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|  | |  | | --- | | **Simulation of TU23FL-CAD-beam in class 2**  **Date: Thursday, September 28, 2023 Designer: Solidworks**  **Study name: Jakob Werle (2023-09-28)**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc146806269)  [Assumptions 2](#_Toc146806270)  [Model Information 3](#_Toc146806271)  [Study Properties 5](#_Toc146806272)  [Units 5](#_Toc146806273)  [Material Properties 6](#_Toc146806274)  [Loads and Fixtures 7](#_Toc146806275)  [Connector Definitions 7](#_Toc146806276)  [Interaction Information 8](#_Toc146806277)  [Mesh information 8](#_Toc146806278)  [Sensor Details 8](#_Toc146806279)  [Resultant Forces 9](#_Toc146806280)  [Beams 10](#_Toc146806281)  [Study Results 11](#_Toc146806282)  [Conclusion 13](#_Toc146806283) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** TU23FL-CAD-beam in class 2**  ****Current Configuration:** Default** | | | | | ****Beam Bodies:**** | | | | | ****Document Name and Reference**** | ****Formulation**** | ****Properties**** | ****Document Path/Date Modified**** | | **SolidBody 1(Boss-Extrude3)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 0.00316692m^2****  ****Length:1,219.2mm****  ****Volume:0.00386111m^3****  ****Mass Density:7,700kg/m^3****  ****Mass:29.7306kg****  ****Weight:291.359N**** | ****C:\Users\jakob\software\TU\23FL\CAD\TU23FL-CAD-beam in class 2.SLDPRT****  **Sep 28 15:09:28 2023** | | **SolidBody 2(Boss-Extrude2)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 0.00316692m^2****  ****Length:914.4mm****  ****Volume:0.00289583m^3****  ****Mass Density:7,700kg/m^3****  ****Mass:22.2979kg****  ****Weight:218.52N**** | ****C:\Users\jakob\software\TU\23FL\CAD\TU23FL-CAD-beam in class 2.SLDPRT****  **Sep 28 15:09:28 2023** | | **SolidBody 3(Boss-Extrude1)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 0.00316692m^2****  ****Length:914.4mm****  ****Volume:0.00289583m^3****  ****Mass Density:7,700kg/m^3****  ****Mass:22.2979kg****  ****Weight:218.52N**** | ****C:\Users\jakob\software\TU\23FL\CAD\TU23FL-CAD-beam in class 2.SLDPRT****  **Sep 28 15:09:28 2023** | |

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| Study Properties  |  |  | | --- | --- | | Study name | Jakob Werle (2023-09-28) | | Analysis type | Static | | Mesh type | Beam Mesh | | Solver type | Automatic | | Inplane Effect: | Off | | Soft Spring: | Off | | Inertial Relief: | Off | | Incompatible bonding options | Automatic | | Large displacement | Off | | Compute free body forces | On | | Result folder | SOLIDWORKS document (C:\Users\jakob\software\TU\23FL\CAD) | |

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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:**** | **Alloy Steel** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Unknown** | | ****Yield strength:**** | **6.20422e+08 N/m^2** | | ****Tensile strength:**** | **7.23826e+08 N/m^2** | | ****Elastic modulus:**** | **2.1e+11 N/m^2** | | ****Poisson's ratio:**** | **0.28** | | ****Mass density:**** | **7,700 kg/m^3** | | ****Shear modulus:**** | **7.9e+10 N/m^2** | | ****Thermal expansion coefficient:**** | **1.3e-05 /Kelvin** | | **SolidBody 1(Boss-Extrude3)(TU23FL-CAD-beam in class 2),**  **SolidBody 2(Boss-Extrude2)(TU23FL-CAD-beam in class 2),**  **SolidBody 3(Boss-Extrude1)(TU23FL-CAD-beam in class 2)** | | **Curve Data:N/A** | | | |

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| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **Fixed-1** |  | |  |  | | --- | --- | | Entities: | **1 Joint(s)** | | Type: | **Fixed Geometry** | | | **Reference Geometry-1** |  | |  |  | | --- | --- | | Entities: | **1 Joint(s)** | | Reference: | **Front Plane** | | Type: | **Use reference geometry** | | Translation: | **---, ---, 0** | | Rotation: | **0, 0, ---** | | Units: | **mm, rad** | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-1** |  | |  |  | | --- | --- | | Entities: | **1 plane(s), 1 Joint(s)** | | Reference: | **Front Plane** | | Type: | **Apply force** | | Values: | **---, -90, --- lbf** | | Moments: | **---, ---, --- lbf.in** | | | **Force-2** |  | |  |  | | --- | --- | | Entities: | **1 plane(s), 1 Beam (s)** | | Reference: | **Front Plane** | | Type: | **Apply force** | | Values: | **---, -1.6667, --- lbf/in** | | Moments: | **---, ---, --- lbf·in/in** | | |

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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 | Beam Mesh |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 30 | | Total Elements | 26 | | Time to complete mesh(hh;mm;ss): | 00:00:00 | | Computer name: | JW-MACHINE | |

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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 | 756.205 | 0 | 756.205 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 1,233.81 | 1,233.81 | |
| Free body forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | 0 | 0 | 0 | 0 |  Free body moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 0 | |

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| BeamsBeam Forces  | Beam Name | Joints | Axial(N) | Shear1(N) | Shear2(N) | Moment1(N.m) | Moment2(N.m) | Torque(N.m) | | --- | --- | --- | --- | --- | --- | --- | --- | | Beam-1(Boss-Extrude3) | 1 | 0 | 0 | 2.9897e-08 | 2.79325e-09 | 0 | 0 | | 2 | 0 | 0 | 355.865 | 216.935 | 0 | 0 | | Beam-2(Boss-Extrude2) | 1 | 0 | 0 | -355.865 | -216.935 | 0 | 0 | | 2 | 0 | 0 | 355.865 | 542.338 | 0 | 0 | | Beam-3(Boss-Extrude1) | 1 | 0 | 0 | 756.205 | 1,233.81 | 0 | 0 | | 2 | 0 | 0 | -756.205 | -542.338 | 0 | 0 |  Beam Stresses  | Beam Name | Joints | Axial(N/m^2) | Bending Dir1(N/m^2) | Bending Dir2(N/m^2) | Torsional (N/m^2) | Upper bound axial and bending(N/m^2) | | --- | --- | --- | --- | --- | --- | --- | | Beam-1(Boss-Extrude3) | 1 | 0 | -0.000111119 | 0 | 0 | 0.000111119 | | 2 | 0 | 8.62997e+06 | 0 | 0 | 8.62997e+06 | | Beam-2(Boss-Extrude2) | 1 | 0 | 8.62997e+06 | 0 | 0 | 8.62997e+06 | | 2 | 0 | 2.15749e+07 | 0 | 0 | 2.15749e+07 | | Beam-3(Boss-Extrude1) | 1 | 0 | 4.90826e+07 | 0 | 0 | 4.90826e+07 | | 2 | 0 | 2.15749e+07 | 0 | 0 | 2.15749e+07 | |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | Upper bound axial and bending | 12.517psi  Element: 1 | 7,118.834psi  Element: 26 | | **TU23FL-CAD-beam in class 2-Jakob Werle (2023-09-28)-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000in  Node: 27 | 0.667in  Node: 1 | | **TU23FL-CAD-beam in class 2-Jakob Werle (2023-09-28)-Displacement-Displacement1** | | | |  | Name | Type | | --- | --- | | Shear-Moment Plot1 | Moment about Dir1 | | **TU23FL-CAD-beam in class 2-Jakob Werle (2023-09-28)-Shear-Moment Plot-Shear-Moment Plot1** | |  | Name | Type | | --- | --- | | Shear-Moment Plot2 | Shear Force in Dir2 | | **TU23FL-CAD-beam in class 2-Jakob Werle (2023-09-28)-Shear-Moment Plot-Shear-Moment Plot2** | | |

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| Conclusion Max stress = 7118.8 psi @ the wall |

A notebook with writing on it

Description automatically generated