Die Set Stress Analysis Report

Analyzed File:	Assembly.iam
Autodesk Inventor Version:	2020 (Build 240168000, 168)
Creation Date:	7/30/2021, 11:33 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	3.72124 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	7/30/2021, 11:14 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)

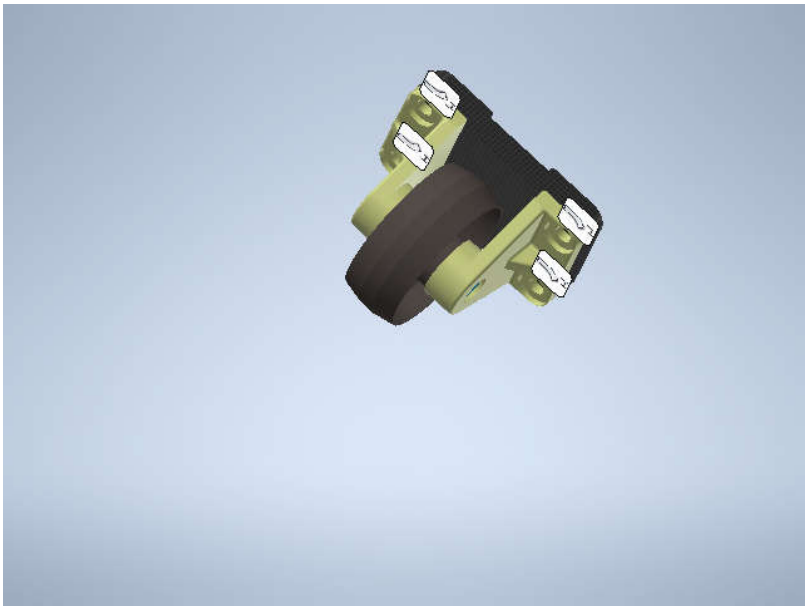
Name	Steel, Carbon	
General	Mass Density	7.85 g/cm^3
	Yield Strength	350 MPa
	Ultimate Tensile Strength	420 MPa
Stress	Young's Modulus	200 GPa
	Poisson's Ratio	0.29 ul
	Shear Modulus	77.5194 GPa
Part Name(s)	axle.ipt axleSupport.ipt topPlate.ipt wheel.ipt axleSupport.ipt	

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

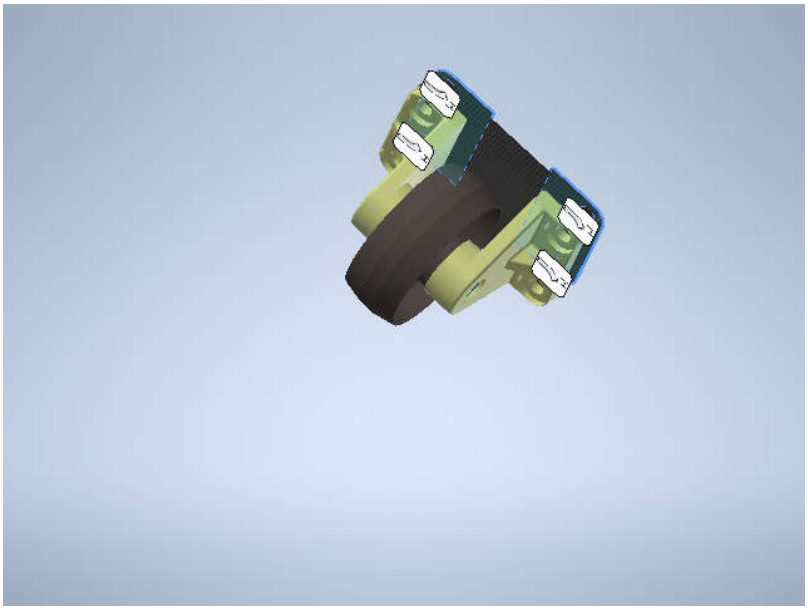
Selected Face(s)



Force:1

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

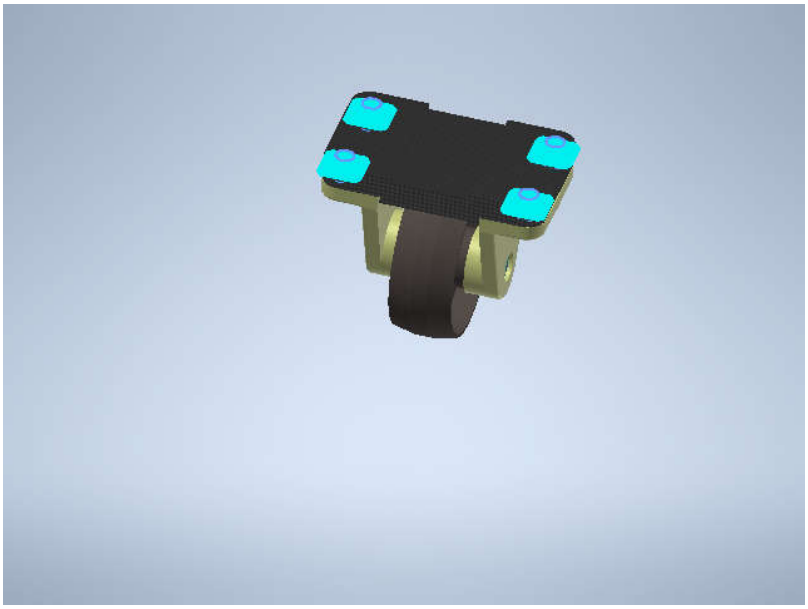
Selected Face(s)

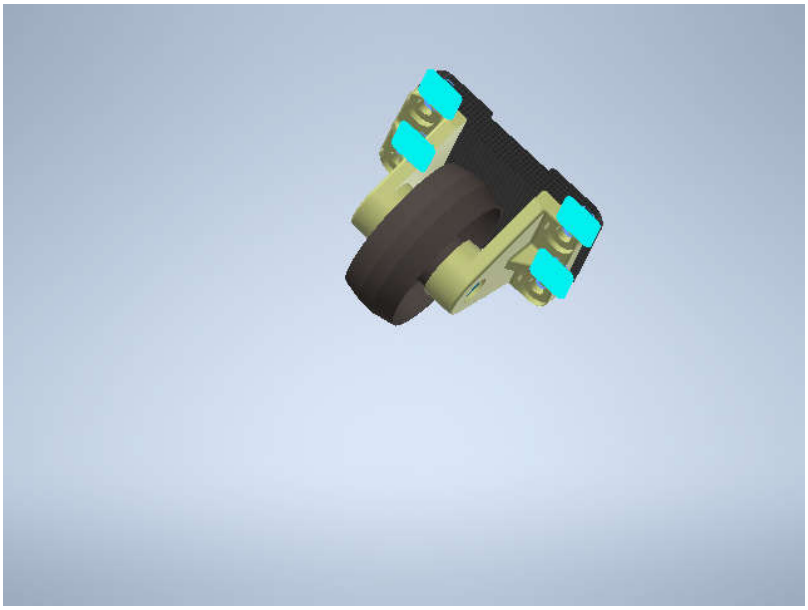


⊟ Fixed Constraint:1

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	100036 N	0 N	0 N m	0 N m
		100036 N		0 N m
		0 N		0 N m

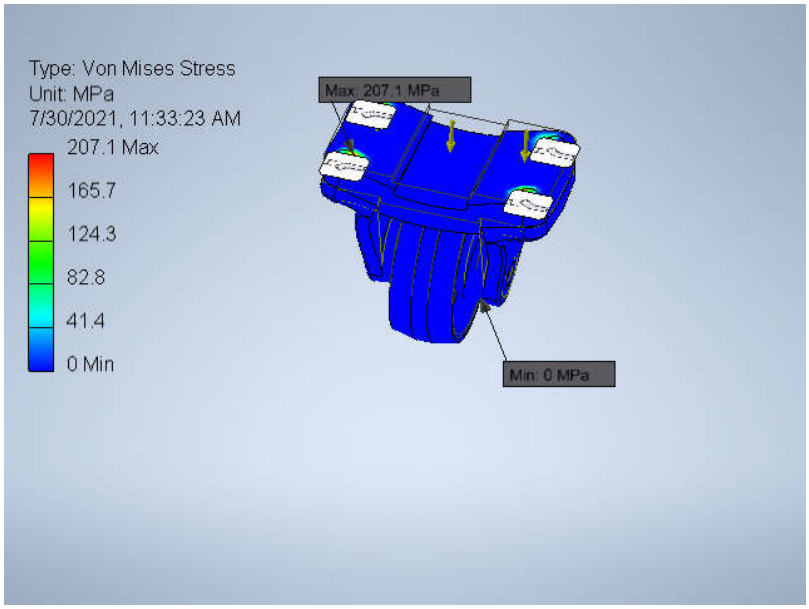
Result Summary

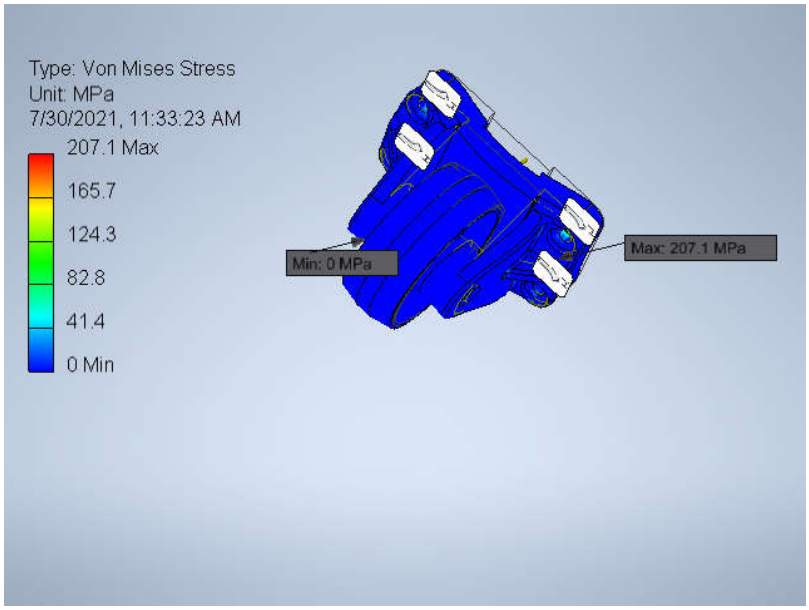
Name	Minimum	Maximum
Volume	474043 mm^3	
Mass	3.72123 kg	
Von Mises Stress	0.00322493 MPa	207.108 MPa
1st Principal Stress	-17.1598 MPa	268.496 MPa
3rd Principal Stress	-100.021 MPa	41.466 MPa
Displacement	0 mm	0.0205115 mm
Safety Factor	1.68994 ul	15 ul
Stress XX	-80.8636 MPa	207.506 MPa
Stress XY	-85.0226 MPa	85.6754 MPa
Stress XZ	-60.0941 MPa	56.5528 MPa

Stress YY	-30.7874 MPa	89.8891 MPa
Stress YZ	-69.2685 MPa	60.3441 MPa
Stress ZZ	-45.5473 MPa	120.342 MPa
X Displacement	-0.0100429 mm	0.0100404 mm
Y Displacement	-0.0205115 mm	0.00136981 mm
Z Displacement	-0.00211491 mm	0.00211708 mm
Equivalent Strain	0.0000000153406 ul	0.000974573 ul
1st Principal Strain	-0.00000889605 ul	0.00115202 ul
3rd Principal Strain	-0.000540547 ul	-0.00000000310791 ul
Strain XX	-0.000400021 ul	0.000821269 ul
Strain XY	-0.000548396 ul	0.000552606 ul
Strain XZ	-0.000387607 ul	0.000364766 ul
Strain YY	-0.000268293 ul	0.000297297 ul
Strain YZ	-0.000446782 ul	0.000389219 ul
Strain ZZ	-0.000229468 ul	0.000437967 ul
Contact Pressure	0 MPa	98.9165 MPa
Contact Pressure X	-60.1838 MPa	64.5092 MPa
Contact Pressure Y	-82.255 MPa	37.3392 MPa
Contact Pressure Z	-35.8708 MPa	34.4177 MPa

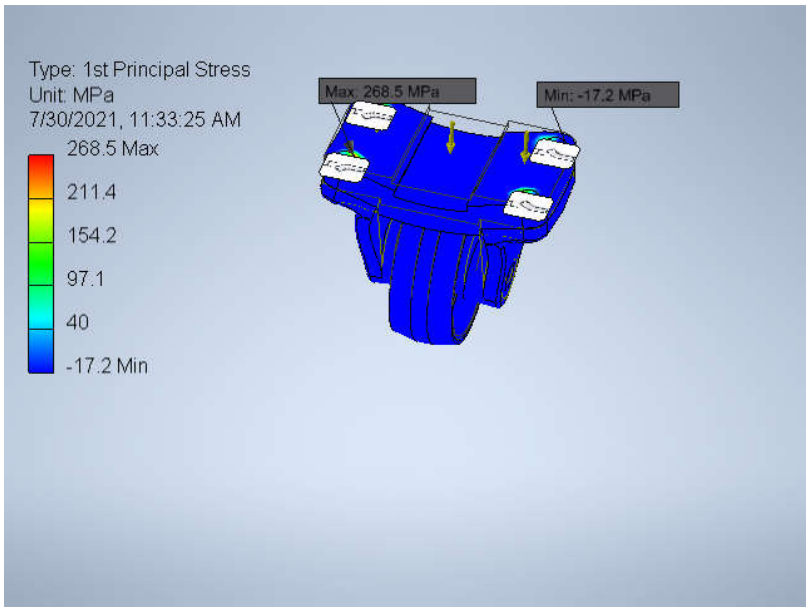
Figures

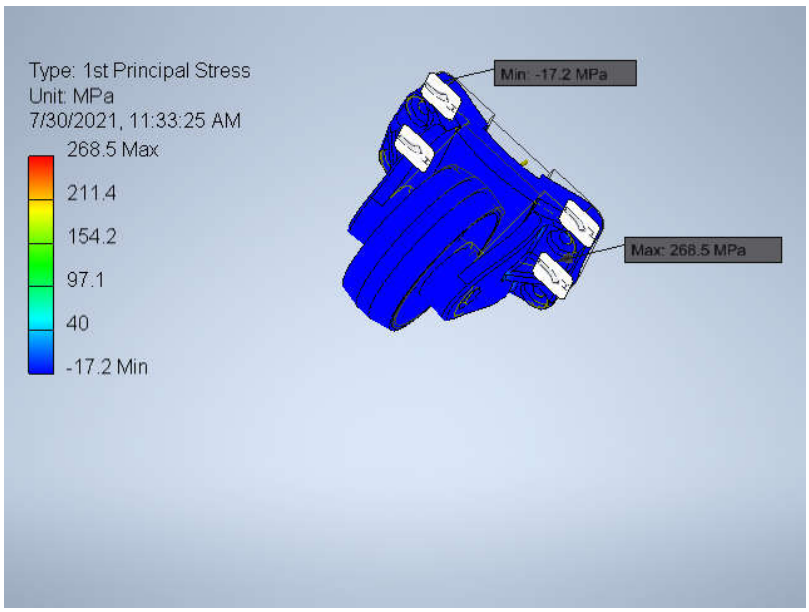
Von Mises Stress



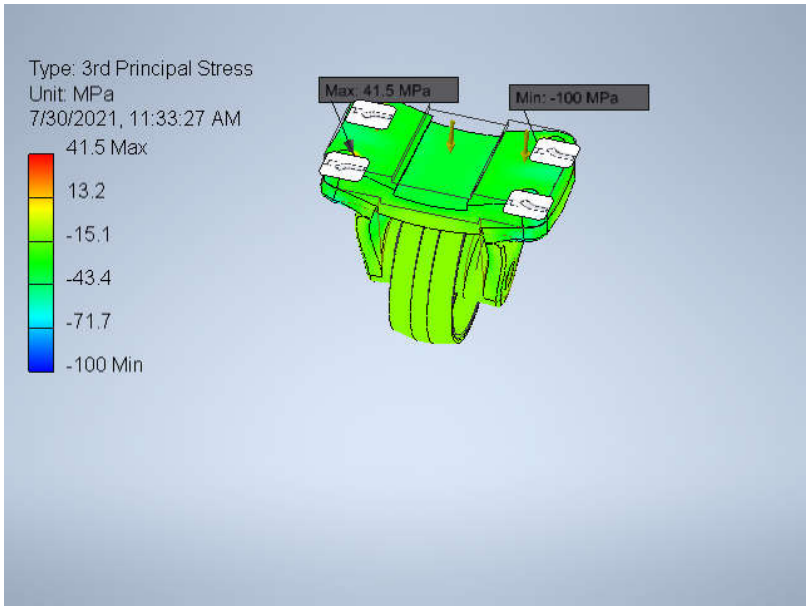


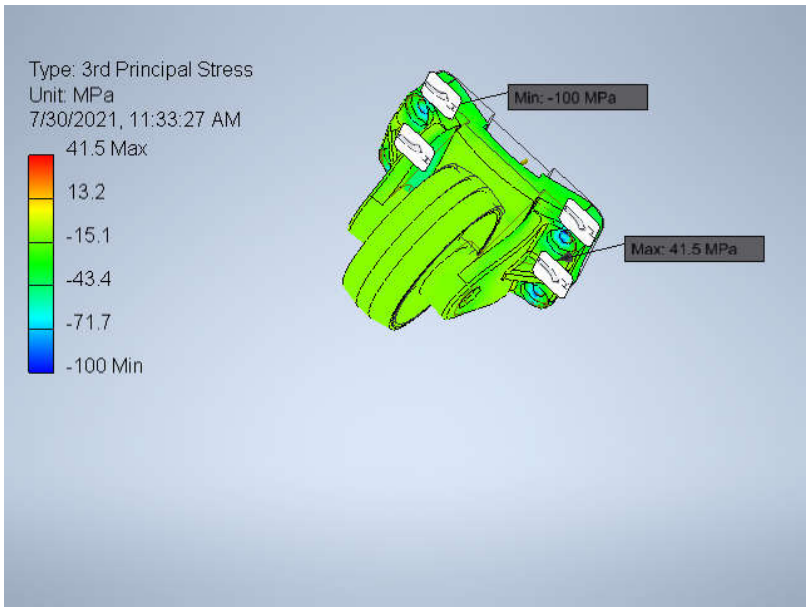
1st Principal Stress



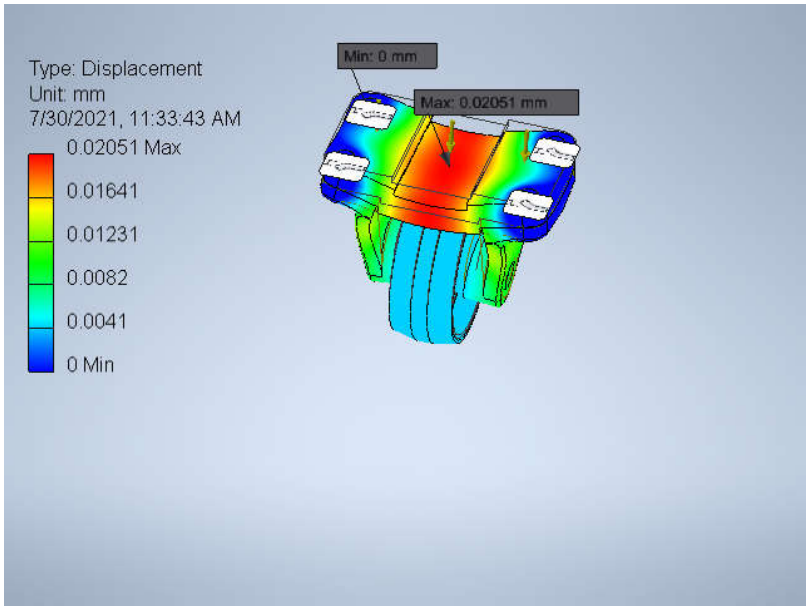


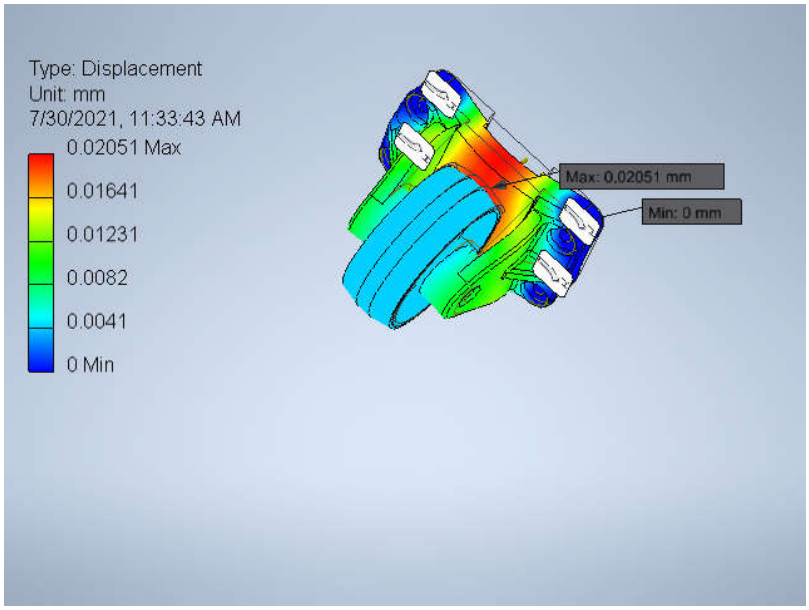
3rd Principal Stress



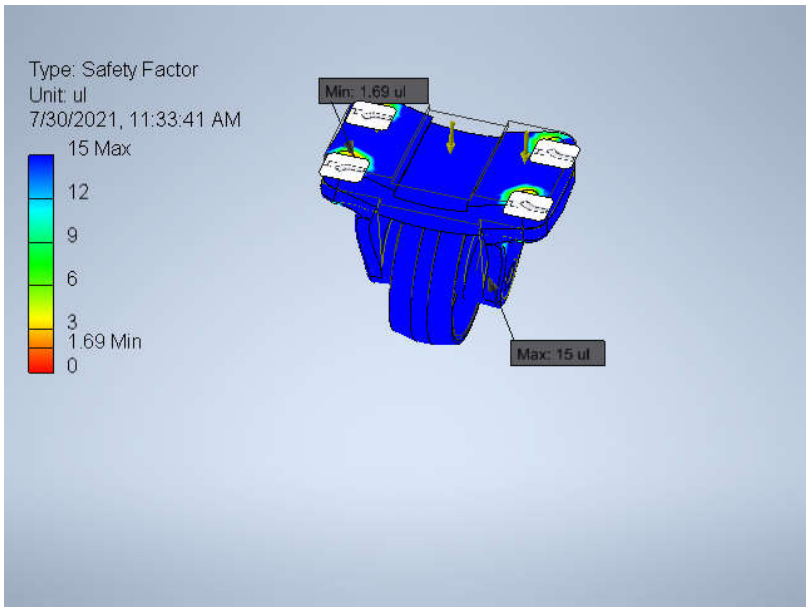


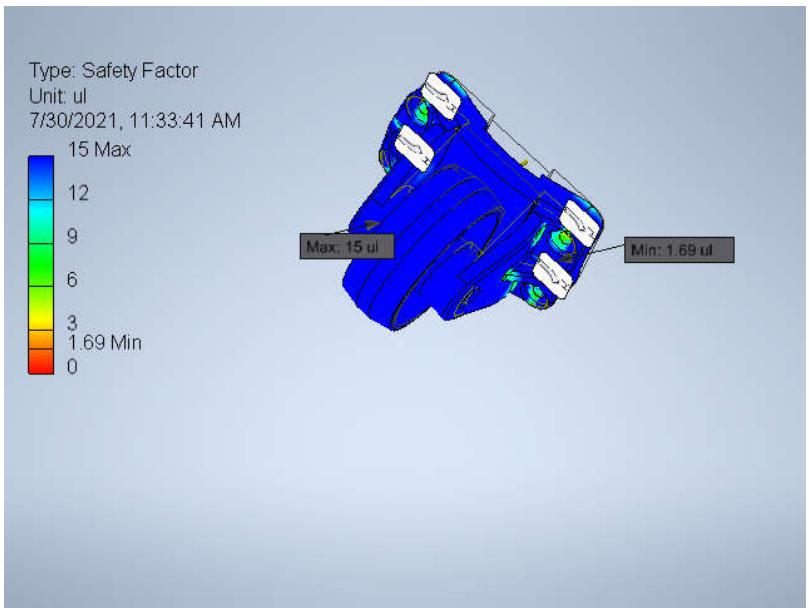
Displacement



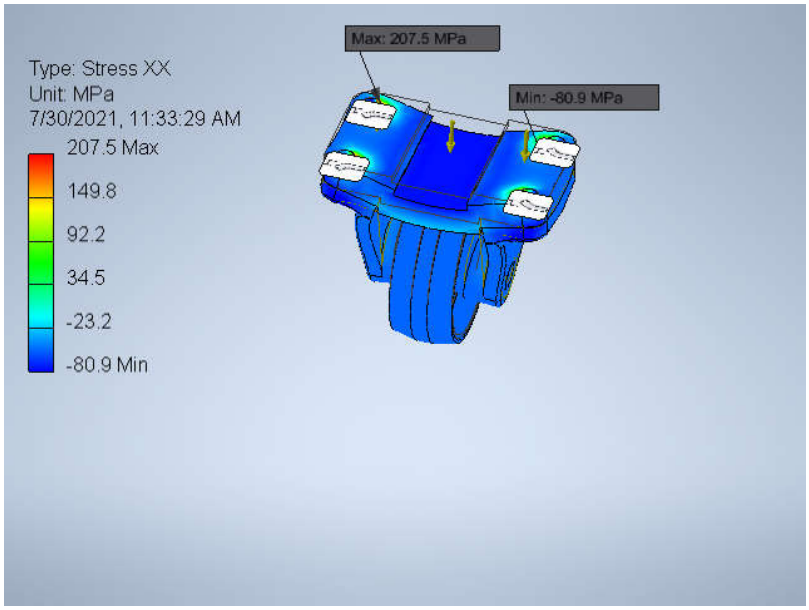


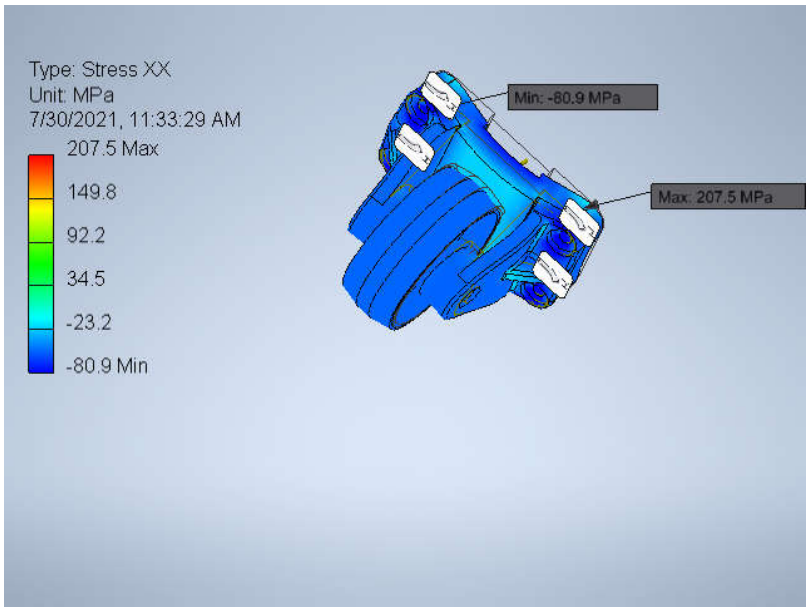
Safety Factor



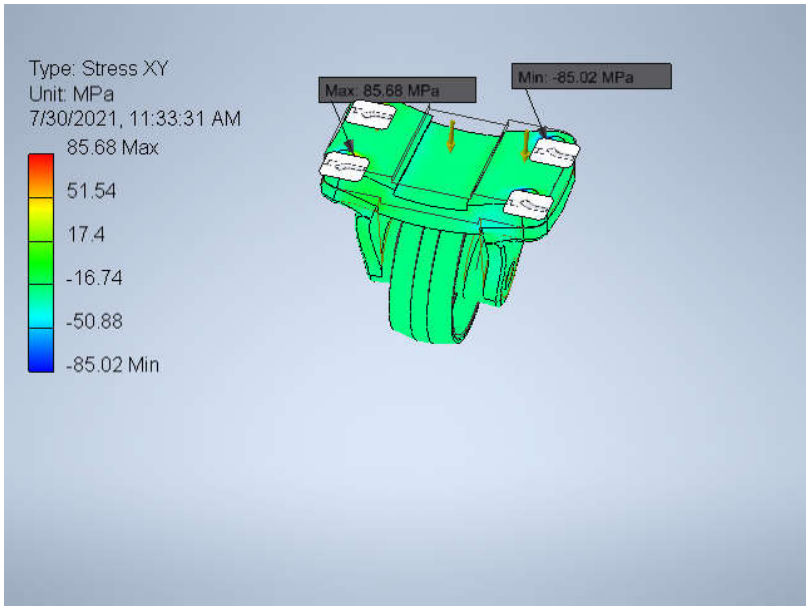


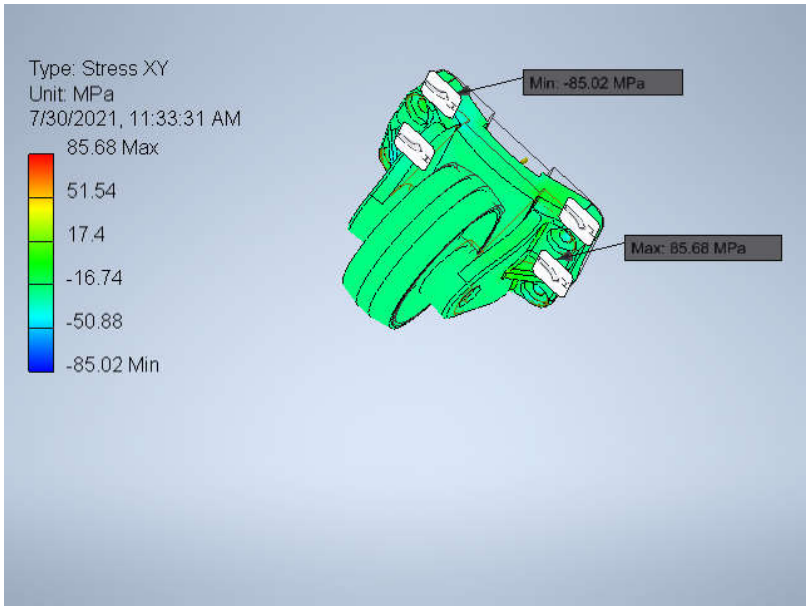
Stress XX





Stress XY

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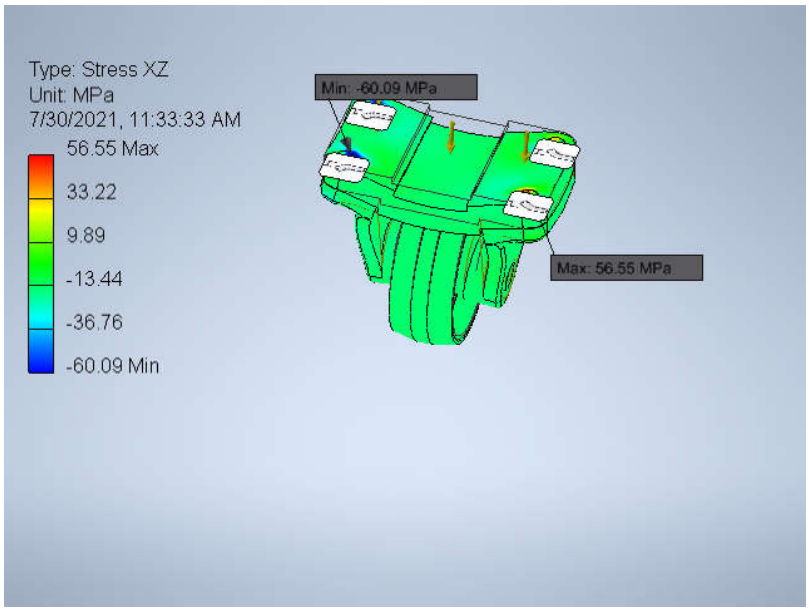
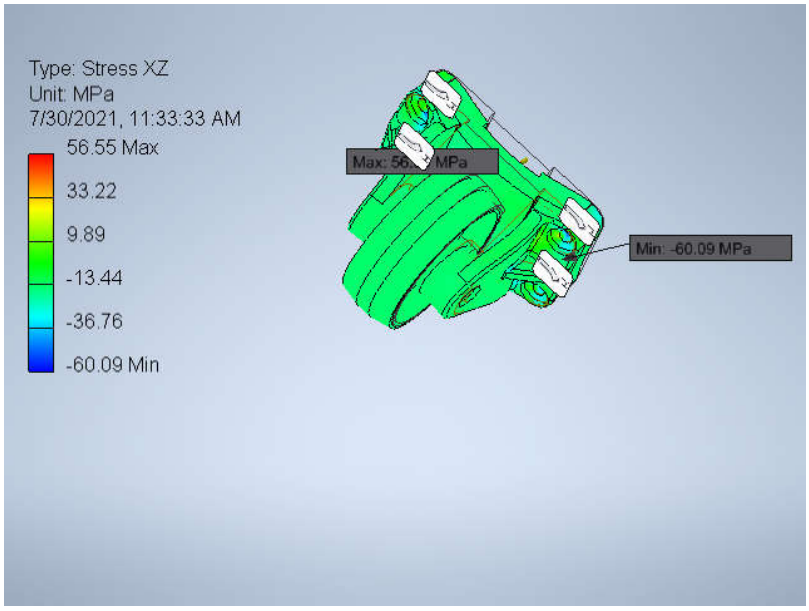
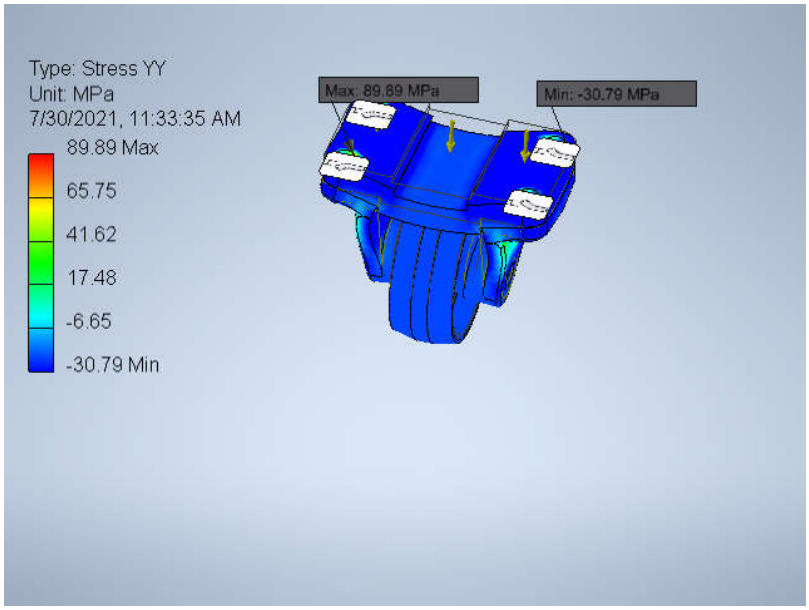
7/30/2021, 11:33:31 AM
85.68 Max
51.54
17.4
-16.74
-50.88
-85.02 Min
Min: -85.02 MPa
Max: 85.68 MPa

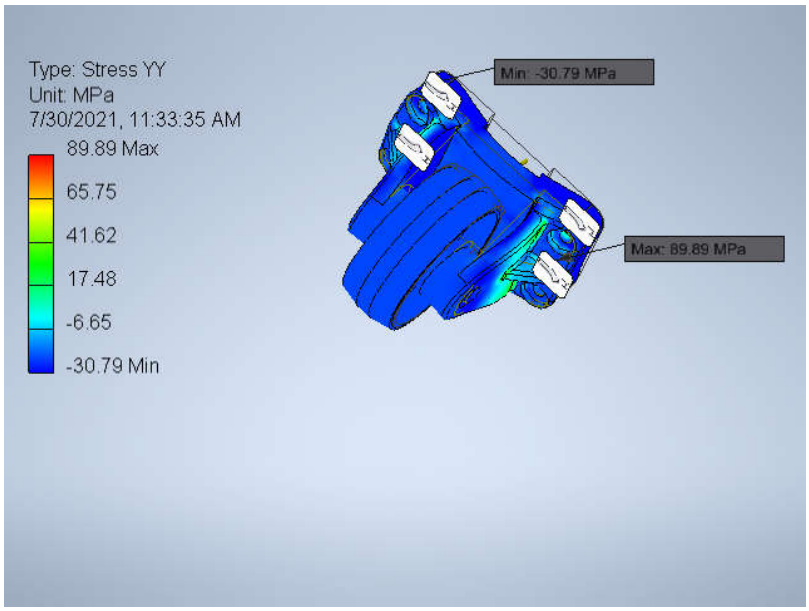
Stress XZ


Type: Stress XZ
Unit: MPa
7/30/2021, 11:33:33 AM
56.55 Max
33.22
9.89
-13.44
-36.76
-60.09 Min
Min: -60.09 MPa
Max: 56.55 MPa

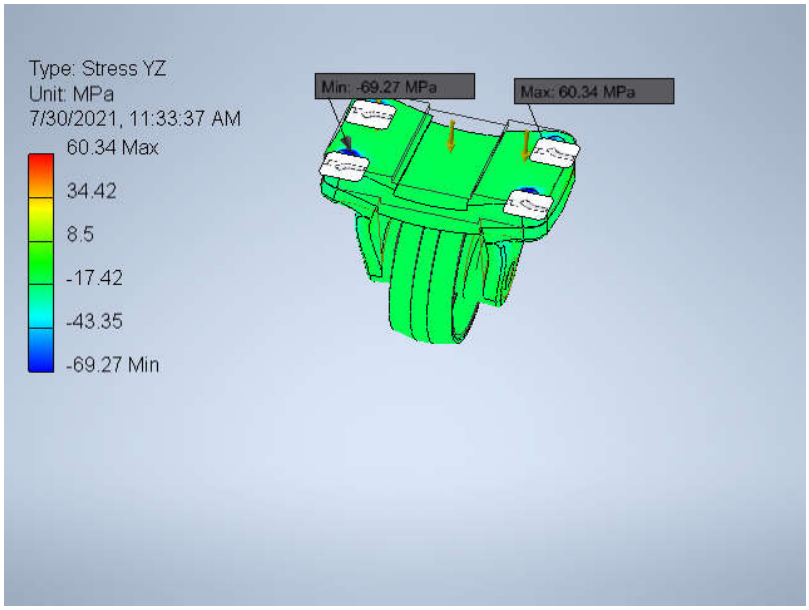

Type: Stress XZ
Unit: MPa
7/30/2021, 11:33:33 AM
56.55 Max
33.22
9.89
-13.44
-36.76
-60.09 Min
Min: -60.09 MPa

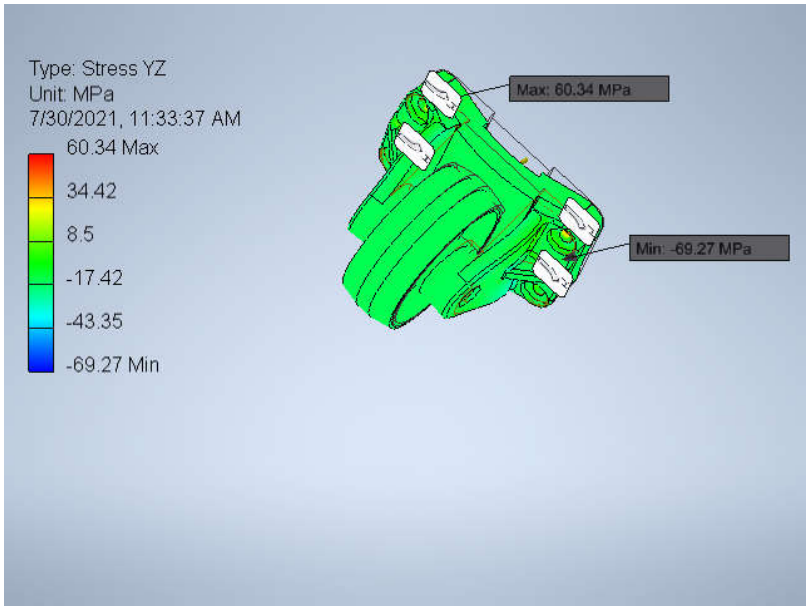
Stress YY





Stress YZ

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Unit: MPa
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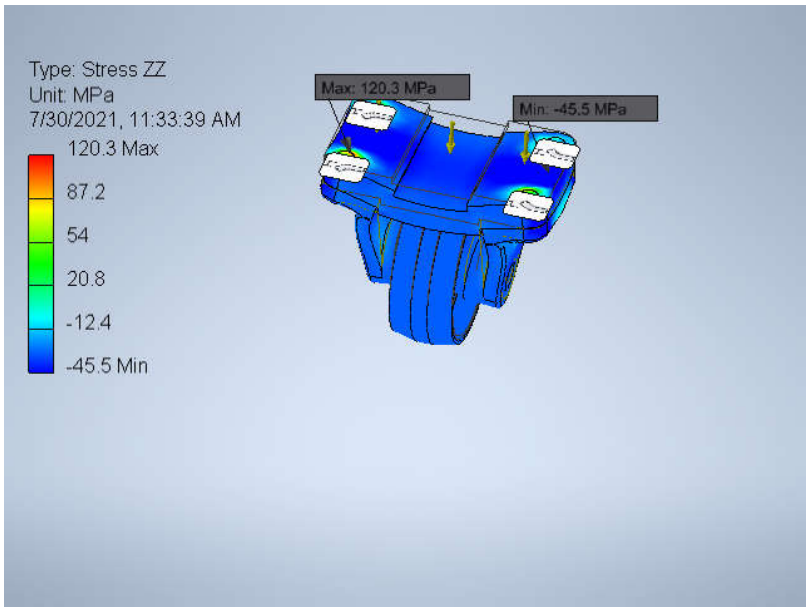
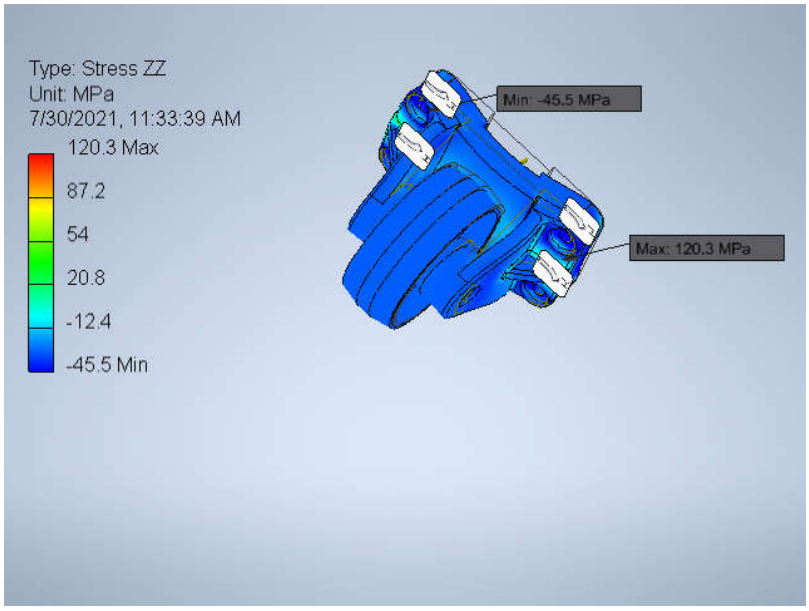
60.34 Max
34.42
8.5
-17.42
-43.35
-69.27 Min
Max: 60.34 MPa
Min: -69.27 MPa

Stress ZZ


Type: Stress ZZ
Unit: MPa
7/30/2021, 11:33:39 AM
120.3 Max
87.2
54
20.8
-12.4
-45.5 Min
Max: 120.3 MPa
Min: -45.5 MPa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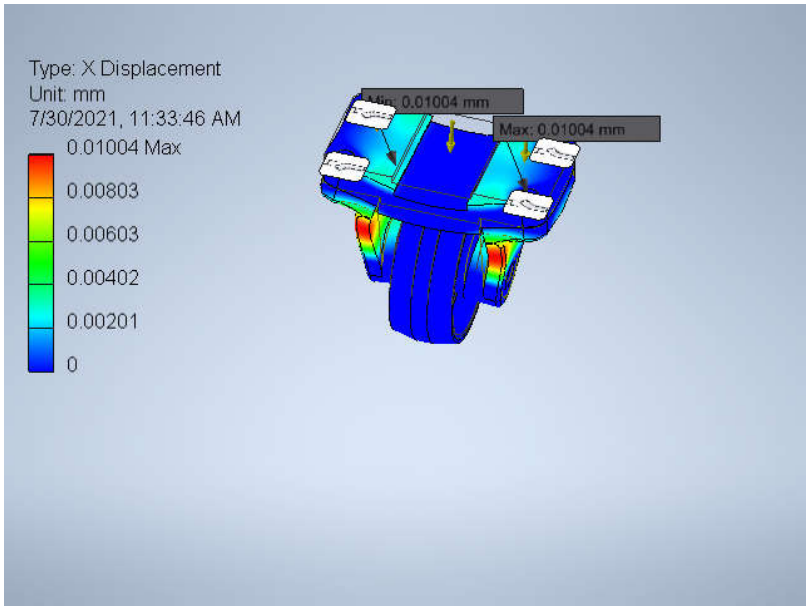
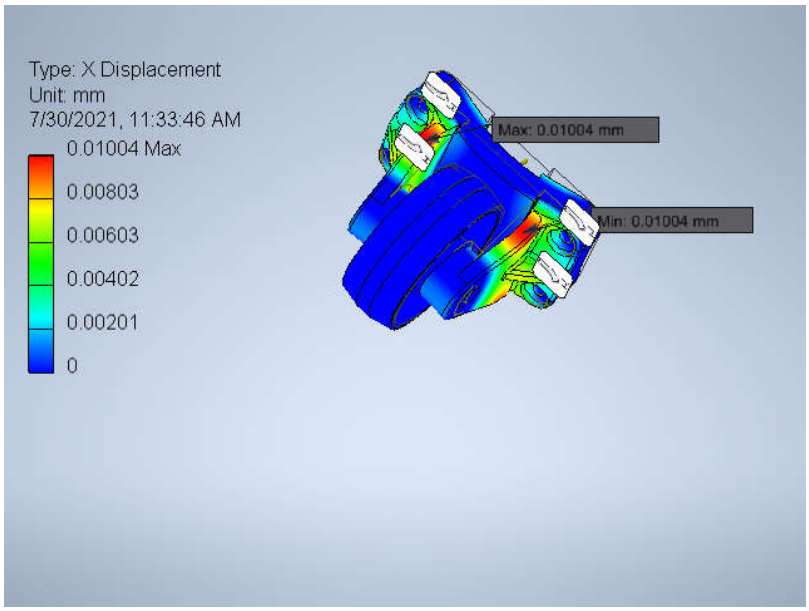
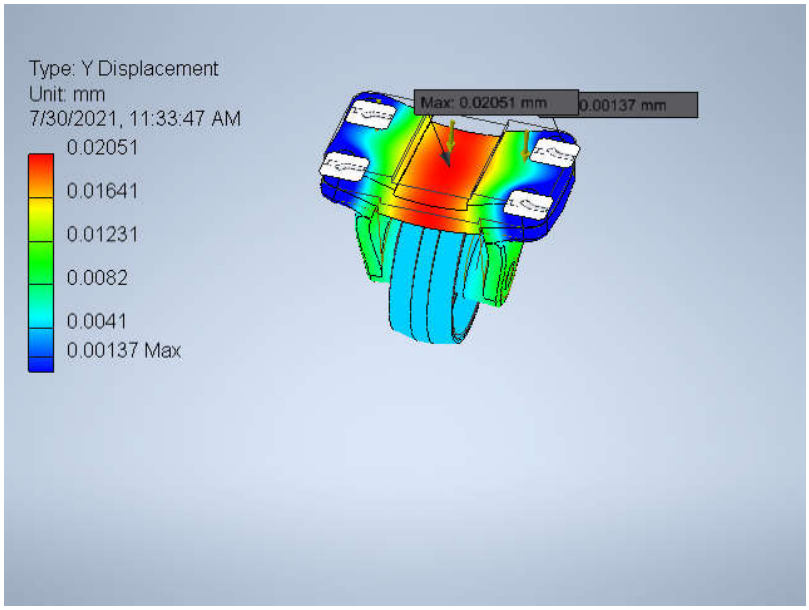
120.3 Max
87.2
54
20.8
-12.4
-45.5 Min
Min: -45.5 MPa
Max: 120.3 MPa

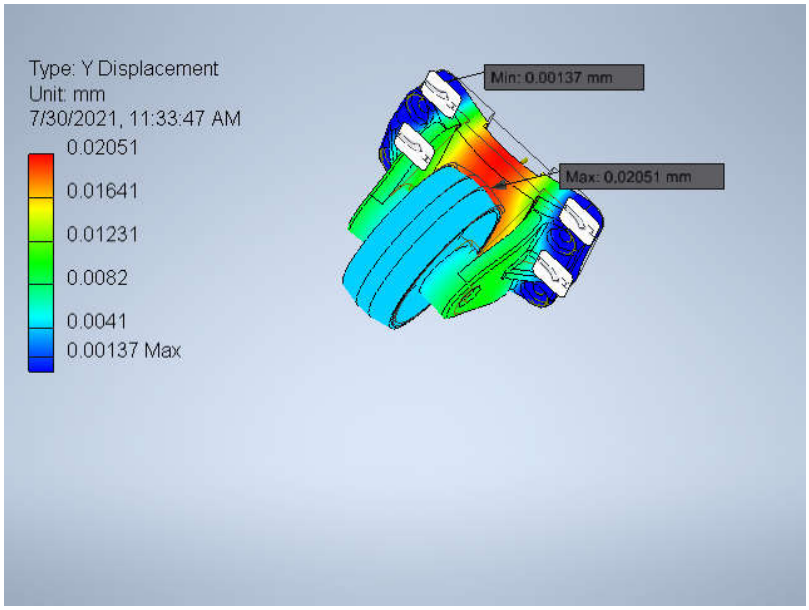
X Displacement



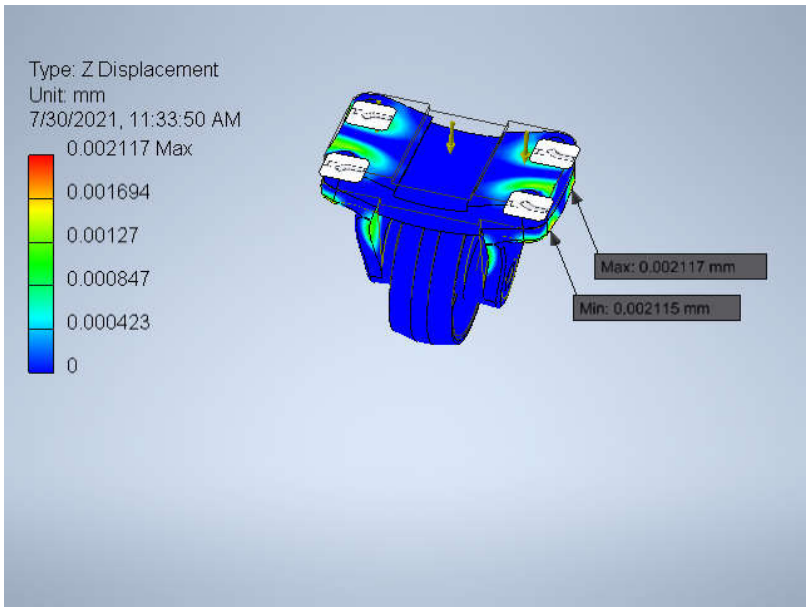


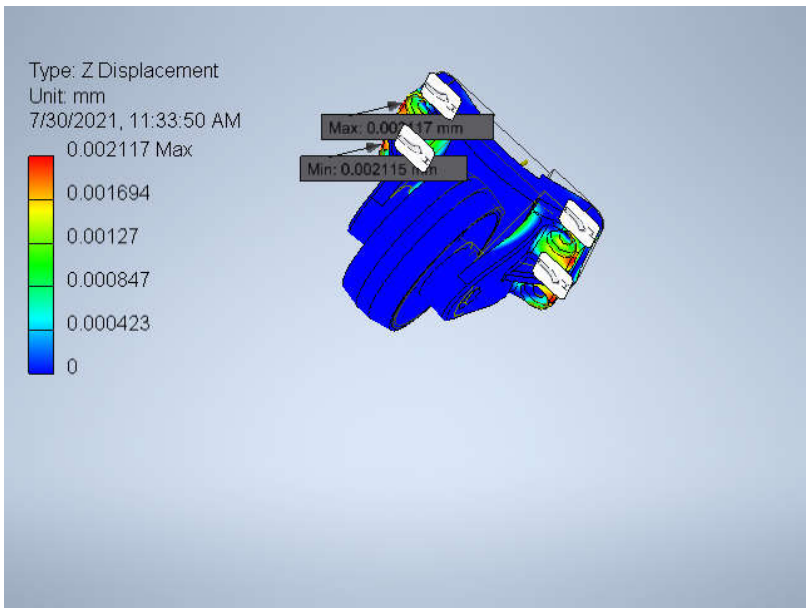
Y Displacement



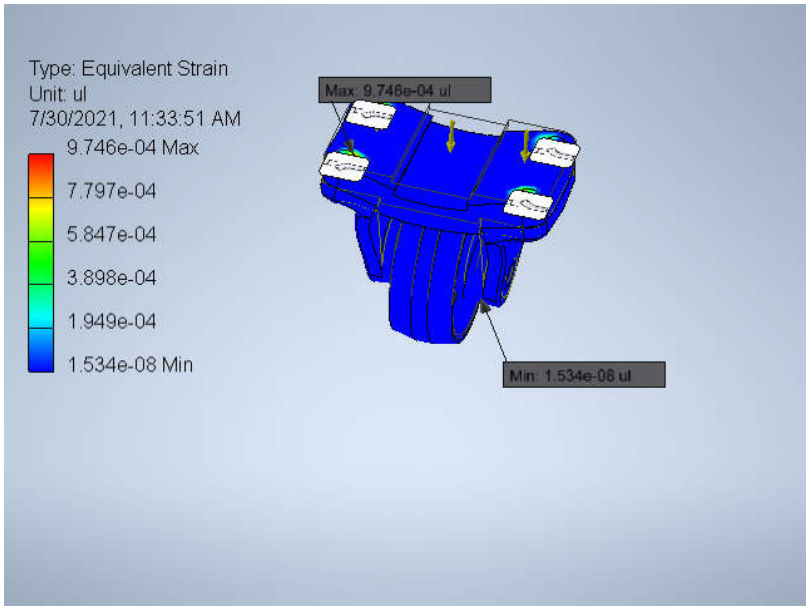


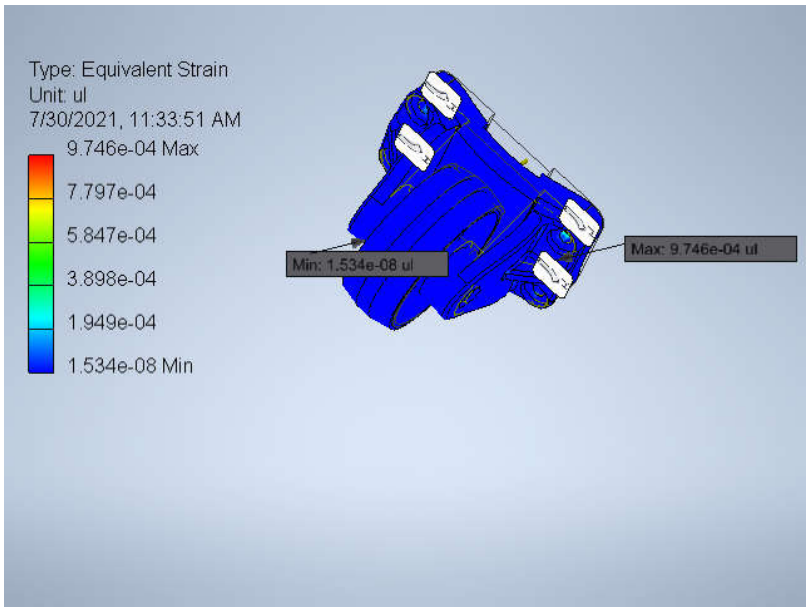
Z Displacement



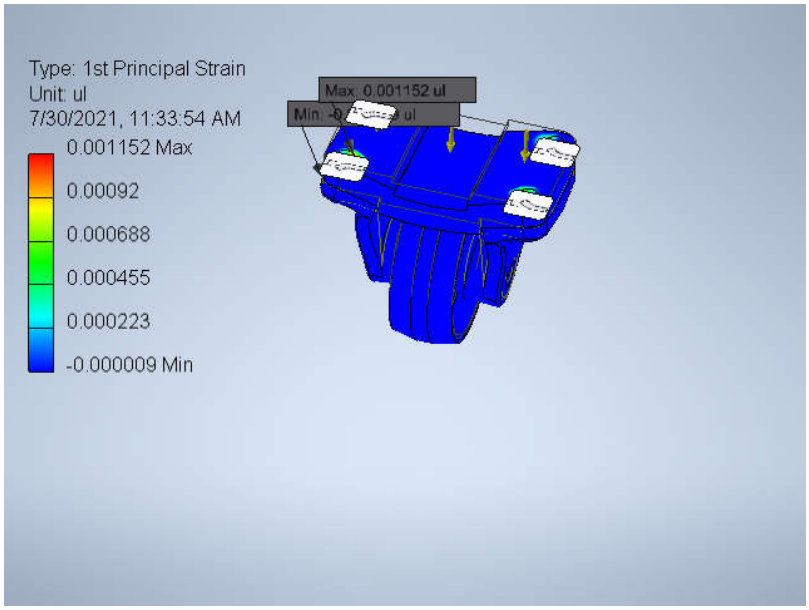


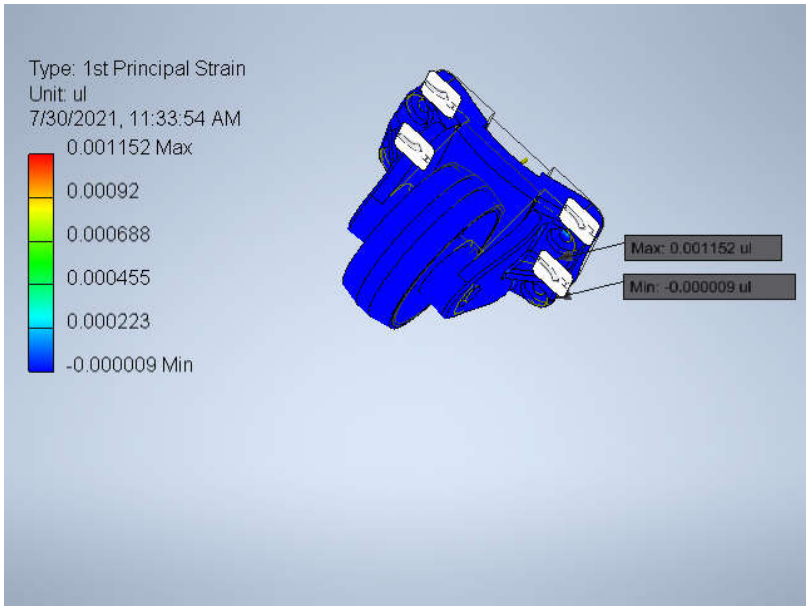
Equivalent Strain



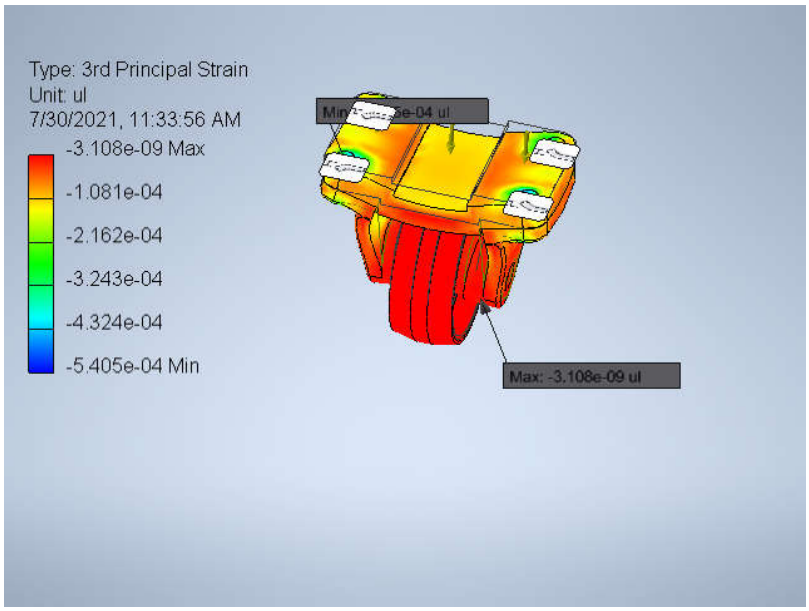


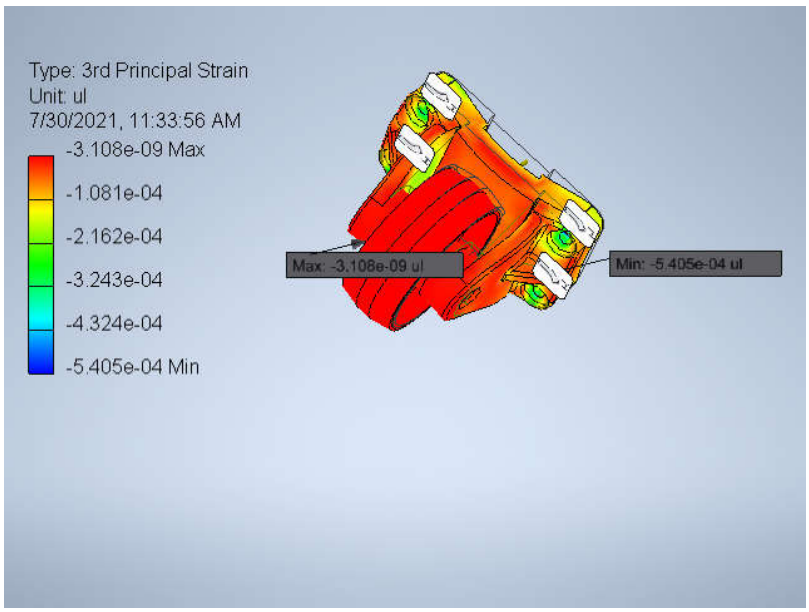
1st Principal Strain



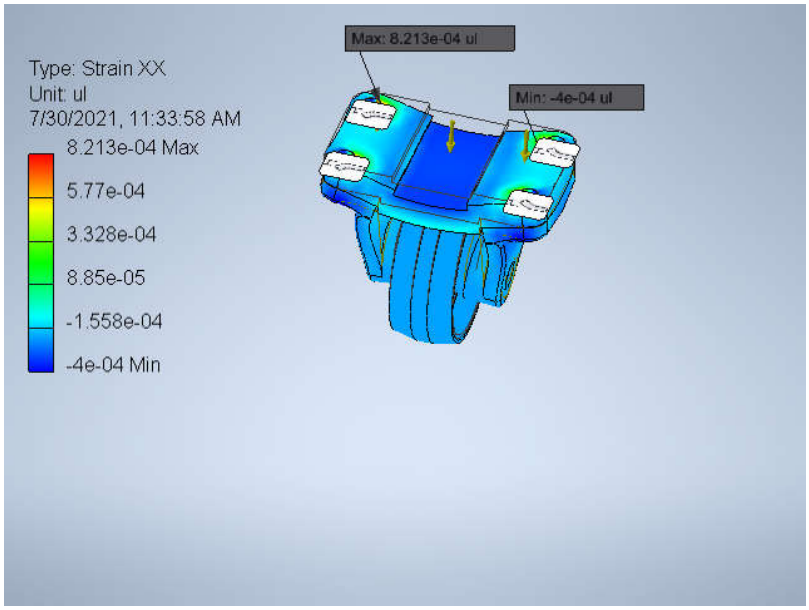


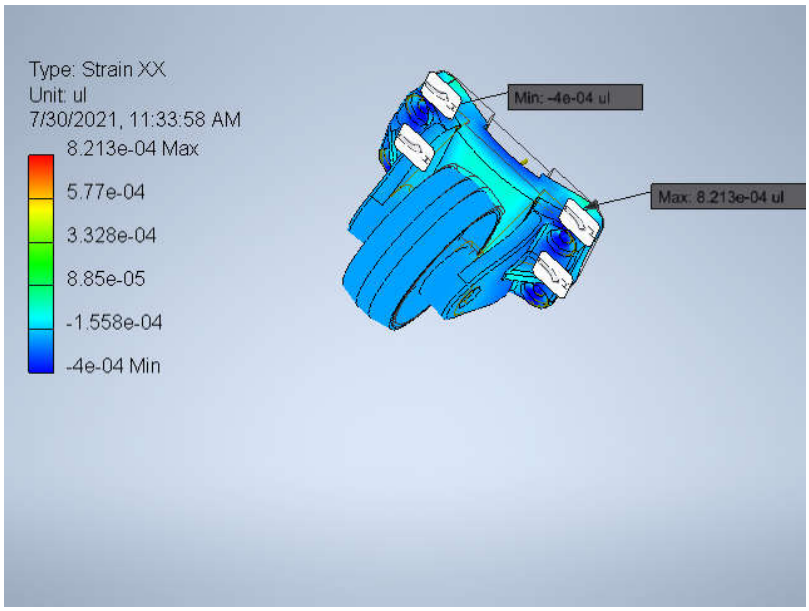
3rd Principal Strain



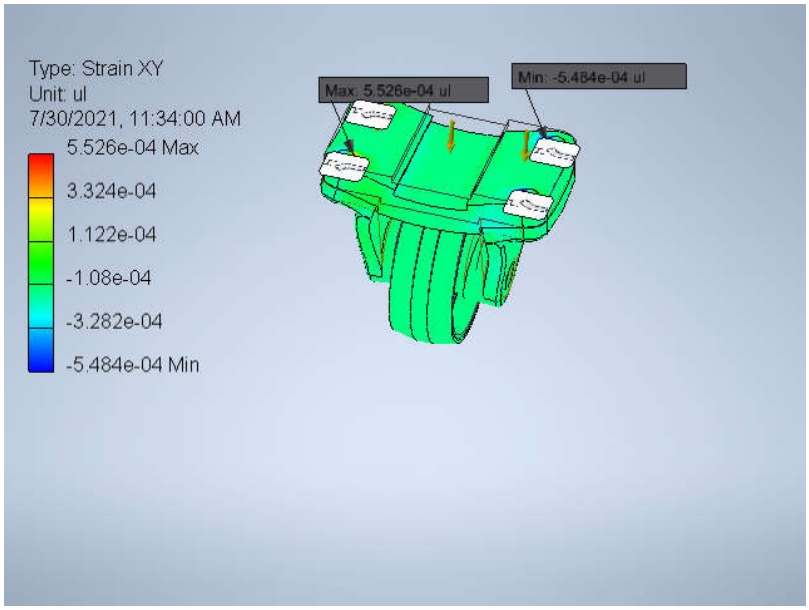


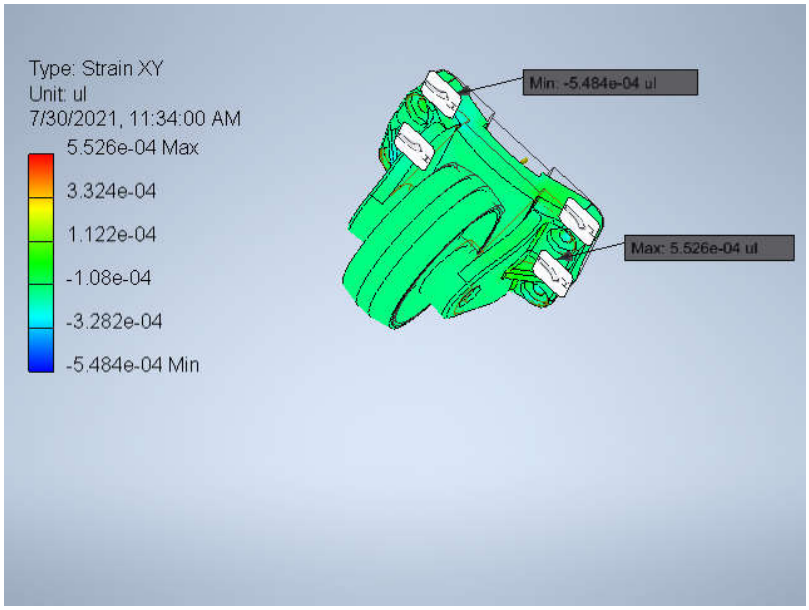
Strain XX





Strain XY

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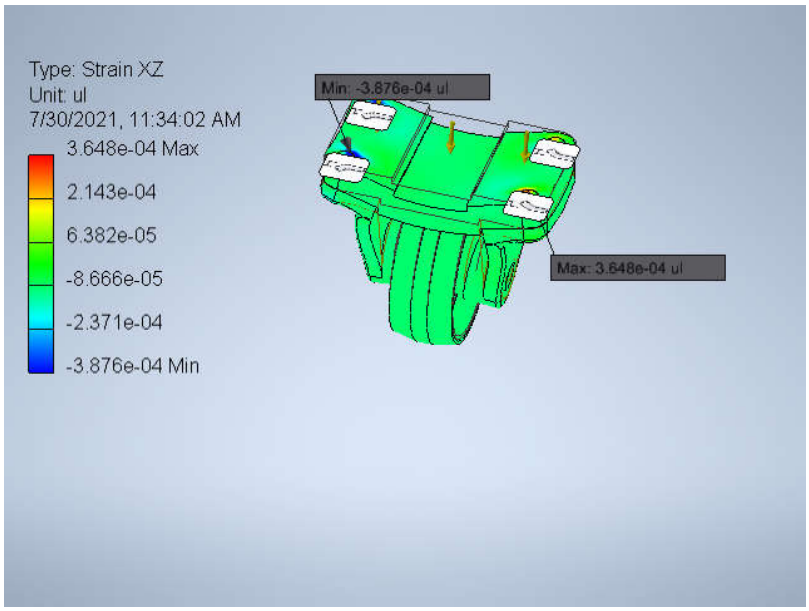
7/30/2021, 11:34:00 AM
5.526e-04 Max
3.324e-04
1.122e-04
-1.08e-04
-3.282e-04
-5.484e-04 Min
Min: -5.484e-04 ul
Max: 5.526e-04 ul

⊟ Strain XZ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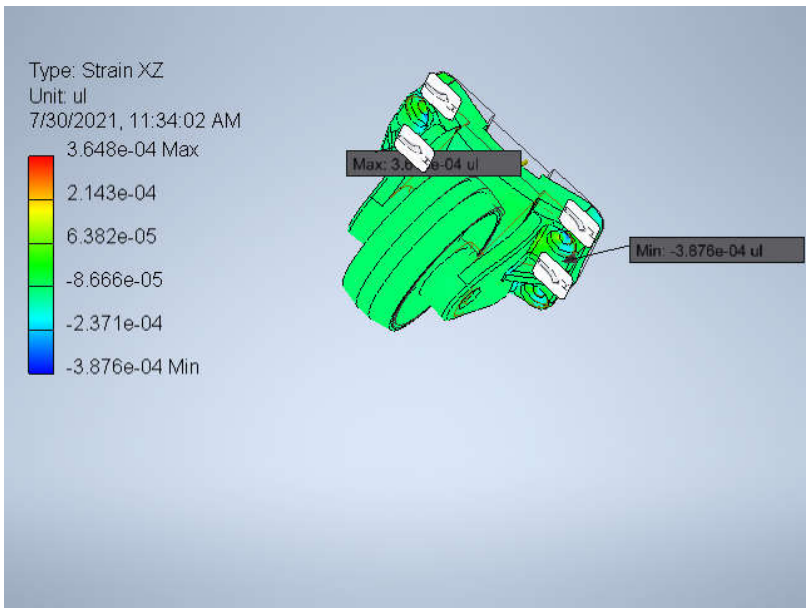
Unit: ul
7/30/2021, 11:34:02 AM
3.648e-04 Max
2.143e-04
6.382e-05
-8.666e-05
-2.371e-04
-3.876e-04 Min
Min: -3.876e-04 ul
Max: 3.648e-04 ul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2.143e-04
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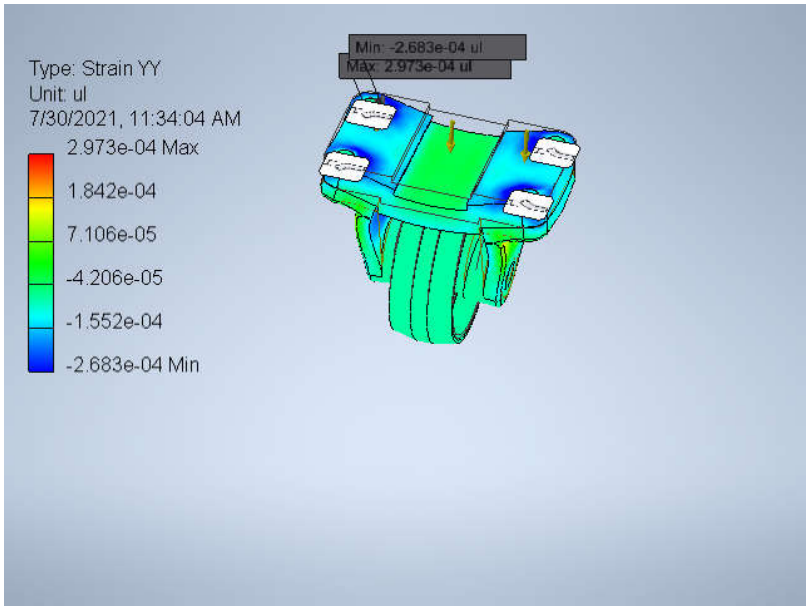
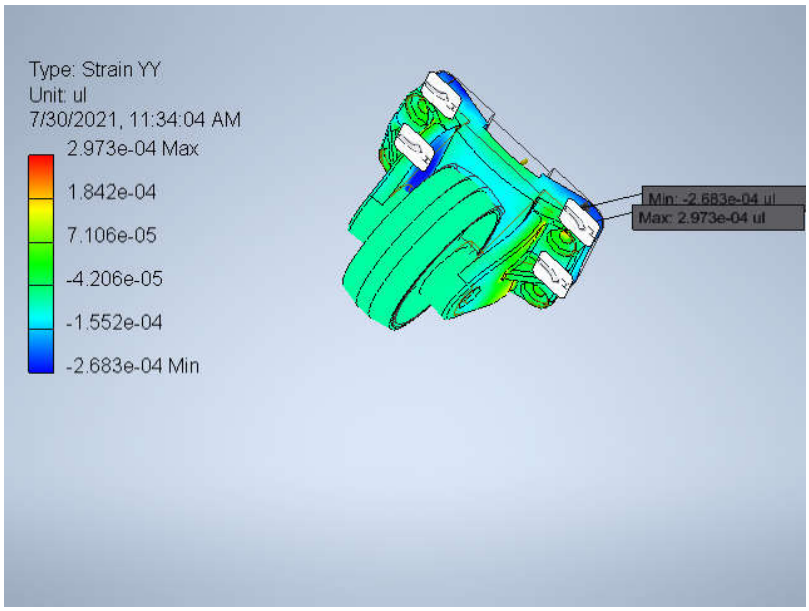
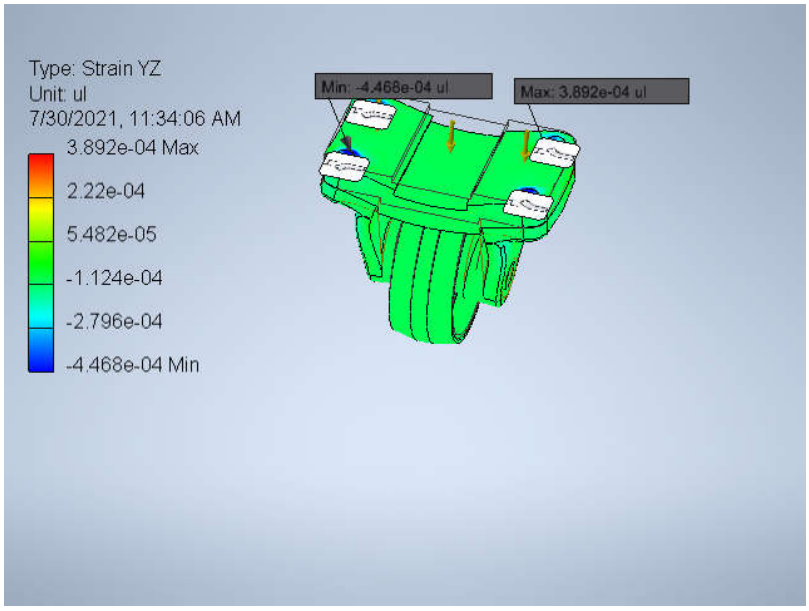
-2.371e-04
-3.876e-04 Min
Min: -3.876e-04 ul

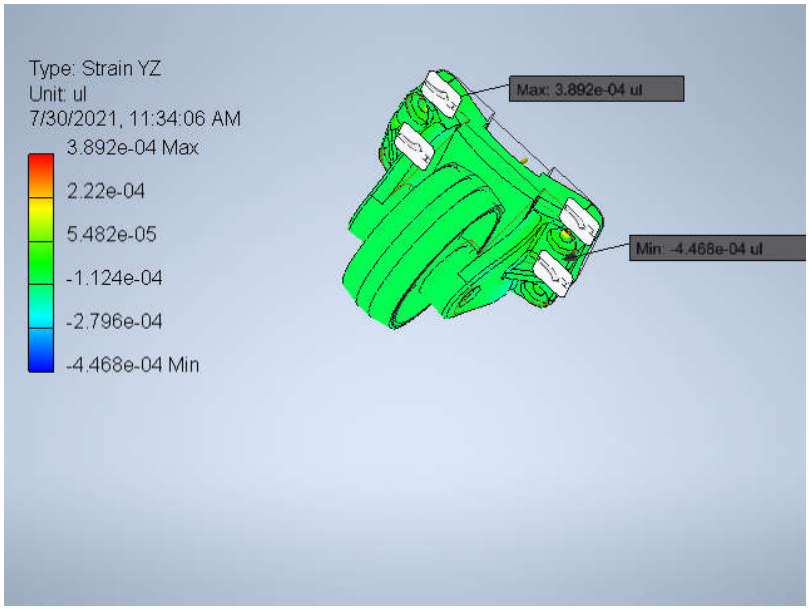
Strain YY





Strain YZ

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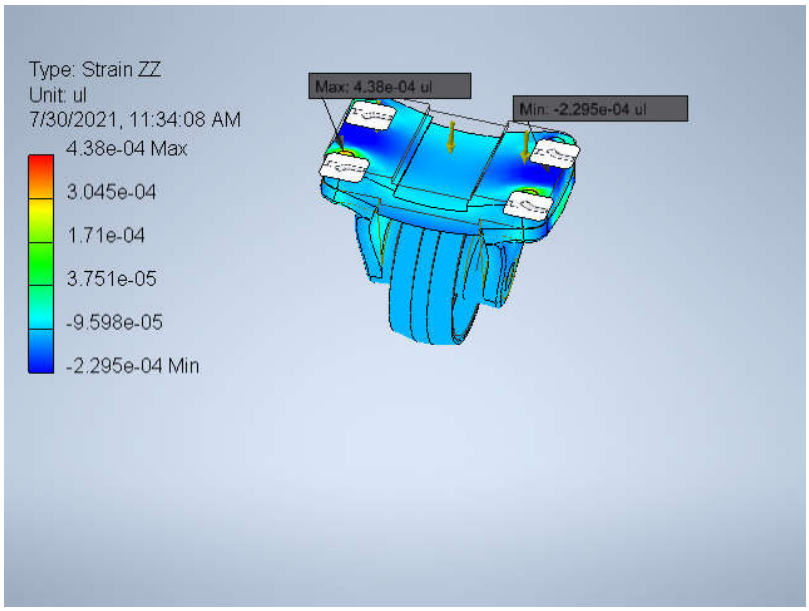
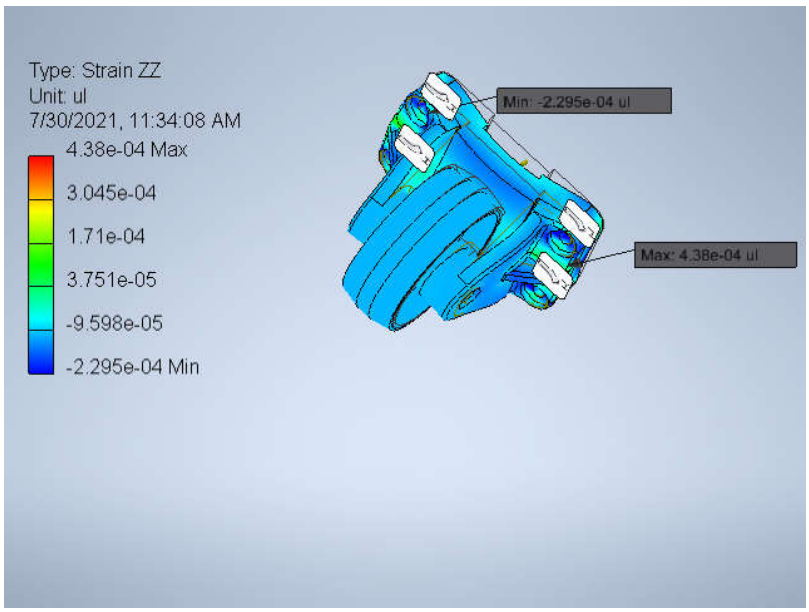
3.892e-04 Max
2.22e-04
5.482e-05
-1.124e-04
-2.796e-04
-4.468e-04 Min
Max: 3.892e-04 ul
Min: -4.468e-04 ul

⊟ Strain ZZ


Type: Strain ZZ
Unit: ul
7/30/2021, 11:34:08 AM
4.38e-04 Max
3.045e-04
1.71e-04
3.751e-05
-9.598e-05
-2.295e-04 Min
Max: 4.38e-04 ul
Min: -2.295e-04 ul


Type: Strain ZZ
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7/30/2021, 11:34:08 AM
4.38e-04 Max
3.045e-04
1.71e-04
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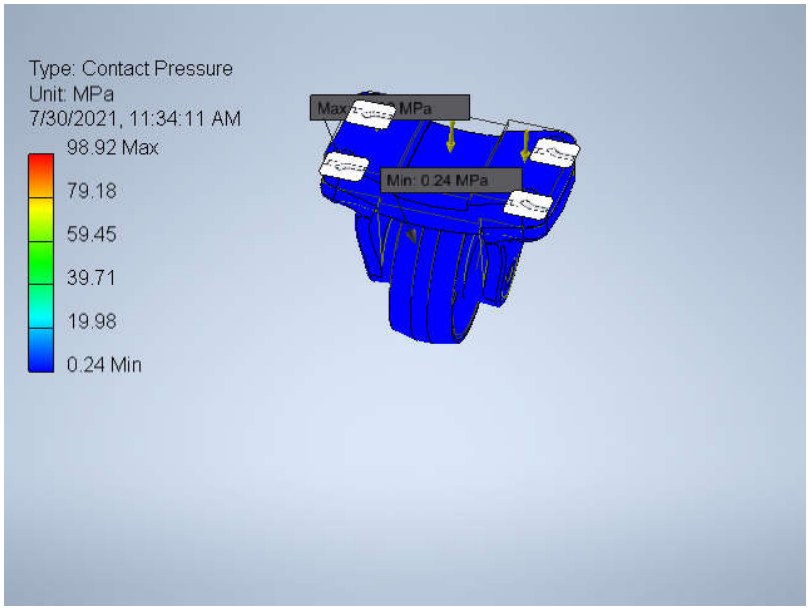
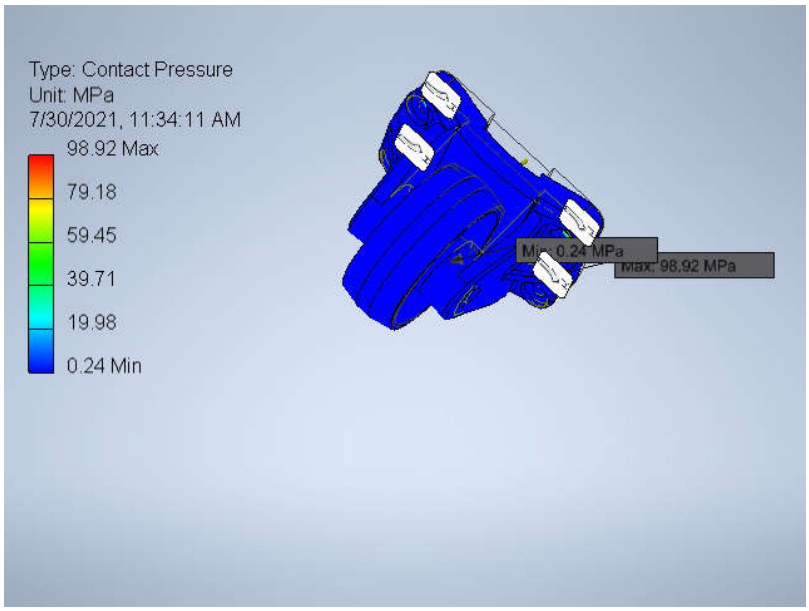
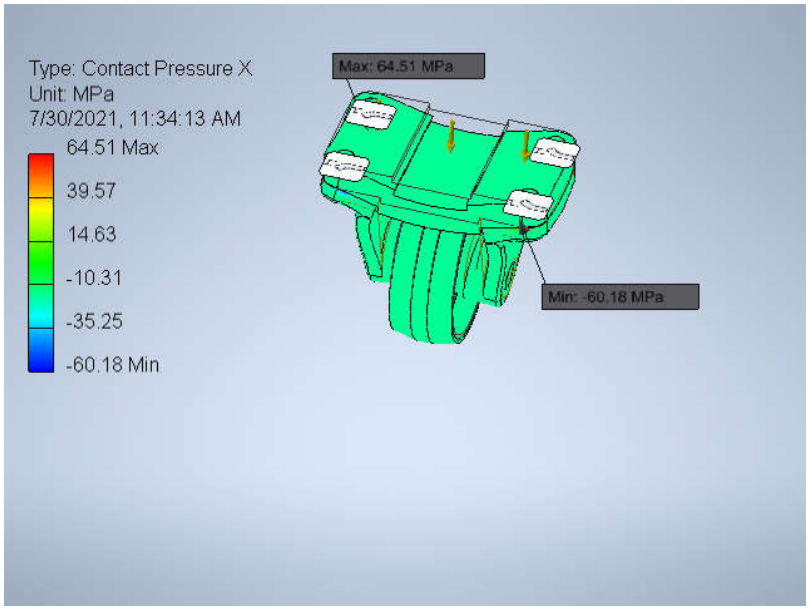
-9.598e-05
-2.295e-04 Min
Min: -2.295e-04 ul
Max: 4.38e-04 ul

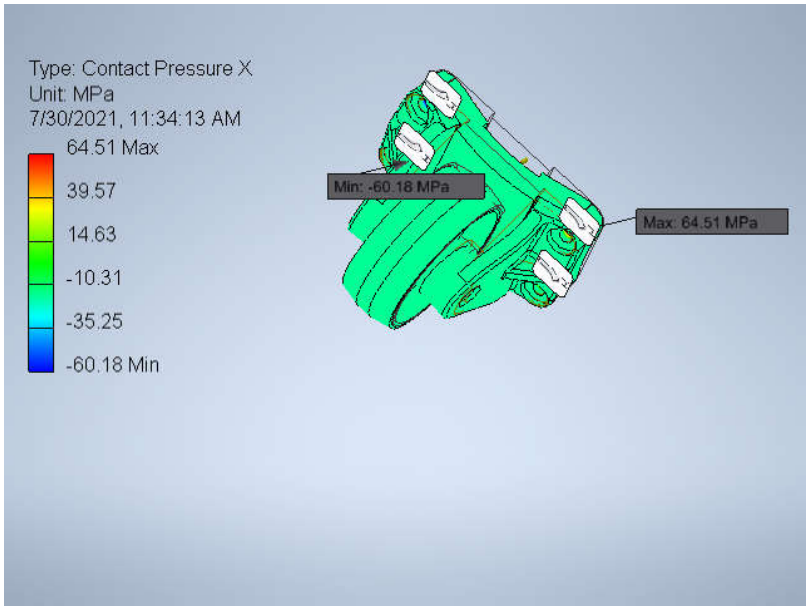
Contact Pressure



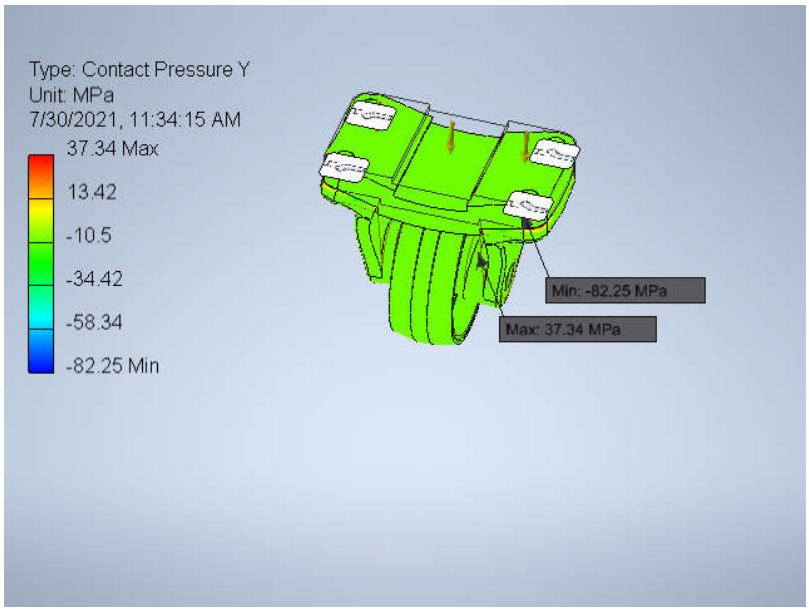


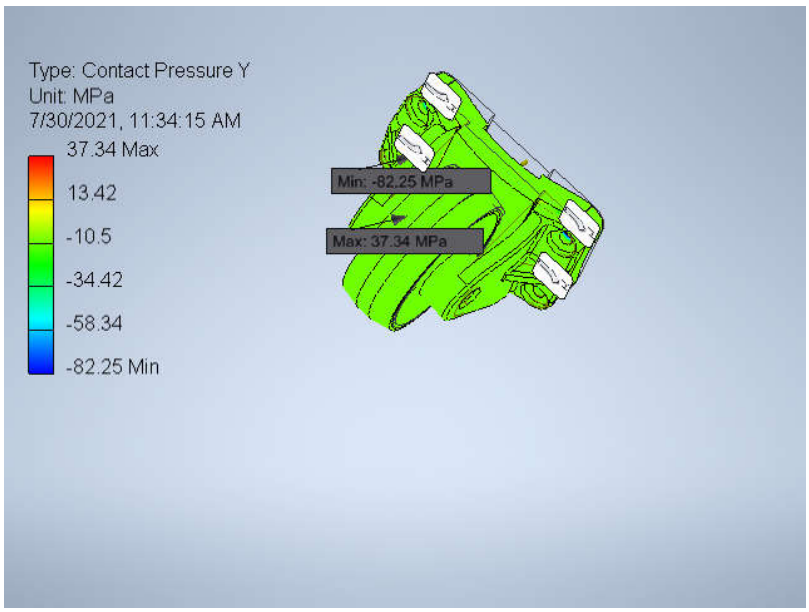
Contact Pressure X



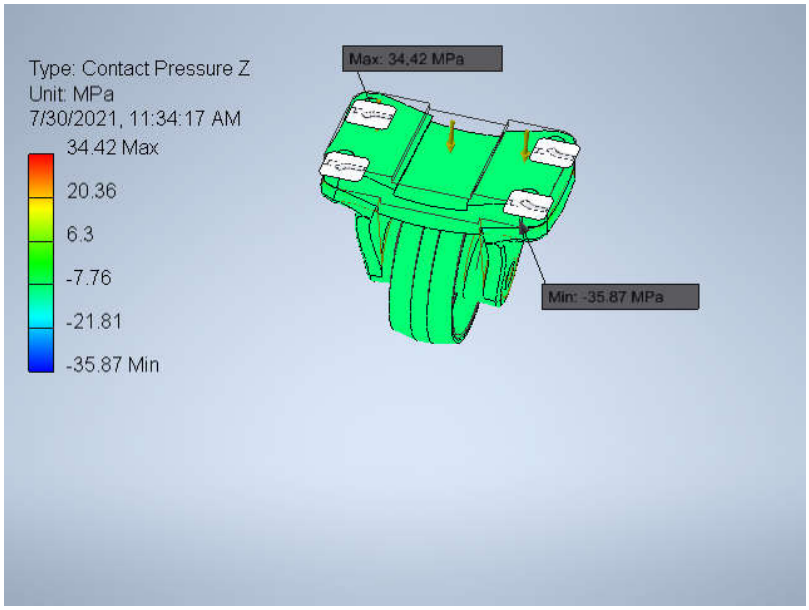


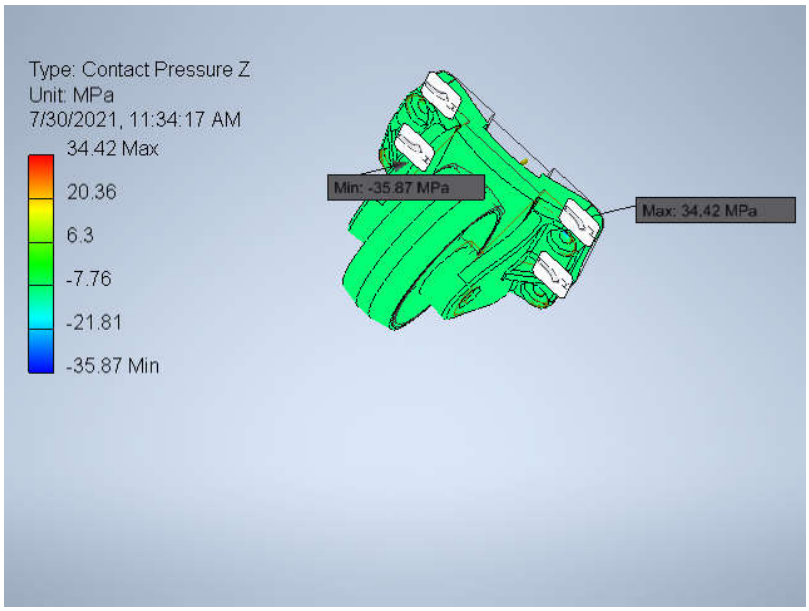
⊟ Contact Pressure Y





⊟ Contact Pressure Z





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