Project

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Save Project Before Solution	No
Save Project After Solution	No

Contents

Units

TABLE 1

Unit System	Metric (mm, kg, N, s, mV, mA) 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	D:\Vedant\Stent Analysis\stent_project_files\dp0\SYS\DM\SYS.agdb
Type	DesignModeler
Length Unit	Meters
Element Control	Program Controlled
Display Style	Body Color
Bounding Box	
Length X	1.12 mm
Length Y	1.12 mm
Length Z	4. mm

Properties	
Volume	0.12133 mm³
Mass	9.033e-007 kg
Scale Factor Value	1.
Statistics	
Bodies	2
Active Bodies	2
Nodes	131028
Elements	23110
Mesh Metric	None
Basic Geometry Options	
Parameters	Independent
Parameter Key	
Attributes	Yes
Attribute Key	
Named Selections	Yes
Named Selection Key	
Material Properties	Yes
Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	Yes
Coordinate System Key	
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\aewin32\AppData\Local\Temp
Analysis Type	3-D
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

TABLE 3
Model (A4) > Geometry > Parts

Object Name	*Stent*	*Balloon*
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	Balloon
Nonlinear Effects	Yes	
Thermal Strain Effects	Yes	
Bounding Box		
Length X	1.12 mm	0.9975 mm
Length Y	1.12 mm	0.9975 mm

Length Z	3.5071 mm	4. mm
Properties		
Volume	0.11507 mm³	6.2643e-003 mm³
Mass	9.033e-007 kg	0. kg
Centroid X	0.68413 mm	0.6331 mm
Centroid Y	0.68412 mm	0.6331 mm
Centroid Z	2.1967 mm	2. mm
Moment of Inertia Ip1	1.098e-006 kg·mm²	0. kg·mm²
Moment of Inertia Ip2	9.3975e-007 kg·mm²	0. kg·mm²
Moment of Inertia Ip3	1.7088e-007 kg·mm²	0. kg·mm²
Statistics		
Nodes	80376	50652
Elements	16008	7102
Mesh Metric	None	

Coordinate Systems

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

Object Name	*Global Coordinate System*	*Polar*
State	Fully Defined	
Definition		
Type	Cartesian	Cylindrical
Coordinate System ID	0.	
Coordinate System		Program Controlled
Suppressed		No
Origin		
Origin X	0. mm	
Origin Y	0. mm	-6.1079e-017 mm
Origin Z	0. mm	2. mm
Define By		Geometry Selection
Geometry		Defined
Directional Vectors		
X Axis Data	[1. 0. 0.]	
Y Axis Data	[0. 1. 0.]	
Z Axis Data	[0. 0. 1.]	
Principal Axis		
Axis		X
Define By		Global X Axis
Orientation About Principal Axis		
Axis		Y
Define By		Default
Transformations		
Base Configuration		Absolute
Transformed Configuration		[0. -6.1079e-017 2.]

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	1.0755e-002 mm
Use Range	No
Face/Face	No
Face/Edge	No
Edge/Edge	No
Priority	Include All
Group By	Bodies
Search Across	Bodies
Statistics	
Connections	1
Active Connections	1

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

Object Name	*Frictionless - Stent To Balloon*
State	Fully Defined
Scope	
Scoping Method	Geometry Selection
Contact	1 Face
Target	1 Face
Contact Bodies	Stent
Target Bodies	Balloon
Definition	
Type	Frictionless
Scope Mode	Manual
Behavior	Asymmetric
Trim Contact	Program Controlled
Suppressed	No
Advanced	
Formulation	Augmented Lagrange
Detection Method	Nodal-Projected Normal From Contact
Penetration Tolerance	Value
Penetration Tolerance Value	1.e-003 mm
Normal Stiffness	Manual
Normal Stiffness Factor	1.e-004
Update Stiffness	Each Iteration

Stabilization Damping Factor	0.
Pinball Region	Program Controlled
Time Step Controls	None
Geometric Modification	
Interface Treatment	Adjust to Touch
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
Shape Checking	Standard Mechanical
Element Midside Nodes	Program Controlled
Sizing	
Size Function	Adaptive
Relevance Center	Coarse
Element Size	Default
Initial Size Seed	Active Assembly
Smoothing	Medium
Transition	Fast
Span Angle Center	Coarse
Automatic Mesh Based Defeaturing	On
Defeature Size	Default
Minimum Edge Length	1.e-003 mm
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	131028

Elements	23110	
Mesh Metric	None	

TABLE 9
Model (A4) > Mesh > Mesh Controls

Object Name	Body Sizing	Body Sizing 2	Face Meshing
State	Fully Defined		
Scope			
Scoping Method	Geometry Selection		
Geometry	1 Body		1 Face
Definition			
Suppressed	No		
Type	Element Size		
Element Size	2.e-002 mm	3.e-002 mm	
Mapped Mesh			Yes
Constrain Boundary			No
Advanced			
Defeature Size	Default		
Behavior	Soft		
Specified Sides			No Selection
Specified Corners			No Selection
Specified Ends			No Selection

Static Structural (A5)

TABLE 10
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 11
Model (A4) > Static Structural (A5) > Analysis Settings

Object Name	Analysis Settings
State	Fully Defined
Step Controls	
Number Of Steps	2.
Current Step Number	1.
Step End Time	1. s
Auto Time Stepping	On
Define By	Substeps
Initial Substeps	200.
Minimum Substeps	20.
Maximum Substeps	1.e+005
Solver Controls	
Solver Type	Program Controlled

Weak Springs	Off
Solver Pivot Checking	Program Controlled
Large Deflection	On
Inertia Relief	Off
Restart Controls	
Generate Restart Points	Program Controlled
Retain Files After Full Solve	No
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	D:\Vedant\Stent Analysis\stent_project_files\dp0\SYS\MECH\
Future Analysis	None
Scratch Solver Files Directory	
Save MAPDL db	No
Delete Unneeded Files	Yes
Nonlinear Solution	Yes
Solver Units	Active System
Solver Unit System	nmm

TABLE 12
Model (A4) > Static Structural (A5) > Analysis Settings
Step-Specific "Step Controls"

Step	Step End Time	Auto Time Stepping	Define By	Initial Substeps	Minimum Substeps	Maximum Substeps
1	1. s	On	Substeps	200.	20.	1.e+005
2	2. s	Program Controlled				

TABLE 13
Model (A4) > Static Structural (A5) > Loads

Object Name	*Displacement*	*Frictionless Support*
State	Fully Defined	
Scope		
Scoping Method	Geometry Selection	
Geometry	1 Face	3 Faces
Definition		
Type	Displacement	Frictionless Support
Define By	Components	
Coordinate System	Polar	
X Component	Tabular Data	
Y Component	0. mm (ramped)	
Z Component	0. mm (ramped)	

Suppressed	No

FIGURE 1
Model (A4) > Static Structural (A5) > Displacement
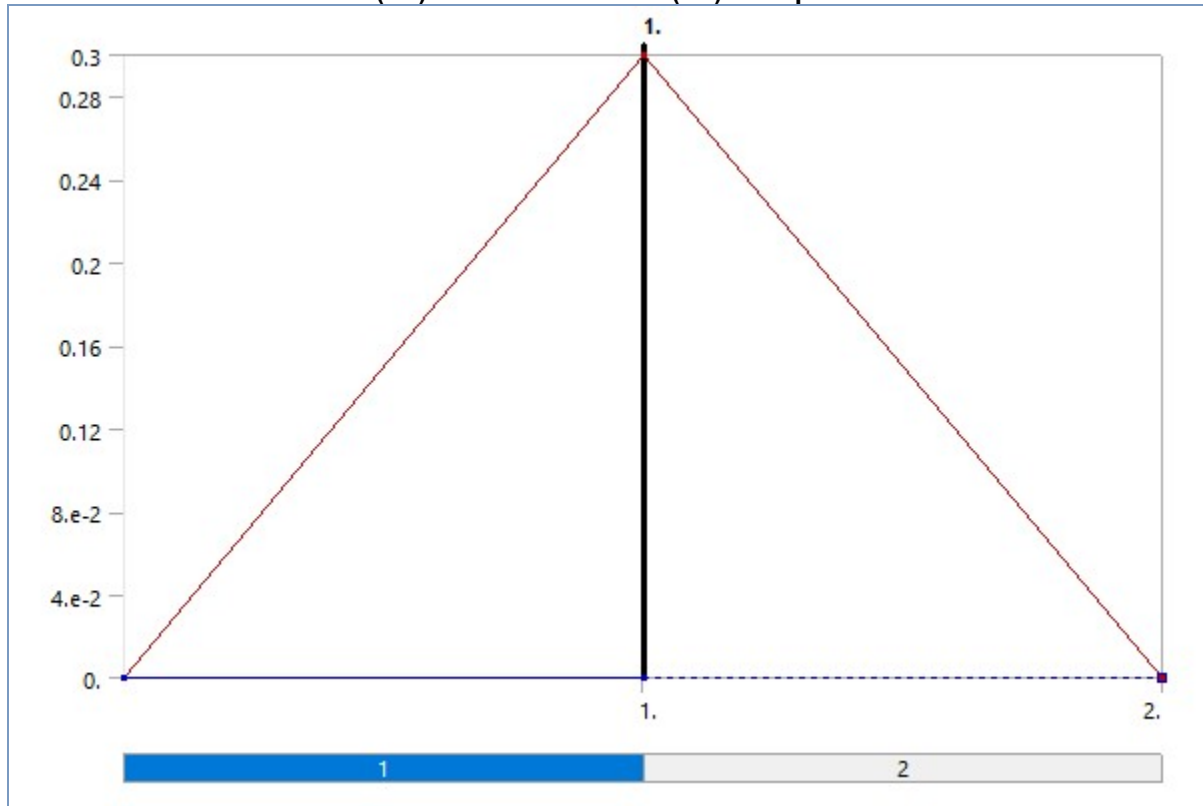
TABLE 14
Model (A4) > Static Structural (A5) > Displacement

Steps	Time [s]	X [mm]	Y [mm]	Z [mm]
1	0.	0.	0.	0.
	1.	0.3		
2	2.	0.	= 0.	= 0.

Solution (A6)

TABLE 15
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	1 h 43 m
MAPDL Memory Used	4.9092 GB
MAPDL Result File Size	1.0257 GB
Post Processing	
Beam Section Results	No

TABLE 16
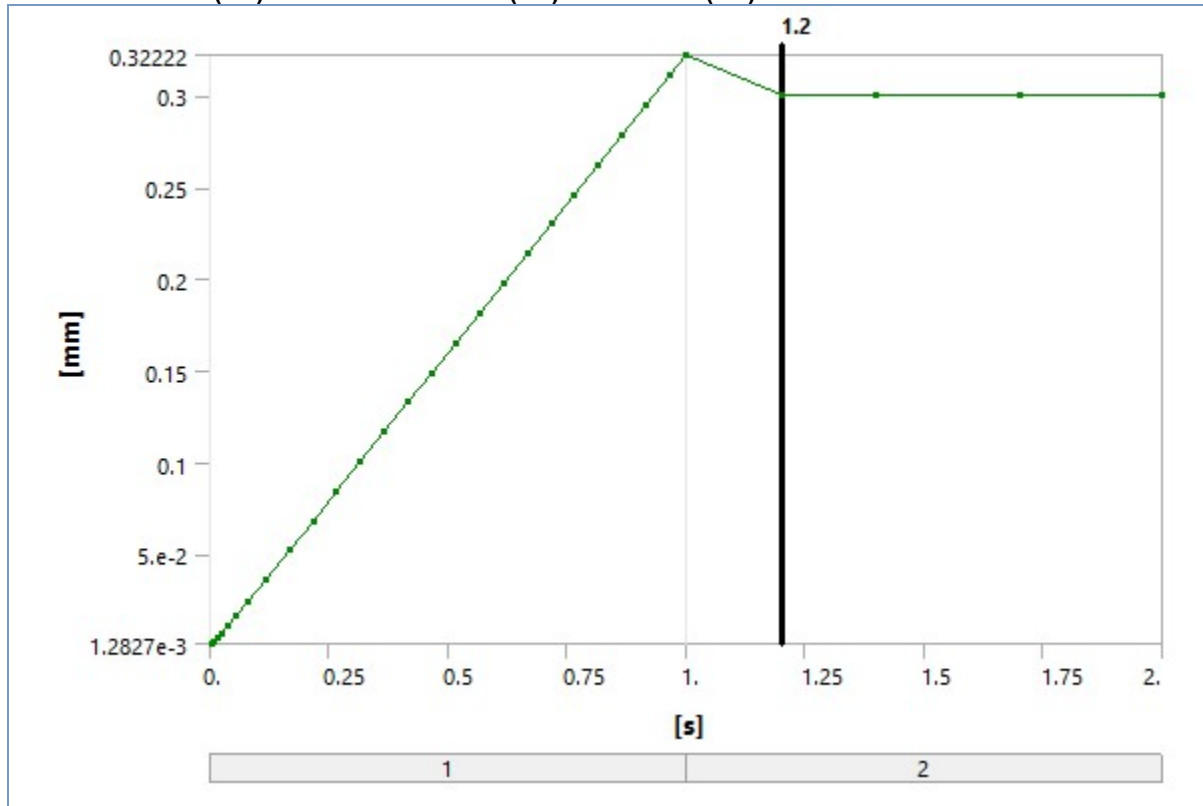**Model (A4) > Static Structural (A5) > Solution (A6) > Solution Information**

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 17
Model (A4) > Static Structural (A5) > Solution (A6) > Results

Object Name	Directional Deformation	Equivalent Stress	Total Deformation
State		Solved	
Scope			
Scoping Method		Geometry Selection	
Geometry	1 Vertex	All Bodies	
Definition			
Type	Directional Deformation	Equivalent (von-Mises) Stress	Total Deformation
Orientation	X Axis		
By		Time	
Display Time	1.2 s	2. s	Last
Coordinate System	Polar		
Calculate Time History		Yes	
Identifier			
Suppressed		No	
Results			
Minimum	0.30029 mm	6.1018e-012 MPa	0. mm
Maximum	0.30029 mm	212.39 MPa	0.40887 mm
Minimum Occurs On	Stent	Balloon	
Maximum Occurs On		Stent	
Minimum Value Over Time			
Minimum	1.2827e-003 mm	6.1018e-012 MPa	0. mm
Maximum	0.32222 mm	3.0149 MPa	0.29979 mm
Maximum Value Over Time			
Minimum	1.2827e-003 mm	28.381 MPa	1.5026e-003 mm
Maximum	0.32222 mm	266.44 MPa	0.43637 mm
Information			
Time	1.2 s	2. s	
Load Step		2	
Substep	1	4	
Iteration Number	208	218	
Integration Point Results			
Display Option		Averaged	

| Average Across Bodies		No	

FIGURE 2
Model (A4) > Static Structural (A5) > Solution (A6) > Directional Deformation

TABLE 18
Model (A4) > Static Structural (A5) > Solution (A6) > Directional Deformation

Time [s]	Minimum [mm]	Maximum [mm]
5.e-003	1.2827e-003	1.2827e-003
1.e-002	2.1605e-003	2.1605e-003
1.75e-002	4.5354e-003	4.5354e-003
2.5e-002	6.9994e-003	6.9994e-003
3.625e-002	1.0676e-002	1.0676e-002
5.3125e-002	1.6151e-002	1.6151e-002
7.8438e-002	2.4218e-002	2.4218e-002
0.11641	3.6323e-002	3.6323e-002
0.16641	5.2243e-002	5.2243e-002
0.21641	6.8338e-002	6.8338e-002
0.26641	8.4426e-002	8.4426e-002
0.31641	0.10046	0.10046
0.36641	0.11664	0.11664
0.41641	0.13291	0.13291
0.46641	0.14903	0.14903
0.51641	0.16515	0.16515
0.56641	0.18141	0.18141
0.61641	0.19759	0.19759
0.66641	0.21379	0.21379
0.71641	0.23	0.23
0.76641	0.24624	0.24624

|		
0.81641	0.26238	0.26238
0.86641	0.27867	0.27867
0.91641	0.29487	0.29487
0.96641	0.31119	0.31119
1.	0.32222	0.32222
1.2		
1.4	0.30029	0.30029
1.7		
2.		

FIGURE 3
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress
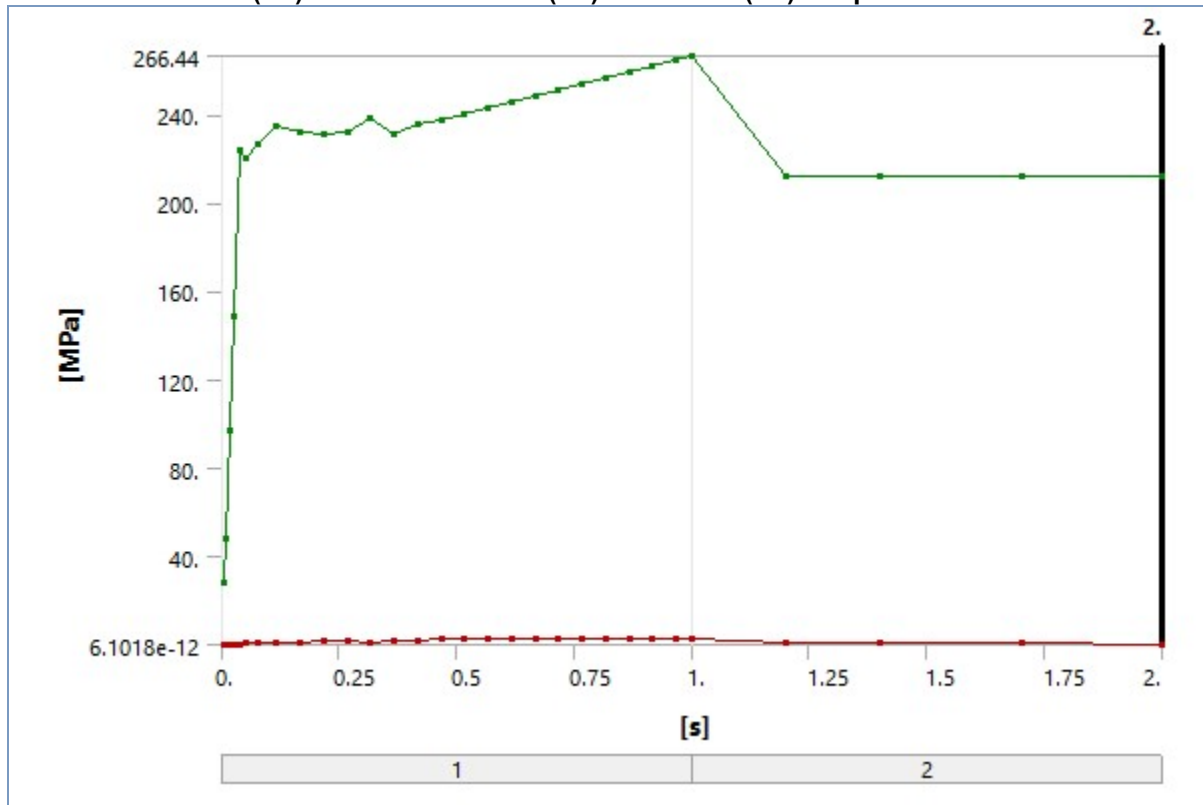
TABLE 19
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress

Time [s]	Minimum [MPa]	Maximum [MPa]
5.e-003	2.8901e-002	28.381
1.e-002	5.2024e-002	47.677
1.75e-002	0.1409	97.361
2.5e-002	0.23734	148.64
3.625e-002	0.34092	223.5
5.3125e-002	0.54814	220.46
7.8438e-002	0.98698	226.79
0.11641	0.49114	234.96
0.16641	0.7457	231.6
0.21641	1.4419	231.16
0.26641	1.8411	231.78
0.31641	1.1998	238.54
0.36641	1.4786	230.71

0.41641	2.0426	235.32
0.46641	2.5062	237.19
0.51641	2.5748	240.2
0.56641	2.5942	243.06
0.61641	2.6325	245.75
0.66641	2.7232	248.36
0.71641	2.7649	250.82
0.76641	2.8032	253.36
0.81641	2.7893	256.23
0.86641	2.8802	259.08
0.91641	2.9293	261.87
0.96641	2.982	264.62
1.	3.0149	266.44
1.2	1.1092	
1.4	1.1096	212.39
1.7	1.1092	
2.	6.1018e-012	

FIGURE 4
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation
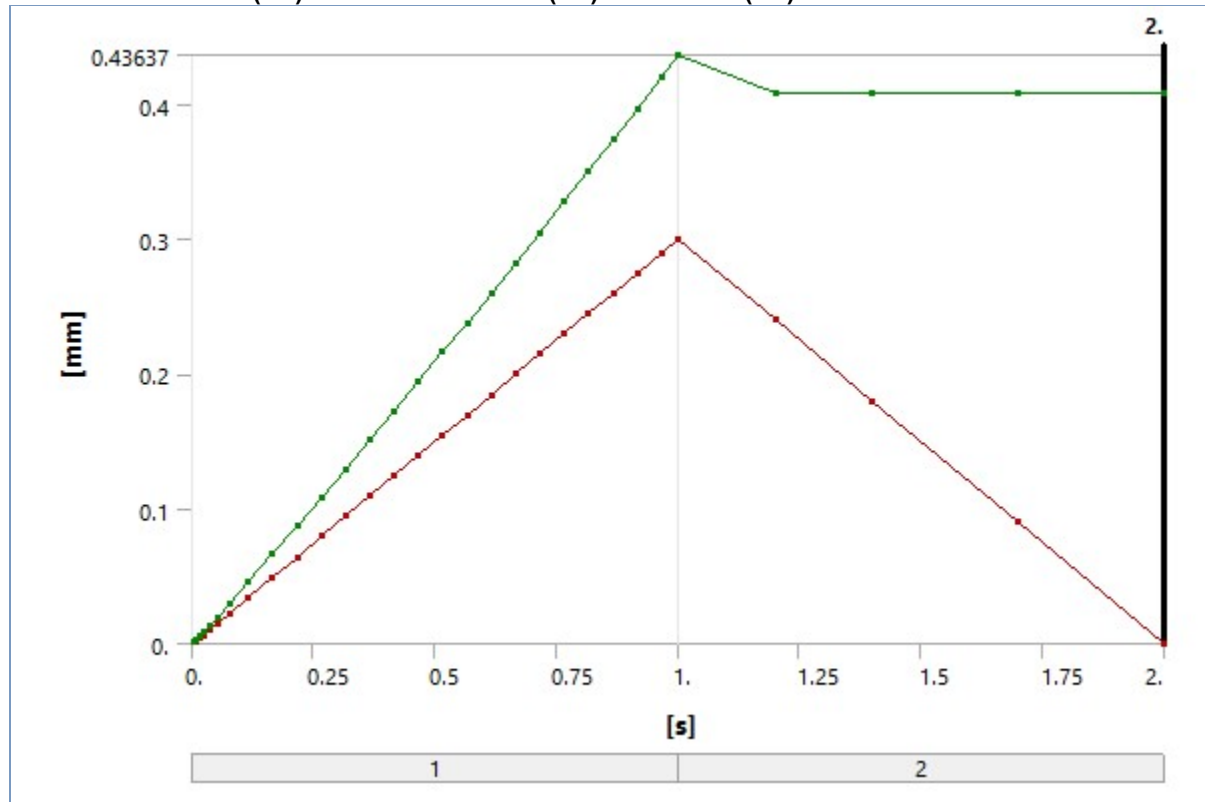
TABLE 20
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

Time [s]	Minimum [mm]	Maximum [mm]
5.e-003	1.1277e-003	1.5026e-003
1.e-002	1.9082e-003	3.0052e-003
1.75e-002	4.1153e-003	5.4762e-003
2.5e-002	6.3785e-003	8.4464e-003
3.625e-002	9.7679e-003	1.2929e-002

5.3125e-002	1.4883e-002	1.9663e-002
7.8438e-002	2.2555e-002	2.9774e-002
0.11641	3.4084e-002	4.5385e-002
0.16641	4.9238e-002	6.6066e-002
0.21641	6.4457e-002	8.7089e-002
0.26641	7.9663e-002	0.1083
0.31641	9.4822e-002	0.12956
0.36641	0.10981	0.15091
0.41641	0.1248	0.17255
0.46641	0.13979	0.19427
0.51641	0.15478	0.21601
0.56641	0.16977	0.23822
0.61641	0.18476	0.26002
0.66641	0.19975	0.28247
0.71641	0.21475	0.30485
0.76641	0.22974	0.32768
0.81641	0.24474	0.35046
0.86641	0.25973	0.37364
0.91641	0.27472	0.39697
0.96641	0.28972	0.42045
1.	0.29979	0.43637
1.2	0.23982	
1.4	0.17984	0.40887
1.7	8.9905e-002	
2.	0.	

Material Data

Structural Steel

TABLE 21
Structural Steel > Constants

Density	7.85e-006 kg mm^-3
Coefficient of Thermal Expansion	1.2e-005 C^-1
Specific Heat	4.34e+005 mJ kg^-1 C^-1
Thermal Conductivity	6.05e-002 W mm^-1 C^-1
Resistivity	1.7e-004 ohm mm

TABLE 22
Structural Steel > Color

Red	Green	Blue
132	139	179

TABLE 23
Structural Steel > Compressive Ultimate Strength

Compressive Ultimate Strength MPa
0

TABLE 24
Structural Steel > Compressive Yield Strength

Compressive Yield Strength MPa
250

TABLE 25
Structural Steel > Tensile Yield Strength

Tensile Yield Strength MPa
250

TABLE 26
Structural Steel > Tensile Ultimate Strength

Tensile Ultimate Strength MPa
460

TABLE 27
Structural Steel > Isotropic Secant Coefficient of Thermal Expansion

Zero-Thermal-Strain Reference Temperature C
22

TABLE 28
Structural Steel > Alternating Stress Mean Stress

Alternating Stress MPa	Cycles	Mean Stress MPa
3999	10	0
2827	20	0
1896	50	0
1413	100	0
1069	200	0
441	2000	0
262	10000	0
214	20000	0
138	1.e+005	0
114	2.e+005	0
86.2	1.e+006	0

TABLE 29
Structural Steel > Strain-Life Parameters

Strength Coefficient MPa	Strength Exponent	Ductility Coefficient	Ductility Exponent	Cyclic Strength Coefficient MPa	Cyclic Strain Hardening Exponent
920	-0.106	0.213	-0.47	1000	0.2

TABLE 30
Structural Steel > Isotropic Elasticity

Temperature C	Young's Modulus MPa	Poisson's Ratio	Bulk Modulus MPa	Shear Modulus MPa
	2.e+005	0.3	1.6667e+005	76923

TABLE 31
Structural Steel > Isotropic Relative Permeability

Relative Permeability
10000

TABLE 32
Structural Steel > Bilinear Isotropic Hardening

Yield Strength MPa	Tangent Modulus MPa	Temperature C
207	692	

Balloon

TABLE 33

Balloon > Color

Red	Green	Blue
234	247	209

TABLE 34
Balloon > Mooney-Rivlin 2 Parameter

Material Constant C10 MPa	Material Constant C01 MPa	Incompressibility Parameter D1 MPa^-1	Temperature C
1.06	114	0	