Team **noon** Hardware Specification - Robot "Minuit 1"

Data marked in italics may be estimates or subject to change.

> Overview

Height (Htop)	*60±5 cm*
Weight (M)	*~2 kg*
BMI	*5.5*

Arms and legs are constructed from CFRP tubes. Joints and torso are primarily 3D-printed (PLA/resin), with selected aluminum components. Silicone elastic elements may be introduced.

> Actuators

We are using two types of motors;

- Low Power: low-torque servo motors (>2 kg·cm, *e.g.* *Turnigy DMC809*)
- High Power: **maxon ECX Flat 22 L** (37W) with custom 1:60 spiroid gearboxes

	DoF	Actuator Type
Head	1	Low Power
Arms	2 x 3	Low Power
Legs	2 x 6	3 x Low & 3 x High Power (per leg)

Total DoF: 19

> Compute, Sensing & Electronics

We are utilising the following components:

- CPU: **CVITEK CV1800B** dual-core RISC-V (1GHz, 0.5TOPs NPU)
- MCUs: 6x **WCH CH32** RISC-V (distributed)
- Vision: **onsemi AR0237CSSC12SHRA0-DR** (1080p@60 RGB, rolling shutter)
- IMU: **TDK InvenSense ICM-42607-P** (3-axis accelerometer & 3-axis gyroscope)
- Motor driver: ***TI MCT8316Z-Q1*** (8A peak trapezoidal BLDC driver)
- Communication: CAN Bus (**NXP TJA1051TK/3/1J**)

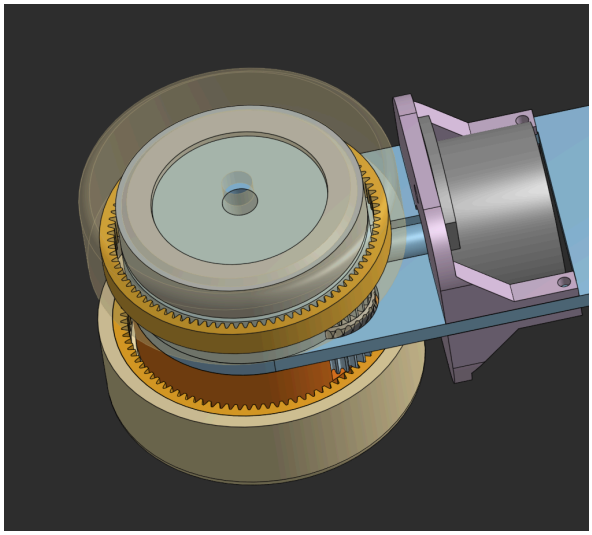
The high-power joints additionally include magnetic absolute angle sensors and force sensors.

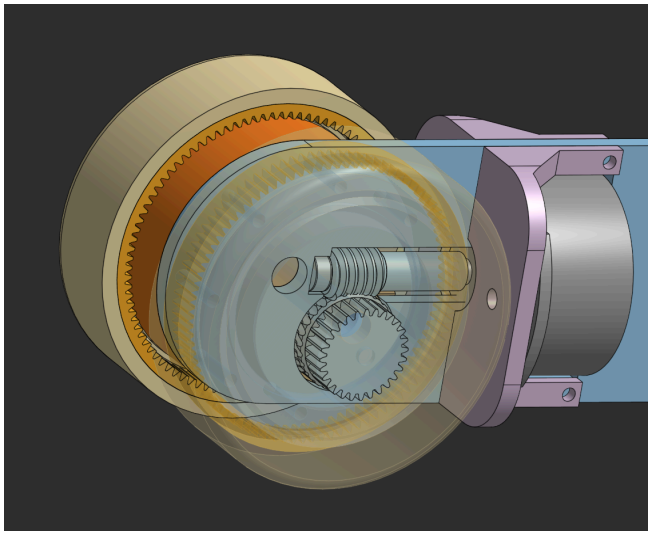
Each robot has 2 redundant *5S1P* fully integrated 18650-based Li-Ion battery packs with around 50Wh of capacity. Candidate cells include ***Molicel INR-18650-P30B*** cells, however we are testing the Samsung INR18650-35E cells as moderate, safe alternatives.
We have multiple power stages, each monitored and protected for ensuring safe operation.

All of our work is open-source on our GitHub and OnShape

> Robot Render

The high-power joints are currently being redesigned, so a complete robot render is not yet available.
We therefore included renders of the previous high-power actuator design for reference.





Here’s an actuator overview, with high-power actuators highlighted in red and the remaining joints using low-power actuators.