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|  | |  | | --- | | **Simulation of upper part**  **Date: 25 June 2021 Designer: Solidworks**  **Study name: Palm simulation**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc75475337)  [Assumptions 2](#_Toc75475338)  [Model Information 2](#_Toc75475339)  [Study Properties 3](#_Toc75475340)  [Units 3](#_Toc75475341)  [Material Properties 4](#_Toc75475342)  [Loads and Fixtures 4](#_Toc75475343)  [Connector Definitions 5](#_Toc75475344)  [Contact Information 5](#_Toc75475345)  [Mesh information 6](#_Toc75475346)  [Sensor Details 7](#_Toc75475347)  [Resultant Forces 7](#_Toc75475348)  [Beams 7](#_Toc75475349)  [Study Results 8](#_Toc75475350)  [Conclusion 10](#_Toc75475351) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** upper part**  ****Current Configuration:** thumb pos** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **Cut-Extrude14** | **Solid Body** | ****Mass:0.106971 kg****  ****Volume:8.6289e-05 m^3****  ****Density:1,239.68 kg/m^3****  ****Weight:1.04831 N**** | ****E:\Official Files\B.Tech\Final Year Project\gripper\Palm\upper part.SLDPRT****  **Jun 21 01:55:57 2021** | |

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| Study Properties  |  |  | | --- | --- | | Study name | Palm simulation | | 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 (E:\Official Files\B.Tech\Final Year Project\gripper\Palm) | |

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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:**** | **PLA** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Unknown** | | ****Yield strength:**** | **4.9e+07 N/m^2** | | ****Tensile strength:**** | **6.5e+07 N/m^2** | | ****Elastic modulus:**** | **3e+09 N/m^2** | | ****Poisson's ratio:**** | **0.35** | | ****Mass density:**** | **1,240 kg/m^3** | | ****Shear modulus:**** | **8.622e+08 N/m^2** | | **SolidBody 1(Cut-Extrude14)(upper part)** | | **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)** | **-0.00138699** | **0.00174636** | **9.79951** | **9.79951** | | **Reaction Moment(N.m)** | **0** | **0** | **0** | **0** | | | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-1** |  | |  |  | | --- | --- | | Entities: | **1 face(s)** | | Reference: | **Edge< 1 >** | | Type: | **Apply force** | | Values: | **---, ---, -9.8 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 for High quality mesh | 16 Points | | Element Size | 9.67811 mm | | Tolerance | 0.483905 mm | | Mesh Quality | High |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 10040 | | Total Elements | 5007 | | Maximum Aspect Ratio | 42.32 | | % of elements with Aspect Ratio < 3 | 46.2 | | Percentage of elements with Aspect Ratio > 10 | 2.16 | | Percentage of distorted elements | 0 | | Time to complete mesh(hh;mm;ss): | 00:01:16 | | 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 | -0.00138699 | 0.00174636 | 9.79951 | 9.79951 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 0 | |
| Free body forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | -0.0267031 | -0.00660472 | -0.101111 | 0.104786 |  Free body moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 1e-33 | |

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| Beams No Data |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | VON: von Mises Stress | 0.000N/mm^2 (MPa)  Node: 2105 | 0.826N/mm^2 (MPa)  Node: 9528 | | **upper part-Palm simulation-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000mm  Node: 67 | 0.020mm  Node: 884 | | **upper part-Palm simulation-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 0.000  Element: 172 | 0.000  Element: 3401 | | **upper part-Palm simulation-Strain-Strain1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Factor of Safety1 | Automatic | 59.351  Node: 9528 | 120,710.539  Node: 2105 | | **upper part-Palm simulation-Factor of Safety-Factor of Safety1** | | | | |

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| Conclusion |