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|  | |  | | --- | | **Simulation of spider**  **Date: Friday, December 6, 2024 Designer: Solidworks**  **Study name: 1st**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc184371956)  [Assumptions 2](#_Toc184371957)  [Model Information 3](#_Toc184371958)  [Study Properties 4](#_Toc184371959)  [Units 4](#_Toc184371960)  [Material Properties 5](#_Toc184371961)  [Loads and Fixtures 5](#_Toc184371962)  [Connector Definitions 6](#_Toc184371963)  [Interaction Information 6](#_Toc184371964)  [Mesh information 7](#_Toc184371965)  [Sensor Details 8](#_Toc184371966)  [Resultant Forces 9](#_Toc184371967)  [Beams 9](#_Toc184371968)  [Study Results 10](#_Toc184371969)  [Conclusion 13](#_Toc184371970) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** spider**  ****Current Configuration:** Default** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **Cut-Extrude1** | **Solid Body** | ****Mass:0.107534 lb****  ****Volume:0.386563 in^3****  ****Density:0.27818 lb/in^3****  ****Weight:0.107461 lbf**** | ****C:\Users\Public\Documents\SOLIDWORKS\SOLIDWORKS 2024\samples\Simulation Examples\Educational Examples\hub.sldprt****  **Jan 18 05:12:10 2024** | | **Boss-Extrude1** | **Solid Body** | ****Mass:0.521137 lb****  ****Volume:1.87338 in^3****  ****Density:0.27818 lb/in^3****  ****Weight:0.520784 lbf**** | ****C:\Users\Public\Documents\SOLIDWORKS\SOLIDWORKS 2024\samples\Simulation Examples\Educational Examples\shaft.sldprt****  **Jan 18 05:12:10 2024** | | **Fillet10** | **Solid Body** | ****Mass:1.06538 lb****  ****Volume:3.82983 in^3****  ****Density:0.27818 lb/in^3****  ****Weight:1.06466 lbf**** | ****C:\Users\Public\Documents\SOLIDWORKS\SOLIDWORKS 2024\samples\Simulation Examples\Educational Examples\spider.SLDPRT****  **Dec 6 09:31:38 2024** | |

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| Study Properties  |  |  | | --- | --- | | Study name | 1st | | Analysis type | Static | | Mesh type | Solid Mesh | | Thermal Effect: | On | | Thermal option | Include temperature loads | | Zero strain temperature | 77 Fahrenheit | | 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 (C:\Users\Public\Documents\SOLIDWORKS\SOLIDWORKS 2024\samples\Simulation Examples\Educational Examples\SimulationTemp) | |

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| Units  |  |  | | --- | --- | | Unit system: | English (IPS) | | Length/Displacement | in | | Temperature | Fahrenheit | | Angular velocity | Hertz | | Pressure/Stress | psi | |

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| Material Properties  |  |  |  | | --- | --- | --- | | ****Model Reference**** | ****Properties**** | ****Components**** | |  | |  |  | | --- | --- | | ****Name:**** | **Alloy Steel** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Max von Mises Stress** | | ****Yield strength:**** | **89,984.6 psi** | | ****Tensile strength:**** | **104,982 psi** | | ****Elastic modulus:**** | **3.04579e+07 psi** | | ****Poisson's ratio:**** | **0.28** | | ****Mass density:**** | **0.27818 lb/in^3** | | ****Shear modulus:**** | **1.1458e+07 psi** | | ****Thermal expansion coefficient:**** | **7.22222e-06 /Fahrenheit** | | **SolidBody 1(Cut-Extrude1)(hub-1),**  **SolidBody 1(Boss-Extrude1)(shaft-1),**  **SolidBody 1(Fillet10)(spider-1)** | | **Curve Data:N/A** | | | |

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| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **Fixed-1** |  | |  |  | | --- | --- | | Entities: | **3 face(s)** | | Type: | **Fixed Geometry** | | | ****Resultant Forces****   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Components** | **X** | **Y** | **Z** | **Resultant** | | **Reaction force(lbf)** | **-317.214** | **355.817** | **150.94** | **500.013** | | **Reaction Moment(lbf.in)** | **0** | **0** | **0** | **0** | | | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-1** |  | |  |  | | --- | --- | | Entities: | **1 face(s)** | | Type: | **Apply normal force** | | Value: | **500 lbf** | | |

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| Connector Definitions No Data |

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| Interaction Information  | Interaction | Interaction Image | Interaction Properties | | --- | --- | --- | | Global Interaction |  | |  |  | | --- | --- | | Type: | **Bonded** | | Components: | **1 component(s)** | | Options: | **Independent mesh** | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Mesh information  |  |  | | --- | --- | | Mesh type | Solid Mesh | | Mesher Used: | Standard mesh | | Automatic Transition: | Off | | Include Mesh Auto Loops: | Off | | Jacobian points for High quality mesh | 16 Points | | Element Size | 0.091335 in | | Tolerance | 0.00456675 in | | Mesh Quality | High | | Remesh failed parts independently | Off | | Reuse mesh for identical parts in an assembly (Blended curvature-based mesher only) | Off |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 89007 | | Total Elements | 56304 | | Maximum Aspect Ratio | 4.5933 | | % of elements with Aspect Ratio < 3 | 99.8 | | Percentage of elements with Aspect Ratio > 10 | 0 | | Percentage of distorted elements | 0 | | Time to complete mesh(hh;mm;ss): | 00:00:03 | | Computer name: | MECHATRONICS |  Mesh Quality Plots  | Name | Type | Min | Max | | --- | --- | --- | --- | | Quality1 | Mesh | - | - | | **spider-1st-Quality-Quality1** | | | | |

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| Sensor Details No Data |

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| Resultant ForcesReaction forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | lbf | -317.214 | 355.817 | 150.94 | 500.013 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | lbf.in | 0 | 0 | 0 | 0 | |
| Free body forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | lbf | 0.009402 | 0.167887 | -0.151392 | 0.226261 |  Free body moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | lbf.in | 0 | 0 | 0 | 8.85075e-33 | |

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| Beams No Data |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | VON: von Mises Stress | 2.439e-02psi  Node: 21941 | 1.528e+04psi  Node: 73930 | | **spider-1st-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000e+00in  Node: 31243 | 1.402e-03in  Node: 7918 | | **spider-1st-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 3.066e-10  Element: 7218 | 3.635e-04  Element: 32538 | | **spider-1st-Strain-Strain1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Factor of Safety1 | Max von Mises Stress | 5.891e+00  Node: 73930 | 3.690e+06  Node: 21941 | | **spider-1st-Factor of Safety-Factor of Safety1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Factor of Safety2 | Max von Mises Stress | 5.891e+00  Node: 73930 | 3.690e+06  Node: 21941 | | **spider-1st-Factor of Safety-Factor of Safety2** | | | | |

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| Conclusion |