PRE-TEST VALIDATION PLAN

Pantry Robot End Effector

Purpose: check shelf-safe grasping before moving from CAD to full assembly.

Status

CAD model + validation plan. Physical testing has not started yet.

PRE-TEST

Validation Requirements

R1 - Shelf clearance	Approach a pantry item without hitting the shelf lip or side wall.
R2 - Stable grasp	Hold and pull a representative can or box from a shelf mockup.
R3 - Mechanical stiffness	Wrist adapter, fasteners, and fingers do not loosen or over-flex.
R4 - Service routing	Cable path avoids pinch, rubbing, and sharp bends through travel.

Test Plan

T1 - CAD and mockup clearance

PLANNED

Method: check gripper path against can, shelf lip, and side wall; confirm with calipers on shelf mockup.
Pass: no visible collision; initial target is at least 0.25 in approach margin.

T2 - Static grip hold

PLANNED

Method: grip a representative pantry item for 10 sec; record mass, aperture, pad material, and slip.
Pass: no drop, no slip, no finger pad peel, and no visible joint movement.

T3 - Pull-out load

PLANNED

Method: use a spring scale while pulling the item in the shelf-removal direction.
Pass: initial slip target is at least 1.5x measured object weight.

T4 - Stiffness and fasteners

PLANNED

Method: apply a small fingertip load, mark fasteners, then inspect bracket movement after cycling.
Pass: target deflection under 5 mm; no screw movement or bracket cracking.

T5 - Cycle and cable route

PLANNED

Method: run 25 open/close cycles with dummy cable installed through the planned motion range.
Pass: no binding, cable pinch, cable rub, or fastener movement.

Test notes to collect

Photos, 10 sec hold clip, scale reading, aperture, object mass, deflection, and failure mode.

Decision gate

Integrate after T1-T5 have recorded pass/fail results and next CAD changes.