

REQUEST FOR PROPOSALS # 2020-063
5 Axis Machining Center
RESPONSE ADDENDUM #1
April 17, 2020

QUESTIONS

Q1: Will the AMC be providing a workpiece for the part run-off at the [REDACTED] factory?
At the AMC?

A1: See attached Appendix A

Q2: Please give a description of the workpiece, drawing, material...

A2: See attached Appendix A

Q3: [REDACTED] will be doing laser calibration of the machine. Will AMC wish to simply review the calibration report or physically witness the laser calibration?

A3: University of Maine Advanced Manufacturing Center (AMC) will plan to have staff present at the chosen Respondent's factory for at least two days as necessary for the machine run off and/or calibration. It is preferred that there is time to witness calibration, but priority will be given to being present for the entirety of run-off machining. AMC will consult with the chosen Respondent to establish a plan that balances AMC expectations with factory standard operating procedure.

Q4: Does UoM AMC have a copy of the requested specification as stated: "Chosen respondent must perform a part run-off on-site at the factory before shipping and at the AMC upon arrival and setup (ISO 10791-7:2020 or equivalent)

A4: AMC cannot redistribute due to licensing agreement. Digital copies can be purchased from the ANSI webstore: <https://webstore.ansi.org/Standards/ISO/ISO107912020>

Q5: Please explain under Precision and Guideway Parameters-

Minimum of .0002 volumetric positioning accuracy

Minimum of .0001 volumetric positioning repeatability

How are these values measured? This is a very tight specification that we want to make sure we are following correctly.

A5: See attached Appendix A for adjustment and clarification.

APPENDIX A

UMAINE AMC PART RUN-OFF AND MACHINE CALIBRATION REQUIREMENTS

Part Run-off Requirements for Chosen Respondent

- All material and fixturing costs shall be realized by the chosen Respondent.
- Toolholders, endmills, and cutting parameters shall be at the discretion of the chosen Respondent using readily available, industry standard options. The University of Maine Advanced Manufacturing Center (AMC) will consult on these selections as necessary. It is acceptable to draw on tooling voucher funds to supply tooling so long as selections are made after consulting with AMC and are included with the delivery of the machine in generally good shape.
- All test pieces shall be inspected on a CMM with traceable NIST calibration in accordance with the specifications per each test piece within ISO 10791-7:2020. Respondent can use their own CMM or source an off-site CMM inspection service. The University of Maine will source inspection services held to the same standard for this requirement for run-off upon delivery.
- All material and fixture selections, tooling selections, cutting parameters, and G code data shall be submitted to AMC prior to final test piece machining.
- Factory run-off test pieces shall be machined during an AMC staff visit to the Respondent's factory for run-off testing.
- AMC staff member(s) shall be present for entire process of machining from rough blanks to finished parts for accepted test pieces, although the chosen Respondent may perform prior testing to tune cutting parameters etc.

- **Machine one test piece per M3_45 (pg 16-20), ISO 10791-7:2020**
 - Workpiece material: **6061-T6 Aluminum**
 - Fixturing method shall be chosen at the discretion of the Respondent and can utilize previously machined tapped holes or other features on the underside of the test piece to the degree deemed necessary for test machining so long as they don't interfere with the test geometry. UMaine AMC will consult as necessary.
- **Machine one test piece per M4_320 (pg 21-28), ISO 10791-7:2020**
 - Workpiece material: 6061-T6 Aluminum
- **Machine three test pieces per M1_160 (pg 7-13), ISO 10791-7:2020**
 - Three work pieces, one each of the following:
 - **Gray cast iron**
 - **316 Stainless Steel**
 - **4140 Steel, HRC 30** or higher machined with **air-blast only**
 - Each of the three work pieces shall be fixtured so that they are evenly distributed over the remainder of the machine table after machining M3 and M4 workpieces. Regardless of the machine configuration, test pieces shall be fixtured so that they are evenly distributed over the machine table's long axis of linear travel, centered about its short axis of linear travel to a reasonable extent.

Following Section Supersedes

Minimum of .0002 volumetric positioning accuracy

Minimum of .0001 volumetric positioning repeatability

Called out in RFP document under Precision and Guideway Parameters

Machine Calibration Requirements

- All proposals shall include a detailed description of their factory and delivery calibration procedures including the manufacturer's part numbers for any laser interferometry equipment used as well as steps taken to compensate for error within the machine's control. The following requirements are minimums and efforts to go beyond them will be given consideration in the performance evaluation of the machine. **Equivalent or better methods from other standards organizations may be accepted so long as the Respondent can demonstrate that they are at least as accurate as the requirement.**
- AMC will consult with the chosen Respondent on the parameters such as ambient temperatures, positioning of measuring instruments, warm up, and feed speeds used for calibrations where it is not specified exactly within the required standards but will generally defer to factory procedures so long as they are reasonable. It is understood that there may be a slight deficit in performance upon delivery if the AMC shop is not able to match these environmental factors.
- Linear bi-directional positioning error, **parameter A**, for X,Y, and Z axes **per ISO 230-2: .0004" or less.** Chosen respondent shall submit reports to AMC validating these parameters during calibration.
- Chosen Respondent shall be required to measure and report body diagonal positioning error across the machine's entire work envelope per **ISO 230-6** to verify the machine's volumetric accuracy including other sources of error beyond linear positioning error. **All respondents** shall include an estimate of the volumetric accuracy for the machine being proposed to be considered within the machine's performance evaluation with the understanding that the machine shall be expected to meet this specification during calibration reporting.