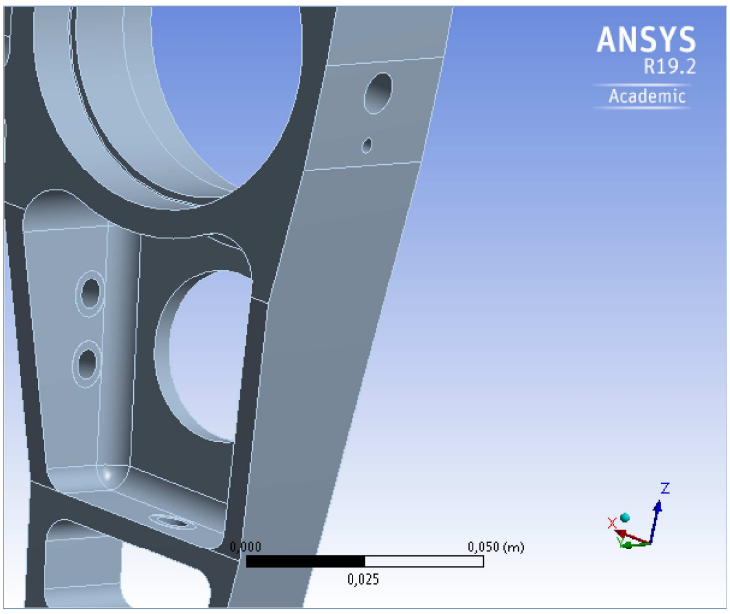
Project

First Saved	Tuesday, December 03, 2019
Last Saved	Tuesday, December 03, 2019
Product Version	19.2 Release
Save Project Before Solution	No
Save Project After Solution	No



Contents

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 (C4)

Geometry

TABLE 2
Model (C4) > Geometry

Object Name	*Geometry*
State	Fully Defined
Definition	
Source	C:\Users\cao\Documents\PAi_EPSA\porte moyeu_files\dp0\SYS-2\DM\SYS-2.scdoc
Type	SpaceClaim
Length Unit	Meters
Element Control	Program Controlled
Display Style	Body Color
Bounding Box	
Length X	0,13245 m
Length Y	4,01e-002 m
Length Z	0,2642 m
Properties	
Volume	2,3455e-004 m³
Mass	0,64969 kg
Scale Factor Value	1,
Statistics	
Bodies	1
Active Bodies	1
Nodes	411942
Elements	273538
Mesh Metric	None
Update Options	
Assign Default Material	No
Basic Geometry Options	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	Yes
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
Analysis Type	3-D
Mixed Import Resolution	None
Clean Bodies On Import	No
Stitch Surfaces On Import	No
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

TABLE 3
Model (C4) > Geometry > Parts

Object Name	*SYS-2\Corps principal*
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	Aluminum Alloy
Nonlinear Effects	Yes
Thermal Strain Effects	Yes
Bounding Box	
Length X	0,13245 m
Length Y	4,01e-002 m
Length Z	0,2642 m
Properties	
Volume	2,3455e-004 m³
Mass	0,64969 kg
Centroid X	5,8539e-003 m
Centroid Y	2,7042e-002 m
Centroid Z	-6,6582e-003 m
Moment of Inertia Ip1	2,4806e-003 kg·m²
Moment of Inertia Ip2	3,1587e-003 kg·m²
Moment of Inertia Ip3	8,4227e-004 kg·m²
Statistics	
Nodes	411942
Elements	273538
Mesh Metric	None
CAD Attributes	
PartTolerance:	0,00000001
Color:175.143.175	

Coordinate Systems

TABLE 4
Model (C4) > Coordinate Systems > Coordinate System

Object Name	*Global Coordinate System*	*b*	*i*	*l*	*u*	*o*	*t*
State	Fully Defined						
Definition							
Type	Cartesian						
Coordinate System ID	0,						
Coordinate System		Program Controlled					
APDL Name							
Suppressed		No					
Origin							
Origin X	0, m	0,10385 m	7,2793e-017 m	-1,01e-002 m	-7,04e-003 m	5,5812e-018 m	4,407e-002 m
Origin Y	0, m	-1,5e-003 m	6,13e-002 m	2,9e-002 m	5,5e-002 m	4,7e-003 m	6,7e-002 m
Origin Z	0, m	-5,4276e-006 m	-3,3806e-018 m	-0,1198 m	0,1128 m	3,3806e-018 m	-7,68e-002 m
Define By		Global Coordinates					
Location		Defined					
Directional Vectors							
X Axis Data	[1, 0, 0,]						
Y Axis Data	[0, 1, 0,]	[0, 0, 1,]	[0, 1, 0,]				
Z Axis Data	[0, 0, 1,]	[0, -1, 0,]	[0, 0, 1,]				
Principal Axis							
Axis		X					
Define By		Fixed Vector					
Orientation About Principal Axis							
Axis		Y					
Define By		Fixed Vector					
Transformations							
Base Configuration		Absolute					
Transformed Configuration		[0,10385 -1,5e-003 -5,4276e-006]	[7,2793e-017 6,13e-002 -3,3806e-018]	[-1,01e-002 2,9e-002 -0,1198]	[-7,04e-003 5,5e-002 0,1128]	[5,5812e-018 4,7e-003 3,3806e-018]	[4,407e-002 6,7e-002 -7,68e-002]

Mesh

TABLE 5
Model (C4) > Mesh

Object Name	*Mesh*
State	Solved
Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Mechanical
Element Order	Program Controlled
Element Size	Default
Sizing	
Use Adaptive Sizing	Yes
Resolution	Default (2)
Mesh Defeaturing	Yes
Defeature Size	Default
Transition	Fast
Span Angle Center	Coarse
Initial Size Seed	Assembly
Bounding Box Diagonal	0,29825 m
Average Surface Area	5,6693e-004 m²

Minimum Edge Length	1,e-004 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
Triangle Surface Mesher	Program Controlled
Topology Checking	Yes
Pinch Tolerance	Please Define
Generate Pinch on Refresh	No
Statistics	
Nodes	411942
Elements	273538

TABLE 6
Model (C4) > Mesh > Mesh Controls

Object Name	*Body Sizing*
State	Fully Defined
Scope	
Scoping Method	Geometry Selection
Geometry	1 Body
Definition	
Suppressed	No
Type	Element Size
Element Size	2,e-003 m
Advanced	
Defeature Size	Default
Behavior	Soft

Static Structural (C5)

TABLE 7
Model (C4) > Analysis

Object Name	*Static Structural (C5)*
State	Solved
Definition	
Physics Type	Structural
Analysis Type	Static Structural
Solver Target	Mechanical APDL
Options	
Environment Temperature	22, °C
Generate Input Only	No

TABLE 8
Model (C4) > Static Structural (C5) > 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
Combine 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\cao\Documents\PAi_EPSA\porte moyeu_files\dp0\SYS-2\MECH\
Future Analysis	None
Scratch Solver Files Directory	
Save MAPDL db	No
Contact Summary	Program Controlled
Delete Unneeded Files	Yes
Nonlinear Solution	Yes
Solver Units	Active System
Solver Unit System	mks

fixations

TABLE 9
Model (C4) > Static Structural (C5) > fixations > Loads

Object Name	*upper*	*lower*	*inner*	*outer*
State	Fully Defined			
Scope				
Scoping Method	Geometry Selection			
Geometry	3 Faces	4 Faces	3 Faces	
Coordinate System	u	l	i	o
X Coordinate	0, m		-2,5e-010 m	0, m
Y Coordinate	0, m		-1,5105e-002 m	0, m
Z Coordinate	0, m		3,7623e-010 m	0, m
Location	Defined			
Definition				
Type	Remote Displacement			
X Component	0, m (ramped)			
Y Component	0, m (ramped)			
Z Component	0, m (ramped)	Free	0, m (ramped)	
Rotation X	Free			
Rotation Y	Free			
Rotation Z	Free			
Suppressed	No			
Behavior	Deformable			
Rotation X		Free		
Rotation Y		Free		
Rotation Z		Free		
Rotation X			0, ° (ramped)	
Rotation Y			0, ° (ramped)	
Rotation Z			0, ° (ramped)	
Rotation X				0, ° (ramped)
Rotation Y				0, ° (ramped)
Rotation Z				0, ° (ramped)
Advanced				
Pinball Region	All			

FIGURE 1
Model (C4) > Static Structural (C5) > fixations > upper

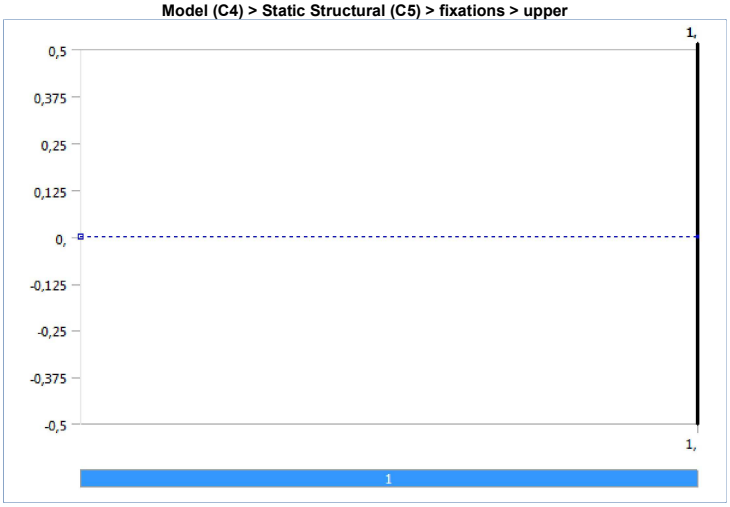


FIGURE 2
Model (C4) > Static Structural (C5) > fixations > lower

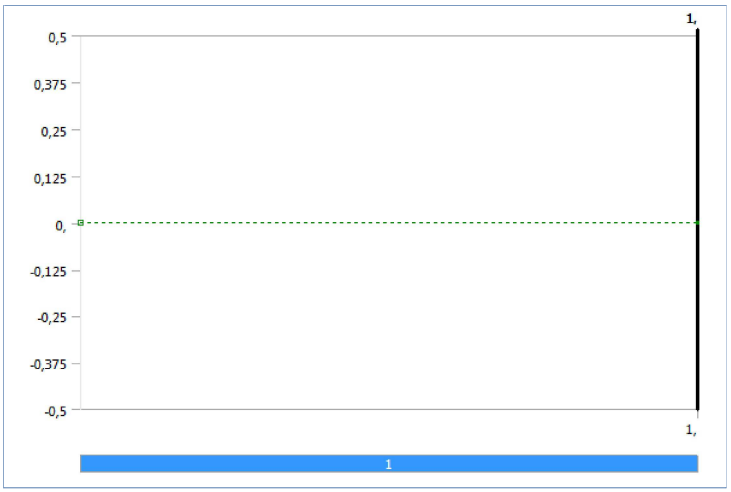


FIGURE 3
Model (C4) > Static Structural (C5) > fixations > inner

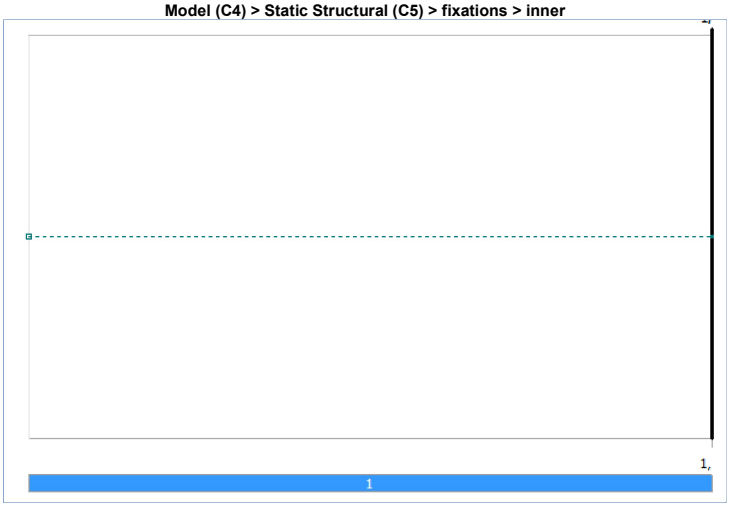
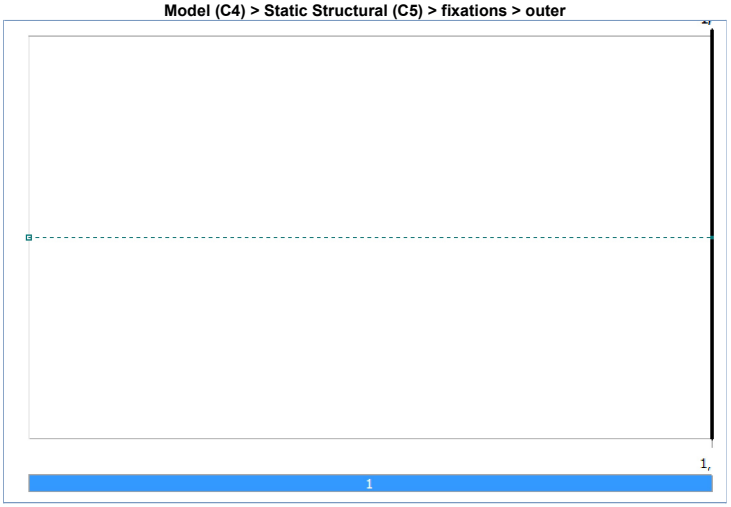


FIGURE 4
Model (C4) > Static Structural (C5) > fixations > outer



compression only

TABLE 10
Model (C4) > Static Structural (C5) > compression only > Loads

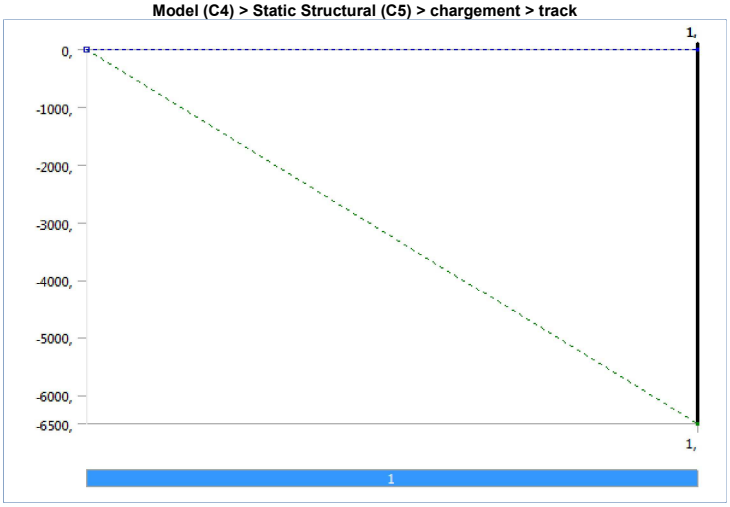
Object Name	*outer*	*inner*
State	Fully Defined	
Scope		
Scoping Method	Geometry Selection	
Geometry	3 Faces	
Definition		
Type	Compression Only Support	
Suppressed	No	
Advanced		
Normal Stiffness	Program Controlled	
Update Stiffness	Never	

chargement

TABLE 11
Model (C4) > Static Structural (C5) > chargement > Loads

Object Name	*track*
State	Fully Defined
Scope	
Scoping Method	Geometry Selection
Geometry	3 Faces
Coordinate System	t
X Coordinate	0, m
Y Coordinate	0, m
Z Coordinate	0, m
Location	Defined
Definition	
Type	Remote Force
Define By	Components
X Component	0, N (ramped)
Y Component	-6500, N (ramped)
Z Component	0, N (ramped)
Suppressed	No
Behavior	Deformable
Advanced	
Pinball Region	All

FIGURE 5
Model (C4) > Static Structural (C5) > chargement > track



Solution (C6)

TABLE 12
Model (C4) > Static Structural (C5) > Solution

Object Name	*Solution (C6)*
State	Solved
Adaptive Mesh Refinement	
Max Refinement Loops	1,
Refinement Depth	2,
Information	
Status	Done
MAPDL Elapsed Time	1 h 32 m
MAPDL Memory Used	2,9199 GB
MAPDL Result File Size	223,44 MB
Post Processing	
Beam Section Results	No
On Demand Stress/Strain	No

TABLE 13
Model (C4) > Static Structural (C5) > Solution (C6) > 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 (C4) > Static Structural (C5) > Solution (C6) > Results

Object Name	*Total Deformation*	*Equivalent Stress*
State	Solved	
Scope		
Scoping Method	Geometry Selection	
Geometry	All Bodies	
Definition		

Type	Total Deformation	Equivalent (von-Mises) Stress
By	Time	
Display Time	Last	
Calculate Time History	Yes	
Identifier		
Suppressed	No	
Results		
Minimum	2,7411e-008 m	19576 Pa
Maximum	5,0418e-004 m	4,189e+008 Pa
Average	2,6361e-005 m	1,7508e+007 Pa
Minimum Occurs On	SYS-2\Corps principal	
Maximum Occurs On	SYS-2\Corps principal	
Information		
Time	1, s	
Load Step	1	
Substep	1	
Iteration Number	13	
Integration Point Results		
Display Option		Averaged
Average Across Bodies		No

FIGURE 6
Model (C4) > Static Structural (C5) > Solution (C6) > Total Deformation

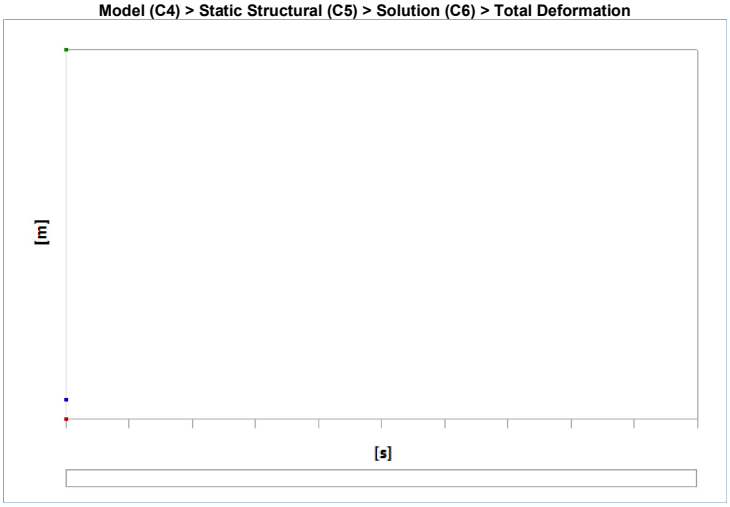


TABLE 15
Model (C4) > Static Structural (C5) > Solution (C6) > Total Deformation

Time [s]	Minimum [m]	Maximum [m]	Average [m]
1,	2,7411e-008	5,0418e-004	2,6361e-005

FIGURE 7
Model (C4) > Static Structural (C5) > Solution (C6) > Total Deformation > Image

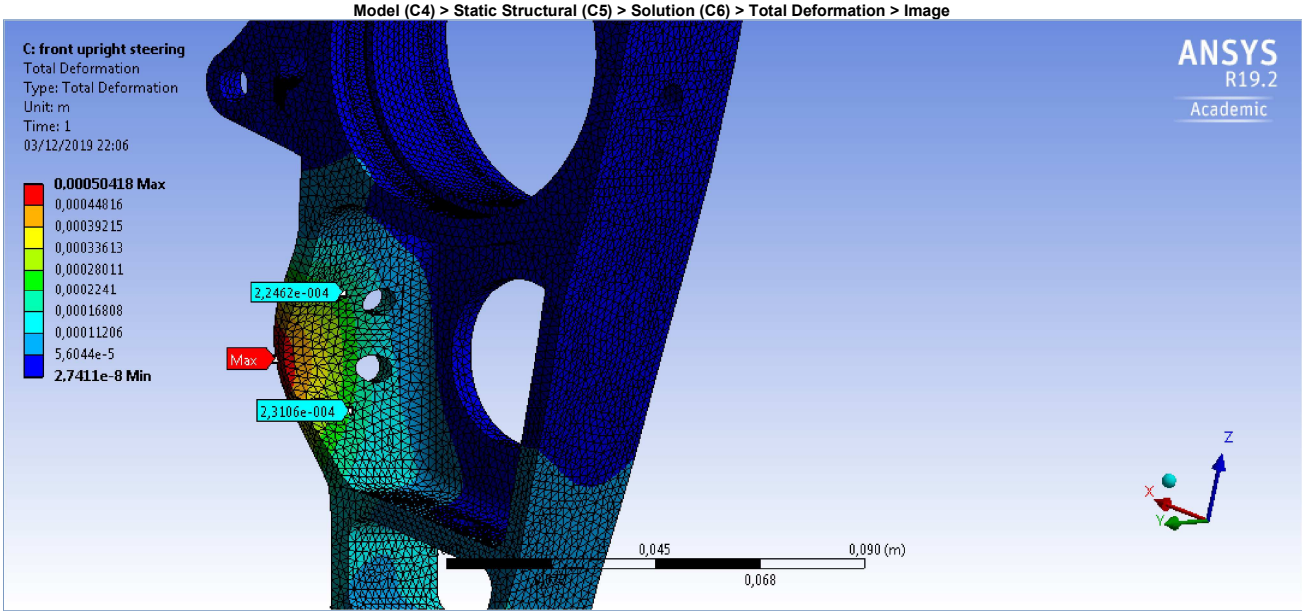


FIGURE 8
Model (C4) > Static Structural (C5) > Solution (C6) > Equivalent Stress

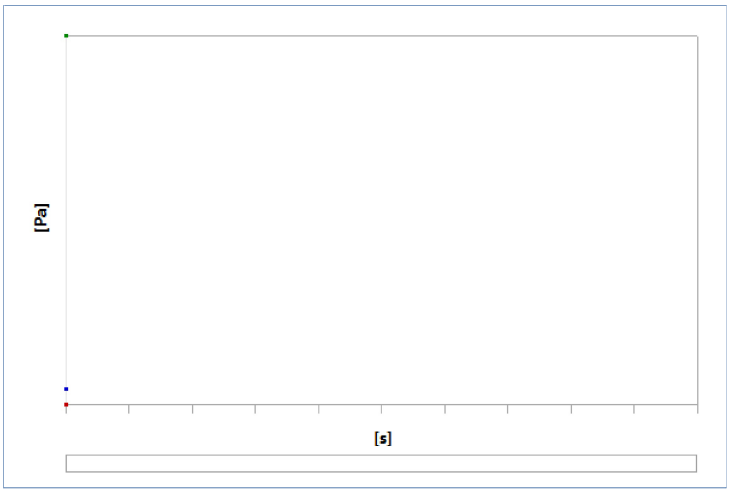


TABLE 16
Model (C4) > Static Structural (C5) > Solution (C6) > Equivalent Stress

Time [s]	Minimum [Pa]	Maximum [Pa]	Average [Pa]
1.	19576	4,189e+008	1,7508e+007

FIGURE 9
Model (C4) > Static Structural (C5) > Solution (C6) > Equivalent Stress > Image

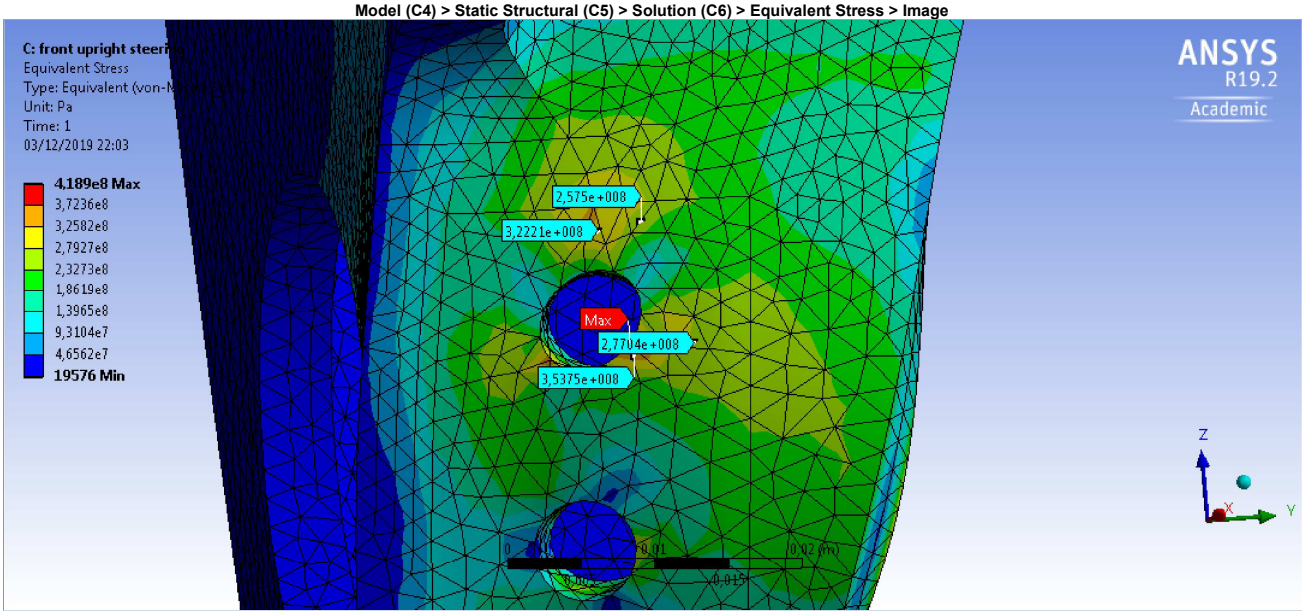


FIGURE 10
Model (C4) > Static Structural (C5) > Solution (C6) > Equivalent Stress > Image

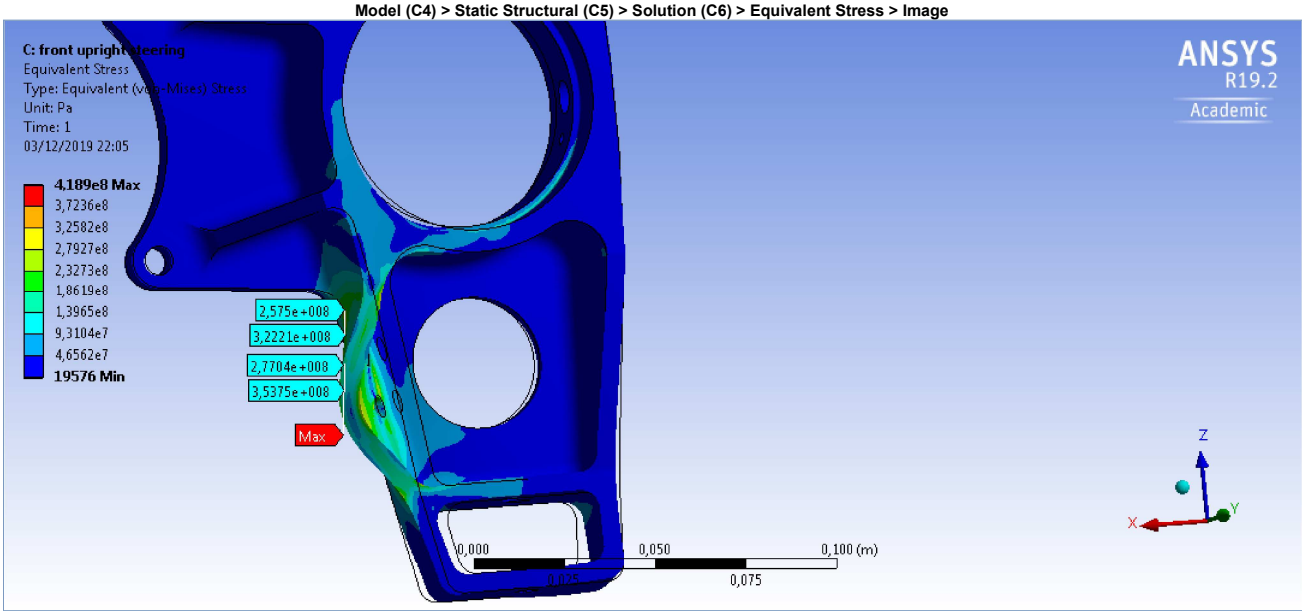


FIGURE 11
Model (C4) > Static Structural (C5) > Solution (C6) > Equivalent Stress > Image

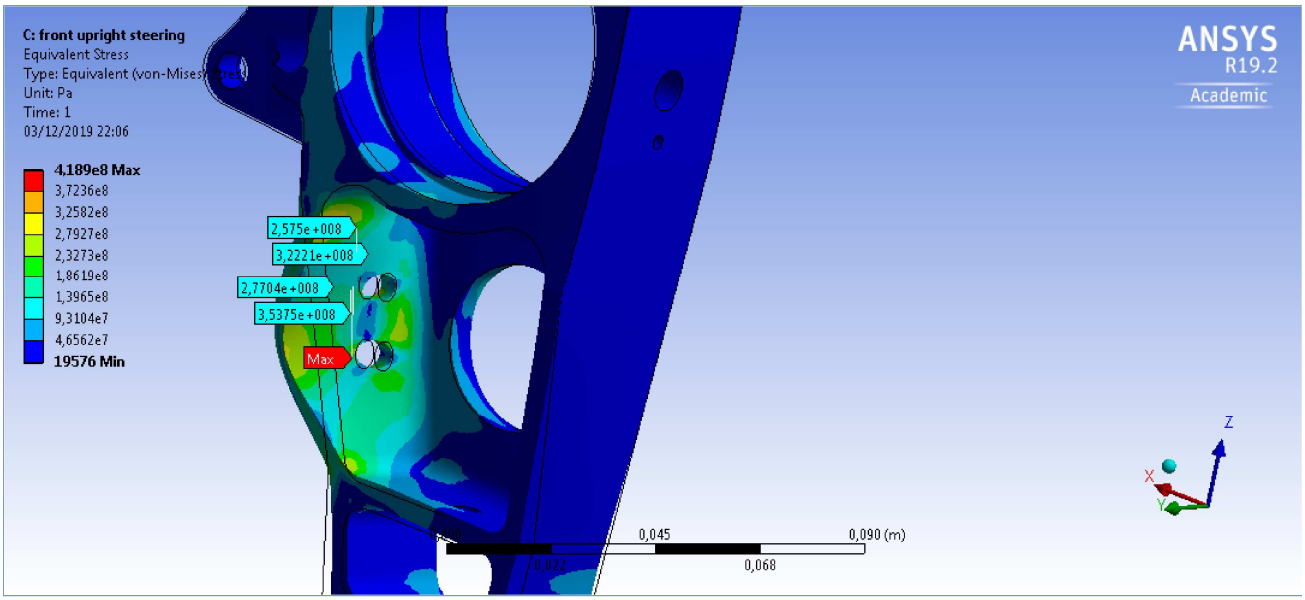
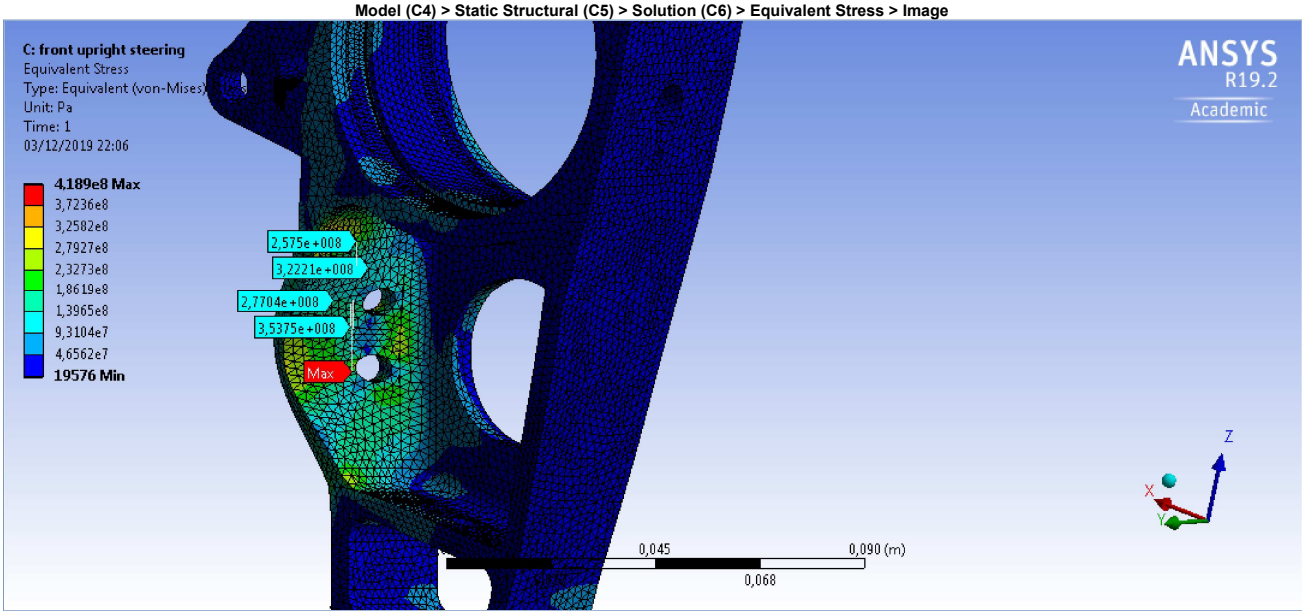


FIGURE 12
Model (C4) > Static Structural (C5) > Solution (C6) > Equivalent Stress > Image



Material Data

Aluminum Alloy

TABLE 17
Aluminum Alloy > Constants

Density	2770, kg m^-3
Isotropic Secant Coefficient of Thermal Expansion	2,3e-005 C^-1
Specific Heat Constant Pressure	875, J kg^-1 C^-1

TABLE 18
Aluminum Alloy > Color

Red	Green	Blue
138,	104,	46,

TABLE 19
Aluminum Alloy > Compressive Ultimate Strength

Compressive Ultimate Strength Pa
0,

TABLE 20
Aluminum Alloy > Compressive Yield Strength

Compressive Yield Strength Pa
2,8e+008

TABLE 21
Aluminum Alloy > Tensile Yield Strength

Tensile Yield Strength Pa
2,8e+008

TABLE 22
Aluminum Alloy > Tensile Ultimate Strength

Tensile Ultimate Strength Pa

3,1e+008

TABLE 23
Aluminum Alloy > Isotropic Secant Coefficient of Thermal Expansion

Zero-Thermal-Strain Reference Temperature C
22,

TABLE 24
Aluminum Alloy > Isotropic Thermal Conductivity

Thermal Conductivity W m^-1 C^-1	Temperature C
114,	-100,
144,	0,
165,	100,
175,	200,

TABLE 25
Aluminum Alloy > S-N Curve

Alternating Stress Pa	Cycles	R-Ratio
2,758e+008	1700,	-1,
2,413e+008	5000,	-1,
2,068e+008	34000	-1,
1,724e+008	1,4e+005	-1,
1,379e+008	8,e+005	-1,
1,172e+008	2,4e+006	-1,
8,963e+007	5,5e+007	-1,
8,274e+007	1,e+008	-1,
1,706e+008	50000	-0,5
1,396e+008	3,5e+005	-0,5
1,086e+008	3,7e+006	-0,5
8,791e+007	1,4e+007	-0,5
7,757e+007	5,e+007	-0,5
7,239e+007	1,e+008	-0,5
1,448e+008	50000	0,
1,207e+008	1,9e+005	0,
1,034e+008	1,3e+006	0,
9,308e+007	4,4e+006	0,
8,618e+007	1,2e+007	0,
7,239e+007	1,e+008	0,
7,412e+007	3,e+005	0,5
7,067e+007	1,5e+006	0,5
6,636e+007	1,2e+007	0,5
6,205e+007	1,e+008	0,5

TABLE 26
Aluminum Alloy > Isotropic Resistivity

Resistivity ohm m	Temperature C
2,43e-008	0,
2,67e-008	20,
3,63e-008	100,

TABLE 27
Aluminum Alloy > Isotropic Elasticity

Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa	Temperature C
7,1e+010	0,33	6,9608e+010	2,6692e+010	

TABLE 28
Aluminum Alloy > Isotropic Relative Permeability

Relative Permeability
1,