

PS-487

Process Specification – Surface Finish Inspection

65678 PPPL NCSX Vacuum Vessel Sub Assembly

1. PURPOSE

This specification establishes the process parameters required to ensure surface finish testing performed on the NCSX SE120-002 Vacuum Vessel Sub Assembly is maintained within the guidelines required by PPPL product specification NCSX-CSPEC-121-02-01

2. SCOPE

This specification defines the minimum requirements for measuring material surface finish of the NCSX VVSA highly shaped vessel walls and components when required by the MTM MIT.

3. DEFINITIONS

PPPL – Princeton Plasma Physics Laboratory

MTM – Major Tool & Machine, Inc.

NCSX – National Compact Stellarator Experiment

VVSA - Vacuum Vessel Sub Assembly

MIT – Manufacturing, Inspection, and Test plan (MTM Mfg. Routing)

IDC – MTM Inspection Data Checklist system

QAP – MTM Quality Assurance Planning system

4. REFERENCE DOCUMENTS

- PPPL Product Specification NCSX-CSPEC-121-02-01
- ASME B46.1 Rev: 95 – Surface Texture (roughness, waviness, and lay)
- Operating manual; Phase II+ Surface Roughness Gage Model # SRG-1000
- QA-SOP-01 Non-Conformance Control
- MTM Mfg. Routing / Inspection Plan / Quality Assurance Plan 65678
- PS483 – Cleanliness Control
- PS485 – Ultrasonic Thickness Testing

5. EQUIPMENT AND SUPPLIES

- Phase II+ Surface Roughness Gage Model # SRG-1000

6. GENERAL INFORMATION

- 6.1. All material will be inspected upon receipt by Receiving Inspection in accordance with the MTM MIT and QAWI008.
- 6.2. All handling equipment such as slings, hooks, and lift-truck forks will be protected with wood, cloth, plastic, or rubber buffers, where feasible, to reduce the possibility of surface damage.
- 6.3. All interior surfaces of the VVSA (including the port extensions) will be polished to a 32 micro-inch roughness average surface finish. Exterior / non-machined surfaces will remain as produced by the material manufacturer, and will be blasted by MTM as specified in the manufacturing routing.
- 6.4. During the polishing process, material thickness will be monitored per PS485. Material thickness tolerances will be provided on the part drawing, or within the manufacturing routing.

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- 6.5. When necessary to protect the surface, polished production components will be covered with a protective polyethylene sheet when not being worked on for an extended period of time. Part temperature must be below 150 Degrees Fahrenheit prior to covering.
- 6.6. Walking on the polished surfaces will be avoided where possible. When necessary to walk on polished surfaces, plastic foam sheeting will be applied to the surface face for protection.
- 6.7. Appropriate care will be taken during subsequent handling of highly polished surfaces to avoid damaging the surfaces.
- 6.8. If final polished surfaces become damaged, or are later found to be non-compliant, the condition will be documented in MTM's Non-Conformance system. Disposition will be provided by Engineering.

7. INSTRUCTIONS INSPECTING THE SURFACE FINISH

- 7.1. Prior to taking measurements, set the gage to “Ra” and a sampling length of 0.8mm.
- 7.2. Ensure accuracy by measuring the standard included with the gage.
- 7.3. Measure the surface finish specified within the manufacturing routing, following the operating manual instructions. Note the vessel wall surfaces are highly shaped. Take special care to ensure the gage is held as perpendicular as possible to the area being tested.
- 7.4. The MTM manufacturing routing and/or IDC will specify the surface finish requirements.
- 7.5. When required document the actual readings within the MTM Manufacturing Routing / IDC provisions.
- 7.6. If a measurement exceeds the specified maximum, report to Engineering (via MTM Non-Conformance Report) for remedial disposition.

8. QUALITY ASSURANCE / DOCUMENTATION

- 8.1. The electronic completion (or “closing / clocking out”) of each sequential manufacturing operation within the MTM (Visual Manufacturing®) Routing which includes reference to this document as a task requisite acknowledges compliance to the relevant requirements. The designated MTM employee completing the electronic exchange acknowledges completeness and compliance to the routing instructions.
- 8.2. When necessary, additional documentation requirements will be provided within the associated MTM IDC, and QAP system.
 - 8.2.1. When an IDC record and/or Inspection report is required, reference to the specific area being tested will be clearly discernable.
 - 8.2.2. When an IDC record and/or Inspection report is required, it will include the following information:
 - MTM Work Order number
 - Part identification number
 - Part description
 - Date of inspection
 - Gage serial number
 - Reference standard serial number

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- Inspector signature, or initials, or stamp
- 8.3. Exceptions / out of tolerance conditions will be documented within the MTM Non-Conformance system per QA-SOP-01.