

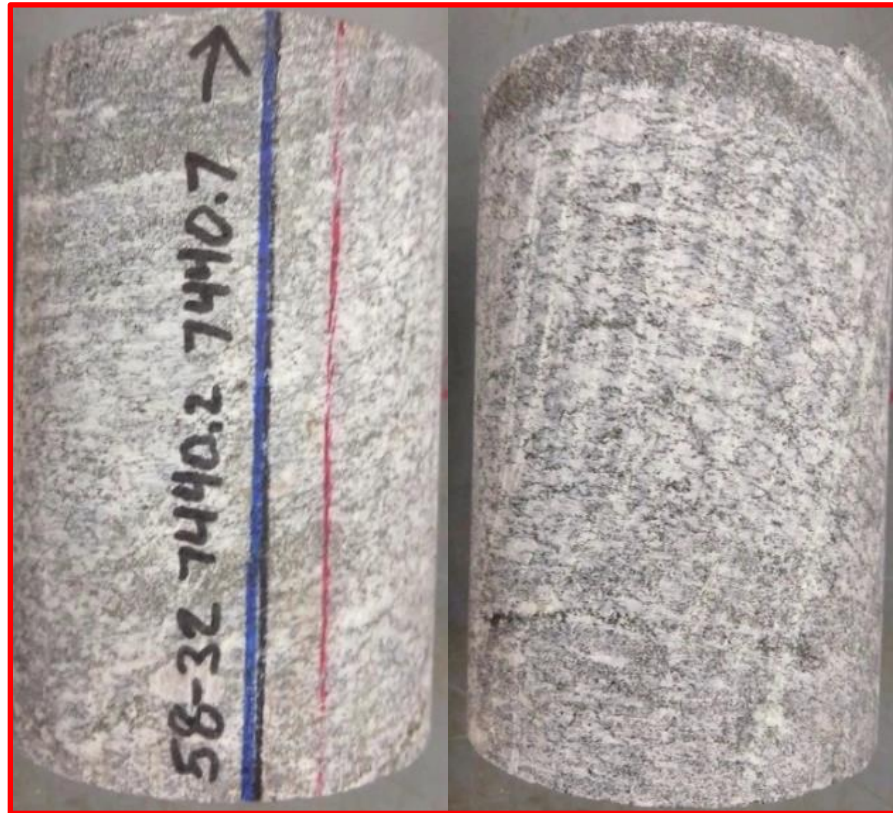
# METAROCK LABORATORIES MR-21000850\_FORGE\_GRANITE THERMAL PROPERTIES UPDATE: 5.4.2021

Prepared for

University of Utah

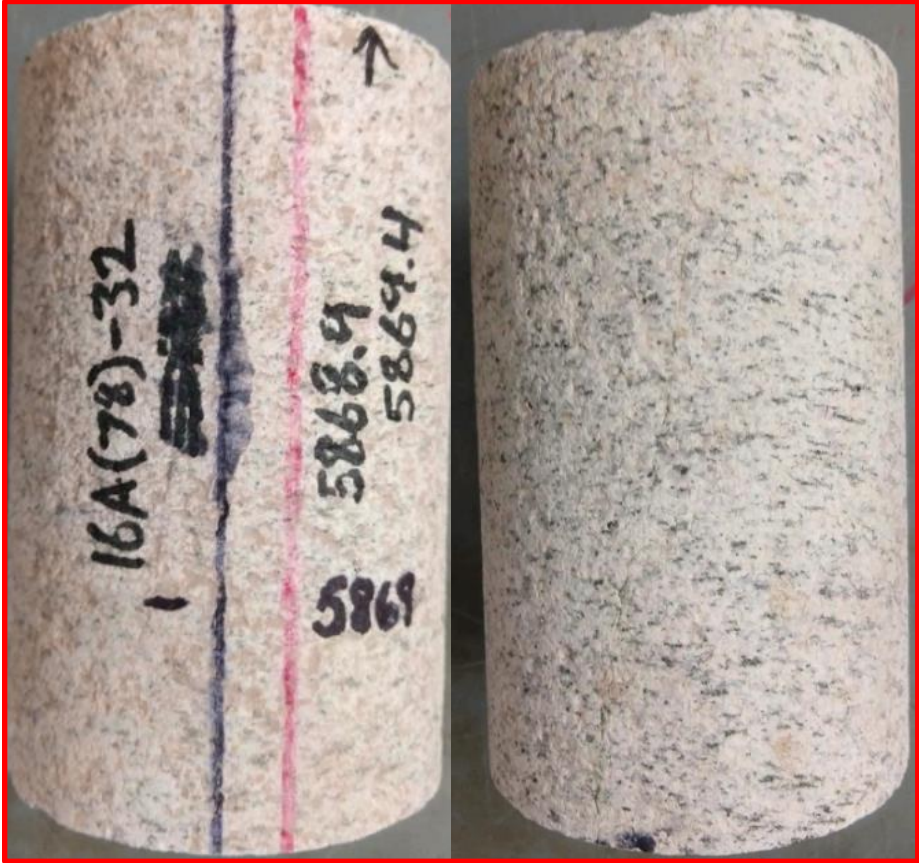


# As Received Cores 58-32



(A)

# As Received Cores 16A(78)-32



(A)

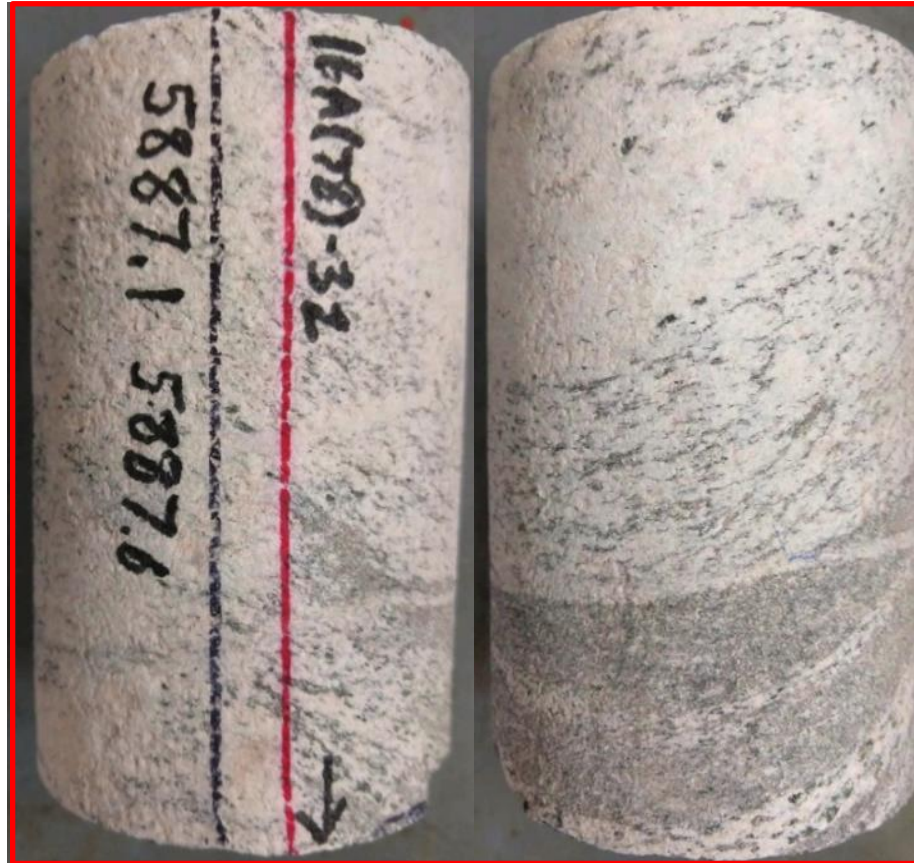


(B)

# As Received Core Details

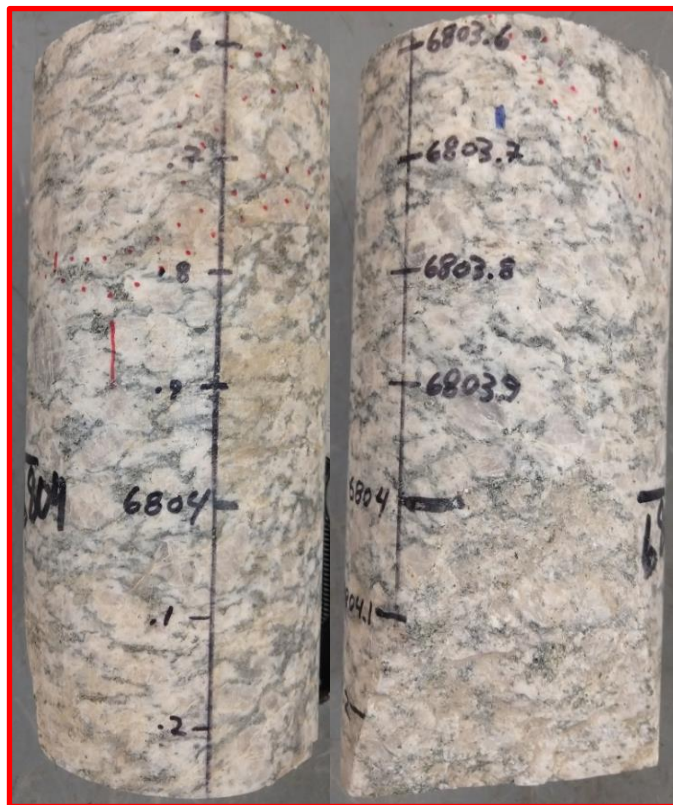
Well	Top (ft MD)	Bottom (ft MD)	Core length (ft)
16A(78)-32	5868.9	5869.4	0.5
16A(78)-32	5887.1	5887.6	0.5
58-32	7440.2	7440.7	0.5

# Core suggested for replacement 16A(78)-32-B



(B)

# Replacement Core 58-32\_B



# Thermal Expansion Test

## Aluminum Calibration up to 80 C at different confining pressures

# Thermal Expansion Test

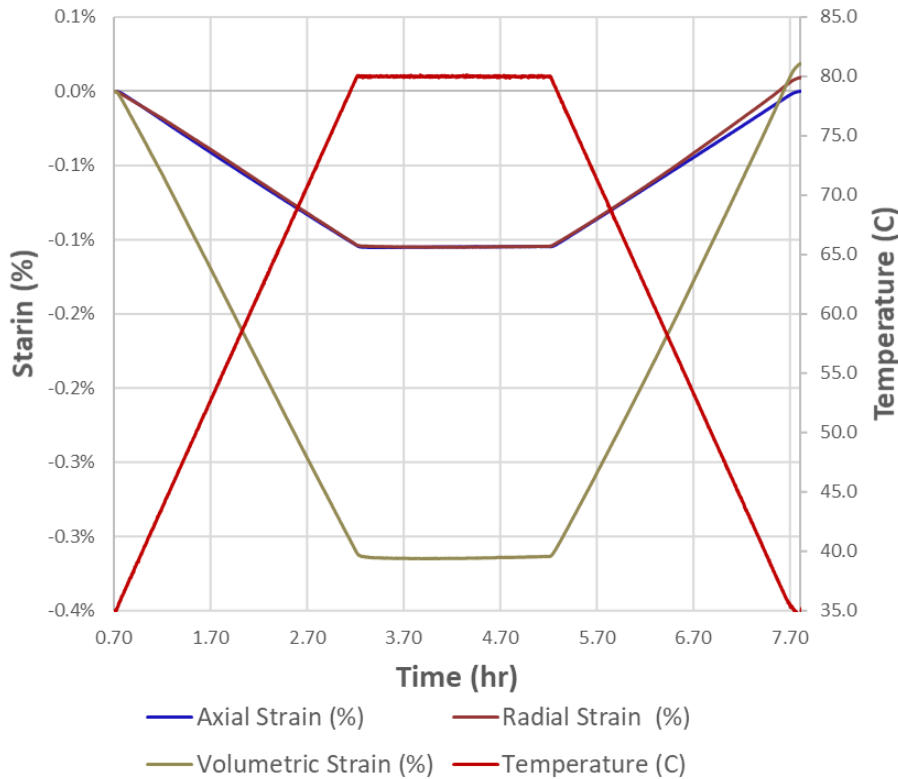
Aluminum Calibration up to 80 C at different confining pressure

UTAH\_ALUM\_80C

Test Overview

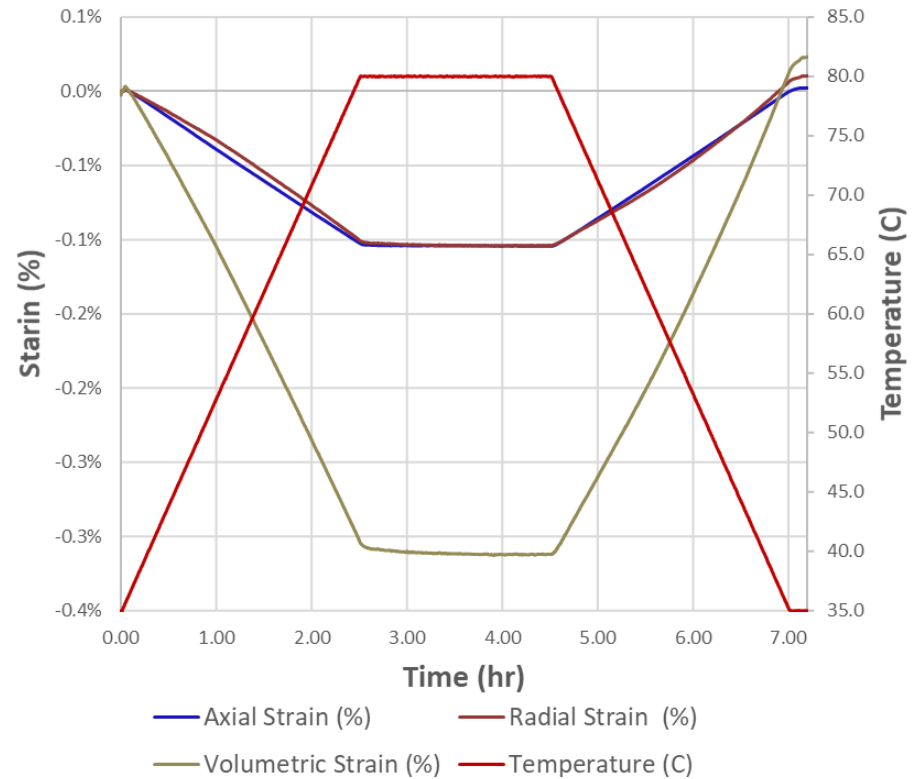
UTAH\_ALUM\_80C

Confining Pressure = 100 Psi



UTAH\_ALUM\_80C

Confining Pressure = 1000 Psi





# Thermal Expansion Test

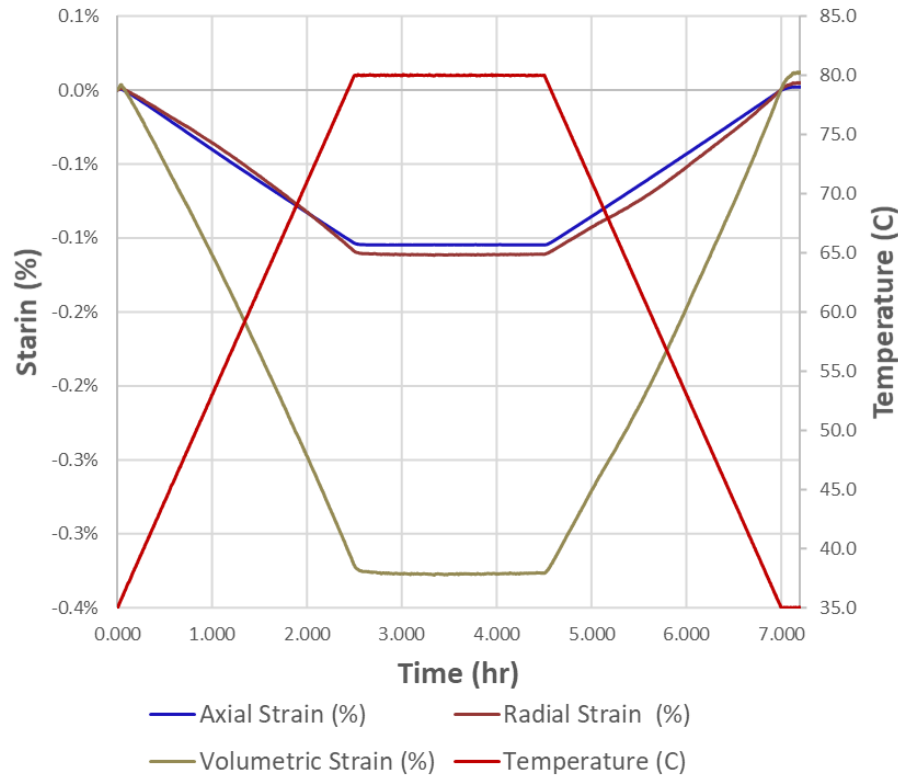
Aluminum Calibration up to 80 C at different confining pressure

UTAH\_ALUM\_80C

## Test Overview

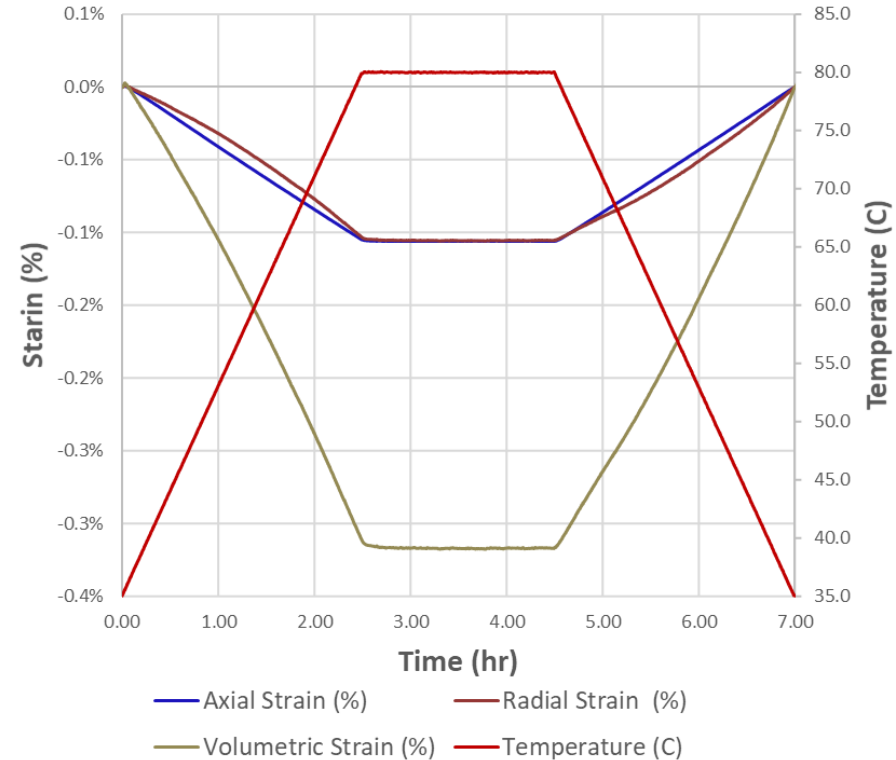
UTAH\_ALUM\_80C

Confining Pressure = 2000 Psi



UTAH\_ALUM\_80C

Confining Pressure = 3000 Psi

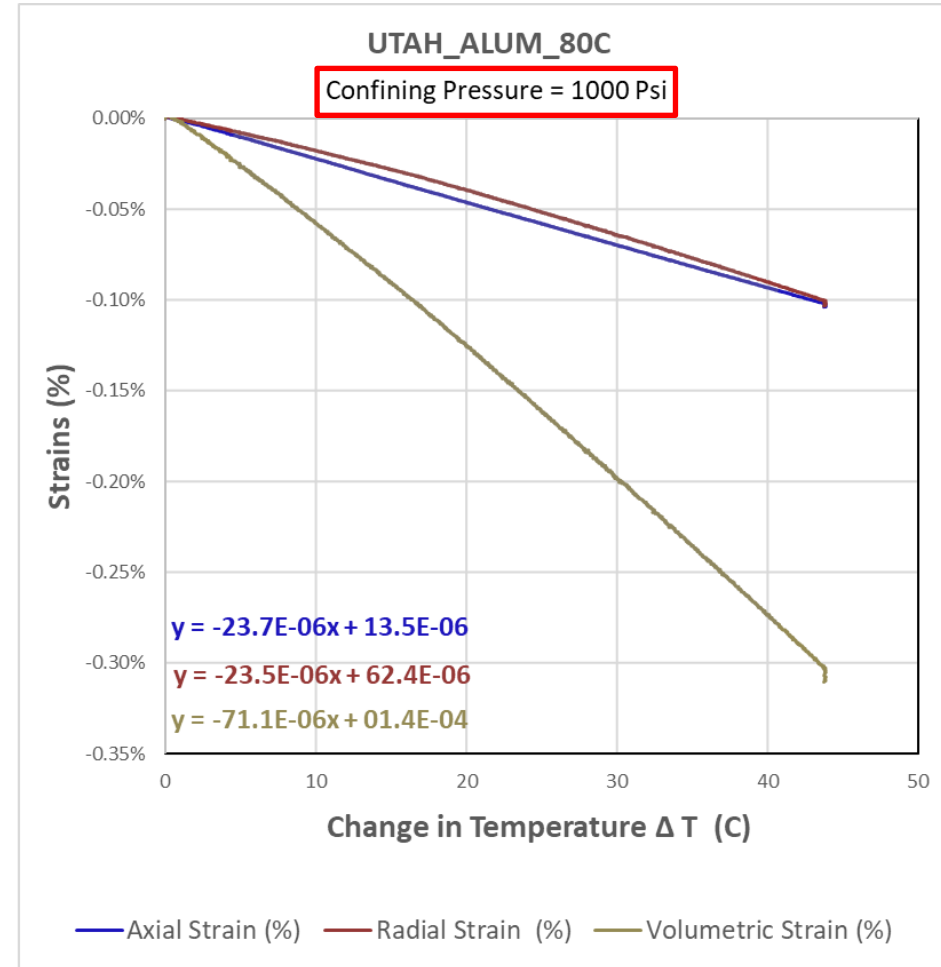
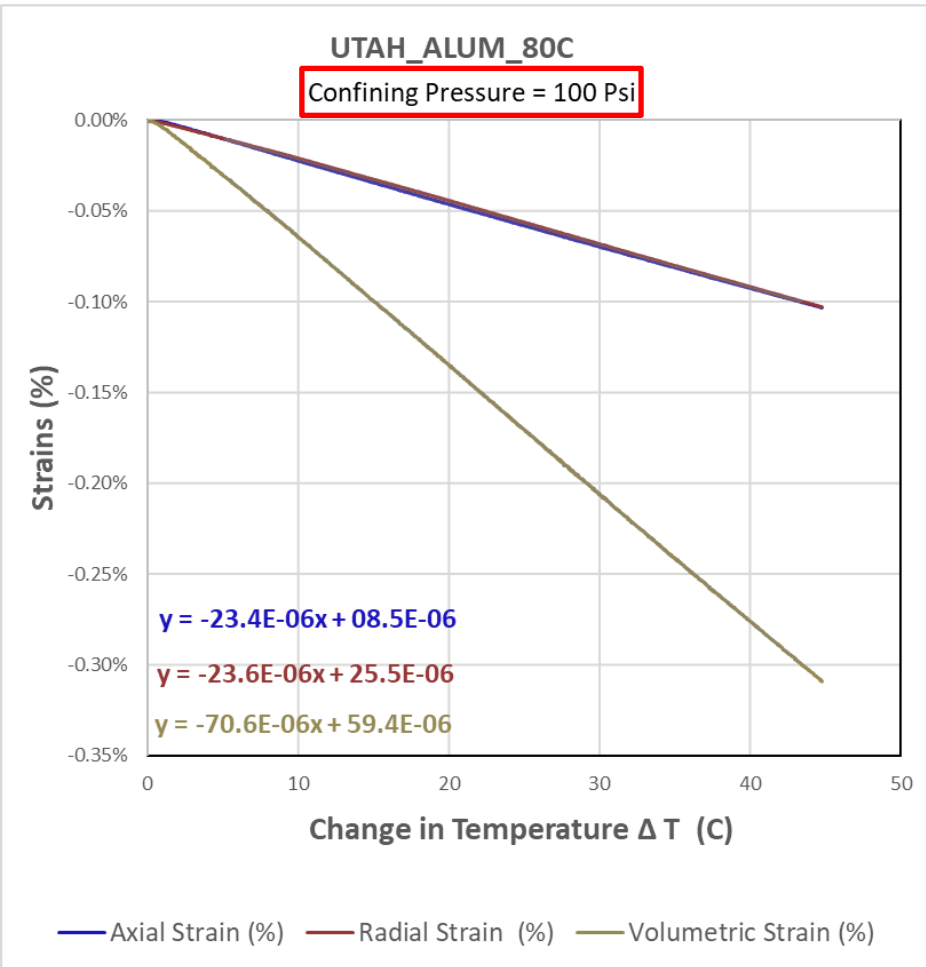


# Thermal Expansion Test

Aluminum Calibration up to 80 C at different confining pressure

UTAH\_ALUM\_80C

Thermal Expansion Coefficient

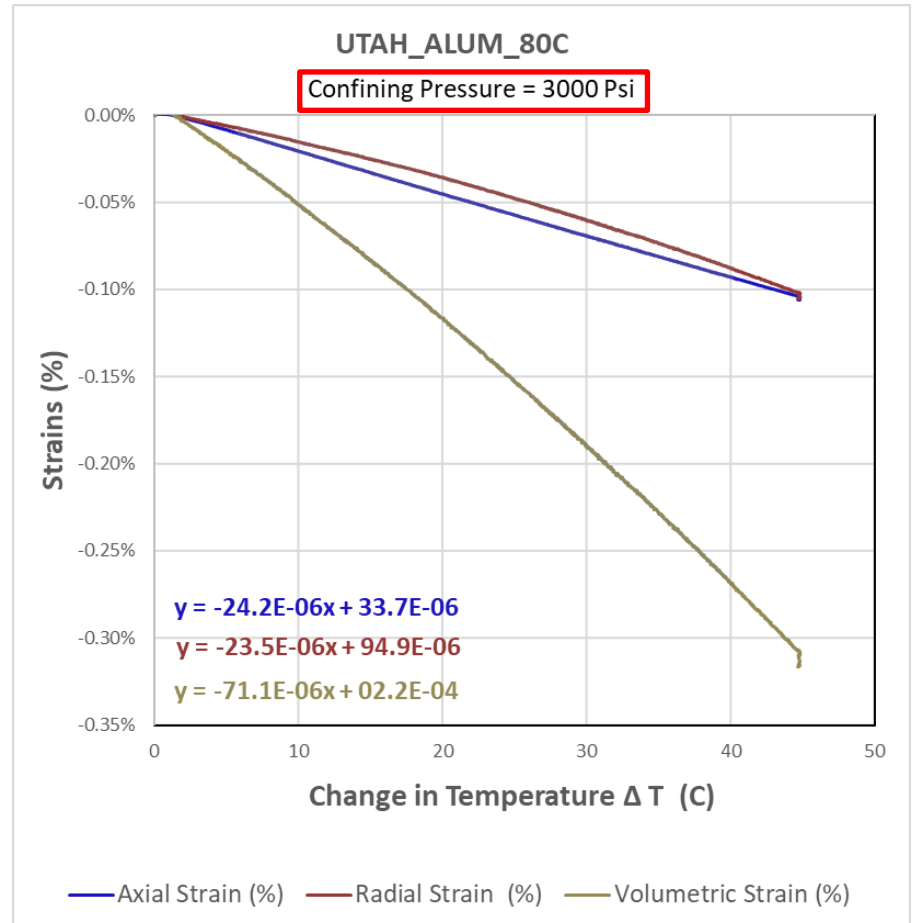
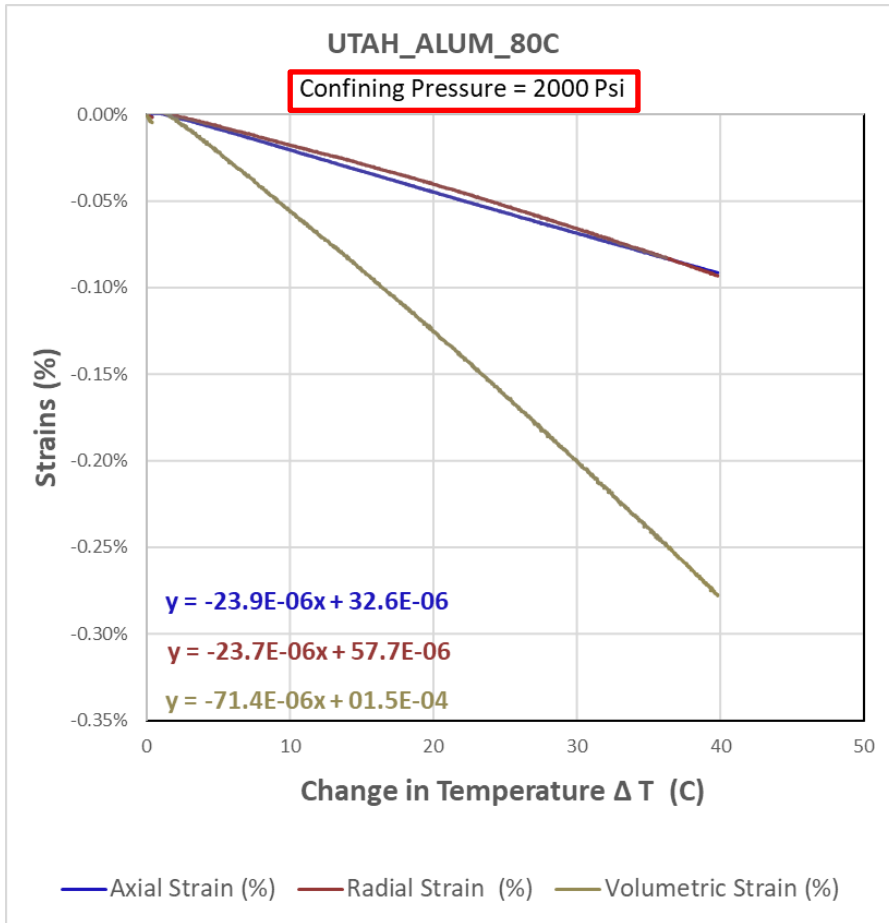


# Thermal Expansion Test

Aluminum Calibration up to 80 C at different confining pressure

UTAH\_ALUM\_80C

## Thermal Expansion Coefficient



# Thermal Expansion Test

Aluminum Calibration up to 80 C at different confining pressure

## Summary

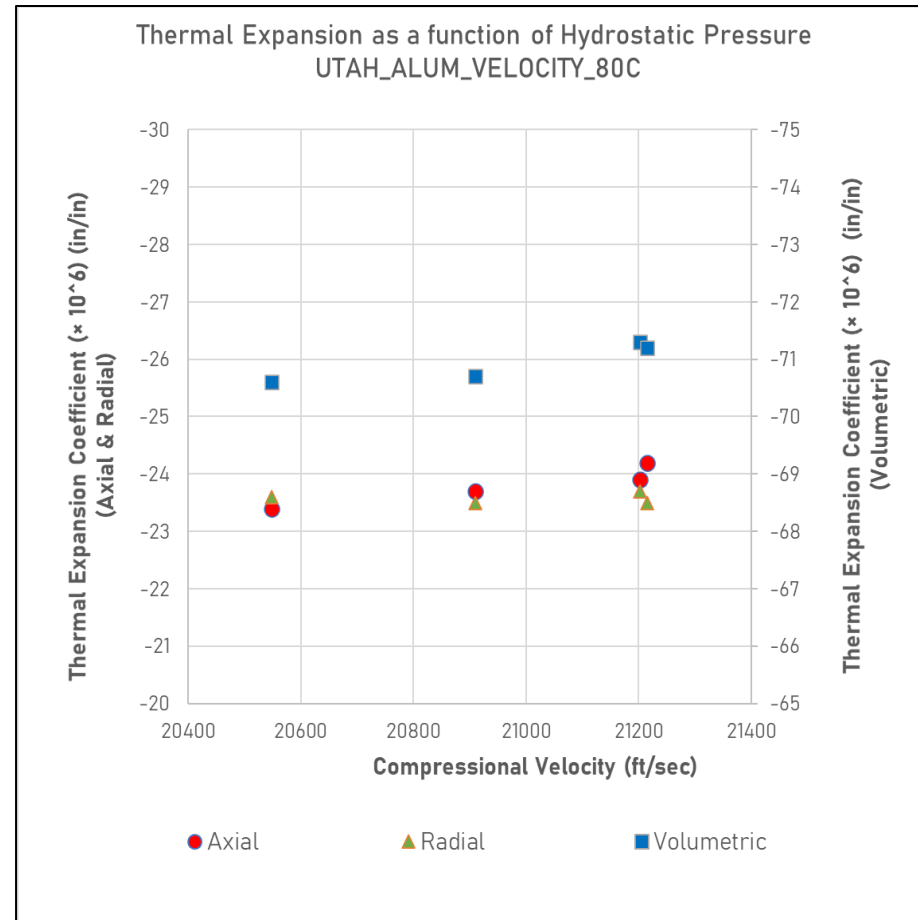
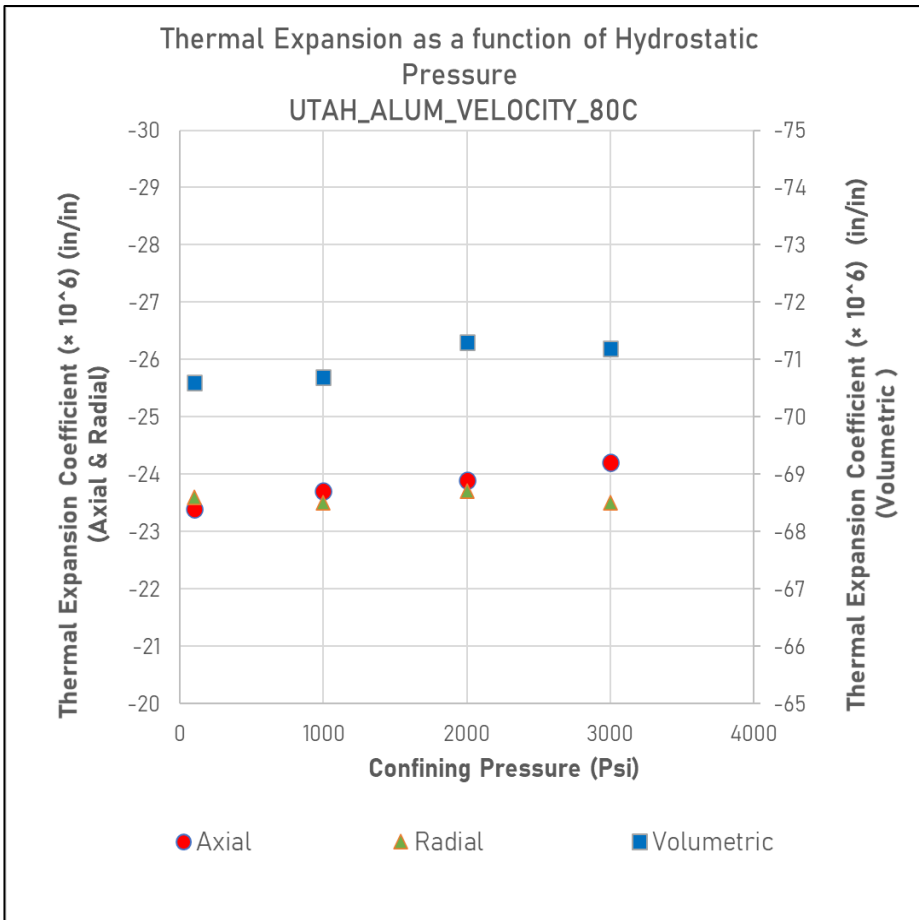
Confining Pressure (Psi)	Thermal Expansion Coefficient ( $\times 10^{-6}$ )			Compressional Velocity (ft/sec)	Change in Compressional Velocity (ft/sec)
	Axial	Radial	Volumetric		
3000	-24.20	-23.50	-71.20	21215	667
2000	-23.90	-23.70	-71.30	21202	653
1000	-23.70	-23.50	-70.70	20909	361
100	-23.40	-23.60	-70.60	20548	0

# Thermal Expansion Test

## Aluminum Calibration up to 80 C at different confining pressure

### UTAH\_ALUM\_VELOCITY\_80C

#### Summary



# Thermal Expansion Test

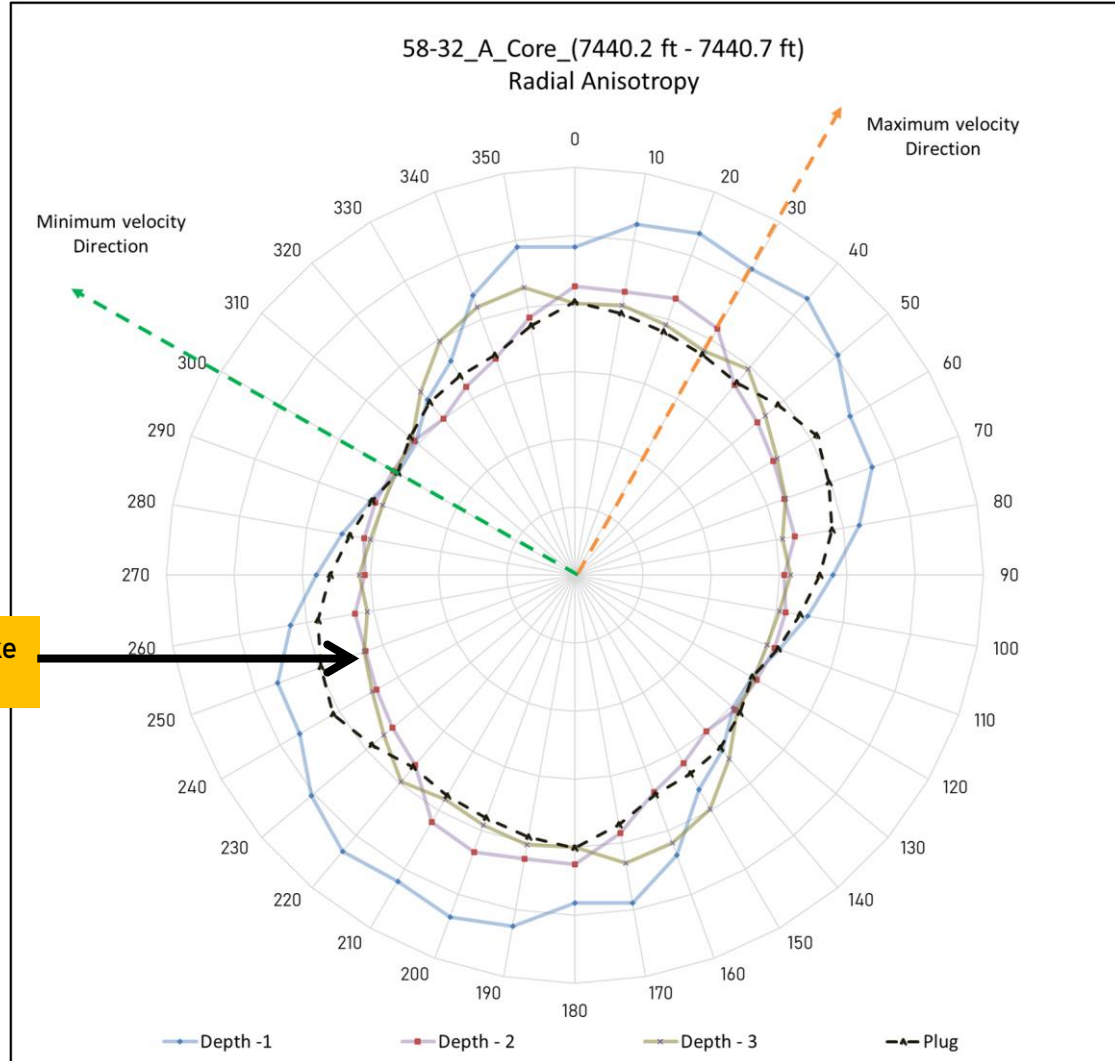
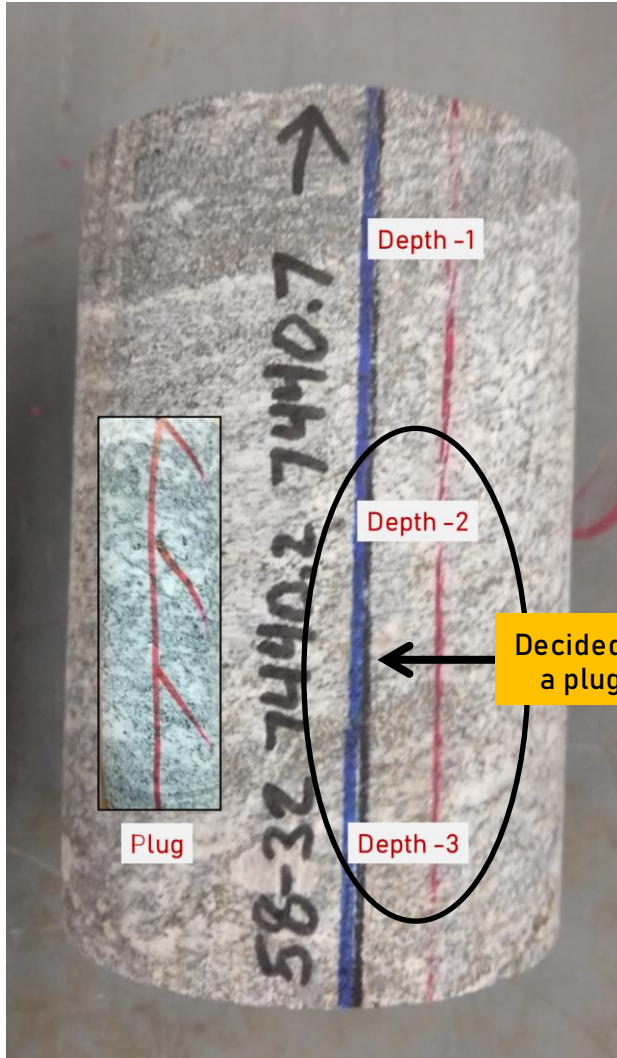
## 58-32\_A\_01\_IV1.A\_HT

7440.43 ft

Sample Name	Depth (ft.)	Archimedes Bulk Volume (cc)	Grain Volume (cc)	Pore Volume (cc)	Grain Density (g/cc)	Bulk Density (g/cc)	Porosity (%)
58-32_A_01_IV1	7440.430	26.025	25.830	0.196	2.689	2.669	0.751

# Radial Velocity Measurement

58-32\_A  
(7440.2 - 7440.7 ft)



# Set01: 58-32\_A\_01

58-32\_A\_01\_1V1  
7440.43 ft.



58-32\_A\_01\_1V2  
7440.43 ft.

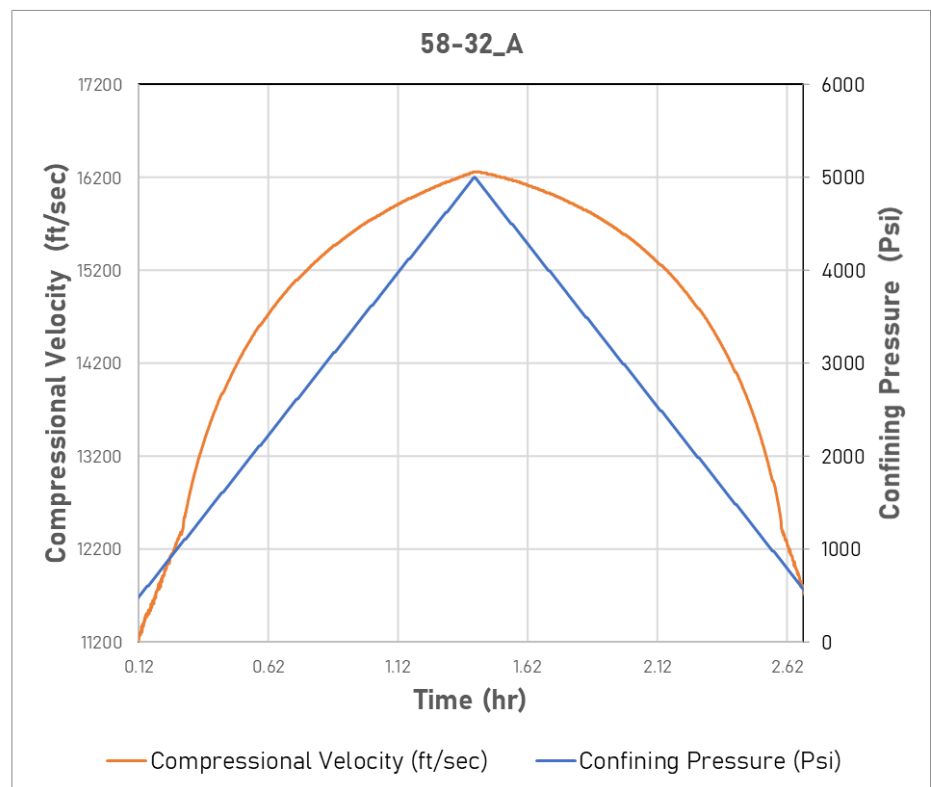
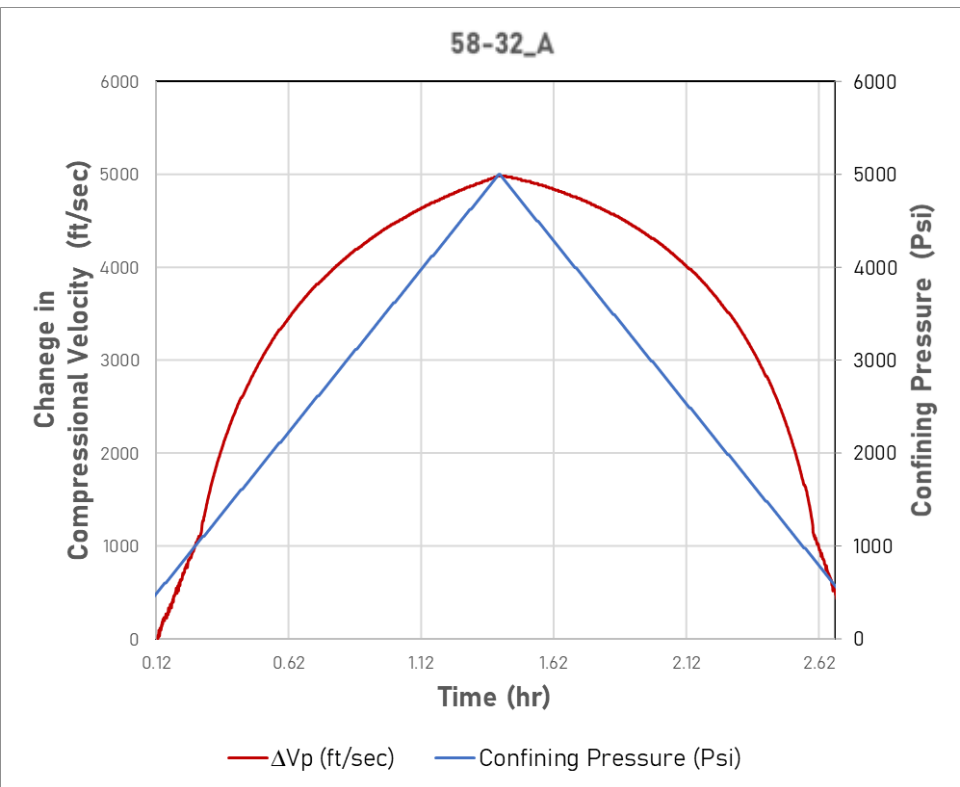




# Hydrostatic Test

## 58-32\_A

(Iso – Test on End-Trim)

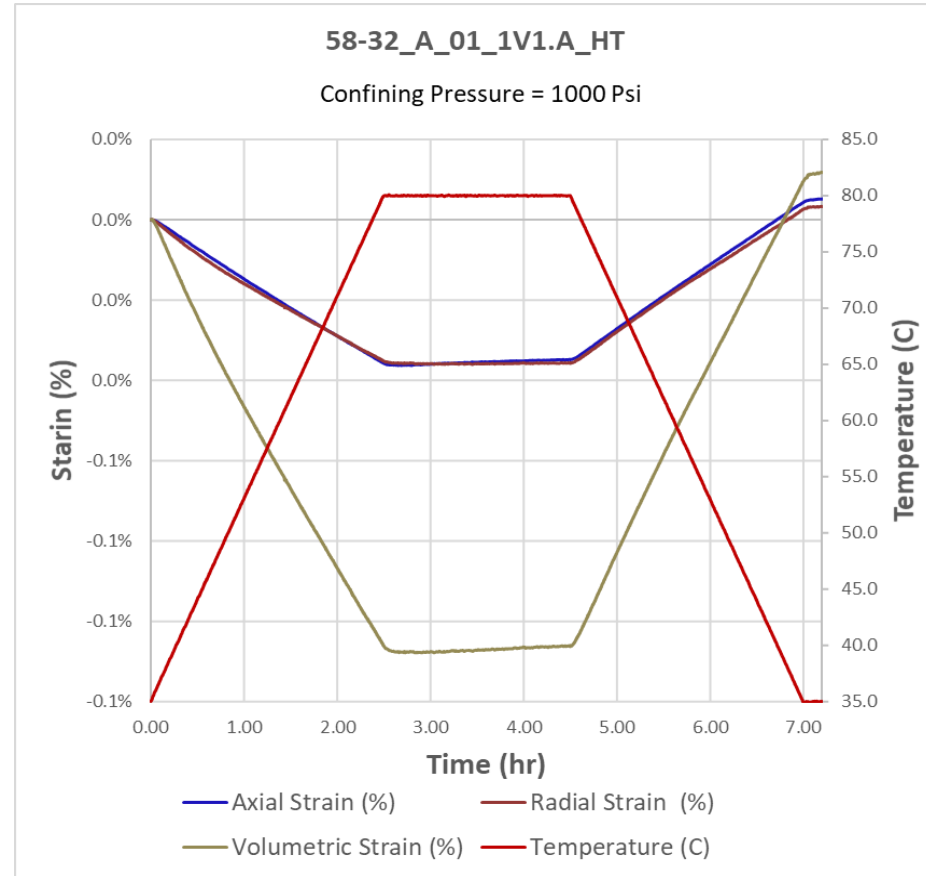
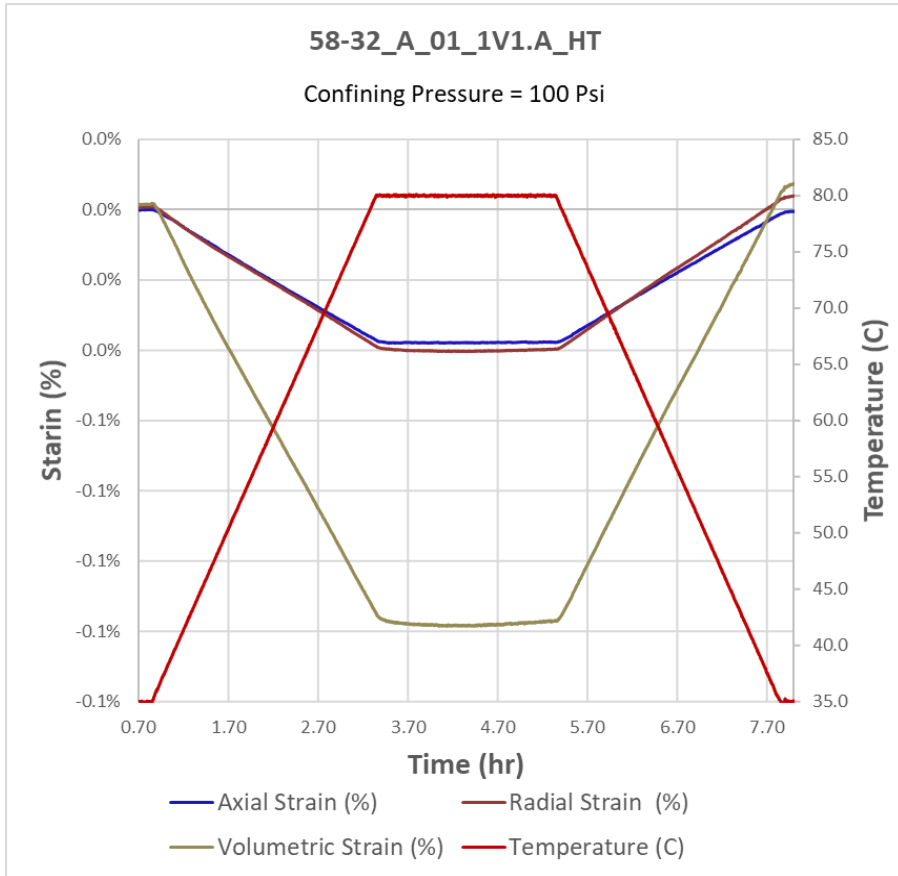


Decided to include two additional confining stages to get the more representative thermal expansion

# Thermal Expansion Test

## 58-32\_A\_01\_1V1.A\_HT

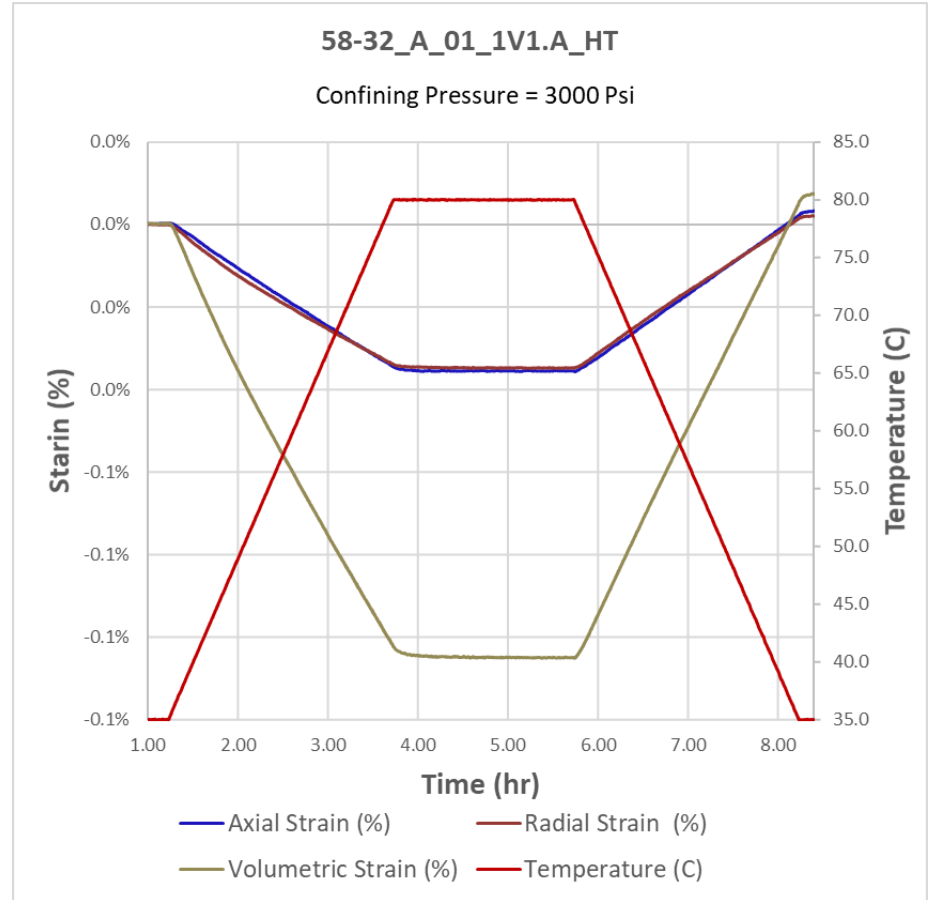
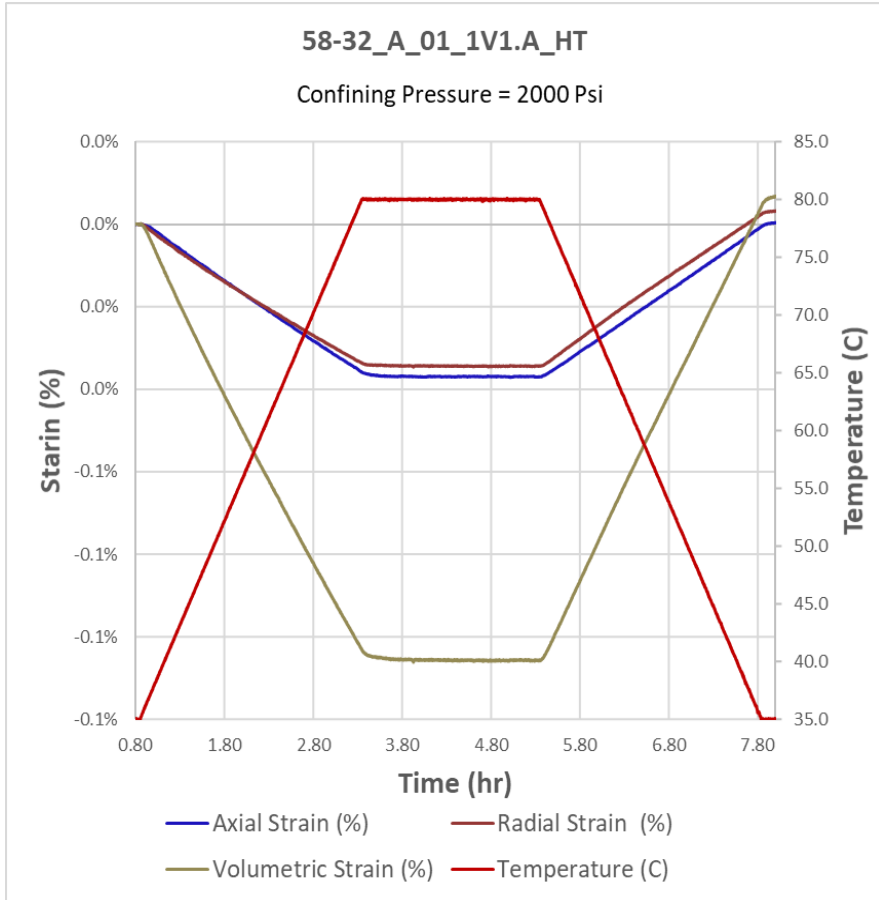
### Test Overview



# Thermal Expansion Test

## 58-32\_A\_01\_1V1.A\_HT

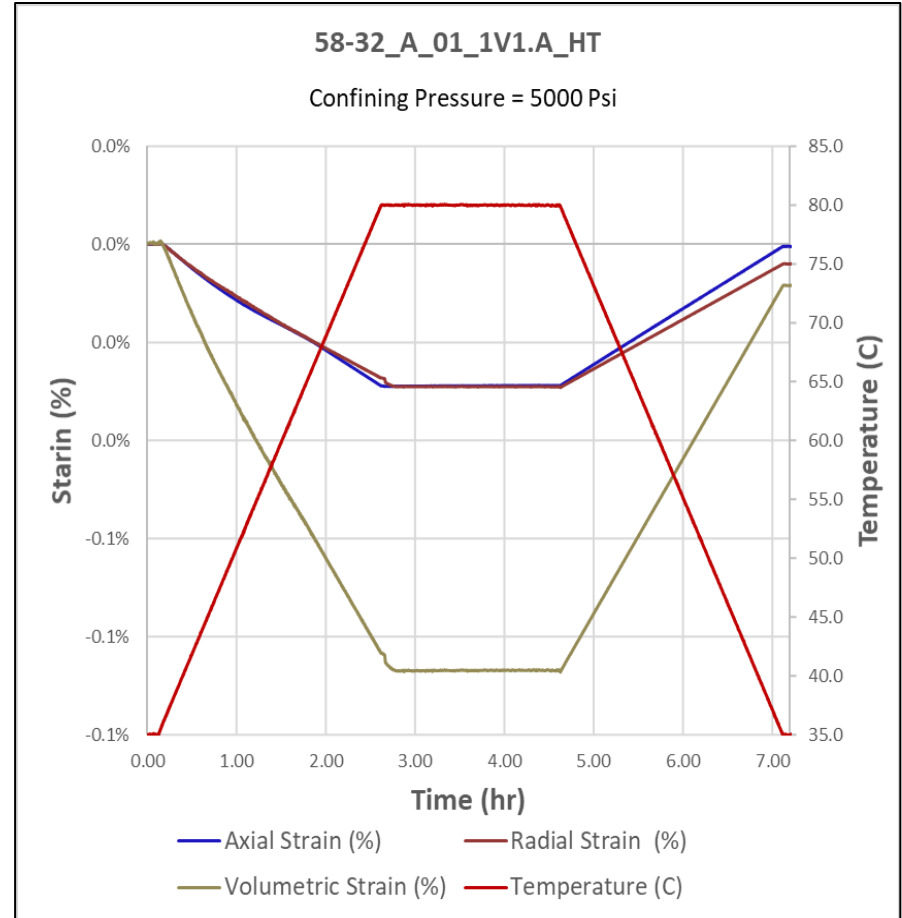
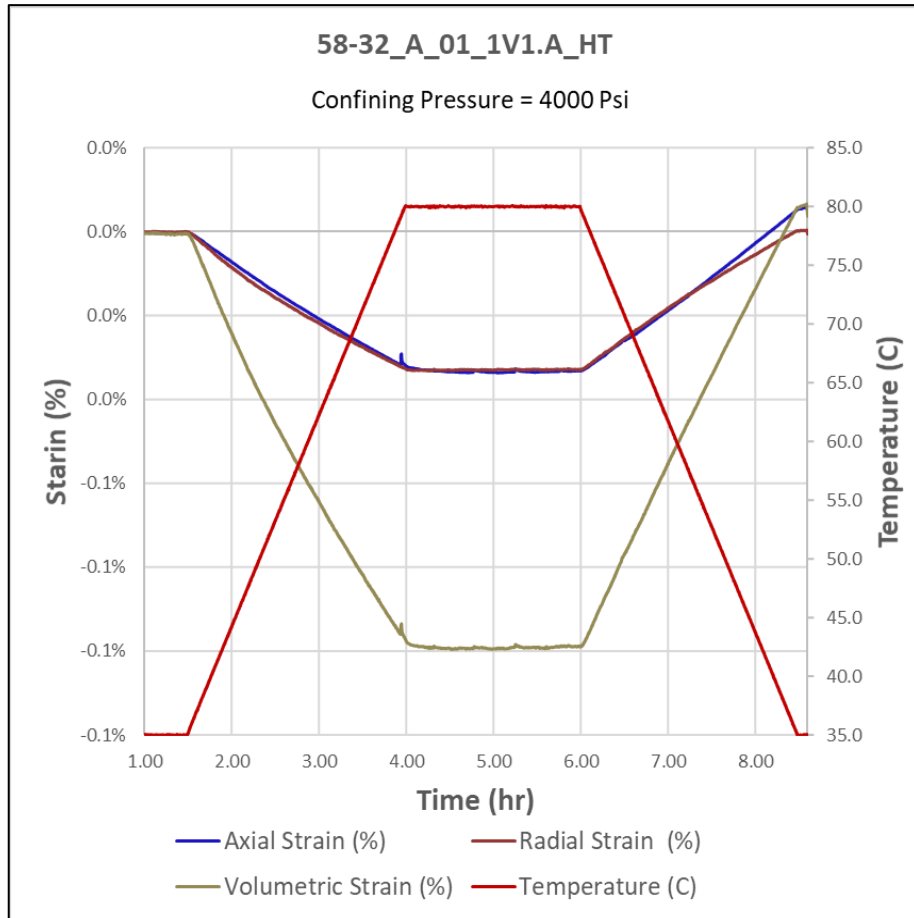
### Test Overview



# Thermal Expansion Test

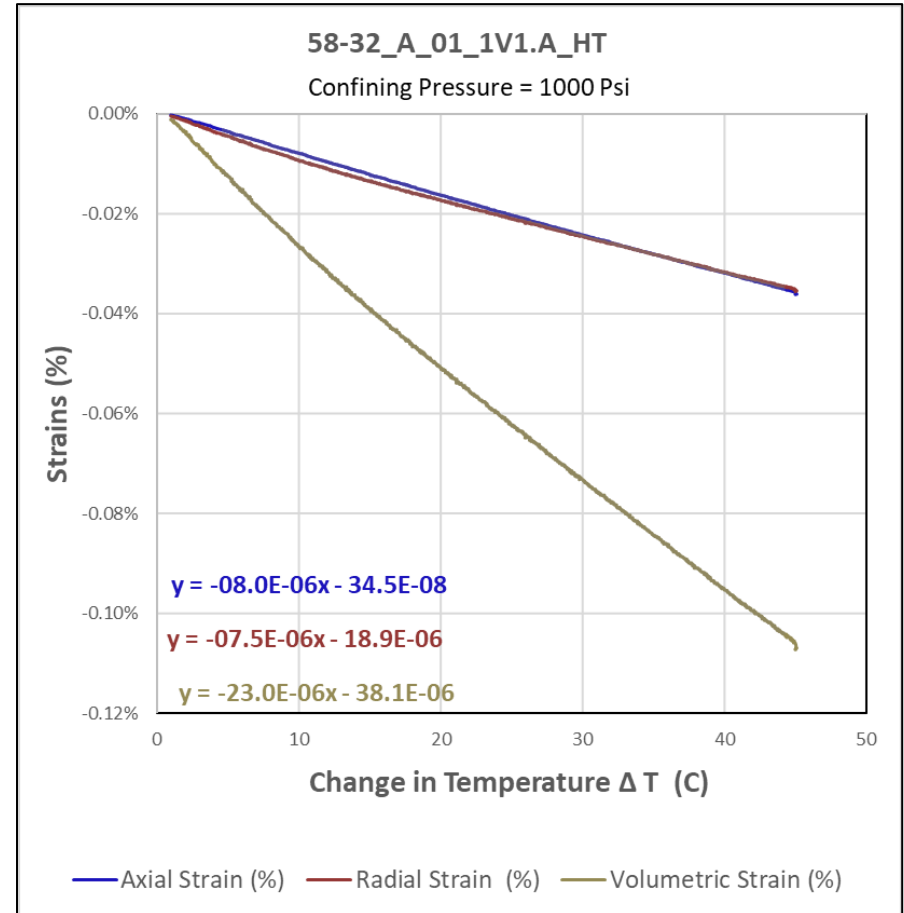
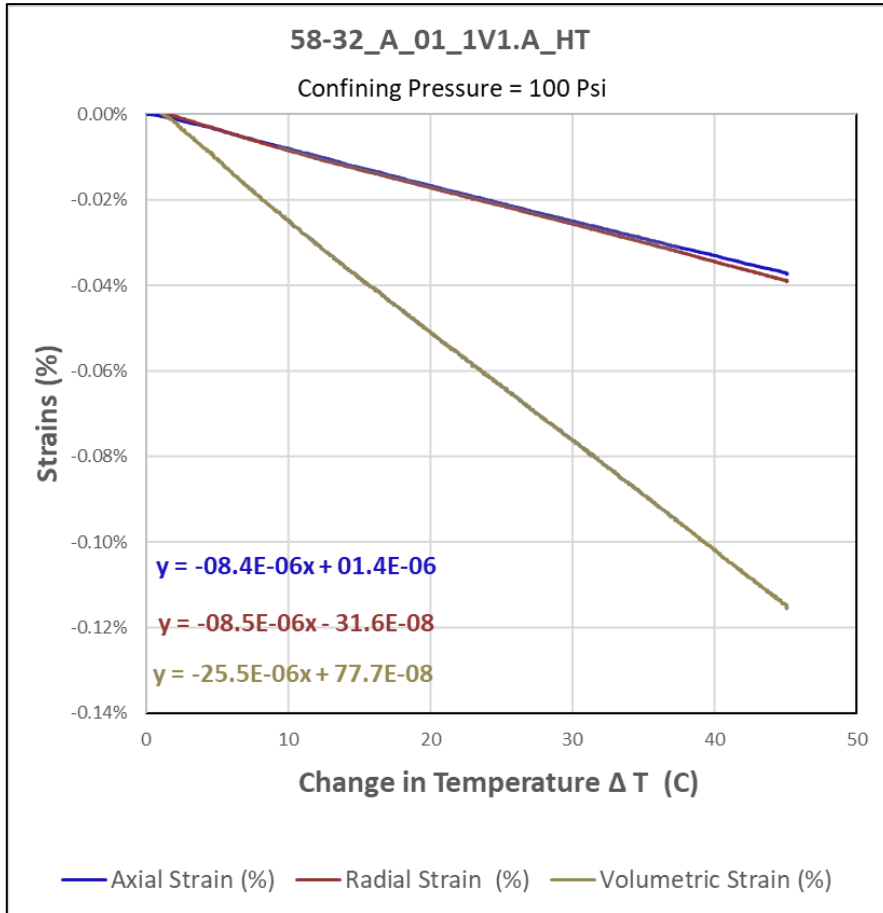
## 58-32\_A\_01\_1V1.A\_HT

### Test Overview



# Thermal Expansion Test

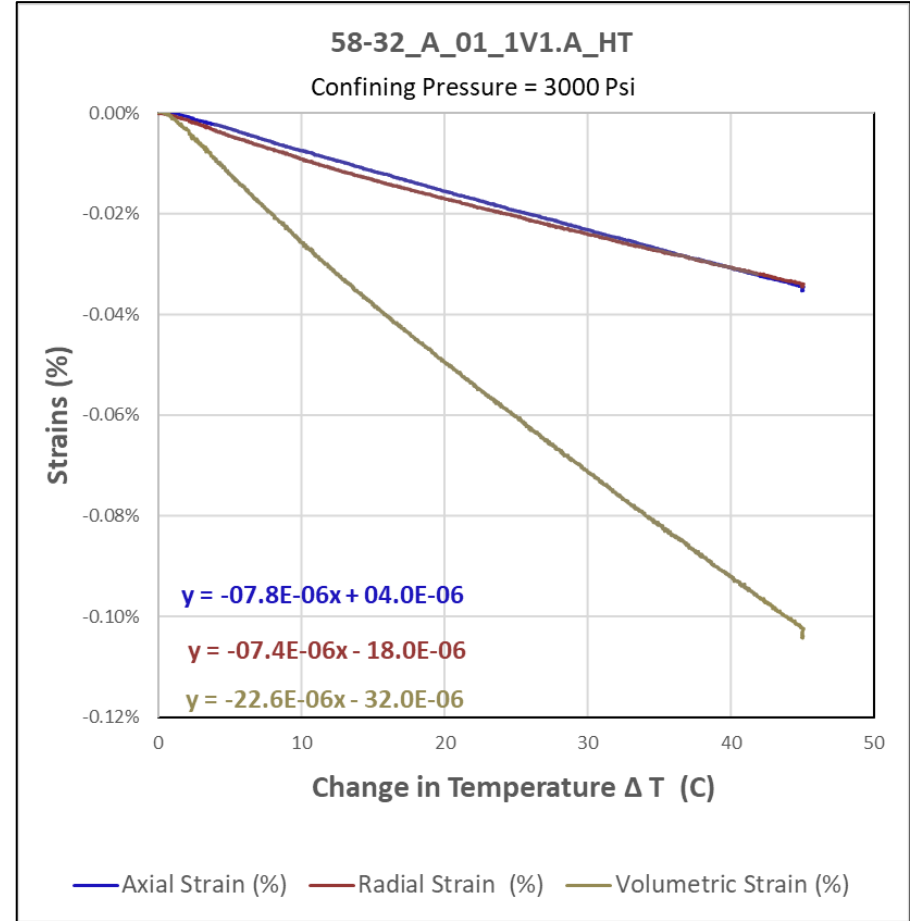
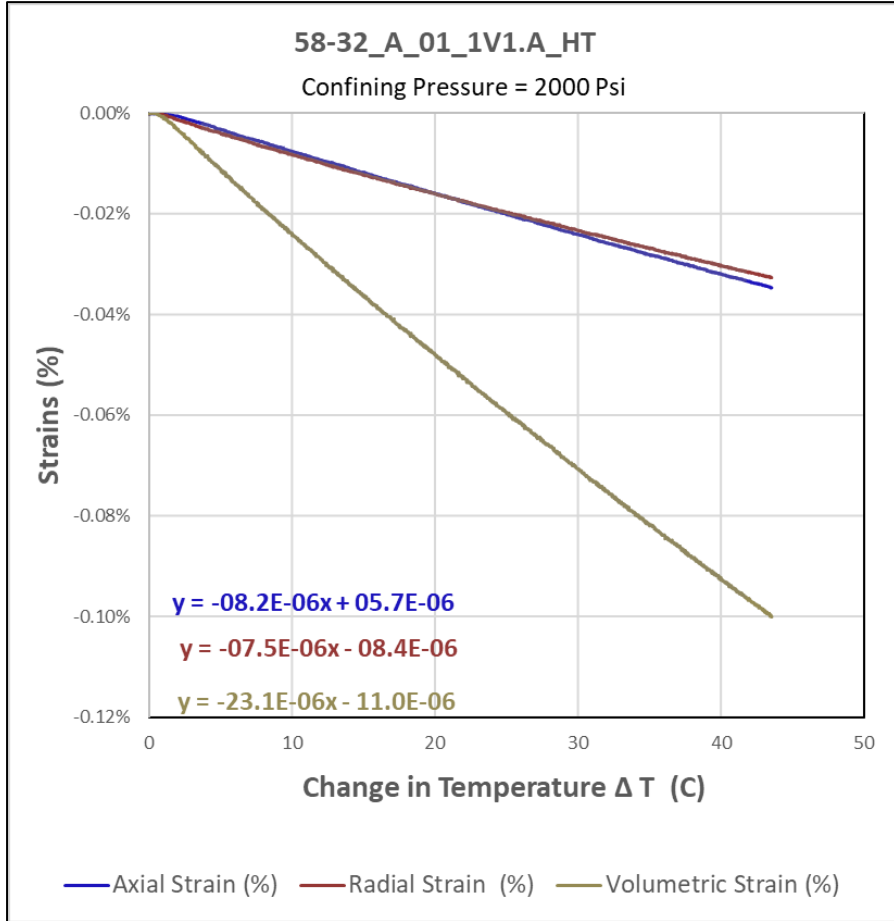
## 58-32\_A\_01\_1V1.A\_HT Test Overview



# Thermal Expansion Test

## 58-32\_A\_01\_1V1.A\_HT

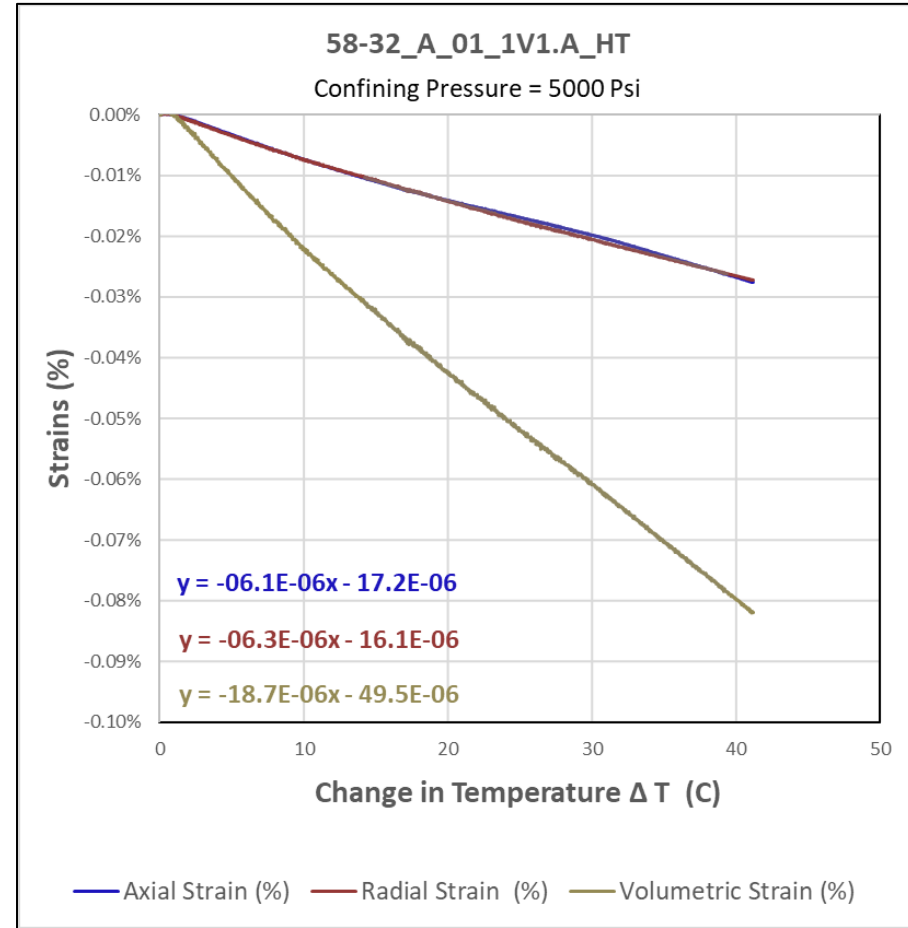
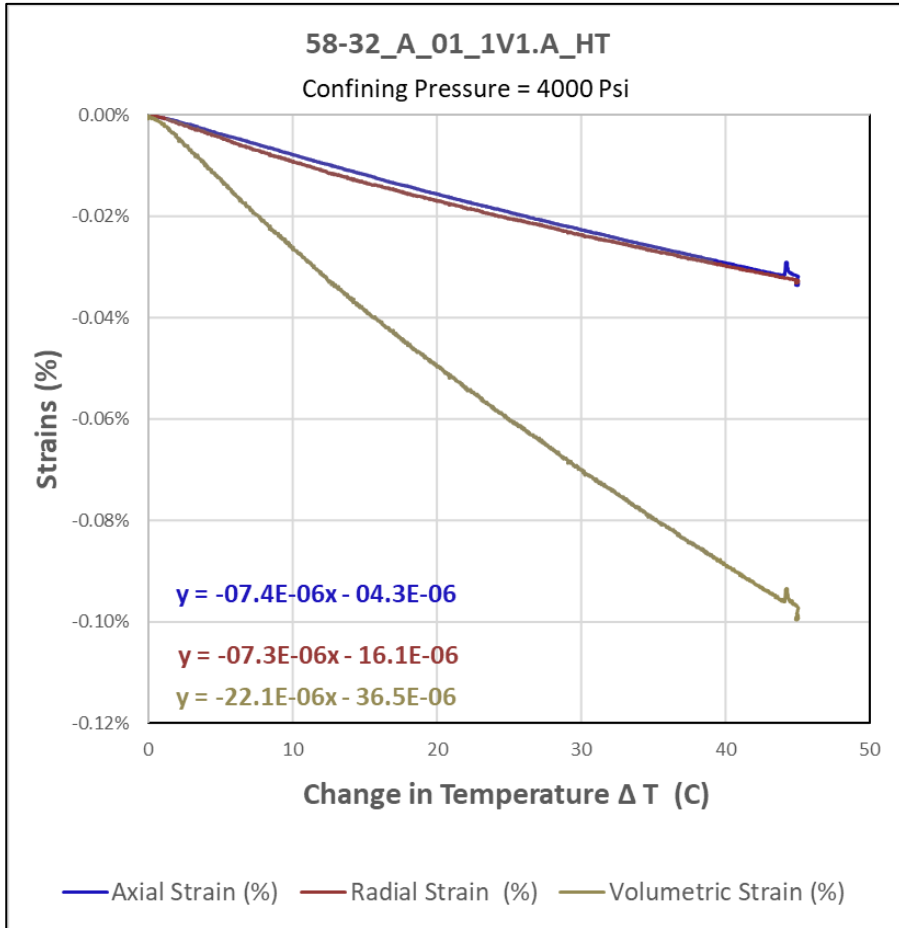
### Test Overview



# Thermal Expansion Test

## 58-32\_A\_01\_1V1.A\_HT

### Test Overview



# Thermal Expansion Test

58-32\_A\_01\_1V1.A\_HT

Summary

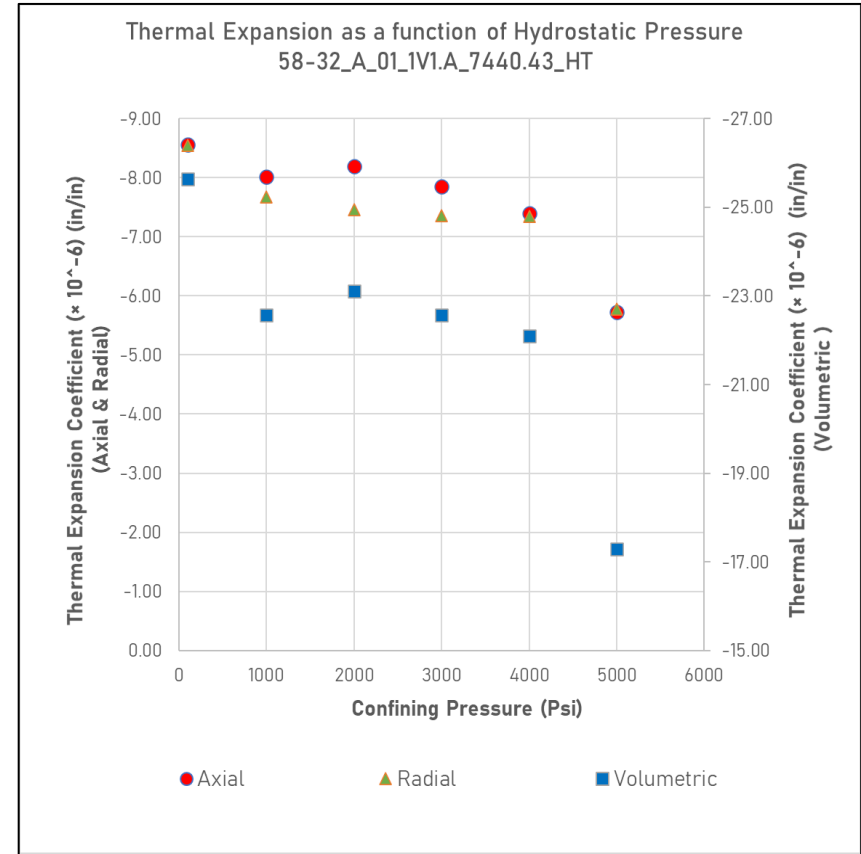
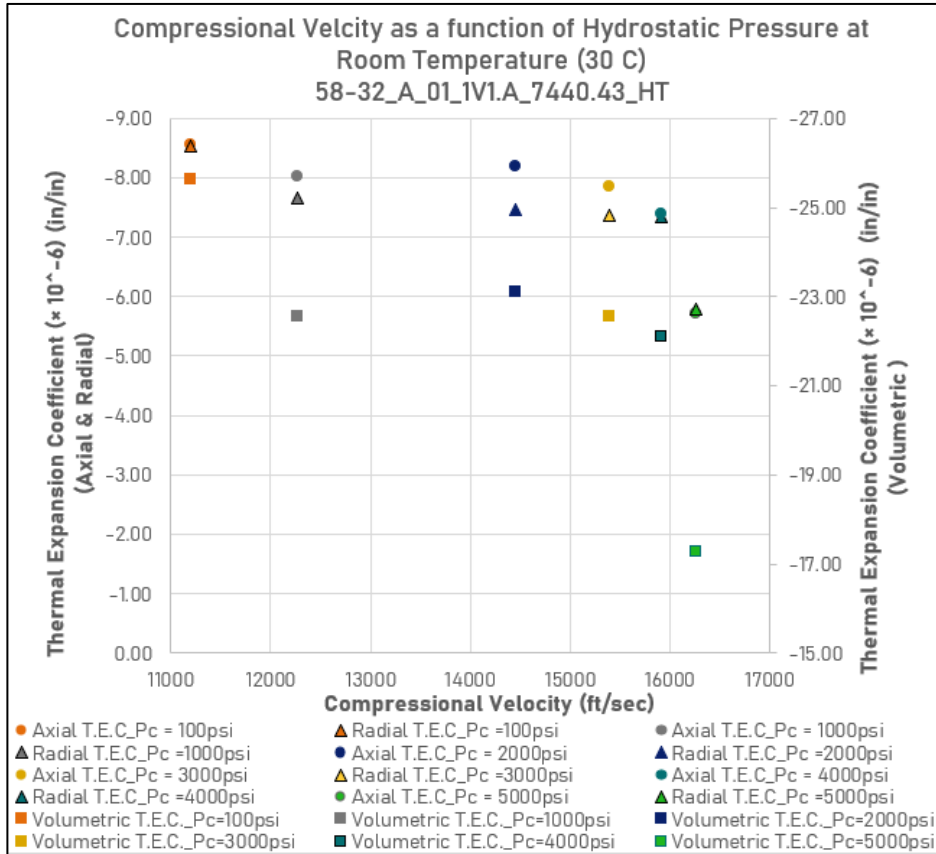
Confining Pressure (Psi)	Thermal Expansion Coefficient ( $\times 10^{-6}$ )			Compressional Velocity	Change in Compressional Velocity
	Axial	Radial	Volumetric	(ft/sec)	(ft/sec)
5000	-5.72	-5.78	-17.29	16257	5057
4000	-7.39	-7.35	-22.09	15917	4717
3000	-7.85	-7.36	-22.56	15390	4190
2000	-8.20	-7.45	-23.10	14456	3256
1000	-8.01	-7.67	-22.57	12272	1072
100	-8.55	-8.54	-25.64	11200	0



# Thermal Expansion Test

## 58-32\_A\_01\_1V1.A\_HT

### Summary



# Set02: 16A(78)\_32\_A\_02

16A(78)-32\_A\_02\_1V1  
5868.9 ft.

16A(78)-32\_A\_02\_1V2  
5868.9 ft.

Undulating fracture



# Set02: 16A(78)\_32\_A\_02

16A(78)-32\_A\_02\_2V1  
5869.15 ft.



16A(78)-32\_A\_02\_2V2.A  
5869.15 ft.



16A(78)-32\_A\_02\_2V2.B  
5869.15 ft.



# Set: 58-32\_B\_03

58-32\_B\_03\_1V1  
6803.975 ft.



58-32\_B\_03\_2V1  
6804.125 ft.





# THANK YOU

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