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Level 3 - Work Instructions WI-00200 / A

Coxsackie

Sub-Tier DPD/MBD Quality Assurance Procedures - Documented Process







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Release and Audit Schedule	
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Expiration Schedule	When Superseded or Obsoleted
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Special Handling on Release	
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1.0 Purpose	
<p>1.1 The purpose of this procedure is to provide a Quality Assurance plan for electronic data provided by Ducommun to our Suppliers. This plan will define the requirements for verifying that valid engineering configuration is used and maintained from receipt of Ducommun data to final product acceptance.</p> <p>1.2 This procedure contains the requirements to assure maintenance controls in the generation and application of electronic data. These requirements apply to all products, tools, and/or software in support of all phases of manufacture, test and inspection, including the use of automated inspection equipment.</p>	
2.0 Scope	
3.0 Responsibilities	

<ol style="list-style-type: none"> 1. Purchasing 2. Quality 3. Engineering
4.0 Definitions  
4.1 DPD Digital Product Definition
4.2 MBD Model Based Definition
5.0 Steps or Attachment  
<p>5.1 Documented Processes - The Supplier, supplier sub division and supplier sub-tiers shall develop and maintain comprehensive documented DPD processes and/or procedures that assure integrity of product and/or tooling configuration is maintained throughout the supplier's QMS from receipt of Ducommun data through creation of derivatives to product acceptance and process improvement.</p> <p>5.1.1. The supplier's documented process shall specifically address the processes and techniques unique to all DPD processes beginning with the receipt of DPD data from Ducommun through the product life cycle.</p> <p>5.1.2. The supplier's documented process shall specify all departmental organizations responsible for performance of CAD/CAM/CAI operations including organizations responsible for the delivery of Ducommun data or supplier derived data to sub-tier suppliers.</p> <p>5.1.3 Any MBD/DPD activity/process that is not addressed in this document is not permitted/authorized without written authorization from Ducommun.</p> <p>5.1.4. Ducommun reserves the right to survey and/or review the supplier's QMS to verify effectiveness of the supplier's documented DPD processes and procedures.</p> <p>5.2 Flow Diagram - The supplier shall include a flow diagram or equivalent in their documented process including process ownership that graphically depicts the flow of data through the DPD system from receipt of Ducommun DPD data through the product life cycle.</p> <p>5.2.1. The flow diagram shall identify the documented DPD processes, and or work instructions associated with control of the datasets and derivatives.</p> <p>5.2.2. In lieu of flow diagram, supplier may provide a complete relational diagram of their internal procedures to the requirements of this document.</p> <p>5.3 Responsibilities - The quality organization shall be responsible for the documented DPD processes with procedures for change control and notification to affected organizations. The authority and responsibility for each element of the documented DPD processes shall be defined and documented to assure consistent implementation.</p> <p>5.3.1. The supplier shall notify Ducommun Quality within 30 calendar days of implementing any changes to:</p> <ol style="list-style-type: none"> a) The Documented DPD Processes b) CAD, CAM (when used for product acceptance), CAI software additions, updates or changes c) Addition of new coordinate measurement system (CMS)
6.0 Configuration Management and Media Security
6.1 Media Security - The Supplier shall develop and maintain documented processes used to ensure the integrity and security of Ducommun provided datasets or Specification Control Drawing (SCD) data. This may include the use of envelope datasets, supplier created CAD/CAM/CAI datasets, type design and tool designs. Integrity and security of datasets shall include requirements for;

6.1.1. Secure storage and retention of Ducommun provided DPD, supplier created DPD derivatives, and digital product acceptance datasets

6.1.2. The supplier shall assure that datasets found discrepant are suspended from use and originator is contacted for disposition.

6.1.3. Archiving procedures with read/write protection which ensure access control per the time specified per program or contract requirements. This includes authority datasets, derivatives and digital inspection media used for product acceptance.

6.1.4. Encryption protection for sending/receiving of electronically transmitted data.

6.1.5. Establishing and maintaining a secure data backup and storage system whether local or remote, a disaster recovery process for authority datasets, derivatives and digital inspection media used for product acceptance.

6.1.6. Access control with permission and/or password protection shall be established in order to ensure that Ducommun provided datasets shall not be inadvertently modified. This process shall include derivative datasets released for manufacturing and inspection.

6.1.7. Supplier will have a process to manage and maintain (addition/removal of) supplier employee access to Ducommun technical data systems such as REDARS, Enovia, Team Center, etc.

6.2 Configuration Management and Traceability - The supplier shall develop and maintain documented processes to ensure configuration control of all Ducommun provided datasets, supplier created CAD/CAM/CAI datasets, type design, tool designs and datasets sent to sub tier suppliers used in the production or inspection of Ducommun products. These procedures shall include the following;

6.2.1. Formal release process of DPD data which ensures that only current authorized

6.2.2. The supplier shall ensure the Ducommun authority dataset(s), planning and all derivative DPD data used to manufacture and inspect product is traceable to the authority dataset and retained as part of that products acceptance package.

6.2.3. Supplier shall be able to demonstrate traceability of all product planning and DPD derivatives to the current authority dataset including filename and file extension.

Additionally derivatives shall have their own revision control system in addition to the product/tool revision.

6.2.4. A documented process for change control and retention for all authority datasets and dataset derivatives including engineering, manufacturing engineering, Bill of Material, SSP's, SPECO's, APO's, and CAE datasets, Etc.

6.2.5. A documented process that includes segregation, storage and retention of noncurrent (obsolete) authority datasets and dataset derivatives.

6.2.6. Supplier shall have a documented process to generate digitized manufacturing/inspection data from Ducommun provided full scale engineering Mylar plots or from any authority physical representation. This process shall ensure integrity of derived dimensions and include review, release and configuration control.

7.0 Product Acceptance Software (PAS)

7.1 Commercial Off The Shelf Software - The supplier shall document and maintain documented processes for the control of Product Acceptance Software (PAS). PAS includes software used in the acceptance of special tooling and products.

7.1.1. Supplier must document and maintain PAS procedures and reference applicable documents in their documented DPD processes. Documented results shall provide for identification of software name, software version and validation results used for all QA applications.

7.1.2. Procedures or processes will be maintained to prevent unauthorized changes, to limit personnel access to software files, and to archive masters and duplicates.

7.1.3. Supplier PAS must be verified prior to product acceptance use. The supplier shall establish and maintain a procedure and validation plan independent of the software developer to determine that the software, and subsequent revisions, accomplishes its intended function. A means of identifying approved PAS is required with configuration control and QA management procedures for relating the PAS to the product being accepted. Sample testing of existing product and tool programs shall be performed with new or revised PAS to verify compatibility.

7.1.4. Supplier PAS verification shall be performed using calibrated standards, known physical artifacts or embedded software testing. Examples of common algorithms include GD&T functions, feature construction, temperature compensation, CAD translations and software that controls hardware.

7.2 Computer Aided Manufacturing Software - When used for inspection (i.e. CNC On-machine probing, etc.) the supplier shall develop and maintain documented processes for configuration identification and control of CAM software and must meet the requirements of section 7.1.1 through 7.1.4.

7.2.1. Supplier must verify numerically controlled software prior to product acceptance and maintain records.

8.0 Internal Quality Audits

8.1 Internal Audits - Internal Audit procedures shall include provisions for auditing all operations annually affecting DPD data and related documentation to assure compliance with contractual requirements, software and production part quality standards, and the observance of security restrictions.

8.1.1 The audit plan shall include provisions for auditing sub-tier suppliers that use DPD data to manufacture or inspection Ducommun product or tooling.

8.1.2 The audit plan shall address all requirements of the latest revision of WI-00045 including notification from sub tier to supplier of items listed in section 5.3.1.

8.1.3 Results of all audits shall be documented and maintained for review by an authorized Ducommun representative per contract requirements

9.0 Procurement Control

9.1 Export Control – Flow down to sub-tier suppliers shall include ITAR, MLA, MA, TAA, and EAR requirements.

9.2 Ducommun Right of Entry - Ducommun reserves the right to survey and/or review the DPD quality assurance and configuration management systems of sub-tiers.

10.0 Control of Measurement Equipment

10.1 Calibration - The supplier shall implement and maintain a documented process for the recall of monitoring and measuring equipment. Calibration shall be traceable to NIST or equivalent international standards.

10.1.1. These controls shall provide records of date of acceptance/rejection and next maintenance due date. Measurement equipment shall be physically identified in accordance with certification records. This includes all CMS equipment, N/C (CAM) equipment used for inspection, Optical Lay-up Template (OLT's), ply cutters, and plotters used to produce Mylars or other inspection or tooling media.

10.2 CMS Procedures - Suppliers using CMS and OLT's for fabrication and/or inspection of Ducommun products (parts and tools) must document and control their processes.

10.2.1. Additional CMS requirements are stated below and require capability approval by Ducommun.

10.2.2. The supplier and its sub-tier suppliers utilizing CMS and OLT must have

documented user level processes or documented procedures that provide adequate asset care, equipment setup, operation, training, and QA procedural methods to perform acceptance of measurements.

Supplier shall determine the applicability and document the criteria to perform the following and any exclusion shall be approved by the Ducommun Quality or designee..

a) Purpose / Scope – Overview or statement of specific equipment and its intended use.

b) 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 but not be limited to CMM reference sphere and Laser Tracker target accessories (e.g. bushings, adapters, sphere mounts, bar/rod, probing, drift nest, supports, all reflector types, etc.) and weather station equipment.

c) Product Acceptance Software – Supplier shall perform Product Acceptance Software testing per section 7.0.

d) Field Checks / Probe Calibration / Set up – Establish criteria for field checks /probe calibrations / set up to ensure data and system accuracy prior to collecting measurement data.

e) 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.

f) Temperature Compensation / Scale Factors – The product dimensional characteristics being verified must meet the engineering definition requirements at 68 degrees Fahrenheit as defined in ANSI/ASME Y14.5, ANSI B89.6.2. When products are measured in an uncontrolled environment a documented process to compensate for thermal effects on the objects being measured is required. Objective evidence is required for temperature compensation when using scale bars, artifacts or temperature calculation. Supplier shall document their temperature compensation process which includes planning for pre, post and during measurement survey analysis. Although scale bars and artifacts are not required for all applications they can be an effective tool for verification of temperature change in the object if object and scale bar temperature are monitored closely throughout the measurement survey.

g) 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. Best Fit alignment shall not be used for production hardware acceptance unless contractually authorized by Ducommun engineering and evidence of authorization shall accompany final inspection reports.

h) Multiple Station Set-up Criteria – When moving CMS equipment or product is moved from one location to another, or combining CMS equipment during a survey, supplier shall document their process and acceptance tolerance. 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.

i) Data Collection Parameters – Establish measurement guidelines and specific collection parameters for the CMS equipment prior to collecting measurement data. (E.g. point density, point labels, time/distance separation parameters, apex angles, distance limitations).

j) Data Analysis – Establish guidelines for the evaluation of 3D point data to tool

engineering, engineering datasets, point maps or drawings.

k) Reports – Establish standard process for CMS reports shall include job information, coordinate system establishment (alignment verification), object temperature, data analysis and measured results, point maps. When products are measured in an uncontrolled environment CMS reports shall also include scale bar and drift point's measurements. Reports shall be in English and in inches unless directed otherwise by customer contract.

l) 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.

m) Training – Suppliers shall define training requirements to assure competence and maintain employee training records, including on-the-job-training, for all users per section 10.0.

10.2.3. Ducommun will recognize a supplier's option to become Nadcap Measurement and Inspection (M&I) approved in lieu of the applicable CMS portion of a Ducommun DPD audit for fixed CMM, Laser Tracker or Articulating Arm measurement devices.

11.0 Inspection Media

11.1 Inspection Planning for Validation - When product or tool engineering definition 2D drawings include digitally defined surfaces/features (3D models), the supplier must ensure inspection of these surfaces/features. Supplier's QA organizations are responsible, at a minimum, for inspection media, measurement instructions and analysis of data for product acceptance. Inspection planning shall include the following activities, as appropriate, in meeting the specified design requirements;

11.1.1. Description of the method and instructions for validation of each digitally defined product feature for first article inspection.

11.1.2. To validate digitally defined product features with methods other than CMS inspection the supplier must document the media and/or process used.

11.2 Inspection Media - The Supplier shall develop and maintain documented processes to create inspection media from DPD datasets. These shall assure:

a) Media is independently derived from and traceable to the authority dataset

b) Media must be under configuration control

c) Media contains graphics, annotations, text, and GD&T to illustrate inspection operations

d) Coordinate system, alignment and datum features are defined

e) Part/Tool set up instructions

f) Media is created by qualified personnel

g) A media review process exists (checker, checklist or peer/team review)

11.2.1. Document the establishment of the coordinate system, datum targets and datum features.

11.2.2. Digitized manufacturing/inspection data generated from Ducommun provided full scale engineering Mylar plots must have evidence of QA acceptance.

11.2.3. Data or datasets identified as "Pre-Release" or "REFERENCE ONLY" shall not be used for product acceptance purposes. Any use of this data for manufacturing or design is at the risk of the supplier.

11.2.4. Supplier may use definition of MDD, MDI, MDS, TDI, loft surfaces or other digital definition, including IGES or STEP format, as authority for product acceptance when supplied by Ducommun.

11.3 Reduced Content Drawings - Suppliers who receive reduced content drawings with an associated 3D model, must be able to extract information from the 3D model sufficient

for manufacturing and inspection in addition to the 2D drawing.

11.3.1. Suppliers must identify and document for manufacturing and inspection, the following requirements at a minimum.

- a) All features identified on the 2D drawing
- b) Features of the 3D model not defined by the 2D drawing
- c) Fabrication & manufacturing process specifications
- d) Flag notes, parts list and other specified requirements
- e) SSP's, SPECO's, and APO's

11.4 Model based Definition - Suppliers who receive Engineering and/or Tooling MBD datasets must extract information from the dataset sufficient for manufacturing and inspection activity for the product. Additionally, utilizing MBD requires a capability assessment by a Ducommun Supplier Quality DPD representative.

11.4.1. Supplier's QA must verify that all design implicit and explicit requirements (e.g., all features defined by GD&T, annotations, specifications, notes and other specified requirements in the authority MBD dataset and associated parts list including dimensional and other properties) are identified and planned for inspection/validation.

Note: 2D drawings, 2D sketches/views or a Low End Viewer (LEV) may be used to convey manufacturing and inspection information as required to fit the supplier's methods of operation.

11.5 First Article Inspection - All explicit and implicit design characteristics within the engineering shall be positively identified within the FAI plan. This shall include all engineering characteristics requiring traceability:

- a) All features annotated within the 3D model (explicit)
- b) Features of the 3D model not annotated (implicit)
- c) All characteristics applicable on the 2D drawings/reduced content drawings
- d) All applicable notes and material lists
- e) All feature tolerances per the standard / general notes.

Note: 100% of all feature characteristics are to be documented within the FAI results.

11.6 Handling Storage - To maintain media accuracy and stability, plots are required to be stored in:

- a) A container not less than 3 inches in diameter
- b) In a dust free, non-condensing moisture and chemical free area
- c) Temperature from 65 to 80 degrees Fahrenheit and relative humidity from 45 to 55 percent.
- d) Do not expose the media to heat generating sources. This may include laser printers, computer monitors, copy machines, air compressors, transformers, batteries, engines and sunlit enclosed places.
- e) Do not fold, crease or damage in anyway, as this also effects the dimensional stability.

11.7 Destruction of Obsolete/Unusable - All materials and computing media of any kind containing Ducommun PROPRIETARY information shall be disposed of by methods that ensure that all Ducommun proprietary information is destroyed so that none of it can be reconstructed from the residue or remains. Disposal methods may include recycling, shredding, burning, etc. and are dependent upon the resources at any given company/supplier facility. Recycling may be used only where procedures are in place to assure continuous security controls throughout the recycling process. The methods used for large-scale disposition shall be approved by the Law Department and Security.

12.0 Data Exchange Methods

12.1 CAD Compatibility Requirements - The supplier shall maintain the current level of hardware configuration, software, software revisions and other digital system information

required to maintain compatibility with Ducommun supplied datasets and/or data exchange formats per applicable Ducommun system(s) requirement documents.
 12.1.1. Supplier must have a documented process that ensures they can translate, receive and validate all authority datasets without change to the data integrity.
 12.1.2. The use of 3D-PDF is for viewing annotation, and shall require authority 3D surface geometry for manufacturing and inspection use.

13.0 Special Tooling

13.1 Tool Design - The supplier shall describe documented processes to ensure release, acceptance, identification, security, access and change control of tool design and tool inspection datasets. Tooling datasets shall have traceability to current authority engineering and derivative tooling dataset sources. The engineering authority dataset(s) shall be identified on the tool design when applicable.

13.1.1. Tool Designs shall be produced using authority data and when required by contract be approved by Ducommun authorized personnel.

13.2 Traceability - All digitally defined special tooling and physical inspection media (check fixtures, templates, etc.) will be identified and traceable to the engineering authority dataset, tool design dataset and any tool inspection datasets.

13.3 Inspection - These tools and tooling media shall be dimensionally accepted and periodically validated to the authority design at a frequency determined to ensure accuracy and repeatability of the tool before use.

14.0 Training and Process Performer

14.1 DPD Training - Suppliers shall define training requirements to assure competence and shall maintain employee training records, including on-the-job-training, for all DPD system users (e.g. quality, IT, planning, purchasing, contract review and Mfg).

14.1.1. The supplier shall ensure that all personnel having DPD system access have completed training adequate to perform digital product acceptance activities including digital inspection media generation, performance of inspections and 3D data collection.

14.1.2. Syllabus shall include training criteria necessary to ensure proficiency of process performers (e.g. planning, programmers, quality, etc.) to interpret ASME Y14.5 Dimensioning and Tolerancing (GD&T).

14.1.3. Training shall be updated due to changes driven by new equipment, software or Ducommun program requirements.

14.1.4. If Quality activities are performed by individuals other than the supplier's quality assurance personnel, the supplier shall define the specific tasks and responsibilities that are authorized and the training necessary to perform those tasks.

Associated Items

Reason for Change

Notification List
Notification Recipients

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