ShadeSync — Budget-Fit Bill of Materials (BOM)

Totals are ballpark and vary slightly by seller.

Totals Summary

Section	Subtotal
Shared base (reuse for all)	$187.01
Add vertical (5 rollers)	$200.10
Add horizontal tilt	$62.29
Shared + Vertical	$387.11
Shared + Horizontal	$249.30
Shared + Vertical + Horizontal	$449.40

Shared base (buy once, reused for both builds)

Item	Qty	Unit	Ext.	Notes / Purpose
BIGTREETECH SKR 1.4 (control board) *(Zyltech)*	1	$24.95	$24.95	Main controller for up to 5 steppers; STEP/DIR outputs, endstops, 24 V input.
TMC2209 stepper drivers (5-pack) *(Wuxn3D)*	1	$29.99	$29.99	Silent, reliable drivers; one per motor axis (x5).
ESP32 DevKitC (Wi-Fi/BLE) *(Digi-Key)*	1	$10.00	$10.00	Mobile app + weather logic; sends commands to

				SKR (UART/GPIO).
Mean Well LRS-200-24 (24 V PSU) *(Mouser)*	1	$23.30	$23.30	Clean 24 V power for motors and drivers.
Pololu D36V28F5 (5 V buck, 3.2 A) *(Pololu)*	1	$21.95	$21.95	Steps 24 V down to 5 V for ESP32 and sensors.
22 mm latching Emergency Stop (1NO/1NC) *(Amazon)*	1	$13.99	$13.99	Safety cutoff; wire inline on AC hot feeding the PSU.
WAGO 221-413 Lever Nuts (3-conductor, 50-pack) *(Amazon)*	1	$19.84	$19.84	Safe, tool-less splitting of 24 V / GND to modules.
18 AWG silicone wire kit (multi-color) *(Amazon)*	1	$18.00	$18.00	Power wiring from PSU to SKR/drivers; color-coded.
JST-XH connector kit / pre-crimp leads *(Amazon)*	1	$9.99	$9.99	Connect motors, endstops, and sensors to headers cleanly.
Hammond 1591 enclosure (size to fit) *(Amazon)*	1	$15.00	$15.00	Mount PSU, SKR, ESP32, E-stop; keeps wiring safe.

Section subtotal: $187.01

Build A — 5 independent vertical rollers (add to shared base)

Item (clickable)	Qty	Unit	Ext.	Notes / Purpose
NEMA-17 stepper 17HS19-1684S1 (45 N·cm) *(StepperOnline)*	5	$10.44	$52.20	One motor per roller lane.
6061-T6 aluminum tube, 1" OD x 0.058" wall (36") *(OnlineMetals)*	2	$28.95	$57.90	Cut into five roller cores; deburr ends.
608ZZ bearings (10-pack) *(Amazon)*	1	$10.00	$10.00	Two bearings per roller for smooth support.
Flexible shaft couplers 5 mm -> 5 mm (5-pack) *(Amazon)*	1	$15.00	$15.00	Couple motor shafts to roller hub inserts.
NEMA-17 L-brackets (5-pack) *(Amazon)*	1	$18.00	$18.00	Rigid mounting of motors to the wooden frame.
Omron V-153-1C25 long-lever limit switch *(Mouser)*	10	$4.70	$47.00	Top/bottom endstops for each lane (2 per roller).

Section subtotal: $200.10

Build B — Horizontal tilt bar (add to shared base)

Item (clickable)	Qty	Unit	Ext.	Notes / Purpose

NEMA-17 stepper 17HS19-1684S1 (45 N·cm) *(StepperOnline)*	1	$10.44	$10.44	Drives the common tilt shaft.
8 mm linear steel shaft (~400 mm) *(Amazon)*	1	$20.49	$20.49	Common tilt bar across slats.
KP08 pillow blocks (8 mm, pair) *(Amazon)*	1	$12.00	$12.00	Shaft supports at ends; keeps alignment.
Flexible shaft coupler 5 mm -> 8 mm *(Amazon)*	1	$8.00	$8.00	Couple motor (5 mm) to 8 mm tilt shaft.
Omron V-153-1C25 long-lever limit switch *(Mouser)*	2	$5.68	$11.36	CW/CCW tilt endstops (2 total).

Section subtotal: $62.29

Connection Overview (how the parts are used)

- AC mains -> Emergency-stop (series on hot) -> Mean Well LRS-200-24 PSU -> 24 V to SKR and TMC2209 drivers.
- PSU -> Pololu 5 V buck -> ESP32 5 V and any sensors.
- ESP32 communicates with SKR (UART or STEP/DIR GPIO) and hosts the mobile/HTTP API + weather logic.
- Vertical build: each lane uses 1x NEMA-17, a 5->5 mm coupler to a 1" aluminum roller, with 608ZZ bearings and two limit switches (top/bottom).
- Horizontal build: one NEMA-17 -> 5->8 mm coupler -> 8 mm shaft on KP08 pillow blocks; two limit switches (CW/CCW).