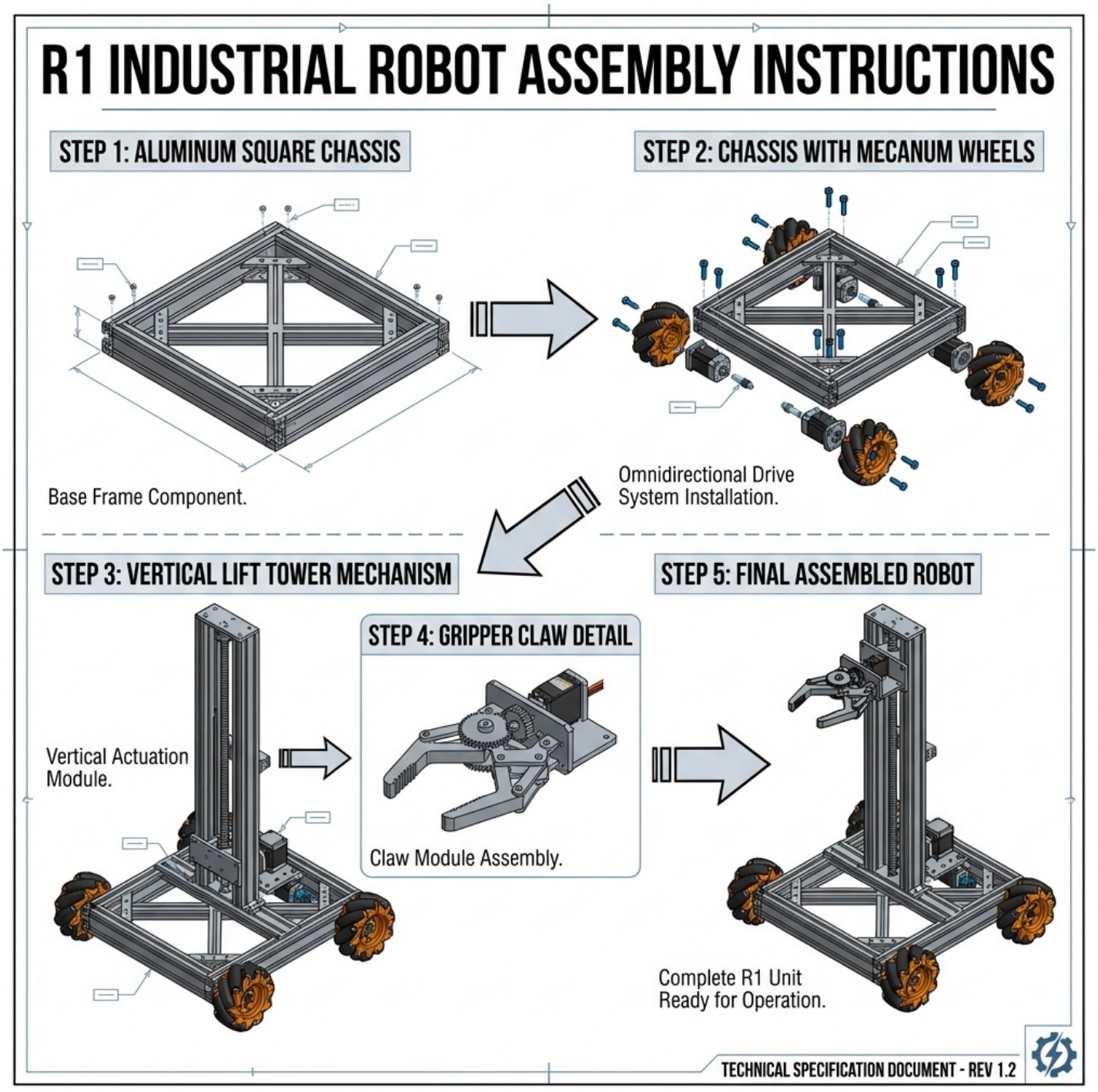
ABU Robocon 2026 - R1 Robot Build Guide

R1 Industrial Robot - Mechanical Assembly



Target Spec: 1000mm x 1000mm Base | 50kg Limit | Mecanum Drive | Vertical Lift

Phase 1: Chassis Frame Assembly (The Foundation)

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Goal: Build a rigid 900mm x 900mm square frame.

Materials:
- Profile: 40mm x 40mm T-Slot Aluminum Extrusion (Series 40)
- Fasteners: M8 T-nuts, M8 x 16mm Hex Socket Head Screws, 90 deg Custom Corners

Steps:
1. Cut Profiles: 2x @ 900mm (Side beams), 2x @ 820mm (Front/Back beams).
2. Assemble Outer Frame: Assemble in a perfect square using corner brackets. Verify diagonals match (~1216mm).
3. Cross Bracing: Install central cross-brace for structural rigidity and battery mounting.

Phase 2: Drivetrain (Mecanum System)

Goal: Install 4 independent wheel modules.

Components:
- Wheels: 4x 152mm (6") Heavy Duty Mecanum
- Motors: 4x Planetary Gear DC Motors (24V, ~300 RPM)
- Mounts: L-shape Steel Brackets

Steps:
1. Mounting: Bolt motors 100mm from corners.
2. Alignment: Ensure wheel rollers form an "X" pattern when viewed from top center.

Phase 3: Lift Mechanisms (The Tower)

Goal: Create a vertical linear actuator with ~600-800mm travel.

Materials:
- Mast: 2x 2040 Extrusions @ 1000mm
- Linear Motion: 2x MGN15 Rails + 1x SFU1605 Ball Screw
- Motor: NEMA23 Stepper with flexible coupler

Steps:
1. Tower Construction: Mount vertical posts centrally on cross-brace.
2. Rails: Align linear rails perfectly parallel to avoid binding.
3. Drive: Connect stepper motor at base to ball screw.

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Phase 4: End Effector (The Hand)

Goal: Gripper compliant with 30mm diameter staff.

Materials:
- Jaws: 3D Printed V-blocks with rubber lining
- Actuator: High-torque Servo or Pneumatic Cylinder

Steps:
1. Assembly: Mount jaws to sliding carriage plate.
2. Clearance: Ensure gripper clears the frame when fully lowered.

Phase 5: Complete Assembly

Goal: Final Integration.

Checklist:
1. Wiring: Route all cables through t-slot channels where possible.
2. Battery: Mount low to maintain center of gravity.
3. Safety: Cover sharp aluminum edges with end caps.