



# Senvol Indexes

Data sets for additive manufacturing material characterization

## Data Set Available for Purchase

This Senvol Index is a data set of the Arcam (AP&C) Ti6Al4V material processed on the Arcam Q20 machine.

Material Used	Machine Used	Manufacturing	Testing
Arcam (AP&C) Ti6Al4V	Arcam Q20	All test specimens were manufactured at an AS9100 certified facility	All test specimens were tested at a NADCAP and A2LA accredited facility

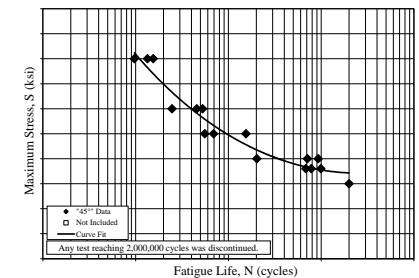
This Senvol Index includes data on: (A) Test Specimen Properties, (B) Process Parameters, and (C) Feedstock Properties.

### Test Specimen Properties

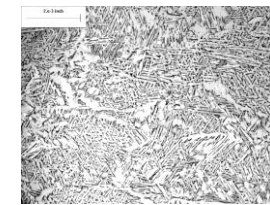
Material property test results reported (for both hot isostatic pressed and as-built specimens) are:

Test Procedure	Standard	Total # of Tests	
		As-Built	HIP'ed
Tensile	ASTM E8	16	32
Tensile Modulus	ASTM E111	4	12
High Cycle Fatigue (5 stress levels)	ASTM E466	16	48
Hardness	ASTM E18	16	32
Compression	ASTM E9	16	32
Double Shear	ASTM B769	16	32
Coefficient of Thermal Expansion	ASTM E831	1	3
Metallographic	ASTM E112/E3	16	32
Density	ASTM B311	1	3
Chemistry (O & N Content)	ASTM E1409	4	8
Chemistry (H Content)	ASTM E1447	4	8
Chemistry (Spectroscopy)	ASTM E2371	4	8

Example S/N Curve:



Example Microstructure Image:

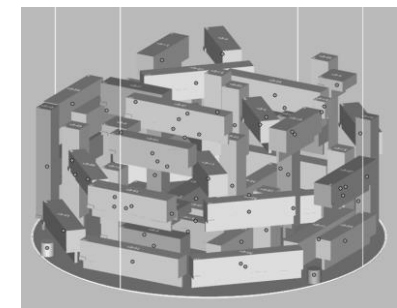


### Process Parameters

Process parameters were documented for the test specimens that were built. Examples of the 75+ parameters include:

- Post-processing (HIP'ed and as-built)
- Locations on the build plate (2 locations)
- Orientation of part (4 orientations)
- Process theme / machine parameters
- Software version
- Hot isostatic pressing post-processing parameters

Image of AM Build (Without Supports):



### Feedstock Properties

The specific feedstock used was tested. Examples of the feedstock characteristics reported include:

- Powder lot
- Particle size distribution (ASTM B214)
- Chemical composition (e.g. ASTM E1409, E1941)

Example of Test Results:

Element	Required	Measured	Testing Method	Status
Aluminum (Al)	5.50-6.75	██████████	ASTM E2371	Conforming
Vanadium (V)	3.50-4.50	██████████	ASTM E2371	Conforming
Iron (Fe)	<0.3	██████████	ASTM E2371	Conforming
Oxygen (O)	<0.2	██████████	ASTM E1409	Conforming
Carbon (C)	<0.08	██████████	ASTM E1941	Conforming
Nitrogen (N)	<0.05	██████████	ASTM E1409	Conforming
Hydrogen (H)	<0.015	██████████	ASTM E1447	Conforming
Yttrium (Y)	<0.005	██████████	ASTM E2371	Conforming
Others, each	<0.10	██████████	ASTM E2371	Conforming
Others, total	<0.40	██████████	ASTM E2371	Conforming
Titanium (Ti)	Remainder	██████████	ASTM E2371	Conforming

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