

Stress Analysis Report



Analyzed File:	wheel.ipt
Autodesk Inventor Version:	2024 (Build 280153000, 153)
Creation Date:	2024-04-13, 3:12 PM
Study Author:	Alex
Summary:	

Static Analysis:1

General objective and settings:

Design Objective	Single Point
Study Type	Static Analysis
Last Modification Date	2024-04-13, 3:05 PM
Model State	[Primary]
Detect and Eliminate Rigid Body Modes	No

iProperties

Summary

Author	Alex
--------	------

Project

Part Number	wheel
Designer	Alex
Estimated Cost	\$0.00
Creation Date	2024-04-09

Status

Design State	WorkInProgress
--------------	----------------

Physical

Material	Aluminum 6061
Density	2.7 g/cm^3
Mass	0.199023 kg

Area	24741.1 mm ²
Volume	73712.4 mm ³
Center of Gravity	x=16.431 mm y=0 mm z=0.000000102765 mm

Note: Physical values could be different from Physical values used by FEA reported below.

Mesh settings:

Avg. Element Size (fraction of model diameter)	0.1
Min. Element Size (fraction of avg. size)	0.2
Grading Factor	1.5
Max. Turn Angle	60 deg
Create Curved Mesh Elements	Yes

Material(s)

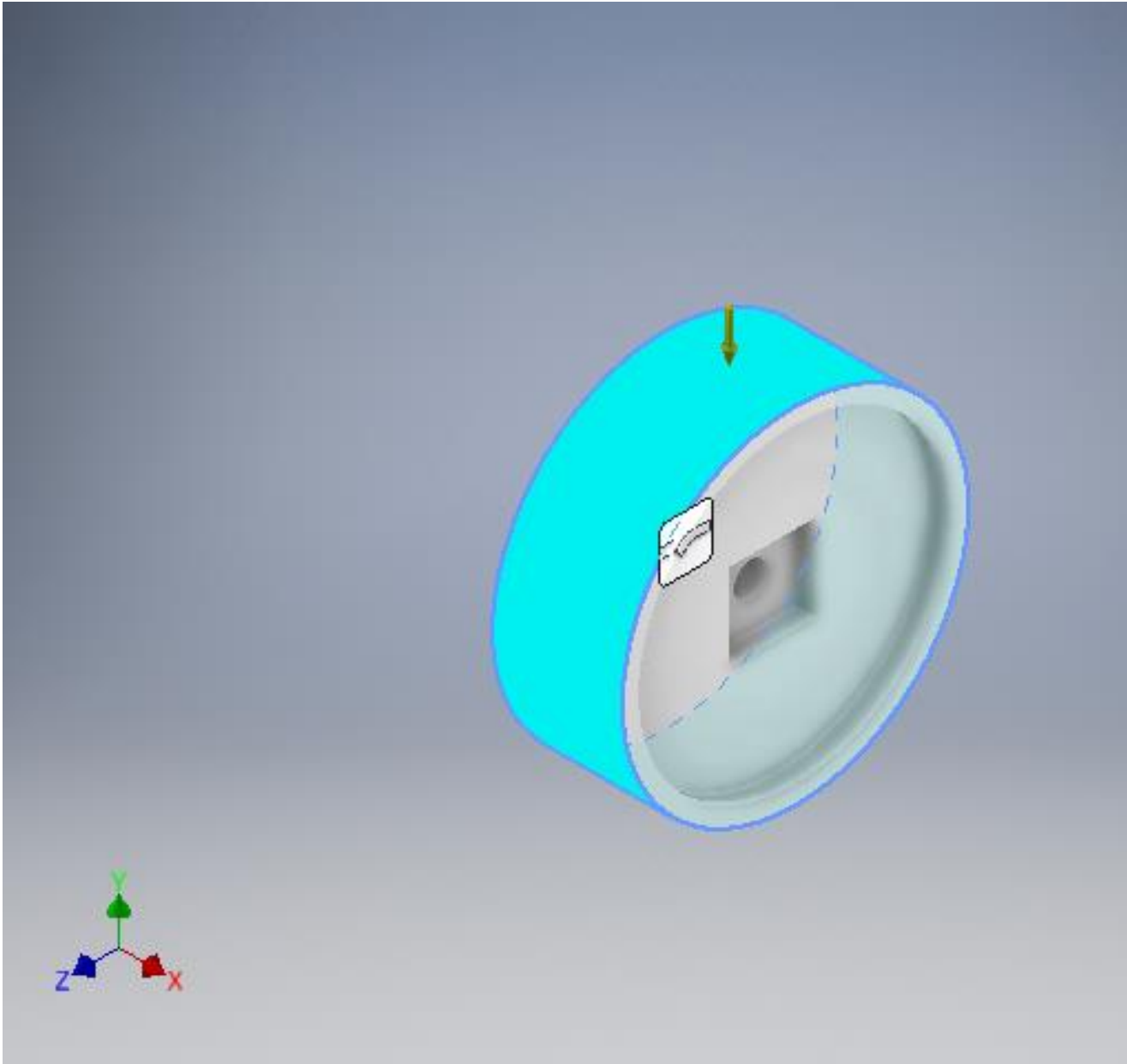
Name	Aluminum 6061	
General	Mass Density	2.7 g/cm ³
	Yield Strength	275 MPa
	Ultimate Tensile Strength	310 MPa
Stress	Young's Modulus	68.9 GPa
	Poisson's Ratio	0.33 ul
	Shear Modulus	25.9023 GPa
Part Name(s)	wheel.ipt	

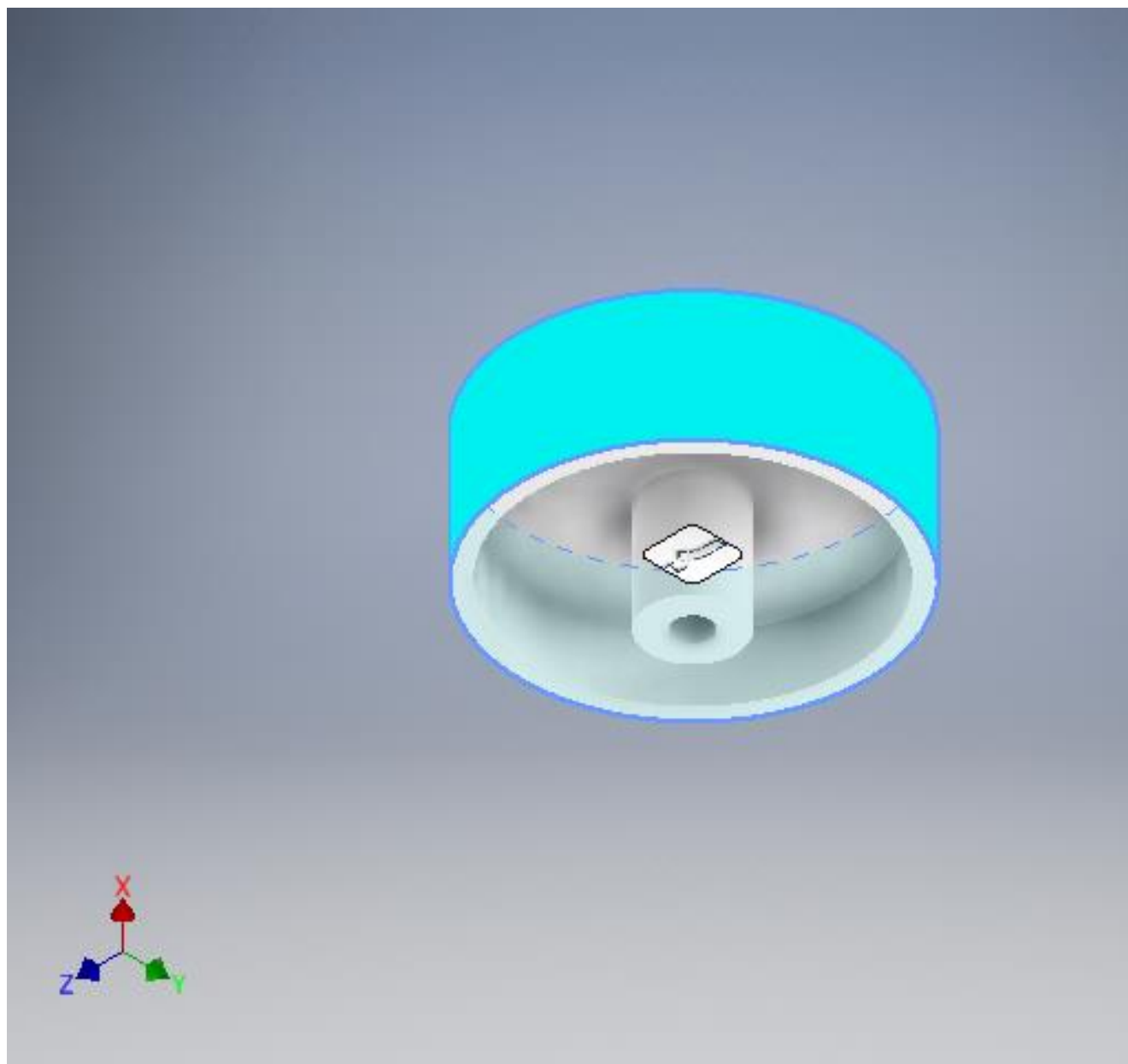
Operating conditions

Force:1

Load Type	Force
Magnitude	22.925 N
Vector X	0.000 N
Vector Y	-22.925 N
Vector Z	0.000 N

Selected Face(s)

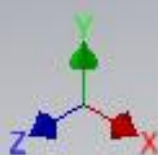
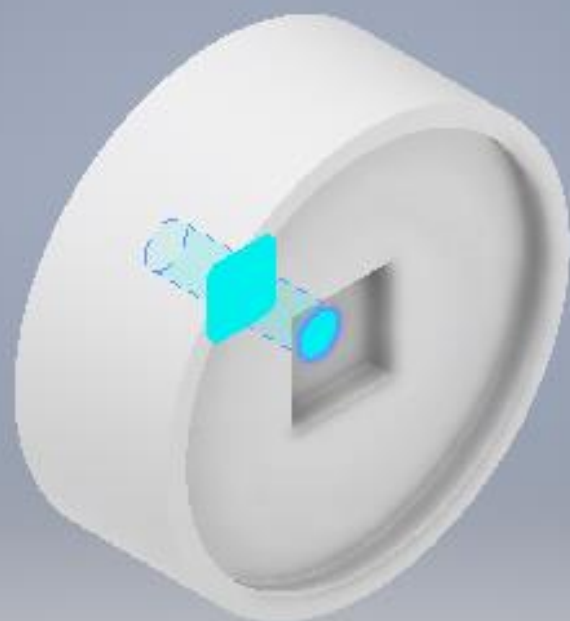


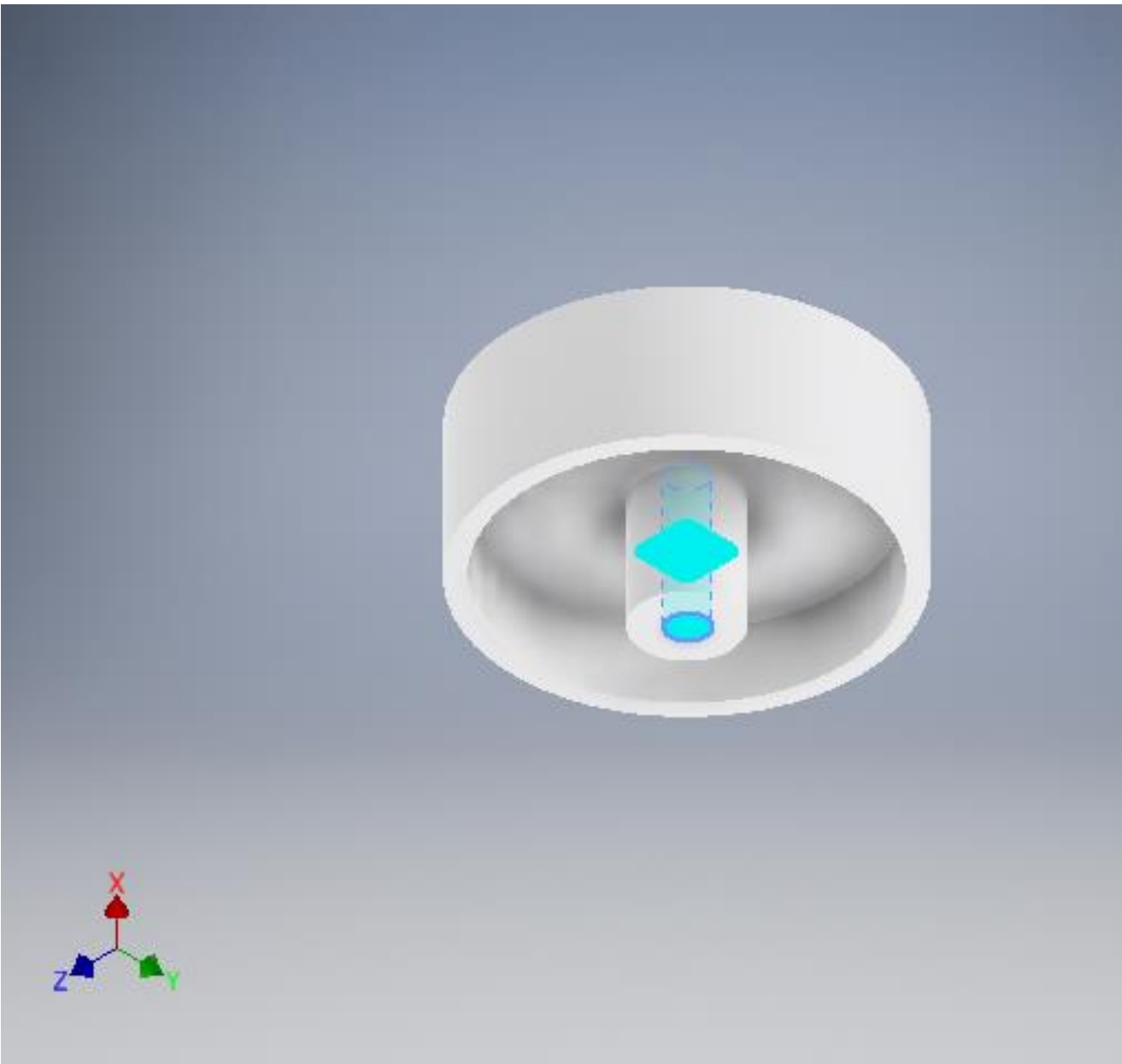


Fixed Constraint:1

Constraint Type	Fixed Constraint
-----------------	------------------

Selected Face(s)





Results

Reaction Force and Moment on Constraints

Constraint Name	Reaction Force		Reaction Moment	
	Magnitude	Component (X,Y,Z)	Magnitude	Component (X,Y,Z)
Fixed Constraint:1	22.925 N	0 N	0.229243 N m	0 N m
		22.925 N		0 N m
		0 N		0.229243 N m

Result Summary

Name	Minimum	Maximum
Volume	73712.4 mm ³	
Mass	0.199023 kg	
Von Mises Stress	0.000144406 MPa	0.172686 MPa
1st Principal Stress	-0.0583105 MPa	0.180597 MPa
3rd Principal Stress	-0.181237 MPa	0.0493392 MPa
Displacement	0 mm	0.000110302 mm
Safety Factor	15 ul	15 ul
Stress XX	-0.0726671 MPa	0.060856 MPa
Stress XY	-0.0519627 MPa	0.0294753 MPa
Stress XZ	-0.0199095 MPa	0.0197321 MPa
Stress YY	-0.174552 MPa	0.17133 MPa
Stress YZ	-0.0997001 MPa	0.0933175 MPa
Stress ZZ	-0.0687406 MPa	0.0504724 MPa
X Displacement	-0.0000657585 mm	0.0000657064 mm
Y Displacement	-0.0000892221 mm	0.000000628859 mm
Z Displacement	-0.000010112 mm	0.00000982842 mm
Equivalent Strain	0.00000000186925 ul	0.00000222228 ul
1st Principal Strain	0.00000000152138 ul	0.00000230452 ul
3rd Principal Strain	-0.00000231549 ul	-0.00000000147502 ul
Strain XX	-0.000000748585 ul	0.000000600951 ul
Strain XY	-0.00000100305 ul	0.000000568972 ul
Strain XZ	-0.00000038432 ul	0.000000380894 ul
Strain YY	-0.00000218645 ul	0.00000216944 ul
Strain YZ	-0.00000192455 ul	0.00000180134 ul
Strain ZZ	-0.00000104265 ul	0.000000984066 ul

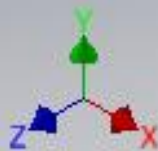
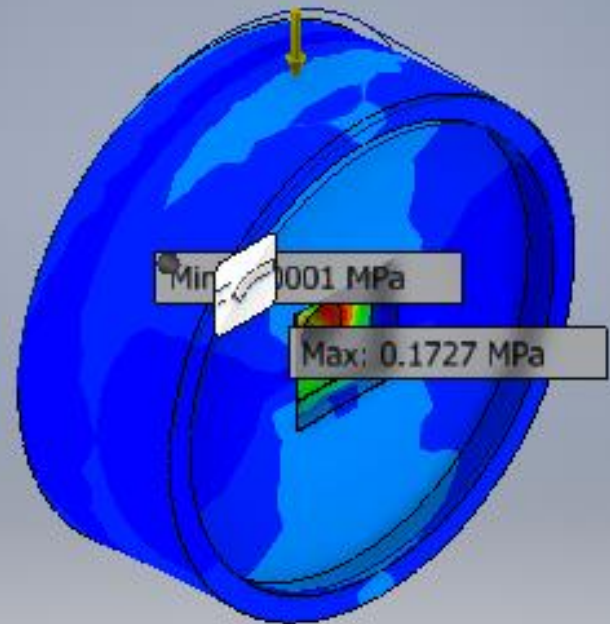
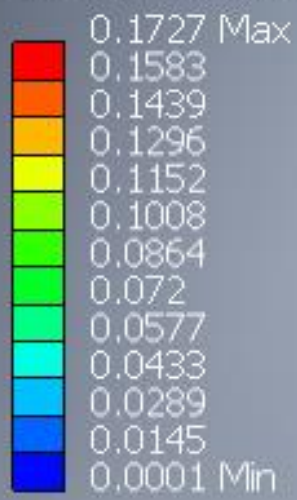
Figures

Von Mises Stress

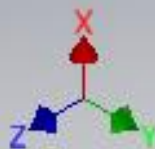
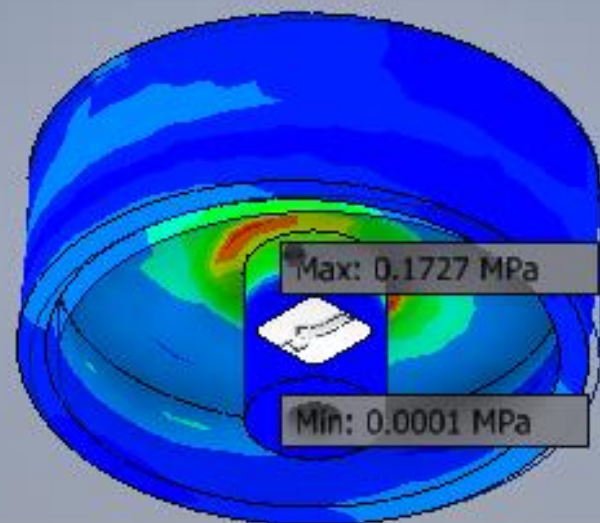
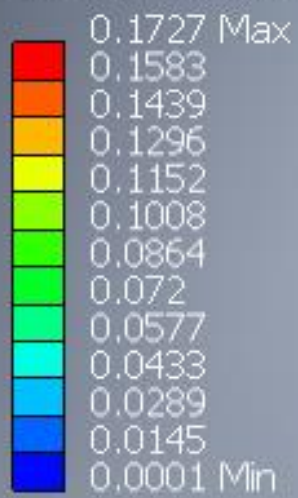
Type: Von Mises Stress

Unit: MPa

2024-04-13, 3:12:13 PM



Type: Von Mises Stress
Unit: MPa
2024-04-13, 3:12:13 PM

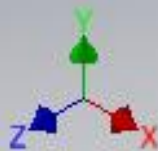
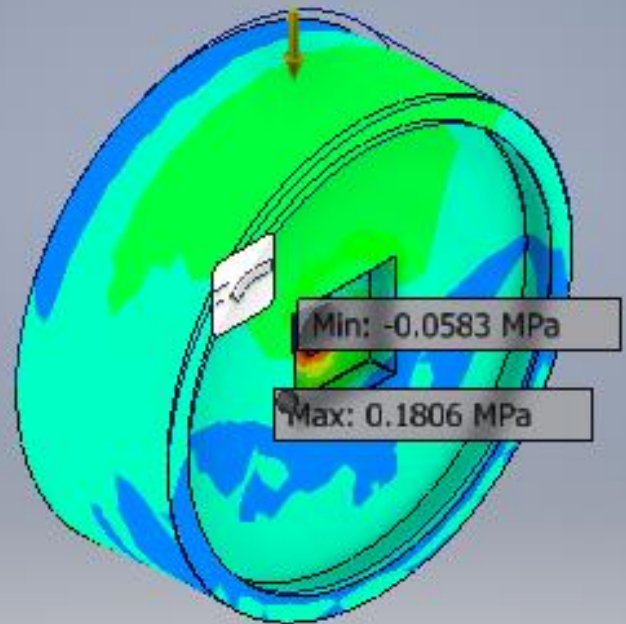
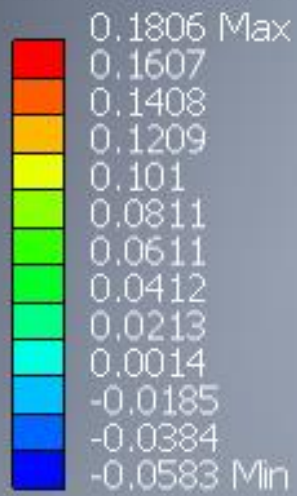


1st Principal Stress

Type: 1st Principal Stress

Unit: MPa

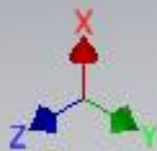
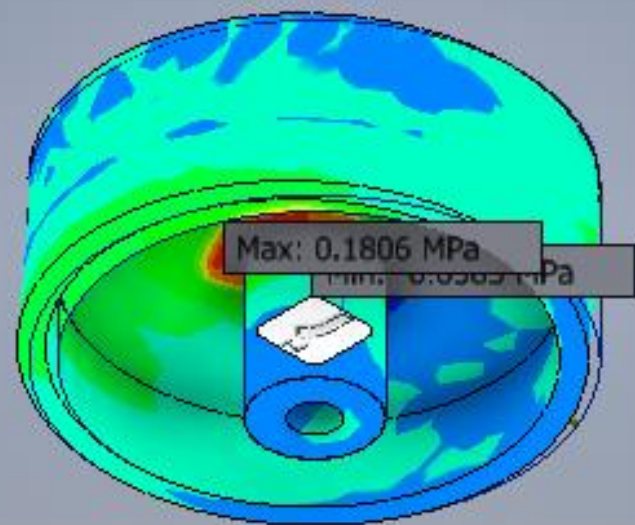
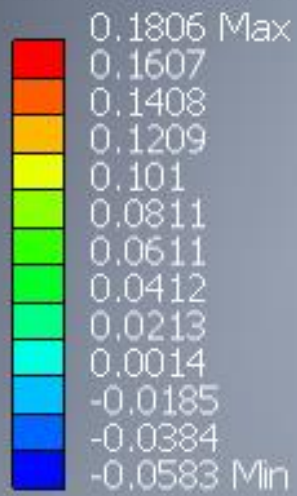
2024-04-13, 3:12:13 PM



Type: 1st Principal Stress

Unit: MPa

2024-04-13, 3:12:13 PM

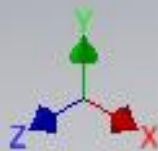
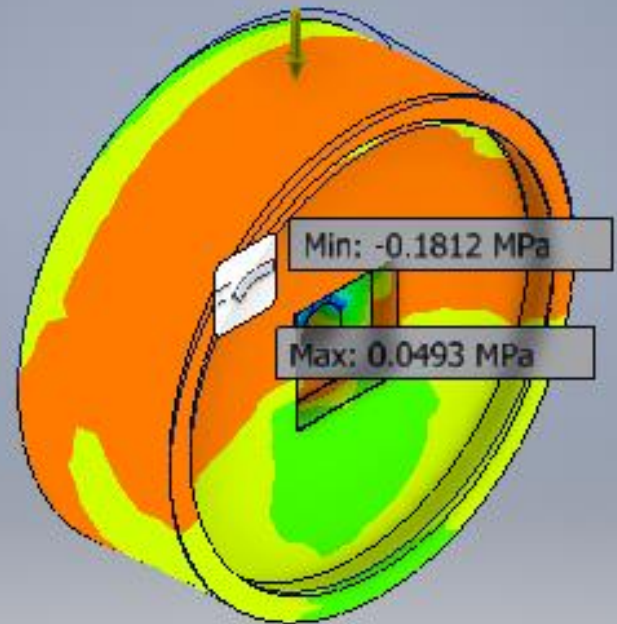
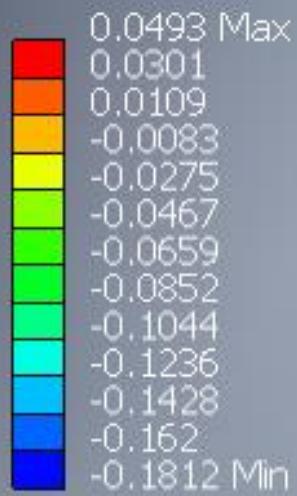


3rd Principal Stress

Type: 3rd Principal Stress

Unit: MPa

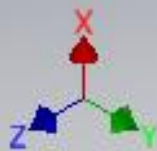
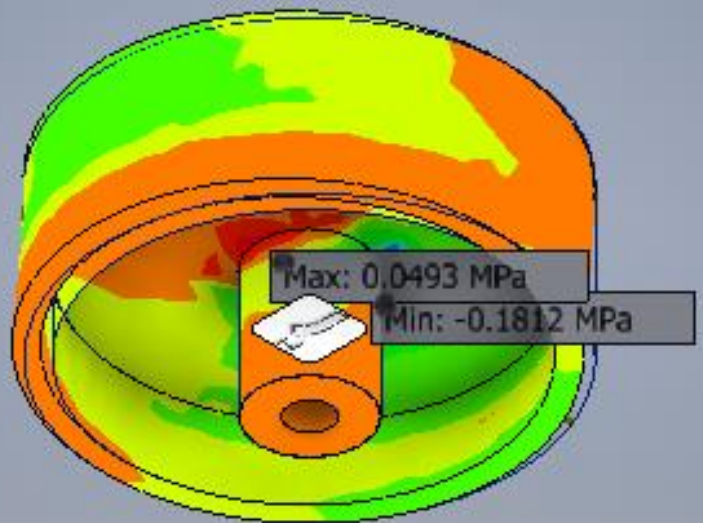
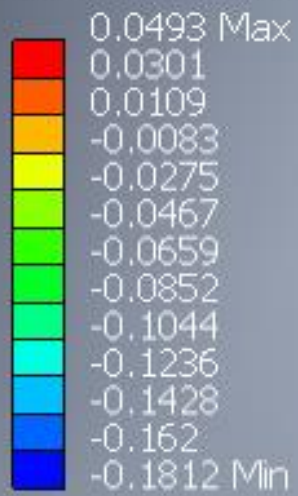
2024-04-13, 3:12:14 PM



Type: 3rd Principal Stress

Unit: MPa

2024-04-13, 3:12:14 PM

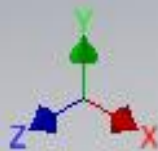
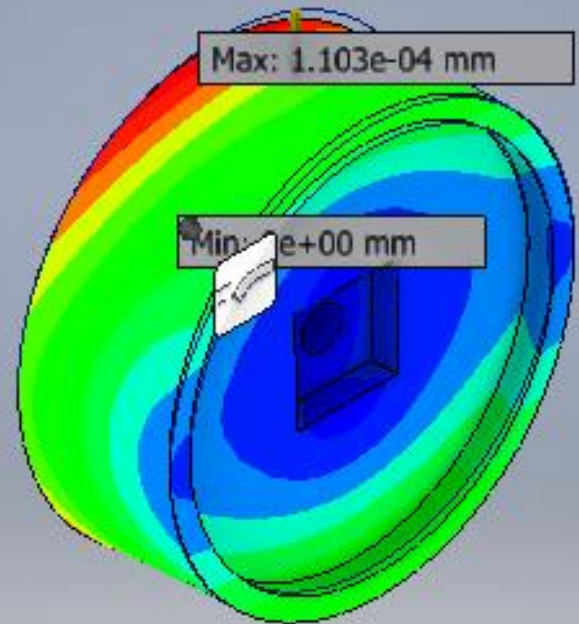


Displacement

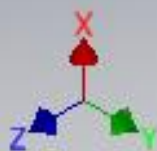
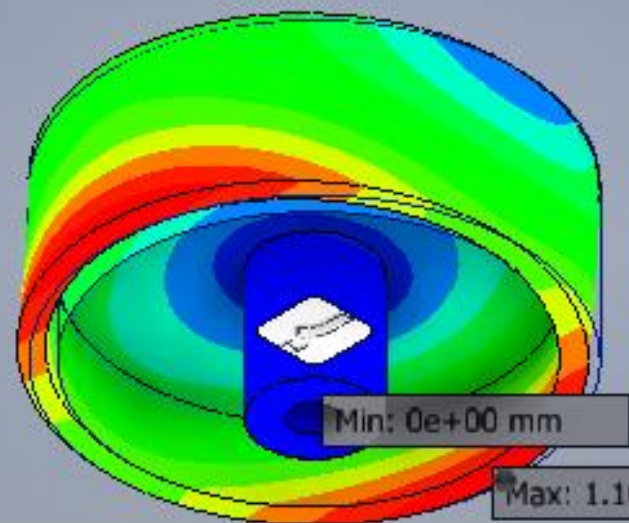
Type: Displacement

Unit: mm

2024-04-13, 3:12:16 PM



Type: Displacement
Unit: mm
2024-04-13, 3:12:16 PM

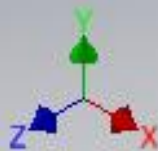
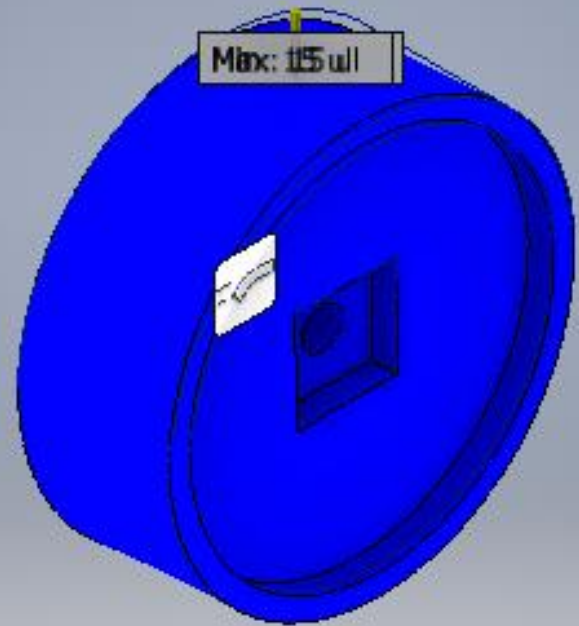
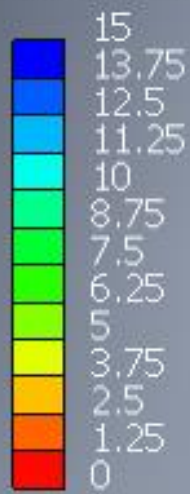


Safety Factor

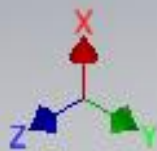
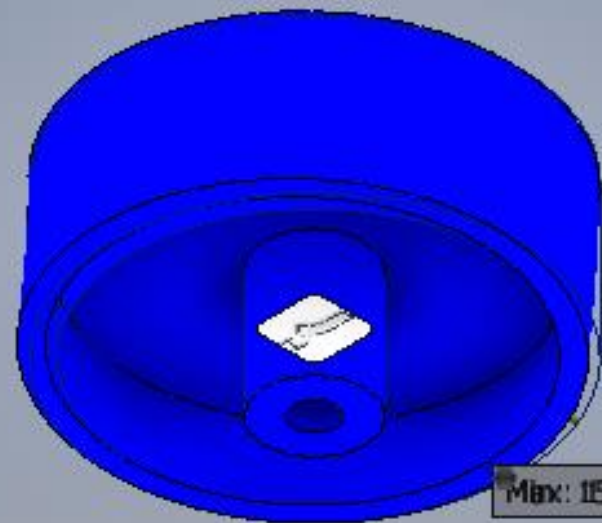
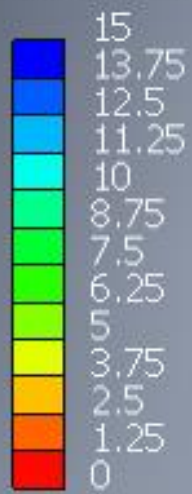
Type: Safety Factor

Unit: ul

2024-04-13, 3:12:16 PM



Type: Safety Factor
Unit: ul
2024-04-13, 3:12:16 PM

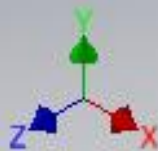
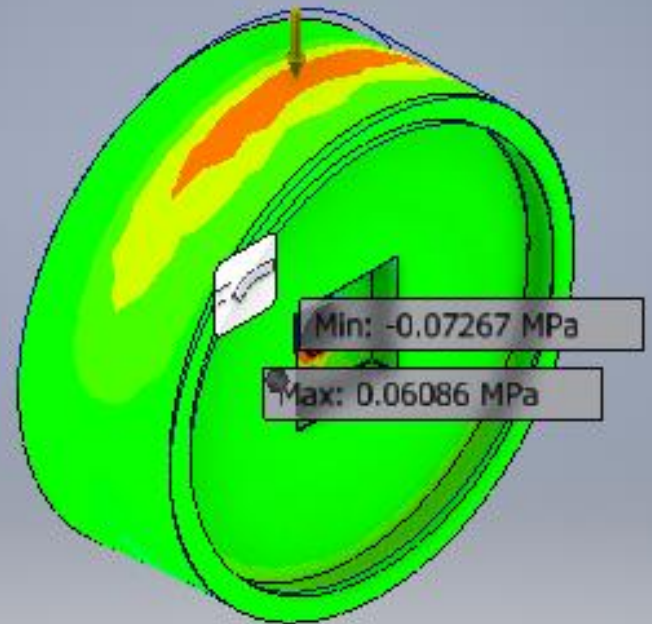
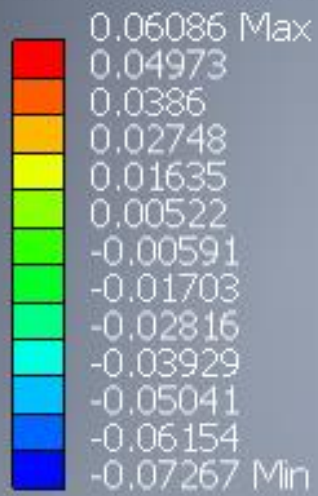


Stress XX

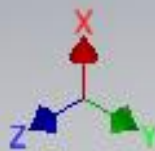
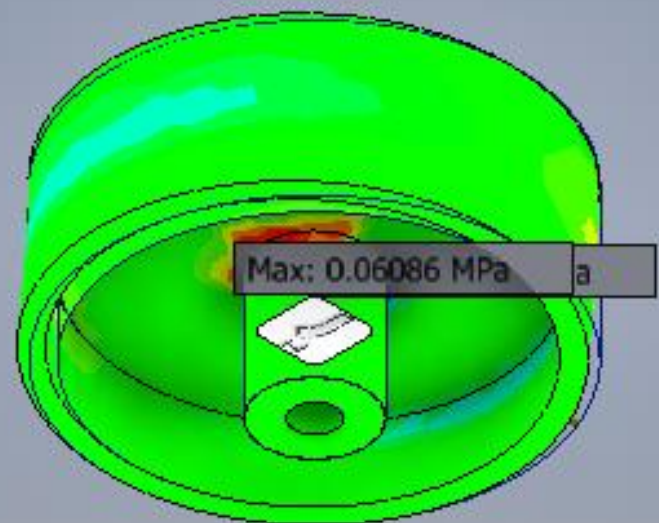
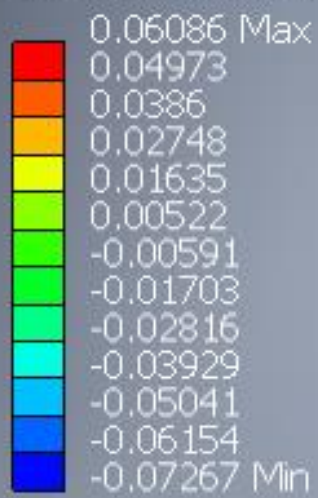
Type: Stress XX

Unit: MPa

2024-04-13, 3:12:14 PM



Type: Stress XX
Unit: MPa
2024-04-13, 3:12:14 PM

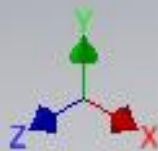
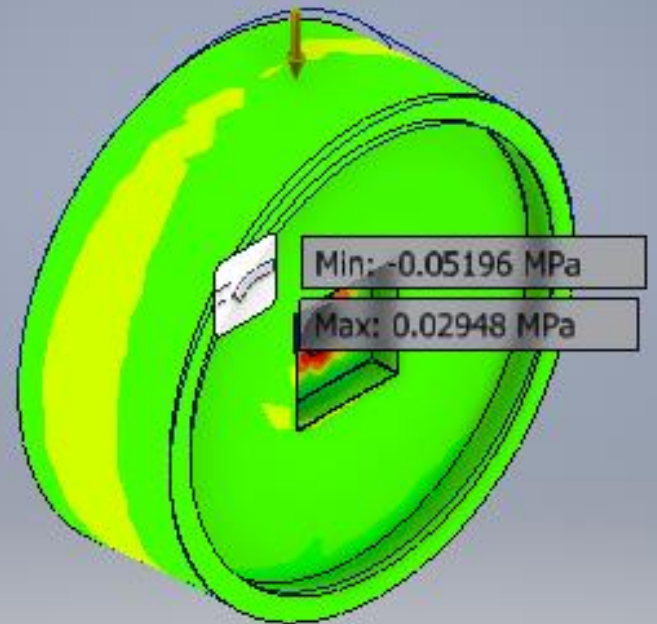
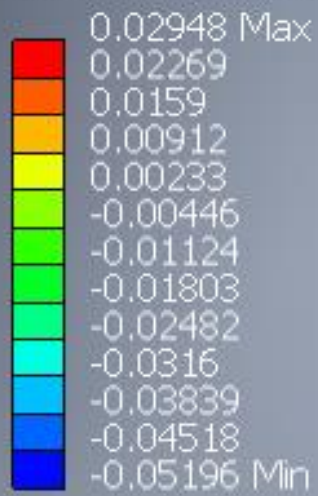


Stress XY

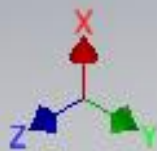
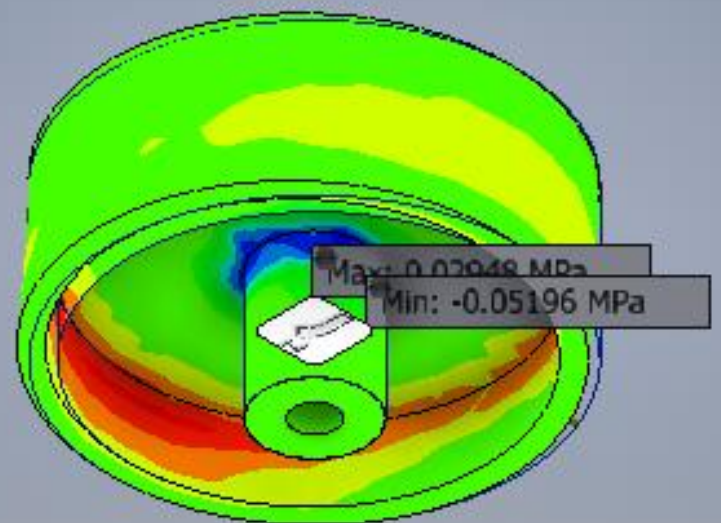
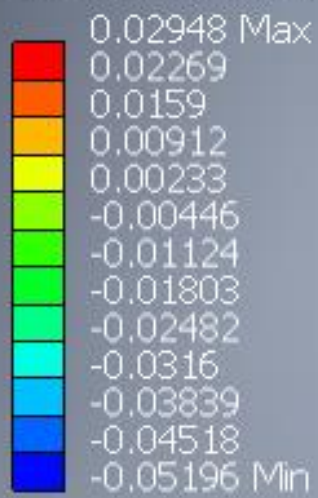
Type: Stress XY

Unit: MPa

2024-04-13, 3:12:14 PM

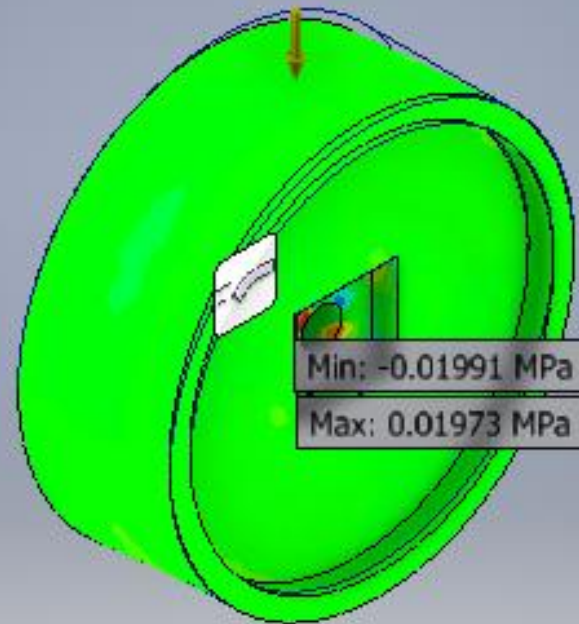
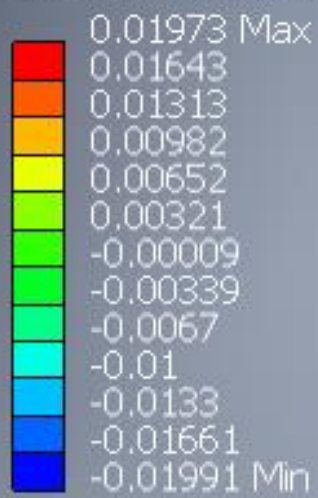


Type: Stress XY
Unit: MPa
2024-04-13, 3:12:14 PM

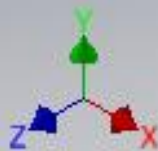


Stress XZ

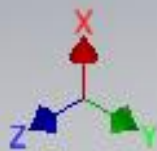
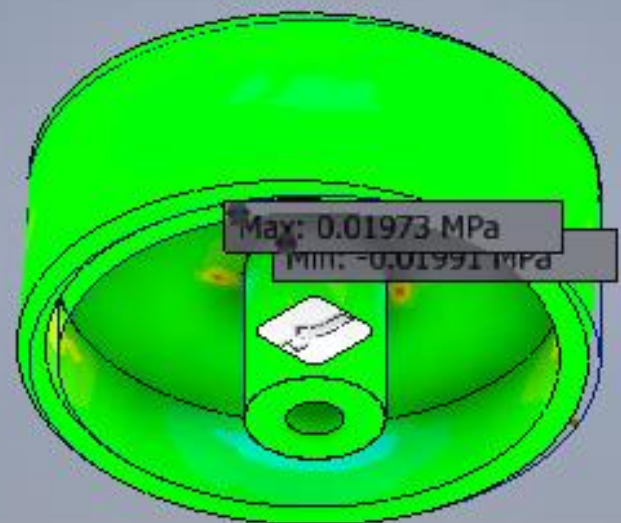
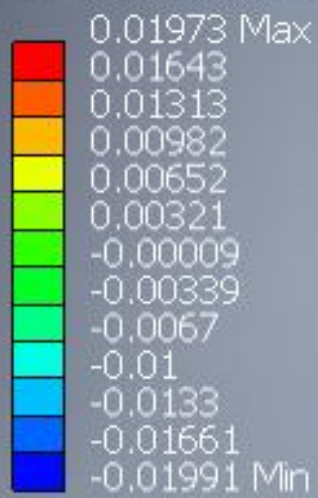
Type: Stress XZ
Unit: MPa
2024-04-13, 3:12:14 PM



Min: -0.01991 MPa
Max: 0.01973 MPa



Type: Stress XZ
Unit: MPa
2024-04-13, 3:12:14 PM

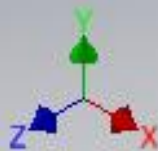
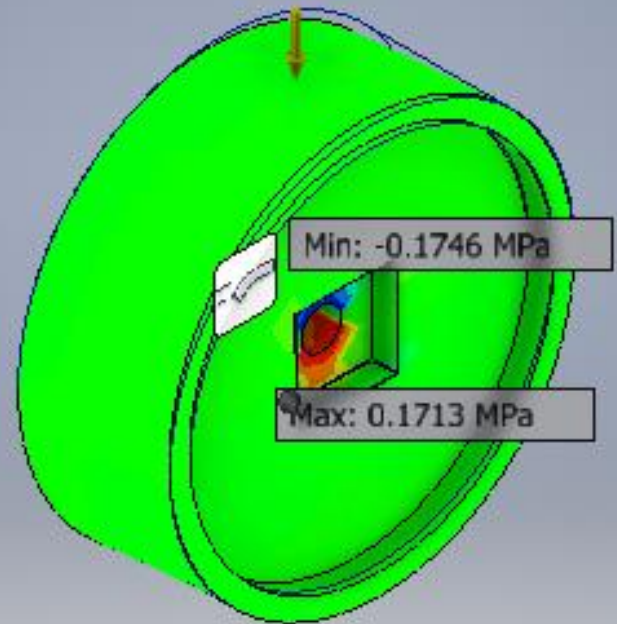
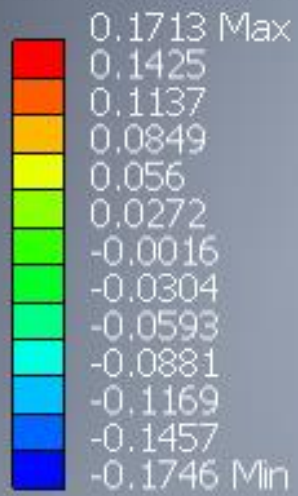


Stress YY

Type: Stress YY

Unit: MPa

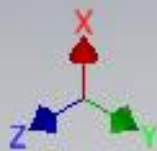
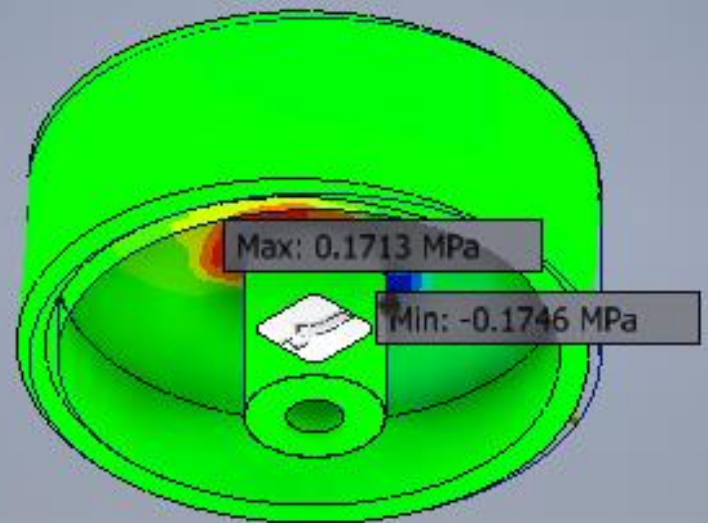
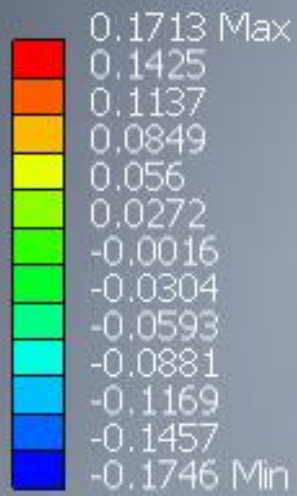
2024-04-13, 3:12:15 PM



Type: Stress YY

Unit: MPa

2024-04-13, 3:12:15 PM

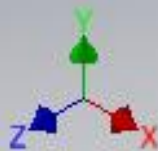
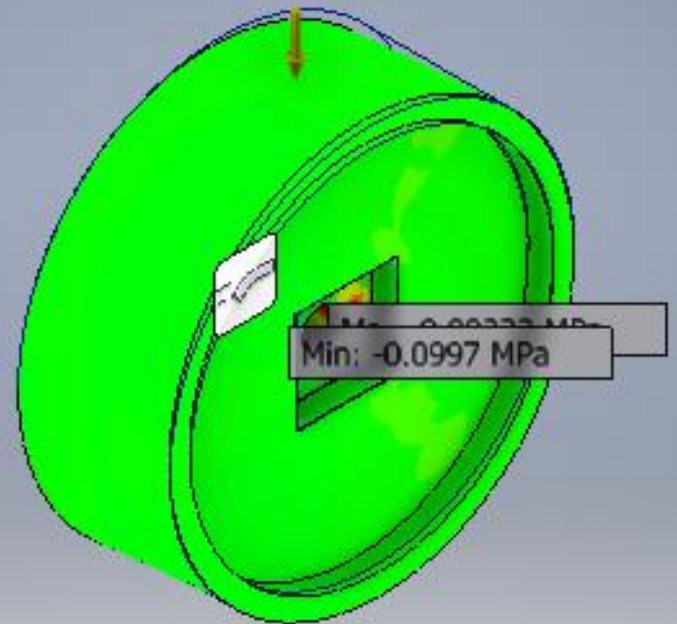
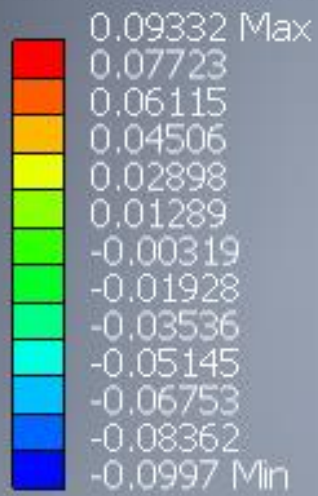


Stress YZ

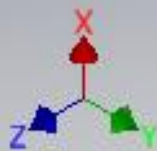
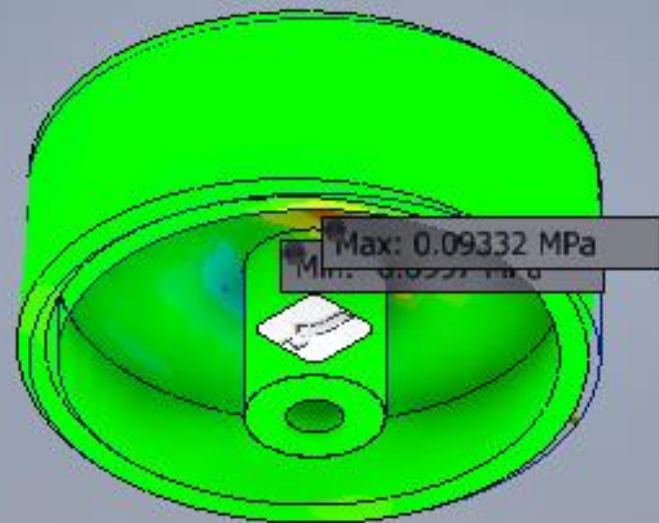
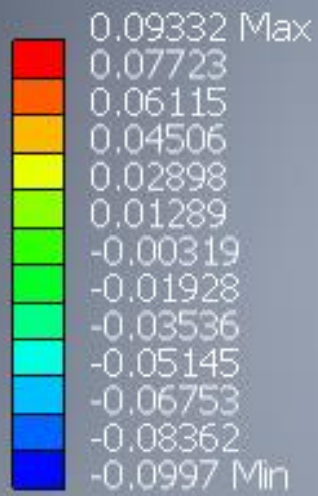
Type: Stress YZ

Unit: MPa

2024-04-13, 3:12:15 PM



Type: Stress YZ
Unit: MPa
2024-04-13, 3:12:15 PM

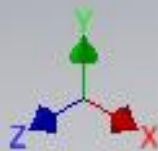
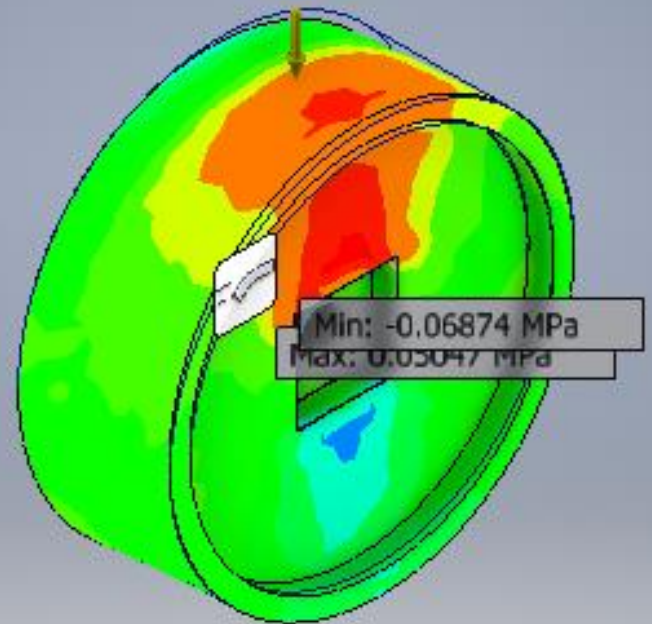
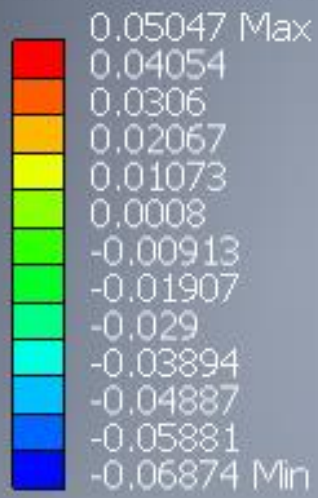


Stress ZZ

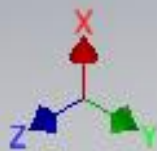
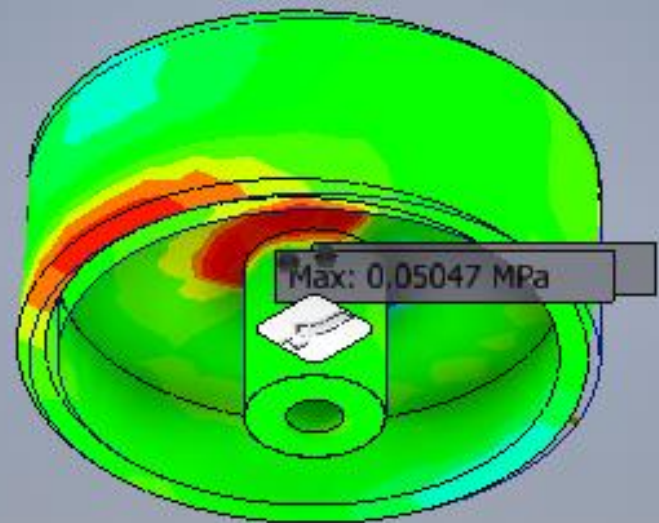
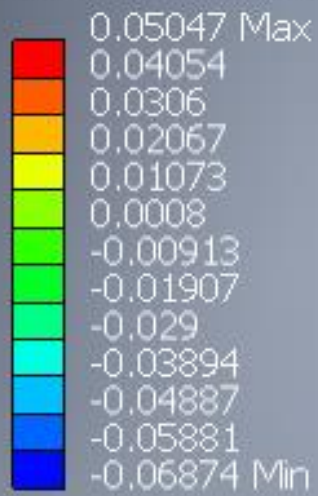
Type: Stress ZZ

Unit: MPa

2024-04-13, 3:12:15 PM

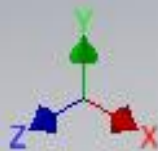
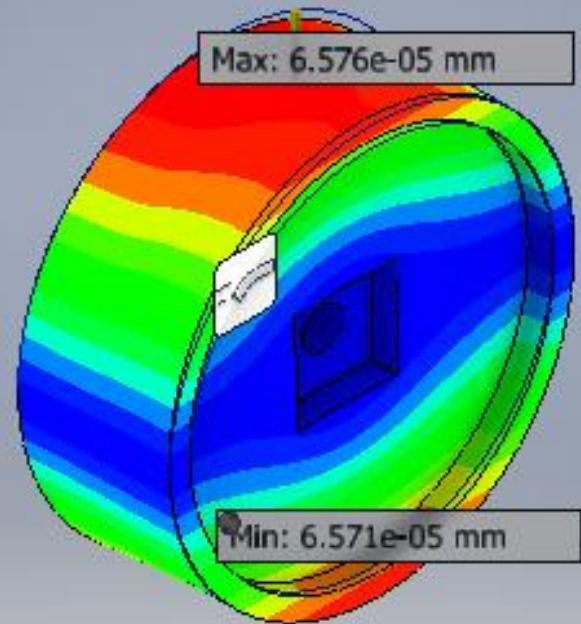


Type: Stress ZZ
Unit: MPa
2024-04-13, 3:12:15 PM

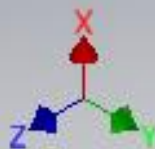
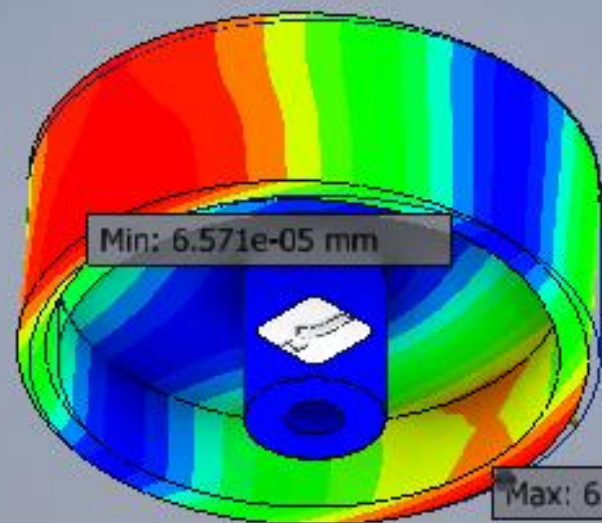


X Displacement

Type: X Displacement
Unit: mm
2024-04-13, 3:12:16 PM



Type: X Displacement
Unit: mm
2024-04-13, 3:12:16 PM

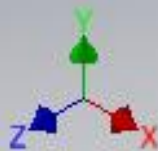
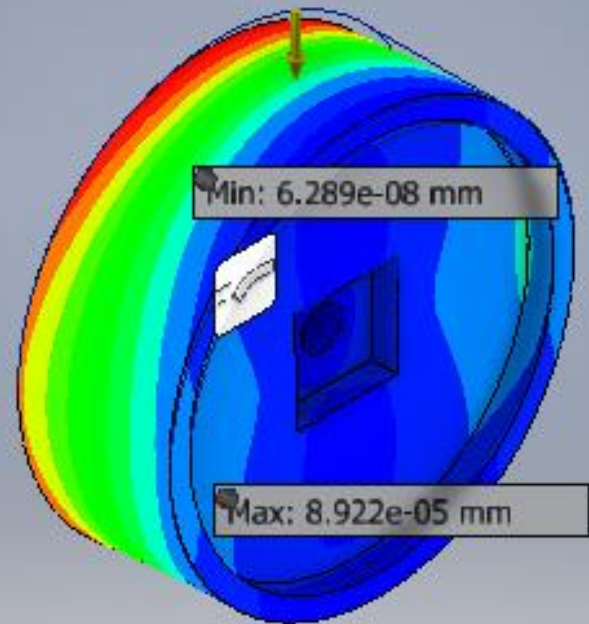
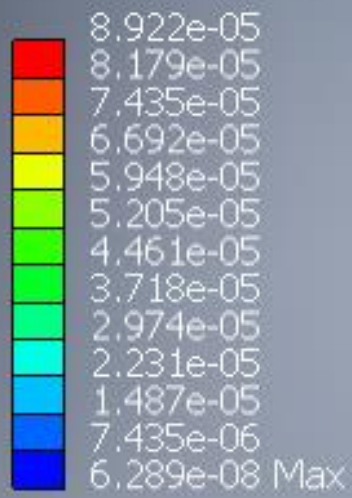


Y Displacement

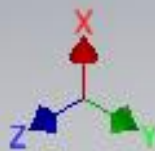
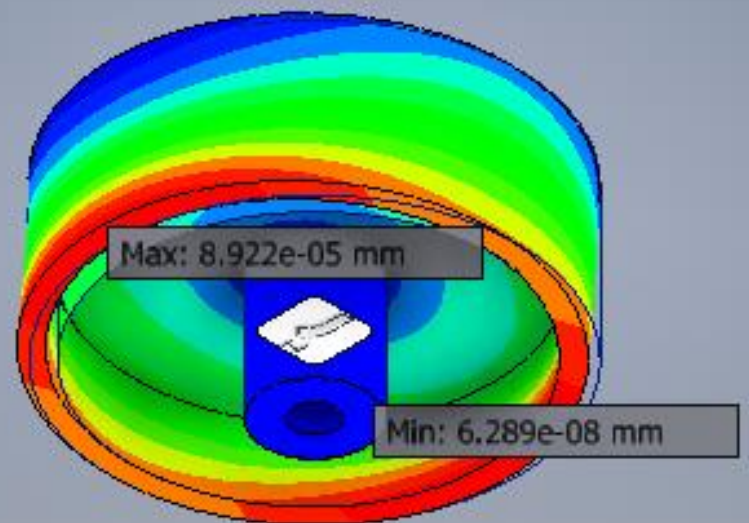
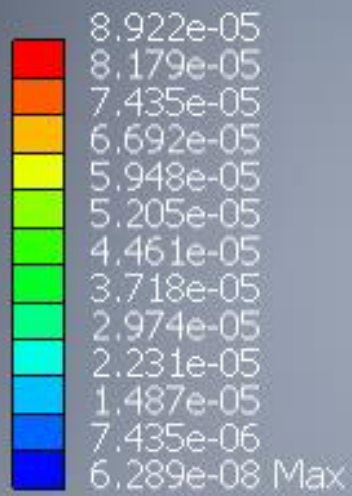
Type: Y Displacement

Unit: mm

2024-04-13, 3:12:16 PM

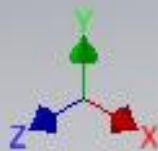
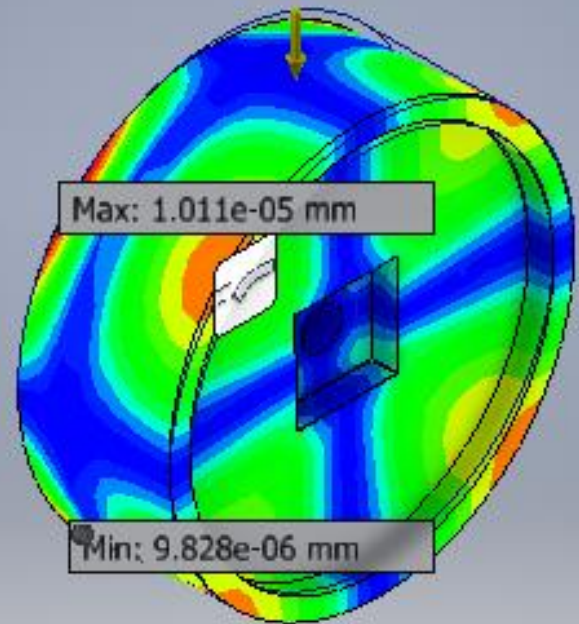


Type: Y Displacement
Unit: mm
2024-04-13, 3:12:16 PM

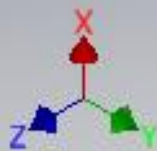
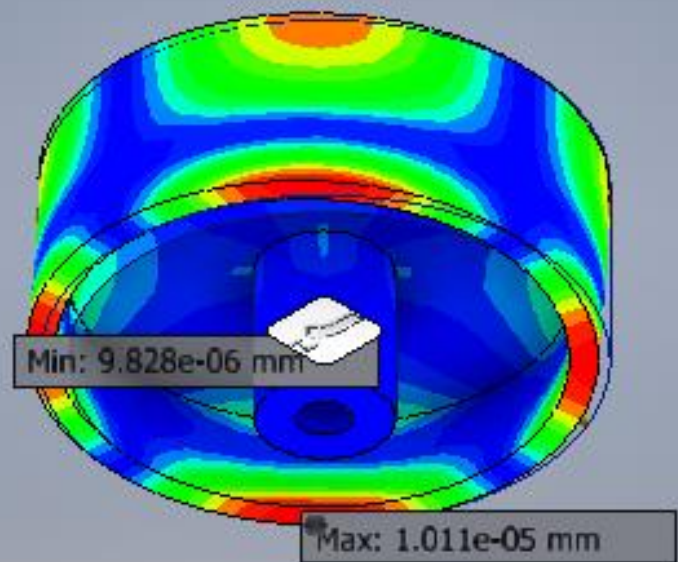


Z Displacement

Type: Z Displacement
Unit: mm
2024-04-13, 3:12:17 PM

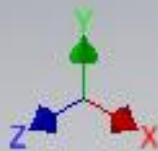
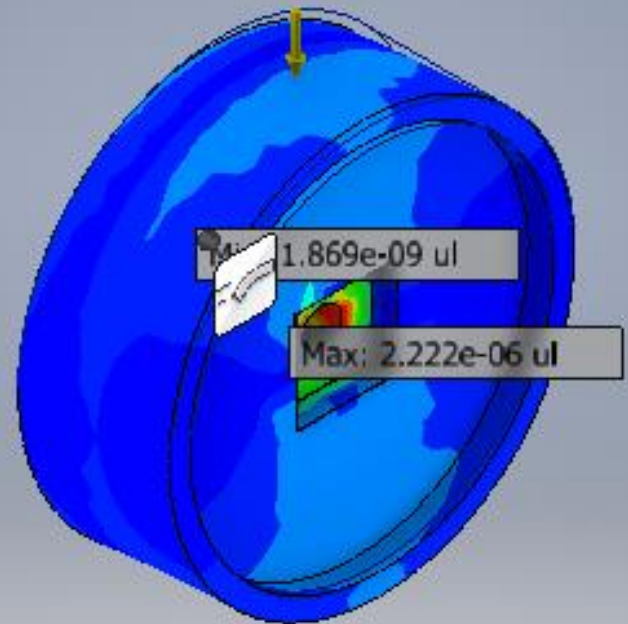
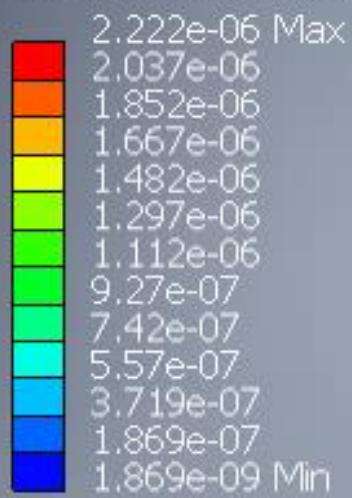


Type: Z Displacement
Unit: mm
2024-04-13, 3:12:17 PM

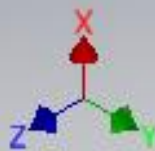
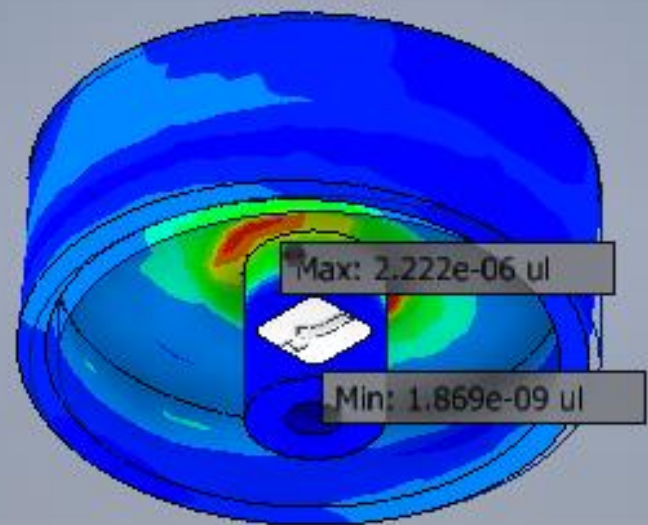


Equivalent Strain

Type: Equivalent Strain
Unit: ul
2024-04-13, 3:12:17 PM



Type: Equivalent Strain
Unit: ul
2024-04-13, 3:12:17 PM

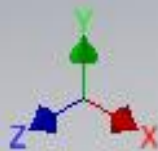
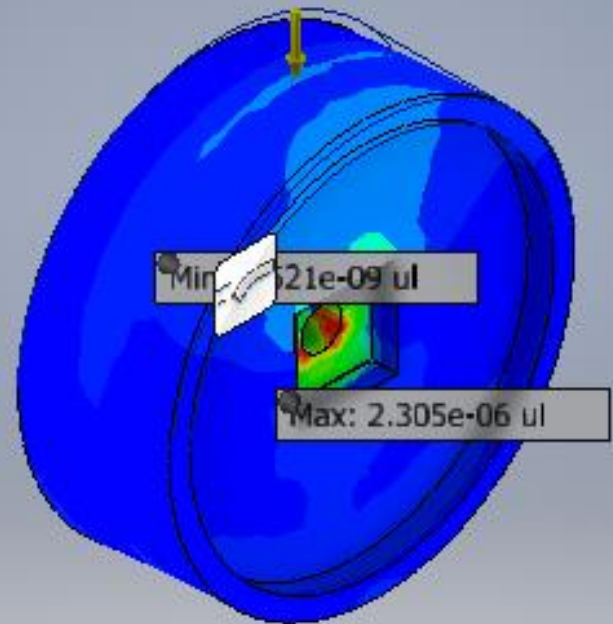


1st Principal Strain

Type: 1st Principal Strain

Unit: ul

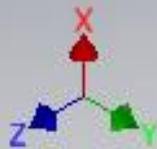
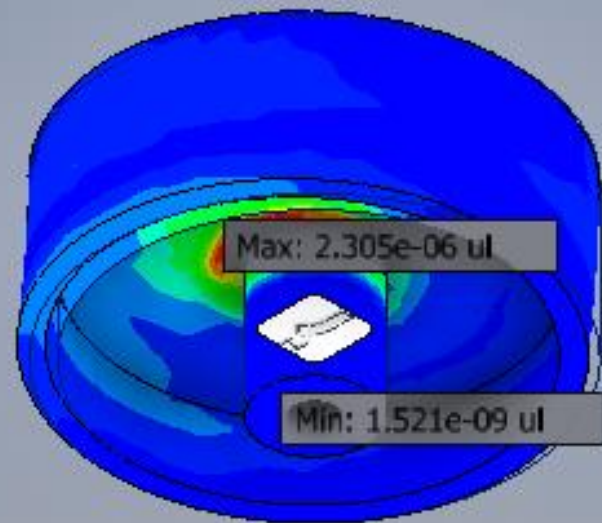
2024-04-13, 3:12:17 PM



Type: 1st Principal Strain

Unit: ul

2024-04-13, 3:12:17 PM

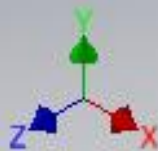
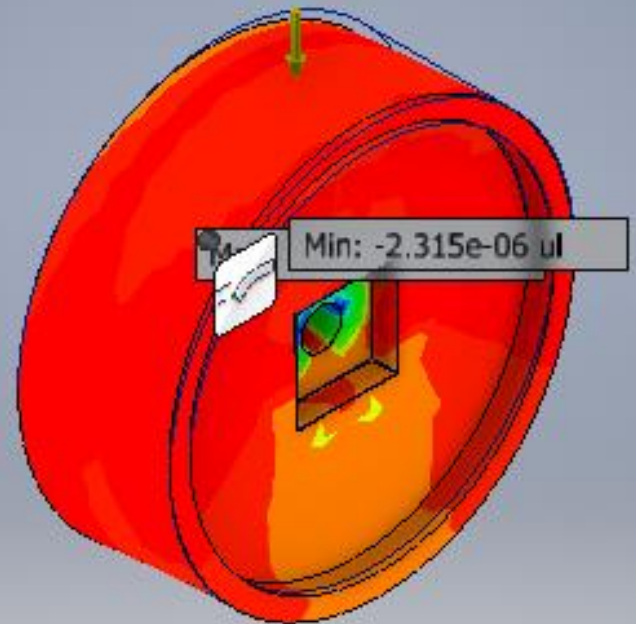


3rd Principal Strain

Type: 3rd Principal Strain

Unit: ul

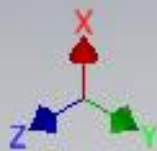
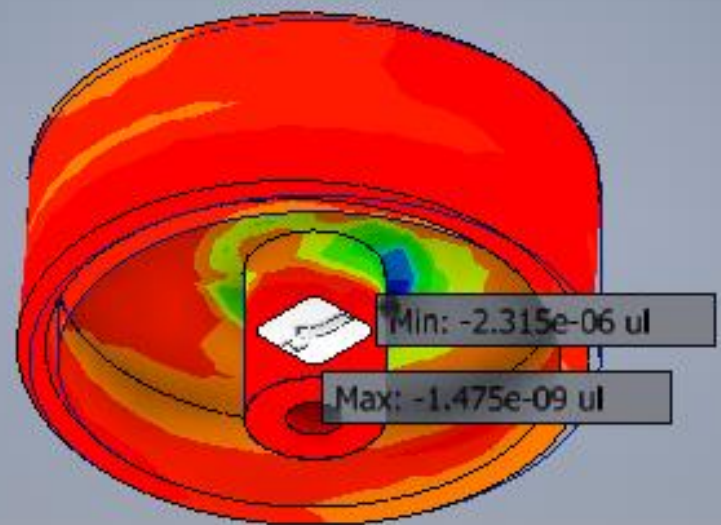
2024-04-13, 3:12:17 PM



Type: 3rd Principal Strain

Unit: ul

2024-04-13, 3:12:17 PM

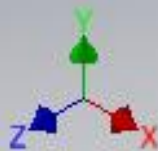
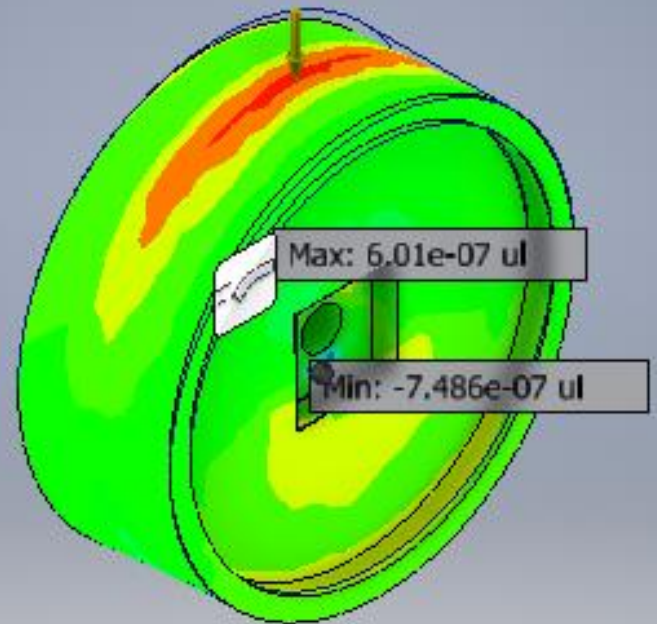
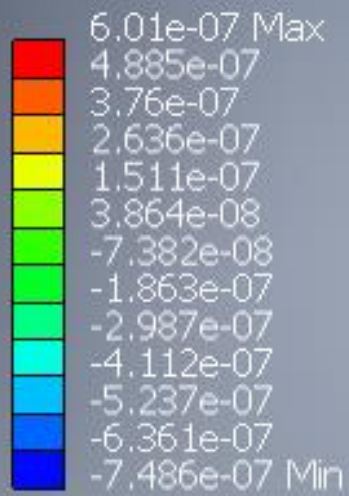


Strain XX

Type: Strain XX

Unit: ul

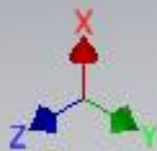
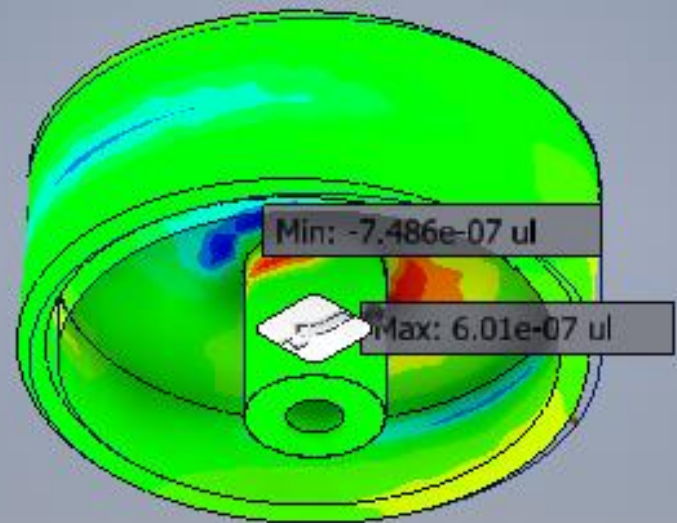
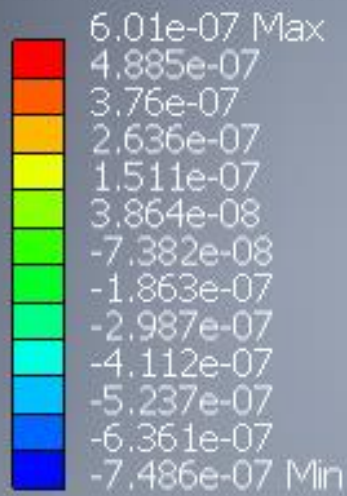
2024-04-13, 3:12:18 PM



Type: Strain XX

Unit: ul

2024-04-13, 3:12:18 PM

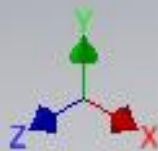
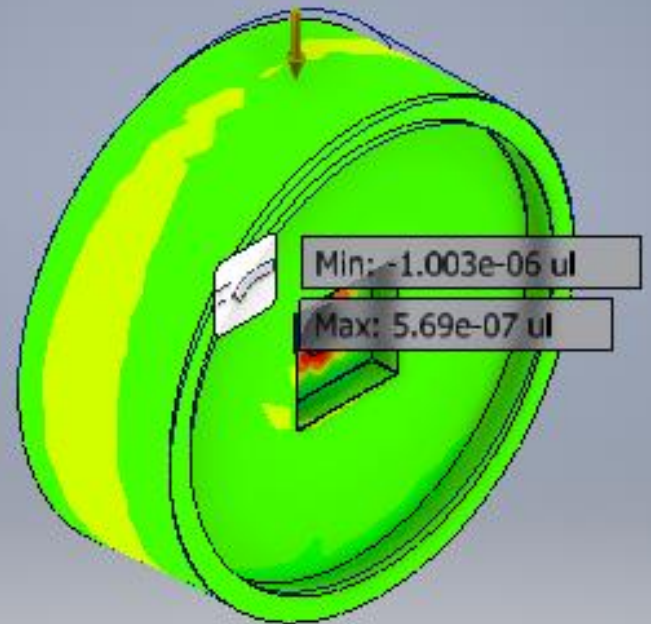
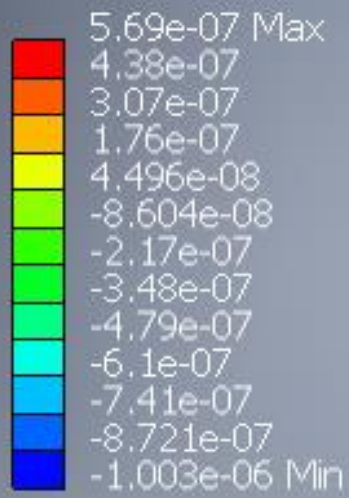


Strain XY

Type: Strain XY

Unit: ul

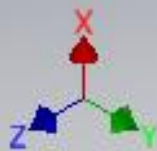
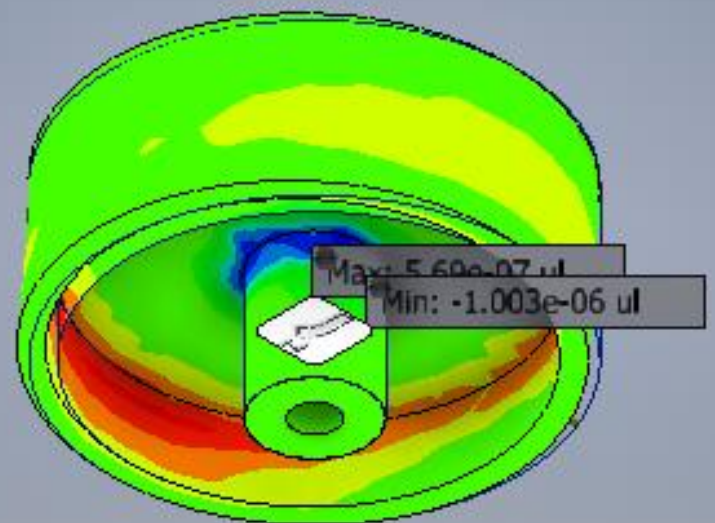
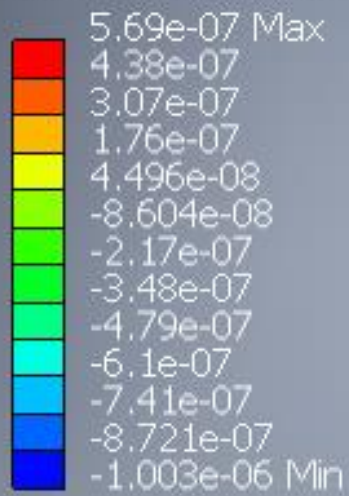
2024-04-13, 3:12:18 PM



Type: Strain XY

Unit: ul

2024-04-13, 3:12:18 PM

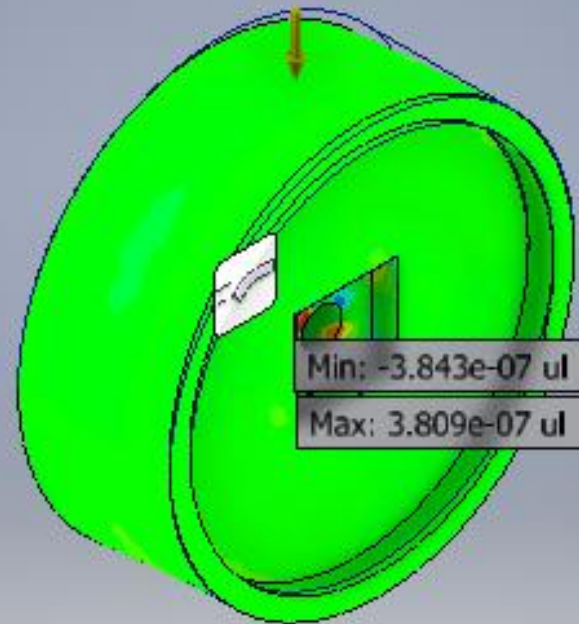


Strain XZ

Type: Strain XZ

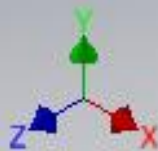
Unit: ul

2024-04-13, 3:12:18 PM



Min: -3.843e-07 ul

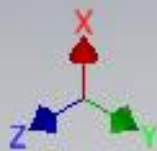
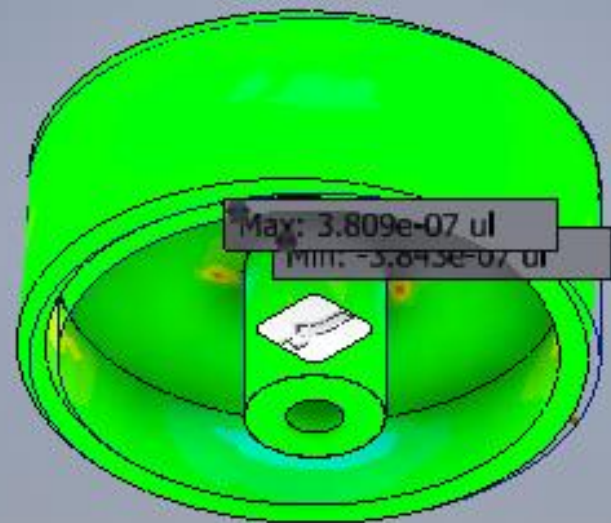
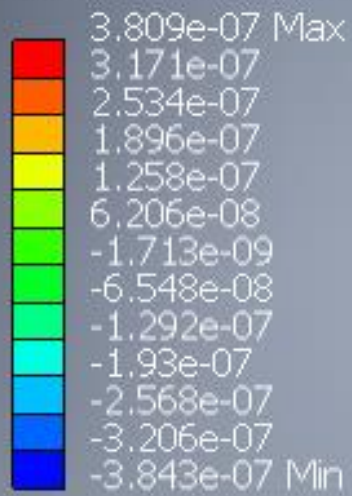
Max: 3.809e-07 ul



Type: Strain XZ

Unit: ul

2024-04-13, 3:12:18 PM

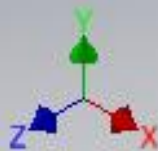
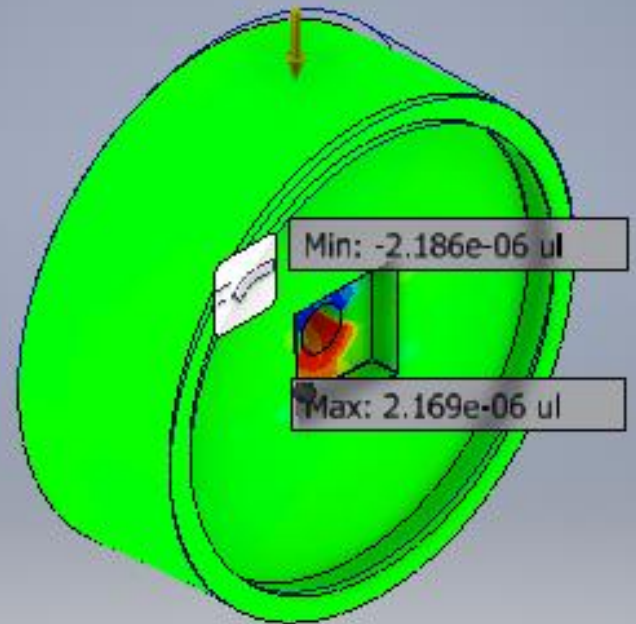


Strain YY

Type: Strain YY

Unit: ul

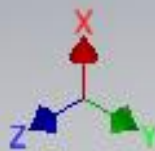
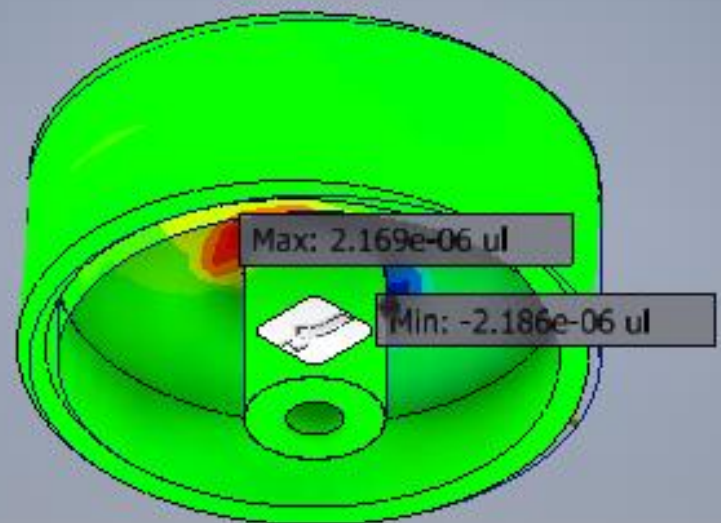
2024-04-13, 3:12:19 PM



Type: Strain YY

Unit: ul

2024-04-13, 3:12:19 PM

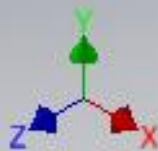
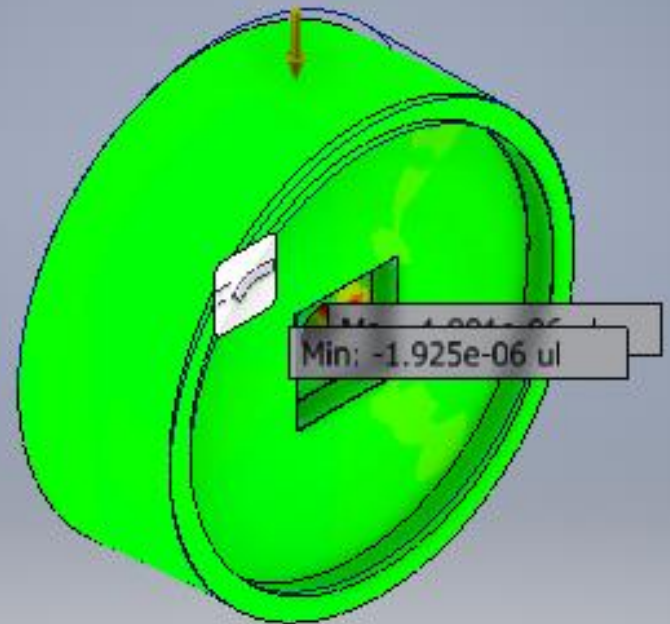


Strain YZ

Type: Strain YZ

Unit: ul

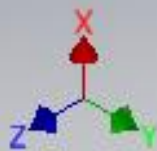
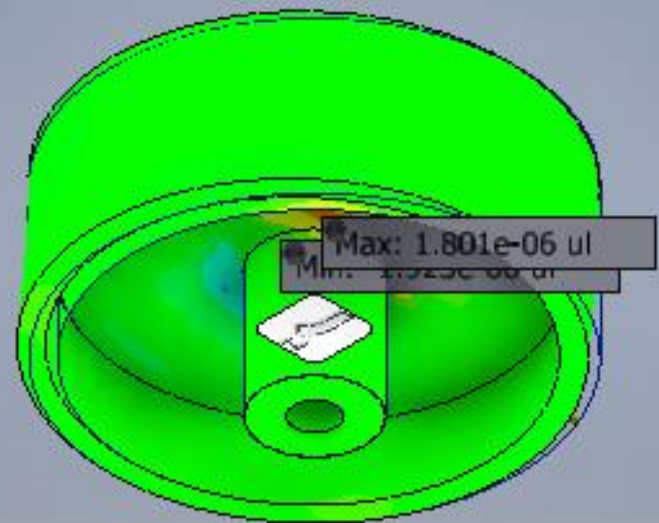
2024-04-13, 3:12:19 PM



Type: Strain YZ

Unit: ul

2024-04-13, 3:12:19 PM

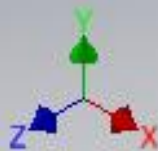
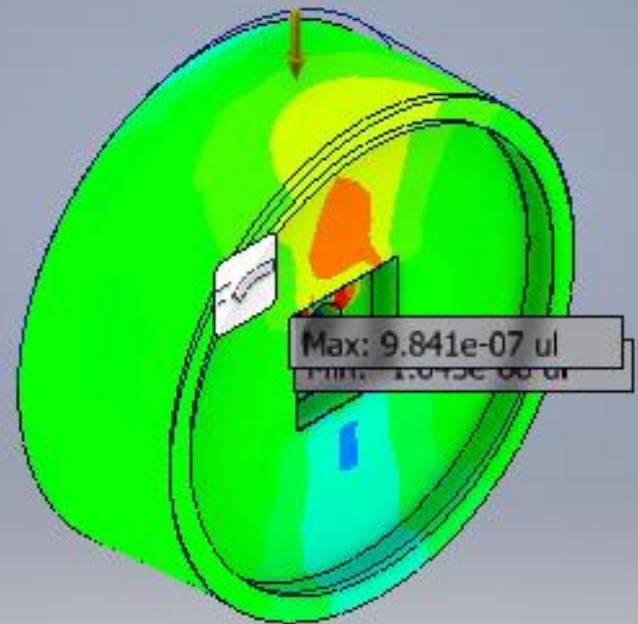


Strain ZZ

Type: Strain ZZ

Unit: ul

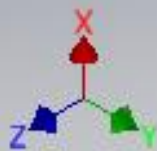
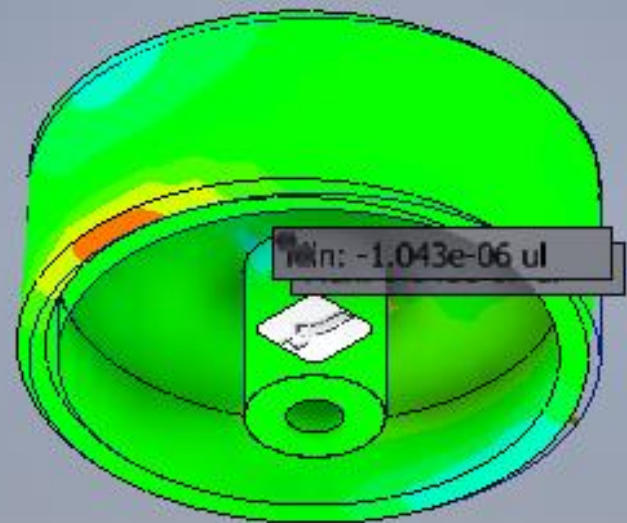
2024-04-13, 3:12:19 PM



Type: Strain ZZ

Unit: ul

2024-04-13, 3:12:19 PM



C:\Shared\alex-bartella-schoolwork\4z03\final\wheel.ipt