ATLANTIC ENGINEERING COUPLING

Sling Coupling: FEM Analysis

Comparison Electrowelded vs Molten

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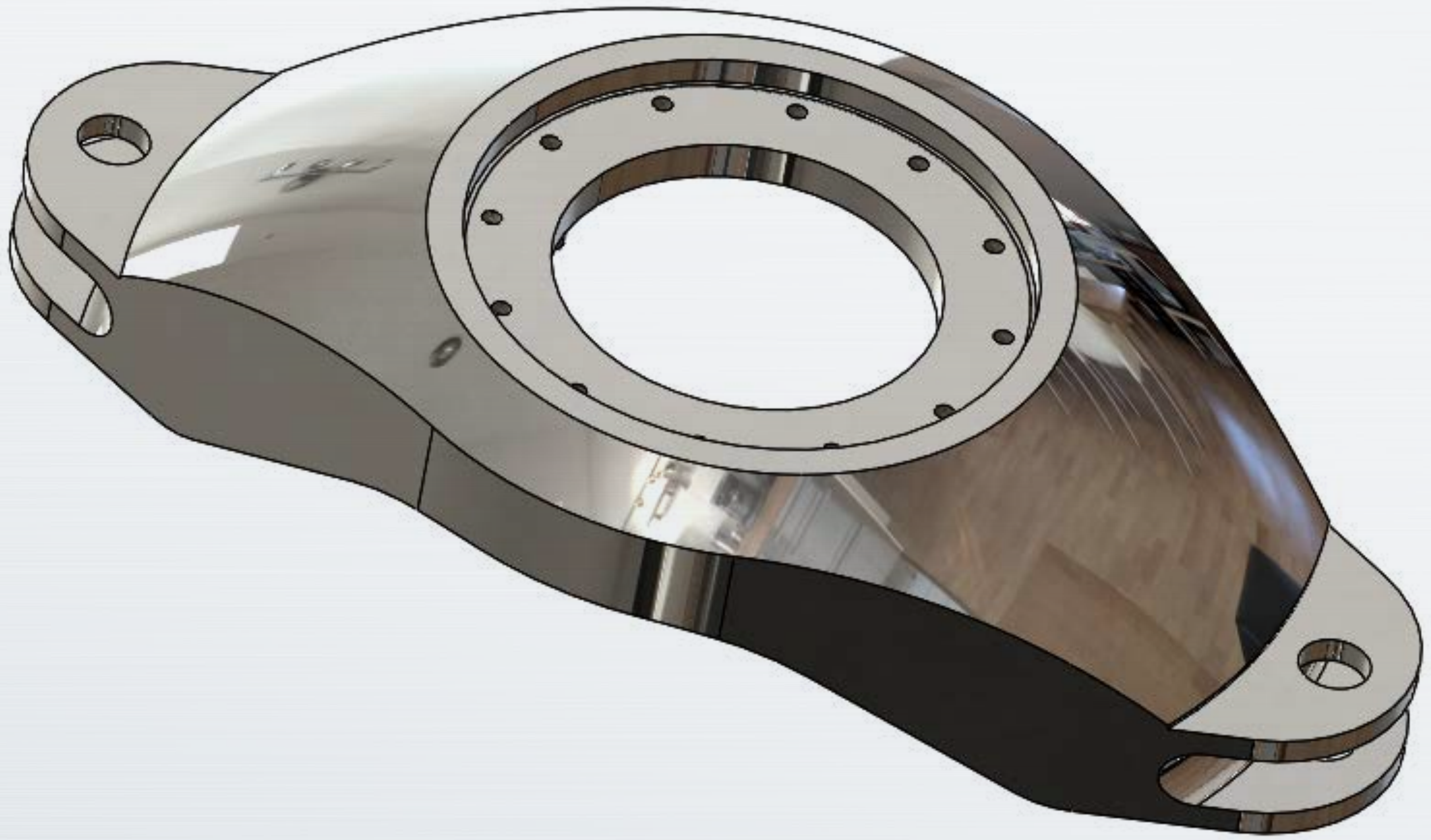
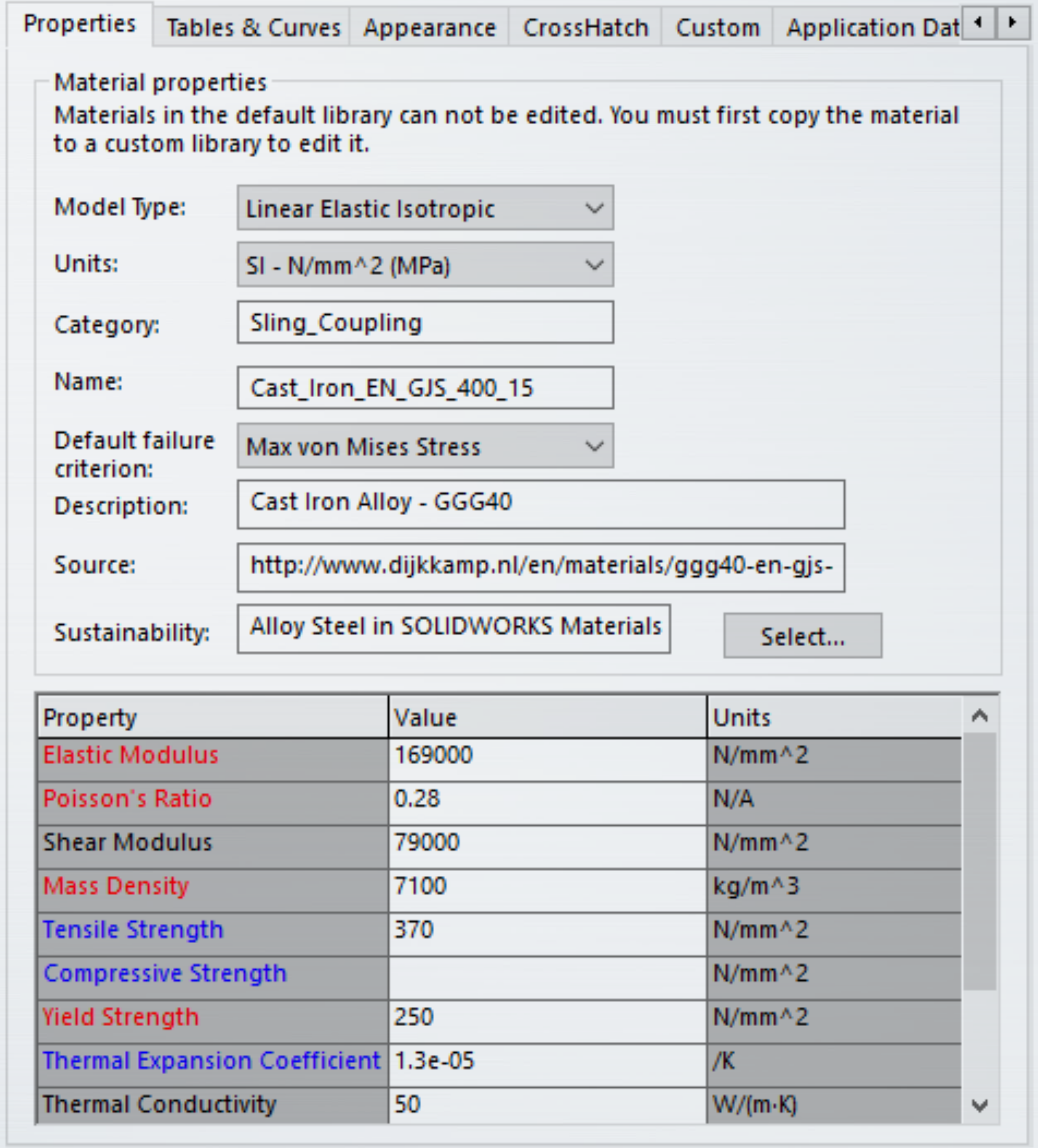
Material





Properties | Tables & Curves | Appearance | CrossHatch | Custom | Application Dat

Material properties

Materials in the default library can not be edited. You must first copy the material to a custom library to edit it.

Model Type: Linear Elastic Isotropic

Units: SI - N/mm^2 (MPa)

Category: Sling_Coupling

Name: Cast_Iron_EN_GJS_400_15

Default failure criterion: Max von Mises Stress

Description: Cast Iron Alloy - GGG40

Source: http://www.dijkkamp.nl/en/materials/ggg40-en-gjs-

Sustainability: Alloy Steel in SOLIDWORKS Materials | Select...

Property	Value	Units
Elastic Modulus	169000	N/mm^2
Poisson's Ratio	0.28	N/A
Shear Modulus	79000	N/mm^2
Mass Density	7100	kg/m^3
Tensile Strength	370	N/mm^2
Compressive Strength		N/mm^2
Yield Strength	250	N/mm^2
Thermal Expansion Coefficient	1.3e-05	/K
Thermal Conductivity	50	W/(m·K)

Cast steel EN-GJS-400-15 (GGG40)

Tensile breaking strength: Rm = 370 MPa

Tensile yield strength: Re = 250 MPa

Modulus of elasticity: E = 169 000 MPa

Poisson's ratio: μ = 0.28

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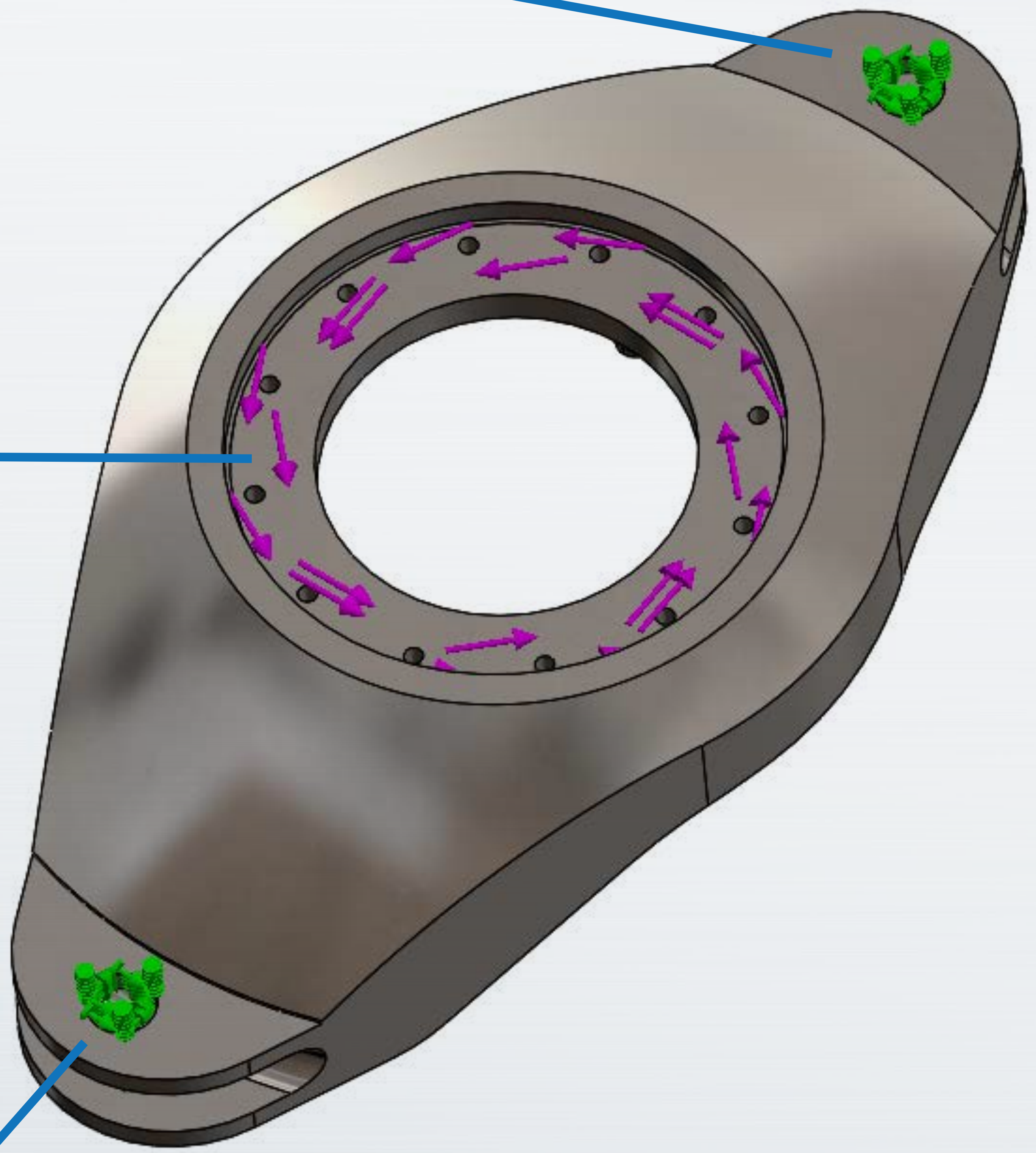
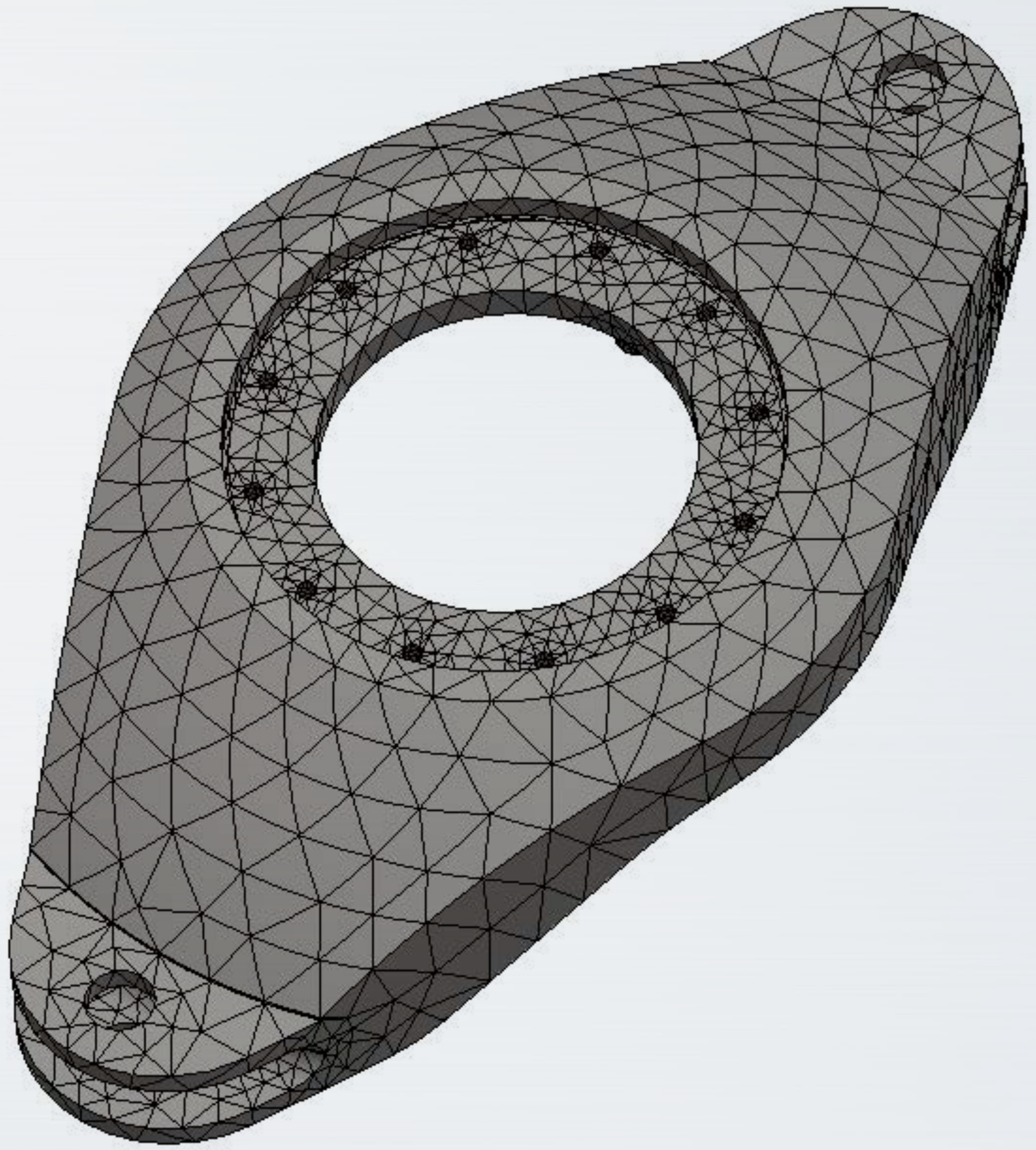
Constraints, Load and Mesh





1250 kNm & 1750 kNm

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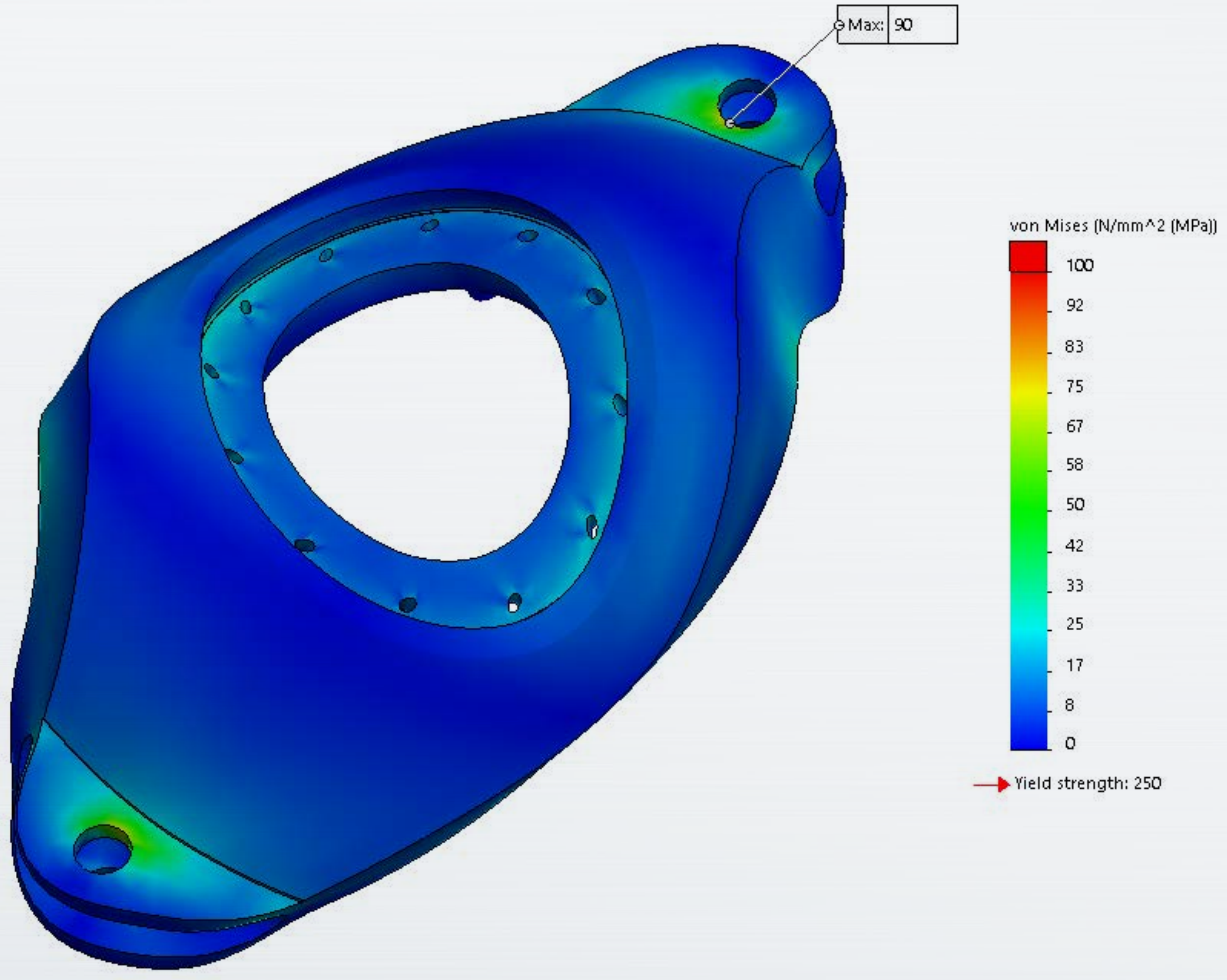
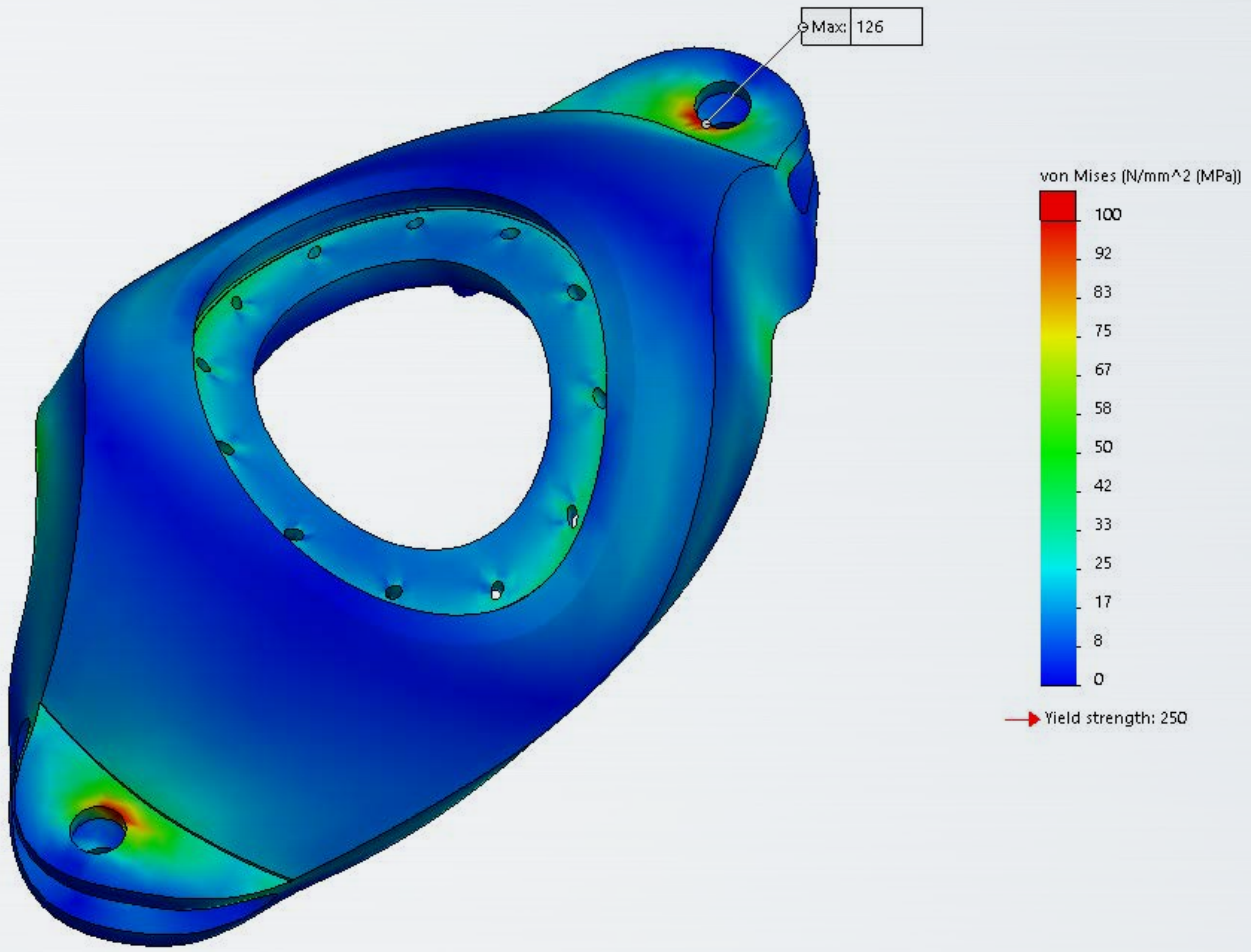
von Mises Stresses for applied Torque





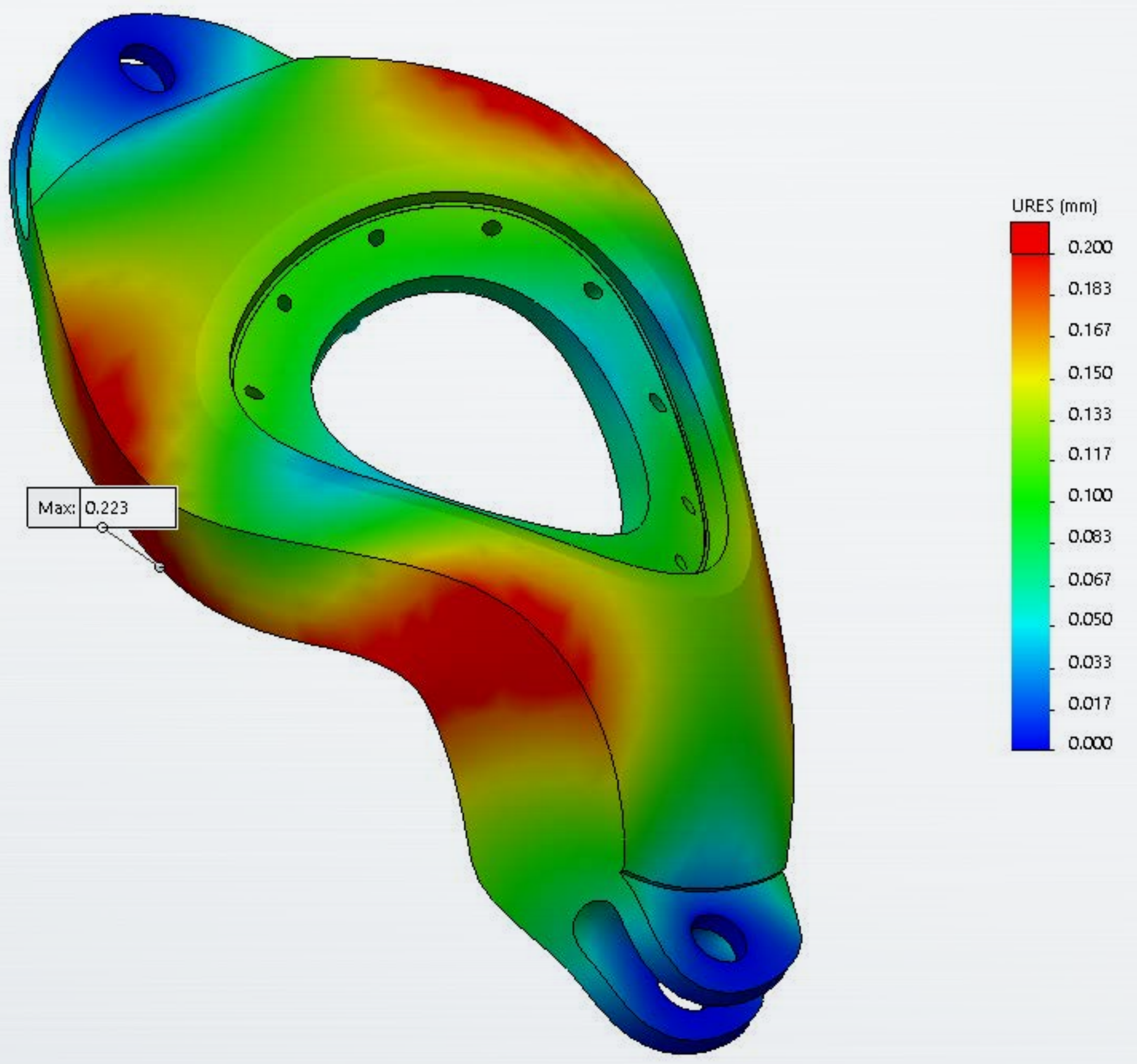
Torque
T = 1250 kNm

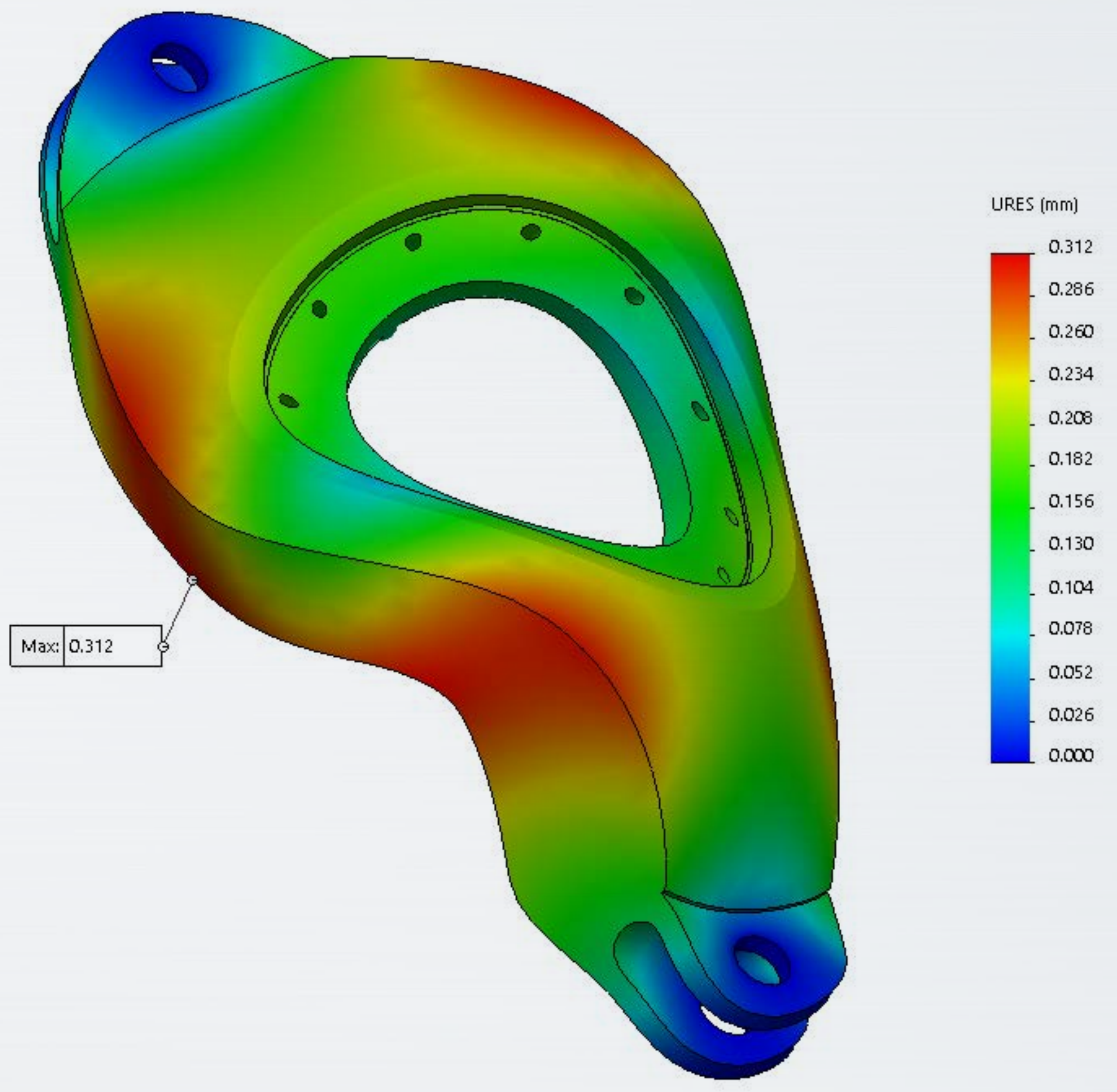
Safety factor
SF = 250/90 = **2.78**
Smax/Syield = 90/250 = **36%**

Torque
T = 1750 kNm

Safety factor
SF = 250/126 = **1.98**
Smax/Syield = 126/250 = **50%**

Displacements for applied load





Torque
T = 1250 kNm

Max Displacement = **0.223 mm**
Deformation scale ~ 1000

Torque
T = 1750 kNm

Max Displacement = **0.312 mm**
Deformation scale ~ 1000

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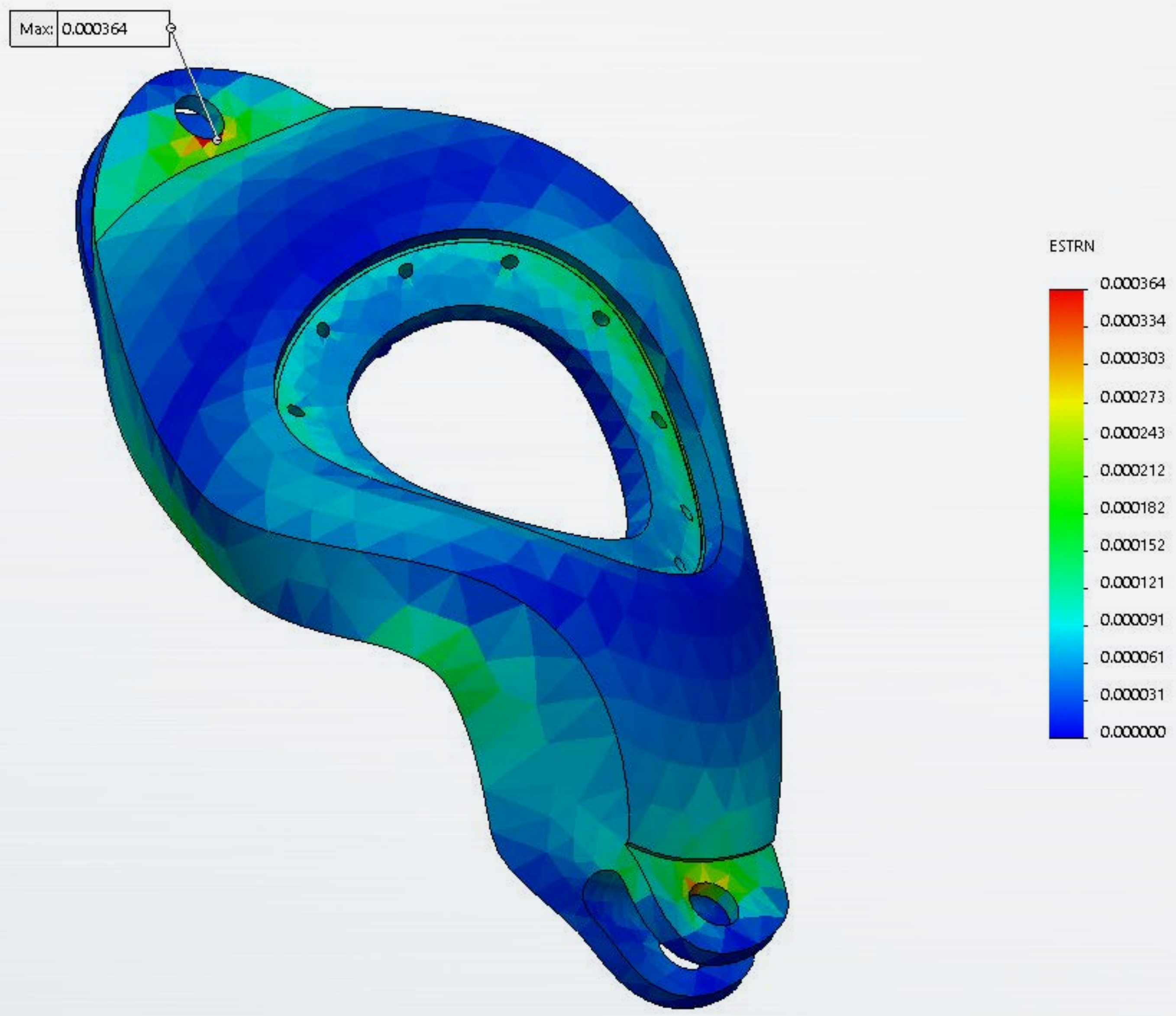
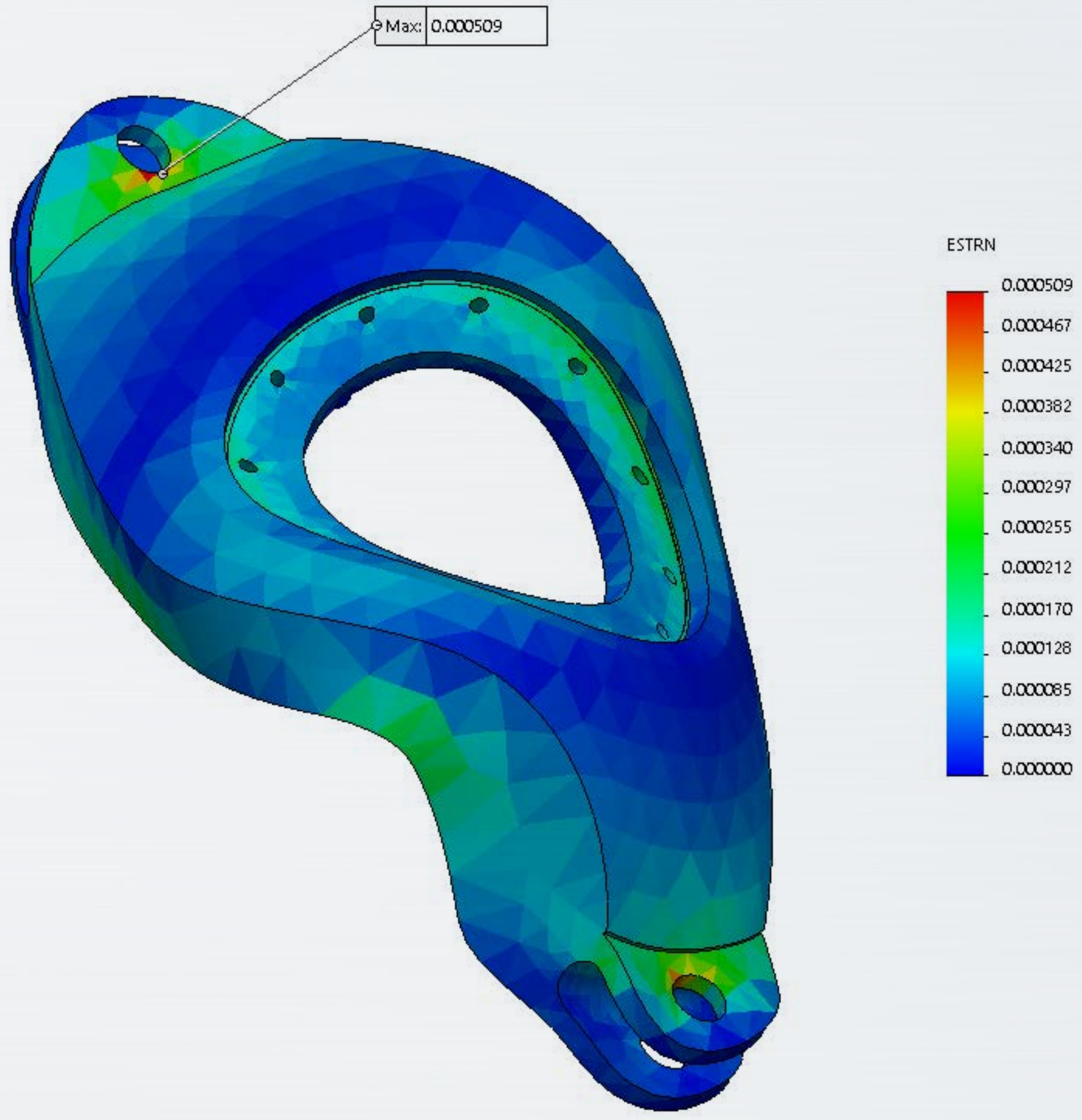
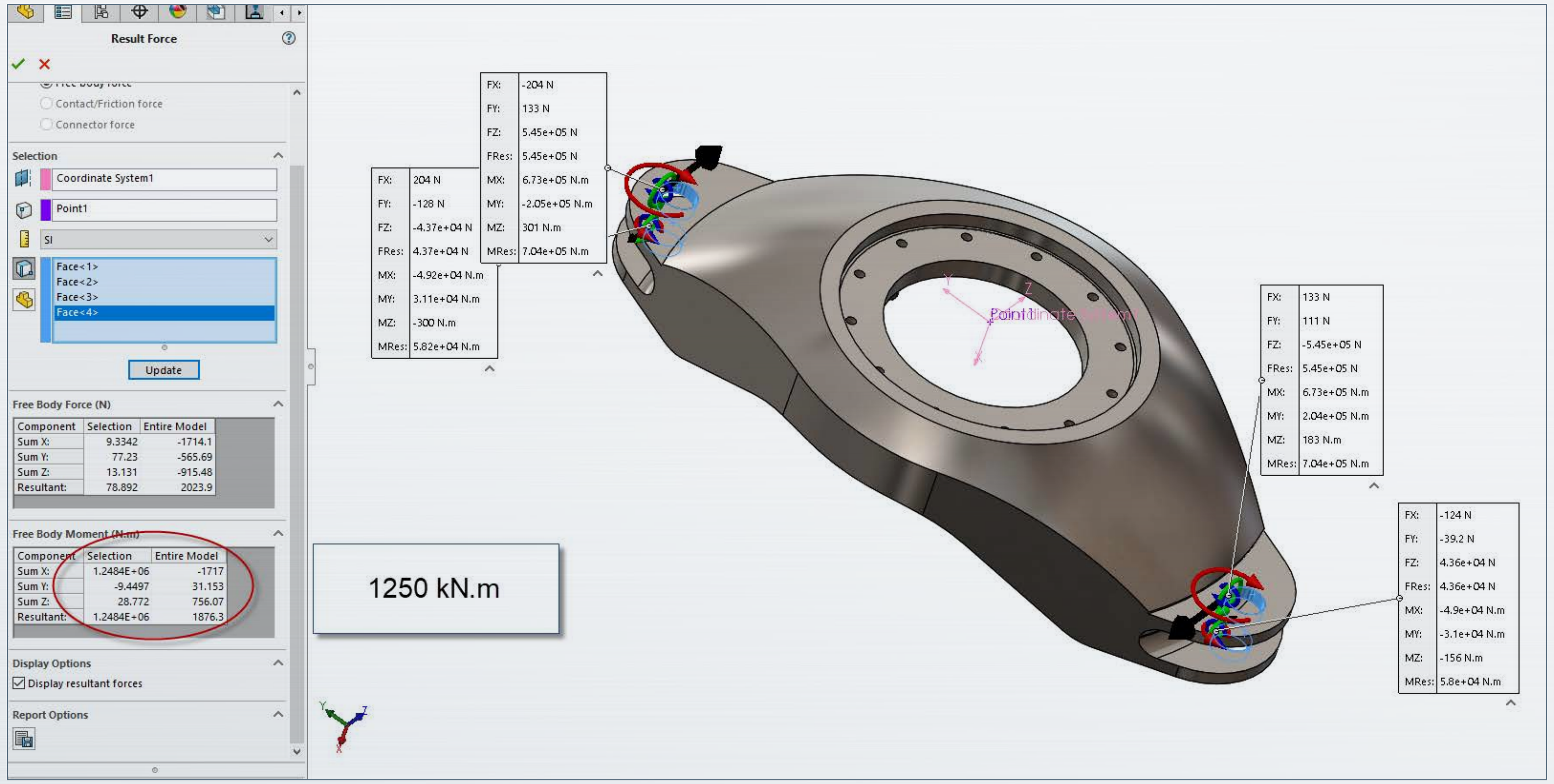
Unit strains for applied Torque

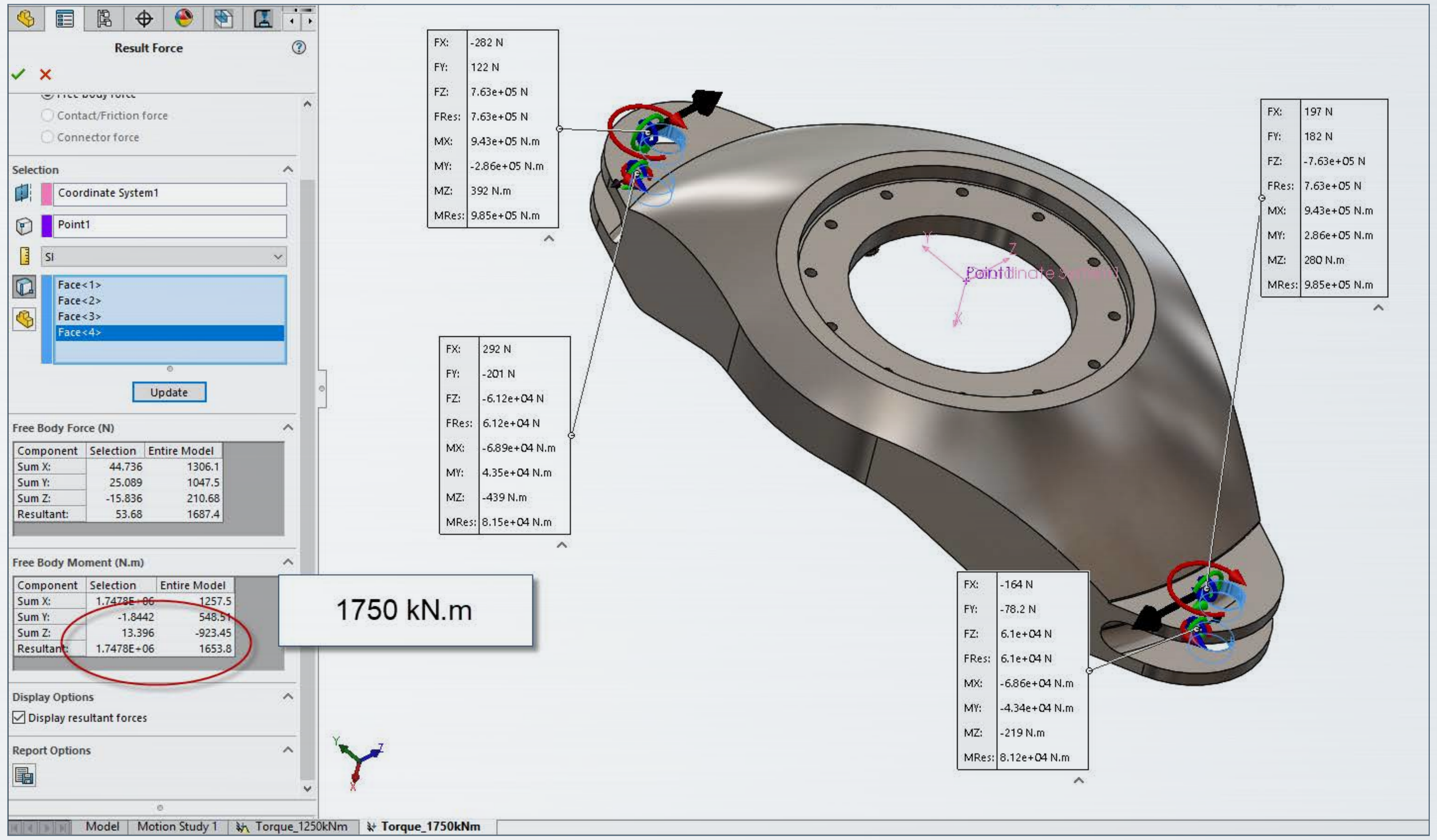




Torque **T = 1250 kNm**	Torque **T = 1750 kNm**
Max Elastic Strain = 0.036%	Max Elastic Strain = 0.051%

Reaction equilibrium check with applied torque





Torque
T = 1250 kNm

Torque
T = 1750 kNm

Conclusions

The stress fields found for the torques of **1250 kN.m** and **1750 kN.m** have a factor of safety of 2.78 and 1.98 respectively. .

The analysis performed is linear static, and for these torque levels it can be said that we are in safe operating regions for a yield stress of **250 MPa.**

More advanced analyses on the component can be evaluated for a better understanding of the component under overtorque states. These types of studies include: **Fatigue and Non-Linear.**

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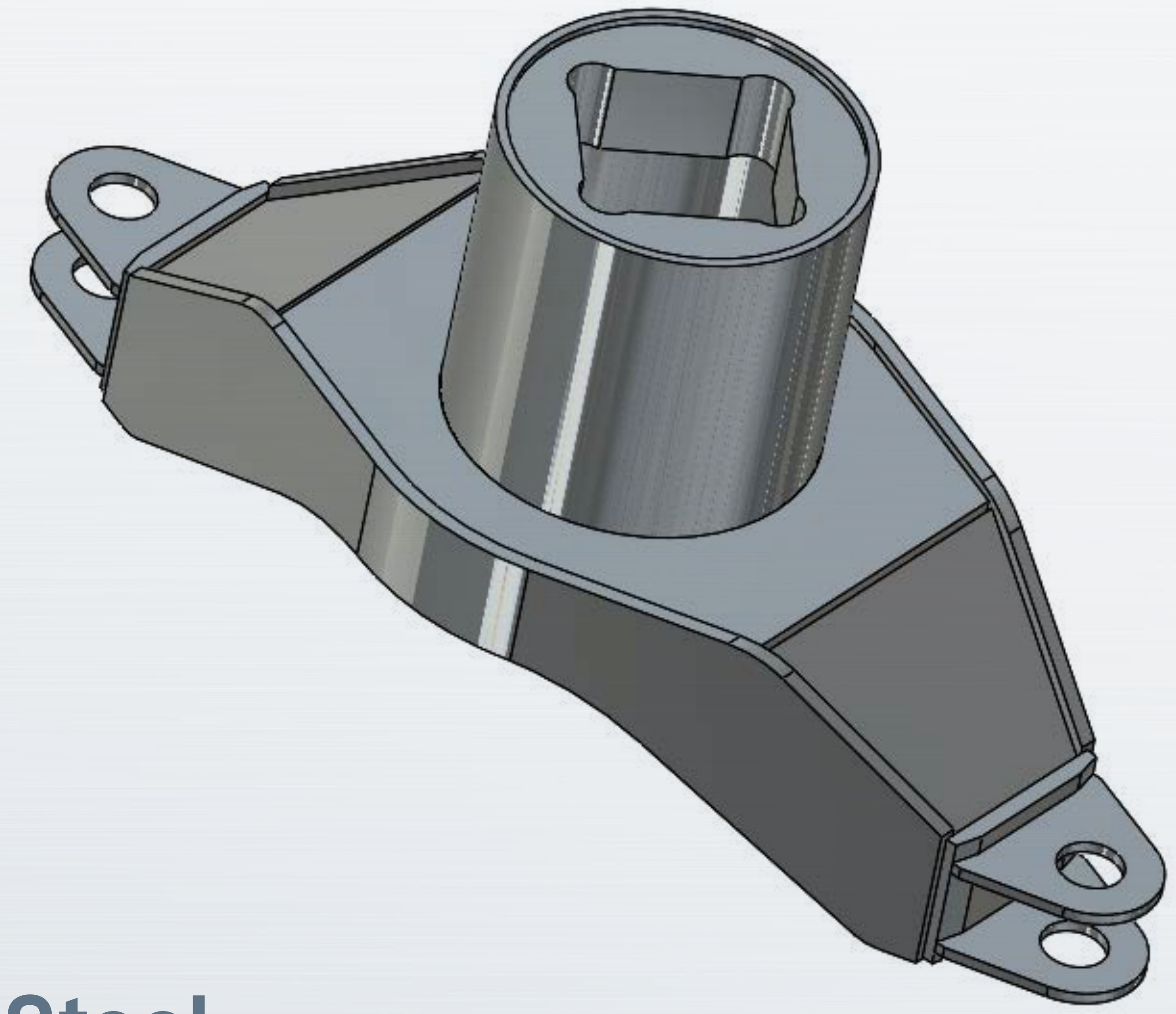
Material: A36



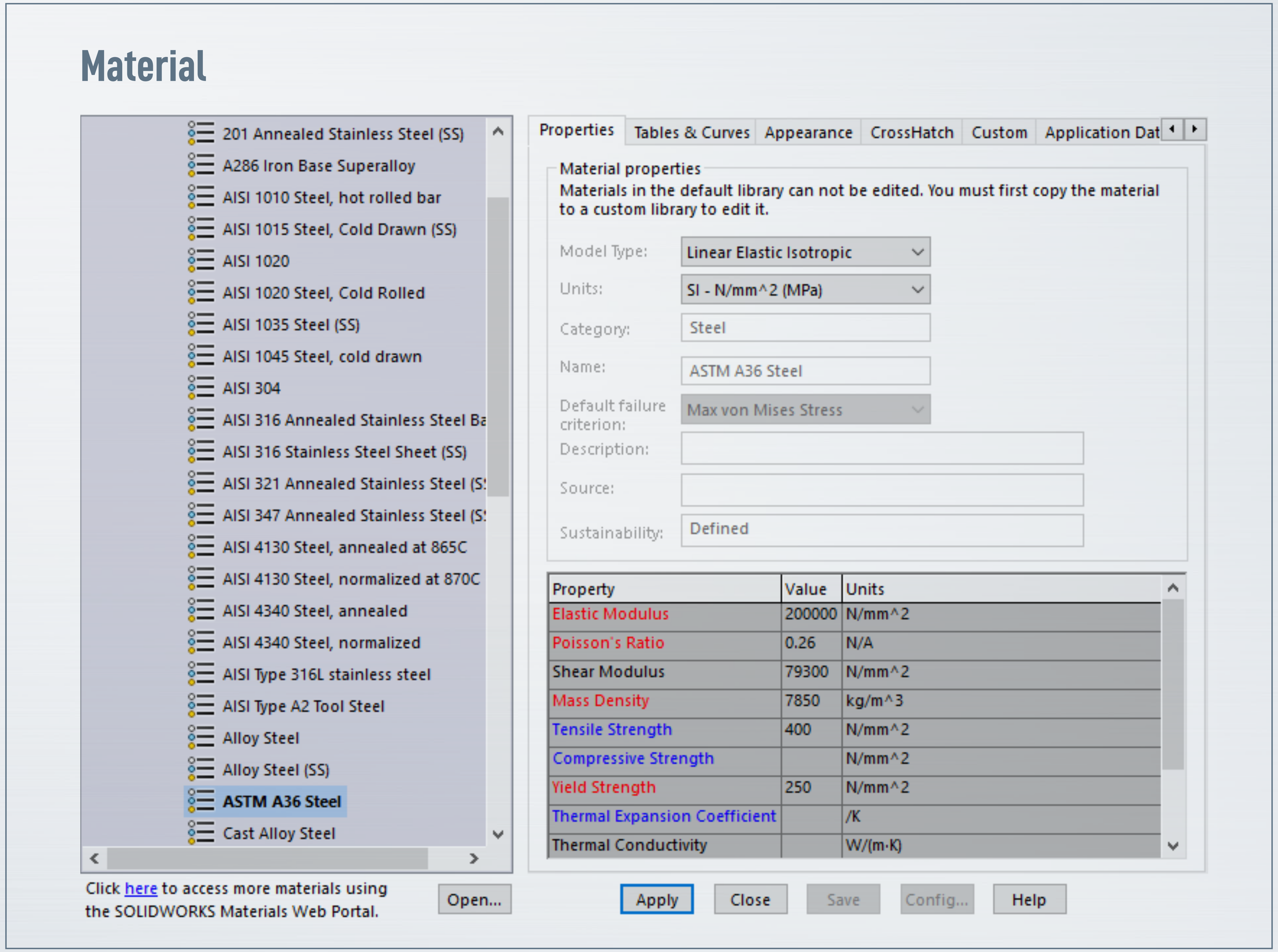
Steel

Tensile breaking strength: Rm = 400 MPa

Tensile yield strength: Re = 250 MPa

Modulus of elasticity: E = 200 000 MPa

Poisson's ratio: μ = 0.26



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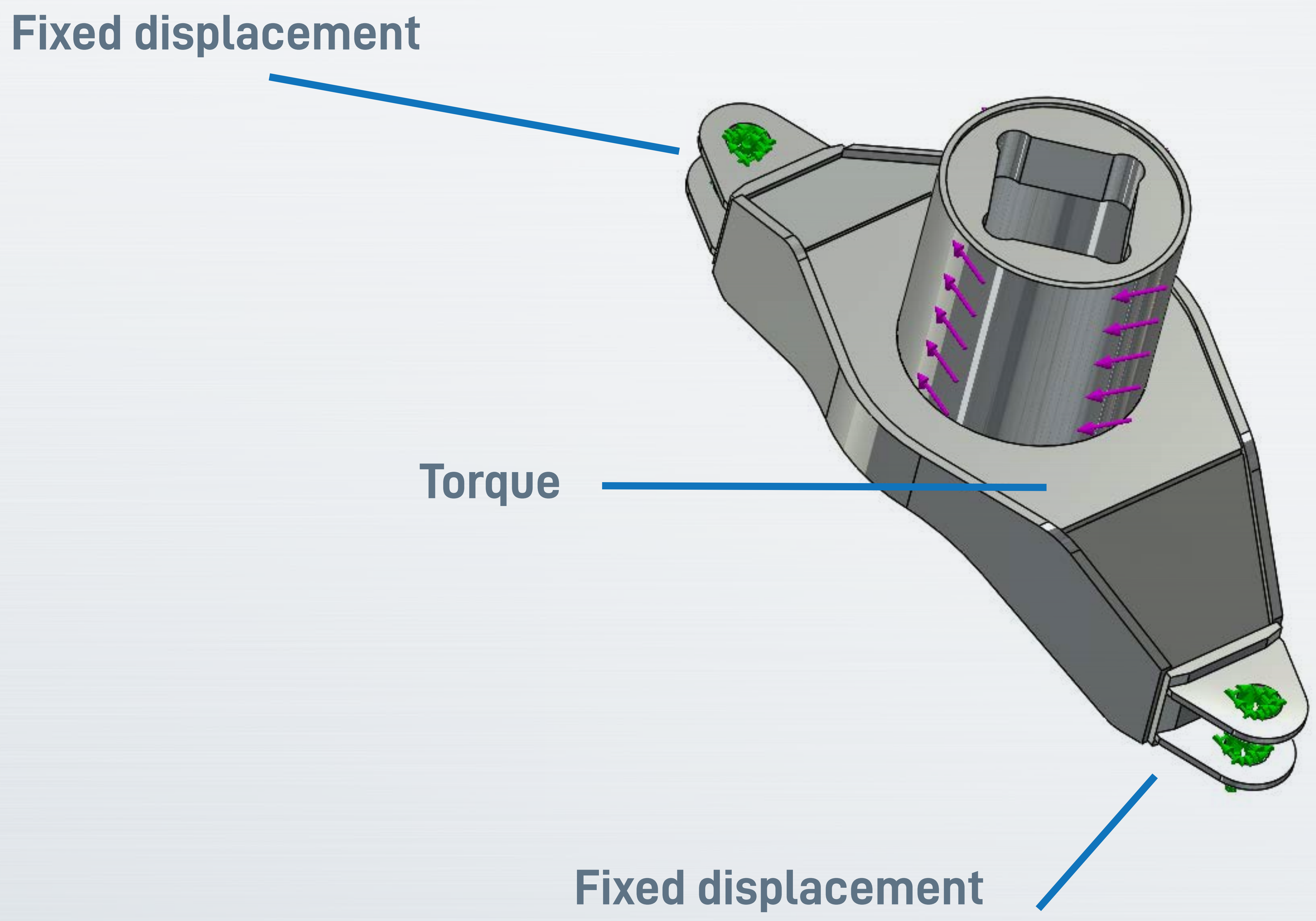
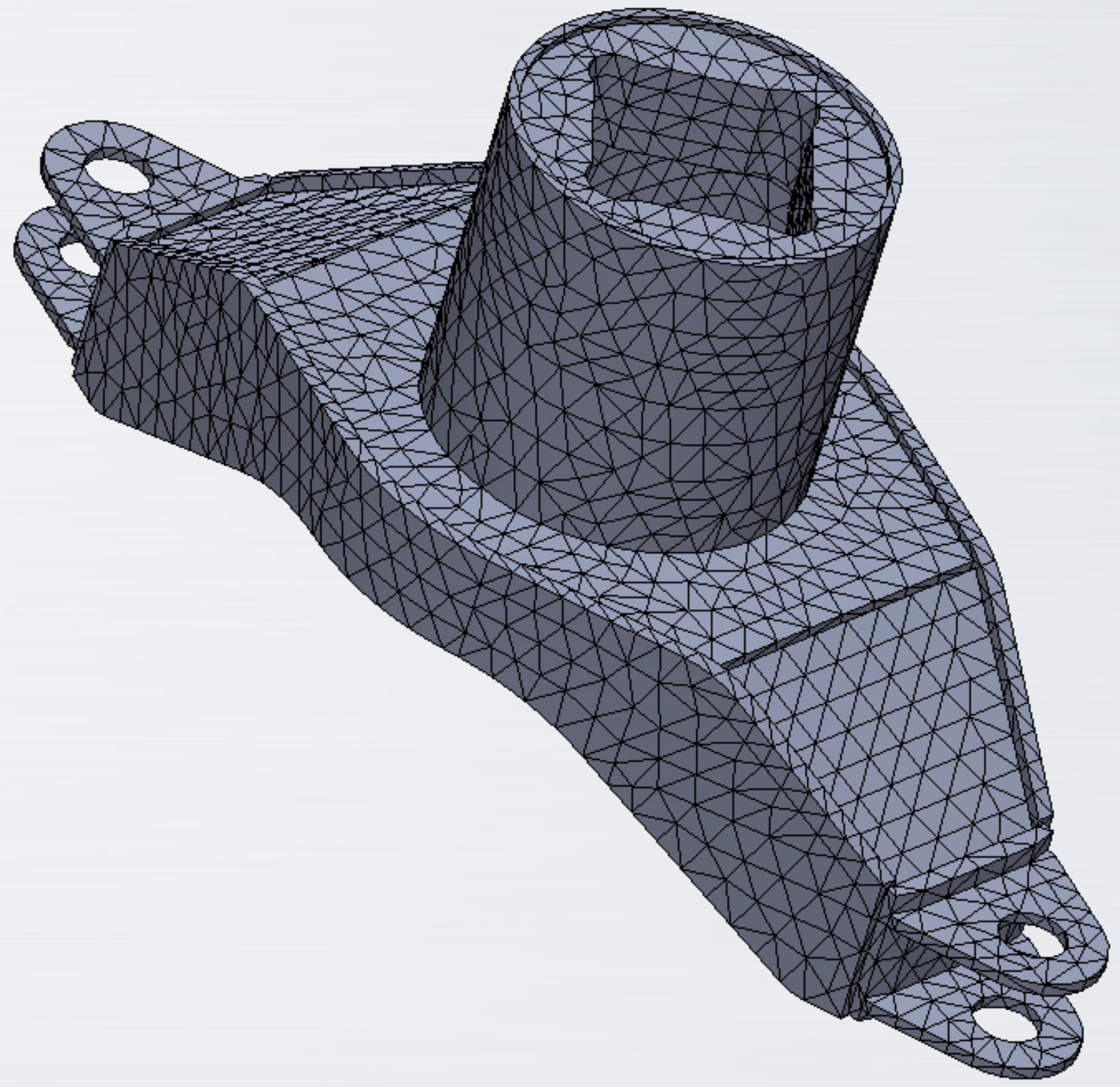
Constraints, Load and Mesh





1250 kNm & 1750 kNm

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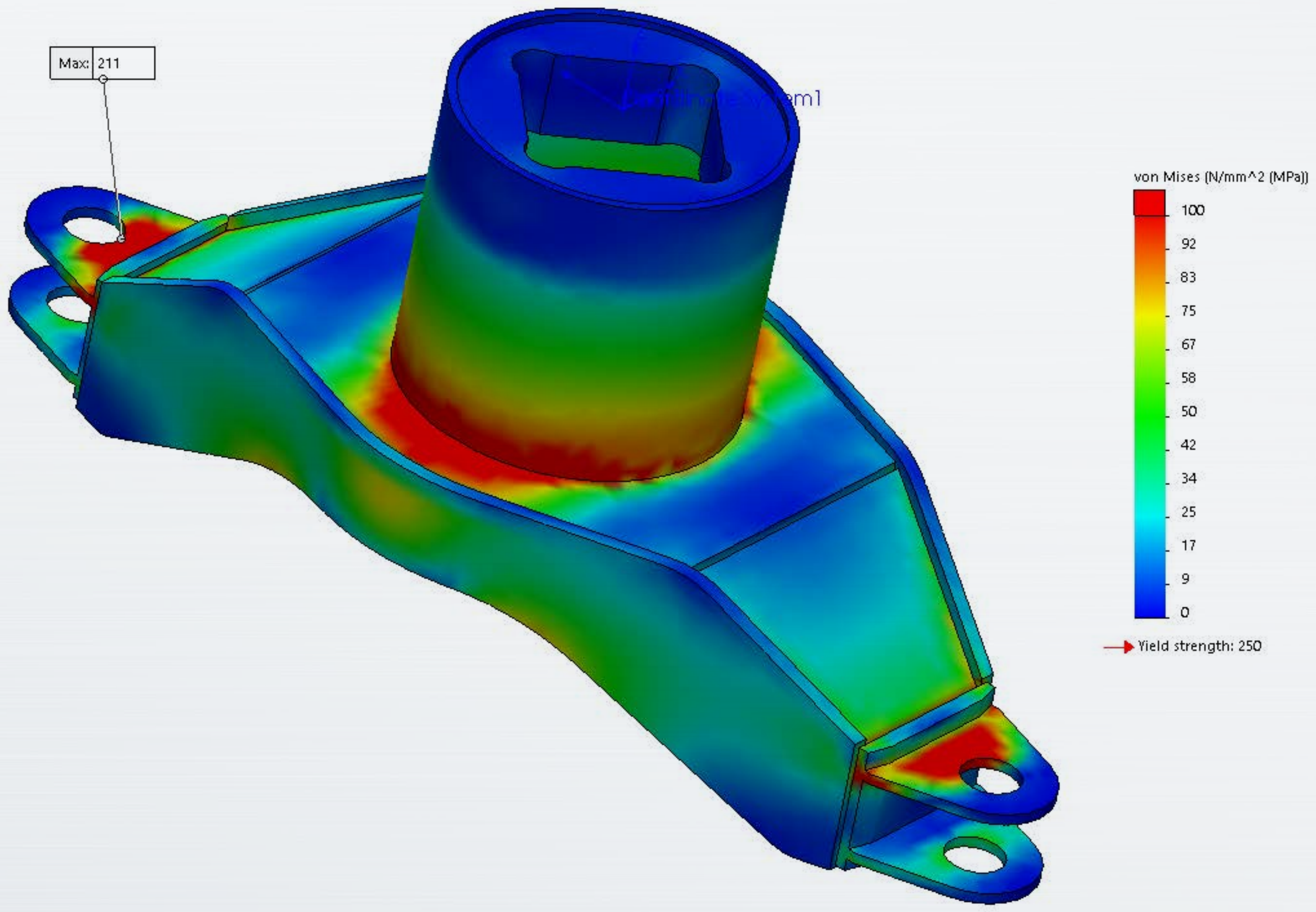
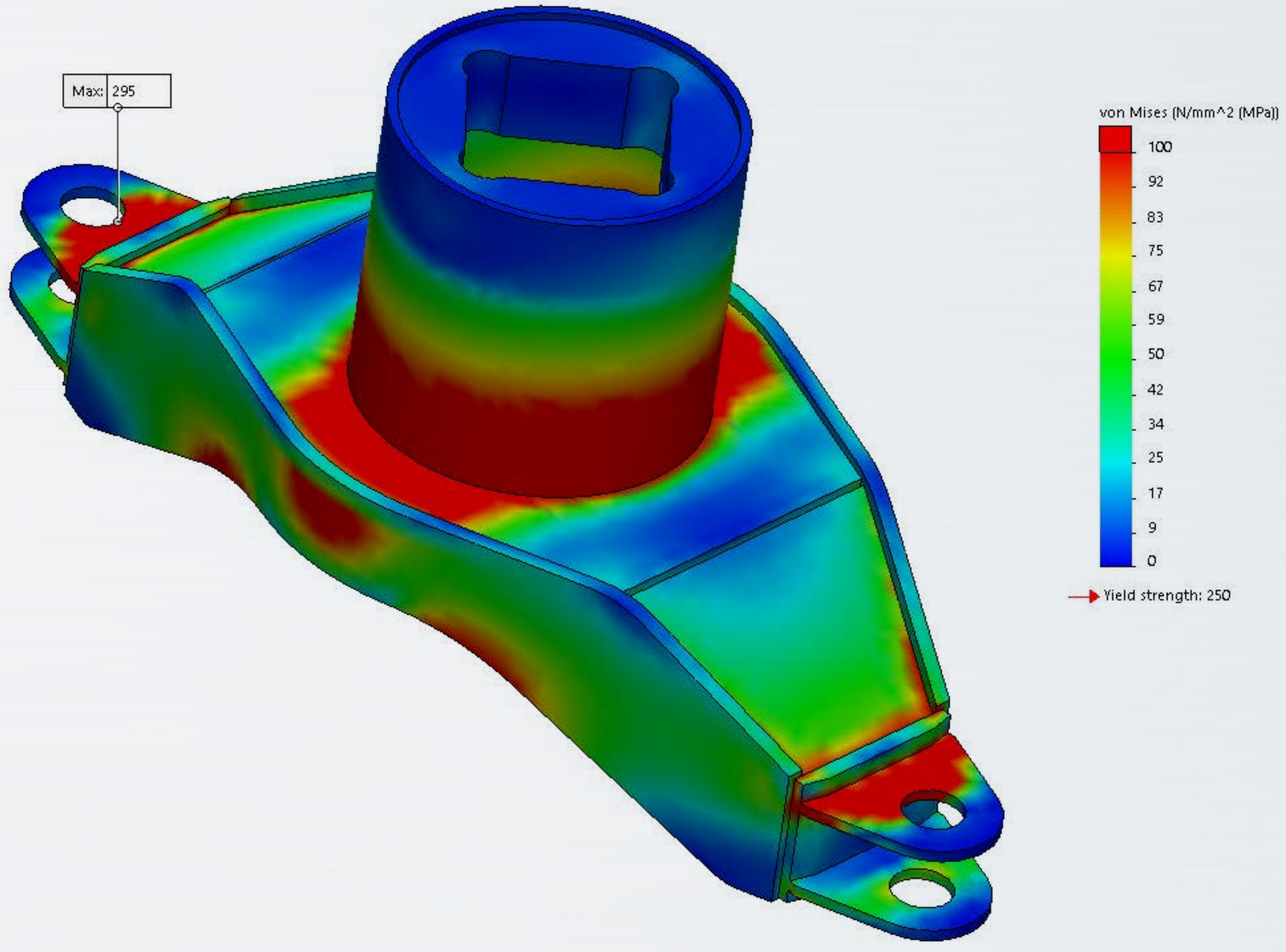
von Mises Stresses for applied Torque





Torque
T = 1250 kNm

Safety factor
SF = 250/211 = **1.18**
Smax/Syield = 208/250 = **84%**

Torque
T = 1750 kNm

Safety factor
SF = 250/295 = **0.85**
Smax/Syield = 295/250 = **118%**

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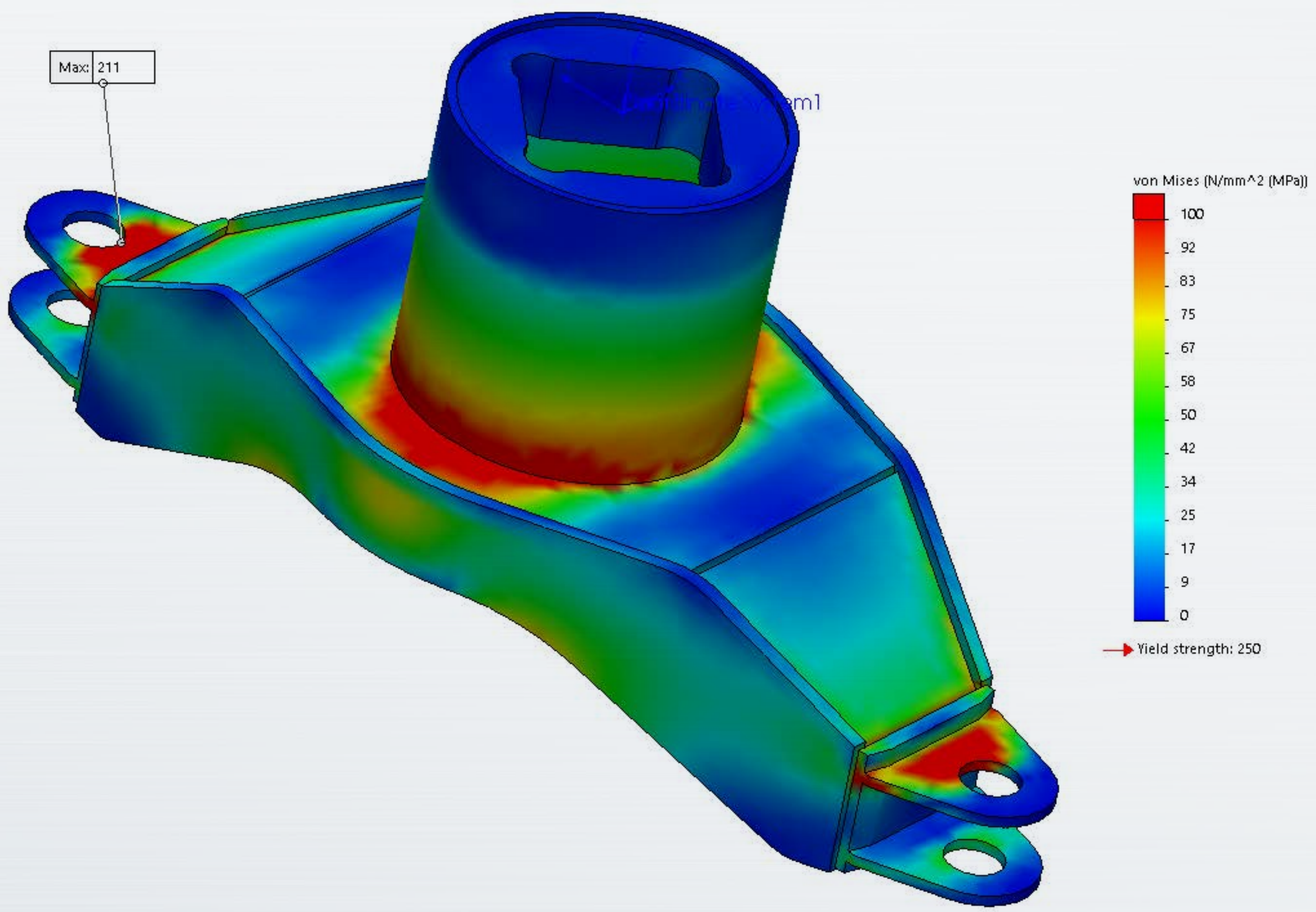
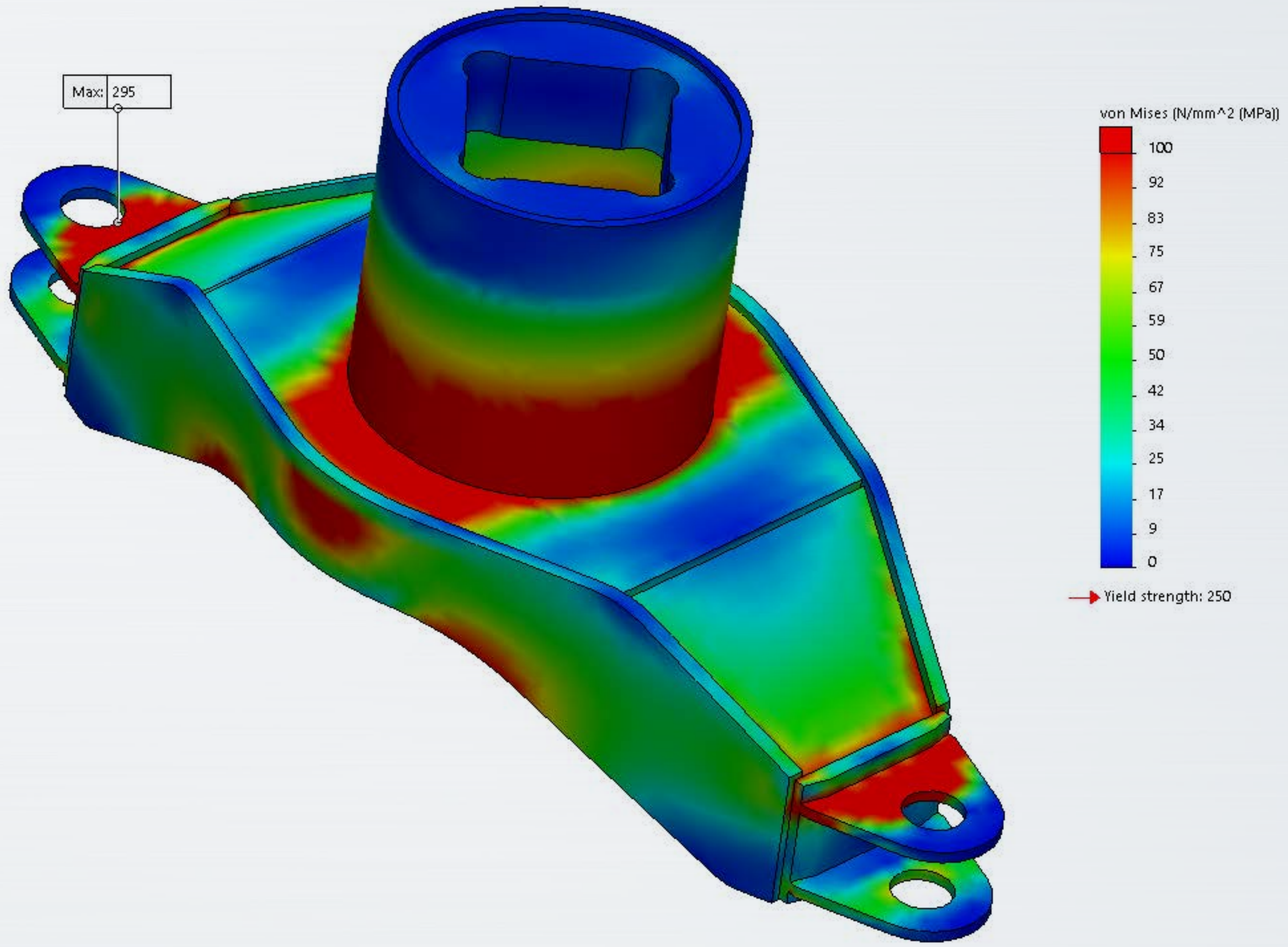
Displacements for applied Torque





Torque **T = 1250 kNm**	Torque **T = 1750 kNm**
Max Displacement = 0.539 mm	Max Displacement = 0.755 mm

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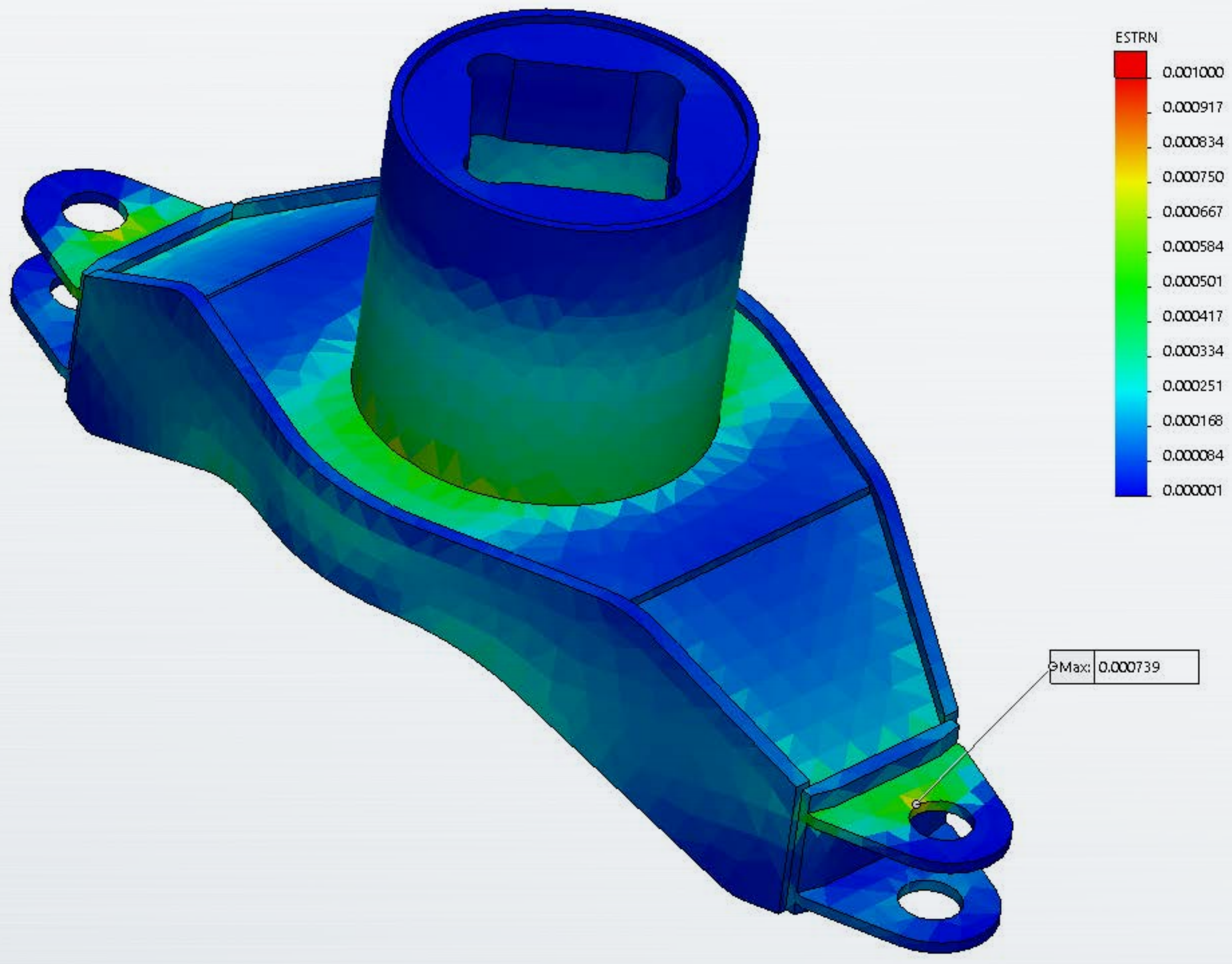
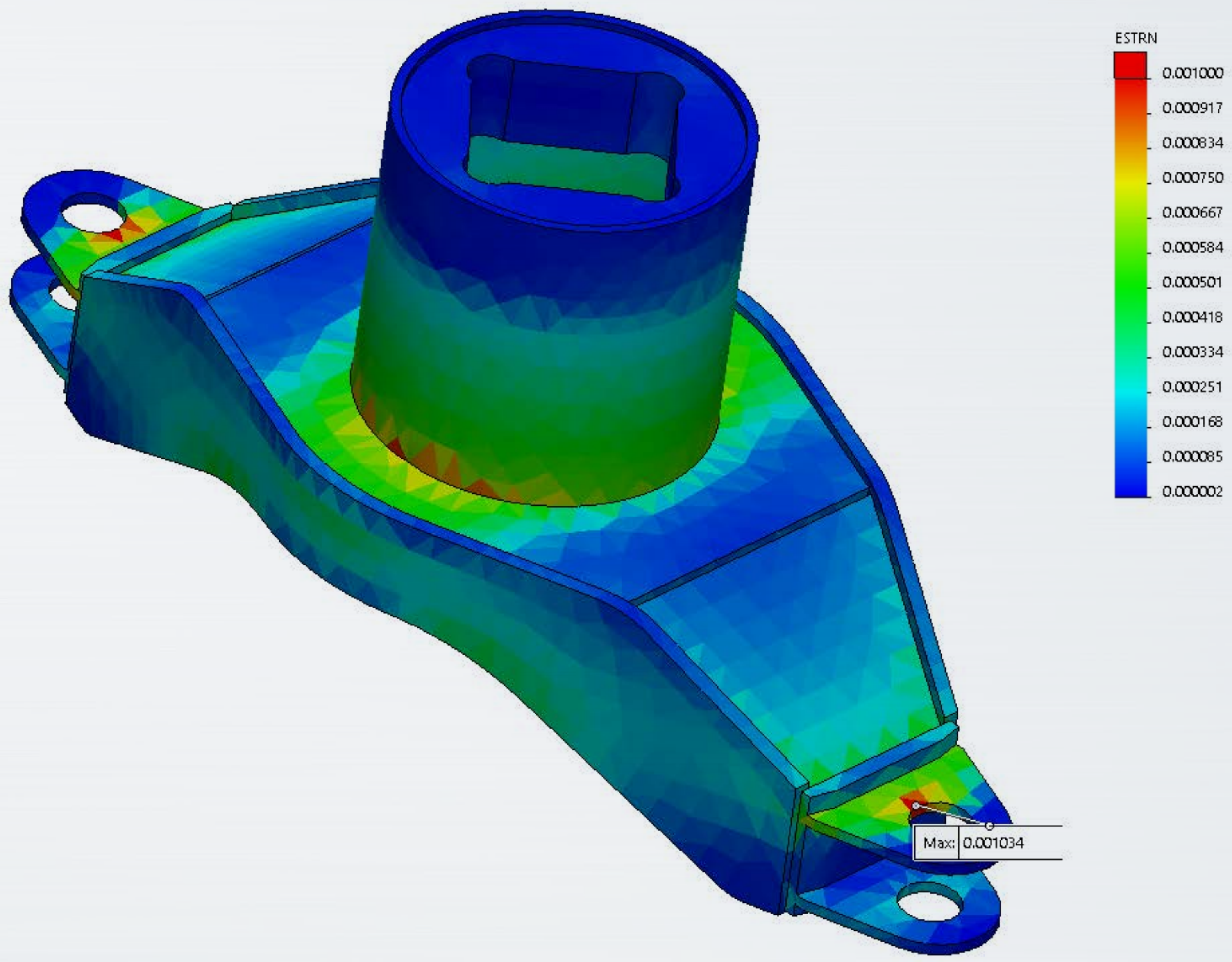
Unit strains for applied Torque





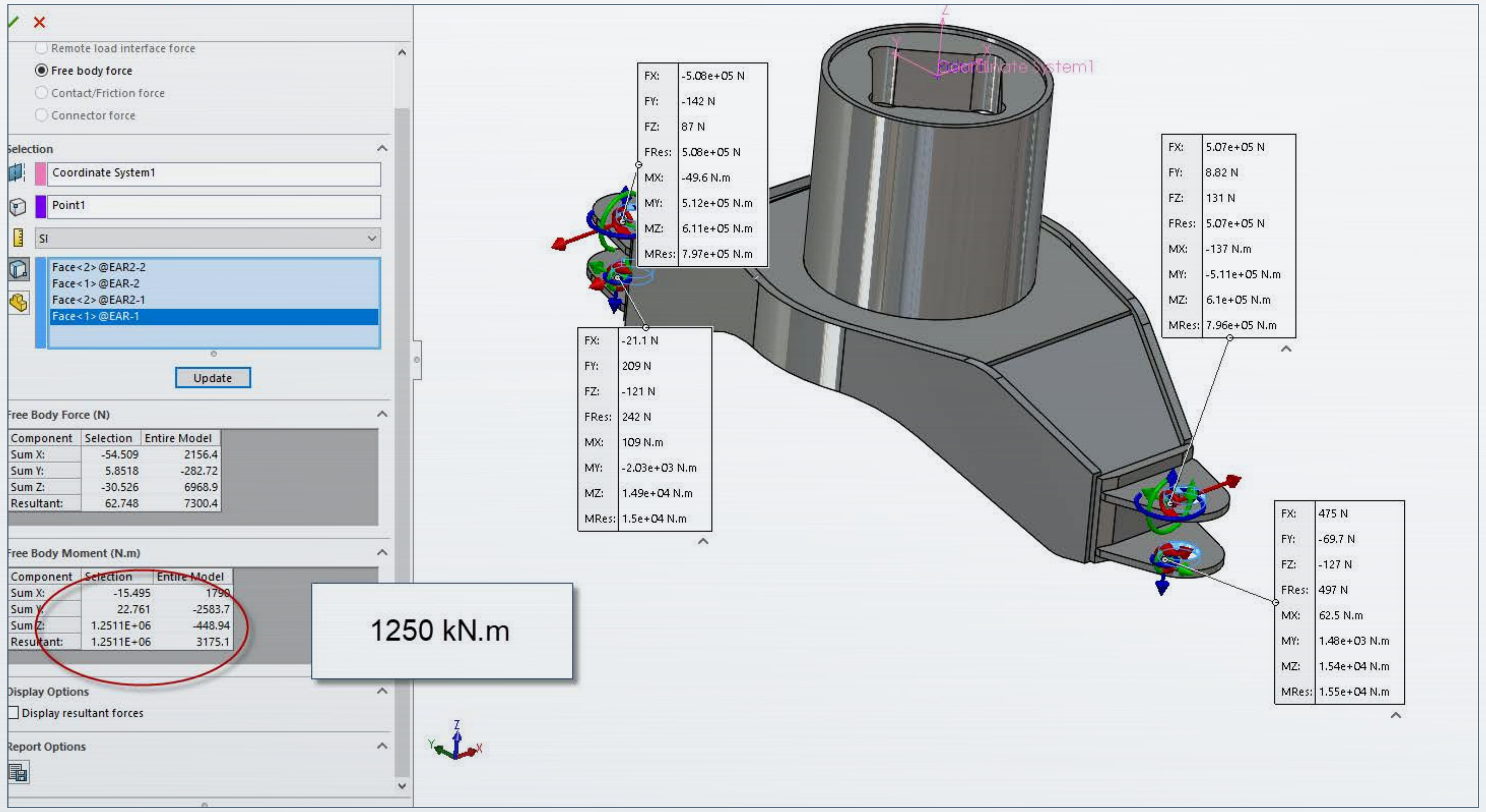
Torque
T = 1250 kNm

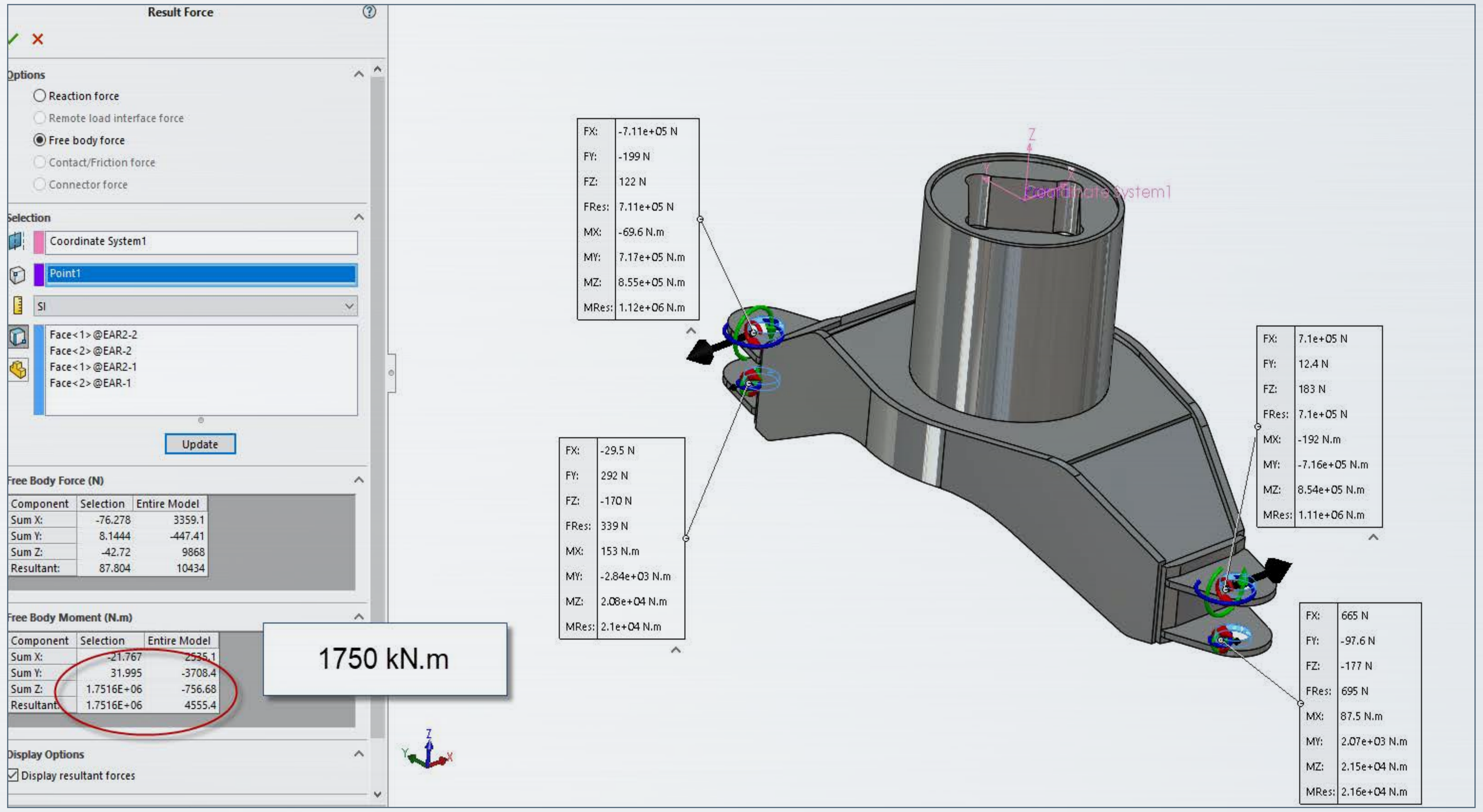
Max Elastic Strain = 0.071%

Torque
T = 1750 kNm

Max Elastic Strain = 0.103%

Unit strains for applied Torque





Torque
T = 1250 kNm

Torque
T = 1750 kNm

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Conclusions

The stress fields found for the **1250 kN.m** and **1750 kN.m** torques have a factor of safety of 1.20 and 0.86 respectively.

The analysis performed is linear static, and for those levels of torque it can be said that we find **NOT safe** regions for a yield stress of **250 MPa**.

More advanced analyses on the component can be evaluated for a better understanding of the component under overtorque states.
These types of studies include: Fatigue and Nonlinear.