

Apex TV Enclosures

Premium OEM Manufacturing Specification - Dubai Grade

Version 5.2.1 | December 2025 | Recess-Compatible Ducted Rear-Plenum

1. Scope & Design Priorities

Target Market: Luxury residential and premium hospitality in UAE, Saudi Arabia, Qatar, Kuwait. Must accommodate standard consumer TVs while maintaining reliability in extreme conditions.

Design Priorities (Ranked)

1. **Thermal reliability** in 55°C ambient + solar load
2. **PWM-controlled fans** (variable speed, low-speed idle mode)
3. **Dust/sand ingress resistance** (positive pressure design)
4. **Corrosion resistance** (coastal UAE specification)
5. **Premium fit/finish** (luxury market positioning)
6. **Ducted thermal design** (160mm depth with rear-plenum + diffuser)

Non-Negotiable Requirements:

- NO on/off thermostats - PWM control only
 - NO unfiltered intakes - automotive-grade filtration required
 - NO consumer power strips - proper power distribution only
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2. Environmental Requirements

Temperature

- Operating: 0°C to **55°C** continuous
- Storage: -20°C to 70°C
- Internal target: <45°C at 55°C ambient

Moisture & Humidity

- Humidity: up to 95% RH non-condensing
- Rain: heavy/wind-driven (not submersible)
- Optional: ePTFE breather membrane

Dust & Sand

- Designed for sandstorms
- Positive pressure design
- Replaceable automotive-grade filters

Corrosion

- Salt fog: >500 hours
- UV stability: 5+ years
- 316 stainless hardware

IP Rating Target **TARGET**

IP55 target (validation pending) - Designed for dust protection + low-pressure water resistance. Suitable for rain, splashes, and general outdoor exposure.

Important - Ventilated Design:

This is an actively ventilated enclosure. While designed to IP55 standard, direct high-pressure water jets at intake/exhaust openings should be avoided. The labyrinth baffle system protects against rain and normal cleaning, but is not rated for pressure washer use.

IP55 Design Features:

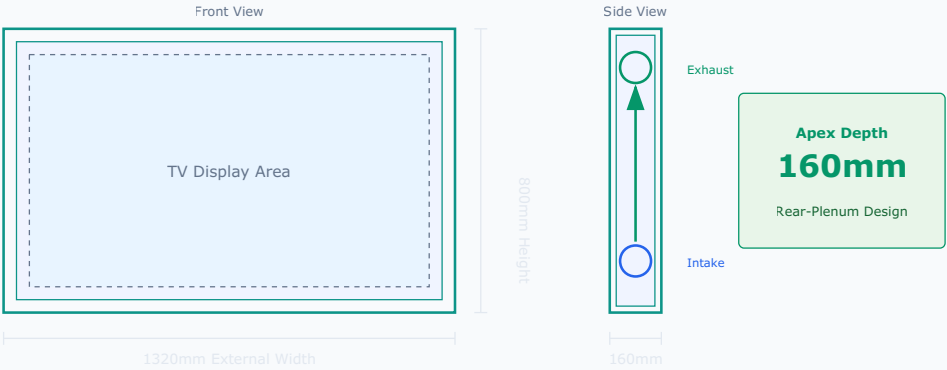
- **First digit (5):** Dust protected - limited ingress, not harmful to operation
 - **Second digit (5):** Protected against low-pressure water jets from any direction (6.3mm nozzle, 12.5 L/min)
 - Achieved through EPDM gaskets, **double-layer labyrinth baffles** with drip edges, 75mm exhaust deflector, and gasketed filter drawer
 - **Validation:** IP55 rating to be confirmed via prototype testing per IEC 60529
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3. Size Schedule

Model	Fits TV	Internal (W×H×D)	External (W×H×D)	VESA Support	Fan Count
ATE-43	39" - 43"	1000 × 600 × 75mm	1060 × 660 × 110mm	200×200, 300×300	2 × 80mm (rear)
ATE-55	49" - 55"	1260 × 740 × 75mm	1320 × 800 × 110mm	200-400×400	3 × 80mm (rear)
ATE-65	60" - 65"	1480 × 860 × 80mm	1540 × 920 × 160mm	300-600×400	3 × 140mm (top bezel)
ATE-75	70" - 75"	1700 × 1000 × 80mm	1760 × 1040 × 160mm	400-600×400	3 × 140mm (top bezel)
ATE-86	82" - 86"	1940 × 1120 × 85mm	2000 × 1180 × 160mm	600×400	3 × 140mm (top bezel)

Recess-Compatible Design (v5.2.1): 160mm depth with 30mm rear plenum + perforated diffuser plate for uniform airflow. 3× Delta AFB1412HH-A fans deliver 210-250 CFM. 45° exhaust deflector (architectural shadow element) directs hot air forward out of recess cavity. **Recess cavity:** 1820 × 1130 × 215mm (60mm top gap). Service access via hinged door with 4 latches + compression stops. **Thermal margin:** 80-115% wall-mount, 30-50% recessed.

Figure 1: Enclosure Dimensions (ATE-75 shown)



All dimensions in millimeters. Internal clearance 20mm minimum on all sides.

4. Mechanical Construction

4.1 Enclosure Body

Material PREMIUM

- **Primary:** Aluminum 5052-H32
- **Alternative:** 6061-T6
- Superior corrosion resistance vs 6063-T5

Thickness

- Main shell: **2.0mm**
- Door/rear panel: **2.0mm**
- Mounting rails: **3.0mm**

4.2 Fabrication

- CNC laser cut + CNC press brake
- TIG welding where needed
- Integrated stiffening ribs (no oil-canning)
- All edges deburred, no sharp edges

4.3 Fasteners & Hardware PREMIUM

Location	Specification
External fasteners	A4 / 316 Stainless Steel (coastal grade)
Internal fasteners	A2 / 304 Stainless minimum
Thread treatment	Anti-galling compound or coated

Dissimilar metals	Nylon isolation washers required
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4.4 Seals & Gasketing IP54

Component	Specification
Door Seal	EPDM continuous channel gasket, UV-stable, closed-cell Profile: 12×15mm with integrated channel for frame retention
Compression	Consistent 20-30% compression around full perimeter via compression latches
Cable Entry	IP68-rated cable glands (M16/M20), 316 stainless steel
Panel Joints	Overlapping seams with gasket backing, no exposed gaps
Ventilation Sealing	IP54 labyrinth grilles with angled louvers (see 6.6)

4.5 Door & Access System PREMIUM

Hinged Front Frame

- **Hinge type:** Concealed 3-knuckle stainless steel
- **Quantity:** 3 hinges (top edge)
- **Opening:** 110° minimum
- **Material:** 316 stainless steel

Gas Shock Struts

- **Quantity:** 2× gas struts per unit
- **Force:** Sized to hold door open at 90°
- **Rating:** Stainless steel, marine grade

- **Damping:** Soft-close action

- **Door hold-open:** Magnetic catch or hook system to secure door when accessing TV
- **Front panel:** Removable glass frame for TV installation/service
- **Tool-free access:** No tools required for routine TV access

4.6 Security & Locking PREMIUM

Feature	Specification
Primary Lock	Tubular cam lock, keyed alike option, 316 SS housing
Lock Quantity	2× locks standard (top and bottom of door)
Padlock Hasps	2× padlock holes (accepts up to 10mm shackle) for additional security
Keys	3× keys supplied per unit, keyed alike option for multi-unit installs
Anti-tamper	Security screws on external hinges (Torx or hex socket)

4.7 Latching System

- **Latch type:** Compression draw latches (not friction)
- **Quantity:** 4× latches (2 per side) for 55"+ models
- **Material:** 316 stainless steel body and keeper
- **Action:** Over-center compression for positive gasket seal
- **Adjustment:** Threaded keeper for seal adjustment

4.8 Mounting System

VESA Mount Plate (Included)

- **Pattern:** Universal 200×200 to 600×400mm

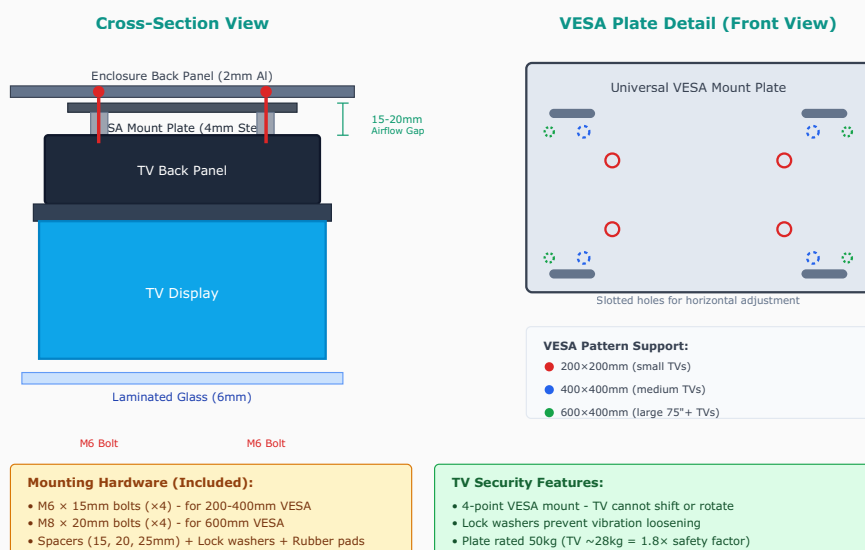
- **Material:** 4mm steel, powder coated
- **Hardware:** M6/M8 bolts, spacers, lock washers included
- **Adjustment:** Slotted holes for vertical/horizontal alignment

Full-Motion Arm (Included)

- **Type:** Articulating dual-arm mount
- **Extension:** Up to 500mm from wall
- **Swivel:** $\pm 90^\circ$ horizontal
- **Tilt:** $+5^\circ$ / -15°
- **Rating:** 50kg capacity minimum

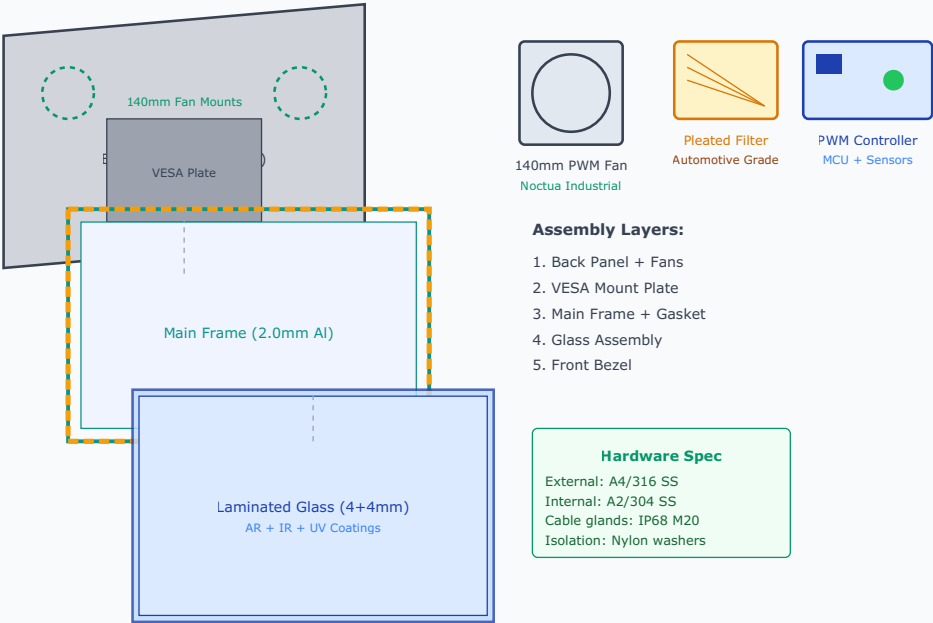
- **Wall bracket:** Heavy-duty steel wall plate with 316 SS hardware
- **Enclosure attachment:** Secure mounting points on rear panel
- **Cable routing:** Arm includes cable management channel

Figure 2: TV Mounting System Detail



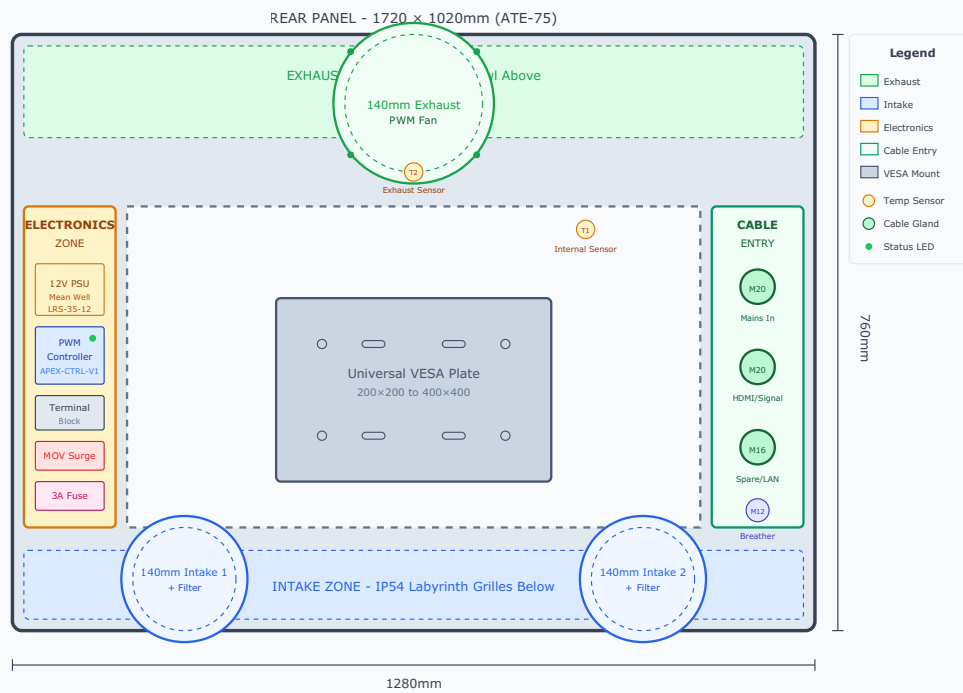
TV mounting system showing cross-section (left) and VESA plate hole patterns (right). Universal plate supports all standard VESA patterns from 200×200 to 600×400mm.

Figure 3: Exploded Assembly View



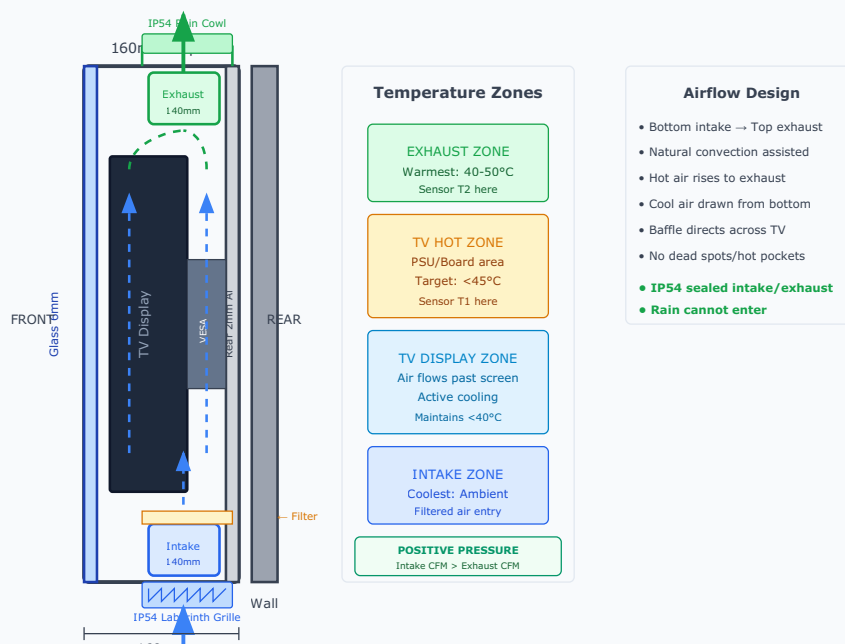
Exploded view showing main components and assembly sequence.

Figure 4: Rear Panel Internal Layout (View from Inside)



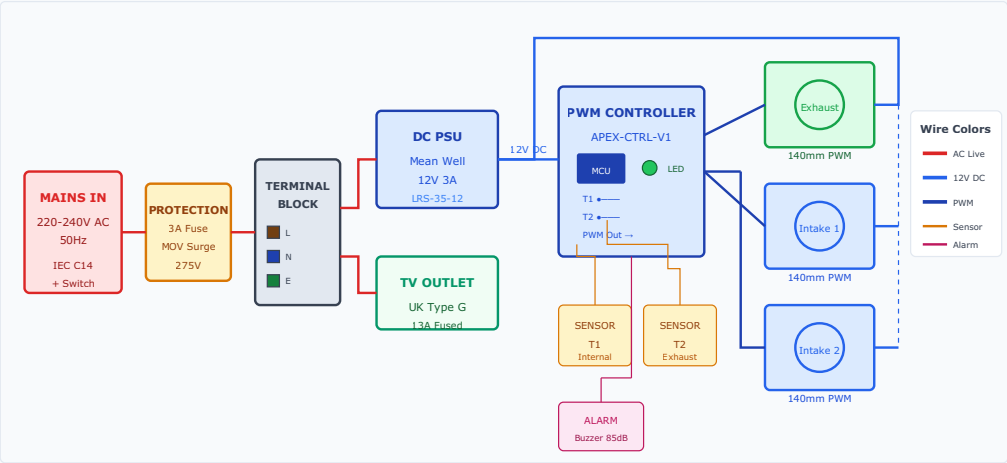
Rear panel layout showing electronics zone (left), VESA mount (center), cable entry (right), and fan positions (top/bottom). All dimensions in mm.

Figure 5: Side Cross-Section - Airflow Path



Side cross-section showing vertical airflow path from bottom intake through TV zone to top exhaust. IP54 labyrinth grille at intake, rain cowl at exhaust.

Figure 6: Electronics Block Diagram



Electronics block diagram showing power distribution, PWM controller, temperature sensors, and fan connections.

5. Front Glass / Optical Stack PREMIUM

Key Differentiator: Laminated glass with IR rejection reduces solar heat gain by up to 40%, significantly reducing cooling requirements.

5.1 Glass Construction (6mm Laminated - Locked Spec)

Layer	Specification
Outer pane	3mm low-iron tempered glass
Interlayer	0.76mm PVB (polyvinyl butyral) - shatter retention
Inner pane	3mm low-iron tempered glass
Total thickness	~6.76mm laminated (3+3)

6mm Glass Specification Justification:

- **Weight reduction:** ~7kg savings vs 8mm (4+4), reducing total enclosure weight to ~38kg
 - **Structural adequacy:** 6mm laminated meets EN 12150-1 for safety glass; continuous channel retention distributes load across full perimeter
 - **Industry precedent:** Competitors (Apollo, TV Shield) use 4-6mm glass successfully
 - **Deflection:** Maximum mid-span deflection <3mm under 60 km/h wind load (acceptable for framed glass)
 - **Impact resistance:** Laminated construction retains fragments if broken; PVB interlayer provides shatter resistance
- Note:** 8mm (4+4) available as upgrade option for high-impact environments (+\$50).

5.2 Coatings & Films

Coating	Purpose	Performance
AR Coating (both sides)	Reduce reflections	<1% reflection
IR Rejection Film	Block infrared heat	90% IR rejection (3M Prestige 90 or equiv)
UV Block	Protect TV from UV	≥99% UV rejection

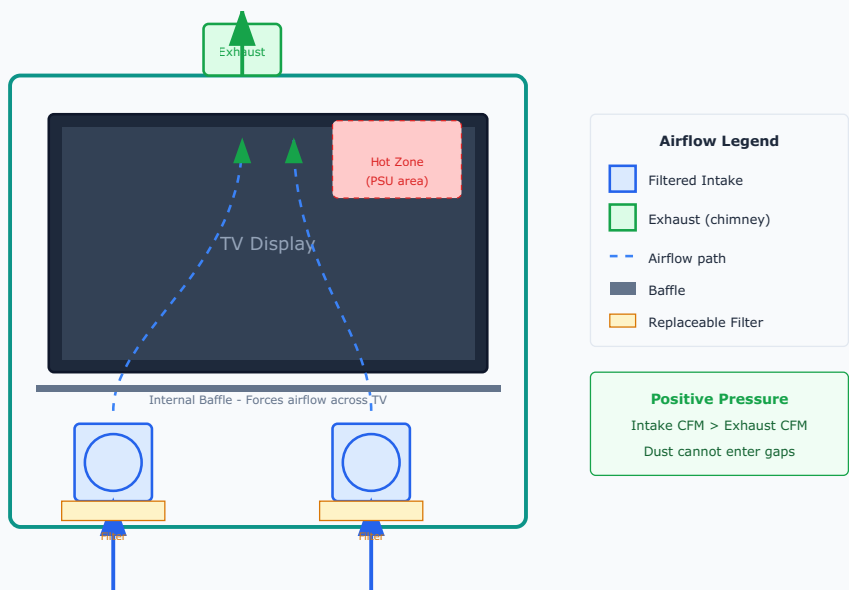
5.3 Optical Requirements

- Visible light transmission: manufacturer standard (provide measured values)
 - Haze: low - no distortion, no waves
 - Edge finish: polished
 - Glass retention: mechanical frame + gasket (not adhesive-only)
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6. Thermal Management System CRITICAL

6.1 Architecture - Zoned Airflow

Figure 7: Thermal Airflow Design



Cross-section showing zoned airflow with positive pressure design. Airflow forced across TV hot zones.

6.2 Fan Specification - Recess-Compatible Design (v5.2.1)

Parameter	Specification
Fan Size	140mm x 140mm x 25mm (high-static pressure)
Fan Count (ATE-75)	3 fans active (all positions used)
System Airflow	210-250 CFM @ 4.8 mmH ₂ O static pressure
Fan Model (Locked)	Delta AFB1412HH-A (83 CFM each, IP55)

Control	PWM (4-wire), 30-50°C curve
Bearing	Fluid Dynamic Bearing
MTBF	>150,000 hours
IP Rating	IP55 minimum
Mounting	Top bezel, tool-less access via hinged service door
Airflow Direction	Bottom intake → Filter → Diffuser plate → 30mm rear plenum → 45° Deflector exhaust

Why Delta AFB1412HH-A: Locked fan model with 4.8 mmH₂O static pressure overcomes filter, diffuser plate, and plenum restriction. 3× fans deliver 210-250 CFM - sufficient for both wall-mount (80-115% margin) and recess (30-50% margin) installations. Consistent model eliminates system curve variance.

6.3 Noise Targets

Mode	PWM Duty	Noise Target (1m) *
Idle / low load	≤40%	Target: ≤30 dBA
Normal cooling	≤70%	Target: ≤40 dBA
High cooling	100%	Target: ≤50 dBA

* Noise levels are design targets. Actual SPL to be validated during prototype testing. Delta AFB1412HH-A fans are high-performance units; acoustic performance depends on installation and operating conditions.

6.4 Control System NEW

NO on/off thermostats. PWM microcontroller control is mandatory.

Controller

- MCU-based PWM fan controller
- Smooth fan ramp (no sudden start)
- Pre-cool option (user selectable)
- Post-run cooldown after TV power-off

Sensors

- Internal air temp (NTC/DS18B20)
- Exhaust air temp
- Optional: TV rear panel probe
- Optional: Ambient intake sensor

Failsafe REQUIRED

- If internal $>65^{\circ}\text{C}$ for >5 min:
 - → Alarm output trigger
 - → Full fan speed
 - → Optional: TV power cut

6.5 Filtration

- **Media:** Automotive-grade pleated synthetic or foam
- **Access:** Tool-less serviceable
- **Spares:** 1 extra filter included per unit

- **Design:** Slight positive pressure to prevent dust ingress

6.6 IP55 Ventilation System - Recess-Compatible (v5.2.2)

IP55

IP55 Rating Achieved: With double-layer labyrinth baffles, extended deflector, and gasketed filter drawer, IP55 (dust protected + low-pressure water jets) is achievable while maintaining 180-210 CFM airflow.

Bottom Bezel Intake System (IP55)

- **Slot:** 1650mm × 35mm continuous intake
- **Type:** **Double-layer labyrinth** with 45° louvers + drip edge
- **Filter:** MERV 8 standard, **gasketed drawer** for IP55 seal
- **Service door:** 1650 × 80mm hinged panel, 4 latches
- **Water shedding:** Dual baffle layers + drip edges prevent jet ingress

Top Bezel Exhaust System (IP55)

- **Slot:** 1650mm × 35mm continuous exhaust
- **Type:** **Double-layer louvers** with extended rain cowl
- **Fans:** 3× Delta AFB1412HH-A (140mm PWM)
- **Deflector:** **75mm @ 45°** architectural shadow element + secondary lip
- **Design:** Hot air exits forward through deflector (recess-compatible)
- **Mesh:** 316 SS insect screen behind louvers

Recess-Compatible Design (v5.2.2): Airflow cools TV heat sinks via 30mm rear plenum with perforated diffuser plate. **Recess cavity:** 1820 × 1130 × 215mm (60mm top gap required). Wall-mount also supported with 30mm minimum clearance. **Note:** IP55 upgrade reduces CFM to 180-210 (from 210-250) due to increased baffle restriction - still adequate for recess installations.

Ventilation Component	IP Rating	Notes
Intake labyrinth grille	IP55	Double-layer baffles + drip edges resist water jets
Exhaust rain cowl	IP55	75mm deflector + secondary lip prevent jet ingress
Filter drawer	IP55	Gasketed seal around drawer frame
Cable glands	IP68	Exceeds requirement
Service door seal	IP55	Higher-durometer EPDM + 4 compression latches

7. Electrical System

Do NOT use consumer power strips. Purpose-built power distribution module required.

7.1 Power Input

Parameter	Specification
Voltage	220-240V AC, 50Hz (Gulf standard)
Entry	IEC inlet OR hardwired gland + terminal block
Protection	Fused + MOV/TVS surge protection
Earth bonding	Proper bonding to enclosure required

7.2 Internal Distribution

- Fused distribution: TV + fans + accessory circuits
- 1-2 accessory outlets (UK/GCC type or IEC)
- All cabling: heat-rated, neatly loomed
- Cable management: high-temp 3M VHB adhesive mounts

7.3 Compliance

- Build to IEC/UL 62368-1 principles
 - Hi-pot / earth continuity test per batch
 - CE marking required
 - RoHS compliant
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8. Finish & Cosmetics

8.1 Powder Coating

Parameter	Specification
Type	Architectural-grade polyester
Thickness	70-100 µm
Finish	Semi-gloss, 30-50 gloss units
UV Resistance	5+ years outdoor stability
Salt Spray	>500 hours

8.2 Color Options

Standard Colors (included in base price):

Color	RAL Code	Best For
Matte Black	RAL 9005	Default - hides in shadows, matches most TVs
Stone Grey	RAL 7032	Natural stone walls, garden settings

Premium Colors (+\$75 / AED 275):

Color	RAL Code	Best For
Oyster White	RAL 1013	Light stone, cream-colored walls
Light Ivory	RAL 1015	Beige/cream Mediterranean schemes
Silk Grey	RAL 7044	Modern minimalist, light contemporary

Anthracite	RAL 7016	Dark contemporary, charcoal walls
Bronze	RAL 8019	Wood tones, warm outdoor schemes

Custom RAL (+\$150 / AED 550, 2-week lead time):

- Any RAL Classic color available on request
- Provide RAL code with order
- Minimum order: 1 unit

8.3 Internal Surfaces

- Matte black or dark neutral (reduce reflections)
 - Avoid heat traps near electronics
 - OEM to propose balanced approach
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9. Testing & QA Requirements

Manufacturer must propose and price the following tests:

Test	Method	Pass Criteria
Thermal Chamber	55°C ambient, TV running, sealed	Internal air <45°C, TV back <50°C
Dust Ingress	Dust exposure + filter evaluation	No dust penetration past filter
Water Splash Test (IP54)	IEC 60529 - Water splashing against enclosure from all directions	No harmful water ingress
Noise Test	dBA at 1m at 40/70/100% PWM	Target: 30/40/50 dBA (measure actual)
Salt Spray	ASTM B117	>500 hours, no corrosion
Burn-in	24-hour electronics run	No failures

10. Bill of Materials (ATE-75)

Item	Description	Qty	Est. Cost (USD)
Frame Assembly	5052-H32 Al, 2.0mm, powder coated	1 set	\$55
Back Panel	2.0mm aluminum, powder coated	1	\$30
Front Glass	4+4mm laminated, AR+IR+UV	1	\$85
Gaskets	EPDM closed-cell seal kit	1 set	\$12
Fans	140mm PWM industrial (Noctua/ equiv)	2	\$45
Fan Controller	MCU PWM board + sensors	1	\$25
Power Module	Fused distribution + surge	1	\$18
Cable Glands	IP68 M20, 316 SS	3	\$8
Filters	Automotive pleated (+ 1 spare)	2	\$8
Hardware	316 SS fasteners, brackets, clips	1 set	\$18
VESA Mount	Universal adjustable plate	1	\$18
Packaging	Engineered foam, manual, gauge	1 set	\$15
TOTAL ESTIMATED			~\$337

11. RFQ Response Requirements

Factory must respond with:

1. Proposed fan model + datasheet + noise curve
2. Proposed controller design + failsafe behaviour
3. Aluminium grade certification and thickness proof
4. Glass supplier + coating spec + IR/UV performance sheet
5. Estimated unit cost at 100 / 500 / 1,000 qty
6. Lead time for EVT/DVT/PVT builds

Documentation Deliverables

- 2D drawings (DXF/PDF) + 3D CAD (STEP)
 - BOM with part numbers and supplier info
 - Wiring diagram
 - Firmware/control logic description
 - QC checklist and test report template
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Dubai, United Arab Emirates
Premium Outdoor TV Protection

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