



## Simulation of z clamp

**Date:** 21 Mayıs 2012 Pazartesi  
**Designer:** Solidworks  
**Study name:** Study 1  
**Analysis type:** Static

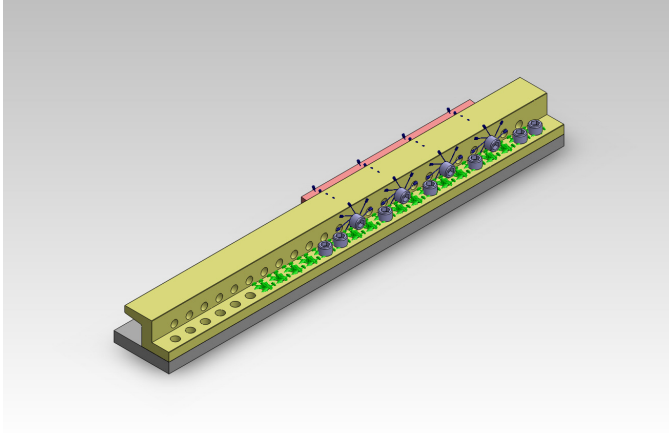
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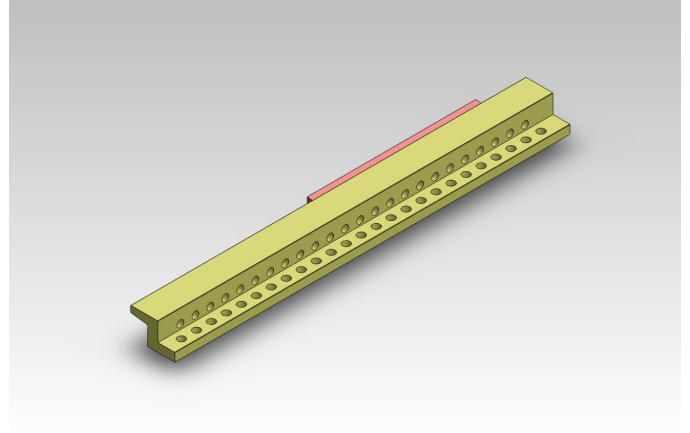
### Description

No Data

## Assumptions

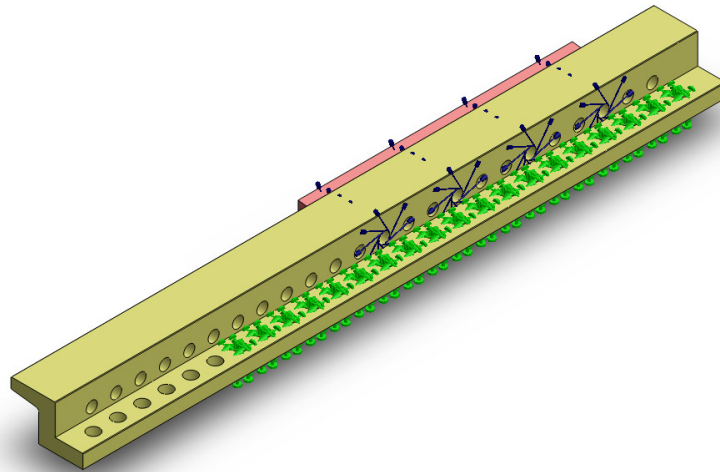


Original Model



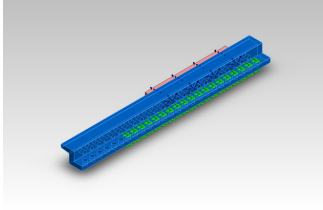
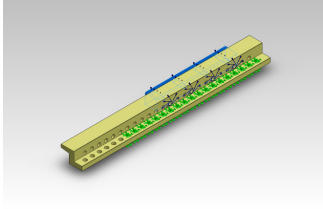
Model Analyzed

## Model Information



Model name: z clamp  
Current Configuration: Default



Solid Bodies			
Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
<p>Chamfer1</p> 	Solid Body	Mass:39.3466 kg Volume:0.00504444 m <sup>3</sup> Density:7800 kg/m <sup>3</sup> Weight:385.597 N	\\Semihb\o\MGM Transfer Klasörü\Test rig alternate design\Z clamp other side.SLDPRT May 17 14:20:31 2012
<p>M20x2.0 Tapped Hole1</p> 	Solid Body	Mass:15.8503 kg Volume:0.00203209 m <sup>3</sup> Density:7800 kg/m <sup>3</sup> Weight:155.333 N	\\Semihb\o\MGM Transfer Klasörü\Test rig alternate design\Z side clamp other side.SLDPRT May 17 14:20:31 2012

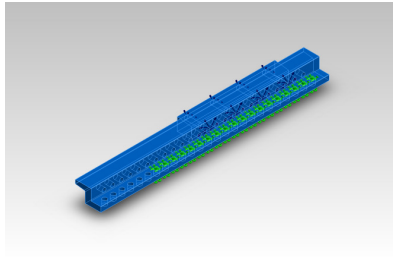
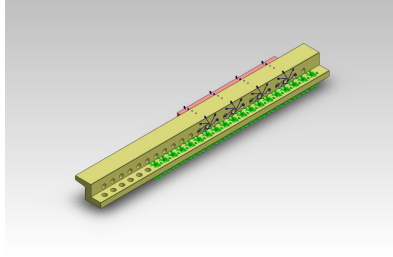
## Study Properties

Study name	Study 1
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	Automatic
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 (\\Semihb\o\MGM Transfer Klasörü\Test rig alternate design\z clamp analysis)

## Units

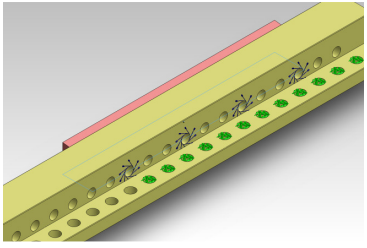
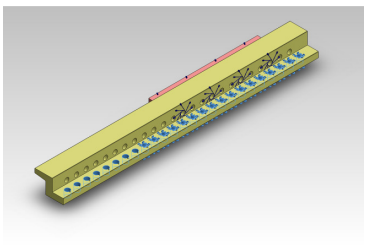
Unit system:	SI (MKS)
Length/Displacement	mm
Temperature	Kelvin
Angular velocity	Rad/sec
Pressure/Stress	N/m <sup>2</sup>

## Material Properties

Model Reference	Properties	Components
	<b>Name:</b> 1.0044 (S275JR) <b>Model type:</b> Linear Elastic Isotropic <b>Default failure criterion:</b> Unknown <b>Yield strength:</b> 2.75e+008 N/m <sup>2</sup> <b>Tensile strength:</b> 5.00826e+008 N/m <sup>2</sup> <b>Elastic modulus:</b> 2.1e+011 N/m <sup>2</sup> <b>Poisson's ratio:</b> 0.28 <b>Mass density:</b> 7800 kg/m <sup>3</sup> <b>Shear modulus:</b> 7.9e+010 N/m <sup>2</sup> <b>Thermal expansion coefficient:</b> 1.1e-005 /Kelvin	SolidBody 1(Chamfer1)(Z clamp other side-1), SolidBody 1(M20x2.0 Tapped Hole1)(Z side clamp other side-1)
Curve Data:N/A		
	<b>Name:</b> Plain Carbon Steel <b>Model type:</b> Linear Elastic Isotropic <b>Default failure criterion:</b> Unknown <b>Yield strength:</b> 2.20594e+008 N/m <sup>2</sup> <b>Tensile strength:</b> 3.99826e+008 N/m <sup>2</sup> <b>Elastic modulus:</b> 2.1e+011 N/m <sup>2</sup> <b>Poisson's ratio:</b> 0.28 <b>Mass density:</b> 7800 kg/m <sup>3</sup> <b>Shear modulus:</b> 7.9e+010 N/m <sup>2</sup> <b>Thermal expansion coefficient:</b> 1.3e-005 /Kelvin	<Material_ComponentList1/>
Curve Data:N/A		

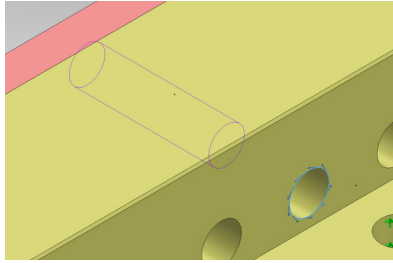


## Loads and Fixtures

Fixture name	Fixture Image	Fixture Details		
Roller/Slider-1		Entities: 1 face(s) Type: Roller/Slider		
<b>Resultant Forces</b>				
Components	X	Y	Z	Resultant
Reaction force(N)	0	-42908	0	42908
Reaction Moment(N-m)	0	0	0	0
Fixed-3		Entities: 25 face(s) Type: Fixed Geometry		
<b>Resultant Forces</b>				
Components	X	Y	Z	Resultant
Reaction force(N)	-0.0030548	42907.9	-0.00455523	42907.9
Reaction Moment(N-m)	0	0	0	0

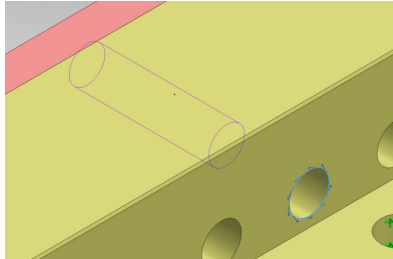
## Connector Definitions

### Pin/Bolt/Bearing Connector

Model Reference	Connector Details	Strength Details
 Counterbore Screw-1	Entities: 1 edge(s), 1 face(s) Type: Bolt(Head/Nut diameter)(Count erbore screw) Head diameter: 30 mm Nominal shank diameter: 18 Preload (Torque): 400 Young's modulus: 2.1e+011 Poisson's ratio: 0.28 Preload units: N-m	No Data

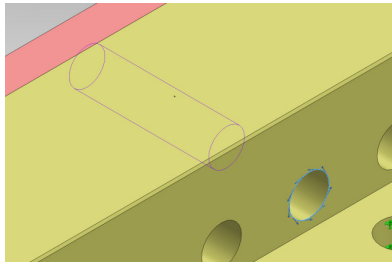
#### Connector Forces

Type	X-Component	Y-Component	Z-Component	Resultant
Axial Force (N)	92573	-1544.5	-1149.6	92593
Shear Force (N)	13.167	778.2	14.796	778.45
Bending moment (N-m)	-0.54947	-0.031183	-44.207	44.21

 Copy[ 1 ] Counterbore Screw-1	Entities: 1 edge(s), 1 face(s) Type: Bolt(Head/Nut diameter)(Count erbore screw) Head diameter: 30 mm Nominal shank diameter: 18 Preload (Torque): 400 Young's modulus: 2.1e+011 Poisson's ratio: 0.28 Preload units: N-m	No Data
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#### Connector Forces

Type	X-Component	Y-Component	Z-Component	Resultant
Axial Force (N)	92573	-1544.5	-1148	92593
Shear Force (N)	16.338	989.8	-14.151	990.04
Bending moment (N-m)	-0.70021	-1.0539	-55.046	55.061



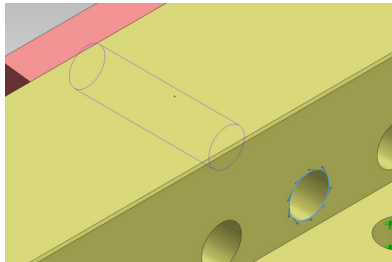
Copy[ 1 ] Counterbore Screw-1{1}

Entities: 1 edge(s), 1 face(s)  
 Type: Bolt(Head/Nut diameter)(Count er bore screw)  
 Head diameter: 30 mm  
 Nominal shank diameter: 18  
 Preload (Torque): 400  
 Young's modulus: 2.1e+011  
 Poisson's ratio: 0.28  
 Preload units: N-m

No Data

### Connector Forces

Type	X-Component	Y-Component	Z-Component	Resultant
Axial Force (N)	92573	-1544.5	-1148	92593
Shear Force (N)	16.349	993.2	-17.895	993.49
Bending moment (N-m)	-0.70086	-0.95785	-55.227	55.239



Copy[ 1 ] Counterbore Screw-1{1}{1}

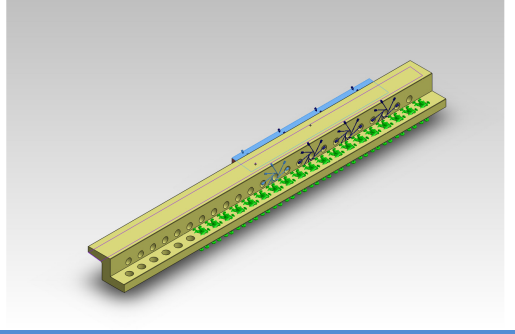
Entities: 1 edge(s), 1 face(s)  
 Type: Bolt(Head/Nut diameter)(Count er bore screw)  
 Head diameter: 30 mm  
 Nominal shank diameter: 18  
 Preload (Torque): 400  
 Young's modulus: 2.1e+011  
 Poisson's ratio: 0.28  
 Preload units: N-m

No Data

### Connector Forces

Type	X-Component	Y-Component	Z-Component	Resultant
Axial Force (N)	92570	-1432.4	-1458.7	92593
Shear Force (N)	11.553	739.95	6.5726	740.07
Bending moment (N-m)	-0.69337	-1.1443	-42.879	42.9

## Contact Information

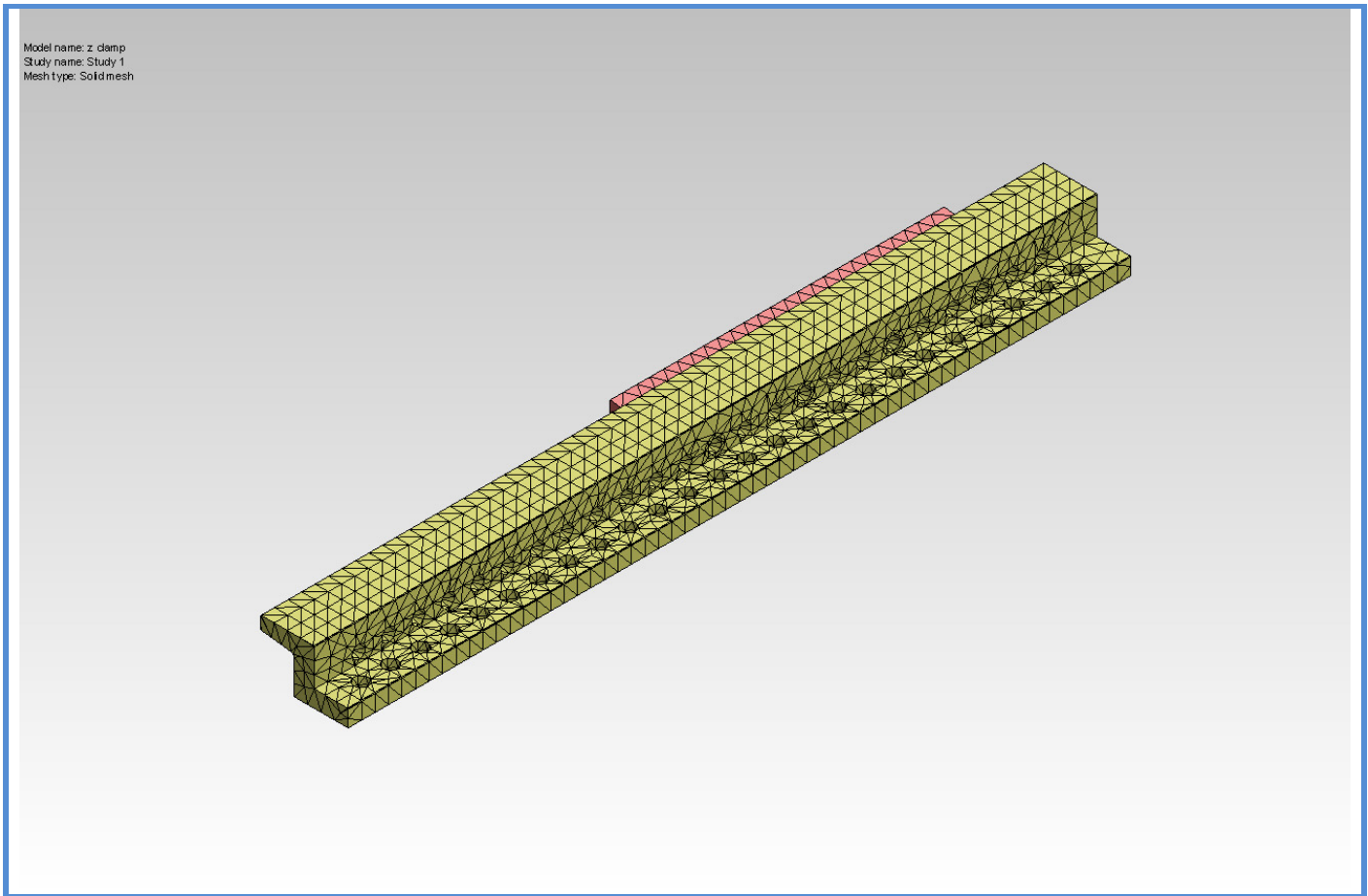
Contact	Contact Image	Contact Properties
Contact Set-1		<p><b>Type:</b> No Penetration contact pair</p> <p><b>Entites:</b> 2 face(s)</p> <p><b>Friction Value:</b> 0.2</p> <p><b>Advanced:</b> Surface to surface</p>

## Mesh Information

Mesh type	Solid Mesh
Mesher Used:	Standard mesh
Automatic Transition:	Off
Include Mesh Auto Loops:	Off
Jacobian points	4 Points
Element Size	20 mm
Tolerance	1 mm
Mesh Quality	High
Remesh failed parts with incompatible mesh	Off

## Mesh Information - Details

Total Nodes	29098
Total Elements	16503
Maximum Aspect Ratio	22.686
% of elements with Aspect Ratio < 3	87.7
% of elements with Aspect Ratio > 10	4.67
% of distorted elements(Jacobian)	0
Time to complete mesh(hh:mm:ss):	00:00:10
Computer name:	BARISY



## Sensor Details

No Data

## Resultant Forces

### Reaction Forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-0.0030548	0.00256348	-0.00455523	0.0060542

### Reaction Moments

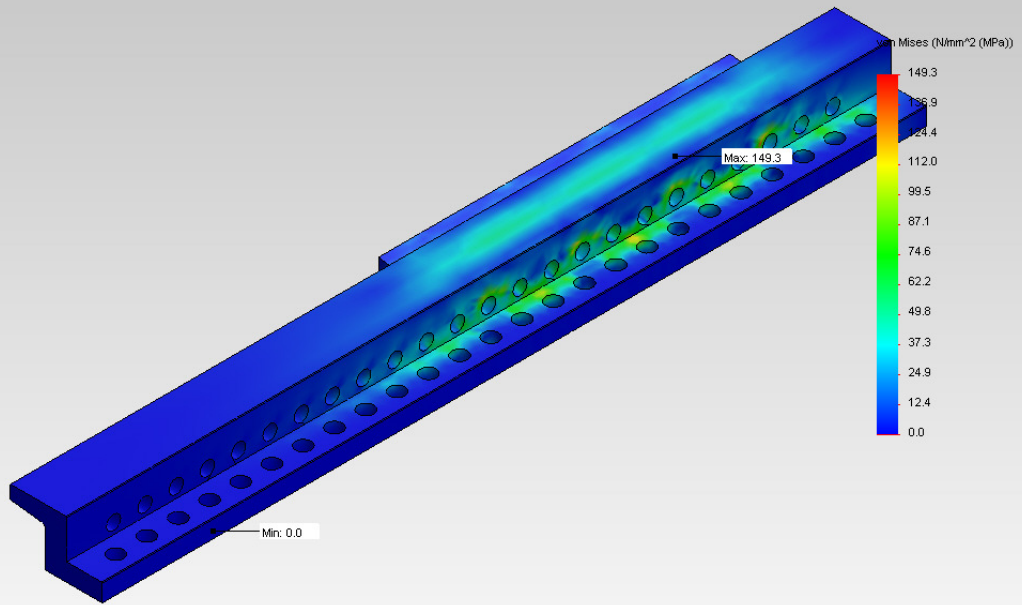
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N-m	0	0	0	0

**Beams**  
No Data

## Study Results

Name	Type	Min	Max
Stress1	VON: von Mises Stress	0.00164627 N/mm <sup>2</sup> (MPa) Node: 15403	149.293 N/mm <sup>2</sup> (MPa) Node: 10876

Model name: z\_clamp  
Study name: Study 1  
Plot type: Static nodal stress Stress1  
Deformation scale: 1

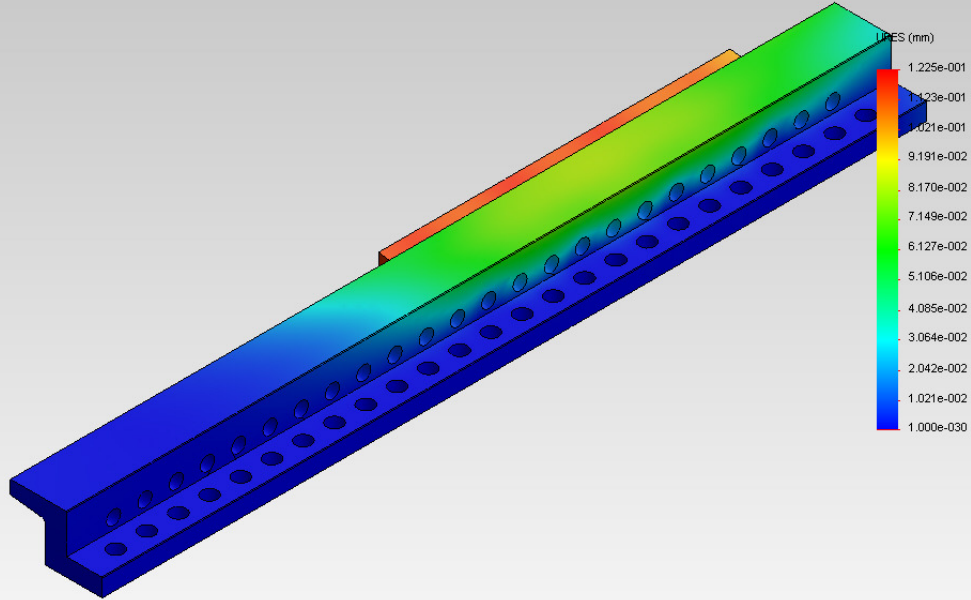


z clamp-Study 1-Stress-Stress1

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0 mm Node: 497	0.122549 mm Node: 23867



Model name: z clamp  
Study name: Study 1  
Plot type: Static displacement Displacement1  
Deformation scale: 1

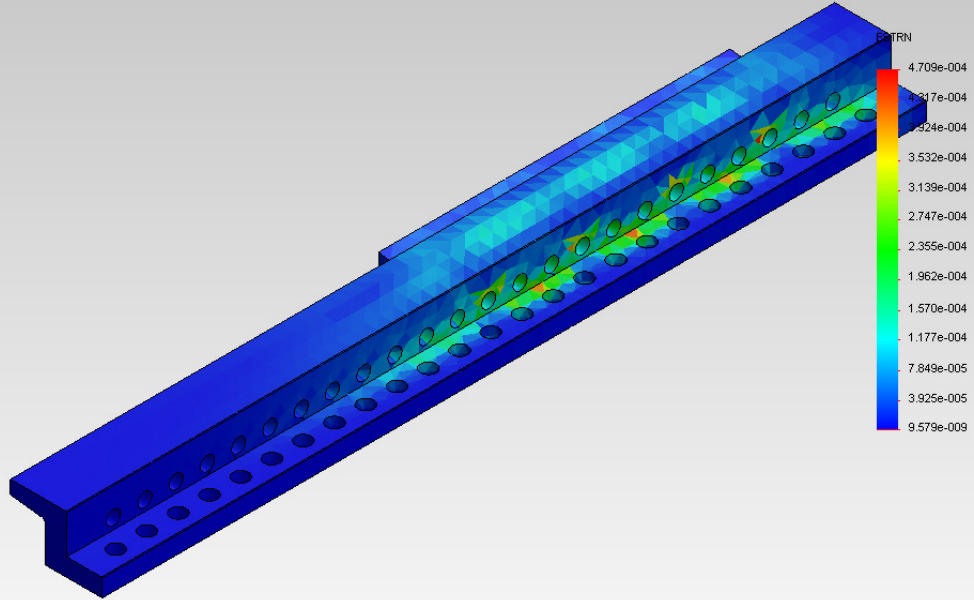


z clamp-Study 1-Displacement-Displacement1

Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	9.57896e-009 Element: 8738	0.000470908 Element: 5392



Model name: z clamp  
Study name: Study 1  
Plot type: Static strain Strain1  
Deformation scale: 1

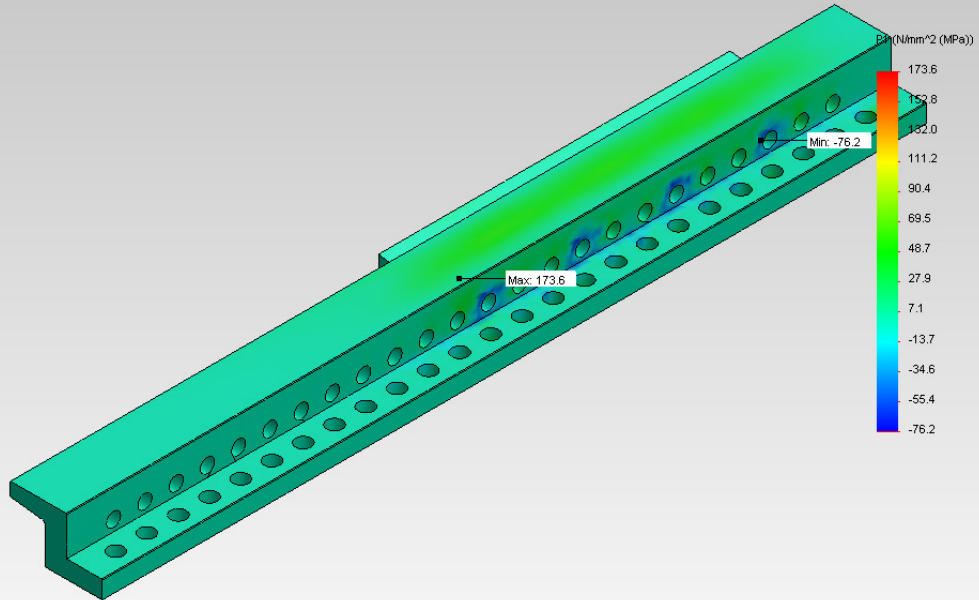


z clamp-Study 1-Strain-Strain1

Name	Type	Min	Max
Stress2	P1: 1st Principal Stress	-76.2003 N/mm <sup>2</sup> (MPa) Node: 23374	173.64 N/mm <sup>2</sup> (MPa) Node: 23930



Model name: z clamp  
Study name: Study 1  
Plot type: Static nodal stress Stress2  
Deformation scale: 1



z clamp-Study 1-Stress-Stress2