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|  | |  | | --- | | **Simulation of FEA\_finger\_joint\_v3.2**  **Date: Thursday, April 1, 2021 Designer: Solidworks**  **Study name: Static 1**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc68209972)  [Assumptions 2](#_Toc68209973)  [Model Information 2](#_Toc68209974)  [Study Properties 3](#_Toc68209975)  [Units 3](#_Toc68209976)  [Material Properties 4](#_Toc68209977)  [Loads and Fixtures 4](#_Toc68209978)  [Connector Definitions 5](#_Toc68209979)  [Contact Information 5](#_Toc68209980)  [Mesh information 6](#_Toc68209981)  [Sensor Details 7](#_Toc68209982)  [Resultant Forces 7](#_Toc68209983)  [Beams 7](#_Toc68209984)  [Study Results 8](#_Toc68209985)  [Conclusion 11](#_Toc68209986) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** FEA\_finger\_joint\_v3.2**  ****Current Configuration:** Default** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **Split Line2** | **Solid Body** | ****Mass:0.0085645 kg****  ****Volume:4.12549e-06 m^3****  ****Density:2,075.99 kg/m^3****  ****Weight:0.0839321 N**** | ****C:\Users\luisa\Documents\GrabCAD\Lunar Dust Challenge\Current\Mechanical\v3\_tiz\FEA\FEA\_finger\_joint\_v3.2.SLDPRT****  **Apr 1 22:46:40 2021** | |

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| Study Properties  |  |  | | --- | --- | | Study name | Static 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 | FFEPlus | | 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\luisa\Documents\GrabCAD\Lunar Dust Challenge\Current\Mechanical\v3\_tiz\FEA) | |

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| Units  |  |  | | --- | --- | | Unit system: | SI (MKS) | | Length/Displacement | mm | | Temperature | Kelvin | | Angular velocity | Rad/sec | | Pressure/Stress | N/m^2 | |

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| Material Properties  |  |  |  | | --- | --- | --- | | ****Model Reference**** | ****Properties**** | ****Components**** | |  | |  |  | | --- | --- | | ****Name:**** | **99.5% Aluminum Oxide** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Mohr-Coulomb Stress** | | ****Yield strength:**** | **2.17185e+07 N/m^2** | | ****Tensile strength:**** | **2.17185e+07 N/m^2** | | ****Compressive strength:**** | **2.99922e+07 N/m^2** | | ****Elastic modulus:**** | **3e+11 N/m^2** | | ****Poisson's ratio:**** | **0.22** | | ****Mass density:**** | **2,075.99 kg/m^3** | | ****Thermal expansion coefficient:**** | **8e-06 /Kelvin** | | **SolidBody 1(Split Line2)(FEA\_finger\_joint\_v3.2)** | | **Curve Data:N/A** | | | |

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| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **Fixed-1** |  | |  |  | | --- | --- | | Entities: | **1 face(s)** | | Type: | **Fixed Geometry** | | | ****Resultant Forces****   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Components** | **X** | **Y** | **Z** | **Resultant** | | **Reaction force(N)** | **-0.000433497** | **-119.998** | **-0.0014181** | **119.998** | | **Reaction Moment(N.m)** | **0** | **0** | **0** | **0** | | | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-1** |  | |  |  | | --- | --- | | Entities: | **1 face(s)** | | Type: | **Apply normal force** | | Value: | **-120 N** | | |

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| Connector Definitions No Data |

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| Contact Information No Data |

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| Mesh information  |  |  | | --- | --- | | Mesh type | Solid Mesh | | Mesher Used: | Standard mesh | | Automatic Transition: | Off | | Include Mesh Auto Loops: | Off | | Jacobian points | 4 Points | | Element Size | 0.802247 mm | | Tolerance | 0.0401124 mm | | Mesh Quality Plot | High |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 83132 | | Total Elements | 54412 | | Maximum Aspect Ratio | 13.498 | | % of elements with Aspect Ratio < 3 | 99.8 | | % of elements with Aspect Ratio > 10 | 0.00919 | | % of distorted elements(Jacobian) | 0 | | Time to complete mesh(hh;mm;ss): | 00:00:03 | | Computer name: |  | |  | | |

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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 | N | -0.000433497 | -119.998 | -0.0014181 | 119.998 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 0 | |
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| Beams No Data |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | VON: von Mises Stress | 8.040e+01 N/m^2  Node: 70215 | 1.301e+07 N/m^2  Node: 81540 | | **FEA\_finger\_joint\_v3.2-Static 1-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000e+00 mm  Node: 1 | 5.728e-04 mm  Node: 3165 | | **FEA\_finger\_joint\_v3.2-Static 1-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 8.533e-11  Element: 7062 | 3.040e-05  Element: 32892 | | **FEA\_finger\_joint\_v3.2-Static 1-Strain-Strain1** | | | |  | Name | Type | | --- | --- | | Displacement1{1} | Deformed shape | | **FEA\_finger\_joint\_v3.2-Static 1-Displacement-Displacement1{1}** | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Factor of Safety1 | Mohr-Coulomb Stress | 1.259e+00  Node: 81540 | 2.330e+05  Node: 70206 | | **FEA\_finger\_joint\_v3.2-Static 1-Factor of Safety-Factor of Safety1** | | | |  | Name | Type | | --- | --- | | Design Insight1 | Design Insight | | **FEA\_finger\_joint\_v3.2-Static 1-Design Insight-Design Insight1** | | |

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| Conclusion |