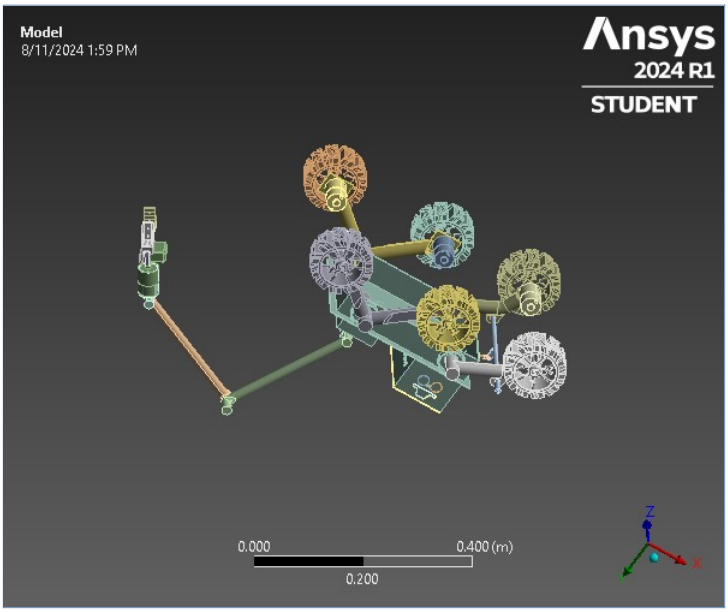
# Project*

| | |
|---|---|
| First Saved | Sunday, August 11, 2024 |
| Last Saved | Sunday, August 11, 2024 |
| Product Version | 2024 R1 |
| Save Project Before Solution | No |
| Save Project After Solution | No |



## Contents



## Report Not Finalized

**Not all objects described below are in a finalized state.** As a result, data may be incomplete, obsolete or in error. View first state problem. To finalize this report, edit objects as needed and solve the analyses.

## 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

**TABLE 2**
**Model > Geometry Imports**

| | |
|---|---|
| Object Name | *Geometry Imports* |
| State | Solved |

**TABLE 3**
**Model > Geometry Imports > Geometry Import**

| | |
|---|---|
| Object Name | *Geometry Import* |
| State | Solved |
| **Definition** | |
| Source | C:\Users\jajoo\Downloads\Final Assembly v5.iges |
| Type | Iges |
| **Basic Geometry Options** | |
| Solid Bodies | Yes |
| Surface Bodies | Yes |
| Line Bodies | No |
| Attributes | No |
| Named Selections | No |
| Material Properties | No |
| **Advanced Geometry Options** | |
| Use Associativity | Yes |
| Coordinate Systems | No |
| 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 |
| Import Facet Quality | Source |
| Clean Bodies On Import | No |
| Stitch Surfaces On Import | None |
| Decompose Disjoint Geometry | Yes |
| Enclosure and Symmetry Processing | Yes |

### *Geometry*

**TABLE 4**
**Model > Geometry**

| | |
|---|---|
| Object Name | *Geometry* |
| State | Underdefined |
| **Definition** | |
| Source | C:\Users\jajoo\Downloads\Final Assembly v5.iges |
| Type | Iges |
| Length Unit | Inches |
| Element Control | Program Controlled |
| Display Style | Body Color |
| **Bounding Box** | |
| Length X | 0.81429 m |
| Length Y | 0.52149 m |
| Length Z | 0.35169 m |
| **Properties** | |

| | |
|---|---|
| Volume | 2.7822e-003 m³ |
| Mass | |
| Scale Factor Value | 1. |
| 2D Tolerance | Default (1.e-005) |
| **Statistics** | |
| Bodies | 49 |
| Active Bodies | 49 |
| Nodes | 0 |
| Elements | 0 |
| Mesh Metric | None |
| **Update Options** | |
| Assign Default Material | No |
| **Basic Geometry Options** | |
| Solid Bodies | Yes |
| Surface Bodies | Yes |
| Line Bodies | No |
| Parameters | None |
| Attributes | No |
| Named Selections | No |
| Material Properties | No |
| **Advanced Geometry Options** | |
| Use Associativity | Yes |
| Coordinate Systems | No |
| 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 |
| Import Facet Quality | Source |
| Clean Bodies On Import | No |
| Stitch Surfaces On Import | None |
| Decompose Disjoint Geometry | Yes |
| Enclosure and Symmetry Processing | Yes |

**TABLE 5**
**Model > Geometry > Parts**

| Object Name | *Final Assembly v5-FreeParts* | *Final Assembly v5-FreeParts[2]* | *Final Assembly v5-FreeParts[3]* | *Final Assembly v5-FreeParts[4]* | *Final Assembly v5-FreeParts[5]* | *Final Assembly v5-FreeParts[6]* | *Final Assembly v5-FreeParts[7]* | *Final Assembly v5-FreeParts[8]* | *Final Assembly v5-FreeParts[9]* | *Final Assembly v5-FreeParts[10]* | *Final Assembly v5-FreeParts[11]* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| State | Underdefined | | | | | | | | | | |
| **Graphics Properties** | | | | | | | | | | | |
| Visible | Yes | | | | | | | | | | |
| Transparency | 1 | | | | | | | | | | |
| **Definition** | | | | | | | | | | | |
| Suppressed | No | | | | | | | | | | |
| Dimension | 3D | | | | | | | | | | |
| Model Type | Shell | | | | | | | | | | |
| Stiffness Behavior | Flexible | | | | | | | | | | |
| Stiffness Option | Membrane and Bending | | | | | | | | | | |
| Coordinate System | Default Coordinate System | | | | | | | | | | |
| Reference Temperature | By Environment | | | | | | | | | | |
| Thickness | 0. m | | | | | | | | | | |
| Thickness Mode | Refresh on Update | | | | | | | | | | |
| Offset Type | Middle | | | | | | | | | | |
| Treatment | None | | | | | | | | | | |
| **Material** | | | | | | | | | | | |
| Assignment | Structural Steel | | | | | | | | | | |
| Nonlinear Effects | Yes | | | | | | | | | | |
| Thermal Strain Effects | Yes | | | | | | | | | | |
| **Bounding Box** | | | | | | | | | | | |
| Length X | 1.639e-002 m | 5.588e-003 m | 1.0668e-002 m | 5.08e-004 m | 4.8768e-002 m | 5.0799e-004 m | 1.1571e-002 m | 6.5826e-003 m | 1.3578e-002 m | 2.6489e-002 m | 9.216e-003 m |
| Length Y | 5.0799e-004 m | 1.3208e-002 m | 5.0799e-004 m | 5.588e-003 m | 5.0799e-004 m | 5.588e-003 m | 5.0799e-004 m | 1.3208e-002 m | 5.0799e-004 m | 2.7186e-002 m | 5.0801e-004 m |
| Length Z | 3.048e-003 m | | | | | | | | | | |
| **Properties** | | | | | | | | | | | |
| Volume | 0. m³ | | | | | | | | | | |
| Mass | | | | | | | | | | | |
| Centroid X | 0.20098 m | 0.1905 m | 0.18288 m | 0.1778 m | 0.20193 m | 0.22606 m | 0.22053 m | 0.21196 m | 0.20193 m | 0.18734 m | 0.20193 m |
| Centroid Y | 0.27178 m | 0.26543 m | 0.25908 m | 0.25654 m | 0.254 m | 0.25654 m | 0.25908 m | 0.26543 m | 0.24568 m | 0.23839 m | 0.24204 m |
| Centroid Z | 0.15113 m | | | | | | | | | | |
| Moment of Inertia Ip1 | 0. kg·m² | | | | | | | | | | |
| Moment of Inertia Ip2 | 0. kg·m² | | | | | | | | | | |
| Moment of Inertia Ip3 | 0. kg·m² | | | | | | | | | | |
| Surface Area (approx.) | 4.034e-005 m² | 3.4743e-005 m² | 2.5806e-005 m² | 1.2903e-005 m² | 1.2258e-004 m² | 1.2903e-005 m² | 2.8101e-005 m² | 3.5758e-005 m² | 3.3197e-005 m² | 1.512e-004 m² | 2.2118e-005 m² |
| **Statistics** | | | | | | | | | | | |
| Nodes | 0 | | | | | | | | | | |
| Elements | 0 | | | | | | | | | | |

| | |
|---|---|
| Mesh Metric | None |

**TABLE 6**
**Model > Geometry > Parts**

| Object Name | *Final Assembly v5-FreeParts[12]* | *Final Assembly v5-asm1\|Base Body* | *Final Assembly v5-asm1\|Leg Shaft* | *Final Assembly v5-asm1\|Leg Shaft[2]* | *Final Assembly v5-asm1\|Rear Legs 2* | *Final Assembly v5-asm1\|Rear Legs* | *Final Assembly v5-asm1\|Boggie Shaft* | *Final Assembly v5-asm1\|Suspensions* | *Final Assembly v5-asm1\|Suspensions 2* | *Final Assembly v5-asm1\|24V DC Gear Motor.step* | *Final Assembly v5-asm1\|24V DC Gear Motor.step[2]* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| State | Underdefined | Fully Defined | | | | | | | | | |
| **Graphics Properties** | | | | | | | | | | | |
| Visible | Yes | Yes | | | | | | | | | |
| Transparency | 1 | 1 | | | | | | | | | |
| **Definition** | | | | | | | | | | | |
| Suppressed | No | No | | | | | | | | | |
| Dimension | 3D | | | | | | | | | | |
| Model Type | Shell | | | | | | | | | | |
| Stiffness Behavior | Flexible | Flexible | | | | | | | | | |
| Stiffness Option | Membrane and Bending | | | | | | | | | | |
| Coordinate System | Default Coordinate System | Default Coordinate System | | | | | | | | | |
| Reference Temperature | By Environment | By Environment | | | | | | | | | |
| Thickness | 0. m | | | | | | | | | | |
| Thickness Mode | Refresh on Update | | | | | | | | | | |
| Offset Type | Middle | | | | | | | | | | |
| Treatment | None | None | | | | | | | | | |
| Reference Frame | | Lagrangian | | | | | | | | | |
| **Material** | | | | | | | | | | | |
| Assignment | Structural Steel | Structural Steel | | | | | | | | | |
| Nonlinear Effects | Yes | Yes | | | | | | | | | |
| Thermal Strain Effects | Yes | Yes | | | | | | | | | |
| **Bounding Box** | | | | | | | | | | | |
| Length X | 2.6489e-002 m | 0.30483 m | 0.28664 m | 0.28516 m | 0.14913 m | | 1.0797e-002 m | 2.9074e-002 m | 3.7812e-002 m | 3.9301e-002 m | 3.9734e-002 m |
| Length Y | 2.7186e-002 m | 0.129 m | 0.14085 m | 0.13768 m | 0.14649 m | | 3.0668e-002 m | 2.1629e-002 m | 2.1508e-002 m | 3.9297e-002 m | 3.973e-002 m |
| Length Z | 3.048e-003 m | 0.2032 m | 0.1016 m | | | | 0.3048 m | 1.2e-002 m | 9.8e-003 m | 8.3219e-002 m | |
| **Properties** | | | | | | | | | | | |
| Volume | 0. m³ | 3.6668e-004 m³ | 1.6232e-004 m³ | | 1.2086e-004 m³ | 1.2073e-004 m³ | 2.4218e-005 m³ | 1.3093e-006 m³ | 1.0768e-006 m³ | 6.0238e-005 m³ | |
| Mass | | 2.8784 kg | 1.2742 kg | | 0.94874 kg | 0.94776 kg | 0.19011 kg | 1.0278e-002 kg | 8.4526e-003 kg | 0.47287 kg | |
| Centroid X | 0.21652 m | 0.12406 m | 1.7242e-002 m | 1.7608e-002 m | 0.24748 m | 0.24743 m | 0.29514 m | 0.27032 m | 0.27619 m | -9.9559e-002 m | -0.10065 m |
| Centroid Y | 0.23839 m | 0.20879 m | 0.14488 m | | 0.15434 m | 0.15435 m | 0.15755 m | 0.18851 m | 0.18599 m | 7.978e-002 m | 8.1102e-002 m |
| Centroid Z | 0.15113 m | 0.24371 m | 0.34938 m | 0.13804 m | 0.3473 m | 0.14014 m | 0.24371 m | | | 0.15564 m | 0.33178 m |
| Moment of Inertia Ip1 | 0. kg·m² | 1.3815e-002 kg·m² | 5.011e-003 kg·m² | | 2.4497e-003 kg·m² | 2.4471e-003 kg·m² | 3.2562e-006 kg·m² | 4.0837e-007 kg·m² | 6.9208e-007 kg·m² | 8.2725e-005 kg·m² | |
| Moment of Inertia Ip2 | 0. kg·m² | 3.6488e-002 kg·m² | 4.0586e-003 kg·m² | | 2.7778e-003 kg·m² | 2.7756e-003 kg·m² | 1.4306e-003 kg·m² | 2.1607e-007 kg·m² | 5.1542e-008 kg·m² | 1.5796e-004 kg·m² | |
| Moment of Inertia Ip3 | 0. kg·m² | 2.7153e-002 kg·m² | 1.7825e-003 kg·m² | | 4.741e-004 kg·m² | 4.7368e-004 kg·m² | 1.4298e-003 kg·m² | 3.9293e-007 kg·m² | 6.9372e-007 kg·m² | 1.5802e-004 kg·m² | |
| Surface Area (approx.) | 1.512e-004 m² | | | | | | | | | | |
| **Statistics** | | | | | | | | | | | |
| Nodes | 0 | 0 | | | | | | | | | |
| Elements | 0 | 0 | | | | | | | | | |
| Mesh Metric | None | None | | | | | | | | | |

**TABLE 7**
**Model > Geometry > Parts**

| Object Name | *Final Assembly v5-asm1\|24V DC Gear Motor.step [3]* | *Final Assembly v5-asm1\|24V DC Gear Motor.step [4]* | *Final Assembly v5-asm1\|24V DC Gear Motor.step [5]* | *Final Assembly v5-asm1\|24V DC Gear Motor.step [6]* | *Final Assembly v5-asm1\|24V DC Gear Motor.step [7]* | *Final Assembly v5-asm1\|WHeeeeeeel* | *Final Assembly v5-asm1\|WHeeeeeeel [2]* | *Final Assembly v5-asm1\|WHeeeeeeel [3]* | *Final Assembly v5-asm1\|WHeeeeeeel [4]* | *Final Assembly v5-asm1\|WHeeeeeeel [5]* | *Final A asm1\|* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| State | Fully Defined | | | | | | | | | | |
| **Graphics Properties** | | | | | | | | | | | |
| Visible | Yes | | | | | | | | | | |
| Transparency | 1 | | | | | | | | | | |
| **Definition** | | | | | | | | | | | |
| Suppressed | No | | | | | | | | | | |
| Stiffness Behavior | Flexible | | | | | | | | | | |
| Coordinate System | Default Coordinate System | | | | | | | | | | |
| Reference Temperature | By Environment | | | | | | | | | | |
| Treatment | None | | | | | | | | | | |
| Reference Frame | Lagrangian | | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Material** | | | | | | | | | | |
| Assignment | Structural Steel | | | | | | | | | |
| Nonlinear Effects | Yes | | | | | | | | | |
| Thermal Strain Effects | Yes | | | | | | | | | |
| **Bounding Box** | | | | | | | | | | |
| Length X | 4.1159e-002 m | | 3.9301e-002 m | 3.9734e-002 m | 7.9474e-002 m | 0.13602 m | 0.14498 m | 0.16282 m | 0.12423 m | 0. |
| Length Y | 4.1155e-002 m | | 3.9297e-002 m | 3.973e-002 m | 9.0847e-002 m | 0.13605 m | 0.14495 m | 0.16283 m | 0.12427 m | 0. |
| Length Z | 8.3219e-002 m | | | | 4.0325e-002 m | 5.1803e-002 m | | | | |
| **Properties** | | | | | | | | | | |
| Volume | 6.0238e-005 m³ | | | | | 1.8081e-004 m³ | | | | |
| Mass | 0.47287 kg | | | | | 1.4194 kg | | | | |
| Centroid X | 0.32256 m | | 0.13393 m | 0.13281 m | -0.32606 m | -0.10065 m | 0.13282 m | 0.13393 m | -9.9558e-002 m | 0.32255 m | 0. |
| Centroid Y | 7.6478e-002 m | | 7.8279e-002 m | 7.6982e-002 m | 0.36881 m | 8.1112e-002 m | 7.6987e-002 m | 7.8289e-002 m | 7.979e-002 m | 7.6486e-002 m | 7.64 |
| Centroid Z | 0.15514 m | 0.33228 m | 0.15564 m | 0.33178 m | 0.23713 m | 0.39337 m | | 9.4051e-002 m | | 0.39387 m | 9.35 |
| Moment of Inertia Ip1 | 8.2725e-005 kg·m² | | | | | 2.8297e-003 kg·m² | | | | |
| Moment of Inertia Ip2 | 1.5796e-004 kg·m² | | | | | 1.7195e-003 kg·m² | | | | |
| Moment of Inertia Ip3 | 1.5802e-004 kg·m² | | | | | 1.7187e-003 kg·m² | | | | |
| **Statistics** | | | | | | | | | | |
| Nodes | 0 | | | | | | | | | |
| Elements | 0 | | | | | | | | | |
| Mesh Metric | None | | | | | | | | | |

**TABLE 8**
**Model > Geometry > Parts**

| Object Name | *Final Assembly v5-asm1\|Hand System Arm 01* | *Final Assembly v5-asm1\|Arm 02* | *Final Assembly v5-asm1\|Arm 02[2]* | *Final Assembly v5-asm1\|Gripper Motor Cup* | *Final Assembly v5-asm1\|ELECTRIC BOX DHAKNA* | *Final Assembly v5-asm1\|gripper\|Base* | *Final Assembly v5-asm1\|gripper\|Part3 (2)* | *Final Assembly v5-asm1\|gripper\|Part3 (2)[2]* | *Final Assembly v5-asm1\|gripper\|Estrella_Predeterminado* |
|---|---|---|---|---|---|---|---|---|---|
| State | Fully Defined | | | | | | | | |
| **Graphics Properties** | | | | | | | | | |
| Visible | Yes | | | | | | | | |
| Transparency | 1 | | | | | | | | |
| **Definition** | | | | | | | | | |
| Suppressed | No | | | | | | | | |
| Stiffness Behavior | Flexible | | | | | | | | |
| Coordinate System | Default Coordinate System | | | | | | | | |
| Reference Temperature | By Environment | | | | | | | | |
| Treatment | None | | | | | | | | |
| Reference Frame | Lagrangian | | | | | | | | |
| **Material** | | | | | | | | | |
| Assignment | Structural Steel | | | | | | | | |
| Nonlinear Effects | Yes | | | | | | | | |
| Thermal Strain Effects | Yes | | | | | | | | |
| **Bounding Box** | | | | | | | | | |
| Length X | 2.7547e-002 m | 0.13952 m | 0.25857 m | 7.5336e-002 m | 0.1016 m | 4.7813e-002 m | 4.26e-002 m | | 1.4917e-002 m |
| Length Y | 8.9604e-002 m | 0.25056 m | 0.12101 m | 8.6398e-002 m | 2.e-003 m | 5.4491e-002 m | 4.7097e-002 m | | 1.3723e-002 m |
| Length Z | 3.8556e-002 m | 5.3052e-002 m | 5.4991e-002 m | 3.7839e-002 m | 0.1778 m | 0.10424 m | 2.2189e-002 m | | 3.6542e-002 m |
| **Properties** | | | | | | | | | |
| Volume | 4.0082e-005 m³ | 7.3677e-005 m³ | | 2.0457e-005 m³ | 3.6129e-005 m³ | 1.8164e-005 m³ | 5.5009e-006 m³ | | 6.779e-007 m³ |
| Mass | 0.31464 kg | 0.57836 kg | | 0.16059 kg | 0.28361 kg | 0.14258 kg | 4.3182e-002 kg | | 5.3215e-003 kg |
| Centroid X | 4.9619e-002 m | -9.9682e-003 m | -0.18618 m | -0.31486 m | 0.20197 m | -0.36277 m | -0.37213 m | -0.37839 m | -0.36908 m |
| Centroid Y | 0.24461 m | 0.39594 m | 0.45511 m | 0.38546 m | 0.28195 m | 0.31447 m | 0.29517 m | 0.29849 m | 0.32091 m |
| Centroid Z | 0.24699 m | 0.22651 m | 0.24921 m | 0.23694 m | 0.24371 m | 0.23925 m | 0.27916 m | 0.19747 m | 0.23848 m |
| Moment of Inertia Ip1 | 2.2779e-004 kg·m² | 4.112e-003 kg·m² | | 1.0215e-004 kg·m² | 2.4406e-004 kg·m² | 3.8403e-005 kg·m² | 5.5857e-006 kg·m² | | 3.9567e-007 kg·m² |
| Moment of Inertia Ip2 | 2.7683e-005 kg·m² | 4.1478e-005 kg·m² | | 3.2381e-005 kg·m² | 9.9112e-004 kg·m² | 1.1333e-004 kg·m² | 2.811e-006 kg·m² | | 4.1396e-007 kg·m² |
| Moment of Inertia Ip3 | 2.2304e-004 kg·m² | 4.0933e-003 kg·m² | | 1.0394e-004 kg·m² | 7.4724e-004 kg·m² | 1.5041e-004 kg·m² | 5.8383e-006 kg·m² | | 2.9102e-008 kg·m² |
| **Statistics** | | | | | | | | | |
| Nodes | 0 | | | | | | | | |
| Elements | 0 | | | | | | | | |
| Mesh Metric | None | | | | | | | | |

**TABLE 9**
**Model > Geometry > Parts**

| Object Name | *Final Assembly v5-asm1\|gripper\|holder* | *Final Assembly v5-asm1\|gripper\|Part4* | *Final Assembly v5-asm1\|gripper\|Part4[2]* | *Final Assembly v5-asm1\|gripper\|Part2* | *Final Assembly v5-asm1\|gripper\|Part2[2]* |
|---|---|---|---|---|---|
| State | Fully Defined | | | | |

| Graphics Properties | | | | | |
|---|---|---|---|---|---|
| Visible | Yes | | | | |
| Transparency | 1 | | | | |
| **Definition** | | | | | |
| Suppressed | No | | | | |
| Stiffness Behavior | Flexible | | | | |
| Coordinate System | Default Coordinate System | | | | |
| Reference Temperature | By Environment | | | | |
| Treatment | None | | | | |
| Reference Frame | Lagrangian | | | | |
| **Material** | | | | | |
| Assignment | Structural Steel | | | | |
| Nonlinear Effects | Yes | | | | |
| Thermal Strain Effects | Yes | | | | |
| **Bounding Box** | | | | | |
| Length X | 1.3946e-002 m | 1.4069e-002 m | 1.3002e-002 m | 3.9718e-002 m | |
| Length Y | 1.1759e-002 m | 1.6348e-002 m | 2.1913e-002 m | 4.3716e-002 m | |
| Length Z | 1.3079e-002 m | 3.432e-002 m | 3.6708e-002 m | 2.7968e-002 m | |
| **Properties** | | | | | |
| Volume | 2.9294e-007 m³ | 5.6828e-007 m³ | | 5.0043e-006 m³ | |
| Mass | 2.2996e-003 kg | 4.461e-003 kg | | 3.9284e-002 kg | |
| Centroid X | -0.34465 m | -0.36667 m | -0.37511 m | -0.38426 m | -0.38928 m |
| Centroid Y | 0.34118 m | 0.32569 m | 0.32194 m | 0.27471 m | 0.27737 m |
| Centroid Z | 0.23743 m | 0.26709 m | 0.21026 m | 0.27112 m | 0.20558 m |
| Moment of Inertia Ip1 | 2.2627e-008 kg·m² | 2.5522e-008 kg·m² | | 7.9807e-006 kg·m² | |
| Moment of Inertia Ip2 | 2.324e-008 kg·m² | 3.513e-007 kg·m² | | 3.1539e-006 kg·m² | |
| Moment of Inertia Ip3 | 3.7995e-008 kg·m² | 3.7013e-007 kg·m² | | 7.4727e-006 kg·m² | |
| **Statistics** | | | | | |
| Nodes | 0 | | | | |
| Elements | 0 | | | | |
| Mesh Metric | None | | | | |

**TABLE 10**
**Model > Materials**

| Object Name | *Materials* |
|---|---|
| State | Fully Defined |
| **Statistics** | |
| Materials | 1 |
| Material Assignments | 0 |

## *Coordinate Systems*

**TABLE 11**
**Model > Coordinate Systems > Coordinate System**

| Object Name | *Global Coordinate System* |
|---|---|
| State | Fully Defined |
| **Definition** | |
| Type | Cartesian |
| Coordinate System ID | 0. |
| **Origin** | |
| Origin X | 0. m |
| Origin Y | 0. m |
| Origin Z | 0. m |
| **Directional Vectors** | |
| X Axis Data | [ 1. 0. 0. ] |
| Y Axis Data | [ 0. 1. 0. ] |
| Z Axis Data | [ 0. 0. 1. ] |
| **Transfer Properties** | |
| Source | |
| Read Only | No |

## *Connections*

**TABLE 12**
**Model > Connections**

| Object Name | *Connections* |
|---|---|
| State | Fully Defined |
| **Auto Detection** | |
| Generate Automatic Connection On Refresh | Yes |
| **Transparency** | |
| Enabled | Yes |
| **Statistics** | |
| Contacts | 47 |
| Active Contacts | 47 |
| Joints | 0 |
| Active Joints | 0 |
| Beams | 0 |
| Active Beams | 0 |
| Bearings | 0 |
| Active Bearings | 0 |
| Springs | 0 |
| Active Springs | 0 |
| Body Interactions | 0 |

| | |
|---|---|
| Active Body Interactions | 0 |

**TABLE 13**
**Model > Connections > Contacts**

| Object Name | *Contacts* |
|---|---|
| State | Fully Defined |
| **Definition** | |
| Connection Type | Contact |
| **Scope** | |
| Scoping Method | Geometry Selection |
| Geometry | All Bodies |
| **Auto Detection** | |
| Tolerance Type | Slider |
| Tolerance Slider | 0. |
| Tolerance Value | 2.5723e-003 m |
| Use Range | No |
| Face/Face | Yes |
| Face-Face Angle Tolerance | 75. ° |
| Face Overlap Tolerance | Off |
| Cylindrical Faces | Include |
| Face/Edge | No |
| Edge/Edge | No |
| Priority | Include All |
| Group By | Bodies |
| Search Across | Bodies |
| **Statistics** | |
| Connections | 47 |
| Active Connections | 47 |

**TABLE 14**
**Model > Connections > Contacts > Contact Regions**

| Object Name | *Contact Region* | *Contact Region 2* | *Contact Region 3* | *Contact Region 4* | *Contact Region 5* | *Contact Region 6* | *Contact Region 7* | *Contact Region 8* | *Contact Region 9* | *Contact Region 10* | *Contact Region 11* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| State | Fully Defined | | | | | | | | | | |
| **Scope** | | | | | | | | | | | |
| Scoping Method | Geometry Selection | | | | | | | | | | |
| Contact | 2 Faces | | | | 5 Faces | 2 Faces | 1 Face | 2 Faces | | 1 Face | |
| Target | 3 Faces | | 2 Faces | | 8 Faces | 1 Face | | | | 2 Faces | |
| Contact Bodies | Final Assembly v5-asm1\|Base Body | | | | | | | Final Assembly v5-asm1\|Leg Shaft | | | |
| Target Bodies | Final Assembly v5-asm1\|Leg Shaft | Final Assembly v5-asm1\|Leg Shaft[2] | Final Assembly v5-asm1\|Rear Legs 2 | Final Assembly v5-asm1\|Rear Legs | Final Assembly v5-asm1\|Suspensions | Final Assembly v5-asm1\|Hand System Arm 01 | Final Assembly v5-asm1\|ELECTRIC BOX DHAKNA | Final Assembly v5-asm1\|24V DC Gear Motor.step [2] | Final Assembly v5-asm1\|24V DC Gear Motor.step [6] | Final Assembly v5-asm1\|WHeeeeeeel | Final Assembly v5-asm1\|WHeeeeeeel [2] |
| Protected | No | | | | | | | | | | |
| **Definition** | | | | | | | | | | | |
| Type | Bonded | | | | | | | | | | |
| Scope Mode | Automatic | | | | | | | | | | |
| Behavior | Program Controlled | | | | | | | | | | |
| Trim Contact | Program Controlled | | | | | | | | | | |
| Trim Tolerance | 2.5723e-003 m | | | | | | | | | | |
| Maximum Offset | 1.e-007 m | | | | | | | | | | |
| Breakable | No | | | | | | | | | | |
| Contact APDL Name | | | | | | | | | | | |
| Target APDL Name | | | | | | | | | | | |
| Suppressed | No | | | | | | | | | | |
| **Display** | | | | | | | | | | | |
| Element Normals | No | | | | | | | | | | |
| **Advanced** | | | | | | | | | | | |
| Formulation | Program Controlled | | | | | | | | | | |
| Small Sliding | Program Controlled | | | | | | | | | | |
| Detection Method | Program Controlled | | | | | | | | | | |
| Penetration Tolerance | Program Controlled | | | | | | | | | | |
| Elastic Slip Tolerance | Program Controlled | | | | | | | | | | |
| Normal Stiffness | Program Controlled | | | | | | | | | | |
| Update Stiffness | Program Controlled | | | | | | | | | | |
| Thermal Conductance | Program Controlled | | | | | | | | | | |
| Electric Conductance | Program Controlled | | | | | | | | | | |
| Electric Capacitance | Program Controlled | | | | | | | | | | |
| Pinball Region | Program Controlled | | | | | | | | | | |
| Restitution Factor | 1 | | | | | | | | | | |
| RBD Contact | Program Controlled | | | | | | | | | | |

| | |
|---|---|
| Detection | |
| **Geometric Modification** | |
| Contact Geometry Correction | None |
| Target Geometry Correction | None |

**TABLE 15**
**Model > Connections > Contacts > Contact Regions**

| Object Name | *Contact Region 12* | *Contact Region 13* | *Contact Region 14* | *Contact Region 15* | *Contact Region 16* | *Contact Region 17* | *Contact Region 18* | *Contact Region 19* | *Contact Region 20* | *Contact Region 21* | *Contact Region* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| State | Fully Defined | | | | | | | | | | |
| **Scope** | | | | | | | | | | | |
| Scoping Method | Geometry Selection | | | | | | | | | | |
| Contact | 2 Faces | | 1 Face | | | 2 Faces | | 1 Face | 2 Faces | | |
| Target | 1 Face | | 2 Faces | | 1 Face | 2 Faces | | 1 Face | 2 Faces | | |
| Contact Bodies | Final Assembly v5-asm1\|Leg Shaft[2] | | | | Final Assembly v5-asm1\|Rear Legs 2 | | | Final Assembly v5-asm1\|Rear Legs | | | Final Assembl v5-asm1\|Bogg Shaft |
| Target Bodies | Final Assembly v5-asm1\|24V DC Gear Motor.step | Final Assembly v5-asm1\|24V DC Gear Motor.step [5] | Final Assembly v5-asm1\|WHeeeeeeel [3] | Final Assembly v5-asm1\|WHeeeeeeel [4] | Final Assembly v5-asm1\|Boggie Shaft | Final Assembly v5-asm1\|24V DC Gear Motor.step [4] | Final Assembly v5-asm1\|WHeeeeeeel [5] | Final Assembly v5-asm1\|Boggie Shaft | Final Assembly v5-asm1\|24V DC Gear Motor.step [3] | Final Assembly v5-asm1\|WHeeeeeeel [6] | Final Assembl v5-asm1\|Suspensi 2 |
| Protected | No | | | | | | | | | | |
| **Definition** | | | | | | | | | | | |
| Type | Bonded | | | | | | | | | | |
| Scope Mode | Automatic | | | | | | | | | | |
| Behavior | Program Controlled | | | | | | | | | | |
| Trim Contact | Program Controlled | | | | | | | | | | |
| Trim Tolerance | 2.5723e-003 m | | | | | | | | | | |
| Maximum Offset | 1.e-007 m | | | | | | | | | | |
| Breakable | No | | | | | | | | | | |
| Contact APDL Name | | | | | | | | | | | |
| Target APDL Name | | | | | | | | | | | |
| Suppressed | No | | | | | | | | | | |
| **Display** | | | | | | | | | | | |
| Element Normals | No | | | | | | | | | | |
| **Advanced** | | | | | | | | | | | |
| Formulation | Program Controlled | | | | | | | | | | |
| Small Sliding | Program Controlled | | | | | | | | | | |
| Detection Method | Program Controlled | | | | | | | | | | |
| Penetration Tolerance | Program Controlled | | | | | | | | | | |
| Elastic Slip Tolerance | Program Controlled | | | | | | | | | | |
| Normal Stiffness | Program Controlled | | | | | | | | | | |
| Update Stiffness | Program Controlled | | | | | | | | | | |
| Thermal Conductance | Program Controlled | | | | | | | | | | |
| Electric Conductance | Program Controlled | | | | | | | | | | |
| Electric Capacitance | Program Controlled | | | | | | | | | | |
| Pinball Region | Program Controlled | | | | | | | | | | |
| Restitution Factor | 1 | | | | | | | | | | |
| RBD Contact Detection | Program Controlled | | | | | | | | | | |
| **Geometric Modification** | | | | | | | | | | | |
| Contact Geometry Correction | None | | | | | | | | | | |
| Target Geometry Correction | None | | | | | | | | | | |

**TABLE 16**
**Model > Connections > Contacts > Contact Regions**

| Object Name | *Contact Region 23* | *Contact Region 24* | *Contact Region 25* | *Contact Region 26* | *Contact Region 27* | *Contact Region 28* | *Contact Region 29* | *Contact Region 30* | *Contact Region* |
|---|---|---|---|---|---|---|---|---|---|
| State | Fully Defined | | | | | | | | |
| **Scope** | | | | | | | | | |
| Scoping Method | Geometry Selection | | | | | | | | |
| Contact | 2 Faces | 4 Faces | | | | | | 6 Faces | |
| Target | 1 Face | 2 Faces | | | | | | | |
| | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Contact Bodies | Final Assembly v5-asm1\|Suspensions | Final Assembly v5-asm1\|24V DC Gear Motor.step | Final Assembly v5-asm1\|24V DC Gear Motor.step[2] | Final Assembly v5-asm1\|24V DC Gear Motor.step[3] | Final Assembly v5-asm1\|24V DC Gear Motor.step[4] | Final Assembly v5-asm1\|24V DC Gear Motor.step[5] | Final Assembly v5-asm1\|24V DC Gear Motor.step[6] | Final Assembly v5-asm1\|24V | |
| Target Bodies | Final Assembly v5-asm1\|Suspensions 2 | Final Assembly v5-asm1\|WHeeeeeeel [4] | Final Assembly v5-asm1\|WHeeeeeeel | Final Assembly v5-asm1\|WHeeeeeeel [6] | Final Assembly v5-asm1\|WHeeeeeeel [5] | Final Assembly v5-asm1\|WHeeeeeeel [3] | Final Assembly v5-asm1\|WHeeeeeeel [2] | Final Assembly v5-asm1\|Gripper Motor Cup | Final Assembly v5-asm1\|gripper\|Ba |
| Protected | No | | | | | | | | |
| **Definition** | | | | | | | | | |
| Type | Bonded | | | | | | | | |
| Scope Mode | Automatic | | | | | | | | |
| Behavior | Program Controlled | | | | | | | | |
| Trim Contact | Program Controlled | | | | | | | | |
| Trim Tolerance | 2.5723e-003 m | | | | | | | | |
| Maximum Offset | 1.e-007 m | | | | | | | | |
| Breakable | No | | | | | | | | |
| Contact APDL Name | | | | | | | | | |
| Target APDL Name | | | | | | | | | |
| Suppressed | No | | | | | | | | |
| **Display** | | | | | | | | | |
| Element Normals | No | | | | | | | | |
| **Advanced** | | | | | | | | | |
| Formulation | Program Controlled | | | | | | | | |
| Small Sliding | Program Controlled | | | | | | | | |
| Detection Method | Program Controlled | | | | | | | | |
| Penetration Tolerance | Program Controlled | | | | | | | | |
| Elastic Slip Tolerance | Program Controlled | | | | | | | | |
| Normal Stiffness | Program Controlled | | | | | | | | |
| Update Stiffness | Program Controlled | | | | | | | | |
| Thermal Conductance | Program Controlled | | | | | | | | |
| Electric Conductance | Program Controlled | | | | | | | | |
| Electric Capacitance | Program Controlled | | | | | | | | |
| Pinball Region | Program Controlled | | | | | | | | |
| Restitution Factor | 1 | | | | | | | | |
| RBD Contact Detection | Program Controlled | | | | | | | | |
| **Geometric Modification** | | | | | | | | | |
| Contact Geometry Correction | None | | | | | | | | |
| Target Geometry Correction | None | | | | | | | | |

**TABLE 17**
**Model > Connections > Contacts > Contact Regions**

| Object Name | *Contact Region 34* | *Contact Region 35* | *Contact Region 36* | *Contact Region 37* | *Contact Region 38* | *Contact Region 39* | *Contact Region 40* | *Contact Region 41* | *Contact Region 4* |
|---|---|---|---|---|---|---|---|---|---|
| State | Fully Defined | | | | | | | | |
| **Scope** | | | | | | | | | |
| Scoping Method | Geometry Selection | | | | | | | | |
| Contact | 2 Faces | | 9 Faces | | 11 Faces | 6 Faces | 2 Faces | 4 Faces | 2 Faces |
| Target | 2 Faces | | 8 Faces | | 19 Faces | 4 Faces | 2 Faces | 3 Faces | 2 Faces |
| Contact Bodies | Final Assembly v5-asm1\|Arm 02 | Final Assembly v5-asm1\|Arm 02 [2] | Final Assembly v5-asm1\|gripper\|Base | | | | Final Assembly v5-asm1\|gripper\|Part3 (2) | | Final Assembly v |
| Target Bodies | Final Assembly v5-asm1\|Arm 02[2] | Final Assembly v5-asm1\|Gripper Motor Cup | Final Assembly v5-asm1\|gripper\|Part3 (2) | Final Assembly v5-asm1\|gripper\|Part3 (2)[2] | Final Assembly v5-asm1\|gripper\|Servo MG966R_Predeterminado | Final Assembly v5-asm1\|gripper\|holder | Final Assembly v5-asm1\|gripper\|Part4 | Final Assembly v5-asm1\|gripper\|Part2 | Final Assembly v5-asm1\|gripper\|Par [2] |
| Protected | No | | | | | | | | |
| **Definition** | | | | | | | | | |
| Type | Bonded | | | | | | | | |
| Scope Mode | Automatic | | | | | | | | |
| Behavior | Program Controlled | | | | | | | | |
| Trim Contact | Program Controlled | | | | | | | | |
| Trim Tolerance | 2.5723e-003 m | | | | | | | | |
| Maximum Offset | 1.e-007 m | | | | | | | | |
| Breakable | No | | | | | | | | |

| | |
|---|---|
| Contact APDL Name | |
| Target APDL Name | |
| Suppressed | No |
| **Display** | |
| Element Normals | No |
| **Advanced** | |
| Formulation | Program Controlled |
| Small Sliding | Program Controlled |
| Detection Method | Program Controlled |
| Penetration Tolerance | Program Controlled |
| Elastic Slip Tolerance | Program Controlled |
| Normal Stiffness | Program Controlled |
| Update Stiffness | Program Controlled |
| Thermal Conductance | Program Controlled |
| Electric Conductance | Program Controlled |
| Electric Capacitance | Program Controlled |
| Pinball Region | Program Controlled |
| Restitution Factor | 1 |
| RBD Contact Detection | Program Controlled |
| **Geometric Modification** | |
| Contact Geometry Correction | None |
| Target Geometry Correction | None |

**TABLE 18**
**Model > Connections > Contacts > Contact Regions**

| Object Name | *Contact Region 45* | *Contact Region 46* | *Contact Region 47* |
|---|---|---|---|
| State | Fully Defined | | |
| **Scope** | | | |
| Scoping Method | Geometry Selection | | |
| Contact | 4 Faces | | 1 Face |
| Target | 3 Faces | 2 Faces | 1 Face |
| Contact Bodies | Final Assembly v5-asm1\|gripper\|Estrella_Predeterminado | | Final Assembly v5-asm1\|gripper\|Servo MG966R_Predeterminado |
| Target Bodies | Final Assembly v5-asm1\|gripper\|Part4 | Final Assembly v5-asm1\|gripper\|Part4[2] | Final Assembly v5-asm1\|gripper\|Servo MG966R_Predeterminado[2] |
| Protected | No | | |
| **Definition** | | | |
| Type | Bonded | | |
| Scope Mode | Automatic | | |
| Behavior | Program Controlled | | |
| Trim Contact | Program Controlled | | |
| Trim Tolerance | 2.5723e-003 m | | |
| Maximum Offset | 1.e-007 m | | |
| Breakable | No | | |
| Contact APDL Name | | | |
| Target APDL Name | | | |
| Suppressed | No | | |
| **Display** | | | |
| Element Normals | No | | |
| **Advanced** | | | |
| Formulation | Program Controlled | | |
| Small Sliding | Program Controlled | | |
| Detection Method | Program Controlled | | |
| Penetration Tolerance | Program Controlled | | |
| Elastic Slip Tolerance | Program Controlled | | |
| Normal Stiffness | Program Controlled | | |
| Update Stiffness | Program Controlled | | |
| Thermal Conductance | Program Controlled | | |
| Electric Conductance | Program Controlled | | |
| Electric Capacitance | Program Controlled | | |
| Pinball Region | Program Controlled | | |
| Restitution Factor | 1 | | |
| RBD Contact Detection | Program Controlled | | |
| **Geometric Modification** | | | |
| Contact Geometry Correction | None | | |
| Target Geometry Correction | None | | |

## *Mesh*

**TABLE 19**
**Model > Mesh**

| Object Name | *Mesh* |
|---|---|
| State | Not Solved |
| **Display** | |

| | |
|---|---|
| Display Style | Use Geometry Setting |
| **Defaults** | |
| Physics Preference | Mechanical |
| Element Order | Program Controlled |
| Element Size | Default (1.9424e-003 m) |
| **Sizing** | |
| Use Adaptive Sizing | No |
| Use Uniform Size Function For Sheets | Yes |
| Growth Rate | Default (1.2) |
| Max Size | Default (1.9424e-003 m) |
| Mesh Defeaturing | Yes |
| Defeature Size | Default (9.7118e-006 m) |
| Capture Curvature | Yes |
| Curvature Min Size | Default (1.9424e-005 m) |
| Curvature Normal Angle | Default (30.0°) |
| Capture Proximity | No |
| Enable Washers | No |
| Bounding Box Diagonal | 1.0289 m |
| Average Surface Area | 2.4146e-004 m² |
| Minimum Edge Length | 1.71e-005 m |
| **Quality** | |
| Check Mesh Quality | Yes, Errors |
| Error Limits | Aggressive Mechanical |
| Target Element Quality | Default (5.e-002) |
| 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 |
| Inflation Element Type | Wedges |
| View Advanced Options | No |
| **Batch Connections** | |
| Mesh Based Connection | No |
| **Advanced** | |
| Number of CPUs for Parallel Part Meshing | Program Controlled |
| Straight Sided Elements | No |
| Rigid Body Behavior | Dimensionally Reduced |
| Triangle Surface Mesher | Program Controlled |
| Topology Checking | Yes |
| Pinch Tolerance | Default (1.7481e-005 m) |
| Generate Pinch on Refresh | No |
| Sheet Loop Removal | No |
| **Statistics** | |
| Nodes | |
| Elements | |
| Show Detailed Statistics | No |

## Material Data

### *Structural Steel*

**TABLE 20**
**Structural Steel > Constants**

| | |
|---|---|
| Density | 7850 kg m^-3 |
| Isotropic Secant Coefficient of Thermal Expansion | 1.2e-005 C^-1 |
| Specific Heat Constant Pressure | 434 J kg^-1 C^-1 |
| Isotropic Thermal Conductivity | 60.5 W m^-1 C^-1 |
| Isotropic Resistivity | 1.7e-007 ohm m |

**TABLE 21**
**Structural Steel > Appearance**

| Red | Green | Blue |
|---|---|---|
| 132 | 139 | 179 |

**TABLE 22**
**Structural Steel > Compressive Ultimate Strength**

| Compressive Ultimate Strength Pa |
|---|
| 0 |

**TABLE 23**
**Structural Steel > Compressive Yield Strength**

| Compressive Yield Strength Pa |
|---|
| 2.5e+008 |

**TABLE 24**
**Structural Steel > Tensile Yield Strength**

| Tensile Yield Strength Pa |
|---|
| 2.5e+008 |

**TABLE 25**
**Structural Steel > Tensile Ultimate Strength**

| Tensile Ultimate Strength Pa |
|---|
| 4.6e+008 |

**TABLE 26**
**Structural Steel > Isotropic Secant Coefficient of Thermal Expansion**

| Zero-Thermal-Strain Reference Temperature C |
|---|
| 22 |

**TABLE 27**
**Structural Steel > S-N Curve**

| Alternating Stress Pa | Cycles | Mean Stress Pa |
|---|---|---|
| 3.999e+009 | 10 | 0 |
| 2.827e+009 | 20 | 0 |
| 1.896e+009 | 50 | 0 |
| 1.413e+009 | 100 | 0 |
| 1.069e+009 | 200 | 0 |
| 4.41e+008 | 2000 | 0 |
| 2.62e+008 | 10000 | 0 |
| 2.14e+008 | 20000 | 0 |
| 1.38e+008 | 1.e+005 | 0 |
| 1.14e+008 | 2.e+005 | 0 |
| 8.62e+007 | 1.e+006 | 0 |

**TABLE 28**
**Structural Steel > Strain-Life Parameters**

| Strength Coefficient Pa | Strength Exponent | Ductility Coefficient | Ductility Exponent | Cyclic Strength Coefficient Pa | Cyclic Strain Hardening Exponent |
|---|---|---|---|---|---|
| 9.2e+008 | -0.106 | 0.213 | -0.47 | 1.e+009 | 0.2 |

**TABLE 29**
**Structural Steel > Isotropic Elasticity**

| Young's Modulus Pa | Poisson's Ratio | Bulk Modulus Pa | Shear Modulus Pa | Temperature C |
|---|---|---|---|---|
| 2.e+011 | 0.3 | 1.6667e+011 | 7.6923e+010 | |

**TABLE 30**
**Structural Steel > Isotropic Relative Permeability**

| Relative Permeability |
|---|
| 10000 |