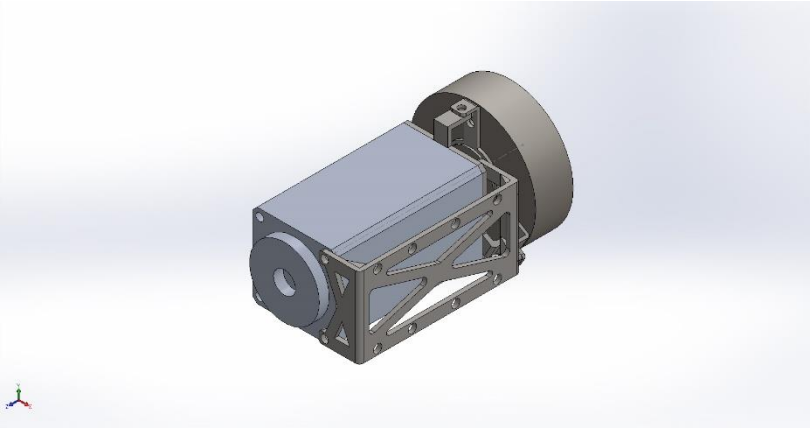


Simulation of finalassembly1

Date: Monday, December 2, 2019
Designer: Solidworks
Study name: Static_finalasem
Analysis type: Static

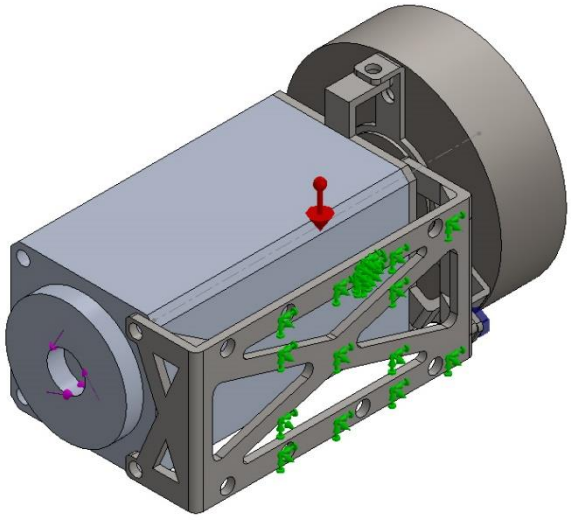
Table of Contents

Description

No Data

Assumptions

Model Information



Model name: finalassembly1
Current Configuration: Default

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Fillet2	Solid Body	**Mass:0.0214443 kg** **Volume:2.71447e-06 m^3** **Density:7,900 kg/m^3** **Weight:0.210154 N**	**C:\Users\rajes\Desktop\sim2\coupling_motor.SLDPRT** Dec 1 20:54:54 2019
Boss-Extrude1	Solid Body	**Mass:1.13064 kg** **Volume:0.000143665 m^3** **Density:7,870 kg/m^3** **Weight:11.0803 N**	**C:\Users\rajes\Desktop\sim2\motor.SLDPRT** Dec 2 09:46:38 2019

Boss-Extrude3	Solid Body	**Mass:0.038879 kg Volume:4.94015e-06 m^3 Density:7,870 kg/m^3 Weight:0.381014 N**	**C:\Users\rajes\Desktop\sim2\motor.SLDPRT** Dec 2 09:46:38 2019
Chamfer2	Solid Body	**Mass:0.110948 kg Volume:1.40976e-05 m^3 Density:7,870 kg/m^3 Weight:1.08729 N**	**C:\Users\rajes\Desktop\sim2\stepup_adap.SLDPRT** Dec 1 19:19:48 2019
Gusset5	Solid Body	**Mass:0.00158 kg Volume:2e-07 m^3 Density:7,900 kg/m^3 Weight:0.015484 N**	**C:\Users\rajes\Desktop\sim2\backsupport.SLDPRT** Dec 2 10:07:14 2019
Boss-Extrude16	Solid Body	**Mass:0.121352 kg Volume:1.5361e-05 m^3 Density:7,900 kg/m^3 Weight:1.18925 N**	**C:\Users\rajes\Desktop\sim2\backsupport.SLDPRT** Dec 2 10:07:14 2019
Fillet16	Solid Body	**Mass:0.00119619 kg Volume:1.51416e-07 m^3 Density:7,900 kg/m^3 Weight:0.0117226 N**	**C:\Users\rajes\Desktop\sim2\backsupport.SLDPRT** Dec 2 10:07:14 2019
Fillet19	Solid Body	**Mass:0.00119619 kg Volume:1.51416e-07 m^3 Density:7,900 kg/m^3 Weight:0.0117226 N**	**C:\Users\rajes\Desktop\sim2\backsupport.SLDPRT** Dec 2 10:07:14 2019
Fillet7	Solid Body	**Mass:0.0540069 kg Volume:6.83632e-06 m^3 Density:7,900 kg/m^3 Weight:0.529268 N**	**C:\Users\rajes\Desktop\sim2\coupling_reducer.SLDPRT** Dec 2 14:02:29 2019
Cut-Extrude2	Solid Body	**Mass:0.976921 kg Volume:0.000361823 m^3 Density:2,700 kg/m^3 Weight:9.57382 N**	**C:\Users\rajes\Desktop\sim2\gearbox.SLDPRT** Dec 2 14:11:40 2019

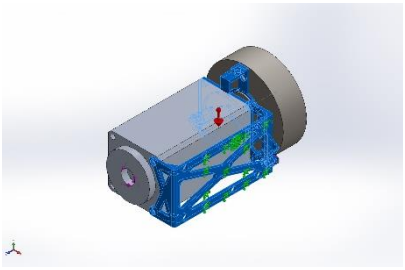
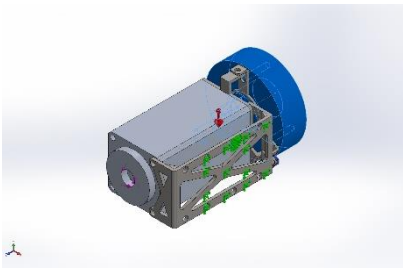
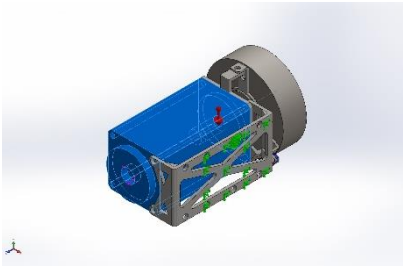
Study Properties

Study name	Static_finalasem
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SOLIDWORKS Flow Simulation	Off
Solver type	FFEPlus
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Large displacement	Off
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SOLIDWORKS document (C:\Users\rajes\Desktop\sim2)

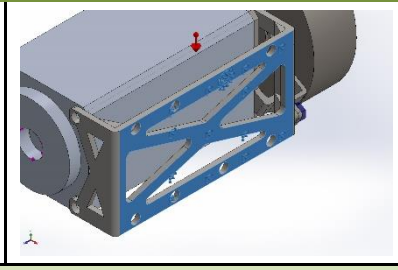
Units

Unit system:	SI (MKS)
Length/Displacement	mm
Temperature	Kelvin
Angular velocity	Rad/sec
Pressure/Stress	N/m^2

Material Properties

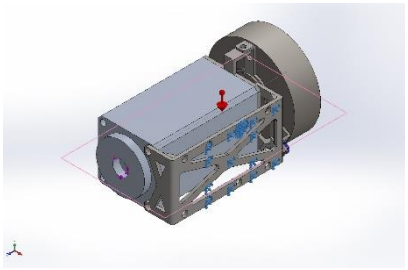
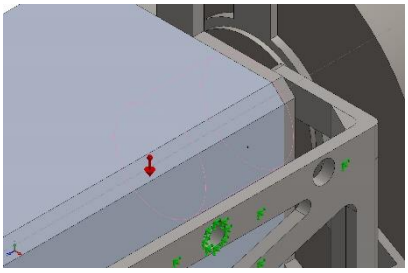
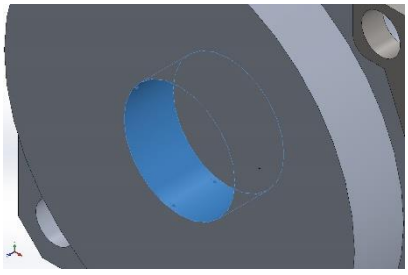
Model Reference	Properties		Components
	**Name:** **Model type:** **Default failure criterion:** **Yield strength:** **Tensile strength:** **Elastic modulus:** **Poisson's ratio:** **Mass density:** **Shear modulus:** **Thermal expansion coefficient:**	AISI 1020 Linear Elastic Isotropic Unknown 3.51571e+08 N/m^2 4.20507e+08 N/m^2 2e+11 N/m^2 0.29 7,900 kg/m^3 7.7e+10 N/m^2 1.5e-05 /Kelvin	SolidBody 1(Fillet2)(subassembly_m1-1/coupling_motor-1), SolidBody 6(Gusset5)(subassembly_r1-1/backsupport-1), SolidBody 7(Boss-Extrude16)(subassembly_r1-1/backsupport-1), SolidBody 8(Fillet16)(subassembly_r1-1/backsupport-1), SolidBody 9(Fillet19)(subassembly_r1-1/backsupport-1), SolidBody 1(Fillet7)(subassembly_r1-1/coupling_reducer-1)
Curve Data:N/A			
	**Name:** **Model type:** **Default failure criterion:** **Yield strength:** **Tensile strength:** **Elastic modulus:** **Poisson's ratio:** **Mass density:** **Shear modulus:** **Thermal expansion coefficient:**	AISI 1020 Steel, Cold Rolled Linear Elastic Isotropic Unknown 3.5e+08 N/m^2 4.2e+08 N/m^2 2.05e+11 N/m^2 0.29 7,870 kg/m^3 8e+10 N/m^2 1.2e-05 /Kelvin	SolidBody 1(Boss-Extrude1)(subassembly_m1-1/motor-1), SolidBody 2(Boss-Extrude3)(subassembly_m1-1/motor-1), SolidBody 1(Chamfer2)(subassembly_m1-1/stepup_adap-1)
Curve Data:N/A			
	**Name:** **Model type:** **Default failure criterion:** **Yield strength:** **Tensile strength:** **Elastic modulus:** **Poisson's ratio:** **Mass density:** **Shear modulus:** **Thermal expansion coefficient:**	1060 Alloy Linear Elastic Isotropic Unknown 2.75742e+07 N/m^2 6.89356e+07 N/m^2 6.9e+10 N/m^2 0.33 2,700 kg/m^3 2.7e+10 N/m^2 2.4e-05 /Kelvin	SolidBody 1(Cut-Extrude2)(subassembly_r1-1/gearbox-1)
Curve Data:N/A			

Loads and Fixtures

Fixture name	Fixture Image	Fixture Details
Fixed-4		**Entities:** 1 face(s) **Type:** Fixed Geometry

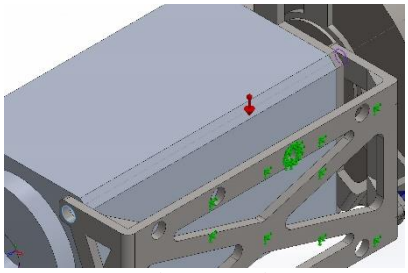
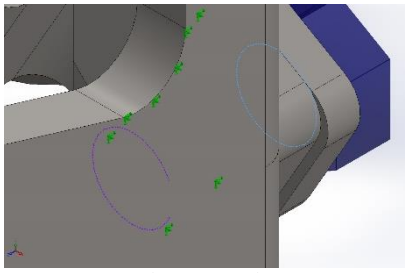
Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	-5.13016	28.8712	-8.7738e-05	29.3235
Reaction Moment(N.m)	0	0	0	0

Load name	Load Image	Load Details
Gravity-1		**Reference:** Top Plane **Values:** 0 0 -9.81 **Units:** m/s^2
Torque-3		**Reference:** Face< 1 > **Type:** Apply torque **Value:** 3 N.m
Torque-4		**Entities:** 1 face(s) **Type:** Apply torque **Value:** -150 N.m

Connector Definitions

Pin/Bolt/Bearing Connector

Model Reference	Connector Details	Strength Details
 **Counterbore with Nut-8**	**Entities:** 2 edge(s) **Type:** Bolt(Head/Nut diameter)(Counterbore) **Head diameter:** 8.25 mm **Nut diameter:** 8.25 mm **Nominal shank diameter:** 5.5 mm **Preload (Torque):** 0 **Young's modulus:** 2.1e+11 **Poisson's ratio:** 0.28 **Preload units:** N.m	No Data
 **Counterbore with Nut-10**	**Entities:** 2 edge(s) **Type:** Bolt(Head/Nut diameter)(Counterbore) **Head diameter:** 7.5 mm **Nut diameter:** 7.5 mm **Nominal shank diameter:** 5 mm **Preload (Torque):** 0 **Young's modulus:** 2.1e+11 **Poisson's ratio:** 0.28 **Preload units:** N.m	No Data

Connector Forces

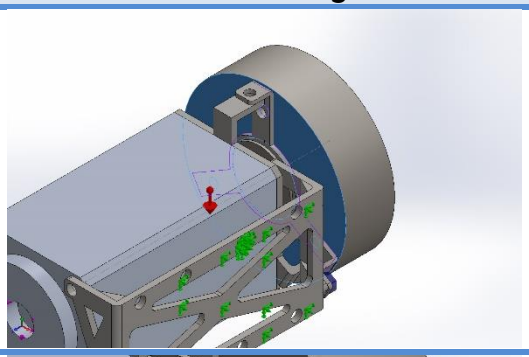
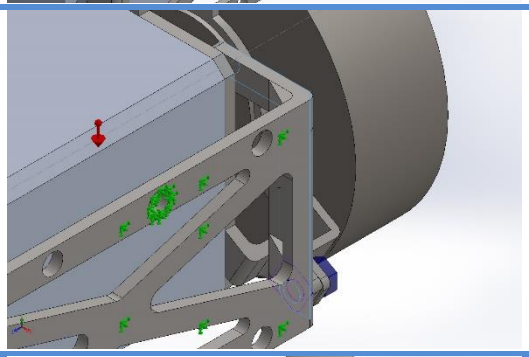
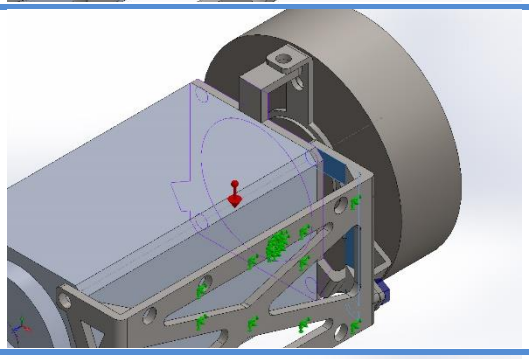
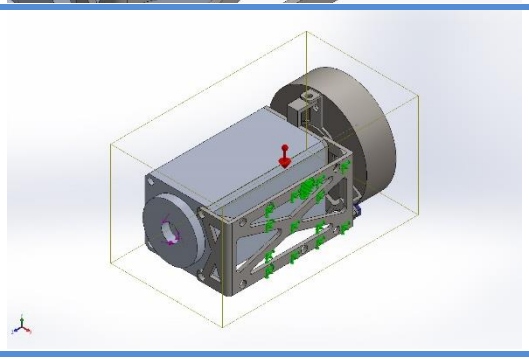
Type	X-Component	Y-Component	Z-Component	Resultant
Axial Force (N)	-0	-0	-212.61	-212.61
Shear Force (N)	-1.9054	-0.76639	0	2.0537
Bending moment (N.m)	-0.079765	0.19867	0	0.21408

<Image_Model_PBB1/> **<Name_PBBConn1/>**	**<PBBConnDetails1/>**	<L_PBBCheck/>: <PBB_OK/> <L_PBBCalFos/>: <PBBCFo/> <L_PBBDesFos/>: <PBBDFo/> <PBBStrengthPlot1/>

Connector Forces

Type	X-Component	Y-Component	Z-Component	Resultant
Axial Force (N)	-0.027458	-0.0099215	-70.756	70.756
Shear Force (N)	-37.261	-0.19355	0.014487	37.262
Bending moment (N.m)	-0.026973	-0.13564	2.9487e-05	0.1383

Contact Information

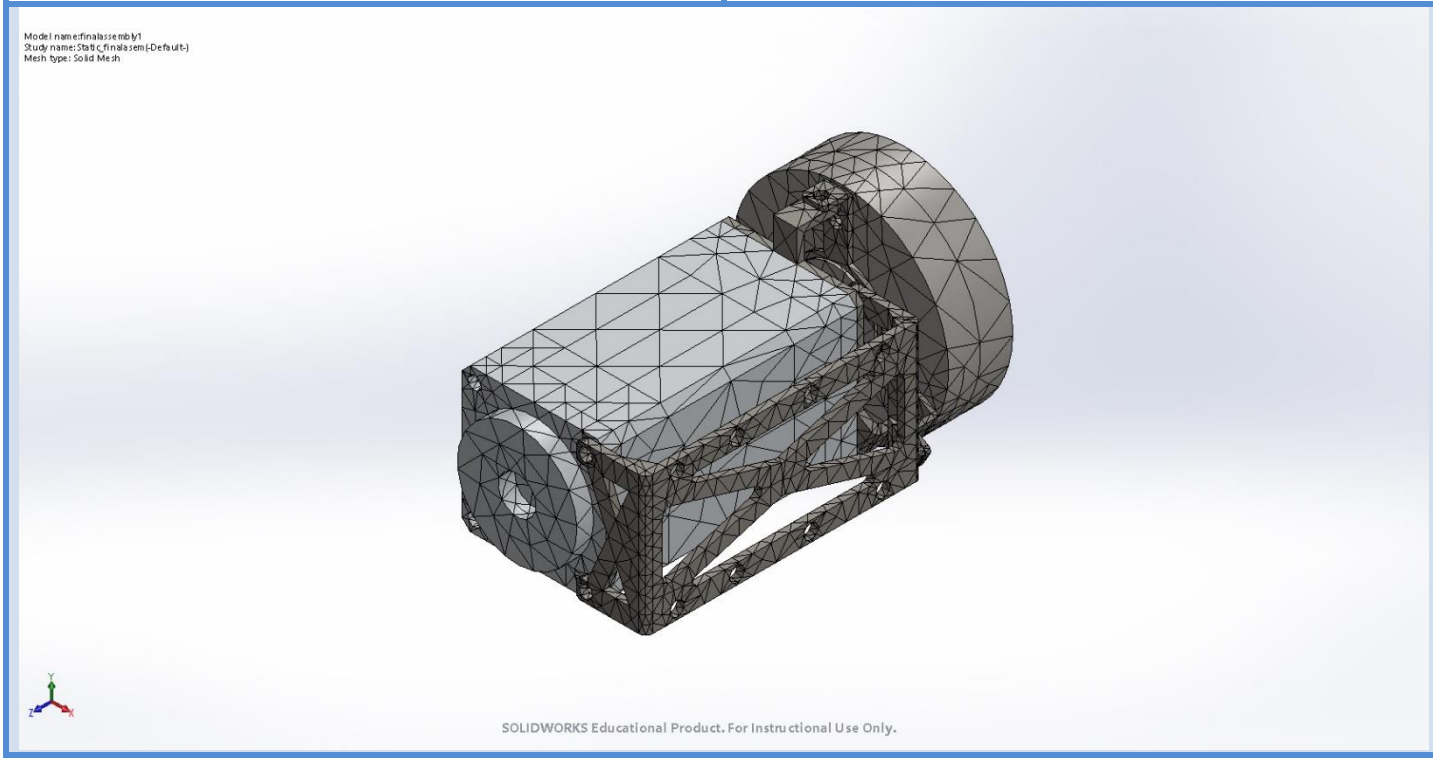
Contact	Contact Image	Contact Properties
Contact Set-1		**Type:** Bonded contact pair **Entities:** 2 face(s)
Contact Set-2		**Type:** Bonded contact pair **Entities:** 2 face(s)
Contact Set-3		**Type:** Bonded contact pair **Entities:** 2 face(s)
Global Contact		**Type:** Bonded **Components:** 1 component(s) **Options:** Compatible mesh

Mesh information

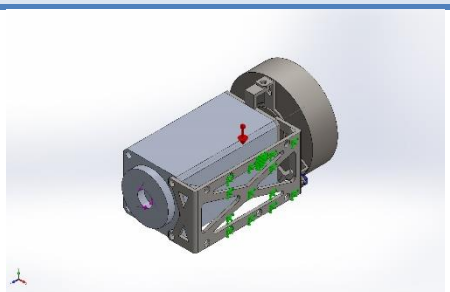
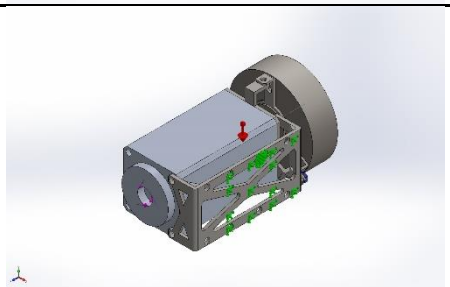
Mesh type	Solid Mesh
Mesher Used:	Curvature-based mesh
Jacobian points	4 Points
Maximum element size	23.4113 mm
Minimum element size	4.68226 mm
Mesh Quality Plot	High
Remesh failed parts with incompatible mesh	Off

Mesh information - Details

Total Nodes	29511
Total Elements	17053
Maximum Aspect Ratio	30.965
% of elements with Aspect Ratio < 3	76.5
% of elements with Aspect Ratio > 10	1.48
% of distorted elements(Jacobian)	0
Time to complete mesh(hh;mm;ss):	00:00:04
Computer name:	



Sensor Details

Sensor name	Location	Sensor Details
Displacement1		Value : 6.609e-02 mm Entities : Result :Displacement Component :URES: Resultant Displacement Criterion :Model Max Step Criterion : Across all Steps Step No.:1 Alert Value: NA
Stress1		Value : 2.816e+08 N/m^2 Entities : Result :Stress Component :VON: von Mises Stress Criterion :Model Max Step Criterion : Across all Steps Step No.:1 Alert Value: NA

Resultant Forces

Reaction forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-5.13016	28.8712	-8.7738e-05	29.3235

Reaction Moments

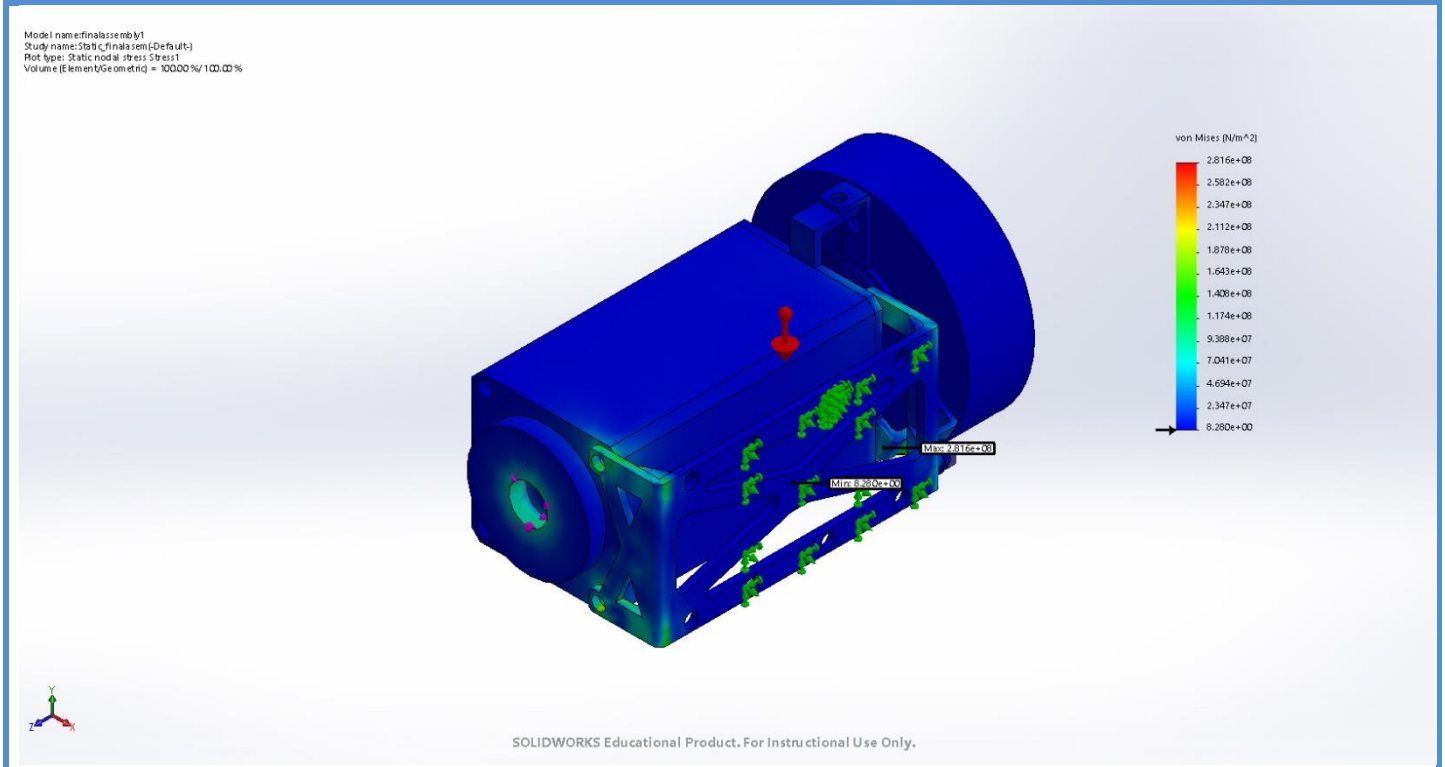
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	0

Beams

No Data

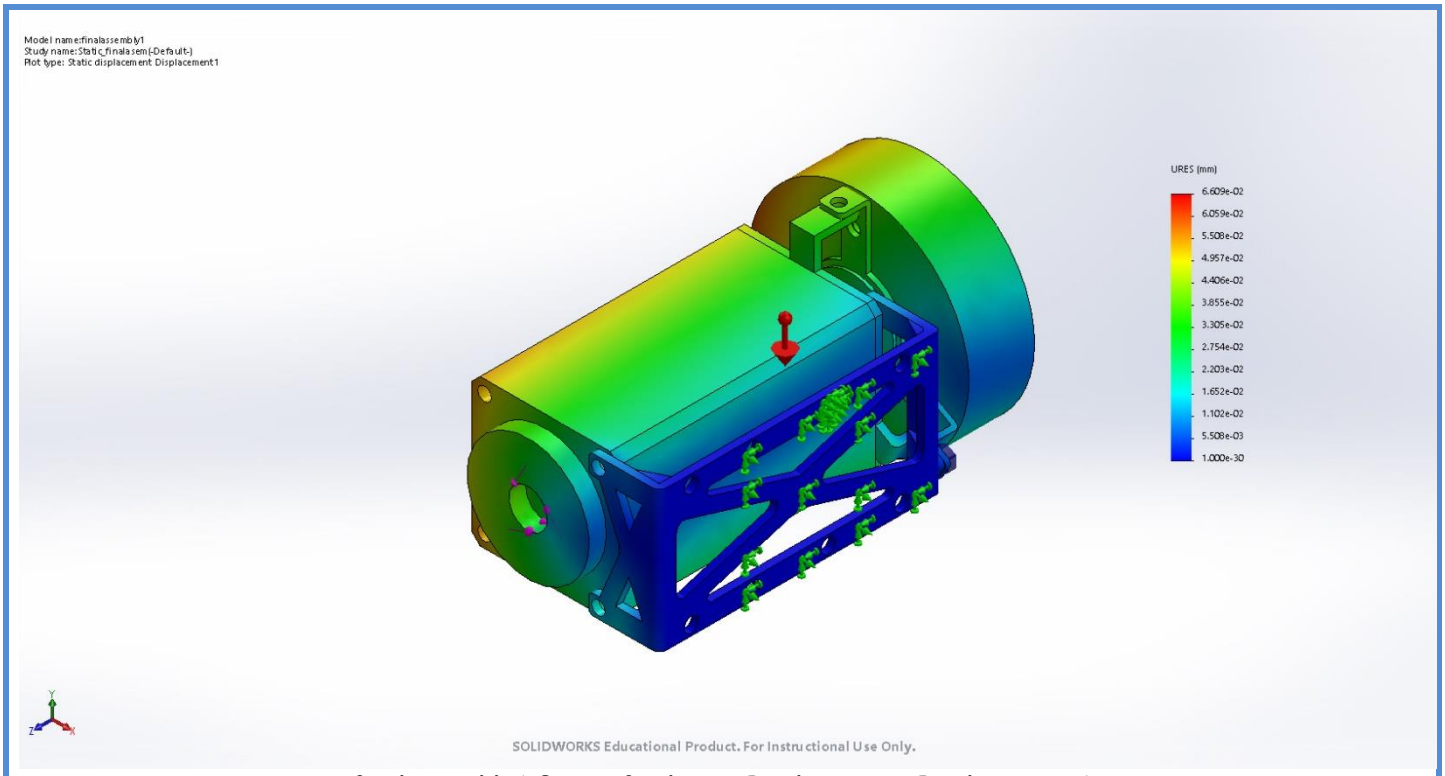
Study Results

Name	Type	Min	Max
Stress1	VON: von Mises Stress	8.280e+00 N/m^2 Node: 9336	2.816e+08 N/m^2 Node: 13455



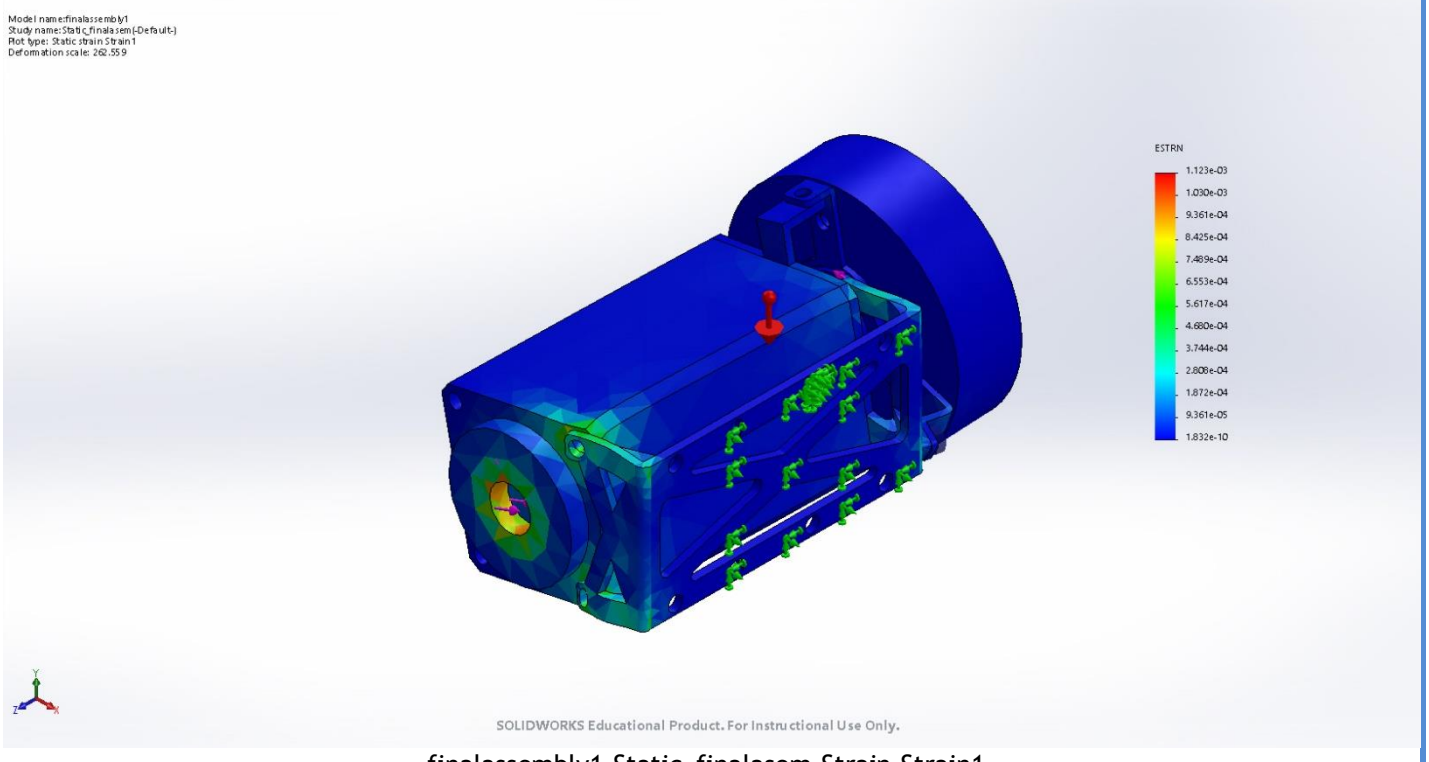
finalassembly1-Static_finalasem-Stress-Stress1

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0.000e+00 mm Node: 8670	6.609e-02 mm Node: 13866



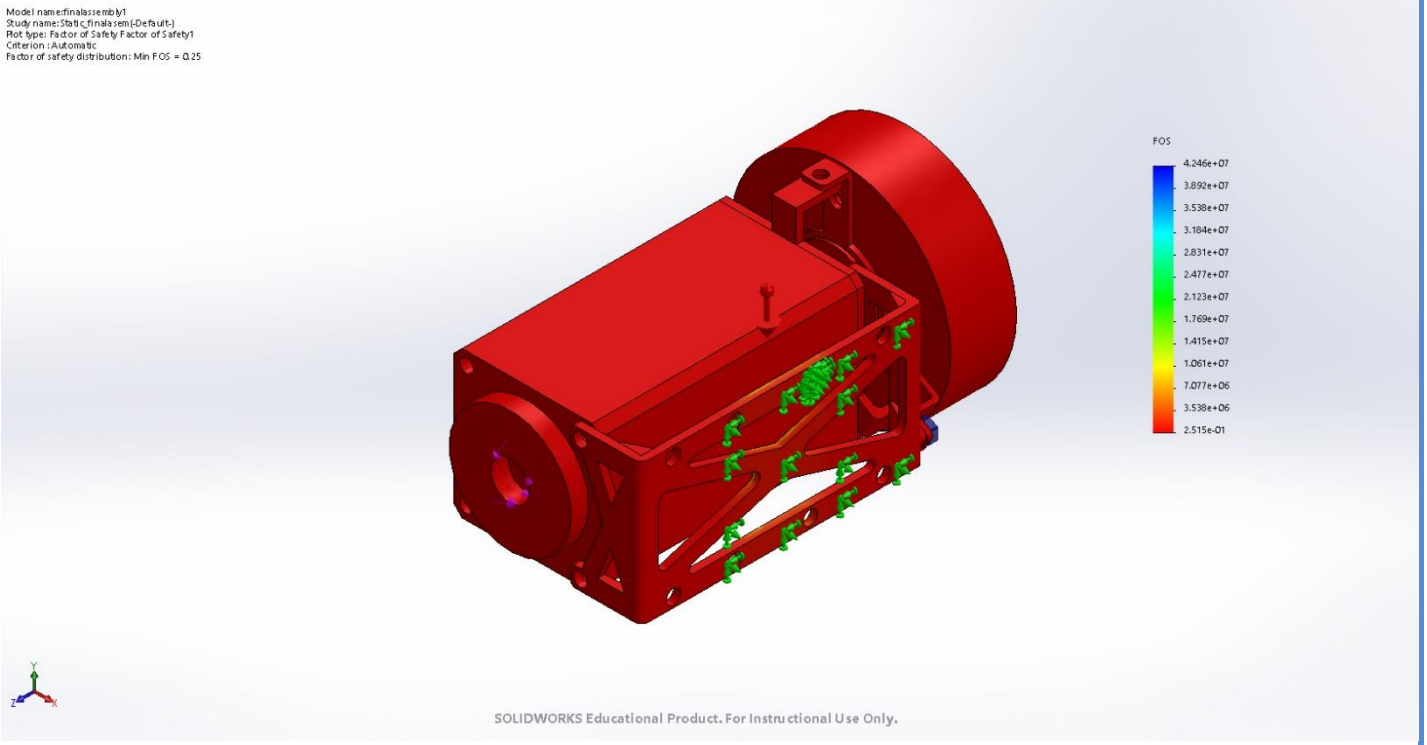
finalassembly1-Static_finalasem-Displacement-Displacement1

Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	1.832e-10 Element: 5396	1.123e-03 Element: 13609



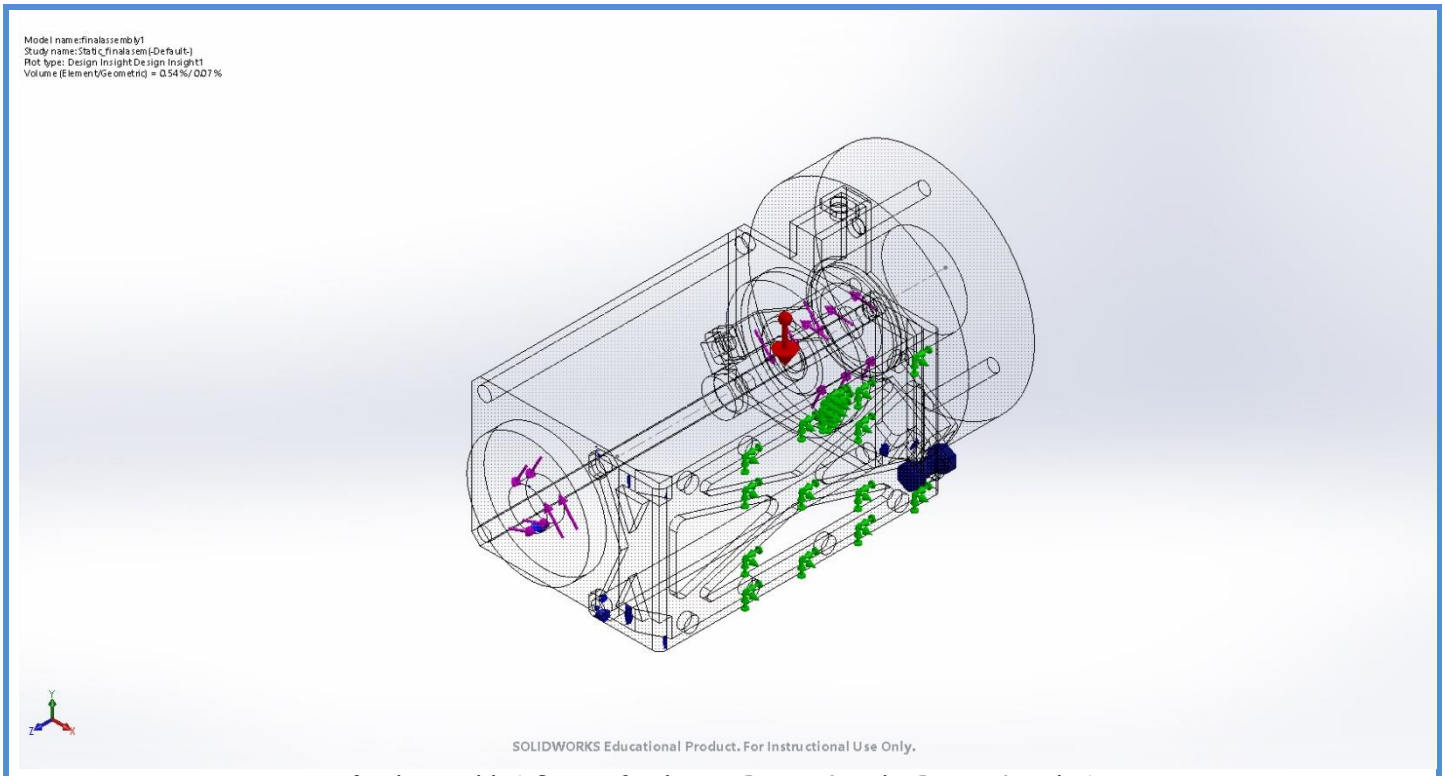
finalassembly1-Static_finalasem-Strain-Strain1

Name	Type	Min	Max
Factor of Safety1	Automatic	2.515e-01 Node: 17096	4.246e+07 Node: 9336



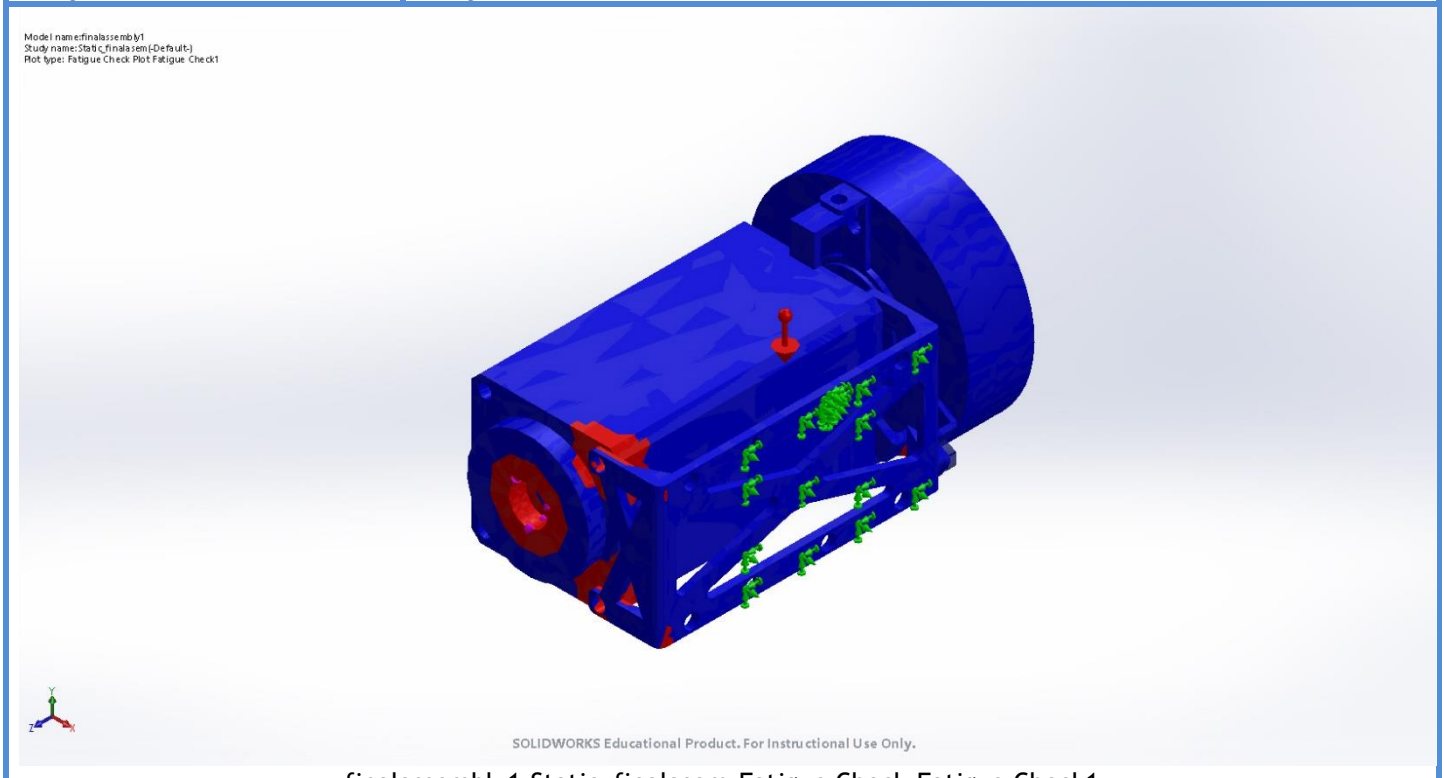
finalassembly1-Static_finalasem-Factor of Safety-Factor of Safety1

Name	Type
Design Insight1	Design Insight



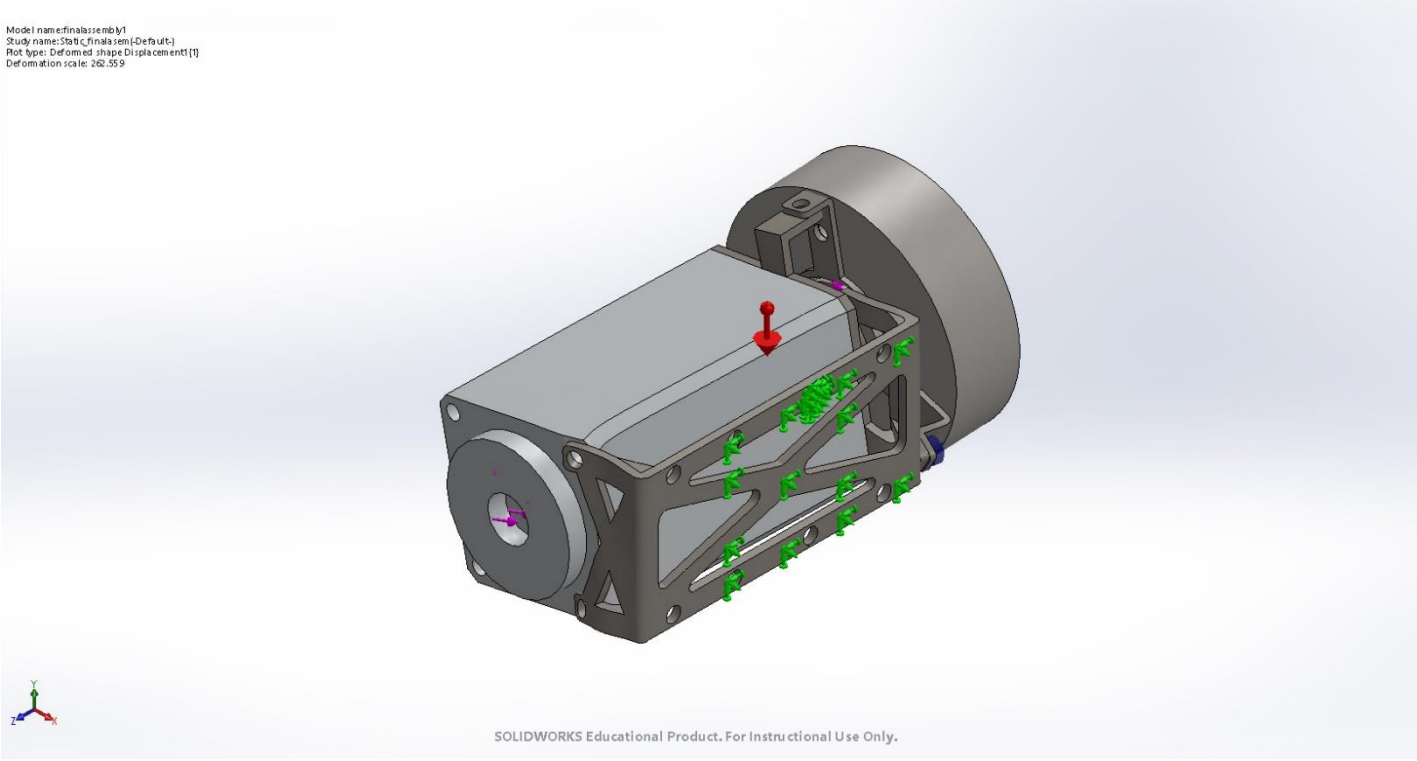
finalassembly1-Static_finalasem-Design Insight-Design Insight1

Name	Type
Fatigue Check1	Fatigue Check Plot



finalassembly1-Static_finalasem-Fatigue Check-Fatigue Check1

Name	Type
Displacement1{1}	Deformed shape



finalassembly1-Static_finalasem-Displacement-Displacement1{1}

Conclusion