Project

First Saved	Thursday, June 6, 2019
Last Saved	Thursday, June 6, 2019
Product Version	18.1 Release
Save Project Before Solution	No
Save Project After Solution	No
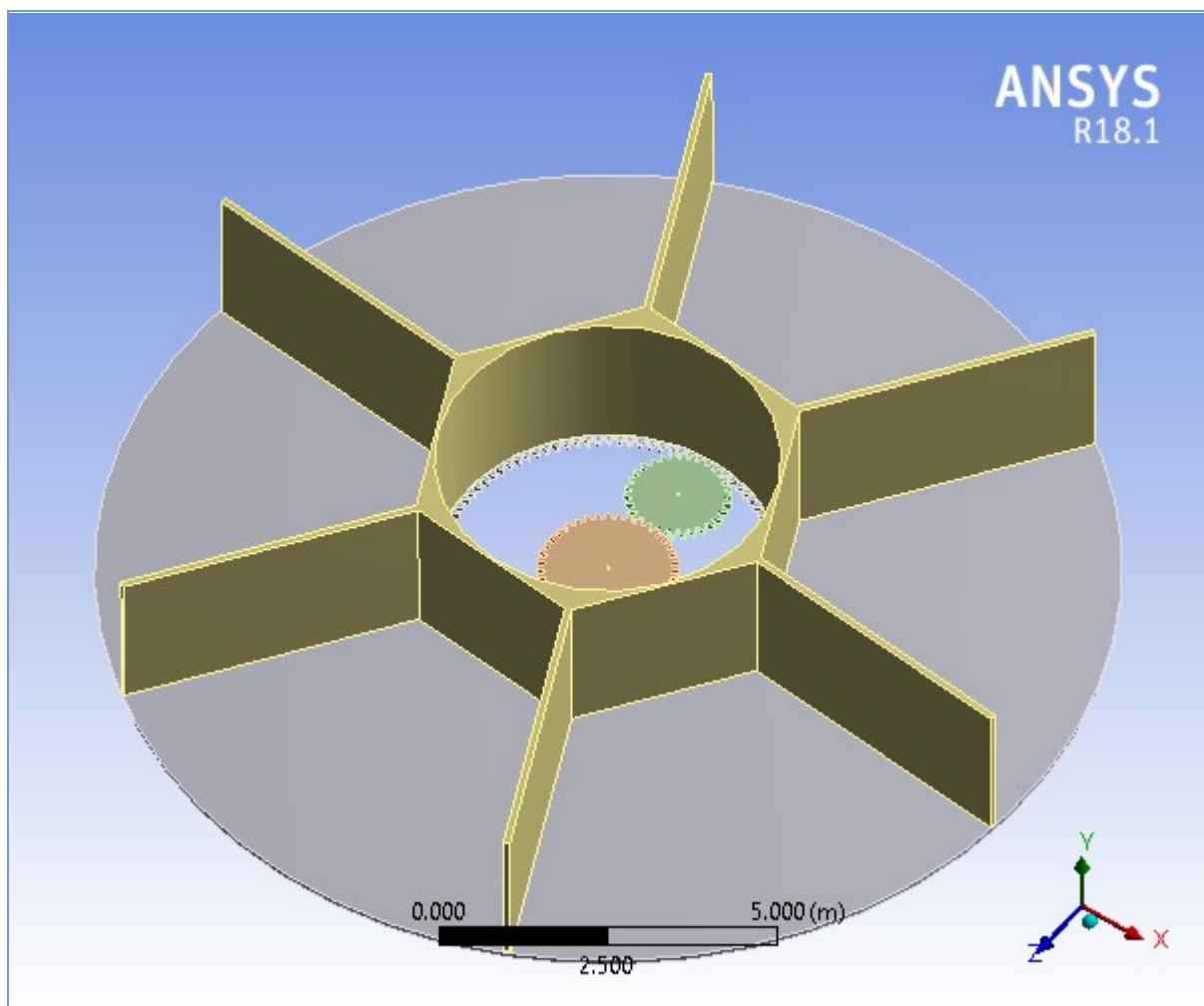
Contents

Report Not Finalized

Not all objects described below are in a finalized state. As a result, data may be incomplete, obsolete or in error. View first state problem. To finalize this report, edit objects as needed and solve the analyses.

Units

TABLE 1

Unit System	Metric (m, kg, N, s, V, A) Degrees rad/s Celsius
Angle	Degrees
Rotational Velocity	rad/s
Temperature	Celsius

Model (A4)

Geometry

TABLE 2
Model (A4) > Geometry

Object Name	*Geometry*
State	Fully Defined
Definition	
Source	C:\Users\Jesus Alberto\Desktop\9.-B\Integración de Sistemas Mecatrónicos\Solidworks\EnsamblajeFinalAhorasiDiosito.x_t
Type	Parasolid
Length Unit	Meters
Element Control	Program Controlled
Display Style	Body Color

Bounding Box	
Length X	20.18 m
Length Y	2.6216 m
Length Z	20.18 m
Properties	
Volume	30.577 m³
Mass	2.4003e+005 kg
Scale Factor Value	1.
Statistics	
Bodies	7
Active Bodies	7
Nodes	125666
Elements	27457
Mesh Metric	None
Basic Geometry Options	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	No
Parameters	Independent
Parameter Key	ANS;DS
Attributes	No
Named Selections	No
Material Properties	No
Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	No
Reader Mode Saves Updated File	No
Use Instances	Yes
Smart CAD Update	Yes
Compare Parts On Update	No
Attach File Via Temp File	Yes
Temporary Directory	C:\Users\Jesus Alberto\AppData\Local\Temp
Analysis Type	3-D
Mixed Import Resolution	None
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

TABLE 3
Model (A4) > Geometry > Parts

Object Name	corona	Satelite	Satelite	Planeta	Base2.5	Pieza1	BaseCajon
State	Meshed						
Graphics Properties							
Visible	Yes						
Transparency	1						
Definition							
Suppressed	No						
Stiffness Behavior	Flexible						
Coordinate							

System	Default Coordinate System						
Reference Temperature	By Environment						
Behavior	None						
Material							
Assignment	Structural Steel						
Nonlinear Effects	Yes						
Thermal Strain Effects	Yes						
Bounding Box							
Length X	5.8115 m	2.1467 m	2.1468 m	2.7875 m	0.15 m	18.329 m	20.18 m
Length Y	0.1 m				0.12 m	2.5 m	0.1016 m
Length Z	5.8115 m	2.1468 m	2.1469 m	2.7875 m	3.6 m	19.294 m	20.18 m
Properties							
Volume	0.11193 m³	0.17301 m³		0.30981 m³	9.4961e-003 m³	13.472 m³	16.328 m³
Mass	878.68 kg	1358.1 kg		2432. kg	74.545 kg	1.0576e+005 kg	1.2817e+005 kg
Centroid X	-3.3009e-003 m	-2.5273e-004 m					
Centroid Y	5.83e-003 m				-5.0487e-002 m	1.3074 m	6.63e-003 m
Centroid Z	3.5996 m	5.35 m	1.85 m	3.6 m			
Moment of Inertia Ip1	2670.7 kg·m²	189.99 kg·m²		604.93 kg·m²	76.286 kg·m²	1.0629e+006 kg·m²	2.0528e+006 kg·m²
Moment of Inertia Ip2	5333.3 kg·m²	377.73 kg·m²		1205.8 kg·m²	76.359 kg·m²	2.0107e+006 kg·m²	4.1055e+006 kg·m²
Moment of Inertia Ip3	2664. kg·m²	189.99 kg·m²		604.93 kg·m²	0.11606 kg·m²	1.0629e+006 kg·m²	2.0528e+006 kg·m²
Statistics							
Nodes	17772	23806		41578	842	3764	14098
Elements	7604	4496		8040	352	530	1939
Mesh Metric	None						

Coordinate Systems

TABLE 4
Model (A4) > Coordinate Systems > Coordinate System

Object Name	*Global Coordinate System*
State	Fully Defined
Definition	
Type	Cartesian
Coordinate System ID	0.
Origin	
Origin X	0. m
Origin Y	0. m
Origin Z	0. m
Directional Vectors	
X Axis Data	[1. 0. 0.]
Y Axis Data	[0. 1. 0.]
Z Axis Data	[0. 0. 1.]

Connections

TABLE 5
Model (A4) > Connections

Object Name	Connections
State	Fully Defined
Auto Detection	
Generate Automatic Connection On Refresh	Yes
Transparency	
Enabled	Yes

TABLE 6
Model (A4) > Connections > Contacts

Object Name	Contacts
State	Fully Defined
Definition	
Connection Type	Contact
Scope	
Scoping Method	Geometry Selection
Geometry	All Bodies
Auto Detection	
Tolerance Type	Slider
Tolerance Slider	0.
Tolerance Value	7.1648e-002 m
Use Range	No
Face/Face	Yes
Face Overlap Tolerance	Off
Cylindrical Faces	Include
Face/Edge	No
Edge/Edge	No
Priority	Include All
Group By	Bodies
Search Across	Bodies
Statistics	
Connections	10
Active Connections	10

TABLE 7
Model (A4) > Connections > Contacts > Contact Regions

Object Name	Contact Region	Contact Region 2	Contact Region 3	Contact Region 4	Contact Region 5	Contact Region 6	Contact Region 8	Contact Region 9	Contact Region 11	Contact Region 12
State	Fully Defined									
Scope										
Scoping Method	Geometry Selection									
Contact	27 Faces		1 Face		13 Faces	2 Faces	13 Faces	2 Faces		1 Face
Target	25 Faces		1 Face		11 Faces	2 Faces	11 Faces	2 Faces		1 Face
Contact Bodies	corona				Satelite				Planeta	Pieza1
Target Bodies	Satelite	Pieza1	BaseCajon	Planeta	Base2.5	Planeta		Base2.5		BaseCajon
Definition										
Type	Bonded									

Scope Mode	Automatic
Behavior	Program Controlled
Trim Contact	Program Controlled
Trim Tolerance	7.1648e-002 m
Suppressed	No
Advanced	
Formulation	Program Controlled
Detection Method	Program Controlled
Penetration Tolerance	Program Controlled
Elastic Slip Tolerance	Program Controlled
Normal Stiffness	Program Controlled
Update Stiffness	Program Controlled
Pinball Region	Program Controlled
Geometric Modification	
Contact Geometry Correction	None
Target Geometry Correction	None

Mesh

TABLE 8
Model (A4) > Mesh

Object Name	*Mesh*
State	Solved
Display	
Display Style	Body Color
Defaults	
Physics Preference	Mechanical
Relevance	0
Element Order	Program Controlled
Sizing	
Size Function	Adaptive
Relevance Center	Coarse
Element Size	Default
Initial Size Seed	Assembly
Transition	Fast
Span Angle Center	Coarse
Automatic Mesh Based Defeaturing	On
Defeature Size	Default
Minimum Edge Length	1.5463e-002 m
Quality	
Check Mesh Quality	Yes, Errors
Error Limits	Standard Mechanical

Target Quality	Default (0.050000)
Smoothing	Medium
Mesh Metric	None
Inflation	
Use Automatic Inflation	None
Inflation Option	Smooth Transition
Transition Ratio	0.272
Maximum Layers	5
Growth Rate	1.2
Inflation Algorithm	Pre
View Advanced Options	No
Advanced	
Number of CPUs for Parallel Part Meshing	Program Controlled
Straight Sided Elements	No
Number of Retries	Default (4)
Rigid Body Behavior	Dimensionally Reduced
Mesh Morphing	Disabled
Triangle Surface Mesher	Program Controlled
Topology Checking	No
Pinch Tolerance	Please Define
Generate Pinch on Refresh	No
Statistics	
Nodes	125666
Elements	27457

Static Structural (A5)

TABLE 9
Model (A4) > Analysis

Object Name	*Static Structural (A5)*
State	Solved
Definition	
Physics Type	Structural
Analysis Type	Static Structural
Solver Target	Mechanical APDL
Options	
Environment Temperature	22. °C
Generate Input Only	No

TABLE 10
Model (A4) > Static Structural (A5) > Analysis Settings

Object Name	*Analysis Settings*
State	Fully Defined
Step Controls	
Number Of Steps	1.
Current Step Number	1.
Step End Time	1. s
Auto Time Stepping	Program Controlled
Solver Controls	
Solver Type	Program Controlled
Weak Springs	Off
Solver Pivot Checking	Program Controlled
Large Deflection	Off

Inertia Relief	Off
Rotordynamics Controls	
Coriolis Effect	Off
Restart Controls	
Generate Restart Points	Program Controlled
Retain Files After Full Solve	No
Combined Restart Files	Program Controlled
Nonlinear Controls	
Newton-Raphson Option	Program Controlled
Force Convergence	Program Controlled
Moment Convergence	Program Controlled
Displacement Convergence	Program Controlled
Rotation Convergence	Program Controlled
Line Search	Program Controlled
Stabilization	Off
Output Controls	
Stress	Yes
Strain	Yes
Nodal Forces	No
Contact Miscellaneous	No
General Miscellaneous	No
Store Results At	All Time Points
Analysis Data Management	
Solver Files Directory	C:\Users\Jesus Alberto\Desktop\9.-B\Integración de Sistemas Mecatrónicos\Ansys\EnsambleEngranajes_files\dp0\SYS\MECH\
Future Analysis	None
Scratch Solver Files Directory	
Save MAPDL db	No
Delete Unneeded Files	Yes
Nonlinear Solution	No
Solver Units	Active System
Solver Unit System	mks

TABLE 11
Model (A4) > Static Structural (A5) > Loads

Object Name	*Cylindrical Support*	*Moment*
State	Fully Defined	
Scope		
Scoping Method	Geometry Selection	
Geometry	1 Face	
Definition		
Type	Cylindrical Support	Moment
Radial	Fixed	
Axial	Fixed	

Tangential	Fixed	
Suppressed	No	
Define By		Vector
Magnitude		13500 N·m (ramped)
Direction		Defined
Behavior		Deformable
Advanced		
Pinball Region		All

FIGURE 1
Model (A4) > Static Structural (A5) > Moment
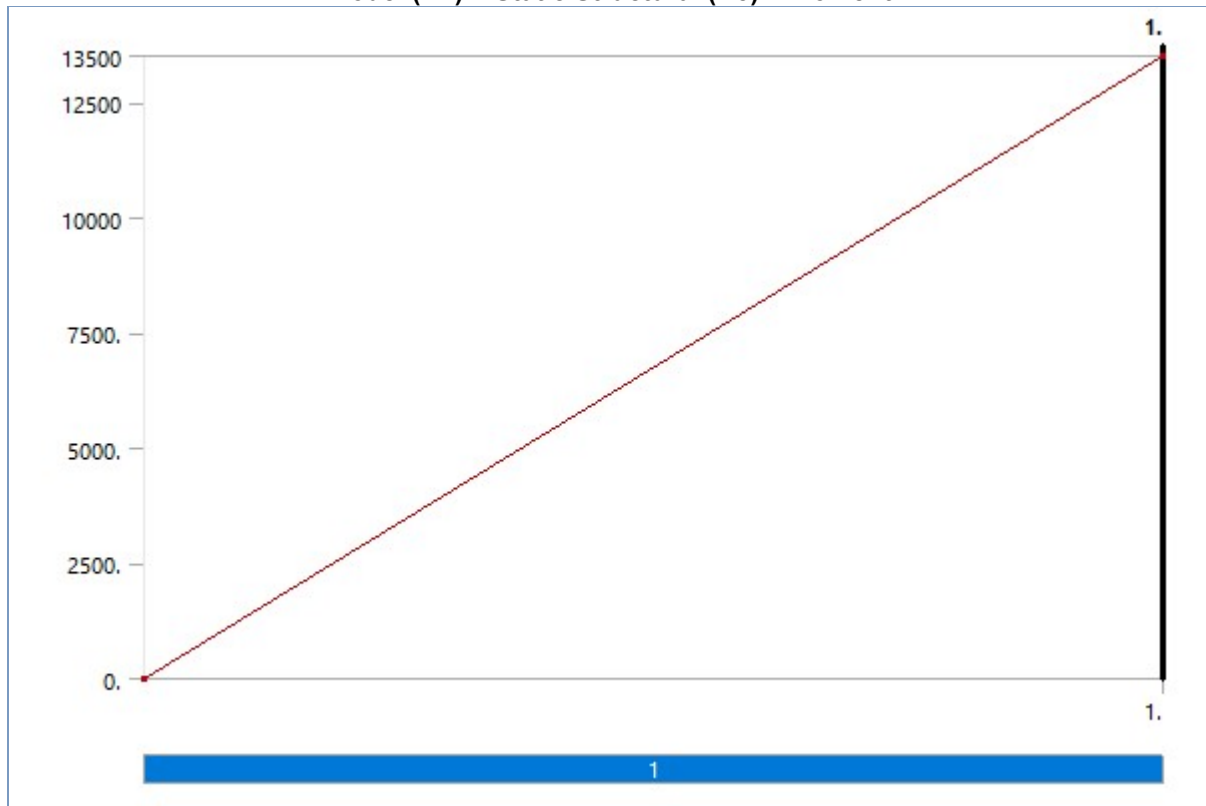
Solution (A6)

TABLE 12
Model (A4) > Static Structural (A5) > Solution

Object Name	Solution (A6)
State	Solved
Adaptive Mesh Refinement	
Max Refinement Loops	1.
Refinement Depth	2.
Information	
Status	Done
MAPDL Elapsed Time	54. s
MAPDL Memory Used	3.0098 GB
MAPDL Result File Size	40.813 MB
Post Processing	
Beam Section Results	No

TABLE 13

Model (A4) > Static Structural (A5) > Solution (A6) > Solution Information

Object Name	*Solution Information*
State	Solved
Solution Information	
Solution Output	Solver Output
Newton-Raphson Residuals	0
Identify Element Violations	0
Update Interval	2.5 s
Display Points	All
FE Connection Visibility	
Activate Visibility	Yes
Display	All FE Connectors
Draw Connections Attached To	All Nodes
Line Color	Connection Type
Visible on Results	No
Line Thickness	Single
Display Type	Lines

TABLE 14
Model (A4) > Static Structural (A5) > Solution (A6) > Results

Object Name	*Equivalent Stress*	*Total Deformation*	*Strain Energy*	*Equivalent Elastic Strain*
State	Solved			
Scope				
Scoping Method	Geometry Selection			
Geometry	All Bodies			
Definition				
Type	Equivalent (von-Mises) Stress	Total Deformation	Strain Energy	Equivalent Elastic Strain
By	Time			
Display Time	Last			
Calculate Time History	Yes			
Identifier				
Suppressed	No			
Integration Point Results				
Display Option	Averaged			Averaged
Average Across Bodies	No			No
Results				
Minimum	0.23013 Pa	0. m	1.0609e-017 J	3.3366e-012 m/m
Maximum	5.1046e+006 Pa	2.0674e-005 m	1.3768e-003 J	2.695e-005 m/m
Minimum Occurs On	corona	Pieza1	corona	Pieza1
Maximum Occurs On	Satelite	Planeta	BaseCajon	Planeta
Information				
Time	1. s			
Load Step	1			
Substep	1			
Iteration Number	1			

FIGURE 2
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress
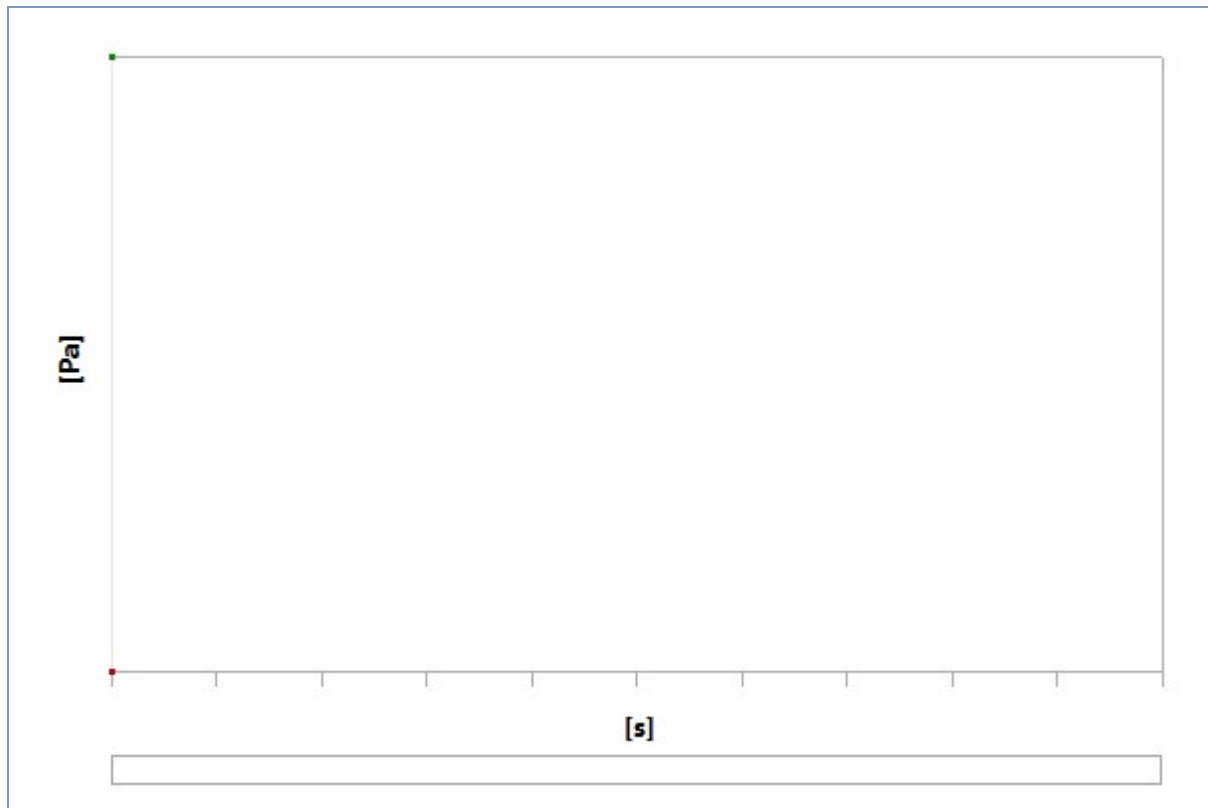
TABLE 15
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress

Time [s]	Minimum [Pa]	Maximum [Pa]
1.	0.23013	5.1046e+006

FIGURE 3
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation
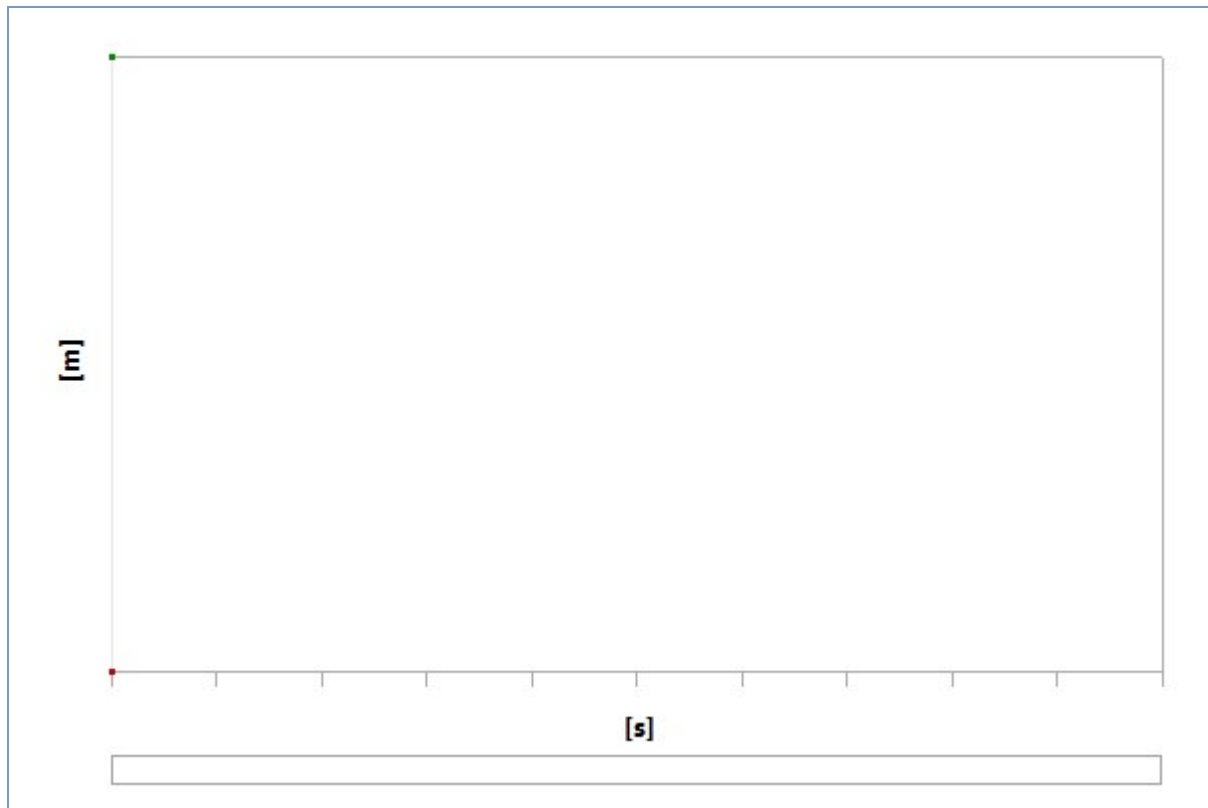
TABLE 16
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

Time [s]	Minimum [m]	Maximum [m]
1.	0.	2.0674e-005

FIGURE 4
Model (A4) > Static Structural (A5) > Solution (A6) > Strain Energy
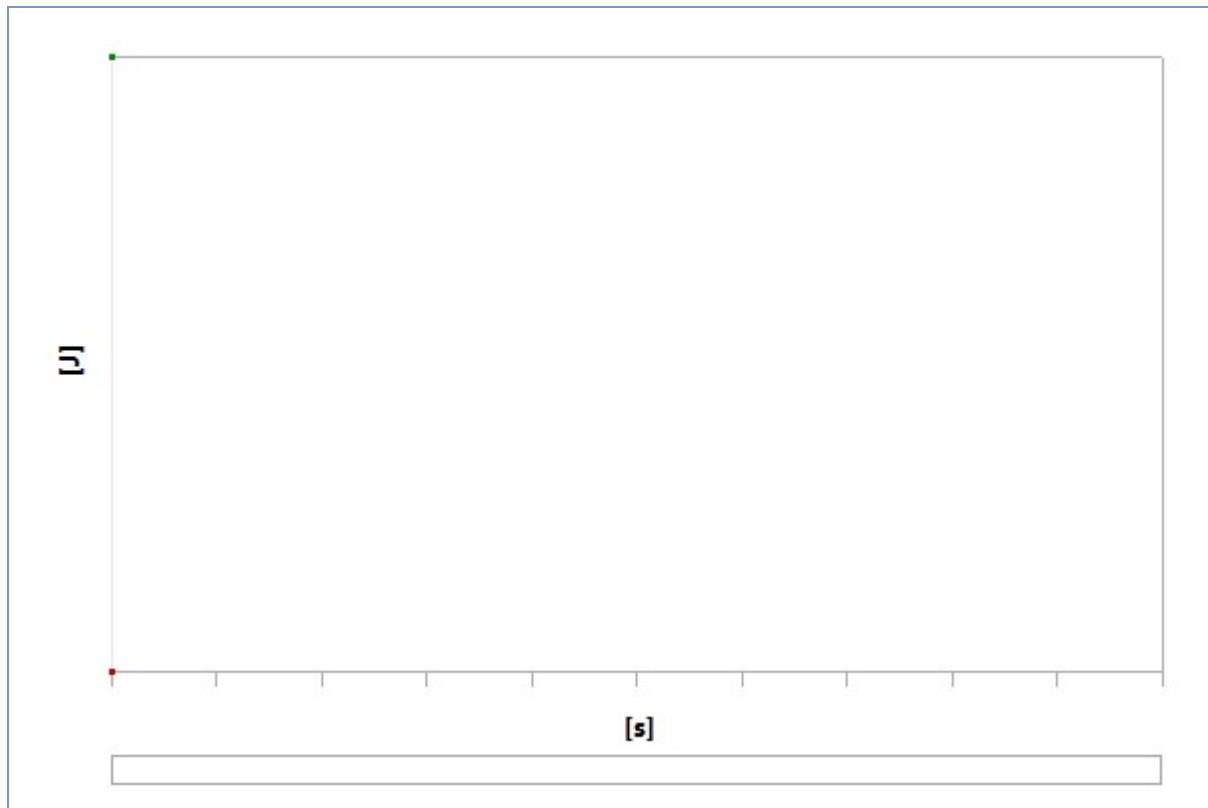
TABLE 17
Model (A4) > Static Structural (A5) > Solution (A6) > Strain Energy

Time [s]	Minimum [J]	Maximum [J]
1.	1.0609e-017	1.3768e-003

FIGURE 5
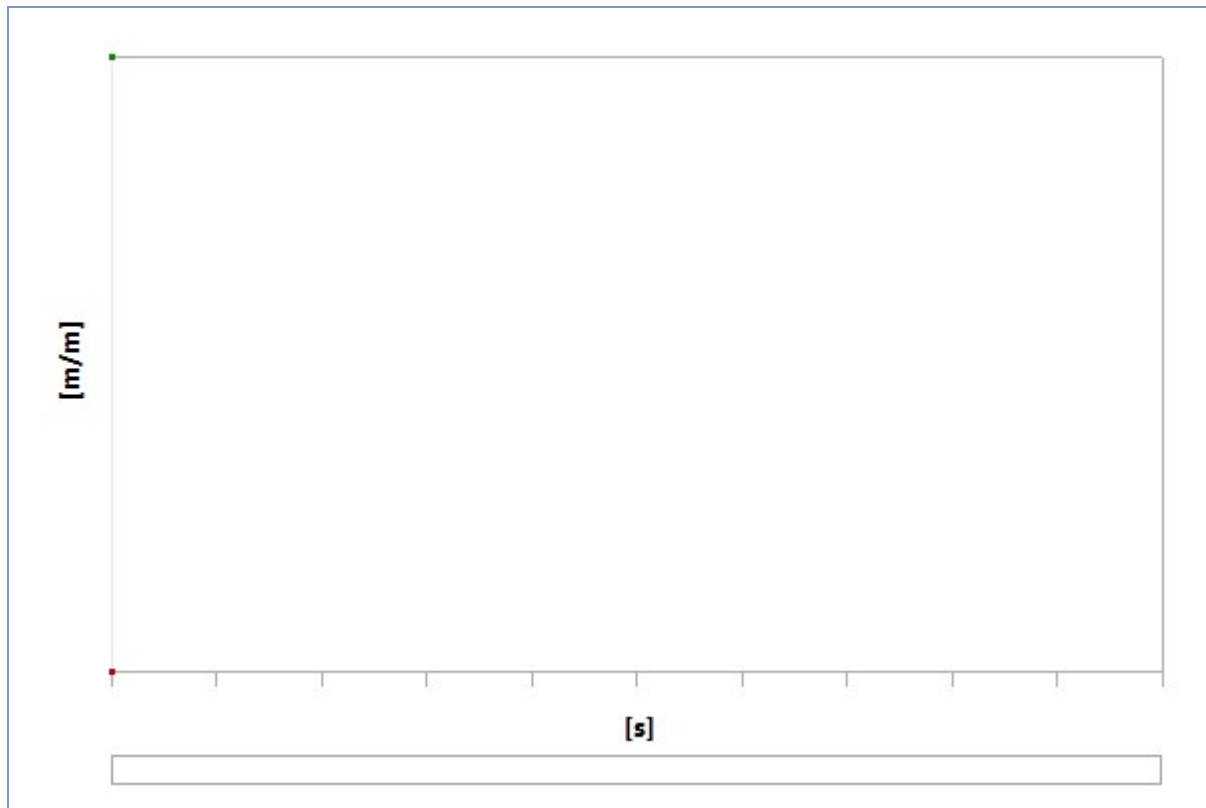**Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Elastic Strain**

TABLE 18
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Elastic Strain

Time [s]	Minimum [m/m]	Maximum [m/m]
1.	3.3366e-012	2.695e-005

Material Data

Structural Steel

TABLE 19
Structural Steel > Constants

Density	7850 kg m^-3
Isotropic Secant Coefficient of Thermal Expansion	1.2e-005 C^-1
Specific Heat	434 J kg^-1 C^-1
Isotropic Thermal Conductivity	60.5 W m^-1 C^-1
Isotropic Resistivity	1.7e-007 ohm m

TABLE 20
Structural Steel > Appearance

Red	Green	Blue
132	139	179

TABLE 21
Structural Steel > Compressive Ultimate Strength

Compressive Ultimate Strength Pa
0

TABLE 22

Structural Steel > Compressive Yield Strength

Compressive Yield Strength Pa
2.5e+008

TABLE 23
Structural Steel > Tensile Yield Strength

Tensile Yield Strength Pa
2.5e+008

TABLE 24
Structural Steel > Tensile Ultimate Strength

Tensile Ultimate Strength Pa
4.6e+008

TABLE 25
Structural Steel > Isotropic Secant Coefficient of Thermal Expansion

Zero-Thermal-Strain Reference Temperature C
22

TABLE 26
Structural Steel > Alternating Stress Mean Stress

Alternating Stress Pa	Cycles	Mean Stress Pa
3.999e+009	10	0
2.827e+009	20	0
1.896e+009	50	0
1.413e+009	100	0
1.069e+009	200	0
4.41e+008	2000	0
2.62e+008	10000	0
2.14e+008	20000	0
1.38e+008	1.e+005	0
1.14e+008	2.e+005	0
8.62e+007	1.e+006	0

TABLE 27
Structural Steel > Strain-Life Parameters

Strength Coefficient Pa	Strength Exponent	Ductility Coefficient	Ductility Exponent	Cyclic Strength Coefficient Pa	Cyclic Strain Hardening Exponent
9.2e+008	-0.106	0.213	-0.47	1.e+009	0.2

TABLE 28
Structural Steel > Isotropic Elasticity

Temperature C	Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa
	2.e+011	0.3	1.6667e+011	7.6923e+010

TABLE 29
Structural Steel > Isotropic Relative Permeability

Relative Permeability
10000