Die Set Stress Analysis Report

Analyzed File:	Assembly.iam
Autodesk Inventor Version:	2020 (Build 240168000, 168)
Creation Date:	7/29/2021, 7:50 AM
Study Author:	Bisqwit
Summary:	

Project Info (iProperties)

Summary

Author	joelm

Project

Part Number	Assembly
Designer	joelm
Cost	$0.00
Date Created	6/13/2021

Status

Design Status	WorkInProgress

Physical

Mass	3.79234 kg
Area	115989 mm^2
Volume	474043 mm^3
Center of Gravity	x=173.763 mm y=174.993 mm z=43.9911 mm

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

Static Analysis:1

General objective and settings:

Design Objective	Single Point
Study Type	Static Analysis
Last Modification Date	7/29/2021, 7:47 AM
Detect and Eliminate Rigid Body Modes	No
Separate Stresses Across Contact Surfaces	No
Motion Loads Analysis	No

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	No
Use part based measure for Assembly mesh	Yes

Material(s)

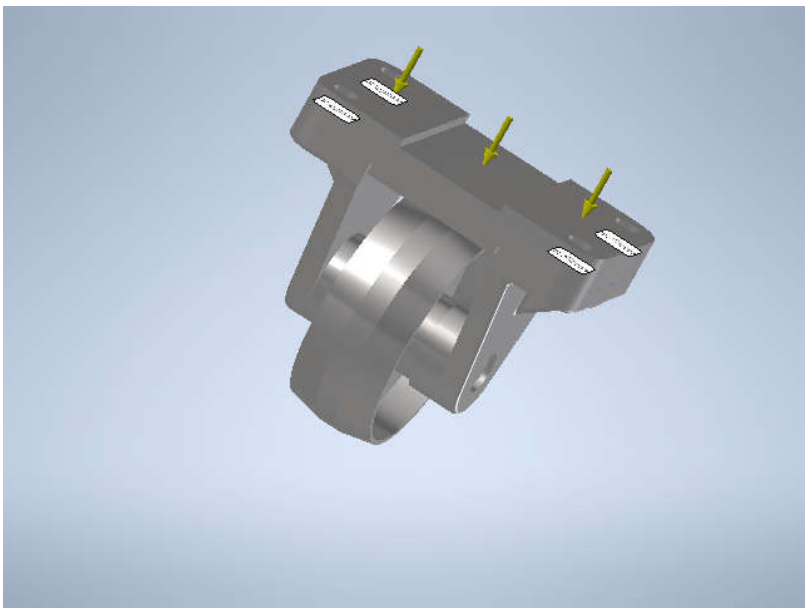
Name	Stainless Steel	
General	Mass Density	8 g/cm^3
	Yield Strength	250 MPa
	Ultimate Tensile Strength	540 MPa
Stress	Young's Modulus	193 GPa
	Poisson's Ratio	0.3 ul
	Shear Modulus	74.2308 GPa
Part Name(s)	axle.ipt axleSupport.ipt topPlate.ipt wheel.ipt axleSupport.ipt	

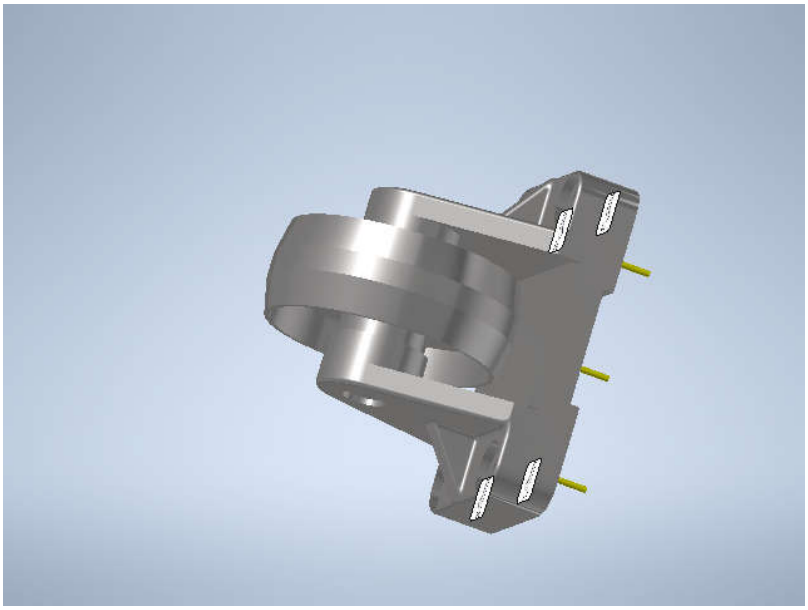
Operating conditions

Gravity

Load Type	Gravity
Magnitude	9810.000 mm/s^2
Vector X	0.000 mm/s^2
Vector Y	-9810.000 mm/s^2
Vector Z	0.000 mm/s^2

Selected Face(s)

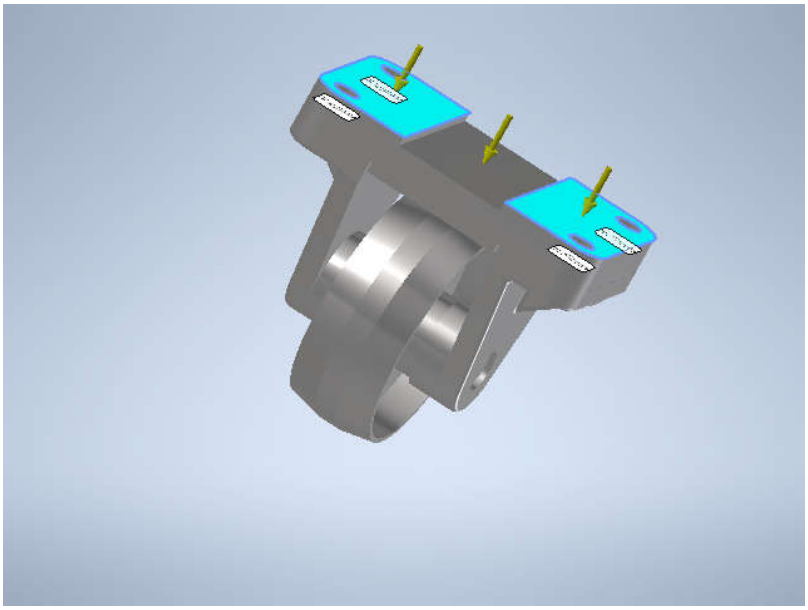


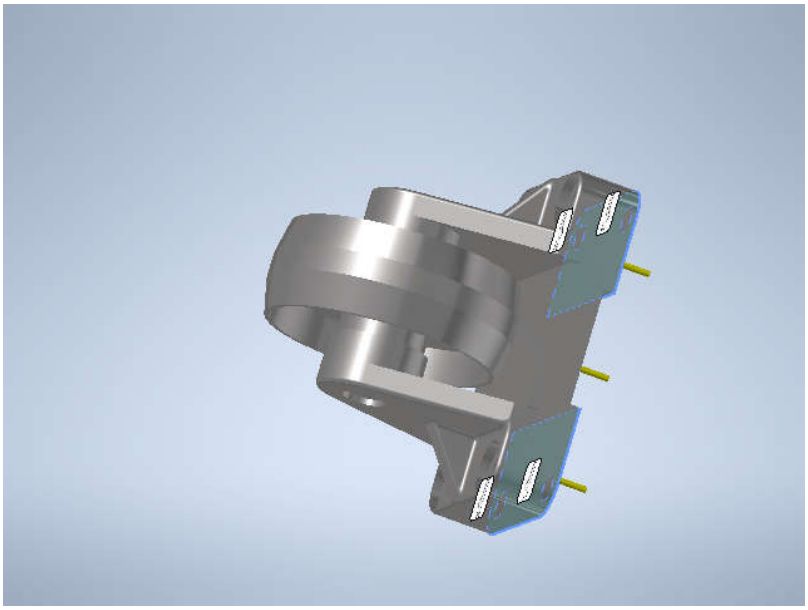


⊟ Force:1

Load Type	Force
Magnitude	100000.000 N
Vector X	0.000 N
Vector Y	-100000.000 N
Vector Z	0.000 N

⊟ Selected Face(s)

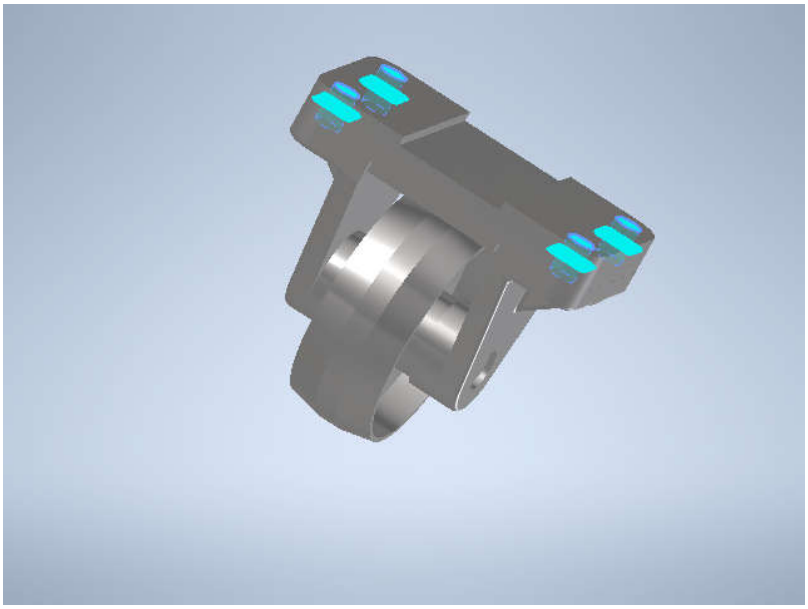


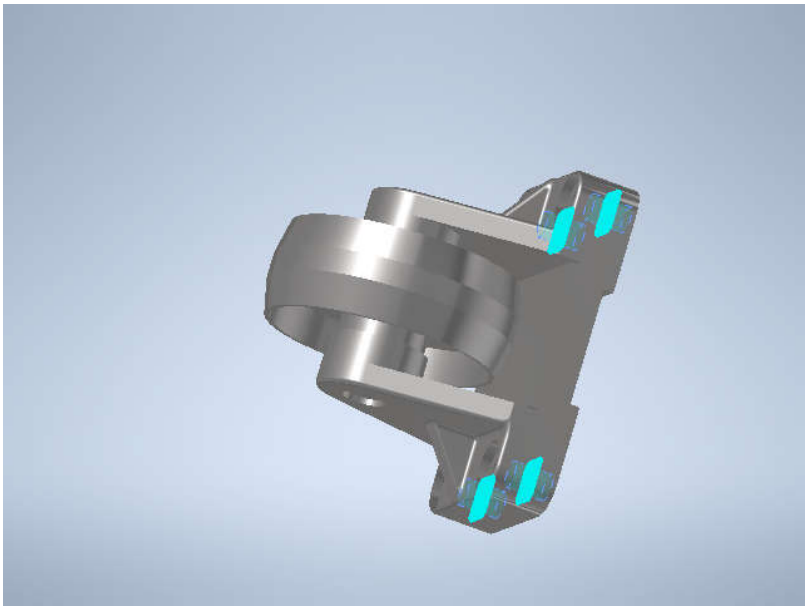


Fixed Constraint:1

Constraint Type	Fixed Constraint

Selected Face(s)





Contacts (Bonded)

Name	Part Name(s)
Bonded:1	axleSupport:1 topPlate:1
Bonded:2	topPlate:1 axleSupport:2
Bonded:3	axle:1 axleSupport:2
Bonded:4	axle:1 axleSupport:1
Bonded:5	axle:1 wheel:1
Bonded:6	axle:1 axleSupport:1
Bonded:7	axle:1 axleSupport:2

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	100037 N	0 N	0 N m	0 N m
		100037 N		0 N m
		0 N		0 N m

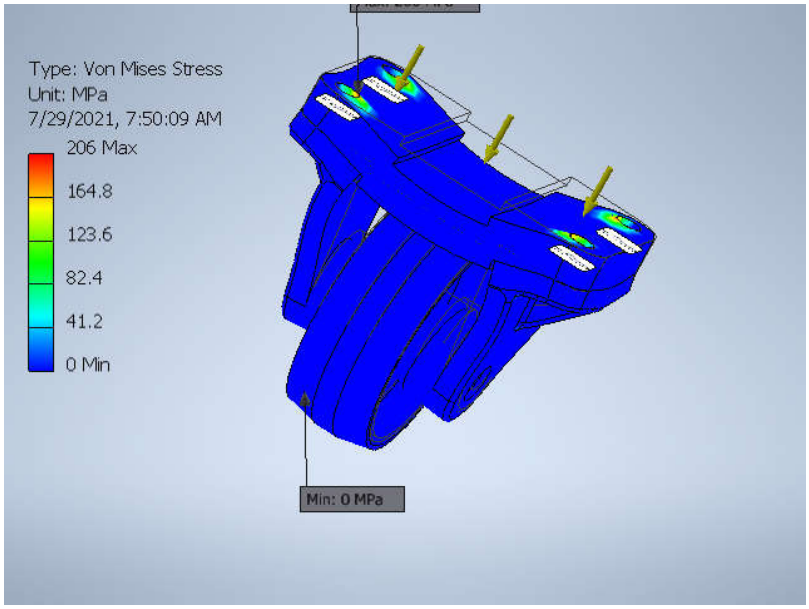
Result Summary

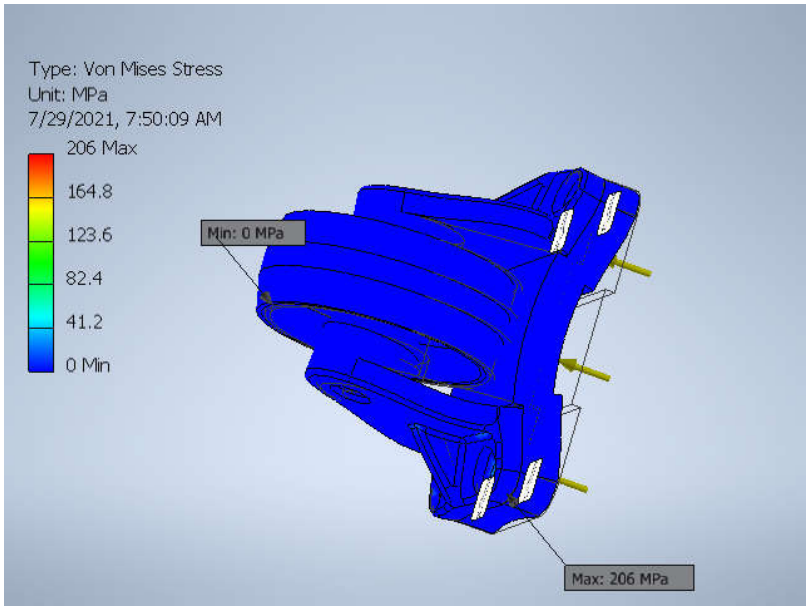
Name	Minimum	Maximum
Volume	474043 mm^3	
Mass	3.79234 kg	
Von Mises Stress	0.00364407 MPa	205.951 MPa
1st Principal Stress	-17.4963 MPa	272.13 MPa
3rd Principal Stress	-99.9985 MPa	45.9474 MPa
Displacement	0 mm	0.0213154 mm
Safety Factor	1.21388 ul	15 ul
Stress XX	-80.9435 MPa	210.618 MPa
Stress XY	-85.4562 MPa	86.1264 MPa
Stress XZ	-59.1787 MPa	55.7213 MPa

Stress YY	-31.2102 MPa	95.4234 MPa
Stress YZ	-69.6277 MPa	60.1183 MPa
Stress ZZ	-45.8762 MPa	122.198 MPa
X Displacement	-0.0104473 mm	0.0104455 mm
Y Displacement	-0.0213154 mm	0.00141184 mm
Z Displacement	-0.00219667 mm	0.00219898 mm
Equivalent Strain	0.0000000164599 ul	0.00100921 ul
1st Principal Strain	-0.00000763018 ul	0.00119025 ul
3rd Principal Strain	-0.000559557 ul	-0.00000000432276 ul
Strain XX	-0.000411893 ul	0.000844054 ul
Strain XY	-0.000575612 ul	0.000580126 ul
Strain XZ	-0.000398613 ul	0.000375325 ul
Strain YY	-0.000287806 ul	0.00030997 ul
Strain YZ	-0.000468995 ul	0.000404942 ul
Strain ZZ	-0.000239288 ul	0.00045091 ul
Contact Pressure	0 MPa	98.5842 MPa
Contact Pressure X	-60.1998 MPa	64.1718 MPa
Contact Pressure Y	-82.2404 MPa	37.4092 MPa
Contact Pressure Z	-36.0869 MPa	34.5843 MPa

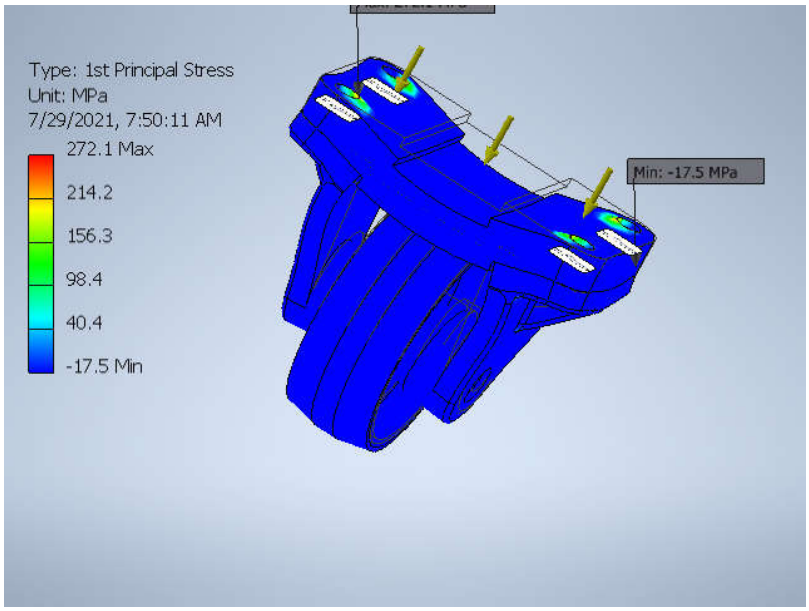
Figures

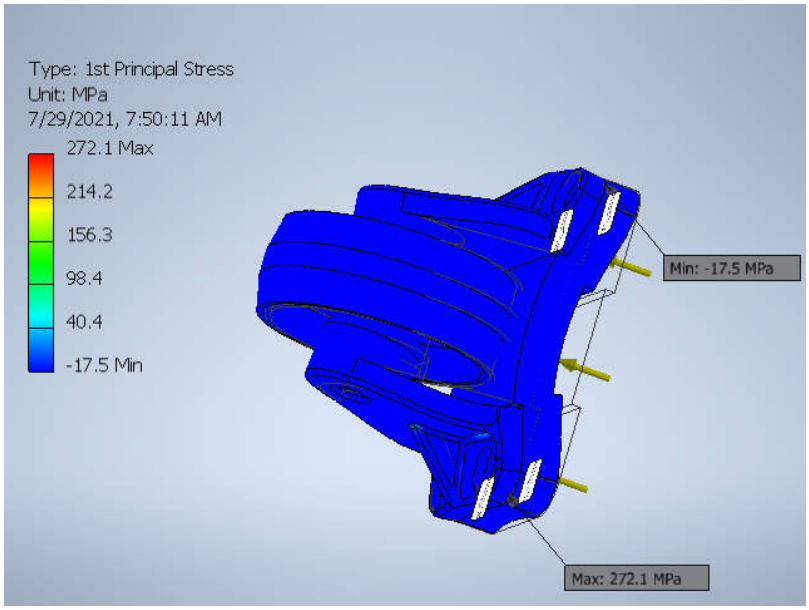
Von Mises Stress



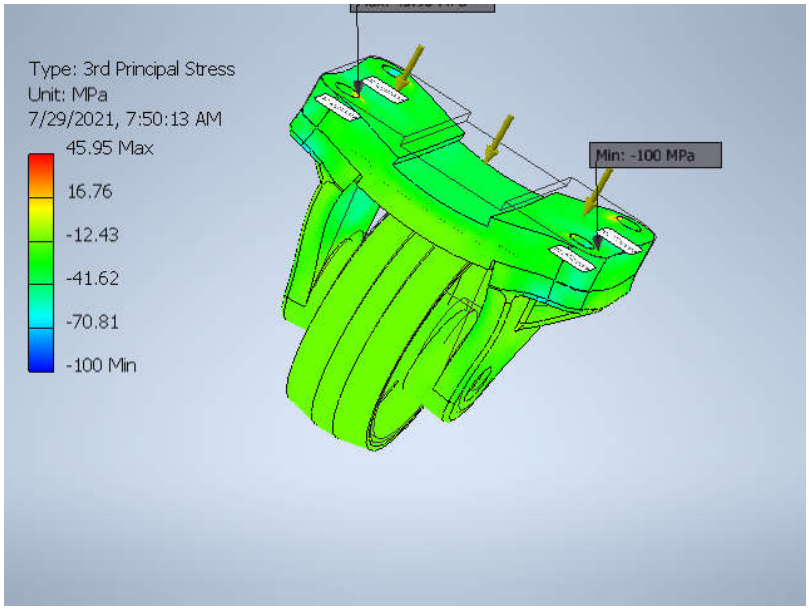


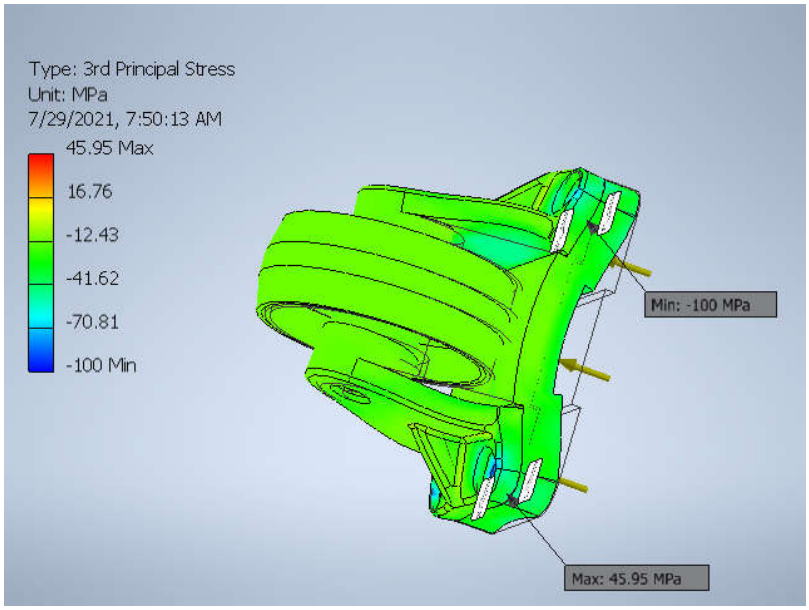
1st Principal Stress



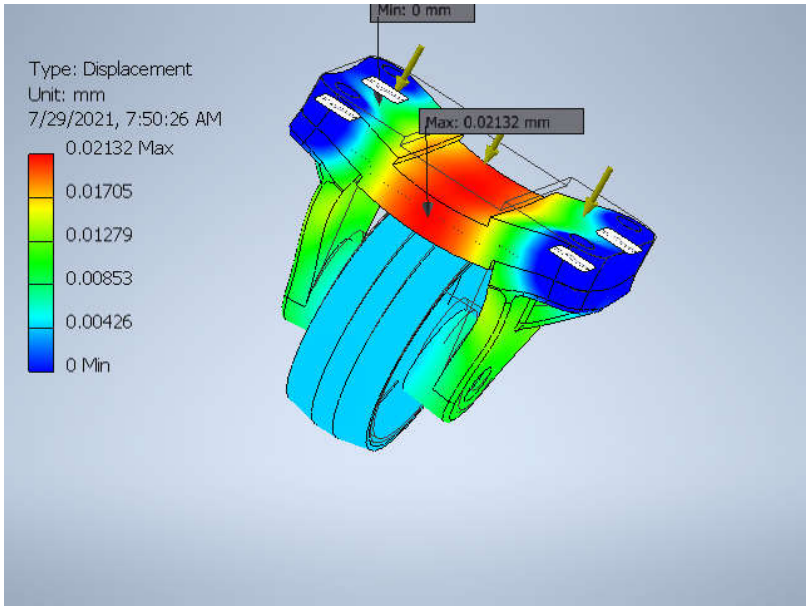


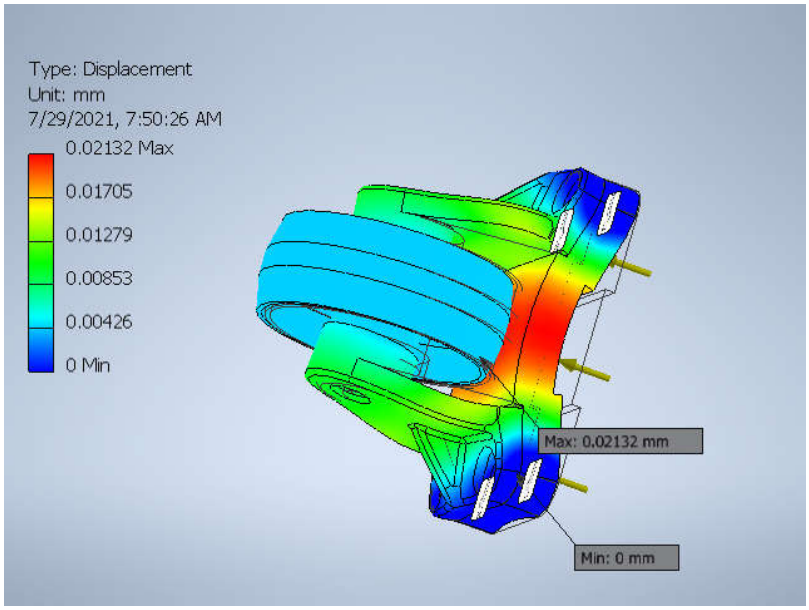
3rd Principal Stress



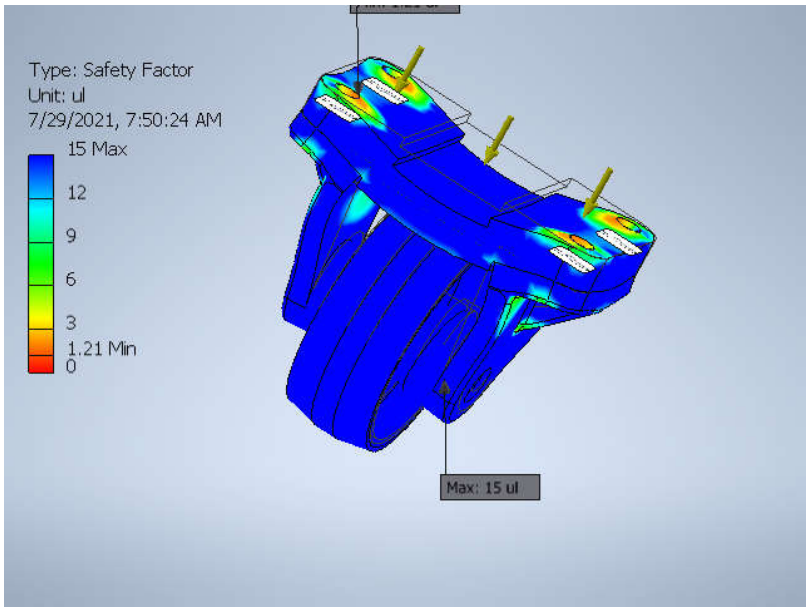


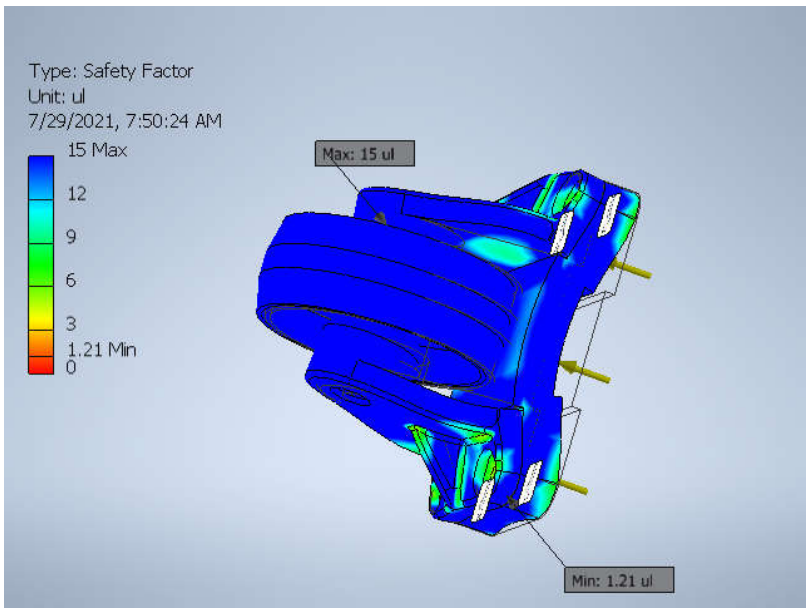
Displacement



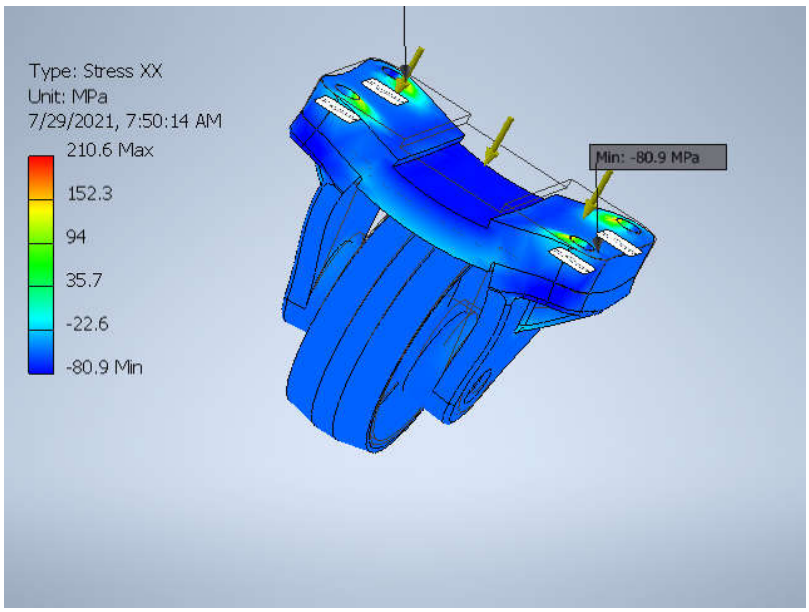


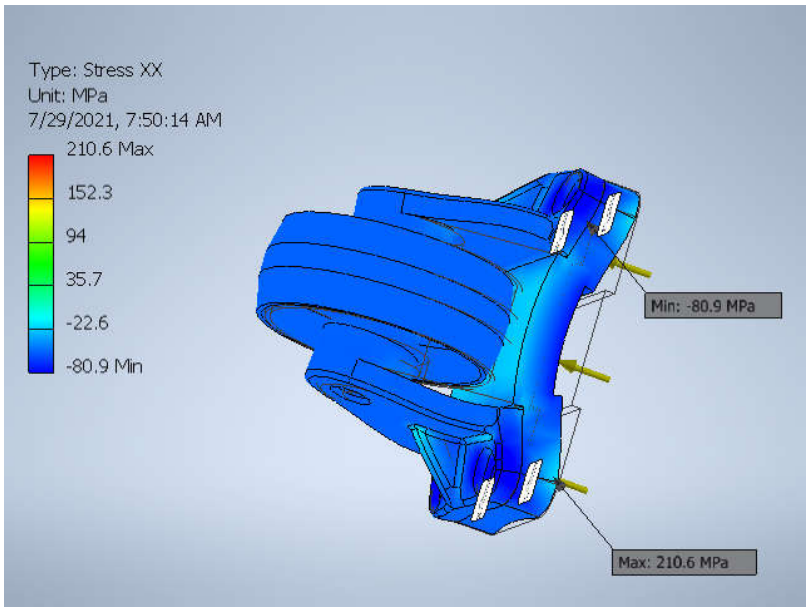
Safety Factor



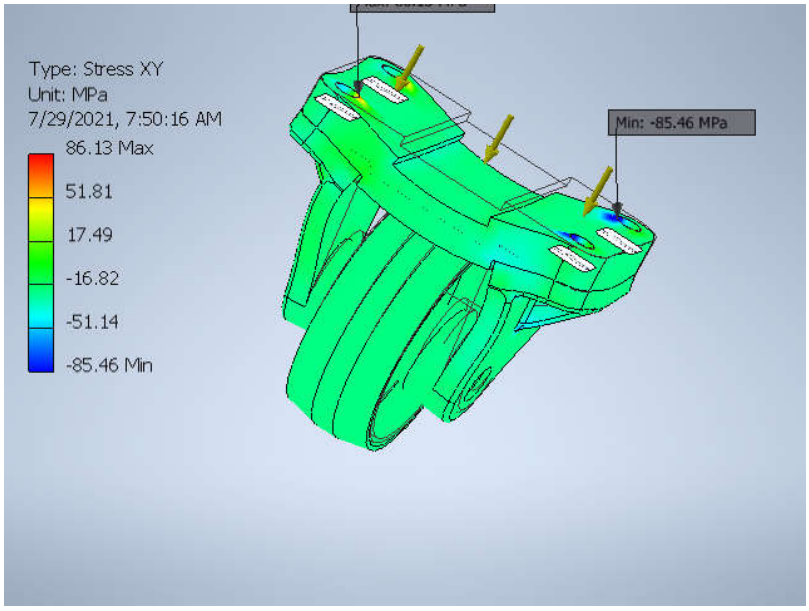


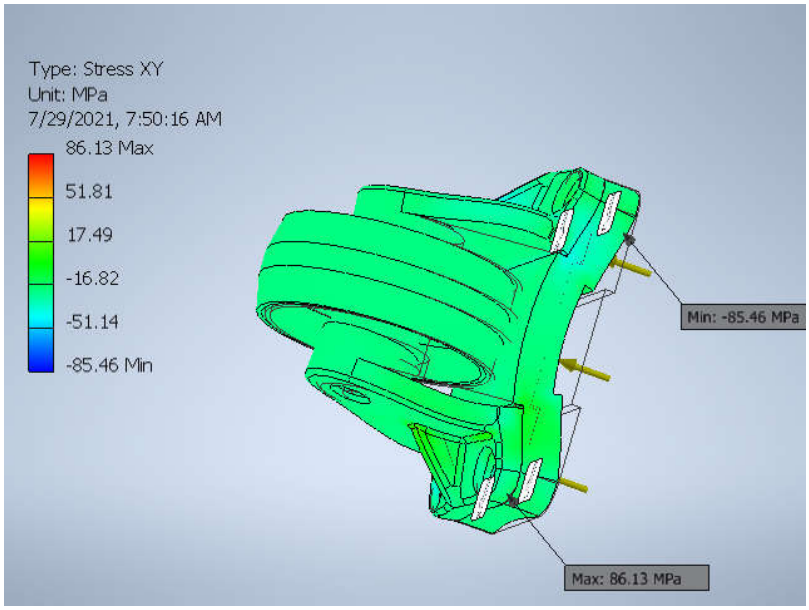
Stress XX





Stress XY

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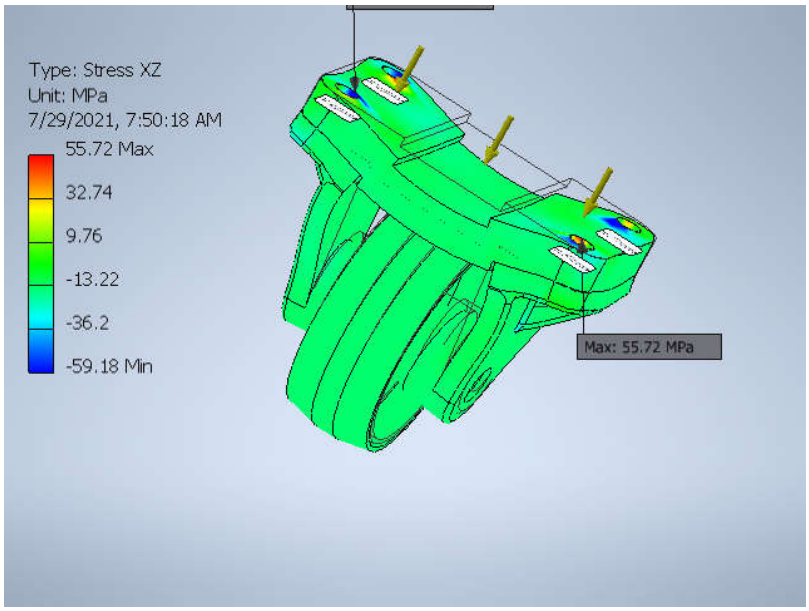
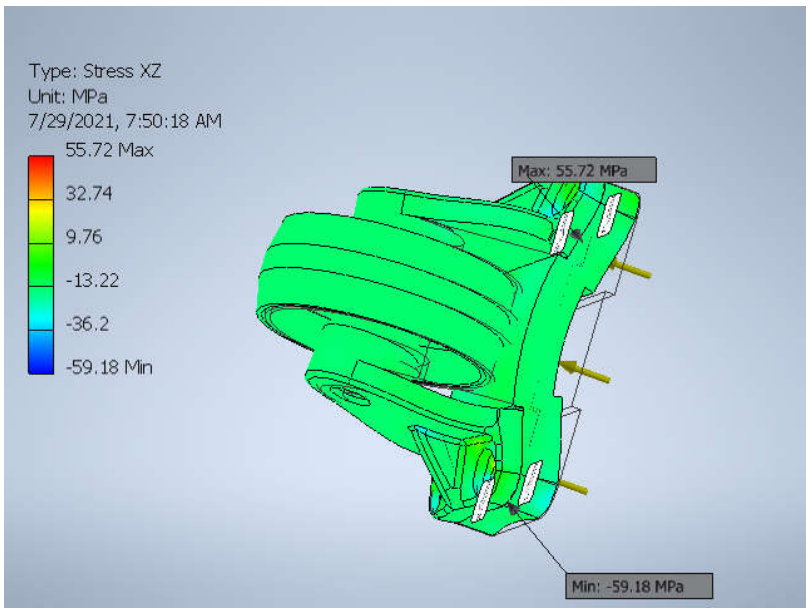
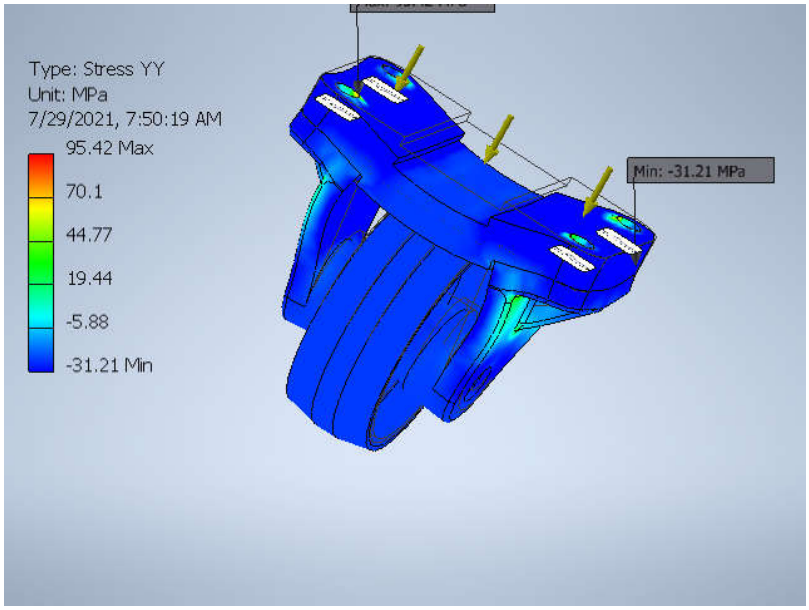
Unit: MPa
7/29/2021, 7:50:16 AM
86.13 Max
51.81
17.49
-16.82
-51.14
-85.46 Min
Min: -85.46 MPa
Max: 86.13 MPa

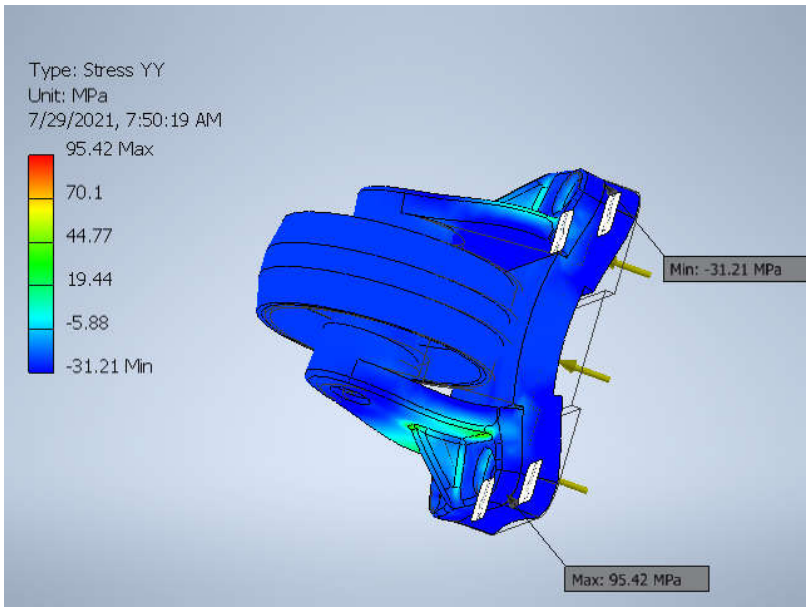
⊟ Stress XZ


Type: Stress XZ
Unit: MPa
7/29/2021, 7:50:18 AM
55.72 Max
32.74
9.76
-13.22
-36.2
-59.18 Min
Max: 55.72 MPa

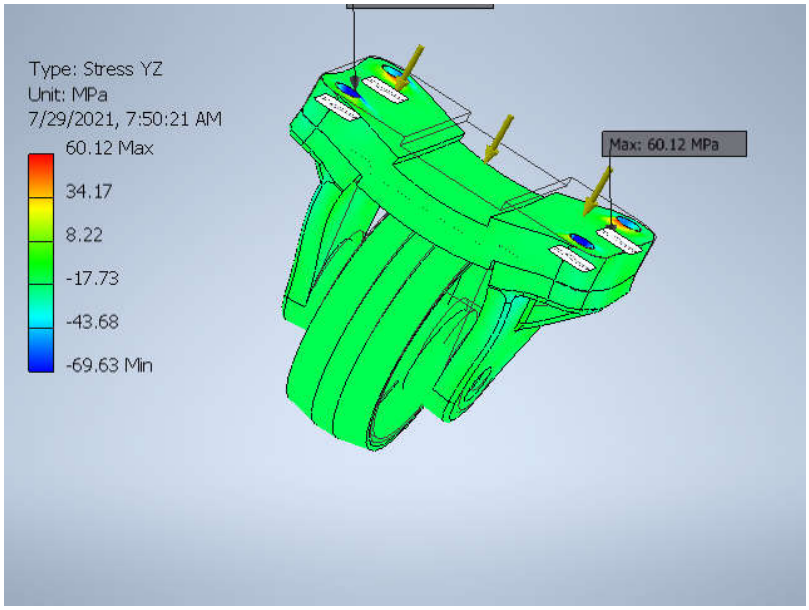

Type: Stress XZ
Unit: MPa
7/29/2021, 7:50:18 AM
55.72 Max
32.74
9.76
-13.22
-36.2
-59.18 Min
Max: 55.72 MPa
Min: -59.18 MPa

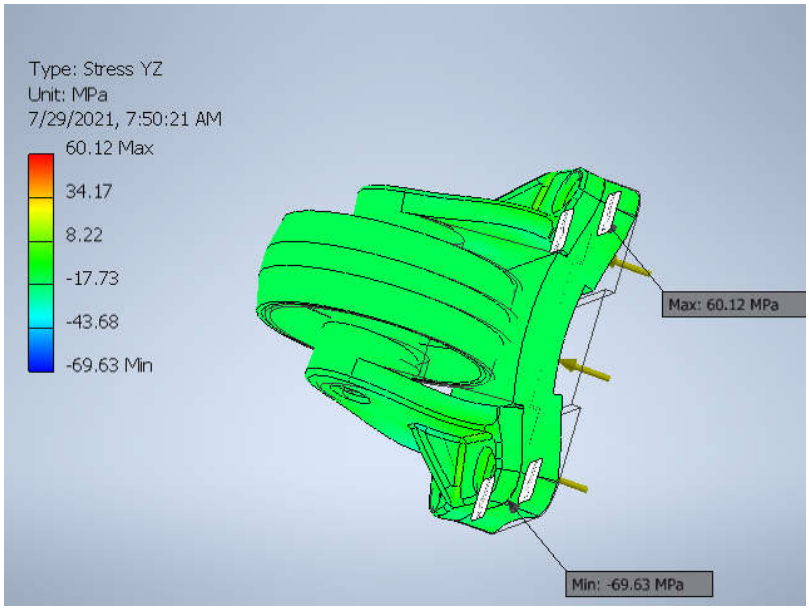
Stress YY



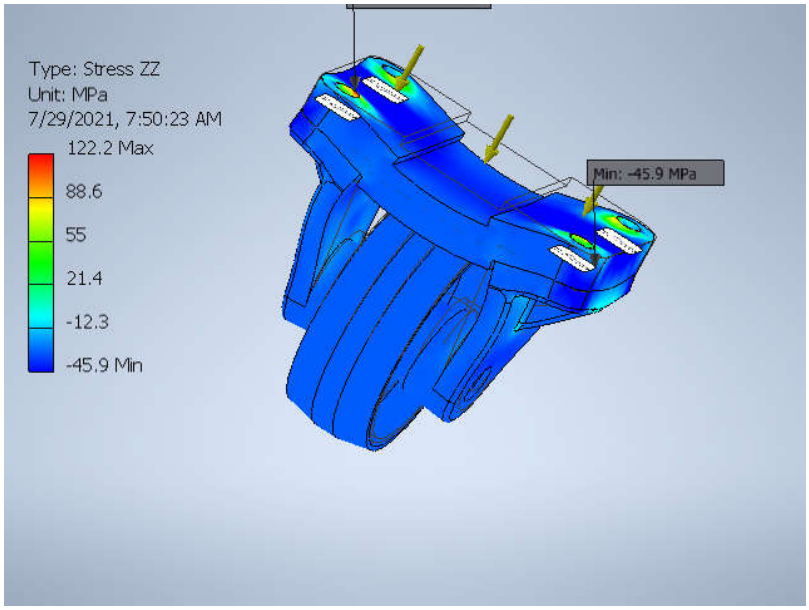


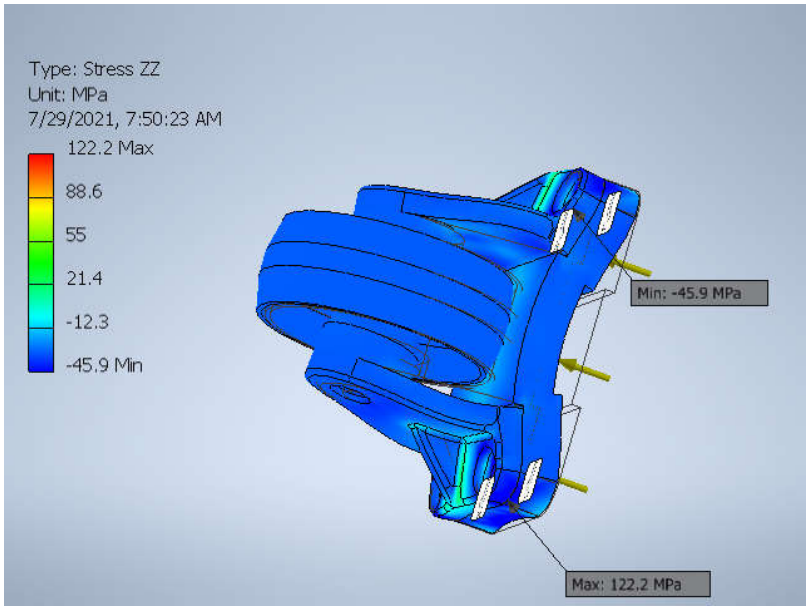
Stress YZ



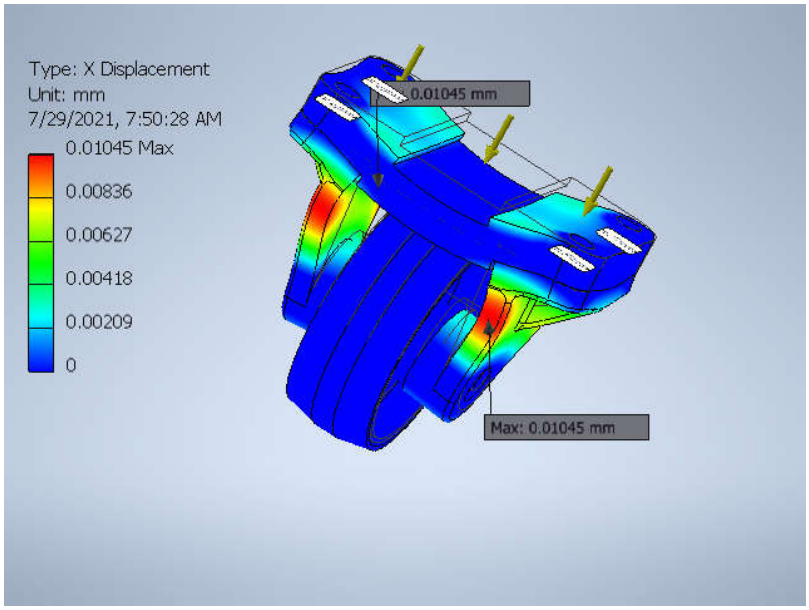

Type: Stress YZ
Unit: MPa
7/29/2021, 7:50:21 AM
60.12 Max
34.17
8.22
-17.73
-43.68
-69.63 Min
Max: 60.12 MPa
Min: -69.63 MPa

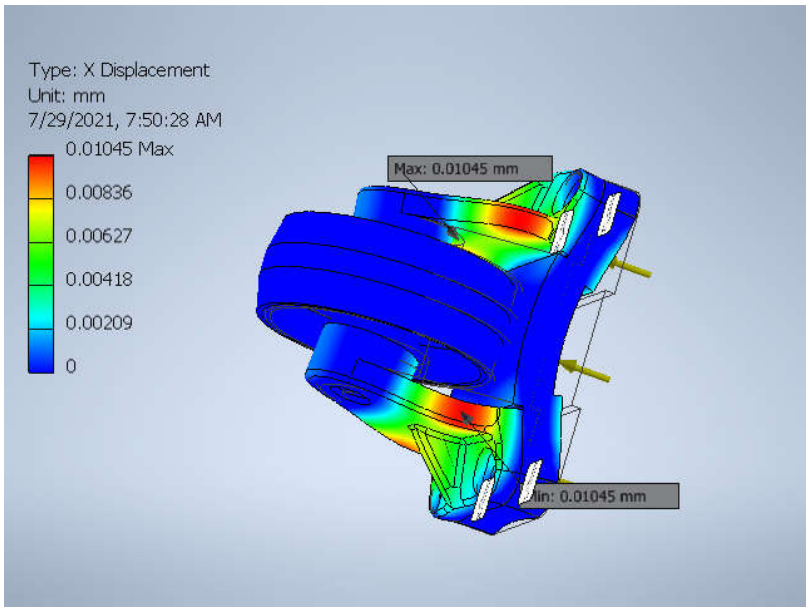
Stress ZZ


Type: Stress ZZ
Unit: MPa
7/29/2021, 7:50:23 AM
122.2 Max
88.6
55
21.4
-12.3
-45.9 Min
Min: -45.9 MPa

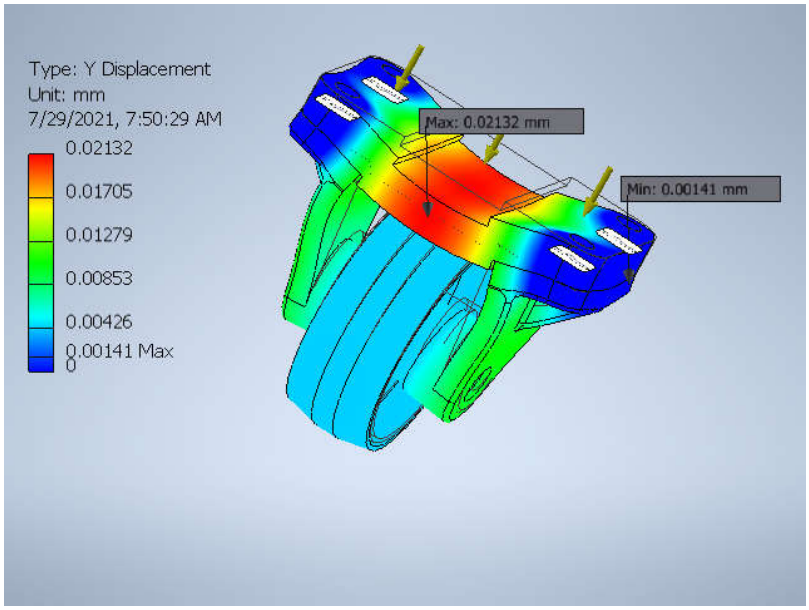

Type: Stress ZZ
Unit: MPa
7/29/2021, 7:50:23 AM
122.2 Max
88.6
55
21.4
-12.3
-45.9 Min
Min: -45.9 MPa
Max: 122.2 MPa

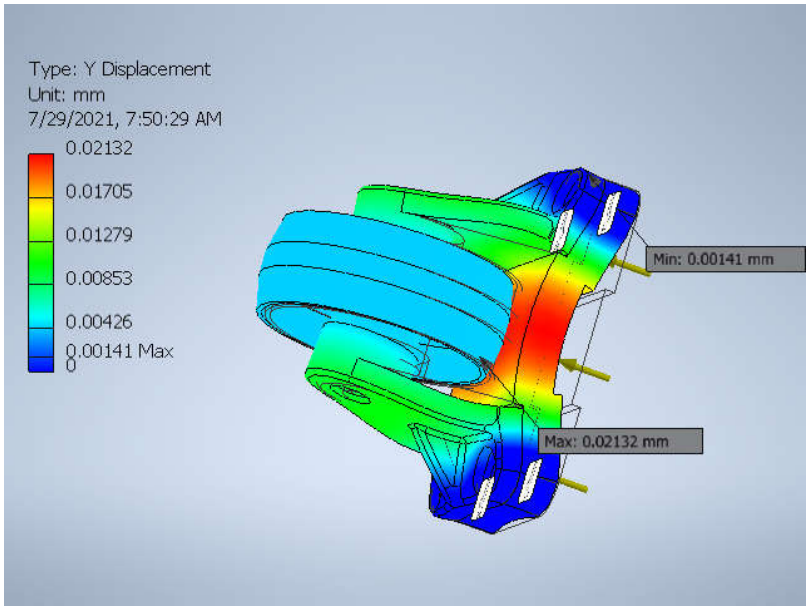
X Displacement



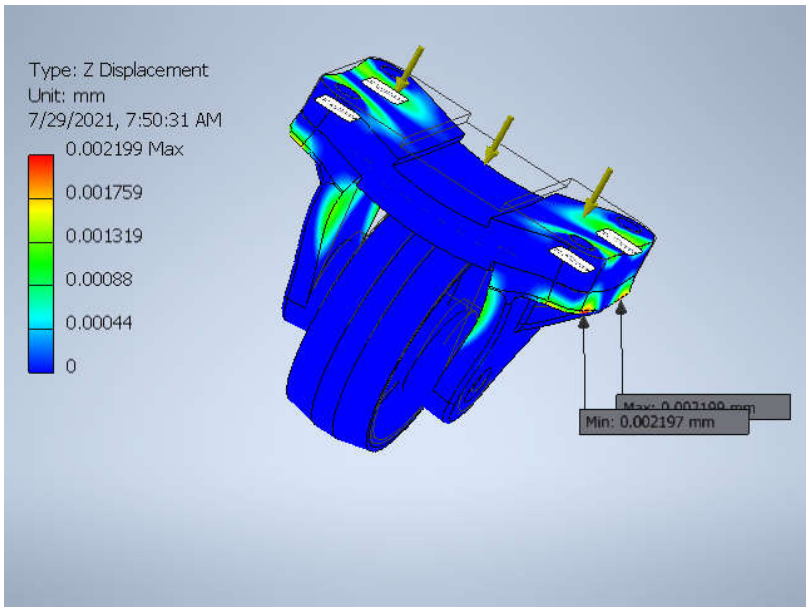


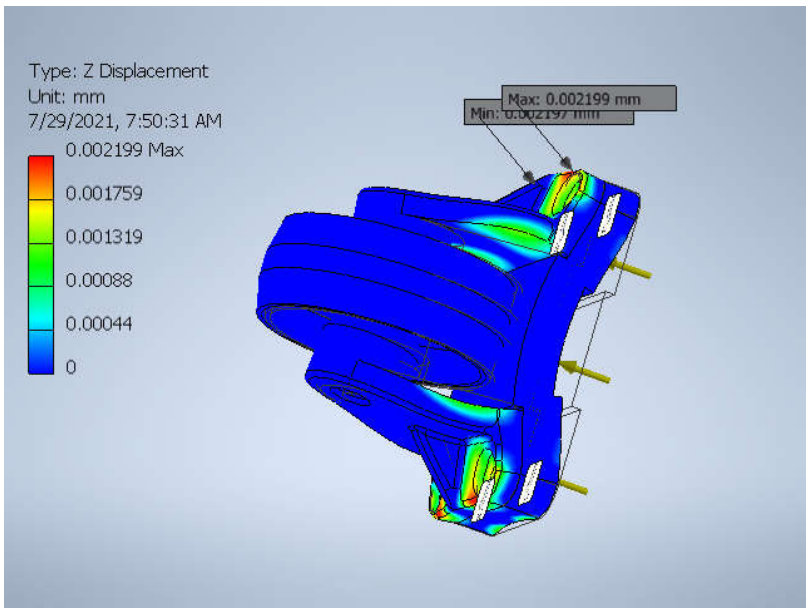
Y Displacement



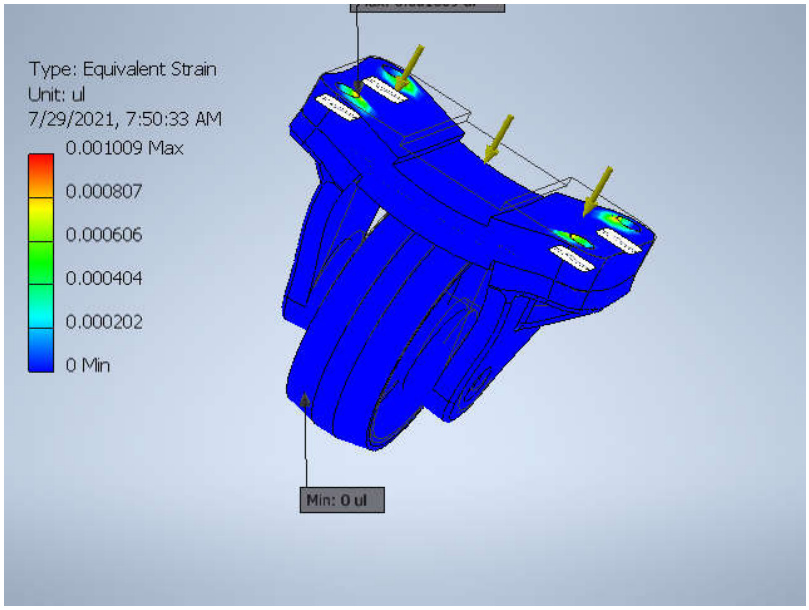


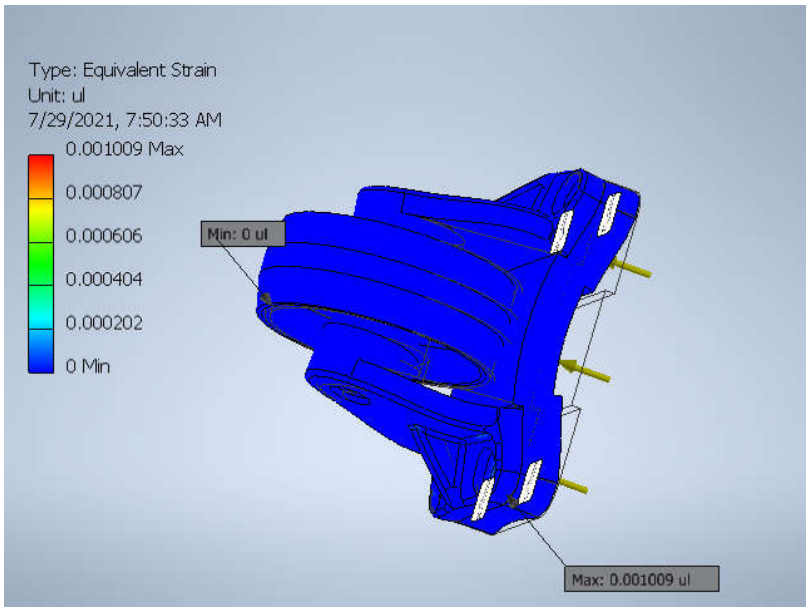
Z Displacement



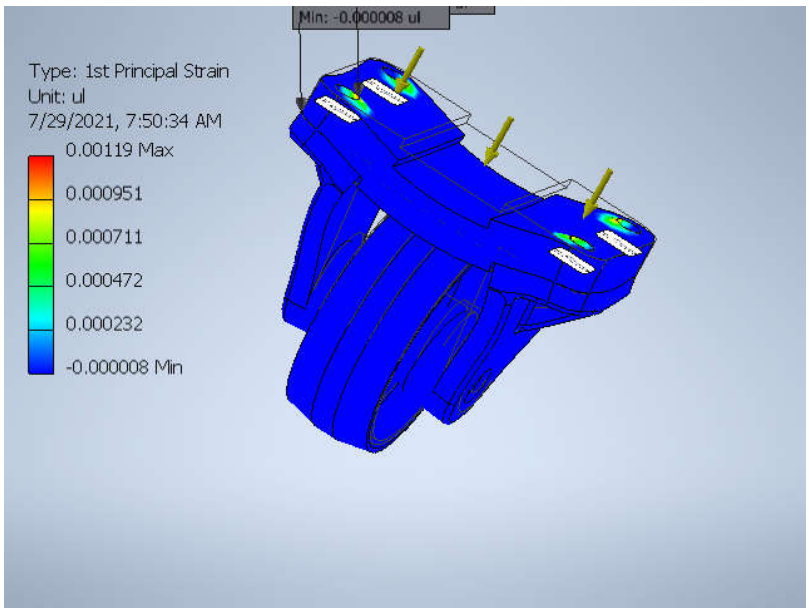


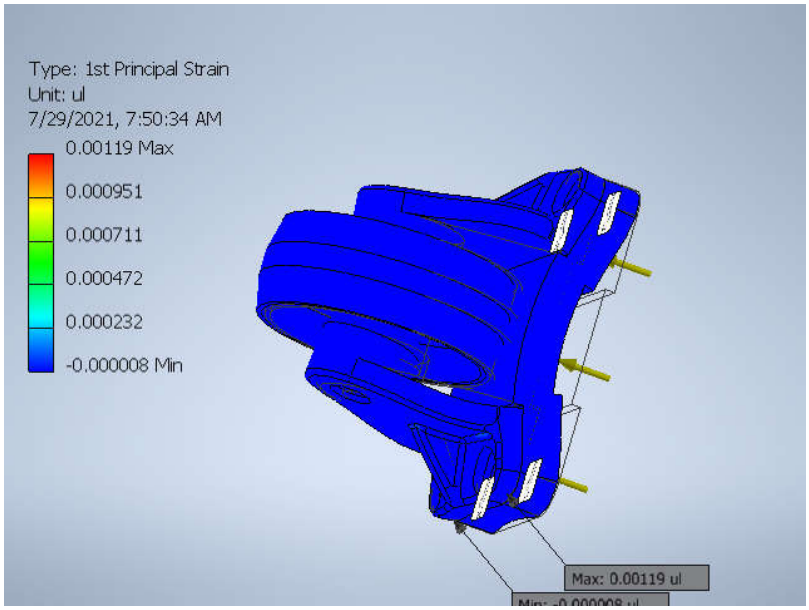
Equivalent Strain



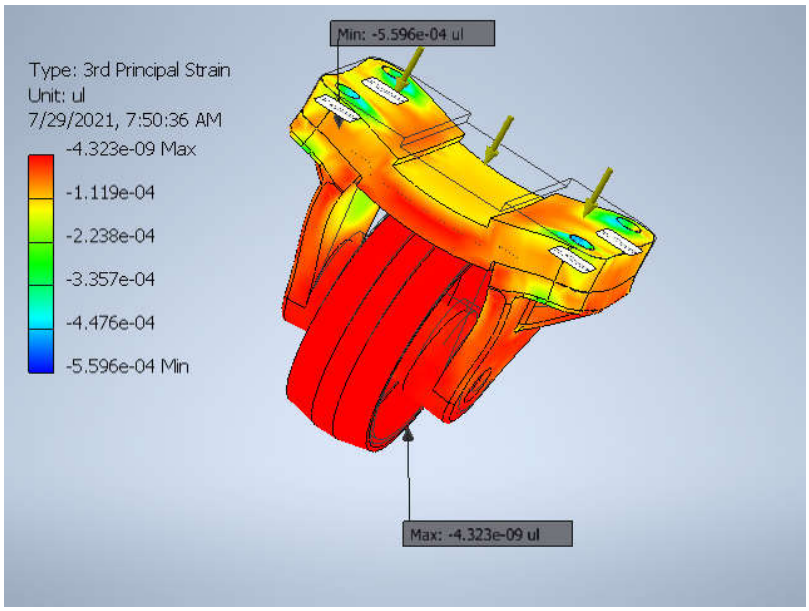


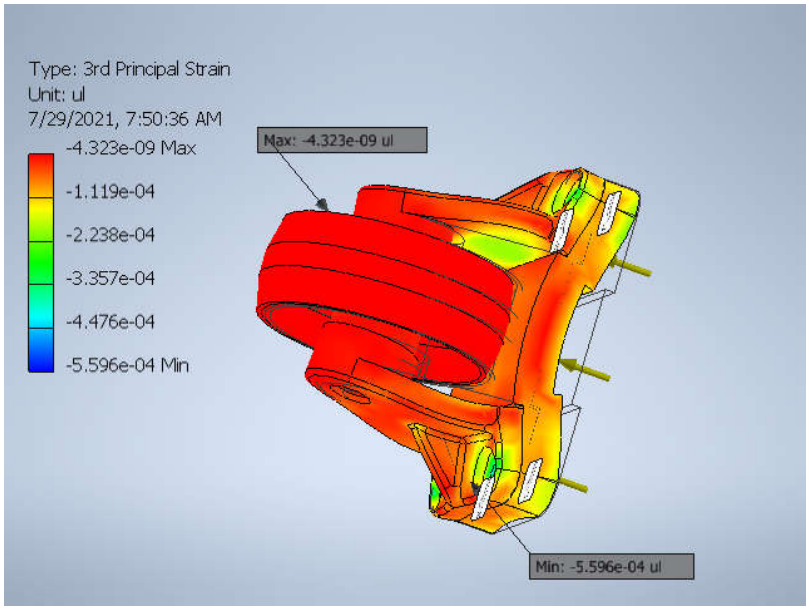
1st Principal Strain



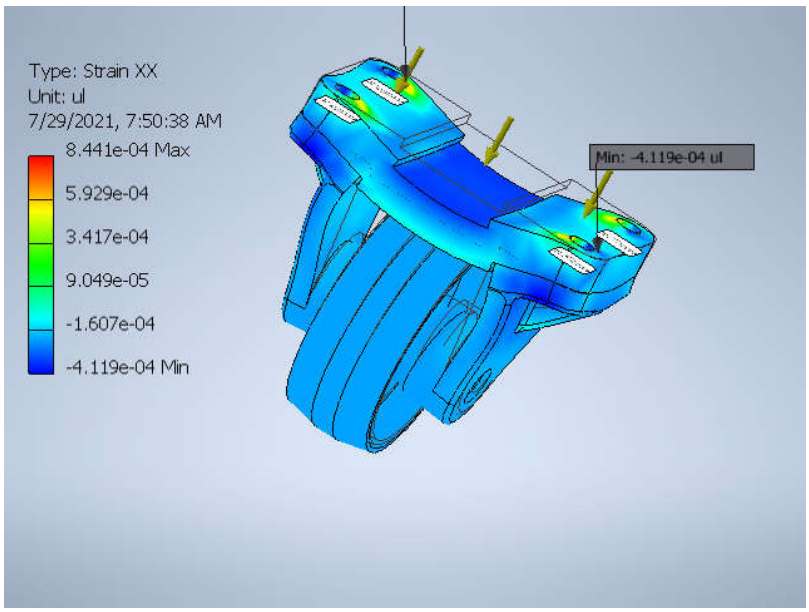


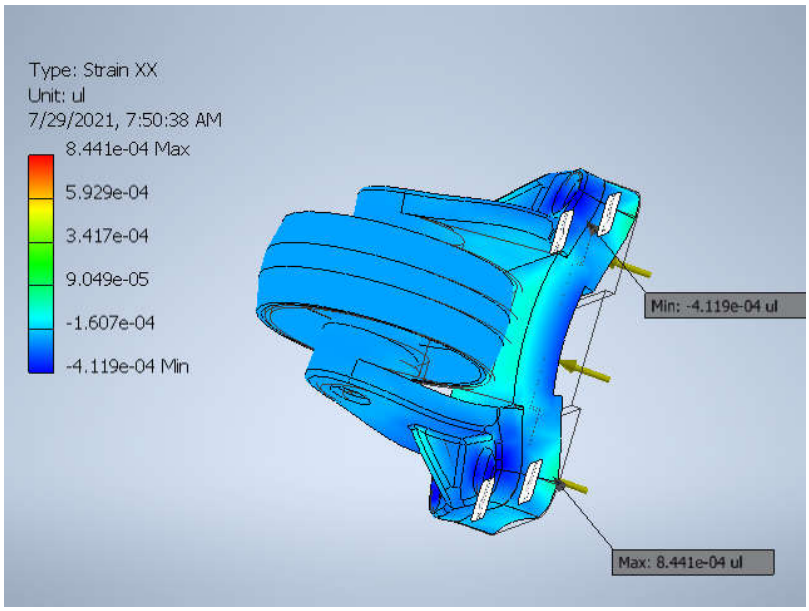
3rd Principal Strain



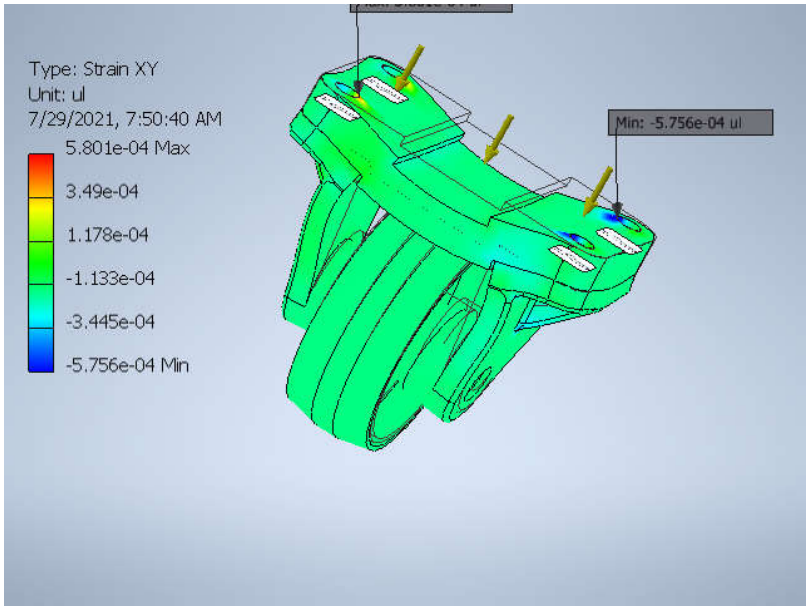


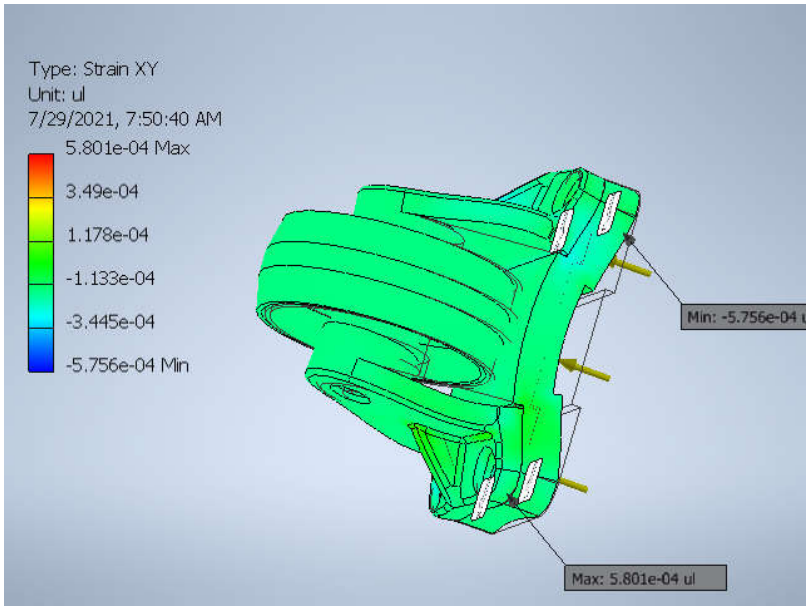
Strain XX





Strain XY

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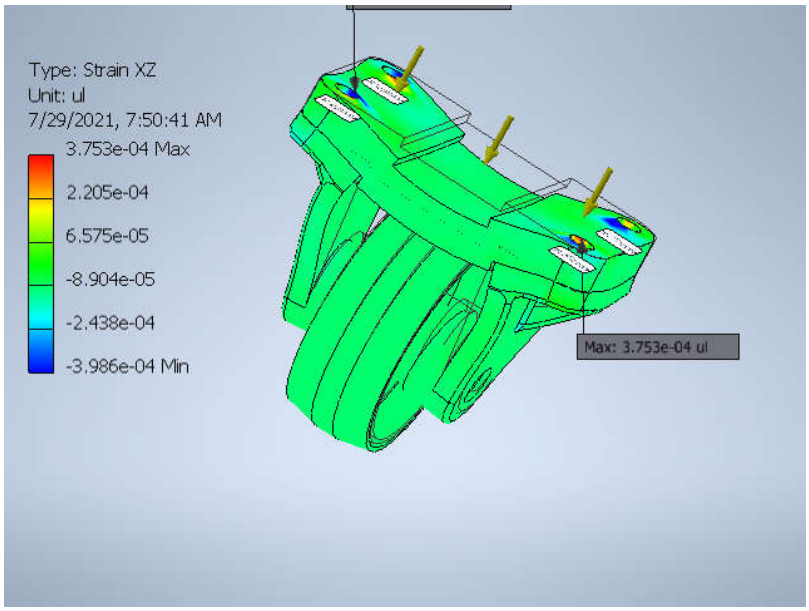
Unit: ul
7/29/2021, 7:50:40 AM
5.801e-04 Max
3.49e-04
1.178e-04
-1.133e-04
-3.445e-04
-5.756e-04 Min
Min: -5.756e-04
Max: 5.801e-04 ul

⊟ Strain XZ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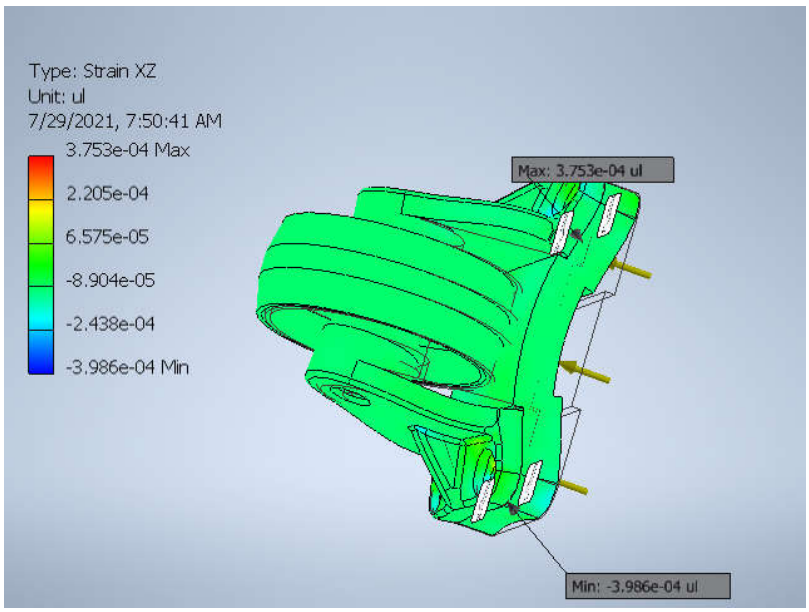
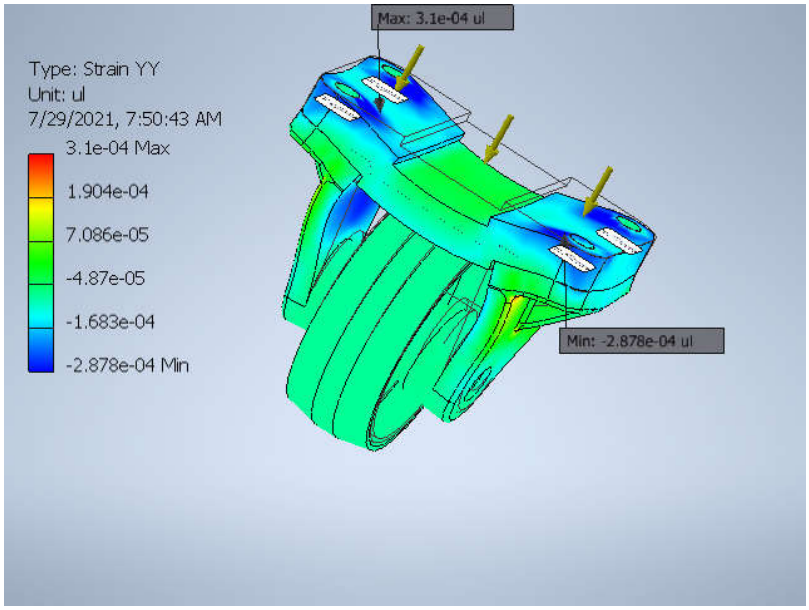
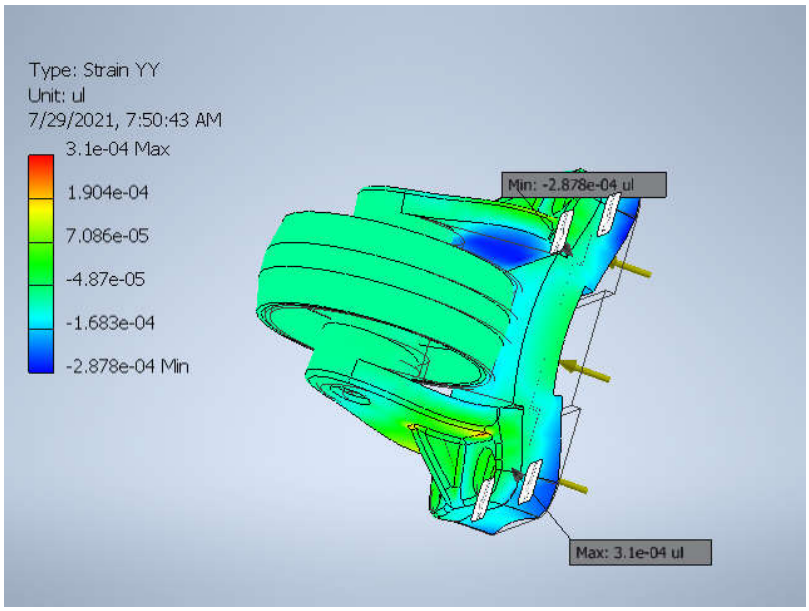
Unit: ul
7/29/2021, 7:50:41 AM
3.753e-04 Max
2.205e-04
6.575e-05
-8.904e-05
-2.438e-04
-3.986e-04 Min
Max: 3.753e-04 ul

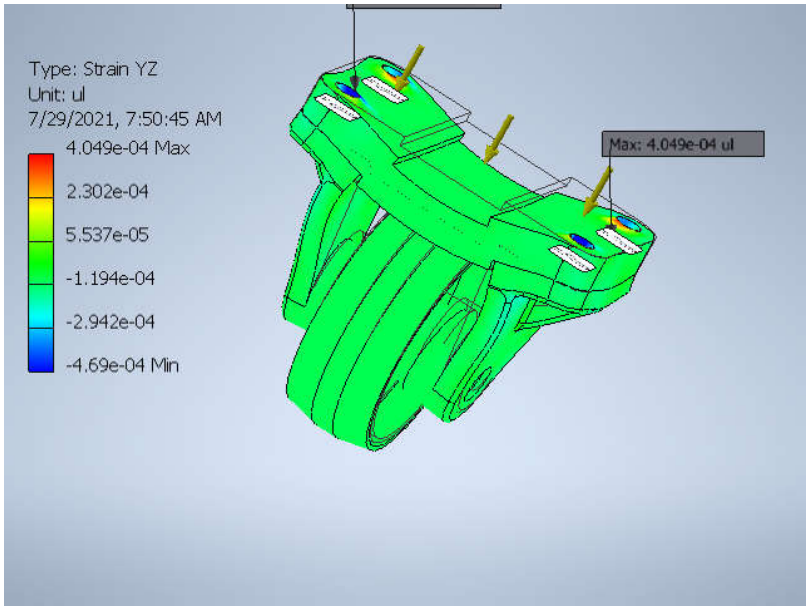

Type: Strain XZ
Unit: ul
7/29/2021, 7:50:41 AM
3.753e-04 Max
2.205e-04
6.575e-05
-8.904e-05
-2.438e-04
-3.986e-04 Min
Max: 3.753e-04 ul
Min: -3.986e-04 ul

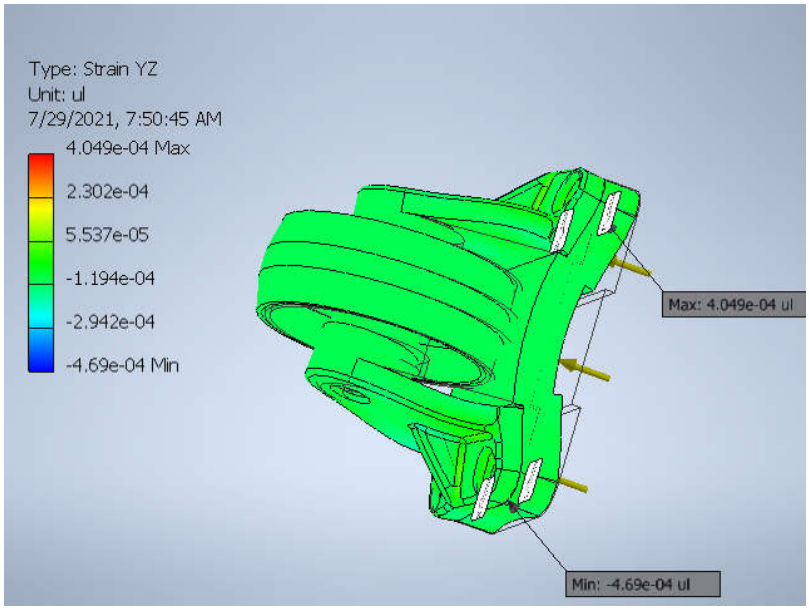
Strain YY





Strain YZ

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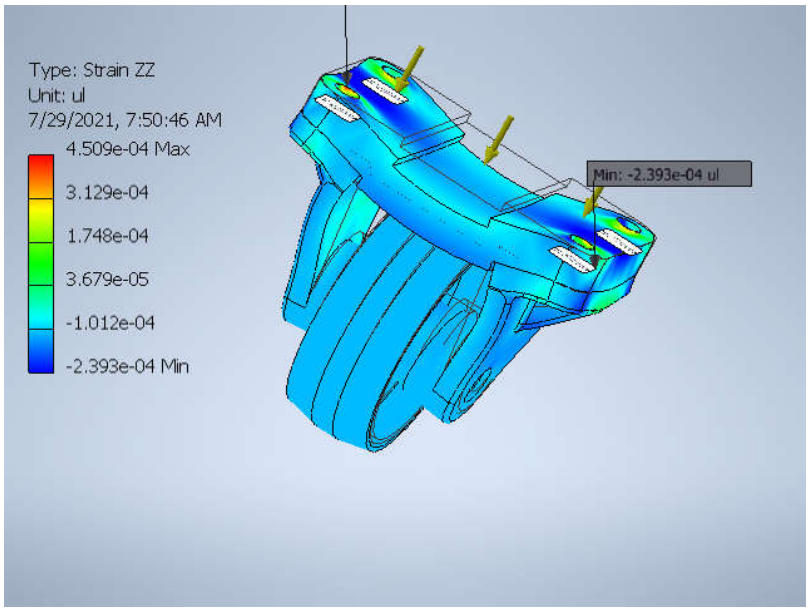
2.302e-04
5.537e-05
-1.194e-04
-2.942e-04
-4.69e-04 Min
Max: 4.049e-04 ul
Min: -4.69e-04 ul

Strain ZZ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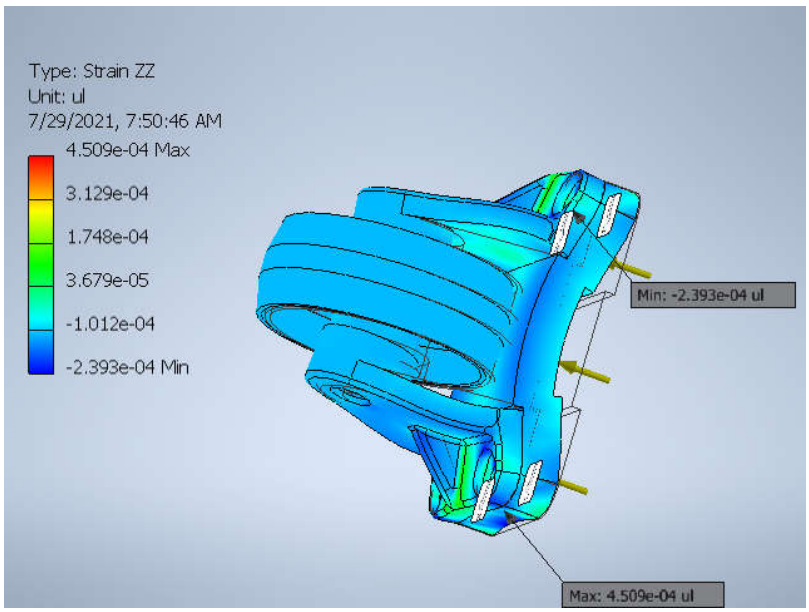
Unit: ul
7/29/2021, 7:50:46 AM
4.509e-04 Max
3.129e-04
1.748e-04
3.679e-05
-1.012e-04
-2.393e-04 Min
Min: -2.393e-04 ul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Unit: ul
7/29/2021, 7:50:46 AM
4.509e-04 Max
3.129e-04
1.748e-04
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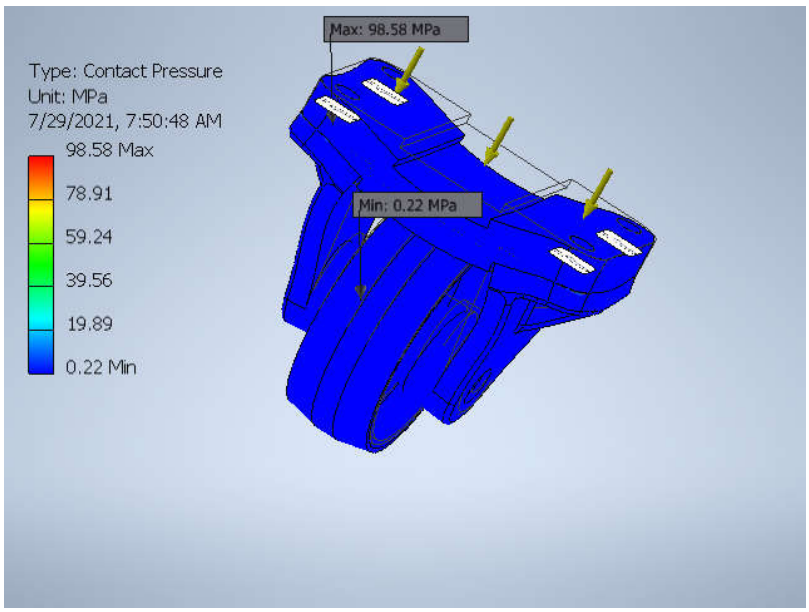
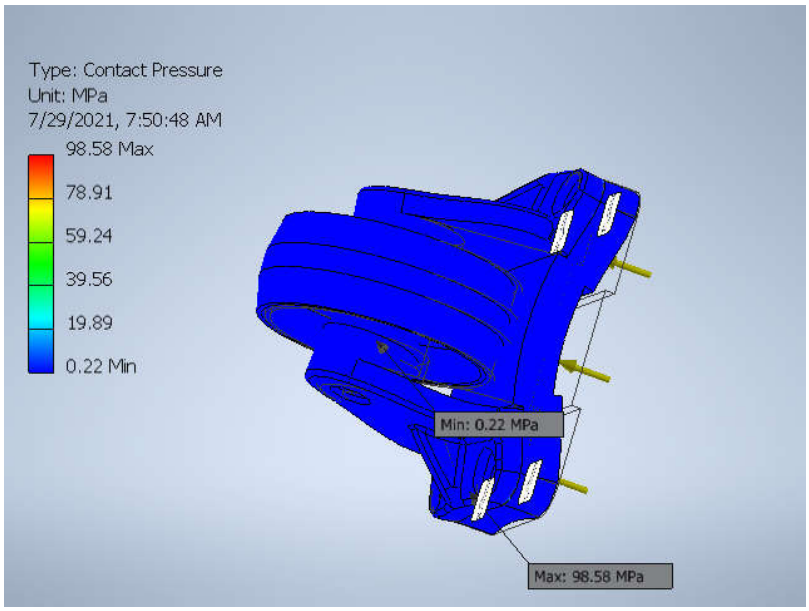
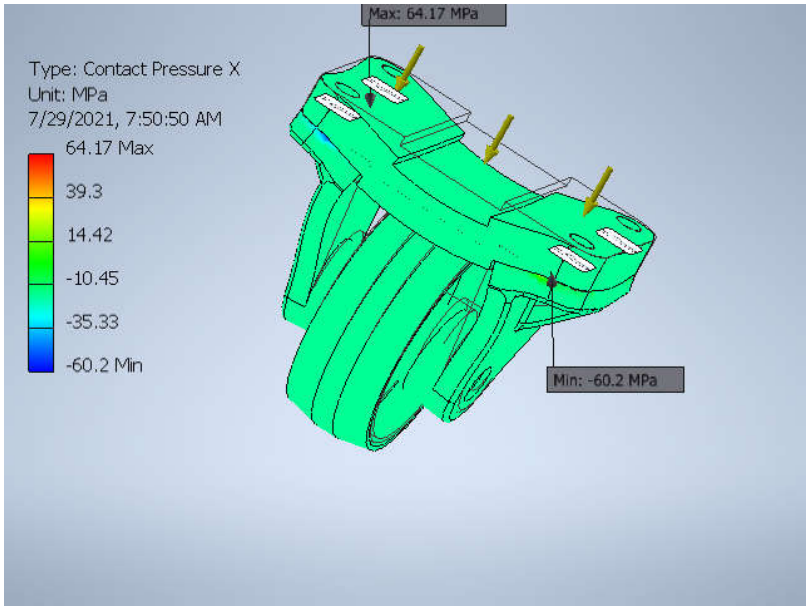
-1.012e-04
-2.393e-04 Min
Min: -2.393e-04 ul
Max: 4.509e-04 ul

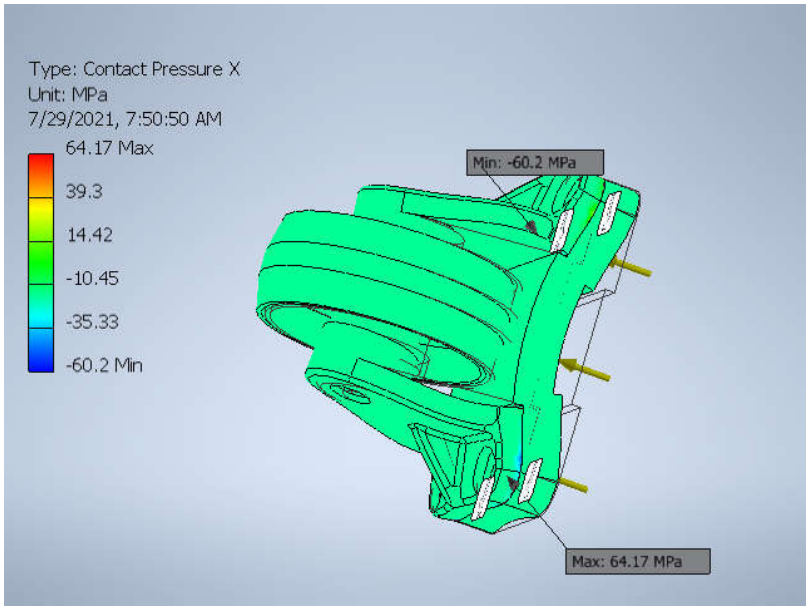
Contact Pressure



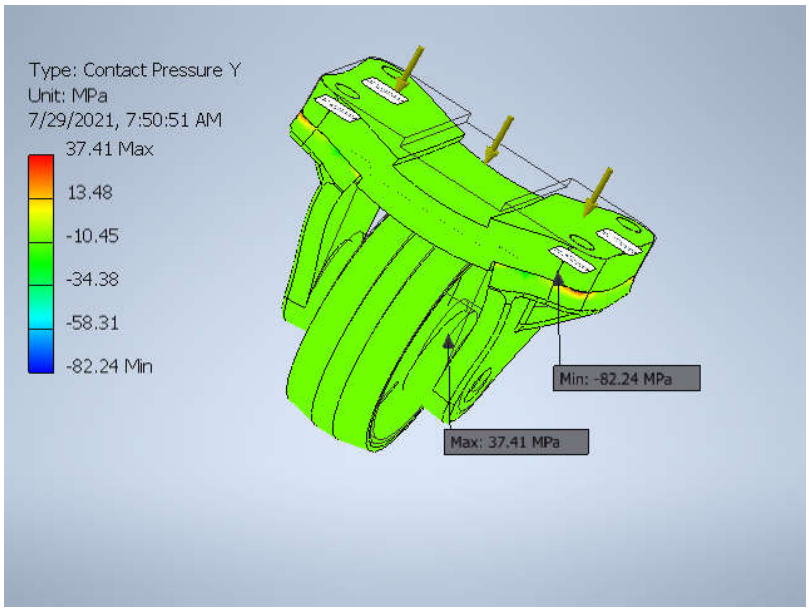


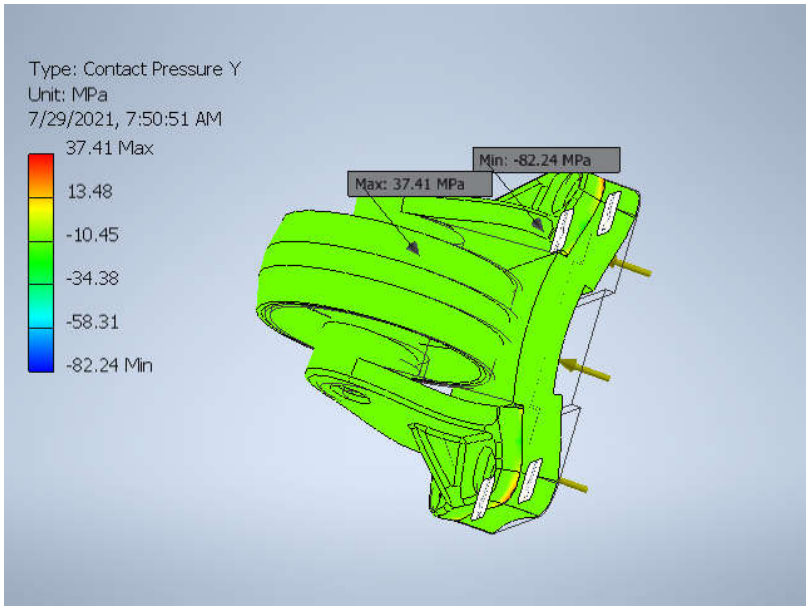
Contact Pressure X



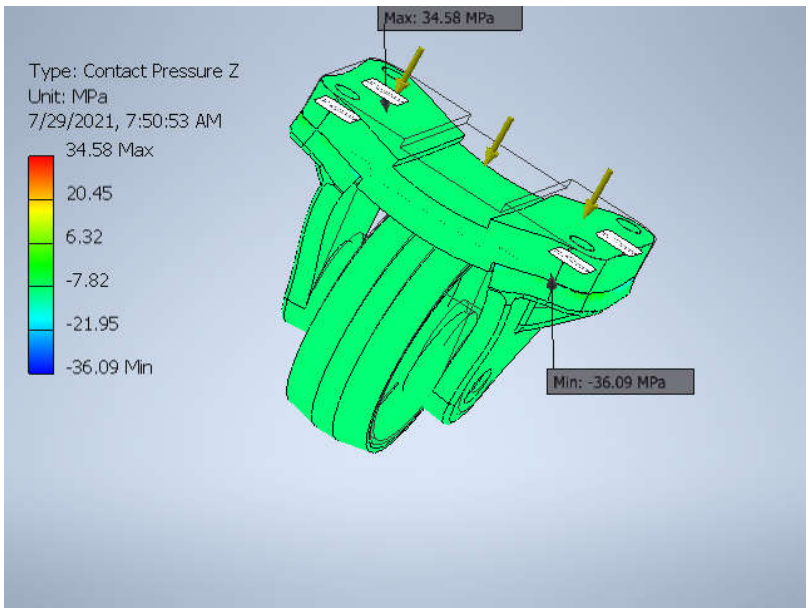


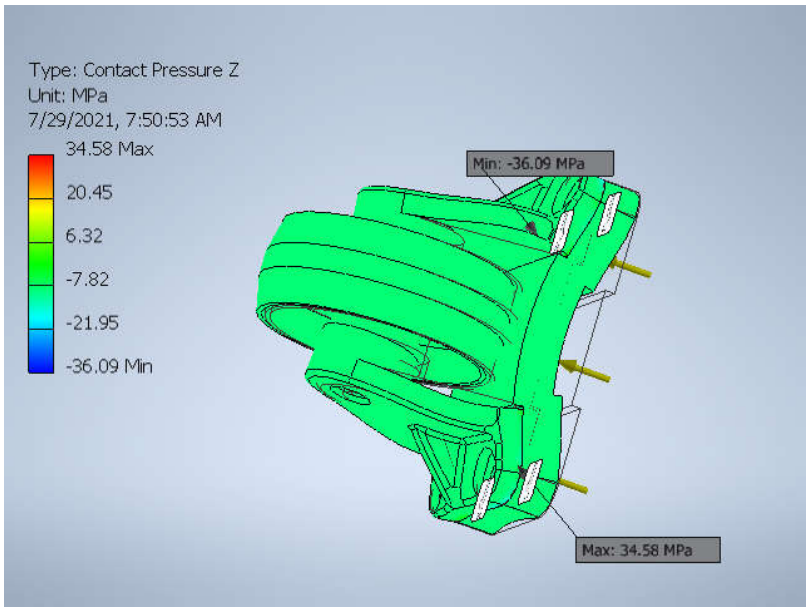
⊟ Contact Pressure Y





Contact Pressure Z





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