

THORMANG 3.0

Hardware

Components

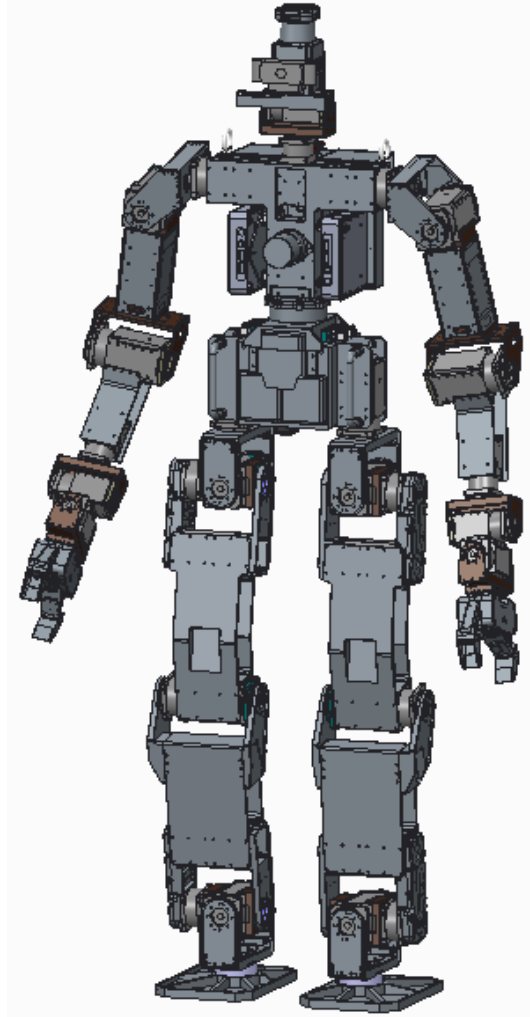




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Hardware Specifications



DOF : 29

Actuator : 200W x 10 / 100W x 11 / 20W x 8

Computer : Intel NUC5i5RYK
(8GRAM / M.2 SSD) x 2

Wireless Router : D-Link DIR-806A x 1

Sensors :

Logitech C920 HD Camera x 1

Intel RealSense x 1

Hokuyo UTM-30LX-EW

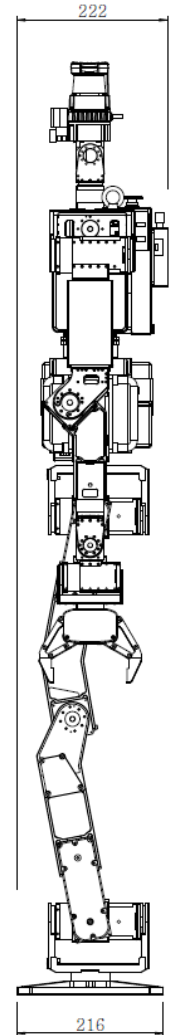
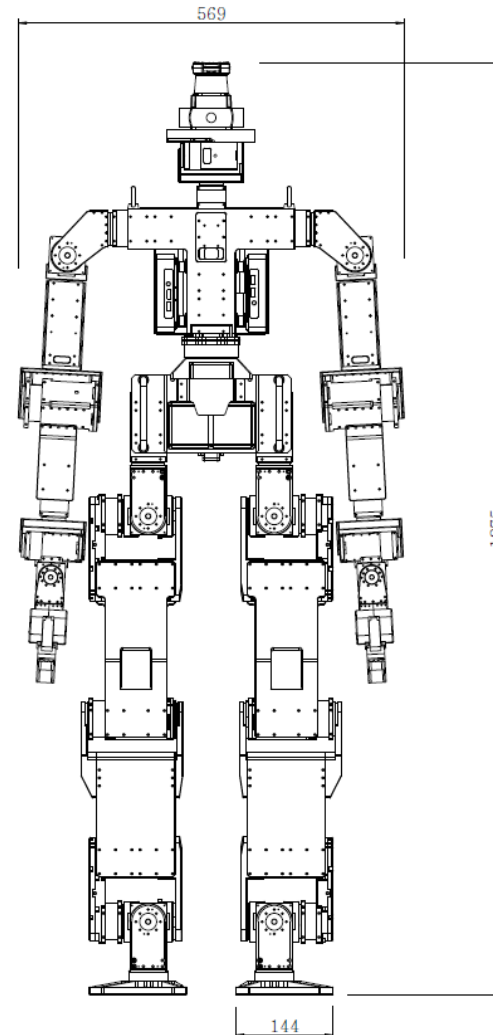
F/T : ATi Mini58-SI-2800-120 x 2

IMU : MicroStrain 3DM-GX4-25 x 1

Battery : 22V, 22000mA x 1
18.5V, 11000mA x 1

Height : 137.5cm

Weight : 42Kg

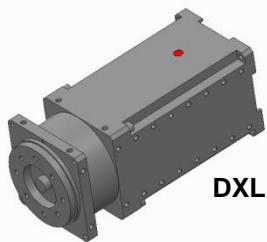




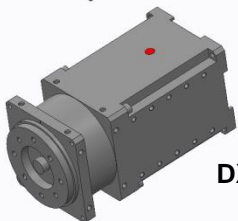
Actuator



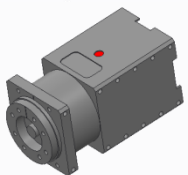
DYNAMIXEL PRO
29 DOF



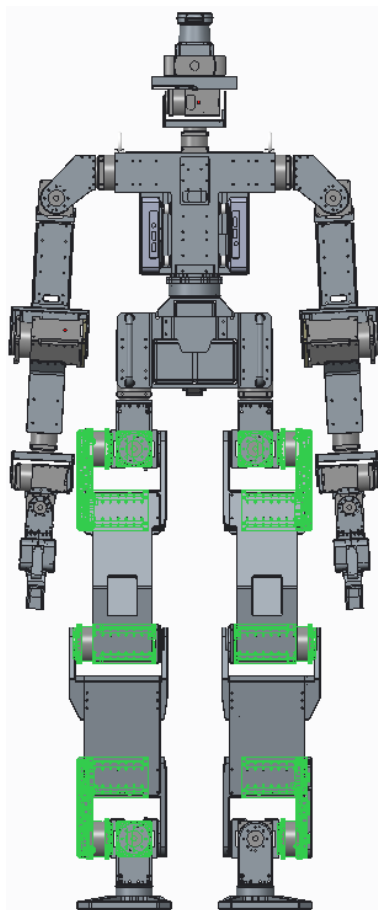
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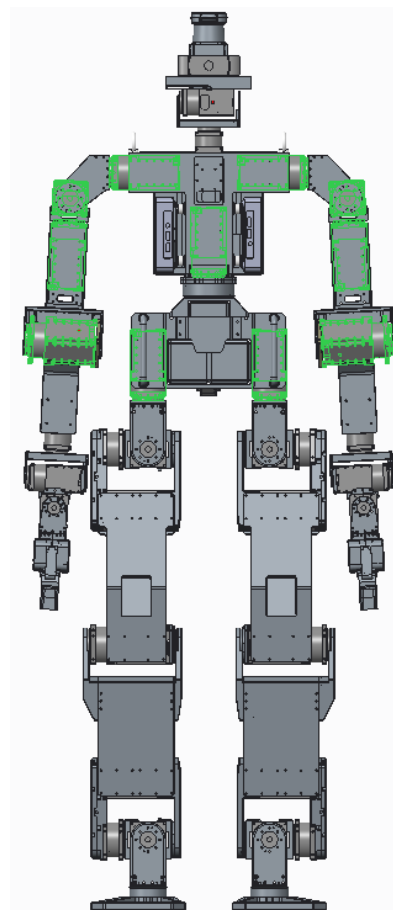
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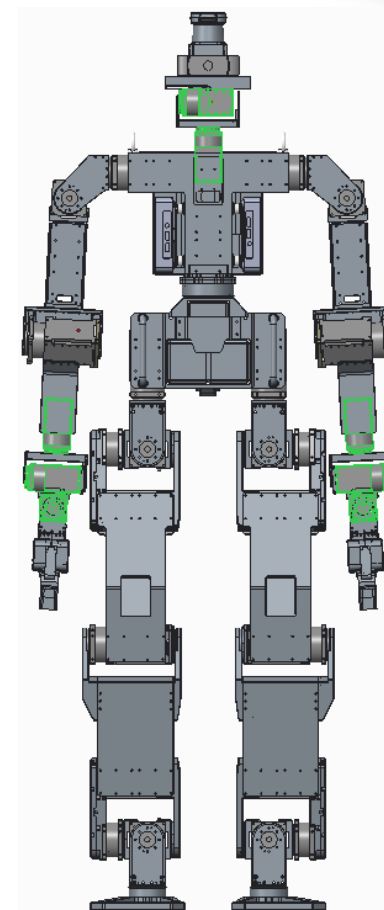
DXL PRO 20W



DXL PRO 200W
X 10



DXL PRO 100W
X 11



DXL PRO 20W
X 8



Upper Body Components (1)



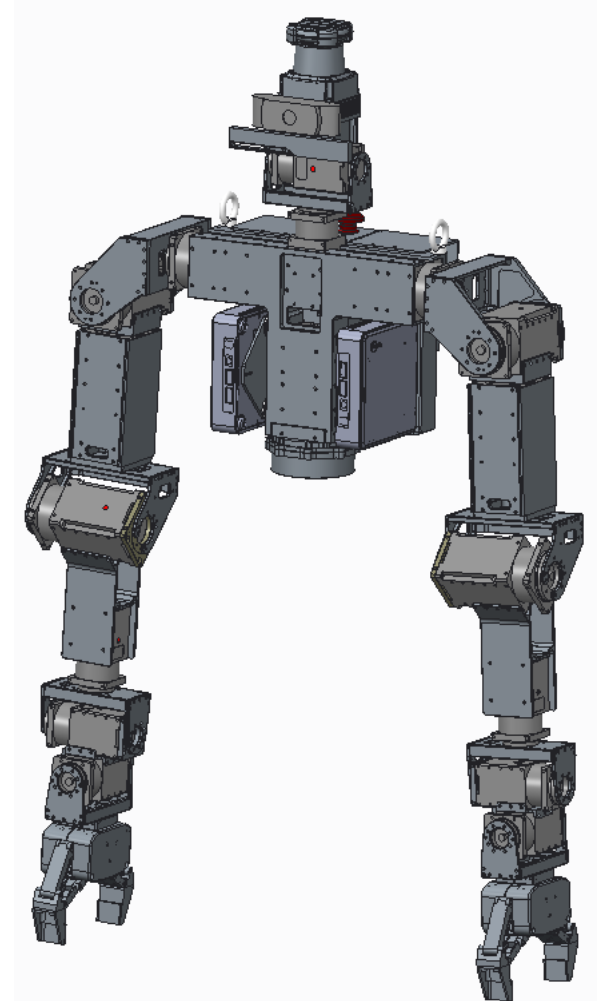
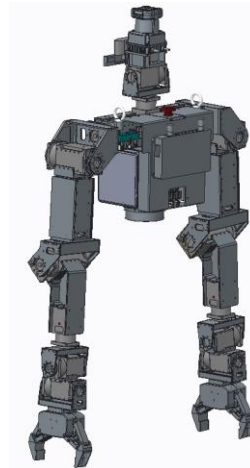
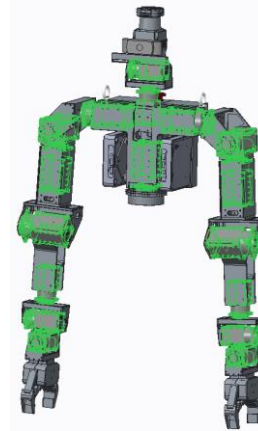
Actuator : 100W x 9
20W x 8

Computer : Intel NUC5i5RYK
(8GRAM / 128G M.2 SSD) x 2

Wireless Router : D-Link DIR-806A x 1

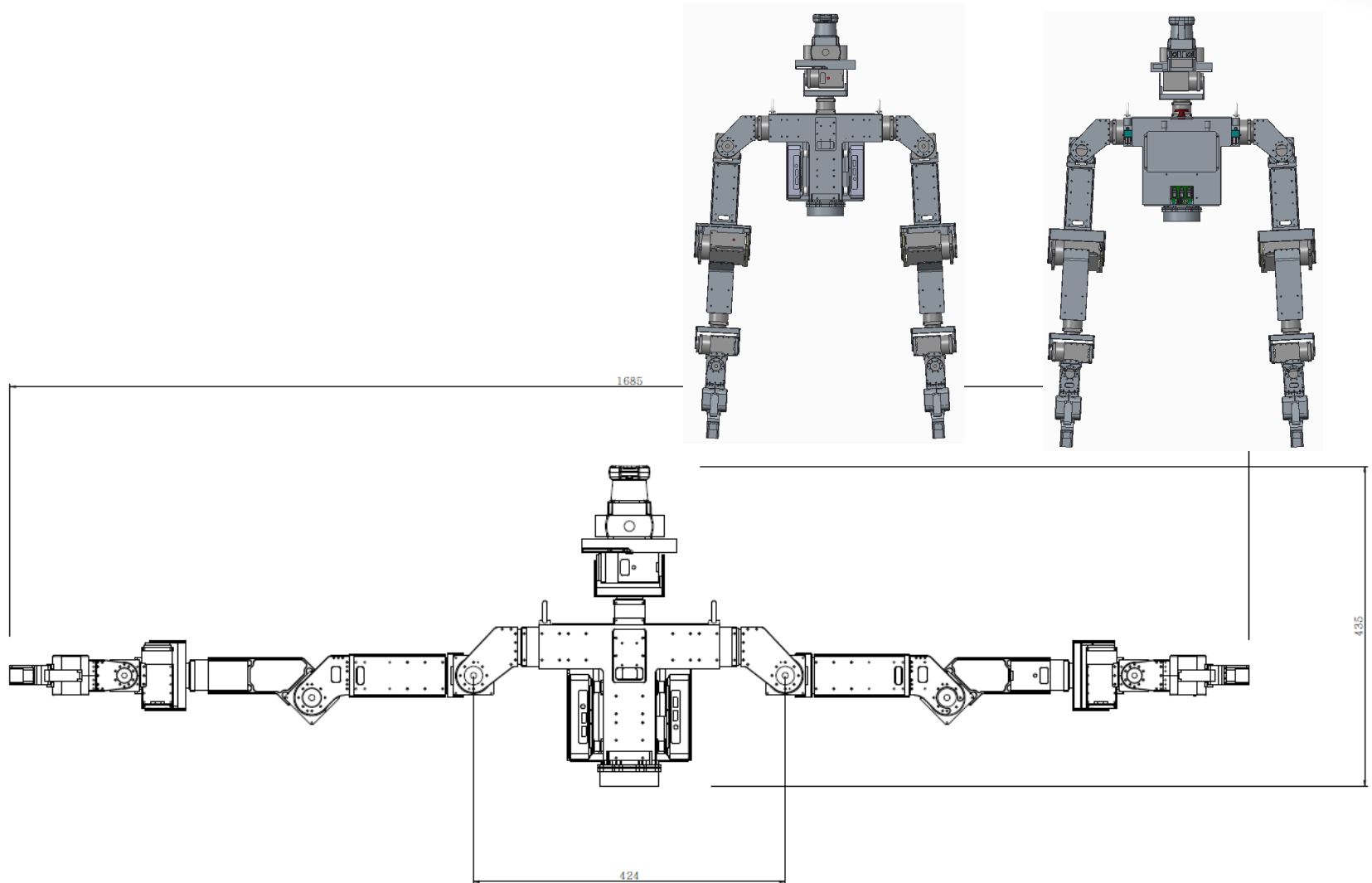
Sensor :

Vision : Logitech C920 HD Camera x 1
Intel RealSense x 1
Hokuyo UTM-30LX-EW





Upper Body Components (2)





Lower Body Components (1)



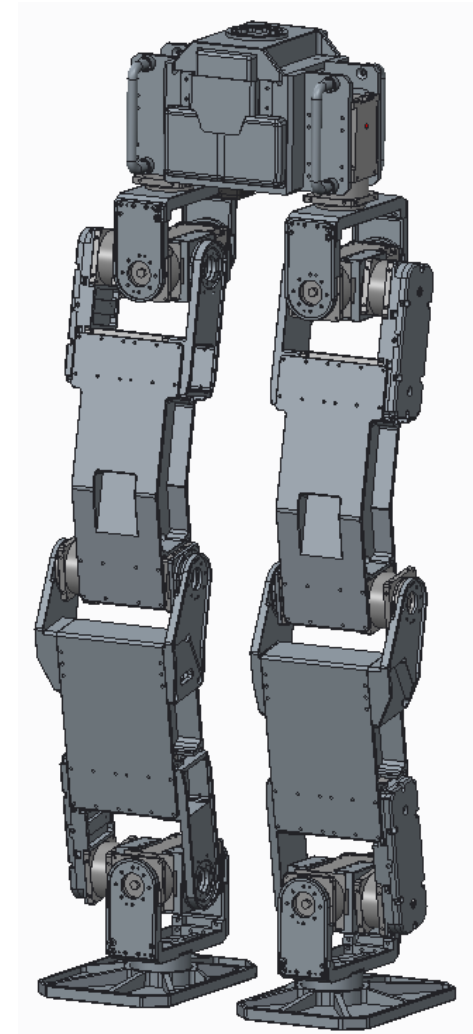
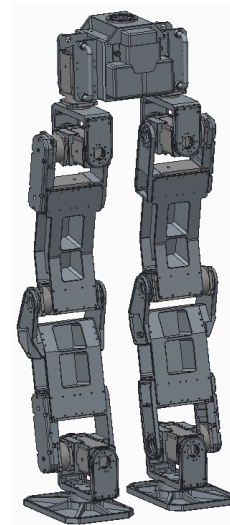
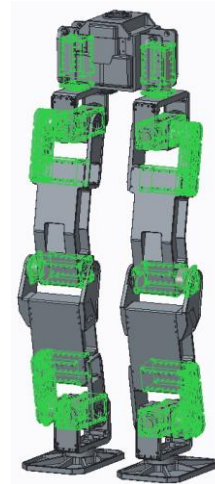
Actuator : 200W x 10
100W x 2

Sensor :

F/T : ATi Mini58-SI-2800-120 x 2

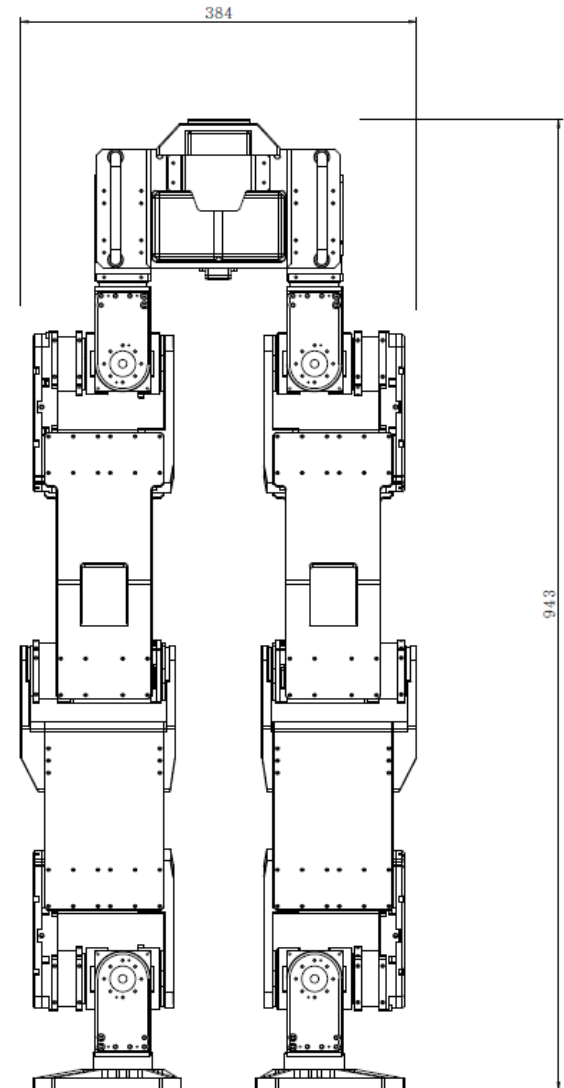
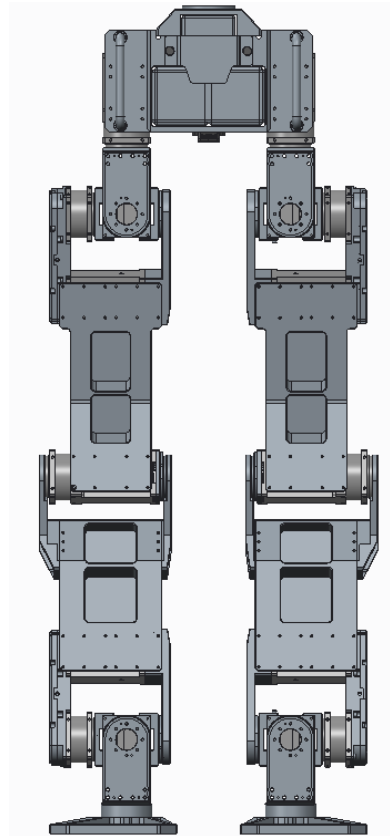
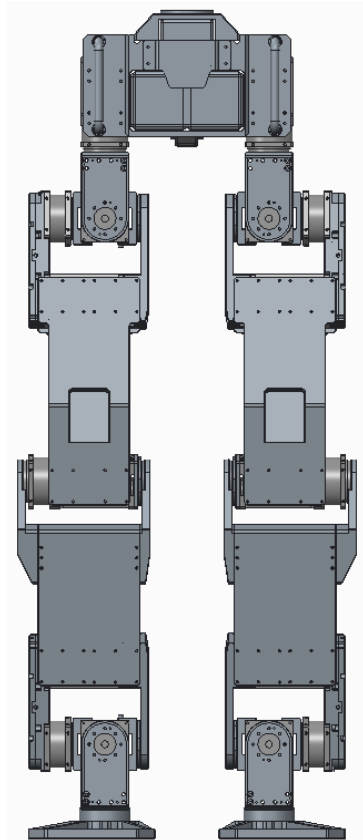
IMU : MicroStrain 3DM-GX4-25 x 1

Battery : 22.2V, 22000mA x 1
18.5V, 11000mA x 1





Lower Body Components (2)



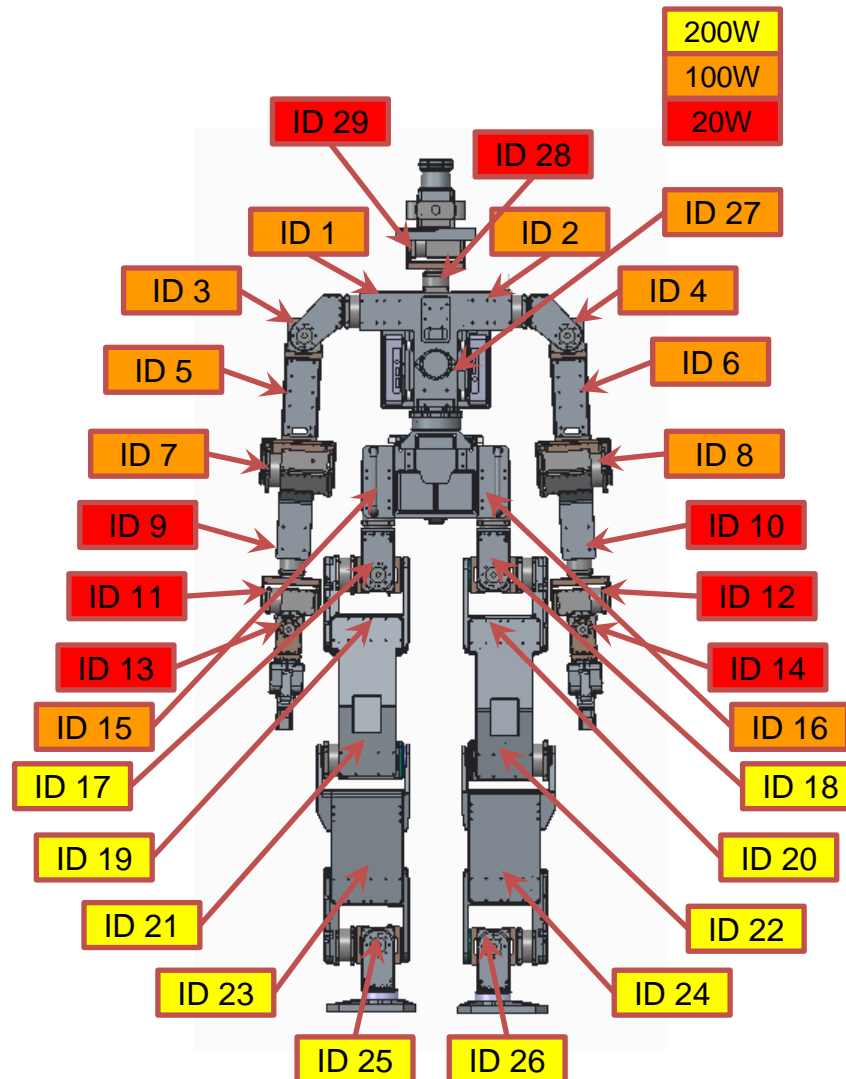


ID Map @ JointName



| CH 0 | |
|------|-------------|
| ID | JointName |
| 27 | torso_y |
| 1 | r_arm_sh_p1 |
| 3 | r_arm_sh_r |
| 5 | r_arm_sh_p2 |
| 7 | r_arm_el_y |
| 9 | r_arm_wr_r |
| 11 | r_arm_wr_y |
| 13 | r_arm_wr_p |
| 31 | r_arm_grip |

| CH 2 | |
|------|-------------|
| ID | JointName |
| 15 | r_leg_hip_y |
| 17 | r_leg_hip_r |
| 19 | r_leg_hip_p |
| 21 | r_leg_kn_p |
| 23 | r_leg_an_p |
| 25 | r_leg_an_r |

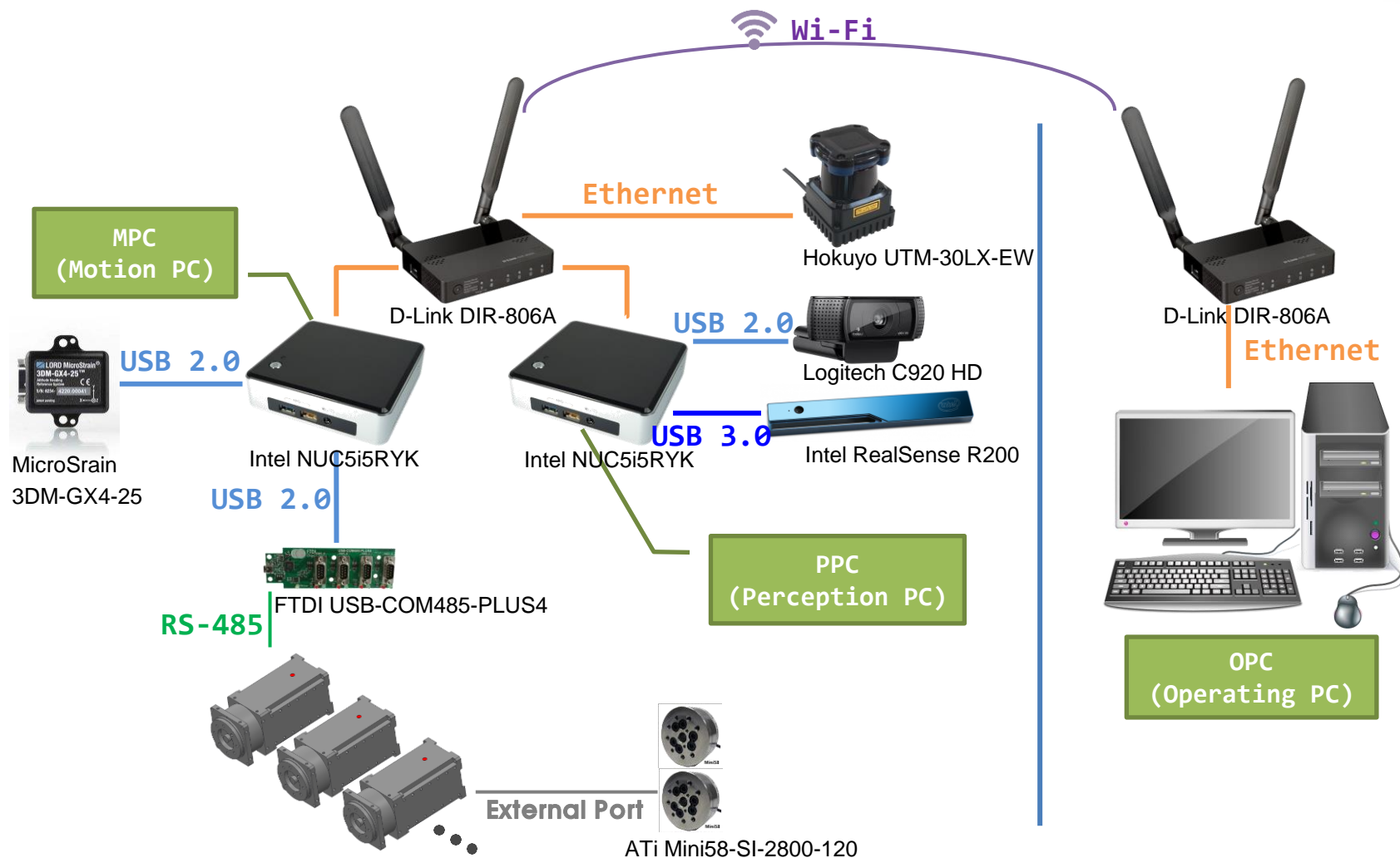


| CH 1 | |
|------|-------------|
| ID | JointName |
| 28 | head_y |
| 29 | head_p |
| 2 | l_arm_sh_p1 |
| 4 | l_arm_sh_r |
| 6 | l_arm_sh_p2 |
| 8 | l_arm_el_y |
| 10 | l_arm_wr_r |
| 12 | l_arm_wr_y |
| 14 | l_arm_wr_p |
| 30 | l_arm_grip |

| CH 3 | |
|------|-------------|
| ID | JointName |
| 16 | l_leg_hip_y |
| 18 | l_leg_hip_r |
| 20 | l_leg_hip_p |
| 22 | l_leg_kn_p |
| 24 | l_leg_an_p |
| 26 | l_leg_an_r |

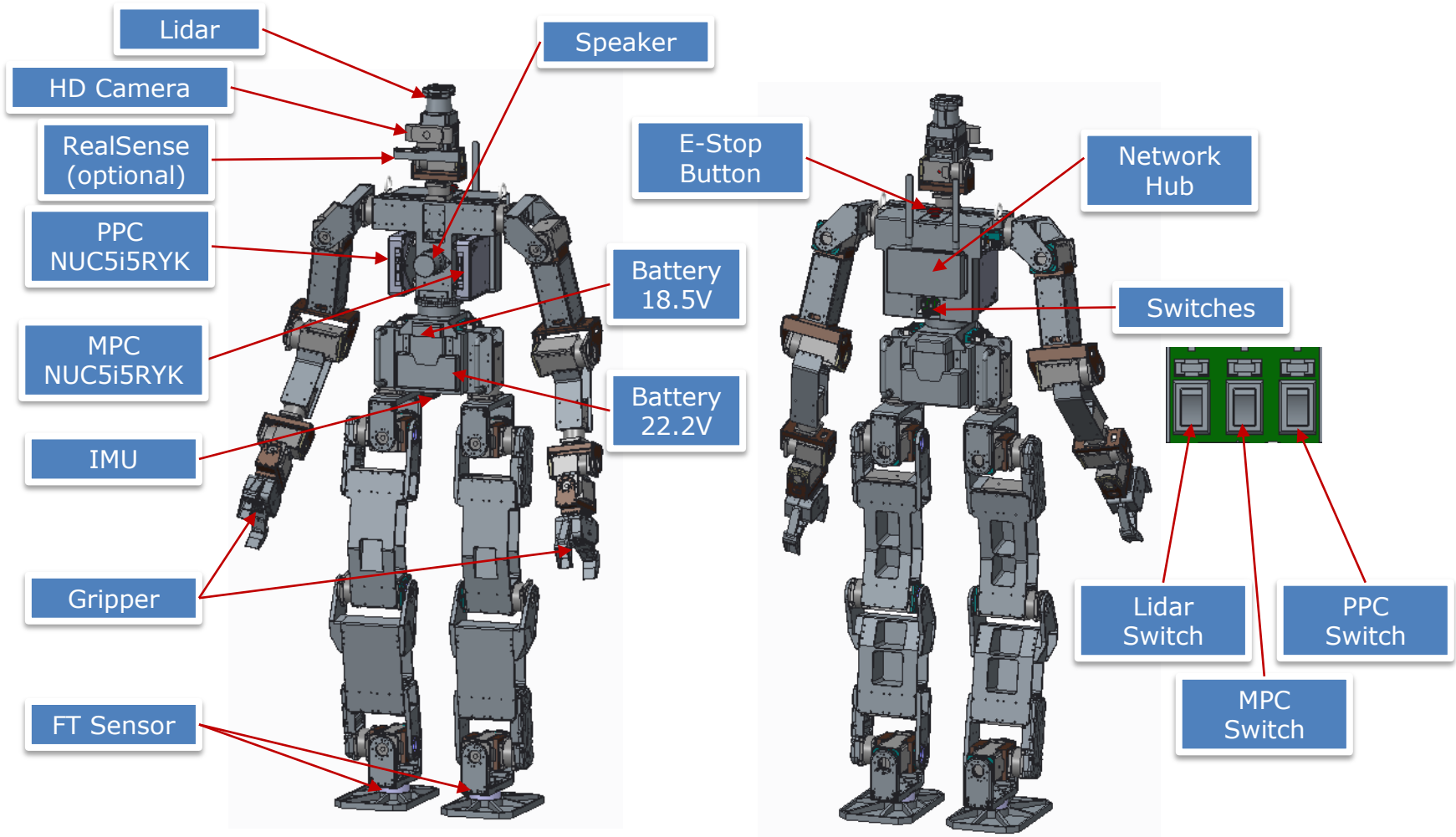


System Configuration



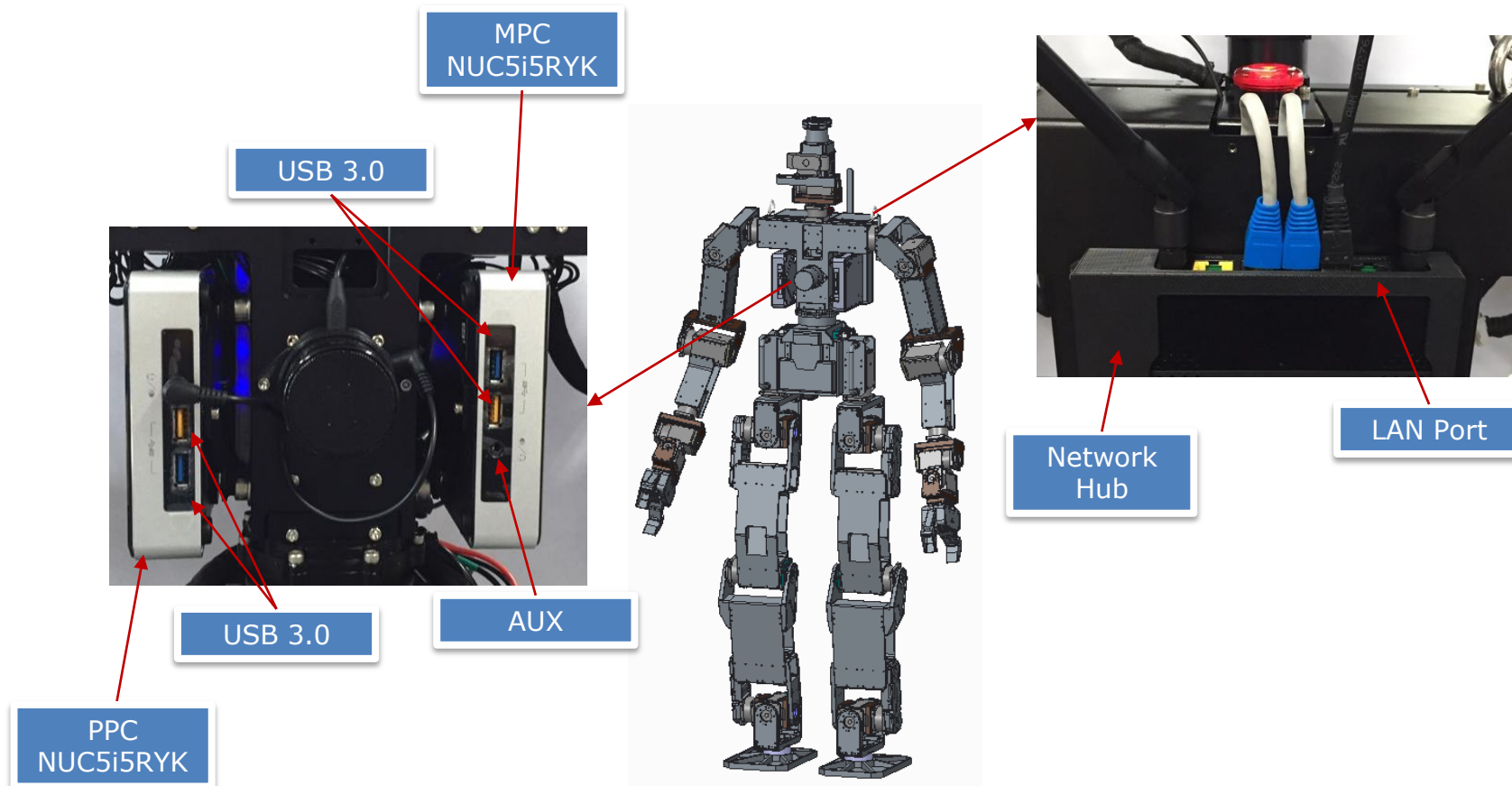


Robot Layout (1)





Robot Layout (2)





AP Server



1. Account

- User : admin
- PW : admin

2. Network

1. IP : 10.17.3.1
2. Wireless
 - 5G
SSID : THORMANG-K30-5G
PW : 11111111
 - 2.4G
SSID : THORMANG-K30
PW : 11111111

3. Description

- Orange : Router
- Green : Repeater
- Red : AP
- RESET : 10 sec





Disassembly Procedures (for Packing)



1. Attach the robot to the lift
2. Disconnect the Right Arm from the Torso
3. Disconnect the Left Arm from the Torso
4. Disconnect the Right Leg from the Torso
5. Disconnect the Left Leg from the Torso
6. Disconnect the Hip Roll Joint Frames from the Torso
7. Disconnect the Torso from the lift and return it to Case 1
8. Place the Right Arm and the Right Leg into Case 2 and place the Left Arm and the Left Leg into Case 3



Disassembly Procedures



1. Attach the robot to the lift

****Steps 2-5 require a minimum of 2 people - 1 person holds the robot while the other person disassembles the robot!**



Disassembly Procedures



2. Disconnect the Right Arm from the Torso

1. Disconnect the cables (2P power cable X 3, 4P com cable X 1)
2. Loosen the hex bolt (3X8 loctite hex bolt X 8) using the ball end hex key.



Disassembly Procedures



3. Disconnect the Left Arm from the Torso

1. Disconnect the cables (2P power cable X 3, 4P com cable X 1)
2. Loosen the hex bolt (3X8 loctite hex bolt X 8) using the ball end hex key.



Disassembly Procedures



4. Disconnect the Right Leg from the Torso

1. Disconnect the cables (2P power cable X 3, 4P com cable X 1)
2. Loosen the hex bolt (3X8 loctite hex bolt X 8) using the ball end hex key.



Disassembly Procedures



5. Disconnect the Left Leg from the Torso

1. Disconnect the cables (2P power cable X 5, 4P com cable X 1)
2. Loosen the hex bolt (3X8 loctite hex bolt X 8, 3X6 hex bolt X 8).



Disassembly Procedures



6. Disconnect the Hip Roll Joint Frames from the Torso

1. Loosen the right hex bolt (3X8 loctite hex bolt X 8)
2. Loosen the left hex bolt (3X8 loctite hex bolt X 8)



Disassembly Procedures



7. Disconnect the Torso from the lift and return it to Case 1. At this time, you will have to fold the neck joint backwards 90 degrees. Put the rest of the parts, including the Hip Roll Joint Frames, into Case 1.



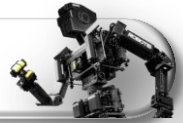
Disassembly Procedures



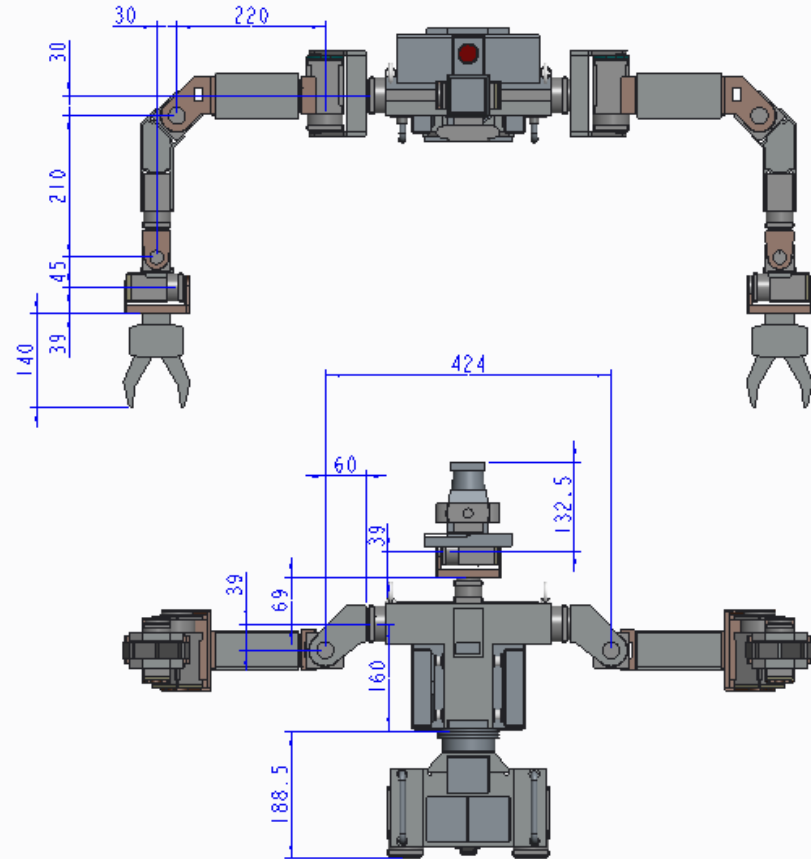
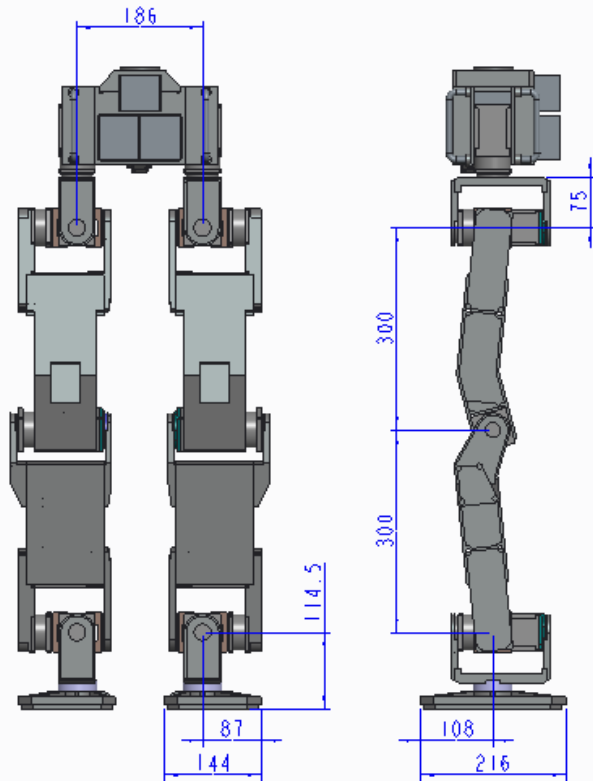
8. Place the Right Arm and the Right Leg into Case 2 and place the Left Arm and the Left Leg into Case 3.



Kinematics Data



Length Overview





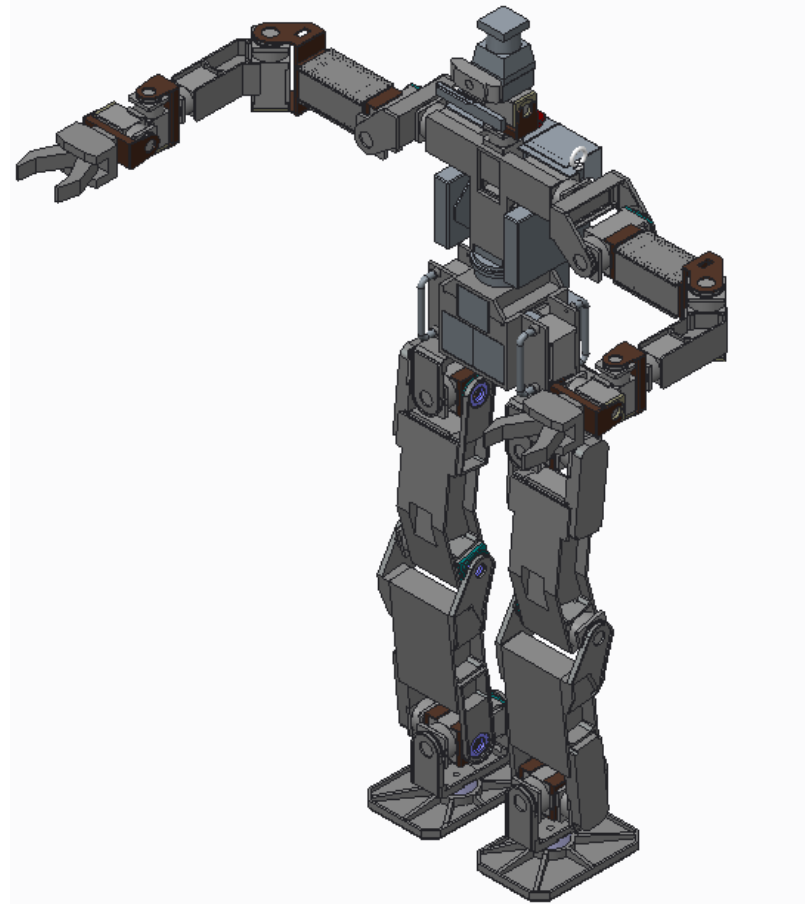
Kinematics Data



Mass

Whole Robot

Whole Robot
Mass = 41.580386 [kg]



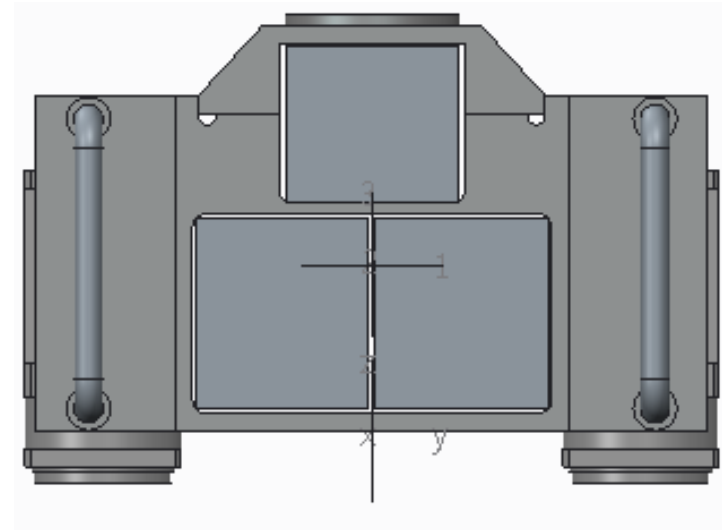
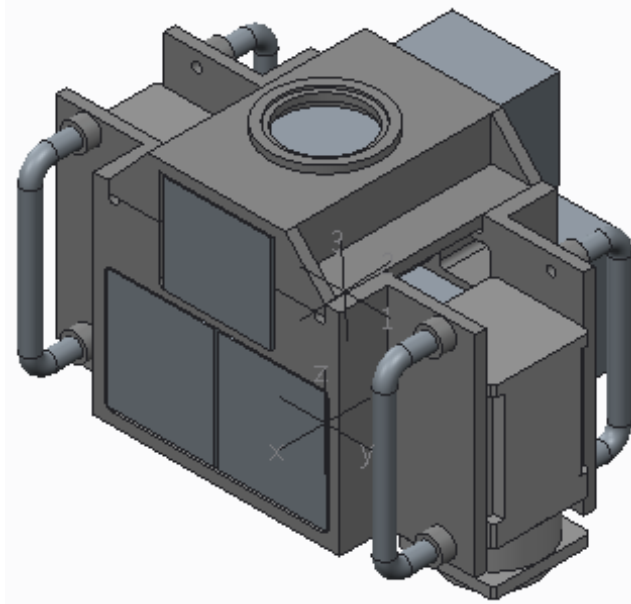


Physical Data



Mass

Pelvis



| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|--------|-----------|-----------|---------|-------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| origin | (pelvis) | 6.869 | -0.011 | 0.000 | 0.058 | 0.03603 | 0.00000 | 0.00016 | 0.02210 | 0.00000 | 0.03830 |

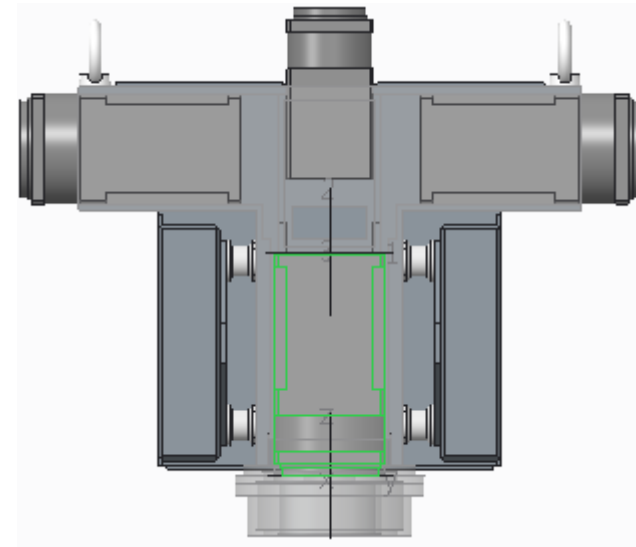
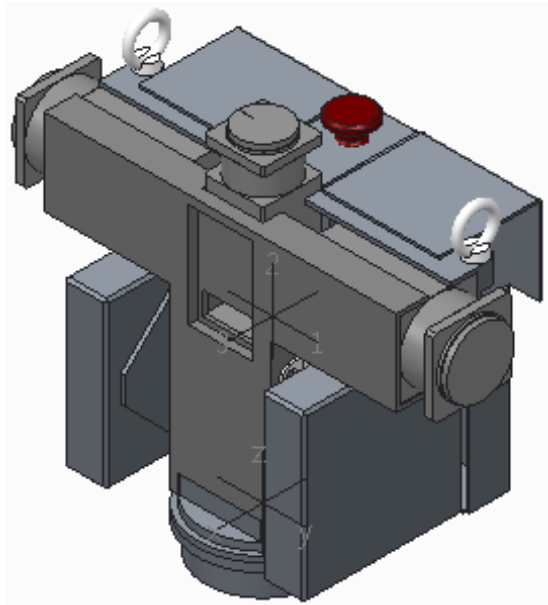


Physical Data



Mass

Torso_y



| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-----------|-----------|---------|-------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 27 | torso_y | 5.383 | -0.007 | 0.000 | 0.109 | 0.04710 | 0.00000 | 0.00036 | 0.02554 | 0.00000 | 0.03094 |

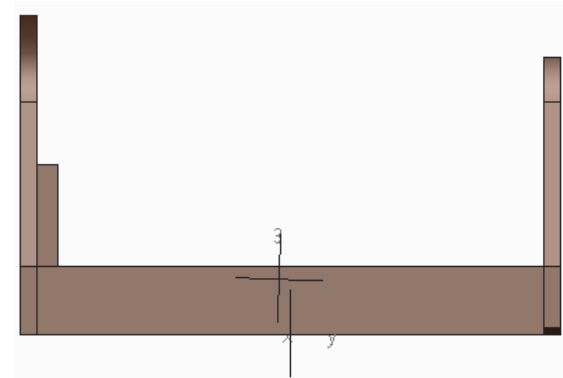
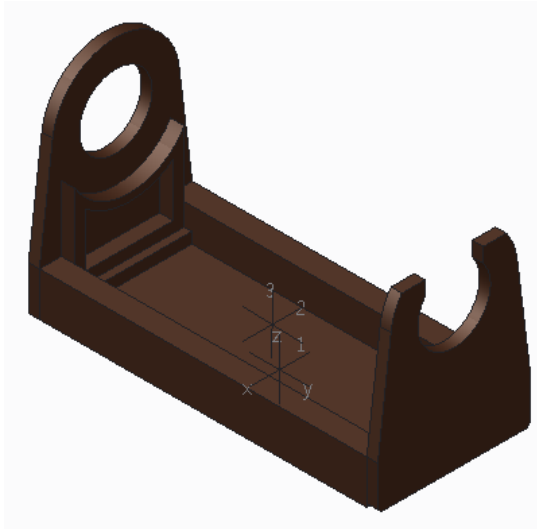


Physical Data



Mass

Head_y



| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-----------|-----------|---------|--------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 28 | head y | 0.087 | 0.000 | -0.002 | 0.010 | 0.00011 | 0.00000 | 0.00000 | 0.00003 | 0.00000 | 0.00012 |

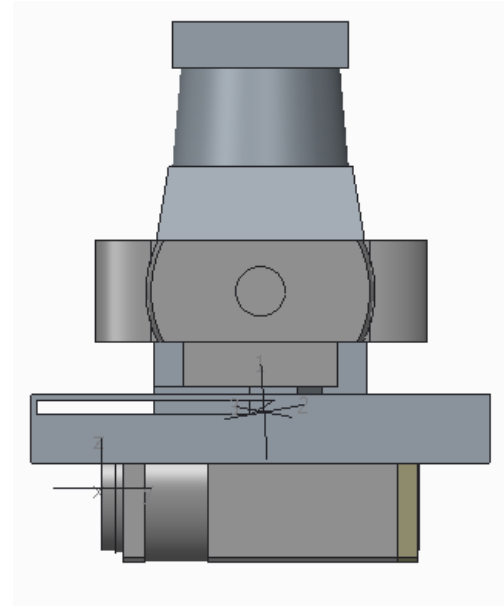
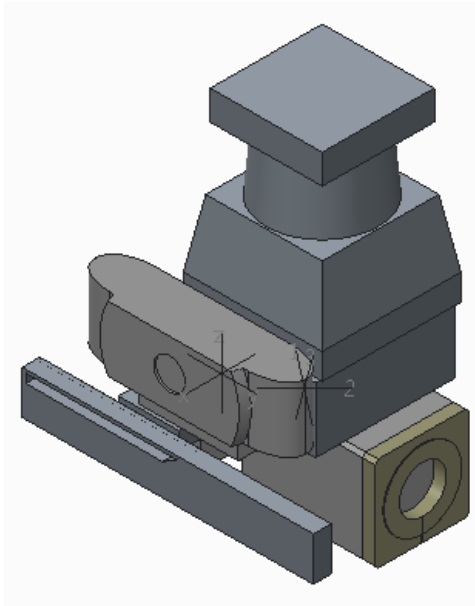


Physical Data



Mass

Head_p



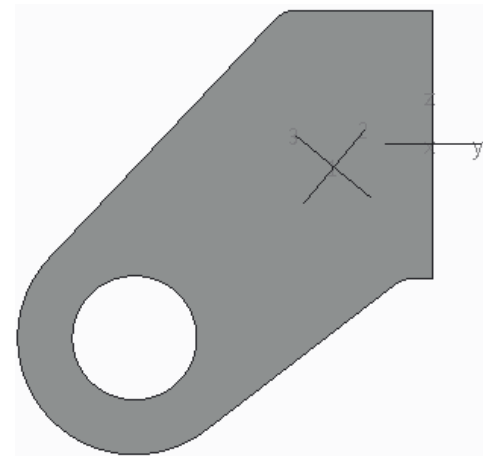
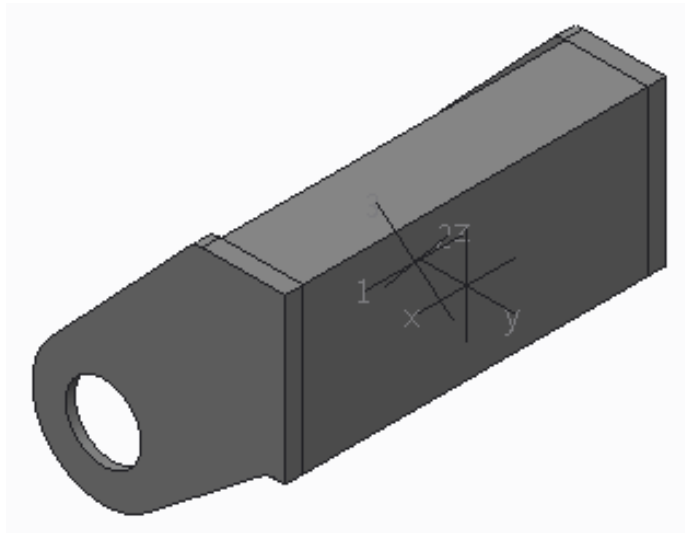
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-----------|-----------|---------|-------|-------|------------------|---------|----------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 29 | head p | 0.724 | 0.009 | 0.046 | 0.022 | 0.00113 | 0.00001 | -0.00005 | 0.00114 | 0.00002 | 0.00084 |



Physical Data



Mass R_arm_sh_p1



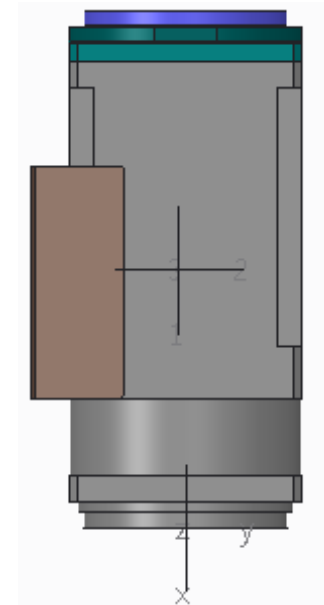
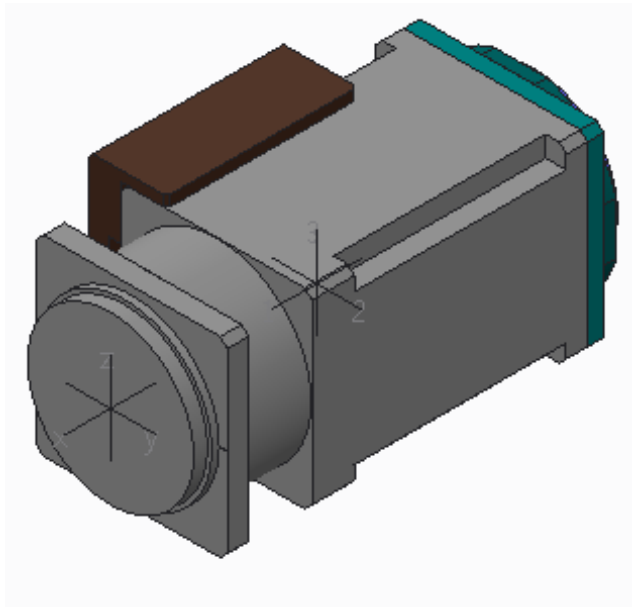
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-------------|-----------|---------|--------|--------|------------------|---------|---------|---------|----------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 1 | r_arm_sh_p1 | 0.194 | -0.003 | -0.020 | -0.005 | 0.00018 | 0.00000 | 0.00000 | 0.00058 | -0.00004 | 0.00057 |



Physical Data



Mass R_arm_sh_r



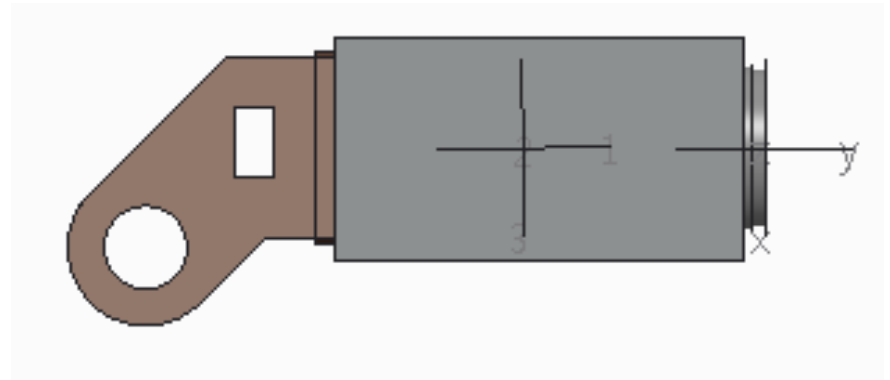
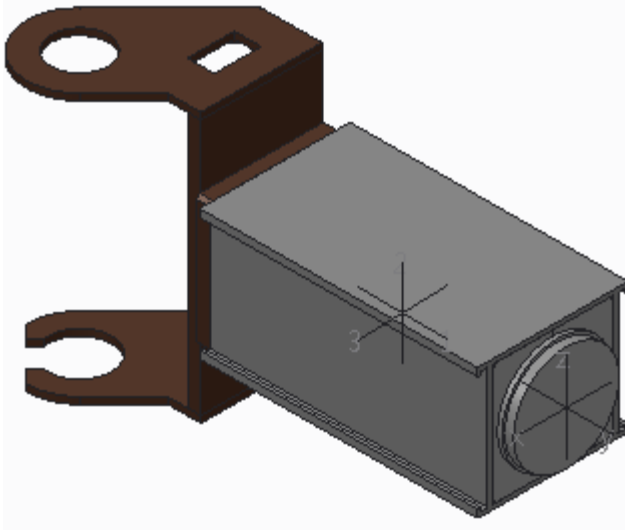
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|--------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 3 | r arm sh r | 0.875 | -0.060 | -0.002 | 0.000 | 0.00043 | 0.00000 | 0.00000 | 0.00112 | 0.00000 | 0.00113 |



Physical Data



Mass R_arm_sh_p2



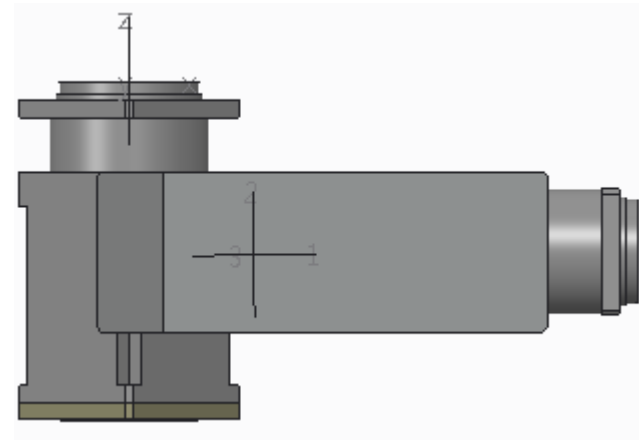
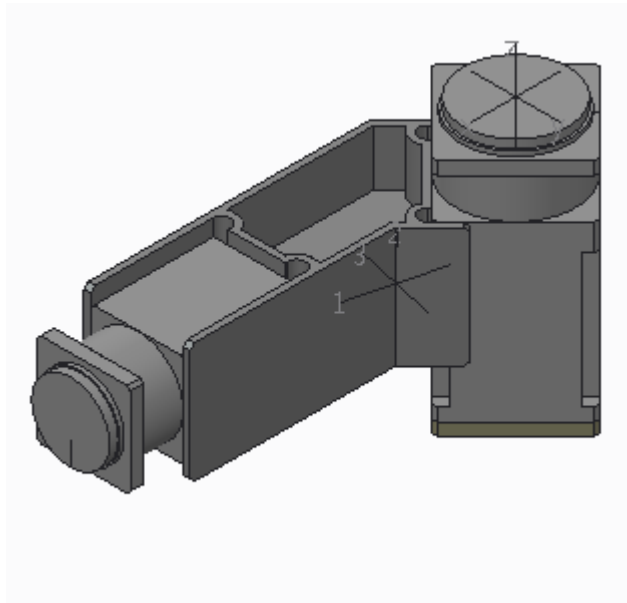
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-------------|-----------|---------|--------|-------|------------------|---------|----------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 5 | r_arm_sh_p2 | 1.122 | 0.000 | -0.073 | 0.000 | 0.00277 | 0.00002 | -0.00001 | 0.00090 | 0.00004 | 0.00255 |



Physical Data



Mass R_arm_el_y



| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|--------|--------|------------------|---------|----------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 7 | r_arm_el_y | 1.357 | 0.042 | -0.012 | -0.058 | 0.00152 | 0.00100 | -0.00006 | 0.00560 | 0.00002 | 0.00528 |

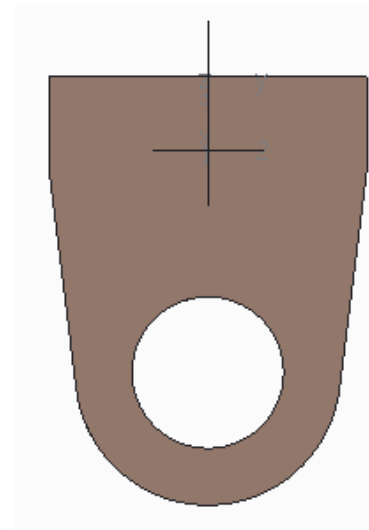
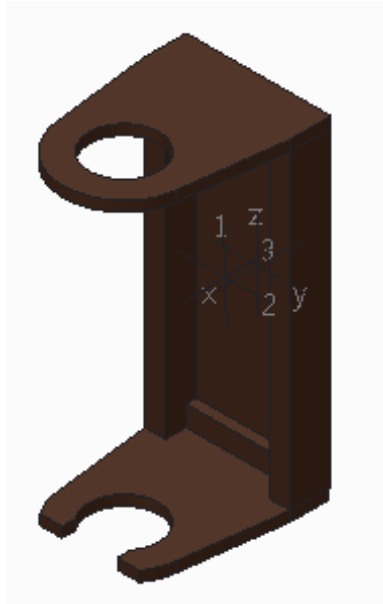


Physical Data



Mass

R_arm_wr_r



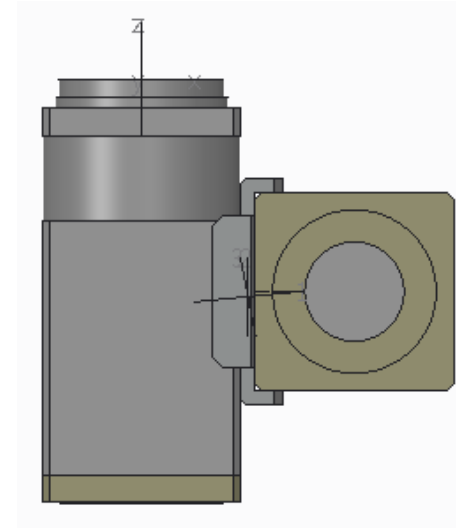
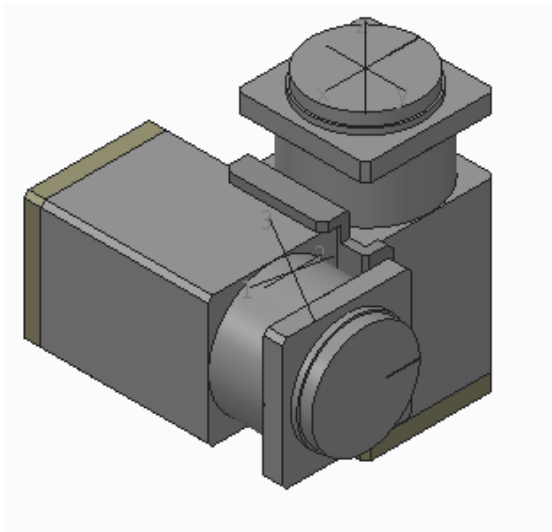
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|-------|--------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 9 | r_arm_wr_r | 0.087 | 0.010 | 0.000 | -0.002 | 0.00012 | 0.00000 | 0.00000 | 0.00011 | 0.00000 | 0.00003 |



Physical Data



Mass R_arm_wr_y



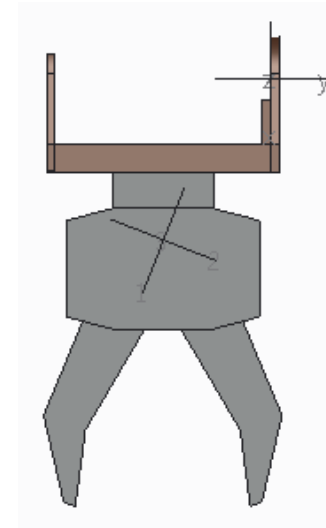
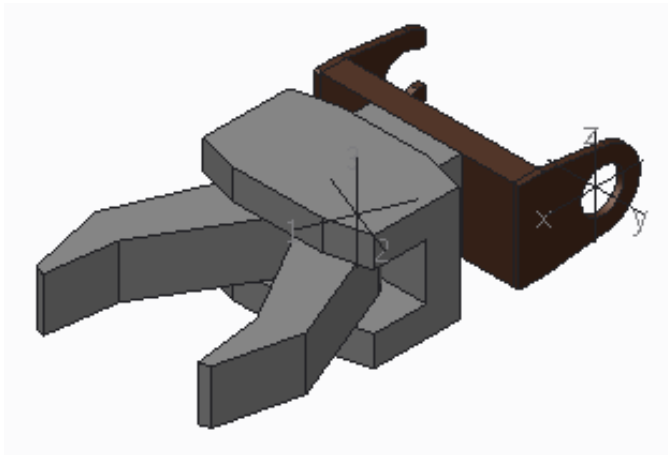
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|--------|--------|------------------|---------|----------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 11 | r_arm_wr_y | 0.768 | 0.023 | -0.001 | -0.046 | 0.00059 | 0.00002 | -0.00002 | 0.00078 | 0.00000 | 0.00078 |



Physical Data



Mass R_arm_wr_p



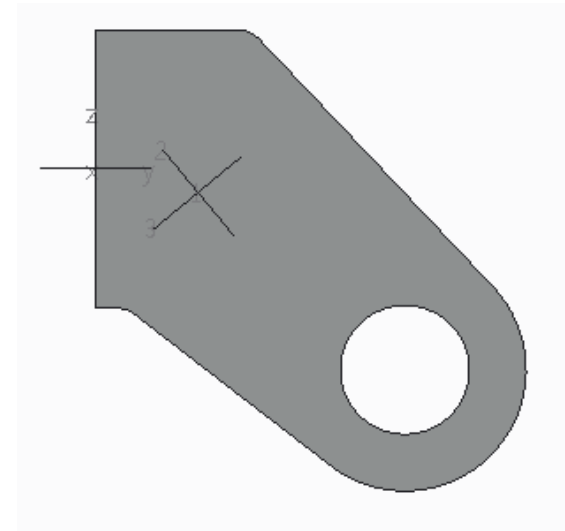
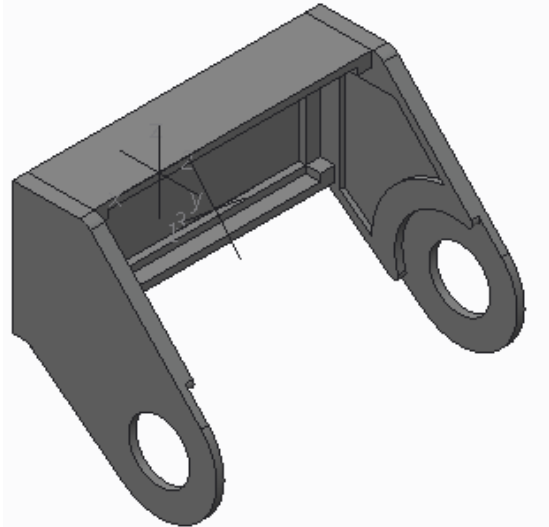
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|--------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 13 | r_arm_wr_p | 0.565 | 0.065 | -0.045 | 0.000 | 0.00047 | 0.00001 | 0.00000 | 0.00042 | 0.00000 | 0.00058 |



Physical Data



Mass L_arm_sh_p1



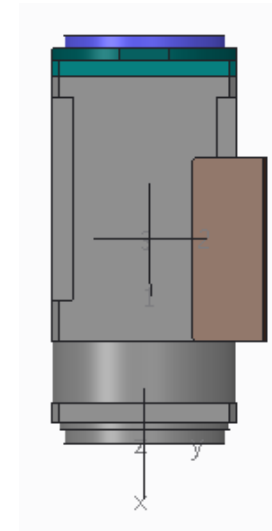
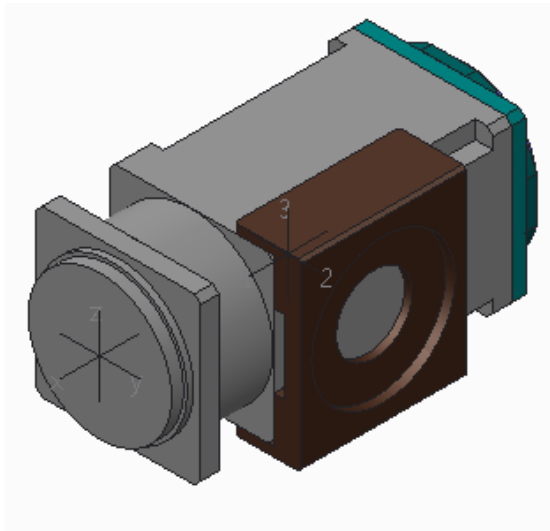
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-------------|-----------|---------|-------|--------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 2 | l_arm_sh_p1 | 0.194 | -0.003 | 0.020 | -0.005 | 0.00018 | 0.00000 | 0.00000 | 0.00058 | 0.00004 | 0.00057 |



Physical Data



Mass L_arm_sh_r



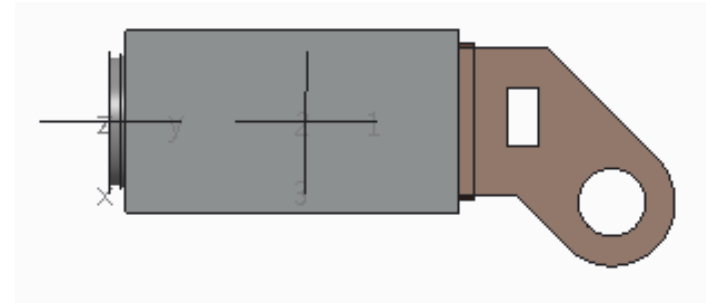
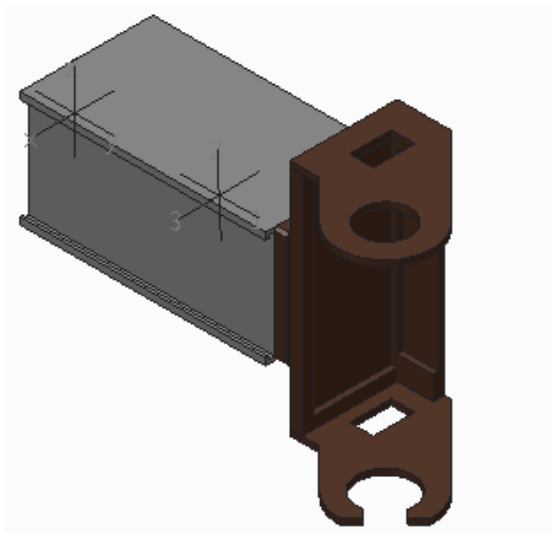
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|-------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 4 | l_arm_sh_r | 0.875 | -0.060 | 0.002 | 0.000 | 0.00043 | 0.00000 | 0.00000 | 0.00112 | 0.00000 | 0.00113 |



Physical Data



Mass L_arm_sh_p2



| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-------------|-----------|---------|-------|-------|------------------|----------|----------|---------|----------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 6 | l_arm_sh_p2 | 1.122 | 0.000 | 0.073 | 0.000 | 0.00277 | -0.00002 | -0.00001 | 0.00090 | -0.00004 | 0.00255 |

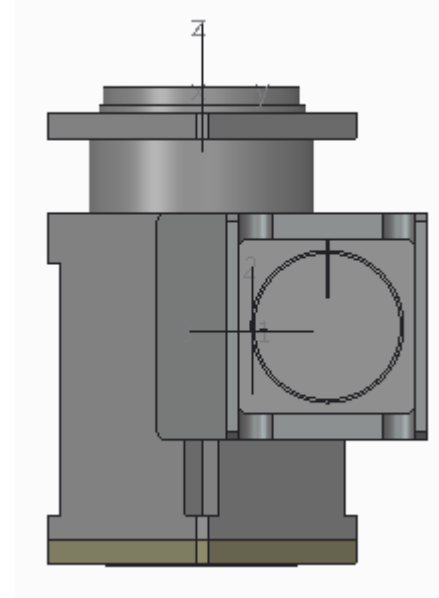
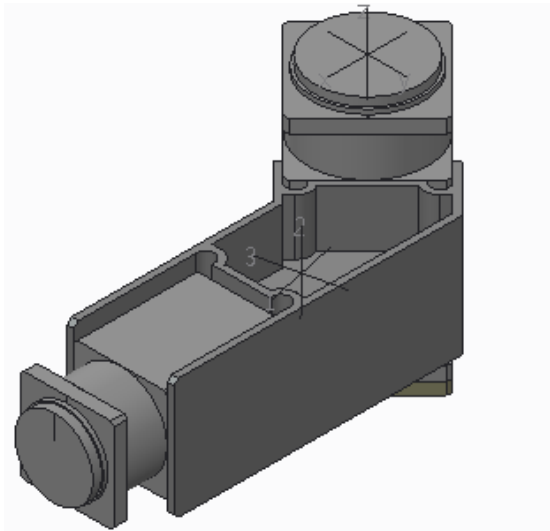


Physical Data



Mass

L_arm_el_y



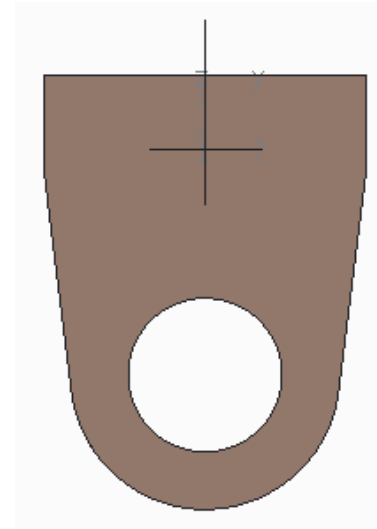
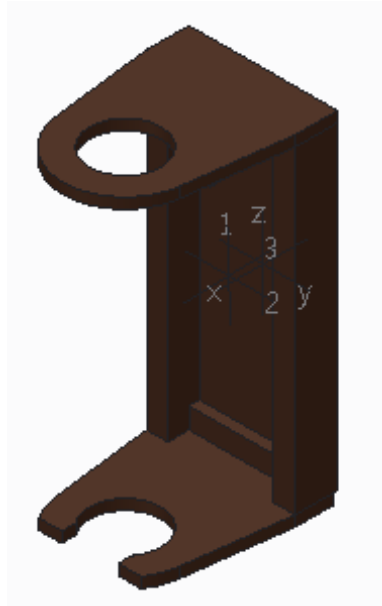
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|-------|--------|------------------|----------|----------|---------|----------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 8 | l_arm_el_y | 1.357 | 0.042 | 0.012 | -0.058 | 0.00152 | -0.00100 | -0.00006 | 0.00560 | -0.00002 | 0.00528 |



Physical Data



Mass L_arm_wr_r



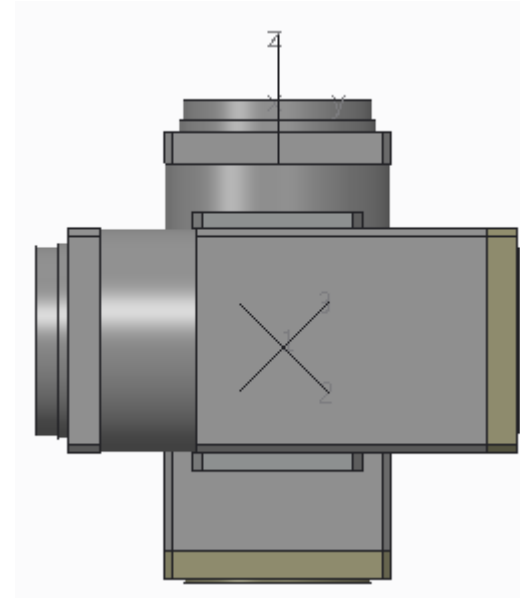
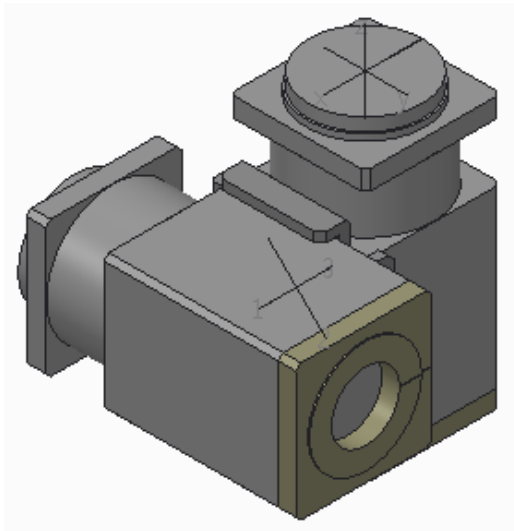
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|-------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 10 | l_arm_wr_r | 0.087 | 0.010 | 0.000 | 0.002 | 0.00012 | 0.00000 | 0.00000 | 0.00011 | 0.00000 | 0.00003 |



Physical Data



Mass L_arm_wr_y



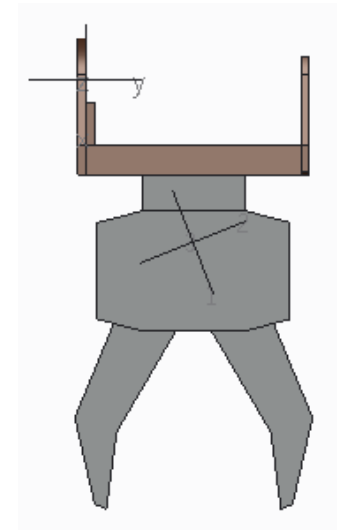
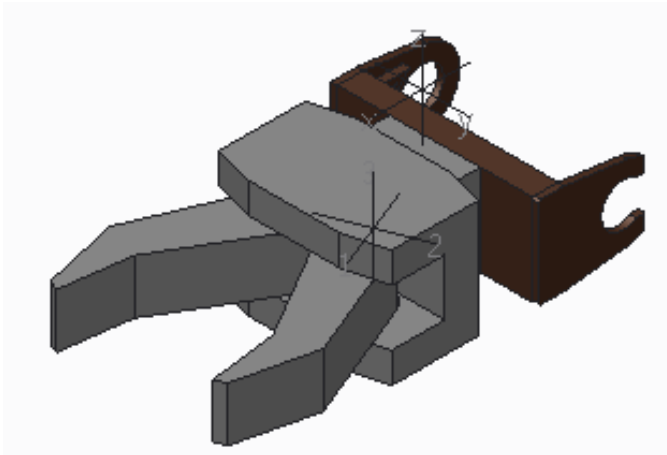
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|-------|--------|------------------|----------|----------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 12 | l_arm_wr_y | 0.768 | 0.023 | 0.001 | -0.046 | 0.00059 | -0.00002 | -0.00002 | 0.00078 | 0.00000 | 0.00078 |



Physical Data



Mass L_arm_wr_p



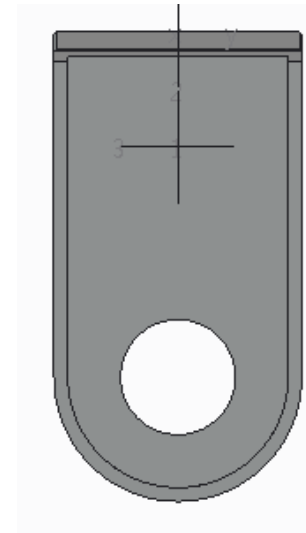
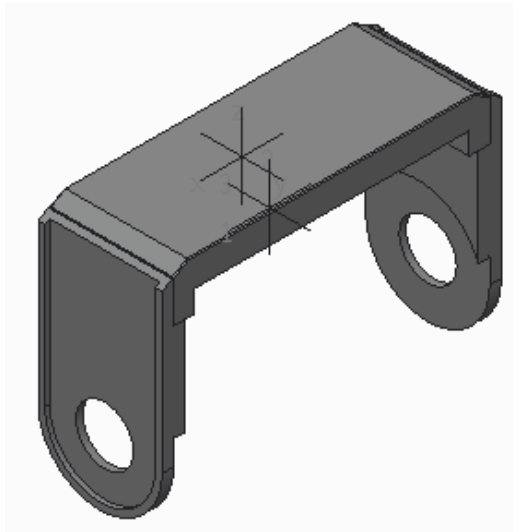
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|-------|-------|------------------|----------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 14 | l_arm_wr_p | 0.565 | 0.065 | 0.045 | 0.000 | 0.00047 | -0.00001 | 0.00000 | 0.00042 | 0.00000 | 0.00058 |



Physical Data



Mass R_leg_hip_y



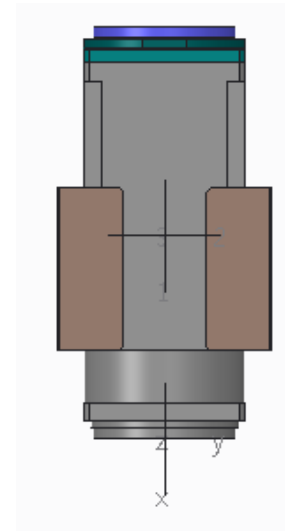
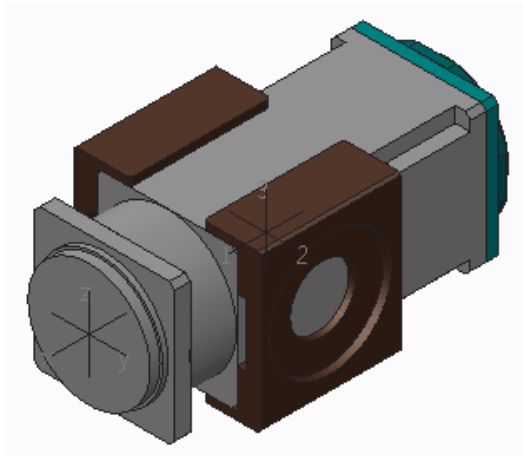
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-------------|-----------|---------|-------|--------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 15 | r leg hip y | 0.243 | -0.012 | 0.000 | -0.025 | 0.00024 | 0.00000 | 0.00000 | 0.00101 | 0.00000 | 0.00092 |



Physical Data



Mass R_leg_hip_r



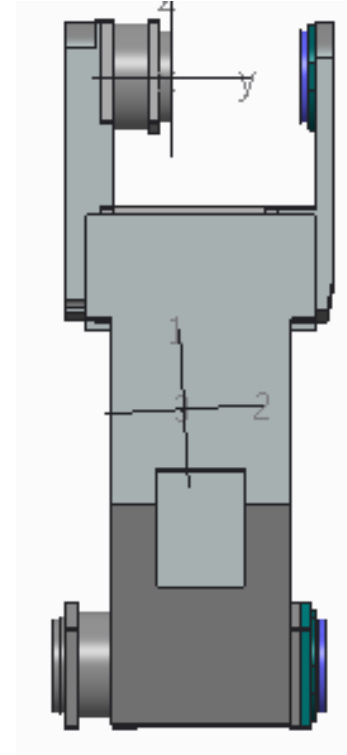
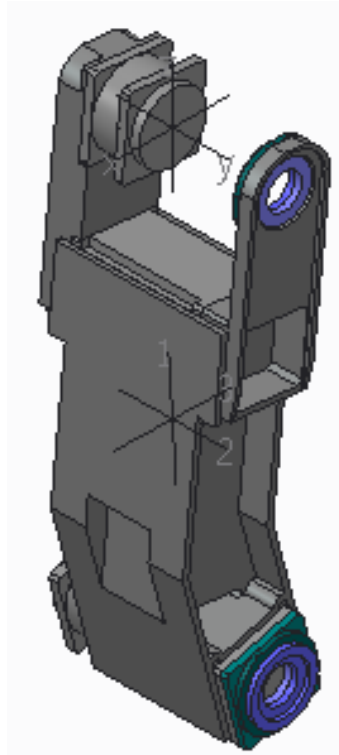
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-------------|-----------|---------|-------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 17 | r leg hip r | 1.045 | -0.068 | 0.000 | 0.000 | 0.00056 | 0.00000 | 0.00000 | 0.00168 | 0.00000 | 0.00171 |



Physical Data



Mass R_leg_hip_p



| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-------------|-----------|---------|-------|--------|------------------|----------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 19 | r leg hip p | 3.095 | 0.022 | 0.007 | -0.168 | 0.04329 | -0.00027 | 0.00286 | 0.04042 | 0.00203 | 0.00560 |

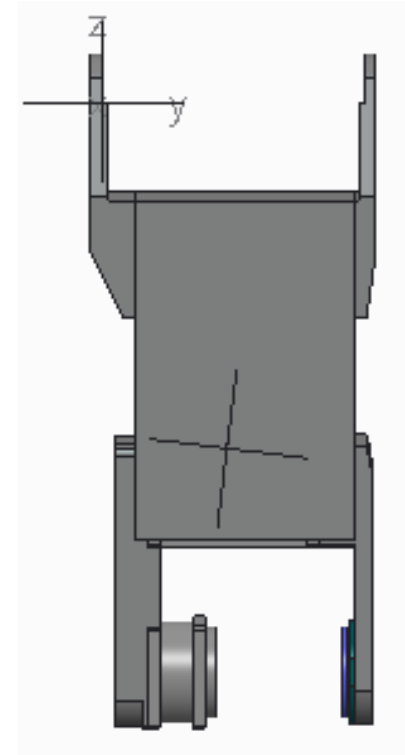
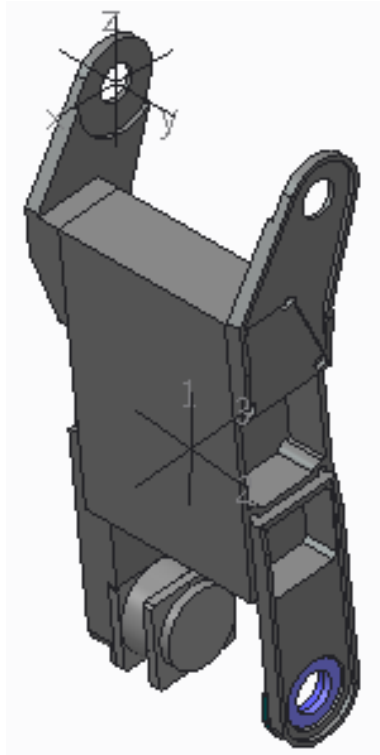


Physical Data



Mass

R_leg_kn_p



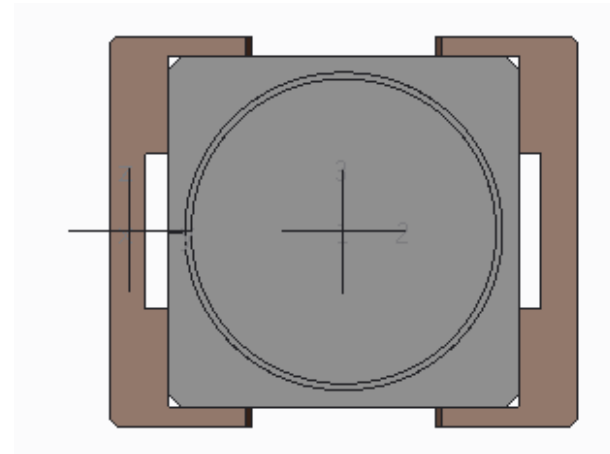
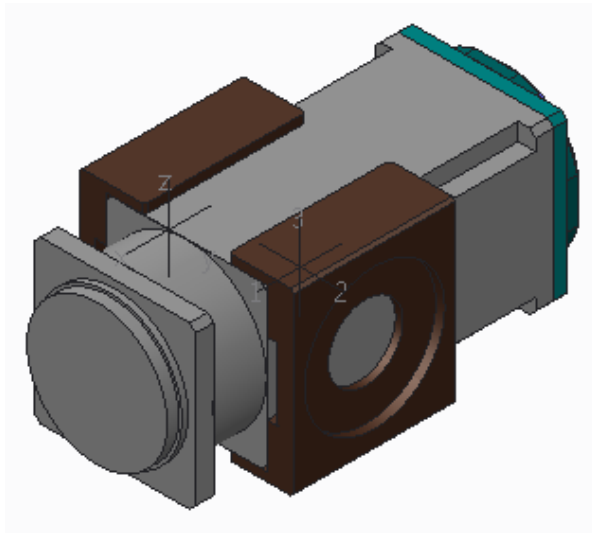
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|-------|--------|------------------|----------|----------|---------|----------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 21 | r leg kn p | 2.401 | -0.002 | 0.066 | -0.183 | 0.01971 | -0.00031 | -0.00294 | 0.01687 | -0.00140 | 0.00574 |



Physical Data



Mass R_leg_an_p



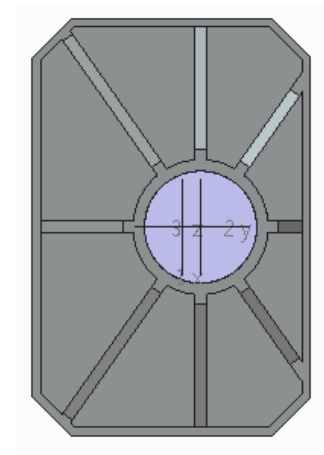
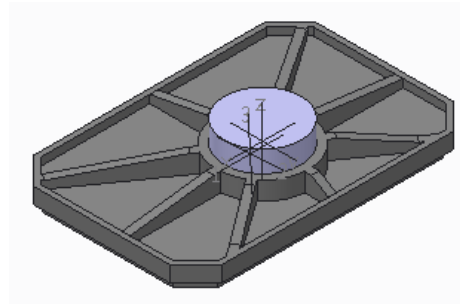
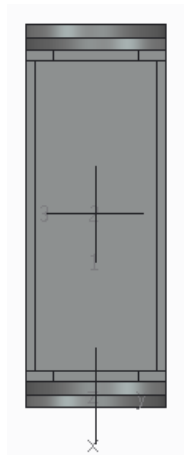
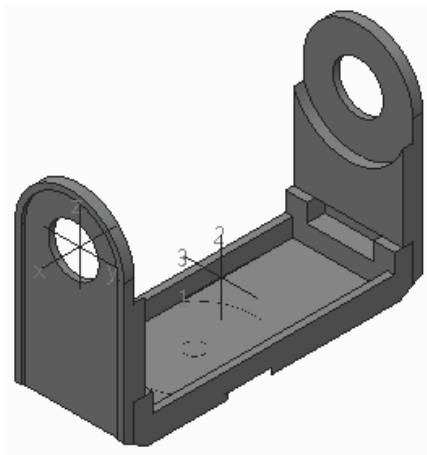
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|-------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 23 | r leg an p | 1.045 | -0.011 | 0.033 | 0.000 | 0.00056 | 0.00000 | 0.00000 | 0.00168 | 0.00000 | 0.00171 |



Physical Data



Mass R_leg_an_r



| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|--------|--------|------------------|---------|----------|---------|----------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 25 | r leg an r | 0.223 | -0.070 | 0.000 | -0.048 | 0.00022 | 0.00000 | -0.00001 | 0.00099 | 0.00000 | 0.00091 |
| | r leg foot | 1.689 | 0.000 | -0.009 | -0.013 | 0.00219 | 0.00000 | 0.00000 | 0.00433 | -0.00011 | 0.00609 |

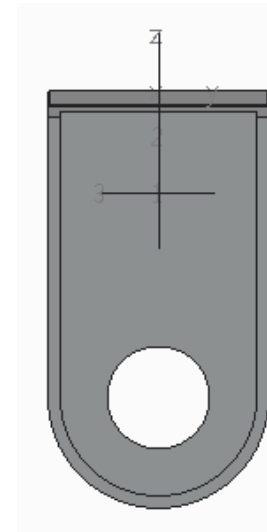
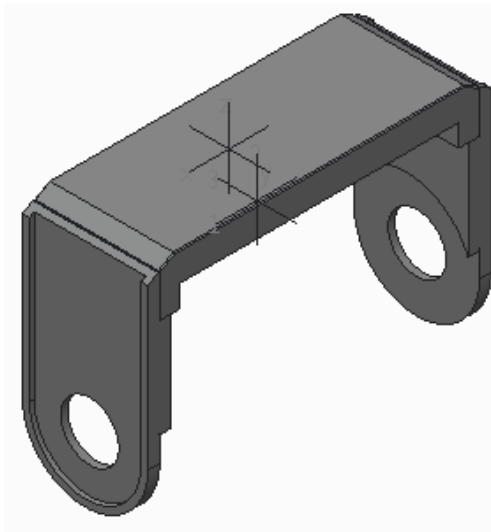


Physical Data



Mass

L_leg_hip_y



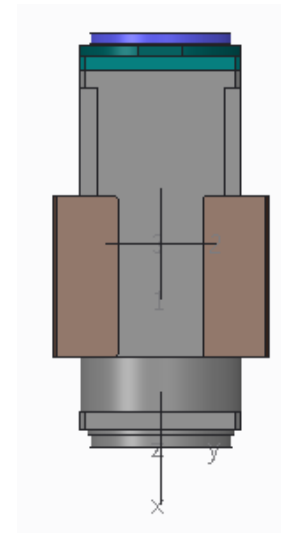
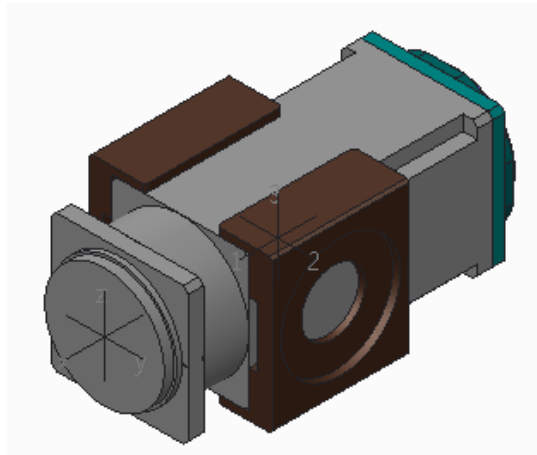
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-------------|-----------|---------|-------|--------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 16 | l leg hip y | 0.243 | 0.012 | 0.000 | -0.025 | 0.00024 | 0.00000 | 0.00000 | 0.00101 | 0.00000 | 0.00092 |



Physical Data



Mass L_leg_hip_r



| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-------------|-----------|---------|-------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 18 | l leg hip r | 1.045 | -0.068 | 0.000 | 0.000 | 0.00056 | 0.00000 | 0.00000 | 0.00168 | 0.00000 | 0.00171 |

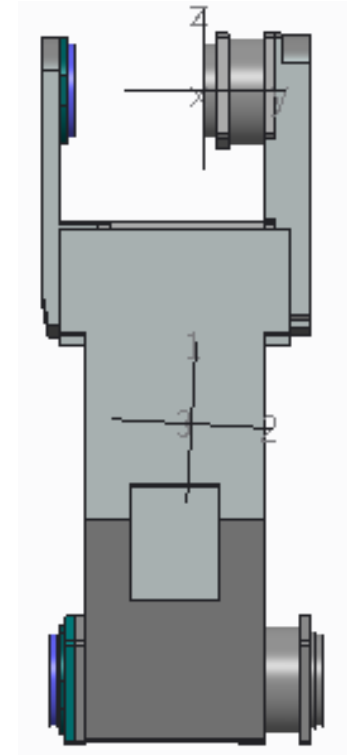
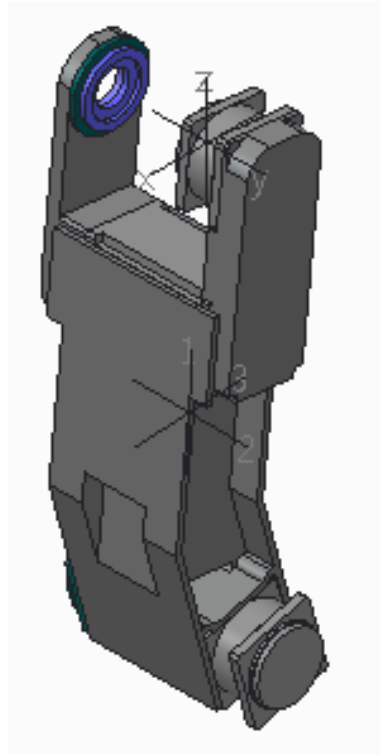


Physical Data



Mass

L_leg_hip_p



| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|-------------|-----------|---------|--------|--------|------------------|---------|---------|---------|----------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 20 | l leg hip p | 3.095 | 0.022 | -0.007 | -0.168 | 0.04328 | 0.00028 | 0.00288 | 0.04042 | -0.00202 | 0.00560 |

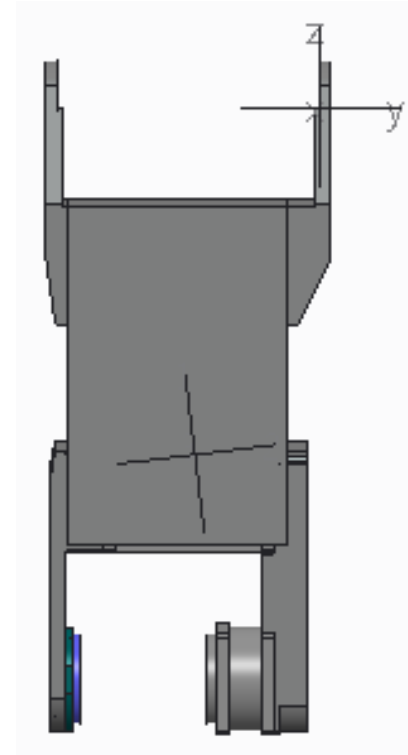
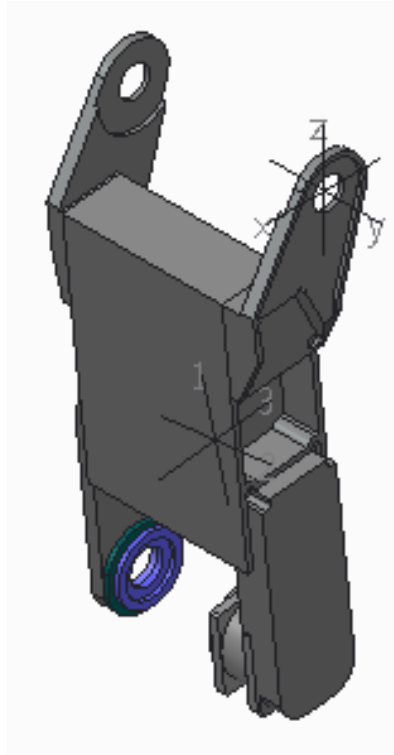


Physical Data



Mass

L_leg_kn_p



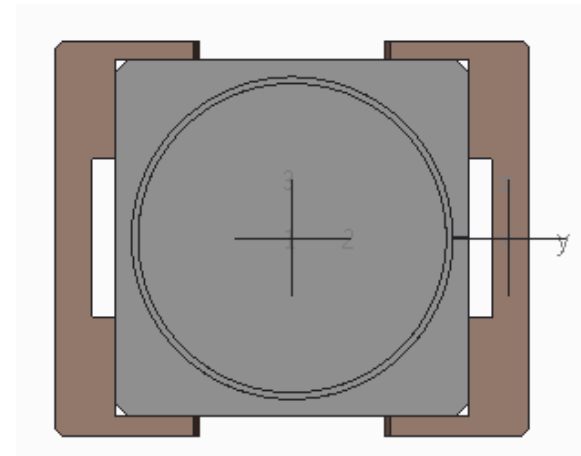
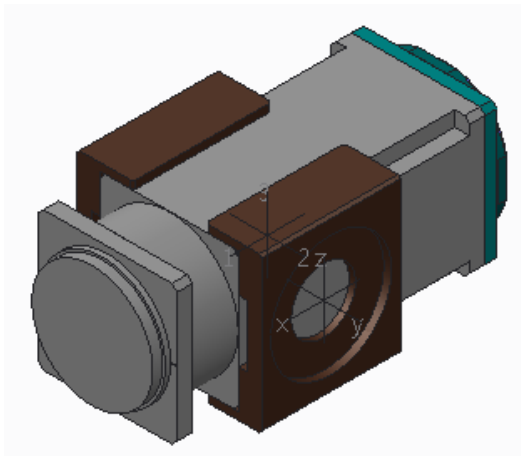
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|--------|--------|------------------|---------|----------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 22 | l leg kn p | 2.401 | -0.002 | -0.066 | -0.183 | 0.01971 | 0.00031 | -0.00294 | 0.01687 | 0.00140 | 0.00574 |



Physical Data



Mass L_leg_an_p



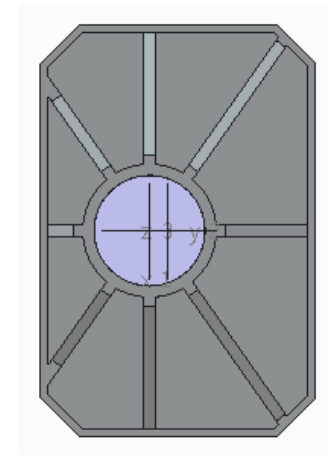
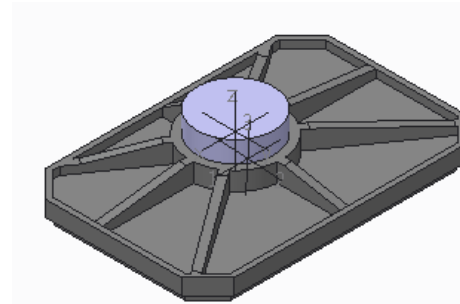
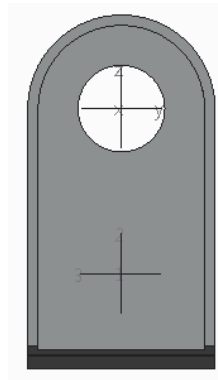
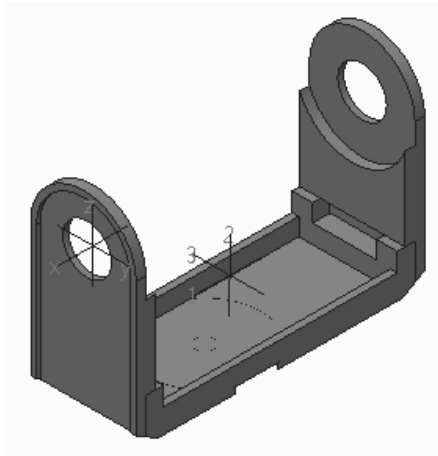
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|--------|-------|------------------|---------|---------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 24 | l leg an p | 1.045 | -0.011 | -0.033 | 0.000 | 0.00056 | 0.00000 | 0.00000 | 0.00168 | 0.00000 | 0.00171 |



Physical Data



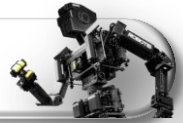
Mass L_leg_an_r



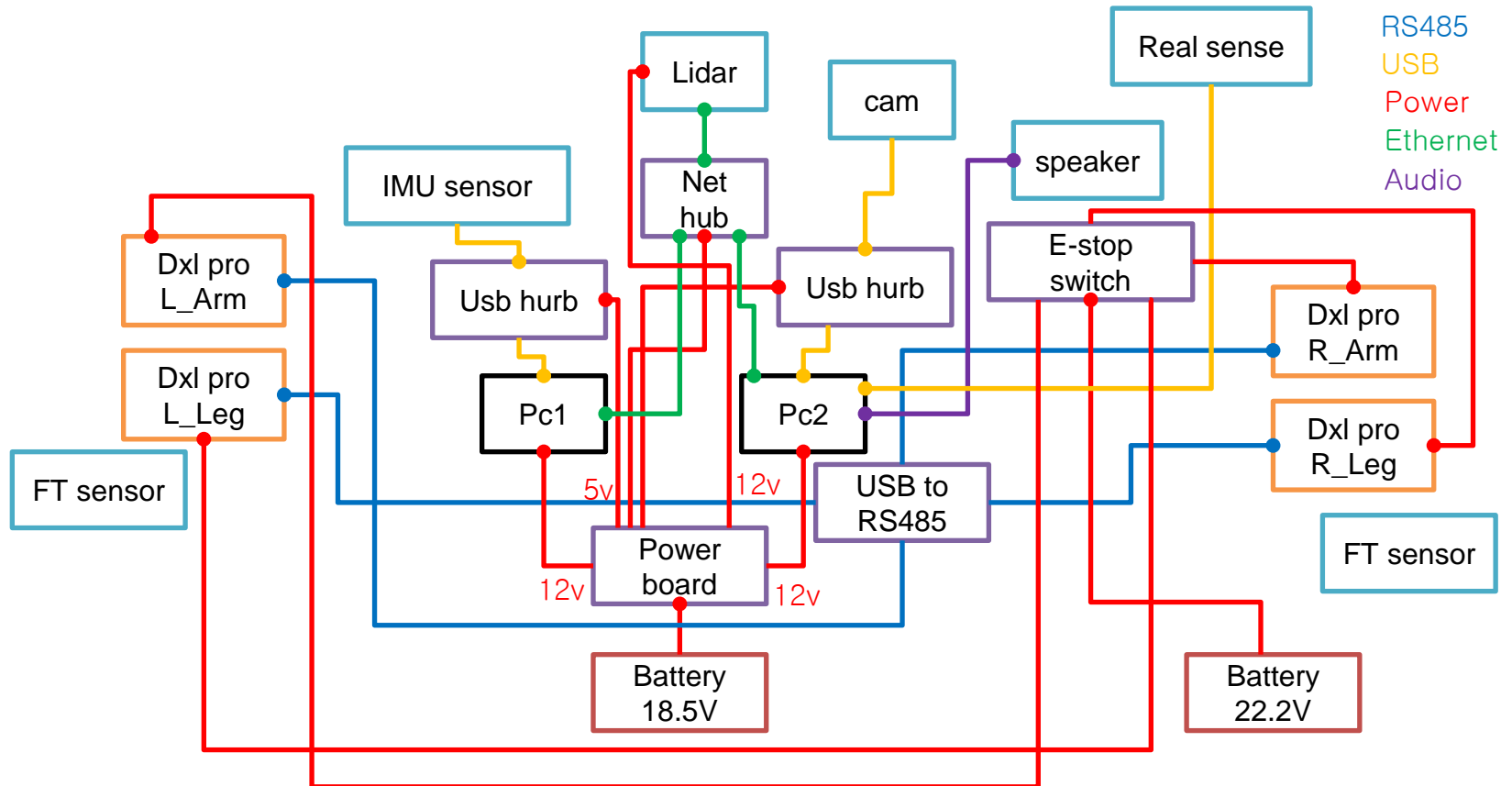
| ID | JointName | Mass [kg] | COM [m] | | | Inertia [kg*m^2] | | | | | |
|----|------------|-----------|---------|-------|--------|------------------|---------|----------|---------|---------|---------|
| | | | x | y | z | xx | xy | xz | yy | yz | zz |
| 26 | l leg an r | 0.223 | -0.070 | 0.000 | -0.048 | 0.00022 | 0.00000 | -0.00001 | 0.00099 | 0.00000 | 0.00091 |
| | l leg foot | 1.689 | 0.000 | 0.009 | -0.013 | 0.00219 | 0.00000 | 0.00000 | 0.00433 | 0.00011 | 0.00609 |



Electrical System Diagram (1)



Whole System





Electrical System Diagram (2)



DXL PRO System

