation of the CMS software
* Approval and certification testing to assure the software meets industry standards. accuracies
* Configuration management
* Problem and Trouble Shooting
* Manuals and documentation for the Supplier Developed CMS Software
 |
| 1. Does the supplier define training requirements that:
* Assure competence and maintain employee training records, including on-the-job-training, for all CMS system users.
* Respond to changes to the CMS process, equipment, or software?

Requirements SCMP 3.7 (a), Sec 11.0 | * There must be specific training requirements that assure operators and inspectors have been trained on all functions associated with use and control of the CMS
* The training process must have instruction to assure training is provided when changes to processes, equipment or software occur
* Supplier shall demonstrate CMS capability and compliance to Triumph approved CMS procedures
* If supplier receives authority dataset to measure product and tooling they must be DPD approved.
 |

| **Checklist Question** | **What to look for…** |
| --- | --- |
| **D - Plotter** |
| 1. Are there documented processes for the control of Mylar plots used as a media of inspection? Those procedures shall include at a minimum the following:
* Plotter Calibration
* Verification of engineering definition
* Verification of plot accuracy
* Quality Acceptance Stamping
* Verify accuracy prior to use

Requirements SCMP 3.7 (a), Sec 8.4 | * Plotter Calibration
	+ Plotting equipment should be located in a temperature and humidity controlled environment.
	+ Typically plotters come with calibration software; this software should be run and used to adjust the plotter.
	+ A Circle, Diamond, Square pattern is preferred as a independent for validation of proper calibration
	+ After the plotter has been calibrated then it should be identified with a calibration sticker and put a scheduled calibration cycle
	+ Plotting environment should be per ANSI Z 540-1.
	+ Record of certification test and frequency any adjustments made and result after adjustment. This is done daily
* Verification of Engineering Definition
	+ Plotted media should be under Configuration control and be traceable to authority dataset
	+ A process to verify flat patterns
	+ Derivative media (Model) shall include gridlines or plot points used for verification.
	+ Plots are not permitted to be used for engineering tolerances < .030 inches
* Verification of plot accuracy
* Process to validate plots at time of creation
* Grid lines or plot points should be +/- .010 across the length of the plot
* Record temp and humidity at the time of plot
* Quality Acceptance Stamp
* Quality should verify the calibration, temp, humidity, and verification of plot accuracy
* Quality should stamp and date and approve the plot for inspection use
* Verify accuracy prior to use
* Plots should be verified prior to each use Sec 8.4
* Temperature compensation
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| 1. Does the supplier define training requirements that:
* Assure competence and maintain employee training records, including on-the-job-training, for all system users.
* Respond to changes to the Plotter process, equipment, or software?

Requirements SCMP 3.7 (a), Sec 11.0 | * There must be specific training requirements that assure operators and inspectors have been trained on all functions associated with use and control of the plotter
* The training process must have instruction to assure training is provided when changes to processes, equipment or software occur
* Supplier shall demonstrate compliance to Triumph approved plotter procedures
* If supplier receives authority dataset to create plotted media must be DPD approved
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