

THE GROVE SG90 MICRO SERVO

Rotation range	≈ 0 – 180°
Torque	≈ 1.2 – 1.8 kg·cm
Operating voltage	4.8 – 6 V
Size	32 × 12 × 30 mm
Weight	≈ 9 g

DESIGN CONSTRAINTS & TIPS

- Keep moving mass light (< 20 g).
- Minimize friction (use loose fits, smooth surfaces; wax / graphite helps).
- Avoid full 180° sweeps with heavy loads (best in ~60° – 150° range).
- Test your mechanism before finalizing your design.

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Designing Robots for CyberPLAYces
SG90 Micro Servo Motion & Mechanism Reference

Given SG90's torque (1.2-1.8 kg-om) and 180° rotation range, here's what's realistically achievable with lightweight materials like corrugated plastic and laser-cut acrylic:

Direct Rotation Mechanism (Simplest)

- Flag/flap raising - a small, corrugated plastic panel pivots up/down
- Rotating disc/wheel - a disc spins partially to reveal different faces/colors/symbols.
- Pointer/dial needle - servo arm directly becomes a pointer (indicating e.g., mood or status)
- Simple door/lid - a small, hinged flap or lid (corrugated plastic, lightweight) opens/ closes on the servo's axis

Rack-and-Pinion (Acrylic, Laser-Cut) with SG90 driving a small pinion gear

- Linear slider - converts rotation into back-and-forth linear motion for a sliding panel, drawer, or shutter
- Elevator/lift - a lightweight platform rides up/down a vertical rack (very limited height/weight)
- Sliding curtain/blind - pulls a small lightweight "curtain" (thin acrylic or fabric) across an opening

Caution: Rack-and-pinion multiplies mechanical complexity/friction. SG90's modest torque means keep the rack very light and minimize friction (ensure laser-cut parts are well-fitted, not binding) or the servo may stall.

Gear Train (Modest Gear Ratios)

- Turning a larger gear via a small gear on the servo shaft -to rotate a larger wheel/disc more than 180°
- Worm gear mechanisms - holds position without constant power draw - for a mechanism that needs to "hold"

Linkage-Based Motion (Converts Rotation to Different Motion Types)

- Four-bar linkage - converts rotation into a more complex motion path (e-g., a "nodding" or "waving" gesture)
- Crank-slider mechanism - converts rotation into a back-and-forth "pecking" or "poking" motion
- Cam mechanism - an irregularly-shaped cam on the servo shaft can create variable, non-uniform motion

Playful/Expressive Actuations using some of the mechanisms above and others

- "Peek-a-boo" mechanism - a small character or shape pops up/hides behind a panel
- Wagging/wiggling motion - rapid partial rotation back and forth simulates a "tail wag" or excited gesture
- Tilting platform - a small platform tilts to roll/move a lightweight object (ball, bead)
- Petal/flower opening — multiple light corrugated "petals" linked to open outward from a central point

Find further inspiration and practical information at www.507movements.com