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New Jersey 08405

ULTEM 9085™ Material Extrusion Polymer Based Additive Manufacturing: Process Parameter Effects on Mechanical Performance

August 2025

Final report

U.S. Department of Transportation
Federal Aviation Administration

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16. Abstract

The project objective is to correlate the changes in microstructure caused by the adjustment of high-impact process parameters to specimen tensile mechanical performance using ASTM D638 Type 1 static tensile tests. This project evaluated the effects of high-impact process parameters on the mechanical performance of additive manufactured ULTEM 9085 CG (certified grade) in a fused filament fabrication/material extrusion process using a Stratasys Fortus 900mc. High-impact process parameters documented in the literature and previous NCAMP qualifications were selected for study based on their ability to alter microstructure and therefore mechanical performance. Analysis was performed to characterize the microstructure at ranges of parameter adjustment in order to capture baseline pristine microstructure corresponding to the ULTEM 9085 qualification and microstructure changes seen when eight selected parameters were adjusted. The air gap between adjacent rasters (AR) parameter, which adjusts the gap between parallel infill rasters, affected the tensile strength the most, where a negative value (creating overlapping beads) is more favorable than a positive value (creating gaps between beads). An increase in porosity occurs when the AR settings changes from negative to positive values, resulting in decreased tensile performance. The parameter adjustment for number of contours was the second key characteristic of microstructure for determining the strength of a printed part after air gaps.

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Acronyms

Acronym	Definition
AM	Additively manufactured
AR	Air gaps between adjacent rasters
CC2	Air gaps between adjacent contours—two contours
CC3	Air gaps between adjacent contours—three contours
CG	Certified Grade
CR	Air gaps between contours and rasters
EVSRAG	Enhanced visible surface raster air gap
EVSRW	Enhanced visible surface raster width
FAA	Federal Aviation Administration
ID	Identification
JAMS	Joint Advance Materials & Structures (Center of Excellence)
NC	Number of contours
NCAMP	National Center for Advanced Materials Performance
NIAR	National Institute for Aviation Research
NPS	NCAMP Process Specification
PRW	Part raster width
PCD	Process control document
QC	Quality control
RTD	Room temperature dry
SMC	Surface maximum contours

Executive summary

As the proliferation of polymer-based additive manufacturing continues throughout the aerospace industry, the importance of understanding process parameters and their influence on the microstructure of a part continues to grow. As an initial step in understanding the process-microstructure relationship, this research project focused on closing the knowledge gap regarding key process parameters and the resulting effects on microstructure for ULTEM 9085 CG (certified grade) fused filament. Researchers fabricated specimens using a Stratasys F900mc and followed ASTM D638 type 1 (ASTM International, 2014) specifications for tensile testing. Specimen microstructure characterization by optical and laser microscopy was used to document baseline characteristics and changes in microstructure as parameters were adjusted. Process parameters, such as air gaps between adjacent rasters (AR), air gaps between contours and rasters (CR), air gaps between adjacent contours (CC2 and CC3), number of contours (NC), enhanced visible surface raster width (EVSRW), part raster width (PRW), surface max contours (SMC), and enhanced visible surface raster air gap (EVSRAG), were altered to observe changes in mechanical properties and microstructure.

The data suggest that AR parameter had the largest effect on tensile strength variation, with a negative correlation to air gap, noting that an overlap of rasters (negative air gap value) demonstrated higher tensile strength than an air gap between the rasters. All enhanced visible surface parameters indicated significantly less deviation of the tensile strength affecting only visible surfaces. Overall, this project is an important step in linking specific aspects of the microstructure to mechanical performance and those same aspects to process parameters. The results overall point to a generalized correlation between the number of effective longitudinal beads (extruded beads of either contour or raster type with a directional component aligning with the loading axis) and the reported tensile strength.

1 Introduction

The ability to print polymer based additively manufactured (AM) parts with equivalent mechanical performance across various machines has been the focus of several investigations over the years, as it has the potential to enable widespread part production across the aerospace industry. In order to move towards equivalent part performance, a better understanding of the underlying material characteristics, such as microstructure, is needed. This project seeks to define baseline microstructure expectations for fabricated AM specimens and correlate changes in fabrication parameters to changes in microstructure and tensile strength. Determining the validity of this assumption is the first step in understanding if expanding material equivalencies to other machines and platforms is possible. An overarching goal for Federal Aviation Administration's Joint Center of Excellence for Advance Materials & Structures (FAA JAMS) polymer AM programs is to develop a robust qualification and equivalency framework with guidelines for best practices. To achieve this goal, it is imperative to investigate whether changing specimen fabrication machines will affect the final mechanical property allowables when maintaining a consistent material microstructure. An initial step towards reaching this multi-machine platform equivalency objective is taken in this project to improve our understanding of parameter changes' influence on microstructure.

The task seeks to characterize how microstructure is affected when key process parameters are varied and to measure the correlated tensile strength as the parameters are adjusted. To quantify this, researchers conducted tensile testing to provide a mechanical performance correlation between the varying microstructures. Additionally, optical and laser scanning microscopes captured images to allow observation and characterization of microstructure and defect types as the parameters were changed. This report provides a key baseline for further AM research efforts within FAA JAMS. Figure 1 displays this project's relationship to other ongoing FAA JAMS research efforts.

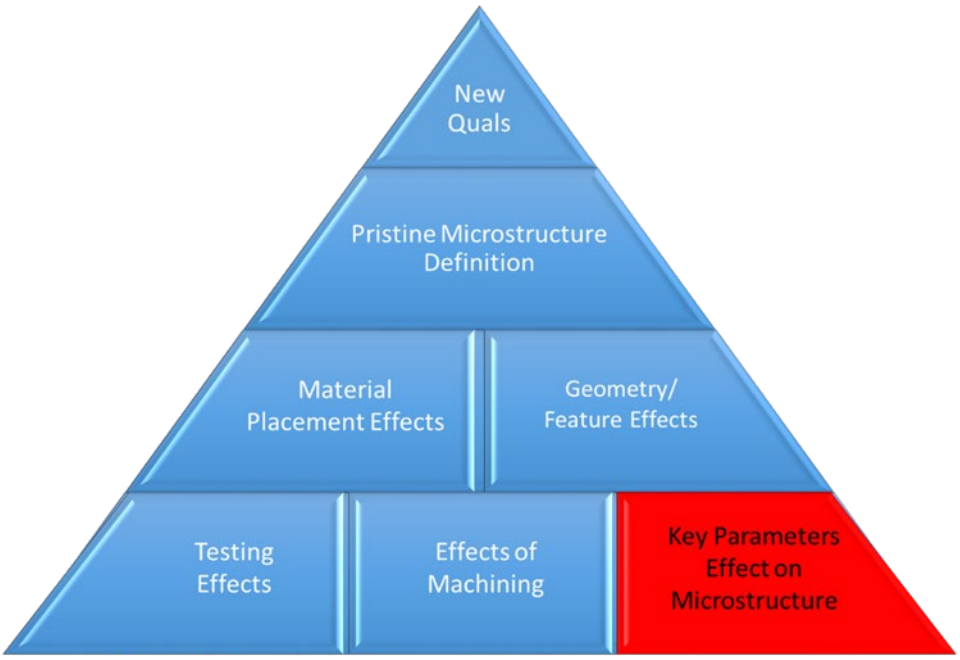


Figure 1. Establishing a parameter effect characterization to enable future qualifications

2 Background and problem statement

2.1 Problem

High-impact parameters listed in the National Center for Advanced Materials Performance (NCAMP) Process Specification (NCAMP, 2021) are based on material and process expertise and a limited number of fabrication testing trials performed prior to the ULTEM 9085 NCAMP qualification. There is little to no consolidated information available on microstructure effects on specimen-level performance. Although there are databases that contain mechanical properties for part designs and materials, none of these databases correlates mechanical data with polymer AM microstructure. Without this information readily available, users are not able to accurately predict the mechanical performance of their parts across a variety of fabrication parameters. As a result, designers fabricate with tightly constrained parameter sets, and correlations between print parameters and part performance are not well understood.

2.2 Past research

Researchers conducted a literature review that collected publicly available information to serve as a reference for making decisions on parameter selection and their applicable ranges. The review covered several Stratasys Insight processing parameters that changed microstructure and

mechanical performance. The parameters reported to have the greatest influence in the literature included raster air gap, raster angle, and raster width.

Attribute	Section	Default	Type I	Notes
Slice Height	Modeler Setup	Dropdown: 0.010"	Dropdown: 0.010"	
Invert Build Materials	Modeler Setup	Dropdown: No	Dropdown: No	
Allow Increased Contour Overfill	Contour Parameters	Unchecked	Unchecked	
Outer Contour Location	Contour Controls	Dropdown: Inside	Dropdown: Inside	
Adjacent Rasters	Air Gaps	0.0000"	0.0000"	
Contours and Rasters	Air Gaps	0.0000"	0.0000"	
Contour and Contour	Air Gaps	0.0000"	0.0000"	
Align Rasters	Raster Fill Parameters	Unchecked	Unchecked	
Parallel Offset Rasters	Raster Fill Parameters	Unchecked	Unchecked	
Use Alternate Sparse Fill Pattern	Raster Fill Parameters	Unchecked	Unchecked	
Sparse Raster Width	Sparse Fill Controls	0.0200"	0.0200"	
Delta Angle	Raster Angle Controls	90	90	
Layers Between Deltas	Raster Angle Controls	1	1	
Part X shrink factor	Toolpath Parameters	1.0100	1.0100	
Part Y shrink factor	Toolpath Parameters	1.0100	1.0100	
Part Z shrink factor	Toolpath Parameters	1.0097	1.0097	
Visible surface raster air gap	Toolpath Parameters	-0.0010"	-0.0010"	Requires Advanced-user experience and training

Figure 2. NCAMP high impact parameter settings

In combination with suggestions from the literature review, the NCAMP Process Specification (NPS) published a list of high impact Insight parameters, as seen in Figure 2 (NCAMP, 2021).

The original Stratasys ULTEM 9085 qualification determined which parameters had the largest impact and investigated the ranges of inputs for those parameters within the processing window. Utilizing the information gathered from the literature review and the process specification list, this study chose eight parameters to evaluate. Extending the investigation of parameters in a wider processing window provided a broader understanding of their effects on mechanical performance and increased the impact of this study.

2.3 Literature review

This literature review gathered information about altering three-fused deposition modeling printing parameters: raster air gap, raster angle, and raster width. Although there are several printing parameters that could have been investigated, these three were the most prevalent in current research and had the largest overall effect on mechanical properties. The papers reviewed for this study all focused on the material extrusion process. It is notable that none of the papers studied ULTEM 9085; however, it is reasonable to believe that similar trends would be seen

using similar techniques on ULTEM 9085. The purpose of this literature review is to inform decision-making about fabrication and testing procedures moving forward.

According to a literature review written by Gordelier et al. (2019), raster angle, air gap, and raster width affected the tensile strength of specimens the most. The raster angle is the path that the nozzle takes with respect to the X-axis while the air gap is the space or voids in between raster paths. Raster width is the thickness of the deposited material bead. Overall trends noted throughout this paper included that higher raster angles, negative air gaps, and larger raster widths increased tensile strength. When looking at raster angle alone for XY orientation (flat) specimens, a 90° raster angle tended to have a higher ultimate tensile strength, however for angles between 0° and 90°, a 50° raster angle had the highest average ultimate tensile strength. The raster angle of 0° is aligned (parallel) with the loading direction and the raster angle of 90°is perpendicular to the loading direction. Gordelier et al. (2019) also showed that some of the tested parameters acted in a dependent manner. For example, a negative air gap had the highest ultimate tensile strength for any raster angle but appeared to have the greatest effect on raster angles of 45° and 90°. Although a negative air gap had the highest ultimate tensile strength, when paired with a larger raster width, there was a slight reduction in overall ultimate tensile strength. However, a larger raster width paired with a higher positive air gap had a slight increase in ultimate tensile strength.

According to the testing reported by Durgan & Ertan (2014), raster angle significantly affected tensile and flexural strength. This study tested raster angles of 0°, 30°, 45°, and 90° printed in three different orientations: horizontal, vertical, and perpendicular. They discovered that the 0° raster angle had the highest tensile strength when printed horizontally and vertically with a noticeable increase in elasticity. Additionally, three-point bending testing revealed an overall trend of decreasing flexural strength as raster angle increased.

Rezayat et al. (2015) tested raster angles of 0°, 45°, and 90° and raster air gaps of -0.05, 0, and 0.05 mm. This study concluded that Young's modulus was highly dependent on both of these parameters. An increase in raster angle resulted in a decrease in Young's modulus and became more exaggerated as the raster air gap changed from -0.05 mm to 0.05 mm. When the angle increased from 0° to 90° and the raster air gap became positive, there were noticeable areas of deformation. The authors believed that these problem areas caused the specimens to fail prematurely.

Studies conducted by Rayegani & Onwubolu (2014) changed specimen orientation, raster angle, raster width, and raster air gap. Generally, the findings presented in this paper correlated with the findings in the papers previously noted, with one additional finding. When a -0.001-in air gap

was paired with a -0.008-in raster width, a 12.5% overlap was noted. This led to the discovery of overfill flaws, which made the surface of the specimen noticeably rough and led to a less-than-ideal mechanical performance. Additionally, they noted that the specimen with the best tensile strength had an orientation of 0°, raster angle of 50°, raster width of 0.2034 in, and an air gap of -0.0025 in.

Anh et al. (2002) examined how specimen orientation, raster air gap, raster width, material color, and temperature affected tensile and compressive strength. The conclusion from this study was that air gap and specimen orientation were the only parameters that had statistically significant effects on mechanical strength. More specifically, a negative air gap dramatically increased tensile strength for a transversely printed specimen but had little effect on axially printed specimens.

3 Technical approach and methodology

The purpose of this project is to determine the correlation between microstructure and mechanical properties of ULTEM 9085 specimens processed with material extrusion. The project used specimens of varying microstructures by changing Insight processing parameters during the fabrication process on a Stratasys F900mc, a material extrusion additive manufacturing system. This project analyzed the effects of Insight processing parameters on the ultimate tensile strength of ULTEM 9085 CG (certified grade) at the specimen level. The chosen Insight parameters were number of contours (NC), part raster width (PRW), enhanced visible surface raster width (EVSRW), enhanced visible surface raster air gap (EVSRAG), surface max contours (SMC), air gaps between adjacent rasters (AR), air gaps between contours and rasters (CR), and air gaps between contours (CC2 and CC3). The last parameter, CC2 and CC3, only applies to specimens with two and three contours.

Following the literature review, the researchers printed ULTEM 9085 specimens in three orientations: XY, XZ, and ZX. Since the majority of literature found that parameters such as the raster air gap, raster angle, and raster width had the greatest impact on mechanical properties, this study examined the same. The AR parameter test included three iterations: negative air gap, no air gap, and positive air gap to allow for a broader understanding of the effects on microstructure. To ensure consistent interlaminar cross-sectional bonding, a delta angle was introduced to have the raster angles rotate between two angles for each filament layer. For example, the raster angle was tested +45° and -45°. While +/- 45° keeps the scope of this project narrow, this parameter may be further examined in future studies to include other delta angles.

The raster width (sparse raster width) parameter varied similarly to the air gap with a small and large raster width.

Researchers printed six specimens for each parameter. Three of the six specimens were for tension tests, and the other three were cut to examine their microstructure. Existing data provided baseline information about tensile strength and microstructure for default parameters.

The goal of this study was to fabricate specimens to characterize the microstructure for a specific material and process to populate a dataset including microstructure characterization and tensile data. The researchers analyzed the resulting dataset to understand the correlation between tensile performance and microstructure and develop a baseline approach to the generation of performance-based specification of varying materials.

3.1 Detailed approach

This section presents detailed information on specifications, workflow steps in the fabrication, and testing phases of this project. Subsections detail important topics such as specimen identification, build planning, pack file creation, testing, and specimen imagery (see sections 3.1.1 thru 3.1.3.2).

3.1.1 Specimen identification

A 14-code reference system uniquely identified all specimens in this project for traceability (Table 1), cross-referenced with descriptive identification information as follows:

Program–Material Manufacturer ID–Material Code–Fabricator ID–Batch ID–Run ID–Build Orientation–Test Type ID–Test Specimen Build Location ID–Test Condition–Insight Parameter–Insight Parameter Value–Specimen Number

Table 1. Specimen identification

Parameter	**Possible Values**
Program:	FAA JAMS 18-2
Material Manufacturer ID:	SY (Stratasys)
Material Code:	U9085 (ULTEM 9085 CG)
Fabricator ID (Company that builds the specimens):	NIAR (National Institute for Aviation Research)
Batch ID (Material batch that builds the specimens):	A
Run ID (Fabrication run that builds the specimens):	01, 02
Build ID:	1, 2, 3, 4, 5

Parameter	Possible Values
Build Orientation:	XY, XZ, ZX
Test Types:	XT, YT, ZT (Static Tension)
Specimen Build Location ID:	15 (Middle)
Test Condition:	RTD (Room Temperature Dry)
Insight Parameter:	AR, CC2, CC3, CR, EVSRW, NC, PRW, SMC, EVSRAG
Insight Parameter Value:	(15), (10), (5), 0, 1, 2, 3, 5, 10, 15, 17, 18, 20, 22, 26
Specimen Number:	1, 2, 3, 4, 5, 6…

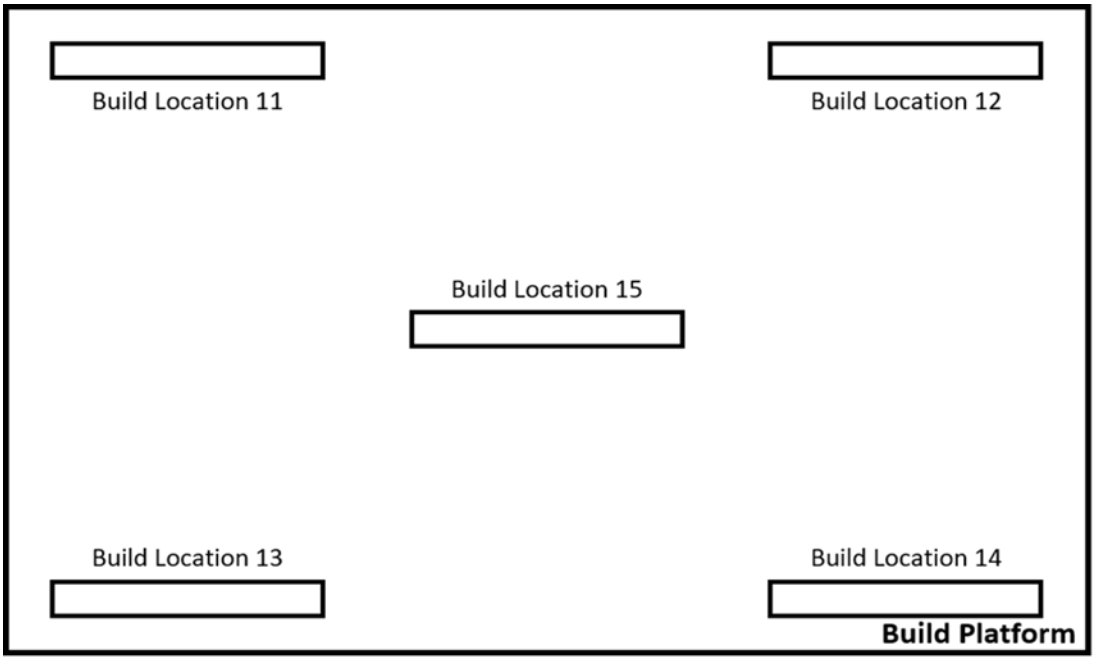


Figure 3. Specimen build platform location diagram

In order to facilitate individual specimen traceability, each individual specimen carries a unique specimen identifier as described this section. To help in verifying build platform location of specimen, the following nomenclature was used in Figure 3: 11-Top Left Corner, 12-Top Right Corner, 13-Bottom Right Corner, 14-Bottom Left Corner, 15-Middle.

To track the orientation of specimens after fabrication, researchers used a two-letter nomenclature, shown in Figure 4. The first letter specifies the build axes that align with the longitudinal axis of the specimen, while the second letter specifies the build axis orthogonal to

both the longitudinal axis of the specimen and the normal vector of the largest face of the specimen.

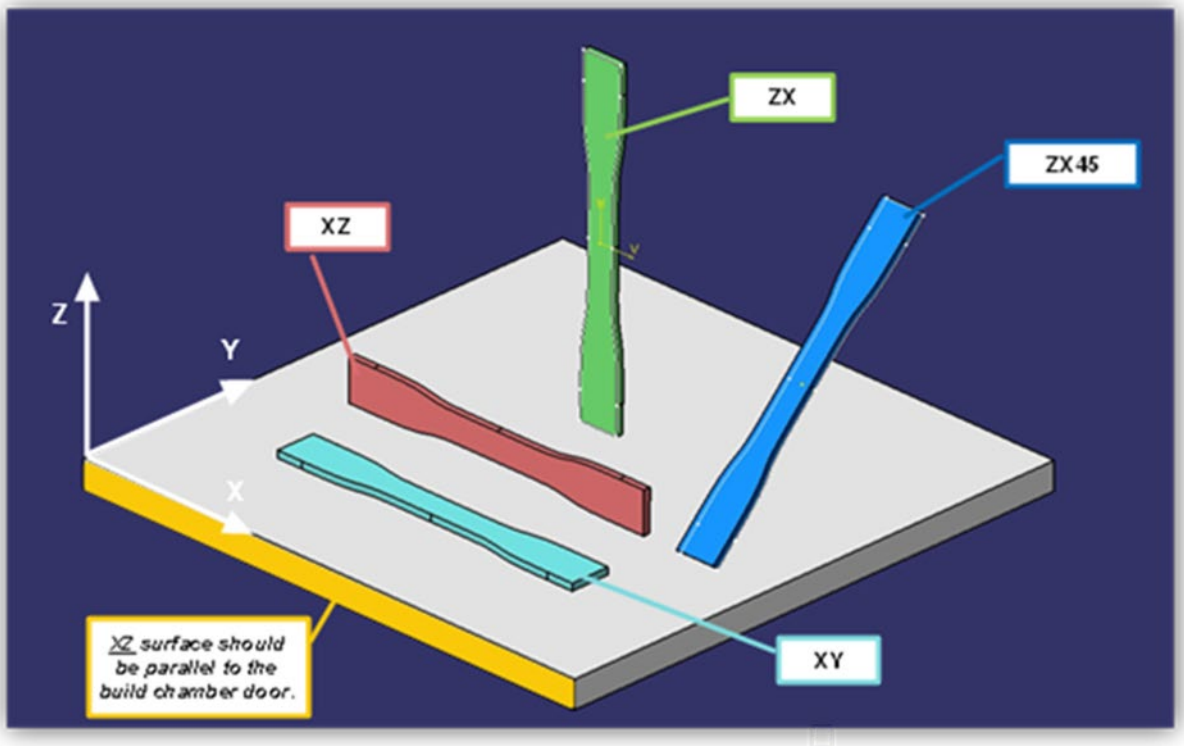


Figure 4. Specimen orientations with respect to the build axes and chamber door

3.1.2 Fabrication

The typical specimen fabrication process includes build planning, build file creation, pack file creation, build fabrication, and, in some cases, post-process machining. However, post-process machining was not included in this project. All specimens were tested in an as-fabricated state as opposed to a machined state. Specimen fabrication immediately preceded dimensioning and conditioning, the first steps for specimen testing.

3.1.2.1 Build planning

The first step of the fabrication workflow was build planning, which transforms the test matrix requirements into a fabrication matrix (See Appendix A: Fabrication matrix). The fabrication matrix is the full list of specimens and their attributes that are necessary to satisfy the test matrix. The fabrication matrix also contains information about which specimen types go into each build as well as the amount. The fabrication matrix was used to simplify build and pack file creation; for this project, specimens were organized by orientation and grouped by parameter to ensure

builds could fit on the small, high-temperature build sheet. Builds were optimized for time and material usage.

3.1.2.2 Build and pack files

After the fabrication matrix was complete, build files were created for each specimen type. The build files contain specimen toolpath data and parameter values, which create the pack files. Pack files are groupings of multiple specimens for fabrication within a run of one build. The researchers used Insight, a proprietary Stratasys pre-processing software package to generate build files. In Insight, the process parameters can be modified, affecting toolpath definitions and ultimately microstructure, which affects mechanical properties. Build files are created for each unique specimen type, not separately for each specimen to be fabricated. Stratasys's Control Center Software, an application included in the Insight pre-processing software package, generates the pack files after the build files are complete. Control Center creates pack files by allowing the user to organize individual build files on the build plate, which it then stitches together to create a pack file and sends directly to the F900mc via Control Center (see example in Figure 5). Just as for build files, only unique builds need pack files. It is best practice to fabricate unique packs multiple times to save time. This study involved pack files where a single parameter was varied and pack files where multiple parameters were varied.

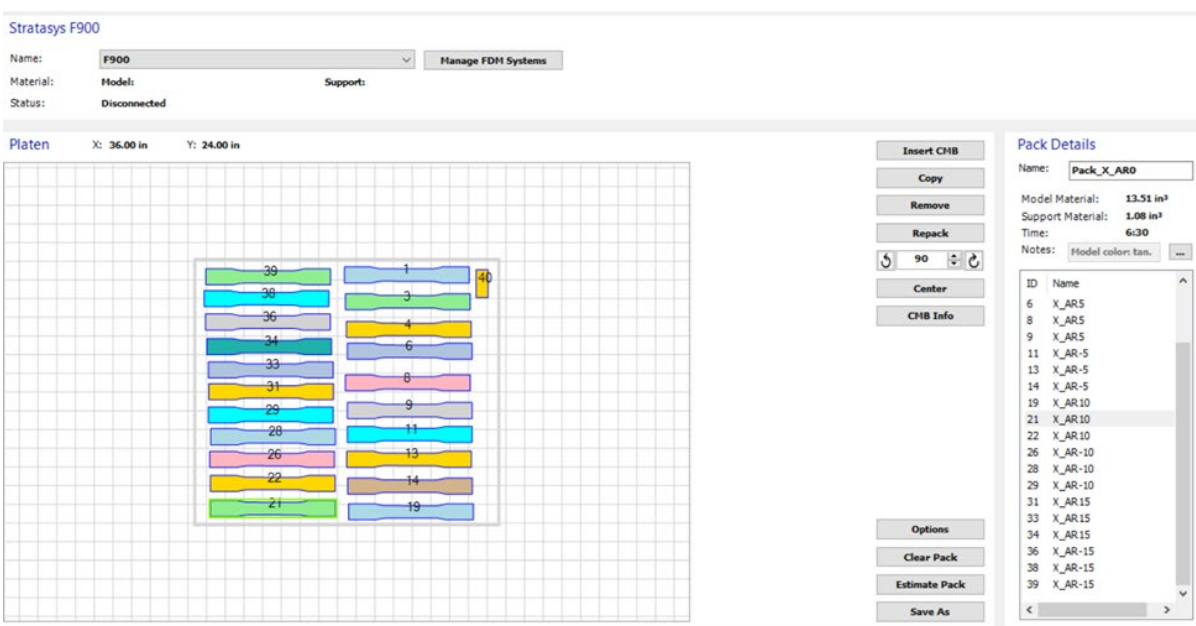


Figure 5. Example image of a completed pack file in Stratasys Control Center

For this project, 120 build files were created and separated into 18 pack files where each pack file was fabricated twice, yielding 720 specimens. The fabrication matrix allowed for 40 unique

Insight parameter variations, 3 orientations, and 6 specimens to be fabricated per unique orientation and insight parameter variation. Of those six specimens per unique orientation and insight parameter variation, four were tested, and two had their microstructures analyzed.

3.1.3 Specimen testing and imagery

All specimens mechanically tested for this project were ASTM D638 Type 1 tension specimens with a 0.13 ± 0.015-in thickness in the as-fabricated state. The researchers performed all tests according to ASTM D638, the standard for tensile strength testing of plastics. Specimen testing includes dimensioning, conditioning, destructive testing, and data compilation.

This project required two types of specimen imaging. The first group was photographed for microstructural images (see Appendix C: Specimen microstructure comparisons). These specimens were analyzed to gain a better understanding of Insight parameters' influence on the fabricated microstructure. The second group had post-test fracture surfaces imaged (see Appendix D: Specimen fracture surface imagery); these images provided information on failure modes and fabrication defects that may have caused fracture initiation. Figure 6 represents acceptable microstructure for ULTEM 9085 fabricated with NCAMP baseline parameter settings from the PCD (NCAMP, 2021) on a Stratasys F900mc. The microstructure was assessed and compared for all process parameter settings to the NCAMP baseline parameter settings.

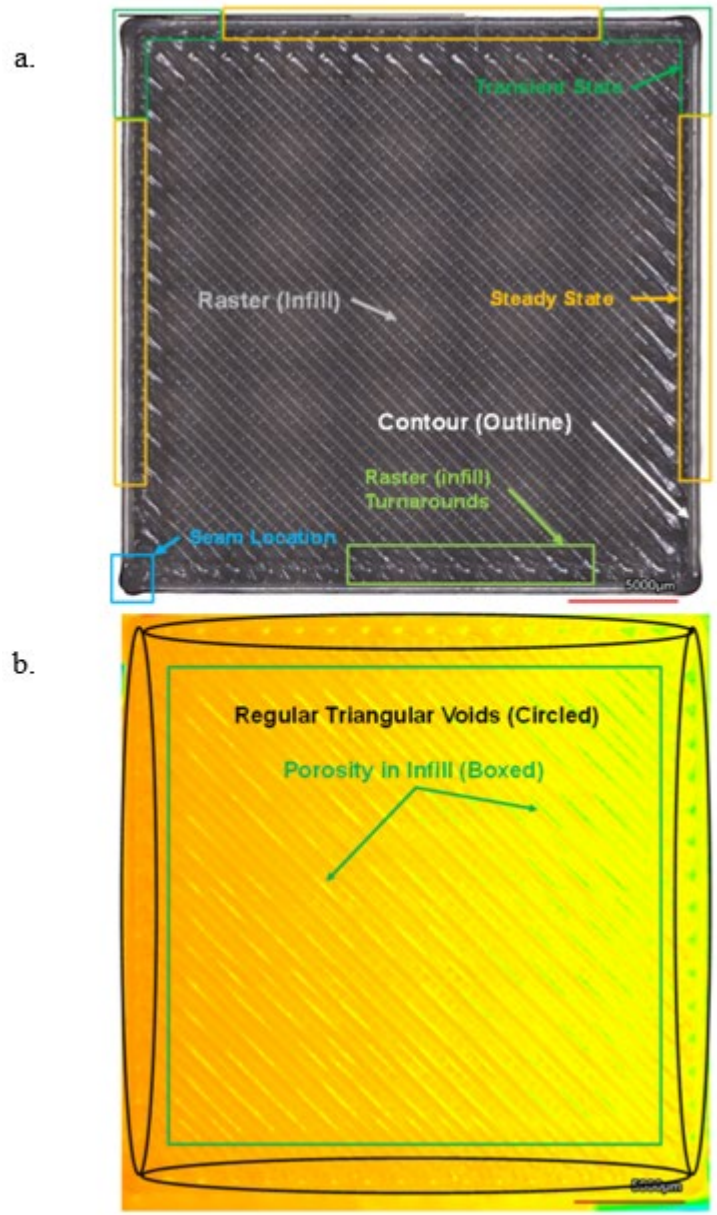


Figure 6. Acceptable ULTEM 9085 microstructures: microstructure (a) and height map (b)

3.1.3.1 Specimen testing

NIAR's quality control (QC) lab dimensioned each specimen prior to mechanical testing with an optical comparator to ensure compliance with both the ASTM D638 Standard and the specific drawing provided for the program, shown in Figure 7. Researchers recorded inspection results for specimens including any nonconformance to the ASTM requirements. If results indicated critical dimensionality that would affect testing performance, the QC lab dispositioned and refabricated

the specimens. No specimens required machining to correct nonconformance. Post-fabrication machining on additively manufactured test specimens would add another point of investigation that was not the focus for this program. In order to accurately identify variations in mechanical performance—a result of print parameter modifications—the lab tested specimens in their as-fabricated state with documentation of any dimensional inconsistencies per the ASTM standard.

Post fabrication specimens require conditioning to their necessary test condition prior to testing. All specimens underwent conditioning for 24 hours at 250 ± 5°F to achieve a dry state before testing at approximately 75°F, to meet the required room temperature dry (RTD) condition. This drying procedure was carried out per NCAMP Material Specification (National Center for Advanced Materials Performance, 2021) to ensure that baseline qualification procedures were followed.

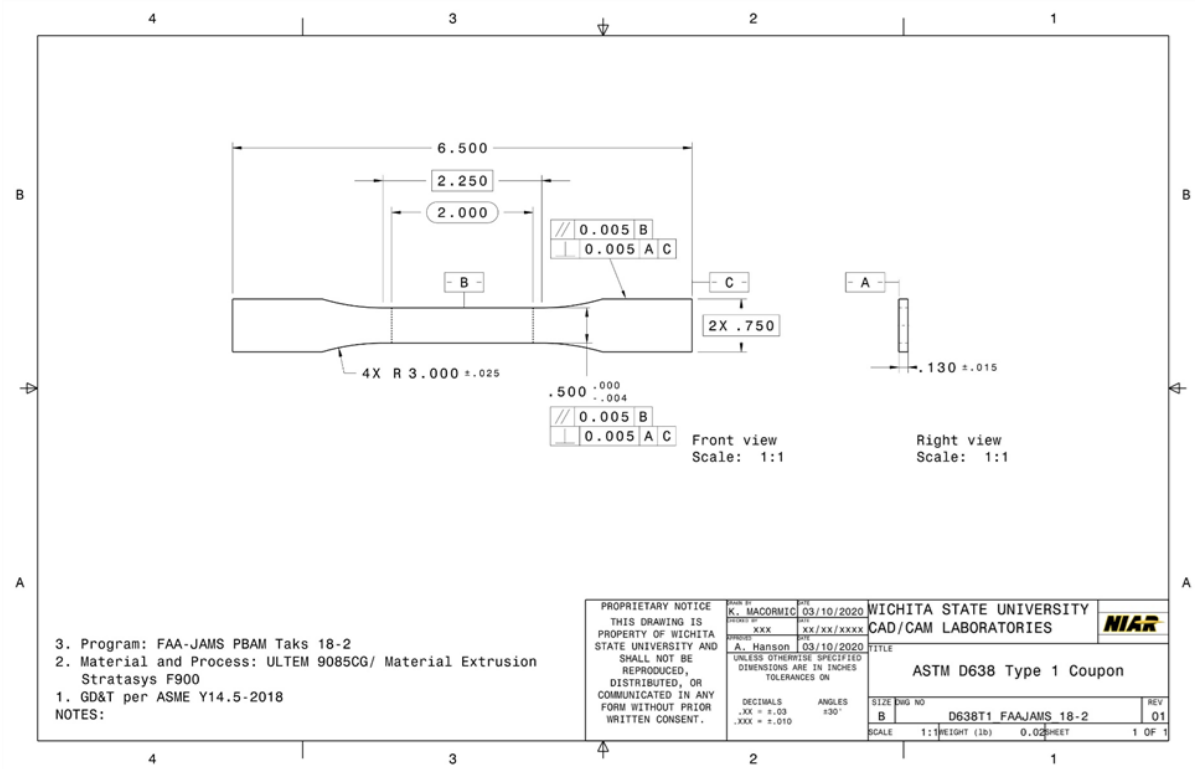


Figure 7. ASTM D638 Type 1 specimen technical drawing

NIAR's Testing Lab performed specimen mechanical testing. The lab conducted destructive testing according to the ASTM D638 standard, which states that the time to failure must be between 0.5 and 5 minutes. As a result, the testing occurred at either 0.2 in/min or 0.15 in/min to ensure that the specimens broke within the required time limit. The lab recorded tensile data for

each specimen and statistical values such as mathematical mean, standard deviation, and calculated Coefficient of Variation; available in Appendix G: Mechanical data.

3.1.3.2 Specimen fracture surface imagery

After mechanical testing, NIAR's QC Lab received specimens for fracture surface imaging with a Keyence VK-X1000. This device takes high-resolution optical images and laser scanning surface profilometry to create 3D images of the fracture surface.

3.2 Project scope

In defining the scope of this project, both the F900mc Process Control Document (PCD) SSYS 300003-0001 (2017) and the project literature review played a role in informing the final decisions. More specifically, the list of high-impact parameters from the PCD was down-selected based on the findings from the project literature review. Of the various high-impact parameters listed in the PCD (see Appendix F: Insight parameter settings), the selected parameters appear in Figure 8 along with their expected weight of impact by variation. Subsequent sections provide full descriptions of each parameter.

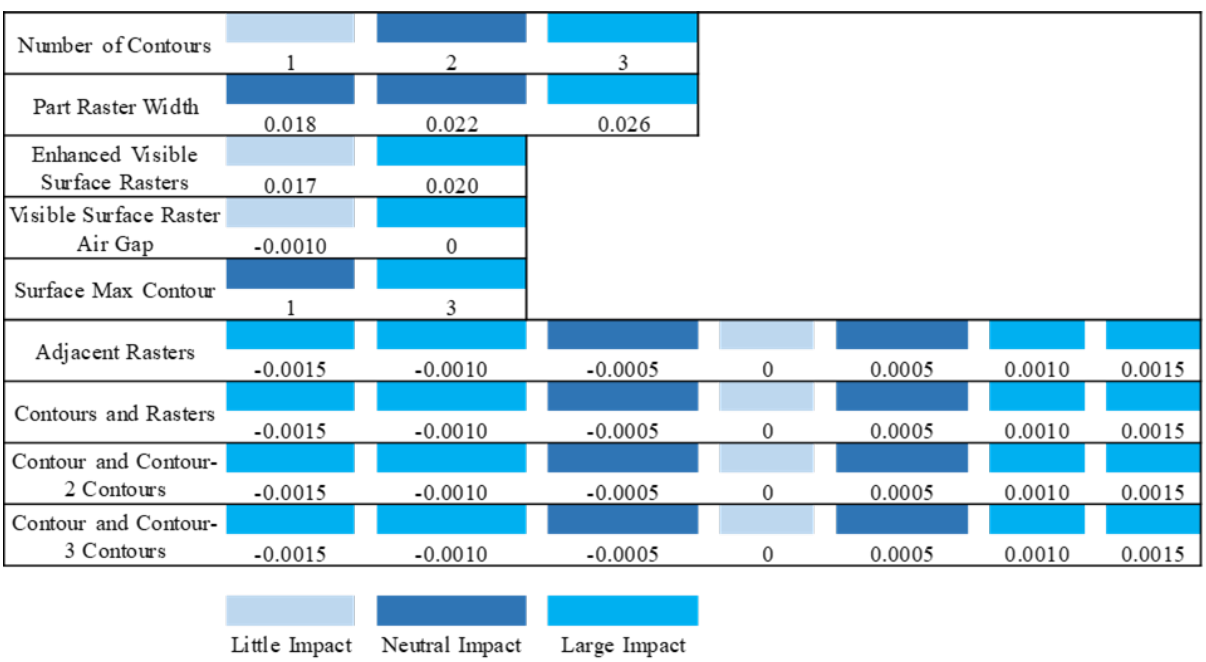


Figure 8. Each parameter's perceived impact by variation

3.2.1 High-impact insight parameters

This section defines and describes the high impact fabrication parameters chosen for this project. Figure 9 provides the definitions for each parameter as defined by Stratasys, while the values tested for these parameters along with each value's perceived impact can be found in Figure 8. Figure 8 depicts each parameter with the default (if the default value is included in this project) and the extreme values in the following sections, as they would appear in Stratasys' Insight software package (see sections 3.2.1.1 thru 3.2.1.9). Figure 10 through Figure 18 display a series of screenshots of the first layer of a 1x1x1 in block in Insight 12.6 as study parameters change; default value images are marked.

1. Number of Contours (NC)	4. Enhanced Visible Surface Raster Air Gap (EVSRAG)	7. Air Gaps Between Contours and Rasters (CR)
The number of contours built around all outer and inner curves.	The gap between adjacent visible surface raster toolpaths.	The gap between the innermost contour and the edge of the raster fill inside the contour.
2. Part Raster Width (PRW)	5. Surface Max Contour (SMC)	8. Air Gaps Between Contours—2 Contours (CC2)
The toolpath width of the raster pattern used to produce solid fill regions of part curves.	The toolpath automatically sets up surface max contours on visible rasters to hide raster turn-arounds when enhanced visible surface rasters are used.	The gap between contours when the part fill style is with two contours.
3. Enhanced Visible Surface Raster Width (EVSRW)	6. Air Gaps Between Adjacent Rasters (AR)	9. Air Gaps Between Contours—3 Contours (CC3)
The toolpath used to produce visible and internal raster widths.	The air gap between adjacent raster toolpaths.	The gap between contours when the part fill style is with three contours.

Figure 9. Definitions of each high impact insight parameter

3.2.1.1 Number of contours

Contours are the outermost toolpaths that outline the inner toolpaths of the part, referred to as *rasters*, as shown in Figure 10. Contours provide an outside shell to the rasters, creating a clean and layered asthetic for a part. Rezayat et al. (2015) found that the contour bears a majority of the load under tensile loading conditions. Based on this research, increasing the number of contours (NC) would likely lead to an increased tensile strength. In this program, one, two, and three contours were tested to determine if such a relationship exists between tensile strength and NC.

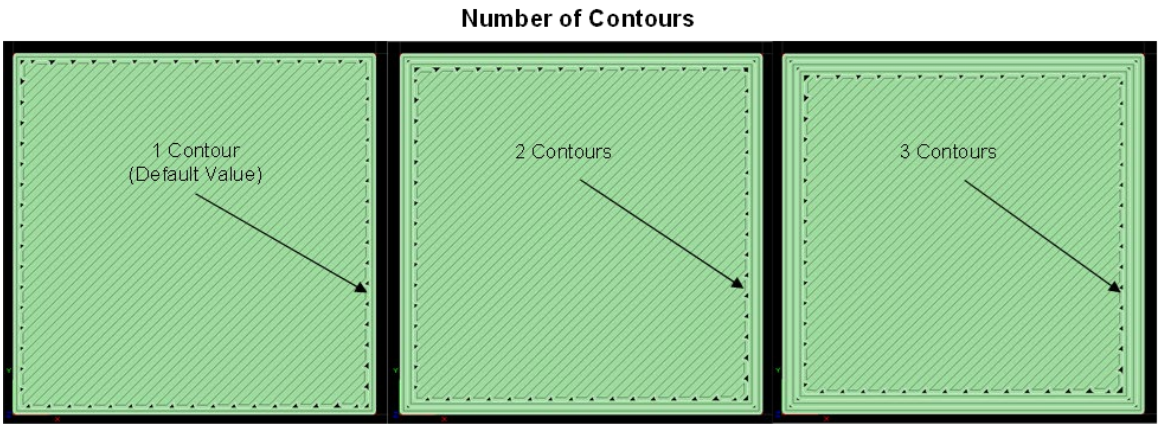


Figure 10. Screenshots as the NC is changed

3.2.1.2 Part raster width

Raster toolpaths are toolpaths that act as the fill inside a part as shown in Figure 11. By default, Insight generates the raster toolpaths as a continuous path, which travels at ± 45° angles, alternating every layer from the FDM System Axis in Insight, across each layer of the part, creating parallel lines with no gaps between them. It was hypothesized that altering the width of the raster toolpaths changes the number of raster lines generated by Insight per layer. Therefore, trading the amount of raster toolpaths per layer for a different cross-sectional area in each individual raster line may alter the tensile strength in the end part.

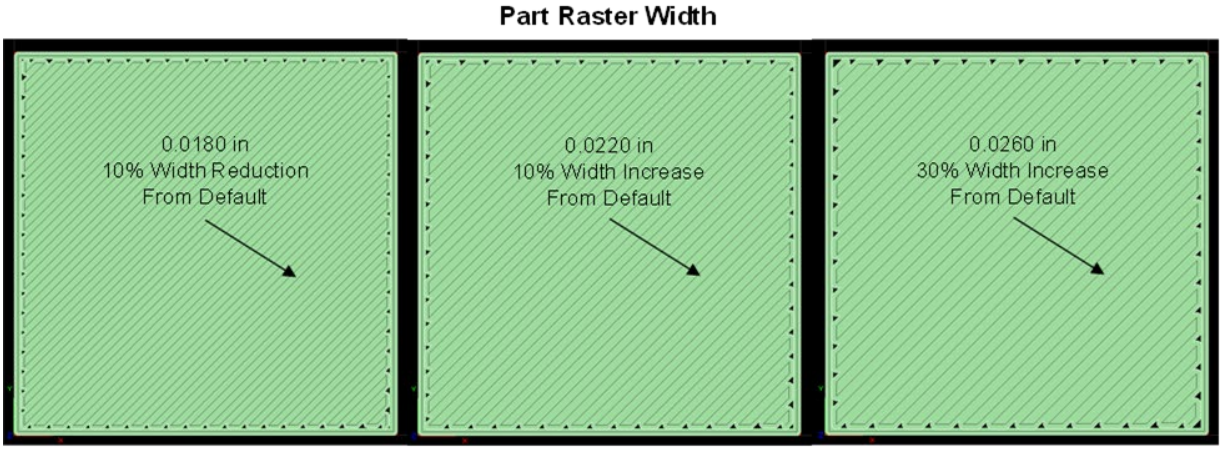


Figure 11. Screenshots as the part raster width is changed

3.2.1.3 Enhanced visible surface raster width

When visible surface style is set to Enhanced Style rather than Normal Style in Insight 12.6, settings for visible surfaces and nonvisible regions of a part are separately controlled. Enabling

the Enhanced Style allows the EVSRW, among other parameters, to become independent from the Normal Style's default raster width used with visible surfaces and for all non-surface raster toolpaths. As seen in Figure 12, with Enhanced Style selected, the EVSRW displays for both the seventeen thousandths of an inch (Enhanced Style default value) and at slightly higher twenty thousandths of an inch raster width (Normal Style default value). Note that for all specimens fabricated with enhanced visible surfaces, the default internal raster width is twenty-four thousandths with an air gap of zero thousandths.

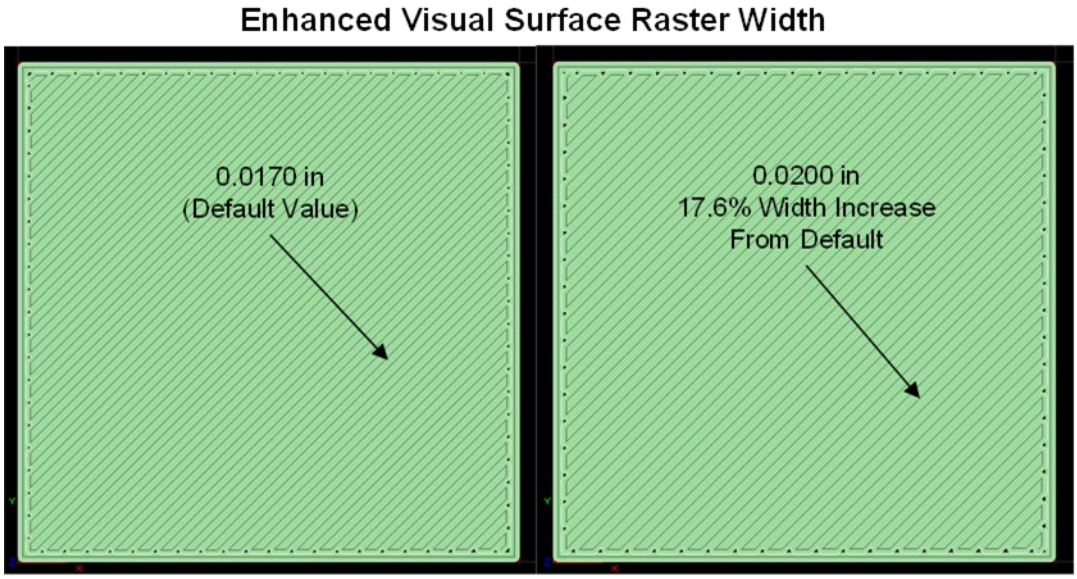


Figure 12. Screenshots as the enhanced visual surface raster width is changed

3.2.1.4 Enhanced visible surface raster air gap

Enabling the Enhanced Style allows the EVSRAG, among other parameters, to become independent from the Normal Style's default raster-to-raster air gap used for visible surfaces and for all non-surface raster toolpaths. As shown in Figure 13, with the Enhanced Style selected, the EVSRAG or the gaps between visible surface raster toolpaths increments from the default value of negative one thousandth, representing an overlap of visible surface raster toolpaths to a value of zero thousandths creating no gaps between visible surface raster toolpaths. Note that for all specimens fabricated with enhanced visible surfaces, the default internal raster width is twenty-four thousandths with an air gap of zero thousandths.

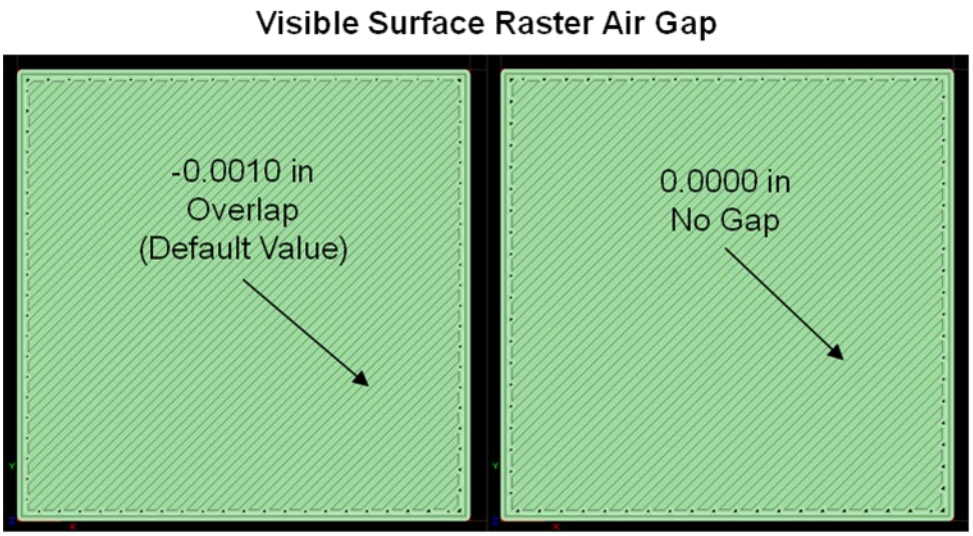


Figure 13. Screenshots as the visible surface raster air gap is changed

3.2.1.5 Surface max contour

Enabling the Enhanced Style option allows the SMC, among other parameters, to become independent from the Normal Style's default NC used with visible surfaces and for all non-surface contour toolpaths. The SMC parameter sets the maximum NC used to hide raster turnarounds, especially on visible sloped surfaces such as the second layer of a 1x1x0.05 in pyramid; see the screenshots in Figure 14. The near-flat 5.7° slopes require Insight to adjust the NC up to SMC so that the raster turnarounds are as hidden as possible to enhance the surface appearance. When allowed only one SMC, Insight forces the visible raster to comply with the Enhanced Style settings, while the internal raster toolpaths use nonvisible or Normal Style settings and generate only one contour. When allowed up to three surface contours, Insight uses up to three contours to fill the visible region, and then it fills with the enhanced raster just as in the case of one SMC. Note that for all specimens fabricated with enhanced visible surfaces, the default internal raster width is twenty-four thousandths with an air gap of zero thousandths.

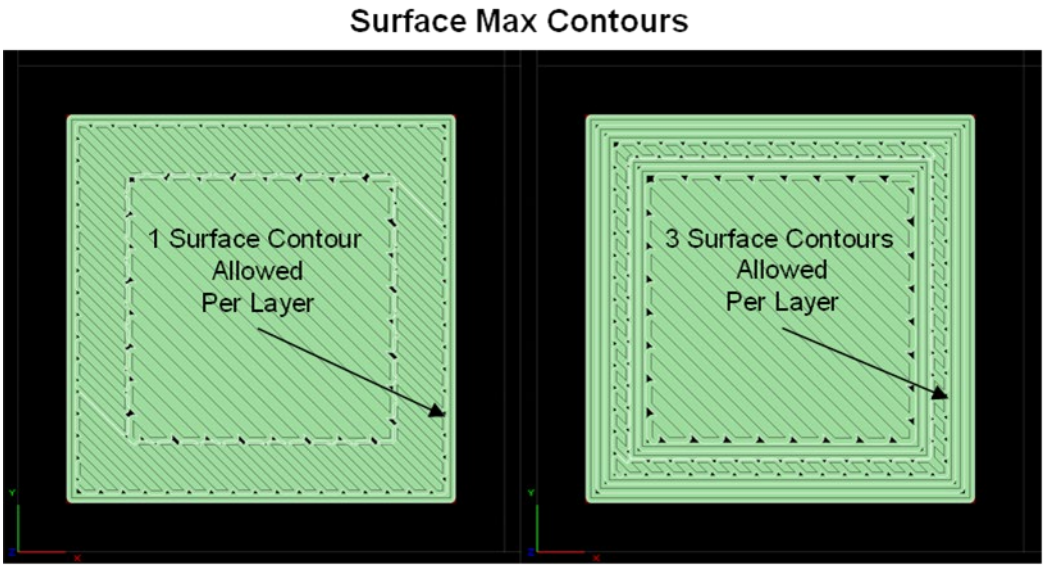


Figure 14. Screenshots as the number of allowed surface contours is increased

3.2.1.6 Air gaps between adjacent rasters

The raster-to-raster air gap, the common name found throughout the literature, is equivalent to the air gaps between AR parameter in Insight 12.6, as shown in Figure 15. Seven values were chosen, ranging from negative fifteen ten-thousandths to positive fifteen ten-thousandths, and including the default value of zero. It was hypothesized that as the air gap becomes more negative, the raster toolpaths will overlap enough to increase the fused strength between the individual raster toolpaths as well as increase the number of raster toolpaths per layer, allowing the raster toolpaths to handle more of the tensile load and take some of the burden away from the contours. Since the raster toolpaths primarily distribute the load to the contours, according to Rezayat et al. (2015), it was hypothesized that the increase in the raster count and bond strength will increase the ultimate tensile strength.

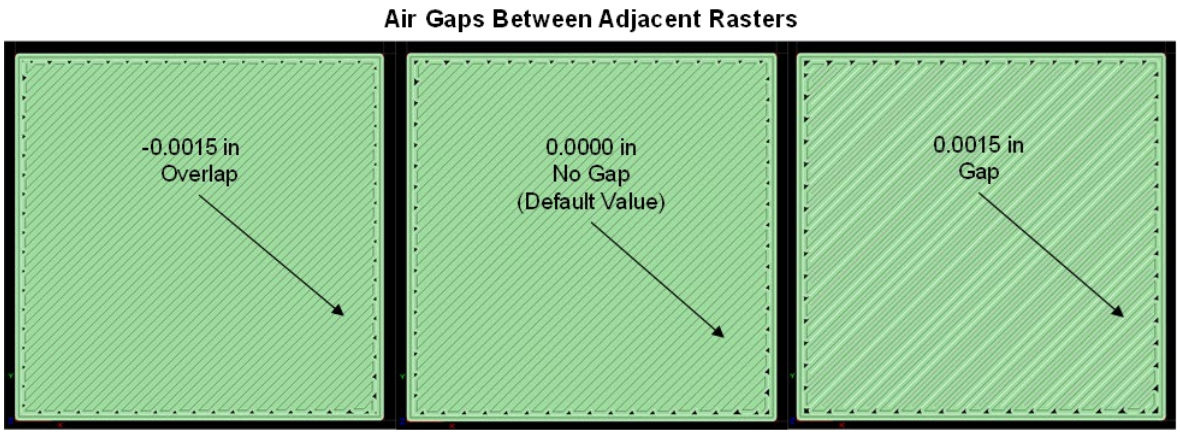


Figure 15. Screenshots as the raster-to-raster air gap is changed

3.2.1.7 Air gaps between contours and rasters

The CR parameter in Insight sets the gap between the innermost contour and the raster toolpaths, as shown in Figure 16. Seven values were chosen, ranging from negative fifteen ten-thousandths to positive fifteen ten-thousandths, and including the default value of zero. According to Rezayat et al. (2015), the rasters primarily distribute loads to the contours. Hence, researchers chose this parameter to investigate the effects of AR on the tensile strength and microstructure.

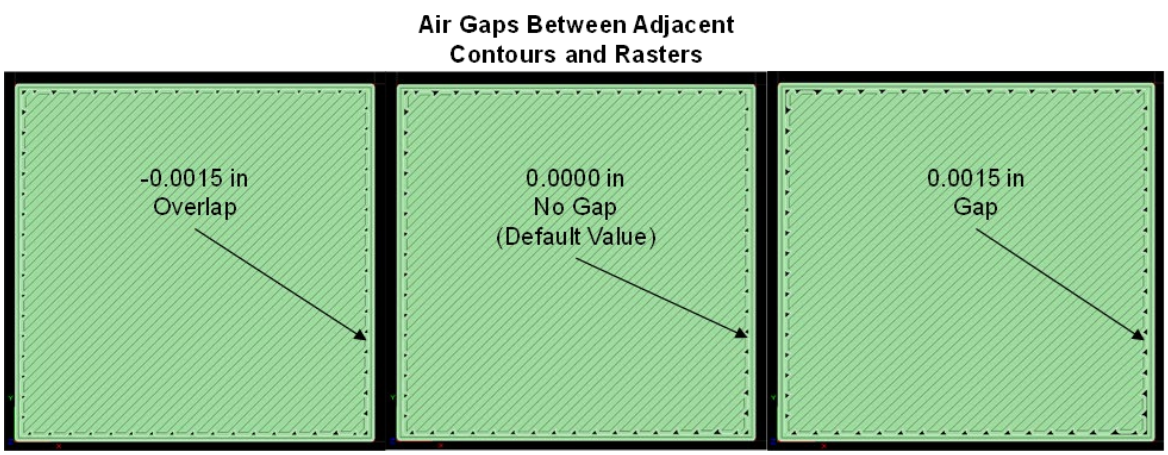


Figure 16. Screenshots as the contour-to-raster air gap is changed

3.2.1.8 Air gaps between contour and contour – 2 contours

Figure 17 shows the contour-to-contour air gap parameter used to specify the gap between contours when there are two or more contours (CC2). It was hypothesized that the more negative the air gap, the greater the tensile strength of the part.

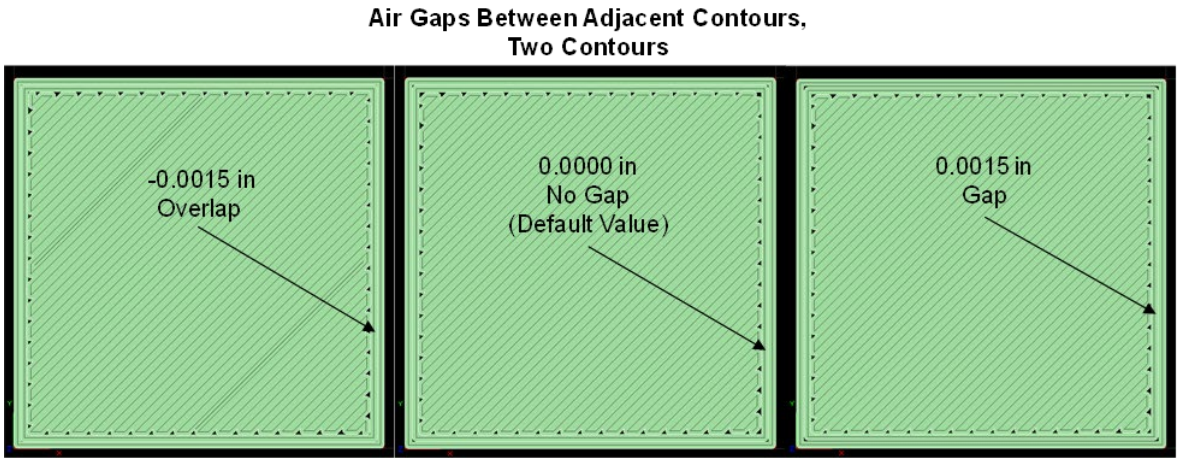


Figure 17. Screenshots as the contour-to-contour air gap is changed for CC2

3.2.1.9 Air gaps between contour and contour—3 contours

Figure 18 shows the contour-to-contour air gap parameter used to specify the gap between contours when there are three or more contours (CC3). It was hypothesized that the more negative the air gap, the greater the tensile strength of the part.

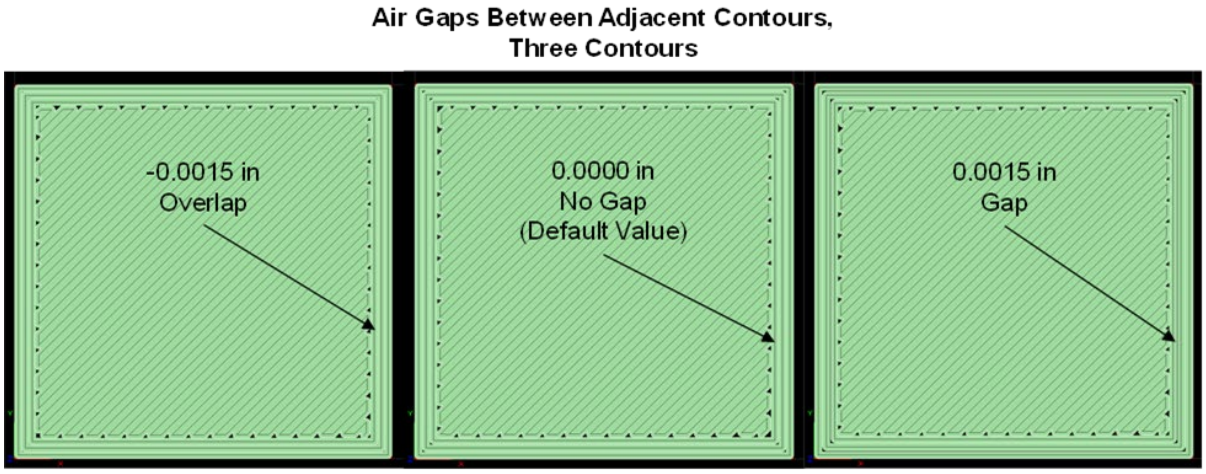


Figure 18. Screenshots as the contour-to-contour air gap is changed for CC3

3.3 NCAMP baseline specimen microstructure

This section provides microstructure images for the investigated parameters used in the NPS 89085 (NCAMP, 2021). The microstructure images provide measurement values for contour widths, raster angles, part raster widths, and layer thicknesses for the baseline XY, XZ, and ZX specimens. This study did not investigate contour width, raster angle, and layer thickness

parameters; however, these parameters used NCAMP baseline settings with values of 0.020 in, 45°, and 0.010 in, respectively.

The images were taken using the Keyence VKX 1000 laser microscope at five times magnification. Table 2 and Figure 19 through Figure 21 provide the NCAMP baseline settings for the parameters of interest and microstructure images for the different specimen orientations.

Table 2. NCAMP baseline settings for the investigated parameters

Parameter	**Settings**
Air gaps between adjacent rasters (AR)	0 in
Part raster width (PRW)	0.020 in
Air gaps between contours and rasters (CR)	0 in
Number of contours (NC)	1
Air gaps between adjacent contours (CC2/CC3)	Not enabled (as only 1 contour)
Enhanced visible surface raster width (EVSRW)	Not enabled
Surface maximum contours (SMC)	
Enhanced visible surface raster air gap (EVSRAG)	

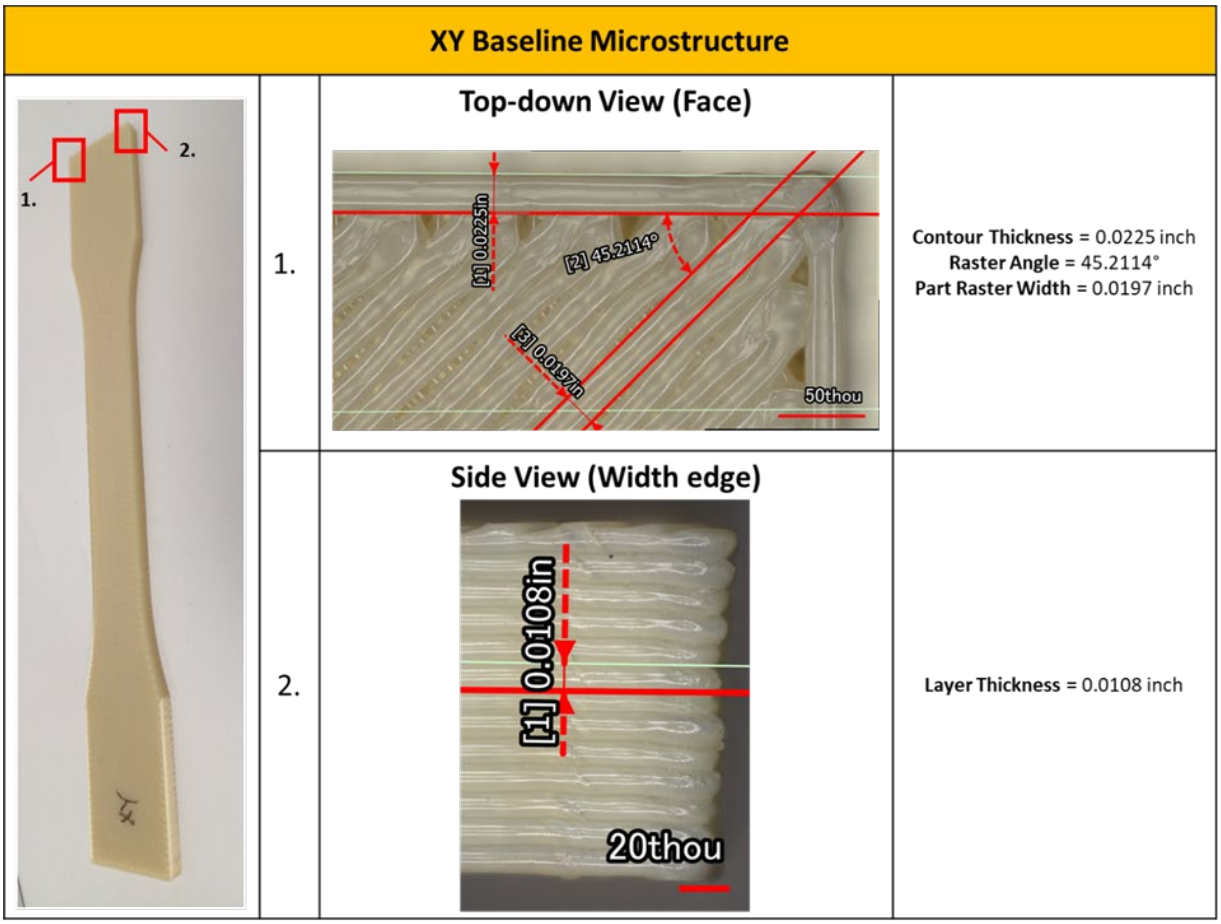


Figure 19. Microstructure of XY orientation specimen with NCAMP baseline settings

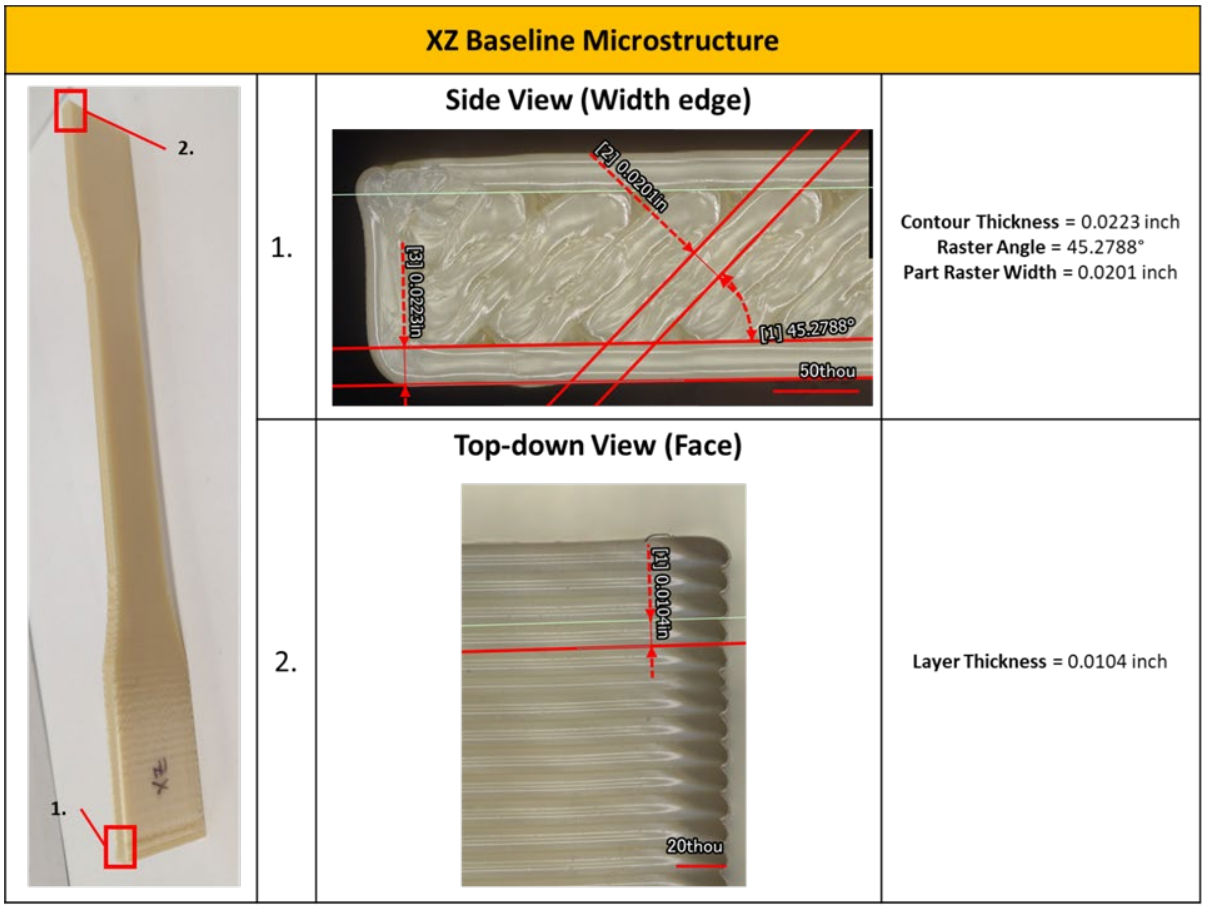


Figure 20. Microstructure of XZ orientation specimen with NCAMP baseline settings

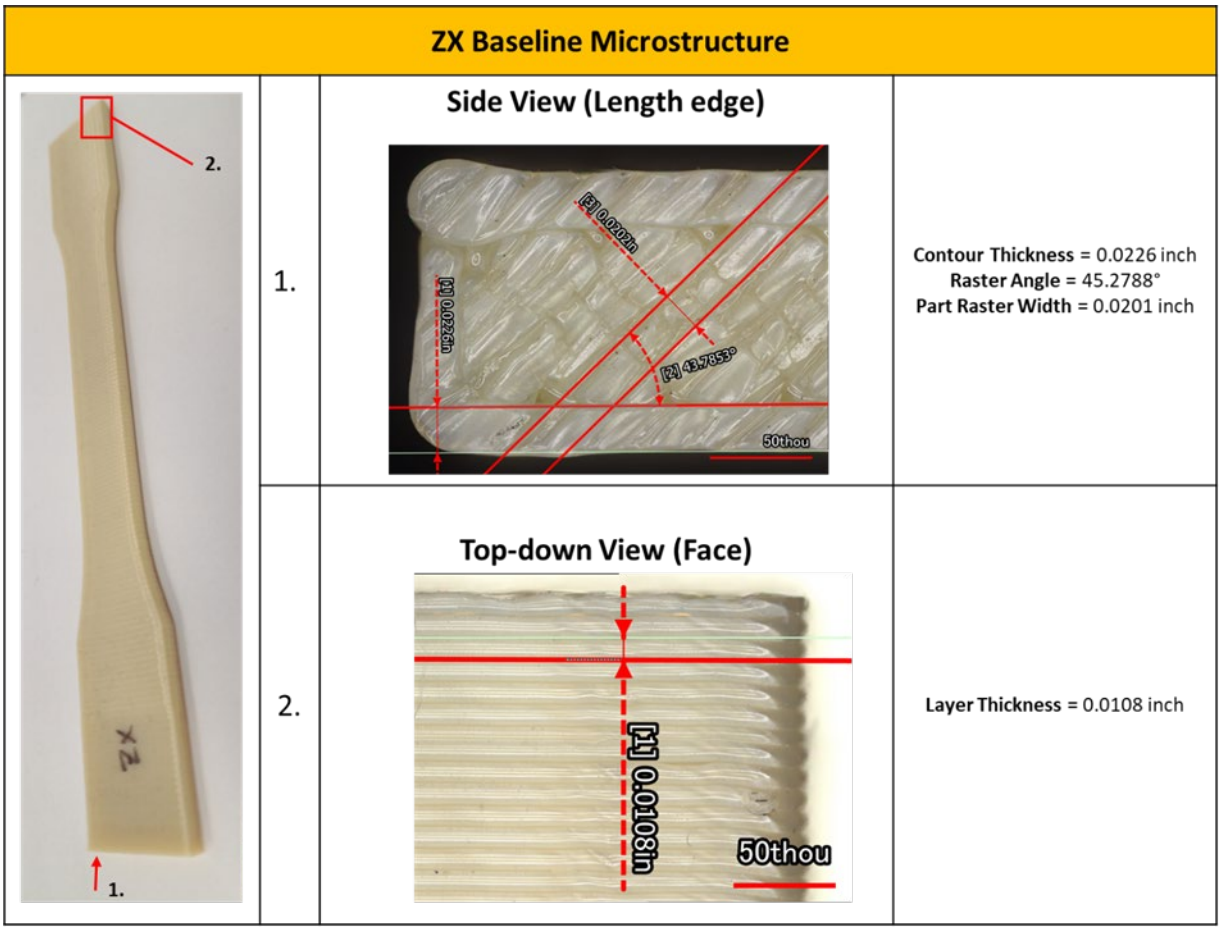


Figure 21. Microstructure of ZX orientation specimen with NCAMP baseline settings

4 Results

The following subsections describe project results grouped by the parameter type varied for the study. The researchers have noted performance trends for each group and, in select cases, for specific build orientations. Figure 22 provides a data table of tensile test results. Figure 23 through Figure 25 provide scatter plots comparing each changed Insight 12.6 parameter grouped by build orientation. The NCAMP baseline values shown as dashed lines in each of these graphs represent the average tensile strength values obtained from the NCAMP Material Qualification Statistical Analysis Report (Clarkson, 2019). The average tensile strength values reported by NCAMP for the XY, XZ, and ZX ULTEM 9085 specimens tested in RTD conditions are 9.73 ksi, 11.18 ksi, and 8.55 ksi respectively. The full program fabrication matrix is provided in Appendix A, and full test results are provided in Appendix G.

	XY Orientation							XZ Orientation							ZX Orientation						
	Air Gaps Between Adjacent Rasters (in)																				
	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015
Mean Tensile Strength [ksi]	12.44	11.32	10.11	8.92	8.33	7.56	6.49	13.03	12.95	12.27	11.44	10.55	11.16	9.63	8.35	8.59	7.98	7.97	7.47	6.93	7.30
Minimum [ksi]	12.24	11.21	10.00	8.82	8.03	7.50	6.13	12.77	12.87	12.20	11.24	10.37	11.13	9.38	8.17	8.38	7.49	7.80	7.06	6.56	6.98
Maximum [ksi]	12.62	11.40	10.24	9.03	8.55	7.65	6.65	13.14	13.04	12.34	11.64	10.73	11.22	9.79	8.69	8.76	8.35	8.23	7.80	7.24	7.45
Standard Deviation [ksi]	0.171	0.090	0.103	0.085	0.244	0.073	0.239	0.179	0.072	0.061	0.170	0.143	0.040	0.177	0.231	0.167	0.400	0.182	0.319	0.338	0.215
C.V. [%]	1.371	0.799	1.015	0.953	2.926	0.968	3.684	1.374	0.553	0.497	1.490	1.359	0.362	1.834	2.764	1.939	5.016	2.288	4.265	4.877	2.942
	Air Gaps Between Adjacent Contours, Two Contours (in)																				
	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015
Mean Tensile Strength [ksi]	9.75	9.78	9.53	9.71	9.40	9.62	9.72	12.62	12.73	12.24	12.39	11.97	12.13	11.78	7.68	7.58	7.40	7.21	7.23	7.18	7.11
Minimum [ksi]	9.54	9.62	9.39	9.59	9.34	9.41	9.56	12.42	12.57	12.02	12.20	11.68	11.88	11.53	7.39	7.13	7.03	7.04	7.04	6.89	6.82
Maximum [ksi]	9.88	9.98	9.73	9.86	9.46	9.88	9.84	13.08	13.13	12.64	12.80	12.51	12.66	12.42	7.91	7.77	7.63	7.60	7.51	7.31	7.31
Standard Deviation [ksi]	0.145	0.190	0.166	0.111	0.068	0.227	0.118	0.305	0.268	0.290	0.280	0.368	0.357	0.432	0.245	0.305	0.262	0.259	0.200	0.192	0.205
C.V. [%]	1.487	1.938	1.739	1.144	0.725	2.362	1.213	2.418	2.108	2.369	2.259	3.077	2.945	3.668	3.184	4.027	3.535	3.599	2.764	2.673	2.885
	Air Gaps Between Adjacent Contours, Three Contours (in)																				
	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015
Mean Tensile Strength [ksi]	10.57	10.55	10.41	10.36	10.15	9.80	9.78	13.73	13.77	12.76	12.88	13.01	12.71	12.82	8.09	8.20	7.03	6.35	6.82	5.81	6.27
Minimum [ksi]	10.30	10.40	10.24	10.23	10.10	9.63	9.63	13.63	13.59	12.68	12.75	12.96	12.56	12.73	7.95	7.83	6.85	5.48	6.51	4.78	5.83
Maximum [ksi]	10.95	10.75	10.63	10.48	10.19	9.93	9.93	13.80	13.85	12.86	12.97	13.05	12.81	12.98	8.45	8.74	7.19	6.82	6.97	6.18	6.61
Standard Deviation [ksi]	0.324	0.172	0.194	0.119	0.039	0.127	0.125	0.076	0.121	0.070	0.095	0.048	0.119	0.114	0.240	0.388	0.163	0.617	0.211	0.688	0.365
C.V. [%]	3.060	1.634	1.868	1.147	0.387	1.291	1.283	0.552	0.882	0.549	0.736	0.367	0.939	0.886	2.972	4.729	2.311	9.724	3.097	11.830	5.823
	Air Gaps Between Adjacent Contours and Rasters (in)																				
	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015	-0.0015	-0.0010	-0.0005	0.0000	0.0005	0.0010	0.0015
Mean Tensile Strength [ksi]	9.62	9.43	9.20	9.07	8.95	9.08	9.12	12.70	12.35	11.56	11.10	10.72	10.43	10.11	8.38	8.31	8.15	8.07	7.71	7.46	7.05
Minimum [ksi]	9.46	9.20	9.06	8.94	8.78	8.85	8.94	12.56	12.27	11.05	10.88	10.52	10.33	9.99	8.24	8.00	7.60	7.70	6.96	7.08	6.22
Maximum [ksi]	10.03	9.63	9.34	9.32	9.09	9.30	9.34	12.85	12.48	11.91	11.27	10.87	10.55	10.20	8.50	8.65	8.42	8.36	8.08	7.89	7.42
Standard Deviation [ksi]	0.272	0.184	0.135	0.177	0.163	0.189	0.199	0.121	0.092	0.360	0.161	0.147	0.092	0.106	0.130	0.273	0.372	0.299	0.512	0.373	0.560
C.V. [%]	2.827	1.948	1.471	1.952	1.826	2.082	2.185	0.950	0.743	3.116	1.450	1.369	0.881	1.047	1.545	3.288	4.569	3.705	6.647	4.995	7.939
	Enhanced Visible Surface, Raster Width (in)																				
	0.0170	0.0200						0.0170	0.0200						0.0170	0.0200					
Mean Tensile Strength [ksi]	9.20	9.26	--	--	--	--	--	11.68	11.67	--	--	--	--	--	7.99	7.59	--	--	--	--	--
Minimum [ksi]	9.09	9.15	--	--	--	--	--	11.28	11.19	--	--	--	--	--	7.86	7.45	--	--	--	--	--
Maximum [ksi]	9.34	9.36	--	--	--	--	--	11.86	11.84	--	--	--	--	--	8.31	7.72	--	--	--	--	--
Standard Deviation [ksi]	0.116	0.093	--	--	--	--	--	0.273	0.319	--	--	--	--	--	0.215	0.124	--	--	--	--	--
C.V. [%]	1.260	1.008	--	--	--	--	--	2.336	2.736	--	--	--	--	--	2.687	1.632	--	--	--	--	--
	Number of Contours																				
	1	2	3					1	2	3					1	2	3				
Mean Tensile Strength [ksi]	8.93	9.36	9.55	--	--	--	--	10.77	11.76	12.99	--	--	--	--	8.47	7.48	6.80	--	--	--	--
Minimum [ksi]	8.75	9.12	9.41	--	--	--	--	10.43	9.67	12.80	--	--	--	--	8.38	7.18	6.53	--	--	--	--
Maximum [ksi]	9.19	9.56	9.72	--	--	--	--	10.99	12.53	13.10	--	--	--	--	8.60	7.74	7.31	--	--	--	--
Standard Deviation [ksi]	0.186	0.196	0.149	--	--	--	--	0.244	1.397	0.130	--	--	--	--	0.092	0.230	0.349	--	--	--	--
C.V. [%]	2.084	2.096	1.564	--	--	--	--	2.263	11.876	1.004	--	--	--	--	1.089	3.080	5.134	--	--	--	--
	Part Raster Width (in)																				
	0.0180	0.0220	0.0260					0.0180	0.0220	0.0260					0.0180	0.0220	0.0260				
Mean Tensile Strength [ksi]	8.93	8.51	8.37	--	--	--	--	11.67	11.98	11.34	--	--	--	--	7.96	7.84	7.32	--	--	--	--
Minimum [ksi]	8.76	8.35	8.31	--	--	--	--	11.49	11.88	11.08	--	--	--	--	7.67	7.64	6.91	--	--	--	--
Maximum [ksi]	9.17	8.64	8.42	--	--	--	--	11.84	12.11	11.49	--	--	--	--	8.41	8.00	7.55	--	--	--	--
Standard Deviation [ksi]	0.179	0.136	0.050	--	--	--	--	0.142	0.100	0.183	--	--	--	--	0.335	0.148	0.283	--	--	--	--
C.V. [%]	2.005	1.599	0.595	--	--	--	--	1.215	0.836	1.616	--	--	--	--	4.210	1.889	3.860	--	--	--	--
	Surface Max Contours																				
	1	3						1	3						1	3					
Mean Tensile Strength [ksi]	9.14	9.45	--	--	--	--	--	11.80	11.63	--	--	--	--	--	7.45	7.84	--	--	--	--	--
Minimum [ksi]	9.06	9.21	--	--	--	--	--	11.33	11.33	--	--	--	--	--	7.13	7.62	--	--	--	--	--
Maximum [ksi]	9.20	9.66	--	--	--	--	--	11.99	11.79	--	--	--	--	--	7.68	8.03	--	--	--	--	--
Standard Deviation [ksi]	0.056	0.224	--	--	--	--	--	0.314	0.207	--	--	--	--	--	0.256	0.176	--	--	--	--	--
C.V. [%]	0.613	2.377	--	--	--	--	--	2.662	1.775	--	--	--	--	--	3.440	2.246	--	--	--	--	--
	Enhanced Visible Surface Raster Air Gap (in)																				
	-0.0010	0.0000						-0.0010	0.0000						-0.0010	0.0000					
Mean Tensile Strength [ksi]	9.36	9.02	--	--	--	--	--	11.61	11.67	--	--	--	--	--	7.60	7.83	--	--	--	--	--
Minimum [ksi]	9.31	8.98	--	--	--	--	--	11.26	11.35	--	--	--	--	--	7.42	7.71	--	--	--	--	--
Maximum [ksi]	9.42	9.06	--	--	--	--	--	11.74	11.90	--	--	--	--	--	7.80	8.02	--	--	--	--	--
Standard Deviation [ksi]	0.048	0.034	--	--	--	--	--	0.231	0.232	--	--	--	--	--	0.202	0.144	--	--	--	--	--
C.V. [%]	0.510	0.376	--	--	--	--	--	1.993	1.987	--	--	--	--	--	2.657	1.839	--	--	--	--	--

Figure 22. Summary table for all tensile data

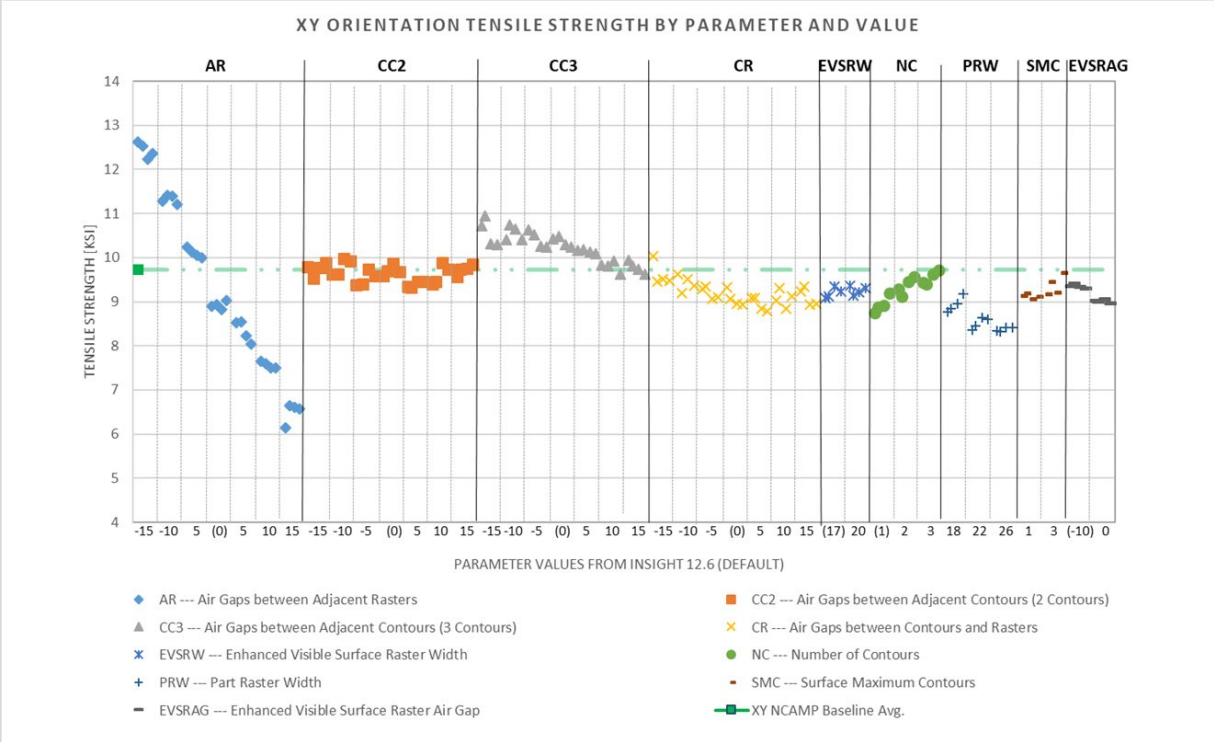


Figure 23. XY orientation tensile strength separated by parameter value

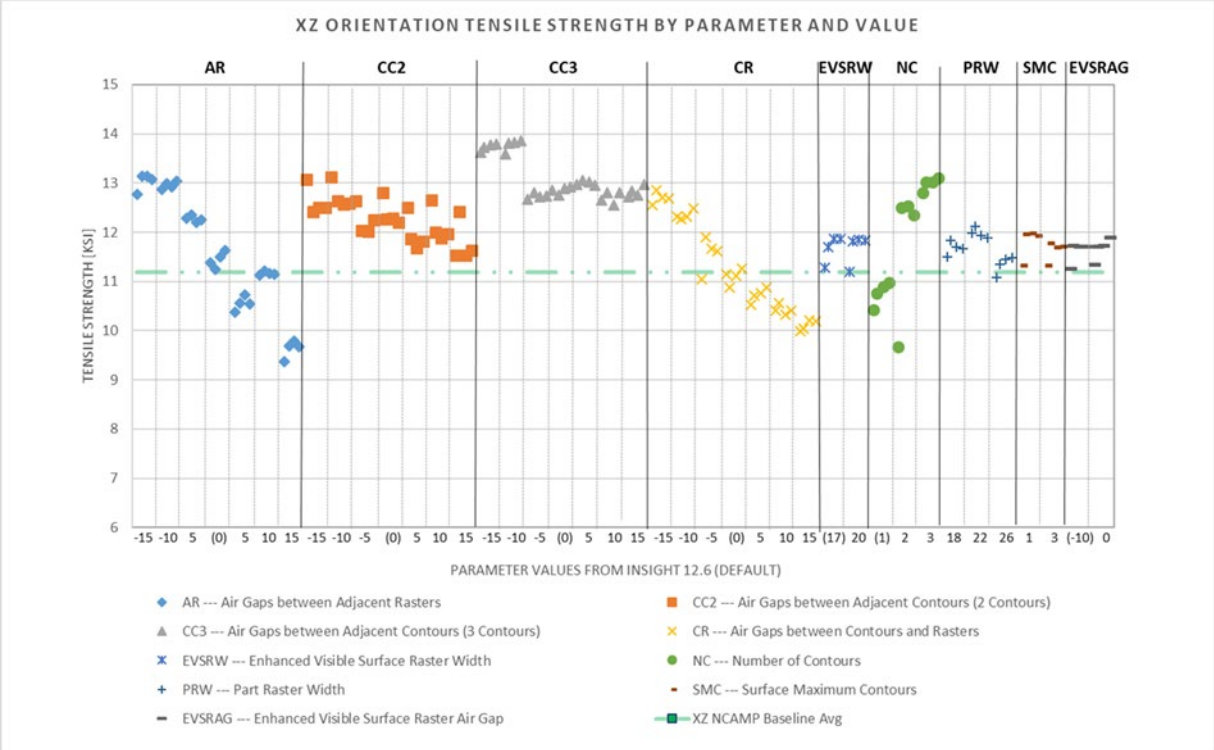


Figure 24. XZ orientation tensile strength separated by parameter value

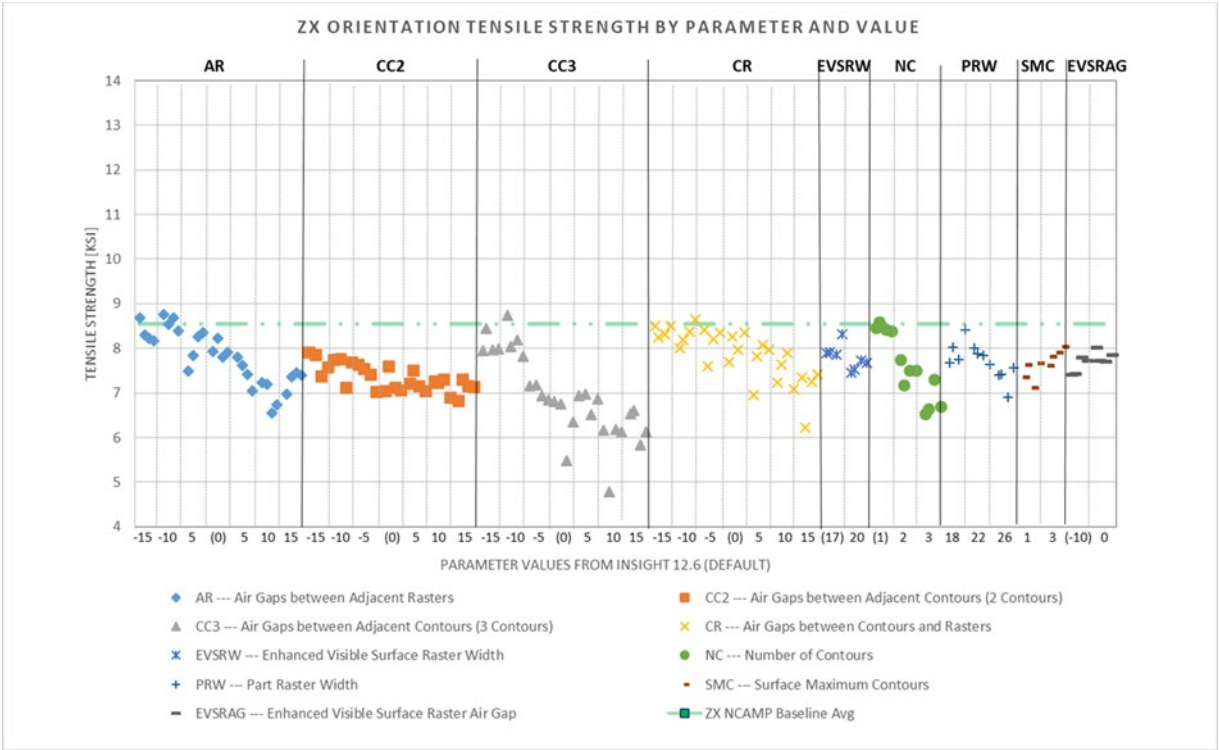


Figure 25. ZX orientation tensile strength separated by parameter value

The following sections illustrate, using optical microscope images, how each parameter change affects the microstructure and average tensile strength when the extreme left (negative) and extreme right (positive) parameter settings are used. For microstructure comparisons, specimens printed for this study with the default NCAMP parameters were used as a baseline reference to compare to specimens fabricated with varied parameter settings. The specimens printed with an AR setting of zero inches were used as the baseline reference for microstructure comparisons for Sections 1.1 through 4.8. Note that due to the inherent variability within AM material extrusion parts when fabricated at different sites and on different machines, the specimens fabricated with the default baseline settings for this study had slightly different tensile strength values when compared to the NCAMP baseline.

Appendix E: Specimen microstructure imagery provides the specimen comparisons for optical microscopy of microstructure. Fracture surface imagery of tested specimens is included in Appendix D: Specimen fracture surface imagery, and all mechanical test datasheets from the program are included in Appendix G: Mechanical data.

4.1 Air gaps between adjacent rasters

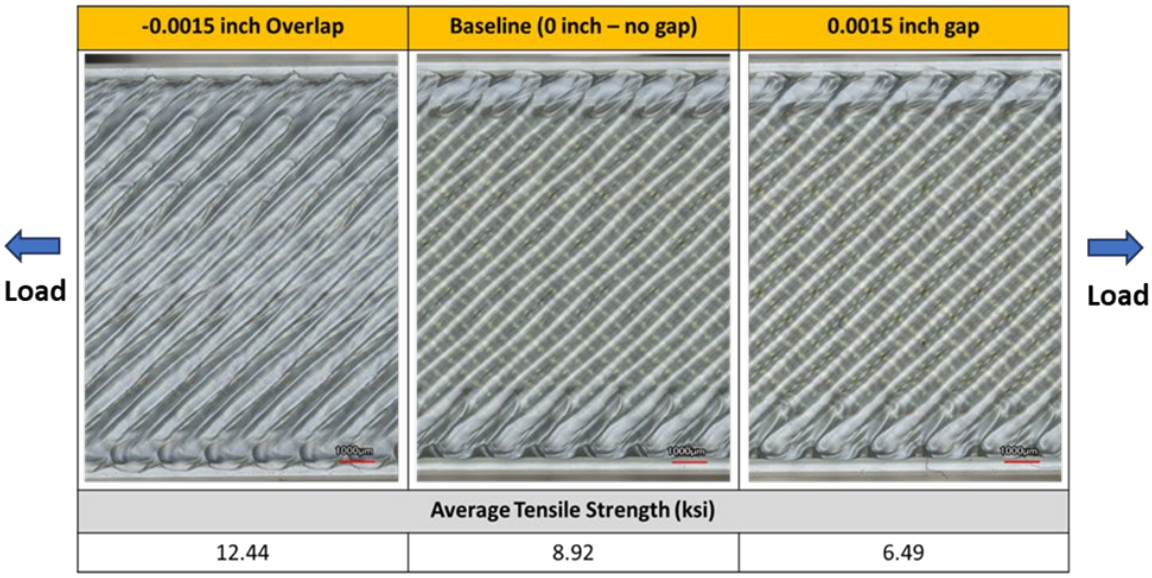


Figure 26. Microstructure comparison for XY specimens when AR setting is varied

AR showed the strongest correlation to the mechanical performance of all parameters studied. Researchers observed a near-linear descending trend for both the XY and XZ orientations, while the ZX orientation trend is nonlinear but still decreasing. The tensile strength decreases as the air gap increases from negative to positive values. The decrease in average tensile strength when the AR setting was varied from -0.0015 in to 0.0015 in for XY, XZ, and ZX specimens was 5.95 ksi, 3.40 ksi, and 1.05 ksi, respectively. Figure 26 compares the microstructure changes for XY orientation specimens and displays increasing air gaps between adjacent rasters as the settings increased from negative values to positive values. For microstructure comparisons for XZ and ZX orientation specimens, refer to Appendix C: Specimen microstructure comparisons.

4.2 Air gaps between adjacent contours

Researchers tested two conditions of fabrication for the air gaps between adjacent contours group: two contours (CC2) and three contours (CC3). The graphed data from these parameters can be seen in Figure 23 through Figure 25. Note that the specimens fabricated with baseline settings used for microstructure comparisons only have one contour. The results show a reduction in tensile strength as the air gap value is increased.

4.2.1 Air gaps between adjacent contours—two contours

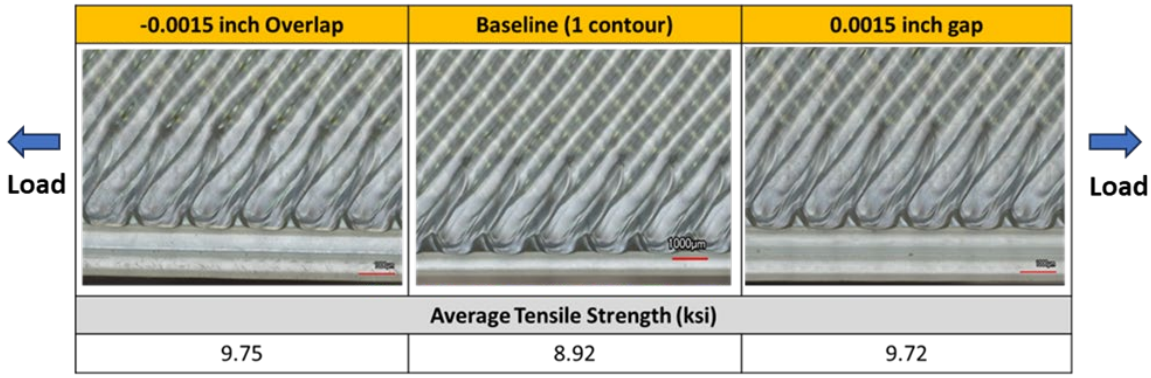


Figure 27. Microstructure comparison for XY specimens when CC2 setting is varied

The researchers observed a descending trend line for all specimen orientations as the parameter setting for air gaps between contours was increased. The decrease in average tensile strength when the CC2 setting was varied from -0.0015 in to 0.0015 in for XY, XZ, and ZX specimens was 0.03 ksi, 0.84 ksi, and 0.57 ksi, respectively. Figure 27 compares the microstructure changes for XY orientation specimens as the CC2 parameter varied from the baseline settings. For microstructure comparisons for XZ and ZX orientation specimens, refer to Appendix C: Specimen microstructure comparisons.

4.2.2 Air gaps between adjacent contours—three contours

Figure 28 illustrates the microstructure changes for ZX orientation specimens as the CC3 parameter varied from the baseline settings. Based on the microstructure images, researchers observed that when the CC3 setting changed from negative to positive values, the air gaps between the contours increased, which resulted in a decreasing trend line for all specimen orientations. As the CC3 setting changed from -0.0015 in to 0.0015 in, the decrease in average tensile strength for XY, XZ, and ZX specimens was 0.79 ksi, 0.91 ksi, and 1.82 ksi, respectively. For microstructure comparisons for XY and XZ orientation specimens, refer to Appendix C: Specimen microstructure comparisons.

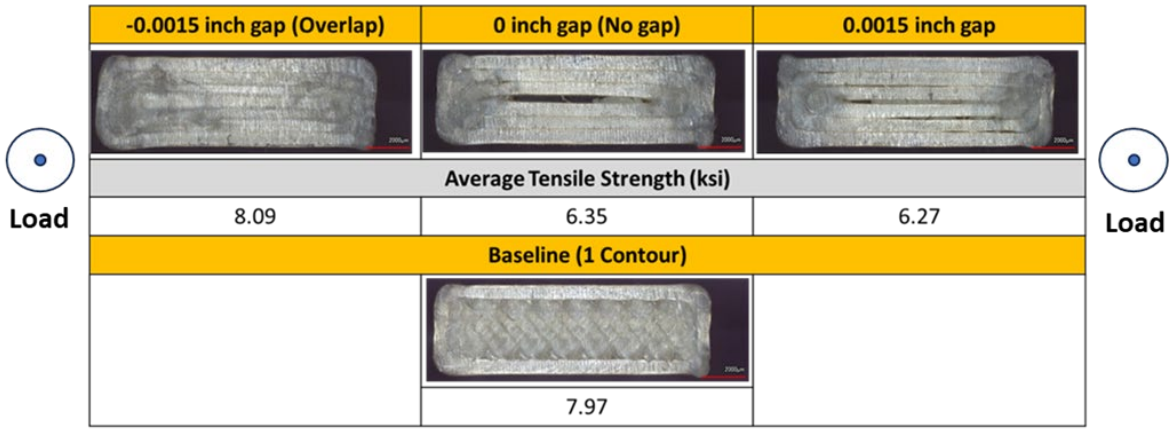


Figure 28. Microstructure comparison for ZX specimens when CC3 is varied

4.3 Air gaps between contours and rasters

Based on Figure 29, air gaps between contours and rasters increased when the CR parameter varied from the baseline settings. As the settings changed from negative to positive values, the average tensile strength for all specimen orientations decreased. The decrease in average tensile strength for XY, XZ, and ZX specimens was 0.50 ksi, 2.59 ksi, and 1.33 ksi, respectively. For microstructure comparisons for XY and ZX orientation specimens, please refer to Appendix C: Specimen microstructure comparisons.

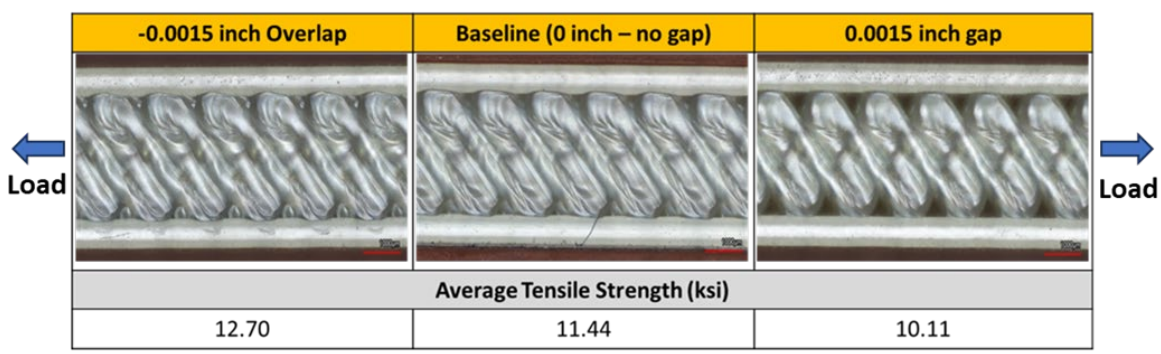


Figure 29. Microstructure comparison for XZ specimens when CR is varied

4.4 Enhanced visible surface raster width

The EVSRW specimens in both XY and XZ orientations had greater tensile strengths than the default Normal Style visible surface specimens have for both 0.017 in and 0.020 in visible raster widths; see Figure 30. For ZX orientation, the EVSRW specimens had lower tensile strength

than the default Normal Style visible surface specimens have for both 0.017 in and 0.020 in raster widths. No significant change in mean tensile strength was observed for XY and XZ orientation specimens. There was an average difference of 0.06 ksi and 0.01 ksi for XY and XZ orientations, respectively, between 0.017 and 0.020 in. However, there is a 0.4-ksi drop for ZX orientation.

Note that for all specimens fabricated with enhanced visible surfaces, the default internal raster width is twenty-four thousandths of an inch with an air gap of zero. The default visible raster width for enhanced surfaces is seventeen thousandths of an inch with negative-ten ten-thousandths of an inch air gap. Figure 30 compares the microstructure changes for XY orientation specimens when the EVSRW parameter varied from the baseline settings. For microstructure comparisons for XZ and ZX orientation specimens, refer to Appendix C: Specimen microstructure comparisons.

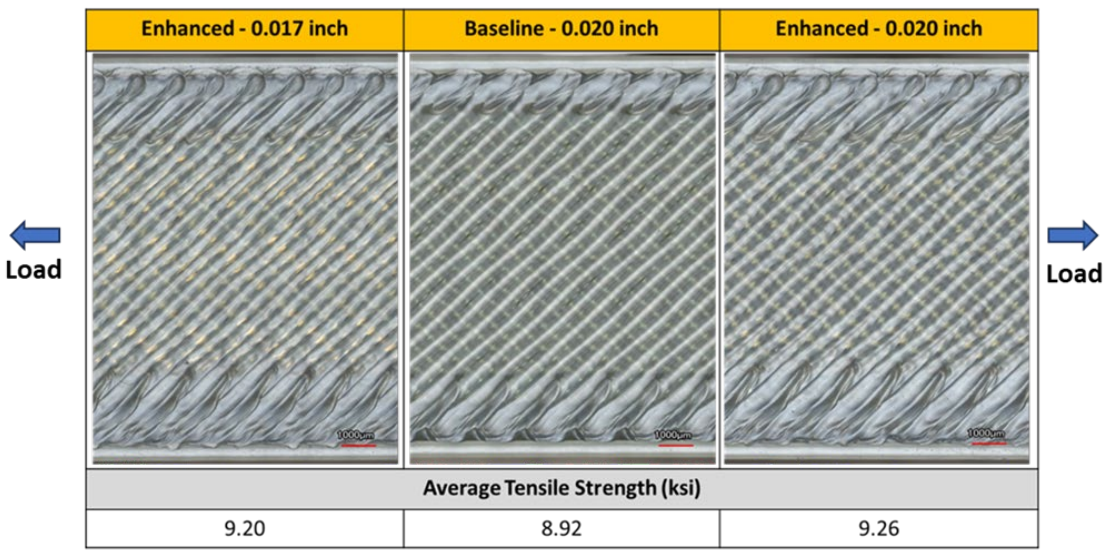


Figure 30. Microstructure comparison for XY specimens when EVSRW setting is varied

4.5 Number of contours

4.5.1 XY and XZ orientation

According to the results, the average tensile strength for the XY and XZ orientation specimens increased as the number of contours increased. As the setting for NC varied from one to three, the increase in average tensile strength for XY and XZ specimens was 0.63 ksi and 1.55 ksi, respectively. Figure 31 compares the microstructure changes for XZ orientation specimens when

the NC parameter increased from the baseline setting of one to three. Based on the microstructure images, data revealed that when the number of contours increased, the raster portion area decreased. For microstructure comparisons for XY and ZX orientation specimens, refer to Appendix C: Specimen microstructure comparisons.

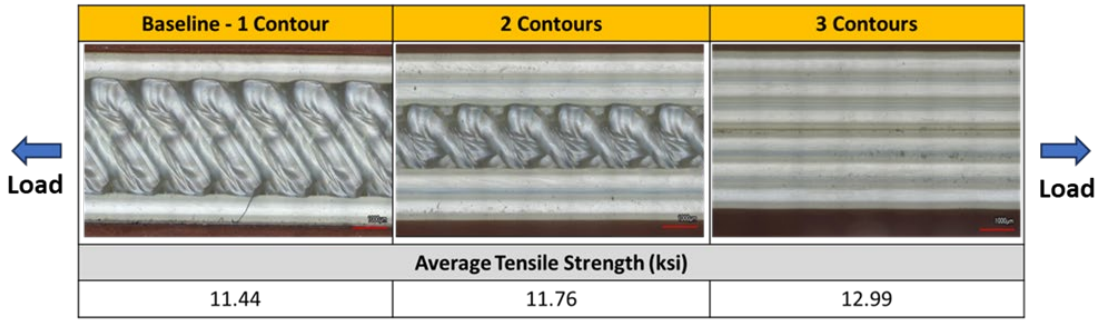


Figure 31. Microstructure comparison for XZ specimens when NC setting is varied

4.5.2 ZX orientation

The average tensile strength for ZX orientation specimens decreased by 1.17 ksi (or 14.7%) as the setting for NC increased from one to three. Based on the microstructure comparison in Figure 32, researchers observed a decrease in the raster portion area. Data show that for ZX specimens with the number of contours set at three, the raster portion area was not present, resulting in a hollow core. For microstructure comparisons for XY and XZ orientation specimens, refer to Appendix C: Specimen microstructure comparisons.

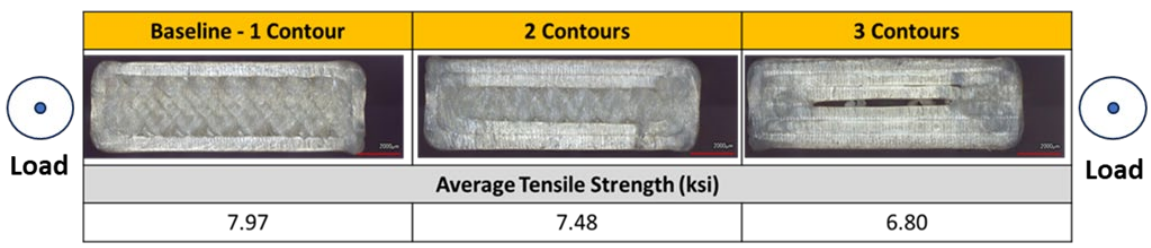


Figure 32. Microstructure comparison for ZX specimens when NC setting is varied

4.6 Part raster width

As the PRW setting for specimens increased, a decreasing trend for all specimen orientations was observed. The decrease in average tensile strength when the PRW setting was changed from 0.018 in to 0.026 in for XY, XZ, and ZX specimens was 0.56 ksi, 0.33 ksi, and 0.64 ksi, respectively. Figure 33 compares the microstructure changes for XZ orientation specimens when

the PRW parameter varied from the baseline settings. The microstructure images illustrated the increasing width of rasters, which resulted in a reduced number of raster beads for the area under the microscope. For microstructure comparisons for XY and ZX orientation specimens, refer to Appendix C: Specimen microstructure comparisons.

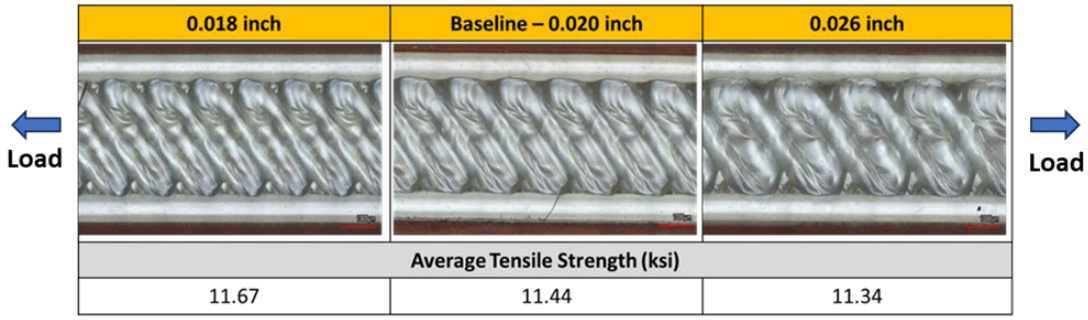


Figure 33. Microstructure comparison for XZ specimens when PRW setting is varied

4.7 Surface maximum contours

XY and ZX orientations saw an increase in tensile strength when SMC was adjusted from one to three; for XY specimens the increase was about 0.31 ksi, and for ZX specimens the increase was about 0.4 ksi. For XZ orientation, there was a decrease of about 0.17 ksi from one to three SMC. Figure 34 compares the microstructure changes for XZ orientation specimens when the SMC parameter varied from the baseline settings. For microstructure comparisons for XY and ZX orientation specimens, please refer to Appendix C: Specimen microstructure comparisons.

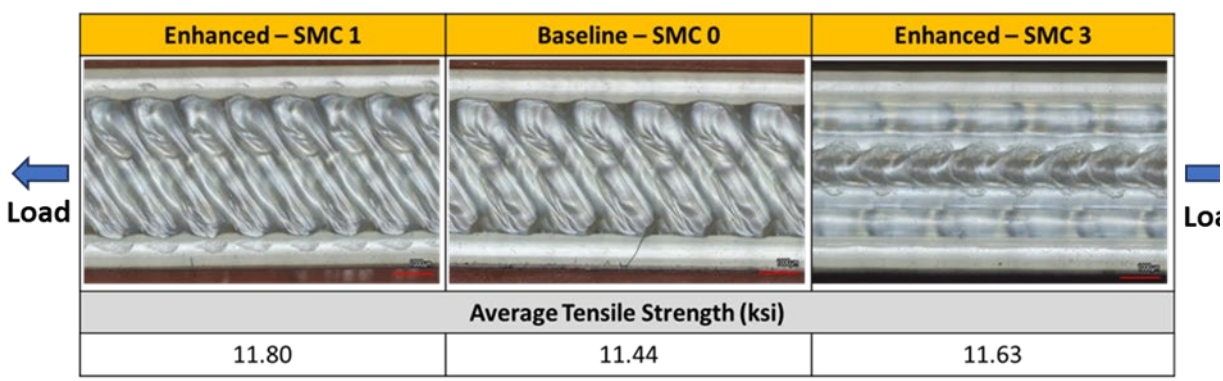


Figure 34. Microstructure comparison for XZ specimens when SMC setting is varied

Note that for all specimens fabricated with enhanced visible surfaces, the default internal raster width is twenty-four thousandths of an inch with an air gap of zero thousandths of an inch. The

default visible raster width for enhanced surfaces is seventeen-thousandths of an inch with negative-ten ten-thousandths of an inch air gap.

4.8 Enhanced visible surface raster air gap

According to the results, the XY orientation specimens saw a decrease in tensile strength of only 0.3 ksi when the EVSRAG was adjusted from -0.0010 in to 0 in. For the XZ orientation specimens, researchers observed a 0.06 ksi increase in tensile strength when comparing air gaps at 0 in to -0.0010 in. For ZX orientation specimens, an increase of 0.23 ksi was observed when comparing EVSRAG at 0 in to -0.0010 in. Figure 35 compares the microstructure changes for XY orientation specimens when the EVSRAG parameter varied from the baseline settings. For microstructure comparisons for XZ and ZX orientation specimens, refer to Appendix C: Specimen microstructure comparisons.

Note that for all specimens fabricated with enhanced visible surfaces, the default internal raster width is twenty-four thousandths of an inch with an air gap of zero thousandths of an inch. The default visible raster width for enhanced surfaces is seventeen-thousandths of an inch with negative-ten ten-thousandths of an inch air gap.

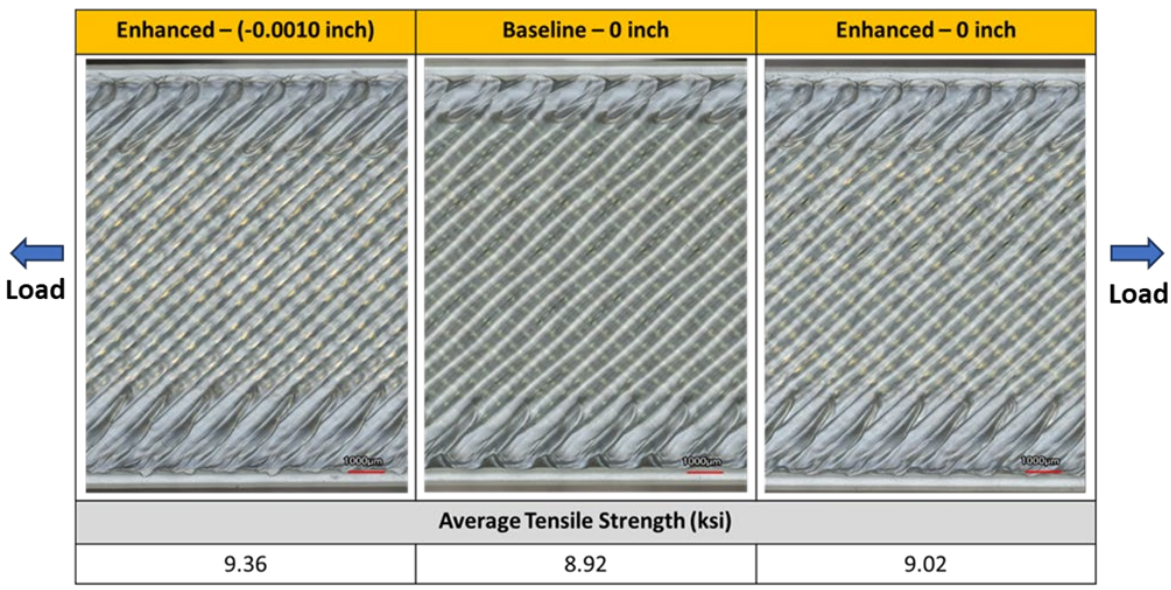


Figure 35. Microstructure comparison for XY specimens when EVSRAG setting is varied

5 Conclusion

While the influence of each high-impact parameter varies by build orientation, the parameter with the strongest correlation to tensile strength is AR, with a physical overlap of rasters

(negative AR value) being more favorable than an air gap between the rasters. The increase in air gap causes the contact area between the individual raster beads to decrease, which decreases the amount of rasters present in any given cross-section as the rasters are replaced by air gaps. This porosity within the layer area decreases the effective cross-sectional area of the specimen and reduces the reported tensile strength, as less material is available to carry load within the cross section. Additionally, printing with a decreased air gap between adjacent rasters value may force polymer chains within the raster beads to mix, forming a stronger bond. Cross-sectional area for tensile strength is based on external physical specimen measurements and does not include considerations for internal porosity. The effective cross-sectional area is the area occupied only by the material at the cross-section of the specimen gage section.

To compare and estimate the actual effective cross-sectional area, researchers used the Keyence VKX 1000 laser microscope to analyze fractured ZX orientation specimens with AR settings of -0.0015 in and 0.0015 in. Due to topographic differences in the fractured surface of the specimens, only half of the gage section was analyzed. Figure 36 illustrates the change in the effective cross-sectional area at the gage section as the AR setting varied for ZX orientation specimens. As the values increased from a negative to a positive setting, less material was present in the cross-section, causing a measured 3% drop in the effective cross-sectional area.

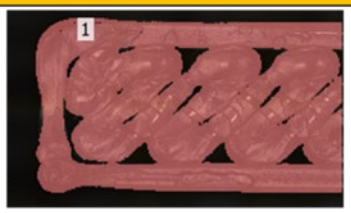
-0.0015 inch (Overlap)	0.0015 inch
	
Effective Cross-Sectional Area (in^2)	
0.0292	0.0282

Figure 36. Effective cross-sectional area comparison for ZX specimens with varied AR

This reduction in the effective cross-sectional area likely causes a decrease in max load that the specimen is capable of carrying, because there is less material to bear the load for the given cross-sectional area of the specimen while the external dimensions are constant. The externally measured dimensions show no change in area, although internally, less material is carrying load. This results in a decrease in calculated strength, since the stress value is calculated using the externally measured specimen dimensions in the stress equation: stress = force/area. Therefore, it is favorable to use fabrication settings that promote a closely packed microstructure to fabricate high-density parts that provide better tensile strength.

The next parameters of focus, in order from high to low influence on tensile strength, are the NC, CR, CC2/CC3, and PRW. The enhanced visible surface parameters showed little change in each parameter group, since only the visible surface layers (uppermost and lowermost layers) were altered, while the bulk of the specimen's microstructure remained consistent. Depending on specimen build orientation, the enhanced visible surface parameters change very little of the cross-sectional area or longitudinal bead count. This study also showed that settings with lower raster widths yielded improved tensile strength. The increase in tensile strength correlates with an increase in the total number of raster beads within the specimen cross section, as smaller raster widths allow for a more tightly packed specimen microstructure, resulting in more load carried across the increased amount of material.

Tensile strength increased by adjusting the bead modes (e.g. feed rate and extrusion rate) in the enhanced visible raster surface mode and increasing the internal raster width. A future study should investigate the Enhanced Style visible surface bead mode as compared to the Normal Style visible surface bead mode to confirm this, as many variables change between the surface styles that were not accounted for in this study, such as the internal raster width.

While individually varying each selected parameter was shown to increase tensile performance of the fabricated specimens, it should be noted that adjusting multiple print variables at the same time was not investigated and may have other detrimental effects to the print quality and microstructure. If mechanical performance is prioritized, print parameters could be adjusted to make slight improvements in strength values, but fabrication quality and microstructure would need to be evaluated in parallel to ensure proper quality parts.

5.1 Recommendations

Two of the high-impact parameters that had the largest effect on tensile strength in this study were related to the air gap. As a result, specimens optimized for tensile strength are recommended to be fabricated with negative values for parameter settings concerning air gaps. Air gaps with negative values will help reduce the porosity within the microstructure and increase the effective cross-sectional area; however, at extreme values, this could come at a detriment to microstructure and part fabrication quality. It is also recommended to orient the longitudinal beads of the contours so they are parallel to the load axis during specimen fabrication, as loads are distributed to the contours from rasters (Rezayat, Zhao, Siriruk, Penumadu, & Babu, 2015). The tensile performance of specimens can also be improved by increasing the number of contours and using parameter settings with negative values for air gaps between contours.

Based on the conclusions, parameters that decrease the air gaps between rasters and orient longitudinal beads parallel to the load axis in a given cross-sectional area provide increased tensile strength. A potential future area of study could be to investigate the correlation of specimen mechanical performance to infill geometry (bead cross section and bead angle compared to applied load). This research may aid in developing an understanding of specimen and part performance and allow the development of a simplified methodology to calculate the effective number of longitudinal load-bearing rasters within the part.

It is recommended that future studies are designed to investigate the theory of effective longitudinal rasters and perform calculations based on specimen bead (contour and infill raster) directionality in the cross-section to correlate the calculations back to mechanical test data performed in this and other FAA JAMS studies. This recommended research could provide an intermediate correlative step prior to performing intensive full-process simulation.

6 References

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A Fabrication matrix

Fabrication Matrix

Definition of No			
No	**Orient**	**Parameter**	**Value**
1	XY	AR	-0.0015
2	XY	AR	-0.0010
3	XY	AR	-0.0005
4	XY	AR	0.0000
5	XY	AR	0.0005
6	XY	AR	0.0010
7	XY	AR	0.0015
8	XY	CC2	-0.0015
9	XY	CC2	-0.0010
10	XY	CC2	-0.0005
11	XY	CC2	0.0000
12	XY	CC2	0.0005
13	XY	CC2	0.0010
14	XY	CC2	0.0015
15	XY	CC3	-0.0015
16	XY	CC3	-0.0010
17	XY	CC3	-0.0005
18	XY	CC3	0.0000
19	XY	CC3	0.0005
20	XY	CC3	0.0010
21	XY	CC3	0.0015
22	XY	CR	-0.0015
23	XY	CR	-0.0010
24	XY	CR	-0.0005
25	XY	CR	0.0000
26	XY	CR	0.0005
27	XY	CR	0.0010
28	XY	CR	0.0015

Definition of No			
No	**Orient**	**Parameter**	**Value**
29	XY	EVSRW	0.017
30	XY	EVSRW	0.020
31	XY	SMC	1
32	XY	SMC	3
33	XY	EVSRAG	-0.0010
34	XY	EVSRAG	0.0000
35	XY	NC	1
36	XY	NC	2
37	XY	NC	3
38	XY	PRW	18
39	XY	PRW	22
40	XY	PRW	26
41	XZ	AR	-0.0015
42	XZ	AR	-0.0010
43	XZ	AR	-0.0005
44	XZ	AR	0.0000
45	XZ	AR	0.0005
46	XZ	AR	0.0010
47	XZ	AR	0.0015
48	XZ	CC2	-0.0015
49	XZ	CC2	-0.0010
50	XZ	CC2	-0.0005
51	XZ	CC2	0.0000
52	XZ	CC2	0.0005
53	XZ	CC2	0.0010
54	XZ	CC2	0.0015
55	XZ	CC3	-0.0015
56	XZ	CC3	-0.0010

Definition of No			
No	**Orient**	**Parameter**	**Value**
57	XZ	CC3	-0.0005
58	XZ	CC3	0.0000
59	XZ	CC3	0.0005
60	XZ	CC3	0.0010
61	XZ	CC3	0.0015
62	XZ	CR	-0.0015
63	XZ	CR	-0.0010
64	XZ	CR	-0.0005
65	XZ	CR	0.0000
66	XZ	CR	0.0005
67	XZ	CR	0.0010
68	XZ	CR	0.0015
69	XZ	EVSRW	0.017
70	XZ	EVSRW	0.020
71	XZ	SMC	1
72	XZ	SMC	3
73	XZ	EVSRAG	-0.0010
74	XZ	EVSRAG	0.0000
75	XZ	NC	1
76	XZ	NC	2
77	XZ	NC	3
78	XZ	PRW	18
79	XZ	PRW	22
80	XZ	PRW	26
81	ZX	AR	-0.0015
82	ZX	AR	-0.0010
83	ZX	AR	-0.0005
84	ZX	AR	0.0000
85	ZX	AR	0.0005
86	ZX	AR	0.0010
87	ZX	AR	0.0015
88	ZX	CC2	-0.0015

Definition of No			
No	**Orient**	**Parameter**	**Value**
89	ZX	CC2	-0.0010
90	ZX	CC2	-0.0005
91	ZX	CC2	0.0000
92	ZX	CC2	0.0005
93	ZX	CC2	0.0010
94	ZX	CC2	0.0015
95	ZX	CC3	-0.0015
96	ZX	CC3	-0.0010
97	ZX	CC3	-0.0005
98	ZX	CC3	0.0000
99	ZX	CC3	0.0005
100	ZX	CC3	0.0010
101	ZX	CC3	0.0015
102	ZX	CR	-0.0015
103	ZX	CR	-0.0010
104	ZX	CR	-0.0005
105	ZX	CR	0.0000
106	ZX	CR	0.0005
107	ZX	CR	0.0010
108	ZX	CR	0.0015
109	ZX	EVSRW	0.017
110	ZX	EVSRW	0.020
111	ZX	SMC	1
112	ZX	SMC	3
113	ZX	EVSRAG	-0.0010
114	ZX	EVSRAG	0.0000
115	ZX	NC	1
116	ZX	NC	2
117	ZX	NC	3
118	ZX	PRW	18
119	ZX	PRW	22
120	ZX	PRW	26

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	X_1_R1	15	1
18-2	X_1_R1	15	1
18-2	X_1_R1	15	1
18-2	X_1_R1	15	2
18-2	X_1_R1	15	2
18-2	X_1_R1	15	2
18-2	X_1_R1	15	3
18-2	X_1_R1	15	3
18-2	X_1_R1	15	3
18-2	X_1_R1	15	4
18-2	X_1_R1	15	4
18-2	X_1_R1	15	4
18-2	X_1_R1	15	5
18-2	X_1_R1	15	5
18-2	X_1_R1	15	5
18-2	X_1_R1	15	6
18-2	X_1_R1	15	6
18-2	X_1_R1	15	6
18-2	X_1_R1	15	7
18-2	X_1_R1	15	7
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18-2	X_2_R1	15	10
18-2	X_2_R1	15	10
18-2	X_2_R1	15	10
18-2	X_2_R1	15	11
18-2	X_2_R1	15	11
18-2	X_2_R1	15	11

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	X_2_R1	15	12
18-2	X_2_R1	15	12
18-2	X_2_R1	15	12
18-2	X_2_R1	15	13
18-2	X_2_R1	15	13
18-2	X_2_R1	15	13
18-2	X_2_R1	15	14
18-2	X_2_R1	15	14
18-2	X_2_R1	15	14
18-2	X_3_R1	15	15
18-2	X_3_R1	15	15
18-2	X_3_R1	15	15
18-2	X_3_R1	15	16
18-2	X_3_R1	15	16
18-2	X_3_R1	15	16
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18-2	X_3_R1	15	17
18-2	X_3_R1	15	17
18-2	X_3_R1	15	18
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18-2	X_3_R1	15	21
18-2	X_3_R1	15	21
18-2	X_3_R1	15	21
18-2	X_4_R1	15	22
18-2	X_4_R1	15	22
18-2	X_4_R1	15	22

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	X_4_R1	15	23
18-2	X_4_R1	15	23
18-2	X_4_R1	15	23
18-2	X_4_R1	15	24
18-2	X_4_R1	15	24
18-2	X_4_R1	15	24
18-2	X_4_R1	15	25
18-2	X_4_R1	15	25
18-2	X_4_R1	15	25
18-2	X_4_R1	15	26
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18-2	X_4_R1	15	27
18-2	X_4_R1	15	27
18-2	X_4_R1	15	27
18-2	X_4_R1	15	28
18-2	X_4_R1	15	28
18-2	X_4_R1	15	28
18-2	X_5_R1	15	29
18-2	X_5_R1	15	29
18-2	X_5_R1	15	29
18-2	X_5_R1	15	30
18-2	X_5_R1	15	30
18-2	X_5_R1	15	30
18-2	X_5_R1	15	31
18-2	X_5_R1	15	31
18-2	X_5_R1	15	31
18-2	X_5_R1	15	32
18-2	X_5_R1	15	32
18-2	X_5_R1	15	32
18-2	X_5_R1	15	33
18-2	X_5_R1	15	33
18-2	X_5_R1	15	33

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	X_5_R1	15	34
18-2	X_5_R1	15	34
18-2	X_5_R1	15	34
18-2	X_6_R1	15	35
18-2	X_6_R1	15	35
18-2	X_6_R1	15	35
18-2	X_6_R1	15	36
18-2	X_6_R1	15	36
18-2	X_6_R1	15	36
18-2	X_6_R1	15	37
18-2	X_6_R1	15	37
18-2	X_6_R1	15	37
18-2	X_6_R1	15	38
18-2	X_6_R1	15	38
18-2	X_6_R1	15	38
18-2	X_6_R1	15	39
18-2	X_6_R1	15	39
18-2	X_6_R1	15	39
18-2	X_6_R1	15	40
18-2	X_6_R1	15	40
18-2	X_6_R1	15	40
18-2	Y_1_R1	15	41
18-2	Y_1_R1	15	41
18-2	Y_1_R1	15	41
18-2	Y_1_R1	15	42
18-2	Y_1_R1	15	42
18-2	Y_1_R1	15	42
18-2	Y_1_R1	15	43
18-2	Y_1_R1	15	43
18-2	Y_1_R1	15	43
18-2	Y_1_R1	15	44
18-2	Y_1_R1	15	44
18-2	Y_1_R1	15	44

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Y_1_R1	15	45
18-2	Y_1_R1	15	45
18-2	Y_1_R1	15	45
18-2	Y_1_R1	15	46
18-2	Y_1_R1	15	46
18-2	Y_1_R1	15	46
18-2	Y_1_R1	15	47
18-2	Y_1_R1	15	47
18-2	Y_1_R1	15	47
18-2	Y_2_R1	15	48
18-2	Y_2_R1	15	48
18-2	Y_2_R1	15	48
18-2	Y_2_R1	15	49
18-2	Y_2_R1	15	49
18-2	Y_2_R1	15	49
18-2	Y_2_R1	15	50
18-2	Y_2_R1	15	50
18-2	Y_2_R1	15	50
18-2	Y_2_R1	15	51
18-2	Y_2_R1	15	51
18-2	Y_2_R1	15	51
18-2	Y_2_R1	15	52
18-2	Y_2_R1	15	52
18-2	Y_2_R1	15	52
18-2	Y_2_R1	15	53
18-2	Y_2_R1	15	53
18-2	Y_2_R1	15	53
18-2	Y_2_R1	15	54
18-2	Y_2_R1	15	54
18-2	Y_2_R1	15	54
18-2	Y_3_R1	15	55
18-2	Y_3_R1	15	55
18-2	Y_3_R1	15	55

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Y_3_R1	15	56
18-2	Y_3_R1	15	56
18-2	Y_3_R1	15	56
18-2	Y_3_R1	15	57
18-2	Y_3_R1	15	57
18-2	Y_3_R1	15	57
18-2	Y_3_R1	15	58
18-2	Y_3_R1	15	58
18-2	Y_3_R1	15	58
18-2	Y_3_R1	15	59
18-2	Y_3_R1	15	59
18-2	Y_3_R1	15	59
18-2	Y_3_R1	15	60
18-2	Y_3_R1	15	60
18-2	Y_3_R1	15	60
18-2	Y_3_R1	15	61
18-2	Y_3_R1	15	61
18-2	Y_3_R1	15	61
18-2	Y_4_R1	15	62
18-2	Y_4_R1	15	62
18-2	Y_4_R1	15	62
18-2	Y_4_R1	15	63
18-2	Y_4_R1	15	63
18-2	Y_4_R1	15	63
18-2	Y_4_R1	15	64
18-2	Y_4_R1	15	64
18-2	Y_4_R1	15	64
18-2	Y_4_R1	15	65
18-2	Y_4_R1	15	65
18-2	Y_4_R1	15	65
18-2	Y_4_R1	15	66
18-2	Y_4_R1	15	66
18-2	Y_4_R1	15	66

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Y_4_R1	15	67
18-2	Y_4_R1	15	67
18-2	Y_4_R1	15	67
18-2	Y_4_R1	15	68
18-2	Y_4_R1	15	68
18-2	Y_4_R1	15	68
18-2	Y_5_R1	15	69
18-2	Y_5_R1	15	69
18-2	Y_5_R1	15	69
18-2	Y_5_R1	15	70
18-2	Y_5_R1	15	70
18-2	Y_5_R1	15	70
18-2	Y_5_R1	15	71
18-2	Y_5_R1	15	71
18-2	Y_5_R1	15	71
18-2	Y_5_R1	15	72
18-2	Y_5_R1	15	72
18-2	Y_5_R1	15	72
18-2	Y_5_R1	15	73
18-2	Y_5_R1	15	73
18-2	Y_5_R1	15	73
18-2	Y_5_R1	15	74
18-2	Y_5_R1	15	74
18-2	Y_5_R1	15	74
18-2	Y_6_R1	15	75
18-2	Y_6_R1	15	75
18-2	Y_6_R1	15	75
18-2	Y_6_R1	15	76
18-2	Y_6_R1	15	76
18-2	Y_6_R1	15	76
18-2	Y_6_R1	15	77
18-2	Y_6_R1	15	77
18-2	Y_6_R1	15	77

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Y_6_R1	15	78
18-2	Y_6_R1	15	78
18-2	Y_6_R1	15	78
18-2	Y_6_R1	15	79
18-2	Y_6_R1	15	79
18-2	Y_6_R1	15	79
18-2	Y_6_R1	15	80
18-2	Y_6_R1	15	80
18-2	Y_6_R1	15	80
18-2	Z_1_R1	15	81
18-2	Z_1_R1	15	81
18-2	Z_1_R1	15	81
18-2	Z_1_R1	15	82
18-2	Z_1_R1	15	82
18-2	Z_1_R1	15	82
18-2	Z_1_R1	15	83
18-2	Z_1_R1	15	83
18-2	Z_1_R1	15	83
18-2	Z_1_R1	15	84
18-2	Z_1_R1	15	84
18-2	Z_1_R1	15	84
18-2	Z_1_R1	15	85
18-2	Z_1_R1	15	85
18-2	Z_1_R1	15	85
18-2	Z_1_R1	15	86
18-2	Z_1_R1	15	86
18-2	Z_1_R1	15	86
18-2	Z_1_R1	15	87
18-2	Z_1_R1	15	87
18-2	Z_1_R1	15	87
18-2	Z_2_R1	15	88
18-2	Z_2_R1	15	88
18-2	Z_2_R1	15	88

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Z_2_R1	15	89
18-2	Z_2_R1	15	89
18-2	Z_2_R1	15	89
18-2	Z_2_R1	15	90
18-2	Z_2_R1	15	90
18-2	Z_2_R1	15	90
18-2	Z_2_R1	15	91
18-2	Z_2_R1	15	91
18-2	Z_2_R1	15	91
18-2	Z_2_R1	15	92
18-2	Z_2_R1	15	92
18-2	Z_2_R1	15	92
18-2	Z_2_R1	15	93
18-2	Z_2_R1	15	93
18-2	Z_2_R1	15	93
18-2	Z_2_R1	15	94
18-2	Z_2_R1	15	94
18-2	Z_2_R1	15	94
18-2	Z_3_R1	15	95
18-2	Z_3_R1	15	95
18-2	Z_3_R1	15	95
18-2	Z_3_R1	15	96
18-2	Z_3_R1	15	96
18-2	Z_3_R1	15	96
18-2	Z_3_R1	15	97
18-2	Z_3_R1	15	97
18-2	Z_3_R1	15	97
18-2	Z_3_R1	15	98
18-2	Z_3_R1	15	98
18-2	Z_3_R1	15	98
18-2	Z_3_R1	15	99
18-2	Z_3_R1	15	99
18-2	Z_3_R1	15	99

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Z_3_R1	15	100
18-2	Z_3_R1	15	100
18-2	Z_3_R1	15	100
18-2	Z_3_R1	15	101
18-2	Z_3_R1	15	101
18-2	Z_3_R1	15	101
18-2	Z_4_R1	15	102
18-2	Z_4_R1	15	102
18-2	Z_4_R1	15	102
18-2	Z_4_R1	15	103
18-2	Z_4_R1	15	103
18-2	Z_4_R1	15	103
18-2	Z_4_R1	15	104
18-2	Z_4_R1	15	104
18-2	Z_4_R1	15	104
18-2	Z_4_R1	15	105
18-2	Z_4_R1	15	105
18-2	Z_4_R1	15	105
18-2	Z_4_R1	15	106
18-2	Z_4_R1	15	106
18-2	Z_4_R1	15	106
18-2	Z_4_R1	15	107
18-2	Z_4_R1	15	107
18-2	Z_4_R1	15	107
18-2	Z_4_R1	15	108
18-2	Z_4_R1	15	108
18-2	Z_4_R1	15	108
18-2	Z_5_R1	15	109
18-2	Z_5_R1	15	109
18-2	Z_5_R1	15	109
18-2	Z_5_R1	15	110
18-2	Z_5_R1	15	110
18-2	Z_5_R1	15	110

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Z_5_R1	15	111
18-2	Z_5_R1	15	111
18-2	Z_5_R1	15	111
18-2	Z_5_R1	15	112
18-2	Z_5_R1	15	112
18-2	Z_5_R1	15	112
18-2	Z_5_R1	15	113
18-2	Z_5_R1	15	113
18-2	Z_5_R1	15	113
18-2	Z_5_R1	15	114
18-2	Z_5_R1	15	114
18-2	Z_5_R1	15	114
18-2	Z_6_R1	15	115
18-2	Z_6_R1	15	115
18-2	Z_6_R1	15	115
18-2	Z_6_R1	15	116
18-2	Z_6_R1	15	116
18-2	Z_6_R1	15	116
18-2	Z_6_R1	15	117
18-2	Z_6_R1	15	117
18-2	Z_6_R1	15	117
18-2	Z_6_R1	15	118
18-2	Z_6_R1	15	118
18-2	Z_6_R1	15	118
18-2	Z_6_R1	15	119
18-2	Z_6_R1	15	119
18-2	Z_6_R1	15	119
18-2	Z_6_R1	15	120
18-2	Z_6_R1	15	120
18-2	Z_6_R1	15	120
18-2	X_1_R2	15	1
18-2	X_1_R2	15	1
18-2	X_1_R2	15	1

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	X_1_R2	15	2
18-2	X_1_R2	15	2
18-2	X_1_R2	15	2
18-2	X_1_R2	15	3
18-2	X_1_R2	15	3
18-2	X_1_R2	15	3
18-2	X_1_R2	15	4
18-2	X_1_R2	15	4
18-2	X_1_R2	15	4
18-2	X_1_R2	15	5
18-2	X_1_R2	15	5
18-2	X_1_R2	15	5
18-2	X_1_R2	15	6
18-2	X_1_R2	15	6
18-2	X_1_R2	15	6
18-2	X_1_R2	15	7
18-2	X_1_R2	15	7
18-2	X_1_R2	15	7
18-2	X_2_R2	15	8
18-2	X_2_R2	15	8
18-2	X_2_R2	15	8
18-2	X_2_R2	15	9
18-2	X_2_R2	15	9
18-2	X_2_R2	15	9
18-2	X_2_R2	15	10
18-2	X_2_R2	15	10
18-2	X_2_R2	15	10
18-2	X_2_R2	15	11
18-2	X_2_R2	15	11
18-2	X_2_R2	15	11
18-2	X_2_R2	15	12
18-2	X_2_R2	15	12
18-2	X_2_R2	15	12

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	X_2_R2	15	13
18-2	X_2_R2	15	13
18-2	X_2_R2	15	13
18-2	X_2_R2	15	14
18-2	X_2_R2	15	14
18-2	X_2_R2	15	14
18-2	X_3_R2	15	15
18-2	X_3_R2	15	15
18-2	X_3_R2	15	15
18-2	X_3_R2	15	16
18-2	X_3_R2	15	16
18-2	X_3_R2	15	16
18-2	X_3_R2	15	17
18-2	X_3_R2	15	17
18-2	X_3_R2	15	17
18-2	X_3_R2	15	18
18-2	X_3_R2	15	18
18-2	X_3_R2	15	18
18-2	X_3_R2	15	19
18-2	X_3_R2	15	19
18-2	X_3_R2	15	19
18-2	X_3_R2	15	20
18-2	X_3_R2	15	20
18-2	X_3_R2	15	20
18-2	X_3_R2	15	21
18-2	X_3_R2	15	21
18-2	X_3_R2	15	21
18-2	X_4_R2	15	22
18-2	X_4_R2	15	22
18-2	X_4_R2	15	22
18-2	X_4_R2	15	23
18-2	X_4_R2	15	23
18-2	X_4_R2	15	23

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	X_4_R2	15	24
18-2	X_4_R2	15	24
18-2	X_4_R2	15	24
18-2	X_4_R2	15	25
18-2	X_4_R2	15	25
18-2	X_4_R2	15	25
18-2	X_4_R2	15	26
18-2	X_4_R2	15	26
18-2	X_4_R2	15	26
18-2	X_4_R2	15	27
18-2	X_4_R2	15	27
18-2	X_4_R2	15	27
18-2	X_4_R2	15	28
18-2	X_4_R2	15	28
18-2	X_4_R2	15	28
18-2	X_5_R2	15	29
18-2	X_5_R2	15	29
18-2	X_5_R2	15	29
18-2	X_5_R2	15	30
18-2	X_5_R2	15	30
18-2	X_5_R2	15	30
18-2	X_5_R2	15	31
18-2	X_5_R2	15	31
18-2	X_5_R2	15	31
18-2	X_5_R2	15	32
18-2	X_5_R2	15	32
18-2	X_5_R2	15	32
18-2	X_5_R2	15	33
18-2	X_5_R2	15	33
18-2	X_5_R2	15	33
18-2	X_5_R2	15	34
18-2	X_5_R2	15	34
18-2	X_5_R2	15	34

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	X_6_R2	15	35
18-2	X_6_R2	15	35
18-2	X_6_R2	15	35
18-2	X_6_R2	15	36
18-2	X_6_R2	15	36
18-2	X_6_R2	15	36
18-2	X_6_R2	15	37
18-2	X_6_R2	15	37
18-2	X_6_R2	15	37
18-2	X_6_R2	15	38
18-2	X_6_R2	15	38
18-2	X_6_R2	15	38
18-2	X_6_R2	15	39
18-2	X_6_R2	15	39
18-2	X_6_R2	15	39
18-2	X_6_R2	15	40
18-2	X_6_R2	15	40
18-2	X_6_R2	15	40
18-2	Y_1_R2	15	41
18-2	Y_1_R2	15	41
18-2	Y_1_R2	15	41
18-2	Y_1_R2	15	42
18-2	Y_1_R2	15	42
18-2	Y_1_R2	15	42
18-2	Y_1_R2	15	43
18-2	Y_1_R2	15	43
18-2	Y_1_R2	15	43
18-2	Y_1_R2	15	44
18-2	Y_1_R2	15	44
18-2	Y_1_R2	15	44
18-2	Y_1_R2	15	45
18-2	Y_1_R2	15	45
18-2	Y_1_R2	15	45

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Y_1_R2	15	46
18-2	Y_1_R2	15	46
18-2	Y_1_R2	15	46
18-2	Y_1_R2	15	47
18-2	Y_1_R2	15	47
18-2	Y_1_R2	15	47
18-2	Y_2_R2	15	48
18-2	Y_2_R2	15	48
18-2	Y_2_R2	15	48
18-2	Y_2_R2	15	49
18-2	Y_2_R2	15	49
18-2	Y_2_R2	15	49
18-2	Y_2_R2	15	50
18-2	Y_2_R2	15	50
18-2	Y_2_R2	15	50
18-2	Y_2_R2	15	51
18-2	Y_2_R2	15	51
18-2	Y_2_R2	15	51
18-2	Y_2_R2	15	52
18-2	Y_2_R2	15	52
18-2	Y_2_R2	15	52
18-2	Y_2_R2	15	53
18-2	Y_2_R2	15	53
18-2	Y_2_R2	15	53
18-2	Y_2_R2	15	54
18-2	Y_2_R2	15	54
18-2	Y_2_R2	15	54
18-2	Y_3_R2	15	55
18-2	Y_3_R2	15	55
18-2	Y_3_R2	15	55
18-2	Y_3_R2	15	56
18-2	Y_3_R2	15	56
18-2	Y_3_R2	15	56

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Y_3_R2	15	57
18-2	Y_3_R2	15	57
18-2	Y_3_R2	15	57
18-2	Y_3_R2	15	58
18-2	Y_3_R2	15	58
18-2	Y_3_R2	15	58
18-2	Y_3_R2	15	59
18-2	Y_3_R2	15	59
18-2	Y_3_R2	15	59
18-2	Y_3_R2	15	60
18-2	Y_3_R2	15	60
18-2	Y_3_R2	15	60
18-2	Y_3_R2	15	61
18-2	Y_3_R2	15	61
18-2	Y_3_R2	15	61
18-2	Y_4_R2	15	62
18-2	Y_4_R2	15	62
18-2	Y_4_R2	15	62
18-2	Y_4_R2	15	63
18-2	Y_4_R2	15	63
18-2	Y_4_R2	15	63
18-2	Y_4_R2	15	64
18-2	Y_4_R2	15	64
18-2	Y_4_R2	15	64
18-2	Y_4_R2	15	65
18-2	Y_4_R2	15	65
18-2	Y_4_R2	15	65
18-2	Y_4_R2	15	66
18-2	Y_4_R2	15	66
18-2	Y_4_R2	15	66
18-2	Y_4_R2	15	67
18-2	Y_4_R2	15	67
18-2	Y_4_R2	15	67

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Y_4_R2	15	68
18-2	Y_4_R2	15	68
18-2	Y_4_R2	15	68
18-2	Y_5_R2	15	69
18-2	Y_5_R2	15	69
18-2	Y_5_R2	15	69
18-2	Y_5_R2	15	70
18-2	Y_5_R2	15	70
18-2	Y_5_R2	15	70
18-2	Y_5_R2	15	71
18-2	Y_5_R2	15	71
18-2	Y_5_R2	15	71
18-2	Y_5_R2	15	72
18-2	Y_5_R2	15	72
18-2	Y_5_R2	15	72
18-2	Y_5_R2	15	73
18-2	Y_5_R2	15	73
18-2	Y_5_R2	15	73
18-2	Y_5_R2	15	74
18-2	Y_5_R2	15	74
18-2	Y_5_R2	15	74
18-2	Y_6_R2	15	75
18-2	Y_6_R2	15	75
18-2	Y_6_R2	15	75
18-2	Y_6_R2	15	76
18-2	Y_6_R2	15	76
18-2	Y_6_R2	15	76
18-2	Y_6_R2	15	77
18-2	Y_6_R2	15	77
18-2	Y_6_R2	15	77
18-2	Y_6_R2	15	78
18-2	Y_6_R2	15	78
18-2	Y_6_R2	15	78

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Y_6_R2	15	79
18-2	Y_6_R2	15	79
18-2	Y_6_R2	15	79
18-2	Y_6_R2	15	80
18-2	Y_6_R2	15	80
18-2	Y_6_R2	15	80
18-2	Z_1_R2	15	81
18-2	Z_1_R2	15	81
18-2	Z_1_R2	15	81
18-2	Z_1_R2	15	82
18-2	Z_1_R2	15	82
18-2	Z_1_R2	15	82
18-2	Z_1_R2	15	83
18-2	Z_1_R2	15	83
18-2	Z_1_R2	15	83
18-2	Z_1_R2	15	84
18-2	Z_1_R2	15	84
18-2	Z_1_R2	15	84
18-2	Z_1_R2	15	85
18-2	Z_1_R2	15	85
18-2	Z_1_R2	15	85
18-2	Z_1_R2	15	86
18-2	Z_1_R2	15	86
18-2	Z_1_R2	15	86
18-2	Z_1_R2	15	87
18-2	Z_1_R2	15	87
18-2	Z_1_R2	15	87
18-2	Z_2_R2	15	88
18-2	Z_2_R2	15	88
18-2	Z_2_R2	15	88
18-2	Z_2_R2	15	89
18-2	Z_2_R2	15	89
18-2	Z_2_R2	15	89

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Z_2_R2	15	90
18-2	Z_2_R2	15	90
18-2	Z_2_R2	15	90
18-2	Z_2_R2	15	91
18-2	Z_2_R2	15	91
18-2	Z_2_R2	15	91
18-2	Z_2_R2	15	92
18-2	Z_2_R2	15	92
18-2	Z_2_R2	15	92
18-2	Z_2_R2	15	93
18-2	Z_2_R2	15	93
18-2	Z_2_R2	15	93
18-2	Z_2_R2	15	94
18-2	Z_2_R2	15	94
18-2	Z_2_R2	15	94
18-2	Z_3_R2	15	95
18-2	Z_3_R2	15	95
18-2	Z_3_R2	15	95
18-2	Z_3_R2	15	96
18-2	Z_3_R2	15	96
18-2	Z_3_R2	15	96
18-2	Z_3_R2	15	97
18-2	Z_3_R2	15	97
18-2	Z_3_R2	15	97
18-2	Z_3_R2	15	98
18-2	Z_3_R2	15	98
18-2	Z_3_R2	15	98
18-2	Z_3_R2	15	99
18-2	Z_3_R2	15	99
18-2	Z_3_R2	15	99
18-2	Z_3_R2	15	100
18-2	Z_3_R2	15	100
18-2	Z_3_R2	15	100

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Z_3_R2	15	101
18-2	Z_3_R2	15	101
18-2	Z_3_R2	15	101
18-2	Z_4_R2	15	102
18-2	Z_4_R2	15	102
18-2	Z_4_R2	15	102
18-2	Z_4_R2	15	103
18-2	Z_4_R2	15	103
18-2	Z_4_R2	15	103
18-2	Z_4_R2	15	104
18-2	Z_4_R2	15	104
18-2	Z_4_R2	15	104
18-2	Z_4_R2	15	105
18-2	Z_4_R2	15	105
18-2	Z_4_R2	15	105
18-2	Z_4_R2	15	106
18-2	Z_4_R2	15	106
18-2	Z_4_R2	15	106
18-2	Z_4_R2	15	107
18-2	Z_4_R2	15	107
18-2	Z_4_R2	15	107
18-2	Z_4_R2	15	108
18-2	Z_4_R2	15	108
18-2	Z_4_R2	15	108
18-2	Z_5_R2	15	109
18-2	Z_5_R2	15	109
18-2	Z_5_R2	15	109
18-2	Z_5_R2	15	110
18-2	Z_5_R2	15	110
18-2	Z_5_R2	15	110

Unique Specimen List			
Prog	**Build**	**Location**	**No**
18-2	Z_5_R2	15	111
18-2	Z_5_R2	15	111
18-2	Z_5_R2	15	111
18-2	Z_5_R2	15	112
18-2	Z_5_R2	15	112
18-2	Z_5_R2	15	112
18-2	Z_5_R2	15	113
18-2	Z_5_R2	15	113
18-2	Z_5_R2	15	113
18-2	Z_5_R2	15	114
18-2	Z_5_R2	15	114
18-2	Z_5_R2	15	114
18-2	Z_6_R2	15	115
18-2	Z_6_R2	15	115
18-2	Z_6_R2	15	115
18-2	Z_6_R2	15	116
18-2	Z_6_R2	15	116
18-2	Z_6_R2	15	116
18-2	Z_6_R2	15	117
18-2	Z_6_R2	15	117
18-2	Z_6_R2	15	117
18-2	Z_6_R2	15	118
18-2	Z_6_R2	15	118
18-2	Z_6_R2	15	118
18-2	Z_6_R2	15	119
18-2	Z_6_R2	15	119
18-2	Z_6_R2	15	119
18-2	Z_6_R2	15	120
18-2	Z_6_R2	15	120
18-2	Z_6_R2	15	120

B Test matrix

Table B- 1. XY orientation test matrix

Test Type in XY Direction (1)	**Fab Orient**	**Insight Parameter**	**Parameter Value**	**Property**	**Number of Batches x Number of Runs x Number of Coupons**
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XY	XY	AR	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	AR	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	AR	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	AR	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	AR	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	AR	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	AR	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC2	-0.0015	Strength and Modulus	1x1x4

Test Type in XY Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XY	XY	CC2	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC2	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC2	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC2	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC2	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC2	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC3	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC3	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC3	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC3	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC3	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CC3	0.0010	Strength and Modulus	1x1x4

Test Type in XY Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XY	XY	CC3	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CR	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CR	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CR	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CR	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CR	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CR	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	CR	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	EVSRW	0.017	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	EVSRW	0.020	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	NC	1	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	NC	2	Strength and Modulus	1x1x4

Test Type in XY Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XY	XY	NC	3	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	PRW	0.018	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	PRW	0.022	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	PRW	0.026	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	SMC	1	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	SCM	3	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	EVSRAG	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XY	XY	EVSRAG	0.0000	Strength and Modulus	1x1x4

Table B- 2. XZ orientation test matrix

Test Type in XZ Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XZ	XZ	AR	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	AR	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	AR	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	AR	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	AR	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	AR	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	AR	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC2	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC2	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC2	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC2	0.0000	Strength and Modulus	1x1x4

Test Type in XZ Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XZ	XZ	CC2	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC2	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC2	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC3	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC3	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC3	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC3	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC3	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC3	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CC3	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CR	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CR	-0.0010	Strength and Modulus	1x1x4

Test Type in XZ Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XZ	XZ	CR	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CR	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CR	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CR	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	CR	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	EVSRW	0.017	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	EVSRW	0.020	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	NC	1	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	NC	2	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	NC	3	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	PRW	0.018	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	PRW	0.022	Strength and Modulus	1x1x4

Test Type in XZ Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XZ	XZ	PRW	0.026	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	SMC	1	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	SMC	3	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	EVSRAG	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	XZ	EVSRAG	0.0000	Strength and Modulus	1x1x4

Table B- 3. ZX orientation test matrix

Test Type in ZX Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XZ	ZX	AR	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	AR	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	AR	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	AR	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	AR	0.005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	AR	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	AR	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC2	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC2	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC2	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC2	0.0000	Strength and Modulus	1x1x4

Test Type in ZX Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XZ	ZX	CC2	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC2	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC2	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC3	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC3	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC3	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC3	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC3	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC3	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CC3	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CR	-0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CR	-0.0010	Strength and Modulus	1x1x4

Test Type in ZX Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XZ	ZX	CR	-0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CR	0.0000	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CR	0.0005	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CR	0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	CR	0.0015	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	EVSRW	0.017	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	EVSRW	0.020	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	NC	1	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	NC	2	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	NC	3	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	PRW	0.018	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	PRW	0.022	Strength and Modulus	1x1x4

Test Type in ZX Direction (1)	Fab Orient	Insight Parameter	Parameter Value	Property	Number of Batches x Number of Runs x Number of Coupons
					Test Environment/Moisture Condition
					RTD
ASTM D638 (type 1) Tension XZ	ZX	PRW	0.026	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	SMC	1	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	SMC	3	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	EVSRAG	-0.0010	Strength and Modulus	1x1x4
ASTM D638 (type 1) Tension XZ	ZX	EVSRAG	0.0000	Strength and Modulus	1x1x4

C Specimen microstructure comparisons

C.1 Air gaps between adjacent rasters (AR)

-0.0015 inch Overlap	Baseline (0 inch – no gap)	0.0015 inch gap
		
Average Tensile Strength (ksi)		
13.03	11.44	9.63

Figure C- 1. Microstructure comparisons for XZ specimens when AR setting is varied

-0.0015 inch Overlap	Baseline (0 inch – no gap)	0.0015 inch gap
		
Average Tensile Strength (ksi)		
8.35	7.97	7.30

Figure C- 2. Microstructure comparisons for ZX specimens when AR setting is varied

C.2 Air gaps between adjacent contours—two contours (CC2)

-0.0015 inch Overlap	Baseline (1 contour)	0.0015 inch gap
		
Average Tensile Strength (ksi)		
12.62	11.44	11.78

Figure C- 3. Microstructure comparisons for XZ specimens when CC2 setting is varied

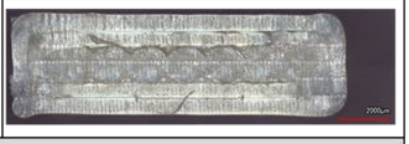
-0.0015 inch gap (Overlap)	0 inch gap (no gap)	0.0015 inch gap
		
Average Tensile Strength (ksi)		
7.68	7.21	7.11
Baseline (1 contour)		
		
	7.97	

Figure C- 4. Microstructure comparisons for ZX specimens when CC2 setting is varied

C.3 Air gaps between adjacent contours—three contours (CC3)

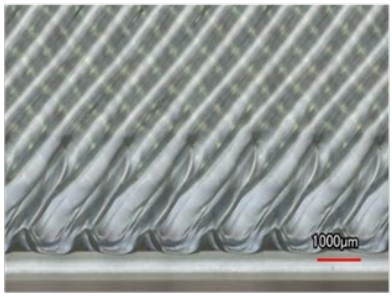
-0.0015 inch Overlap	Baseline (1 contour)	0.0015 inch gap
		
Average Tensile Strength (ksi)		
10.57	8.92	9.78

Figure C- 5. Microstructure comparisons for XY specimens when CC3 setting is varied

-0.0015 inch Overlap	Baseline (1 contour)	0.0015 inch gap
		
Average Tensile Strength (ksi)		
13.73	11.44	12.82

Figure C- 6. Microstructure comparisons for XZ specimens when CC3 setting is varied

C.4 Air gaps between contours and rasters (CR)

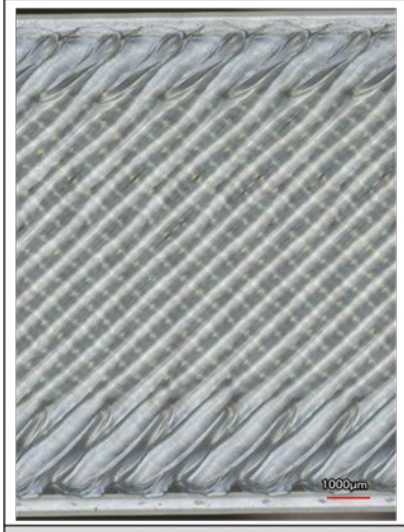
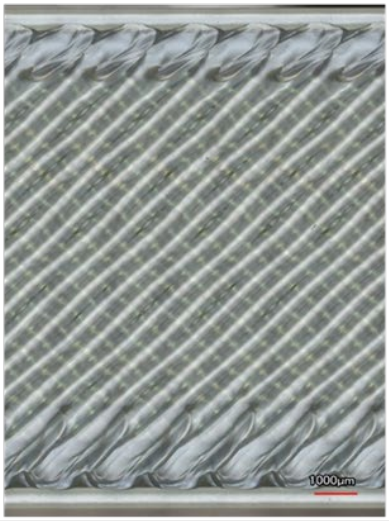
-0.0015 inch Overlap	Baseline (0 inch – no gap)	0.0015 inch gap
		
Average Tensile Strength (ksi)		
9.62	8.92	9.12

Figure C- 7. Microstructure comparisons for XY specimens when CR setting is varied

-0.0015 inch Overlap	Baseline (0 inch – no gap)	0.0015 inch gap
		
Average Tensile Strength (ksi)		
8.38	7.97	7.05

Figure C- 8. Microstructure comparisons for ZX specimens when CR setting is varied

C.5 Enhanced visible surface raster width (EVSRW)

Enhanced - 0.017 inch	Baseline - 0.020 inch	Enhanced - 0.020 inch
		
Average Tensile Strength (ksi)		
11.68	11.44	11.67

Figure C- 9. Microstructure comparisons for XZ specimens when EVSRW setting is varied

Enhanced - 0.017 inch	Baseline - 0.020 inch	Enhanced - 0.020 inch
		
Average Tensile Strength (ksi)		
7.99	7.97	7.59

Figure C- 10. Microstructure comparisons for ZX specimens when EVSRW setting is varied

C.6. Number of contours (NC)

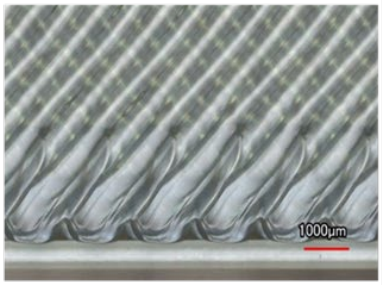
Baseline - 1 Contour	2 Contours	3 Contours
		
Average Tensile Strength (ksi)		
8.92	9.36	9.55

Figure C- 11. Microstructure comparisons for XY specimens when NC setting is varied

C.7 Part raster width (PRW)

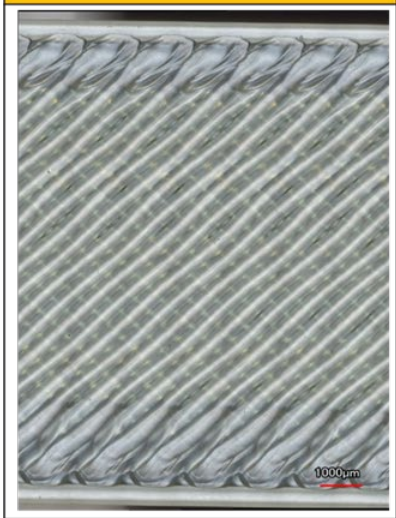
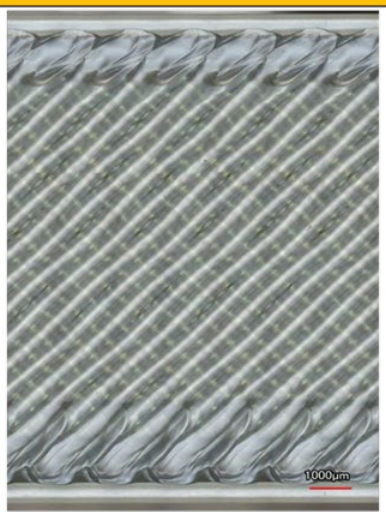
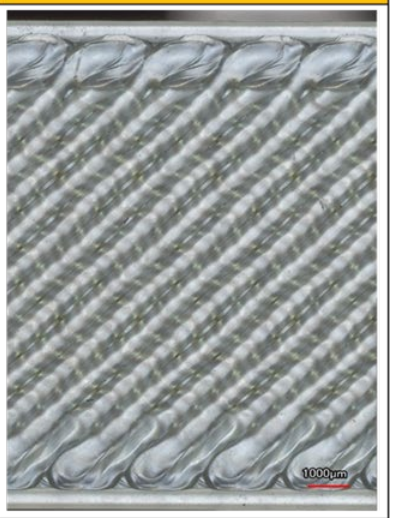
0.018 inch	Baseline – 0.020 inch	0.026 inch
		
Average Tensile Strength (ksi)		
8.93	8.92	8.37

Figure C- 12. Microstructure comparisons for XY specimens when PRW setting is varied

0.018 inch	Baseline – 0.020 inch	0.026 inch
		
Average Tensile Strength (ksi)		
7.96	7.97	7.32

Figure C- 13. Microstructure comparisons for ZX specimens when PRW setting is varied

C.8 Surface maximum contours (SMC)

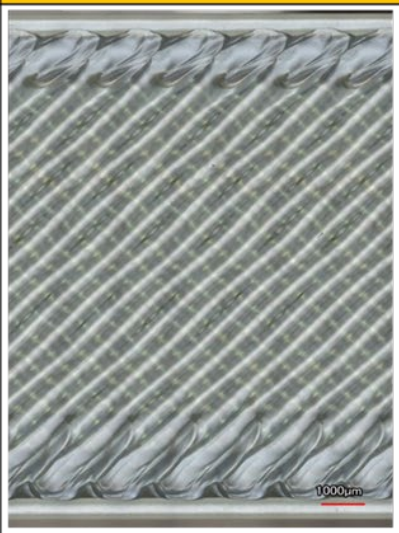
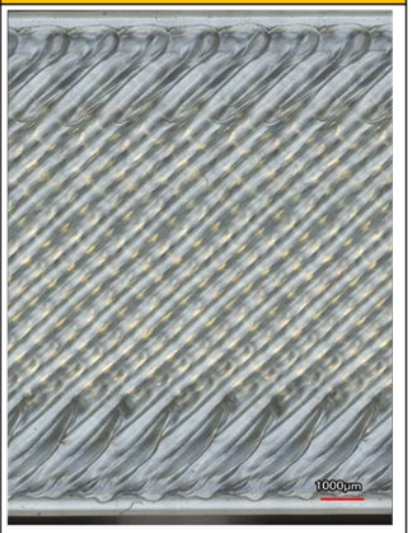
Enhanced – SMC 1	Baseline – SMC 0	Enhanced – SMC 3
		
Average Tensile Strength (ksi)		
9.14	8.92	9.45

Figure C- 14. Microstructure comparisons for XY specimens when SMC setting is varied

Enhanced – SMC 1	Baseline – SMC 0	Enhanced – SMC 3
		
Average Tensile Strength (ksi)		
7.45	7.97	7.84

Figure C- 15. Microstructure comparisons for ZX specimens when SMC setting is varied

C.9 Enhanced visible surface raster air gap (EVSRAG)

Enhanced – (-0.0010 inch)	Baseline – 0 inch	Enhanced – 0 inch
		
Average Tensile Strength (ksi)		
11.61	11.44	11.67

Figure C- 16. Microstructure comparisons for XZ specimens when EVSRAG setting is varied

Enhanced – (-0.0010 inch)	Baseline – 0 inch	Enhanced – 0 inch
		
Average Tensile Strength (ksi)		
7.6	7.97	7.83

Figure C- 17. Microstructure comparisons for ZX specimens when EVSRAG setting is varied

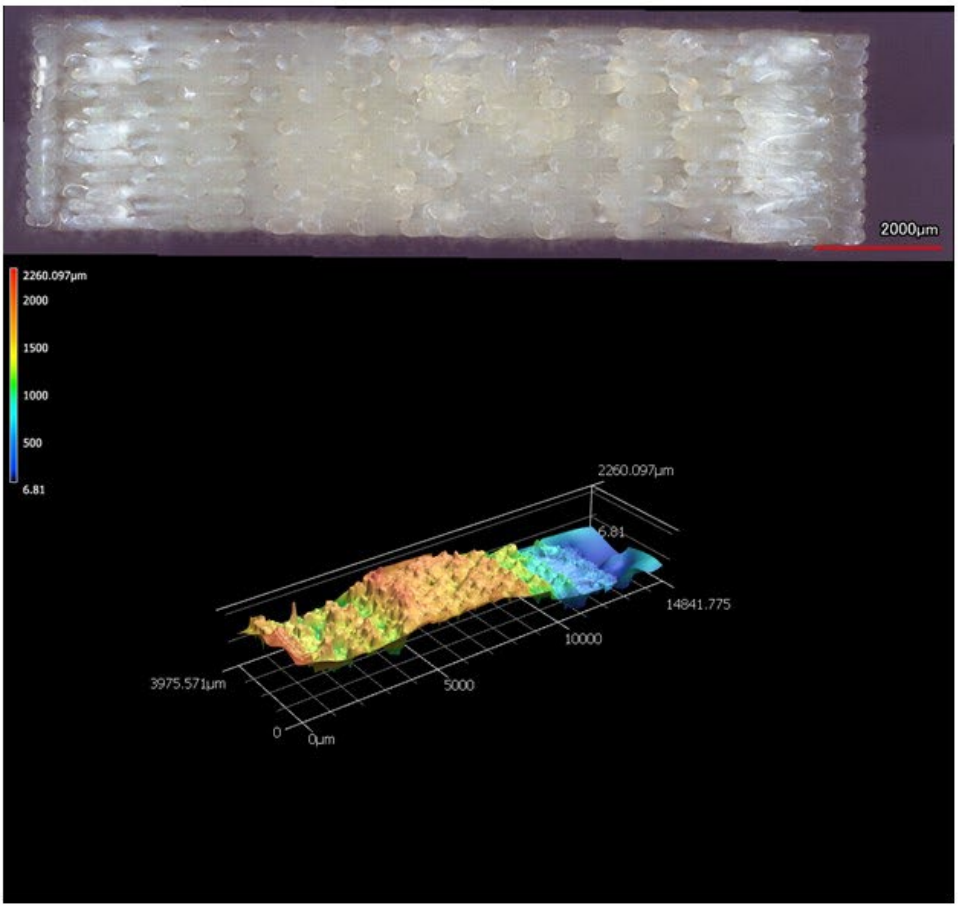
D Specimen fracture surface imagery

All following surface imagery are cross-referenced with descriptive identification information as follows:

Insight Parameter, Insight Parameter Value–Test Types–Specimen Halves (Surface Type)

Table D- 1. Table for fracture surface imagery identification

Parameter	**Possible Values**
Insight Parameter:	AR, CC2, CC3, CR, EVSRW, NC, PRW, SMC, EVSRAG
Insight Parameter Value:	(15), (10), (5), 0, 1, 2, 3, 5, 10, 15, 17, 18, 20, 22, 26
Test Types:	XT, YT, ZT (Static Tension)
Specimen Halves:	A, B
Surface Type:	(FRAC) = Fractured Surface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10000
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0µm

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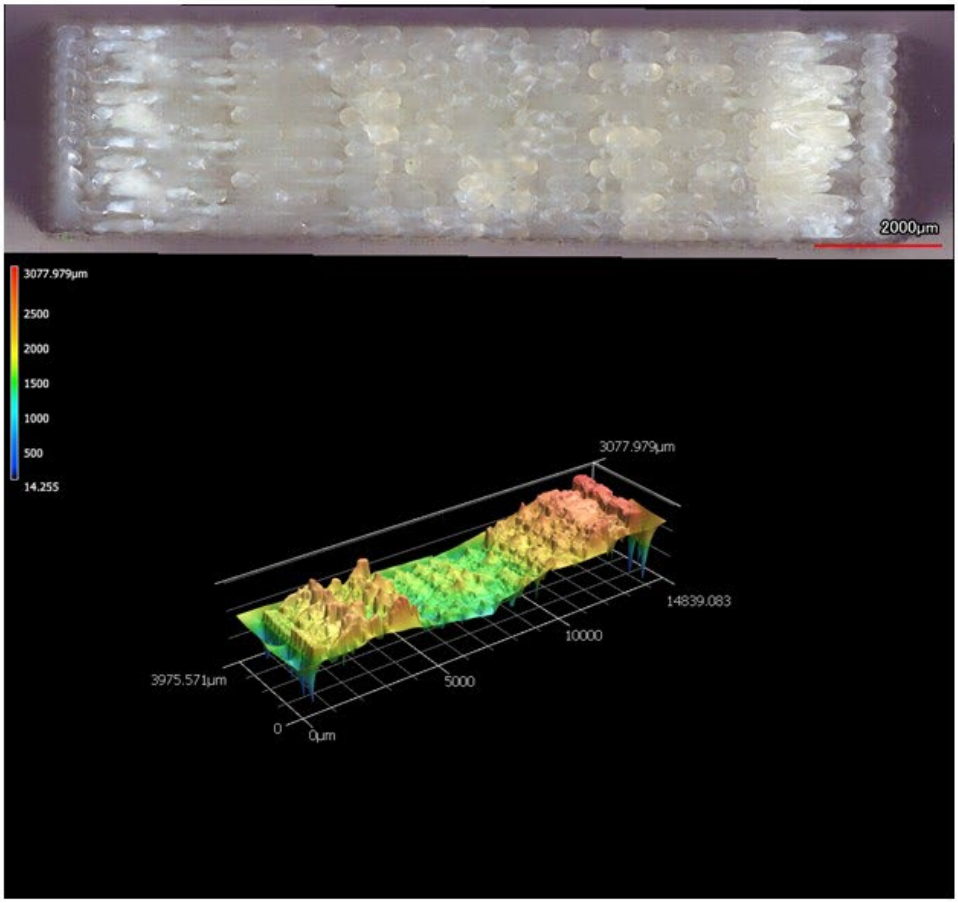
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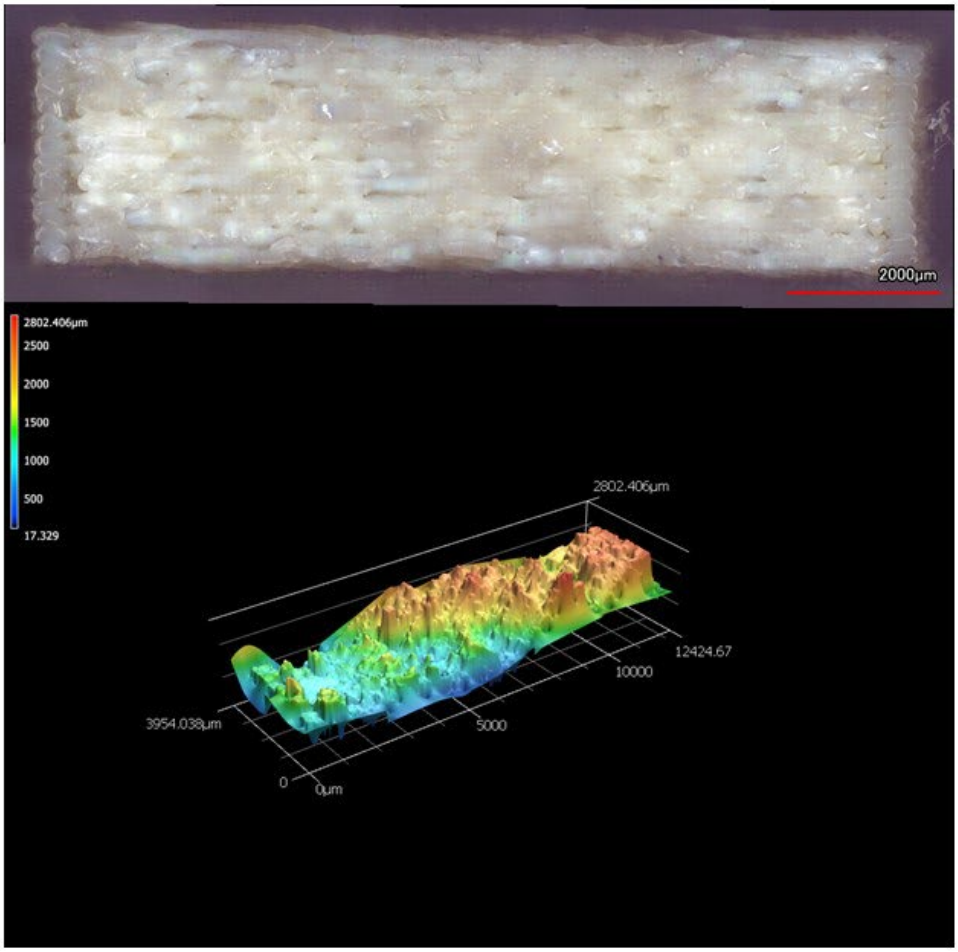

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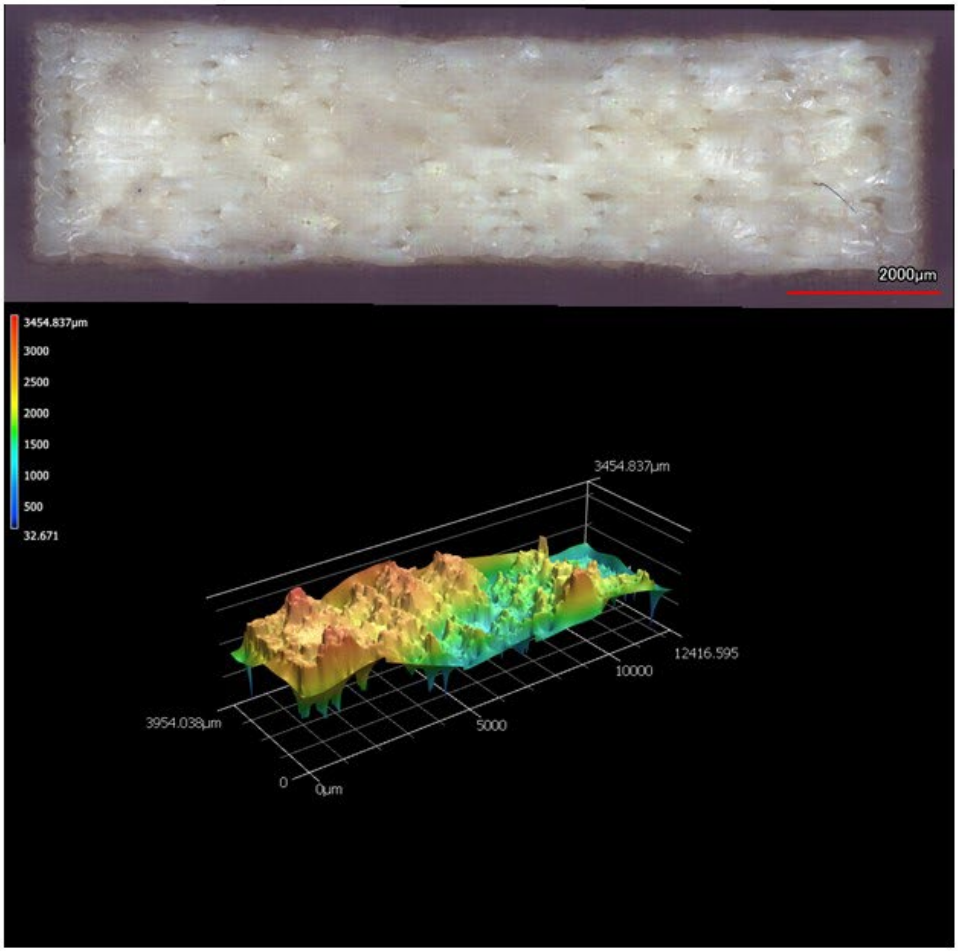

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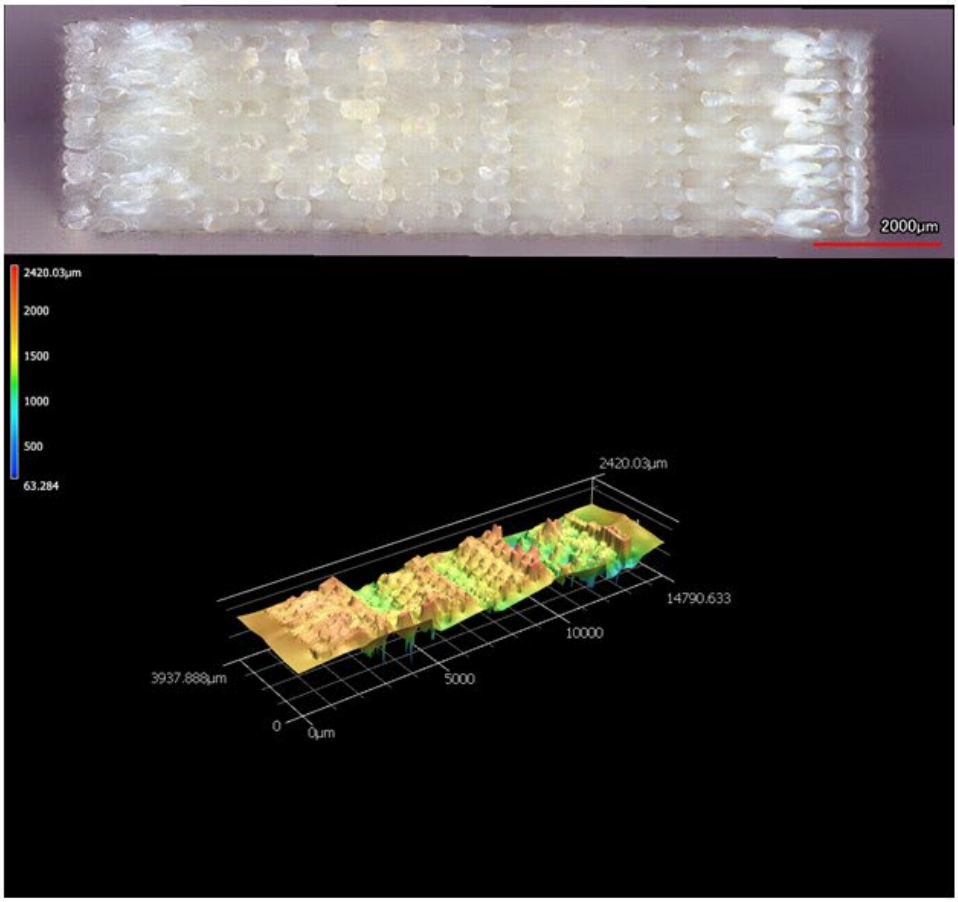

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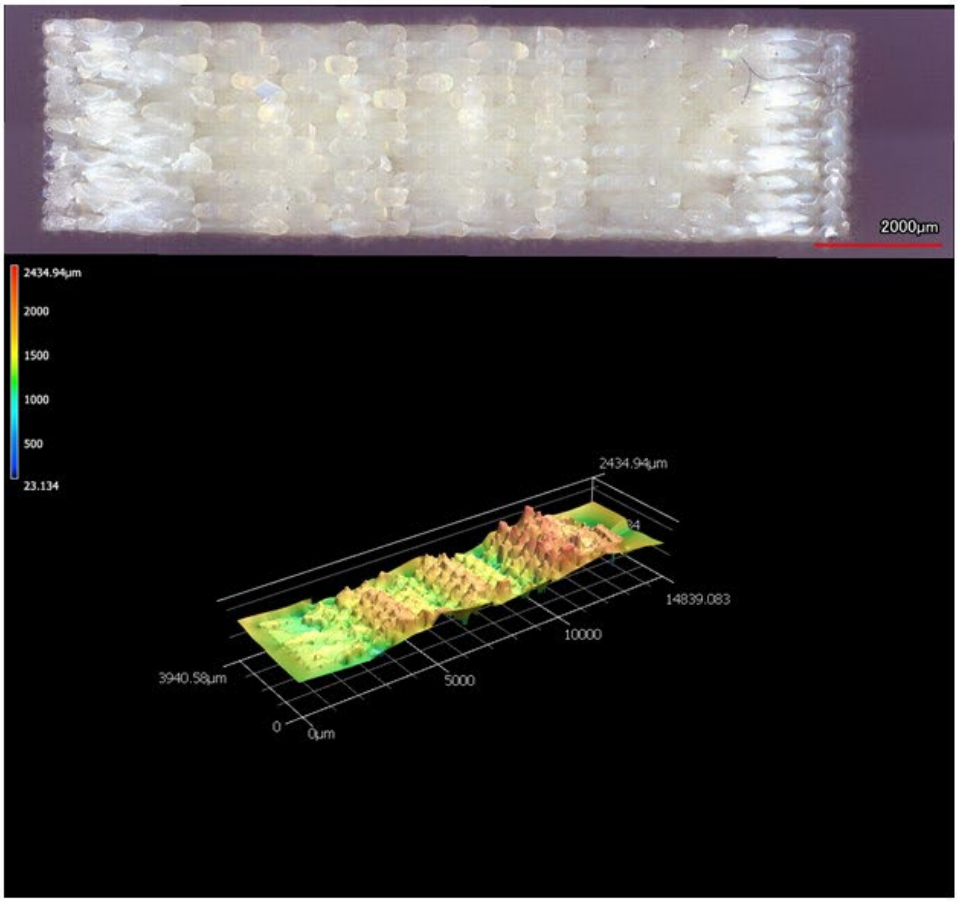

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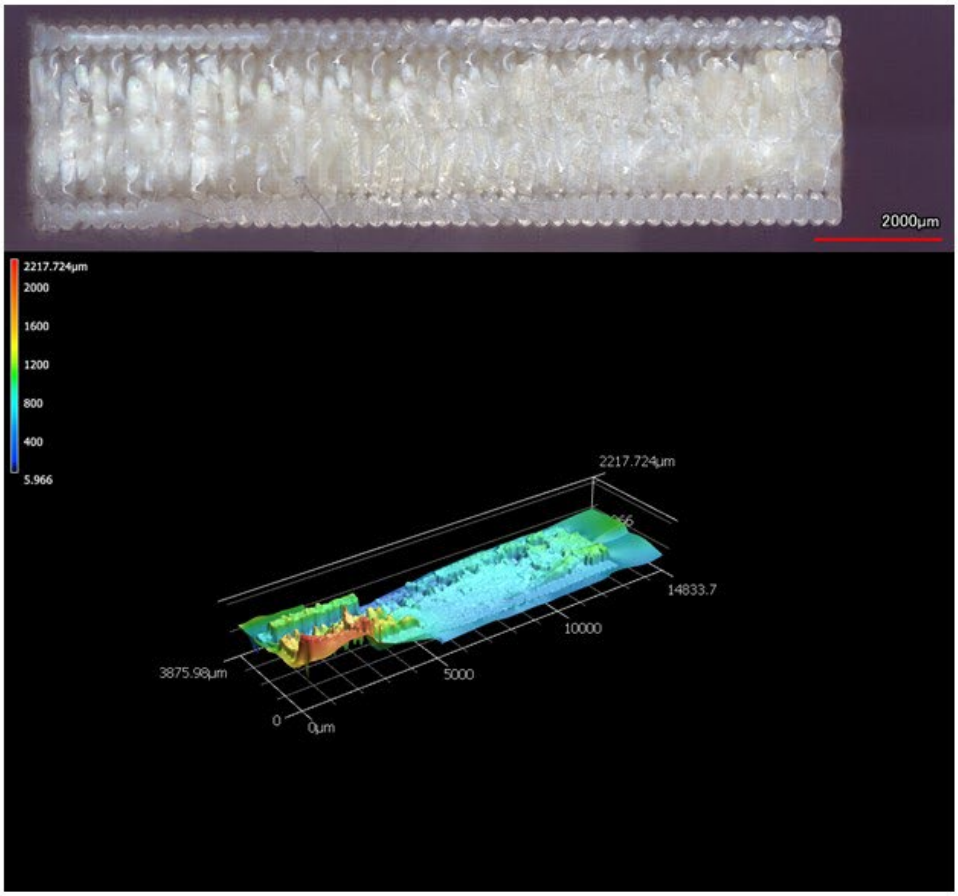
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1600
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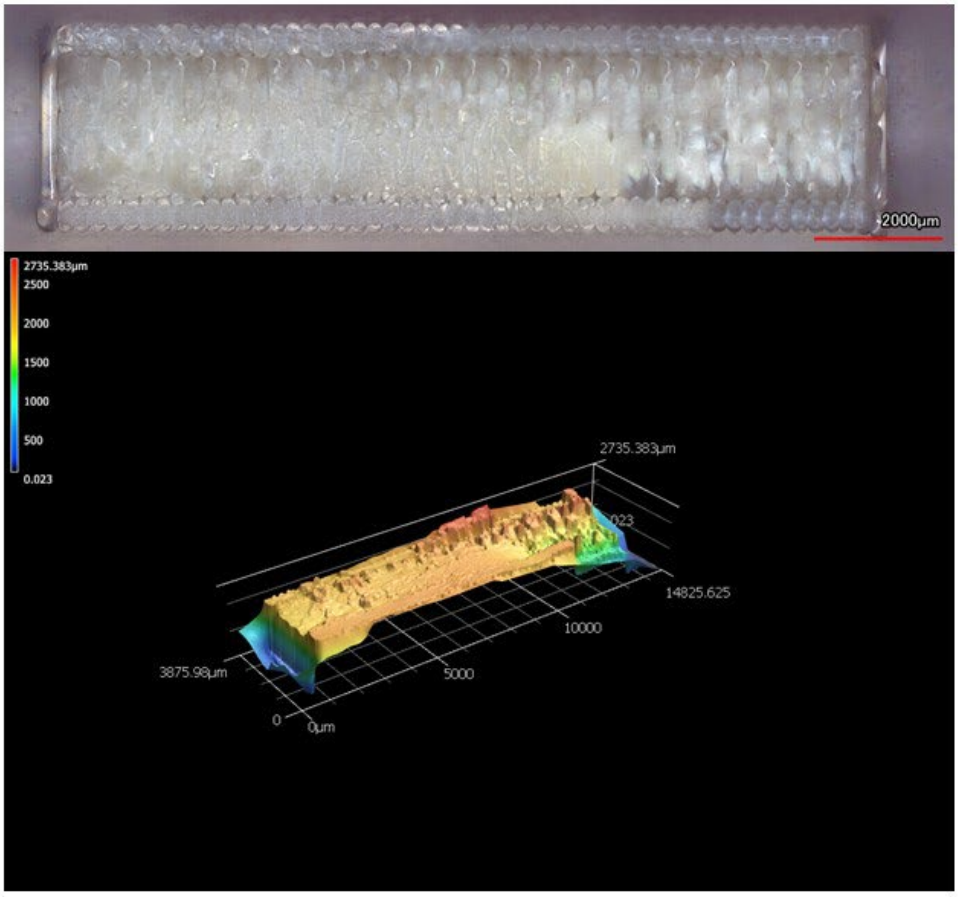
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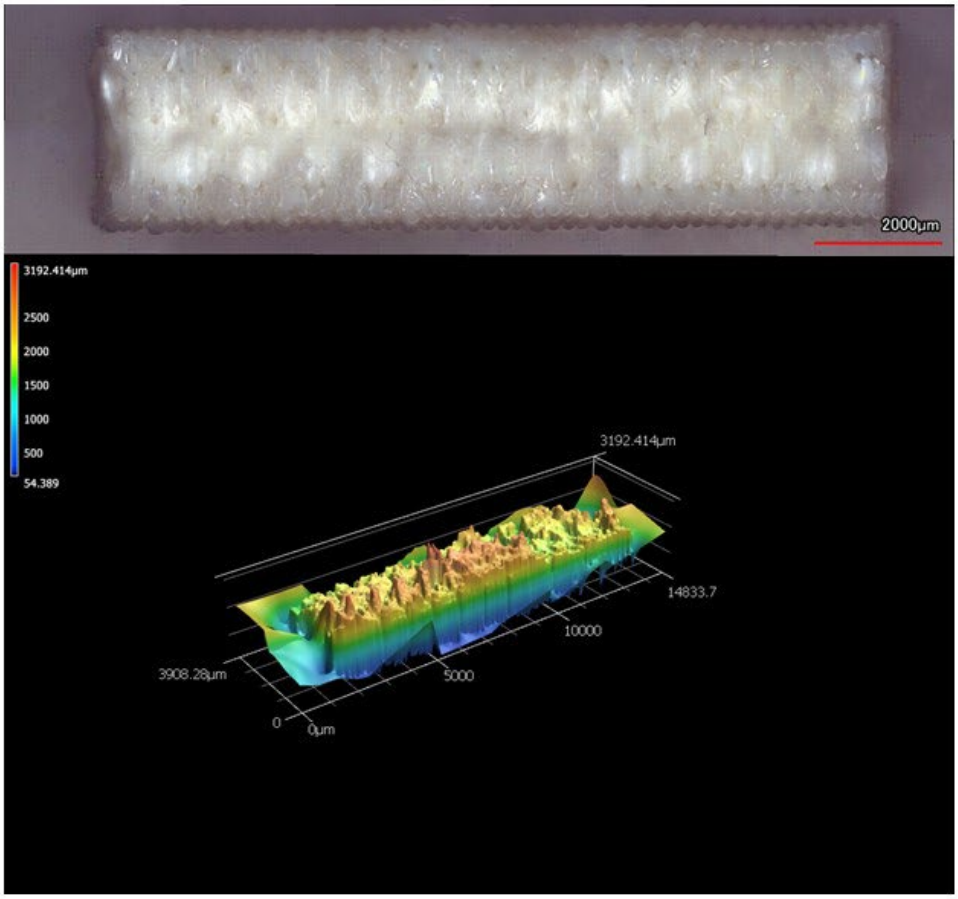

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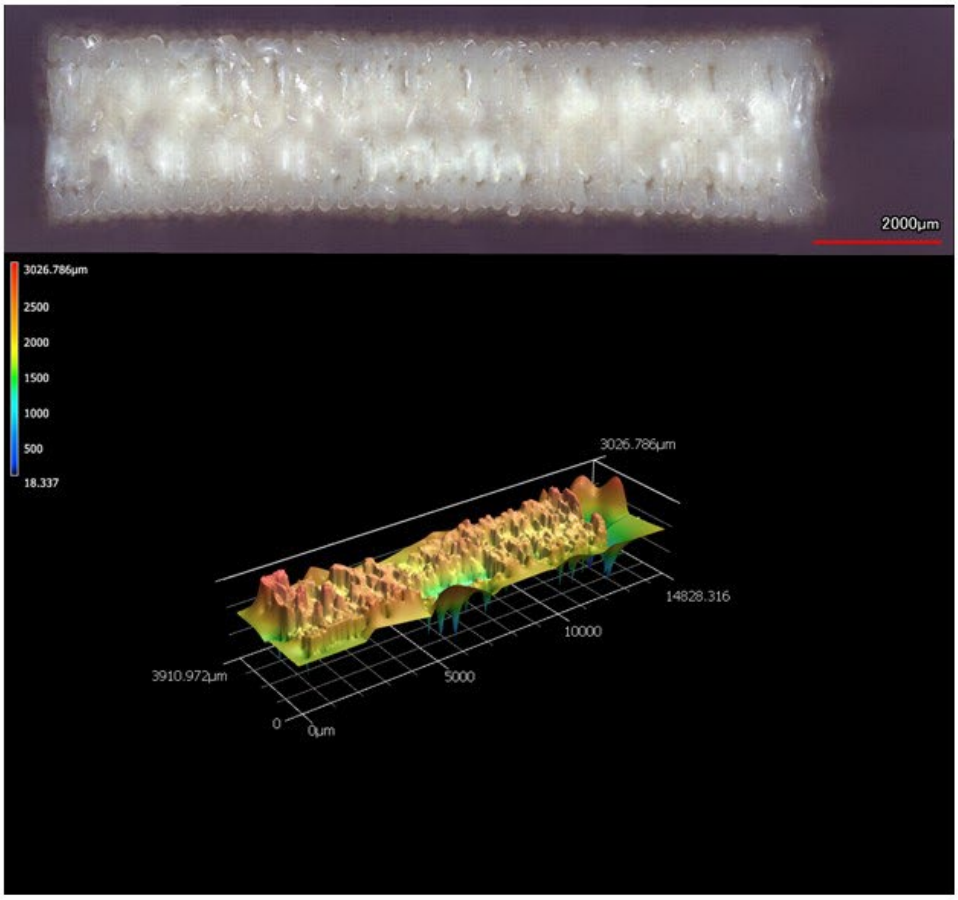

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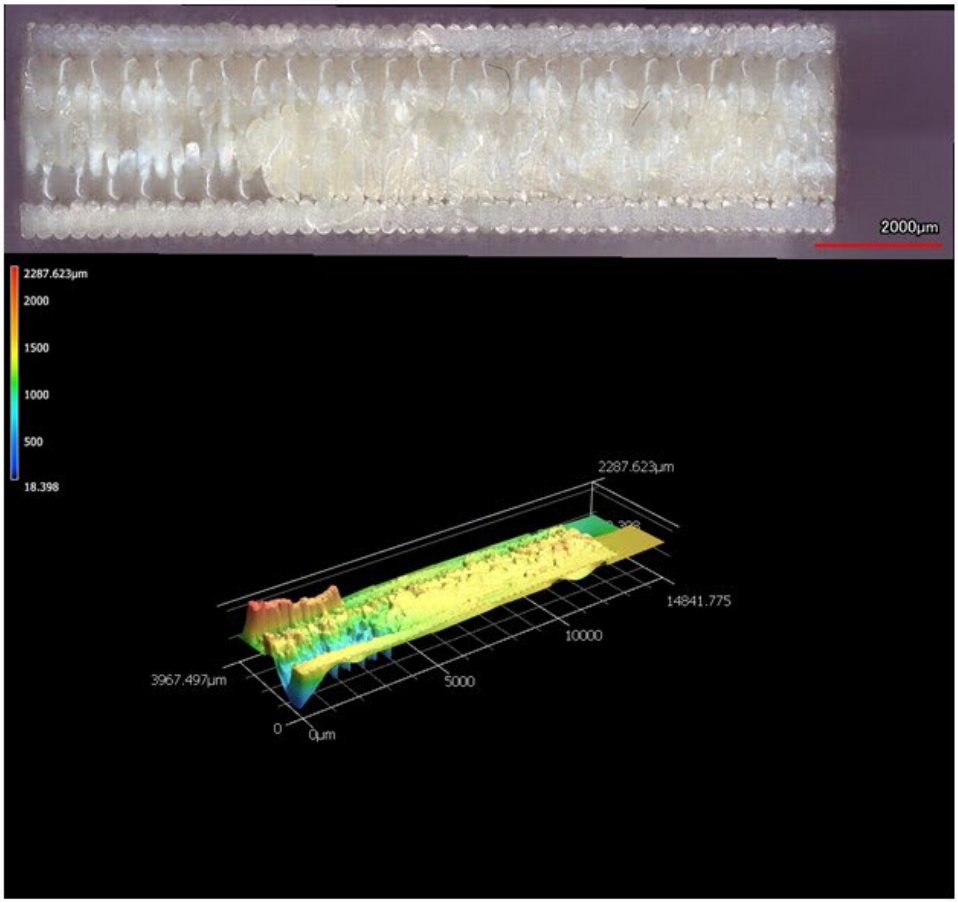

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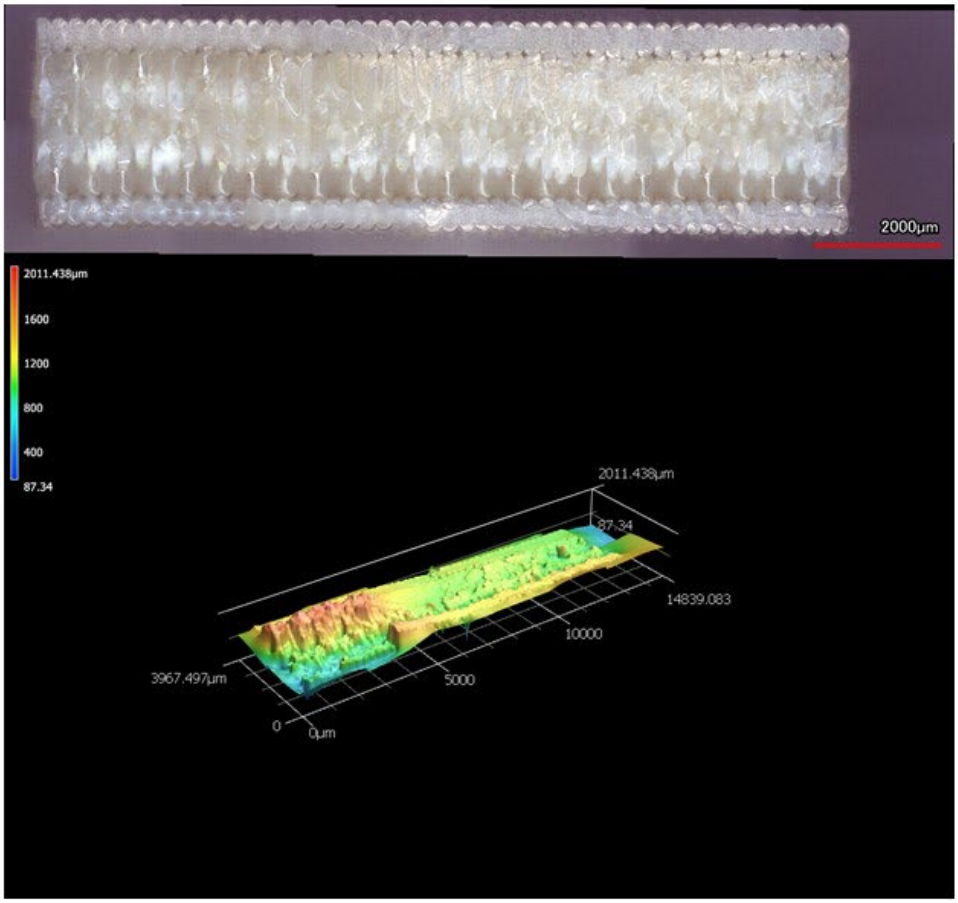

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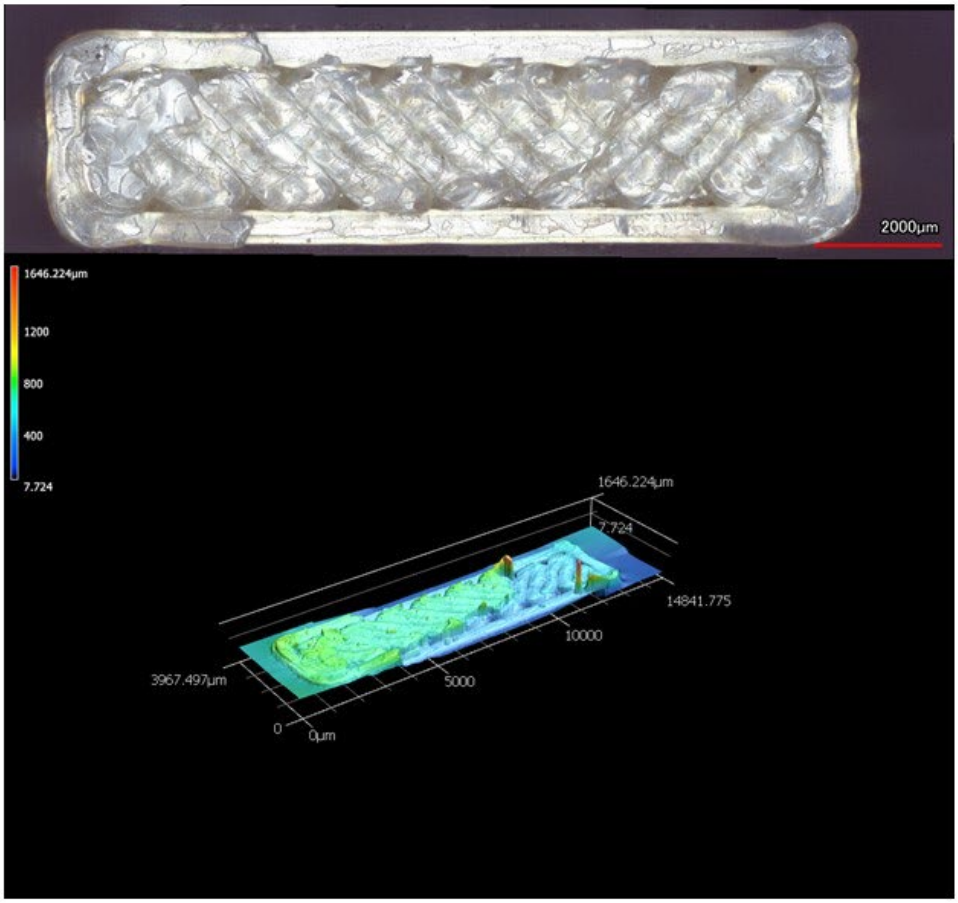
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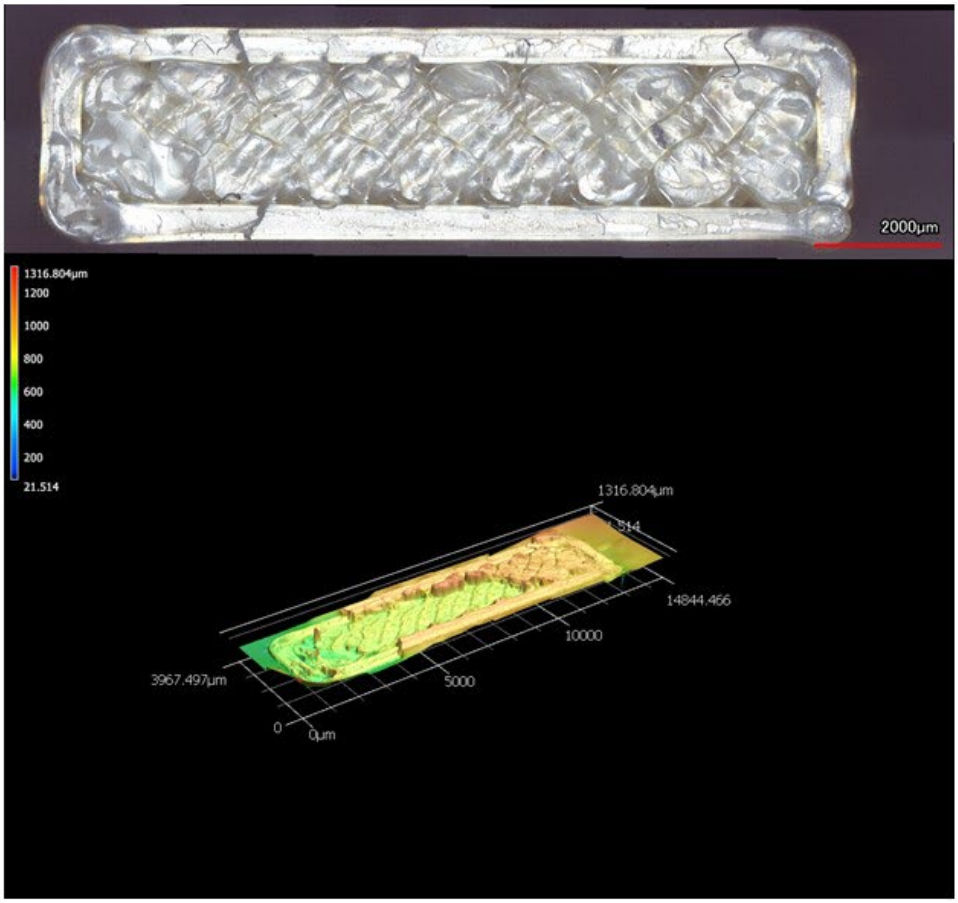
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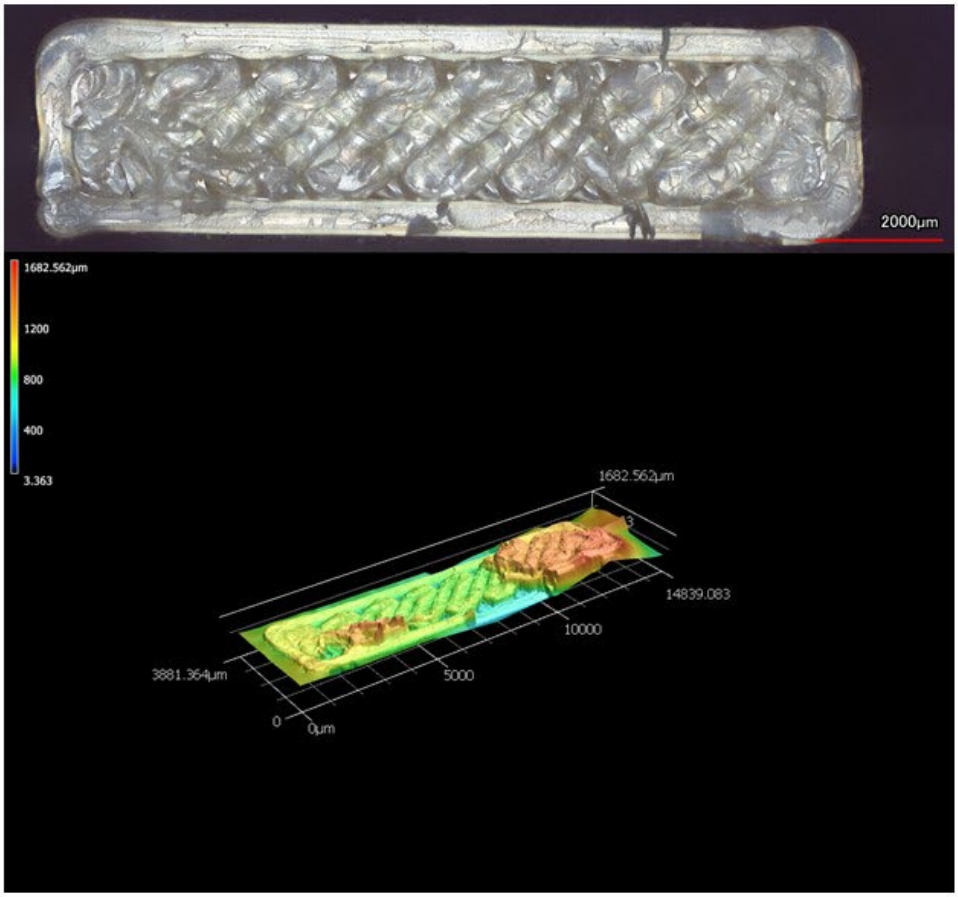

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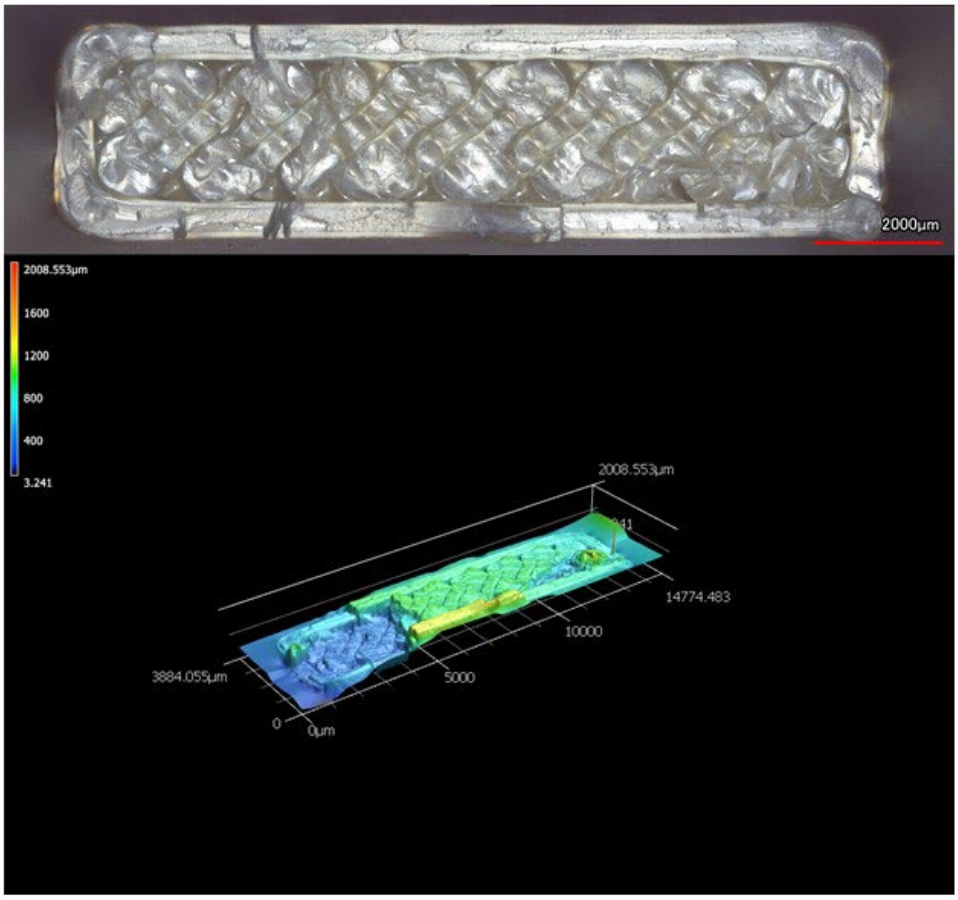

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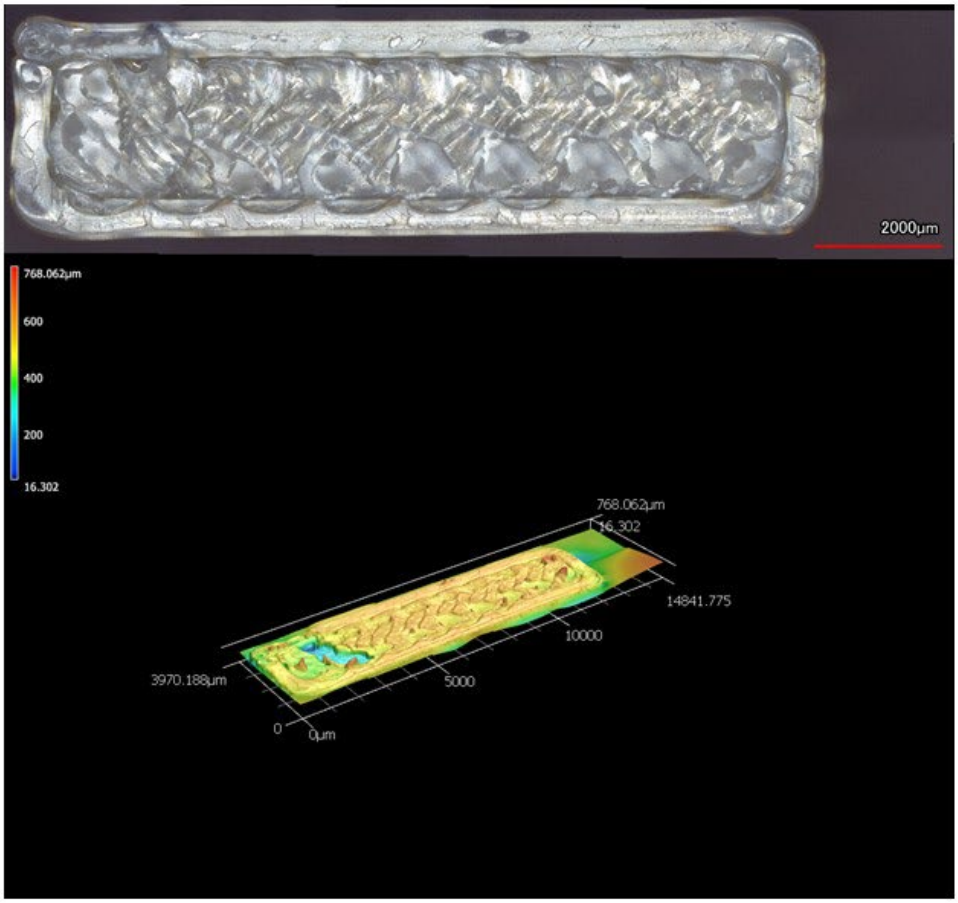

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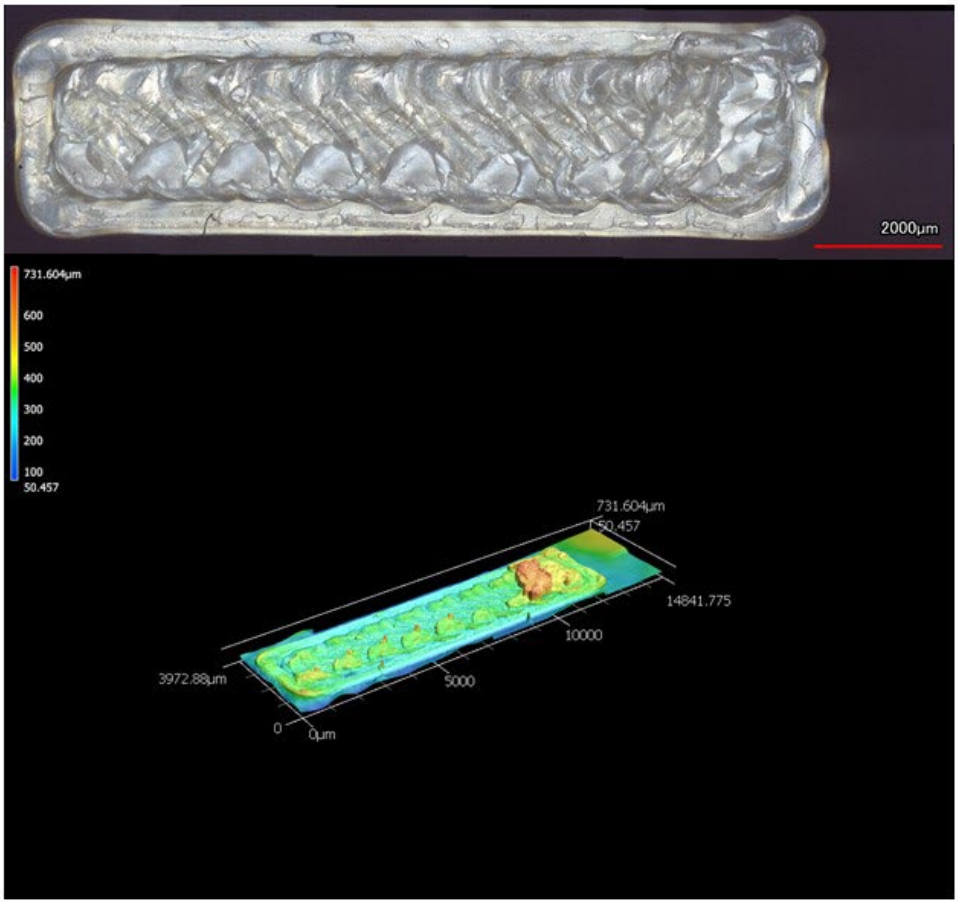

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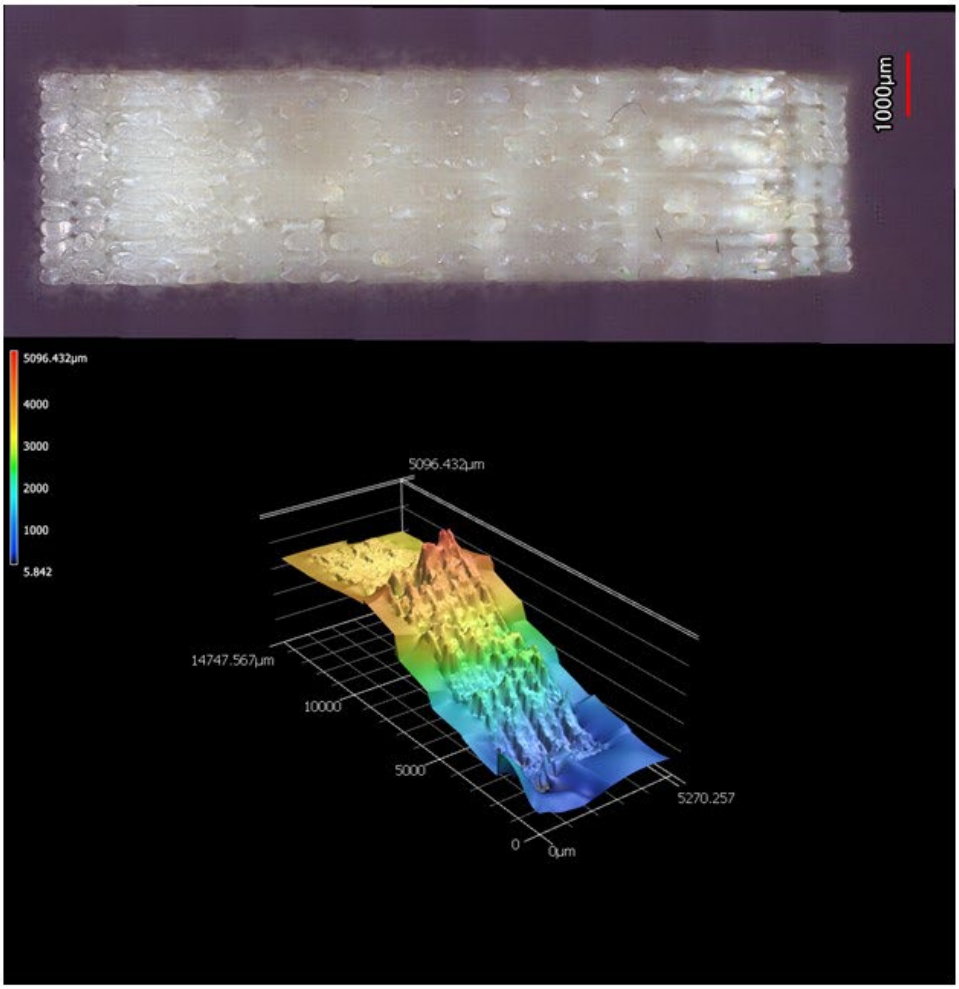

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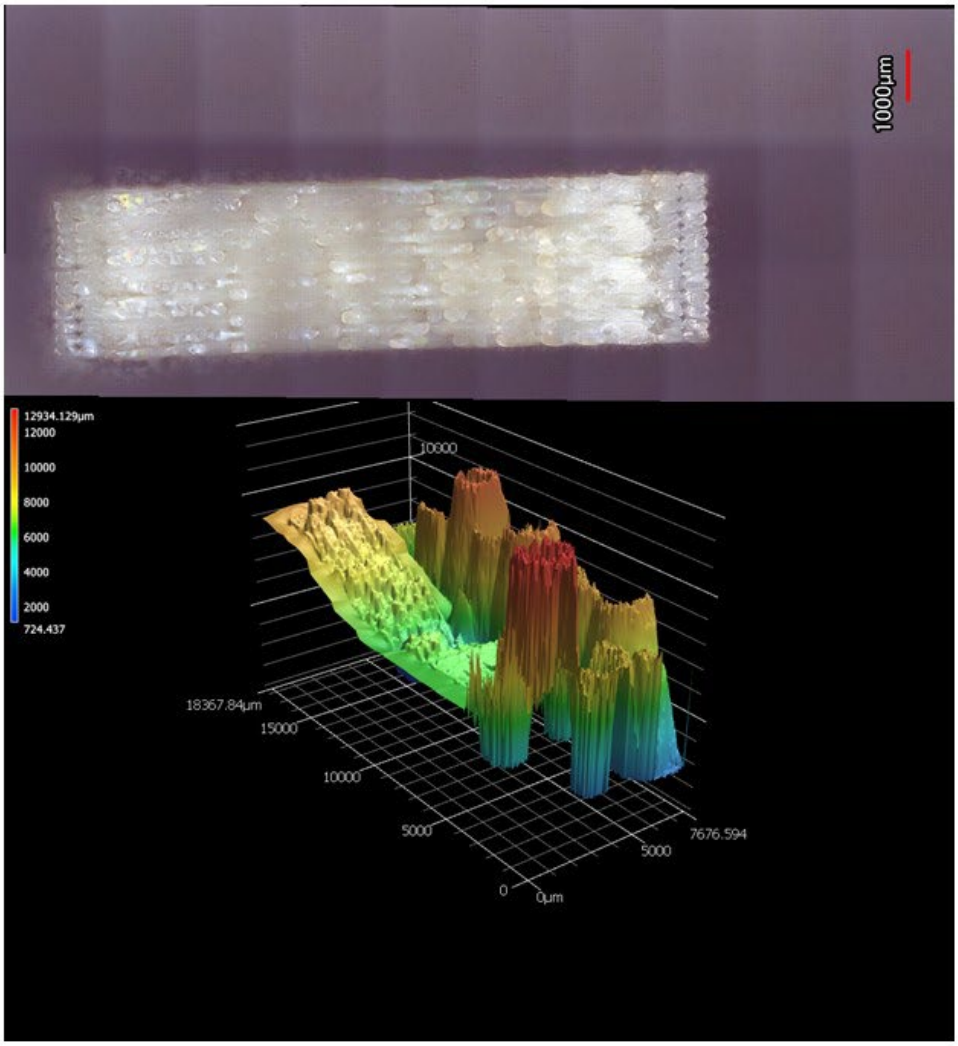

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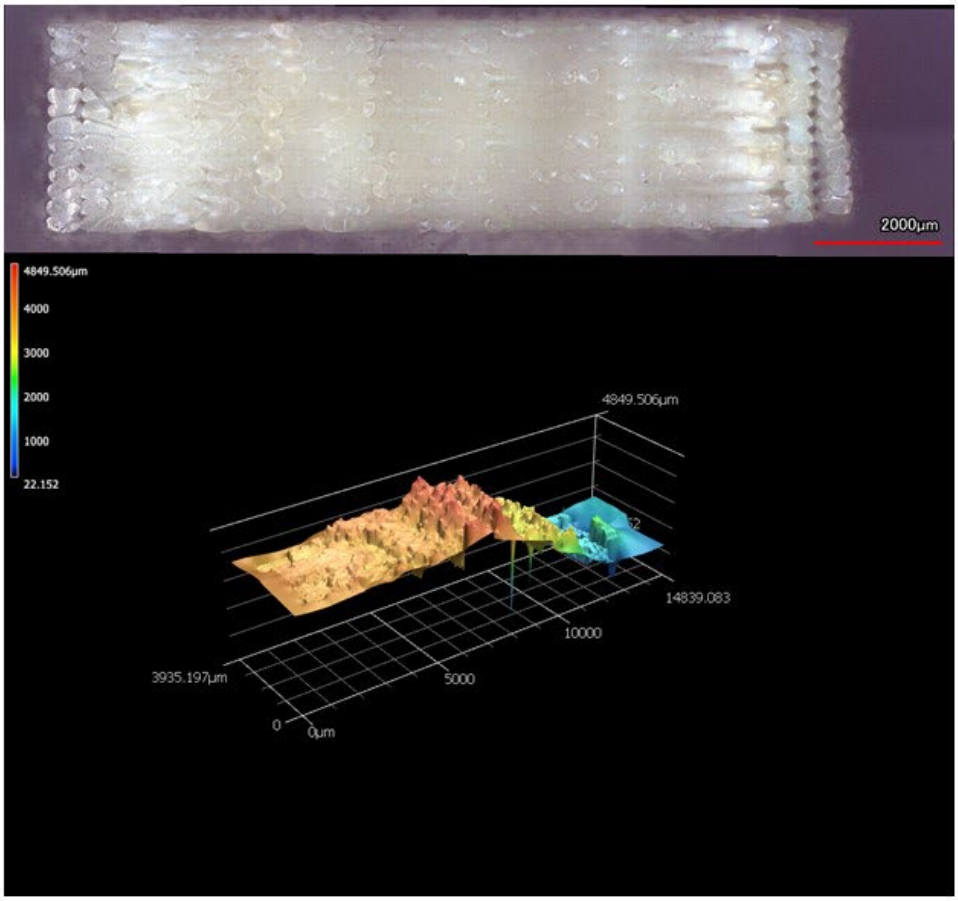

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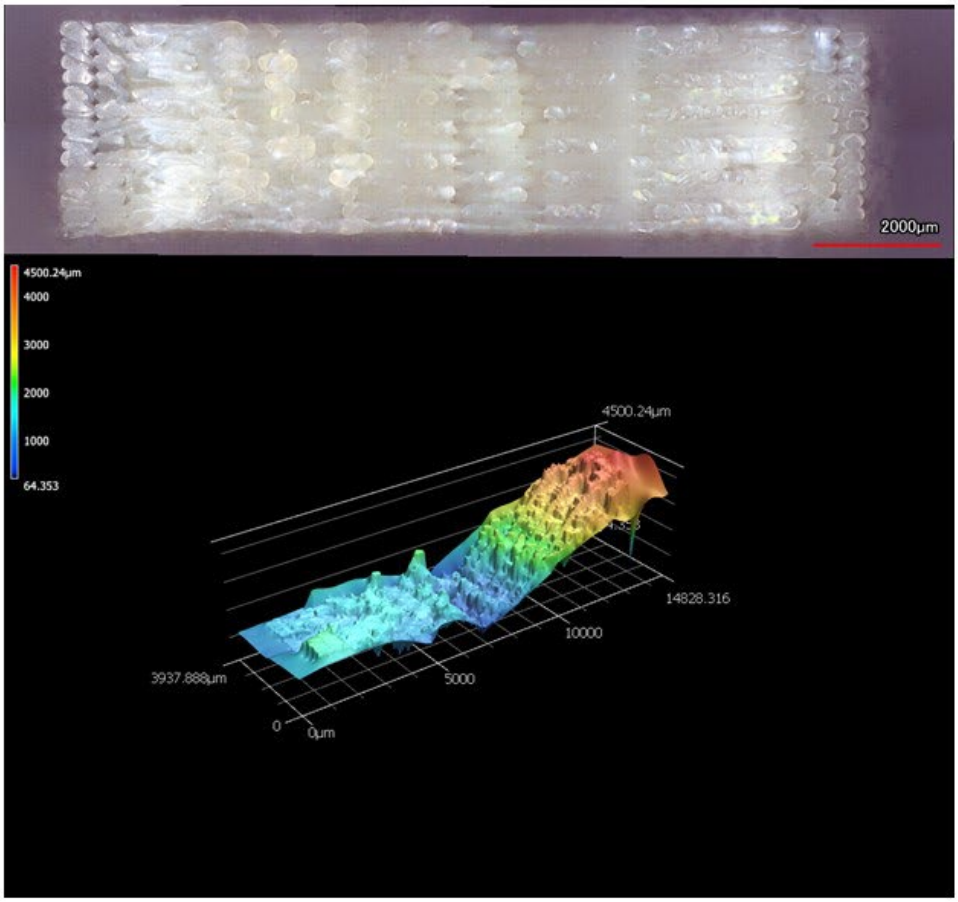

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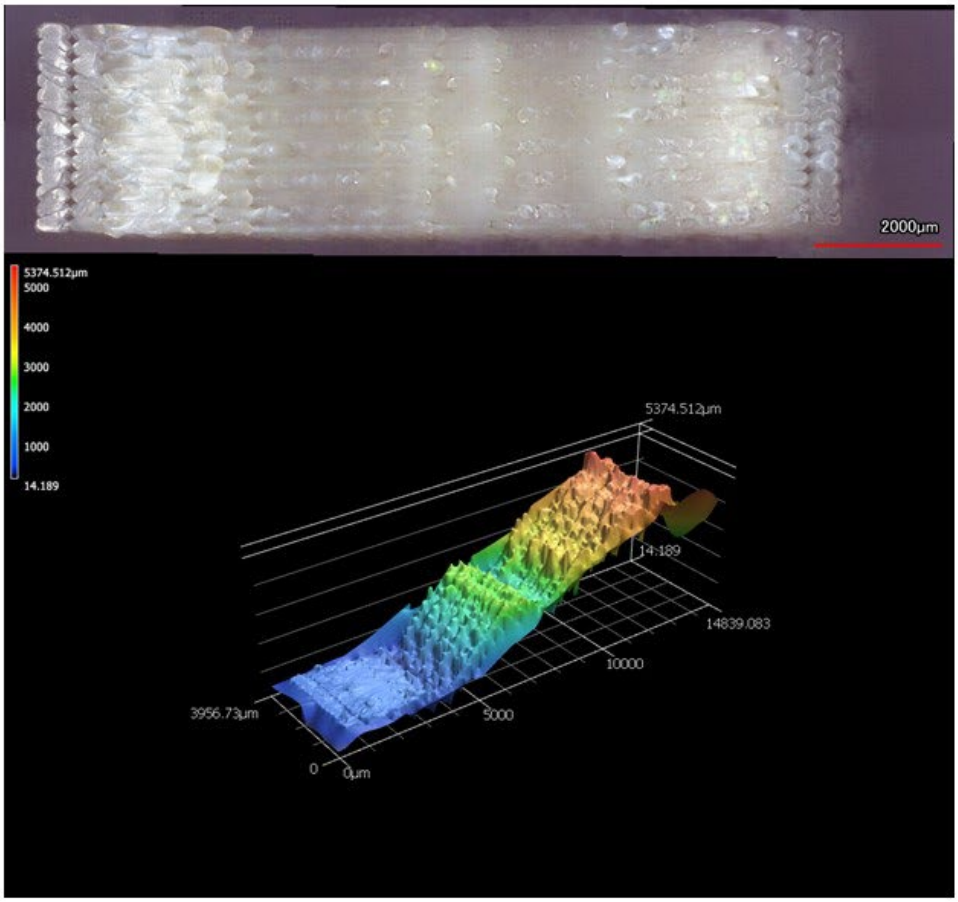

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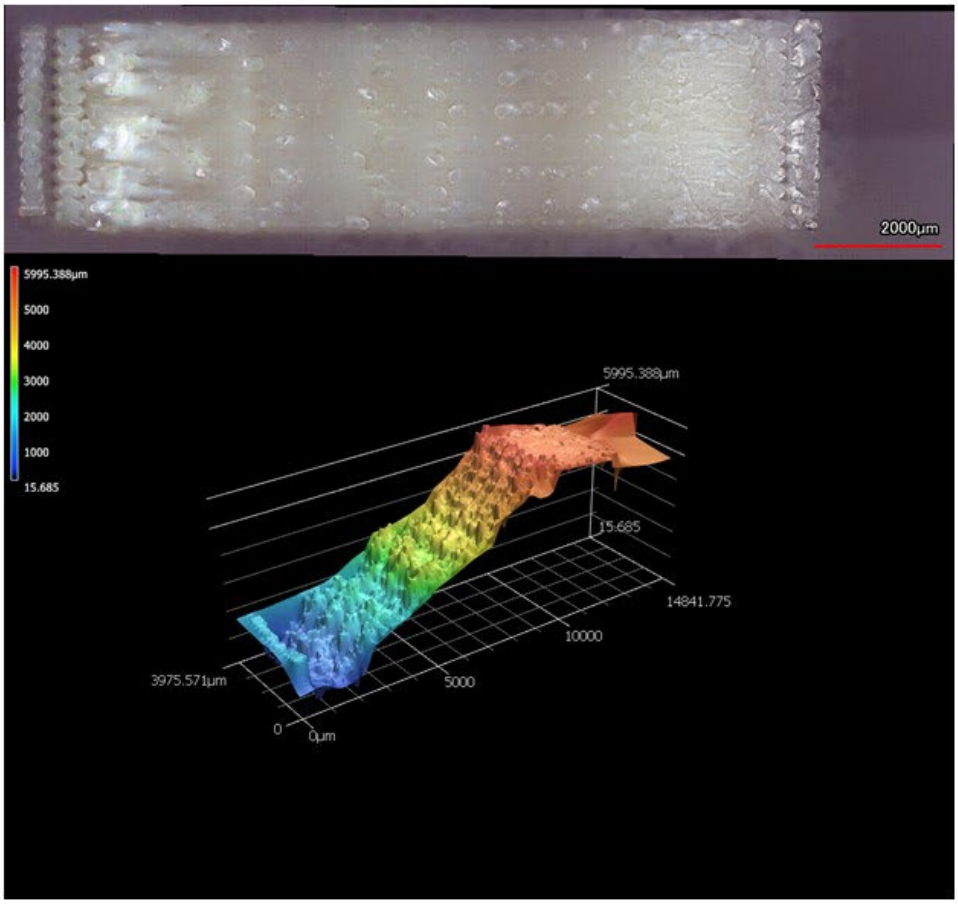

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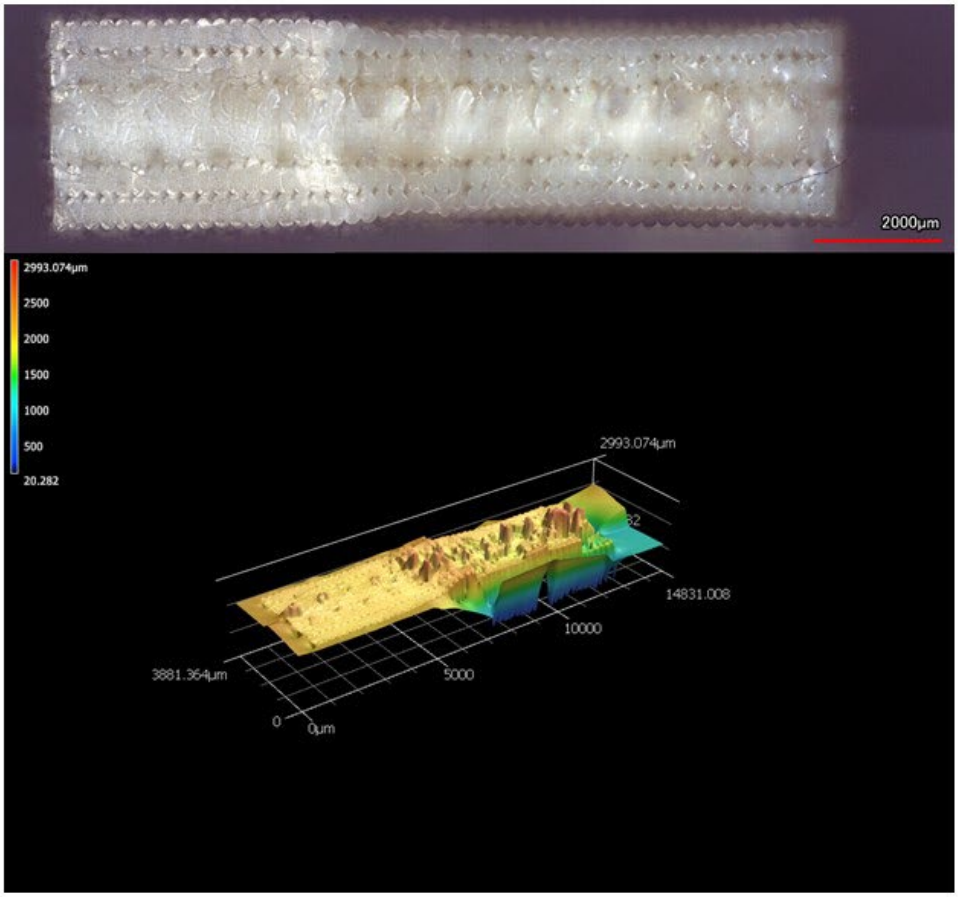

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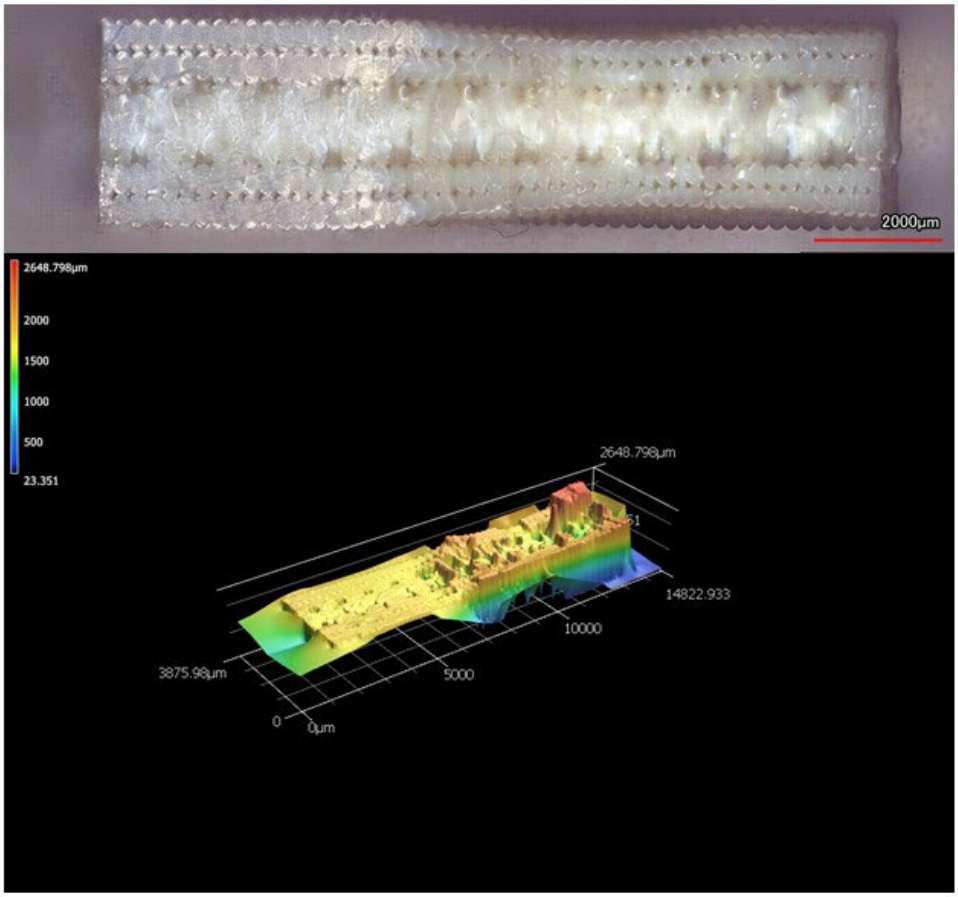

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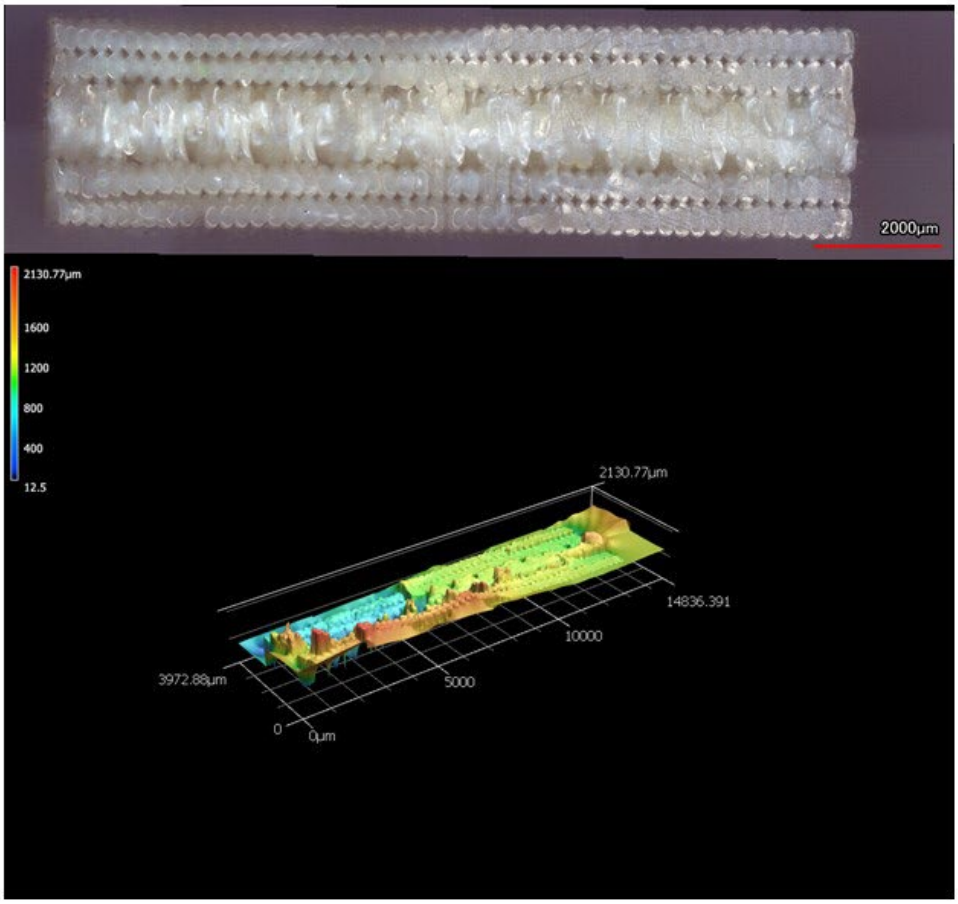

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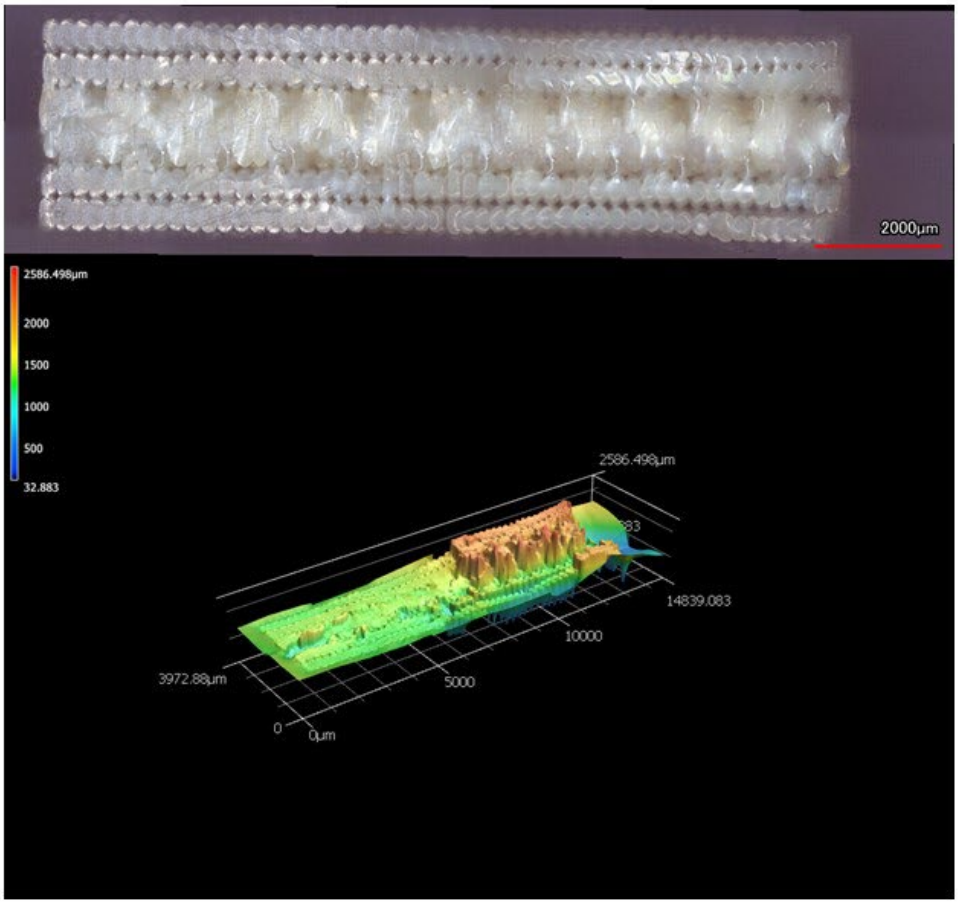

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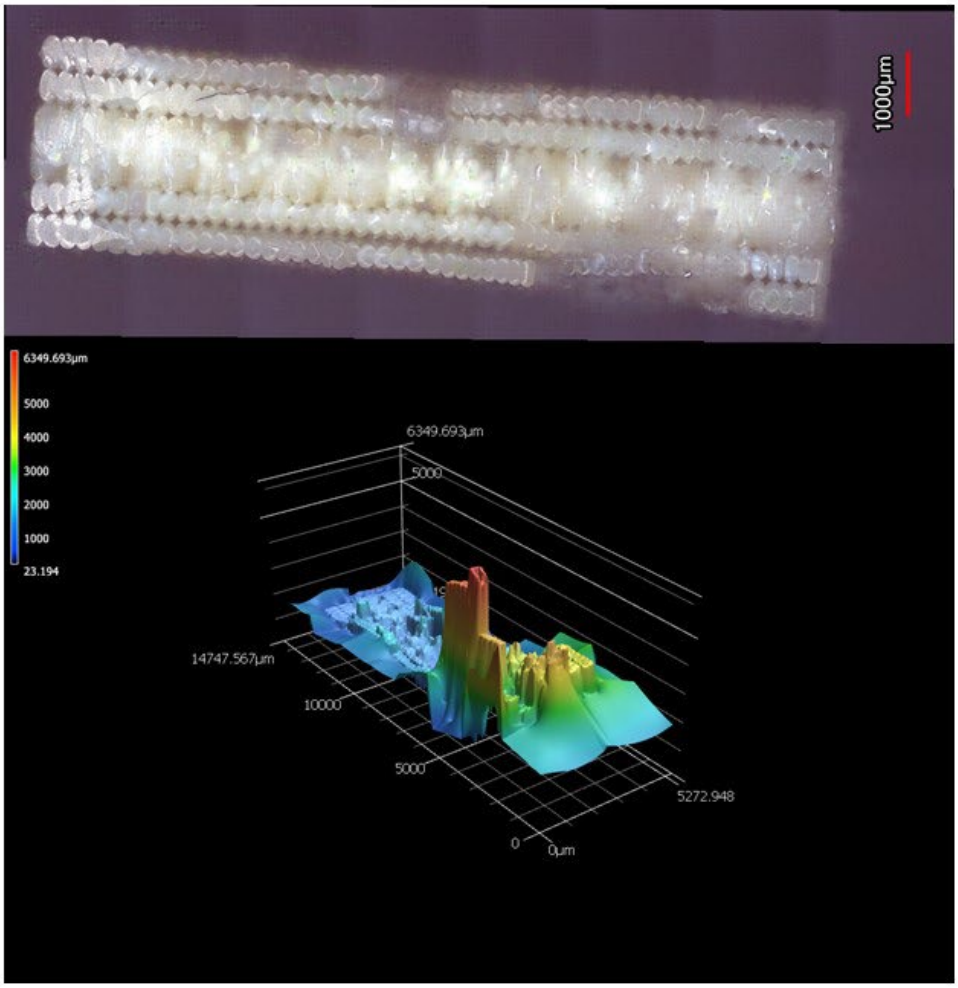

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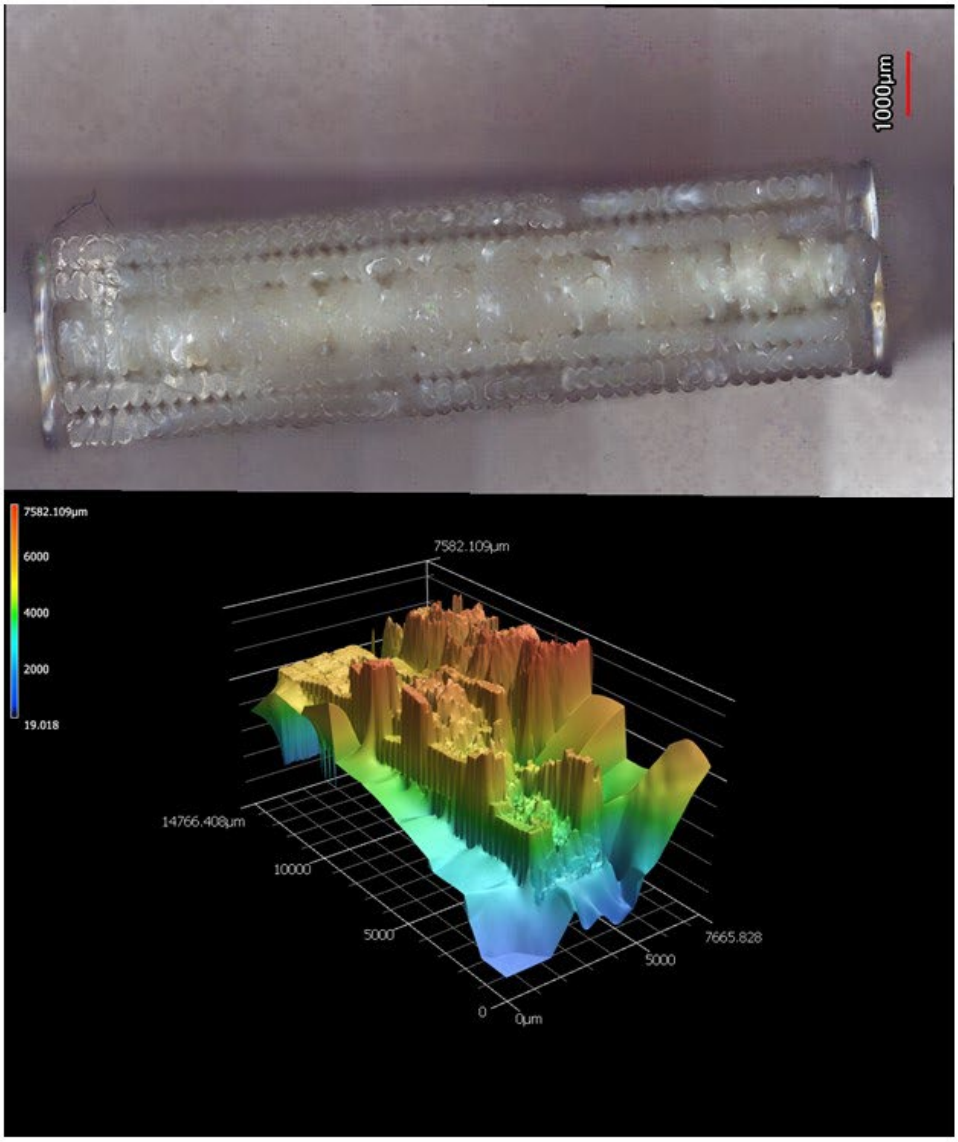

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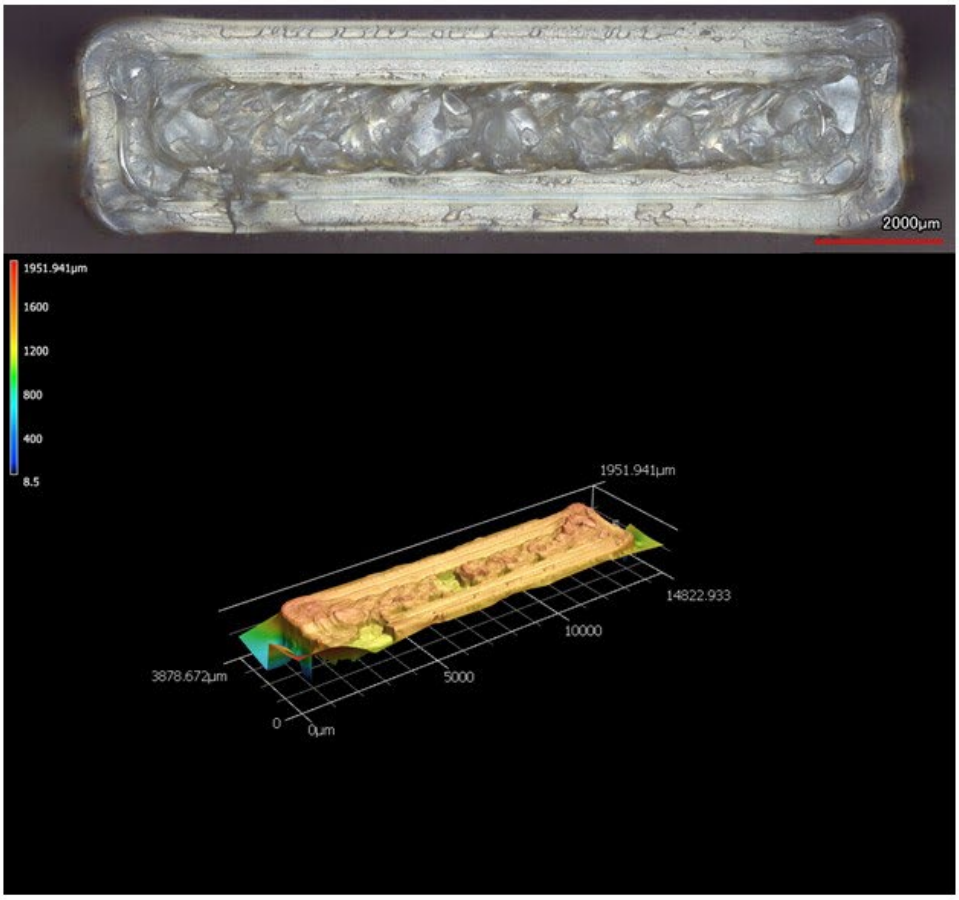

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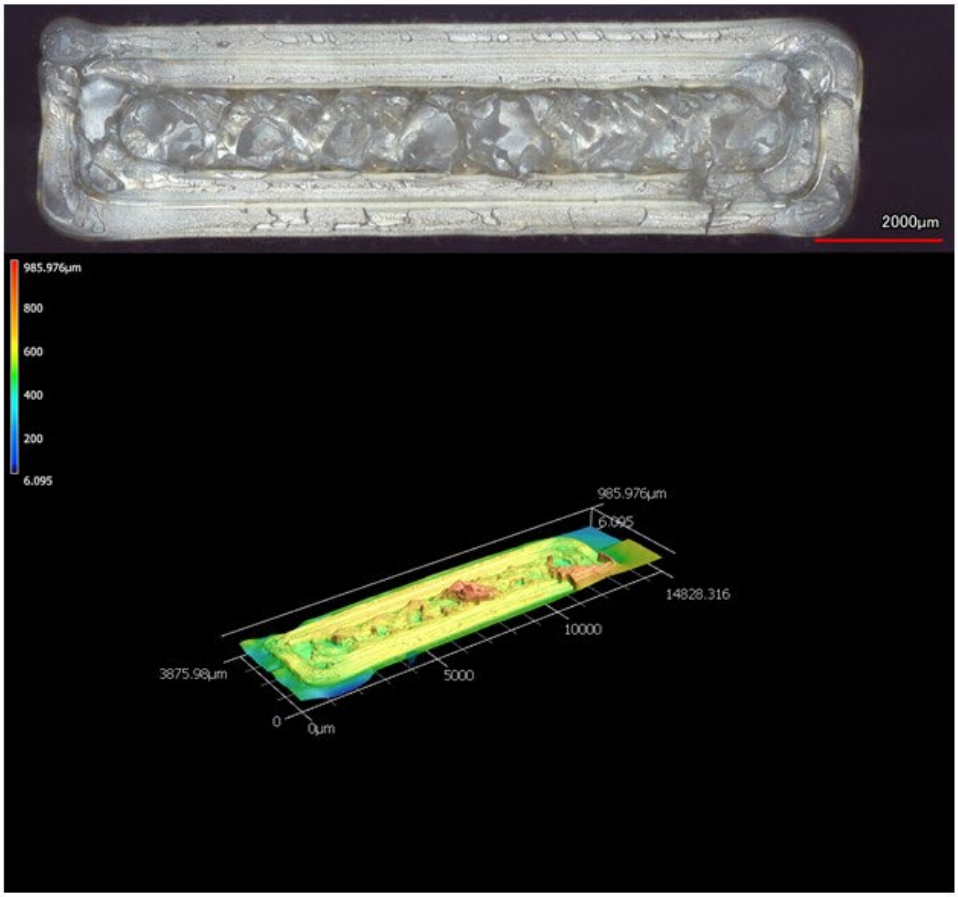

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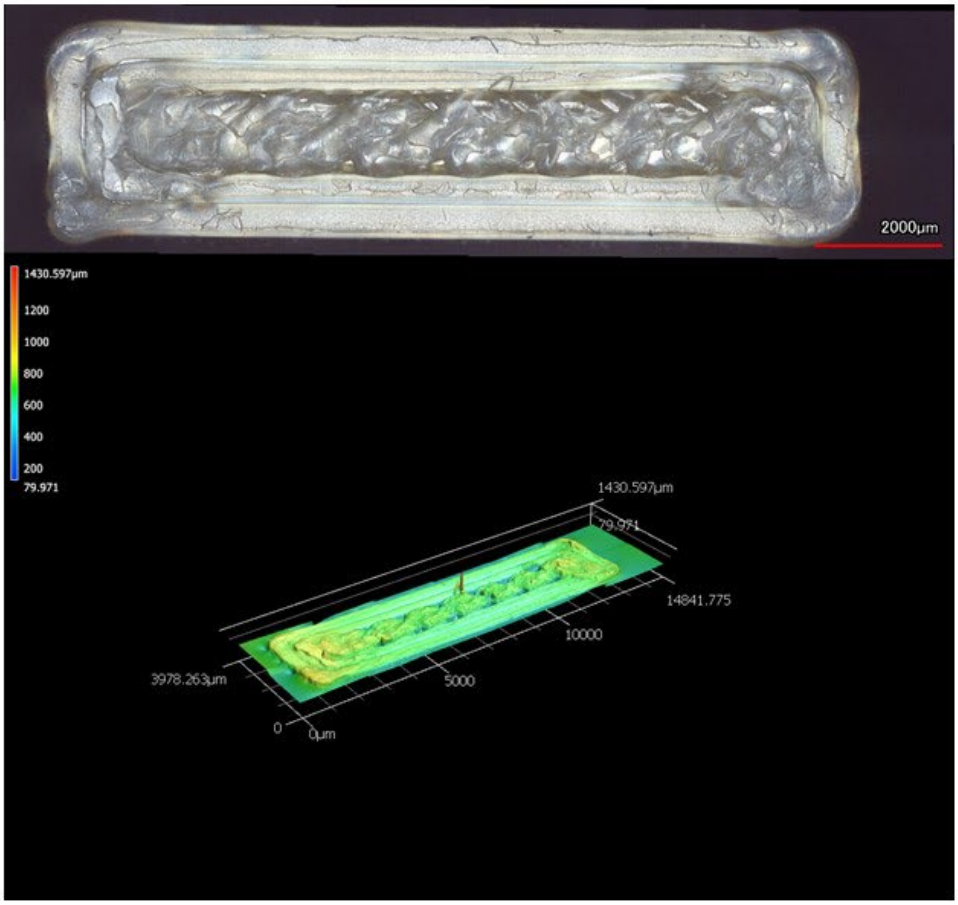

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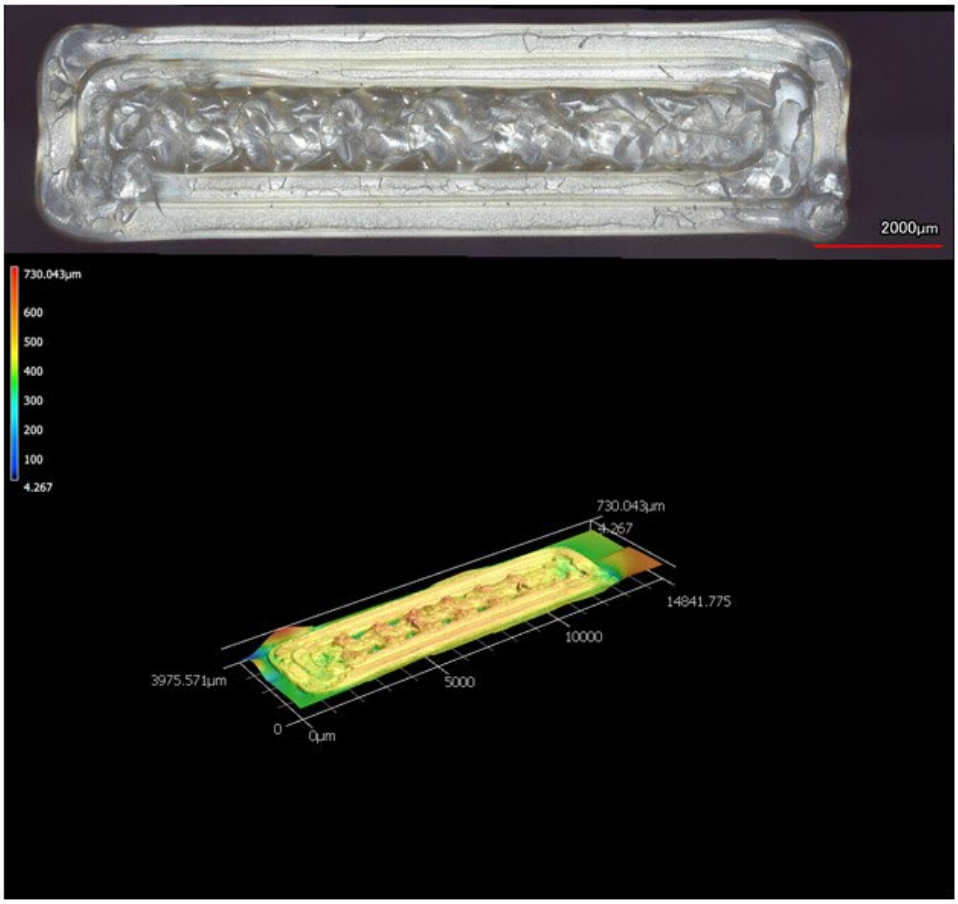

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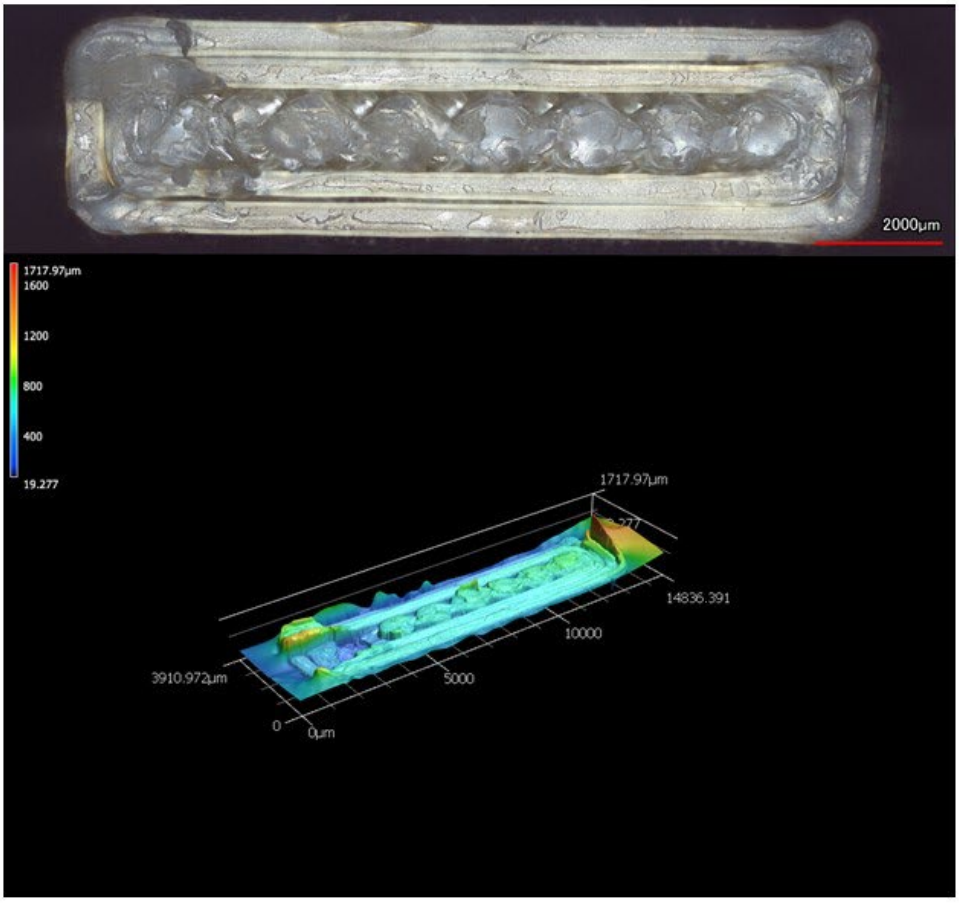

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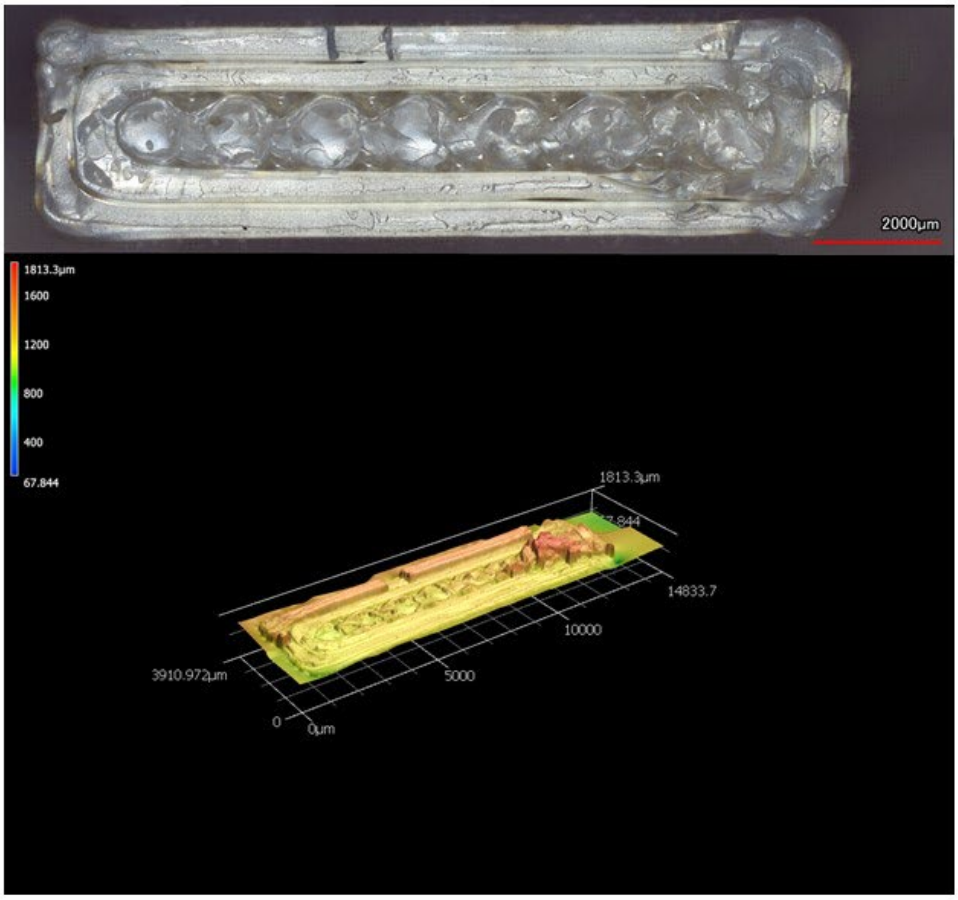

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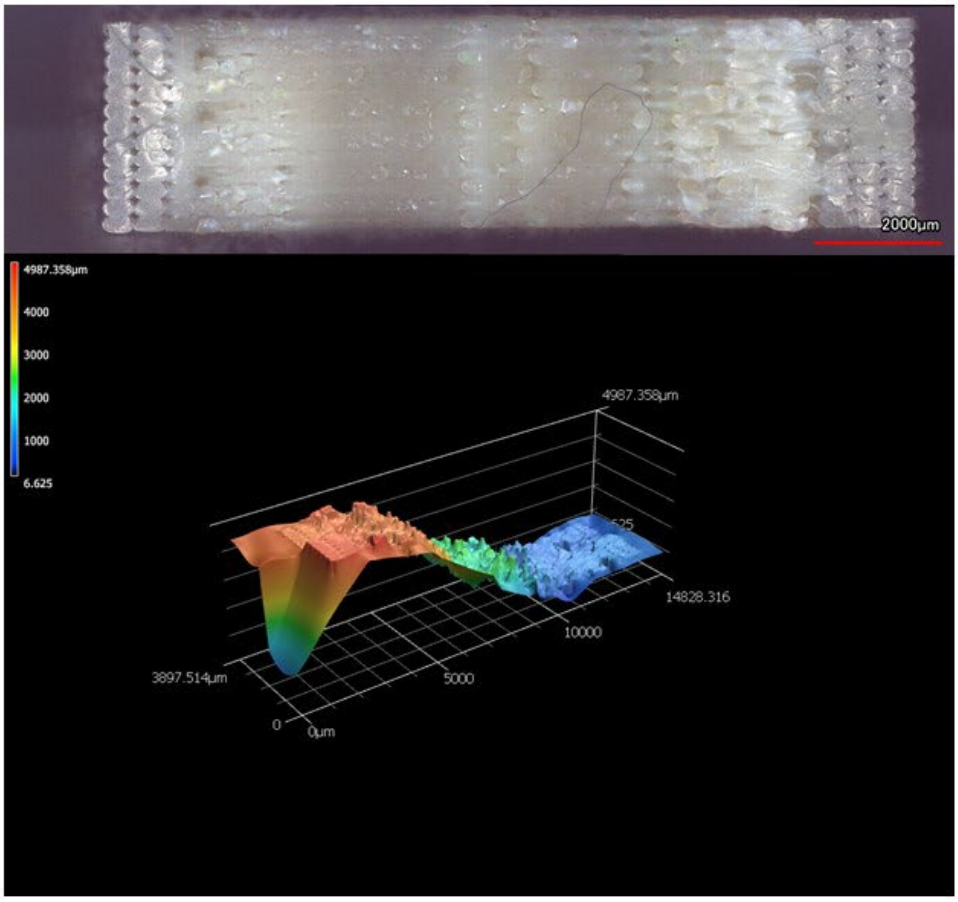

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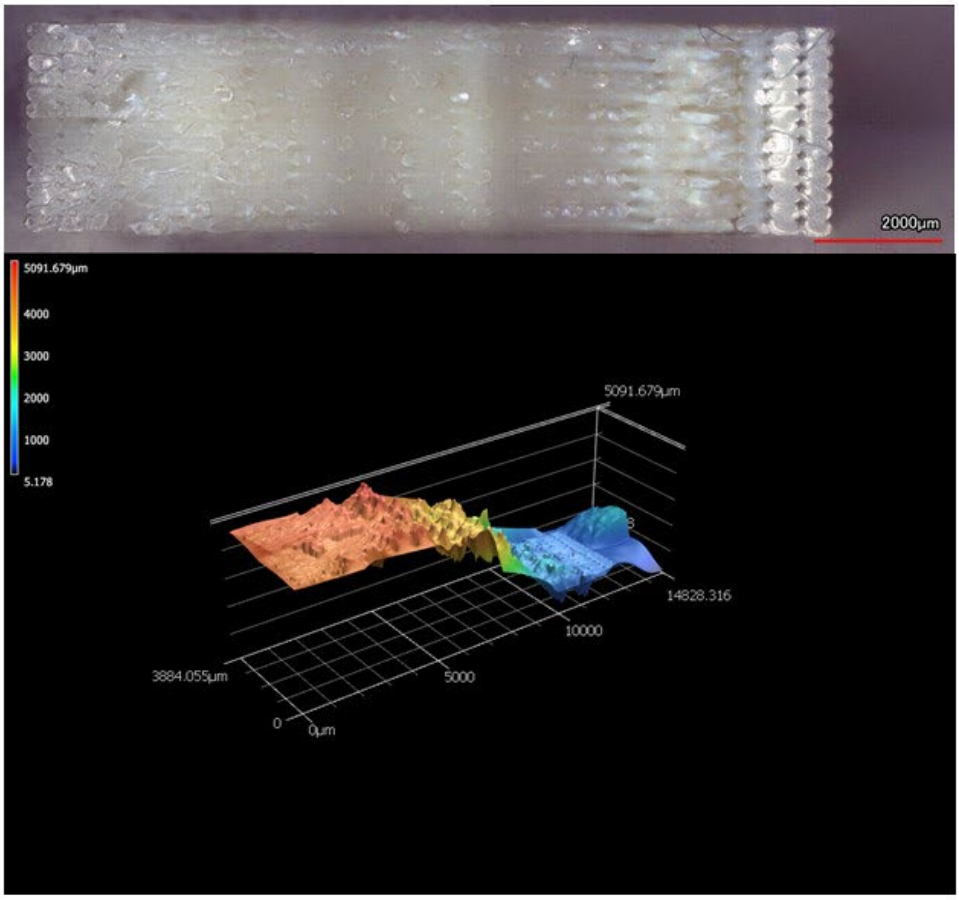

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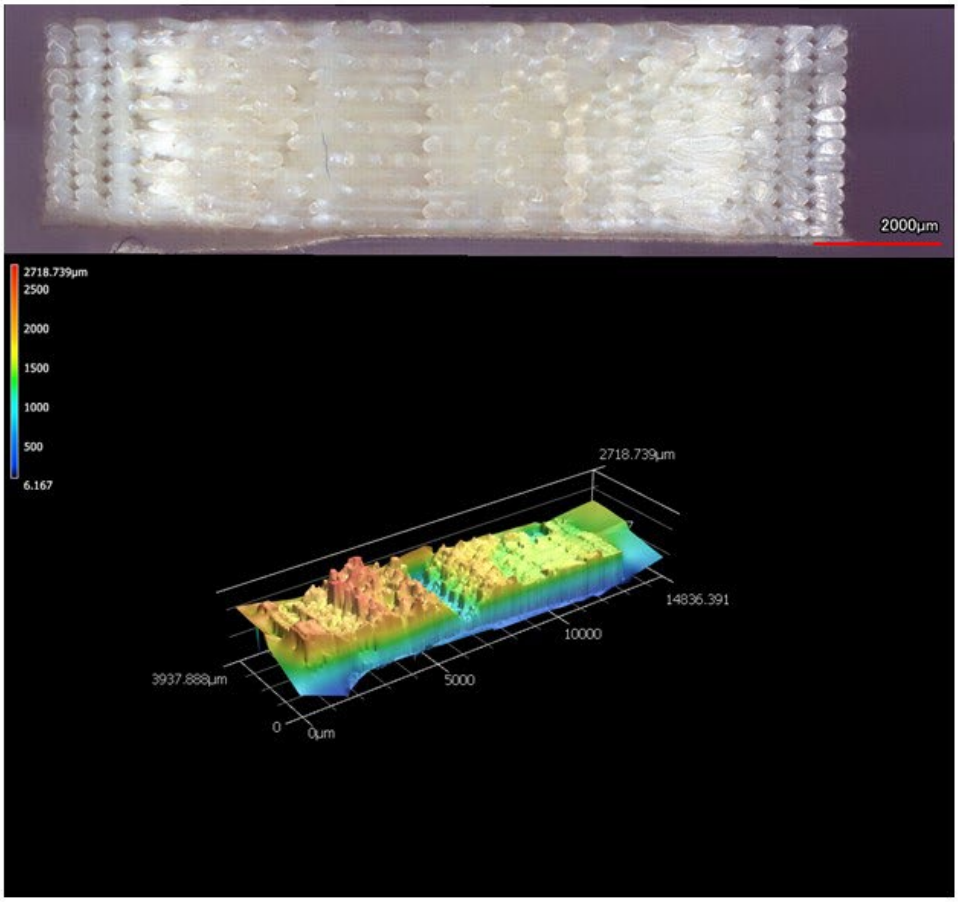

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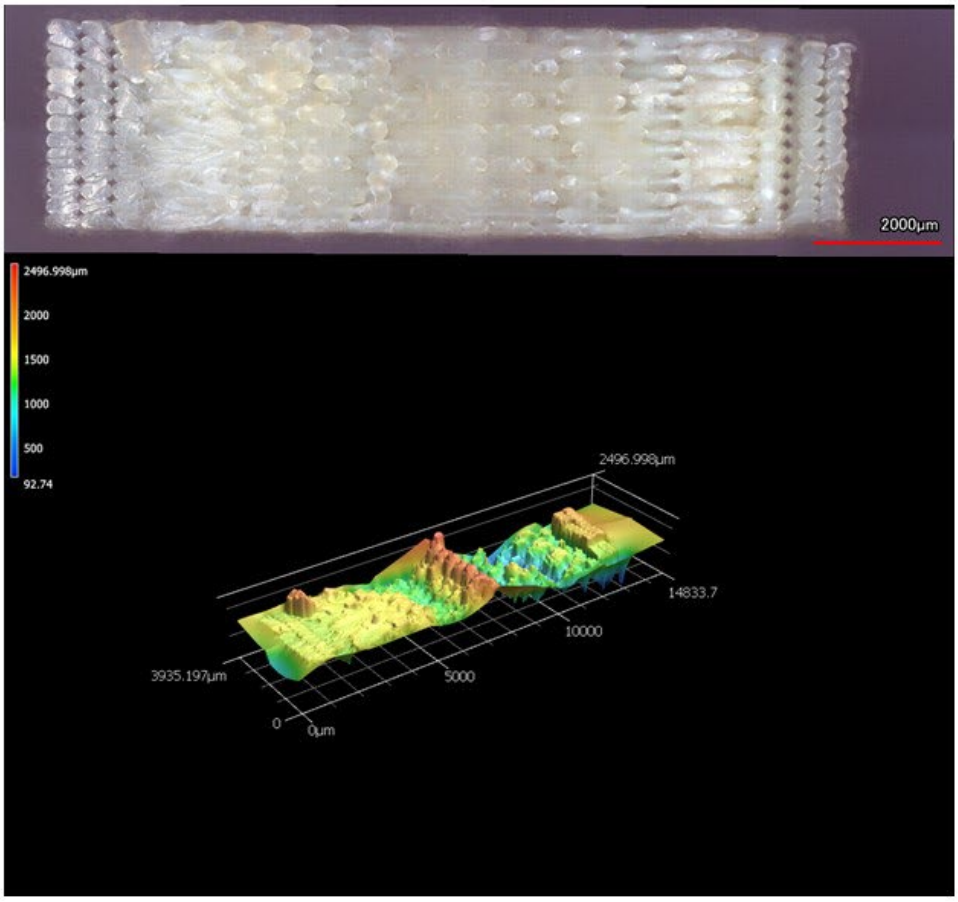
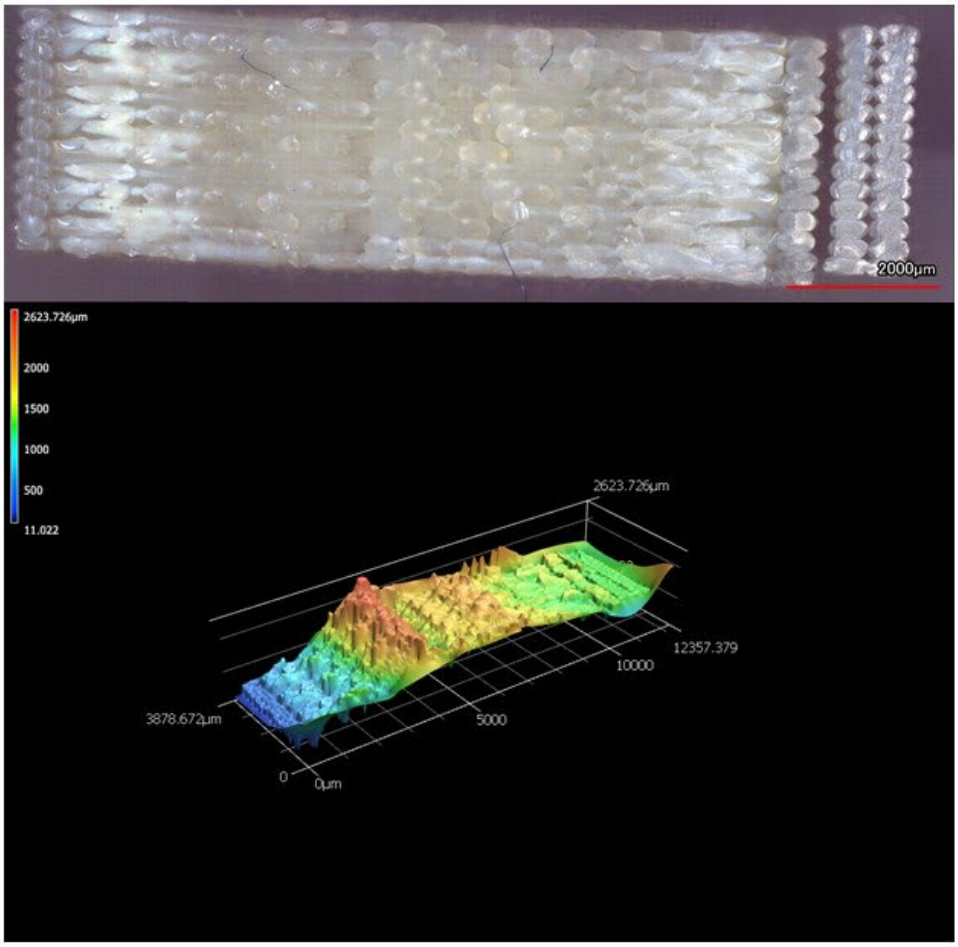
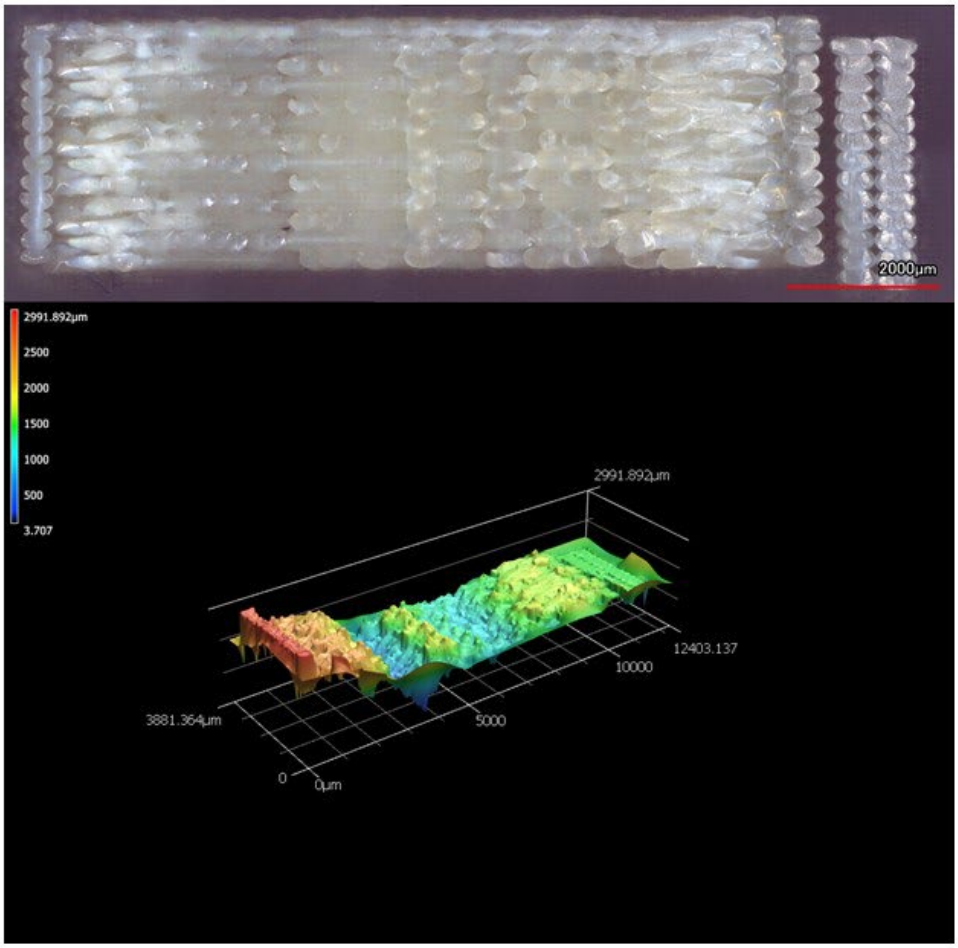


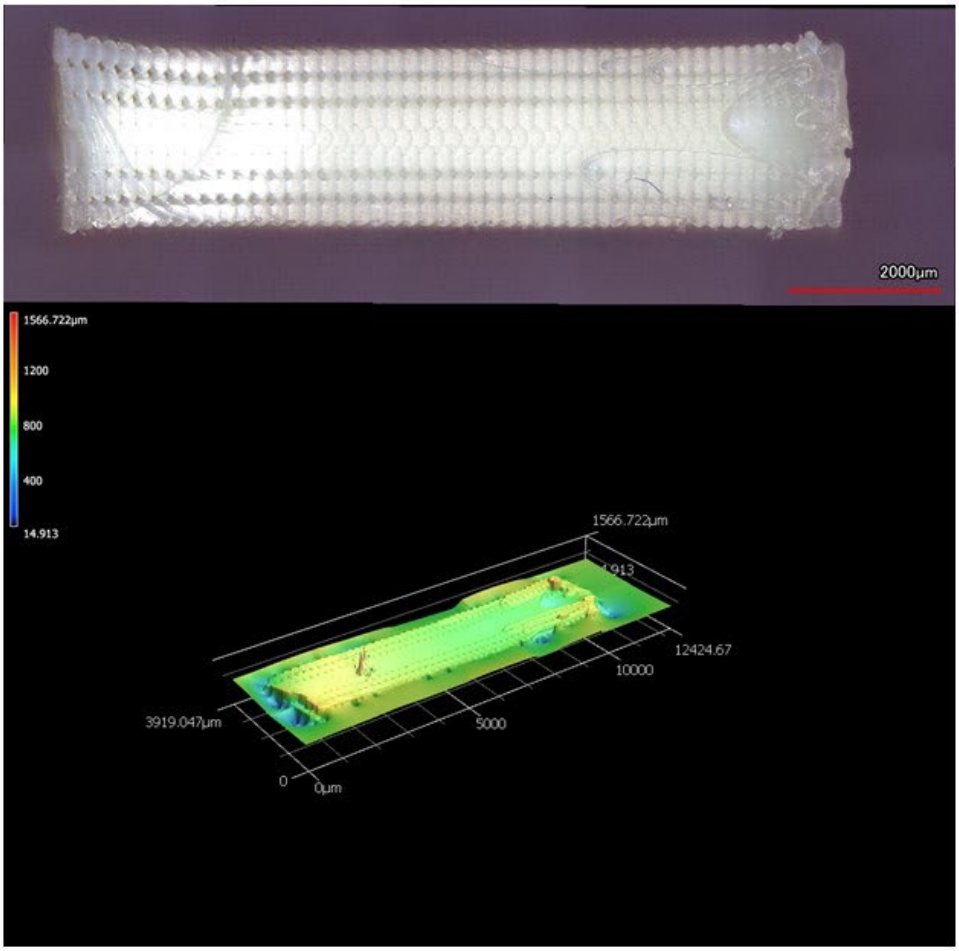
CC30-XT-B (FRAC)



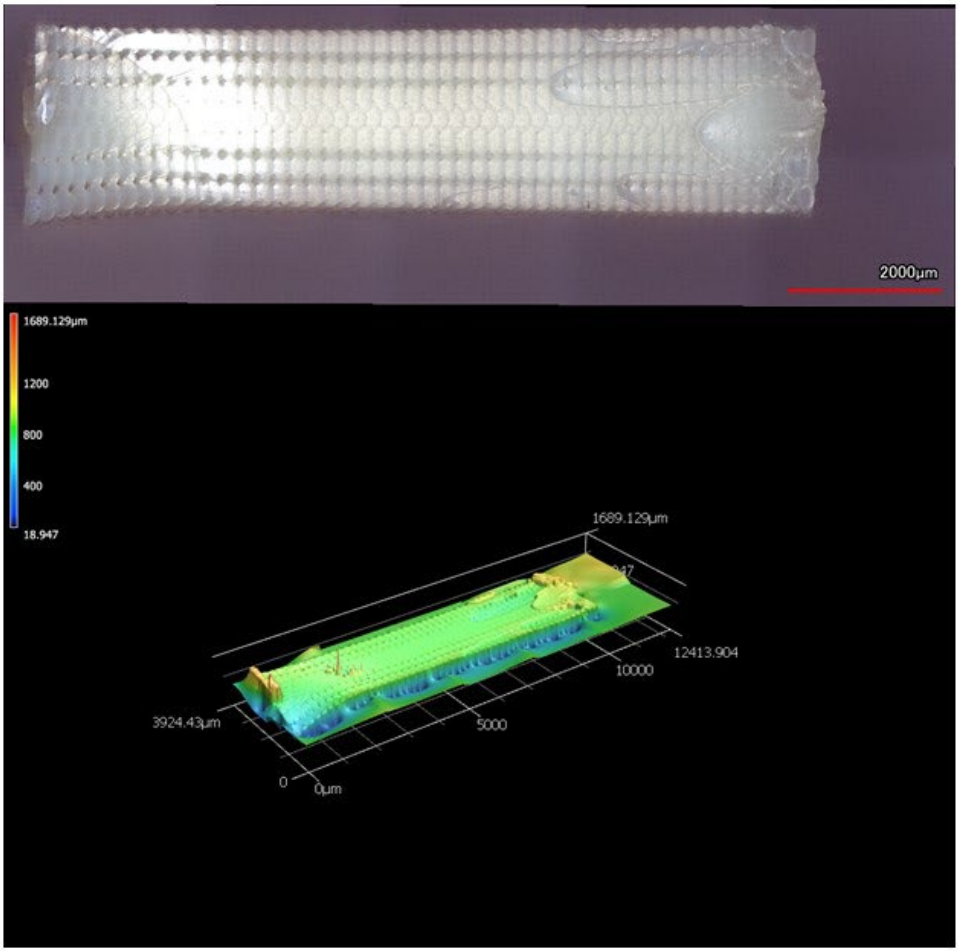
CC315-XT-A (FRAC)



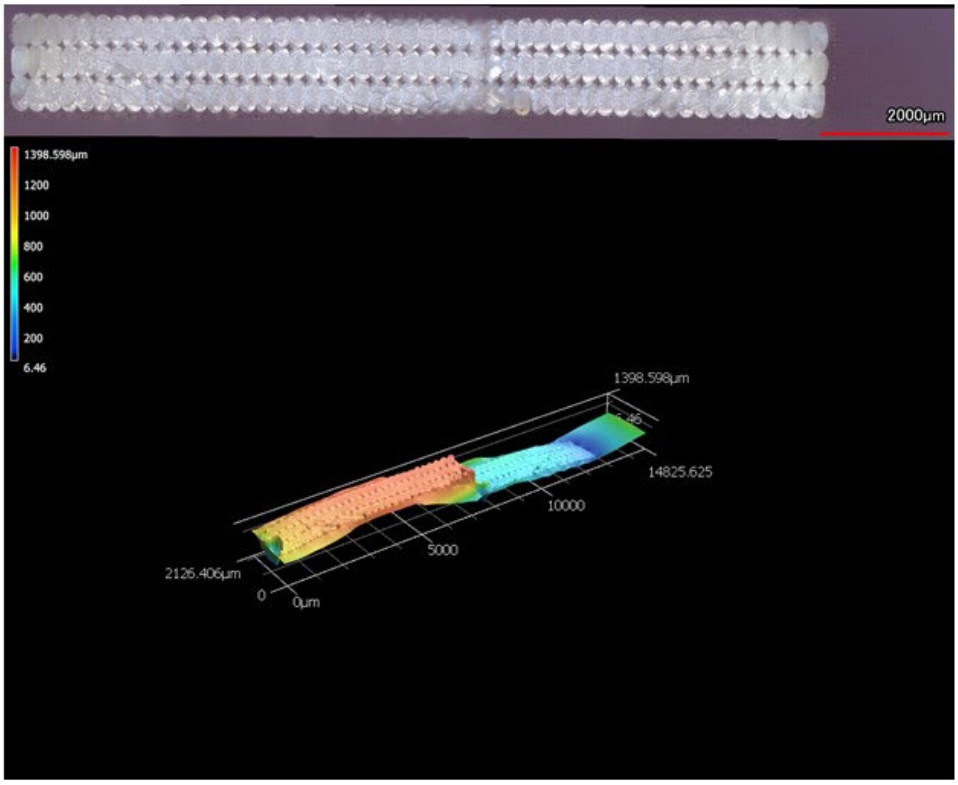
CC315-XT-B (FRAC)



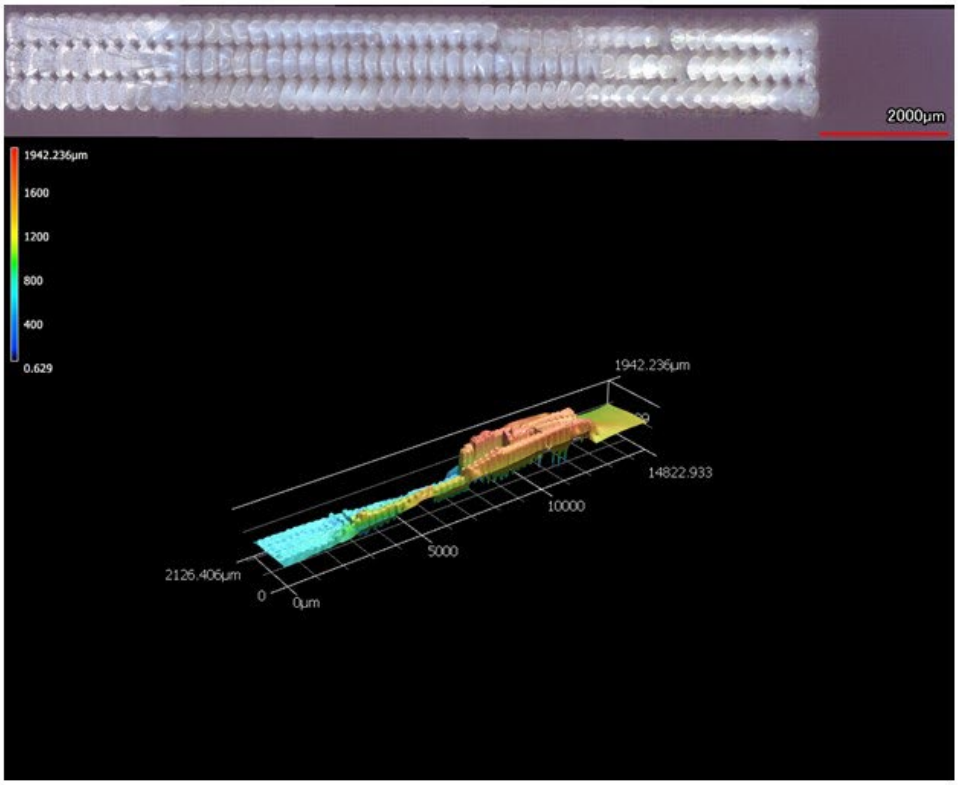
CC3(15)-YT-A (FRAC)



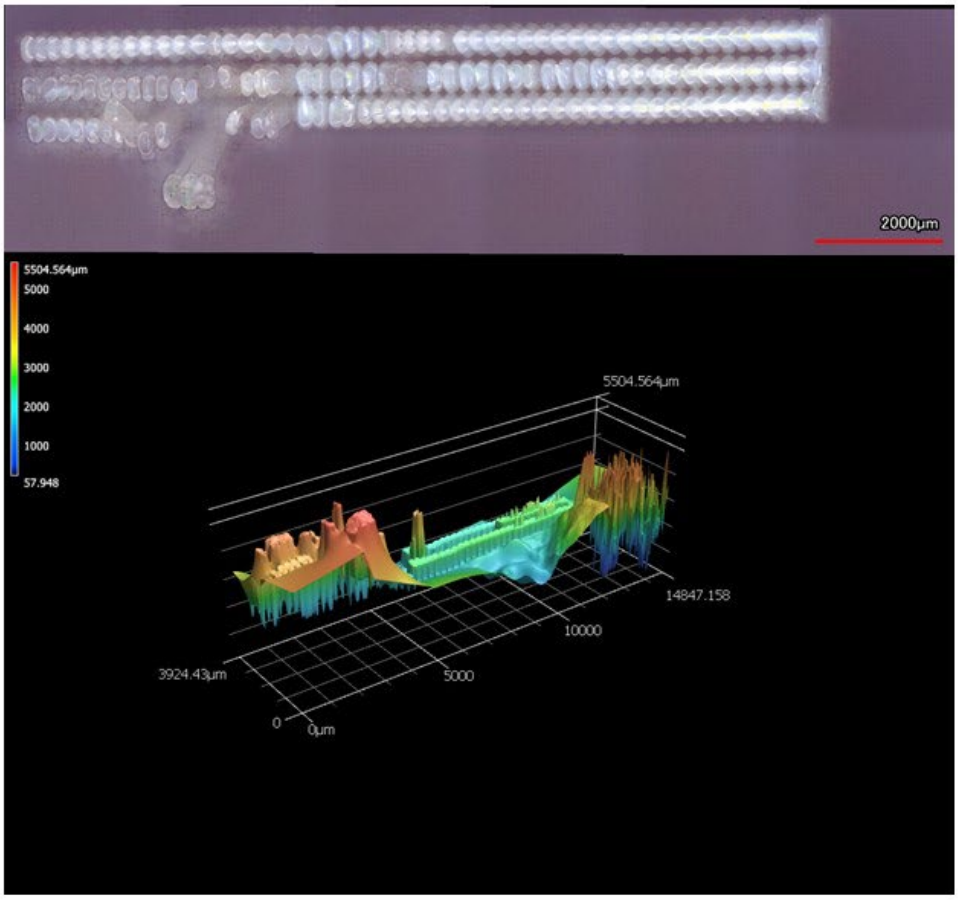
CC3(15)-YT-B (FRAC)



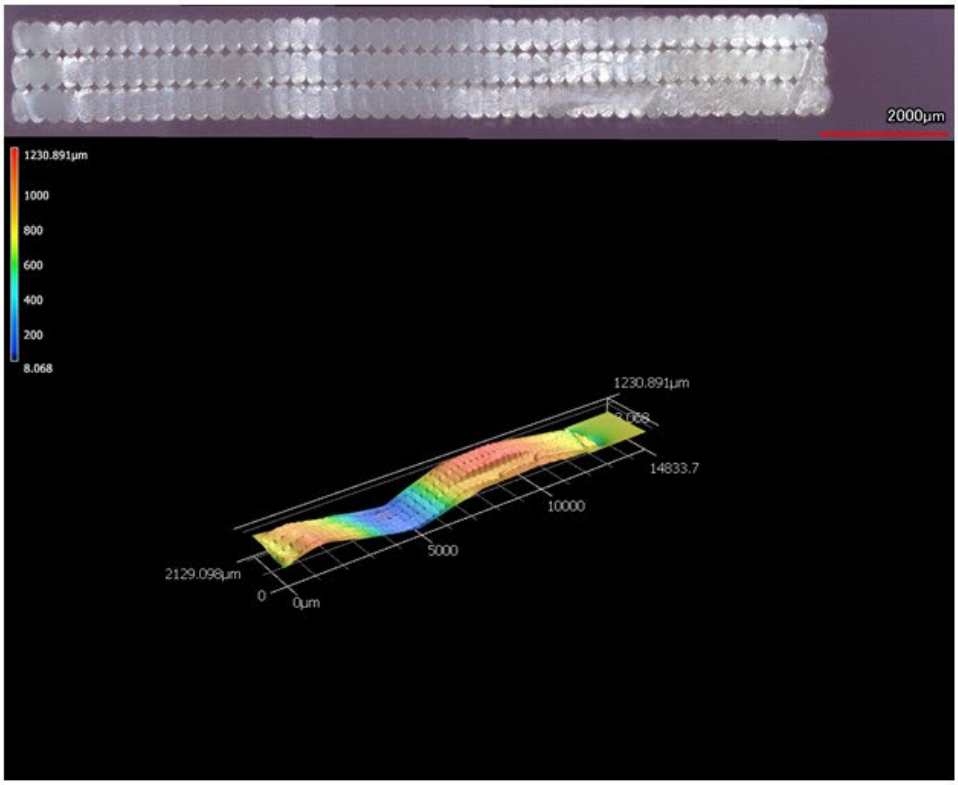
CC30-YT-A-1 (A-2 UNREACHABLE) (FRAC)



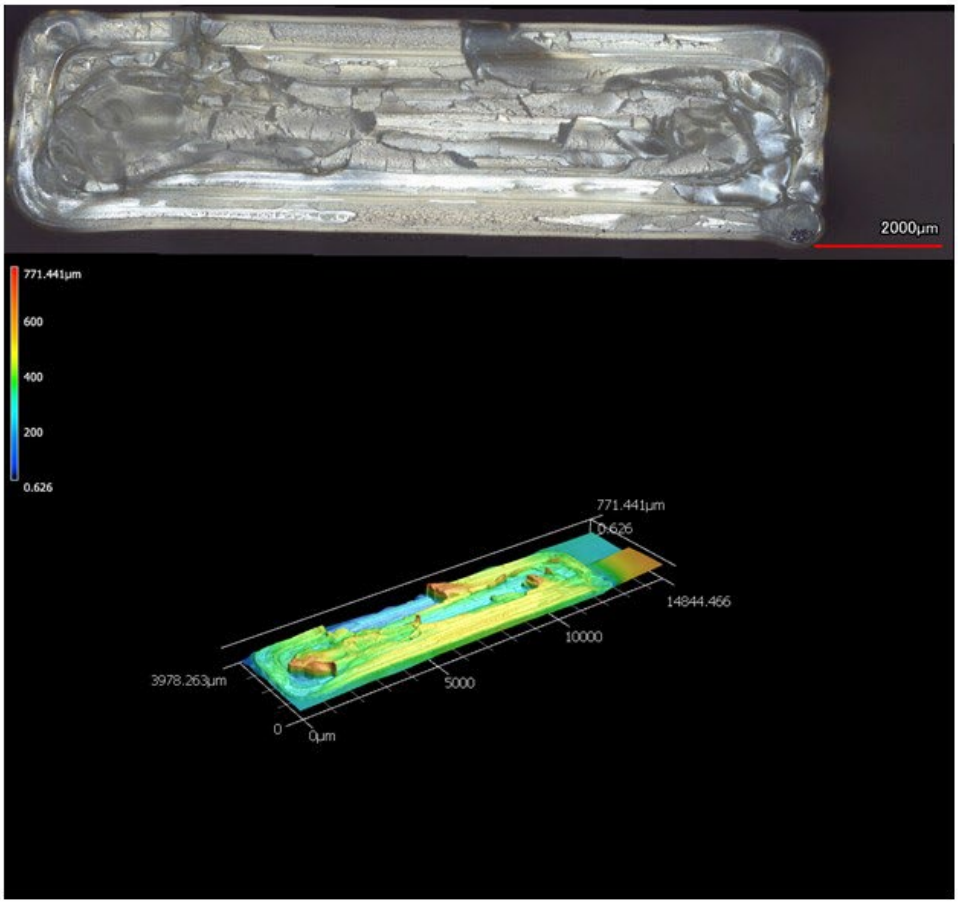
CC30-YT-B-1 (B-2 UNREACHABLE) (FRAC)



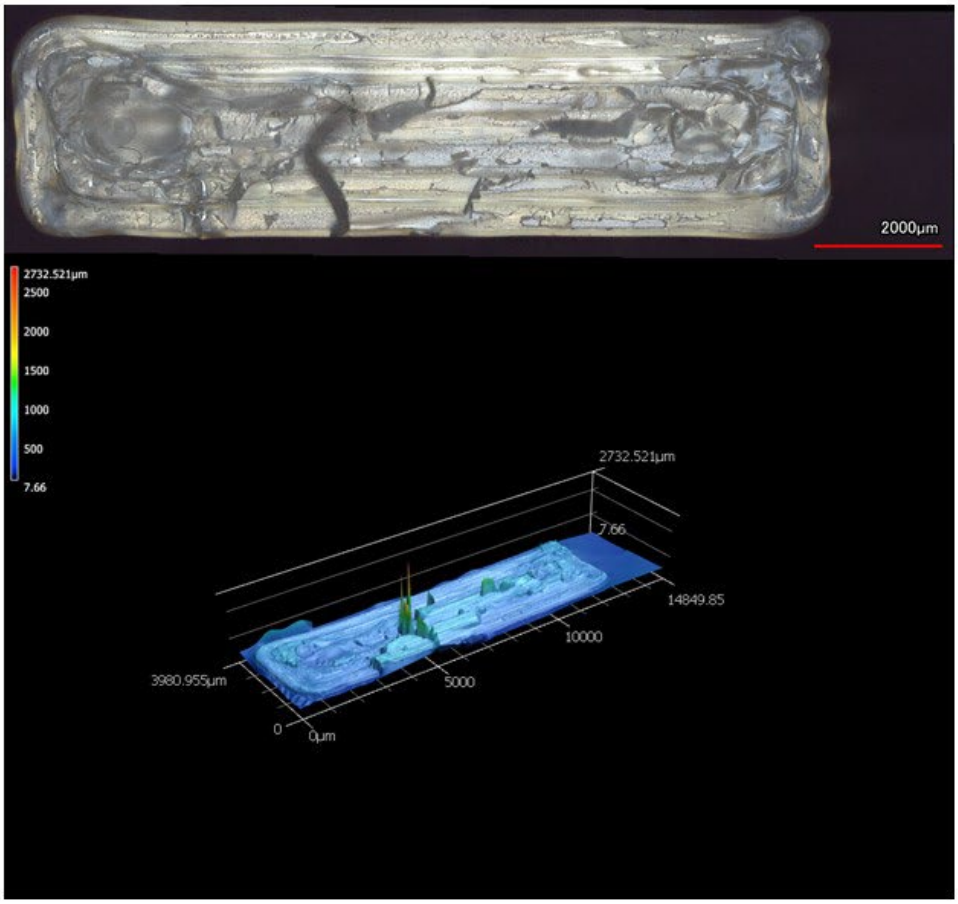
CC315-YT-A-1 (A-2 UNREACHABLE) (FRAC)



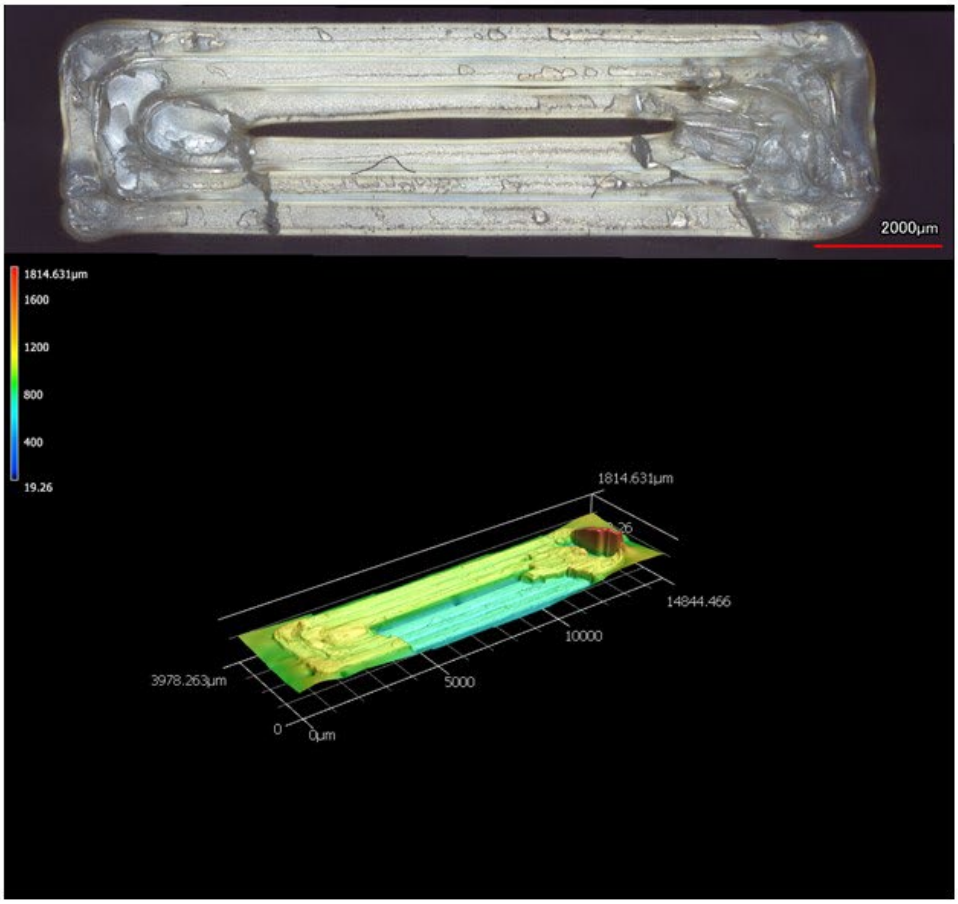
CC315-YT-B-1 (B-2 UNREACHABLE) (FRAC)



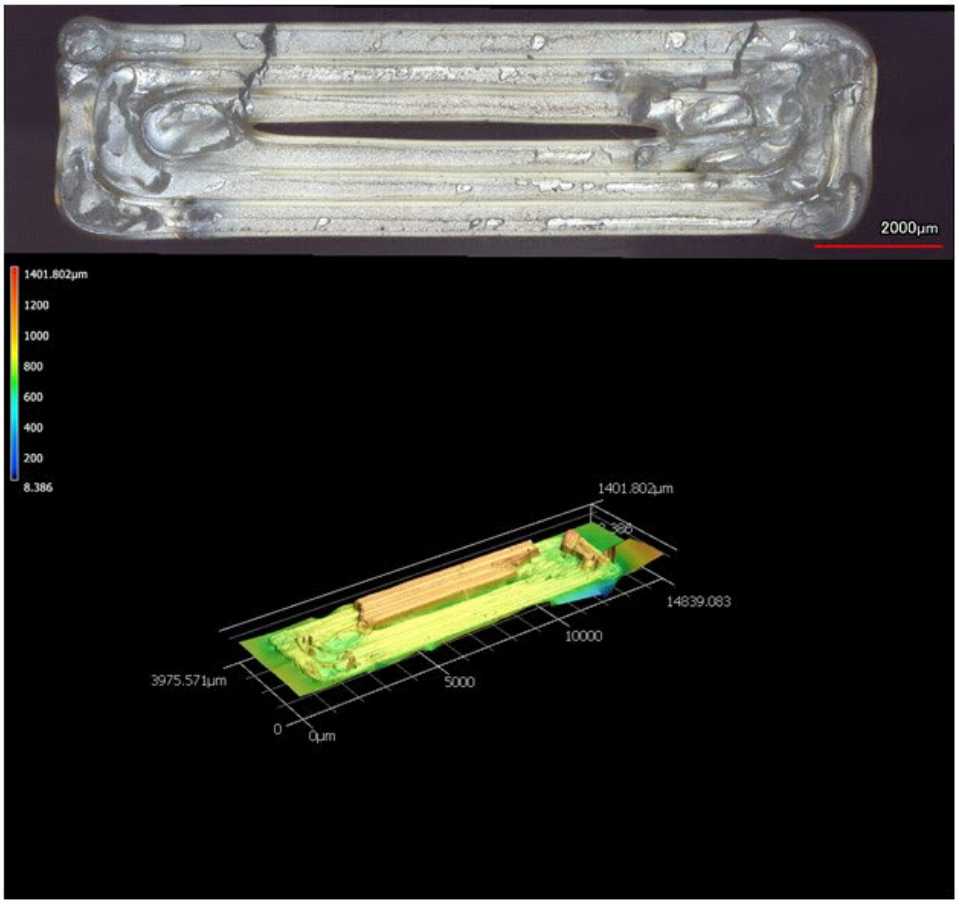
CC3(15)-ZT-A (FRAC)



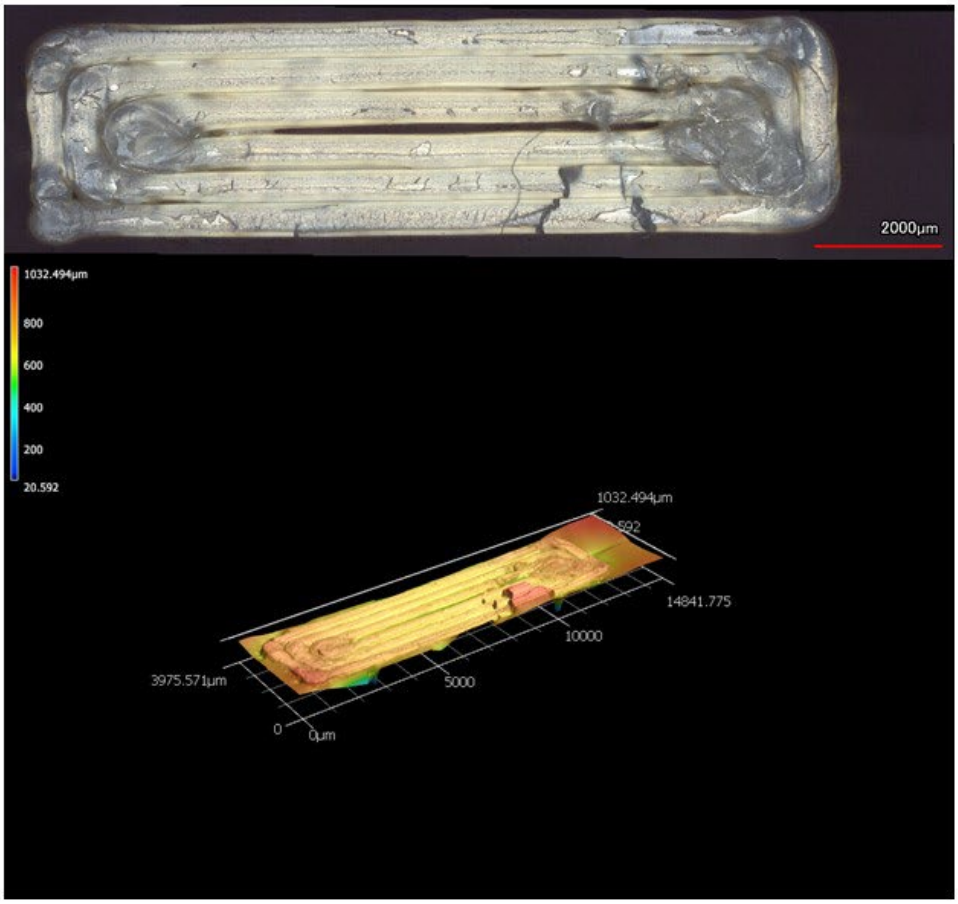
CC3(15)-ZT-B (FRAC)



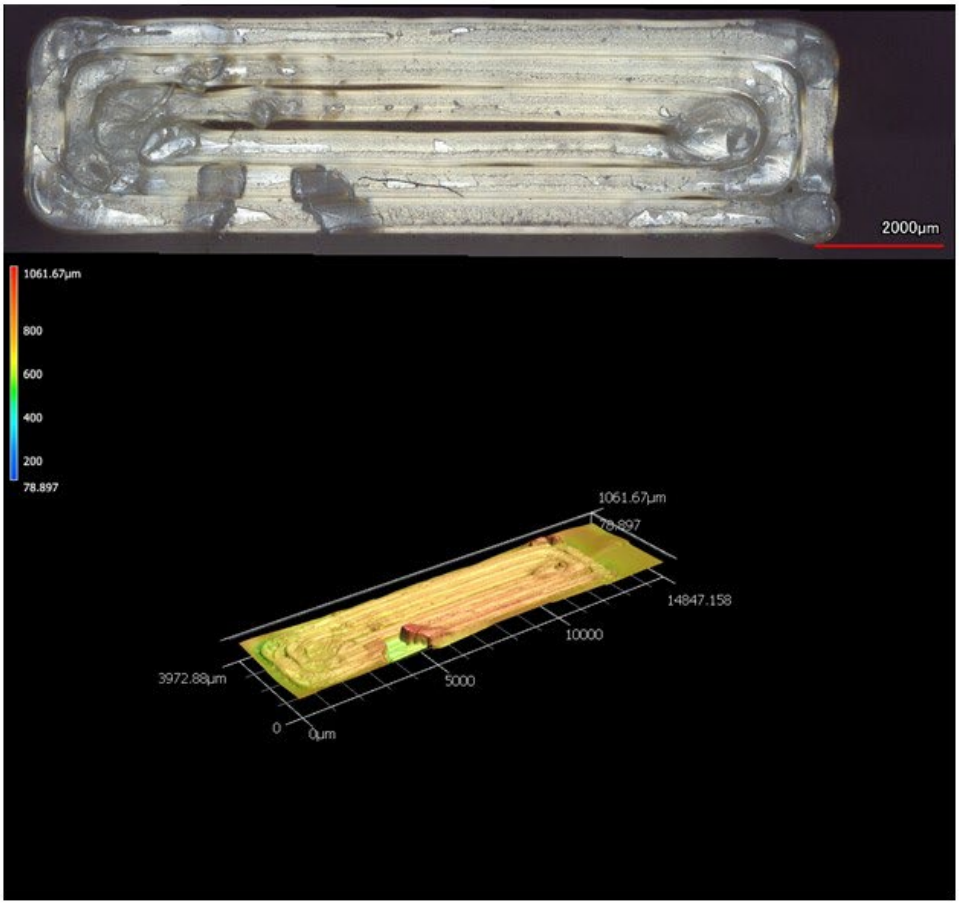
CC30-ZT-A (FRAC)



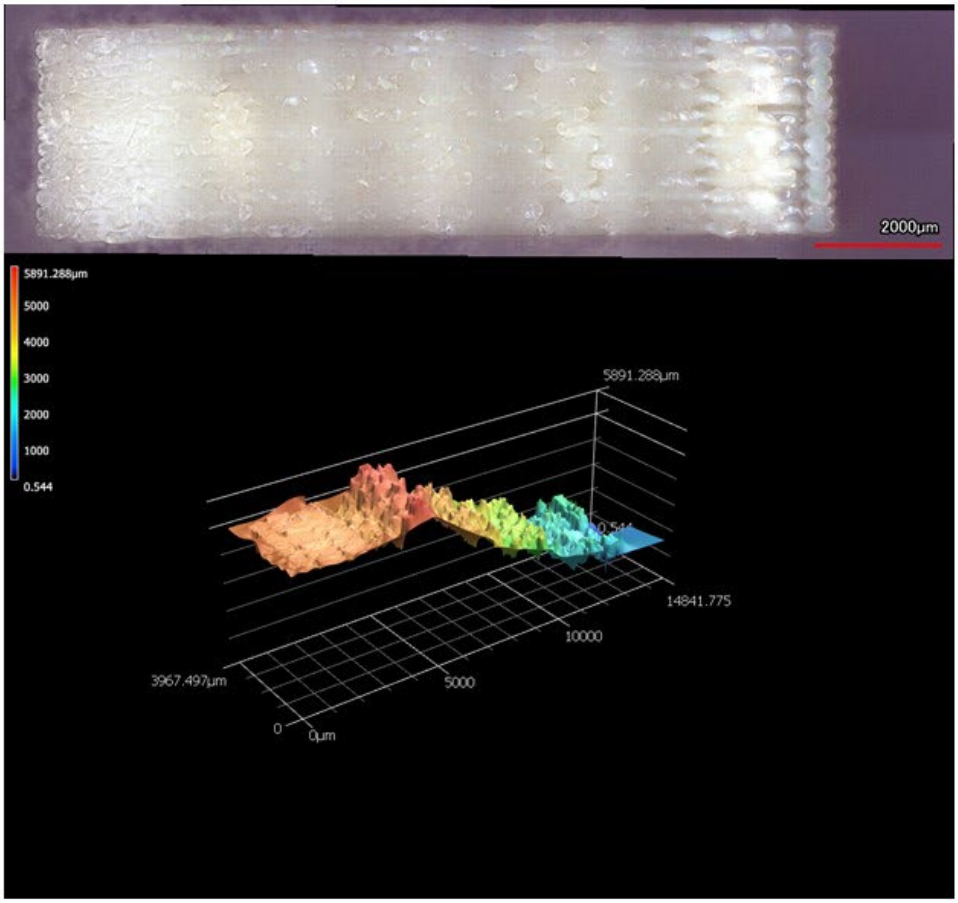
CC30-ZT-B (FRAC)



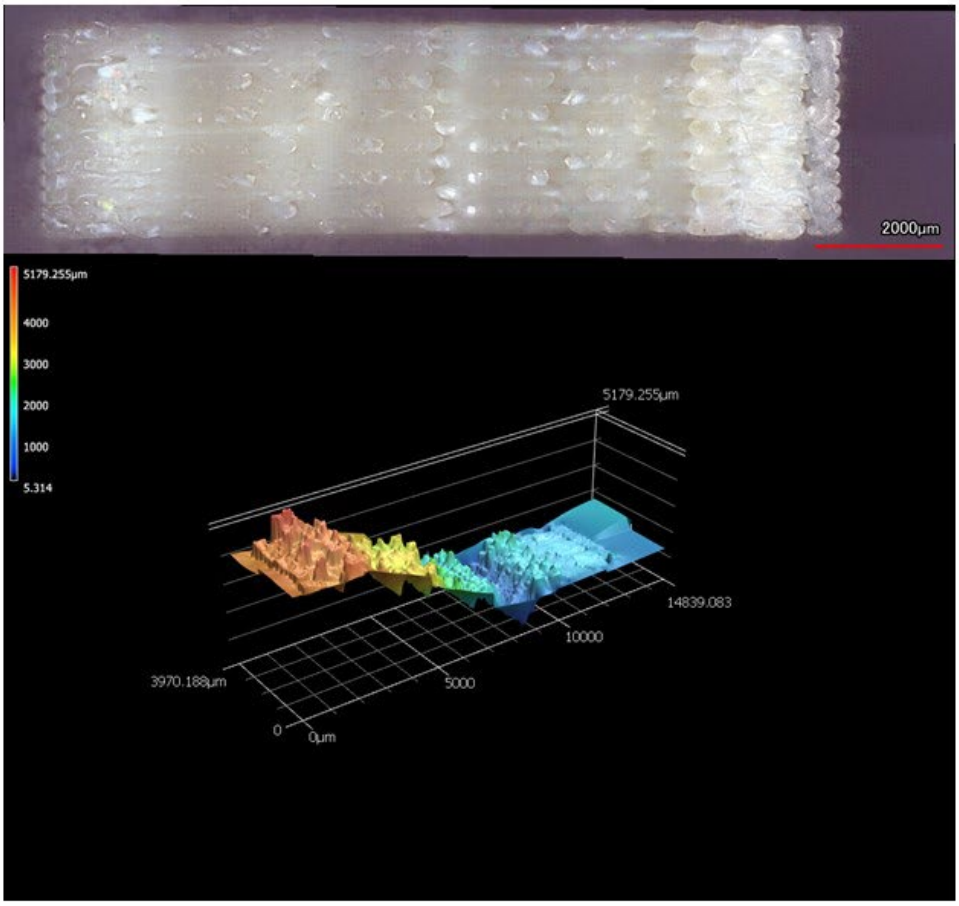
CC315-ZT-A (FRAC)



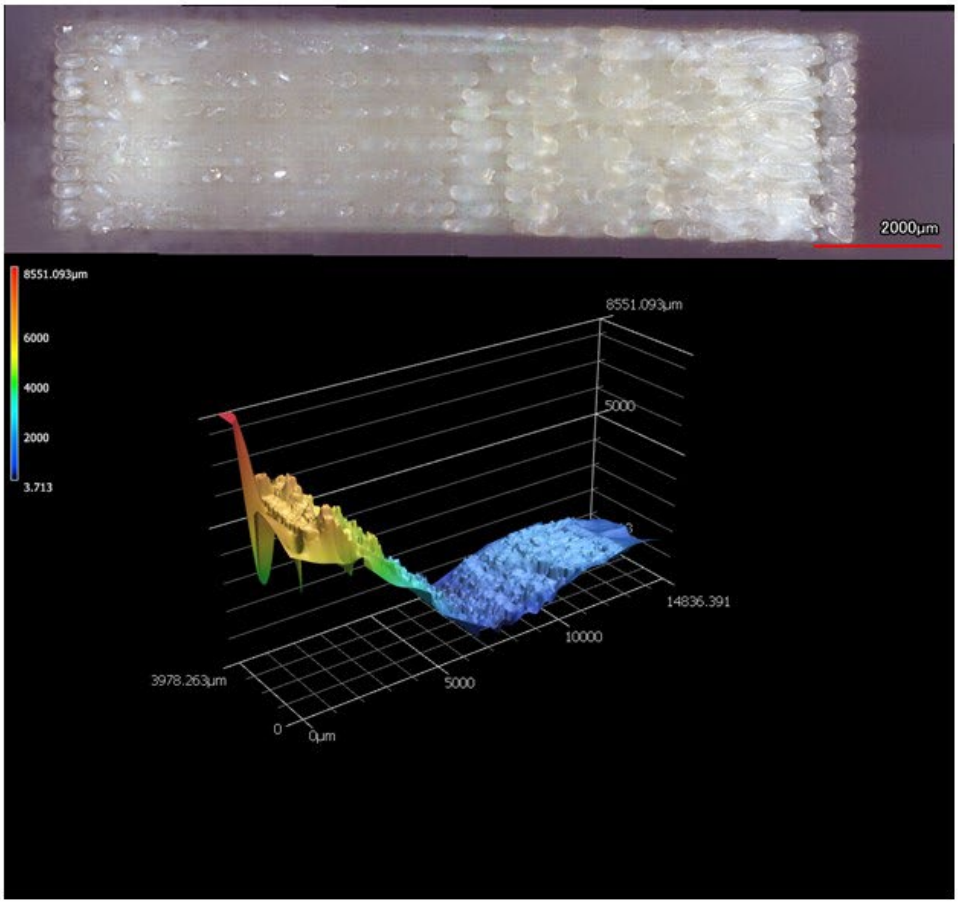
CC315-ZT-B (FRAC)


2000µm
5891.288µm
5000
4000
3000
2000
1000
0.544
5891.288µm
14841.775
10000
5000
3967.497µm
0
0µm

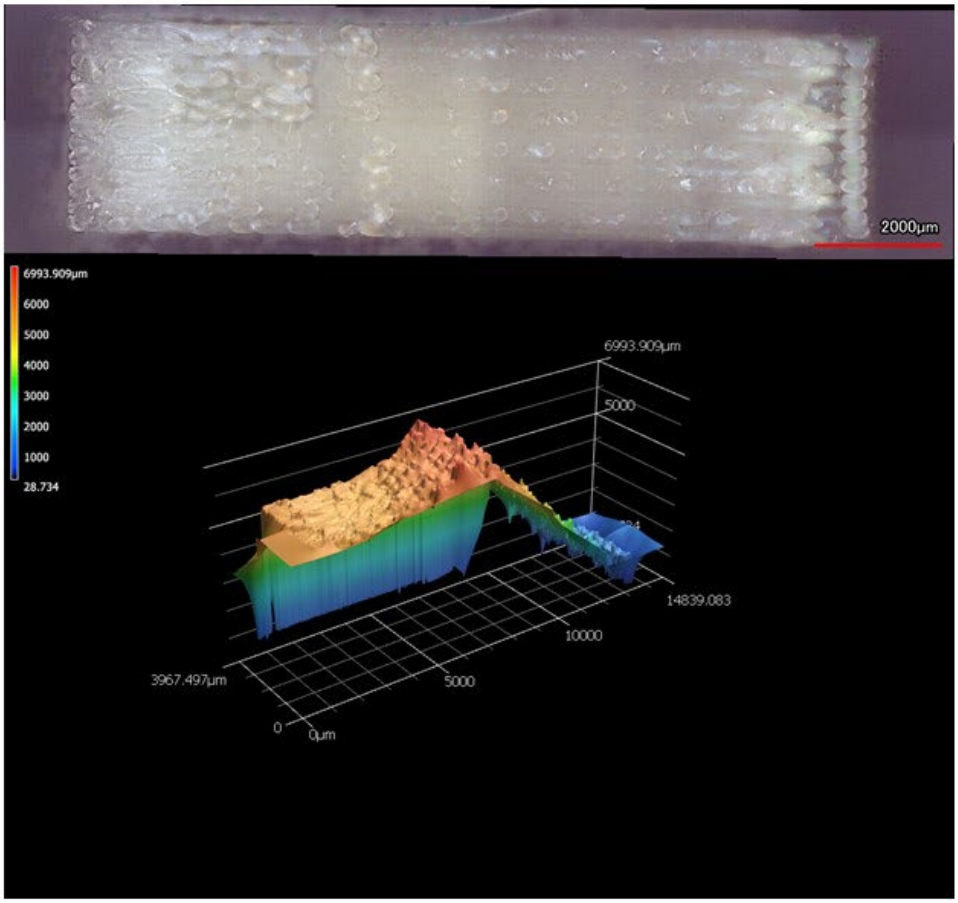
CR0-XT-A (FRAC)


2000µm
5179.255µm
4000
3000
2000
1000
5.314
5179.255µm
14839.083
10000
5000
3970.188µm
0
0µm

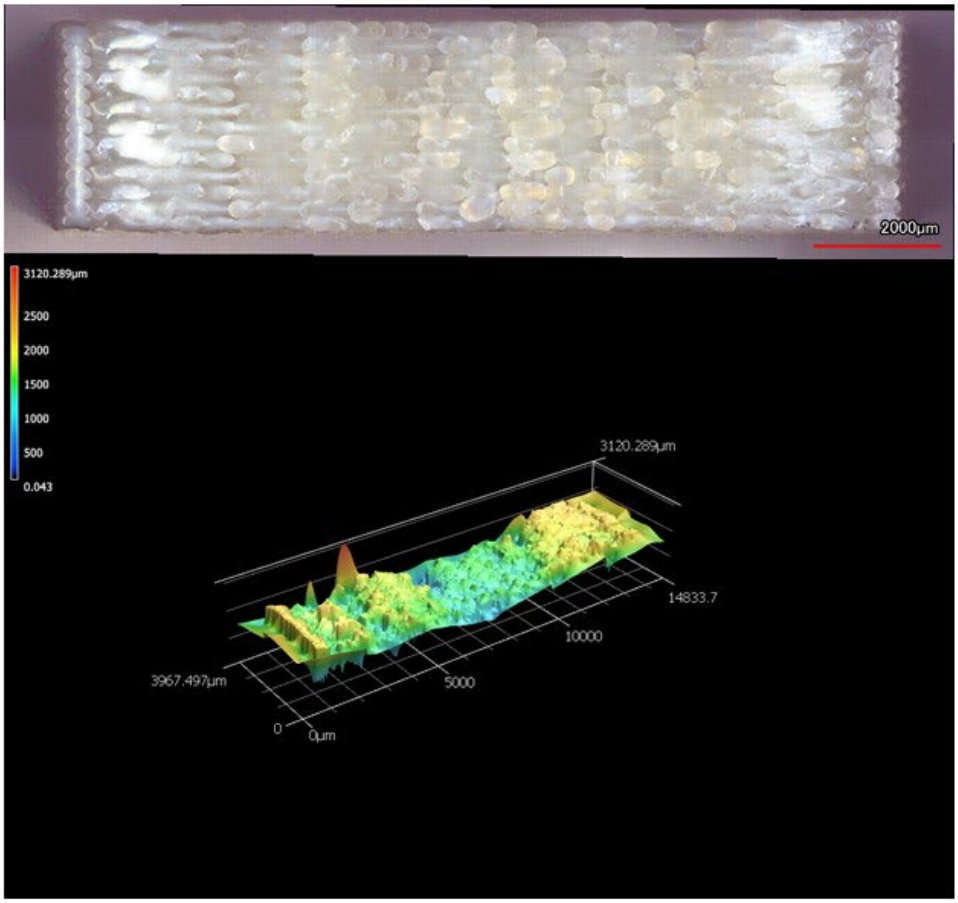
CR0-XT-B (FRAC)


2000µm
8551.093µm
6000
4000
2000
3.713
8551.093µm
5000
14836.391
10000
3978.263µm
5000
0
0µm

CR(15)-XT-A



CR(15)-XT-B (FRAC)



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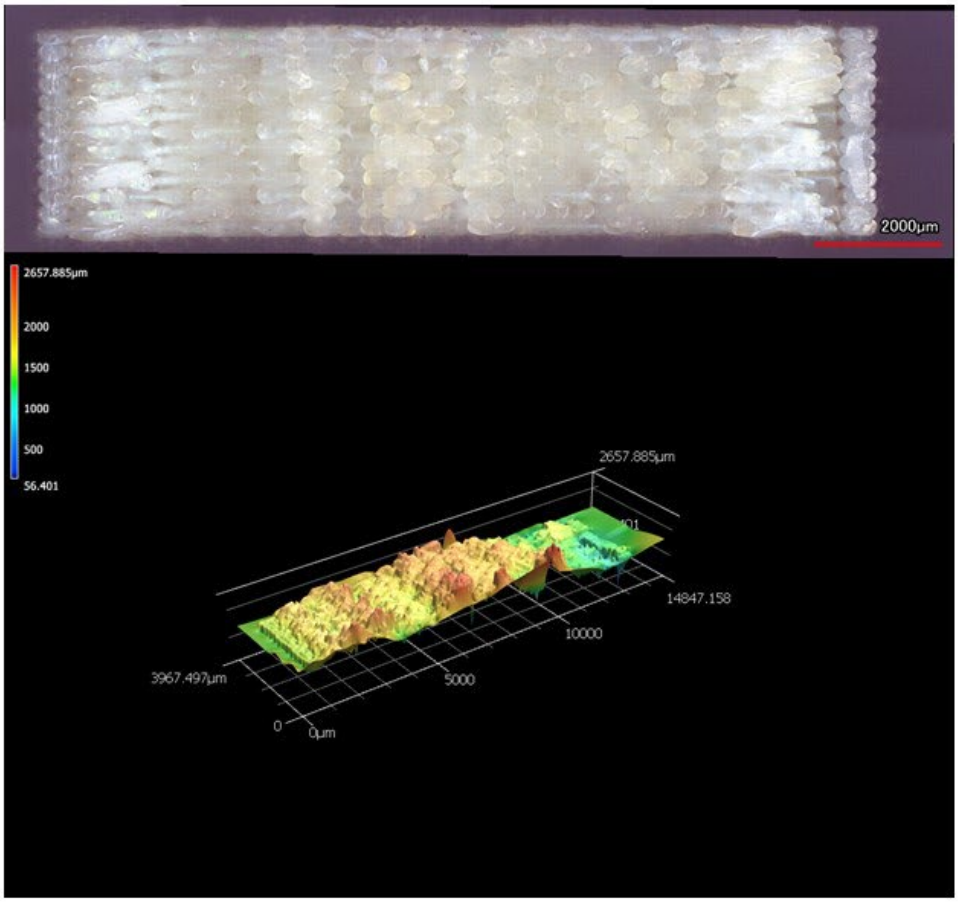
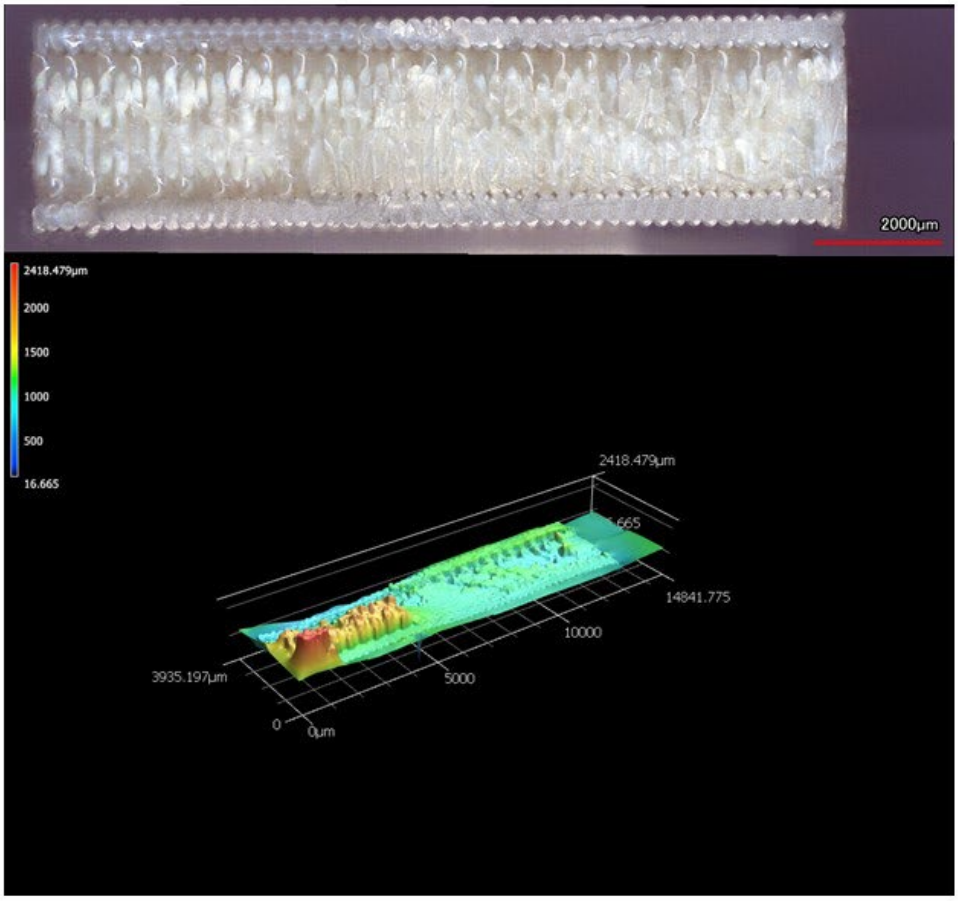
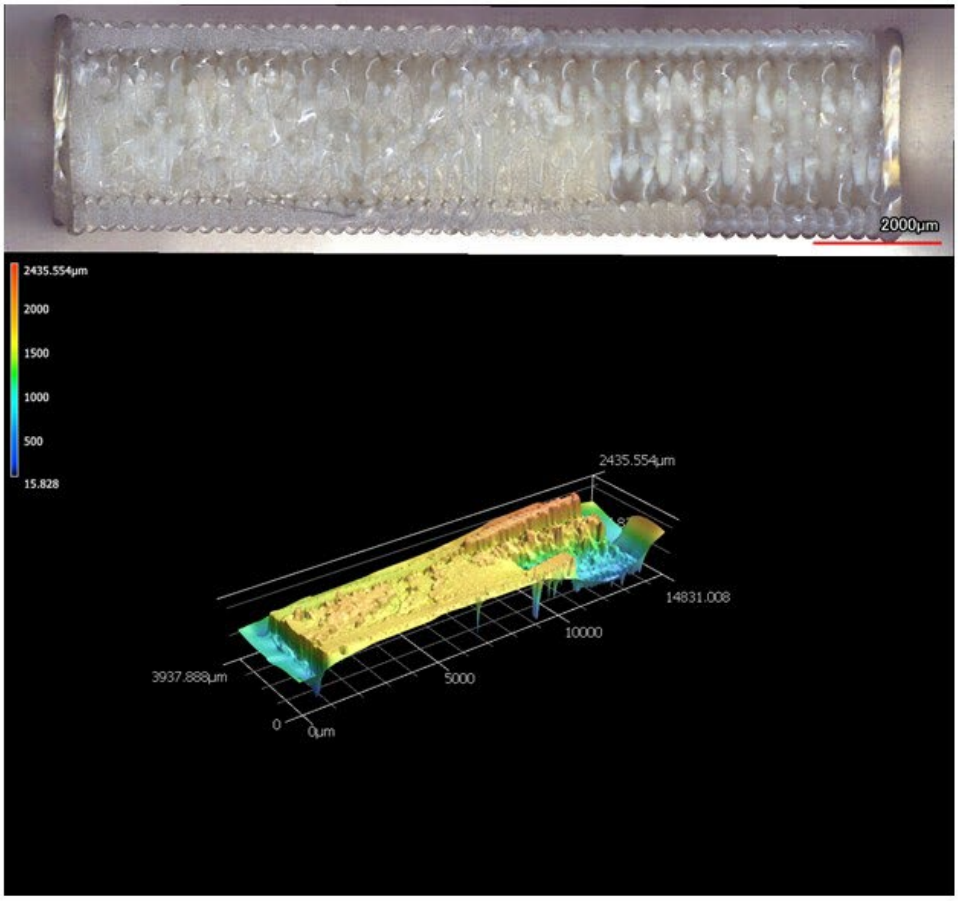


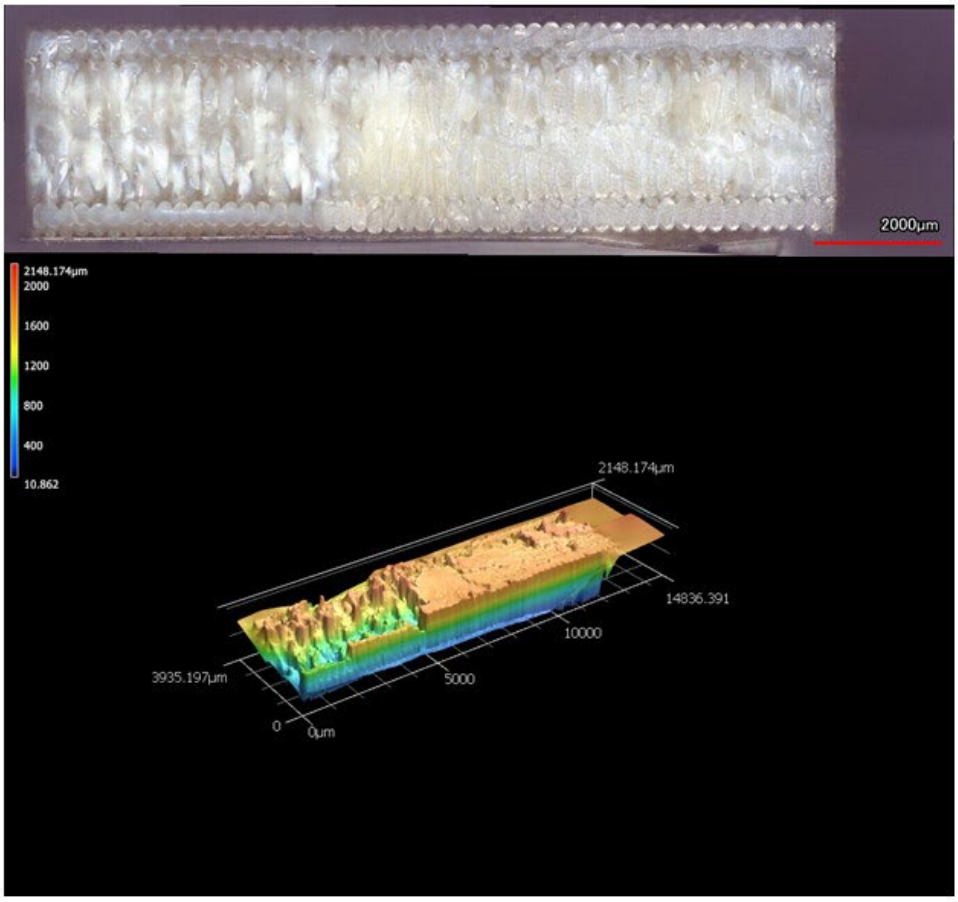
CR15-XT-B (FRAC)


2000µm
2418.479µm
2000
1500
1000
500
16.665
2418.479µm
14841.775
10000
5000
3935.197µm
0
0µm

CR0-YT-A (FRAC)


2000µm
2435.554µm
2000
1500
1000
500
15.828
2435.554µm
14831.008
10000
5000
3937.888µm
0
0µm

CR0-YT-B (FRAC)



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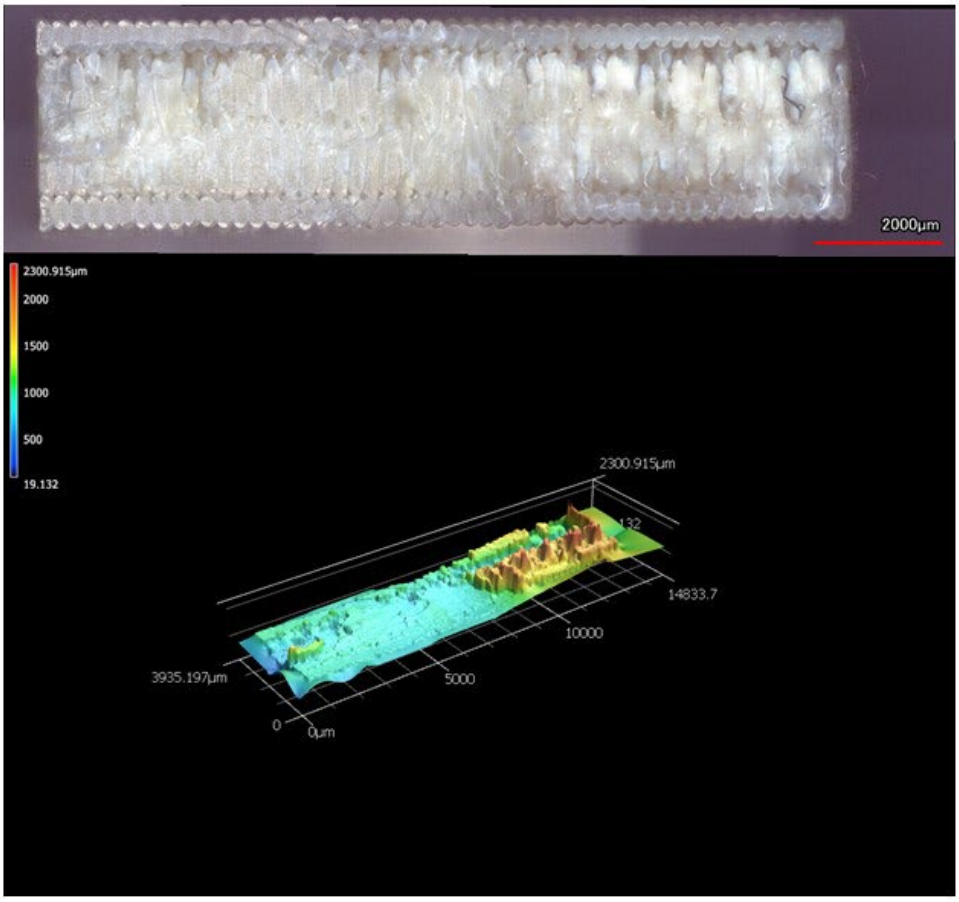
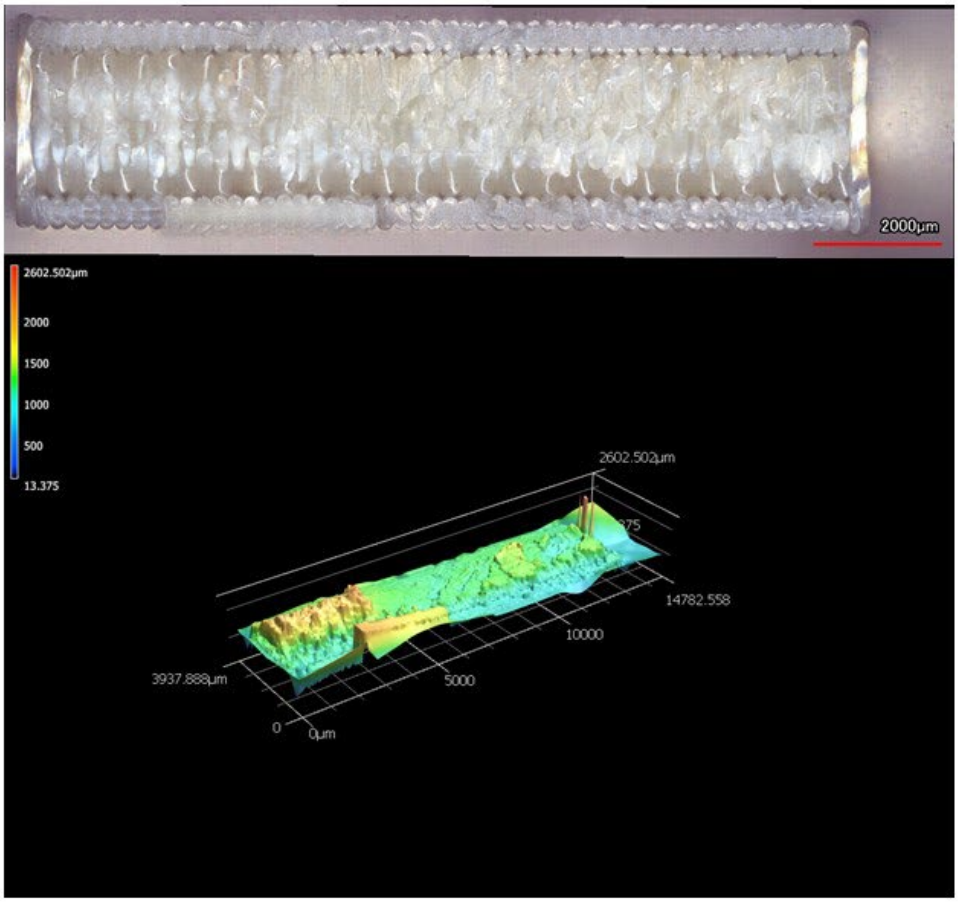
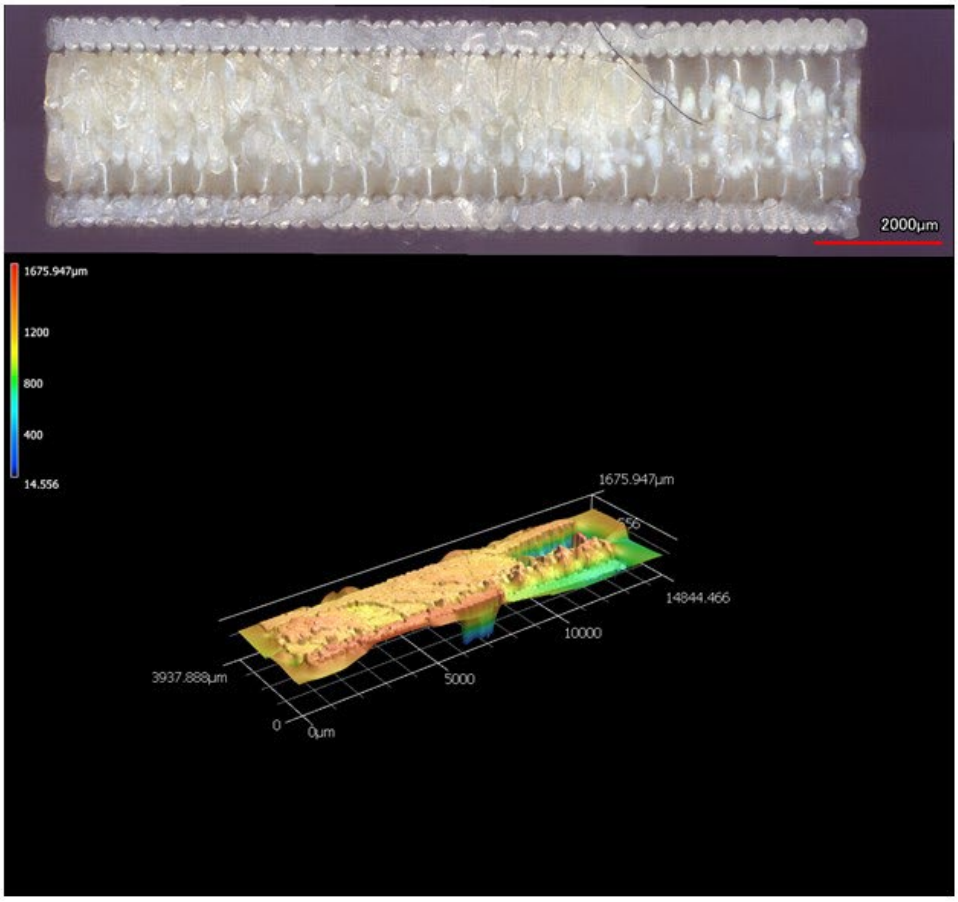


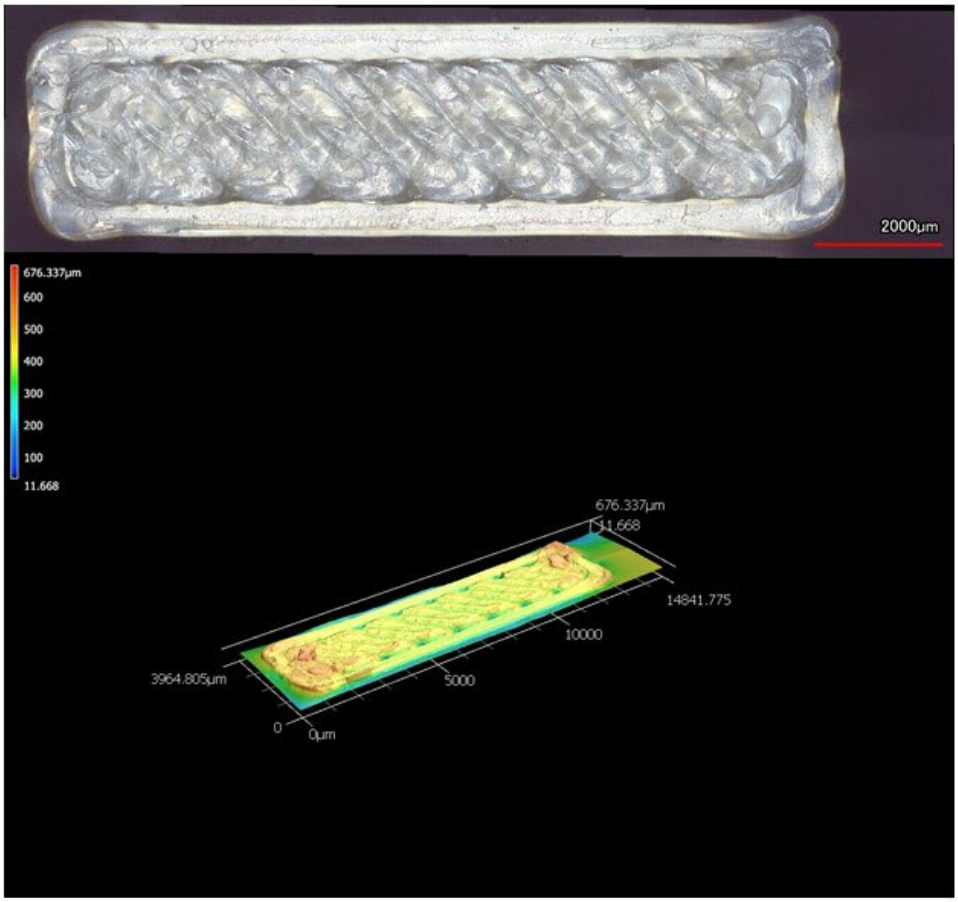
CR(15)-YT-B (FRAC)



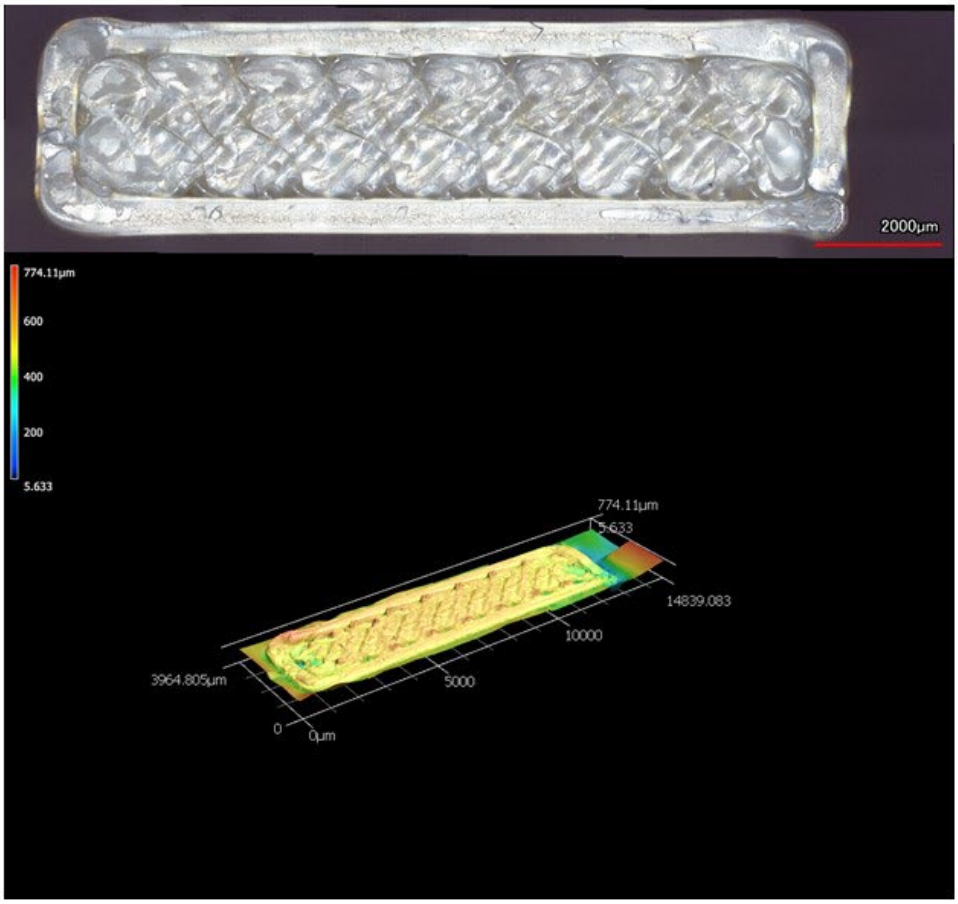
CR15-YT-A (FRAC)



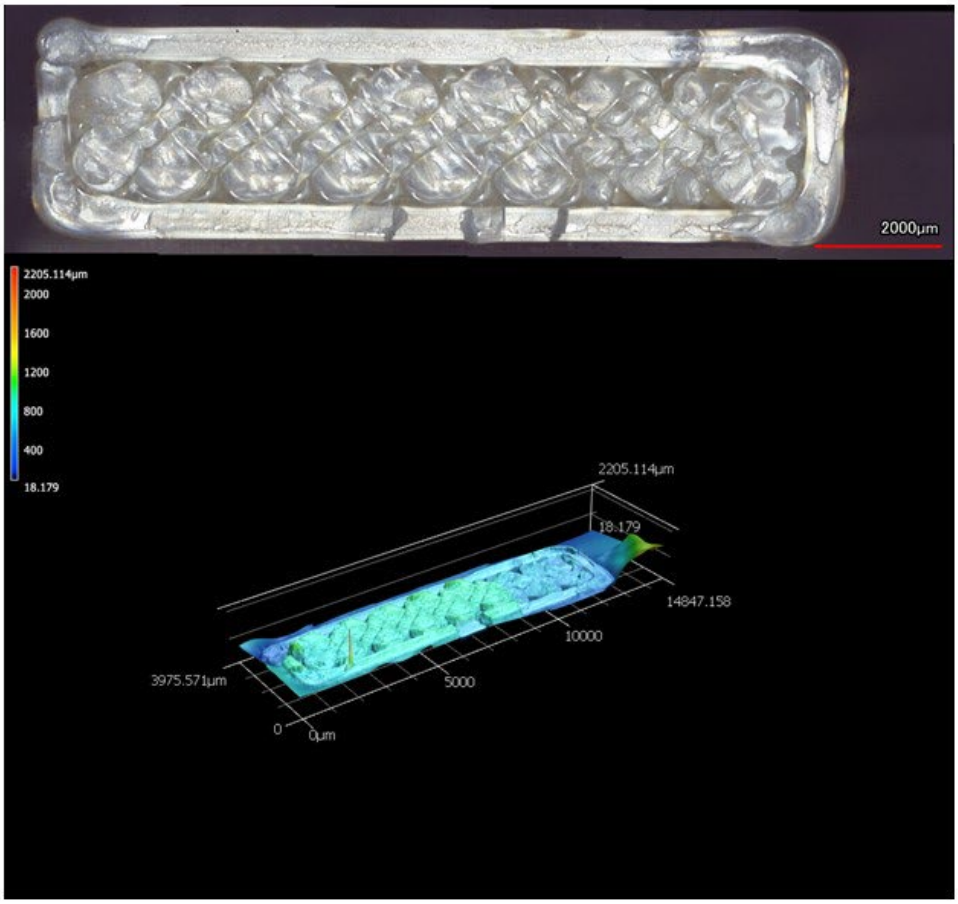
CR15-YT-B (FRAC)


2000µm
676.337µm
600
500
400
300
200
100
11.668
676.337µm
11.668
14841.775
10000
5000
3964.805µm
0
0µm

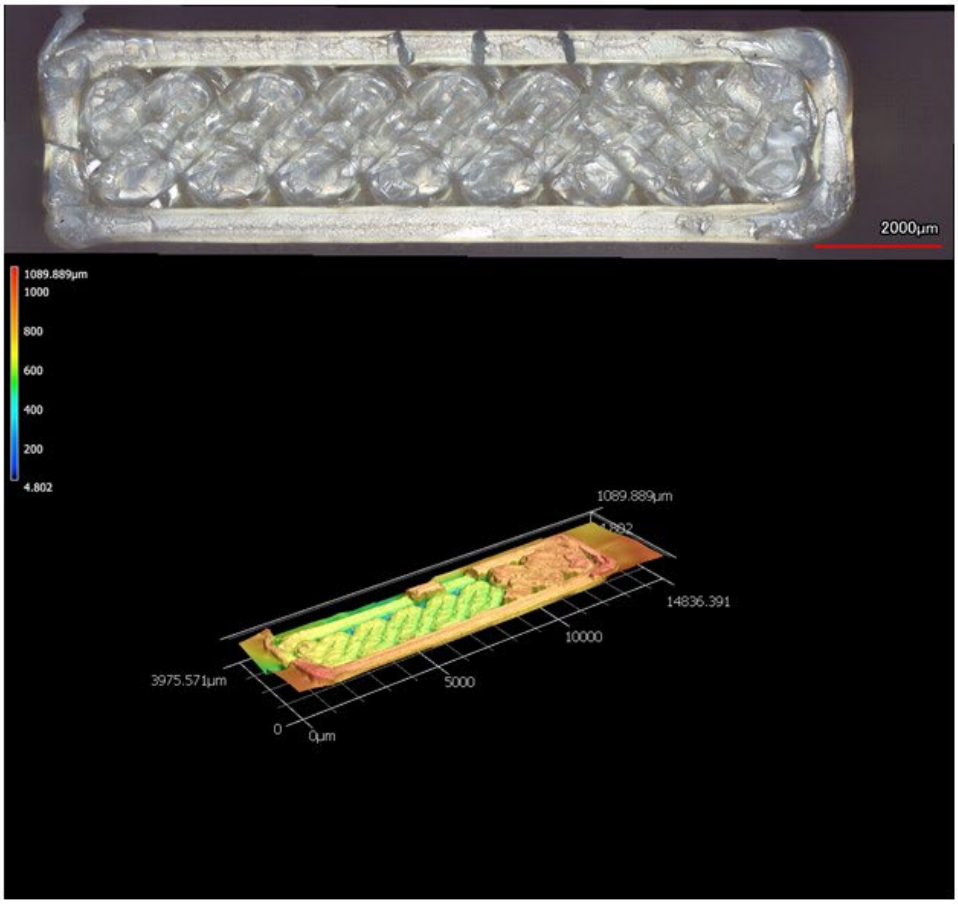
CR0-ZT-A (FRAC)


2000µm
774.11µm
600
400
200
5.633
774.11µm
5.633
14839.083
10000
5000
3964.805µm
0
0µm

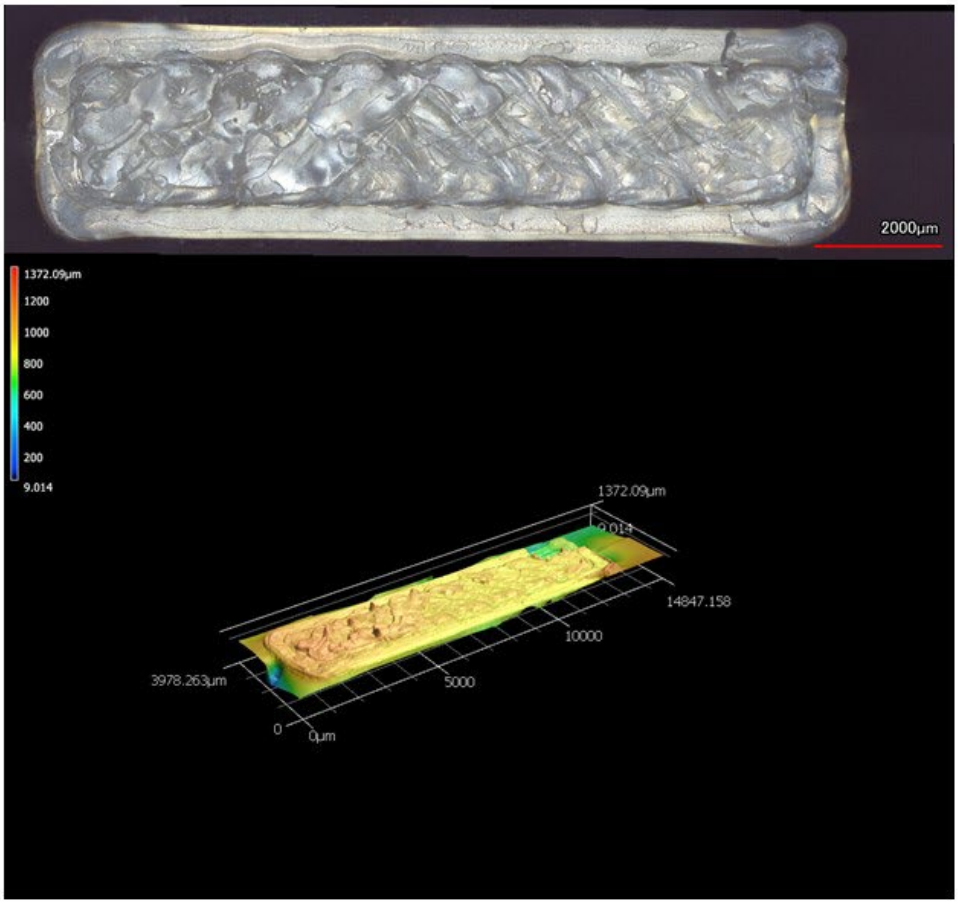
CR0-ZT-B (FRAC)



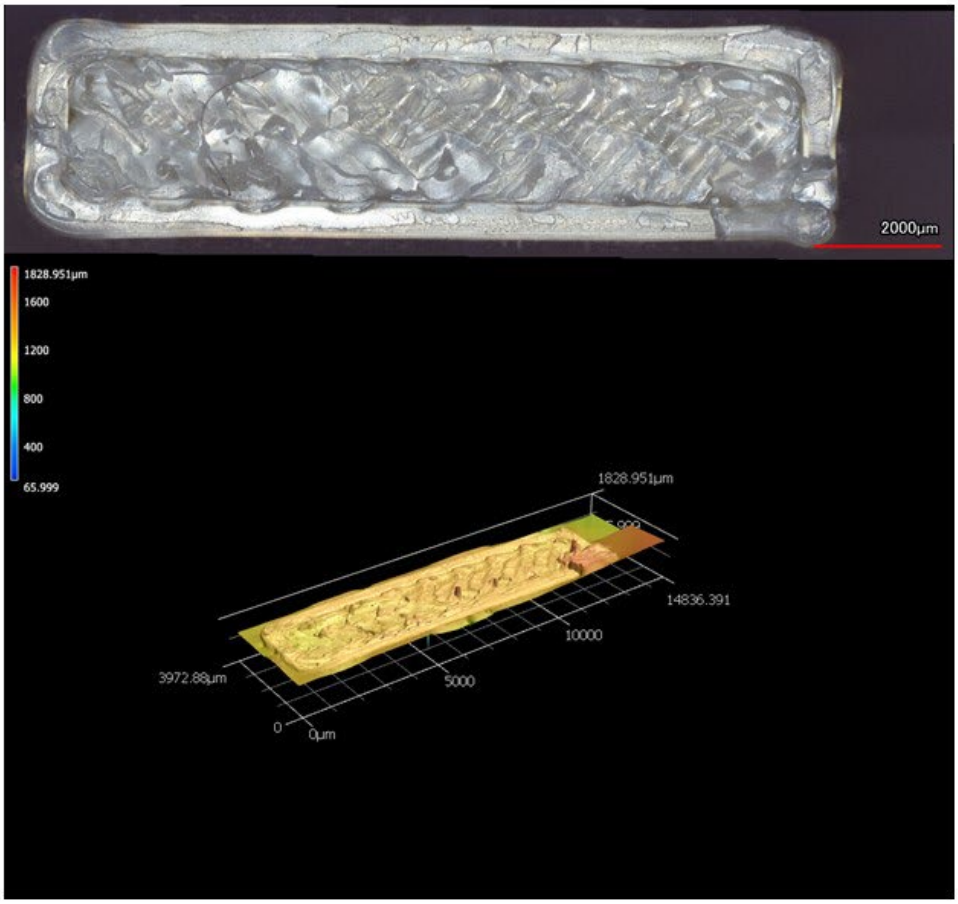
CR15-ZT-A (FRAC)



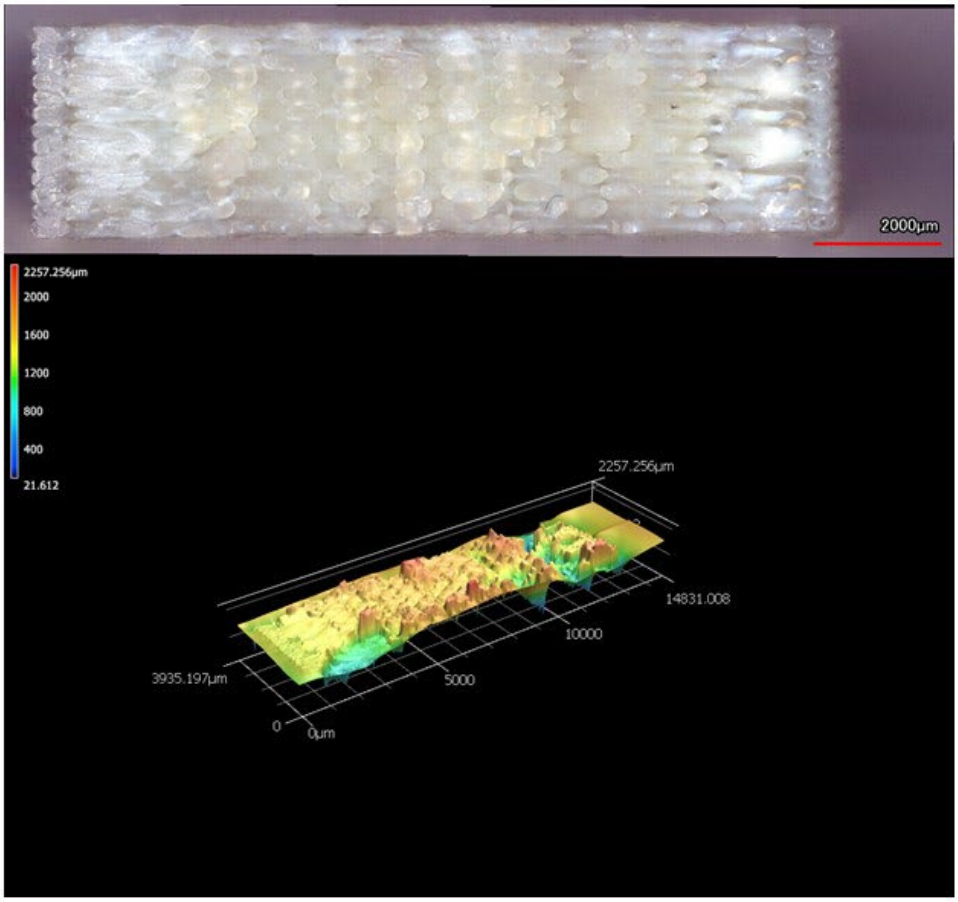
CR15-ZT-B (FRAC)



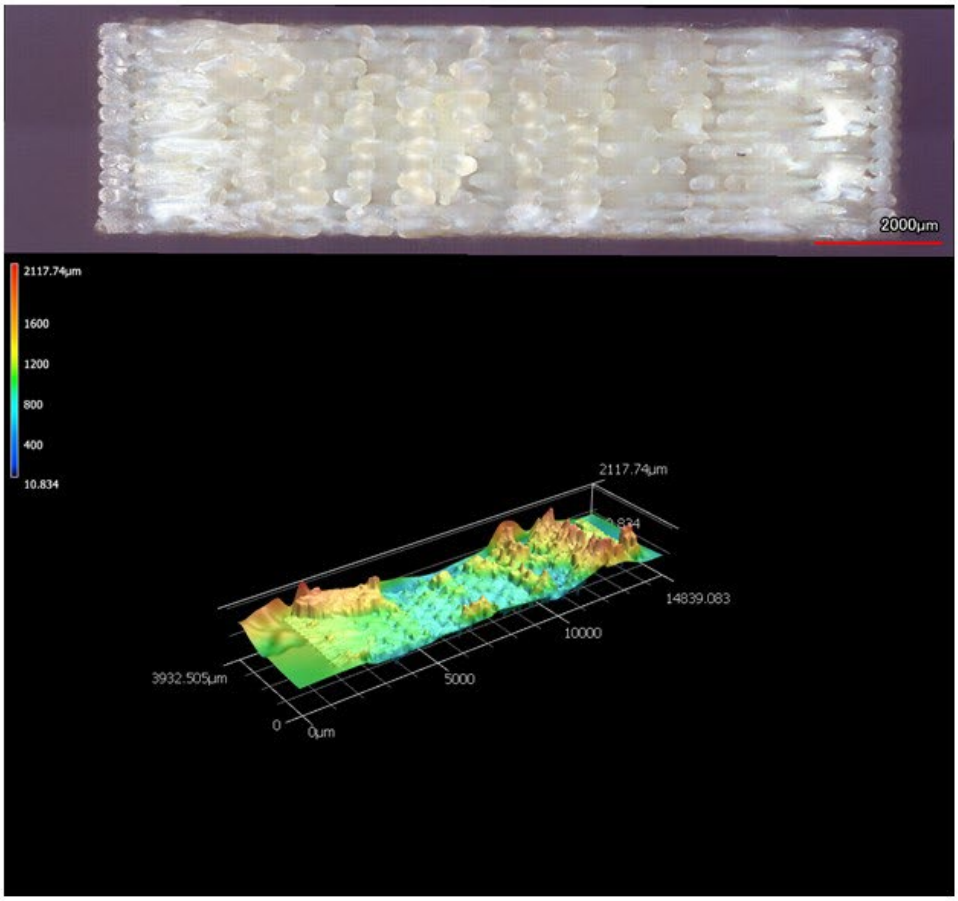
CR(15)-ZT-A (FRAC)



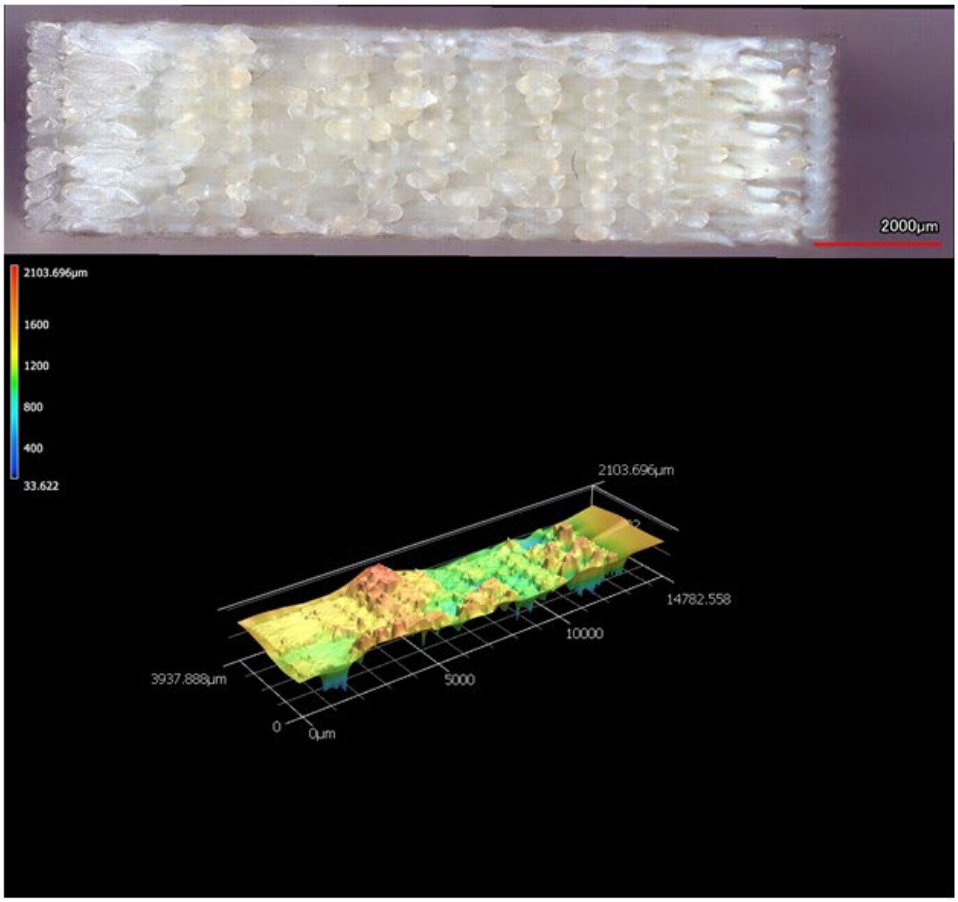
CR(15)-ZT-B (FRAC)



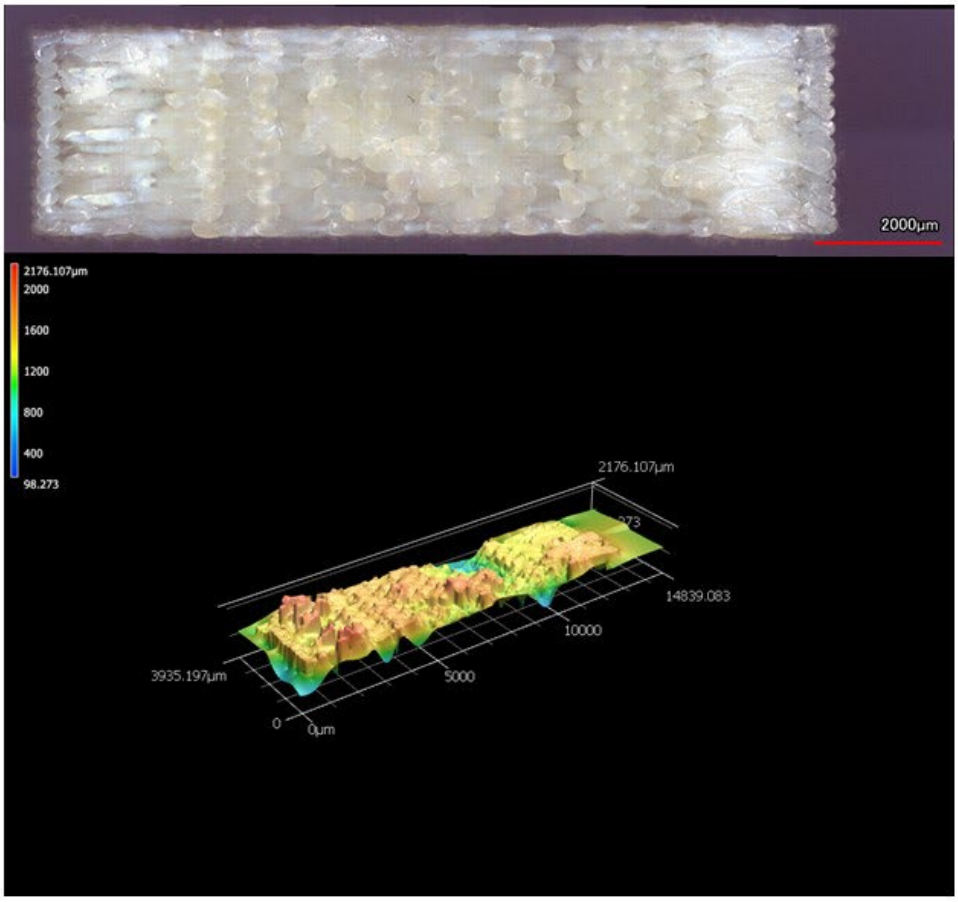
EVSR17-XT-A (FRAC)



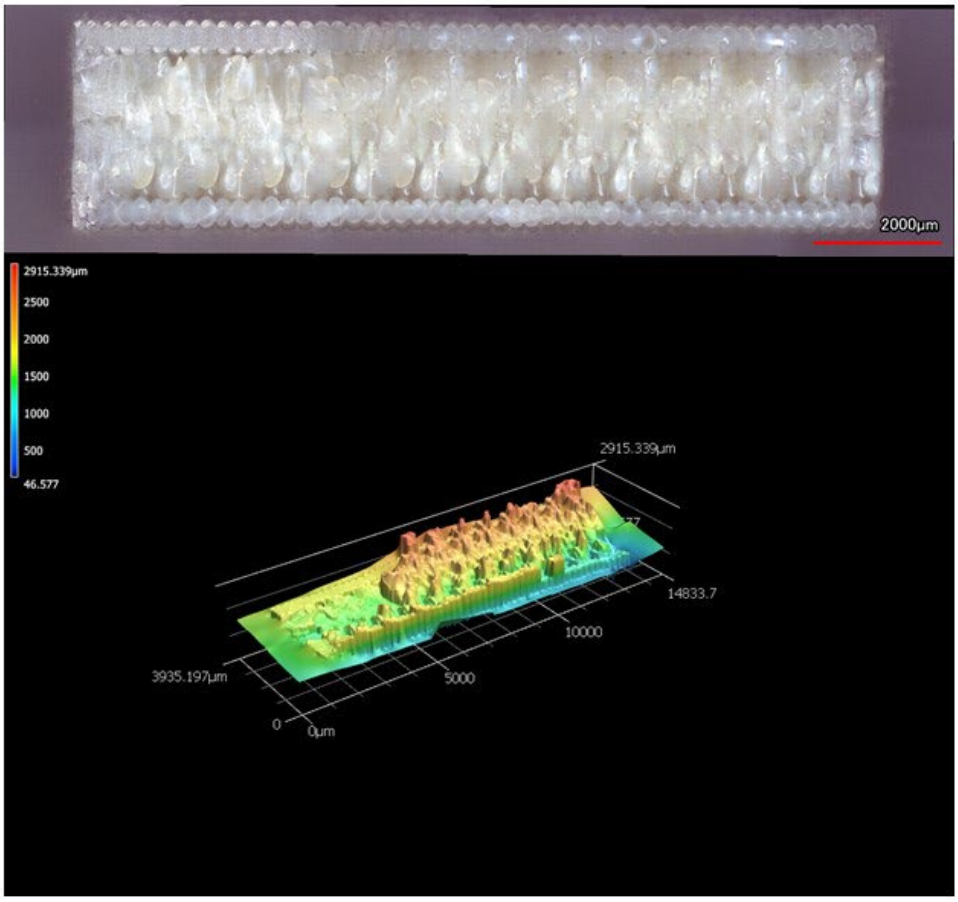
EVSR17-XT-B (FRAC)



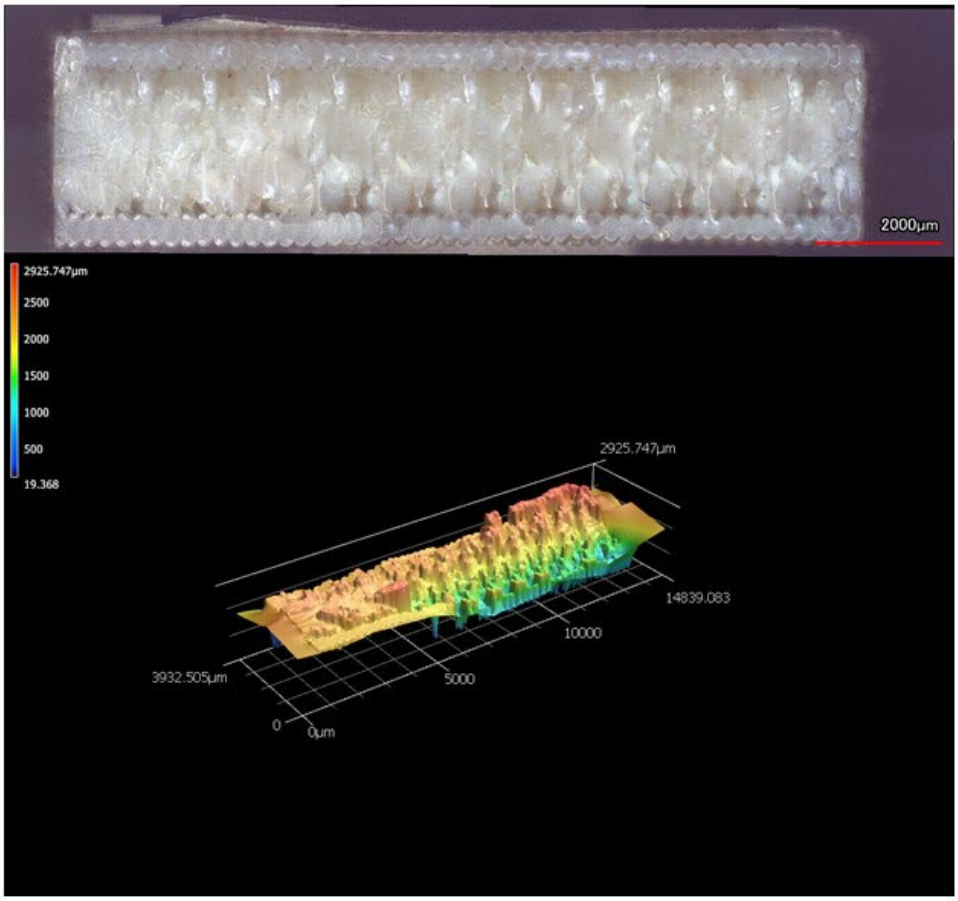
EVSR20-XT-A (FRAC)



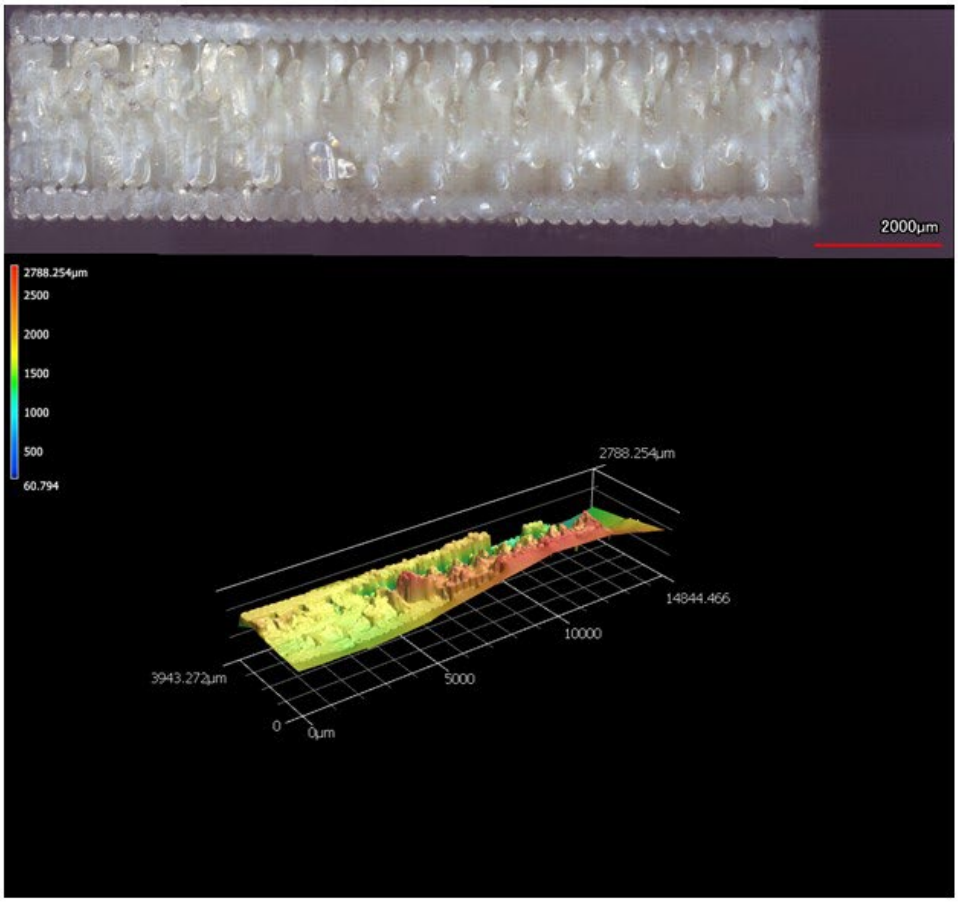
EVSR20-XT-B (FRAC)



EVSR17-YT-A (FRAC)



EVSR17-YT-B (FRAC)



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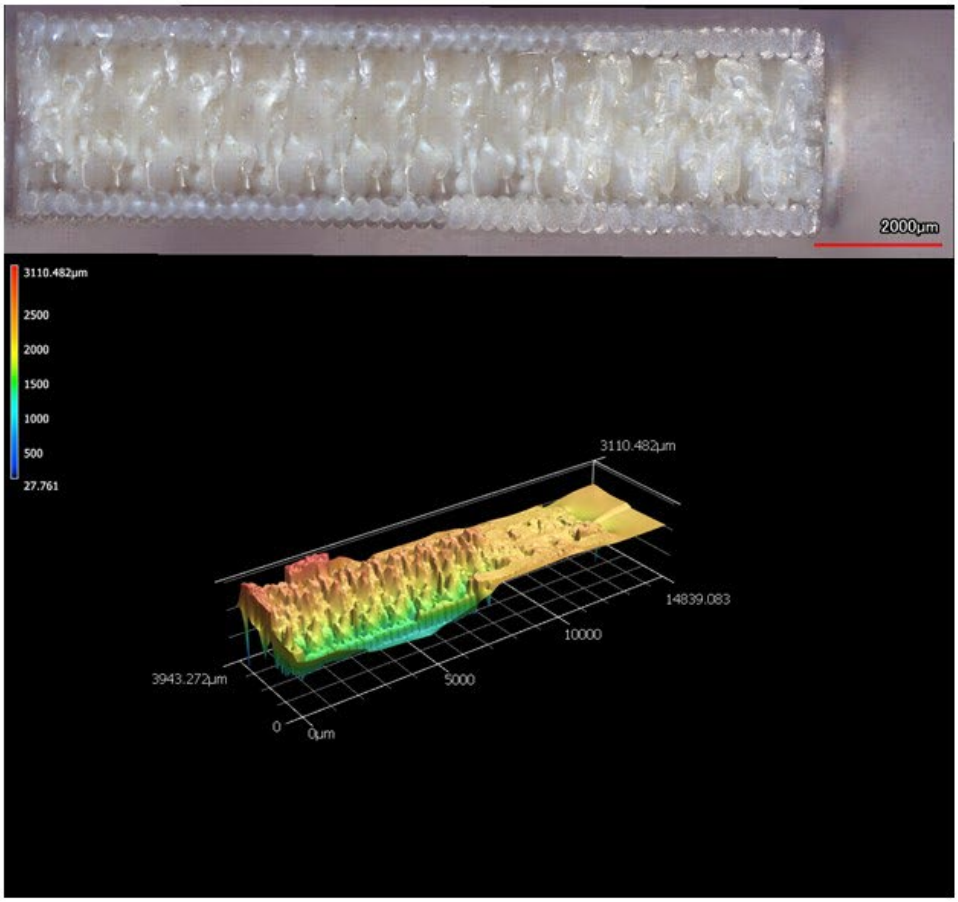
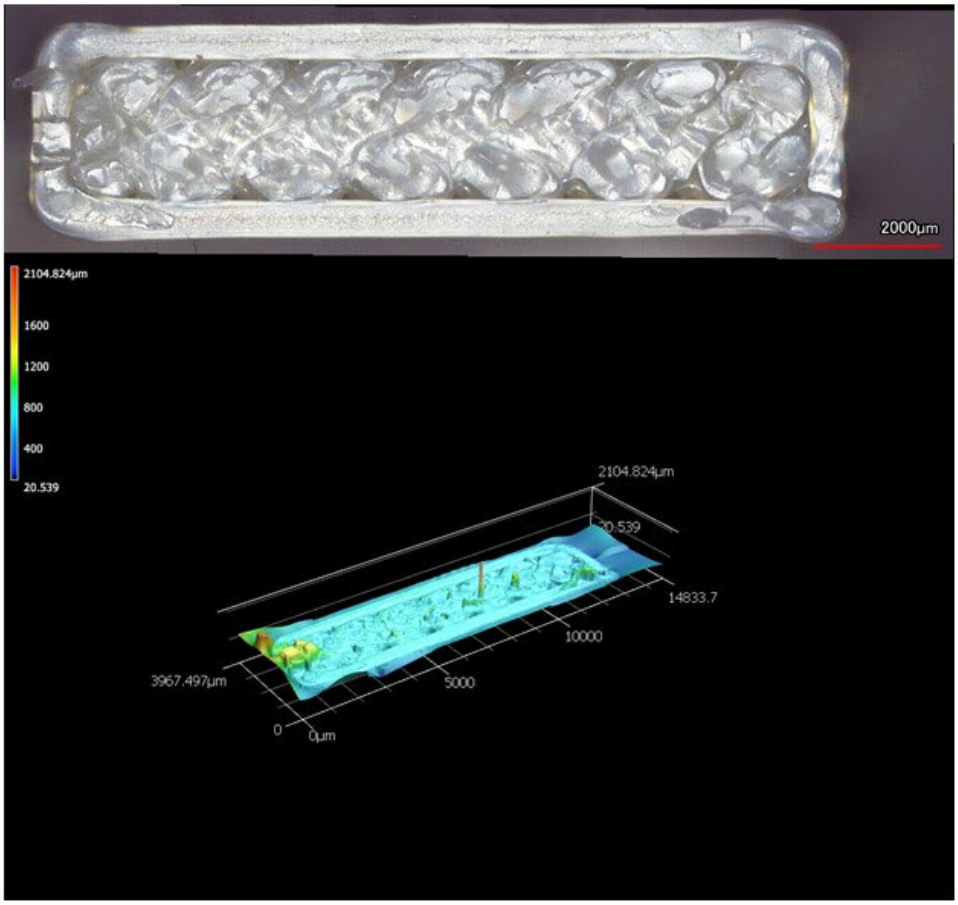
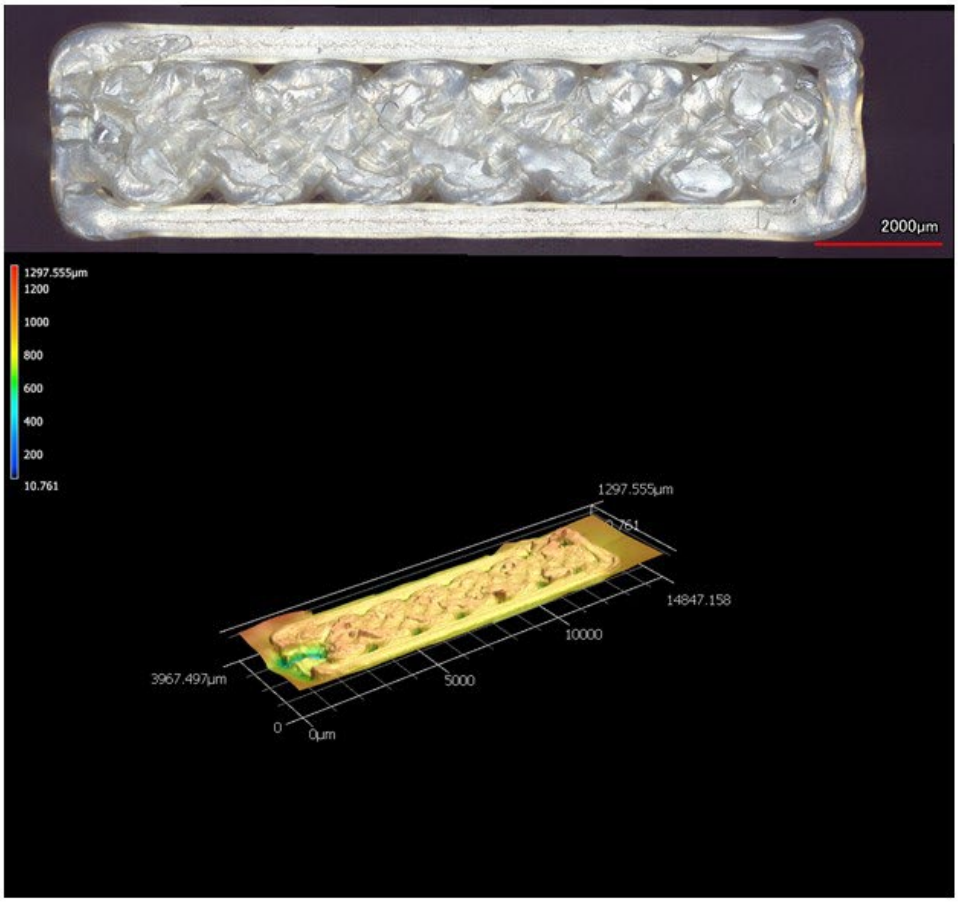


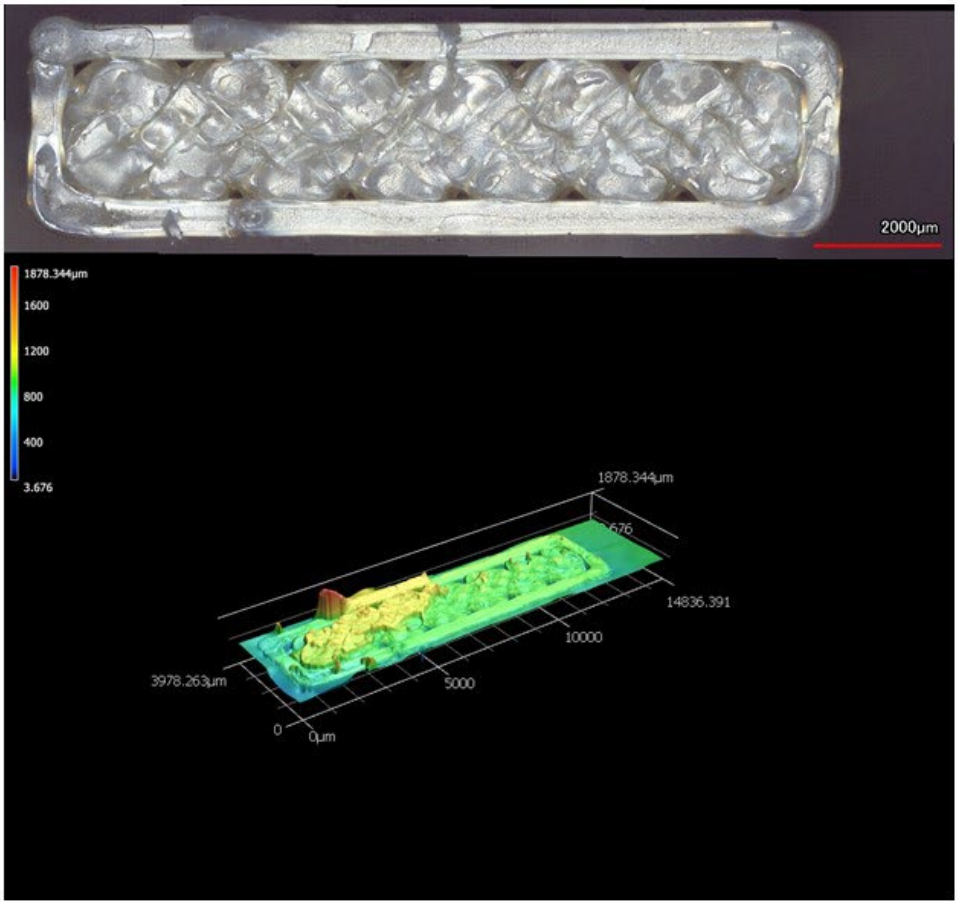
EVSR20-YT-B (FRAC)



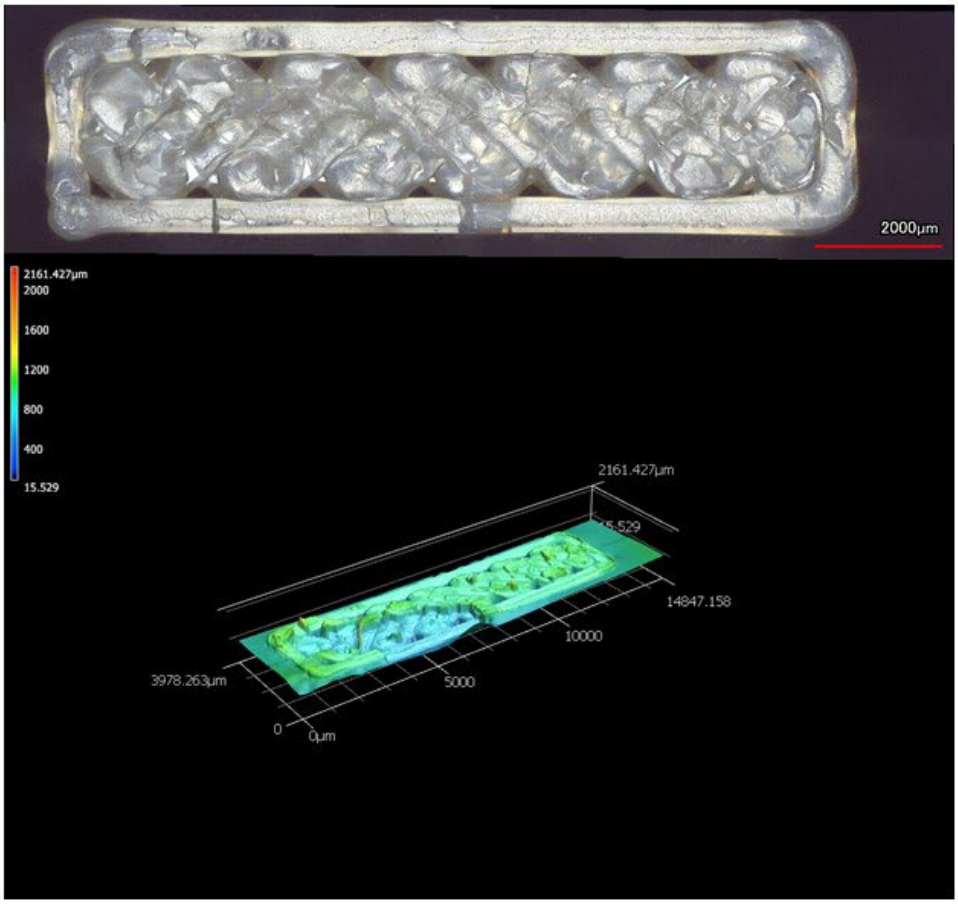
EVSR17-ZT-A (FRAC)



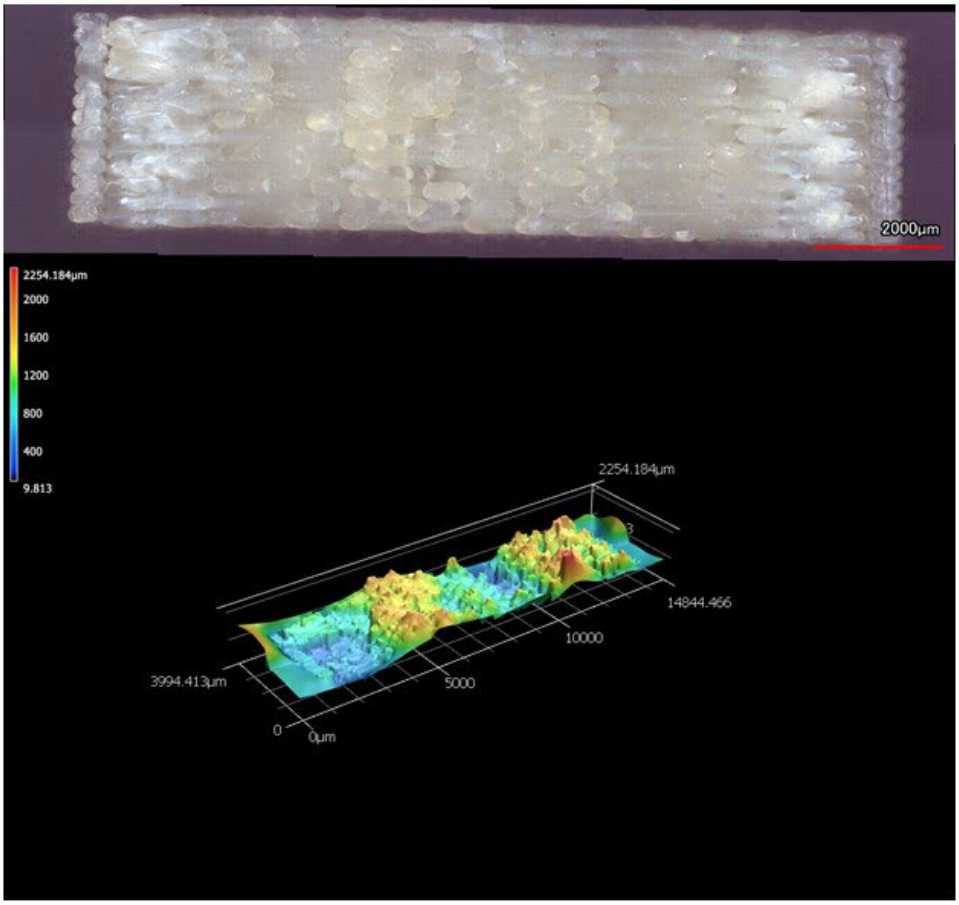
EVSR17-ZT-B (FRAC)



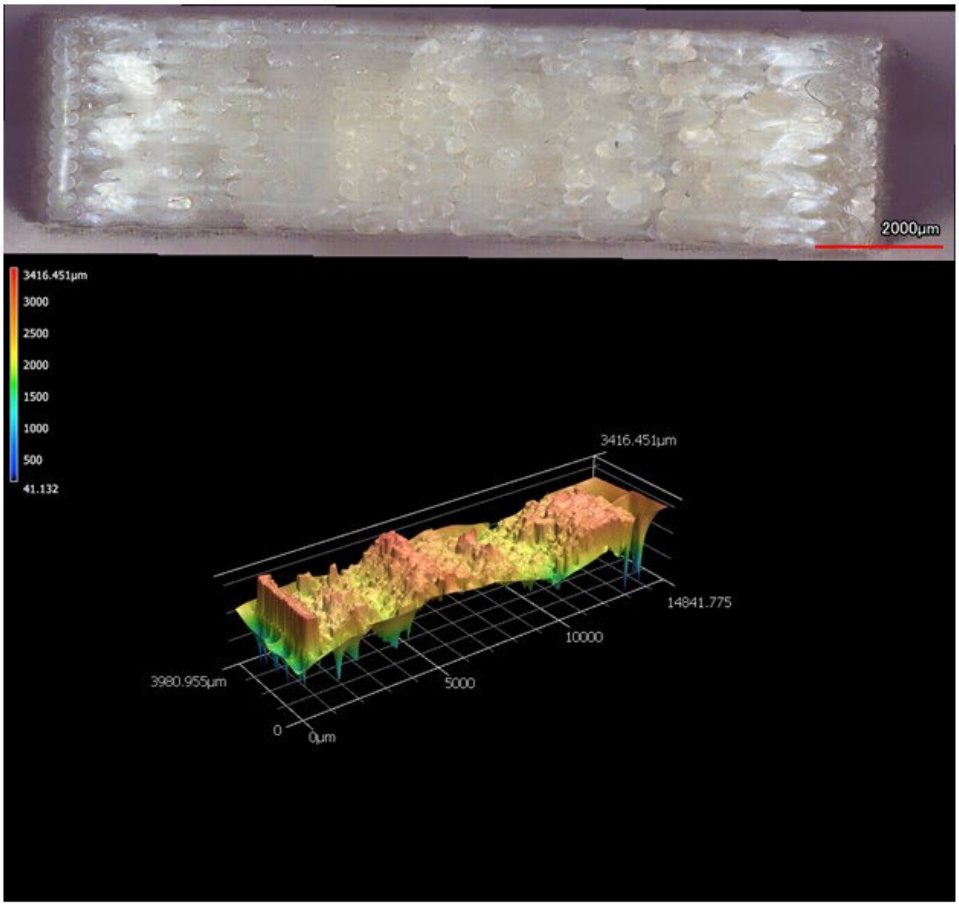
EVSR20-ZT-A (FRAC)



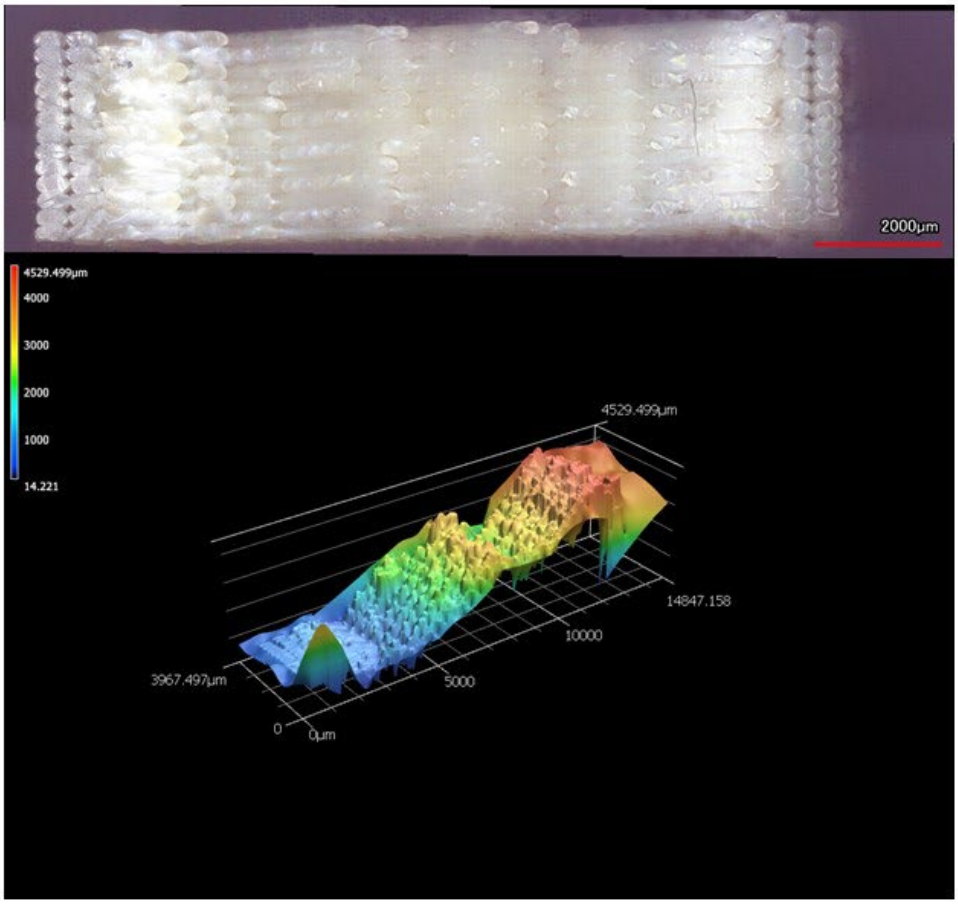
EVSR20-ZT-B (FRAC)


2000µm
2254.184µm
2000
1600
1200
800
400
9.813
2254.184µm
14844.466
10000
5000
3994.413µm
0
0µm

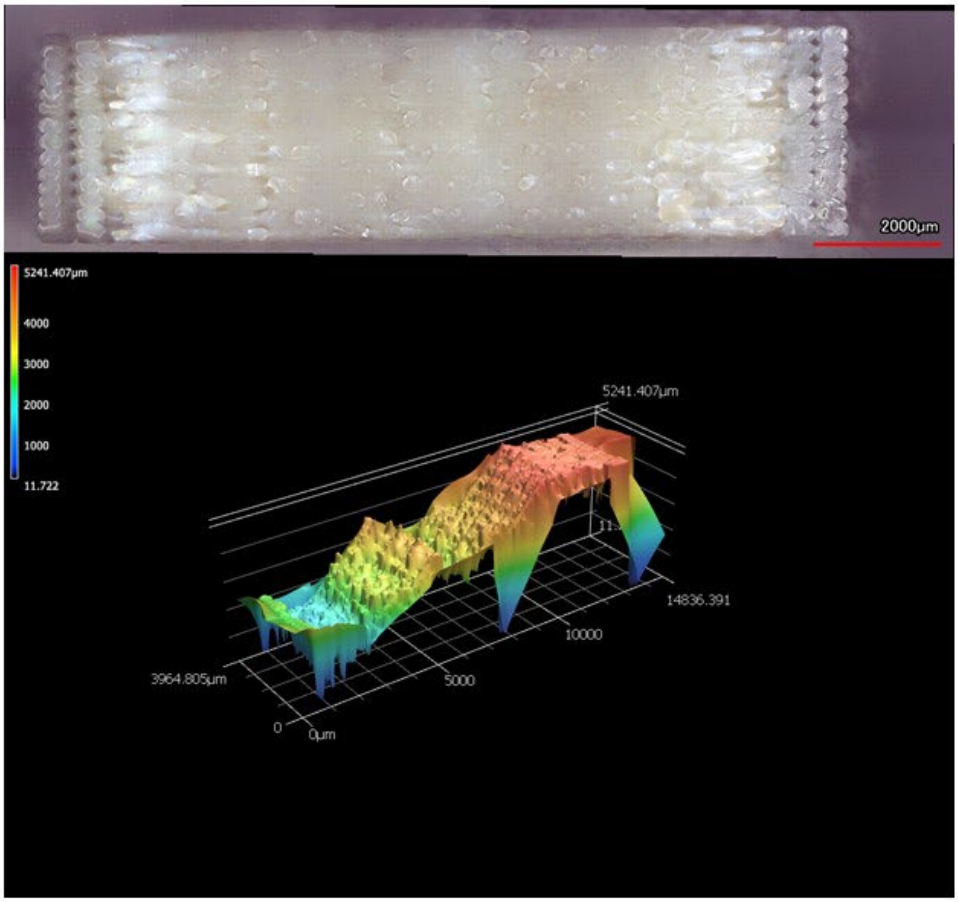
NC1-XT-A (FRAC)


2000µm
3416.451µm
3000
2500
2000
1500
1000
500
41.132
3416.451µm
14841.775
10000
5000
3980.955µm
0
0µm

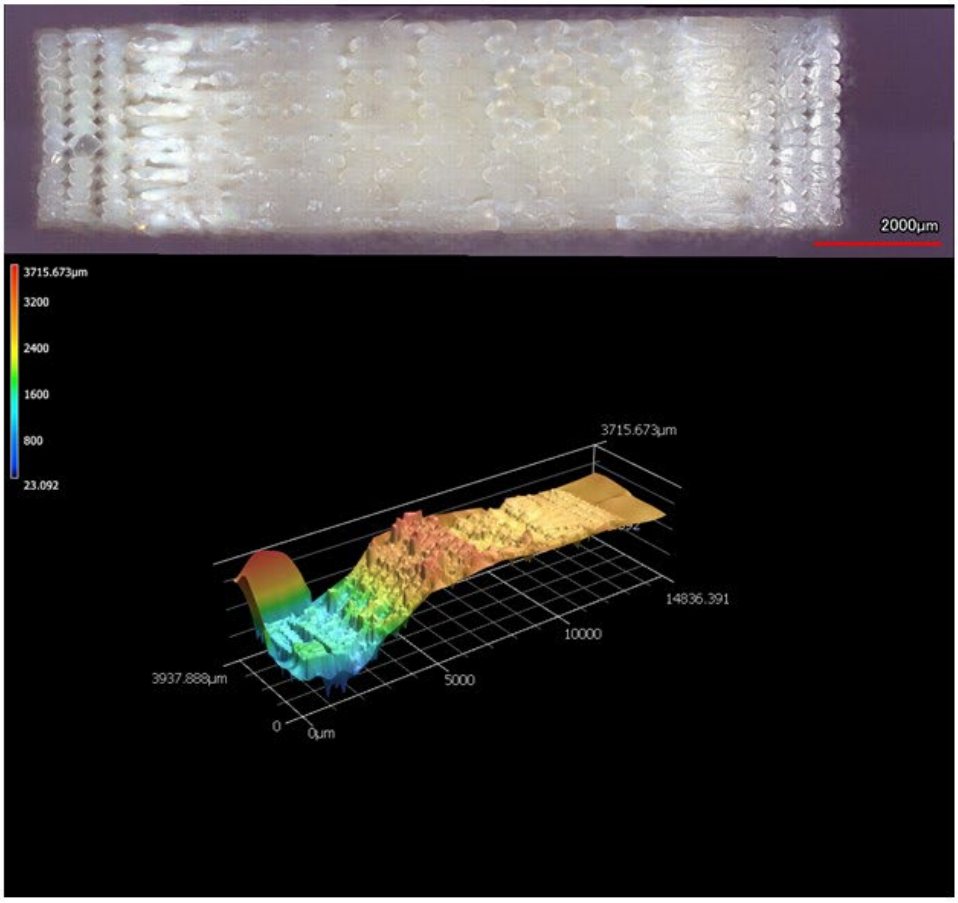
NC1-XT-B (FRAC)


2000µm
4529.499µm
4000
3000
2000
1000
14.221
4529.499µm
14847.158
10000
5000
3967.497µm
0
0µm

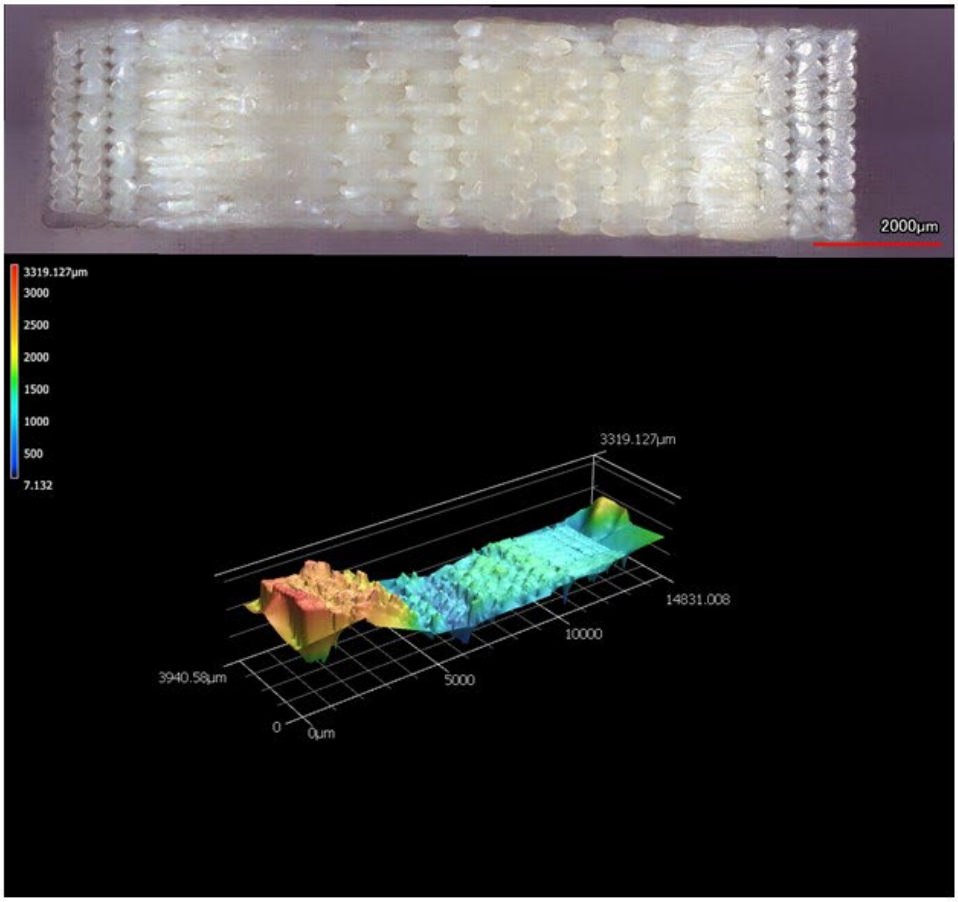
NC2-XT-A (FRAC)


2000µm
5241.407µm
4000
3000
2000
1000
11.722
5241.407µm
14836.391
10000
5000
3964.805µm
0
0µm

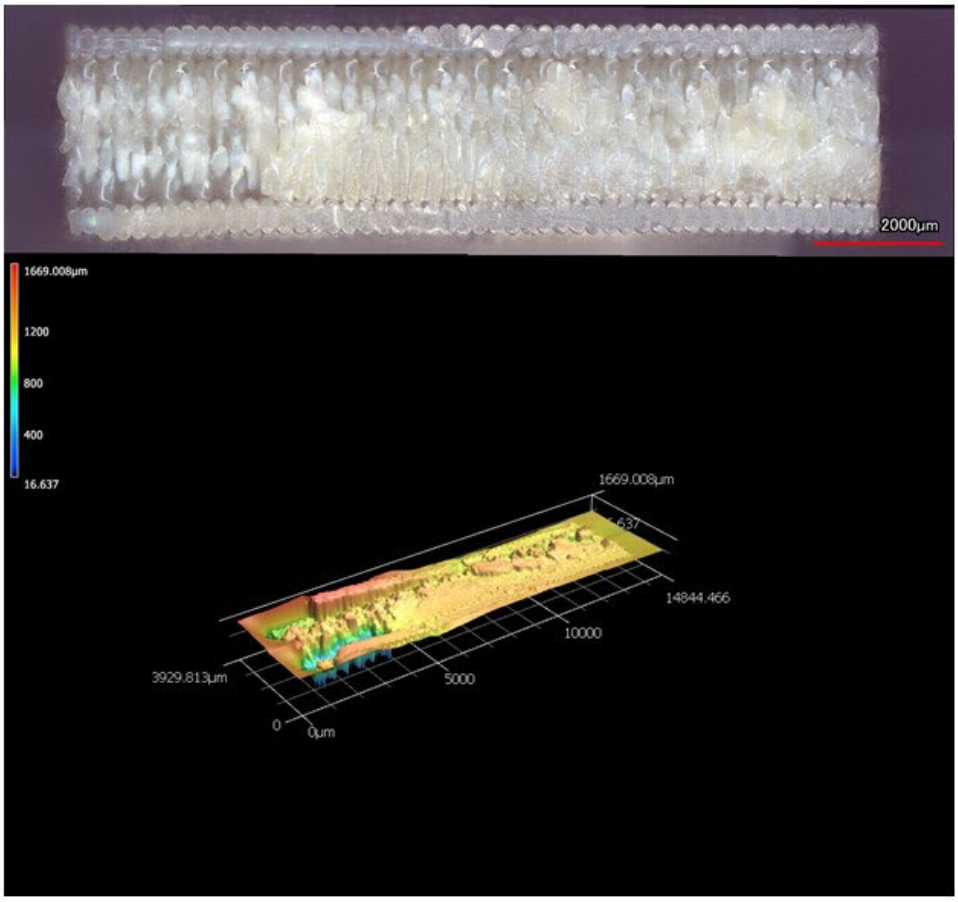
NC2-XT-B (FRAC)


2000µm
3715.673µm
3200
2400
1600
800
23.092
3715.673µm
14836.391
10000
5000
3937.888µm
0
0µm

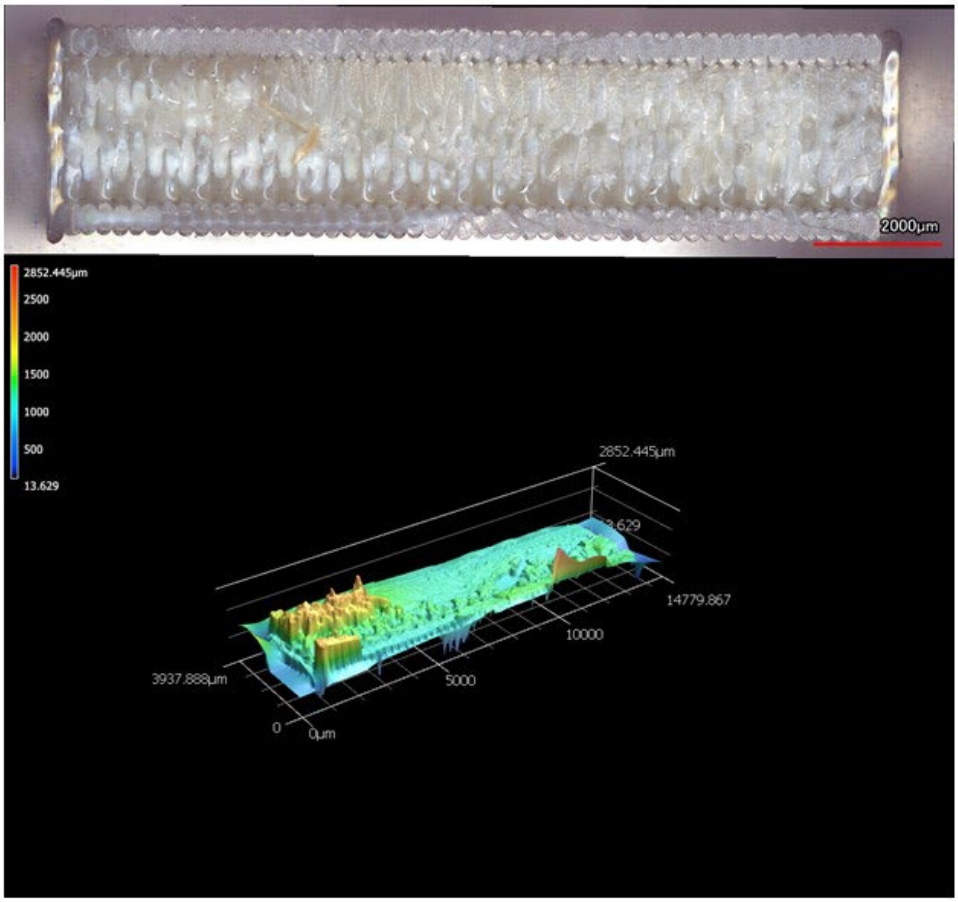
NC3-XT-A (FRAC)


2000µm
3319.127µm
3000
2500
2000
1500
1000
500
7.132
3319.127µm
14831.008
10000
5000
3940.58µm
0
0µm

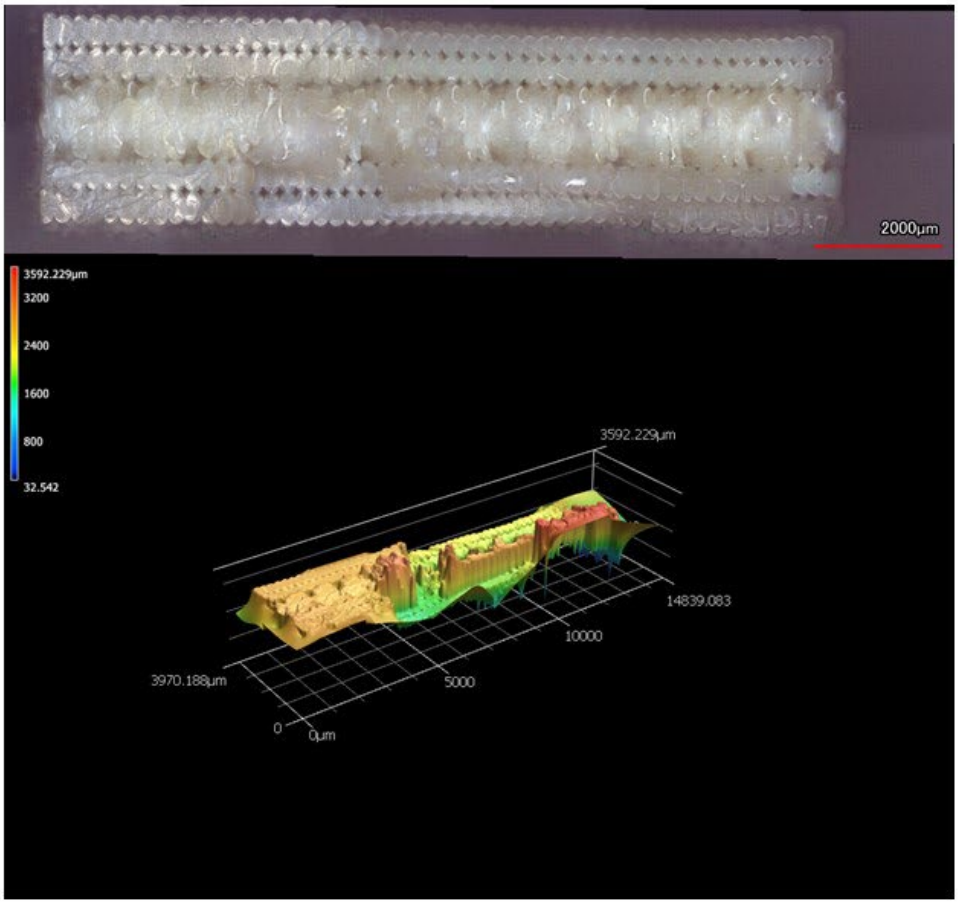
NC3-XT-B (FRAC)


2000µm
1669.008µm
1200
800
400
16.637
1669.008µm
637
14844.466
10000
5000
3929.813µm
0
0µm

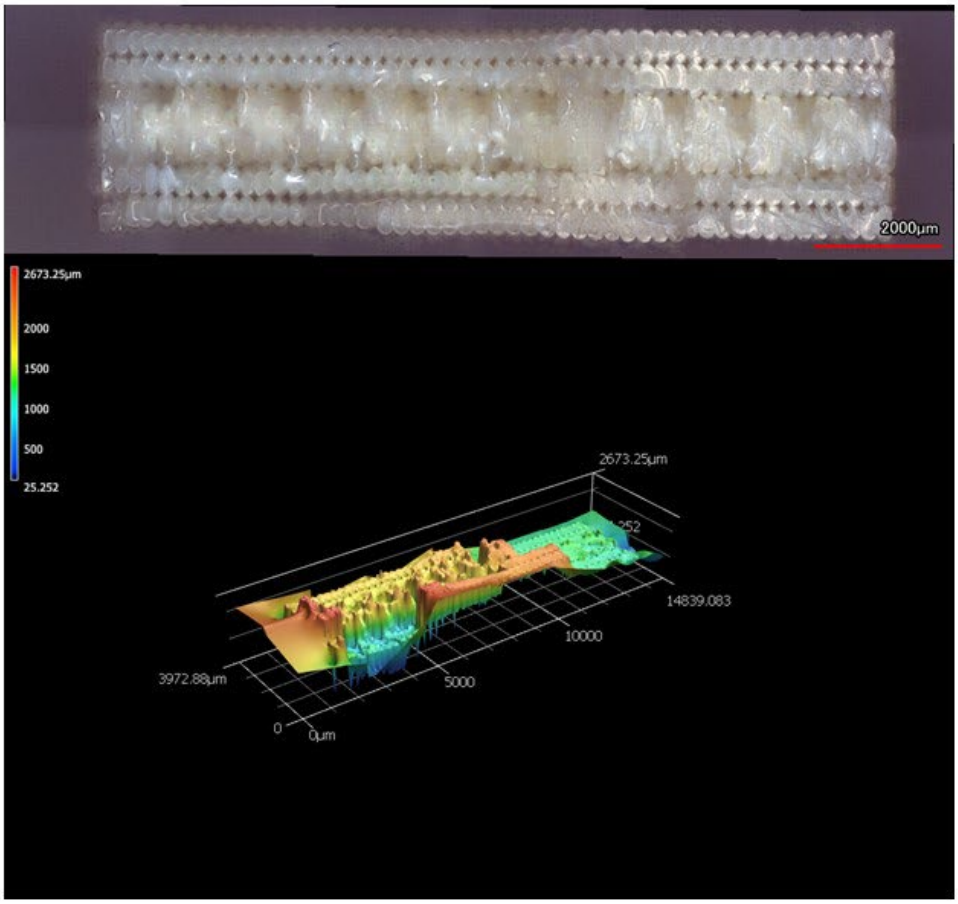
NC1-YT-A (FRAC)


2000µm
2852.445µm
2500
2000
1500
1000
500
13.629
2852.445µm
14779.867
10000
5000
3937.888µm
0
0µm

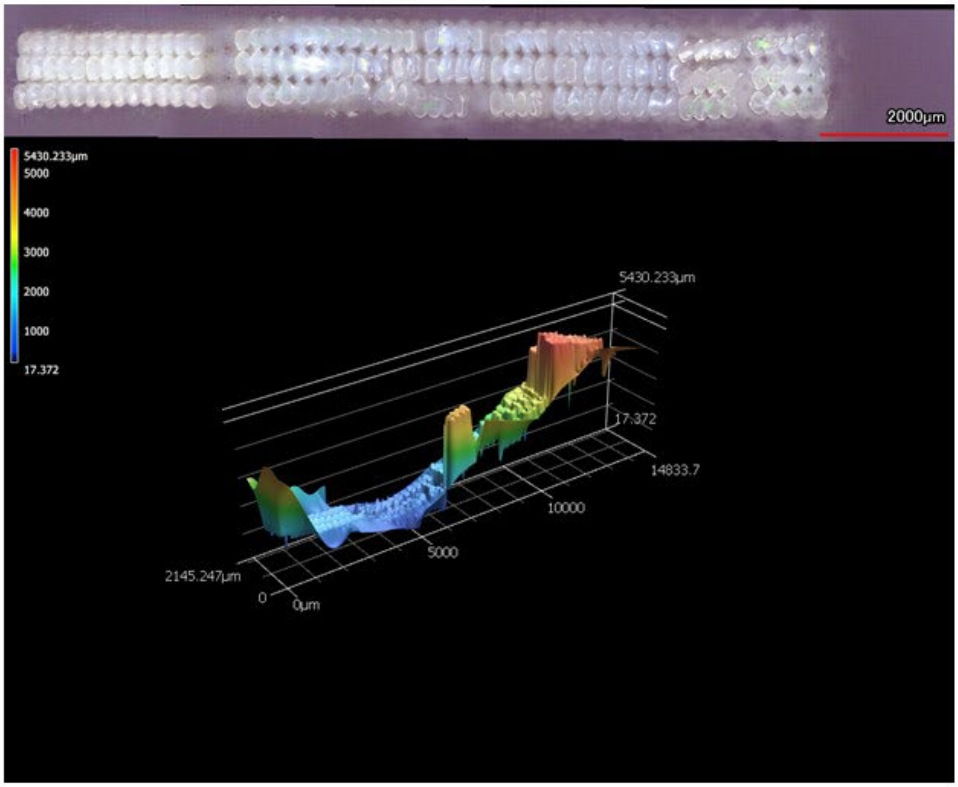
NC1-YT-B (FRAC)


2000µm
3592.229µm
3200
2400
1600
800
32.542
3592.229µm
14839.083
10000
5000
3970.188µm
0
0µm

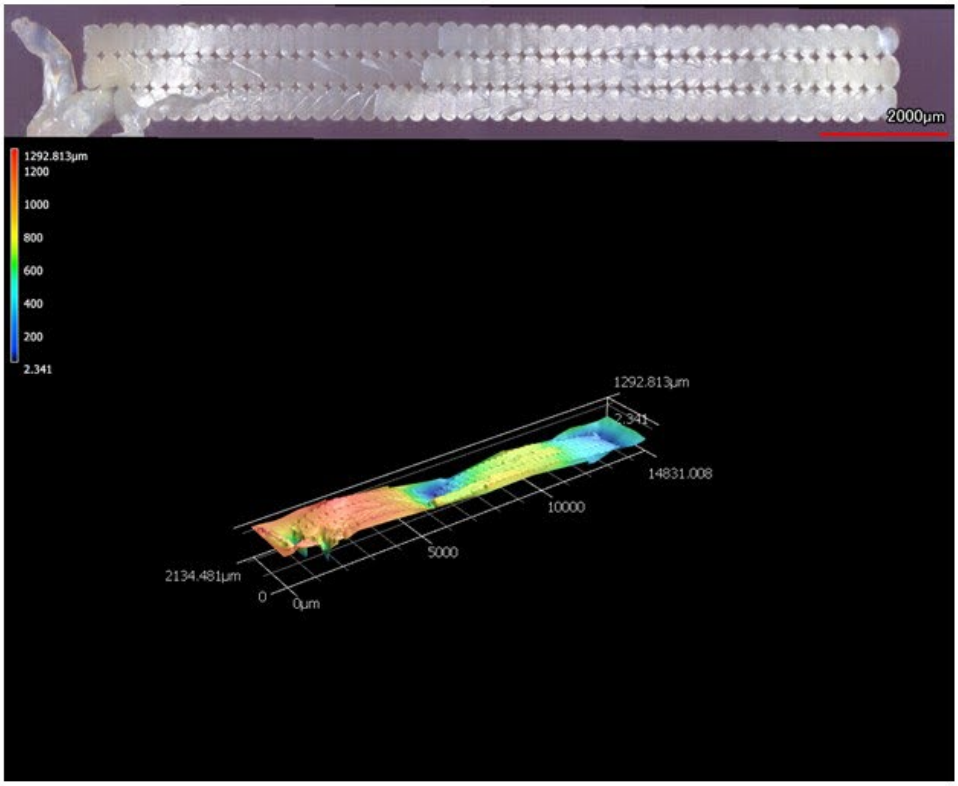
NC2-YT-A (FRAC)


2000µm
2673.25µm
2000
1500
1000
500
25.252
2673.25µm
252
14839.083
10000
5000
3972.88µm
0
0µm

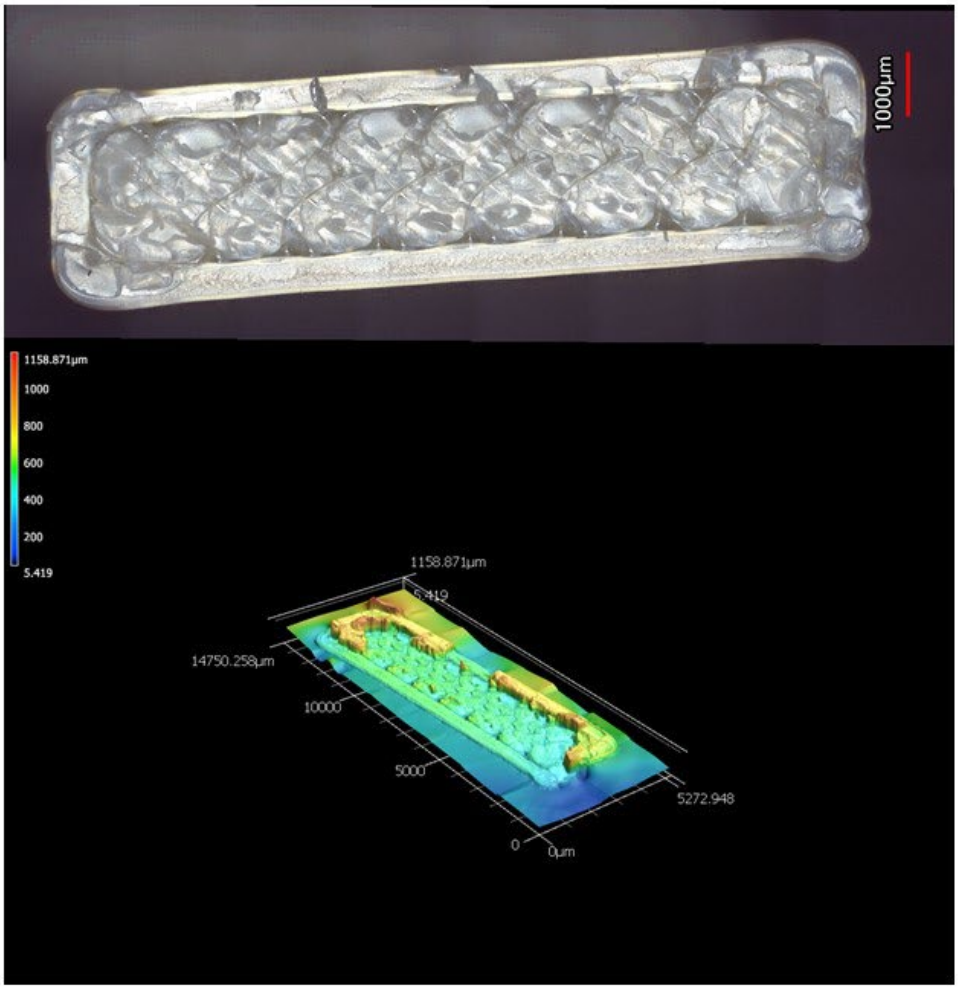
NC2-YT-B (FRAC)



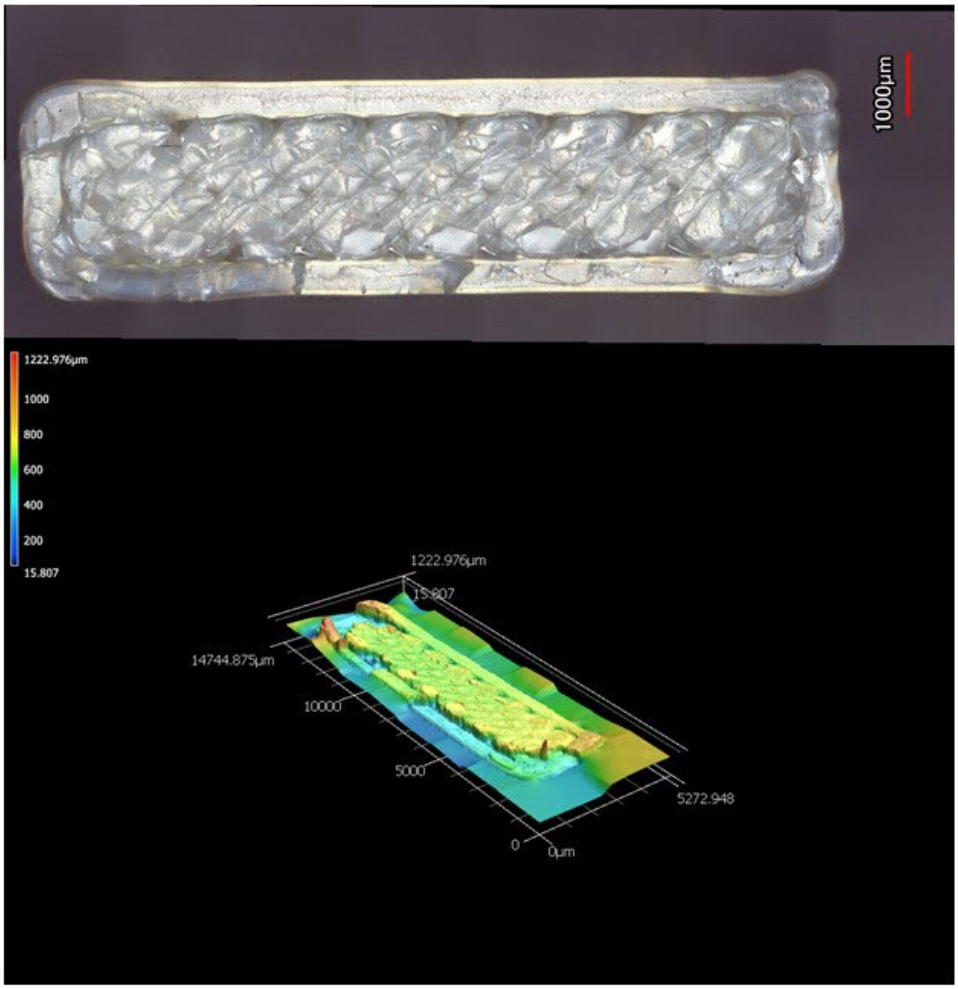
NC3-YT-A-1 (A-2 UNREACHABLE) (FRAC)



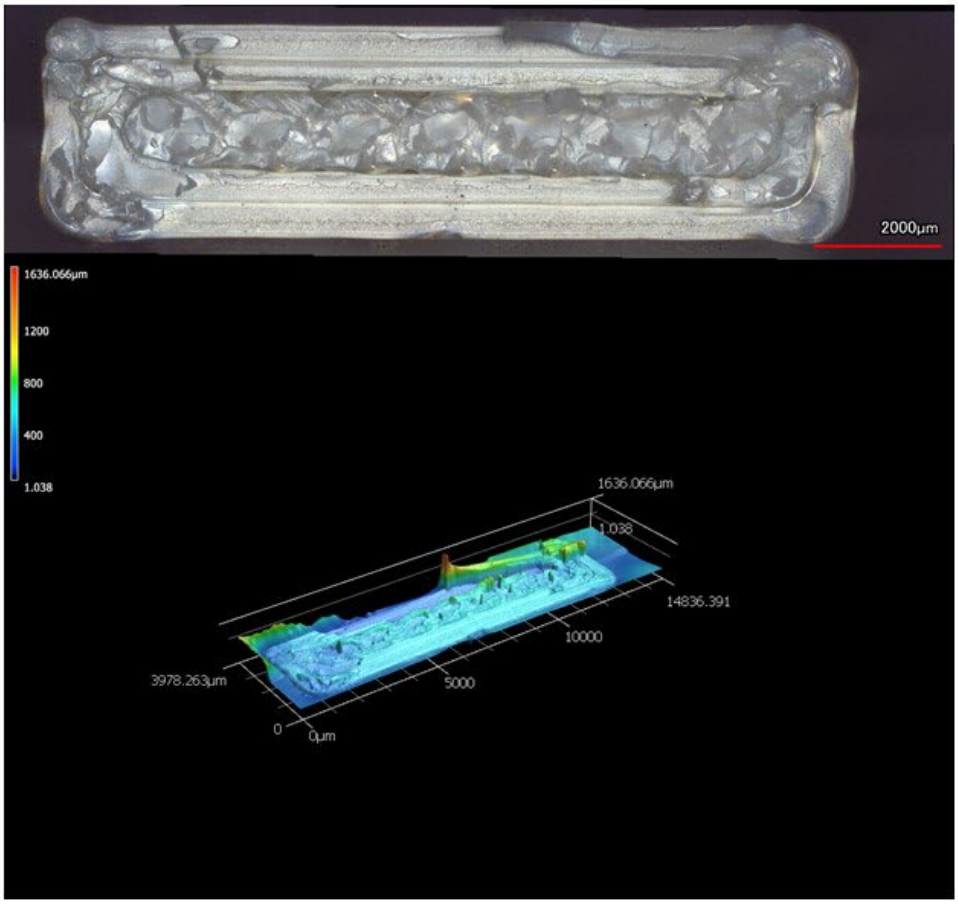
NC3-YT-B-1 (B-2 UNREHABLE) (FRAC)


1000µm
1158.871µm
1000
800
600
400
200
5.419
1158.871µm
14750.258µm
10000
5000
0
0µm
5272.948

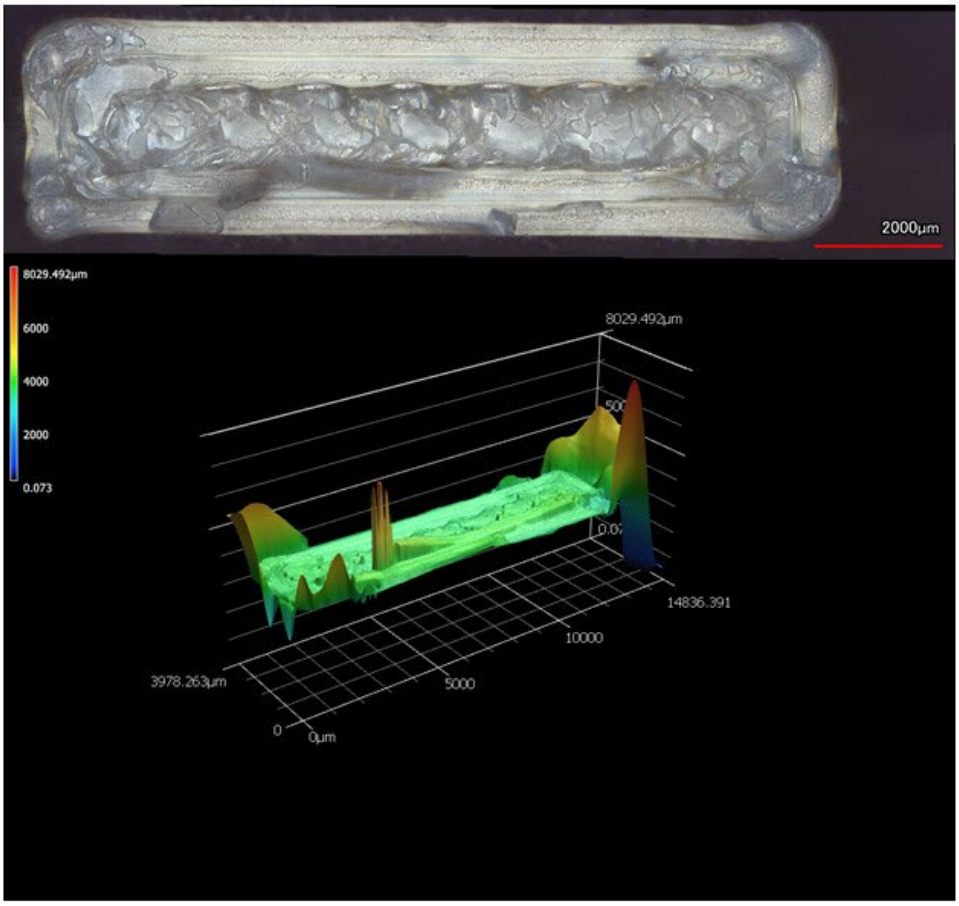
NC1-ZT-A (FRAC)


1000µm
1222.976µm
1000
800
600
400
200
15.807
1222.976µm
15.807
14744.875µm
10000
5000
0
0µm
5272.948

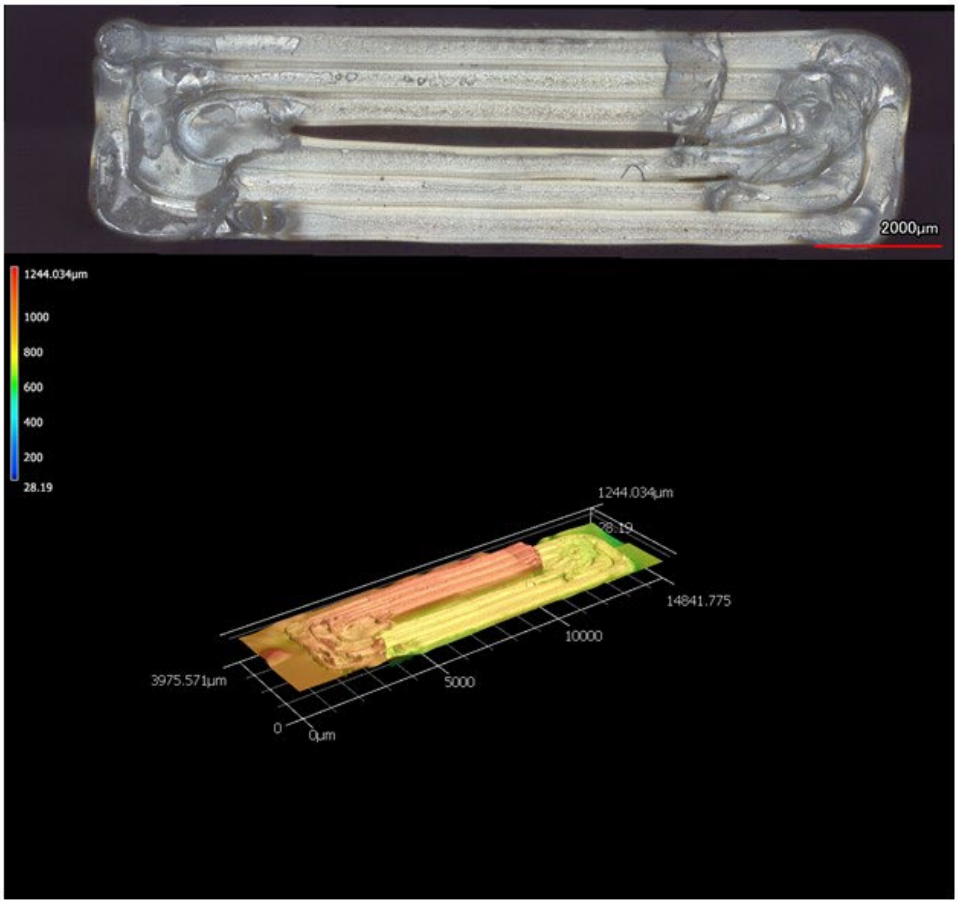
NC1-ZT-B (FRAC)


2000µm
1636.066µm
1200
800
400
1.038
1636.066µm
1.038
14836.391
10000
5000
3978.263µm
0
0µm

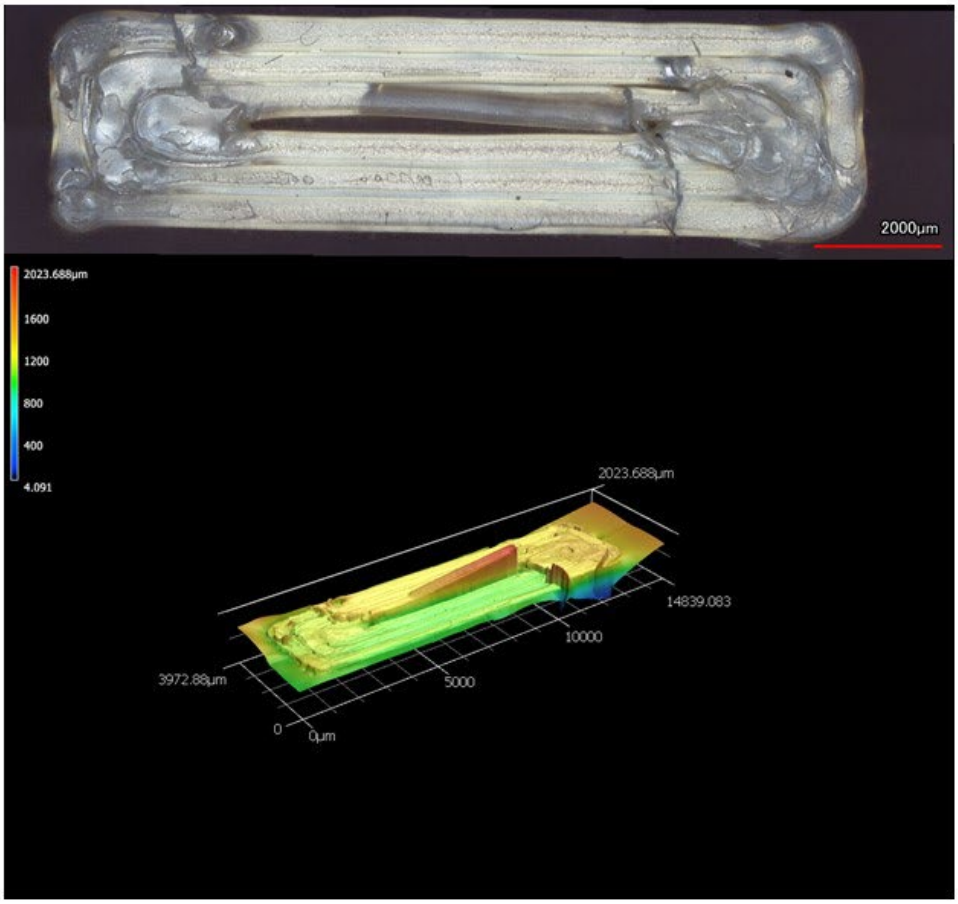
NC2-ZT-A (FRAC)


2000µm
8029.492µm
6000
4000
2000
0.073
8029.492µm
14836.391
10000
5000
3978.263µm
0
0µm

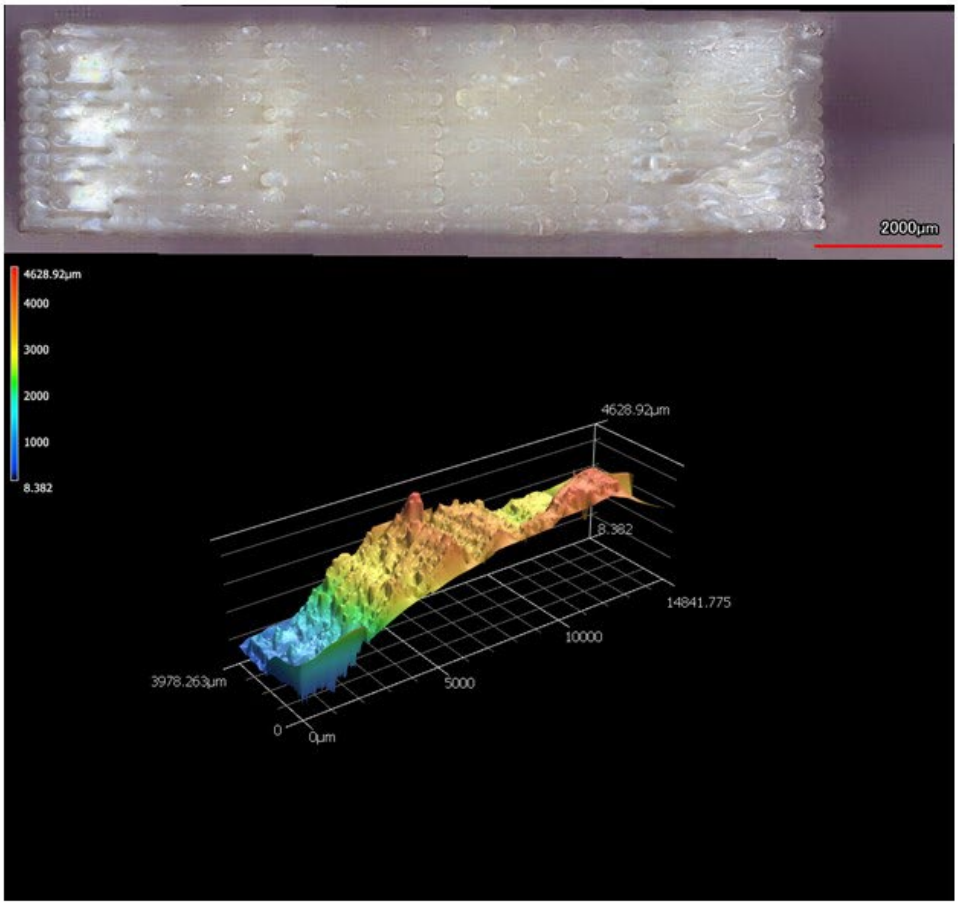
NC2-ZT-B (FRAC)


2000µm
1244.034µm
1000
800
600
400
200
28.19
1244.034µm
28.19
14841.775
10000
5000
3975.571µm
0
0µm

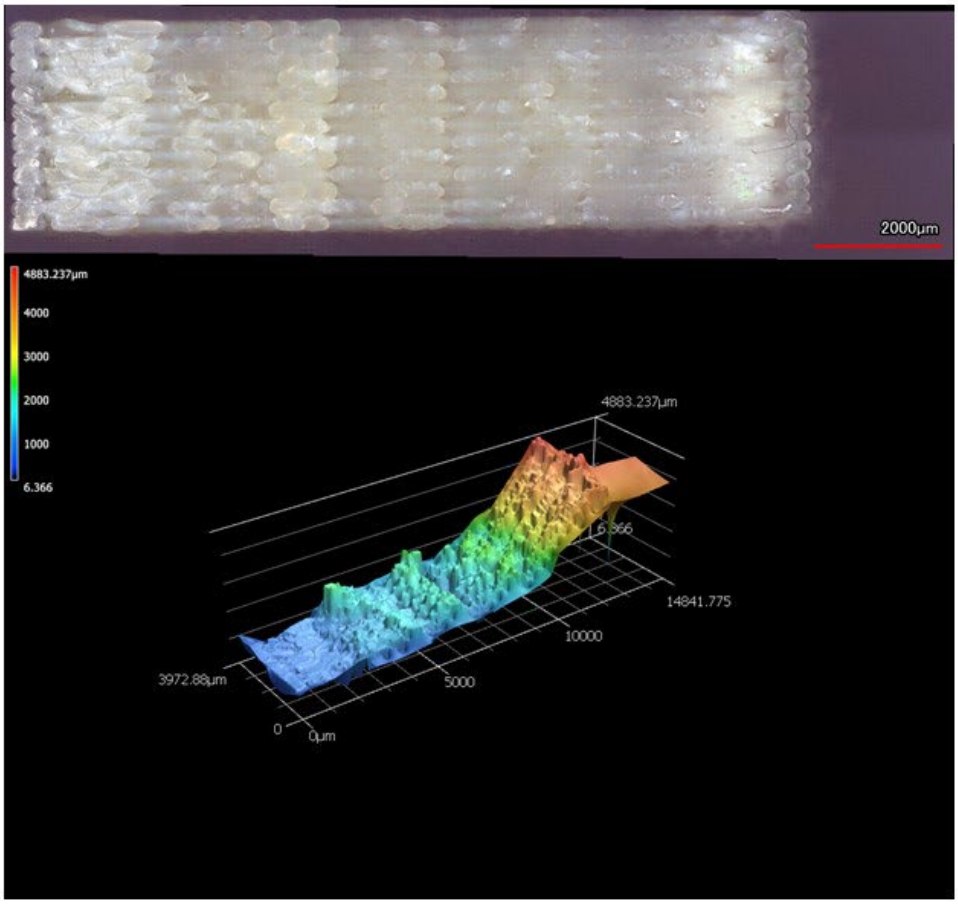
NC3-ZT-A (FRAC)


2000µm
2023.688µm
1600
1200
800
400
4.091
2023.688µm
14839.083
10000
5000
3972.88µm
0
0µm

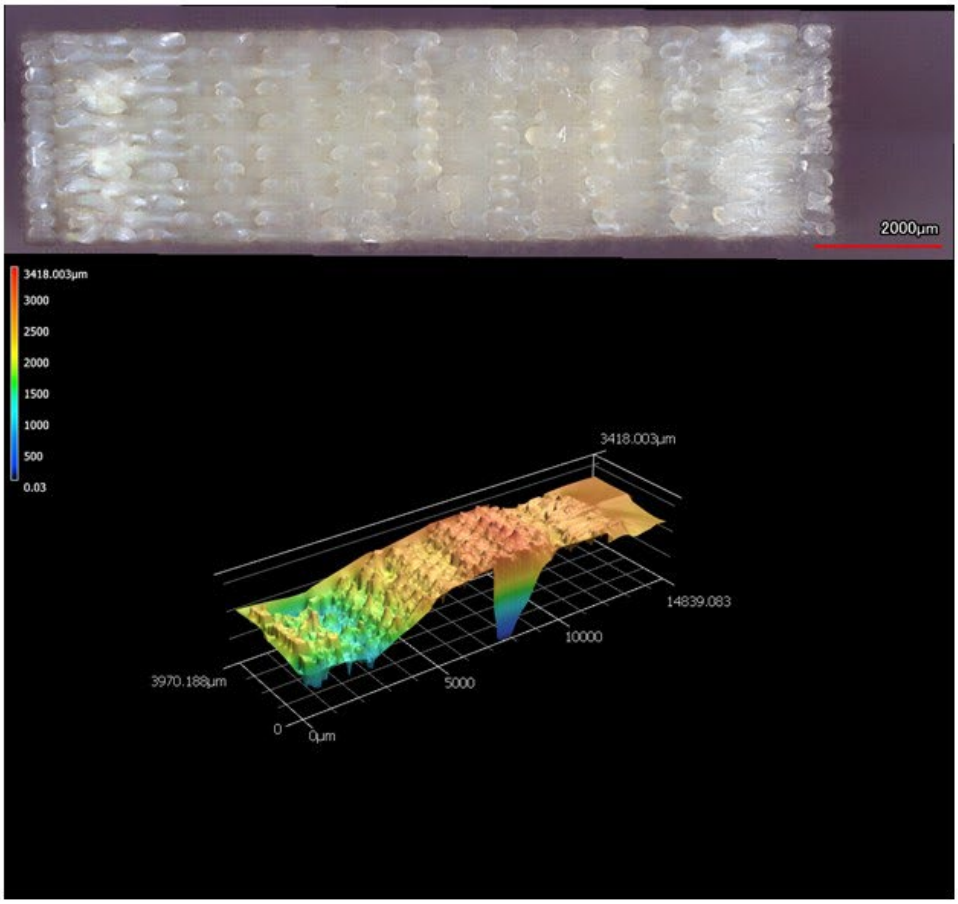
NC3-ZT-B (FRAC)



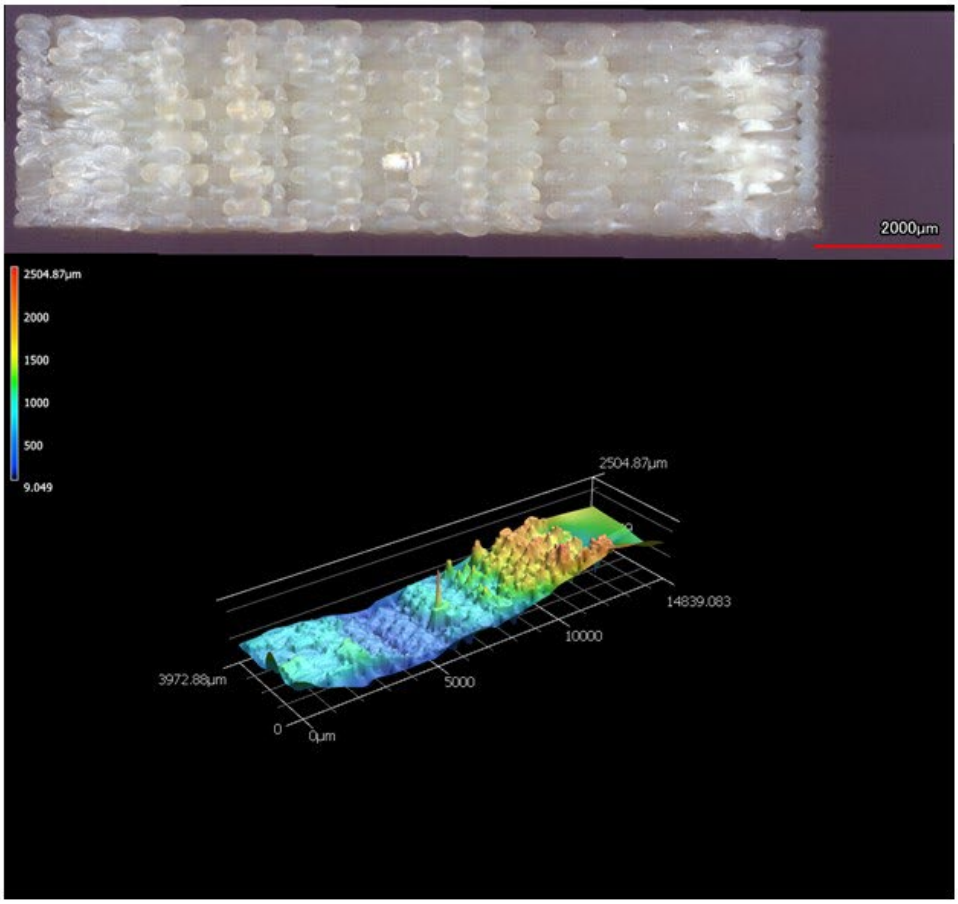
PRW18-XT-A (FRAC)



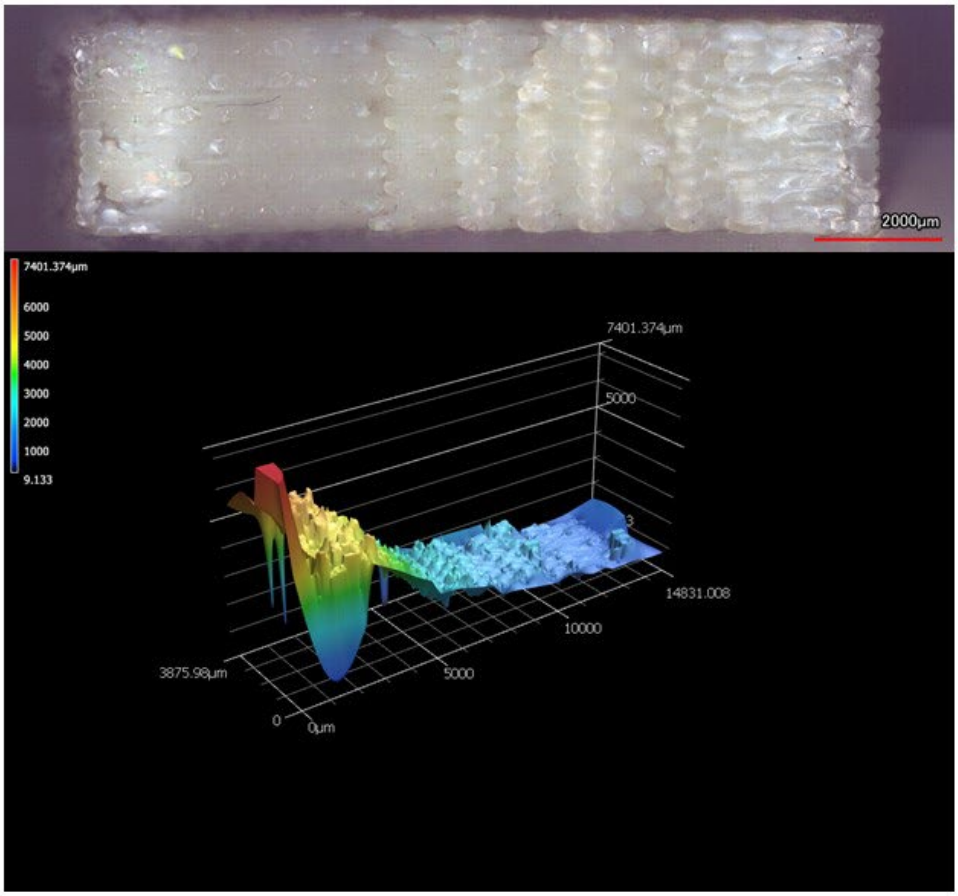
PRW18-XT-B (FRAC)



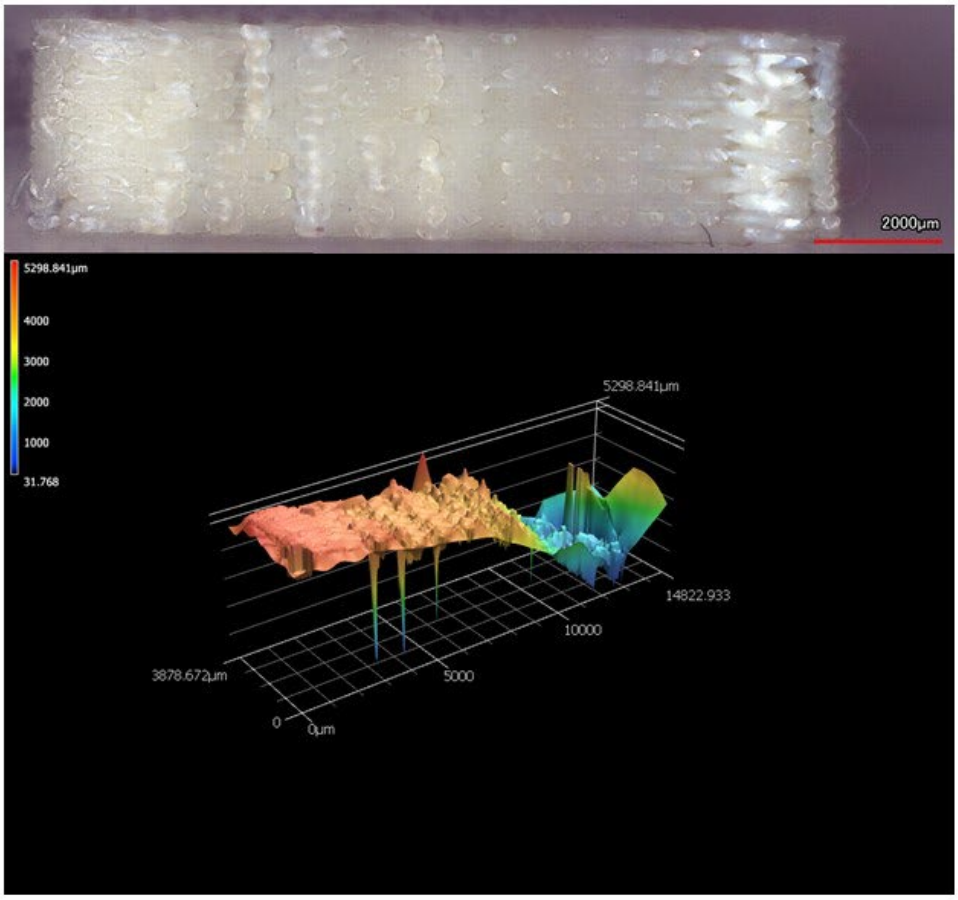
PRW22-XT-A (FRAC)



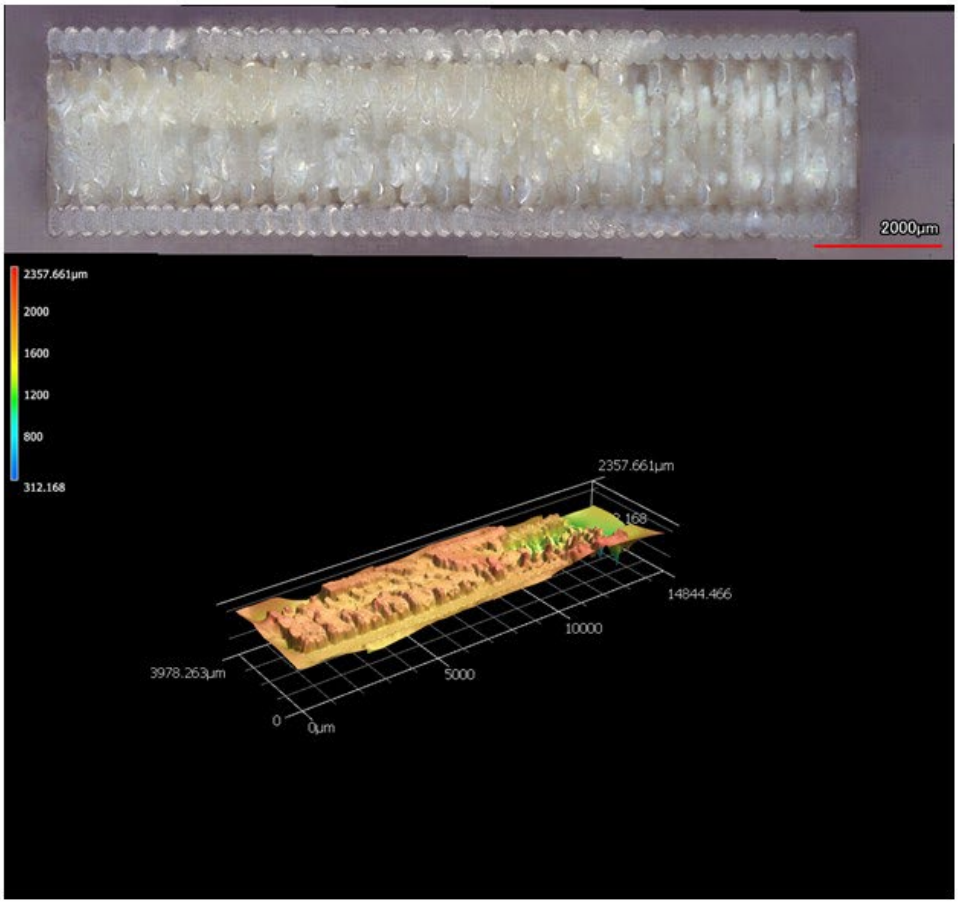
PRW22-XT-B (FRAC)



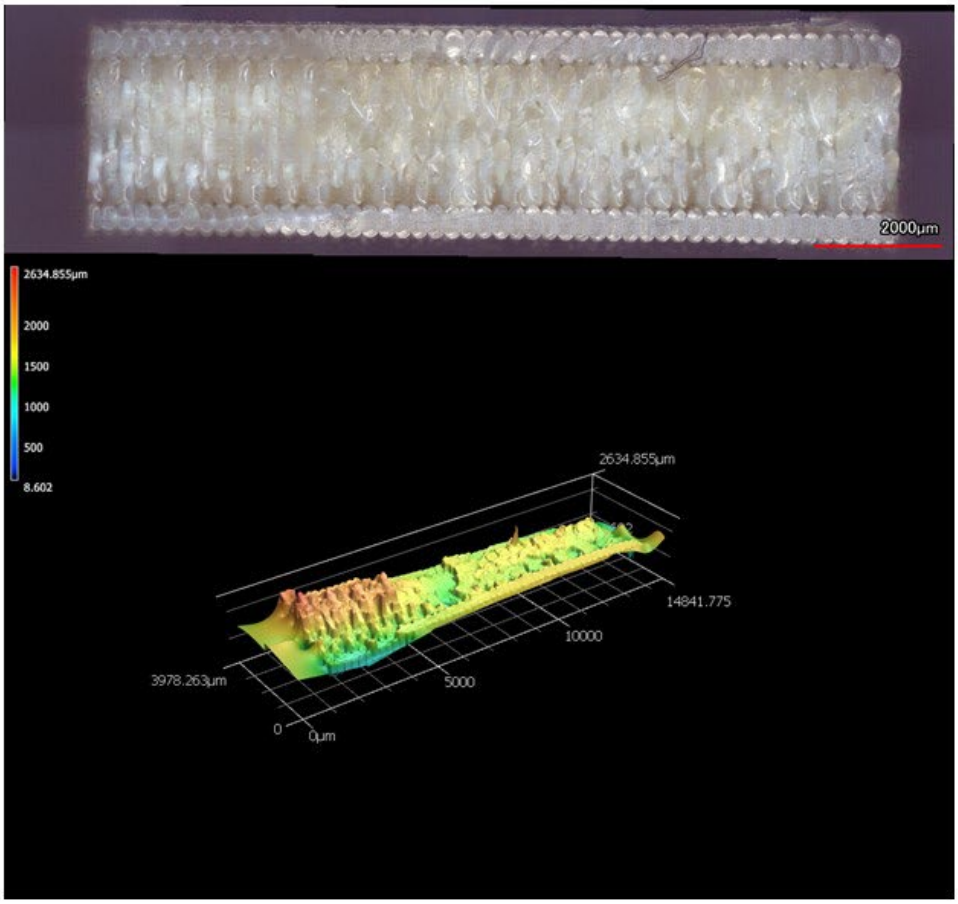
PRW26-XT-A (FRAC)



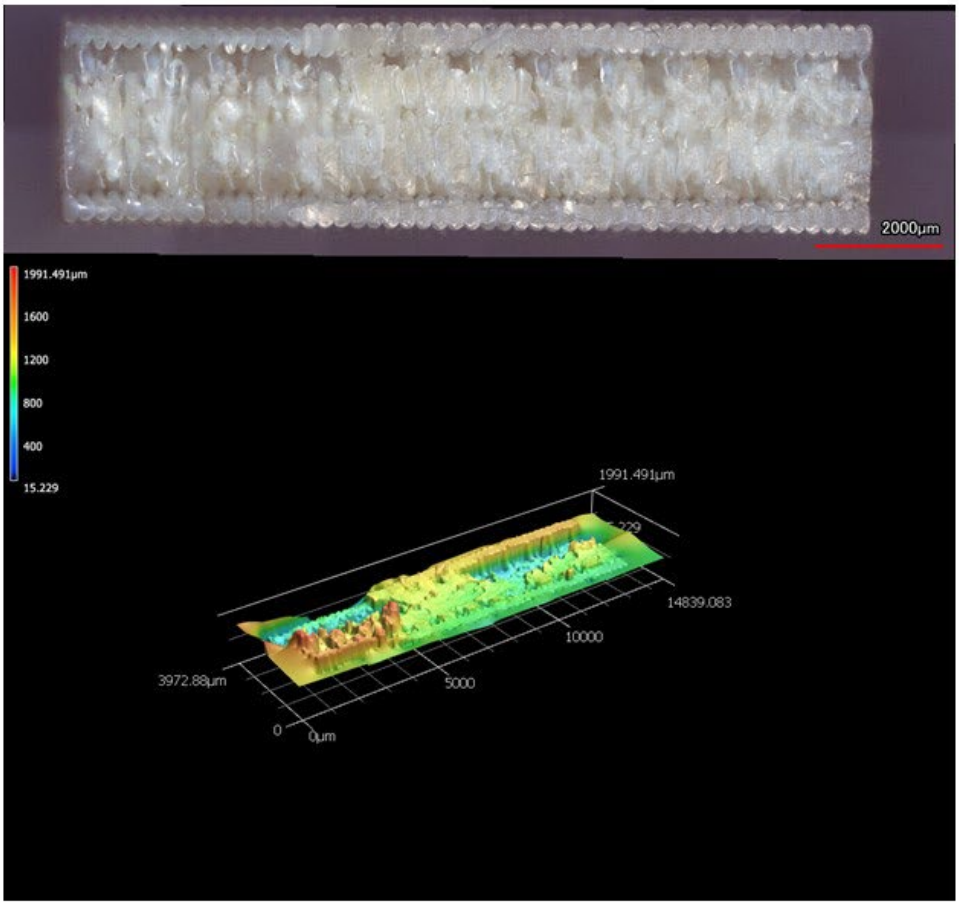
PRW26-XT-B (FRAC)



PRW18-YT-A (FRAC)



PRW18-YT-B (FRAC)



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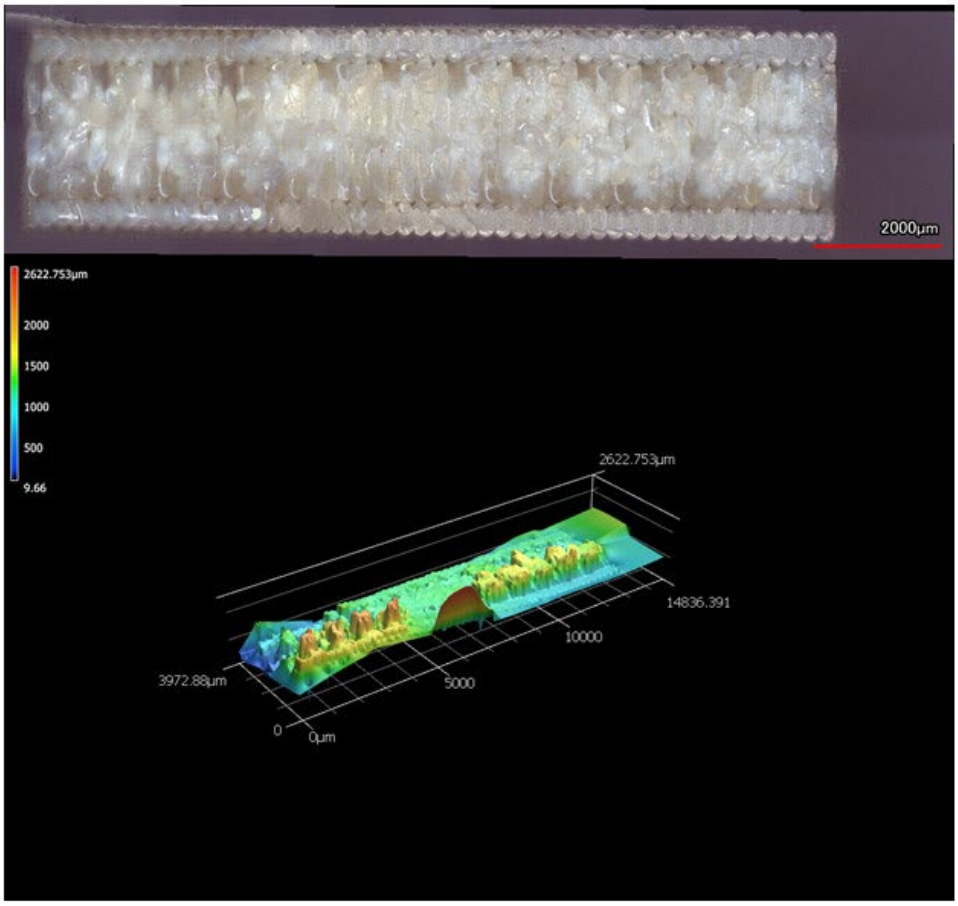

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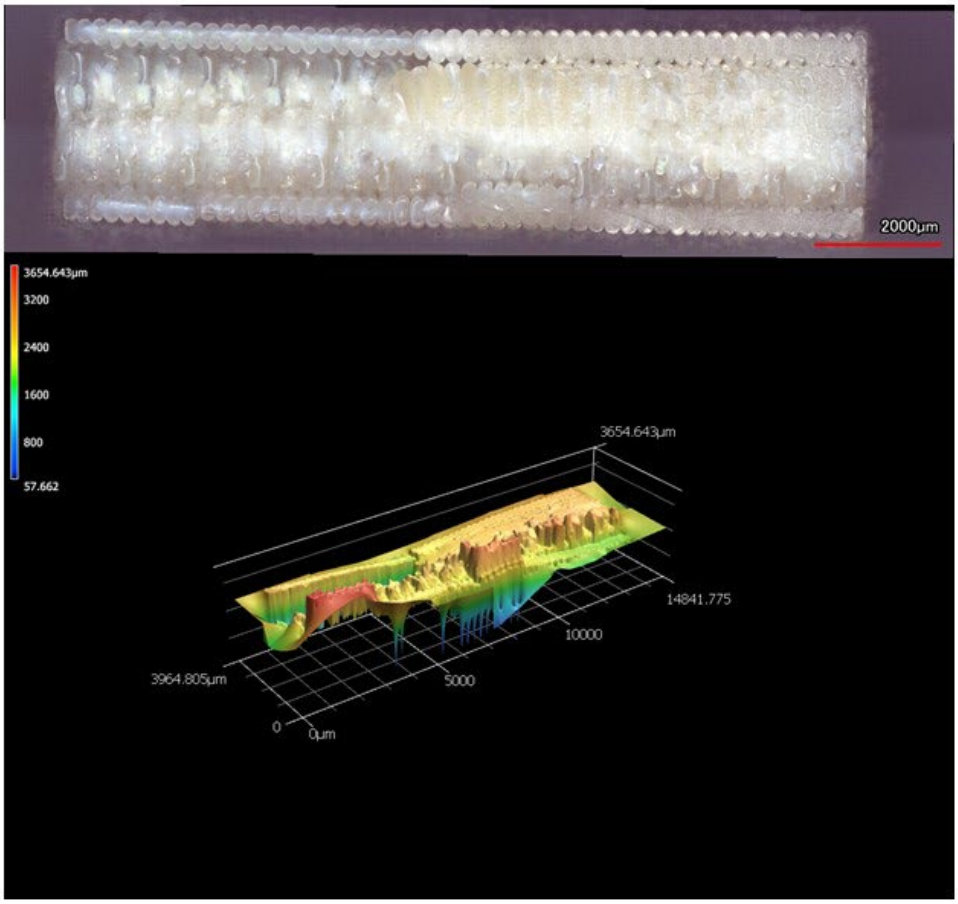

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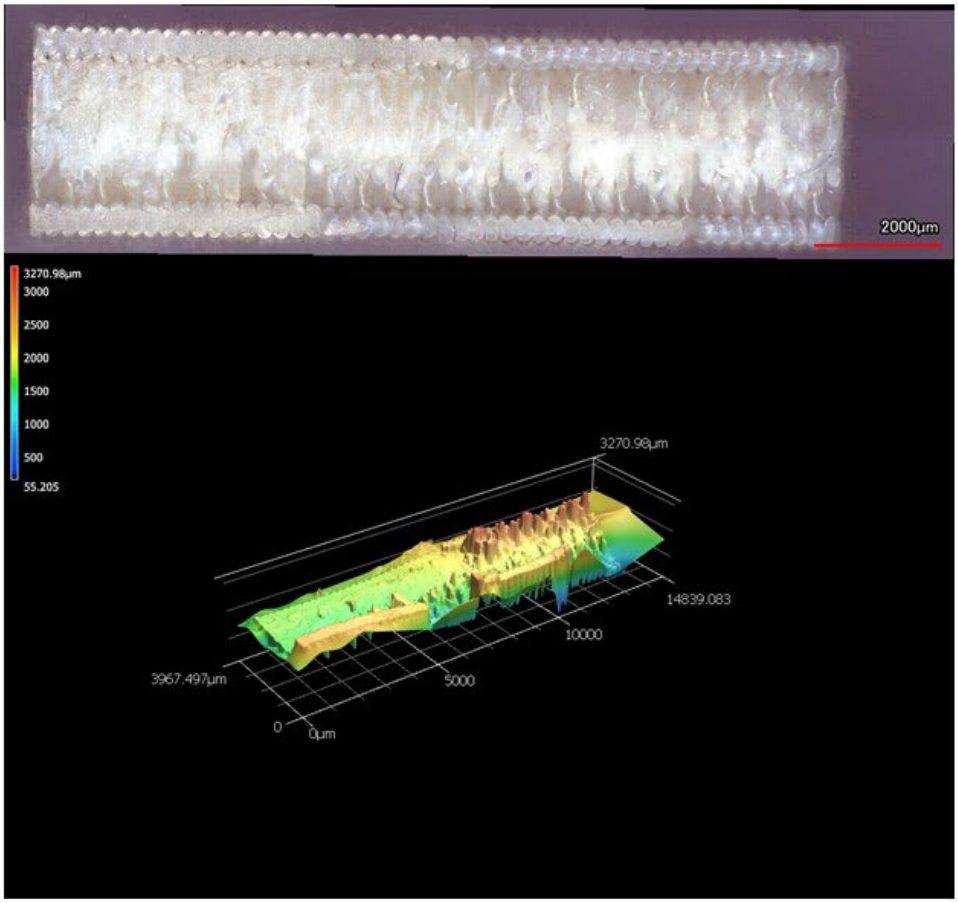

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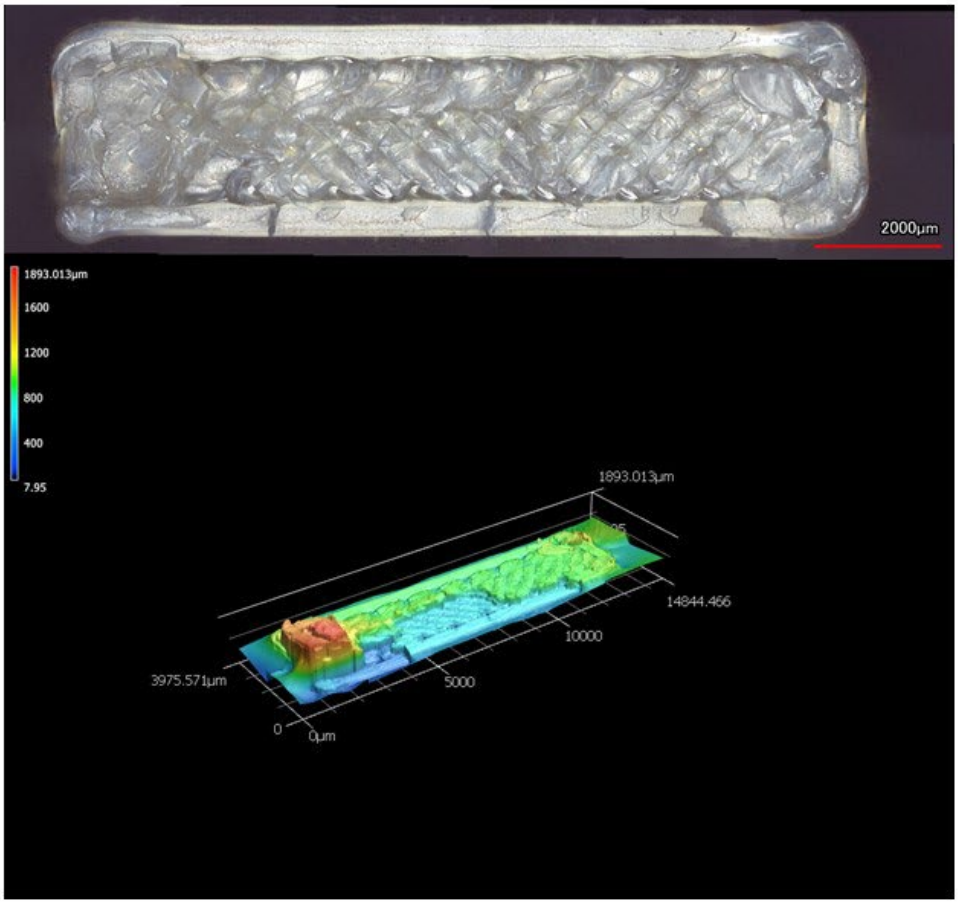

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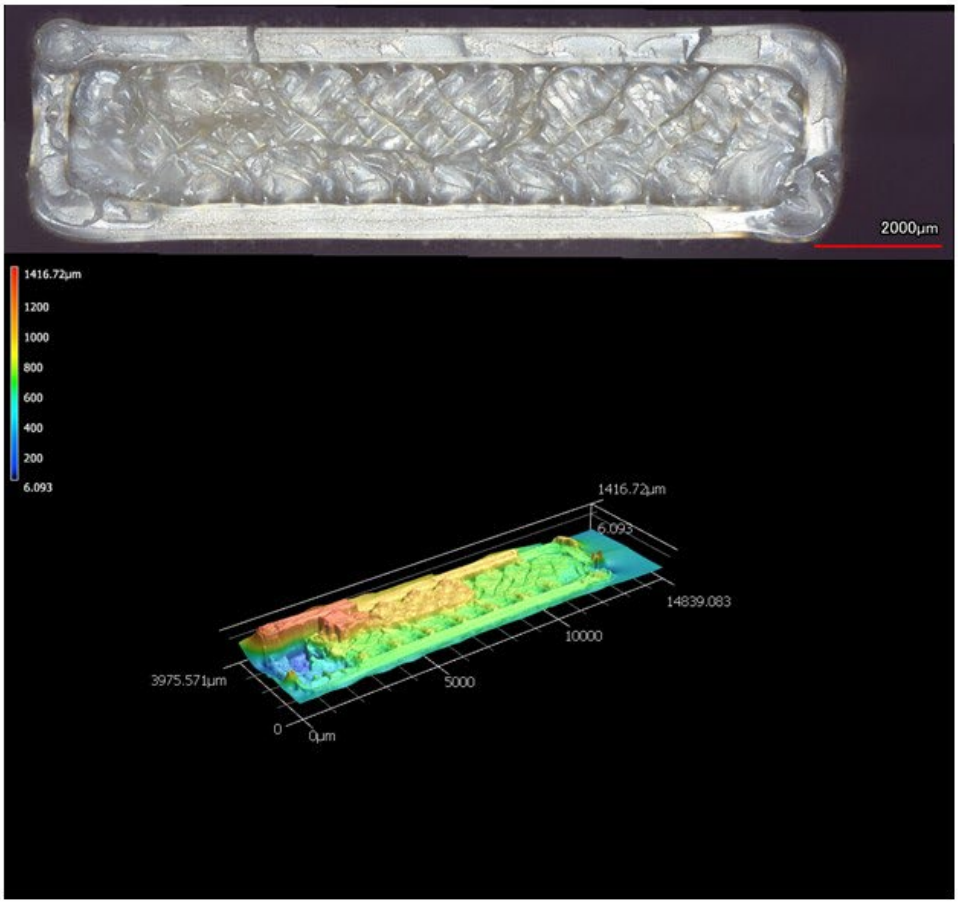
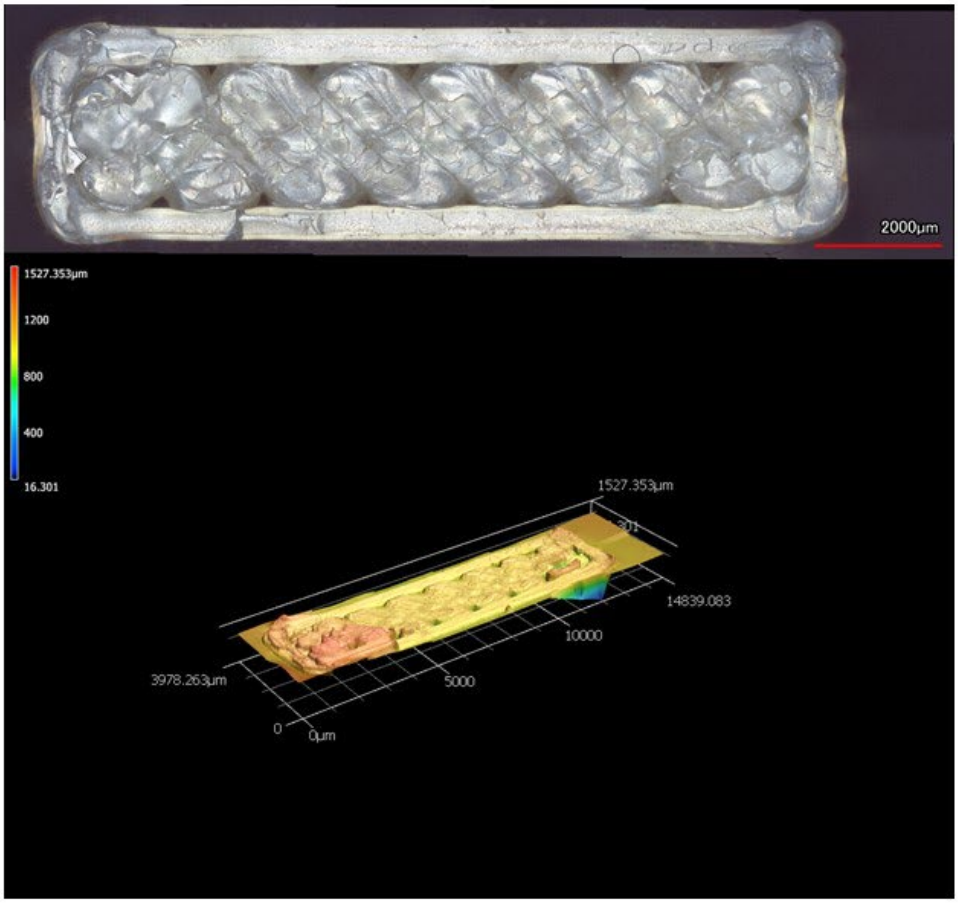
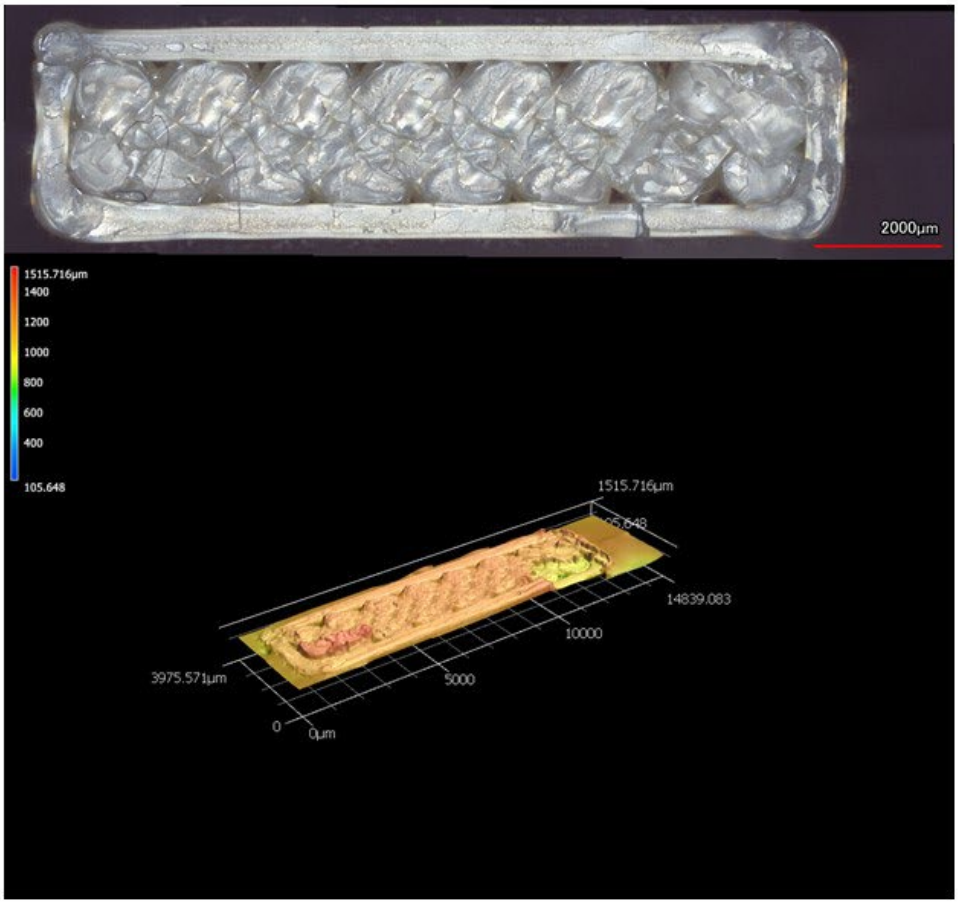


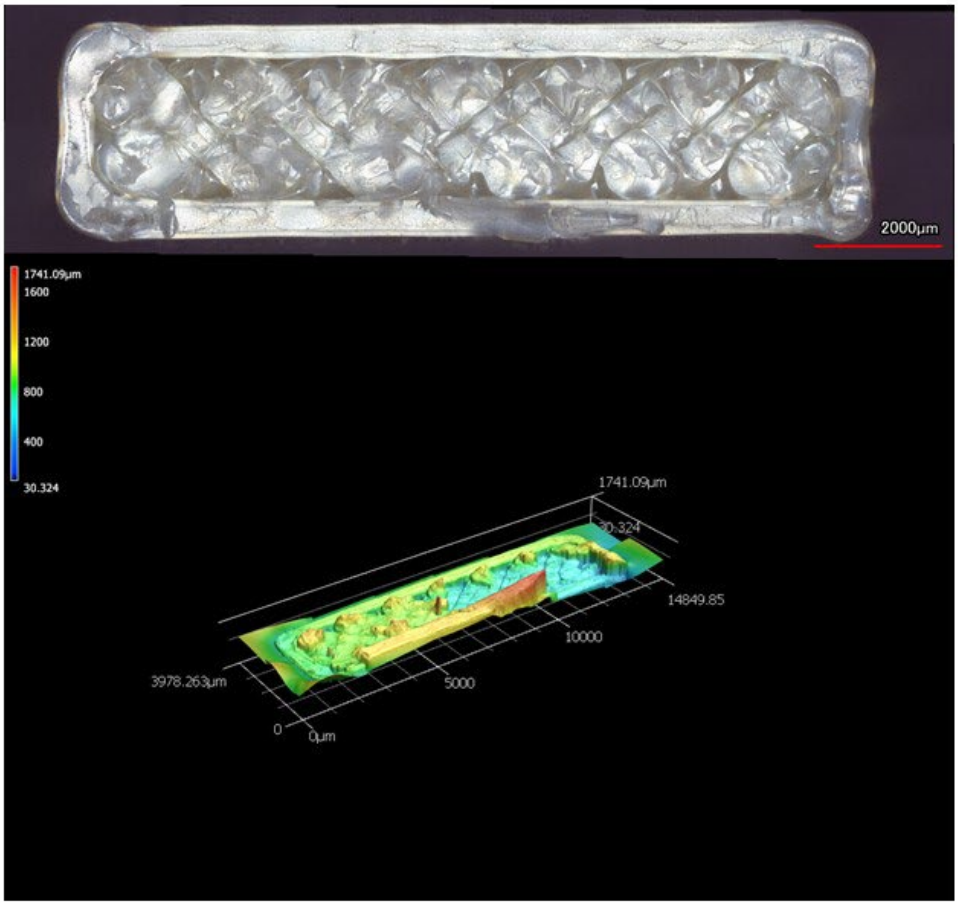
PRW8-ZT-B (FRAC)



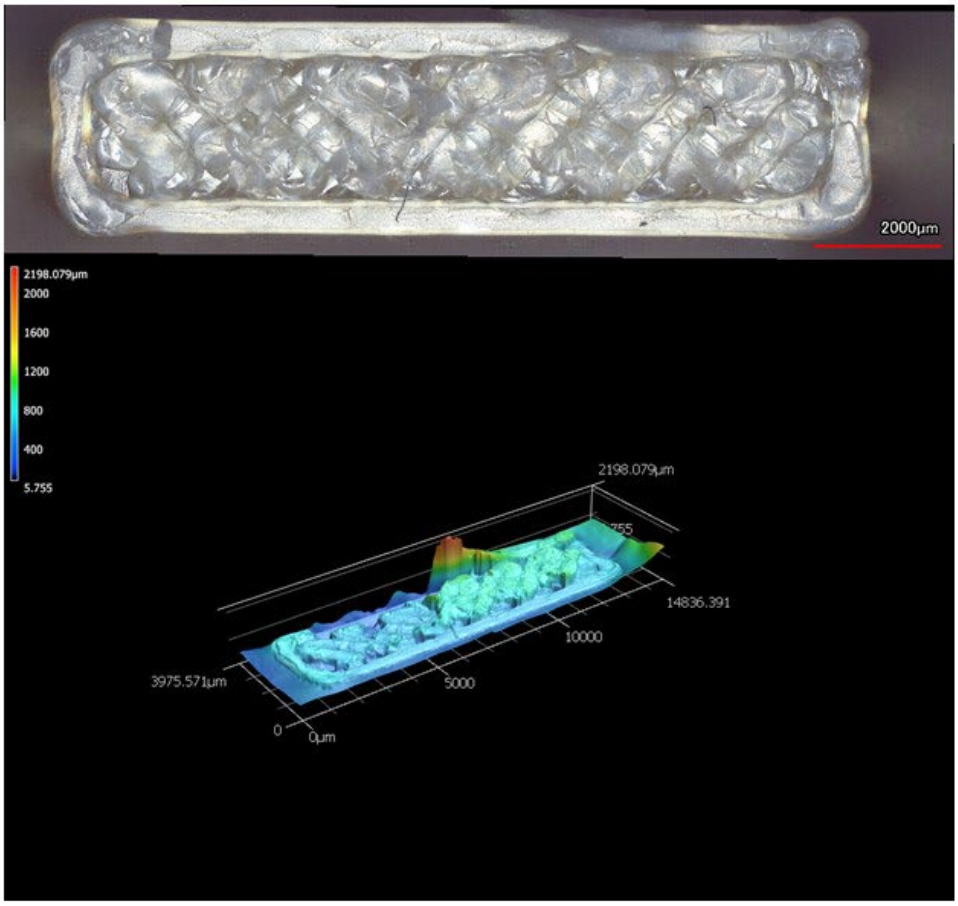
PRW22-ZT-A (FRAC)



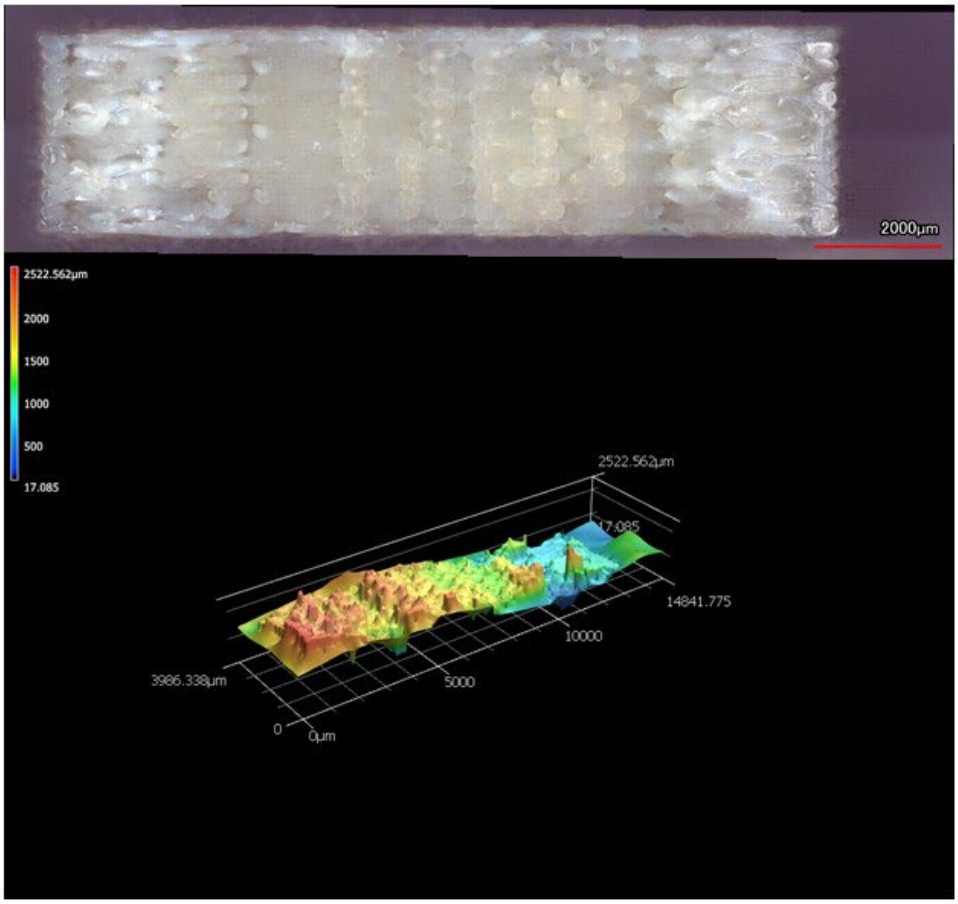
PRW22-ZT-B (FRAC)



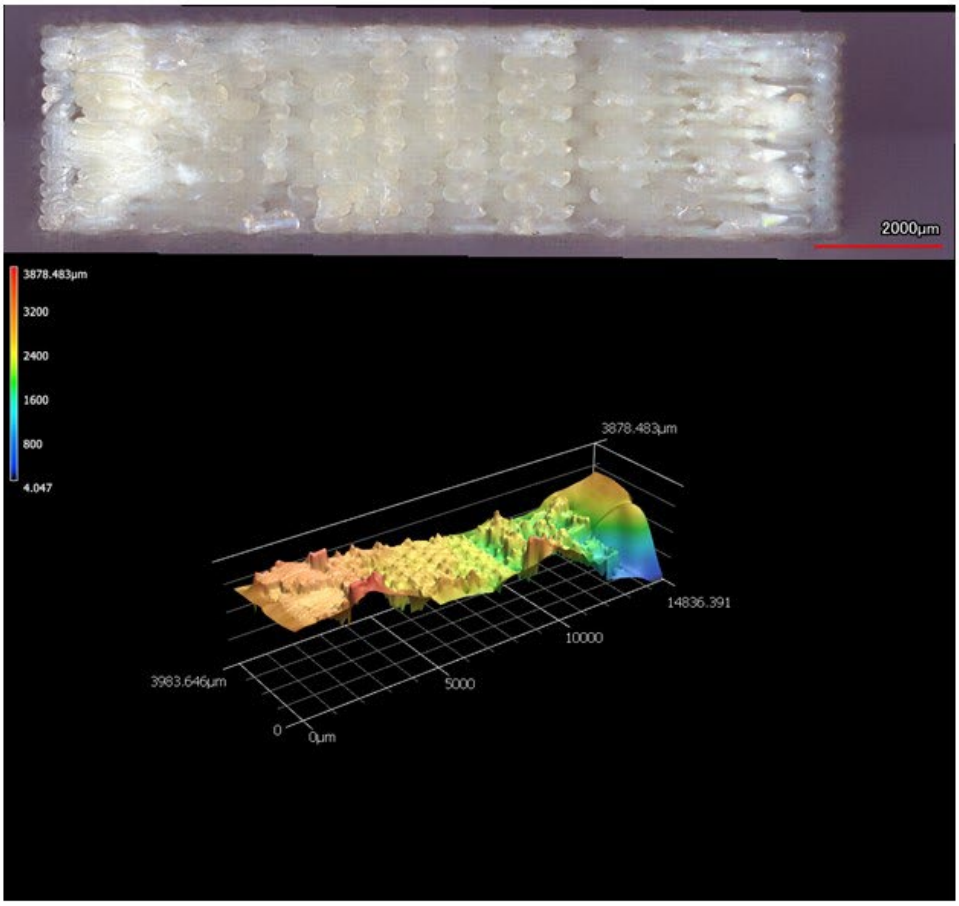
PRW26-ZT-A (FRAC)



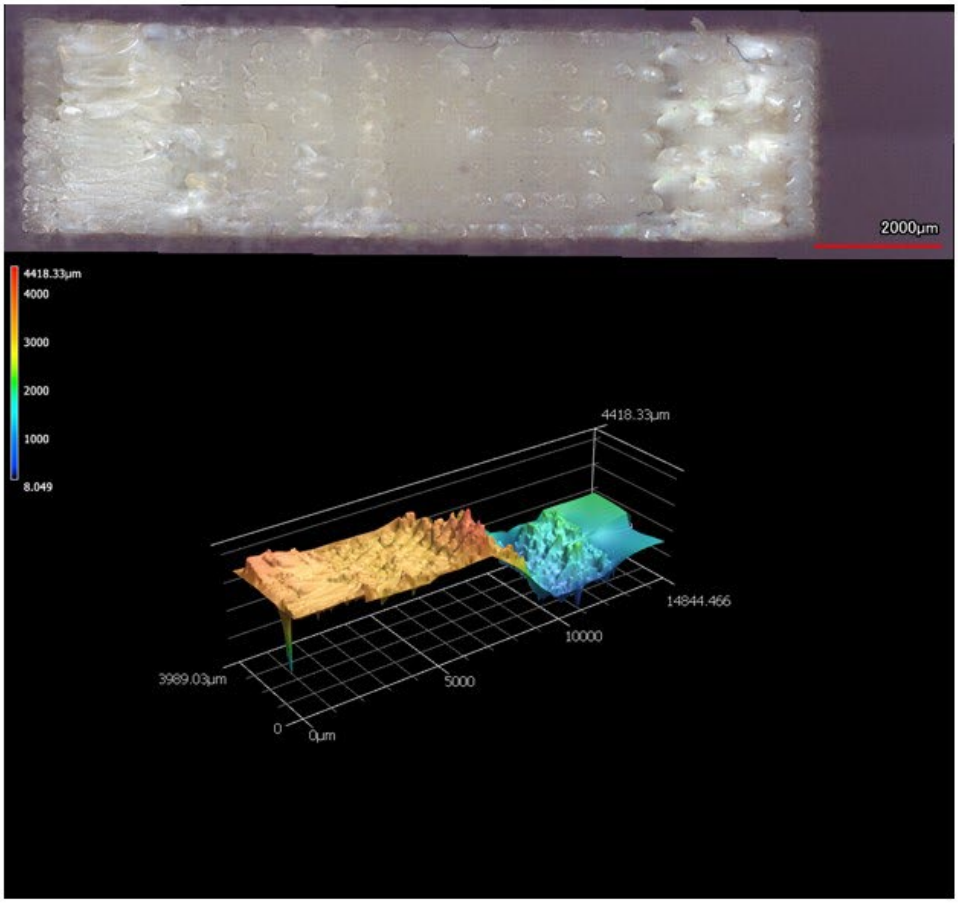
PRW26-ZT-B (FRAC)



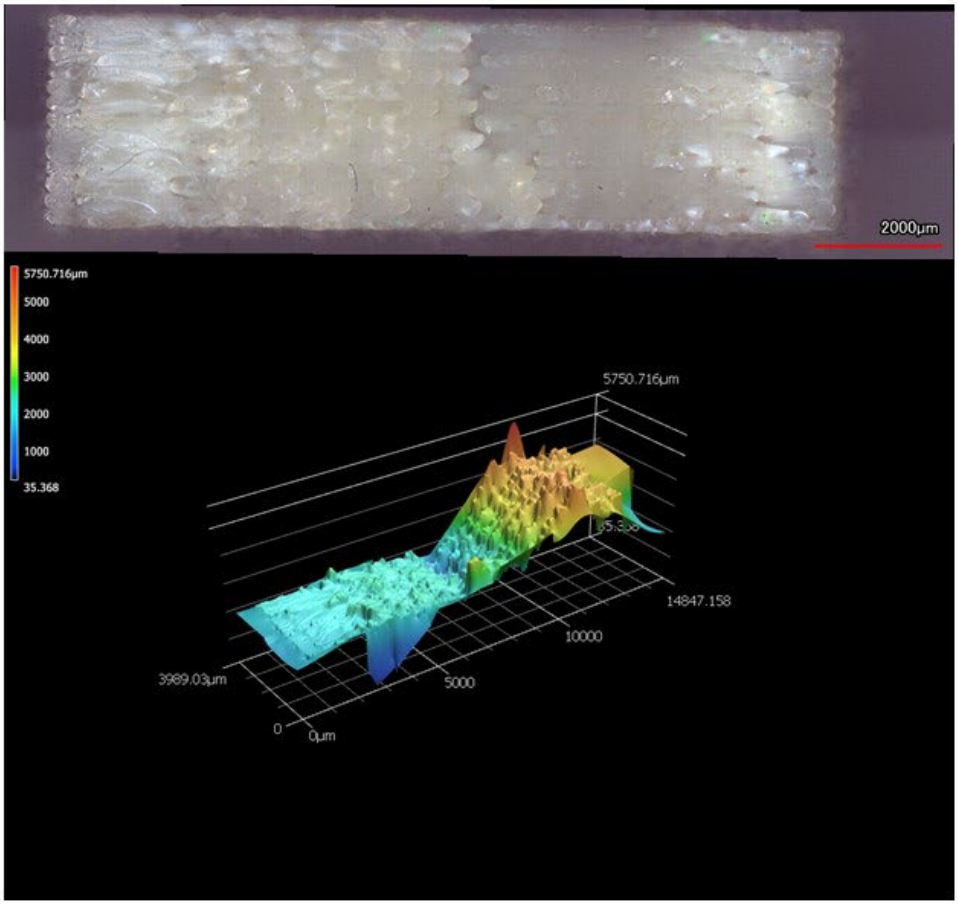
SMC1-XT-A (FRAC)



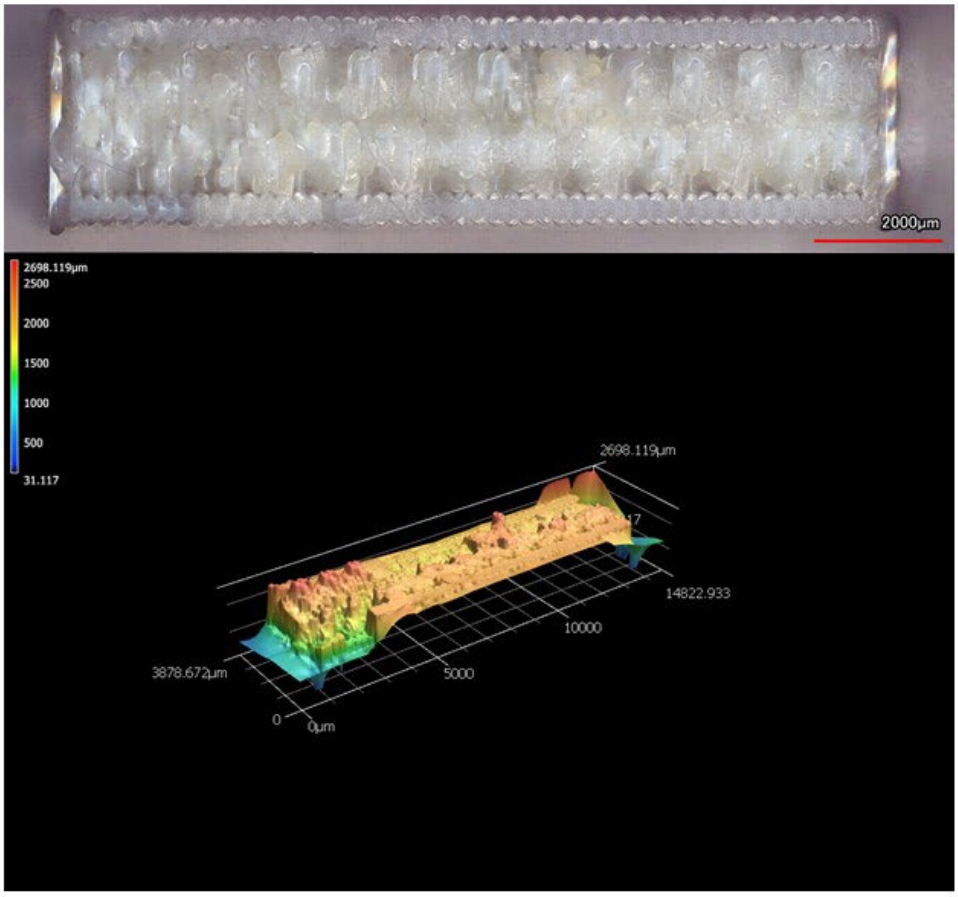
SMC1-XT-B (FRAC)



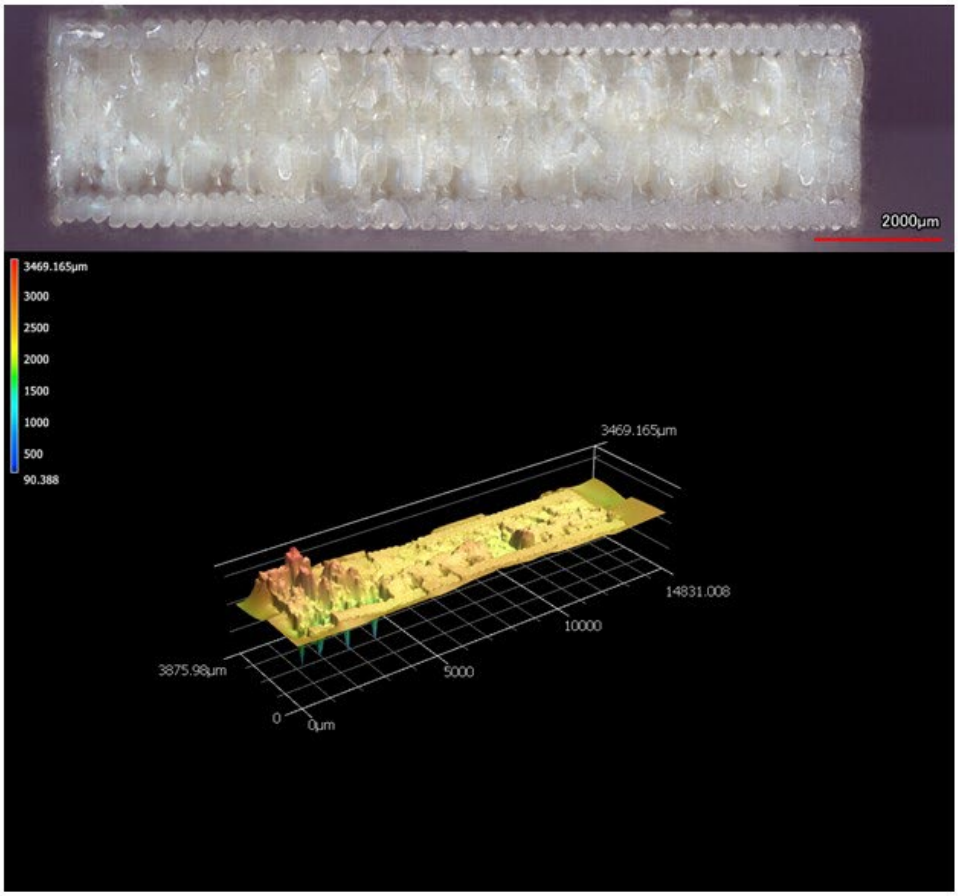
SMC3-XT-A (FRAC)



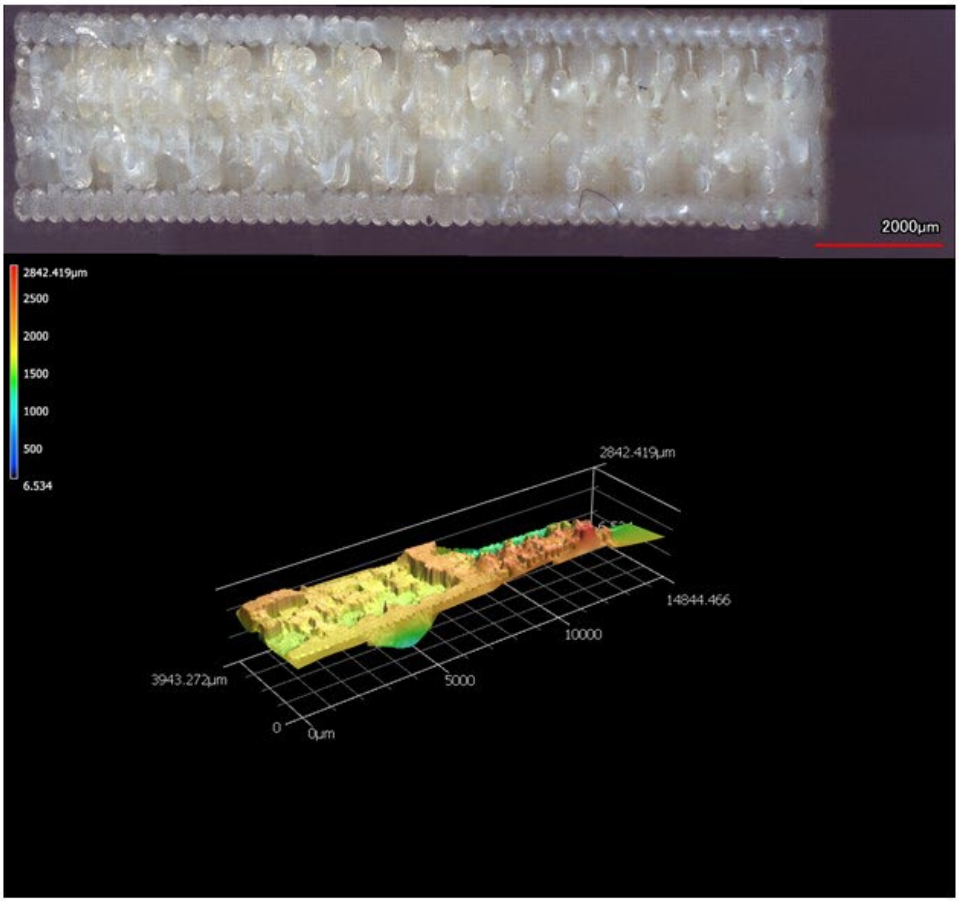
SMC3-XT-B (FRAC)



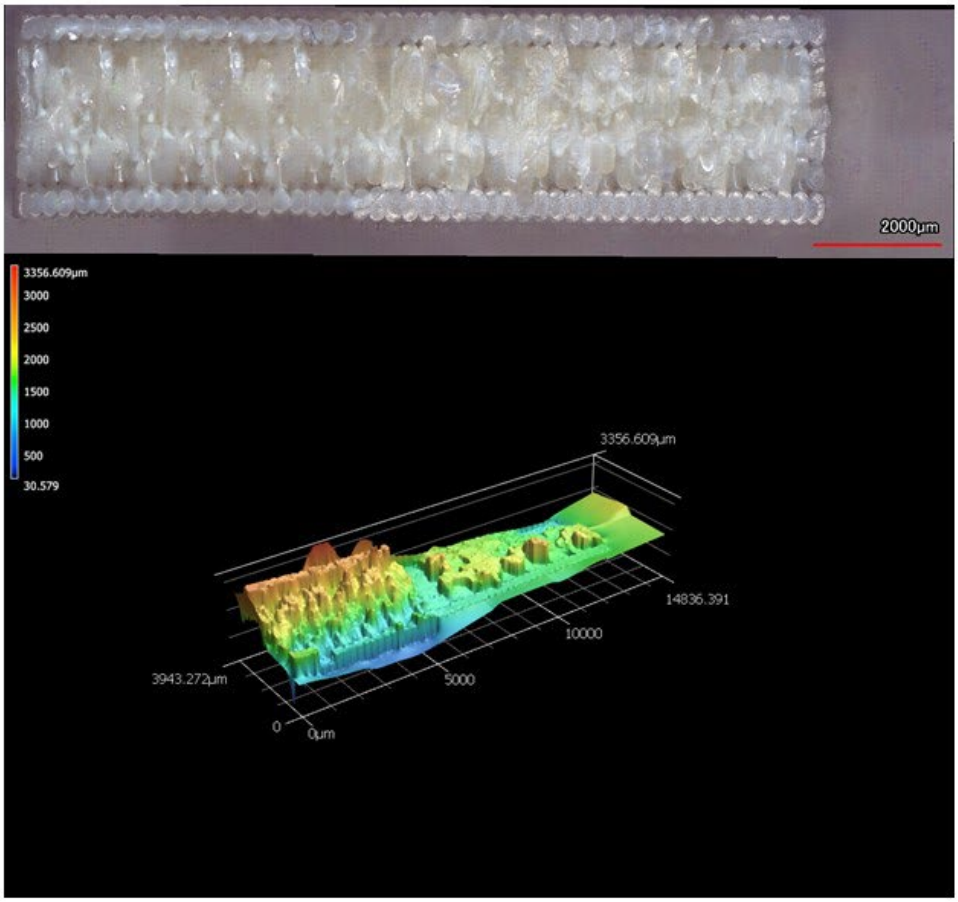
SMC1-YT-A (FRAC)



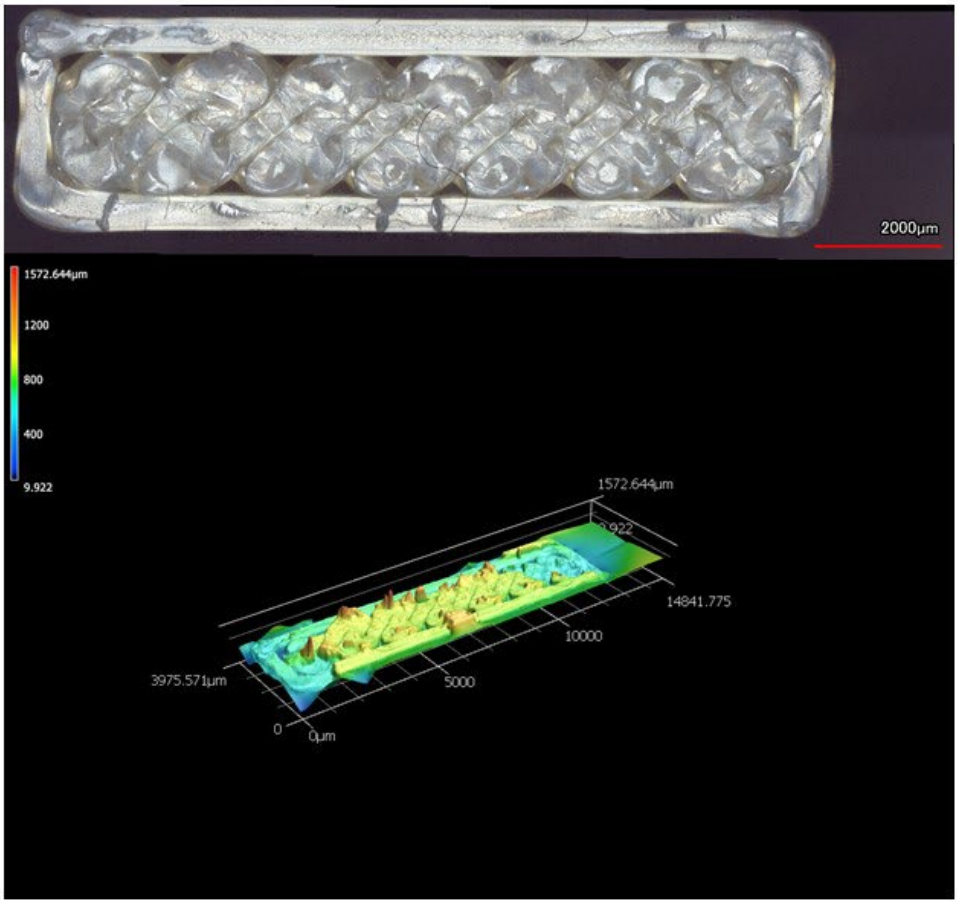
SMC1-YT-B (FRAC)



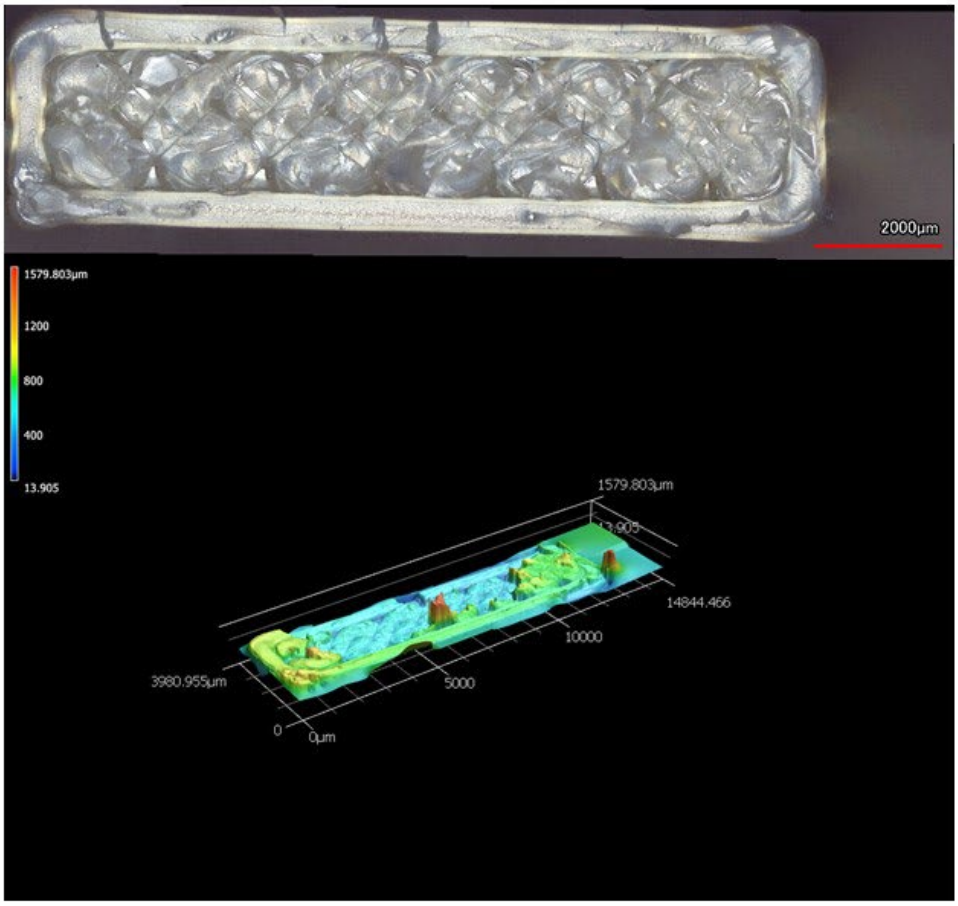
SMC3-YT-A (FRAC)



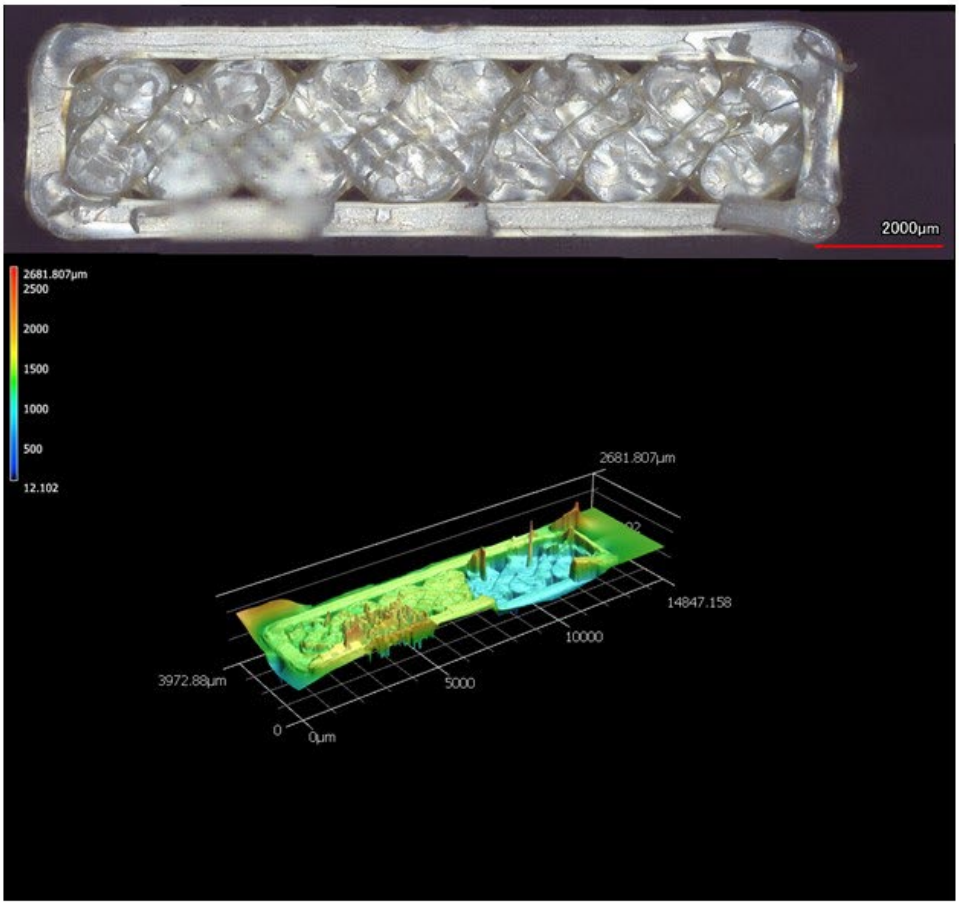
SMC3-YT-B (FRAC)



SMC1-ZT-A (FRAC)



SMC1-ZT-B (FRAC)



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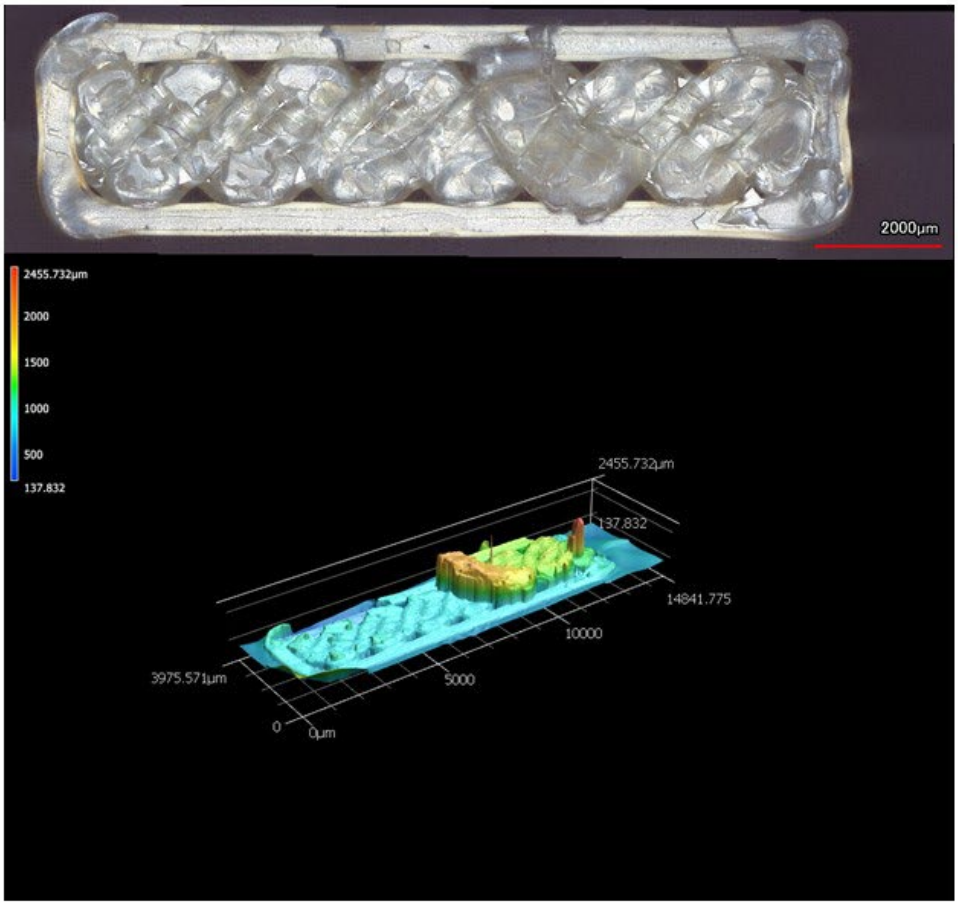
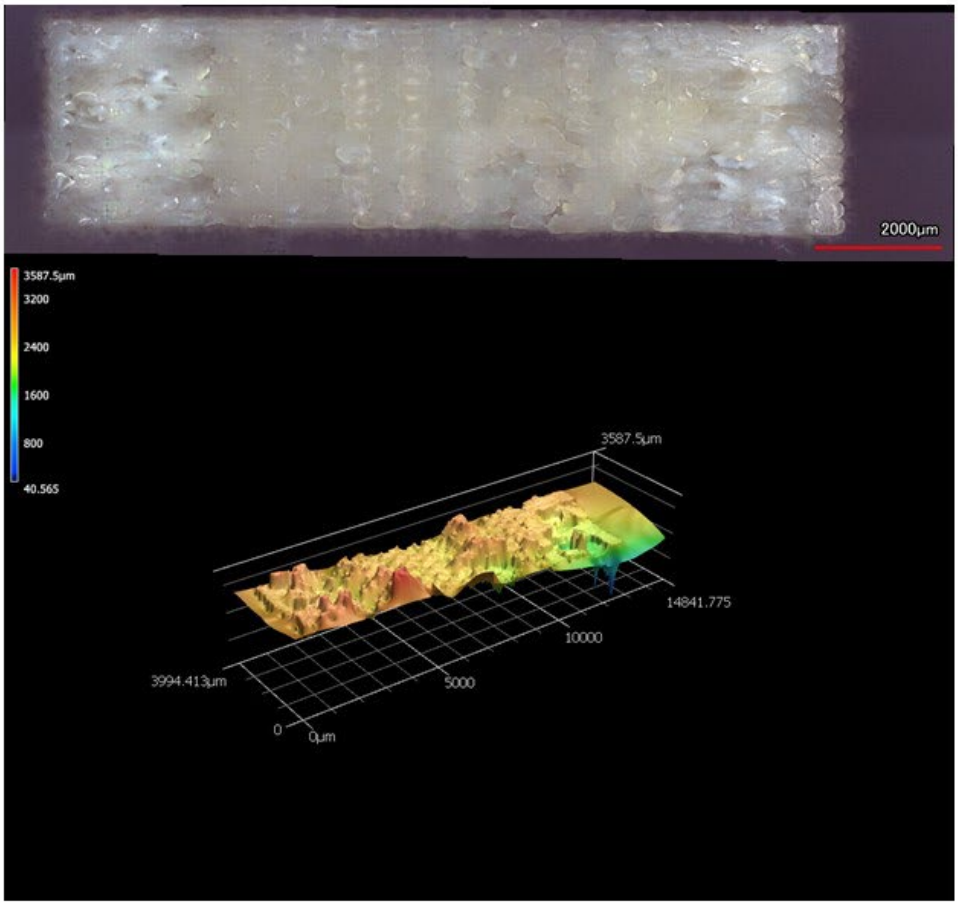
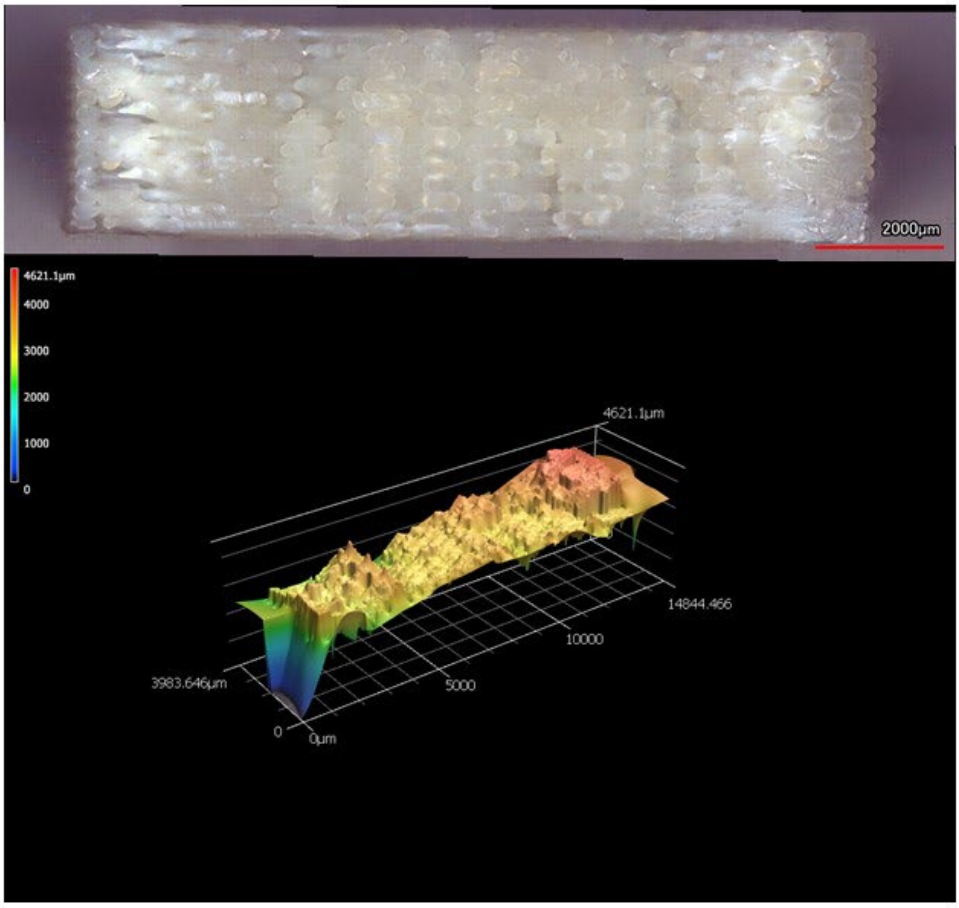


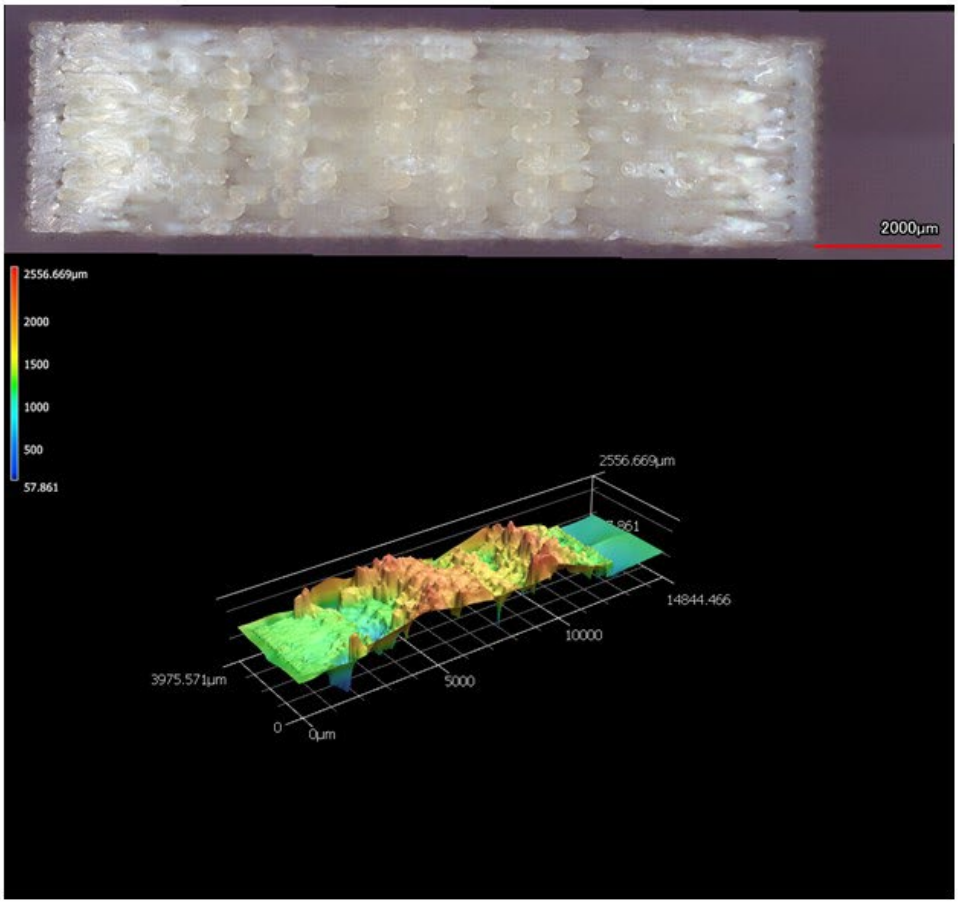
SMC3-ZT-B (FRAC)



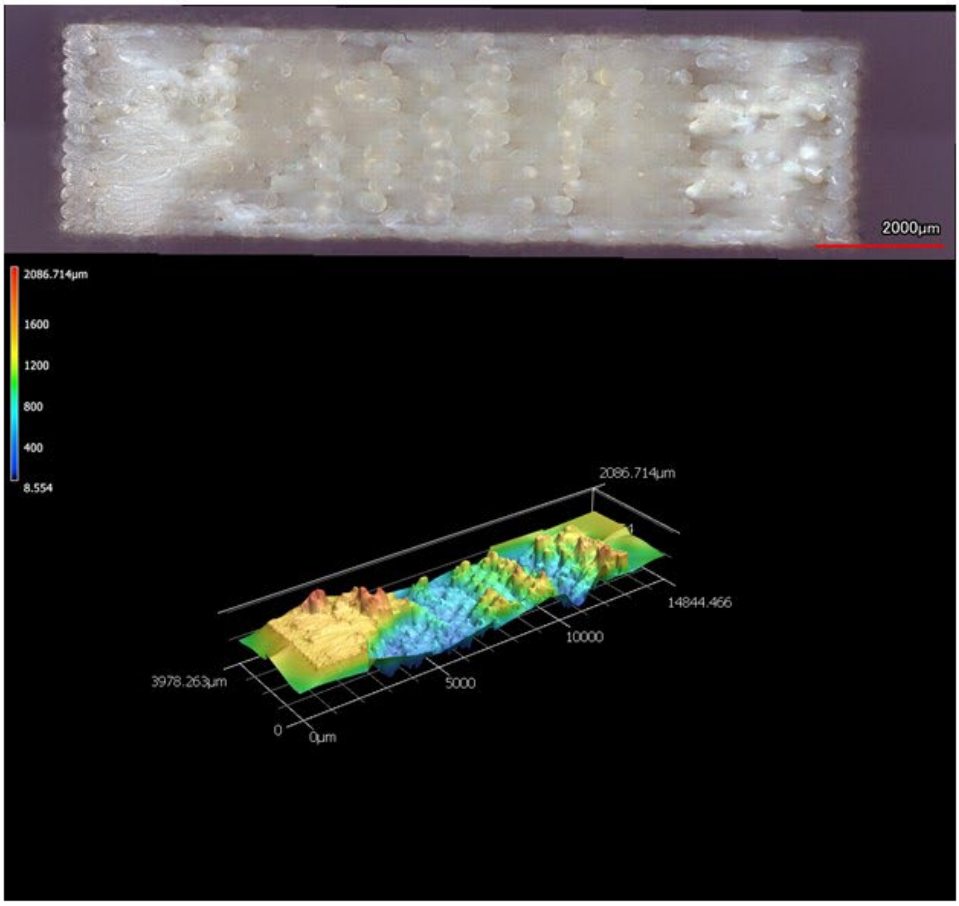
VSRAG0-XT-A (FRAC)



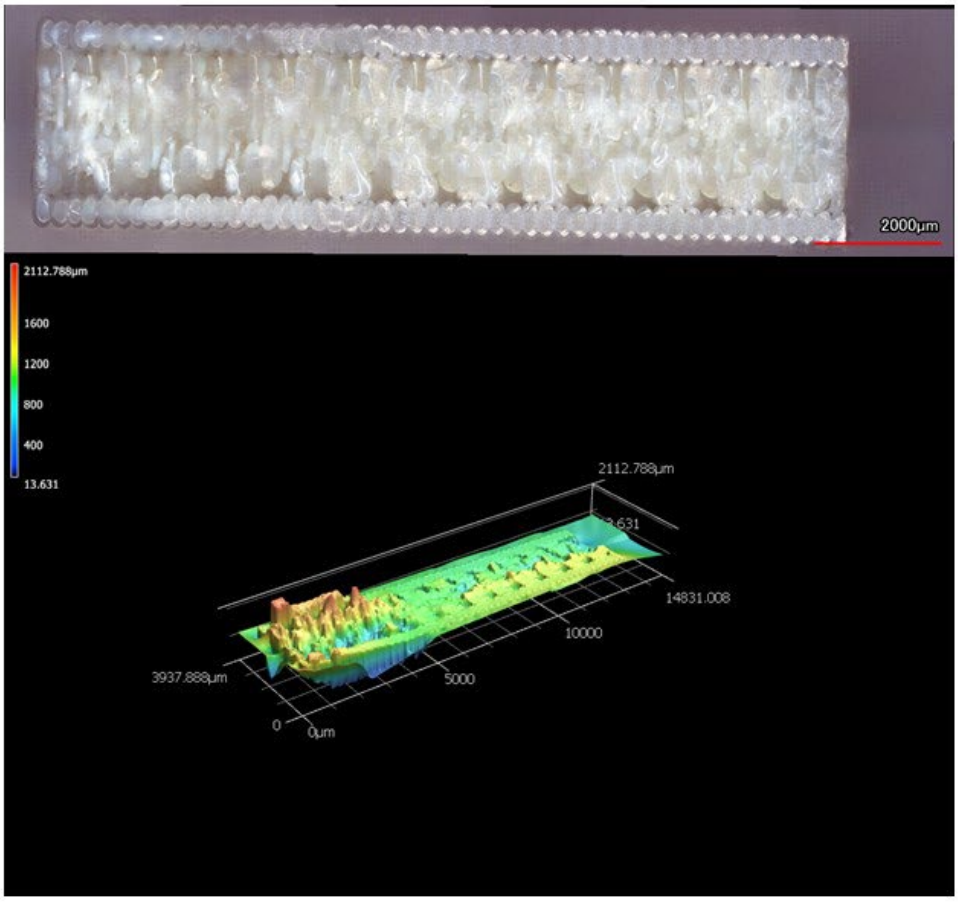
VSRAG0-XT-B (FRAC)



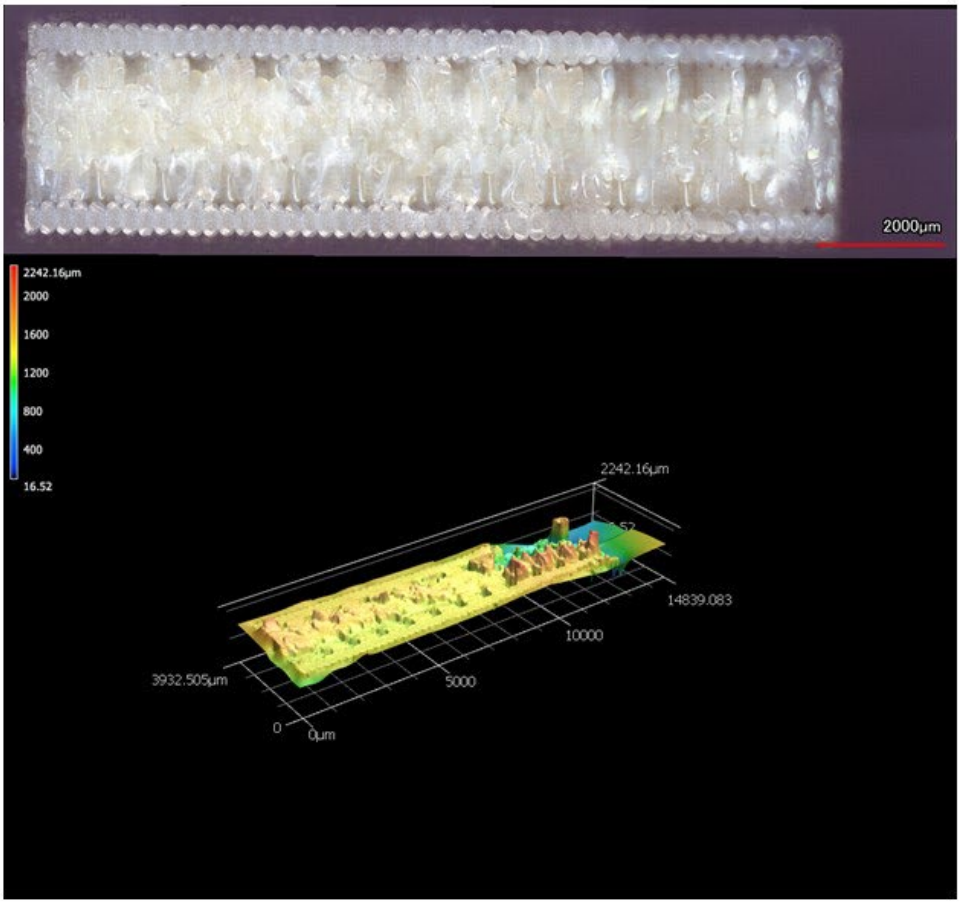
VSRAG(10)-XT-A (FRAC)



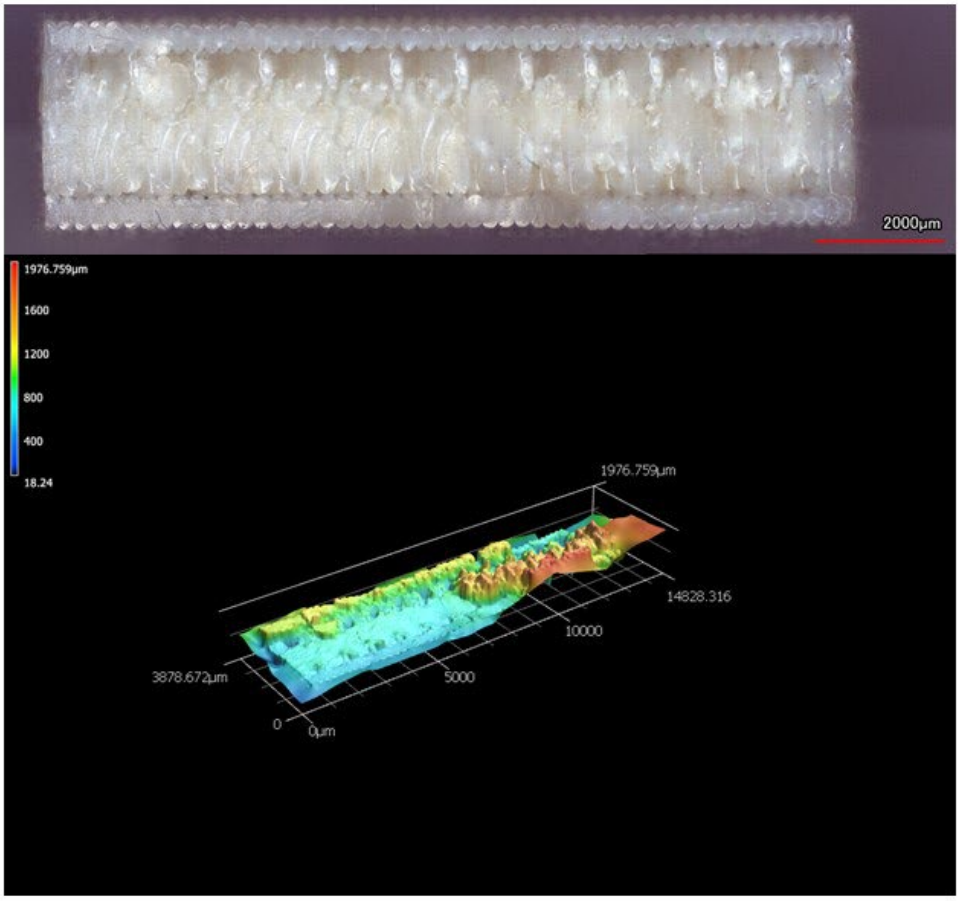
VSRAG(10)-XT-B (FRAC)



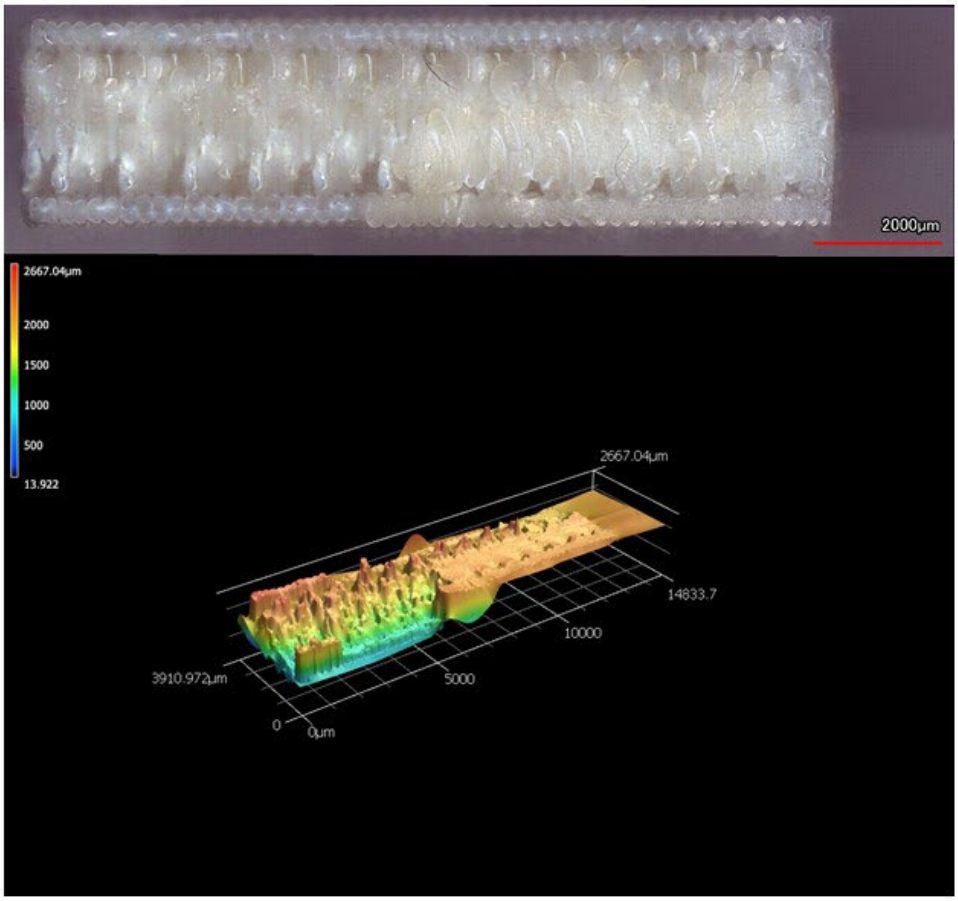
VSRAG0-YT-A (FRAC)



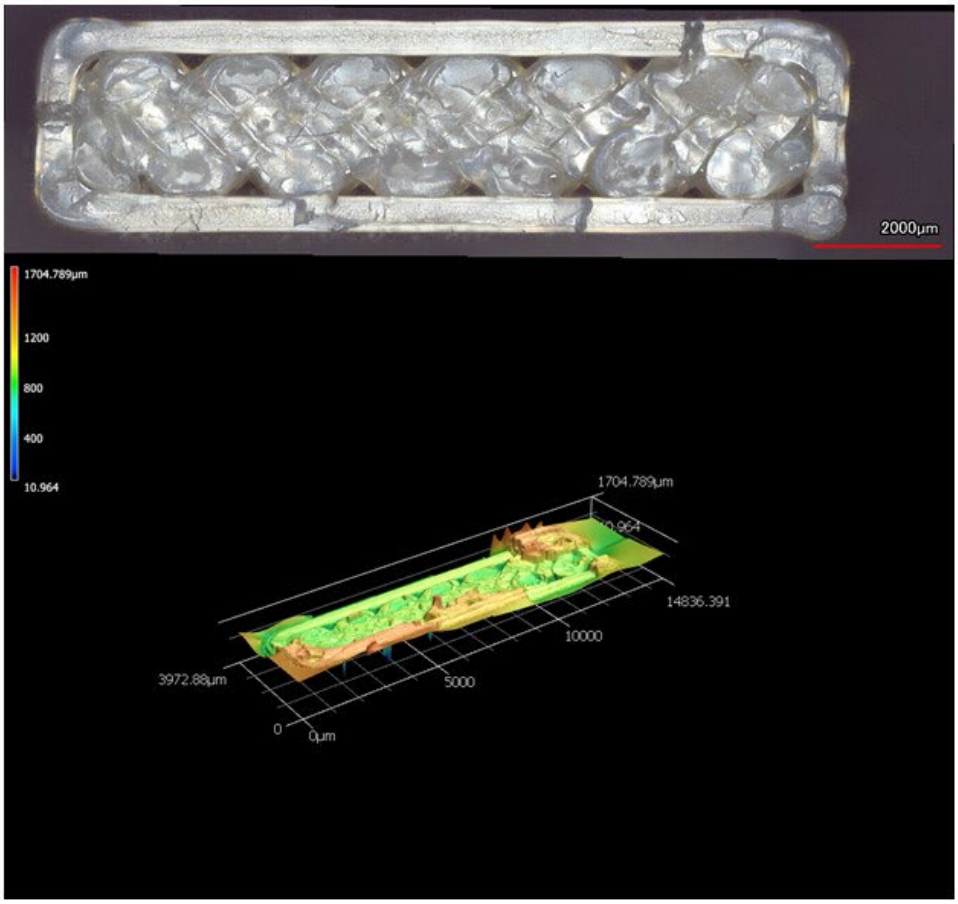
VSRAG(10)-YT-B (FRAC)



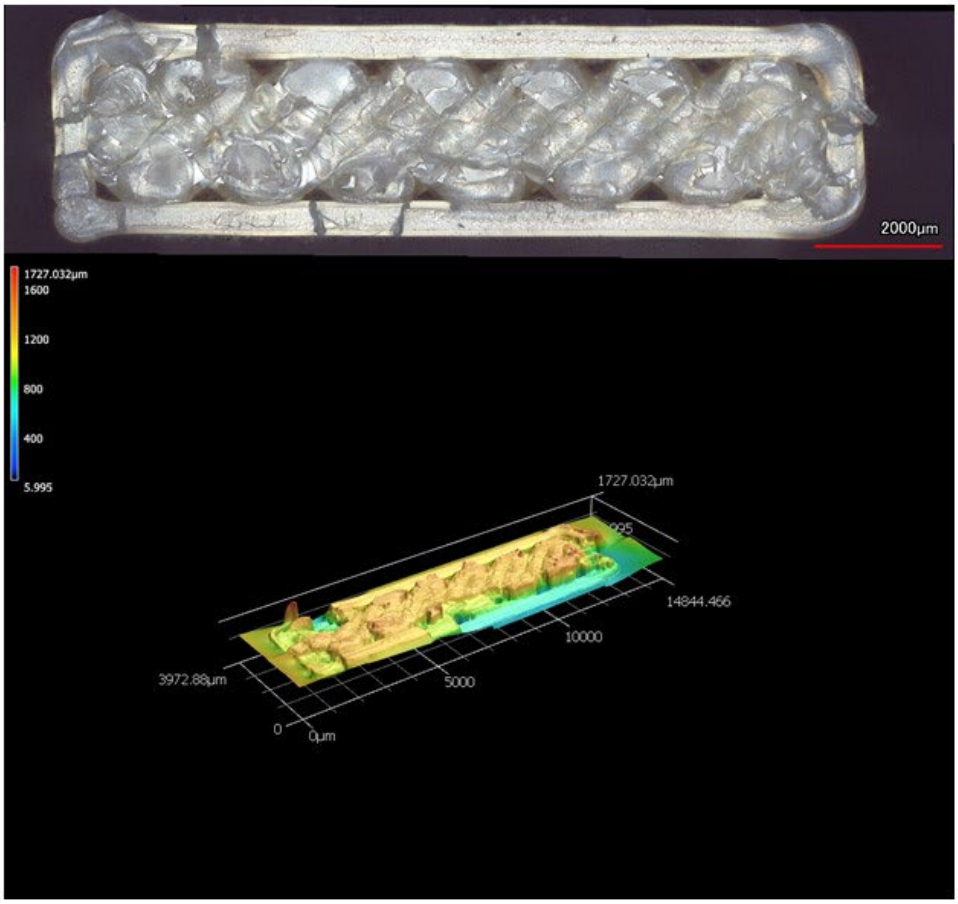
VSRAG(10)-YT-A (FRAG)



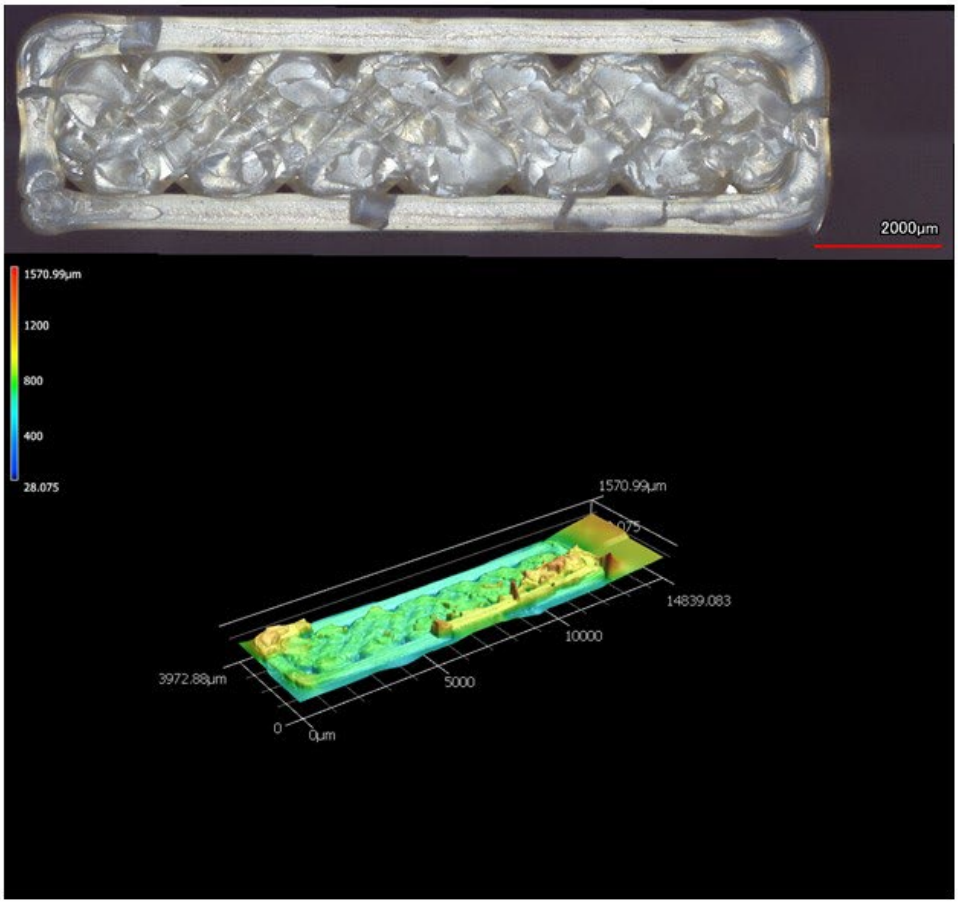
VSRAG(10)-YT-B (FRAC)



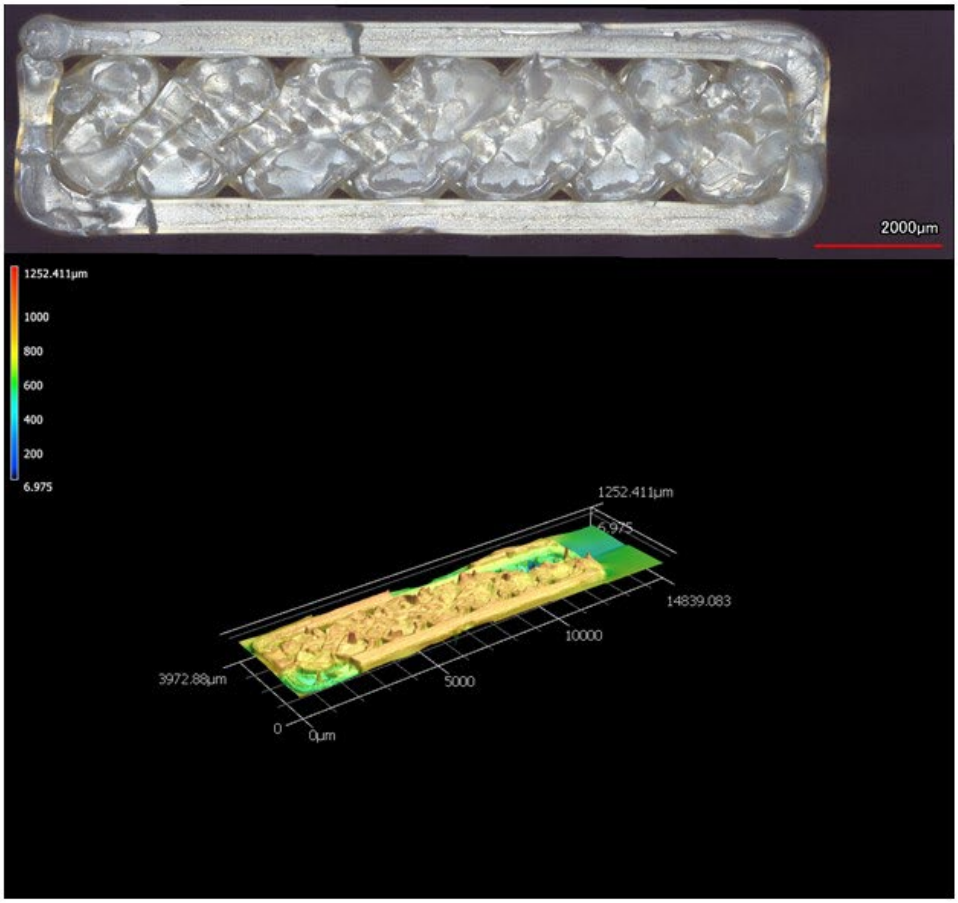
VSRAG0-ZT-A (FRAC)



VSRAG0-ZT-B (FRAC)



VSRAG(10)-ZT-A (FRAC)



VSRAG(10)-ZT-B (FRAC)

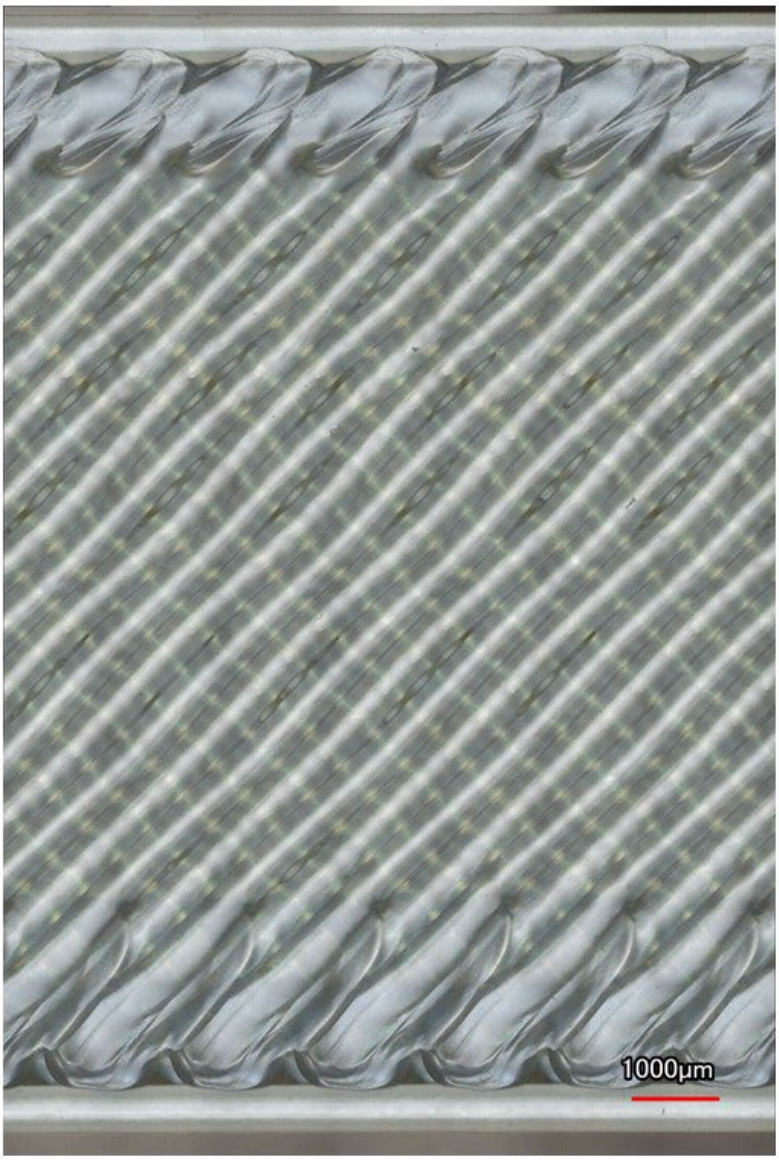
E Specimen microstructure imagery

All following surface imagery are cross-referenced with descriptive identification information as follows:

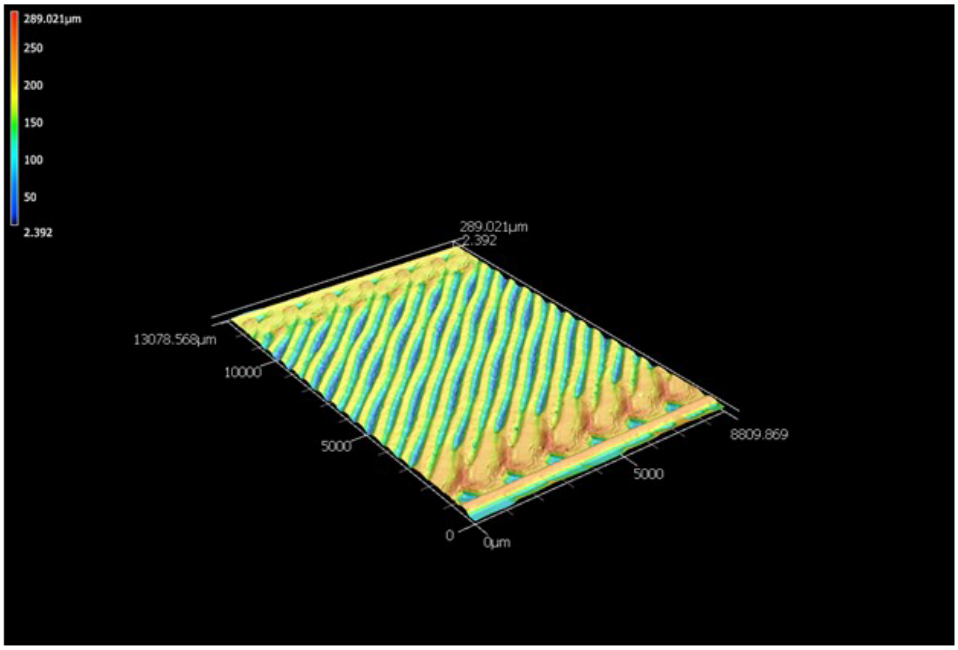
Insight Parameter, Insight Parameter Value–Test Types, (Surface Types)

Table E- 1. Table for specimen imagery identification

Parameter	**Possible Values**
Insight Parameter:	AR, CC2, CC3, CR, EVSRW, NC, PRW, SMC, EVSRAG
Insight Parameter Value:	(15), (10), (5), 0, 1, 2, 3, 5, 10, 15, 17, 18, 20, 22, 26
Test Types:	XT, YT, ZT (Static Tension)
Surface Type:	(NO CUT) = As-fabricated Surface (CUT) = Machined Surface

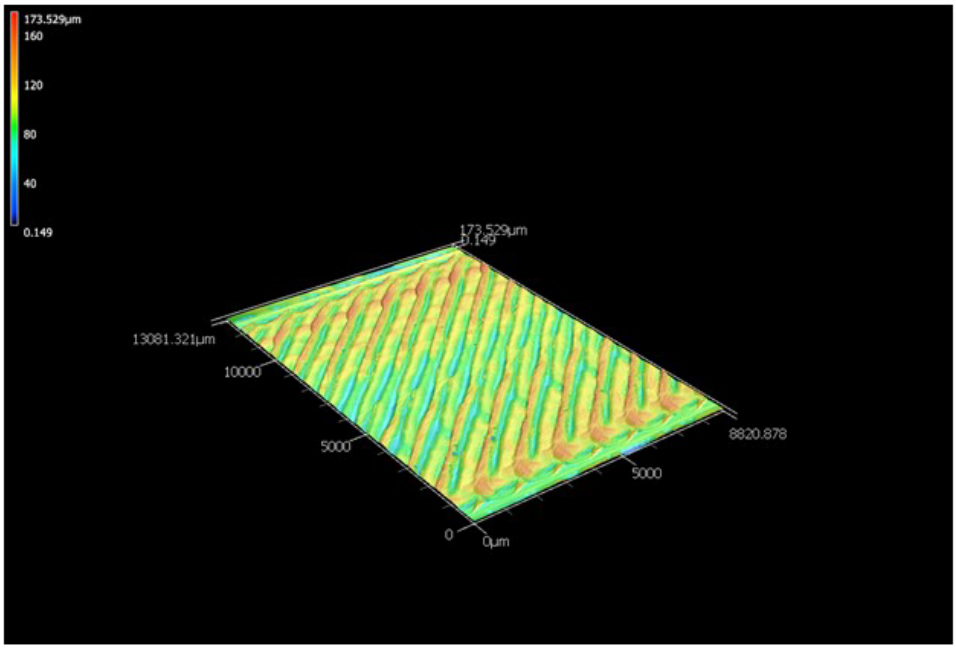


AR0-XT (NO CUT) 1 OF 2

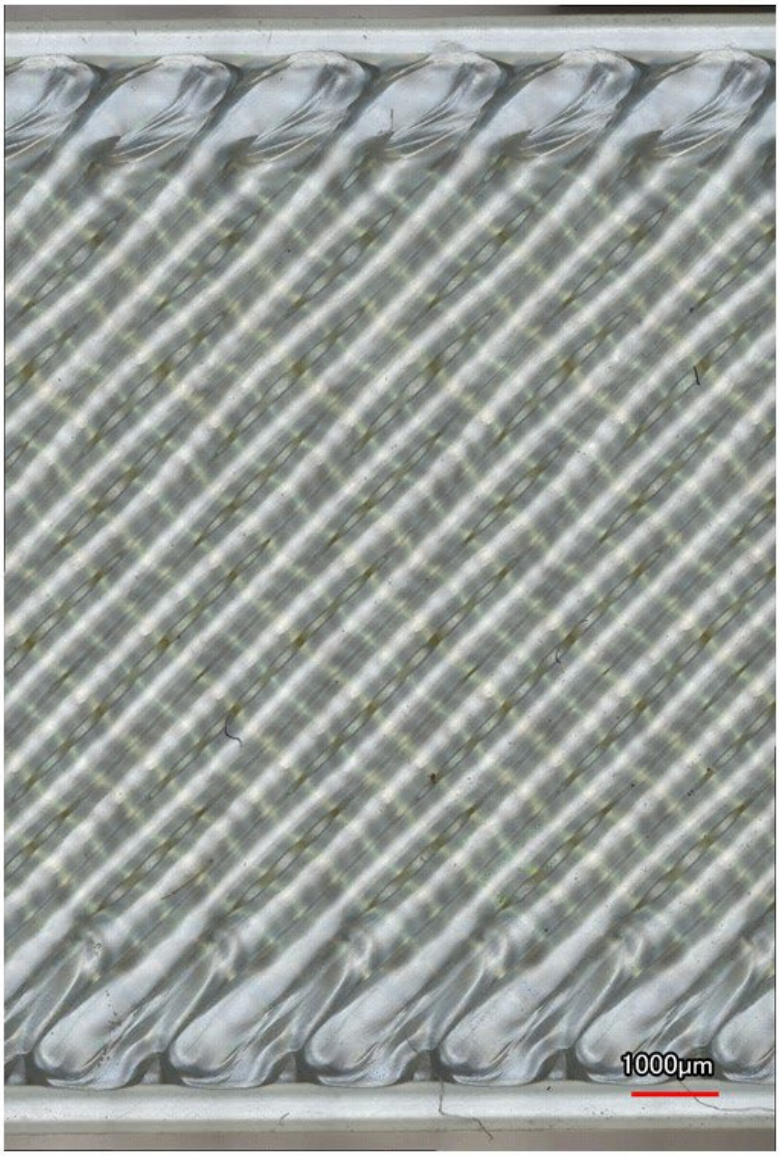


AR0-XT (NO CUT) 2 OF 2

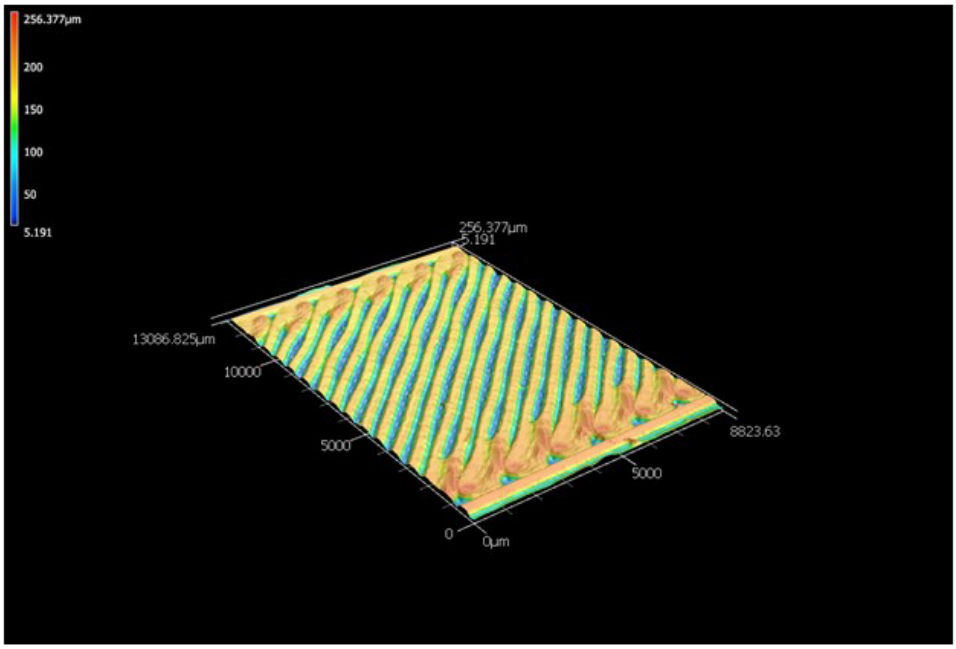
AR(15)-XT (NO CUT) 1 OF 2



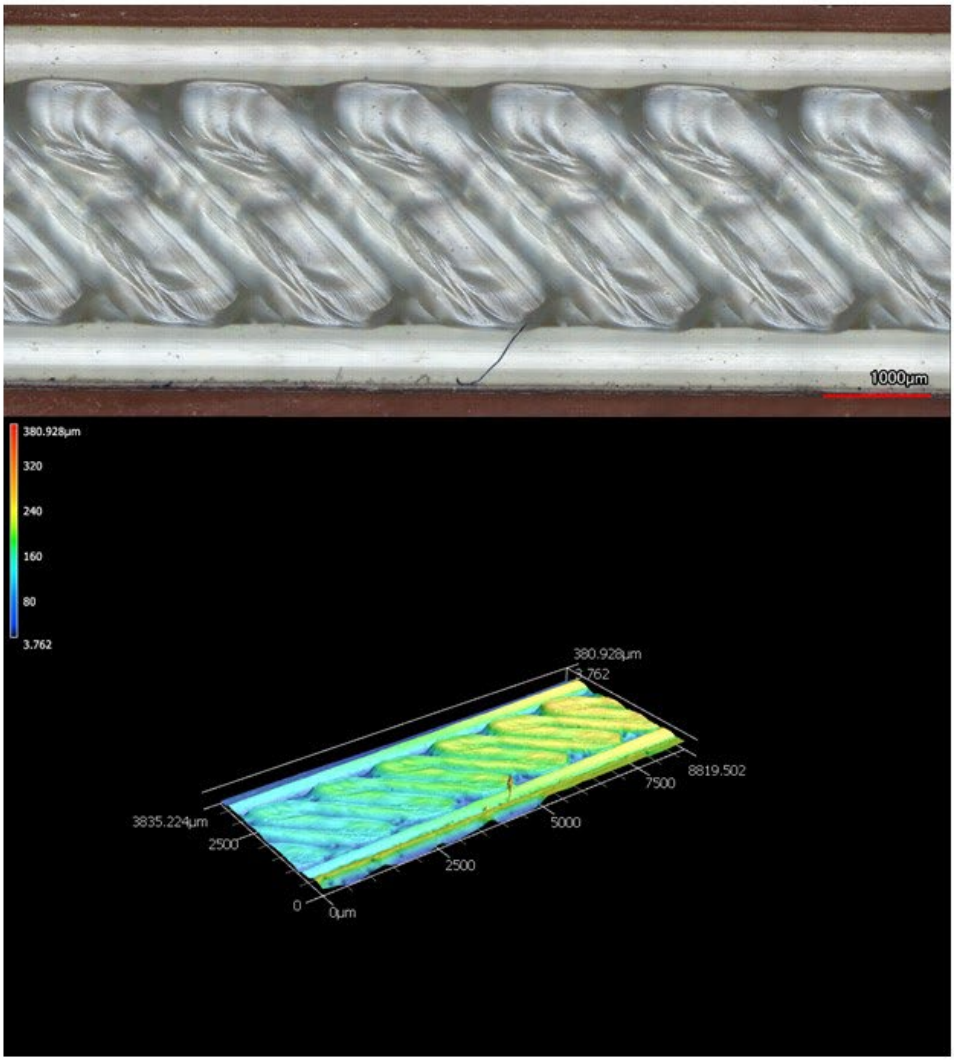
AR(15)-XT (NO CUT) 2 OF 2



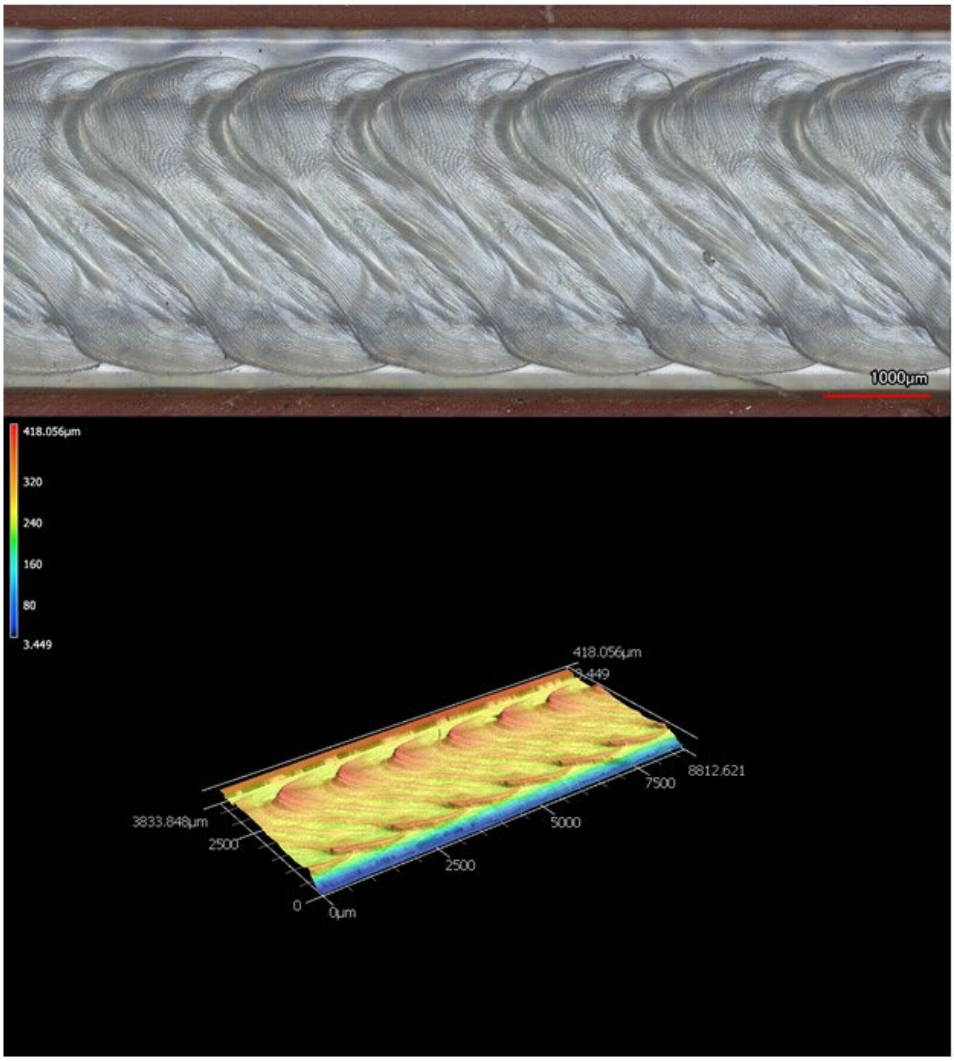
AR15-XT (NO CUT) 1 OF 2



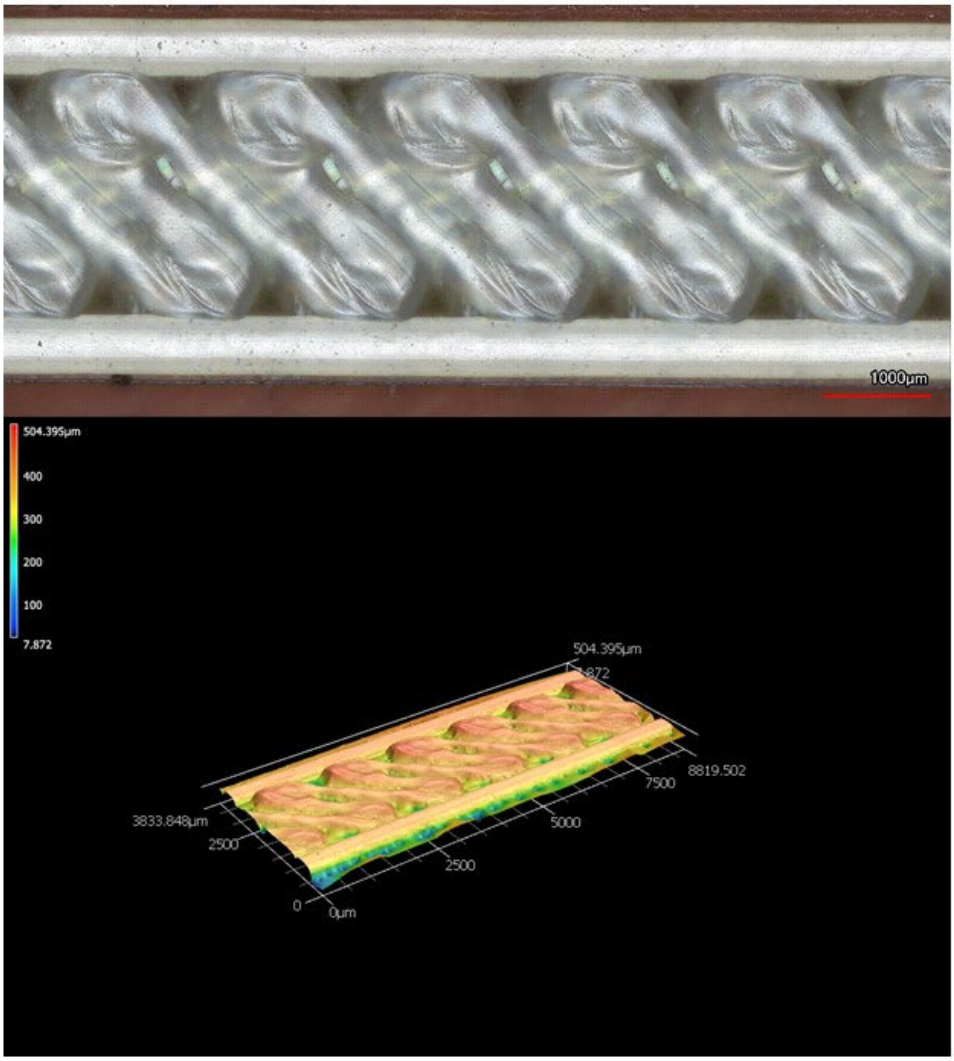
AR15-XT (NO CUT) 2 OF 2


1000µm
380.928µm
320
240
160
80
3.762
380.928µm
3.762
8819.502
7500
5000
2500
0µm
3835.224µm
2500
0

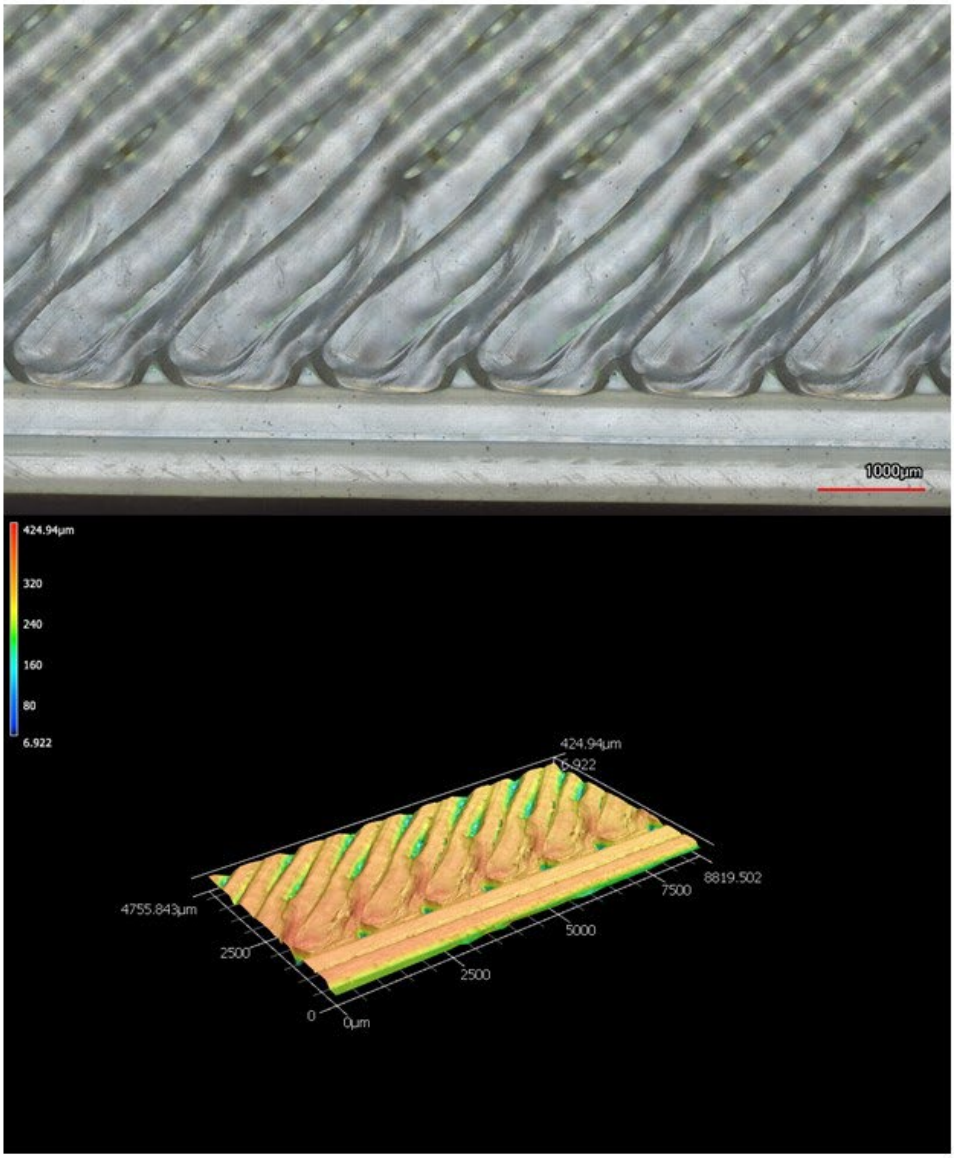
AR0-YT (NO CUT)



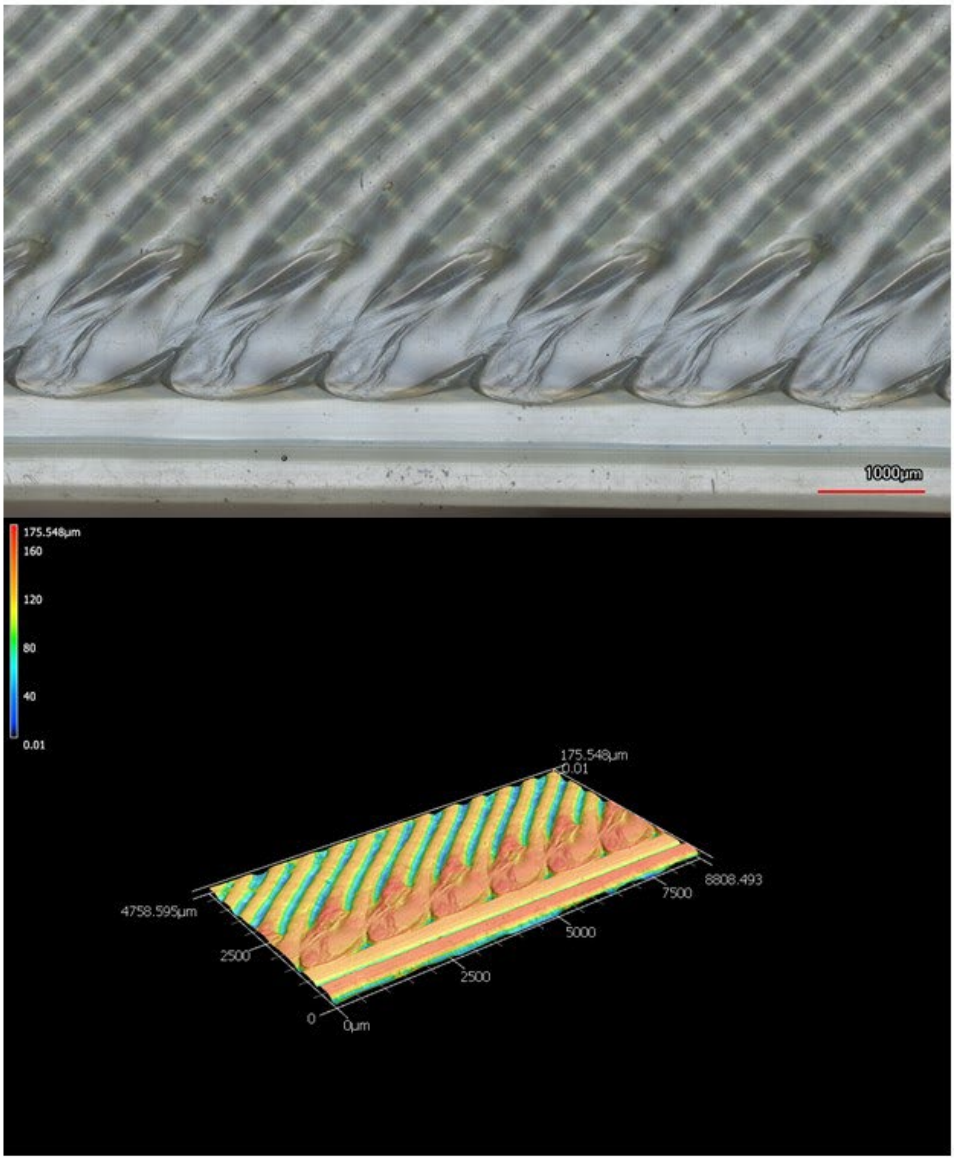
AR(15)-YT (NO CUT)



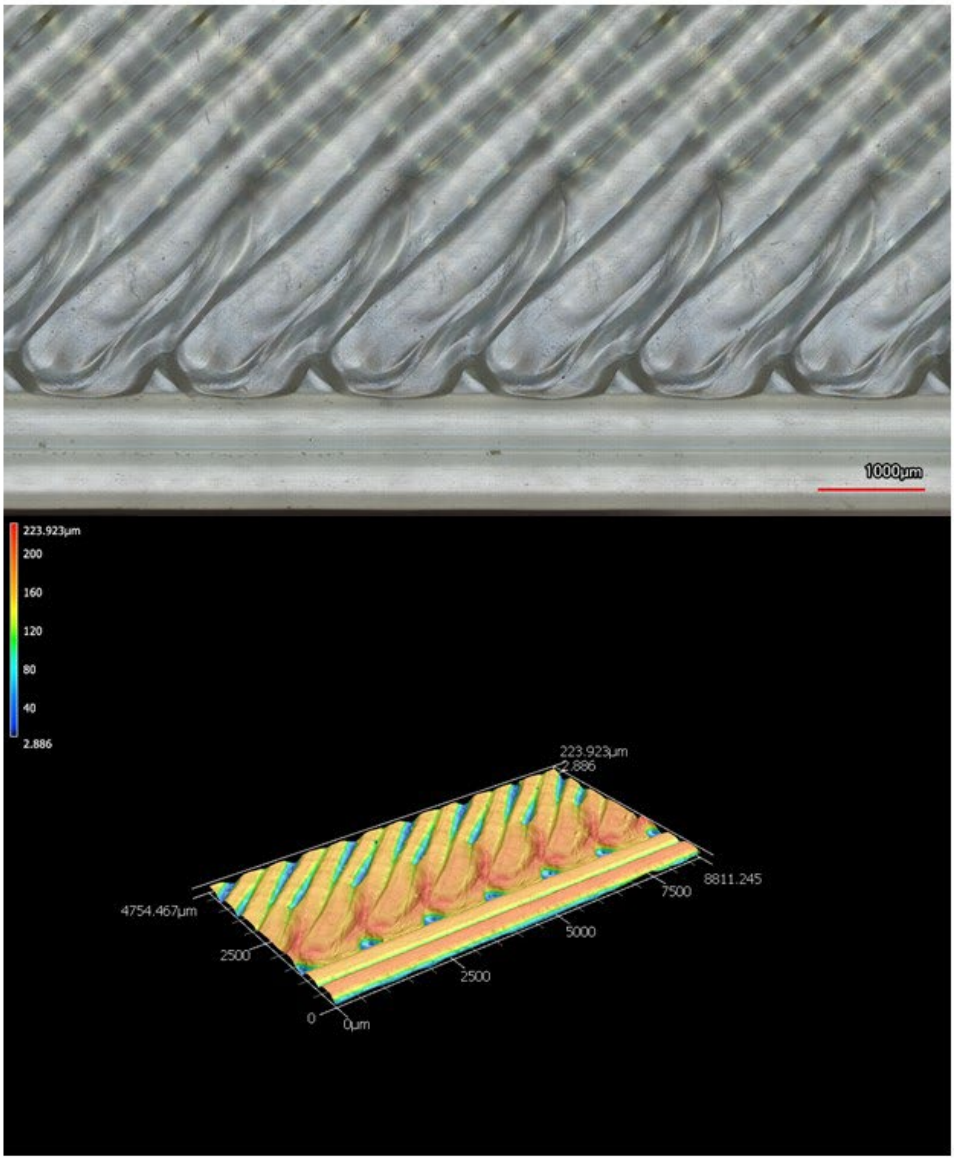
AR15-YT (NO CUT)



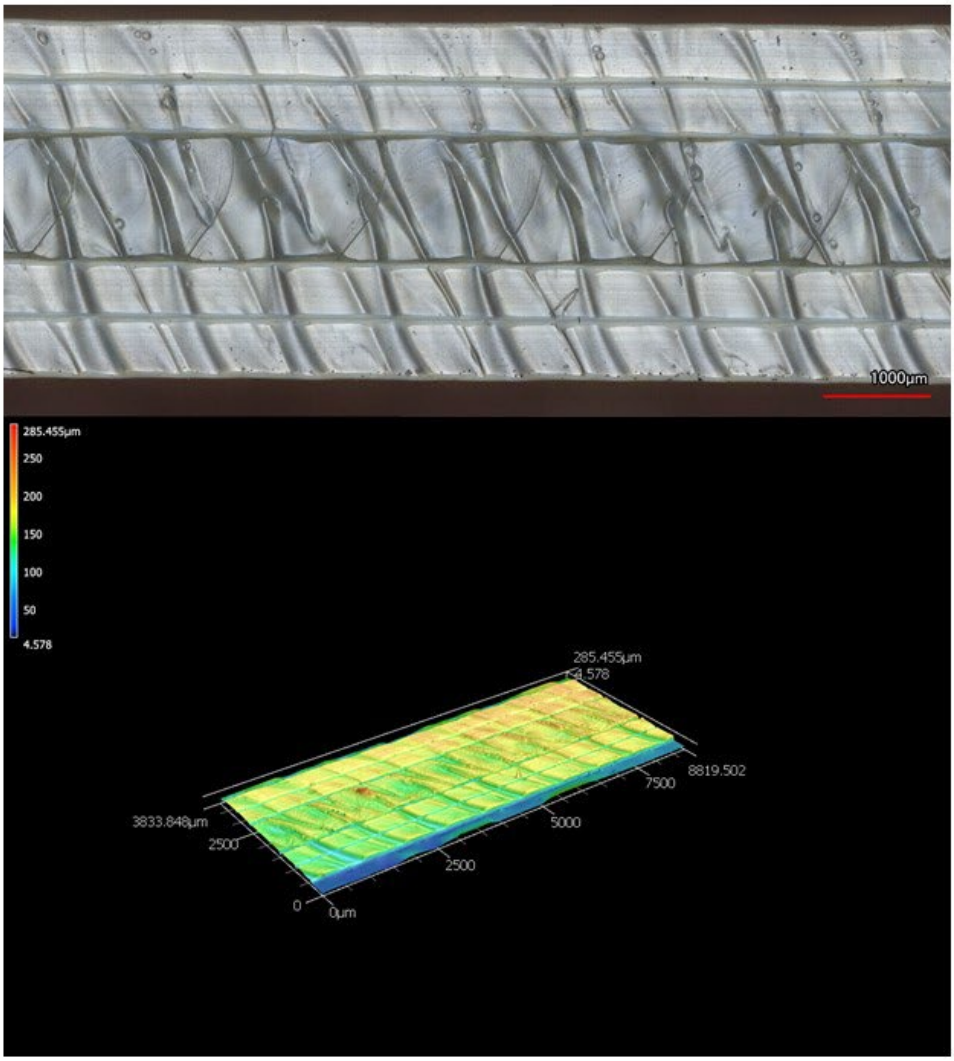
CC2(15)-XT (NO CUT)



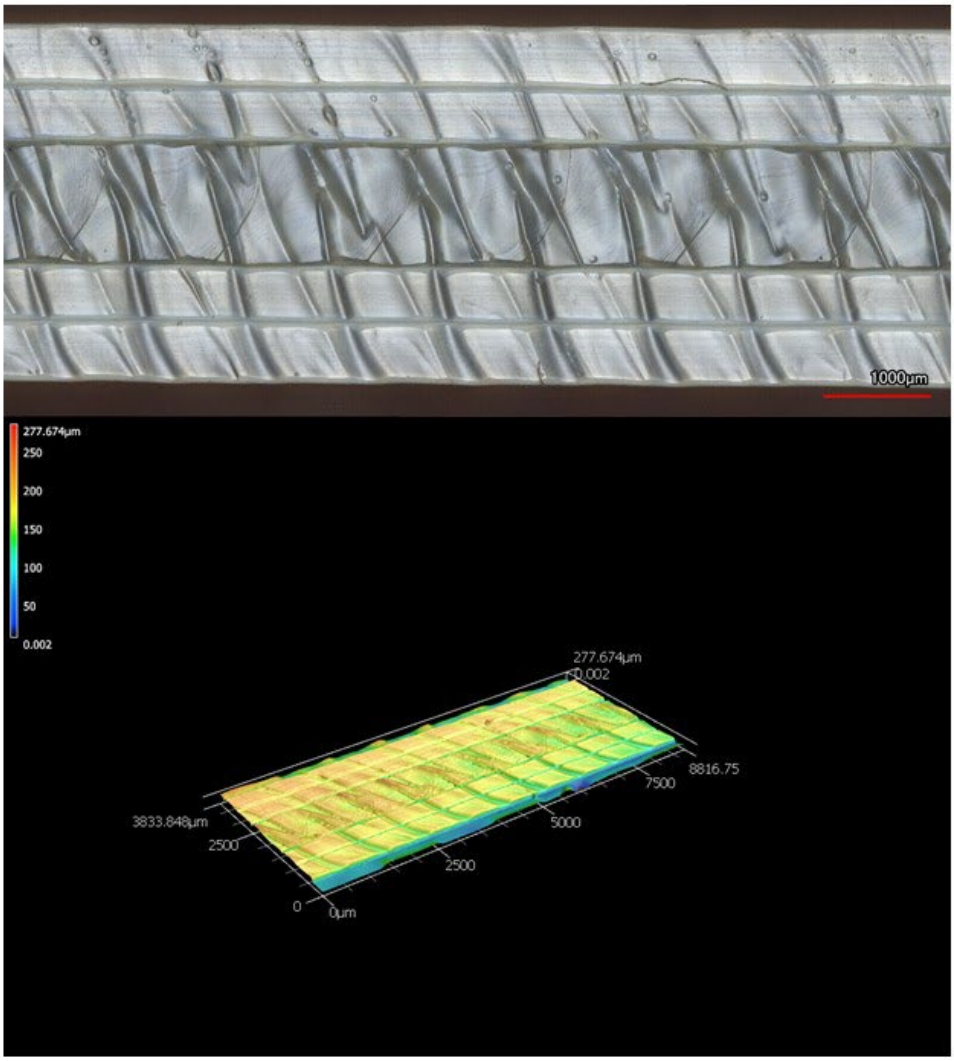
CC20-XT (NOCUT)



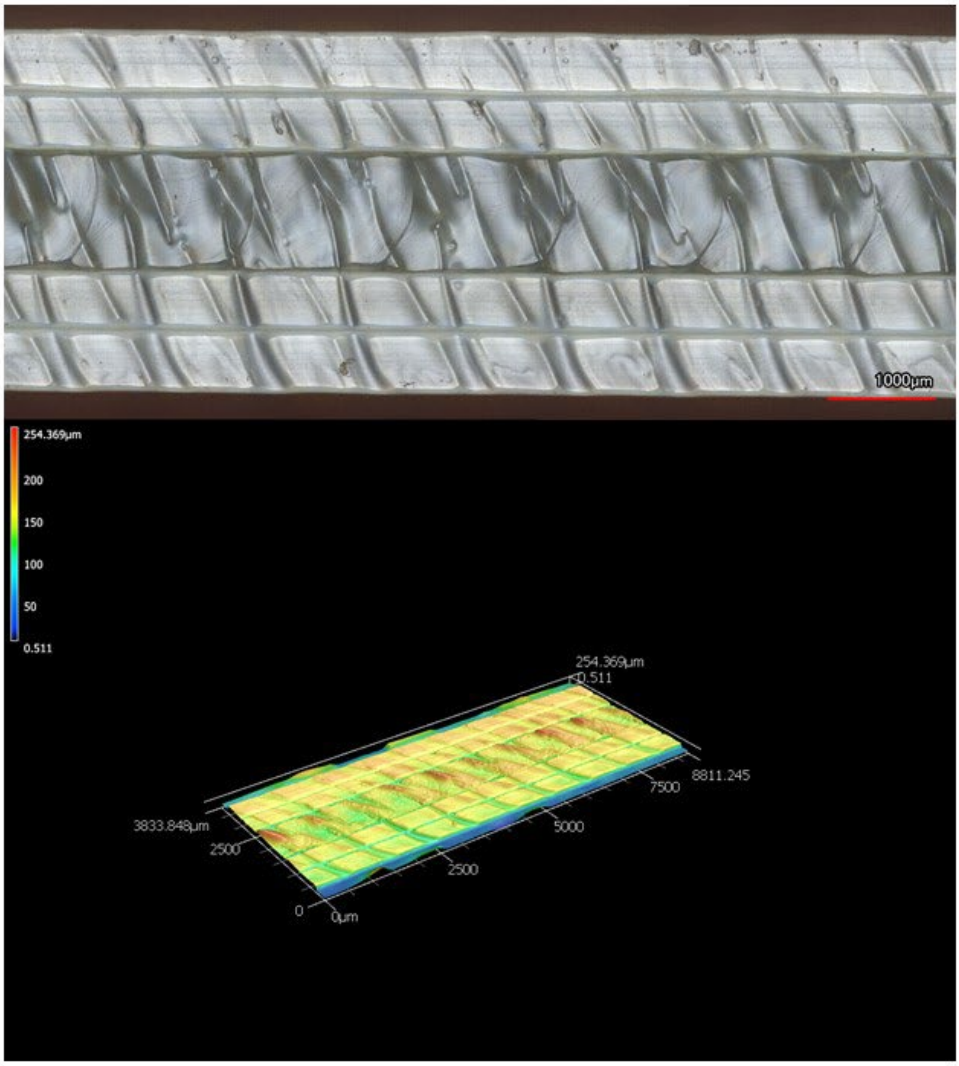
CC215-XT (NO CUT)



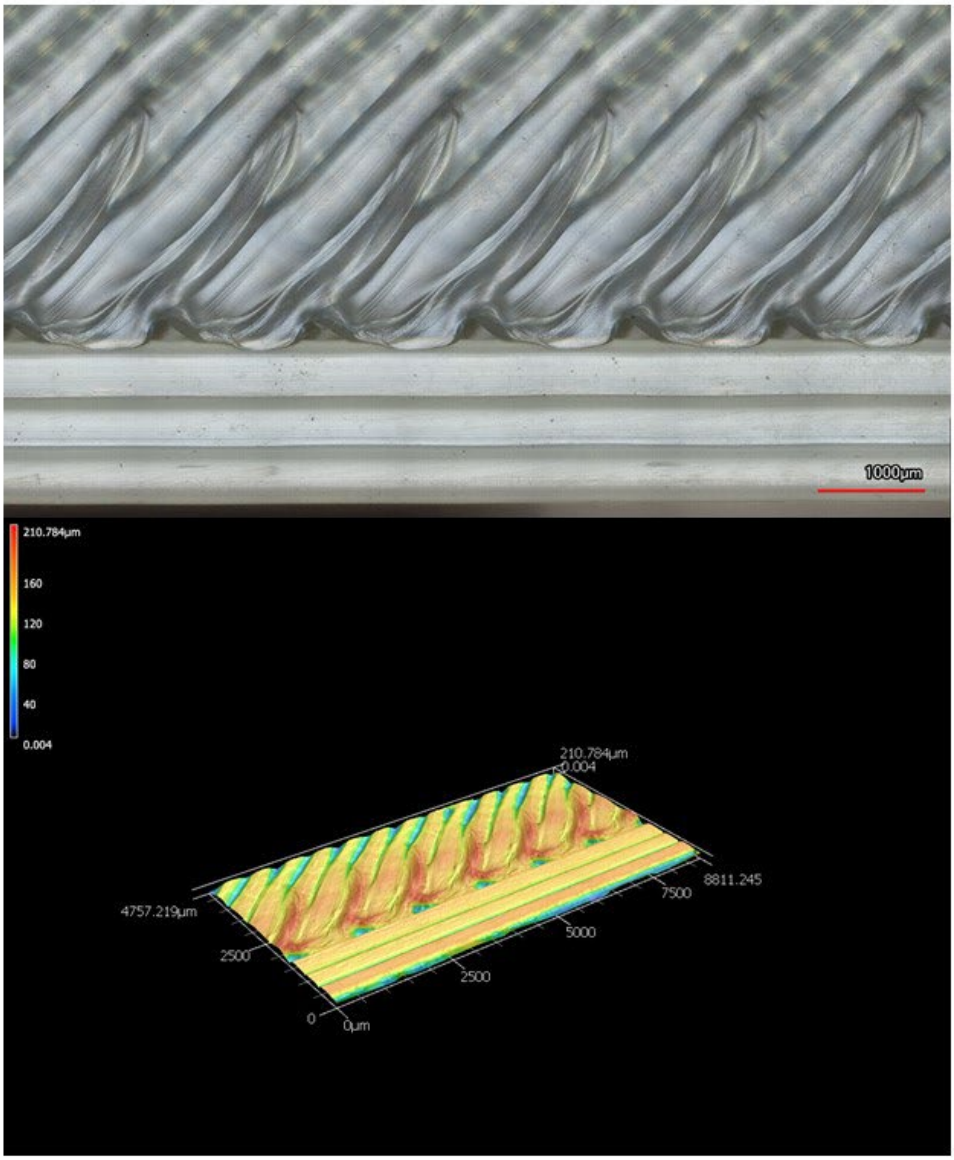
CC2(15)-YT (NO CUT)



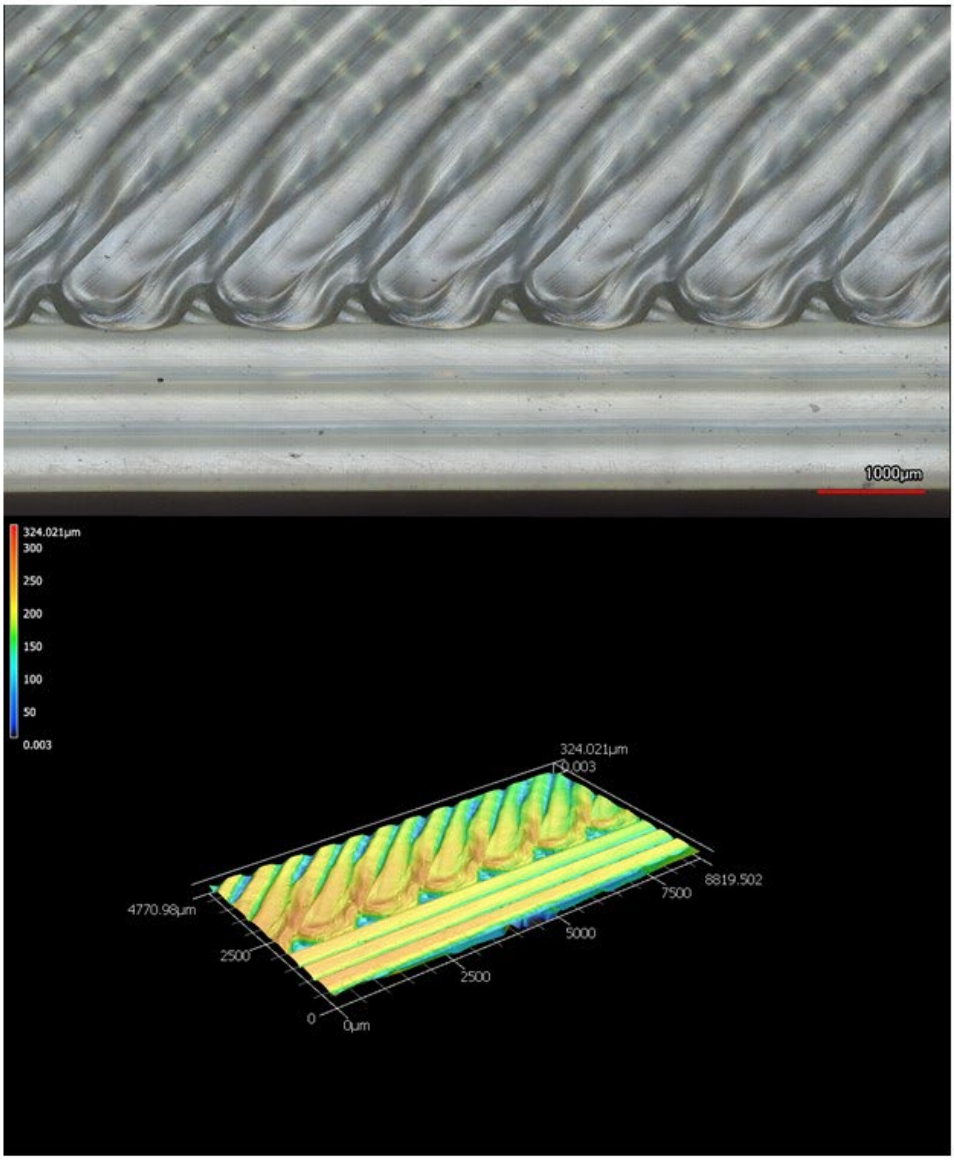
CC20-YT (NO CUT)



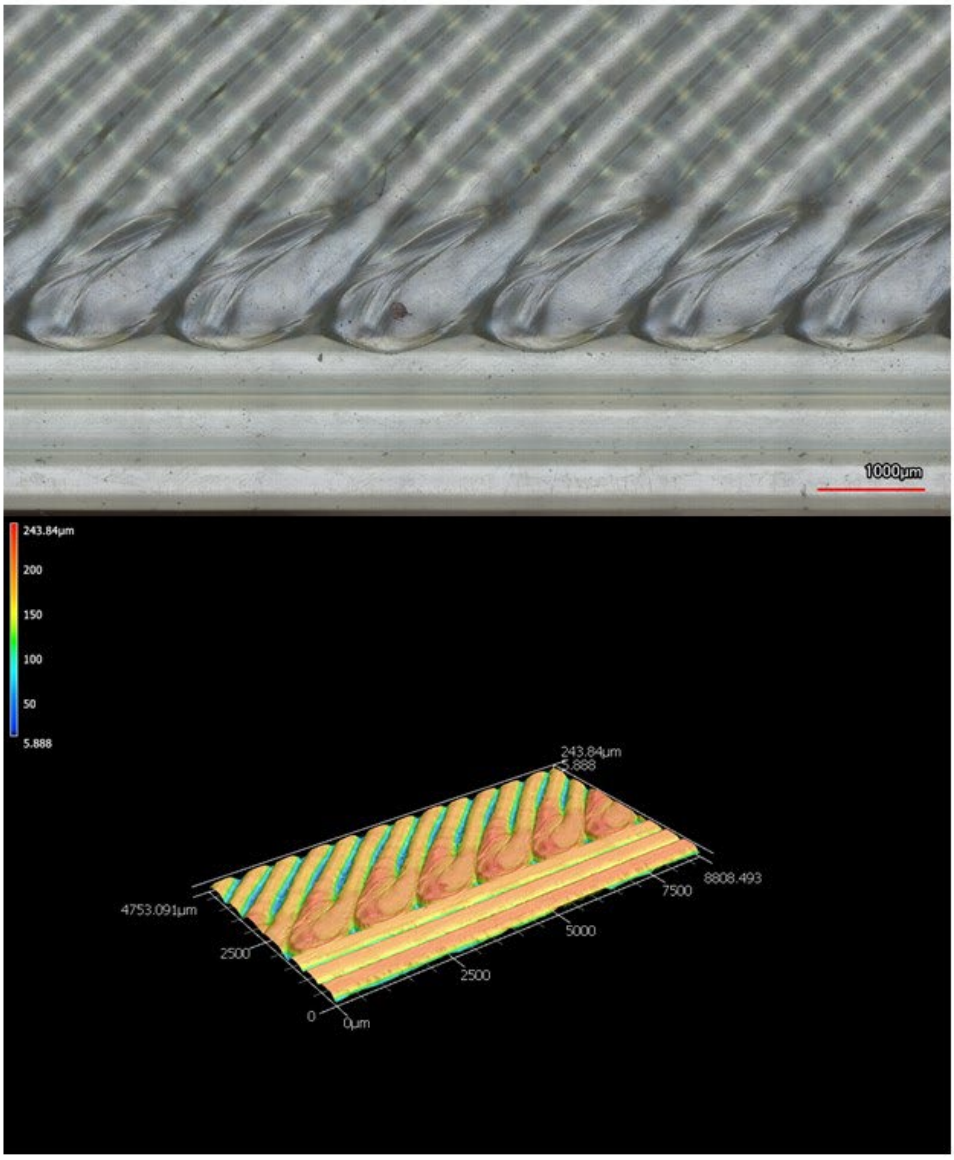
CC215-YT (NO CUT)



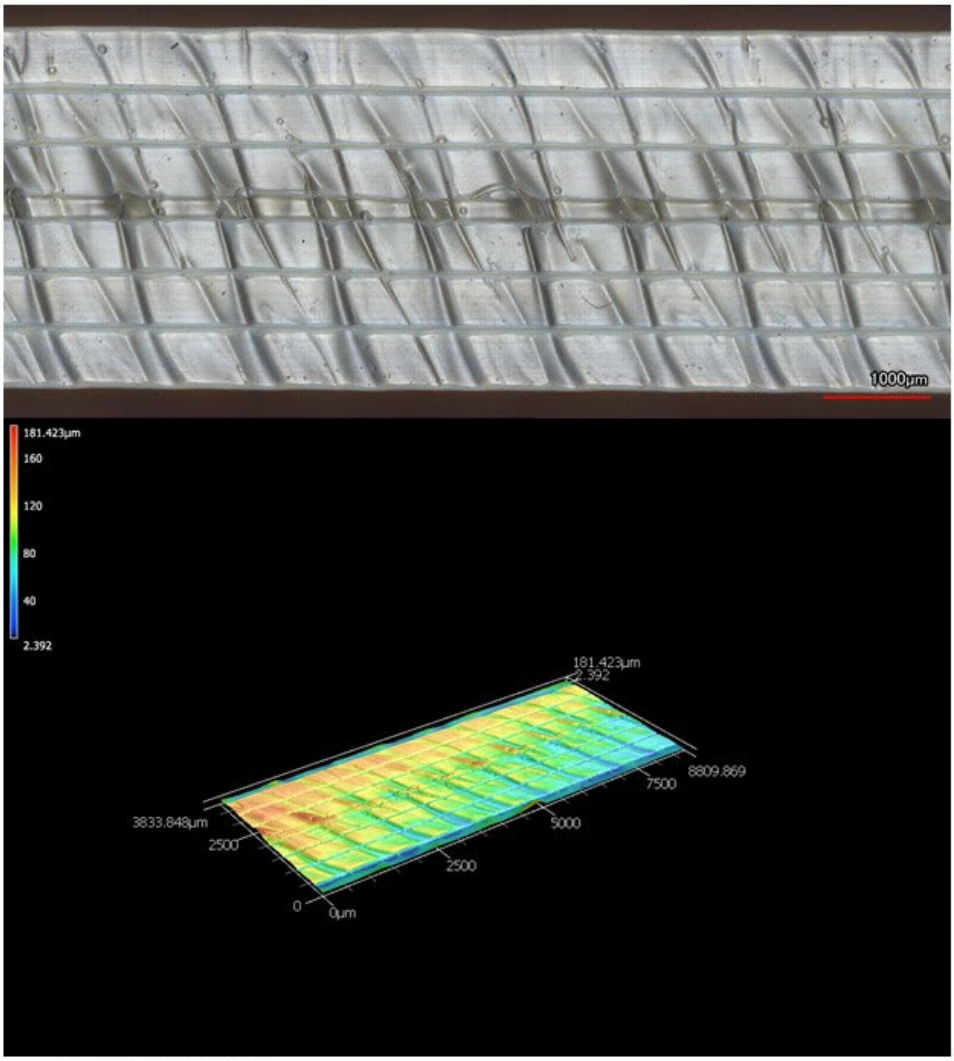
CC3(15)-XT (NO CUT)



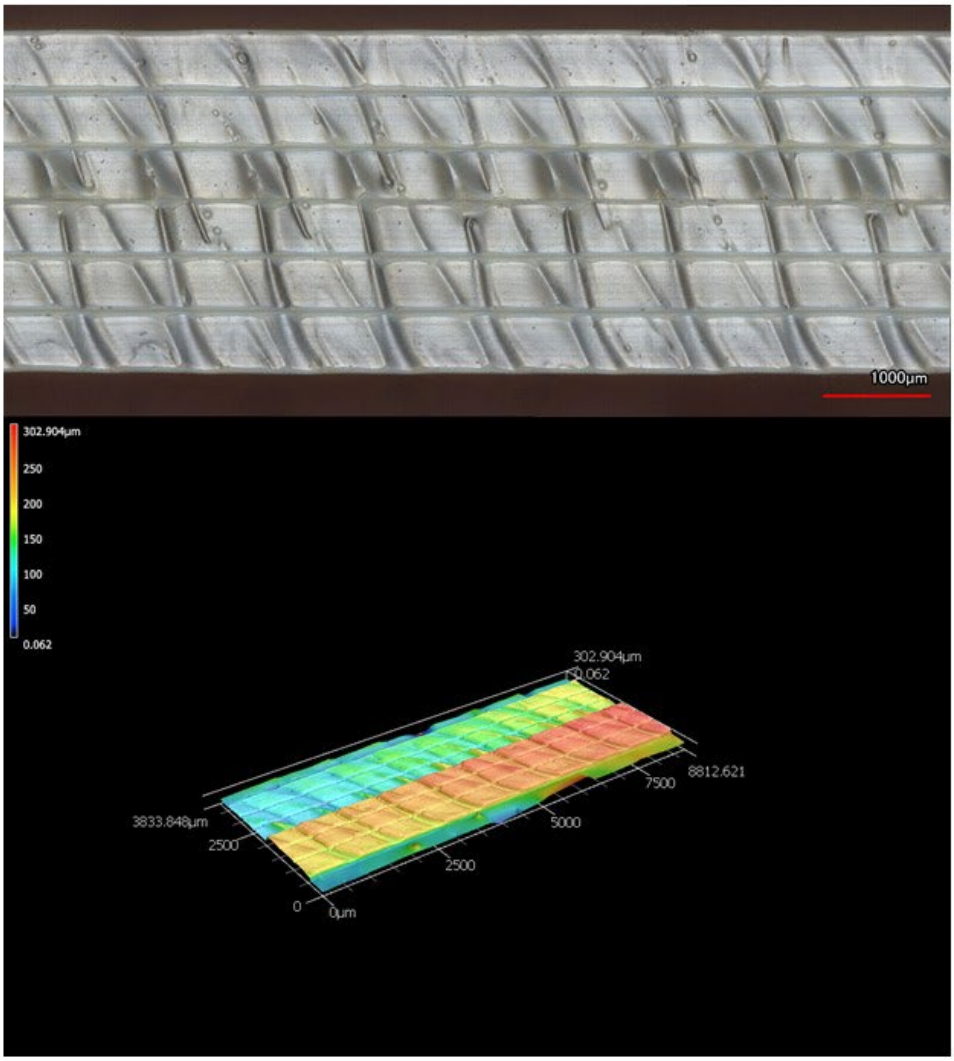
CC30-XT (NO CUT)



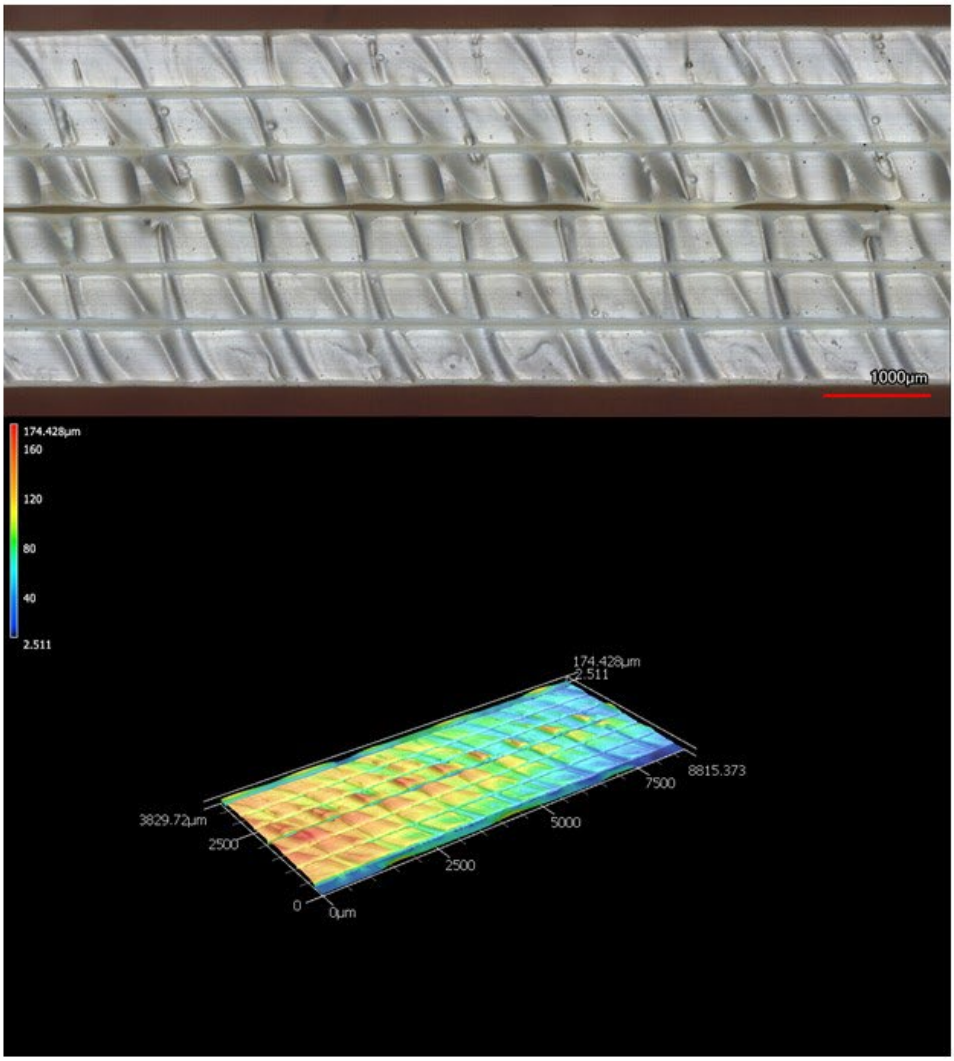
CC315-XT (NO CUT)



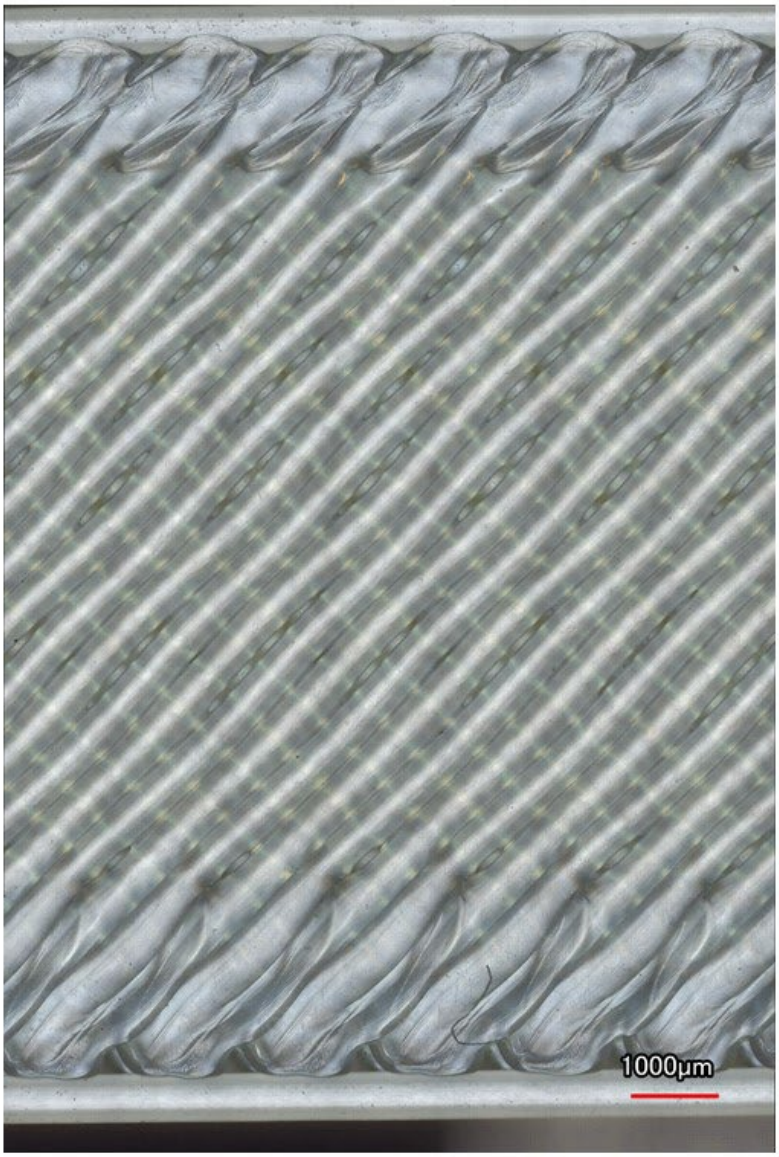
CC3(15)-YT (NO CUT)



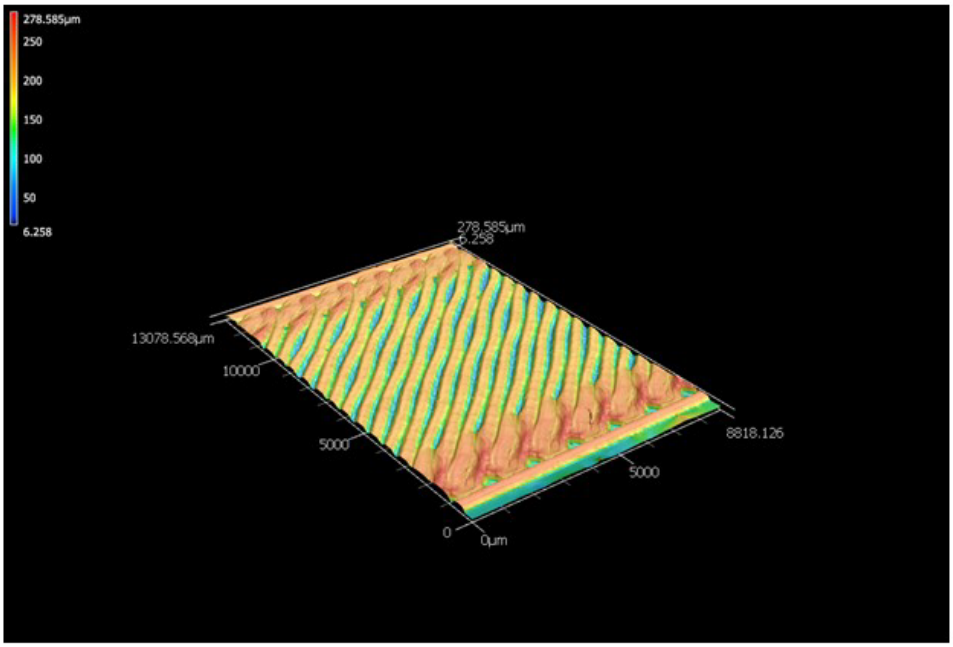
CC30-YT (NO CUT)



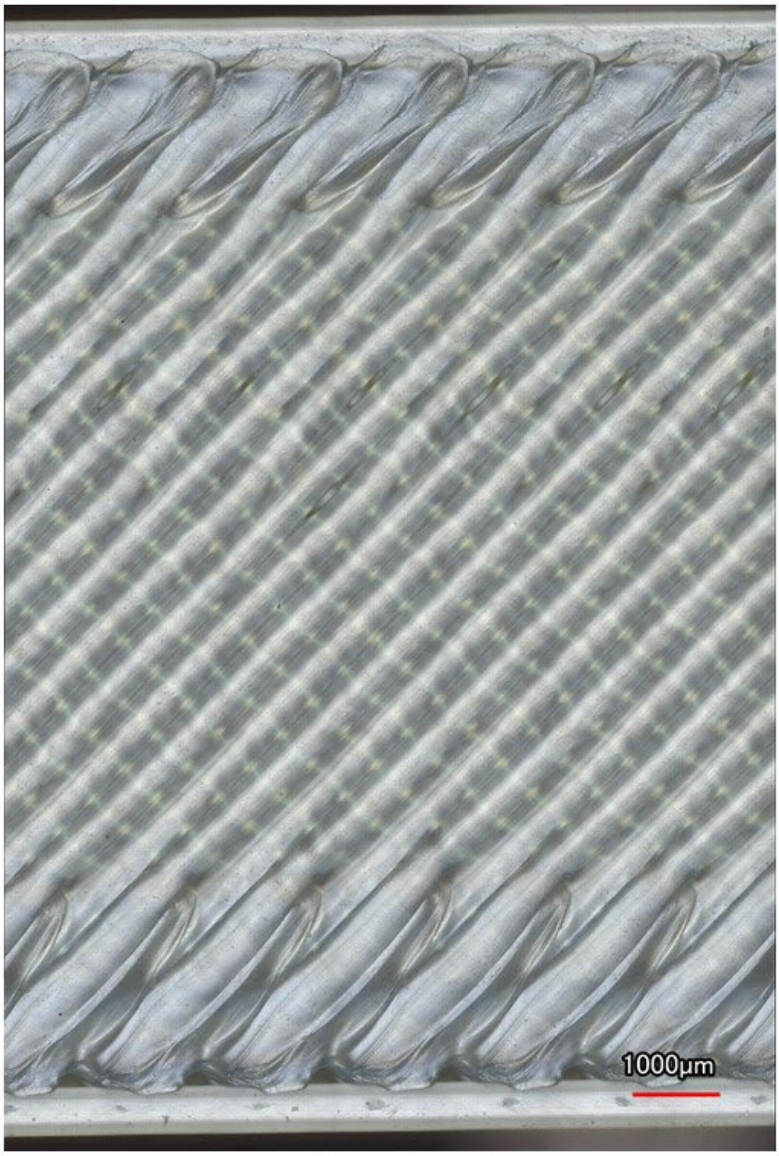
CC315-YT (NO CUT)



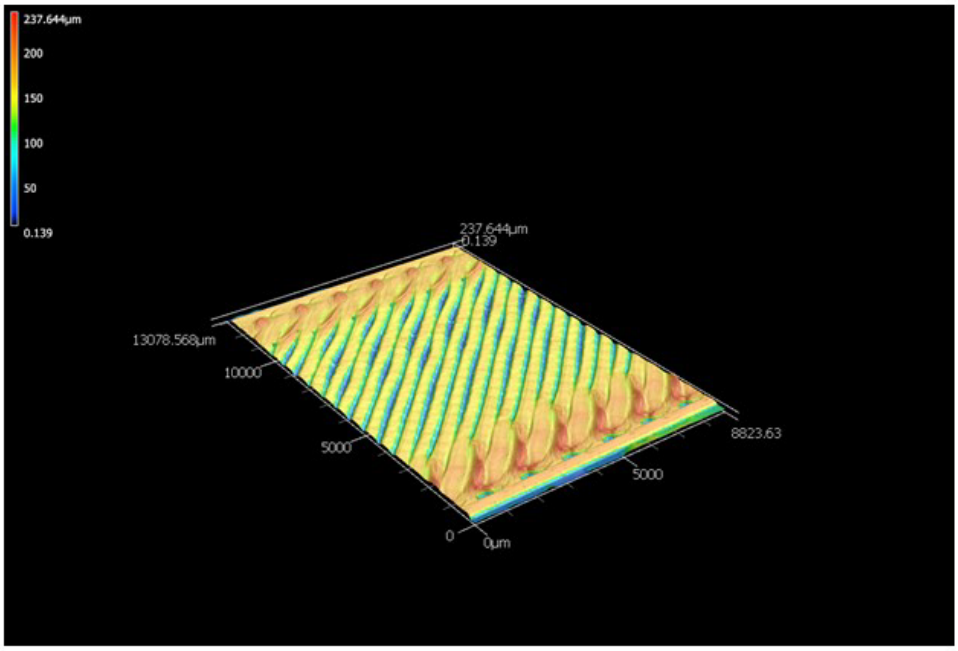
CR0-XT (NO CUT) 1 OF 2



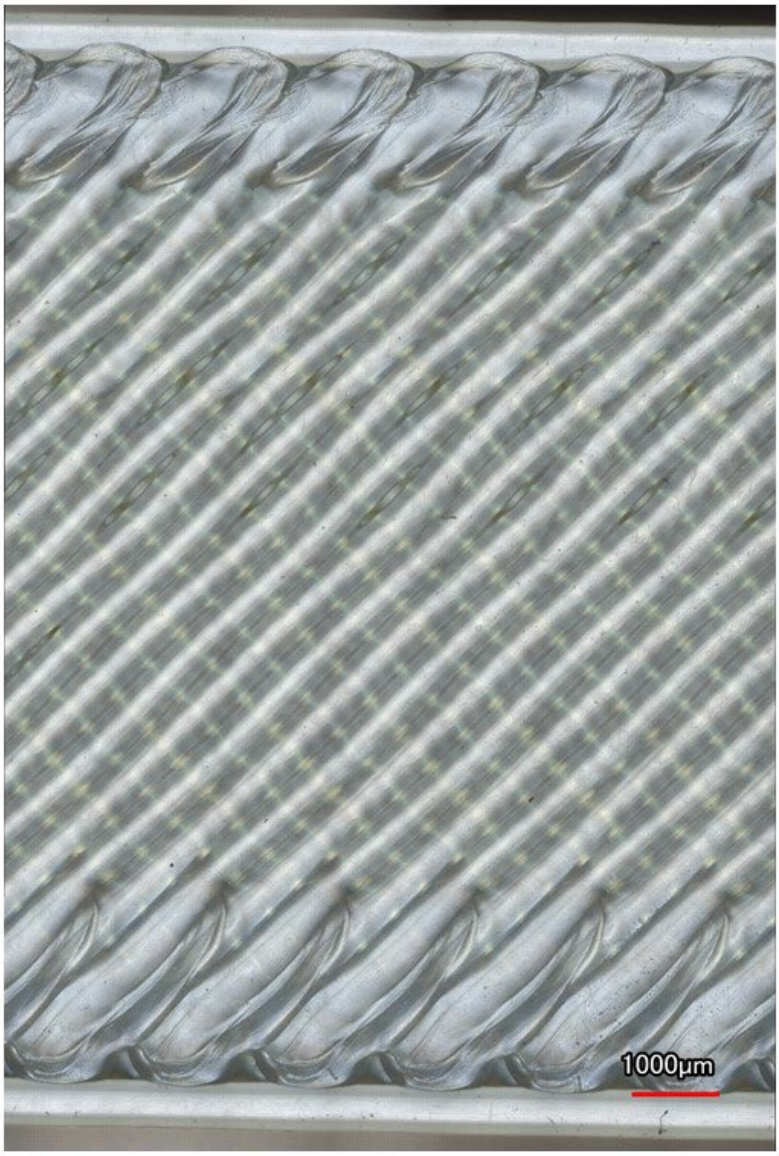
CR0-XT (NO CUT) 2 OF 2



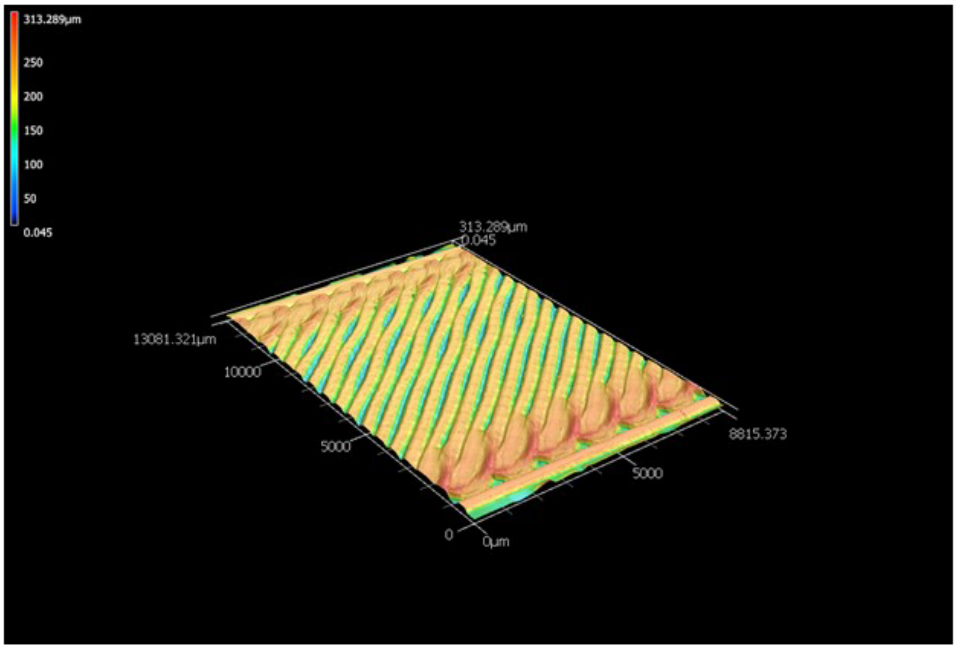
CR(15)-XT (NO CUT) 1 OF 2



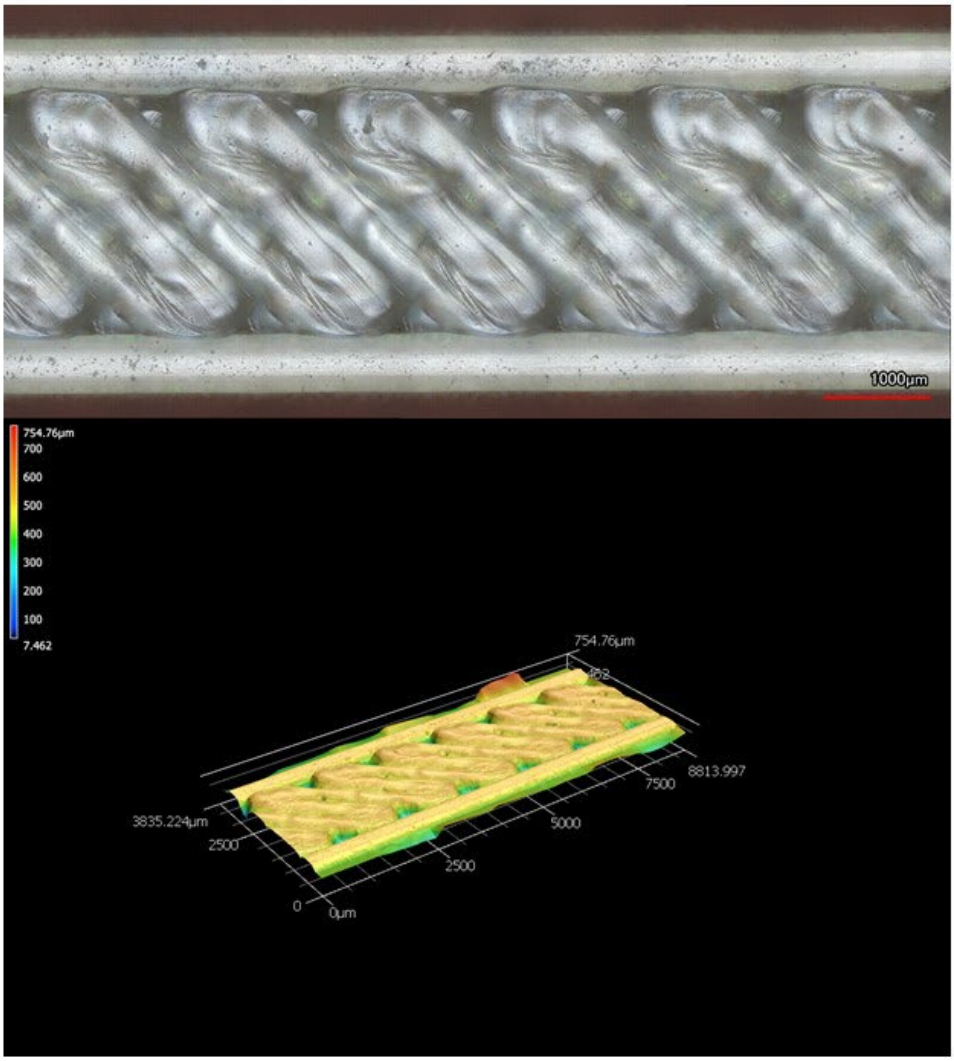
CR(15)-XT (NO CUT) 2 OF 2



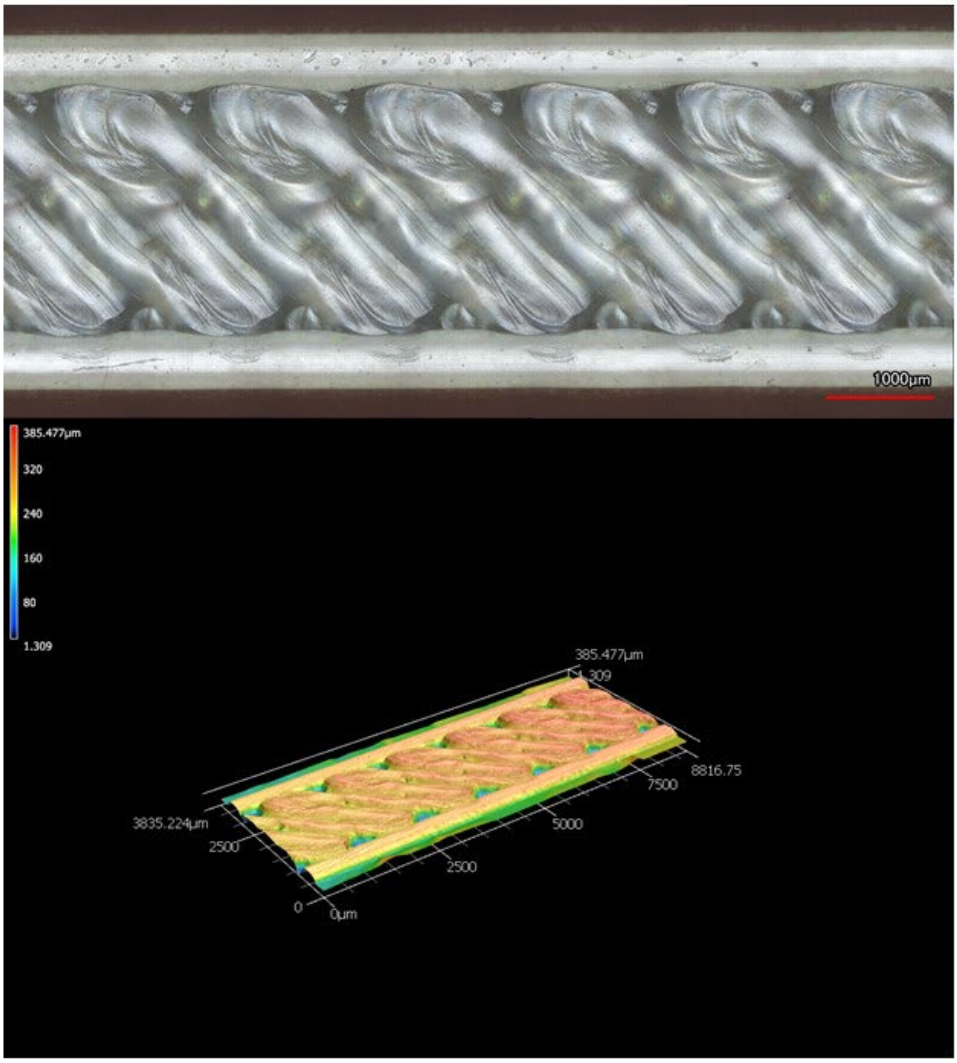
CR15-XT (NO CUT) 1 OF 2



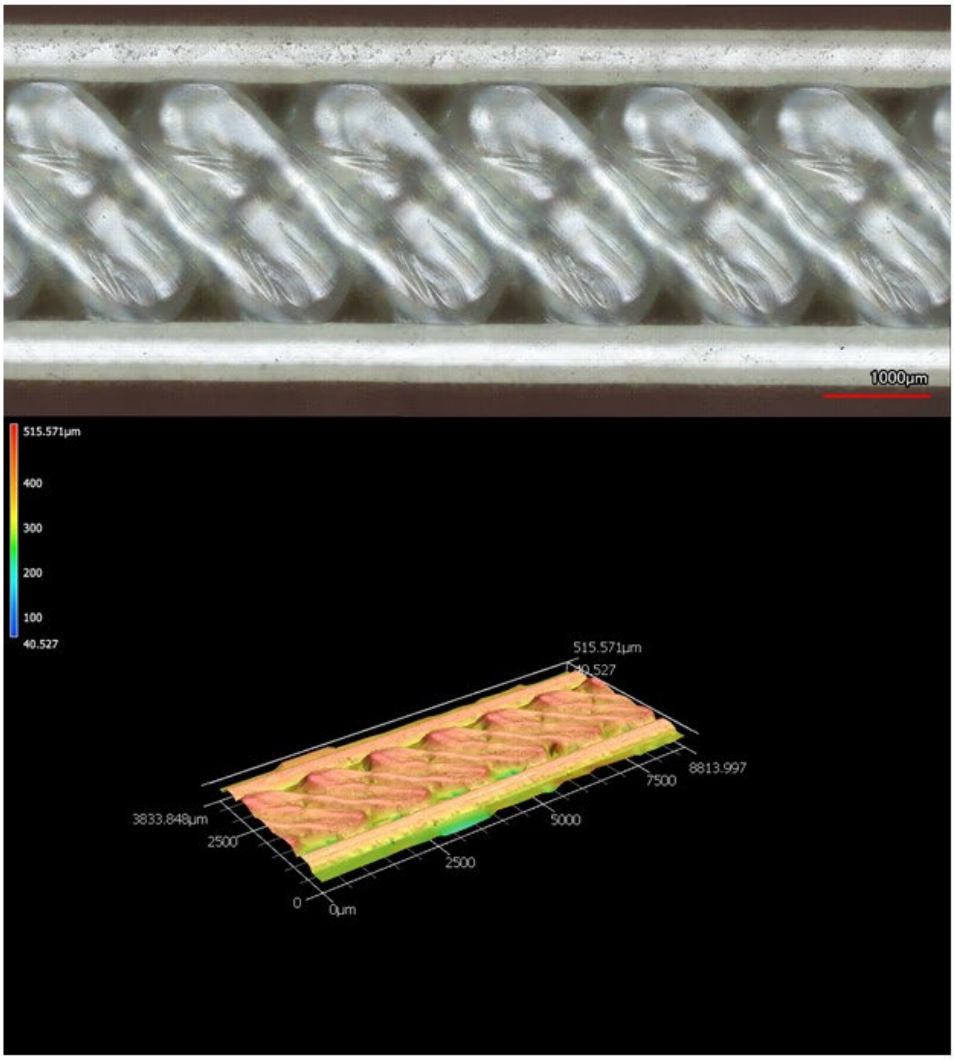
CR15-XT (NO CUT) 2 OF 2


1000µm
754.76µm
700
600
500
400
300
200
100
7.462
754.76µm
182
8813.997
7500
5000
2500
0µm
3835.224µm
2500
0

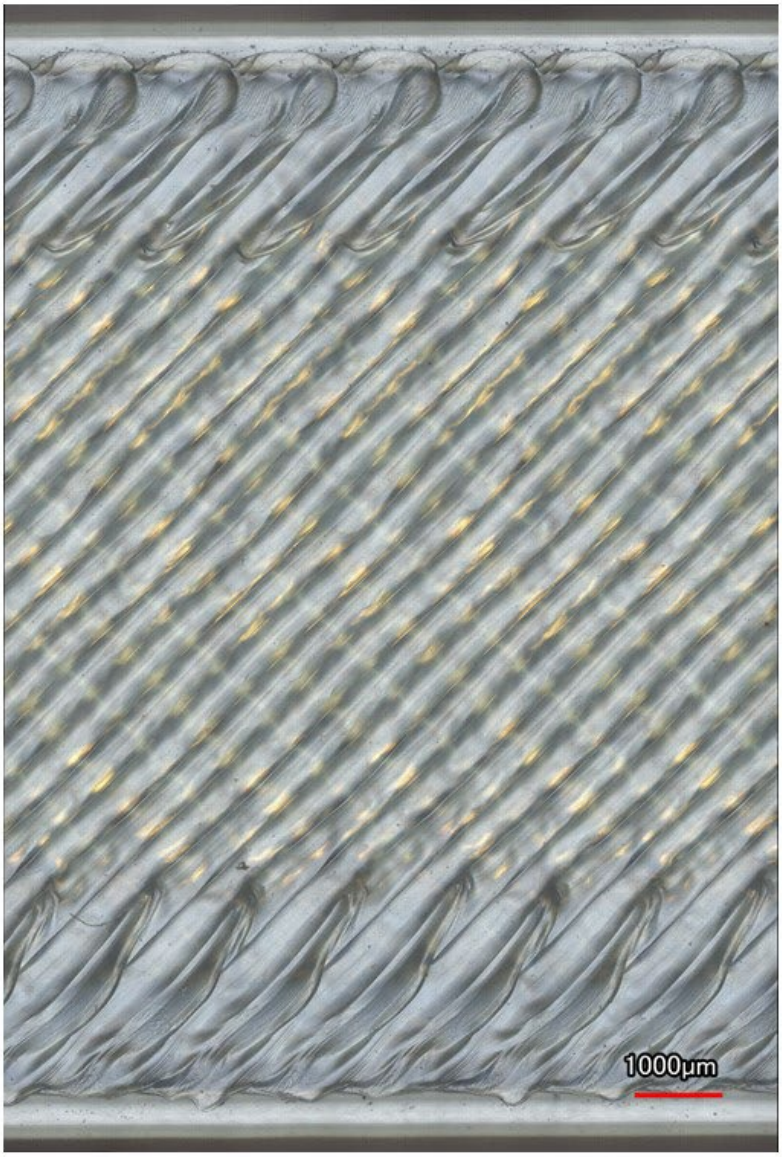
CR0-YT (NO CUT)



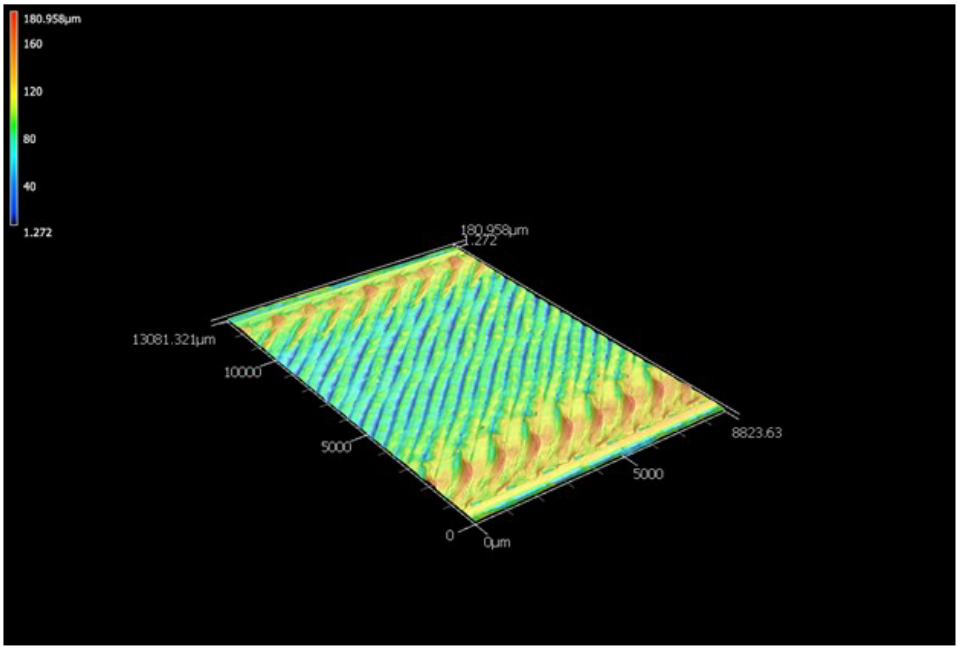
CR(15)-YT (NO CUT)



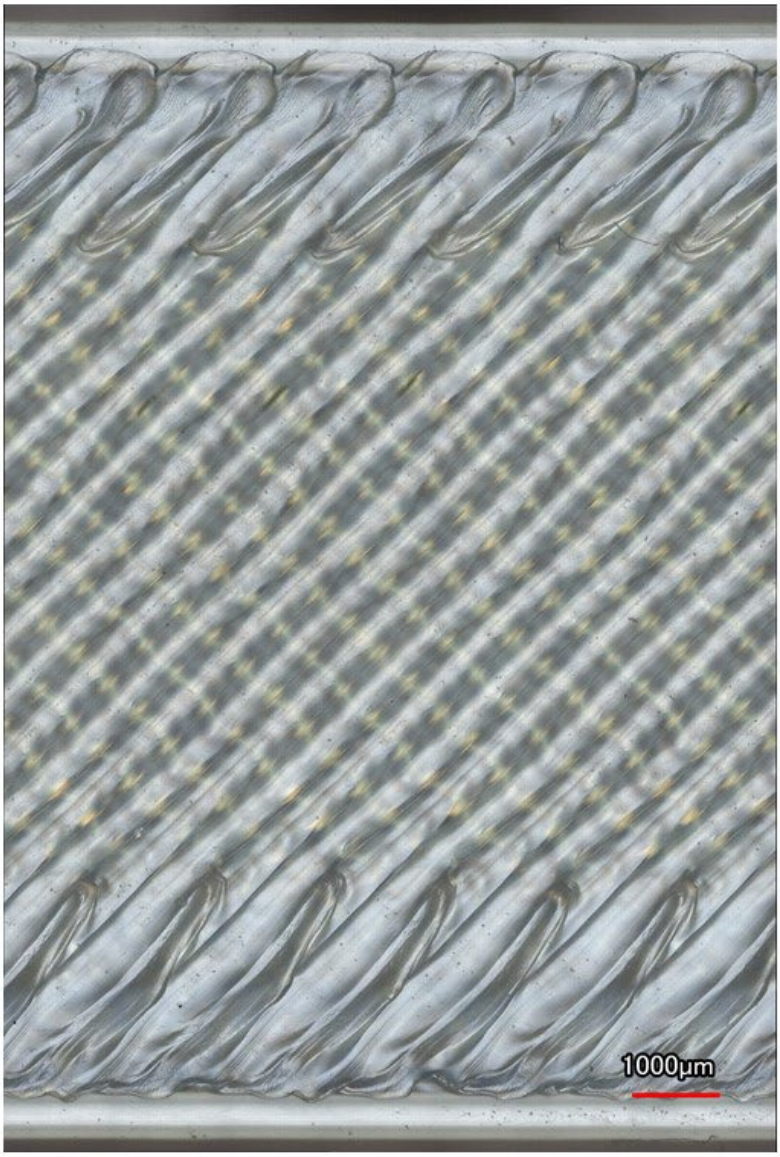
CR15-YT (NO CUT)



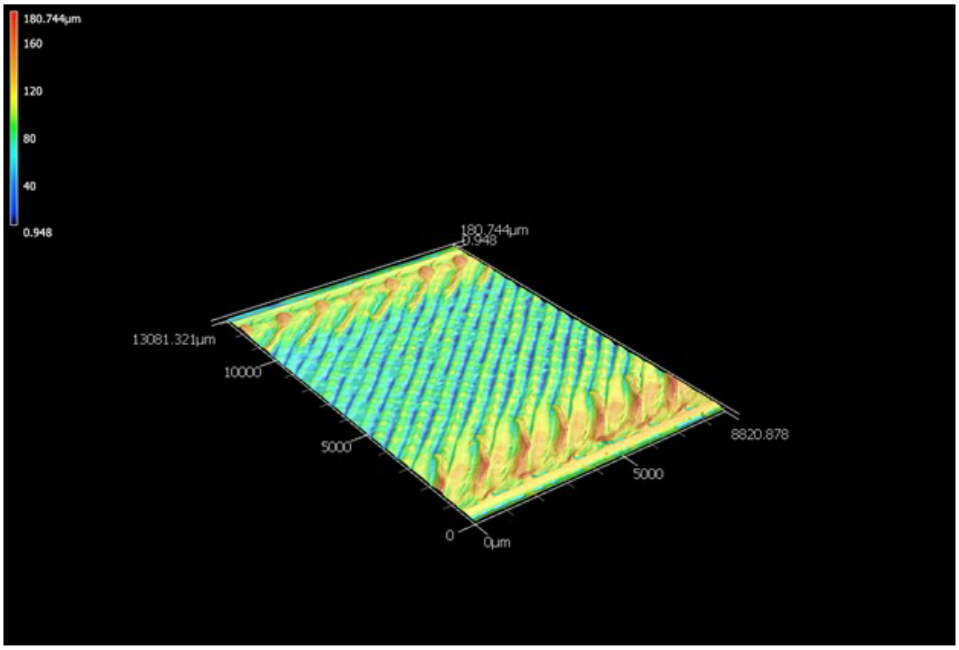
EVSR17-XT (NO CUT) 1 OF 2



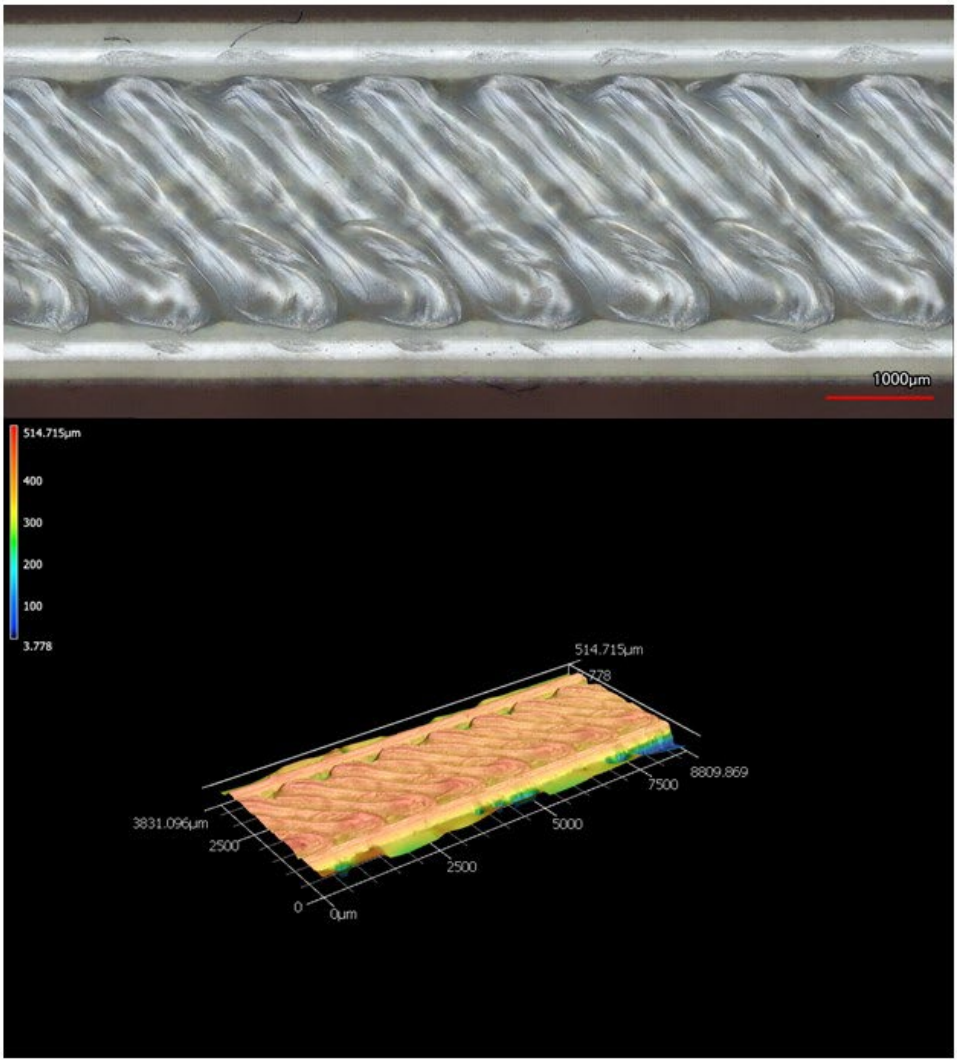
EVSR17-XT (NO CUT) 2 OF 2



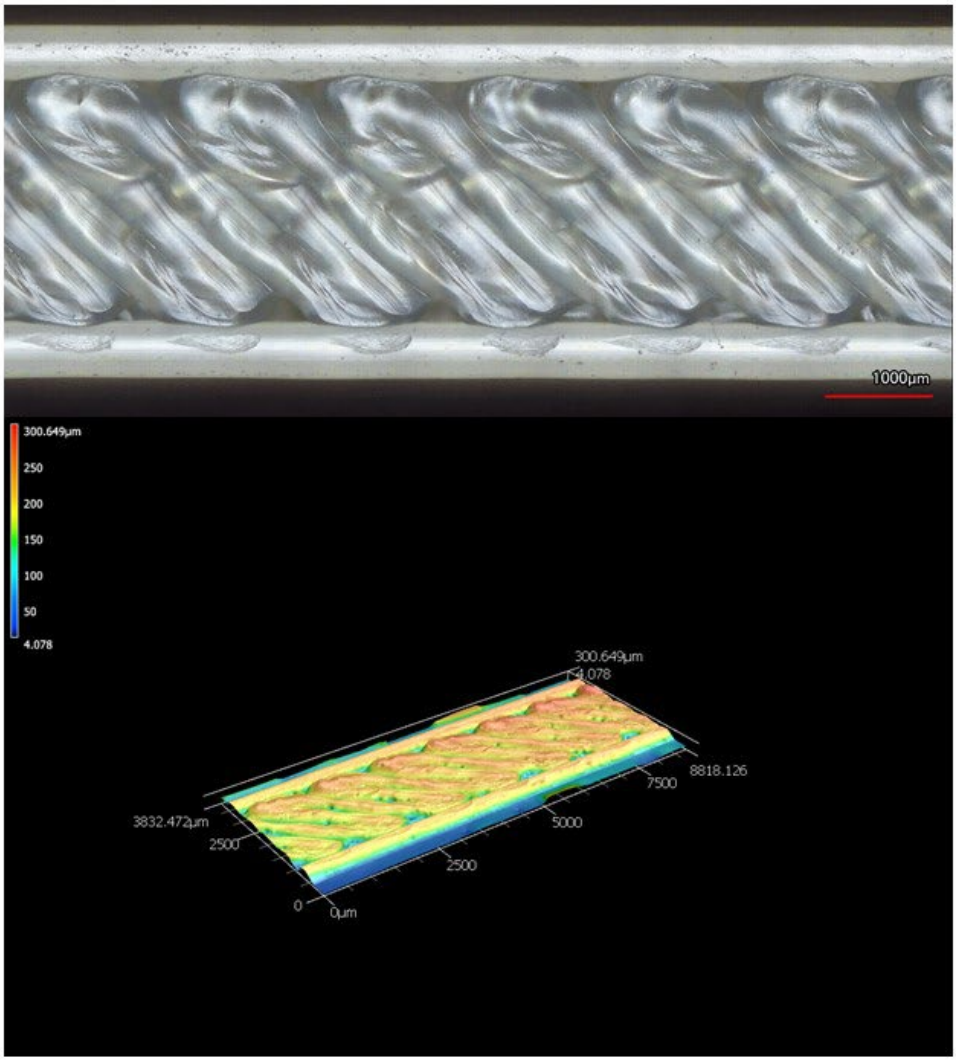
EVSR20-XT (NO CUT) 1 OF 2



EVSR20-XT (NO CUT) 2 OF 2

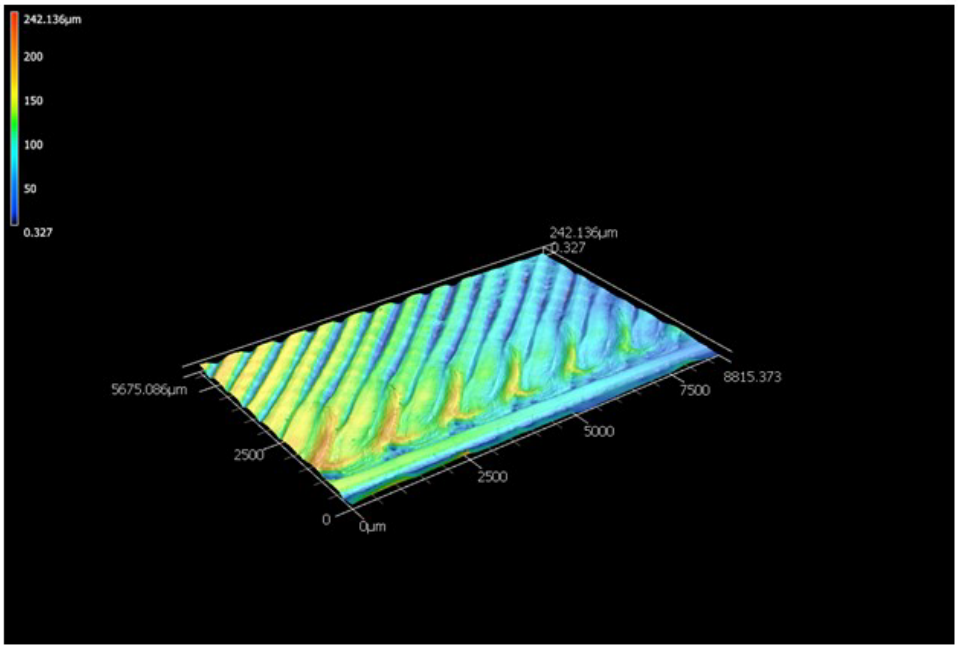


EVSR17-YT (NO CUT)

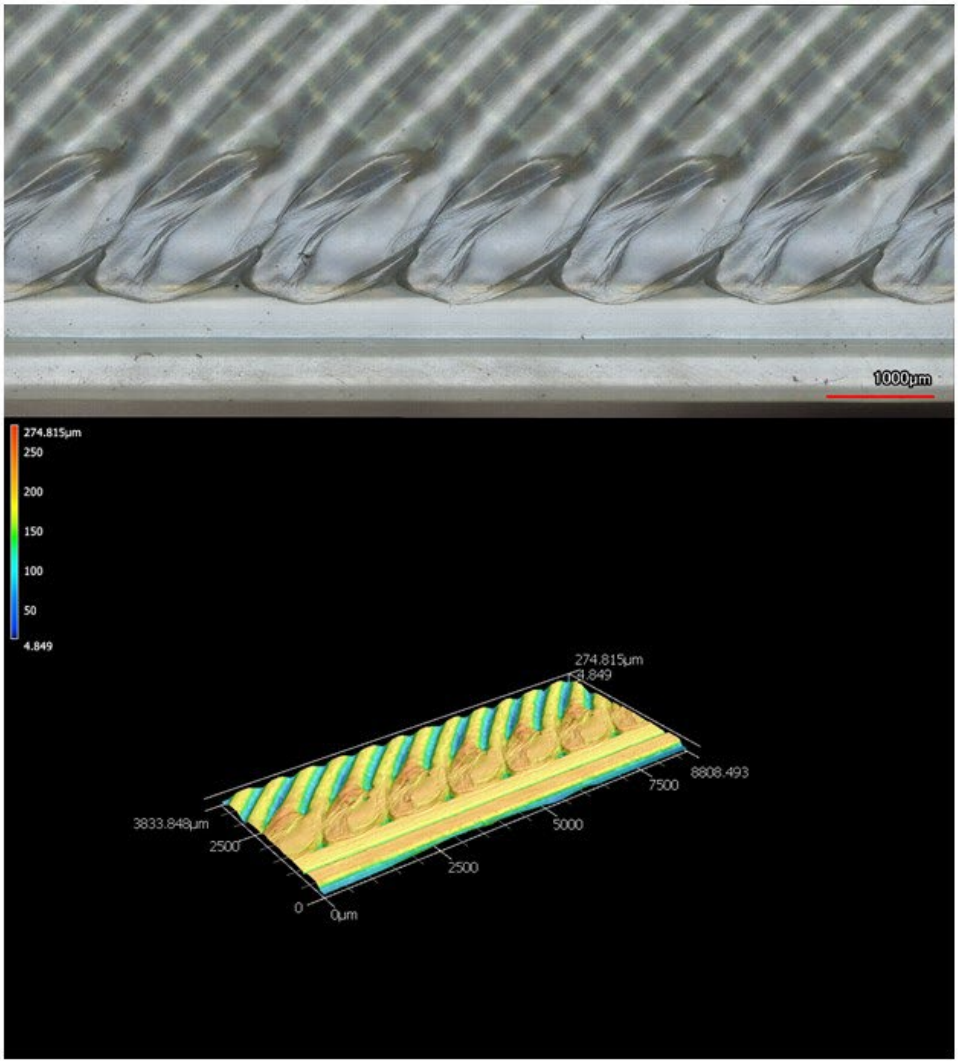


EVSR20-YT (NO CUT)

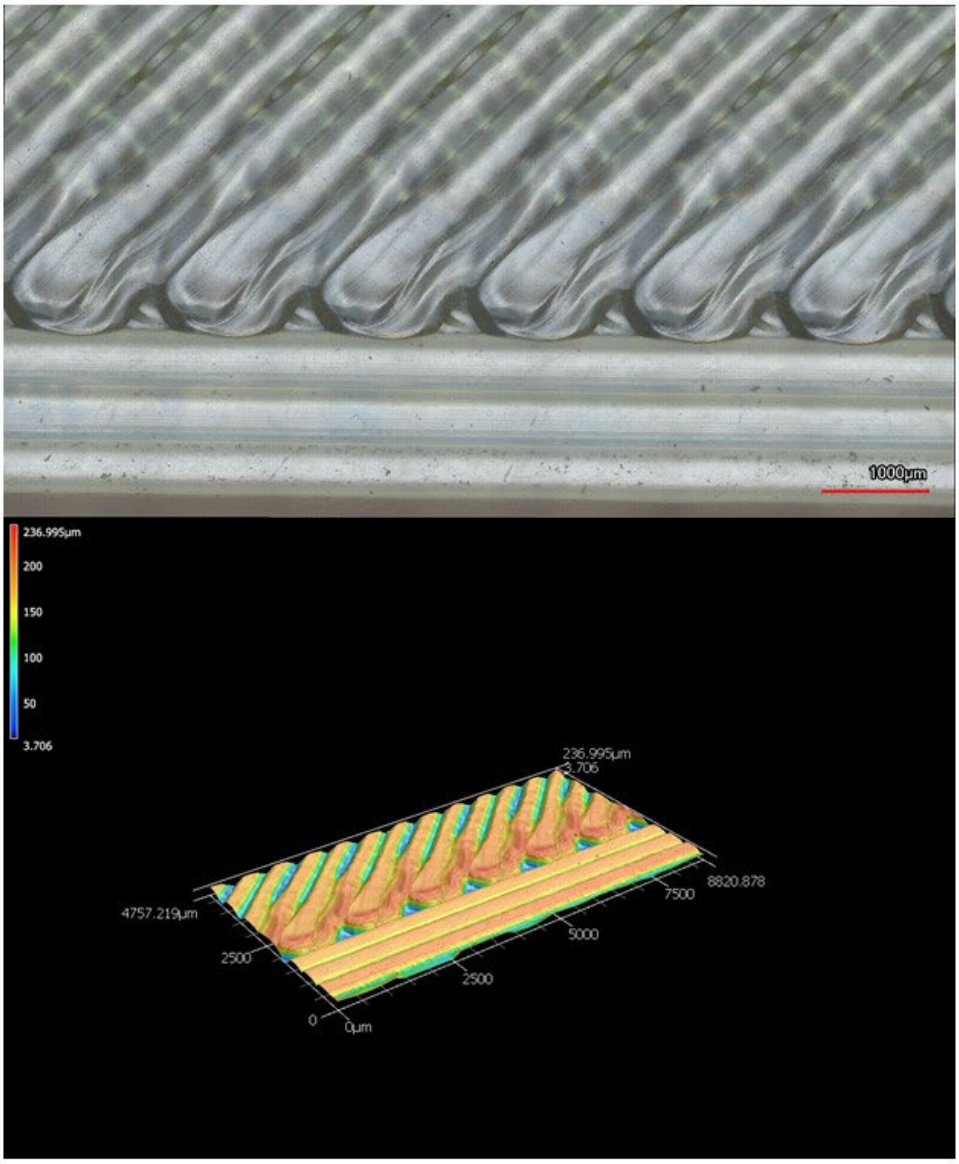
NC1-XT (NO CUT) 1 OF 2



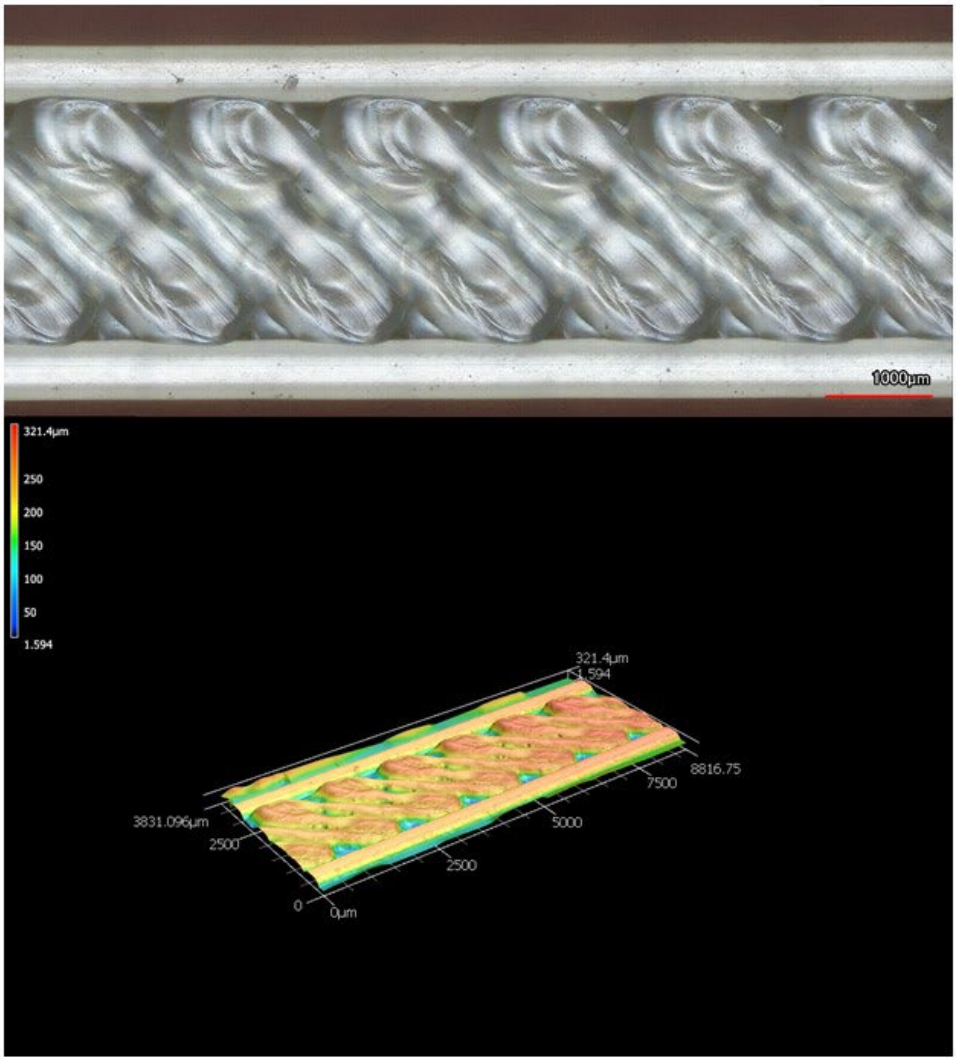
NC1-XT (NO CUT) 2 OF 2


1000µm
274.815µm
250
200
150
100
50
4.849
274.815µm
4.849
8808.493
7500
5000
2500
0µm
3833.848µm
2500
0

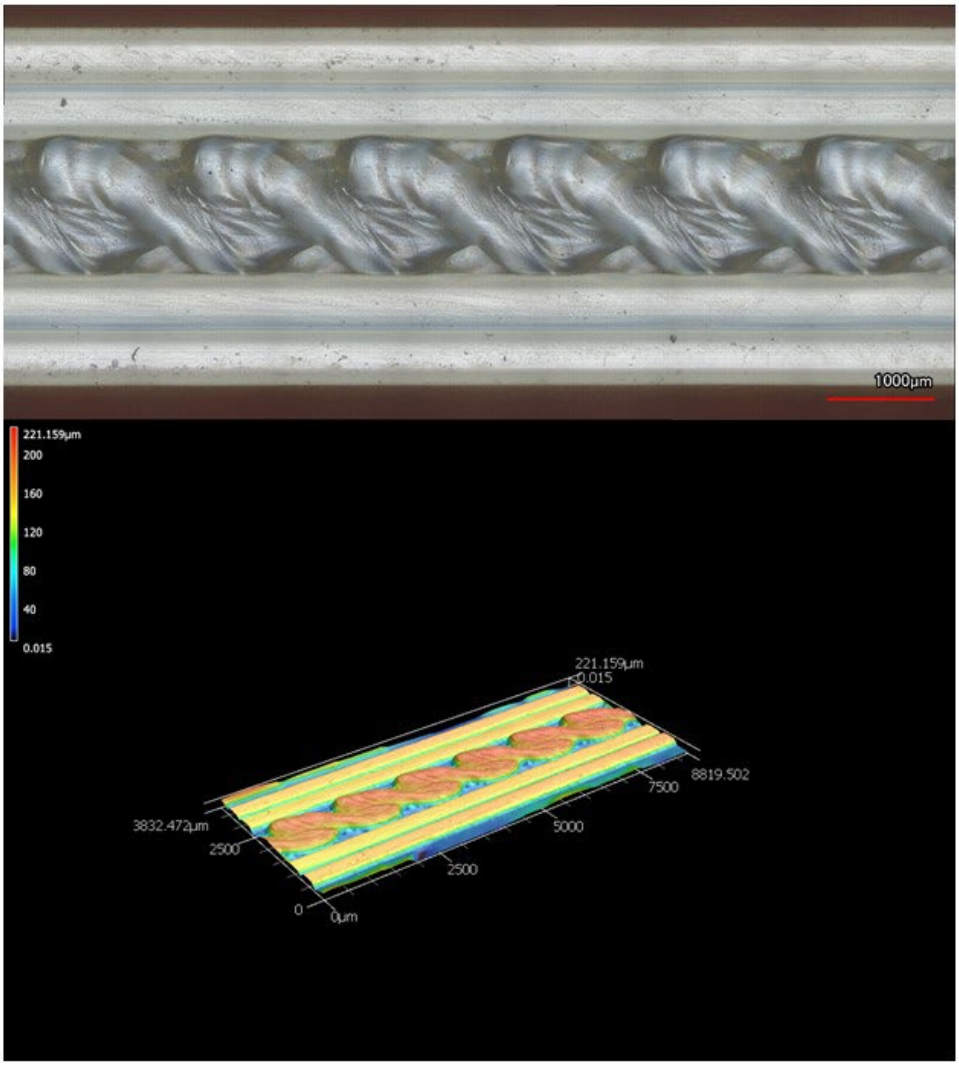
NC2-XT (NO CUT)


1000µm
236.995µm
200
150
100
50
3.706
236.995µm
3.706
8820.878
7500
5000
2500
0µm
4757.219µm
2500
0

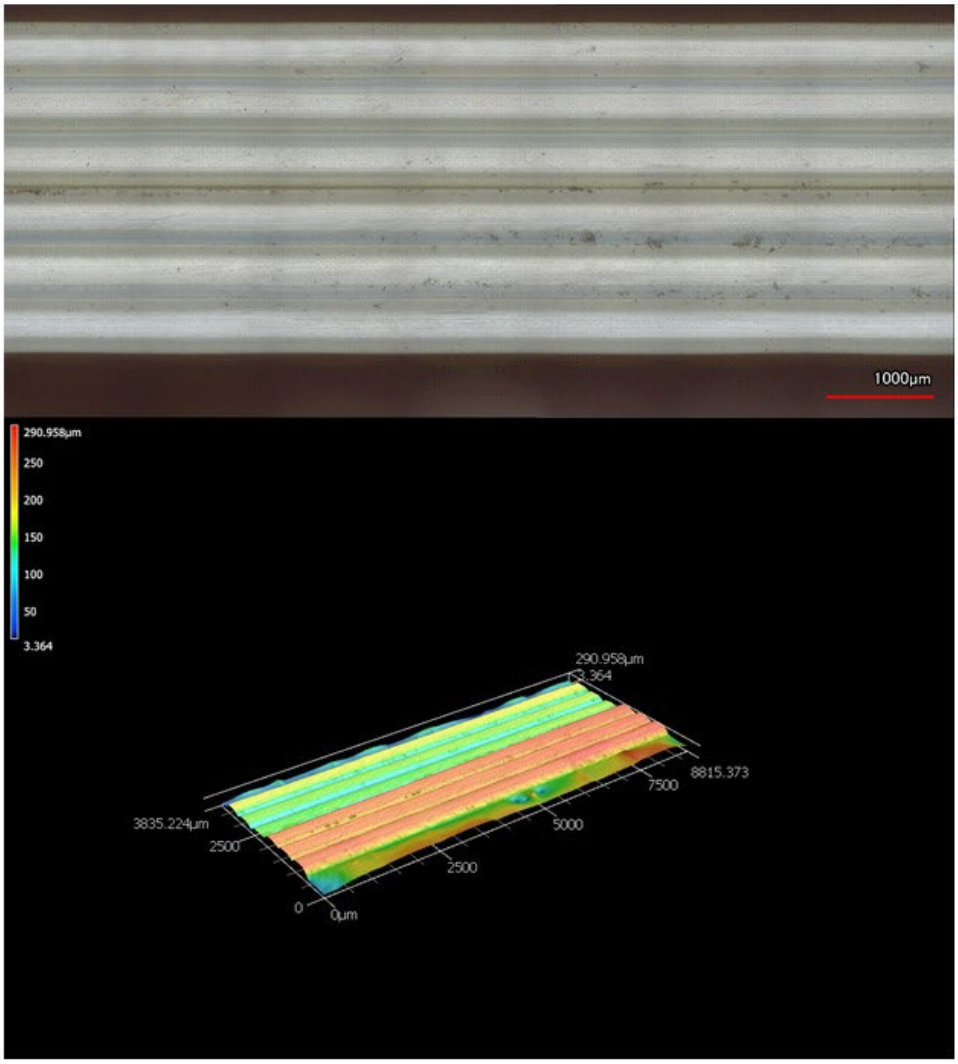
NC3-XT (NO CUT)


1000µm
321.4µm
250
200
150
100
50
1.594
321.4µm
1.594
8816.75
7500
5000
2500
0µm
3831.096µm
2500
0

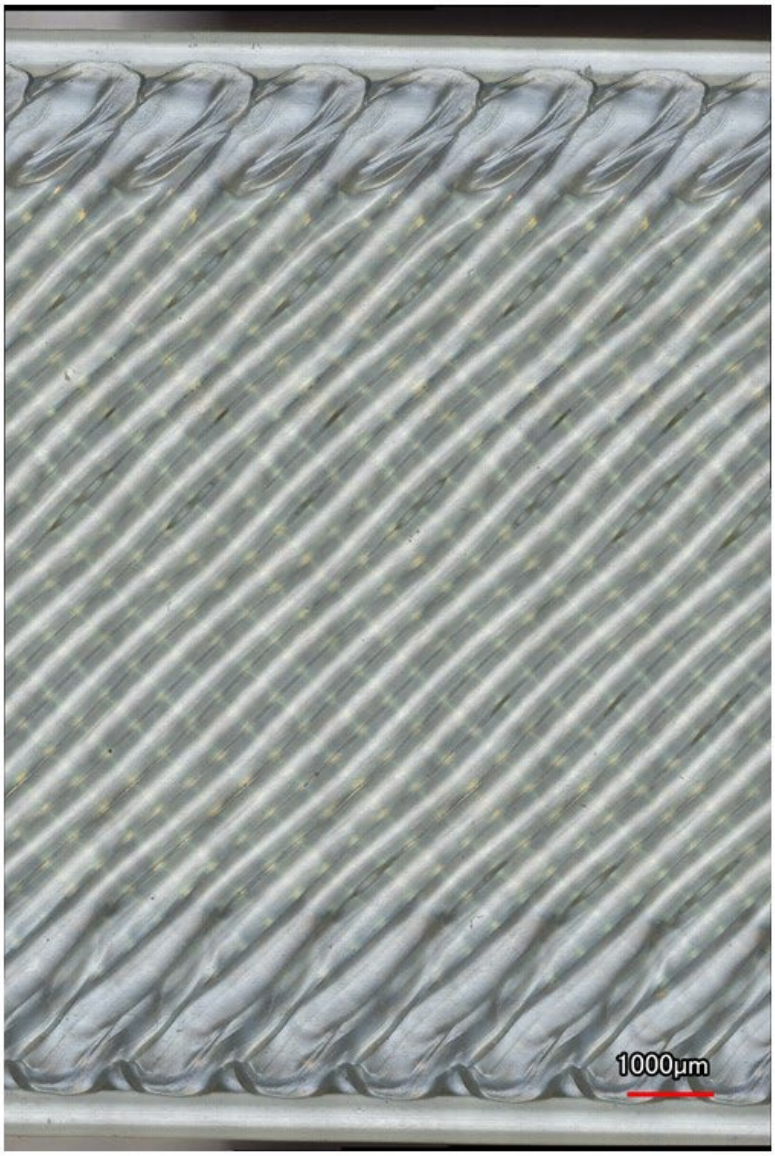
NC1-YT (NO CUT)


1000µm
221.159µm
200
160
120
80
40
0.015
221.159µm
0.015
8819.502
7500
5000
2500
0µm
3832.472µm
2500
0

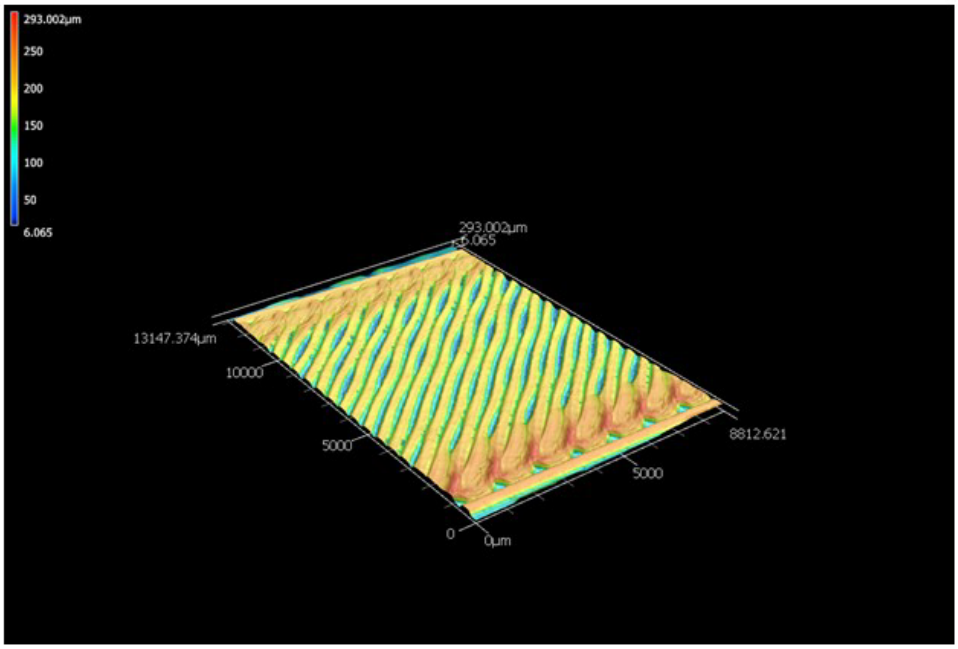
NC2-YT (NO CUT)


1000µm
290.958µm
250
200
150
100
50
3.364
290.958µm
3.364
8815.373
7500
5000
2500
0µm
3835.224µm
2500
0

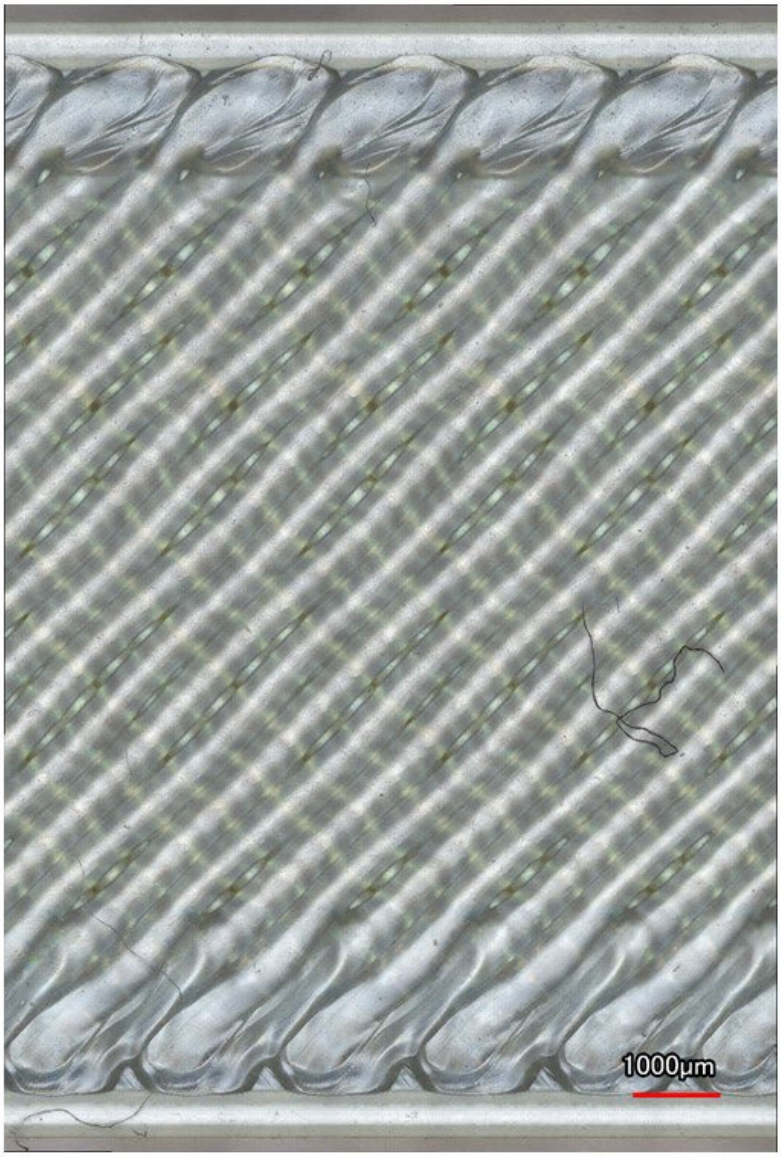
NC3-YT (NO CUT)



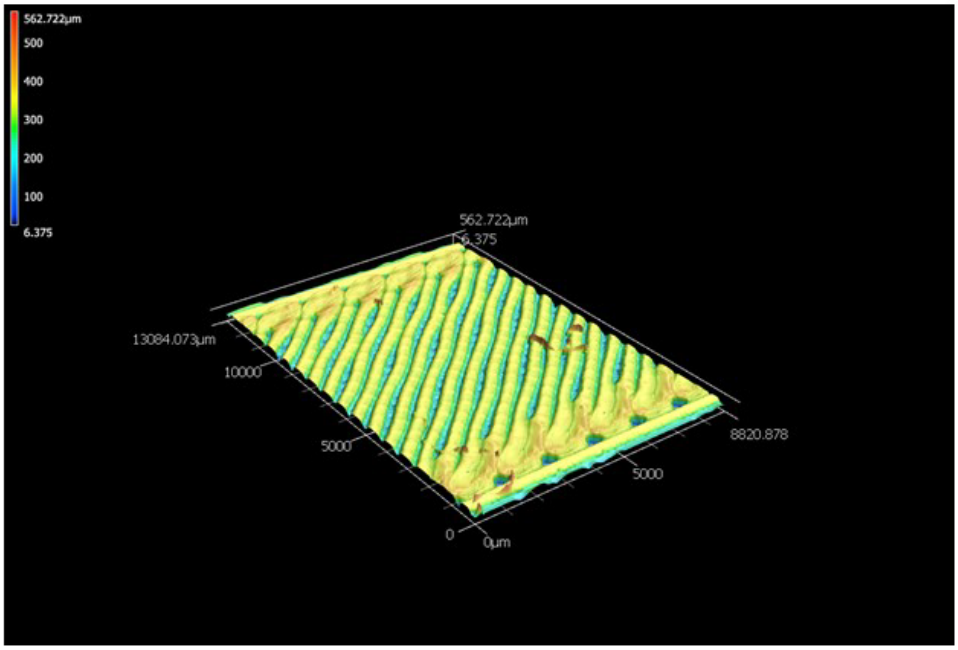
PRW18-XT (NO CUT) 1 OF 2



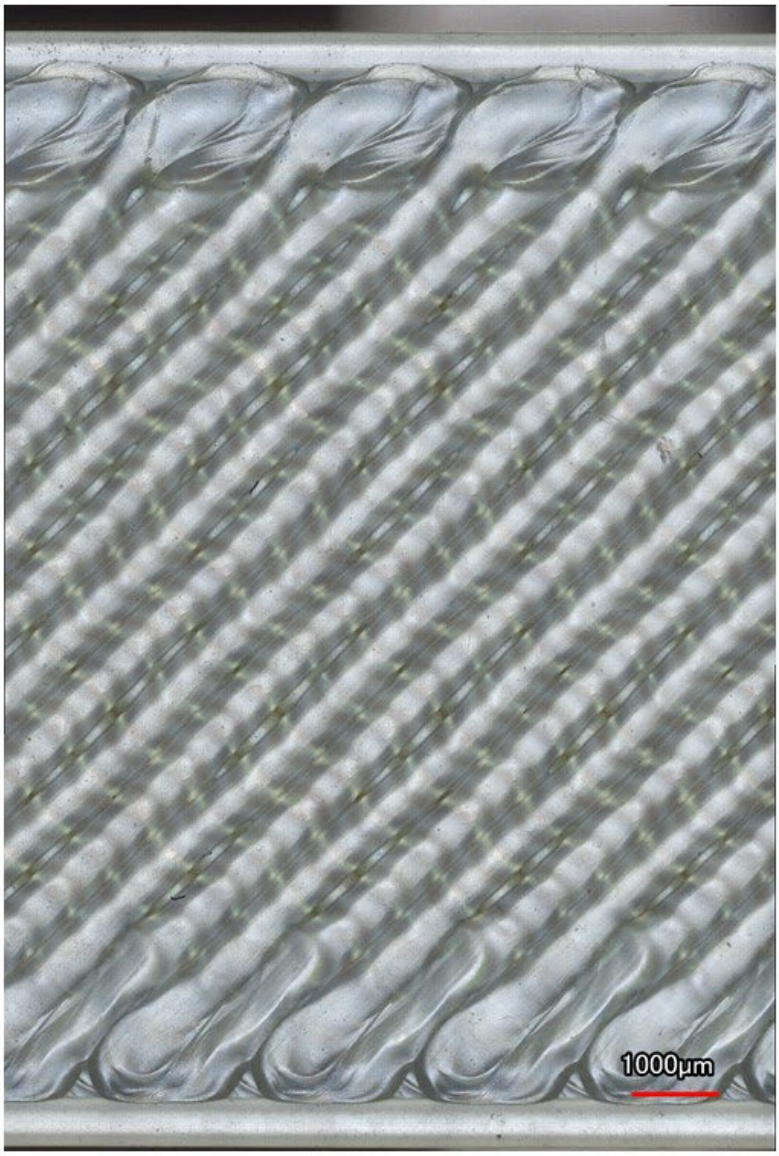
PRW18-XT (NO CUT) 2 OF 2



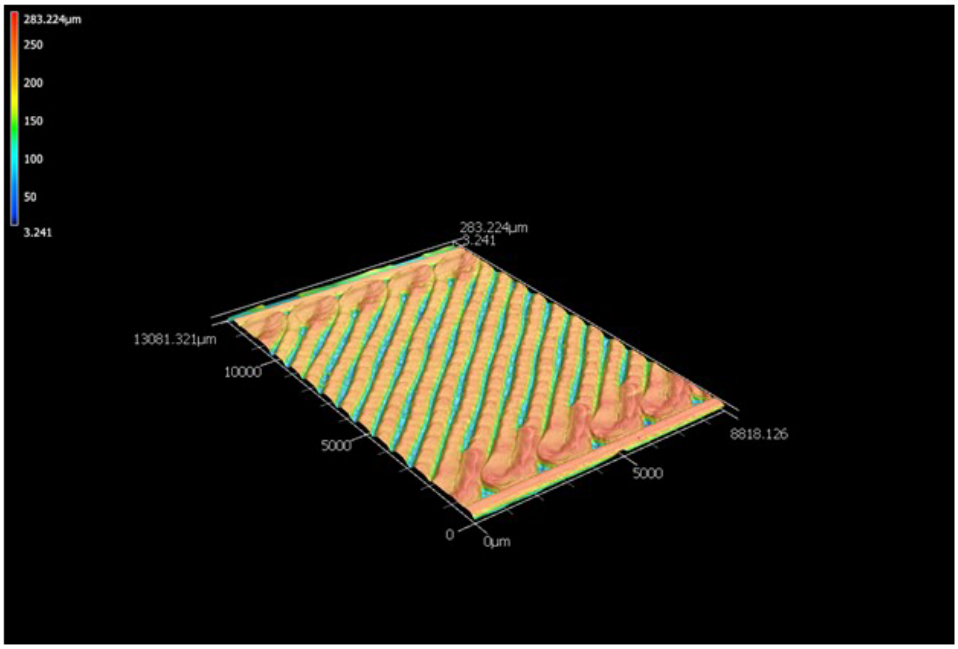
PRW22-XT (NO CUT) 1 OF 2



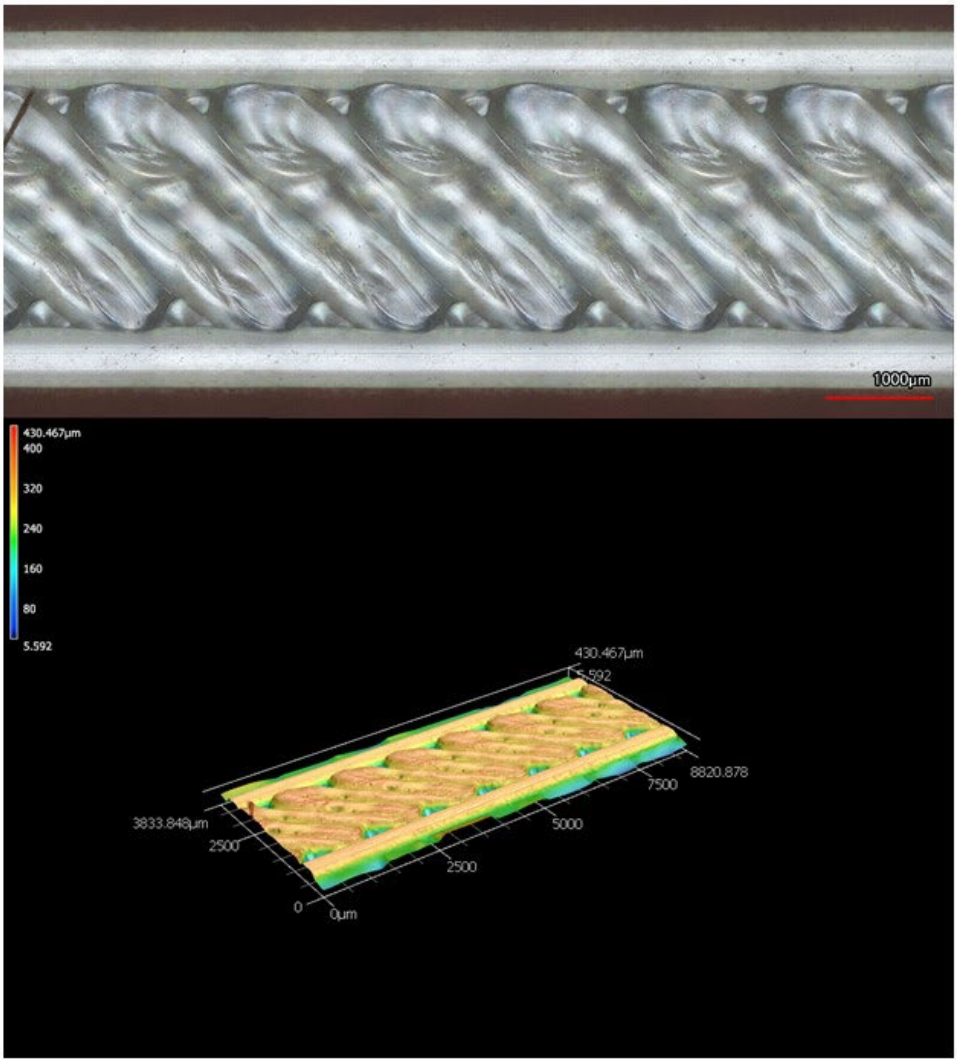
PRW22-XT (NO CUT) 2 OF 2



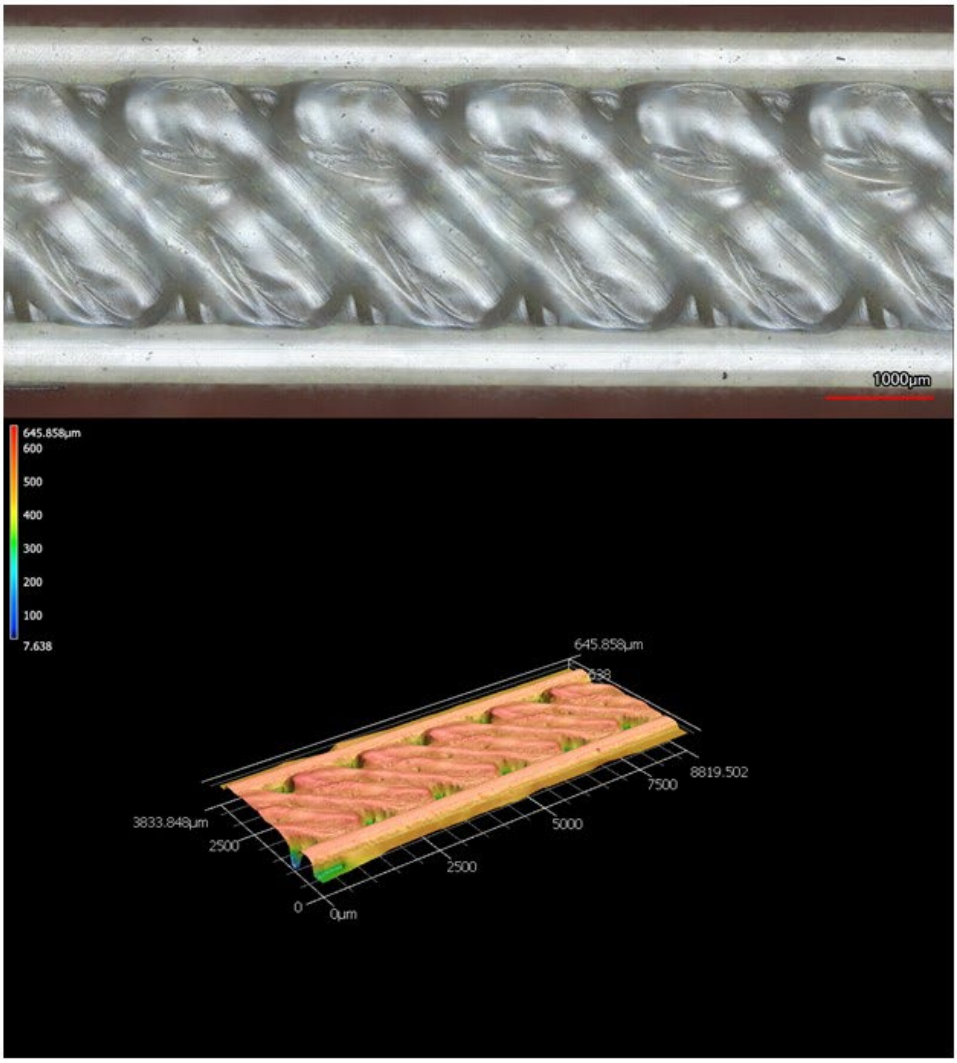
PRW26-XT (NO CUT) 1 OF 2



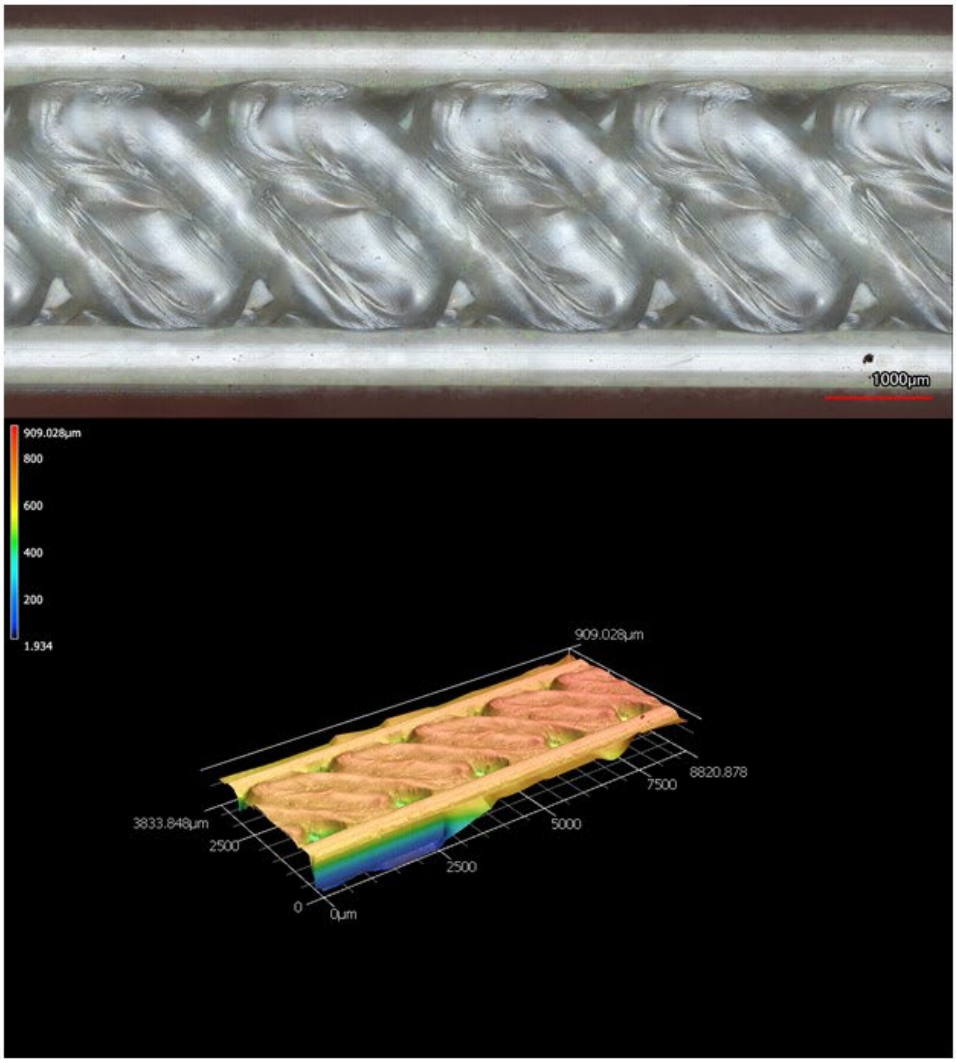
PRW26-XT (NO CUT) 2 OF 2



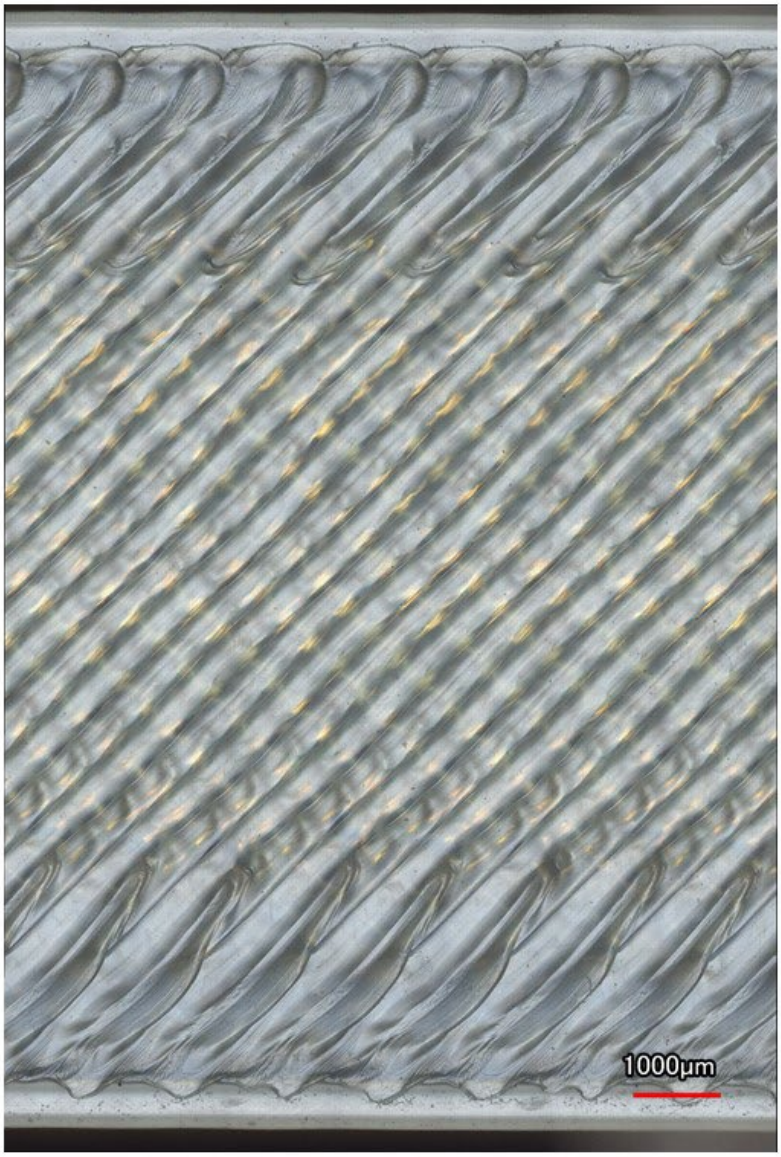
PRW18-YT (NO CUT)



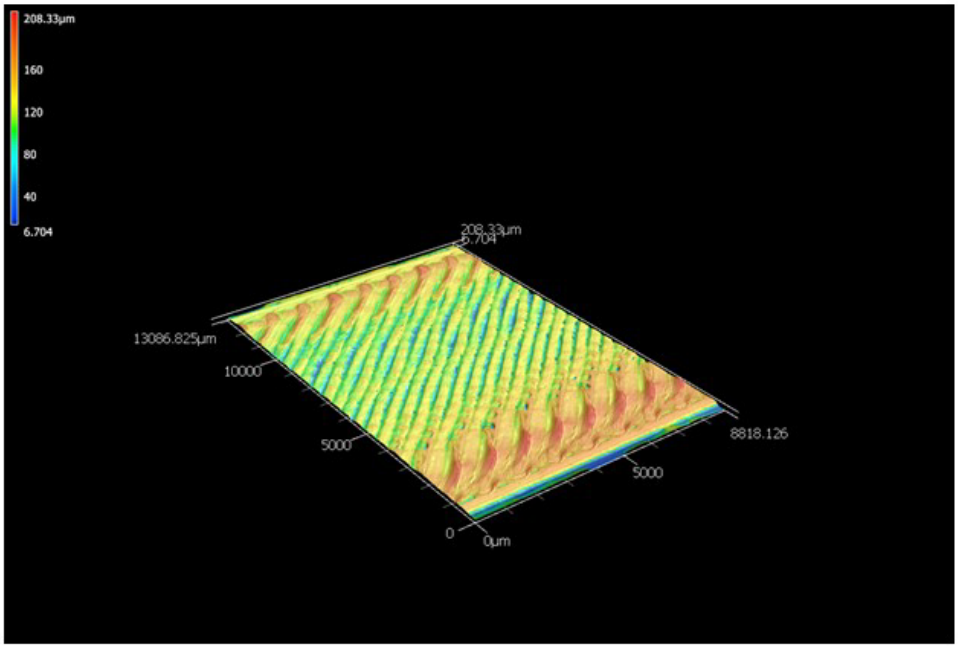
PRW22-YT (NO CUT)



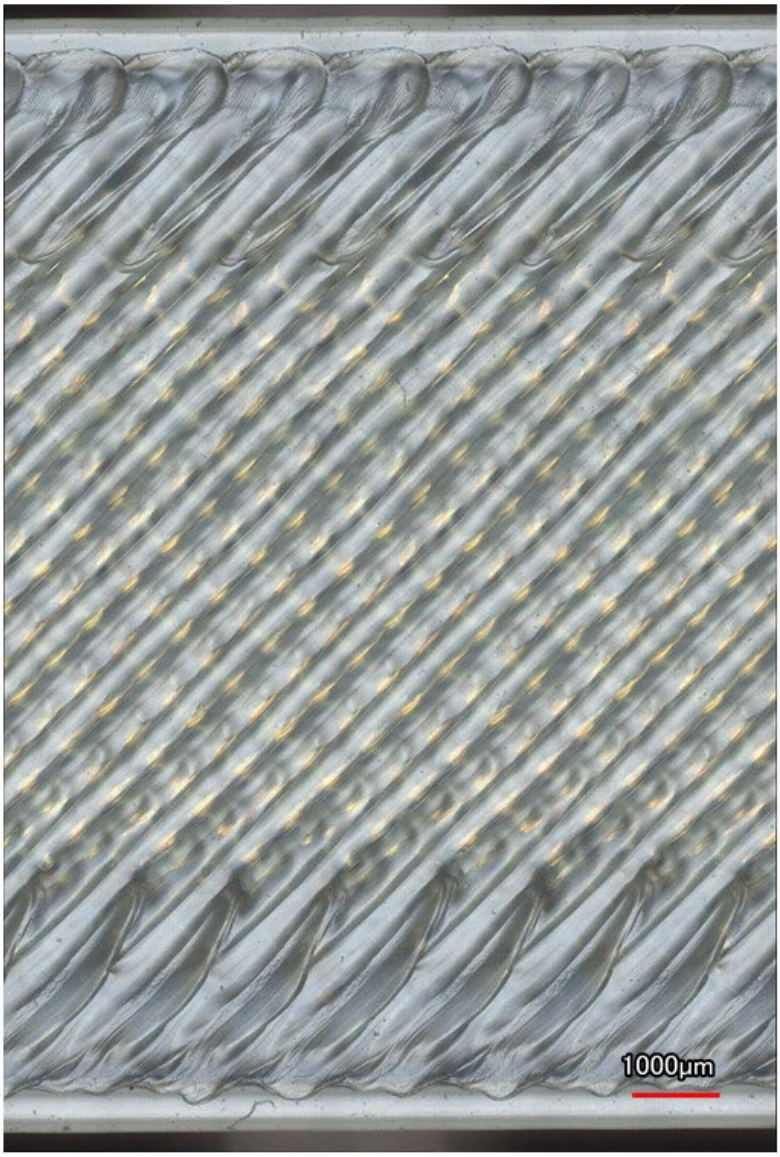
PRW26-YT (NO CUT)



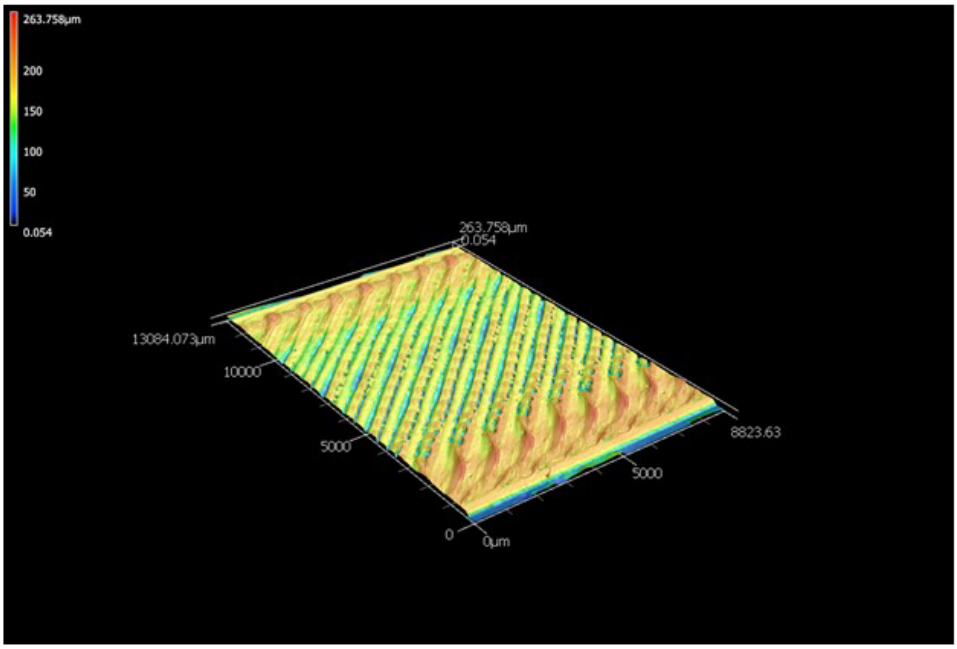
SMC1-XT (NO CUT) 1 OF 2



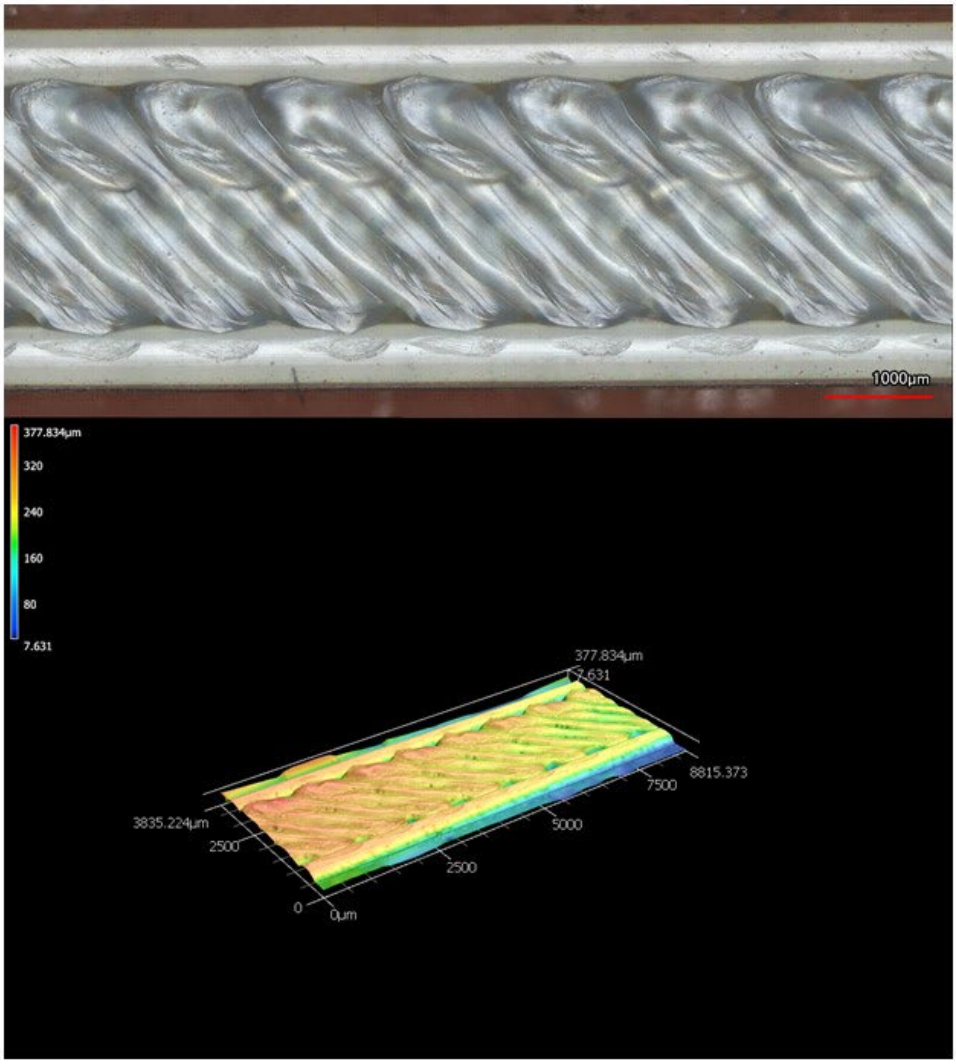
SMC1-XT (NO CUT) 2 OF 2



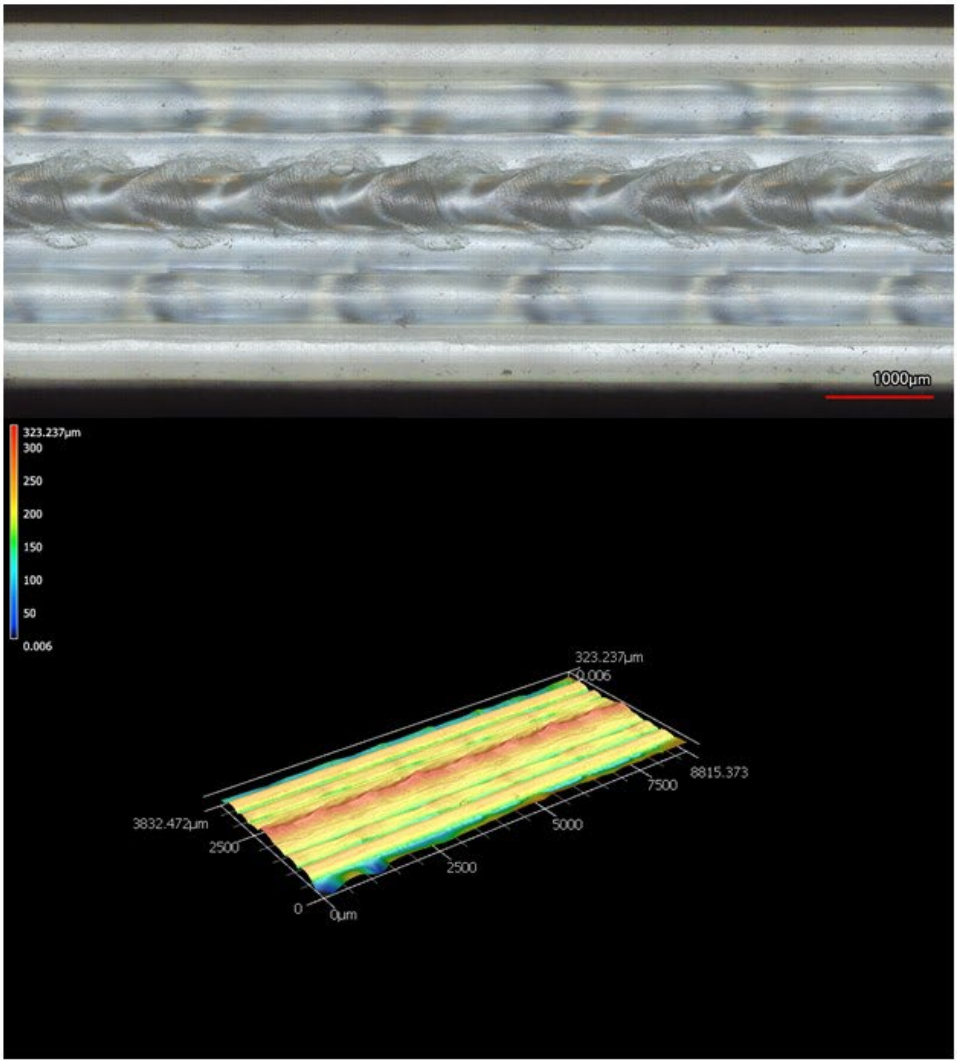
SMC3-XT (NO CUT) 1 OF 2



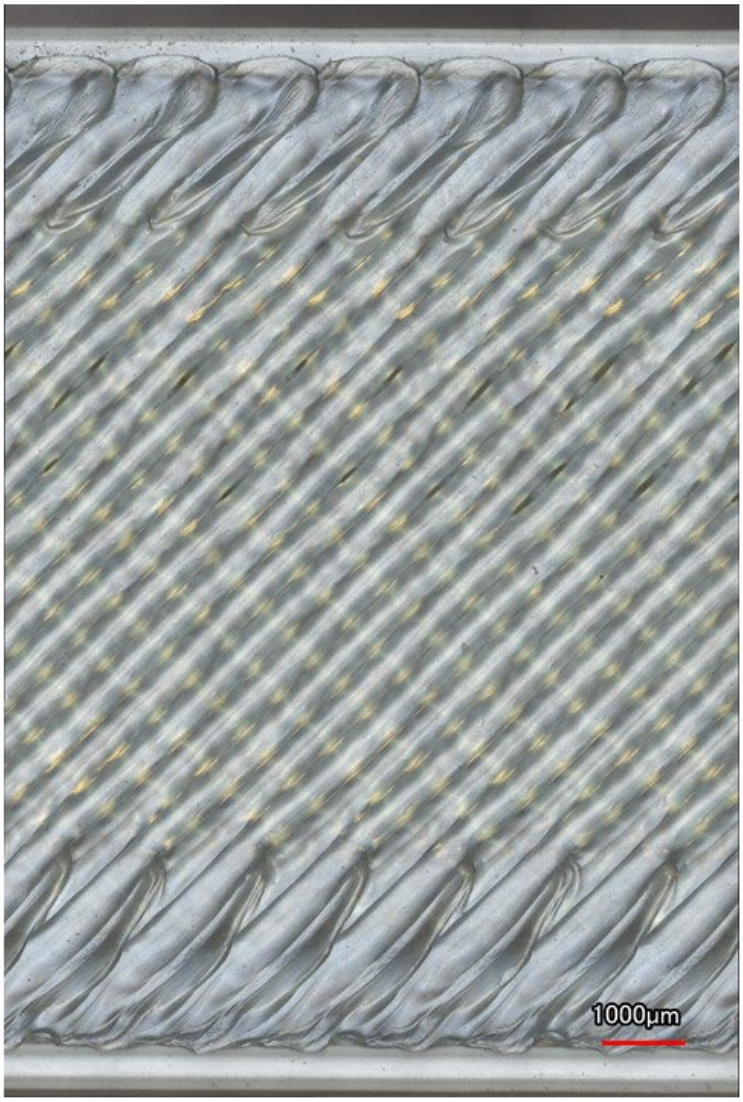
SMC3-XT (NO CUT) 2 OF 2



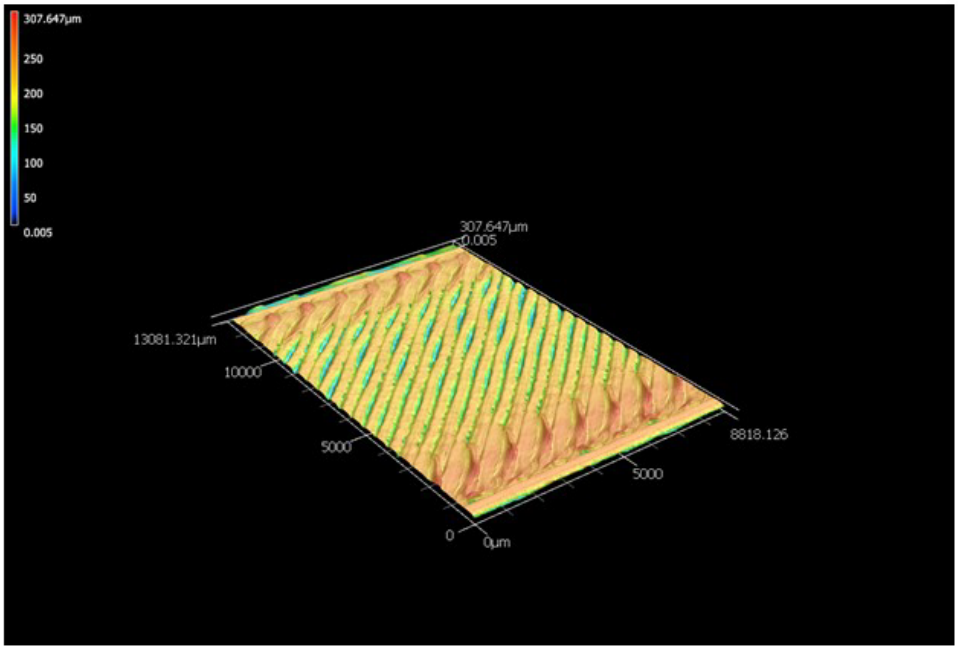
SMC1-YT (NO CUT)



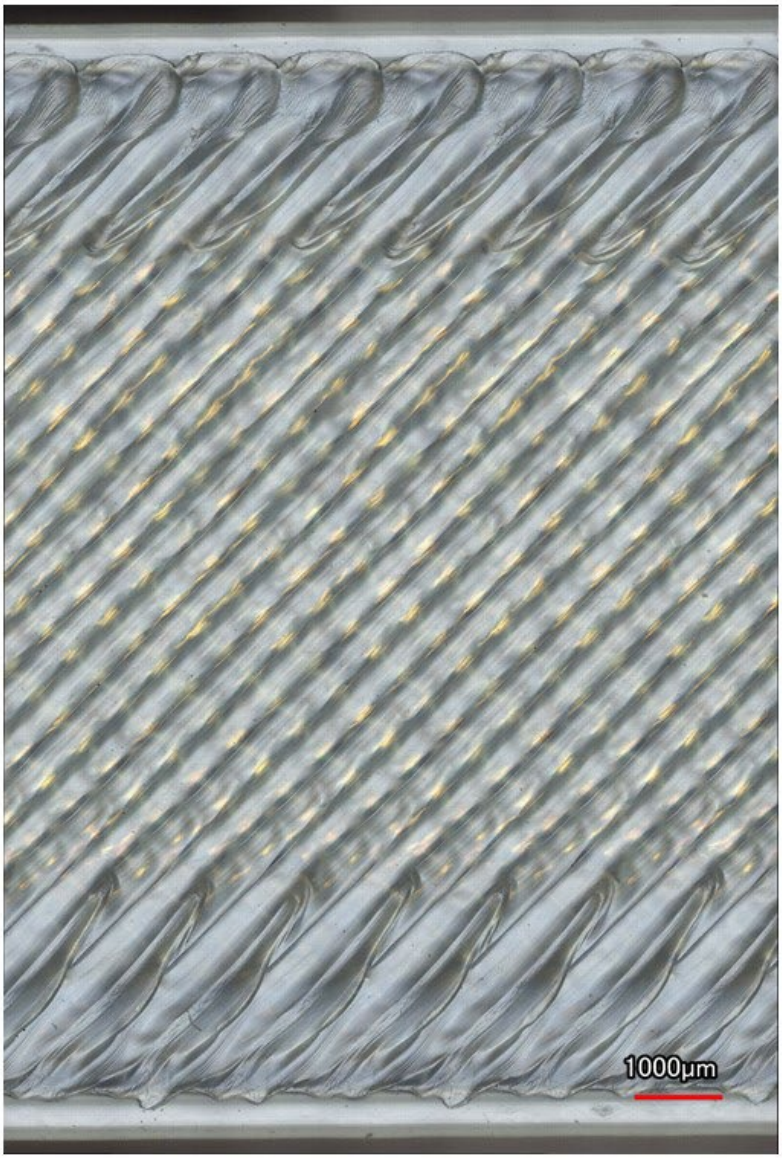
SMC3-YT (NO CUT)



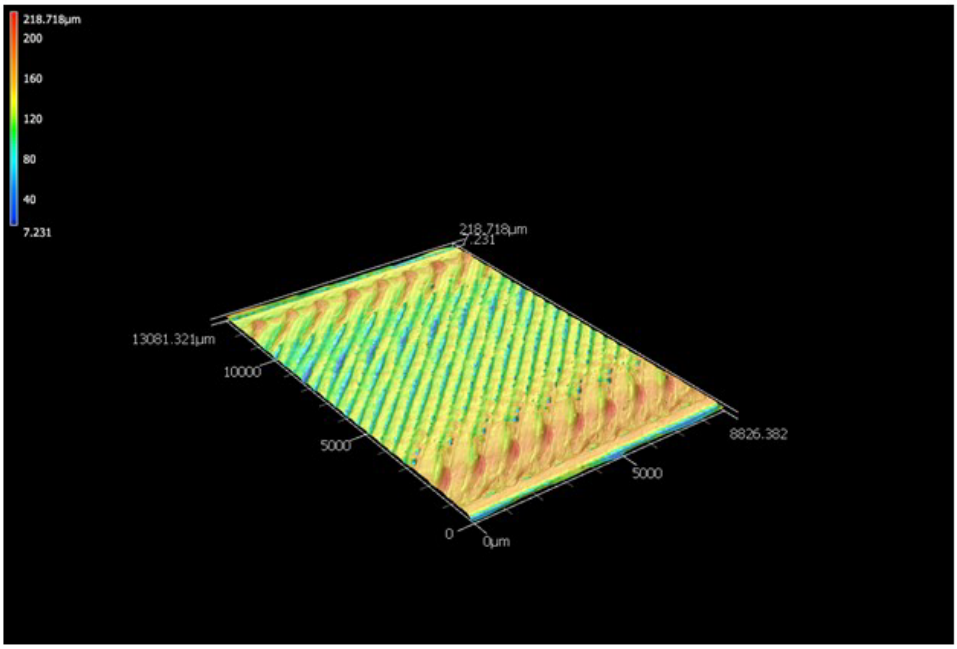
VSRAG0-XT (NO CUT) 1 OF 2



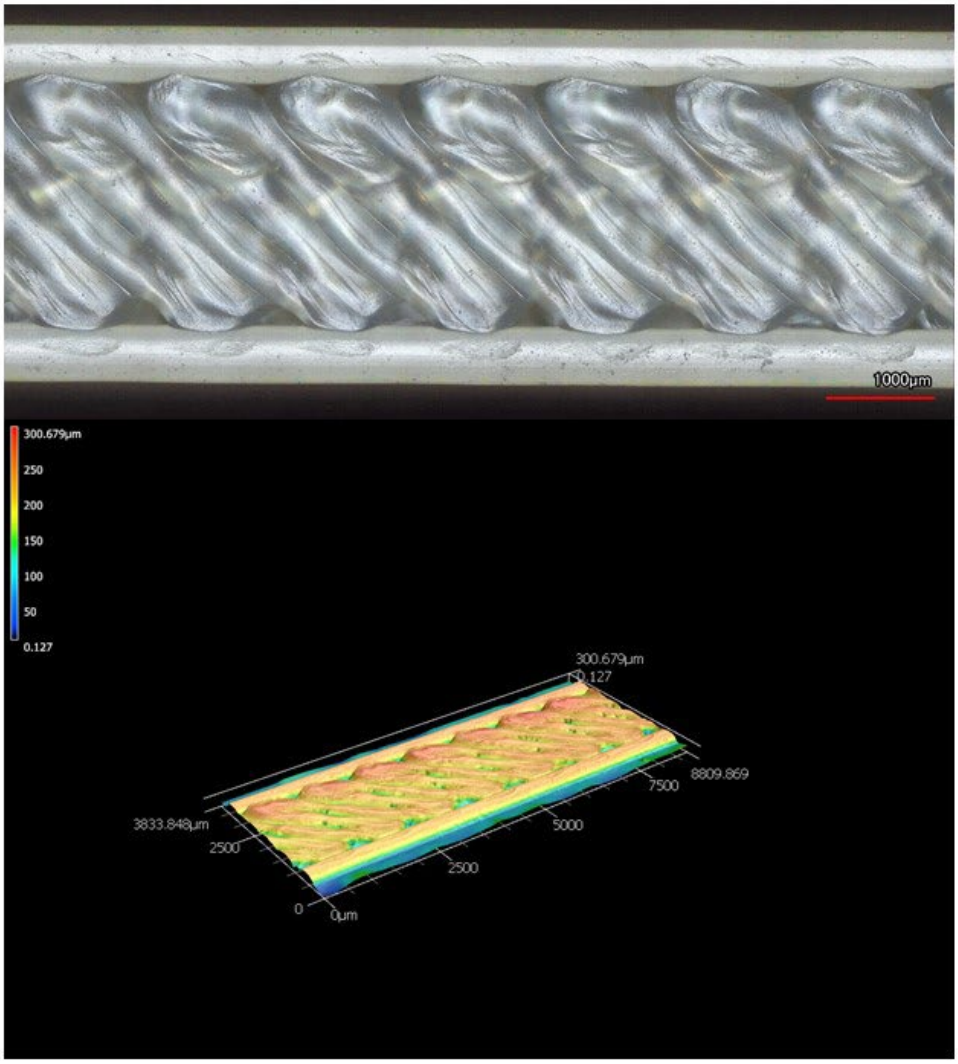
VSRAG0-XT (NO CUT) 2 OF 2



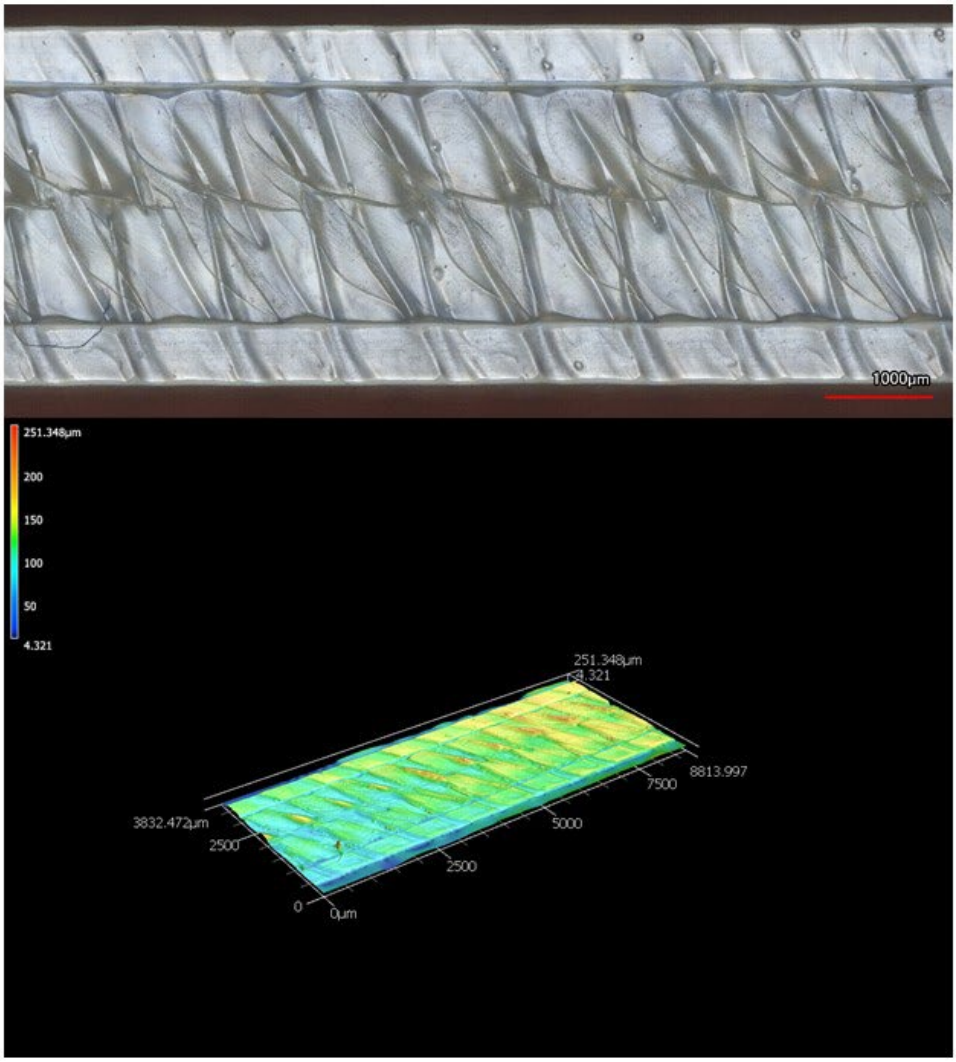
VSRAG(10)-XT (NO CUT) 1 OF 2



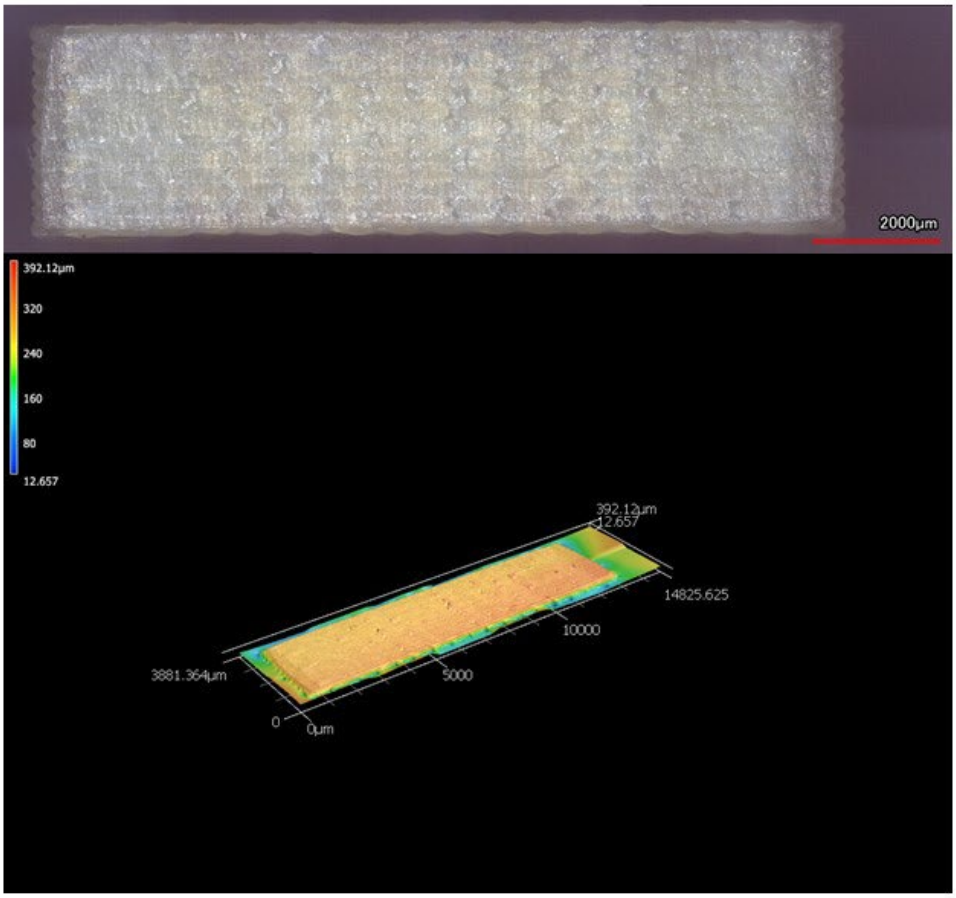
VSRAG(10)-XT (NO CUT) 2 OF 2



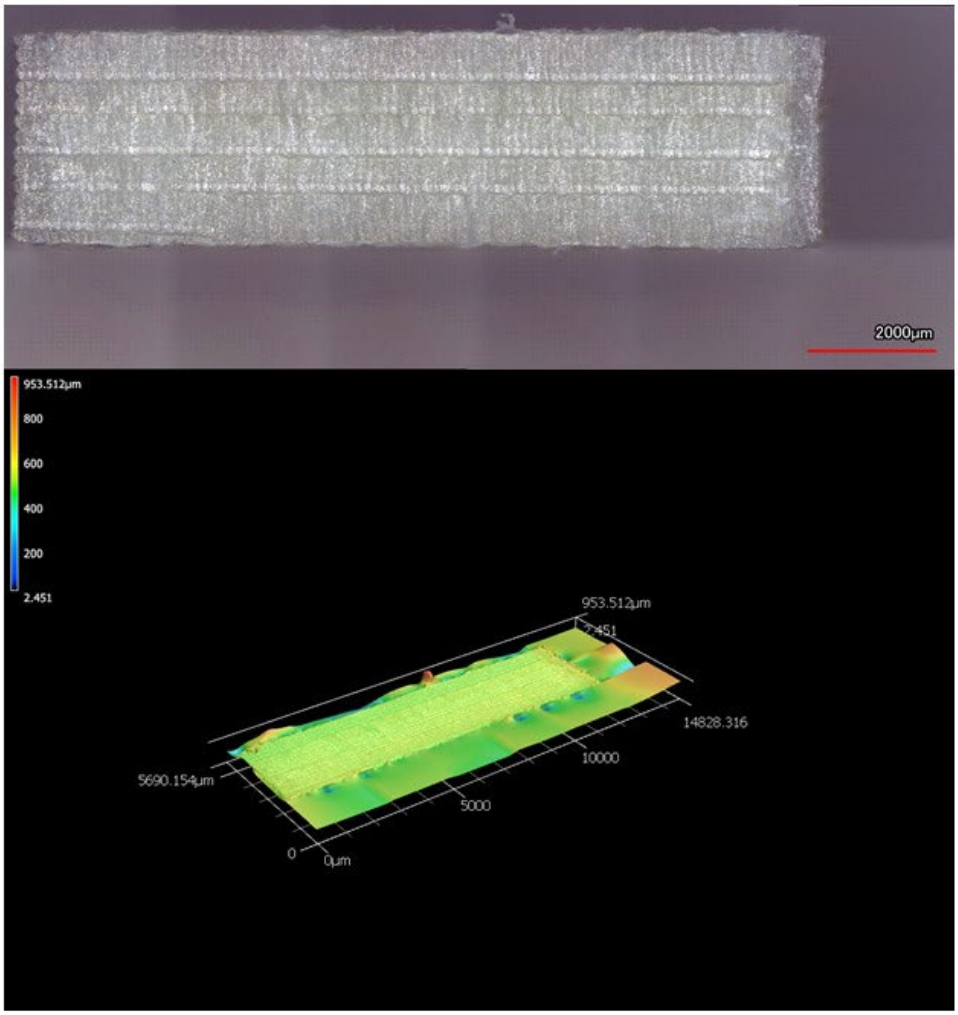
VSRAG0-YT (NO CUT)



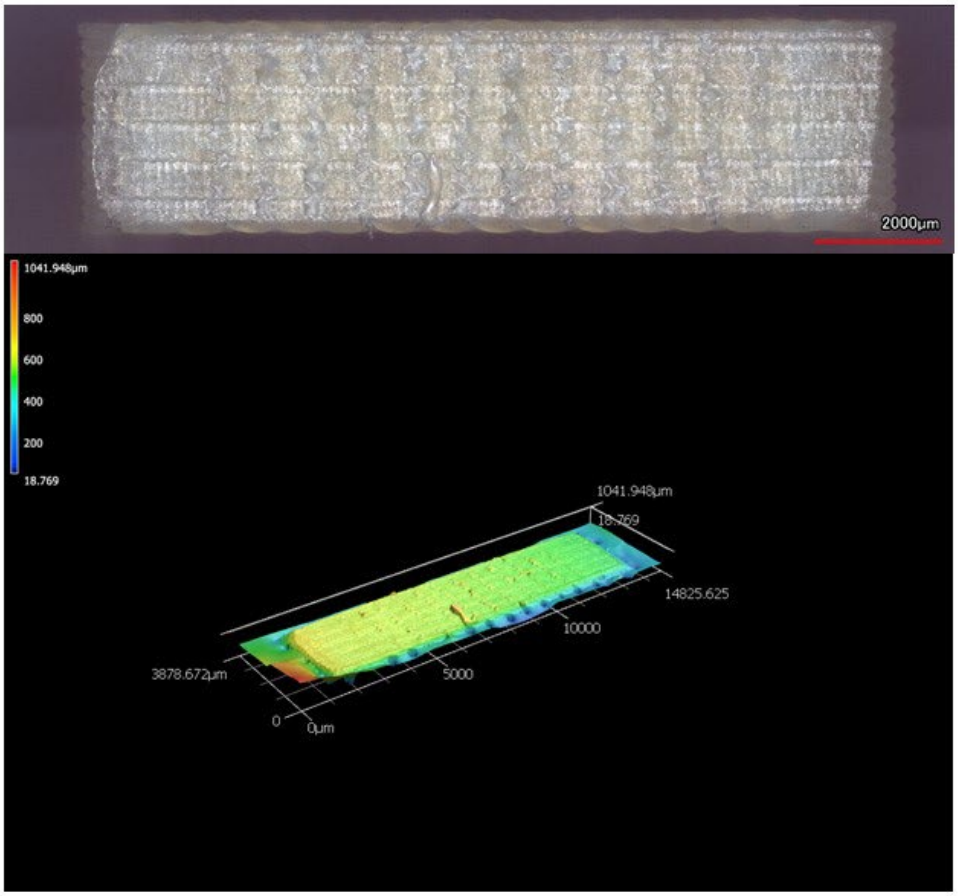
VSRAG(10)-YT (NO CUT)


2000µm
392.12µm
320
240
160
80
12.657
392.12µm
12.657
14825.625
10000
5000
3881.364µm
0
0µm

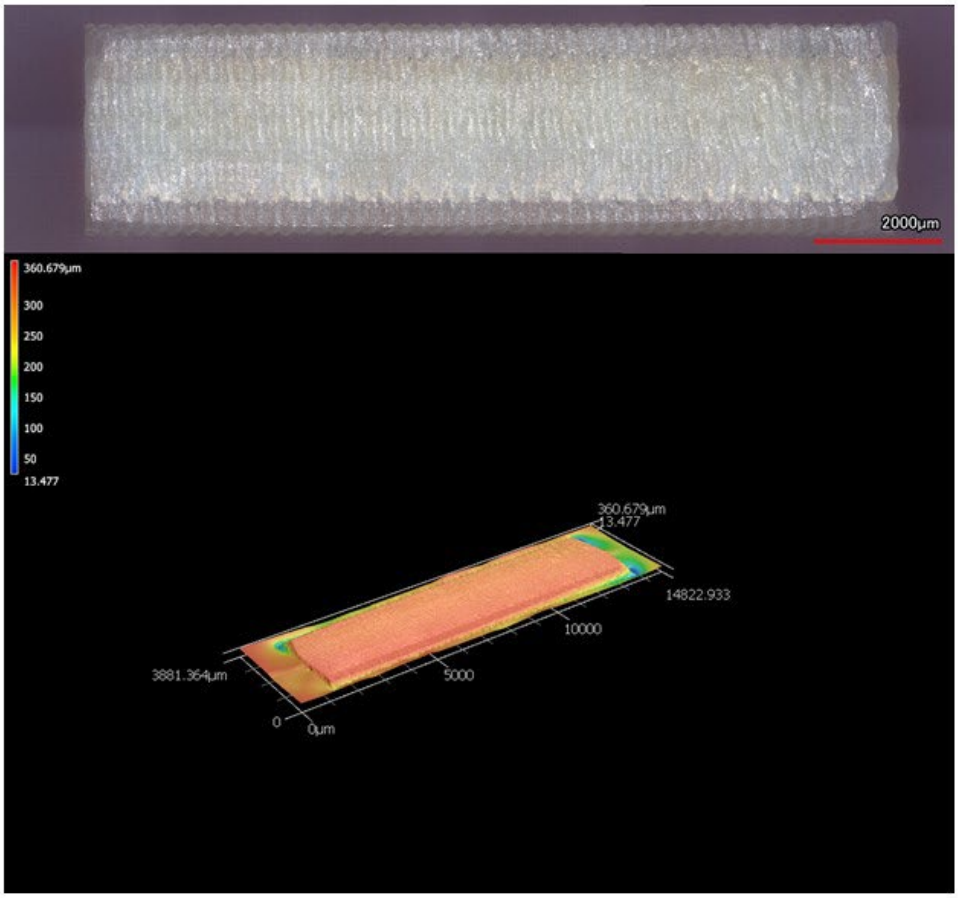
AR0-XT (Cut)


2000µm
953.512µm
800
600
400
200
2.451
953.512µm
2.451
14828.316
10000
5000
0µm
5690.154µm
0

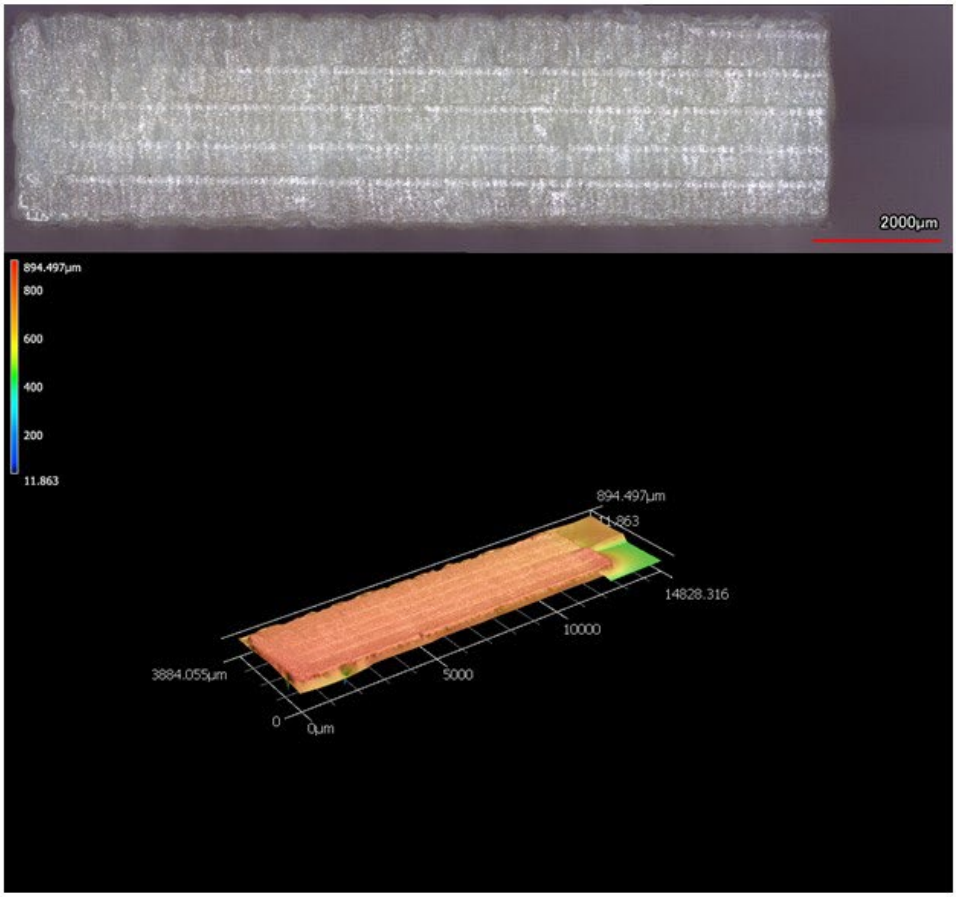
AR(15)-XT (Cut)


2000µm
1041.948µm
800
600
400
200
18.769
1041.948µm
18.769
14825.625
10000
5000
3878.672µm
0
0µm

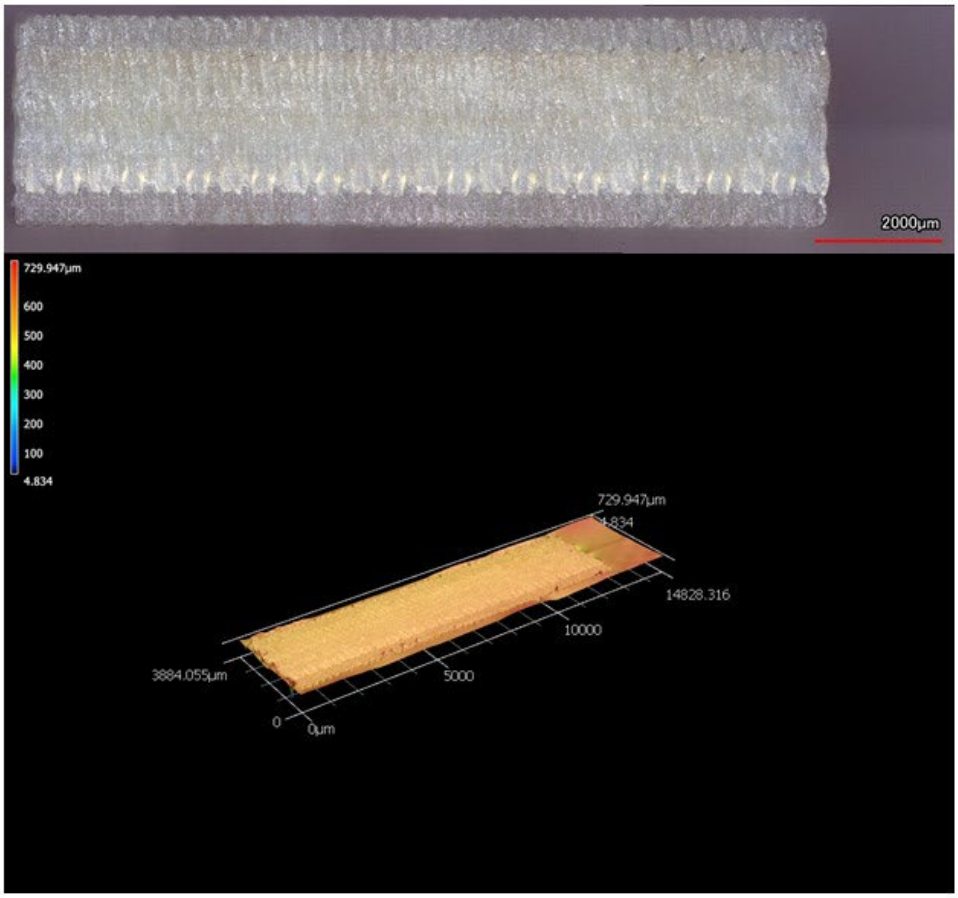
AR15-XT (Cut)


2000µm
360.679µm
300
250
200
150
100
50
13.477
360.679µm
13.477
14822.933
10000
5000
3881.364µm
0
0µm

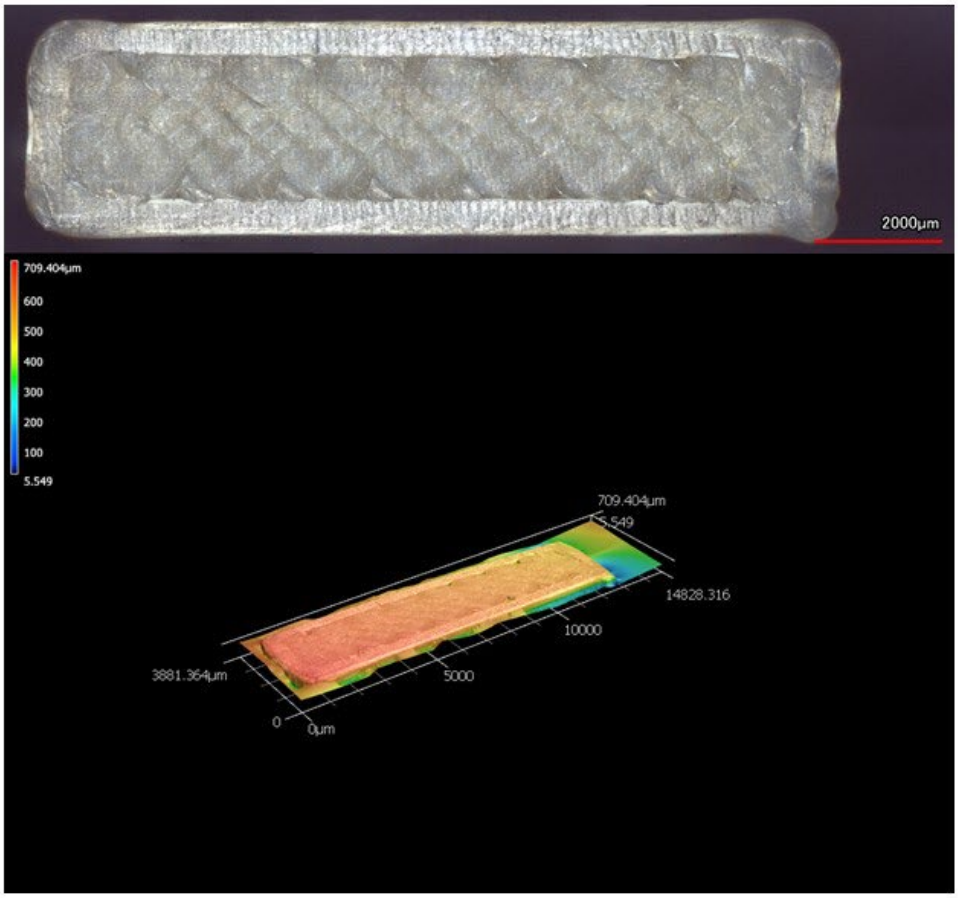
AR0-YT (Cut)


2000µm
894.497µm
800
600
400
200
11.863
894.497µm
11.863
14828.316
10000
5000
3884.055µm
0
0µm

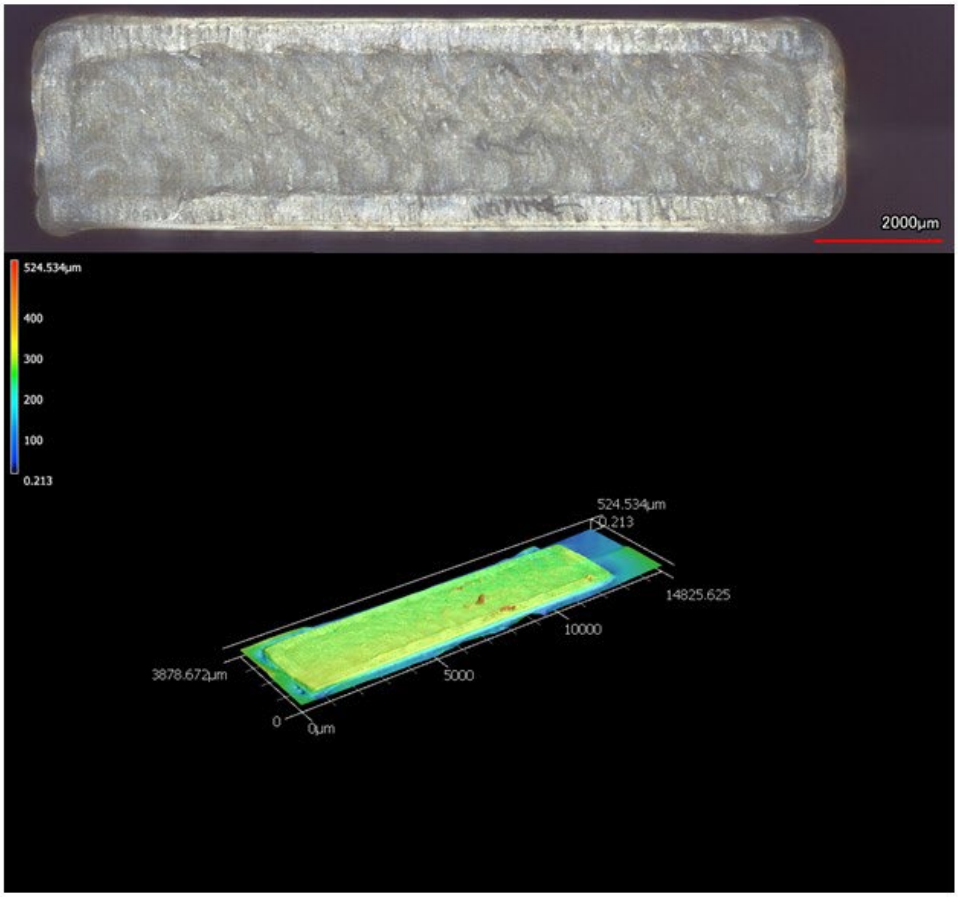
AR(15)-YT (Cut)


2000µm
729.947µm
600
500
400
300
200
100
4.834
729.947µm
4.834
14828.316
10000
5000
3884.055µm
0
0µm

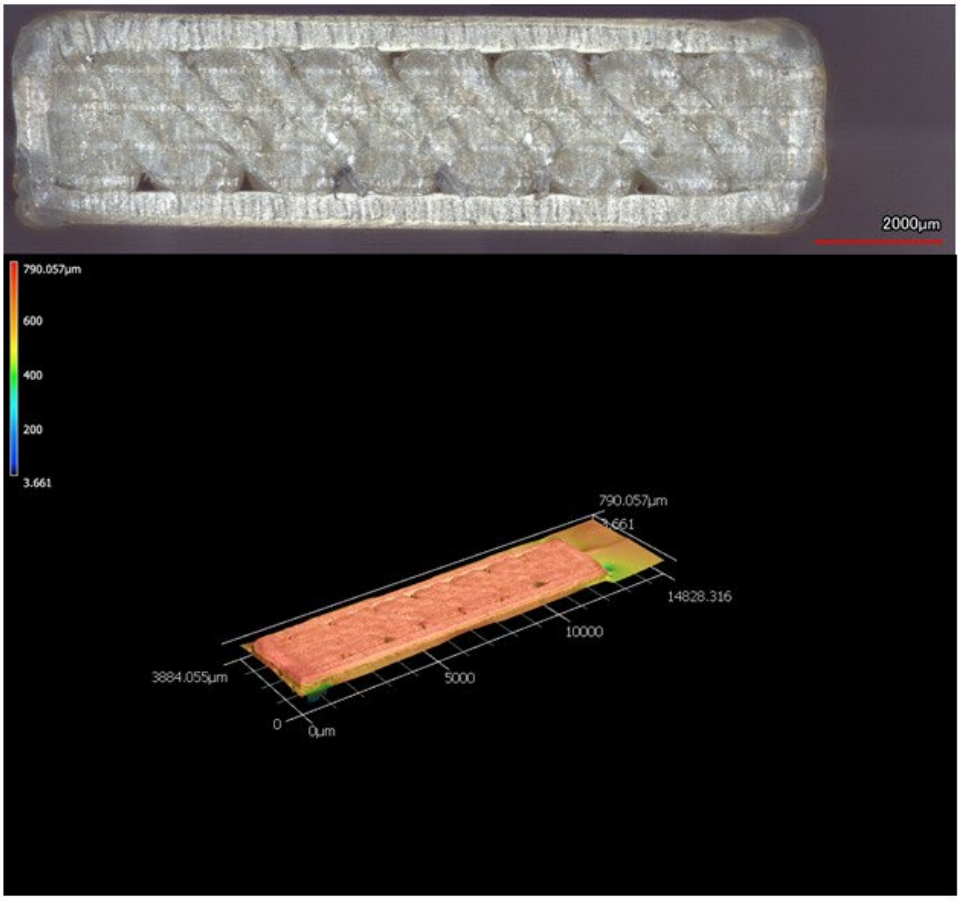
AR15-YT (Cut)


2000µm
709.404µm
600
500
400
300
200
100
5.549
709.404µm
5.549
14828.316
10000
5000
3881.364µm
0
0µm

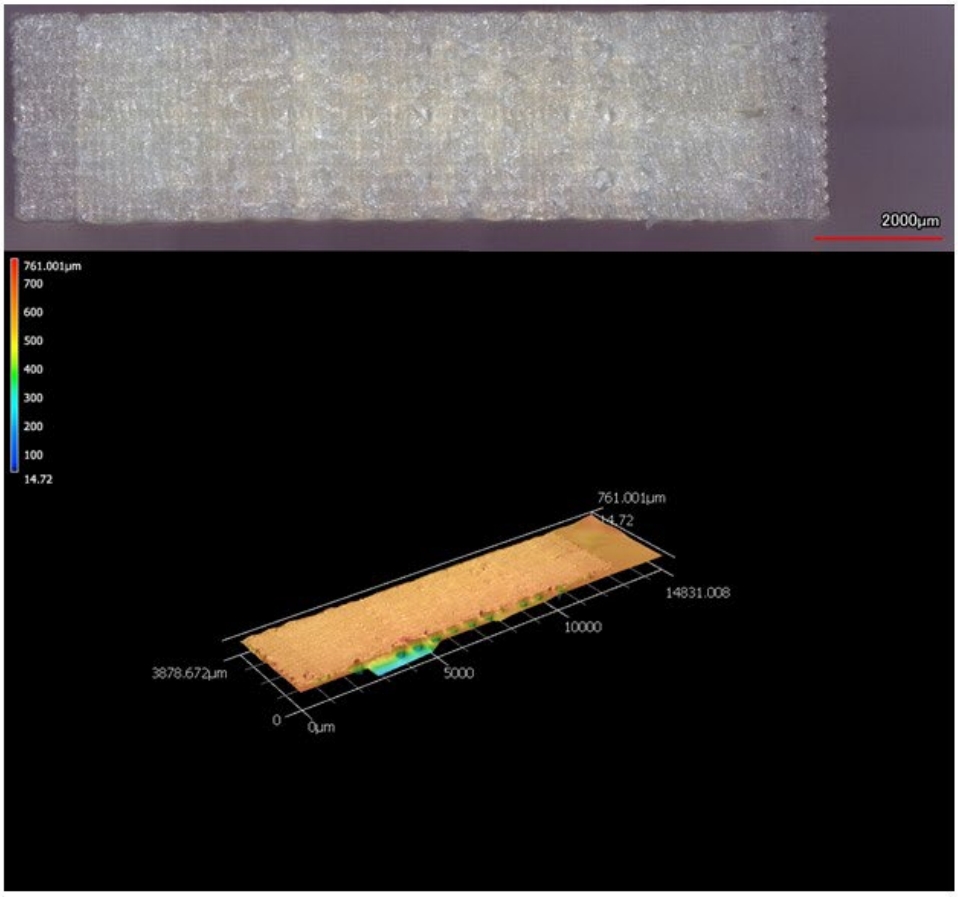
AR0-ZT (Cut)


2000µm
524.534µm
400
300
200
100
0.213
524.534µm
0.213
14825.625
10000
5000
3878.672µm
0
0µm

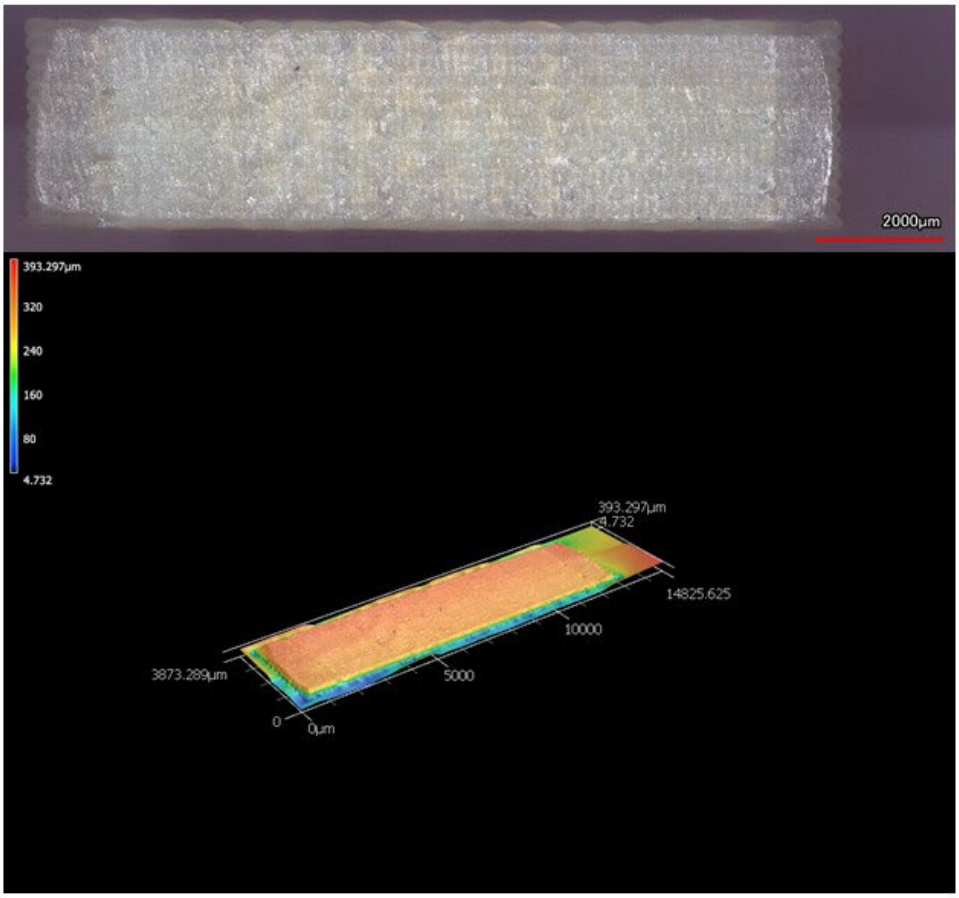
AR(15)-ZT (Cut)


2000µm
790.057µm
600
400
200
3.661
790.057µm
3.661
14828.316
10000
5000
3884.055µm
0
0µm

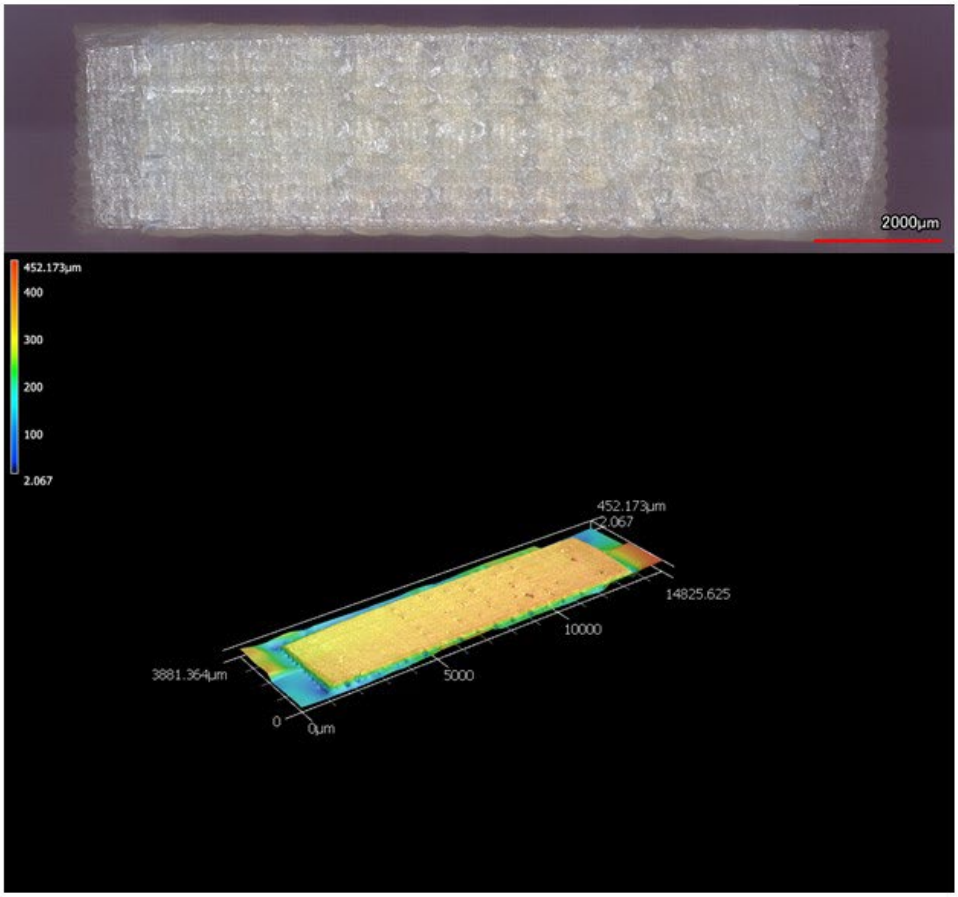
AR15-ZT (Cut)


2000µm
761.001µm
700
600
500
400
300
200
100
14.72
761.001µm
14.72
14831.008
10000
5000
3878.672µm
0
0µm

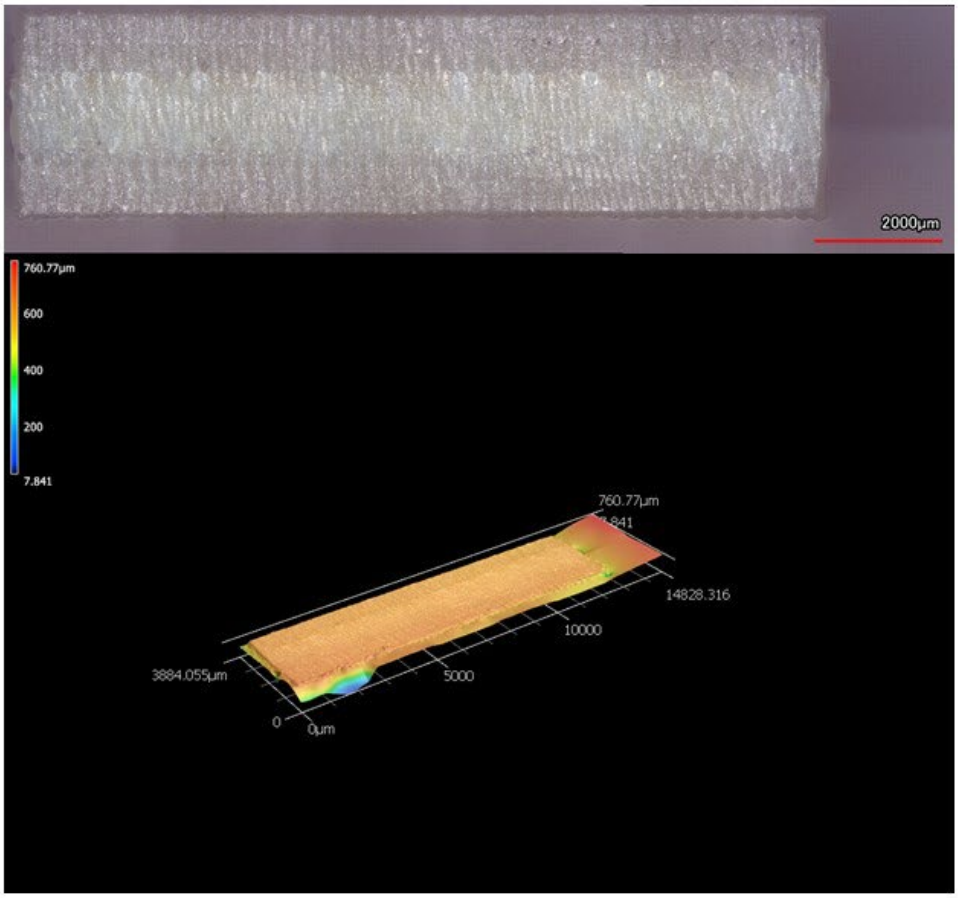
CC2(15)-XT (Cut)


2000µm
393.297µm
320
240
160
80
4.732
393.297µm
4.732
14825.625
10000
5000
3873.289µm
0
0µm

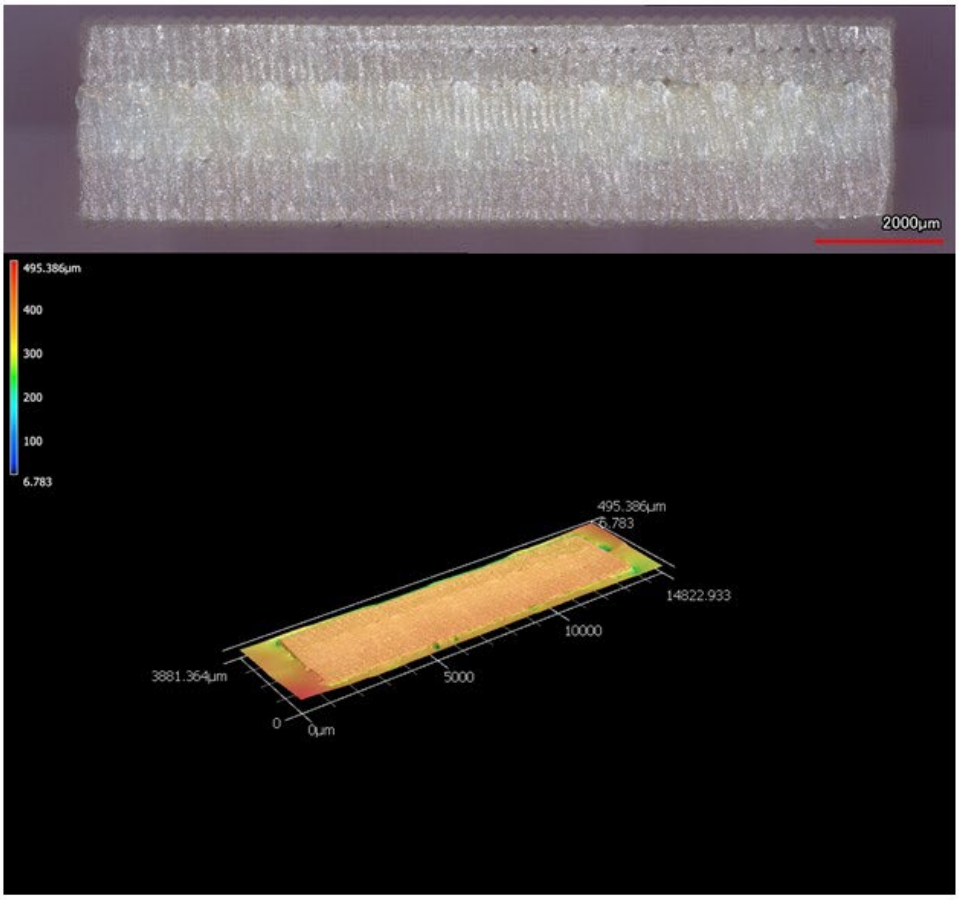
CC20-XT (Cut)


2000µm
452.173µm
400
300
200
100
2.067
452.173µm
2.067
14825.625
10000
5000
3881.364µm
0
0µm

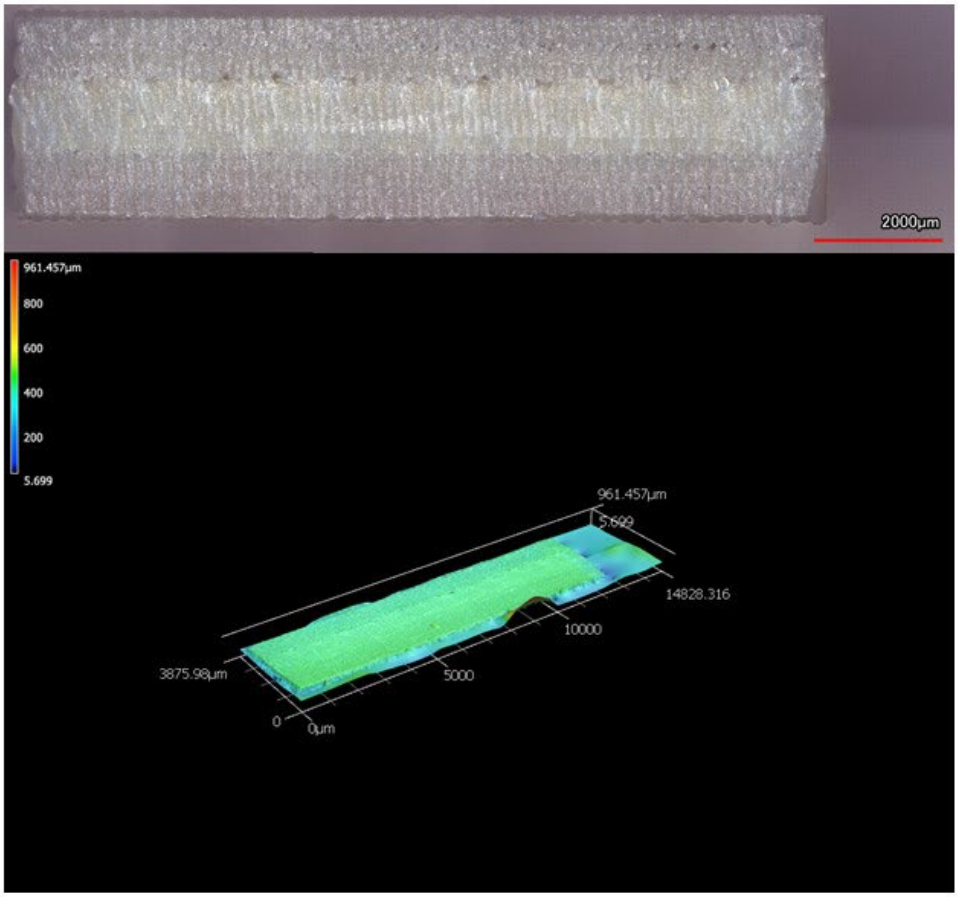
CC215-XT (Cut)


2000µm
760.77µm
600
400
200
7.841
760.77µm
14828.316
10000
5000
3884.055µm
0
0µm

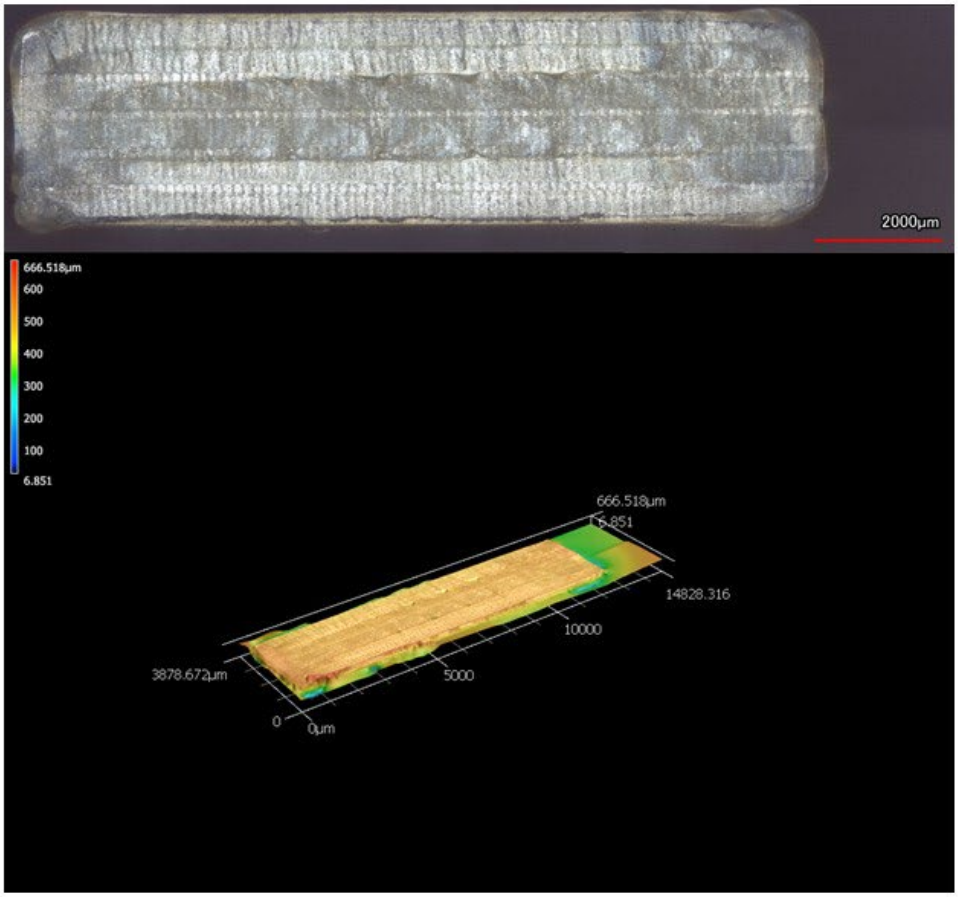
CC2(15)-YT (Cut)


2000µm
495.386µm
400
300
200
100
6.783
495.386µm
6.783
14822.933
10000
5000
3881.364µm
0
0µm

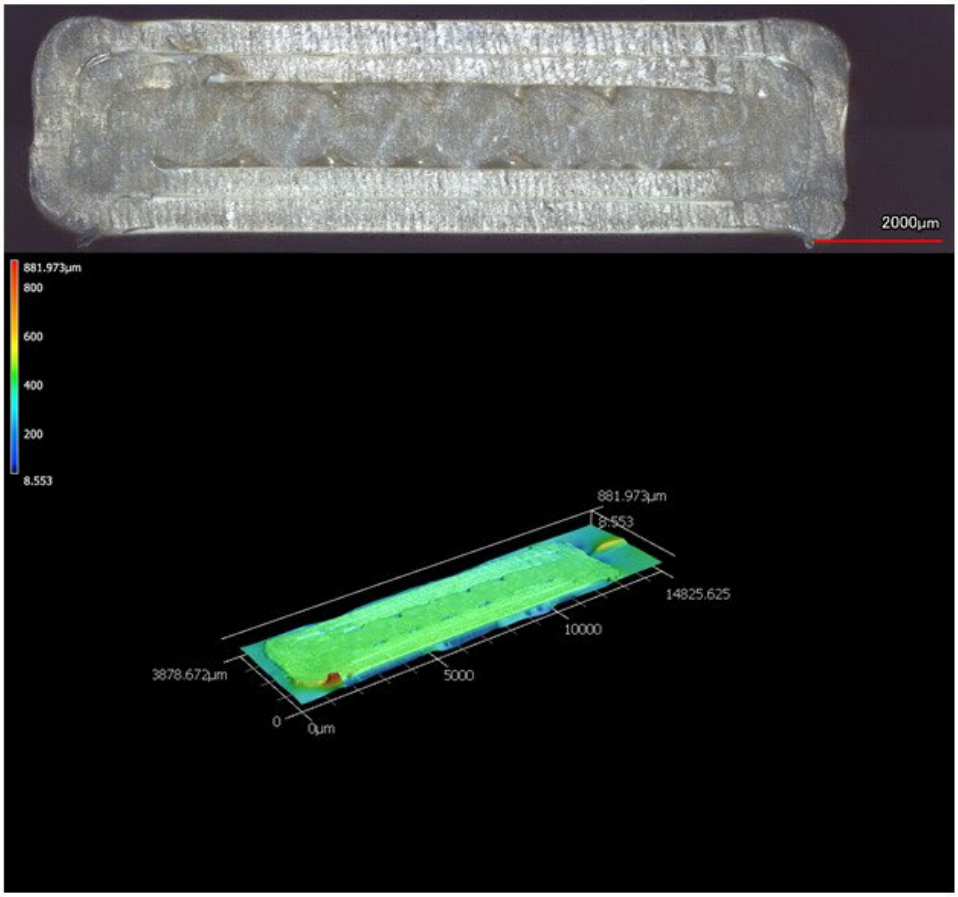
CC20-YT (Cut)


2000µm
961.457µm
800
600
400
200
5.699
961.457µm
5.699
14828.316
10000
5000
3875.98µm
0
0µm

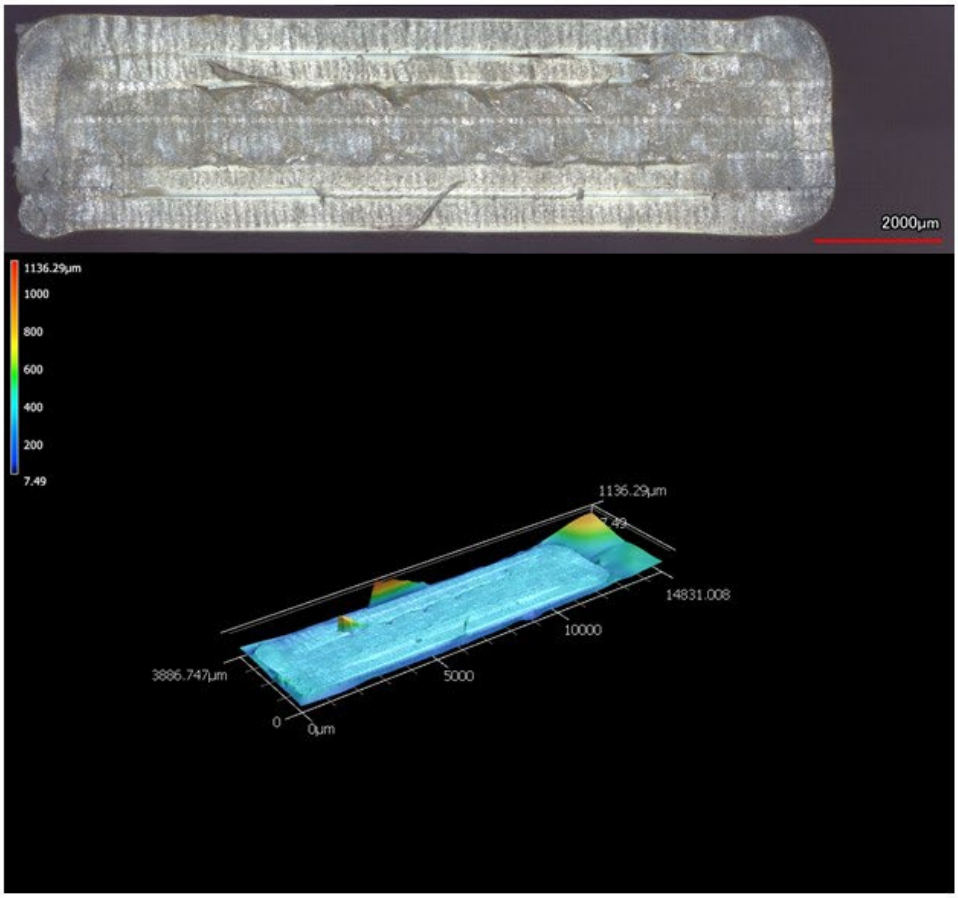
CC215-YT (Cut)


2000µm
666.518µm
600
500
400
300
200
100
6.851
666.518µm
6.851
14828.316
10000
5000
0µm
3878.672µm
0

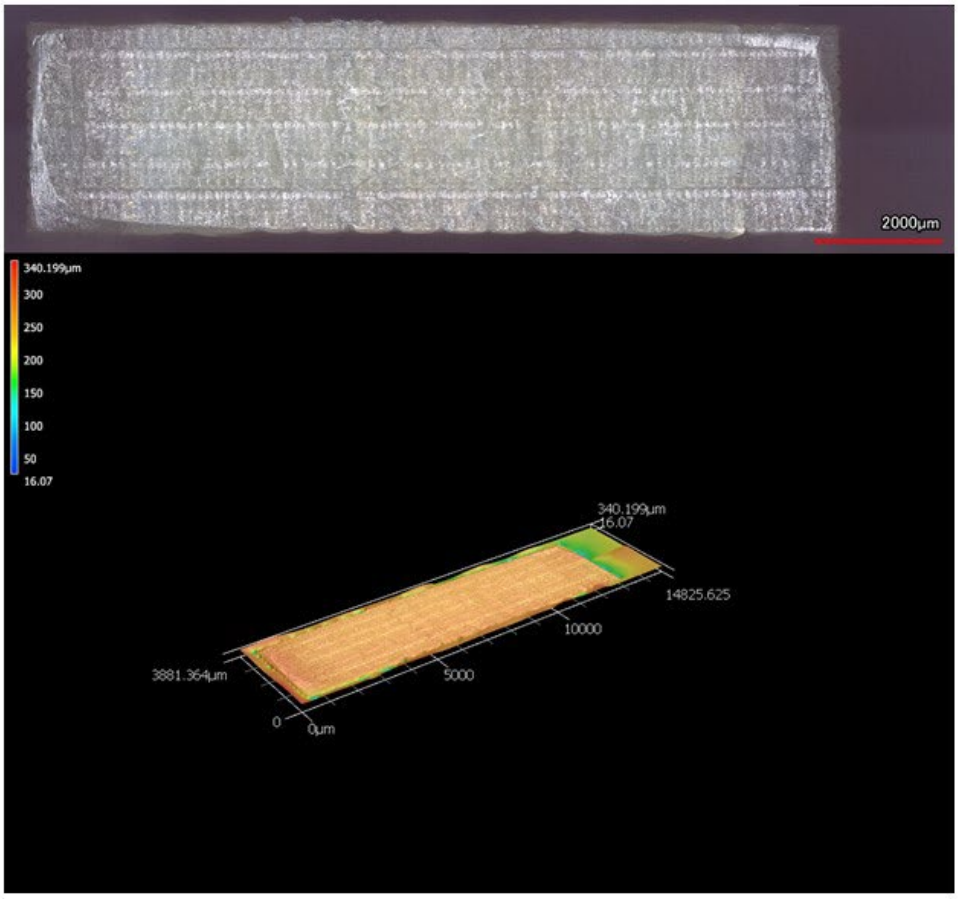
CC2(15)-ZT (Cut)


2000µm
881.973µm
800
600
400
200
8.553
881.973µm
8.553
14825.625
10000
5000
3878.672µm
0
0µm

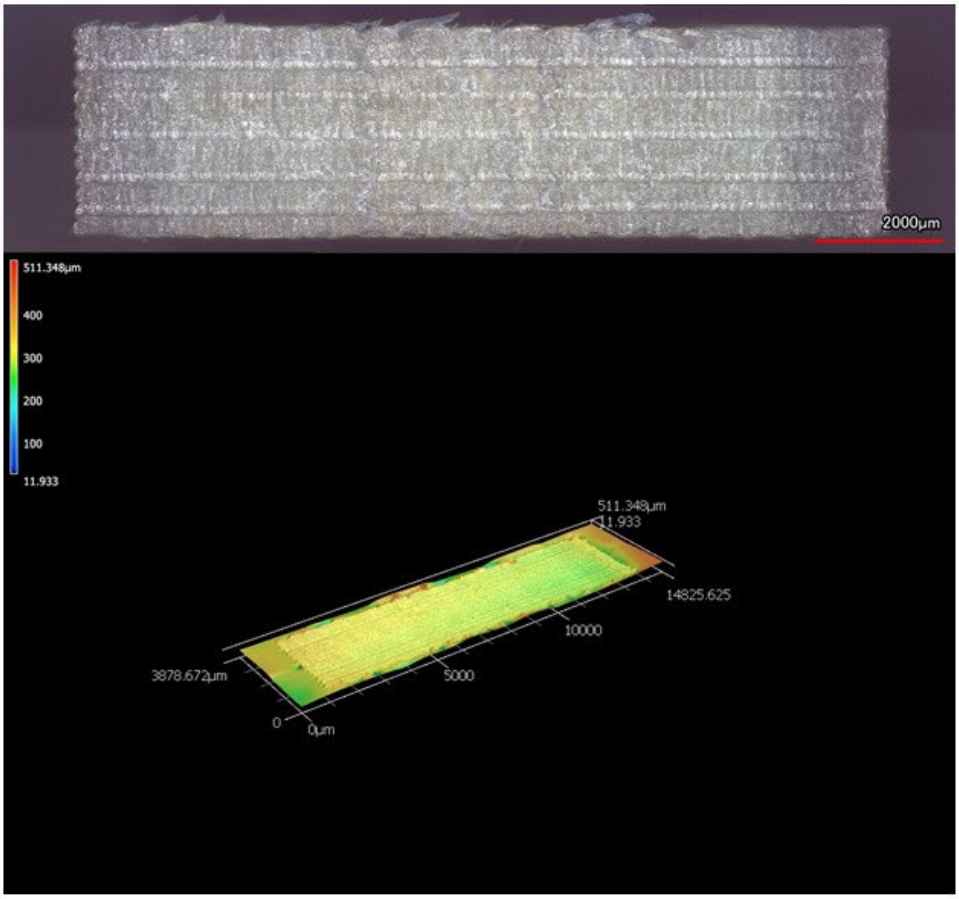
CC20-ZT (Cut)


2000µm
1136.29µm
1000
800
600
400
200
7.49
1136.29µm
14831.008
10000
5000
3886.747µm
0
0µm

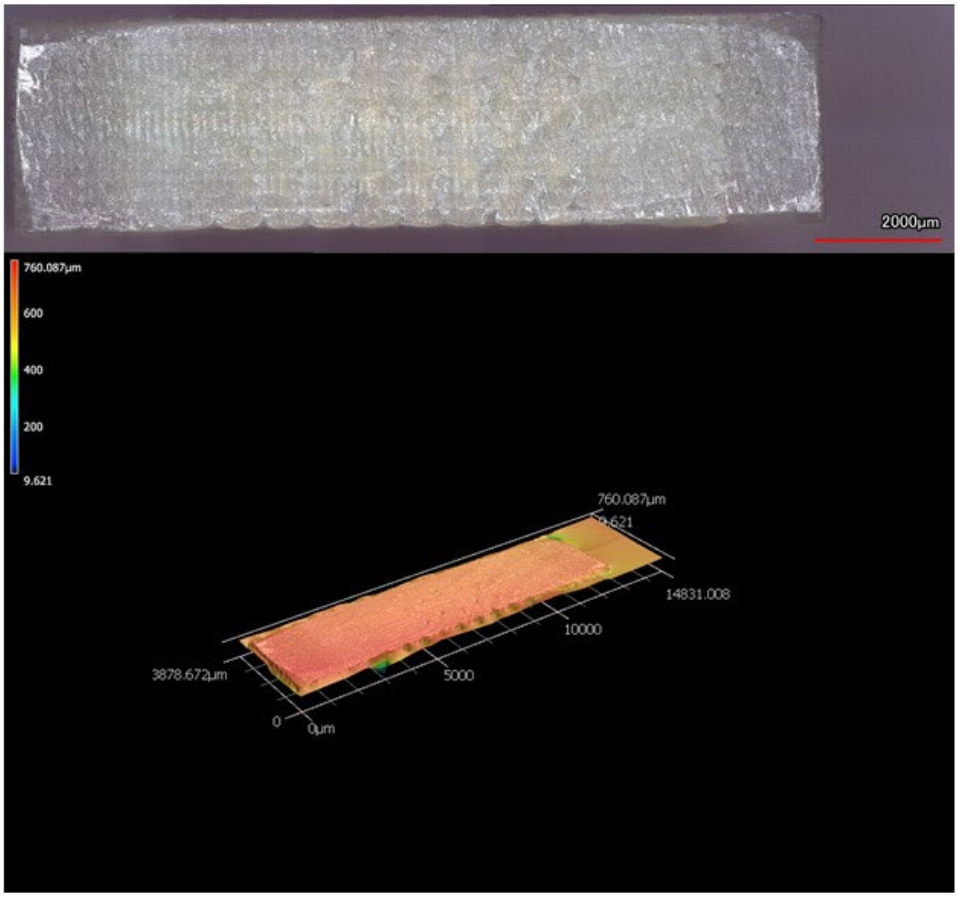
CC215-ZT (Cut)


2000µm
340.199µm
300
250
200
150
100
50
16.07
340.199µm
16.07
14825.625
10000
5000
3881.364µm
0
0µm

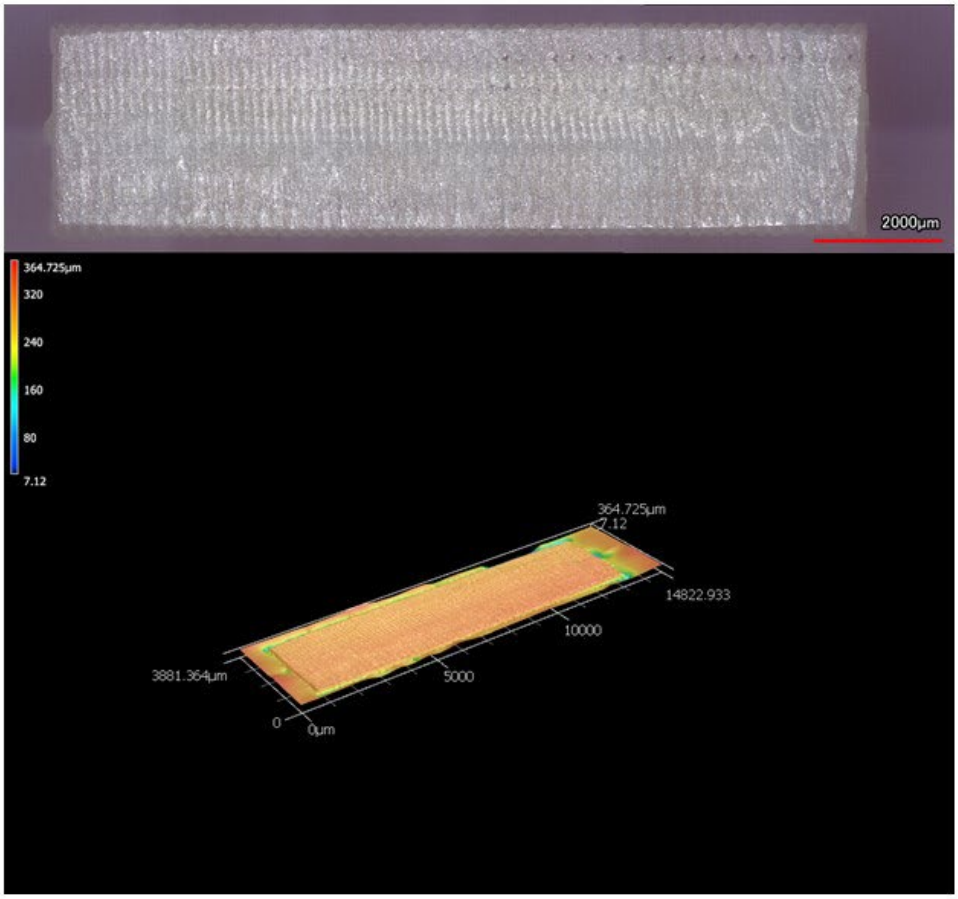
CC3(15)-XT (Cut)


2000µm
511.348µm
400
300
200
100
11.933
511.348µm
11.933
14825.625
10000
5000
3878.672µm
0
0µm

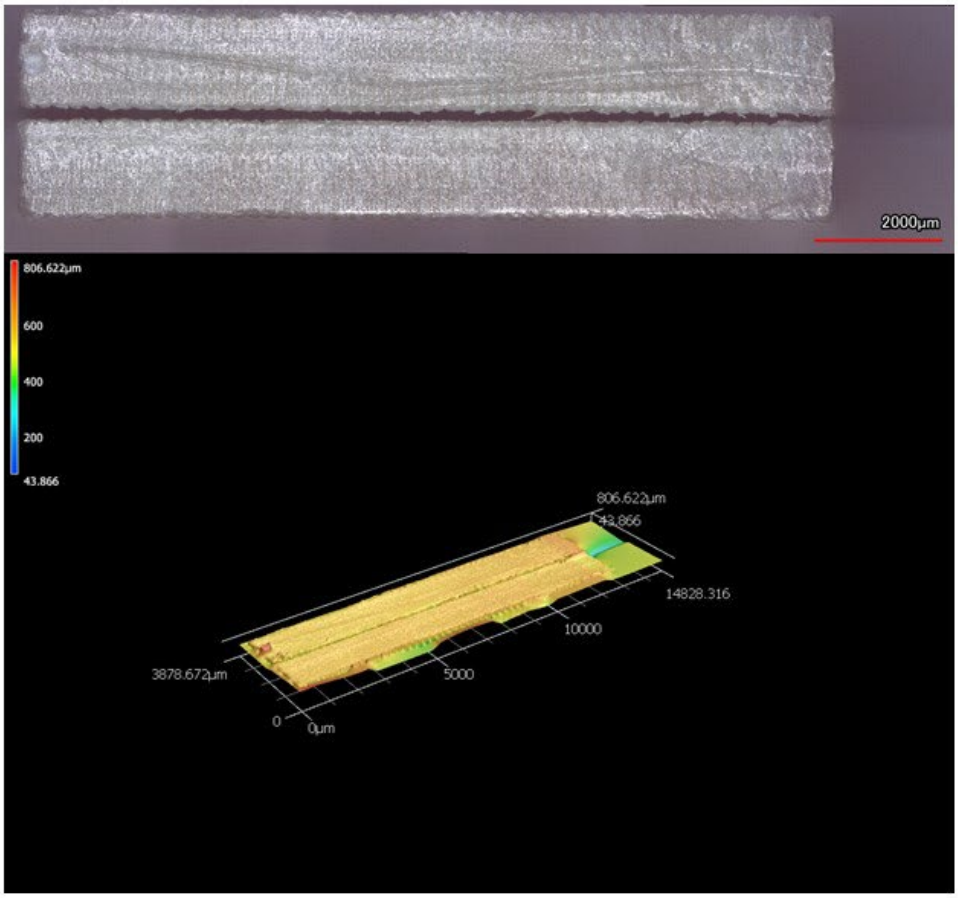
CC30-XT (Cut)


2000µm
760.087µm
600
400
200
9.621
760.087µm
9.621
14831.008
10000
5000
3878.672µm
0
0µm

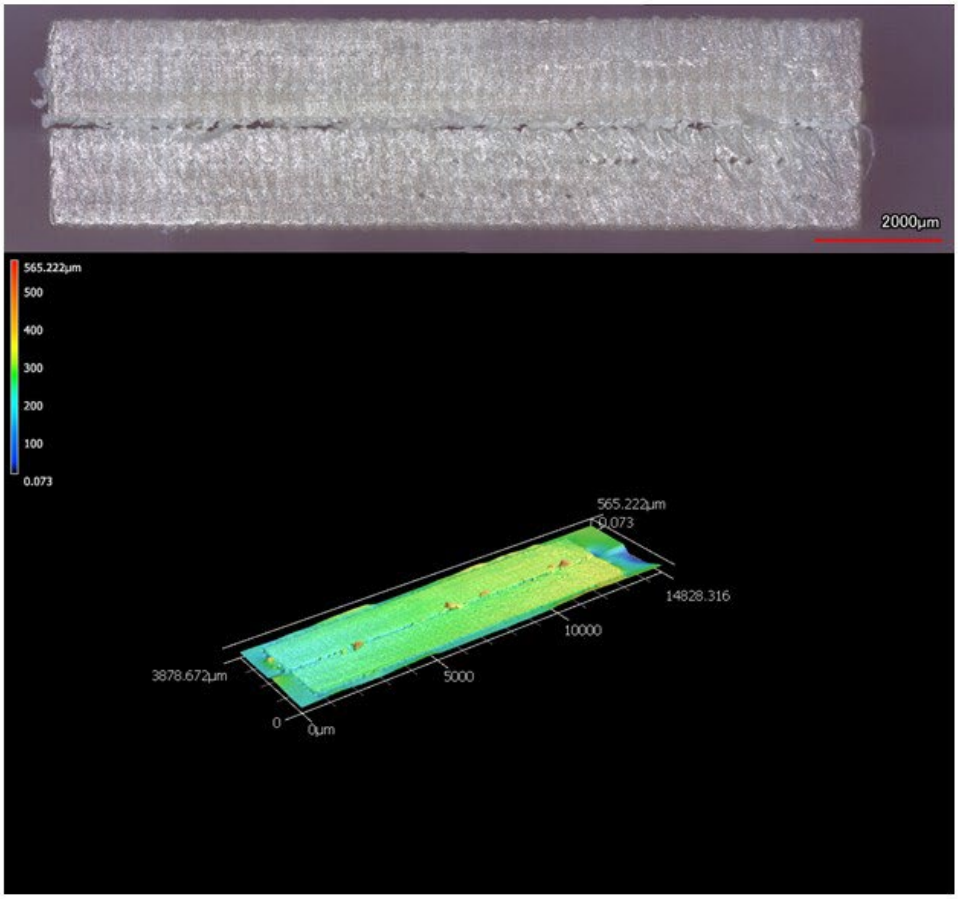
CC315-XT (Cut)


2000µm
364.725µm
320
240
160
80
7.12
364.725µm
7.12
14822.933
10000
5000
3881.364µm
0
0µm

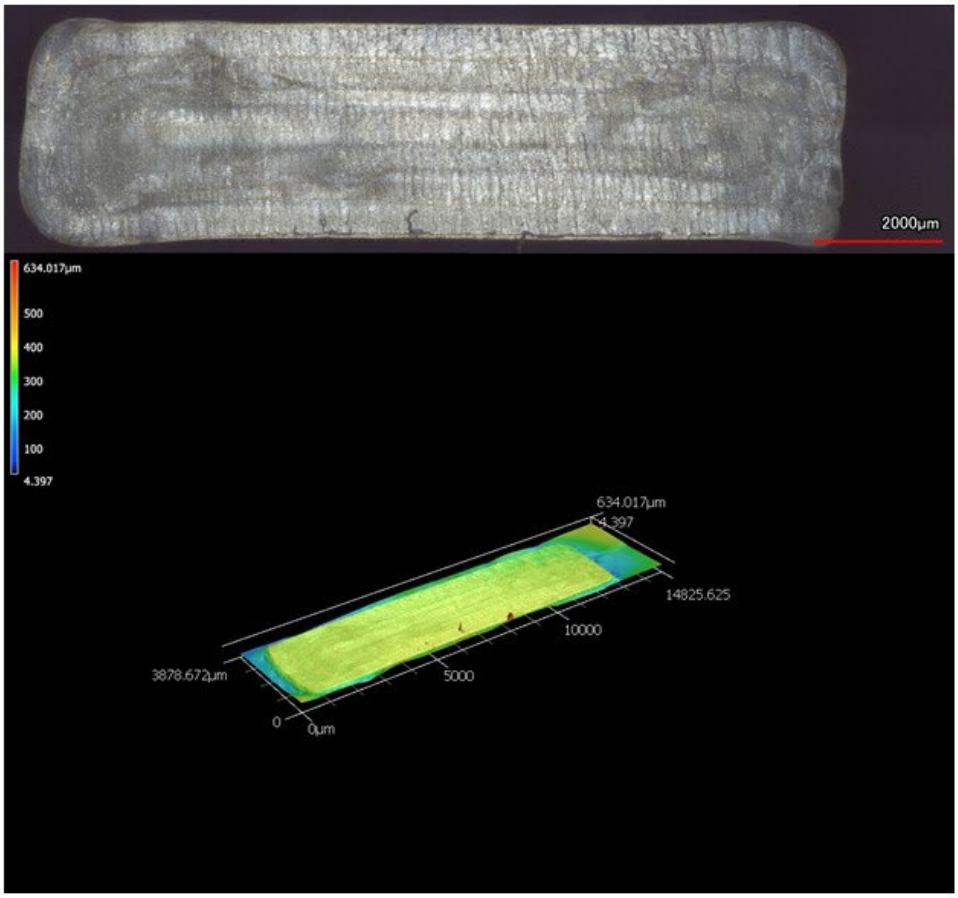
CC3(15)-YT (Cut)


2000µm
806.622µm
600
400
200
43.866
806.622µm
43.866
14828.316
10000
5000
3878.672µm
0
0µm

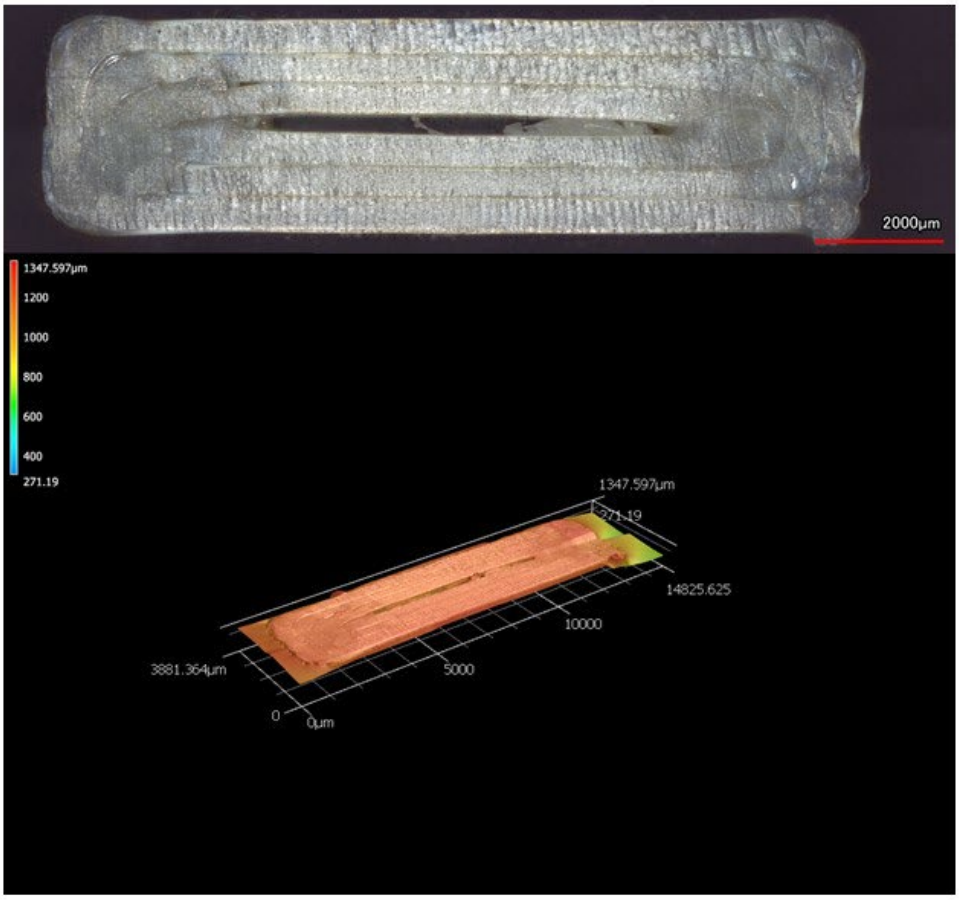
CC30-YT (Cut)


2000µm
565.222µm
500
400
300
200
100
0.073
565.222µm
0.073
14828.316
10000
5000
3878.672µm
0
0µm

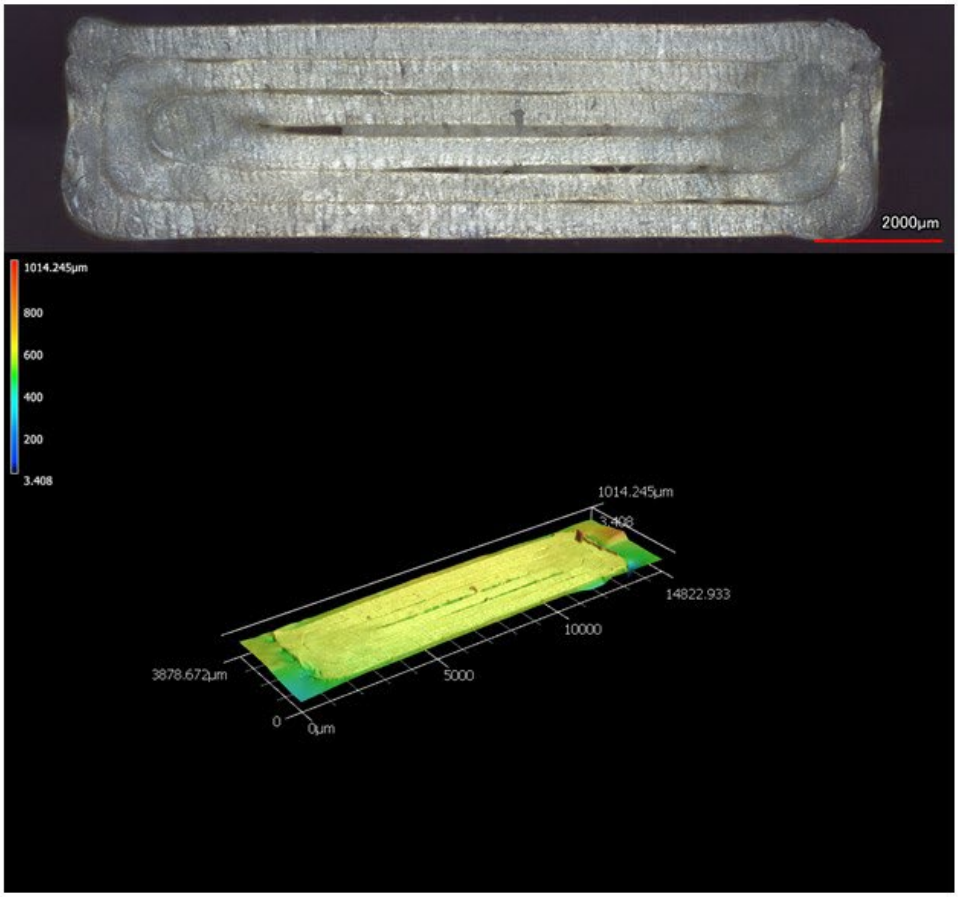
CC315-YT (Cut)


2000µm
634.017µm
500
400
300
200
100
4.397
634.017µm
4.397
14825.625
10000
5000
3878.672µm
0
0µm

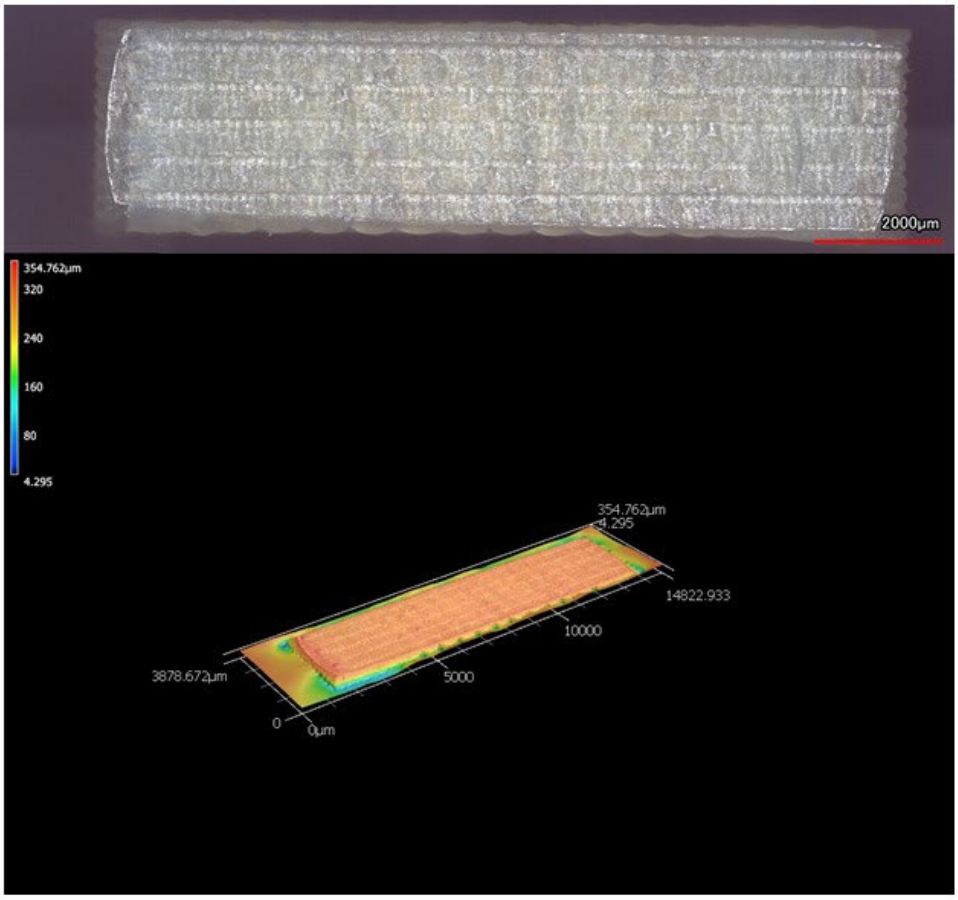
CC3(15)-ZT (Cut)


2000µm
1347.597µm
1200
1000
800
600
400
271.19
1347.597µm
271.19
14825.625
10000
5000
3881.364µm
0
0µm

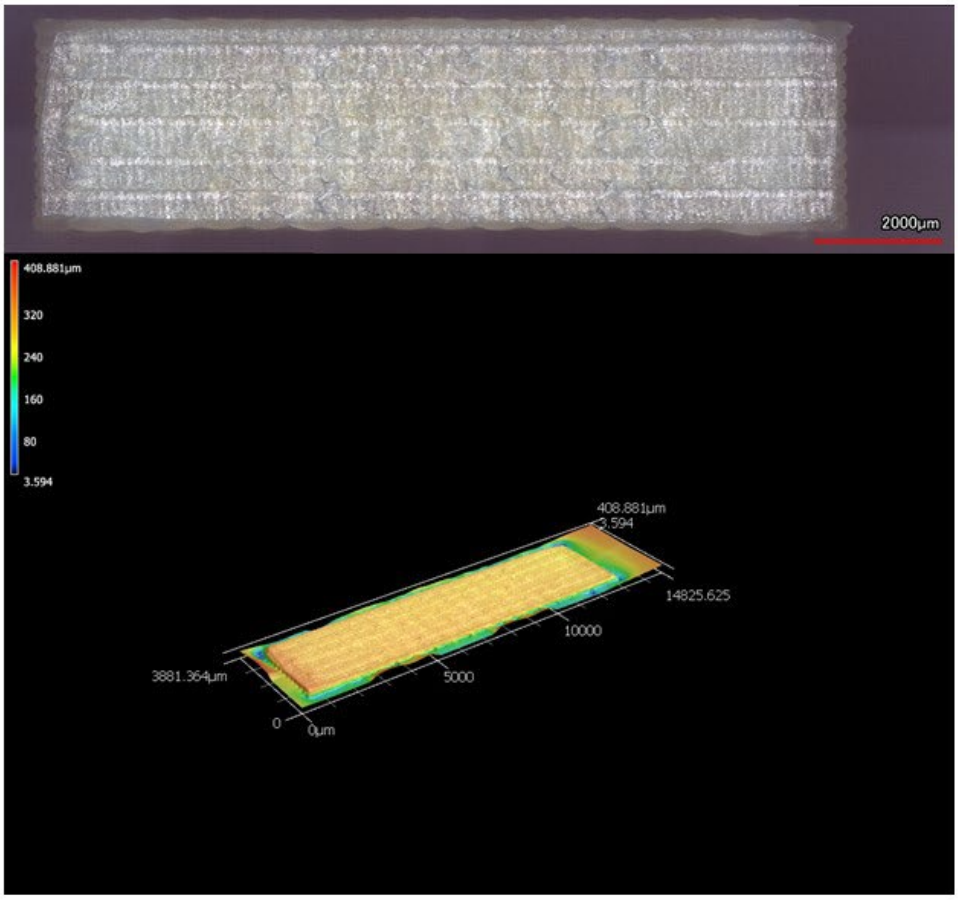
CC30-ZT (Cut)


2000µm
1014.245µm
800
600
400
200
3.408
1014.245µm
14822.933
10000
5000
3878.672µm
0
0µm

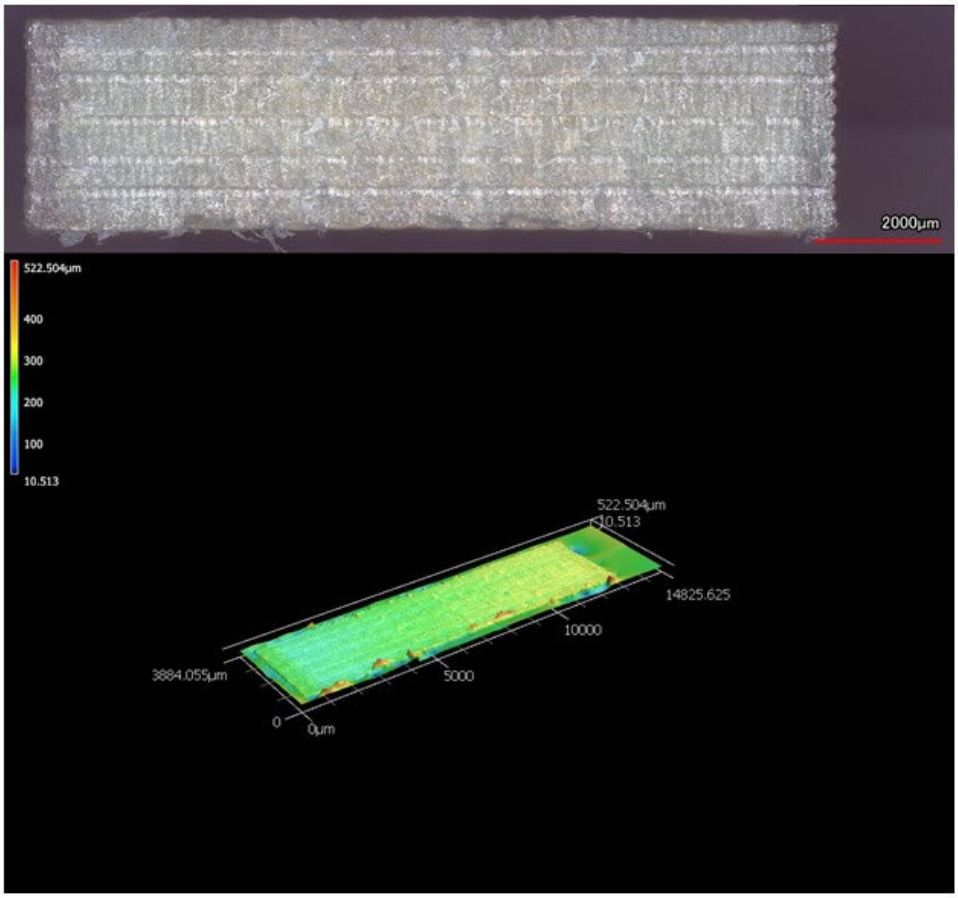
CC315-ZT (Cut)


2000µm
354.762µm
320
240
160
80
4.295
354.762µm
4.295
14822.933
10000
5000
3878.672µm
0
0µm

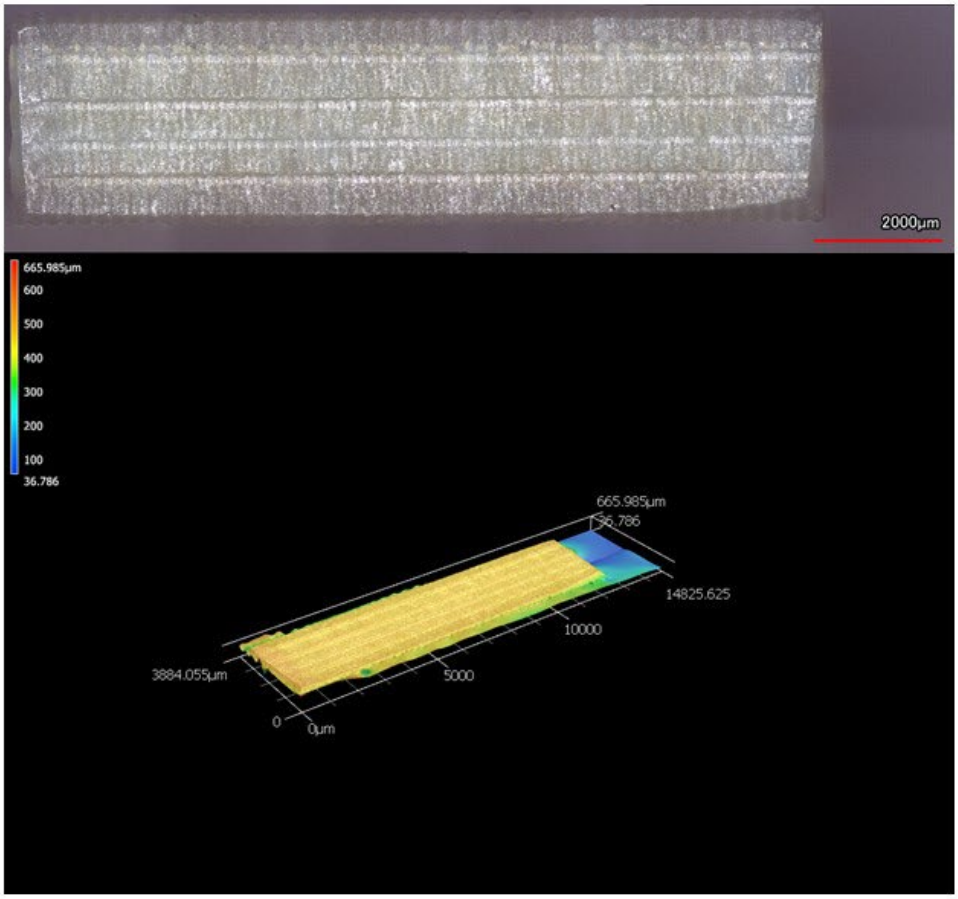
CR0-XT (Cut)


2000µm
408.881µm
320
240
160
80
3.594
408.881µm
3.594
14825.625
10000
5000
3881.364µm
0
0µm

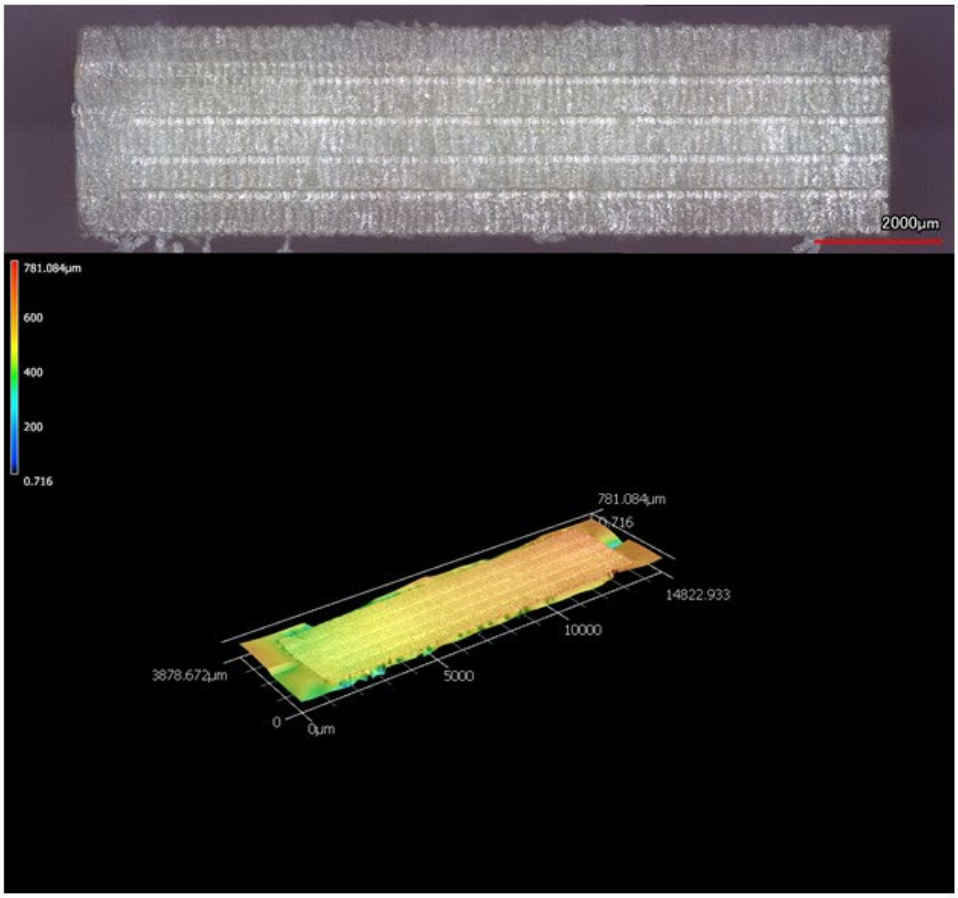
CR(15)-XT (Cut)


2000µm
522.504µm
400
300
200
100
10.513
522.504µm
10.513
14825.625
10000
5000
3884.055µm
0
0µm

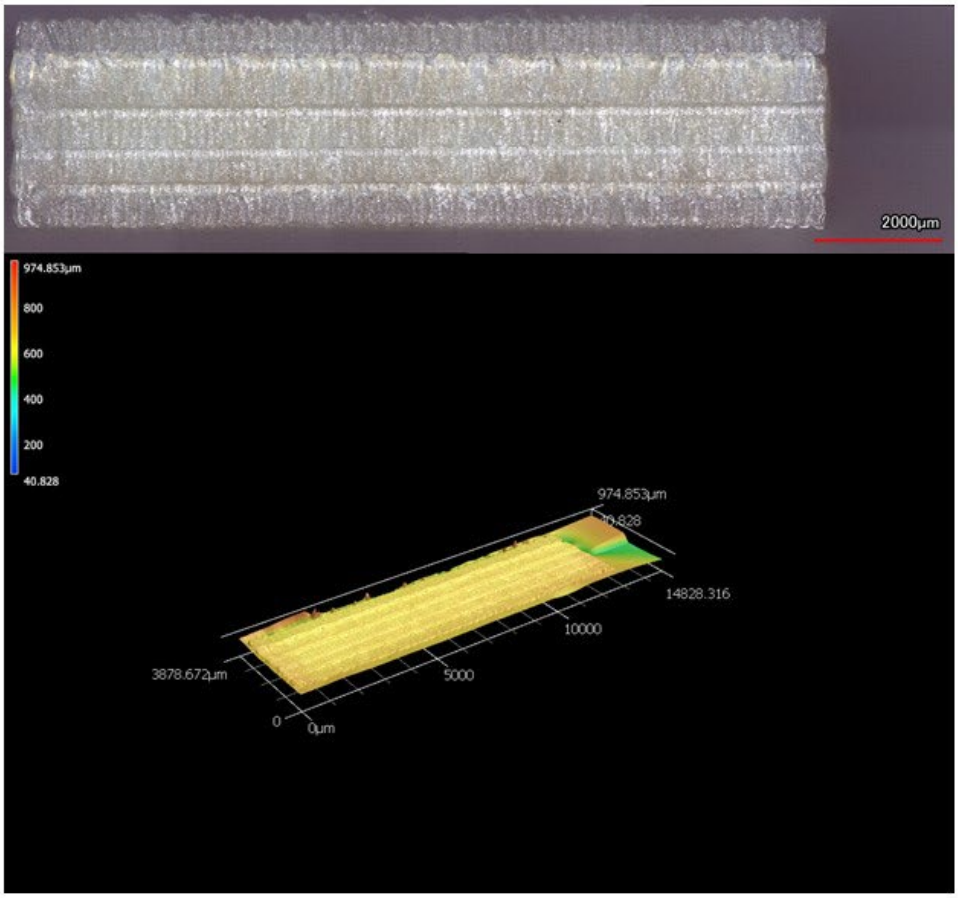
CR15-XT (Cut)


2000µm
665.985µm
600
500
400
300
200
100
36.786
665.985µm
36.786
14825.625
10000
5000
3884.055µm
0
0µm

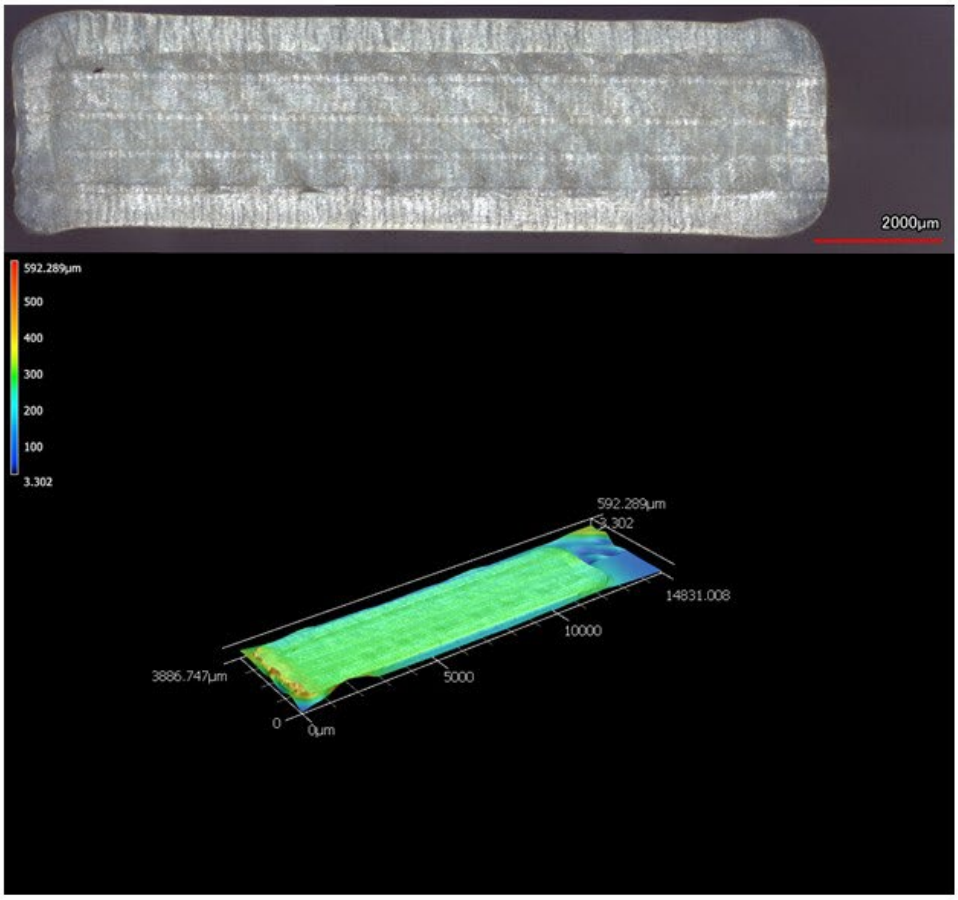
CR0-YT (Cut)


2000µm
781.084µm
600
400
200
0.716
781.084µm
0.716
14822.933
10000
5000
3878.672µm
0
0µm

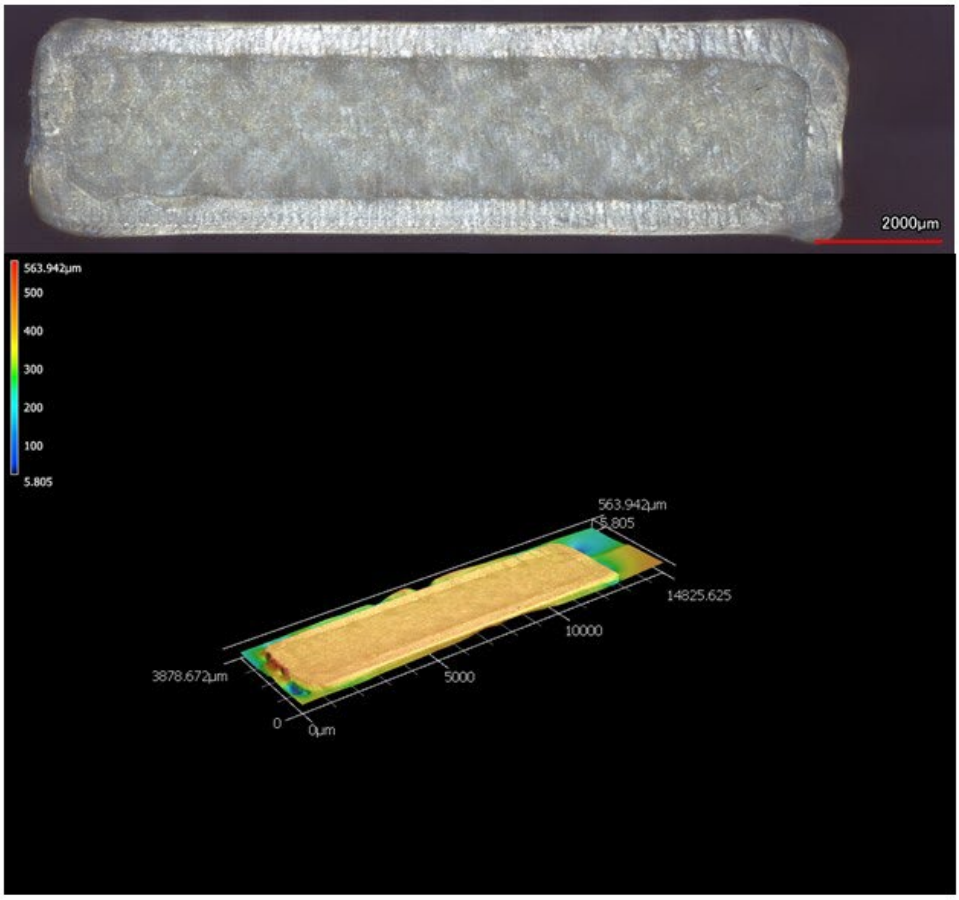
CR(15)-YT (Cut)


2000µm
974.853µm
800
600
400
200
40.828
974.853µm
14828.316
10000
5000
3878.672µm
0
0µm

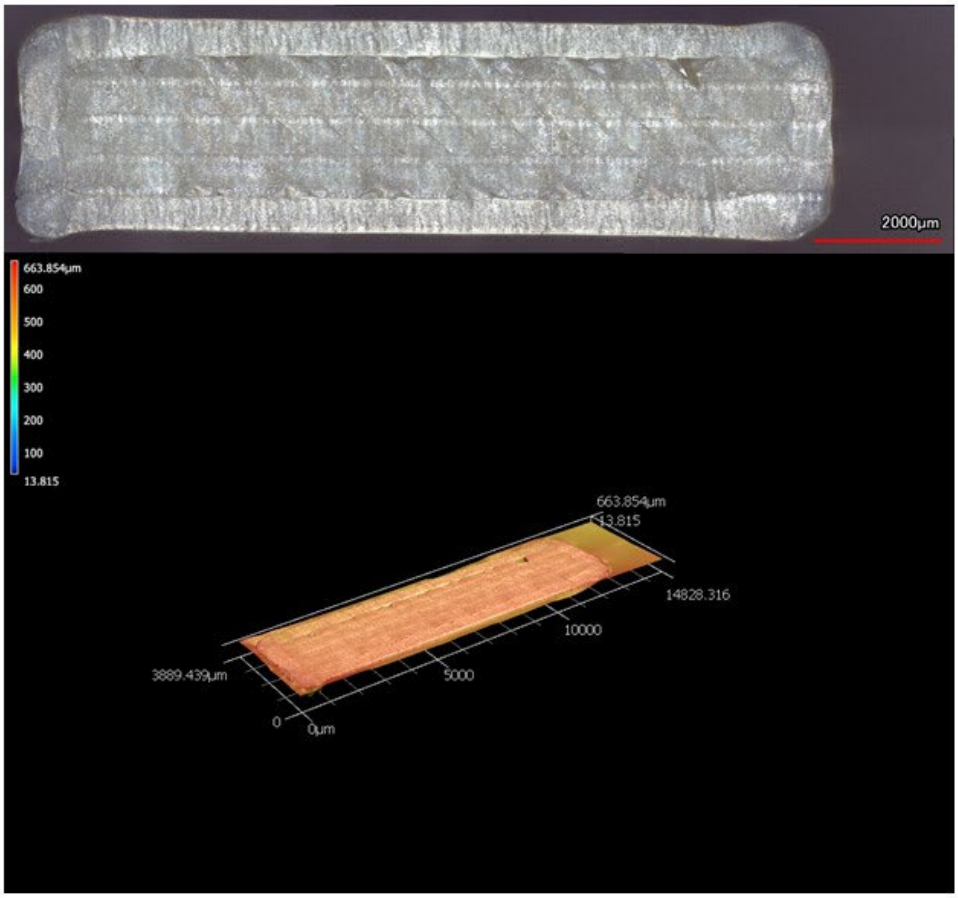
CR15-YT (Cut)


2000µm
592.289µm
500
400
300
200
100
3.302
592.289µm
3.302
14831.008
10000
5000
3886.747µm
0
0µm

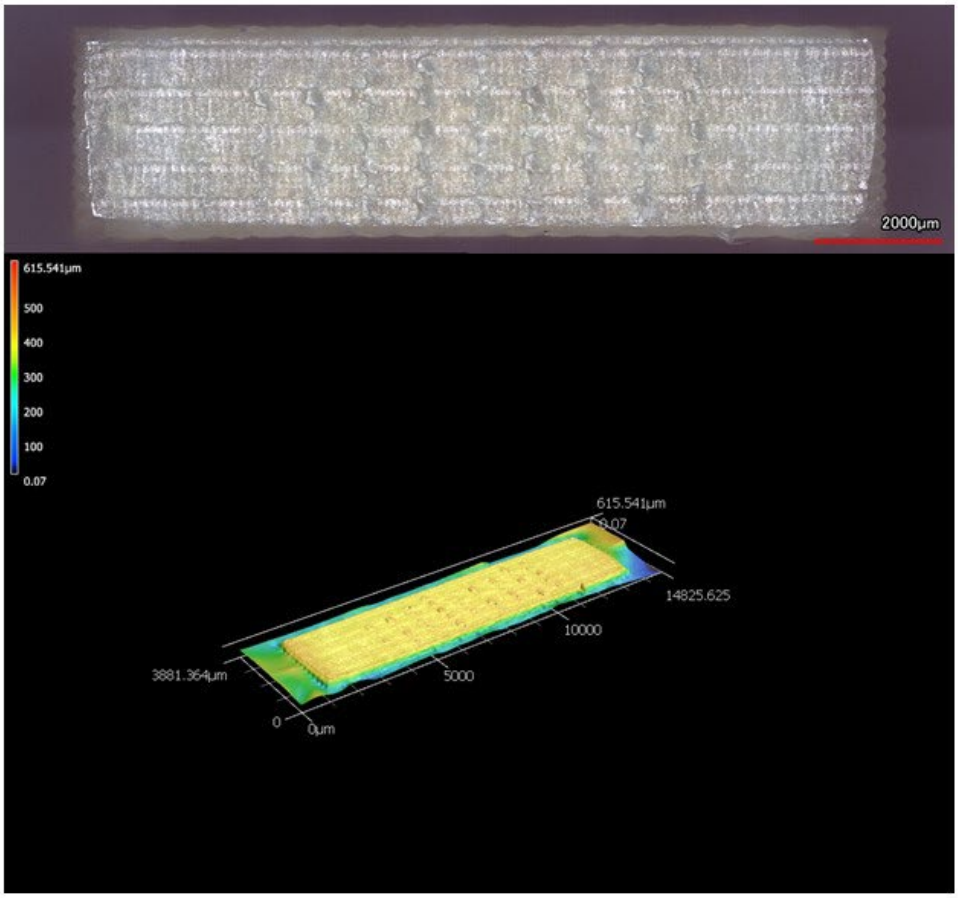
CR0-ZT (Cut)


2000µm
563.942µm
500
400
300
200
100
5.805
563.942µm
5.805
14825.625
10000
5000
3878.672µm
0
0µm

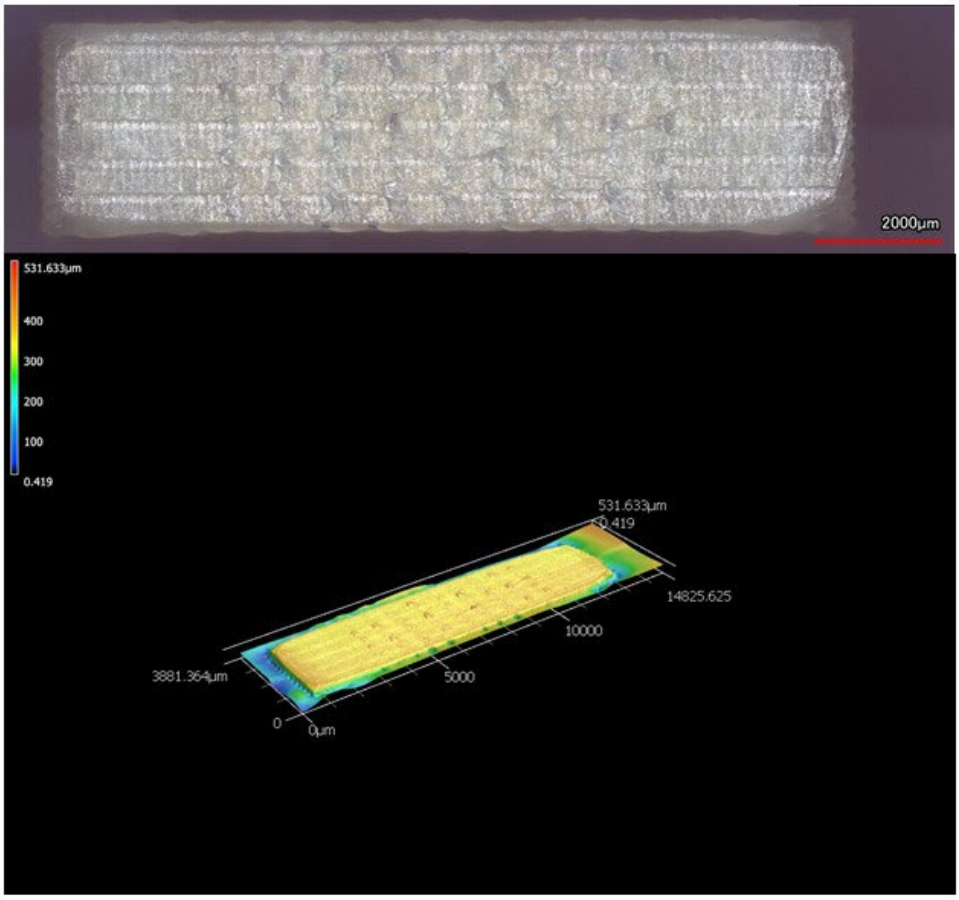
CR(15)-ZT (Cut)


2000µm
663.854µm
600
500
400
300
200
100
13.815
663.854µm
13.815
14828.316
10000
5000
3889.439µm
0
0µm

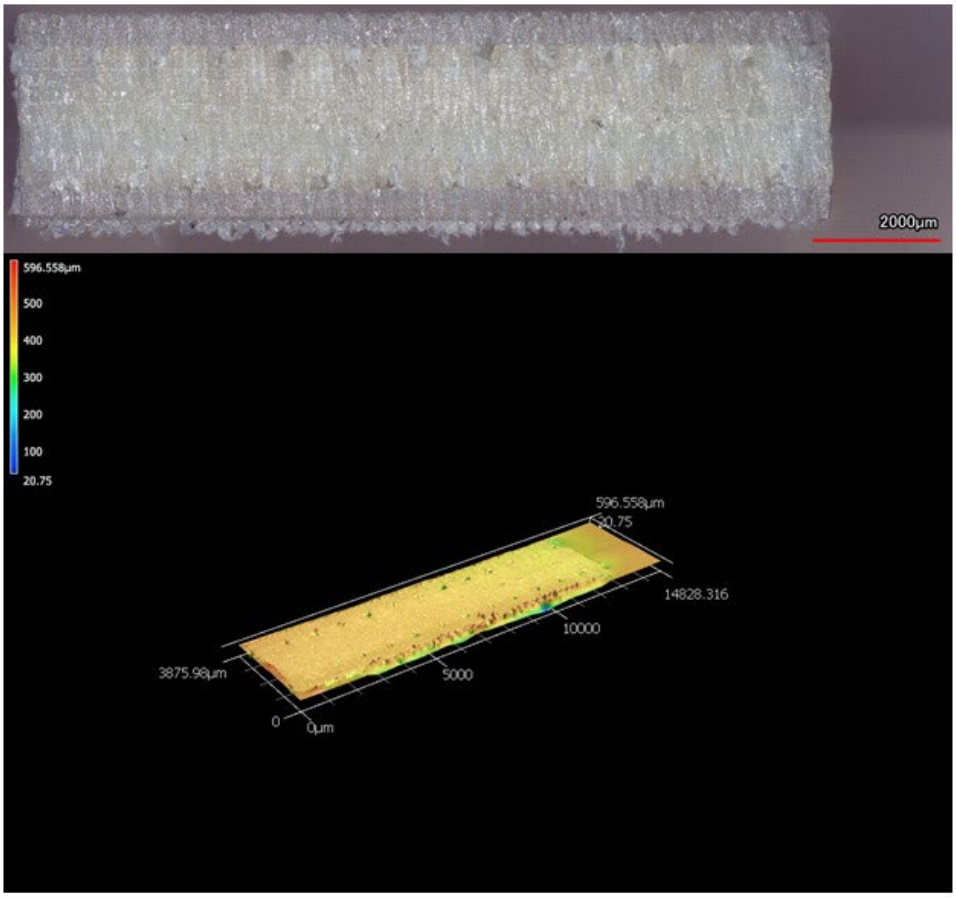
CR15-ZT (Cut)



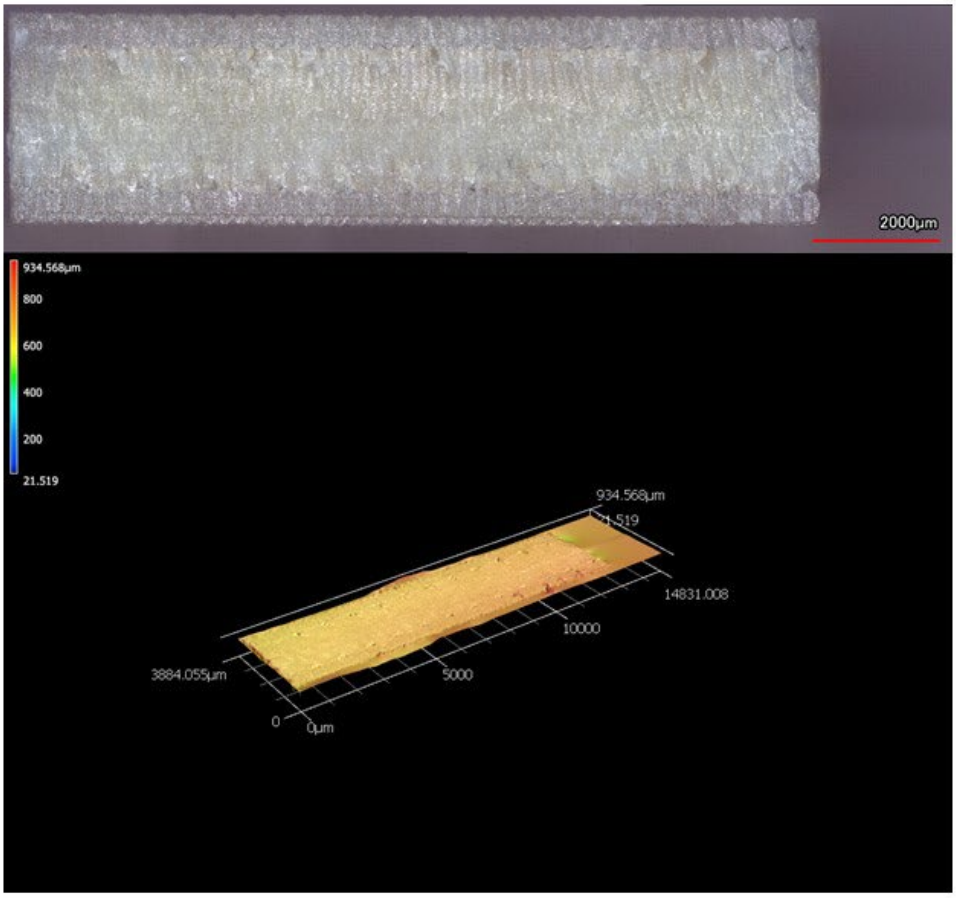
EVSR17-XT (Cut)



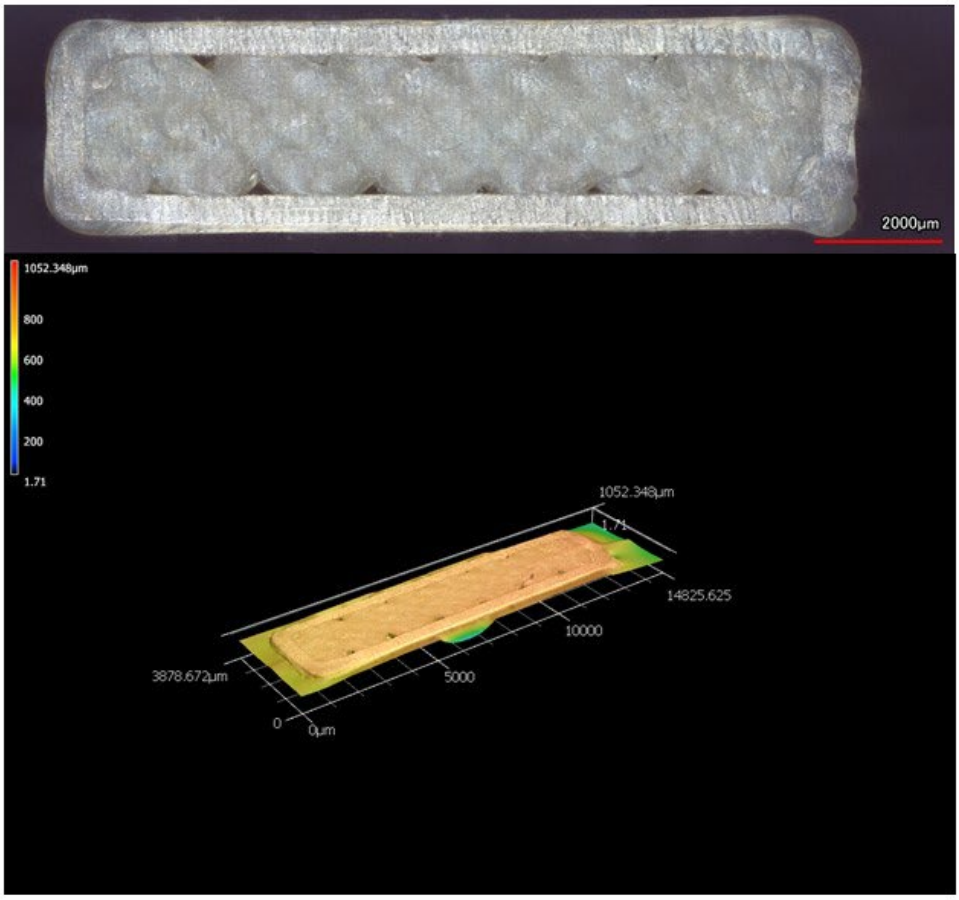
EVSR20-XT (Cut)



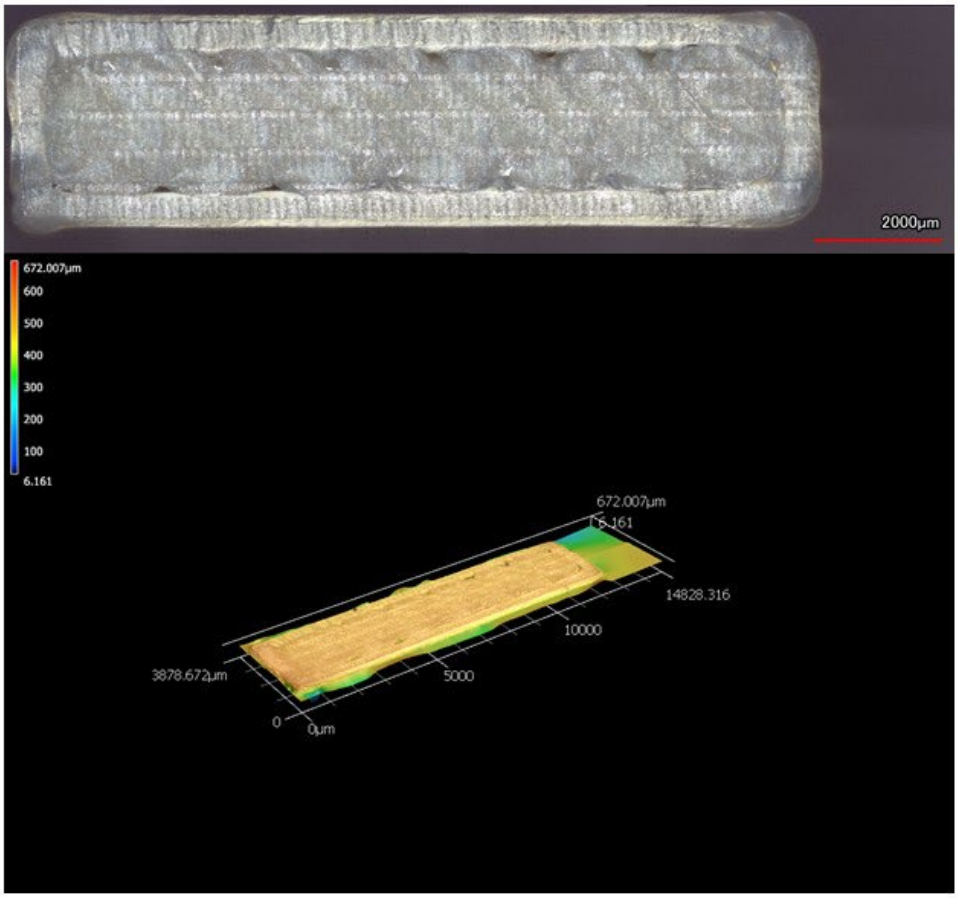
EVSR17-YT (Cut)



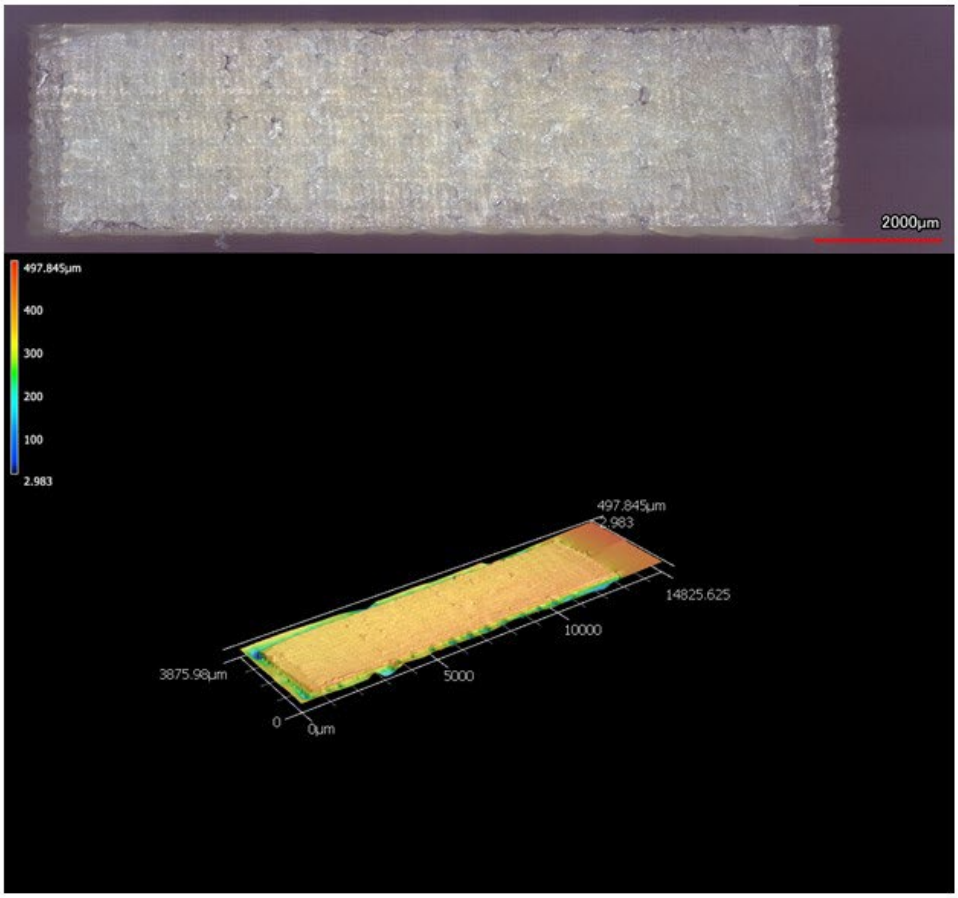
EVSR20-YT (CUT)



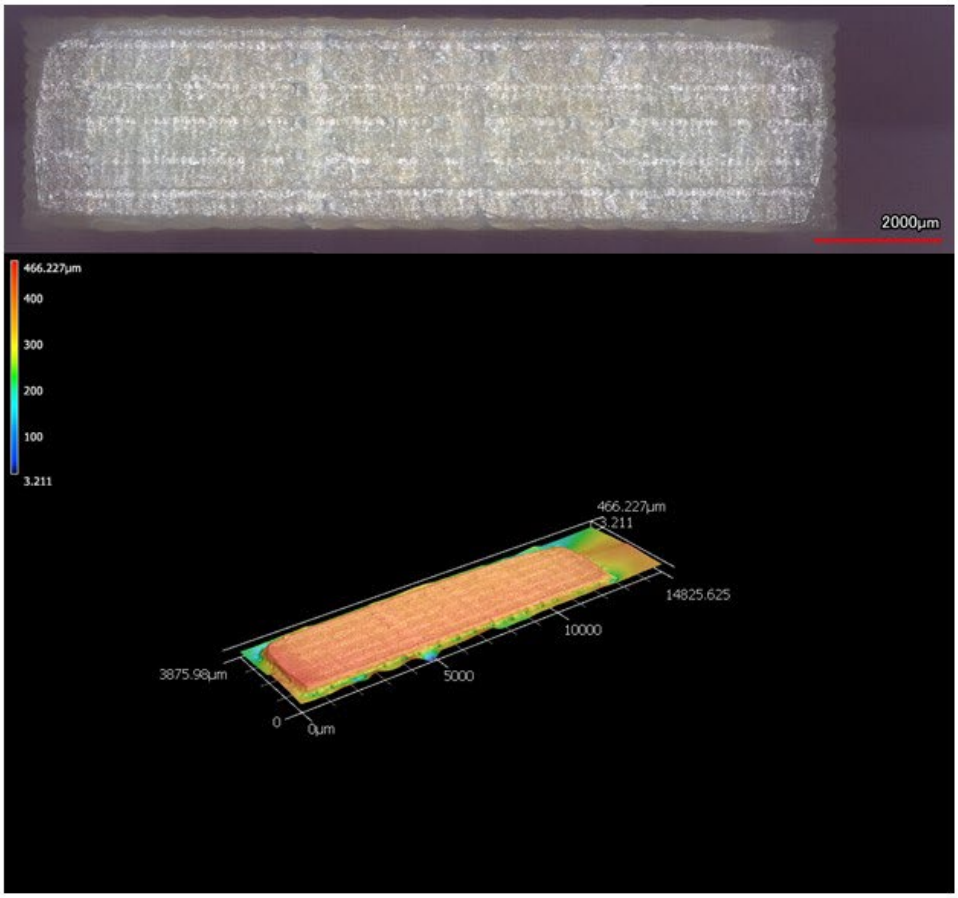
EVSR17-ZT (Cut)



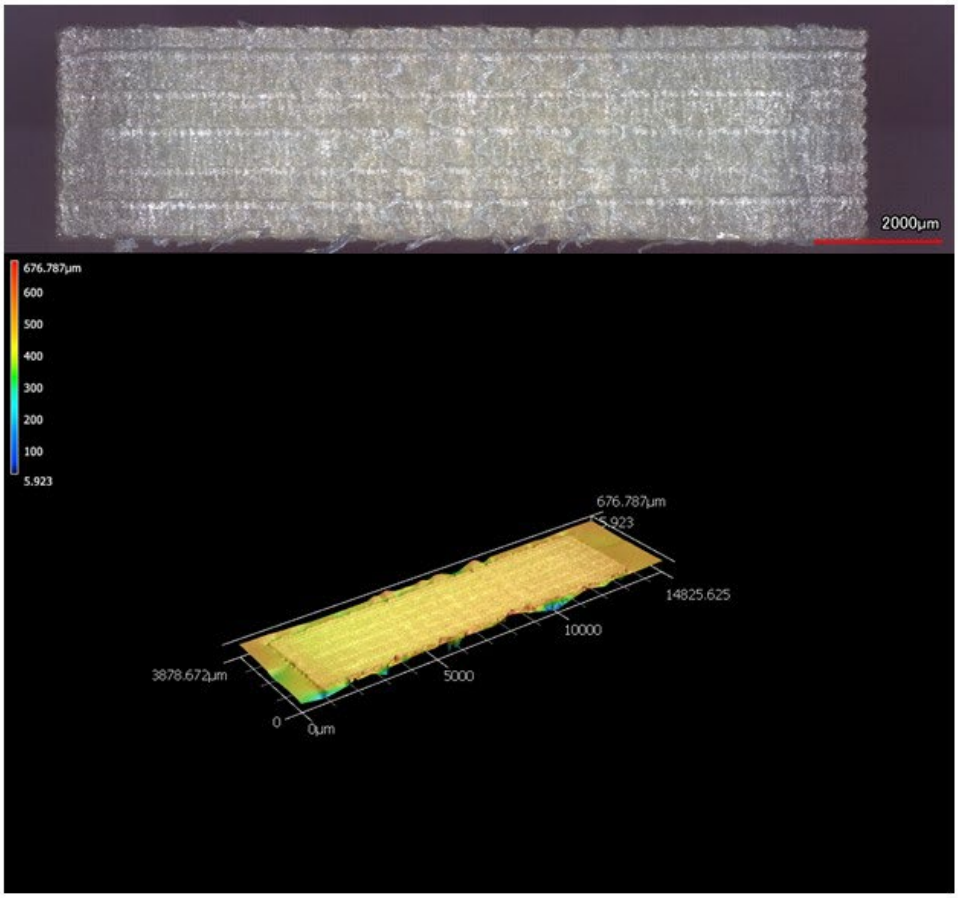
EVSR20-ZT (Cut)


2000µm
497.845µm
400
300
200
100
2.983
497.845µm
2.983
14825.625
10000
5000
3875.98µm
0
0µm

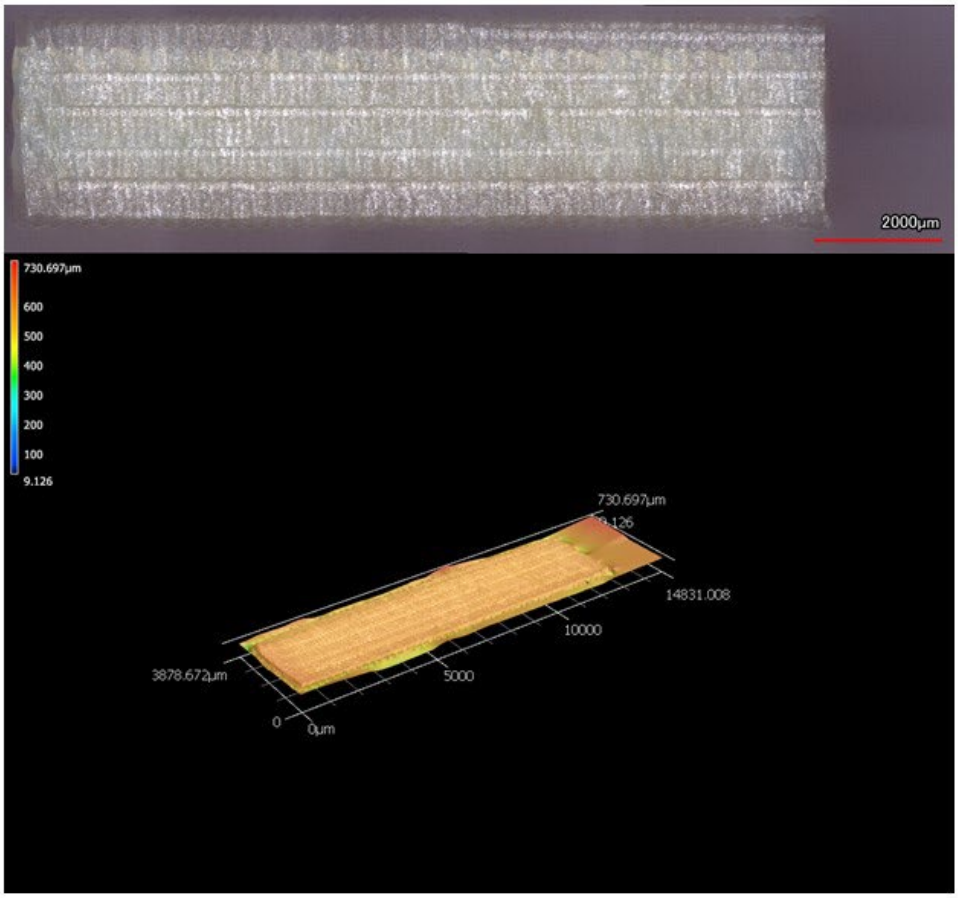
NC1-XT (Cut)


2000µm
466.227µm
400
300
200
100
3.211
466.227µm
3.211
14825.625
10000
5000
3875.98µm
0
0µm

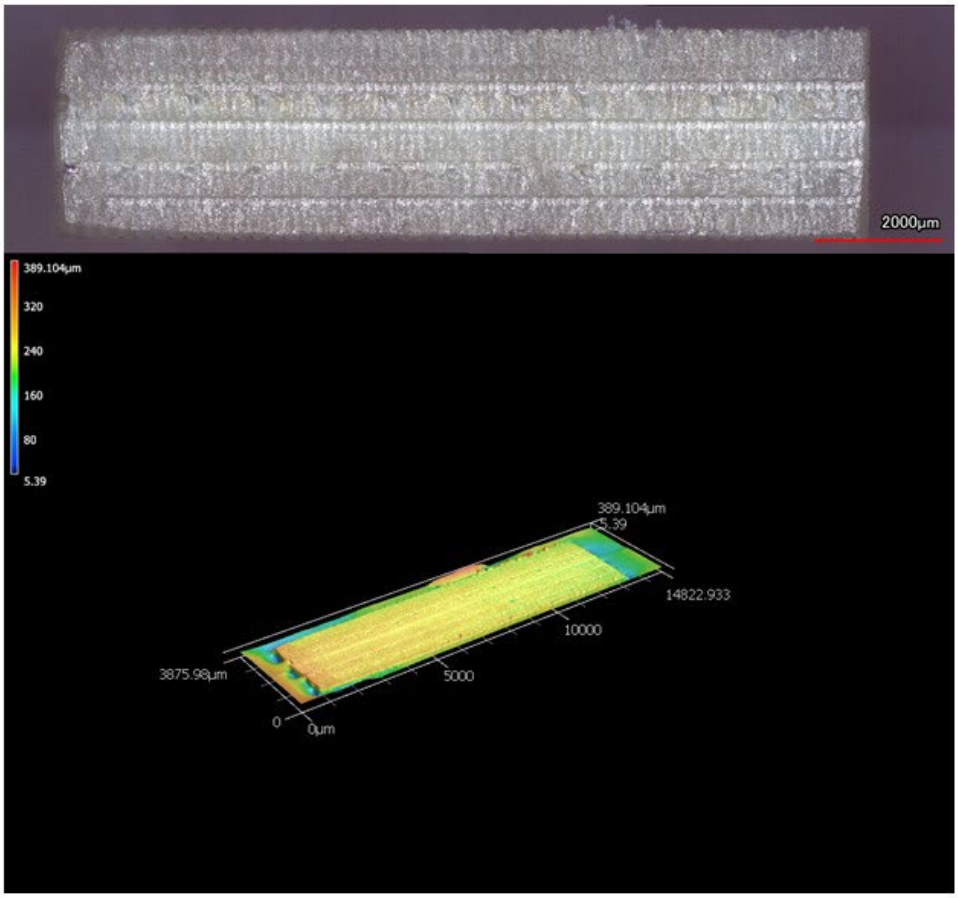
NC2-XT (Cut)


2000µm
676.787µm
600
500
400
300
200
100
5.923
676.787µm
5.923
14825.625
10000
5000
3878.672µm
0
0µm

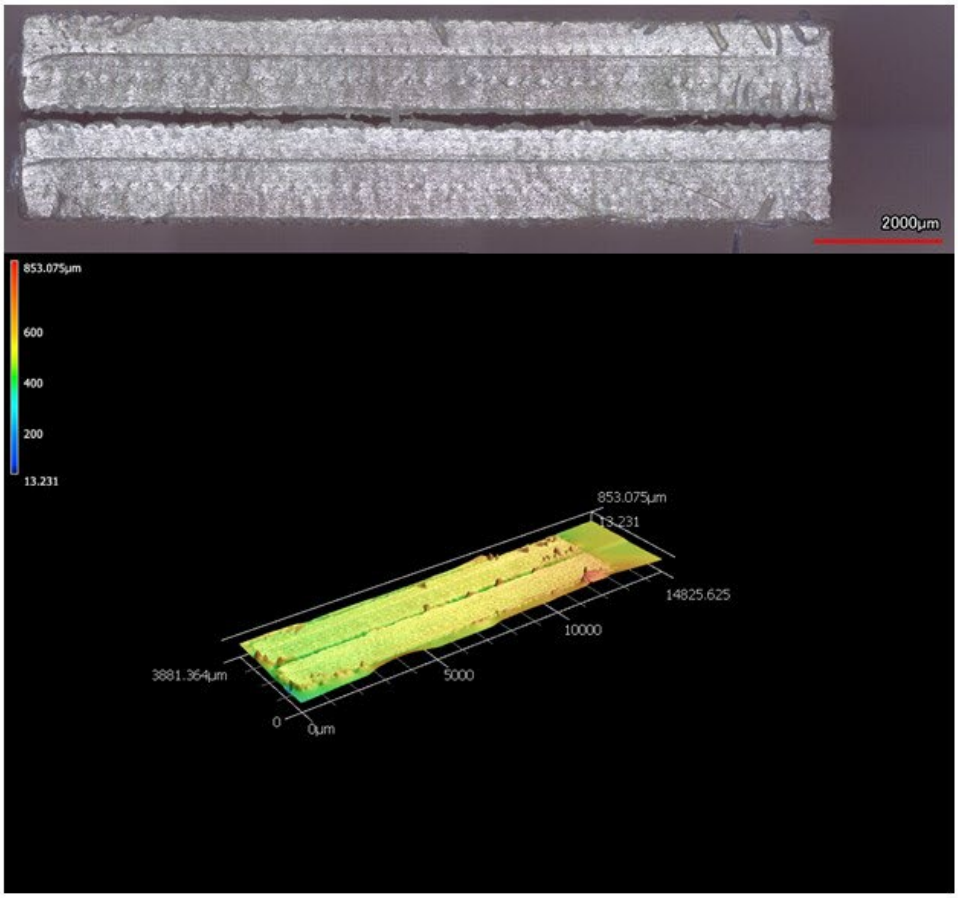
NC3-XT (Cut)


2000µm
730.697µm
600
500
400
300
200
100
9.126
730.697µm
14831.008
10000
5000
3878.672µm
0
0µm

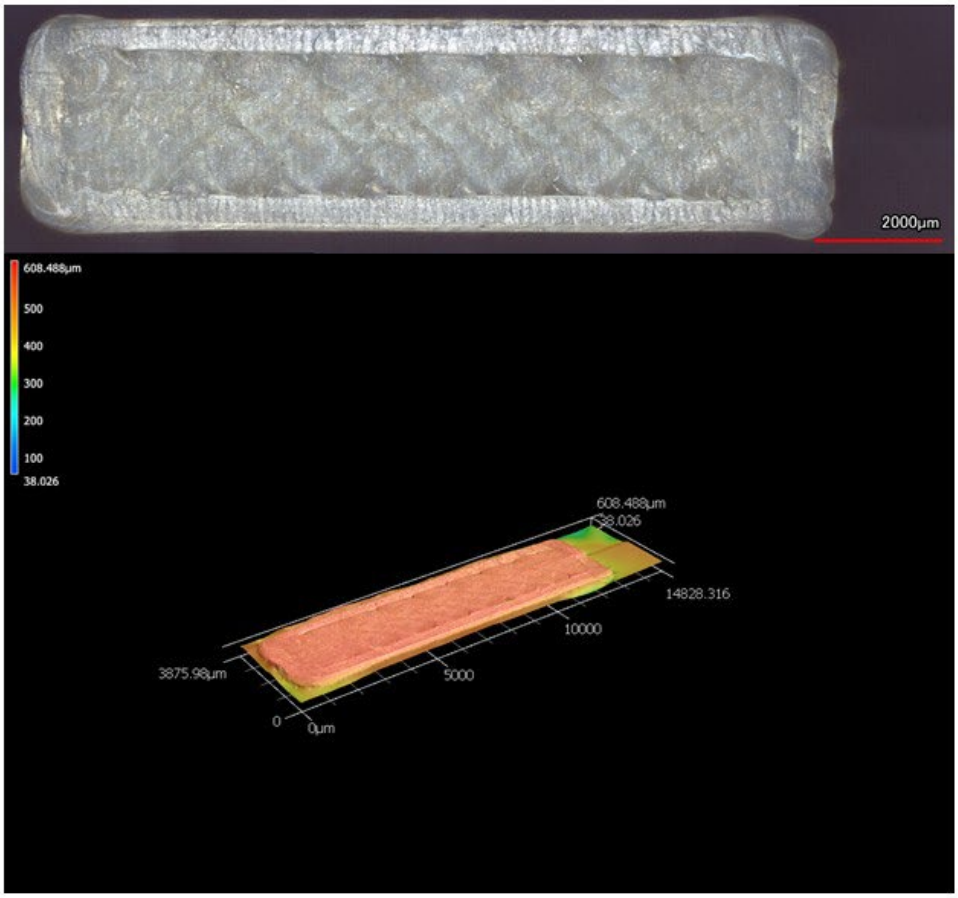
NC1-YT (Cut)


2000µm
389.104µm
320
240
160
80
5.39
389.104µm
5.39
14822.933
10000
5000
3875.98µm
0
0µm

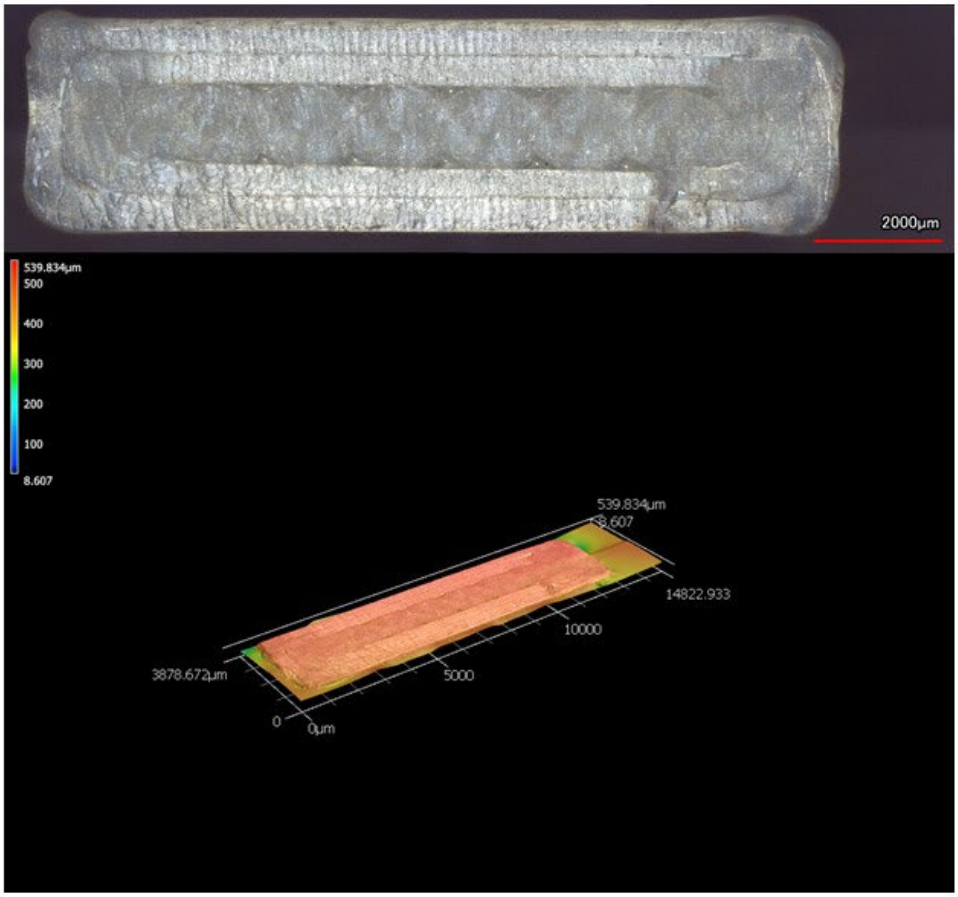
NC2-YT (Cut)


2000µm
853.075µm
600
400
200
13.231
853.075µm
13.231
14825.625
10000
5000
3881.364µm
0
0µm

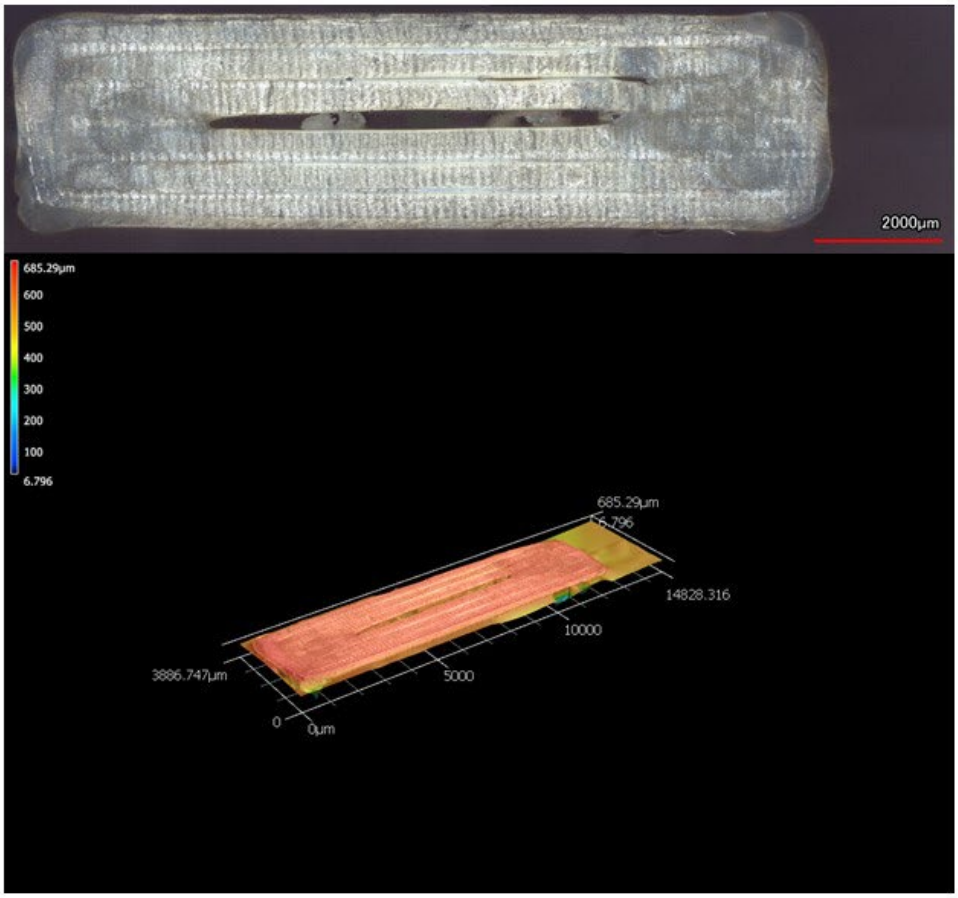
NC3-YT (Cut)


2000µm
608.488µm
500
400
300
200
100
38.026
608.488µm
38.026
14828.316
10000
5000
3875.98µm
0
0µm

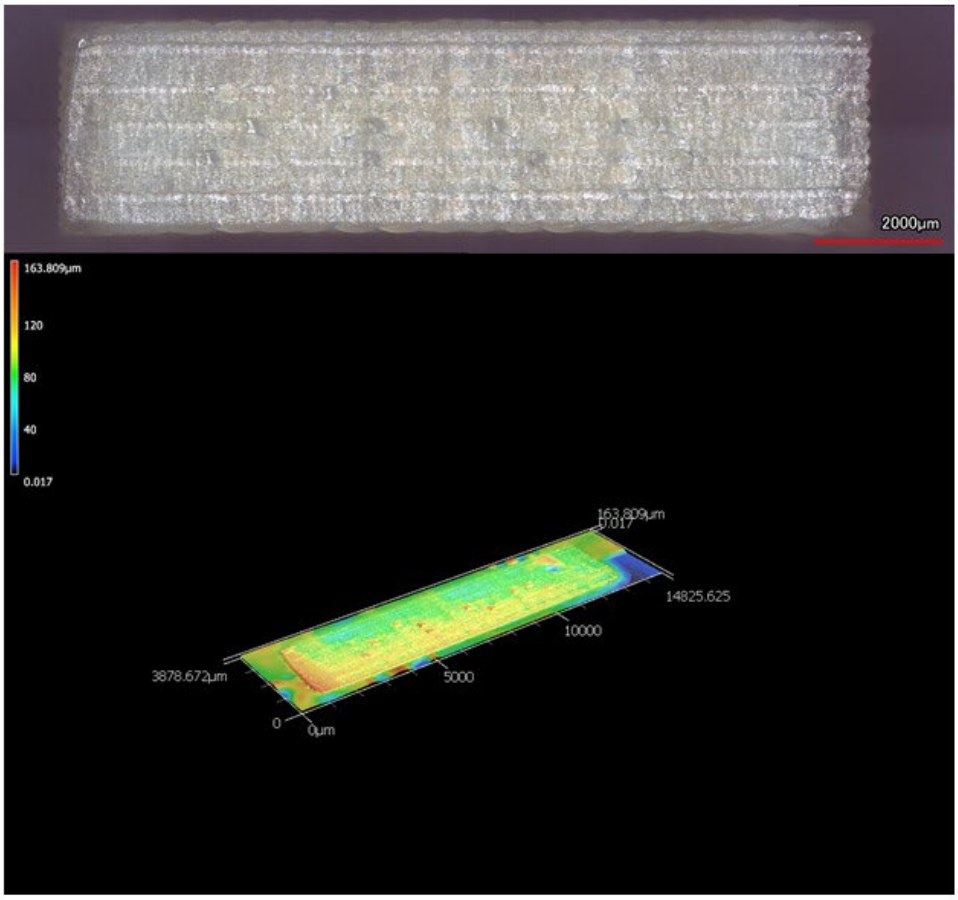
NC1-ZT (Cut)


2000µm
539.834µm
500
400
300
200
100
8.607
539.834µm
8.607
14822.933
10000
5000
3878.672µm
0
0µm

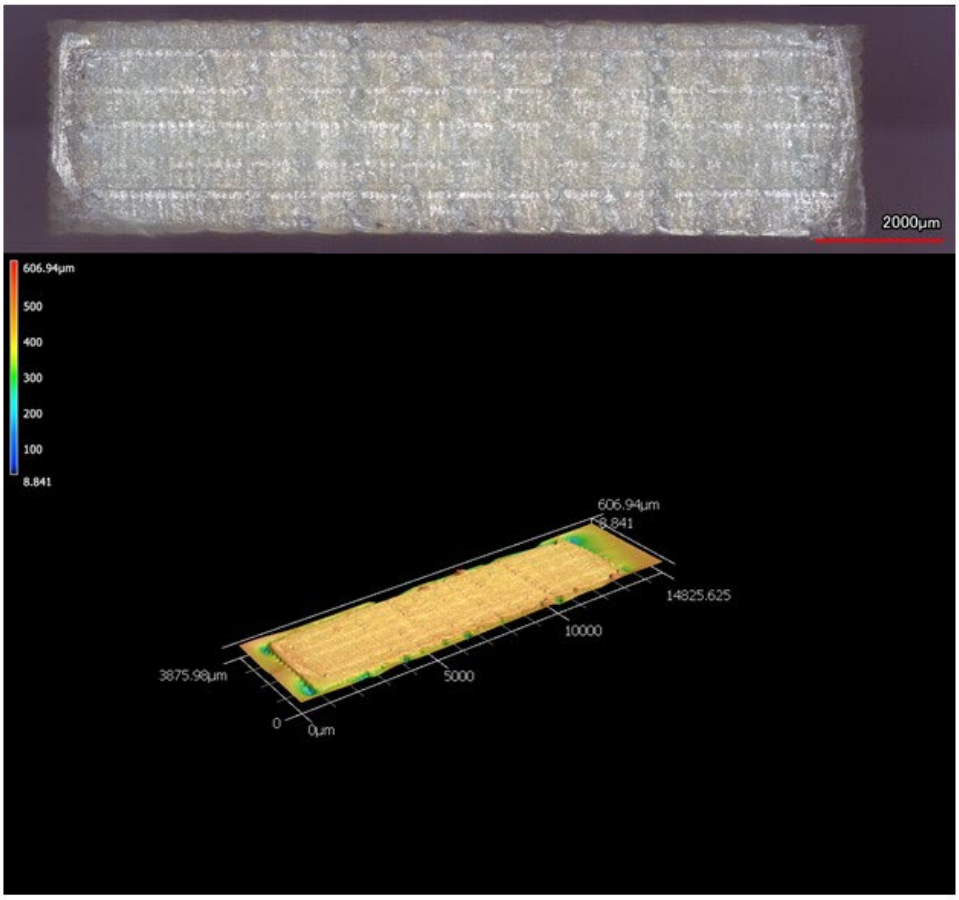
NC2-ZT (Cut)


2000µm
685.29µm
600
500
400
300
200
100
6.796
685.29µm
6.796
14828.316
10000
5000
3886.747µm
0
0µm

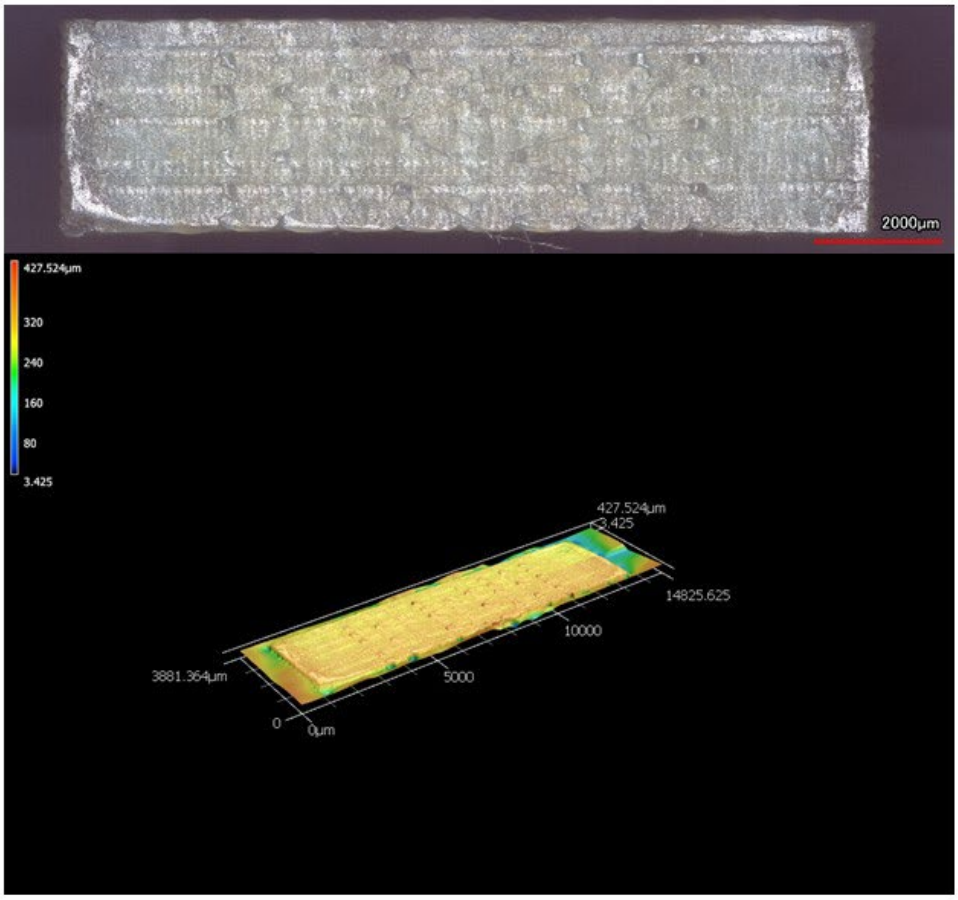
NC3-ZT (Cut)


2000µm
163.809µm
120
80
40
0.017
163.809µm
0.017
14825.625
10000
5000
3878.672µm
0
0µm

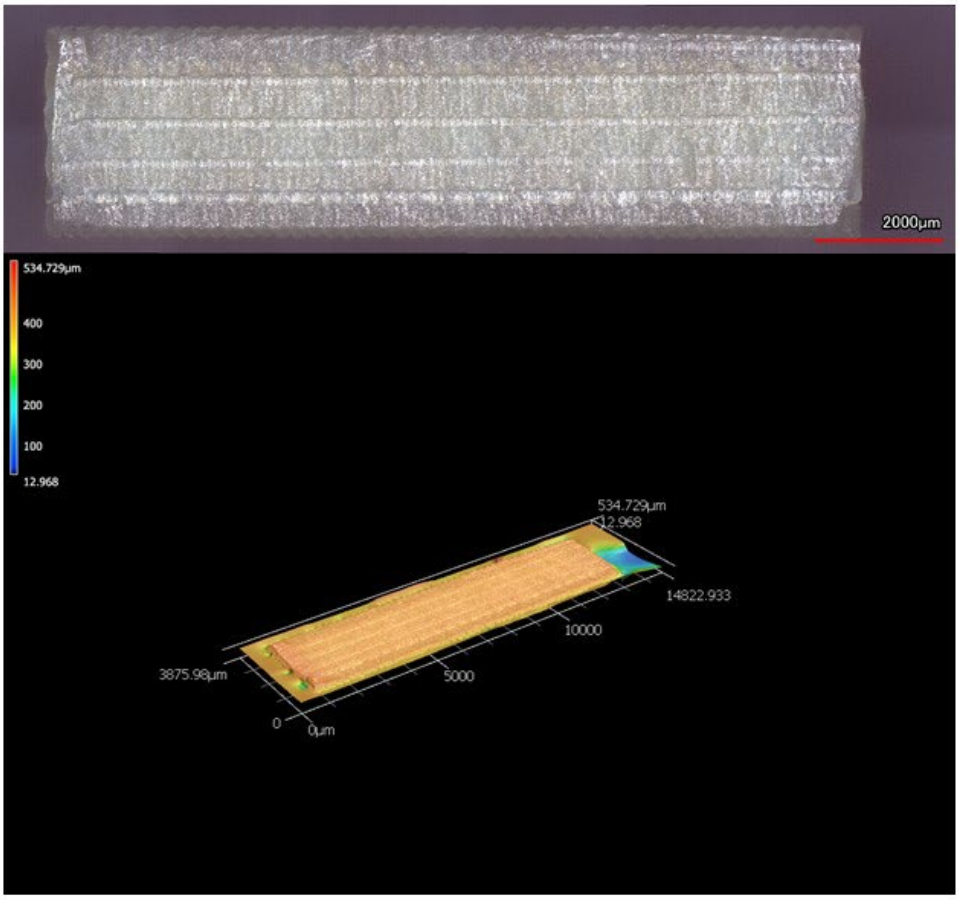
PRW18-XT (Cut)


2000µm
606.94µm
500
400
300
200
100
8.841
606.94µm
8.841
14825.625
10000
5000
3875.98µm
0
0µm

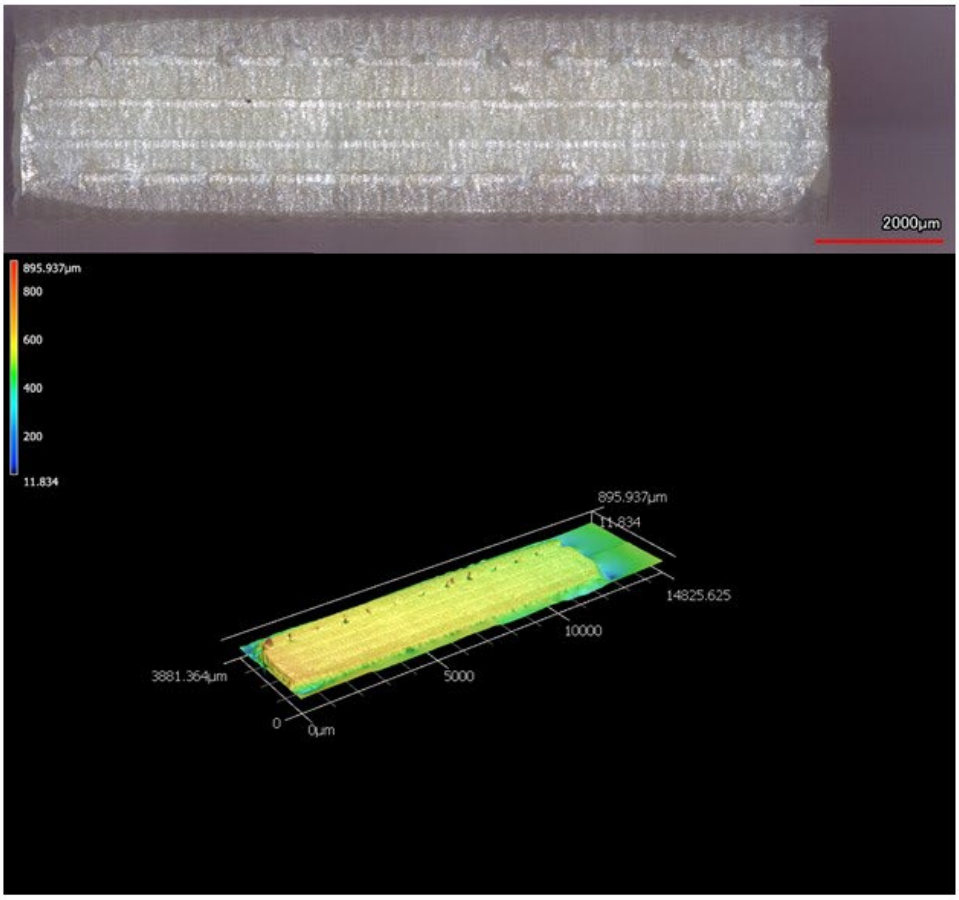
PRW22-XT (Cut)


2000µm
427.524µm
320
240
160
80
3.425
427.524µm
3.425
14825.625
10000
5000
3881.364µm
0
0µm

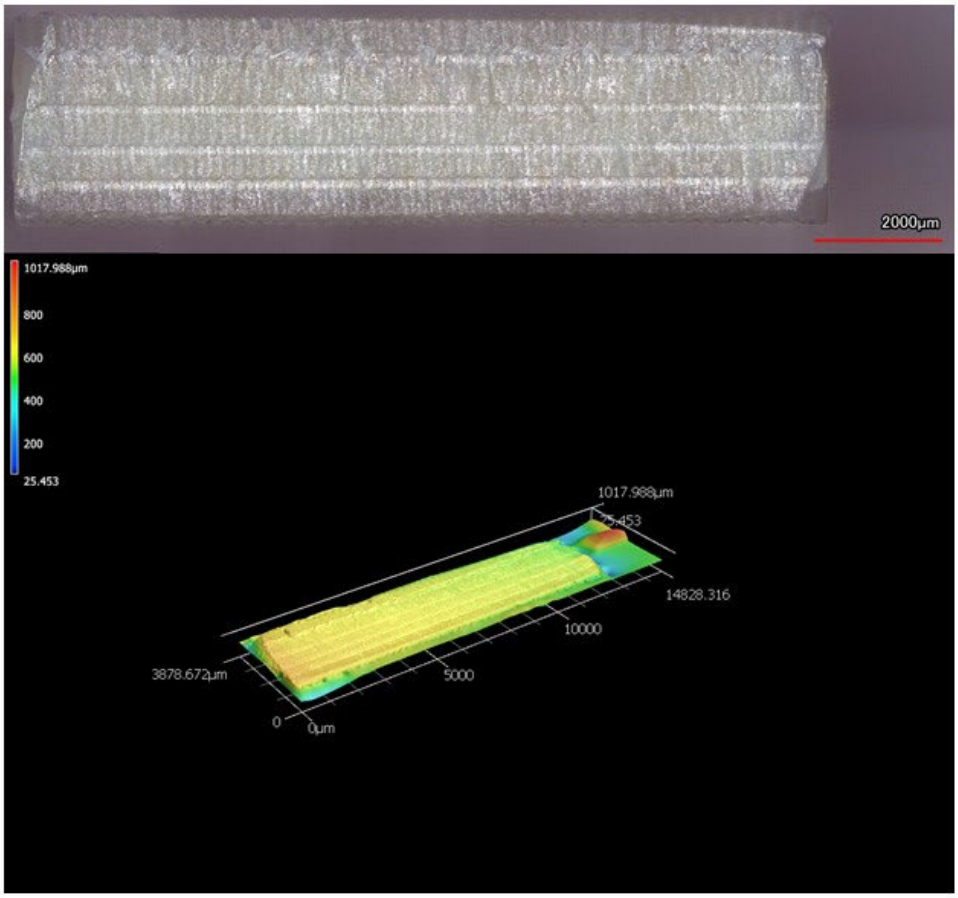
PRW26-XT (Cut)


2000µm
534.729µm
400
300
200
100
12.968
534.729µm
12.968
14822.933
10000
5000
3875.98µm
0
0µm

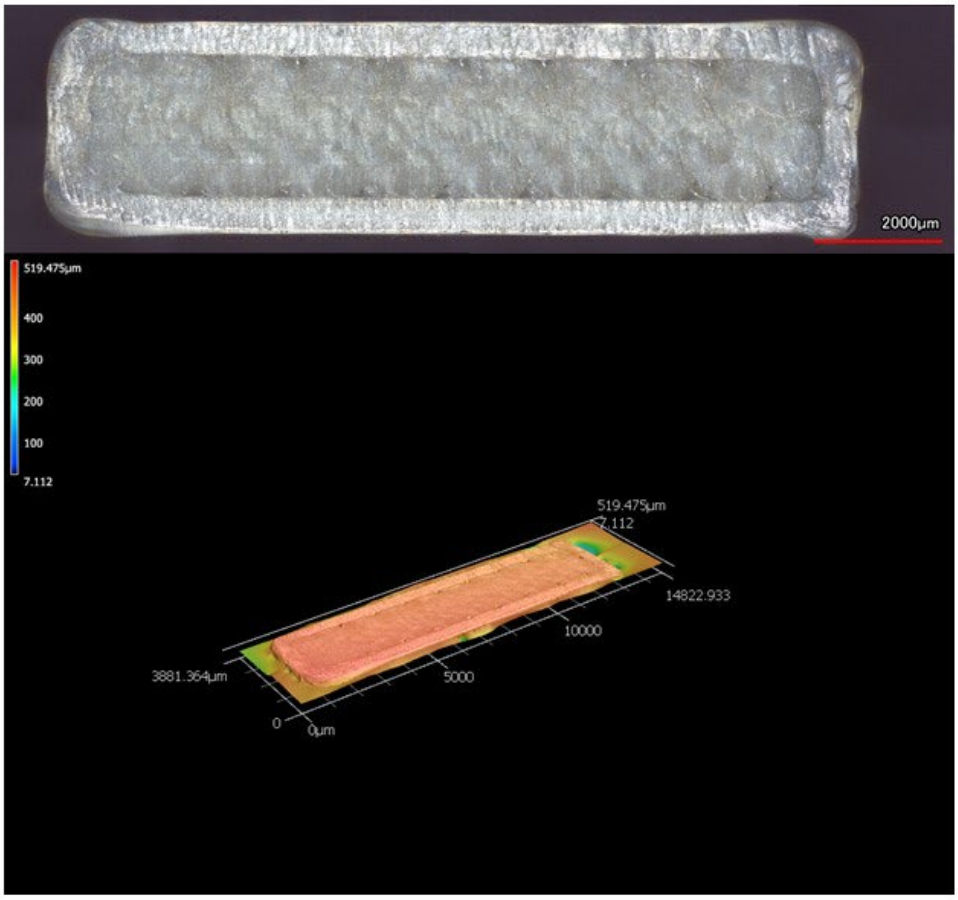
PRW18-YT (Cut)


2000µm
895.937µm
800
600
400
200
11.834
895.937µm
11.834
14825.625
10000
5000
3881.364µm
0
0µm

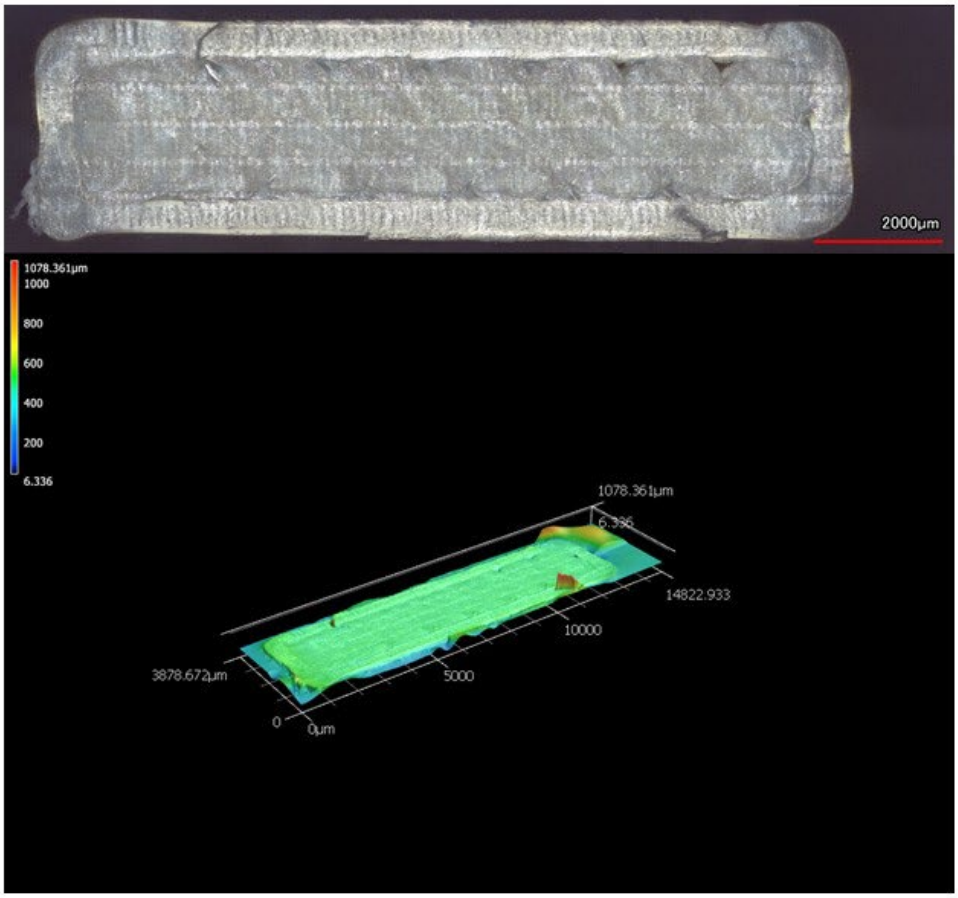
PRW22-YT (Cut)


2000µm
1017.988µm
800
600
400
200
25.453
1017.988µm
25.453
14828.316
10000
5000
3878.672µm
0
0µm

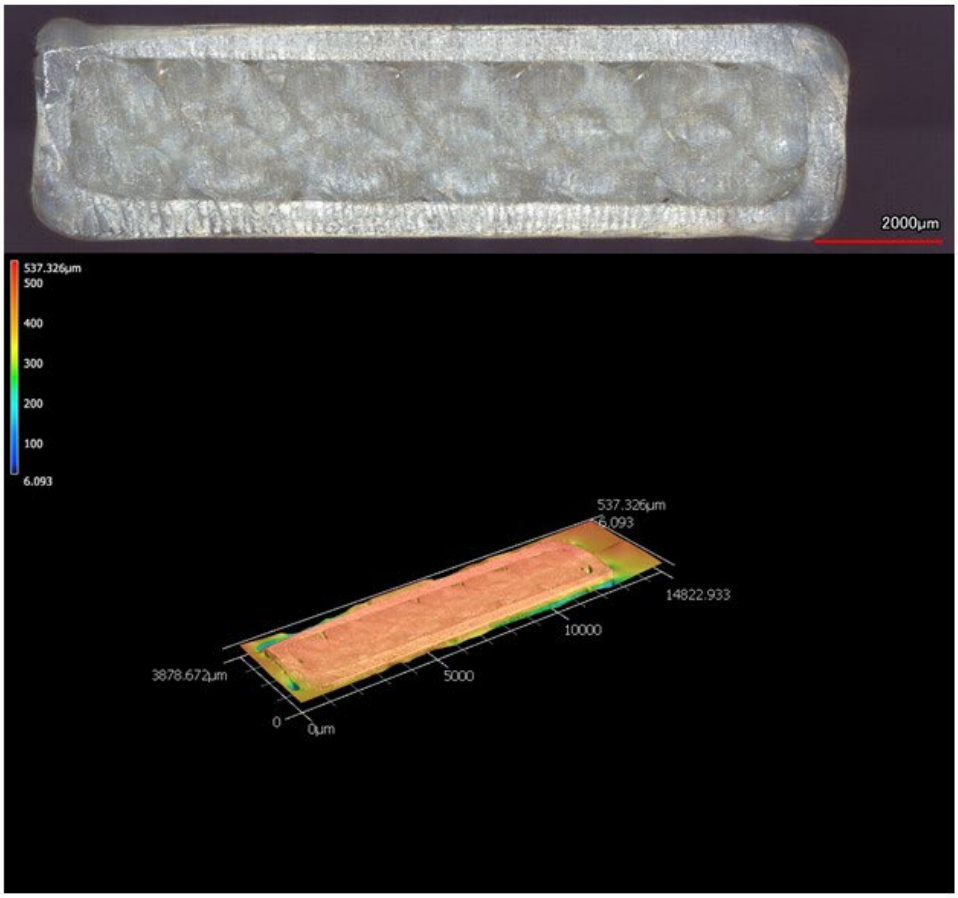
PRW26-YT (Cut)


2000µm
519.475µm
400
300
200
100
7.112
519.475µm
7.112
14822.933
10000
5000
3881.364µm
0
0µm

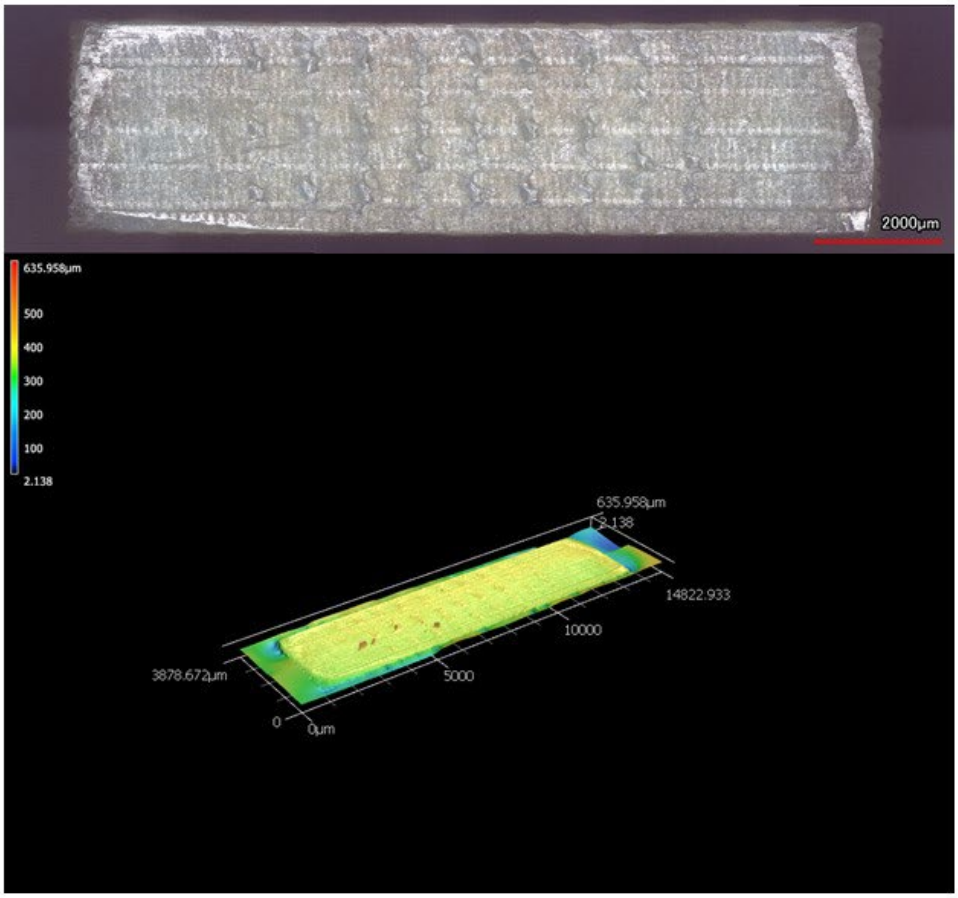
PRW18-ZT (Cut)


2000µm
1078.361µm
1000
800
600
400
200
6.336
1078.361µm
6.336
14822.933
10000
5000
3878.672µm
0
0µm

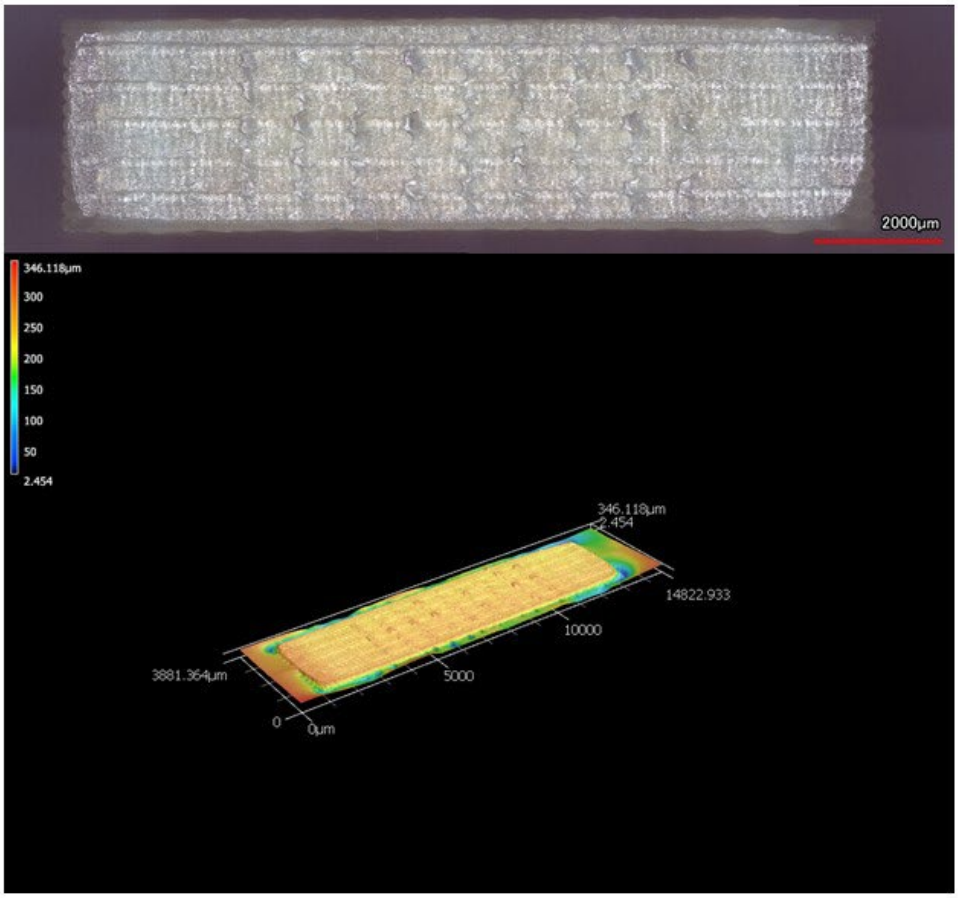
PRW22-ZT (Cut)


2000µm
537.326µm
500
400
300
200
100
6.093
537.326µm
6.093
14822.933
10000
5000
3878.672µm
0
0µm

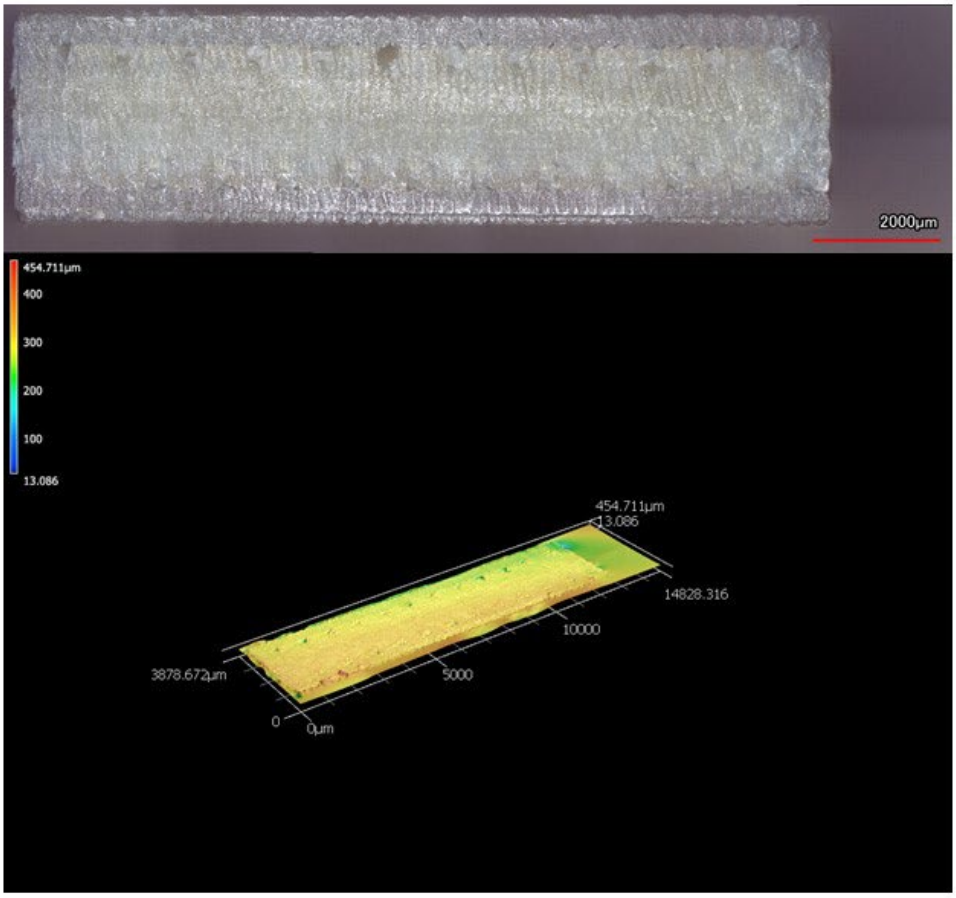
PRW26-ZT (Cut)


2000µm
635.958µm
500
400
300
200
100
2.138
635.958µm
2.138
14822.933
10000
5000
3878.672µm
0
0µm

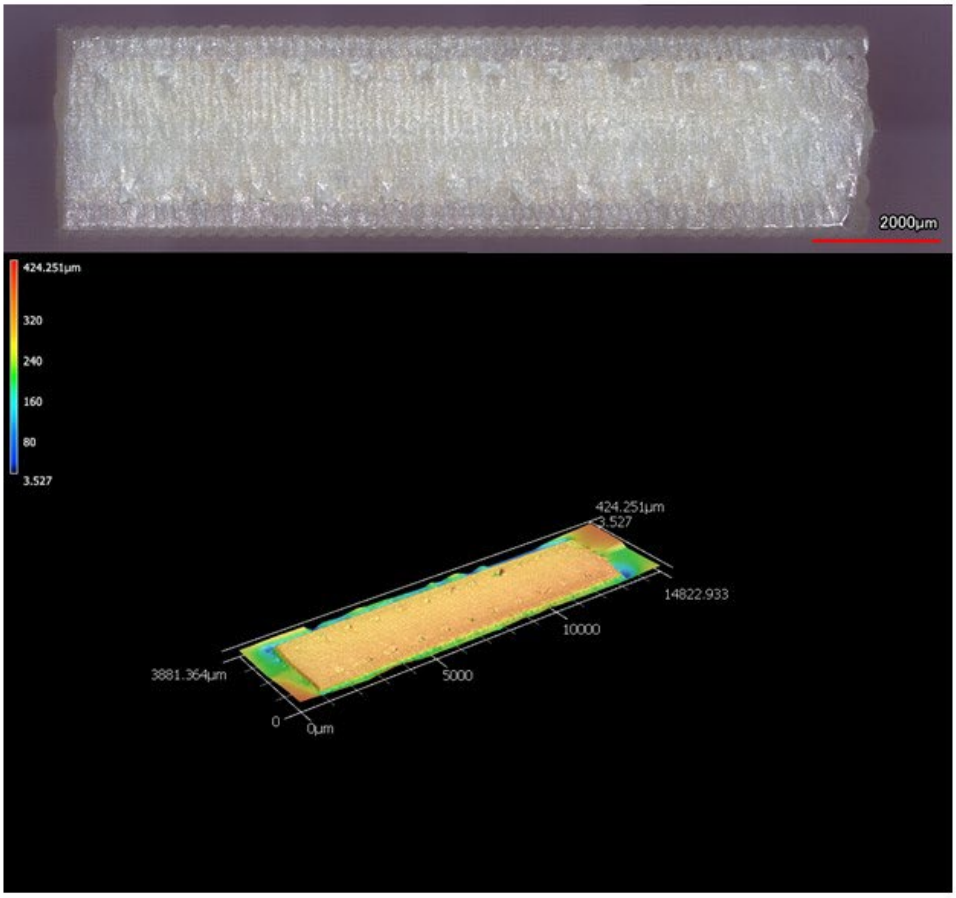
SMC1-XT (Cut)


2000µm
346.118µm
300
250
200
150
100
50
2.454
346.118µm
2.454
14822.933
10000
5000
3881.364µm
0
0µm

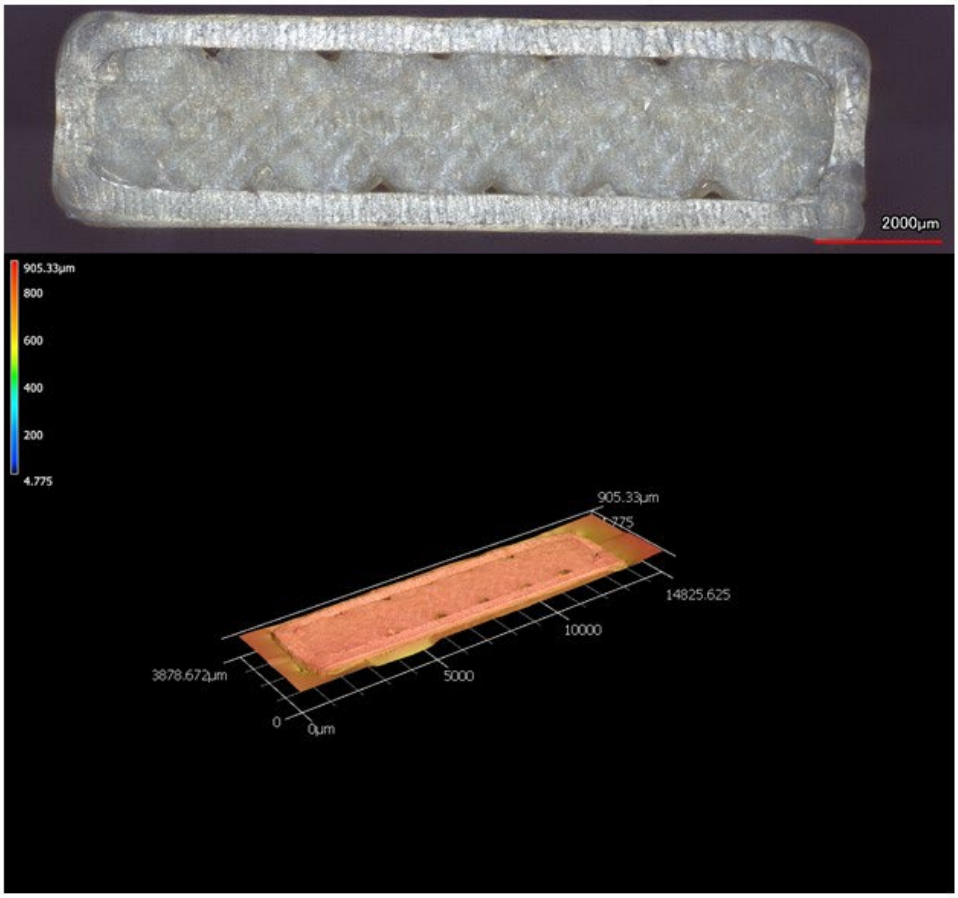
SMC3-XT (Cut)


2000µm
454.711µm
400
300
200
100
13.086
454.711µm
13.086
14828.316
10000
5000
3878.672µm
0
0µm

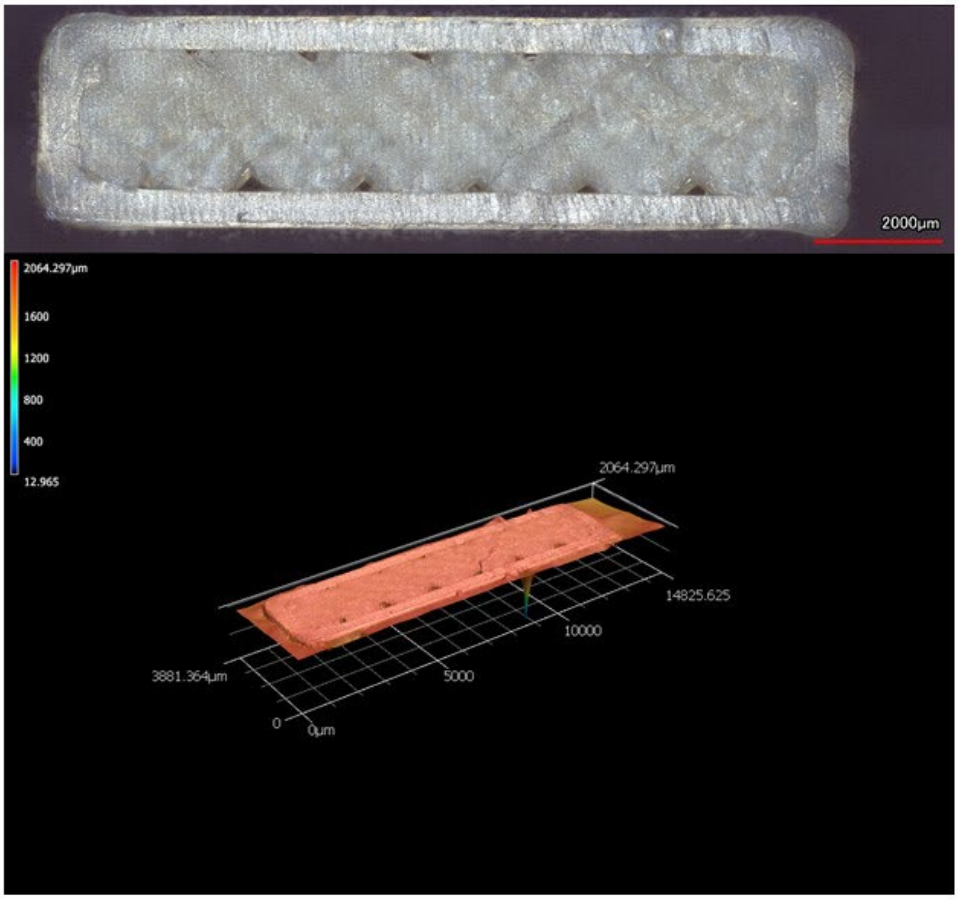
SMC1-YT- (CUT)


2000µm
424.251µm
320
240
160
80
3.527
424.251µm
3.527
14822.933
10000
5000
3881.364µm
0
0µm

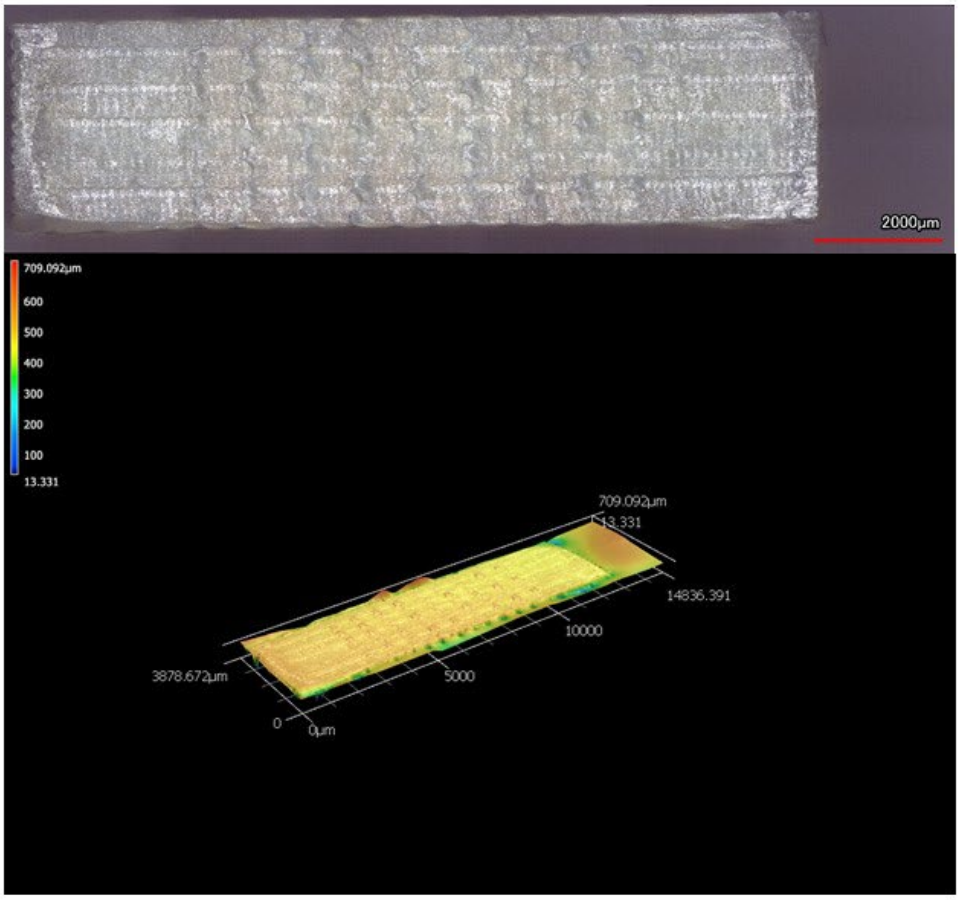
SMC3-YT (CUT)


2000µm
905.33µm
800
600
400
200
4.775
905.33µm
14825.625
10000
5000
3878.672µm
0
0µm

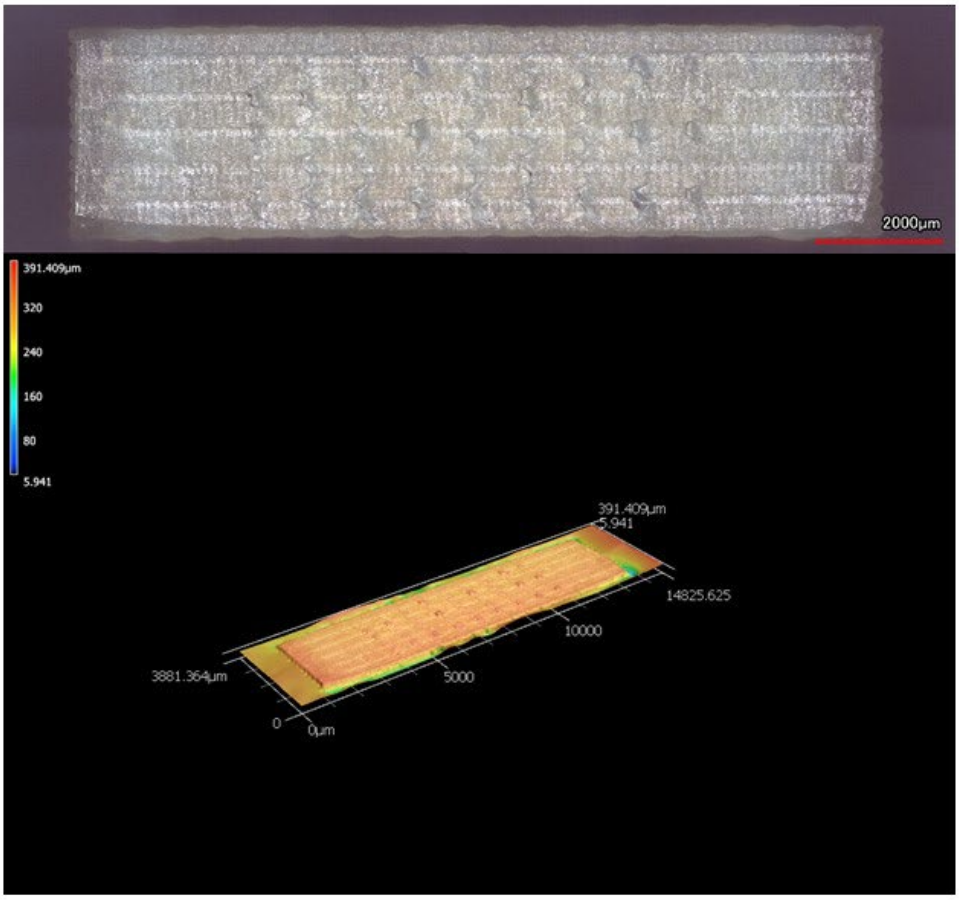
SMC1-ZT (Cut)


2000µm
2064.297µm
1600
1200
800
400
12.965
2064.297µm
14825.625
10000
5000
3881.364µm
0
0µm

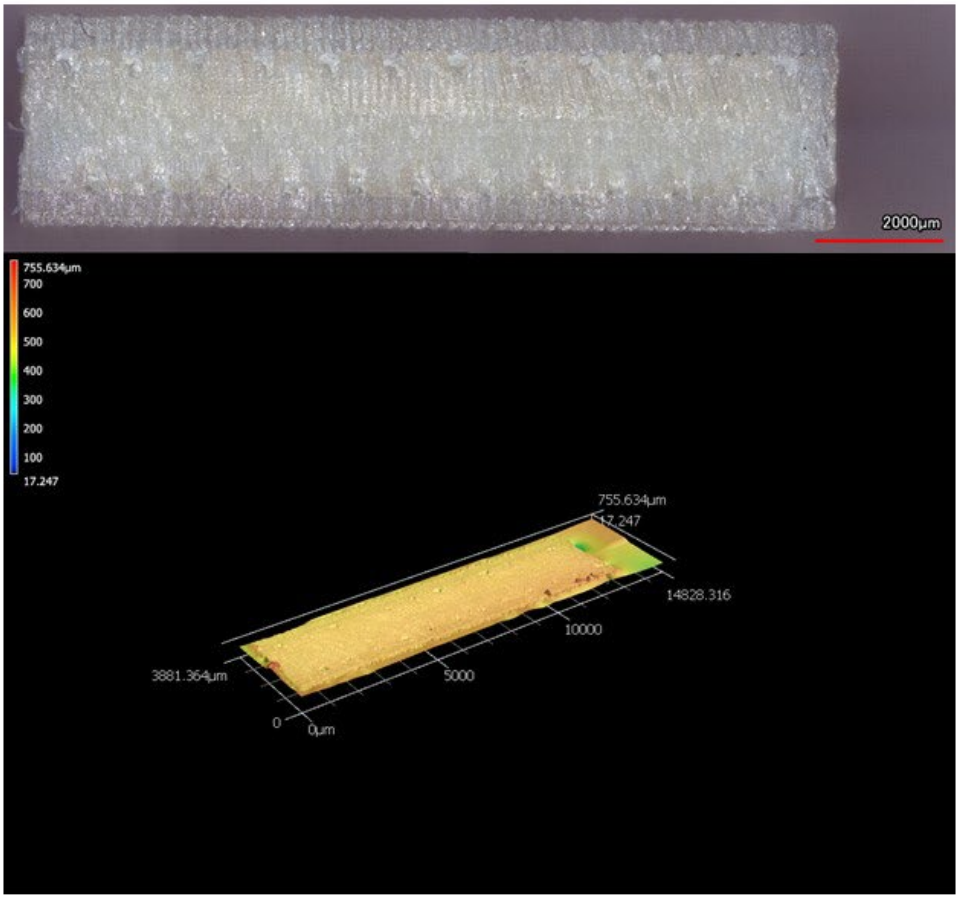
SMC3-ZT (Cut)



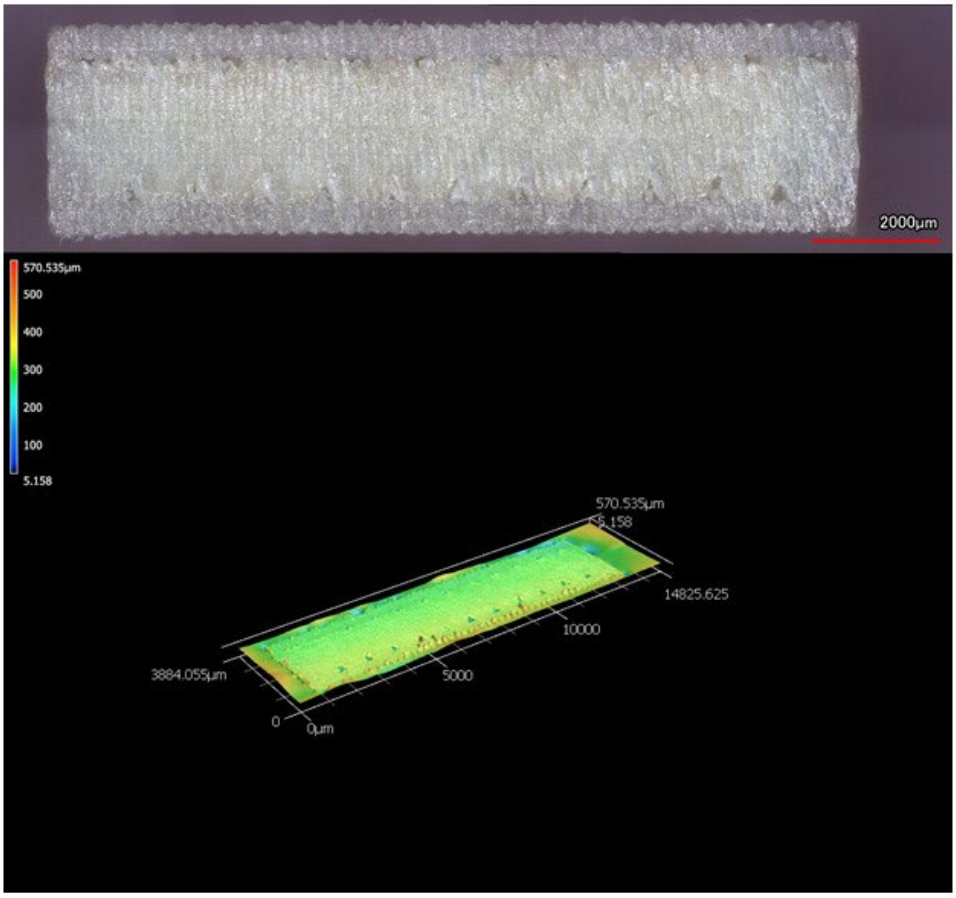
VSRAG0-XT (Cut)



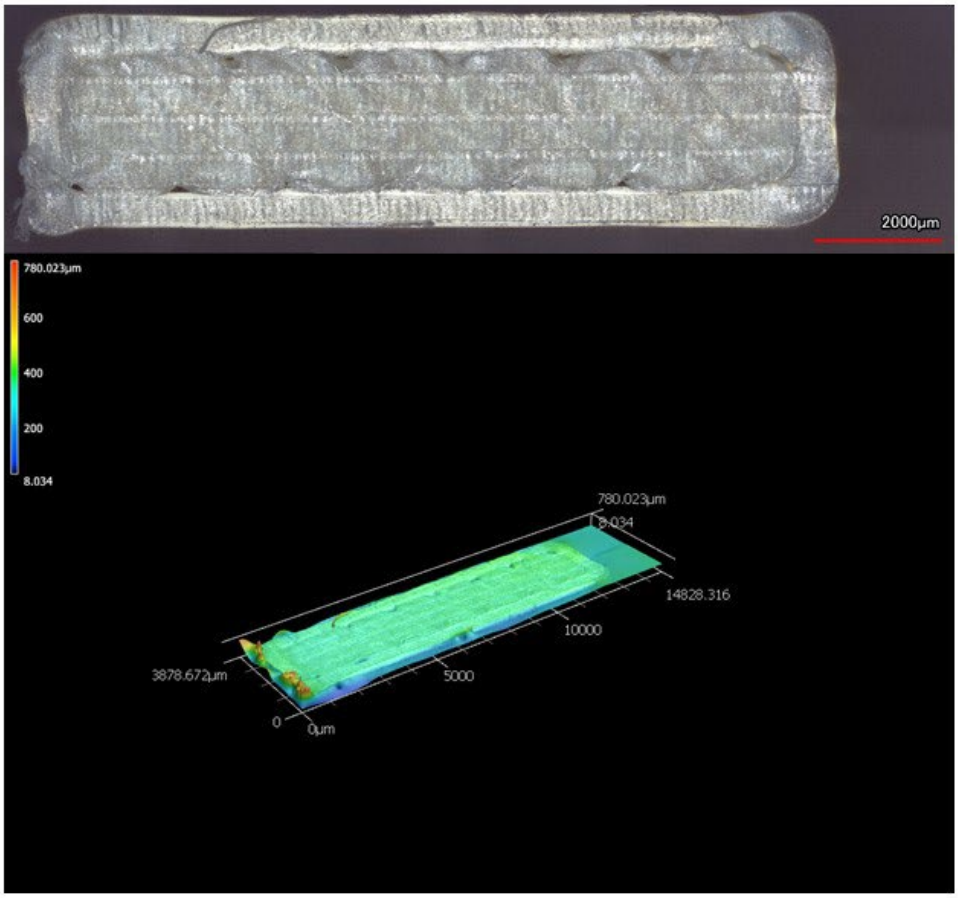
VSRAG(10)-XT (Cut)



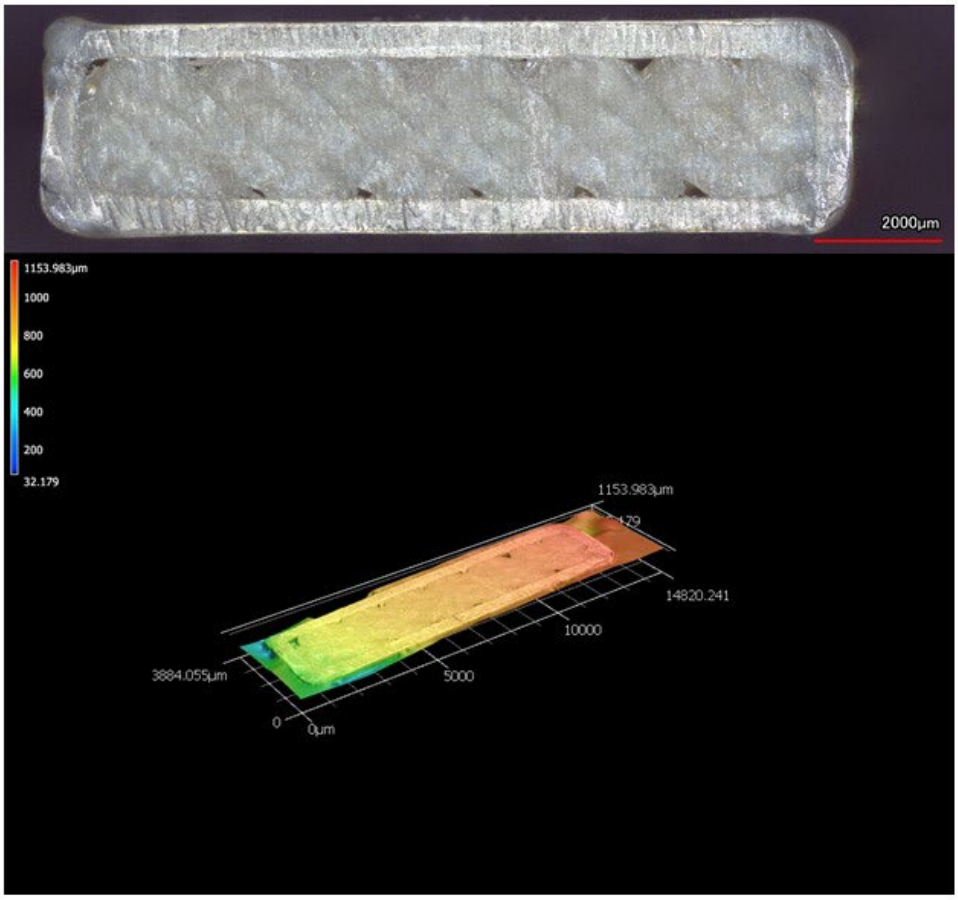
VSRAG0-YT (CUT)



VSRAG(10)-YT (CUT)



VSRAG0-ZT (Cut)



VSRAG(10)-ZT (Cut)

F Insight parameter settings

The highlighted cells in the medium- and high-impact parameter setting table below were the parameters evaluated in this study. For further details, please refer to NCAMP NPS 89085 Rev D document (NCAMP, 2021).

Low Impact	**Medium Impact**	**High Impact**
Support Style	Part Interior Style	Slice Height
Linked Contours	Contour Style	Invert Build Materials
Bypass Seam Placement	Contour Width	Allow Increased Contour Overfill
Start Angle	Number of Contours (NC)	Outer Contour Location
Add a Contour Around Sparse	Part Raster Width (PRW)	Adjacent Rasters (AR)
Seam Placement Method	Double Dense Raster	Contours and Rasters (CR)
	Part Interior Style	Contour and Contour (CC2 and CC3)
	Sparse Raster Air Gap	Align Rasters
	Start Angle (Sparse Fill)	Parallel Offset Rasters
	Visible Surface Raster (EVSRW)	Use Alternate Sparse Fill Pattern
	Surface Max Contours (SMC)	Sparse Raster Width
		Delta Angle
		Layers Between Deltas
		Part X Shrink Factor
		Part Y Shrink Factor
		Part Z Shrink Factor
		Visible Surface Raster Air Gap (EVSRAG)

G Mechanical data

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR0-X-T-X-1-7-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR0-1-T-X-1-7-3	0.128	0.501	0.064	0.0	570.876	8.897	5.252	0.306	57190.000	1000-3000	5.779	69F / 41%	FAILURE AT FILLET
NIAR-AR0-1-T-X-1-7-4	0.129	0.501	0.064	0.0	575.316	8.939	5.086	0.309	63403.500	1000-3000	6.661	69F / 41%	FAILURE AT FILLET
NIAR-AR0-2-T-X-1-7-3	0.128	0.500	0.064	0.0	566.447	8.823	4.941	0.308	63783.000	1000-3000	6.657	69F / 41%	FAILURE AT FILLET
NIAR-AR0-2-T-X-1-7-4	0.128	0.502	0.064	0.0	580.985	9.027	5.071	0.312	66717.500	1000-3000	7.171	69F / 41%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.922**	**5.088**	**0.309**
STANDARD DEVIATION	0.085	0.127	0.003
COEFFICIENT OF VARIATION [%]	0.954	2.501	0.830

Comments:

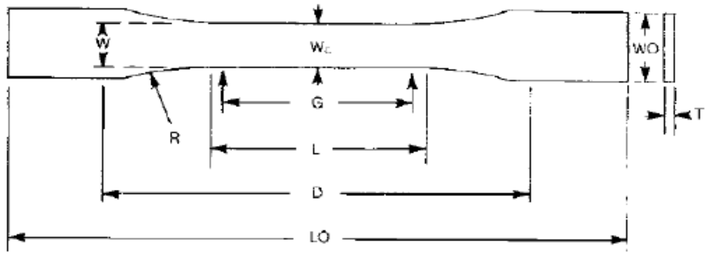
ALL SPECIMENS EXCEPT 2-4 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS EXCEPT 1-4 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
SPECIMEN 1-4 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-3 DOES NOT MEET THE REQUIREMENT FOR WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY	25-Mar-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR0-1-T-X-1-7-3	0.129	0.128	0.128	0.751	0.751	0.502	0.500	0.500	6.518	0.001
NIAR-AR0-1-T-X-1-7-4	0.130	0.128	0.128	0.751	0.751	0.501	0.501	0.501	6.517	0.002
NIAR-AR0-2-T-X-1-7-3	0.129	0.128	0.128	0.750	0.751	0.500	0.500	0.500	6.516	0.000
NIAR-AR0-2-T-X-1-7-4	0.129	0.129	0.128	0.752	0.751	0.502	0.502	0.501	6.516	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR0-X-T-Y-1-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR0-1-T-Y-1-7-1	0.128	0.501	0.064	0.0	729.404	11.381	6.652	0.380	54170.500	1000-3000	5.815	68F / 32%	FAILURE AT GAGE
NIAR-AR0-2-T-Y-1-7-1	0.128	0.501	0.064	0.0	719.892	11.240	6.555	0.381	52072.500	1000-3000	5.426	68F / 32%	FAILURE AT GAGE
NIAR-AR0-2-T-Y-1-7-3	0.127	0.501	0.064	0.0	734.157	11.506	6.835	0.379	52150.000	1000-3000	5.504	68F / 32%	FAILURE AT GAGE
NIAR-AR0-2-T-Y-1-7-4	0.127	0.501	0.064	0.0	741.494	11.639	6.791	0.385	53169.500	1000-3000	5.536	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.441**	**6.708**	**0.381**
STANDARD DEVIATION	0.171	0.128	0.003
COEFFICIENT OF VARIATION [%]	1.490	1.914	0.656

Comments:

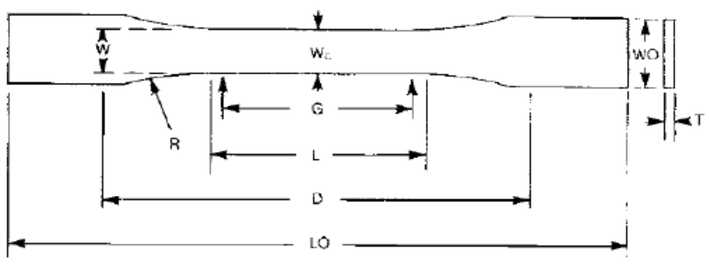
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR0-1-T-Y-1-7-1	0.128	0.128	0.127	0.753	0.752	0.501	0.502	0.501	6.511	0.001
NIAR-AR0-2-T-Y-1-7-1	0.129	0.127	0.128	0.755	0.754	0.501	0.501	0.501	6.512	0.001
NIAR-AR0-2-T-Y-1-7-3	0.127	0.127	0.127	0.755	0.755	0.501	0.501	0.500	6.511	0.000
NIAR-AR0-2-T-Y-1-7-4	0.128	0.127	0.126	0.756	0.755	0.501	0.502	0.501	6.511	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR0-X-T-Z-1-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR0-1-T-Z-1-7-1	0.128	0.502	0.064	0.0	508.837	7.932	5.658	0.338	31283.000	3.128	1000-3000	73F / 31%	FAILURE AT GAGE
NIAR-AR0-1-T-Z-1-7-4	0.129	0.501	0.064	0.0	529.999	8.232	5.757	0.329	35819.000	3.582	1000-3000	73F / 31%	FAILURE AT GAGE
NIAR-AR0-2-T-Z-1-7-3	0.129	0.500	0.064	0.0	502.569	7.804	5.738	0.334	30414.500	3.041	1000-3000	73F / 31%	FAILURE AT GAGE
NIAR-AR0-2-T-Z-1-7-4	0.128	0.501	0.064	0.0	509.468	7.921	5.692	0.331	31889.000	3.189	1000-3000	73F / 31%	FAILURE AT GAGE

AVERAGE	**7.972**	**5.711**	**0.333**
STANDARD DEVIATION	0.182	0.045	0.004
COEFFICIENT OF VARIATION [%]	2.288	0.786	1.205

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

Comments:

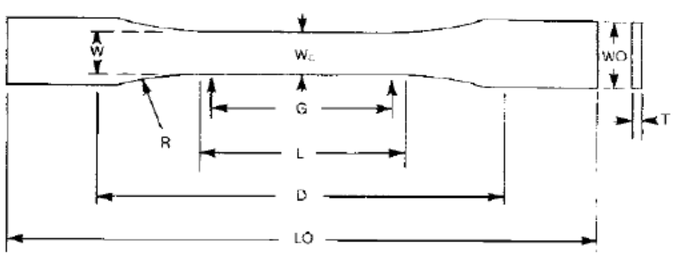
SPECIMEN 2-4 DOES NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-1 AND 2-4 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
SPECIMEN 2-4 DOES NOT MEET THE REQUIREMENT FOR WIDTH (=0.50" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	CHENG MIN	16-Apr-20
DATA ENTRY/REDUCTION I	CONOR	17-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR0-1-T-Z-1-7-1	0.129	0.127	0.128	0.752	0.751	0.502	0.502	0.501	6.505	0.001
NIAR-AR0-1-T-Z-1-7-4	0.129	0.128	0.129	0.750	0.752	0.502	0.500	0.500	6.503	0.001
NIAR-AR0-2-T-Z-1-7-3	0.129	0.128	0.129	0.751	0.751	0.501	0.500	0.500	6.503	0.002
NIAR-AR0-2-T-Z-1-7-4	0.129	0.129	0.128	0.749	0.750	0.501	0.501	0.500	6.503	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR5-X-T-X-1-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR5-1-T-X-1-8-6	0.128	0.502	0.064	0.0	545.581	8.518	4.717	0.291	57576.500	1000-3000	5.773	68F / 32%	FAILURE AT FILLET
NIAR-AR5-1-T-X-1-8-9	0.128	0.502	0.064	0.0	550.197	8.545	4.751	0.294	56779.000	1000-3000	5.706	68F / 32%	FAILURE AT FILLET
NIAR-AR5-2-T-X-1-8-6	0.128	0.502	0.064	0.0	529.295	8.236	4.557	0.286	55960.500	1000-3000	5.606	68F / 32%	FAILURE AT FILLET
NIAR-AR5-2-T-X-1-8-8	0.128	0.502	0.064	0.0	515.072	8.033	4.462	0.279	55242.500	1000-3000	5.560	68F / 32%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**8.333**	**4.622**	**0.288**
STANDARD DEVIATION	0.244	0.136	0.007
COEFFICIENT OF VARIATION [%]	2.926	2.946	2.374

Comments:

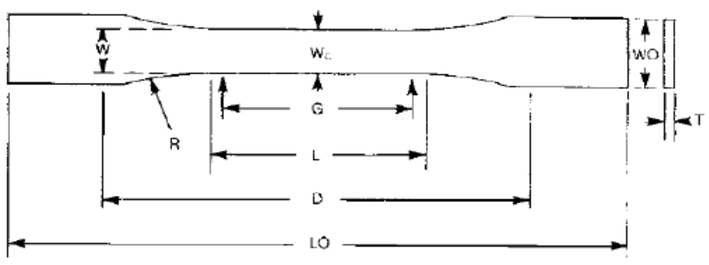
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-9 DOES NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	28-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR5-1-T-X-1-8-6	0.127	0.128	0.128	0.752	0.751	0.502	0.501	0.502	6.514	0.001
NIAR-AR5-1-T-X-1-8-9	0.128	0.129	0.128	0.752	0.752	0.502	0.502	0.502	6.515	0.001
NIAR-AR5-2-T-X-1-8-6	0.129	0.128	0.128	0.752	0.752	0.502	0.501	0.502	6.511	0.001
NIAR-AR5-2-T-X-1-8-8	0.127	0.128	0.128	0.751	0.751	0.502	0.502	0.503	6.510	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR-5-X-T-X-1-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR-5-1-T-X-1-9-11	0.128	0.503	0.064	0.0	658.147	10.236	6.123	0.350	59675.000	1000-3000	7.441	69F / 46%	FAILURE AT GAGE
NIAR-AR-5-1-T-X-1-9-13	0.128	0.501	0.064	0.0	651.758	10.130	6.209	0.346	59975.000	1000-3000	7.586	69F / 46%	FAILURE AT GAGE
NIAR-AR-5-2-T-X-1-9-13	0.127	0.502	0.064	0.0	642.245	10.058	6.000	0.345	65828.000	1000-3000	8.556	69F / 46%	FAILURE AT GAGE
NIAR-AR-5-2-T-X-1-9-14	0.127	0.501	0.064	0.0	636.141	9.997	5.950	0.342	64046.000	1000-3000	8.330	69F / 46%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**10.105**	**6.071**	**0.346**
STANDARD DEVIATION	0.103	0.118	0.003
COEFFICIENT OF VARIATION [%]	1.015	1.938	0.965

Comments:

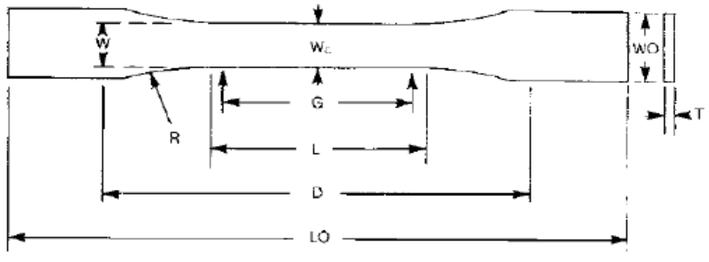
SPECIMEN 1-13 DOES NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR-5-1-T-X-1-9-11	0.129	0.127	0.127	0.752	0.752	0.504	0.502	0.503	6.513	0.002
NIAR-AR-5-1-T-X-1-9-13	0.130	0.128	0.128	0.751	0.751	0.502	0.501	0.500	6.513	0.002
NIAR-AR-5-2-T-X-1-9-13	0.128	0.127	0.127	0.752	0.751	0.504	0.501	0.501	6.511	0.001
NIAR-AR-5-2-T-X-1-9-14	0.127	0.127	0.127	0.752	0.752	0.501	0.501	0.501	6.511	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR5-X-T-Y-1-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR5-1-T-Y-1-8-6	0.128	0.501	0.064	0.0	664.897	10.374	6.133	0.359	51414.000	1000-3000	5.222	70F / 42%	FAILURE AT GAGE
NIAR-AR5-2-T-Y-1-8-6	0.127	0.502	0.064	0.0	673.082	10.559	6.347	0.363	49646.500	1000-3000	5.007	70F / 42%	FAILURE AT GAGE
NIAR-AR5-2-T-Y-1-8-8	0.128	0.502	0.064	0.0	688.130	10.725	6.400	0.363	53269.000	1000-3000	5.875	70F / 42%	FAILURE AT GAGE
NIAR-AR5-2-T-Y-1-8-9	0.127	0.502	0.064	0.0	673.066	10.546	6.286	0.362	52702.500	1000-3000	5.513	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**10.551**	**6.292**	**0.362**
STANDARD DEVIATION	0.143	0.115	0.002
COEFFICIENT OF VARIATION [%]	1.359	1.835	0.523

Comments:

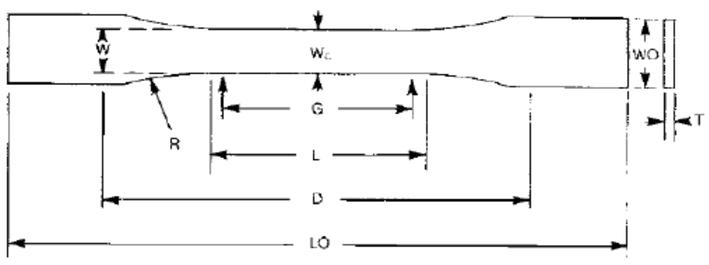
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS EXCEPT 1-6 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	ERIC	22-Apr-20
DATA ENTRY/REDUCTION I	MING	23-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR5-1-T-Y-1-8-6	0.128	0.128	0.128	0.753	0.752	0.501	0.501	0.502	6.510	0.001
NIAR-AR5-2-T-Y-1-8-6	0.127	0.127	0.127	0.755	0.755	0.502	0.502	0.502	6.512	0.001
NIAR-AR5-2-T-Y-1-8-8	0.128	0.128	0.128	0.756	0.754	0.502	0.502	0.501	6.512	0.001
NIAR-AR5-2-T-Y-1-8-9	0.127	0.127	0.127	0.754	0.754	0.503	0.502	0.502	6.512	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR-5-X-T-Y-1-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR-5-1-T-Y-1-9-14	0.129	0.503	0.065	0.0	795.724	12.285	7.107	0.386	58382.000	1000-3000	6.129	68F / 32%	FAILURE AT GAGE
NIAR-AR-5-2-T-Y-1-9-11	0.128	0.503	0.065	0.0	797.410	12.345	7.217	0.388	58114.500	1000-3000	7.134	68F / 32%	FAILURE AT GAGE
NIAR-AR-5-2-T-Y-1-9-13	0.129	0.503	0.065	0.0	791.184	12.199	7.029	0.388	55679.000	1000-3000	5.706	68F / 32%	FAILURE AT GAGE
NIAR-AR-5-2-T-Y-1-9-14	0.129	0.502	0.065	0.0	792.090	12.251	7.186	0.387	53267.500	1000-3000	5.367	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**12.270**	**7.135**	**0.387**
STANDARD DEVIATION	0.061	0.084	0.001
COEFFICIENT OF VARIATION [%]	0.497	1.182	0.183

Comments:

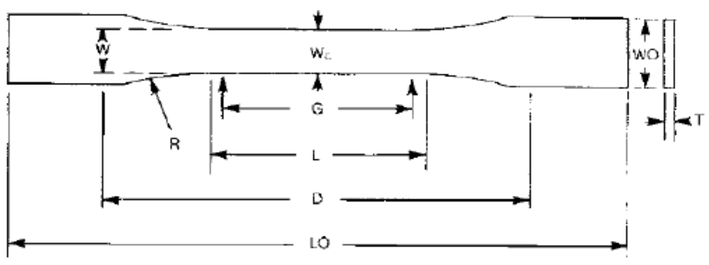
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-14 DOES NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	28-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR-5-1-T-Y-1-9-14	0.129	0.129	0.129	0.754	0.753	0.504	0.503	0.503	6.516	0.000
NIAR-AR-5-2-T-Y-1-9-11	0.129	0.129	0.128	0.755	0.754	0.503	0.503	0.503	6.514	0.000
NIAR-AR-5-2-T-Y-1-9-13	0.129	0.129	0.129	0.756	0.755	0.503	0.502	0.503	6.513	0.001
NIAR-AR-5-2-T-Y-1-9-14	0.129	0.128	0.129	0.756	0.755	0.503	0.502	0.502	6.513	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR5-X-T-Z-1-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR5-1-T-Z-1-8-6	0.127	0.500	0.064	0.0	495.206	7.796	5.460	0.319	34568.662	3.457	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-AR5-1-T-Z-1-8-9	0.128	0.500	0.064	0.0	487.665	7.625	5.596	0.316	32458.235	3.246	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-AR5-2-T-Z-1-8-8	0.127	0.500	0.064	0.0	472.550	7.416	5.581	0.314	30665.305	3.067	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-AR5-2-T-Z-1-8-9	0.127	0.500	0.064	0.0	448.376	7.056	5.223	0.321	28123.134	2.812	1000-3000	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.473**	**5.465**	**0.318**
STANDARD DEVIATION	0.319	0.172	0.003
COEFFICIENT OF VARIATION [%]	4.265	3.156	1.083

Comments:

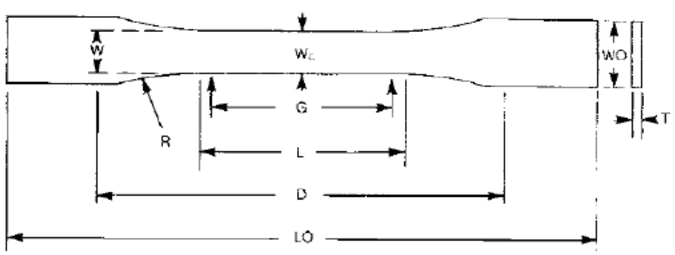
SPECIMENS 1-9, 2-8, 2-9 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-9, 2-8, 2-9 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	CHENG MIN	14-Apr-20
DATA ENTRY/REDUCTION I	CONOR	15-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR5-1-T-Z-1-8-6	0.128	0.127	0.126	0.749	0.750	0.501	0.500	0.500	6.507	0.001
NIAR-AR5-1-T-Z-1-8-9	0.128	0.128	0.128	0.750	0.749	0.500	0.500	0.500	6.508	0.000
NIAR-AR5-2-T-Z-1-8-8	0.128	0.127	0.128	0.750	0.748	0.500	0.500	0.500	6.507	0.002
NIAR-AR5-2-T-Z-1-8-9	0.128	0.127	0.126	0.749	0.749	0.500	0.500	0.499	6.507	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR-5-X-T-Z-1-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR-5-1-T-Z-1-9-11	0.127	0.500	0.064	0.0	476.119	7.485	6.191	0.344	26209.278	1000-3000	2.621	71F / 32%	FAILURE AT GAGE
NIAR-AR-5-1-T-Z-1-9-14	0.127	0.501	0.064	0.0	499.082	7.837	5.908	0.341	28849.955	1000-3000	2.885	71F / 32%	FAILURE AT GAGE
NIAR-AR-5-2-T-Z-1-9-13	0.128	0.500	0.064	0.0	527.299	8.261	5.952	0.339	32052.986	1000-3000	3.205	71F / 32%	FAILURE AT GAGE
NIAR-AR-5-2-T-Z-1-9-14	0.127	0.501	0.064	0.0	531.056	8.351	5.982	0.342	32669.850	1000-3000	3.267	71F / 32%	FAILURE AT GAGE

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST		in/min

AVERAGE	**7.984**	**6.008**	**0.341**
STANDARD DEVIATION	0.400	0.125	0.002
COEFFICIENT OF VARIATION [%]	5.016	2.087	0.575

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	CHENG MIN	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Comments:

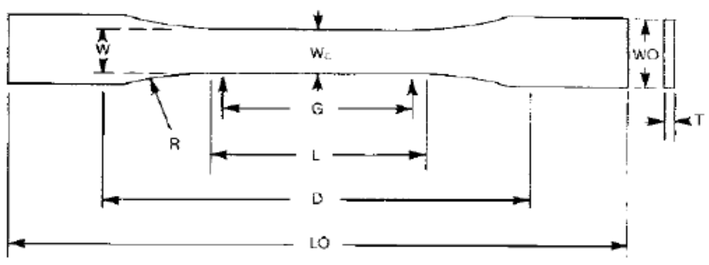
SPECIMEN 2-13 DOES NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-13 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-11 AND 2-13 DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638
SPECIMEN 1-11 DOES NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 200 psi

TEST SPEED FOR NIAR-AR-5-1-T-Z-1-9-11 : 0.2 in/min
TEST SPEED FOR NIAR-AR-5-1-T-Z-1-9-14, NIAR-AR-5-2-T-Z-1-9-(13,14) : 0.15 in/min

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR-5-1-T-Z-1-9-11	0.128	0.128	0.127	0.751	0.749	0.500	0.500	0.500	6.507	0.001
NIAR-AR-5-1-T-Z-1-9-14	0.128	0.127	0.127	0.752	0.751	0.502	0.501	0.501	6.513	0.001
NIAR-AR-5-2-T-Z-1-9-13	0.128	0.128	0.127	0.750	0.749	0.500	0.500	0.500	6.508	0.002
NIAR-AR-5-2-T-Z-1-9-14	0.128	0.127	0.126	0.751	0.751	0.501	0.501	0.501	6.512	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR-10-X-T-X-1-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR-10-1-T-X-1-2-26	0.128	0.501	0.064	0.0	725.107	11.290	6.783	0.369	66793.000	1000-3000	8.603	69F / 46%	FAILURE AT GAGE
NIAR-AR-10-1-T-X-1-2-28	0.128	0.501	0.064	0.0	733.236	11.403	6.802	0.373	63391.000	1000-3000	8.762	69F / 46%	FAILURE AT GAGE
NIAR-AR-10-2-T-X-1-2-28	0.128	0.501	0.064	0.0	728.344	11.385	6.894	0.370	66417.000	1000-3000	10.634	69F / 46%	FAILURE AT GAGE
NIAR-AR-10-2-T-X-1-2-29	0.128	0.501	0.064	0.0	717.085	11.208	6.560	0.373	64620.000	1000-3000	10.370	69F / 46%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**11.322**	**6.760**	**0.371**
STANDARD DEVIATION	0.090	0.142	0.002
COEFFICIENT OF VARIATION [%]	0.799	2.097	0.591

Comments:

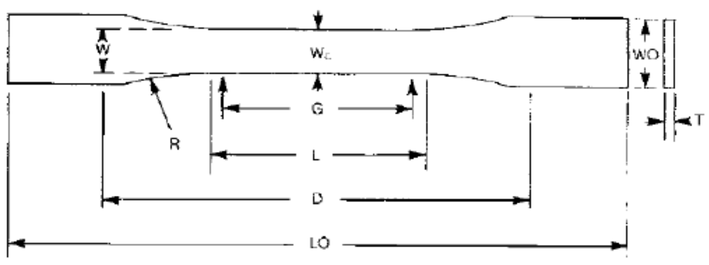
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-28 DOES NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR-10-1-T-X-1-2-26	0.129	0.128	0.128	0.751	0.750	0.501	0.500	0.501	6.511	0.001
NIAR-AR-10-1-T-X-1-2-28	0.128	0.128	0.129	0.752	0.752	0.501	0.500	0.501	6.511	0.001
NIAR-AR-10-2-T-X-1-2-28	0.128	0.127	0.128	0.752	0.751	0.502	0.501	0.500	6.510	0.001
NIAR-AR-10-2-T-X-1-2-29	0.128	0.128	0.127	0.752	0.751	0.501	0.501	0.501	6.508	0.001



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR10-X-T-X-1-X-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR10-1-T-X-1-3-21	0.129	0.500	0.064	0.0	488.147	7.589	4.209	0.258	52804.000	1000-3000	5.300	68F / 32%	FAILURE AT FILLET
NIAR-AR10-1-T-X-1-9-19	0.129	0.502	0.065	0.0	496.478	7.655	4.176	0.266	52555.500	1000-3000	5.309	68F / 32%	FAILURE AT FILLET
NIAR-AR10-2-T-X-1-3-21	0.129	0.501	0.065	0.0	486.205	7.501	4.083	0.258	55049.500	1000-3000	5.533	68F / 32%	FAILURE AT FILLET
NIAR-AR10-2-T-X-1-3-22	0.128	0.502	0.064	0.0	483.024	7.506	4.132	0.256	55014.000	1000-3000	5.526	68F / 32%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**7.563**	**4.150**	**0.260**
STANDARD DEVIATION	0.073	0.055	0.005
COEFFICIENT OF VARIATION [%]	0.968	1.321	1.774

Comments:

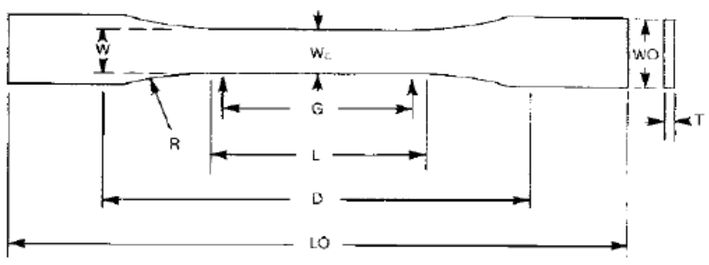
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN NIAR-AR10-1-T-X-1-3-21 DOES NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR10-1-T-X-1-3-21	0.129	0.129	0.128	0.751	0.750	0.500	0.500	0.500	6.513	0.000
NIAR-AR10-1-T-X-1-9-19	0.129	0.129	0.129	0.751	0.752	0.505	0.501	0.501	6.517	0.001
NIAR-AR10-2-T-X-1-3-21	0.129	0.129	0.130	0.751	0.751	0.503	0.500	0.500	6.511	0.001
NIAR-AR10-2-T-X-1-3-22	0.129	0.128	0.128	0.751	0.751	0.504	0.501	0.502	6.512	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR-10-X-T-Y-1-3-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR-10-1-T-Y-1-3-23	0.129	0.503	0.065	0.0	836.131	12.870	7.310	0.393	62918.500	1000-3000	10.189	68F / 32%	FAILURE AT GAGE
NIAR-AR-10-2-T-Y-1-3-21	0.129	0.504	0.065	0.0	843.650	12.982	7.598	0.390	62090.500	1000-3000	7.600	68F / 32%	FAILURE AT GAGE
NIAR-AR-10-2-T-Y-1-3-23	0.130	0.504	0.065	0.0	844.167	12.926	7.448	0.391	62351.000	1000-3000	9.057	68F / 32%	FAILURE AT GAGE
NIAR-AR-10-2-T-Y-1-3-24	0.129	0.505	0.065	0.0	849.862	13.037	7.485	0.391	60683.500	1000-3000	8.881	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**12.954**	**7.460**	**0.391**
STANDARD DEVIATION	0.072	0.119	0.001
COEFFICIENT OF VARIATION [%]	0.553	1.590	0.322

Comments:

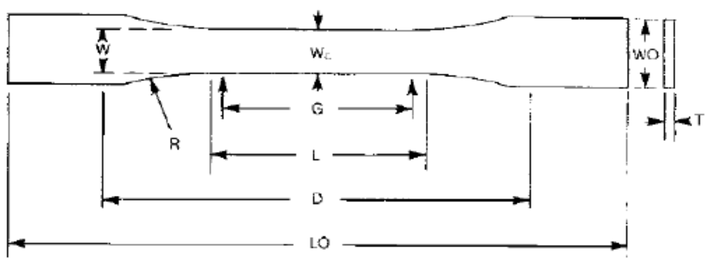
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR-10-1-T-Y-1-3-23	0.129	0.129	0.129	0.754	0.753	0.503	0.502	0.503	6.510	0.000
NIAR-AR-10-2-T-Y-1-3-21	0.128	0.129	0.130	0.757	0.757	0.504	0.504	0.504	6.516	0.001
NIAR-AR-10-2-T-Y-1-3-23	0.130	0.130	0.129	0.757	0.757	0.504	0.504	0.504	6.515	0.001
NIAR-AR-10-2-T-Y-1-3-24	0.129	0.129	0.130	0.757	0.756	0.505	0.504	0.505	6.516	0.001



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR10-X-T-Y-1-6-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR10-1-T-Y-1-6-16	0.128	0.503	0.065	0.0	718.840	11.125	6.298	0.354	62480.500	1000-3000	7.203	68F / 32%	FAILURE AT GAGE
NIAR-AR10-2-T-Y-1-6-16	0.129	0.502	0.065	0.0	725.712	11.220	6.304	0.356	61479.500	1000-3000	7.685	68F / 32%	FAILURE AT GAGE
NIAR-AR10-2-T-Y-1-6-18	0.129	0.503	0.065	0.0	723.524	11.160	6.422	0.349	62248.000	1000-3000	7.850	68F / 32%	FAILURE AT GAGE
NIAR-AR10-2-T-Y-1-6-19	0.129	0.503	0.065	0.0	723.829	11.147	6.397	0.349	62683.500	1000-3000	7.915	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.163**	**6.355**	**0.352**
STANDARD DEVIATION	0.040	0.063	0.003
COEFFICIENT OF VARIATION [%]	0.362	0.998	0.983

Comments:

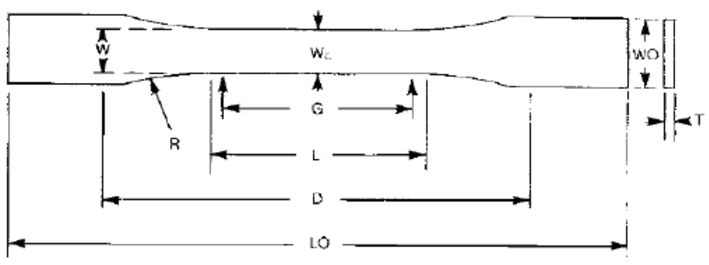
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	28-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR10-1-T-Y-1-6-16	0.129	0.128	0.128	0.754	0.753	0.504	0.503	0.503	6.510	0.000
NIAR-AR10-2-T-Y-1-6-16	0.129	0.129	0.128	0.755	0.754	0.503	0.502	0.502	6.515	0.001
NIAR-AR10-2-T-Y-1-6-18	0.129	0.129	0.129	0.755	0.754	0.503	0.503	0.503	6.515	0.000
NIAR-AR10-2-T-Y-1-6-19	0.129	0.129	0.129	0.755	0.754	0.503	0.503	0.503	6.513	0.000



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR-10-X-T-Z-1-5-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR-10-1-T-Z-1-5-21	0.127	0.501	0.064	0.0	559.785	8.760	6.183	0.352	34242.000	1000-3000	3.424	73F / 23%	FAILURE AT GAGE
NIAR-AR-10-1-T-Z-1-5-24	0.128	0.501	0.064	0.0	547.650	8.530	6.177	0.344	32955.000	1000-3000	3.305	73F / 23%	FAILURE AT GAGE
NIAR-AR-10-2-T-Z-1-5-23	0.127	0.501	0.064	0.0	552.717	8.682	6.098	0.353	33627.500	1000-3000	3.363	73F / 23%	FAILURE AT GAGE
NIAR-AR-10-2-T-Z-1-5-24	0.127	0.501	0.064	0.0	534.909	8.384	6.119	0.353	30917.000	1000-3000	3.092	73F / 23%	FAILURE AT FILLET

AVERAGE	**8.589**	**6.144**	**0.351**
STANDARD DEVIATION	0.167	0.042	0.005
COEFFICIENT OF VARIATION [%]	1.939	0.688	1.288

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

Comments:

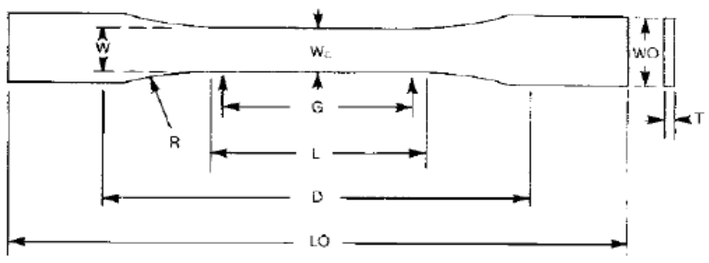
SPECIMENS 1-24, 2-23, 2-24 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-24 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638
SPECIMENS 1-21, 1-24, 2-23 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	CHENG MIN	15-Apr-20
DATA ENTRY/REDUCTION I	MING	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR-10-1-T-Z-1-5-21	0.128	0.127	0.127	0.752	0.750	0.501	0.502	0.501	6.510	0.000
NIAR-AR-10-1-T-Z-1-5-24	0.128	0.129	0.127	0.752	0.748	0.501	0.502	0.501	6.506	0.002
NIAR-AR-10-2-T-Z-1-5-23	0.127	0.127	0.127	0.750	0.748	0.501	0.501	0.501	6.506	0.001
NIAR-AR-10-2-T-Z-1-5-24	0.129	0.127	0.126	0.750	0.748	0.501	0.501	0.501	6.506	0.003



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR10-X-T-Z-1-6-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR10-1-T-Z-1-6-16	0.127	0.502	0.064	0.0	461.379	7.236	5.260	0.309	31916.500	1000-3000	3.192	73F / 23%	FAILURE AT GAGE
NIAR-AR10-1-T-Z-1-6-18	0.128	0.501	0.064	0.0	460.293	7.203	5.209	0.308	31277.500	1000-3000	3.128	73F / 23%	FAILURE AT GAGE
NIAR-AR10-2-T-Z-1-6-16	0.127	0.502	0.064	0.0	418.899	6.557	5.142	0.306	26872.000	1000-3000	2.687	73F / 23%	FAILURE AT GAGE
NIAR-AR10-2-T-Z-1-6-18	0.126	0.500	0.063	0.0	426.000	6.740	5.145	0.313	27194.500	1000-3000	2.719	73F / 23%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**6.934**	**5.189**	**0.309**
STANDARD DEVIATION	0.338	0.056	0.003
COEFFICIENT OF VARIATION [%]	4.877	1.086	0.948

Comments:

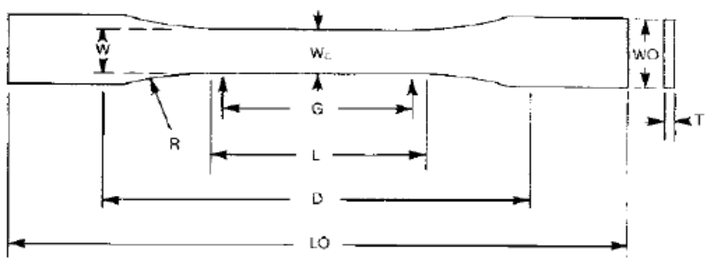
SPECIMENS 1-16, 1-18, 2-18 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-16 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-18, 2-18 DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE RQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	CHENG MIN	15-Apr-20
DATA ENTRY/REDUCTION I	MING	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR10-1-T-Z-1-6-16	0.128	0.127	0.127	0.751	0.752	0.502	0.502	0.502	6.512	0.001
NIAR-AR10-1-T-Z-1-6-18	0.129	0.128	0.126	0.750	0.749	0.501	0.501	0.500	6.508	0.003
NIAR-AR10-2-T-Z-1-6-16	0.128	0.127	0.126	0.750	0.752	0.502	0.502	0.501	6.511	0.002
NIAR-AR10-2-T-Z-1-6-18	0.127	0.126	0.126	0.749	0.748	0.501	0.500	0.500	6.506	0.001



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR-15-X-T-X-1-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR-15-1-T-X-1-1-36	0.129	0.500	0.065	0.0	816.675	12.622	7.328	0.394	60673.000	1000-3000	15.892	70F / 34%	FAILURE AT GAGE
NIAR-AR-15-1-T-X-1-1-39	0.129	0.501	0.065	0.0	811.597	12.526	7.522	0.386	61285.500	1000-3000	13.599	70F / 34%	FAILURE AT GAGE
NIAR-AR-15-2-T-X-1-1-36	0.129	0.500	0.064	0.0	788.673	12.238	7.267	0.384	62782.000	1000-3000	14.042	70F / 34%	FAILURE AT GAGE
NIAR-AR-15-2-T-X-1-1-39	0.129	0.500	0.065	0.0	798.792	12.363	7.206	0.388	61503.000	1000-3000	16.154	70F / 34%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**12.437**	**7.331**	**0.388**
STANDARD DEVIATION	0.171	0.137	0.004
COEFFICIENT OF VARIATION [%]	1.371	1.864	1.136

Comments:

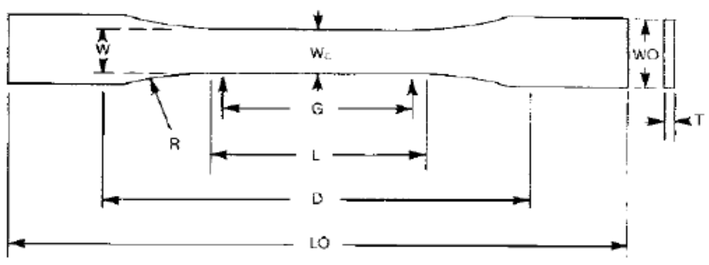
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-39 DOES NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR-15-1-T-X-1-1-36	0.129	0.129	0.130	0.751	0.752	0.500	0.500	0.500	6.514	0.001
NIAR-AR-15-1-T-X-1-1-39	0.129	0.129	0.130	0.750	0.752	0.502	0.501	0.500	6.512	0.002
NIAR-AR-15-2-T-X-1-1-36	0.129	0.129	0.129	0.750	0.750	0.501	0.499	0.500	6.509	0.001
NIAR-AR-15-2-T-X-1-1-39	0.129	0.129	0.130	0.752	0.750	0.500	0.500	0.500	6.509	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR15-X-T-X-1-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [^{o} F / % RH]	FAILURE MODE
NIAR-AR15-1-T-X-1-2-31	0.127	0.501	0.064	0.0	390.081	6.133	3.817	0.225	41290.500	1000-3000	4.273	70F / 42%	FAILURE AT GAGE
NIAR-AR15-1-T-X-1-2-34	0.127	0.502	0.064	0.0	423.419	6.651	3.981	0.238	44135.000	1000-3000	4.417	70F / 42%	FAILURE AT GAGE
NIAR-AR15-2-T-X-1-2-31	0.127	0.500	0.063	0.0	418.652	6.600	3.907	0.230	47544.000	1000-3000	4.775	70F / 42%	FAILURE AT GAGE
NIAR-AR15-2-T-X-1-2-33	0.127	0.501	0.064	0.0	419.223	6.566	3.785	0.234	47086.000	1000-3000	4.718	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**6.487**	**3.873**	**0.232**
STANDARD DEVIATION	0.239	0.089	0.006
COEFFICIENT OF VARIATION [%]	3.684	2.290	2.453

Comments:

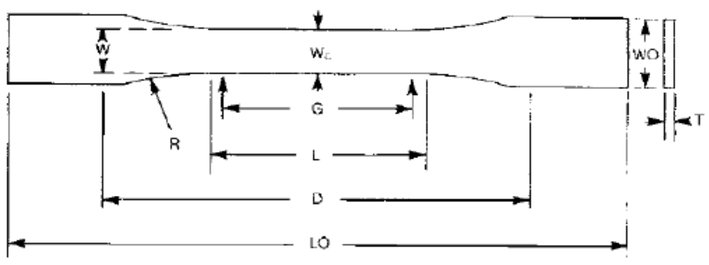
SPECIMENS 2-31 AND 2-33 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 2-31 AND 2-33 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
SPECIMEN 2-33 DOES NOT MEET THE REQUIREMENT FOR LENGTH AT NARROW SECTION(=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	24-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR15-1-T-X-1-2-31	0.127	0.128	0.127	0.751	0.751	0.501	0.500	0.501	6.512	0.001
NIAR-AR15-1-T-X-1-2-34	0.128	0.127	0.126	0.752	0.751	0.503	0.501	0.502	6.512	0.003
NIAR-AR15-2-T-X-1-2-31	0.127	0.126	0.127	0.752	0.750	0.500	0.500	0.500	6.510	0.001
NIAR-AR15-2-T-X-1-2-33	0.128	0.127	0.127	0.751	0.751	0.501	0.502	0.501	6.509	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR-15-X-T-Y-1-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR-15-1-T-Y-1-1-36	0.129	0.507	0.065	0.0	835.600	12.768	7.387	0.389	61985.000	1000-3000	9.829	69F / 41%	FAILURE AT GAGE
NIAR-AR-15-2-T-Y-1-1-34	0.129	0.507	0.065	0.0	857.368	13.142	7.572	0.397	62422.000	1000-3000	9.411	69F / 41%	FAILURE AT GAGE
NIAR-AR-15-2-T-Y-1-1-36	0.128	0.507	0.065	0.0	853.325	13.144	7.586	0.397	61657.500	1000-3000	8.653	69F / 41%	FAILURE AT GAGE
NIAR-AR-15-2-T-Y-1-1-37	0.128	0.508	0.065	0.0	852.793	13.076	7.553	0.394	61365.500	1000-3000	9.969	69F / 41%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**13.033**	**7.524**	**0.394**
STANDARD DEVIATION	0.179	0.092	0.004
COEFFICIENT OF VARIATION [%]	1.374	1.227	0.908

Comments:

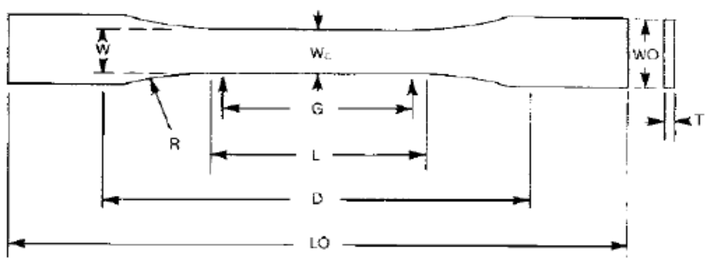
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-36, 2-34 AND 2-37 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR-15-1-T-Y-1-1-36	0.129	0.129	0.129	0.758	0.758	0.507	0.508	0.507	6.515	0.001
NIAR-AR-15-2-T-Y-1-1-34	0.129	0.129	0.128	0.756	0.758	0.507	0.507	0.507	6.516	0.001
NIAR-AR-15-2-T-Y-1-1-36	0.129	0.128	0.127	0.756	0.756	0.508	0.507	0.506	6.516	0.002
NIAR-AR-15-2-T-Y-1-1-37	0.130	0.128	0.128	0.757	0.758	0.509	0.508	0.507	6.517	0.003



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR15-X-T-Y-1-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR15-1-T-Y-1-2-26	0.127	0.503	0.064	0.0	598.527	9.378	5.640	0.324	53988.500	1000-3000	5.614	70F / 34%	FAILURE AT GAGE
NIAR-AR15-2-T-Y-1-2-26	0.127	0.503	0.064	0.0	616.837	9.691	5.930	0.329	53402.000	1000-3000	5.989	70F / 34%	FAILURE AT GAGE
NIAR-AR15-2-T-Y-1-2-28	0.127	0.502	0.064	0.0	621.724	9.787	5.974	0.331	53395.500	1000-3000	5.787	70F / 34%	FAILURE AT GAGE
NIAR-AR15-2-T-Y-1-2-29	0.127	0.503	0.064	0.0	618.002	9.674	5.843	0.329	53847.500	1000-3000	5.576	70F / 34%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.633**	**5.847**	**0.328**
STANDARD DEVIATION	0.177	0.148	0.003
COEFFICIENT OF VARIATION [%]	1.834	2.533	0.965

Comments:

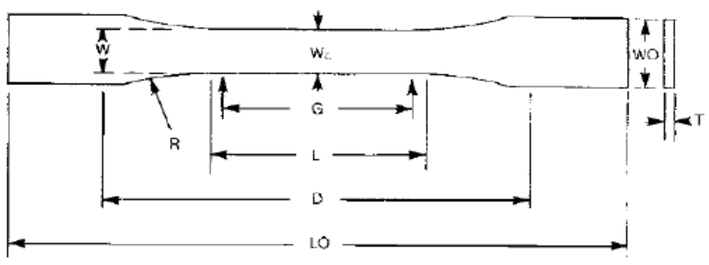
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-26, 2-26 AND 2-28 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
TESTER I	CHENG MIN	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR15-1-T-Y-1-2-26	0.127	0.127	0.126	0.753	0.752	0.504	0.503	0.502	6.509	0.001
NIAR-AR15-2-T-Y-1-2-26	0.128	0.126	0.126	0.754	0.753	0.503	0.503	0.503	6.514	0.002
NIAR-AR15-2-T-Y-1-2-28	0.128	0.126	0.126	0.754	0.754	0.502	0.502	0.501	6.515	0.002
NIAR-AR15-2-T-Y-1-2-29	0.128	0.126	0.127	0.754	0.753	0.503	0.502	0.502	6.517	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR-15-X-T-Z-1-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR-15-1-T-Z-1-1-31	0.128	0.501	0.064	0.0	557.441	8.686	6.286	0.353	32942.000	1000-3000	3.294	73F / 23%	FAILURE AT GAGE
NIAR-AR-15-1-T-Z-1-1-33	0.127	0.501	0.064	0.0	528.427	8.304	6.214	0.360	29626.500	1000-3000	2.963	73F / 23%	FAILURE AT GAGE
NIAR-AR-15-2-T-Z-1-1-31	0.127	0.500	0.064	0.0	525.156	8.232	6.263	0.354	29418.000	1000-3000	2.942	73F / 23%	FAILURE AT GAGE
NIAR-AR-15-2-T-Z-1-1-34	0.128	0.501	0.064	0.0	523.156	8.174	6.159	0.358	28651.000	1000-3000	2.865	73F / 23%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.349**	**6.231**	**0.356**
STANDARD DEVIATION	0.231	0.056	0.003
COEFFICIENT OF VARIATION [%]	2.764	0.902	0.915

Comments:

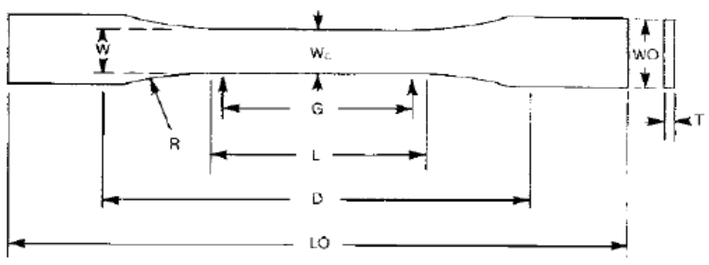
SPECIMENS 1-31, 1-33, 2-31 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638
SPECIMENS 1-31, 2-31 DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	CHENG MIN	15-Apr-20
DATA ENTRY/REDUCTION I	MING	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	21-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR-15-1-T-Z-1-1-31	0.130	0.127	0.127	0.749	0.751	0.500	0.501	0.500	6.507	0.003
NIAR-AR-15-1-T-Z-1-1-33	0.127	0.127	0.127	0.752	0.751	0.501	0.502	0.501	6.510	0.001
NIAR-AR-15-2-T-Z-1-1-31	0.128	0.128	0.127	0.748	0.750	0.501	0.500	0.500	6.506	0.001
NIAR-AR-15-2-T-Z-1-1-34	0.129	0.127	0.127	0.750	0.751	0.502	0.501	0.500	6.510	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-AR15-X-T-Z-1-4-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-AR15-1-T-Z-1-4-28	0.128	0.500	0.064	0.0	444.886	6.979	5.110	0.322	27805.000	1000-3000	2.781	71F / 19%	FAILURE AT GAGE
NIAR-AR15-1-T-Z-1-4-29	0.127	0.500	0.063	0.0	466.032	7.353	5.254	0.317	30972.500	1000-3000	3.097	71F / 19%	FAILURE AT GAGE
NIAR-AR15-2-T-Z-1-4-26	0.128	0.499	0.064	0.0	474.231	7.445	5.169	0.323	31169.500	1000-3000	3.117	71F / 19%	FAILURE AT GAGE
NIAR-AR15-2-T-Z-1-4-29	0.127	0.500	0.063	0.0	469.116	7.406	5.169	0.323	31021.500	1000-3000	3.102	71F / 19%	FAILURE AT GAGE

AVERAGE	**7.296**	**5.176**	**0.321**
STANDARD DEVIATION	0.215	0.059	0.003
COEFFICIENT OF VARIATION [%]	2.943	1.138	0.942

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

Comments:

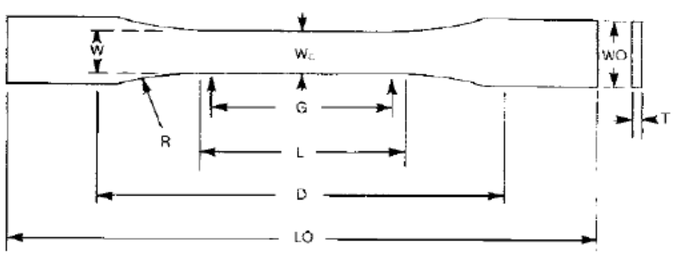
SPECIMENS 1-28, 2-26 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-26, 1-29 AND 2-28 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 2-29 DOES NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638
1-28, 1-29-, 2-29 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	JENNIFER	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-AR15-1-T-Z-1-4-28	0.129	0.127	0.126	0.748	0.751	0.500	0.500	0.500	6.505	0.003
NIAR-AR15-1-T-Z-1-4-29	0.127	0.127	0.127	0.749	0.751	0.501	0.499	0.499	6.506	0.000
NIAR-AR15-2-T-Z-1-4-26	0.129	0.127	0.126	0.748	0.749	0.500	0.499	0.499	6.507	0.003
NIAR-AR15-2-T-Z-1-4-29	0.128	0.126	0.126	0.748	0.750	0.500	0.500	0.499	6.504	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC2-5-X-T-X-2-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC2-5-1-T-X-2-7-1	0.128	0.500	0.064	0.0	600.532	9.388	5.293	0.307	69302.500	1000-3000	8.896	69F / 46%	FAILURE AT GAGE
NIAR-CC2-5-1-T-X-2-7-3	0.127	0.503	0.064	0.0	602.032	9.399	5.362	0.308	66734.500	1000-3000	8.146	69F / 46%	FAILURE AT GAGE
NIAR-CC2-5-2-T-X-2-7-1	0.127	0.503	0.064	0.0	623.762	9.733	5.559	0.318	66765.500	1000-3000	7.702	69F / 46%	FAILURE AT GAGE
NIAR-CC2-5-2-T-X-2-7-4	0.128	0.502	0.064	0.0	617.266	9.592	5.544	0.311	66139.500	1000-3000	8.471	69F / 46%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.528**	**5.439**	**0.311**
STANDARD DEVIATION	0.166	0.133	0.005
COEFFICIENT OF VARIATION [%]	1.740	2.439	1.543

Comments:

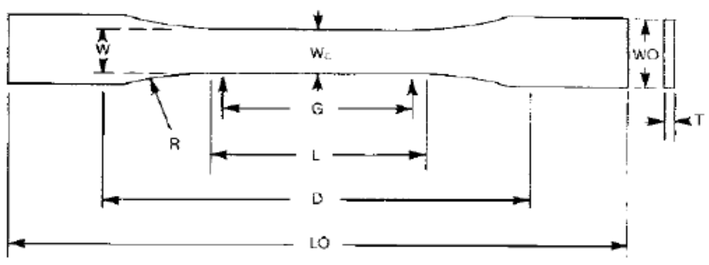
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-4 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-1, 1-3 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC2-5-1-T-X-2-7-1	0.127	0.128	0.128	0.751	0.751	0.500	0.501	0.500	6.511	0.001
NIAR-CC2-5-1-T-X-2-7-3	0.128	0.128	0.127	0.753	0.752	0.503	0.503	0.502	6.511	0.001
NIAR-CC2-5-2-T-X-2-7-1	0.128	0.128	0.127	0.751	0.751	0.505	0.501	0.503	6.515	0.001
NIAR-CC2-5-2-T-X-2-7-4	0.129	0.127	0.129	0.751	0.751	0.501	0.501	0.503	6.515	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC2-5-X-T-Y-2-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC2-5-1-T-Y-2-7-1	0.130	0.503	0.065	0.0	826.577	12.643	7.225	0.374	61071.000	1000-3000	6.969	69F / 41%	FAILURE AT GAGE
NIAR-CC2-5-2-T-Y-2-7-1	0.131	0.502	0.066	0.0	789.514	12.035	6.788	0.367	63138.000	1000-3000	7.976	69F / 41%	FAILURE AT GAGE
NIAR-CC2-5-2-T-Y-2-7-3	0.131	0.502	0.066	0.0	789.021	12.022	6.574	0.372	63302.500	1000-3000	7.735	69F / 41%	FAILURE AT GAGE
NIAR-CC2-5-2-T-Y-2-7-4	0.129	0.502	0.065	0.0	792.448	12.247	6.856	0.372	63441.000	1000-3000	8.078	69F / 41%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**12.237**	**6.861**	**0.371**
STANDARD DEVIATION	0.290	0.271	0.003
COEFFICIENT OF VARIATION [%]	2.368	3.953	0.835

Comments:

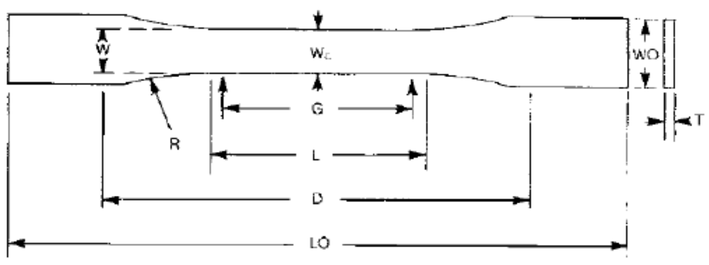
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-T-Y-2-7-1, 2-T-Y-2-7-1 AND 2-T-Y-2-7-4 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	RAMEESHA W.	3-Apr-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC2-5-1-T-Y-2-7-1	0.132	0.129	0.129	0.755	0.755	0.503	0.503	0.502	6.513	0.003
NIAR-CC2-5-2-T-Y-2-7-1	0.130	0.130	0.132	0.753	0.754	0.502	0.502	0.503	6.507	0.003
NIAR-CC2-5-2-T-Y-2-7-3	0.130	0.130	0.133	0.754	0.753	0.502	0.502	0.502	6.506	0.003
NIAR-CC2-5-2-T-Y-2-7-4	0.129	0.129	0.129	0.754	0.753	0.502	0.502	0.502	6.506	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC2-5-X-T-Z-2-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC2-5-1-T-Z-2-7-3	0.129	0.503	0.065	0.0	495.912	7.630	5.489	0.325	31010.500	1000-3000	3.101	71F / 19%	FAILURE AT GAGE
NIAR-CC2-5-1-T-Z-2-7-4	0.129	0.502	0.065	0.0	489.137	7.537	5.563	0.321	30622.000	1000-3000	3.062	71F / 19%	FAILURE AT GAGE
NIAR-CC2-5-2-T-Z-2-7-3	0.129	0.502	0.065	0.0	481.028	7.411	5.253	0.338	28255.000	1000-3000	2.826	71F / 19%	FAILURE AT GAGE
NIAR-CC2-5-2-T-Z-2-7-4	0.130	0.501	0.065	0.0	458.043	7.034	5.381	0.331	26349.500	1000-3000	2.635	71F / 19%	FAILURE AT GAGE

AVERAGE	**7.403**	**5.422**	**0.329**
STANDARD DEVIATION	0.262	0.135	0.008
COEFFICIENT OF VARIATION [%]	3.535	2.489	2.285

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

Comments:

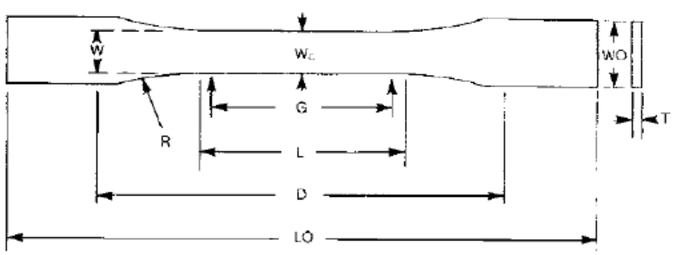
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 2-3 AND 2-4 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
ALL SPECIMENS EXCEPT 1-3 DO NOT MEET THE REQUIREMENT FOR OVERALL WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	24-Mar-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	JENNIFER	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC2-5-1-T-Z-2-7-3	0.129	0.129	0.129	0.752	0.751	0.503	0.502	0.505	6.505	0.001
NIAR-CC2-5-1-T-Z-2-7-4	0.129	0.130	0.130	0.751	0.750	0.502	0.502	0.502	6.506	0.001
NIAR-CC2-5-2-T-Z-2-7-3	0.130	0.129	0.129	0.752	0.750	0.502	0.502	0.501	6.504	0.001
NIAR-CC2-5-2-T-Z-2-7-4	0.129	0.130	0.131	0.751	0.750	0.502	0.502	0.501	6.504	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC2-10-X-T-X-2-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC2-10-1-T-X-2-8-6	0.127	0.502	0.064	0.0	612.709	9.620	5.464	0.322	66007.000	1000-3000	7.424	69F / 46%	FAILURE AT GAGE
NIAR-CC2-10-1-T-X-2-8-9	0.127	0.501	0.064	0.0	611.064	9.621	5.520	0.315	66745.500	1000-3000	9.114	69F / 46%	FAILURE AT GAGE
NIAR-CC2-10-2-T-X-2-8-6	0.127	0.502	0.064	0.0	638.691	9.975	5.698	0.327	66518.500	1000-3000	7.928	69F / 46%	FAILURE AT GAGE
NIAR-CC2-10-2-T-X-2-8-8	0.127	0.504	0.064	0.0	632.517	9.917	5.753	0.322	65161.500	1000-3000	7.820	69F / 46%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.783**	**5.609**	**0.322**
STANDARD DEVIATION	0.190	0.139	0.005
COEFFICIENT OF VARIATION [%]	1.938	2.469	1.456

Comments:

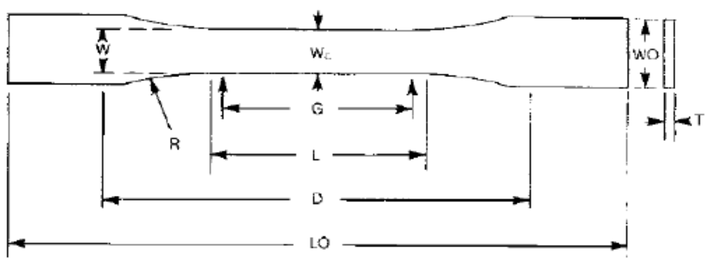
SPECIMENS 1-6, 1-9, 2-6 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-6 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-9 DOES NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC2-10-1-T-X-2-8-6	0.128	0.127	0.127	0.751	0.751	0.502	0.502	0.502	6.511	0.001
NIAR-CC2-10-1-T-X-2-8-9	0.127	0.127	0.127	0.752	0.752	0.501	0.502	0.501	6.511	0.000
NIAR-CC2-10-2-T-X-2-8-6	0.129	0.127	0.127	0.752	0.752	0.503	0.501	0.503	6.515	0.002
NIAR-CC2-10-2-T-X-2-8-8	0.127	0.126	0.127	0.753	0.752	0.505	0.503	0.503	6.514	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC2-10-X-T-Y-2-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC2-10-1-T-Y-2-8-8	0.127	0.501	0.064	0.0	837.280	13.128	7.703	0.384	62677.500	1000-3000	7.516	69F / 46%	FAILURE AT GAGE
NIAR-CC2-10-2-T-Y-2-8-6	0.126	0.501	0.063	0.0	799.887	12.631	7.208	0.382	64438.000	1000-3000	8.845	69F / 46%	FAILURE AT GAGE
NIAR-CC2-10-2-T-Y-2-8-8	0.127	0.501	0.064	0.0	797.995	12.566	7.206	0.377	64223.000	1000-3000	9.121	69F / 46%	FAILURE AT GAGE
NIAR-CC2-10-2-T-Y-2-8-9	0.127	0.502	0.064	0.0	799.742	12.585	7.369	0.376	63920.000	1000-3000	9.470	69F / 46%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**12.727**	**7.371**	**0.380**
STANDARD DEVIATION	0.268	0.234	0.004
COEFFICIENT OF VARIATION [%]	2.108	3.173	1.061

Comments:

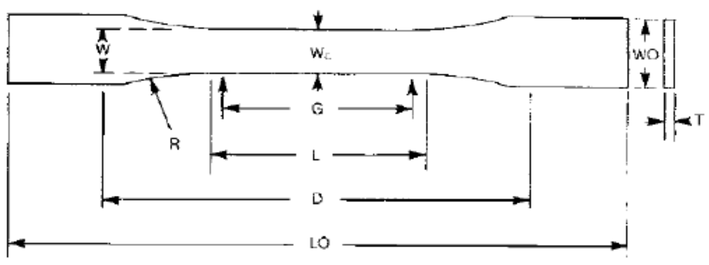
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 2-9 AND 2-9 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY T.	3-Apr-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC2-10-1-T-Y-2-8-8	0.128	0.127	0.127	0.753	0.753	0.501	0.501	0.501	6.512	0.002
NIAR-CC2-10-2-T-Y-2-8-6	0.127	0.127	0.125	0.754	0.752	0.501	0.501	0.501	6.515	0.002
NIAR-CC2-10-2-T-Y-2-8-8	0.127	0.127	0.126	0.754	0.753	0.501	0.501	0.501	6.513	0.001
NIAR-CC2-10-2-T-Y-2-8-9	0.127	0.126	0.126	0.754	0.752	0.503	0.502	0.501	6.514	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC2-10-X-T-Z-2-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC2-10-1-T-Z-2-8-6	0.128	0.502	0.064	0.0	498.138	7.753	5.708	0.326	31044.000	1000-3000	3.104	71F / 19%	FAILURE AT GAGE
NIAR-CC2-10-1-T-Z-2-8-9	0.128	0.502	0.064	0.0	498.279	7.767	5.504	0.338	30650.000	1000-3000	3.065	71F / 19%	FAILURE AT FILLET
NIAR-CC2-10-2-T-Z-2-8-8	0.128	0.503	0.064	0.0	458.719	7.128	5.903	0.332	25850.000	1000-3000	2.585	71F / 19%	FAILURE AT GAGE
NIAR-CC2-10-2-T-Z-2-8-9	0.128	0.502	0.064	0.0	492.746	7.686	5.601	0.337	29608.500	1000-3000	2.961	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.583**	**5.679**	**0.333**
STANDARD DEVIATION	0.305	0.171	0.005
COEFFICIENT OF VARIATION [%]	4.028	3.007	1.627

Comments:

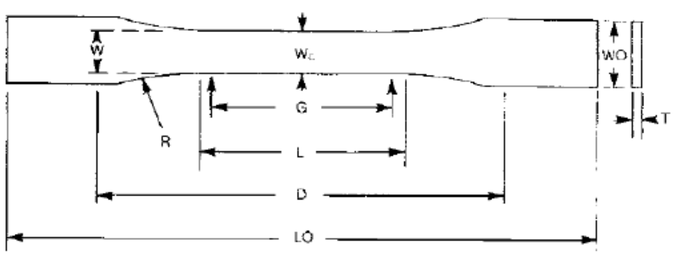
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-6 AND 1-9 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	JENNIFER	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC2-10-1-T-Z-2-8-6	0.128	0.128	0.128	0.752	0.751	0.502	0.502	0.501	6.503	0.001
NIAR-CC2-10-1-T-Z-2-8-9	0.128	0.128	0.128	0.752	0.751	0.504	0.502	0.502	6.505	0.000
NIAR-CC2-10-2-T-Z-2-8-8	0.128	0.127	0.128	0.751	0.751	0.506	0.501	0.503	6.503	0.001
NIAR-CC2-10-2-T-Z-2-8-9	0.128	0.127	0.128	0.751	0.751	0.502	0.501	0.503	6.504	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC2-15-X-T-X-2-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC2-15-1-T-X-2-9-13	0.127	0.501	0.064	0.0	625.482	9.794	5.555	0.327	66287.000	1000-3000	8.231	70F / 29%	FAILURE AT GAGE
NIAR-CC2-15-1-T-X-2-9-14	0.127	0.502	0.064	0.0	610.009	9.538	5.533	0.313	66053.500	1000-3000	8.787	70F / 29%	FAILURE AT GAGE
NIAR-CC2-15-2-T-X-2-9-11	0.128	0.502	0.064	0.0	628.044	9.773	5.633	0.318	65663.000	1000-3000	7.552	70F / 29%	FAILURE AT GAGE
NIAR-CC2-15-2-T-X-2-9-13	0.128	0.501	0.064	0.0	632.721	9.876	5.757	0.322	67079.500	1000-3000	8.523	70F / 29%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.745**	**5.620**	**0.320**
STANDARD DEVIATION	0.145	0.101	0.006
COEFFICIENT OF VARIATION [%]	1.487	1.799	1.829

Comments:

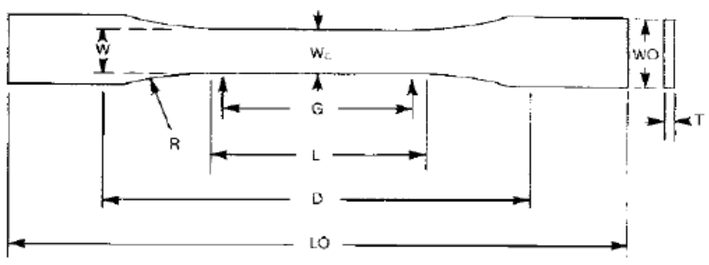
SPECIMENS 1-13 AND 2-11 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-14 AND 2-11 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC2-15-1-T-X-2-9-13	0.128	0.127	0.128	0.752	0.751	0.501	0.501	0.501	6.510	0.001
NIAR-CC2-15-1-T-X-2-9-14	0.128	0.127	0.128	0.752	0.752	0.502	0.502	0.503	6.512	0.001
NIAR-CC2-15-2-T-X-2-9-11	0.128	0.128	0.128	0.752	0.752	0.502	0.502	0.502	6.516	0.001
NIAR-CC2-15-2-T-X-2-9-13	0.127	0.128	0.128	0.752	0.751	0.501	0.501	0.501	6.515	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC2-15-X-T-Y-2-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC2-15-1-T-Y-2-9-11	0.129	0.503	0.065	0.0	848.570	13.078	7.325	0.389	62200.000	1000-3000	8.345	71F / 19%	FAILURE AT GAGE
NIAR-CC2-15-2-T-Y-2-9-11	0.129	0.503	0.065	0.0	805.666	12.416	7.168	0.373	62882.500	1000-3000	8.361	71F / 19%	FAILURE AT GAGE
NIAR-CC2-15-2-T-Y-2-9-13	0.129	0.503	0.065	0.0	807.722	12.495	6.810	0.384	62455.000	1000-3000	8.968	71F / 19%	FAILURE AT GAGE
NIAR-CC2-15-2-T-Y-2-9-14	0.129	0.504	0.065	0.0	810.357	12.509	6.804	0.384	63345.500	1000-3000	7.604	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**12.625**	**7.027**	**0.383**
STANDARD DEVIATION	0.305	0.262	0.007
COEFFICIENT OF VARIATION [%]	2.418	3.722	1.791

Comments:

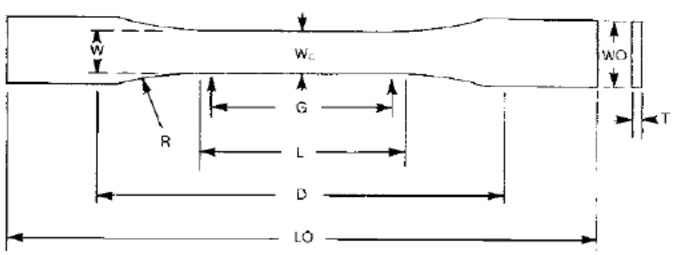
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 2-11 AND 2-13 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	3-Apr-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	JENNIFER	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC2-15-1-T-Y-2-9-11	0.129	0.129	0.129	0.754	0.754	0.503	0.503	0.503	6.519	0.000
NIAR-CC2-15-2-T-Y-2-9-11	0.129	0.129	0.129	0.754	0.753	0.503	0.503	0.503	6.514	0.000
NIAR-CC2-15-2-T-Y-2-9-13	0.129	0.128	0.129	0.754	0.753	0.503	0.503	0.503	6.514	0.000
NIAR-CC2-15-2-T-Y-2-9-14	0.128	0.129	0.129	0.754	0.753	0.504	0.504	0.504	6.514	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC2-15-X-T-Z-2-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC2-15-1-T-Z-2-9-13	0.129	0.503	0.065	0.0	514.914	7.913	5.275	0.343	31932.500	1000-3000	3.193	71F / 19%	FAILURE AT GAGE
NIAR-CC2-15-1-T-Z-2-9-14	0.129	0.503	0.065	0.0	509.152	7.852	5.664	0.333	31214.000	1000-3000	3.121	71F / 19%	FAILURE AT GAGE
NIAR-CC2-15-2-T-Z-2-9-11	0.130	0.502	0.065	0.0	480.525	7.386	5.496	0.338	27823.500	1000-3000	2.782	71F / 19%	FAILURE AT GAGE
NIAR-CC2-15-2-T-Z-2-9-13	0.130	0.503	0.065	0.0	494.276	7.583	5.619	0.337	28820.000	1000-3000	2.882	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.684**	**5.514**	**0.338**
STANDARD DEVIATION	0.245	0.174	0.004
COEFFICIENT OF VARIATION [%]	3.184	3.164	1.248

Comments:

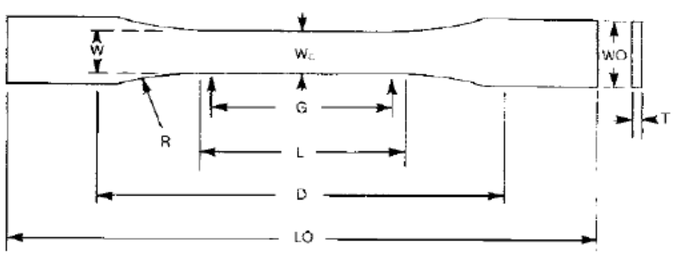
SPECIMENS 15-1-T-Z-2-9-13, 15-2-T-Z-2-9-X (11,13) DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 15-1-T-Z-2-9-13, 15-2-T-Z-2-9-11 DO NOT MEET Width Overall (WO) 0.75" ≤ WO ≤ 1.00" PER ASTM D638
SPECIMENS 15-1-T-Z-2-9-14, 15-2-T-Z-2-9-13 DO NOT MEET Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	24-Mar-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	JENNIFER	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC2-15-1-T-Z-2-9-13	0.129	0.129	0.130	0.752	0.750	0.505	0.502	0.503	6.503	0.001
NIAR-CC2-15-1-T-Z-2-9-14	0.129	0.129	0.128	0.753	0.753	0.503	0.503	0.504	6.510	0.001
NIAR-CC2-15-2-T-Z-2-9-11	0.129	0.130	0.130	0.751	0.750	0.503	0.502	0.502	6.503	0.000
NIAR-CC2-15-2-T-Z-2-9-13	0.129	0.130	0.130	0.752	0.750	0.503	0.503	0.502	6.507	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC3-5-X-T-X-3-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC3-5-1-T-X-3-7-1	0.128	0.501	0.064	0.0	681.567	10.628	6.288	0.338	65456.000	1000-3000	8.054	70F / 29%	FAILURE AT GAGE
NIAR-CC3-5-1-T-X-3-7-3	0.128	0.501	0.064	0.0	674.847	10.527	6.060	0.335	66490.000	1000-3000	8.264	70F / 29%	FAILURE AT GAGE
NIAR-CC3-5-2-T-X-3-7-1	0.127	0.500	0.064	0.0	652.712	10.252	5.944	0.325	67265.000	1000-3000	8.568	70F / 29%	FAILURE AT GAGE
NIAR-CC3-5-2-T-X-3-7-4	0.127	0.502	0.064	0.0	655.089	10.244	5.888	0.323	68227.500	1000-3000	8.440	70F / 29%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**10.413**	**6.045**	**0.330**
STANDARD DEVIATION	0.194	0.177	0.007
COEFFICIENT OF VARIATION [%]	1.868	2.927	2.206

Comments:

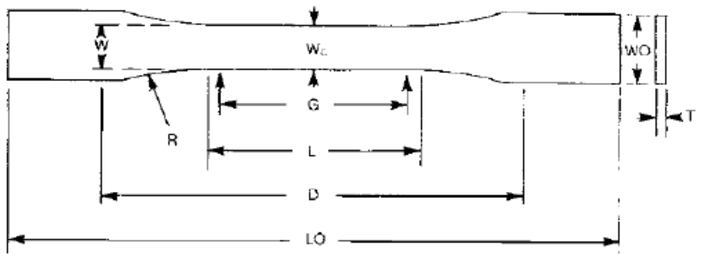
SPECIMENS 1-3 AND 2-1 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS EXCEPT 1-3 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY	25-Mar-20
TESTER I	CHENG MIN	17-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC3-5-1-T-X-3-7-1	0.129	0.127	0.127	0.752	0.752	0.501	0.502	0.501	6.519	0.002
NIAR-CC3-5-1-T-X-3-7-3	0.129	0.128	0.127	0.752	0.751	0.503	0.501	0.501	6.519	0.001
NIAR-CC3-5-2-T-X-3-7-1	0.128	0.127	0.127	0.751	0.751	0.500	0.500	0.500	6.520	0.001
NIAR-CC3-5-2-T-X-3-7-4	0.129	0.127	0.127	0.752	0.751	0.502	0.502	0.502	6.518	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC3-5-X-T-Y-3-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC3-5-1-T-Y-3-7-3	0.123	0.501	0.062	0.0	781.521	12.678	7.895	0.353	63633.500	7.119	1000-3000	72F / 29%	FAILURE AT FILLET
NIAR-CC3-5-1-T-Y-3-7-4	0.122	0.501	0.061	0.0	782.790	12.810	7.340	0.373	62637.000	6.440	1000-3000	72F / 29%	FAILURE AT FILLET
NIAR-CC3-5-2-T-Y-3-7-1	0.123	0.501	0.061	0.0	781.422	12.728	7.218	0.371	58154.000	5.954	1000-3000	72F / 29%	FAILURE AT FILLET
NIAR-CC3-5-2-T-Y-3-7-3	0.123	0.501	0.062	0.0	784.782	12.744	7.452	0.366	60946.000	6.124	1000-3000	72F / 29%	FAILURE AT FILLET
NIAR-CC3-5-2-T-Y-3-7-4	0.122	0.500	0.061	0.0	786.545	12.856	7.445	0.367	61423.000	6.514	1000-3000	72F / 29%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**12.763**	**7.470**	**0.366**
STANDARD DEVIATION	0.070	0.256	0.008
COEFFICIENT OF VARIATION [%]	0.549	3.427	2.179

Comments:

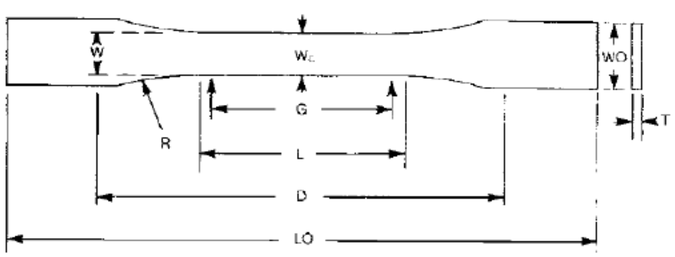
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	24-Mar-20
TESTER I	CHENG MIN	16-Apr-20
DATA ENTRY/REDUCTION I	CONOR	17-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC3-5-1-T-Y-3-7-3	0.123	0.122	0.124	0.754	0.754	0.501	0.501	0.501	6.511	0.002
NIAR-CC3-5-1-T-Y-3-7-4	0.122	0.121	0.123	0.754	0.754	0.501	0.501	0.501	6.510	0.002
NIAR-CC3-5-2-T-Y-3-7-1	0.123	0.122	0.123	0.753	0.753	0.502	0.501	0.501	6.515	0.001
NIAR-CC3-5-2-T-Y-3-7-3	0.124	0.122	0.123	0.754	0.753	0.501	0.500	0.501	6.516	0.001
NIAR-CC3-5-2-T-Y-3-7-4	0.123	0.121	0.122	0.753	0.752	0.501	0.500	0.501	6.514	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC3-5-X-T-Z-3-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC3-5-1-T-Z-3-7-1	0.130	0.503	0.065	0.0	465.986	7.153	5.027	0.315	29974.000	1000-3000	2.997	71F / 19%	FAILURE AT GAGE
NIAR-CC3-5-1-T-Z-3-7-4	0.130	0.503	0.065	0.0	468.636	7.185	5.296	0.303	30674.000	1000-3000	3.067	71F / 19%	FAILURE AT GAGE
NIAR-CC3-5-2-T-Z-3-7-3	0.129	0.502	0.065	0.0	450.304	6.937	4.878	0.313	29773.000	1000-3000	2.977	71F / 19%	FAILURE AT GAGE
NIAR-CC3-5-2-T-Z-3-7-4	0.129	0.501	0.065	0.0	443.050	6.853	5.060	0.305	29286.000	1000-3000	2.929	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.032**	**5.065**	**0.309**
STANDARD DEVIATION	0.163	0.173	0.006
COEFFICIENT OF VARIATION [%]	2.312	3.416	1.972

Comments:

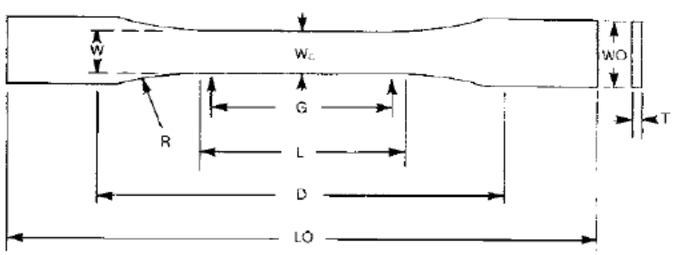
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	26-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	26-Mar-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	JENNIFER	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC3-5-1-T-Z-3-7-1	0.130	0.129	0.130	0.754	0.751	0.504	0.502	0.503	6.504	0.001
NIAR-CC3-5-1-T-Z-3-7-4	0.130	0.130	0.129	0.752	0.751	0.505	0.502	0.503	6.505	0.001
NIAR-CC3-5-2-T-Z-3-7-3	0.129	0.128	0.131	0.750	0.750	0.503	0.501	0.502	6.501	0.002
NIAR-CC3-5-2-T-Z-3-7-4	0.129	0.129	0.129	0.750	0.753	0.501	0.501	0.501	6.503	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC3-10-X-T-X-3-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC3-10-1-T-X-3-8-6	0.128	0.502	0.064	0.0	669.568	10.405	6.035	0.335	65705.500	1000-3000	7.613	70F / 29%	FAILURE AT GAGE
NIAR-CC3-10-1-T-X-3-8-8	0.127	0.501	0.064	0.0	686.295	10.746	6.242	0.344	66371.000	1000-3000	8.794	70F / 29%	FAILURE AT GAGE
NIAR-CC3-10-2-T-X-3-8-8	0.128	0.501	0.064	0.0	680.889	10.651	6.183	0.335	67601.500	1000-3000	8.944	70F / 29%	FAILURE AT GAGE
NIAR-CC3-10-2-T-X-3-8-9	0.127	0.502	0.064	0.0	664.014	10.410	6.007	0.328	66287.500	1000-3000	7.881	70F / 29%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**10.553**	**6.117**	**0.335**
STANDARD DEVIATION	0.172	0.114	0.007
COEFFICIENT OF VARIATION [%]	1.633	1.859	1.985

Comments:

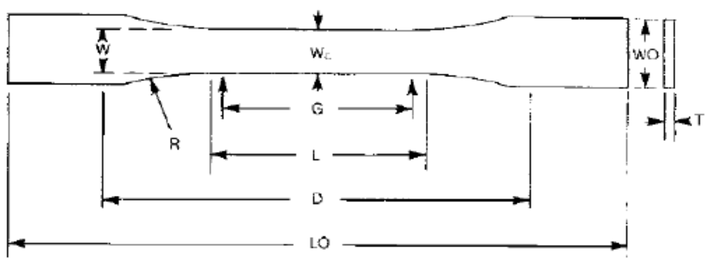
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-9 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY	25-Mar-20
TESTER I	CHENG MIN	17-Apr-20
DATA ENTRY/REDUCTION I	ZHI	22-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY		

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC3-10-1-T-X-3-8-6	0.129	0.128	0.128	0.752	0.752	0.502	0.502	0.501	6.516	0.001
NIAR-CC3-10-1-T-X-3-8-8	0.128	0.127	0.127	0.751	0.753	0.502	0.501	0.501	6.516	0.000
NIAR-CC3-10-2-T-X-3-8-8	0.129	0.127	0.127	0.752	0.752	0.501	0.501	0.500	6.518	0.002
NIAR-CC3-10-2-T-X-3-8-9	0.128	0.127	0.127	0.752	0.752	0.502	0.502	0.502	6.519	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC3-10-X-T-Y-3-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC3-10-1-T-Y-3-8-6	0.128	0.503	0.064	0.0	874.701	13.589	7.441	0.398	65249.500	1000-3000		68F / 32%	FAILURE AT GAGE
NIAR-CC3-10-2-T-Y-3-8-6	0.127	0.504	0.064	0.0	884.752	13.806	7.493	0.402	63631.500	1000-3000		68F / 32%	FAILURE AT GAGE
NIAR-CC3-10-2-T-Y-3-8-8	0.127	0.503	0.064	0.0	885.055	13.827	7.561	0.402	62991.000	1000-3000		68F / 32%	FAILURE AT GAGE
NIAR-CC3-10-2-T-Y-3-8-9	0.127	0.503	0.064	0.0	884.945	13.854	7.689	0.399	62878.000	1000-3000		68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**13.769**	**7.546**	**0.400**
STANDARD DEVIATION	0.121	0.107	0.002
COEFFICIENT OF VARIATION [%]	0.882	1.420	0.472

Comments:

ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

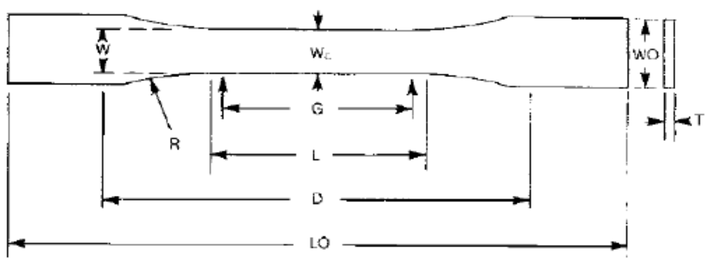
GRIP PRESSURE: 150 psi

ELONGATION AT BREAK ARE NOT REPORTED FOR ALL SPECIMENS DUE TO EXTENSOMETER SLIPPAGE PRIOR TO SPECIMEN FRACTURE

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY T.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC3-10-1-T-Y-3-8-6	0.128	0.129	0.127	0.756	0.754	0.503	0.503	0.502	6.510	0.002
NIAR-CC3-10-2-T-Y-3-8-6	0.128	0.127	0.127	0.755	0.754	0.503	0.504	0.504	6.514	0.001
NIAR-CC3-10-2-T-Y-3-8-8	0.127	0.127	0.127	0.755	0.753	0.503	0.504	0.503	6.519	0.000
NIAR-CC3-10-2-T-Y-3-8-9	0.127	0.127	0.126	0.755	0.753	0.504	0.503	0.503	6.521	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC3-10-X-T-Z-3-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC3-10-1-T-Z-3-8-6	0.129	0.505	0.065	0.0	569.887	8.737	6.601	0.350	31779.500	1000-3000	3.178	73F / 23%	FAILURE AT GAGE
NIAR-CC3-10-1-T-Z-3-8-9	0.129	0.505	0.065	0.0	525.497	8.043	6.248	0.360	27378.000	1000-3000	2.738	73F / 23%	FAILURE AT GAGE
NIAR-CC3-10-2-T-Z-3-8-8	0.130	0.502	0.065	0.0	535.425	8.189	5.796	0.360		1000-3000		73F / 23%	FAILURE AT GAGE
NIAR-CC3-10-2-T-Z-3-8-9	0.128	0.503	0.065	0.0	504.975	7.829	6.027	0.357	27473.000	1000-3000	2.747	73F / 23%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.199**	**6.168**	**0.357**
STANDARD DEVIATION	0.388	0.343	0.005
COEFFICIENT OF VARIATION [%]	4.729	5.557	1.396

Comments:

ALL SPECIMENS EXCEPT 1-9 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS EXCEPT 1-9 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
SPECIMENS 1-6 AND 1-9 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (2.25" ± 0.02") PER ASTM D638

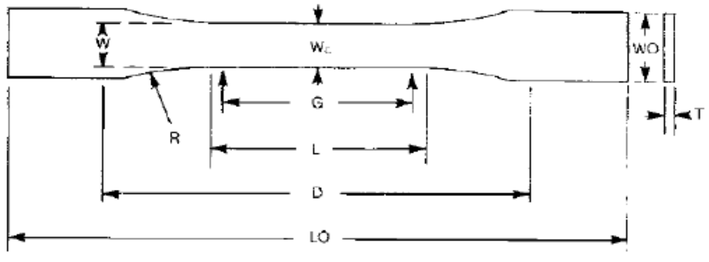
GRIP PRESSURE: 150 psi

FINAL STRAIN AND ELONGATION AT BREAK ARE NOT REPORTED FOR NIAR-CC3-10-2-T-Z-3-8-8 DUE TO EXTENSOMETER SLIPPAGE.

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	CHENG MIN	15-Apr-20
DATA ENTRY/REDUCTION I	MING	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	21-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC3-10-1-T-Z-3-8-6	0.130	0.128	0.129	0.753	0.752	0.505	0.505	0.505	6.505	0.002
NIAR-CC3-10-1-T-Z-3-8-9	0.130	0.129	0.130	0.751	0.750	0.505	0.504	0.505	6.507	0.001
NIAR-CC3-10-2-T-Z-3-8-8	0.131	0.130	0.130	0.750	0.751	0.502	0.502	0.501	6.502	0.001
NIAR-CC3-10-2-T-Z-3-8-9	0.128	0.128	0.129	0.751	0.750	0.503	0.503	0.503	6.504	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC3-15-X-T-X-3-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC3-15-1-T-X-3-9-13	0.127	0.502	0.064	0.0	684.234	10.729	6.449	0.339	62509.500	1000-3000	7.110	70F / 29%	FAILURE AT GAGE
NIAR-CC3-15-1-T-X-3-9-14	0.127	0.503	0.064	0.0	701.168	10.953	6.588	0.348	65543.500	1000-3000	7.891	70F / 29%	FAILURE AT GAGE
NIAR-CC3-15-2-T-X-3-9-11	0.127	0.502	0.064	0.0	660.103	10.311	6.038	0.330	63774.500	1000-3000	7.982	70F / 29%	FAILURE AT GAGE
NIAR-CC3-15-2-T-X-3-9-13	0.128	0.503	0.064	0.0	660.343	10.296	6.064	0.326	63642.000	1000-3000	7.073	70F / 29%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**10.572**	**6.285**	**0.335**
STANDARD DEVIATION	0.324	0.276	0.010
COEFFICIENT OF VARIATION [%]	3.060	4.387	2.956

Comments:

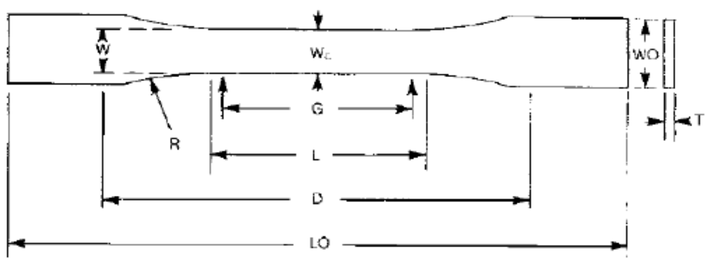
SPECIMENS 1-14 AND 2-13 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-14 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	17-Apr-20
DATA ENTRY/REDUCTION I	ZHI	22-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY		

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC3-15-1-T-X-3-9-13	0.127	0.127	0.127	0.753	0.751	0.502	0.502	0.502	6.513	0.001
NIAR-CC3-15-1-T-X-3-9-14	0.127	0.128	0.127	0.753	0.752	0.505	0.502	0.504	6.514	0.001
NIAR-CC3-15-2-T-X-3-9-11	0.128	0.127	0.128	0.752	0.752	0.503	0.502	0.502	6.515	0.001
NIAR-CC3-15-2-T-X-3-9-13	0.127	0.128	0.127	0.752	0.751	0.504	0.502	0.502	6.515	0.001



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC3-15-X-T-Y-3-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC3-15-1-T-Y-3-9-13	0.128	0.506	0.065	0.0	886.062	13.628	7.811	0.391	64765.000	1000-3000	29.679	70F / 42%	FAILURE AT GAGE
NIAR-CC3-15-2-T-Y-3-9-11	0.129	0.507	0.065	0.0	896.358	13.719	7.830	0.389	63336.500	1000-3000	7.819	70F / 42%	FAILURE AT GAGE
NIAR-CC3-15-2-T-Y-3-9-13	0.128	0.507	0.065	0.0	892.480	13.772	7.929	0.392	63341.000	1000-3000	7.229	70F / 42%	FAILURE AT GAGE
NIAR-CC3-15-2-T-Y-3-9-14	0.128	0.507	0.065	0.0	896.479	13.800	7.906	0.392	62588.500	1000-3000	7.709	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**13.729**	**7.869**	**0.391**
STANDARD DEVIATION	0.076	0.057	0.002
COEFFICIENT OF VARIATION [%]	0.552	0.728	0.404

Comments:

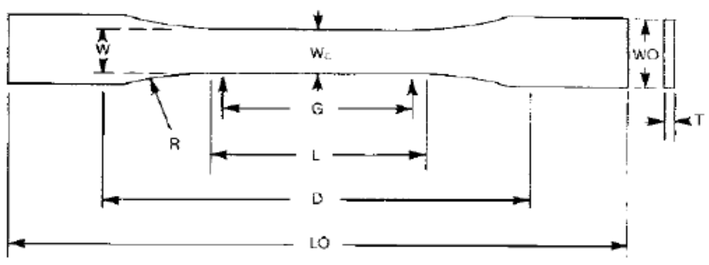
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-13, 2-14 DOES NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	24-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC3-15-1-T-Y-3-9-13	0.129	0.129	0.128	0.756	0.758	0.507	0.507	0.506	6.526	0.001
NIAR-CC3-15-2-T-Y-3-9-11	0.130	0.129	0.128	0.756	0.757	0.508	0.506	0.506	6.524	0.002
NIAR-CC3-15-2-T-Y-3-9-13	0.128	0.128	0.127	0.757	0.757	0.508	0.507	0.507	6.536	0.001
NIAR-CC3-15-2-T-Y-3-9-14	0.129	0.128	0.128	0.757	0.755	0.507	0.508	0.507	6.535	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC3-15-X-T-Z-3-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC3-15-1-T-Z-3-9-13	0.130	0.506	0.066	0.0	524.446	7.952	6.138	0.361	26980.000	2.698	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CC3-15-1-T-Z-3-9-14	0.130	0.508	0.066	0.0	558.244	8.451	6.629	0.352	30152.000	3.015	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CC3-15-2-T-Z-3-9-13	0.130	0.505	0.066	0.0	523.060	7.967	5.956	0.358	28357.000	2.836	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CC3-15-2-T-Z-3-9-14	0.130	0.506	0.066	0.0	525.940	7.994	5.697	0.369	28311.500	2.831	1000-3000	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.091**	**6.105**	**0.360**
STANDARD DEVIATION	0.241	0.393	0.007
COEFFICIENT OF VARIATION [%]	2.973	6.443	2.021

Comments:

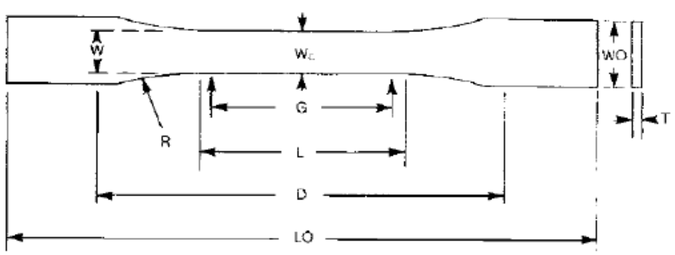
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-13 AND 2-13 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
SPECIMEN 2-13 DOES NOT MEET THE REQUIREMENT FOR OVERALL WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638
SPECIMENS 1-13 AND 2-13 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	24-Mar-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	CONOR	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC3-15-1-T-Z-3-9-13	0.130	0.130	0.131	0.753	0.751	0.508	0.506	0.506	6.507	0.001
NIAR-CC3-15-1-T-Z-3-9-14	0.131	0.129	0.130	0.755	0.753	0.508	0.508	0.508	6.511	0.002
NIAR-CC3-15-2-T-Z-3-9-13	0.130	0.131	0.130	0.750	0.748	0.507	0.504	0.503	6.505	0.001
NIAR-CC3-15-2-T-Z-3-9-14	0.130	0.130	0.130	0.753	0.751	0.507	0.505	0.506	6.510	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC20-X-T-X-2-3-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC20-1-T-X-2-3-18	0.127	0.500	0.064	0.0	611.165	9.592	5.415	0.316	68104.500	1000-3000	8.551	70F / 42%	FAILURE AT GAGE
NIAR-CC20-1-T-X-2-3-19	0.127	0.501	0.064	0.0	618.414	9.702	5.554	0.317	67333.000	1000-3000	8.564	70F / 42%	FAILURE AT GAGE
NIAR-CC20-2-T-X-2-3-18	0.127	0.500	0.063	0.0	625.669	9.859	5.720	0.319	65042.500	1000-3000	7.925	70F / 42%	FAILURE AT GAGE
NIAR-CC20-2-T-X-2-3-19	0.128	0.500	0.064	0.0	619.457	9.679	5.434	0.315	67462.000	1000-3000	8.387	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.708**	**5.531**	**0.317**
STANDARD DEVIATION	0.111	0.140	0.002
COEFFICIENT OF VARIATION [%]	1.144	2.531	0.568

Comments:

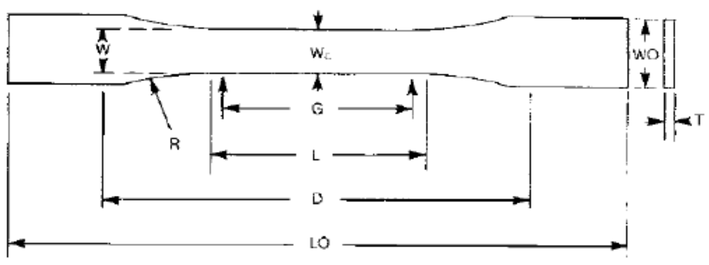
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-T-X-2-3 (18,19) AND 2-T-18-2-3 Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY	25-Mar-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	24-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC20-1-T-X-2-3-18	0.127	0.127	0.128	0.751	0.750	0.500	0.500	0.500	6.514	0.000
NIAR-CC20-1-T-X-2-3-19	0.128	0.127	0.127	0.752	0.751	0.501	0.501	0.501	6.515	0.001
NIAR-CC20-2-T-X-2-3-18	0.127	0.127	0.127	0.750	0.750	0.500	0.500	0.499	6.516	0.000
NIAR-CC20-2-T-X-2-3-19	0.128	0.128	0.128	0.751	0.751	0.500	0.500	0.501	6.519	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC20-X-T-Y-2-6-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC20-1-T-Y-2-6-19	0.128	0.504	0.064	0.0	824.859	12.802	7.255	0.379	62409.500	1000-3000	8.205	70F / 42%	FAILURE AT GAGE
NIAR-CC20-2-T-Y-2-6-16	0.127	0.504	0.064	0.0	787.341	12.265	6.968	0.371	63497.500	1000-3000	9.398	70F / 42%	FAILURE AT GAGE
NIAR-CC20-2-T-Y-2-6-18	0.128	0.502	0.064	0.0	788.150	12.280	6.981	0.370	64721.500	1000-3000	9.427	70F / 42%	FAILURE AT GAGE
NIAR-CC20-2-T-Y-2-6-19	0.128	0.503	0.065	0.0	787.695	12.197	6.998	0.365	63556.000	1000-3000	7.792	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**12.386**	**7.050**	**0.371**
STANDARD DEVIATION	0.280	0.137	0.006
COEFFICIENT OF VARIATION [%]	2.259	1.941	1.504

Comments:

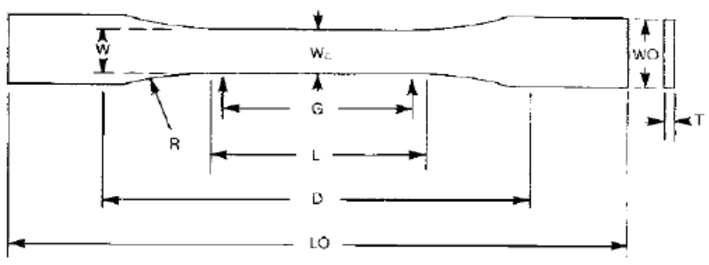
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	24-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC20-1-T-Y-2-6-19	0.128	0.128	0.128	0.753	0.754	0.505	0.503	0.503	6.512	0.001
NIAR-CC20-2-T-Y-2-6-16	0.127	0.127	0.128	0.754	0.752	0.504	0.503	0.504	6.504	0.000
NIAR-CC20-2-T-Y-2-6-18	0.128	0.128	0.127	0.754	0.752	0.503	0.501	0.502	6.503	0.001
NIAR-CC20-2-T-Y-2-6-19	0.128	0.128	0.128	0.755	0.753	0.504	0.503	0.503	6.507	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC20-X-T-Z-2-6-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC20-1-T-Z-2-6-16	0.127	0.503	0.064	0.0	449.772	7.045	5.335	0.336	26167.000	1000-3000	2.617	70F / 25%	FAILURE AT GAGE
NIAR-CC20-1-T-Z-2-6-18	0.128	0.501	0.064	0.0	486.277	7.596	5.529	0.329	29909.000	1000-3000	2.991	70F / 25%	FAILURE AT GAGE
NIAR-CC20-2-T-Z-2-6-16	0.127	0.503	0.064	0.0	453.385	7.123	5.419	0.327	27174.000	1000-3000	2.717	70F / 25%	FAILURE AT GAGE
NIAR-CC20-2-T-Z-2-6-19	0.128	0.501	0.064	0.0	453.596	7.074	5.413	0.333	26352.500	1000-3000	2.635	70F / 25%	FAILURE AT GAGE

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.20	in/min

AVERAGE	**7.210**	**5.424**	**0.332**
STANDARD DEVIATION	0.259	0.080	0.004
COEFFICIENT OF VARIATION [%]	3.599	1.466	1.225

Comments:

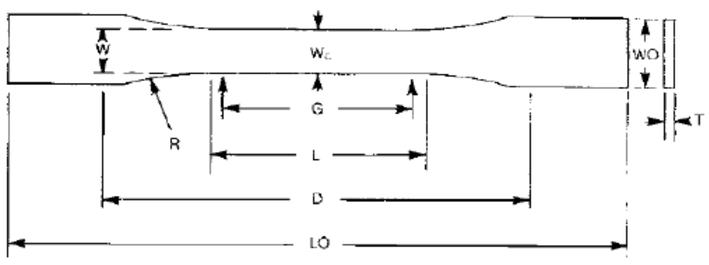
SPECIMENS 1-18, 2-16, 2-19 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 1-16 DOES NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638
SPECIMENS 1-18, 2-19 DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 200 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	ERIC	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC20-1-T-Z-2-6-16	0.127	0.127	0.127	0.753	0.752	0.503	0.504	0.503	6.512	0.001
NIAR-CC20-1-T-Z-2-6-18	0.130	0.128	0.126	0.751	0.749	0.502	0.501	0.501	6.507	0.004
NIAR-CC20-2-T-Z-2-6-16	0.127	0.126	0.126	0.752	0.751	0.503	0.503	0.503	6.512	0.001
NIAR-CC20-2-T-Z-2-6-19	0.130	0.127	0.127	0.751	0.748	0.501	0.501	0.501	6.506	0.003



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC25-X-T-X-2-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC25-1-T-X-2-2-23	0.129	0.502	0.065	0.0	602.634	9.341	5.316	0.310	65081.000	1000-3000	7.493	69F / 41%	FAILURE AT GAGE
NIAR-CC25-1-T-X-2-2-24	0.128	0.502	0.064	0.0	600.946	9.335	5.052	0.315	66467.000	1000-3000	8.114	69F / 41%	FAILURE AT GAGE
NIAR-CC25-2-T-X-2-2-23	0.129	0.501	0.065	0.0	612.570	9.456	5.289	0.311	65719.000	1000-3000	8.399	69F / 41%	FAILURE AT GAGE
NIAR-CC25-2-T-X-2-2-24	0.128	0.502	0.064	0.0	609.630	9.456	5.297	0.313	65192.500	1000-3000	7.691	69F / 41%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.397**	**5.238**	**0.312**
STANDARD DEVIATION	0.068	0.125	0.002
COEFFICIENT OF VARIATION [%]	0.724	2.387	0.688

Comments:

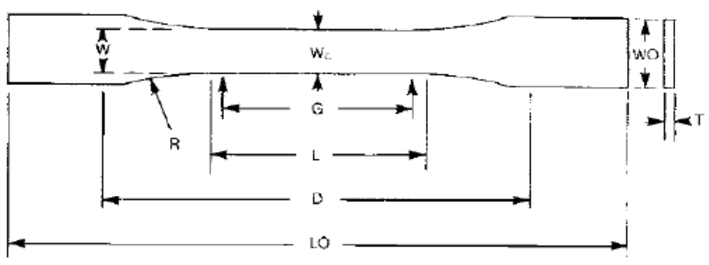
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 11-23, 1-24 AND 2-23 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	RAMEESHA W.	3-Apr-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC25-1-T-X-2-2-23	0.129	0.129	0.129	0.752	0.752	0.502	0.502	0.502	6.508	0.000
NIAR-CC25-1-T-X-2-2-24	0.128	0.128	0.128	0.752	0.751	0.502	0.502	0.503	6.510	0.000
NIAR-CC25-2-T-X-2-2-23	0.128	0.128	0.132	0.752	0.751	0.501	0.502	0.501	6.518	0.004
NIAR-CC25-2-T-X-2-2-24	0.128	0.129	0.128	0.752	0.753	0.502	0.502	0.502	6.520	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC25-X-T-Y-2-3-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC25-1-T-Y-2-3-23	0.129	0.503	0.065	0.0	813.869	12.510	6.967	0.374	62777.000	1000-3000	8.344	70F / 40%	FAILURE AT GAGE
NIAR-CC25-2-T-Y-2-3-21	0.129	0.504	0.065	0.0	771.185	11.869	6.823	0.359	64105.500	1000-3000	8.993	70F / 40%	FAILURE AT GAGE
NIAR-CC25-2-T-Y-2-3-23	0.130	0.504	0.065	0.0	762.596	11.683	6.652	0.358	62535.500	1000-3000	7.363	70F / 40%	FAILURE AT GAGE
NIAR-CC25-2-T-Y-2-3-24	0.129	0.504	0.065	0.0	769.317	11.818	6.487	0.367	63035.500	1000-3000	9.714	70F / 40%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**11.970**	**6.732**	**0.365**
STANDARD DEVIATION	0.368	0.208	0.007
COEFFICIENT OF VARIATION [%]	3.077	3.088	2.035

Comments:

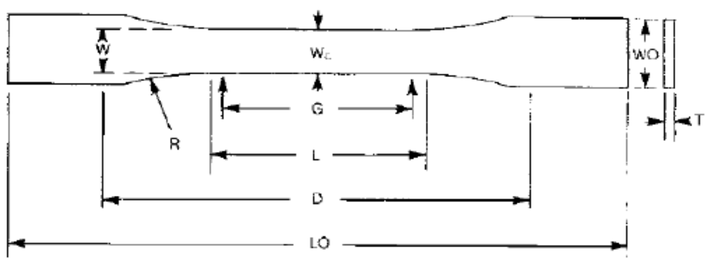
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-23 AND 2-24 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	ERIC	16-Apr-20
DATA ENTRY/REDUCTION I	ZHI	22-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY		

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC25-1-T-Y-2-3-23	0.130	0.129	0.129	0.753	0.754	0.503	0.503	0.503	6.510	0.001
NIAR-CC25-2-T-Y-2-3-21	0.129	0.129	0.129	0.754	0.753	0.504	0.503	0.504	6.508	0.000
NIAR-CC25-2-T-Y-2-3-23	0.130	0.130	0.130	0.753	0.752	0.504	0.503	0.504	6.504	0.000
NIAR-CC25-2-T-Y-2-3-24	0.130	0.129	0.129	0.754	0.752	0.504	0.504	0.503	6.506	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC25-X-T-Z-2-5-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC25-1-T-Z-2-5-23	0.127	0.501	0.064	0.0	459.746	7.205	5.283	0.329	27843.500	1000-3000	2.784	69F / 46%	FAILURE AT GAGE
NIAR-CC25-1-T-Z-2-5-24	0.128	0.501	0.064	0.0	480.343	7.513	5.303	0.326	30748.500	1000-3000	3.075	69F / 46%	FAILURE AT GAGE
NIAR-CC25-2-T-Z-2-5-21	0.127	0.502	0.064	0.0	454.799	7.161	5.394	0.328	27906.500	1000-3000	2.791	69F / 46%	FAILURE AT GAGE
NIAR-CC25-2-T-Z-2-5-23	0.127	0.501	0.064	0.0	448.660	7.044	5.544	0.321	27114.000	1000-3000	2.711	69F / 46%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST		in/min

AVERAGE	**7.231**	**5.381**	**0.326**
STANDARD DEVIATION	0.200	0.119	0.004
COEFFICIENT OF VARIATION [%]	2.764	2.211	1.076

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Comments:

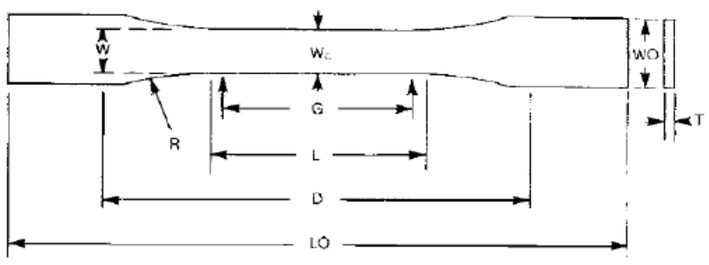
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-T-Z-2-5-24 AND 2-T-Z-2-5-23 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

TEST SPEED FOR NIAR-CC25-1-T-Z-2-5-23 : 0.15 in/min
TEST SPEED FOR NIAR-CC25-1-T-Z-2-5-24 & NIAR-CC25-2-T-Z-2-5-(21,23) : 0.14 in/min

Customer/Prime Contractor (if available):		FAA
Job/P.O. Number (if available):		JAMS PBAM Task 18-2
Testing Procedure with latest revision:		CP 7203 Rev B
Material Specification and revision (if available):		ULTEM
Test requirements specified on shop paper (if available):		N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC25-1-T-Z-2-5-23	0.126	0.127	0.128	0.748	0.751	0.501	0.501	0.501	6.507	0.002
NIAR-CC25-1-T-Z-2-5-24	0.128	0.128	0.127	0.748	0.751	0.501	0.501	0.501	6.505	0.001
NIAR-CC25-2-T-Z-2-5-21	0.127	0.126	0.126	0.749	0.751	0.501	0.501	0.502	6.508	0.001
NIAR-CC25-2-T-Z-2-5-23	0.128	0.128	0.126	0.748	0.751	0.501	0.501	0.501	6.505	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC30-X-T-X-3-X-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC30-1-T-X-3-3-18	0.128	0.500	0.064	0.0	673.746	10.483	5.689	0.343	65102.000	1000-3000	7.658	68F / 32%	FAILURE AT GAGE
NIAR-CC30-1-T-X-3-9-16	0.129	0.502	0.065	0.0	673.368	10.434	5.840	0.338	65075.500	1000-3000	8.482	68F / 32%	FAILURE AT GAGE
NIAR-CC30-2-T-X-3-3-18	0.128	0.501	0.064	0.0	656.613	10.232	5.684	0.330	63568.500	1000-3000	7.195	68F / 32%	FAILURE AT GAGE
NIAR-CC30-2-T-X-3-9-16	0.129	0.501	0.064	0.0	663.186	10.287	5.601	0.331	68496.000	1000-3000	8.052	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**10.359**	**5.704**	**0.336**
STANDARD DEVIATION	0.119	0.100	0.006
COEFFICIENT OF VARIATION [%]	1.147	1.745	1.831

Comments:

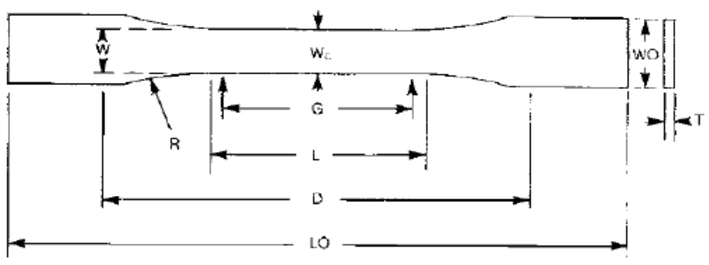
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-3-18 DOES NOT MEET THE REQUIREMENT FOR OVERALL WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC30-1-T-X-3-3-18	0.129	0.128	0.128	0.750	0.750	0.500	0.500	0.500	6.517	0.001
NIAR-CC30-1-T-X-3-9-16	0.128	0.129	0.129	0.751	0.751	0.502	0.502	0.502	6.517	0.000
NIAR-CC30-2-T-X-3-3-18	0.128	0.128	0.128	0.750	0.750	0.501	0.500	0.501	6.518	0.001
NIAR-CC30-2-T-X-3-9-16	0.128	0.129	0.129	0.752	0.751	0.502	0.501	0.501	6.520	0.000



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC30-X-T-Y-3-6-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC30-1-T-Y-3-6-16	0.122	0.502	0.061	0.0	781.031	12.750	7.606	0.363	64307.500	1000-3000	7.336	69F / 41%	FAILURE AT GAGE
NIAR-CC30-2-T-Y-3-6-16	0.122	0.501	0.061	0.0	789.125	12.884	7.388	0.370	61616.500	1000-3000	6.380	69F / 41%	FAILURE AT GAGE
NIAR-CC30-2-T-Y-3-6-18	0.122	0.501	0.061	0.0	788.093	12.926	7.371	0.373	60517.500	1000-3000	6.144	69F / 41%	FAILURE AT GAGE
NIAR-CC30-2-T-Y-3-6-19	0.121	0.501	0.061	0.0	789.266	12.970	7.274	0.376	62028.000	1000-3000	6.340	69F / 41%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**12.882**	**7.410**	**0.370**
STANDARD DEVIATION	0.095	0.140	0.006
COEFFICIENT OF VARIATION [%]	0.736	1.893	1.559

Comments:

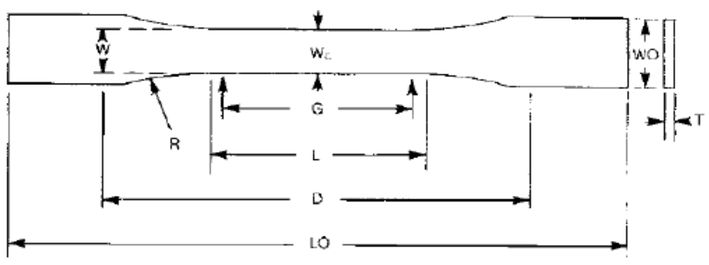
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 2-16, 2-18 AND 2-19 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC30-1-T-Y-3-6-16	0.122	0.122	0.122	0.753	0.755	0.502	0.501	0.502	6.531	0.000
NIAR-CC30-2-T-Y-3-6-16	0.124	0.121	0.121	0.753	0.753	0.500	0.501	0.501	6.537	0.003
NIAR-CC30-2-T-Y-3-6-18	0.123	0.121	0.121	0.753	0.753	0.501	0.501	0.500	6.515	0.002
NIAR-CC30-2-T-Y-3-6-19	0.122	0.121	0.121	0.753	0.752	0.501	0.502	0.501	6.516	0.001



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC30-X-T-Z-3-6-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC30-1-T-Z-3-6-16	0.127	0.504	0.064	0.0	435.040	6.817	5.269	0.302	28092.949	1000-3000	2.816	71F / 29%	FAILURE AT GAGE
NIAR-CC30-1-T-Z-3-6-18	0.128	0.502	0.064	0.0	434.844	6.755	5.220	0.305	27424.572	1000-3000	2.750	71F / 29%	FAILURE AT GAGE
NIAR-CC30-2-T-Z-3-6-18	0.128	0.501	0.064	0.0	351.610	5.478	4.911	0.309	20587.930	1000-3000	2.059	71F / 29%	FAILURE AT GAGE
NIAR-CC30-2-T-Z-3-6-19	0.128	0.501	0.064	0.0	407.188	6.342	5.059	0.307	25248.784	1000-3000	2.530	71F / 29%	FAILURE AT GAGE

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.15	in/min

AVERAGE	**6.348**	**5.115**	**0.306**
STANDARD DEVIATION	0.617	0.163	0.003
COEFFICIENT OF VARIATION [%]	9.724	3.179	1.019

Comments:

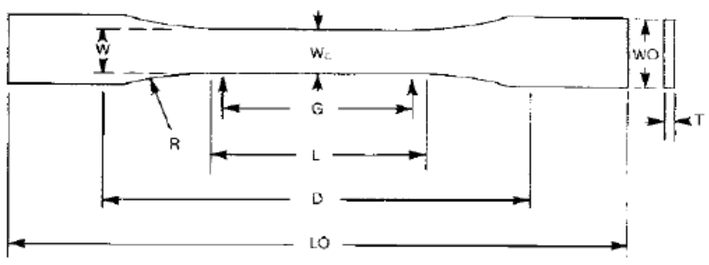
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-16 AND 1-18 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-18, 2-18, 2-19 DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 200 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	CHENG MIN	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC30-1-T-Z-3-6-16	0.128	0.126	0.126	0.751	0.753	0.504	0.504	0.504	6.513	0.002
NIAR-CC30-1-T-Z-3-6-18	0.129	0.128	0.127	0.748	0.752	0.503	0.502	0.502	6.509	0.002
NIAR-CC30-2-T-Z-3-6-18	0.129	0.128	0.127	0.747	0.752	0.501	0.501	0.501	6.505	0.002
NIAR-CC30-2-T-Z-3-6-19	0.129	0.128	0.127	0.748	0.750	0.501	0.501	0.501	6.508	0.003



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC35-2-T-Y-3-3-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC35-2-T-Y-3-3-21	0.122	0.501	0.061	0.0	796.101	13.054	7.526	0.375	60456.500	1000-3000	6.329	70F / 25%	FAILURE AT FILLET
NIAR-CC35-2-T-Y-3-3-23	0.122	0.501	0.061	0.0	794.227	13.025	7.122	0.384	59581.000	1000-3000	5.994	70F / 25%	FAILURE AT FILLET
NIAR-CC35-2-T-Y-3-3-24	0.122	0.501	0.061	0.0	793.067	12.961	7.812	0.369	57237.500	1000-3000		70F / 25%	FAILURE AT FILLET

AVERAGE	**13.013**	**7.486**	**0.376**
STANDARD DEVIATION	0.048	0.347	0.008
COEFFICIENT OF VARIATION [%]	0.367	4.633	2.029

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.20	in/min

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	Kadi Stithem	24-Mar-20
TESTER I	ERIC	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

Comments:

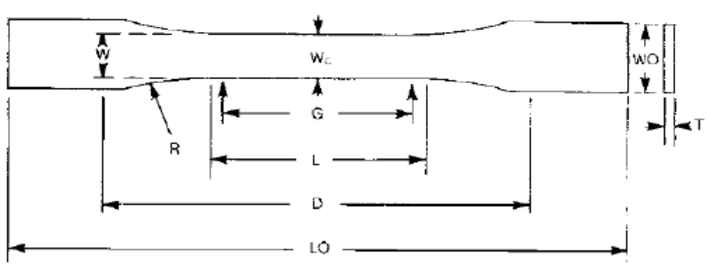
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 23,24 DO NOT MEET THE REQUIREMENTS FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 200 psi

ELONGATION AT BREAK IS NOT REPORTED FOR NIAR-CC35-2-T-Y-3-3-24 DUE TO EXTENSOMETER SLIPPAGE PRIOR TO SPECIMEN FRACTURE

ELONGATION AT BREAK MAY NOT BE ACCURATE FOR ALL SPECIMENS AS THE FRACTURE OCCURRED OUTSIDE OF EXTENSOMETER GAGE LENGTH

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC35-2-T-Y-3-3-21	0.122	0.121	0.122	0.753	0.752	0.501	0.501	0.502	6.511	0.001
NIAR-CC35-2-T-Y-3-3-23	0.122	0.121	0.122	0.752	0.752	0.501	0.501	0.501	6.510	0.001
NIAR-CC35-2-T-Y-3-3-24	0.122	0.122	0.122	0.753	0.752	0.502	0.501	0.501	6.511	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC35-X-T-X-3-X-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC35-1-T-X-3-2-24	0.128	0.502	0.064	0.0	655.582	10.185	5.746	0.328	65812.500	1000-3000	6.772	70F / 34%	FAILURE AT GAGE
NIAR-CC35-1-T-X-3-3-21	0.128	0.501	0.064	0.0	652.678	10.166	5.688	0.329	67697.000	1000-3000	7.766	70F / 34%	FAILURE AT GAGE
NIAR-CC35-2-T-X-3-2-23	0.129	0.502	0.064	0.0	650.986	10.096	5.854	0.322	64896.000	1000-3000	7.314	70F / 34%	FAILURE AT GAGE
NIAR-CC35-2-T-X-3-3-21	0.128	0.501	0.064	0.0	652.104	10.133	5.745	0.324	68333.500	1000-3000	8.008	70F / 34%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**10.145**	**5.758**	**0.326**
STANDARD DEVIATION	0.039	0.069	0.003
COEFFICIENT OF VARIATION [%]	0.386	1.198	1.012

Comments:

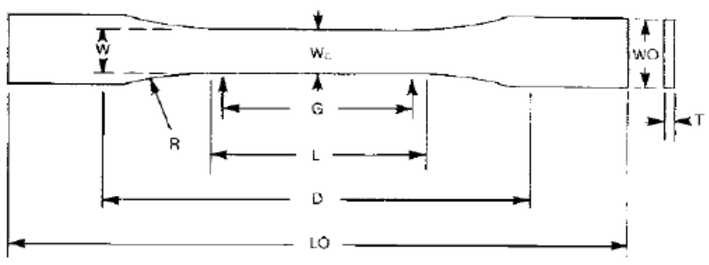
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	CHENG MIN	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC35-1-T-X-3-2-24	0.129	0.128	0.128	0.751	0.752	0.502	0.502	0.501	6.513	0.000
NIAR-CC35-1-T-X-3-3-21	0.128	0.128	0.128	0.751	0.751	0.500	0.501	0.501	6.515	0.001
NIAR-CC35-2-T-X-3-2-23	0.129	0.128	0.128	0.752	0.751	0.504	0.501	0.500	6.517	0.001
NIAR-CC35-2-T-X-3-3-21	0.128	0.129	0.128	0.750	0.750	0.502	0.501	0.501	6.516	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC35-X-T-Z-3-5-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC35-1-T-Z-3-5-21	0.128	0.502	0.064	0.0	446.630	6.943	5.265	0.302	29050.500	1000-3000	2.905	71F / 29%	FAILURE AT GAGE
NIAR-CC35-1-T-Z-3-5-24	0.127	0.501	0.064	0.0	444.458	6.972	5.354	0.305	28537.000	1000-3000	2.854	71F / 29%	FAILURE AT GAGE
NIAR-CC35-2-T-Z-3-5-21	0.126	0.501	0.063	0.0	412.232	6.514	4.850	0.315	26319.000	1000-3000	2.632	71F / 29%	FAILURE AT GAGE
NIAR-CC35-2-T-Z-3-5-23	0.128	0.501	0.064	0.0	440.031	6.861	4.688	0.315	29811.000	1000-3000	2.981	71F / 29%	FAILURE AT GAGE

AVERAGE	**6.822**	**5.039**	**0.309**
STANDARD DEVIATION	0.211	0.321	0.007
COEFFICIENT OF VARIATION [%]	3.097	6.380	2.187

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

Comments:

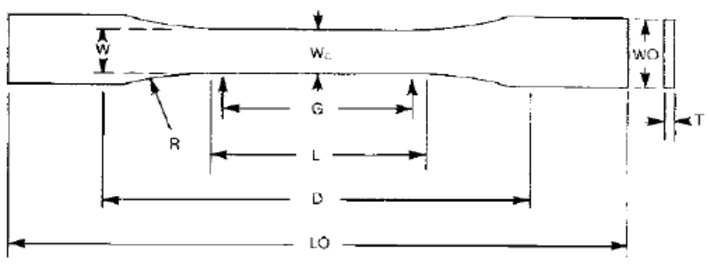
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY T.	3-Apr-20
TESTER I	CHENG MIN	17-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC35-1-T-Z-3-5-21	0.130	0.127	0.127	0.752	0.749	0.502	0.502	0.502	6.509	0.003
NIAR-CC35-1-T-Z-3-5-24	0.128	0.127	0.126	0.751	0.748	0.502	0.501	0.501	6.507	0.003
NIAR-CC35-2-T-Z-3-5-21	0.127	0.126	0.126	0.753	0.748	0.501	0.501	0.501	6.508	0.001
NIAR-CC35-2-T-Z-3-5-23	0.129	0.128	0.127	0.751	0.747	0.501	0.501	0.500	6.505	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC210-X-T-X-2-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC210-1-T-X-2-2-26	0.128	0.501	0.064	0.0	602.314	9.406	5.089	0.316	68672.500	1000-3000	8.119	68F / 32%	FAILURE AT GAGE
NIAR-CC210-1-T-X-2-2-28	0.128	0.501	0.064	0.0	609.562	9.463	5.183	0.316	67448.000	1000-3000	8.853	68F / 32%	FAILURE AT GAGE
NIAR-CC210-2-T-X-2-2-28	0.128	0.502	0.064	0.0	636.363	9.884	5.437	0.332	64771.000	1000-3000	7.693	68F / 32%	FAILURE AT GAGE
NIAR-CC210-2-T-X-2-2-29	0.128	0.503	0.064	0.0	627.909	9.742	5.305	0.326	65510.500	1000-3000	7.652	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.624**	**5.253**	**0.323**
STANDARD DEVIATION	0.227	0.151	0.008
COEFFICIENT OF VARIATION [%]	2.363	2.875	2.414

Comments:

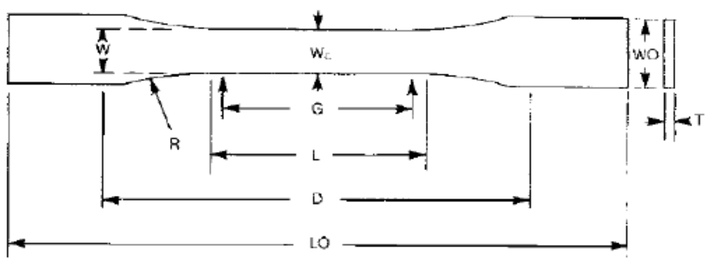
SPECIMENS 1-26 AND 2-28 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC210-1-T-X-2-2-26	0.128	0.127	0.128	0.751	0.752	0.501	0.501	0.501	6.517	0.001
NIAR-CC210-1-T-X-2-2-28	0.128	0.128	0.129	0.751	0.751	0.502	0.501	0.501	6.515	0.001
NIAR-CC210-2-T-X-2-2-28	0.129	0.128	0.128	0.752	0.751	0.502	0.502	0.501	6.519	0.000
NIAR-CC210-2-T-X-2-2-29	0.128	0.128	0.128	0.752	0.752	0.503	0.503	0.503	6.519	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC210-X-T-Y-2-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC210-1-T-Y-2-2-29	0.128	0.503	0.064	0.0	811.859	12.657	7.362	0.371	63184.500	1000-3000	9.601	70F / 29%	FAILURE AT GAGE
NIAR-CC210-2-T-Y-2-2-26	0.126	0.503	0.063	0.0	761.732	11.999	7.034	0.362	62815.500	1000-3000	9.037	70F / 29%	FAILURE AT GAGE
NIAR-CC210-2-T-Y-2-2-28	0.127	0.502	0.064	0.0	758.411	11.883	6.700	0.366	62100.000	1000-3000	10.243	70F / 29%	FAILURE AT GAGE
NIAR-CC210-2-T-Y-2-2-29	0.126	0.503	0.063	0.0	759.539	11.968	6.979	0.361	63441.000	1000-3000	8.260	70F / 29%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**12.127**	**7.019**	**0.365**
STANDARD DEVIATION	0.357	0.272	0.005
COEFFICIENT OF VARIATION [%]	2.944	3.873	1.250

Comments:

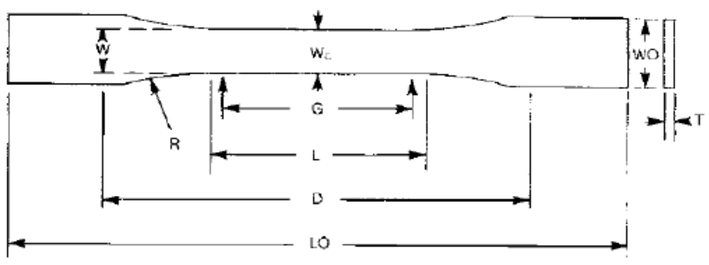
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY T.	3-Apr-20
TESTER I	CHENG MIN	17-Apr-20
DATA ENTRY/REDUCTION I	ZHI	22-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY		

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC210-1-T-Y-2-2-29	0.128	0.128	0.126	0.752	0.752	0.503	0.503	0.503	6.512	0.002
NIAR-CC210-2-T-Y-2-2-26	0.127	0.126	0.125	0.753	0.753	0.503	0.503	0.503	6.502	0.002
NIAR-CC210-2-T-Y-2-2-28	0.128	0.126	0.126	0.753	0.752	0.503	0.502	0.502	6.510	0.002
NIAR-CC210-2-T-Y-2-2-29	0.127	0.126	0.126	0.753	0.752	0.503	0.504	0.502	6.510	0.002



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC210-X-T-Z-2-4-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC210-1-T-Z-2-4-26	0.128	0.500	0.064	0.0	464.599	7.276	5.451	0.315	29543.000	1000-3000	2.954	73F / 23%	FAILURE AT GAGE
NIAR-CC210-1-T-Z-2-4-28	0.127	0.500	0.063	0.0	458.892	7.229	5.391	0.321	28809.000	1000-3000	2.881	73F / 23%	FAILURE AT GAGE
NIAR-CC210-2-T-Z-2-4-26	0.127	0.500	0.063	0.0	462.328	7.306	5.553	0.317	29598.000	1000-3000	2.960	73F / 23%	FAILURE AT GAGE
NIAR-CC210-2-T-Z-2-4-28	0.127	0.500	0.063	0.0	436.770	6.892	5.164	0.329	26543.500	1000-3000	2.654	73F / 23%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.176**	**5.390**	**0.320**
STANDARD DEVIATION	0.192	0.165	0.006
COEFFICIENT OF VARIATION [%]	2.673	3.054	2.028

Comments:

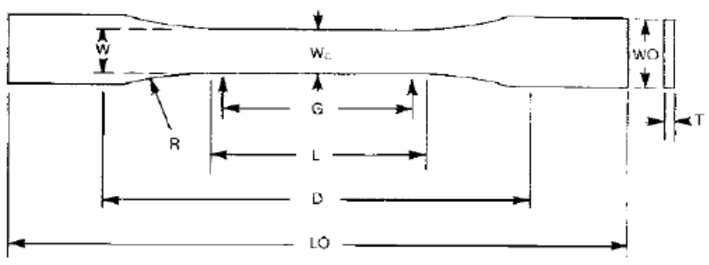
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-26 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT OF Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	CHENG MIN	15-Apr-20
DATA ENTRY/REDUCTION I	MING	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	21-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC210-1-T-Z-2-4-26	0.129	0.127	0.127	0.749	0.748	0.500	0.500	0.500	6.505	0.002
NIAR-CC210-1-T-Z-2-4-28	0.128	0.127	0.127	0.751	0.748	0.500	0.501	0.500	6.504	0.001
NIAR-CC210-2-T-Z-2-4-26	0.128	0.127	0.125	0.750	0.748	0.500	0.500	0.499	6.506	0.002
NIAR-CC210-2-T-Z-2-4-28	0.128	0.126	0.126	0.750	0.748	0.500	0.500	0.500	6.504	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC215-X-T-X-2-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC215-1-T-X-2-1-31	0.126	0.500	0.063	0.0	603.705	9.561	5.174	0.324	67624.000	1000-3000	8.348	70F / 34%	FAILURE AT GAGE
NIAR-CC215-1-T-X-2-1-34	0.126	0.500	0.063	0.0	612.692	9.737	5.518	0.319	67955.500	1000-3000	8.035	70F / 34%	FAILURE AT GAGE
NIAR-CC215-2-T-X-2-1-31	0.126	0.499	0.063	0.0	613.829	9.748	5.478	0.319	67340.000	1000-3000	8.284	70F / 34%	FAILURE AT GAGE
NIAR-CC215-2-T-X-2-1-34	0.126	0.500	0.063	0.0	619.363	9.844	5.558	0.320	66543.500	1000-3000	7.759	70F / 34%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST		in/min

AVERAGE	**9.722**	**5.432**	**0.320**
STANDARD DEVIATION	0.118	0.175	0.002
COEFFICIENT OF VARIATION [%]	1.213	3.223	0.707

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	MICHAEL B.	1-Apr-20
TESTER I	CHENG MIN	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Comments:

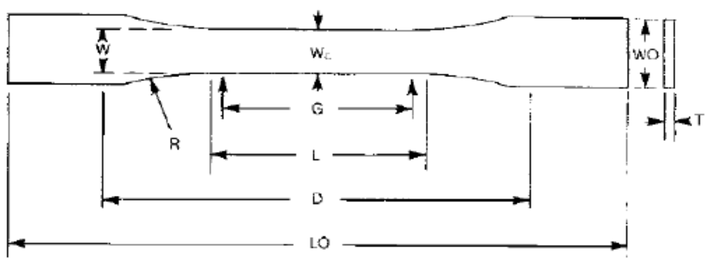
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-34 AND 2-31 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
SPECIMENS 1-31 AND 2-31 DO NOT MEET THE REQUIREMENT FOR OVERALL WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

TEST SPEED FOR NIAR-CC215-1-T-X-2-1-31 : 0.15 in/min
TEST SPEED FOR NIAR-CC215-1-T-X-2-1-34 & NIAR-CC215-2-T-X-2-1-(31,34) : 0.2 in/min

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC215-1-T-X-2-1-31	0.127	0.127	0.126	0.751	0.750	0.500	0.499	0.500	6.514	0.001
NIAR-CC215-1-T-X-2-1-34	0.127	0.126	0.125	0.750	0.751	0.500	0.500	0.499	6.515	0.002
NIAR-CC215-2-T-X-2-1-31	0.127	0.126	0.126	0.750	0.750	0.499	0.499	0.499	6.519	0.001
NIAR-CC215-2-T-X-2-1-34	0.127	0.125	0.126	0.751	0.750	0.500	0.499	0.499	6.519	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC215-X-T-Y-2-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC215-1-T-Y-2-1-31	0.130	0.503	0.065	0.0	752.590	11.529	6.273	0.360	63320.500	1000-3000	8.260	69F / 41%	FAILURE AT GAGE
NIAR-CC215-2-T-Y-2-1-31	0.128	0.503	0.064	0.0	798.620	12.421	6.923	0.374	62006.500	1000-3000	7.480	69F / 41%	FAILURE AT GAGE
NIAR-CC215-2-T-Y-2-1-33	0.130	0.503	0.065	0.0	753.618	11.525	6.434	0.357	63156.000	1000-3000	8.498	69F / 41%	FAILURE AT GAGE
NIAR-CC215-2-T-Y-2-1-34	0.129	0.503	0.065	0.0	756.770	11.632	6.670	0.354	63486.500	1000-3000	7.914	69F / 41%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**11.777**	**6.575**	**0.361**
STANDARD DEVIATION	0.432	0.284	0.009
COEFFICIENT OF VARIATION [%]	3.668	4.313	2.450

Comments:

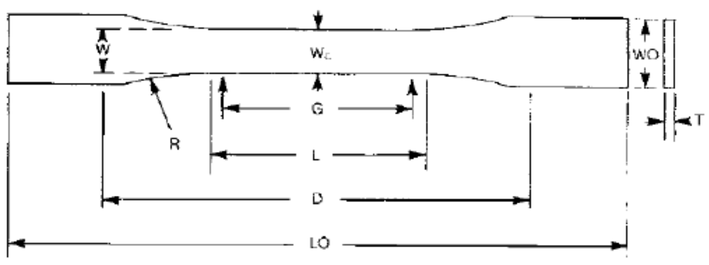
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-31, 2-33 AND 2-34 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC215-1-T-Y-2-1-31	0.129	0.129	0.131	0.753	0.754	0.503	0.503	0.504	6.513	0.002
NIAR-CC215-2-T-Y-2-1-31	0.129	0.127	0.128	0.754	0.753	0.503	0.503	0.503	6.507	0.001
NIAR-CC215-2-T-Y-2-1-33	0.130	0.129	0.131	0.754	0.753	0.502	0.503	0.502	6.507	0.002
NIAR-CC215-2-T-Y-2-1-34	0.129	0.130	0.130	0.754	0.753	0.503	0.504	0.502	6.507	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC215-X-T-Z-2-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC215-1-T-Z-2-1-31	0.127	0.500	0.064	0.0	434.681	6.820	5.386	0.315	26645.000	1000-3000	2.665	70F / 29%	FAILURE AT GAGE
NIAR-CC215-1-T-Z-2-1-33	0.126	0.500	0.063	0.0	461.666	7.305	5.477	0.314	29942.500	1000-3000	2.994	70F / 29%	FAILURE AT GAGE
NIAR-CC215-2-T-Z-2-1-31	0.127	0.500	0.063	0.0	453.634	7.162	5.495	0.310		1000-3000		70F / 29%	FAILURE AT GAGE
NIAR-CC215-2-T-Z-2-1-33	0.127	0.500	0.064	0.0	454.847	7.149	5.063	0.334	28291.500	1000-3000	2.829	70F / 29%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.109**	**5.355**	**0.318**
STANDARD DEVIATION	0.205	0.201	0.011
COEFFICIENT OF VARIATION [%]	2.885	3.749	3.355

Comments:

ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

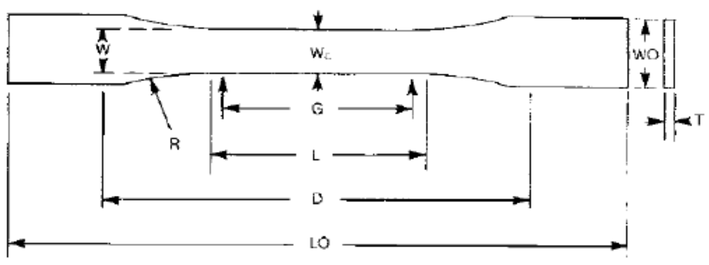
GRIP PRESSURE: 150 psi

FINAL STRAIN AND ELONGATION AT BREAK ARE NOT REPORTED FOR NIAR-CC215-2-T-Z-2-1-31 DUE TO EXTENSOMETER SLIPPAGE

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY T.	3-Apr-20
TESTER I	CHENG MIN	17-Apr-20
DATA ENTRY/REDUCTION I	ZHI	22-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY		

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC215-1-T-Z-2-1-31	0.128	0.128	0.127	0.751	0.747	0.501	0.500	0.500	6.504	0.001
NIAR-CC215-1-T-Z-2-1-33	0.127	0.126	0.127	0.750	0.747	0.500	0.501	0.500	6.507	0.001
NIAR-CC215-2-T-Z-2-1-31	0.127	0.126	0.126	0.750	0.746	0.500	0.500	0.500	6.504	0.001
NIAR-CC215-2-T-Z-2-1-33	0.128	0.127	0.127	0.749	0.747	0.500	0.500	0.500	6.505	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC310-X-T-X-3-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC310-1-T-X-3-2-28	0.129	0.501	0.064	0.0	634.157	9.836	5.714	0.322	59251.500	1000-3000	6.055	69F / 41%	FAILURE AT GAGE
NIAR-CC310-1-T-X-3-2-29	0.129	0.502	0.064	0.0	632.848	9.813	5.515	0.324	63442.500	1000-3000	6.870	69F / 41%	FAILURE AT GAGE
NIAR-CC310-2-T-X-3-2-28	0.128	0.501	0.064	0.0	637.126	9.927	5.385	0.329	63872.500	1000-3000	6.697	69F / 41%	FAILURE AT GAGE
NIAR-CC310-2-T-X-3-2-29	0.129	0.502	0.065	0.0	621.056	9.625	5.262	0.322	59561.500	1000-3000	5.993	69F / 41%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.800**	**5.469**	**0.324**
STANDARD DEVIATION	0.127	0.193	0.003
COEFFICIENT OF VARIATION [%]	1.291	3.529	1.017

Comments:

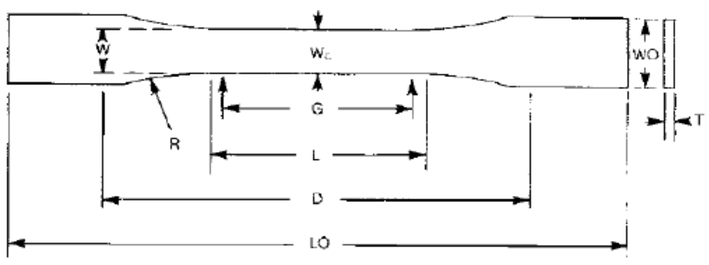
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-28 DOES NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	3-Apr-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC310-1-T-X-3-2-28	0.129	0.129	0.128	0.751	0.752	0.501	0.502	0.501	6.515	0.000
NIAR-CC310-1-T-X-3-2-29	0.128	0.129	0.128	0.751	0.752	0.502	0.502	0.502	6.515	0.001
NIAR-CC310-2-T-X-3-2-28	0.128	0.128	0.128	0.751	0.751	0.501	0.500	0.501	6.519	0.000
NIAR-CC310-2-T-X-3-2-29	0.129	0.128	0.128	0.752	0.751	0.502	0.502	0.502	6.519	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC310-X-T-Y-3-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC310-1-T-Y-3-2-26	0.123	0.502	0.062	0.0	779.918	12.662	7.370	0.364	63621.500	1000-3000	7.055	69F / 41%	FAILURE AT FILLET
NIAR-CC310-2-T-Y-3-2-26	0.123	0.501	0.062	0.0	788.687	12.810	7.184	0.371	61469.500	1000-3000	6.371	69F / 41%	FAILURE AT FILLET
NIAR-CC310-2-T-Y-3-2-28	0.125	0.502	0.063	0.0	787.374	12.561	6.754	0.371	61742.500	1000-3000	6.206	69F / 41%	FAILURE AT FILLET
NIAR-CC310-2-T-Y-3-2-29	0.122	0.502	0.061	0.0	784.862	12.800	7.153	0.372	59220.000	1000-3000		69F / 41%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**12.708**	**7.115**	**0.370**
STANDARD DEVIATION	0.119	0.259	0.004
COEFFICIENT OF VARIATION [%]	0.939	3.644	1.006

Comments:

ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638
SPECIMENS 2-28 DO NOT MEET THE REQUIREMENT FOR THICKNESS VARIATION (≤ 0.005") PER ASTM D638

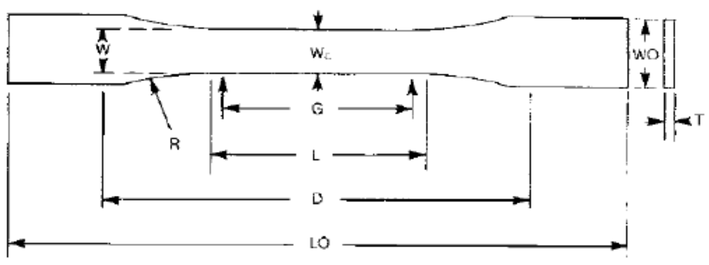
GRIP PRESSURE: 150 psi

ELONGATION AT BREAK IS NOT REPORTED FOR NIAR-CC310-2-T-Y-3-2-29 DUE TO EXTENSOMETER SLIPPAGE PRIOR TO SPECIMEN FRACTURE

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	RAMEESHA W.	3-Apr-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC310-1-T-Y-3-2-26	0.123	0.123	0.122	0.753	0.754	0.502	0.502	0.502	6.509	0.001
NIAR-CC310-2-T-Y-3-2-26	0.124	0.121	0.123	0.752	0.752	0.501	0.501	0.502	6.510	0.003
NIAR-CC310-2-T-Y-3-2-28	0.127	0.122	0.126	0.753	0.752	0.502	0.502	0.501	6.508	0.005
NIAR-CC310-2-T-Y-3-2-29	0.122	0.122	0.122	0.752	0.753	0.502	0.502	0.502	6.504	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC310-X-T-Z-3-4-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC310-1-T-Z-3-4-26	0.130	0.501	0.065	0.0	401.210	6.163	4.836	0.307	24503.000	1000-3000	2.450	71F / 19%	FAILURE AT GAGE
NIAR-CC310-1-T-Z-3-4-29	0.130	0.501	0.065	0.0	311.755	4.781	4.781	0.305	17639.500	1000-3000	1.764	71F / 19%	FAILURE AT GAGE
NIAR-CC310-2-T-Z-3-4-28	0.131	0.500	0.066	0.0	405.938	6.175	4.427	0.306	26138.000	1000-3000	2.614	71F / 19%	FAILURE AT GAGE
NIAR-CC310-2-T-Z-3-4-29	0.131	0.500	0.065	0.0	401.012	6.130	5.029	0.286	26033.500	1000-3000	2.603	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**5.812**	**4.768**	**0.301**
STANDARD DEVIATION	0.688	0.251	0.010
COEFFICIENT OF VARIATION [%]	11.830	5.271	3.405

Comments:

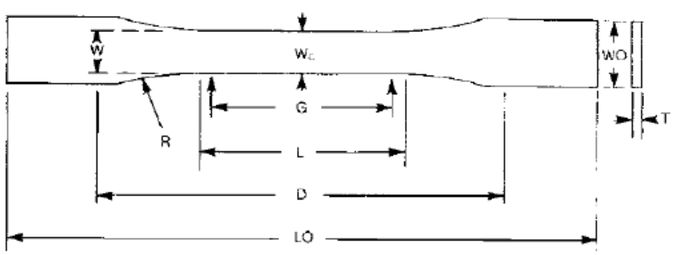
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-T-Z-3-4-29, 2-T-Z-3-4-29 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
ALL SPECIMEN DO NOT MEET THE REQUIREMENT FOR Width Overall (WO) 0.75" ≤ WO ≤ 1.00" PER ASTM D638
SPECIMENS 1-T-Z-3-4-X (26,29), 2-T-Z-3-4-28 Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	24-Mar-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	JENNIFER	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC310-1-T-Z-3-4-26	0.130	0.130	0.129	0.748	0.751	0.501	0.501	0.502	6.503	0.001
NIAR-CC310-1-T-Z-3-4-29	0.130	0.130	0.130	0.748	0.751	0.501	0.501	0.502	6.502	0.001
NIAR-CC310-2-T-Z-3-4-28	0.132	0.132	0.131	0.747	0.750	0.500	0.501	0.500	6.501	0.002
NIAR-CC310-2-T-Z-3-4-29	0.132	0.131	0.130	0.747	0.751	0.500	0.500	0.501	6.502	0.001



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC315-X-T-X-3-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC315-1-T-X-3-1-31	0.127	0.500	0.063	0.0	629.747	9.934	5.794	0.339	51377.500	1000-3000	5.292	69F / 41%	FAILURE AT GAGE
NIAR-CC315-1-T-X-3-1-34	0.125	0.500	0.063	0.0	614.411	9.801	5.976	0.339	45940.500	1000-3000	5.787	69F / 41%	FAILURE AT GAGE
NIAR-CC315-2-T-X-3-1-33	0.126	0.500	0.063	0.0	613.583	9.745	5.615	0.333	51297.000	1000-3000	5.253	69F / 41%	FAILURE AT GAGE
NIAR-CC315-2-T-X-3-1-34	0.126	0.500	0.063	0.0	608.959	9.632	5.553	0.326	51997.000	1000-3000	5.273	69F / 41%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.778**	**5.735**	**0.334**
STANDARD DEVIATION	0.125	0.191	0.006
COEFFICIENT OF VARIATION [%]	1.283	3.326	1.782

Comments:

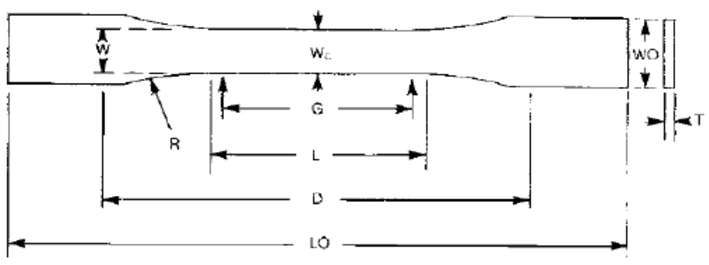
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-31, 1-34 AND 2-34 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638
SPECIMEN 2-33 DOES NOT MEET THE REQUIREMENT FOR OVERALL WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY T.	3-Apr-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC315-1-T-X-3-1-31	0.128	0.127	0.126	0.751	0.750	0.500	0.500	0.500	6.516	0.002
NIAR-CC315-1-T-X-3-1-34	0.126	0.125	0.125	0.751	0.752	0.500	0.501	0.500	6.517	0.001
NIAR-CC315-2-T-X-3-1-33	0.127	0.126	0.125	0.751	0.750	0.501	0.500	0.500	6.519	0.002
NIAR-CC315-2-T-X-3-1-34	0.127	0.126	0.127	0.751	0.750	0.501	0.500	0.500	6.520	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC315-X-T-Y-3-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC315-1-T-Y-3-1-34	0.122	0.502	0.061	0.0	781.479	12.726	6.999	0.376	62493.500	1000-3000	6.595	70F / 42%	FAILURE AT FILLET
NIAR-CC315-2-T-Y-3-1-31	0.122	0.501	0.061	0.0	786.256	12.839	7.201	0.374	61319.000	1000-3000		70F / 42%	FAILURE AT FILLET
NIAR-CC315-2-T-Y-3-1-33	0.122	0.501	0.061	0.0	781.305	12.747	7.288	0.369	60020.500	1000-3000		70F / 42%	FAILURE AT GAGE
NIAR-CC315-2-T-Y-3-1-34	0.121	0.501	0.061	0.0	786.763	12.976	7.245	0.379	60963.500	1000-3000		70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**12.822**	**7.183**	**0.374**
STANDARD DEVIATION	0.114	0.128	0.004
COEFFICIENT OF VARIATION [%]	0.886	1.780	1.176

Comments:

ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

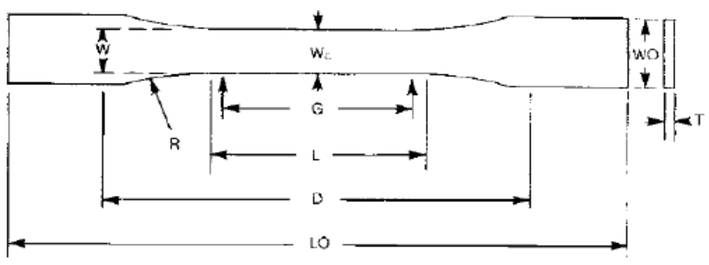
GRIP PRESSURE: 150 psi

ELONGATION AT BREAK ARE NOT REPORTED FOR NIAR-CC315-2-T-Y-3-1-(31,33,34) DUE TO EXTENSOMETER SLIPPAGE PRIOR TO SPECIMEN FRACTURE

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	24-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC315-1-T-Y-3-1-34	0.124	0.122	0.121	0.753	0.753	0.502	0.502	0.501	6.513	0.003
NIAR-CC315-2-T-Y-3-1-31	0.123	0.122	0.122	0.752	0.751	0.501	0.501	0.501	6.516	0.001
NIAR-CC315-2-T-Y-3-1-33	0.124	0.122	0.120	0.752	0.751	0.501	0.501	0.501	6.516	0.004
NIAR-CC315-2-T-Y-3-1-34	0.120	0.122	0.121	0.753	0.752	0.501	0.502	0.501	6.518	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CC315-X-T-Z-3-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CC315-1-T-Z-3-1-31	0.129	0.504	0.065	0.0	425.366	6.530	4.873	0.302	27341.500	2.734	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CC315-1-T-Z-3-1-33	0.129	0.502	0.065	0.0	426.796	6.609	4.926	0.302	27767.000	2.777	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CC315-2-T-Z-3-1-31	0.130	0.502	0.065	0.0	379.433	5.828	4.894	0.280	24733.500	2.473	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CC315-2-T-Z-3-1-34	0.128	0.502	0.064	0.0	394.128	6.120	4.814	0.298	25397.000	2.540	1000-3000	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**6.272**	**4.877**	**0.296**
STANDARD DEVIATION	0.365	0.047	0.010
COEFFICIENT OF VARIATION [%]	5.823	0.972	3.487

Comments:

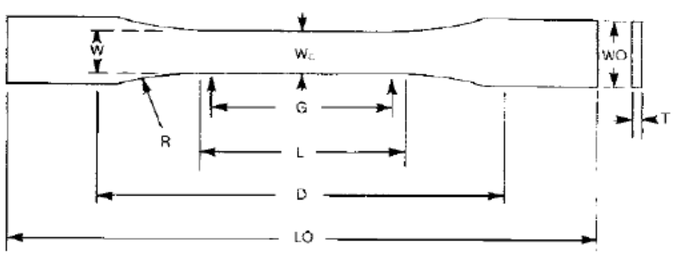
SPECIMENS 1-33, 2-34 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638
SPECIMENS 1-31, 2-31, 2-34 DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL		25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	CONOR	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CC315-1-T-Z-3-1-31	0.129	0.130	0.129	0.750	0.747	0.504	0.501	0.505	6.502	0.002
NIAR-CC315-1-T-Z-3-1-33	0.129	0.130	0.127	0.751	0.751	0.502	0.502	0.502	6.502	0.004
NIAR-CC315-2-T-Z-3-1-31	0.131	0.129	0.129	0.750	0.746	0.504	0.500	0.502	6.502	0.002
NIAR-CC315-2-T-Z-3-1-34	0.128	0.129	0.128	0.754	0.748	0.502	0.502	0.503	6.505	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR0-X-T-X-4-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR0-1-T-X-4-7-1	0.129	0.501	0.065	0.0	602.491	9.319	5.391	0.318	61681.500	1000-3000	6.250	70F / 34%	FAILURE AT FILLET
NIAR-CR0-1-T-X-4-7-4	0.129	0.503	0.065	0.0	586.797	9.068	5.259	0.304	62352.500	1000-3000	6.486	70F / 34%	FAILURE AT FILLET
NIAR-CR0-2-T-X-4-7-3	0.129	0.502	0.065	0.0	579.310	8.949	5.151	0.303	66446.500	1000-3000	8.402	70F / 34%	FAILURE AT GAGE
NIAR-CR0-2-T-X-4-7-4	0.129	0.502	0.065	0.0	577.811	8.938	5.215	0.305	61042.500	1000-3000	6.160	70F / 34%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.069**	**5.254**	**0.308**
STANDARD DEVIATION	0.177	0.101	0.007
COEFFICIENT OF VARIATION [%]	1.952	1.932	2.327

Comments:

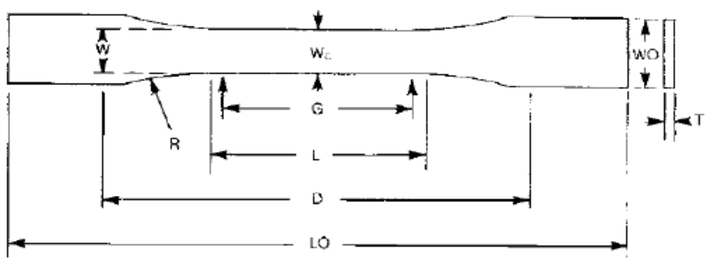
SPECIMENS 1-4 AND 2-4 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	24-Mar-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY		

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR0-1-T-X-4-7-1	0.129	0.128	0.130	0.751	0.750	0.502	0.501	0.501	6.515	0.001
NIAR-CR0-1-T-X-4-7-4	0.129	0.128	0.129	0.751	0.751	0.504	0.502	0.502	6.515	0.001
NIAR-CR0-2-T-X-4-7-3	0.129	0.129	0.129	0.751	0.751	0.502	0.502	0.502	6.514	0.001
NIAR-CR0-2-T-X-4-7-4	0.129	0.129	0.128	0.751	0.750	0.504	0.502	0.502	6.516	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR0-X-T-Y-4-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR0-1-T-Y-4-7-4	0.128	0.501	0.064	0.0	716.455	11.153	6.559	0.379	52012.000	1000-3000	5.481	68F / 32%	FAILURE AT GAGE
NIAR-CR0-2-T-Y-4-7-1	0.129	0.501	0.065	0.0	702.081	10.884	6.495	0.370	52734.000	1000-3000	5.514	68F / 32%	FAILURE AT GAGE
NIAR-CR0-2-T-Y-4-7-3	0.129	0.501	0.064	0.0	716.237	11.112	6.606	0.375	52163.000	1000-3000	5.543	68F / 32%	FAILURE AT GAGE
NIAR-CR0-2-T-Y-4-7-4	0.128	0.501	0.064	0.0	723.861	11.268	6.677	0.376	53079.000	1000-3000	5.813	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.104**	**6.584**	**0.375**
STANDARD DEVIATION	0.161	0.077	0.004
COEFFICIENT OF VARIATION [%]	1.450	1.171	0.996

Comments:

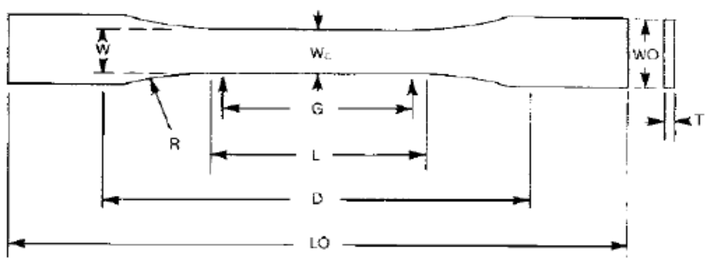
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR0-1-T-Y-4-7-4	0.128	0.128	0.128	0.754	0.753	0.501	0.501	0.501	6.516	0.000
NIAR-CR0-2-T-Y-4-7-1	0.129	0.128	0.129	0.755	0.754	0.501	0.501	0.501	6.519	0.001
NIAR-CR0-2-T-Y-4-7-3	0.129	0.128	0.129	0.754	0.754	0.501	0.501	0.501	6.518	0.001
NIAR-CR0-2-T-Y-4-7-4	0.128	0.128	0.128	0.754	0.754	0.501	0.501	0.501	6.518	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR0-X-T-Z-4-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR0-1-T-Z-4-7-1	0.129	0.501	0.065	0.0	497.018	7.700	5.692	0.348	28089.000	2.809	1000-3000	72F / 29%	FAILURE AT GAGE
NIAR-CR0-1-T-Z-4-7-4	0.129	0.501	0.065	0.0	533.549	8.267	5.768	0.341	32916.500	3.292	1000-3000	72F / 29%	FAILURE AT GAGE
NIAR-CR0-2-T-Z-4-7-1	0.129	0.502	0.065	0.0	515.302	7.970	5.766	0.337	31111.000	3.111	1000-3000	72F / 29%	FAILURE AT GAGE
NIAR-CR0-2-T-Z-4-7-4	0.129	0.501	0.065	0.0	540.494	8.357	5.577	0.340	35355.000	3.536	1000-3000	72F / 29%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.073**	**5.701**	**0.342**
STANDARD DEVIATION	0.299	0.090	0.005
COEFFICIENT OF VARIATION [%]	3.705	1.576	1.371

Comments:

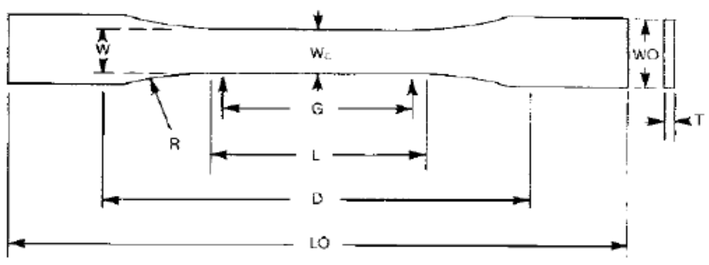
SPECIMEN 1-1 DOES NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-1 AND 2-1 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	26-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	26-Mar-20
TESTER I	CHENG MIN	16-Apr-20
DATA ENTRY/REDUCTION I	CONOR	17-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR0-1-T-Z-4-7-1	0.128	0.129	0.129	0.752	0.751	0.501	0.501	0.501	6.506	0.001
NIAR-CR0-1-T-Z-4-7-4	0.128	0.130	0.129	0.750	0.751	0.501	0.500	0.501	6.506	0.001
NIAR-CR0-2-T-Z-4-7-1	0.129	0.129	0.128	0.751	0.750	0.503	0.501	0.502	6.506	0.001
NIAR-CR0-2-T-Z-4-7-4	0.129	0.130	0.128	0.750	0.752	0.501	0.500	0.501	6.506	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR5-X-T-X-4-X-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR5-1-T-X-4-8-8	0.129	0.502	0.065	0.0	587.815	9.084	5.121	0.314	57589.000	1000-3000	5.784	70F / 34%	FAILURE AT FILLET
NIAR-CR5-1-T-X-4-8-9	0.129	0.505	0.065	0.0	590.732	9.093	5.398	0.301	67861.500	1000-3000	8.072	70F / 34%	FAILURE AT FILLET
NIAR-CR5-2-T-X-4-7-6	0.128	0.502	0.064	0.0	569.548	8.842	5.190	0.306	52983.500	1000-3000	5.313	70F / 34%	FAILURE AT FILLET
NIAR-CR5-2-T-X-4-8-9	0.128	0.504	0.065	0.0	567.517	8.777	5.132	0.297	57891.000	1000-3000	5.918	70F / 34%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**8.949**	**5.210**	**0.304**
STANDARD DEVIATION	0.163	0.129	0.007
COEFFICIENT OF VARIATION [%]	1.827	2.473	2.300

Comments:

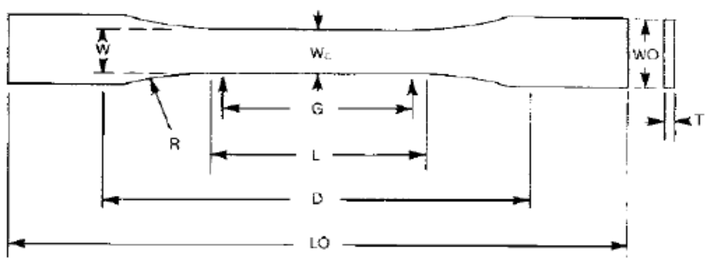
SPECIMENS 1-8-8, 2-7-6 AND 2-8-9 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	3-Apr-20
TESTER I	CHENG MIN	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR5-1-T-X-4-8-8	0.129	0.129	0.128	0.752	0.752	0.502	0.503	0.502	6.520	0.001
NIAR-CR5-1-T-X-4-8-9	0.129	0.129	0.129	0.754	0.754	0.505	0.505	0.505	6.519	0.001
NIAR-CR5-2-T-X-4-7-6	0.128	0.128	0.128	0.752	0.752	0.502	0.502	0.502	6.519	0.000
NIAR-CR5-2-T-X-4-8-9	0.128	0.128	0.128	0.753	0.753	0.504	0.505	0.504	6.518	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR-5-X-T-X-4-X-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR-5-1-T-X-4-8-11	0.129	0.503	0.065	0.0	601.600	9.285	5.424	0.310	61944.500	1000-3000	7.093	70F / 34%	FAILURE AT FILLET
NIAR-CR-5-1-T-X-4-8-13	0.129	0.502	0.065	0.0	604.779	9.340	5.553	0.308	66208.000	1000-3000	7.802	70F / 34%	FAILURE AT FILLET
NIAR-CR-5-2-T-X-4-8-13	0.129	0.504	0.065	0.0	586.879	9.062	5.215	0.306	63326.500	1000-3000	6.579	70F / 34%	FAILURE AT FILLET
NIAR-CR-5-2-T-X-4-9-14	0.129	0.502	0.065	0.0	588.858	9.104	5.437	0.302	61767.000	1000-3000	6.198	70F / 34%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.198**	**5.407**	**0.307**
STANDARD DEVIATION	0.135	0.141	0.003
COEFFICIENT OF VARIATION [%]	1.471	2.601	1.133

Comments:

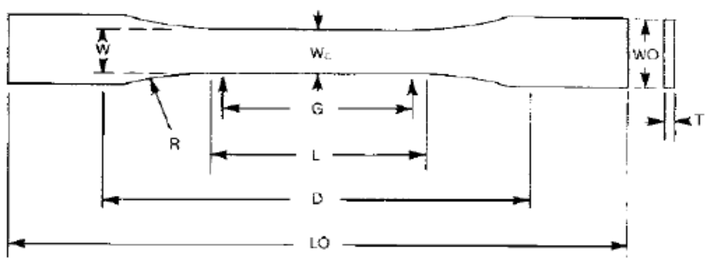
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
SPECIMENS 5-1-T-X-4-8-11, 5-1-T-X-4-8-13 AND 5-2-T-X-4-9-14 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	CHENG MIN	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR-5-1-T-X-4-8-11	0.129	0.128	0.129	0.752	0.752	0.504	0.502	0.501	6.519	0.001
NIAR-CR-5-1-T-X-4-8-13	0.130	0.129	0.129	0.753	0.752	0.503	0.502	0.502	6.517	0.001
NIAR-CR-5-2-T-X-4-8-13	0.129	0.128	0.128	0.753	0.753	0.506	0.502	0.503	6.518	0.001
NIAR-CR-5-2-T-X-4-9-14	0.129	0.129	0.129	0.752	0.752	0.503	0.502	0.501	6.517	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR5-X-T-Y-4-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR5-1-T-Y-4-8-9	0.127	0.502	0.064	0.0	672.674	10.522	6.332	0.362	49777.500	1000-3000	5.106	68F / 32%	FAILURE AT GAGE
NIAR-CR5-2-T-Y-4-8-6	0.128	0.501	0.064	0.0	685.938	10.704	6.271	0.368	51985.500	1000-3000	5.602	68F / 32%	FAILURE AT GAGE
NIAR-CR5-2-T-Y-4-8-8	0.128	0.501	0.064	0.0	690.196	10.769	6.353	0.367	52035.000	1000-3000	5.483	68F / 32%	FAILURE AT GAGE
NIAR-CR5-2-T-Y-4-8-9	0.127	0.501	0.064	0.0	694.267	10.871	6.535	0.366	53515.500	1000-3000	5.893	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**10.716**	**6.373**	**0.366**
STANDARD DEVIATION	0.147	0.114	0.003
COEFFICIENT OF VARIATION [%]	1.369	1.784	0.734

Comments:

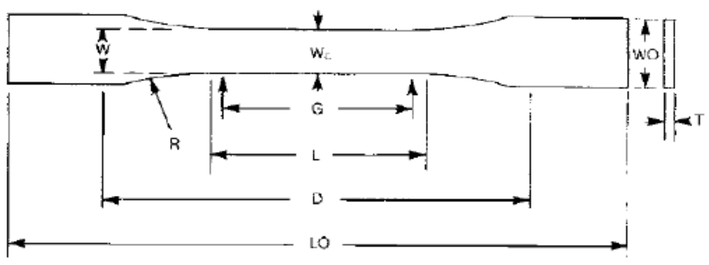
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-T-Y-4-8-9, 2-T-Y-4-8-6, 2-T-Y-4-8-9 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	Kadi Stithem	25-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR5-1-T-Y-4-8-9	0.127	0.127	0.128	0.753	0.753	0.502	0.502	0.502	6.513	0.001
NIAR-CR5-2-T-Y-4-8-6	0.129	0.128	0.127	0.754	0.753	0.501	0.501	0.501	6.513	0.002
NIAR-CR5-2-T-Y-4-8-8	0.128	0.128	0.128	0.754	0.753	0.502	0.501	0.502	6.511	0.000
NIAR-CR5-2-T-Y-4-8-9	0.128	0.127	0.127	0.754	0.753	0.501	0.502	0.501	6.512	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR-5-X-T-Y-4-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR-5-1-T-Y-4-9-13	0.129	0.503	0.065	0.0	714.056	11.054	6.688	0.374	49938.500	1000-3000	5.058	68F / 32%	FAILURE AT GAGE
NIAR-CR-5-2-T-Y-4-9-11	0.128	0.502	0.064	0.0	765.914	11.908	7.151	0.384	54067.500	1000-3000	5.766	68F / 32%	FAILURE AT GAGE
NIAR-CR-5-2-T-Y-4-9-13	0.129	0.502	0.065	0.0	753.918	11.658	6.866	0.382	54988.500	1000-3000	6.208	68F / 32%	FAILURE AT GAGE
NIAR-CR-5-2-T-Y-4-9-14	0.129	0.502	0.065	0.0	749.758	11.612	6.972	0.379	54273.500	1000-3000	5.680	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.558**	**6.919**	**0.380**
STANDARD DEVIATION	0.360	0.194	0.004
COEFFICIENT OF VARIATION [%]	3.116	2.802	1.093

Comments:

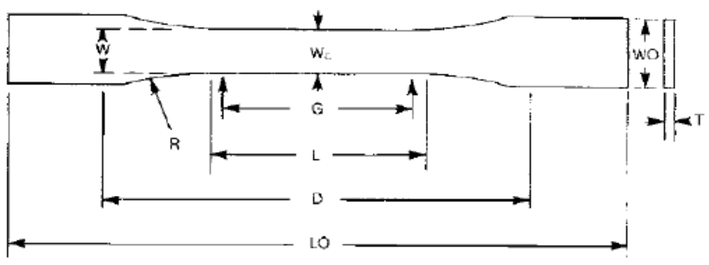
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
SPECIMEN 2-13 DOES NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR-5-1-T-Y-4-9-13	0.129	0.128	0.129	0.754	0.753	0.502	0.502	0.503	6.515	0.000
NIAR-CR-5-2-T-Y-4-9-11	0.129	0.128	0.128	0.755	0.754	0.502	0.502	0.502	6.515	0.001
NIAR-CR-5-2-T-Y-4-9-13	0.129	0.129	0.129	0.754	0.753	0.502	0.502	0.503	6.514	0.000
NIAR-CR-5-2-T-Y-4-9-14	0.129	0.129	0.128	0.754	0.754	0.503	0.502	0.503	6.514	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR5-X-T-Z-4-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR5-1-T-Z-4-8-6	0.128	0.502	0.064	0.0	446.327	6.955	5.532	0.344	24524.500	2.452	1000-3000	72F / 29%	FAILURE AT GAGE
NIAR-CR5-1-T-Z-4-8-9	0.128	0.501	0.064	0.0	503.472	7.827	5.821	0.331	30461.500	3.046	1000-3000	72F / 29%	FAILURE AT GAGE
NIAR-CR5-2-T-Z-4-8-6	0.129	0.500	0.065	0.0	522.841	8.080	5.707	0.330	33988.000	3.399	1000-3000	72F / 29%	FAILURE AT GAGE
NIAR-CR5-2-T-Z-4-8-8	0.128	0.502	0.064	0.0	513.144	7.971	5.719	0.337	31685.000	3.169	1000-3000	72F / 29%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.708**	**5.695**	**0.336**
STANDARD DEVIATION	0.512	0.120	0.007
COEFFICIENT OF VARIATION [%]	6.647	2.108	1.942

Comments:

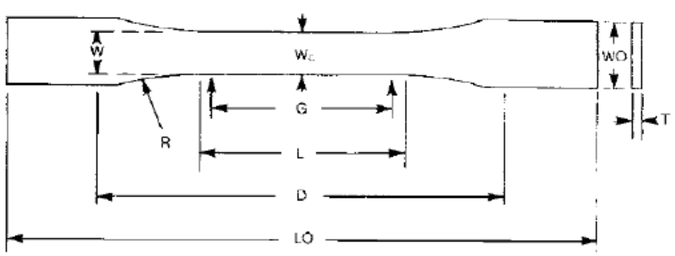
SPECIMEN 1-9 DOES NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 2-6, 2-8 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	26-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	26-Mar-20
TESTER I	CHENG MIN	16-Apr-20
DATA ENTRY/REDUCTION I	CONOR	17-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR5-1-T-Z-4-8-6	0.128	0.129	0.127	0.751	0.752	0.500	0.500	0.505	6.504	0.001
NIAR-CR5-1-T-Z-4-8-9	0.129	0.128	0.128	0.750	0.750	0.501	0.500	0.501	6.505	0.001
NIAR-CR5-2-T-Z-4-8-6	0.129	0.129	0.130	0.750	0.751	0.500	0.500	0.500	6.505	0.001
NIAR-CR5-2-T-Z-4-8-8	0.129	0.129	0.128	0.750	0.751	0.501	0.500	0.504	6.504	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR-5-X-T-Z-4-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR-5-1-T-Z-4-9-13	0.127	0.501	0.064	0.0	537.423	8.416	6.050	0.351	31544.389	1000-3000	3.154	71F / 32%	FAILURE AT GAGE
NIAR-CR-5-1-T-Z-4-9-14	0.128	0.502	0.064	0.0	487.607	7.605	5.895	0.345	27214.326	1000-3000	2.721	71F / 32%	FAILURE AT GAGE
NIAR-CR-5-2-T-Z-4-9-11	0.129	0.501	0.065	0.0	530.524	8.198	5.854	0.341	32310.730	1000-3000	3.238	71F / 32%	FAILURE AT GAGE
NIAR-CR-5-2-T-Z-4-9-14	0.128	0.502	0.064	0.0	538.247	8.362	5.956	0.340	33732.297	1000-3000	3.373	71F / 32%	FAILURE AT GAGE

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.145**	**5.939**	**0.344**
STANDARD DEVIATION	0.372	0.085	0.005
COEFFICIENT OF VARIATION [%]	4.569	1.433	1.537

Comments:

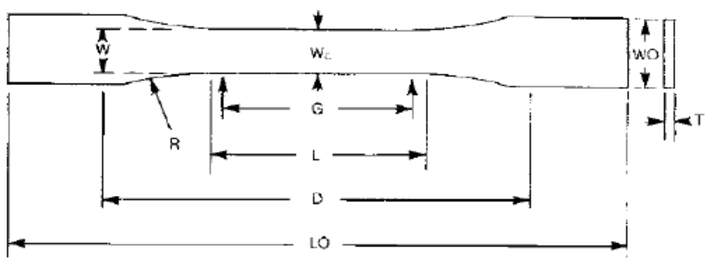
SPECIMEN 2-11 DOES NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 200 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR-5-1-T-Z-4-9-13	0.127	0.127	0.128	0.751	0.750	0.501	0.501	0.502	6.506	0.001
NIAR-CR-5-1-T-Z-4-9-14	0.127	0.128	0.128	0.754	0.751	0.502	0.502	0.502	6.509	0.001
NIAR-CR-5-2-T-Z-4-9-11	0.129	0.130	0.130	0.749	0.749	0.501	0.500	0.500	6.505	0.001
NIAR-CR-5-2-T-Z-4-9-14	0.129	0.128	0.127	0.752	0.751	0.502	0.501	0.502	6.510	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR-10-X-T-X-4-3-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR-10-1-T-X-4-3-21	0.126	0.501	0.063	0.0	608.570	9.625	5.409	0.331	64570.000	1000-3000	8.202	69F / 41%	FAILURE AT GAGE
NIAR-CR-10-1-T-X-4-3-24	0.127	0.502	0.064	0.0	588.313	9.204	5.299	0.313	64357.000	1000-3000	6.892	69F / 41%	FAILURE AT FILLET
NIAR-CR-10-2-T-X-4-3-21	0.127	0.501	0.064	0.0	605.435	9.522	5.236	0.332	64165.000	1000-3000	6.721	69F / 41%	FAILURE AT FILLET
NIAR-CR-10-2-T-X-4-3-23	0.128	0.501	0.064	0.0	599.539	9.368	5.135	0.331	62226.500	1000-3000	6.417	69F / 41%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.430**	**5.270**	**0.326**
STANDARD DEVIATION	0.184	0.115	0.009
COEFFICIENT OF VARIATION [%]	1.948	2.179	2.788

Comments:

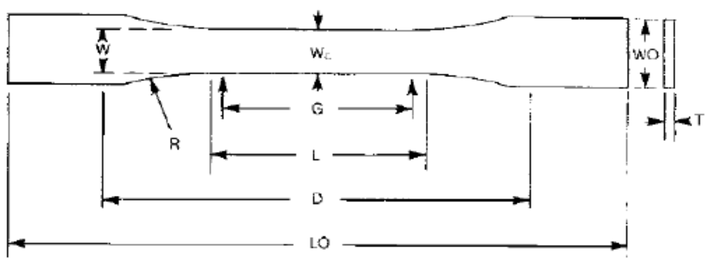
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR-10-1-T-X-4-3-21	0.126	0.126	0.127	0.751	0.750	0.501	0.501	0.501	6.516	0.001
NIAR-CR-10-1-T-X-4-3-24	0.126	0.129	0.127	0.752	0.752	0.503	0.501	0.502	6.515	0.002
NIAR-CR-10-2-T-X-4-3-21	0.127	0.127	0.127	0.751	0.750	0.501	0.500	0.501	6.514	0.001
NIAR-CR-10-2-T-X-4-3-23	0.129	0.127	0.127	0.751	0.751	0.501	0.500	0.501	6.514	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR10-X-T-X-4-X-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR10-1-T-X-4-3-19	0.128	0.502	0.064	0.0	597.575	9.302	5.132	0.323	63470.000	1000-3000	6.643	68F / 32%	FAILURE AT FILLET
NIAR-CR10-1-T-X-4-9-16	0.129	0.501	0.064	0.0	582.216	9.031	5.208	0.306	61505.500	1000-3000	6.338	68F / 32%	FAILURE AT FILLET
NIAR-CR10-2-T-X-4-3-19	0.128	0.501	0.064	0.0	586.400	9.126	5.146	0.313	63950.500	1000-3000	6.736	68F / 32%	FAILURE AT FILLET
NIAR-CR10-2-T-X-4-9-16	0.129	0.502	0.065	0.0	572.410	8.849	5.048	0.303	61803.000	1000-3000	6.286	68F / 32%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.077**	**5.133**	**0.311**
STANDARD DEVIATION	0.189	0.066	0.009
COEFFICIENT OF VARIATION [%]	2.082	1.285	2.849

Comments:

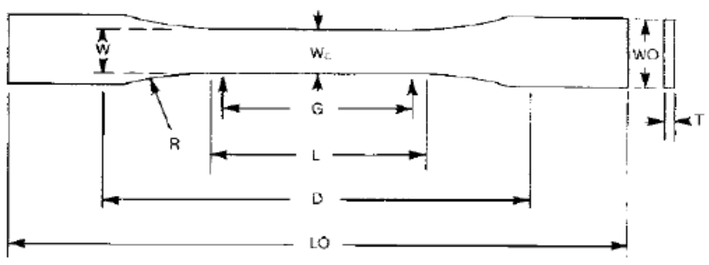
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (= 3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	RAMEESHA W.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR10-1-T-X-4-3-19	0.128	0.128	0.128	0.752	0.752	0.501	0.502	0.502	6.512	0.001
NIAR-CR10-1-T-X-4-9-16	0.129	0.129	0.129	0.750	0.750	0.501	0.501	0.502	6.516	0.000
NIAR-CR10-2-T-X-4-3-19	0.128	0.129	0.128	0.752	0.751	0.501	0.502	0.502	6.511	0.001
NIAR-CR10-2-T-X-4-9-16	0.129	0.129	0.129	0.753	0.753	0.502	0.502	0.502	6.514	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR-10-X-T-Y-4-3-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR-10-1-T-Y-4-3-21	0.127	0.503	0.064	0.0	785.078	12.319	7.224	0.391	55832.500	1000-3000	6.347	68F / 32%	FAILURE AT GAGE
NIAR-CR-10-2-T-Y-4-3-21	0.127	0.502	0.064	0.0	784.354	12.272	7.034	0.396	54724.000	1000-3000	5.966	68F / 32%	FAILURE AT GAGE
NIAR-CR-10-2-T-Y-4-3-23	0.128	0.503	0.065	0.0	795.672	12.322	7.155	0.390	56589.000	1000-3000	6.480	68F / 32%	FAILURE AT GAGE
NIAR-CR-10-2-T-Y-4-3-24	0.128	0.503	0.064	0.0	800.777	12.482	7.267	0.391	58616.500	1000-3000	6.708	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**12.349**	**7.170**	**0.392**
STANDARD DEVIATION	0.092	0.102	0.003
COEFFICIENT OF VARIATION [%]	0.743	1.422	0.676

Comments:

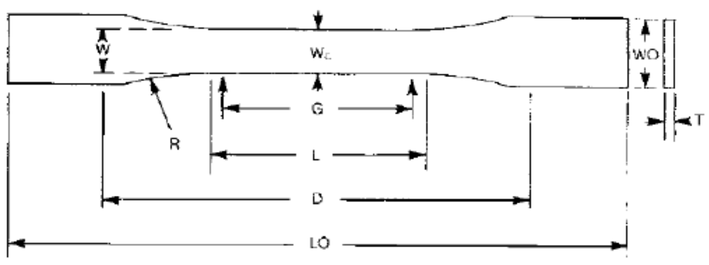
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-21 AND 2-24 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR-10-1-T-Y-4-3-21	0.127	0.127	0.127	0.753	0.752	0.503	0.503	0.503	6.513	0.000
NIAR-CR-10-2-T-Y-4-3-21	0.127	0.127	0.127	0.754	0.753	0.503	0.502	0.503	6.511	0.001
NIAR-CR-10-2-T-Y-4-3-23	0.129	0.129	0.128	0.754	0.753	0.503	0.503	0.503	6.511	0.001
NIAR-CR-10-2-T-Y-4-3-24	0.128	0.128	0.128	0.754	0.753	0.503	0.503	0.502	6.511	0.000



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR10-X-T-Y-4-6-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR10-1-T-Y-4-6-19	0.128	0.503	0.064	0.0	671.154	10.410	6.145	0.354	53723.000	1000-3000	6.056	68F / 32%	FAILURE AT GAGE
NIAR-CR10-2-T-Y-4-6-16	0.128	0.503	0.065	0.0	680.870	10.552	6.161	0.359	54827.500	1000-3000	6.107	68F / 32%	FAILURE AT GAGE
NIAR-CR10-2-T-Y-4-6-18	0.129	0.502	0.065	0.0	669.814	10.333	5.989	0.356	50304.000	1000-3000	5.083	68F / 32%	FAILURE AT GAGE
NIAR-CR10-2-T-Y-4-6-19	0.129	0.503	0.065	0.0	672.960	10.406	6.197	0.353	52884.500	1000-3000	5.632	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**10.425**	**6.123**	**0.356**
STANDARD DEVIATION	0.092	0.092	0.003
COEFFICIENT OF VARIATION [%]	0.881	1.503	0.784

Comments:

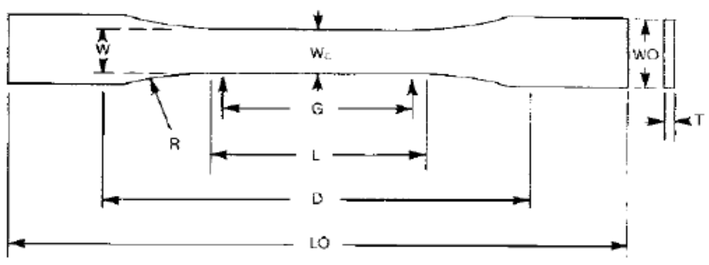
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-19, 2-16 AND 2-19 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR10-1-T-Y-4-6-19	0.129	0.128	0.128	0.754	0.753	0.503	0.503	0.504	6.515	0.001
NIAR-CR10-2-T-Y-4-6-16	0.128	0.128	0.129	0.755	0.754	0.503	0.503	0.503	6.514	0.002
NIAR-CR10-2-T-Y-4-6-18	0.129	0.129	0.129	0.755	0.754	0.503	0.502	0.503	6.514	0.001
NIAR-CR10-2-T-Y-4-6-19	0.129	0.129	0.128	0.755	0.754	0.503	0.503	0.503	6.515	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR-10-X-T-Z-4-5-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR-10-1-T-Z-4-5-21	0.129	0.504	0.065	0.0	518.903	8.005	5.969	0.352	28891.583	1000-3000	2.889	71F / 29%	FAILURE AT GAGE
NIAR-CR-10-1-T-Z-4-5-24	0.129	0.502	0.065	0.0	529.139	8.195	6.138	0.345	30239.189	1000-3000	3.024	71F / 29%	FAILURE AT GAGE
NIAR-CR-10-2-T-Z-4-5-23	0.130	0.502	0.065	0.0	545.837	8.376	5.913	0.344	33052.239	1000-3000	3.305	71F / 29%	FAILURE AT GAGE
NIAR-CR-10-2-T-Z-4-5-24	0.129	0.501	0.065	0.0	560.490	8.646	6.014	0.344	35331.974	1000-3000	3.541	71F / 29%	FAILURE AT GAGE

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.305**	**6.009**	**0.346**
STANDARD DEVIATION	0.273	0.096	0.004
COEFFICIENT OF VARIATION [%]	3.288	1.593	1.131

Comments:

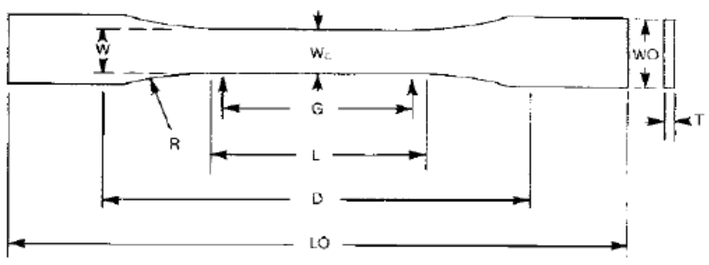
SPECIMENS 1-24 AND 2-24 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-24 AND 2-24 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR OVERALL WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 200 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	24-Mar-20
TESTER I	CHENG MIN	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR-10-1-T-Z-4-5-21	0.129	0.129	0.128	0.751	0.750	0.506	0.502	0.503	6.510	0.001
NIAR-CR-10-1-T-Z-4-5-24	0.129	0.128	0.129	0.750	0.749	0.504	0.501	0.501	6.503	0.000
NIAR-CR-10-2-T-Z-4-5-23	0.130	0.130	0.130	0.750	0.748	0.503	0.501	0.501	6.505	0.000
NIAR-CR-10-2-T-Z-4-5-24	0.130	0.129	0.129	0.750	0.748	0.501	0.501	0.501	6.505	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR10-X-T-Z-4-6-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR10-1-T-Z-4-6-18	0.129	0.502	0.065	0.0	467.326	7.227	5.598	0.331	27086.000	2.709	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CR10-1-T-Z-4-6-19	0.129	0.502	0.065	0.0	494.590	7.640	5.305	0.339	30027.500	3.003	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CR10-2-T-Z-4-6-16	0.129	0.502	0.065	0.0	510.719	7.889	5.470	0.328	33293.000	3.329	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CR10-2-T-Z-4-6-19	0.129	0.502	0.065	0.0	458.076	7.078	5.398	0.331	26666.500	2.667	1000-3000	71F / 19%	FAILURE AT GAGE

AVERAGE	**7.459**	**5.443**	**0.332**
STANDARD DEVIATION	0.373	0.124	0.005
COEFFICIENT OF VARIATION [%]	4.996	2.274	1.393

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

Comments:

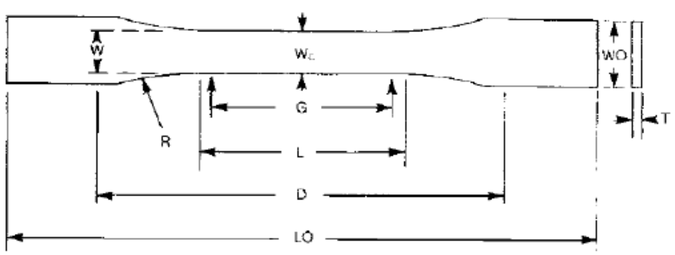
SPECIMEN 1-18 DOES NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-19 DOES NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
SPECIMENS 1-18, 1-19 AND 2-19 DO NOT MEET THE REQUIREMENT FOR OVERALL WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	24-Mar-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	CONOR	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR10-1-T-Z-4-6-18	0.129	0.129	0.129	0.749	0.750	0.504	0.501	0.502	6.504	0.000
NIAR-CR10-1-T-Z-4-6-19	0.129	0.129	0.129	0.749	0.750	0.503	0.501	0.503	6.503	0.000
NIAR-CR10-2-T-Z-4-6-16	0.129	0.128	0.130	0.750	0.751	0.503	0.502	0.502	6.509	0.001
NIAR-CR10-2-T-Z-4-6-19	0.129	0.129	0.129	0.750	0.748	0.501	0.501	0.504	6.504	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR-15-X-T-X-4-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR-15-1-T-X-4-1-31	0.127	0.500	0.063	0.0	635.590	10.028	5.892	0.333	65193.000	1000-3000	7.644	69F / 46%	FAILURE AT GAGE
NIAR-CR-15-1-T-X-4-1-33	0.127	0.503	0.064	0.0	605.657	9.459	5.626	0.314	65384.000	1000-3000	8.187	69F / 46%	FAILURE AT GAGE
NIAR-CR-15-2-T-X-4-1-31	0.128	0.501	0.064	0.0	609.053	9.521	5.698	0.318	65603.000	1000-3000	7.346	69F / 46%	FAILURE AT FILLET
NIAR-CR-15-2-T-X-4-1-34	0.128	0.502	0.064	0.0	608.824	9.479	5.453	0.321	63423.500	1000-3000	7.300	69F / 46%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.622**	**5.667**	**0.322**
STANDARD DEVIATION	0.272	0.182	0.008
COEFFICIENT OF VARIATION [%]	2.827	3.211	2.615

Comments:

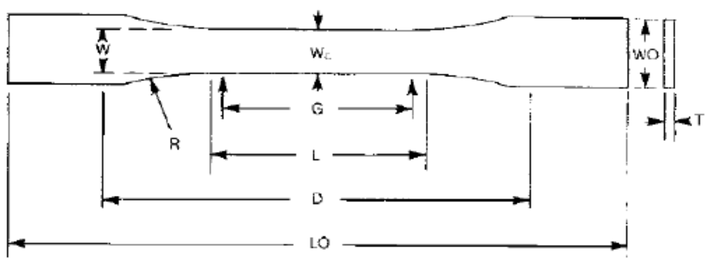
SPECIMENS 1-31, 2-31, 2-34 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-31, 1-33 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR-15-1-T-X-4-1-31	0.127	0.127	0.126	0.751	0.751	0.500	0.500	0.500	6.514	0.001
NIAR-CR-15-1-T-X-4-1-33	0.127	0.128	0.127	0.752	0.755	0.504	0.502	0.502	6.515	0.001
NIAR-CR-15-2-T-X-4-1-31	0.127	0.128	0.128	0.752	0.750	0.501	0.501	0.501	6.514	0.001
NIAR-CR-15-2-T-X-4-1-34	0.128	0.127	0.128	0.751	0.751	0.503	0.502	0.502	6.515	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR15-X-T-X-4-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR15-1-T-X-4-2-28	0.127	0.502	0.064	0.0	588.549	9.229	5.419	0.312	55110.000	1000-3000	5.547	70F / 34%	FAILURE AT FILLET
NIAR-CR15-1-T-X-4-2-29	0.127	0.501	0.063	0.0	593.047	9.345	5.398	0.313	63413.000	1000-3000	6.681	70F / 34%	FAILURE AT FILLET
NIAR-CR15-2-T-X-4-2-26	0.127	0.502	0.064	0.0	568.265	8.944	5.248	0.300	57728.500	1000-3000	5.790	70F / 34%	FAILURE AT FILLET
NIAR-CR15-2-T-X-4-2-28	0.127	0.501	0.064	0.0	569.889	8.959	5.251	0.301	58981.000	1000-3000	5.939	70F / 34%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.119**	**5.329**	**0.306**
STANDARD DEVIATION	0.199	0.092	0.007
COEFFICIENT OF VARIATION [%]	2.185	1.735	2.264

Comments:

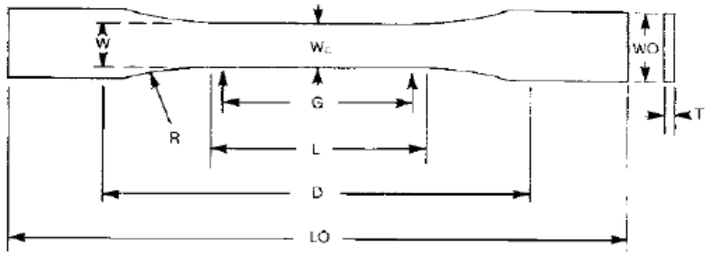
SPECIMEN 1-29 DOES NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-28, 1-29, 2-28 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 2-26 AND 2-28 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR15-1-T-X-4-2-28	0.127	0.127	0.127	0.751	0.750	0.502	0.501	0.502	6.516	0.001
NIAR-CR15-1-T-X-4-2-29	0.126	0.127	0.127	0.750	0.750	0.501	0.501	0.501	6.514	0.001
NIAR-CR15-2-T-X-4-2-26	0.127	0.127	0.126	0.751	0.751	0.503	0.501	0.501	6.514	0.001
NIAR-CR15-2-T-X-4-2-28	0.128	0.126	0.126	0.751	0.751	0.501	0.501	0.500	6.514	0.002



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR-15-X-T-Y-4-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR-15-1-T-Y-4-1-33	0.128	0.503	0.064	0.0	809.697	12.558	7.302	0.391	57246.500	1000-3000	6.673	68F / 32%	FAILURE AT GAGE
NIAR-CR-15-2-T-Y-4-1-31	0.129	0.502	0.065	0.0	829.745	12.853	7.140	0.400	59599.500	1000-3000	8.039	68F / 32%	FAILURE AT GAGE
NIAR-CR-15-2-T-Y-4-1-33	0.129	0.501	0.065	0.0	821.835	12.697	7.211	0.394	60062.000	1000-3000	7.033	68F / 32%	FAILURE AT GAGE
NIAR-CR-15-2-T-Y-4-1-34	0.129	0.503	0.065	0.0	824.747	12.693	7.121	0.395	58918.500	1000-3000	7.558	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**12.700**	**7.194**	**0.395**
STANDARD DEVIATION	0.121	0.082	0.004
COEFFICIENT OF VARIATION [%]	0.950	1.144	1.010

Comments:

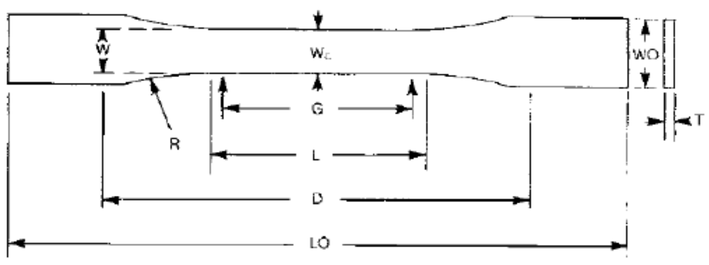
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-33 AND 2-34 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR-15-1-T-Y-4-1-33	0.128	0.128	0.128	0.753	0.752	0.503	0.503	0.503	6.515	0.001
NIAR-CR-15-2-T-Y-4-1-31	0.129	0.129	0.128	0.754	0.754	0.503	0.502	0.502	6.515	0.000
NIAR-CR-15-2-T-Y-4-1-33	0.129	0.129	0.129	0.754	0.754	0.502	0.501	0.502	6.516	0.000
NIAR-CR-15-2-T-Y-4-1-34	0.129	0.129	0.129	0.754	0.754	0.503	0.504	0.503	6.516	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR15-X-T-Y-4-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR15-1-T-Y-4-2-26	0.127	0.504	0.064	0.0	637.090	9.993	6.042	0.328	55281.000	1000-3000	5.782	70F / 42%	FAILURE AT GAGE
NIAR-CR15-2-T-Y-4-2-26	0.128	0.503	0.064	0.0	647.710	10.046	6.102	0.328	56005.000	1000-3000	6.114	70F / 42%	FAILURE AT GAGE
NIAR-CR15-2-T-Y-4-2-28	0.128	0.503	0.064	0.0	655.068	10.202	6.175	0.336	55105.000	1000-3000	5.777	70F / 42%	FAILURE AT GAGE
NIAR-CR15-2-T-Y-4-2-29	0.127	0.503	0.064	0.0	648.828	10.197	6.166	0.334	54255.000	1000-3000	5.510	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**10.109**	**6.121**	**0.332**
STANDARD DEVIATION	0.106	0.062	0.004
COEFFICIENT OF VARIATION [%]	1.047	1.014	1.161

Comments:

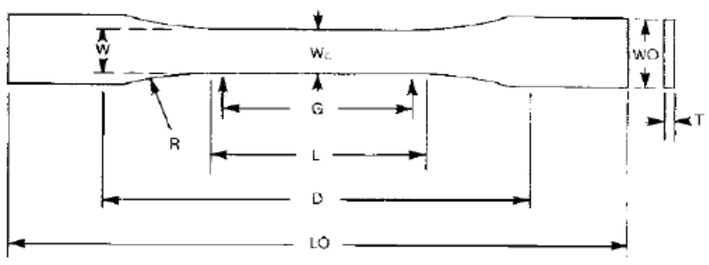
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-26, 2-28, 2-29 DO NOT MEET THE REQUIREMENT OF Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	24-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR15-1-T-Y-4-2-26	0.126	0.128	0.126	0.752	0.752	0.504	0.503	0.503	6.511	0.002
NIAR-CR15-2-T-Y-4-2-26	0.129	0.128	0.129	0.755	0.753	0.503	0.503	0.503	6.510	0.001
NIAR-CR15-2-T-Y-4-2-28	0.128	0.127	0.128	0.755	0.753	0.504	0.503	0.503	6.512	0.000
NIAR-CR15-2-T-Y-4-2-29	0.126	0.126	0.127	0.755	0.753	0.504	0.503	0.503	6.512	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR-15-X-T-Z-4-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR-15-1-T-Z-4-1-33	0.128	0.501	0.064	0.0	542.661	8.492	6.272	0.361	30465.000	1000-3000	3.047	69F / 41%	FAILURE AT GAGE
NIAR-CR-15-1-T-Z-4-1-34	0.127	0.501	0.064	0.0	526.601	8.241	6.167	0.354	29639.000	1000-3000	2.964	69F / 41%	FAILURE AT FILLET
NIAR-CR-15-2-T-Z-4-1-31	0.127	0.501	0.064	0.0	529.822	8.309	5.964	0.362	30117.500	1000-3000	3.026	69F / 41%	FAILURE AT GAGE
NIAR-CR-15-2-T-Z-4-1-34	0.128	0.501	0.064	0.0	545.946	8.496	5.969	0.354	32579.500	1000-3000	3.258	69F / 41%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.384**	**6.093**	**0.358**
STANDARD DEVIATION	0.130	0.152	0.004
COEFFICIENT OF VARIATION [%]	1.545	2.500	1.124

Comments:

ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR OVERALL WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638

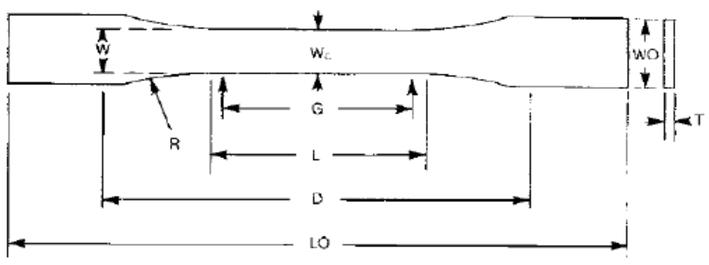
GRIP PRESSURE: 150 psi

ELONGATION AT BREAK MAY NOT BE ACCURATE FOR NIAR-CR-15-1-T-Z-4-1-34 THE FRACTURE OCCURRED OUTSIDE OF EXTENSOMETER GAGE LENGTH

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY T.	3-Apr-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY		

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR-15-1-T-Z-4-1-33	0.128	0.128	0.127	0.749	0.751	0.501	0.502	0.501	6.506	0.001
NIAR-CR-15-1-T-Z-4-1-34	0.128	0.127	0.127	0.752	0.749	0.501	0.501	0.501	6.509	0.000
NIAR-CR-15-2-T-Z-4-1-31	0.128	0.127	0.127	0.750	0.748	0.500	0.501	0.501	6.506	0.001
NIAR-CR-15-2-T-Z-4-1-34	0.128	0.128	0.129	0.751	0.749	0.502	0.502	0.501	6.510	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-CR15-X-T-Z-4-4-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-CR15-1-T-Z-4-4-26	0.129	0.500	0.065	0.0	473.636	7.333	5.120	0.316	31595.500	3.160	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CR15-1-T-Z-4-4-29	0.129	0.501	0.064	0.0	401.067	6.220	5.160	0.312	23826.500	2.383	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CR15-2-T-Z-4-4-28	0.129	0.501	0.065	0.0	468.021	7.245	4.943	0.309	32813.500	3.281	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-CR15-2-T-Z-4-4-29	0.129	0.500	0.064	0.0	477.798	7.416	5.223	0.303	34384.500	3.438	1000-3000	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.054**	**5.111**	**0.310**
STANDARD DEVIATION	0.560	0.120	0.006
COEFFICIENT OF VARIATION [%]	7.940	2.349	1.818

Comments:

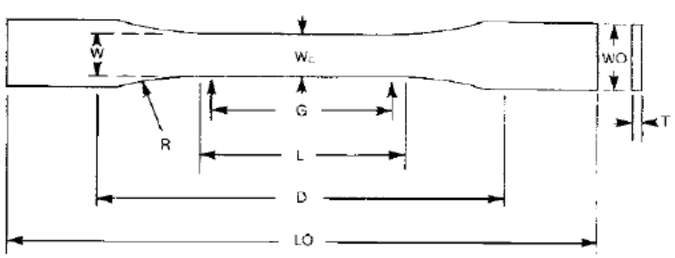
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-28 DOES NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR OVERALL WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	24-Mar-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	CONOR	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-CR15-1-T-Z-4-4-26	0.129	0.129	0.129	0.750	0.750	0.501	0.500	0.500	6.504	0.001
NIAR-CR15-1-T-Z-4-4-29	0.129	0.128	0.129	0.750	0.748	0.504	0.500	0.500	6.503	0.001
NIAR-CR15-2-T-Z-4-4-28	0.129	0.129	0.129	0.750	0.748	0.503	0.500	0.500	6.502	0.001
NIAR-CR15-2-T-Z-4-4-29	0.129	0.129	0.129	0.750	0.749	0.500	0.500	0.500	6.503	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-EVSR17-X-T-X-5-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-EVSR17-1-T-X-5-7-1	0.129	0.501	0.065	0.0	588.055	9.085	5.273	0.297	63494.000	1000-3000	7.471	70F / 42%	FAILURE AT FILLET
NIAR-EVSR17-1-T-X-5-7-4	0.129	0.502	0.065	0.0	589.701	9.120	5.263	0.297	62901.000	1000-3000	6.899	70F / 42%	FAILURE AT GAGE
NIAR-EVSR17-2-T-X-5-7-1	0.129	0.502	0.065	0.0	603.529	9.339	5.359	0.312	63465.000	1000-3000	6.870	70F / 42%	FAILURE AT GAGE
NIAR-EVSR17-2-T-X-5-7-3	0.129	0.502	0.065	0.0	599.056	9.241	5.162	0.312	64006.000	1000-3000	7.201	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.196**	**5.264**	**0.304**
STANDARD DEVIATION	0.116	0.081	0.009
COEFFICIENT OF VARIATION [%]	1.260	1.530	2.801

Comments:

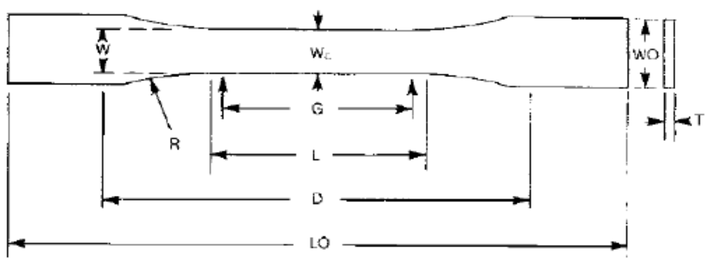
SPECIMENS 1-1, 1-4 AND 2-1 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-1 AND 2-1 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	23-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-EVSR17-1-T-X-5-7-1	0.129	0.129	0.129	0.751	0.751	0.501	0.501	0.501	6.522	0.001
NIAR-EVSR17-1-T-X-5-7-4	0.129	0.129	0.129	0.752	0.752	0.502	0.502	0.502	6.522	0.001
NIAR-EVSR17-2-T-X-5-7-1	0.129	0.129	0.129	0.751	0.751	0.502	0.502	0.502	6.518	0.000
NIAR-EVSR17-2-T-X-5-7-3	0.129	0.129	0.129	0.753	0.752	0.502	0.502	0.502	6.518	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-EVSR17-X-T-Y-5-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-EVSR17-1-T-Y-5-7-4	0.128	0.504	0.064	0.0	726.045	11.284	6.392	0.361	58948.500	1000-3000	7.428	68F / 32%	FAILURE AT GAGE
NIAR-EVSR17-2-T-Y-5-7-1	0.129	0.502	0.065	0.0	755.424	11.706	6.762	0.367	61932.000	1000-3000	8.985	68F / 32%	FAILURE AT GAGE
NIAR-EVSR17-2-T-Y-5-7-3	0.128	0.503	0.064	0.0	761.692	11.862	6.677	0.374	61335.500	1000-3000	9.767	68F / 32%	FAILURE AT GAGE
NIAR-EVSR17-2-T-Y-5-7-4	0.128	0.503	0.064	0.0	762.081	11.860	6.772	0.371	62419.500	1000-3000	8.522	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.678**	**6.651**	**0.368**
STANDARD DEVIATION	0.273	0.177	0.005
COEFFICIENT OF VARIATION [%]	2.336	2.666	1.470

Comments:

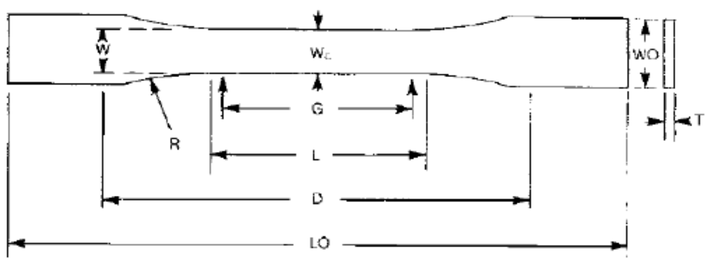
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-4 AND 2-4 DO NOT MEET THE REQIREMENT FOR WIDTH AT CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY	24-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	28-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-EVSR17-1-T-Y-5-7-4	0.127	0.128	0.128	0.753	0.754	0.504	0.504	0.504	6.514	0.000
NIAR-EVSR17-2-T-Y-5-7-1	0.129	0.128	0.129	0.755	0.755	0.502	0.502	0.502	6.512	0.001
NIAR-EVSR17-2-T-Y-5-7-3	0.128	0.128	0.127	0.755	0.755	0.503	0.502	0.503	6.513	0.001
NIAR-EVSR17-2-T-Y-5-7-4	0.128	0.128	0.127	0.754	0.755	0.503	0.503	0.503	6.510	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-EVSR17-X-T-Z-5-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-EVSR17-1-T-Z-5-7-1	0.129	0.500	0.064	0.0	508.247	7.892	5.781	0.344	29384.000	2.938	1000-3000	74F / 26%	FAILURE AT GAGE
NIAR-EVSR17-1-T-Z-5-7-3	0.129	0.501	0.065	0.0	510.679	7.906	5.751	0.336	30638.000	3.064	1000-3000	74F / 26%	FAILURE AT GAGE
NIAR-EVSR17-2-T-Z-5-7-3	0.128	0.501	0.064	0.0	506.050	7.857	5.921	0.325	31038.000	3.104	1000-3000	74F / 26%	FAILURE AT GAGE
NIAR-EVSR17-2-T-Z-5-7-4	0.128	0.501	0.064	0.0	532.660	8.313	5.803	0.332	35083.000	3.508	1000-3000	74F / 26%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.992**	**5.814**	**0.334**
STANDARD DEVIATION	0.215	0.074	0.008
COEFFICIENT OF VARIATION [%]	2.687	1.279	2.365

Comments:

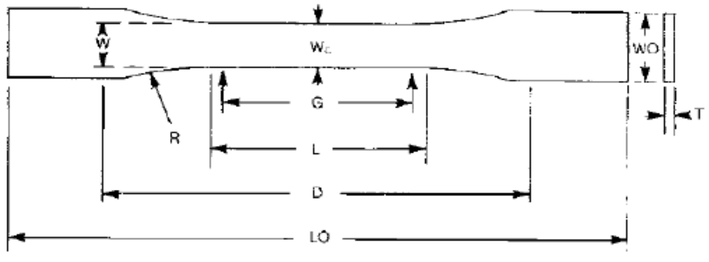
SPECIMEN 2-3 DOES NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 1-3 DOES NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
SPECIMENS 1-1 AND 1-3 DO NOT MEET THE REQUIREMENT FOR LENGTH (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	CHENG MIN	16-Apr-20
DATA ENTRY/REDUCTION I	CONOR	17-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-EVSR17-1-T-Z-5-7-1	0.128	0.129	0.129	0.751	0.748	0.501	0.500	0.500	6.502	0.001
NIAR-EVSR17-1-T-Z-5-7-3	0.129	0.128	0.130	0.750	0.748	0.503	0.500	0.500	6.503	0.002
NIAR-EVSR17-2-T-Z-5-7-3	0.128	0.129	0.129	0.752	0.750	0.502	0.501	0.501	6.504	0.000
NIAR-EVSR17-2-T-Z-5-7-4	0.128	0.128	0.128	0.751	0.751	0.501	0.501	0.501	6.505	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-EVSR20-X-T-X-5-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-EVSR20-1-T-X-5-8-8	0.129	0.502	0.065	0.0	604.615	9.356	5.310	0.309	63490.500	1000-3000	6.779	70F / 42%	FAILURE AT GAGE
NIAR-EVSR20-1-T-X-5-8-9	0.129	0.503	0.065	0.0	593.784	9.148	5.218	0.301	64933.500	1000-3000	7.634	70F / 42%	FAILURE AT GAGE
NIAR-EVSR20-2-T-X-5-8-6	0.129	0.503	0.065	0.0	598.265	9.220	5.157	0.310	66505.500	1000-3000	8.553	70F / 42%	FAILURE AT GAGE
NIAR-EVSR20-2-T-X-5-8-8	0.129	0.502	0.065	0.0	601.794	9.313	5.327	0.308	63804.500	1000-3000	7.218	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.259**	**5.253**	**0.307**
STANDARD DEVIATION	0.093	0.080	0.004
COEFFICIENT OF VARIATION [%]	1.008	1.523	1.395

Comments:

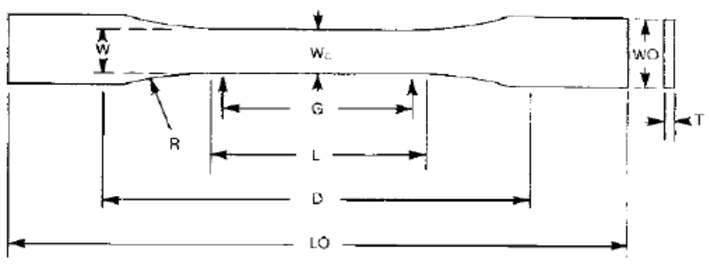
SPECIMENS 1-8, 1-9 AND 2-8 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 1-9 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	23-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-EVSR20-1-T-X-5-8-8	0.129	0.129	0.129	0.752	0.752	0.502	0.502	0.502	6.522	0.000
NIAR-EVSR20-1-T-X-5-8-9	0.129	0.129	0.129	0.752	0.752	0.503	0.502	0.503	6.522	0.000
NIAR-EVSR20-2-T-X-5-8-6	0.129	0.129	0.129	0.753	0.752	0.503	0.503	0.503	6.519	0.001
NIAR-EVSR20-2-T-X-5-8-8	0.129	0.129	0.128	0.752	0.752	0.502	0.502	0.502	6.520	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-EVSR20-X-T-Y-5-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-EVSR20-1-T-Y-5-8-6	0.128	0.503	0.064	0.0	719.974	11.191	6.522	0.356	58012.000	1000-3000	6.675	68F / 32%	FAILURE AT GAGE
NIAR-EVSR20-2-T-Y-5-8-6	0.128	0.504	0.065	0.0	763.246	11.811	6.756	0.368	60329.500	1000-3000	7.652	68F / 32%	FAILURE AT GAGE
NIAR-EVSR20-2-T-Y-5-8-8	0.128	0.503	0.064	0.0	763.551	11.845	6.695	0.372	61622.500	1000-3000	8.024	68F / 32%	FAILURE AT GAGE
NIAR-EVSR20-2-T-Y-5-8-9	0.129	0.504	0.065	0.0	766.676	11.832	6.753	0.369	62079.000	1000-3000	8.061	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.670**	**6.681**	**0.366**
STANDARD DEVIATION	0.319	0.110	0.007
COEFFICIENT OF VARIATION [%]	2.736	1.649	1.851

Comments:

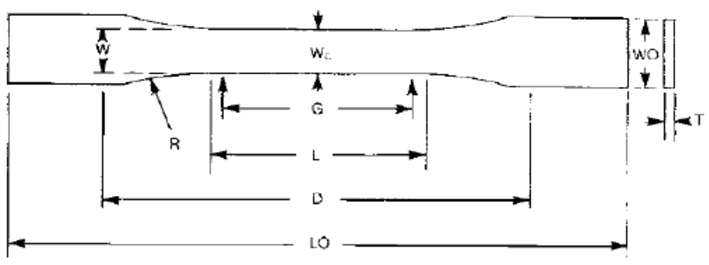
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-EVSR20-1-T-Y-5-8-6	0.128	0.128	0.128	0.753	0.754	0.502	0.503	0.503	6.514	0.001
NIAR-EVSR20-2-T-Y-5-8-6	0.129	0.128	0.128	0.755	0.755	0.504	0.504	0.503	6.513	0.001
NIAR-EVSR20-2-T-Y-5-8-8	0.129	0.128	0.128	0.755	0.755	0.503	0.503	0.504	6.513	0.001
NIAR-EVSR20-2-T-Y-5-8-9	0.129	0.129	0.128	0.755	0.755	0.504	0.504	0.504	6.514	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-EVSR20-X-T-Z-5-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-EVSR20-1-T-Z-5-8-6	0.129	0.501	0.065	0.0	481.046	7.454	5.685	0.339	27263.586	1000-3000	2.733	72F / 30%	FAILURE AT GAGE
NIAR-EVSR20-1-T-Z-5-8-9	0.129	0.501	0.064	0.0	485.211	7.525	5.857	0.338	27552.911	1000-3000	2.755	72F / 30%	FAILURE AT GAGE
NIAR-EVSR20-2-T-Z-5-8-6	0.129	0.501	0.064	0.0	497.924	7.722	5.702	0.330	29929.670	1000-3000	3.000	72F / 30%	FAILURE AT FILLET
NIAR-EVSR20-2-T-Z-5-8-8	0.128	0.502	0.064	0.0	493.914	7.668	5.532	0.338	29165.374	1000-3000	2.923	72F / 30%	FAILURE AT GAGE

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.592**	**5.694**	**0.336**
STANDARD DEVIATION	0.124	0.133	0.004
COEFFICIENT OF VARIATION [%]	1.633	2.334	1.322

Comments:

SPECIMENS 1-9, 2-6 AND 2-8 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-6 DOES NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
SPECIMEN 1-6 DOES NOT MEET THE REQUIREMENT FOR WIDTH (=0.50" ± 0.02") PER ASTM D638
SPECIMEN 2-8 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (2.25" ± 0.02") PER ASTM D638

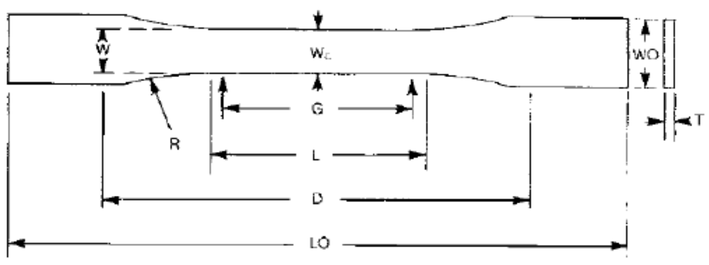
GRIP PRESSURE: 200 psi

ELONGATION AT BREAK MAY NOT BE ACCURATE FOR NIAR-EVSR20-1-T-Z-5-8-6 AND NIAR-EVSR20-2-T-Z-5-8-(6,8) AS THE FRACTURE OCCURRED OUTSIDE OF EXTENSOMETER GAGE LENGTH

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	N/A	N/A
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	CHENG MIN	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-EVSR20-1-T-Z-5-8-6	0.129	0.128	0.129	0.750	0.748	0.504	0.500	0.500	6.504	0.001
NIAR-EVSR20-1-T-Z-5-8-9	0.129	0.129	0.128	0.750	0.750	0.502	0.500	0.500	6.505	0.001
NIAR-EVSR20-2-T-Z-5-8-6	0.129	0.129	0.128	0.752	0.750	0.502	0.501	0.501	6.505	0.001
NIAR-EVSR20-2-T-Z-5-8-8	0.128	0.129	0.128	0.752	0.750	0.503	0.501	0.502	6.505	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-NC1-X-T-X-6-3-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-NC1-1-T-X-6-3-18	0.129	0.500	0.064	0.0	563.774	8.752	4.816	0.307	63583.000	1000-3000	6.429	68F / 32%	FAILURE AT FILLET
NIAR-NC1-1-T-X-6-3-19	0.129	0.501	0.065	0.0	572.552	8.874	4.925	0.306	63656.500	1000-3000	6.641	68F / 32%	FAILURE AT FILLET
NIAR-NC1-2-T-X-6-3-16	0.129	0.501	0.065	0.0	574.641	8.909	4.987	0.311	59545.000	1000-3000	6.063	68F / 32%	FAILURE AT FILLET
NIAR-NC1-2-T-X-6-3-18	0.128	0.501	0.064	0.0	591.241	9.192	5.184	0.312	67838.000	1000-3000	9.234	68F / 32%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**8.932**	**4.978**	**0.309**
STANDARD DEVIATION	0.186	0.154	0.003
COEFFICIENT OF VARIATION [%]	2.084	3.099	0.976

Comments:

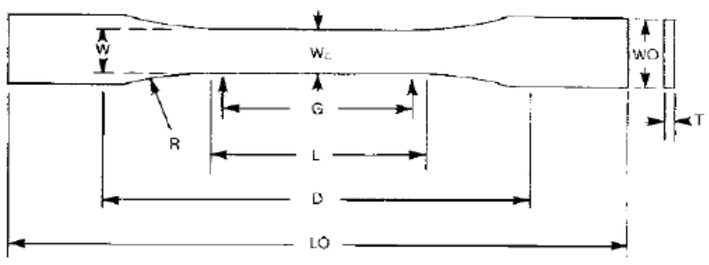
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-18, 1-19 AND 2-16 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-18 DOES NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	28-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-NC1-1-T-X-6-3-18	0.129	0.129	0.129	0.750	0.750	0.500	0.500	0.500	6.513	0.001
NIAR-NC1-1-T-X-6-3-19	0.128	0.129	0.129	0.751	0.751	0.501	0.501	0.501	6.513	0.001
NIAR-NC1-2-T-X-6-3-16	0.129	0.129	0.129	0.750	0.750	0.501	0.501	0.501	6.515	0.001
NIAR-NC1-2-T-X-6-3-18	0.128	0.129	0.128	0.751	0.750	0.501	0.501	0.501	6.516	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-NC1-X-T-Y-6-7-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-NC1-1-T-Y-6-7-1	0.129	0.502	0.065	0.0	676.225	10.431	5.947	0.369	53546.000	1000-3000	5.746	68F / 32%	FAILURE AT GAGE
NIAR-NC1-2-T-Y-6-7-1	0.128	0.501	0.064	0.0	691.301	10.762	6.207	0.377	52293.000	1000-3000	5.593	68F / 32%	FAILURE AT GAGE
NIAR-NC1-2-T-Y-6-7-3	0.128	0.502	0.064	0.0	700.234	10.899	6.693	0.369	50096.000	1000-3000	5.199	68F / 32%	FAILURE AT GAGE
NIAR-NC1-2-T-Y-6-7-4	0.128	0.502	0.064	0.0	706.759	10.986	6.589	0.373	49278.000	1000-3000	4.966	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**10.770**	**6.359**	**0.372**
STANDARD DEVIATION	0.244	0.345	0.004
COEFFICIENT OF VARIATION [%]	2.263	5.428	1.034

Comments:

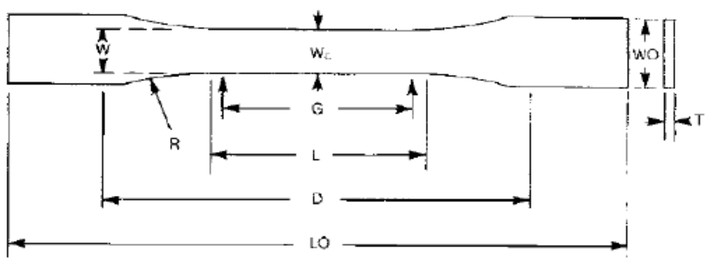
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (= 3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
SPECIMENS 2-3 AND 2-4 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-NC1-1-T-Y-6-7-1	0.129	0.129	0.129	0.754	0.753	0.502	0.502	0.502	6.531	0.000
NIAR-NC1-2-T-Y-6-7-1	0.128	0.128	0.128	0.754	0.753	0.502	0.501	0.501	6.519	0.000
NIAR-NC1-2-T-Y-6-7-3	0.128	0.128	0.128	0.753	0.752	0.502	0.502	0.502	6.519	0.001
NIAR-NC1-2-T-Y-6-7-4	0.128	0.128	0.128	0.753	0.753	0.503	0.502	0.502	6.519	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-NC1-X-T-Z-6-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-NC1-1-T-Z-6-7-3	0.128	0.502	0.064	0.0	544.926	8.466	5.896	0.347	33052.000	1000-3000	3.305	73F / 23%	FAILURE AT GAGE
NIAR-NC1-1-T-Z-6-7-4	0.128	0.502	0.064	0.0	554.509	8.600	5.952	0.343	34966.500	1000-3000	3.497	73F / 23%	FAILURE AT GAGE
NIAR-NC1-2-T-Z-6-7-1	0.129	0.502	0.065	0.0	546.509	8.436	5.908	0.346	33444.000	1000-3000	3.344	73F / 23%	FAILURE AT GAGE
NIAR-NC1-2-T-Z-6-7-4	0.128	0.502	0.064	0.0	536.806	8.383	5.966	0.335	33870.000	1000-3000	3.387	73F / 23%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.471**	**5.930**	**0.343**
STANDARD DEVIATION	0.092	0.034	0.006
COEFFICIENT OF VARIATION [%]	1.089	0.566	1.676

Comments:

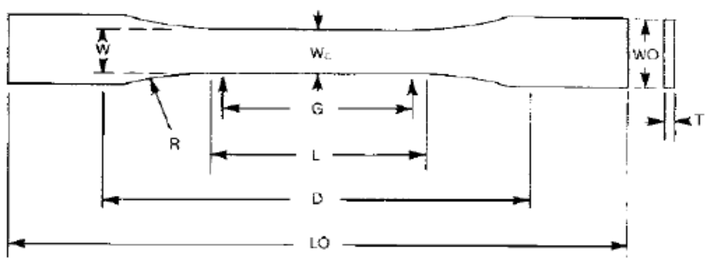
SPECIMENS 1-T-Z-6-7-3, 1-T-Z-6-7-4, 2-T-Z-6-7-1 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-T-Z-6-7-3, 2-T-Z-6-7-1 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	27-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	27-Mar-20
TESTER I	CHENG MIN	15-Apr-20
DATA ENTRY/REDUCTION I	MING	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	21-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-NC1-1-T-Z-6-7-3	0.128	0.128	0.129	0.755	0.751	0.502	0.501	0.502	6.503	0.001
NIAR-NC1-1-T-Z-6-7-4	0.128	0.128	0.129	0.751	0.751	0.502	0.501	0.503	6.503	0.001
NIAR-NC1-2-T-Z-6-7-1	0.130	0.129	0.129	0.751	0.750	0.502	0.501	0.502	6.503	0.001
NIAR-NC1-2-T-Z-6-7-4	0.128	0.128	0.127	0.751	0.751	0.503	0.501	0.502	6.504	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-NC2-X-T-X-6-2-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-NC2-1-T-X-6-2-23	0.127	0.501	0.064	0.0	592.700	9.289	5.178	0.307	69633.500	1000-3000	8.157	69F / 46%	FAILURE AT GAGE
NIAR-NC2-1-T-X-6-2-24	0.128	0.501	0.064	0.0	584.621	9.117	5.124	0.305	67586.500	1000-3000	8.165	69F / 46%	FAILURE AT GAGE
NIAR-NC2-2-T-X-6-2-21	0.126	0.500	0.063	0.0	595.903	9.458	5.351	0.314	67689.500	1000-3000	9.466	69F / 46%	FAILURE AT GAGE
NIAR-NC2-2-T-X-6-2-24	0.127	0.501	0.064	0.0	609.801	9.564	5.479	0.316	67326.000	1000-3000	8.543	69F / 46%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.357**	**5.283**	**0.310**
STANDARD DEVIATION	0.196	0.162	0.005
COEFFICIENT OF VARIATION [%]	2.096	3.075	1.685

Comments:

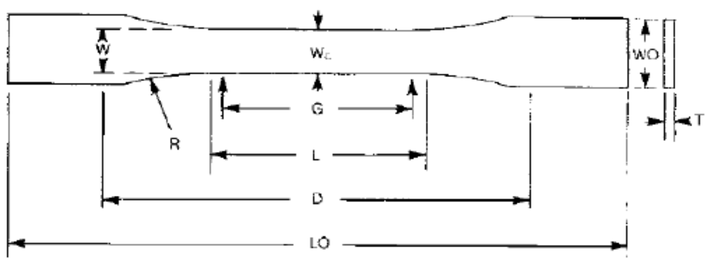
SPECIMENS 1-T-X-6-2-(23,24) AND 2-T-X-6-2-21 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-NC2-1-T-X-6-2-23	0.127	0.127	0.128	0.751	0.751	0.500	0.501	0.500	6.516	0.001
NIAR-NC2-1-T-X-6-2-24	0.129	0.128	0.128	0.752	0.751	0.501	0.501	0.501	6.517	0.001
NIAR-NC2-2-T-X-6-2-21	0.126	0.126	0.126	0.751	0.751	0.500	0.500	0.500	6.515	0.001
NIAR-NC2-2-T-X-6-2-24	0.129	0.127	0.126	0.750	0.751	0.501	0.501	0.501	6.515	0.003



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-NC2-X-T-Y-6-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-NC2-1-T-Y-6-8-9	0.128	0.503	0.065	0.0	624.569	9.670	7.223	0.365	32113.000	1000-3000	3.334	70F / 34%	FAILURE AT GAGE
NIAR-NC2-2-T-Y-6-8-6	0.129	0.503	0.065	0.0	812.247	12.498	7.288	0.364	63296.500	1000-3000	7.871	70F / 34%	FAILURE AT GAGE
NIAR-NC2-2-T-Y-6-8-8	0.129	0.503	0.065	0.0	812.411	12.534	7.207	0.369	62895.500	1000-3000	9.396	70F / 34%	FAILURE AT GAGE
NIAR-NC2-2-T-Y-6-8-9	0.130	0.504	0.065	0.0	807.305	12.344	7.129	0.362	63348.000	1000-3000	7.581	70F / 34%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.762**	**7.212**	**0.365**
STANDARD DEVIATION	1.397	0.065	0.003
COEFFICIENT OF VARIATION [%]	11.876	0.907	0.821

Comments:

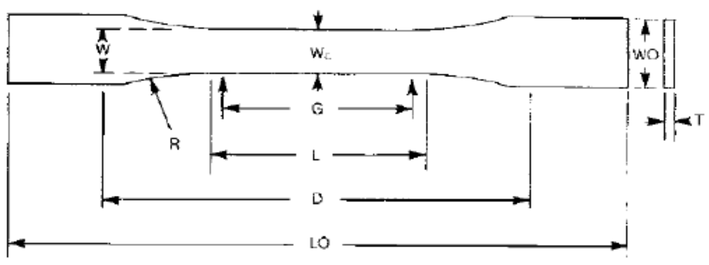
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-9 AND 2-9 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	CHENG MIN	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	29-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-NC2-1-T-Y-6-8-9	0.129	0.129	0.127	0.754	0.753	0.503	0.503	0.503	6.522	0.002
NIAR-NC2-2-T-Y-6-8-6	0.130	0.129	0.129	0.754	0.753	0.503	0.503	0.503	6.517	0.001
NIAR-NC2-2-T-Y-6-8-8	0.129	0.128	0.129	0.754	0.753	0.504	0.503	0.503	6.513	0.001
NIAR-NC2-2-T-Y-6-8-9	0.130	0.130	0.130	0.754	0.753	0.504	0.504	0.504	6.517	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-NC2-X-T-Z-6-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-NC2-1-T-Z-6-8-6	0.128	0.502	0.064	0.0	498.091	7.740	5.492	0.337	30268.000	1000-3000	3.027	73F / 23%	FAILURE AT GAGE
NIAR-NC2-1-T-Z-6-8-8	0.129	0.502	0.065	0.0	465.807	7.179	5.269	0.338	27142.000	1000-3000	2.714	73F / 23%	FAILURE AT GAGE
NIAR-NC2-2-T-Z-6-8-6	0.129	0.501	0.064	0.0	484.076	7.511	5.505	0.326	29811.500	1000-3000	2.981	73F / 23%	FAILURE AT GAGE
NIAR-NC2-2-T-Z-6-8-9	0.128	0.503	0.064	0.0	482.109	7.503	5.553	0.327	29492.000	1000-3000	2.949	73F / 23%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.483**	**5.455**	**0.332**
STANDARD DEVIATION	0.230	0.127	0.006
COEFFICIENT OF VARIATION [%]	3.080	2.319	1.851

Comments:

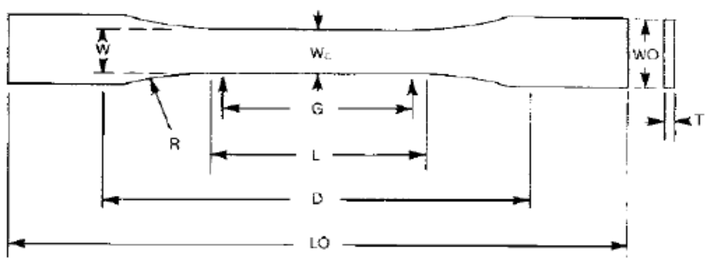
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	27-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	27-Mar-20
TESTER I	CHENG MIN	15-Apr-20
DATA ENTRY/REDUCTION I	MING	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-NC2-1-T-Z-6-8-6	0.128	0.129	0.129	0.752	0.750	0.501	0.501	0.503	6.503	0.001
NIAR-NC2-1-T-Z-6-8-8	0.128	0.130	0.129	0.751	0.750	0.503	0.501	0.503	6.504	0.001
NIAR-NC2-2-T-Z-6-8-6	0.129	0.129	0.128	0.752	0.750	0.502	0.501	0.502	6.504	0.001
NIAR-NC2-2-T-Z-6-8-9	0.127	0.128	0.128	0.751	0.751	0.502	0.502	0.505	6.505	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-NC3-X-T-X-6-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-NC3-1-T-X-6-1-26	0.129	0.502	0.065	0.0	610.966	9.441	5.150	0.309	69021.000	1000-3000	7.308	70F / 42%	FAILURE AT GAGE
NIAR-NC3-1-T-X-6-1-28	0.129	0.502	0.065	0.0	606.791	9.406	5.143	0.307	70563.000	1000-3000	8.778	70F / 42%	FAILURE AT GAGE
NIAR-NC3-2-T-X-6-1-28	0.129	0.502	0.065	0.0	622.118	9.633	5.272	0.317	68810.000	1000-3000	8.067	70F / 42%	FAILURE AT GAGE
NIAR-NC3-2-T-X-6-1-29	0.129	0.501	0.065	0.0	627.816	9.716	5.462	0.316	69026.000	1000-3000	8.750	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.549**	**5.257**	**0.312**
STANDARD DEVIATION	0.149	0.149	0.005
COEFFICIENT OF VARIATION [%]	1.564	2.840	1.514

Comments:

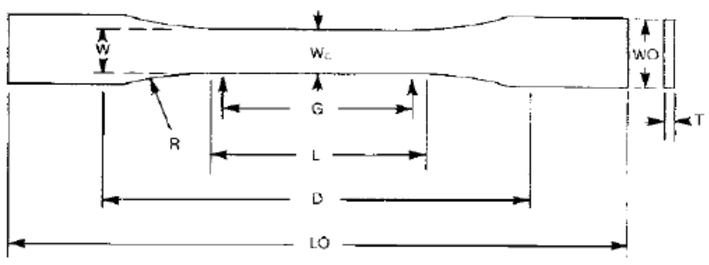
SPECIMENS 2-28 AND 2-29 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	24-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-NC3-1-T-X-6-1-26	0.129	0.129	0.129	0.752	0.751	0.502	0.501	0.502	6.517	0.001
NIAR-NC3-1-T-X-6-1-28	0.128	0.129	0.128	0.751	0.752	0.502	0.502	0.502	6.514	0.000
NIAR-NC3-2-T-X-6-1-28	0.129	0.129	0.129	0.752	0.751	0.502	0.502	0.502	6.514	0.000
NIAR-NC3-2-T-X-6-1-29	0.129	0.129	0.129	0.752	0.751	0.502	0.501	0.501	6.513	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-NC3-X-T-Y-6-9-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-NC3-1-T-Y-6-9-13	0.123	0.501	0.061	0.0	786.725	12.799	6.995	0.374	62733.000	1000-3000	6.373	68F / 32%	FAILURE AT FILLET
NIAR-NC3-2-T-Y-6-9-11	0.122	0.502	0.061	0.0	793.793	13.023	6.911	0.381	61834.500	1000-3000	6.310	68F / 32%	FAILURE AT FILLET
NIAR-NC3-2-T-Y-6-9-13	0.122	0.501	0.061	0.0	793.773	13.016	7.476	0.368	61879.000	1000-3000	6.499	68F / 32%	FAILURE AT FILLET
NIAR-NC3-2-T-Y-6-9-14	0.121	0.502	0.061	0.0	794.969	13.104	7.185	0.380	60937.500	1000-3000	6.418	68F / 32%	FAILURE AT FILLET

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**12.986**	**7.142**	**0.376**
STANDARD DEVIATION	0.130	0.250	0.006
COEFFICIENT OF VARIATION [%]	1.004	3.506	1.647

Comments:

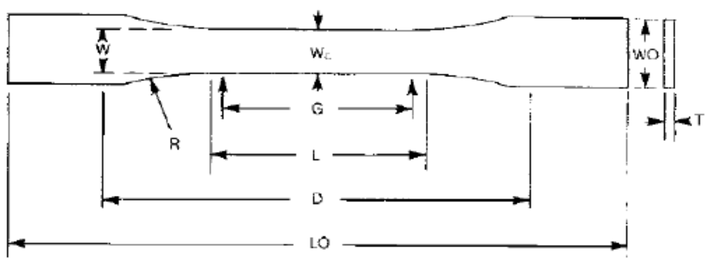
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY		

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-NC3-1-T-Y-6-9-13	0.123	0.123	0.122	0.753	0.752	0.501	0.500	0.501	6.526	0.002
NIAR-NC3-2-T-Y-6-9-11	0.122	0.121	0.122	0.753	0.752	0.502	0.501	0.502	6.518	0.002
NIAR-NC3-2-T-Y-6-9-13	0.122	0.122	0.121	0.753	0.752	0.502	0.501	0.501	6.520	0.002
NIAR-NC3-2-T-Y-6-9-14	0.121	0.121	0.121	0.753	0.752	0.502	0.501	0.502	6.520	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-NC3-X-T-Z-6-9-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-NC3-1-T-Z-6-9-13	0.129	0.503	0.065	0.0	423.558	6.533	5.076	0.309	26341.500	2.634	1000-3000	71F / 31%	FAILURE AT GAGE
NIAR-NC3-1-T-Z-6-9-14	0.128	0.504	0.065	0.0	430.207	6.651	4.932	0.312	27148.000	2.715	1000-3000	71F / 31%	FAILURE AT GAGE
NIAR-NC3-2-T-Z-6-9-11	0.128	0.502	0.064	0.0	471.419	7.310	4.822	0.311	33424.500	3.351	1000-3000	71F / 31%	FAILURE AT GAGE
NIAR-NC3-2-T-Z-6-9-13	0.128	0.502	0.064	0.0	430.657	6.694	5.062	0.305	27679.500	2.768	1000-3000	71F / 31%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**6.797**	**4.973**	**0.309**
STANDARD DEVIATION	0.349	0.120	0.003
COEFFICIENT OF VARIATION [%]	5.134	2.408	1.060

Comments:

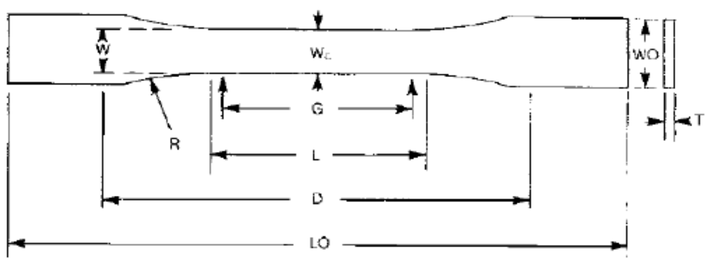
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS EXCEPT 3-11 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638
SPECIMEN 2-13 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	25-Mar-20
TESTER I	CHENG MIN	16-Apr-20
DATA ENTRY/REDUCTION I	CONOR	17-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-NC3-1-T-Z-6-9-13	0.130	0.128	0.129	0.752	0.751	0.503	0.503	0.502	6.504	0.001
NIAR-NC3-1-T-Z-6-9-14	0.128	0.129	0.129	0.754	0.753	0.503	0.504	0.504	6.509	0.001
NIAR-NC3-2-T-Z-6-9-11	0.129	0.128	0.128	0.752	0.752	0.502	0.502	0.503	6.505	0.001
NIAR-NC3-2-T-Z-6-9-13	0.129	0.128	0.128	0.752	0.751	0.502	0.502	0.501	6.505	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-PRW18-X-T-X-6-7-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-PRW18-1-T-X-6-7-3	0.129	0.502	0.065	0.0	565.396	8.761	4.837	0.304	69844.500	1000-3000	7.478	69F / 41%	FAILURE AT FILLET
NIAR-PRW18-1-T-X-6-7-4	0.128	0.504	0.065	0.0	571.134	8.834	4.899	0.304	69758.500	1000-3000	7.843	69F / 41%	FAILURE AT FILLET
NIAR-PRW18-2-T-X-6-7-3	0.128	0.503	0.065	0.0	578.082	8.951	4.903	0.314	69141.000	1000-3000	8.155	69F / 41%	FAILURE AT GAGE
NIAR-PRW18-2-T-X-6-7-4	0.127	0.502	0.064	0.0	586.553	9.171	5.299	0.310	70075.000	1000-3000	8.582	69F / 41%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.929**	**4.985**	**0.308**
STANDARD DEVIATION	0.179	0.212	0.005
COEFFICIENT OF VARIATION [%]	2.006	4.249	1.502

Comments:

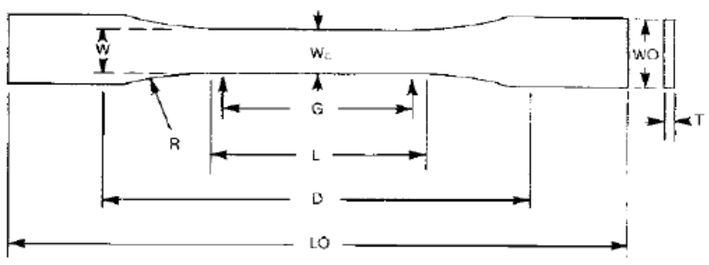
SPECIMENS 1-3 AND 2-4 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-4 AND 2-3 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	26-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	26-Mar-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-PRW18-1-T-X-6-7-3	0.128	0.130	0.128	0.751	0.751	0.503	0.502	0.502	6.512	0.002
NIAR-PRW18-1-T-X-6-7-4	0.129	0.128	0.128	0.752	0.751	0.509	0.502	0.501	6.512	0.001
NIAR-PRW18-2-T-X-6-7-3	0.129	0.129	0.128	0.752	0.752	0.506	0.502	0.501	6.512	0.001
NIAR-PRW18-2-T-X-6-7-4	0.128	0.128	0.127	0.752	0.751	0.502	0.502	0.503	6.511	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-PRW18-X-T-Y-6-3-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-PRW18-1-T-Y-6-3-19	0.127	0.502	0.064	0.0	730.479	11.493	6.913	0.366	54972.500	1000-3000	5.713	70F / 29%	FAILURE AT GAGE
NIAR-PRW18-2-T-Y-6-3-16	0.126	0.502	0.063	0.0	750.635	11.838	7.197	0.370	57806.000	1000-3000	5.860	70F / 29%	FAILURE AT GAGE
NIAR-PRW18-2-T-Y-6-3-18	0.127	0.502	0.064	0.0	744.929	11.697	7.239	0.367	51283.500	1000-3000	5.143	70F / 29%	FAILURE AT GAGE
NIAR-PRW18-2-T-Y-6-3-19	0.127	0.502	0.064	0.0	745.771	11.658	7.132	0.366	56722.500	1000-3000	6.043	70F / 29%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**11.671**	**7.120**	**0.367**
STANDARD DEVIATION	0.142	0.145	0.002
COEFFICIENT OF VARIATION [%]	1.215	2.036	0.522

Comments:

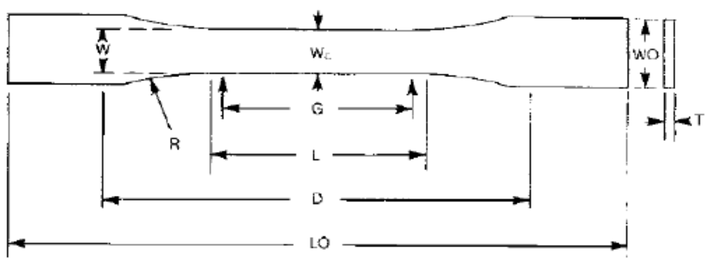
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
TESTER I	CHENG MIN	17-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-PRW18-1-T-Y-6-3-19	0.128	0.126	0.126	0.751	0.752	0.502	0.502	0.501	6.515	0.001
NIAR-PRW18-2-T-Y-6-3-16	0.127	0.126	0.126	0.752	0.752	0.502	0.502	0.502	6.515	0.002
NIAR-PRW18-2-T-Y-6-3-18	0.127	0.126	0.127	0.752	0.752	0.502	0.503	0.502	6.515	0.001
NIAR-PRW18-2-T-Y-6-3-19	0.128	0.127	0.127	0.751	0.752	0.503	0.503	0.502	6.516	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-PRW18-X-T-Z-6-6-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-PRW18-1-T-Z-6-6-16	0.128	0.503	0.064	0.0	491.338	7.666	5.725	0.345	28111.000	1000-3000	2.811	71F / 26%	FAILURE AT GAGE
NIAR-PRW18-1-T-Z-6-6-19	0.128	0.501	0.064	0.0	514.731	8.018	5.836	0.344	30057.000	1000-3000	3.015	71F / 26%	FAILURE AT GAGE
NIAR-PRW18-2-T-Z-6-6-16	0.128	0.502	0.064	0.0	497.987	7.754	5.552	0.341	29849.500	1000-3000	2.985	71F / 26%	FAILURE AT GAGE
NIAR-PRW18-2-T-Z-6-6-18	0.128	0.501	0.064	0.0	540.468	8.412	5.577	0.342	36721.500	1000-3000	3.682	71F / 26%	FAILURE AT GAGE

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.20	in/min

AVERAGE	**7.962**	**5.672**	**0.343**
STANDARD DEVIATION	0.335	0.133	0.002
COEFFICIENT OF VARIATION [%]	4.210	2.348	0.629

Comments:

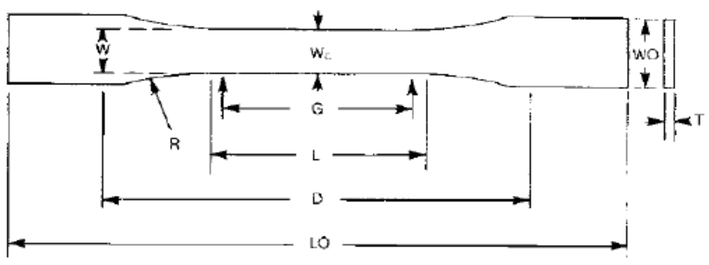
SPECIMEN 1-19 DOES NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-16, 2-16 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638
SPECIMEN 1-19 DOES NOT MEET THE REQUIREMENT FOR Width Overall (WO) 0.75" ≤ WO ≤ 1.00" PER ASTM D638

GRIP PRESSURE: 200 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY	25-Mar-20
TESTER I	ERIC	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-PRW18-1-T-Z-6-6-16	0.128	0.127	0.127	0.753	0.751	0.503	0.502	0.502	6.512	0.002
NIAR-PRW18-1-T-Z-6-6-19	0.129	0.127	0.128	0.751	0.749	0.501	0.501	0.501	6.505	0.002
NIAR-PRW18-2-T-Z-6-6-16	0.129	0.128	0.127	0.752	0.751	0.503	0.502	0.502	6.512	0.001
NIAR-PRW18-2-T-Z-6-6-18	0.129	0.128	0.128	0.751	0.750	0.501	0.501	0.501	6.509	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-PRW22-X-T-X-6-8-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-PRW22-1-T-X-6-8-8	0.129	0.503	0.065	0.0	542.549	8.353	4.637	0.284	64282.500	1000-3000	6.690	69F / 41%	FAILURE AT GAGE
NIAR-PRW22-1-T-X-6-8-9	0.129	0.502	0.065	0.0	548.234	8.443	4.411	0.297	65400.500	1000-3000	7.487	69F / 41%	FAILURE AT GAGE
NIAR-PRW22-2-T-X-6-8-6	0.129	0.503	0.065	0.0	560.830	8.641	4.861	0.294	67064.000	1000-3000	8.611	69F / 41%	FAILURE AT GAGE
NIAR-PRW22-2-T-X-6-8-9	0.129	0.502	0.065	0.0	557.846	8.606	4.765	0.292	65756.500	1000-3000	7.647	69F / 41%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**8.511**	**4.669**	**0.292**
STANDARD DEVIATION	0.136	0.195	0.006
COEFFICIENT OF VARIATION [%]	1.599	4.170	1.960

Comments:

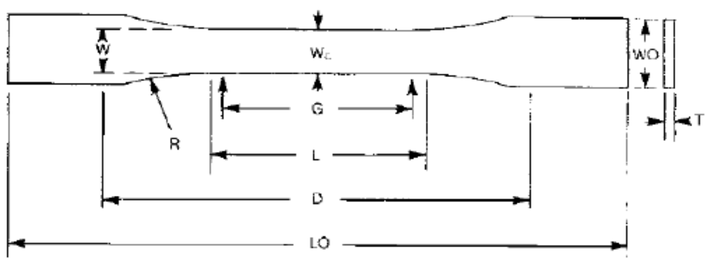
SPECIMENS 1-T-X-6-8-9, 2-T-X-6-8-(6 AND 9) DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 2-T-X-6-8-(6 AND 9) DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	ERIC	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-PRW22-1-T-X-6-8-8	0.129	0.130	0.129	0.753	0.753	0.503	0.503	0.503	6.518	0.001
NIAR-PRW22-1-T-X-6-8-9	0.130	0.129	0.129	0.752	0.752	0.502	0.502	0.502	6.517	0.000
NIAR-PRW22-2-T-X-6-8-6	0.129	0.129	0.129	0.752	0.752	0.503	0.502	0.503	6.518	0.001
NIAR-PRW22-2-T-X-6-8-9	0.129	0.130	0.129	0.753	0.752	0.503	0.502	0.502	6.518	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-PRW22-X-T-Y-6-2-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-PRW22-1-T-Y-6-2-24	0.127	0.503	0.064	0.0	766.554	11.977	6.944	0.372	60800.000	1000-3000	8.056	70F / 42%	FAILURE AT GAGE
NIAR-PRW22-2-T-Y-6-2-21	0.127	0.503	0.064	0.0	775.713	12.112	7.010	0.375	60401.000	1000-3000	7.199	70F / 42%	FAILURE AT GAGE
NIAR-PRW22-2-T-Y-6-2-23	0.127	0.502	0.064	0.0	762.343	11.936	7.093	0.368	60058.000	1000-3000	8.223	70F / 42%	FAILURE AT GAGE
NIAR-PRW22-2-T-Y-6-2-24	0.128	0.503	0.064	0.0	761.973	11.877	7.061	0.365	60079.500	1000-3000	8.234	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.975**	**7.027**	**0.370**
STANDARD DEVIATION	0.100	0.065	0.004
COEFFICIENT OF VARIATION [%]	0.836	0.927	1.100

Comments:

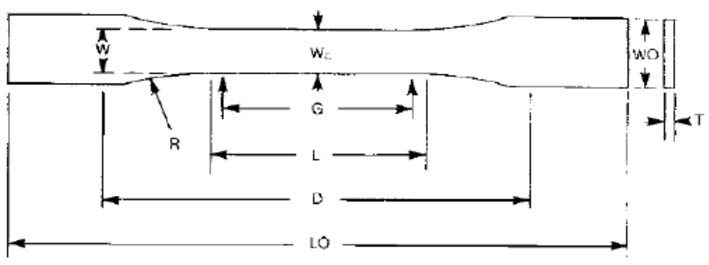
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 2-21, 2-23 DOES NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	CHENG MIN	22-Apr-20
DATA ENTRY/REDUCTION I	MING	24-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY		

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-PRW22-1-T-Y-6-2-24	0.128	0.128	0.126	0.754	0.753	0.504	0.503	0.503	6.516	0.001
NIAR-PRW22-2-T-Y-6-2-21	0.128	0.127	0.127	0.754	0.752	0.503	0.503	0.503	6.511	0.001
NIAR-PRW22-2-T-Y-6-2-23	0.128	0.127	0.127	0.753	0.753	0.503	0.502	0.501	6.511	0.001
NIAR-PRW22-2-T-Y-6-2-24	0.129	0.127	0.127	0.753	0.755	0.502	0.502	0.504	6.513	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-PRW22-X-T-Z-6-5-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-PRW22-1-T-Z-6-5-21	0.127	0.502	0.064	0.0	510.187	7.998	6.047	0.352	28572.500	2.857	1000-3000	71F / 19%	FAILURE AT FILLET
NIAR-PRW22-1-T-Z-6-5-23	0.128	0.501	0.064	0.0	506.219	7.881	5.973	0.347	28474.000	2.847	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-PRW22-2-T-Z-6-5-21	0.128	0.501	0.064	0.0	500.954	7.833	5.750	0.349	28642.500	2.864	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-PRW22-2-T-Z-6-5-23	0.127	0.500	0.064	0.0	485.801	7.643	5.905	0.351	27016.500	2.702	1000-3000	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.839**	**5.919**	**0.350**
STANDARD DEVIATION	0.148	0.126	0.002
COEFFICIENT OF VARIATION [%]	1.889	2.135	0.527

Comments:

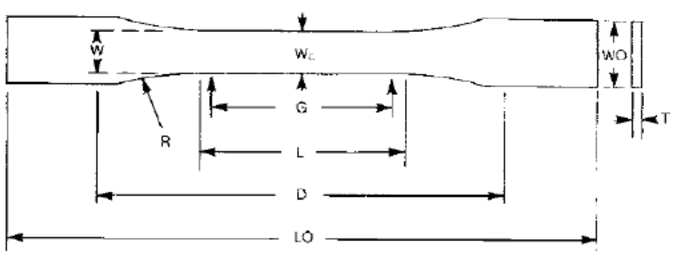
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 2-T-Z-6-5-21 AND 2-T-Z-6-5-23 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR OVERALL WIDTH (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY T.	3-Apr-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	CONOR	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-PRW22-1-T-Z-6-5-21	0.127	0.128	0.127	0.752	0.750	0.502	0.501	0.502	6.508	0.001
NIAR-PRW22-1-T-Z-6-5-23	0.129	0.128	0.128	0.750	0.749	0.501	0.501	0.502	6.504	0.002
NIAR-PRW22-2-T-Z-6-5-21	0.129	0.127	0.127	0.751	0.750	0.502	0.501	0.501	6.509	0.002
NIAR-PRW22-2-T-Z-6-5-23	0.127	0.127	0.127	0.750	0.748	0.501	0.501	0.500	6.506	0.001



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-PRW26-X-T-X-6-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-PRW26-1-T-X-6-9-11	0.130	0.502	0.065	0.0	542.833	8.347	4.507	0.285	63594.500	1000-3000	7.183	68F / 32%	FAILURE AT GAGE
NIAR-PRW26-1-T-X-6-9-14	0.130	0.502	0.065	0.0	541.894	8.314	4.537	0.282	63150.000	1000-3000	6.954	68F / 32%	FAILURE AT GAGE
NIAR-PRW26-2-T-X-6-9-11	0.129	0.502	0.065	0.0	546.675	8.416	4.809	0.278	63141.000	1000-3000	7.098	68F / 32%	FAILURE AT GAGE
NIAR-PRW26-2-T-X-6-9-13	0.129	0.503	0.065	0.0	544.925	8.411	4.398	0.290	64365.000	1000-3000	7.332	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**8.372**	**4.563**	**0.284**
STANDARD DEVIATION	0.050	0.175	0.005
COEFFICIENT OF VARIATION [%]	0.595	3.834	1.869

Comments:

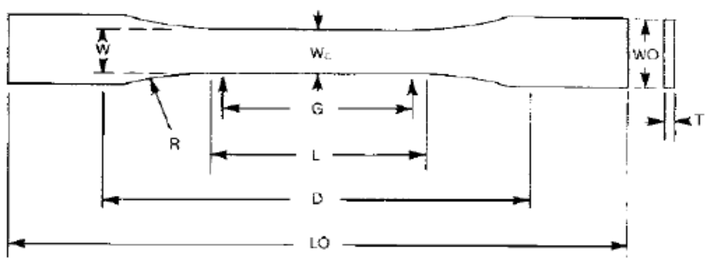
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-T-X-6-9-4 and 2-T-X-6-9-11 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-T-X-6-9-11 Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	28-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-PRW26-1-T-X-6-9-11	0.130	0.130	0.129	0.752	0.752	0.502	0.502	0.502	6.516	0.001
NIAR-PRW26-1-T-X-6-9-14	0.130	0.130	0.130	0.752	0.752	0.502	0.502	0.502	6.516	0.000
NIAR-PRW26-2-T-X-6-9-11	0.130	0.129	0.129	0.752	0.752	0.502	0.502	0.503	6.515	0.001
NIAR-PRW26-2-T-X-6-9-13	0.129	0.129	0.128	0.752	0.752	0.503	0.503	0.503	6.516	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-PRW26-X-T-Y-6-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-PRW26-1-T-Y-6-1-29	0.128	0.502	0.064	0.0	713.274	11.080	6.656	0.359	55735.000	1000-3000	7.159	69F / 46%	FAILURE AT GAGE
NIAR-PRW26-2-T-Y-6-1-26	0.126	0.504	0.064	0.0	722.794	11.345	6.538	0.369	53831.500	1000-3000	6.462	69F / 46%	FAILURE AT GAGE
NIAR-PRW26-2-T-Y-6-1-28	0.126	0.505	0.064	0.0	727.558	11.448	7.039	0.361	54091.500	1000-3000	6.953	69F / 46%	FAILURE AT GAGE
NIAR-PRW26-2-T-Y-6-1-29	0.126	0.504	0.063	0.0	728.053	11.486	6.962	0.366	55301.000	1000-3000	7.612	69F / 46%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**11.340**	**6.799**	**0.364**
STANDARD DEVIATION	0.183	0.240	0.004
COEFFICIENT OF VARIATION [%]	1.616	3.528	1.151

Comments:

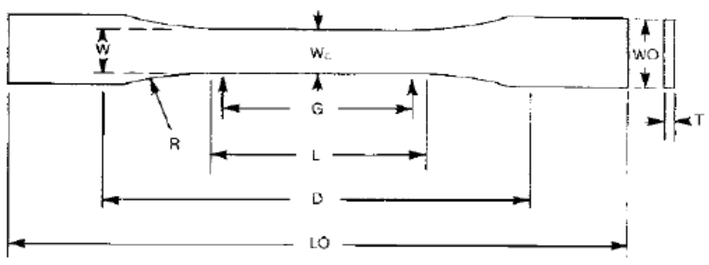
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-PRW26-1-T-Y-6-1-29	0.128	0.129	0.128	0.754	0.753	0.503	0.502	0.502	6.515	0.001
NIAR-PRW26-2-T-Y-6-1-26	0.126	0.126	0.126	0.753	0.752	0.505	0.504	0.504	6.516	0.000
NIAR-PRW26-2-T-Y-6-1-28	0.127	0.126	0.125	0.753	0.753	0.505	0.504	0.504	6.515	0.001
NIAR-PRW26-2-T-Y-6-1-29	0.127	0.125	0.125	0.754	0.753	0.505	0.504	0.504	6.514	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-PRw26-X-T-Z-6-4-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-PRw26-1-T-Z-6-4-26	0.128	0.501	0.064	0.0	476.394	7.403	5.474	0.326	29690.529	1000-3000	2.969	71F / 32%	FAILURE AT GAGE
NIAR-PRw26-1-T-Z-6-4-29	0.129	0.502	0.065	0.0	478.342	7.414	5.415	0.322	30498.550	1000-3000	3.055	71F / 32%	FAILURE AT GAGE
NIAR-PRw26-2-T-Z-6-4-28	0.129	0.501	0.065	0.0	447.271	6.910	5.189	0.319	27889.188	1000-3000	2.797	71F / 32%	FAILURE AT GAGE
NIAR-PRw26-2-T-Z-6-4-29	0.128	0.501	0.064	0.0	484.667	7.555	5.242	0.320	33273.040	1000-3000	3.335	71F / 32%	FAILURE AT GAGE

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.320**	**5.330**	**0.321**
STANDARD DEVIATION	0.283	0.136	0.003
COEFFICIENT OF VARIATION [%]	3.859	2.553	0.943

Comments:

SPECIMENS 1-26, 2-28, 2-29 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 1-29 DOES NOT MEET THE REQUIREMENTS FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

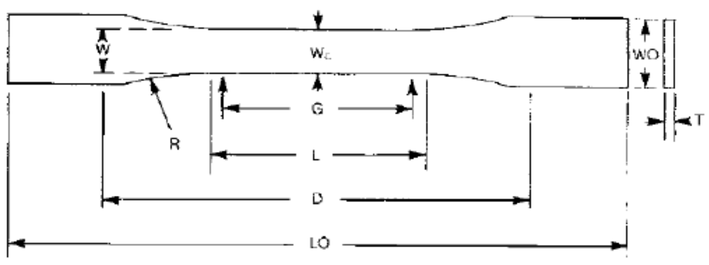
GRIP PRESSURE: 200 psi

ELONGATION AT BREAK MAY NOT BE ACCURATE FOR NIAR-PRw26-1-T-Z-6-4-(26,29) AS THE FRACTURE OCCURRED OUTSIDE OF EXTENSOMETER GAGE LENGTH

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	26-Feb-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	26-Feb-20
TESTER I	CHENG MIN	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-PRw26-1-T-Z-6-4-26	0.129	0.128	0.129	0.751	0.751	0.501	0.500	0.501	6.505	0.002
NIAR-PRw26-1-T-Z-6-4-29	0.129	0.129	0.128	0.751	0.750	0.502	0.501	0.501	6.502	0.001
NIAR-PRw26-2-T-Z-6-4-28	0.129	0.130	0.129	0.750	0.751	0.501	0.500	0.501	6.503	0.001
NIAR-PRw26-2-T-Z-6-4-29	0.129	0.128	0.128	0.751	0.751	0.501	0.500	0.501	6.503	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-SMC1-X-T-X-5-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-SMC1-1-T-X-5-9-11	0.130	0.502	0.065	0.0	595.460	9.147	5.336	0.301	63737.500	1000-3000	8.045	69F / 46%	FAILURE AT GAGE
NIAR-SMC1-1-T-X-5-9-13	0.129	0.502	0.065	0.0	594.833	9.201	5.161	0.306	62346.500	1000-3000	8.634	69F / 46%	FAILURE AT GAGE
NIAR-SMC1-2-T-X-5-9-11	0.129	0.503	0.065	0.0	587.099	9.060	5.167	0.307	63624.000	1000-3000	7.954	69F / 46%	FAILURE AT GAGE
NIAR-SMC1-2-T-X-5-9-13	0.129	0.502	0.065	0.0	589.663	9.113	5.298	0.303	64224.500	1000-3000	8.382	69F / 46%	FAILURE AT GAGE
NIAR-SMC1-2-T-X-5-9-14	0.129	0.502	0.065	0.0	594.186	9.180	5.207	0.305	66540.500	1000-3000	8.188	69F / 46%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**9.140**	**5.234**	**0.304**
STANDARD DEVIATION	0.056	0.079	0.002
COEFFICIENT OF VARIATION [%]	0.613	1.514	0.819

Comments:

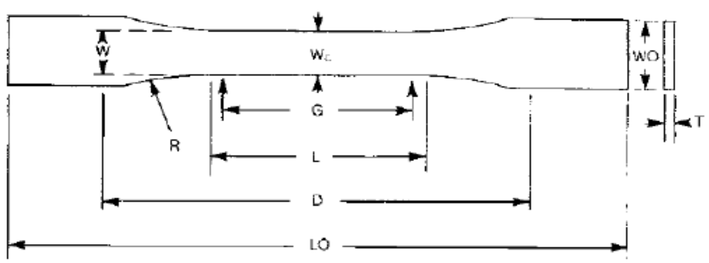
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-13, 2-11, 2-13 AND 2-14 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER ((W-0.004") ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	RAMEESHA W.	3-Apr-20
TESTER I	CHENG MIN	20-Apr-20
DATA ENTRY/REDUCTION I	MING	21-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	22-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-SMC1-1-T-X-5-9-11	0.129	0.129	0.131	0.752	0.752	0.502	0.502	0.502	6.515	0.002
NIAR-SMC1-1-T-X-5-9-13	0.129	0.129	0.129	0.752	0.751	0.502	0.502	0.502	6.515	0.001
NIAR-SMC1-2-T-X-5-9-11	0.129	0.129	0.129	0.753	0.752	0.502	0.503	0.503	6.511	0.001
NIAR-SMC1-2-T-X-5-9-13	0.129	0.129	0.129	0.752	0.752	0.502	0.502	0.502	6.512	0.001
NIAR-SMC1-2-T-X-5-9-14	0.129	0.129	0.129	0.752	0.752	0.501	0.502	0.502	6.511	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-SMC1-X-T-Y-5-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-SMC1-1-T-Y-5-9-13	0.127	0.503	0.064	0.0	725.124	11.335	6.692	0.358	59614.500	1000-3000	7.746	70F / 42%	FAILURE AT GAGE
NIAR-SMC1-2-T-Y-5-9-11	0.127	0.503	0.064	0.0	765.489	11.964	6.796	0.373	61666.000	1000-3000	8.842	70F / 42%	FAILURE AT GAGE
NIAR-SMC1-2-T-Y-5-9-13	0.127	0.503	0.064	0.0	764.655	11.991	6.780	0.374	62239.500	1000-3000	9.499	70F / 42%	FAILURE AT GAGE
NIAR-SMC1-2-T-Y-5-9-14	0.127	0.503	0.064	0.0	764.843	11.927	6.696	0.374	64278.000	1000-3000	10.471	70F / 42%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.804**	**6.741**	**0.370**
STANDARD DEVIATION	0.314	0.055	0.008
COEFFICIENT OF VARIATION [%]	2.662	0.809	2.159

Comments:

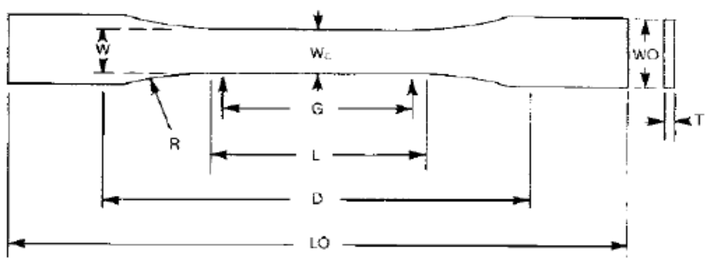
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 2-11 AND 2-14 DO NOT MEET THE REQUIREMENT FOR WIDTH AT THE CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	SHREY	25-Mar-20
TESTER I	ERIC	22-Apr-20
DATA ENTRY/REDUCTION I	MING	23-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	24-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-SMC1-1-T-Y-5-9-13	0.128	0.128	0.127	0.752	0.753	0.503	0.502	0.503	6.515	0.001
NIAR-SMC1-2-T-Y-5-9-11	0.128	0.127	0.127	0.755	0.756	0.503	0.503	0.502	6.511	0.001
NIAR-SMC1-2-T-Y-5-9-13	0.127	0.127	0.127	0.755	0.755	0.503	0.503	0.503	6.514	0.001
NIAR-SMC1-2-T-Y-5-9-14	0.129	0.127	0.127	0.755	0.756	0.504	0.503	0.503	6.512	0.002



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-SMC1-X-T-Z-5-9-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	ELONGATION AT BREAK [%]	STRAIN RANGE [με]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-SMC1-1-T-Z-5-9-13	0.128	0.501	0.064	0.0	471.125	7.359	5.594	0.349	26298.500	2.630	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-SMC1-1-T-Z-5-9-14	0.128	0.501	0.064	0.0	488.222	7.635	5.726	0.345	27870.500	2.787	1000-3000	71F / 19%	FAILURE AT GAGE
NIAR-SMC1-2-T-Z-5-9-13	0.127	0.503	0.064	0.0	455.086	7.129	5.592	0.338	25766.500	2.577	1000-3000	71F / 19%	FAILURE AT FILLET
NIAR-SMC1-2-T-Z-5-9-14	0.128	0.502	0.064	0.0	494.058	7.677	5.559	0.333	29706.000	2.971	1000-3000	71F / 19%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.450**	**5.618**	**0.341**
STANDARD DEVIATION	0.256	0.074	0.007
COEFFICIENT OF VARIATION [%]	3.440	1.313	2.127

Comments:

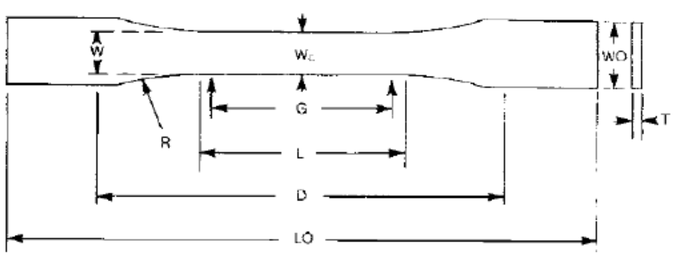
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-T-Z-5-9-X (13,14), 2-T-Z-5-9-13 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
ALL SPECIMENS DO NOT MEET Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	25-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	25-Mar-20
TESTER I	ERIC	14-Apr-20
DATA ENTRY/REDUCTION I	CONOR	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	20-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-SMC1-1-T-Z-5-9-13	0.128	0.128	0.128	0.751	0.751	0.500	0.501	0.501	6.506	0.000
NIAR-SMC1-1-T-Z-5-9-14	0.128	0.128	0.128	0.751	0.751	0.501	0.501	0.501	6.510	0.000
NIAR-SMC1-2-T-Z-5-9-13	0.127	0.126	0.128	0.752	0.751	0.505	0.502	0.501	6.506	0.001
NIAR-SMC1-2-T-Z-5-9-14	0.128	0.129	0.128	0.753	0.752	0.502	0.502	0.502	6.511	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-SMC3-X-T-X-5-3-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-SMC3-1-T-X-5-3-18	0.128	0.501	0.064	0.0	608.271	9.460	5.395	0.308	64073.500	1000-3000	7.860	71F / 26%	FAILURE AT GAGE
NIAR-SMC3-1-T-X-5-3-19	0.128	0.503	0.065	0.0	594.634	9.214	5.161	0.303	63246.500	1000-3000	6.584	71F / 26%	FAILURE AT GAGE
NIAR-SMC3-2-T-X-5-3-16	0.128	0.501	0.064	0.0	621.787	9.662	5.399	0.323	64982.500	1000-3000	8.171	71F / 26%	FAILURE AT GAGE

AVERAGE	**9.445**	**5.318**	**0.311**
STANDARD DEVIATION	0.225	0.136	0.010
COEFFICIENT OF VARIATION [%]	2.377	2.557	3.274

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.20	in/min

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	24-Mar-20
TESTER I	ERIC	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

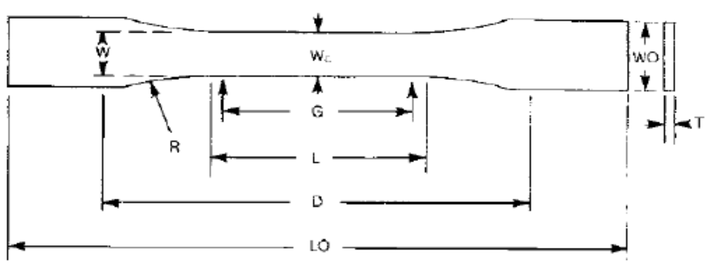
Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

Comments:

ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-18 AND 2-16 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-18 AND 2-16 DO NOT MEET THE REQUIREMNENT FOR WIDTH AT CENTER (W-0.004" ≤ Wc ≤ W) PER ASTM D638

GRIP PRESSURE: 200 psi

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-SMC3-1-T-X-5-3-18	0.128	0.129	0.128	0.750	0.749	0.502	0.500	0.501	6.517	0.001
NIAR-SMC3-1-T-X-5-3-19	0.128	0.129	0.128	0.751	0.751	0.503	0.501	0.504	6.514	0.001
NIAR-SMC3-2-T-X-5-3-16	0.129	0.129	0.128	0.750	0.749	0.503	0.500	0.501	6.512	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-SMC3-X-T-Y-5-3-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-SMC3-1-T-Y-5-3-18	0.128	0.502	0.064	0.0	726.439	11.330	6.518	0.362	58914.000	1000-3000	7.154	68F / 32%	FAILURE AT GAGE
NIAR-SMC3-2-T-Y-5-3-16	0.128	0.507	0.065	0.0	766.435	11.790	6.490	0.373	62220.500	1000-3000	7.023	68F / 32%	FAILURE AT GAGE
NIAR-SMC3-2-T-Y-5-3-18	0.128	0.507	0.065	0.0	760.115	11.693	6.593	0.367	60966.000	1000-3000	7.447	68F / 32%	FAILURE AT GAGE
NIAR-SMC3-2-T-Y-5-3-19	0.128	0.506	0.065	0.0	762.113	11.724	6.532	0.370	63431.000	1000-3000	7.578	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.634**	**6.533**	**0.368**
STANDARD DEVIATION	0.207	0.043	0.005
COEFFICIENT OF VARIATION [%]	1.775	0.666	1.334

Comments:

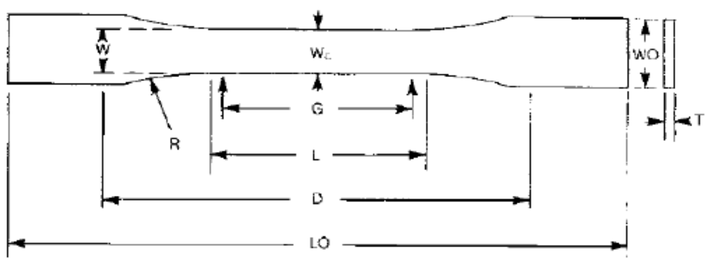
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (= 2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	3-Apr-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-SMC3-1-T-Y-5-3-18	0.128	0.128	0.128	0.753	0.754	0.502	0.502	0.502	6.526	0.000
NIAR-SMC3-2-T-Y-5-3-16	0.128	0.128	0.128	0.755	0.755	0.507	0.507	0.507	6.515	0.000
NIAR-SMC3-2-T-Y-5-3-18	0.128	0.128	0.128	0.755	0.754	0.507	0.506	0.507	6.514	0.000
NIAR-SMC3-2-T-Y-5-3-19	0.129	0.128	0.128	0.755	0.755	0.507	0.506	0.506	6.515	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-SMC3-X-T-Z-5-6-X

CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-SMC3-1-T-Z-5-6-16	0.126	0.501	0.063	0.0	482.098	7.616	5.737	0.352	27055.500	1000-3000	2.706	71F / 26%	FAILURE AT GAGE
NIAR-SMC3-1-T-Z-5-6-19	0.127	0.500	0.064	0.0	496.746	7.813	5.785	0.345	28583.000	1000-3000	2.866	71F / 26%	FAILURE AT FILLET
NIAR-SMC3-2-T-Z-5-6-16	0.127	0.502	0.064	0.0	504.070	7.910	5.575	0.347	29984.500	1000-3000	2.998	71F / 26%	FAILURE AT GAGE
NIAR-SMC3-2-T-Z-5-6-18	0.127	0.500	0.064	0.0	510.328	8.033	5.846	0.339	30961.500	1000-3000	3.105	71F / 26%	FAILURE AT GAGE

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.20	in/min

AVERAGE	**7.843**	**5.736**	**0.346**
STANDARD DEVIATION	0.176	0.116	0.005
COEFFICIENT OF VARIATION [%]	2.246	2.027	1.578

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	NEVILLE T.	1-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	1-Apr-20
TESTER I	ERIC	9-Apr-20
DATA ENTRY/REDUCTION I	MING	14-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Comments:

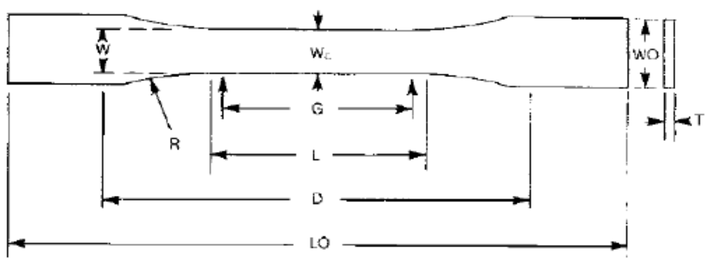
SPECIMENS 1-16, 1-19, 2-16 DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-16 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-19, 2-18 DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638
SPECIMEN 1-16, 2-18 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638

GRIP PRESSURE: 200 psi

ELONGATION AT BREAK MAY NOT BE ACCURATE FOR NIAR-SMC3-1-T-Z-5-6-19 AS THE FRACTURE OCCURRED OUTSIDE OF EXTENSOMETER GAGE LENGTH

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-SMC3-1-T-Z-5-6-16	0.127	0.126	0.126	0.752	0.750	0.502	0.501	0.501	6.512	0.001
NIAR-SMC3-1-T-Z-5-6-19	0.127	0.127	0.127	0.751	0.749	0.500	0.500	0.501	6.507	0.001
NIAR-SMC3-2-T-Z-5-6-16	0.128	0.126	0.126	0.752	0.750	0.502	0.502	0.502	6.513	0.002
NIAR-SMC3-2-T-Z-5-6-18	0.128	0.127	0.126	0.751	0.748	0.501	0.500	0.500	6.508	0.003



WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH

ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-VSRAG0-X-T-X-5-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-VSRAG0-1-T-X-5-2-23	0.128	0.501	0.064	0.0	580.034	9.035	5.038	0.300	64141.000	1000-3000	7.321	68F / 32%	FAILURE AT GAGE
NIAR-VSRAG0-1-T-X-5-2-24	0.129	0.501	0.065	0.0	581.322	9.007	4.917	0.304	62518.500	1000-3000	6.398	68F / 32%	FAILURE AT GAGE
NIAR-VSRAG0-2-T-X-5-2-23	0.128	0.501	0.064	0.0	582.174	9.058	5.033	0.308	60163.000	1000-3000	6.127	68F / 32%	FAILURE AT GAGE
NIAR-VSRAG0-2-T-X-5-2-24	0.129	0.502	0.065	0.0	580.818	8.979	4.886	0.305	65327.500	1000-3000	7.352	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.020**	**4.968**	**0.304**
STANDARD DEVIATION	0.034	0.078	0.003
COEFFICIENT OF VARIATION [%]	0.376	1.578	1.149

Comments:

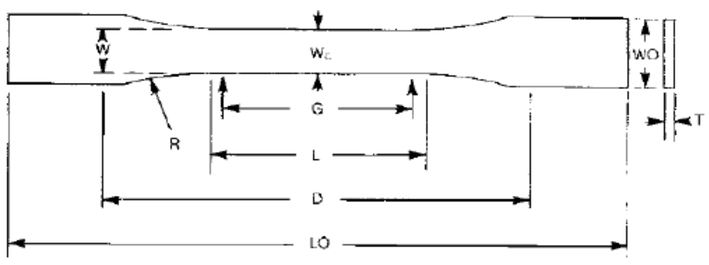
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 1-T-23-5-2 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-VSRAG0-1-T-X-5-2-23	0.128	0.128	0.129	0.751	0.751	0.501	0.500	0.501	6.520	0.001
NIAR-VSRAG0-1-T-X-5-2-24	0.129	0.128	0.129	0.751	0.751	0.501	0.501	0.501	6.521	0.001
NIAR-VSRAG0-2-T-X-5-2-23	0.128	0.129	0.128	0.752	0.751	0.501	0.501	0.501	6.517	0.000
NIAR-VSRAG0-2-T-X-5-2-24	0.129	0.129	0.129	0.752	0.751	0.502	0.502	0.502	6.519	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-VSRAG0-X-T-Y-5-2-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-VSRAG0-1-T-Y-5-2-21	0.128	0.501	0.064	0.0	729.270	11.350	6.717	0.354	58986.500	1000-3000	6.695	70F / 34%	FAILURE AT GAGE
NIAR-VSRAG0-2-T-Y-5-2-21	0.129	0.503	0.065	0.0	759.010	11.713	6.806	0.362	63512.500	1000-3000	10.342	70F / 34%	FAILURE AT GAGE
NIAR-VSRAG0-2-T-Y-5-2-23	0.129	0.503	0.065	0.0	759.890	11.729	6.924	0.359	63625.500	1000-3000	10.279	70F / 34%	FAILURE AT GAGE
NIAR-VSRAG0-2-T-Y-5-2-24	0.128	0.504	0.065	0.0	769.757	11.901	6.969	0.363	64199.500	1000-3000	11.392	70F / 34%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.673**	**6.854**	**0.360**
STANDARD DEVIATION	0.232	0.114	0.004
COEFFICIENT OF VARIATION [%]	1.988	1.668	1.085

Comments:

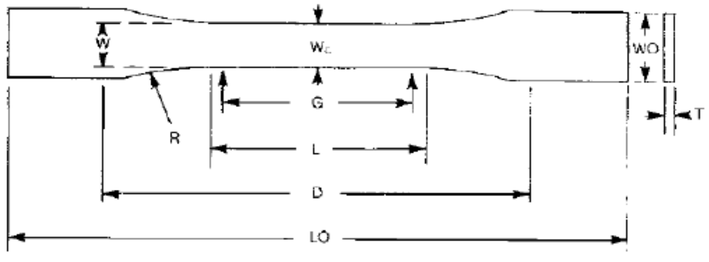
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (= 3.00" ± 0.04") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	3-Apr-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI S.	3-Apr-20
TESTER I	CHENG MIN	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-VSRAG0-1-T-Y-5-2-21	0.129	0.128	0.128	0.754	0.753	0.501	0.501	0.501	6.525	0.001
NIAR-VSRAG0-2-T-Y-5-2-21	0.129	0.129	0.128	0.754	0.754	0.504	0.503	0.503	6.512	0.001
NIAR-VSRAG0-2-T-Y-5-2-23	0.129	0.129	0.128	0.754	0.754	0.503	0.503	0.504	6.510	0.001
NIAR-VSRAG0-2-T-Y-5-2-24	0.128	0.128	0.129	0.753	0.754	0.504	0.503	0.504	6.513	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-VSRAG0-X-T-Z-5-5-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET YIELD STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-VSRAG0-1-T-Z-5-5-21	0.128	0.501	0.064	0.0	513.221	8.023	5.893	0.339	30820.837	1000-3000	3.089	72F / 29%	FAILURE AT GAGE
NIAR-VSRAG0-1-T-Z-5-5-23	0.129	0.501	0.064	0.0	498.128	7.732	5.767	0.338	29337.531	1000-3000	2.934	72F / 29%	FAILURE AT GAGE
NIAR-VSRAG0-2-T-Z-5-5-21	0.128	0.501	0.064	0.0	494.296	7.710	5.710	0.335	29234.787	1000-3000	2.923	72F / 29%	FAILURE AT GAGE
NIAR-VSRAG0-2-T-Z-5-5-24	0.128	0.500	0.064	0.0	504.657	7.860	5.610	0.337	30713.459	1000-3000	3.071	72F / 29%	FAILURE AT GAGE

MACHINE ID	EAGLE	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	110432A	
CAL. REPORT NO.	DVH00738	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10278542	
CAL. REPORT NO.	JMH01285	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.831**	**5.745**	**0.337**
STANDARD DEVIATION	0.144	0.118	0.002
COEFFICIENT OF VARIATION [%]	1.838	2.060	0.547

Comments:

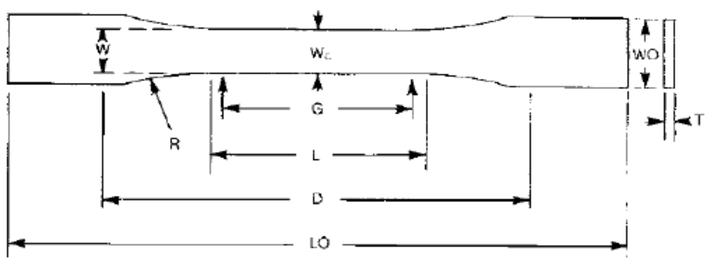
SPECIMEN 2-21 DOES NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-21 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 2-21 AND 2-24 DO NOT MEET THE REQUIREMENT FOR Width at the center (Wc) (W-0.004") ≤ Wc ≤ W (W is measured width of narrow section) PER ASTM D638
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 200 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	26-Feb-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	26-Feb-20
TESTER I	CHENG MIN	9-Apr-20
DATA ENTRY/REDUCTION I	MING	13-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	17-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-VSRAG0-1-T-Z-5-5-21	0.128	0.129	0.126	0.749	0.751	0.501	0.500	0.501	6.506	0.002
NIAR-VSRAG0-1-T-Z-5-5-23	0.128	0.128	0.129	0.750	0.748	0.502	0.500	0.501	6.503	0.001
NIAR-VSRAG0-2-T-Z-5-5-21	0.128	0.128	0.128	0.751	0.749	0.501	0.501	0.501	6.507	0.001
NIAR-VSRAG0-2-T-Z-5-5-24	0.128	0.128	0.128	0.748	0.751	0.500	0.500	0.501	6.503	0.000



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-VSRAG-10-X-T-X-5-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-VSRAG-10-1-T-X-5-1-26	0.129	0.500	0.064	0.0	603.646	9.369	5.228	0.310	64289.000	1000-3000	8.267	68F / 32%	FAILURE AT GAGE
NIAR-VSRAG-10-1-T-X-5-1-29	0.129	0.501	0.065	0.0	607.831	9.420	5.137	0.317	64365.500	1000-3000	7.614	68F / 32%	FAILURE AT GAGE
NIAR-VSRAG-10-2-T-X-5-1-28	0.129	0.501	0.065	0.0	603.428	9.346	5.393	0.309	66718.500	1000-3000	7.821	68F / 32%	FAILURE AT GAGE
NIAR-VSRAG-10-2-T-X-5-1-29	0.129	0.502	0.065	0.0	602.541	9.306	5.143	0.312	65561.500	1000-3000	7.578	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**9.360**	**5.225**	**0.312**
STANDARD DEVIATION	0.048	0.119	0.003
COEFFICIENT OF VARIATION [%]	0.510	2.282	1.068

Comments:

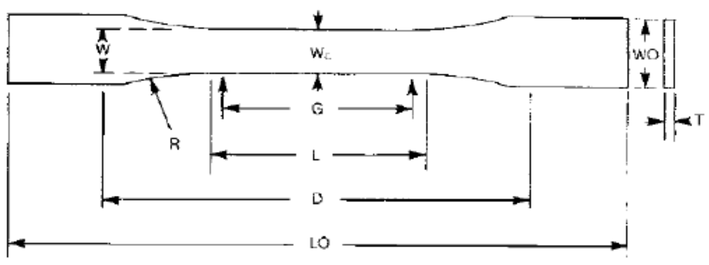
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 1-26, 1-29 AND 2-28 DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMEN 1-26 DOES NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-VSRAG-10-1-T-X-5-1-26	0.129	0.129	0.129	0.750	0.750	0.501	0.500	0.500	6.520	0.001
NIAR-VSRAG-10-1-T-X-5-1-29	0.128	0.128	0.129	0.751	0.751	0.502	0.501	0.501	6.520	0.001
NIAR-VSRAG-10-2-T-X-5-1-28	0.129	0.129	0.128	0.752	0.751	0.501	0.501	0.502	6.516	0.001
NIAR-VSRAG-10-2-T-X-5-1-29	0.130	0.129	0.129	0.751	0.751	0.502	0.502	0.502	6.517	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-VSRAG-10-X-T-Y-5-1-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-VSRAG-10-1-T-Y-5-1-28	0.128	0.503	0.064	0.0	725.250	11.261	6.623	0.354	58424.500	1000-3000	6.942	68F / 32%	FAILURE AT GAGE
NIAR-VSRAG-10-2-T-Y-5-1-26	0.129	0.505	0.065	0.0	762.956	11.735	6.673	0.367	64105.000	1000-3000	10.750	68F / 32%	FAILURE AT GAGE
NIAR-VSRAG-10-2-T-Y-5-1-28	0.129	0.506	0.065	0.0	761.400	11.714	6.664	0.368	62862.500	1000-3000	10.355	68F / 32%	FAILURE AT GAGE
NIAR-VSRAG-10-2-T-Y-5-1-29	0.128	0.505	0.065	0.0	759.589	11.720	6.655	0.367	62212.500	1000-3000	10.147	68F / 32%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.20	in/min

AVERAGE	**11.608**	**6.654**	**0.364**
STANDARD DEVIATION	0.231	0.022	0.007
COEFFICIENT OF VARIATION [%]	1.993	0.327	1.815

Comments:

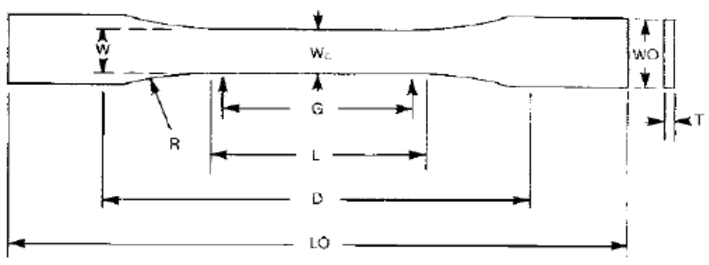
ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMENS 2-T-Y-5-1-(26,28 AND 29) DO NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	24-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	NEVILLE T.	24-Mar-20
TESTER I	ERIC	21-Apr-20
DATA ENTRY/REDUCTION I	MING	27-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	28-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-VSRAG-10-1-T-Y-5-1-28	0.128	0.128	0.128	0.754	0.754	0.503	0.503	0.503	6.528	0.000
NIAR-VSRAG-10-2-T-Y-5-1-26	0.129	0.129	0.128	0.755	0.754	0.506	0.505	0.505	6.515	0.001
NIAR-VSRAG-10-2-T-Y-5-1-28	0.129	0.128	0.129	0.754	0.754	0.506	0.506	0.506	6.515	0.000
NIAR-VSRAG-10-2-T-Y-5-1-29	0.128	0.128	0.129	0.755	0.754	0.506	0.505	0.505	6.516	0.001



ASTM D638-16
TENSILE PROPERTIES OF PLASTICS

BATCH NAME: NIAR-VSRAG-10-X-T-Z-5-4-X
CONDITION (RTA, RTD, RTW, RTF) : RTD

SPECIMEN NAME	AVG THICKNESS [in]	AVG WIDTH AT NARROW SECTION [in]	AREA [in^2]	INITIAL LOAD OFFSET [lb]	MAX LOAD [lb]	TENSILE STRENGTH [ksi]	0.2% OFFSET TENSILE STRENGTH [ksi]	TENSILE MODULUS [Msi]	FINAL STRAIN [με]	STRAIN RANGE [με]	ELONGATION AT BREAK [%]	TEMP / HUMIDITY [° F / % RH]	FAILURE MODE
NIAR-VSRAG-10-1-T-Z-5-4-28	0.129	0.501	0.065	0.0	479.104	7.422	5.613	0.339	27451.500	1000-3000	2.745	73F / 23%	FAILURE AT GAGE
NIAR-VSRAG-10-1-T-Z-5-4-29	0.129	0.500	0.064	0.0	477.511	7.426	5.832	0.335	27353.000	1000-3000	2.735	73F / 23%	FAILURE AT GAGE
NIAR-VSRAG-10-2-T-Z-5-4-26	0.128	0.501	0.064	0.0	500.564	7.805	5.655	0.333	30801.000	1000-3000	3.080	73F / 23%	FAILURE AT GAGE
NIAR-VSRAG-10-2-T-Z-5-4-28	0.128	0.500	0.064	0.0	494.118	7.736	5.384	0.346	29427.500	1000-3000	2.943	73F / 23%	FAILURE AT GAGE

MACHINE ID	ATLANTIS	
LOAD CELL	5500	lb
LOAD CELL MODEL	FR20-11K-B000	
LOAD CELL SERIAL	109961A	
CAL. REPORT NO.	DVH00653	
EXTENSOMETER MODEL	634.25E-25	
EXTENSOMETER SERIAL	10201581B	
CAL. REPORT NO.	JMH01205	
SPEED OF TEST	0.15	in/min

AVERAGE	**7.597**	**5.621**	**0.338**
STANDARD DEVIATION	0.202	0.185	0.006
COEFFICIENT OF VARIATION [%]	2.656	3.283	1.664

Comments:

ALL SPECIMENS DO NOT MEET THE REQUIREMENT FOR RADIUS OF FILLET (=3.00" ± 0.04") PER ASTM D638
SPECIMEN 2-28 DOES NOT MEET THE REQUIREMENT FOR LENGTH OF NARROW SECTION (=2.25" ± 0.02") PER ASTM D638
SPECIMENS 1-29. 2-26 DO NOT MEET THE REQUIREMENT FOR WIDTH OVERALL (0.75" ≤ WO ≤ 1.00") PER ASTM D638

GRIP PRESSURE: 150 psi

	NAME	DATE
MACHINING INTEGRITY PERSONNEL	MICHAEL B.	27-Mar-20
DIMENSIONAL INTEGRITY PERSONNEL	KADI STITHEM	27-Mar-20
TESTER I	CHENG MIN	15-Apr-20
DATA ENTRY/REDUCTION I	MING	16-Apr-20
TESTER II		
DATA ENTRY/REDUCTION II		
REVIEWED BY	ZHI	21-Apr-20

Customer/Prime Contractor (if available):	FAA
Job/P.O. Number (if available):	JAMS PBAM Task 18-2
Testing Procedure with latest revision:	CP 7203 Rev B
Material Specification and revision (if available):	ULTEM
Test requirements specified on shop paper (if available):	N/A

SPECIMEN NAME	THICKNESS 1	THICKNESS 2	THICKNESS 3	OVERALL WIDTH 1 (WO)	OVERALL WIDTH 2 (WO)	WIDTH AT NARROW SECTION 1 (W)	WIDTH AT NARROW SECTION (Wc)	WIDTH AT NARROW SECTION 2 (W)	OVERALL LENGTH (LO)	THICKNESS VARIATION
NIAR-VSRAG-10-1-T-Z-5-4-28	0.130	0.128	0.129	0.750	0.751	0.501	0.501	0.502	6.501	0.001
NIAR-VSRAG-10-1-T-Z-5-4-29	0.129	0.129	0.127	0.751	0.748	0.500	0.500	0.501	6.502	0.002
NIAR-VSRAG-10-2-T-Z-5-4-26	0.128	0.128	0.128	0.751	0.749	0.501	0.500	0.503	6.505	0.001
NIAR-VSRAG-10-2-T-Z-5-4-28	0.128	0.129	0.126	0.750	0.752	0.501	0.500	0.500	6.503	0.003