	Number:	Effective Date:	Revision:	Directly supports AS9100 Clause(s):
QARBON AEROSPACE	**QA-PRO-00.21.0100**	**05/13/2024**	**A**	**8.4, 8.5**

CMS Operator Instruction and Reporting Requirements

1. **Process Owner**

   Quality Assurance

2. **Purpose**

   This document provides the requirements necessary to create and maintain a standard format for all supplier Coordinate Measuring System reports.

3. **Scope**

   All Supplier provided Coordinate Measuring System reports

4. **References, Definitions and Acronyms**

   4.1. References

   None

   4.2. Definitions

   None

   4.3. Acronyms

   CMS   Coordinate Measuring System

   CMD   Coordinate Measuring Device

   DPD   Digital Product Definition

   IGS   Initial Graphics Exchange Specification

   MBD   Model Based Definition

   SQE   Supplier Quality Engineer

   STEP   Standard for the Exchange of Product Data

5. **CMS reports must include the information in this procedure as the minimum requirements. Reporting formats which do not include the below information must be approved in writing from Qarbon Aerospace Quality Assurance. Figures are taken from form QA-FRM-00.21.0100 and is available upon request.**

   5.1. The CMS Operator Instruction documents/data must be maintained and controlled for each revision. The contract will define record retention requirements for documents/data.

   5.2. CMS Operator Instructions Cover Sheet (Document/Illustrate):

   5.2.1. CMS Cover Sheet **(Figure 1)**

   5.2.1.1. Company Information

   5.2.1.1.1. Name

   5.2.1.1.2. Address

   5.2.1.1.3. CMS Contact Name

   5.2.1.1.4. CMS Contact Phone Number & Email

   5.2.2. Part Information

   5.2.2.1. Part Number Measured & Revision

   5.2.2.2. Design Engineering Description of Part

   5.2.2.3. Project Name

5.2.3. CMS Program Information (Information linked to CMS Report)

    5.2.3.1. Program identification/Serial number & Revision

    5.2.3.2. Date of program release

5.2.4. CMS Equipment

    5.2.4.1. Manufacturer & Model Name/number

    5.2.4.2. Last Calibration Date

    5.2.4.3. Calibration Expiration Date

5.2.5. CMS Software

    5.2.5.1. Name of Software

    5.2.5.2. Version/Revision

5.2.6. Data/Models/Specifications used to make CMS Program

    5.2.6.1. Names, Types, & Revision of Data/Models used to create CMS Inspection Plan

    5.2.6.2. Storage location

    5.2.6.3. MBD/DPD names

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Figure 1

Company Name				Company Address	
Smith Supply LTD				201 Hill Street	
				Somewhere, TX 15717	
CMS Contact Name		CMS Contact email		CMS Contact Phone Number	
Joe Smith		j.smith@gmail.com		(123)456-7890	
CMS Inspection Plan					
Part Number & Revision		**Description**		**Project**	**Page**
123P4S5678-123_001		Upper Skin, LH		Airplane	1 of 11
CMS Program Number & Revision		**Remark**	**Date**	**Prepared/Stamp**	**Approved**
CMS123P4S5678P1R1			1/18/24	JS Q15	JST Q61
CMS Equipment Brand/Model/Serial#		**Last Calibration**	**Calibration Exp Date**		
Hexagon Global 960 SN1234567		01/02/24	12/31/24		
CMS Software Name		**Version**			
Spatial Analyzer		2020.07.20			
Name#	**Type**	**Revision**	**Storage**	**MBD/DPD Name(s)**	
123P4S5678-123	PL	001			
123P4S5678-123	CIS	NC1	CMS Production		
123P4S5678-123	PVS	NC1		123P4S5678-123_001.stp	
123P4S5678-123	TSSP	00		123P4S5678-123_001.CATPart	

Comments

Temperature of 68 Degrees
All features not covered by this CMS Plan is to be bench inspected using conventional tools and methods

All cells with yellow highlight must be populated by the CMS operator. All cells **not** highlighted are titles of the template.

Open	**Open**	**Open**	**Open**	**Open**	**Open**

This lower section shown with "Open" is provided as an area to list documentation associated with the cover sheet.

5.2.7. Measurement Completion Data must be filled out in Operator Instructions or in CMS Report

    5.2.7.1. Time/Date

    5.2.7.2. Part Temperature at Start & End of measurement.

    5.2.7.3. CMS Operator

5.3. CMS Operator Instructions for securing/orientating the Part Holding Fixture/Datum Simulator/CMS Equipment (Document/Illustrate):

    5.3.1. Set-Up Instructions to Secure/Orient the Fixture/Datum Simulator/Equipment to CMS Table (If Applicable) **(Figure 2)**

        5.3.1.1. Header

            5.3.1.1.1. Part Number and Revision

            5.3.1.1.2. CMS Program Number and Revision

            5.3.1.1.3. Fixture/Datum Simulator/CMS Equipment Name & Revision

            5.3.1.1.4. Alignment of Fixture/Datum Simulator/CMS Equipment to CMS table, Primary, Secondary & Tertiary Datum

        5.3.1.2. Body of Fixture/Datum Simulator/CMS Equipment Set-Up Instructions

            5.3.1.2.1. Picture of Fixture/Datum Simulator/CMS Equipment located to CMS Table

            5.3.1.2.2. Identify CMS Reference System

            5.3.1.2.3. Identify Fixture/Datum Simulator Reference System

            5.3.1.2.4. Datums of Fixture/Datum Simulator (if applicable)

            5.3.1.2.5. Step by step process to Orient & Secure Fixture/Datum Simulator/Equipment to CMS Table

            5.3.1.2.6. Highlight Features measured to validate proper orientation of Fixture/Datum Simulator/Equipment

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Figure 2

Part Number & Revision 123P4S5678-123_001			
Set Up Instruction for Datum Simulator (Holding Fixture)		**Page**	**2 of 11**

CMS Program Number & Revision CMS123P4S5678P1R1	**Fixture/Datum Simulator/Equipment & Rev** 123P4S5678FiXP1R1	**Alignment: Fixture to CMS** **Primary:** Base of tool **Secondary**: Hole C4 Fixture Base **Tertiary:** Slot in Fixture Base at J4

Fixture Datum A
Bottom of Fixture
Bolt 6 Places
Fixture slot pinned at CMS Table loc. J4
Fixture Datum C
Fixture hole pinned at CMS Table loc. C4
Fixture Datum B
C4 (24.0000,36.0000, 0.0000) CMS Ref Sys
(0,0) CMS Ref Sys

Remarks: Measurement of the Datum Simulator

1) Load Fixture onto CMS Table, align fixture hole to pin at table location C4, align fixture slot to pin at location J4, Bolt fixture to table 6 places
2) Measure 7 Header Boards that contact Part OML (Datum A) (Yellow Highlight) 35 places (5 on each header board)
3) Measurements must be within a profile tolerance of (0.005) to the fixture datums in the nominal model
4) Use measurement of 7 header boards to establish Datum A simulator used for Part orientation

5.4.   CMS Operator Instructions for securing/orientating the Part (Document/Illustrate):

5.4.1.   Set-Up Instructions to Secure/Orient the Part to the Fixture/Datum Simulator/Equipment/CMS Table **(Figure 3)**

5.4.1.1.   Header

5.4.1.1.1.   Part Number and Revision

5.4.1.1.2.   CMS Program Number and Revision

5.4.1.1.3.   Fixture/Datum Simulator/CMS Equipment Name & Revision

5.4.1.1.4.   Alignment of Part to Fixture, Primary, Secondary & Tertiary Datum

5.4.1.2.   Body of Part Set-Up Instructions

5.4.1.2.1.   Picture of Part located to Fixture/Datum Simulator/CMS Equipment located to CMS Table

5.4.1.2.2.   Identify Part Reference System

5.4.1.2.3.   Identify Fixture/Datum Simulator/CMS Equipment Reference System

5.4.1.2.4.   Identify CMS Reference System

5.4.1.2.5.   Datums of Part

5.4.1.2.6.   Step by step process to Orient & Secure Part to Fixture/Datum Simulator/Equipment

5.4.1.2.7.   Highlight Features measured to validate proper orientation of Fixture/Datum Simulator/Equipment (if applicable)

5.4.1.2.8.   Identify Location & Weight of any weighting (within engineering weighting allowance) used to hold the part to Fixture/Datum Simulator/Equipment

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Figure 3

Part Number & Revision	Set Up Instruction for Part Position 1		Page	3 of 11
123P4S5678-123_001				

CMS Program Number & Revision	Fixture/Datum Simulator/Equipment & Rev	Alignment: Part to Fixture
CMS123P4S5678P1R1	123P4S5678FiXP1R1	Primary: Part OML
		Secondary: Part Pt51
		Tertiary: Part PT118

Pt51 (23.2341,37.1234, 5.7891) CMS Ref Sys

(0,0) CMS Ref Sys

Place 2, 3-pound bags as shown below to hold the part to the

Part Datum A

Place 2, 3-pound bags as shown below to hold the part to the fixture.

Pin Part Pt118 to Fixture Slot
Part Datum C

Pin Part Pt51 to Fixture
Part Datum B

Remarks: Measurement of the Datum Simulator

1) Load Part onto fixture, pin part hole Pt51 to fixture, pin part hole Pt118 to fixture, apply 2, 3-pound bags at locations shown above

2) Make sure there are no gaps between part & header board by using a (0.005) feeler, if there is gapping, apply approved weighting until all gaps gone

3) Approval stamp on Page 1 is confirmation that Set-Up was completed successfully

4)

5.5. CMS Operator Instructions Datum Simulator Point Map(s). If the Datum Simulator Point Map is not a part of the Operator Instructions and is a separate document, then that separate document must be listed on the cover sheet and provided with the Operator Instructions and Inspection Report.

　5.5.1. Datum Simulator Point Map. If the Datum of a part cannot be measured directly with the CMS device, then the Datum Simulator needs to be measured before the part is placed onto the Datum Simulator to assure location accuracy. **(Figure 4)**

　　5.5.1.1. Header

　　　5.5.1.1.1. Fixture/Datum Simulator/Equipment & Revision

　　5.5.1.2. Body of Part Set-Up Instructions

　　　5.5.1.2.1. Picture(s) of Fixture/Datum Simulator/Equipment

　　　5.5.1.2.2. Specify Measurement/Requirement being measured.
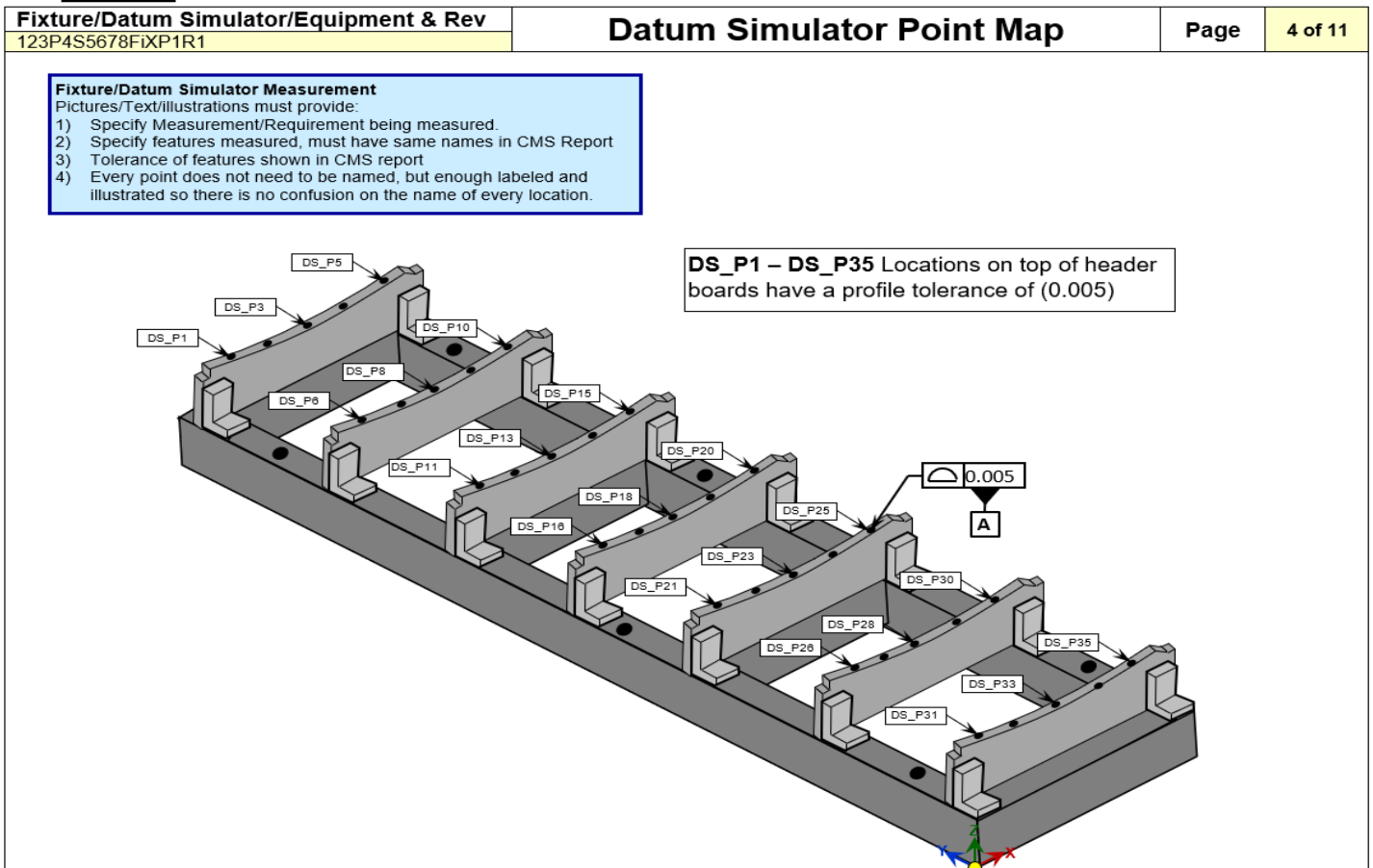
　　　5.5.1.2.3. Specify features measured, must have same names in CMS Report

　　　5.5.1.2.4. Tolerance of features shown in CMS report

　　　5.5.1.2.5. Every point does not need to be named, but enough labeled and illustrated so there is no confusion on the name of every location.

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Figure 4

Fixture/Datum Simulator/Equipment & Rev 123P4S5678FiXP1R1	Datum Simulator Point Map	Page	4 of 11

Fixture/Datum Simulator Measurement
Pictures/Text/illustrations must provide:
1) Specify Measurement/Requirement being measured.
2) Specify features measured, must have same names in CMS Report
3) Tolerance of features shown in CMS report
4) Every point does not need to be named, but enough labeled and illustrated so there is no confusion on the name of every location.

DS_P1 – DS_P35 Locations on top of header boards have a profile tolerance of (0.005)

5.6. CMS Operator Instructions Part Feature Point Map(s). If the Part Feature Point Map(s) is not a part of the Operator Instructions and is a separate document, then that separate document must be listed on the cover sheet and provided with the Operator Instructions and Inspection Report.

5.6.1. Datum Simulator Point Map. If the Datum of a part cannot be measured directly with the CMS device, then the Datum Simulator needs to be measured before the part is placed onto the Datum Simulator to assure location accuracy. **(Figure 5)**

5.6.1.1. Header

5.6.1.1.1. Part Number & Revision

5.6.1.2. Body of Part Set-Up Instructions

5.6.1.2.1. Picture(s) of Product Features

5.6.1.2.2. Specify Measurement/Requirement being taken.

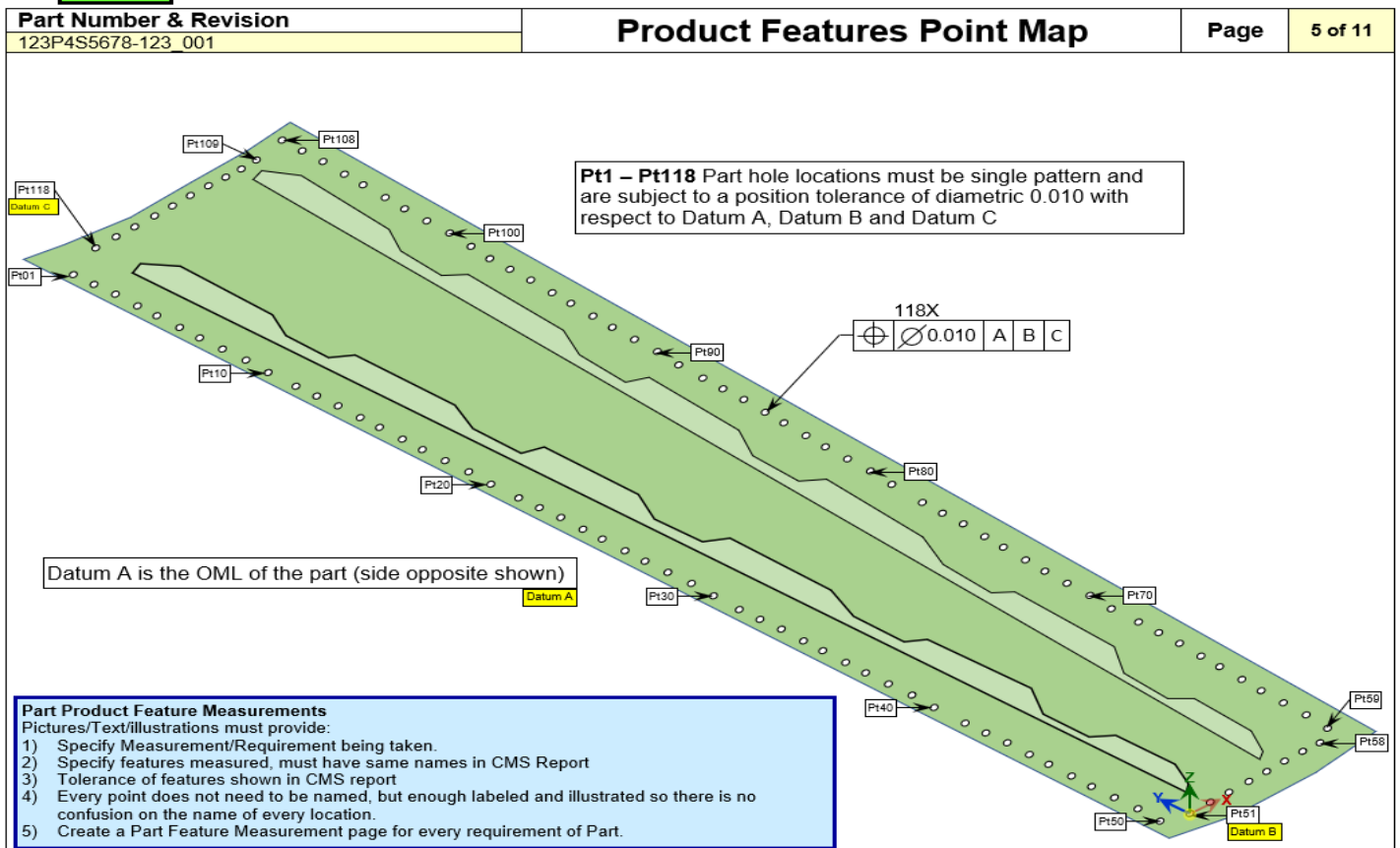5.6.1.2.3. Specify features measured, must have same names in CMS Report

5.6.1.2.4. Tolerance of features shown in CMS report

5.6.1.2.5. Every point does not need to be named, but enough labeled and illustrated so there is no confusion on the name of every location.

5.6.1.2.6. Create a Part Product Feature Measurement page for every requirement in CMS Inspection Plan

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Figure 5

Part Number & Revision: 123P4S5678-123_001

Product Features Point Map — Page 5 of 11

Pt1 – Pt118 Part hole locations must be single pattern and are subject to a position tolerance of diametric 0.010 with respect to Datum A, Datum B and Datum C

118X ⊕ ⌀0.010 A B C

Datum A is the OML of the part (side opposite shown)

Part Product Feature Measurements
Pictures/Text/illustrations must provide:
1) Specify Measurement/Requirement being taken.
2) Specify features measured, must have same names in CMS Report
3) Tolerance of features shown in CMS report
4) Every point does not need to be named, but enough labeled and illustrated so there is no confusion on the name of every location.
5) Create a Part Feature Measurement page for every requirement of Part.

6. CMS Reporting Requirements – The CMS Reports must include but are not limited to the requirements below:

6.1.   The CMS Report documents/data must be maintained and controlled for each revision required. The contract will define the amount of time documents/data must be maintained.

6.2.   The CMS Device(s) used to Measure Qarbon Parts must be Calibrated annually with reports available to Qarbon SQE and/or the Qarbon Buyer upon request.

6.3.   CMS Report Requirements Header **(Figure 6)**

    6.3.1.   Header

        6.3.1.1.   Part Number and Revision

        6.3.1.2.   Part Description from Engineering

        6.3.1.3.   Process Step and Position. Some parts may need 2 set-ups to measure all features. The side being measured described with Position.

        6.3.1.4.   Work Order Number

        6.3.1.5.   CMS Program Name and Revision

        6.3.1.6.   MBD/DPD Name and Revision

        6.3.1.7.   Supplier Name

        6.3.1.8.   Time/Date of Measurement

        6.3.1.9.   CMS Operator

        6.3.1.10.   Page of Pages

        6.3.1.11.   Number of Non-Conformances

        6.3.1.12.   Start and Finish Part Temperature
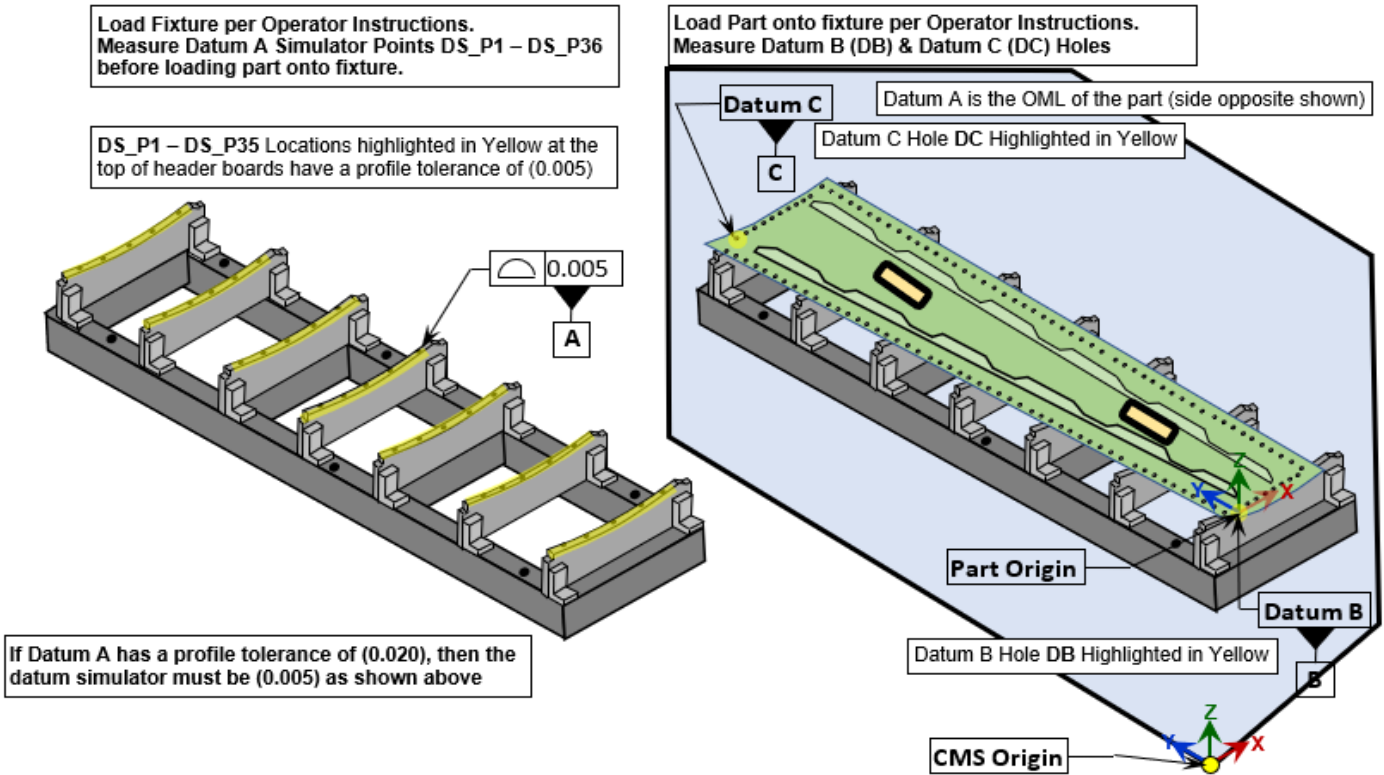
QA-FRM-00.21.0100

Figure 6

All cells with yellow highlight must be populated by the CMS operator. All cells **not** highlighted are titles of the template.

Part Number & Rev:	1234P4S5678-123_001	Supplier Name:	Smith Supply LTD
Part Description:	Upper Skin, RH	Time/Date of Measure:	9:00AM 01/17/24
Process Step/Position:	Pos 1 of 2, Side cm Datum A	CMS Operator:	Joe Smith
Work Order #:	Y1234567890	Pg. of Pg.:	1 of 99
CMS Prog # & Rev:	CMS123P4S5678P1R1	Number Non-Conform:	0
MBD/DPD Name & Rev:	123P4S5678-123_001.stp	Start/Finish Part Temp:	Start:68°F Finish:68°F

6.4.   CMS Report Requirements Orientation of Device to Part Picture

    6.4.1.   Picture to show the Orientation of the Measuring Device to the Part using the Engineering Defined Datums. **(Figure 7)**

        6.4.1.1.   Picture to include Fixture/Datum simulator/CMS equipment used to secure and orient the part.

        6.4.1.2.   Datum simulator tolerance must be 25% of engineering tolerance for that specific feature. If that tolerance cannot be achieved, then the achievable tolerance must be approved by Qarbon SQE in writing.

Figure 7

Load Fixture per Operator Instructions.
Measure Datum A Simulator Points DS_P1 – DS_P36 before loading part onto fixture.

DS_P1 – DS_P35 Locations highlighted in Yellow at the top of header boards have a profile tolerance of (0.005)

0.005 | A

If Datum A has a profile tolerance of (0.020), then the datum simulator must be (0.005) as shown above

Load Part onto fixture per Operator Instructions.
Measure Datum B (DB) & Datum C (DC) Holes

Datum C

Datum A is the OML of the part (side opposite shown)

Datum C Hole DC Highlighted in Yellow

Part Origin

Datum B

Datum B Hole DB Highlighted in Yellow

CMS Origin

6.5.   CMS Reporting Requirements Orientation of Device to Part Datum Data

    6.5.1.   Datum Data provided to show proper alignment of CMD Device to Part

        6.5.1.1.   CMS Measurement Software must have the capability of providing Nominal and Measured/Actual data in an IGS or STEP format upon request. An example of the IGS or STEP file must be provided to Qarbon Supplier Quality Prior to contract award.

        6.5.1.2.   If CMS software has summary capability, provide Summary prior to the Measured Data. A summary does not negate the need for Measured Data.

        6.5.1.3.   CMS Data for every point measured.

        6.5.1.4.   All CMS Data must be expressed **(Figure 8)**:

            6.5.1.4.1.   Must be 4 place decimal (0.0000)

            6.5.1.4.2.   Every Point must have a point label that matches the Point Map

            6.5.1.4.3.   Nominal X, Y, & Z Provided

            6.5.1.4.4.   Measured/Actual X, Y, & Z Provided

            6.5.1.4.5.   Delta between Nominal and Actual provided for dX, dY, dZ, & Magnitude

            6.5.1.4.6.   Indication of In-Tolerance or Our of Tolerance in separate column

            6.5.1.4.7.   The tolerance can be expressed in the Summary Box. If a summary box is not provided, then the tolerance must be shown in the Body Box for each measurement.

6.5.1.4.8.   Data must be in Design Engineering Reference system. A Design Engineering defined Local Part Reference System or the Airplane Reference System. The Reference system used must be found in the MBD or DPF. Tooling Reference systems or CMS Reference systems are not acceptable.

6.5.1.4.9.   Data must be presented in order of precedence (Datum A, B, then C).

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Figure 8

Summary Box

Body Box

All Vectors Summary: Datum A, DS_P1 – DS_P36

Statistic	dX	dY	dZ	Mag
Min	-0.0010	0.0000	-0.0010	0.0010
Max	0.0000	0.0010	0.0010	0.0017
Average	-0.0006	0.0007	0.0009	0.0015
Std Dev from Avg	0.0005	0.0005	0.0005	0.0003
Std Dev from Zero	0.0008	0.0009	0.0010	0.0015
RMS	0.0007	0.0008	0.0010	0.0015
Tol Range				-0.0025
				0.0025
In Tol				36 (100%)
Out Tol				0 (0%)
Count	36			
Comment				

Vector Group Measurements: Datum A, DS_P1 – DS_P36

Point Name	Nominal Nom X	Nom Y	Nom Z	Actual Act X	Act Y	Act Z	Delta Delta X	Delta Y	Delta Z	Mag	In/Out Tol
DS_P1	396.4520	60.0550	160.1480	396.4510	60.0560	160.1490	-0.0010	0.0010	0.0010	0.0017	In
DS_P2	396.5490	60.0440	160.1670	396.5480	60.0440	160.1680	-0.0010	0.0000	0.0010	0.0014	In
DS_P3	396.6470	60.0450	160.1840	396.6460	60.0460	160.1850	-0.0010	0.0010	0.0010	0.0017	In
DS_P4	396.7460	60.0400	160.2030	396.7450	60.0410	160.2040	-0.0010	0.0010	0.0010	0.0017	In
DS_P5	396.8430	60.0460	160.2190	396.8430	60.0460	160.2200	0.0000	0.0000	0.0010	0.0010	In
DS_P6	396.9410	60.0450	160.2360	396.9410	60.0460	160.2350	0.0000	0.0010	-0.0010	0.0014	In
DS_P7	397.0390	60.0430	160.2530	397.0390	60.0430	160.2540	0.0000	0.0000	0.0010	0.0010	In
DS_P8	397.1380	60.0380	160.2710	397.1370	60.0390	160.2720	-0.0010	0.0010	0.0010	0.0017	In
DS_P9	397.2360	60.0380	160.2880	397.2360	60.0390	160.2890	0.0000	0.0010	0.0010	0.0014	In
DS_P10	397.3340	60.0320	160.3050	397.3330	60.0330	160.3060	-0.0010	0.0010	0.0010	0.0017	In
DS_P11	397.4320	60.0280	160.3220	397.4320	60.0280	160.3230	0.0000	0.0000	0.0010	0.0010	In
DS_P12	397.5310	60.0290	160.3380	397.5310	60.0300	160.3390	0.0000	0.0010	0.0010	0.0014	In
DS_P13	397.6290	60.0370	160.3530	397.6290	60.0370	160.3540		0.0000	0.0010	0.0010	In
DS_P14	397.7270	60.0500	160.3670	397.7260	60.0510	160.3680	-0.0010	0.0010	0.0010	0.0017	In
DS_P15	397.8250	60.0590	160.3820	397.8240	60.0600	160.3830	-0.0010	0.0010	0.0010	0.0017	In
DS_P16	397.9220	60.0750	160.3950	397.9220	60.0760	160.3960	0.0000	0.0010	0.0010	0.0014	In
DS_P17	398.0200	60.0930	160.4080	398.0190	60.0940	160.4090	-0.0010	0.0010	0.0010	0.0017	In
DS_P18	396.4520	60.0550	160.1480	396.4510	60.0560	160.1490	-0.0010	0.0010	0.0010	0.0017	In
DS_P19	396.4520	60.0550	160.1480	396.4510	60.0560	160.1490	-0.0010	0.0010	0.0010	0.0017	In
DS_P20	396.5490	60.0440	160.1670	396.5480	60.0440	160.1680	-0.0010	0.0000	0.0010	0.0014	In
DS_P21	396.6470	60.0450	160.1840	396.6460	60.0460	160.1850	-0.0010	0.0010	0.0010	0.0017	In
DS_P22	396.7460	60.0400	160.2030	396.7450	60.0410	160.2040	-0.0010	0.0010	0.0010	0.0017	In
DS_P23	396.8430	60.0460	160.2190	396.8430	60.0460	160.2200	0.0000	0.0000	0.0010	0.0010	In
DS_P24	396.9410	60.0450	160.2360	396.9410	60.0460	160.2350	0.0000	0.0010	-0.0010	0.0014	In
DS_P25	397.0390	60.0430	160.2530	397.0390	60.0430	160.2540	0.0000	0.0000	0.0010	0.0010	In
DS_P26	397.1380	60.0380	160.2710	397.1370	60.0390	160.2720	-0.0010	0.0010	0.0010	0.0017	In
DS_P27	397.2360	60.0380	160.2880	397.2360	60.0390	160.2890	0.0000	0.0010	0.0010	0.0014	In
DS_P28	397.3340	60.0320	160.3050	397.3330	60.0330	160.3060	-0.0010	0.0010	0.0010	0.0017	In
DS_P29	397.4320	60.0280	160.3220	397.4320	60.0280	160.3230	0.0000	0.0000	0.0010	0.0010	In
DS_P30	397.5310	60.0290	160.3380	397.5310	60.0300	160.3390	0.0000	0.0010	0.0010	0.0014	In
DS_P31	397.6290	60.0370	160.3530	397.6290	60.0370	160.3540	0.0000	0.0000	0.0010	0.0010	In
DS_P32	397.7270	60.0500	160.3670	397.7260	60.0510	160.3680	-0.0010	0.0010	0.0010	0.0017	In
DS_P33	397.8250	60.0590	160.3820	397.8240	60.0600	160.3830	-0.0010	0.0010	0.0010	0.0017	In

CMS Operator Instruction and Reporting Requirements

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Figure 8 (Continued)

All Vectors Summary: Datum B, DB				
Statistic	dX	dY	dZ	Mag
Min	0.0000	0.0000	0.0000	0.0000
Max	0.0000	0.0000	0.0000	0.0000
Average	0.0000	0.0000	0.0000	0.0000
Std Dev from Avg	0.0000	0.0000	0.0000	0.0000
Std Dev from Zero	0.0000	0.0000	0.0000	0.0000
RMS	0.0000	0.0000	0.0000	0.0000
Tol Range				-0.0000
				0.0000
In Tol				1 (100%)
Out Tol				0 (0.0%)
Count	1			
Comment				

Vector Group Measurements: Datum B, DB											
Point	Nominal			Actual			Delta				In/Out
Name	Nom X	Nom Y	Nom Z	Act X	Act Y	Act Z	Delta X	Delta Y	Delta Z	Mag	Tol
DB	465.5000	45.4511	159.8899	465.5000	45.4511	159.8899	0.0000	0.0000	0.0000	0.0000	In

All Vectors Summary: Datum C, DC				
Statistic	dX	dY	dZ	Mag
Min	0.0000	0.0000	0.0000	0.0000
Max	0.0000	0.0000	0.0000	0.0000
Average	0.0000	0.0000	0.0000	0.0000
Std Dev from Avg	0.0000	0.0000	0.0000	0.0000
Std Dev from Zero	0.0000	0.0000	0.0000	0.0000
RMS	0.0000	0.0000	0.0000	0.0000
Tol Range				-0.0000
				0.0000
In Tol				1 (100%)
Out Tol				0 (0.0%)
Count	1			
Comment				

Vector Group Measurements: Datum C, DC											
Point	Nominal			Actual			Delta				In/Out
Name	Nom X	Nom Y	Nom Z	Act X	Act Y	Act Z	Delta X	Delta Y	Delta Z	Mag	Tol
DC	465.5000	45.4511	159.8899	465.5000	45.4511	159.8899	0.0000	0.0000	0.0000	0.0000	In

6.6.   CMS Report Requirements Picture of Feature to be Measured.

    6.6.1.   Picture for each Feature to be measured. Each Feature must have a picture and the associated data following the picture. **(Figure 9)**

        6.6.1.1.   Picture of the part and highlight the features to be measured.

        6.6.1.2.   Tolerance of the feature provided.

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Figure 9

Pt1 – PT118 Holes highlighted in Yellow around profile of part positional tolerance of (0.010) to Datums A, B, & C.

118X

$\oplus$ | $\varnothing 0.010$ | A | B | C
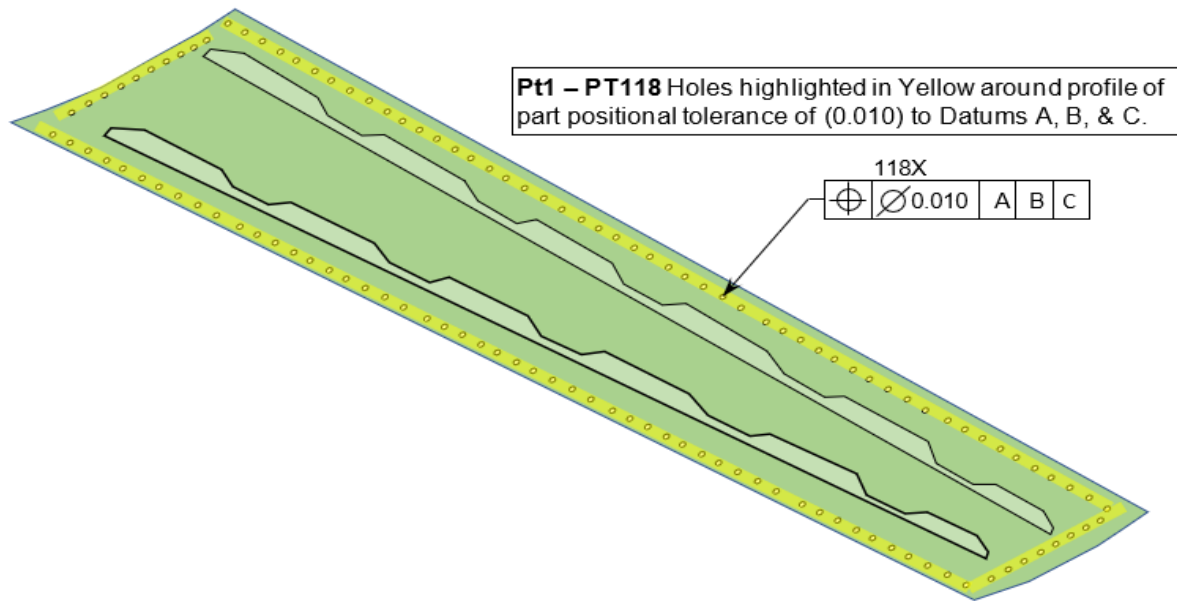
6.7. CMS Report Requirements Feature Measurement Data

6.7.1. Measurement Data for each Feature to be measured. Each Feature must have a picture, tolerance, and associated data. **(Figure 10)**

6.7.1.1. CMS Measurement Software must have the capability of providing Nominal and Measured/Actual data in an IGS or STEP format upon request. An example of the IGS or STEP file must be provided to Supplier Quality prior to contract award.

6.7.1.2. If CMS software has summary capability, please provide the Summary prior to the Measured Data. A summary does not negate the need for Measured Data.

6.7.1.3. CMS Data for every point measured.

6.7.1.4. All CMS Data must be expressed:

6.7.1.4.1. Must be 4 place decimal (0.0000)

6.7.1.4.2. Every Point must have a point label that matches the Point Map

6.7.1.4.3. Nominal X, Y, & Z Provided

6.7.1.4.4. Measured/Actual X, Y, & Z Provided

6.7.1.4.5. Delta between Nominal & Actual provided for dX, dY, dZ, & Magnitude

6.7.1.4.6. Indication of In-Tolerance or Out of Tolerance in separate column

6.7.1.4.7. The tolerance can be documented in the Summary Box. If a summary box is not provided, then the tolerance must be shown in the Body Box for each measurement.

6.7.1.4.8.   When the tolerance is expressed in a Feature Control Frame (FCF) that is measuring the Feature-Relating Tolerance Zone (FRTZ), the degrees of freedom, the degrees locked, and the transformation in X, Y, and Z must be documented in the report.

6.7.1.4.9.   Data must be in Design Engineering Reference system. A Design Engineering defined Local Part Reference System or the Airplane Reference System. The Reference system used must be found in the MBD or DPF. Tooling Reference systems or CMS Reference systems are not acceptable.

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Figure 10

All Vectors Summary: Upper Fwd Surf Patch, Pt1 – Pt116				
Statistic	dX	dY	dZ	Mag
Min	-0.0010	-0.0000	-0.0030	-0.0030
Max	0.0000	0.0011	0.0040	0.0040
Average	0.0000	0.0000	0.0000	0.0000
Std Dev from Avg	0.0000	0.0000	0.0010	0.0010
Std Dev from Zero	0.0000	0.0000	0.0010	0.0010
RMS	0.0000	0.0000	0.0010	0.0010
Tol Range				-0.0050
				0.0050
In Tol				116 (100%)
Out Tol				0 (0.0%)
Count	116			
Comment				

Vector Group Measurements: Upper Fwd Surf Patch, Pt1 – Pt344											
Point	Nominal			Actual			Delta				In/Out
Name	Nom X	Nom Y	Nom Z	Act X	Act Y	Act Z	Delta X	Delta Y	Delta Z	Mag	Tol
Pt1	396.4520	60.0550	160.1480	396.4510	60.0560	160.1510	-0.0010	0.0010	0.0030	0.0030	In
Pt2	396.5490	60.0440	160.1670	396.5480	60.0440	160.1700	-0.0010	0.0010	0.0030	0.0030	In
Pt3	396.6470	60.0450	160.1840	396.6460	60.0460	160.1880	-0.0010	0.0010	0.0030	0.0030	In
Pt4	396.7460	60.0400	160.2030	396.7450	60.0410	160.2060	-0.0010	0.0010	0.0040	0.0040	In
Pt5	396.8430	60.0460	160.2190	396.8430	60.0460	160.2230	-0.0010	0.0010	0.0040	0.0040	In
Pt6	396.9410	60.0450	160.2360	396.9410	60.0460	160.2390	-0.0010	0.0010	0.0040	0.0040	In
Pt7	397.0390	60.0430	160.2530	397.0390	60.0430	160.2560	0.0000	0.0000	0.0030	0.0030	In
Pt8	397.1380	60.0380	160.2710	397.1370	60.0390	160.2750	-0.0010	0.0010	0.0040	0.0040	In
Pt9	397.2360	60.0380	160.2880	397.2360	60.0390	160.2920	-0.0010	0.0010	0.0040	0.0040	In
Pt10	397.3340	60.0320	160.3050	397.3330	60.0330	160.3090	-0.0010	0.0010	0.0040	0.0040	In
Pt11	397.4320	60.0280	160.3220	397.4320	60.0280	160.3240	0.0000	0.0000	0.0020	0.0020	In
Pt12	397.5310	60.0290	160.3380	397.5310	60.0300	160.3400	0.0000	0.0000	0.0010	0.0010	In
Pt13	397.6290	60.0370	160.3530	397.6290	60.0370	160.3550	0.0000	0.0000	0.0020	0.0020	In
Pt14	397.7270	60.0500	160.3670	397.7260	60.0510	160.3710	-0.0010	0.0010	0.0030	0.0030	In
Pt15	397.8250	60.0590	160.3820	397.8240	60.0600	160.3830	0.0000	0.0000	0.0020	0.0020	In
Pt16	397.9220	60.0750	160.3950	397.9220	60.0760	160.3970	0.0000	0.0000	0.0020	0.0020	In
Pt17	398.0200	60.0930	160.4080	398.0190	60.0940	160.4110	0.0000	0.0010	0.0030	0.0030	In
Pt18	396.4520	60.0550	160.1480	396.4510	60.0560	160.1510	-0.0010	0.0010	0.0030	0.0030	In
Etc.											

7. Appendices

7.1. Flow Chart

None

7.2. Forms

No.	Ref. No.	Description	Responsibility	Document Mode
1	QA-FRM-00.21.0100		Quality Assurance	Soft copy / Hard Copy

8. Records

None

9. Training Materials

None

10. Revision History

Rev.	Date	Summary of change	Authorized by
Original	02/26/2024	Initial Issue	Quality Assurance
A	05/13/2024	Minor clarifications and document re-formatting	Quality Assurance